

Chapter 10 Dam Failure

10.1 Risk Assessment

10.1.1 Description of Hazards

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

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

As shown in Table 22, there are five dams located within Santa Cruz County that, based on their size, are regulated by the State Division of Safety of Dams. The Newell Dam is located within the jurisdiction of the City of Santa Cruz. The remaining four include: 1) Mill Creek Dam at the Lockheed facility near the end of Empire Grade in northern Santa Cruz County, 2) Sempervirens Dam within Big Basin Redwoods State Park, 3) Oak Site Dam found near the Lockheed facility, and 4) Soda Lake located along Highway 129 in southeastern Santa Cruz County. None of these dams are owned or operated by the County of Santa Cruz but are the responsibilities of other state agencies or private entities. The reservoirs range in size from 20 acre-feet to over 10,000 acre- feet, with the oldest dam being constructed in the late 1890s and the newest in 1985.

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

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

Table 22 Dams in and near Santa Cruz County

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

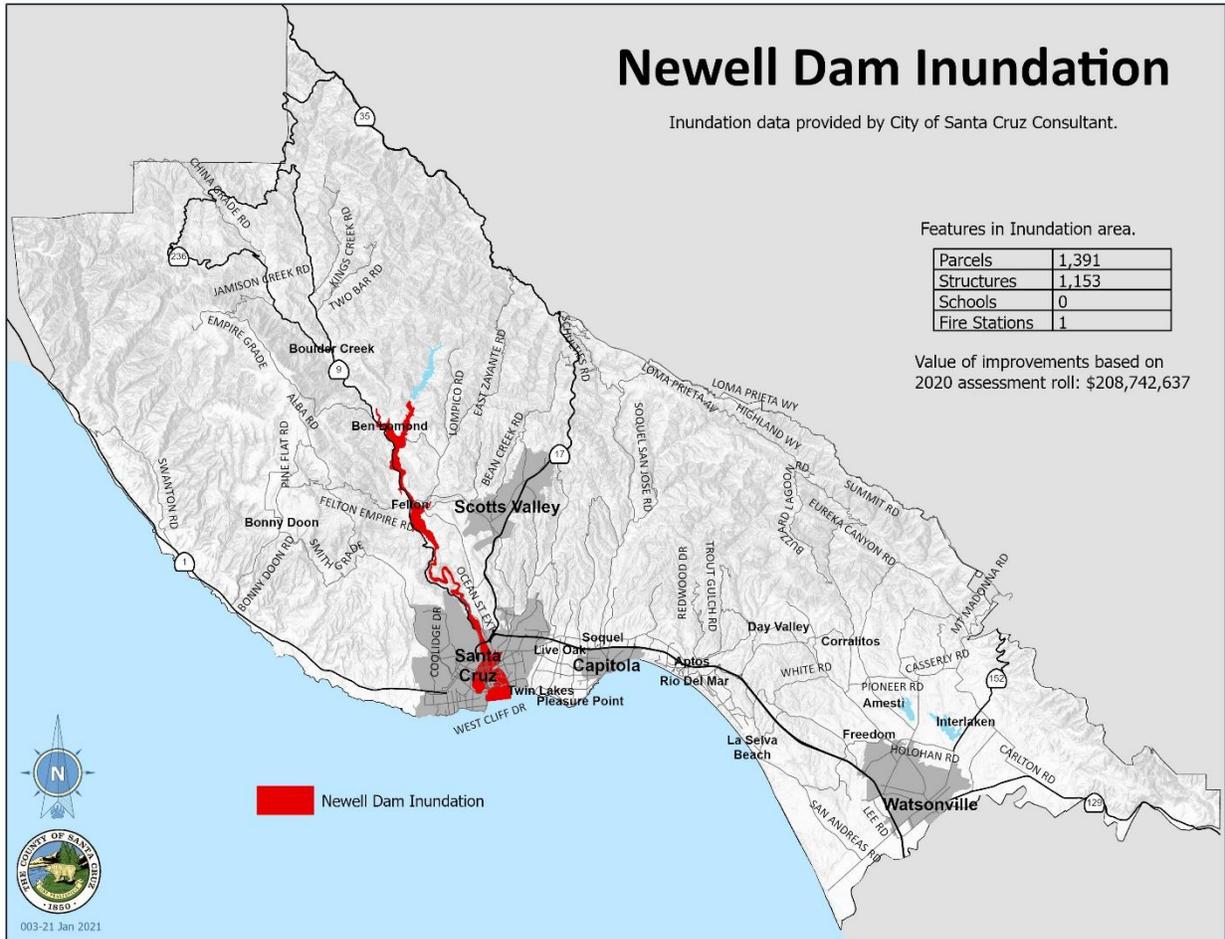


Figure 22 Newell Creek Dam inundation area

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

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

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

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

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

10.1.2 Previous Occurrences

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

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

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

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

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

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

10.1.3 Assessing Vulnerability: Overview

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

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

10.1.4 Assessing Vulnerability: Identifying Structures

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

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

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

10.1.5 Assessing Vulnerability: Estimating Potential Losses

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

As Table 23 illustrates, the majority of structures within the Newell Creek Dam inundation area are residential. For this land use category alone, the loss would be nearly \$209 million.

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

Table 23 Dam failure potential loss inventory

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

10.1.6 Assessing Vulnerability: Analyzing Development Trends

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

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

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

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

10.2 Mitigation Strategy

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

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

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

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

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

10.2.1 Mitigation Goals

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

Dam Failure Goal

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

10.2.2 Identification and Analysis of Mitigation Actions

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

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

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

2021 Progress Report

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

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

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