

Appendix J

Water Supply Assessment

**UC Santa Cruz
2021 Long Range Development Plan
Water Supply Evaluation**

PREPARED FOR

UC Santa Cruz

UC SANTA CRUZ

PREPARED BY



2021 Long Range Development Plan Water Supply Evaluation

Prepared for

UC Santa Cruz

Project No. 750-60-20-02



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LIST OF ACRONYMS AND ABBREVIATIONS

asf	Assignable Square Feet
ASR	Aquifer Storage and Recovery
CESA	California Endangered Species Act
City	City of Santa Cruz
CLRDP	Coastal Long Range Development Plan
CLUMAC	Campus Land Use and Management Action Committee
CSP	Campus Sustainability Plan
EIR	Environmental Impact Report
FEIR	Final Environmental Impact Report
FESA	Federal Endangered Species Act
FTE	Full-Time Equivalent
FY	Fiscal Year
gpd	Gallons Per Day
HCP	Habitat Conservation Plan
LAFCO	Local Area Formation Commission
LRDP	Long Range Development Plan
MBR	Membrane Bioreactor
MG	Million Gallons
mgd	Million Gallons Per Day
MGY	Million Gallons Per Year
Regents	University of California Board of Regents
SAGMC	Soquel-Aptos Groundwater Management Committee
SB 610	Senate Bill 610
SCPWD	Santa Cruz Public Works Department
SCWD	Santa Cruz Water Department

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SGMA	Sustainable Groundwater Management Act
SqCWD	Soquel Creek Water District
SVWD	Scotts Valley Water District
UC	University of California
UCOP	UC Office of the President
UWMP	Urban Water Management Plan
WAP	Water Action Plan
WSA	Water Supply Assessment
WSAC	Water Supply Advisory Committee

2021 Long Range Development Plan Water Supply Evaluation

EXECUTIVE SUMMARY

Purpose of Water Supply Evaluation

The University of California, Santa Cruz (UC Santa Cruz or University) is one of ten campuses in the University of California (UC) system. In support of its continued mission to provide a diverse array of leading academic programs, UC Santa Cruz is preparing a Long Range Development Plan (LRDP) to guide the physical development necessary to achieve the campus' mission through 2040. The LRDP establishes a land use framework for academic and administrative space needs, housing, open space, circulation, and other land uses that ultimately facilitate the appropriate siting of capital projects.

The purpose of this Water Supply Evaluation is to demonstrate that adequate water supplies are available to meet the projected UC Santa Cruz water demands under the proposed 2021 LRDP. The Water Supply Evaluation considers the existing and projected future water demands, the availability and reliability of water supplies under normal, single dry and multiple dry year conditions, and additional planned water supplies and water conservation programs to determine water supply sufficiency. For completeness and clarity, this Water Supply Evaluation has been prepared to comply with California Senate Bill 610 requirements for a Water Supply Assessment, although Senate Bill 610 does not apply to campus development under the proposed 2021 LRDP.

Existing and Projected Future Water Demands

Water demands on the UC Santa Cruz Main Campus have dropped dramatically in recent years. In Fiscal Year (FY) 12/13 water use on the Main Campus was 179 million gallons per year (MGY) and dropped to 154 MGY in FY 17/18, representing a 14 percent decrease. The downward trend in water consumption has resulted from proactive water conservation, improved water use efficiency, and drought response measures on the campus. Much of the water conservation efforts were in response to the statewide drought from 2013 to 2017. During the 2014 and 2015 drought years, the City of Santa Cruz (City) declared a Stage 3 Water Emergency and requested the campus to reduce domestic water use by 20 percent, as metered and billed by the City, compared to a 2013 baseline, which UC Santa Cruz accomplished.

The previously projected water demands for UC Santa Cruz, included in the City's 2015 Urban Water Management Plan (UWMP), were based on the previously estimated 2035 development demand of 349 MGY¹. The 349 MGY was based on the projected future water demand estimated in the 2005 LRDP Environmental Impact Report (EIR) and the subsequent 2008 Settlement Agreement between the City and UC Santa Cruz related to the 2005 LRDP, and included existing and projected future water demand for the Main Campus, the Westside Research Park (located at and previously referred to as 2300 Delaware Avenue) and the Coastal Science Campus (previously referred to as the Marine Science Campus).

¹ This water demand estimate was based on the projected water demand for UC Santa Cruz developed for the City's Sphere of Influence Amendment EIR (339 MGY) plus 10 MGY of additional water demands for additional development beyond 2020 (Source: City of Santa Cruz Sphere of Influence Amendment EIR Table 2-4 and City of Santa Cruz 2010 UWMP (page 4-19)). This water demand estimate was the basis for the water demand estimate for UC Santa Cruz included in the City's 2015 UWMP.

Water demand for UC Santa Cruz under the proposed 2021 LRDP is projected to increase from the existing (FY 17/18) baseline of 155 MGY to 289 MGY in 2040. This increase in projected water demands represents an 87 percent increase over existing water use and includes existing water demands for the Main Campus and the Westside Research Park, but excludes the Coastal Science Campus.

The Coastal Science Campus is governed by a separate Coastal Long Range Development Plan (CLRDP) that was adopted by the University of California Board of Regents (Regents) and certified by the California Coastal Commission in 2008. As a result, the Coastal Science Campus is not a part of the proposed 2021 LRDP. The existing water demand for the Coastal Science Campus is approximately 7.4 MGY (based on 2018 water use) and is anticipated to increase by an additional 10 MGY in the future², for a total projected future water demand of 17.4 MGY.

Thus, the overall projected future water demand for UC Santa Cruz, including the Main Campus, the Westside Research Park, and the Coastal Science Campus, is approximately 307 MGY.

