City of Santa Cruz

2020 Urban Water Management Plan

November 2021

Prepared by: City of Santa Cruz Water Department

City of Santa Cruz Water Department

Final Adopted

2020 Urban Water Management Plan

Santa Cruz City Council

Donna Meyers, Mayor
Sonja Brunner, Vice Mayor
Sandy Brown
Justin Cummings
Renee Golder
Shebreh Kalantari-Johnson
Martine Watkins

Water Commission

Sierra Ryan, Chair
Walt Wadlow, Vice Chair
Justin Burks
Tom Burns
Doug Engfer
Alejandro Páramo
Doug Schwarm

Rosemary Menard, Water Director
Heidi Luckenbach, Interim Water Director/
Deputy Water Director and Engineering Manager

Prepared by
Sarah Easley Perez, Principal Planner

Assisted by
Ben Pink, Environmental Programs Analyst II
Neal Christen, Water Conservation Representative
Margaret Haddon, Water Conservation Representative
Katy Fitzgerald, Administrative Assistant III

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TABLE OF CONTENTS

Appendices

ACRONYMS AND ABBREVIATIONS

ACS	American Community Survey
AMBAG	Association of Monterey Bay Area Governments
AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
ASR	Aquifer Storage and Recovery
AWWA	American Water Works Association
CCF	Centium Cubic Feet
CCLEAN	Central Coast Long-Term Environmental Assessment Network
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CFS	Cubic feet per second
CIMIS	California Irrigation Management Information System
CMIP3	Geophysical Fluid Dynamics Laboratory Coupled Model or GFDL2.1
CMIP5	Coupled Model Intercomparison Project 5
DRA	Drought Risk Assessment
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
F	Fahrenheit
FESA	Federal Endangered Species Act
GFDL2.1	Geophysical Fluid Dynamics Laboratory Coupled Model or CMIP3
GHWTP	Graham Hill Water Treatment Plant
GPCD	Gallons per capita per day
GPF	Gallons per Flush

GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCP	Habitat Conservation Plan
IN	Inches
IRF	Infrastructure Reinvestment Fee
IRWM	Santa Cruz Integrated Regional Water Management Group
IWA	International Water Association
LAFCO	Local Agency Formation Commission (of Santa Cruz County)
LHMP	Local Hazard Mitigation Plan
LRDP	Long Range Development Plan
MG	Million Gallons
MGA	Santa Cruz Mid-County Groundwater Agency
MGD	Million gallons per day
MGY	Million gallons per year
NMFS	NOAA National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
RUWMP	Regional Urban Water Management Plan
RWFPS	Recycled Water Facilities Planning Study
SCMU	Santa Cruz Municipal Utility
SGMA	Sustainable Groundwater Management Act
SMGA	Santa Margarita Groundwater Agency
SWMP	Storm Water Management Program
UCSC	University of California, Santa Cruz
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WCMP	Water Conservation Master Plan

WELO	Water Efficient Landscape Ordinance
WSAC	Water Supply Advisory Committee
WSAS	Water supply Augmentation Strategy
WSCP	Water Shortage Contingency Plan
WWTF	Wastewater Treatment Facility

Chapter 1

INTRODUCTION AND OVERVIEW

1.1 Urban Water Management Planning Act

This report has been prepared by the City of Santa Cruz Water Department in response to the Urban Water Management Planning Act. The Act, which became part of the California Water Code with the passage of Assembly Bill 797 in 1983, requires that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt an Urban Water Management Plan (UWMP), and to update it every five years.

The Act requires water agencies to evaluate and describe their water resource supplies and projected needs over a twenty-year planning horizon and to address a number of related subjects including water conservation, water service reliability, water recycling, opportunities for water transfers, and contingency plans for drought events.

The Act recognizes that water is a limited and renewable resource subject to ever-increasing demands and that conservation and efficient use of urban water supplies is a statewide concern. The Act also states that a long-term reliable supply of water is essential to protect the productivity of California's businesses and economic climate and, as part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry years.

The purpose, required contents, and process for preparing and adopting Urban Water Management Plans are specified in Water Code sections 10608 and 10610 – 10657. The overall goal is to provide water suppliers throughout the state a framework for carrying out their long-term planning responsibilities and for reporting their strategies to meet future water challenges to both state government and the communities they serve. These sections of Water Code, as of January 1, 2020, are included as Appendix A of the 2020 Urban Water Management Plan Guidebook (CA DWR, 2021).

1.2 Recent Changes to the Water Code

The Act has continued to be revised and expanded since the preparation of the 2015 UWMP driven by issues such as prolonged droughts, groundwater overdraft, regulatory modifications, and changing climatic conditions.

Recent legislative amendments to the Water Code since 2015 include the following:

- Five Consecutive Dry-Year Water Reliability. The dry-year water reliability assessment, which examines reliability over a twenty to twenty five year planning horizon was modified to consider a drought lasting five consecutive water years.

- Drought Risk Assessment. This new assessment requires examination of water supply reliability over a five-year period from 2021 to 2025 under a reasonable prediction for five consecutive dry years.

- Seismic Risk. Seismic risk to water facilities is now a required assessment.

- Energy Use Information. Readily obtainable information on estimated amounts of energy for water uses is now required to be included in the UWMP.

- Water Loss Reporting for Five Years. The UWMP now requires the past five years of water loss audit reports to be included.

- Water Shortage Contingency Plan. Specific elements are now required in the more prescriptive Water Shortage Contingency Plan.

- Groundwater Supplies Coordination. Consistency with Groundwater Sustainability Plans in areas where those plans have been completed by a Groundwater Sustainability Agency is now required.

- Lay Description. There is a new statutory requirement for an easy to understand description of the fundamental determinations of the UWMP, specifically regarding water service reliability, challenges ahead, and strategies for managing reliability risks.

A summary of the changes to the Water Code since 2015 is included as Appendix B of the 2020 Urban Water Management Plan Guidebook (DWR, 2021).

1.3 Report Format

For this 2020 submittal cycle, the City has elected to utilize the basic structure and organization used in the 2015 UWMP, which is in alignment with 2020 Urban Water Management Plan Guidebook (DWR, 2021). Required content is grouped by topic as follows:

Chapter 1 – Introduction and Overview: This chapter covers the background, purpose, and scope of an Urban Water Management Plan and includes the lay description.

Chapter 2 – Plan Preparation: This chapter covers the process used to develop the 2020 plan, including efforts in coordination and outreach.

Chapter 3 – System Description: This chapter describes the City's water service area including population, climate, and other factors affecting the City's water management planning, including governance and the City of Santa Cruz Water Department's organizational structure.

Chapter 4 – System Water Use: This chapter covers the past, current, and projected water uses within the City's water service area. It also provides information on distribution system water losses.

Chapter 5 – Conservation Target Compliance: This chapter provides information about the City's baseline per capita water use and urban water use targets and success in achieving its 2020 target.

Chapter 6 – System Supplies: This chapter describes and quantifies the current and projected sources of water available to the City, including surface water, groundwater, recycled water, transfers, and future water projects that support the City's Water Supply Augmentation Strategy including the Santa Cruz Water Rights Project, and the Santa Cruz Water Program. Climate change impacts to water supply and energy use are also addressed in this chapter.

Chapter 7 – Water Supply Reliability and Drought Risk Assessment: This chapter characterizes the reliability of the City water supply system over a 25-year planning horizon under differing hydrologic conditions including normal/average year, single dry year, and a five consecutive dry year scenarios. The five-year Drought Risk Assessment is also included in this chapter. These analyses are conducted using both historic hydrology and a projected climate change hydrology.

Chapter 8 – Water Shortage Contingency Planning: This chapter in combination with Appendix O, Water Shortage Contingency Analysis and Implementation, comprise the City's 2021 Water Shortage Contingency Plan. It summarizes the City's plan for addressing water shortages and describes actions that would be undertaken in response to a catastrophic interruption of water supplies.

Chapter 9 – Demand Management Measures: This chapter describes the measures currently being implemented by the City to promote conservation and discusses the future water conservation activities.

Chapter 10 – Plan Adoption, Submittal, and Implementation: This chapter describes the steps taken to adopt and submit the Urban Water Management Plan and Water Shortage Contingency Plan and to make the plan available for public use and reference.

1.4 Urban Water Management Plans in Relation to Other Planning Efforts

Urban Water Management Plans serve a variety of purposes and are intended to be consistent with and support other local, regional, and statewide plans and processes. Information about water use and supplies reported by water agencies is collected and used by the state in updating the California Water Plan every five years. They provide a common basis for cooperative water resource management through preparation of Integrated Regional Water Management Programs, such as one now being implemented in Santa Cruz County, of which the City of Santa Cruz is an active project participant. Land use agencies rely on a water agency's Urban Water Management Plan as a long-range planning document to aid in updating city and county General Plans and for the preparation of environmental documents under the California Environmental Quality Act (CEQA). They also serve as a detailed source of information to coordinate local water supply availability and certain land use decisions made by cities and counties under Senate Bills 610 and 221 of 2001.

1.5 UWMPs and Funding Eligibility

In order for an urban water supplier to be eligible for any state water grants or loans administered by California Department of Water Resources, the agency must have a current Urban Water Management Plan on file that has been determined by California Department of Water Resources to address the requirements of the Water Code.

Urban water suppliers must also comply with the requirements of the Water Conservation Act of 2009 in order to be eligible for state water grants and loans, meaning an agency must both meet its water use target and report compliance in its 2020 Urban Water Management Plan.

1.6 2020 Urban Water Management Plan Lay Description

This document constitutes the seventh update of the City's Urban Water Management Plan. Since 1986, the City has prepared the following plans:

- 1985 UWMP adopted 1986,
- 1990 UWMP, adopted 1991,
- 1995 UWMP, adopted 1996,
- 2000 UWMP, adopted 2001,
- 2005 UWMP, adopted 2006,
- 2010 UWMP, adopted 2011, and
- 2015 UWMP, adopted 2016.

The plan was most recently updated and adopted in 2016. This 2020 Urban Water Management reflects current system circumstance and events in 2020.

A lay description of the fundamental determinations of this Urban Water Management Plan is provided below:

1.6.1 System Water Use and Water Demand

Until the early 2000s, the general trend in the City of Santa Cruz water system use was one in which water use rose roughly in parallel with account and population growth over time, except during two major drought periods in the late 1970s and the early 1990s. Around 2000, this pattern changed and system demand began a long period of decline, accelerated by pricing changes, drought, economic downturn, and other factors. In 2015, after two years of water rationing, annual water use fell to a level of about 2.5 billion gallons, similar to the level experienced during the 1970s drought. In 2020, demand was still at a similar level as 2015, about 2.6 billion gallons, despite several years above long-term average rainfall from 2016 and 2020. While demand did rebound following droughts in the 1970s and 1980s, demand has not rebounded to pre-drought conditions following 2014, contrary to previous projections. Current projections forecast that water use over the next 25 years, including projected population growth, will increase at a very slow rate to reach approximately 2.8 billion gallons per year by 2045. For additional details, see Chapter 4 of this Urban Water Management Plan.

1.6.2 Conservation Target Compliance

The Water Conservation Act of 2009, also known as SB X7-7, required the State to reduce urban per capita water use by 20 percent by the year 2020. Each retail urban water supplier was required to determine a target water use for the year 2020 in order to help the State achieve the 20 percent reduction. The City of Santa Cruz' target gross per capita water use[1] for 2020 was 110 gallons per capita per day (GPCD) as determined in accordance with California Department of Water Resources' technical methodologies. In 2020, the City's gross per capita water use was 74 GPCD. This 2020 gross per capita water use is far below the 2020 target, and the City is in compliance with all requirements of Senate Bill X7-7. For additional details, see Chapter 5 of this Urban Water Management Plan.

1.6.3 Existing System Water Supply

The Santa Cruz water system relies predominantly on local surface water supplies, which include the North Coast sources (Liddell Spring and Laguna, Majors, and Reggiardo Creeks), the San Lorenzo River, and Loch Lomond Reservoir. Together, these surface water sources represent the majority of the City's total annual water production used to meet system demand. The balance of the City's supply comes from groundwater, all of which is extracted from the Beltz Well system in the Purisima Formation in the Santa Cruz Mid-County Groundwater Basin. During the past decade, the North Coast sources represented 23 percent of the total water supply, the San Lorenzo River represented 56 percent, Loch Lomond Reservoir (Newell Creek) represented 15 percent, and the Beltz Well system contributed the remaining 5 percent.

The City does not currently operate a recycled water system in its service area; however, the Pasatiempo Golf Course, located within the City's service area, now receives disinfected secondary effluent from the City of Scotts Valley that it treats to tertiary standards at the Pasatiempo Golf Course Tertiary Plant for use as recycled water golf course irrigation. This reduces the demand for potable water from the Santa Cruz water system that would otherwise be used for irrigation.

For additional details, see Chapter 6 of this Urban Water Management Plan.

1.6.4 Future Water Projects

As described in Section 1.6.5 below, the City of Santa Cruz is vulnerable to water shortages during multiple dry year periods and as such faces potential obstacles in meeting its future water supply needs. This is primarily due to the limitation in when and how much

[1] Gross water use is the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier.

water is available to meet system demand, exacerbated by a lack of storage within the system. To address these limitations, the City is actively planning and implementing a number of projects and major investments in the water system designed to secure future water supply reliability. Major projects are described below. For additional details on these projects, see Chapter 6 of this Urban Water Management Plan.

1.6.4.1 Water Supply Augmentation Strategy

Since 2015, the City of Santa Cruz has been pursuing a Water Supply Augmentation Strategy (WSAS) developed by the Water Supply Advisory Committee. The Water Supply Advisory Committee was a citizen committee formed in 2014 by Santa Cruz City Council with the charge to analyze potential solutions to deliver a safe, adequate, reliable, affordable and environmentally sustainable water supply for the City of Santa Cruz. The WSAS portfolio elements, which are being pursued on a concurrent timeline, and current progress are summarized below:

- **Element 0: Demand Management**. Demand Management, or conservation, is not considered a water supply for the purposes of the UWMP, and is discussed in Chapter 9 of this Urban Water Management Plan.
- **Element 1: Transfers and Exchanges**. The City has been piloting water transfers to the Soquel Creek Water District since 2018, as water supplies are available, under a cooperative piloting agreement that extends through 2025. The Santa Cruz Water Rights Project Draft Environmental Impact Report, described below, examines implementation of water transfers and exchanges with local water districts, the Soquel Creek Water District, Central Water District, Scotts Valley Water District, and San Lorenzo Valley Water District, that would be facilitated by the proposed water rights modifications to place of use.
- **Element 2: Aquifer Storage and Recovery**. The City has been evaluating the feasibility of ASR in both the Santa Cruz Mid-County and in the Santa Margarita Groundwater Basins, with current work primarily focused on the portion of Santa Cruz Mid-County Basin within the City of Santa Cruz service area. Pilot testing has been conducted at the existing Beltz 8 and Beltz 12 well facilities to better understand potential water quality and operational constraints. The Santa Cruz Water Rights Project Draft Environmental Impact Report, described below, examines implementation of ASR that would be facilitated by the proposed water rights modifications. Next steps include consideration of longer-term demonstration of ASR at existing Beltz Well system facilities.

- **Element 3: Recycled Water or Desalination**. Following completion of the 2017 Desalination Feasibility Update Review Report (Appendix J), further study of recycled water has been prioritized over study of seawater desalination. The City is continuing to examine the use of recycled water through commissioned engineering studies. The 2018 Recycled Water Facilities Planning Study (Appendix I) recommendation includes two projects that would provide non-potable reuse in the City:
  - Santa Cruz Public Works Department Title 22 Upgrade Project
  - BayCycle Project

  The City is also committed to exploring other reuse opportunities, including:
    - Coordination with Soquel Creek Water District's Pure Water Soquel project
    - Explore Groundwater Replenishment Reuse at Beltz Well system
    - Explore Groundwater Replenishment Reuse in Santa Margarita Groundwater Basin

  The City of Santa Cruz is continuing to actively investigate the feasibility of recycled water though an ongoing Phase 2 Regional Recycled Water Facilities Planning Study.

1.6.4.2 Santa Cruz Water Rights Project

The Santa Cruz Water Rights Project supports the implementation of the WSAS and involves the modification of the City's existing water rights to increase the flexibility of the water system by improving the City's ability to utilize surface water within existing allocations. This project also incorporates into the City's water rights bypass flow requirements for all of the City's surface water sources which are protective of local anadromous fisheries (Agreed Flows). The success of this project is necessary for fisheries protection and to facilitate future water supply projects. The primary components of the Santa Cruz Water Rights Project include:

- **Water rights modifications** related to place of use, method of diversion, points of diversion and rediversion, underground storage and purpose of use, extension of time, and stream bypass requirements for fish habitats;
- **Water supply augmentation components**, including new aquifer storage and recovery (ASR) facilities at unidentified locations, ASR facilities at the existing Beltz Well facilities, water transfers and exchanges and intertie improvements; and
- **Surface water diversion improvements**, including the Felton Diversion fish passage improvements and the Tait Diversion and Coast Pump Station improvements.

State Water Resources Control Board noticed the City's water rights change petitions on February 10, 2021. Subsequently, the project's Draft EIR was released for public review in summer 2021. The Final EIR, to be prepared addressing comments received on the Draft EIR, is expected to be completed in late 2021 or early 2022. Once completed, the Santa Cruz City Council will consider project approval and certification of the EIR and the State Water Resources Control Board will consider action on the City's water rights change petitions. The Santa Cruz Water Rights Project Community Guide is included as Appendix L.

1.6.4.3 Santa Cruz Water Program (Capital Investment Program)

City of Santa Cruz has embarked on an ambitious capital investment program, the Santa Cruz Water Program, to secure its future water supply portfolio, to improve reliability and resiliency in the face of climate change, and to address aged infrastructure. Major investments are planned in the coming years to advance toward a twenty-first century water system. Information on all projects included in the Program is included in Appendix N. Elements of the Santa Cruz Water Program Program that will help contribute to support implementation of the WSAS and support water supply reliability include the following.

- **Graham Hill Water Treatment Plant Projects**. Upgrades to the City's Graham Hill Water Treatment Plant are critical to the implementation of the WSAS to allow treatment of higher turbidity source water that otherwise would need to be bypassed during high flow periods such as during and after storm events. Recent and ongoing projects include major maintenance repairs to the flocculation, sedimentation and filtration basins, and replacement of three of the four concrete tanks. Simultaneous with these component repair and replacement projects, staff has been developing the Facilities Improvement Project. The project is a comprehensive evaluation of the facility that identifies the most cost-effective improvements to meet water treatment objectives and improve the overall reliability and resiliency of the plant. These investments are designed to address aging infrastructure, prevent noncompliance with drinking water standards under anticipated future conditions, and support mission-critical values of supplying adequate, safe, and reliable water for the City's customers.
- **Raw Water Transmission Pipeline Projects**. The City is planning improvements to raw water conveyance by upgrades to both the Newell Creek Pipeline and segments of the North Coast system. These projects will improve reliability and reduce hydraulic constraints to improve delivery of raw water to the Graham Hill Water Treatment Plant.
- **Tait Diversion Improvements**. The City is also investigating improvements to the Tait Diversion facility that would improve reliability and fish screening. As described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, if the Tait Diversion is added as a new point of diversion to existing Felton water rights,

Tait Diversion capacity would be increased to accommodate the combined diversion of water under both the Tait and the Felton water rights at this facility.

1.6.5 Water Service Reliability Analyses

The Drought Risk Assessment (DRA) is a new requirement in the 2020 Urban Water Management Plan. The assessment includes a supply and use comparison looking ahead assuming drought conditions over the next five years, 2021 - 2025. In this Urban Water Management Plan, the period 1973 – 1977 is used as the DRA and five-consecutive-year drought in the reliability assessment because it is the period in the historic record that would pose the greatest challenge to the City's water supply system. The City also conducted a parallel analysis utilizing a projected climate change hydrology and five-year consecutive drought. Based on anticipated timing of certification of the Santa Cruz Water Rights Project Environmental Impact Report and action by the State Water Resources Control Board on proposed water rights modifications, the City's proposed water rights modifications, including implementation of the Agreed Flows which are protective of local anadromous fisheries, are assumed for 2022 through 2025 of the DRA, but are not assumed in the first year of the analysis.

Figure 1-1 presents the results of the DRA and anticipated supply from each source. This analysis shows that projected supply would meet projected demand for the first four years of the extended five-year drought, but that in the fifth year, a substantial, 27 percent, shortage is projected. This projected shortage would require aggressive reduction savings according to the City's Water Shortage Contingency Plan. During an extended drought period, however, the City would likely utilize the Water Shortage Contingency Plan and implement demand reduction requirements in earlier years before an actual shortage is experienced, to ensure adequate supplies remain in Loch Lomond Reservoir, thereby potentially reducing the depth of shortage experienced in the fifth year.

The City also conducted Drought Risk Assessment utilizing a selected climate change projection. Figure 1-1C illustrates the City's water supply by source that is projected to be utilized under this climate change projection. The vulnerability of flowing sources, the North Coast Streams and San Lorenzo River, to drought can be seen in the rapid drop of availability of these sources between years two and three in this scenario. Subsequently, the inability to refill Loch Lomond Reservoir during ensuing dry years, leads to two successive years of projected substantial supply shortages.

Figure 1-1: Drought Risk Assessment Supply by Source

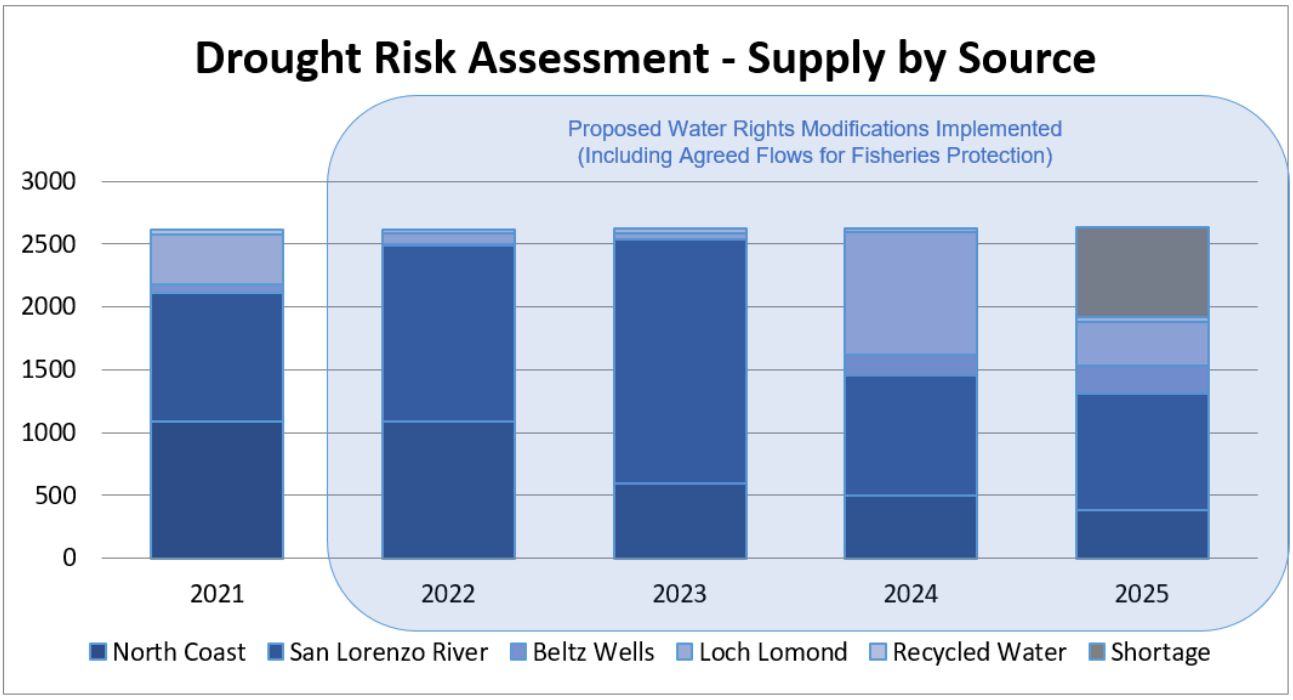
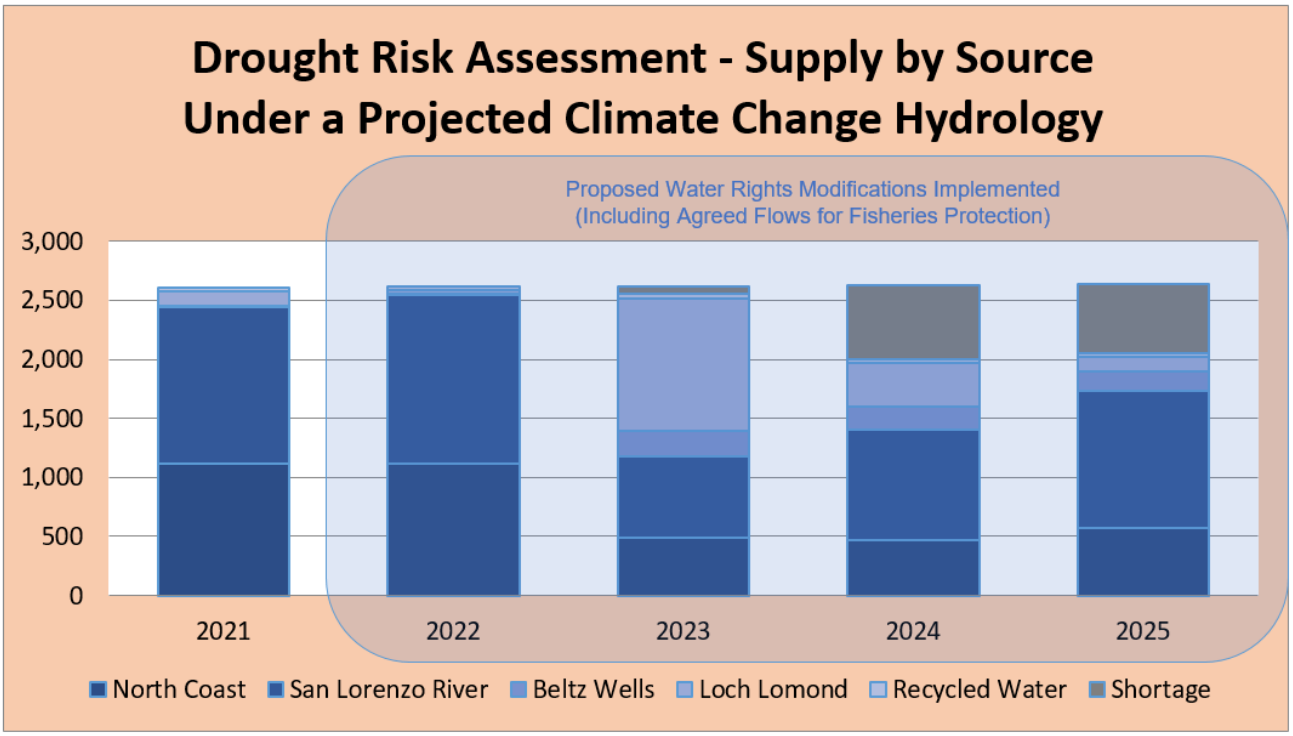


Figure 1-1C: Drought Risk Assessment Supply by Source under a Projected Climate Change Hydrology



To demonstrate supply reliability over time for under different conditions, Figure 1-2 illustrates projected supply available relative to demand over the 25-year planning horizon assessment. The City is safeguarding against future water shortages by actively implementing future water projects as described in Chapter 6, Section 6.8. Implementation of these projects is therefore assumed in the City's water supply planning process. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies over the 25-year planning horizon of this analysis.

- In 2025, the City will have implemented proposed water rights modifications, including implementation of the Agreed Flows which are protective of local anadromous fisheries, as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report (see Section 6.8.2) and
- In 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects:
    - Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report,
    - Improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program (see Section 6.8.3),
    - Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and
    - Replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program.

Under this supply and demand reliability assessment, the City projects having sufficient water supply available in normal years and single dry years to serve anticipated demand throughout the 2025 – 2045 planning period.

Under multi-year drought conditions in the near term (2025), with proposed water rights modifications but before implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the multi-year drought scenario, but would fall short of demand by 27 percent in year five. While the analysis characterizes this vulnerability for year five of the drought period, depending on sequencing of rain years, in reality it is possible that such a shortage could occur sooner and persist longer through a multiple dry year period. Under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the mutli-year drought scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than a negligible two percent.

Figure 1-2C shows the projected supply available relative to demand under the modeled climate change hydrology. Compared to historic hydrology, there is potential for decreased reliability under a single dry year and under multi-year drought conditions under the climate change scenario. The City projects having sufficient water supply available in normal years under the climate change hydrology.

In single dry year conditions under a projected climate change hydrology in the near term (2025), with proposed water rights modifications but before implementation of the ASR and planned infrastructure projects, supply would fall short of projected demand by seven percent. Under multi-year drought conditions in the near term, available supplies would meet projected demand in years one and two of the multi-year drought scenario, but would fall short of system demands by two percent in year three and by 23 percent in years four and five. However, under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than five percent.

Figure 1-2: Projected Supply Availability as Demand Served

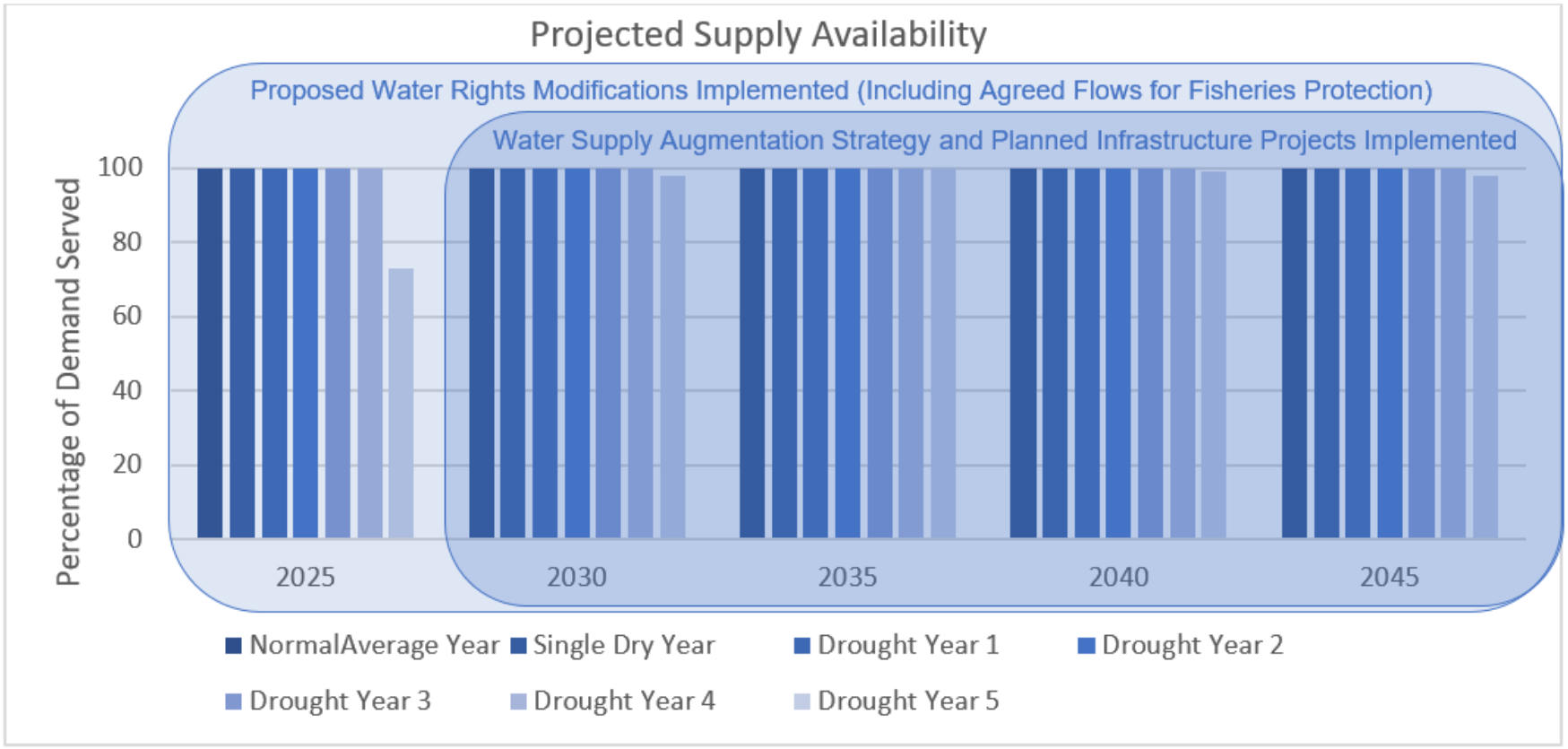
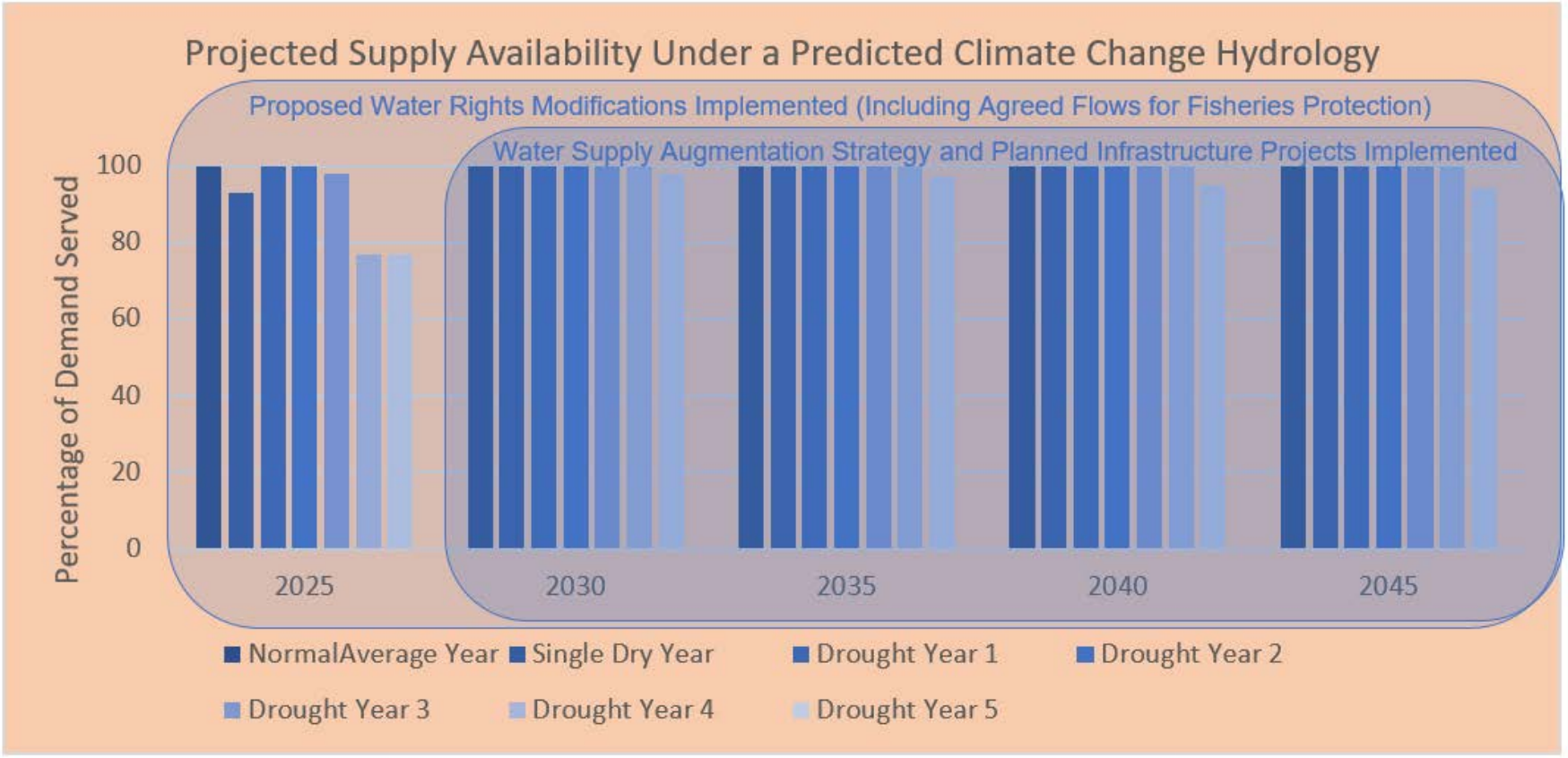


Figure 1-2C: Projected Supply Availability as Demand Served under a Projected Climate Change Hydrology



This assessment illustrates that without implementation of the future water projects described in Chapter 6, Section 6.8, the City would face critical challenges in meeting demand in a projected multi-year drought, under either hydrology consistent with historic conditions or under a climate change scenario. This is largely driven by the City's dependence on local surface water flows and the lack storage with the supply system. The ongoing implementation of the WSAS, including the Santa Cruz Water Rights Project, and Santa Cruz Water Program are critical and necessary elements to secure the City's existing and future water supply reliability.

For additional details on these analyses, see Chapter 7 of this Urban Water Management Plan.

1.6.6 Strategies for Managing Reliability Risks.

As described above, the City of Santa Cruz water system reliability is vulnerable to multiple consecutive dry years in the near term due to the high reliance on surface water sources and limited storage within the system. To address these reliability challenges, the City is pursuing the WSAS including future water projects such as the Santa Cruz Water Rights Project, and the Santa Cruz Water Program.

As required by California Water Code and to manage risks due to water supply shortages that can be expected in the future, this Urban Water Management Plan includes a Water Shortage Contingency Plan. The Water Shortage Contingency Plan presents information about how the City of Santa Cruz manages the water system during a water shortage emergency that arises as a result of drought. It also describes water supply and demand assessment procedures, compliance and enforcement strategies, and actions that would be undertaken in response to a catastrophic interruption of water supplies, including a regional power outage, earthquake, or other emergency situation, legal authority, and other topics.

The Water Shortage Contingency Plan (WSCP) includes six standard water shortage levels and actions that would be taken to reduce demand at each level. Shortage stages in this WSCP are based on peak season demand and correspond to the six standard shortage levels defined in Water Code of up to ten, twenty, thirty, forty, fifty and greater than fifty percent shortage, as summarized in Table 1-1.

Table 1-1: Water Shortage Contingency Plan Levels

Water Shortage Contingency Plan Levels		
Shortage Level	Percent Shortage Range	Shortage Response Actions
1	Up to 10%	Water Shortage Warning. Stage 1 applies to relatively minor water shortage that requires up to a 10% level of demand reduction. The allocation system applies to all stages. At Stage 1, allocations are provided to customers but excess use penalties are not yet implemented.
2	Up to 20%	Water Shortage Alarm. Stage 2 applies to moderate water shortages with a demand reduction requirement of up to 20%. This condition requires more vigorous public information and outreach. The primary demand reduction measure that will be implemented at this stage and all stages going forward is the use of excess use penalties for water use above customer allocations.
3	Up to 30%	Water Shortage Emergency. Stage 3 applies to a serious water shortage with a demand reduction requirement of up to 30%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 3 levels.
4	Up to 40%	Severe Water Shortage. Stage 4 applies to a serious water shortage with a demand reduction requirement of up to 40%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 4 levels. The water supply conditions that would trigger Stage 4 parallel the difficult situation the City experienced in the drought of late 1970s. Under this scenario, virtually all available water must be reserved either for health and safety purposes or to sustain local business.
5	Up to 50%	Critical Water Shortage. Stage 5 represents an imminent and extraordinary crisis threatening health, safety, and security of the entire community. Under this dire situation, extreme measures are necessary to cut back water use by up to half the normal amount. Not enough water would exist even to meet the community's full health and safety needs, the top priority. All water should be reserved for human consumption, sanitation, and fire protection purposes and any remaining amount allocated to minimize economic harm. A shortage of this severity could be expected to generate stress and confusion, much the same as any major emergency and at some point could transform into a full blown natural disaster that can no longer be governed by local ordinance and may need to be managed by the basic principles and command structures of the state Standardized Emergency Management System. The City has experienced water shortages in the past but never one of such large proportion.
6	>50%	Catastrophic Water Shortage. For Stage 6, Santa Cruz takes the position that this level of shortage would most likely only occur due to a major disaster that caused significant damage to our water treatment and/or distribution infrastructure. In such a disaster, such as a large earthquake, the Santa Cruz response would not come from this WSCP, but rather from the main Santa Cruz Water Department Emergency Response Plan.

The very low system-wide water use in the City of Santa Cruz Water System described in Sections 1.6.1 and 1.6.2 above is beneficial from the perspective of meeting demands and preserving water resources, but it also represents a “hardened demand” that presents limited opportunity for further per capita demand reductions. These new demand characteristics mean that reductions at higher stages will be difficult to achieve. In the view of the Santa Cruz Water staff, curtailments beyond Stage 2 of this plan are not really feasible to implement without significant impacts to public health and safety and the Santa Cruz economy. The City is actively implementing its WSAS as the solution to dealing with larger shortages rather than demand curtailment.

