2025–2030 City of Santa Cruz
Local Hazard Mitigation Plan – Climate Adaptation Plan

Version Control Document

Change #	Date	Author	Summary of Changes Made

EXECUTIVE SUMMARY

Hazard mitigation planning is a process that helps communities reduce the impacts of disasters on people and places before a disaster occurs. It involves identifying hazards, understanding vulnerabilities, and developing long-term risk-reduction strategies. For nearly 25 years, hazard mitigation planning has been driven by a federal law, known as the Disaster Mitigation Act of 2000 (DMA 2000), which emphasizes the need for state, tribal, and local entities to closely coordinate hazard mitigation planning and implementation efforts. It also provides the legal basis for the Federal Emergency Management Agency (FEMA) to require state, tribal, and local entities to develop hazard mitigation plans to receive certain types of federal disaster assistance. These requirements are defined in FEMA's State and Local Mitigation Planning Policy Guides and the Tribal Mitigation Plan Review Guide.

Similar to hazard mitigation planning, climate adaptation planning is also an approach used to identify hazards and threats that may impact a community and develop and implement various strategies to reduce them. Unlike hazard mitigation planning, climate adaptation planning focuses solely on climate-related hazards. Its planning process also includes adjusting to future conditions and building resilience to withstand those changes through adaptation pathways. Climate adaptation planning is also different from hazard mitigation planning in that there are no state or federal laws that drive this process. Rather, climate adaptation planning follows state and federal guidance including the California Planning Adaptation Guide and the Climate Adaptation Planning Guidance for Emergency Managers.

To meet the requirements of the DMA 2000, the City has updated its 2018–2023 Local Hazard Mitigation Plan (LHMP). Because climate adaptation and hazard mitigation share a common goal of reducing impacts from natural and climate-related hazards that are expected to increase in frequency and intensity due to climate change, the City used this plan update as an opportunity to update and incorporate its 2018–2023 Climate Adaptation Plan (CAP) into its LHMP. This new document is called the 2025–2030 City of Santa Cruz Local Hazard Mitigation Plan – Climate Adaptation Plan (herein referred to as the 2025–2030 LHMP – CAP).

Like previous versions of LHMP and CAP, only natural and climate-related hazards are addressed in this plan and include coastal erosion, dam failure, drought, earthquake, extreme heat, flood (riverine flood, flash flood, and coastal flood, caused by intense or prolonged rainfall, high tide, storm surge, and localized wave action), landslide, tsunami, sea level rise, and wildfire. Secondary hazards, which are hazards that occur because of the primary hazard and can have domino effects, are discussed in the plan within the context of the primary hazard. Multiple hazards —also known as multi-hazards— are when two or more hazards can occur simultaneously in a series, or over time. Multi-hazards will be addressed as a separate annex to this plan at a later date. In addition, potential emerging hazards such as cybersecurity threats, disease outbreaks, and extreme winds, that are not included in this plan update may be addressed in City plans and future LHMP – CAP updates.

The 2025-2030 LHMP – CAP includes over two dozen mitigation actions and climate adaptation strategies that will help the City tackle the impacts from, and increase resilience to, natural and climate-related hazards. The actions and strategies identified in the plan were developed by members of the LHMP – CAP planning team, or were previously identified in other City plans, programs, and studies, or have been highlighted as success stories and best management practices elsewhere. They include the Main and Cowell Beaches Shoreline Adaptation Blueprint; East Cliff/Seabright State Beach Shoreline Adaptation Blueprint; West Cliff 5-Year Roadmap Implementation and Shoreline Adaptation Blueprint; San Lorenzo River Climate Adaptation

Strategy; Wharf Resilience Improvements Project; Coastal Change Monitoring Network; New Creek Dam Enhanced Monitoring Project; Utility Customer Assistance Program; Aquifer Storage and Recovery; Water Supply Augmentation Program; Drinking Source Water Protection and Forest Health; Newell Creek Pipeline Replacement; Retrofit Grant Program; Critical Facility and Infrastructure Rapid Visual Screening, Engineering Evaluation and Seismic Retrofit; Graham Hill Water Treatment Plant Facilities Improvement Project ; Murray Street Bridge Seismic Retrofit; Union/Locust Admin Building Back-up Generator; Water Facility Infrastructure Improvements/Backup Power System; Community Resilience Centers and Climate Resilience Awareness; Frontline Neighborhood Tree Planting; Downtown Sea Level Rise Drainage Assessment and Pump Station Upgrades; Coast Pump Station Rehabilitation/Replacement; Tait Diversion Retrofit; TsunamiReady Program; Fuel Reduction Assessments and Wildfire Resilience Strategies for City Critical Facilities and Infrastructure; Mid- and Steep-Sloped Property Protection in High Fire Hazard Severity Zones and Wildland Urban Interface Areas; Roadside Fuel Reduction and Fuel Breaks; and Hazard Mitigation Database.

To ensure that the mitigation actions and climate adaptation strategies are implemented, and that the overall 2025-2030 LHMP – CAP remains relevant, the City of Santa Cruz will administer a system to track disasters that have occurred; community assets that have been damaged; public outreach that has been conducted; mitigation actions and climate adaptation strategies that have been implemented; new and/or updated studies, reports, and maps that have been published; and changes that have made and/or that need to be made to the current or future LHMP – CAP. This process, along with a multi-department approach to planning integration and ongoing community engagement, will enable the City to effectively implement priority mitigation actions and climate adaptation strategies that will improve Santa Cruz's resilience as well as the safety, equity, and vibrancy of the City.

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LIST OF ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AAR	Annual Average
BRIC	Building Resilient Infrastructure and Communities
CAL FIRE	California Department of Forestry and Fire Protection
Cal OES	California Office of Emergency Services
CAP	Climate Adaptation Plan
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CSCC	California State Coastal Conservancy
CRS	Community Rating System
DFIRM	Digital Flood Insurance Rate Map
DMA 2000	Disaster Mitigation Act of 2000
DR	Major Disaster Declaration
DSCR	Dam Safety and Climate Resilience
DSOD	California Department of Water Resources, Division of Safety of Dams
DWSRF	Drinking Water State Revolving Fund
EM	Emergency Declaration
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FHSZ	Fire Hazard Severity Zone
FIRM	Flood Insurance Rate Map
FRA	Federal Responsibility Area
GIS	geographic information systems
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
LHMP	Local Hazard Mitigation Plan
LRA	Local Responsibility Area
NASA	National Aeronautics and Space Administration
NBS	Nature Based Solutions
NOAA	National Oceanic and Atmospheric Administration
OPC	Ocean Protection Council
PGA	peak ground acceleration
RCP	Representative Concentration Pathway
SCMU	Santa Cruz Municipal Utilities
SFHA	Special Flood Hazard Area
SRA	State Responsibility Area
UCLA	University of California, Los Angeles

UC Santa Cruz	University of California, Santa Cruz
UCAP	Utility Customer Assistance Program
USFS	U.S. Forest Service
USGS	United States Geological Survey
WIFIA	Water Infrastructure Finance and Innovation Act of 2014
WUI	Wildland–Urban Interface

1.0 INTRODUCTION

1.1 HAZARD MITIGATION AND CLIMATE ADAPTATION PLANNING

Hazard mitigation planning is a process that helps communities reduce the impacts of disasters on people and places before a disaster occurs. It involves identifying hazards, understanding vulnerabilities, and developing long-term risk-reduction strategies. For nearly 25 years, hazard mitigation planning has been driven by a federal law, known as the Disaster Mitigation Act of 2000 (DMA 2000), which emphasizes the need for state, tribal, and local entities to closely coordinate hazard mitigation planning and implementation efforts. It also provides the legal basis for the Federal Emergency Management Agency (FEMA) to require state, tribal, and local entities to develop hazard mitigation plans to receive certain types of federal disaster assistance. These requirements are defined in FEMA's State and Local Mitigation Planning Policy Guides and the Tribal Mitigation Plan Review Guide.

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1.2 2025–2030 LHMP – CAP SYNOPSIS

To meet the requirements of the DMA 2000, the City has updated its 2018–2023 Local Hazard Mitigation Plan (LHMP). Because climate adaptation and hazard mitigation share a common goal of reducing impacts from natural and climate-related hazards that are expected to increase in frequency and intensity due to climate change, the City used this plan update as an opportunity to update and incorporate its 2018–2023 Climate Adaptation Plan (CAP) into its LHMP. This new document is called the 2025–2030 City of Santa Cruz Local Hazard Mitigation Plan – Climate Adaptation Plan (herein referred to as the 2025–2030 LHMP – CAP).

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The 2025–2030 LHMP – CAP is organized to follow FEMA's 2023 Local Mitigation Plan Review Tool, which demonstrates how hazard mitigation plans meet the DMA 2000 regulations. As such, the specific planning elements of this review tool are discussed in their appropriate plan sections.

After this introduction, the 2025–2030 LHMP – CAP consists of the following sections:

- Section 2, Planning Process, provides an overview of the planning process, starting with a timeline. It identifies planning team members and describes their involvement. This section also details stakeholder involvement and public outreach. In addition, it provides an overview of the existing plans and reports, describing how those documents were incorporated into the 2025–2030 LHMP – CAP. Documentation that supports the planning process is provided in Appendix A.
- Section 3, Prologue, describes the City, including the planning area, demographics and development trends, and community assets. Supporting figures are provided in Appendix B.
- Section 4, Risk Assessment, describes each of the 10 hazards as well as secondary hazards addressed in this plan. Hazard figures are also provided in Appendix B. This section also describes the City's vulnerability to each hazard, and supporting vulnerability tables are provided in Appendix C. In addition, this section includes hazard impact tables as well as a discussion around the National Flood Insurance Program (NFIP).
- Section 5, Mitigation and Climate Adaptation Strategy, provides a hazard-mitigation-and-climate-adaptation-specific capability assessment. It also describes the mitigation and climate adaptation goals, the recommended short-term and long-term mitigation and climate adaptation strategy, the prioritized short-term mitigation and climate adaptation strategy plan, and the process to integrate the 2025–2030 LHMP – CAP into other planning mechanisms. Documentation that supports the mitigation strategy is provided in Appendix D.
- Section 6, Plan Maintenance, describes continued public participation and outlines how the plan will be implemented, integrated into other documents, and updated in 5 years. Documentation that supports the mitigation strategy is provided in Appendix E.
- Section 7, Plan Update, describes the changes in development and priorities and provides an update on mitigation actions identified in the 2018–2023 LHMP and 2018 CAP and how the 2018–2023 LHMP was integrated into other planning documents. Documentation that supports the plan maintenance process is provided in Appendix F.
- Section 8, Plan Adoption, documents the plan adoption process. The adoption resolution is provided in Appendix G.
- Appendices include Appendix A–Planning Process, Appendix B – Figures, Appendix C – Risk Assessment, Appendix D – Mitigation and Climate Adaptation Strategy, Appendix E – Plan Maintenance, Appendix F – Plan Update, and Appendix G – Plan Adoption.

2.0 PLANNING PROCESS

This section addresses Element A: Planning Process of the Local Mitigation Plan Regulation Checklist.

Element A: Planning Process	
A1.	Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))
A1-a.	Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan's development, as well as who was involved?
A1-b.	Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?
A2.	Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))
A2-a.	Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?
A3.	Does the plan document how the public was involved in the planning process during the drafting stage? (Requirement 44 CFR § 201.6(b)(1))
A3-a.	Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?
A4.	Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))
A4-a.	Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?

Key: CFR = Code of Federal Regulations

2.1 OVERVIEW OF THE 2025–2030 CITY OF SANTA CRUZ LHMP – CAP

As noted in Section 1, the City decided to use this LHMP update as an opportunity to combine both their LHMP and CAP into one document. This decision was made in 2021 when the City applied for a FEMA grant to update its LHMP (and the decision to integrate both plans into one was noted in the grant application).

The update for the 2025–2030 LHMP – CAP occurred over a 17-month period from July 2023 to December 2024. The City's Sustainability and Resiliency Officer served as the project manager for the plan update, and the City's Climate Analyst assisted in this process. In June 2024, the City hired a consultant to assist with finalizing the plan update. A timeline of the major planning tasks and milestones by month, including the six times the planning team met, is provided in Table 2-1. A list of the planning team members and how they contributed to the development of the plan is provided in Table 2-2. Planning team agendas are provided in Appendix A, pages A-2 through A-7.

Table 2-1: 2025–2030 LHMP – CAP Timeline

Date	Tasks	People Involved
July 2023	Held planning team meeting #1 on July 19 to kick off plan update process.	Project manager, project coordinator, and planning team
August 2023	Launched stakeholder involvement and public outreach effort. Held planning team meeting #2 on August 30 to determine hazards to profile and review and revise 2018–2023 LHMP mitigation actions.	Project manager, project coordinator, and planning team
September 2023	Held meeting with City department heads to discuss the integration of climate adaptation into the 2025–2030 LHMP – CAP.	Project manager, project coordinator, and City departments
October 2023	Held planning team meeting #3 (October 26).	Project manager, project coordinator, and planning team
November 2023 – May 2024	Drafted updates to various components of the 2018–2023 LHMP, including community profile, planning process, hazard identification, and mitigation strategy.	Project manager and project coordinator
June 2024	Held planning team meeting #4 on June 21 to review LHMP requirements and CAP recommendations, establish new timeline, confirm hazards to be profiled, and discuss draft community asset information.	Project manager, project coordinator, planning team, and AECOM
July 2024	Reviewed and provided status updates for the 2018–2023 mitigation actions and climate adaptation strategies. Drafted hazard profiles.	AECOM
August 2024	Conducted an overlay analysis of community assets in hazard areas and determined which assets are at risk. Developed list of draft mitigation actions and climate adaptation strategies. Held planning team meeting #5 on August 16 to review updated hazard figures, draft major critical assets and other major assets list, and draft mitigation action and climate adaptation strategies.	Project manager, project coordinator, planning team, and AECOM
September 2024	Updated the capability assessment and plan maintenance procedures. Prioritized mitigation actions and climate adaptation strategies. Created the Administrative Draft.	Project manager, project coordinator, and AECOM
October 2024	Held planning team meeting #6 on October 7 and presented Administrative Draft. Held a 2-week planning team review period.	Project manager, project coordinator, planning team, and AECOM

Date	Tasks	People Involved
November 2024	Created the Public Review Draft. Notified stakeholders and public of the Public Review Draft. Held a 3-week public comment period.	Project manager, project coordinator, and AECOM
December 2024	Created the Final Draft and submitted it to California Office of Emergency Services (Cal OES) and FEMA for review.	AECOM
Date TBD	Final Draft approved by FEMA. Final Plan adopted by the City of Santa Cruz.	LHMP – CAP project manager
Date TBD	Project closeout.	LHMP – CAP project manager, planning team, and AECOM

Key: Cal OES = California Office of Emergency Services; CAP = Climate Adaptation Plan; FEMA = Federal Emergency Management Agency; LHMP = Local Hazard Mitigation Plan; TBD = to be determined

Table 2-2: Planning Team

City of Santa Cruz Department	Name, Title	Involvement
City Manager	Tiffany Wise-West, Sustainability and Resiliency Officer	Served as project manager for the 2025–2030 LHMP – CAP. In addition, attended planning team meetings and reviewed and provided input on the Administrative Draft.
City Manager	Larry Imwalle, Homelessness Response Manager	Attended planning team meetings and reviewed the Administrative Draft.
City Manager	Lisa Murphy, Deputy City Manager	Attended planning team meetings.
City Manager	Saara Ranabhat, Climate Analyst	Served as project coordinator for the 2025–2030 LHMP – CAP. In addition, attended planning team meetings and reviewed Administrative Draft.
City Manager	Erika Smart, Communications Manager and Public Information Officer	Attended planning team meetings and reviewed the Administrative Draft.
Economic Development and Housing	David McCormice, Asset and Development Manager	Attended planning team meetings, provided input on public facilities, affordable/subsidized housing properties, and reviewed the Administrative Draft.
Fire Department	Meredith Albert, Office of Emergency Services Manager	Attended planning team meetings, provided input on terms, plan integration, and reviewed the Administrative Draft.
Information Technology	Richard Westfall, GIS Manager	Attended planning team meeting, provided GIS datasets, and reviewed the Administrative Draft.

City of Santa Cruz Department	Name, Title	Involvement
Parks and Recreation	Tony Elliot, Director	Attended planning team meetings and reviewed the Administrative Draft.
Public Works	Kevin Crossley, Assistant Director/City Engineer	Attended planning team meetings and reviewed the Administrative Draft.
Water	Sarah Easley Perez, Principal Planner	Provided input on Water Department critical facilities and infrastructure to include in the risk assessment as well as projects to include in the mitigation and climate adaptation strategy. In addition, attended planning team meetings and reviewed the Administrative Draft.
Water	Heidi Luckenbach, Water Department Director	Provided input on Water Department critical facilities and infrastructure to include in the risk assessment as well as projects to include in the mitigation and climate adaptation strategy. In addition, attended planning team meetings and reviewed the Administrative Draft.

Key: CAP = Climate Adaptation Plan; LHMP = Local Hazard Mitigation Plan

2.2 OPPORTUNITIES FOR STAKEHOLDERS

In addition to the planning team, the project manager engaged relevant community partners and the Santa Cruz County Emergency Management Council as part of the plan update process.

A complete list of stakeholders is in Appendix A, Tables A-1 through A-3, and include:

- Local and regional agencies involved in mitigation and climate adaptation activities, including the Coastal Watershed Council, Ecology Action, and Save our Shores
- Agencies that have the authority to regulate development, including the Santa Cruz City Council and the California Coastal Commission
- Neighboring communities, including the City of Capitola, City of Scotts Valley, City of Watsonville, and Santa Cruz County
- Representatives of businesses, including the Downtown Association of Santa Cruz, Santa Cruz Chamber of Commerce, and Santa Cruz Works
- Academia and other private organizations, including Monterey Bay Aquarium Research Institute, UC Santa Cruz, and Visit Santa Cruz County
- Representatives of nonprofit organizations that work directly with or provide support to underserved communities and socially vulnerable populations, including Central Coast Energy Services, Community Bridges, and Resource Center for Nonviolence, and Santa Cruz Neighbors

As part of this engagement, the City's Community Relations Specialist reached out to the stakeholders via email on August 14, 2023, to notify them of the plan update process, take the community-wide survey, and spread the word through their own websites and social media accounts, or in their newsletter. Due to staffing changes, email documentation to the stakeholders

is no longer available. However, the press release, which was included in the August 14, 2023, email, is provided in Appendix A, page A-10.

During the drafting process, the project manager also presented an overview of the plan update to select stakeholder members at the September 2024 Santa Cruz County Emergency Management Council meeting (Appendix A, page A-11) and the Climate Action Task Force in October 2024 (Appendix A, page A-12). One month later, on November 8, 2024, the City's Community Relations Specialist reached out to the plan's stakeholders again to notify them of the Public Review Draft period. No stakeholder comments were received (Appendix A, page A-13).

2.3 PUBLIC INVOLVEMENT

The City's Community Relations Specialist also posted the August 14, 2023, press release about the LHMP – CAP kick-off process to its website and through its social media accounts. The kick-off announcement was also picked up by the local news station, KION. The survey, in both English and Spanish, was available on the City's website and through a QR code over a 5-week period from August to September 2023. About 500 people completed the 32-question survey and input from the survey, including protection of critical facilities and concern for underserved populations and vulnerable communities, was used to develop mitigation actions and climate adaptation strategies for the 2025-2030 LHMP – CAP. Supporting public outreach material for the plan kick-off and survey are included in Appendix A, pages A-14 through A-21.

The project manager also promoted the LHMP – CAP and survey at a "tabling" event at the Santa Cruz Museum of Natural History on August 4, 2023, and at a climate change public forum at the London Nelson Center on September 6, 2023. The project manager estimates that between 100 and 200 community members attended each event. A photograph from the August 4, 2023, event is included in Appendix A, page A-22. No photographs were available of the September 6, 2023, event.

On November 8, 2024, the City's Community Relations Specialist announced the Public Review Draft period (November 8 through November 29) on its website and social media accounts (Appendix A, pages A-23 through A-25). The announcement, as well as an executive summary, were also provided in Spanish. In addition, the website also contained a comment form for community members to provide input and comments about the Public Review Draft. During the public review period, the City received 17 public comments and responded to the relevant commenters who provided their contact information.

2.4 OUTREACH TO UNDERSERVED POPULATIONS AND VULNERABLE COMMUNITIES

As noted in the 2030 General Plan, the City of Santa Cruz's underserved populations and vulnerable communities include individuals with physical, developmental or intellectual disabilities, chronic conditions or injuries, limited English proficiency, older adults, and those that are economically disadvantaged and/or experiencing homelessness. According to Cal OES, individuals with access and functional needs (such as listed above) are disproportionally affected by disasters. To reach these populations, the City coordinated with Community Bridges and Santa Cruz Neighbors to share the City's plan kick-off press releases and community-wide survey (both available in English and Spanish).

2.5 Review and Incorporation of Existing Studies, Plans, Reports, and Technical Information

A list of the relevant existing studies, plans, reports, and technical information reviewed and incorporated into the 2025–2030 LHMP – CAP is provided in Table 2-3. In addition, these sources of information are referenced throughout the plan.

Table 2-3: Existing Studies, Plans, Reports, and Technical Information

Plan/Report	Information to be Incorporated into the 2025–2030 LHMP – CAP
Cal-Adapt (2024)	Maps of projected change for maximum temperature and precipitation rate were downloaded and analyzed, and findings were included in Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
Draft State of California Sea Level Rise Guidance: 2024 Science and Policy Update (2024)	Scientific assessments of sea level rise were incorporated into Section 4.1, Hazard Identification.
NASA Analysis Sees Spike in 2023 Global Sea Level Due to El Niño (2024)	Relevant hazard information was incorporated into Section 4.1, Hazard Identification.
Fifth National Climate Assessment (2023)	Relevant hazard information was incorporated into Section 4.1, Hazard Identification.
NASA Study Finds Climate Extremes Affect Landslides in Surprising Ways (2022)	Scientific assessments of climate change and landslides were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
City of Santa Cruz 2030 Climate Action Plan (2022)	Climate action measures were incorporated into Table D-1, Draft Mitigation Actions and Climate Adaptation Strategies, and Table 5-5, Finalized Mitigation Action and Climate Adaptation Plan.
Santa Cruz County – San Mateo County Community Wildfire Protection Plan (2022)	Wildfire mitigation actions were incorporated into Table D-1, Draft Mitigation Actions and Climate Adaptation Strategies, and Table 5-5, Finalized Mitigation Action and Climate Adaptation Plan.
Protecting Californians from Extreme Heat: A State Action Plan to Build Community Resilience (2022)	Scientific assessments of climate change and extreme heat were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
Scripps Institution of Oceanography: Climate Change Projected to Increase Atmospheric River Flood Damages in the United States (2022)	Scientific assessments of climate change and atmospheric rivers were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
Nature: Mapping the Wildland-Urban Interface in California Using Remote Sensing Data (2022)	Relevant hazard information was incorporated into Section 4.1, Hazard Identification.

Plan/Report	Information to be Incorporated into the 2025–2030 LHMP – CAP
Virginia Tech News: New Research Makes Waves Tackling the Future of Tsunami Monitoring and Modeling	Scientific assessments of climate change and tsunamis were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
County of Santa Cruz Local Hazard Mitigation Plan 2021–2026 (2021)	Relevant hazard information was incorporated into Section 4.1, Hazard Identification.
Resilient Coast Santa Cruz Initiative (2019–2022), including the West Cliff Drive Adaptation Management Plan (2021)	Proposed climate adaptation strategies were incorporated into Table D-1, Draft Mitigation Actions and Climate Adaptation Strategies, and Table 5-5, Finalized Mitigation Action and Climate Adaptation Plan.
Center for Disease Control's Drought and Health: Health Impacts of Drought (2020)	Scientific assessments of climate change and drought were incorporated into Section 4.3, Potential Impacts from Each of the Identified Hazards.
U.S. Census Bureau 2020	Population data was used to analyze population risk.
UCLA Center for Climate Science: Future of Extreme Precipitation in California Project (2020)	Extreme storm and extreme precipitation findings were incorporated into Section 4.1, Hazard Identification.
NASA's Jet Propulsion Laboratory: Can Climate Affect Earthquakes, Or Are the Connections Shaky? (2019)	Scientific assessments of climate change and earthquakes were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
City of Santa Cruz 2030 General Plan (amended 2019)	Neighborhoods, land use classifications, and Sensitive habitats geographic information systems (GIS) data were used for demographics and community assets.
City of Santa Cruz Vulnerability and Adaptation Strategy (2019)	Scientific models and assessments of climate threats to the Central Coast were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
Woods Hole Oceanographic Institution: Changing Shorelines & Erosion (2019)	Scientific assessments of climate change and coastal erosion and sea level rise were incorporated into Section 4.3, Potential Impacts from Each of the Identified Hazards.
City of Santa Cruz Local Hazard Mitigation Plan Five-Year Update 2018–2023 (2018)	Multiple components of the previous plan, including the hazard profiles and capability assessment, were included and updated in this newest version of the plan.
City of Santa Cruz Climate Adaptation Plan Update 2018–2023 (2018)	Climate adaptation strategies were incorporated into Table D-1, Draft Mitigation Actions and Climate Adaptation Strategies, and Table 5-5, Finalized Mitigation Action and Climate Adaptation Plan.
California's Fourth Climate Change Assessment Central Coast Region Report (2018)	Scientific assessments of climate threats to the Central Coast were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.

Plan/Report	Information to be Incorporated into the 2025–2030 LHMP – CAP
FEMA Flood Insurance Study, Santa Cruz County and Incorporated Areas (2017)	Flood management applications, area studied, and engineering methods of the flood insurance study project were incorporated into Section 4.1, Hazard Identification.
City of Santa Cruz 2017 Sea Level Rise Vulnerability Assessment	Scientific assessments of climate threats to the City of Santa Cruz were incorporated into Section 4.1, Hazard Identification.
Santa Cruz County Coastal Climate Change Vulnerability Report (2017)	Scientific assessments of climate threats to Santa Cruz County were incorporated into Section 4.1, Hazard Identification.
U.S. Climate Resilience Toolkit (2014)	Scientific assessments of climate change were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
NOAA News: Coastal Flooding in California (2016)	Scientific assessments of California's high tide were incorporated into Section 4.1, Hazard Identification, and Section 4.3, Potential Impacts from Each of the Identified Hazards.
Monterey Bay Sea Level Rise Vulnerability Study (2014)	Scientific assessments of climate threats to Monterey Bay were incorporated into Section 4.1, Hazard Identification.

Key: CAP = Climate Adaptation Plan; FEMA = Federal Emergency Management Agency; GIS = geographic information systems; LHMP = Local Hazard Mitigation Plan; NASA = National Aeronautics and Space Administration; NOAA = National Oceanic and Atmospheric Administration; UCLA = University of California, Los Angeles

3.0 PROLOGUE

This section provides an overview of the City of Santa Cruz, demographics, development trends, and community assets.

3.1 PLANNING AREA, DEMOGRAPHICS AND DEVELOPMENT TRENDS

The City of Santa Cruz is located along the Pacific Coast in Santa Cruz County, California. At 12.69 miles of land, it sits on the northern edge of the Monterey Bay, about 32 miles south of San Jose and 75 miles south of San Francisco (Appendix B Figure 1). It is known for its moderate climate, natural environment, coastline featuring coastal bluffs and coastal lagoons, and redwood forests in the Santa Cruz Mountains. The City, with a population of 62,956 (U.S. Census Bureau 2020), serves as the County government seat and is home to the Santa Cruz Beach Boardwalk, an oceanfront amusement park, UC Santa Cruz, and the Monterey Bay National Marine Sanctuary.

The City is compact and has an urban central core, circumscribed by designated open space and endowed with a diverse natural and built environment. Public and privately owned agricultural areas, natural areas, parks, and coastal recreation areas form a greenbelt of open space along the City's western, northern, and eastern boundaries. As shown in Table 3-1 and Figure 2.a (Appendix B), the 2030 General Plan divides the City into 34 neighborhoods. Calculating the proportional analysis of the 2020 U.S. Census Bureau population data to these boundaries shows that 59,424 people reside in these 34 neighborhoods.