Water Supply Availability and Reliability

The projected future water demand of approximately 307 MGY for UC Santa Cruz (including the proposed 2021 LRDP and the Coastal Science Campus) is considerably lower than the 349 MGY previously projected for buildout of the 2005 LRDP, and is lower than the 2035 primary water demand projection for UC Santa Cruz included in the City's 2015 UWMP. Therefore, the water supply availability and reliability analysis, and timing of these new water system demands, as included in the City's 2015 UWMP, is still applicable.

Water Supply Evaluation Findings

Key findings of this Water Supply Evaluation are summarized as follows:

- Water demands on the UC Santa Cruz Main Campus have dropped dramatically in recent years as a result of water conservation measures in response to the recent drought. Many of the water conservation measures have resulted in permanent reductions in water use (e.g., plumbing fixture retrofits, improvements in leak detection, etc.).
- In the recent drought years, UC Santa Cruz successfully met the City's mandatory water reduction goals as a result of proactive water conservation, improved water use efficiency, and drought response measures, together with close collaboration between representatives of all sectors across campus, as well as with the City Water Department.
- The projected potable water demands for the UC Santa Cruz proposed 2021 LRDP are approximately 289 MGY by 2040, which includes the existing and projected future water demands for the Main Campus and the Westside Research Park.
- The projected potable water demands for the UC Santa Cruz Coastal Science Campus are 17.4 MGY, which includes the existing water demand and projected future water demand for the Coastal Science Campus. Although the Coastal Science Campus is not part of the proposed 2021 LRDP, it is considered part of the UC Santa Cruz overall water demand to be served by the City.

² Additional water demand for the Coastal Science Campus is based on growth projections for the UC Santa Cruz campus as included in the City of Santa Cruz Sphere of Influence Amendment Final EIR dated July 2010 (Section 3.0, page 3-9).

- The projected future water demand of approximately 307 MGY for UC Santa Cruz (including the proposed 2021 LRDP and the Coastal Science Campus) is considerably lower than the 349 MGY previously projected for buildout of the 2005 LRDP, and is lower than the 2035 primary water demand projection for UC Santa Cruz included in the City's 2015 UWMP.
- As described in Section 7 of this Water Supply Evaluation, the City predicts the supply and demand volumes to be in balance for 90 percent of all normal water years for 2020-2035. However, in single dry years and multiple dry years, the City does project water supply shortages. As a City water customer, UC Santa Cruz is subject to these potential water shortages and is subject to the City's water supply allocation system and demand reduction measures. As described, UC Santa Cruz has been very successful in reducing water use in recent years in response to the drought and has updated its Water Action Plan to implement additional measures to reduce potable water use.

1.0 INTRODUCTION

The purpose of this Water Supply Evaluation is to determine the sufficiency of water supplies to serve UC Santa Cruz under the proposed 2021 LRDP. The Water Supply Evaluation considers the existing and projected future water demands, the availability and reliability of water supplies under normal, single dry and multiple dry year conditions, and additional planned water supplies and water conservation programs to determine water supply sufficiency.

California Senate Bill 610 (SB 610) amended state law, effective January 1, 2002, to improve the link between information on water supply availability and certain land use decisions made by cities and counties. SB 610 sought to promote more collaborative planning between local water suppliers and cities and counties. The statute requires detailed information regarding water availability to be provided to the city and county decision-makers prior to approval of specified large development projects. The purpose of this coordination is to ensure that prudent water supply planning has been conducted, and that planned water supplies are adequate to meet existing demands, anticipated demands from approved projects and tentative maps, and the demands of proposed projects.

SB 610 amended California Water Code sections 10910 through 10915 (inclusive) to require land use lead agencies to identify any public water purveyor that may supply water for a proposed development project and request a Water Supply Assessment (WSA) from the identified water purveyor. The purpose of a WSA is to demonstrate the sufficiency of the purveyor's water supplies to satisfy the water demands of the proposed development, while still meeting the water purveyor's existing and planned future uses. Water Code sections 10910 through 10915 delineate the specific information that must be included in the WSA.

Although the SB 610 requirements do not specifically apply to UC Santa Cruz or the University, because it is not a city or county, the University has voluntarily elected to prepare a WSA-like Water Supply Evaluation to determine and demonstrate the sufficiency of the City's water supplies to satisfy the water demand of the planned development under the UC Santa Cruz proposed 2021 LRDP.

Therefore, this Water Supply Evaluation has been prepared and organized to parallel and be consistent with the requirements for a WSA per Water Code sections 10910 through 10915, such that this Water Supply Evaluation provides a comprehensive evaluation of the availability and reliability of water supplies to serve the planned development.

This Water Supply Evaluation includes the following sections:

- Section 1: Introduction
- Section 2: Description of Proposed Project
- Section 3: Required SB 610 Determinations
- Section 4: City of Santa Cruz Water Service Area
- Section 5: City of Santa Cruz Water Demands
- Section 6: City of Santa Cruz Water Supplies
- Section 7: Determination of Water Supply Sufficiency Based on the Requirements of SB 610
- Section 8: Water Supply Evaluation Findings
- Section 9: References

Relevant citations of Water Code sections 10910 through 10915 are included throughout this Water Supply Evaluation in italics to demonstrate consistency with the specific requirements of SB 610.

This Water Supply Evaluation will be included as an appendix to the Draft EIR for the proposed 2021 LRDP and the findings and conclusions reached in this document will be considered in analyzing the project's potential water supply impacts.

