



County of Santa Cruz

**Local Hazard
Mitigation
Plan
2021- 2026**

July 2021

This page intentionally left blank

Contents

Contents.....	i
How to Use this Plan.....	1
Part 1 Introduction and Community Profile	3
Chapter 1 Introduction	5
1.1 Hazard Mitigation	5
1.2 Acknowledgments.....	6
1.3 Summary	8
Chapter 2 Community Profile	12
2.1 Community Profile	12
2.2 Community Vision.....	18
2.3 Community Facilities.....	20
Part 2 The Planning Process.....	24
Chapter 3 The Planning Process.....	26
3.1 The Purpose of the Plan	26
3.2 Documentation of the Planning Process.....	27
3.3 Local Capabilities Assessment and Integration.....	33
Part 3 Hazard Identification and Risk Assessment.....	38
Risk Assessment of Hazards in Santa Cruz.....	40
Chapter 4 Earthquakes and Liquefaction.....	44
4.1 Risk Assessment	44
4.2 Mitigation Strategy.....	55
Chapter 5 Wildfires	58
5.1 Risk Assessment	58
5.2 Mitigation Strategy.....	64
Chapter 6 Floods and Coastal Storms.....	70
6.1 Risk Assessment	70
6.2 Mitigation Strategy.....	89
Chapter 7 Drought.....	97
7.1 Risk Assessment	97
7.2 Mitigation Strategy.....	102
Chapter 8 Tsunami	109

8.1 Risk Assessment	109
8.2 Mitigation Strategy.....	114
Chapter 9 Coastal Erosion	117
9.1 Risk Assessment	117
9.2 Mitigation Strategy.....	126
Chapter 10 Dam Failure.....	131
10.1 Risk Assessment	131
10.2 Mitigation Strategy.....	136
Chapter 11 Landslide.....	139
11.1 Risk Assessment	139
11.2 Mitigation Strategy.....	144
Chapter 12 Expansive Soils.....	147
12.1 Risk Assessment	147
12.2 Mitigation Strategy.....	151
Chapter 13 Climate Change	153
13.1 Risk Assessment	153
13.2 Mitigation Strategy.....	160
Chapter 14 Multi-Hazard Summary	165
Part 4 Mitigation Strategy.....	167
Chapter 15 Mitigation Strategy.....	169
15.1 Mitigation Strategy	169
Part 5 Plan Maintenance Process	202
Chapter 16 Plan Maintenance Process	204
16.1 Monitoring, Evaluating and Updating the Plan	204
16.2 Incorporation into Existing Planning Mechanisms	206
16.3 Continued Public Involvement	207
Part 6 Adoption by the Board of Supervisors	208
Appendices.....	210
Appendix A Hazards Not a Risk to Santa Cruz County	212
Appendix B Acronyms and Abbreviations.....	214
Appendix C Glossary of Terms	216
Appendix D Critical County Facilities and Emergency Shelters.....	224
Appendix E Senior Assisted Living Facilities.....	232

Appendix F Public Schools.....	234
Appendix G Private Schools	238
Appendix H Successful Programs and Projects	240
Appendix I Tsunami Response Plan Concept of Operations	242
Appendix J Tsunami Inundation Map Preparation Methodology.....	246
Appendix K Map of Urban and Rural Services Lines	250
Appendix L Mitigation Action Progress Report.....	252
Figure 1 Santa Cruz County and General Plan Boundaries	8
Figure 2 County of Santa Cruz.....	12
Figure 3 Key transportation routes in Santa Cruz County	16
Figure 4 Public Works Department critical infrastructure	20
Figure 5 Location of levee flood gates	21
Figure 6 Critical facilities throughout Santa Cruz County	22
Figure 7 Office of Response, Recovery and Resiliency structure.....	35
Figure 8 Fault zones of Santa Cruz County.....	46
Figure 9 Map of liquefaction potential in Santa Cruz County.....	47
Figure 10 Isoseismal map for the San Francisco Bay region for the 1989 Loma Prieta earthquake	49
Figure 11 Map of Fire Hazard Severity Zones	59
Figure 12 Generalized FEMA flood hazard area in Santa Cruz County	71
Figure 13 Infrastructure vulnerable to coastal storm flooding with sea level rise	79
Figure 14 Pajaro Dunes vulnerability to coastal storm flooding with sea level rise	80
Figure 15 Pajaro River flood risk map	82
Figure 16 Santa Cruz County major water purveyors.....	99
Figure 17 Tsunami inundation map	110
Figure 18 Coastal Erosion areas in Santa Cruz County.....	118
Figure 19 East Cliff Drive coastal erosion with sea level rise	121
Figure 20 Pajaro Dunes coastal erosion with sea level rise	122
Figure 21 Newell Creek Dam inundation area	133
Figure 22 Landslide hazard areas.....	140
Figure 23 Map of expansive soils	148
Table 1 Santa Cruz County property valuation and tax	11
Table 2 Temperature and rainfall averages for Santa Cruz	13
Table 3 County of Santa Cruz population, household, and economic data.....	14
Table 4 County of Santa Cruz unincorporated area population and household data	14
Table 5 2010 LHMP meeting schedule.....	28
Table 6 Summary of outreach for 2016 and 2021 LHMP update	32
Table 7 Review of all hazards relative to County of Santa Cruz.....	41
Table 8 Hazard screening for Santa Cruz County	42
Table 9 Modified Mercalli Intensity Scale.....	45

Table 10 Average repeat time and likelihood of earthquakes in the San Francisco region	50
Table 11 Earthquake potential loss inventory	53
Table 12 Residential building permits issued 2010 to 2019	54
Table 13 Recent history of wildfire in Santa Cruz County.....	60
Table 14 Fire potential loss inventory.....	62
Table 15 FEMA Special Flood Hazard Area zones and definitions	73
Table 16 Flood probability terms.....	77
Table 17 Santa Cruz County stream/river flood stages	84
Table 18 Flood insurance claims data for Santa Cruz County from January 1978 - March 2023	87
Table 19 Flood potential loss inventory.....	88
Table 20 Water suppliers within Santa Cruz County	98
Table 21 Tsunami potential loss inventory	113
Table 22 Coastal erosion potential loss inventory.....	125
Table 23 Dams in and near Santa Cruz County	132
Table 24 Dam failure potential loss inventory.....	135
Table 25 Landslide potential loss inventory	143
Table 26 Expansive soil potential loss inventory	150

How to Use this Plan

The Federal Emergency Management Agency (FEMA) has defined very specific requirements for Local Hazard Mitigation Plans (LHMPs) and this plan follows those guidelines. The organization of the Plan follows FEMA's structural requirements and includes the four following organizational levels:

Parts

Chapters

Sections

Subsections

This LHMP is organized into six primary parts and 16 chapters that follow the phases of the plan's development (and the FEMA Local Mitigation Planning Handbook, March 2013) as follows:

- Part 1 Introduction, and Community Profile
- Part 2 The Planning Process
- Part 3 Hazard Identification and Risk Assessment
- Part 4 Mitigation Strategies
- Part 5 Plan Implementation and Maintenance Process
- Part 6 Adoption by the Board of Supervisors

This LHMP has been reviewed and revised in 2021 to reflect, current information, changes in development, progress in local mitigation efforts, and changes in priorities. Plan updates are addressed within each Part.

The risk assessment (Part 3) is organized into specific hazards by chapter (Chapters 4-13.) Within each of these chapters all elements required by the FEMA Handbook are addressed and the sections and subsections of each of these chapters follow a standard section numbering pattern. Each chapter includes sections addressing the mitigation strategies applicable to the hazard. Each of the hazard risk assessment chapters contains the following subsections:

1 Risk Assessment

- 1.1 Hazard Identification
- 1.2 Hazard Profile including subsections on location, extent, previous occurrences, and probability of future events
- 1.3 Assessing Vulnerability
- 1.4 Identifying Structures
- 1.5 Estimating Potential Losses
- 1.6 Analyzing Development Trends

2 Mitigation Strategy

- 2.1 Mitigation Goals
- 2.2 Identification and Analysis of Mitigation Actions

Mitigation strategies are addressed in detail under each hazard chapter and summarized and prioritized in Part 4. Goals and actions specific to a particular hazard are included within the hazard chapter and

are labeled by hazard (e.g. Earthquake Goal 1). Goals, objectives, and actions, which apply to one or more potential hazards, are listed in Part 4.

Goals, objectives, and action items identified as part of the mitigation strategy were formulated in collaboration with County departments responsible for implementation of the actions. These goals and supporting actions are in general not new but have been taken from various plans adopted by the Board of Supervisors including, but not limited to, the Santa Cruz County Strategic Plan, the General Plan Public Safety Element, the Integrated Regional Water Management Plan, the Emergency Management Plan, the Climate Action Strategy, and the Community Wildfire Protection Plan.

Handbook sections that do not apply to the County of Santa Cruz such as multi-jurisdiction plan requirements are not included. This is a single jurisdiction plan for the County of Santa Cruz.

Each part of the LHMP includes required elements specified under Section 201.6 of Title 44 of the *Code of Federal Regulations* (44 CFR). Since one of the objectives established for the LHMP is to achieve compliance for the County of Santa Cruz under the Federal Disaster Mitigation Act, the requirements specified for program compliance are often cited at the beginning of a subsection to illustrate how that subsection attempts to comply with the requirement.

At the end of this LHMP are Appendix A through Appendix L. These appendices include vital information or explanations to support the main content of this plan. Technical terms, acronyms, and abbreviations are used throughout this document. To aid the reader, technical terms used are defined in the glossary. The list of acronyms and abbreviations defines all shortened forms used in hazard mitigation planning and/or this LHMP.

Part 1 Introduction and Community Profile

This page intentionally left blank

Chapter 1 Introduction

People, property, and the environment in Santa Cruz are at risk from a variety of hazards, which have the potential to cause widespread loss of life, damage to property, infrastructure, and natural resources. Some hazards are natural, such as earthquakes, while others are natural hazards exacerbated by the use of land, such as building along a cliff and development within floodplains. A natural hazard can result in damages and hardships for an entire community for many years following the event. Flooding, drought, earthquakes, wildfires, and cliff retreat have all occurred in the County within the last fifty years. Flooding and landsliding during winter storms had caused the most severe damage in the County until the 1989 Loma Prieta earthquake and the 2020 CZU Lightning Complex Fire. There is a very strong possibility of an earthquake equal to or larger than the Loma Prieta earthquake occurring in the Santa Cruz area within the next 100 years, and the CZU Lightning Complex Fire has created a new debris flow hazards both inside and outside the burn area.

Because climate change will continue to occur regardless of efforts to reduce greenhouse gas (GHG) emissions, it is necessary to prepare for a range of possible effects. While there is a range of possible hazards as a result of climate change, it is important to note that many of the hazards we may experience will not be new situations created by previously unknown processes, but rather a worsening of hazards that the community has experienced in the past. For example, severe winter storms are experienced periodically in Santa Cruz County. The damage from “atmospheric river” intense rainfall events may increase risks from debris flows, landslides, and other mass wasting events. The damage from flooding and coastal waves associated with severe winter storms may worsen as the climate changes due to higher sea levels exacerbating wave damage, coastal erosion, and coastal flooding. Increased temperatures and longer dry seasons will increase wildfire hazards and strain existing water supplies.

1.1 Hazard Mitigation

The purpose of hazard mitigation is to implement and sustain actions that reduce vulnerability and risk from hazards or reduce the severity of the effects of hazards on people and property, and the natural environment. Mitigation actions include both short-term and long-term activities which reduce the impacts of hazards, reduce exposure to hazards, or reduce effects of hazards through various means including preparedness, response, and recovery measures. Effective mitigation actions also reduce the adverse impacts and cost of future disasters.

The County of Santa Cruz developed this Local Hazard Mitigation Plan (LHMP) to create a safer community. The LHMP represents the County’s commitment to reduce risks from natural and other hazards and serves as a guide for decision-makers as they commit resources to reducing the effects of potential hazards. The LHMP serves as a basis for the State Office of Emergency Services (OES) to provide technical assistance and to prioritize project funding. (Code of Federal Regulations (CFR) §201.6.)

For disasters declared after November 1, 2004, the County of Santa Cruz must have an approved LHMP pursuant to CFR §201.6 in order to receive Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation (PDM) project grants or to receive post-disaster Hazard Mitigation Grant Program (HMGP) project funding. The LHMP is written to meet the statutory requirements of the Disaster Mitigation Act, enacted October 30, 2000, and Title 44 of the Code of Federal Regulations CFR Part 201–Mitigation Planning, Interim Final Rule, published February 26, 2002.

1.2 Acknowledgments

The development of the original LHMP in 2010 and this 2021 update of the LHMP were accomplished through the efforts of numerous County staff from many County departments. The update project was led by the Planning Department with contributions from Public Works, Environmental Health, Emergency Services, General Services, Geographic Information Systems, and Health Services. In addition, the Santa Cruz County Emergency Management Council contributed to the planning and update process. The LHMP is required to be adopted by the Board of Supervisors. Following are the current members of the Emergency Management Council and the Board of Supervisors.

1.2.1 Santa Cruz County Board of Supervisors

Manu Koenig	First District Supervisor
Zach Friend	Second District Supervisor
Ryan Coonerty	Third District Supervisor
Greg Caput	Fourth District Supervisor
Bruce McPherson	Fifth District Supervisor

1.2.3 Emergency Management Council 2021

Member	Agency
Mark Bisbee	County Office of Response, Recovery, and Resilience (OR3)
Mitch Medina	Sheriff-Coroner of the County designee
Michael Bennett	County Department of Public Works designee
Martin Heaney	County Planning Department designee
Ian Larkin	Area Fire Coordinator of the Fire Chief's Association or designee
Brenda Brenner	County Emergency Medical Services designee
Randy Fedak	Human Service Department designee
Amanda Gulling	UC Santa Cruz designee
Charles "Cap" Pennell	Amateur Radio (RACES)
Patsy Gasca	American Red Cross
Vacant	Local Emergency Communications Committee of Monterey Bay (EAS)
Paul Horvat	City of Santa Cruz OES
Tom Avila	City of Watsonville OES
Mike Dean	City of Scotts Valley OES
Andy Dally	City of Capitola OES
Donna Odryna	Medical Society of Santa Cruz County
Eric Conrad	Dominican Santa Cruz Hospital
Jennifer Buesing	County Office of Education
Matko Vranjes	Watsonville Community Hospital
Nancy Yellin	1 st Supervisorial District community representative
Scott Cullen	2 nd Supervisorial District community representative
Joe Christy	3 rd Supervisorial District community representative
Bob Wiser	4 th Supervisorial District community representative
Liz Taylor-Selling	5 th Supervisorial District community representative
Robert Ritchey	At Large Community Member

1.2.4 County of Santa Cruz Planning Participants and Contributors

Staff Member	Department	Title
David Carlson (Project Manager)	Planning	Resource Planner
Mark Bisbee	Office of Response, Recovery, and Resilience (OR3)	Director
David Reid	OR3	Senior Administrative Analyst
Karen Adler	OR3	Administrative Aide
Elissa Benson	County Administrative Office	Assistant County Administrative Officer
Matt Price	Geographic Information Systems (GIS)	GIS Manager
Paul Garcia	GIS	Senior Departmental Information System Analyst
Michael Beaton	General Services Department	General Services Department Director
Matt Machado	Department of Public Works (DPW)	Deputy CAO/Director of Public Works
Kent Edler	DPW	Assistant Director Public Works Special Services
Steve Wiesner	DPW	Assistant Director
Rachel Fatoohi	DPW	Senior Civil Engineer
Mark Strudley	DPW	Senior Civil Engineer
Sierra Ryan	Environmental Health Services	Interim Water Resources Manager
Paia Levine	Planning	Interim Planning Director
Stephanie Hansen	Planning	Principal Planner
Leah MacCarter	Planning	Resource Planner
Jeff Nolan	Planning	County Geologist
Jessica deGrassi	Planning	Resource Planner
Chris Walters	County Fire Department	Deputy Fire Marshall

1.3 Summary

The physical environment of Santa Cruz County is one of the most beautiful and diverse in California. The topography is varied, containing the redwood forests in the Santa Cruz Mountains in the north and northeast, the mid-County coastal terraces where a large portion of the County's population resides, and the alluvial plains of South County, which is predominantly in agricultural use. The central California coast location and the County's topographical features contribute to the ideal Mediterranean climate of Santa Cruz County.



Figure 1 Santa Cruz County and General Plan Boundaries

Natural hazards that have affected Santa Cruz in the past and those that may affect it in the future can be identified with a high degree of probability. Flooding, fire, earthquakes, and cliff retreat have all occurred in the County in the past. The County is prone to reoccurring droughts and will periodically witness flood conditions. Until 1989, flooding and landslides as a result of winter storms had caused the most severe damage in the County. However, the 1989 Loma Prieta earthquake changed that history followed three decades later by the CZU Lightning Complex Fire.

On October 17, 1989, the Loma Prieta earthquake, the largest earthquake to hit an urban area in California since the 1906 San Francisco earthquake, struck Santa Cruz County. The earthquake destroyed 674 dwellings, 32 mobile homes and 310 businesses within the county and the State Office of Emergency Services estimated monetary damages to residential buildings at \$176 million and \$98 million to commercial structures.

The CZU Lightning Complex Fire started as a series of lightning fires on August 16, 2020 across western Santa Cruz and San Mateo counties. The separate fires quickly merged and rapidly spread across the North Coast and Bonny Doon areas and into the San Lorenzo Valley. The fire was fully contained on September 22, 2020 after burning a total of 86,509 acres. Over 1,400 structures were destroyed, and one life was lost. Over 900 of the destroyed structures were residences. Monetary damages have been estimated at \$340 million including approximately \$30 million of damage to public infrastructure.

While every possible hazard that may strike the community cannot be predicted or avoided, many impacts can be anticipate and steps taken to avoid or reduce the harm they will cause. This LHMP is part of an ongoing process to evaluate the risks that different types of hazards pose to Santa Cruz and will engage the County and the community in dialogue to identify the most important steps to pursue in order to reduce these risks.

The County of Santa Cruz and community members will continue to work together to identify and address the risks posed by earthquakes, floods, landslides, fires, and other potential hazards. Many measures such as vegetation management, a comprehensive water management plan, and seismic retrofits have significantly reduced the community's vulnerability to these hazards. Over time, this constant focus on disaster preparation will make the County a much safer and more sustainable community.

Following the CZU Lightning Complex Fire disaster, the Board of Supervisors approved the establishment of a County Office of Response, Recovery and Resiliency (OR3) in the County Administrative Office (CAO) to coordinate the County's response to the CZU Lightning Complex Fire, respond to future disasters and increase resiliency of the County overall in response to climate change. Because of the interdependency in responsibilities, the OR3 combines the County's existing Office of Emergency Services with the new office.

It is the intention of this plan to meet the requirements of the Federal Disaster Mitigation Act of 2000. Section 322 of the Act specifically addresses the requirement for local governments to conduct mitigation planning as a condition of receipt of federal funding for hazard mitigation. Following approval of this LHMP update by FEMA, the County of Santa Cruz will continue to be eligible to apply for mitigation grants before disasters strike.

This LHMP, originally completed in 2010, has been reviewed and revised in 2016 and 2021 to reflect current information, progress in local mitigation efforts, and changes in priorities. Plan updates are addressed within each Part. The update reports on progress made implementing the mitigation strategy outlined in the original plan.

1.3.1 Planning process

In 2020 and 2021, the Planning Department led the effort to coordinate an update of the Plan. The purpose of the update is to review the Plan, revise the Plan if necessary, and resubmit the Plan for approval in order to remain eligible for benefits awarded under the Disaster Mitigation Act. The update

was led by Planning Department staff involved in the update of the General Plan Public Safety Element. Best available information was used to update the hazard risk assessment. The action plan has been reviewed and revised, where appropriate, to account for any actions completed, dropped, or changed and to account for changes in the risk assessment or new county policies identified under other planning mechanisms, as appropriate. The plan update process has involved appropriate agencies, and the public has been given an opportunity to comment. Staff will request the County Board of Supervisors adopt the updated plan following approval by the California Governor's Office of Emergency Services (Cal OES) and FEMA.

1.3.2 Mitigation Plan Objectives and Actions

Santa Cruz County strives to be a disaster-resistant county that can avoid, mitigate, survive, recover from, and thrive after a disaster while maintaining its unique character and way of life. County government should be able to provide critical services in the immediate aftermath of a devastating event of any kind. The people, buildings, infrastructure, and environment of Santa Cruz County should be resilient to disasters. The County's overall objective is to have basic government services and commercial functions resume quickly after a damaging earthquake or wildfire, or another significant event.

This Plan has four primary goals for reducing disaster risk in Santa Cruz:

1. Avoid or reduce the potential for loss of life, injury, and economic damage to Santa Cruz County residents from hazard events.
2. Increase the ability of the County government and partner organizations to serve the community during and after hazard events.
3. Protect Santa Cruz County's unique character, scenic beauty, and values in the natural and built environment from being compromised by hazard events.
4. Identify and encourage mitigation activities to increase the disaster resilience of our community, institutions, private companies, and systems essential to a functioning Santa Cruz County.

1.3.3 Capability Assessment

In the LHMP update, the planning team has verified that capabilities are documented sufficiently and capability changes from the previous plan are described. The Plan identifies actions that are within the capability of the County and its partners to implement and describes how the mitigation action items have been implemented since 2016.

The 2016 update of the LHMP was further informed by the County's Climate Action Strategy developed in 2013. The Planning Department developed the Climate Action Strategy and has update the LHMP accordingly to ensure consistency between Plans. The current update follows the update of the County General Plan Public Safety Element in 2020, which incorporated the Climate Action Strategy and the LHMP by reference.

1.3.4 Risk Assessment

The Assessment Roll normally varies from year to year and over the long term. A review of assessment value and property tax data during this update period indicates a significant increase in assessed valuation and property tax between 2014 and 2019 compared to the period between 2009 and 2014 (Table 1). The assessed valuation in Table 1 includes the total assessed value of land and improvements. In general, it is only the value of improvements that is at risk and it is assumed the value of

improvements has also increased accordingly. This change in the overall data, or value at risk, since the previous Plan was adopted, shows increasing value at risk.

Fiscal Year	Assessed Valuation (in thousands)	Property Tax (in thousands)
2009	\$ 32,531,717	\$ 72,032
2014	\$ 35,996,363	\$ 71,929
2019	\$ 47,620,014	\$ 100,409

Table 1 Santa Cruz County property valuation and tax

This update focuses on how risk has changed since the previous plan was completed, particularly changes related to land use development and new hazard information. Overall, there has not been significant new development in hazard-prone areas since the previous plan was adopted. However, the winter storms of 2016-2017 caused approximately \$120 million in damage to public infrastructure and the CZU Lightning Complex Fire caused approximately \$ 340 million in damage to private structures and public infrastructure, and both events led to federal disaster declarations. The County’s Climate Action Strategy, adopted in 2013, and containing new hazard information, was incorporated into the LHMP during the 2016 update to address the risk of climate change and sea level rise.

1.3.5 Mitigation Strategy

This step refines the mitigation strategy, particularly in light of experiences gained from the implementation of the previous plan. The 2021 update of the LHMP reflects current conditions and progress in mitigation efforts; the update assesses previous goals and actions, evaluates progress in implementing the action plan, and makes adjustments to actions, where appropriate, to address current realities.

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the previous mitigation plan has been implemented over the last five years is included in each hazard chapter and summarized in Appendix L. The updates describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years.

Broad based efforts by a variety of County departments and agencies have resulted in completion or partial completion of 93% of Very High Priority Actions, as well as 85% of High Priority Actions and 94% of Important Actions recommended in the 2016 LHMP. It should be noted, however, that nearly all the actions involve ongoing activities and planning to maintain the level of hazard mitigation provided by the action. In other words, “completion” of an action does not mean the action is no longer relevant or should be removed from the LHMP. On the contrary, nearly all of the actions remain relevant and part of the mitigation strategy of the LHMP.

1.3.6 Plan Maintenance Procedures

Plan updates provide the opportunity to consider how well the procedures established in the previously approved plan worked and revise them as needed. The procedures outlined in the original plan have worked well during this update. No new or modified procedures are recommended.

Chapter 2 Community Profile

2.1 Community Profile

Santa Cruz County is situated on the northern shore of Monterey Bay (Figure 2). The county's coastline borders the Monterey Bay National Marine Sanctuary. The bay, beaches, and coastline are appreciated by the community as a valuable natural resource as well as a key economic resource. This location along the coast also presents several potential hazards to the community such as coastal erosion, flooding, and tsunami.

The County's mild weather, proximity to several northern California metropolitan centers, and scenic and recreation resources make it a popular day and extended-stay recreation area. As a result, the population is subject to large seasonal variations due to an influx of visitors during summer and other peak recreational periods. Planning for potential hazards in Santa Cruz County must address the safety of its visitor population as well as residents, large student population, and workers within the community.

The County occupies a picturesque location along the coast of the Pacific Ocean, between the Monterey Bay and the Santa Cruz Mountains. It is a land of steep coastal bluffs, deep mountain canyons, redwood, oak and madrone forests, open meadows, and beaches. This picturesque location also contributes to the potential hazards. Parts of Santa Cruz County, such as the communities of downtown Soquel and Felton Grove and other areas, are located within a flood plain. Coastal areas are also subject to flooding and erosion from coastal storms. Many mountainous areas are subject to landslide hazards and wildland fires. The entire County is subject to seismic shaking from several nearby active earthquake faults. These are a few examples of the many natural hazards addressed in this plan.



Figure 2 County of Santa Cruz

The County's Mediterranean climate is characterized by warm, dry summers and mild, rainy winters. Warm temperatures and low precipitation are the norm from approximately April through October. Cooler temperatures and heavy rains dominate November through March. Though winters are typically mild, colder winds from inland regions with more continental climates can result in short-term cold snaps. According to the National Oceanic and Atmospheric Administration (NOAA), the annual mean temperature in Santa Cruz is 57.1 degrees Fahrenheit. The mean high temperature is 61.9 degrees Fahrenheit, and the mean low temperature is 51.6 degrees Fahrenheit. Mean monthly high and low temperatures during winter and summer are shown in Table 2.

Because of this temperate climate, extreme heat is rarely a threat to the community. Both summer and winter temperatures are moderated by the marine influence and summer fog is a common occurrence. Winds are generally northwesterly and seldom reach severe intensities. The Santa Cruz Mountains form a natural barrier to winds from the north and from the hot interior valleys. Rainfall varies throughout the county, from approximately 80 inches per year in Bonny Doon, to approximately 22 inches per year in the Watsonville area. According to NOAA, the mean annual precipitation in Santa Cruz is 29.43 inches. Annual precipitation in Santa Cruz has ranged from just 5.1 inches in 2013 to 59.8 inches in 1983. Mean monthly high and low temperatures during winter and summer are shown in Table 2.

Average High/Low Temperature	Average Rainfall
January 55.6°/41.6° F (13.1°/5.3° C)	January 6.1 inches (155 mm)
August 70.9°/58.8° F (21.6°/14.9° C)	August 0.07 inches (1.8 mm)
Annual 61.9°/51.6° F (16.6°/10.9° C)	Annual 29.43 inches (747 mm)

Table 2 Temperature and rainfall averages for Santa Cruz

Select demographic, economic, and housing information for Santa Cruz County, including the four incorporated cities, was obtained from the U.S. Census Bureau, and summarized in Table 3 (U.S. Census Bureau 2014-2018 5-year American Community Survey).

Population	Number	Percent
Total Population	273,765	100%
Sex and Age		
Male	135,727	49.6%
Female	138,038	50.4%
Median Age (years)	37.4	
Under 18	53,761	19.6%
65 years and older	41,001	15.0%
Disabled	30,314	11.1%
Households		
Total Households	95,756	100%
Persons per household	2.73	
Median household income	\$78,041	
Percent of population below poverty level		14.3%
Percent of population 25 and over with bachelor's degree or higher		40%

Housing Characteristics		
Total Housing Units	105,894	100%
Occupied Housing Units	95,756	90.4%
Vacant Housing Units	10,138	9.6%
Owner Occupied Housing Units	56,873	59.4%
Renter Occupied Housing Units	38,883	40.6%
Housing Units in 1-unit detached structures	68,170	64.4%

Table 3 County of Santa Cruz population, household, and economic data

Select population and housing information for the unincorporated area of Santa Cruz County, not including the four cities, was obtained from the Association of Monterey Bay Governments (AMBAG) 2022 Regional Growth Forecast. Information for the year 2020 is summarized in Table 4.

Population	Number	Percent
Total population	133,493	
Households		
Total Households	52,156	
Persons per household	2.52	
Housing Characteristics		
Total housing units	57,662	
Vacancy rate		9.5%

Table 4 County of Santa Cruz unincorporated area population and household data

As noted in Table 3 above, approximately 11.1% of county residents are disabled. Also, 15% of the county's population is age 65 or above. In addition, according to the American Community Survey, approximately 26% of the county's population speaks Spanish at home and approximately 11% do not speak English very well. It is important to consider these special populations in creating a hazard mitigation plan, as they may need extra assistance during emergencies. As an example, during the CZU Lightning Complex Fire all press releases regarding evacuation, shelters, public assistance, and other important information were provided in both English and Spanish. The County's Emergency Management Plan (EMP) does address special population needs and this hazard plan was written with reference to the EMP.

2.1.1 The University of California at Santa Cruz (UCSC)

Santa Cruz County is home to the University of California at Santa Cruz (UCSC). The main University campus consists of over 2,000 acres on the northwest side of the City of Santa Cruz off High and Bay Streets. Approximately 53 percent of the campus, including most of the developed area, is located within the City of Santa Cruz limits, and the remainder of the campus lies in the unincorporated area of Santa Cruz County.

In addition to the main University campus, the University also has a Marine Lab Facility at the north side of the County situated along the coast.

Much of the University infrastructure and services are at least somewhat dependent on the City and County of Santa Cruz. UC Santa Cruz receives water and sewer treatment services from the City of Santa Cruz. In normal and wet years, the water supply system is capable of meeting the needs of the current population, but even without population increases, the system is highly vulnerable to shortages in drought years. The City and the University are also linked through mutual aid agreements in areas such as fire services.

The University has a current enrollment of approximately 19,494 undergraduate and graduate students supported by approximately 4,486 faculty and staff.

The University adopted its own Hazard Mitigation Plan in 2005 and prepared a Hazard Mitigation Progress Report in 2011. It also has an Emergency Response Plan that can be found online at <https://oes.ucsc.edu/emergency-preparedness/eop-11-2015.pdf>. This plan, prepared in 2015, provides details about hazard response, vulnerabilities, and mitigation measures for the University community.

2.1.2 Cabrillo Community College

The County is also home to one of the highest-rated community colleges in the state. Cabrillo Community College sits on 160 acres overlooking Monterey Bay. The main campus is located in Aptos, on the north side of Hwy 1. There are two satellite campuses, one in the City of Watsonville and the other in Scotts Valley. The college also owns seven acres in Bonny Doon for use of anthropology and archeology students.

The College has a current enrollment of approximately 11,300 students supported by approximately 1,000 faculty and staff. The developed area (existing and approved) of the campus consists of 60 buildings with over 746,000 gross square feet.

There is no student housing on campus but there is a newly built student center, which includes a Health Center. The College contracts with the County Sheriff's Department to provide all law enforcement services. It is also dependent on the County of Santa Cruz for fire protection and other services such as water and sewer.

The College has developed an Emergency Operations Plan updated December 2018. This plan clearly delineates areas of responsibility for staff and partner agencies and specifically addresses earthquake, fire, flood, storms, landslide, and other hazards that might occur on campus. This policy also defines when a state of emergency should be declared on campus and the steps necessary to address said emergency.

2.1.3 California Polytechnic University

Swanton Pacific Ranch is a working ranch owned by Cal Poly. It has three distinct operations: Forest Steward Council (FSC) certified selective forestry, natural grass-fed beef, and certified organic crops. Located on 3200 acres, the exceptional diversity of this property, and the greater Scotts Creek watershed, provide remarkable conditions for agriculture production, which support several unique educational programs and research opportunities based on site. The ranch was threatened by the

Lockheed Fire in August 2009, but no damage occurred. However, the CZU Lightning Complex Fire destroyed much of the ranch and its structures.

2.1.4 Household Income and Education

The median household income for Santa Cruz County in 2013 was an estimated \$78,041 compared to \$71,228 for the State of California. Residents of Santa Cruz County are highly educated, with 40 percent of residents over age 25 having achieved a bachelor's degree or higher by 2018 (Table 3).

2.1.5 Residents' Place of Work

The following data is from the Santa Cruz County Regional Transportation Commission [Data & Statistics \(sccrtc.org\)](http://sccrtc.org). In addressing potential hazards, it is significant that over 28,000 county residents commute to neighboring counties for work. This represents approximately 23% of the total number of workers in the county. Over 17,000 county residents commute to work in Santa Clara County, which is connected to Santa Cruz County by Highway 17, a winding, four-lane mountain pass prone to traffic accidents and small slides, especially during the rainy season. Nearly 6,000 county residents commute to Monterey County via Highway 1, portions of which are two lanes and prone to accidents, which cause major traffic jams.

There are far fewer commuters into the county. Over 17,000 workers commute from outside Santa Cruz County into the county, the vast majority of which (9,178) come from Monterey County via Highway 1. As previously mentioned, this can be problematic due to accidents, which tie up this main artery to the coast.

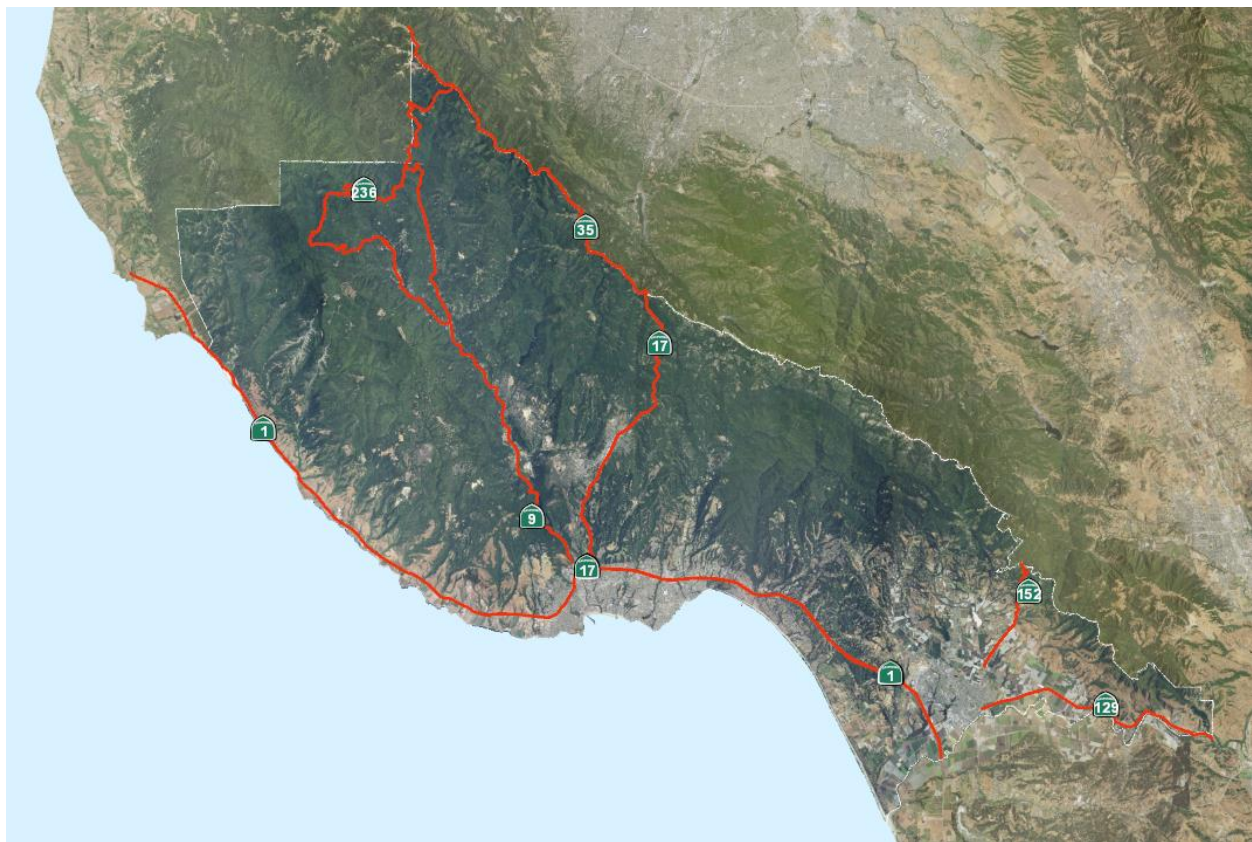


Figure 3 Key transportation routes in Santa Cruz County

Five major state highways connect Santa Cruz County with adjacent counties. Highway 1 leads along the coast from San Francisco south to the cities of Santa Cruz, Capitola, and Watsonville and then on to Monterey. Highway 9 traverses the County from the City of Santa Cruz through the unincorporated towns of Felton, Ben Lomond, Brookdale, and Boulder Creek, which are all located in the San Lorenzo Valley. Highway 17 also crosses the Santa Cruz Mountains into Santa Clara County passing through the City of Scotts Valley. Highways 129 and 152 join the City of Watsonville with neighboring Santa Clara County. The Santa Cruz Metropolitan Transit District (Metro) provides bus service throughout Santa Cruz County. Metro also operates bus service between Santa Cruz County and Santa Clara County. One municipal airport is located in the City of Watsonville. Several private airports exist in the County in Bonny Doon, Big Creek Lumber on the north coast, and at the Monterey Bay Academy in the Pajaro Valley.

Route 9 is the only viable access to the San Lorenzo Valley, serving the unincorporated communities. Bonny Doon is accessible via either Highway 9 or via Highway 1 and then inland near Davenport. Davenport and Watsonville, and indeed, most other mid county locations are all accessible from Highway 1.

The County maintains a distinction between urban and rural areas through the use of a stable Urban/Rural Boundary, consistent with a local growth management referendum of 1978, known as Measure J. The Urban/Rural Boundary is represented by an Urban Services Line (USL) and a Rural Services Line (RSL) (see Appendix K).

Urban concentrations of development are located within the four incorporated cities of Scotts Valley, Santa Cruz, Capitola, and Watsonville and in the unincorporated areas of Live Oak, Soquel, Aptos, and Freedom as defined by the USL. It is basic county policy to direct a large share of the County's growth into the areas within the USL to facilitate the provision of services for future growth, preservation of the environment and hazard mitigation.

2.1.6 Economic Trends

The following information is from the [2013 Santa Cruz County Economic Vitality Strategy Economic Trends report](#). The key industry sector in Santa Cruz County is centered in agriculture. Other key economic sectors include education and health care, retail trade, leisure and hospitality, and government. As previously noted, there are two major educational institutions in the County: Cabrillo Community College located in mid-county and the University of California at Santa Cruz (UCSC) located in the north county area.

Between 2001 and 2011 Santa Cruz County saw an overall decline in employment by nearly 11,000 jobs, an overall decline of approximately 11%. The greatest job loss occurred in manufacturing (loss of 3,822 jobs), followed by construction (loss of 1,919 jobs), and information (loss of 1,675 jobs) Professional & Technical Services and Leisure & Hospitality also experienced substantial job losses during this period. Job losses in Santa Cruz County were somewhat offset by gains in Health Care & Education (2,667 jobs), Other Services (613 jobs), Agriculture & Mining (538 jobs), and Wholesale Trade (56 jobs). Along with the increase in jobs in the agricultural sector, according to Annual Crop Reports published by the Santa Cruz County Agricultural Commissioner, the production value of local crops increased from \$365 million in 2001 to over \$625.3 million in 2019. This is an important consideration in hazard mitigation planning, as much of the unincorporated area of the county is agricultural land, some of which lies in the flood plain. Proper flood mitigation could save millions of dollars in lost crops. According to the [2022 AMBAG](#)

[Regional Growth Forecast](#), the County has seen job growth occur over the last five years, gaining approximately 9,500 jobs countywide, including approximately 3,200 jobs in the unincorporated area.

The following information is from the [2020-2021 County Budget and Financial Reports](#). State and federal revenue is the County's single largest revenue source. Property taxes, sales tax, transient occupancy, and other taxes are the County's second largest revenue source. For every \$1.00 paid in Federal and State taxes, property taxes, sales taxes, and other taxes, charges, and fees, the County receives varying portions of that tax revenue to fund County functions. As a result of the COVID-19 public health emergency and shelter-in-place requirement, the economic downturn has resulted in reduced revenues from sales tax, transient occupancy tax and charges for some services. The COVID-19 pandemic has created a great deal of uncertainty about the County's revenues and budget. The five-year forecast prepared before the COVID-19 pandemic anticipated budget shortfalls. The General Fund met its obligations for 2020-21 through reductions to department operations, position eliminations, and a 7.5% to 10% employee furlough. However, due to declining revenues continuing through 2024-25, the General Fund is unlikely to meet its obligations without new or increased revenues and/or continued cost reductions that will impact programs and services.

2.2 Community Vision

The County of Santa Cruz General Plan includes a Public Safety Element, which addresses many of the potential hazards addressed in this plan. The overall goals guiding the Public Safety Element of the General Plan are as follows:

- To protect human life, private property, and the environment.
- To minimize public expenses by preventing inappropriate use and development or location of public facilities and infrastructures in those areas, which by virtue of natural dynamic processes or proximity to other activities, present a potential threat to the public health, safety, and general welfare.

The Public Safety Element of the General Plan also identifies major hazards that may occur within the county, policies that address each hazard and mitigation factors. It provides information on all pertinent county policies relating to hazard mitigation, as well. The General Plan has informed this LHMP. Working with the Planning Department collaboratively on this LHMP supports a broader vision of what factors need to be considered in order to protect the health and welfare of county residents.

In 2011 the Planning Department obtained funding from the Department of Housing and Community Development (HCD) Community Development Block Grant (CDBG) Disaster Recovery Initiative grant program to implement recommendations of the 2010 LHMP related to flooding, coastal bluffs and beaches, erosion, and fire. This project to amend portions of the General Plan/Local Coastal Program (GP/LCP) and the Santa Cruz County Code (SCCC) that address public safety was initiated to promote goals, policies and regulations that would increase the resilience of the community relative to the expected impacts of climate change in Santa Cruz County, provide for adaptation strategies, and implement several Priority Actions in the County's 2010 LHMP.

In 2013 the County adopted a Climate Action Strategy (CAS) to address the two pillars of community response to climate change: reduction of greenhouse gas emissions, and adaptation to the environmental changes that are expected to occur. Many of the proposed General Plan policies and

code amendments implement the adaptation portion of the CAS, minimize impacts from climate change, and increase resilience in unincorporated area.

On September 15, 2020, the Board of Supervisors adopted the proposed amendments to the Public Safety Element of the GP/LCP, the proposed amendments to SCCC Chapter 16.10 Geologic Hazards, Chapter 16.13 Floodplain Regulations, Chapter 16.20 Grading Regulations, and Chapter 16.22 Erosion Control. The updated policies and regulations are in effect outside the Coastal Zone and will become effective inside the Coastal Zone upon certification by the California Coastal Commission. Significant modifications by the Coastal Commission require concurrence by the Board of Supervisors.

General Plan Guiding Principles

The overall goals and guiding principles for the Land Use Element of the General Plan, which need to be considered in the LHMP, are as follows:

- **Population and Residential Growth Goals:** To provide an organized and functional balance of urban, rural, and agricultural land use that maintains environmental quality, enhances economic vitality, protects the public health, safety, and welfare, and preserves the quality of life in the unincorporated areas of the county.
- **Rural Residential Siting and Density:** To achieve patterns of rural residential development that are compatible with the physical limitations of the land, the natural and cultural resources of the County, the availability of public services, and protection of the natural environment.
- **Urban Residential Siting and Density:** To provide urban residential areas within the Urban Services Line which are protected from noise, traffic congestion, natural hazards, and other objectionable influences of nonresidential land use; and to establish a variety of residential land use categories and dwelling unit densities offering a diverse choice of housing opportunities.
- **Commercial and Industrial Siting and Development:** To provide adequate facilities to meet the shopping, service, and employment needs of County residents and area visitors in a manner compatible with adjacent residential development, availability of public facilities, protection of natural resources, and maintenance of environmental quality and high standards of urban design.
- **Public Facility/Institutional Siting and Development:** To ensure adequate present and future availability of land for both public and quasi-public facility uses including schools, hospitals, cemeteries, sanitary landfills, and water supply and sewage treatment facilities.
- **Jobs/Housing Balance:** To develop an efficient land use pattern which improves the area's jobs/housing balance and thereby reduces the total amount of vehicle miles traveled and reduces polluting emissions.
- **Village, Town, Community and Specific Plans:** To continue using village, town, community, and specific plans to provide a planning framework to guide future public and private improvements in town centers and other concentrated urban and rural areas, to provide a higher level of planning detail and involvement.
- **Airport Land Use Compatibility and Safety:** To Require compatibility between the Watsonville Municipal Airport and future land uses in the unincorporated area of the County that surround the Airport, and comply with State of California statutes, and regulations, and other laws governing land uses surrounding and within the airport, including consistency with the California Airport Land Use Planning Handbook which contains the mandatory criteria for safety, land use and density restrictions in the vicinity, and federal aviation regulations.

2.3 Community Facilities

The County of Santa Cruz owns or leases a large number of facilities and critical infrastructure. These buildings, bridges, culverts etc. are used for various purposes including government administration, emergency services, public works, and recreation. After the 1989 Loma Prieta earthquake, many of these structures were examined for seismic safety. Critical infrastructure maintained by the Public Works Department consists of the following major elements:

- All sanitation pump stations and treatment plants
- All county-maintained bridges and major culverts
- Approximately 600 miles of County-maintained roads
- County rain and stream gauges
- Pajaro and Salsipuedes levee flood gates
- Public Works yards
- Davenport Water Treatment Facility
- 38th Ave. Drainage Facility

Figures 4 and 5 contain maps of the location of these facilities.

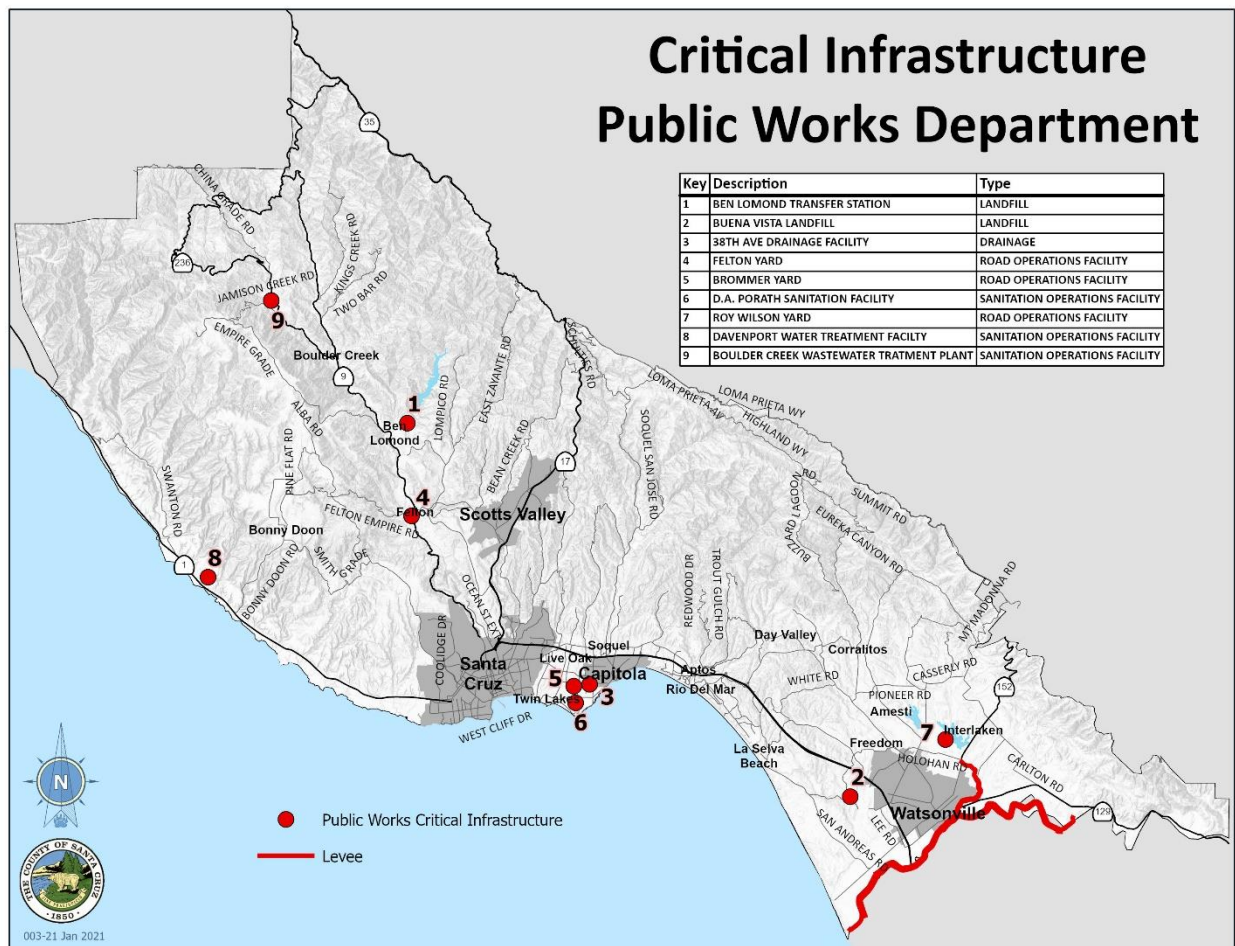


Figure 4 Public Works Department critical infrastructure

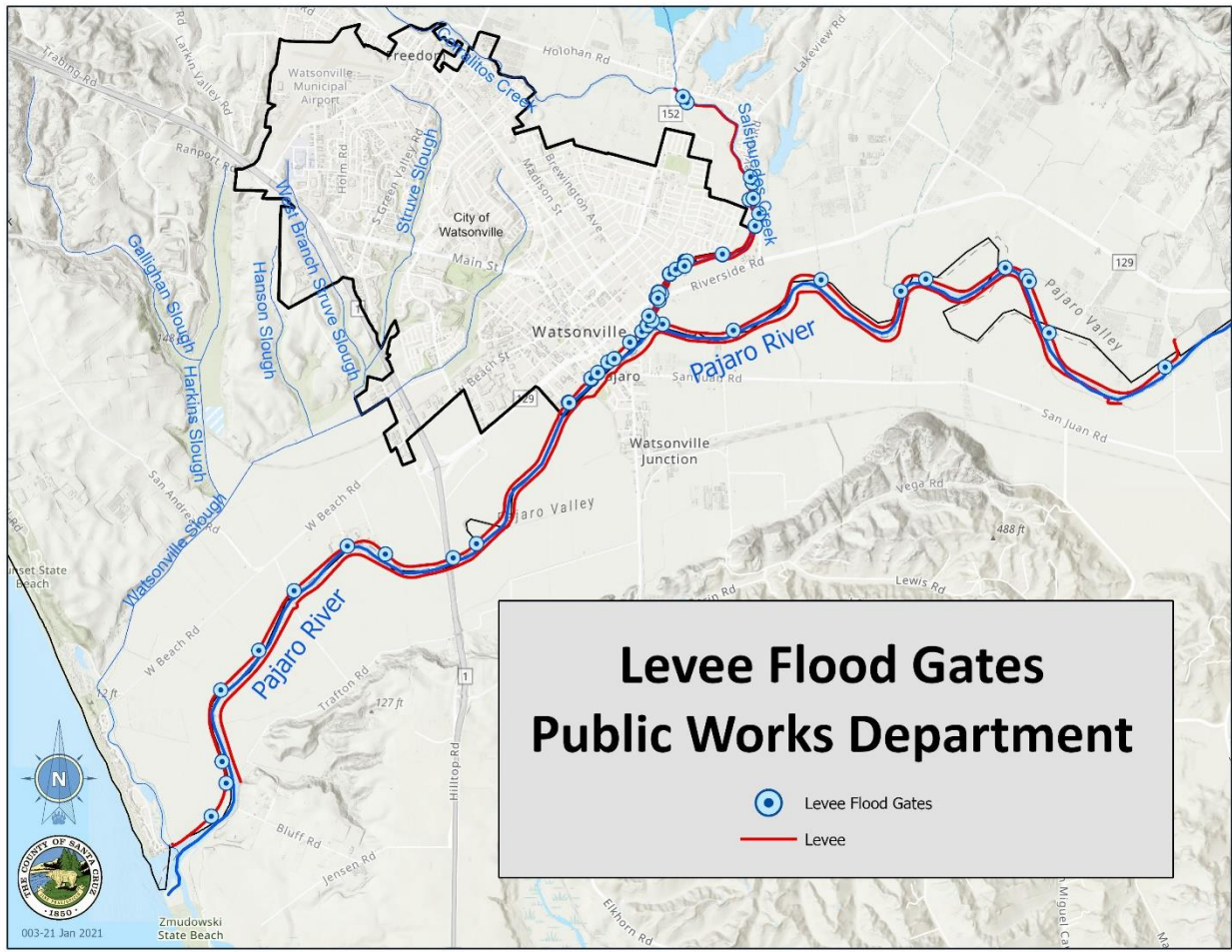


Figure 5 Location of levee flood gates

Other Critical Facilities

Hospitals, designated shelter facilities and schools are some of the critical facilities not owned by the County designated as Disaster Medical Facilities or shelters. Figure 6 is a map of other critical facilities throughout the County and Appendix D contains a list of the critical facilities depicted in Figure 6.

There are three hospitals within the county limits: Dominican Santa Cruz Hospital, Watsonville Community Hospital, and Sutter Maternity and Surgery Center. Of the three, only Dominican and Watsonville have emergency rooms. All three hospitals are designated for use during Public Health emergencies. There are also several skilled nursing facilities, rehabilitation centers, medical clinics, and long-term care facilities within the county. A list of these facilities is in Appendix E.

The Santa Cruz County Office of Education (COE) oversees all public schools within the county, some of which have been used in the past as emergency operation centers and emergency shelters. The COE has an Emergency Plan, which is incorporated within this LHMP. A list of all public schools is in Appendix F, and a list of all private schools is in Appendix G.

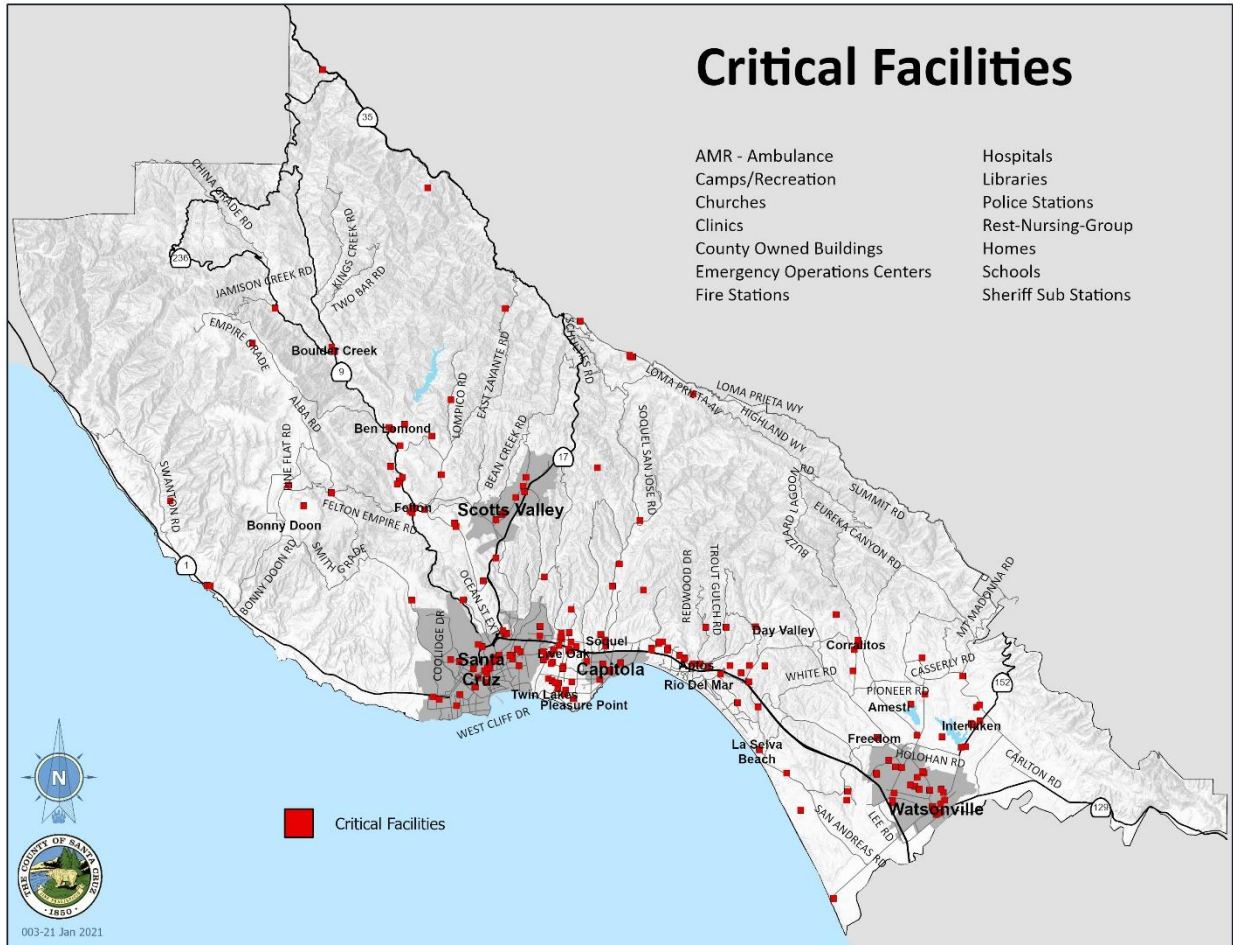


Figure 6 Critical facilities throughout Santa Cruz County

Historical Structures

The Planning Department keeps an inventory of historic sites and properties within the county. A historic evaluation is provided for each site which provides the basis for classifying the properties. The evaluation and rating of these properties in this inventory is based upon guidelines published by the National Park Service for placement on the National Register of Historic Sites. A review of this list revealed that most of the properties are privately owned. Notable exceptions include Wilder Ranch State Park, which is under the authority of the state government, and Felton Covered Bridge, which is located in a County Park.

This page intentionally left blank

Part 2 The Planning Process

This page intentionally left blank

Chapter 3 The Planning Process

3.1 The Purpose of the Plan

The Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390), commonly known as the 2000 Stafford Act Amendments, was approved by Congress on October 10, 2000. To implement the DMA 2000 planning requirements, FEMA prepared an Interim Final Rule, published in the Federal Register on February 26, 2002, which established planning and funding criteria for states and local communities. This act required state and local governments to develop hazard mitigation plans as a condition for federal grant assistance. For the Pre-Disaster Mitigation (PDM) program, local jurisdictions must have an approved mitigation plan to receive a project grant. Prior to 2000, federal legislation provided funding for disaster relief, recovery, and some hazard mitigation planning. The DMA improves upon the planning process by emphasizing the importance of community planning for disasters before they occur. Using this initiative as a foundation for proactive planning, the County of Santa Cruz developed this hazard mitigation plan in an effort to reduce future loss of life and property resulting from disasters. Through careful planning and collaboration among public agencies, stakeholders, and citizens, it is possible to avoid or minimize losses that can occur from disasters. Hazard mitigation is any action taken to permanently eliminate or reduce long-term risks to human life and property from natural hazards. Along with preparedness, response, and recovery, mitigation is an essential element in emergency management. Disasters can have significant impacts on communities. They can destroy or damage life, property, and infrastructure, local economies, and the environment.

This LHMP is intended to assist the County of Santa Cruz in reducing its risk from all hazards by identifying resources, information, and strategies for risk reduction. The plan will also help guide and coordinate mitigation activities throughout the County. Building on a tradition of progressive planning and past mitigation successes, the County of Santa Cruz planning team set out to develop a plan that would meet the objectives summarized below.

- The plan would meet or exceed program requirements specified under the DMA
- The plan would meet the needs of the County of Santa Cruz
- The plan would coordinate existing plans and programs so that high priority initiatives and projects to mitigate possible disaster impacts would be funded and implemented. The plan would also create a linkage between the LHMP and established plans such as the County's General Plan and Emergency Management Plan so that they will work together in achieving successful disaster mitigation.

It should be noted that DMA compliance is not the sole purpose of this LHMP. Santa Cruz County experienced the most significant disaster in our community since the 1989 Loma Prieta earthquake in 2020 with the CZU lightning Complex Fire. This event has fostered an enhanced effort of proactive planning and program implementation. This practice is further enhanced by the update of our LHMP. Multiple objectives drive this planning effort, one of which is DMA compliance. Elements and strategies included in this plan were selected not only because they meet a program requirement but also because they meet the needs of the community.

3.2 Documentation of the Planning Process

This section describes the process to develop the original LHMP and this update to the plan. This includes the federal requirement followed by the County's actions applied to this process.

Public Involvement - Requirement §201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

- (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process; and
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Documentation of the Planning Process - Requirement §201.6(c)(1): The plan shall document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

The County of Santa Cruz first completed this LHMP in 2010 and updated it in 2016. This 2021 update is the second update of the original plan. The County Office of Emergency Services took on the initial responsibility for development of the plan. The initial phase of the planning process established a project team made up of representatives from various County government departments responsible for different aspects of the hazard mitigation plan including Planning and Building, Public Works, Fire, and Geographic Information Systems (GIS). From this group, project team leaders were identified. The project team was formed as a task group to develop the plan. Meeting dates were set based on progress and focus. The project team invited interested parties such as UCSC, Cabrillo College, the cities of Capitola, Watsonville, Scotts Valley and Santa Cruz, the local American Red Cross as well as scientific and technical specialists at the local, state, and national level to review the draft at various stages.