Much of the City's underserved and vulnerable populations (as defined in Section 2.4 Outreach to Underserved Populations and Vulnerable Communities) reside in the City's frontline community neighborhoods including Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhood, Downtown District, Downtown Neighborhoods, Lower Ocean Neighborhoods, Ocean Street Corridor, River Street District, San Lorenzo Park Neighborhoods, and Lower and Upper Seabright Neighborhoods. Frontline communities are those most vulnerable to climate change and suffered disproportionately because of historical injustice and disinvestment and have large populations with access and functional needs. These neighborhoods are shown in Appendix B, Figure 2.b. Additional vulnerable individuals including those with physical, developmental or intellectual disabilities, older adults, and those that are economically disadvantaged or experiencing homelessness are addressed in Section 3.2.

Table 3-1: Neighborhoods

Name	Acres	Population
Arana Gulch	66.46	0
Banana Belt Neighborhoods	454.77	5,188
Beach and Boardwalk District	98.26	1,369
Beach Hill/Beach Flats Neighborhoods	60.09	983
Branciforte Drive Neighborhoods	48.87	636
California Street/Mission Hill Neighborhoods	158.45	2,152
Carbonera Neighborhoods	212.09	332
DeLaveaga Park	552.98	39

Name	Acres	Population
Downtown District	88.35	1,559
Downtown Neighborhoods	187.48	3,804
Harvey West District	247.46	890
King Street Neighborhoods	238.89	3,033
Lighthouse Field State Beach	47.66	56
Lighthouse/The Circles Neighborhoods	572.21	7,015
Lower Ocean Neighborhoods	77.93	1,727
Lower Seabright Neighborhoods	117.98	781
Mission Street Corridor	73.34	834
Moore Creek Upland Open Space	250.76	17
Natural Bridges State Beach	66.65	47
Neary Lagoon	61.66	472
Ocean Street Corridor	30.98	543
Pogonip	619.69	13
Prospect Heights Neighborhoods	226.97	2,223
River Street District	65.17	763
San Lorenzo Park Neighborhoods	7.40	40
Soquel Avenue Corridor	91.21	1,081
Tanner Heights Neighborhoods	73.44	216
University of California, Santa Cruz	1057.46	8,458
Upper Ocean Neighborhoods	33.34	733
Upper Seabright Neighborhoods	481.65	6,430
Water Street Corridor	65.97	923
Western Drive/Nobel Neighborhoods	579.87	3,762
Westlake Neighborhoods	396.71	2,443
Westside Industrial District	391.87	862

To preserve and build upon the City's sense of place and environmental character, the 2030 General Plan stipulates that growth will be accommodated by densification of residential, commercial, and industrial development on lands within existing City boundaries. The Pacific Ocean and publicly owned open space as well as agricultural and natural areas will be preserved to define and contain urban development. Employment and population projections prepared by the Association of Monterey Bay Area Governments for the City estimate a 2030 population of 73,375. Most, if not all, growth will occur via infill development of vacant and underutilized parcels throughout the City. The 2030 General Plan envisions residential and commercial intensification

along the major street corridors (Water Street, Soquel Avenue, Mission Street, and Ocean Street) and through private and public redevelopment of opportunity sites. The 2030 General Plan as well as Downtown Expansion Plan also encourage intensification in the downtown area, including the Front Street corridor, lower Pacific Avenue, and the area south of Laurel Street. Altogether these areas include the Beach and Boardwalk District, Beach Hill and Beach Flats Neighborhoods, California Street/Mission Hill Neighborhoods, Downtown Neighborhoods, Downtown District, Mission Street Corridor, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, Water Street, and Westside Industrial District (Appendix B, Figure 2.c). The City's Upcoming Significant Housing Projects Map also identifies a handful of 100 percent affordable housing properties to be developed in these neighborhoods soon.

3.2 COMMUNITY ASSETS

FEMA identifies "community lifelines and other critical facilities" that are essential for life, safety, and economic viability. For this plan, these types of assets are referred to as "critical facilities and infrastructure" for City owned and/or operated facilities and infrastructure and "other major assets" for buildings and facilities that are located within City limits, utilized by the community, and often serve as community gathering places but are not owned and/or operated by the City. The most critical, or important, of these City facilities and infrastructure are listed in Table 3-2 and depicted in Appendix B, Figures 3.a–3.j, while other major assets are listed in Table 3-3 and depicted in Appendix B, Figures 4.a–4.e. Table 3-2 also identifies City facilities for people experiencing homelessness, while Table 3-3 identifies affordable/subsidized housing properties for the economically disadvantaged, elderly, and people with disabilities.

In addition to critical facilities and infrastructure as well as other major assets, additional community assets included in this plan are as follows: selective highways and bridges (Table 3-4 and Appendix B, Figure 5), selective land use designations (Table 3-5 and Appendix B, Figure 6), sensitive habitats (Table 3-6 and Appendix B, Figure 7), and water assets (Table 3-7 and Appendix B, Figures 8.a–8.c).

Table 3-2: City Critical Facilities and Infrastructure

Type	Number
City Hall Campus	11 City Hall Campus buildings
City Manager	9 facilities, including shelters and safe parking programs
Fire Department	6 facilities, including fire stations, lifeguard headquarters, and the Emergency Operations Center
Parks and Recreation Department	57 parks, trails, beaches, open spaces, greenways, and facilities, including DeLaveaga Golf Course, Harvey West Pool, London Nelson Community Center, Santa Cruz Civic Auditorium, Santa Cruz Teen Center, Santa Cruz Wharf, Surfing Museum, Market St. Senior Center, Santa Cruz Natural History Museum, Harvey West Parks Yard, Santa Cruz Shakespeare, and Nueva Vista Community Center
Police Department	1 police station
Public Works Department*	124 parking lots and structures, corporation yard, resource recovery facility, and stormwater and wastewater system facilities and infrastructure (pumps, tanks, generators, and a treatment facility)

Type	Number
Water Department*	97 water system facilities and infrastructure including a reservoir, interties, diversion facilities, treatment facilities, tanks, pumps, and wells 19.12 linear miles of raw water pipelines 262.87 miles of treated water distribution system
Levees	2.93 linear miles of levees
Future	The Public Works Department and Water Department each have 1 critical facility to be constructed over the next 5 years

Note: Some Public Works Department and Water Department critical facilities and infrastructure that extend beyond City limits are included in this list.

Table 3-3: Other Major Assets

Type	Number
Affordable and Subsidized Housing Properties	190 buildings
Historic Buildings	719 buildings
Kaiser Permanente Arena	1 building
Santa Cruz Beach Boardwalk	1 facility
Santa Cruz Harbor	1 harbor
Santa Cruz City Schools	9 schools
Santa Cruz Public Libraries	3 libraries

Table 3-4: Highways and Bridges

Type		Number
Highways	Highway 1	6.07 linear miles
	Highway 9	1.36 linear miles
	Highway 17	1.64 linear miles
Bridges		25 pedestrian and vehicular bridges

Table 3-5: Land Use Designations

Type	Number
Coastal Dependent	78.70 acres
Coastal Recreation	108.44 acres
Agriculture	6.46 acres
Parks	383.54 acres
Natural Areas	1,531.02 acres

Table 3-6: Sensitive Habitats

Type	Number
Aquatic	102.71 acres
Freshwater Wetland	14.31 acres
Grassland	370.40 acres
Riparian	230.94 acres
Salt Marsh	0.94 acres
Monarch Butterfly	161.80 acres
Seabird	7.60 acres
Mt. Hermon June Beetle	8.89 acres
Ohlone Tiger Beetle	251.81 acres
Robust Spineflower	0.52 acres

Table 3-7: Water Assets

Type		Number
Lakes		0.14 square miles
San Lorenzo River		2.63 linear miles
Creeks		19.07 linear miles
Watersheds*	Laguna	7.79 square miles
	Lidell	5.98 square miles
	Majors	4.98 square miles
	San Lorenzo	135.95 square miles
Groundwater basins*	Santa Cruz Mid-County	56.05 square miles
	Santa Margarita	34.76 square miles

Note: Watersheds and groundwater basins that extend beyond City limits are included in this list.

4.0 RISK ASSESSMENT

This section addresses Element B: Risk Assessment of the Local Mitigation Plan Regulation Checklist.

Element B: Risk Assessment	
B1.	Does the plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement 44 CFR § 201.6(c)(2)(ii))
B1-a.	Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?
B1-b.	Does the plan include information on the location of each identified hazard?
B1-c.	Does the plan describe the extent for each identified hazard?
B1-d.	Does the plan include the history of previous hazard events for each identified hazard?
B1-e.	Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature, and sea levels), on the type, location, and range of anticipated intensities of identified hazards?
B1-f.	For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?
B2.	Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))
B2-a.	Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?
B2-b.	For each participating jurisdiction, does the plan describe the potential Impacts from each of the identified hazards on each participating jurisdiction?
B2-c.	Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?

Key: CFR = Code of Federal Regulations; NFIP = National Flood Insurance Program

4.1 HAZARD IDENTIFICATION

During the first planning team meeting in August 2023, the LHMP – CAP project manager and planning team identified potential hazards to include in the 2025–2030 LHMP – CAP. These included the "big three" hazards in California—earthquake, flood (riverine flood, flash flood, and coastal flood), and wildfire—as well as additional current community concerns and climate-related driven events, including coastal erosion, drought, extreme heat, and sea level rise, and additional mapped hazards for the City, including dam failure, landslide, and tsunami.

For each identified hazard, the nature, disaster history, locations of historical hazard events and their extent/severity, probability of future hazards, and how they are impacted by climate change and/or exacerbate additional climate stressors are described. The hazards profiled for the 2025–2030 LHMP – CAP are presented alphabetically, not by level of risk, in Tables 4-1 through 4-10. Supporting Figures 9–23 are provided in Appendix B.

4.1.1 Coastal Erosion

Table 4-1: Coastal Erosion Profile

Profile	Description
Nature	Erosion is the loosening and transportation of rock and soil debris by wind, rain, or moving water. Coastal erosion refers to the wearing away of coastal land. It is commonly used to describe the horizontal retreat of the shoreline along the ocean. Erosion and accretion are the two components of shoreline change. Erosion results when more sediment is lost along a particular shoreline than is re-deposited by the water body. Accretion results when more sediment is deposited along a particular shoreline than is lost. When these two processes are balanced, the shoreline is said to be stable. Coastal erosion includes both cliff and/or bluff erosion and beach erosion and is a result of both winter wave attack and slowly rising sea level. Winter storm waves are larger, steeper, and contain more energy and typically move significant amounts of sand from the beaches to offshore bars than waves not associated with winter storms, 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 erode the cliffs and bluffs more frequently. During extreme storm events, such as when strong atmospheric rivers that push ocean water toward coastlines collide with North Pacific swells (large distant ocean waves), the forces involved in coastal erosion can be quite destructive and cause significant damage to the coastline, including the built environment. Because there are so many factors involved in coastal erosion, including human activity, storm activity, sea level rise, seasonal fluctuations, and climate change, sand movement is not consistent year after year in the same location.
Location	As shown in Figure 9, the entire coastal edge of the City of Santa Cruz is affected by coastal storms and other natural events that cause erosion. West Cliff Drive from Cowell Beach to Natural Bridges State Park is at the highest risk of, and continues to be shaped and impacted by, coastal erosion processes.
History	Storms continually erode the Santa Cruz coastline, particularly during El Niño years. NOAA Storm Events Database for high surf and coastal flood events shows that from January 1, 2020, to December 1, 2024, there were 5 days of coastal flood events and 37 days of high surf events for the San Francisco Peninsula and northern Monterey Bay, which include the City of Santa Cruz. The number of recorded events has increased in recent years and most of the events were the result of significant winter storms or weather systems. In recent years, the federal government declared 9 Major Disaster Declarations (DRs) and Emergency Declarations (EMs) for heavy rain, flood, and other storm-related events in Santa Cruz County, including the City of Santa Cruz. These storm-related events generally cause erosion and include the following: • 1981–1982, Severe Storms, Flood, Mudslide, and High Tide (DR 651) • 1986, Severe Storms and Flooding (DR 758) • 2017, Severe Winter Storms, Flooding, and Mudslides (DRs 4305 and 4308) • 2022–2023, Severe Winter Storms, Flooding, Landslides, and Mudslides (DR 4683) • 2023, Severe Winter Storms, Flooding, Landslides, and Mudslides (EMs 3591 and 3592) • 2023, Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides (DR 4699)

Profile	Description
	• 2024, Severe Winter Storms, Tornadoes, Flooding, Landslides, and Mudslides (DR 4769)
Extent/ Severity	Erosion is 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 events, changes in the geometry of tidal inlets and bays, and human-made structures and human activities such as shore protection structures and dredging. A quantitative assessment by researchers from UC Santa Cruz and the University of Tehran showed that the total retreat of the West Cliff Drive coastline over 65 years (1953–2018) was 0.3–32 meters (0.98–105 feet), and the maximum cliff retreat rate was 0.5 meters (1.6 feet) a year. As shown in Figure 9, modeling developed as part of the 2014 Monterey Bay Sea Level Rise Vulnerability Study and refined in the City's 2017 Sea Level Rise Vulnerability Analysis shows existing dune and cliff coastal erosion as 0.10 square miles/64 acres (0.83 percent) in the City of Santa Cruz.
Future Events, Including the Effects of Climate Change	The United States Geological Survey (USGS) has tied severe coastal erosion to El Niño events, which occur irregularly, but generally every 2–7 years. Many scientists believe that increased global temperatures will intensify extreme weather events associated with El Niño, including storm surge and rainfall events (which will lead to accelerated coastal erosion). The 2014 Monterey Bay Sea Level Rise Vulnerability Study and City's 2017 Sea Level Rise Vulnerability Analysis also show potential for future dune and cliff erosion hazard zones by modeling historical trends in erosion and additional erosion caused by accelerating high sea level rise scenarios and large storm wave events. Planning horizons for this study were developed for 2030, 2060, and 2100 and assume that existing coastal protection infrastructure or "armoring" will no longer function after 2030, as it will have failed or needed to be removed, replaced, or significantly redesigned during the planning horizons. As such, it is assumed that erosion migration rates will accelerate and by 2030, 0.12 square miles/76.8 acres (0.93 percent) of the City of Santa Cruz will be included in this hazard area. By 2060 this number will grow to 0.22 square miles/140.8 acres (1.70 percent), and by 2100 it will reach 0.3 square miles/192 acres (2.33 percent). Most of the coastal erosion processes during this time frame will occur along the Santa Cruz Harbor, beach frontage, and cliff frontage near the mouth of the San Lorenzo River. It is also noted for the study that "while not all areas within the hazard zone are expected to erode to this extent by the specified planning horizon, any location has the potential to erode to this extent for the selected scenario."

Key: DR = Major Disaster Declaration; EM = Emergency Declaration; NOAA = National Oceanic and Atmospheric Administration; UC Santa Cruz = University of California, Santa Cruz; USGS = United States Geological Survey

4.1.2 Dam Failure

Table 4-2: Dam Failure Profile

Profile	Description
Nature	Dam failure, also known as a dam breach, is the structural collapse of a dam that releases the water stored in the reservoir behind the dam. A dam failure is usually the result of the age of the structure, inadequate spillway capacity, or structural damage caused by an earthquake or flood. When a dam fails, a large, uncontrolled quantity of water is suddenly released with a great potential to cause human casualties, economic loss, and environmental damage. This type of disaster is especially dangerous because it can occur suddenly, providing little warning or evacuation time for the people living downstream. The flows resulting from dam failure are generally much larger than the capacity of the downstream channels and therefore lead to extensive flooding. Flood damage occurs because of the flood's momentum caused by the sediment-laden water flooding over the channel banks and the impact of the flow's debris.
Location	In California, any dam with a height of more than 6 feet and impounding 50 acre-feet or more of water or any dam that is 25 feet or higher and impounds more than 15 acre-feet of water is under the State's jurisdictional oversight, unless exempted. As shown in Figure 10, according to the California Department of Water Resources, Division of Safety of Dams (DSOD), there are five State jurisdictional dams within Santa Cruz County, but none are located within the City of Santa Cruz. The City of Santa Cruz owns the Newell Creek Dam (also referred to as the Newell Dam) in the Santa Cruz Mountains. The dam is a 195-foot-high earth-fill dam constructed in 1961 impounding Loch Lomond Reservoir (maximum storage capacity of 8,646 acre-feet). The dam is operated by the Santa Cruz Water Department and regulated by the DSOD. In December 2023, the City of Santa Cruz Water Department completed the 4-year inlet/outlet replacement project that addressed aging infrastructure and allows the dam to meet current reservoir drawdown requirements. The Newell Creek Dam breach inundation area includes downtown Santa Cruz as well as much of the Beach and Boardwalk District and Lower Ocean Neighborhoods.
History	There is no history of a dam failure event within the City of Santa Cruz.
Extent/ Severity	The Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures (FEMA P-946, July 2013) defines the downstream hazards for dam incidents, not the probability of failure. The downstream hazards are based "solely on the potential downstream impacts to life and property should the dam fail when operating with a full reservoir." FEMA has developed three categories of increasing severity for downstream hazards: Low, Significant, and High. DSOD adds a fourth category of Extremely High. High hazard potential dams are expected to cause the loss of at least one human life if they fail. Dams that are classified as Extremely High hazard potential dams are expected to cause loss of human life or have an inundation area with a population of 1,000 or more. A dam breach inundation map shows the downstream flooding that could result from a hypothetical failure of the dam or its critical appurtenant structure. In 2017, the California legislature passed a law requiring all owners of State jurisdictional dams—except for owners of Low hazard potential dams—to develop inundation maps approved by DSOD and emergency action plans approved by Cal OES. The approved Extremely High and High hazard potential dam breach inundation maps for Newell Creek Dam are shown in Figures 11.a and 11.b, which show that a total of 1.08 square

Profile	Description
	miles/691.2 acres (8.48 percent) of mapped dam breach inundation area is in the City of Santa Cruz.
Future Events, Including the Effects of Climate Change	Dams fail for various reasons, including substandard construction materials/techniques, spillway design error, geological instability, poor maintenance, intense rainfall, flow regulation, or earthquakes. Therefore, recurrence probabilities are unknown. State-jurisdictional dams are regulated by the DSOD, and each dam undergoes an annual inspection to ensure that it is safe, performing as intended, and not developing safety issues. According to the DSOD, dams have been designed to withstand storms so massive that they happen only once every 1,000 years (i.e., a 0.1 percent chance). However, in recent years, there has been growing concern about extreme precipitation events pushing aging dams beyond what they were designed to handle. Water flowing over the top of a dam is considered among the worst possible failures, as it puts pressure on the structure and increases the odds of a complete collapse. However, before overtopping of the dam occurs, an emergency release valve would be opened to lower the water level within the reservoir to prevent overtopping. According to Cal-Adapt, the region in the Santa Cruz Mountains where the Loch Lomond Reservoir and Newell Creek Dam are located is projected to see an increase in both average annual precipitation rates and more extreme precipitation events through mid- and late-century. These projections indicate that there may be more impacts and risks that lead to dam failure over time. More specifically, extreme precipitation events may exceed the capacity of existing infrastructure (e.g. emergency spillway), can cause increased sediment build-up in the reservoir, and increase the likelihood of landslides surrounding the reservoir and watersheds. Increased sediment loads from upstream networks can reduce reservoir capacity, obstruct intakes where downstream releases are made, increase operation and maintenance costs, and potentially lead to dam failure if not addressed.

Key: Cal OES = California Office of Emergency Services; DSOD = California Department of Water Resources, Division of Safety of Dams; FEMA = Federal Emergency Management Agency

4.1.3 Drought

Table 4-3: Drought Profile

Profile	Description
Nature	Drought is a normal, recurrent feature of virtually all climatic zones, including areas of both high and low rainfall, though the characteristics of droughts will vary significantly from one region to another. Drought differs from normal aridity, which is a permanent feature of the climate in areas of low rainfall. Drought is the result of a natural decline in the expected precipitation over an extended period, typically one or more seasons. Other climatic characteristics impact the severity of drought conditions, including high temperatures, high winds, and low relative humidities. Four common definitions for drought are as follows: • Meteorological drought is defined solely on the degree of dryness, expressed as a departure from actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales. • Hydrological drought is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels. • Agricultural drought is defined mainly in soil moisture deficiencies relative to the water demands of plant life, usually crops. • Socioeconomic drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply due to weather-related supply shortfall. It may also be called a water management drought. A drought's severity depends on numerous factors, including duration, intensity, geographic extent, and regional water supply demands by humans and vegetation.
Location	Drought occurrences are regional and can impact large areas of the central California coast, including the City of Santa Cruz. Therefore, all the City of Santa Cruz is vulnerable to drought.
History	Drought is a cyclic part of the climate of California, occurring in both summer and winter, with an average recurrence interval of 3 to 10 years. The driest year to date (since record keeping began in 1895) occurred in 2022. The droughts that have occurred in the State of California, including the City of Santa Cruz, over the past 100 years are listed below: • 1917–1921, statewide, except for central Sierra Nevada and north coast • 1922–1926, statewide, except for central Sierra Nevada • 1928–1937, statewide • 1943–1951, statewide • 1959–1962, statewide • 1976–1977, statewide, except for southwestern deserts • 1987–1992, statewide • 2007–2009, statewide, particularly the Central Coast • 2012–2017, statewide • 2021–2023, statewide In recent years, drought state emergencies were issued by the California governor from January 17, 2014–April 7, 2017 (Executive Order B-17-2014) and April 12, 2021/May 10, 2021/July 8, 2021/October 19, 2021–February 1, 2023 (Executive Order N-7-22). FEMA has never declared a drought as a major or emergency disaster in the United States.

Profile	Description
Extent/ Severity	The National Drought Mitigation Center produces drought monitor maps for the United States. It classifies droughts into five categories from least severe to most severe as follows: • D0 (abnormally dry) • D1 (moderate drought) • D2 (severe drought) • D3 (extreme drought) • D4 (exceptional drought) These maps are updated every week and provide expert-based best judgment on regional-scale drought conditions based on recent precipitation totals across the country compared to their long-term averages. The maps also account for other variables including temperature, soil moisture, water levels in streams and lakes, snow cover, meltwater runoff, and drought impacts such as water shortages and business interruptions. The City of Santa Cruz was classified as having consistent drought conditions from February 2020 – March 2023. These drought classifications generally ranged from D0 (abnormally dry) to D2 (severe drought). However, from early May 2021 to the end of December 2021, the area reached D3 (extreme drought) conditions. During the drafting of this plan in the Fall 2024, the City of Santa Cruz was classified as having D0 (abnormally dry) drought conditions.
Future Events, Including the Effects of Climate Change	As noted above, drought is a cyclic part of the climate of California, with an average recurrence interval of 3 to 10 years. Drought projections carry more uncertainty when compared to other climate hazards, as climate models tend to differ on precipitation trends. However, according to UCLA's Center for Climate Science, climate probabilities in Northern California (including the City of Santa Cruz) by the year 2100 show that extreme dry years will occur 1.8 times more frequently than the 1895 to 2017 frequency rate of one time every 100 years. According to the California Department of Water Resources, the increase in extreme dry events over time will put additional stress on the Central Coast's water supply, as it is one of the State regions most vulnerable to drought because there are relatively less groundwater resources available in this area than in other parts of the State.

Key: UCLA = University of California, Los Angeles

4.1.4 Earthquake

Table 4-4: Earthquake Profile

Profile	Description
Nature	An earthquake is a sudden motion or trembling caused by the release of strain accumulated in or along the edge of Earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and can cause massive damage and extensive casualties in a few seconds. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure. Ground motion is the vibration or shaking of the ground during an earthquake. Seismic waves radiate when a fault ruptures, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter. Soft soils can amplify ground motions. In addition to ground motion, several secondary natural hazards can occur from earthquakes, including the following: • Surface faulting: Surface faulting is the differential movement of two sides of a fault at the Earth's surface. Displacement along faults varies in terms of both length and width but can be significant (e.g., up to 20 feet), as can the length of the surface rupture (e.g., up to 200 miles). Surface faulting can cause severe damage to infrastructure, including railways, highways, pipelines, tunnels, and dams. • Liquefaction: Liquefaction occurs when seismic waves pass through saturated granular soil, distorting its granular structure and causing some of the empty spaces between granules to collapse. Liquefaction causes lateral spreads (i.e., horizontal movements of 10 to 15 feet most commonly but up to 100 feet), flow failures (i.e., massive flows of soil, typically hundreds of feet but up to 12 miles), and loss of bearing strength (i.e., soil deformations causing structures to settle or tip). Liquefaction can cause severe damage to property. • Landslides/debris flows: Landslides and debris flows occur as a result of horizontal seismic inertia forces induced in slopes by ground shaking. The most common earthquake-induced landslides include shallow, disrupted landslides such as rockfalls, rockslides, and soil slides. Debris flows are created when surface soil on steep slopes becomes completely saturated with water. Once the soil liquefies, it loses its ability to hold together and can flow downhill at very high speeds, taking vegetation and structures with it. Slide risks increase during a wet winter after an earthquake. The most common measure of earthquake intensity used in the United States is the Modified Mercalli Intensity Scale, which measures felt intensity, peak ground acceleration (PGA), and instrumental intensity by quantifying how hard the earth shakes in each location. The scale ranges from an intensity of I to X, with the lower numbers of the intensity scale generally dealing with the "manner in which the earthquake is felt by people" while the higher numbers on the scale are based on "observed structural damage." The Modified Mercalli Intensity Scale includes: • Intensity I, no shaking felt • Intensity II–III, weak shaking, felt by only a few people (mainly those indoors) • Intensity IV, light shaking, felt noticeably by people indoors and outdoors by a few • Intensity V, moderate shaking, felt by nearly everyone • Intensity VI, strong shaking, felt by all (many frightened)

Profile	Description
	• Intensity VII, very strong shaking, negligible damage in buildings of good design. • Intensity VIII, severe shaking, considerable damage in buildings of good design • Intensity IX, violent shaking, great damage in buildings of good design • Intensity X, extreme shaking, some buildings of good design destroyed
Location	As shown in Figure 12, there are three major faults within Santa Cruz County: the San Andreas fault, San Gregorio fault, and Zayante fault. Major faults like these three are not actually each one single fault but instead make up fault zones or systems, or networks of parallel faults, including the Corralitos fault complex, Monterey Bay fault complex, Butano fault, and Ben Lomond fault. The Ben Lomond fault, which is a subsidiary fracture within the San Andreas fault system, is the largest fault in the City of Santa Cruz, starting offshore in the Monterey Bay and extending 11 miles up into the Santa Cruz Mountains.
History	The California Geological Survey maintains a database of historical earthquake events in California from 1769 to 2015. As shown in Figure 12, no documented magnitude ≥5.0 earthquake epicenters have been within the City of Santa Cruz. However, there have been 10 documented magnitude ≥5.0 earthquakes within Santa Cruz County from 1769–2015. This count includes the magnitude 6.9 Loma Prieta Earthquake that occurred on October 17, 1989, in the Santa Cruz Mountains about 10 miles northeast of the City of Santa Cruz. The earthquake was declared a major disaster (DR-845) the day after.
Extent/ Severity	The California Geological Survey has developed probabilistic seismic hazard maps for earthquake shaking potential for California. The maps refer to an estimate of the probability of exceeding a certain amount of ground shaking or ground motion in 50 years, which is the same as the level of ground shaking with about a 2,500-year average repeat time. The hazard depends on the magnitudes and locations of likely earthquakes, how often they occur, and the properties of the rocks and sediments that the earthquake waves travel through. Regions near major, active faults are shown in orange, red, and pink and experience stronger earthquake shaking more frequently. Regions that are distant from known, active faults are shown in blue, green, and yellow; these areas experience lower levels of shaking and do so less frequently. A probabilistic seismic hazard map depicting a 2 percent probability of exceedance in 50 years (Appendix B, Figure 13.a and Figure 13.b) shows that 10.51 square miles/6,732. acres (82.85 percent) of the City is in a potential shake area of ≥0.65g PGA and will experience stronger shaking, more frequently. This includes nearly all the City except for the majority of the UC Santa Cruz Neighborhood and approximately half of Pogonip.
Future Events, Including the Effects of Climate Change	According to the USGS, the major fault and fault zones in and around the City of Santa Cruz have the following potential for surface rupture and the following characteristics of a maximum earthquake: • San Andreas fault: high potential for surface rupture with a maximum magnitude of 8.5 with an estimated recurrence interval of 100–1,000 years for a major earthquake event (although historical evidence suggests shorter end of this interval, even 50–100 years). • San Gregorio fault: moderate to high potential for surface rupture with a maximum magnitude of 7.2–7.9 with an estimated recurrence interval of 10–100 years for a major earthquake event.