Under implementation of the WSCP, the City of Santa Cruz will rely primarily on demand reduction through the implementation of allocations to address shortages at each WSCP stage, the plan also includes outreach, operational changes, mandatory restrictions, and other actions to be implemented at each stage.

For additional details on the WSCP see Chapter 8 and Appendix O of this Urban Water Management Plan.

1.6.7 Challenges Ahead

As with elsewhere in California, the challenges for managing water supply and demand in the central coast region are dynamic. This plan describes in detail the water system as of 2020 and projects future conditions based on known factors, but also acknowledges that the future is both variable and uncertain and that change will continue to occur. Continued implementation the WSAS and planned projects to support improved system reliability including the Santa Cruz Water Rights Project, and Santa Cruz Water Program is essential to securing the future of the Santa Cruz water system to face the challenges ahead.

Chapter 2

PLAN PREPARATIOIN

2.1 Basis for Preparing a Plan

In accordance with the California Water Code, every urban water supplier with 3,000 or more service connections or supplying more than 3,000 acre-feet of water per year are required to prepare an Urban Water Management Plan every five years. With 24,592 active service connections, the City of Santa Cruz clearly meets the definition of "Urban Water Supplier" and therefore must prepare a plan.

The Santa Cruz water system also qualifies under the California Health and Safety Code, Section 116275, as a "Public Water System" that provides drinking water for human consumption and is regulated by the State Water Resources Control Board, Division of Drinking Water. The City operates a single, retail drinking water system. It receives no water from any wholesale supplier nor does it supply either raw or treated water to another agency at the present time, except under a pilot transfer project as described in Chapter 6 of this document.

Table 2-1: Water System Identification (submittal table 2-1R)

Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020 (MG)
CA4410010	Santa Cruz Water Department	24,592	2,606
	TOTAL	24,592	2,606
NOTES: Volume of water supplied is presented in million gallons (MG)			

2.2 Regional Planning and Compliance

The City of Santa Cruz actively participates in several regional, interagency, groundwater and watershed basin management efforts. As indicated in Table 2-2, however, the City is choosing to prepare an individual Urban Water Management Plan.

Table 2-2: Plan Identification (submittal table 2-2)

Plan Identification		
Select Only One	Type of Plan	
☑	Individual Urban Water Management Plan (UWMP)	
	☐	Water Supplier is also a member of a RUWMP
	☐	Water Supplier is also a member of a Regional Alliance
☐	Regional Urban Water Management Plan (RUWMP)	

Similarly, for the purpose of determining, reporting, and assessing compliance with its urban water use baselines and targets as described in Chapter 5, the City of Santa Cruz is choosing to report as an individual supplier.

2.3 Reporting Year and Units of Measure

All information in this plan, except where otherwise noted, is reported on a calendar year basis, and volumes are expressed in units of million gallons.

Table 2-3: Supplier Identification (submittal table 2-3)

Supplier Identification	
Type of Supplier	
☐	Supplier is a wholesaler
☑	Supplier is a retailer
Fiscal or Calendar Year	
☑	UWMP Tables are in calendar years
☐	UWMP Tables are in fiscal years
Units of measure used in UWMP	
Unit	Million Gallons (MG)

2.4 Coordination and Outreach

2.4.1 Wholesale and Regional Coordination

The City of Santa Cruz does not receive a water supply from any wholesaler; therefore, wholesaler reporting is not required. Accordingly, Submittal Table 2-4, Water Supplier Information Exchange is not included in this plan.

2.4.2 Coordination with Other Agencies and the Community

Water Department staff prepared the draft urban water management plan in winter, spring, and summer of 2021 with the by following the guidance outlined in the state's *Urban Water Management Plan Guidebook 2020* (DWR, 2021). Throughout development of this plan, staff was communicating and coordinating with neighboring water agencies, city and county land use agencies within the service area, as well as the staff from the City's wastewater treatment facilities, City of Scotts Valley, and the Santa Cruz County Sanitation District in accordance with section 10620(d)(2) of the Act.

Written notice regarding the plan review and update was sent to both the City of Capitola and the County of Santa Cruz in January 2021, more than 60 days prior to the public hearing, as required by Section 10621(b) of the Act (Appendix B). Notices were provided both to the City Manager/County Administrative Officer and the Community Development Director/Planning Director of these two jurisdictions.

In February 2021, the City conducted outreach to all major public water agencies, wastewater utilities, and land use agencies in Santa Cruz County. This effort included the following organizations:

- Association of Monterey Bay Area Governments
- Central Water District
- City of Capitola
- City of Scotts Valley
- City of Watsonville
- City of Watsonville, Water Division
- County of Santa Cruz
- Local Agency Formation Commission of Santa Cruz County (Santa Cruz LAFCO)
- Pajaro Valley Water Management Agency
- Regional Water Management Foundation
- Resource Conservation District of Santa Cruz County
- San Lorenzo Valley Water District
- Santa Cruz Mid-County Groundwater Sustainability Agency

- Santa Margarita Groundwater Sustainability Agency
- Scotts Valley Water District
- Soquel Creek Water District

Additional coordination focusing on projected population and demand was conducted through a series of meetings with the County of Santa Cruz, City of Capitola, and the University of California, Santa Cruz. Additional coordination regarding wastewater and recycled water was conducted with County of Santa Cruz, City of Scotts Valley, Scotts Valley Water District, and the Pasatiempo Golf Course. As a department of the City of Santa Cruz, the Water Department also coordinated with staff from the City's Planning and Community Development, Economic Development, and Public Works departments during the development of this Urban Water Management Plan.

All of these entities were notified of availability of the Draft Urban Water Management Plan when it was released in September 2021 and directed to an electronic copy of the draft plan on the department website.

The active involvement of the local community within our service area was also encouraged during the development of the Urban Water Management Plan. Plan development and various specific plan elements were presented at public Santa Cruz Water Commission meetings in 2020 and 2021 where the public was given the opportunity to provide input and comment. Water Commission meetings addressing topics covered in this Urban Water Management Plan included the following:

- February 3, 2020: Water Shortage Contingency Plan Update: Data Analysis and Plan Development Process
- July 6, 2020: Analysis of the Probability and Size of Potential Future Water shortages
- September 14, 2020: Working Draft of the Water Shortage Contingency Plan
- December 7, 2020: Draft Water-Sewer Affordability Analysis
- January 4, 2021: Updated Water Shortage Contingency Plan
- February 1, 2021: Preliminary Long-Term Water Demand Forecast Update
- March 1, 2021: Urban Water Management Plan – Approach to Water Service Reliability and Drought Risk Assessment
- April 5, 2021: Urban Water Management Plan: Results of Drought Risk Assessment and Water Supply Reliability Assessment

The process of plan adoption, submittal, and implementation, including associated public hearings, is described in Chapter 10.

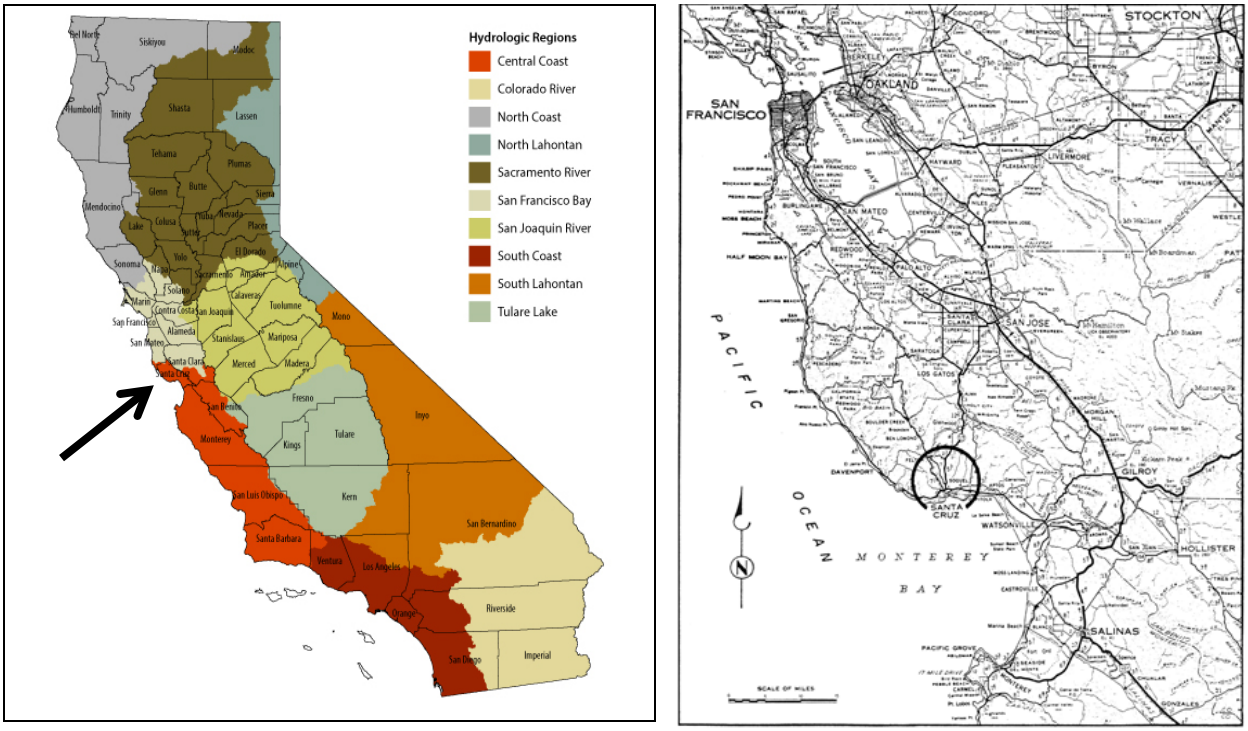
Chapter 3

SYSTEM DESCRIPTION

3.1 General Description of Service Area

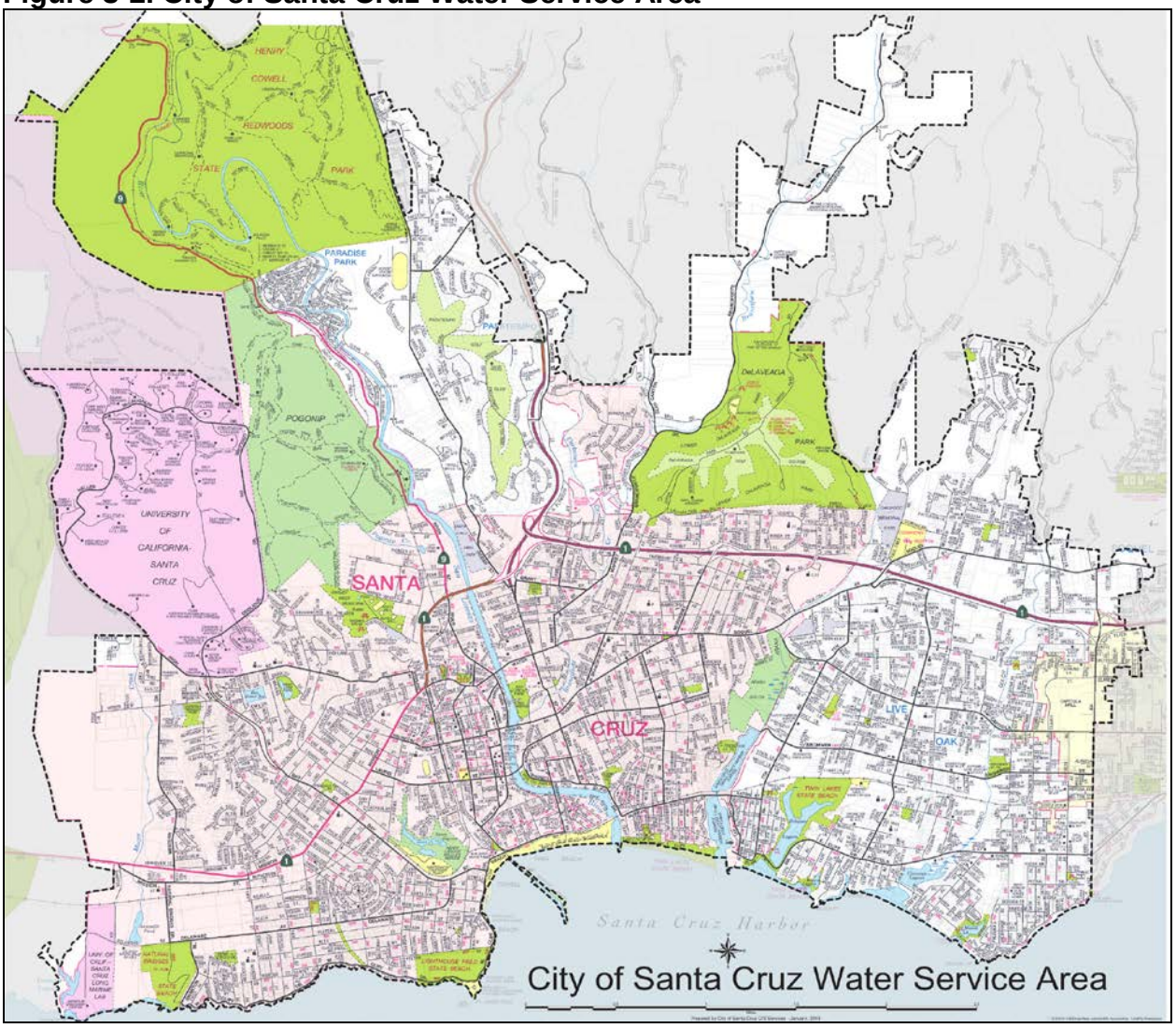
The City of Santa Cruz is located on the central coast of California along the northern shore of Monterey Bay. The City's position on the northern end of the state's Central Coast Hydrologic Region (Region 3) and vicinity relative to the San Francisco Bay Area are shown below in Figure 3-1.

Figure 3-1. California Hydrologic Region and Vicinity Maps



Water service is provided to an area approximately 20 square miles in size, including the entire City of Santa Cruz, adjoining unincorporated areas of Santa Cruz County, a small part of the City of Capitola, and coastal agricultural lands north of the city. A generalized map of the water service area, excluding the coastal agricultural lands north of the City, is provided in Figure 3-2. No significant changes to the City's service area boundary have occurred in many years.

Figure 3-2. City of Santa Cruz Water Service Area



People are drawn to the Santa Cruz area for its recreational attractions, its small town ambiance and sense of community, its pleasant weather, its natural beauty and scenic coastline, and its higher education facilities. The sandy beaches and nearby mountains attract millions of visitors to the region every year. The City is bounded by several state parks and open-space lands that provide facilities for bicycling, hiking and other outdoor activities. The seashore and ocean waters of the Monterey Bay National Marine Sanctuary serve as a prime destination in the summer months for sunbathers, surfers, and tourists. Other visitor attractions include the Santa Cruz Beach Boardwalk, Municipal Pier, and Pacific Avenue Mall.

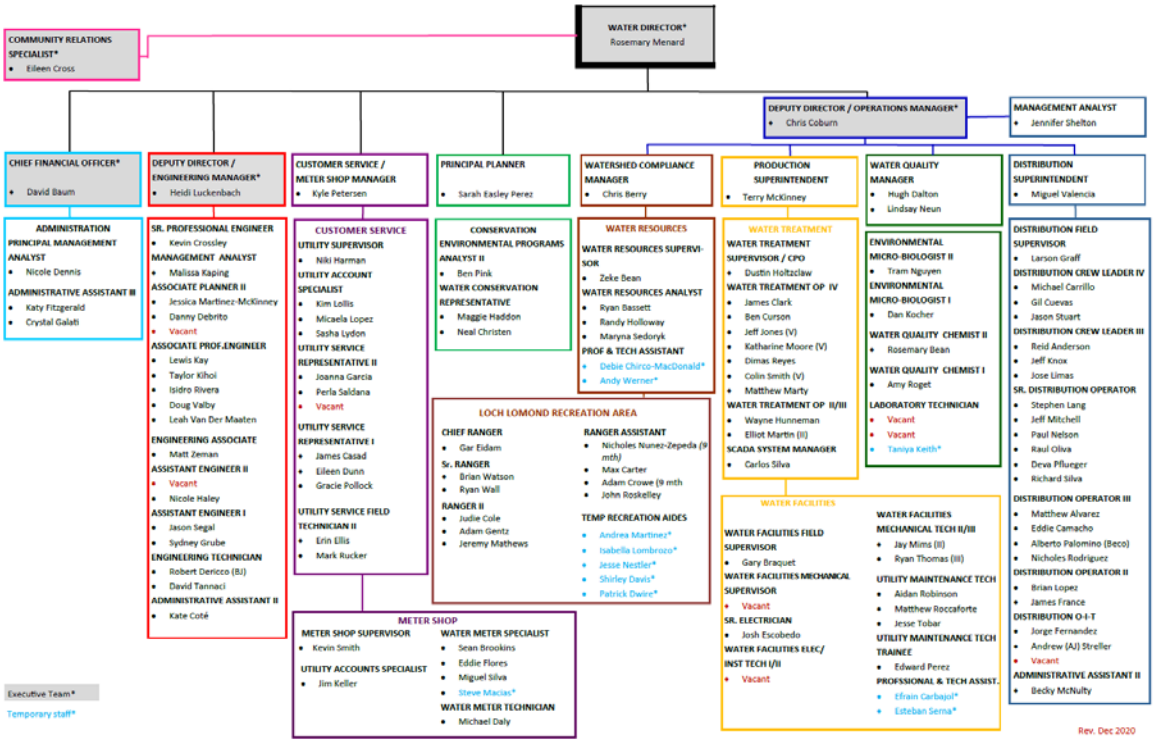
The University of California, Santa Cruz is situated atop the upper west side of the City overlooking downtown and the Monterey Bay. During the 2020 academic year, enrollment was slightly higher than 19,000 undergraduate and graduate students (UCSC, 2021).

3.2 Water Department

The Santa Cruz Water Department (Water Department) is a municipal utility that is owned and operated by the City of Santa Cruz. It is led by a Director who is appointed by the City Manager. The governing body for the Water Department is the seven-member City Council. A seven-member Water Commission advises the Council on policy matters involving the operations and management of the water system. The Commission is composed of six members who reside within the City limits and one member who resides in the unincorporated portion of the water service area.

The Water Department is organized into eight sections. These include Administration, Customer Service and Meter Shop, Water Conservation, Engineering, Water Resources/Recreation, Water Production, Water Quality, and Water Distribution. There is currently the equivalent of 116.5 full-time staff positions in the Water Department. An organization chart of the Water Department in December 2020 is shown in Figure 3-3.

Figure 3-3. Water Department Organization



The Water Department's mission statement is as follows:

> ***"To provide a safe, clean, and continuous supply of water for municipal and fire protection purposes that meets or exceeds local, State, and Federal standards for public health and environmental quality, and to provide courteous, responsive, and efficient service in the most cost-effective manner to our customers".***

The Water Department's major water infrastructure facilities include three water treatment plants, including the Graham Hill Water Treatment Plant and two groundwater treatment plants related to the Beltz well system; four raw water pump stations; ten treated water pump stations; 15 distribution tanks with a total maximum capacity of 21.2 million gallons of treated water storage; seven surface water diversions; seven production wells[1]; and approximately 300 miles of treated and raw water pipelines interconnecting the entire system.

The Water Department operates financially as an enterprise in which all the costs of running the system are paid by water rates, service charges, and related revenues. The Water Fund receives no tax or general fund revenues. In addition to providing water service, the Water Department has responsibility for billing and customer service functions related to sewer, refuse, and recycling services inside the City limits.

Long-range goals and policies for guiding growth and development in the City, including civic and community facilities like the water system, are contained in the City's 2030 General Plan. The General Plan includes a series of policy statements regarding water service that support and promote the General Plan's overarching goal of achieving a safe, reliable, and adequate water supply. (Appendix C). Because these policies have not been updated since the development of the City's Water Supply Augmentation Strategy (described in Chapter 6, Section 6.8), some of these policies require updating to reflect the City's current direction for water supply planning.

[1] The City operates four groundwater production wells within the Beltz well system and three production wells at the Tait Diversion wells that are assumed to be hydraulically connected to surface water and considered to be tied to the City's appropriative rights for surface diversion.

3.3 Service Area Climate

Santa Cruz enjoys a pleasant Mediterranean climate that is characterized by warm, mostly dry summers and mild, wet winters. Due to its proximity to Monterey Bay, fog and low overcast are common during the night and morning hours, especially in the summer. Monthly and annual climate data for Santa Cruz are shown in Table 3-1 below.

Mean monthly temperatures range between 52 to 65 degrees Farenheit (F), with the warmest weather usually occurring during August and September. Extreme temperatures are rare and short-lived, with weather conditions being moderated by the oceanic influence and presence of summer fog.

Rainfall in Santa Cruz averages 31.35 inches annually, but varies considerably from year to year as shown in Table 3-1. The bulk of seasonal rainfall occurs between November and March. In the watershed above the City's Loch Lomond reservoir in the Santa Cruz Mountains, rainfall averages nearly 50 inches per year.

Table 3-1: Climate Data for Santa Cruz (Current 30-year Normal)

Climate Data for Santa Cruz													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean High Temp (F)	62.2	64.4	66.4	69.5	71.9	74.7	75.3	76.2	76.4	73.2	66.8	61.9	69.9
Mean Low Temp (F)	41.3	43.3	44.4	46.0	48.9	51.8	54.0	54.3	53.0	49.5	44.9	41.2	47.7
Mean Temp (F)	51.9	53.8	55.4	57.8	60.4	63.2	64.7	65.2	64.7	61.4	55.8	51.5	58.8
Precipitation (in)	6.28	6.24	4.63	1.97	0.84	0.19	0.01	0.04	0.27	1.45	3.75	5.68	31.35
Evapotran-spiration (in)	1.5	1.8	2.6	3.5	4.3	4.4	4.8	4.4	3.8	2.8	1.7	1.2	36.6
NOTES: National Climatic Data Center 1981-2010 Monthly Normals; CA Department of Water Resources													

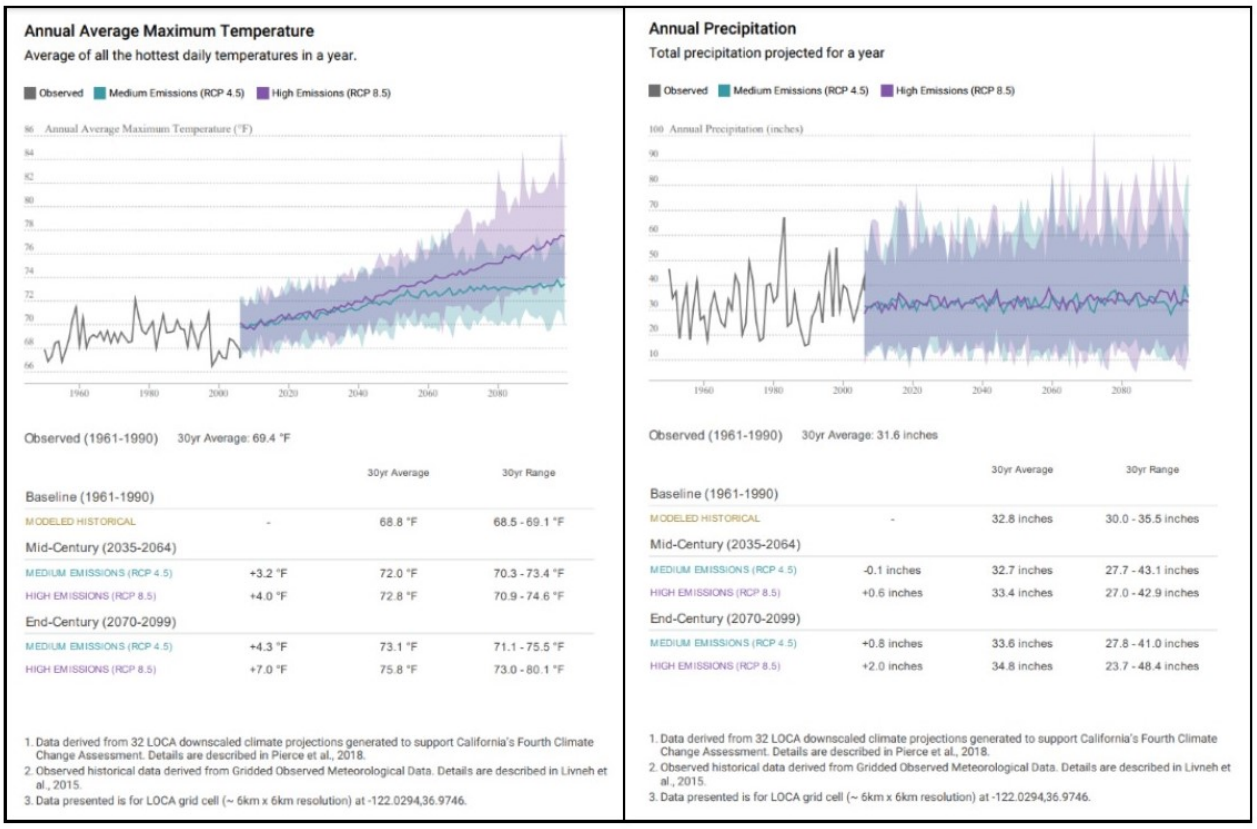
Reference evapotranspiration - a standard measurement of environmental parameters used for determining irrigation needs - averages 39.0 inches per year in Santa Cruz. Average monthly evapotranspiration varies seasonally from a low of 1.2 inches in December and January to a high of 5.1 inches in June (DWR, 2012).

Like other coastal communities, the marine influence on local air temperature, humidity, and cloud cover helps keep demand for water relativity low in the City's service area.

The presence of summer fog moderates outdoor water use during peak summer season compared to inland locations within Santa Cruz County and elsewhere in California.

Future average temperatures in Santa Cruz are expected to increase due to the effects of climate change. Figure 3-4 below shows two projections of mean temperature to 2100 under different climate change scenarios from the Cal-Adapt Local Climate Change Snapshot (Cal-Adapt.org, 2021) [2]. A temperature increase of between 4.3 and 7.0 degrees F compared to the historic average is predicted by the end of the century. Cal-Adapt models of future mean annual precipitation also show a slight increase over time. An increase in precipitation ranging from 0.8 inches to 2.0 inches compared to the historic average is predicted by the end of the century.

Figure 3-4. Projected Mean Temperature and Annual Precipitation for Santa Cruz



Source: Cal-Adapt, 2021

[2] The Local Climate Change Snapshot tool was generated by Cal-Adapt to support California's Fourth Climate Change Assessment. For water supply planning purposes, the City utilizes the CMIP5 climate change model for analyses in this Urban Water Management as described in Chapter 6. Section 6-10.

The City's Climate Adaptation Plan Update 2018-2023, and appendix to the City's Local Hazard Mitigation Plan Five Year Update 2018-2023 indicates changing temperatures and precipitation will impact ecosystems, fire risk, water quality and quantity, human and environmental health (City of Santa Cruz, 2018). As a coastal community, the City of Santa Cruz recognizes the significance of climate change to the City's economic well-being, public health, and environment, and has begun taking steps as a local agency to respond. Impacts of ongoing climate change on water demand, water supply, and water system reliability are discussed further in Chapters 4, 6, and 7.

3.4 Service Area Population and Demographics

The current population residing in the Santa Cruz water service area is estimated to be 96,186 people. Approximately two thirds of the total population, over 64,000, lives inside the City limits. The University of California, Santa Cruz campus houses about 9,000 students on campus within City limits; although a majority of the campus was closed during 2020 due to the COVID-19 pandemic[3]. It is estimated that almost 32,000 people, or about one third of the service area population, live outside the City limits. Since the 2010 US Census, the water service area population has grown by almost 5,000 persons, mostly inside the City limits.

Table 3-2 shows the current and projected population for the water service area out to 2045, in five-year increments.

The 2020 population estimate is based upon California Department of Finance estimates for population within the City of Santa Cruz, and a "persons-per-connection" method for population outside City limits, consistent with methodology required to demonstrate compliance with SB X7-7 (see Chapter 5). Population projections were developed by M.Cubed as part of the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (Appendix D) and are based on the Association of Monterey Bay Area Governments (AMBAG) 2022 Regional Growth Forecast (AMBAG, 2020) and coordination with local jurisdictions[4]. According to the forecast, the total number of people receiving water service is expected to grow by about 17,500 people and reach slightly more than 113,500 in 2045. This equates to a population growth rate of less than one percent per year.

[3] For information on COVID-19 related impacts to water demand in 2020, see Chapter 4, Section 4.4.
[4] Future housing growth in within the service area in City of Capitola is expected to be driven by the proposed Capitola Mall redevelopment project. The project could to add 637 new housing units, and this forecast assumes this new housing will in use by 2030.

Table 3-2: Population Current and Projected (submittal table 3-1R)

Population - Current and Projected						
Population Served	2020	2025	2030	2035	2040	2045
	96,168	101,964	106,072	109,193	112,853	113,650
NOTES: 2020 population from City of Santa Cruz. Population projections from Update of the City of Santa Cruz's Long-Range Water Demand Forecast prepared by M.Cubed (M.Cubed, 2021) (UWMP Appendix D).						

Demographic information is presented in Table 3-3. In addition to information for the City of Santa Cruz, information for the State of California is included for comparison.

Table 3-3: Demographics for City of Santa Cruz and California

Demographics (2019)		
	City of Santa Cruz	California
Median Age (years)	28.8	36.5
Racial Makeup – race alone or in combination with one or more other races (%)		
White	78.3	63.6
Black or African American	4.7	7.0
American Indian and Alaska Native	3.0	2.0
Asian	13.9	17.1
Native Hawaiian	0.3	0.8
Some other race	8.8	14.9
Hispanic or Latino of any race (%)	25.6	39.4
Mexican	18.8	32.6
Puerto Rican	0.8	0.6
Cuban	0.3	0.2
Other Hispanic or Latino	5.8	6.0
Educational Attainment (%)		
Bachelor's Degree or Higher	53.8	33.9
Primary Language Spoken at Home (%)		
English Only	93.8	82.2
Limited English-Speaking Households	2.7	8.9
Median Household Income ($)	77,921	75,235
Population below Federal Poverty Level (%)	20.9	13.4

Source: American Community Survey (ACS) Data: https://data.census.gov/cedsci/

3.5 Land Use and Housing

All three jurisdictions served by the Santa Cruz water system (Cities of Santa Cruz and Capitola and the County of Santa Cruz) have general plans, local coastal programs, zoning regulations, and development standards that determine the location, type, and density of growth allowed in the region. The General Plan serves as the principal policy and planning document guiding long-range land use and conservation decisions in cities and counties.

The cities of Santa Cruz and Capitola have both completed comprehensive updates to their General Plans within the last ten years. The City of Santa Cruz General Plan timeline extends to 2030, and the Capitola General Plan, updated in 2019, has a 20 to 30 year planning horizon. The County is currently developing a comprehensive update to its General Plan which was adopted in 1994. The Sustainability Policy and Regulatory Update (Sustainability Update), is expected to be completed in 2022 and also includes updates to the County's Local Coastal Program and modernization of the County Code. The County has also adopted a Sustainable Santa Cruz County plan addressing sustainable land use, housing, economic development, and transportation objectives in the urban area of the County, part of which is served by the City's water system (Santa Cruz County, 2015). The time horizon of that plan is through 2035.

In addition to city and county General Plans, the University of California, Santa Cruz has Long Range Development Plans (LRDPs) for both its main campus (UCSC, 2005) and its marine science campus (UCSC, 2008, revised 2013) located on the southwestern edge of the City. These plans provide a comprehensive framework to guide physical development, land use, and resource protection to meet the University's academic and institutional objectives through the year 2020. The University released an updated draft 2021 LRDP for its main campus and an associated Draft Environmental Impact Report (EIR). The University is currently in the process of finalizing the LRDP and EIR, but information from the draft 2021 LRDP was used here to inform the development of projected population and demand estimates (Appendix D).

The size of the City water service area has remained relatively fixed over time due to a long-standing prohibition against new water connections along the north coast, the acquisition of open space lands which created a greenbelt around the City, and the County's urban services boundary, all of which have served to inhibit urban sprawl. Accordingly, most growth and redevelopment that does happen going forward is expected to be concentrated within the confines of the existing service area boundary. Any proposed changes to the City's service area boundary that do come forward are

subject to approval by both City Council and the Santa Cruz Local Agency Formation Commission (Santa Cruz LAFCO).

The City's land use patterns are the result of historic development, the establishment of the University of California, Santa Cruz campus in 1964, and more recent land use policies established by the City. The Water Department serves all areas within the City. Land use within the City consists of a mix of residential, commercial, mixed use, office, industrial, public and institutional, park, open space, parking, and vacant land uses. Within the County of Santa Cruz, the areas served by the Water Department include a portion of the Live Oak Plan area, including all of the Pleasure Point Community Plan area. Land use in this area is predominantly residential with a mix of commercial, office, light industrial, open space, parks and public facilities. Within the City of Capitola, the Water Department serves a portion of the 41st Avenue West Capitola residential neighborhood and a portion of the 41st Avenue/Capitola Mall commercial district which includes the Capitola Mall (a region serving shopping plaza), an auto plaza, two hotels as well as a variety of other retail, office, and service establishments within the service area.

Within the City of Santa Cruz, only a small amount of land remains undeveloped. The same is true in the parts of the County and City of Capitola served by the City. Because of the relative scarcity of undeveloped land, the majority of future growth in the area is likely to be achieved through redevelopment, remodeling, increased density on underutilized land, and infill development in the urban core and along major transportation corridors, along with new construction on the limited amount of undeveloped land remaining. Within the City of Capitola, the Capitola Mall is a region serving shopping plaza planned for redevelopment currently including 637 new residential units proposed at conceptual level design.

Many of the major decisions made by local governing bodies about public improvements and private development are also subject to the review and oversight of, or may be appealed to, the California Coastal Commission. Accordingly, major changes within the City water service area tend to occur slowly, if at all, and only after exhaustive public process.

According to utility billing records, there are some 37,701 housing units within the City's water service area. The number of housing units, broken down by account type and jurisdiction is shown in Table 3-4 below. Approximately 19,095, or a little over half of all

households in the service area are classified as single family accounts[5]. The other 18,606 homes are multiple family dwelling units consisting of various housing types including duplexes, condominium and townhouse complexes, apartments, mobile homes and alternative housing types such as live/work units, mixed use development, single room occupancy, and accessory dwelling units. A large proportion of the local housing stock (over 50 percent) is rented. The figures below do not include dormitory rooms, apartments, and other housing units located on the UC Santa Cruz main campus, nor does it include residential units associated with mixed use/commercial accounts.

Table 3-4: Housing Units within Area Served

Housing Units, by Account Type and Jurisdiction			
Jurisdiction	Single Family	Multi-family	Total
City of Santa Cruz	12,287	10,568	22,852
County of Santa Cruz	6,665	7,919	14,584
City of Capitola	146	119	265
Total within Area Served	19,095	18,606	37,701
NOTES: 2020 Annual Sales Report, EDEN Multi-residential units counts report Jul 22, 2021			

Each of the three jurisdictions served by the City has an adopted Housing Element that addresses its required regional fair share of the statewide housing needs established by AMBAG. These documents set forth goals and objectives for housing construction, rehabilitation, and conservation for the period through 2023.The housing elements include regional housing goals for the three jurisdictions served by the City. For this housing element cycle, the City is planning for an additional 747 units. The County is planning for a total of 1,837 units to be built Countywide through 2023. Capitola has a goal to construct 143 units by 2023 in its housing element. Only a portion of the housing within the County and City of Capitola is expected to be within the Santa Cruz Water Department service area. Together, these Housing Elements project a total residential development potential in the near term of about 1,149 new homes within the service area, of which an estimated 414, about one-third, are planned for low-income categories.

[5] Water account categories are not the same as housing type. A single family account has one dwelling unit per meter, but may be any type of residence. A multifamily account has two or more dwelling units per meter.

The Update of the City of Santa Cruz's Long-Range Water Demand Forecast (Appendix D), includes an updated housing estimate for 2020 and a forecast through 2045 broken down by forecasts for housing growth in the service area by inside-City and outside-City. In 2020, total combined occupied and unoccupied housing units within the service area were estimated to be 38,751, and the total number of housing until is projected by 2045 to grow by 3,575 to 42,326.

It is important to note that while each jurisdiction must demonstrate it has land zoned that can accommodate its fair share of the regional housing needs, it does not necessarily mean such housing actually will be constructed. Some of the units projected above are already permitted and under construction. In the last five years, 70 new single-family accounts and 634 multifamily accounts have been added to the service area. The City now incentivizes smaller, more vertical, mixed-use or multifamily-type housing units along its major transportation corridors, and State law has streamlined approvals of Accessory Dwelling Units. What type of housing is ultimately built, though, will depend largely on market forces. And despite the collective vision for increased housing in the community, actual progress remains slow.

3.6 Employment and the Economy

Overall, the University of California, Santa Cruz is a key component of the region's economic fabric in terms of employment, spending, research, and business creation. It is the area's largest single employer. Other top employers include the County of Santa Cruz, City of Santa Cruz, Plantronics, and the Santa Cruz Beach Boardwalk. Tourism and lodging are additional major economic drivers in the community. Commercial development is centered in downtown Santa Cruz including River Street, around 41st Avenue in Capitola, and along the major transportation corridors including Mission, Ocean and Water Streets, and Soquel Avenue. The Harvey West area and west side of Santa Cruz support a diverse mix of light industry, retail, high tech, research, and consumer goods and service enterprises. Regional hospitals, medical and health care facilities and services are concentrated along Soquel Drive in unincorporated Santa Cruz County. Like other coastal communities, housing supply in the service area remains limited and housing affordability is a major economic, political, and social issue for families, residents, and employers alike.

The State Employment Development Department estimates employment within the City's water service area in the second quarter of 2020 (the most recent quarter for which complete data exists) to be about 38,061. The three largest employment sectors are health care and social assistance, educational services, and retail trade (Table 3-5). There are significant reductions in employment noted since 2015, particularly in the retail trade sector likely due to the impact of the global COVID-19 pandemic and economic shut down which occurred in spring of 2020.

Nationally, the U.S. economy lost 22 million jobs between February and April 2020, and the job loss in March and April of 2020 had no precedent since the end of World War II (U.S. Bureau of Labor Statistics, 2020). The City saw an increase in unemployment of more than 7% between the end of 2019 and the end of 2020. Likewise, the City saw decreases in new small businesses and significant decreases in hotel occupancy rates (50 to 75 percent between March and June 2020). Commercial vacancy rates in the City of Santa Cruz increased more than four-fold between the fourth quarters of 2019 and 2020, while the City of Capitola and County of Santa Cruz saw vacancy rates double over the same timeframe. COVID-19 impacts on business water use are discussed in Chapter 4.

Table 3-5: Employment within the Service Area

Employment in Santa Cruz Water Service Area, 2020 second quarter		
Major Industry NAICS Sector	Business Establishments	Employment
AGRICULTURE, FORESTRY, FISHING & HUNTING	15	97
MINING	1	**
UTILITIES	2	**
CONSTRUCTION	290	1,600
MANUFACTURING	131	1,794
WHOLESALE TRADE	104	652
RETAIL TRADE	382	4,604
TRANSPORTATION & WAREHOUSING	46	948
INFORMATION	51	288
FINANCE & INSURANCE	99	707
REAL ESTATE & RENTAL & LEASING	167	496
PROFESSIONAL, SCIENTIFIC, & TECHNICAL SERVICES	419	2,274
MANAGEMENT OF COMPANIES AND ENTERPRISES	9	627
ADMIN & SUPPORT & WASTE MGMT & REMEDIATION	134	1,291
EDUCATIONAL SERVICES	107	6,381
HEALTH CARE & SOCIAL ASSISTANCE	1,158	8,502
ARTS, ENTERTAINMENT, & RECREATION	59	885
ACCOMMODATION & FOOD SERVICES	331	3,266
OTHER SERVICES	250	1,359
NON-CLASSIFIED	*	*
GOVERNMENT	18	2,273
TOTAL	3,773	38,061

NOTES: Data and GIS analysis by Labor Market Division of the California Employment Development Department. www.labormarketinfo.edd.ca.gov . April 2021.

* No data
** Data are confidential and suppressed

Chapter 4

SYSTEM WATER USE

This chapter describes the City's customer classification system, summarizes trends in water consumption, and presents projections of water use out to the year 2045. It also covers water for low-income housing units, future water savings, expected water savings from plumbing codes and standards, and information on distribution system losses.

4.1 Customer Classification System

The City divides its water customers into eight major classes and one miscellaneous category, as follows. In addition to designating accounts into various customer classes. As of 2020, the City also grouped its customers into either "inside-City" or "outside-City" categories for billing purposes.

Single-Family Residential: Individually metered residential units (regardless of housing type).

Multiple-Family Residential*:* Any residential account with more than one dwelling unit served by one water meter.

Business: Commercial establishments including restaurants, hotel/motel, retail, medical, schools, offices, churches and mixed-use buildings. This category also includes county and state government accounts.