The original plan was developed between May 2008 and December 2009. The project team leaders met once per week and the project team met approximately once per month from September 2009, through December 2009, and then as needed in 2010 until the draft plan was circulated for a 30-day public review on January 15, 2010. The project team leaders identified characteristics and potential consequences of natural hazards that are a potential threat to Santa Cruz County. With the understanding of the risks posed by the identified hazards, the team determined priorities and assessed various methods to avoid or minimize any undesired effects. Responsible departments were consulted at several points in the development of the goals, objectives, and actions. As a result, the mitigation strategy, including goals, objectives, and actions, was determined, followed by an implementation and monitoring plan. This monitoring plan included tracking of hazard mitigation projects, changes in day-to-day County operations, and continued hazard mitigation development.

Public input during the development of the original mitigation plan assisted in shaping plan goals and mitigations and integrating the LHMP with the Public Safety Element of the General Plan Update. The 2010 LHMP was a topic of discussion at three public meetings of the Emergency Management Council.

When the draft was completed, a 30-day public comment period was initiated. A public notice was placed in the local paper to invite the public to review and comment on the draft plan. Copies of the plan were made available at the Aptos, Live Oak and Felton Branches of the Santa Cruz Public Library and in the General Services Department at the County Administrative Building. A draft of the plan was posted on the County’s website with an interactive response option that provided an opportunity for interested members of the public to comment on the draft LHMP on the web. Those comments were incorporated into the final document.

The draft LHMP was also sent to members of a technical committee, which consisted of national, state, and local scientists and experts for review prior to creation of the Public Draft. Comments received were incorporated into the final draft LHMP. A summary of the in-house and public meetings is in Table 5.

LHMP Meetings	Date	Type
Project Team Leaders	July 1, 2009	In house
Subject Matter Expert	July 21, 2009	In house - Flood
Subject Matter Expert	July 28, 2009	In house – City of Santa Cruz
Consultant	July 29, 2009	In house – Civil Engineering
Project Team Leaders	August 3, 2009	In house
Consultant	September 2, 2009	In house – Civil Engineering
Emergency Management Council (EMC) presentation and adoption of goals and objectives	September 3, 2009	Public
Consultant	October 8, 2009	In house
Project Team Leaders & GIS	October 13, 2009	In house
Project Team	October 15, 2009	In house
Project Team (CRS Team)	October 29, 2009	In house
EMC section review	November 5, 2009	Public
Project Team Crosswalk Review	December 9, 2009	In house
Project Team	December 16, 2009	In house
EMC Presentation of draft plan	January 7, 2010	Public
Project Team Leaders	January 11, 2010	In house

Table 5 2010 LHMP meeting schedule

The LHMP was approved in 2010 and must be updated on a 5-year cycle, and the Planning Department is the agency designated to lead the plan update process. In 2015, the Planning Department Project Leader initiated the update process by assembling a Project Team. Information on the update process

and roles of team members was provided to Project Team members on June 1, 2015. For the 2016 Plan Update, the Project Team worked under the direction of the Project Leader to evaluate and update the plan. The Project Team was responsible for evaluating the hazards, risks, and mitigation measures identified in the previous plan within their respective areas of expertise and providing feedback to the Project Leader for incorporation in the updated Plan. The Project Leader facilitated this process through direct email and telephone communication with staff to ensure full participation by staff members to provide input on every aspect of the plan's content. Using guidance from FEMA, report forms for each Mitigation Action were created and sorted by responsible Department. The forms were provided to staff in each responsible department along with guidance and instructions for the purpose of completing an overall evaluation of the plan as applicable to each staff's and each department's area of expertise. This part of the process occurred during the month of June 2015. Following this phase of the plan update process the Project Leader incorporated the work of the Project Team into the plan update, including reporting our progress on the Mitigation Actions, and revising the plan as appropriate based on an overall evaluation of the plan.

The 2016 update of the LHMP was informed by a complementary planning processes involving the update of the General Plan Public Safety Element and creation of a County Climate Action Strategy (CAS). As further described below and summarized in the table at the end of this section, a number of complimentary planning efforts and public outreach and participation contributed to the process of updating the LHMP in 2016 and 2021.

The project to update the Public Safety Element included a process of public and agency outreach that played an important role in update of the LHMP. The project has facilitated a comprehensive review of policies related to fire hazards, flood hazards, coastal erosion hazards, and hazards related to climate change. The 2016 LHMP update identified the hazard of climate change as a significant hazard and included a series of additional mitigation actions to address the hazard, as further described below.

The 2016 update of the LHMP involved a long process conducted in stages beginning with creation of a CAS. The CAS includes a plan for adaptation to climate change impacts, which, according to the best available science, are very likely to occur. The Climate Change Adaptation Strategy became the major component of the 2016 update to the LHMP, comprising the additional Chapter 13 of the LHMP Update. Therefore, the public outreach effort to develop the Climate Change Adaption Strategy had a specific application to the 2016 LHMP update.

In 2013 the County adopted a CAS to address the two pillars of community response to climate change: reduction of greenhouse gas emissions, and adaptation to the environmental changes that are expected to occur. Efforts to understand, mitigate and adapt to climate change cross many disciplines and departmental areas of responsibility were made. Recommended strategies guide a multitude of practical endeavors at the County. These strategies seek to mitigate Climate change impacts from land use, resource management, County operations, transportation, building, economic development, emergency management, and the environment. For this reason, the preparation of the CAS included many County Departments and has benefitted from review by a wide variety of staff people, technical experts, stakeholder groups, and community members, as indicated on the acknowledgments page of the CAS, reproduced below.

The CAS was the subject of a community meeting in June 2012 and several focus group meetings in 2012 with members of the public, non-profit and volunteer groups working in the climate action arena, and with representatives of agriculture including the Santa Cruz County Farm Bureau and University of

California Cooperative Extension. There was outreach to the business community in the context of renewable energy and energy efficiency financing, which included local financial institutions, solar installers, the Chamber of Commerce, and commercial property owners. A web page was created, which included a brief explanation of the CAS, a link to the document, and an online tool for providing feedback called "Open Town Hall." Substantial improvements and modifications were made to the CAS as a result of public input, including the addition of the agricultural inventory, a forestry section, and a detailed emissions inventory.

On January 23, 2013, a presentation of the CAS was provided to the Commission on the Environment at public hearing. As recommended by the Commission on the Environment, on February 26, 2013 the CAS was adopted by the Board of Supervisors at a public hearing.

In 2011 the Planning Department obtained funding from the Department of Housing and Community Development (HCD) Community Development Block Grant (CDBG) Disaster Recovery Initiative grant program to implement recommendations of the 2010 LHMP related to flooding, coastal bluffs and beaches, erosion, and fire. The project to amend portions of the General Plan and related County Code chapters that address public safety was initiated to promote goals, policies and regulations that would increase the resilience of the community relative to the expected impacts of climate change in Santa Cruz County, provide for adaptation strategies, and implement several Priority Actions in the County's 2010 LHMP. The project to update the Public Safety Element was led by the Planning Department and involved input from representatives of other agencies, local stakeholder groups and the general public.

The process to update the Public Safety Element involved six public hearings of the Planning Commission and three public hearings of the Board of Supervisors. Public input was exclusively focused on the policies addressing the hazard of sea level rise along the coast with updates to the geologic hazard assessment policies for development on coastal bluffs and beaches. The approach by County staff involved updating the County's historic policy and practice regulating development in coastal hazards areas with the intent of the Coastal Commission's Sea Level Rise Guidance (Guidance). The updated policies addressing development on coastal bluffs and beaches are a balance between the goals to protect human life, private property, and the environment, and to minimize public expenses by preventing inappropriate use and development or location of private and public facilities and infrastructure in those areas which, by virtue of natural dynamic processes or proximity to other activities, present a potential threat to the public health, safety, and general welfare. The Board of Supervisors adopted the updated Public Safety Element on September 15, 2020. The updated policies and regulations are in effect outside the Coastal Zone and will become effective inside the Coastal Zone upon certification by the California Coastal Commission. However, significant modifications by the Coastal Commission could require concurrence of the Board of Supervisors after a public hearing.

Public outreach for the 2016 LHMP update sought to build on these complimentary planning efforts by emphasizing outreach to the public and local agency representatives that normally are interested in and participate in hazard mitigation and response activities. This was accomplished through the process of the County Emergency Management Council (EMC), specifically their meeting held on September 3, 2015. The meeting agenda was mailed to all members of the EMC, a list of interested parties in the at-large community, and publicly noticed according to standard public meeting notification procedures. A sign in sheet from the September 3, 2015 meeting indicates attendance at this meeting by a total of 23 people representing members of the EMC and other members of the public associated in some way with disaster response and hazard mitigation. At this meeting, the Project Leader described the LHMP Update project, including the Climate Change Adaptation Strategy, inviting them to participate in the

development of the LHMP Update and giving them the opportunity to be involved in the planning process. Access to the LHMP Update document was provided for this purpose by posting the document on the Planning Department website. In addition, a general announcement regarding the LHMP Update project placed on the main page of the Planning Department website for access by any interested member of the public. This posting included notice the plan was available at local public libraries throughout the County. No input or feedback was received as a result of these efforts.

This outreach effort was similar to the efforts in preparation of the original 2010 LHMP. However, considering the outreach efforts associated with the update of the Safety Element and the development of the CAS, the list of contributors for the update, and the broad range of outreach efforts associated with the update and related planning processed, is more extensive and represents a broader effort to include interested member of the public as well as agency personnel. Table 6 is a summary of the outreach effort for the 2016 and 2021 updates of the LHMP.

Planning Process	Date	Meeting/Work Type
Disaster Recovery Initiative Grant	June 2011	Funding to update Public Safety Element
Climate Action Strategy	June 2012	Community meeting
Climate Action Strategy	2012	Focus group meetings
Climate Action Strategy	January 23, 2013	Commission on the Environment public hearing
Climate Action Strategy	February 26, 2013	Board of Supervisors public hearing
Public Safety Element update	September/October 2014	FPO monthly meetings
Public Safety Element update	November 2014	Meeting with private sector engineers, geologists, and land use planning consultants
Public Safety Element update	December 2014	Environment Review public comment period
Public Safety Element update	February 2015	Planning Commission public hearing
Public Safety Element update	April 2015	Stakeholder meeting
Public Safety Element update	April 2015	Meeting with California Coastal Commission staff
LHMP update	June 1, 2015	Project Leader assembles Project Team
LHMP update	June 2015	Project Team evaluation and update of LHMP
LHMP update	June through September 2015	Project Leader update of LHMP
Public Safety Element update	September 2015	Meeting with California Coastal Commission staff
Disaster Management Council meeting on LHMP update	September 3, 2015	Public meeting of local and regional agencies
Public review period for LHMP update	September 2015	Public notice on website LHMP posted on website and local libraries

Planning Process	Date	Meeting/Work Type
LHMP update	October 2015 through February 2016	Plan revisions by Project Leader in response to State OES comments
LHMP update	August 3, 2016	FEMA approval
Safety Element update	June 22, 2018 to August 1, 2018	CEQA review public comment period
Public Safety Element update	October 10, 2018	Planning Commission public hearing
Public Safety Element update	October 24, 2018	Planning Commission public hearing
Public Safety Element update	November, 2018	Community meetings
Public Safety Element update	December 12, 2018	Planning Commission public hearing
Public Safety Element update	February 13, 2019	Planning Commission public hearing
Public Safety Element update	March 13, 2019	Planning Commission public hearing
Public Safety Element update	November 13, 2019	Planning Commission public hearing
Public Safety Element update	October 8, 2019	Board of Supervisors public hearing
Public Safety Element update	February/March, 2020	Community meetings
Public Safety Element update	March 10, 2020	Board of Supervisors public hearing
Public Safety Element update	September 15, 2020	Board of Supervisors public hearing
LHMP update	January 7, 2021	Emergency Management Council meeting
LHMP update	Jan. - June, 2021	Project Team reviews, LHMP updates
LHMP update	June/July 2021	Public input period
LHMP update	July, 2021	Emergency Management Council review

Table 6 Summary of outreach for 2016 and 2021 LHMP update

In summary, in 2016 the Planning Department led the effort to coordinate an update of the Plan. The purpose of the update was to review the Plan, revise the Plan if necessary, and resubmit the Plan for approval in order to remain eligible for benefits awarded under the DMA. The update was led by Planning Department staff involved in the update of the General Plan Safety Element. Best available information was used to update the hazard risk assessment. The action plan has been reviewed and amended, to account for changes in the risk assessment and new county policies identified under other planning mechanisms, as appropriate (such as the General Plan and Climate Action Strategy). The plan update process involved appropriate agencies, and the public was given an opportunity to comment. The updated plan was presented to the County Board of Supervisors for adoption. Final approval of the adopted updated Plan was provided by FEMA in a letter dated August 3, 2016. The LHMP must be updated and submitted to FEMA by August 3, 2021 for the County to remain eligible for disaster-related assistance under the DMA.

The 2021 update of the plan followed a similar process lead by the Planning Department Project Leader to incorporate staff, agency, and public input. Communications with County staff occurred via email, phone, and virtual meeting in the COVID-19 remote working environment. A draft of the plan update was developed and circulated amongst various County staff in their respective areas of expertise. The Community Profile is updated with the best available information. The plan was updated to reflect changes in development trends, progress in local mitigation efforts, and changes in priorities. Significant changes in development patterns are identified. A notable improvement in the 2021 update compared to the 2016 update, is the risk assessment was updated to reflect new information, updated maps, and current data on the hazards and vulnerability. Additional lessons learned, and modifications to risks and

hazards were identified and included as a result of the 2020 CZU Lightning Complex Fire. Progress in local mitigation efforts is documented in updated mitigation action worksheets in Appendix L. The process for staff, public, and agency input was similar to the previous update. Nearly all communication for the update was by electronic applications including email, web, phone, and virtual meeting platforms in a COVID-19 remote working environment. This process of staff, agency, and public outreach occurred beginning in late 2020 and continued through July 2021.

In July 2021, the updated plan was posted on a dedicated page of the [County Planning Department website](#) with an announcement on the main page about the availability of the plan for public review and comment. The webpage contains a brief overview of the purpose of the plan and the update process, including links to the entire document and separate links to individual chapters. A companion document was prepared and posted that provides a guide to the update highlighting all of the significant updates to the plan. County social media applications (Twitter and Facebook) were used to advertise the availability of the plan for public review and comment. Activity on social media included over 10,000 estimated views and over 300 engagements with the plan. No public comments were received, and positive feedback was received from one member of the Emergency Management Council.

3.3 Local Capabilities Assessment and Integration

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. **Reference §201.4(c)(3)(ii):** Inform the State’s blueprint for reducing the losses identified in their risk assessment by providing a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

This assessment of the mitigation goals, programs and capabilities included a review of the following items:

- Human and technical resources
- Financial resources and funding sources
- Local ordinances, zoning and building codes
- On-going plans or projects

Sources used to inform the LHMP include, but are not limited to, the General Plan Public Safety Element, the Emergency Management Plan, the Integrated Regional Water Management Plan, the Climate Action Strategy, the Community Wildfire Protection Plan, the Capital Improvement Program (CIP), County policies, ordinances, zoning and building codes. Consistency between these plans, programs and policies was reviewed by using these approved plans and policies as a foundation for the LHMP and by consulting with the departments responsible for the various plans and programs. In reviewing the effectiveness of local programs, Appendix H lists successful programs that have been implemented by the County. While these programs and the updated Emergency Management Plan have increased the County’s hazard mitigation capabilities, funding availability is the limiting factor in the implementation of additional identified hazard mitigation programs.

The Project Team leaders met several times with County staff and members of the Planning Department to ensure that the LHMP was consistent with the General Plan Public Safety Element. The project leaders met with County staff in the Environmental Health Department to incorporate hazard mitigation efforts identified by the various Water Departments within the county. Project leaders met with Fire Department staff to ensure that the LHMP was consistent with the current and planned programs and fire safety plans. The project leaders also met with the County GIS coordinator to ensure that maps were consistent with those in the General Plan and were accurate as of the draft publication date.

In this plan update, the planning team has verified that capabilities are documented sufficiently and capability changes from the previous plan are described. The Plan identifies actions that are within the capability of the County and its partners to implement and describes how the mitigation action items have been implemented since 2016. In this 2020-2021 update the Plan was enhanced by identifying changes to the community profile, any significant changes in development patterns, and progress in local mitigation efforts. Additionally, relevant updates to local zoning, building, and fire codes, and updated plans, including the Emergency Management Plan, Capital Improvement Program, and General Plan Safety Element, were reviewed to ensure consistency between the plans, programs, and policies as the foundation for the LHMP.

Following the CZU Lightning Complex Fire the County is actively engaged in rebuild and recovery efforts from the fire. Recognizing the importance of improving and expanding its hazard response, mitigation, and recovery capability, the County has established a new Office of Response, Recovery and Resiliency (OR3) in the County Administrative Office (CAO) in November of 2020. Through the creation of this interdepartmental office the County is increasing resiliency and capacity to respond to future disasters, including the impacts of climate change. The structure of the OR3 builds on the framework for fire recovery and rebuilding including, Human Care and Recovery, Rebuild and Recovery, and Emergency Preparedness and Resiliency as depicted in Figure 7.

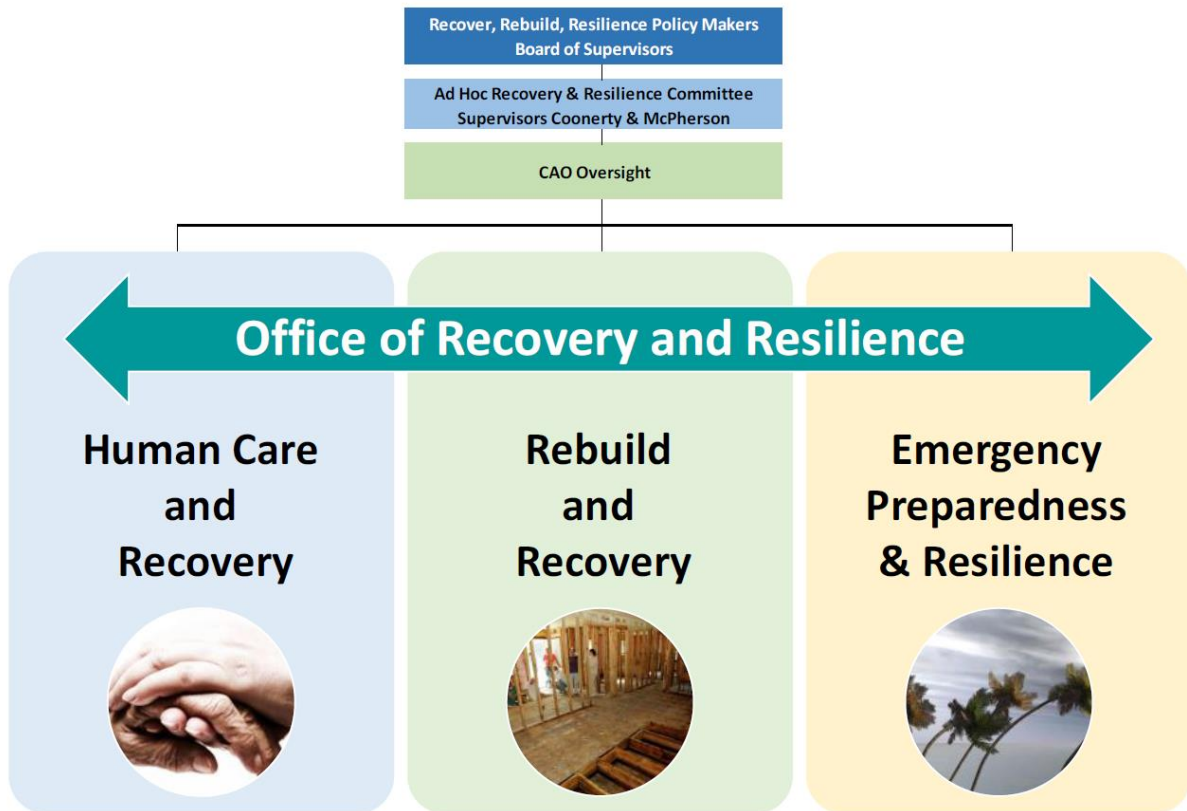


Figure 7 Office of Response, Recovery and Resiliency structure

The technical and adaptive challenges were described in the Board memo and discussed at the public hearing on November 10, 2020 on the new OR3:

The County of Santa Cruz faces a multitude of interconnected challenges. The impacts of global climate change are already being felt in the form of drought and severe storm events and there is the expectation of sea level rise. Earthquakes are also an ever-present danger and our aging infrastructure may be inadequate to meet the needs of the future. Combined with housing unaffordability and the need to address social inequity, the County stands at a crossroads as we plan for today and prepare for tomorrow.

In order to improve our emergency response, increase the public’s disaster awareness and prepare for a new normal where disasters are more prevalent and more robust due to climate change, we will need to engage our community in adaptive work. In order to envision a different future, we will need to create bold new goals. We will have to ask ourselves hard questions about our policy goals and funding priorities. We will have to get a clearer picture of our community values, and we will need to manage conflicts between those values and our strategic plan goals.

For technical work to succeed, a critical path of specific steps and milestones to achieve must be forged. For adaptive work to succeed, new tools need to be developed, leadership across sectors will be required and building community capacity through direct engagement must occur. A plan should be made but may need revisions along the way as new information is gathered and synthesized.

The CZU Lightning Complex Fire has provided us with a unique opportunity to improve community connections so that varied challenges can be approached strategically. The creation of the Office of Response, Recovery and Resiliency is the first step in transforming this tragedy into an opportunity to learn and develop a community that thrives.

This page intentionally left blank

Part 3 Hazard Identification and Risk Assessment

This page intentionally left blank

Risk Assessment of Hazards in Santa Cruz

Requirement: §201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

It is important for a community's risk assessment, mitigation, and preparedness efforts to be founded on accurate information about the types and scale of damage hazards pose to the community. This section of the Plan contains a description of those hazards identified as potential significant threats to Santa Cruz – earthquakes, wildfires, floods, drought, tsunami, extreme weather, coastal erosion, debris flows and landslides as well as the lesser threats of dam failure and expansive soils – and the exposure and vulnerability of the County to these hazards. These risks have been identified based on current experiences and historical information of hazard events including researching past disaster declarations in the County, region and state, input from geologic, climatic, and wildfire specialists and organizations as well as public comments and newspaper articles. Probable damage and the consequences to the county's quality of life are described.

The County of Santa Cruz has expanded and updated its GIS database, mapping critical facilities and hazard risk areas. Data from this mapping was used to determine hazards that present the greatest risk to the County.

Each hazard type was mapped as a GIS layer. In some cases, the hazard layers were developed and provided by outside agencies. Estimated loss is based on assessed valuation of improvements associated with the 2020 Assessment Roll. Total assessed valuation is the total assessed value of land and improvements. Values at risk are limited to the improvement values and not the land value. Therefore, the assessed value of improvements was joined to the county's parcel layer to estimate potential losses. The unincorporated parcels were queried out (which excluded the city parcels in the analysis). For each hazard type, the unincorporated parcels that fell within the hazard type were selected and the assessed value of improvements were totaled. Valuation of parcels is based on improvement and land values as they appear on the Assessment Roll. They do not reflect potential sale or replacement value. ESRI's ArcGIS software was used to develop the hazard layers and conduct the analysis.

The Assessment Roll normally varies from year to year and over the long term. A review of Assessed valuation and property tax data during this update period indicates there has been an increase in property value, or value at risk, since the original LHMP was adopted (Table 1).

This update focuses on how risk has changed since the previous plan was completed, particularly changes related to land use development and new hazard information. Overall, there has not been significant new development in hazard-prone areas since the previous plan was adopted. However, the winter storms of 2016-2017 caused approximately \$120 million in damage to public infrastructure and the CZU Lightning Complex Fire caused approximately \$ 340 million in damage to private structures and public infrastructure, and both events led to federal disaster declarations. The County's Climate Action Strategy, adopted in 2013, and containing new hazard information, was incorporated into the LHMP during the 2016 update to address the risk of climate change and sea level rise. In 2020, the General

Plan Public Safety Element was updated to implement a recommendation in the Climate Action Strategy to prepare coastal areas for sea level rise. The Public Safety Element now contains a section incorporating the LHMP by reference. Other sections of the Public Safety Element that were updated include seismic hazards, flood hazards, fire hazards, landslide hazards, and grading and erosion control. Table 8 is a list of all hazards as they relate to Santa Cruz County.

Hazard	Risk	Probability	Consequences	Loss of Life
Avalanche (snow)	None	N/A	N/A	N/A
Climate Change	High	High	High	Low
Coastal Erosion	High	High	High	Low
Coastal Storm	High	High	High	Low
Dam Failure	Low	Low	High	High
Debris Flows	High	High	High	Medium
Drought	High	High	High	Low
Earthquake	High	High	High	Medium
Expansive soils	Low	Medium	Low	N/A
Extreme Heat	Low	Low	Low	Low
Flood	High	High	High	Low
Freezing Events	Medium	Low	Medium	Low
Hailstorm	Low	Low	Low	N/A
Hurricane	None	N/A	N/A	N/A
Land subsidence	Low	Low	Low	low
Landslide	High	High	Medium	Low
Liquefaction	High	High	High	Low
Winter Snowstorm	None	N/A	N/A	N/A
Tornado	None	N/A	N/A	N/A
Tsunami	High	Low	High	High
Volcano	None	N/A	N/A	N/A
Wildfire	High	High	High	Low

Table 7 Review of all hazards relative to County of Santa Cruz

Santa Cruz County is exposed to a number of natural hazards that vary in their potential intensity and impact. This mitigation plan addresses eight high-risk natural hazards, selected because of the

likelihood of occurrence or the potential consequences, as well as two additional hazards that present either less risk of occurrence or extent of damage (Table 8). The natural hazards of floods, earthquake, and tsunami are of great concern because they can occur independently, or in combinations that can trigger secondary hazards such as dam failure. Another high-risk hazard, drought, can exacerbate the potential for wildfires. Climate change had been considered a lesser risk in the last update but is now considered a higher risk due to increasing scientific concern regarding magnitude and certainty of potential affects.

Risk	Affected Areas
Very Significant Risk	
Earthquake (including liquefaction)	Entire County
Wildfire	Mapped fire hazard areas (State and local)
Flood (including coastal storms)	Mapped flood hazards areas (FEMA)
Drought	Entire County
Tsunami	Mapped Coastal Areas
Coastal Erosion	Coastal Areas
Landslide (including Debris Flows)	Mapped landslide hazard areas
Climate Change	Entire County
Lesser risk	
Dam Failure	Mapped inundation area
Expansive Soils	Mapped areas

Table 8 Hazard screening for Santa Cruz County

The natural hazards included in this plan were identified through a community-based process including input from scientific experts in various fields and in conjunction with the update of the General Plan including the Public Safety Element and the preparation of the Climate Action Strategy. The original LHMP was the result of a number of public meetings, project team meetings, scientific expert, and community input as well as suggestions submitted by community members of the county. Key contributors included members of the Project Team, the Emergency Management Council, County staff, and local academic and professional experts who worked on programs and research that were incorporated in the General Plan and Public Safety Element. The preparation of the Climate Action Strategy was the result of a similar public process. Other natural hazards that are extremely rare or non-existent in the county are not included in this plan but are listed in Appendix A.

The worst potential disaster that Santa Cruz County might face involves multiple hazards occurring at the same time. A major earthquake could trigger tsunamis, wildfires, or floods, which would be exacerbated by damage to dams, stream culverts and storm drains. The County of Santa Cruz plans for and responds to emergency events in accordance with the Santa Cruz County Operation Area Memorandum of Understanding (MOU). The Emergency Management Plan describes the role and

operation of the County departments and personnel during a major emergency. In addition to researching each hazard individually, this Plan explores how the hazards interact, and how mitigation activities for each hazard impact the overall disaster risk in Santa Cruz.

Chapter 4 Earthquakes and Liquefaction

4.1 Risk Assessment

4.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

An earthquake is a sudden release of energy in the earth's crust. Caused by movement along fault lines, earthquakes vary in size and severity. The focus of an earthquake is found at the first point of movement along the fault line, and the epicenter is the corresponding point above the focus at the earth's surface. The size of an earthquake has been measured in various ways, the most familiar being the now obsolete Richter magnitude scale, which determines the amount of ground displacement or shaking that occurs near the epicenter. The Richter magnitude scale has now been replaced by the Moment Magnitude scale for medium and large sized earthquakes. While this scale attempts to characterize the amount of energy released by an earthquake, another scale - the Modified Mercalli Intensity Scale - measures ground shaking intensity in terms of perception and damage and takes into account localized earthquake effects (Table 9).

Intensity	Shaking	Description/Damage
1 (I)	Not felt	Not felt except by very few under especially favorable conditions
2 (II)	Weak	Felt only by a few people at rest, especially on upper floors of buildings
3 (III)	Weak	Felt quite noticeably by people indoors, especially on upper floors of buildings: Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations are similar to the passing of a truck, with duration estimated.
4 (IV)	Light	Felt indoors by many, outdoors by few during the day: At night, some are awakened. Dishes, windows, and doors are disturbed; walls make cracking sounds. Sensations are like a heavy truck striking a building. Standing motor cars are rocked noticeably.
5 (V)	Moderate	Felt by nearly everyone; many awakened: Some dishes and windows are broken. Unstable objects are overturned. Pendulum clocks may stop.
6 (VI)	Strong	Felt by all, and many are frightened. Some heavy furniture is moved; a few instances of fallen plaster occur. Damage is slight.
7 (VII)	Very Strong	Damage is negligible in buildings of good design and construction; but slight to moderate in well-built ordinary structures; damage is considerable in poorly built or badly designed structures; some chimneys are broken.

Intensity	Shaking	Description/Damage
8 (VIII)	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
9 (IX)	Violent	Damage is considerable in specially designed structures; well-designed frame structures are thrown out of plumb. Damage is great in substantial buildings, with partial collapse. Buildings are shifted off foundations. Liquefaction occurs.
10 (X)	Extreme	Some well-built wooden structures are destroyed; most masonry and frame structures are destroyed with foundations. Rails are bent.
11 (XI)	Catastrophe	Few, if any, (masonry) structures remain standing. Bridges are destroyed. Broad fissures erupt in the ground. Underground pipelines are rendered completely out of service. Earth slumps and land slips in soft ground. Rails are bent greatly.
12 (XII)	Enormous Catastrophe	Damage is total. Waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.

Table 9 Modified Mercalli Intensity Scale

Damage from earthquakes varies with the local geologic conditions, the quality of construction, the energy released by the earthquake, the distance from the earthquake's focus, and the type of faulting that generates the earthquake. Ground motion is the primary cause of damage and injury during earthquakes and can result in surface rupture, liquefaction, landslides, lateral spreading, differential settlement, tsunamis, building failure and broken utility lines, leading to fire and other collateral damage. Typically, areas underlain by thick, water-saturated, unconsolidated material will experience greater shaking motion than areas underlain by firm bedrock, but in some cases, relief may intensify shaking along ridge tops.

Fires and structural failure are the most hazardous results of ground shaking. Most earthquake-induced fires start because of ruptured power lines and gas or electrically powered stoves and equipment, while structural failure is generally the result of age and type of building construction.

Past experience has shown that the entire county is vulnerable to earthquake hazards. Within Santa Cruz County there are several active and potentially active faults. Zones of fracture are designated in the Seismic Safety Element of the General Plan/Local Coastal Plan and California State designated Seismic Review Zones. Fault zones designated for review by the County include the Butano, Sargent, Zayante, and Corralitos complexes. State-designated seismic review zones include the San Andreas, San Gregorio, and portions of the Zayante and Butano complexes. No new active or potentially active faults have been identified in the County for this plan update (Figure 8).

Movement along these faults can cause fault-related surface deformation (e.g., surface fault rupture) where the fault reaches the surface of the ground. Within the mapped fault zones in the County, it is

likely that movement along these faults will damage structures, roads, utilities, and other fixed facilities. The mapping of these zones has not changed for this plan update.

In addition to these zones, other ground cracking was observed during the Loma Prieta earthquake and the San Francisco earthquake of 1906. Many of these ground cracks can be attributed to movement or consolidation of large and moderate sized landslides while other ground cracks were most likely related to ridge spreading. Although much of the ground cracking was found near the fault zones and in the Summit area of the county, other ground cracking was found on ridge tops throughout Santa Cruz County. During the past five years Santa Cruz County has not experienced similar ground cracking as a result of an earthquake.

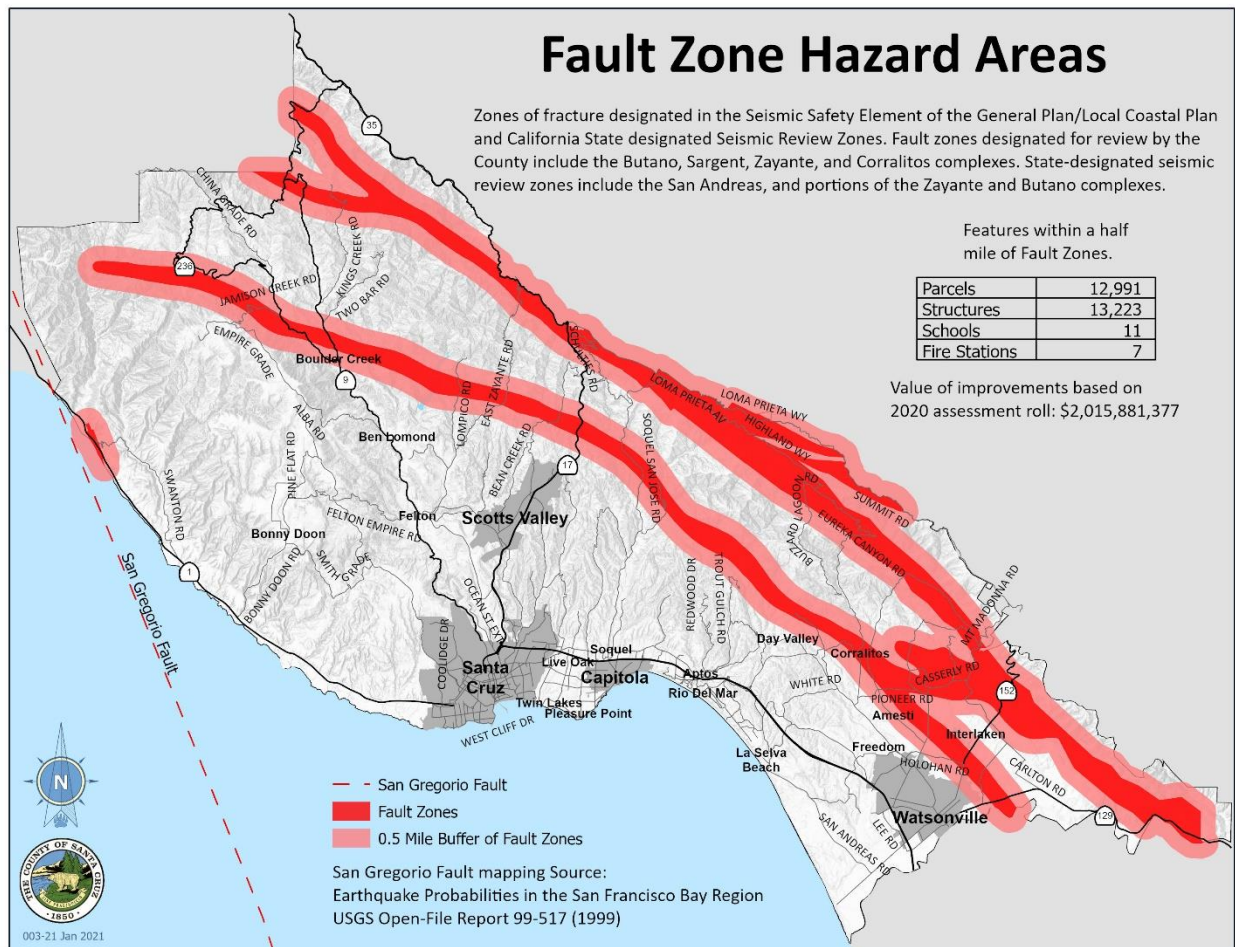


Figure 8 Fault zones of Santa Cruz County

Liquefaction is the transformation of loose, water-saturated granular materials (such as sand or silt) from a solid to a liquid state accompanying ground shaking during an earthquake. Liquefaction commonly, but not always, leads to ground failure. On slopes liquefaction may result in slope failure. Liquefaction potential varies significantly, and site-specific analysis is needed to accurately determine liquefaction potential in earthquake prone areas. Most of the valley bottoms in the southern regions of the County are underlain by alluvium and are considered at very high, high, or moderate risk for liquefaction potential based on the Santa Cruz County Liquefaction Hazard Areas map (Figure 9). Coastline regions also have low to very high liquefaction potential.

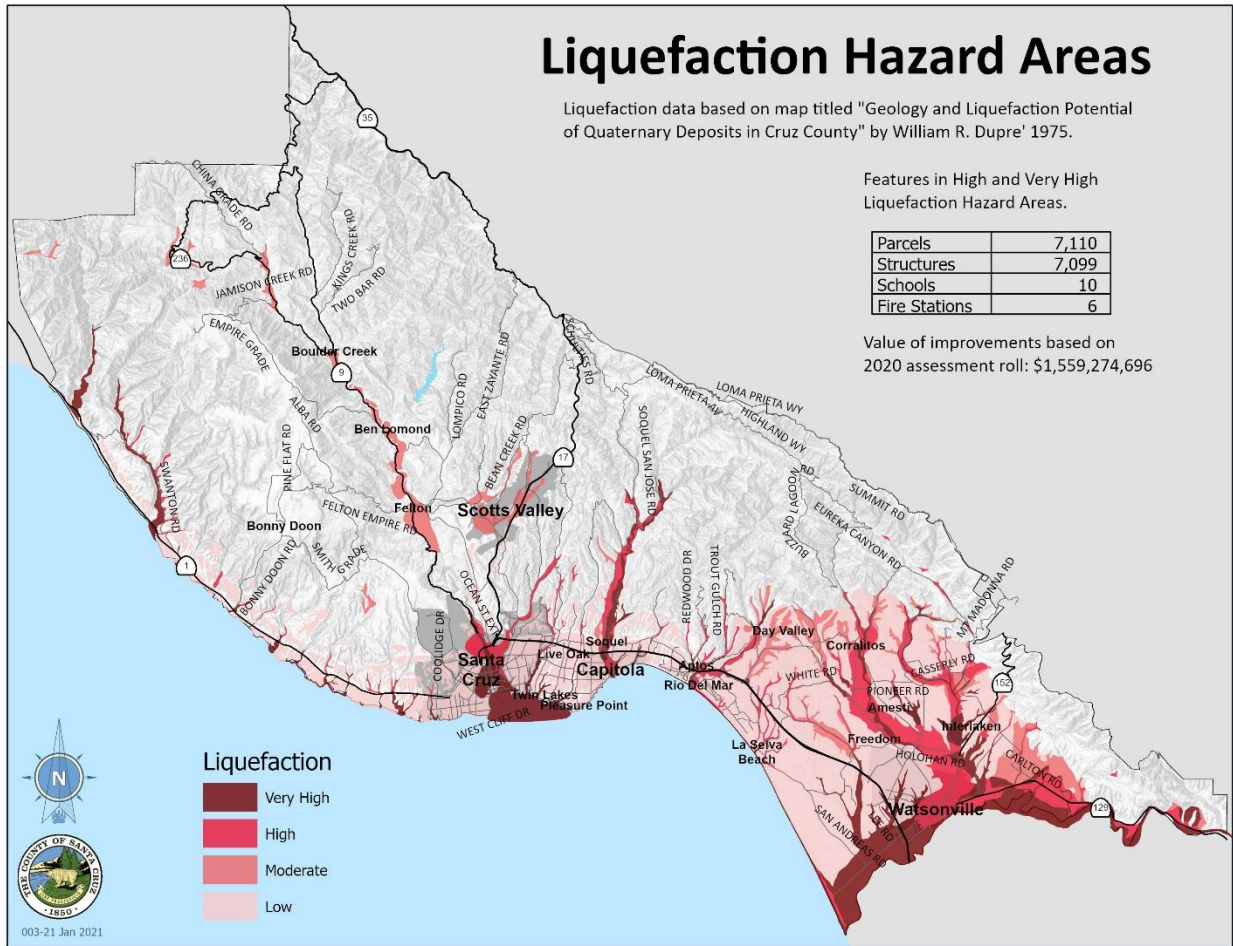


Figure 9 Map of liquefaction potential in Santa Cruz County

4.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

The following is a list of previous events, dates, severity, level of damage, duration, sources of information used, and maps (where available) to show areas affected. While Santa Cruz County has sustained numerous earthquakes throughout its history, the two most destructive ones were the 1906 San Francisco earthquake and the 1989 Loma Prieta earthquake.

Moderate-Sized Earthquakes before 1906: Four moderate-sized earthquakes (estimated Richter magnitude 6 to 6.5) were recorded in Santa Cruz County before the April 18, 1906 earthquake: a Richter magnitude 6 earthquake on February 26, 1864 centered somewhere in the southern Santa Cruz Mountains, a Richter magnitude 6.5 earthquake on October 8, 1865 centered in the Santa Cruz

Mountains, a Richter magnitude 6 earthquake on March 26, 1884 centered in the Santa Cruz Mountains, and a Richter magnitude 6.25 earthquake in the Pajaro Gap on April 24, 1890. All of these together indicate that a pattern of earthquakes nearly the same size of the Loma Prieta earthquake have occurred in the recent past. Each of these earthquakes caused some damage and would cause damage to homes today (all magnitudes cited are estimates based on descriptions of the damage which occurred). Figure 9 shows the intensity of effects from the 1989 Loma Prieta earthquake in terms of the Modified Mercalli Scale measurement of level of damage in different locations.

April 18, 1906: (Richter magnitude: 8.3) There were no recorded deaths in Santa Cruz County, but the old courthouse partially collapsed and about 1/3 of the chimneys within the city of Santa Cruz were destroyed or damaged. Landsliding was observed throughout the Santa Cruz Mountains, and fault rupture was nearly continuous along the San Andreas fault zone, and nearby fault zones in Santa Cruz County. Infrastructure, including bridges, were destroyed, and broken mains and pipes shut off the water supply.

October 1926: (Richter magnitude 6.1) Two large earthquakes occurred during this year. Three of the aftershocks cracked plaster in Santa Cruz, almost bringing down the chimneys of numerous buildings. It broke plate glass windows along Pacific Avenue. The city water main broke at Laguna Creek and articles fell from shelves at stores.

October 17, 1989: (Richter magnitude: 7.1) At 5:04 p.m., a magnitude 7.1 earthquake rocked the Monterey Bay and San Francisco Bay regions. The initial quake lasted only 22 seconds, although in the following two weeks, more than 4000 aftershocks were recorded, with 20 of these greater than magnitude 5 on the Richter Scale. The epicenter of the Loma Prieta earthquake was about 10 miles east-northeast of the city of Santa Cruz in the Aptos planning area on the San Andreas Fault. In Santa Cruz County, 674 dwellings, 32 mobile homes and 310 businesses were destroyed in the earthquake. The Loma Prieta earthquake was the largest to strike California since 1906, causing 62 deaths and 3,757 injuries. More than 12,000 people were left homeless, and transportation, utilities and communications were disrupted. There was more than \$6 billion in property damage. Figure 10 is a map based on the Modified Mercalli Intensity Scale for the Loma Prieta earthquake.

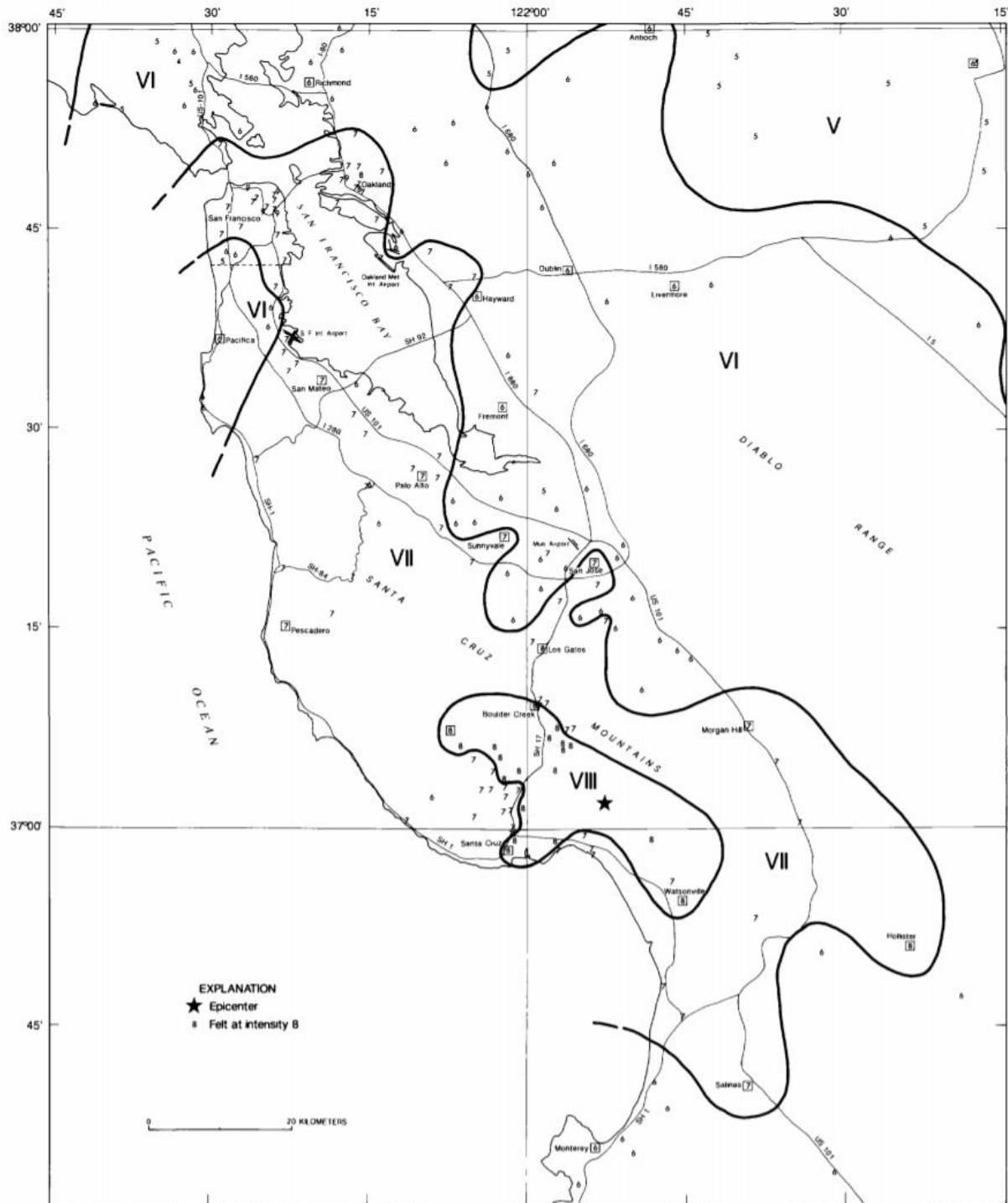


Figure 10 Isoseismal map for the San Francisco Bay region for the 1989 Loma Prieta earthquake

There are at least six major faults and fault systems within or near Santa Cruz County, placing it in an area of high seismic risk. Because earthquakes can cause severe damage over a long distance, the Santa Cruz area remains at risk from continued seismic activity along the many faults in the greater San Francisco Bay region. The reduction of seismic stresses that occurred in the Loma Prieta earthquake did

nothing to relieve, and possibly increased, stresses within other faults, including other sections of the San Andreas Fault.

To clarify the extent of future earthquake risk, a partnership of the United States Geologic Survey, the California Geologic Survey, and the Southern California Earthquake Center, known as the Working Group on California Earthquake Probabilities, evaluated, and systemized currently available historic and paleoseismic information to produce a probabilistic seismic hazards analysis to indicate the type of future earthquakes. The resulting model, referred to as the third Uniform California Earthquake Rupture Forecast, or “UCERF3”¹, represents the best available science for estimates of the magnitude, location, and likelihood of potentially damaging earthquakes in California. The UCERF3 was developed in 2013 and represents the latest earthquake rupture forecast model that tells us where and when the Earth might slip along the state’s many faults.

The results of the UCERF3 for the San Francisco region are shown in Table 10. The table indicates the average time between earthquakes and the likelihood of having one or more such earthquakes in the next 30 years (starting from 2014). It is important to note that the repeat times are averages and actual repeat times will certainly vary significantly. The fault systems producing these earthquakes are located throughout the San Francisco region and near Santa Cruz County (USGS Fact Sheet 2016-3009).

San Francisco Region		
Magnitude (greater than or equal to)	Average repeat time (years)	30-year likelihood of one or more events
5	1.3	100%
6	8.9	98%
6.7	29	72%
7	48	51%
7.5	124	20%
8	825	4%

Table 10 Average repeat time and likelihood of earthquakes in the San Francisco region

As noted, the UCERF3 is an earthquake fault rupture forecast model that tells us where and when earthquakes might occur. Combining this information with ground motion prediction models that estimate the ensuing shaking from a fault rupture results in estimates of seismic hazards in the areas where fault rupture might occur. The UCERF3 has been used for the 2014 update of the U.S. Geological Survey National Seismic Hazard Maps. Combining the seismic hazard information with engineering models of the built environment results in estimates of seismic risk, which is the probability of losses or damage to the built environment if exposed to a seismic hazard.

¹ <https://www.scec.org/ucerf>

4.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

The vulnerability of a community to earthquake hazard is based on a variety of factors including proximity to active and inactive faults, the age of structures, the density of the population and development, the value of property and infrastructure, the construction materials used in residential and non-residential buildings, and the location of critical facilities in a community. Recent history indicates that Santa Cruz County has a very high vulnerability to earthquakes due to proximity to faults, density of population and development within the floodplains of the many creeks and rivers, which are subject to liquefaction.

One or more moderate to large sized earthquakes (magnitude 6.5 to 7.5) will likely shake the entire County of Santa Cruz during the life span of most residents. Many older homes that were damaged but not destroyed in 1989 were improved seismically but still are at a higher risk than newer construction using the latest building code standards. Modern homes will normally fare better in earthquakes but 1989 showed that this is not necessarily the case. Some older homes fared better than newer ones due to location and design.

A great earthquake on the San Andreas Fault or other regional major faults will:

- Damage roads, bridges, and critical structures, and could severely damage most homes in the County.
- Liquefaction could occur along alluvial areas such as Pajaro Valley, parts of Capitola and Santa Cruz, and along streams such as Corralitos Creek, the San Lorenzo River, and other streams throughout Santa Cruz County.
- Fault Rupture may occur near the major faults as zoned by the County and State, and
- Ground Cracking may occur through the hillslopes and near the Fault Zones.
- As indicated in the sections on landsliding and coastal erosion, earthquakes can reactivate landslides and cause coastal bluff failure, and also contribute to the initiation of other landslides and slope failures.

4.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Large areas of the County are located within 0.5 mile of a State or County designated fault zones or in a liquefaction hazard area, as indicated on the maps in Figures 8 and 9. Estimates of the types and numbers of existing buildings, facilities and infrastructure located in these mapped areas is determined using the County’s GIS application. The earthquake hazard layer and 0.5-mile buffer are overlaid on

the parcel layer to identify the parcels that fall within the earthquake hazard layers. The liquefaction hazard layer is defined by the mapped high and very high liquefaction hazard areas. Using the County Assessor information for the improvement characteristics for the selected parcels, the number of structures located with the seismic hazard areas is determined. The number of structures is shown on the maps in Figures 8 and 9.

Past experience has shown that the entire county is vulnerable to earthquake hazards including severe ground shaking. Thus, every structure in the unincorporated area of the County is vulnerable to earthquake related hazards. However, the structures identified in Figures 8 and 9 and the value at risk shown in Table 11 are particularly vulnerable because of their location in proximity of a fault zone or high or very high liquefaction area.

4.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Figures 8 and 9 include information on the number and type of structures located within 0.5 miles of a mapped fault zone or in a liquefaction hazard area and the total value of the structures. Table 11 is a summary of the number, type, and value of all structures located in fault zones and the 0.5-mile buffer and in a high or very high liquefaction hazard area. The methodology used to prepare both estimates is the same. Using the County’s GIS application, the earthquake hazard layer and 0.5-mile buffer and the high and very high liquefaction hazard area is overlaid on the parcel layer to identify the parcels that fall within the earthquake hazard layers and their assessed value. There is some overlap of the fault zone layer and liquefaction hazard layer in the southern portion of the County, therefore, the amounts shown in Table 11 include some double counting of parcels and structures and is, therefore, an overestimate. Vulnerability estimates are limited to ground motion-induced losses to buildings only. In other words, the losses to other elements of the built environment, such as transportation, lifeline and communication facilities are not reported. Furthermore, the losses reported are only the direct economic losses due to building damage, which consist of capital stock loss.

Land Use	Parcels	Structures	Total Assessed Value in 2020 Dollars
Agricultural	1,016	1488	\$148,191,432
Commercial	419	727	\$182,247,585
Government	667	161	0
Industrial	49	136	\$30,508,089
Institutional	200	479	\$69,619,425
Miscellaneous	624	544	\$64,831,045
Residential	16,988	16740	\$3,079,653,024
Utilities	138	47	\$105,473
Total	20,101	20,322	\$3,575,156,073

Population	36,809		
Population is based on the 2010 Census. Unincorporated Block centroids were selected by the hazard area.			

Table 11 Earthquake potential loss inventory

An additional method of earthquake loss estimation has been developed and updated by the California Geologic Survey (CGS). In 2016², using the latest Hazus default information for built environment and demographics, CGS updated statewide annualized earthquake losses for California. The annualized earthquake loss (AEL) is the estimated long-term value of earthquake losses to the general building stock in any single year in a specified geographic area. This AEL update is based on ground motions from the 2014 update of the U.S. Geological Survey National Seismic Hazard Model. AEL estimate at the state level is approximately \$3.7 billion. AEL estimate for Santa Cruz County is approximately \$43 million.

4.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Santa Cruz County has a number of compact urban communities as well as extensive areas of agricultural land and forested hillsides. A number of rural villages and towns are located throughout the County. As dictated by the 1978 Growth Management Ordinance, most new development has occurred within or adjacent to the urban services line (i.e., the boundary point for such infrastructure as water and sewage service). As with most communities, increased housing costs has resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available. Other development is mostly infill or reuse development, and development of existing rural residential properties.

Growth management policies limit development from occurring where hazards are present and, in most cases, require substantial setbacks from these hazards. Seismic safety standards are a requirement for all building permits. As infrastructure is repaired or replaced, updated seismic safety standards are incorporated.

No changes in these development regulations or patterns occurred that would affect the County's overall vulnerability since the previous plan was adopted in 2010. While the County does not track the number of residential and commercial structures that have been built in earthquake and liquefaction hazards zones since the last LHMP was adopted in 2010, it is a subset of the overall number of new structures built in the unincorporated portion of the County. As noted above, most new development of residential structures and virtually all new development of commercial structures occurs within the urban services line and outside of earthquake and liquefaction hazards zones.

² Chen, R., K.S. Jaiswal, D. Bausch, H. Seligson, and C.J. Wills (2016). Annualized Earthquake Loss Estimates for California and Their Sensitivity to Site Amplification, *Seismological Research Letters*, v 87 (8), Pre-Issue Publication Article, doi: 10.1785/0220160099.

The County has adopted growth management policies and ordinances that limit growth. According to annual Growth Management Reports, there have been about 900 new residential structures built in the County since 2010, broken down by year in Table 12.

Residential Building Permit Issued				
Year	Market Rate	Affordable	Second Units	Total
2010	35	0	24	59
2011	34	89	18	141
2012	55	64	19	138
2013	42	4	29	75
2014	61	2	19	82
Subtotal (2016 LHMP update)	227	159	109	495
2015	30	1	29	60
2016	32	66	19	117
2017	76	0	28	104
2018	36	1	36	73
2019	37	2	21	60
Subtotal (2021 LHMP Update)	211	70	133	414
Total	438	229	242	909

Table 12 Residential building permits issued 2010 to 2019.

As stated above, growth management policies limit and mitigate new development near seismic hazards. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks and other requirements to mitigate potential impacts from earthquake and liquefaction hazards. The Environmental Planning Section of the Planning Department, staffed by resource planners, specializes in reviewing each application for new residential and commercial structures to ensure that new development does not occur in earthquake and liquefaction hazards and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified earthquake and liquefaction hazards. These policies and procedures implement the mitigation strategy described below.

4.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The primary mitigation strategy to avoid or reduce damage from earthquakes is continuation of design review and code enforcement to meet current seismic standards, including adequate geologic engineering and geotechnical monitoring protocols to ensure structural integrity. Current policies that assist in meeting these standards include:

- Continued Enforcement of the Geologic Hazards Section of Santa Cruz County Code: Chapter 16.10 of the County Code requires the assessment of geologic hazards by the County Geologist and/or private engineering geologists for all new development projects. The geologic hazards identified through this assessment process are then mitigated by avoidance or through measures designed by civil engineers using the California Building Code.
- Continued rigorous enforcement of the California Building Standards with regards to seismicity including requiring engineering and liquefaction studies for all affected development.
- Continuing to encourage development adjacent to urban areas: By encouraging development in areas with urban services, the exposure of the population to areas where earthquakes may damage roadways and other utilities is reduced.
- Encourage the State’s re-mapping of Santa Cruz County through the Seismic Hazards Zonation Program. Consider sharing the cost of the preparation of these new maps.

An assessment of this mitigation strategy as part of this five-year plan update indicates the strategy is effective for reducing potential losses identified in the risk assessment. The earthquake risk has not changed since the previous plan was adopted. No adjustments are needed to address a change in circumstances. There have been no earthquake-related disasters during the five-year update period.

4.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Earthquake Goals

Earthquake 1 - Avoid or reduce the potential for life loss, injury, property, or economic damage to Santa Cruz from earthquakes.

Earthquake 2 - Encourage retrofitting and other mitigation activities that increase disaster resilience to earthquake.

Earthquake 3 - Encourage further investigation and evaluation of faults in and near Santa Cruz County and incorporate new information into the County of Santa Cruz site and building design requirements.

4.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Earthquake hazards are a significant threat to Santa Cruz County. The following mitigation actions are critical to the future safety of residents of Santa Cruz County. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Coordinate preparedness efforts with other agencies. (A-1)
- Upgrade roadways, sewer, water, and other infrastructure to withstand seismic shaking. (B-1)
- Promote seismic safety upgrade of all emergency use and critical structures. (B-16)
- Review all new and replacement critical structures to require that they be designed to standards of the California Building and County Geologic Hazards codes. (B-17)
- Train appropriate plan check staff on seismic requirements for structures. (B-18)
- Encourage zoning in geologically constrained areas that reflect the nature and extent of the hazard. (B-19)

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for seismic hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to earthquake and liquefaction hazard reduction.

- Earthquake preparedness and disaster response is coordinated by the Emergency Management Council (EMC) with other agencies and cities within the County. The EMC continues to meet on a bi-monthly basis. (A-1)
- Infrastructure such as roads, bridges, and drainage structures are continually prioritized for upgrade to withstand seismic shaking as allowed by funding resources available to the Department of Public Works. (B-1)
- County staff applies the current seismic design standards to all projects with a view to upgrade emergency uses and critical structures. As critical structures are renovated modern Building Code standards are applied to each renovation by both the design and review staff. (B-16)
- The Planning Department continues to review development applications for emergency use and critical structures, and all other structures, for compliance with the California building code and the Geologic Hazards Ordinance regarding seismic hazards. (B-17)
- Plan review staff and the building inspectors undergo continuous education courses through CALBO that include training in current seismic construction standards. (B-18)
- The County's zoning has not been revised during the reporting period in any manner that would increase or decrease earthquake hazards. The County's permit review process already requires addressing geologic constraints through application of the requirements in SCCC 16.10 Geologic Hazards. The County has adopted the latest version of the California Building Code. (B-19)

The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. There are no recommended changes to the mitigation actions for earthquake hazards, or the priorities of the mitigation actions. The actions will continue to be implemented on an ongoing basis through existing regulatory mechanisms and funding availability.

Chapter 5 Wildfires

5.1 Risk Assessment

5.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

A wildland fire may be defined as any unwanted fire involving outdoor vegetation. This may be perceived as only occurring in forests, rangelands, or agricultural fields, but it might also occur in vacant lots, highway medians, parks, golf courses and rural residential areas. The term Wildland Urban Interface (WUI) describes many of these areas. The nature and frequency of wildland fire in California has changed since the County adopted the 2013 Climate Action Strategy, and the last LHMP update in 2016, especially as it pertains to the WUI. The potential for both life and property losses in the WUI is exponentially higher than non-populated wildlands. In addition, human influence, forest management practices, and aging utility infrastructure has greatly increased the number and variety of potential sources of ignition. A fire threat will always exist in the WUI. There will always be flammable vegetation, residential structures, utility infrastructure and human activities creating risks for the next large fire in the county.

Wildland fires are influenced by three factors: fuel, weather, and topography. Wildfire spread depends on the type of fuel involved (grass, brush, and trees). Weather influences wildland fire behavior with factors such as wind, relative humidity, temperature, fuel moisture and possibly lightning. Several of these factors can modify the rate the fire will burn. What has been seen in the past several years is that wind events have been both the mechanism and significant driver of the severity of wildland fire events in California. Topography is a significant influence on fire severity as well. While historically normal weather conditions in the Santa Cruz Mountains could be categorized as cold and damp with extensive marine influence (fog). There is an increasing frequency and duration each year when conditions are created where fuel moisture levels have been measured below 5% with temperatures above 90 degrees Fahrenheit, and offshore winds greater than 45 mph.