Profile	Description
	• Zayante fault: moderate potential for surface rupture with a maximum magnitude of 7.4 with a likely recurrence interval of hundreds to a few thousand years for a major earthquake event. • Corralitos fault complex: moderate potential for a surface rupture with a maximum magnitude of 6.9 with a likely recurrence interval of hundreds to a few thousand years for a major earthquake event. • Monterey Bay fault complex: moderate potential for a surface rupture with a maximum magnitude of 6.5 with an unknown recurrence interval (probably less than 10,000 years and possibly less than 1,000 years) for a major earthquake event. • Butano fault: moderate potential for a surface rupture with a maximum magnitude of 6.4 with an unknown recurrence interval (probably less than 10,000 years and possibly less than 1,000 years) for a major earthquake event. • Ben Lomond fault: maximum magnitude of 5.5; the potential for a surface rupture and recurrence interval on this fault are unknown due to insufficient data. According to the National Aeronautics and Space Administration (NASA), there is no way of knowing at this point if and where climate-related stress could promote earthquakes.

Key: DR = Major Disaster Declaration; NASA = National Aeronautics and Space Administration; PGA = peak ground acceleration (expressed as fraction of Earth's gravity, "g"); UC Santa Cruz = University of California, Santa Cruz; USGS = United States Geological Survey

4.1.5 Extreme Heat

Table 4-5: Extreme Heat Profile

Profile	Description
Nature	According to the State of California, extreme heat refers to temperatures that are well above normal conditions and are consecutive for days and nights for a given area. Because some places are hotter than others, extreme heat temperatures depend on what is considered an average based on historical conditions. In addition, humidity can make it seem hotter than it really is. Ready.gov defines extreme heat as "a period of high heat and humidity with temperatures above 90 Fahrenheit (°F) for at least two to three days." The U.S. Environmental Protection Agency (EPA) also refers to a persistent period of unusually hot days as an extreme heat event or heat wave. In addition to extreme heat classifications, the National Weather Service Forecast Office, along with local partners, determines and issues warnings for heat advisories, excessive heat warnings, and excessive heat watches.
Location	Per Climate California, the direct cause of nearly all heatwaves in California is the direct result of a strong high-pressure system that remains stationary for a long period of time, killing off clouds/causing bright sunlight to heat the ground throughout the day and trapping heat, which prevents heat from rising. This phenomenon is often referred to as a "heat dome." Strong, high-pressure systems can extend throughout the State or even several states. Some areas along the coast, including the City of Santa Cruz, are often spared from the worst of these extreme events because of the cooling influences of the Pacific Ocean.
History	NOAA's Storm Events Database shows that since January 1, 2000, to December 1, 2024, there were two excessive heat events for the San Francisco Peninsula and northern Monterey Bay, which include the City of Santa Cruz. The events occurred on September 1, 2017, and July 9, 2021. FEMA has never declared a heatwave as a major or emergency disaster in the United States.
Extent/ Severity	According to First Street models, the City Santa Cruz currently experiences 7 hot days a year. A hot day in Santa Cruz is any day above a "feels like" temperature of 82°F. The hottest temperature in the City of Santa Cruz in recent recorded history was 110°F on September 1, 2017.
Future Events, Including the Effects of Climate Change	Cal Adapt climate projections for the Central Coast (including all of the City of Santa Cruz), under a business-as-usual scenario (which refers to a projected climate change scenario where no significant efforts are made to reduce greenhouse gas emissions), project that the number of extreme heat days per year (daily temperatures exceeding 93.1°F) will increase by approximately 4 days per year into mid-century (2035–2064) and by 10 days per year by the end of the century (2070–2099). The longest stretches of consecutive extreme heat days are also projected to increase from a historical baseline of 1 day per year to 2 days per year in mid-century and 4 days per year by the end of the century. As shown in Figure 14, Cal-Adapt models for projected long-term Annual Average Maximum Temperature (change from historical baseline) show that all of the City of Santa Cruz will see an increase in maximum temperature by mid-century (2035–2064) of 4.06°F under the high emissions scenario (Representative Concentration Pathway [RCP 8.5]) and an increase in maximum temperature by end of century (2070–2099) of 6.99°F under the high emissions scenario (RCP 8.5).

Key: °F = degrees Fahrenheit; EPA = U.S. Environmental Protection Agency; NOAA = National Oceanic and Atmospheric Administration; RCP = Representative Concentration Pathway

4.1.6 Flood

Table 4-6: Flood (Riverine Flood, Flash Flood, and Coastal Flood)

Profile	Description
Nature	A flood is the overflowing of water onto land that is normally dry, or in areas that are above the normal high tide line. In California, the most serious flooding comes from large storm centers originating in the mid-Pacific Ocean. Known as atmospheric rivers, these storms deliver large amounts of rainfall (or snow) in a short period of time. In Northern California, atmospheric rivers are more frequent and more severe during El Niño years, because atmospheric conditions created by El Niño increase moisture transport toward the coast, and warm surface waters associated with El Niño increase sea levels. They generally occur in the fall and winter, but are most prevalent during the months of December, January, and February. Atmospheric rivers are primarily responsible most common flood types in the City of Santa Cruz which include: • Riverine flood: a flood that occurs when rivers and creeks overflow their banks due to excessive rain over the same area for an extended period of time, and flow into surrounding areas. Localized flooding can occur as a result of riverine flooding when logjams divert high velocity flows. • Flash flood: a fast-moving, high velocity flood that rapidly occurs in low-lying areas because of heavy rainfall in a short period of time. Flash floods can carry large amounts of debris. • Coastal flood: a flood that inundates areas along the coast with seawater. There are several causes of coastal flooding, including high tide, storm surge, localized wave action (wave runup and wave overtopping), rising sea levels, and tsunami. Sea level rise and tsunami are addressed separately in Sections 4.1.8 and 4.1.9, respectively. Coastal flooding can cause extreme damage to coastlines, including the built environment along the coast, due to the direct force of storm surge waves.
Location	Areas most vulnerable to riverine flooding include the San Lorenzo River basin. The highest risk flood areas along the San Lorenzo River have been mitigated by water control structures such as levees, flap gates, slide gates, and pumps. However, flooding still exists in the downtown corridor, downtown area, and the edges of Harvest West. There are also several smaller creeks in the City that are subject to periodic flooding, including the lower reaches of Moore Creek (where only shallow stream channels are present), Neary Lagoon, Laurel Creek, the lower portion of Arana Gulch, north of Santa Cruz Yacht Harbor, and along portions of Branciforte Creek and Carbonera Creek. Areas most vulnerable to flash flooding include mountainous streams and rivers, urban areas, low-lying areas, and areas around storm drains and culverts. Areas most vulnerable to coastal flooding, including high tide, storm surge, localized wave action, and accompanying high velocity water, include the entire coastline of the City of Santa Cruz, including Westside Industrial District, Natural Bridges State Beach, Lighthouse/The Circles Neighborhoods, Beach and Boardwalk District, and Lower and Upper Seabright.
History	According to NOAA's Storm Events Database, since January 1, 2000, to December 1, 2024, the following days of various coastal storm and surge-related flood events have been recorded in Santa Cruz County: • 31 days of flood events, including 2 days of countywide flood events and 4 days of flood events specific to the City of Santa Cruz

Profile	Description
	• 5 days of coastal flood events, all regionwide • 37 days of high surf events • 20 days of flash flood events, including 13 days countywide flood events and 1 day specific to the City of Santa Cruz The number of recorded events has increased in recent years and most of the events were the result of significant winter storms or weather systems. In recent years, the federal government declared following major and emergency disasters for heavy rain, flood, and other storm-related events for Santa Cruz County, which includes the City of Santa Cruz: • 1981–1982, Severe Storms, Flood, Mudslide, and High Tide (DR 651) • 1986, Severe Storms and Flooding (DR 758) • 2017, Severe Winter Storms, Flooding, and Mudslides (DRs 4305 and 4308) • 2022–2023, Severe Winter Storms, Flooding, Landslides, and Mudslides (DR 4683) • 2023, Severe Winter Storms, Flooding, Landslides, and Mudslides (EMs 3591 and 3592) • 2023, Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides (DR 4699) • 2024, Severe Winter Storms, Tornadoes, Flooding, Landslides, and • Mudslides (DR 4769) DR 4683 was the result of a "family" of nine atmospheric river events with near continuous atmospheric river conditions for 23 days, which is the longest duration of continuous atmospheric river conditions in the 70 years of record keeping.
Extent/ Severity	The magnitude of flooding that is used as the standard for floodplain management in the United States is a flood with a probability of occurrence of 1 percent in any given year. This flood is also known as the 100-year flood (i.e., the base flood). The 100-year flood (1 percent annual chance flood) is identified on FEMA's Digital Flood Insurance Rate Maps (DFIRMs) as the Special Flood Hazard Area (SFHA), specifically flood zones A and V. As shown in Figure 15, the DFIRM for the County of Santa Cruz identifies 1.32 square miles/844.8 acres (10.42 percent) within the SFHA in the City of Santa Cruz. For most areas within the City of Santa Cruz that are along rivers, streams, and small lakes, the SFHA boundaries are based on the amount of water expected to enter the area during a 1 percent annual chance flood. Floods in these areas are generally considered riverine floods and are typically caused by prolonged and/or excessive rainfall from storm events. For areas on or near the coast, SFHA boundaries shown on the DFIRM reflect the increase in water levels due to extreme tides, storm surge, and overland wave effects due to a storm event (FEMA 2017). For certain coastal areas in the SFHA, a Coastal High Hazard Area designation identifies areas that are at greater risk of experiencing structural damage caused by wave action and/or high-velocity water. It is important to note that DFIRMs do not factor in future impacts such as increased precipitation or sea level rise caused by climate change. In addition to DFIRMs, additional coastal storm flooding hazard zones for Santa Cruz have been modeled through the 2014 Monterey Bay Sea Level Rise Vulnerability Study and refined in the City's 2017 Sea Level Rise Vulnerability Analysis. The analysis includes storm surge, wave overtopping, and extreme lagoon water levels caused by rainfall events, under a high sea level rise scenario. As shown in Figure 16, 0.31 square miles/198.4 acres (2.46 percent) of the City of Santa Cruz is in an existing coastal storm flooding hazard zone.

Profile	Description
Future Events, Including the Effects of Climate Change	Climate modeling shows that atmospheric rivers will continue to become more potent in a warming climate and lead to more extreme precipitation events. In fact, UCLA's Center for Climate Science reports that by the year 2100, extreme wet years will occur 2.25 times more frequently than the 1895 to 2017 frequency rate of four times in every 100 years in Northern California. As shown in Figure 17, according to Cal-Adapt models, average annual precipitation is projected to modestly increase throughout the City of Santa Cruz, with extreme events also projected to increase in both frequency and intensity for mid-century (2035–2064; max +0.006 inches annual average precipitation rate change/day) and end of century (2070–2099; max +0.014 inches annual average precipitation rate change/day) for high-emission scenarios (RCP 8.5). These projections indicate that flood risk may be more severe over time, with impacts to riverine and creek systems throughout the City's jurisdiction. Extreme precipitation events will also likely cause added stress to stormwater systems throughout the City, necessitating increased operation and maintenance costs and potential capacity increases through time. In addition to flooding caused by extreme precipitation, these more severe storm events will increase storm surge and wave overtopping. These factors have been modeled in the 2014 Monterey Bay Sea Level Rise Vulnerability Study and refined in the City's 2017 Sea Level Rise Vulnerability Analysis to produce projected coastal storm flooding hazard areas (Figure 16) for the following planning horizons: • 2030: Areas vulnerable to coastal storm flooding hazards include 0.35 square miles /224 acres of the City, including the Beach and Boardwalk District, Lower and Upper Seabright Neighborhoods, and Natural Bridges State Beach. • 2060: Areas vulnerable to coastal storm flooding hazards include 0.49 square miles/313.6 acres of the City, including Beach and Boardwalk District, Beach Hill/Beach Flat Neighborhoods, Lower and Upper Seabright Neighborhoods, Natural Bridges State Beach, and Nearly Lagoon. • 2100: Areas vulnerable to coastal storm flooding hazards include 0.67 square miles/428.8 of the City, including Beach and Boardwalk District, Beach Hill/Beach Flat Neighborhoods, Downtown Neighborhoods, Lower and Upper Seabright Neighborhoods, Natural Bridges State Beach, and Nearly Lagoon.

Key: DFIRM = Digital Flood Insurance Rate Map; DR = Major Disaster Declaration; EM = Emergency Declaration; FEMA = Federal Emergency Management Agency; NOAA = National Oceanic and Atmospheric Administration; UCLA = University of California, Los Angeles; UC Santa Cruz = University of California Santa Cruz

4.1.7 Landslide

Table 4-7: Landslide Profile

Profile	Description
Nature	Landslide is a general term for the dislodging and fall of a mass of soil or rocks along a sloped surface or for the dislodged mass itself. The term is used for varying phenomena, including mudflows, mudslides, debris flows, rockfalls, rockslides, debris avalanches, debris slides, and slump-earth flows. Landslides may result from a wide range of combinations of natural rock, soil, or artificial fill. The susceptibility of hilly areas to landslides depends on variations in geology, topography, vegetation, and weather. Landslides may also occur because of indiscriminate development of sloping ground or the creation of cut-and-fill slopes in areas of unstable or inadequately stabilized geologic conditions. In California, landslides range from small, shallow landslides that may mobilize into rapidly moving deadly debris flows to larger, deep-seated landslides that can move entire houses and infrastructure downslope. Cliff collapses and cliff erosion are also concerns along the coast of Northern California and, more recently, debris flows from burned areas after wildfires.
Location	In 2011, the California Geological Survey created a deep-seated landslide grid map to show the relative likelihood of deep-seated landslides in California. The map combines landslide inventory, geology, rock strength, slope, average annual rainfall, and layers with earthquake shaking potential to create classes of landslide susceptibility (Figures 18.a and 18.b). According to the California Geological Survey, "these classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks. High landslide susceptibility, classes VIII, IX, and X, includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks." Land that is most susceptible to deep-seated landsliding is predominately foothill areas of the City, including DeLaveaga Park, Moore Creek Upland Open Space, Pogonip, and Western Drive and Nobel neighborhoods. Additional, previously documented areas of shallow landsliding in the City and/or that impact City infrastructure including the Brackney Road area, Pipeline Road, east bank of Loch Lomond Reservoir, Laguna and Majors Creeks Pipelines and access roads, East Zayante Road, Graham Hill Water Treatment Plant property. Additional riparian, drainage, and coastal areas such as the Parkway headwall at Allerton Street, Pasatiempo Creek Open Concrete Channel at Ocean Street and Plymouth Street, East Cliff Drive at Alhambra Avenue, East Cliff Drive at Third Street Stairs Slope, Esmeralda Court, Upper Park Road, and West Cliff Drive Path, as well as Moore Creek and Arroyo Seco Canyon open space areas.
History	The federal government declared the following major disasters and emergency disasters for mudslides and landslides in Santa Cruz County over the past 30 years: • 1981–1982, Severe Storms, Flood, Mudslide, and High Tide (DR 651) • 2017, Severe Winter Storms, Flooding, and Mudslides (DRs 4305 and 4308) • 2022–2023, Severe Winter Storms, Flooding, Landslides, and Mudslides (DR 4683) • 2023, Severe Winter Storms, Flooding, Landslides, and Mudslides (EMs 3591 and 3592) • 2023, Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides (DR 4699) • 2024, Severe Winter Storms, Tornadoes, Flooding, Landslides, and Mudslides (DR 4769) According to the California Department of Conservation's Reported Landslide Database, recent landslides reported in and around the City of Santa Cruz include:

Profile	Description
	• January 1, 2023, debris on State Route 9 south of Rincon • January 5, 2023, bluff failures at three locations along West Cliff Drive (Mitchell's Cove Beach area) • January 9, 2023, slide and rocks across southbound lane of Branciforte Drive and Granite Creek Road • January 17, 2023, slide in northbound lane of State Route 1 near Wilder Creek • January 17, 2023, slide in north and southbound lanes State Route 9 near Keystone Way
Extent/ Severity	Shallow landslides are generally those that are less than 10 to 15 feet deep. When shallow landslides are sufficiently wet, they may move rapidly and can be highly mobile over long distances. Deep-seated landslides are hundreds to thousands of feet long or wide and only move fractions of an inch per year; however, during heavy rainfall events, a landslide can move several yards a minute or faster. In these areas, rocks have been weakened through faulting and fracturing, uplift, and saturated soils due to heavy or prolonged rainfall. In addition, these slippages can be exacerbated by the temperature fluctuation, known as the freeze-thaw cycle, and by ongoing drought conditions, which cause soil-water repellency. As shown in Figures 18.a and 18.b, there are 2.04 square miles/1,350.6 acres (16.07 percent) of land classified as classes VIII, IX, or X that are deep-seated landslide high susceptibility areas in the City.
Future Events, Including the Effects of Climate Change	Shallow landslides can occur at any time during the winter but are more likely to happen when the ground is nearly saturated, which typically occurs after the first few storms in November and December. However, deep-seated landslides are generally triggered by deep infiltration of rainfall (which can take weeks or months to occur) and therefore tend to occur toward the end of the winter season in March or April. Every federally declared landslide event reported in and around the City of Santa Cruz has followed a rain event; therefore, it is assumed that the probability of a future landslide event will be highly tied to rain events. Based on current historical occurrences, severe storm events are likely in the Santa Cruz area every 2 to 7 years. However, according to UCLA's Center for Climate Science, an increase in the frequency of intense rainfall/precipitation due to climate change will mean that extreme wet years will occur 2.25 times more frequently than the 1895 to 2017 frequency rate of four times every 100 years, while severe storm sequences will occur five times more frequently than the 1895 to 2017 frequency rate of one time every 200 years. NASA researchers have found that landslides move on average faster and farther downhill during rainy periods compared to drought years. However, researchers are still trying to better understand why landslides react the way they do from increased rainfall and drought, except that existing landslide-prone areas move faster and farther during rainy periods. It can be assumed that at minimum, the same neighborhoods (DeLaveaga Park, Moore Creek Upland Open Space, Pogonip, and Western Drive and Nobel neighborhoods) will likely remain vulnerable to landslides and potentially faster and larger deep-seated landslide events. Additional areas prone to shallow landsliding may include bare steep-sloped areas that have been recently burned by wildfires. In Santa Cruz, areas with significant steep slopes (30 percent or greater) include Carbonera Neighborhoods, DeLaveaga Park, Moore Creek Upland Open Space, Pogonip, UC Santa Cruz, Western Drive/Nobel Neighborhoods, Westlake Neighborhoods, and portions of the watershed including Loch Lomond.

Key: DR = Major Disaster Declaration; EM = Emergency Declaration; NASA = National Aeronautics and Space Administration; UCLA = University of California, Los Angeles; UC Santa Cruz = University of California, Santa Cruz

4.1.8 Sea Level Rise

Table 4-8: Sea Level Rise Profile

Profile	Description
Nature	Sea level rise defined by the Fifth National Climate Assessment is an increase to the height of sea level, both globally and locally (relative sea level change) due to a change in the ocean volume because of thermal expansion of the oceans and the melting glaciers and ice sheets associated with climate change. Other factors determining the rate of sea level rise include changes in Earth's gravitational and rotational fields, changes in the shape of the ocean basins, and local subsidence or uplift of the land.
Location	Existing rising tide inundation areas for the City of Santa Cruz have been modeled in the 2014 Monterey Bay Sea Level Rise Vulnerability Study and refined in the City's 2017 Sea Level Rise Vulnerability Analysis. According to the study, these areas show monthly tide inundation for the Extreme Monthly High Water level, which are areas that would be flooded by normal high water level tides on average once per month. The inundation areas include areas that are connected through low topography and other low-lying and flood-prone areas that do not have any connections through culverts, underpasses, etc. As shown in Figure 19, these areas include Lower Seabright Neighborhoods, Neary Lagoon, Upper Seabright Neighborhoods, and the Westside Industrial District.
History	According to California's Fourth Climate Assessment Central Coast Region Report, the closest tide gauge (NOAA Monterey tide station) to the City of Santa Cruz shows that from 1973–2016, the relative sea level trend was 1.39 millimeters/year (0.05 inches/year). More recent and recalibrated datasets by NOAA show this number could be as high as 1.77 millimeters/year (0.07 inches/year) based on monthly mean sea level data from 1976–2023. As noted by NASA's Jet Propulsion Laboratory, sea level rise can dramatically increase during the switch between La Niña and El Niño conditions, such as the case in 2022–2023. A strong El Niño that year put a lot of rain in the ocean, which raised sea levels temporarily (NASA 2024). During that timeframe, the federal government issued three emergency and major disaster declarations (DR 4683 and EMs 3591 and 3592) for severe winter storms and flooding in Santa Cruz County.
Extent/ Severity	As noted above, recent and recalibrated NOAA datasets show sea level rise as high as 1.77 millimeters/year (0.07 inches/year) based on monthly mean sea level data from 1976–2023. Existing rising tide inundation areas for the Extreme Monthly High Water level include 0.15 square miles/96 acres (1.15 percent) within the City of Santa Cruz.
Future Events, Including the Effects of Climate Change	The 2014 Monterey Bay Sea Level Rise Vulnerability Study and City's 2017 Sea Level Rise Vulnerability Analysis show projected inundation caused by rising tide caused by future sea level rise (not considering storms or wave overtopping) for the following planning horizons: • 2030: Areas impacted by 0.3-foot-high sea level rise include 0.15 square miles/96 acres of the City, including the Lower Seabright Neighborhoods and Upper Seabright Neighborhoods. • 2060: Areas impacted by 2.4-foot-high sea level rise include 0.24 square miles/153.6 acres of the City, including the Beach and Boardwalk District, Lower Ocean Neighborhoods, Lower and Upper Seabright Neighborhoods, and Neary Lagoon.

Profile	Description
	• 2100: Areas impacted by 5.2-foot-high sea level rise include 0.45 square miles/288 acres of the City, including Beach and Boardwalk District, Beach Hills/Beach Flats Neighborhoods, Lower Ocean Neighborhoods, Lower and Upper Seabright Neighborhoods, and Neary Lagoon. In addition to coastal inundation of low-lying areas caused by sea level rise, the Draft State of California Sea Level Rise Guidance: 2024 Science and Policy Update notes that by 2030 "sea level rise will increase the frequency of coastal flooding events, which occur when sea level rise amplifies short-term elevated water levels associated with higher tides, large storms, El Niño events, or when large waves coincide with high tides."

Key: DR = Major Disaster Declaration; EM = Emergency Declaration; NASA = National Aeronautics and Space Administration; NOAA = National Oceanic and Atmospheric Administration

4.1.9 Tsunami

Table 4-9: Tsunami Profile

Profile	Description
Nature	A tsunami is a series of traveling ocean waves of extremely long length, generated by disturbances associated primarily with earthquakes occurring below or near the ocean floor. Subduction zone earthquakes at plate boundaries often cause tsunamis. However, tsunamis can also be generated by underwater landslides or volcanic eruptions, the collapse of volcanic edifices, and—in very rare instances—large meteorite impacts in the ocean. In the deep ocean, a tsunami may have a length from wave crest to wave crest of 100 miles or more, but a wave height of only a few feet or less. Therefore, the wave period can be up to several hours and wavelengths can exceed several hundred miles. Tsunamis are unlike typical wind-generated swells on the ocean, which might have about 10 seconds and a wavelength of up to 300 feet. Tsunamis cannot be felt aboard ships, and they cannot be seen from the air or the open ocean. In deep water, the waves may reach speeds exceeding 700 miles per hour. Tsunamis arrive as a series of successive crests (high water levels) and troughs (low water levels). These successive crests and troughs can occur anywhere from 5 to 90 minutes apart; however, they usually occur 10 to 45 minutes apart. Tsunamis not only affect beaches that are open to the ocean, but also bay mouths, tidal flats, and the shores of large coastal rivers. Tsunami waves can also diffract around land masses. Because tsunamis are asymmetrical, the waves may be much stronger in one direction than another, depending on the nature of the source and the surrounding geography. However, tsunamis propagate outward from their source, so coasts in the shadow of affected land masses are safer. Along the Central Coast, including the City of Santa Cruz, tsunamis are most likely to be generated by very distant subduction faults (such as those in Washington, Alaska, Japan, and Russia) than by local strike-slip faults (such as the San Andreas fault) or local landslides (such as in Monterey Canyon). Most tsunami damage and destruction are caused by flooding, wave impacts, erosion, strong currents, and floating debris.
Location	In 2022, the California Geological Survey, along with its technical partners, created new tsunami hazard maps for the entire coast of California. The updated maps show maximum tsunami hazard inundation caused by potential long-distance and local-sourced scenarios. For the long-distance scenario, the model used a magnitude 9.3 earthquake in the eastern Aleutian Islands as the worst-case long-distance-sourced scenario with a return interval of 975 years. For the worst-case local-sourced scenario, the model used an underwater landslide in Monterey Canyon. Figure 20 shows that an overall worst-case tsunami scenario would likely hit low-elevation areas around the boardwalk and the harbor.
History	According to NOAA's Global Historical Tsunami Database, since 1880, about 150 tsunamis have hit the California coast. In recent years, the City of Santa Cruz has experienced two tsunamis that have caused significant damage to the waterfront. On March 11, 2011, the Tohoku (Japan) earthquake and tsunami generated a massive tsunami that tore across the Pacific, causing approximately $20 million in damage to the Santa Cruz Harbor. The federal government issued a Major Disaster Declaration (DR 1968) in Santa Cruz County. The harbor was damaged by a tsunami again in 2022. On January 14, 2022, an eruption of the Hunga-Tonga Ha'apai volcano generated a massive tsunami that caused an estimated $6.5 million worth of damage to the harbor.

Profile	Description
Extent/ Severity	According to California Geological Survey modeling, 1.63 square miles/1,043.2 acres (12.87 percent) in the City of Santa Cruz are at risk of a worst-case scenario tsunami run-up.
Future Events, Including the Effects of Climate Change	The Tsunami Research Center at University of Southern California states that the "likelihood of a large tsunami to strike California would be hard to predict… small tsunamis will swell into California (which includes the Santa Cruz coastline) every few years." Even though tsunamis are not related to climate, their impacts to coastal communities may be exacerbated due to rising sea levels, increased frequency and intensity of coastal storms, warming air temperatures, and increasing sea surface temperatures (U.S. Climate Resilience Toolkit 2014). It can be assumed that at minimum, the same areas (Arana Gulch, Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhoods, Branciforte Drive Neighborhoods, Downtown District, Downtown Neighborhoods, Lighthouse Field State Beach, Lighthouse/The Circles Neighborhoods, Lower Ocean Neighborhoods, Lower Seabright Neighborhoods, Natural Bridges State Beach, Neary Lagoon, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, Upper Seabright Neighborhoods, Water Street Corridor, and Westside Industrial District) in the current mapped tsunami hazard area will likely remain vulnerable to future tsunami inundation.