2.0 DESCRIPTION OF PROPOSED PROJECT

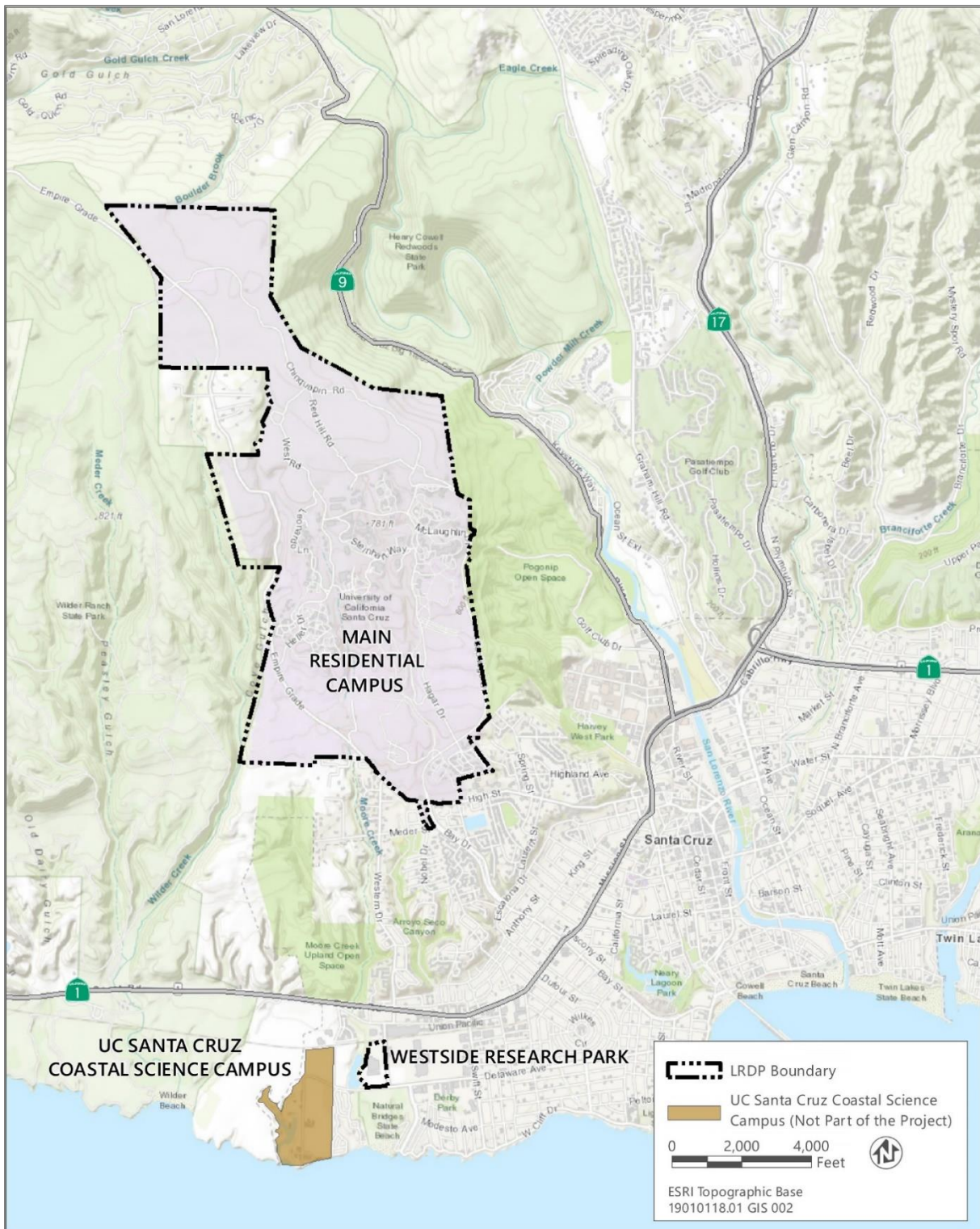
The following sections provide a description of the Proposed Project, including the proposed development plan, projected water demand, and projected water supply.

2.1 UC Santa Cruz 2021 Long Range Development Plan

UC Santa Cruz is one of 10 campuses in the University of California system. In support of its continued mission to provide a diverse array of leading academic programs, UC Santa Cruz is preparing an LRDP to guide the physical development necessary to achieve the campus’s mission through 2040. The proposed 2021 LRDP establishes a land use framework for academic and administrative space needs, housing, open space, circulation and other land uses that ultimately facilitate the appropriate siting of capital projects. All UC campuses are required to prepare a LRDP to guide physical campus development. An LRDP is defined by statute (Public Resources Code 21080.09) as a “physical development and land use plan to meet the academic and institutional objectives for a particular campus or medical center of public higher education.”

The Regents adopted the existing UC Santa Cruz LRDP in September of 2006 (also referred to as the 2005 LRDP), and the 2005 LRDP has served as the guide for campus growth and development since its adoption. The proposed 2021 LRDP would replace the 2005 LRDP for the campus and identifies land uses to support the academic mission of UC Santa Cruz through 2040. The 2021 LRDP campus population forecast is 28,000 Full-Time Equivalent (FTE) students and 5,000 FTE faculty and staff. To accommodate the projected increase in campus population, the 2021 LRDP provides for 8,500 student housing beds, up to 550 employee housing units, and approximately 3.1 million square feet of assignable square feet (asf) of academic and administrative building space.

The proposed 2021 LRDP land use plan supports potential growth on the UC Santa Cruz main residential campus and the Westside Research Park (located at and previously referred to as 2300 Delaware Avenue) in the City of Santa Cruz (see Figure 2-1). The third UC Santa Cruz property, the Coastal Science Campus (previously referred to as the Marine Science Campus), is a 100-acre property on the west side of the City and is governed by a separate CLRDP that was adopted by the Regents and certified by the California Coastal Commission in 2008. As a result, the Coastal Science Campus is not a part of the proposed 2021 LRDP.



Source: Ascent Environmental, July 2020.

Figure 2-1. Project Location and Plan Area

Table 2-1 summarizes the list of projects and housing proposed to be developed under the 2021 LRDP in asf and number of beds.