Large areas of the County have been mapped and designated in the County's General Plan as Critical Wildfire Hazard Areas due to accumulations of wildfire prone vegetation, steep and dry slopes, and the presence of structures vulnerable to wildland fires. These areas are generally situated in the steeper higher elevations of the county. Most of these areas are along the border of Santa Clara County or in the Coastal ridges between Highway 9 and Highway 1. While areas designated Critical Fire Hazard Areas are areas of increased wildfire risk, it should be noted that wildland fires may occur anywhere within the County.

The State Responsibility Area (SRA) is the area of the County where financial responsibility for the prevention and suppression of wildfires is primarily the responsibility of the state. In general, SRA includes forest-covered lands, whether of commercial value or not, or brush or grass-covered lands. SRA does not include lands within city boundaries or in federal ownership. Local Responsibility Areas (LRA) include incorporated cities and other urbanized areas, and cultivated agriculture lands. CalFire has

mapped fire hazard severity zones within SRA and LRA. Mapping of the areas, referred to as Very High, High, and Moderate Fire Hazard Severity Zones (VHFHSZ), is based on relevant factors such as fuels, terrain, and weather (Figure 11). This mapping includes all of the Critical Fire Hazards Areas designated in the General Plan.



Figure 11 Map of Fire Hazard Severity Zones

5.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Prior to about 1950 information on wildfire in Santa Cruz County was limited to verbal history and newspaper accounts. After the Division of Forestry began gathering data in the 1950s, significant wildfires in Santa Cruz and adjacent counties were documented in the early 1960s and again in the 1980s (Lexington fire). The devastating wildfires that occurred in Santa Cruz County in 2008 (Summit, Martin and Trabing fires) and 2009 (Lockheed and Loma fires) burned a combined area of nearly 14,000 acres and numerous homes and structures.

Beginning in the early morning hours of August 16, 2020 a lightening event started multiple fires in Santa Cruz and San Mateo Counties. The fires eventually joined and formed the CZU Lightning Complex Fire. Over 45,000 people were evacuated in the North Coast, San Lorenzo Valley and Scotts Valley areas. About 1,431 structures were destroyed and 134 structures damaged, with a preliminary total damage valuation of \$340 Million including public infrastructure. Of the structures destroyed, 911 were single family homes, 3 were multiple residential, 148 were commercial or mixed-use structures, and 391 were other minor structures.

Fire Name	Year	Acres Burned
Pine Mountain	1948	15,893
Newell Creek	1954	166
Newell Creek #2	1959	1,326
Austrian Gulch	1961	9,067
Lincoln Hill	1962	3,234
Big Basin #7	1980	378
Big Basin	1982	300
Rocha #2	1984	1,239
Lexington	1985	13,122
Croy Fire	2002	3,006
Summit Fire	2008	4,270
Martin Fire	2008	520
Trabing Fire	2008	630
Lockheed Fire	2009	7,819
Loma Fire	2009	485
<i>Subtotal</i>	<i>1948 to 2019</i>	<i>61,455</i>
CZU Lightning Complex Fire	2020	85,509

Table 13 Recent history of wildfire in Santa Cruz County

What makes wildfire different today as compared to the early part of the last century is the number of people living in the rural area, or the Wildland Urban Interface (WUI). According to the United States Census, the population of Santa Cruz County including all four incorporated cities has increased by over 200,000 people since the middle of the last century, from an estimated 66,534 in 1950 to an estimated 273,213 in 2019. Much of the increase occurred in urban areas, but rural areas have experienced significant population increases, as well. According to the San Mateo - Santa Cruz Unit Strategic Fire Plan, this has caused the fire agencies to change approaches to fire hazards from focusing primarily on the fire to dealing with increasing demands for protecting roads, structures, and people. Because there

are not enough firefighters or fire apparatus to protect each and every home during a wildfire, the community and government must take greater responsibility for preventative measures to make homes, neighborhoods, and the community more defensible from wildfire.

Given the history of drought and climate change, it is likely that dry fuel conditions will occur every year in the future. Areas identified as likely to have a wildland fire are spread out across the county. Most of these areas are associated with the higher dryer elevations with fuels consisting of Manzanita, chamise and knobcone pine. Even with the large acreages recently burned in 2020, much larger areas of the County in SRA and LRA contain vegetation conditions that could fuel future wildfires. The development of rural residences in these hazardous areas combined with aging utility infrastructure, hazardous fuel loads and continued recreational and transient uses in these remote locations will continue to elevate wildfire hazards.

5.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

According to a 2008 report by Headwaters Economics, Santa Cruz County was ranked 9th among 413 western state counties for percentage of homes along the WUI and 14th in California for fire risk. During the preparation of the countywide Community Wildfire Protection Plan (CWPP), numerous assets at risk were identified. These include thousands of residences, several schools including a University campus, several youth camps, and numerous commercial facilities. There are five local public water systems with extensive infrastructure situated within high hazard areas. Three state highways and three major power transmission rights-of-way cross through vulnerable areas. Due to topography and limited access, both the protection plus potential reconstruction of these assets will be hampered.

The impact of wildfire on a community is far-reaching. The most significant impacts would be environmental damage and loss of property. The loss of life is a significant risk depending on the nature of the wildfire event and advanced warning abilities. Air quality is also a major issue, which can force the closure of schools and businesses as well as limit human activity. Damage to infrastructure such as culverts, roads and bridges can be difficult to locate and repair in a timely manner. During the rainy season, burned-over areas are subject to mud slides and debris flows which can be exacerbated by infrastructure damage. Sedimentation due to winter rains can destroy fish habitats, which can have a catastrophic effect on the eco-system. All of these effects have been and will continue to be felt to varying degrees as a result of the CZU Lightning Complex Fire.

5.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

By definition WUI areas are adjacent to residential and open space areas. Many public and private buildings are immediately threatened by wildland fires. As part of this evaluation, Fire Hazard Severity Zones (Moderate, High, and Very High) were assessed. Contained within these critical areas are over 36,000 structures including 30 schools and 22 fire stations (Figure 11).

5.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Figure 11 includes information on the number and type of structures located within Very High, High, and Moderate Fire Hazard Severity Areas and the total value of the structures. Table 14 is a summary of the number, type, and value of all structures located in the Fire Hazard Severity Areas. Using the County’s GIS application, the Fire Hazard Severity layer is overlaid on the parcel layer to identify the parcels that fall within the fire hazard layers and their assessed value.

Land Use	Parcels	Structures	Total Assessed Value 2020
Agricultural	910	1,596	\$160,244,513
Commercial	427	526	\$130,950,085
Government	916	300	\$416,954
Industrial	44	139	\$43,978,619
Institutional	336	861	\$131,493,049
Miscellaneous	1,028	697	\$70,275,465
Residential	31,950	32,109	\$5,685,918,660
Utilities	345	92	\$1,122,883
Total	35,956	36,320	\$6,224,400,228
Population	63,328		
Population is based on the 2010 Census. Unincorporated Block centroids were selected by the hazard area.			

Table 14 Fire potential loss inventory

5.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

As demand for housing increases, residential construction has spread out into all of the different vegetative cover and topographic types throughout the county. Access to small rural residential clusters is governed by topography, land use criteria, parcel size and ownership trends. Many residential clusters may have only one ingress and egress, which is usually limited to long stretches of narrow winding mountain roads. When these roads are blocked, all access is blocked to these clusters.

Santa Cruz County covers a large area made up of numerous remote areas with small rural residences. This makes comprehensive patrolling and protecting the county from wildfire difficult. The county might be relatively small, but poor access and remoteness of many of the small rural residential clusters result in long response times for suppression equipment.

In addition to lightning, various human infrastructure and activities in the wildland environment create a high risk of fire starts. Of the 20 most destructive fires in California, 7 were from power lines or electrical sources with a number still under investigation³. Other human activities that can elevate risk include camping, “backyard” burning, illegal fireworks, arson, and structure fires spreading to the wildland. All of these factors have caused wildland fires of various magnitudes.

The County has adopted growth management policies and ordinances that limit growth in accordance with a local growth management referendum of 1978, known as Measure J. Growth management policies steer new development to urbanized areas and limit new land divisions in rural areas but this has not stopped continued construction on existing rural lots. Most new development of residential structures and virtually all new development of commercial structures occurs within the urban services line and outside of high fire hazard zones.

No changes in these development regulations or patterns occurred that would affect the County’s overall vulnerability since the LHMP was adopted in 2016. While the County does not track the number of residential and commercial structures that have been built in fire hazard areas since the last update, it is a subset of the overall number of new structures built in the unincorporated portion of the County. According to annual Growth Management Reports, there have been 909 new residential structures built in the County since 2010 (Table 12).

Development on existing lots of record is required to avoid hazards and incorporate appropriate access, water supply for fire suppression, construction materials, and defensible space requirements to mitigate potential impacts from fire hazards. The Environmental Planning Section of the Planning Department, staffed by Resource Planners, the Building Plan Check and Inspection Section of the Planning Department, and the local fire district, specialize in reviewing each application for new residential and commercial structures to ensure that new development generally does not occur in fire hazard zones and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified fire hazards. These policies and procedures implement the mitigation strategy described below.

³ Top Twenty Most Destructive California Wildfires <https://www.fire.ca.gov/stats-events/>

5.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

In wildland fire, the priorities of the fire service are:

1. Life
2. Property
3. Natural Resources

Lower priorities are only protected when higher priorities have been confirmed safe.

The various agencies responsible for protecting Santa Cruz County from losses due to wildland fires have implemented a number of mitigation programs over the years. They are as follows:

- Implementation and use of a Reverse 911 style community notification and warning system.
- Implementation of a new community notification tools (CodeRed).
- Implementation of a new Evacuation Management Tool (ZoneHaven).
- Fuel reduction projects along transportation corridors.
- Comprehensive mutual aid system for fire protection.
- Routine and frequent training by local and state fire jurisdictions.
- Annual Residential Defensible Space education and enforcement programs.
- Collaborative and cross jurisdiction Vegetation Management Programs including fuel reduction and shaded fuel break programs.
- Update of the countywide Community Wildfire Protection Plan (CWPP) using Federal Grant funding. Integrating a comprehensive prioritized hazardous fuel management strategy.
- Implementation of new County building codes addressing WUI related issues including building materials, construction requirements, water systems/supply and code enforcement.
- Promotion of built-in fire extinguishing, alarms, and water systems per new fire code requirements.
- Comprehensive hazardous fuel management strategy using a project prioritization across jurisdictional boundaries and areas of responsibility.
- Indigenous land stewardship practices of hazardous fuel management through controlled burns.

Wildland fire protection in California is the responsibility of the State, local government, or the federal government depending on location. The State Responsibility Area (SRA) is the area of the state where financial responsibility for the prevention and suppression of wildfires is primarily the responsibility of the state. Of course, the partnership of private property owners is essential for implementing fire prevention strategies. In general, SRA includes forest-covered lands, whether of commercial value or not, or brush or grass-covered lands. SRA does not include lands within city boundaries or in federal ownership. Fire protection in SRA is typically provided by CAL FIRE. However, in Santa Cruz County, autonomous fire protection districts provide fire protection in large parts of the SRA. Local responsibility areas (LRA) include incorporated cities and other urbanized areas and cultivated

agriculture lands. Local responsibility area fire protection is typically provided by city fire departments, fire protection districts, and by CAL FIRE under contract to local government.

CAL FIRE is the County Fire Department for the unincorporated areas of Santa Cruz County that are not included in an autonomous fire protection district. In addition, the County contracts with CAL FIRE to provide fire protection for Pajaro Dunes, and to provide administrative and staffing needs for the Pajaro Valley Fire Protection District.

Because the majority of wildland fires occur in the SRA, there is potential for many different agencies in the county to be affected. In many cases, fires occur in Mutual Threat Zones (MTZs) or in areas near adjoining jurisdictions and also in the LRAs. It is through mutual relationships with local government agencies where initial attack resources become larger and more effective. The following Santa Cruz County local government agencies are typically available and involved in suppressing wildland fires:

Scotts Valley Fire Protection District
Boulder Creek Fire Protection District
Central Fire Protection District of Santa Cruz County (combined with Aptos/La Selva Fire Protection District)
Felton Fire Protection District
Santa Cruz City Fire Department
Watsonville Fire Department
Zayante Fire Protection District
Ben Lomond Fire Protection District
Branciforte Fire Protection District
Pajaro Valley Fire Protection District

A person who owns, leases, controls, operates, or maintains a building or structure in, upon, or adjoining SRAs are required by Public Resource Code (PRC) 4291 to maintain defensible space around structures on their property. Defensible space means the area adjacent to a structure or dwelling where wildfire prevention or protection practices are implemented to provide defense from an approaching wildfire or to minimize the spread of a structure fire to wildlands or surrounding areas. Responsibility for maintaining defensible space is limited to 100 feet from structure(s) or to the property line, whichever is closer. Defensible space inspections are completed by inspectors from CAL FIRE, engine companies, and fire protection districts (Central and Aptos/La Selva). Educational materials are distributed to residents during inspections, through direct mailing, and at public events including a brief pamphlet focusing on defensible space and a document called "Living With Fire in Santa Cruz County."

The Santa Cruz County Code requires new projects and construction to meet fire safety standards consistent with State law (PRC 4290). Chapter 7.92 of the County Code establishes requirements for fuel modification and emergency water supply, as well as minimum fire safe driveway and road standards. New structures built in Santa Cruz County must also comply with fire safety building regulations. These building codes require the use of ignition-resistant building materials in higher risk areas and establish design standards to improve the ability of a building to survive a wildfire.

The San Mateo - Santa Cruz Unit Strategic Fire Plan identifies and prioritizes pre-fire and post-fire management strategies and tactics meant to reduce losses within the Unit. There is a history of collaborative efforts between fire agencies and communities including Las Cumbres, Olive Springs, and Bonny Doon. Efforts such as these have resulted in numerous hazardous fuel reduction projects and

community education. More recently, the Unit has seen an unprecedented level of pre-fire “grass roots” organization, including the formation of the Soquel, South Skyline, and Bonny Doon Fire Safe Councils. Also, with the assistance of the Resource Conservation District (RCD) through a grant from the United States Fish and Wildlife Service, a Community Wildfire Protection Plan (CWPP) was developed with input from stakeholders throughout Santa Cruz County. In 2010, the Board of Supervisors for Santa Cruz County adopted the 2010 San Mateo County – Santa Cruz County CWPP. The CWPP was updated in 2018. The Unit Strategic Fire Plan is meant to work in collaboration with the CWPP.

The CWPP attempts to identify fire hazards, as seen across the landscape, and provide strategies to mitigate wildfire risk and restore healthier, more resilient ecosystems while protecting life and property. A CWPP also serves as a tool for the accrual of grant funding to aid in the implementation of wildfire prevention projects. The CWPP is a guidance document that recommends both general and specific projects in priority fuel reduction areas and provides recommendations to reduce the ignitability of structures. Local projects are subject to appropriate permitting and environmental review processes. The CWPP was developed collaboratively by CAL FIRE, Resource Conservation District of Santa Cruz and San Mateo Counties, the United State Fish and Wildlife Service, other agencies, and members of the community.

The San Mateo – Santa Cruz Unit Strategic Fire Plan and the CWPP address areas with inadequate access and evacuation routes and identify risk to life and property from wildland fire and provide information on firefighter safety, community evacuation and recommended actions by first responders. The plans also address post-fire responsibilities for natural resource recovery, including watershed protection reforestation, and ecosystem restoration.

These programs remain relevant for reducing potential losses identified in the risk assessment. Since the last update, the County was devastated by the CZU Lightning Complex fire, which caused widespread destruction and one loss of life. As the highest priority of fire and law enforcement agencies, over 45,000 people were evacuated from areas in Santa Cruz County threatened by the fire with no major logistical problems or injuries, a notable success in the overall context of the disaster. The wildfire risk in other parts of the County has not changed since the previous LHMP update was adopted. In the aftermath of the CZU Lightning Complex Fire there is an opportunity to learn from that experience. Adjustments to existing programs and implementation of additional measures will result from that process under the existing mitigation blueprint in this LHMP update.

5.2.1 Mitigation Goals

<p>Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.</p>

Wildfire Goals

Wildfire 1 - Avoid or reduce the potential for injury, loss of life, property, and economic and environmental damage to Santa Cruz County from wildfire.

Wildfire 2 - Collaborate with other local fire districts and departments in mutual aid fire protection efforts.

5.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Wildfire mitigation strategy includes the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Reduction of fire risk in urban/wildland interface (WUI) through improved building materials and appropriate code enforcement including defensible space programs. (A-4)
- Land use planning to reduce incidence of human caused wildfires especially in very high fire hazard areas. (A-5)
- Appropriate road and secondary access improvement and creation program. (A-6)
- Early notification/warning of residents by technology-based applications. (A-10)
- Promotion of built-in fire extinguishing systems and fire alarm systems. (A-11)
- Establish and maintain cooperative fire protection and fire prevention agreements with other agencies. (A-12)
- Increased visibility and reduced response times with proper road and address markings. (A-13)
- Enhanced support for interoperability communications systems with local, state, and federal emergency services both inside and around the County. (A-14)
- Reduction of fire risk in the urban/wildland interface (WUI) through hazardous fuel reduction projects including but not limited to indigenous land use practices of controlled burns, hazardous fuel removal, other shaded fuel break burn strategies. (A-20 New)
- Implement additional fire prevention programs in schools, institutions, and commercial buildings through inspections and education to promote fuel reduction, hazard abatement. (B-3)
- Maintain adequate Fire Suppression and Prevention staffing levels to meet the need of the county population and development trends. (B-4)
- Support CZU Fire Recovery for survivors utilizing best practices for improving overall safety of rebuild. (A-21 New)

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for wildfire hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to fire hazard reduction.

- Defensible space inspections are completed by inspectors from CAL FIRE, engine companies, and the Central Fire Protection District. Educational materials are distributed to residents during inspections, through direct mailing, and at public events including a brief pamphlet focusing on defensible space and a document called Living With Fire in Santa Cruz County. The Santa Cruz County Code requires new projects and construction to meet fire safety standards consistent with State law (PRC 4290). Chapter 7.92 of the County Code establishes requirements for fuel

modification and emergency water supply, as well as minimum fire safe driveway and road standards. New structures built in Santa Cruz County must also comply with fire safety building regulations. These building codes require the use of ignition-resistant building materials in higher risk areas and establish design standards to improve the ability of a building to survive a wildfire. (A-4)

- Review and amendment of the County’s General Plan Safe Element Fire Hazards section has brought alignment of the road and building standards. (A-5)
- The County continues to enforce current fire and building codes, and the secondary access road standards in the Safety Element. (A-6)
- The Long-Range Radio Infrastructure Management Planning Group continues to meet quarterly to strategically consider interoperability and coordination of communications systems development and change out. The County Office of Emergency Services continues to seek grant funding opportunities for emerging technologies and enhancements. The narrow banding communications project has been completed for all county emergency services partners. (A-10)
- The County maintains an agreement with CAL Fire to run the County Fire program. (A-12)
- Approximately \$57,600 worth of warning guide signs meeting current state specifications were purchased through a federal Highway Safety Improvement Project (HSIP) grant and were installed by the County road crews. County road crews continuously clear vegetation from around traffic control signs to maintain sign visibility. (A-13)
- All communications systems have been changed to comply with the FCC narrow banding requirement. (A-14)
- In spite of long-term funding challenges resulting in systematic cuts over the last several years, including reduction of personnel staffing, the County Fire fund balance has been maintained by careful fiscal management for extreme necessity. Grants, CAL FIRE contract saving, and economic recovery have contributed to this preservation. The County Fire structural budget deficit continues to be the administrative priority. In January 2020, a new assessment was approved by voters in CSA 48, the County Fire Department operating area, that would provide a higher level of fire protection and emergency response service by increasing staffing levels to nationally recognized standards and providing for improved apparatus and equipment replacement. (B-4)
- County Fire puts on education programs for schools and businesses in the unincorporated areas of the County. Additional school programs have been added as part of the County Fire Prevention and Education program. All schools in County Fire are inspected annually. Commercial Business inspections are ongoing. (C-5)
- Fire Safe Santa Cruz County (FSSCC) was formed in September 2016 as a nonprofit corporation, 501(c)(3), in the state of California through collaboration between local fire safe councils, CAL FIRE, local government, water districts, non-profit organizations, industry, and the Resource Conservation District of Santa Cruz County (RCD). The purpose of Fire Safe Santa Cruz County (FSSCC) is to educate and mobilize the people of Santa Cruz County to protect their community, homes, and environment from wildfire. See <https://www.firesafesantacruz.org/>. (C-5)
- The new 2019 fire and building code has been adopted by all County Fire agencies. (A-11)

The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. There are no recommended changes to the mitigation actions for wildfire hazards, or the priorities of the mitigation actions. The actions will continue to be implemented on an ongoing basis through existing regulatory mechanisms and funding availability. Finally, the work of independent “grass roots” fire safe councils has made a

significant contribution to fire safety in the local communities through public education, organizing, and completion of defensible space and (shaded) fuel break projects.

This page intentionally left blank

Chapter 6 Floods and Coastal Storms

6.1 Risk Assessment

6.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

Flooding and coastal storms present similar risks and are usually related types of hazards in Santa Cruz County. Coastal storms can cause increases in tidal elevations (called storm surge), wind speed, coastal erosion, and debris flows, as well as flooding. During a flood, excess water from rainfall or storm surge accumulates and overflows the channels of creeks and rivers onto the banks and adjacent floodplains and inundates beaches. Floodplains are lowlands adjacent to rivers, lakes and oceans that are subject to recurring floods. Several factors determine the severity of floods, including rainfall intensity and duration, creek and storm drain system capacity, and the infiltration rate of the ground.

A flood occurs when a waterway receives a discharge greater than its conveyance capacity. Floods may result from intense rainfall, localized drainage problems, tsunamis or failure of flood control or water supply structures such as levees, dams, or reservoirs. Floodwaters can carry large objects downstream with a force strong enough to destroy stationary structures such as homes and bridges and break utility lines. Floodwaters also saturate materials and earth resulting in the instability, collapse, and destruction of structures as well as the loss of human life.

Floods usually occur in relation to precipitation. Flood severity is determined by the quantity and rate at which water enters the waterway, increasing volume and velocity of water flow. The rate of surface runoff, the major component to flood severity, is influenced by the topography of the region as well as the extent to which ground soil allows for infiltration in addition to the percent of impervious surfaces. It is important to note that a stream can crest long after the precipitation has stopped.

As storms arrive onto land from the Pacific and rise over the mountains and ridges that border the eastern boundaries of the County, the air associated with those storms cools and that cooling results in large amounts of precipitation also known as the orographic effect. The topography provides fairly steep and well-defined watershed areas to funnel the falling rain into runoff tributaries. Periods of very heavy rainfall are common throughout fall and winter months and the two rivers in the County, along with several creeks and streams, can rise to flood stage in a short period of time. Settlement and habitation in the County, from the historic Ohlone/Awaswas indigenous communities through the founding of the Santa Cruz Mission in 1791, and subsequent logging communities throughout the 1800s, tended to acknowledge the floodplain areas of the rivers and streams, building on the higher ground. However, as the population grew, particularly in the middle 1900's, low lying areas near virtually every waterway were encroached upon for housing, business, or agricultural development.

Climatologists point out that the period between 1920 and 1970, the years of most significant growth in Santa Cruz County, was a "dry cycle" for most of central California. Only one or two instances of serious

winter weather in the 1950’s highlighted the consequence of development in low-lying areas. Over time, land that had previously been avoided was developed for both commercial and residential use in the floodplains of the San Lorenzo and Pajaro Rivers, Soquel, and Aptos Creeks, and along the beaches.

As a consequence, substantial portions of the City of Santa Cruz and the City of Watsonville have been flooded, houses and businesses in the San Lorenzo Valley have been damaged or destroyed by floodwaters, and there have been losses along Soquel Creek, Aptos Creek, and in beach areas on multiple occasions over the past half-century.

Most of the known floodplains in the United States have been mapped by FEMA, which administers the National Flood Insurance Program (NFIP). Information about floodplains in Santa Cruz County can be found in FEMA’s most recent Flood Insurance Study (FIS) and on the Flood Insurance Rate Maps (FIRM). A small-scale version of all the FIRM panels for the County is shown in Figure 12.

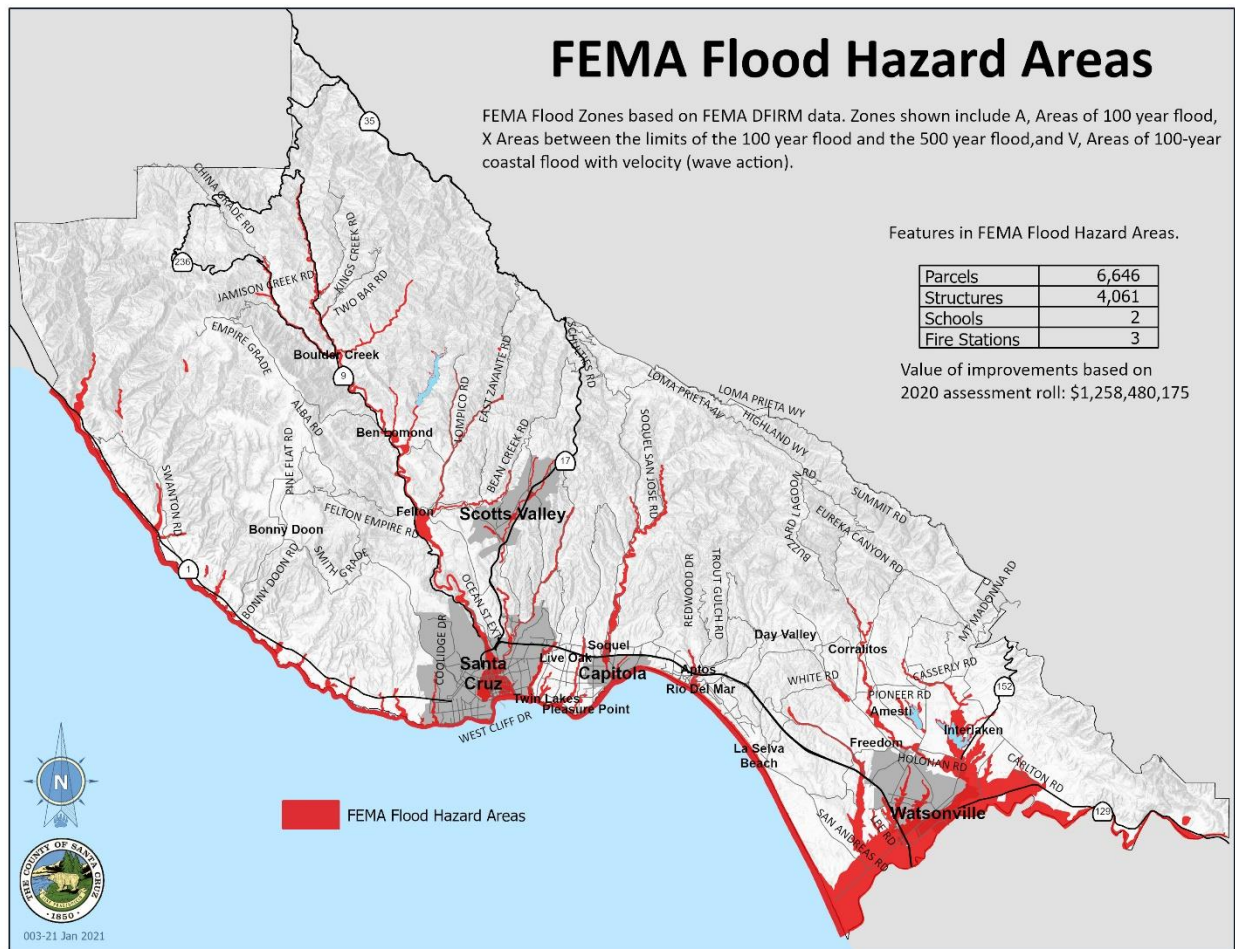


Figure 12 Generalized FEMA flood hazard area in Santa Cruz County

Within Santa Cruz County there are numerous areas subject to flooding due to rivers, creeks, or coastal storms. The two main rivers in the County that are subject to flooding are the Pajaro River and the San Lorenzo River. The Pajaro River and its floodplain runs through agricultural lands within the Pajaro Valley and, downstream, through downtown Watsonville. The San Lorenzo River runs through the

heavily populated San Lorenzo Valley and into downtown Santa Cruz, where a 2002 levee project has significantly reduced the flood risk for downtown residents, merchants, and landowners.

Other major creeks in Santa Cruz County adjacent to rural and urban development that are subject to flooding include Aptos Creek, Trout Creek, Valencia Creek, Salsipuedes Creek, Corralitos Creek, Soquel Creek, and their tributaries. The steepness of many of these creek canyons and the surrounding mountain areas contribute to the speed that flood water can accumulate and move resulting in relatively short warning times, increasing the hazard for those at risk. There are also many smaller creeks and tributaries throughout the County that are subject to flooding. Most of these are tributaries to the major creeks and rivers noted above.

Areas of low-density development characterize the creeks along the North Coast of Santa Cruz County. Flooding of developed areas from storm surges is unlikely in this area since development has occurred mainly on cliffs and inland of the coastal flood areas. While flooding is still a risk in these areas, there are no occurrences of repetitive loss from flooding along the North Coast.

Coastal flooding along the heavily developed Monterey Bay coastline of Santa Cruz County may occur with the simultaneous occurrence of large waves and storm swells during the winter. Storm centers from the southwest direction produce the type of storm pattern most commonly responsible for the majority of severe coastline flooding. The strong winds combined with high tides that create storm surges are usually accompanied by heavy rains. When storms occur simultaneously with high tides, flood conditions, particularly flooding at the mouth of the Pajaro River and Aptos Creek, are exacerbated.

Flood hazard areas identified on the Flood Insurance Rate Map are identified as Special Flood Hazard Areas (SFHA). The FIS and FIRMs for Santa Cruz County were updated by FEMA in 2017. SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zone AE, Zone A99, Zone AR, Zone V, and Zone VE. See Table 15 for an explanation of these zones. Moderate flood hazard areas, labeled Zone X (shaded), are the areas between the limits of the base flood and the 0.2- percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded).

Flood Zone	Definition
A	Areas subject to inundation by the 1-percent-annual-chance flood event. Base Flood Elevations or flood depths not determined.
AE	Areas subject to inundation by the 1-percent-annual chance flood event. Base Flood Elevations determined.
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations determined.
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths determined.

AR	Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under- construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes.
V	Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves. Base Flood Elevations not determined.
VE	Areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Base Flood Elevations determined.
X (Shaded on FIRM)	Areas of 0.2-percent-annual-chance flood; areas of 1-percent-annual- chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1- percent-annual-chance flood.
X (not shaded on FIRM)	Areas determined to be outside the 0.2-percent-annual-chance flood.

Table 15 FEMA Special Flood Hazard Area zones and definitions

6.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Flooding in Santa Cruz County has occurred in each of the primary drainages and will continue to do so in the future given the right set of meteorological conditions. Previous occurrences are well documented for all primary drainages. The known occurrences are detailed below.

Summary of Historical Floods in Santa Cruz County

Major storms and associated flooding are known to have occurred during March 1899, December 1937, February 1940, November 1950, January 1952, December 1955, April 1958, January 1963, January 1967, January 1973, and January 1982. The December 1955 and January 1982 storms were the most severe in recent times. Below is a summary of the historic flooding for the major rivers, creeks, and beaches in Santa Cruz County. The historical information cited below comes from studies and reports completed by the United States Army Corps of Engineers (USACE) and the Federal Emergency Management Agency (FEMA) Flood Insurance Studies (FIS).

Aptos, Trout, and Valencia Creeks

Aptos Creek drainage basin is of small size and limited flood problems. It includes the drainage areas of Valencia Creek, Trout Creek, Bridge Creek and Mangles Gulch. Floods are known to have occurred in 1955, 1963 and 1982, however little information is available prior to 1955.

During the four-day period ending December 22, 1955, heavy rains fell over the basin causing Aptos and Valencia Creeks to slightly exceed bank full stages at several points in the lower basin. Agricultural damage was primarily due to scour and erosion of first shelf lowlands planted to pasture, a few orchard crops, and idle croplands. The peak flow was measured at 3,500 cfs and approximately 140 acres were inundated, of which 20 acres were cropland. Non-cropland damages were generally very minor, consisting of eroded private roads and washed-out culverts. County roads and bridges experienced relatively heavy damages at the Valencia Road crossing. The bridge on Aptos Creek just below the confluence of Aptos and Valencia Creeks sustained a washout of cribbing endangering the bridge structure. Four homes along Moosehead Drive, downstream from the village of Aptos, experienced flooding. The Southern Pacific Railroad sustained minor damage due to undermining of the roadbed at Aptos, which resulted in a seven-day interruption of rail service. The local telephone company sustained minor damages to the undermining of facilities in the floodplain (USACE, Floodplain Information, Aptos, Trout, and Valencia Creeks, 1973).

The January 1982 flood had a peak flow of 3,950 cfs and corresponded to a 40-year recurrence interval based upon stream gauge data in Aptos Creek. Heavy damage occurred from this storm. At least seven homes along Moosehead and Spreckels Drive between Highway 1 and the Spreckels Drive Bridge suffered major damage. Further downstream damage resulted to major portions of two streets paralleling Aptos Creek.

Pajaro River, Salsipuedes Creek, and Corralitos Creek

During December 21 through 24, 1955, and April 2 through 4, 1958, the Pajaro Valley experienced flooding. These floods are the two largest on record for the Pajaro River. The associated discharges for these events were 24,000 cfs and 23,500 cfs, respectively, at the Chittenden gauge (USACE, 1963). The estimated recurrence intervals for floods of these magnitudes are 27 years and 26 years, respectively. In comparison, the estimated discharge at Chittenden for a 100-year flood is 43,000 cfs. (FEMA FIS 2006).

In the December 1955 flood, the Pajaro River was maintained within the levees in the Watsonville area, but the levees were breached 2.1 miles upstream of the confluence with Salsipuedes Creek (USACE, 1963). Although no lives were lost, 972 people were evacuated, and \$1.12 million damage incurred. Included in these costs were monies spent to repair levees damaged by erosion. Additional levee repairs were required because of the April 1958 flood; however, no other significant damage resulted (USACE, 1963). Significant flooding along Corralitos and Salsipuedes Creeks also occurred in December 1955 and April 1958. Peak discharges for Corralitos Creek at Green Valley Road have been estimated from high-water elevations (USACE, 1956). The estimated discharges for the 1955 and 1958 floods are 3,620 cfs and 2,680 cfs, which correspond to recurrence intervals of 12 and 7 years, respectively. The overflow of Corralitos Creek upstream of the leveed section on Salsipuedes Creek flooded 29 blocks within the City of Watsonville during the December 1955 flood (USACE, 1963).

The Pajaro Valley experienced only minor damage from the January 1982 flood. (FEMA FIS, 2006). In 1995, a major flood event breached the Pajaro River levees and the Town of Pajaro was flooded.

San Lorenzo River

The San Lorenzo River basin is the largest drainage basin contained entirely within the County. Few records exist of flooding in the San Lorenzo Basin (outside of the City limits) prior to 1940. However damaging storms are known to have occurred in 1940, 1955, 1958, and 1982.

In January 1862, within the City limits, land was consumed and buildings along the riverbanks were destroyed.

January 1890 saw the largest river level recorded to this date.

In January 1895, a storm caused flooding of basement, yards, and lots in the City of Santa Cruz.

In March 1907, floodwaters were higher than previous floods. February 1940 and 1941, saw continued episodes of flooding.

December 1955 was the highest historic flood along the San Lorenzo River and had a peak discharge of 30,400 cfs, which equates to approximately a 30-year recurrence interval. The most intensive rainfall fell during a four-day period from December 21-24. In the central part of the basin, known as the Ben Lomond area, the San Lorenzo River exceeded bank full stage. Local reports indicate previous maximum stages of record were exceeded along Kings, Boulder, Two Bar, and Zayante Creeks in the upper basin. Overflows occurred from the headwaters to the mouth, resulting in the maximum flood of record. The heavy rains and overflows loosened and scoured out large trees and floated them downstream where they became lodged at channel points of constriction, impounding flow, causing extremely severe local flooding. The numerous log jams and other channel obstructions diverted the high velocity flows, causing the streams to change from the normal alignment, undercut and scour out numerous bridges, road fills, channel dams and private developments. It is estimated that at least 388 acres were flooded. Seven people (5 within the Santa Cruz City limits, 2 outside) lost their lives as a result of the flood. It is estimated that 390 people outside the City limits were displaced by the floodwaters. Numerous houses, roads, parks, and commercial properties were damaged or destroyed in the Boulder Creek, Ben Lomond, Felton, and Paradise Park areas. (USACE, 1973)

The April 1958 flood was minor in comparison to the 1955 flood, but still saw erosion, creek bank failures and damage and loss of houses.

The magnitude of the January 1982 flood was similar to the December 1955 flood and had a peak discharge of 19,700 cfs. Damage upstream of the City of Santa Cruz was extensive. The damage was most extensive in the area between the upstream limits of Felton and in the areas of Paradise Park, Gold Gulch and Felton Grove. In the Felton Grove area, floodwaters in the overbanks reached 3 to 7 feet and inundated 50 homes and cabins. An additional 60-70 homes were flooded between Felton and Ben Lomond. It is estimated that the 1982 flood had a recurrence interval along the San Lorenzo River of approximately 30 years. (FEMA FIS, 2006).

Soquel Creek

Storms of flood-producing magnitude occurred during March 1899, December 1937, February 1940, January 1943, November 1950, January 1952, December 1955, April 1958, October 1962, January 1963, January 1967, and January 1982. The December 1955 storm is the most severe storm of recent times, its seventy-two-hour rainfall interval was equivalent to about 35 percent of the normal annual rainfall.

During the flood of 1955, a major logjam occurred at the Soquel Avenue Bridge, causing a severe backwater condition. In Soquel, eight city blocks were inundated displacing 359 persons (USACE, 1956). Just upstream of the confluence with Hinkley Creek, floodwaters in the overbanks reached depths of five to six feet. The peak flow for Soquel Creek at the Soquel gauge indicated a peak flow of 15,800 cfs, which is a recurrence interval of 70 years (FEMA Flood Insurance Study March 2, 2006).

During the 1982 flood, the Soquel Creek basin experienced major flooding in the vicinity of the Soquel Avenue Bridge. A massive logjam diverted flow down the main street of the town of Soquel. The floodwaters rose rapidly along Soquel Creek and caused major damage to two mobile home parks adjacent to the stream. The estimated peak flow was 9,700 cfs, which equates to an estimated recurrence interval of approximately 16 years.

Beach / Coastal Flooding

Flooding along the Pacific coast of Santa Cruz is typically associated with the simultaneous occurrence of high tides, large waves, and storm swells during the winter. Significant storms, with associated damage, strike the Monterey Bay communities with regular frequency. As a result, ocean front development has not been compatible with the natural instability of the shoreline and intense winter weather conditions. (FEMA FIS, March 2, 2006).

The most severe storms on record to hit the California coast occurred in 1978 and 1983 when high water levels were accompanied by very large storm waves (FEMA FIS, 2006).

In 1978, a series of storms emanated from a more southerly direction, than normal. Consequently, some of the more protected beaches were damaged. Jetties and breakwater barriers were overtopped, and in some cases, undermined. Direct wave damage occurred to many beachfront homes and seawalls, especially in the more populated beachfront areas such as at Seacliff Beach and Rio Del Mar Beach. (FEMA FIS, 2006).

In 1983 a similar storm hit the Santa Cruz Coast. During this storm, a new 3,500-foot seawall was destroyed and in Seacliff Beach 19 of 21 homes were significantly damaged when the existing riprap protection was overtopped. (FEMA FIS, 2006).

The Pajaro Dunes area of the County that is fronted by dunes has also been subject to severe damage to structures as well as rapid beach retreat in 1968, 1969, 1978 and also in 1983. (FEMA FIS, 2006).

No major flooding events on local rivers, creek, or beaches has occurred since the previous LHMP was adopted.

Significant storms and associated damage from flooding strike the Monterey Bay communities with a frequency of one large storm every three to four years. A 100-year flood has a one percent probability of occurring in any given year and while considered to be a severe flood, it still has a reasonable possibility of regular occurrence. For the purposes of the protection of property, life and safety, floods of other magnitudes and occurrence intervals should also be considered in mitigation efforts.

Floods are gauged by their cresting elevation, the area of inundation or damages and either the size of the event or the probability of occurrence. The size and depth of the floodplain area is computed using mathematical models of precipitation, slope, runoff, soil type and cross-section. Flood depths are

calculated at intervals along a stream or channel corridor and then mapped and interpolated between sections. This results in the floodplain map.

The probability of occurrence is expressed in a percentage of the chance of a flood of a specific extent occurring in any given year. The most widely adopted design and regulatory standard for floods in the United States is the 1-percent annual chance flood, and this is the standard formally adopted by FEMA. The 1-percent annual flood is also commonly referred to as the “100-year flood,” leading to the misconception that it should occur only once every 100 years. In fact, a 100-year flood may occur in any year, regardless of the time that has passed since the last one. It is the probability that smaller floods occur more often than larger floods that compels the percentage.

Flood Occurrence Intervals	Percent Chance of Occurrence Annually
10 years	10.0%
50 years	2.0%
100 years	1.0%
500 years	0.2%

Table 16 Flood probability terms

A recent study conducted by the U.S. Geological Survey projects that climate change will cause a shift in peak precipitation from January to February, with less precipitation occurring in the fall (November-December) and spring (March-April) by 2100. The U.S. Geological Survey (USGS) also concluded that while the amount of annual precipitation is not expected to substantially change as a result of climate change, precipitation will be concentrated in mid-winter⁴. As a result, flood occurrence intervals are expected to shift with the “10-year” event occurring more frequently, for example. flooding is a growing threat that deserves careful attention as one of the more hazardous impacts of climate change.

The flood hazard maps prepared by FEMA do not account for future sea level rise. In 2017 The Central Coast Wetlands Group conducted a study of future sea level rise impacts along the Santa Cruz County coast. The report titled Coastal Climate Change Vulnerability Report was funded through a grant from the Ocean Protection Council through the Local Coastal Program Sea Level Rise Adaptation Grant Program. This grant program is focused on updating Local Coastal Programs (LCPs), and other plans authorized under the Coastal Act such as Port Master Plans, Long Range Development Plans and Public Works Plans (other Coastal Act authorized plans) to address sea-level rise and climate change impacts, recognizing them as fundamental planning documents for the California coast.

The project was intended to achieve key objectives to further regional planning for the inevitable impacts associated with sea-level rise (SLR):

1. Identify what critical coastal infrastructure will be compromised due to SLR and estimate when those risks may occur; and
2. Define appropriate response strategies for these risks and discuss with regional partners the programmatic and policy options that can be adopted for LCP updates.

⁴ Flint, L.E., and Flint, A.L., 2012. Simulation of Climate Change in San Francisco Bay Basins, California: Case Studies in the Russian River Valley and Santa Cruz Mountains: U.S. Geological Survey Scientific Investigations Report 2012-5132, 55 p.

The project incorporated the most complete inventory of coastline revetment and seawalls for the Monterey Bay with coastal hazard GIS layers developed by Phil Williams and Associates and ESA Consulting to account for current protections from current and future coastal hazards. The project evaluated the impacts of sea level rise on municipal infrastructure, private properties, and natural resources. The project also evaluated relevant state policies and adaptation response alternatives ranging from “grey to green” for integration into municipal planning documents. The project also fostered regional discussions regarding inclusion of appropriate adaptation strategies into Local Coastal Program and other planning documents.

The study evaluated how various sea level rise scenarios would impact both coastal flooding and coastal erosion. Two examples of the results of the study for coastal flooding of particularly vulnerable locations along the coast are shown in the following two maps. Figure 13 depicts the results of the study at Corcoran and Moran Lakes assuming increasing amounts of sea level rise (from 10 centimeters to 159 centimeters) by the year 2100. Figure 14 is a similar depiction of the hazard at Pajaro Dunes by the year 2030 with 10 centimeters of sea level rise.

**CORCORAN AND MORAN LAKES
INFRASTRUCTURE VULNERABLE TO COASTAL STORM FLOODING**



Figure 13 Infrastructure vulnerable to coastal storm flooding with sea level rise

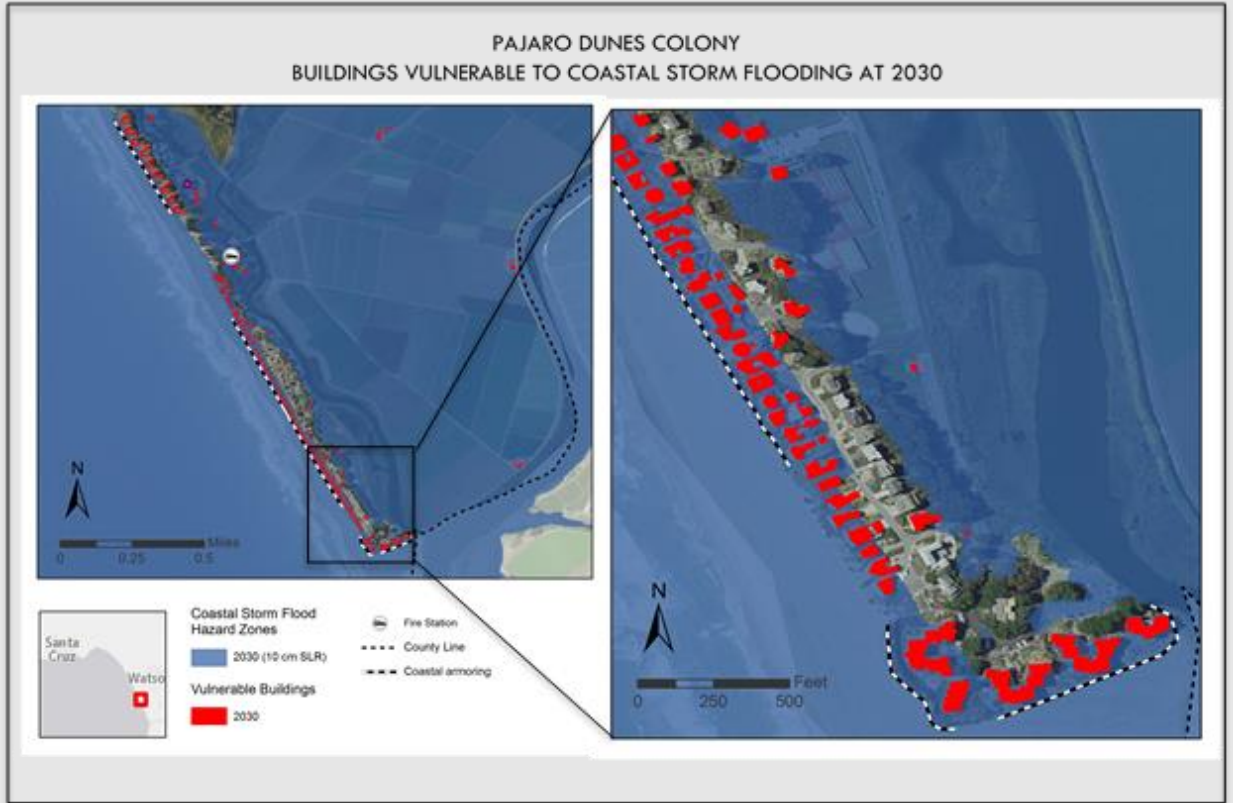


Figure 14 Pajaro Dunes vulnerability to coastal storm flooding with sea level rise

6.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Overall Summary of Flood Vulnerability

Riverine flooding is a risk for many parts of the communities of Boulder Creek, Ben Lomond, Brookdale, Felton, Zayante, Paradise Park, unincorporated Santa Cruz, unincorporated Scotts Valley, Live Oak, Soquel, Rio Del Mar, Aptos, and unincorporated Watsonville. Coastal flooding is a risk for many homes along Live Oak, Aptos, Seascape, and unincorporated Watsonville beaches. Many homes, apartments, hotels, shops, and critical facilities have been built in these areas to accommodate resident and tourist needs. Properly protecting these structures from flooding is essential to preventing loss of human life and protecting the local economy.

Based on the 100-year flood plain (FEMA Zone A and VE), there are over 4,000 structures located in a flood hazard are in the County. Of that total, 83% are residential buildings (3,363), 6% are commercial buildings (246), 5% are agricultural buildings (208), and 1% each are government (58), industrial (45) and institutional buildings (45). Miscellaneous and utility-related buildings represent 3% (96). The institutional buildings in the floodplain include 2 schools and 3 fire stations.

Summary of Flood Protection Measures and Future Vulnerability

Flood protection measures implemented in the unincorporated areas of Santa Cruz County have included nonstructural and structural measures. The nonstructural measures include floodplain zoning ordinances that regulate building within the floodplain as well as protection of riparian areas that further limits impacts of flooding on structures. Structural measures implemented in the County have been limited primarily to the Pajaro Valley.

Although dozens of houses in the flood prone areas of the County have been elevated above the 100-year flood or wave run-up elevation over the past several decades, areas previously inundated by flooding will continue to do so in the future, with potentially substantial impacts to property, lives, and infrastructure.

Flows in excess of approximately 10,000 cfs caused flooding on the lower Pajaro River before completion of the Federal levee project (USACE, 1963). After the floods of 1938 and 1941, the USACE designed levees for the Pajaro River and Salsipuedes Creek.

Levees were completed along the Pajaro River by the USACE in 1949. Levees along the north bank begin just upstream of the mouth at the Pacific Ocean and continue to approximately River Mile 11.8 (Murphy Road); levees along the south bank begin just upstream of the mouth and continue to River Mile 10.6. The levees increased the capacity of the Pajaro River to 22,000 cfs downstream of Salsipuedes Creek, equivalent to a 25-year flood. In the same year, levee construction on Salsipuedes Creek from the confluence with the Pajaro River to River mile 2.5 on the west bank to River Mile 1.7 on the east bank was also completed (USACE, 1963). The addition of the levees increased the capacity of Salsipuedes Creek to 10,000 cfs (USACE, 1963).

In 1963, the USACE performed additional studies and recommended that the levees along the Pajaro River and along Salsipuedes and Corralitos Creeks be modified to provide additional protection (USACE, 1963). Construction was authorized in the Flood Control Act of 1966 and the project proceeded to the advanced stages of design, but local support in Watsonville was withdrawn and the project was placed in a deferred status (USACE, 1978; and USACE, 1974).

However, in recent years, studies on the Pajaro River levees have indicated that they may fail under a roughly 8-year event (approximate flow of 18,000 cfs). The County of Santa Cruz and the U.S. Army Corps of Engineers are currently working together to come up with a solution to enhance the levees and increase the level of flood protection. See Figure 15 for Pajaro River Flood Risk map.

The Santa Cruz County Flood Control and Water Conservation District (District) was established to provide funding for implementing proposed Army Corps of Engineers (Corps) flood control projects on the Pajaro River, Salsipuedes Creek, and Corralitos Creek. District staff coordinates with the Corps to ensure local needs are addressed; provides assistance to the Corps in project evaluation, as necessary, administrative, and engineering drainage services; and is responsible for the replacement, upgrade, and maintenance of drainage and flood control facilities in the levee system. The District provides administration and coordination of the Corps Pajaro River Flood Risk Reduction Project, and staff for the County's participation in the Pajaro River Watershed Flood Prevention Authority. The District staff is working to identify funding for the long-awaited levee reconstruction project. In the meantime, the

recently completed Pajaro River Bench Excavation Project has provided some additional flood conveyance capacity.

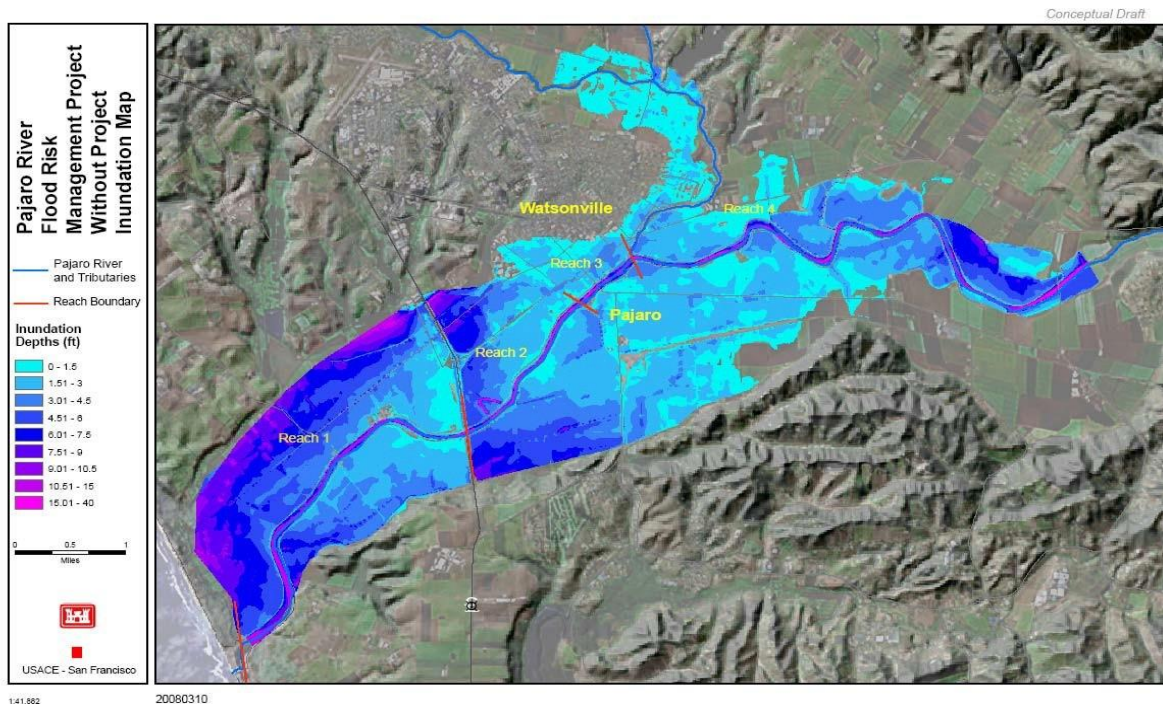


Figure 15 Pajaro River flood risk map

No major flood control projects have been constructed in the Aptos Creek, Soquel Creek, or the Santa Cruz County portion of the San Lorenzo River basins. Local interests have provided non-continuous bank protection constructed of various materials including concrete, timber, and riprap. A multiple-purpose reservoir on Soquel Creek, approximately 5 miles upstream from Monterey Bay, was found to be economically justified, but has not been implemented. A major flood control project, which includes levees and channel improvements, was constructed on the San Lorenzo River. These improvements, however, are located within the Santa Cruz City limits and not in the unincorporated portion of the county.

Residents and municipalities of northern Monterey Bay have spent hundreds of thousands of dollars on flood protection measures to prevent coastal flood damage. Permanent structures such as seawalls, boulder-sized riprap, timber, and concrete bulkheads have been installed. Of the 9.5 miles of urbanized northern Monterey Bay coastline, over half is protected by seawalls or riprap. Severe storms in January of 1983 overtopped many of the structures. Protection varied by site. At Seacliff State Beach, repeated storms have destroyed reconstruction efforts, while at New Brighton State Beach, damage was minor. At Seacliff State Beach in January 1983, high waves associated with high tides overtopped a rock rubble mound to cause major damage to 19 of 21 homes.

After the major flood in December 1955, a flood-control project was constructed by the USACE to provide protection against a flow of 53,000 cfs at the mouth of the San Lorenzo River. The flood-control project included improvements on the San Lorenzo River as well as Branciforte Creek. On the San

Lorenzo River, the project extended from the Southern Pacific Railroad (SPRR) bridge near the mouth to the city's concrete weir diversion works. Between the SPRR bridge and the State Highway 1 bridge, the project included levees, channel improvements, and bank protections; upstream of State Highway 1, only channel improvements were made. The modified channel was wider with a lower invert than the natural channel. Channel improvements were designed to provide 3 feet of freeboard and to carry 53,000 cfs downstream of the confluence with Branciforte Creek and 46,800 cfs between the confluence and the State Highway 1 bridge. On Branciforte Creek, a rectangular concrete channel was constructed and extended upstream 1 mile from the confluence with the San Lorenzo River at the Soquel Avenue bridge.

Nonstructural measures employed by the City of Santa Cruz include a logjam removal procedure and flood plain zoning ordinances. The zoning ordinances regulate development in the flood plain areas of the city.

Impact of Hazards

Flooding in the various river basins impact public health and safety, critical facilities, and infrastructure, as well as the community's economy.

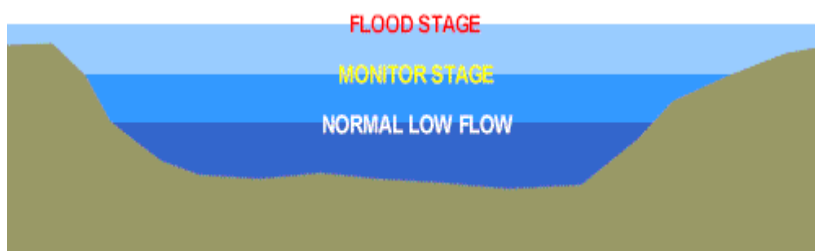
When floods hit the community, as shown by past history, public health, and safety issues (including loss of life and property as well as the overall health of the community) can be widespread. Recognition of these hazards has led the County of Santa Cruz to work with FEMA, in recent years, to assist property owners in funding elevation of homes above the base flood elevation (Felton Grove) and to develop a plan to improve levee safety (Pajaro River). Additionally, the County of Santa Cruz has improved rain and stream gauging in the San Lorenzo River, Soquel Creek, Corralitos Creek and Pajaro River watersheds. The improved gauging includes real-time monitoring of rainfall and stream levels that are monitored 24 hours a day during storm event. See Watershed Flood Monitoring Table 17, for monitoring information for various rivers and streams.

This monitoring is coordinated with the County Public Works Department, the County Emergency Operations Center, the National Weather Service in Monterey, NOAA, and the USGS. In the Pajaro River watershed, monitoring coordination also includes the Santa Clara Water District, and the counties of San Benito and Monterey. Close coordination has allowed an alert system to be developed through the use of a reverse 911 system. This system may not save fixed structures, but it can save lives. Coordination with other agencies has also helped to time releases from reservoirs (Santa Clara Water District), so that releases do not coincide with peak flows. Following is a table of Santa Cruz County Stream / River Flood Stages that has been developed to assist flood control staff in their monitoring of flooding.

Stream & Location	Datum = 0	Today's Levels	Flood Watch Stage	Flood Monitor Stage	Initial Overflow Areas	Flood Warning Stage
San Lorenzo R. Big Trees, Felton	227.0' NGVD		10.0'	14.0'	Felton Grove, Gold Gulch, and Paradise Park	18.0'
Soquel Creek Bridge St.	21.4' NGVD		8.0'	11.5'	Heart of Soquel, Old Mill Mobile Home Park, Areas west of Porter St.	14.5'
Corralitos Cr Green Valley Rd.	89.4' NGVD		9.0'	9.0'	Orchard Park Subdivision, College Rd. <u>Flood Watch & Monitor Stages</u> at the same level due to fast rising water	11.5'
Salsipuedes Cr Hwy 129			25.0'	32.0'	2.4-mi down-stream from Corralitos Cr., Orchard Park, College Rd (Drew Lake) Top of levee at 37.5'	34.5'
Pajaro River @ Chittenden	81.9' NGVD		23.0'	25.0'	Area along channel extending 2.5-miles upstream from confluence of Pajaro R. & Salsipuede s Cr. Top of levee at 34.5'	32.0'
Pajaro River @ Main St	0' NGVD		23.0'	27.5'		31.0'
LARC (computer voice msg - stream levels) SLR @ Big Trees: 335-9365						

Table 17 Santa Cruz County stream/river flood stages

Non-leveed Streams

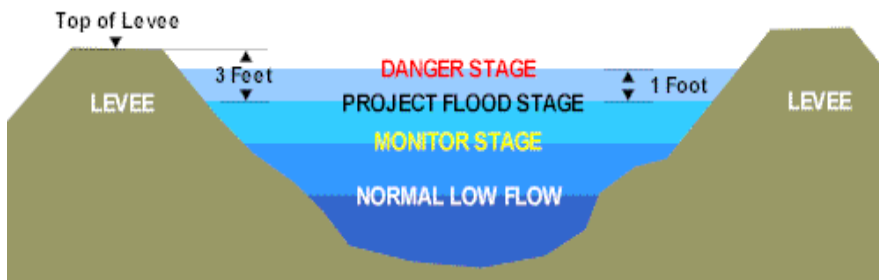


Flood Watch Stage: The Stage at which current or developing conditions pose a threat of flooding but it is NOT certain or imminent.

Flood Monitor Stage: The Stage at which initial action must be taken by concerned interests (livestock warning, removal of equipment from lowest overflow areas, or simply general surveillance of the situation). This level may produce overbank flows sufficient to cause minor flooding of low-lying lands and local roads.

Flood Warning Stage: The Stage at which overbank flows are of sufficient magnitude to cause considerable inundation of land and roads and/or threat of significant hazard to life and property.

Leveed Streams



Flood Monitor Stage: The Stage at which patrol of flood control project levees by the responsible levee maintaining agency becomes mandatory, or the Stage at which flow occurs into bypass areas from project overflow weirs.

Project Flood Stage: The Stage at which the flow in a flood control project is at maximum design capacity (U.S. Corps of Engineers "Project Flood Plain"). At this level there is a minimum freeboard of 3 feet to the top of levees.

Danger Stage: The Stage at which the flow in a flood control project is greater than maximum design capacity and where there is extreme danger with threat of significant hazard to life and property in the event of levee failure. This is generally 1 foot above project flood stage.

Requirement §201.6(c)(2)(ii): The Plan shall address NFIP insured structures within the jurisdictions that have been repetitively damaged by floods.