Key: Cal OES = California Office of Emergency Services; DR = Major Disaster Declaration; EM = Emergency Declaration

4.1.10 Wildfire

Table 4-10: Wildfire Profile

Profile	Description
Nature	Wildfires spread by consuming flammable vegetation. This type of fire often begins unnoticed, spreads quickly, and is usually signaled by dense smoke that may be visible from miles away. Wildfires can be caused by human activities (e.g., unattended burns, campfires, or off-road vehicles without spark-arresting mufflers) or by natural events such as lightning. Wildfires often occur in forests or other highly vegetated areas. In addition, wildfires can be classified as forest, urban, interface or intermix, and prescribed burns. Topography, fuel, and weather contribute significantly to wildfire behavior and can be used to identify wildfire hazard areas: • Topography describes slope increases, which influence wildfire spread rate increases. South-facing slopes are subject to more solar radiation than slopes facing other directions, so south-facing slopes tend to be drier and thereby intensify wildfire behavior. However, ridge tops may mark the end of wildfire spread because fire spreads more slowly (or may even be unable to spread) downhill. • Fuel refers to the type and condition of vegetation; fuel plays a significant role in wildfire spread. Certain plant types are more susceptible to burning or will burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available as fire fuel (referred to as the "fuel load"). The living-to-dead plant matter ratio is also important. Certain climate changes may increase wildfire risk significantly during prolonged drought periods because the moisture content of both living and dead plant matter decreases. Both the horizontal and vertical fuel load continuity are also important factors. • Weather is the most variable factor affecting wildfire behavior. Temperature, humidity, wind, and lightning can affect ignition opportunities and fire spread rate. Extreme weather (such as high temperatures, offshore "Diablo wind" events, and low humidity) can lead to extreme wildfire activity. Climate change increases the susceptibility of vegetation to ignition due to longer dry seasons. By contrast, cooling temperatures and higher humidities often signal reduced wildfire occurrence and easier containment. Wildfire frequency and severity sometimes result from other hazard impacts such as drought and infestations. If not promptly controlled, wildfires may grow into an emergency or disaster. Even small fires can threaten lives and resources and destroy improved properties. In addition to affecting people, wildfires may severely affect livestock and pets. Such events may require emergency water/food, evacuation, and shelter. Indirect wildfire effects can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and exacerbate river and stream siltation, thereby increasing flood potential, harming aquatic life, and degrading water quality. Vegetation-stripped lands are also more susceptible to increased debris flow hazards.
Location	The California Department of Forestry and Fire Protection (CAL FIRE) Fire Resource and Assessment Program provides vital data on California's forests and rangelands

Profile	Description
	through various mapping tools, including Fire Hazard Severity Zone (FHSZ) maps. CAL FIRE develops these FHSZ maps using a geospatial model that is designed to describe relative fire hazard potential over the long term (30–50 years) for all areas of the State without considering mitigation. Data inputs for the model include fire history, existing and potential fuel (natural vegetation), predicted flame length, blowing embers, terrain, and typical fire weather for the area. In addition, different steps were taken for modeling FHSZ in wildland areas versus non-wildland areas, as fuel models cannot be applied. Likewise, slightly different rules were applied for mapping in different jurisdictional boundary areas. The FHSZ areas are represented as moderate, high, or very high. They are also divided into Local Responsibility Areas (LRAs), State Responsibility Areas (SRAs), and Federal Responsibility Areas (FRAs). LRA fire protection is typically provided by City fire departments, fire protection districts, counties, and by CAL FIRE under contract to the local government. SRA is a legal term defining the area where the State has financial responsibility for wildfire protection based on land ownership, population density, and land use. As shown in Figures 21.a and 21.b, high SRA and LRA FHSZs include densely vegetated, steep-sloped areas in Arana Gulch, DeLaveaga Park, King Street Neighborhoods, Moore Creek Upland Open Space, Natural Bridges State Park, Pogonip, Prospect Heights Neighborhoods, UC Santa Cruz Neighborhoods, and the Westside Industrial Neighborhood. In addition to FHSZ, the Wildland–Urban Interface (WUI) area is used by communities within California to identify areas that "are perceived as high-risk areas of human-caused wildfires due to the accumulation of wildland vegetation, the concentration of flammable human structures, and the strewing of sparks left by human activities" (Nature 2022). WUI maps are modeled using building density and vegetation proportion thresholds. As shown in Figure 22, WUI areas include Arana Gulch, Carbonera Neighborhoods, DeLaveaga Park, Harvey West District, Moore Creek Upland Open Space, Pogonip, Prospect Heights Neighborhoods, UC Santa Cruz, Western Drive/Nobel Neighborhoods, and Westlake Neighborhoods.
History	Per CAL FIRE historical records, Santa Cruz County has experienced four wildfires of greater than 5,000 acres over the past 100 years (1923–2023), including the following. As shown in Figure 23, none of these fires occurred within the Santa Cruz City limits. • July 1961, Austrian Gulch Fire, 9,7100 acres burned • July 1985, Lexington Fire, 13,128 acres burned • August 2009, Lockheed Fire, 7,783 acres burned • August 2020, CZU Lightning Complex, 86,553 acres burned The federal government issued a Major Disaster Declaration (DR 4558) in Santa Cruz County for the CZU Lightning Complex fires, which started early on August 16, 2020. Lightning strikes from a thunderstorm produced hundreds of fires throughout the State, including the Warnella and Waddell fires. The fires merged to become the CZU Lightning Complex fires and burned over 86,000 acres. Within Santa Cruz County, the CZU Lightning Complex fires destroyed nearly 1,500 buildings in the unincorporated communities of Boulder Creek, Bonny Doon, and Swanton, and some historic structures in Big Basin Redwoods State Park.
Extent/ Severity	As shown in Figures 21.a and 21.b, there are 0.62 square miles/396.8 acres (4.89 percent) in the City of Santa Cruz that are in a high-very high FHSZ. Note that the CAL FIRE FHSZ maps do not include severity zones for FRA. Although the FRA lands are not designated, they are assumed to carry the same designation as neighboring SRA designations due to their proximity.

Profile	Description
	Regarding the WUI area (Figure 22), there are 6.20 square miles/3,968 acres (48.88 percent) in the City of Santa Cruz.
Future Events, Including the Effects of Climate Change	Predicting wildfire frequency and severity is challenging, especially given uncertainty in interannual precipitation and wind events. However, a new report by Climate Central examined heat, dryness, and wind and found that the average fire weather days (defined as when temperatures, relative humidity, and sustained wind speeds simultaneously reached certain thresholds for at least two of the 24 hours) are increasing across the majority of California. The 2024 report found that along the Central Coast, including the City of Santa Cruz, fire weather days have increased on average an additional 4 days annually (average annual fire days from 1973–2023 along the Central Coast were 1–7 days). Because the report focuses on meteorological conditions, it does not consider changes in vegetation that have occurred over the last 50 years, the increased incidence of dry lightning bursts, or the extent to which development has pushed into WUI. These and other factors, including the projected increase of drought and extreme heat events, will likely continue to increase wildfire intensity and vulnerabilities in the City's high-very high FHSZ and WUI areas. Post-wildfire floods and debris flows may also put additional areas prone at risk, especially on slopes burned by recent wildfires. In Santa Cruz, areas with significant steep slopes (30 percent or greater) include Carbonera Neighborhoods, DeLaveaga Park, Moore Creek Upland Open Space, Pogonip, UC Santa Cruz, Western Drive/Nobel Neighborhoods, and Westlake Neighborhoods.

Key: CAL FIRE = California Department of Forestry and Fire Protection; DR = Major Disaster Declaration; FHSZ = Fire Hazard Severity Zone; FRA = Federal Responsibility Area; LRA = Local Responsibility Area; SRA = State Responsibility Area; UC Santa Cruz = University of California, Santa Cruz; WUI = Wildland–Urban Interface

4.2 OVERALL SUMMARY OF VULNERABILITY

A vulnerability analysis evaluates the potential vulnerability of person or a "place" (neighborhood, critical facility or infrastructure, major asset, highways and bridges, and ecosystems) against a broad range of identified hazards, helping identify what is at risk and why. For the 2025–2030 LHMP – CAP, a hazard overlay analysis was conducted to show people and places within a hazard area.

Hazards included in this analysis are identified in Section 4.1 and include the highest hazard areas for coastal erosion, dam failure, drought, earthquake, extreme heat, flood, landslide, sea level rise, tsunami, and wildfire, as follows in Table 4-11.

Table 4-11: Highest Hazard Areas

Hazard	Hazard Area
Coastal Erosion	Existing Erosion Area
	Projected 2030 Erosion Area 0.3-foot Sea Level Rise with Armoring
	Projected 2060 Erosion Area 2.4-foot Sea Level Rise
	Projected 2100 Erosion Area 5.2-foot Sea Level Rise
Dam Failure	Dam Breach Inundation Area
Drought	Long-Term Drought
Earthquakes	Potential Seismic Shaking Area ≥0.65g PGA for 2 Percent Probability of Exceedance in 50 Years
Extreme Heat	Projected 2035–2064 Max Temp. Increase 4.06°F High Emissions Scenario
	Projected 2070–2099 Max Temp. Increase 6.99°F High Emissions Scenario
Flood (Riverine Flood, Flash Flood, and Coastal Flood)	Special Flood Hazard Area (SFHA) 1 Percent Annual Chance Flood
	Existing Coastal Storm Flooding Area
	Projected 2030 Coastal Storm Flooding Area 0.3-foot Sea Level Rise Scenario
	Projected 2060 Coastal Storm Flooding Area 2.4-foot Sea Level Rise Scenario
	Projected 2100 Coastal Storm Flooding Area 5.2-foot Sea Level Rise Scenario
	Projected 2035–2064 Max +0.006 in. Annual Average (AAR) Precipitation Rate Change/Day High Emissions Scenario
	Projected 2070–2099 Max +0.014 in. AAR Precipitation Rate Change/Day High Emissions Scenario
Landslide	High Deep-Seated Landslide Susceptibility Area Classes VIII – X
Sea Level Rise	Existing Rising Tides Area
	Projected 2030 Rising Tides Area w/ 0.3-foot Sea Level Rise Scenario
	Projected 2060 Rising Tides Area w/ 2.4-foot Sea Level Rise Scenario
	Projected 2100 Rising Tides Area w/ 5.2-foot Sea Level Rise Scenario
Tsunami	Tsunami Hazard Area
Wildfire	High-Very Fire Hazard Severity Zones in the Local Responsibility Area and State Responsibility Area
	Wildland Urban Interface Area

Key: °F = degrees Fahrenheit; AAR = Annual Average; PGA = peak ground acceleration (expressed as fraction of Earth's gravity, "g"); SFHA = Special Flood Hazard Area

People and places considered in this analysis are identified in Sections 3.1 and 3.2 and include the planning area, demographics, development trends, and community assets. More specifically, they include the categories of land area (City limits), neighborhoods (population and land area, including frontline communities and areas of future growth and development), existing and future City critical facilities and infrastructure, other major assets, highways and bridges, land use designations, sensitive habitats, and water assets.

For land area, lakes, watersheds, and groundwater basins, the analysis shows the number of square miles of a hazard area within these geographical boundaries. For land area within a neighborhood, land use categories, and Sensitive habitats, the analysis shows the number of acres of a hazard area within these geographic boundaries. For population within a neighborhood, a proportional analysis shows the number of people within each neighborhood living in a hazard area. For City critical facilities and infrastructure, other major assets, and bridges, point locations were used for smaller-sized assets, while polygons were created for larger ones. If the point location, including a 50-foot buffer or 100-foot buffer, or any portion of the polygon was in a hazard area, the critical facility/infrastructure, other major asset, or bridge was considered to be in that hazard area. For linear assets, including the San Lorenzo River, creeks, state highways, levees, and the pipelines, the analysis shows the number of linear miles of a hazard area for each of these assets.

Lastly, the analyses for some assets that extend beyond the City limits were limited as the datasets for coastal erosion, coastal storm flooding, sea level rise, and the WUI area were not available at the county level.

The overall results of this vulnerability analysis are shown in table format in Appendix C, Tables C--1 through C-7, and summarized in Tables 4-12 through 4-21.

4.3 Potential Impacts from Each of the Identified Hazards

A hazard impact statement describes the social, economic, and environmental influence hazards can have on society. Hazard impact statements have been prepared for each of the 10 hazards addressed in this plan that describe how each hazard impacts people and places identified for this plan. In addition, each impact statement includes a discussion on how the effects of climate change will affect or magnify each hazard.

4.3.1 Coastal Erosion

Table 4-12: Potential Impacts from Coastal Erosion

Type	Potential Impacts
Neighborhoods	According to modeling developed as part of the 2014 Monterey Bay Sea Level Rise Vulnerability Study and refined in the City of Santa Cruz Sea Level Rise Vulnerability Analysis, 0.10 square miles (64 acres) of the City of Santa Cruz is vulnerable to coastal erosion. People that are vulnerable to current coastal erosion processes live and/or work in Beach and Boardwalk District, Lighthouse/The Circles Neighborhoods, Lower Seabright Neighborhoods, and Westside Industrial District. Coastal erosion impacts may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, and displacement.
Frontline Communities	Frontline communities that are vulnerable to current coastal erosion processes include the Beach and Boardwalk District and Lower Seabright Neighborhoods. Coastal erosion impacts may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, and displacement. Frontline communities may have older housing and of lower physical quality, resulting in more material losses and/or greater damage and destruction from coastal erosion. In addition, community members may have fewer relative resources, including insurance and government assistance, to prepare for and recover from coastal erosion impacts.
Future Growth and Development	Of the 11 neighborhoods that have been identified for population growth and land use development, the Beach and Boardwalk District, which is also a frontline community, and the Westside Industrial District will likely be vulnerable to coastal erosion hazards. There are no upcoming substantial affordable housing properties in either neighborhood. Coastal erosion may cause flooding, property damage and property loss, reduced property values, reduced recreational areas and open space, transportation accessibility issues, and displacement. However, the City's Shoreline Protection Overlay District, Coastal Overlay District, and Coastal Implementation Plan regulate development in this hazard area. In addition, new development in the SFHA's coastal flood area will not only have to adhere to the 2022 California Building Standards Code, but also to construction standards to safeguard against floodwaters as outlined in the City's floodplain management regulations. Thus, potentially reducing costs and damages from coastal erosion.
City Critical Facilities & Infrastructure	There are seven City critical facilities and infrastructure and 0.11 linear miles of the treated water distribution system that are vulnerable to current coastal erosion processes. Coastal erosion may cause loss of land, loss of access, loss of utilities or compromised utility performance, structural damage, and economic loss. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety. There are no known future City critical facilities or infrastructure to be constructed in this hazard area.
Other Major Assets	Other major assets that are vulnerable to current coastal erosion processes include six historic buildings and the Santa Cruz Beach Boardwalk and Santa Cruz Harbor. Coastal erosion may cause flooding, loss of land, loss of access, compromised utility performance, structural damage, and economic losses.

Type	Potential Impacts
Highways and Bridges	There are no highways or bridges in the existing coastal erosion hazard area.

Type	Potential Impacts
Land Use Designations	Land use designations that are vulnerable to current coastal erosion processes include 3 percent of coastal dependent and 47 percent of coastal recreation areas. Coastal erosion may cause land loss, landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, and contamination of land use designations. These impacts can result in short-term and long-term closure of public lands and amenities.
Sensitive habitats	Sensitive habitats that are vulnerable to coastal erosion include aquatic (5 percent) and seabird (3 percent). Coastal erosion may cause habitat loss and habitat fragmentation.
Water Assets	A very small portion of the San Lorenzo River and creeks are vulnerable to existing coastal erosion processes. Very little-to-none of the watersheds and groundwater basins are in this hazard area. However, due to mapping limitations, these numbers are likely lower than the actual number According to Woods Hole, Oceanographic Institution, coastal erosion may disrupt natural systems that regulate the exchanges of water, nutrients, and organisms with the open ocean.
Effects of Climate Change	Models for future coastal erosion processes caused by the increase in the intensity of extreme storms project the following: • By 2030, coastal erosion will continue to increase and impact the Beach and Boardwalk District (frontline community and future growth and development area), Lighthouse/The Circles Neighborhoods, Lower Seabright (frontline community), and Westside Industrial District (future growth and development area). There are no upcoming substantial affordable housing properties in this projected hazard area. No additional existing or future City critical facilities or infrastructure are expected to be impacted by this hazard either except for 0.21 linear miles of the treated water distribution system. Six historic buildings will be in this projected hazard area. Land use designations, Sensitive habitats, and water assets that are vulnerable to existing coastal erosion will be further impacted by coastal erosion projected by 2030. • By 2060, coastal erosion will continue to increase and impact the Beach and Boardwalk District (frontline community and future growth and development area), Lighthouse/The Circles Neighborhoods, Lower Seabright (frontline community), and Westside Industrial District (future growth and development area). A total of 11 City critical facilities and infrastructure and 3.08 linear miles of the treated water distribution system are in this projected hazard area. There are no upcoming substantial affordable housing properties or future City critical facilities or infrastructure in this hazard area. Nine historic buildings and one existing affordable/subsidized housing properties will likely be vulnerable to coastal erosion by 2060. Land use designations (coastal dependent, coastal recreation, and natural areas), Sensitive habitats (aquatic and seabird habitat), and water assets (San Lorenzo River and creeks) will be further impacted by an even larger coastal erosion hazard area. In addition, parks and salt marshes will be potentially impacted by coastal erosion. • By 2100, coastal erosion will continue to increase and impact the Beach and Boardwalk District (frontline community and future growth and development area), Beach Hill/Beach Flats Neighborhood (frontline community and future growth and development area), Lighthouse/The Circles Neighborhoods, Lower Seabright (frontline community), and Westside Industrial District (future growth and development area). There

Type	Potential Impacts
	are no upcoming substantial affordable housing projects in this hazard area. A total of 16 existing City critical facilities and infrastructure, 5.08 linear miles of the treated water distribution system, 36 historic buildings, 2 bridges, and 3 existing affordable/subsidized housing properties will be potentially impacted by this hazard. No future City critical facilities or infrastructure are in this projected hazard area. Land use designations (coastal dependent, coastal recreation, natural areas, and parks), Sensitive habitats (aquatic, salt marsh, and seabird habitat), and water assets (San Lorenzo River and creeks) will be further impacted again by an even larger coastal erosion hazard area. Future coastal erosion impacts may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, and displacement. In addition, frontline communities will likely continue to have fewer relative resources, including insurance and government assistance, to prepare for and recover from these impacts. Coastal erosion will likely continue to cause flooding, loss of land, loss of access, compromised utility performance, and economic losses to City critical facilities and infrastructure and other major assets. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety. Land use designations, sensitive habitats, and water assets will likely continue to experience disruptions to natural systems that regulate the exchanges of water, nutrients, and organisms with the open ocean as well as loss of habitat and overall loss of land caused by coastal erosion.

4.3.2 Dam Failure

Table 4-13: Potential Impacts from Dam Failure

Type	Potential Impacts
Neighborhoods	DSOD mapping shows 1.08 square miles (691.2 acres) of mapped dam breach inundation area within the City of Santa Cruz. People vulnerable to dam failure live and/or work in the Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhood, Branciforte Drive Neighborhoods, Downtown District, Downtown Neighborhoods, Lower Ocean Neighborhoods, Nearly Lagoon, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, Upper Ocean Neighborhoods, and Water Street Corridor. For those in a dam breach inundation area, the potential loss of life, injuries, and damage to property due to a dam failure depends on several variables, including depth and velocity of water released, number of people residing in the inundation area, warning time, and public perception of the hazard. Catastrophic flooding from a dam failure may cause loss of utilities; disrupt or limit access; pollute drinking water systems and overwhelm wastewater systems; damage or destroy residential, commercial, and public buildings; cause secondary hazards including landslides and mudslides; and lead to trauma, injuries, or even death.
Frontline Communities	Frontline communities vulnerable to dam failure include the Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhood, Downtown District, Downtown Neighborhoods, Lower Ocean Neighborhoods, Ocean Street Corridor, and River Street District. For those in a dam breach inundation area, the potential loss of life, injuries, and damage to property due to a dam failure depends on several variables, including depth and velocity of water released, number of people residing in the inundation area, warning time, and public perception of the hazard. Catastrophic flooding from a dam failure may cause loss of utilities; disrupt or limit access; pollute drinking water systems and overwhelm wastewater systems; damage or destroy residential, commercial, and public buildings; cause secondary hazards including landslides and mudslides; and lead to trauma, injuries, or even death. Frontline communities may have older housing and of lower physical quality, resulting in more material losses and/or greater damage and destruction from dam failure inundation. In addition, frontline communities affected by this hazard may have fewer relative resources, including insurance and government assistance, to prepare for and recover from dam failure impacts. They may also be more exposed to floodwater pollutants and therefore water-related illnesses.
Future Growth and Development	Of the 11 neighborhoods that have been identified for population growth and land use development, the Beach and Boardwalk District, eight neighborhoods, six of which are also frontline communities, may be vulnerable to dam failure inundation. They are the Boardwalk District, Beach Hill/Beach Flats Neighborhood, Downtown District, Downtown Neighborhoods, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, and Water Street Corridor. There are also five of the City's upcoming substantial affordable housing projects in this hazard area. For those in a dam breach inundation area, the potential loss of life, injuries, and damage to property due to a dam failure depends on several variables, including depth and velocity of water released, number of people residing in the inundation area, warning time, and public perception of the hazard. Catastrophic flooding from a dam failure may cause loss of utilities; disrupt or limit access; pollute drinking water systems and overwhelm wastewater systems; damage or destroy residential, commercial, and public buildings; cause secondary hazards including landslides and mudslides; and lead to

Type	Potential Impacts
	trauma, injuries, or even death. The economically disadvantaged affected by this hazard may have fewer relative resources, including insurance and government assistance, to prepare for and recover from dam failure impacts. Dam failure inundation zones are not considered part of the SFHA, and therefore, new development will not be subject to the City floodplain management regulations. However, development in this potential hazard area will be subject to the 2022 California Building Standards Code that includes minimum design and construction requirements, resulting in improved construction quality and stronger structural integrity. Thus, potentially reducing casualties, costs, and damages from a dam failure inundation event.
City Critical Facilities and Infrastructure	There are 134 City critical facilities and infrastructure, including 1 future facility, as well as 4.08 linear miles of the raw water pipelines, 18.30 linear miles of the treated water distribution system, and 0.8 linear miles of levees that are vulnerable to dam failure. Dam failure inundation may cause loss of land, loss of access, loss of utilities or compromised utility performance, structural damage, and economic loss. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety.
Other Major Assets	Other major assets that are vulnerable to dam failure include 72 affordable/subsidized housing properties, 203 historic buildings, and one of each of the following: arena, boardwalk, harbor, library, and school. For those living, working, or visiting, or attending an event or school in a dam breach inundation area, the potential loss of life, injuries, and damage to property due to a dam failure depends on several variables, including depth and velocity of water released, number of people residing in the inundation area, warning time, and public perception of the hazard. Catastrophic flooding from a dam failure may cause loss of utilities; disrupt or limit access; pollute drinking water systems and overwhelm wastewater systems; damage or destroy residential, commercial, and public buildings; disrupt school and public events; cause secondary hazards including landslides and mudslides; and lead to trauma, injuries, or even death. Lower-income households may also have fewer relative resources, including insurance and government assistance, to prepare for and recover from dam failure impacts. They may also be more exposed to floodwater pollutants and therefore water-related illnesses.
Bridges and Highways	Transportation assets that are vulnerable to dam failure include approximately 0.1 linear miles of Highway 1 and 0.4 linear miles of Highway 19, as well as 17 bridges. Catastrophic flooding from a dam failure may cause significant damage to roads and bridges, including erosion or washout of road sections and road embankments, and debris obstructions.
Land Use Designations	Land use designations vulnerable to dam failure include 22 percent of coastal recreation, 3 percent of parks, and 9 percent of natural areas. Catastrophic flooding from a dam failure may cause land loss, landscape and watercourse alteration, soil erosion and sediment deposition, and contamination. These impacts can result in short-term and long-term closure of public lands.
Sensitive habitats	Sensitive habitats that may be impacted by dam failure include aquatic (51 percent), freshwater (49 percent), riparian (28 percent), and seabird (87 percent). Catastrophic flooding from a dam failure may cause habitat loss, habitat fragmentation, landscape and watercourse alteration, soil erosion and sediment deposition, and contamination.

Type	Potential Impacts
Water Assets	Water assets that may be impacted by dam failure include San Lorenzo River, lakes, creeks and a very small portion of the San Lorenzo Watershed and Santa Margarita Groundwater Basin. Catastrophic flooding from a dam failure may cause landscape and watercourse alteration, soil erosion, sediment deposition, and contamination.
Effects of Climate Change	As noted in Section 4.1.2, there has been growing concern about extreme precipitation events pushing aging dams beyond what they were designed to handle. Water overtopping a dam is considered among the worst possible failures, as it puts pressure on the structure, increasing the odds of a complete collapse. Dam breach inundation maps show the downstream flooding that could result from a hypothetical failure of the dam or its critical appurtenant structure. As such, climate-driven dam failures likely would not increase the size of the mapped inundation areas but may increase the velocity of dam floodwaters due to more extreme precipitation events. Therefore, the neighborhoods, frontline communities, future growth and development areas, City critical facilities and infrastructure, other major assets, land use designations, sensitive habitats, and water assets located within the mapped inundation areas will still be vulnerable to dam failures and perhaps at risk to greater loss and damage due to the potential increase in the velocity of dam floodwaters.

Key: DSOD = California Department of Water Resources, Division of Safety of Dams

4.3.3 Drought

Table 4-14: Potential Impacts from Drought

Type	Potential Impacts
Neighborhoods	All the City of Santa Cruz is vulnerable to drought. Drought impacts may include water use restrictions, excessive exceedance penalties, and monthly fees. Higher temperatures can also coexist with drought. Higher temperatures that can coexist with drought can also exacerbate mental and physical health issues.
Frontline Communities	All frontline communities are vulnerable to drought. Drought impacts may include water use restrictions, excessive exceedance penalties, and monthly fees. According to the Public Policy Institute of California, such service fees can disproportionately impact lower-income and fixed-income households, who generally use less water. Higher temperatures that can coexist with drought can also exacerbate mental and physical health issues.
Future Growth and Development	All the 11 neighborhoods that have been identified for population growth and land use development, including all the City's upcoming substantial affordable housing projects and all six frontline communities, will be vulnerable to future drought. Drought impacts may include water use restrictions, excessive exceedance penalties, and monthly fees. As new development will be subject to the California Building Standards Code 2022 edition, which require water efficiency, water customers in these buildings may find it easier to stay within their water allocations during droughts.
City Critical Facilities & Infrastructure	All City critical facilities and infrastructure are vulnerable to drought. As outlined in the City's Water Shortage Contingency Plan, during periods of drought, the City may have to prioritize water usage for City health/safety facilities and infrastructure over commerce and irrigation. Also of particular concern is the City's water supply during drought conditions. The City relies on locally available surface water and groundwater that is vulnerable to water shortages during multiple dry-year periods.
Other Major Assets	All other major assets are vulnerable to drought. Drought impacts may include water use restrictions, excessive exceedance penalties, and monthly fees. According to the Public Policy Institute of California, such service fees disproportionately can impact lower-income and fixed-income households, who generally use less water. Higher temperatures that can coexist with drought can also exacerbate mental and physical health issues.
Highways and Bridges	All highways and bridges within the City of Santa Cruz are vulnerable to drought. When high temperatures coexist with drought, subsidence can occur and cause bridges and roads to warp.
Land Use Designations	All land use designations are vulnerable to drought. According to Drought.gov, short-term drought effects may include drier vegetation and lower surface water bodies. Longer-term drought effects may include production losses (agricultural land uses), pests and disease, decreased water availability, invasive plant species and invasive species, land subsidence and seawater intrusion, and ecosystem damage.