Table 2-1. Projected Increases in Building Space under the Proposed 2021 LRDP			
	Existing Conditions (2018-2019)	Net New under 2021 LRDP	Projected Total (2040)
Academic and Support Service			
Instruction and Research, asf	858,627	1,127,373	1,986,000
Academic and Administrative Support, asf	765,368	1,290,438	2,055,806
Student Support and Public Services, asf	348,628	608,110	956,738
Facilities & Operations, asf	115,805	57,903	173,708
Residential Space			
Student Housing, asf	1,346,938	1,885,000	3,231,938
Student Housing, beds	9,283	8,500	19,958 ^(a)
Faculty & Staff Housing, asf	317,622	660,000	977,622
Faculty & Staff Housing, units	270	558	867 ^(b)
<i>Source: UC Santa Cruz LRDP Program, June 2020 and Sherwood Engineers Water Demand Projections, November 2020</i>			
(a) Total includes 2,175 approved but not operational student beds.			
(b) Total includes 39 approved but not operational faculty and staff housing units.			

2.2 Projected Water Demand

Projected water demands for the proposed development under the 2021 LRDP for the Main Campus and the Westside Research Park have been estimated by Sherwood Design Engineers (Sherwood). The water demand analysis used the projected increases in student and employee populations (reported as full-time equivalents, FTEs), and housing capacity (reported as beds), to estimate future water demands. Water use data was analyzed by Sherwood over time and by water use category (including existing residential housing, non-residential, mechanical, and irrigation). The most recent years of data are considered a more accurate reflection of the campus’s efficiency improvements, which should be sustained and improved upon into the future. Key efficiency gains noted in the UC Santa Cruz 2017 Water Action Plan included smart-metering system and leak detection, irrigation reductions, efficiency audits, fixture replacement and behavior change campaigns. Sherwood’s Technical Memorandum describing the water demand projections is included as Appendix A of this Water Supply Evaluation.

Table 2-2 provides a summary of the UC Santa Cruz existing and projected future potable water demands at full development under the proposed 2021 LRDP (estimated to occur by about 2040). As shown, the total water demand is projected to be approximately 289 MGY by 2040.

Table 2-2. Projected Water Demand for the Proposed 2021 LRDP

Water User Category	Existing (FY 17/18)		Projected 2040	
	Annual Demand, MGY	Average Daily Demand, gpd	Annual Demand, MGY	Average Daily Demand, gpd
Demand by Water Use Category				
Interior Water Demands				
Non-Residential	29.1	79,658	44.7	122,508
Residential	75.2	205,913	168.8	462,535
Mechanical	6.8	18,763	16.1	43,977
Irrigation				
Grounds	29.4	80,640	37.5	102,609
Non-Grounds	14.0	38,483	22.1	60,510
Total	154.5	423,457	289.1	792,121
Demand by Campus Area				
Main Campus	154.0	421,994	283.5	776,827
Westside Research Park (2300 Delaware Avenue)	0.5	1,463	5.6	15,294
Total	154.5	423,457	289.1	792,121
<i>Source: Sherwood Design Engineers, UC Santa Cruz Long Range Development Plan Water Demand Projections, November 2020.</i>				
gpd = gallons per day				

It should be noted that FY 17/18 campus water use data was used as the baseline instead of FY 18/19 because it was the most accurate full fiscal year of data available at the time of this analysis. UC Santa Cruz recently modified the way in which sub-metered water data is collected and some anomalies were found in the FY 18/19 sub-meter data. Accurate sub-meter data is needed to categorize water demands by end-use (irrigation, housing, academic buildings, etc.). Using FY 17/18 water data allows for a more reliable estimate of future water demands, projecting by each end-use category as described in Sherwood’s Technical Memorandum (see Appendix A).

It should also be noted that these projections do not consider further increases in water-use efficiency and conservation. While options to increase building water-use efficiency should continue to be explored, UC Santa Cruz has been highly proactive to-date and is already achieving efficient demand factors. In addition, UC Santa Cruz plans to explore the development of non-potable water sources as a pathway to offset potable water use as the campus grows.

As described in Section 3.3 of this Water Supply Evaluation, the projected water demand for the proposed development for the 2021 LRDP, together with the projected water demand for the Coastal Science Campus, is considerably lower than the 349 MGY previously projected for buildout of the 2005 LRDP, and is lower than the primary projection for UC Santa Cruz included in the City’s 2015 UWMP. Therefore, the water supply availability and reliability analysis, and timing of these new water system demands, as included in the City’s 2015 UWMP, is still applicable.

2.3 Projected Water Supply

The projected water supply includes both potable water and recycled water, each is further described below.

2.3.1 Potable Water Supply

Under the terms of a 1962 Water Services Agreement between the City of Santa Cruz and UC Santa Cruz, the City agreed to provide sufficient water to meet the demands associated with the projected growth of the campus. The agreement also states that the City will provide, at no expense to UC Santa Cruz, water and sewer lines up to the boundaries of the main residential campus. An additional agreement made between UC Santa Cruz and the City in 1965 states that the City will install a water system capable of supplying 2 million gallons per day (mgd) to UC Santa Cruz for fire flow and ordinary use. Through these agreements, the University has contracted for adequate water service for the entire campus. In 1998, UC Santa Cruz also executed a Memorandum of Understanding with the City of Santa Cruz under which the University agreed to pay the cost of certain pump upgrades that could be needed in the future to serve the campus.

Most of the UC Santa Cruz main residential campus and the entire Westside Research Park are located within the boundary of the current City of Santa Cruz Water Department (SCWD) water service area. A portion of the UC Santa Cruz main residential campus, including development proposed in the LRDP, is located outside the City limit line, in Santa Cruz County. Specifically, LRDP development areas in the northernmost part of campus and to the west of Empire Grade are outside the current service boundary. However, the 1962 and 1965 agreements do not restrict water service to areas within the City limits; to the contrary, they require the City to provide water to the entire campus, irrespective of its location. Accordingly, the City is committed, by contract, to providing water to the areas both within and outside the city limits and there is no need for a service area boundary adjustment, typically approved by the Local Agency Formation Commission (LAFCO), to provide water service to those portions of the campus that lie in unincorporated Santa Cruz County.