Industry/UCSC: This category is comprised of one primary customer - the University of California, Santa Cruz - and a small number of manufacturing businesses.

Municipal: These are City-owned and operated facilities such as city offices, parks, police and fire stations, a wastewater treatment plant, street medians, and parking lots.

Irrigation: Dedicated water services for landscape irrigation associated with large multiple residential complexes and homeowners associations, or with commercial, industrial, and institutional sites, including schools, churches, parks, etc.

Golf Irrigation: Accounts serving the two golf courses in the service area.

Coast Irrigation: Agricultural accounts receiving untreated or “raw” water on the north coast.

Other: Miscellaneous uses such as temporary construction accounts, hydrant meters, and bulk water sales.

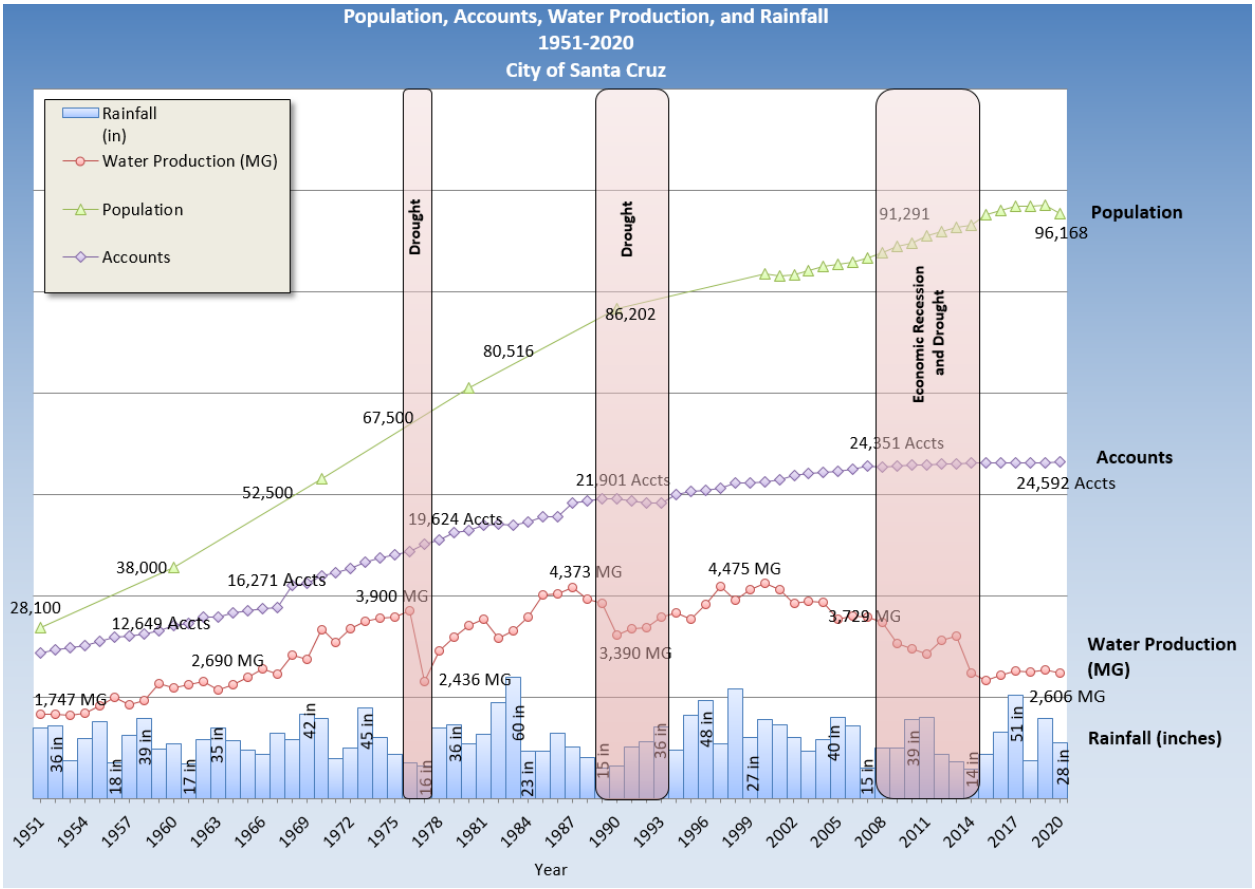
While not customer classes, water transfers and ASR are accounted for in consumption data. As part of the City’s implementation of the Water Supply Augmentation Strategy (WSAS) (see section 6.8), beginning in 2018, the City began piloting water transfers to the Soquel Creek Water District under the “Cooperative Water Transfer Pilot Project for Groundwater Recharge and Water Resource Management”, and beginning in 2019, the City began piloting aquifer storage and recovery (ASR) at existing groundwater wells in the Beltz well system.

Except for coast irrigation accounts that receives raw water, all water supplied is potable water. The City does not currently provide recycled water within its service territory; although, recycled water is supplied to the Pasatiempo Golf Course, which is within the City of Santa Cruz service area, through an agreement with the City of Scotts Valley.

4.2 Historical Water Use

The overall trend in population, number of accounts and total annual water use going back to the 1950s is presented in Figure 4-1.

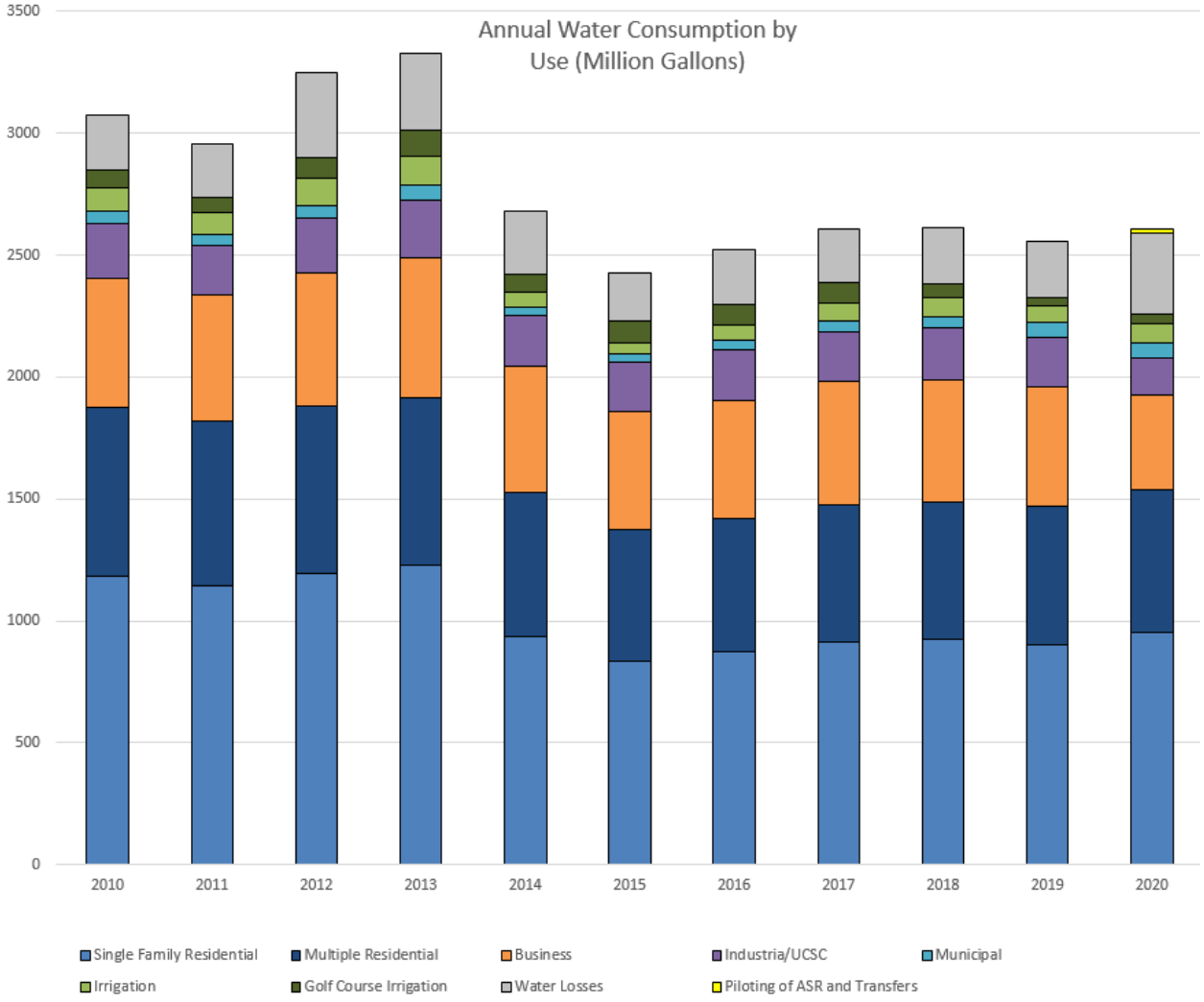
Figure 4-1: Historic Trends for City of Santa Cruz



Until the early 2000s, the general trend in system demand was one in which water use rose roughly in parallel with account and population growth over time, except during two major drought periods in the late 1970s and the early 1990s. Around 2000, this pattern changed and system demand began a long period of decline, accelerated by pricing changes, drought, economic downturn, and other factors including the influences of active conservation programs and updated plumbing codes.

In 2015, after two years of water rationing, annual water use fell to a level of about 2.5 billion gallons, similar to the level experienced during the 1970s drought. In 2020, demand was still at a similar level as 2015, about 2.6 billion gallons, despite several years above long-term average rainfall from 2016 and 2020. While demand did rebound following droughts in the 1970s and 1980s, demand has not rebounded to pre-drought conditions following 2014, contrary to previous projections. A breakdown of annual water consumption by the City's major customer classes since 2010, along with system water losses, is illustrated in Figure 4-2.

Figure 4-2: Annual Water Consumption by Use (million gallons)



4.3 2020 Demands by Sector

Actual demands for potable and non-potable water in calendar year 2020 are reported by use type in Table 4.1 below.

Table 4-1: Demand for Potable and Non-Potable Water (submittal table 4-1R)

Demands for Potable and Non-Potable[1] Water – Actual			
Use Type	2020 Actual		
	Additional Description (as needed)	Level of Treatment When Delivered	Volume (MG)
Single Family	Individually metered dwellings	Drinking Water	952
Multi-Family	2 or more dwelling units	Drinking Water	588
Commercial	Business	Drinking Water	388
Industrial		Drinking Water	39
Industrial	University of California, Santa Cruz -Main Campus	Drinking Water	4
Industrial	University of California, Santa Cruz - Coastal Campus	Drinking Water	106
Institutional/Governmental	Municipal	Drinking Water	66
Landscape	Dedicated irrigation accounts	Drinking Water	77
Landscape	Golf irrigation - potable water	Drinking Water	39
Other Potable	Piloting Aquifer Storage and Recovery at Betlz Well 8	Drinking Water	4
Sales/Transfers/Exchanges to other Suppliers	Piloting Transfers t to Soquel Creek Water District	Drinking Water	13
Losses		Drinking Water	331
		TOTAL	2,606

[1] *Recycled water demands are not reported in this table.*

NOTES: System water losses are considered provisional until 2020 annual water audit is completed. High losses could be attributable to meter failures. A system-wide meter replacement program is underway in 2021. Figures above do not include raw water sales of 6MG in 2020 for coastal irrigation. No drinking water was otherwise used for groundwater recharge, saline water intrusion barrier, or wetlands or wildlife habitat.

In addition to the potable water demand listed below, the City also supplied 6 million gallons of raw water to coast irrigation accounts in 2020. Recycled water demand at Pasatiempo Golf Course is reported separately in table 4.3 below.

Provisional water losses were reported to be 331 million gallons representing a noticeable increase over the long-term average. While, this value is considered provisional until the 2020 annual water audit is completed, the increased water loss is believed to be attributable to an increasing number of meter failures throughout the system. The City is slated to begin a system-wide replacement of its metering system in fall 2021. This project will replace all meters that are older than three years and outfit all meters with an Advanced Metering Infrastructure (AMI) radio over a 15-month period.

4.4 Water Demand Projections

The forecast of future water demand is a foundational component of any Urban Water Management Plan. In 2014 and 2015, the City of Santa Cruz worked with M.Cubed to develop a long-term water demand forecast using econometric forecasting for the first time that was used in the 2015 Urban Water Management Plan, and that demand forecast was updated in 2021 for use in this 2020 Urban Water Management Plan. Appendix D includes a summary and results from M.Cubed's forecasting work.

Econometric demand forecasting develops statistically-based models of average water use per service by customer class. The 2015 demand forecast was developed based on these models and incorporating empirical relationships between water use and key explanatory variables, including season, weather, water rates, household income, employment, conservation, and drought restrictions. Monthly models of water demand were then combined with service and housing growth forecasts to predict future water demands. The approach built on similar models of water demand developed for the California Urban Water Conservation Council (Western Policy Research, 2011), Bay Area Water Supply and Conservation Agency (Western Policy Research, 2014), California Water Service Company (A&N Technical Services, 2014, M.Cubed 2015), and Contra Costa Water District (M.Cubed 2014).

Water use was rationed by the City of Santa Cruz in 2014 and 2015 due to severe drought conditions. In the years following the end of rationing, water sales remained significantly below the long-term projections included in the 2015 Urban Water Management Plan. Following up on the 2015 work, M.Cubed prepared a comparative analysis for the calendar year 2018 to analyze the divergence between projected and actual sales. After normalizing for weather, the forecast was found to be approximately 19% greater than actual sales in this year. The divergence of the forecast from actual sales coincided with changes to the City's water rate structure adopted in 2016. The

new rate structure resulted in significant increases in the marginal cost of water service. Most of the forecast error was found to be driven by the increase in the marginal cost of water service. Weather was not found to be a significant explanatory factor, nor were differences in actual and projected sales to large customers (UCSC and the two golf courses).

Subsequently, M.Cubed updated its long-term forecast for this 2020 Urban Water Management Plan in 2021, adjusting to reflect the higher marginal cost of water service and incorporating other updated information. This update included:

- Updated service area population, land use and housing projections consistent with Association of Monterey Bay Area Governments projections[1],
- Updated baseline estimates of average water use per service connection by customer class based on customer-level billing data,
- Adjustment to baseline averages use estimates to account for the effects of plumbing codes, on-going conservation, and marginal water service cost,
- Adjustment to projections for future water demands of the University of California Santa Cruz, based on their 2020 draft Long-Range Development Plan, and
- Accounting for COVID-19 pandemic on current and future water use.

The resulting water demand projection predicated on average weather and normal (predicted) income and growth, by customer class, is presented in Table 4-3. For reference, the 2015 demand forecast projected stable demand of 3.4 billion gallon per year for 2020 through 2035 with only very slight increase in demand over this period. As summarized below, current expectation for water system demands are for demand to increase at a slow rate from about 2.6 billion gallons per year in 2020 to about 2.7 billion gallons per year with total water use projected to be about 2.8 billion gallons per year in 2045.

[1] Future housing growth in within the service area in City of Capitola is expected to be driven by the proposed Capitola Mall redevelopment project. The project could to add 637 new housing units, and this forecast assumes this new housing will in use by 2030.

Table 4-2: Projected Water Use (submittal table 4-2R)

Use for Potable and Non-Potable[1] Water - Projected						
Use Type	Additional Description (as needed)	Projected Water Use (MG) *Report To the Extent that Records are Available*				
		2025	2030	2035	2040	2045
Single Family	Individually metered dwellings	954	952	958	966	974
Multi-Family	2 or more dwelling units	604	608	602	607	611
Commercial	Business	504	488	464	458	462
Industrial		37	37	37	37	37
Institutional/Governmental	Municipal	54	51	47	47	47
Landscape	Dedicated irrigation accounts	77	69	59	58	59
Landscape	Golf irrigation - potable water	44	40	36	35	35
Institutional/Governmental	University of California, Santa Cruz - Main Campus	10	15	21	26	26
Institutional/Governmental	University of California, Santa Cruz - Coastal Campus	152	199	245	292	292
Losses		197	199	200	204	206
TOTAL		**2,633**	**2,659**	**2,668**	**2,730**	**2,749**

[1] *Recycled water demands are NOT reported in this table.*

NOTES: Excludes 12 MG of projected raw water use for North Coast agriculture projected for 2025 through 2045. Raw water demand is not incorporated into the City's Confluence water supply model. Projected water use is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (UWMP Appendix D).

Compared to water use in pre-pandemic years 2018-2019, water use in 2020 during the global COVID-19 pandemic was significantly lower for business use and slightly higher for residential water use. The change in business water use is thought to be a consequence of the Governor's shelter-in-place order and business restrictions put in place in response to the pandemic. Observed changes in residential water use can be attributed to both the pandemic and to weather differences. See Chapter 3, Section 3.6 for additional discussion of local economic impacts of the COVID-19 pandemic.

Current and projected total water use, including recycled water use as described in Chapter 6, are presented in Table 4-3.

Table 4-3: Total Water Use (submittal table 4-3R)

Total Water Use (Potable and Non-Potable)						
	2020	2025	2030	2035	2040	2045
Potable Water, Raw, Other Non-potable	2,606	2,633	2,659	2,669	2,730	2,749
Recycled Water Demand	36	35	35	35	35	35
TOTAL WATER USE	2,642	2,668	2,694	2,704	2,765	2,784
NOTES: Projected water use is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (UWMP Appendix D).						

4.5 Estimating Future Water Savings

Current levels of customer demand and the long term forecast indicate that the Santa Cruz community has already achieved levels of water conservation well beyond the levels of anticipated in the 2015 Urban Water Management Plan and well beyond the levels forecasted by implementation of the City's 2017 Water Conservation Master Plan (WCMP), and has done so without the anticipated spending on implementation the WCMP.

As described in Appendix D, the City of Santa Cruz Updated Long-Range Water Demand Forecast includes passive savings from plumbing code effects. In the forecast, the baseline average water use per service was developed based on observed water use in each customer category. Baseline average use was then adjusted over the forecast period for the effects of plumbing codes, and changes in marginal water service costs. Indoor residential water use was adjusted for plumbing code effects, with a floor of 36 gallons per capita day (gpcd) set. This floor is set because 36 gpcd is the average water use of highly efficient WaterSense retrofitted households, as measured by the 2016 Residential End Uses of Water Study (Water Research Foundation 2016), and average indoor water use is not expected to fall below this already highly efficient level. Non-residential baseline water use per service, other than Industrial, was also adjusted for plumbing codes effects.

In this demand projection, water savings from the City of Santa Cruz water conservation programs were assumed to be subsumed within adjustments made to marginal water costs. This is because as marginal water cost increases, customers demand less water by forgoing consumption and by substituting other factors of production. For example, households may install more efficient water using appliances or change their landscaping and irrigation practices. Utility conservation programs, such as the City of Santa Cruz Conservation program, facilitate these transitions. In other words, the price change motivates program participation. The estimates of price elasticity used in the demand forecast capture these dynamics.

Plumbing code effects in the demand projection were derived from estimates prepared by M.Cubed for the California Department of Water Resources (M.Cubed 2016). Plumbing code and appliance efficiency standards considered include:

- AB 715, enacted in 2007, requiring standards for toilets and urinals.
- Water use standards for residential and commercial clothes washers and dishwashers established by the U.S. Department of Energy.
- CalGreen Code requirements for new construction and renovation.
- SB 407, enacted in 2009, requiring compliance with plumbing fixture standards for all buildings in California by 2019. SB 407 also requires compliance or disclosure of non-compliant plumbing to a purchaser or transferee for single family, multi-family, or commercial transactions.
- SB 837 passed in 2011, which reinforces the disclosure requirement under SB 407.

Table 4-4: Inclusion in Water Use Projections (submittal table 4-5R)

Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections?	Yes
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found.	2020 Urban Water Management Plan Chapter 4, Section 4.5
Are Lower Income Residential Demands Included In Projections?	Yes

4.6 Water Use for Lower Income Households and Affordability

In its demand forecast, the City expects over 1,000 new housing units to be built in its service area by 2045. Chapter 3, Section 3.5, Land Use and Housing, provides details about these housing units, including units that are planned for lower income categories. The water demand for these low-income units, while not separately calculated, is well within the range of housing units factored into the City's demand forecast.

The City of Santa Cruz also recently completed an updated Water/Sewer Affordability Analysis (Appendix E) to help support the City's water rate setting process. The analysis was conducted for each census block in the City's water service area and was focused on the affordability of essential water use for both single and multi-family residential customers. The analysis is planned to be updated to assess how affordability may change as a result of the proposed rate restructuring.

Key findings of the 2020 study included:

- Essential water and sewer service in Santa Cruz remain affordable for most customers.
- Approximately 20% of households served by the City of Santa Cruz are located within census blocks with high affordability ratios indicating that water and sewer service costs may constitute a financial burden.
- Approximately 16% of households are located within census blocks where the financial burden of water and sewer service costs were scored high due to both high affordability ratios and high poverty prevalence. These customers are most likely to struggle with meeting basic living expenses, of which water and sewer service are a part.

4.7 Distribution System Water Losses

The volume of total system water demand is composed primarily of metered water sales in addition to a range of authorized, metered and unmetered operational uses such as main flushing, water tank maintenance, firefighting, and sewer flushing, as well as losses due to underground leaks. The difference between the amount of water produced at the City's water treatment plants entering the distribution system and the amount of water consumed, including both metered and unmetered uses, is referred to as system water losses. System losses have two components: physical losses from leaking service lines and water mains, and apparent losses in which actual consumption is underreported due to sales meter inaccuracies and other factors.

The City has conducted audits of the distribution system annually since the late 1990's to account for unmetered water uses and to track how much water is lost to leakage over time. The City uses AWWA water balance software to help quantify and track water losses associated with the water distribution system and identify areas for improved efficiency and cost recovery. Total water losses vary from year to year, averaging 221 million gallons per year from 2015 to 2019.

The volume of water loss for calendar year 2015 through 2019, which is the most recent five years of data available, is presented in Table 4-5. In 2018, the City concluded a four-year Water Loss Control program to examine the City's water system and operations practices to better validate where losses are occurring, evaluate options, and set forth a formal strategy to improve water accountability and reduce the annual volume of Non-revenue water. Provisional water losses for 2020 are provided in Section 4.3. More information on distribution system water losses is covered in Chapter 9.

Table 4-5: Water Loss Audit Reporting (submittal table 4-4R)

Last Five Years of Water Loss Audit Reporting	
Reporting Period Start Date	Volume of Water Loss (MG)
2015	198.34
2016	226.825
2017	219.609
2018	232.296
2019	225.729
NOTES: 2020 annual audit data not yet available.	

4.8 Climate Change Impacts on Water Use

The City's analysis and exploration of potential climate change effects on water system supplies are described in Chapter 6, Section 6.10, and consideration of potential climate change effects on system reliability are further included in the analyses in Chapter 7.

Using parameters from the econometric demand models, weather effects on City water demand were investigated using historical data on sales and weather and expressed as the expected change in demand per a one degree F increase in average maximum daily air temperature over the entire year (M.Cubed, 2016). The analysis showed, based on water use patterns, demand would increase from between 0.19 to 1.38 percent for one degree increase in average daily high temperature for every customer group except industrial. Results are summarized in Table 4-6.

Golf consumption s expected to have the largest increase in demand due to change in maximum daily temperature and multifamily consumption is the least responsive. Total system demand would be expected to increase by about 0.45 percent per one degree F increase in average daily high temperature. Therefore, in the higher scenario for projected temperature for the end of the century (2070 – 2099) shown in Figure 3-4, if average temperature in Santa Cruz were to rise by 7 degrees, water demand could be expected according to this analysis to increase by 3.2 percent.

Table 4-6: Expected Change in Demand per Change in Monthly Temperature

Expected Percent Change in Demand per 1 Degree Fahrenheit Change in Monthly Average Maximum Daily Air Temperature	
SFR	0.62
MFR	0.19
BUS	0.29
MUN	1.09
IRR	0.80
GOLF	1.38
IND	0.00
Weighted Average	0.45
NOTES: M.Cubed, 2016. UCSC not listed since it was not modeled in econometric demand forecast.	

Chapter 5

SB X7-7 BASELINES AND TARGETS

This chapter provides a description and calculations for the City's baseline daily per capita water use and future water use targets, in accordance with technical methods developed by the California Department of Water Resources, as required by Water Code section 10608.

> ***CWC 10608.20***
>
> ***(e)*** *An urban retail water supplier shall include in its urban water management plan . . . the baseline daily per capita water use, urban water use target, interim water use target, along with the bases for determining those estimates, including references to supporting data.*

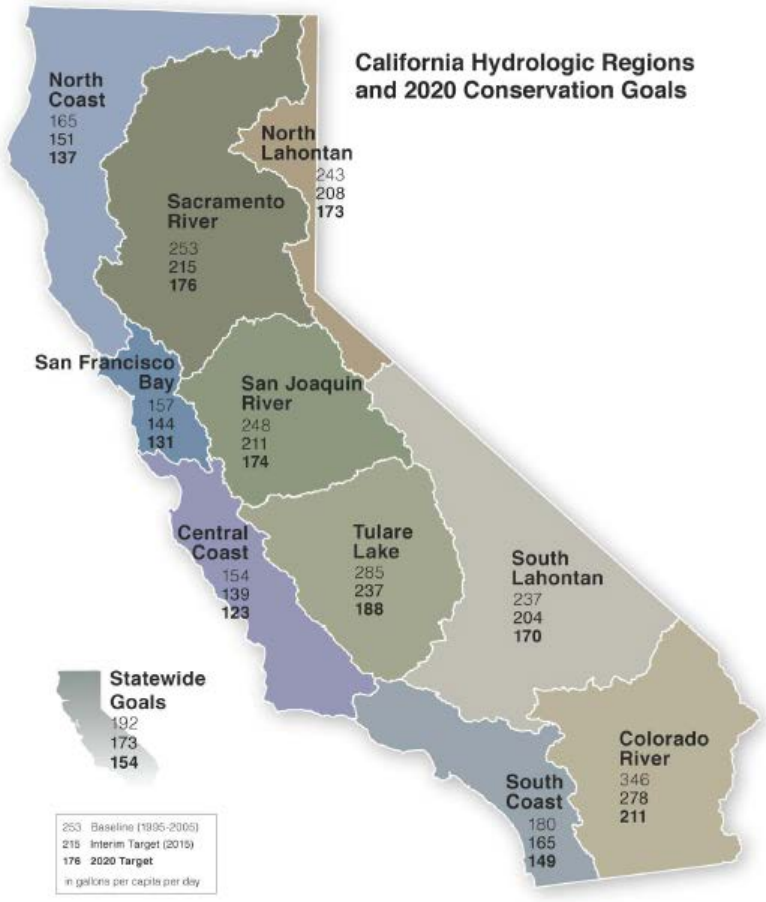
5.1 Background Information

In February 2008, the Governor introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. As part of this effort, the Governor directed state agencies to develop a plan to reduce statewide per capita water use by 20 percent by the year 2020.

The final 20x2020 Water Conservation Plan was issued February 2010 (DWR, 2010). It reported urban water use varied between 152 GPCD in the Central Coast region (Region 3) to 346 gallons per capita per day (GPCD)[1] in the Colorado River region (Region 10) and averaged 192 GPCD statewide. The report concluded that California could achieve a 20 percent reduction in urban per capita water use to an average of 154 GPCD using current and new conservation actions. It also established for water resources planning purposes baseline values and future water use targets for each of the state's ten hydrologic regions, summarized in Figure 5-1.

[1] Gallons per capita per day or GPCD is the total number of gallons used by the region divided by the population

Figure 5-1: Regional Urban Water Use Targets



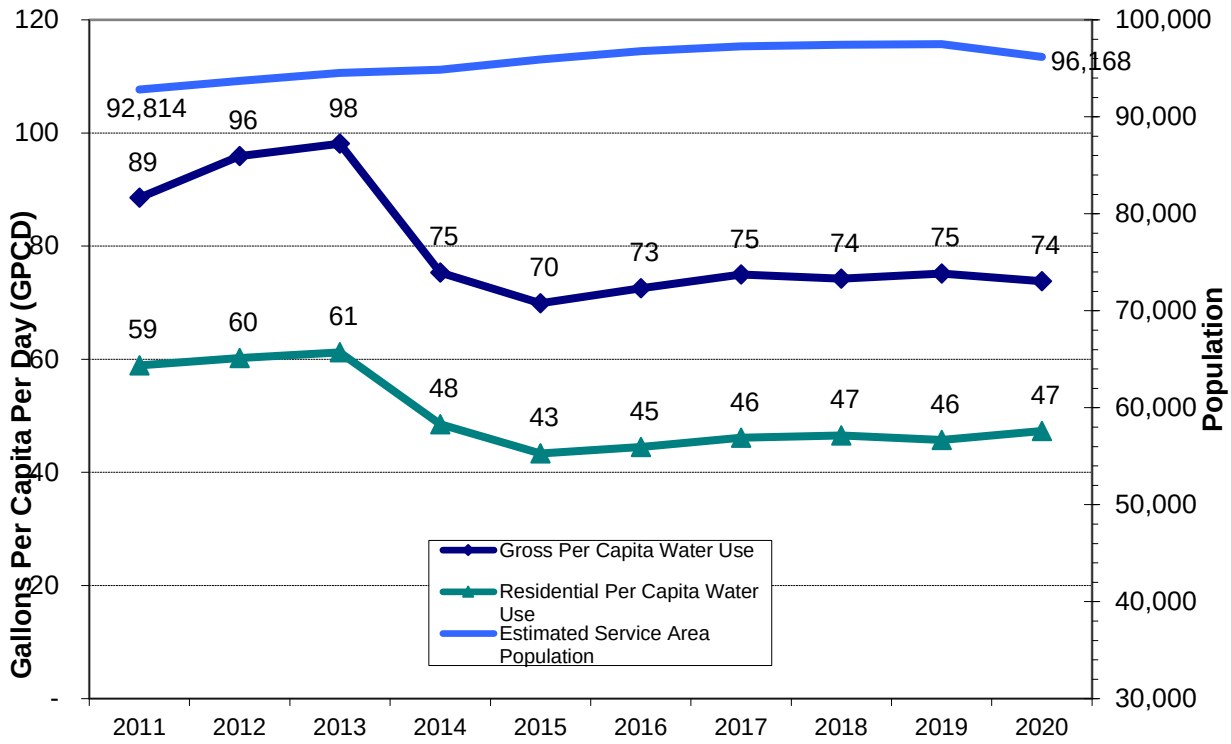
With the enactment of the Water Conservation Act of 2009, also known as SB X7-7, the state is required to set a goal to reduce urban per capita water use by 20 percent by the year 2020. Each retail urban water supplier was required to determine its baseline water use during their baseline period and also target water use for the years 2015 and 2020 in order to help the State achieve the 20 percent reduction.

To provide for consistent implementation of the law, suppliers are required to conform to Technical Methodologies prepared by the CA Department of Water Resources, which details the process that urban water suppliers are to follow and the options available for complying with the legislation (DWR, February 2016). Water suppliers have some flexibility in setting and revising water use targets. For instance, a water supplier may set its water use target and comply individually, or as part of a regional alliance. The City of Santa Cruz elects to report as an individual retail supplier. In this 2020 Plan, water

agencies must demonstrate compliance with their established water use target for the year 2020. Retail water agencies are also required to separately complete and submit the standard tables in the SB X7-7 verification form (Appendix G).

Figure 5-2 below shows the City's per capita water use and estimated population since 2011. The dark blue line labeled Gross Per Capita Water Use[2] is the metric that water agencies are required to calculate and to reduce under SB X7-7. It represents all the treated water entering the distribution system over one year's time, divided by the total population, and expressed in gallons per person per day. As explained further below, gross per capita water use includes residential and nonresidential uses of water in the community, as well as unmetered uses such as firefighting and losses that occur due to leakage on the distribution system.

Figure 5-2: Per Capita Water Use and Service Area Population



[2] Gross water use is the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier.

The bottom line labeled Residential Per Capita Water Use is included for reference only. It represents the total annual metered water consumption for single and multiple residential accounts, divided by the residential population[3]. It is intended to show the estimated average amount of water used by a person both indoors and outdoors at their home on a daily basis. This metric better approximates how most people relate to their own personal water use at their property.

The City's gross per capita water use has declined significantly since 2000 when gross per capita water use was about 127 GPCD. In the past ten years, the gross per capita water use has ranged from a high of 98 GPCD in 2013 to a low of 70 GPCD in 2015. The City's current gross per capita water to 74 GPCD in 2020.

5.2 SB X7-7 Compliance Summary

As shown in Tables 5-1 and 5-2, the City's gross per capita water use is presently far below its **2020 target of 110 GPCD,** as determined in accordance with DWR's technical methodologies. Accordingly, the City is presently in compliance with all requirements of SB X7-7.

Table 5-1: Baselines and Targets Summary (submittal table 5-1R)

Baselines and Targets Summary From SB X7-7 Verification Form				
Baseline Period	Start Year	End Year	Average Baseline GPCD	Confirmed 2020 Target (GPCD)
10-15 year	2001	2010	113	110
5 Year	2003	2007	116	

Table 5-2: Compliance Summary Table (submittal table 5-2R)

X7-7 2020 Compliance Form				
2020 GPCD			2020 Confirmed Target GPCD	Did Supplier Achieve Targeted Reduction for 2020?
Actual 2020 GPCD	2020 TOTAL Adjustments	Adjusted 2020 GPCD		
74	0	74	110	Yes

[3] Residential population differs from total population. There are several thousand students, families, and staff living on the University main campus, which is classified as an industrial account. Only the people living in residences off-campus are counted for the purpose of calculating R-GPCD.

5.3 2020 Calculated Baseline and Target

Because the Santa Cruz Water Department submitted a 2015 UWMP including the SB X7-7 Verification Form and has not had a change to its service area, the baselines and targets from the 2015 UWMP do not need to be recalculated for 2020. The City calculated its 2020 target in compliance with the Water Conservation Act of 2009 using Method 3 of the four approved methods as described in DWR's Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009). Refer to the 2015 Urban Water Management Plan for detailed information on this methodology.

5.4 2020 Population and Gross Water Use

Consistent with requirements for demonstrating SB X7-7 compliance, the 2020 population estimate was developed by the City based upon California Department of Finance estimates for 2020 population within the incorporated City of Santa Cruz and a "persons-per-connection" method for the population outside City limits (Appendix D). The water service area outside City of Santa Cruz limits, includes portions of the City of Capitola and portions of unincorporated Santa Cruz County.

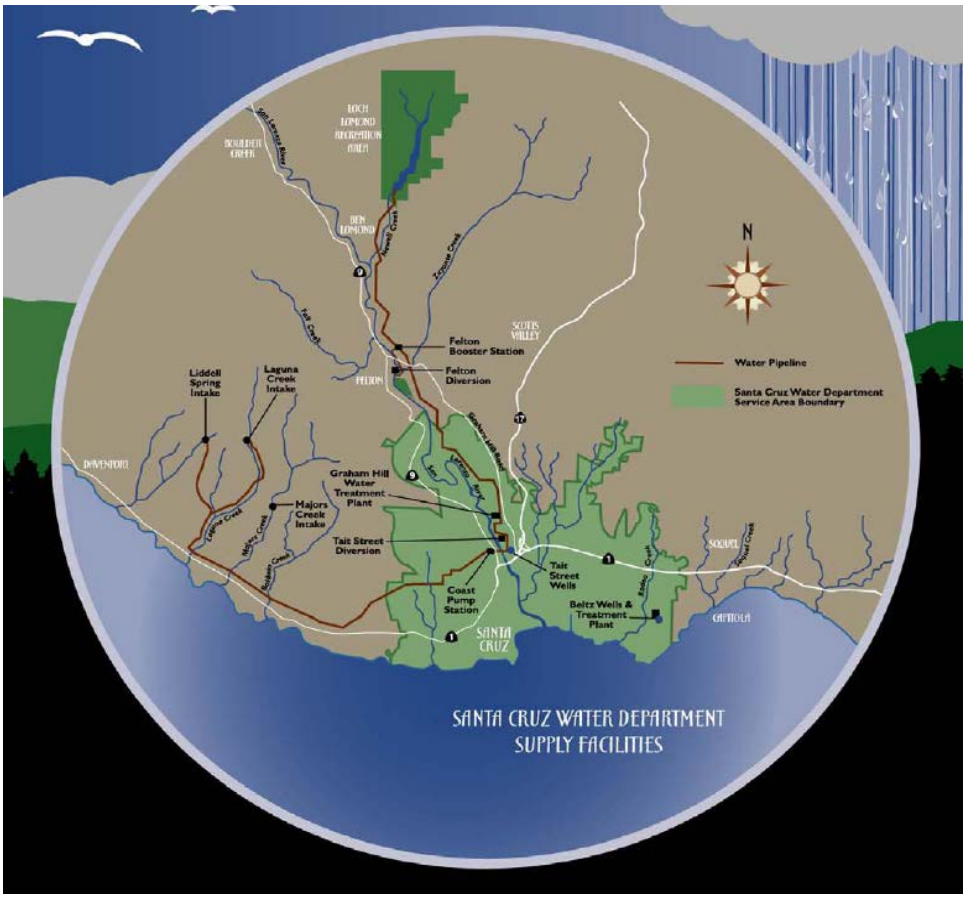
Chapter 6

SYSTEM SUPPLIES

This chapter describes the City's water supply system, discusses plans to enhance the City's existing supply portfolio, and presents current and projected supply source production volumes.

The Santa Cruz water system relies predominantly on local surface water supplies, which include the North Coast sources (Liddell Spring and Laguna, Majors, and Reggiardo Creeks), the San Lorenzo River (Felton Diversion, Tait Diversion, and Tait Wells), and Loch Lomond Reservoir. Together, these surface water sources represent approximately 95 percent of the City's total annual water production. The balance of the City's supply comes from groundwater, all of which is extracted from the Beltz Well system the Santa Cruz Mid-County Groundwater Basin. These main production elements of the City's water supply system are illustrated below in Figure 6-1.

Figure 6-1. City of Santa Cruz Water Supply System



While water supply is considered to be adequate in normal and single dry years, the water supply reliability and drought risk assessments included in Chapter 7 of this plan demonstrate a potential lack of adequate supplies during near-term multiple consecutive dry years. To address this supply vulnerability, the City is implementing its Water Supply Augmentation Strategy (WSAS), in addition to ongoing water conservation, including the development of aquifer storage and recovery (ASR) facilities, transfers and/or exchanges with neighboring water districts, and increased use of recycled water as described below.

6.1 Purchased or Imported Water

The City of Santa Cruz does not now, nor does it plan to, import water, either from outside the Central Coast Hydrologic Region, or outside the Santa Cruz County boundaries. All of its water supplies are obtained from local sources. The system relies entirely on rainfall, surface runoff, and groundwater infiltration occurring within watersheds located in Santa Cruz County. No water is purchased from state or federal sources or imported to the region from outside the Santa Cruz area.

In 2020, a small amount (2 million gallons (MG)) was imported from Soquel Creek Water District through the emergency intertie during a pipeline rupture on the City's Newell Creek Pipeline that transmits water from the Loch Lomond Reservoir to the Graham Hill Water Treatment Plant. The rupture occurred during a time of year when the City relies on the reservoir to meet demand. Upon repair of the pipeline, the import was discontinued.

6.2 Groundwater

Even though groundwater constitutes only up to about 5 percent of the entire City water supply on an annual basis, it is a crucial component of the water system for meeting peak season demands, maintaining pressure in the eastern portion of the distribution system, and for weathering periods of drought.

The Beltz Well system, or Live Oak Well system, consists of four production wells and two water treatment plants located in the eastern portion of the City water service area. The facilities were originally acquired by the City from the Beltz Water Company in 1964, and are still referred to as the "Beltz" wells. Wells 8 and 9 were installed in 1998 as replacement wells for Wells 1 and 2, which were damaged in the 1989 Loma Prieta earthquake. Well 7, which began operating in 1974, has been replaced by Well 10. The newest well, Beltz 12 and associated water treatment facilities, were completed in 2015.

6.2.1 Basin Description

The geographical area from which the City pumps groundwater is identified as the *Santa Cruz Mid-County Groundwater Basin,* Basin Number 3-001(Basin) in *California's Groundwater, Bulletin 118 Interim Update 2016*. The Basin is described in detail in the Santa Cruz Mid-County Groundwater Sustainability Plan (GSP), adopted by the Santa Cruz Mid-County Groundwater Sustainability Agency on November 21, 2019. The adopted GSP was submitted to California Department of Water Resources (DWR) for approval on January 30, 2020. DWR approved the GSP on June 3, 2021 as being found to satisfy the requirements of the Sustainable Groundwater Management Act (DWR 2021b). The Basin GSP is included as Appendix H and is posted online at the following link: https://sgma.water.ca.gov/portal/gsp/all.

The Basin was consolidated from all or part of four previously existing basins: Soquel Valley (Basin Number 3-1), West Santa Cruz Terrace (Basin Number 3-26), Santa Cruz Purisima Formation (Basin Number 3-21), and Pajaro Valley Basins (Basin Number 3-2). The Purisima Formation and Aromas Red Sands are the two main geographic formations within the basin. The Basin is defined by both jurisdictional and geologic boundaries and is intended to include all areas that constitute the shared groundwater resources in the stacked aquifer system of the Purisima Formation, as well as the Aromas Red Sands and some other units underlying the Purisima Formation.