Type	Potential Impacts
Sensitive Habitats	All sensitive habitats are vulnerable to drought. Like land use designations, short-term drought effects may include drier vegetation and lower surface water bodies and groundwater. Longer-term drought effects may include pests and disease, decreased water availability, invasive plant species and invasive species, land subsidence and seawater intrusion, and ecosystem damage.
Water Assets	All water assets are vulnerable to drought. Reduced stream and river flows may reduce water available for local consumption and could increase the concentration of pollutants in reservoirs and cause stagnation of water (Center for Disease Control 2020). Groundwater depletion/aquifer levels dropping may lead to reduced water usage for consumption and irrigation and potential sea water intrusion in the Santa Cruz Mod-County Basin.
Effects of Climate Change	As noted earlier, according to UCLA's Center for Climate Science, climate probabilities in Northern California (including the City of Santa Cruz) by the year 2100 show that extreme dry years will occur 1.8 times more frequently than the 1895 to 2017 frequency rate of one time every 100 years. As such, all neighborhoods, frontline communities, and future growth and development areas will likely all continue to be vulnerable to drought. Impacts will likely include greater water use restrictions, excessive exceedance penalties, and monthly fees. Higher temperatures that can coexist with drought will likely continue to exacerbate mental and physical health issues (particularly for vulnerable populations). The City will have to continue to prioritize water usage for City health/safety facilities and infrastructure over commerce and irrigation. According to the City of Santa Cruz Water Department, "despite low demand, Santa Cruz is vulnerable to water shortages during multiple dry year periods; this situation is exacerbated when impacts of climate change are included in the analysis with single year supply deficits potentially ranging from 10–50 percent." Longer-term drought effects for land use categories, sensitive habitats, and water assets will likely include greater production losses (agricultural land uses), continued decrease in water availability and lower surface water and groundwater, and an increase in invasive plant species and invasive species, land subsidence, seawater intrusion, pests and diseases, and ecosystem damage.

UCLA = University of California, Los Angeles

4.3.4 Earthquake

Table 4-15: Potential Impacts from Earthquakes

Type	Potential Impacts
Neighborhoods	A probabilistic seismic hazard map depicting a 2 percent probability of exceedance in 50 years shows that 10.51 square miles (6,732.8 acres) of the City is in a potential shake area of ≥0.65g PGA and will experience very strong ground shaking. This includes nearly all the City except for the majority of the UC Santa Cruz Neighborhood and approximately half of Pogonip. These two neighborhoods are still vulnerable to strong earthquakes with a potential shake area of ≥0.45g PGA. Earthquake impacts may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, displacement, and secondary hazards including ground rupture, landslides, tsunamis, liquefaction, fire, and chemical spills. Earthquakes can result in trauma, injuries, or even death.
Frontline Communities	All frontline communities are vulnerable to very strong ground shaking. Earthquake impacts may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, displacement, and secondary hazards including ground rupture, landslides, tsunamis, liquefaction, fire, and chemical spills. Earthquakes can result in trauma, injuries, or even death. Frontline communities may have older housing and of lower physical quality, resulting in more material losses and/or greater damage and destruction from earthquakes to their homes. They may also have fewer relative resources, including insurance and government assistance, to prepare for and recover from earthquake impacts.
Future Growth and Development	All the 11 neighborhoods that have been identified for population growth and land use development, which includes six frontline communities as well as all six of the City's upcoming substantial affordable housing projects, will be vulnerable to very strong ground shaking. Earthquakes may cause a loss of power, water, and gas; structural damage; breaks in pipelines; additional impacts from secondary hazards including ground rupture, landslides, tsunamis, liquefaction, fire, and chemical spills; and trauma, injuries, or even death. As new development will be required to adhere to the 2022 California Building Standards Code's seismic codes, these structures should be more resilient against ground motion. Thus, potentially reducing casualties, costs, and damages from an earthquake event.
City Critical Facilities & Infrastructure	There are 273 City critical facilities and infrastructure, 18.77 linear miles of raw water pipelines, 258.51 linear miles of the treated water distribution system, and 2.93 linear miles of the levees that are vulnerable to very strong ground shaking. Earthquakes may cause loss of access, loss of utilities or compromised utility performance, structural damage, economic loss, and additional impacts from secondary hazards including ground rupture, landslides, tsunamis, liquefaction, fire, and chemical spills. In addition, damage and/or limited access to and from these facilities and infrastructure may impede public services and public safety. Both known future City critical facilities and infrastructure are vulnerable to stronger earthquake shaking.

Type	Potential Impacts
Other Major Assets	All affordable/subsidized housing properties, Santa Cruz City schools, Santa Cruz Public Libraries, and the arena, boardwalk, and harbor are vulnerable to very strong ground shaking. In addition, 707 historic buildings are vulnerable to very strong ground shaking. Earthquakes may cause loss of access, loss of utilities or compromised utility performance, structural damage, economic loss, disrupt learning and public events, and additional impacts from secondary hazards including ground rupture, landslides, tsunamis, liquefaction, and fire and chemical spills. Affordable/subsidized housing properties may be more vulnerable to earthquake damage because they are often older and of lower physical quality, resulting in more material losses and/or greater damage and destruction from earthquakes. In addition, historic buildings are also more vulnerable to earthquake damage, as they were built before seismic codes were adopted.
Highway and Bridges	All of Highway 1 and Highway 17, nearly all of Highway 9, and 26 bridges within the City are vulnerable to very strong ground shaking. Earthquakes may cause road shifting and buckling, bridge sway, structural damage, and additional impacts from secondary hazards including ground rupture, landslides, tsunamis, liquefaction, fire, and chemical spills.
Land Use Designations	All agriculture and parks and nearly all coastal dependent and coastal recreation areas are vulnerable to very strong ground shaking. In addition, nearly 75 percent of natural areas are also vulnerable to this hazard. Earthquakes may cause ground movement and ground displacement, changes to water courses, damage to agricultural systems, and additional impacts from secondary hazards including ground rupture, landslides, tsunamis, liquefaction, fire, and chemical spills.
Sensitive Habitats	Sensitive habitats that are vulnerable to very strong ground shaking include nearly all aquatic, freshwater wetland, grasslands, riparian, salt marsh, monarch butterfly, Ohlone Tiger Beetle, and Robust Spineflower habitats. Earthquakes may cause ground movement and ground displacement, changes to water courses, and additional impacts from secondary hazards including ground rupture, landslides, tsunamis, liquefaction, fire, and chemical spills.
Water Assets	Nearly all the lakes, San Lorenzo River, and groundwater basins, and a large majority of the creeks and watersheds are vulnerable to very strong ground shaking. Earthquakes may cause changes to water courses and cause additional impacts from secondary hazards including ground rupture, landslides, tsunamis, liquefaction, fire, and chemical spills.
Effects of Climate Change	As noted in Section 4.1.4, according to NASA, there is no way of knowing at this point if and where climate-related stress could promote earthquakes.

Key: NASA = National Aeronautics and Space Administration; PGA = peak ground acceleration (expressed as fraction of Earth's gravity, "g")

4.3.5 Extreme Heat

Table 4-16: Potential Impacts from Extreme Heat

Type	Potential Impacts
Neighborhoods	All the City of Santa Cruz is vulnerable to extreme heat. Some areas along the coast are often spared from the worst of these extreme events because of the cooling influences of the Pacific Ocean. Extreme heat impacts may cause power outages, heat-related illnesses and deaths, reduced air quality, and secondary hazards including drought and wildfires. In addition to physical health issues, extreme heat can exacerbate mental health issues.
Frontline Communities	All frontline communities are vulnerable to extreme heat. Extreme heat may cause power outages, heat-related illnesses and deaths, reduced air quality, and secondary hazards including drought and wildfires. Frontline communities may have older housing and of lower physical quality, often that is not adequately insulated or equipped with air conditioning, that is more vulnerable to extreme heat. Vulnerable populations in frontline communities may be unable to cool their homes either due to a lack of in-home cooling and/or because of increased energy costs. In addition, the lack of tree canopy and lack of access to cooling may amplify a frontline community's exposure to extreme heat and resulting heat and respiratory illnesses. In addition to physical health issues, extreme heat can exacerbate mental health issues.
Future Growth and Development	All 11 neighborhoods that have been identified for population growth and land use development, which includes all six of the City's frontline communities as well as all six of the City's upcoming substantial affordable housing projects, will be vulnerable to extreme heat. Extreme heat may cause power outages, heat-related illnesses and deaths, reduced air quality, and secondary hazards including drought and wildfires. However, new developments may be better designed to withstand heat and may also have backup power systems too. Thus, potentially reducing potential health issues associated with extreme heat events for those residing in new developments.
City Critical Facilities & Infrastructure	All City critical facilities and infrastructure are vulnerable to extreme heat. Extreme heat may cause power outages, which may compromise performance, lead to economic losses, and impede public services and public safety. Extreme heat may also result in secondary hazards including drought and wildfires.
Other Major Assets	All other major assets are vulnerable to extreme heat. Extreme heat impacts may cause power outages, heat-related illnesses and deaths, reduced air quality, disruption in learning and at public events, and secondary hazards including drought and wildfires. Vulnerable populations in affordable/subsidized housing may be unable to cool their homes either due to a lack of in-home cooling and/or because they cannot afford the increased energy rates. In addition, the lack of tree canopy and lack of access to cooling may amplify exposure to extreme heat and resulting heat and respiratory illnesses. In addition to physical health issues, extreme heat can exacerbate mental health issues.
Highways and Bridges	All highways and bridges in the City of Santa Cruz are vulnerable to extreme heat. Extreme heat can cause roads to soften and asphalt to deteriorate. In addition, when high temperatures coexist with drought, subsidence can occur and cause bridges and roads to warp.

Type	Potential Impacts
Land Use Designations	All land use designations are vulnerable to extreme heat. Extreme heat can cause production losses (agricultural land uses), habitat alteration, decreased water availability, ecosystem damage, and favorable wildfire conditions.
Sensitive Habitats	All sensitive habitats are vulnerable to extreme heat. Extreme heat may cause decreased water availability, increased water temperatures, ecosystem damage, heat stress, and favorable drought and wildfire conditions.
Water Assets	All water assets are vulnerable to extreme heat. Extreme heat may cause decreased water availability, increased water temperatures leading to algae bloom and increased water evaporation, ecosystem damage, and favorable drought and wildfire conditions.
Effects of Climate Change	Climate projections for the Central Coast (including all the City of Santa Cruz), under a business-as-usual scenario, project that the number of extreme heat days per year (daily temperatures exceeding 93.1°F) will increase by approximately 4 days per year into mid-century (2035–2064) and by 10 days per year by the end of the century (2070–2099). All the City of Santa Cruz will likely remain vulnerable to heat-related impacts, including power outages, reduced air quality, and secondary natural hazards such as drought and wildfires. As the frequency and intensity of extreme heat continues to rise, so too will the vulnerability of the City's residents, particularly frontline communities and other vulnerable people. According to the World Health Organization "extended periods of high day and nighttime temperature conditions create cumulative stress on the human body, increasing the risk of illness and death from heat exposure." Although extreme heat impacts to Santa Cruz are projected to increase slightly but remain relatively infrequent compared to many inland areas nearby, the City's proximity to cooler marine waters moderates temperatures will help it serve as a refuge for residents of heat impacted communities throughout the region. As a result, during prolonged heatwaves, the City will likely continue to experience a significant influx of tourists, including itinerant residents who may not have adequate shelter, corresponding traffic congestion, public health and safety, and other concerns may result.

Key: °F = degrees Fahrenheit

4.3.6 Flood

Table 4-17: Potential Impacts from Floods (Riverine Flood, Flash Flood, and Coastal Flood)

Type	Potential Impacts
Neighborhoods	The DFIRM for the County of Santa Cruz identifies 1.32 square miles (844.8 acres) with a 1 percent annual chance of high risk of flooding in City of Santa Cruz. People that are vulnerable to flooding caused by intense or prolonged rainfall, storm surge, localized wave action, and/or high tide live and/or work in the Banana Belt Neighborhood, Beach and Boardwalk District, Beach Hill/Beach Flat Neighborhoods, Downtown District, Downtown Neighborhoods, Harvey West District, Lighthouse/The Circles Neighborhood, Lower and Upper Ocean Neighborhoods, Lower and Upper Seabright Neighborhoods, Neary Lagoon, Ocean Street Corridor, River Street District, San Lorenzo Park Neighborhoods, Soquel Avenue Corridor, Water Street Corridor, and Westside Industrial District. According to modeling developed as part of the 2014 Monterey Bay Sea Level Rise Vulnerability Study and refined in the City of Santa Cruz Sea Level Rise Vulnerability Analysis, 0.31 square miles (198.4 acres) of the City of Santa Cruz is vulnerable to coastal storm flooding. People that are vulnerable to coastal storm flooding live and/or work in the Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhoods, Lighthouse/The Circle Neighborhood, Lower Ocean Neighborhoods, Lower and Upper Seabright Neighborhoods, Neary Lagoon, and Westside Industrial District. When storms occur simultaneously with high tides, flood conditions including flooding at the mouth of the San Lorenzo River and wave overtopping of the bluffs along West Cliff Drive will be further exacerbated. Coastal storm flood impacts may include utility disruption; property damage and property loss; reduced property values; reduced recreational areas and open space; loss of access/disrupted transportation; displacement; secondary hazards such as landslides, mudslides, and chemical spills; and water-related health impacts. Floods can result in trauma, injuries, or even death.
Frontline Communities	Frontline communities that are vulnerable to floods caused by intense or prolonged rainfall, storm surge, localized wave action, and/or high tide include the Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhoods, Downtown District, Downtown Neighborhoods, Lower Ocean Neighborhoods, Lower and Upper Seabright Neighborhoods, San Lorenzo Park Neighborhoods, Ocean Street Corridor, and River Street District. Frontline communities that are also vulnerable to coastal storm flooding include Lower Ocean Neighborhoods and Lower and Upper Seabright Neighborhoods. Flood impacts may include utility disruption; property damage and property loss; reduced property values; reduced recreational areas and open space; loss of access/disrupted transportation; displacement; secondary hazards such as landslides, mudslides, and chemical spills; and water-related health impacts. Floods can result in trauma, injuries, or even death. Frontline communities may have older housing and of lower physical quality, resulting in more material losses and/or greater damage and destruction from flooding. In addition, frontline communities affected by this hazard may have fewer relative resources, including insurance and government assistance, to prepare for and recover from flood impacts. They may also be more exposed to floodwater pollutants and therefore water-related illnesses.

Type	Potential Impacts
Future Growth and Development	Of the 11 neighborhoods that have been identified for future population growth and land use development, those that will be most vulnerable to flooding caused by intense or prolonged rainfall, storm surge, localized wave action, and/or high tide include the Beach and Boardwalk District (frontline community), Beach Hill/Beach Flats Neighborhoods (frontline community), Downtown District (frontline community), Downtown Neighborhoods (frontline community), Ocean Street Corridor (frontline community), River Street District, (frontline) and Westside Industrial District. Future growth and development areas that may also be vulnerable to coastal storm flooding include the Beach and Boardwalk District (frontline community), Beach Hill/Beach Flats Neighborhoods (frontline community), and Westside Industrial District. Five of the City's upcoming substantial housing projects for affordable housing are vulnerable to riverine flooding and/or wave attack. However, none are vulnerable to coastal storm flooding. Floods may cause property damage and property loss, reduced property values, loss of access/disrupted transportation, and displacement. However, However, new development in these neighborhoods may be subject to regulations and requirements outlined in the City's Shoreline Protection Overlay District, Coastal Overlay District, Floodplain District, and Coastal Implementation Plan. In addition, new development in the SFHA's coastal flood area will not only have to adhere to the 2022 California Building Standards Code, but also to construction standards to safeguard against floodwaters as outlined in the City's floodplain management regulations. Thus, potentially reducing costs and damages from coastal erosion.
City Critical Facilities & Infrastructure	There are 142 City critical facilities and infrastructure (including 1 future facility), 1.96 linear miles of raw water pipelines, 18.17 linear miles of the treated water distribution system, and 2.86 linear miles of levees that are vulnerable to flooding caused by intense or prolonged rainfall, storm surge, localized wave action, and/or high tide. There are 33 City critical facilities and infrastructure and 1.65 linear miles of the treated water distribution system that are vulnerable to coastal storm flooding. Floods may cause loss of utilities, overwhelm wastewater systems and damage water equipment and structures, and cause significant erosion, saltwater intrusion, and secondary hazards including landslides and mudslides.
Other Major Assets	There are 67 affordable/subsidized housing properties, 195 historic buildings, 2 schools, 1 library, and the arena, boardwalk, and harbor that are vulnerable to flooding caused by intense or prolonged rainfall, storm surge, localized wave action, and/or high tide. There are 7 affordable/subsidized housing properties, 12 historic buildings, and the boardwalk and the harbor that are vulnerable to coastal storm flooding. Floods may cause loss of utilities, block transportation routes, pollute drinking water systems and overwhelm wastewater systems, damage or destroy buildings and other structures, disrupt learning and public events, cause secondary hazards including landslides and mudslides, and lead to trauma, injuries or even death. In addition, lower-income households affected by this hazard may have fewer relative resources, including insurance and government assistance, to prepare for and recover from flood impacts. They may also be more exposed to floodwater pollutants and therefore water-related illnesses.
Highways and Bridges	Approximately 0.3 linear miles of Highways 1, 9 and 17 as well as 24 bridges are vulnerable to flooding caused by intense or prolonged rainfall, storm surge, localized wave action, and/or high tide. There are 10 bridges that are

Type	Potential Impacts
	vulnerable to coastal storm flooding. Flooding may cause significant damage to roads and bridges, including erosion or washout of road sections and road embankments, and debris obstructions.
Land Use Designations	Over half of coastal dependent and nearly half of coastal recreation areas are vulnerable to flooding caused by intense or prolonged rainfall, storm surge, localized wave action, and/or high tide. However, less than 2 percent of agriculture land, 5 percent of park land, and 15 percent of natural areas are vulnerable to riverine flooding and/or wave attack and even less so to coastal storm flooding. Flooding may cause land loss, landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, and contamination of land use designations. These impacts can result in short-term and long-term closure of public lands.
Sensitive Habitats	Nearly all aquatic and salt marsh habitats are vulnerable to flooding caused by intense or prolonged rainfall, storm surge, localized wave action, and/or high tide. Over 75 percent of freshwater wetlands and over 50 percent riparian habitat are also vulnerable to this hazard. Flooding can cause habitat loss, habitat fragmentation, landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, and contamination to these sensitive habitats.
Water Assets	All of the San Lorenzo River, nearly all the lakes, and half of the creeks are in the SFHA. However, only 1–2 percent of each watershed and between 3-4 percent of both groundwater basins are in hazard area. Approximately half of the lakes and half of the San Lorenzo River are also vulnerable to coastal storm flooding. Very little-to-none of the watersheds and groundwater basins are in this hazard area. However, due to mapping limitations, these numbers are likely lower than the actual number. Flooding may cause landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, and contamination.
Effects of Climate Change	Cal-Adapt models show that average annual precipitation is projected to modestly increase throughout the City of Santa Cruz, with extreme events also projected to increase in both frequency and intensity by mid-century and end-of-century. These projections indicate that flood risk associated with extreme precipitation may be more severe over time, with impacts to riverine and creek systems throughout the City's jurisdiction. Because DFIRMs are not designed to account for flooding caused by intense rainfall, flooding caused by extreme events will likely occur outside of the SFHA, likely in low-lying areas near flooding sources. Flooding caused by extreme precipitation may cause loss of utilities; disrupt or limit access; pollute drinking water systems and overwhelm wastewater systems; damage or destroy residential, commercial, and public buildings; cause secondary hazards including landslides and mudslides; and lead to trauma, injuries, or even death. Models for future coastal storm flooding, which include storm surge and wave overtopping, caused by accelerated large coastal storm events project the following: • By 2030, coastal storm flooding will continue to increase and further impact the Beach and Boardwalk District (frontline community and future growth and development area), Beach Hill/Beach Flats Neighborhoods (frontline community and future growth and development area), Lighthouse/The Circle Neighborhood, Lower Ocean Neighborhoods (frontline community), Lower and Upper Seabright Neighborhoods (frontline

Type	Potential Impacts
	community), Neary Lagoon, and Westside Industrial District (future growth and development area). There are no upcoming substantial affordable housing projects that are vulnerable to 2030 coastal storm flooding projections. However, 37 City critical facilities and infrastructure, 2.57 linear miles of the treated water distribution system, 12 affordable/subsidized housing properties, 16 historic buildings, 11 bridges, and the boardwalk and harbor are vulnerable to these future projections. Land use designations, sensitive habitats, and water assets that are vulnerable to existing coastal storm flooding will be further impacted by coastal storm flooding in 2030. • By 2060, coastal storm flooding will continue to increase and further impact the Beach and Boardwalk District (frontline community and future growth and development area), Beach Hill/Beach Flats Neighborhoods (frontline community and future growth and development area), Lighthouse/The Circle Neighborhood, Lower Ocean Neighborhoods (frontline community), Lower and Upper Seabright Neighborhoods (frontline community), Neary Lagoon, and Westside Industrial District (future growth and development area). There are no upcoming substantial affordable housing projects that are vulnerable to 2060 coastal storm flooding projections. However, 44 City critical facilities and infrastructure, 5.30 linear miles of the treated water distribution system, 22 affordable/subsidized housing properties, 29 historic buildings, 14 bridges, and the boardwalk and the harbor are vulnerable to 2060 coastal storm flooding projections. Land use designations, sensitive habitats, and water assets that are vulnerable to existing coastal storm flooding will also be further impacted by projected coastal storm flooding in 2060. • By 2100, coastal storm flooding will continue to increase and further impact the Beach and Boardwalk District (front line community and future growth and development area), Beach Hill/Beach Flats Neighborhoods (frontline community and future growth and development area), Lighthouse/The Circle Neighborhood, Lower Ocean Neighborhoods (frontline community), Lower and Upper Seabright Neighborhoods (frontline community), Neary Lagoon, and Westside Industrial District (future growth and development area). Three upcoming substantial affordable housing projects, 64 City critical facilities and infrastructure, 8.79 linear miles of the treated water distribution system, 38 affordable/subsidized housing properties, 63 historic buildings, 18 bridges, and the boardwalk and the harbor are vulnerable to 2100 coastal storm flooding projections. Land use designations, sensitive habitats, and water assets that were vulnerable to existing coastal storm flooding will be further impacted by projected coastal storm flooding in 2100. Increased coastal storm flooding may cause loss of utilities, block transportation routes, pollute drinking water systems, and overwhelm wastewater systems. Storm surge, wave overtopping, and high velocity waters associated with severe storm events may also damage or destroy buildings and other structures, and lead to trauma, injuries, or even death. Coastal storm flooding may cause significant damage to roads and bridges, including erosion/washout of road sections and road embankments and debris obstructions, limiting access, delaying traveling time and impeding public services and public safety. It can cause land loss, landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, contamination, habitat loss, habitat fragmentation, and saltwater intrusion too. Increased flooding from groundwater rise can be permanent (related to sea level rise) or intermittent as the water

Type	Potential Impacts
	tables rise and reduces the capacity of soil to absorb stormwater. The impacts include changes to the riparian systems and effectiveness in draining stormwater which could increase the risk and duration of upstream flooding.

Key: DFIRM = Digital Flood Insurance Rate Map; SFHA = Special Flood Hazard Area

4.3.7 Landslide

Table 4-18: Potential Impacts from Landslides

Type	Potential Impacts
Neighborhoods	The California Geological Survey deep-seated landslide grid map shows that there are 2.04 square miles (1,305.6 acres) of land classified as classes VIII, IX, or X that are deep-seated landslide high susceptibility areas in the City. People that are vulnerable to deep-seated landslides live and/or work in the Banana Belt Neighborhood, Beach and Boardwalk District, Branciforte Drive Neighborhoods, California Street/Mission Hill Neighborhoods, Carbonera Neighborhoods, Harvey West District, King Street Neighborhoods, Lighthouse/The Circles Neighborhoods, Prospect Heights Neighborhoods, Tanner Heights Neighborhoods, Lower and Upper Seabright Neighborhoods, Western Drive/Nobel Neighborhoods, Westlake Neighborhoods, and Westlake Industrial District. There are additional areas, including DeLaveaga Park, Moore Creek Upland Open Space, and Pogonip, that are vulnerable to deep-seated landslides but do not have a large population at risk. Landslide impacts may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, displacement, and secondary hazards including landslides, mudslides, and chemical spills. Landslides can result in trauma, injuries, or even death.
Frontline Communities	Frontline communities that are vulnerable to deep-seated landslides include the Beach and Boardwalk District, and Lower and Upper Seabright Neighborhoods. Landslides can cause loss of utilities, block transportation routes, change landscapes, and damage or destroy buildings and other structures. Rapidly moving water and debris from landslides can lead to trauma, injuries, or even death. Frontline communities may have older housing and of lower physical quality, resulting in more material losses and/or greater damage and destruction from landslides. In addition, frontline communities affected by this hazard may have fewer relative resources, including insurance and government assistance, to prepare for and recover from landslide impacts.
Future Growth and Development	Of the 11 neighborhoods that have been identified for future population growth and land use development, the Beach and Boardwalk District (frontline community), California Street/Mission Hill Neighborhoods, and Westside Industrial District will likely be most vulnerable to deep-seated landslides. None of the City's upcoming substantial housing projects for affordable housing are in deep-seated landslide hazard areas. Landslides can cause loss of utilities, block transportation routes, change landscapes, and damage or destroy buildings and other structures. Rapidly moving water and debris from landslides can lead to trauma, injuries, or even death. That said, new development within slopes and geologic hazard areas will be regulated by the City's zoning ordinance and must also meet the 2022 California Building Standards Code for soils and foundations. Thus, potentially reducing casualties, costs and damages from a landslide event.
City Critical Facilities & Infrastructure	There are 89 City critical facilities and infrastructure, including 1 future facility, 4.25 linear miles of raw water pipelines, and 17.74 linear miles of the treated water distribution system that are vulnerable to deep-seated landslides. Landslides may damage and/or destroy large areas of land, utilities, and structures and systems, block transportation

Type	Potential Impacts
	routes, and cause economic losses. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety.
Other Major Assets	There are 19 affordable/subsidized housing properties, 59 historic buildings, and 6 Santa Cruz City schools located in a deep-seated landslide hazard area. Landslides can cause loss of utilities, block transportation routes, change landscapes, and damage or destroy buildings and other structures. Rapidly moving water and debris from landslides can lead to trauma, injuries, or even death.
Highways and Bridges	There are 0.2 linear miles of Highway 1, 0.6 linear miles of Highway 17, and six bridges that are vulnerable to deep-seated landslides. Landslides may cause significant damage to roads and bridges, including land instability, road cuts, and debris obstructions.
Land Use Designations	Approximately 10 percent of coastal dependent, coastal recreation, agriculture, and park areas and 35 percent of natural areas are in a high-susceptibility deep-seated landslide hazard area. Landslides can cause land loss, landscape and watercourse alteration, soil erosion and sediment deposition, and contamination of land use designations. These impacts can result in short-term and long-term closure of public lands.
Sensitive Habitats	Grasslands, riparian, monarch butterfly, Mt. Hermon June Beetle, Ohlone Tiger Beetle, and the Robust Spineflower sensitive habitats have between 25–65 percent of their habitat area in a high-susceptibility deep-seated landslide hazard area. Landslides can cause habitat loss, habitat fragmentation, landscape and watercourse alteration, soil erosion and sediment deposition, and contamination to these sensitive habitats.
Water Assets	While not all water assets are in a very high deep-seated landslide hazard area, all water assets are vulnerable to landslides as they can occur in close proximity to water assets and cause damage to them. Specifically, landslides may cause land and water course alteration, soil erosion and sediment deposition, damming, and contamination.
Effects of Climate Change	As noted in Section 4.1.7, researchers are still trying to better understand why landslides react the way they do from increased rainfall and drought, except that they do know that existing landslide-prone areas move faster and farther during rainy periods. It can be assumed that at minimum, the same neighborhoods, frontline communities, areas of future growth and development, City critical facilities and infrastructure, other major assets, land use designations, sensitive habitats, and water assets in deep-seated landslide hazard areas will likely remain vulnerable to deep-seated landslides, including potentially faster and larger deep-seated landslide events that may cause even more damage and destruction than detailed above. In addition to changing precipitation regimes, wildfires may also impact occurrence and intensity of landslides, specifically, debris flows. Wildfires followed by extreme precipitation events, or large precipitation years, may also exacerbate the likelihood of debris flows, especially in areas of the City with 30 percent or greater steeper slopes, including Carbonera Neighborhoods, DeLaveaga Park, Moore Creek Upland Open Space, Pogonip, UC Santa Cruz, Western Drive/Nobel Neighborhoods, and Westlake Neighborhoods. There are no frontline communities or future growth and development areas in these steeper sloped neighborhoods. However, there are 48 City critical facilities

Type	Potential Impacts
	and infrastructure, 36 affordable housing properties, 7 historic buildings, 5 schools, and the boardwalk and harbor in this hazard area. Highways 1 and 9 go through steeped sloped areas. One of the City's upcoming substantial housing projects for affordable housing is in this hazard area too.