In 2008 and as part of condition of a Settlement Agreement between the City and UC Santa Cruz related to the 2005 LRDP, UC Santa Cruz agreed to apply to the Santa Cruz County LAFCO for a Sphere of Influence amendment (City application) for extraterritorial water and sewer services (UC Santa Cruz application) for the north campus subarea. The Settlement Agreement provided that the University's application to LAFCO for extraterritorial water and sewer services was not an admission that UC Santa Cruz is subject to LAFCO jurisdiction, and did not change the underlying agreements between the City and UC Santa Cruz. Further, the terms of the Settlement Agreement were specifically related to the 2005 LRDP. The 2005 LRDP along with the Settlement Agreement will lapse once a new LRDP is adopted.

A description of the City's water supplies is provided in Section 6 of this Water Supply Evaluation. A description of the UC Santa Cruz water conservation program success is provided in Section 7 of this Water Supply Evaluation.

2.3.2 Recycled or Non-Potable Water Supply

Although the potential future use of recycled or non-potable water use to offset potable water demands is possible on the UC Santa Cruz campus, recycled or non-potable water use for potable water demand offsets are not relied upon for this Water Supply Evaluation. However, UC Santa Cruz is currently implementing site-specific non-potable water utility systems where feasible to offset the overall potable water demand of the campus.

The campus may operate an existing well (Well WSW#1) located adjacent to the Center for Agroecology and Sustainable Food Systems in Jordan Gulch to extract groundwater for non-potable use to offset irrigation demand for the Center and the Arboretum to reduce the campus demand for water from the City during drought years, or in the event that the City does not provide water to some portions of the campus. Current annual demand (i.e., based on FY 17/18) for the Center and Arboretum is approximately 4.6 MGY and 5.0 MGY, respectively, and is projected to increase to 5.7 and 6.3 MGY, respectively, by 2040 (Sherwood 2020). Well WSW#1 is capable of sustainably pumping approximately 92.5 gpm with very limited drawdown and no observable effects to off-site spring flow. This sustainable flow rate is equivalent to approximately 48.6 MGY.

Recycled water is not currently provided on Campus. As part of the Student Housing West project, currently planned under the 2005 LRDP, wastewater generated in new student housing on the Heller site will be collected and treated in a wastewater treatment facility that would be located in the southeastern portion of the Heller site. The facility would be a membrane bioreactor (MBR) plant to treat the wastewater and generate recycled water for irrigation and toilet flushing use on the Heller site and, potentially, at other areas of the Campus. An MBR plant is also planned for new family student housing that would be developed on the Hagar site as part of the Student Housing West project, which would provide recycled water for toilet flushing and irrigation use on that site.

3.0 REQUIRED DETERMINATIONS

The section describes the required determinations for an SB 610 Water Supply Assessment. Although these determinations do not specifically apply to UC Santa Cruz, they are provided here to demonstrate that this Water Supply Evaluation is consistent with SB 610 Water Supply Assessment methodology.

3.1 Does SB 610 Apply to the Proposed Project?

Cities and counties are the only lead agencies specifically required by SB 610 to prepare a water supply assessment for certain projects. Although the SB 610 requirements do not specifically apply to UC Santa Cruz or the University, because it is not a city or county, the University has voluntarily elected to prepare a WSA-like document to determine and demonstrate the sufficiency of the City's water supplies to satisfy the water demand of the planned development under the proposed 2021 LRDP.

This Water Supply Evaluation has been prepared to document the projected water demands for the UC Santa Cruz Main Campus and the Westside Research Park and to demonstrate that adequate water supplies are available from the City to meet the projected UC Santa Cruz water demands. For completeness and clarity, this Water Supply Evaluation has been prepared to comply with SB 610 requirements for a WSA, although SB 610 does not apply to campus development under the proposed 2021 LRDP.

3.2 Who is the Identified Public Water System?

10910(b) The city or county, at the time that it determines whether an environmental impact report, a negative declaration, or a mitigated negative declaration is required for any project subject to the California Environmental Quality Act pursuant to Section 21080.1 of the Public Resources Code, shall identify any water system that is, or may become as a result of supplying water to the project identified pursuant to this subdivision, a public water system, as defined by Section 10912, that may supply water for the project

10912 (c) "Public water system" means a system for the provision of piped water to the public for human consumption that has 3,000 or more service connections...

The UC Santa Cruz Main Campus and the Westside Research Park are located within the City of Santa Cruz Water Department water service area; therefore, the City of Santa Cruz Water Department is the public water system for the proposed project.

3.3 Does the City Have an Adopted Urban Water Management Plan (UWMP) and does the UWMP include the Projected Water Demand for the Proposed Project?

10910(c)(1) The city or county, at the time it makes the determination required under Section 21080.1 of the Public Resources Code, shall request each public water system identified pursuant to subdivision (b) to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with Section 10610).

The City's 2015 UWMP was adopted by the Santa Cruz City Council on August 23, 2016. The City's 2015 UWMP includes existing and projected future water demands for all UC Santa Cruz facilities, including the Main Campus, the Westside Research Park (located at and previously referred to as 2300 Delaware

Avenue), and the Coastal Science Campus (previously referred to as the Marine Science Campus). The potable water demand projections included in the City’s 2015 UWMP are summarized in Table 3-1.

	2015, (actual) ^(a)	2020	2025	2030	2035	2040 ^(b)
Total City Demand, MGY ^(c)	2,452	3,327	3,225	3,205	3,220	--
UC Santa Cruz Demand, MGY^(d)	160	196	234	271	308	322
UC Santa Cruz Demand, as a percent of Total City Demand	6.5%	5.9%	7.3%	8.5%	9.6%	--

(a) 2015 actual demands are from Table 4-1 of the City’s 2015 UWMP.
 (b) 2040 projections were not provided in the City of Santa Cruz 2015 UWMP but are provided here to show the extrapolated 2040 value for UC Santa Cruz (see Table 3-2 for additional information on the 2040 demand projection).
 (c) Projected City water demands for 2020 to 2035 are from Table 4-3 of City’s 2015 UWMP.
 (d) Projected UC Santa Cruz water demands for 2020 to 2040 are based on the Primary Projection presented below in Table 3-2.