The Basin lies within the Central Coast hydrologic region that covers 36,290 acres and stretches from the Santa Cruz Mountains to the Pacific Ocean and from Live Oak to La Selva Beach along the coast of the Monterey Bay. The Basin is comprised of a portion of the City of Santa Cruz, all of the City of Capitola, and portions of unincorporated Santa Cruz County (Groundwater Exchange, 2021). A map of the Basin is shown in Figure 6-3. The City's Betlz Well system is the western side of the Basin, shown in the green area labeled Live Oak.

The majority of land use in the Basin is residential and open space, with limited amounts of commercial and agricultural lands. Urban and suburban areas are concentrated along the coastal terraces with rural communities and lower population densities in the foothills and mountains.

Groundwater is the primary water supply for most residents within the Basin, except for the approximately 32,000 residents that are supplied by the City water system. As described above, customers of the City water system rely primarily on surface water but with a critical portion of water supply coming from groundwater supply from the Beltz Well system in the Basin.

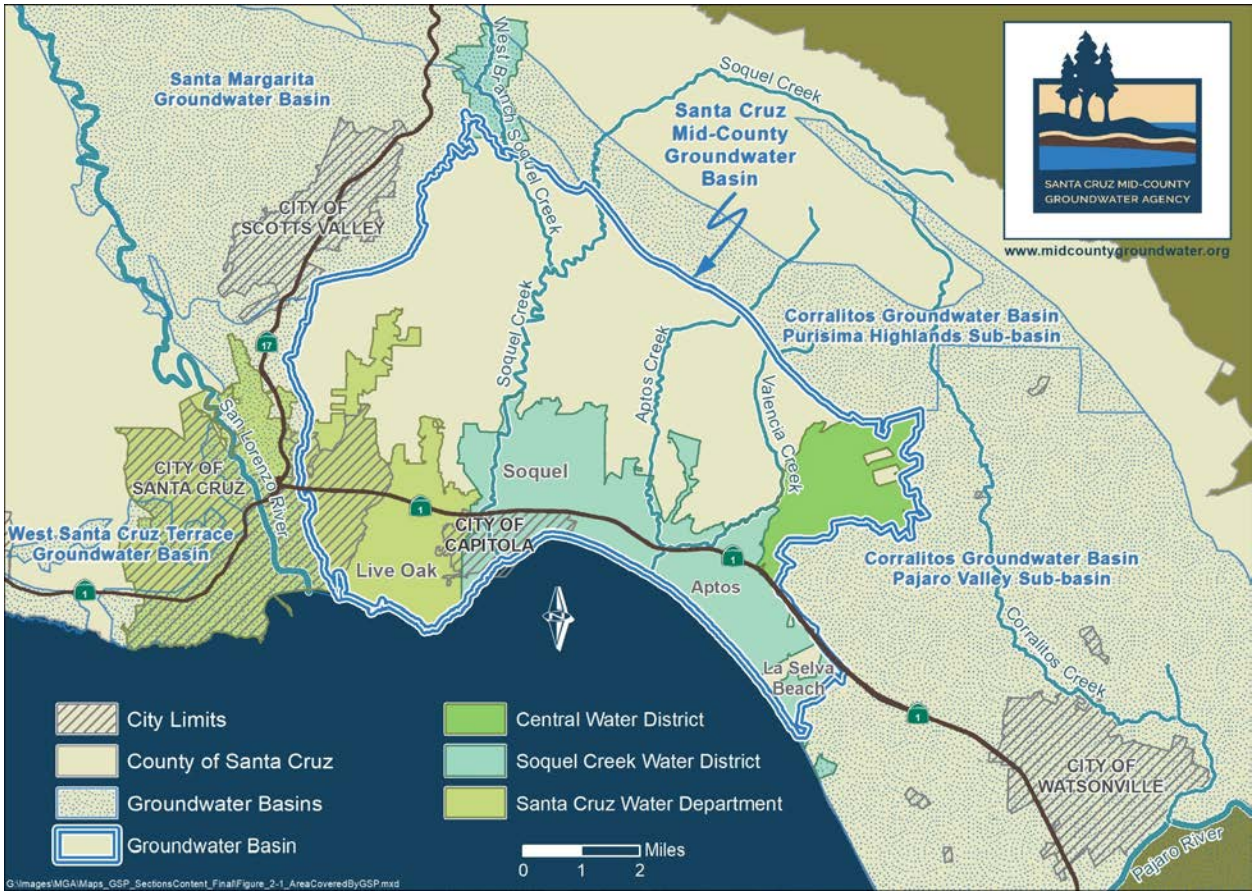
The entire production of the City's Beltz Well system is derived from the Purisima Formation, which is the primary groundwater aquifer underlying the Basin. Groundwater from the Purisima Formation is used by the City, Soquel Creek Water District, Central Water District, several small water systems, and numerous private rural water wells.

The Purisima Formation is a collection of distinct geologic units composed of sandstone interbedded with layers of siltstone and claystone. These units, designated as AA through FF, vary in thickness and hydrogeological characteristics, with AA being the deepest and oldest unit. The formation is relatively shallow under the City's water service area, but dips southeast, becoming deeper and thicker towards Capitola and Aptos and outcrops at the cliffs along the Monterey Bay shoreline. The A zone is the primary supply for both the City's Beltz Well system and the Soquel Creek Water District's Service Area 1 wells and is continuous and connected between these areas of groundwater extraction. Recharge is thought to occur from deep percolation of rainfall in the upper watersheds and along streambeds of Branciforte Creek, Arana Gulch, Rodeo Creek and Soquel Creek.

To better understand how the Purisima Formation responds to pumping stresses and to detect seawater intrusion, the City has installed and maintains a network of 36 monitoring wells at 14 sites, contributing to a network of 174 wells within the Basin that are monitored at least twice a year (MGA, 2019). Groundwater levels and water quality parameters, including chlorides, pH, total dissolved solids, general minerals, and other constituents are measured. Data collected from these monitoring wells are shared with adjoining public water agencies interested in management and planning of groundwater supply.

The Basin contains no areas with adjudicated groundwater rights.

Figure 6-3. Santa Cruz Mid-County Groundwater Basin



Source: Santa Cruz Mid-County Groundwater Sustainability Agency, 2019

6.2.2 Groundwater Management

The California Department of Water Resources (DWR) classifies the Basin as a high priority basin in a state of critical overdraft because of active seawater intrusion. Over pumping of the Basin has led to lower groundwater levels in coastal areas and seawater intrusion into coastal portions of the groundwater aquifers. Without active management, there is a threat of more widespread seawater contamination of groundwater in the Basin.

The City has participated in regional evaluation, monitoring, and management activities in the basin for over 50 years. The first major study of regional groundwater resources was conducted in late 1960s by the United States Geological Survey in collaboration with the County of Santa Cruz, the Soquel Creek Water District, and the City of Santa Cruz (Hickey, 1968). The study identified the importance of the Purisima Formation for regional water supply and recognized seawater intrusion into the aquifer as the greatest threat to regional groundwater supplies. Since that time and prior to the passage of the Sustainable Groundwater Management Act (SGMA) in 2014, the City and other agencies that rely on groundwater from the Basin have continued engagement in monitoring and pursued

various management strategies to help prevent the intrusion of seawater into groundwater supplies.

With the passage of SGMA came the formation of the Santa Cruz Mid-County Groundwater Sustainability Agency (MGA) in May 2016 under a Joint Exercise of Powers Agreement. The MGA now oversees groundwater management activities in the Basin and is comprised of four member agencies representing the principal public agencies that extract groundwater or regulate groundwater extraction and/or land use in the Basin: Central Water District, City of Santa Cruz, County of Santa Cruz, and Soquel Creek Water District .The MGA is governed by an eleven-member board of directors including two representatives from each member agency and three private well owner representatives, in addition to alternates. The City of Santa Cruz representatives are appointed by City Council. In 2020, they were former Water Commissioner David Baskin and City Councilmember Justin Cummings.

The GSP describes the projects and management actions that the MGA has developed to achieve Basin groundwater sustainability, primarily focused on avoidance of seawater intrusion, with related benefits to surface water and groundwater dependent ecosystems. Because the City's water system relies heavily on surface water, an additional focus of the project and management actions is development of a supplemental drought supply to improve the City's water supply reliability, consistent with the City's WSAS (see section 6.8) and Basin sustainability. The individual member agencies, including the City, have responsibility for implementing the various projects and management actions described in the GSP, including permitting, funding, and oversight.

The project and management actions are categorized into three groups based on how and when they will be implemented and are described below:

Baseline Projects and Management Actions (Group 1)
This group includes existing groundwater management activities and commitments by the MGA member agencies. These activities were already being implemented when the GSP was developed and are expected to continue to be implemented to help achieve groundwater sustainability in the Basin. Group 1 includes the following:

- Water conservation and demand management, implemented by all member agencies
- Installation and redistribution of municipal groundwater pumping, implemented by the City and Soquel Creek Water District

Projects and Management Actions Evaluated Against the Sustainable Management Criteria (Group 2)

This group includes projects and activities planned for near-term implementation. These activities have been developed and fully vetted by the MGA member agencies. Group 2 includes the following:

- Pure Water Soquel (Basin replenishment through injection of advanced purified water treated to drinking water standards), implemented by Soquel Creek Water District
- Aquifer storage and recovery (ASR), implemented by the City
- Water transfers/in-lieu groundwater recharge, implemented by the City and Soquel Creek Water District
- Distributed storm water managed aquifer recharge, implemented by County of Santa Cruz and Soquel Creek Water District

Identified Projects and Management Actions that May be Evaluated in the Future (Group 3)
This group includes projects and management activities that could be pursued by member agencies in the event that Group 2 activities either fail to be implemented or do not achieve the expected sustainability results. Selection from the projects and management actions in Group 3 will be pursued if and as needed. Criteria for selection and implementation would include factors such as magnitude of water shortage, speed of implementation, and the scale of regulatory and political hurtles. Group 3 projects include:

- Recycled water - groundwater replenishment and reuse
- Recycled water - surface water (reservoir) augmentation
- Recycled water - direct potable reuse
- Desalination implemented through a local or regional project
- Groundwater pumping curtailment and/or restrictions

For more detailed information on specific project and management actions, refer to the GSP (Appendix H), Section 4. For a full description of the City's current and planned activities, see descriptions of the City's water conservation and demand management program in Chapter 9 and the City's Water Supply Augmentation Strategy in Section 6.8.

6.2.3 Groundwater Pumping

The Beltz Well system is utilized during the peak season which is the months of May through September. Table 6-1 below shows the actual volume pumped from the City's Beltz Well system over the last five years. Average volume over this time was 140 million gallons per year (MGY). The current understood sustainable yield volume is 170 MGY which is utilized by the City when planning for the operation of the Beltz Well system.

Table 6-1: Groundwater Volume Pumped (submittal table 6-1R)

Groundwater Volume Pumped (MG)						
Groundwater Type	Location or Basin Name	2016	2017	2018	2019	2020
Alluvial Basin	Santa Cruz Mid-County Basin (3-001)	156	169	165	57	147
	TOTAL	156	169	165	57	147

NOTES: Note in 2020, pilot testing of Aquifer Storage and Recovery at Beltz Well 8 included injection of 4 MG of treated surface water and subsequent extraction and disposal of 6 MG during the pilot testing. The 6 MG extraction is included in 2020 total. In 2019, pilot testing of Aquifer Storage and Recovery at Beltz 12 included injection of 21 MG of treated surface water and subsequent extraction of 25 MG. Of the 25 MG extraction volume, 7 MG was disposed of and 18 MG entered into the distribution system. The full 25 MG of extraction is included in 2019 total.

6.3 Surface Water

As presented in Chapter 3, the surface water system supplies are located both within and outside of the City of Santa Cruz with a mix of flowing sources and a storage reservoir. The introductory section of the map provided in Figure 6-1 illustrates the various surface water sources and the conveyance systems that comprise the supply facilities of the City. Each of the surface water sources are briefly described in the following sections.

6.3.1 North Coast Creeks and Spring

The North Coast sources consist of surface diversions from three coastal streams and a natural spring located approximately six to eight miles northwest of downtown Santa Cruz. These sources are: Liddell Spring, Laguna Creek, Reggiardo Creek, and Majors Creek. The use of these sources by the City dates back as far as 1890.

Figure 6-4. Laguna Creek Diversion Dam

6.3.2 San Lorenzo River

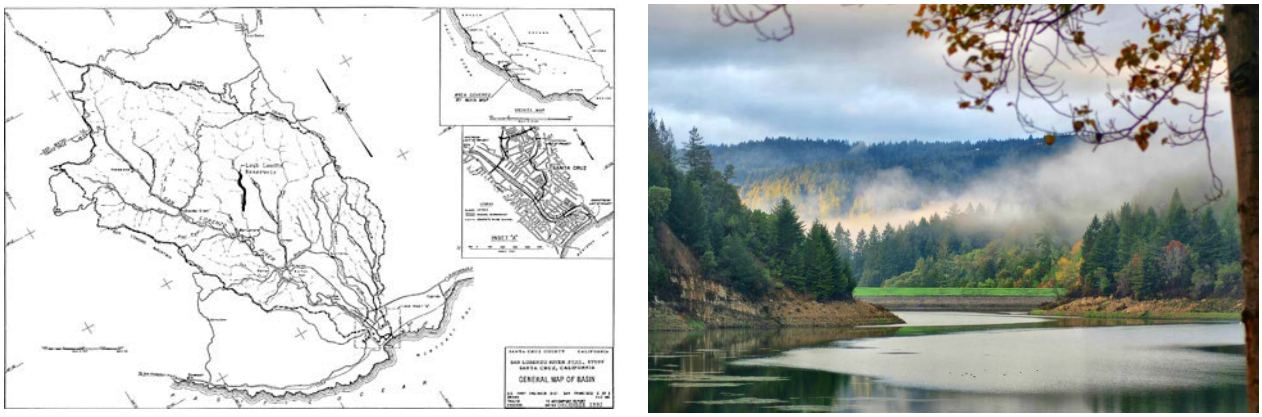
The San Lorenzo River is the City's largest source of water supply. The main surface water diversion is the Tait Diversion near the City limits just north of Highway 1. Use of this source dates back to the 1870s and was consolidated under public ownership in 1917. The Tait Diversion is supplemented by shallow, auxiliary wells located directly across the river referred to as the Tait Wells. These wells are assumed to be hydraulically connected to the river and considered to be tied to the City's appropriative rights for surface diversion. The drainage area above the Tait Diversion is 115 square miles.

Figure 6-5. San Lorenzo River Tait and Felton Diversions

The other diversion on the San Lorenzo River is Felton Diversion, which is an inflatable dam and intake structure built in 1974 that is located about six miles upstream from the Tait Diversion. Water is pumped from this diversion through the Felton Booster Station to Loch Lomond Reservoir. The facility is used to augment storage in the reservoir during dry years when natural inflow from Newell Creek is low.

While the City is the largest user of water from the San Lorenzo River basin, two other water districts, several private water companies and numerous individual property owners share the San Lorenzo River watershed as their primary source for drinking water supply (Figure 6-6).

Figure 6-6. San Lorenzo River Watershed and Loch Lomond Reservoir



6.3.3 Newell Creek and Loch Lomond Reservoir

Loch Lomond Reservoir is located near the town of Ben Lomond in the Santa Cruz Mountains. The reservoir was constructed in 1960 and has a maximum capacity of 2,810 million gallons (MG). In addition to providing surface water storage, the reservoir and surrounding watershed are used for public recreation purposes, including fishing, boating, hiking, and picnicking (swimming and wading are prohibited). The Newell Creek watershed above the reservoir is about nine square miles. In addition to the City, the San Lorenzo Valley Water District is entitled by contract to receive a portion of the water stored in Loch Lomond.

Water System Operations and Water Rights

The City of Santa Cruz follows a variety of policies, procedures, and legal restrictions in operating the water supply system. In general, the system is managed to use available flowing sources to meet daily demands as much as possible. Groundwater and stored water from Loch Lomond are used mainly during the summer and fall months when flows in the coast and river sources decline and additional supply is needed to meet higher daily water demands. Water from Loch Lomond is also used during winter storms and high stream and river flows when water from surface water sources is too turbid to treat at the Graham Hill Water Treatment Plant.

The amount of water produced from each of the City surface water sources is controlled by different water rights. A summary of these existing water rights is presented below.

Summary of Water Rights Held by the City of Santa Cruz

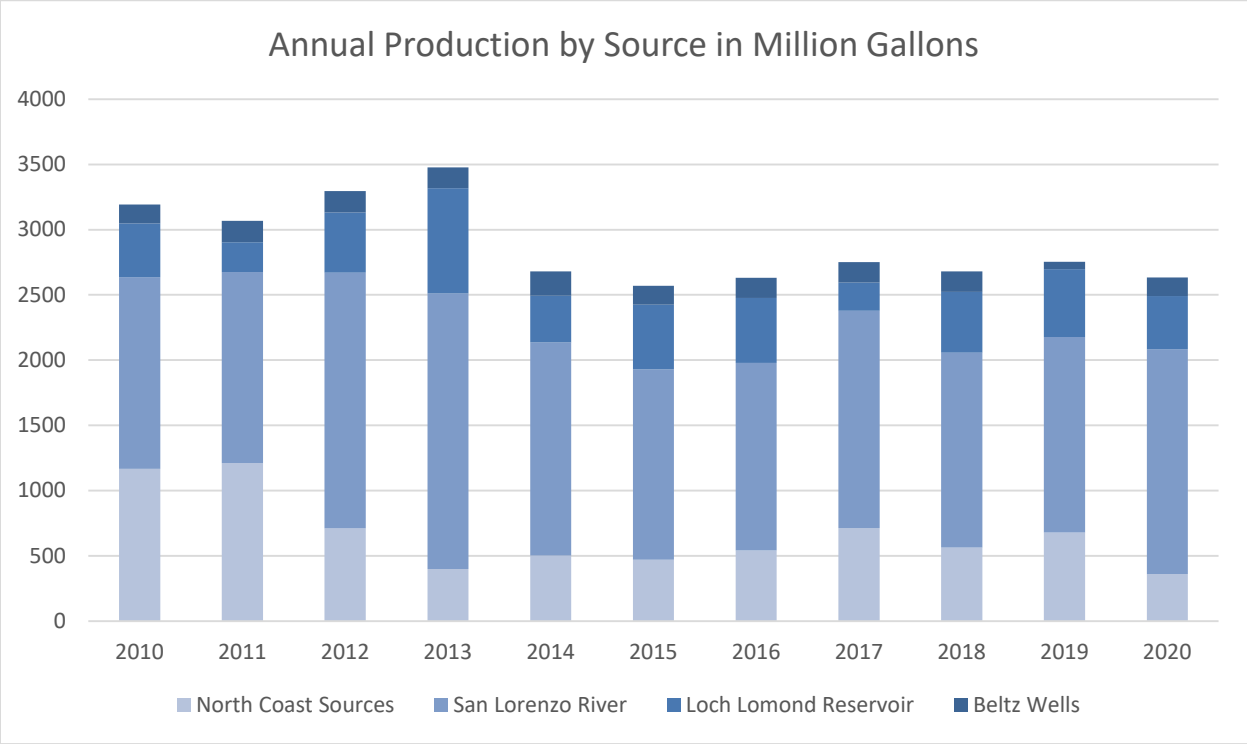
Source	Date of First Use/Priority	Season of Diversion	Maximum Diversion Rate (CFS)	Byapss Requirement (CFS)	Annual Diversion Limit (MG)
North Coast: Liddell Spring: Statement of Water Diversion and Use S002043 Laguna Creek: Statement of Water Diversion and Use S002042 Majors Creek: Statement of Water Diversion and Use S002044 Reggiardo Creek: Statement of Water Diversion and Use S008610	Pre-1914	Year round	No limit	None	None
San Lorenzo River: Tait Diversion: License 1553 (A004017) and License 7200 (A005215)	1924 and 1926	Year-round	12.2	None	None
San Lorenzo River: Felton Diversion: Permit 161233 (A022313) and Permit 166013 (A023710)	1965 and 1971	Sept	7.8	10	977
		Oct	20	25	
		Nov-May	20	20	
		Jun-Aug	0	--	
Newell Creek (Loch Lomond Reservoir): License 9847 (A017913)	1957	Sept-Jun	No limit	1 (released from Newell Creek Dam)	Max collection: 1,825 Max withdrawal: 1,042

The City In 2007, the City began voluntarily releasing in-stream flows from the North Coast system in connection with ongoing development of a Habitat Conservation Plan (HCP) for federal Endangered Species Act and California Endangered Species Act compliance for water system operations and maintenance activities that may adversely affect local special-status anadromous salmonids (coho salmon and steelhead trout). Over the last 13 years, the City has dramatically reduced its diversion of water from Laguna Creek and increased instream flow releases on the San Lorenzo River to benefit fisheries habitat.

The City is currently working with the State Water Resources Control Board to revise the City's existing water rights to allow more options for where and how the City can use its existing rights while enhancing stream flows for local anadromous fisheries. The Santa Cruz Water Rights Project would improve flexibility in operation of the City's water system and include for all City surface water sources fish flow bypass requirements developed in coordination with the National Marine Fisheries Service and California Department of Fish and Wildlife for the HCP. See description of this project of in Section 6.8.2.

Gross annual production volumes from the City's surface and groundwater sources over the past ten years are shown in Figure 6-7, broken down by source of supply. During the past decade, the North Coast sources represented 23 percent of the total water supply, the San Lorenzo River represented 56 percent, Loch Lomond Reservoir (Newell Creek) represented 15 percent, and Beltz Well system contributed the remaining 5 percent.

Figure 6-7. Annual Production Volumes by Supply Source



6.4 Storm Water

At this time, local urban storm runoff is not used by the City to meet its urban water demands. The City is regulated, however, by the California Regional Water Quality Control Board and has responsibility to reduce the amount of pollutants discharged in urban runoff, and to improve and protect water quality. The City is currently covered under the State's General Permit for Storm Water Discharges from Small Municipal Storm Sewer Systems (MS4s). The General Permit requires the City to develop and implement a comprehensive Storm Water Management Program (SWMP). A complete description of this program is provided in the Storm Water Annual Report.

The City of Santa Cruz, through its Public Works Department, maintains seven miles of underground storm water pipeline, eight miles of surface storm water ditches, six storm water pump stations, approximately 1,500 catch basins, and 125 outfalls. The City also maintains the U.S. Army Corps of Engineers flood control channel and levee system on the San Lorenzo River, which is approximately three miles long with five pump stations. The City's operations and maintenance program for the flood control facilities on the San Lorenzo River includes the removal of sand and silt from the channels of the river and Branciforte Creek; maintenance of pumps, gates and levees; and removal of weeds and growth in drainage ditches and catch basins. As a best management practice, the City has routine street sweeping and regularly cleans the storm drain pipeline system, among other activities.

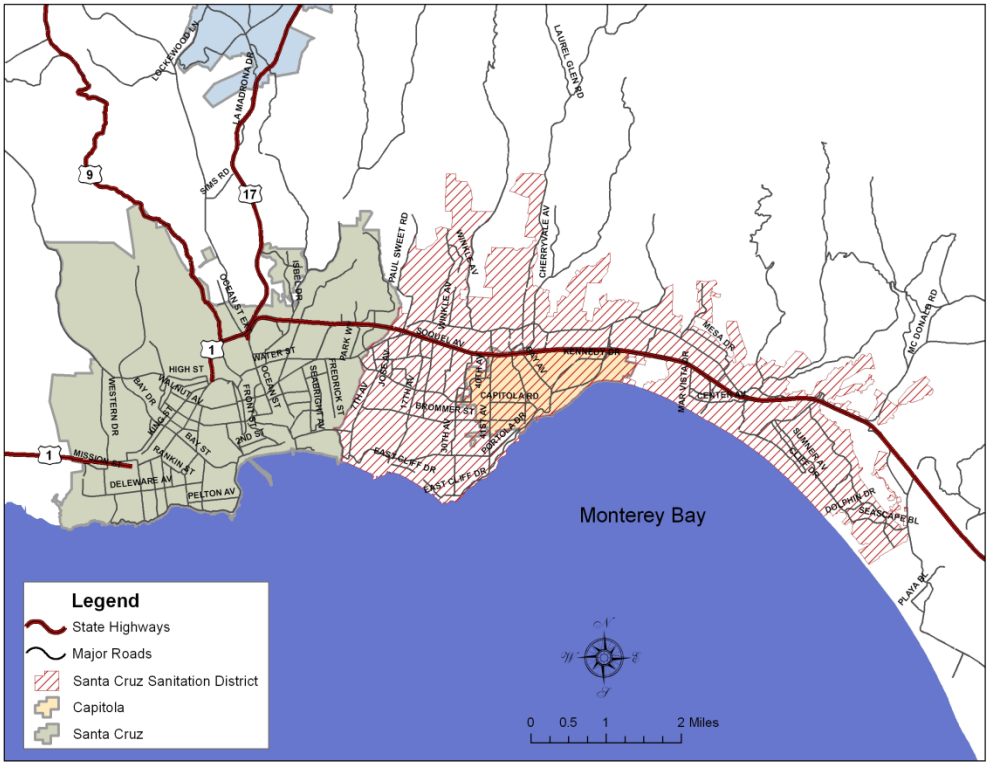
Storm water system management maintenance in the unincorporated area and Capitola is provided by the Santa Cruz County Flood Control and Water Conservation District, Zone 5, operated through the County Public Works Department. The County Board of Supervisors serves as the Board of Directors for the District. Facilities include underground storm drain systems and above ground ditches and watercourses.

6.5 Wastewater and Recycled Water

The City of Santa Cruz owns and operates a City-wide wastewater collection and regional wastewater treatment and disposal facility providing service to a total urban population of approximately 130,000 people in an area extending from Santa Cruz out to the communities of Seascape and Aptos in unincorporated Santa Cruz County (Figure 6-8).

The City's Wastewater Treatment Facility (WWTF) is not currently permitted for and does not now produce recycled water for offsite reuse. Treated wastewater is reused internally within the wastewater plant to meet its major process water needs, including chemical mixing, contact and non-contact cooling water, equipment washing, heating, and cleaning. The 1998 upgrade of the plant to provide reuse water for on-site activities reduced potable water demand at the WWTF by about 90 percent. It now operates using only 3 to 4 million gallons per year for sanitary, irrigation, and other miscellaneous onsite uses. The only use of recycled water outside the WWTF has been that used by the City's Public Works crews in trucks for flushing the sanitary sewer system as a way to conserve potable water. Soquel Creek Water District is currently designing and constructing the Pure Water Soquel Project which will utilize wastewater from the WWTF, enhancing the recycled water system in the region and allowing for potential opportunities for future expansion.

Figure 6-8. Geographic Area Served by Santa Cruz Wastewater Facility



6.5.1 Wastewater

Wastewater collection, treatment, and disposal are described below.

6.5.1.1 Wastewater Collection

Municipal wastewater generated within the City limits is delivered to the treatment plant through a collection system consisting of 160 miles of gravity mains, 3.5 miles of force main, and 21 pumping stations. The City's collection system, treatment plant and ocean disposal system are managed and operated by the City's Public Works Department.

The Santa Cruz County Sanitation District, a special district operated through the Santa Cruz County Public Works Department, collects wastewater from the Live Oak, Capitola, Soquel, Aptos, and Seacliff areas through a system consisting of 220 miles of gravity main, 14 miles of force main, and 35 pump stations. It transports wastewater from a central pumping facility in Live Oak to the Santa Cruz WWTF for treatment and disposal. This wastewater is generated from outside the service area of the City of Santa Cruz and is treated within the service area.

In addition to the City and County Sanitation District, one small County Service Area serving the community of Woods Cove and a portion of the community of Rollingwoods and is connected to the City's wastewater system. Dry weather flows from Neary Lagoon are

also diverted through the WWTF to help protect water quality at local beaches for public health and recreation.

A third-party organization is not operating a facility under contract in the Santa Cruz service area. With the exception of some outlying areas and individual parcels that have onsite wastewater systems, the vast majority of the estimated people residing in the City of Santa Cruz water service area are served by these two wastewater collection systems. Table 6-2 summarizes wastewater collected from these two agencies in 2020.

Table 6-2: Wastewater Collected Within Service Area in 2020 (submittal table 6-2R)

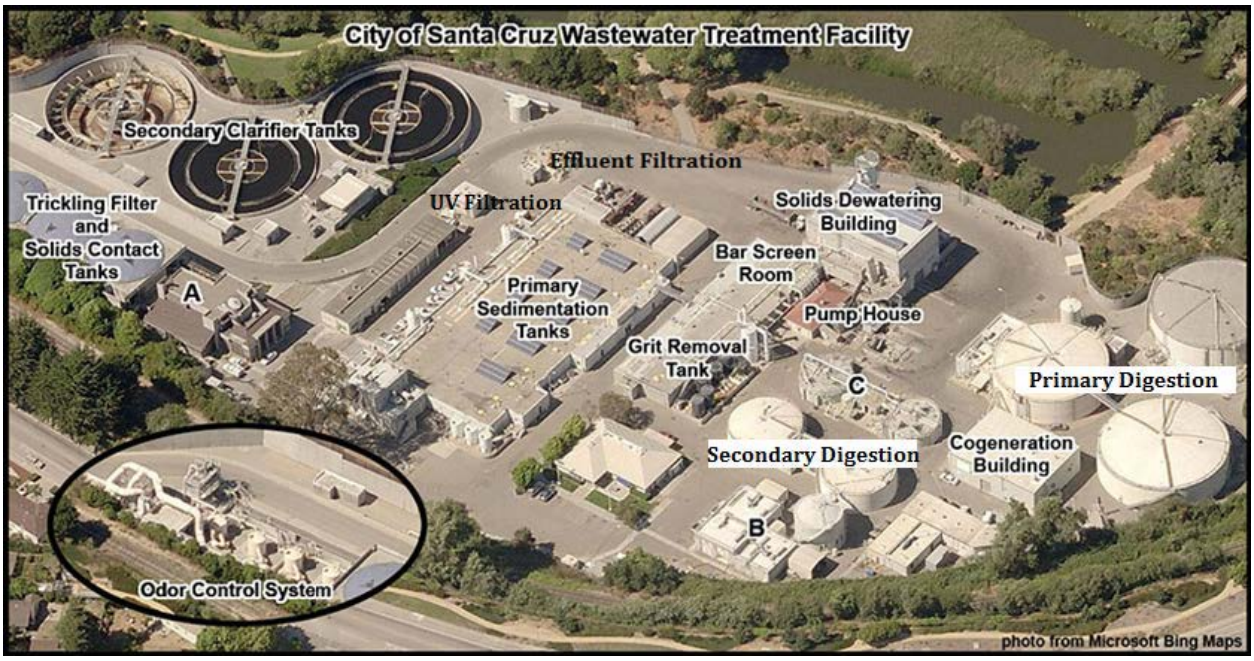
Wastewater Collected Within Service Area in 2020						
Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020 (MG)	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of Santa Cruz	Metered	1,395	City of Santa Cruz	Wastewater Treatment Facility	Yes	No
Santa Cruz County Sanitation District	Metered	1,218	City of Santa Cruz	Wastewater Treatment Facility	Yes	No
Total Wastewater Collected from Service Area in 2020:		2,613				

6.5.1.2 Wastewater Treatment

The City's treatment plant was modernized in the late 1990's from the advanced primary level to provide full secondary treatment in order to meet State and Federal waste discharge requirements (Figure 6-9).

The treatment process consists of screening, grit removal, primary sedimentation, biological treatment (trickling filters), secondary clarification, and disinfection (UV). Bio-solids removed from the wastewater stream are treated by gravity thickening, anaerobic digestion, and dewatering by centrifuges.

Figure 6-9. City of Santa Cruz Wastewater Treatment Facility



The City's WWTF is designed to treat an average dry weather flow of 17 million gallons per day (MGD) and can accommodate peak wet weather flows of up to 81 MGD. Due to conservation measures and reduced demand in recent years, the amount of wastewater generated in the City and the Sanitation District's service areas has dropped substantially, averaging 6.5 MGD during the dry season and totaling 2,613 million gallons in 2020.

6.5.1.3 Wastewater Disposal

Wastewater effluent from the WWTF is disinfected with UV prior to being discharged to the Pacific Ocean through a deep water outfall extending 12,250 feet on the ocean bottom and terminating one mile offshore at a depth of approximately 110 feet below sea level. A 2,100 foot diffuser at the end of the pipe provides a minimum initial dilution of 139 parts seawater to one part wastewater.

The City's wastewater facility is regulated under a waste discharge permit issued by the California Regional Water Quality Control Board, Central Coast Region (Order No. R3 - 2017 - 0030). Monterey Bay and surrounding ocean waters was designated in 1992 as a National Marine Sanctuary and is widely recognized for its unique and diverse biological characteristics and physical features. To protect receiving water quality and sanctuary resources, the wastewater influent and effluent characteristics are carefully monitored for compliance with state water quality requirements. The City also performs receiving water monitoring and participates in a regional monitoring program with other dischargers in the Monterey Bay area, known as Central Coast Long-Term Environmental Assessment Network (CCLEAN). The City of Scotts Valley treats its wastewater separately and

transmits secondary treated effluent to Santa Cruz for combined disposal through the City's ocean outfall.

Table 6-3 below provides the total amount of wastewater treated and disposed by the City's wastewater treatment facility in 2020.

Table 6-3: Wastewater Treatment and Discharge in 2020 (submittal table 6-3R)

Wastewater Treatment and Discharge Within Service Area in 2020							
Wastewater Treatment Plant Name	Discharge Location Name or Identifier and Discharge Location Description	Wastewater Discharge ID Number	Method of Disposal	Treat Wastewater Generated Outside the Service Area?	Treatment Level	2020 volumes (MG)	
						Wastewater Treated	Discharged Treated Wastewater
Wastewater Treatment Facility	Monterey Bay/Pacific Ocean Bay Outfall Deep water outfall	3-440102001	Ocean outfall	yes	Secondary, Undisinfected	2,613	2,613
					Total	2,613	2,613

NOTES: Volumes for wastewater treated and discharged treated wastewater are presented as equal to satisfy the objective of this table. The recycled water that is reused wihtin the facility is not considered eligible for designation as recycled water under current Title 22 requirements. Figures presented do not include City of Scotts Valley waste discharge volumes.

6.5.2 Recycled Water

Since 2000, the City has been examining the use of recycled water through commissioned engineering studies regarding potential uses of recycled water for agricultural irrigation, landscape irrigation, groundwater recharge, direct potable reuse, and use of recycled water from neighboring water districts. These studies include the following:

- Alternative Water Supply Study (Carollo Engineers, 2000)
- Evaluation of Regional Water Supply Alternatives (Carollo Engineers, 2002)
- Integrated Water Plan Environmental Impact Report (EIR) (City of Santa Cruz, 2005)
- Opportunities and Limitations for Recycled Water Use (Kennedy/Jenks, 2010)
- Current and Potential Future Opportunities for Indirect and Direct Potable Reuse of Recycled Water Use (Kennedy/Jenks, 2010)
- Regional Recycled Water Facilities Planning Study, Phase 1 (Kennedy/Jenks, 2018)

The City of Santa Cruz is continuing to actively investigate the feasibility of recycled water though an ongoing Santa Cruz Recycled Water Feasibility Study Phase 2 with Kennedy/Jenks as further described below.

6.5.2.1 Recycled Water Coordination

As presented in Section 2.4, preparation of this 2020 UWMP was coordinated with all local water, wastewater, groundwater, and planning agencies throughout the water service area and Santa Cruz County. Coordination regarding recycled water use and planning studies has involved working with the following entities:

- Santa Cruz Public Works Department (regional WWTF operator)
- Santa Cruz County Sanitation District (local wastewater collection agency)
- City of Scotts Valley Public Works (local WWTF operator)
- Scotts Valley Water District
- Soquel Creek Water District
- Pasatiempo Golf Course
- County of Santa Cruz
- University of California, Santa Cruz
- State Water Resources Control Board's Water Recycling Funding Program

6.5.2.2 Recycled Water System

The City does not currently operate a recycled water system in its service area. The Pasatiempo Golf Course, located within the City's service area, receives disinfected secondary effluent from the City of Scotts Valley, which it treats to tertiary standards at the Pasatiempo Golf Course Tertiary Plant for use as golf course irrigation, reducing the demand for potable water that would otherwise be used for irrigation. Additionally, Soquel Creek Water District is designing and constructing the Pure Water Soquel Project, which will enhance the recycled water system in the region and allow for potential opportunities for future expansion. See description in 6.5.4.1 below.

6.5.2.3 Recycled Water Beneficial Uses

Title 22 (California Code of Regulations, Division 4, Chapter 3, Sections 60301-60355) is the regulation overseeing the reuse or recycling of municipal wastewater to protect public health. Level of treatment and bacteriological water quality standards define what beneficial uses are legally allowed. The quality of waste water produced at the City's treatment plant currently would be best classified under the Title 22 criteria as "Secondary, Undisinfected", even though the wastewater plant provides ultraviolet disinfection, and the City consistently meets its receiving water limitations contained in its NPDES permit for bacteriological objectives. The City's treated wastewater is therefore potentially suitable for only very limited agricultural applications and for flushing sanitary sewers according to the standards in Title 22.

The present level of wastewater treatment is not sufficient for the water to be used for unrestricted use on playgrounds, parks, schoolyards, construction, cooling and other non-contact industrial processes, or general landscape irrigation. Additional treatment above that currently provided would be needed to meet the state public health and safety requirements. In addition to the treatment upgrades, a separate distribution system, including pumps, storage facilities, and piping would be required to convey recycled water to potential customers.

6.5.2.4 Current Use and Planned Uses of Recycled Water

Current Use

In 2017, the Pasatiempo Golf Course, located within the City's service area, entered into an agreement with the City of Scotts Valley to provide disinfected secondary effluent to golf course where it is further treated to tertiary standards and used for golf course irrigation. City of Scotts Valley agreed to provide up to 35 million gallons per year for 30 years with the option for the golf course to purchase more if available. The golf course received and utilized the following annual quantities of recycled water:

- 2018 – 36 million gallons
- 2019 – 56 million gallons
- 2020 – 36 million gallons

The City of Santa Cruz continues to supply the remainder of the Pasatiempo golf course water demand as needed for potable water uses and as supplemental water for irrigation.

Planned Use

In 2018, the City completed a regional Recycled Water Facilities Planning Study (RWFPS) under a contract with Kennedy/Jenks Consultants (Appendix I). The RWFPS is intended to help guide the City to identify a preferred recycled water project(s) for the future.

The RWFPS was a joint project between the Santa Cruz Water Department, the Santa Cruz Public Works Department, which operates the WWTF, and the State of California, who is funding a portion of the project through the State Water Resources Control Board's Water Recycling Funding. Study Contributors include Soquel Creek Water District, Scotts Valley Water District, the University of California Santa Cruz (UCSC), the County of Santa Cruz, and the Santa Cruz County Sanitation District. The study also recognized the potential to develop future partnerships with the aforementioned regional agencies, and possibly the San Lorenzo Valley Water District, to increase reuse in the region.

The preferred project developed in the RWFPS is a phased approach that provides for near-term local action while leaving the door open for increased regional coordination in the

future as more information is available on all the alternatives. The recommendation includes two projects that would provide non-potable reuse in the City:

- **Santa Cruz Public Works Department (SCPWD) Title 22 Upgrade Project –** implement a near-term non-potable reuse project to meet in-plant demands, develop a bulk water station and serve the near-by La Barranca and Neary Parks.
- **BayCycle Project** – expand the SCPWD Title 22 Upgrade Project to increase production and non-potable reuse to serve UCSC and City customers along the way.

The City is also committed to exploring other reuse opportunities, including:

- **Coordination with Pure Water Soquel** – continue to work closely with Soquel Creek Water District to support the evaluation of the Pure Water Soquel project, described below, including, but not limited to, the delivery of source water and considerations for benefits of shared infrastructure.
- **Explore Groundwater Replenishment Reuse at Beltz Wellfield** – to replenish the Santa Cruz Mid-County Groundwater Basin in the Beltz Well system area, through a collaborative project with Pure Water Soquel or as an independent City led project.
- **Explore Groundwater Replenishment Reuse in Santa Margarita Groundwater Basin**– continue regional discussions related to the benefits and limitations for a regional groundwater replenishment reuse project in the Santa Margarita Groundwater Basin, which has the potential to make the region more resilient in the long term.

Additionally, in 2018, further study of recycled water was prioritized over seawater desalination in a motion by the City Council, with direction to perform additional analysis on identified recycled water projects and to support continued evaluation of improvements to the WWTF to provide tertiary treatment that would be necessary for any beneficial use of recycled water.