Key: UC Santa Cruz = University of California, Santa Cruz

4.3.8 Sea Level Rise

Table 4-19: Potential Impacts from Sea Level Rise

Type	Potential Impacts
Neighborhoods	The 2014 Monterey Bay Sea Level Rise Vulnerability Study and City's 2017 Sea Level Rise Vulnerability Analysis shows that 0.15 square miles (96 acres) within the City of Santa Cruz are currently in the existing rising tide inundation areas for the Extreme Monthly High Water level. People that are vulnerable to this hazard include those that live and/or work in the Beach and Boardwalk District, Nearly Lagoon, and Lower and Upper Seabright Neighborhoods. Sea level rise impacts may include utility disruption; property damage and property loss from wave overtopping and flooding; reduced property values; reduced recreational areas and open space; loss of access/disrupted transportation; displacement; secondary hazards such as landslides, mudslides, and chemical spills; saltwater intrusion; and water-related health impacts.
Frontline Communities	Frontline communities that are vulnerable to existing sea level rise include Beach and Boardwalk District, and Lower and Upper Seabright Neighborhoods. Sea level rise impacts may include utility disruption; property damage and property loss from wave overtopping and flooding; reduced property values; reduced recreational areas and open space; loss of access/disrupted transportation; displacement; secondary hazards such as landslides, mudslides, and chemical spills; and water-related health impacts. Frontline communities may have older housing and of lower physical quality, resulting in more material losses and/or greater damage and destruction from sea level rise. Frontline communities may have fewer relative resources, including insurance and government assistance, to prepare for and recover from sea level rise impacts. They may also be more exposed to floodwater pollutants and therefore water-related illnesses.
Future Growth and Development	Of the 11 neighborhoods identified to accommodate population growth and development, only a very small portion of future population growth and land use development in the Beach and Boardwalk District (frontline community) and Westside Industrial District are in existing rising tide inundation area. Sea level rise impacts may include utility disruption; property damage and property loss from wave overtopping and flooding; reduced property values; reduced recreational areas and open space; loss of access/disrupted transportation; displacement; secondary hazards such as landslides, mudslides, and chemical spills; saltwater intrusion; and water-related health impacts. While there are no codes or ordinances to specifically address sea level rise, new development in these areas may be subject to the City's flood damage prevention ordinance, Shoreline Protection District, Coastal Overlay District, and Coastal Implementation Plan requirements, and therefore, these newer structures may be more resilient against flooding caused by sea level rise. Thus, potentially reducing some costs and damages from sea level rise inundation.
City Critical Facilities & Infrastructure	There are 15 City critical facilities and infrastructure (and no future ones) that may be impacted by existing rising tides. Rising tides may flood and destroy and/or destroy large areas of land, utilities, and structures and systems, and cause economic losses. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety.

Type	Potential Impacts
Other Major Assets	There are three historic buildings and Santa Cruz Harbor that may be impacted by existing rising tides. Sea level rise may cause property damage and property loss from wave overtopping and flooding, reduced property values, reduced recreational areas and open space, transportation accessibility issues, displacement, and economic losses. The Santa Cruz Municipal Wharf will also more frequently be exposed to larger wave heights relative to its elevation, with potential for greater impacts and property loss.
Highways and Bridges	There are seven bridges that are vulnerable to existing rising tides. The rise of sea level may block access and corrode, scour, and flood bridges.
Land Use Designations	Approximately 50 percent of the coastal dependent areas, 25 percent of natural areas, and less than 10 percent of the coastal recreation areas are vulnerable to existing rising tides. The rise of sea level may cause land loss, landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, groundwater rise, and contamination of land use designations. These impacts can result in short-term and long-term closure of public lands.
Sensitive Habitats	Nearly 70 percent of aquatic sensitive habitats and 15 percent of freshwater wetlands are vulnerable to existing rising tides. The rise of sea level may cause habitat loss, habitat fragmentation, landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, groundwater rise, and contamination of these sensitive habitats.
Water Assets	Nearly 1 mile of the San Lorenzo River and nearly 2 miles of creeks are vulnerable to existing rising tides. Additionally, a very small area of the watersheds and groundwater basins are vulnerable to this hazard; however, this percentage is likely low due to the limitations of the hazard area mapping boundaries. The rise of the sea level may cause landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, and contamination. Groundwater rise also has the potential to impact underground infrastructure through increased corrosion, displacement, and intrusion from salt water.
Effects of Climate Change	Models for future sea level rise caused by accelerating high sea level rise scenarios project the following: • By 2030, sea level rise will continue to increase and further impact those that live and/or work in the Beach and Boardwalk District (frontline community and future growth and development area), Lower and Upper Seabright Neighborhoods (frontline community), Neary Lagoon, and Westside Industrial District (future growth and development area). There are no upcoming substantial affordable housing projects in this projected hazard area. There are 36 existing City critical facilities and infrastructure in this hazard area, but no future City critical facilities or infrastructure. Three historic buildings, Santa Cruz Harbor, and eight bridges are vulnerable to this hazard. Land use designations, sensitive habitats, and water assets that are vulnerable to existing coastal erosion will be further impacted by sea level rise projected by 2030. • By 2060, sea level rise will continue to increase and likely further impact those that live and/or work in the Beach and Boardwalk District (frontline community and future growth and development area), Lower and Upper Seabright Neighborhoods (frontline community), Neary Lagoon, and Westside Industrial District (future growth and development area). There are no upcoming substantial affordable housing projects or future City critical facilities or infrastructure in this hazard area. Five affordable/subsidized housing properties, 10 historic

Type	Potential Impacts
	buildings, Santa Cruz Beach Boardwalk, Santa Cruz Harbor, and 12 bridges will be vulnerable to sea level rise projected by 2060. Land use designations, sensitive habitats, and water assets that are vulnerable to existing coastal erosion will be further impacted by sea level rise projected by 2060. • By 2100, sea level rise will continue to increase and likely further impact those that live and/or work in the the Beach and Boardwalk District (frontline community and future growth and development area), Lower and Upper Seabright Neighborhoods (frontline community), Neary Lagoon, and Westside Industrial District (future growth and development area). In addition, by 2100 the Downtown District (frontline community and future growth and development area) and Downtown Neighborhood (frontline community and future growth and development area) will also be vulnerable to this hazard. There are no upcoming substantial affordable housing projects in this hazard area. A total of 49 existing City critical facilities and infrastructure, 1.72 linear miles of the treated water distribution system, 25 affordable/subsidized housing properties, 28 historic buildings, 14 bridges, arena, beach boardwalk, and harbor are vulnerable to this hazard. Land use designations, sensitive habitats (which now include all salt marshes and nearly all seabirds), and water assets that are vulnerable to existing coastal erosion will be further impacted by sea level rise projected by 2100. Future sea level rise will likely continue to cause or exacerbate coastal property damage and property loss due to wave overtopping and flooding, thereby reducing property values, reducing recreational areas and open space, and causing loss of access/disrupted transportation, and displacement. In addition, frontline communities will likely continue to have fewer relative resources, including insurance and government assistance, to prepare for and recover from these impacts. They may also likely continue to be more exposed to floodwater pollutants and therefore water-related illnesses. Sea level rise will likely continue to cause wave overtopping, flooding, loss of land, loss of access, compromised utility performance, and economic losses to City critical facilities and infrastructure and other major assets. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety. Land use designations, sensitive habitats, and water assets will likely continue to experience disruptions to natural systems that regulate the exchanges of water, nutrients, and organisms with the open ocean as well as loss of habitat and overall loss of land. As forecasted by the USGS, rising seas will likely impact the City's water table too.

4.3.9 Tsunami

Table 4-20: Potential Impacts from Tsunamis

Type	Potential Impacts
Neighborhoods	According to California Geological Survey modeling, 1.63 square miles (1,043.2 acres) in the City of Santa Cruz are at risk of a worst-case scenario tsunami run-up. People that are vulnerable to tsunami inundation live and/or work in the Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhoods, Branciforte Drive Neighborhoods, California Street/Mission Hill Neighborhoods, Downtown District, Downtown Neighborhoods, Lighthouse/The Circles Neighborhoods, Lower Ocean Neighborhoods, Lower Seabright Neighborhoods, Neary Lagoon, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, Upper Seabright Neighborhoods, Water Street Corridor, and Westside Industrial District. Tsunami impacts may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, and displacement. Tsunamis can also cause water-related health issues and result in trauma, injuries, or even death.
Frontline Communities	Frontline communities that are vulnerable to tsunami inundation include Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhoods, Downtown District, Downtown Neighborhoods, Lower Ocean Neighborhoods, Lower Seabright Neighborhoods, Neary Lagoon, Ocean Street Corridor, River Street District, and Upper Seabright Neighborhoods. Tsunamis can cause loss of utilities, block transportation routes, change landscapes, and damage or destroy buildings and other structures. Incoming and outgoing water as well as debris from tsunamis can lead to trauma, injuries, or even death. Frontline communities may have older housing and of lower physical quality, resulting in more material losses and/or greater damage and destruction from tsunami inundation to homes. Frontline communities may have fewer relative resources, including insurance and government assistance, to prepare for and recover from tsunami impacts. They may also be more exposed to floodwater pollutants and therefore water-related illnesses.
Future Growth and Development	Of the 11 neighborhoods identified to accommodate population growth and development, the Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhoods, Downtown District, Downtown Neighborhoods, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, Water Street Corridor, and Westside Industrial District, may be vulnerable to tsunami inundation. Six of these neighborhoods identified for future growth and development are also frontline communities. Five of the City's upcoming substantial housing projects for affordable housing are located in this hazard area. Tsunamis can cause loss of utilities, block transportation routes, change landscapes, and damage or destroy buildings and other structures. Incoming and outgoing water as well as debris from tsunamis can lead to trauma, injuries, or even death. New development in these neighborhoods may be subject to regulations and requirements outlined in the City's Shoreline Protection Overlay District, Coastal Overlay District, Coastal Implementation Plan, and flood management ordinance. In addition, they will have to be built to the 2022 California Building Standards Code's minimum design and construction requirements, resulting in improved construction quality and stronger structural integrity. Thus, potentially reducing costs and damages from tsunami inundation.

Type	Potential Impacts
City Critical Facilities & Infrastructure	There are 126 City critical facilities and infrastructure, including 1 future critical facility, 39.60 linear miles of the treated water distribution system, and 2.58 linear miles of levees that are in the mapped tsunami hazard area. Tsunami inundation may damage and/or destroy large areas of land, utility performance, and structures and systems, and cause economic losses. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety.
Other Major Assets	Other major assets in the mapped tsunami hazard area include 66 affordable/subsidized housing properties, 280 historic buildings, 1 school, 1 library, arena, boardwalk, and harbor. Tsunami inundation may damage and/or destroy large areas of land, utilities, and structures and systems, and cause economic losses. They can disrupt school and public events too. Incoming and outgoing water as well as debris from tsunamis can lead to trauma, injuries, or even death. Lower-income households in affordable/subsidized housing may have more material losses and/or greater damages from tsunami inundation due to older housing and of lower physical quality. They may have fewer relative resources, including insurance and government assistance, to prepare for and recover from tsunami impacts. They may also be more exposed to floodwater pollutants and therefore water-related illnesses.
Highways and Bridges	There are 0.6 linear miles of Highway 1 and 23 bridges that are in the tsunami hazard area. Tsunami inundation may block access and cause significant damage to roads and bridges, including erosion or washout of road sections and road embankments, and debris obstructions.
Land Use Designations	Nearly all coastal dependent and coastal recreation areas at vulnerable to tsunami inundation. Approximately 5 percent of parks and 12 percent of natural areas are also vulnerable to this hazard. Tsunami inundation may cause land loss, landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, and contamination of land use designations. These impacts can result in short-term and long-term closure of public lands.
Sensitive Habitats	Sensitive habitats that may be most impact by tsunami include nearly all aquatic and seabird sensitive habitats as well as approximately 10 percent of monarch butterflies, 67 percent of freshwater wetlands, and 43 percent of riparian sensitive habitats are also in this hazard area. Flooding caused by tsunami inundation may cause habitat loss, habitat fragmentation, landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, and contamination to these sensitive habitats.
Water Assets	Nearly all the lakes and the San Lorenzo River and over a quarter of the creeks are vulnerable to tsunami inundation. Flooding from tsunami inundation may cause landscape and watercourse alteration, soil erosion and sediment deposition, saltwater intrusion, and contamination.
Effects of Climate Change	As noted in Section 4.1.9, even though tsunamis are not related to climate, according to the U.S. Climate Resilience Toolkit, their impacts to coastal communities may be exacerbated due to rising sea levels, increased frequency and intensity of coastal storms, warming air temperatures, and increasing sea surface temperatures. It can be assumed that at minimum, the same neighborhoods, frontline communities, areas of future growth and development, City critical facilities and infrastructure, other major assets, land use designations, sensitive habitats, and water assets in the

Type	Potential Impacts
	tsunami hazard area noted above will likely remain vulnerable to tsunami inundation, and higher sea levels may allow for tsunamis to travel further inland and cause even more damage and destruction than detailed above.

4.3.10 Wildfire

Table 4-21: Potential Impacts from Wildfires

Type	Potential Impacts
Neighborhoods	According to CAL FIRE, 0.62 square miles (396.8 acres) of the City of Santa Cruz is in a high-very high FHSZ. People that work and/or live in this hazard area include those in the King Street Neighborhood, Prospect Heights Neighborhoods, UC Santa Cruz, Western Drive/Nobel Neighborhoods, and Westside Industrial District. Additional neighborhoods that are in the high-very high FHSZ but do not have a large population at risk include DeLaveaga Park and Natural Bridges State Beach. WUI maps show there are 6.20 square miles (3,968 acres) in the City of Santa Cruz. People that live and/or work in the WUI area and are vulnerable to wildfires include those in the Carbonera Neighborhoods, Harvey West District, Prospect Heights Neighborhoods, Tanner Heights Neighborhoods, UC Santa Cruz, Western Drive/Nobel Neighborhoods, and Westlake Neighborhoods. Additional neighborhoods that are in the WUI but do not have a large population at risk include Arana Gulch, DeLaveaga Park, Moore Creek Upland Open Space, and Pogonip. Wildfire impacts may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, displacement, and secondary hazards including landslides and mudslides. Wildfires can cause to smoke-related health issues and result in trauma, injuries, or even death.
Frontline Communities	There are no frontline communities in the high-very high FHSZ or WUI area.
Future Growth and Development	Of the 11 neighborhoods identified to accommodate population growth and land use development, growth and development in Westside Industrial District may be most vulnerable to wildfires. However, no upcoming substantial housing projects for affordable housing are in this neighborhood. Wildfire impacts to population growth and land use develop may include utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, displacement, and secondary hazards including landslides and mudslides. Wildfires in these areas may cause smoke-related health issues and result in trauma, injuries, or even death. However, as new development in the WUI area will be subject to the 2019 California Fire Code and the 2022 California Building Standards Code that contains WUI building construction requirements and WUI vegetation and fuel management requirements, these structures should be more resilient against wildfires. Thus, potentially reducing casualties, costs and damages from wildfires.

Type	Potential Impacts
City Critical Facilities & Infrastructure	There are 39 City critical facilities and infrastructure, 8.22 linear miles of raw water pipeline and 16.57 linear miles of the treated water distribution system in the high-very high FHSZ. There are 69 City critical facilities and infrastructure, 3.07 linear miles of raw water pipelines and 32.65 linear miles of the treated water distribution system in the WUI area. There are no future critical facilities or infrastructure within City limits that are in either hazard area. Wildfires may cause loss of land, loss of access, loss of utilities or compromised utility performance, structural damage, economic loss, and secondary hazards including landslides and mudslides. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety. Wildfire ash and contaminants can threaten drinking water.
Other Major Assets	There are 13 other major assets, including 10 affordable/subsidized housing properties, 2 historic buildings, and 1 school, that are in the high-very high FHSZ and 63 other major assets, including 27 affordable/subsidized housing properties, 34 historic buildings, and 2 schools, that are in the WUI area. Wildfires may cause loss of land, loss of access, loss of utilities or compromised utility performance, structural damage, economic loss, and secondary hazards including landslides and mudslides. In addition, damage or limited access to and from these facilities and infrastructure as well as throughout the City may impede public services and public safety. In addition, lower-income households in affordable/subsidized housing in the WUI area may experience more material losses and/or greater damage and destruction from a wildfire due to having older housing and of lower physical quality. These community members may have fewer relative resources, including insurance and government assistance, to prepare for and recover from wildfire impacts. They may also be more exposed to wildfire pollutants and therefore wildfire and smoke-related illnesses.
Highways and Bridges	Approximately 0.35 linear miles of Highway 1 is in a high-very high FHSZ and 0.89 linear miles of Highway 1, 1.29 linear miles of Highway 9, 1.58 linear miles of Highway 17, and three bridges are in a WUI area. Wildfires can block access, compromise pavement performance, and damage bridges.
Land Use Designations	Between 3–13 percent of coastal recreation, parks, and natural areas are in a high-very high FHSZ. About 32 percent of agriculture and about 85 percent of parks and natural areas are in a WUI area. Wildfire can cause production losses (agricultural land uses), alter habitat, transform landscapes, compromise water quality, introduce invasive species, and damage ecosystems. Secondary hazards can include erosion, flooding, and landslides. All of these impacts can result in short-term and long-term closure of public lands.
Sensitive Habitats	All of the salt marshes and about 17 percent of the monarch butterfly are located in a high-very high FHSZ. Approximately 20 percent of freshwater wetlands, 97 percent of grasslands, 50 percent of riparian habitat, 54 percent of monarch butterfly, and nearly 100 percent of the Mt. Herman June Beetle, Ohlone Tiger Beetle, and Robust Spineflower are in a WUI area. Wildfire can alter habitat, transform landscapes, compromise water quality, introduce invasive species, and damage ecosystems. Secondary hazards can include erosion, flooding, and landslides.

Type	Potential Impacts
Water Assets	About 4 percent of creeks, 57 percent of the Laguna Watershed, 23 percent of the Liddell Watershed, 77 percent of the Majors Watershed, 81 percent of the San Lorenzo Watershed, 55 percent of the Mid-County Groundwater Basin, and 75 percent of the Santa Margarita Groundwater Basin are in a high-very high FHSZ. Within the WUI are 14 percent lakes, 27 percent of the San Lorenzo River, and 64 percent of creeks. The number and percentage of watersheds and groundwater basins in the WUI area are likely severely undercounted as the WUI area dataset doesn't extend past City limits. Wildfires. Wildfire can alter habitat, transform landscapes, compromise water quality, introduce invasive species, and damage ecosystems. Secondary hazards can include erosion, flooding, and landslides.
Effects of Climate Change	The projected increase of drought and extreme heat events will likely continue to increase wildfire intensity and vulnerabilities in the City's high-very high FHSZ and WUI areas and potentially in surrounding areas, such as neighborhoods in moderate FHSZ, including Arana Gulch, Banana Belt Neighborhoods, Carbonera Neighborhoods, DeLaveaga Park, Harvey West District, King Street Neighborhoods, Lighthouse/The Circles Neighborhoods, Mission Street Corridor, Moore Creek Upland Open Space, Natural Bridges State Beach, Pogonip, Prospect Heights Neighborhoods, Soquel Avenue Corridor (future growth and development area), Tanner Heights Neighborhoods, UC Santa Cruz, Upper Seabright Neighborhoods (frontline community), Western Drive/Nobel Neighborhoods, Westlake Neighborhoods, and the Westside Industrial District (future growth and development area). Those that work or reside in these existing high-very high FHSZs, as well as City critical facilities and infrastructure, other major assets and highways and bridges located there, will likely be at greater risk of utility disruption, property damage and property loss, reduced property values, reduced recreational areas and open space, loss of access/disrupted transportation, displacement, smoke-related health issues, and secondary hazards including post-wildfire floods and debris flows from wildfires Post-wildfire floods and debris flows may also put additional areas prone at risk, especially on slopes burned by recent wildfires. In Santa Cruz, areas with significant steep slopes (30 percent or greater) include Carbonera Neighborhoods, DeLaveaga Park, Moore Creek Upland Open Space, Pogonip, UC Santa Cruz, Western Drive/Nobel Neighborhoods, and Westlake Neighborhoods. Fortunately, no frontline communities or future growth and development areas are in this hazard area. However, there are 48 City critical facilities and infrastructure, 36 affordable housing properties, 7 historic buildings, 5 schools, and the boardwalk and harbor in steeped sloped areas. Highways 1 and 9 go through this terrain. One of the City's upcoming substantial housing projects for affordable housing is in this hazard area too. Post-wildfire floods can cause flooding to occur much faster than normal conditions while debris flows can carry soil, logs, and large boulders. Both hazards can cause serious damage to the natural and built environment and lead to life-threatening injuries and even death.

Key: CAL FIRE = California Department of Forestry and Fire Protection; FHSZ = Fire Hazard Severity Zone; UC Santa Cruz = University of California, Santa Cruz; WUI = Wildland–Urban Interface

4.4 NATIONAL FLOOD INSURANCE PROGRAM

Since 2018, the City of Santa Cruz has been classified as a Category A repetitive loss community. Category A is defined as "a community that has no repetitive loss properties, or whose repetitive loss properties all have been mitigated. A Category A community has no special requirements except to submit information to update its repetitive loss list, as needed." In the City's 2021–2022 Community Rating System (CRS) review, a FEMA report erroneously listed a property as a repetitive loss property within City limits. This was disputed and documentation provided that the subject property was in Paradise Park (outside the City limits) and in the County of Santa Cruz jurisdiction. Since 2022, there have been no requests for repetitive loss claims submitted.

5.0 MITIGATION AND CLIMATE ADAPTATION STRATEGY

This section addresses Element C: Mitigation Strategy of the Local Mitigation Plan Regulation Checklist.

Element C: Mitigation Strategy	
C1.	Does the plan document each participant's existing authorities, policies, programs, and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))
C1-a.	Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?
C1-b.	Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?
C2.	Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))
C2-a.	Does the plan contain a narrative description or a table/list of their participation activities?
C3.	Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))
C3.-a.	Does the plan include goals to reduce the risk from the hazards identified in the plan?
C4.	Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.6(c)(3)(ii))
C4-a.	Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?
C4-b.	Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?
C5.	Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR §§ 201.6(c)(3)(iii–iv))
C5-a.	Does the plan describe the criteria used for prioritizing actions?
C5-b.	Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?

Key: CFR = Code of Federal Regulations; NFIP = National Flood Insurance Program

5.1 AUTHORITIES, POLICIES, PROGRAMS, AND RESOURCES

The City of Santa Cruz's existing authorities, plans, policies, programs, and financial resources available for hazard mitigation are provided in Tables 5-1 through 5-3. Table 5-4 also identifies the City's ability to expand and improve on its hazard mitigation capabilities, when possible.

Table 5-1: Human and Technical Resources for Hazard Mitigation

Department/ Program	Principal Activities Related to Hazard Mitigation
City Manager	The City Manager is appointed by and reports directly to the City Council and is responsible for the overall administration of the City and for seeing that City Council policies are carried out. The City Manager's Office also handle special projects and Council assignments that do not fall within the jurisdiction of any one City department. Within this department, the Communications Team oversees communications and resources, and the Sustainability and Resiliency Officer is responsible for climate mitigation and resiliency projects.
Planning and Community Development Department	The City Planning and Community Development Department provides land use and development guidelines to enhance the quality of life, safety, and civic pride for the City of Santa Cruz. This department includes the Floodplain Manager, who oversees the NFIP and provides flood insurance zone information using FEMA maps and data.
Fire Department	The Fire Department includes four fire stations and one lifeguard headquarters providing structure fire suppression, wildland fire suppression, and marine rescue services along with other emergency services such as paramedic and hazardous materials incident response. Staff in this department include firefighters/paramedics, captains, battalion chiefs, fire prevention staff, training staff, and administrative staff. The Fire Department's Office of Emergency Services Manager coordinates planning, preparedness, response, and recovery from a disaster.
Information Technology	The Information Technology Department provides technology services to support City departments and the community through online platforms. The department manages the City's GIS public platform (GeoHub) for exploring, visualizing, and downloading geospatial data, including those related to hazards such as coastal sea level rise.
Public Works	The Public Works Department provides services related to hazard mitigation including storm water management and flood control. It also provides engineering design, traffic engineering, street maintenance, resource recovery, waste reduction, and wastewater management. The department provides the public with resources related to storm preparation and bridge projects for enhancing flood protection.
Water	The Water Department collects, moves, stores, treats, and distributes water to the residents and businesses within the Santa Cruz City limits, Live Oak, portions of the City of Capitola, and limited service along Highway 1 north of Santa Cruz. This department's long-term water supply planning accounts for drought.