The water demands for UC Santa Cruz included in the City’s 2015 UWMP are based on the previously estimated buildout demand for UC Santa Cruz of 349 MGY³. The 349 MGY is based on the projected water demand estimated for the 2005 LRDP and 2008 Settlement Agreement and included existing (based on 2007 water use) Main Campus water demand with added existing and projected water demand for the Coastal Science Campus and the Westside Research Park. The only change made by City staff to the water demand projection was to shift the previous buildout demand forecast of 349 MGY in 2030 further out into the future to reflect a lower, more realistic, rate of growth with two potential endpoints: 2035 and 2050. In the lower bound forecast (low projection), the buildout demand of 349 MGY is assumed to occur in 2050. In the upper bound forecast (high projection), the buildout demand of 349 MGY is assumed to occur in 2035. The primary projection (which was included in the City’s 2015 UWMP) is the calculated midpoint between the low projection and the high projection. These demand forecasts are shown in Table 3-2. It should be noted that 2040 projections were not provided in the City’s 2015 UWMP, but have been shown in Table 3-2 to show the extrapolated 2040 values for the water demand projections to coincide with the buildout of the proposed 2021 LRDP.

	2013 (actual)	2020	2025	2030	2035	2040 ^(a)
Low Projection, MGY ^(b)	182	186	213	240	268	295
Primary Projection, MGY^(c)	182	196	234	271	308	322
High Projection, MGY ^(d)	182	207	254	302	349	349

Source: City of Santa Cruz 2015 UWMP, Appendix E.

(a) 2040 projections were not provided in the City of Santa Cruz 2015 UWMP but are provided here to show the extrapolated 2040 values for the low, high and primary projections. For the 2040 extrapolation of the High Projection, the 2040 demand is assumed to be the same as the 2035 buildout demand of 349 MGY.
 (b) Under the Low Projection, buildout to a total demand of 349 MGY was assumed to occur in 2050.
 (c) The Primary Projection is the calculated midpoint between the Low Projection and the High Projection.
 (d) Under the High Projection, buildout to a total demand of 349 MGY was assumed to occur in 2035.

³ Based on the projected water demand for UC Santa Cruz developed for the City’s SOI Amendment EIR (339 MGY) plus 10 MGY of additional water demands for additional development at the Coastal Science Campus beyond 2020. Source: City of Santa Cruz SOI Amendment EIR Table 2-4 and City of Santa Cruz 2010 UWMP (page 4-19).

As described in Section 2.3, the projected future potable water demand for proposed development under the 2021 LRDP is approximately 289 MGY, with buildout of the 2021 LRDP currently anticipated to occur by 2040. The existing water demand for the Coastal Science Campus is approximately 7.4 MGY (based on 2018 water use) and is anticipated to increase by an additional 10 MGY in the future⁴, for a total projected future water demand of 17.4 MGY. Thus, the overall projected future water demand for UC Santa Cruz, including the Main Campus, the Westside Research Park, and the Coastal Science Campus, is approximately 307 MGY (289.1 MGY + 17.4 MGY).

This combined projected future water demand is lower than the previous buildout demand forecast of 349 MGY (described above), and lower than the 2035 primary projection for UC Santa Cruz included in the City's 2015 UWMP as shown above in Table 3-2. As such, the projected water demand for proposed development under the 2021 LRDP, as well as proposed development at the Coastal Science Campus, is included in the City's 2015 UWMP.

⁴ Additional water demand for the Coastal Science Campus is based on growth projections for the UC Santa Cruz campus as included in the City of Santa Cruz Sphere of Influence Amendment Final EIR dated July 2010 (Section 3.0, page 3-9).

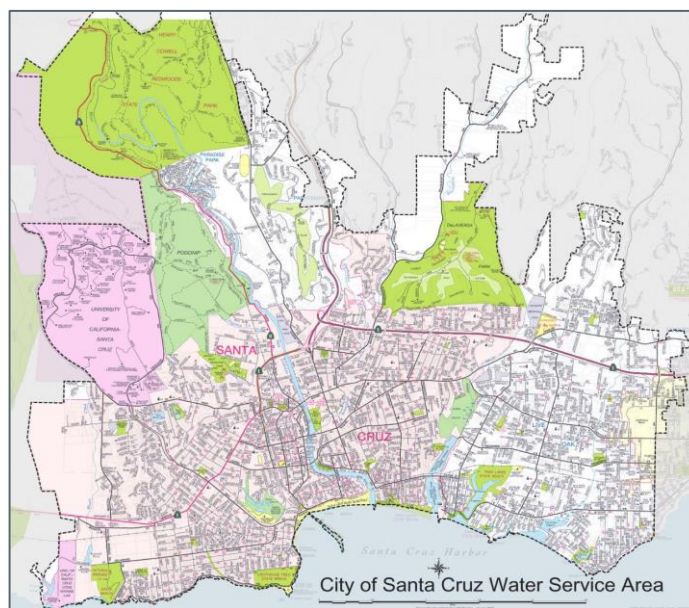
4.0 CITY OF SANTA CRUZ WATER SYSTEM

The following sections describe the City of Santa Cruz’s water system, including the water service area, water system, and water supplied to UC Santa Cruz.

4.1 Water Service Area

The City of Santa Cruz provides water service 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, coastal agricultural lands north of the City, and the UC Santa Cruz Main Campus, Coastal Science Campus and Westside Research Park (located in the western part of the City). A generalized map of the water service area, excluding the north coast, is provided on Figure 4-1. No significant changes to the City’s service area boundary have occurred in many years.

According to the City’s 2015 UWMP, the current (2015) population residing in the Santa Cruz water service area is estimated to be 95,251 people. Approximately two thirds of the total population, almost 64,000, lives inside the City limits. The UC Santa Cruz Main Campus is located on the west side of the City. About 9,900 people including students, faculty, staff, and their families reside on the UC Santa Cruz Main Campus.