Santa Cruz County is classified as a Category C Repetitive Loss Community under the Community Rating System (CRS). Category C Communities are those with more than 10 repetitive loss properties. FEMA records indicate a total of 77 repetitive loss properties in Santa Cruz County containing a total of 94 structures. These are NFIP-insured structures that have had at least two paid flood losses of more than \$1,000 each in any 10-year period since 1978. Repetitive Loss Area properties account for 252 of the total flood insurance claims shown in Table 18. The average number of losses for a Repetitive Loss Area property is 3, with a range of 2 to 11 claims. Total flood insurance claim payments (contents and building) for Repetitive Loss Properties are valued at \$4.3 million dollars, with an average payment of \$17,000 dollars per flood insurance claim. Only a single property in the County of Santa Cruz received the Increased Cost of Compliance payment value at \$15,000. Repetitive loss properties are concentrated in the San Lorenzo River corridor and the Aptos beach area. By 2012, and as a result of the 2010 LHMP, the County has worked to mitigate the flood hazard on 18 of these properties primarily through elevation of the structures. Currently, there are 59 repetitive loss properties that have not been mitigated.

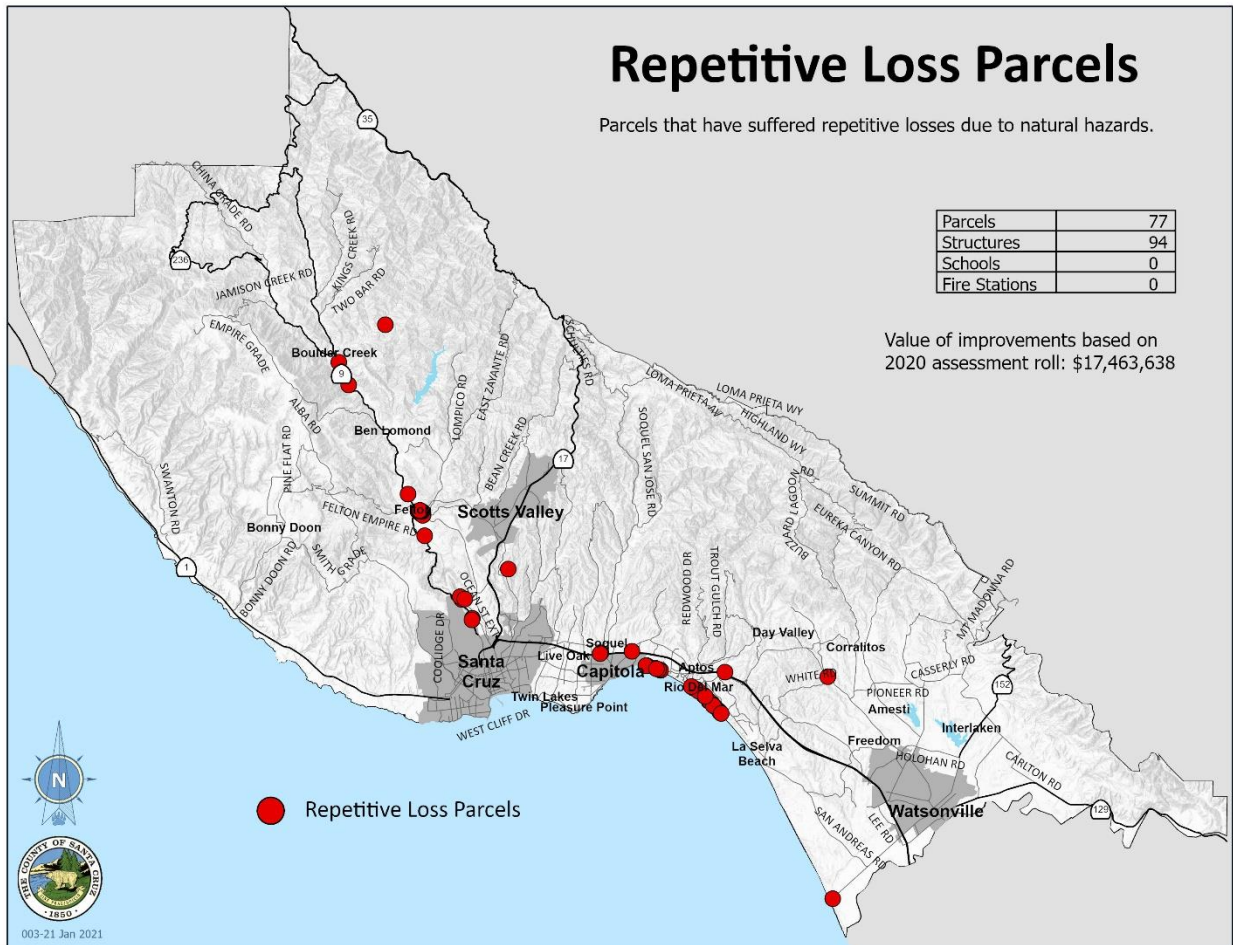


Figure 16 Repetitive loss properties in Santa Cruz County

	Non-Residential	Other Residential	Condo	Manufactured/Mobile Home	Single-Family	Single-family residential Building with the exception Of a mobile home or a single Residential unit within a Multi-unit building	Two- to Four-Family
Claims	20	14	1	4	861	138	27
Net Building Payment	\$48,850	\$45,231	\$20,000	\$29,993	\$7,277,349	\$1,666,506	\$229,122
Net Contents Payment	\$24,797	\$24,797	\$0	\$3,014	\$1,049,989	\$66,169	\$17,976
Net Total Payments	\$73,647	\$70,028	\$20,000	\$33,007	\$8,342,338	\$1,732,675	\$247,098
Average Net Payment	\$9,454	\$5,836	\$20,000	\$11,002	\$14,924	\$15,752	\$13,728

Table 18 Flood insurance claims data for Santa Cruz County from January 1978 - March 2023

6.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Table 19 identifies the number of parcels that intersect the flood plain. All of the structures on those parcels have been included as potential losses in that table. However, a more detailed analysis, recently completed for the FEMA Biennial Report, assessed whether specific habitable structures on those parcels were located within the floodplain. This data shows that there are over 2,000 1–4-unit residential structures and over 200 other habitable structures in the flood hazard areas of Santa Cruz County. Approximately 16,000 permanent year-round Santa Cruz County residents live in flood hazard areas.

6.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Potential Dollar Loss to Vulnerable Structures

More than 6,600 parcels lie within the flood zone areas with the majority of these parcels categorized as residential. Within the residential areas, there are over 3,300 structures. The population in the flood zone is approximately 16,182. The potential loss in residential areas alone tops \$ 1 billion. When all types of land use are considered, the potential loss is nearly \$ 1.26 billion.

Land Use	Parcels	Structures	Total Assessed Value 2020
Agricultural	333	208	\$37,258,624
Commercial	227	246	\$83,568,431
Government	257	58	\$0
Industrial	42	45	\$26,548,326

Institutional	80	45	\$43,267,619
Miscellaneous	276	80	\$19,398,018
Residential	5,394	3,363	\$1,048,044,563
Utilities	37	16	\$394,594
Total	6,646	4,061	\$1,258,480,175
Population	14,726		
Population is based on the number of residential parcels x 2.73 (See Table 3)			

Table 19 Flood potential loss inventory

Methodology Used to Prepare Estimate

Valuations of parcels within a hazard area are based on improvement values only as collected by appraisers with the Santa Cruz County Assessor’s Office. They do not reflect sale value or replacement value. If a parcel intersected a hazard, the entire improvement value of that parcel was used.

Census population blocks were reduced to center points. If a hazard intersected a center point, that population was counted.

Since FEMA flood data is mapped on the federal level, the data is somewhat coarse in horizontal accuracy. The data is a rough estimate of expected flood elevations and loss areas.

Estimating flood losses is an established process. If a “100 year” flood occurred in our county, meaning that the flood has a 1% chance of occurring in any given year, it would impact over 4,000 structures to various degrees. This was determined by intersecting the county’s database of structures with the FEMA-developed maps of the 100-year floodplain. Structures within the floodplain vary in construction, size, and materials, ranging from single- family homes to multi-family to commercial.

The 2017 Santa Cruz County Coastal Climate Change Vulnerability Report provides similar estimates for coastal flood hazard areas subject to future sea level rise. Regarding the areas of Rio Del Mar and Pajaro Dunes, for example, coastal access, parking and 80 commercial and residential buildings are vulnerable to wave damage and coastal flooding by 2030 (10 cm of sea level rise) within the low-lying sections of Rio del Mar. More than 130 buildings within the Pajaro Dunes Colony (many comprised of multiple residences) are also vulnerable to flooding during winter storms.

By 2060 more than 800 additional buildings are at risk of impact from a predicted 2.4 ft. rise in sea levels as coastal protective structures begin to fail. If current structures are replaced, it is estimated that 500 of the vulnerable buildings would be protected, 400 of which are private residence. By 2100, more than 1,800 residential properties within the unincorporated county are vulnerable to coastal climate change hazards.

6.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Santa Cruz County has a number of compact urban communities as well as extensive areas of agricultural land and forested hillsides. A number of rural villages and towns are located throughout the County. As mandated by the 1978 Growth Management Ordinance, most new development has occurred within or adjacent to the urban services line (i.e., the boundary point for such infrastructure as water and sewage service). As with most communities, increased housing costs have resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available. Other development is mostly infill or reuse development, and development of existing rural residential properties.

Growth Management policies prevent development from occurring where hazards are present and, in most cases, require substantial setbacks from these hazards.

No changes in these development regulations or patterns occurred that would affect the County's overall vulnerability since the previous plan was adopted in 2016. As stated above, growth management policies prevent new development from occurring where hazards are present. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks, structural elevation, floodproofing, and other requirements to mitigate potential impacts from flood hazards. Since the last LHMP in 2016, there has been twelve new residential structures and one commercial structure built on existing lots of record in flood hazard areas in the County. The Environmental Planning Section of the Planning Department, staffed by Resource Planners, one of which is the designated floodplain manager, specialize in reviewing each application for new residential and commercial structures to ensure that new development does not occur in hazard zones and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified flood hazards. These policies and procedures implement the mitigation strategy described below.

6.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

Programs Currently in Effect

The County participates in the National Flood Insurance Program (NFIP) regulating development in the floodplain according to NFIP standards. The County has adopted a floodplain management ordinance that incorporates the FEMA model ordinance and includes stricter local requirements. The County's floodplain management ordinance and other activities and programs implemented locally by the Planning Department have qualified us to participate in the NFIP and the Community Rating System,

which has reduced flood risk and incrementally reduced flood insurance rates for all residences in Santa Cruz County. The County entered the NFIP program following the publication of the original NFIP insurance rate maps for Santa Cruz County in 1984. The County has continuously participated in the program and plans to continue to comply with NFIP requirements.

The County of Santa Cruz currently addresses land use within the floodplain in the General Plan as well as actively enforcing related building, zoning, and resource planning codes, and other land use regulations concerning development within the 100-year floodplain. The 2019 California Building Code has several new enforceable provisions for development in flood hazard areas, which are incorporated into County building and resource planning codes.

The County participates in a number of ongoing mitigation actions to avoid or reduce the threats of flood. Actions include:

- The County is the lead agency in an early warning flood forecasting system for evacuation of areas susceptible to flooding.
- Continual improvements to the early warning system are being planned and implemented, especially as they relate to the Upper Pajaro watershed, the San Lorenzo watershed and in the severely burned areas of recent fires.
- Regulations on development and alteration of flood plains, stream channels and protective barriers that accommodate overflow are in place.
- Developing improvement plans for the Pajaro River Levee system in collaboration with the Army Corps of Engineers to meet 100-year storm event capacity.
- Encouragement of property owners, potential buyers and residents living in floodplains and coastal inundation areas to participate in the National Flood Insurance Program (NFIP).
- Rehabilitation of remote culverts and storm drainage systems to reduce flooding caused by inadequate storm drainage.

Additionally, annual flood control maintenance on the Pajaro River is performed by the Public Works Department. This work is required by the U.S. Army Corps of Engineers and consists primarily of managing in-stream riparian vegetation to encourage geomorphic form and function. The vegetation management plan is identified in the Final EIR for the Pajaro River and Salsipuedes and Corralitos Creeks and requires vegetated buffer zones to be generally maintained at 10-feet at the toe of the levees and 5-feet along the wetted edge of the river. The vegetation management is required in order for winter flows not to exceed the design capacity of the Pajaro River levees.

Future Plans

The County has taken the necessary steps to apply for and be accepted into the Community Rating System (CRS). The CRS is a voluntary incentive program that is part of the National Flood Insurance Program (NFIP). The program recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements (FEMA 2002). As a result, flood insurance premium rates have been discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses
- Facilitate accurate insurance rating

- Promote awareness of flood insurance

For communities participating in the CRS, flood insurance premium rates are discounted in increments of 5 percent, with the lowest class communities receiving the highest discount. For example, a Class One community would receive a 45 percent premium discount, and a Class Nine community would receive a 5 percent discount. A Class Eight community, which is the current designation for Santa Cruz County, receives a 10% discount. The CRS classes for local communities are based on 18 creditable activities organized under the following four categories:

- Public Information
- Mapping and Regulations
- Flood Damage Reduction
- Flood Preparedness

Currently, approximately 1,000 communities nationwide receive flood insurance premium discounts based on implementation of local mitigation, outreach, and educational activities that go well beyond minimum NFIP requirements.

Assigning Priority to Mitigation Actions

Priority levels have been assigned to each of the mitigation actions. Highest priority has been given to those actions that are relatively inexpensive to implement, are required as part of other programs (e.g. NFIP), and/or will reduce the costs of flood damage to the County and the costs of flood insurance to the public.

Project Feasibility

It should be noted that there are many items that are infeasible at this time due to current County budget cuts and recent and possible future layoffs. These items include installing gauges on Aptos and Valencia Creeks, and expansion of drainage system monitoring. In addition to limited funding for implementing these programs, there is very little staff time to devote to applying for financial assistance. As the economic climate improves, these programs can be integrated into future iterations of this report.

An assessment of this mitigation strategy as part of this 5-year plan update indicates the strategy is effective for reducing potential losses identified in the risk assessment. The current flooding risk has not changed since the previous plan was adopted. No adjustments are needed to address a change in circumstances. There have been no major flooding events during the five-year update period.

6.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The County of Santa Cruz has developed several flood hazard mitigation goals to create a more flood-resistant community.

Flood Goals

Flood 1 - Avoid or reduce the potential for life loss, property, and economic damage from flooding.

Flood 2 - Enhance emergency management tools.

Flood 3 - Protect critical facilities, schools, and utilities from flooding.

Flood 4 - Promote public awareness of flood hazards, mitigation measures and flood insurance.

Flood 5 - Preserve open space in the flood hazard area.

6.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Flood hazard mitigation strategies include the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Continue to enforce flood plain management regulations on all permit applications. (A-2)
- Continue to participate in the Community Rating system to improve floodplain management. (A-3)
- Review and revise California Environmental quality Act (CEQA) Initial Study checklist to ensure storm water runoff is fully mitigated. (B-2)
- Update and revise the Geologic Hazards Ordinance. (B-5)
- Pursue elevation of structures to raise them above the 100-year flood level. (B-6)
- Continue to enforce requirements for on-site retention of storm water runoff from impervious surfaces where feasible for all new development in the Groundwater Recharge Zone and the Water Supply Watershed Zone and throughout Santa Cruz County. (B-7)
- Evaluate the effectiveness of current policies and ordinances designed to limit storm water runoff and recommend revisions to improve the effectiveness of these policies. (B-8)
- Evaluate the effectiveness of current drainage plan requirements. (B-9)
- Implement the “Stormwater Facilities Master Plan” for Flood control Districts 5. (B-10)
- Continue to inspect and maintain drainage system infrastructure. (B-11)
- Develop public education materials on flood protection and mitigation by working collaboratively with community groups, non- governmental organizations, and the local media. (B-12)
- Regulate development in flood zones to optimize preservation of open space through the application of the Geologic Hazards Ordinance and Open Space Preservation policies. (B-13)
- Limit development and monitor conditions of development and grading permits near natural channels and wetlands to prevent sedimentation. (B14)

- Implement the Pajaro River Flood Risk Management Project to reduce the probability and consequences of flooding in the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands. (B-20 New)

Implementation and Evaluation

As part of the County’s participation in the CRS program, a Flood Mitigation Planning Committee has been created and consists of the Floodplain Manager and key Planning Department, Office of Emergency Services, and Department of Public Works staff members. The County convenes regular meetings of the Committee to assess and evaluate progress on the goals and action items in the Plan. Additionally, the Committee works with responsible agencies to promote the goals and action items in their annual budgets and work programs. The Committee prepares an Annual Evaluation Report and distributes the report to the Board of Supervisors, the Community Rating System Coordinator for inclusion in the annual Community Rating System Report, the local news media, and the public.

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. Continuing efforts to address flood hazards has been a very high priority for Planning Department staff. Accomplishments include updating how we define substantial damage/substantial improvement in flood plain management to reflect current structure valuation, and participation in the Community Rating System to improve flood plain management and reduce insurance costs. The Planning Department has updated the Safety Element of the General Plan, the Geologic Hazards Ordinance, and the Flood Plain Ordinance. These updates are in effect outside of the Coastal Zone and are awaiting certification by the California Coastal Commission prior to being in effect in the Coastal Zone. The Planning Department continues to review development applications for emergency use and critical structures, and all other structures, for compliance with the California building code and the Geologic Hazards Ordinance regarding flood hazards. Planning staff has developed public education materials and mailed to properties within flood hazard areas. An explanation of how the previous mitigation plan has been implemented over the last five years is included in Appendix L. The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. There are no recommended changes to the mitigation actions for earthquake hazards, and the actions will continue to be implemented on an ongoing basis through existing regulatory mechanisms and funding and staff resources.

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for flood hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to flood hazard reduction.

- The County participates in the National Flood Insurance Program and has a flood plain management ordinance administered by a floodplain manager. All permit applications potentially impacted by flood hazards are reviewed by the floodplain manager. Notably, the issue of substantial improvement of existing building has been addressed. The “Flood Zones – Substantial Improvements” interpretation became effective February 10, 2010. The interpretation effectively increased the substantial improvement dollar value per square foot from \$107 to \$212.17 for most single-family dwellings and \$318.25 for single family dwellings in

the coastal high hazard area. The “Flood Zones –Substantial Improvements” interpretation was subsequently superseded by the new Substantial Improvement / Damage Review forms created in March 2013. These forms have simplified the permit requirements for applicants and reduced application review time for staff. (A-2)

- Planning Department staff completed the application for participation in the CRS Program during the 2011-2012 fiscal year. The County of Santa Cruz was accepted into the program as a Class 8 Community effective October 1, 2012. Staff has maintained this rating since the effective date. The Class 8 rating qualifies homeowners for a 10% reduction in flood insurance premiums. (A-3)
- The Initial Study Checklist used by County staff has been updated to ensure that storm water runoff is fully considered and mitigated to the extent possible. Ongoing updates will take place, as necessary. (B-2)
- Funding was obtained and the Geologic Hazards Ordinance was amended in 2020. The completed Geologic Hazards Ordinance update is awaiting certification by the California Coastal Commission. The update of the ordinance was coordinated with an update of the Safety Element of the General Plan and other implementing ordinances. (B-5)
- Per the Geologic Hazards Ordinance, the Planning Department continues to evaluate incoming building and development permit applications for structures in flood hazard areas to determine if the work will meet or exceed the threshold for a substantial improvement. Structures for which substantial improvements are proposed are required to be elevated. For those projects that do not exceed substantial improvement, the applicant is advised of the benefits of elevation of the structure. During the reporting period, the Planning Department has issued 10 permits for elevated structures and received 8 elevation certificates for newly elevated structures. Applicants continue to keep the size of renovation projects below the substantial improvement threshold in order to avoid the elevation requirement. (B-6)
- Public Works Stormwater Management staff continues to require on site mitigations to control runoff volume and rates from new or redeveloped impervious areas where feasible throughout Santa Cruz County. (B-7)
- On March 6, 2012, the Board of Supervisors adopted Ordinance No. 5117 adding Chapter 7.79 Runoff and Pollution Control to the Santa Cruz County Code. The adoption of the ordinance was supplemented by changes to the County Design Criteria on the same day (B-8)
- As part of developing the 2012 Ordinance, requirements for both new and redeveloped sites have been generated to minimize impervious area impacts to flooding and water quality. Stormwater mitigation requirements apply to new and redevelopment type of projects. Work is needed to develop quantifiable criteria for minimizing impervious areas required by both the Design Criteria and the General Plan (B-9)
- The Master Plan for Zones 5 and 6, the most urbanized areas of the county, was completed in August 2013. The Master Plan identified recommended improvements that Public Works and the Flood Control Districts will consider in prioritizing the drainage improvements within these zones. Zone 5 is in the process of updating the Zone Drainage Master Plan to assess the condition and capacity of the larger conveyances within the Zone, to estimate the cost of comprehensive maintenance and CIP program. The goal of this update is also to seek sustainable funding source to maintain and upgrade the drainage facilities within the zone. Also, one of the tasks in the Zone 5 Master Plan update will be about “limited” modeling for climate change and sea level rise. One iteration of climate change impacts will be modeled on the CIP pipe and creek models. The climate change iteration will include tidal boundary change due to sea level rise and increased runoff due to precipitation change. (B-10)

- The Department of Public Works continued to inspect and maintain drainage system infrastructure. Approximately 3000 junction structures, 2262 minor culverts, and 160 bridges and major culverts are maintained. From 2014 through present the Public Works Department has replaced approximately 116 culverts. Public Works continues to struggle to maintain the County's existing drainage infrastructure due to the continued shortfall of State and Federal funds and declining gas tax revenues. The lack of available funding affects our staffing levels and our ability to perform necessary maintenance and repairs. (B-11)
- Distribution of a flood hazard brochure is required as a condition of participation within the CRS Program. The brochure is sent out annually to properties within flood hazard areas. The brochure is also provided annually to real estate offices, mortgage companies, and insurance providers within the County. The flood hazard brochure gets sent to over 4700 addresses every year. This requires significant staff resources to print, fold and tape the brochures. In 2017, the County was required to update the CRS program to conform to the guidelines in the revised CRS Coordinator's Manual. The brochure at that time was replaced with a postcard that directs the property owner or resident to an online resource with the required information. (B-12)
- The existing Geologic Hazards Ordinance and Riparian Corridor and Wetland Protection Ordinance have been effective at preserving open space for most development. The Planning Department continues to improve on understanding the relationship between the two and enforcing them cohesively. The new Flood Hazard Ordinance has been adopted based on the State model ordinance and will further optimize preservation of open space through clarification of the existing ordinance. Revisions to the Riparian Corridor and Wetland Protection Ordinance have been postponed due to limited staff resources. (B-13)
- The Riparian Protection ordinance prohibits development within riparian corridors and buffers. The Planning Department actively works with developers to reduce the need for Riparian Exceptions when they can be avoided. In addition, the new Runoff and Pollution Control ordinance authorizes Public Works staff to inspect stormwater mitigation practices for development projects once every five years (or more often if necessary). (B-14)

The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. There are no recommended changes to the mitigation actions for flood hazards, or the priorities of the mitigation actions. The actions will continue to be implemented on an ongoing basis through existing regulatory mechanisms and funding availability.

Requirement §201.6(c)(3)(ii): The Plan shall address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate.

The Planning Department continues to review all permit applications, including over-the-counter applications, within the Special Flood Hazard Area (SFHA) for compliance with NFIP and County floodplain management regulations for new and substantially improved structures. The construction value for permits issued within the SFHA are recorded and tracked for cumulative improvements within a 5-year period. Since the adoption of the most recent LHMP in 2016 the Planning Department has reviewed approximately 330 permits within the SFHA.

The County of Santa Cruz was accepted into the Community Rating System (CRS) program as a Class 8 Community effective October 1, 2012. The County continues to participate in the program. A 5-year

Cycle Visit was held on November 15, 2017 to review the County floodplain management program under the 2017 CRS Coordinator Manual. Results were returned to the County in July 2018. Staff has maintained a Class 8 rating even under migration from scoring using the 2007 CRS Coordinators Manual to the 2017 Manual. A Class 8 rating qualifies homeowners for a 10% reduction in flood insurance premiums. The 2019 CRS Annual Recertification was accepted on September 13, 2019.

Chapter 7 Drought

7.1 Risk Assessment

7.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

Santa Cruz County surface water and groundwater resources provide drinking water for residents and visitors, critical habitat to numerous plant and animal species, and opportunities for recreational and commercial activities. Like many other areas of California, the County faces water resource challenges including inadequate water supply particularly during droughts, impaired water quality, overdrafted groundwater basins, depleted streams, and degraded riparian habitat. The overwhelming majority of Santa Cruz’s water supply is locally derived – a unique situation in a state supported by large federal and state water projects. Domestic supply within the region is provided by five large public agencies, four medium water systems, 115 small water systems, and some 8,000 individual wells. Water use in 2020 is shown in Table 20. County staff, local agencies, organizations, and the community are continuing to work together toward long term solutions to ensure a reliable water supply balanced with maintaining environmental benefits.

Water Supplier	Connections	Population	Water Use acre-foot/year	Groundwater	Surface Water	Recycled Water	Imported
Santa Cruz City Water Department	24,561	97,417	8,375	5%	95%		
Watsonville City Water Department	14,855	65,966	7,201	100%			
Soquel Creek Water District	14,479	40,632	3,312	96.7%	3.3%		
San Lorenzo Valley Water District	7,900	23,700	1,953	53%	47%		
Scotts Valley Water District	3,807	10,709	1,339	87%		13%	
Central Water District	823	2,706	411	100%			
Big Basin Water Company	605	1,694	205	37%	63%		
Mount Hermon Association	494	2,850	155	100%			
Forest Lakes Mutual Water Company	326	1,076	40	100%			

Water Supplier	Connections	Population	Water Use acre-feet/year	Groundwater	Surface Water	Recycled Water	Imported
Smaller Water Systems (5-199 conn.)	2,616	7,691	1,552	91%	6%		3%
Individual Users*	8000	21,000	2,400	95%	5%		
Mid- & North County Agriculture			2,400	90%	10%		
Pajaro Agriculture (SC Co. only)**			22,250	92%	1%	7.2%	
Totals	78,466	275,441	51,593	78%	19%	3%	0.1%
Summary by Water Source (acre-feet/year)				40,027	9,788	1,776	47
Summary of Non-Agricultural Use (acre-feet/year)			26,943	17,397	9,326	174	47
*Values are Estimates							
**Includes a small number of water systems							
Source: 2020 Water Resources Annual Report							

Table 20 Water suppliers within Santa Cruz County

Nearly all of Santa Cruz County's water supply is derived from local surface water (streams and reservoirs - 20% of supply) and groundwater (80% of supply), which are fed entirely by precipitation and do not receive any imported water. A small amount of recycled water is produced for irrigation (4%). Partially because Santa Cruz County obtains all of its own water it is somewhat insulated from drought that has a greater impact on the portions of the state that rely on State or Federal water projects for their supply. However, the County continues to face major water supply challenges in that most groundwater basins have more water removed on an annual basis than is replaced and the major water supply agencies do not have sufficient sustainable supplies to meet current and future demand, even with very effective water conservation programs already in place.

While there are numerous small water diversions on many of the county streams, most of the stream water used is diverted from the San Lorenzo River Watershed, North Coast streams, and Corralitos Creek. Most groundwater is contained in permeable geologic basins, typically referred to as aquifers. There are three major groundwater basins in the county: the Santa Margarita, Santa Cruz Mid-County, and Pajaro.

Stream flow is inadequate to meet demands during a drought and all the major groundwater basins in Santa Cruz County are in some level of overdraft (i.e., more water is being extracted from the aquifers than is naturally recharged through the soils and stream valleys). In the Pajaro Valley, agricultural use far exceeds sustainable yield. In other parts of the County, historical development contributes to the overdraft both through demand but also because development covers the ground surface with impervious layers that greatly reduce groundwater recharge. Negative consequences of overdraft include declining groundwater levels, a decrease in groundwater quality, reduced streamflow, and seawater intrusion along the coast that destroys wells.

Figure 17 depicts the service areas of the major water agencies in Santa Cruz County. These agencies include the San Lorenzo Valley Water District (SLVWD), Lompico County Water District (merged with SLVWD), Scotts Valley Water District, City of Santa Cruz Water Department (CSCWD), Soquel Creek Water District, Central Water District, City of Watsonville Department of Public Works, and Utilities

(CWWD) and the Pajaro Valley Water Management Agency (PVWMA). With the exception of the recycled water project, the PVWMA does not provide water but rather is a management agency tasked with developing supplemental supplies and bringing the aquifers within its boundary into sustainable yield.

As with private well owners and stream diverters, the major water purveyors share the water resources in the County and most purveys obtain water from multiple sources. While most of the major purveyors depend solely on groundwater for their potable supply, the CSCWD, CWWD and SLVWD get a large portion of their water supply from local streams. The CSCWD is the largest user of surface water in the county, deriving approximately 90% of their supply from the San Lorenzo River Watershed and North Coast streams.

The water purveyors are working together to make our limited water resources sustainable for current and future generations of Santa Cruz residents. In fact, some of the most progressive water conservation programs in the country have been implemented by our local agencies and per-capita water use is far below state or national averages. Water Purveyors are working cooperatively and individually to develop additional sources of water, such as desalted sea water and recycled wastewater. An Integrated Regional Water Management Plan covers the County and has provided for ongoing collaboration between agencies as well as facilitated grant funding for project implementation.

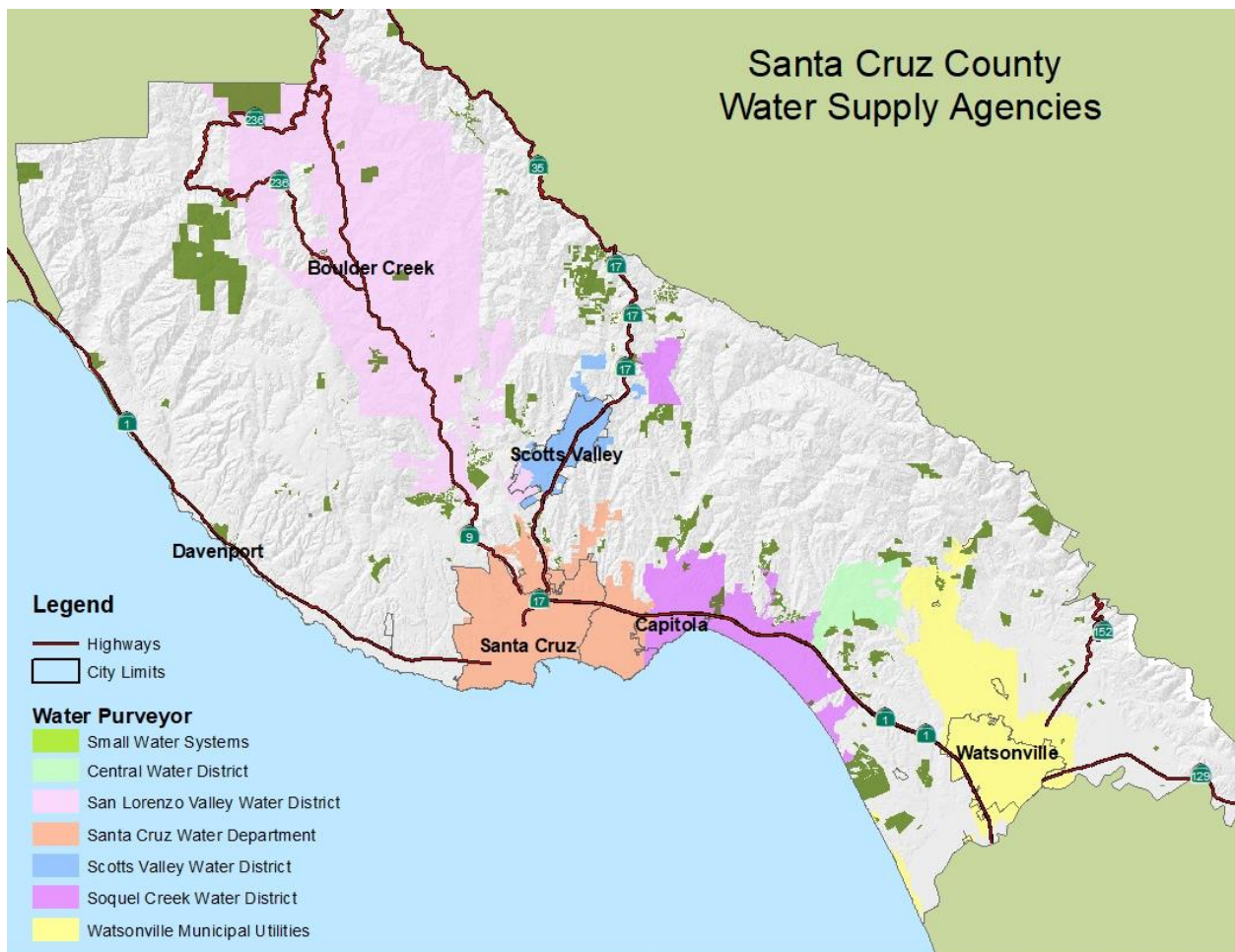


Figure 16 Santa Cruz County major water purveyors

Santa Cruz County has no direct authority over the entities that provide water supply to county residents. The two largest suppliers are governed by the city councils elected by city residents. Independently elected Boards govern the other public entities. The California Public Utilities Commission oversees the privately owned water systems to some extent. All water systems are governed by state and federal safe drinking water regulations. The larger systems with more than 200 connections are regulated directly by the California Department of Public Health.

The County serves as an agent of the state, ensuring compliance with the state regulations for 115 small water systems with 5-199 connections. The County also permits individual water systems to serve new homes in rural areas. Typically, these are on wells. Although well yield standards for new development are conservative, it is possible that individual wells and older wells serving small water systems may experience diminished yield or go dry during an extended drought. The County has no ongoing oversight of water use for individual water systems after the initial development permit is approved.

7.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

A drought is a period of dry weather that persists long enough to cause serious problems such as crop damage and/or water supply shortages. Droughts may not be predictable, but they should be expected. They occur with some regularity and varying levels of severity. The magnitude and duration of a drought is something that can be predicted based on historical records and should be taken into account in water resources planning. In recent history, Santa Cruz County experienced 3 drought periods: 1976-77, 1987-1992, 2007-09, and most recently in 2012-15. It is expected that the effects of climate change will result in more severe droughts of longer duration.

The expected effects of climate change will also increase the risk of drought. Numerous climate models have been run with various predictions for the Santa Cruz County area. Although it is unclear whether the average amount of rainfall will increase, it is apparent that the timing and intensity of rainfall will change, which will lead to more severe extended droughts. More intense rainfall will contribute to relatively diminished groundwater storage, which will reduce groundwater storage and dry season stream baseflows, which will have adverse impacts on water supply. The projected increase in temperatures will also lead to an increase in water demand for irrigation, particularly in the inland parts of the county that are less influenced by coastal fog. It will also lead to greater rates of evapotranspiration, further exacerbating reduced stream flow. The county water agencies are currently pursuing more detailed assessments, which will help to better quantify the expected impacts of climate change.

7.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Vulnerability to drought varies with the different water agencies and their sources. Agencies with a greater reliance on surface water are more vulnerable than those that rely entirely on groundwater. County water agencies have installed interties among jurisdictions to be able to exchange water in the event of an emergency or shortage.

The countywide decline in groundwater levels and streamflow is indicative of the continuing need to reduce any non-essential water use throughout the county by small and large water systems, private wells, and stream diversions. Conservation programs, curtailment programs, and plans to increase water supply are all components that will decrease the vulnerability of the community to drought.

7.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Structures and facilities are not vulnerable to drought. Physical losses would probably be limited to public and private landscaping. However, the impacts to surrounding natural plant communities (and wildlife) that occur as the result of severe drought conditions also increase the risk of wildfire and subsequent damage to structures as a result.

7.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

While structures are not at risk, significant losses may occur as a result of severe rationing during a water shortage. One of the County's major industries is tourism. The vulnerability to drought (or more specifically water shortages as a result of drought) reaches its peak during the summer tourism season. Restaurants, hotels, amusement parks and other tourist serving businesses would all be at risk of closing or severe restrictions during a critical drought. This is critical to funding ongoing County services because of the County's reliance on the Transient Occupancy Tax (TOT). Other industries such as agriculture, food processing, contractors, landscapers, nurseries, golf courses, public landscaping and school grounds would all experience losses, and other water dependent businesses would suffer economic damages. These economic losses have not been calculated.

While potential economic losses have been considered, they have not been calculated; therefore, there is no loss estimate.

7.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The greater Santa Cruz area is a compact urban area surrounded by mountains, greenbelt, and the Pacific Ocean. The sizes of the water service areas are generally fixed by the County's urban services line. Water service areas for all jurisdictions have generally remained constant over time due to policies limiting water main extensions to unserved areas. The only extensions of service or agency boundaries have involved incorporating an existing developed area into a larger district, which has better capabilities for providing reliable water service. Accordingly, any growth and redevelopment that does happen going forward is expected to be concentrated within the confines of the existing service area boundaries.

Within the City of Santa Cruz, the San Lorenzo Valley, and other areas only a relatively small amount of land remains undeveloped. Because of the relative scarcity of raw buildable land, the majority of future growth in the area is likely to be achieved through redevelopment, remodeling, infill, and increased density on underutilized land, along with new construction on the little amount of vacant land remaining. In other words, the service areas are relatively fixed and not growing outward. There has not been a residential subdivision in rural areas of the county since the adoption of Measure J, the County's growth management plan, in the late 1970s. Both the City of Watsonville and the City of Santa Cruz have also established urban growth boundaries.

The housing elements of the County and the cities have recently been updated to address the required regional fair share housing needs established by AMBAG. These documents set forth goals and objectives for housing production, rehabilitation, and conservation. The plans identify generally where sites are available for housing to be built and describe programs to facilitate new housing opportunities, but this does not necessarily mean such housing actually will be constructed.

The County has adopted growth management policies and ordinances that limit growth. According to annual Growth Management Reports, there have been 909 new residential structures built in the County since 2010 (Table 12).

New development is required to incorporate water conservation measures to mitigate potential impacts from drought. These requirements implement the drought mitigation strategy described below.

7.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

Each water supply agency that serves more than 3,000 connections is required to prepare and maintain an urban water management plan, which among other things, outlines the susceptibility of the supply to drought over a 30-year planning horizon. Those plans have been completed by all the large agencies and take into account expected population growth and climate change impacts.

Local governments, agencies, organizations in Santa Cruz County share a history of long-range planning efforts at the scale of individual groundwater basins, watersheds, and jurisdictions. In 1998, a variety of entities came together to support coordinated programs for water resources and watershed management. Between 2002 and 2004, local agencies and special districts began integrated planning efforts, including coordination of water bond funding. In 2005, local agencies collaborated on the development initial Integrated Regional Water Management Plan (IRWMP) to address the region's water supply, water quality, and resource stewardship needs. In 2006, the Partner agencies signed a Memorandum of Agreement and most formerly adopted the IRWMP. The IRWMP was updated in 2014. Development of the IRWMP has helped secure millions of dollars of grant funding for high priority water resource projects.

In 2011, the California Department of Water Resources (DWR) awarded \$999,750 to the Regional Water Management Foundation to support an update of the Region's IRWMP and to complete key technical studies to inform water resources management. This work provided critical data to evaluate resource management strategies to address the water resource challenges facing the Region. In 2016, DWR awarded a \$1.2 million grant to partially fund the implementation of three projects, including two drinking water supply reliability projects and upgrades to a wastewater/recycled water treatment facility. An addendum to the IRWMP was completed in 2019 to update and expand content in the Plan to meet the state's IRWMP Standards, including new information on water quality and climate change vulnerabilities.

The County has worked with the water districts and purveyors, small water system operators, and private wells for many years to manage groundwater, a critical source of drinking water in the county. The existing collaborations laid the groundwork for complying with the Sustainable Groundwater Management Act of 2014 (SGMA) went into effect on January 1, 2015. In addition to the work required under SGMA, the individual agencies that depend on groundwater for some or all of their water supply continue to implement projects and management actions.

The three groundwater basins subject to SGMA are the Pajaro Valley Basin, the Santa Cruz Mid-County Basin, and the Santa Margarita Basin. The County is a member of the two agencies tasked with overseeing sustainable management of the Mid-County and Santa Margarita Basins. A Groundwater Sustainability Plan for the Mid-County Basin was adopted in 2019 and the Plan for the Santa Margarita basin is expected to be adopted in 2021. The Pajaro Valley Water Management Agency is currently updating their Basin Management Plan. All three agencies have received grant money from the Department of Water Resources for their planning efforts.

An assessment of the combined mitigation strategies of the water agencies and the County as part of this 5-year plan update indicates the strategy is effective for reducing potential losses identified in the risk assessment. The drought risk has not changed since the previous plan was adopted. No adjustments are needed to address a change in circumstances. A number of mitigation strategies have been effectively implemented during the current drought during the five-year update period.

7.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Given that the County does not have any direct authority over water supply, the County is limited in the actions it can take to mitigate drought, other than to support the efforts of various water supply entities to address drought. Goals to reduce the impacts of drought are contained in the various plans described above such as the Urban Water Management Plans and the IRWMP, and the Groundwater Sustainability Plans.

Drought Goals

Drought 1 - Reduce near-term drought shortages through water conservation and water supply projects.

Drought 2 - Provide a reliable supply that meets long-term needs while insuring protection of public health and safety as well as environmental users of water.

Drought 3 - Support land use patterns that encourage higher density residential development along major transit corridors, as this type of residential living product uses less water per capita than conventional stand-alone single family residential development.

7.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Drought mitigation strategies include the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Implement water conservation to maximize the use of existing water resources. (A-7)
- Support the development of additional water supplies (A-8)
- Promote more effective use of groundwater storage through increased groundwater recharge and conjunctive use among agencies. (A-9)
- Promote drought planning by the 115 small water systems under County jurisdiction. (B-15)
- Passage of the Sustainable Santa Cruz County Plan to support higher density development along major transit corridors. (C-12 New)

Drought does not present a direct hazard to buildings. Proper maintenance and weed abatement including removal of dead landscape vegetation adjacent to buildings will reduce the threat of structure fire during dry years.

See Part 4 for a complete discussion of process and criteria used to prioritize mitigation actions. Individual water supply master plans, groundwater management plans, and urban water management plans were developed with a process for technical review and public review, which resulted in a prioritization of recommendations for each water supply agency. The Santa Cruz IRWMP maintains a list of projects from the various plans prepared by the water supply agencies. In addition, the Groundwater Sustainability Plans outline diverse and coordinated projects to bring groundwater basins into sustainability. The projects included in those plans are at varying levels of design, and are largely comprised of the following project types:

- Stormwater capture and recharge
- Recycled water for both irrigation and potable use
- Active recharge of groundwater basins with surplus surface water when available (Aquifer Storage and Recovery)
- Conjunctive use of surface and groundwater resources within and between water agencies to allow groundwater wells to rest when surface water is available (in-lieu recharge)
- Redistribution of pumping to protect water supply and natural resources.

2021 Progress Report

The Board of Supervisors has adopted a number of water conservation measures, including water efficient landscaping, prohibition on inefficient use of water, an update of the requirement for the retrofit of water efficient toilets and showerheads upon property transfer, and measures to encourage drought planning among small water systems will be considered. The County participates in regional collaborations and partnerships such as the IRWMP and the Water Conservation Coalition of Santa Cruz County.

Although the County is not a large regional water purveyor or manager (the County operates the Davenport water system), there are a number of actions the County has been taking to address water conservation as detailed in the Annual Water Resources Status Reports to the Board of Supervisors.

Water Conservation. Both the state water law and the County's General Plan call for a strong emphasis on water conservation and elimination of water waste to stretch existing sources, minimize the need for new water sources, and protect the environment. Most of the water agencies have strong conservation programs, which are supported by the County. Long term water conservation measures have been implemented by major water agencies, resulting in declining total demand. During the recent drought, agencies reduced water use from 2013 to 2016 by 25%, and subsequent water use has remained much lower than pre-drought levels. The County has implemented additional prohibitions on wasteful water use practices (Chapter 7.69) and has implemented the Water Efficient Landscape Ordinance (Chapter 13.13). Water efficiency measures for large users are required as a condition of obtaining a well permit (Chapter 7.70). Small water systems are required to install meters and report water use (Chapter 7.71). County staff continue to provide education and outreach on water conservation and respond to complaints of excessive water use. The Pajaro Valley Water Management Agency has been partnering with the Resource Conservation District of Santa Cruz County to promote conservation in agricultural water use as well. (A-7)

Recycled Water and Groundwater Storage. There are currently three water recycling plants in the County, all focusing on tertiary treatment for irrigation: one operated by the City of Scotts Valley, one by the Pasatiempo Golf Course, and one by the City of Watsonville and Pajaro Valley Water Management

Agency. The first potable recycled water is in the final development stages with construction expected to start in 2021. The Pure Water Soquel project is being spearheaded by Soquel Creek Water District in partnership with the City of Santa Cruz who will provide the source water. The project will purify 1500 acre-feet of water per year, which will be injected into the Mid-County Groundwater Basin for use as both a supply and for seawater intrusion prevention. The City of Santa Cruz is investigating the use of the Mid-County Basin as a place to store excess surface water through an Aquifer Storage and Recovery program. The City is currently piloting the feasibility of using surplus winter flows and injecting them into the Basin for future use. They are also in the process of updating their water rights to allow flexibility in the use of their surface water sources. The County is considering investigating the feasibility of septic consolidation and centralized sewage treatment in a portion of the San Lorenzo Valley, which would make recycled water available to mitigate water supply constraints and/or for fire suppression. (A-8)

Water Transfers, Recharge and Conjunctive Use. County staff are supporting the efforts of the water agencies to evaluate more possibilities for water exchanges and conjunctive use options which would have the potential to utilize more surface water during wet periods, increase use of recycled water, increase groundwater storage, increase stream baseflow, and potentially make more groundwater available to surface water users during drought periods. County staff is also pursuing various methods to increase groundwater recharge through projects and policies to restore and maintain storm water infiltration. City of Santa Cruz, San Lorenzo Valley Water District, Scotts Valley Water District and Soquel Creek Water District are all actively evaluating conjunctive use options and negotiations are underway for transfer of surface water to reduce groundwater use. In particular, the City of Santa Cruz and Soquel Creek Water District have been actively transferring water since 2019 and just negotiated a 5-year extension of that program. The County has received Integrated Regional Water Management grant funds to implement a stormwater recharge project at the Seascape Golf Course. The Resource Conservation District is continuing to develop projects to capture and recharge groundwater from agricultural areas of South County. Stormwater regulations have been amended to require maintaining infiltration rates at pre-development levels for new development and redevelopment. The Pajaro Valley Water Management Agency has recently certified two water supply project EIRs. One is for their College Lake Project which will supply approximately 1,800 to 2,300 acre-feet per year of water to growers in the Pajaro Valley. The other is for their Watsonville Slough Managed Aquifer Recharge project which temporarily stores excess surface water underground for use as irrigation water during the dry season. (A-9)

Drought Planning for Small Water Systems. The County requires water use measurement and reporting by the small water systems (5-199 connections) that the County oversees. Under drought conditions it is appropriate to require individual meters on connections within the water systems so that the system operators and individual users can better measure the effectiveness of the water conservation efforts. During the recent drought, the County frequently communicated with small water systems to provide water saving suggestions and technical assistance as needed. (B-15)

The County has dedicated significant staff resources and leadership to water conservation and supply issues. By using various planning mechanisms to implement mitigation actions the County has demonstrated progress in reducing the risk and consequences of drought. Further explanation of how the previous mitigation plan has been implemented over the last five years is included in Appendix L. The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. The projects described in

Mitigation Actions A-7, A-8, A-9, and B-15 are still relevant and will continue to be implemented over the next five years.

The County did not use a formal cost benefit analysis. Costs were carefully considered when determining goals and objectives but there was not an emphasis on cost benefit review to maximize benefits.

This page intentionally left blank

Chapter 8 Tsunami

8.1 Risk Assessment

8.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

A tsunami is a series of waves generated by an impulsive disturbance in a large body of water such as an ocean or large lake. Tsunamis are produced when movement occurs on faults in the ocean floor, usually during very large earthquakes. Sudden vertical movement of the ocean or lake floor by a fault, landslide or similar movement displaces the overlying water, creating a wave that travels outward from the source. The waves can travel across oceans and maintain enough energy to damage distant shorelines. The hazard posed by tsunamis came to the attention of the world during the 2004 Indian Ocean tsunami that killed as many as 300,000 people who lived more than a thousand miles from the source of the earthquake. An earthquake anywhere in the Pacific Ocean can cause tsunamis around the entire Pacific basin, including offshore of Santa Cruz County. Since the Pacific Rim is highly seismically active, tsunamis are not uncommon, but historically have been only a few meters in height. Significant damage occurred in the Santa Cruz Harbor as a result of a 9.0 earthquake in Japan. While the tsunami caused massive damage and casualties in Japan, the Santa Cruz Harbor suffered approximately \$20 million in damage. However, the historic record is short, and may not reflect the true tsunami hazard to the County. The potential outcome of a tsunami could be more significant damage and loss of life.

Santa Cruz County is located on Monterey Bay. Several active and potentially active earthquake faults are located within or near Santa Cruz County. An earthquake occurring in or near any of the nearby faults could result in local source tsunamis from submarine landsliding in Monterey Bay. Additionally, distinct-source tsunamis from the Cascadia Subduction Zone to the north, or teletsunamis from elsewhere in the Pacific Ocean, are also capable of causing significant destruction. Figure 19 is a map of potential tsunami inundation areas in Santa Cruz County.

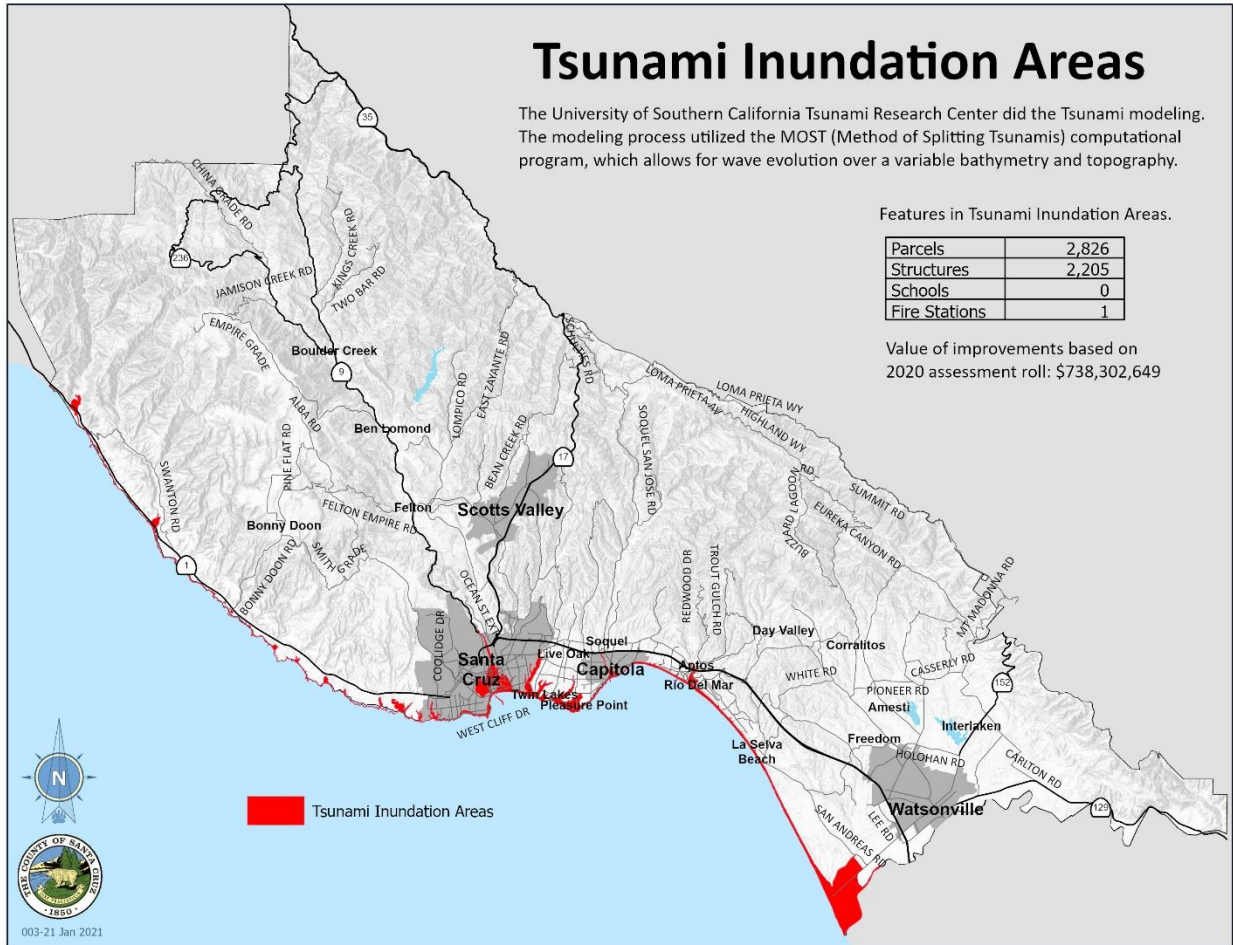


Figure 17 Tsunami inundation map

A local source tsunami generated by an earthquake on any of the faults affecting Santa Cruz County could arrive just minutes after the initial shock. The lack of warning time from such a nearby event would result in higher casualties than if it were a distant tsunami where the Tsunami Warning System for the Pacific Ocean could warn threatened coastal areas in time for evacuation (2011 Santa Cruz Harbor tsunami, for example). Past experience has not resulted in extensive damage from nearby tsunamis, but proximity to faults does create the possibility as a result of future quakes.

8.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Tsunamis have affected Santa Cruz County several times in recorded history. The first recorded tsunami was a tele-tsunami that initiated from an earthquake near Japan on June 15, 1896. In Japan, the death toll was approximately 20,000 people, but in Santa Cruz the tsunami was only a meter and a half high and there is little record of damage. A more significant tsunami occurred on April 1, 1946 when a magnitude 7.8 earthquake in the Aleutian Islands produced a 115-foot wave, which destroyed the Scotch Cap lighthouse killing five Coast Guardsmen. A related tsunami was 56 feet high in Hawaii, killing

173 people. The wave was observed all along the west coast. In Santa Cruz County, a man drowned, and minor damage was done by 10-foot waves. It should be noted that scientific observations place the 1946 Tsunami run up at 1.5 meters. Santa Cruz County was hit by a similar sized tsunami generated by the Good Friday Earthquake of March 27, 1964. Reports vary indicating heights between 1.5 meters and 3.3 meters. After the Loma Prieta Earthquake, a seiche, or oscillating wave in an enclosed or partially enclosed body of water, was observed at the Santa Cruz Harbor. The most recent tsunami occurred as a result of the magnitude 9.0 earthquake in Japan on March 11, 2011. In Japan nearly 16,000 deaths occurred as a result of the earthquake and tsunami, which generated a wave of water up to 113 feet in height travelling inland up to six miles. This tsunami hit the Santa Cruz Harbor with waves estimated to be several feet combined with swift and chaotic currents causing approximately \$20 million in damage.

California is at risk from both local and distant source tsunamis. Eighty-two possible or confirmed tsunamis have been observed or recorded in California during historic times. Most of these events were small and only detected by tide gages. Eleven were large enough to cause damage and four events resulted in deaths.

Anticipating the extent of future tsunami hazard is difficult because the historic record is limited, as is our understanding of the source mechanisms and influence of offshore geometry on the impact of tsunami in Santa Cruz County.

Studies have recently been undertaken by Richard K. Eisner, Jose C. Borrero and Costas E. Synolakis through the Governor's Office of Emergency Services and the Department of Civil Engineering at the University of Southern California, Los Angeles. In Inundation Maps for the State of California, the authors clarify that the results are based on worst-case scenario events and the maps are only to be used for emergency preparedness and evacuation planning. Pre-1994 inundation computations underestimated inundation height. Newer inundation models are now capable of modeling extreme events more accurately. These new inundation models (known as MOST) permit quantitative evaluation of inundation from nearfield tsunamis, provided accurate regional tectonic models and high-resolution bathymetry exist. Even using state of the art inundation prediction tools, California presents unique challenges in assessing tsunami hazards because:

- There is an extremely limited historic record of tsunamis in the state. In California there are no known records before the 19th century. Some paleo-seismic investigations have revealed evidence of pre-historic tsunamis, but not in Santa Cruz County.
- Most of the geologic work in the state has concentrated on identifying the risks associated with onshore faults and there is scant available information on offshore faults or landslide and slump scars suggestive of past submarine mass failures.
- Earlier estimates of tsunami hazards created the impression among planners and the public that the tsunami hazard was small.
- Nearshore seismic events may trigger tsunamis arriving within less than 20 minutes from peroration, allowing little time for evacuation.
- Shorelines and shoreline platforms vary significantly throughout the state, which modify tsunami run up and the corresponding potential damage.

8.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

There are two primary types of tsunami vulnerability in Santa Cruz County. The first is a teletsunami or distant-source tsunami from elsewhere in the Pacific Ocean. This type of tsunami is capable of causing significant destruction in Santa Cruz County. However, this type of tsunami would usually allow time for the Tsunami Warning System for the Pacific Ocean to warn threatened coastal areas in time for evacuation.

The more vulnerable risk to Santa Cruz County is a tsunami generated as the result of an earthquake along one of the many earthquake faults in the region. Even a moderate earthquake could cause a local source tsunami from submarine landsliding in Monterey Bay. A local-source tsunami generated by an earthquake on any of the faults affecting Santa Cruz County would arrive just minutes after the initial shock. The lack of warning time from such a nearby event would result in higher casualties than if it were a teletsunami.

8.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Among every type of land use within the county, over 2,800 parcels lie within the tsunami inundation zone. The number of structures on these parcels is 2,205. Expected total loss in value would be over \$738 million (Table 21).

8.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Land Use	Parcels	Structures	Total Assessed Value 2020
Agricultural	28	23	\$1,286,675
Commercial	29	19	\$10,148,786
Government	144	41	\$0
Industrial	3	0	\$1,658,660
Institutional	10	3	\$4,022,180
Miscellaneous	76	11	\$13,656,300

Land Use	Parcels	Structures	Total Assessed Value 2020
Residential	2,529	2,106	\$707,147,912
Utilities	7	2	\$382,136
Total	2,826	2,205	\$738,302,649
Population	4,076		
Population is based on the 2010 Census. Unincorporated Block centroids were selected by the hazard area.			

Table 21 Tsunami potential loss inventory

Valuation of parcels within a hazard area is based on improvement values only as collected by appraisers with the County of Santa Cruz Assessor’s Office. They do not reflect sale value or replacement value. If a parcel intersected a hazard the entire improvement value of that parcel was used. Census population blocks were reduced to center points. If a hazard intersected a center point, that population was counted.

Tsunamis create many risks similar to riverine and coastal flooding and the tsunami and flood inundation areas are similar. However, tsunamis also produce a run up that can be much more extensive than the run up that occurs with typical coastal flooding. In determining the extent of tsunami damage an estimate must be made of the extent of the flooding. Current mapping of tsunami flooding and damage is not meant to be measured against parcel level information and therefore is a rough estimate of damage and loss in a worst-case scenario.

8.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

As was described previously, Santa Cruz County has compact urban areas as well as large expanses of agricultural and forested land. Most development is now infill or reuse development²², although development of existing rural parcels continues. As discussed under Flood Hazards, new development is not allowed within the 100-year floodway and must meet flood hazard regulations within the remainder of the floodplain. Reconstruction of existing structures within these areas must meet the flood elevation requirements for habitable space dictated by the FEMA guidelines and regulations. Although FEMA flooding regulations may indirectly protect against some tsunamis, these standards are inadequate as tsunamis have a different direction of force and energy and can inundate areas that are not affected by riverine or coastal flooding.

No changes in these development regulation or patterns occurred that would affect the County’s overall vulnerability since the previous plan was adopted in 2016. Although the County does not track the number of residential and commercial structures that have been built in tsunami hazard areas since the last LHMP was adopted in 2016, the number includes the number of new structures built in the flood hazard area in the unincorporated portion of the County. Since the last LHMP in 2016, there has been

twelve new residential structures and one commercial structure built on existing lots of record in flood hazard areas in the County. As stated above, growth management policies prevent new development from occurring where hazards are present. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks, structural elevation, floodproofing, and other requirements to mitigate potential impacts from flood hazards. The Environmental Planning Section of the Planning Department, staffed by Resource Planners, one of which is the designated floodplain manager, specialize in reviewing each application for new residential and commercial structures to ensure that new development does not occur in hazard zones and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified flood hazards.

8.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The County’s current tsunami mitigation strategy is based upon notification and evacuation (see Appendix I). The strategy also includes continuation of an up-to-date Emergency Management Plan, an effective public information program and continuing collaborative efforts with the cities, agencies, and community organizations to facilitate collaborative efforts in providing up-to-date tsunami mapping, preparation, information, warning dissemination and education.

Mapping of tsunami inundation areas in Santa Cruz County, including the map used in this plan, is inadequate. This map should be viewed as an estimate of a worst-case scenario for planning purposes only. More accurate mapping of potential tsunami outcomes based on simulations of specific geologic events has been identified as an important component in preparing updates to this Hazard Mitigation Plan.

An assessment of this mitigation strategy as part of this 5-year plan update indicates this strategy would be an effective method for reducing potential losses identified in the risk assessment. The earthquake risk has not changed since the previous plan was adopted. No adjustments are needed to address a change in circumstances. The County will seek to update the tsunami mapping during the next five-year update.

8.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Tsunami Goals

Tsunami 1 - Avoid or reduce the potential for life loss, injury, property, and economic damage to Santa Cruz County from tsunami events.

Tsunami 2 - Continue to enhance emergency management systems including a defined public information process that includes an early warning system for evacuation prior to a tsunami event.