Following this direction, the City is continuing to investigate the feasibility of recycled water though an ongoing Santa Cruz Recycled Water Feasibility Study Phase 2. This includes ongoing evaluation of potential regional reuse project supported by Soquel Creek Water District's Pure Water Soquel Project. Other planned and potential uses for recycled water are landscape irrigation, bulk-water fill stations, and to fulfill onsite needs at the wastewater treatment facility.

Soquel Creek Water District is currently in design and initial phases of constructing the Pure Water Soquel Project, which will utilize wastewater from the City's wastewater treatment facility that has been treated to drinking water standards for groundwater replenishment within the Santa Cruz Mid-County Basin. The project includes an advanced purification water treatment facility and upgrades to the City's wastewater treatment facility,

conveyance infrastructure, and the construction of three seawater intrusion prevention wells and associated monitoring wells.

Soquel Creek Water District has identified 490 million gallons per year as the goal for groundwater replenishment, and has sized the Pure Water Soquel conveyance infrastructure to accommodate up to 980 million gallons per year for possible future expansion and potential partnership with the City and other local water suppliers.

The current and projected uses of recycled water within the City's service area are presented in Tables 6-4a and 6-4b.

Table 6-4a: Recycled Water Direct Beneficial Uses (submittal table 6-4R)

Recycled Water Direct Beneficial Uses Within Service Area								
Name of Supplier Producing (Treating) the Recycled Water:			City of Scotts Valley and Pasatiempo Golf Course					
Name of Supplier Operating the Recycled Water Distribution System:			City of Scotts Valley					
Beneficial Use Type	General Description of 2020 Uses	Level of Treatment	2020	2025	2030	2035	2040	2045
Golf course irrigation	Pasatiempo Golf Course	Golf course irrigation	36	35	35	35	35	35
		Total:	36	35	35	35	35	35

Table 6-4b: Recycled Water Direct Beneficial Uses (submittal table 6-4R)

Recycled Water Direct Beneficial Uses Within Service Area		
Name of Supplier Producing (Treating) the Recycled Water:		City of Santa Cruz and/or Soquel Creek Water District
Name of Supplier Operating the Recycled Water Distribution System:		City of Santa Cruz and/or Soquel Creek Water District and/or City of Scotts Valley
Beneficial Use Type	**Potential** Beneficial Uses of Recycled Water	Amount of **Potential** Uses of Recycled Water
Landscape irrigation (exc golf courses)	**Title 22 Upgrade Project** - landscape irrigation at La Barranca and Neary Parks, and **BayCycle Project** - landscape irrigation at City Facilities and University of California, Santa Cruz (UCSC)	57.9 MG per year
Golf course irrigation	**Coordination with Pure Water Soquel** - Delavega Golf Course Irrigation	42 MG per year
Commercial use	**Title 22 Upgrade Project** - Bulk Water Station	1.8 MG per year
Industrial use	**BayCycle Project** - UCSC cooling towers and dual-plummed institutional buildings at UCSC	7.5 MG per eyar
Groundwater recharge (IPR)	**Groundwater Replenishment** Reuse at Beltz Wellfield and/or in Santa Margarita Groundwater Basin	328.5 MG per year

6.5.2.5 Planned Versus Actual Use of Recycled Water

Recycled water, as defined by the California Department of Water Resources, was not used by the City in 2015. The 2015 projected recycled water use for 2020 was 40 MG. While the 35 MG of projected golf course irrigation use was achieved, the 1 MG and 4 MG respectively for landscape irrigation and commercial uses were not achieved. A comparison of actual versus projected use is provided in Table 6-5.

Table 6-5: Recycled Water Use Projection Compared to Actual (submittal table 6-5R)

2015 UWMP Recycled Water Use Projection Compared to 2020 Actual		
Beneficial Use Type	2015 Projection for 2020 (MG)	2020 Actual Use (MG)
Landscape irrigation (excluding golf courses)	1	
Golf course irrigation	35	36
Commercial use	4	
Total	40	36

6.5.2.6 Actions to Encourage Future Recycled Water Use

Currently the City does not produce recycled water for use outside its wastewater treatment plant, therefore actions to encourage the use, including financial incentives, and development of a plan to optimize the use of recycled water in the City's service area do not apply at this time. The steps and actions to encourage and optimize recycled water will be defined in the future.

Table 6-6: Methods to Expand Future Recycled Water Use (submittal table 6-6R)

Methods to Expand Future Recycled Water Use			
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Santa Cruz Recycled Water Feasibility Study Phase 2	Contract with Kennedy/Jenks to further evaluate potential uses of recycled water	TBD	TBD

6.6 Desalinated Water Opportunities

For a decade or more, the City pursued a 2.5 mgd desalination facility as a regional project with Soquel Creek Water District to diversify both agencies' water supply portfolio. The WSAS, described in Section 6.8, includes desalinated water, but only as a last resort, and after exhausting several other preferred options (City of Santa Cruz, 2015).

In 2017, the City embarked on development of a Desalination Feasibility Update Review Report to evaluate the feasibility, cost, timeliness, and approach for pursuing a seawater desalination facility. While the 2018 report (Appendix J) found such a project to be technically feasible, additional feasibility review of a collector well system would be required, and it was further determined that the City's timeliness objective would not be met. Subsequently, further study of recycled water has been prioritized over seawater desalination.

6.7 Exchanges or Transfers

In 2016, the City and Soquel Creek Water District entered into a "Cooperative Water Transfer Pilot Project for Groundwater Recharge and Water Resource Management" agreement to transfer a small amount of water to Soquel Creek Water District in the winter months when excess surface water from the North Coast is available. The pilot agreement was extended in 2021 through 2026 (Appendix K). The agreement represents a first step in the implementation of the Water Supply Augmentation Strategy, described in Section 6.8, and serves to further study and determine the potential benefits of local exchanges and transfers as a groundwater management tool and supply reliability strategy.

Following successful completion of preliminary water quality studies, pilot transfers began in December 2018 and continued into March 2019. Ongoing water quality monitoring was conducted throughout the transfers and these data confirmed the results of the pre-transfer studies. Some additional transfers occurred in the winter of 2019-2020. Dry conditions have limited the City's ability to transfer water since the end of January 2020. Yearly totals for transfers of treated surface water to Soquel Creek Water District are as follows:

- In 2018, a total of 9 MG was transferred,
- In 2019, a total of 68 MG was transferred, and
- In 2020, a total of 13 MG of was transferred.

6.8 Future Water Projects

Future water projects are a critical to ensuring future water supply reliability for City of Santa Cruz Water customers. These projects are described below.

6.8.1 Water Supply Augmentation Strategy

Since 2015, the City of Santa Cruz has been pursuing its WSAS developed by the Water Supply Advisory Committee as described in the 2015 Urban Water Management Plan. The Water Supply Advisory Committee was formed in 2014 when the City Council approved formation and membership of the citizen committee with the charge to "explore, through an iterative, fact-based process, the City's water profile, including supply, demand and future risks; analyze potential solutions to deliver a safe, adequate, reliable, affordable and environmentally sustainable water supply; and, to develop recommendations for City Council consideration" (WSAC, 2015). The committee developed the Water Supply Advisory Committee Final Report on Agreements and Recommendations (October 2015), which was accepted by the City Council in November 2015. The Final Report was incorporated by reference into the 2015 Urban Water Management Plan, and the guiding recommendations continue to serve as the water supply management strategy for the City.

The WSAC recommendations are designed to address the "Problem Statement" included in the WSAC Final report:

> "Santa Cruz's water supply reliability issue is the result of having only a marginally adequate amount of storage to serve demand during dry and critically dry years when the system's reservoir doesn't fill completely. Both expected requirements for fish flow releases and anticipated impacts of climate change will turn a marginally adequate situation into a seriously inadequate one in the coming years. Santa Cruz's lack of storage makes it particularly vulnerable to multi-year droughts. The key management strategy currently available for dealing with this vulnerability is to very conservatively manage available storage. This strategy typically results in regular calls for annual curtailments of demand that may lead to modest, significant, or even critical requirements for reduction. In addition, the Santa Cruz supply lacks diversity, thereby further increasing the system's vulnerability to drought conditions and other risks…" (WSAC, 2015)

The overarching goal of the WSAS is to provide significant improvement in the sufficiency and reliability of the City water supply. As presented in the 2015 UWMP, the WSAS portfolio elements include the following (WSAC 2015):

- Element 0: Demand Management. Additional water conservation with a goal of achieving an additional 200 to 250 million gallons per year (MGY) of demand reduction by 2035 by expanding water conservation programs.
- Element 1: Transfers and Exchanges. Passive recharge of regional aquifers by working to develop agreements for delivering surface water to the Soquel Creek Water District and/or the Scotts Valley Water District so they can rest their groundwater wells, help the aquifers recover, and potentially store water for use by the City in dry periods.
- Element 2: Aquifer Storage and Recovery. Active recharge of regional aquifers by using existing infrastructure and potential new infrastructure in the Purisima aquifer in the Soquel-Aptos Basin (now referred to as the Santa Cruz Mid-County Groundwater Basin), in the Santa Margarita/Lompico/Butano aquifers (now referred to as the Santa Margarita Groundwater Basin) in the Scotts Valley area, or in both to store water that can be available for use by the City in dry periods.
- Element 3: Recycled Water or Desalination. A potable water supply using advanced-treated recycled water as its source as a supplemental or replacement supply in the event the groundwater storage strategies described in Element 1 and Element 2 prove insufficient to meet the goals of cost-effectiveness, timeliness, or yield. In the event advanced-treated recycled water does not meet the City's needs, desalination would become Element 3.

The Santa Cruz Water Department has been actively pursuing these recommendations since 2015 and continues to make steady progress. Conservation, or demand management, is not considered a water supply for the purposes of the UWMP. Details on this program can be found in Chapter 9. The current WSAS implementation schedule is included as Appendix M. Progress toward implementation of Elements 1 through 3 is described below.

6.8.1.1 Implementation of Transfers and Exchanges (Element 1)

The City has been working with Soquel Creek Water District to evaluate the feasibility of water transfers and exchanges since 2015 through the development of a formal pilot agreement, studies to assess the compatibility of surface and groundwater resources in distribution systems, and eventually piloting of water transfers in 2018 – 2020 as described in Section 6.7. The transfer agreement has been extended for an additional five years, 2021 – 2026, and additional piloting will continue as water supply conditions allow.

Future transfers and exchanges with local agencies, including Soquel Creek Water District, Central Water District, Scotts Valley Water District, and San Lorenzo Valley Water District would be facilitated by the water rights modifications to place of use proposed in the Santa Cruz Water Rights Project described in Section 6.8.2 below. The Santa Cruz Water Rights Project Draft EIR additionally examines implementation of water transfers and exchanges with local agencies. Limitations of this strategy include that it is limited both by availability of surface water for transfer and by the demand of other-agency systems to utilize transferred water when available. Transfers with Soquel Creek Water District may be further limited by the implementation of Pure Water Soquel due to potential operational constraints that are still being explored.

6.8.1.2 Implementation of Aquifer Storage and Recovery (Element 2)

The City has been evaluating the feasibility of ASR in both the Santa Cruz Mid-County and in the Santa Margarita Groundwater Basins, with current work primarily focused on the portion of Santa Cruz Mid-County Basin within the City of Santa Cruz service area. The City has completed groundwater modeling of over 20 scenarios, a well siting study, and a geotechnical study. Pilot testing has been conducted at the existing Beltz 12 well facility in 2019 and the existing Beltz 8 well facility in 2020 to better understand potential water quality and operational constraints. Additionally, the effects of implementation of the Pure Water Soquel Project, which was not anticipated when the WSAS was developed but is expected to improve basin sustainability, on future ASR project are being explored.

ASR in both basins would be facilitated by the water rights modifications proposed in the Santa Cruz Water Rights Project described in Section 6.8.2 below. The Santa Cruz Water

Rights Project Draft EIR additionally examines implementation of ASR. Next steps include consideration of longer-term demonstration of ASR at existing Beltz Well system facilities.

6.8.1.3 Implementation of Recycled Water or Desalination (Element 3)

As described in Section 6.7, further study of recycled water has been currently prioritized over seawater desalination. The City's evaluation of recycled water use is covered in detain in Section 6.4.

Table 6-7: Expected Future Water Supply Projects or Programs (submittal table 6-7R)

Expected Future Water Supply Projects or Programs					
Name of Future Projects or Programs	Joint Project with other suppliers?	Description	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Supplier (MG)
Water Supply Augmentation Strategy (WSAS): • Element 1: In Lieu. This alternative could include the sale of water to other agencies with or without the assumption of additional water back to the City during droughts. • Element 2: Aquifer Storage and Recovery. Evaluations of both the Mid-County and Santa Margarita Groundwater Basins are being conducted. • Element 3: Advanced Treated Recycled Water or Seawater Desalination.	Yes. Some elements could be developed in coordination with neighboring water districts including Soquel Creek Water District, Scotts Valley Water District, and/or San Lorenzo Valley Water District	See 2020 UWMP Section 6.8 for full description	2030	All Year Types	0 - 1200
NOTES: Some future water supply projects are not compatible with this table and are described in the narrative.					

6.8.2 Santa Cruz Water Rights Project

This project supports the implementation of the WSAS and involves the modification of the City's existing water rights to increase the flexibility of the water system by improving the City's ability to utilize surface water within existing allocations. This project also adds into the City's water rights Agreed Flows bypass flow requirements for all of the City's surface water sources which are protective of local anadromous fisheries. (See Chapter 7, Section 7.1.2 for additional description of the Agreed Flows). The success of this project is necessary for fisheries protection and to facilitate future water supply projects. The primary components of the Santa Cruz Water Rights Project include:

1. Water rights modifications related to place of use, method of diversion, points of diversion and rediversion, underground storage and purpose of use, extension of time, and Agreed Flows stream bypass requirements for fish habitats;
2. Water supply augmentation components, including new aquifer storage and recovery (ASR) facilities at unidentified locations, ASR facilities at the existing Beltz well facilities, water transfers and exchanges and intertie improvements; and
3. Surface water diversion improvements, including the Felton Diversion fish passage improvements and the Tait Diversion and Coast Pump Station improvements.

State Water Resources Control Board noticed the City's water rights change petitions on February 10, 2021. Subsequently, the project's Draft EIR was released for public review in summer 2021. The Final EIR, to be prepared addressing comments received on the Draft EIR, is expected to be completed in late 2021 or early 2022. Once completed, the Santa Cruz City Council will consider project approval and certification of the EIR and the State Water Resources Control Board will consider action on the City's water rights change petitions. The Santa Cruz Water Rights Project Community Guide is included as Appendix L.

6.8.3 Santa Cruz Water Program (Capital Investment Program)

City of Santa Cruz has embarked on ambitious capital investment program, the Santa Cruz Water Program, to secure our future water supply portfolio, to improve reliability and resiliency in the face of climate change, and to address aged infrastructure. Major investments are planned in the coming years to advance toward a twenty-first century water system. Staff has been working with HDR Engineering to implement the Water Program. Some elements of the program will help contribute to the WSAS and and support water supply reliability such as improvements to the Graham Hill Water Treatment Plant, raw water pipeline improvements, Tait diversion, as described below. Information on all projects included in the Program is included in Appendix N.

6.8.3.1 Graham Hill Water Treatment Plant Projects

Upgrades to the City's Graham Hill Water Treatment Plant are critical to the implementation of the WSAS to allow treatment of higher turbidity source water that otherwise would need

to be bypassed during period high flow periods such as during and after storm events. Recent and ongoing projects include major maintenance repairs to the flocculation, sedimentation and filtration basins, and replacement of three of the four concrete tanks. Simultaneous with these component repair and replacement projects, staff has been developing the Facilities Improvement Project. This project is a comprehensive evaluation of the treatment plant that identifies the most cost-effective improvements to meet water treatment objectives and improve the overall reliability and resiliency of the plant. Staff have been working since December 2017, completing a comprehensive condition assessment of the facility, evaluating alternative treatment processes, performing pilot testing, jar testing, and bench-top studies to analyze treatment alternatives as well as developing a plan for identified non-treatment items such as deficient office space and seismic upgrades to the operations building. These investments are designed to address aging infrastructure, prevent noncompliance with drinking water standards under anticipated future conditions, and support mission-critical values of supplying adequate, safe, and reliable water for the City's customers.

6.8.3.2 Raw Water Transmission Pipeline Projects

The City is planning improvements to raw water conveyance by upgrades to both the Newell Creek Pipeline and segments of the North Coast system. These projects will improve reliability and reduce hydraulic constraints to improve delivery of raw water to the Graham Hill Water Treatment Plant.

6.8.3.3 Tait Diversion Improvements

The City is also investigating improvements to the Tait Diversion facility that would improve reliability and fish screening. As described in the Santa Cruz Water Rights Project Draft EIR, if the Tait Diversion is added as a new point of diversion to existing Felton water rights, Tait Diversion capacity would be increased to accommodate the combined diversion of water under both the Tait and the Felton water rights at this facility.

6.9 Summary of Existing and Planned Sources of Water

6.9.1 Existing Sources of Water

The City's existing sources and actual production volumes for 2020 are presented in Table 6-8. The figures represent production volumes experienced during the exception COVID-19 global pandemic. As analyzed in Appendix D, 2020 saw residential water use in Santa Cruz slightly higher and business water use significantly lower than expected. The change in business water is thought to be a consequence of the shelter-in-place order and business restrictions mandated in response to the pandemic. Pandemic-related changes in residential water use on the order of 3-5 gallons per capital per day in other parts of California were measured (DWR, 2021a). Observed increases in Santa Cruz residential

water use between 2017-19 and 2020 were on the order of two gallons per capital per day. Some of this increase may also be attributed to weather differences.

Table 6-8: Water Supplies – Actual (submittal table 6-8R)

Water Supplies — Actual			
Water Supply	Additional Detail on Water Supply	2020	
		Actual Volume*	Water Quality
Surface water (not desalinated)	North Coast	360	Drinking Water
Surface water (not desalinated)	San Lorenzo River	1,724	Drinking Water
Supply from Storage	Loch Lomond	408	Drinking Water
Groundwater (not desalinated)	Beltz Well System	141	Drinking Water
Purchased or Imported Water	Emergency Intertie	2	Drinking Water
Recycled Water	Produced by City of Scotts Valley/ Pasatiempo Golf Course	35	Recycled Water
	Total	2,670	
NOTES: Net production. Source: Annual production data 2020.			

6.9.2 Planned Sources of Water

Table 6-9 provides an estimate of the volume of water, by source, that is reasonably projected to be available from 2025 to 2045. These volumes are based on deliveries for average years, projected water demands, available surface water flows consistent with ecosystem protection goals, and future water projects according to the City's water supply planning operations model, Confluence ®.

The City is safeguarding against future water shortages by and actively implementing future water projects as described in Section 6.8. Implementation of these projects is therefore assumed in the City's water supply planning process. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies described in this Urban Water Management Plan.

- In 2025, the City will have implemented proposed water rights modifications, including implementation of the Agreed Flows which are protective of local anadromous fisheries, as described in the Santa Cruz Water Rights Project Draft EIR (see Section 6.8.2) and
- In 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects:
    - Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft EIR,
    - Improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft EIR and as included in the Santa Cruz Water Program (see Section 6.8.3),
    - Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and
    - Replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program.

Table 6-9: Water Supplies – Projected (submittal table 6-9R)

Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply				
		2025	2030	2035	2040	2045
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Surface water*	North Coast	346	346	346	346	346
Surface water*	San Lorenzo River	1,847	1,877	1,887	1,948	1,967
Supply from Storage	Loch Lomond	349	331	331	331	331
Groundwater*	Beltz Well System	91	87	87	87	87
Recycled Water	Produced by City of Scotts Valley/ Pasatiempo Golf Course	35	35	35	35	35
Other	Aquifer Storage and Recovery	0	18	18	18	18
	Total	2,668	2,694	2,704	2,765	2,784
Not desalinated						

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. Projected water supply is based on normal year type. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program.

6.10 Climate Change Impacts to Water Supply

As the City of Santa Cruz water supply consists of only local sources maintained and recharged by natural processes, the potential weather conditions related to climate change could greatly impact the sources of supply. Prior to approximately 2013, water supply planning and the estimation of future water shortages for the City of Santa Cruz (City) were based solely on the 73 years of hydrologic record available for the Santa Cruz region. Using temperature and precipitation data and resulting hydrology from the past 73 years, the City used available tools and experience to predict future conditions. While this approach allowed the City to simulate longer droughts by synthetically creating time-sequences of dry periods, it was not capable of incorporating more severe droughts in terms of dryer, warmer climates.

Ongoing studies including evaluations of paleoclimate records and future climate model projections indicate that longer-term drought conditions have occurred in the past and are likely to occur again. Additionally, the 73-year period of record is characterized by rainfall patterns well above long-term averages and therefore the worst droughts reflected in the past 73 years likely understate future conditions.

During the Water Supply Advisory Committee process, which concluded in 2015, the City began incorporation of consideration of possible climate change hydrologies, in addition to the historic hydrology, into water supply planning. A goal of the process was to develop a supply augmentation work plan that was adaptable to future climate conditions. Through the supply planning work and the initial development of the pending HCP, the City focused on a worst-case climate change dataset, which for the Cal-Adapt datasets was the downscaled Geophysical Fluid Dynamics Laboratory Coupled Model (GFDL2.1 or CMIP3) for the A2 emissions scenario. It should be noted that the Cal-Adapt program was just getting up and running at that time to help state agencies respond to climate change.

The experiences and insights of the Water Supply Advisory Committee technical team have shown that the City's current supply system is vulnerable to future climate conditions projected in this region. By relying on local sources that are dominated by surface water and limited by a single reservoir, the City water system is vulnerable to any combination of conditions that result in drier or warmer climate, more intense rainfall over shorter periods of time, etc.

After completion of the process, the City has continued the evaluation of supply reliability under climate change conditions with additional model scenarios including but not limited to the use of the Coupled Model Intercomparison Project 5 (CMIP5) data set, including modified scenarios. An objective of this work is to understand the reasonable boundaries of future climate conditions with respect to timing, duration, and depth of supply deficits. The findings, whereas different in terms of magnitude of shortage and reliability of existing

supplies among the scenarios, all conclude that the City's current water supply situation is inadequate for meeting the longer-term challenges of climate change.

For the purposes of assessing climate change considerations in this Urban Water Management Plan, the water supply modeling for the supply reliability assessments presented in Chapter 7 were prepared using the City's water supply operations model, Confluence, utilizing both historic hydrology and CMIP5 climate change hydrology. The CMIP scenario used in the CMIP5 50-99 scenario which has been adjusted to include warmer air temperatures. It is important to note that this CMIP5 climate change hydrology represents a single possible future under climate change conditions that the City has selected to represent a reasonable prediction of future conditions. In this way, it is one useful way to think about climate change, but actual climate change could unfold in many different ways.

To address this type of uncertainty, moving forward, the City is adopting a new approach working with the Hydrosystems Group at the University of Massachusetts, Amherst to conduct a vulnerability assessment and develop an adaptation plan to understand the limitations of the current water supply system and evaluate adaptation options to mitigate effects of climate change to meet the City's water demand. This is being conducted through assessing the vulnerability of our system through an extensive exploration of future conditions to stress test the water system. What is expected to come from this analysis is a better understanding of the capabilities of the current system to meet future climate conditions, and under what conditions the current system begins to break down. This work, which is expected to ultimately replace the City's Confluence water supply operations model, is currently underway.

6.11 Energy Use

The City of Santa Cruz tracks municipal energy use, including Water Department energy use, on an online public energy dashboard as part of the City's ongoing climate action program. As summarized in Table 6-10, the City utilized about 5,800,000 kilowatt hours of energy system wide in 2020. This energy was used in the production, conveyance, treatment, and distribution of water within the water system. This results in a calculated energy intensity of 2,227 kilowatt hours per million gallons. Additionally, the Water Department generated about 600,000 kilowatt hours of self-generated renewable energy from solar arrays at the Graham Hill Water Treatment Plant and Bay Street Tanks site in 2020.

Table 6-10: Energy Reporting (submittal table O-1b) Recommended Energy Reporting - Total Utility Approach

Enter Start Date for Reporting Period	1/1/2020	Sum of All Water Management Processes		
End Date	12/31/2020			
		Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (MG)		*2604*		*2604*
Energy Consumed (kWh)		*5,799,263*		*5799263*
Energy Intensity (kWh/vol. converted to MG)		*2227.1*	*0.0*	*2227.1*

Quantity of Self-Generated Renewable Energy:
637,882 kWh

Data Quality:
Metered Data. No upstream data embedded.

Data from City of Santa Cruz Energy Dashboard for water production during the year 2020. The energy dashboard is publicly available online at:
https://app.powerbi.com/view?r=eyJrIjoiYTk4Yzk0NjctYTcyZC00YzYyLTkzYzUtMjY4M2JhNzM4NjE0IiwidCI6IjRjYTJkNDI0LTBlMmYtNDM3My04MGQwLTdiZjMwNWQwYmRiOCIsImMiOjZ9&pageName=ReportSection

Narrative for All Water Supply:
~Extraction and Diversion - energy is use to operate equipment at diversion facilities and wells
~Conveyance - energy is use at booster and pump stations to convey raw water
~Treatment - energy is used at surface water and groundwater treatment facilities
~Distribution - energy is used at pump stations to convey treated water and at reservoir/tank sites within the distribution system
~Self-generated renewable energy is produced from solar arrays at the Graham Hill Water Treatment Plant and the Bay Street Tanks site (distribution system)

Chapter 7

WATER SUPPLY RELIABILITY AND DROUGHT RISK ASSESSMENT

This chapter characterizes the City's water service reliability through assessments of forecasted supply relative to forecasted demand. Short-term reliability planning that requires immediate action, such as drought or a catastrophic supply interruption, is addressed in Chapter 8, Water Shortage Contingency Planning, and Appendix O, Water Shortage Contingency Analysis and Implementation.

7.1 Constraints on Water Sources

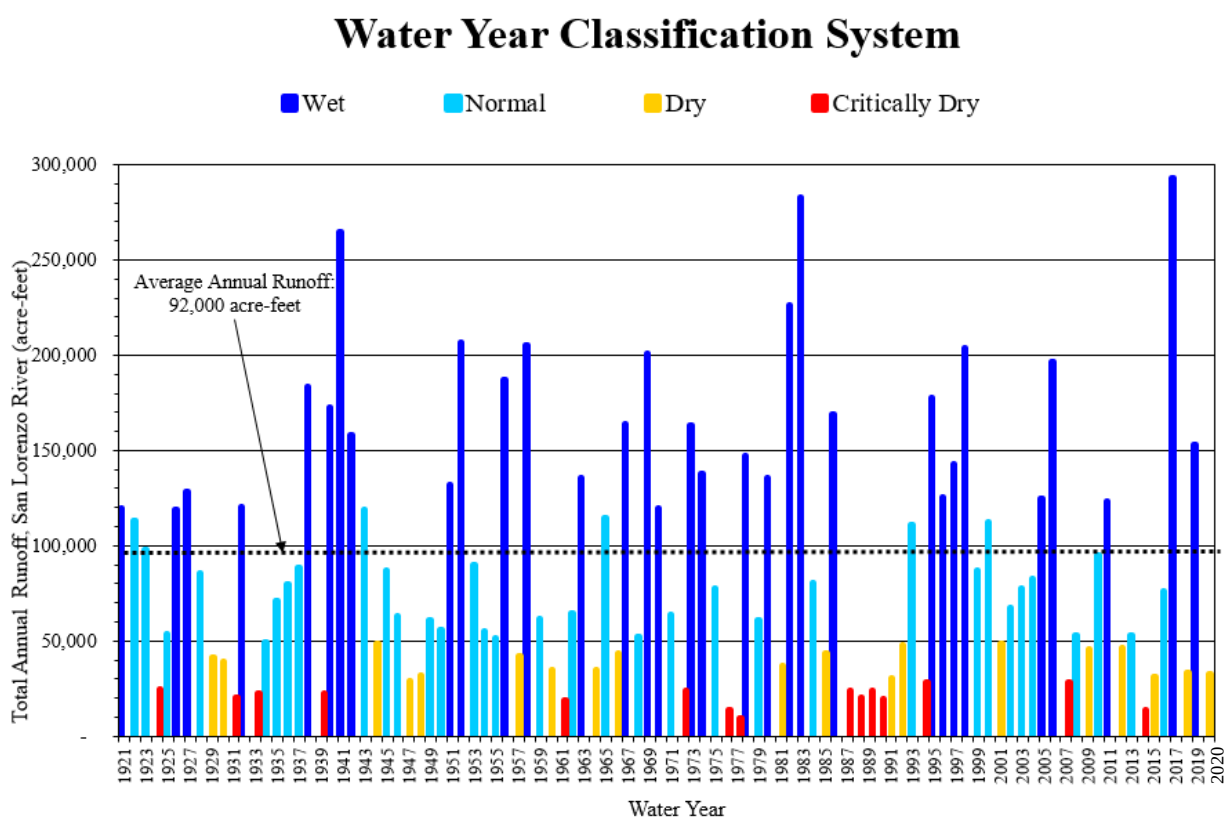
The City of Santa Cruz faces several obstacles in meeting its present and future water supply needs that necessitate future water supply projects. While each constraint presents a unique set of water management challenges, the common theme is the limitation in when and how much water is available to meet the area's water service needs, particularly during years when rainfall is below average, exacerbated by a lack of storage within the system. The following sections outline the known constraints on supply. Refer to Chapter 6, Section 6.8 for a discussion of the future water projects that the City is actively engaged in to address these identified constraints.

7.1.1 Local Supply Variability and Limited Storage

As explained in Chapter 3, the City water system draws almost exclusively on local surface water sources, whose yield varies from year to year depending on the amount of rainfall received during the winter season and generated runoff that provides beneficial inflows.

Figure 7-1 below shows the total annual runoff for the San Lorenzo River over the 90-year period from 1921 to 2020 and the classification for each water year. The graph illustrates the dramatic variation in discharge from year to year. This natural variation in the level of runoff available in local streams and rivers, from which the City draws the majority of its supply, is the major factor that results in an inconsistent level of water supply from year to year. Ultimately, the only water available to the City is that which originates from rain that falls on the ocean side of the Santa Cruz Mountains. In normal and wet years, when rainfall and runoff are abundant, the water system is capable of meeting the community's current total and anticipated annual water requirements.

Figure 7-1 Total Annual Stream Discharge from the San Lorenzo River



The system is highly vulnerable to shortage in extended dry periods or critically dry years, when the flow in local streams and river sources runs low. Moreover, like other communities on California's central coast, the Santa Cruz water system is physically and geographically isolated. Emergency interconnections with neighboring districts is limited by the lack of existing interties with neighboring districts. Due to the nature of the critically over drafted Santa Cruz Mid-County Groundwater Basin, the primary function of the existing intertie with the Soquel Creek Water District has been to send water to the District rather than from the District to the City.

Water is currently stored in the City's single reservoir, Loch Lomond Reservoir (impounded by the Newell Creek Dam), to serve peak season demands. This reservoir is an integral part of the supply system. Some amount of storage is used each year, mainly in the summer and fall months when the flows in the coast and river sources decline and additional supply is needed to meet higher daily water demands than during winter and spring. Storage is also used in winter months during storm events when water quality concerns prevent the use of the City's flowing sources.

During dry years, the system relies more heavily on water stored in Loch Lomond to satisfy demand, which draws down the reservoir level lower than usual and depletes available storage. In multi-year or critical drought conditions, the combination of very low surface flows in the coast and river sources and depleted storage in Loch Lomond Reservoir reduces available supply to a level that cannot support average dry season demands. Compounding the situation is the need to retain a certain amount of water in the reservoir if drought conditions continue into the following year. The existing system is not able to provide a reliable supply during multi-year droughts or prolonged periods of drier than normal hydrologic conditions within the source watersheds.

7.1.2 Ecosystem Restoration and Protected Species

Since 2002, the City of Santa Cruz has been working toward the development of a Habitat Conservation Plan (HCP) that covers operation and maintenance activities at the North Coast streams and San Lorenzo River diversions as well as other activities which may result in "take" of threatened and/or endangered species. An HCP is an operational avoidance and minimization and mitigation plan prepared under Section 10 of the Federal Endangered Species Act (FESA) and Section 2081 of the California Endangered Species Act (CESA) by nonfederal parties seeking to obtain a permit for incidental take of federally or state-listed threatened and endangered species.

The City initiated the HCP process because the streams from which the City diverts water currently support steelhead (*Oncorhynchus mykiss*) and the San Lorenzo River and Laguna Creek support coho (*Oncorhynchus kisutch*). Within the Central California Coast Region, steelhead is currently listed as "threatened" and coho is listed as "endangered" on the ESA federal list and Coho salmon are also listed as "threatened" under CESA.

Numerous studies undertaken in support of the HCP have evaluated what limiting factors may be affecting fish in these streams. Among other things, this includes evaluation of instream flow needs during all freshwater life phases (migration, spawning, incubation and rearing) over a range of hydrologic year types. Because these studies indicated that habitat conditions in these streams could be improved with increased instream flows, the City began voluntarily diverting less flow in 2007 on an interim basis in connection with the pursuit of the HCP.

The HCP conservation strategy has been designed to avoid, minimize, and fully mitigate the effects of the City's "Covered Activities" on "Covered Species" (steelhead and coho) and their habitat in support of the long-term viability of these populations within streams

affected by the HCP Covered Activities.[1] The ultimate fate of these populations depends on the actions of many other entities and natural processes both within and beyond areas under the City's control. The conservation strategy recognizes that the City's efforts will support and coordinate with overarching efforts to preserve these species within Santa Cruz County and the larger habitat boundaries for these species. The HCP biological goals and objectives address key limiting conditions in the Santa Cruz Mountains diversity stratum, particularly the effects of surface water diversions, as identified in the recovery plans for steelhead and coho (NMFS 2012, 2016).

The City has negotiated long-term minimum bypass flow requirements (Agreed Flows) for all City surface water sources with California Department of Fish and Wildlife (CDFW) and National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) as part of the HCP process. In particular, the HCP seeks to optimize habitat conditions for all life-stages of the subject species within the natural variability of the hydrologic regime. Any impacts to coho would be of particular concern because coho populations south of the Golden Gate Bridge are on the brink of extirpation. Provision of the Agreed Flows would generally require reduced diversions from the North Coast sources and from the San Lorenzo River at certain times and corresponding increased use of stored water from Loch Lomond Reservoir and use of groundwater. This would result in reduced storage in Loch Lomond Reservoir available for use during dry and drought periods. Overall, the implementation of the Agreed Flows would further reduce the City's dry-year water supply reliability, as it would further limit the amount of water that the City can divert.

The HCP was submitted to CDFW and NMFS for agency review in spring 2021 (City of Santa Cruz, 2021). Initiation of environmental review for the HCP and associated permit applications is expected to commence in fiscal year 2022 with the goal of permit process completion by late 2022 or early 2023.

The City's adoption of the HCP will be subject to review under the California Environmental Quality Act, and NMFS's processing of the HCP as a Section 10 permit application will be subject to a separate environmental review under the National Environmental Policy Act. However, as both CDFW and NMFS have tentatively agreed on the bypass flow requirements, the City has independently committed to implement the Agreed Flows as part of the Santa Cruz Water Rights Project (see Section 6.8.2), regardless of the final outcome of the HCP process. Under the Agreed Flows, less water will be available from the City's flowing sources for supply in future years

[1] The HCP Covered Activities include operation, maintenance, and rehabilitation of the City's water supply and water system facilities, including surface water diversions, operation and maintenance of the City's municipal facilities, and management of City lands.

compared, and as such, there will be greater reliance on water stored in Loch Lomond Reservoir to meet the community's annual water needs and the aforementioned vulnerability to shortage could be exacerbated.

7.1.3 Water Rights Constraints

As described in Chapter 6, the City of Santa Cruz holds pre-1914 water rights to its North Coast Sources and post-1914 licenses and permits for its water rights on the San Lorenzo River and Newell Creek. Through planning processes including the development of the draft HCP and City's Water Supply Augmentation Strategy (WSAS), the City has identified the need to improve flexibility in operation of the City's water system while enhancing stream flows for local anadromous fisheries. Incorporating the Agreed Flows into all City water rights is necessary to benefit local fisheries, specifically for coho and steelhead, but will further constrain the City's limited surface water supply. Consequently, the City has a need to improve the operational flexibility of the water system within existing rights, permits, and licenses to allow more effective use of limited water resources. To do this, the City is proposing water rights modifications to its existing rights, permits, and licenses to expand the authorized place of use (POU), to better utilize existing diversions, and to extend the City's time to put water to full beneficial use.

The Santa Cruz Water Rights Project, described in Chapter 6, Section 6.8.2, includes the following objectives to address current water rights constraints:

1. Improve the flexibility with which the City operates the water system to facilitate the City's ability to meet drinking water demand while providing flow conditions protective of coho and steelhead.
2. Provide flow conditions that are protective of coho and steelhead within all streams from which the City diverts water, as negotiated with CDFW and NMFS during the preparation of the pending HCP, which is the habitat conservation plan being developed under the federal ESA and CESA.
3. To improve the City's limited storage and support the implementation of the City's WSAS Element 1 (passive recharge of regional aquifers via water transfers and exchanges) and Element 2 (active recharge of regional aquifers via aquifer storage and recovery (ASR)) in order to deliver a safe, adequate, reliable and environmentally sustainable water supply.
4. Facilitate opportunities within the City and regionally for conjunctive use[2] of the City's surface water rights in combination with groundwater, including by addressing significant barriers to implementing conjunctive use due to the place of use associated with the City's water-right permits and licenses to, among other

[2] Conjunctive use refers to a range of actions and projects that provide for the coordinated management of surface water and groundwater supplies to increase total supplies and enhance water supply reliability. Conjunctive use actions and projects can also be used to sustainably manage groundwater supplies.

things, assist in implementation of the "Water Transfers/In Lieu Groundwater Recharge" element of the Santa Cruz Mid-County Groundwater Basin Groundwater Sustainability Plan (GSP).

5. Provide more options for where and how the City can utilize its existing appropriative water rights.
6. Provide for the underground storage of surface water primarily to support more reliable and improved water supply by allowing the City to use such stored water during dry periods and also to contribute to the protection of groundwater quality from seawater intrusion per the Santa Cruz Mid-County Groundwater Basin GSP and to allow for the implementation of the "Aquifer Storage and Recovery" element of the Santa Cruz Mid-County Groundwater Basin GSP.
7. Remove potential operational constraints on City water rights that do not explicitly recognize direct diversion.
8. Allow additional time for the City to fully reach beneficial use under existing water-right permits at Felton.
9. Improve fish screening at the Felton Diversion and Tait Diversion and improve fish passage at the Felton Diversion. Consideration of fish passage improvements at Tait Diversion would be incorporated into future projects as required.
10. Address reliability and operational deficits at the Tait Diversion and Coast Pump Station to meet other project objectives.
11. Implement state policy favoring integrated regional water management by involving the City and other local agencies in "significantly improving" the "reliability of water supplies" by "diversifying water portfolios, taking advantage of local and regional opportunities, and considering a broad variety of water management strategies," specifically by making more extensive conjunctive use of the surface-water, groundwater and groundwater-storage resources available to the City and, when Agreed Flows and City demands are met, making excess surface water under the City's surface-water rights available to neighboring agencies who are dependent on overdrafted groundwater basins. (Water Code Section 10531[c].)
12. Consider other related actions or activities that would be foreseeable as a logical part in a chain of contemplated actions should the project be approved, including facilities that would provide for ASR, water transfers, and water exchanges.

7.1.4 Source Water Quality and Treatment Capacity

The City's Graham Hill Water Treatment Plant (GHWTP) currently complies with all drinking water standards set by the US Environmental Protection Agency and the State Water Resources Control Board Division of Drinking Water. These regulations require monitoring of water sources, watershed protection, treatment techniques, and extensive monitoring of treated water quality throughout the distribution system.

The primary issues with respect to water quality are treatment challenges posed by future changes in our source water mix driven in part by ecosystem protection requirements and to accommodate the WSAS. The treatment plant is a conventional surface water treatment plant that was commissioned in 1960 as a 12 million gallons per day (MGD) plant and has undergone an expansion and a number of improvements over the last 50 years. Except for groundwater from the Beltz Well system, all water delivered through the City system is treated at this plant. In other words, it must operate properly 100 percent of the time to maintain water service throughout the entire system. Following the last major expansion the plant can process up to 24 MGD. Currently, the plant's ten-year average production is between 7 MGD and 8 MGD.

In addition to addressing aging infrastructure at the treatment plant, the City has been evaluating improvements to address a variety of changing conditions, including climate change considerations. This includes changing the mix of source water when accommodating the Agreed Flows, treating more turbid flows and providing potential higher daily plant output in winter to support the WSAS, accommodating changing storm patterns that may deliver regional rainfall in higher volumes over shorter periods of time, and evolving water quality regulations.

7.2 Drought Risk Assessment

The Drought Risk Assessment (DRA) is a new requirement in the 2020 Urban Water Management Plan. The assessment includes a supply and use comparison looking ahead assuming drought conditions over the next five years. The DRA can be modified or updated on an interim cycle, as such, it is required to include a description of the basis for assessment, an analysis of reliability for individual water sources, as well as a comparison of total water supply and use comparison over a five year drought period, even if this information is provided in detail elsewhere in the Urban Water Management Plan.