Key: FEMA = Federal Emergency Management Agency; GIS = geographic information systems; NFIP = National Flood Insurance Program

Table 5-2: Financial Resources for Hazard Mitigation

Type	Name	Purpose
Local	General Fund	The General Fund is the City's primary fund for resource inflows and outflows that are not associated with special purpose funds.
	General Capital Improvement Fund	The General Capital Improvement Fund is the City's fund for all capital improvement projects in a given fiscal year.
	Wastewater Enterprise Fund	This fund accounts for the activities of the City's wastewater utility, which provides wastewater collection and treatment services to the residents of the City and some residents of the County.
	Water Enterprise Fund	This fund accounts for the activities of the City's water utility, which provides water delivery services to the residents of the City and some residents of the County.
	City Wide Storm Water Enterprise Fund	This fund accounts for storm water utility fees on properties within the City limits.
	Flood Plan Overlay Enterprise Fund	This fund accounts for fees on properties within the limits of the flood control system. These fees provide funding for flood control improvements associated with the San Lorenzo River Flood Control Project, storm water pollution prevention measures, and measures to comply with the EPA Non-Point Pollution Discharge Emissions Standards Program.
	Clean Rivers, Oceans and Beaches Fund	This fund is used to account for parcel tax revenues earned and expenditures incurred per the voters Measure E ballot measure of 2008.
State	California Department of Conservation Regional Forest and Fire Capacity Program	California Department of Conservation Regional Forest and Fire Capacity Program makes available block grants to support regional leadership to "build local and regional capacity and develop, prioritize, and implement strategies and projects that create fire adapted communities and landscapes by improving ecosystem health, community wildfire preparedness, and fire resilience." Regional Forest and Fire Capacity Program block grants support partner capacity, project readiness, implementation of demonstration projects, and regional priority planning to achieve landscape-level and community wildfire resilience.
	California Department of Water Resources Dam Safety and Climate Resilience Local Assistance Program	The Dam Safety and Climate Resilience Local Assistance Program (DSCR) funds the repairs, rehabilitation, enhancements, and other dam safety projects at existing State jurisdictional dams and associated facilities. The projects must address one or more of the following: protection of public safety, restoration of water storage, flood risk reduction, enhancement of water supply reliability, enhancement, protection, or restoration of habitat for fish and wildlife,

Type	Name	Purpose
		and/or protection of water quality. As of September 2024, there is $47.5 million available for this program.
	CAL FIRE Forest Health Grant Program	The Forest Health Grant Program provides financial assistance for forest restoration projects that restore forest resilience from catastrophic disturbance. Eligible activities include forest fuels reduction, fire reintroduction, reforestation, and utilization of forest biomass.
	CAL FIRE Wildfire Prevention Grants Program	The Wildfire Prevention Grants Program offers financial assistance for local projects in and near fire-threatened communities that focus on increasing the protection of people, structures, and communities. Qualified activities include hazardous fuels reduction, wildfire prevention planning, and wildfire prevention education with an emphasis on improving public health and safety while reducing greenhouse gas emissions.
	California Department of Water Resources Urban and Multi-Benefit Drought Relief Grant Program	The Urban and Multi-Benefit Drought Relief Program offers financial assistance to address drought impacts for local and tribal governments/special districts "facing the loss or contamination of their water supplies due to the drought, to address immediate drought impacts on human health and safety, and to protect fish and wildlife resources plus other public benefits, such as ecosystem improvements."
	California Ocean Protection Council (OPC)	The California Ocean Protection Council (OPC) manages various funding sources including bond funds, general funds, and special funds, to "advance strategic investments in scientific research and monitoring, collaborative policy development, restoration, and other projects that will improve conditions for ocean and coastal ecosystems and California communities". OPC's Senate Bill 1 Sea Level Rise Adaptation Planning Grant Program provides funding to local, regional, and tribal governments to develop sea level rise adaptation plans and sea level rise resilience projects along the California coast and the San Francisco Bay.
	California State Coastal Conservancy (CSCC) Grants	CSCC funds a wide array of projects along the California coast, San Francisco Bay, and in coastal watersheds to "increase availability of beaches, parks and trails for the public, protect and restore natural lands and wildlife habitat, preserve working lands, and increase community resilience to the impacts of climate change." Most of the CSCC grants are awarded through a rolling pre-application solicitation, and most grant awards are between $200,000 and $5,000,000. Projects funded generally include pre-project feasibility studies; property acquisition; project planning including community involvement, design, environmental review, permitting, and construction; and project-related monitoring. The City of Santa Cruz was recently awarded a Coastal Conservancy grant of $297,000 to develop a Living Shorelines, Nature Based Solutions, and Sand Management Feasibility Study. It was also awarded up to $6,893,700 to construct improvements in the East Parking Lot and wave crash zone areas of the Santa Cruz Municipal Wharf in the City of Santa Cruz and to further the planning for

Type	Name	Purpose
		future improvements for increased resiliency to the effects of climate change. The Fire Department also received approximately $220,000 for wildfire fuel reduction efforts and fire access enhancements in the open space areas of Pogonip and Arana Gulch.
	State of California Governor's Office of Planning and Research Integrated Climate Adaptation and Resiliency Program's Grant Program	The Integrated Climate Adaptation and Resiliency Program's Grant Programs provide funding to help fill local, regional, and tribal adaptation planning and resilience needs; provide resources; and support the development of a pipeline of climate resilient projects. Three grant programs in this Integrated Climate Adaptation and Resiliency Program include the Adaptation Planning Grant Program, the Regional Resilience Planning and Implementation Grant Program, and the Extreme Heat and Community Resilience Grant Program.
	State of California Proposition 84 (Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006)	Proposition 84 contains $5.38 billion spread over eight broad project areas: water quality; protection of rivers, lakes, and streams; flood control/flood subventions; sustainable communities and climate change reduction; protection of beaches, bays, and coastal waters; parks and natural education facilities; forest and wildlife conservation; and statewide water planning.
	California State Water Resources Control Board	California's Drinking Water State Revolving Fund (DWSRF) program assists public water systems in financing the cost of drinking water facility and infrastructure projects in order to achieve or maintain compliance with federal Safe Drinking Water requirements.
	California Strategic Growth Council Community Resilience Center Program	California's Strategic Growth Council's new Community Resilience Center program will fund new construction and upgrades of neighborhood-level resilience centers to provide shelter and resources during climate and other emergencies. The program will also fund year-round services and ongoing programming that build overall community resilience. Applicants must demonstrate collaboration with community members; involvement with community-based organizations and residents in governance and decision-making; multi-stakeholder partnerships; and accessible Community Resilience Centers providing eligible services and amenities year-round to community residents. This program has been identified in the 2025–2030 LHMP – CAP Mitigation and Climate Adaptation Strategy.
Federal	FEMA HMA Grants	The HMA grant program provides technical and financial assistance to help mitigate hazards through the following grants: • Building Resilient Infrastructure and Communities (BRIC): BRIC is an annual competitive pass-through grant program that focuses on reducing the nation's risk by funding public infrastructure projects that increase a community's resilience before a disaster affects an area. BRIC was created in 2020 as part of the Disaster Recovery Reform Act of 2018 and replaces FEMA's legacy Pre-Disaster Mitigation grant

Type	Name	Purpose
		program. BRIC funds a wide variety of mitigation activities, including microgrids, flood control, wetland restoration, community relocation/buyouts, seismic retrofits, and nature-based solutions. BRIC Direct Technical Assistance is a non-financial-assistance grant program for local hazard mitigation plan development initial support, identifying solutions for specific hazards, assisting with hazard mitigation project planning, requesting application development support, demonstrating cost-effectiveness of a BRIC sub-application submission, and understanding hazard mitigation grant management. The City was recently awarded a $15 million BRIC grant to harden a pump station, construct a new one, and implement riparian restoration measures and tree planting. • Hazard Mitigation Grant Program (HMGP): HMGP is a pass-through grant program that supports pre- and post-disaster mitigation plans and projects for state and local agencies and federally recognized tribal governments. HMGP funding is authorized with a Presidential Major Disaster Declaration. A governor or tribal chief executive may request HMGP funding when submitting a disaster declaration. The amount of funding made available to the applicant is generally 15 percent of the total federal assistance amount provided for recovery from the Presidential Major Disaster Declaration. • HMGP Post Fire: HMGP Post Fire is a pass-through grant program that provides funding for state and local agencies and federally recognized tribal governments to reduce wildfire risks. Funded projects include (but are not limited to) defensible space initiatives, ignition-resistant construction, hazardous fuels reduction, erosion control measures, slope failure prevention measures, and flash flooding prevention. HMGP Post Fire grants are available to eligible states and territories that receive Fire Management Assistance declarations and to federally recognized tribal governments that have land burned within a designated area. A Post Fire Presidential Disaster Declaration is not required to activate funding. Funding amounts are determined by FEMA and are based on a national aggregate calculation of historical Fire Management Assistance Grant declarations over the past 10 years.
	NOAA Climate Resilience Regional Challenge	NOAA's Climate Resilience Regional Challenge is a competitive grant program focused on collaborative projects that "increase the resilience of coastal communities to extreme weather and other climate change impacts, including sea level rise and drought." Projects must consider risk reduction, regional collaboration, equity and inclusion, and enduring capacity. In July 2024, $575 million was allocated to 19 Climate Resilience Regional Challenge recipients, including the City of Santa Cruz. The City of Santa Cruz was awarded $8 million in funding as part of a larger grant to the California Marine Sanctuary Foundation. The grant will support the

Type	Name	Purpose
		planning, design, and construction of resiliency projects at the mouth of the San Lorenzo River on Main Beach, San Lorenzo Park, and Jessie Street Marsh.
	U.S. Bureau of Reclamation: WaterSMART Cooperative Watershed Management Program	The WaterSMART Cooperative Watershed Management Program provides funding to develop collaborative solutions to address water management needs. Funding is provided on a competitive basis for the development of watershed groups, watershed restoration planning, and watershed management project design.
	U.S. Department of Agriculture: Natural Resources Conservation Service Watershed Programs	The Natural Resources Conservation Service Watershed Programs provide technical and financial assistance to help implement conservation practices that address watershed resource concerns through the following grant programs: • Emergency Watershed Protection Program: The Emergency Watershed Protection Program offers technical and financial assistance to help relieve imminent threats to life and property caused by floods, fires, windstorms, and other natural disasters that impair a watershed. Emergency Watershed Protection Program grants are available to local agencies, conservation districts, federally recognized tribal governments, and interested public and private landowners that have a sponsor. • Watershed Protection and Flood Prevention Program: The Watershed Protection and Flood Prevention Program provides technical and financial assistance to help plan and implement watershed programs, including flood prevention. It is available to state and local agencies, federally recognized tribal governments, and watersheds that are 250,000 acres and smaller.
	U.S. EPA Water Infrastructure Finance and Innovation Act Loans	The Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) established a federal credit program administered by the EPA for eligible water and wastewater infrastructure projects. Eligible projects include aquifer recharge; alternative water supply; and drought prevention, reduction, or mitigation, among others. Eligible borrowers include local, state, and tribal government entities; project must be creditworthy and have a dedicated source of revenue; and the maximum portion of project costs that WIFIA can fund is 49 percent.
	U.S. Fish and Wildlife Service National Coastal Wetlands Conservation Grants Program	The National Coastal Wetlands Conservation Grants Program is an annual grant program that provides up to $1 million per project in coastal and Great Lakes states, as well as U.S. territories to “protect, restore and enhance coastal wetland ecosystems and associated uplands.” Eligible projects include the acquisition of real property interest in coastal lands or waters and the restoration, enhancement, or management of coastal wetlands ecosystems. In 2024, the program awarded $10.8 million to support 12 projects.
	U.S. Department of Agriculture’s Forest Service	USFS Urban and Community Forestry Grants, authorized under the Inflation Reduction Act, provide funding to community-based organizations, tribes, state and local agencies, public

Type	Name	Purpose
	(USFS): Urban and Community Forestry Grant Program	colleges and universities, and non-profits working to provide equitable access to trees and nature and the benefits they provide to urban communities. In 2023, the program awarded $1 billion to fund 385 projects in all 50 states, two U.S. territories, three U.S. affiliated Pacific Islands, and several tribes. In 2023, the City of Santa Cruz was awarded $1 million in grant funding to plant trees and increase engagement in urban forestry in Santa Cruz's federally designated opportunity zones, including the neighborhoods of Beach Flats, Lower Ocean, and portions of downtown, Midtown, and Seabright.
	USFS: Community Wildfire Defense Grant	The USFS's Community Wildfire Defense Grant, funded through the Bipartisan Infrastructure Law, is intended to help at-risk local communities and tribes reduce the risk against wildfire. The grant provides funding for two types of projects: the development and revision of community wildfire protection plans and the implementation of projects described in community wildfire protection plans that were written less than 10 years ago. Priority is given to at-risk communities in an area identified as having high or very high wildfire hazard potential, that are low-income, and/or have been impacted by a severe disaster.
	U.S. Department of Housing and Urban Development: Community Development Block Grant	Although limited, Community Development Block Grant (CDBG) funds may be used to advance certain adaptation projects or programs, particularly those within a neighborhood revitalization strategy area or serving disadvantaged residents. Following a federal disaster declaration additional CDBG funds generally become available for a wider variety of recovery projects.
	U.S. Economic Development Administration: Economic Adjustment, Disaster Recovery, and Public Works Programs	The U.S. Economic Development Administration provides funding through three primary funding programs, these are focused on overcoming economic changes, disaster recovery, and public works that advance economic development goals in the regions adopted comprehensive economic development strategy. The City of Santa Cruz has a good working relationship with U.S. Economic Development Administration and has been successful securing funding for numerous projects at the Wharf, Tannery, and in Downtown Santa Cruz.

Key: BRIC = Building Resilient Infrastructure and Communities; CAL FIRE = California Department of Forestry and Fire Protection; CSCC = California State Coastal Conservancy; CDBG = Community Development Block Grant; DSCR = Dam Safety and Climate Resilience; DWSRF = Drinking Water State Revolving Fund; EPA = U.S. Environmental Protection Agency; EPA = U.S. Environmental Protection Agency; FEMA = Federal Emergency Management Agency; HMA = Hazard Mitigation Assistance; HMGP = Hazard Mitigation Grant Program; NOAA = National Oceanic and Atmospheric Administration; OPC = Ocean Protection Council; USFS = U.S. Forest Service; WIFIA = Water Infrastructure Finance and Innovation Act of 2014

Table 5-3: Planning, Policy, Program, and Public Outreach Resources for Hazard Mitigation

Type	Name	Description
Plan	2025-2030 Consolidated Plan and Neighborhood Revitalization Strategy Area	The City of Santa Cruz is an entitlement community with U.S. Housing and Urban Development for Community Development Block Grant (CDBG) funds. To maintain eligibility for these annual federal resources, the City must have a current Consolidated Plan (and Annual Action Plan) detailing specific community needs, largely focused on disadvantaged areas and populations, and specifying priorities and strategies for the use of CDBG funding. The City is in the process of updating is five (5) year CP, which should be in effect in early 2025.
	City of Santa Cruz 50-Year Vision for West Cliff (2024)	The 50-year community vision reflects West Cliff's aspirations, guiding long-term resource allocation for projects that may take decades to plan, fund, and complete. This also allows the City time to build disaster resilience along West Cliff withstand extreme storms and ongoing stressors, and to keep the community protected from the impacts of climate change.
	City of Santa Cruz Community Wildfire Resiliency Plan (2024)	The City of Santa Cruz Fire Department is developing a Community Wildfire Resiliency Plan that will address specific critical infrastructure and WUI vegetation management maintenance priorities. The department anticipates completion of this document in late 2024.
	Lower Ocean/Downtown/River Neighborhood Revitalization Strategy (2023)	Along with the HUD Consolidated Plan, HUD allows the City to provide increased targeting of CDBG and HUD resources for work that occurs within an approved neighborhood revitalization strategy area. The approved neighborhood revitalization strategy targets several of the City's most disadvantaged communities, including vulnerable frontline communities in the Beach and Lower Ocean Areas. The plan outlines numerous resilience strategies to mitigate hazards to these communities, including everything from infrastructure, public facilities, housing, and transportation, to programs supporting workforce development, youth intervention and gang prevention, and business support, among others.
	A Resilient West Cliff, Accessible to All Roadmap (2023)	The purpose of the Resilient West Cliff, Accessible for All Roadmap (Roadmap) is to develop a shared vision for West Cliff, defined here as the area between Natural Bridges State Beach and Dream Inn.
	City of Santa Cruz 2030 Climate Action Plan (2022)	The City of Santa Cruz 2030 Climate Action Plan was completed in September 2022 and provides updated policies, programs, and incentives for the community to work toward climate mitigation, climate restoration, and building a climate economy. The Climate Action Plan recognizes the impacts of climate change relating to exacerbating existing hazards such as coastal erosion and flooding worsening with sea level rise, drought, wildfire, and extreme heat.
	City of Santa Cruz 2020 Urban Water Management Plan (2020), Including Water	The City of Santa Cruz 2020 Urban Water Management Plan is required by the Urban Water Management Planning Act of 1983. This plan evaluates and describes the water resource supplies and projected needs over a 20-year planning horizon and addresses several related subjects such

Type	Name	Description
	Shortage Contingency Plan (2021)	as water conservation, water service reliability, water recycling, opportunities for water transfers, and contingency plans for drought events. This updates the 2015 Urban Water Management Plan and is required to be updated every 5 years.
	Santa Cruz Economic Development Strategy (2021)	Adopted amid the height of COVID-19 pandemic impacts, the Santa Cruz Economic Development Strategy identifies strategies to help local businesses survive and recover from economic uncertainty. The Plan primarily focuses on the actions of the City's Business Support division with Economic Development and Housing, but also touches on fiscal sustainability, infrastructure, and investments in key business sectors.
	West Cliff Drive Adaptation and Management Plan (2021)	The West Cliff Drive Adaptation and Management Plan, adopted in 2021, develops a set of coastal management projects to address coastal erosion and adopt them in a Public Works Plan format. It also details monitoring and maintenance programs to reduce the need for emergency repairs.
	Santa Cruz County 2020 Comprehensive Economic Development Strategy	The countywide Santa Cruz County 2020 Comprehensive Economic Development Strategy is a regional strategy mandated by the U.S. Economic Development Administration and provides eligibility for certain federal programs. The strategy provides guidance on key sector trends and strategies to promote economic resilience and growth.
	Santa Cruz Parks Master Plan 2030 (2020)	The Santa Cruz Parks Master Plan 2030 is a tool to guide the City of Santa Cruz in parks, facility, beach, and open space planning on a long-term basis. This document contains policies and actions for the provision of parks services and recommendations for improvements at specific parks.
	Santa Cruz Beach Management Plan 2021-25 (2020)	The purpose of the Beach Management Plan is to guide the activities of public agencies and private property owners in use and operations associated with Main and Cowell Beaches as a means to protect natural resources, provide for public safety, and to maximize the extent and quality of the recreational experience of the residents of and visitors to the City of Santa Cruz.
	City of Santa Cruz 2030 General Plan (2019)	The City's 2030 General Plan was adopted in 2012 and amended in October 2019. This was a revision to the City's 1990–2005 General Plan, which was first adopted in October 1992. The General Plan has 11 chapters including the chapter on Hazards, Safety and Noise. This chapter focuses on reducing human injury, loss of life, property damage, and economic and social dislocation caused by natural and human-made disasters.
	City of Santa Cruz Beach Vulnerability and Adaptation Strategy (2019)	The City of Santa Cruz prepared this plan to understand the incremental effects of coastal adaptation policy on coastal resources (beaches, coastal access and use, visual and recreation). This plan focuses on policies and strategies identified in the 2018 CAP Update.

Type	Name	Description
	City of Santa Cruz Water Conservation Master Plan (2017)	The City of Santa Cruz Water Conservation Master Plan maximizes the community's efficient use of water. The plan includes 35 measures to be implemented over a 20-year period between 2015 and 2035. The focus of the plan is on reducing peak season water use and reducing per capita water use to the maximum extent feasible.
	City of Santa Cruz Emergency Operations Plan (2011)	The City of Santa Cruz Emergency Operations Plan (EOP) describes the roles and operations of the departments and personnel of the City of Santa Cruz during a major emergency resulting from floods, storms, earthquakes, tsunami, hazardous material incidents, and other natural or human-made disasters. The plan addresses integration and coordination with other governmental entities and outlines and incorporates the Incident Command System.
	Santa Cruz Wharf Master Plan and Engineering Report (2014, Adopted 2024)	This plan was completed in 2015 on the 100th anniversary of the Santa Cruz Wharf. The Wharf Master Plan and Engineering Report guides and facilitates development of the wharf while evaluating its structural conditions to determine the need for repair and replacement and general longevity. The report includes methods for increasing the resiliency of the structure to reduce potential damage and enhance public safety in extreme weather conditions related to climate change and rising sea levels as well as seismic events.
	City of Santa Cruz Emergency Operations Plan (2011)	The City of Santa Cruz EOP describes the roles and operations of the departments and personnel of the City of Santa Cruz during a major emergency. The plan sets forth standard operating procedures for managing public emergencies resulting from floods, storms, earthquakes, tsunamis, hazardous material incidents, and other natural or human-made disasters. The plan defines and describes the emergency management organization which shall be used during emergencies. The plan also addresses the integration and coordination with other governmental levels when required.
	Santa Cruz County and San Mateo County Community Wildfire Protection Plan (2010)	This plan was prepared by CAL FIRE, San Mateo–Santa Cruz Unit, and the Resource Conservation District for San Mateo County and Santa Cruz County. The plan attempts to identify wildfire hazards and provide strategies to prepare for and recover from wildfire risk and restore healthier, more resilient ecosystems while protecting life and property. The City of Santa Cruz Fire Department has jurisdiction within the Santa Cruz Central planning area, and the City of Santa Cruz Water Department has properties and watersheds within several of the planning areas.
	City of Santa Cruz Storm Water Management Plan (2009)	The City of Santa Cruz Storm Water Management Plan fulfills the requirements of the Phase II National Pollutant Discharge Elimination System permit program for urban runoff and other "non-point source" discharges.

Type	Name	Description
	City-Wide Creeks and Wetlands Management Plan (2006)	The City-Wide Creeks and Wetlands Management Plan was completed in 2006 and provides specific setbacks for each watercourse within the City boundaries. Previously, there was a 100-foot setback from new development to the centerline of all watercourses unless a management plant was prepared, as written in the 1990–2005 General Plan/Local Coastal Plan. Modifications to the standard 100-foot setback reflect the understanding of the value of watercourses and wetlands and provide a more strategic approach to management that is intended to result in better protection, enhancement, and management of the City's riparian and wetland resources and water quality.
	San Lorenzo Urban River Plan (2003)	Adopted in 2003, this plan identifies vegetated buffer zones that are maintained at 10 feet at the toe of the levees and 5 feet along the wetted edge of the river. Vegetation management is required for winter flows not to exceed the design capacity of the river and to promote scouring of the river.
	Santa Cruz Municipal Code: Building Code	The City of Santa Cruz enforces the 2022 California Building Standards Code in Title 18 of the Santa Cruz Municipal Code. The California Buildings Standards Code outlines regulations for building planning and construction in California and includes occupancy classification, structural design (seismic requirements), building materials, and fire-resistance requirements. Building permits are required by both the California Residential Code and the California Building Code, resulting in structural/seismic design requirements for residential and non-residential buildings and structures. Applications for permits include plans and supporting documentation showing seismic design compliance. Structural design is typically accomplished by a Registered Engineer. Plans are reviewed and approved by professional plan review staff. Inspections are accomplished by City inspection staff. Additionally, special inspection/material testing and structural observation may be accomplished by qualified third-party inspection agencies and the project engineer as required.
	Santa Cruz Municipal Code: Fire Code	Santa Cruz Municipal Code Title 19, Zoning, adopts the 2022 Edition of the California Fire Code. These codes include vegetation clearance requirements in the WUI area.
	Santa Cruz Municipal Code: Coastal Zone Overlay District	The Coastal Zone Overlay District within Title 24 Zoning of the Santa Cruz Municipal Code. It protects and improves the quality of coastal resources and public access. The city's coastal regulations take precedence over the underlying district's regulations
	Santa Cruz Municipal Code: Shoreline Protection District Overlay	The Shoreline Protection District Overlay within Title 24 Zoning of the Santa Cruz Municipal Code preserves and protects the coastal and environmental resources in Santa Cruz. It is furthermore intended that this Shoreline Protection Overlay District accomplish the following: to minimize cut, fill, earthmoving, riprap placement, grading operations, and other such human-made intrusions in coastal areas; to control erosion; to protect development from geological or other

Type	Name	Description
		coastal-related hazards; to protect public views; to protect and enhance shoreline access for the public; to protect paleontological resources; and to generally implement the policies of the Local Coastal Land Use Plan. This district lies generally between the sea and the first public road paralleling the sea, or within 300 feet of the mean high tide line of the sea, whichever is the greater distance. This section of the zoning ordinance is also part of the Local Coastal Implementation Plan.
	Santa Cruz Municipal Code: Slope Regulations	Slope regulations within Title 24 Zoning of the Santa Cruz Municipal Code minimizes risks associated with project development in areas characterized by combustible vegetation and steep and/or unstable slopes (such as canyons, arroyos, and slopes over 30 percent).
	Santa Cruz Municipal Code: Floodplain District	The Floodplain District within Title 24 Zoning of the Santa Cruz Municipal Code is to protect public health, safety, and welfare through regulations of uses in areas which are unprotected from flooding or are required to carry the flood flows of a stream. New construction in the Floodplain District is regulated so that it is protected against damage and located to avoid causing excessive increases in flood heights or velocities. It is also part of Local Coastal Implementation Plan.
	Santa Cruz Municipal Code: Floodplain Management Regulations	The purpose of the Floodplain Management Regulations chapter within Title 24 Zoning of the Santa Cruz Municipal Code is to appoint a floodplain administrator and establish flood management regulations for the SFHA, flood management and variance procedures, and other general provisions within the floodplains, floodways, and standards for coastal flood areas and A-99 flood zone areas.
	City Policy 34.7: Securing Our Water Future	Santa Cruz Policy 34.7, Securing Our Water Future, provides guidance for selection and implementation of the water supply augmentation projects needed to meet the City's water supply reliability standard identified in the policy.
Program	City of Santa Cruz Capital Investment Program	Fire, Parks and Recreation, Public Works, Economic Development, and Water Departments as well as the City Manager annually prepare a 3-year Capital Investment Program to plan out expenditure of the General Capital Improvement Fund.
	Community Rating System	The FEMA Community Rating System (CRS) is a voluntary incentive program that rewards communities for floodplain management practices that exceed the minimum requirements of the NFIP. The CRS program has awarded the City of Santa Cruz a Class Seven rating. This rating is an important factor in determining the magnitude of the potential for flood along the San Lorenzo River, and because of the rating, flood insurance premium rates are discounted to reflect the reduced flood risk from community actions that exceed the minimum requirements.

Type	Name	Description
	Local Coastal Program	Under the California Coastal Act, coastal cities and counties are required to adopt Local Coastal Programs to guide development in the coastal zone. Recently, Local Coastal Programs have also started to address the impacts of climate change and sea level rise. The current Local Coastal Program was originally approved by City Council in 1992 as part of the City's General Plan. With the adoption of a new General Plan in 2013 and environmental issues including climate change and sea level rise to be addressed, the update of the Local Coastal Program aims to bring the City's policy documents into alignment and to address issues that are important both locally and globally. The Planning and Community Development Department released the Public Review Draft Local Coastal Program in November 2021 and is working to incorporate a new Beaches and Bluffs chapter in 2025.
	National Flood Insurance Program	The NFIP aims to reduce the impact of flooding on residential and non-residential buildings by providing insurance to property owners and encouraging communities to adopt and enforce floodplain management regulations. Participation in the NFIP is based on an agreement between local communities and the federal government. As noted in Section 5.2, the City of Santa Cruz joined the NFIP on February 15, 1985. It currently holds a CRS Class 7 rating.
	Resilient Coast Santa Cruz Initiative	The Resilient Coast Santa Cruz Initiative's mission is to protect and enhance the unique coastal environment of Santa Cruz, ensuring it remains vibrant and resilient in the face of climate change. Projects within this initiative focus on innovative nature-based solutions and community-driven efforts focusing on safeguarding shorelines, parks, and marshes from extreme weather and sea level rise. The City's Resilient Coast Santa Cruz Initiative resulted in 5,000 touchpoints through 50 engagements ranging from talks with community groups, focus group meetings, workshops, open houses, and surveys to engage the public about local coastal issues. The initiative continues through ongoing coastal planning, projects and programming taking place.
	Coastal Change Monitoring Network	The Coastal Change Monitoring Network is a network of sensors, cameras, and dashboards that track coastal changes funded by a National Science Foundation Grant with the UC Santa Cruz and 12 other partners, refined through a California Coastal Commission Grant. This networks' deployment has been identified in the 2025–2030 LHMP – CAP Mitigation and Climate Adaptation Strategy
Public Outreach	News and Notifications	The City of Santa Cruz provides community updates and announcements through its electronic newsletters, weekly reports and other social media notifications, including the following: • Electronic newsletter and notifications (News and Notifications | City of Santa Cruz) • City Manager Weekly Reports (City Manager's Weekly Reports | City of Santa Cruz)

Type	Name	Description
		• Social media platforms such as Facebook (Santa Cruz City Government | Santa Cruz CA | Facebook), X ((1) City of Santa Cruz (@CityofSantaCruz)/X), and Instagram (City of Santa Cruz Official (@officialcityofsantacruz) • Instagram photos and videos)
	Surveys	The City of Santa Cruz continually seeks feedback through surveys on various Citywide topics to better serve the community. According to the City, surveys are essential for gathering valuable feedback from the community and enabling informed decision-making by providing data that reflect residents' needs and preferences. Current department surveys can be found on the City Manager's webpage (Surveys with the City | City of Santa Cruz).
	Department Webpages	City department webpages provide department-specific hazard mitigation and climate adaptation public outreach material, including the following: • City Manager: Local Hazard Mitigation, Climate Adaptation Program and West Cliff • Fire Department: Reducing Wildfire Risks and Fire Prevention and Life Safety • Public Works Department: Stormwater and the NFIP • Water Department: Capital Investment Program, Education Programs, Watershed, and Water Supply Planning
	Education Programs	The City of Santa Cruz Water Department offers free, science-based programs for Santa Cruz and San Lorenzo Valley students to learn about their watersheds, including the following: • All fifth-grade students spend a day learning about their drinking water watershed, exploring where their water comes from, what species share the watershed, and how their actions can affect water quality and quantity. • Students at San Lorenzo Valley Elementary and Middle School learn about environmental science, endangered species, and watershed protection. • Students at San Lorenzo Valley High School can participate in "Watershed Academy," which is a deeper dive into environmental science and local water resource management. In addition, the department's Watershed Team provides a variety of miscellaneous programs, including co-hosting the annual State of the San Lorenzo River Symposium, interpretive "Loch Walks" in the Loch Lomond Recreation Area, and participation in local watershed and fisheries-related events. The City of Santa Cruz Public Works Stormwater Division funds a variety of non-profit organizations to provide school education programs including O'Neil Sea Odyssey, Save the Whales, Save Our Shoes, and others. Additionally, Public Works Stormwater staff provide hands-on activities at public events such as an interactive watershed model that demonstrates the sources and effects of water pollution and a stormwater trivia wheel.