Tsunami 3 - Pursue unification of the County of Santa Cruz evacuation plan with those of the cities of Watsonville, Capitola, and Santa Cruz.

8.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Tsunami hazard mitigation strategies include the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Coordinate a communication system with other agencies and cities, including evacuation operations for homes and businesses within specific areas. (A-10)
- Management of the early warning system including a defined public information process including establishing a reverse 911 system that will notify all homes and businesses within the tsunami inundation areas, and a public address protocol to have local and regional radio, TV and cable outlets announce evacuation notifications to the community. (C-1)
- Update tsunami maps and signage defining evacuation zones. (C-2)
- Encourage investigation of the tsunami threat to Santa Cruz County, and update development regulations based upon this investigation. (C-14)

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for tsunami hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to tsunami hazard reduction.

- Continue to meet quarterly with Long Range Radio Infrastructure Management Planning Group to strategically consider interoperability and coordination of communications systems development and change out. Continue to seek grant funding opportunities for emerging technologies and enhancements. The narrow banding communications project has been completed for all county emergency services partners. (A-10)
- Continue to use Code Red EWS. Also added IPAWS. In addition, Public Works installed tsunami warning signs along the coastal areas in cooperation with Emergency Services. (C-1)
- The County uses the latest tsunami inundation maps referenced in this plan. The existing maps will be updated when new information becomes available. (C-2)
- The County will pursue update of the tsunami inundation maps as better scientific information becomes available. (C-14)

By using these communication and warning systems combined with current maps the County has demonstrated progress in reducing the risk from tsunami hazards. Further explanation of how the previous mitigation plan has been implemented over the last five years is included in Appendix L. The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. The projects described in Mitigation Actions A-10, C-1, C-2, and C-14 are still relevant and will continue to be implemented over the next five years.

Chapter 9 Coastal Erosion

9.1 Risk Assessment

9.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

Coastal erosion is the wearing away of coastal land. It is commonly used to describe the horizontal retreat of the shoreline along the ocean. Erosion can be measured as a rate, with respect to either a linear retreat (feet of shoreline recession per year) or volumetric loss (cubic yards of eroded sediment per linear foot of shoreline frontage per year).

Erosion rates are not uniform and vary over time at any single location. Annual variations are the result of seasonal changes in wave action and water levels. Erosion is caused by coastal storms and flood events, changes in the geometry of tidal inlets and bays and human-made structures and human activities such as shore protection structures and dredging.

Coastal erosion includes both cliff or bluff erosion and beach erosion and is a result of both winter wave attack as well as constant wave action. Local residents will notice that beaches change seasonally in response to changes in wave conditions. Winter storm waves are larger, steeper and contain more energy, and typically move significant amounts of sand from the beaches to offshore bars, creating steep, narrow beaches. In the summer, lower, less energetic waves return the sand, widening beaches and creating gentle slopes. During the winter months when beaches are narrow, or absent altogether, the storm waves attack the cliffs and bluffs more frequently. There are many factors involved in coastal erosion, including human activity, sea-level rise, seasonal fluctuations and climate change, and sand movement will not be consistent year after year in the same location.

Wind, waves, and the long-shore currents are some of the driving forces behind coastal erosion. The removal and deposition of sand creates long-term changes to beach shape and structure. Sand may be transported to landside dunes, deep ocean trenches, other beaches, and deep ocean bottoms.

Coastal erosion such as cliff and bluff erosion is also a result of processes related to the land such as rainfall and runoff, weathering, and earthquakes. Santa Cruz County is bounded on one side by the Pacific Ocean. The entire coastal edge of the county is affected by coastal erosion.

On the north coast, where there are few structures near the coastline, the risk to structures and infrastructure is less than the coastline in the middle and southern portions of the County where homes and some businesses, as well as roads and related infrastructure are located very close to the shoreline.

Most of the significant cliff, bluff and dune erosion occurs in the area of the County from Live Oak to the southern County line during major winter storms at times of very high tides. The north coast area of the County also experiences coastal erosion, however, to a lesser degree. All of the cliffs along the ocean experience some degree of coastal erosion.

The north coast area of the County (from the City of Santa Cruz to the Santa Cruz/San Mateo County line) is underlain by the geologically older Santa Cruz Mudstone formation, which is less susceptible to coastal erosion than areas in the County to the south.

The bluffs in the Live Oak area and eastward to Rio Del Mar are underlain by the younger Purisima formation capped by terrace deposits which have been estimated to be retreating at a rate of six inches to one to two feet per year.

Eolian deposits that are also sensitive to coastal erosion underlie the areas south of Rio Del Mar.

Figure 19 depicts coastal flood zones as mapped by FEMA to evaluate the extent of the coastal erosion hazard.

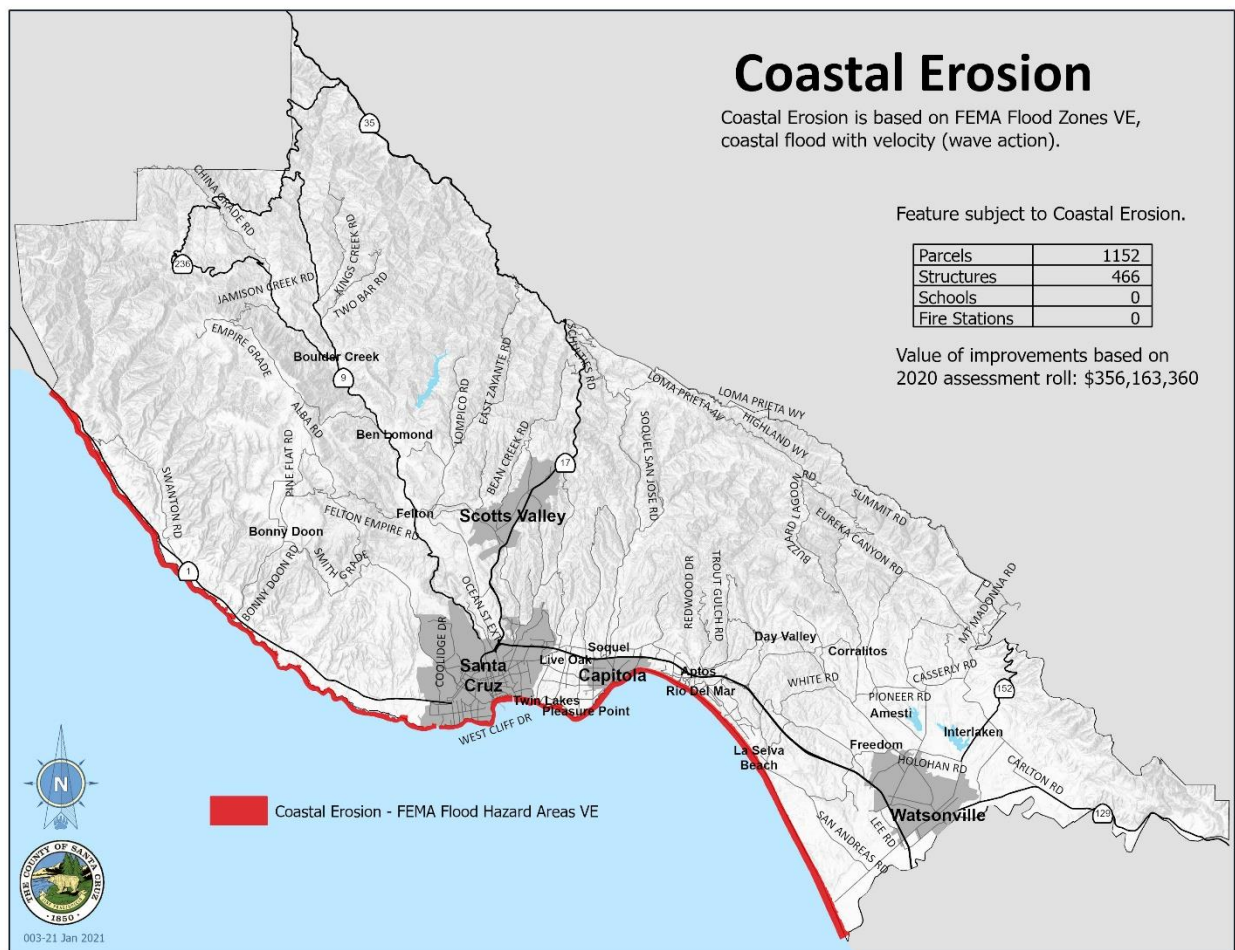


Figure 18 Coastal Erosion areas in Santa Cruz County

9.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Nearly the entire California coast is actively eroding due to complex oceanographic and geologic conditions, and to human activities that affect the delivery and movement of sand along the coast.²⁴

Bluff failure takes place through processes related to the sea (mainly those that affect wave action) and to the land (rainfall and runoff, weathering, earthquakes), although the terrestrial processes are less often appreciated than the marine processes. Wave attack during periods of high tides or otherwise elevated sea level (e.g. El Niño or storm surge) is one of the most common mechanisms of episodic cliff failure. El Niño increases storm frequency, elevated sea levels, wave height and rainfall. Studies have been performed on El Niño, storm frequency, and coastal erosion history for the central California coast from 1910-1995. This research indicated that the majority of documented coastal erosion occurred during El Niño storms that originated from the southwest.

During the severe El Niño winters of 1983 and 1997-98, sea levels were further elevated and storm damage along the coastal area was extensive. Wave attack combined with a global rise in sea level over the past 18,000 years has led to the continued migration of the shoreline. At the end of the last Ice Age, about 18,000 years ago, the coastline at Santa Cruz was about 10 miles offshore. As the ice sheets and glaciers melted, sea level gradually rose and continues to rise today.

Over the past several decades it has been discovered that coastal wave climate and storm frequency are related to larger scale climatic oscillations that affect the entire Pacific Ocean. During the time period from about 1945 to 1978, the California coast was characterized by a fairly calm climate, few large storms, less rainfall and less coastal erosion and storm damage. Beginning in 1978 and continuing until 1998, California experienced a period of more frequent and severe El Niño events with associated elevated sea levels, large waves, heavier rainfall and more extensive coastal storm damage and cliff and beach erosion.

While the sea level rose a little less than a foot over the past century, most scientists are concerned that due to the increase in greenhouse gases from human activity, warming will accelerate. As a result, glaciers will continue to retreat and the rate of sea level rise will increase, with the best estimate being about three feet higher by 2100. Given this estimate, the probability of future coastal erosion is very high.

In 2017 The Central Coast Wetlands Group conducted a study of future sea level rise impacts along the Santa Cruz County coast. The report titled Coastal Climate Change Vulnerability Report was funded through a grant from the Ocean Protection Council through the Local Coastal Program Sea Level Rise Adaptation Grant Program. This grant program is focused on updating Local Coastal Programs (LCPs), and other plans authorized under the Coastal Act such as Port Master Plans, Long Range Development Plans and Public Works Plans (other Coastal Act authorized plans) to address sea-level rise and climate change impacts, recognizing them as fundamental planning documents for the California coast.

The project was intended to achieve key objectives to further regional planning for the inevitable impacts associated with sea-level rise (SLR):

1. Identify what critical coastal infrastructure will be compromised due to SLR and estimate when those risks may occur; and
2. Define appropriate response strategies for these risks and discuss with regional partners the programmatic and policy options that can be adopted for LCP updates.

The project incorporated the most complete inventory of coastline revetment and seawalls for the Monterey Bay with coastal hazard GIS layers developed by Phil Williams and Associates and ESA Consulting to account for current protections from current and future coastal hazards. The project evaluated the impacts of sea level rise on municipal infrastructure, private properties, and natural resources. The project also evaluated relevant state policies and adaptation response alternatives ranging from “grey to green” for integration into municipal planning documents. The project also fostered regional discussions regarding inclusion of appropriate adaptation strategies into Local Coastal Program and other planning documents.

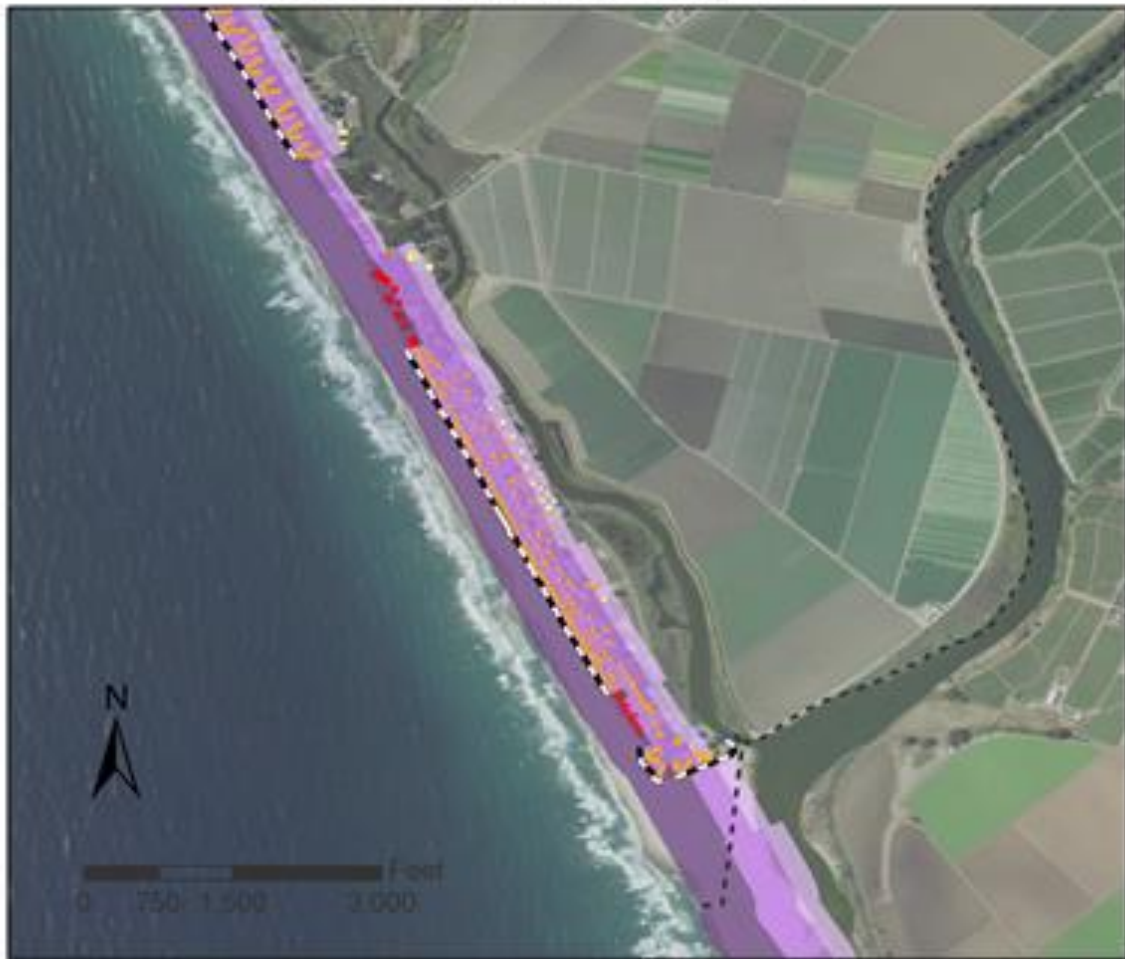
The study evaluated how various sea level rise scenarios would impact both coastal flooding and coastal erosion. Two examples of the results of the study for coastal erosion of particularly vulnerable locations along the coast are shown in the following two maps. Figure 20 depicts the results of the study along East Cliff Drive and Opal Cliffs Drive assuming increasing amounts of sea level rise (from 10 centimeters to 159 centimeters) by the year 2100. Figure 21 is a similar depiction of the hazard at Pajaro Dunes.

EAST CLIFF AVENUE BUILDINGS VULNERABLE TO EROSION



Figure 19 East Cliff Drive coastal erosion with sea level rise

PAJARO DUNES COLONY
BUILDINGS VULNERABLE TO EROSION



Erosion Hazard Zones

- 2030 with Armor
- 2060
- 2100

Vulnerable Buildings

- 2030
- 2060
- 2100

- - - County Line
- · - Coastal armoring

Figure 20 Pajaro Dunes coastal erosion with sea level rise

9.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Much of the Santa Cruz County coastline, particularly in the developed areas, has some level of armoring (walls, riprap, etc.). The majority of the protection structures have been installed within the last 40 years, and they have varying levels of adequacy and performance. While these protection structures help protect buildings and infrastructure during storms, they are still vulnerable to failure during larger storm events and may not provide full protection. Riprap structures along the coastline are particularly vulnerable to failure and require more maintenance and upgrading over time than the concrete seawalls.

While the entire Santa Cruz coast is subject to coastal erosion, the primary locations vulnerable to coastal erosion are the areas from the Santa Cruz Harbor eastward toward Pleasure Point, the area from Pleasure Point to Opal Cliffs, and the area south of New Brighton Beach to the southern Santa Cruz County line.

The area from the Santa Cruz Harbor to Pleasure Point contains numerous homes on the coastal bluff as well as roads and other infrastructure, particularly near the coastal lagoons, that are vulnerable to coastal erosion. There are also several sea caves that may affect the integrity of homes and infrastructure in this area as well. The primary type of coastal armoring in this area is riprap. It is not uncommon for East Cliff Drive to be closed or damaged where it crosses Schwann Lake, Corcoran Lagoon and Moran Lake during large winter storms. Many of the homes that exist along the coast in this area, although somewhat protected, may be subject to further coastal erosion as sea levels rise, earthquakes occur, and waves and rainfall impact the coast.

The area from Pleasure Point to Opal Cliffs also contains numerous homes on the coastal bluff as well as roads and other infrastructure that are vulnerable to coastal erosion. The coastal armoring in this area is a mix of riprap, concrete seawalls, and a combination of both. A seawall has been constructed in the Pleasure Point area along East Cliff Drive that should greatly reduce potential damage from coastal erosion to East Cliff Drive as well as the homes on the other side of the road. Many of the homes that exist along the coast in this area, although somewhat protected, may be subject to further coastal erosion as sea levels rise, earthquakes occur, and waves and rainfall impact the coast.

The area south of New Brighton Beach to the southern Santa Cruz County line contains numerous homes on the bluffs, at the base of the bluffs and on the beach. There is also infrastructure and several County roads on the beach and bluffs that may be affected by coastal erosion. Many of the homes along and above both Las Olas Drive and Beach Drive will experience the continuing effects of coastal erosion. There are also several other communities (including Seascape, La Selva Beach, Sunset Beach and Pajaro Dunes) that are vulnerable to coastal erosion. Many of the homes that exist along the coast in this area, although somewhat protected, may be subject to further coastal erosion as sea levels rise, earthquakes occur, and waves and rainfall impact the coast.

Along the north coast of Santa Cruz County, regulations have limited development and structures have been constructed in very limited locations.

Although seawalls reduce or delay coastal erosion processes as long as they remain functioning, ultimately coastal erosion continues, and the best seawalls need maintenance. While seawalls remain in place, they modify coastal erosion through the reduction of wave erosion energy, or reflection or refraction of wave energy. Focused erosion can occur at the ends of the seawalls. While seawalls are helpful in protecting against coastal erosion, proper setbacks from the brow of bluffs, drainage control, and special construction are all necessary to protect structures, roadways, and utilities from damage. Modern seawall construction, such as the recently constructed structures in the Pleasure Point area, can also be designed to improve coastal access by incorporating stairways and viewing platforms, and removal of debris from previous attempts at coastal protection that block lateral access along the shoreline.

9.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

As shown in Table 22 there are a total of approximately 1,152 parcels affected by coastal erosion containing a total of 466 structures. The analysis captures only those structures that are in flood hazard zone VE, or houses at beach level. The actual number of structures subject to coastal erosion hazard would also include structures on coastal bluffs outside of the flood hazard zone, but still subject to coastal erosion hazards. Based on a staff analysis of County Assessors records, this would bring the total number of structures vulnerable to coastal erosion hazards to over 1,000 structures. The potential loss value of the 466 structures is over \$356 million; therefore, actual potential loss value is more than twice that amount and well over \$700 million.

9.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Land Use	Parcels	Structures	Total Assessed Value 2020
Agricultural	4		\$282,777
Commercial	3		\$2,374,321
Government	95	20	\$0
Industrial			\$0
Institutional	3		\$2,049,384
Miscellaneous	37	3	\$13,231,635
Residential	1,008	443	\$338,225,243

Land Use	Parcels	Structures	Total Assessed Value 2020
Utilities	2		\$0
Total	1,152	466	\$356,163,360
Population	2,752		
Population is based on the number of residential parcels x 2.73 (See Table 3)			

Table 22 Coastal erosion potential loss inventory

The 2017 Santa Cruz County Coastal Climate Change Vulnerability Report provides similar estimates for coastal flood hazard areas subject to future sea level rise. Regarding the areas of Rio Del Mar and Pajaro Dunes, for example, coastal access, parking and 80 commercial and residential buildings are vulnerable to wave damage and coastal flooding by 2030 (10 cm of sea level rise) within the low-lying sections of Rio del Mar. More than 130 buildings within the Pajaro Dunes Colony (many comprised of multiple residences) are also vulnerable to flooding during winter storms.

By 2060 more than 800 additional buildings are at risk of impact from a predicted 2.4 ft. rise in sea levels as coastal protective structures begin to fail. If current structures are replaced, it is estimated that 500 of the vulnerable buildings would be protected, 400 of which are private residence. By 2100, more than 1,800 residential properties within the unincorporated county are vulnerable to coastal climate change hazards.

9.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Every coastal community in California is dealing with the issues of sea level rise and shoreline retreat armoring is becoming an increasingly controversial and contentious issue. Since seawalls now protect so much of the developed portion of Santa Cruz County coastline, the controversy now centers on improving these walls and their impacts. Coastal erosion poses many problems to coastal communities in that valuable property is frequently lost to this dynamic beach-ocean system. Additionally, human activity may modify the process of coastal erosion with uncertain results. Thus, issues of beach restoration and erosion control are at the forefront in coastal communities. Santa Cruz County's shoreline is now part of the Monterey Bay Marine Sanctuary, which will also influence development trends along the Santa Cruz coast.

The majority of the undeveloped areas along the coastline are farmland or other areas currently protected from development. The current trend in development along the coastline in Santa Cruz County is in-fill within the developed areas and reconstruction of existing structures and infrastructure. The County of Santa Cruz's Geologic Hazards Ordinance Section 16.10.070(h) requires development on coastal bluffs and beaches to be reviewed by the County Geologist. The ordinance requires

development to be setback at least 25 feet from the top of a coastal bluff, or the distance required to provide 100-year stability, whichever is greater. Shoreline protection structures are also subject to the County's Geologic Hazards Ordinance and review by the County Geologist. Most current seawall permits are for maintenance and improvement of existing walls, which allows the County of Santa Cruz to require modifications that reduce the walls' impacts.

No changes in these development regulations or patterns occurred that would affect the County's overall vulnerability since the LHMP was adopted in 2016. While the County does not track the number of residential and commercial structures that have been built in coastal erosion hazard areas since the last update, it is a subset of the overall number of new structures built in the unincorporated portion of the County. According to annual Growth Management Reports, there have been 909 new residential structures built in the County since 2010 (Table 11).

As stated above, growth management policies prevent new development from occurring where hazards are present. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks and other requirements to mitigate potential impacts from coastal erosion hazards. The Environmental Planning Section of the Planning Department, staffed by Resource Planners, specialize in reviewing each application for new residential and commercial structures to ensure that new development does not occur in hazard zones and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified coastal erosion hazards.

9.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The Santa Cruz County General Plan and Local Coastal Program Safety Element, the Geologic Hazards Ordinance and Coastal Zone Regulations provide a framework for protecting and preserving the coastline through the permit review process. County policies and regulations require careful planning and design when considering a new seawall, and maintenance of existing seawalls. Restoration efforts can help to mitigate damage from coastal storms by increasing natural resilience to coastal hazards.

An assessment of this mitigation strategy as part of this 5-year plan update indicates the strategy is effective for reducing potential losses identified in the risk assessment. The coastal erosion risk has not changed since the previous plan was adopted. Adjustments are needed to address a change in circumstances, however. The increased risk of coastal erosion in the future as a result of sea level rise is addressed in the Climate Change chapter. There have been no coastal erosion related disasters during the five-year update period.

9.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Coastal Erosion Goals

Coastal Erosion 1 - Avoid or reduce the potential for life loss, injury, property, and economic damage to Santa Cruz County from coastal erosion.

Coastal Erosion 2 - Protect and preserve natural resources.

Coastal Erosion 3 - Protect and preserve current infrastructure.

9.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Coastal erosion mitigation strategies include the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Protect and preserve the coastline through permit review and continue to review coastal development for conformance with the County's Geologic Hazards ordinance. (C-3)
- Encourage the replacement of existing seawalls with better-designed walls that result in less of an impact to coastal access and beach area and integrate coastal access elements. (C-4)
- Protect and preserve the coastline and infrastructure through restoration efforts (C-8)

Minimizing Hazards from Coastal Erosion

Much of the urban coastline in the County has boulder riprap or concrete seawalls to minimize the energetic wave impacts that drive cliff erosion and to protect residences and infrastructure. Because these structures have finite life spans and can have adverse effects on other parts of the coast, engineering solutions can be very expensive in both the short-term and long-term. In other cases, the solution is to leave the coastline relatively undeveloped and to allow erosion to occur naturally. This option preserves the normal input of sand into the littoral drift system, perhaps lessening erosion at neighboring beaches.

The three primary management strategies that may be used to plan for and respond to coastal erosion are hazard avoidance, relocation, and coastal protection. The maximum potential efficacy and acceptability of these strategies can best be determined with multi-disciplinary project planning, design, monitoring and evaluation.

Hazard Avoidance – A Commonsense Approach

The most logical method for preventing potential damage to new development in the coastal zone is to avoid building where coastal erosion will impact such development. This concept, known as hazard avoidance, could circumvent many subsequent permitting and legal challenges. Hazard avoidance has

proven effective when used in a number of ways including designing public infrastructure to discourage development in high geologic hazard areas along the coast.

Relocation – Moving Development Out of Harm’s Way

In some instances, development is sited in unstable, erosion-prone areas that may be damaged or destroyed by natural processes acting on the coast. Relocating existing public or private development away from erosion-prone areas may be the most effective long-term option when responding to the eventual or imminent threat of damage. While relocating coastal development away from hazardous areas would be the most direct way to eliminate the risk of damage and the need for coastal protection, this response may not be technically, financially, or legally feasible. Another approach to consider under certain circumstances is the concept of “managed retreat,” that is the gradual removal or abandonment of development from areas of high geologic hazard. In the context of coastal management, the concept of managed retreat acknowledges the natural erosive processes at work along the coast.

Coastal Protection

In situations where hazard avoidance and relocation are not viable options, coastal protection strategies can be used to reduce the potential for beach loss, coastal erosion, and coastal access loss. There are two general types of coastal protection, hard and soft. A “hard” protection device utilizes concrete or rock in a variety of configurations to absorb or dissipate storm wave energy, generally in the form of vertical seawalls, rock revetments or bulkheads. “Soft” protection primarily involves dune or beach restoration or enhancement to reduce the chances of storm waves from reaching the backshore. A hard protection device differs substantially from most soft erosion response alternatives in that it does not add sand to the system of sediment.

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for coastal erosion hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to coastal erosion hazard reduction.

- Planning staff is currently involved in protecting and preserving the coastline during review of development projects for conformance with the Geologic Hazards ordinance. In 2020 the Board of Supervisors adopted amendments to the Safety Element of the General Plan and Local Coastal Plan (GP/LCP) to incorporate sea level rise into policies addressing coastal bluff and beach hazards and floodplain management. The amendments will not be effective until certification by the California Coastal Commission. The amendments preserve existing policies and regulations regarding development on coastal bluffs and beaches intended to avoid coastal erosion and flooding hazards, including coastal bluff setbacks to avoid coastal erosion hazards and elevation of substantially improved structures on the beach to avoid flooding hazards. The amendments include new policies and regulations to preserve and protect the coastline including a prohibition on new seawall construction on the beach and requirements to mitigate impacts of existing seawalls as a condition of development projects. As a condition of new development, property owners would be required to acknowledge the risks of development in a hazardous area and the potential that future occupancy of structures may be prohibited as a result of coastal hazards. (C-3)

- Policies encouraging the replacement of existing seawalls with better-designed walls that result in less of an impact are incorporated in the Safety Element amendments recently adopted by the Board of Supervisors. In addition to a prohibition on new seawall construction on the beach, the new policies would encourage construction of seawalls in a defined urbanized area referred to as the Shoreline Protection Exception Area. In this area, the goal would be to continue the existing pattern of bluff protection exemplified by the County projects between 32nd and 36th Avenue and at the end of 41st Avenue. The County project resulted in improved coastal access both vertically and laterally. This project was informed by sea level rise vulnerability assessments in the Monterey Bay, and coastal regional sediment management studies. (C-4)
- Protecting and preserving infrastructure along the coast through restoration efforts is ongoing. Construction of the East Cliff Drive, 32nd Avenue to 36th Avenue and 41st, Bluff Protection Project was completed on March 21, 2011. Continued maintenance of existing coastal protection structures occurs as needed. The policy amendments described above would also result in improved maintenance of private seawalls that indirectly protect public infrastructure. Public Works continues to struggle to maintain its existing coastal protection infrastructure due to the continued shortfall of State and Federal funds and declining gas tax revenues. The lack of available funding also affects the Departments ability to plan, design, and construct new coastline protection infrastructure. (C-8)

By using these planning mechanisms to protect and preserve the coastline, encouraging the upgrade of existing coastal protection structures, and protect and preserve infrastructure along the coast, the County has demonstrated progress in reducing the risk from coastal erosion hazards. Further explanation of how the previous mitigation plan has been implemented over the last five years is included in Appendix L. The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. The projects described in Mitigation Actions C-3, C-4, and C-8 are still relevant and will continue to be implemented over the next five years.

This page intentionally left blank

Chapter 10 Dam Failure

10.1 Risk Assessment

10.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

Dam failure can occur as a result of earthquakes, seiches, structural instability, or intense rain in excess of design capacity. Timber, rock, concrete, earth, steel, or a combination of these materials may be used to build a dam. Dams must have spillway systems to safely convey normal stream and flood flows over, around, or through the dam. Spillways are commonly constructed of non-erosive materials such as concrete. Dams also have a drain or other water- withdrawal facility to control the reservoir level and to lower or drain the reservoir for normal maintenance and emergency purposes.

As shown in Table 23, there are five dams located within Santa Cruz County that, based on their size, are regulated by the State Division of Safety of Dams. The Newell Dam is located within the jurisdiction of the City of Santa Cruz. The remaining four include: 1) Mill Creek Dam at the Lockheed facility near the end of Empire Grade in northern Santa Cruz County, 2) Sempervirens Dam within Big Basin Redwoods State Park, 3) Oak Site Dam found near the Lockheed facility, and 4) Soda Lake located along Highway 129 in southeastern Santa Cruz County. None of these dams are owned or operated by the County of Santa Cruz but are the responsibilities of other state agencies or private entities. The reservoirs range in size from 20 acre-feet to over 10,000 acre- feet, with the oldest dam being constructed in the late 1890s and the newest in 1985.

Name	Owner	County	Stream	Year Built	Capacity (Ac-ft)	Res. Area (Acres)
Mill Creek	Lockheed Missiles and Space Co.	Santa Cruz	Mill Creek	1889	223	12
Oak Site	State Dept of Forestry	Santa Cruz	Tr. Big Creek	1969	20	2
Sempervirens	California Dept of Parks and Recreation	Santa Cruz	Sempervirens Creek	1951	78	4
Soda Lake	Granite Rock Co.	Santa Cruz	Tr. Pajaro River	1978	1,983	72
Newell	City of Santa Cruz	Santa Cruz	Newell Creek (SLR)	1960	8,991	172

Name	Owner	County	Stream	Year Built	Capacity (Ac-ft)	Res. Area (Acres)
Elmer J Chesbro	Santa Clara Valley Wd	Santa Clara	Llagas Creek (PR)	1955	8,086	328
Uvas	Santa Clara Valley Wd	Santa Clara	Uvas Creek (PR)	1957	10,000	280
San Justo	Bureau of Reclamation	San Benito	Offstream	1985	10,300	202

Table 23 Dams in and near Santa Cruz County

Given their location, a major dam failure at the Newell Creek Dam could result in extensive property damage or loss of life in the San Lorenzo Valley and the City of Santa Cruz (Figure 22). A dam failure at either the Mill Creek, Oak Site or Sempervirens dams could affect people and property in northern Santa Cruz County, to the east of the community of Boulder Creek. Soda Lake is a storage facility for fine-grained material or “fines” from the Wilson Quarry in San Benito County. Failure of the Soda Lake levees could potentially release this material and impact one or more nearby residences and encroach upon Highway 129. Although located in neighboring counties, a failure of the Elmer J Chesbro, Uvas, or San Justo dams could potentially impact people and properties along the Pajaro River in Santa Cruz County.

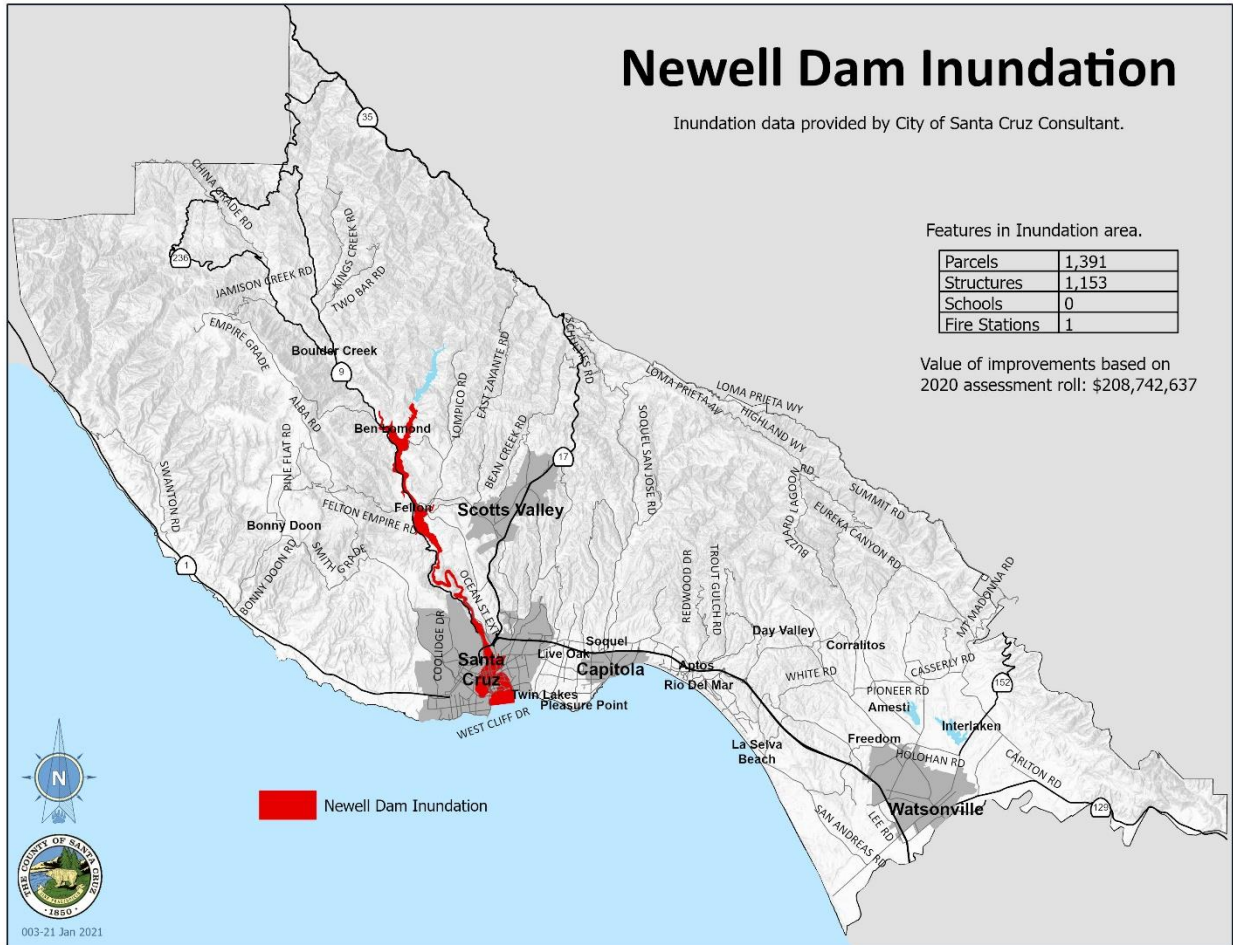


Figure 21 Newell Creek Dam inundation area

Three additional State-regulated dams, located in neighboring counties, also have the potential to affect Santa Cruz County residents and properties should they be compromised or fail. These include Elmer J Chesbro Dam and Uvas Dam in Santa Clara County and the San Justo Dam in San Benito County. The Santa Clara Valley Water District is responsible for Elmer J Chesbro and Uvas reservoirs, while San Justo reservoir is the responsibility of the San Benito County Water District under contract with the Federal Bureau of Reclamation. Programs to ensure ongoing dam safety are implemented by these agencies.

There are also a total of eight mining operations in Santa Cruz County that utilize ponds to hold processing plant wash water and storm water. These ponds are constructed using both artificial and natural barriers depending on whether the pond is created by a levee or dam, or excavation below grade. Because of limited dam height or storage capacity none of these ponds is within the jurisdiction of the State of California Division of Safety of Dams. In some cases, quarry ponds are non-jurisdictional because they are created by excavation, which means there is no artificial barrier that would qualify as a “dam” under state law.

There are an unknown number of other dams in the County associated with agriculture, small water systems and private ponds. These facilities are likely non-jurisdictional. Santa Cruz County Planning

Department files may contain documentation for some of these dams while a number of others are undocumented.

Given their location, failure of a non-jurisdictional dam or levee at a quarry pond could affect a limited amount of people or property in downstream areas. For an unknown number of dams, which are likely non-jurisdictional, the extent of the dam failure hazard is unknown at this time.

10.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

There have been no reported dam failures for the Newell Creek facility. There have been no reported failures at the Mill Creek, Oak Site or Sempervirens dams. Because the Elmer J Chesbro, Uvas and San Justo dams are located in adjacent counties, information is not readily available regarding previous dam failures, if any.

After the Loma Prieta Earthquake, an extensive set of cracks was observed at the crest of the Soda Lake west embankment and adjacent areas on the levee's interior face. The west levee was excavated to bedrock and reconstructed in 1997 with the approval of the California Division of Safety of Dams. Additional stability issues involving the north levee tie-in to the hillside have been addressed by the Division of Safety of Dams in a letter to Graniterock Company dated September 20, 2000.

According to Planning Department records there have been no dam failures at any of the mines in Santa Cruz County. There have been rare events involving uncontrolled releases of water due to natural and human causes, but none of these events involved dam failure.

Previous occurrences of dam failure affecting Santa Cruz County are not known for any other dams.

Currently available information gives no indication that any of the dams would fail or otherwise sustain damage under any circumstance (This does not include human-made disaster). Stability issues involving quarry ponds are addressed with the quarry operator. The Division of Safety of Dams is aware of the issue involving the north levee of Soda Lake.

10.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

The losses to life and property associated with complete dam failure would be high. Given the monitoring protocol at the Newell Creek, the probability of dam failure is very low.

10.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Structures vulnerable to dam failure of the Newell Creek Dam are those structures on parcels located with the mapped dam inundation area.

In the event of a dam or levee failure at a quarry pond, significant environmental impacts and property damage could occur. Environmental impacts would likely be limited to temporary impacts on water quality and erosion. Property damage would likely be limited to impacts on downstream drains, culverts, roads, and bridges.

10.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

As Table 24 illustrates, the majority of structures within the Newell Creek Dam inundation area are residential. For this land use category alone, the loss would be nearly \$209 million.

Land Use	Parcels	Structures	Total Assessed Value 2020
Agricultural	8	4	\$2,021,630
Commercial	67	64	\$18,705,658
Government	24	21	0
Industrial	4	4	\$1,426,561
Institutional	29	17	\$14,026,382
Miscellaneous	59	3	0
Residential	1,195	1,040	\$172,562,406
Utilities	5	0	0
Total	1,391	1,153	\$208,742,637
Population	2,235		
Population based on 2010 census block centroids that fall in Newell Dam inundation areas.			

Table 24 Dam failure potential loss inventory

Valuation of parcels within the hazard area are based on improvement values only as collected by the County of Santa Cruz Assessor's Office. They do not reflect sale or replacement value. If a parcel intersected a hazard, the entire improvement value of that parcel was used.

10.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Santa Cruz County has a number of compact urban communities as well as extensive areas of agricultural land and forested hillsides. A number of rural villages and towns are located throughout the County. As dictated by the 1978 Growth Management Ordinance, most new development has occurred within or adjacent to the urban services line (i.e., the boundary limit for such infrastructure as water and sewage service). As with most communities, increased housing costs have resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available. Other development is mostly infill or reuse development and development of existing rural residential properties.

No changes in development regulations or patterns occurred that would affect the County's overall vulnerability since the previous plan was adopted in 2016. Although the County does not track the number of residential and commercial structures that have been built in the mapped inundation zone for the Newell Creek Dam since the last LHMP was adopted in 2016, the number includes the number of new structures built in the flood hazard area. Since the last LHMP in 2016, there have been twelve new residential structures and one commercial structure built on existing lots of record in flood hazard areas throughout the County. As stated above, growth management policies prevent new development from occurring where hazards are present. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks, structural elevation, floodproofing, and other requirements to mitigate potential impacts from flood hazards. The Environmental Planning Section of the Planning Department, staffed by resource planners, one of which is the County's designated floodplain manager, specialize in reviewing each application for new residential and commercial structures to ensure that new development does not occur in hazard zones and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified flood hazards.

There is limited potential for significant expansion of mining activities in Santa Cruz County. As quarry resources are depleted, the sites are reclaimed. Reclamation will include elimination of unnecessary water impoundments and eliminating any danger to public health and safety from failure of any remaining dams or levees.

10.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The primary mitigation strategy is the continuation of monitoring protocols for structural integrity. The City of Santa Cruz is responsible for monitoring of both the Bay Street Reservoir and the Newell Creek Dam.

The mitigation strategy for other dams in Santa Cruz County would involve documentation and site inspection to determine what, if any, further documentation, or remedial actions may be needed.

The Santa Cruz County Planning Department regulates mining operations in the County. All quarry ponds have been reviewed for geotechnical stability and hydrologic capacity as part of the permitting process for each mine. In addition, mine sites are inspected on a regular basis, which includes verifying the current conditions of ponds and conformance with approved plans. As a result, any necessary remedial measures identified during the permit process, or ongoing inspections, are addressed as part of the quarry inspection process.

An assessment of this mitigation strategy as part of this 5-year plan update indicates the strategy remains relevant for reducing potential losses identified in the risk assessment. The dam failure risk has not changed since the previous plan was adopted. No adjustments are needed to address a change in circumstances. There have been no dam failures during the five-year update period.

10.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Dam Failure Goal

Dam Failure 1 - Avoid or reduce the potential for life loss, injury, property, or economic damage to Santa Cruz County from dam failure.

10.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Dam failure mitigation strategies include the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Develop an event protocol with the State Division of the Safety of Dams. (C-5)
- Update dam inundation maps. (C-9)
- Review Planning Department files and other available information for the purpose of locating any other dams in Santa Cruz County to determine the extent of possible damage. (C-10)

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for dam failure hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to dam failure hazard reduction.

- Development of an event protocol with the State Division of the Safety of Dams has not been implemented during the reporting period. With additional funding and staff resources, and prioritization from both County and State sources, this project may occur during the next reporting period. (C-5)
- The County will continue to reference existing General Plan dam inundation maps. The project to update the maps has been delayed due to limitations of budget and staff resources available to address all priority actions. (C-9)
- This project to review files and other information to determine the extent of other dam failure hazards was not implemented during the reporting period. With additional funding and staff resources, and prioritization, this project may occur during the next reporting period. (C-10)

By referencing existing dam inundation maps the County is able to identify areas of risk from dam failure. Further explanation of how the previous mitigation plan has been implemented over the last five years is included in Appendix L. The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. The projects described in Mitigation Actions C-5, C-9, and C-10 are still relevant and will be implemented over the next five years depending on County and State budget and staff resources.

Chapter 11 Landslide

11.1 Risk Assessment

11.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

Landsliding is a general term that describes a wide variety of mass downslope movements of soil and rock in response to gravity. Landsliding occurs as falls, topples, slides, spreads, flows, and a combination of these categories, and may change from one form of failure to another during their movement.

Factors causing landsliding include the rock strength and orientation of elements on the slope, erosion, weathering, high rainfall, steepness of slopes, recent fire activity, and human activities such as the removal of vegetation and inappropriate grading.

Landslides occur throughout the world, but Santa Cruz County's unique geologic conditions make large portions of the County particularly susceptible to many forms of landsliding. Factors that contribute to landsliding in Santa Cruz County include:

- storms
- earthquakes
- fires
- freezing and thawing
- erosion
- wildfire burn scars along steep terrain
- vegetation removal, grading and other human activities.

Landslide problems can also be caused by land or stormwater drainage mismanagement, particularly in mountain, canyon, and coastal regions. In areas burned by forest and brush fires, a lower threshold of precipitation will initiate landslides or debris flows. The deterioration of old timber harvest roads may also result in concentration of drainage that induces landsliding. The County of Santa Cruz's General Plan, along with Chapter 16.10 of the County Code set standards to reduce damage from landslides through avoidance of hazardous areas and/or mitigation. These County standards, along with the California Building Code and good engineering practices minimize many landslide problems, but do not eliminate them.

Landsliding occurs throughout Santa Cruz County, but is centered primarily along the steeper slopes in the hills and mountains, along stream corridors, and along coastal bluffs and inlets. Large areas of the County are subject to several forms of landsliding as indicated in Figure 23, but isolated sliding occurs throughout the County. The types of landsliding that occur in Santa Cruz can be summarized as follows:

- Coastal Bluffs: Shallow landslides, debris flows and topples
- Rivers and streams: Shallow landslides, rotational landslides, and lateral spreading
- Hillslopes: Large deep composite landslides, and debris flows.

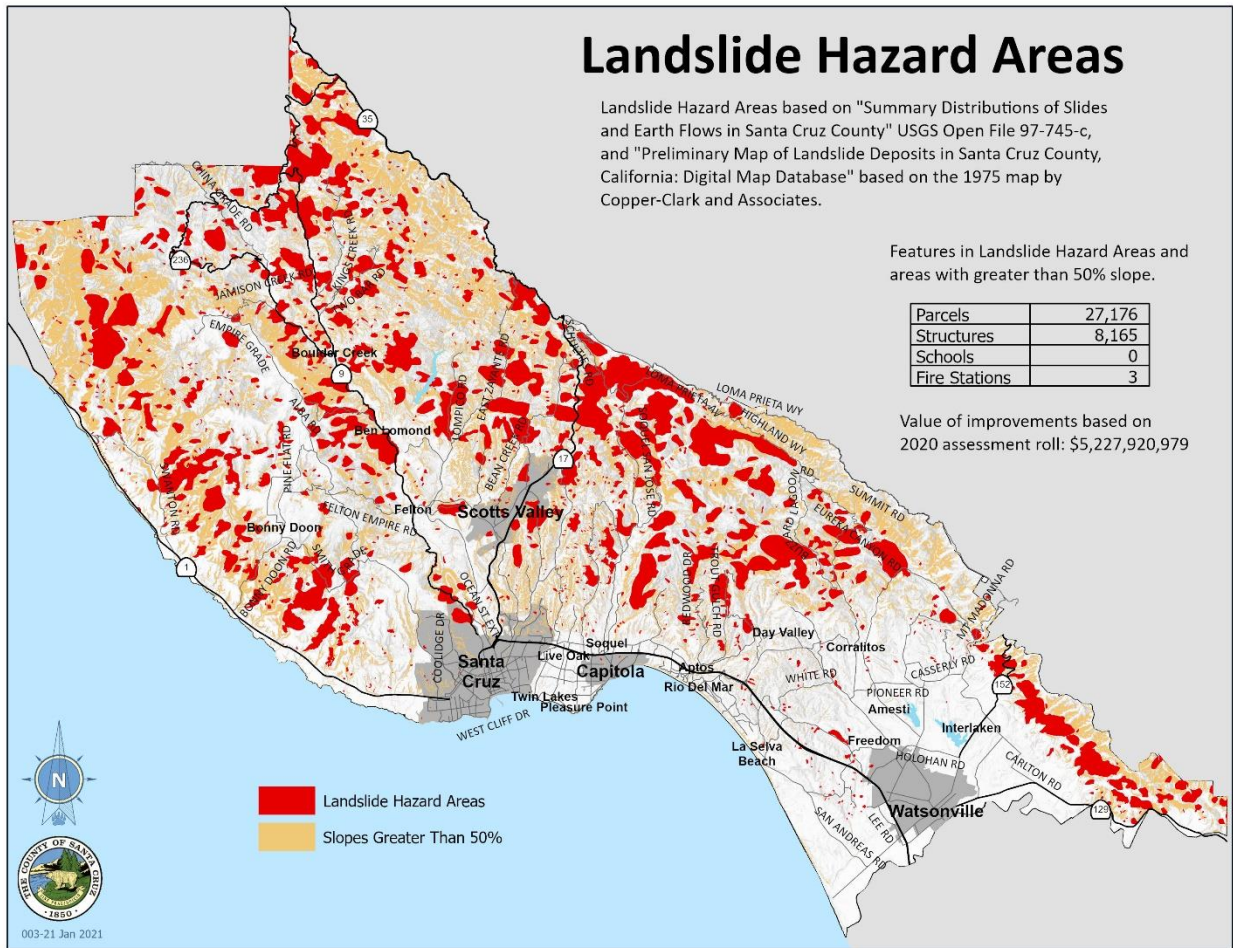


Figure 22 Landslide hazard areas

Landslides are a common occurrence in the Santa Cruz Mountains. Our intense winter storms, high rainfall amounts, especially during El Nino weather patterns, and steep terrain are conducive to landsliding. Earthquake activity contributes to this landsliding, as illustrated by the 1906 earthquake, which set off dozens of large landslides in the Santa Cruz Mountains, some of which claimed human lives. The 1989 Loma Prieta earthquake produced a similar pattern of landsliding. The potential for loss of life and property is much greater today due to the increase in population residing in areas of possible instability.

Most recent landslides in the Santa Cruz Mountains have been caused by a combination of human activity and natural factors. Human activities that act to further destabilize slopes, are old timber harvest roads and skid trails, conversion of land from forest to residential and agricultural uses, road building, grading and other housing construction and any activity that alters normal drainage patterns or concentrates runoff. The likelihood that any of these factors will contribute to landsliding is dependent upon the existing conditions and also on the care with which activities are conducted in these locations.

County Code Section 16.10 in combination with the California Building Code require careful consideration of landslide factors by both engineering geologists, soils engineers, and civil engineers.

However, even with proper care, there remains a higher-than-normal potential for damage from landsliding in many areas of the County.

11.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Several periods of landsliding have occurred in Santa Cruz County in recent history. Some of the better-documented landslides are:

Mount Hermon Landslide: The Mountain Hermon landslide moved in the late 1950s after the El Nino year of 1957–1958. This landsliding occurred in an area of suspected older landsliding and the new movement extended from the Kaiser Quarry to the bottom of Bean Creek blocking Conference Drive and is one of the reasons for construction of the Mount Hermon bypass. At the time of the landsliding there was some concern that the quarry (and a small earthquake) may have contributed to the re-initiation of the landslide.

Rainstorms of January 1982: Severe storms caused multiple landslides throughout the Bay Area and especially in the Santa Cruz Mountains. One very large composite landslide along Love Creek, west of Loch Lomond Reservoir, killed ten people. This landslide was and continues to be an indicator of the potential severity of landslide activity and the need for observation and/or mitigation. Other landslides, including debris flows, destroyed 135 homes, damaged 300 homes, and killed 5 other people. In addition to damage to homes, widespread landslide damage occurred to roadways, driveways, and stream channels.

Loma Prieta Earthquake October 17, 1989: Landslides occurred throughout Santa Cruz County during and after the Loma Prieta earthquake. Most of these larger landslides moved only during the actual shaking, but others continue to the present. Smaller landslides occurred along coastal bluffs and along ridge tops.

El Nino Winter Storms of 1986, 1998, and 2005: These storms caused multiple landslides, particularly debris flows, throughout the Santa Cruz Mountains. During the 1998 winter, many homes were affected by landsliding and several roadways were damaged including Highway 9, Branciforte Road, and Amesti Road. Winter rains also induced landsliding within the quarries throughout the County.

Landsliding will continue to affect the County, especially during El Nino weather patterns. Most of the critical structures within Santa Cruz County are located away from landslides, but many homes and roadways are located in and around landslides. El Nino weather patterns will continue approximately every seven years, and the San Andreas Fault, as well as other faults, will generate earthquakes, which will contribute to the formation of landslides.

11.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Past experience has shown that many areas of the County are susceptible to the effects of landslides. Most of the damage caused by landslides will be to privately owned structures although a fair number of County maintained roads are also at risk.

Santa Cruz County terrain, weather, and seismicity increase the likelihood of landsliding. Homes built before 1989 are particularly vulnerable to landslides as some of these were constructed without the benefit of engineering or engineering geologic investigations. Most of the roadways were constructed many years ago with little consideration to slope stability and will likely be affected by landsliding in the future. Because utilities follow these roads, damage to roads will often disrupt sewers, water systems, gas and electricity, and cable and telephone utilities.

Areas that have experienced landsliding include:

- The steep hillslopes throughout the Santa Cruz County, especially near the Zayante and San Andreas fault zones, and within the San Lorenzo Valley and Eureka Canyon.
- The river channels along major streams, and across the broader alluvial plain of the Pajaro River and Corralitos Creek.
- Along coastal bluffs, especially above Beach and Las Olas drives, and above Sunset Beach in the Seacliff Beach area.

The 2020 CZU Lightning Complex Fire, created an increased potential for debris flows in the burned watersheds. While storm driven shallow landslides and debris flows are common within the Santa Cruz Mountains, the loss of soil cover, vegetation, and canopy, as well as soil heating caused by the CZU Fire increased the landslide hazard. The increased hazard is expected to persist for the next several winter seasons because of the wildfire. The debris flow hazard exists on the steep slopes within the drainage areas burned by the wildfire and extends out onto the alluvial fans at the mouth of the drainages, which are typically occupied by residential development.⁵

11.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Parcels and structures potentially subject to landslide hazards were identified by location in a mapped landslide hazard area or on greater than 50% slopes. A wide range of land uses are located in a landslide hazard area as listed in Table 25, but 90% of the structures are residential. The WERT report on the CZU

⁵ Watershed Emergency Response Team (WERT) Evaluation, CZU Lightning Complex, CA-CZU-005205. October 1, 2020.

Fire identified over 100 “Values-at-Risk” (VARs) related to human life safety and property, including residences and infrastructure, from increased debris hazards. The report identified significant risk to water supply infrastructure for the San Lorenzo Valley Water District and the City of Santa Cruz.

11.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Figure 23 includes information on the number and type of structures located within mapped landslide hazard areas and on slopes greater than 50 percent and the total value of the structures. Table 24 is a summary of the number, type, and value of all structures located in landslide hazard areas and on slopes greater than 50 percent. The methodology used to prepare the estimate used the County’s GIS application. The landslide hazard areas and areas with slopes greater than 50 percent is overlaid on the parcel layer to identify the parcels that fall within the landslide hazard layer and their assessed value. This estimate would include many, if not all of the VARs identified in the WERT report. Over 27,000 parcels have been identified as under threat from landslide. However, many of these parcels are undeveloped or unbuildable. Over 8,000 structures have been identified on these parcels, which represent a value of over \$5 billion.

Land Use	Parcels	Structures	Total Assessed Value 2020
Agricultural	973	341	\$161,623,207
Commercial	249	91	\$138,413,982
Government	892	59	\$0
Industrial	64	36	\$53,961,882
Institutional	276	170	\$225,750,431
Miscellaneous	738	146	\$82,767,371
Residential	23,763	7,309	\$4,563,981,817
Utilities	221	13	\$1,422,289
Total	27,176	8,165	\$5,227,920,979
Population	18,806		
Population based on 2010 census. Blocks that had centers in the Landslide hazard area or slopes greater than 50% were included.			

Table 25 Landslide potential loss inventory

11.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Santa Cruz County has a number of compact urban communities as well as extensive areas of agricultural land and forested hillsides. A number of rural villages and towns are located throughout the County. As dictated by the 1978 Growth Management Ordinance, most new development has occurred within or adjacent to the urban services line (i.e., the boundary point for such infrastructure as water and sewage service). As with most communities, increased housing costs have resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available. Other development is mostly infill or reuse development, and development of existing rural residential properties.

Growth management policies prevent development from occurring where hazards are present and, in most cases, require substantial setbacks from these hazards.

No changes in these development regulation or patterns occurred that would affect the County's overall vulnerability since the previous plan was adopted in 2016. While the County does not track the number of residential and commercial structures that have been built in landslide hazard zones since the last LHMP was adopted in 2016, it is a subset of the overall number of new structures built in the unincorporated portion of the County. According to annual Growth Management Reports, there have been 909 new residential structures built in the County since 2010 (Table 12). As noted above, however, most new development of residential structures and virtually all new development of commercial structures occurs within the urban services line and outside of landslide hazards zones.

As stated above, growth management policies prevent new development from occurring where hazards are present. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks and other requirements to mitigate potential impacts from landslide hazards. The Environmental Planning Section of the Planning Department, staffed by Resource Planners, specialize in reviewing each application for new residential and commercial structures to ensure that new development does not occur in hazard zones and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified potential landslide hazards.

11.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

An assessment of this mitigation strategy as part of this 5-year plan update indicates the strategy is effective for reducing potential losses identified in the risk assessment. The Planning Department continues to review development applications for emergency use and critical structures, and all other

structures, for compliance with the California building code and the Geologic Hazards Ordinance regarding landslide hazards.

As a result of the CZU Fire, the landslide risk has increased since the previous plan was adopted. Based on the increased hazard, the County implemented the recommendations of the WERT report during the winter of 2020 and 2021, which was a historically dry winter overall and only minor debris flow activity occurred during individual storm events. The County’s preparations, however, included utilizing early warning systems (CodeRED), monitoring of rainfall events, public education, and increased maintenance and monitoring of storm drainage systems. These heightened preparations will be implemented in future winters as long as the increased debris flow hazard persists in the burn area.

11.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The County’s over-all strategy to mitigate landslide hazards is to:

Landslide 1 - Require the involvement of qualified experts in identifying specific landslide hazards.

Landslide 2 - Maintain records of the types and locations of these hazards.

Landslide 3 - Require that new development avoid landslide areas whenever possible.

Landslide 4 - Ensure that building plans incorporate all reasonable mitigation measures for structures that must be sited in or near hazard areas.

An assessment of this mitigation strategy as part of this 5-year plan update indicates the strategy is effective for reducing potential losses identified in the risk assessment. The Planning Department continues to review development applications for emergency use and critical structures, and all other structures, for compliance with the California building code and the Geologic Hazards Ordinance regarding landslide hazards. The landslide risk has changed since the previous plan was adopted as a result of the CZU Lightning Complex Fire. Adjustments were implemented to address a change in circumstances to address the elevated debris flow hazard after the fire disaster. There have been no landslide related disasters during the five-year update period.

11.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Landslide hazard mitigation strategies include the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Continue to require that the County Geologist review development in areas of suspected landsliding and require engineering geology reports when landsliding is identified or suspected. (A-15)
- Continue to require that an engineering geologist and/or geotechnical engineer investigate the site of any proposed construction near landsliding and require mitigation of landslide hazards before issuing any building or grading permits. (A-16)
- Continue to require that an engineering geologist and/or a geotechnical engineer investigate any landslide damage to homes or roadways before repair of the landslide and reuse of the homes or roadways. (A-17)
- Enhance our early warning, and rainfall monitoring capacity in the high debris flow risk areas of the County following the CZU fires of 2020. (A-22 New)
- Identify, monitor, and mitigate where feasible the hazards and risks associated with post fire debris flows. (A-23 New)

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for landslide hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to landslide hazard reduction.

- Staff continues to review all development for slope instability including landsliding. (A-15)
- Sites near landsliding are investigated by engineering geologist and/or geotechnical engineers, and mitigations are required (where necessary) to prevent damage to development. (A-16)
- Engineering geologic and geotechnical engineering investigations and reports are required for all homes and habitable structures damaged by landsliding. (A-17)
- Implementation of rainfall monitoring and early warning systems after the CZU Fire during the winter of 2020 and 2021 along with an extensive public education campaign, positioned the County to respond to an eminent debris flow hazard and protect public safety through evacuation warnings and orders. A relatively dry winter overall resulted in no evacuations; however, these capabilities will be maintained and enhanced in preparation for future winter seasons. (New)
- An extensive effort to identify and map debris flow hazard areas after the fire disaster allowed the County to identify potential hazard zones and infrastructure at risk. This allowed the County to perform pre-disaster mitigation of infrastructure such as culvert cleanout and pre-positioning of equipment to respond to a debris flow event. These efforts will continue in future winter seasons. (New)

By using these planning mechanisms to avoid, minimize, and mitigate landslide hazards, the County has demonstrated progress in reducing the risk from landslide hazards. Further explanation of how the previous mitigation plan has been implemented over the last five years is included in Appendix L. The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. The projects described in Mitigation Actions A-15, C-16, and C-17 are still relevant and will continue to be implemented over the next five years along with the new mitigation actions described above related to debris flow hazard.

Chapter 12 Expansive Soils

12.1 Risk Assessment

12.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

Expansive soils are generally clays or sedimentary rocks derived from clays, which experience volume changes as a result of moisture variation.