7.2.1 Basis for Assessment

The data, methods, and basis for assumed water shortage conditions are consistent with those used throughout this 2020 Urban Water Management Plan. Specifically, projected demand is based upon the long-term demand forecast prepared for the City by M.Cubed. In 2014 and 2015, the City of Santa Cruz worked with M.Cubed to develop a long-term water demand forecast using econometric forecasting, and that demand forecast was updated in 2021 for use in this Urban Water Management Plan (Appendix D).

The City of Santa Cruz utilizes the Confluence® model to analyze the variability of water supplies to determine potential water supply shortages. The City has been utilizing the Confluence® model to support water supply planning activities since 2003 and this model was also used to generate the results for the 2010 and 2015 UWMP. The model takes into account the variation in demand both within and between years, the availability of water from various sources, and the capacity of infrastructure to pump and treat the water. The results presented in this section provide perspective on the City's drought risk and water supply reliability based on accepted assumptions and projected conditions in the water system under historic hydrology and a selected climate change hydrology.

In this Urban Water Management Plan, the period 1973 – 1977 is used as the DRA and five-consecutive-year drought in the reliability assessment described below because it is the period in the historic record that would pose the greatest challenge to the City's water supply system. Even though the sequence began with wet and normal years, the extremely dry period that occurred in the final two years of the sequence in 1976 and 1977 would result in greatest water supply shortages of any five-year period in the historical record. The sequencing of year types in this period is as follows:

- Year One (1973) – Wet
- Year Two (1974) – Wet
- Year Three (1975) – Normal
- Year Four (1976) – Critically Dry
- Year Five (1977) – Critically Dry

By way of comparison, the drought of 1987 – 1991 was a period of more consecutive years classified as either dry or critically dry, but the hydrology of the period of 1973 – 1977 would result greater supply shortages for the City's supply system.

The City has chosen to conduct this analysis using both historic hydrology and a selected climate change hydrology, CMIP-5, similar to the approach utilized for the reliability assessment described below. The scenario used is the CMIP5 50-99 scenario which has been adjusted to include warmer air temperatures. The five-year consecutive drought period was selected as the driest period identified from the climate change hydrology resulting in the greatest projected supply shortages.

Based on anticipated timing of certification of the Santa Cruz Water Rights Project Environmental Impact Report and action by the State Water Resources Control Board on proposed water rights modifications, the City's proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report (see Chapter 6, Section 6.8.2), including implementation of the Agreed Flows which are protective of local anadromous fisheries, are assumed for 2022 through 2025 of the DRA, but are not assumed in the first year of the analysis. Neither implementation of ASR of planned infrastructure projects are assumed to be implemented within the timeframe of this analysis.

7.2.2 Total Water Supply and Use Comparison

Table 7-1 presents the results of the DRA. This analysis shows that projected supply would meet projected demand for the first four years of the extended five-year drought, but that in the fifth year, a substantial, 27 percent, shortage is projected. This projected shortage would require aggressive reduction savings according to the City's Water Shortage Contingency Plan. During an extended drought period, however, the City would likely utilize the Water Shortage Contingency Plan and implement demand reduction requirements in earlier years before an actual shortage is experienced, to ensure adequate supplies remain in Loch Lomond Reservoir, thereby potentially reducing the depth of shortage experienced in the fifth year.

Table 7-1C presents the DRA under the selected climate change hydrology. Under these conditions, a minor shortage of 3% would be expected in the second year, but substantial shortages of 25 percent and 23 percent would be expected during the fourth and fifth years of the extended drought scenario respectively. These projected shortages would require high levels reduction savings implemented per the Water Shortage Contingency Plan.

These near-term drought risks underline the City's need for water supply augmentation and for the pursuit of its WSAS and Water Program described in Chapter 6, Section 6.8.

Table 7-1: Five-Year Drought Risk Assessment (submittal table 7-5R)

Five-Year Drought Risk Assessment	
2021	Total
Total Water Use (MG)	2,646
Total Supplies (MG)	2,646
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2022	Total
Total Water Use (MG)	2,652
Total Supplies (MG)	2,652
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from action	0%
2023	Total
Total Water Use (MG)	2,657
Total Supplies (MG)	2,657
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2024	Total
Total Water Use (MG)	2,663
Total Supplies (MG)	2,663
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2025	Total
Total Water Use (MG)	2,668
Total Supplies(MG)	1,948
Surplus/Shortfall w/o Action (MG)	(720)
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	720
Resulting % Use Reduction from Action	27%

Table 7-1C: Five Year Drought Risk Assessment Table under a Projected Climate Change Hydrology

Five-Year Drought Risk Assessment Under a Projected Climate Change Hydrology	
2021	Total
Total Water Use (MG)	2,646
Total Supplies (MG)	2,646
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2022	Total
Total Water Use (MG)	2,652
Total Supplies (MG)	2,652
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2023	Total
Total Water Use (MG)	2,657
Total Supplies (MG)	2,586
Surplus/Shortfall w/o Action (MG)	(71)
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	71
Resulting % Use Reduction from Action	3%
2024	Total
Total Water Use (MG)	2,633
Total Supplies (MG)	2,005
Surplus/Shortfall w/o Action (MG)	(628)
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	628
Resulting % Use Reduction from Action	25%
2025	Total
Total Water Use (MG)	2,668
Total Supplies (MG)	2,089
Surplus/Shortfall w/o Action (MG)	(581)
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	581
Resulting % Use Reduction from Action	23%

7.2.3 Individual Water Source Reliability and Determination

The DRA includes an assessment of the reliability of and determination on each water source over the five-consecutive year drought. The DRA captures a period when the City will be implementing Agreed Flows, which are protective of local anadromous fisheries, but before WSAS projects to augment water supply are operational. Figure 7-2 illustrates the water supply by source for each year in the drought risk assessment. The City's flowing sources, the North Coast streams and San Lorenzo River, comprise the majority of the City's water supply. After 2022, assuming implementation of proposed water rights modifications, these sources will be managed according to Agreed Flows bypass requirements which are protective of local anadromous fisheries and will limit the ability for the City to divert from flowing sources compared to historical practices. These flowing sources are also highly susceptible to reduced flow availability during drought conditions.

Reduced water availability from the flowing sources results in increased reliance during dry years on the Beltz Well system for groundwater and Loch Lomond Reservoir for supply from storage. The Beltz Well system, however, is constrained by the limited capacity of the four groundwater wells and is managed as a basin in critical overdraft per the Santa Cruz Mid-County Groundwater Basin Groundwater Sustainability Plan (Appendix H). Furthermore, Loch Lomond Reservoir is currently the City's only supply storage, and as such, it must be managed conservatively to ensure sufficient supplies are available to address the possibility of extended drought. Because of this, the City will typically activate its Water Shortage Contingency Plan as described in Chapter 8 during single dry years, when supplies may otherwise be sufficient to meet current-year demand, to hold as much storage as possible for possible subsequent dry years without opportunity to refill the reservoir during winter rains.

Recycled water used within the system is currently limited to irrigation of the Pasatiempo Golf Course and is supplied from the City of Scotts Valley. This recycled water supply is not expected to be impacted by drought conditions.

The City additionally conducted the Drought Risk Assessment utilizing the selected climate change projection. Figure 7-2C illustrates the City's water supply by source that is projected to be utilized under this scenario. The vulnerability of flowing sources, the North Coast Streams and San Lorenzo River, to drought can be seen in the rapid drop of availability of these sources between years two and three in this scenario. Subsequently, the inability to refill Loch Lomond Reservoir during ensuing dry years, leads to two successive years of significant projected supply shortages.

Figure 7-2: Drought Risk Assessment Supply by Source

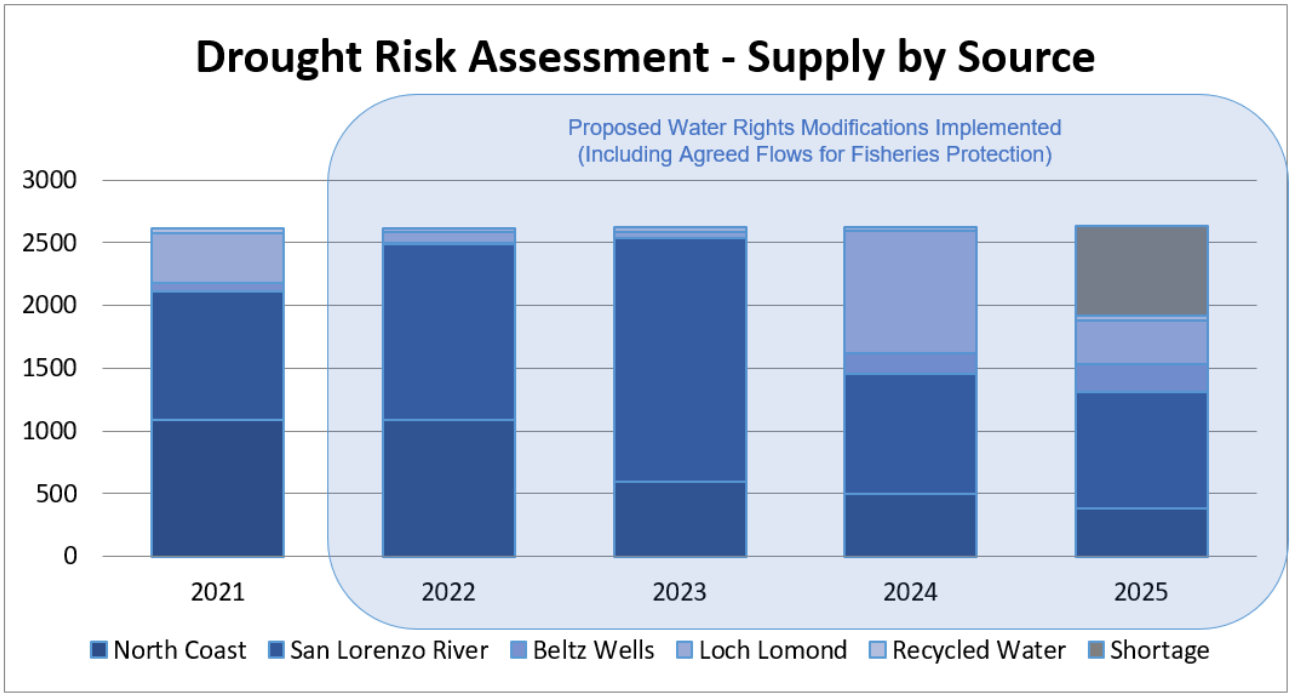
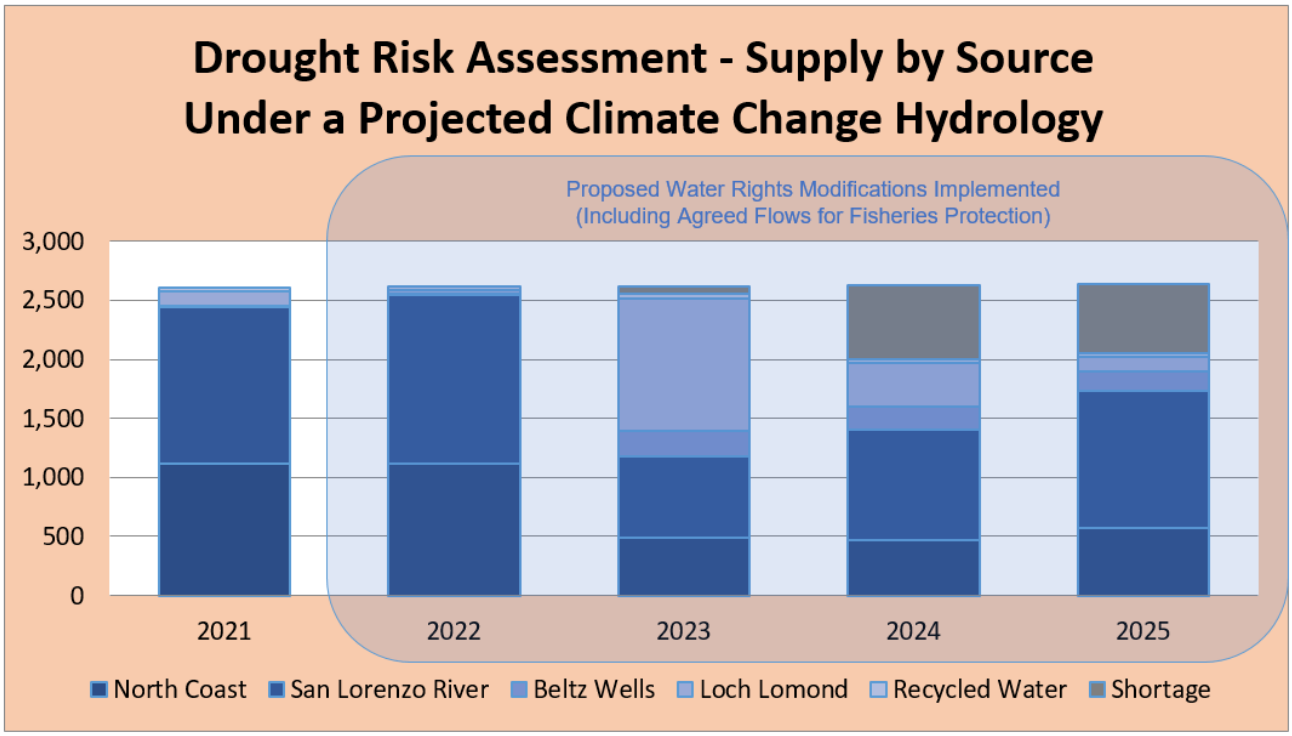


Figure 7-2C: Drought Risk Assessment Supply by Source under a Projected Climate Change Hydrology



7.3 Reliability by Type of Year

For the purposes of assessing water system reliability, the California Department of Water Resources uses the following definitions for determining year type:

Average/Normal Year: This condition represents the water supplies available during normal conditions. This could be a single year or averaged range of years that most closely represents the average water supply available. In this reliability assessment, the year 2010 is used to represent the average year because flows in the San Lorenzo River during this year were very close to the historical average.

Single-dry Year: A year that represents the lowest water supply available to the agency. In this reliability assessment, the year 1977 is used as the single dry year because it was the single driest year in this historical record.

Five-Consecutive-Year Drought: The five-consecutive-year drought represents the driest five year historical period for the supplier. In this reliability assessment, the period 1973 – 1977 is used as the five-consecutive-year drought because it is the period in the historic record that was most challenging from a water supply perspective, particularly due to the extremely dry two years of 1976 to 1977 as described in Section 7.2.1 above.

While the Urban Water Management Plan requires that reliability assessments be conducted utilizing the historic record as the basis for analysis, the City also elected to conduct the reliability assessments using a selected climate change hydrology, a modified CMIP-5 scenario, as described in Chapter 6, Section 6.10. Average, single-dry, and a five-year consecutive drought period were selected as representative from the climate change hydrology, and are presented in Table 7-1C.

Table 7-2: Basis of Water Year Data (submittal table 7-1)

Basis of Water Year Data (Reliability Assessment)			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP.
		☑	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available (MG)	% of Average Supply
Average Year	2010	2785	100%
Single-Dry Year	1977	2785	100%
Consecutive Dry Years 1st Year	1973	2785	100%
Consecutive Dry Years 2nd Year	1974	2785	100%
Consecutive Dry Years 3rd Year	1975	2785	100%
Consecutive Dry Years 4th Year	1976	2684	96%
Consecutive Dry Years 5th Year	1977	1954	70%

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply planning) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

Table 7-2C: Basis of Water Year Data under a Projected Climate Change Hydrology

Basis of Water Year Data (Reliability Assessment) Under a Projected Climate Change Hydrology			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP.
		☑	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available (MG)	% of Average Supply
Average Year	n/a	2785	100%
Single-Dry Year	n/a	2486	89%
Consecutive Dry Years 1st Year	n/a	2785	100%
Consecutive Dry Years 2nd Year	n/a	2785	100%
Consecutive Dry Years 3rd Year	n/a	2607	94%
Consecutive Dry Years 4th Year	n/a	2060	74%
Consecutive Dry Years 5th Year	n/a	2060	74%

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing a modeled climate change hydrology (CMIP-5). The Confluence model utilizes system demands to model available water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

7.4 Supply and Demand Reliability Assessment

To demonstrate supply reliability over time for each base year type modelled, Figure 7-3 illustrates projected supply available relative to demand over the 25-year planning horizon of this assessment. As further described below and consistent with the City's WSAS, implementation of pending water rights modifications, including Agreed Flows which are protective of local anadromous fisheries, is assumed after 2025. Improved reliability is projected after 2030 due to implementation of ASR and planned infrastructure projects.

As will be expanded on in the following section, the City projects having sufficient water supply available in normal years and single dry years to serve anticipated demand throughout the 2025 – 2045 analysis period.

Under multi-year drought conditions in the near term (2025), with proposed water rights modifications but before implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the multi-year drought scenario, but would fall short of demand by 27 percent in year five. While the analysis characterizes this vulnerability for year five of the drought period, depending on sequencing of rain years, in reality it is possible that such a shortage could occur sooner and persist longer through a multiple dry year period. Under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the mutli-year drought scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than a negligible two percent.

Figure 7-3C shows the projected supply available relative to demand under the modeled climate change hydrology. Compared to historic hydrology, there is potential for decreased reliability under a single dry year and under multi-year drought conditions under the climate change scenario. The City projects having sufficient water supply available in normal years under the climate change hydrology.

In single dry year conditions in the near term (2025), with proposed water rights modifications but before implementation of the ASR and planned infrastructure projects, supply would fall short of projected demand by seven percent. Under multi-year drought conditions in the near term available supplies would meet projected demand in years one and two of the multi-year drought scenario, but would fall short of system demands by two percent in year three and by 23 percent in years four and five. However, under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than five percent.

Figure 7-3: Projected Supply Availability as Demand Served

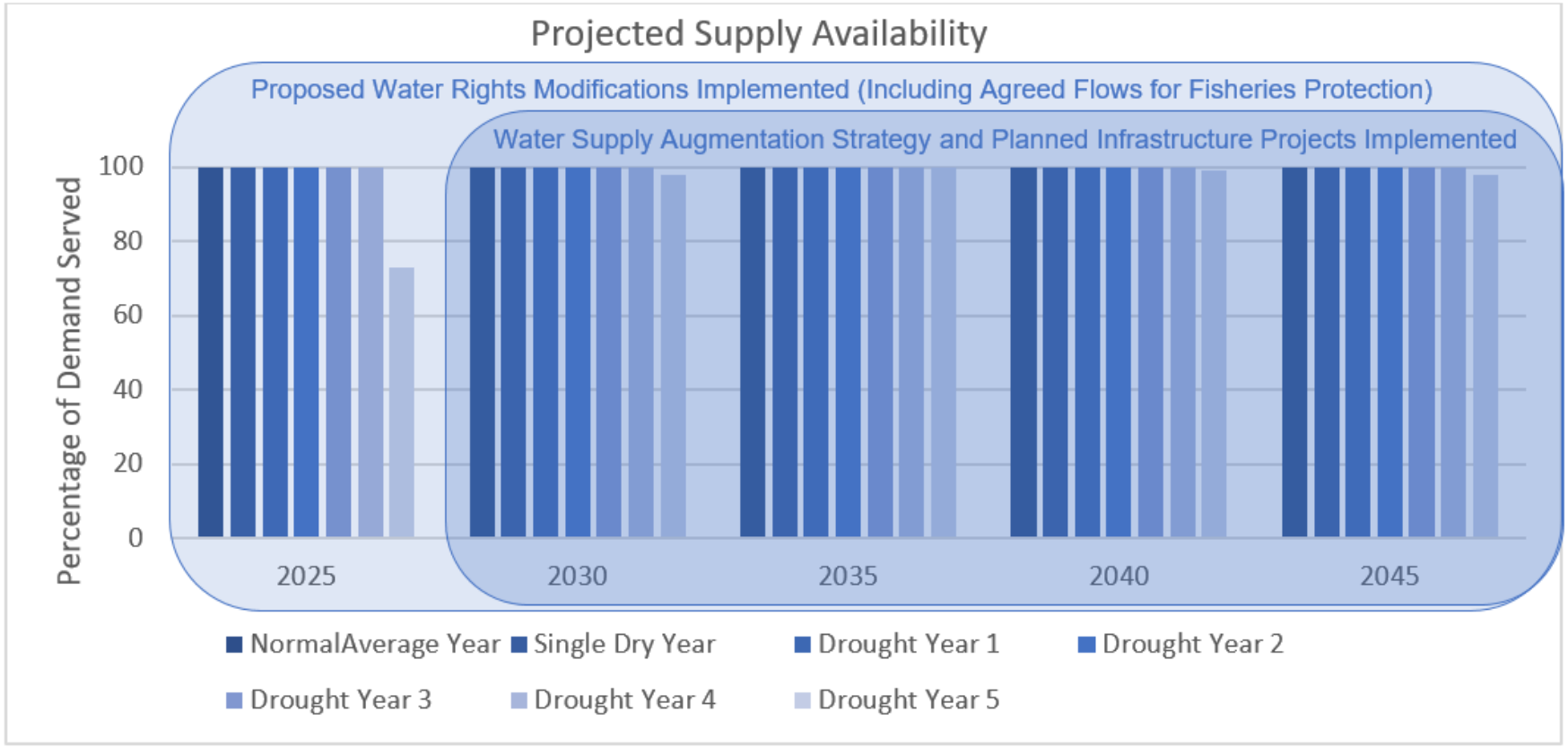
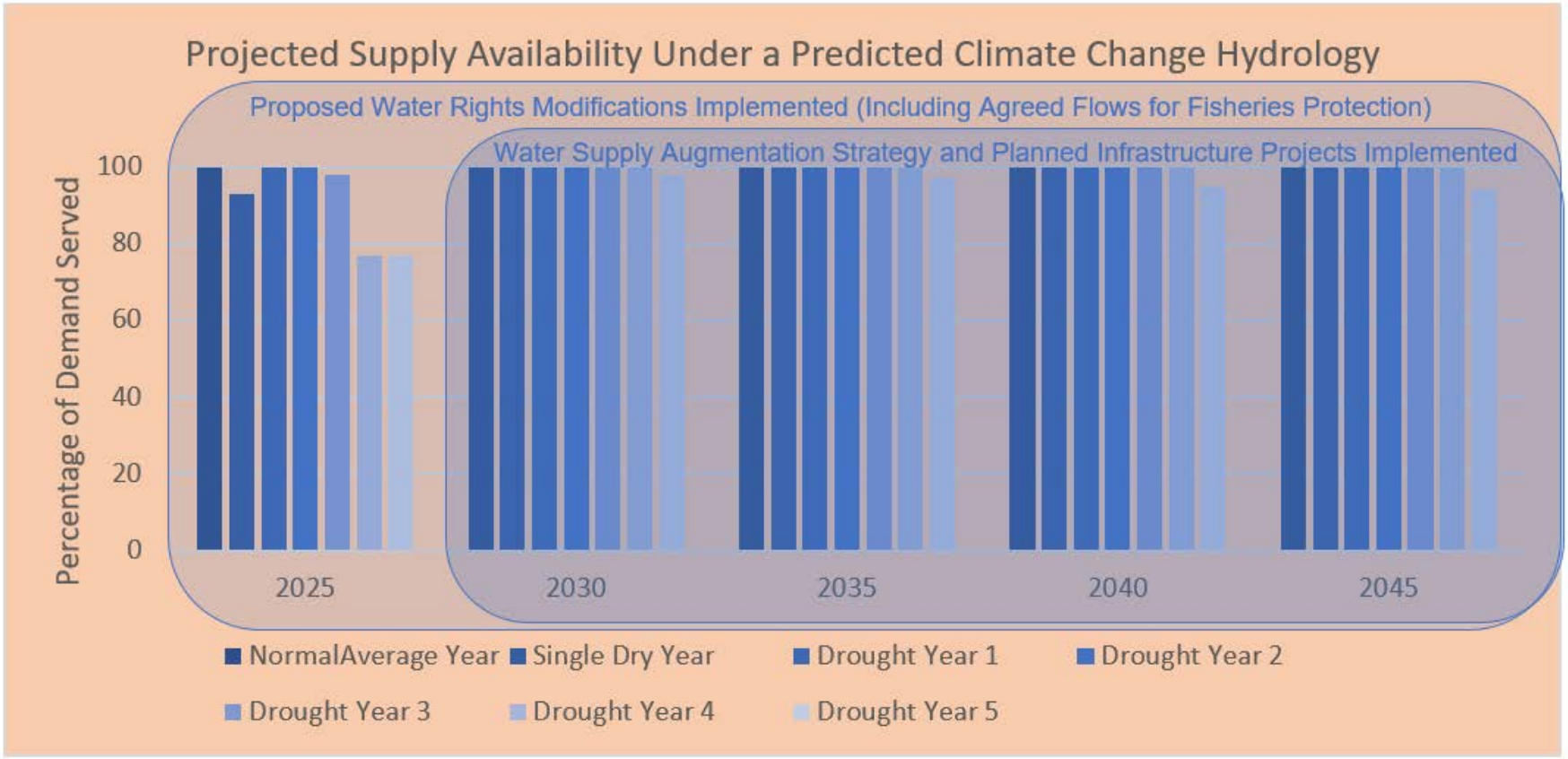


Figure 7-3C: Projected Supply Availability as Demand Served under a Projected Climate Change Hydrology



As described in Section 7.2.1, the City of Santa Cruz utilizes the Confluence® model to analyze the variability of water supplies to determine potential water supply shortages. The model takes into account the variation in demand both within and between years, the availability of water from various sources, and the capacity of infrastructure to pump and treat the water. The results provide perspective on the City's water supply reliability based on accepted assumptions and projected conditions in the water system. Similar to the DRA, the results presented in this section provide perspective on the City's water supply reliability based on accepted assumptions and projected conditions in the water system under historic hydrology and a selected climate change hydrology.

The City is safeguarding against future water shortages by actively implementing future water projects as described in Chapter 6, Section 6.8. Implementation of these projects is therefore assumed in the City's water supply planning process. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies over the 25-year planning horizon of this Urban Water Management Plan.

- In 2025, the City will have implemented proposed water rights modifications, including implementation of the Agreed Flows which are protective of local anadromous fisheries, as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report (see Section 6.8.2) and
- In 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects:
    - Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 MGD injection and 8.0 MGD extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report,
    - Improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program (see Section 6.8.3),
    - Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and
    - Replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program.

7.4.1 Normal/Average Water Year

After selecting the representative normal year (2010) from the 78-year period of record, average conditions were projected for the future five-year intervals through 2045. The summary results of this assessment, showing no shortages over the planning period with implementation of future water projects, are presented in Table 7-2 below for historic hydrology and Table 7-2C for the projected climate change hydrology.

Table 7-3: Normal Year Supply and Demand Comparison (submittal table 7-2R)

Normal Year Supply and Demand Comparison					
	2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
Supply totals	2,668	2,694	2,704	2,765	2,784
Demand totals	2,668	2,694	2,704	2,765	2,784
Difference	0	0	0	0	0

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

Table 7-3C: Normal Year Supply and Demand Comparison under a Projected Climate Change Hydrology

Normal Year Supply and Demand Comparison Under a Projected Climate Change Hydrology					
	2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
Supply totals	2,668	2,694	2,704	2,765	2,784
Demand totals	2,668	2,694	2,704	2,765	2,784
Difference	0	0	0	0	0

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing a modeled climate change hydrology (CMIP-5). The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

7.4.2 Single Dry Water Year

This assessment presents water supply available to the City as reflecting conditions comparable to water year 1977, which was the driest year in the historical record. As shown in Table 7-3, water supply during a single dry year is sufficient to meet the demand over the planning horizon through 2045 with implementation of future water projects.

The same analysis using the driest year in the projected climate change hydrology indicates a potential supply shortage of about seven percent in the near term, 2025 as indicated in Table 7-3C. As described above, in 2025, the analysis assumes proposed water rights modifications including implementation of the Agreed Flows bypass requirements which are protective of local anadromous fisheries and will limit the ability for the City to divert from flowing sources compared to historical practices, but implementation of the WSAS and planned infrastructure projects is not anticipated or assumed in the analysis until the year 2030. With both the proposed water rights modifications and water supply augmentation in place in 2030 and beyond, no water supply shortages are expected under the single dry year scenario under projected climate change hydrology conditions.

Table 7-4: Single Dry Year Supply and Demand Comparison (submittal table 7-3R)

Single Dry Year Supply and Demand Comparison					
	2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
Supply totals*	2,668	2,694	2,704	2,765	2,784
Demand totals*	2,668	2,694	2,704	2,765	2,784
Difference	0	0	0	0	0

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

Table 7-4C: Single Dry Year Supply and Demand Comparison under a Projected Climate Change Hydrology

Single Dry Year Supply and Demand Comparison Under a Projected Climate Change Hydrology					
	2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
Supply totals*	2,486	2,694	2,704	2,765	2,784
Demand totals*	2,668	2,694	2,704	2,765	2,784
Difference	182	0	0	0	0

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing a modeled climate change hydrology (CMIP-5). The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

7.4.3 Multiple Dry Water Year Period

The City chose to present the estimated water supply available during the multiple-dry water-year period of a five-year drought sequence using hydrology from 1973 through 1977 even though the first two years of this period were categorized as wet . As described above, the extreme critical dry years in years four and five (1976 and 1977) of the scenario make this period the most challenging period for the City's water supply system in the historical record. The results of the multiple dry year supply and demand comparison are provided as totals and overall differences in Table 7-5.

In an extreme five-year drought similar to the 1973 to 1977 event, the estimated water supply available to the City in the near term, 2025, during the fourth year would meet over 99 percent of projected demand, but during the fifth year only 73 percent of projected demand would be met. As described above, the analysis assumes proposed water rights modifications including implementation of the Agreed Flows bypass requirements which are protective of local anadromous fisheries and will limit the ability for the City to divert from flowing sources compared to historical practices, but implementation of the WSAS and planned infrastructure projects is not anticipated or assumed in the analysis until the year 2030. While the analysis characterizes this vulnerability to shortage for the final year of the extended drought period, depending on sequencing of rain years, in reality such a shortage could occur sooner and persist longer through a multiple dry-year period. Additionally, during an extended drought period, the City would likely implement demand reduction requirements per the City's Water shortage Contingency Plan in earlier years before an actual shortage is experienced to ensure adequate supplies remain in Loch Lomond Reservoir, thereby potentially reducing the depth of shortage experienced in later year(s).

With implementation of both WSAS and planned infrastructure projects, along with the proposed water rights modifications, in all place by 2030 and beyond, projected supply would meet projected demand, except for very small projected shortages during the fifth year of the extended drought during the 2040 – 2045 timeframe. During this period in the fifth year of the extended drought, supply is projected to be able to meet 98 percent of demand.

Under the projected climate change hydrology, greater shortages are projected in both the near and long term as compared to the analysis using historic hydrology. Under this scenario, shortages would be expected during years three through five of the five-year drought in the near term, 2025. Shortages would range from two percent in the third year to 23 percent in years four and five. In the period from 2030 to 2045, with subsequent implementation of proposed water supply augmentation and planned infrastructure projects, the City could expect small shortages of two to five percent during the fifth year of the extended drought sequence under the selected climate change conditions. The results of the multiple dry year supply and demand comparison under the selected climate change scenario are provided as totals and overall differences in in Table 7-4C.

Table 7-5: Multiple Dry Year Supply and Demand Comparison (submittal table 7-4R)

Multiple Dry Years Supply and Demand Comparison						
		2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
First year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Second year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Third year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Fourth year	Supply totals	2,660	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(8)	0	0	0	0
Fifth year	Supply totals	1,954	2,694	2,704	2,723	2,723
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(714)	0	0	(42)	(61)

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

Table 7-5C: Multiple Dry Years Supply and Demand Comparison under a Projected Climate Change Hydrology

Multiple Dry Years Supply and Demand Comparison Under a Projected Climate Change Hydrology						
		2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
First year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Second year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Third year	Supply totals	2,607	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(6`)	0	0	0	0
Fourth year	Supply totals	2,060	2,681	2,693	2,755	2,773
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(608)	0	0	0	0
Fifth year	Supply totals	2,060	2,630	2,630	2,630	2,630
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(608)	(64)	(74)	(135)	(154)

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing a modeled climate change hydrology (CMIP-5). The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

This assessment illustrates that without implementation of the future water projects described in Chapter 6, Section 6.8, the City would face critical challenges in meeting demand in a projected multi-year drought, under either hydrology consistent with historic conditions or under a climate change scenario. This is largely driven by the City's dependence on local surface water flows and the lack storage with the supply system. The ongoing implementation of the WSAS and associated Santa Cruz Water Rights Project and Santa Cruz Water Program are critical and necessary elements to secure the City's existing and future water supply reliability.

7.5 Regional Supply Reliability

The City of Santa Cruz continues to focus its supply planning and reliability efforts on programs and projects that emphasize the maximization of available resources. To date, the City has not pursued supply planning that included importing water from outside the Central Coast hydrologic region but is concentrating on options within Santa Cruz County.

Currently, all of the City's water resources are obtained from local sources. In order to build drought supply reliability, the City continually works to develop partnerships within the region that promote responsible and sustainable water resource management. A known constraint on the regional supply are the over drafted, threatened, and recovering aquifers. The City's future supply vision includes projects serving to benefit regional aquifer recovery and increased reliability of groundwater sources. Recognizing the path toward regional reliability requires a comprehensive framework that supports dependability of all recognized supplies within the region and the types of tools being proposed and evaluated at present seek to benefit multiple stakeholders.

At this point in time, the City is actively participating in regional teams formed to increase coordination of activities among resource agencies. Further, the City's WSAS necessitate collaborative work with regional partners and benefits from participation of stakeholders that include government and non-government resource management agencies. The City is one of four members of the Santa Cruz Mid-County Groundwater Agency (MGA), as discussed in Chapter 6, and participates on the Board of Directors for the Santa Margarita Groundwater Agency (SMGA). The City is also engaged with the Santa Cruz Integrated Regional Water Management Group (IRWM), an organization made up of nine local agencies.

Chapter 8

WATER SHORTAGE CONTINGENCY PLANNING

This chapter presents information about how the City of Santa Cruz manages the water system during a water shortage emergency that arises as a result of drought. It also describes water supply and demand assessment procedures, actions that would be undertaken in response to a catastrophic interruption of water supplies, including a regional power outage, earthquake, or other emergency situation, legal authority, and other topics.

This Chapter 8, Water Shortage Contingency Planning, and Appendix O, Water Shortage Contingency Analysis and Implementation, together comprise the City of Santa Cruz's complete Water Shortage Contingency Plan (WSCP), in compliance with the California Water Code Section 10632 and incorporated guidance from the State of California Department of Water Resources (DWR) Urban Water Management Plan Guidebook (DWR, 2021).

8.1 Water Supply Reliability Analysis

This 2020 Urban Water Management Plan includes in Chapter 7 a supply reliability analysis for a normal/average water year, a single dry water year, and a multiple dry water five-year period based on historical hydrology for the forecast period which extends through 2045. The City is safeguarding against future water shortages by actively implementing future water projects as described in Chapter 6, Section 6.8. Implementation of these projects is therefore assumed in the City's water supply planning process. In the water supply reliability analysis, consistent with the City's Water Supply Augmentation Strategy (WSAS), implementation of pending water rights modifications, including Agreed Flows which are protective of local anadromous fisheries, is assumed after 2025. Furthermore, improved reliability is projected after 2030 due to implementation of Aquifer Storage and Recovery (ASR) and planned infrastructure projects.

The water supply reliability analysis finds that the City projects having sufficient water supply available in normal years and single dry years to serve anticipated demand throughout the 2025 – 2045 planning period. Under multi-year drought conditions in the near term (2025), with proposed water rights modifications but before implementation of ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the multi-year drought scenario, but would fall short

of demand by 27 percent in year five. Under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the multi-year drought scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than a negligible two percent.

While the analysis characterizes vulnerability to shortage for the fifth year of the extended drought period, depending on sequencing of water year types, in reality such a shortage could occur sooner and persist longer through a multiple dry year period. Additionally, during an extended drought period, the City would likely implement demand reduction requirements in earlier years before an actual shortage is experienced to ensure adequate supplies remain in Loch Lomond Reservoir, thereby potentially reducing the depth of shortage experienced in later year(s).

This Urban Water Management Plan also includes in Chapter 7 a Drought Risk Assessment including a supply and use comparison assuming drought conditions from 2021 through 2025. This analysis assumes implementation of pending water rights modification (including implementation of the Agreed Flows which are protective of local anadromous fisheries) in years 2022 through 2025 and shows that projected supply would meet projected demand in years 2021 through 2024 of the extended five-year drought, but that in 2025, a 27 percent shortage is projected. Neither implementation of ASR of planned infrastructure projects are assumed to be implemented within the timeframe of this analysis as they not projected to be fully accomplished until 2030.

The City recognizes that the challenge of meeting demand through a multi-year drought period as the key reliability issue facing the water system. The City is actively addressing this issues through the ongoing implementation of the City's WSAS to improve system operating flexibility and long term reliability. In the short term, reliance on this Water Supply Contingency Plan may be required to reduce demand during periods of shortage.

8.2 Annual Water Supply and Demand Assessment Procedures

Every year during the winter season, the City of Santa Cruz Water Department (the Department) monitors local rainfall, runoff, and reservoir storage levels. At the end of January, which represents the mid-point of the winter wet season, staff prepares a written statement that describes current water conditions and discusses the water supply outlook for the year ahead. This initial water supply outlook is typically presented as a written memo to the Water Director and then to the Water Commission. Later on in the season, typically toward the end of March or early April, a more formal final "Water Supply and

Demand Assessment" is prepared and also presented to the Director and Water Commission. If, based on this analysis, a water shortage is anticipated, the information would be presented to the Santa Cruz City Council which could then declare a water shortage and authorize implementation of a specific stage of the WSCP. The Department has been conducting this annual water supply and demand assessment on its own for its internal purposes for decades. Now however, the same type of assessment is being required of all water suppliers. Specifically, beginning in 2022, California state law requires that all urban water suppliers prepare this type of assessment and submit it to the California Department of Water Resources (DWR) on an annual basis. DWR is in the process of developing guidance for suppliers to conduct an annual assessment, including key data inputs and the decision making process for determining if a water shortage is indicated. Although State guidance is in development, the City currently has its own procedure and format for conducting the assessment and producing the written reports that summarize the results. Santa Cruz Municipal Code Section 16.01.020 includes the following (Appendix Q):

> "The provisions of this chapter shall take effect whenever the director, upon analysis of city water supplies, finds and determines that a water shortage exists or is imminent within the city of Santa Cruz water service area and a declaration of a water shortage is made by a resolution of the city council, and they shall remain in effect for the duration of the peak season through October 31st, unless rescinded earlier or extended by city council."

8.2.1 Decision Making Process

This section describes the general inputs and process for evaluating the adequacy of supply to meet demand for year ahead and, in particular, for the peak season.

8.2.1.1 Decision Making Inputs

Rainfall, runoff, water year type, and reservoir storage are the key hydrologic indicators used by the City to evaluate water conditions. These factors affect the City's water supply and the forecasting process and management considerations used in dry years to determine whether a water shortage is expected for the year ahead.

In Santa Cruz, a water shortage occurs when the combination of low surface flows in the north coast and San Lorenzo River sources and depleted surface water storage in Loch Lomond Reservoir reduces the available supply to a level that cannot support existing demand. Ordinarily, one abnormally dry year would not create a water shortage in Santa Cruz. Usually there is sufficient storage in Loch Lomond Reservoir, even after one dry winter, to carry the system though the following summer. Based on past experience, however, a shortage might occur when the central coast region experiences multiple dry winter seasons in a row.

Rainfall

The water supply of the City of Santa Cruz originates from precipitation that falls in the form of rain on the Pacific Ocean side of the Santa Cruz Mountains during the fall, winter, and early spring. The majority of rainfall normally occurs in a five-month period between November and March. The amount of precipitation that falls is one basic indicator of whether the city is experiencing a wet or dry year. Rainfall amounts on the central coast vary widely from year to year.

Daily rainfall data is collected for water supply purposes at various sites in the Newell Creek watershed, at Ben Lomond, and in the City of Santa Cruz. The Ben Lomond and Santa Cruz sites are both official National Oceanographic and Atmospheric Administration (NOAA) weather observation stations with extended rainfall records.

The pattern in both timing and distribution of rainfall can be as important in determining water supply availability as the total amount of rainfall received. Years in which the majority of rainfall occurs early in the rainy season or is concentrated in a short time frame tend to produce lower river and stream flows during the peak summer season. Conditions where storms are spread out through the winter season or occur late into spring help sustain higher base flows in the coastal streams and the San Lorenzo River later into the year.

Runoff

Under normal operating conditions, the north coast streams and San Lorenzo River flows provide about 80 percent of the City's total annual water supply. Accordingly, runoff is a key parameter used to assess the City's water supply condition.