Type	Name	Description
		The City of Santa Cruz Climate Action Program partners with community-based organizations to promote bilingual education programming including emergency preparedness planning documents and comic books, virtual reality sea level rise explorer tools, and other novel materials. The Office of Emergency Services shares information through community outreach about natural hazards and community vulnerability. Outreach includes regular seasonal information as well as information related to forecasted or current threats. Educational materials from Federal, State and local partner agencies are distributed, for example through email notifications, social media, and shared at community events. Examples of educational outreach include resources related to the National Tsunami Hazard Mitigation Program, CalFire's "Ready, Set, Go" Campaign, the USGS Earthquake Hazards Program. Local feedback is solicited to gauge the efficacy of educational outreach. For example, evacuation planning materials are used to collect community input that is maintained by OES. This feedback is used to update planning materials on an annual basis. The fire department regularly provides education to the community in the form of fire safety, fire prevention and overall emergency preparedness in schools. Training topics include but are not limited to, fire extinguisher use, smoke detectors, "Stop, Drop and Roll" and evacuation planning and preparation. Additionally, the fire department participates in educating the community on home hardening/defensible space, CPR and basic first aid. The fire department's marine division employs lifeguards that educate both visitors and the local community on ocean safety as well as leading the instruction of the Santa Cruz Junior Lifeguard program that educates youth on ocean safety and environmental protection.
	Open Data	The GeoHub (Santa Cruz City GIS [arcgis.com]) is the City's public platform for exploring, visualizing, and downloading location-based Open Data including hazard-related information such as WUI areas for fire hazards and sea level rise and combined coastal climate hazards.
	Santa Cruz Public Libraries	Flood insurance information including FIRMs, brochures discussing flood proofing, and other mitigation measures are available at Santa Cruz Public Libraries.

Key: CAL FIRE = California Department of Forestry and Fire Protection; CAP = Climate Adaptation Plan; CRS = Community Rating System; EOP = Emergency Operations Plan; FEMA = Federal Emergency Management Agency; FIRM = Flood Insurance Rate Map; LHMP = Local Hazard Mitigation Plan; NFIP = National Flood Insurance Program; SFHA = Special Flood Hazard Area; UC Santa Cruz = University of California, Santa Cruz; WIFIA = Water Infrastructure Finance and Innovation Act of 2014; WUI = Wildland–Urban Interface

Table 5-4: Ability to Improve On/Expand Resources

Capability	Type/Description	Expansion
Human and Technical	Resiliency Planner	The City of Santa Cruz is creating a new position for a resiliency planner. The position is expected to be filled in Spring 2025 and be in the City Manager's Office and/or Public Works Department.
	Energy Manager	The City of Santa Cruz is creating a new position for an energy manager. The position is to be filled in Summer 2025 and be in City Manager's Office and/or Public Works Department.
Financial	Prepare HMGP Notice of Intent	Upon approval and adoption of the 2025–2030 LHMP – CAP, the City of Santa Cruz will prepare Notices of Intent, which are accepted by Cal OES Hazard Mitigation on an ongoing basis for future HMGP funding opportunities. According to Cal OES, a Notice of Intent is intended to provide an opportunity for eligible sub-applicants to propose well-defined mitigation actions that reduce risk to life and property from future natural hazards.
Planning, Policy, Program, and Public Outreach	Prepare Santa Cruz Living Shorelines, Nature Based Solutions and Sand Management Feasibility Study	The City has identified potential sites for different types of living shorelines, Nature Based Solutions (NBS), and sand management solutions across its coastline, providing a foundation to build upon with consultants. In 2023, the City applied for and was awarded CSCC funding to rapidly complete a feasibility study, identifying the technical, ecological, legal, regulatory, political, and social viability and trade-offs of living shorelines, NBS, and sand management across the contiguous Santa Cruz coastline. The study will help the City of Santa Cruz identify which solutions are the most feasible at specific locations and yield multiple benefits to be integrated into the City's ongoing coastal management and adaptation planning.
Planning, Policy, Program, and Public Outreach	Pursue the creation of Community Resilience Centers and climate resilience programming community engagement	California's Strategic Growth Council's new Community Resilience Center program will fund new construction and upgrades of neighborhood-level resilience centers to provide shelter and resources during climate and other emergencies. The program will also fund year-round services and ongoing community outreach programming that build overall community resilience. Applicants must demonstrate collaboration with community members, involvement with community-based organizations and residents in governance and decision-making, multi-stakeholder partnerships, and accessible Community Resilient Centers providing eligible services and amenities year-round to community residents. This program has been identified in the 2025–2030 LHMP – CAP Mitigation & Climate Adaptation Strategy.

Key: Cal OES = California Office of Emergency Services; CSCC = California State Coastal Commission; HMGP = Hazard Mitigation Grant Program; LHMP – CAP = Local Hazard Mitigation Plan – Climate Adaptation Plan; NBS = Nature Based Solutions

5.2 National Flood Insurance Program Participation

The NFIP aims to reduce the impact of flooding on residential and non-residential buildings by providing insurance to property owners and encouraging communities to adopt and enforce floodplain management regulations. Participation in the NFIP is based on an agreement between local communities and the federal government. The City of Santa Cruz joined the NFIP on February 15, 1985. Its current DFIRM, which has been adopted by the City, became effective on September 29, 2017.

The City enforces floodplain management regulations in its municipal code. For a small portion of the City that is in the SFHA, but is not in the A-99 Flood Zone, if the cost of reconstruction, additions, or other improvements to a building equals or exceeds 50 percent of the building's market value, then the building must meet the same construction requirements as a new building. Substantially damaged buildings must also be brought up to the same standards. Substantial improvement and substantial damage determinations are made by the City's floodplain administrator, the Director of the Planning and Community Department, and are checked for during the permitting process by the department's Building Safety Division.

The most recent Community Assistance Visit with a California Department of Water Resources staff member on behalf of FEMA to verify the City is adequately enforcing its floodplain management regulations was on November 10, 2022. This visit was also part of the recertification of the City's CRS standing of Class 7, which it retained and was awarded on August 1, 2023.

The City of Santa Cruz has worked to improve the flood capacity of the San Lorenzo River levees over the past 20 years. In 2002, FEMA redesignated much of the downtown and beach area from the A-11 to the A-99 Flood Zone designation in recognition of the significant flood improvements resulting from the San Lorenzo River Flood Control and Environmental Restoration Project. Under the A-99 designation, new buildings and improvements are no longer mandated to meet FEMA flood construction requirements, and flood insurance premiums are significantly reduced. In 2020, the U.S. Army Corps of Engineers concluded the construction phase of the Flood Control project and turned it over to the City. The City immediately began pursuing accreditation of the project. In 2023, the City of Santa Cruz Public Works Department and the County of Santa Cruz Community Development and Infrastructure Department submitted an application to FEMA for a Letter of Map Revision to update the FIRMs for downtown Santa Cruz and the San Lorenzo River Floodplain.

In addition to enforcing floodplain reduction activities through the City's floodplain management regulations and improving flood capacity through the San Lorenzo River Flood Control and Environmental Restoration Project, the City also addresses improving flood capability for the San Lorenzo River in its City-Wide Creeks and Wetlands Plan, development in floodplains in the General Plan's zoning ordinances, and flooding associated with climate change in its Climate Action Plan.

5.3 Mitigation and Climate Adaptation Goals

Mitigation goals are defined as general guidelines that explain what the City of Santa Cruz wants to achieve in terms of hazard and loss prevention. Goal statements are typically long-range, policy-oriented statements representing a community-wide vision.

These 2025–2030 LHMP – CAP goals are based on the updated 2018–2023 LHMP goals and objectives and include the following:

1. Avoid or reduce the potential for loss of life, injury, and economic damage to Santa Cruz residents from hazard events, including coastal erosion, dam failure, drought, earthquake, extreme heat, flood, landslide, sea level rise, tsunami, and wildfire.
2. Educate and engage the community on preparedness for, and mitigation of, potential impacts from hazard events, including coastal erosion, dam failure, drought, earthquake, extreme heat, flood, landslide, sea level rise, tsunami, and wildfire, to the City of Santa Cruz.
3. Increase the ability of the City government to communicate local emergency information and serve the community during and after hazard events, including coastal erosion, dam failure, drought, earthquake, extreme heat, flood, landslide, sea level rise, tsunami, and wildfire.
4. Protect Santa Cruz's unique character and values; scenic beauty; quality of life; and historic, natural, and cultural resources from being compromised by hazard events, including coastal erosion, dam failure, drought, earthquake, extreme heat, flood, landslide, sea level rise, tsunami, and wildfire.
5. Encourage mitigation activities and climate adaptation strategies to increase the disaster resilience of systems essential to a functioning Santa Cruz, critical facilities, infrastructure, other major assets, institutions, and private companies.

5.4 Draft Mitigation Action and Climate Adaptation Strategy

Mitigation actions—also known as mitigation projects—and climate adaptation strategies help achieve the goals of an LHMP and CAP. Mitigation actions and climate adaptation strategies can include structure and infrastructure projects, nature-based solutions, and community resiliency projects and programs. Table D-1 in Appendix D presents an overview of the draft mitigation action and climate adaptation strategy list developed by the planning team for the 2025–2030 LHMP – CAP. These actions and strategies are based on the following:

- 2018–2023 LHMP mitigation strategy
- 2025–2030 LHMP – CAP vulnerability analysis
- 2018 CAP Update
- City of Santa Cruz Capital Investment Program
- City of Santa Cruz 2030 Climate Action Plan and the Resilient Coast Santa Cruz Initiative
- Other City of Santa Cruz Plans such as the Wharf Master Plan and Engineering Report, Urban Water Management Plan and Water Shortage Contingency Plan, Community Wildfire Resiliency Plan, and additional State and federal climate adaptation and mitigation programs
- FEMA success stories and best management practices

At least one mitigation action/climate adaptation strategy has been developed to address each hazard profiled in this plan. As shown in Table D-2, for each mitigation action and climate adaptation strategy, an overview of the project, the hazards and goals it addresses, the type of asset it protects, the associated benefits and costs, and project source(s) are provided.

5.5 Finalized Mitigation Action and Climate Adaptation Strategy Plan

The draft mitigation action and climate adaptation strategies listed in Appendix D, Table D-1, are displayed as a finalized mitigation action and climate adaptation strategy plan below in Table 5-5. These actions and strategies have been prioritized based on a method to rank or rate the relative

importance of a project based on factors such as fiscal sustainability (funding availability), infrastructure (condition, maintenance, and longevity), regulatory or mandated requirements, project readiness, and health in all policies (equity, sustainability, and public health). This prioritization process is based on the City's Capital Investment Program prioritization process (Appendix D), and each mitigation action or climate adaptation strategy is assigned "high" or "highest" priority to implement over the next 5 years.

In addition to priority level, the finalized mitigation action and climate adaptation strategy plan includes hazards addressed, potential funding sources, department lead, and implementation timelines for each mitigation action and climate adaptation strategy. The implementation of this list over the next 5 years is the result of this planning process.

Table 5-5: Finalized Mitigation Action and Climate Adaptation Strategy Plan

Project Name	Hazard Addressed	Priority	Potential or Known Funding Source	Project Lead	Implementation Timeline
Main and Cowell Beaches Shoreline Adaptation Blueprint	Coastal Erosion, Flood, and Sea Level Rise	Highest	OPC grant, CSCC grant, or BRIC/HMGP	City Manager	5+ years
East Cliff/Seabright State Beach Shoreline Adaptation Blueprint	Coastal Erosion, Flood, and Sea Level Rise	Highest	OPC grant, CSCC grant, or BRIC/HMGP	City Manager	5+ years
West Cliff 5-Year Roadmap Implementation and Shoreline Adaptation Blueprint	Coastal Erosion, Flood, and Sea Level Rise	Highest	OPC grant, CSCC grant, or BRIC/HMGP	City Manager	5+ years
San Lorenzo River Climate Adaptation Strategy	Coastal Erosion, Flood, and Sea Level Rise	Highest	NOAA Climate Resilience Regional Challenge	City Manager	5+ years
Wharf Resilience Improvements Project	Coastal Erosion, Flood, and Sea Level Rise	Highest	CSCC grant	City Manager	1–3 years
Coastal Change Monitoring Network	Coastal Erosion, Flood, and Sea Level Rise	Highest	CSCC grant	City Manager	1 – 5 years
New Creek Dam Enhanced Monitoring Project	Dam Failure	High	DSCR	Water Department	1-5+ years
Utility Customer Assistance Program	Drought	High	General Capital Improvement Fund	Water Department	1 – 2 years
Aquifer Storage and Recovery	Drought	Highest	BRIC and U.S. Bureau of Reclamation and other federal grants	Water Department	1–5+ years
Water Supply Augmentation Program	Drought and Flood	Highest	BRIC and U.S. Bureau of Reclamation and other federal grants	Water Department	1–5+ years

Project Name	Hazard Addressed	Priority	Potential or Known Funding Source	Project Lead	Implementation Timeline
Drinking Source Water Protection and Forest Health	Drought, Flood, and Wildfire	Highest	BRIC, CSCC grants or other watershed-related grant programs	Water Department	1–5 years
Newell Creek Pipeline Replacement	Earthquake, Landslide, and Wildfire	Highest	BRIC, WIFIA, and DWSRF	Water Department	5+ years
Retrofit Grant Program	Earthquake	High	BRIC or HMGP	Public Works Department	3–5 years
Critical Facility and Infrastructure Rapid Visual Screening, Engineering Evaluation and Seismic Retrofit	Earthquake	High	BRIC or HMGP	Public Works Department	1–2 years
Graham Hill Water Treatment Plant Facilities Improvement Project	Earthquake and Wildfire	Highest	BRIC or WIFIA	Water Department	5–6 years*
Murray Street Bridge Seismic Retrofit	Earthquake	Highest	General Capital Improvement Fund	Public Works Department	2 years
Union/Locust Admin Building Back-up Generator	Earthquake, Extreme Heat, and Wildfire	Highest	General Capital Improvement Fund	Water Department	1 year
Water Facility Infrastructure Improvements/Backup Power System	Earthquake, Extreme Heat, and Wildfire	High	BRIC/HMGP	Water Department	3-5 years
Community Resilience Centers and Climate Resilience Awareness	Earthquake, Extreme Heat, Flood, Landslide, and Wildfire	Highest	Office of Planning and Research Integrated Climate Adaptation and Resiliency Program's Grant Program	City Manager	1–3 years
Frontline Neighborhood Tree Planting	Extreme Heat and Flood	High	Urban and Community Forestry Grant Program, Inflation Reduction Act	Parks and Recreation Department	1–5 years

Project Name	Hazard Addressed	Priority	Potential or Known Funding Source	Project Lead	Implementation Timeline
Downtown Sea Level Rise Drainage Assessment and Pump Station Upgrades	Flood and Sea Level Rise	Highest	BRIC	Public Works Department	1–5 years
Coast Pump Station Rehabilitation/Replacement	Flood and Sea Level Rise	Highest	BRIC	Water Department	3 years*
Tait Diversion Retrofit	Flood	Highest	BRIC or General Capital Improvement Fund	Water Department	3 years*
TsunamiReady Program	Tsunami	High	General Funds	Office of Emergency Services	1–2 years
Fuel Reduction Assessments and Wildfire Resilience Strategies for City Critical Facilities and Infrastructure	Wildfire	Highest	BRIC, HMGP, and CAL FIRE Wildfire Prevention Grants Program	Fire Department	1–5 years
Mid- and Steep-Sloped Property Protection in High Fire Hazard Severity Zones and Wildland Urban Interface Areas	Wildfire	High	BRIC, HMGP, and CAL FIRE Wildfire Prevention Grants Program	Fire Department	1–3 years
Roadside Fuel Reduction and Fuel Breaks	Wildfire	Highest	BRIC, HMGP, and CAL FIRE Wildfire Prevention Grants Program	Fire Department	1–5 years
Hazard Mitigation Database	All	High	General Funds	Information Technology	1 year

Note: * = includes design and construction phases
Key: BRIC = Building Resilient Infrastructure and Communities; CAL FIRE = California Department of Forestry and Fire Protection; CSCC = California State Coastal Conservancy; HMGP = Hazard Mitigation Grant Program; NOAA = National Oceanic and Atmospheric Administration; OPC= Ocean Protection Council; WIFIA = Water Infrastructure Finance and Innovation Act of 2014

6.0 PLAN MAINTENANCE

This section addresses Element D: Plan Maintenance of the Local Mitigation Plan Regulation Checklist.

Element D: Plan Maintenance	
D1.	Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))
D1-a.	Does the plan describe how communities will continue to seek future public participation after the plan has been approved?
D2.	Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))
D2-a.	Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?
D2-b.	Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible
D2-c.	Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?
D3.	Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))
D3-a.	Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?
D3-b.	Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?
D3-c.	For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?

Key: CFR = Code of Federal Regulations

6.1 CONTINUED PUBLIC PARTICIPATION

A copy of the 2025–2030 LHMP – CAP will be available on the City's website, along with contact information for the project manager. Additionally, the project manager will use the website and social media accounts to notify the public of, and seek input on, any changes or updates to the 2025–2030 LHMP – CAP, including the implementation of the mitigation action plans and the 2030–2035 LHMP – CAP kickoff. The project manager will also reach out to agencies and organizations that work with vulnerable and underserved communities to notify them of any changes or updates to the current LHMP – CAP as well as announcing the future LHMP – CAP kickoff.

6.2 Plan Evaluation Process, Update Method, and Schedule

To ensure project implementation, plan integration, and overall document relevance, the project manager (Sustainability and Resiliency Officer) will administer an annual plan review system with the help of the planning team. Specifically, every January (2026, 2027, 2028, and 2029), the project manager will send out an Annual Review Tracker (Appendix E) to the planning team and ask each member to complete the tracker that documents disasters that have occurred; community assets that have been damaged; public outreach that has been conducted; mitigation actions and climate adaptation strategies that have been implemented (including the goals that each mitigation action and climate adaptation strategy address, as shown in Appendix D); new and/or updated studies, reports, and maps that have been published; and changes that have made and/or that need to be made to the current or future LHMP – CAP. The project manager will collate and summarize the findings, and for each mitigation action and climate adaptation strategy implemented, the goal(s) it addresses will be identified. The project manager will distribute a summary sheet to the planning team.

In addition to the Annual Review Tracker, the project manager will collect any FEMA Mitigation Progress Reports (or other similar forms) from the previous year. The project manager will email these documents to each member of the planning team for review. The project manager will subsequently hold a planning team meeting in the first quarter of each year to determine, based on the findings from the Annual Review Tracker and FEMA Mitigation Progress Reports, if the mitigation actions and climate adaptation strategies (and therefore the identified goals that they address) undertaken the previous year are helping achieve the plan's mitigation goals.

Finally, on the fourth year of the annual review, the project manager will kick off the 2030–2035 LHMP – CAP in the summer of 2029 with the following activities:

- The project manager will reconvene the planning team and update membership.
- The planning team will review the summarized Annual Review Tracker findings to determine the hazards, community assets, and other related information to be included in the 2030–2035 LHMP – CAP.
- The project manager will develop a new work plan.
- The project manager—with support from the planning team—will begin the plan update process in mid-2029. The plan update process is expected to take up to 6 months and be completed and submitted to Cal OES by the end of 2029 for an on-time re-approval of April 2030.

6.3 Plan Integration

Table 6-1 identifies how the 2025–2030 LHMP – CAP will be integrated into other City-specific plans and programs.

Table 6-1: Integration of 2025–2030 LHMP – CAP

2025–2030 LHMP- CAP	Existing Plan/Policy/Program	Process/Time Frame
Section 4, Risk Assessment, and Section 5, Mitigation and Climate Adaptation Strategy	City of Santa Cruz 2030 General Plan	Update the City of Santa Cruz 2030 General Plan's Chapter 8, Hazards, Safety, and Noise, with the 2025–2030 LHMP – CAP's Section 4, Risk Assessment, and Section 5, Mitigation and Climate Adaptation Strategy, when the 2030 General Plan is next amended.

2025–2030 LHMP- CAP	Existing Plan/Policy/Program	Process/Time Frame
Section 4, Risk Assessment	City of Santa Cruz EOP (2011)	Replace the City of Santa Cruz EOP Appendix B, Hazard Analysis Summaries in the City of Santa Cruz (specifically, Appendices B3 – Flood Hazard Analysis, B4 – Earthquake and Liquefaction Hazard Analysis, B5 – Dam Inundation Hazard Analysis, B6 – Wildland Fire Hazard Analysis, and B7 – Tsunami Hazard Analysis) with relevant hazard profiles and summaries of potential hazards impacts from the 2025–2030 LHMP – CAP's Section 4, Risk Assessment, when the EOP or EOP Appendix B is next amended or revised. Also consider developing Hazard Analysis summaries for hazards addressed in the 2025–2030 LHMP – CAP but not listed in the EOP Appendix B, such as extreme heat.
2025-2030 LHMP-CAP or Section 4 or Section 4, Risk Assessment	City of Santa Cruz 2025 Urban Water Management Plan	The 2025-2030 LHMP – CAP or Section 4, Risk Assessment of the 2025-2030 LHMP – CAP will be included as an annex of the City of Santa Cruz 2025 Urban Water Management Plan when it is updated in 2026.

Key: CAP = Climate Adaptation Plan; EOP = Emergency Operations Plan; LHMP = Local Hazard Mitigation Plan

7.0 PLAN UPDATE

This section addresses Element E: Plan Update of the Local Mitigation Plan Regulation Checklist.

Element E: Plan Update	
E1.	Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))
E2.	Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))
E2-a.	Does the plan describe how it was revised due to changes in community priorities?
E2-b.	Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?
E2-c.	Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?

Key: CFR = Code of Federal Regulations

7.1 CHANGES IN DEVELOPMENT

According to the Association of Monterey Bay Area Governments, the City of Santa Cruz exceeded its Regional Housing Need Allocation targets for the 2014–2023 cycle, permitting 1,777 new homes in all affordability categories (including homes priced for low- and very low-income households as defined by state-set income limits), well more than double the City's housing production target of 747 homes. Much of the development occurred in the downtown area and on major streets due to increased height and density limits, including the neighborhoods of the Beach and Boardwalk District, Beach Hill and Beach Flats Neighborhoods, California Street/Mission Hill Neighborhoods, Downtown District, Downtown Neighborhoods, Mission Street Corridor, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, Water Street, and Westside Industrial District.

As such, development that occurred within City limits over the past 5 years may have made the City more vulnerable to the following hazards."

- Coastal erosion in the Beach and Boardwalk District and Westside Industrial District. End-of-century projections show that development that occurred in the Beach Hill and Beach Flats Neighborhoods may be vulnerable to this hazard too.
- Dam breach inundation in the Beach and Boardwalk District, Beach Hill and Beach Flats Neighborhoods, Downtown District, Downtown Neighborhoods, Ocean Street Corridor, River Street District, and Water Street Corridor.
- Prolonged drought in all neighborhoods.
- Earthquake shaking in all the neighborhoods that experienced development, including Beach and Boardwalk District, Beach Hill and Beach Flats Neighborhoods, California Street/Mission Hill Neighborhoods, Downtown District, Downtown Neighborhoods, Mission Street Corridor, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, Water Street, and Westside Industrial District.
- Extreme heat, particularly for development in areas that lack sufficient tree canopy and/or have large amounts of impervious and dark surfaces, such as neighborhoods of

the neighborhoods of Beach Hill and Beach Flats, Downtown District and Downtown Neighborhoods.

- Flooding, for development in the mapped SFHAs, including the Beach and Boardwalk District, Beach Hill and Beach Flats Neighborhoods, Downtown District, Downtown Neighborhoods, Ocean Street Corridor, River Street District, and Westside Industrial District. In addition, the Beach and Boardwalk District, Beach Hill and Beach Flats Neighborhoods, and Westside Industrial District are vulnerable to coastal storm flooding. All neighborhoods are vulnerable to increased precipitation rates.
- Deep-seated landslide hazards for Boardwalk District, Beach Hill/Beach Flats Neighborhood, Downtown District, Downtown Neighborhoods, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, and Water Street Corridor.
- Sea level rise in the Beach and Boardwalk District and Westside Industrial District. End-of-century projections show a small portion of the Beach Hill and Beach Flats Neighborhoods, Downtown Neighborhoods, and Downtown District may also be impacted by this hazard.
- Tsunami inundation in the Beach and Boardwalk District, Beach Hill/Beach Flats Neighborhoods, Downtown District, Downtown Neighborhoods, Ocean Street Corridor, River Street District, Soquel Avenue Corridor, Water Street Corridor, and Westside Industrial District.
- Wildfires in the Westside Industrial District.

A complete vulnerability analysis of the neighborhoods where much of the City's development occurred over the past 5 years is included in Appendix C, Tables C-2 and C-3.

7.2 CHANGES IN PRIORITIES

According to FEMA, changes in a community's priorities do not always directly relate to how a plan prioritizes mitigation actions but could include new or modified goals for the plan and new hazards in the plan. There were several changes in priorities made to the 2025–2030 LHMP – CAP, including the following:

- Incorporating climate adaptation planning into hazard mitigation planning to create an integrated framework for decision-makers to build a more resilient and sustainable community that is informed by the most current climate science.
- Including extreme heat, which is becoming more frequent, more severe, and longer lasting, as a profiled hazard.
- Mapping and analyzing the City's 34 neighborhoods, including the City's frontline communities and future growth and development areas.
- Amending the mitigation goals and objectives from the 2018–2023 LHMP to reflect City and communitywide mitigation and climate adaptation intentions over the next 5 years and beyond.
- Revising the mitigation actions and climate adaptation strategies to focus on projects previously identified in existing City plans and programs as well as those already successfully implemented elsewhere. The prioritization process for the mitigation and climate adaptation strategy was also updated to more closely align with the process used to prioritize projects in the City's Capital Investment Program.

7.3 2018-2023 LHMP's Mitigation Action Status

The review of the 2018–2023 LHMP's mitigation actions as well as the 2018–2023 CAP's climate adaptation strategies is included in Tables F-1 and F-2. A status update for each mitigation action has been provided as well as whether it has been included in the 2025–2030 LHMP – CAP mitigation and climate adaptation strategy.

7.4 Integration of the 2018–2023 LHMP into Other Planning Mechanisms

In 2017, the City of Santa Cruz coordinated across departments to prepare the 2018–2023 LHMP and CAP concurrently, allowing the City to streamline processes and identify interconnections related to climate change and sea level rise. This integration was in response to the growing threat of climate-related hazards, and the multi-departmental approach used to update the 2018-2023 LHMP and CAP has subsequently been applied to the General Plan Amendment (2019), Local Coastal Program Public Works Plan (2021), and the Local Coastal Program Land Use Plan Update (in development).

In 2023, the City of Santa Cruz underwent its 5-year audit for the CRS program which, as previously noted, is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. Communities that participate in the CRS must undergo an audit in which 19 local floodplain management activities are described, measured, and evaluated by the CRS to determine a community's level of program participation and discounted flood insurance premium rates. One of the 19 activities that can receive CRS points is Activity 510 – Element 12, Floodplain Management Planning. For this activity, jurisdictions can receive CRS credit for multi-hazard mitigation plans, such as the 2018–2023 LHMP. Out of a total of 382 CRS points for Activity 510 - Element 12, Floodplain Management Planning, the City received 178 points for its 2018-2023 LHMP.

8.0 PLAN ADOPTION

This section addresses Element F: Plan Adoption of the Local Mitigation Plan Regulation Checklist.

Element F: Plan Adoption	
F1.	For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))
F1-a.	Does the participant include documentation of adoption?
F2.	For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))
F2-a.	Did each participant adopt the plan and provide documentation of that adoption?

Key: CFR = Code of Federal Regulations

8.1 FORMAL ADOPTION

The plan was formally adopted by resolution by the Santa Cruz City Council on [date to be determined].