The hazard that expansive soils create can be significant. Many of the expansive soils do not create large areas of destruction; however, they can disrupt supply lines (i.e. roads, power lines, railways, and bridges) and damage structures. The effects on structures can be dramatic if expansive soils supporting structures are allowed to become too wet or too dry. Lightly loaded one-story or two-story buildings, warehouses, residences, and pavements are especially vulnerable to damage because these structures are less able to suppress the differential heave of the swelling foundation soil than heavy, multistory structures. Patios, driveways, and walkways may also crack and heave as the underlying expansive soils become wet and swell.

Expansive soils do not change size quickly; observing damage in real-time can sometimes be difficult. Although the damage might not occur in a matter of minutes, it still has the potential to severely damage structures and roads over a matter of time if not sufficiently mitigated.

Many areas of Santa Cruz County are underlain by expansive soils. However, expansive soil does not cause problems unless poorly designed structures are built on it. A house built on expansive soil will probably move if the foundation was not designed to take this soil type into account. Movement occurs because the soils expand so forcefully, the foundation actually moves. Different parts of the house can move at different rates and distances, thus cracking the foundation. Significant cracks often appear at the corners of windows and doors, in walls, garage slabs, walkways, and driveways. Doors and windows may become jammed. The integrity, design, value and use of a home could be affected. During extreme drought conditions, even homes that are not normally affected by expansive soil problems may experience slight cracking.

The general areas of expansive soils within Santa Cruz County are known (Figure 24). The National Resource Conservation Service's (NRCS) Soil Survey of Santa Cruz County mapped various soils types throughout the County. In addition, soils reports performed over the years throughout the County for building permits have corroborated the locations of expansive soils. The primary soil types mapped by NRCS as expansive are Watsonville Loam, Clear Lake Clay, Diablo Clay, Fagan Loam, Los Osos Loam, Mocho Silt Loam, Pinto Loam, Felton Sandy Loam, Cropley Silty Clay, Danville Loam and Lompico Varient Loam. The general locations of expansive soils are in the coastal terraces in Live Oak, Seacliff, and Rio Del Mar and in South County near Watsonville. However, smaller pockets of expansive soils may exist throughout the County.

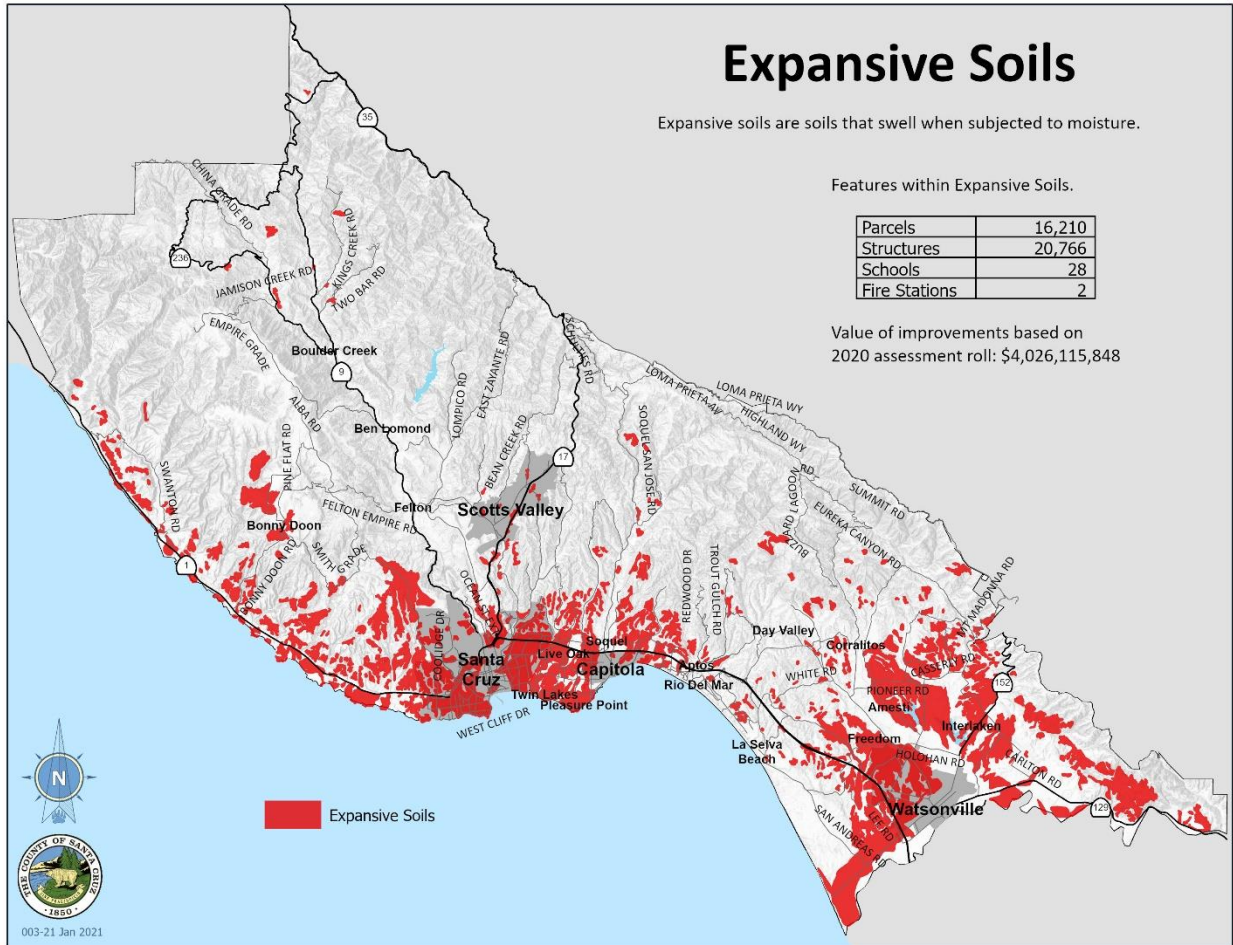


Figure 23 Map of expansive soils

Each year in the United States, expansive soils cause billions of dollars in damage to buildings, roads, pipelines, and other structures. This is more damage than that caused by floods, hurricanes, tornadoes, and earthquakes combined (FEMA 1997).

It is estimated that Santa Cruz County has thousands of homes built on expansive soils. Typically, the structures that experience problems with expansive soils are older homes, but newer homes (built within the last 15 years) may also experience problems due to expansive soils. The types of problems associated with expansive soils are generally not catastrophic, but the effects result in cracked foundations, cracked walls, cracked concrete slabs, cracks around windows and doors, as well as jammed windows and doors. Cracks to foundations may lead to additional problems if other catastrophic events were to occur (such as earthquakes).

12.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Each year the Building Department reviews many permit applications to fix problems associated with expansive soils. The number of occurrences is difficult to measure, since property owners may consider the effects of expansive soils to be minor and therefore choose not to do anything about it.

Structures in Santa Cruz County will continue to experience problems with expansive soils on a yearly basis as moisture conditions in soils fluctuate.

Building Codes (2019 California Building Code (CBC) Section 1802 provide local jurisdictions with tools to request soils reports for building permits in areas where expansive soils are suspected and have detailed procedures to determine when soils are considered expansive. In addition, Section 1805.8 of the 2019 CBC provides requirements for design for expansive soils. Therefore, over time we expect to see fewer problems with structures due to expansive soils.

12.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

It is estimated that Santa Cruz County has over 20,000 homes built on expansive soils. Typically, the structures that experience problems with expansive soils are older homes, but newer homes (built within the last 15 years) may also experience problems due to expansive soils. The types of problems associated with expansive soils are generally not catastrophic, but the effects result in cracked foundations, cracked walls, cracked concrete slabs, cracks around windows and doors, as well as jammed windows and doors. Cracks to foundations may lead to additional problems if other catastrophic events were to occur (such as earthquakes).

12.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Due to its unique geologic makeup, expansive soils are located mainly in the coastal areas and in agricultural areas in the southern portion of the County. Over 16,000 parcels are estimated to be located on expansive soils with nearly 21,000 structures built on these parcels. These areas represent some of the most expensive real estate in the county and the estimated potential total loss in value comes to over \$4 billion (Table 24). Depending on the extent of damage and cost of repairs, however, the actual potential losses is probably significantly lower.

12.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Over 14,000 residential parcels have been identified as threatened by expansive soils, and those parcels contain over 18,500 structures with a potential total loss value of over \$3.3 billion.

Land Use	Parcels	Structures	Total Assessed Value 2020
Agricultural	391	457	\$70,418,713
Commercial	521	633	\$294,988,893
Government	271	162	\$0
Industrial	109	124	\$84,523,561
Institutional	135	488	\$184,528,509
Miscellaneous	387	285	\$30,126,533
Residential	14,326	18,591	\$3,361,132,321
Utilities	70	26	\$397,318
Total	16,210	20,766	\$4,026,115,848
Population	35,234		
Population is based on the 2010 Census. Unincorporated Block centroids were selected by the hazard area.			

Table 26 Expansive soil potential loss inventory

12.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Santa Cruz County has a number of compact urban communities as well as extensive areas of agricultural land and forested hillsides. A number of rural villages and towns are located throughout the County. As dictated by the 1978 Growth Management Ordinance, most new development has occurred within or adjacent to the urban services line (i.e., the boundary point for such infrastructure as water and sewage service). As with most communities, increased housing costs have resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available. Other development is mostly infill or reuse development, and development of existing rural residential properties.

Since expansive soils exist both within and outside of the urban services line, mitigation of expansive soils must be looked at on a countywide basis with a focus on the areas of known expansive soils.

No changes in these development regulation or patterns occurred that would affect the County's overall vulnerability since the previous plan was adopted in 2016. While the County does not track the number of residential and commercial structures that have been built in areas of expansive soil since the last LHMP was adopted in 2010, it is a subset of the overall number of new structures built in the unincorporated portion of the County. According to annual Growth Management Reports, there have been 909 new residential structures built in the County since 2010 (Table 12).

As stated above, growth management policies prevent new development from occurring where hazards are present. Development on existing lots of record is required to avoid hazards and incorporate appropriate foundation designs and other requirements to mitigate potential impacts from expansive soils. The Environmental Planning Section of the Planning Department, staffed by Resource Planners, specialize in reviewing each application for new residential and commercial structures to ensure that new development does not occur in hazard zones and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified expansive soil hazards.

12.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The mitigation strategy includes:

- Continuation of review of building permit applications to require identification;
- Mitigation of expansive soils as required per the 2007 California Building Code; and
- Pursue an effective public information program and continuing collaborative efforts with the cities, agencies, and community organizations to facilitate collaborative efforts in providing expansive soil mapping, information, and education.

An assessment of this mitigation strategy as part of this 5-year plan update indicates the strategy is effective and remains relevant for reducing potential losses identified in the risk assessment. The expansive soil risk has not changed since the previous plan was adopted. No adjustments are needed to address a change in circumstances. There have been no expansive soil related disasters during the five-year update period.

12.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Santa Cruz County has developed several expansive soils mitigation goals to decrease the problems associated with expansive soils.

Expansive Soils 1 - Education and Awareness: Train building plan check staff on expansive soils. Provide public information and education/awareness to all residents of the County concerning expansive soil areas and mitigation efforts.

Expansive Soils 2 - Preventative and Implementation: Develop and implement activities to protect properties and infrastructure.

Expansive Soils 3 - Funding and Partnerships: Seek partnerships in funding and resources for future mitigation efforts.

12.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

The County participates in ongoing mitigation actions to avoid or reduce the effects of expansive soils. Flood hazard mitigation strategies include the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Continue to require soils reports as part of the building permit process. (C-6)
- Develop design criteria for expansive soils properties. (C-11)

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for expansive soil hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to expansive soil hazard reduction.

- Planning staff continues to require soils reports as part of the building permit process. (C-6)
- The permit review process uses design criteria based on the State building code and local amendments. (C-11)

By using these planning mechanisms to avoid, minimize, and mitigate the hazards from expansive soils, the County has demonstrated progress in reducing the risk from landslide hazards. Further explanation of how the previous mitigation plan has been implemented over the last five years is included in Appendix L. The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. The projects described in Mitigation Actions C-6 and C-11 are still relevant and will continue to be implemented over the next five years.

Chapter 13 Climate Change

13.1 Risk Assessment

13.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

Because climate change will continue to occur regardless of efforts to reduce GHG emissions, it is necessary to prepare for a range of possible effects. The range of possible hazards as a result of climate change includes:

- Sea Level Rise
- Flooding
- Extreme Storm Events
- Coastal Storm Damage, Bluff Erosion, Beach Loss and Landslides
- Changes in Temperatures
- Increase in Wildland Fires
- Impacts to Water Supply
- Impacts to Public Health

It is important to note that many of the hazards we may experience will not be new situations created by previously unknown processes, but rather a worsening of hazards that the community has experienced in the past. For example, severe winter storms are experienced periodically in Santa Cruz County. The damage from flooding and coastal waves associated with severe winter storms may worsen as the climate changes due to higher sea levels exacerbating wave damage, coastal erosion, and coastal flooding.

Climate change hazards are described in detail in the County of Santa Cruz Climate Action Strategy, February 2013, and also briefly summarized below.

Sea Level Rise

Impacts from rising sea level will accelerate coastal erosion, increase the extent of coastal inundation, increase localized elevated groundwater levels, and magnify the impacts of extreme storm and wave events including El Niño events. A 2012 study prepared by the National Academy of Sciences projects that sea level will rise 1.6–11.8 inches (4–30 cm) by 2030 relative to 2000, 4.7–24.0 inches (12–61 cm) by 2050, and 16.5–65.7 inches (42–167 cm) by 2100 (National Research Council, 2012⁶).

The 2018 California Ocean Protection Council Sea Level Rise Guidance is considered the best available science and provides sea level rise projections that have been refined for 12 tide gauges throughout California. The report provides projections for planning purposes based on probability of occurrence and the level of risk aversion. Low risk aversion means a high risk of occurrence, and extreme risk aversion

⁶ National Research Council, 2012. Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future. Prepared by the National Research Council, of the National Academies. Released in 2012.

means an extremely low risk of occurrence. For the Monterey tide gauge there is a high risk of sea level rise of approximately one foot by the year 2050 (2000-2050), a moderate risk of two feet, and an extremely low risk of up to 2.7 feet of sea level rise over the same time period. By the year 2100 the report projects a low risk of between 2.3 and 3.3 feet of sea level rise, a moderate risk of between 5.5 and 6.9 feet, and an extremely low risk of up to 10 feet of sea level rise.

Sea level rise has the potential to adversely impact the following types of public and private infrastructure.

City of Santa Cruz Neary Lagoon Wastewater Treatment Plant: Groundwater level at the Neary Lagoon Wastewater Treatment Facility is very high. The anticipated rise in groundwater due to sea level rise may adversely impact the facility by impacting storage tanks and associated infrastructure (City of Santa Cruz, 2018). A large underground pump gallery is also susceptible to groundwater impacts through infiltration of groundwater through electrical conduits and cracking walls (City of Santa Cruz 2018)⁷.

Santa Cruz County Sanitation District Sewer Infrastructure: Numerous pump stations and associated sanitary sewer infrastructure operated by the Santa Cruz County Sanitation District are situated in locations vulnerable to winter storm damage. The primary high-pressure sewer line that transports 3-8 million gallons of raw sewage a day to the Neary Lagoon Wastewater Treatment facility crosses the face of Schwan Lake and is susceptible to sea level rise. It is expected that several of these facilities may be increasingly impacted as sea level rises and storms increase.

Coastal Transportation Infrastructure: Roads at the top edge of coastal bluffs are vulnerable to damage because the rate of retreat of unprotected coastal bluffs is expected to increase in response to increased exposure to storm waves and intense rain events. Roads at low elevations at the back beach and the subsurface infrastructure within the roads are also particularly vulnerable to coastal erosion.

Oceanfront Residential and Commercial Properties: The projected rise in sea level would put most Santa Cruz County oceanfront properties at greater risk from either inundation and/or coastal flooding, or from increased bluff erosion. Unincorporated Santa Cruz County has approximately 29 miles of coastline. Approximately 3 miles of the most intensively developed coastline with primarily residential uses is located in the mid-county community of Live Oak. An additional 3 miles of vulnerable beaches with extensive coastal residential and commercial development occurs from Seacliff to Rio Del Mar.

Flooding

Flooding and coastal storms present similar risks and are usually related types of hazards in Santa Cruz County. Coastal storms can cause increases in tidal elevations (called storm surge), wind speed, coastal erosion, and debris flows, as well as flooding (See Chapter 6 Floods and Coastal Storms).

As a result of climate change, seasonal precipitation patterns, including timing, intensity, and form of precipitation, are projected to shift. A recent study conducted by the U.S. Geological Survey⁸ projects that there will be a shift in peak precipitation from January to February, with less precipitation occurring in the fall (November-December) and spring (March-April) by 2100. The U.S. Geological Survey (USGS)

⁷ City of Santa Cruz, 2018. Climate Adaptation Plan Update 2018-2023.

⁸ Flint, L.E., and Flint, A.L., 2012. Simulation of Climate Change in San Francisco Bay Basins, California: Case Studies in the Russian River Valley and Santa Cruz Mountains: U.S. Geological Survey Scientific Investigations Report 2012-5132, 55 p.

also concluded that while the amount of annual precipitation is not expected to substantially change as a result of climate change, precipitation will be concentrated in mid-winter. As a result, flooding is a growing threat that deserves careful attention as one of the more hazardous impacts of climate change.

Extreme Storm Events

Some models predict that extreme storm events will become more common, and that heightened sea level will persist longer as sea level rises, increasing the potential for damage.

Coastal Storm Damage, Bluff Erosion, Beach Loss and Landslides

An increase in future coastal storm frequency and/or intensity will increase cliff retreat rates as well as cause potential damage to oceanfront property or public infrastructure. Practically speaking, the entire coast of California has been retreating or eroding for the past 18,000 years. There is an important distinction, however, between the erosion or retreat of coastal cliffs or bluffs, which is an irreversible process, and the seasonal or longer-term erosion of the beaches, which can be recoverable. Thus, even as the coastline continues to retreat landward, beaches will be present as long as the supply of sand to the shoreline is maintained. However, hard armoring placed along the shoreline prevents landward retreat of the coastline and increases water depth as sea level rises, causing beaches to disappear (See Chapter 9 Coastal Erosion).

An anticipated increase in precipitation during midwinter months (December and January) may lead to increased impact to roadways and residences from flooding and landslides.

Changing Temperatures

Increased greenhouse gases in the atmosphere raises temperatures and alters seasonal temperature patterns. Effects can include changes in average temperature, the timing of seasons, and the degree of cooling that occurs in the evening. In addition to new seasonal temperature patterns, extreme events such as heat waves are projected to occur more frequently and/or last for longer periods of time.

Wildfire

Climate change is expected to increase an already high risk of wildfires in terms of fire frequency, size, and severity beyond the historic range of natural wildfire variability due to increasing length of the fire season, drier fuels, and decreasing forest health. These changes are being driven by alterations in temperature and precipitation regimes to a warmer and drier condition. There has been no more devastating example of the increased risk than the 2020 CZU Lightning Complex Fire (See Chapter 5 Wildfires).

Impacts to Water Supply

The effects of climate change on water supplies will have impacts on agriculture, recreation and tourism, and the economy overall as well as on natural ecosystems. Water supply in Santa Cruz County is provided by a number of independent water agencies. Almost all of the jurisdictions are experiencing some kind of water supply shortfall from overdraft of the groundwater basin, inadequate supply during a drought, or inadequate facilities to meet current demands (See Chapter 7 Drought).

Impacts to Public Health

In Santa Cruz County the predicted health effects of climate change include increased incidence of emerging diseases and vector-borne disease if ecological changes lead to migration of insect and animal disease vectors, and physical and mental health impacts associated with severe weather events, such as flooding, when they cause population dislocation and infrastructure loss. Though extreme heat may be

moderated in our coastal location, inland areas of the County can experience much higher temperatures. An increase in temperature can exacerbate existing respiratory disease, cardiovascular disease, and stroke. Wildfires are also expected to increase in frequency and severity as drought takes hold, which may cause respiratory distress, exacerbation of existing disease, physical and mental dislocation, as well as some number of direct fatalities.

13.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Climate change is currently affecting California and Santa Cruz County, where sea level has risen by as much as seven inches along the coast over the last century, increasing pressure on the state's and county's infrastructure, water supplies, and natural resources. The state and county have seen increased average temperatures, more extreme hot days, fewer cold nights, shifts in the water cycle with less winter precipitation falling as snow, and snowmelt running off sooner in the year (California Natural Resources Agency, 2018⁹). These are only some of the changes that have occurred.

There is consensus among the world's leading climate change scientists that human-generated emissions of heat-trapping greenhouse gases (GHGs) are the primary cause of the warming trend. Projections indicate that atmospheric concentrations of GHGs will continue to increase throughout this century. Data describing atmospheric GHG concentrations over the past 800,000 years demonstrates that concentrations of carbon dioxide (CO₂), the primary anthropogenic GHG, have increased substantially since pre-industrial times, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century. (IPCC, 2014¹⁰).

The Intergovernmental Panel on Climate Change (IPCC) described potential global emission scenarios for the coming century. The scenarios vary from a best-case, characterized by low population growth, clean technologies, and low GHG emissions; to a worst-case, wherein high population and fossil-fuel dependence result in extreme levels of GHG emissions. Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive, and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks. Many aspects of climate change and associated impacts will continue for centuries, even if anthropogenic emissions of greenhouse gases are stopped. The risks of abrupt or irreversible changes increase as the magnitude of the warming increases (IPCC 2014).

⁹ California Natural Resources Agency, 2018. Safeguarding California Plan: 2018 Update, California's Climate Adaptation Strategy.

¹⁰ IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri, and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Our natural, economic, and cultural systems are closely tied to the climate. Significant changes in the climate will impact the way people live: the food we grow, our health and safety, the availability of water, our economy, wildlife and vegetation, and many other aspects of our lives. Preparation of a Climate Action Strategy (CAS) is an opportunity for the community to review the local activities that contribute to GHG emissions, to consider changes we can make to decrease our local contribution to climate change, and to plan the community response to the local impacts that will occur as climate change progresses.

13.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Adaptation to climate change is fundamentally a risk management strategy, or an insurance policy against an uncertain future. Risk is a combination of the likelihood of any of the previously described climate related events occurring in the future, and the magnitude of the potential consequences. Some processes or events, several years of drought, for example, have occurred often in the past and have a very high probability of occurring in the future, probably more frequently. The consequences of a prolonged drought can be very significant. The product of the probability and consequences of drought and the associated water shortages, therefore, produce a very high-risk rating, over both the short and long-term.

Processes such as floods and droughts reflect climate variations or fluctuations. The County has adequate records for these types of events, simply because the County has experienced these types of events many times throughout its history. As a result, there is a high degree of certainty that both floods and droughts will occur in the future. The uncertainty lies in how much more frequent and how much more severe these events will be in the future as a result of changing climate.

There are other events related to climate change, those related to sea level rise for example (inundation of low-lying coastal areas, a rise in the water table beneath Rio Del Mar Esplanade/Flats), where the future unknowns are higher, simply because of the lack of certainty about future greenhouse gas emissions and how they will influence climate and sea level rise. Despite the uncertainties, it is possible to make some judgment as to the relative level of risk that each of these poses to the County based on some range of future projections.

Over the next 30 years (between 2020 and 2050), it is expected that the highest risks to Santa Cruz County will come from:

- Wildfire. Climate change is expected to result in additional risk of increased fire frequency, size, and severity beyond the historic range of natural wildfire variability due to increasing length of the fire season, drier fuels, and decreasing forest health. These changes are being driven by alterations in temperature and precipitation regimes (generally, warmer, and drier). As a result, the consequence would be very high while the probability of such an event occurring is also very high.

- Water Shortages. Potential water shortages due to the combination of increasing temperatures, changes in precipitation patterns increasing climatic water deficit, increased saltwater intrusion, decreased groundwater recharge, and higher demand. This has a very high probability of occurrence and also significant (high) consequences.
- Coastal Storms. Potential increase in future coastal storm frequency and/or intensity will increase cliff retreat rates as well as cause potential damage to oceanfront property or public infrastructure. According to some studies, the coastlines of northern California, Oregon and Washington have experienced increasingly intense winter storms and greater wave heights over the past few decades, both of which may be leading to more severe winter erosion (NRC, 2012). The consequence of coastal bluff erosion is high due to the extent of high-value public and private improvements (infrastructure, structures, etc.).
- Flooding. Flooding in Santa Cruz County has occurred in each of the primary drainages and will continue to occur in the future given certain sets of meteorological conditions. Previous occurrences are well documented for all primary drainages with the exception of Aptos Creek, which is not gauged. In addition, low-lying areas such as Rio Del Mar Esplanade/Flats will experience more frequent flooding and inundation from sea level rise and increased wave heights. As a result, the consequence would be high in terms of structural and economic loss, with the probability of such an event occurring also being high.
- Groundwater Overdraft. Groundwater extraction rates from the Pajaro River Valley groundwater basin have exceeded sustainable pumping rates for decades, causing groundwater levels to drop significantly, resulting in saltwater intrusion, and rendering some coastal groundwater wells unsuitable for use. With the rise in sea level in the coming decades, saltwater intrusion will be exacerbated. The probability of saltwater intrusion is high due to the current groundwater overdraft situation in the Pajaro Valley, and the consequence of this occurring is high due to the economic effects of following large expanses of farmland to reduce groundwater pumping. However, efforts are being developed to reduce groundwater pumping and to stop saltwater intrusion. The success of these efforts will be challenged by the additional effects of climate change. Many of the wells located within the boundaries of the Soquel Creek Water District are also threatened with saltwater intrusion. A reduction in groundwater pumping will be necessary to meet the protective and target water levels necessary to avoid saltwater intrusion into the wells.
- High Groundwater. Rising water table beneath the Rio Del Mar Esplanade is already an issue. As sea level continues to rise, the present problems will be exacerbated. The consequence of a continuing water table rise on commercial and residential structures and infrastructure, including the wastewater pump station is high, and the likelihood of this taking place in the immediate future is high.
- Extreme Heat. Heat waves in Santa Cruz County are likely to become more frequent in the future due to climate change; however, due to the marine climate, temperature increases would be moderate. As a result, the consequence would be low while the probability of such an event occurring is high.

Based on the trends of the past century and the various climate models that have been developed, the risks from each of these climate-related events will almost certainly increase over the intermediate- to long-term, 2050-2100.

13.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Due to the nature and extent of the potential hazards due to climate change it is not possible to accurately assess the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the County that may be vulnerable to multiple climate change related hazards.

13.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Potential dollar losses were not estimated.

13.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Santa Cruz County has a number of compact urban communities as well as extensive areas of agricultural land and forested hillsides. A number of rural villages and towns are located throughout the County. As dictated by the 1978 Growth Management Ordinance, most new development has occurred within or adjacent to the urban services line (i.e., the boundary point for such infrastructure as water and sewage service). As with most communities, increased housing costs have resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available. Other development is mostly infill or reuse development, and development of existing rural residential properties.

No changes in these development regulation or patterns occurred that would affect the County's overall vulnerability since the previous plan was adopted in 2016. According to annual Growth Management Reports, there have been 909 new residential structures built in the County since 2010 (Table 12).

13.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

Adaptation efforts in Santa Cruz County by government and other organizations already exist in the form of emergency preparedness plans, public health programs, water supply contingency plans, flood regulations, sustainable agriculture efforts, and land protection programs. Additional research and planning should build on these existing efforts and amend them to address climate change directly.

13.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The following goals have been proposed in an effort to guide development of more specific adaptation strategies that would reduce our vulnerability to climate change.

Climate Change 1 - Encourage and support actions that reduce risks and vulnerabilities now, while recognizing the importance of identifying, making decisions about, and preparing for impacts and risks that may develop in the future.

Climate Change 2 - Support the reduction of risks from other environmental hazards, noting the strong interrelationships and benefits between reducing risk from climate change, non-climate change-related disasters, and most other environmental hazards.

Climate Change 3 - Build resilience into all programs, policies, and infrastructure.

Climate Change 4 - Encourage climate change resilience planning and actions in private companies, institutions, and systems essential to a functioning County of Santa Cruz.

Climate Change 5 - Encourage community involvement and public-private partnerships to respond to potential climate impacts, particularly for those most vulnerable.

Climate Change 6 - Ensure that Santa Cruz County remains a safe, healthy, and attractive place with a high quality of life for its residents, businesses, and visitors.

13.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Mitigation actions for each of the vulnerabilities and impacts that have been recognized and evaluated are located throughout the LHMP. Sections on Wildfire, Floods and Coastal Storms, Drought, Tsunami, and Landslide all contain mitigation actions that address some of the hazards identified in this section on Climate Change. Additional recommended actions are summarized below. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Address climate change in Public Health Preparedness Plan Update, General Plan Update, and other pertinent plans in order to implement policies and programs to reduce impact of climate change (C-13)
- Develop a forum for ongoing engagement with coastal private property owners and the California Coastal Commission to discuss frameworks for land use policies that respond to expected future losses. (C-14)
- Consider relocating coastal development away from areas that will be inundated to eliminate the risk of damage and the need for coastal protection. (C-15)
- Consider limiting new engineered protection structures to infill in locations where the back beach is currently fixed. (C-16)
- Consider a program to identify those areas where managed retreat should replace engineered protection structures, based on public benefit. (C-17)
- Work with the engineering community to define a standard increment of additional height that should be added to the FEMA 100-year wave run up, storm surge, and flood levels when analyzing hazards in specific locations. (C-18)
- In consultation with the California Coastal Commission, consider revising regulations that address rebuilding structures that are repeatedly damaged by SLR and coastal storms. (C-19)
- Amend the Safety Element of the General Plan and revise implementing regulations to increase the efficacy of the damage prevention and flood protection aspects of the National Flood Insurance Program. (C-20)
- Work with the County Office of Response, Recovery, and Resilience to refine FEMA flood hazard mapping to account for climate change, as maps are the basis for evacuation notification in the event of anticipated flooding and/or a tsunami. (C-21)
- Consider evaluating unprotected developed coastal bluff areas subject to future erosion, and develop plans and timeline for either armor placement, or retreat and relocation of existing public structures and/or infrastructure. (C-22)
- Consider designing and siting all future County projects and infrastructure to account for sea level rise projections, considering projected life span of project. (C-23)
- Consider securing federal grant funding for the following drainage improvements within the Rio Del Mar Esplanade necessary to protect against a 10-year storm. (C-24)
- Continue to improve wastewater collection system to reduce infiltration by groundwater or surface water. (C-25)

- Consider coordinating with the City of Santa Cruz on programs to minimize vulnerabilities at the Neary Lagoon plant. (C-26)
- Expand use and functionality of targeted shelters County Wide to serve as “All Hazard Resiliency Centers” which can serve as an all-hazard resource for community members in events including but not limited to: earthquakes, fires, floods, Public Safety Power Shut-off events, extreme weather events, poor air quality days. Building resiliency centers may include but is not limited to back-up power generation capacity, air filtration, air conditioning, kitchen facilities, shelter capacity. (A-24 New)

2021 Progress Report

- The County has adopted a Climate Action Strategy that provides recommendations for addressing climate change in the updates of other pertinent plans. In 2020 the Safety Element has been updated accordingly. The County Health Services Agency staff has completed a Public Health Hazard and Vulnerability Assessment Tool to identify the top ten public health hazards facing the community which includes hazards related to and exacerbated by climate change impacts. The next update of the Public Health Preparedness Plan should address climate change impacts as they relate to public health. (C-13)
- Planning Department staff conducted a series of public hearings and community meetings to discuss frameworks for land use policies that respond to sea level rise. In 2020, the project resulted in adoption by the Board of Supervisors of an amended Safety Element and related implementing ordinances. See Chapter 9 Coastal Erosion Progress Report for Mitigation Actions C-3, C-4, and C-8 for additional details. (C-14)
- County land use policies and regulations include thresholds and requirements to relocate structures away from hazardous coastal locations if feasible based on-site conditions and project scope. See Chapter 9 Coastal Erosion Progress Report for Mitigation Actions C-3, C-4, and C-8 for additional details. (C-15)
- The recently amended Safety Element containing an updated section on coastal hazards addresses engineered protection structures. See Chapter 9 Coastal Erosion Progress Report for Mitigation Actions C-3, C-4, and C-8 for additional details. (C-16)
- In 2020 the Board of Supervisors adopted the updated Safety Element that includes policies establishing areas of the County coastline where managed retreat will be required, and new engineered protection will be prohibited. See Chapter 9 Coastal Erosion Progress Report for Mitigation Actions C-3, C-4, and C-8 for additional details. (C-17)
- In 2020 the Board of Supervisors adopted an amended Safety Element and related implementing ordinances containing increased freeboard requirements for development in both alluvial flood hazard areas and coastal high hazard areas. For inland riverine flood hazards areas, the additional freeboard requirement is 2 feet. For coastal high hazards areas, the additional freeboard requirement is 3 feet. (C-18)
- In 2020 the Board of Supervisors adopted an amended Safety Element and related implementing ordinances containing a new repetitive loss policy with the intent of reducing future flood losses on repetitive loss properties. (C-19)
- In 2020 the Board of Supervisors adopted an amended Safety Element and related implementing ordinances addressing flood hazards. The County adopted new Floodplain Regulations using the State model code as a template. In addition to the increased freeboard requirements for development in flood hazard areas, the model ordinance contains more clarity

and detail regarding development in the floodplain intended to make local floodplain regulation more effective. (C-20)

- In 2017 FEMA completed an updated Flood Insurance Study and revised maps for the County. However, the study and map updates do not account for sea level rise. This is the reason the County adopted local regulations that require increased freeboard above mapped flood elevations to account in part for future sea level rise. (C-21)
- In 2020 the Board of Supervisors adopted an amended Safety Element and related implementing ordinances containing policies that plan for future conditions along the coast that are likely to exist as a result of sea level rise. Policies require as part of future development projects an evaluation of unprotected developed coastal bluff areas subject to future erosion, and development of plans and timeline for either armor placement, or retreat and relocation of existing public structures and/or infrastructure. See Chapter 9 Coastal Erosion Progress Report for Mitigation Actions C-3, C-4, and C-8 for additional details. (C-22)
- County projects and infrastructure in the Coastal Zone require review for consistency with both County policy and California Coastal Commission Guidance. It is standard practice currently to incorporate sea level rise analysis in project designs. An example of this involves the update of the Stormwater Facilities Master Plan for Zone 5. One of the tasks in the Zone 5 Master Plan update will be about “limited” modeling for climate change and sea level rise. One iteration of climate change impacts will be modeled on the CIP pipe and creek models. The climate change iteration will include tidal boundary change due to sea level rise and increased runoff due to precipitation change. (C-23)
- The Rio Del Mar drainage improvement project has been designed and permitted. The Dept. Of Public Works has received federal grant funding but continues to seek the balance of the funding to construct the project. (C-24)
- The Dept. Of Public Works continues to implement a program to upgrade wastewater collection infrastructure as funding allows. (C-25)
- A project to address the vulnerabilities at the Neary Lagoon Wastewater Treatment Plant has not been implemented. (C-26)

This page intentionally left blank

Chapter 14 Multi-Hazard Summary

Any of the hazards that threaten Santa Cruz County could happen in combination with another hazard. In fact, there is a high likelihood that a major earthquake on the San Andreas or other faults would unleash secondary hazards that could be as disastrous to Santa Cruz as the earthquake itself. A reference point for the Bay Area is the devastating fire in 1906 that burned down San Francisco, causing significantly more destruction than the earthquake that sparked it.

Earthquake shaking can start fires in numerous ways, such as tipping over appliances with pilot lights or damaging electrical equipment leading to sparks. Ruptured gas lines, both underground and where they connect to houses, or spilled flammable chemicals can cause post-earthquake fires to spread quickly. Efforts to fight fires after an earthquake are often severely hampered by non-functional water systems, damaged electrical systems that are needed to provide energy to pump water, or roads blocked by debris or landslides. These problems coincide with fire personnel being required for search and rescue activities and other disaster response activities.

Santa Cruz County may also experience landslides during the next earthquake, particularly if the earthquake occurs during rainy winter months. Small aftershocks could continue to cause slides for weeks after a quake, blocking roads and damaging homes. In addition, the next earthquake may cause significant damage to the county's water supply (some of which is located in a mountainous slide prone area) and storm drain systems.

Although the risk is very low, an earthquake has the potential to cause dam failure. Breaks in the dams, levees and stream culverts could lead to catastrophic flooding in areas that have not seen floodwaters previously.

Drought increases the risk of wildfires, and wildfires increase the risk of landslide and flood. When all supporting vegetation is burned away, hills become destabilized and prone to erosion. The charred surface of the earth becomes hard and absorbs less water during rainfall, leading to increased runoff resulting in more rapid coastal erosion.

Many mitigation activities reduce risk from more than one hazard. However, there are some mitigation activities that reduce risk from one possible threat while increasing it from another. One example is placing utility lines underground. Underground utilities are less damaged by a major fire than those aboveground. In an earthquake, under-ground utilities in areas prone to landslides or liquefaction are susceptible to damage and are more costly and time-consuming to repair than aboveground utilities. Another example of a mitigation activity with positive and negative impacts is vegetation removal for wildfire risk reduction. Trees and other established plants play a key role in securing hillsides and reducing landslide risk. They also reduce erosion and slow rain runoff time, which reduces flood peaks. It is important to remember all of the implications of any risk reduction steps when planning mitigation activities.

This page intentionally left blank

Part 4 Mitigation Strategy

This page intentionally left blank

Chapter 15 Mitigation Strategy

15.1 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The County of Santa Cruz endeavors to be a disaster-resistant and resilient community that can survive and recover from a disaster while preserving the quality of life for residents and the diversity and quality of its natural and built environments. The community strives to offer excellent cultural and community services as well as maintain and improve infrastructure, community safety and emergency preparedness. This Local Hazard Mitigation Plan (LHMP) is a part of this effort.

The County of Santa Cruz has developed a range of policies and programs to act as a “blueprint” for the Hazard Mitigation Strategy. Strategies include “everyday operations” that also contribute to reducing the impact of future hazards as well as specific hazard mitigation projects. While County efforts are focused on evaluation and improvement of County owned structures, particularly those identified as critical facilities, the plan also encourages the establishment of standards to encourage private property owners to upgrade the hazard resistance of their own properties. Finally, the County is actively engaged with other local and regional organizations to collaboratively work towards mitigation actions that meet the County of Santa Cruz’s objective to be a healthy, safe, and more affordable community that is culturally diverse, economically inclusive, and environmentally vibrant.

This plan focuses on mitigation goals and actions, meaning activities that occur prior to a hazard event that reduce or avoid damage when disasters strike. Damage prevention includes structural improvements to existing buildings, land use decisions that will minimize damage and ongoing programs such as firewise vegetation management in wildland/urban interface areas. This plan does not include emergency response activities. The County of Santa Cruz has an Emergency Management Plan (EMP) to help coordinate information and resources for disasters or threat of disasters. As a part of the EMP annual training, critical information updates and drills are conducted to protect people and property. However, the EMP does inform this Hazard Mitigation Plan and can be accessed at: <https://www.co.santa-cruz.ca.us/OR3/Response/PlansReports.aspx> .

15.1.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Goals

Goals are general guidelines that explain what is to be achieved. They are broad-based, policy-type statements, which are long-term, and represent global visions. Goals help define the benefits that the

plan is trying to achieve. The success of the LHMP, once implemented, should be measured by the degree to which its goals have been met.

The County of Santa Cruz LHMP team held several meetings to review the identified risks and developed goals, objectives and actions based on the risk assessment. Goals which provided the greatest benefit in hazard reduction were identified as primary goals.

Additional goals, specifically related to each identified potential hazard are presented under each hazard heading.

The LHMP has four primary mitigation goals:

- 1 Avoid or reduce the potential for life loss, injury, and economic damage to Santa Cruz County residents from hazard events.
- 2 Increase the ability of the County government and partner organizations to serve the community during and after hazard events.
- 3 Protect Santa Cruz County's unique character, scenic beauty, and values in the natural and built environment from being compromised by hazard events.
- 4 Identify and encourage mitigation activities to increase the disaster resilience of our community, institutions, private companies, and systems essential to a functioning County of Santa Cruz.

Objectives

The LHMP team selected the objectives listed below to meet multiple goals. The objectives serve as a stand-alone measurement of a mitigation action rather than as a subset of a goal. Achievement of the objectives is a measure of the effectiveness of a mitigation strategy. The objectives are also used to help establish priorities.

Objectives are defined as short-term aims which, when combined, form a course of action to meet a goal. Unlike goals, objectives are specific and measurable.

The County of Santa Cruz Local Hazard Mitigation Team identified this list of objectives:

- 1 Consider the impacts of hazards on future land use decisions in Santa Cruz County by coordinating with other planning mechanisms including the General Plan and land use code developments.
- 2 Protect and sustain reliable local emergency operations and communication facilities during and after a disaster.
- 3 Develop new or enhance existing early warning response systems.
- 4 Seek to enhance emergency response capabilities through improvements to infrastructure and County programs.
- 5 Support Fire Recovery for CZU fire survivors, enhancing their safety to all hazards.
- 6 Seek to enhance our understanding of how hazards and disasters may disproportionately impact certain members of our community and identify ways to build community resilience.
- 7 Seek mitigation projects that provide the highest degree of hazard protection at the least cost.
- 8 Seek to update information on hazards, vulnerabilities, and mitigation measures by coordinating planning efforts and creating partnerships with appropriate local, state, and federal agencies.

- 9 Seek to implement codes, standards, and policies that will protect life, property and quality of life including environmental, historic, and cultural resources from the impacts of hazards within Santa Cruz County.
- 10 Educate the community on preparedness for and mitigation of potential impacts of hazards to Santa Cruz County.
- 11 Encourage retrofit, purchase, or relocation of structures in high hazard areas, including those known to be repetitively damaged.

15.1.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

The Local Hazard Mitigation Goals were enumerated above. In support of those goals, the County of Santa Cruz has identified a number of hazard mitigation actions. This set of actions was developed through an inclusive community process. The LHMP team, with input from the County of Santa Cruz General Plan Update, the Emergency Management Plan, the Capital Improvement Program, the Integrated Regional Water Management Plan as well as other agencies and community members, has selected the following actions as the most beneficial for Santa Cruz County. These actions represent the highest priority mitigation actions identified for each hazard or for a multi-hazard event.

These mitigation actions have proven effective in reducing or eliminating hazard risk. Each of these actions directly meets an objective or goal listed in Santa Cruz County Hazard Mitigation Strategy. These actions are not meant to be exhaustive but rather to inspire thought and provide each department of the County of Santa Cruz with a role in hazard mitigation and a baseline of actions backed by a planning process, consistent with the goals and objectives and within the capabilities of the County. The County departments were not bound to the list of alternatives presented. They were given the opportunity to edit the list. Actions not included in the action plan were eliminated based on the following:

- Action is currently outside the scope of the defined priority rankings
- County’s jurisdiction is not vulnerable to the hazard
- Action has already been implemented
- Estimated cost exceeded estimated benefit

15.1.3 Prioritization of Mitigation Actions

Requirement §201.6(c)(3)(iii): The mitigation strategy shall include an action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This Plan promotes 67 action items. The list below summarizes all of the actions, identifies the hazard(s) each one addresses, and indicates the assigned priority level of the action. The actions were prioritized in the same way that they were identified. The team leaders proposed an initial prioritization system, dividing the actions into categories of **Very High Priority**, **High Priority**, and **Important**. County staff, committee and community members were given an opportunity to review these categorizations.

Many factors were considered when assigning priorities, as further described below. In general, those actions with strong community support and addressing hazards presenting the highest risk to Santa Cruz County were given Very High or High priority ratings. The updated loss estimates presented in Part 3 of this Plan, and recent experience with the CZU Lightning Complex Fire and the resultant heightened debris flow hazard, are the primary considerations in reordering of risk levels and prioritization of actions. Based on the updated vulnerability assessments in Part 3, wildfires, landslides, earthquakes, and floods have the most potential to cause great economic and human losses, therefore, actions related to these hazards were generally assigned Very High and High Priority. While there is no dollar loss calculation for the hazard of drought, water supply is essential to the survival of the County; therefore, drought and threats to the water system were ranked as Very High Priority. Loss calculations for the hazard of expansive soils shows a high potential loss value; however, potential damage from the hazard of expansive soils is generally not catastrophic but would generally result in minor damage to structures. The level of risk from tsunami, coastal erosion, and dam failure is relatively lower; therefore, these hazards were assigned a relatively lower yet still important priority. The hazard of climate change is a long-term phenomenon and there is no loss calculation for this hazard. However, the effects of climate change exacerbate the hazards of wildfire, landslides, floods, and drought due to changes in seasonal patterns of rainfall and temperature; therefore, actions to address climate change are an important priority. The number of plan objectives potentially addressed by the action, and capability in terms of availability of funding and staffing (identified in the County Budget or Capital Improvement Program or other source) were important additional factors in priority determination.

Section 201.6(c)(3)(iii) of Title 44 of the *Code of Federal Regulations* requires that an action plan describe how actions identified were prioritized. The planning team developed a prioritization methodology for the action plan that meets the needs of the County while at the same time meeting the requirements of CFR 201.6(c)(3)(iii). The mitigation strategies identified were prioritized according to the criteria defined below.

Very High Priority

- A project that meets multiple plan objectives
- Benefits exceed cost
- Has strong community support
- Addresses those hazards presenting the highest risk
- Funds are identified or potentially available
- Project can be completed in one to five years once project is funded

High Priority

- Project meets at least one plan objective
- Benefits exceed costs
- Funding has not been secured
- Project can be completed in one to five years once project is funded

Important

- Project mitigates the risk of a hazard
- Benefits exceed costs
- Funding has not been identified and/or timeline for completion is considered long-term (five to ten years)

A formal cost benefit analysis has not been done. However, in reviewing the mitigation actions proposed, the costs and benefits of each action were considered under the following rating:

Cost Ratings

- High: Existing funding levels are not adequate to cover the costs of the proposed project and would require an increase in revenue through an alternative source (e.g. bonds, grants, and fee increases) to implement.
- Medium: The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- Low: The project could be funded under the existing budget. The project is part of or can be part of an existing, ongoing program.

Benefit Ratings

- High: Project will have an immediate impact on the reduction of risk exposure to life and property.
- Medium: Project will have a long-term impact on the reduction of risk exposure to life and property or project will provide an immediate reduction in the risk exposure to property.
- Low: Long-term benefits of the project are difficult to quantify in the short-term.

In recent years, and in response to the 1989 Loma Prieta earthquake, the County of Santa Cruz has made significant progress through efforts to reduce risk in public buildings, fire stations, major municipal facilities, and public schools. This plan will continue these types of efforts and expand them throughout the community. These efforts will protect future generations from the devastation of natural hazards experienced by the residents of Santa Cruz County in the past.

The County will pursue the implementation of these actions to meet the goals set out above. The Very High and High priority actions will be conducted actively over the next three to five years as funding becomes available.

As part of the plan update the priorities set forth below are reordered based on the updated risk and vulnerability assessments described in Part 3 and summarized above. The lists of actions are renumbered with the old action number in parenthesis. No actions have been deleted, but several new actions are added as a result of the update process. The new actions are noted as new in parenthesis in the respective sections in Part 3 and in the lists below. The new actions address the hazards of wildfire (A-20 and A-21), landslides (A-22 and A-23), flooding (B-20), drought (C-12), and two additional actions addresses all hazards (A-18 and A-19).

List of Very High Priority Actions (A)

#	Action	Hazard	Responsible Department	Timeline
A-1	Coordinate preparedness efforts with other agencies and cities within the county	All Hazards	OES/OR3	Ongoing
A-2	Continue to enforce floodplain management regulations on all permit applications	Flood	Planning	Ongoing
A-3	Continue to participate in the Community Rating System to improve floodplain management	Flood	Planning	Ongoing
A-4 (B-3) ¹¹	Reduce fire risk in urban/wildland interface (WUI) by advocating use of improved building materials and appropriate code enforcement, including defensible space and fuel reduction programs.	Wildfire	CalFire	Ongoing
A-5 (C-7)	Promote land use planning which will reduce incidence of human caused wildfires especially in very high hazard areas	Wildfire	Planning	Ongoing
A-6 (C-8)	Advocate for creation of secondary road access improvement	Wildfire	CalFire	Ongoing
A-7	Implement water conservation efforts to maximize the use of existing water resources	Drought	Env. Health	Ongoing
A-8	Support the development of additional water supplies	Drought	Env. Health	Ongoing
A-9	Promote more effective use of groundwater storage through increased groundwater recharge and conjunctive use among agencies	Drought	Env. Health	Ongoing

¹¹ As part of the plan update the priorities are reordered based on the updated risk and vulnerability assessments. The lists of actions are renumbered with the old action number from the last plan update in parenthesis. New actions added as part of the current plan update are also identified in parenthesis.

#	Action	Hazard	Responsible Department	Timeline
A-10	Continue to coordinate communication system upgrades with other agencies and cities, including evacuation management and operations, for homes and businesses within specific areas	All hazards	OES/OR3	Ongoing
A-11 (C-6)	Promotion of built-in fire extinguishing systems and fire alarm systems	Wildfire	CalFire	Ongoing
A-12	Continue to maintain cooperative fire protection and prevention agreements with other agencies	Wildfires	CalFire	Ongoing
A-13	Improve road signs and address marking to increase visibility and reduce response times	Wildfires	Public Works	Ongoing
A-14	Enhance support for interoperability communications system with local, state, and federal emergency services	All hazards	OES/OR3	Ongoing
A-15 (C-18)	Continue to require that the County Geologist review development in areas of suspected landsliding and require engineering geology reports when landsliding is identified or suspected	Landslide	Planning	Ongoing
A-16 (C-19)	Continue to require that an engineering geologist and/or geotechnical engineer investigate the site of any proposed construction near landsliding and require mitigation of landslide hazards before issuing any building or grading permit	Landslide	Planning	Ongoing
A-17 (C-20)	Continue to require that an engineering geologist and a geotechnical engineer investigate any landslide damage to homes or roadways before repair of the landslide and reuse of the homes or roadways	Landslide	Planning	Ongoing
A-18 (New)	Continue to refine and improve our evacuation management plans and tools using Zonehaven	All Hazards	CalFire Sheriff OES/OR3	Ongoing
A-19 (new)	Re-establish and support Community Organizations Assisting in Disaster (COAD)	All Hazards	OES/OR3	Ongoing

#	Action	Hazard	Responsible Department	Timeline
A-20 (new)	Reduction of fire risk in the urban/wildland interface (WUI) through hazardous fuel reduction projects including but not limited to indigenous land use practices of controlled burns, hazardous fuel removal, other shaded fuel break burn strategies.	Wildfire	Fire agencies Partners	Ongoing
A-21 (New)	Support CZU Fire Recovery for survivors utilizing best practices for improving overall safety of rebuild	Wildfire	Planning	Ongoing
A-22 (New)	Enhance our early warning, and rainfall monitoring capacity in the high debris flow risk areas of the County following the CZU fires of 2020.	Landslides	OES/OR3 Planning Public Works	Ongoing
A-23 (New)	Identify, monitor, and mitigate where feasible the hazards and risks associated with post fire debris flows.	Landslides	Planning	Ongoing
A-24 (New)	Expand use and functionality of targeted shelters County Wide to serve as “All Hazard Resiliency Centers” which can serve as an all-hazard resource for community members in events including but not limited to: earthquakes, fires, floods, Public Safety Power Shut-off events, extreme weather events, poor air quality days. Building resiliency centers may include but is not limited to back-up power generation capacity, air filtration, air conditioning, kitchen facilities, shelter capacity.	All Hazards/Clim ate Change	OES/OR3	Ongoing

List of High Priority Actions (B)

#	Action	Hazard	Responsible Department	Timeline
B-1	Upgrade roadways, sewer, water, and other infrastructure to withstand seismic shaking	Earthquake	Public Works	Ongoing

#	Action	Hazard	Responsible Department	Timeline
B-2	Review and revise California Environmental quality Act (CEQA) Initial Study checklist to ensure storm water runoff is fully mitigated	Flood	Planning	Completed
B-3 (C-5)	Implement additional fire prevention programs through inspections and education	Wildfire	CalFire	Ongoing
B-4	Maintain adequate Fire Suppression and Prevention staffing levels to meet the needs of the county residents and development trends	Wildfire	CalFire	Ongoing
B-5	Update and revise the Geologic Hazards Ordinance	Flood	Planning	Ongoing
B-6	Pursue elevation of structures to raise them above the 100-year flood level	Flood	Planning	Ongoing
B-7	Continue to enforce requirements for on-site retention of storm water runoff from impervious surfaces where feasible for all new development in the Groundwater Recharge Zone and the Water Supply Watershed Zone and throughout Santa Cruz County	Flood	Public Works	Ongoing
B-8 (A-4)	Evaluate the effectiveness of current policies and ordinances designed to limit storm water runoff and recommend revisions to improve the effectiveness of these policies.	Flood	Public Works	Ongoing
B-9 (A-5)	Evaluate the effectiveness of current drainage plan requirements	Flood	Public Works	Ongoing
B-10 (A-6)	Implement the "Stormwater Facilities Master Plan" for Flood control Districts 5 & 6	Flood	Public Works	Ongoing
B-11 (C-9)	Continue to inspect and maintain drainage system infrastructure	Flood	Public Works	Ongoing
B-12 (C-10)	Develop public education materials on flood protection and mitigation by working collaboratively with community	Flood	Planning	Ongoing

#	Action	Hazard	Responsible Department	Timeline
	groups, non- governmental organizations, and the local media			
B-13 (C-11)	Regulate development in flood zones to optimize preservation of open space through the application of the Geologic Hazards Ordinance and Open Space Preservation policies	Flood	Planning	Ongoing
B-14 (C-12)	Limit development and monitor conditions of development and grading permits near natural channels and wetlands to prevent sedimentation.	Flood	Planning Public Works	Ongoing
B-15 (C-13)	Promote drought planning by the 150 small water systems under county jurisdiction	Drought	Env. Health	Ongoing
B-16 (C-1)	Promote seismic safety upgrade of all emergency use and critical structures	Earthquake	Planning	Ongoing
B-17 (C-2)	Require all new and replacement critical structures be designed to standards of the California building Code and County Geologic Hazard Code	Earthquake	Planning	Ongoing
B-18 (C-3)	Train appropriate plan check staff on seismic requirements for structures	Earthquake	Planning	Ongoing
B-19 (C-4)	Encourage zoning in geologically constrained areas that reflect the nature and extent of the seismic hazard	Earthquake	Planning	Ongoing
B-20 (New)	Implement the Pajaro River Flood Risk Management Project to reduce the probability and consequences of flooding in the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands.	Flood	Public Works (Zone 7)	Ongoing

List of Important Actions (C)

#	Action	Hazard	Responsible Department	Timeline
C-1 (B-8)	Management of early warning system	Tsunami	OES/OR3	Ongoing
C-2 (B-9)	Update tsunami maps	Tsunami	Planning	Unknown
C-3 (B-10)	Protect and preserve the coastline through permit review and continue to review coastal development for conformance with the County's Geologic Hazards ordinance	Coastal Erosion	Planning	Ongoing
C-4 (B-11)	Encourage the replacement of existing seawalls with shoreline protection structures which meet current engineering practice, integrate coastal access elements, and reduce their footprint impact on coastal resources.	Coastal Erosion	Planning	Ongoing
C-5 (B-12)	Develop an event protocol with the State Division of Safety of Dams	Dam Failure	Planning	Not completed
C-6 (B-13)	Continue to require soils reports as part of the building permit process	Expansive Soils	Planning	Ongoing
C-7 (C-14)	Encourage investigation of tsunami threat to the county and update development regulations based upon the best available information	Tsunami	Planning	Ongoing
C-8 (C-15)	Protect and preserve the coastline and infrastructure through restoration efforts	Coastal Erosion	Planning Public Works	Ongoing
C-9 (C-16)	Update dam inundation maps	Dam Failure	Planning	Not completed
C-10 (C-17)	Review dam evaluation files to determine the extent of potential dam failures	Dam Failure	Planning	Not completed
C-11 (C-21)	Continue to enforce design criteria for areas of known expansive soils	Expansive Soils	Planning	Ongoing
C-12 (New)	Adopt General Plan and County Code amendments to implement the Sustainable Santa Cruz County Plan to	Drought	Planning	2022

#	Action	Hazard	Responsible Department	Timeline
	support higher density development along major transit corridors.			
C-13 (C-22)	Plan for climate change	Multi-hazard	Public Health Planning OES/OR3	Ongoing
C-14 (C-23)	Develop a forum for ongoing engagement with coastal private property owners and the California Coastal Commission to discuss frameworks for land use policies that respond to expected future losses	Sea Level Rise	Planning	Ongoing
C-15 (C-24)	Consider relocating coastal development away from areas that will be inundated to eliminate the risk of damage and the need for coastal protection	Sea Level Rise	Planning	Ongoing
C-16 (C-25)	Consider limiting new engineered protection structures to infill in locations where the back beach is currently fixed	Sea Level Rise	Planning	Ongoing
C-17 (C-26)	Consider a program to identify those areas where managed retreat should replace engineered protection structures, based on public benefit	Sea Level Rise	Planning	Ongoing
C-18 (C-27)	Work with the engineering community to define a standard increment of additional height that should be added to the FEMA 100-year wave run up, storm surge, and flood levels when analyzing hazards in specific locations	Sea Level Rise	Planning	Ongoing
C-19 (C-28)	In consultation with the California Coastal Commission, consider revising regulations that address rebuilding structures that are repeatedly damaged by SLR and coastal storms	Sea Level Rise	Planning	Ongoing
C-20 (C-29)	Amend the Public Safety Element of the General Plan and revise implementing regulations to increase the efficacy of the damage prevention and flood protection	Sea Level Rise	Planning	2021-2022

#	Action	Hazard	Responsible Department	Timeline
	aspects of the National Flood Insurance Program			
C-21 (C-30)	Work with the County Office of Response, Recovery, and Resilience to refine FEMA flood hazard mapping to account for climate change, as maps are the basis for evacuation notification in the event of anticipated flooding and/or a tsunami	Sea Level Rise	Planning	Ongoing
C-22 (C-31)	Consider evaluating unprotected developed coastal bluff areas subject to future erosion, and develop plans and timeline for either armor placement, or retreat and relocation of existing public structures and/or infrastructure	Sea Level Rise	Planning	Ongoing
C-23 (C-32)	Consider designing and siting all future County projects and infrastructure to account for sea level rise projections, considering projected life span of project	Sea Level Rise	Public Works	Ongoing
C-24 (C-33)	Consider securing federal grant funding for the following drainage improvements within the Rio Del Mar Esplanade necessary to protect against a 10-year storm	Sea Level Rise	Public Works	Ongoing
C-25 (C-34)	Continue to improve wastewater collection system to reduce infiltration by groundwater or surface water	Sea Level Rise	Public Works	Ongoing
C-26 (C-35)	Consider coordinating with the City of Santa Cruz on programs to minimize vulnerabilities at the Neary Lagoon plant	Sea Level Rise	Public Works	Ongoing

Details of Very High Priority Actions (A)

A-1 Proposed Activity	Emergency Preparedness Coordination Continue to participate in the Emergency Management Council by planning, implementing, and evaluating pre-event activities including ongoing training for county staff
--------------------------	---

Hazard	All
Environmental Concerns	None
Lead Dept.	OES/OR3
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-2	Floodplain Regulation
Proposed Activity	Continue to enforce flood plain management regulations on all permit applications
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-3	Community Rating System Application
Proposed Activity	Continue to participate in the Community Rating System to improve floodplain management
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff Time
Funding Source	Departmental budget
Funding Priority	Very High

A-4	Wildfire Hazard Abatement
Proposed Activity	Reduce fire risk in wildland/urban interface (WUI) by advocating use of improved building materials and appropriate code enforcement, including defensible space and fuel break and reduction programs
Hazard	Wildfire
Environmental Concerns	Wildfire
Lead Dept.	CalFire
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-5	WUI Land Use Planning
Proposed Activity	Promote land use planning to reduce incidence of human- caused wildfires

Hazard	Wildfire
Environmental Concerns	Wildfire
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff Time
Funding Source	Departmental budget
Funding Priority	Very High

A-6	Emergency Personnel Road Access
Proposed Activity	Advocate for creation of secondary road access improvement
Hazard	Wildfire
Environmental Concerns	Wildfire
Lead Dept.	CalFire
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-7	Water Conservation
Proposed Activity	Implement water conservation programs to maximize the use of existing water resources
Hazard	Drought
Environmental Concerns	Water supply
Lead Dept.	Environmental Health
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-8	Develop Additional Water Supplies
Proposed Activity	Support the development of additional water supplies
Hazard	Drought
Environmental Concerns	Water supply
Lead Dept.	Environmental Health
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very high

A-9	Drought Protection
Proposed Activity	Promote more effective use of groundwater storage through increased groundwater recharge
Hazard	Drought
Environmental Concerns	None
Lead Dept.	Environmental Health

Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-10	Early Notification\ Warning Systems
Proposed Activity	Continue to coordinate communication system upgrades with other agencies and the cities of Santa Cruz, Watsonville, and Capitola, including evacuation operations, for homes and businesses in specific hazard areas
Hazard	Multi-Hazards
Environmental Concerns	None
Lead Dept.	OES/OR3
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, Federal and state grants
Funding Priority	Very High

A-11	Promote Alarm and Fire-Retardant Systems
Proposed Activity	Promote installation, inspection, and testing of built-in fire alarm and sprinkler systems
Hazard	Wildfire
Environmental Concerns	Wildfire
Lead Dept.	CalFire
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Permit Fees
Funding Priority	Very High

A-12	Fire Protection and Prevention
Proposed Activity	Maintain fire protection and prevention agreements with other agencies
Hazard	Wildfire
Environmental Concerns	Wildfire
Lead Dept.	CalFire
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-13	Reduction of Emergency Response Times
Proposed Activity	Improve road signage visibility and address markings Hazard
Hazard	Multi-Hazard
Environmental Concerns	None
Lead Dept.	Public Works

Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-14	Communications Interoperability
Proposed Activity	Enhance support for interoperability of communications system with local, state, and federal emergency services
Hazard	All Hazards
Environmental Concerns	None
Lead Dept.	OES/OR3
Timeline	Ongoing
Resources Required	Staff time, new equipment
Funding Source	Departmental budget, State and Federal grants
Funding Priority	Very High

A-15	Minimize Landslide Risk
Proposed Activity	Continue to require that the County Geologist review development in areas of suspected landsliding and require engineering geology reports when landsliding is identified or suspected
Hazard	Landslide
Environmental Concerns	Landslide
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, permit fees
Funding Priority	Very High

A-16	Landslide Regulations
Proposed Activity	Continue to require that an engineering geologist and/or geotechnical engineer investigate the site of any proposed construction near landsliding and require mitigation of landslide hazards before issuing any building or grading permits
Hazard	Landslide
Environmental Concerns	Landslide
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, permit fees
Funding Priority	Very High

A-17	Landslide Inspections
Proposed Activity	Continue to require that an engineering geologist

	and/or a geotechnical engineer investigate any landslide damage to homes or roadways before repair of the landslide and reuse of the homes or roadways
Hazard	Landslide
Environmental Concerns	Landslide
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, Permit fees
Funding Priority	Very High

A-17	Minimize Damage from Expansive Soils
Proposed Activity	Continue to enforce design criteria for areas of known expansive soils
Hazard	Expansive soils
Environmental Concerns	Geology
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-18	Evacuation Plans
Proposed Activity	Continue to refine and improve our evacuation management plans and tools using Zonehaven
Hazard	All hazards
Environmental Concerns	None
Lead Dept.	Fire agencies, Sheriff, OES/OR3
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-19	Community Organizations Assisting in Disaster (COAD)
Proposed Activity	Re-establish and support Community Organizations Assisting in Disaster (COAD)
Hazard	All hazards
Environmental Concerns	None
Lead Dept.	OES/OR3
Timeline	2021-2026
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-20	Hazardous Fuel Reduction
------	--------------------------

Proposed Activity	Reduction of fire risk in the urban/wildland interface (WUI) through hazardous fuel reduction projects including but not limited to indigenous land use practices of controlled burns, hazardous fuel removal, other shaded fuel break burn strategies.
Hazard	Wildfire
Environmental Concerns	Wildfire
Lead Dept.	Fire agencies, partners
Timeline	Ongoing
Resources Required	Staff time, partner agencies
Funding Source	Departmental budget, grant funding
Funding Priority	Very High

A-21 Proposed Activity	CZU Fire Recovery Support CZU Fire Recovery for survivors utilizing best practices for improving overall safety of rebuild
Hazard	Wildfire
Environmental Concerns	Site dependent
Lead Dept.	Planning, OES/OR3
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Very High

A-22 Proposed Activity	Early Warning Systems Enhance our early warning, and rainfall monitoring capacity in the high debris flow risk areas of the County following the CZU fires of 2020.
Hazard	Debris Flow
Environmental Concerns	Landslide
Lead Dept.	OES/OR3, Planning, Public Works
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, State and Federal grants
Funding Priority	Very High

A-23 Proposed Activity	Debris Flow Hazard Mitigation Identify, monitor, and mitigate where feasible the hazards and risks associated with post fire debris flows.
Hazard	Landslide
Environmental Concerns	Landslide
Lead Dept.	Planning
Timeline	2021-2026

Resources Required	Staff time, partner agencies
Funding Source	Departmental budget, grant funding
Funding Priority	Very High

A-24	Emergency Shelters
Proposed Activity	Expand use and functionality of targeted shelters County Wide to serve as “All Hazard Resiliency Centers” which can serve as an all-hazard resource for community members in events including but not limited to: earthquakes, fires, floods, Public Safety Power Shut-off events, extreme weather events, poor air quality days. Building resiliency centers may include but is not limited to back-up power generation capacity, air filtration, air conditioning, kitchen facilities, shelter capacity.
Hazard	All Hazards/Climate Change
Environmental Concerns	N/A
Lead Dept.	OES/OR3
Timeline	2021-2026
Resources Required	Staff time, partner agencies
Funding Source	Departmental budget, grant funding
Funding Priority	Very High

Details of High Priority Actions (B)

B-1	Infrastructure Upgrades
Proposed Activity	Upgrade roadways, sewer, water, and other infrastructure to withstand seismic shaking
Hazard	Earthquake
Environmental Concerns	Geology
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff time, external funding
Funding Source	Departmental budget, Federal and State grants
Funding Priority	High

B-2	Review Stormwater Runoff Regulations
Proposed Activity	Review and revise California Environmental Quality Act (CEQA) Initial Study checklist to ensure that storm water runoff is fully considered and mitigated to the extent possible
Hazard	Flood
Environmental Concerns	Flood
Lead Dept.	Planning
Timeline	Completed

Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	High

B-3 Proposed Activity	Fire Safety and Prevention Programs Implement additional fire prevention programs in schools, institutions, and commercial buildings through inspections and education
Hazard	Wildfire
Environmental Concerns	Wildfire
Lead Dept.	CalFire
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, grants
Funding Priority	High

B-4 Proposed Activity	Adequate Staffing Maintain adequate Fire Suppression and Prevention staffing levels to meet the needs of the county
Hazard	Wildfire
Environmental Concerns	Wildfire
Lead Dept.	CalFire
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	High

B-5 Proposed Activity	Geologic Hazards Ordinance Update Update and revise the Geologic Hazards Ordinance
Hazard	Multi- Hazard
Environmental Concerns	Geology
Lead Dept.	Planning
Timeline	In process
Resources Required	Staff time
Funding Source	Departmental budget, Federal and State Grants
Funding Priority	High

B-6 Proposed Activity	Elevation of Structures in Floodplain Continue to pursue elevation of structures above level of 100-year flood Hazard
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time, consultants, technical studies

Funding Source	Departmental budget, Federal/State grants, permit fees
Funding Priority	High

B-7	Stormwater Management
Proposed Activity	Continue to enforce requirements for on-site retention of storm water
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, Permit fees
Funding Priority	High

B-8	Stormwater Policy and Ordinance Evaluation
Proposed Activity	The County shall evaluate the effectiveness of current policies and ordinances designed to limit storm water runoff and flooding and, if needed, recommend revisions to improve effectiveness of these policies and codes
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	High

B-9	Drainage Plan Evaluation
Proposed Activity	The county shall evaluate the effectiveness of the current drainage plan requirements to ensure that storm water runoff from impervious surfaces does not contribute to flooding and, if needed, revise permit conditions of approval
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff Time
Funding Source	Departmental budget
Funding Priority	High

B-10	Stormwater Control
Proposed Activity	Implement the "Stormwater Facilities Master Plan" for Flood control Districts 5 & 6
Hazard	Flood

Environmental Concerns	None
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff Time
Funding Source	Departmental budget
Funding Priority	High

B-11	Drainage system Infrastructure Integrity
Proposed Activity	Continue to inspect and maintain drainage system infrastructure
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff time, consultant, repair funds
Funding Source	Departmental budget, Federal and State grants
Funding Priority	High

B-12	Flood Mitigation Education
Proposed Activity	Continue to develop public education materials by working collaboratively with community groups, non-governmental organizations, and the local media
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	High

B-13	Open Space in Flood Zones
Proposed Activity	Regulate development in flood zones to optimize preservation of open space
Hazard	Flood
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	High

B-14	Flood Zone Development Regulation
Proposed Activity	Limit development and monitor conditions of development and grading permits near natural channels and wetlands to prevent sedimentation
Hazard	Flood

Environmental Concerns	Flooding
Lead Dept.	Planning, Public Works
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	High

B-15	Promote Drought Planning
Proposed Activity	Promote drought planning by the 130 small water systems under county jurisdiction
Hazard	Drought
Environmental Concerns	Water Supply
Lead Dept.	Environmental Health
Timeline	Ongoing
Resources Required	Staff time, consultant
Funding Source	Departmental budget, federal and state grants
Funding Priority	High

B-16	Protection of Critical Structures
Proposed Activity	Promote seismic safety upgrade of all emergency use and critical structures
Hazard	Earthquake
Environmental Concerns	Earthquake
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	High

B-17	Critical Structural Safety
Proposed Activity	Require all new and replacement critical structures be designed to standards of the California building code and the county's Geologic Hazards Code
Hazard	Earthquake
Environmental Concerns	Earthquake
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	High

B-18	Training for Planning Staff
Proposed Activity	Train appropriate plan check staff on seismic requirements for structures
Hazard	Earthquake
Environmental Concerns	Earthquake

Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time, training consultant
Funding Source	Departmental budget, federal and state grants
Funding Priority	High

B-19	Seismic Zoning
Proposed Activity	Encourage zoning in geologically constrained areas that reflect the nature and extent of the seismic hazard
Hazard	Earthquake
Environmental Concerns	Earthquake
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	High

B-20	Pajaro River Flood Risk Management Project
Proposed Activity	Implement the Pajaro River Flood Risk Management Project to reduce the probability and consequences of flooding in the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands.
Hazard	Flooding
Environmental Concerns	Flooding
Lead Dept.	Department of Public Works Zone 7
Timeline	Ongoing
Resources Required	Departmental budget, federal and state assistance
Funding Source	Departmental budget, federal grants, County matching funds
Funding Priority	High

Details of Important Actions (C)

C-1	Management of Early Warning System
Proposed Activity	Maintain a reverse 911 system that notifies all homes and businesses within tsunami inundation areas and maintain a media protocol for evacuation notices
Hazard	Tsunami
Environmental Concerns	Flooding
Lead Dept.	OES/OR3
Timeline	Ongoing
Resources Required	Staff time

Funding Source	Departmental budget, FEMA Grant funds
Funding Priority	Important

C-2	Minimize Risk from Tsunami
Proposed Activity	Update tsunami inundation maps
Hazard	Tsunami
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Unknown
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Important

C-3	Protect and Preserve Coastline
Proposed Activity	Protect and preserve coastline through permit review process
Hazard	Coastal Erosion
Environmental Concerns	Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Important

C-4	Protect Coastline and Infrastructure
Proposed Activity	Encourage replacement of existing seawalls with shoreline protection structures which meet current engineering standards
Hazard	Coastal Erosion
Environmental Concerns	Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time, consultants
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-5	Minimize Risk from Dam Failure
Proposed Activity	Develop an event protocol with the State Division of Safety of Dams
Hazard	Dam Failure
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Unknown
Resources Required	Staff Time
Funding Source	Departmental budget
Funding Priority	Important

C-6	Minimize Risks from Expansive soils
Proposed Activity	Continue to require soils reports as part of the building permit process
Hazard	Expansive soils
Environmental Concerns	Geology
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Important

C-7	New Regulations in Tsunami Inundation Areas
Proposed Activity	Encourage investigation of the tsunami threat to the county and update development regulations based upon this investigation
Hazard	Tsunami
Environmental Concerns	None
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Federal and state grants
Funding Priority	Important

C-8	Restoration of Coastline
Proposed Activity	Protect and preserve the coastline and infrastructure through restoration efforts
Hazard	Coastal Erosion
Environmental Concerns	Erosion
Lead Dept.	Planning, Public Works
Timeline	Ongoing
Resources Required	Staff time, consultants
Funding Source	Departmental budget, Federal and State grants
Funding Priority	Important

C-9	Update Inundation Maps
Proposed Activity	Update dam inundation maps
Hazard	Dam Failure
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Unknown
Resources Required	Staff time
Funding Source	Departmental budget, State grants
Funding Priority	Important

C-10	Review Dam Hazards
Proposed Activity	Review dam evaluation files to determine the extent of potential dam failures

Hazard	Dam Failure
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	Unknown
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Important

C-11	Minimize Damage from Expansive Soils
Proposed Activity	Continue to enforce design criteria for areas of known expansive soils
Hazard	Expansive soils
Environmental Concerns	Geology
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget
Funding Priority	Important

C-12	Reduce Per-Capita Water Consumption
Proposed Activity	Adopt General Plan and County Code amendments to implement the Sustainable Santa Cruz County Plan to support higher density development along major transit corridors.
Hazard	Drought
Environmental Concerns	Water Supply
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time, consultants
Funding Source	Departmental budget, grant funding
Funding Priority	Important

C-13	Climate Change
Proposed Activity	Address climate change in Public Health Preparedness Plan Update, General Plan Update, and other pertinent plans in order to implement policies and programs to reduce impact of climate change
Hazard	Multi-Hazards
Environmental Concerns	Multiple
Lead Dept.	Public Health, Planning, OES
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-14	Climate Change
------	----------------

Proposed Activity	Develop a forum for ongoing engagement with coastal private property owners and the California Coastal Commission to discuss frameworks for land use policies that respond to expected future losses.
Hazard	Sea Level Rise
Environmental Concerns	Flooding, Coastal Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time, consultants
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-15 Proposed Activity	Climate Change Consider relocating coastal development away from areas that will be inundated to eliminate the risk of damage and the need for coastal protection.
Hazard	Sea level rise
Environmental Concerns	Coastal Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-16 Proposed Activity	Climate Change Consider limiting new engineered protection structures to infill in locations where the back beach is currently fixed.
Hazard	Sea Level Rise
Environmental Concerns	Coastal Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-17 Proposed Activity	Climate Change Consider a program to identify those areas where managed retreat should replace engineered protection structures, based on public benefit.
Hazard	Sea Level Rise
Environmental Concerns	Flooding, Coastal Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time

Funding Source	Departmental budget, Federal and State grants
Funding Priority	Important

C-18	Climate Change
Proposed Activity	Work with the engineering community to define a standard increment of additional height that should be added to the FEMA 100-year wave run up, storm surge, and flood levels when analyzing hazards in specific locations.
Hazard	Sea Level Rise
Environmental Concerns	Flooding, Coastal Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, Federal and State grants
Funding Priority	Important

C-19	Climate Change
Proposed Activity	In consultation with the California Coastal Commission, consider revising regulations that address rebuilding structures that are repeatedly damaged by SLR and coastal storms.
Hazard	Sea Level Rise
Environmental Concerns	Flooding, Coastal Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, Federal and State grants
Funding Priority	Important

C-20	Climate Change
Proposed Activity	Amend the Safety Element of the General Plan and revise implementing regulations to increase the efficacy of the damage prevention and flood protection aspects of the National Flood Insurance Program.
Hazard	Sea Level Rise
Environmental Concerns	Flooding
Lead Dept.	Planning
Timeline	2021-2022
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-21	Climate Change
Proposed Activity	Work with the County Office of Response, Recovery, and Resilience to refine FEMA flood

Hazard	hazard mapping to account for climate change, as maps are the basis for evacuation notification in the event of anticipated flooding and/or a tsunami.
Environmental Concerns	Sea Level Rise
Lead Dept.	Flooding
Timeline	Planning
Resources Required	Ongoing
Funding Source	Staff time
Funding Priority	Departmental budget, Federal and State grants
	Important

C-22	Climate Change
Proposed Activity	Consider evaluating unprotected developed coastal bluff areas subject to future erosion, and develop plans and timeline for either armor placement, or retreat and relocation of existing public structures and/or infrastructure.
Hazard	Sea Level Rise
Environmental Concerns	Coastal Erosion
Lead Dept.	Planning
Timeline	Ongoing
Resources Required	Staff time, consultants
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-23	Climate Change
Proposed Activity	Consider designing and siting all future County projects and infrastructure to account for sea level rise projections, considering projected life span of project.
Hazard	Sea Level Rise
Environmental Concerns	Coastal Erosion, Flooding
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, Federal and State grants
Funding Priority	Important

C-24	Climate Change
Proposed Activity	Consider securing federal grant funding for the following drainage improvements within the Rio Del Mar Esplanade necessary to protect against a 10-year storm
Hazard	Sea Level Rise
Environmental Concerns	Flooding
Lead Dept.	Public Works

Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-25	Climate Change
Proposed Activity	Continue to improve wastewater collection system to reduce infiltration by groundwater or surface water
Hazard	Sea Level Rise
Environmental Concerns	Flooding
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

C-26	Climate Change
Proposed Activity	Consider coordinating with the City of Santa Cruz on programs to minimize vulnerabilities at the Neary Lagoon plant.
Hazard	Sea Level Rise
Environmental Concerns	Flooding
Lead Dept.	Public Works
Timeline	Ongoing
Resources Required	Staff time
Funding Source	Departmental budget, federal and state grants
Funding Priority	Important

This page intentionally left blank

Part 5 Plan Maintenance Process

This page intentionally left blank

Chapter 16 Plan Maintenance Process

16.1 Monitoring, Evaluating and Updating the Plan

Requirement §201.6(c)(4)(i): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

16.1.1 Evaluation of the Plan

Title 44 of the *Code of Federal Regulations* (CFR) Section 201.6(c)(4)(i) requires a hazard mitigation plan to include a plan maintenance process that includes the following:

- A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.
- A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate.
- A discussion on how the community will continue public participation in the plan maintenance process.

The plan maintenance section of this document details the formal process that will ensure that the County of Santa Cruz hazard mitigation plan (LHMP) remains an active and relevant document. The LHMP maintenance process includes a schedule for monitoring and evaluating the plan every five years. This chapter also describes how the County will integrate public participation throughout the plan maintenance and implementation process. Finally, this chapter explains how the County intends to incorporate the mitigation strategies outlined in this LHMP into existing planning mechanisms and programs, such as the County General Plan, Capital Improvement Program, as well as building code enforcement and implementation. The LHMP's format allows the County to review and update sections when new data becomes available. New data can be easily incorporated, resulting in a plan that will remain current and relevant to Santa Cruz County.

The ongoing task of the hazard mitigation planning team leadership will be the evaluation of the progress of the LHMP and incorporating the actions into other plans. This evaluation will include the following elements as staff and funding capabilities allow:

- Summary of any hazard events that occurred during the prior year and their impact on the community.
- Review of successful mitigation initiatives identified in the LHMP.
- Evaluation of actions that were not completed.
- Re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term project because of funding availability).
- Recommendations for new projects.
- Changes in or potential for new funding options (grant opportunities).

- Integration of new data such as GIS data and mapping used to inform the Plan.
- Impact of any other planning programs or initiatives within the County that involve hazard mitigation.

16.1.2 Method and Schedule for Updating the Plan within Five Years

Method and Schedule for Updating the Plan within five years

Section 201.6.(d)(3) of Title 44 of the *Code of Federal Regulations* requires that local hazard mitigation plans be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for benefits awarded under the Disaster Mitigation Act (DMA). The County of Santa Cruz intends to update the LHMP on a five-year cycle from the date of initial plan adoption. This cycle may be accelerated to less than five years based on the following triggers:

- A Presidential Disaster Declaration that impacts Santa Cruz County.
- A hazard event that causes loss of life.

It will not be the intent of this update process to develop a new complete LHMP for Santa Cruz County. Based on needs identified by the planning team, this update will, at a minimum, include the elements below:

- The update process will be convened through a committee appointed by the Planning Director and will consist of at least one member of the General Plan Update committee or staff to insure consistency between plans.
- The hazard risk assessment will be reviewed and updated using best available information and technologies.
- The evaluation of critical structures and mapping will be updated and improved as funding becomes available.
- The action plan will be reviewed and revised to account for any actions completed, dropped, or changed and to account for changes in the risk assessment or new county policies identified under other planning mechanisms, as appropriate (such as the General Plan).
- The draft update will be sent to appropriate agencies for comment.
- The public will be given an opportunity to comment prior to adoption.
- The Santa Cruz County Board of Supervisors will adopt the updated plan.

The next plan update will begin one year prior to the due date for the next five-year update. The schedule will include presentations on the plan's progress at regularly scheduled meetings of the Disaster Management Council, the Commission on the Environment, and the Fire Prevention Officers Association, and the Board of Supervisors. These meetings occur on a quarterly basis and will allow for both public and stakeholder input during and throughout the year long update process. These meetings will begin in the first quarter of the year. This process will be accompanied and enhanced by postings on the County's social media and interactive website.

The update process will be led by the Sustainability and Special Projects Section of the Planning Department in coordination with the OR3 and assistance from the Emergency Management Council. The 2020/2021 update process was led by David Carlson, Resource Planner, Sustainability and Special Projects Section, in the Planning Department. It is expected that the next update will be led by the same staff.

16.1.3 Implementation Through Existing Programs

The effectiveness of the County's non-regulatory LHMP depends on the implementation of the plan and incorporation of the outlined action items into existing County plans, policies, and programs. The LHMP includes a range of action items that, if implemented, would reduce loss from hazard events in Santa Cruz County. Together, the action items in the LHMP provide the framework for activities that the County can choose to implement over the next five years. The planning team has prioritized the plan's goals and identified actions that will be implemented (resources permitting) through existing plans, policies, and programs.

The Planning Department has taken on the responsibility for overseeing the plan's implementation and maintenance through the County's existing programs. The Director of Planning or designated appointee will assume lead responsibility for facilitating LHMP implementation and maintenance meetings. Although the Planning Department will have primary department responsibility for review, coordination, and promotion, plan implementation and evaluation will be a shared responsibility among all departments identified as lead departments in the mitigation action plan. The Planning Department will continue to work closely with the Emergency Operations Manager to insure consistency in Plans.

16.2 Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): The plan shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as the comprehensive or capital improvement plans when appropriate.

The information on hazard, risk, vulnerability, and mitigation contained in this plan is based on the best information and technology available at the time the LHMP was prepared. As previously stated, the County's General Plan is considered to be an integral part of this plan. The County, through adoption of its 1994 General Plan Safety Element goals, and as amended in 2020, has planned for the impact of natural hazards. The LHMP process provided the County with the opportunity to review and expand on policies contained within the General Plan. The County views the General Plan and the LHMP as complementary planning documents that work together to achieve the ultimate goal of the reduction of risk exposure to the citizens of Santa Cruz. Many of the ongoing recommendations identified in the mitigation strategy are programs recommended by the General Plan, the Urban Water Management Plan, the Capital Improvement Program, and other adopted plans.

The County will coordinate the recommendations of the LHMP with other planning processes and programs including the following:

- County Emergency Management Plan
- Capital Improvement Program
- County of Santa Cruz Building Codes
- Community design guidelines
- Water conservation guidelines
- Storm Water Management Program
- Climate Action Strategy

- General Plan Safety Element

Most action items do not need to be implemented through regulation. Instead, these items can be implemented through the creation of educational programs, continued interdepartmental and interagency coordination, or improved public participation.

16.3 Continued Public Involvement

Requirement §201.6(c)(4)(iii): The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

The public will continue to be apprised of LHMP actions through the County website and by providing copies of the annual progress reports to the media. Copies of the LHMP will be distributed to the Santa Cruz Library System. Upon initiation of the LHMP up-date process, a new public involvement strategy will be initiated based on guidance from the committee. This strategy will be based on the needs and capabilities of the County at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area and the County's website.

The next plan update will include a schedule of public outreach activities that will begin one year prior to the completion of the next five-year update. The schedule will include public outreach through existing planning mechanisms that will engage and encourage feedback. This will include presentations on the plan's progress at regularly scheduled meetings of the Disaster Management Council, the Commission on the Environment, and the Fire Prevention Officers Association, and the Board of Supervisors. These meetings occur on a quarterly basis and will allow for both public and stakeholder input during throughout the year long update process. These meeting will begin in the first quarter of the year. This process will be accompanied and enhanced by postings on the County's social media and interactive website.

The Plan is implemented on an ongoing basis through a number of planning mechanisms such as the Climate Action Strategy, Capital Improvement Program, water resources management, building codes, and other planning mechanisms. The Plan will be monitored and maintained on an ongoing basis through implementation of the various planning mechanisms. The Planning Department reports annually to the Board of Supervisors on implementation of the Climate Action Strategy, for example. As a publicly noticed agenda item before the Board of Supervisors, there is an opportunity for public input. Similarly, the CIP, water resources management reports, floodplain management reports are presented annually in the same manner to the Board of Supervisors. In addition, the Planning Department recently engaged in an update of the General Plan Safety Element, which includes updates to policies addressing, development in floodplains, beaches, and coastal bluffs, fire hazards, erosion hazards, and airport safety.

Part 6 Adoption by the Board of Supervisors

Requirement §201.6(c)(5): The plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan.

This page intentionally left blank as a placeholder. The updated LHMP will be reviewed and approved by the California Governor's Office of Emergency Services (Cal OES) and the Federal Emergency Management Agency (FEMA) pending adoption by the Board of Supervisors.

This page intentionally left blank

Appendices

This page intentionally left blank

Appendix A Hazards Not a Risk to Santa Cruz County

AVALANCHE

An avalanche is defined as a mass of loosened snow, ice, or earth suddenly and swiftly sliding down a mountain. In general practice this is assumed to be a snow avalanche unless another term such as ice, rock, mud, etc., is used. The Sierra Nevada Mountains which are over 200 hundred miles from Santa Cruz County are the nearest area with a risk of avalanche. This is not considered a significant hazard risk.

Source: <https://avalanche.org/>

HURRICANES, TYPHOONS AND COASTAL STORMS

A hurricane is a severe tropical storm that forms in the North Atlantic Ocean, the Northeast Pacific Ocean east of the dateline, or the South Pacific Ocean east of 160°. Hurricanes need warm tropical oceans, moisture, and light winds above them. If the right conditions last long enough, a hurricane can produce violent winds, incredible waves, torrential rains, and floods. In other regions of the world, these types of storms have different names. This is called a typhoon when they occur in the Northwest Pacific. A tropical storm becomes a hurricane when winds reach 74 mph. When hurricanes move onto land, the heavy rain, strong winds and heavy waves can damage buildings, trees, and cars. The heavy waves are called a storm surge. Storm surges are very dangerous as they threaten low-lying coastal lands with inundation.

Coastal storms in Santa Cruz consist of precipitation, occasional high winds, and heavy waves. Because the County is not in an area subject to hurricanes, the risks from coastal storms are generally limited to flooding and coastal erosion, which are discussed separately.

Source: National Hurricane Center, National Oceanic & Atmospheric Administration U.S. Department of Commerce

<https://www.nhc.noaa.gov/>

LAND SUBSIDENCE

Land subsidence is defined as a settling, compaction, or caving in of land caused by subsurface mining, ground-water withdrawal, thawing permafrost, or pumping of oil and gas. Land subsidence occurs in Santa Cruz only in conjunction with severe coastal storms and earthquake and is addressed under those topics.

Source: [USGS, Water Resources, Land Subsidence](#)

WINTER STORMS and HAILSTORMS

Severe winter storms and weather include extreme cold, heavy snowfall, ice storms, winter storms, and/or strong winds. In addition, winter storms may result in other hazards such as flooding, severe thunderstorms, tornadoes, or extreme winds.

Snow has been reported in nearly every part of California, but it is very infrequent west of the Sierra Nevada except at high elevations of the Coast Range and the Cascades. Santa Cruz County is in a mild coastal area without risk of heavy snowfall or ice storms.

Source: National Centers for Environmental Information, National Oceanic & Atmospheric Administration U.S. Department of Commerce
<https://www.ncdc.noaa.gov/>

TORNADOS

A tornado is a violently rotating column of air extending between, and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as a funnel cloud. On a local-scale, tornadoes are the most intense of all atmospheric circulations with wind that can reach destructive speeds of more than 300 mph.

Since 1950, 292 tornadoes have occurred in 42 counties throughout California resulting in 103 injuries. However, since 1950, no deaths caused by tornadoes have been recorded in California. A search of NOAA Satellite and Information Service shows seven minor tornadoes in Santa Cruz on record since 1965. There were no deaths and only minor property damage.

Source: National Centers for Environmental Information, National Oceanic & Atmospheric Administration U.S. Department of Commerce
<https://www.ncdc.noaa.gov/>

VOLCANOES

Volcanoes are described as a vent in the Earth's crust through which molten or hot rock, steam, and ash reach the surface, including the cone built by the eruptions. At least ten eruptions have taken place in the past 1,000 years—most recently, the Lassen Peak eruption of 1914–17 in northern California—and future volcanic eruptions are inevitable. Based on the record of volcanic activity over the last five millennia, the probability of another small- to moderate-sized eruption in California in the next 30 years is estimated to be similar to the forecast for a magnitude 6.7 or greater earthquake specific to the San Andreas Fault in the San Francisco Bay region. The U.S. Geological Survey's (USGS) national volcanic threat assessment (Ewert and others, 2005; 2018) identifies eight young volcanic areas, designated as moderate, high, or very high threat, dispersed throughout the state—from the Oregon border southward to Mexico. All of these areas are relatively distant from Santa Cruz County, therefore, the risk to the County of significant impacts from volcanic activity is considered low.

Source: Mangan, M., Ball, J., Wood, N., Jones, J.L., Peters, J., Abdollahian, N., Dinitz, L., Blankenheim, S., Fenton, J., and Pridmore, C., 2019, California's exposure to volcanic hazards (ver. 1.1, December 2019): U.S. Geological Survey Scientific Investigations Report 2018–5159, 49 p.,
<https://doi.org/10.3133/sir20185159>.

Appendix B Acronyms and Abbreviations

BFE	Base flood elevation
CAGS	California Geological Survey
CBC	California Building Code
CCR	California Code of Regulations
CDF	California Department of Forestry
CERT	Community Emergency Response Team
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CFS	Cubic feet per second
CIP	Capital improvement Program
CRS	Community Rating System
DHS	U.S. Department of Homeland Security
DMA	Disaster Mitigation Act (Public Law 106-390)
DOF	Depth of flooding
EIR	Environmental impact report
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FIS	Flood Insurance Study
Ft	Feet
GHG	Greenhouse gas
GIS	Geographical information system
HMGP	Hazard Mitigation Grant Program
IBC	International Building Code
Km	Kilometer
M	Magnitude
MCE	Maximum credible earthquake
MH	Multi-hazard
ML	Local magnitude
Mph	Miles per hour
NA	Not applicable
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NFIRS	National Fire Incident Reporting System
NOAA	National Oceanic and Atmospheric Administration
OES	California Governor's Office of Emergency Services
OR3	County Office of Response, Recovery, and Resilience
PDM	Pre-Disaster Mitigation Grant Program
RCRA	Resource Conservation and Recovery Act
SEMS	Standardized Emergency Management System
SFHA	Special flood hazard area
SHELDUS	Spatial Hazard Events and Losses Database for U.S.
UBC	Uniform Building Code
USACE	U.S. Army Corps of Engineers

This page intentionally left blank

Appendix C Glossary of Terms

100-Year Flood	The term “100-year flood” can be misleading. The 100-year flood does not necessarily occur once every 100 years. Rather, it is the flood that has a 1 percent chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The Federal Emergency Management Agency (FEMA) defines it as the 1 percent annual chance flood, which is now the standard definition used by most federal and state agencies and by the National Flood Insurance Program (NFIP).
Acre-Foot	An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre-foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.
Action	Program, project, or specific act taken to promote goal, in this case the goal of hazard mitigation.
Asset	An asset is any human-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.
Base Flood Elevation (BFE):	The BFE is the water surface elevation of a 100-year flood event (a flood that has a 1 percent chance of occurring in any given year as defined by the NFIP). The base flood is a statistical concept used to ensure that all properties subject to NFIP are protected to the same degree against flooding.
Basin:	A basin is the area within which all surface water – whether from rainfall, snowmelt, springs, or other sources – flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as “watersheds” and “drainage basins.”
Benefit:	A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.
Benefit/Cost Analysis	A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.
Building:	A building is defined as a structure that is walled and roofed, principally above the ground, and permanently fixed to a site. The term includes manufactured homes on permanent foundations on which the wheels and axles carry no weight.

Capability Assessment	A capability assessment provides a description and analysis of a community’s current capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency’s mission, programs, and policies, and an analysis of its capacity to carry them out. A capability assessment is an integral part of the planning process in which a community’s actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified.
Community Rating System (CRS)	The CRS is a voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.
Critical Facility	A critical facility is vital to the City’s ability to provide essential services and protect life and property. Loss of a critical facility would result in a severe economic or catastrophic impact; Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers needed for disaster response before, during, and after hazard events; Public and private utilities and infrastructure vital to maintaining or restoring normal services to areas damaged by hazard events; Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a hazard event.
Dam	A dam is any artificial barrier or controlling mechanism that can or does impound 10 acre-feet or more of water.
Dam Failure	Dam failure refers to a partial or complete breach in a dam (or levee) that impacts its integrity. Dam failures occur for a number of reasons, such as flash flooding, inadequate spillway size, mechanical failure of valves or other equipment, earthquakes, and intentional destruction.
Debris	Debris refers to the scattered remains of assets broken or destroyed during the occurrence of a hazard. Debris caused by wind or water hazards can cause additional damage to other assets.
Depth of Flooding (DOF)	The DOF is the difference between regulatory flood elevation (RFE) and the elevation of the lowest grade adjacent to a structure.
Disaster Mitigation Act of 2000 (DMA)	The DMA is Public Law 106-390 and is the latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving financial assistance under the Robert T. Stafford Act. The DMA emphasizes planning for disasters before they occur. Under the DMA, a pre-disaster hazard mitigation program, and new requirements for the national post-disaster hazard mitigation grant program (HMGP) were established.
Drought	Drought is a period of time without substantial rainfall from one year to the next. Drought can also be defined as the cumulative impacts of several dry years or a deficiency of precipitation over an extended period of time, which in turn results in water shortages. A hydrological drought is caused by deficiencies in surface and subsurface water supplies. A socioeconomic drought impacts the health, well-being, and quality of life or starts to have an adverse impact on a region. Drought is a normal, recurrent feature of climate and occurs almost everywhere.

Duration	Duration is defined as the length of time that a hazard occurs. For example, the duration of a tornado can be minutes, but release of a chemical warfare agent such as mustard gas can persist for hours or weeks if unremediated.
Earthquake	An earthquake is defined as a sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy. Earthquakes can last from a few seconds to over 5 minutes and have been known to occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris as shocks shake, damage, or demolish buildings and other structures.
Exposure	Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.
Extent:	The extent is the size of an area affected by a hazard.
Federal Emergency Management Agency (FEMA)	An independent agency (now part of the Department of Homeland Security) created in 1978 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery.
Fire Behavior	Fire behavior refers to the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).
Flash Flood	A flash flood occurs with little or no warning when water levels rise at an extremely fast rate.
Flooding	Flooding is a general and temporary condition of rising and overflowing water resulting in partial or complete inundation of normally dry land areas. Floods result from: (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation of runoff of surface water from any source, and (3) mudflows or the sudden collapse of shoreline land.
Flood Depth	Flood depth is the height of the floodwater surface above the ground surface.
Flood Elevation	Flood elevation is the height of water surface above an established datum (for example, the National Geodetic Vertical Datum of 1929 [NGVD], North American Vertical Datum of 1988, or mean sea level).
Flood Insurance Rate Map (FIRM)	FIRM is the official map of a community for which FEMA has delineated the special flood hazard area (SFHA) and the risk premium zones applicable to the community.
Flood Insurance Study	A flood insurance study is published for a community by the Federal Insurance and Mitigation Administration in conjunction with the community's FIRM. The study contains background data such as base flood discharges and water surface elevations that were used to prepare the study.
Floodplain	A floodplain is any land area that becomes inundated with water during a flood or from any other source. Floodplain can be defined in different ways but is commonly defined as the area that is also called the 100-year floodplain.

Floodway	A floodway is an area within a floodplain reserved for the purpose of conveying flood discharge without increasing the BFE by more than 1 foot. Generally speaking, no development is allowed in floodways because any structures there would block the flow of floodwater.
Frequency	For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.
General Plan	California state law requires that every county and city prepare and adopt a comprehensive long-range plan to serve as a guide for community development. The plan must consist of an integrated and internally consistent set of goals, policies, and implementation measures. In addition, the plan must focus on issues of the greatest concern to the community and be written in a clear and concise manner. County actions, such as those relating to land-use allocation, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with such a plan.
Goal	A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of the RHMP, once implemented, should be measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).
GIS	GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.
Hazard	A hazard is a source of potential danger or adverse condition that could harm people and/or cause property damage. Natural hazards include floods, tsunamis, and earthquakes. Human-made hazards include acts of terrorism and hazardous material spills.
Hazard Mitigation Grant Program (HMGP)	Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster.
Hazard Mitigation Plan	A hazard mitigation plan is a collaborative document that identifies hazards that could affect a community, assesses vulnerability to hazards, and represents consensus decisions reached on how to minimize or eliminate the effects of hazards.

HAZUS-MH	Hazards U.S. Multi-Hazard (HAZUS-MH) Loss Estimation Program is a GIS-based program used to support the development of risk assessments as required under the DMA. The HAZUSMH software program assesses risk in a quantitative manner to estimate damages and losses associated with natural hazards. HAZUS-MH is FEMA’s nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods, and wind hazards.
Hydraulics	Hydraulics is the branch of science or engineering that addresses fluids (especially water) in motion in rivers or canals, works and machinery for conducting or raising water, the use of water as a prime mover, and other fluid-related areas.
Hydrology	Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.
Intensity	Intensity refers to the measure of the effects of a hazard.
Inventory	The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs, and community resources are at risk. Assets include people, buildings, transportation, and other community resources.
Landslide	A landslide refers to the sliding movement of masses of loosened rock and soil down a hillside or slope under the force of gravity. Fundamentally, slope failure occurs when the strength of soils forming the slope is exceeded by pressure acting upon the soils (caused by factors such as weight or saturation).
Liquefaction	Liquefaction is the failure of soils when soils lose shear strength and flow horizontally during earthquakes. Liquefaction is most likely to occur in fine-grained sands and silts with high water content. Liquefaction undermines the ground’s ability to solidly support building structures. Foundations on liquefiable soils can lose their ability to support load and can experience settlement on the order of several inches or more. This situation is extremely hazardous and may result in extreme property damage and threats to life and safety. Differential settlement can cause significant damage to buildings, lifelines, and transportation structures with partial or total collapse.
Magnitude	Magnitude is the measure of the strength of an earthquake, typically measured by the Richter Scale. Magnitude is most commonly measured by local magnitude (ML) used by the Richter Scale or by Mercalli Intensity. In the Richter Scale, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.
Mitigation Actions	Mitigation actions are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

NFIP	National Flood Insurance Program (NFIP): In 1968, Congress created the NFIP in response to the rising cost of taxpayer-funded disaster relief for flood victims and the increasing amount of damage caused by floods. The Mitigation Division is the FEMA section that manages the NFIP and oversees the floodplain management and mapping components of the program. Nearly 20,000 communities across the United States and its territories participate in NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities.
Objective	An objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.
Peak Ground Acceleration	Peak ground acceleration is a measure of the highest amplitude of ground shaking that accompanies an earthquake based on a percentage of the force of gravity.
Preparedness	Preparedness refers to actions that strengthen the capability of government, citizens, and communities to respond to disasters.
Presidential Disaster Declaration	These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.
Probability of Occurrence	The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.
Recovery	Recovery refers to actions taken by an individual or community after a catastrophic event to restore order and community lifelines.
Repetitive Loss Property	A repetitive loss property is any NFIP-insured property that, since 1978 and regardless of any change(s) of ownership during that period, has experienced any of the following: <ul style="list-style-type: none"> • Four or more paid flood losses exceeding \$1,000 each • Two paid flood losses exceeding \$1,000 each within any 10-year period since 1978 • Three or more paid losses that equal or exceed the current value of the insured property

Risk	Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
Risk Assessment	Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards and focuses on <ol style="list-style-type: none"> 1. hazard identification; 2. impacts of hazards on physical, social, and economic assets; 3. vulnerability identification; and 4. estimates of the cost of damage or costs that could be avoided through mitigation.
Risk Ranking	This ranking serves two purposes, first to describe the probability that a hazard will occur, and second to describe the impact a hazard will have on the people, property, and economy of Santa Cruz. Risk estimates for the City are based on the methodology that the City used to prepare the risk assessment for this plan. The following equation shows the risk ranking calculation: Risk Ranking = Probability + Impact (people + property + economy)
Riverine	Riverine refers to anything of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.
Stafford Act	The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.
Tornado	A tornado is a violently rotating column of air extending between and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as funnel clouds. Tornadoes are the most intense of all atmospheric circulations. Winds can reach speeds of more than 300 mph. A tornado's vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long.
Vulnerability	Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed	A watershed is an area that drains down gradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.
Wildfire or Wildland Fire	These terms refer to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, topography, and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.
Windstorm	Windstorms are generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage.
Zoning Ordinance	The zoning ordinance designates allowable land use and intensities for the City. Zoning ordinances consist of two components: a zoning text and a zoning map.

Appendix D Critical County Facilities and Emergency Shelters

A critical facility is vital to a community’s ability to provide essential services and protect life and property. Loss of a critical facility would result in a severe economic or catastrophic impact. Under the Santa Cruz County Local Hazard Mitigation Plan definition, critical facilities include the following: Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers needed for disaster response before, during, and after hazard events; Public and private utilities and infrastructure vital to maintaining or restoring normal services to areas damaged by hazard events; Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a hazard event. The first table contains the list of County Department of Public Works critical facilities depicted on Figures 4 and 5. The second table contains the list of critical facilities depicted on Figure 6. The third table contains a list of sites available for use as emergency shelters.

Public Works Critical Facilities (see Figures 4 and 5)

Facility	Location
Ben Lomond Transfer Station	Newell Av, Ben Lomond
Buena Vista Landfill	Buena Vista Drive at Harkins Slough Rd
38 th Ave Drainage Facility	Southeast corner 38 th Ave and Brommer St
Felton Yard	201 Hihn St, 95018
Brommer Yard	2700 Brommer St, 95062
D.A. Porath Sanitation Facility	2750 Lode St, 95062
Roy Wilson Yard	198 Grimmer Road, 95076
Davenport Water Treatment Facility	700 Highway 1, 95017
Boulder Creek Wastewater Treatment Plant	End of Lake Dr, Boulder Creek, 96006
Pajaro River and Salsipuedes Creek Levees and Flood Gates	Along Pajaro River and Salsipuedes Creek
All sanitation pump stations and treatment plants	County-Wide
All county-maintained bridges and major culverts	County-Wide
Approximately 600 miles of County-maintained roads	County-Wide
County rain and stream gauges	County-Wide

Critical Facilities (see Figure 6)

Facility	Location
AMR - Ambulance	10 Victor Square, Scotts Valley
Camps/Recreation	
Veterans Memorial Building	842 Front St 95060
Museum of Art & History (MAH)	705 Front St 95060
Simpkins Swim Center	979 17th Ave 95062
Live Oak Senior Center	1777 Capitola Rd 95062
Capitola Community Center	4400 Jade St 95010
Aptos Village Park Hall	100 Aptos Creek Rd 95003
Pinto Lake Park Hall	757 Green Valley Rd 95076
JJ Crosetti Hall	2601 E Lake Ave 95076

Harvest Building	2601 E Lake Ave 95076
Fine Arts Building	2601 E Lake Ave 95076
Santa Cruz County Fairgrounds Grange Hall	2601 E Lake Ave 95076
Moose Lodge # 545	2470 El Rancho 95067
Quail Hollow Ranch	800 Quail Hollow Rd 95018
Loma Prieta Community Center	23800 Summit Road 95033
Seventh Day Adventist Camp	1931 Soquel San Jose Rd, Soquel 95062
Valencia Park Hall	2555 Valencia Rd 95003
Churchs	
New Life Center	707 Fair Ave 95060
First United Methodist Church	250 California St, Santa Cruz 95060
Calvary Episcopal Church	532 Center St, Santa Cruz 95060
Messiah Lutheran	801 High St, Santa Cruz 95960
Trinity Presbyterian Church	420 Melrose Ave, Santa Cruz 95062
St Philip Episcopal Church	5271 Scotts Valley Dr 95066
Twin Lakes Church	2701 Cabrillo College Dr, Aptos
Resurrection Catholic Church	7600 Soquel Dr. Aptos 95003
St Andrews Presbyterian Church	9850 Monroe Ave, Aptos 95003
New Hope Community Church	7200 Freedom Blvd. 95003
Christ Lutheran Church of Aptos	10707 Soquel Dr 95073
Our Lady Help of Christian Valley	2401 East Lake Ave, Watsonville 95076
Our Lady Help of Christian Valley	2401 East Lake Ave, Watsonville 95076
St Lawrence Orthodox Church	6192 Highway 9, Felton 95018
Mt Cross Ministries Lutheran Camp	7795 Hwy 9 95005
Trinity Bible Church	7301 Highway 9, Felton 95018
St Andrews Episcopal Church	101 Riverside Ave, Ben Lomond 95005
Corralitos Community Church	26 Browns Valley Rd 95076
Holy Eucharist Catholic Community	527 Corralitos Rd, Watsonville 95076
Clinics	
Kaiser Permanente Clinic - Santa Cruz	115 Locust Street Santa Cruz 95060
Santa Cruz County Clinic- Santa Cruz	1080 Emeline Ave, Santa Cruz
HPHP-Coral Street Clinic	115-A Coral St, Santa Cruz
Clinica Del Valle	45 Nielson St, Watsonville
Satellite Healthcare (Dialysis Center)	40 Penny Lane Ste 1 Wts 95076
Kaiser Permanente Clinic - Watsonville	1931 Main Street Watsonville 95076
Kaiser Permanente Clinic - Scotts Valley	5615 Scotts Valley Dr
Dominican Medical Offices	1595 Soquel Drive 95062
Santa Cruz Psychiatric Health	2250 Soquel Ave Santa Cruz 95062
Satellite Healthcare (Dialysis Center)	3801 Clares Street Captola 95010
Cabrillo College Health Center	6500 Soquel Dr.
Juvenile Hall Clinic	3650 Graham Hill Road, Felton

County-Owned Buildings	
County Warehouse	220 A Fern St 95060
Santa Cruz County Warehouse	2861 Mission St 95060
County Government Center	701 Ocean St 95060
County Offices	1020 Emeline Ave 95060
Homeless Shelter	115 Coral St 95060
County Jail	259 Water St 95060
County Probation Office	303 Water St 95060
County Offices Child Support Services	440 May Ave 95060
County Offices Child Support Services	420 May Ave 95060
Santa Cruz Regional 9-1-1	495 Upper Park Rd 95065
Veterans Memorial Building	215 E Beach St 95076
Paloma House Treatment Program	321 E Beach St 95076
Health Clinic	12 W Beach St 95076
County Courthouse Watsonville	101 Second St 95076
WIC (Women, Infant Children)	18 W Lake Ave 95076
Agriculture Commissioner	175 West Ridge Dr 95076
Encompass / Papas Family Counseling	225 Westridge 95076
Santa Cruz County Clinic - Watsonville	1430 Freedom Blvd 95076
Children's Medical Services	1430 Freedom Blvd 95076
County Animal Shelter	2200 7th Ave 95062
Mosquito Abatement & Vector Control Office	640 Capitola Rd 95062
Community Counseling	941 El Dorado Ave 95062
DPW Lode Street Facility	2750 Lode St 95062
Sheriff's Headquarters (Operations/Patrol)	5400 Soquel Ave 95060
Sheriff's Department Headquarters	5200 Soquel Av.
Sheriff's Headquarters (Forensics/Coroner)	2400 Chanticleer Ave 95060
DPW Brommer Yard	2700 Brommer 95062
Porter Memorial Library	3050 Porter St 95073
Wilson Yard Facility	198 Grimmer Rd 95076
Buena Vista Landfill	1231 Buena Vista Dr
Rountree Detention Facility	90 Rountree Ln 95076
County Offices	1400 Emeline Ave 95060
Juvenile Hall	3650 Graham Hill Rd 95018
Highlands Park Hall	8500 Hwy 9 95005
Ben Lomond Transfer Station	9835 Newell Creek Rd 95005
DPW Felton Yard	201 Hihn St
Emergency Operations Centers	
County Health Dept DOC	1080 Emeline 95062
Santa Cruz County Emergency Ops Center	5200 Soquel Av.
CZU Emergency Command Center	6059 Hwy 9 95018

Fire Stations	
Santa Cruz Fire Station 3	335 Younglove Ave 95062
Santa Cruz Fire Station 1	711 Center St 95060
Santa Cruz Fire Station 2	1103 Soquel Ave 95062
Watsonville Fire Station 2	370 Airport Blvd 95076
Watsonville Fire Station 1	115 2nd Street 95076
Scotts Valley Fire Station 1	7 Erba Lane 95066
Scotts Valley Fire Station 2	251 Glenwood Dr 95066
Central Fire Station 2	3445 Thurber Ln 95065
Central Fire Station 1	930 17th Ave 95062
Central Fire Station 3	4747 Soquel Dr 95073
Central Fire Station 4	405 Capitola Ave 95010
Aptos La Selva Fire Station 5	6934 Soquel Dr 95003
Rio Del Mar Fire Station 6	300 Bonita Dr 95003
La Selva Beach Fire Station 7	312 Estrella Ave 95003
CalFire Station 42 Pajaro Dunes	50 Rio Boca Rd
CalFire Station 33 Big Creek	240 Swanton Rd 95017
CalFire Station 37 Davenport Volunteer	75 Marine View Ave 95060
CalFire Station 38 Paradise Park	211 Keystone Wy
CalFire Station 32 Martin Volunteer	975 Martin Rd 95060
Felton Fire Station	131 Kirby St 95018
CalFire Station 39 CZU HQ	6059 Hwy 9 95018
Zayante Fire Station 1	7700 E Zayante Rd 95018
Zayante Fire Station 2	10580 Lompico Rd, 95018
Ben Lomond Fire Station 1	9430 Hwy 9 95005
CalFire Station 34 McDermitt Volunteer	7276 Empire Grade 95060
CalFire Station 31 Fall Creek	7272 Empire Grade 95060
CalFire Camp 80 Ben Lomond	13575 Empire Grade 95060
Boulder Creek Fire Station 1	13230 Central Ave 95006
CalFire Station 23 Jamison Creek	16115 Jamison Creek Rd 95006
CalFire Station 21 Saratoga Summit	12900 Skyline Blvd 95030
CalFire Station 29 Las Cumbres Volunteer	18271 Las Cumbres 95030
Zayante Fire Station 3	15585 Upper Zayante
CalFire Station 36 Loma Prieta Volunteer	17445 Old Summit Rd, Los Gatos
CalFire Station 47 Burrell	25050 Highland Wy, Los Gatos, CA 95030
Branciforte Fire Station 2	2300 Jarvis Rd, Santa Cruz CA 95065
Branciforte Fire Station 1	2711 Branciforte Dr 95065
CalFire Station 43 Soquel	4750 Soquel San Jose Rd 95073
CalFire Station 49 Corralitos	120 Eureka Canyon 95076
CalFire Station 45 Pajaro Valley	562 Casserly Rd 95076
Hospitals	

Watsonville Community Hospital	75 Nielson St, Watsonville
Sutter Maternity and Surgery Center	2900 Chanticleer Av, Santa Cruz
Dominican Hosptial - Dignity Health	1555 Soquel Drive 95062
Libraries	
Live Oak Library	2380 Portola Dr, Santa Cruz
Aptos Public Library	7695 Soquel Drive, Aptos
Boulder Creek Library	13390 W Park St 95006
Police Stations	
Santa Cruz Police Department	155 Center Street
Scotts Valley Police Department	1 Civic Center Drive
Capitola Police Department	410 Capitola Avenue
Watsonville Police Department	215 Union Street
Rest-Nursing-Group Homes	
Valley Convalescent Hospital	919 Freedom Blvd Watsonville Ca 95076
Watsonville Post-Acute Center	525 Auto Center Dr Watsonville 95076
Watsonville Nursing Center	535 Auto Center Dr Watsonville 95076
Dominican Oaks Senior Housing	3400 Paul Sweet Rd Santa Cruz CA95065
Hearts and Hands	2990 Soquel Ave Santa Cruz Ca 95062
Santa Cruz Post-Acute	1115 Capitola Rd Santa Cruz Ca 95062
Driftwood Convalescent Hospital	675 24th Ave Santa Cruz Ca 95062
Pacific Coast Manor	1935 Wharf Rd Capitola Ca 95010
Aegis Assisted Living	125 Heather Te #100 Aptos Ca 95003
Schools	
Westlake Elementary	1000 High St, Santa Cruz
Pacific Collegiate Charter	3004 Mission St., Santa Cruz
Spring Hill Advanced School	250 California St, Santa Cruz
Mission Hill Middle	425 King St, Santa Cruz
Santa Cruz High	415 Walnut St, Santa Cruz
De Laveaga Elementary	1145 Morrissey Blvd, Santa Cruz
Branciforte Middle	315 Poplar St, Santa Cruz
Monarch Elementary	840 North Branciforte Avenue
Ark Independent Studies	840 North Branciforte Avenue
Alternative Family Education	840 North Branciforte Avenue
Costanoa Continuation High	840 North Branciforte Avenue
Gault Elementary	1320 Seabright Ave, Santa Cruz
Freedom Elementary	25 Holly Dr, Freedom
Starlight Elementary	225 Hammer Dr, Watsonville
Cesar E. Chavez Middle	440 Arthur Rd, Watsonville
H. A. Hyde Elementary	125 Alta Vista Ave, Watsonville
Mintie White Elementary	515 Palm Ave, Watsonville
E. A. Hall Middle	201 Brewington Ave, Watsonville

Scotts Valley Middle	8 Bean Creek Rd, Scotts Valley
Good Shepherd Catholic School	2727 Mattison Ln, Santa Cruz
VHM Christian	427 Capitola Rd Ext, Santa Cruz
Green Acres Elementary	966 Bostwick Ln, Santa Cruz
Bay School, The	1026 Capitola Road, Santa Cruz
Shoreline Middle	855 17th Ave, Santa Cruz
Del Mar Elementary	1959 Merrill St, Santa Cruz
Live Oak Elementary	1916 Capitola Rd, Santa Cruz
Soquel Elementary	2700 Porter St, Soquel
Soquel High	401 Old San Jose Rd, Soquel
New Brighton Middle School Gym	250 Washburn Ave, Capitola
New Brighton Middle School Cafeteria	250 Washburn Ave, Capitola
Twin Lakes Christian	2701 Cabrillo College Dr, Aptos
Cabrillo College Cafeteria	6500 Soquel Dr. Bldg 900
Cabrillo College Gymnasium	6500 Soquel Dr. Bldg 1100
Mar Vista Elementary	6860 Soquel Dr, Aptos
Web of Life Field School	220 Cloister Ln, Aptos 95003
Valencia Elementary	250 Aptos School Rd, Aptos
Orchard School	2288 Trout Gulch Rd, Aptos
Aptos Junior High	1001 Huntington Dr, Aptos
Aptos High	100 Mariner Way, Aptos
St. Abraham's Classical Christian Academy	1940 Bonita Dr, Aptos
Renaissance High Continuation	11 Spring Valley Rd, Watsonville
Monterey Bay Academy	783 San Andreas Rd, La Selva Beach
Calabasas Elementary	202 Calabasas Rd, Watsonville
Amesti Elementary	25 Amesti Rd, Watsonville
St. Francis High Salesian College Prep	2400 East Lake Ave, Watsonville
Alianza Charter	115 Casserly Rd, Watsonville
Watsonville Charter School of the Arts	75 Whiting Rd, Watsonville
Rio del Mar Elementary	819 Pinehurst Dr, Aptos
Pacific Elementary	50 Ocean St, Davenport
Santa Cruz Waldorf School	2190 Empire Grade, Santa Cruz
St Lawrence Academy	6180-a Hwy 9, Felton
Brook Knoll Elementary	151 Brook Knoll Dr, Scotts Valley
San Lorenzo Valley Elementary	7155 Hwy 9, Felton
San Lorenzo Valley Middle	7179 Hacienda Wy, Felton
San Lorenzo Valley High	7105 Hwy 9, Felton
C. T. English Middle	23800 Summit Rd, Los Gatos
Loma Prieta Elementary	23800 Summit Rd, Los Gatos
Santa Cruz Gardens Elementary	8005 Winkle Ave, Santa Cruz
Mountain Elementary	3042 Old San Jose Rd, Soquel

Tara Redwood School	5810 Prescott Rd, Soquel
Salesian Elementary and Jr. High	605 Enos Ln, Corralitos
Bradley Elementary	321 Corralitos Rd, Watsonville
Monte Vista Christian	2 School Way, Watsonville
Bonny Doon Elementary	1492 Pine Flat, Santa Cruz
<i>Sheriff Sub Stations</i>	
Sheriff Aptos Station Service Center	171 Aptos Village Way 95003
Sheriff South County Service Center	790 Green Valley Road 95076
Sheriff North Coast Service Center	75 Marine View Ave 95017
Sheriff San Lorenzo Valley Service Center	6062 Graham Hill Road 95018
Sheriff Boulder Creek Service Center	13210 Central Ave 95006

Emergency Shelters

Facility	Address
High St. Community Church	850 High St, Santa Cruz 95060
Peace United Church of Christ	900 High St, Santa Cruz 95060
Portuguese Community Hall	216 Evergreen
St. Francis Soup Kitchen	109 Amat St
Bay View Elementary	1231 Bay St, Santa Cruz
Santa Cruz Civic Auditorium	307 Church St SC 95060
Vintage Faith Church	350 Mission St, Santa Cruz 95060
Santa Cruz Bible Church	440 Frederick St, Santa Cruz 95062
Rolling Hills Middle	130 Herman Ave, Watsonville
Watsonville High	250 E Beach St, Watsonville
Pajaro Valley High	500 Harkins Slough Rd, Watsonville
All Saints' Episcopal Church	437 Rogers Ave, Watsonville 95076
Scotts Valley Senior Center	370 Kings Village Rd
Valley Vineyard Church	360 Kings Village Rd
Scotts Valley High	555 Glenwood Dr, Scotts Valley
Live Oak Grange #503	1900 17th Ave
Main Street Elementary	3400 North Main St, Soquel
Shorelife Community Church	875 Monterey Ave, Capitola 95010
St Joseph's Catholic Community	435 Monterey Ave, Capitola 95010
Cabrillo College Horticulture Center	6500 Soquel Dr Bldg 5000
Lakeview Middle	2350 E. Lake Ave, Watsonville
Big Creek Lumber / Davenport	3564 Hwy 1
Davenport Resource Center	150 Church St Davenport 95060
Felton Community Hall	6191 Hwy 9
St Johns Church	120 Russell Ave 9 Felton 95018
Felton Bible Church	5999 Graham Hill Rd
Boulder Creek Elementary	400 Lomond St, Boulder Creek

Redwood Glen Camp and Conference Center	3100 Bean Creek Rd
Mountain Bible Church of Loma Prieta	23946 Summit Rd
Happy Valley Elementary	3125 Branciforte Dr, Santa Cruz
Corralitos Community Center	30 Browns Valley Rd
Corralitos Woman's Club	33 Brown's Valley Rd
Pajaro Middle	250 Salinas Road
Ohlone Elementary	21 Bay Farms Road
New Brighton Middle	250 Washburn Ave, Capitola
Cabrillo College	6500 Soquel Dr.
Santa Cruz County Fairgrounds	2601 E Lake Ave 95076
Aromas Fire Station 1	492 Carpenteria Rd. in Aromas CA

Appendix E Senior Assisted Living Facilities

Source: State Department of Social Services www.ccl.dss.ca.gov/carefacilitysearch

Agency	Address	City	State	Zip
Aegis Assisted Living	125 Heather Terrace	Aptos	CA	95003
De Un Amor	460 Eureka Canyon Rd.	Corralitos	CA	95076
Dominican Oaks	3400 Paul Sweet Rd.	Santa Cruz	CA	95062
Dominican Rehabilitation Center	610 Frederick Street	Santa Cruz	CA	95061
Driftwood Health Center	675 24th Ave.	Santa Cruz	CA	95062
Oak Tree Villa	100 Lockwood Lane	Scotts Valley	CA	95066
Pacific Coast Manor	1935 Wharf Rd.	Capitola	CA	95010
Hearts & Hands Post-Acute Care & Rehab Center	2990 Soquel Ave.	Santa Cruz	CA	95062
Santa Cruz Skilled Nursing Center	2990 Soquel Ave.	Santa Cruz	CA	95062
Kindred Nursing and Transitional Care	1115 Capitola Rd.	Santa Cruz	CA	95062
Sunshine Villa	80 Front St.	Santa Cruz	CA	95060
Valley Convalescent Hospital	919 Freedom Blvd.	Watsonville	CA	95076
Watsonville Post-Acute Center	525 Auto Center Drive	Watsonville	CA	95076
Watsonville Nursing Center	535 Auto Center Dr.	Watsonville	CA	95076
Alexandria Victoria Assisted Living	226 Morrissey Blvd	Santa Cruz	CA	95062
Valley Haven Assisted Living	2266 Chanticleer Ave.	Santa Cruz	CA	95062
Chateau Guest House	1340 17th Ave.	Santa Cruz	CA	95062
Darwin House	707 Darwin Street	Santa Cruz	CA	95062
Hanover Guest House	813 Hanover Street	Santa Cruz	CA	95062
La Posada Retirement Community	609 Frederick Street	Santa Cruz	CA	95062
The Maple House I	410 Pennsylvania Ave.	Santa Cruz	CA	95062
The Maple House II	2000 Brommer Street	Santa Cruz	CA	95062
Bright View Care Home*	109 Behler Rd.	Watsonville	CA	95066
Mystic Oaks Assisted Living	163 Glenwood Drive	Scotts Valley	CA	95062
Oliveira's Guest Home	919 Summer Street	Santa Cruz	CA	95062
Opal Cliffs Residential Center	4795 Opal cliffs Drive	Santa Cruz	CA	95062
Rillera's Guest Home*	40 Fletcher Ct.	Watsonville	CA	95076
Seaview Guest Home	7321 Mesa Drive	Aptos	CA	95003
Shady Rest Manor	1836 16th Ave.	Santa Cruz	CA	95062
Soquel Leisure Villa*	4101 Fairway Drive	Soquel	CA	95073

Paradise Villa Assisted Living	2177 17th Ave.	Santa Cruz	CA	95062
Valley Haven Care Home	157 Herman Avenue	Watsonville	CA	95076
Villa Cruz Guest Home	127 Laurent Street	Santa Cruz	CA	95062
Watsonville Manor Residential Care	311 Montecito Ave.	Watsonville	CA	95076
Wesley House II	121 La Selva Drive	La Selva Beach	CA	95076
Wesley House III	123 La Selva Drive	La Selva Beach	CA	95076
Wesley House IV	922 Brewington Ave.	Watsonville	CA	95076

Hospitals

Dominican Santa Cruz Hospital, 1555 Soquel Drive, Santa Cruz

Sutter Maternity and Surgery Center, 2900 Chanticleer Avenue, Santa Cruz

Watsonville Community Hospital, 75 Nielson Street., Watsonville

Appendix F Public Schools

Source: - Santa Cruz County Office of Education (santacruzcoe.org)

Schools by District	Schools by District
Alternative Education Programs (Santa Cruz COE)	San Lorenzo Valley Unified School District
DeWitt Anderson School	Elementary Schools
El Nido	Boulder Creek
Escuela Quetzal	San Lorenzo Valley
Freedom Community School	Secondary Schools
La Manzana Personalized Learning	San Lorenzo Valley Middle School
Lighthouse High School	San Lorenzo Valley High
Loudon Nelson Community School	Charter Program
Natural Bridges High School/Green Careers Center	Santa Cruz City Schools
Oasis High School	Alternative Family Education (K – 12)
Phoenix Academy School	Elementary Schools
Ponderosa High School and Career Training Center	Bay View Elementary
Robert A. Hartman School	DeLaveaga Elementary
San Lorenzo Valley Community School	Gault Elementary
Seabright High School	Monarch Community School
Sequoia Academy	Westlake Elementary
Sequoia High School	Secondary Schools
Sequoia Junior High School	Ark Independent Studies
Star Community School	Branciforte Middle School
Star Personalized Learning Center (Star PLC)	Costanoa Continuation School
The Camp	Delta School (Charter High School)
The Cottage	Harbor High
Bonny Doon Union Elementary School District	Mission Hill Middle School
Bonny Doon Elementary	Santa Cruz Adult School
Happy Valley Union Elementary School District	Santa Cruz High
Happy Valley Elementary School District Office	Soquel High
Live Oak School District	Santa Cruz COE Charter Schools
Elementary Schools	Career Advancement Charter
Del Mar Elementary	Cypress Charter High School
Green Acres Elementary	Pacific Collegiate
Live Oak Elementary	Scotts Valley Unified School District

Ocean Alternative Education	Elementary Schools
Tierra Pacifica Charter (K-8)	Brook Knoll Elementary
Secondary School	Vine Hill Elementary
Shoreline Middle	Secondary School
Mountain Elementary School District	Scotts Valley Middle
http://www.mountainesd.org/	Scotts Valley High
Pacific Elementary School District	Soquel Union Elementary School District
Pacific Elementary School	Elementary Schools
Pajaro Valley Unified School District)	Main Street Elementary
Elementary Schools	Santa Cruz Gardens Elementary
Alianza Elementary	Soquel Elementary
Amesti Elementary	Secondary School
Ann Soldo Elementary	New Brighton Middle
Bradley Elementary	
Calabasas Elementary	
Freedom Elementary	
H.A. Hyde Elementary	
Hall Elementary	
Landmark Elementary	
Linscott Charter School	
MacQuiddy Elementary	
Mar Vista Elementary	
Mintie White Elementary	
Ohlone Elementary	
Radcliff Elementary	
Rio Del Mar Elementary	
Starlight Elementary	
Valencia Elementary	
Secondary Schools	
Aptos High	
Ceiba College Prep Academy	
Aptos Junior High	
E.A. Hall Middle	
Lakeview Middle School	
New School	

Pacific Coast Charter School
Pajaro Middle
Pajaro Valley High
Renaissance High
Rolling Hills Middle
Watsonville-Aptos Adult School
Watsonville Charter School of the Arts (K – 12)
Watsonville High

This page intentionally left blank

Appendix G Private Schools

Source: California Department of Education

VHM Christian
Central Christian School
Green Valley Christian School
Monte Vista Christian
Monterey Bay Academy
Moreland Notre Dame
Mount Madonna School
OASIS: Outdoor Autism and Special Issues School
Orchard School
Salesian Elementary and Jr. High
St. Abraham's Classical Christian Academy
St. Francis High School Salesian College Preparatory, Inc.
Pacific Sands Academy
St. Lawrence Academy
Gateway School
Holy Cross
Santa Cruz Children's School
Santa Cruz Waldorf School
Spring Hill School
The Bay School
Beach High School
Georgiana Bruce Kirby Preparatory School
Merit Academy
Baymonte Christian School
Brite Horizons School
Silicon Valley High School
Good Shepherd Catholic School
Merton Academy International - Arts & Career Technology
Santa Cruz Montessori
Twin Lakes Christian

This page intentionally left blank

Appendix H Successful Programs and Projects

County Organization

- Establishment of the Office of Response, Recovery, and Resiliency (OR3).