Stream flow in the San Lorenzo River is monitored at two locations using the United States Geological Survey (USGS) gauges located at Henry Cowell Redwoods State Park near Felton and downstream next to the Tait Diversion. The gauge in Felton is particularly important for assessing water supply conditions because the river is the City's single largest supply source and because of the long historic record that exists for the site. Real time flow records are available on the USGS website. The USGS also prepares printed reports that provide a record of average daily and monthly flows, in cubic feet per second, and stream discharge, expressed in acre-feet. Water Department staff charts monthly flows and compares them with long-term averages and the previous year's flow to assess trends. On the north coast sources, there were no stream gauges until a few years ago. Flow records are now being gathered for these sources will become valuable in future years for assessing water conditions of these sources.

In the San Lorenzo River, runoff fluctuates annually and seasonally, depending on the amount and timing of rainfall. The majority of runoff typically occurs over a three-month period from January through March, once the watershed becomes saturated. After the rainy season ends, stream flow in the San Lorenzo River gradually declines over the course of the summer dry season.

Water Year Type

The City uses a water year classification system as a primary index of its water supply conditions. Under this classification system, the water year, which runs from October 1 to September 30, is designated as one of four types, depending on the total annual stream discharge of the San Lorenzo River, measured at Felton, and expressed in acre-feet. This classification system is shown in Figure 8-1 below.

Table 8-1: Water Year Classification System

Classification	Total Annual Discharge (in acre-feet)
Wet	> 119,000
Normal	49,000 - 119,000
Dry	29,000 – 49,000
Critically Dry	< 29,000

While the current water year type is of primary consideration in assessing water conditions, the previous water year type also has some influence on summer water supply availability. An antecedent year that is classified as wet will help sustain river base flows longer into the year, whereas a previous dry year can cause river flows to decline sooner and measure below than would otherwise be expected.

Reservoir Storage

Loch Lomond Reservoir is the City's only source of stored water and has a total storage capacity of 2.8 billion gallons. In normal and wet years, reservoir storage refills naturally to full capacity with runoff from the Newell Creek watershed, usually by February or March. Storage can also be supplemented in dry years with water pumped up to the reservoir from the Felton Diversion on the San Lorenzo River. In a normal year, the reservoir will start the dry season full with 2.8 billion gallons in storage.

8.2.1.2 Determining If a Water Shortage is Imminent

In normal or wet years when the water supply outlook is favorable, there is generally a surplus of water available from the various sources to meet existing demand. A general rule of thumb is that if Loch Lomond Reservoir is at full capacity by spring, it is not necessary for the City to institute any short-term demand reduction measures the following summer. The City undertakes an annual analysis to forecast whether water supplies will be deficient relative to estimated water needs for the coming dry season. This calculation must be made

before the end of the rainy season in time to decide on appropriate actions and to provide adequate notice to the public. There is always the chance that late winter rains will change the water supply outlook, thus, the situation remains dynamic through the end of April.

The peak season as defined as May 1 through October 31, is considered the critical period for the purpose of defining the potential degree of water supply shortfall, and for selecting the appropriate demand reduction goal. This is the period when water availability in the City's flowing sources is generally lowest and water demand normally would be at its highest, potentially creating a summer water supply shortage. Past experience indicates that, even in water short years, there is generally adequate water in the City's flowing sources to meet system demands during the off-peak months between November and April, and that there is little if any need to reduce water demand this time of year when consumption is low.

There is no one single criterion, trigger, or definition that is used to determine if a water shortage exists. The determination of a shortfall involves consideration of all the parameters mentioned previously, as well as expected system demand.

8.2.2 Methodology

A detailed description of the City of Santa Cruz Annual Assessment methodology is presented below.

8.2.2.1 Forecasting Water Production

To determine the degree of shortfall, the City follows a three-step process:

1. Develop a monthly forecast of supply available from flowing sources and wells and compare the supply available from flowing sources and wells to the expected water demand and estimate production needed from Loch Lomond.
2. Calculate the monthly and seasonal drawdown on Loch Lomond Reservoir.
3. Evaluate whether the amount of water in Loch Lomond Reservoir is adequate to meet expected demand for the coming dry season and for the following year in case the dry weather pattern continues through the next winter.

Of primary importance to the system operation is the ability to forecast at the end of a winter season how the San Lorenzo River, the City's most important source, will flow through the coming summer and into the dry fall season. In dry and critically dry years, natural flows can drop below bypass flow requirements at the Tait Street intake during summer, requiring diversions from the San Lorenzo River to be scaled back. Once the water year type has been established, statistical tables are used to forecast the mean monthly flow in the San Lorenzo River through the remainder of the dry season. This technique helps to identify at what point in the year river production will likely be reduced and by how much.

Forecasting supplies available from north coast sources involves less certainty due to the lack of historic stream flow information. The technique used to forecast supplies on the North Coast supplies is to find historic water years with a similar pattern in rainfall amount and timing. The production records from those years are examined to assess the likely yield of those sources for the coming season, while taking into account any operational rules, capacity constraints, or in-stream flow releases that may have changed from those previous years.

Water production from the City's Beltz Well system is projected as a function of the production capacity for any wells in operation and duration that the wells will be operated.

The City necessarily uses a conservative estimate of yield to ensure the supply forecast for flowing sources and groundwater production is reliable. Once the forecast of supply available from surface diversions and wells is made, supplies are compared with expected water demand to determine how much lake water from the Loch Lomond Reservoir would be needed to meet unrestricted system demand. The amount of water lost from the reservoir to evaporation and released for downstream fisheries preservation is then factored in. From this analysis, a projection can be made about the expected rate of drawdown of the reservoir over the dry season; the expected lake level at the end of October; and the expected carryover storage for the following year.

8.2.2.2 Evaluation Criteria

The determination of whether a shortage exists is essentially a risk assessment regarding the predicted end of season lake level and carryover storage needed in Loch Lomond Reservoir. The City's main considerations in undertaking this assessment include the following:

- Would allowing unrestricted water use in the current year leave insufficient reserves if drought conditions continue into next year?
- Knowing that another dry year could mean the City's flowing sources would drop even lower, how much water should be withheld in the reservoir for the following year to be prudent?

There is no set formula to determine the optimal allocation. Rule curves were developed in the past to mimic how lake resources theoretically would be allocated under various water conditions. Under these rule curves, no shortage is indicated if lake storage is above 2.4 billion gallons (85 percent of capacity) on April 1 and as long as the lake is forecast to remain above 1.8 billion gallons (64 percent of capacity) though the end of September. Below these levels, a shortage is assumed to occur. The lower the lake level, the greater the shortage. One important consideration for lake storage is that the bottom 1.0 billion gallons (35 percent of capacity) in the reservoir is regarded as

minimum carry over storage necessary to hedge against a subsequent dry year. This ensures that there is always some limited amount of supply preserved in storage for the following year.

In the real world, with a water system largely dependent on surface water sources and no reliable ability to predict when a drought may end, prudent management dictates a conservative approach to shortage declarations to maintain as much water storage in the system as possible. This means generally favoring implementation of the WSCP during single dry years so that the carryover storage amount would be enough, along with other sources, to meet essential health and safety needs if the subsequent winter is as dry as the driest year on record. According to the literature, the main lesson from other utilities that have been through droughts is that they would have acted earlier to save more water, in retrospect, in order lessen the impact of implementing more severe cutbacks later on.

The ultimate decision about whether supplies are adequate in Santa Cruz for a given dry year are thus dependent not just how much water is available in that year from the City's sources of supply, but also on the level of demand exerted by customers over the coming season and management's comfort level with predicted carry over storage.

With the low levels of water demand that have been sustained since the end of the 2014-2015 drought, the water system and the City can better withstand dry conditions like the current drought of 2020-2021. The one caveat, though, is that because present use is already so conservative, there is a declining ability for increased conservation when the next shortage arises.

8.2.2.3 Modeling

The primary tool the City uses is assess water supply and demand is an Excel spreadsheet that performs a mass balance on a monthly time step to solve for the end of season storage in Loch Lomond Reservoir using a three-step process:

1. Develop a monthly forecast of supply available from flowing sources (North Coast sources and the San Lorenzo River) and the Beltz Well system;
2. Compare the supply available from the flowing sources and Beltz Well system to the expected unrestricted water demand; and
3. Calculate the monthly change in storage and end of season storage in Loch Lomond Reservoir.

Other than the beginning of season lake volume, which is a known variable, the model inputs are all estimates based on imperfect information that are subject to error and uncertainties. However, some variables are more significant than others in terms of influencing the results.

The model is to be used to create several different supply and demand scenarios to test the sensitivity of different assumptions, and to assist in decision-making. The primary purpose of this model to assist management staff in determining if a water shortage declaration is appropriate for the year ahead, and to help decide on the level of curtailment needed. Other factors used in this consideration include infrastructure constraints such as infrastructure limitations due to planned work or from known or expected facility outages.

8.2.2.4 Timing

The forecast is typically prepared in late March, when most of wet weather has already occurred for the year, but before the end of the rainy season. This is done in order to prepare a recommendation for consideration by the Water Commission to the City Council in the month of April. There is always the chance that later winter rains will improve the water supply outlook. Thus, the situation remains dynamic through the end of April and into May. The longer the forecast can be delayed, the more accurate the results will be.

The approximate times of the year when the City evaluates water supply conditions are as follows:

- October through December: Monitor rainfall, reservoir level, and runoff amounts
- Late January: Prepare written status report on water supply conditions
- Early February: Present initial estimate of water supply availability for year ahead to Water Commission
- Early March: Present revised estimate of water supply availability for year ahead to Water Commission
- Mid-March: Determine existence of water shortage (if applicable)

If it is necessary to declare a water shortage, the following approximate timing is followed, with some variability depending on weather conditions:

- Mid to late March: Determine monthly water production budget and assess the need for response
- Early April: Present shortage response recommendation to Water Commission; City Council notice of public hearing published
- Mid-April: City Council formally declares water supply shortage, adopts emergency ordinance
- May: Water shortage regulations become effective

8.3 Six Standard Water Shortage Levels

In Santa Cruz, it is typically the peak summer season during which water supplies are limited because the system's flowing surface water sources, north coast streams and San Lorenzo River which together represent about eighty percent of total system supply, are less available during the peak season than they are in the wet season, and because stored water is very limited. If winter rains have not replenished Loch Lomond's storage in a given year, peak season usage reductions are typically applied in order to ensure that water for essential uses will continue to be available throughout the peak season and into the following water year as well. Until implementation of the City's WSAS, demand management through restrictions is the only real tool the City has to manage this risk.

The peak season is defined to include the six-month period from May 1 to October 31, which is reflected in the consumption shown on the June through November utility bills. The peak season is defined within this range because water supplies are historically adequate to meet demand in November through April. In addition, water shortage regulations usually are not put into effect until May 1st or June 1st during a shortage year.

Shortage stages in this WSCP are based on peak season demand and correspond to the six standard shortage levels defined in Water Code of up to ten, twenty, thirty, forty, fifty, and greater than fifty percent shortage, as shown in Table 8-2.

Table 8-2: Water Shortage Contingency Plan Levels (submittal table 8-1)

Water Shortage Contingency Plan Levels		
Shortage Level	Percent Shortage Range	Shortage Response Actions
1	Up to 10%	Water Shortage Warning. Stage 1 applies to relatively minor water shortage that requires up to a 10% level of demand reduction. The allocation system applies to all stages. At Stage 1, allocations are provided to customers but excess use penalties are not yet implemented.
2	Up to 20%	Water Shortage Alarm. Stage 2 applies to moderate water shortages with a demand reduction requirement of up to 20%. This condition requires more vigorous public information and outreach. The primary demand reduction measure that will be implemented at this stage and all stages going forward is the use of excess use penalties for water use above customer allocations.
3	Up to 30%	Water Shortage Emergency. Stage 3 applies to a serious water shortage with a demand reduction requirement of up to 30%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 3 levels.
4	Up to 40%	Severe Water Shortage. Stage 4 applies to a serious water shortage with a demand reduction requirement of up to 40%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 4 levels. The water supply conditions that would trigger Stage 4 parallel the difficult situation the City experienced in the drought of late 1970s. Under this scenario, virtually all available water must be reserved either for health and safety purposes or to sustain local business.
5	Up to 50%	Critical Water Shortage. Stage 5 represents an imminent and extraordinary crisis threatening health, safety, and security of the entire community. Under this dire situation, extreme measures are necessary to cut back water use by up to half the normal amount. Not enough water would exist even to meet the community's full health and safety needs, the top priority. All water should be reserved for human consumption, sanitation, and fire protection purposes and any remaining amount allocated to minimize economic harm. A shortage of this severity could be expected to generate stress and confusion, much the same as any major emergency and at some point could transform into a full blown natural disaster that can no longer be governed by local ordinance and may need to be managed by the basic principles and command structures of the state Standardized Emergency Management System. The City has experienced water shortages in the past but never one of such large proportion.
6	>50%	Catastrophic Water Shortage. For Stage 6, Santa Cruz takes the position that this level of shortage would most likely only occur due to a major disaster that caused significant damage to our water treatment and/or distribution infrastructure. In such a disaster, such as a large earthquake, the Santa Cruz response would not come from this WSCP, but rather from the main Santa Cruz Water Department Emergency Response Plan.

8.4 Shortage Response Actions

The City of Santa Cruz used a core set of principles to guide the WSCP planning process. These principles, with minor adjustments, are based on the core principals developed for the 2009 WSCP. The principles are as follows:

- **Shared Contribution**: All customers will be asked to save their share in order to meet necessary reduction goals during water shortages.
- **Reduce non-essential uses first**: The plan gives priority to health and safety uses of water and targets non-essential uses for reductions first. However, even some amounts of essential use are reduced under this plan at higher stages due to the overall low levels of demand.
- **Preserve jobs and the local economy to the extent possible**: Given today's demand characteristics, the business customer class will be subject to the allocation system at each stage of shortage. However, the amount of water the business customer class will need to reduce at each stage is relatively low given that there is a substantial amount of health and safety related use in the overall usage by business customers.
- **Existing conservation measures recognized**: Customers who have already been conserving will have an easier time maintaining consumption below the allocation levels set out in the plan. This will be especially true in earlier stages of shortage. Customers who haven't conserved as much or at all will find it harder to stay within allocation amounts.
- **Communication at every stage**: A public information campaign at every level of shortage is essential for customer preparation and will encourage confidence in the City's ability to respond to water shortages.
- **Flexibility**: The Department will gauge the necessity of implementing each set of actions at each stage of shortage and evaluate whether they make sense at the time. Not all actions must be implemented simply by virtue of being listed in the plan at that stage.
- **Even-handedness**: The policies and rules developed under this plan to manage a shortage will be applied to all customer groups in a consistent, even-handed manner.

A fundamental issue any water supplier faces in managing a water shortage involves the allocation of water and how to distribute the available supply among customer categories when supplies fall short. Due to the degree of ongoing water use efficiency practices adopted by Santa Cruz consumers, staff determined that the more typically used strategies for curtailing water use would not be likely to produce the demand reductions associated with each stage of the WSCP. This reality drove the decision to use customer water allocations rather than other approaches during all stages of the plan.

The allocation system in this WSCP produces specific demand reduction/delivery goals for each major customer category at each level of shortfall based on the unique usage characteristics of each customer category.

To determine how much water would need to be curtailed for each WSCP stage[1], overall and from each customer group, the following methodology was utilized. These four steps were used to generate both the reductions required and the water remaining for use at each WSCP shortage stage. These were in turn used to develop delivery goals for each customer class at each WSCP stage.

1. Examine the level and seasonality of water use in each customer class, by breaking down water use in each sector into indoor uses and outdoor/seasonal components;
2. Divide the peak season usage into three usage priorities: 1) health and safety, 2) commerce, and 3) irrigation and other outdoor usage;
3. Determine the level of reductions required at each shortage level and from each use priority; and
4. Calculate the percentage reductions needed to develop a specific reduction goal for each customer class at each shortage stage.

Specific application of this approach is further described in Appendix O, 2021 WSCP Appendix. The resulting delivery goals for each customer class derived by required reductions are presented in Table 8-3.

[1] Curtailments were not developed for Level 6. For Level 6, Catastrophic Water Shortage, this would most likely only occur due to a major disaster causing significant damage to the water treatment and/or distribution system. In such a disaster, such as a large earthquake, the Santa Cruz response would be guided by the Water Department's Emergency Response Plan rather than this WSCP.

Table 8-3: Customer Class Delivery Goals by WSCP Stages

Customer Class	Normal Demand (Million Gallons) Jun-Nov	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
		Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
Single Family Residential	517	89%	79%	68%	58%	51%
		463	408	354	299	262
Multiple Residential	297	92%	84%	76%	68%	59%
		273	249	225	202	176
Business	297	95%	90%	85%	79%	60%
		282	267	252	234	178
UC Santa Cruz	91	91%	81%	72%	62%	55%
		82	74	65	57	50
Municipal	33	79%	58%	38%	17%	15%
		26	19	12	6	5
Irrigation	59	75%	50%	25%	0%	0%
		44	30	15	0	0
Golf Course Irrigation	50	82%	64%	45%	26%	10%
		41	32	23	13	5
North Coast Agriculture	13	95%	90%	85%	75%	30%
		12	12	11	10	4
Other	1	95%	90%	100%	100%	100%
		1	1	1	1	1
Overall Delivery Each Stage						
Total – All Classes	1,358	90%	80%	70%	60%	50%
		1,225	1,092	959	820	677

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In a serious shortage, it will be critical to have a system in place that not only is fair to all customer groups but is also likely to succeed. As described in chapter 4 of this Urban Water Management Plan, current and forecasted levels of customer demand indicate that the Santa Cruz community has already achieved high levels of water conservation. This very low system-wide water use is beneficial from the perspective of meeting demands and preserving water resources, but it also represents a “hardened demand” that presents limited opportunity for further per capita demand reductions. These new demand characteristics mean that reductions at higher stages will be difficult to achieve. In the view of the Water Department staff, curtailments beyond Stage 2 of this plan are not really feasible to implement without significant impacts to public health and safety and the Santa Cruz economy. The City is actively implementing its WSAS as the solution to dealing with larger shortages.

8.4.1 Demand Reduction Actions

The approach to demand reduction in this WSCP is to provide customer allocations starting at Stage 1 of the plan and reducing these allocations at each successive stage of the plan. This approach gives customers an amount of water to use each month and allows them to use that water as they see fit to meet their needs. The allocations are based upon the customer class delivery goals at each stage presented in Table 8-4. The allocation approach is designed to maximize the probability that the demand reductions required at each stage will be achieved.

Table 8-4: Allocations by WSCP Stage

Customer Class	Stage 1 Allocation (%)	Stage 2 Allocation (%)	Stage 3 Allocation (%)	Stage 4 Allocation (%)	Stage 5 Allocation (%)
Single Family Residential	89%	79%	68%	58%	51%
Multiple Residential	92%	84%	76%	68%	59%
Business	95%	90%	85%	79%	60%
UC Santa Cruz	91%	81%	72%	62%	55%
Municipal	79%	58%	38%	17%	15%
Irrigation	75%	50%	25%	0%	0%
Golf Course Irrigation	82%	64%	45%	26%	10%
North Coast Agriculture	95%	90%	85%	75%	30%
Other	95%	90%	100%	100%	100%
All Classes Combined	90%	80%	70%	60%	50%

These demand reduction allocation and other demand reduction actions to be implemented in parallel are documented in Table 8-5 below.

Table 8.5: Demand Reduction Actions (submittal table 8-2)

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 1 - Water Shortage Warning	Implement or Modify Drought Rate Structure or Surcharge	10 percent demand reduction	• Implement water allocations for all customers at the Stage 1 allocation level	No
Stage 1 - 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Create communication pieces including social media posts, direct mail, paid advertising • Create dedicated webpage • Dedicate monthly SCMU email newsletters to disseminating water shortage information • Utilize bi-annual utility newsletter • Inform large landscape/property manager/green industry of irrigation restrictions • Disseminate information for customers to learn how to read their meters	No
Stage 1 - 5	Increase Water Waste Patrols	Supports demand reduction to be achieved through implementation of water allocations	• Delegate water waste patrol duties to all field personnel	No
Stage 1 - 5	CII - Restaurants may only serve water upon request	Supports demand reduction to be achieved through implementation of water allocations	• Prohibit serving drinking water by restaurant or food service establishments except upon request	No
Stage 1 - 5	CII - Lodging establishment must offer opt out of linen service	Supports demand reduction to be achieved through implementation of water allocations	• Require hotel, motel, and other commercial lodging establishments to offer option of not laundering towels and linen daily	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 1 - 5	Other - Prohibit use of potable water for washing hard surfaces	Supports demand reduction to be achieved through implementation of water allocations	• Prohibit use of potable water for washing driveways, patios, parking lots or other paved surfaces	No
Stage 1 - 5	Other - Require automatic shut of hoses	Supports demand reduction to be achieved through implementation of water allocations	• Require hoses used for any purpose to have shut off nozzles	No
Stage 1 - 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Step up enforcement of water waste ordinance • Undertake contingency planning for continuing/escalating shortage • Coordinate water conservation actions with other City Departments and public agencies • Adopt water shortage ordinance prohibiting non-essential water use • Eliminate system water uses deemed non-essential	No
Stage 2 - Water Shortage Alarm	Implement or Modify Drought Rate Structure or Surcharge	20 percent demand reduction	• Implement mandatory water allocations for all customers at the Stage 2 allocation levels • Implement excess use penalties for use over allocation	Yes

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 2 - 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Disseminate PSAs to targeted local radio and television stations • Regularly update the public on consumption and supply numbers • Include information in City Manager's monthly email newsletter • Initiate presentations to local Chambers of Commerce, business associations, board of realtors, etc. • Inform large landscape/property managers/green industry of water budget reductions • Consult with major customers to develop conservation plans • Conduct workshops on large landscape requirements for property owners, contractors, and maintenance personnel • Disseminate PSAs to targeted local radio and television stations • Regularly update the public on consumption and supply numbers • Include information in City Manager's monthly email newsletter • Initiate presentations to local Chambers of Commerce, business associations, board of realtors, etc. • Inform large landscape/property managers/green industry of water budget reductions • Consult with major customers to develop conservation plans • Conduct workshops on large landscape requirements for property owners, contractors, and maintenance personnel	No
Stage 2 - 5	Increase Water Waste Patrols	Supports demand reduction to be achieved through implementation of water allocations	• Hire, train dispatch water waste patrol	No
Stage 2 - 5	Decrease Line Flushing	Supports demand reduction to be achieved through implementation of water allocations	• Suspend main flushing except as required for emergency and essential operations	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 2 - 5	Reduce System Water Loss	Supports demand reduction to be achieved through implementation of water allocations	• Intensify distribution system leak detection and repair	No
Stage 2 - 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Develop strategy to mitigate revenue losses • Stop issuing bulk water permits	No
Stage 3 - Water Shortage Emergency	Implement or Modify Drought Rate Structure or Surcharge	30 percent demand reduction	• Implement mandatory water allocations for all customers at the Stage 3 allocation level • Continue to implement excess use penalties for use over allocation	Yes
Stage 3 - 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Provide regular, prescriptive media briefings • Provide regular and ongoing briefings to Water Commission, City Council, and other key stakeholders • Prepare communication pieces for possible future service connection moratorium	No
Stage 3 - 5	Increase Water Waste Patrols	Supports demand reduction to be achieved through implementation of water allocations	• Expand size and coverage of water waste patrol	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 3 - 5	Moratorium or Net Zero Demand Increase on New Connections	Supports demand reduction to be achieved through implementation of water allocations	• Institute a temporary water service connection ban	No
Stage 3 - 5	Reduce System Water Loss	Supports demand reduction to be achieved through implementation of water allocations	• Increase monitoring of unauthorized use from hydrants and other sources.	No
Stage 3 - 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Further increase of water waste enforcement • Require all commercial customers to prominently display “save water” signage with specified language at specified location • Increase customer service training to address high bills and irate customers • Expand, strengthen water conservation education, activities, and program • Increase frequency of monitoring and reporting of water production and consumption • Undertake contingency planning for continuing/escalating shortage • Shut down all bulk water stations • Stop issuing construction hydrant meters	No
Stage 4 - Severe Water Shortage	Implement or Modify Drought Rate Structure or Surcharge	40 percent demand reduction	• Reduce water allocations for all customer classes to Stage 4 levels • Continue to implement excess use penalties for use over allocation	Yes
Stage 4 - 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Contract with outside PR agency to manage comprehensive public awareness campaign, including paid ads, earned media, direct mail, etc. • Promote zeroscape landscaping • Partner with other water agencies to promote appropriate grey water use, etc. • Prepare emergency messaging for possible critical water shortage utilizing Nixel, CodeRed, reverse 911	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 4 - 5	Other - Prohibit use of potable water for construction and dust control	Supports demand reduction to be achieved through implementation of water allocations	• Rescind hydrant and bulk water permits, prohibit use except by special permission	No
Stage 4 - 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Scale up administrative appeals staff to support hearing officer(s) • Expand water waste enforcement to 24/7	No
Stage 5 - Critical Water Shortage	Implement or Modify Drought Rate Structure or Surcharge	50 percent demand reduction	• Further reduce allocations for all customer classes • Continue to implement excess use penalties for use over allocation	Yes
Stage 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Implement crisis/emergency communications including establishment of a Joint Information Center (JIC) • Deploy prepared emergency messaging on Nixel, CodeRed, reverse 911	No
Stage 5	Landscape - Prohibit all landscape irrigation	Supports demand reduction to be achieved through implementation of water allocations	• Prohibit all outdoor irrigation	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 5	Other water feature or swimming pool restriction	Supports demand reduction to be achieved through implementation of water allocations	• No water for outdoor washing or recreational purposes; close pools, public showers	No
Stage 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Continue water waste enforcement 24/7 • Consider shifting to EOC model of command management for overall policy guidance and coordination • Coordinate with CA Division of Drinking Water, District Engineer and other emergency response agencies regarding water quality, public health issues • Coordinate with law enforcement agencies to address enforcement challenges • Delegate field staff to assist in enforcement (shut offs, flow restrictors) • Continue close monitoring and reporting of water production and consumption • Coordinate with local sanitation agencies regarding sewer line maintenance • Investigate potential for reduced in-stream release • Procure resources to utilize dead storage, if needed • Undertake emergency planning for continuing/escalating shortage	No
Stage 6 - Catastrophic Water Shortage	Other	Greater than 50 percent demand reduction	• Activate the Santa Cruz Water Department Emergency Response Plan	No

Notes:

1. The City of Santa Cruz is utilizing an allocation system as the primary means to reduce demand at all shortage levels. Excess use penalties for exceeding allocations are applied at Level 2 and higher. The allocation approach is designed to maximize the probability that the demand reductions will be achieved.

8.4.2 Other Actions to Address Shortages

As described in Chapter 6, Section 6.8, the City is actively pursuing water supply augmentation to improve long-term reliability through implementation of its WSAS, including water rights modifications (which includes Agreed Flows bypass requirements protective of local fisheries) and implementation of ASR and planned infrastructure projects such as upgrades to the Graham Hill Water Treatment Plant . Because these efforts are well underway, they are considered as future water projects and are incorporated into the reliability assessments included in Chapter 7 of this Urban Water Management Plan rather than as elements of this WSCP. With implementation the WSAS, water supply reliability will be significantly improved by 2030, eliminating projected shortages that would require implementation of this WSCP. However, in the event of projected near-term shortages before the WSAS components are fully realized, the City would pursue early implementation of strategies included in the WSAS, such as ASR and exchanges, to the extent feasible.

Table 8.6: Supply Augmentation (submittal table 8-3)

Supply Augmentation and Other Actions			
Shortage Level	Supply Augmentation Methods and Other Actions by Water Supplier	How much is this going to reduce the shortage gap?	Additional Explanation or Reference
NOTES: City of Santa Cruz is actively pursuing a Water Supply Augmentation Strategy to alleviate the City's projected water supply gap, reduce the frequency and severity of shortage experienced, and limit the need to implement this Water Shortage Contingency Plan. These activities are underway and ongoing, and as such, are not included as actions within this Water Shortage Contingency Plan.			

When implementing this WSCP, the City will rely primarily on demand reduction through the implementation of allocations to address shortages at each level. Proposed operational changes and mandatory restrictions to be implemented at each WSCP stages are embedded in Table 8-2 above. Other actions triggered by WSCP levels are described below.

8.4.3 Emergency Response Plans

The City of Santa Cruz maintains a confidential Emergency Response Plan per the requirements of the America's Water Infrastructure Act of 2018 that includes response plans to a wide range of emergency conditions including earthquake, flood/atmospheric river, landslide, and human-caused catastrophes. The procedures in this plan would be followed in the event of a catastrophic water shortage or other emergency. To comply with Water Code requirements regarding seismic risk assessment, this Urban Water

Management Plan includes as appendices following the Local Hazard Mitigation Plans (LHMP) as Appendix P:

- City of Santa Cruz LHMP Five Year Update 2018 – 2023
- City of Capitola LHMP Five Year Update 2020
- County of Santa Cruz Five 2015 – 2020 - The County of Santa Cruz was in the process of updating their LHMP at the time of drafting this Urban Water Management Plan

8.5 Communications Protocols

Timely and effective communication is a key element of the City of Santa Cruz WSCP. Specific communications protocols are documented in Table 8-2 above. The City would inform customers, the public and others regarding any shortage response actions triggered or anticipated to be triggered and other relevant communications. Communication protocols are further detailed in Appendix O.

8.6 Compliance and Enforcement

The City of Santa Cruz utilizes a variety of compliance and enforcement strategies to facilitate compliance with the requirements of the WSCP as described below.

8.6.1 Excess Use Penalties

The foundation of the demand reduction measures in this plan is the water allocation system. In order for an allocation system to work, a financial disincentive is required for customers to stay within their allocation. This is achieved through the use of Excessive Use Penalty fees for use above customer allocations. These penalties are applied to a customer's water bill when the billing system detects that usage in a month exceeds the customer's allocation. The excess use penalties begin at Stage 2 and continue on with higher stages.

Administrative enforcement of excessive use penalties is codified in Santa Cruz Municipal Code, Chapter 16.01 (Appendix Q). Specifically, Section 16.01.110 states:

> "Penalties. The purpose of the administrative penalties assessed pursuant to this section is to assure future chapter compliance by the cited customer through the imposition of increasingly significant penalties so as to create a meaningful disincentive to commit future chapter violations. In acknowledgment of the fact that the city's water is a scarce and irreplaceable commodity and that this chapter is intended to equitably distribute that commodity among water department customers and to assure that, to the extent feasible, city water is

> conserved and used only for purposes deemed necessary for public health and safety, the penalty schedule herein prescribed is not to be construed as creating a "water pricing" structure pursuant to which customers may elect to pay for additional water at significantly higher rates. To this end, a customer's repeated violation of this chapter shall result in either the installation of a flow restriction device or disconnection of the customer's property from the city's water service system at the customer's cost."

The schedule for the administrative penalties is two-tiered system as shown below in Table 8-7.

Table 8-7: Administrative Penalties

Excess Use Range	Water Use in Excess of Allotment	Excessive Us Penalty Fee[1]
A	100 cubic feet (1 CCF) over allotment up to 10%	$25
B	Greater than 10% over allotment	$50

Note:. Fee is per 1 CFF of water used in excess of allotment, in addition to all regular water consumption charges

The purpose of a two-tier excess use structure is to avoid very large penalties for households that make a good faith effort to stay within their allocation but wind up going over a little. If a customer's water use exceeds one's allocation by a large amount, though, the penalty is designed to be very steep.

8.6.2 Water School

In the drought of 2014 and 2015, the City of Santa Cruz implemented a novel approach for working with customers who had incurred large excess use penalties. A process was set up to allow for a one-time forgiveness of excess use penalties while under water rationing. To be considered for such forgiveness, the customer was required to sign up and complete a short weekend or evening course that became known as "water school". This course covered topics such as basic meter reading, leak detection, and other topics relevant to the water restrictions in place at the time. This provides financial relief to customers receiving high bills, and most importantly, gives them the opportunity, education, and tools they need to achieve ongoing compliance with water use rules and regulations for the remainder of the shortage. The process of providing penalty forgiveness for customers by attending water school will continue under this WSCP.

8.6.3 Flow Restriction

Some customers will continue to exceed their allotment regardless of the amount of their water bill. In such instances, the City is authorized to install a flow restricting device to provide minimal water flow, just enough for health and safety purposes. In these cases the customer is charged a fee to cover the staff time needed to install the flow

restrictor and another fee for its removal. The City would not use this method where fire suppression sprinklers are on the same supply line as domestic water.

8.6.4 Disconnection and Reconnection Fees

Water suppliers have the legal authority to enforce water shortage regulations by terminating service for egregious violations. In such cases, the customer would be charged for both disconnection and reconnection.

8.6.5 Enforcement of Water Waste Prohibitions

During a water shortage, in addition to complying with water allocations, customers will also need to comply with existing requirements related to water waste. In cases such as a report of water waste, City staff will take steps to communicate with the customer by telephone, letter, door tag, or by making personal contact in the field to provide information about water waste regulations. Many times this contact is all that is required to get the problem resolved. If not, enforcement progresses to a written notice of violation. Beyond this, there are several methods in the City's existing water conservation and water shortage ordinances that can be used to enforce water waste restrictions and regulations. These methods are described below.

Penalty fees for Water Waste: For repeated violations of the City's water waste ordinance, a penalty fee may be issued to a customer's utility bill. This would occur after a written notice has been sent to the customer in advance. The penalty fee would increase with subsequent violations as follows:

- 1st Violation $100
- 2nd Violation $250
- 3rd Violation $500
- 4th Violation $1,000

8.6.6 Exceptions

No water shortage plan can account for all situations. The exception procedure allows the City to provide for special or exceptional circumstances that otherwise would create undue hardship for an individual customer or class of customers.

An exception allows a customer to be relieved of a particular regulation or receive an increased allocation for the duration of the shortage. Therefore, it should be granted only when justified on specific grounds that warrant allocating more water than is allocated to other similarly situated customers and when consistent with the intent of the water shortage regulations, while providing equal treatment of all customers. For detailed explanation of the exception process, refer to Appendix O.

8.7 Legal Authority

The City of Santa Cruz is legally authorized to implement this WSCP pursuant to California Water Code Section 10632, Santa Cruz Municipal Code Chapter 16.01 (attached as Appendix Q to the Urban Water Management Plan), and pursuant to the provisions of the WSCP itself which is adopted pursuant to City Council resolution. In the event of a water shortage, the City Council shall declare a water shortage emergency, the City shall thereupon activate and implement the WSCP, and in doing so, shall coordinate with the City of Capitola and the County of Santa Cruz for their respective local water shortage proclamations.

8.8 Financial Consequences of the Water Shortage Contingency Plan

Water shortages and implementation of a WSCP have the potential to impact both expenditures and revenues of a water supplier. Expenditures can be increased due to the time and materials necessary to implement demand reduction measures, other actions necessary to address shortages, and as well as for compliance and enforcement activities to discourage excessive water use. These expenditures can range from additional staff with associated salary, benefits, office space, computer, and vehicle needs, to increased public information costs including postage, additional printed materials, new advertising on various media, and other outreach expenses. At the same time, revenues can be impacted by reduced water sales due to successful water conservation and demand reduction actions, with impacts varying depending on the water supplier's rate structure.

The City has estimated costs for implementing staffing changes associated with implementation of Stage 1 and Stage 2 shortage levels. At Stage 1, three additional temporary staff are anticipated to be needed to implement the WSCP measures. These staff and other associated expenses are estimate to be approximately $400,000 per year. At Stage 2, fourteen temporary staff in addition to the temporary staff needed at Stage 1 are anticipated to be needed to implement plan measures. Costs for these additional staff and other associated expenses are estimated to be approximately $670,000 per implementation cycle, with the assumption that all additional staff can be accommodated within existing office space. Implementation of higher plan stages, Stage 3 and above, if needed would be challenging for the community to carry out due to hardened local demand and City implementation would be expected to be even more expensive to implement.

The City of Santa Cruz mitigates for the financial consequences of implementation of the WSCP primarily through a Drought Cost Recovery Fee structure that is developed as part of its Proposition 218-compliant water rate schedule. Drought Cost Recovery Fees are stage specific and designed to recover the lost revenues associated with lowered water consumption that results from implementation of curtailments. These fees are collected as a fixed charge based on meter size and are collected over a full 12 month period to mitigate the impacts to monthly bills. Refer to Appendix O for additional information on the Drought Cost Recovery Fees.

8.9 Monitoring and Reporting

There are two general components to monitoring and reporting. One is the City's ongoing monitoring and subsequent reporting to the State. The Water Department tracks production through the water supply and distribution system on a daily, monthly, and annual time step. Water use is tracked through the customer billing system on a time step dependent on meter type and water loss is audited on an annual basis.

The City compiles, analyzes, and submits monthly production reporting to the State Water Resources Control Board covering both overall production as well as a calculation of water use in gallons per capita per day. This reporting would continue throughout any water shortage that may occur. This data is publicly available and accessible online.

Monitoring and reporting utilized specifically during a shortage includes online month-by-month presentation of usage data to customers. During a shortage of Stage 2 or higher, a dedicated drought webpage would be created to display usage data and progress on meeting reduction goals. This would be in addition to the communications protocols that would be implemented during the activation of any WSCP stage of shortage as described in Section 8.4.

8.10 Refinement Procedures

The City of Santa Cruz will review its WSCP after each year that a shortage stage is implemented and as necessary based on any identified needs for refinement. This review will focus on areas of the plan that require refinement or adaption to existing circumstances or otherwise need to be adjusted. Upon completion of such a review, staff will determine if an update to the WSCP is needed. If so, a new draft WSCP will be developed and circulated for public review as required by law before any public hearings or consideration of adoption by the Santa Cruz City Council.

8.11 Special Water Features Distinction

Water Code Section 20632 requires the separate evaluation of special water features separately from pools and spas. The City of Santa Cruz WSCP demand reduction actions rely primarily on an allocation system that requires water customers to maintain water use within a given allotment rather than providing prescriptive use restrictions. Special water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains are not specifically restricted at any WSCP stage if they are maintained with a given customer allotment. Similarly, pools and spas are not restricted at any WSCP stage if they are maintained with a given customer allotment; although, public pools and showers would be closed at Stage 5.

8.12 Plan Adoption, Submittal, and Availability

The City of Santa Cruz developed an Updated Interim WSCP in early 2021 in order to be prepared to implement the plan in the event of water shortage in the peak season of 2021. The timeline for review and adoption of that interim plan were as follows:

- Recommended by the Santa Cruz Water Commission to Santa Cruz City Council for adoption on January 4, 2021.
- Adopted by City Council on February 23, 2021 at a duly noticed public hearing.
- Implementing amendments to Chapter 16.01 of the Santa Cruz Municipal Code were adopted by City Council on April 13, 2021.

This WSCP, updated since the adoption of the Updated Interim WSCP, is comprised of this Chapter 8 and Appendix O of this Urban Water Management Plan. It is currently being made available for public review in conjunction with the public review of this Urban Water Management Plan. Details on the public hearing, adoption, public availability, and submittal to the California Department of Water Resources will be added to this Urban Water Management Plan upon completion of these processes.

Chapter 9

DEMAND MANAGEMENT MEASURES

The City of Santa Cruz has long recognized the importance of conserving water as a responsible demand management strategy to help protect the area's natural resources, to stretch existing water supplies, to help downsize and/or delay the need for costly additional water supply, treatment, and distribution upgrades, and to fulfill the City's overall goal of ensuring a safe, reliable, and adequate water supply. Since the 1980s, the City has offered a highly effective variety of programs, informational materials, and incentives to become more water-efficient, putting the City water customers among the lowest per capita water users in California. The City's very low system-wide water use is highly beneficial from the perspective of meeting demands and preserving water resources, but it also represents a "hardened demand" that presents limited opportunity for further per capita demand reductions moving forward. This section describes the City's current water demand management measures.

9.1 Demand Management Measures for Wholesale Agencies

The City of Santa Cruz currently is not a wholesale water supplier nor does it receive water from a wholesale agency. This requirement does not apply to the City.

9.2 Demand Management Measures for Retail Agencies

This section presents the City of Santa Cruz demand management measures, including water waste prevention ordinances, metering, conservation pricing, public outreach and education, programs to assess and manage distribution system losses coordination and staffing support, and other measures.

9.2.1 Water Waste Prevention Ordinances

The City's water conservation ordinance (Santa Cruz Municipal Code 16.02) has been in operation since 1981 and was updated last in 2003 (Appendix Q). Under the ordinance it is unlawful for any person to use water for any of the following:

- unauthorized use of water from a fire hydrant,
- watering of landscaping in a manner or to an extent that allows excess water running off the property,
- allowing plumbing leaks to go unrepaired,

- outdoor washing of structures, vehicles, or surfaces without the use of an automatic shut-off nozzle, and
- operation of a fountain unless water is recycled

Provisions of the ordinance regulating new development include prohibitions on:

- use of water in new ice-making machines and any other new mechanical equipment that utilizes a single pass cooling system to remove and discharge heat to the sanitary sewer,
- washing of vehicles at a commercial car wash unless the facility utilizes water recycling equipment,
- use of water for new non-recirculating industrial clothes wash systems, and
- use of potable water for dust control or soil compaction purposes in construction activities where there is a reasonably available source of reclaimed water appropriate for such use.

The ordinance is in effect at all times and is upheld mainly through communication with the responsible customer.

During declared water shortages, the City's Water Shortage Contingency Plan takes effect as codified in Santa Cruz Municipal Code 16.02 (Appendix Q). The aforementioned restrictions are repeated in 16.01, and are enforceable by a first warning, followed by a progressive series of fines from $100 to $500.

The public is also encouraged to report water waste, either by calling the Water Conservation Office's designated "leak line" (831 420-LEAK) or reporting water waste through the City website. When water waste is observed, site visits, in-person customer contact, phone, and/or mail correspondence is used to resolve the issue. Field staff will increase drive-by checks of sites receiving water waste complaints to help ensure the issue was resolved. Software acquired in 2009 was used to help document, track and manage water waste complaints, including the photo evidence of water waste incidents.

Water waste prevention is also implemented through the City's Landscape Water Conservation Ordinance as codified in Santa Cruz Municipal Code Chapter 16.16 to ensure landscapes and irrigation systems in new and renovated development are designed to avoid runoff, overspray, low-head drainage and other similar conditions where water flows off site onto adjacent property (Appendix Q). Further description of this ordinance can be found in section 9.3.1.3 of this plan.

9.2.2 Metering

All of the City's 24,592 water connections are fully metered with most using Automated Meter Reading (AMR) technology. Approximately 33 percent of all City water meters are now connected with Advanced Metering Infrastructure (AMI) technology, allowing access to hourly meter reads. Water meters are required for all new service connections. In addition, a separate, dedicated irrigation meter equipped with AMI is required for all new and renovated multi-family and commercial landscape projects with over 5,000 square feet of landscaped area.

All meters are read and billed monthly according to the volume of water consumed. Monthly billing was first instituted inside the City in 2005 mainly to facilitate rising rates for all City utilities, but it also served in aiding in leak detection and allowing for more accurate monitoring of individual account usage and categorical water consumption. Outside City customers were later transitioned to monthly billing in April 2014 to facilitate water rationing.

In 2010, the City adopted a new Meter Testing, Repair, and Replacement Policy that accelerated large meter replacement and should help improve overall meter accuracy. In 2013, the City completed a feasibility study to assess the merits of a program to switch mixed-use commercial accounts that have substantial irrigation demands by installing a dedicated landscape meter. Of the almost 1,900 commercial properties analyzed, only nine sites, mostly schools, were identified as potential commercial candidates meriting retrofitting or future sub-metering.

The City is slated to begin a system-wide replacement of its metering system in fall 2021. This project will replace all meters that are older than 3 years, and outfit all meters with an AMI radio. Pending final negotiations with various contractors, installation is scheduled to last about 15 months.

This project began in earnest with a business case evaluation from May 2018 that found strong financial justification, as well as compelling qualitative benefits for customers and staff, to pursue a full replacement of the City's aging metering system. Key financial justifications include replacement of stuck and under-registering meters, wholesale discounts on bulk purchases of meters and radios, and capture of lost revenue due to a reduction of billing adjustments due to leaks. Qualitative benefits for customers and staff include improved understanding of water use and related charges, reduced carbon footprint from drive-by meter reading, improved drought response, and standardization of metering equipment and software.

Following the installation phase of the project, the City will begin work on incorporating the myriad benefits of interval meter read data, including optimization of the meter-to-cash operation, further calibration of the hydraulic model, and expansion of distribution water loss analysis. Additionally, the City will incentivize use of an online customer portal by integrating interval data with customized leak alerts, budget-based alerts, or—during declared water shortages—over-allotment alerts.

9.2.3 Conservation Pricing

The Santa Cruz Water Department Customer Service section, also referred to as "Santa Cruz Municipal Utilities," provides customer service and handles utility billing for water, sewer, refuse, and recycling services to the residents and businesses of the City of Santa Cruz, and services for water only to the unincorporated surrounding areas and part of the City of Capitola.

The water portion of the City's utility bill consists of five components: 1) a fixed, monthly "Readiness-to-Serve" charge, 2) a volumetric charge, 3) an infrastructure reinvestment fee, 4) a rate stabilization fee and 5) for customers residing in elevated pressure zones, an elevation charge applies.

The 2020 Readiness-to-serve charge varies by meter size and location (see Table 9-1).

Table 9-1: 2020 Readiness to Serve Changes

Readiness to Serve Charges (2020)		
Meter Size	Inside City (monthly)	Outside City (monthly)
5/8	$10.71	$12.26
3/4"	$10.99	12.59
1"	$11.83	$13.55
1.5"	$12.94	$14.83
2"	$16.02	$18.35
3"	$38.71	$44.34
4"	$47.11	$53.96
6"	$66.71	$76.42
8"	$89.11	$102.09
10"	$114.32	$130.95

For the volumetric charges, the City has an inclining rate structure in place for residential and irrigation customers. Residential tiers are based on CCF used, and irrigation tiers are based on assigned budgets. The Infrastructure Reinvestment Fees (IRFs) for these customer classes follows the same tiered structure. The current residential rates and fees as of July 1, 2019 are listed in Table 9-2, and irrigation rates and fees are listed in Table 9-3. For all other customers, including, business, industrial, municipal, and golf customers, water is billed at a uniform rate of $8.01/CCF inside the city and $9.18/CCF outside the City. These customer classes are billed an Infrastructure Reinvestment Fee of $2.96/CCF inside the city and $3.38 outside the city.

Table 9-2: Fiscal Year 2021 Residential Water Rate Structure

Residential Water Rate Structure (2021)				
Tier	Inside City Volumetric Charge	Outside City Volumetric Charge	Inside City IRF	Outside City IRF
1 (0-5 CCF)	$7.01	$8.04	$2.02	$2.33
2 (6-7 CCF)	$7.83	$8.99	$3.03	$3.49
3 (8-9 CCF)	$9.04	$10.41	$3.74	$4.31
4 (10+ CCF)	$10.72	$12.38	$5.02	$5.80

Table 9-3: Fiscal Year 2021 Landscape/Irrigation Water Rate Structure

Landscape/Irrigation Water Rate Structure (2021)				
Tier	Inside City Volumetric Charge	Outside City Volumetric Charge	Inside City IRF	Outside City IRF
1 (<100% of budget)	$8.36	$9.58	$3.67	$4.21
2 (101%-150%)	$11.16	$12.79	$5.50	$6.30
3 (150% and above)	$12.52	$14.34	$5.57	$6.38

All customers are charged a rate stabilization fee of $1.00/CCF to mitigate the risk associated with the volumetric based rates structure that encourages conservation. Customers in elevated pressure zones also pay an elevation surcharge of $0.51/CCF inside the city and $0.59 outside the city for the cost of being served by an elevated storage reservoir.

In October of 2016, the rate structure moved from one that collects about 65 percent of revenue in volume charges (based on the amount of water used) to one that collects about 90 percent of revenues from volume charges. Other changes at that time included:

- Established the IRF that collects the funding needed to support pay-as-you-go capital and debt service costs. The fee would be collected as a separate charge based on water use.
- Established a $1.00/centium cublic feet[1] (CCF) surcharge on water use beginning in July 2017 to increase the Department's Rate Stabilization Fund. This fund is used to mitigate the potential revenue instability associated with the volumetric based rate structure, and augment revenues in normal years.
- Transitioned multi-family and irrigation accounts to a tiered, rather than fixed, rate structure, and transitioned irrigation accounts to a simple budget-based rate structure.

The Water Department is currently in the processes of updating water rates and the Long Range Financial Plan for Fiscal Year 2022. No changes are being recommended to the water rate structure. The proposed water rate structure includes the following priority water pricing policy objectives for use in evaluating water rate structure options. The selected objectives included:

- Ensures water for essential use is affordable to all customers;
- Maintains transparency and equity for capital and water reliability needs; and
- Provides sufficient revenues to meet operating, capital, and customer service level needs.

On September 21, 2021, the City Council took action to adopt the 2021 Water Department Long Range Financial Plan, to accept the recommended proposed schedule of water rate increases for FY 2023 through FY 2027 and the recommended proposed FY 2022 through FY 2027 Drought Cost Recovery Fee schedule, and to authorize the Water Department to issue a Proposition 218 compliant public notice of the 45-day protest period and November 23, 2021 public hearing. The 2021 Water Department Long Range Financial Plan is included as Appendix R and the Proposition 218 Notice to the public about the proposed rates in included as Appendix S.

The financial plan and recommended rates are needed to ensure the long-term financial health of the utility. These enable the Water Department to support ongoing operations and maintenance of the water system and to make the capital investments required to comply with regulations, ensure adequate water supply, and rehabilitate and replace aging infrastructure. Table 9-4 includes recommended water rates for Fical Year 2023 – Fiscal Year 2027.

[1] A centum cubic foot is one hundred cubic feet of water.

Table 9-34: Recommended Water Rates Fiscal Year 2023 - 2027

Commodity Charges (dollars per CCF) - Consumption Charge, Infrastructure Reinvestment Fee, Rate Support Fund						
Customer Class	Current	As of 7/1/22	As of 7/1/23	As of 7/1/24	As of 7/1/25	As of 7/1/26
Residential*						
Tier 1	$9.60	$9.74	$11.33	$13.17	$14.09	$15.07
Tier 2	$11.58	$14.23	$16.54	$19.23	$20.57	$22.00
Tier 3	$13.64	$18.75	$21.80	$25.34	$27.10	$28.98
Tier 4	$16.83					
Commercial**						
Uniform	$11.70	$11.37	$13.23	$15.38	$16.45	$17.60
UCSC						
Uniform	$12.06	$12.07	$14.04	$16.33	$17.46	$18.67
Landscape Irrigation***						
Tier 1	$12.86	$20.53	$23.87	$27.75	$29.68	$31.74
Tier 2	$17.82	$28.59	$33.24	$38.63	$41.31	$44.17
Tier 3	$19.33	$36.32	$42.22	$49.07	$52.47	$56.10
North Coast Agriculture						
Maintain Reliability	$8.98	$6.45	$7.51	$8.74	$9.35	$10.00
Decrease Reliability	$8.98	$2.88	$3.36	$3.92	$4.20	$4.50
Rate Stabilization Fee	$1.00	$1.00	$1.00	$1.00	$1.00	$1.00
***Includes Single Family and Multi-Family, tier width is per dwelling unit**						
****Includes Business, Industrial, Restaurant, Hotel, Golf, Municipal, Bulk, Fire Service Leaks, and Temporary**						
*****Tiers based on percent of water budget for each customer**						

9.2.4 Public Education and Outreach

The City of Santa Cruz Water Department values and actively promotes public awareness and education about the City's water resources and the importance of water conservation. The City of Santa Cruz disseminates information to the general public in different forms including: 1) media, 2) workshops and community events, and 3) billing and customer service.

The City uses media coverage to broadly share information and updates on events, programs, and news to the public in the following ways:

- "SCMU Review", utility newsletter which includes news and information on water conservation topics;
- City of Santa Cruz Water Conservation website;
- Formal water supply outlook published at least once a year sharing the water conditions/ supply availability;
- Weekly water conditions webpage;
- Paid advertising in local newspapers;

- Opinion page coverage;
- Marketing and advertising of EPA's "Fix a Leak Week"; and
- Television and radio news interviews and community television programs.

In addition, the City uses workshops and community events to engage and interact with the public by the following:

- Tabling at local fairs, farmers markets, and events;
- Participation in regional water forums;
- Participation with other local water agencies in local events and sponsorships of water conservation-related activities;
- Free workshops on irrigation efficiency, new irrigation technologies, and water conservation strategies for the landscape; and
- Financial support to the Green Gardener Program, Water-Smart Gardening Faire, and the Water Education Foundation.

The City of Santa Cruz also uses a personable approach to public education and outreach through billing and customer service, which includes the following:

- Marketing and distribution of free water conservation devices and literature;
- Marketing of rebates and distribution of rebate applications;
- Bill inserts;
- Field representatives showing customers how to read their meter and check for leaks at their properties;
- Messages and information on customer's bills showing daily consumption and a graph charting monthly consumption for the entire year;
- A new web portal for customers to view and track their water use, receive custom conservation recommendations, and ask questions. Customers with AMI can access their hourly and daily data through this portal; and
- Water supply tours.

The City offers school education activities for students ranging from upper elementary age children up to the University level. The program gives students an opportunity to learn about the City's water supply system and water conservation. School educational activities include:

- Field trips and presentations at Loch Lomond Reservoir and San Lorenzo River;
- Loch Lomond Trout in the Classroom fish release field trip;
- Distribution of age and grade level appropriate curriculum and educational materials, including a water education booklet specially developed for Santa Cruz County students;
- High School Watershed Academy program.

9.2.4.1 Water School

In summer 2014, the City of Santa Cruz Water Department started hosting Water School as a result of rationing and curtailment during a declared water shortage. Residential customers were required to stay within their assigned allotment or pay an excessive use penalty for each additional unit of water used over their allotment. Water School served as a one-time opportunity for customers who exceeded their monthly allotment to dismiss their penalty by attending a two-hour class session held at the local community center. The session was followed by a short quiz and a survey for feedback and additional questions. The class curriculum consisted of an overview of the City water system, statewide and local drought conditions, Santa Cruz Municipal Utility (SCMU) services, water use regulations and restrictions, and water conservation strategies to practice at home and outside. The purpose of water school was to educate customers about the water shortage and local impacts, show customers support, empower customers to conserve and think critically about their own usage, and prevent customers from exceeding their allotment in the future. In 2014, the city held 27 classes for 702 customers, which collectively waived $462,050 in penalties. In 2015, there were 14 classes for 461 customers, which dismissed $266,760 in penalties.

The City of Santa Cruz also offered a separate Water School for large landscape accounts that exceeded their water budgets created from the landscape water budget software, Waterfluence. The landscape water school shared some elements with the residential water school curriculum and included tips on how to use Waterfluence effectively and communicate with different staff or stakeholders. In 2014, 28 irrigation customers attended and dismissed $40,375. In 2015, a pre-rationing water efficient workshop was offered to prepare irrigation accounts for rationing where 19 customers attended. The 2015 landscape water school consisted of 20 customers and dismissed $34,850 in excessive use penalties.

Water School has not been implemented since 2014 and 2015. The Water Department is currently updating its Water School curriculum and redesigning the structure of the course to be offered online. The purpose of Water School will remain the same in that it will continue to educate customers about where their water comes from, help customers stay within their allotments, and provide relief for penalties incurred for exceeding their allotment.

9.2.5 Programs to Assess and Manage Distribution System Losses

As mentioned in Chapter 4, Section 4.7, the City has conducted an annual water audit of the City's water distribution system since 1997 to quantify how much water and revenue is lost through physical leaks and apparent losses and to identify steps to minimize system losses and improve the operational efficiency of the water system. The City uses

AWWA water balance software to help quantify and track water losses associated with the water distribution system and identify areas for improved efficiency and cost recovery.

Water audit results indicate average annual system water loss from 2015 to 2019 is 221 million gallons per year (MGY). Of this amount, it is estimated that an average of 161 MGY is lost due to physical leakage in the distribution system, also referred to as "real" losses, including leaking service lines, valves, fittings, and water mains. On average, it is estimated that another 59 MGY is not physically lost but goes unreported on the billing system primarily due to sales meter inaccuracies, billing and accounting errors, and other factors. This second category of losses, labeled "apparent" losses, has a negative impact on both utility revenue and on consumption data accuracy.

In 2015, the City contracted with Water Systems Optimization, Inc. to examine the City's water system and operations practices, validate where losses are occurring, evaluate options, and set forth a formal strategy to improve water accountability and reduce lost water. Water Systems Optimization's proposed scope of work is organized into three tasks, involving the following elements:

- Water audit validation, to assess the accuracy of the system input meters and data transfer systems, and to perform a business process review of meter testing, reading, and billing activities;
- Component analysis of real losses, to quantify the volume of different types of leaks and determine the economic level of leakage – the balance between the value of the water that is lost through leakage and the cost of finding and fixing leakage or reducing leakage through pressure management; and
- Water loss control program design, to outline the most cost-effective strategies for reducing both real and apparent losses over time.

The recommendations produced from this year-long study are used to guide a robust water loss control strategy and serve as a foundation for completing and reporting future annual water audits to the state that began in 2017 under the requirements of SB 555 of 2015.

Currently, the City addresses physical leakage by expediting leak repairs on service connections and mains, and by performing service line and water main replacements on an ongoing basis. The Department budgeted on average a total of about $2.5 million annually between 2016 and 2020 in its capital investment program for water main replacement projects. Projected annual spending on water main replacements through 2030 is estimated to be approximately $1.6 million annually. Although a formal leak detection program is currently not in place, the Water Department uses sonic leak detection equipment to locate and repair leaks in the water system. In addition, the Department monitors for leaks on the customer's side of the meter by reviewing exception reports for

high meter readings. Customers are notified so they can take appropriate action to repair leaks, even before they receive their water bills.

9.2.6 Water Conservation Program Coordination and Staffing Support

The Santa Cruz Water Department Water Conservation section is responsible for promoting efficient water use, administering conservation programs, and implementing drought response measures outlined in the Water Shortage Contingency Plan. This section includes one Environmental Programs Analyst and two Water Conservation Representatives. The section is responsible for coordination of conservation activities with the public and with the Administration, Engineering, Production, Distribution, and Customer Service sections of the Water Department. The Environmental Programs Analyst and Water Conservation Representatives are responsible for operating existing programs and assisting with new program development.

9.2.6.1 Water Conservation Program Activities

The responsibilities and major activities of the Water Conservation Section fall into the following four general categories:

Public Awareness and Education: to promote public awareness and education about the City's water resources and the importance of water conservation; and to provide timely and accurate information to utility customers and the general public about conservation practices and technologies, as well as the City’s conservation programs and policies.

Water Demand Monitoring: to monitor water production, consumption and system water losses; to track weather and population data; to evaluate trends in per capita water use; to track demand associated with new service connections; to compare actual water demand with projected use by customer category; and to develop and support water demand forecasts for the water service area for use in supply planning.

Long-Term Water Conservation Programs: to develop and implement various conservation projects and programs that result in a sustained reduction in customer water demand; to track water savings from ongoing conservation programs; and to evaluate the need for program modifications to improve efficiency, customer service, and water savings in keeping with conservation goals.

Planning and Emergency Management: to periodically update and implement the City’s Water Shortage Contingency Plan and the Urban Water Management Plan, and to assist in Departmental and City-wide emergency planning and management activities.

During periods of drought or water supply shortages, drought management becomes the Conservation section's primary function, accelerating public education and outreach activities as well as addressing increased public interest and participation in long-term conservation programs.

9.2.6.2 Program Funding

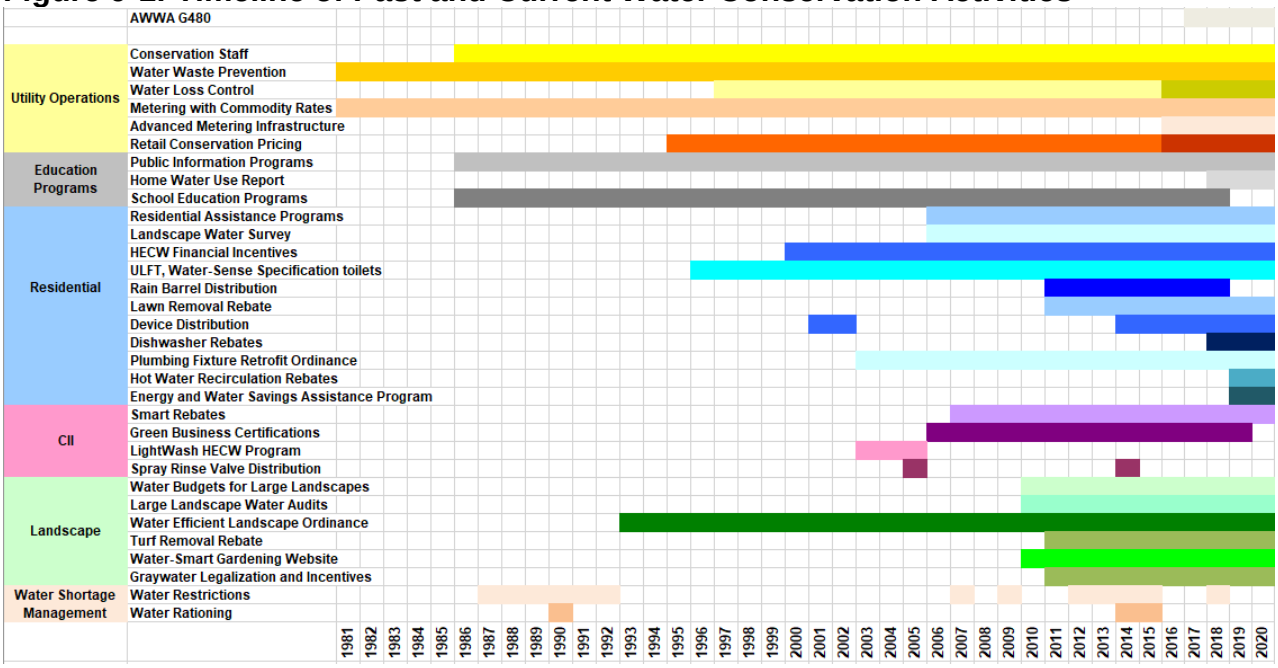
The City's water conservation program is funded by a combination of water rates, system development charges, and miscellaneous service fees. With regard to water conservation, revenues from system development charges are used primarily for various rebate programs, including residential and commercial toilets, urinals, clothes washers, dishwashers, hot water recirculation pump, Smart Rebates, and lawn removal rebates, which account for the majority of long-term water savings generated each year. The total budgeted resources for the Water Conservation Section in FY 2022 is $923 thousand.

9.2.7 Other Demand Management Practices

The City offers a suite of programs to residential, commercial, and irrigation customers to help and encourage them to manage their water consumption. Figure 9-1 below provides a summary and timeline of past and current water conservation activities. The following is a list of programs that were active from 2016 to 2020. The nature and extent of these measures are described in Section 9.3.

- Residential
    - Toilet, dishwasher, clothes washer, hot water recirculation pump, turf removal, and graywater rebate programs
    - Rain Barrel distribution program
    - Free water saving device distribution, including showerheads, aerators, hose timers, and automatic shutoff nozzles for hoses
    - Energy and Savings Assistance program, offering free toilet replacements to low-income qualifying customers
    - Plumbing fixture retrofit ordinance, requiring the replacement of inefficient toilets and showerheads
    - Home water surveys and home water use reports
- Commercial, Industrial, and Institutional
    - Smart business rebates for toilets, clothes washer, and urinals
    - Green business certification
- Irrigation
    - Water budgets for large landscapes
    - Water Efficient Landscape Ordinance (WELO)
    - Turf removal rebates
    - Water-smart gardening website
    - Greywater rebates

Figure 9-1: Timeline of Past and Current Water Conservation Activities



9.3 Reporting Implementation

Demand management program implementation is described in the section below including implementation over the past five years and implementation to achieve water use targets.

9.3.1 Implementation over the Past Five Years

Implementation over the past five years of the City of Santa Cruz residential, commercial and landscape programs are described in the subsequent sections.

9.3.1.1 Residential Programs

Residential water use constitutes almost two thirds of system consumption and therefore is a main focal point of the City's water conservation efforts. Current residential water conservation programs consist of the following: 1) Home Water Survey Program, 2) High Efficiency Clothes Washer Rebate Program, 3) Toilet Rebate Program, 4) Dishwasher rebates 5) Hot Water Recirculation Pump rebates, 6) Laundry to Landscape Rebate Programs, 7) Plumbing Fixture Retrofit Ordinance, and 8) Energy and Water Savings Assistance Program.

The Home Water Survey program is a free service offered to single and multi-family residences and consists of reviewing billing and consumption information, showing how to read a meter and detect leaks, inspecting home plumbing fixtures, and offering free showerheads, faucet aerators, and rebate forms. The survey also assesses outdoor water

use and needs by checking the irrigation system and timer and evaluating the landscape area, design, and plants. Although home water surveys are not in high demand, they play an important role in providing education and customer service. This program was temporarily suspended in 2020 due to the COVID-19 pandemic, and has not yet been reinstated.

The High Efficiency Clothes Washer Rebate program offers $100 for the purchase and installation of an Energy Star clothes washer to single and multi-family (non-communal laundry) residences, and $200 for Energy Star Most Efficient Models. The Energy Star Most Efficient models have the lowest water factor and energy factor of all clothes washers. By increasing the rebate amount for these specific models, the City hopes to encourage customers to use clothes washers that have the lowest water factors. Between 2016 and 2020, the City approved rebates for over 800 water efficient clothes washers, with about half of those being Most Efficient models, saving approximately 6.4 MG of water annually.

The City has operated a rebate program to promote the installation of ultra-high-efficiency or high-efficiency toilets in residential accounts since 1995. The program originally featured a $75 rebate as a financial incentive for customers to remove their higher-volume toilets and replace them with 1.6 gallon ultra-low-flush toilets. This $75 rebate was discontinued in 2010. The City's current toilet rebate program offers $150 rebate for toilets meeting WaterSense[2] criteria of 1.28 gallon per flush maximum. Eligibility requirements depend on the flush volume of the toilet that customer is replacing. Older, higher usage toilets of 3.5+ gallons per flush are eligible with the replacement of a high efficiency toilet of 1.28 gpf or lower. Customers who have toilets less than 3.5 gallons per flush must install ultra-high efficiency toilets of 1.0 gallons per flush or less to be eligible. In the last five years, 1,447 water efficient toilets were installed under the program saving approximately 4.3 million gallons of water annually.

The City also offers a Laundry to Landscape rebate of $150 to customers who install a Laundry to Landscape greywater system and attend a workshop offered by Central Coast Greywater Alliance. The requirement to attend a workshop is intended to ensure systems are installed in accordance with the guidelines listed in the California plumbing code. The program has attracted only very sporadic participation.

Up until 2019, the City offered a Rain Barrel Program for a 50-gallon rain barrel catchment system at a subsidized rate of $50 per barrel. Customers were able to order online during the rainy season from Rainwater Solutions to reserve rain barrels for the upcoming distribution event. Several distribution events were held during the rain barrel

[2] WaterSense is a voluntary partnership program sponsored by the U.S. Environmental Protection Agency, is both label for water-efficient products and a resource to help consumers save water.

sale for customers to pick up their orders at the City's corporation yard. A total of 293 rain barrels have been sold from 2016 to 2019, resulting in an estimated water savings of 193.5 thousand gallons annually. Due to a decrease in participation, the program was discontinued in early 2019. A new rain catchment program is being considered that would offer a rebate to customers still interested in pursuing water savings through rain catchment.

In 2003, the City adopted a plumbing fixture retrofit ordinance, codified as Santa Cruz Municipal Code Chapter 16.03 (Appendix Q). This regulation requires that all residential, commercial, and industrial properties be retrofitted with low consumption showerheads, toilets, and urinals when real estate is sold. As part of the initial program implementation, the City worked closely with the County of Santa Cruz and the City of Capitola to have similar ordinances passed in these other jurisdictions. Under the law, the seller of the property is responsible for retrofitting any older toilets, urinals, and showerheads on the property with low consumption fixtures, and for obtaining a water conservation certificate from the Water Department. There is an option in the ordinance that allows the responsibility for retrofitting to be transferred from the seller to the buyer, if both parties agree. In either case, the City tracks real estate sales and requires every property to be inspected to verify that the plumbing fixtures on the property being sold meet the low consumption standards, with the exception of already existing 1.6 gallon per flush toilets. A custom database program was developed by a consultant to manage property sales data on local properties and retrofitting records, as well as follow-up enforcement of the ordinance. In the last five years, 2,031 properties have been certified under the program, saving about 25.2 million gallons per year.

In 2018 the City began offering a $50 rebate to customers for the purchase and installation of a new Energy Star rated dishwasher. An Energy Star rated dishwasher uses equal to or less than 3.5 gallons per cycle. Between 2018 and 2020, 216 dishwashers have been installed saving approximately 37.5 total gallons per year.

Lastly, in 2019 the City partnered with the Pacific Gas and Electric Energy Savings Assistance Program to offer free water saving assistance to qualifying low-income customers. Through this program, customers received literature, toilet assessments, and toilet replacements for toilets that used 1.6 gallons per flush or greater with Niagara Stealth 0.8 gallon per flush models. The water-saving measures of this program are funded by the Water Department and Pacific Gas and Electric contractors are responsible for the administration of the program. Since the start of this program in 2019, 200 toilets have been replaced, saving approximately 4 million gallons per year.

9.3.1.2 Commercial Programs

The City provides water to about 1,900 commercial and industrial accounts within the service area, which together represents about 20 percent of total system water use. The City offers a Smart Business Rebate programs to encourage commercial customers to become more water efficient by using water-saving technology.

The Smart Business Rebate Program was offered as a result of the conclusion of the statewide Smart Rebate program in 2013. The City's Smart Business Rebate Program mirrors the old statewide program by offering businesses rebates for installing water efficient fixtures including:

- High-Efficiency (1.28 gallons per flush (GPF)) or Ultra-High-Efficiency (1.0 GPF) toilets- $200
- High-Efficiency Urinals (0.125 GPF)- $300
- High-Efficiency Clothes Washer- $400

The eligibility requirements for these rebates are the same for the other programs. Clothes washers must be Energy Star certified and inspected if five or more are installed. Toilet rebate eligibility depends on what is currently being replaced, like the residential program. In the last five years, the City has approved 88 applications, saving an estimated 1.4 million gallons per year.

The City has also distributed water conservation materials to all local hotels, and drinking water upon request table tents to all local restaurants, and continues to make them available upon request.

9.3.1.3 Landscape Programs

The City of Santa Cruz also offers rebates and programs for outdoor water use and landscapes which include: 1) Lawn Removal Rebate Program, 2) Large Landscape Water Budgets, and 3) Water Efficient Landscape Ordinance.

The Lawn Removal Rebate Program currently offers $1.00 per square foot of lawn removed for single family, multi-family, and commercial customers. Single-family residences are eligible to receive up to $1,000 (1,000 square feet) and multi-family or commercial are eligible for up to $5,000 (5,000 square feet). The general requirements are the following:

- Lawn that is maintained or previously maintained prior to drought,
- Lawn must be watered by an in-ground irrigation system,
- Removal or capping of the overhead spray system in the area to be converted,
- Replacement of lawn with very low or low water use plants and mulch (with or without low volume drip irrigation) or install no water use permeable hardscape options,

- Agreement to pre- and post- inspections to take measurements and ensure eligibility requirements have been met,
- Completion of landscape conversion within a year, and
- One rebate per customer per year.

In 2016, the City increased the rebate from $0.50 to $1.00 per square foot removed with the same limitations of rebating up to 1,000 square feet for single-family residences and 5,000 square feet for multi-family and commercial. The hope was to encourage more lawn conversions by offering a higher rebate. Over the last five years, this program has resulted in a total of 298,000 square feet of turf to be removed, saving an estimated 5.7 million gallons of water per year.

In July 2010, the City launched a new program for customers with large landscapes and dedicated irrigation accounts. After converting all dedicated irrigation accounts to monthly meter reading, the City contracted with a consultant, Waterfluence LLC, to map landscape areas using aerial imagery, to develop irrigation budgets for the City's 110 largest irrigation customers, and to distribute the information through monthly Landscape Water Use Reports. Since its launch, participation in the program has expanded to include 305 sites representing 435 acres or 19 million square feet of irrigated area. There are an addition 99 analytics-only accounts, representing 11.3 acres of irrigated area. For each site, Waterfluence provides a site-specific irrigation budget based on landscape size and plantings, type of irrigation, and real-time local weather conditions that is obtained from the CIMIS station located at the DeLaveaga Golf Course (California Irrigation Management Information System (CIMIS) Station 104). Customers receive monthly reports via mail or email comparing their actual consumption to the irrigation budget over a one to three year-long period. Because City irrigation customers have experienced numerous interventions over the last ten years including Waterfluence, drought, advanced metering infrastructure, and water rate increases among other factors, the effects from Waterfluence program along cannot be isolated. The key performance indicator for the irrigation class over time is overwatering. Over the last ten years, overwatering was observed to decrease from 0.86 to 0.39 feet per year over all irrigated landscape. The 0.47 feet per year decrease in overwatering translates into water savings of an estimated 68.5 million gallons per year.

In addition to receiving monthly reports, participants in the program are also eligible for a professional irrigation audit performed by Waterfluence. The audits include an assessment of irrigation efficiency, notation of irrigation issues (scheduling, tilted nozzles, leaks, breaks, pressure, overspray etc.), and a confirmation of the landscape area measurements. Customers receive a detailed report with site photos noting irrigation

problems, a sprinkler condition analysis, cost-effective recommendations, scheduling suggestions, and a list of water management essentials.

The City's Water Efficient Landscape Ordinance was first adopted to establish landscape water conservation regulations for major development projects situated in the City's service area in 1993. Since then it has been rewritten and revised in 2001, 2010, and 2016. It is codified in Santa Cruz Municipal Code Chapter 16.16 (Appendix Q). The overall purpose of the ordinance is to ensure that the City's limited water supply is used efficiently and effectively in new landscapes within the City's water service area and to avoid certain landscape and irrigation design aspects that have the potential to result in water waste.

The City's ordinance applies throughout the entire water service area as a condition of receiving water service. The ordinance covers all new and renovated, commercial, industrial and public projects, and new single-family and multifamily development projects resulting in three or more dwelling units where: 1) the landscape is installed by the developer, and 2) the total landscape area of the project is 500 square feet or more, and new single-family and two-unit residential development projects on properties equal to or larger than 10,000 square feet. Certain provisions also apply to pre-existing landscapes over one acre in size. The ordinance contains provisions for the following:

- Dedicated irrigation meters for new landscapes or expansion of existing landscapes over 5,000 square feet in area;
- Landscape water budgets based on 55 % (residential) and 45% (non-residential) of reference evapotranspiration;
- Turf is limited to 25% on residential projects (turf not permitted for non-residential);
- Requiring very low to moderate water using plant materials, grouping plants with similar water needs;
- Irrigation design to avoid conditions that lead to runoff and overspray;
- Appropriate irrigation equipment, including requiring weather-based irrigation controllers and flow sensors to maximize water efficiency and detect leaks;
- Soil preparation and mulching;
- Storm water management; and
- Alternative water sources.

A complete landscape plan must be submitted and found to satisfy the standards before a building permit can be issued. Water Conservation Section staff reviews the landscape plans for compliance with the ordinance, coordinates plan review with the Santa Cruz Water Department Engineering Section and other City departments and jurisdictions, and once installed, performs final inspections of the completed landscape.

9.3.2 Implementation to Achieve Water Use Targets

In 2013, the City contracted with Maddaus Water Management, Inc. to develop an updated Water Conservation Master Plan. The goal of the updated plan was to define the next generation of water conservation activities through 2035 and serve as a roadmap to help the community achieve maximum, practical water use efficiency. Strengthening water conservation efforts has been identified as a priority by the City Council, the City's Water Commission, and the City's Water Supply Advisory Committee in its effort aimed at delivering a safe, adequate, affordable, and environmentally sustainable water supply.

The plan included a total of 35 measures for implementation between 2015 and 2035. Many were already underway at the time the plan was written, though some were implemented in the last five years. The City Council accepted the plan in concept as a Technical Memorandum in April 2016, and the final report was completed in 2017. Based on the calculated water savings resulting from the implementation of the plan, the City would achieve its water use target in 2020. The demand management measures in Section 9.2 were considered in the Water Conservation Master Plan, and were implemented to help reach and maintain the City's reduction goals.

Current levels of customer demand and the Updated Long-Range Water Demand Forecast (Appendix D) indicate that the Santa Cruz community has achieved levels of water conservation well beyond the levels of anticipated as a product of the programmatic conservation included in the Water Conservation Master Plan, and has done so without the associated spending on program implementation that the Water Conservation Master Plan had envisioned. The water conservation realized over the last five years have been achieved primarily through the effects of a combination of increased water rates and customer water use behavior changes as a result of the 2014-2015 drought. At the time the 2015 Urban Water Management Plan was written the City had already achieved its 20x2020 goal of 110 GPCD. At the time of this 2020 Urban Water Management Plan, the City has maintained level of water use well below this target, with customers using just 74 GPCD in 2020. This very low system-wide water use is highly beneficial from the perspective of meeting demands and preserving water resources, but it also represents a "hardened demand" that presents limited opportunity for further per capita demand reductions moving forward.

9.4 Water Use Objectives

Water use objectives based on specific standards for certain water use sectors will be developed by 2023 as required by California Water Code. While a framework for the new standards has been published by the California Department of Water Resources, parts of the framework remain unfinished. Given the City of Santa Cruz well-demonstrated track record of water conservation and its customers being among the lowest per capita water users in California, the City expects to be able to maintain compliance with upcoming standards.

Chapter 10

PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

This chapter summarizes the process of adoption, submittal, and implementation of the 2020 Urban Water Management Plan and 2021 Water Shortage Contingency Plan, including the steps for amendment if it becomes necessary. The process of preparing the Urban Water Management Plan is described in Chapter 2, and process of preparing the Water Shortage Contingency Plan is described in the Water Shortage Contingency Analysis and Implementation (Appendix O).

10.1 Inclusion of all 2020 Data

As mentioned in Section 2.3, the City is reporting on a calendar year basis. The plan was prepared in 2021 and accordingly includes water use and planning data for the entire calendar year of 2020, except where noted.

10.2 Notice of Public Hearing

Water suppliers must hold a public hearing before adopting an Urban Water Management Plan and a Water Shortage Contingency Plan. The public hearing provides an opportunity for the public to provide input before these plans are adopted by City Council.

Table 10-1 below lists all the cities and counties that receive water service from the City of Santa Cruz and that were sent a notice of the public hearing. As mentioned in Section 2.4, these jurisdictions were previously sent written notice regarding the plan review and update process well in advance of 60 days before the public hearing, in accordance with the Section 10621(b) of the Act. These notices are included in Appendix B.

Table 10-1: Notification to Cities and Counties

Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
City of Capitola	Yes	Yes
City of Santa Cruz	Yes	Yes
County Name	60 Day Notice	Notice of Public Hearing
Santa Cruz County	Yes	Yes

Prior to the public hearing, the draft plans were made available for public inspection, review, and comment on the City's web site, at the Water Department office, and at the City's Central Library beginning on September 30, 2021.

The draft plans were also circulated, along with notice of the time and place of the public hearing, to the County of Santa Cruz and the City of Capitola as required by law. Notification letters included the location where the draft 2020 Urban Water Management Plan and Water Shortage Contingency Plan could be viewed, the hearing schedule, and contact information of the preparer for the City. Copies of these letters are included in Appendix T.

In addition to these jurisdictions, the City provided the notice of the public hearing to the Association of Monterey Bay Area Governments, local elected officials, the Santa Cruz Local Agency Formation Commission, and to all major public water utilities in Santa Cruz County, including the following:

- Soquel Creek Water District
- San Lorenzo Valley Water District
- Scotts Valley Water District
- Central Valley Water District
- City of Watsonville

The public hearing was noticed to the public in the local newspaper as prescribed in Government Code 6066. The notice included the time and place of the hearing, as well as the various locations where the plans were made available for public review. A copy of the notices of the public hearing published in the Santa Cruz Sentinel newspaper are included in Appendix T.

10.3 Public Hearing and Adoption

The City Council is planned to hold a public hearing on the Urban Water Management Plan and Water Shortage Contingency Plan in accordance with California Water Code section 10642. Copies of any written comments received during the public review process, a summary of minor changes after circulation of the draft Urban Water Management Plan, official minutes of the public hearing, and the adoption resolutions for the plans are included in Appendix T.

10.4 Plan Submittal

The final adopted Urban Water Management Plan and Water Shortage Contingency Plan will be submitted electronically to DWR and the California State Library within 30 days of adoption, and transmitted to all jurisdictions receiving water service from the

City of Santa Cruz within 60 days of its submission to California Department of Water Resources, in accordance with California Water Code sections 10644 and 10635. Additionally, all final data tables will be submitted to California Department of Water Resources using the Water Use Efficiency data portal.

10.5 Plan Availability

The final, adopted Urban Water Management Plan and Water Shortage Contingency Plan will be made available to the public in accordance with California Water Code sections 10645 and 10632 by posting on the City's web site within 30 days of submission to the California Department of Water Resources.

Table 10-1 lists the cities and counties that receive water service from the City of Santa Cruz. These entities will be provided copies of the plans within 30 days of plan submittal to California Department of Water Resources.

10.6 Amendment Process

If the City of Santa Cruz chooses or needs to amend the adopted 2020 Urban Water Management Plan or Water Shortage Contingency Plan, proper notification, including copies of the amendments, will be provided in accordance with sections 10621, 10640, and 10644 in a manner set forth for the notification, public hearing, adoption and submittal.

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