Wildfire Mitigation

- Implementation and use of a reverse 911 community notification and warning system
- Comprehensive mutual aid system for fire protection
- Routine and frequent training by local and state fire jurisdictions
- Annual Residential Defensible space education and enforcement programs
- Collaborative and cross jurisdiction Vegetation management programs including fuel reduction and shaded fuel break programs
- Preparation of a countywide Community Wildfire Protection Plan (CWPP)
- Implementation of new county building codes addressing WUI related issues including building materials, construction requirements, water system/supply and code enforcement
- Promotion of built-in fire extinguishing alarms and water systems
- Public Works Dept. roadside drainage ditch inspection and clearing, culvert inspection, cleaning, and debris removal programs
- “Large Woody Material Management Program” for streams in Dept. of Public Works and Environmental Health Dept.
- Fire protection and prevention is a very high priority issue, and the County has addressed this by maintaining our agreement with CAL Fire to run the County Fire program and improving interoperability of communication systems.
- The 2013 fire and building code has been adopted by all County Fire agencies and the County’s General Plan has been reviewed for consistency with the updated codes.
- County Fire continues to provide public education about fire prevention in public schools businesses and homes through events and annual inspections.

Flood and Coastal Erosion Mitigation

- Multi-year sediment study downstream from burned wildfire areas initiated by Flood Control and Water Conservation District
- Real-time flood control gauge installed by Flood control and Water Conservation District off Ormsby Rd. in the heart of the burn area
- Avenues (32nd to 37th) Drainage Project (phases 1 & 2)
- Mission Dr. drainage improvements
- Winkle Ave/Prather Lane Park drainage
- Thurber Lane drainage project
- 14th Ave. to Bonita Lagoon drainage
- Venice Dr. drainage improvements
- Soquel Dr.-Bargetto Bridge replacement
- East cliff Dr. emergency crib wall repair
- Repetitive loss properties foundation raising program

- Updated how we define substantial damage/substantial improvement in flood plain management to reflect current structure valuation
- Participation in the Community Rating System to improve flood plain management and reduce insurance costs
- Updating the Safety Element of the General Plan, the Geologic Hazards Ordinance, and the Flood Plain Ordinance

Earthquake Mitigation

- “Brace for the Quake” program – seismic retrofits for 1,524 housing units

Drought

- The Board of Supervisors has adopted a number of water conservation measures, including water efficient landscaping, prohibition on inefficient use of water, an update of the requirement for the retrofit of water efficient toilets and showerheads upon property transfer, and measures to encourage drought planning among small water systems
- The County participates in regional collaborations and partnerships such as the Integrated Regional Water Management Plan, Sustainable Groundwater Management, and the Water Conservation Coalition of Santa Cruz County.

Climate Change

- Adoption of Climate Action Strategy in February 2013 addressing greenhouse gas emissions reduction and adaptation to climate change.
- Updating the Public Safety Element of the General Plan, the Geologic Hazards Ordinance, and the Flood Plain Ordinance to require assessment of sea level rise in the hazard avoidance and mitigation analysis for projects.

Appendix I Tsunami Response Plan Concept of Operations

CONCEPT OF OPERATIONS

Special Case: Local Source Tsunami

Should an event produce a potential tsunami that could impact the County within two hours, public warning and evacuation operations will take place immediately. Warning and evacuation will not be delayed by information gathering or threat assessment.

Alert

Upon receipt of a Tsunami Watch or Warning from the California State Warning Center, NETCOM will notify all agencies as per the Tsunami Alert Notification Procedure. The OES staff will evaluate the threat and recommend many – if not all – of the following actions to the County Sheriff (Or Alternate):

- Conduct public warning in the Tsunami Inundation Area
- Notify all Operational Area public safety agencies and organizations
- Move all public safety resources out of the Tsunami Inundation Area
- Activate Operational Area EOC
- Hold over all public safety personnel at the end of current shift
- Stage additional safety resources outside of the Tsunami Inundation Area
- Begin Emergency Public Information efforts

Warning

In the event of a Tsunami Warning, population in the designated risk areas will be warned and advised to voluntarily evacuate to higher ground or safe refuge areas. The public will be instructed to move by the quickest method available to a point no less than 50 feet above sea level. The expected arrival time of the tsunami will also be provided if available. After warning the general public, alerting, and moving institutional populations such as schools or convalescent care facilities has the highest priority.

Evacuation

The Santa Cruz County Sheriff's Office will lead and direct the tsunami evacuation effort. In each incident area, fire agencies, Public Works, and CERT through field divisions. Resources will report to the Incident Commander and assist in the public warning and evacuation efforts. Evacuations are voluntary.

Public safety agencies will evacuate the tsunami inundation area at least thirty minutes prior to the expected arrival of the first wave. The public will remain outside the tsunami inundation area until the All Clear is sounded.

Traffic Control/Security

Law Enforcement will establish traffic control along evacuation routes and perimeter security operations at selected points. Evacuated residents and sightseers will be prohibited from entering the Tsunami Inundation Area under the authority of California Penal Code 409.5.

Two Tsunami Observation Posts will be established to monitor the arrival of the initial and any subsequent tsunami waves. Observers will maintain contact with NETCOM and report all activity.

Search and Rescue

For the purpose of coordinating emergency rescue operations, the Santa Cruz coast areas may be organized into six incidents:

- Watsonville
- Los Olas/Rio Del Mar
- Capitola
- New Brighton Beach
- Wharf/Boardwalk/Downtown Santa Cruz
- North Coast Beaches

Each incident will establish an Incident Command Post and will be resources with fire, law, EMS, public works, and communication assets. Each incident will establish Unified Command and an incident command team. Communications assets will be allocated to and coordinated within each incident prior to re-entering the inundation area.

Initial Incident Objectives:

- Conduct Search and Rescue
- Identify and Isolate Hazards
- Conduct Recovery Operations
- Conduct Security Operations

Damage Assessment

The Damage Assessment Unit at the Operational Area EOC will coordinate all damage assessment teams. Information will be forwarded to the Operational Area EOC Planning Section for evaluation and consolidation.

Emergency Public Information

The Public Information Officer (PIO) at the Operational Area EOC will coordinate all public information activities and will supervise field PIOs assigned to each incident. The PIO may recommend establishing a Joint Information Center (JIC) closer to the scene of the incident. The PIO may also recommend activating an Emergency Public Information Hotline.

Inundation Area Re-entry Policy

Tsunamis may produce several waves with subsequent waves larger than the first. Once public safety personnel and equipment have evacuated the inundation area, they will not re-enter the area until the "All Clear" message has been transmitted by NETCOM.

REFERENCES

Local Planning Guidance on Tsunami Response, Second Edition; A Supplement to the Emergency Planning Guidance for Local Governments. California Governor's Office of Emergency Services, May 1998.

Local Guidelines for Controlling Movement of People and Property During an Emergency. California Governor's Office of Emergency Services, July 1999.

Legal Guidelines for Flood Evacuation. California Governor's Office of Emergency Services, November 1997.

Tsunami Warning Systems and Procedures; Guidance for Local Officials. Oregon Emergency Management and the Department of Geology and Mineral Industries, 2001.

This page intentionally left blank

Appendix J Tsunami Inundation Map Preparation Methodology

Title

Tsunami Inundation Map for Emergency Planning

<https://www.conservation.ca.gov/cgs/tsunami/maps/santa-cruz>

Method of Preparation

Initial tsunami modeling was performed by the University of Southern California (USC) Tsunami Research Center funded through the California Emergency Management Agency (CalEMA) by the National Tsunami Hazard Mitigation Program. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping (Titov and Gonzalez, 1997; Titov and Synolakis, 1998).

The bathymetric/topographic data that were used in the tsunami models consist of a series of nested grids. Near-shore grids with a 3 arc-second (75- to 90-meters) resolution or higher, were adjusted to “Mean High Water” sea-level conditions, representing a conservative sea level for the intended use of the tsunami modeling and mapping.

A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides (Table 1). Local tsunami sources that were considered include offshore reverse-thrust faults, restraining bends on strike-slip fault zones and large submarine landslides capable of significant seafloor displacement and tsunami generation. Distant tsunami sources that were considered include great subduction zone events that are known to have occurred historically (1960 Chile and 1964 Alaska earthquakes) and others which can occur around the Pacific Ocean “Ring of Fire.”

Table 1: Tsunami sources modeled for the Santa Cruz County coastline.

Sources (M = moment magnitude used in modeled event)		Areas of Inundation Map Coverage and Sources Used		
		Pescadero	Santa Cruz	Monterey Bay Big
Local Source	Monterey Canyon Landslide			X
Distant Sources	Cascadia Subduction Zone-full rupture (M9.0)		X	
	Central Aleutians Subduction Zone #1 (M8.9)	X	X	X
	Central Aleutians Subduction Zone #2 (M8.9)		X	
	Central Aleutians Subduction Zone #3 (M9.2)	X		X
	Chile North Subduction Zone (M9.4)		X	
	1960 Chile Earthquake (M9.3)		X	
	1964 Alaska Earthquake (M9.2)	X	X	X
	Japan Subduction Zone #2 (M8.8)		X	
	Kuril Islands Subduction Zone #2 (M8.8)		X	
	Kuril Islands Subduction Zone #3 (M8.8)		X	
Kuril Islands Subduction Zone #4 (M8.8)		X		
Marianas Subduction Zone (M8.6)	X		X	

In order to enhance the result from the 75- to 90-meter inundation grid data, a method was developed utilizing higher-resolution digital topographic data (3- to 10-meters resolution) that better defines the location of the maximum inundation line (U.S. Geological Survey, 1993; Intermap, 2003; NOAA, 2004).

The location of the enhanced inundation line was determined by using digital imagery and terrain data on a GIS platform with consideration given to historic inundation information (Lander, et al., 1993). This information was verified, where possible, by field work coordinated with local county personnel.

The accuracy of the inundation line shown on these maps is subject to limitations in the accuracy and completeness of available terrain and tsunami source information, and the current understanding of tsunami generation and propagation phenomena as expressed in the models. Thus, although an attempt has been made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event.

This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region (Table 1). For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event.

References

Intermap Technologies, Inc., 2003, Intermap product handbook and quick start guide: Intermap NEXTmap document on 5-meter resolution data, 112 p.

Lander, J.F., Lockridge, P.A., and Kozuch, M.J., 1993, Tsunamis Affecting the West Coast of the United States 1806-1992: National Geophysical Data Center Key to Geophysical Record Documentation No. 29, NOAA, NESDIS, NGDC, 242 p.

National Atmospheric and Oceanic Administration (NOAA), 2004, Interferometric Synthetic Aperture Radar (IfSAR) Digital Elevation Models from GeoSAR platform (EarthData): 3-meter resolution data.

Titov, V.V., and Gonzalez, F.I., 1997, Implementation and Testing of the Method of Tsunami Splitting (MOST): NOAA Technical Memorandum ERL PMEL – 112, 11 p.

Titov, V.V., and Synolakis, C.E., 1998, Numerical modeling of tidal wave runup: *Journal of Waterways, Port, Coastal and Ocean Engineering*, ASCE, 124 (4), pp 157-171.

U.S. Geological Survey, 1993, Digital Elevation Models: National Mapping Program, Technical Instructions, Data Users Guide 5, 48 p.

Purpose of this map

This tsunami inundation map was prepared to assist cities and counties in identifying their tsunami hazard. It is intended for local jurisdictional, coastal evacuation planning uses only. This map, and the information presented herein, is not a legal document and does not meet disclosure requirements for real estate transactions nor for any other regulatory purpose.

The inundation map has been compiled with best currently available scientific information. The inundation line represents the maximum considered tsunami runup from a number of extreme, yet realistic, tsunami sources. Tsunamis are rare events; due to a lack of known occurrences in the historical record, this map includes no information about the probability of any tsunami affecting any area within a specific period of time.

Please refer to the following websites for additional information on the construction and/or intended use of the tsunami inundation map:

State of California Emergency Management Agency, Earthquake and Tsunami Program:

<http://www.oes.ca.gov/WebPage/oeswebsite.nsf/Content/B1EC51BA215931768825741F005E8D80?OpenDocument>

University of Southern California – Tsunami Research Center:

<http://www.usc.edu/dept/tsunamis/2005/index.php>

State of California Geological Survey Tsunami Information:

http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/index.htm

National Oceanic and Atmospheric Agency Center for Tsunami Research (MOST model):

<http://nctr.pmel.noaa.gov/time/background/models.html>

Map Base

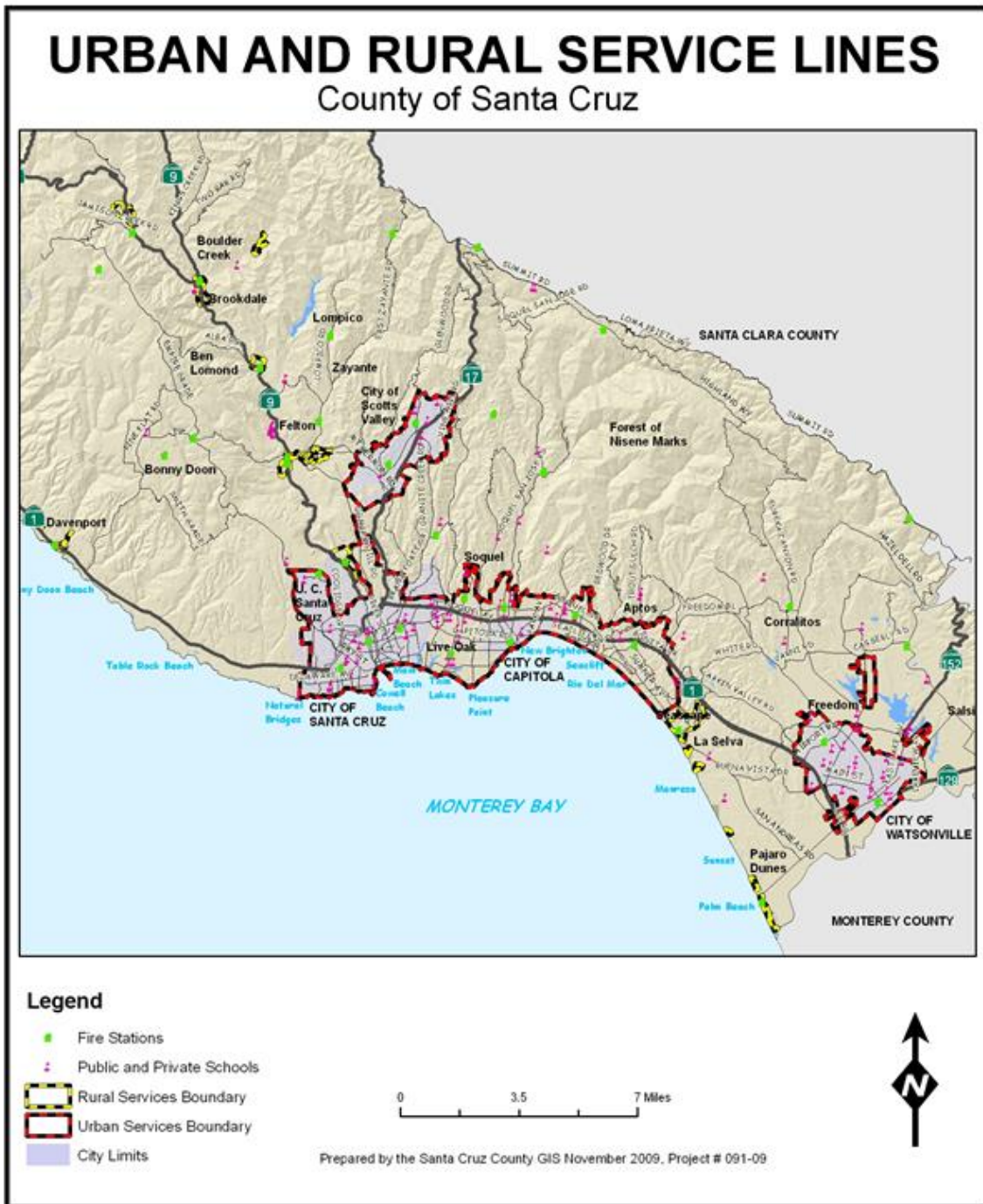
Topographic base maps prepared by U.S. Geological Survey as part of the 7.5-minute Quadrangle Map Series (originally 1:24,000 scale). Tsunami inundation line boundaries may reflect updated digital orthophotographic and topographic data that can differ significantly from contours shown on the base map.

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.

This page intentionally left blank

Appendix K Map of Urban and Rural Services Lines



This page intentionally left blank

Appendix L Mitigation Action Progress Report

Mitigation Action A-1 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-1 Emergency Preparedness Coordination Continue to participate in the Emergency Management Council by planning, implementing, and evaluating pre-event activities including ongoing training for county staff	
Responsible Agency	OES/OR3	
Contact Name	Michael Beaton/Karen Adler	
Contact Phone/Email	(831) 454-2210 michael.beaton@santacruzcounty.us (831) 454-2166 karen.adler@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The Emergency Management Council continues to meet every two months. All of the local emergency services partners are invited to attend or are voting members.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-2
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-2 Floodplain Management Continue to enforce floodplain management regulations on all permit applications. Create a policy interpretation for calculating “Substantial Improvement” more effectively in the floodplain	
Responsible Agency	Planning Department	
Contact Name	Leah MacCarter	
Contact Phone/Email	(831) 454-3164 / Leah.MacCarter@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The “Flood Zones –Substantial Improvements” interpretation became effective February 10, 2010. The interpretation effectively increased the substantial improvement dollar value per square foot to better reflect current actual construction costs.

The “Flood Zones –Substantial Improvements” interpretation was subsequently superseded by the new Substantial Improvement / Damage Review forms created in March 2013. These forms have simplified the permit requirements for applicants and reduced application review time for staff.

2. What obstacles, problems, or delays did the project encounter?

The “Flood Zones –Substantial Improvements” interpretation worked well for additions but proved to be more difficult to use for remodels. For that reason, the Substantial Improvement / Damage Review forms were created.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-3
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-3 Community Rating System Application Continue to participate in the Community Rating System to improve floodplain management	
Responsible Agency	Planning Department	
Contact Name	Leah MacCarter	
Contact Phone/Email	(831) 454-3164 / Leah.MacCarter@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Planning Department staff completed the application for participation in the CRS Program during the 2011-2012 fiscal year. The County of Santa Cruz was accepted into the program as a Class 8 Community effective October 1, 2012. Staff has maintained this rating since the effective date.

2. What obstacles, problems, or delays did the project encounter?

Although the application preparation and review process took over 2 years to complete, there were no major obstacles, problems, or delays.

3. Is the project still relevant?

Yes, ongoing participation in the program involves annual activities including, staff meetings, record-keeping, ordinance updates, and public outreach and education.

4. Should the project be changed or revised? No

5. Other comments:

The Class 8 rating qualifies homeowners for a 10% reduction in flood insurance premiums.

Mitigation Action A-4
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-4 Wildfire Hazard Abatement Reduce fire risk in wildland/urban interface (WUI) by advocating use of improved building materials and appropriate code enforcement, including defensible space and fuel break and reduction programs	
Responsible Agency	CalFire/Santa Cruz County Fire Marshall	
Contact Name	Chris Walters	
Contact Phone/Email	(831) 335-6748 chris.walters@fire.ca.gov	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Defensible space inspections are completed by inspectors from CAL FIRE, engine companies, and fire protection districts (Central and Aptos/La Selva). Educational materials are distributed to residents during inspections, through direct mailing, and at public events including a brief pamphlet focusing on defensible space and a document called Living With Fire in Santa Cruz County.

The Santa Cruz County Code requires new projects and construction to meet fire safety standards consistent with State law (PRC 4290). Chapter 7.92 of the County Code establishes requirements for fuel modification and emergency water supply, as well as minimum fire safe driveway and road standards. New structures built in Santa Cruz County must also comply with fire safety building regulations. These building codes require the use of ignition-resistant building materials in higher risk areas and establish design standards to improve the ability of a building to survive a wildfire.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-5
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-5 WUI Land Use Planning Promote land use planning which will reduce incidence of human caused wildfires especially in very high hazard areas	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173 david.carlson@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Amendment of the County’s General Plan Public Safety Element Fire Hazards section in 2020 incorporated the latest references to State law regarding development standards in the WUI including access, water supply, and fuels management and has brought alignment of the road and building standards. Local amendments of the Fire Code incorporate stricter standards for access for new land divisions.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-6
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-6 Emergency Personnel Road Access Advocate for creation of secondary road access improvement	
Responsible Agency	CalFire	
Contact Name	Chris Walters	
Contact Phone/Email	(831) 335-6748 chris.walters@fire.ca.gov	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Review of rural land division application for conformance with local access standards including secondary access where required. Amendment of the County’s General Plan Safety Element has brought alignment of the road and building standards.

The new 2019 fire and building code has been adopted by all County Fire agencies.

2. What obstacles, problems, or delays did the project encounter?

The County continues to enforce current fire and building codes, and the secondary access road standards in the Safety Element.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-7
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-7 Water Conservation Implement water conservation programs to maximize the use of existing water resources	
Responsible Agency	Environmental Health Services	
Contact Name	Sierra Ryan	
Contact Phone/Email	(831) 454-3133 sierra.ryan@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Long term water conservation measures have been implemented by major water agencies, resulting in declining total demand. During the recent drought, agencies reduced water use from 2013 to 2016 by 25%. The County has implemented additional prohibitions on wasteful water use practices (Chapter 7.69) and has implemented the Water Efficient Landscape Ordinance (Chapter 13.13). Water efficiency measures for large users are required as a condition of obtaining a well permit (Chapter 7.70). Small water systems will be required to install meters and report water use (Chapter 7.71). County staff continue to provide education and outreach on water conservation and respond to complaints of excessive water use.

2. What obstacles, problems, or delays did the project encounter?

It is challenging to determine effectiveness of programs in rural areas where users do not meters on their water sources.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-8
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-8 Develop Additional Water Supplies Support the development of additional water supplies and promote more effective use of groundwater storage through increased groundwater recharge and conjunctive use among agencies	
Responsible Agency	Environmental Health	
Contact Name	Sierra Ryan	
Contact Phone/Email	(831) 454-3133 sierra.ryan@santacruzcounty.us	
Project Status	Substantial progress. Project is ongoing. Water agencies were pursuing a desalination project, but this has been delayed or stopped indefinitely due to community concerns over impacts of the proposed project.	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Recycled Water and Groundwater Storage. There are currently three water recycling plants in the County, all focusing on tertiary treatment for irrigation: one operated by the City of Scotts Valley, one by the Pasatiempo Golf Course, and one by the City of Watsonville and Pajaro Valley Water Management Agency. The first potable recycled water is in the final development stages with construction expected to start in 2021. The Pure Water Soquel project is being spearheaded by Soquel Creek Water District in partnership with the City of Santa Cruz who will provide the source water. The project will purify 1500 acre-feet of water per year, which will be injected into the Mid-County Groundwater Basin for use as both a supply and for seawater intrusion prevention. The City of Santa Cruz is investigating the use of the Mid-County Basin as a place to store excess surface water through an Aquifer Storage and Recovery program. The City is currently piloting the feasibility of using surplus winter flows and injecting them into the Basin for future use. They are also in the process of updating their water rights to allow flexibility in the use of their surface water sources. The County is considering investigating the feasibility of septic consolidation and centralized sewage treatment in a portion of the San Lorenzo Valley, which would make recycled water available to mitigate water supply constraints and/or for fire suppression.

2. What obstacles, problems, or delays did the project encounter? Cost and public acceptance have delayed project implementation.

3. Is the project still relevant? The project is still very relevant and will be further refined as more information is made available for public review.

4. Should the project be changed or revised? No

Mitigation Action A-9
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-9 Drought Protection Promote more effective use of groundwater storage through increased groundwater recharge	
Responsible Agency	Environmental Health	
Contact Name	Sierra Ryan	
Contact Phone/Email	(831) 454-3133 sierra.ryan@santacruzcounty.us	
Project Status	Substantial progress. Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Water Transfers, Recharge and Conjunctive Use. County staff are supporting the efforts of the water agencies to evaluate more possibilities for water exchanges and conjunctive use options which would have the potential to utilize more surface water during wet periods, increase use of recycled water, increase groundwater storage, increase stream baseflow, and potentially make more groundwater available to surface water users during drought periods. County staff is also pursuing various methods to increase groundwater recharge through projects and policies to restore and maintain storm water infiltration. City of Santa Cruz, San Lorenzo Valley Water District, Scotts Valley Water District and Soquel Creek Water District are all actively evaluating conjunctive use options and negotiations are underway for transfer of surface water to reduce groundwater use. In particular, the City of Santa Cruz and Soquel Creek Water District have been actively transferring water since 2019 and just negotiated a 5-year extension of that program. The County has received Integrated Regional Water Management grant funds to implement a stormwater recharge project at the Seascape Golf Course. The Resource Conservation District is continuing to develop projects to capture and recharge groundwater from agricultural areas of South County. Stormwater regulations have been amended to require maintaining infiltration rates at pre-development levels for new development and redevelopment. The Pajaro Valley Water Management Agency has recently certified two water supply project EIRs. One is for their College Lake Project which will supply approximately 1,800 to 2,300 acre-feet per year of water to growers in the Pajaro Valley. The other is for their Watsonville Slough Managed Aquifer Recharge project which temporarily stores excess surface water underground for use as irrigation water during the dry season (A-9).

2. What obstacles, problems, or delays did the project encounter? Much recharge has already been lost by development in recharge areas. Financing to restore recharge has been made available for grants, but ongoing funding for recharge restoration is limited.

3. Is the project still relevant? Project is relevant as is.

4. Should the project be changed or revised? No

Mitigation Action A-10
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-10 Early Notification\ Warning Systems Continue to coordinate communication system and upgrades with other agencies and the cities of Santa Cruz, Watsonville, and Capitola, including evacuation operations, for homes and businesses in specific hazard areas	
Responsible Agency	OES/OR3	
Contact Name	Michael Beaton/Karen Adler, OES	
Contact Phone/Email	(831) 454-2210 michael.beaton@santacruzcounty.us (831) 454-2166 karen.adler@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Continue to meet quarterly with Long Range Radio Infrastructure Management Planning Group to strategically consider interoperability and coordination of communications systems development and change out.

Continue to seek grant funding opportunities for emerging technologies and enhancements.

The narrow banding communications project has been completed for all county emergency services partners.

It is relevant to note here that communications with the public during the CZU Lightning Complex Fire in the form of press releases were issued in both English and Spanish.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-11
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-11 Promote Alarm and Fire-Retardant Systems Promote installation, inspection, and testing of built-in fire alarm and sprinkler systems	
Responsible Agency	CalFire	
Contact Name	Chris Walters	
Contact Phone/Email	(831) 335-6748 chris.walters@fire.ca.gov	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The new 2019 fire and building code has been adopted by all County Fire agencies.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-12

Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-12 Fire Protection and Prevention Establish and maintain fire protection and prevention agreements with other agencies	
Responsible Agency	CalFire, OES	
Contact Name	Michael Beaton, OES	
Contact Phone/Email	(831) 454-2210 michael.beaton@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Updated existing MOU with Cal Fire to run the County Fire Program.

2. What obstacles, problems, or delays did the project encounter? None

3. If uncompleted, is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-13
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-13 Reduction of Emergency Response Times Improve road signage visibility and address markings	
Responsible Agency	Public Works	
Contact Name	Steve Wiesner, Dept. of Public Works	
Contact Phone/Email	(831) 454-2794 steve.wiesner@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Approximately \$57,600 worth of warning guide signs meeting current state specifications were purchased through a federal Highway Safety Improvement Project (HSIP) grant and were installed by the County road crews.

County road crews continuously clear vegetation from around traffic control signs to maintain sign visibility.

In addition, Public Works installed tsunami warning signs along the coastal areas in cooperation with Emergency Services.

2. What obstacles, problems, or delays did the project encounter? None.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-14
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-14 Communications Interoperability Enhance support for interoperability of communications system with local, state, and federal emergency services	
Responsible Agency	OES/OR3, CalFire	
Contact Name	OES/OR3 staff	
Contact Phone/Email	(831) 454-2210 michael.beaton@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

All communications systems have been changed to comply with the FCC narrow banding requirement.

2. What obstacles, problems, or delays did the project encounter?

Availability of funding

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-15
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-15 Minimize Landslide Risk Continue to require that the county geologist review development in areas of suspected landsliding and require engineering reports when landsliding is identified or suspected	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Staff does review all development for slope instability including landsliding.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-16
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-16 Landslide Regulations Continue to require that an engineering geologist and/or geotechnical engineer investigate the site of any proposed construction near landsliding and require mitigation of landslide hazards before issuing any building or grading permits	
Responsible Agency	Planning Dept.	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Sites near landsliding are (were) investigated by engineering geologist and/or geotechnical engineers, and mitigations are required (where necessary) to prevent damage to development.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-17
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	A-17 Landslide Inspections Continue to require that an engineering geologist and/or a geotechnical engineer investigate any landslide damage to homes or roadways before repair of the landslide and reuse of the homes or roadways	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Engineering geologic and geotechnical engineering investigations and reports have been required for all homes and habitable structures damaged by landsliding.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action A-18
 Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	A-18 Evacuation Plans Continue to refine and improve our evacuation management plans and tools using Zonehaven	
Responsible Agency	Calfire, Sheriff, OES/OR3	
Contact Name	OES/OR3 staff	
Contact Phone/Email	(831) 454-3407, david.reid@santacruzcounty.us	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action A-19
 Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	A-19 Community Organizations Assisting in Disaster (COAD) Re-establish and support Community Organizations Assisting in Disaster (COAD)	
Responsible Agency	OES/OR3	
Contact Name	OES/OR3 staff	
Contact Phone/Email	(831) 454-3407, david.reid@santacruzcounty.us	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action A-20
 Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	A-20 Hazardous Fuel Reduction Reduction of fire risk in the urban/wildland interface (WUI) through hazardous fuel reduction projects including but not limited to indigenous land use practices of controlled burns, hazardous fuel removal, other shaded fuel break burn strategies.	
Responsible Agency	Fire agencies, partners	
Contact Name	Fire agencies, partners	
Contact Phone/Email	Fire agencies, partners	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action A-21
 Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	A-21 CZU Fire Recovery Support CZU Fire Recovery for survivors utilizing best practices for improving overall safety of rebuild	
Responsible Agency	OES/OR3, Planning	
Contact Name	OES/OR3 staff	
Contact Phone/Email	(831) 454-3407, david.reid@santacruzcounty.us	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action A-22
 Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	A-22 Early Warning Systems Enhance our early warning, and rainfall monitoring capacity in the high debris flow risk areas of the County following the CZU fires of 2020.	
Responsible Agency	OES/OR3, Planning, Public Works	
Contact Name	Various	
Contact Phone/Email	Various	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action A-23
 Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	A-23 Debris Flow Hazard Mitigation Identify, monitor, and mitigate where feasible the hazards and risks associated with post fire debris flows.	
Responsible Agency	Planning	
Contact Name	Jeff Nolan, County Geologist	
Contact Phone/Email	(831) 454-3175, jeff.nolan@santacruzcounty.us	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action A-24

Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	<p>A-24 Emergency Shelters</p> <p>Expand use and functionality of targeted shelters County Wide to serve as “All Hazard Resiliency Centers” which can serve as an all-hazard resource for community members in events including but not limited to: earthquakes, fires, floods, Public Safety Power Shut-off events, extreme weather events, poor air quality days. Building resiliency centers may include but is not limited to back-up power generation capacity, air filtration, air conditioning, kitchen facilities, shelter capacity.</p>	
Responsible Agency	OES/OR3	
Contact Name	OES/OR3 staff	
Contact Phone/Email	(831) 454-3407, david.reid@santacruzcounty.us	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action B-1
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-1 Infrastructure Upgrades Upgrade roadways, sewer, water, and other infrastructure to withstand seismic shaking	
Responsible Agency	Dept. of Public Works	
Contact Name	Matt Machado	
Contact Phone/Email	(831) 454-2160 Matt.Machado@santacruzcounty.us	
Project Status	Project partially completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Continue prioritizing vulnerable infrastructure such as roads, bridges, and drainages structures.

2. What obstacles, problems, or delays did the project encounter? Funding

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-2
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-2 Review Stormwater Runoff Regulations Review and revise California Environmental Quality Act (CEQA) Initial Study checklist to ensure that storm water runoff is fully considered and mitigated to the extent possible	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173 david.carlson@santacruzcounty.us	
Project Status	Project completed	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The Initial Study Checklist used by County staff has been updated to ensure that storm water runoff is fully considered and mitigated to the extent possible.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-3
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-3 Fire Safety and Prevention Programs Implement additional fire prevention programs in schools, institutions, and commercial buildings through inspections and education	
Responsible Agency	Santa Cruz County Fire Marshall	
Contact Name	Chris Walters	
Contact Phone/Email	(831) 335-6748 chris.walters@fire.ca.gov	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

County Fire puts on education programs for schools and businesses in the unincorporated areas of the County.

Additional school programs have been added as part of the County Fire Prevention and Education program. All schools in County Fire are inspected annually. Commercial Business inspections are ongoing.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-4
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-4 Adequate Staffing Maintain adequate Fire Suppression and Prevention staffing levels to meet the needs of the county	
Responsible Agency	Santa Cruz County Fire Marshall	
Contact Name	Chris Walters	
Contact Phone/Email	(831) 335-6748 chris.walters@fire.ca.gov	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

In spite of long-term funding challenges resulting in systematic cuts over the last several years, including reduction of personnel staffing, the County Fire fund balance has been maintained by careful fiscal management for extreme necessity. Grants, CAL FIRE contract saving, and economic recovery have contributed to this preservation. The County Fire’s structural budget deficit continues to be the administrative priority. In January 2020, a new assessment was approved by voters in CSA 48, the County Fire Department operating area, that would provide a higher level of fire protection and emergency response service by increasing staffing levels to nationally recognized standards and providing for improved apparatus and equipment replacement.

2. What obstacles, problems, or delays did the project encounter? See above.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-5
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-5 Geologic Hazards Ordinance Update Seek funds to update and revise the Geologic Hazards Ordinance	
Responsible Agency	Planning Department	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Funding was obtained for updating the Geologic Hazards Ordinance. A revised ordinance was adopted by the Board of Supervisors on October 6, 2020.

2. What obstacles, problems, or delays did the project encounter?

The public hearing process was lengthy due to public controversy over the portion of the ordinance regulating development on coastal bluffs and beaches.

3. If uncompleted, is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-6
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-6 Elevation of Structures in Floodplain Continue to pursue elevation of structures above level of 100-year flood	
Responsible Agency	Planning, OES	
Contact Name	Leah MacCarter, Planning Department	
Contact Phone/Email	(831) 454-3164 / Leah.MacCarter@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Per the Geologic Hazards Ordinance, the Planning Department continues to evaluate incoming building and development permit applications for structures in flood hazard areas to determine if the work will meet or exceed the threshold for a substantial improvement. Structures for which substantial improvements are proposed are required to be elevated. For those projects that do not exceed substantial improvement, the applicant is advised of the benefits of elevation of the structure. During the reporting period, the Planning Department has issued 10 permits for elevated structures and received 8 elevation certificates for newly elevated structures.

2. What obstacles, problems, or delays did the project encounter?

Applicants continue to keep the size of renovation projects below the substantial improvement threshold in order to avoid the elevation requirement.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-7
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-7 Stormwater Management Continue to enforce requirements for on-site retention of storm water	
Responsible Agency	Planning and Public Works	
Contact Name	Rachel Fatoohi, Dept. of Public Works	
Contact Phone/Email	454-2160, Rachel.fatoohi@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Public Works Stormwater Management staff continues to require on site mitigations to control runoff volume and rates from new or redeveloped impervious areas where feasible throughout Santa Cruz County.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-8
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-8 Stormwater Policy and Ordinance Evaluation The County shall evaluate the effectiveness of current policies and ordinances designed to limit storm water runoff and flooding and, if needed, recommend revisions to improve effectiveness of these policies and codes	
Responsible Agency	Public Works	
Contact Name	Rachel Fatoohi, Dept. of Public Works	
Contact Phone/Email	(831) 454-2160, Rachel.fatoohi@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

On 3/6/12, the Board of Supervisors adopted Ordinance No. 5117 adding Chapter 7.79 Runoff and Pollution Control to the Santa Cruz County Code. The adoption of the ordinance was supplemented by changes to the County Design Criteria on the same day.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-9
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-9 Drainage Plan Evaluation The county shall evaluate the effectiveness of the current drainage plan requirements to ensure that storm water runoff from impervious surfaces does not contribute to flooding and, if needed, revise permit conditions of approval	
Responsible Agency	Public Works	
Contact Name	Rachel Fatoohi	
Contact Phone/Email	(831) 454-2160, Rachel.fatoohi@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

What was accomplished for this project during this reporting period?

As part of developing the 2012 Ordinance, requirements for both new and redeveloped sites have been generated to minimize impervious area impacts to flooding and water quality.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

4. Other comments:

Stormwater mitigation requirements apply to new and redevelopment type of projects. Work is needed to develop quantifiable criteria for minimizing impervious areas required by both the Design Criteria and the General Plan

Mitigation Action B-10
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-10 Stormwater Control Implement the “Stormwater Facilities Master Plan” for Flood Control Districts 5 & 6	
Responsible Agency	Dept. of Public Works	
Contact Name	Rachel Fatoohi	
Contact Phone/Email	(831) 454-2160, Rachel.fatoohi@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The Master Plan for Zones 5 and 6, the most urbanized areas of the county, was completed in August 2013. The Master Plan identified recommended improvements that Public Works and the Flood Control Districts will consider in prioritizing the drainage improvements within these zones. Zone 5 is in the process of updating the Zone Drainage Master Plan to assess the condition and capacity of the larger conveyances within the Zone, to estimate the cost of comprehensive maintenance and CIP program. The goal of this update is also to seek sustainable funding source to maintain and upgrade the drainage facilities within the zone. Also, one of the tasks in the Zone 5 Master Plan update will be about “limited” modeling for climate change and sea level rise. One iteration of climate change impacts will be modeled on the CIP pipe and creek models. The climate change iteration will include tidal boundary change due to sea level rise and increased runoff due to precipitation change.

2. What obstacles, problems, or delays did the project encounter?

Condition assessment was completed for a limited number of pipes because of lack of funding. Lack of funding continues to be an issue.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

5. Other comments:

New sustainable sources of funding are needed to complete comprehensive condition assessment of the drainage facilities as well as to implement improvements to address the identified capacity and condition restrictions. Following the completion of the Zone 5 Master Plan Update, Zone 5 will seek additional sustainable funding, based on the options to be recommended by the Master Plan consultants.

Mitigation Action B-11
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-11 Drainage system Infrastructure Integrity Continue to inspect and maintain drainage system infrastructure	
Responsible Agency	Public Works	
Contact Name	Rachel Fatoohi	
Contact Phone/Email	(831) 454-2160, Rachel.fatoohi@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The Department of Public Works continued to inspect and maintain drainage system infrastructure. Approximately 3000 junction structures, 2262 minor culverts, and 160 bridges and major culverts are maintained. From 2014 through present the Public Works Department has replaced approximately 116 culverts.

2. What obstacles, problems, or delays did the project encounter?

Public Works continues to struggle to maintain the County's existing drainage infrastructure due to the continued shortfall of State and Federal funds and declining gas tax revenues. The lack of available funding affects our staffing levels and our ability to perform necessary maintenance and repairs.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

5. Other comments:

Public Works maintenance of the County's drainage infrastructure is ongoing.

Mitigation Action B-12
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-12 Flood Mitigation Education Develop public education materials by working collaboratively with community groups, non-governmental organizations, and the local media	
Responsible Agency	Planning	
Contact Name	Leah MacCarter	
Contact Phone/Email	(831) 454-3164, leah.maccarter@santacruzcounty.us	
Project Status	Project is completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Distribution of a flood hazard brochure is required as a condition of participation within the CRS Program. The brochure is sent out annually to properties within flood hazard areas. The brochure is also provided annually to real estate offices, mortgage companies, and insurance providers within the County.

In addition, the Santa Cruz County Stream Care Guide was updated in August 2013.

2. What obstacles, problems, or delays did the project encounter?

The flood hazard brochure gets sent to over 4700 addresses every year. This requires significant staff resources to print, fold and tape the brochures.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? See below.

5. Other comments:

In 2017, the County will be required to update the CRS program to conform to the guidelines in the revised CRS Coordinator’s Manual. The brochure at that time will likely be replaced with a postcard that directs the property owner or resident to an online resource with the required information.

Mitigation Action B-13
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-13 Open Space in Flood Zones Regulate development in flood zones to optimize preservation of open space	
Responsible Agency	Planning	
Contact Name	Leah MacCarter	
Contact Phone/Email	831-454-3164, leah.maccarter@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The existing Geologic Hazards Ordinance and Riparian Corridor and Wetland Protection Ordinance have been effective at preserving open space for most development. The Planning Department continues to improve on understanding the relationship between the two and enforcing them cohesively. The new Flood Hazard Ordinance has been adopted based on the State model ordinance and will further optimize preservation of open space through clarification of the existing ordinance. Revisions to the Riparian Corridor and Wetland Protection Ordinance have been postponed due to limited staff resources.

2. What obstacles, problems, or delays did the project encounter?

Revisions to the Riparian Corridor and Wetland Protection Ordinance have been postponed due to limited staff resources.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

5. Other comments:

The Floodplain Regulations were updated in 2020 using the State model code as a template.

Mitigation Action B-14
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-14 Flood Zone Development Regulation Limit development and monitor conditions of development and grading permits near natural channels and wetlands to prevent sedimentation	
Responsible Agency	Planning, Public Works	
Contact Name	Leah MacCarter	
Contact Phone/Email	831-454-3164, leah.maccarter@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The Riparian Protection ordinance prohibits development within riparian corridors and buffers. The Planning Department actively works with developers to reduce the need for Riparian Exceptions when they can be avoided. In addition, the new Runoff and Pollution Control ordinance authorizes Public Works staff to inspect stormwater mitigation practices for development projects once every five years (or more often if necessary).

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-15
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-15 Promote Drought Planning Promote drought planning by the 130 small water systems under county jurisdiction	
Responsible Agency	Environmental Health	
Contact Name	Sierra Ryan	
Contact Phone/Email	(831) 454-3133 sierra.ryan@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

We have been in touch with water systems during the recent drought to provide water saving suggestions and technical assistance as needed. The state has offered funding assistance for emergency assistance. Metering and reporting of total water use will be required of small water systems.

2. What obstacles, problems, or delays did the project encounter?

Systems have limited resources. Only a few have experienced any problems during the recent 4-year drought and most do not have an incentive to invest time and effort into developing a drought plan. Most have made water saving recommendations to their users in the absence of a formal plan.

3. Is the project still relevant? Yes

4. Should the project be changed or revised?

Ongoing support and encouragement are warranted, but a higher level of effort is probably not needed.

Mitigation Action B-16

Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-16 Protection of Critical Structures Promote seismic safety upgrade of all emergency use and critical structures	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

County staff applies the current seismic design standards to all projects with a view to upgrade emergency uses and critical structures. As critical structures renovated modern Building Code standards are applied to each renovation by both the design and review staff.

The County has also developed new policy with regards to Climate Change set strict standards for new critical structure and identifying the types of hazards that could affect both existing and proposed safety infrastructure and critical structures.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised?

Improving existing emergency infrastructure and critical structures is continuous and ongoing process.

Mitigation Action B-17

Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-17 Critical Structural Safety Require all new and replacement critical structures be designed to standards of the California building code and the county's Geologic Hazards Code	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

All Critical structures have been designed and review to assure compliance with the California Building Code and the County's Geologic Hazards Code.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-18

Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-18 Training for Planning Staff Train appropriate plan check staff on seismic requirements for structures	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Plan review staff and the building inspectors undergo continuous education courses through CALBO that include training in current seismic construction standards.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action B-19

Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	B-19 Seismic Zoning Encourage zoning in geologically constrained areas that reflect the nature and extent of the seismic hazard	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is pending	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The County's zoning has not been revised during the reporting period. The County's permit review process already requires identification and assessment of geologic constraints.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

5. Other comments:

Updating zoning designations to reflect geologic constraints may be helpful but is not a high priority action at this time because the permit review process already requires identification and assessment of geologic constraints.

Mitigation Action B-20
 Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	B-20 Pajaro River Flood Risk Management Project Implement the Pajaro River Flood Risk Management Project to reduce the probability and consequences of flooding in the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands.	
Responsible Agency	Flood Control and Water Conservation District – Zone 7	
Contact Name	Mark Strudley	
Contact Phone/Email	(831) 454-2807, mark.strudley@santacruzcounty.us	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action C-1
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-1 Management of Early Warning System Define public information process including establishing a reverse 911 system that will notify all homes and businesses within tsunami inundation areas and develop media protocol for evacuation notices	
Responsible Agency	OES	
Contact Name	Michael Beaton	
Contact Phone/Email	(831) 454-2210 michael.beaton@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Continue to use Code Red EWS. Also added IPAWS. In addition, Public Works installed tsunami warning signs along the coastal areas in cooperation with Emergency Services.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-2
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-2 Minimize Risk from Tsunami Update tsunami inundation maps	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454- 3173, david.carlson@santacruzcounty.us	
Project Status	Project pending	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The County uses the latest tsunami inundation maps referenced in this plan.

2. What obstacles, problems, or delays did the project encounter?

The existing maps will be updated when new information becomes available.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-3
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-3 Protect and Preserve Coastline Protect and preserve coastline through permit review process	
Responsible Agency	Planning, Dept. of Public Works	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454- 3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Continue to administer the land use permit and building permit process with the objective to reduce, minimize to an acceptable level, and internalize costs of private property investments, the risks to life, property, and public infrastructure from coastal hazards, including projected hazards due to sea level rise, wave run-up and coastal erosion, and to minimize impacts on coastal resources from developments granted coastal development permits and granted extensions to monitoring, maintenance, and repair programs for shoreline protection structures.

The Safety Element of the General Plan and Local Coastal Plan (GP/LCP) has been amended to incorporate sea level rise into policies addressing coastal bluff and beach hazards and floodplain management.

2. What obstacles, problems, or delays did the project encounter?

The public hearing process for the Safety Element amendments was lengthy.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-4
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-4 Protect Coastline and Infrastructure Encourage replacement of existing seawalls with shoreline protection structures which meet current engineering standards	
Responsible Agency	Planning, Public Works	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454- 3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

This action item has been incorporated in the Safety Element amendments and related amendments of the Geologic Hazards ordinance recently adopted by the Board of Supervisors.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-5
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-5 Minimize Risk from Dam Failure Develop an event protocol with the State Division of Safety of Dams	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454- 3173, david.carlson@santacruzcounty.us	
Project Status	Project is pending	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

This project has not been implemented during the reporting period.

2. What obstacles, problems, or delays did the project encounter?

With additional funding and staff resources, and prioritization from both County and State sources, this project may occur during the next reporting period.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-6
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-6 Minimize Risks from Expansive soils Continue to require soils reports as part of the building permit process	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Planning staff continues to require soils reports as part of the building permit process.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-7
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-7 New Regulations in Tsunami Inundation Areas Encourage investigation of the tsunami threat to the county and update development regulations based upon this investigation	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is pending	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The County uses the latest tsunami inundation maps referenced in this plan.

2. What obstacles, problems, or delays did the project encounter?

The existing maps will be updated when new information becomes available.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-8
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-8 Restoration of Coastline Protect and preserve the coastline and infrastructure through restoration efforts	
Responsible Agency	Dept. of Public Works	
Contact Name	Steve Wiesner	
Contact Phone/Email	(831) 454-2794 steve.wiesner@santacruzcounty.us	
Project Status	Project completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Construction of the East Cliff Drive, 32nd Avenue to 36th Avenue and 41st, Bluff Protection Project completed on March 21, 2011. Continued maintenance of existing coastal protection structures as needed.

2. What obstacles, problems, or delays did the project encounter?

Public Works continues to struggle to maintain its existing coastal protection infrastructure due to the continued shortfall of State and Federal funds and declining gas tax revenues. The lack of available funding also affects the Departments ability to plan, design, and construct new coastline protection infrastructure.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

5. Other comments:

Protection, preservation, and restoration of the coastline is an ongoing project.

Mitigation Action C-9
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-9 Update Inundation Maps Update dam inundation maps	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is pending	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

This project was not implemented during the reporting period.

2. What obstacles, problems, or delays did the project encounter?

With additional funding and staff resources, and prioritization, this project may occur during the next reporting period.

3. If uncompleted, is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-10

Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-10 Review Dam Hazards Review dam evaluation files to determine the extent of potential dam failures	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is pending	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

This project was not implemented during the reporting period.

2. What obstacles, problems, or delays did the project encounter?

With additional funding and staff resources, and prioritization, this project may occur during the next reporting period.

3. If uncompleted, is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-11
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-10 Minimize Damage from Expansive Soils Develop design criteria for areas of known expansive soils	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project completed	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The permit review process uses design criteria based on the State building code and local amendments.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-12
 Progress Report Form

Progress Report Period	From Date: 2021	To Date: 2026
Action/Project Title	C-12 Reduce Per-Capita Water Consumption Adopt General Plan and County Code amendments to implement the Sustainable Santa Cruz County Plan to support higher density development along major transit corridors.	
Responsible Agency	Planning	
Contact Name	David Carlson	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	This is a new action item that will be reported on for the next update of the LHMP.	

Mitigation Action C-13
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-13 Climate Change Address climate change in Public Health Preparedness Plan Update, General Plan Update, and other pertinent plans in order to implement policies and programs to reduce impact of climate change	
Responsible Agency	Public Health, Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Project is ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The County has adopted a Climate Action Strategy that provides recommendations for addressing climate change in the updates of other pertinent plans. In 2020 the Safety Element has been updated accordingly. The County Health Services Agency staff has completed the Public Health Hazard and Vulnerability Assessment Tool to identify the top ten public health hazards facing the community which includes hazards related to and exacerbated by climate change impacts.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-14
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-14 Climate Change Develop a forum for ongoing engagement with coastal private property owners and the California Coastal Commission to discuss frameworks for land use policies that respond to expected future losses.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

Planning Department staff conducted a series of public hearings and community meetings to discuss frameworks for land use policies that respond to sea level rise. In 2020, the project resulted in adoption by the Board of Supervisors of an amended Safety Element and related implementing ordinances.

2. What obstacles, problems, or delays did the project encounter?

The public hearing process was lengthy.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-15
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-15 Climate Change Consider relocating coastal development away from areas that will be inundated to eliminate the risk of damage and the need for coastal protection.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

County land use policies and regulations include thresholds and requirements to relocate structures if feasible based on-site conditions and project scope.

2. What obstacles, problems, or delays did the project encounter?

Property owner's will design their projects to remain below the thresholds for relocation.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-16
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-16 Climate Change Consider limiting new engineered protection structures to infill in locations where the back beach is currently fixed.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

This action item is addressed in the recently amended Public Safety Element containing an updated section on coastal hazards.

2. What obstacles, problems, or delays did the project encounter?

The public hearing process was lengthy.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-17
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-17 Climate Change Consider a program to identify those areas where managed retreat should replace engineered protection structures, based on public benefit.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

In 2020 the Board of Supervisors adopted the updated Public Safety Element that includes policies establishing areas of the County coastline where managed retreat will be required, and new engineered protection will be prohibited.

2. What obstacles, problems, or delays did the project encounter?

The public hearing process was lengthy.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-18
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-18 Climate Change Work with the engineering community to define a standard increment of additional height that should be added to the FEMA 100-year wave run up, storm surge, and flood levels when analyzing hazards in specific locations.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

In 2020 the Board of Supervisors adopted an amended Safety Element and related implementing ordinances containing increased freeboard requirements for development in both alluvial flood hazard areas and coastal high hazard areas.

2. What obstacles, problems, or delays did the project encounter?

The public hearing process was lengthy.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-19
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-19 Climate Change In consultation with the California Coastal Commission, consider revising regulations that address rebuilding structures that are repeatedly damaged by SLR and coastal storms.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

In 2020 the Board of Supervisors adopted an amended Safety Element and related implementing ordinances containing a new repetitive loss policy with the intent of reducing future flood losses on repetitive loss properties

2. What obstacles, problems, or delays did the project encounter?

The public hearing process was lengthy.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-20
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-20 Climate Change Amend the Public Safety Element of the General Plan and revise implementing regulations to increase the efficacy of the damage prevention and flood protection aspects of the National Flood Insurance Program.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Partially complete	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

In 2020 the Board of Supervisors adopted an amended Public Safety Element and related implementing ordinances addressing flood hazards. The County adopted new Floodplain Regulations using the State model code as a template. The new regulations include increased freeboard requirements for development in flood hazard areas. The Public Safety Elements amendments have been submitted to the California Coastal Commission for certification expected in 2021-2022 timeframe.

2. What obstacles, problems, or delays did the project encounter?

The public hearing process was lengthy.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-21
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-21 Climate Change Work with the County Office of Emergency Services to refine FEMA flood hazard mapping to account for climate change, as maps are the basis for evacuation notification in the event of anticipated flooding and/or a tsunami.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

In 2017 FEMA completed an updated Flood Insurance Study and revised maps for the County. However, the study and map updates do not account for sea level rise. This is the reason the County adopted local regulations that require increased freeboard above mapped flood elevations to account in part for future sea level rise.

2. What obstacles, problems, or delays did the project encounter?

FEMA flood hazard mapping along the coast does not account for sea level rise.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-22
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-22 Climate Change Consider evaluating unprotected developed coastal bluff areas subject to future erosion, and develop plans and timeline for either armor placement, or retreat and relocation of existing public structures and/or infrastructure.	
Responsible Agency	Planning	
Contact Name	David Carlson, Planning Dept.	
Contact Phone/Email	(831) 454-3173, david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

In 2020 the Board of Supervisors adopted an amended Safety Element and related implementing ordinances containing policies that plan for future conditions along the coast that are likely to exist as a result of sea level rise. Policies require as part of future development projects an evaluation of unprotected developed coastal bluff areas subject to future erosion, and development of plans and timeline for either armor placement, or retreat and relocation of existing public structures and/or infrastructure.

2. What obstacles, problems, or delays did the project encounter?

The public hearing process was lengthy.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-23
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-23 Climate Change Consider designing and siting all future County projects and infrastructure to account for sea level rise projections, considering projected life span of project.	
Responsible Agency	Planning Dept., Dept. Of Public Works	
Contact Name	David Carlson	
Contact Phone/Email	(831)454-3173 david.carlson@santacruzcounty.us	
Project Status	Completed and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

These types of projects in the Coastal Zone require review for consistency with both County policy and California Coastal Commission Guidance. It is standard practice currently to incorporate sea level rise analysis in project designs. An example of this involves the update of the Stormwater Facilities Master Plan for Zone 5. One of the tasks in the Zone 5 Master Plan update will be about “limited” modeling for climate change and sea level rise. One iteration of climate change impacts will be modeled on the CIP pipe and creek models. The climate change iteration will include tidal boundary change due to sea level rise and increased runoff due to precipitation change.

2. What obstacles, problems, or delays did the project encounter? None

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-24
Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-24 Climate Change Consider securing federal grant funding for the drainage improvements within the Rio Del Mar Esplanade necessary to protect against a 10-year storm	
Responsible Agency	Dept. Of Public Works	
Contact Name	Rachel Fatoohi	
Contact Phone/Email	(831) 454-2160, Rachel.fatoohi@santacruzcounty.us	
Project Status	Partially complete	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The project has been designed and permitted. The Dept. Of Public Works has received federal grant funding but continues to seek the balance of the funding to construct the project. Funding from FEMA and the State has been secured to pay a total 87.5% of the construction cost. Public Works is working on securing sustainable funding source for the on-going maintenance cost of the drainage improvements when/if the improvements get constructed. The improvements will protect the Rio Del Mar flats against 10-year storms.

2. What obstacles, problems, or delays did the project encounter?

Lack of funding.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-25
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-25 Climate Change Continue to improve wastewater collection system to reduce infiltration by groundwater or surface water	
Responsible Agency	Dept. Of Public Works	
Contact Name	Kent Edler	
Contact Phone/Email	(831) 454-2791 kent.edler@santacruzcounty.us	
Project Status	Partially complete and ongoing	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

The Dept. Of Public Works continues to implement a program to upgrade wastewater collection infrastructure as funding allows.

2. What obstacles, problems, or delays did the project encounter?

Lack of funding.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No

Mitigation Action C-26
 Progress Report Form

Progress Report Period	From Date: 2016	To Date: 2021
Action/Project Title	C-26 Climate Change Consider coordinating with the City of Santa Cruz on programs to minimize vulnerabilities at the Neary Lagoon plant.	
Responsible Agency	Santa Cruz County Sanitation District	
Contact Name	Matt Machado, District Engineer	
Contact Phone/Email	(831) 454-2160 DPW.LateralProgram@santacruzcounty.us	
Project Status	Pending	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

This project has not been implemented.

2. What obstacles, problems, or delays did the project encounter?

Lack of funding and physical site limitations.

3. Is the project still relevant? Yes

4. Should the project be changed or revised? No