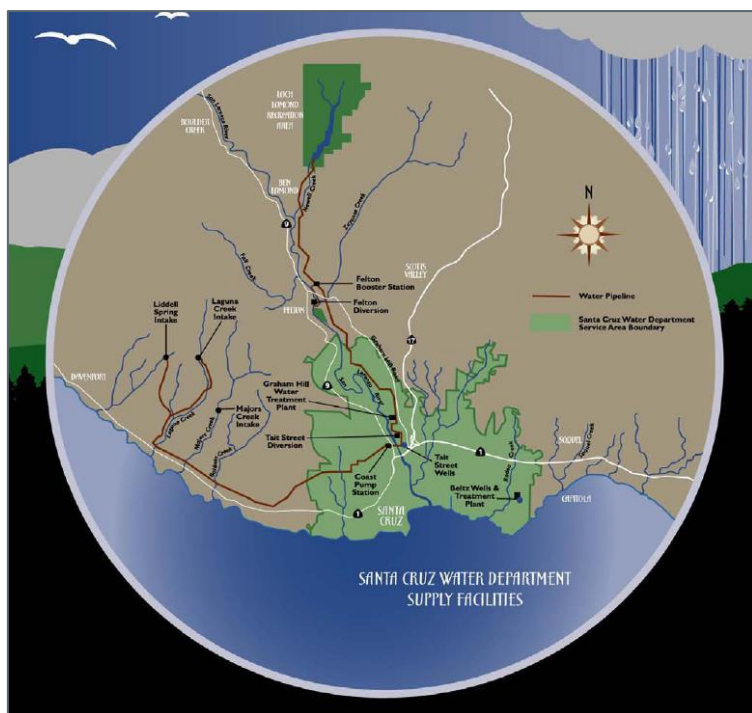


Source: City of Santa Cruz, 2015 Urban Water Management Plan, August 2016

Figure 4-1. City of Santa Cruz Water Service Area

4.2 Overview of Water Supply Sources

The Santa Cruz water system relies predominantly on local surface water supplies, which include the following: diversions from three North Coast streams (Reggiardo Creek, Laguna Creek, and Majors Creek) and one natural spring (Liddell Spring); the San Lorenzo River; 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 wells in the Purisima Formation in the mid-County area (Live Oak Well system). These main production elements of the City’s water supply system are illustrated on Figure 4-2.



Source: City of Santa Cruz 2015 Urban Water Management Plan, August 2016

Figure 4-2. City of Santa Cruz Water Supply System

All of the City’s water resources 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 general, the City’s water 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 in the summer and fall months when flows in the coast streams and river sources decline, and additional supply is needed to meet higher daily water demands. On a typical summer day, the North coast sources yield 1 to 2 mgd, the San Lorenzo River produces 7.5 mgd, groundwater makes up 0.8 mgd, and the reservoir contributes an average of 1 to 2 mgd.

4.3 Water Service to UC Santa Cruz

The City of Santa Cruz Water Department (SCWD) supplies water to UC Santa Cruz for domestic use, fire flow and irrigation on campus. As shown in Table 3-1, in 2015, UC Santa Cruz accounted for approximately 6.5 percent of the City’s total annual water consumption.

The UC Santa Cruz Main Campus receives potable water through nine connections to the SCWD system (four locations each with two meters and a fifth location serving only the Barn Theater). SCWD pumps potable water to three consecutive in-line reservoirs at separate elevations ranging from 400 feet to 1,113 feet at a point in the northern campus. The Main Campus water system then distributes water to campus facilities in eight separate pressure zones.⁵ The Main Campus also has an emergency water storage reservoir (a 1-million-gallon tank) in the upper campus that is available to provide the campus with an emergency water supply and to provide adequate fire flow to the Crown/Merrill Apartments.⁶

⁵ Source: UC Santa Cruz Water Action Plan, December 2017.

⁶ Source: University of California Santa Cruz Long-Range Development Plan 2005 - 2020, Final Environmental Impact Report (FEIR), Volume II, October 2005.

5.0 CITY OF SANTA CRUZ WATER DEMANDS

This section describes the City's historical and existing water demands and projected future water demands. The descriptions provided below for the City's water demands have been taken, for the most part, from the City's 2015 UWMP, which was adopted by City Council in May 2016. Supplemental information from other available reports has been included to provide the most recent data available.

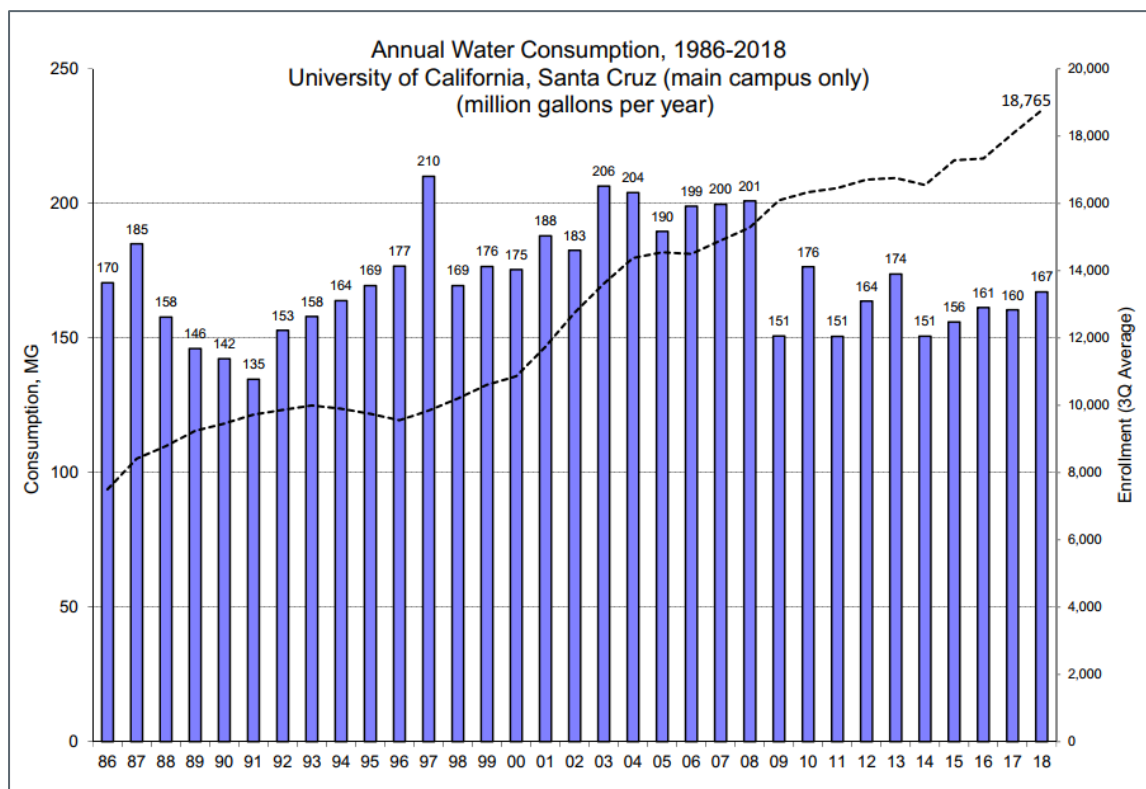
Water Code section 10910(c)(2) states the following:

10910(c)(2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g).

5.1 Historical and Existing Water Demand

Historically, the general trend in the City's water 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. In 2015, after two years of water rationing, annual water use fell to a level of about 2.45 billion gallons, similar to the level experienced during the 1970s drought.

Historical water demands for the UC Santa Cruz Main Campus have also followed similar patterns, with water demands generally increasing each year, until the recent drought years when water use on the Main Campus dropped dramatically in response to the drought. Prior to 2009, annual water use on the Main Campus was about 200 MGY. In more recent years, annual water use on the Main Campus dropped to as low as 151 MGY (in 2009, 2011 and 2014), representing an approximate 25 percent reduction in water use in response to drought conditions and associated water conservation. Water use has increased somewhat following the drought but remains considerably lower than historical water use. It is also important to note that the decreases in campus water use over the last 10 years have occurred despite increases in student enrollment over the same period. Historical annual water consumption and student enrollment on the Main Campus are shown on Figure 5-1.



Source: University Water Consumption (1986-2018) with Marine Science Campus.xls

Figure 5-1. UC Santa Cruz Main Campus Annual Water Consumption and Student Enrollment (1986-2018)

5.2 Future Water Demand

The City utilized a demand model to forecast future demands for 2020 through 2035 in its 2015 UWMP, considering numerous factors including historical data on customer class water use, weather, price of water, household income, conservation, and other economic variables driving water demand. Table 5-1 provides a summary of the City’s future water demand projections for its various water use types, including the future water demand projection for UC Santa Cruz.

Use Type	2015	2020	2025	2030	2035
Single Family	835	1,277	1,223	1,191	1,170
Multi Family	538	772	714	690	678
Commercial	485	574	541	525	519
Industrial	43	56	59	60	61
UC Santa Cruz^(a)	160	196	234	271	308
Institutional/Governmental	35	46	42	40	40
Landscape (Dedicated Irrigation)	46	112	119	134	144
Landscape (Golf Irrigation)	87	58	52	47	47
Water Losses	223	236	241	247	253
Total	2,452	3,327	3,225	3,205	3,220

Source: City of Santa Cruz 2015 UWMP, Tables 4-1 and 4-3.

(a) Based on the Primary Projection for UC Santa Cruz shown in Table 3-2.

As described in Section 3.3, the water demands for UC Santa Cruz included in the City's 2015 UWMP are based on the previously projected buildout demand of 349 MGY⁷. The 349 MGY projection included the existing Main Campus water demand, the projected water demand estimated for the 2005 LRDP and 2008 Settlement Agreement, and existing and projected water demand for the University's Coastal Science Campus and the Westside Research Park.

As described in Section 3.3, the projected UC Santa Cruz potable water demand for proposed development under the 2021 LRDP is approximately 289 MGY; and buildout of the 2021 LRDP is anticipated to occur by 2040. The current projected water demand for the 2021 LRDP, along with the projected water demand for the Coastal Science Campus, together totaling approximately 307 MGY, is considerably lower than the previously projected buildout demand of 349 MGY.

⁷ Based on the projected water demand for UC Santa Cruz developed for the City's SOI Amendment EIR (339 MGY) plus 10 MGY of additional water demands for additional development beyond 2020. Source: City of Santa Cruz SOI Amendment EIR Table 2-4 and City of Santa Cruz 2010 UWMP (page 4-19).

6.0 WATER SUPPLIES

This section describes the City's existing water supplies and planned additional water supplies to serve its existing and future water customers, including UC Santa Cruz. Also described are recycled water supplies proposed to be produced and used on the UC Santa Cruz campus. The descriptions provided below for the City's water supplies have been taken, for the most part, from the City's 2015 UWMP, which was adopted by City Council in May 2016. Although SB 610 applies only to cities and counties, and not to the University of California, supplemental information from other available reports has been included in this Water Supply Evaluation to provide the most recent data available and to meet the specific requirements of SB 610.

In 2001, the California Legislature passed Senate Bill 610 (Water Code Section 10910 et seq.) including the following provisions:

10910(c)(2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f) and (g).

10910(d)(1) The assessment required by this section shall include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts

10910(d)(2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall be demonstrated by providing information related to all of the following:

- (A) Written contracts or other proof of entitlement to an identified water supply.*
- (B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system.*
- (C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply.*
- (D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply.*

10910(e) If no water has been received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts, the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall also include in its water supply assessment pursuant to subdivision (c), an identification of the other public water systems or water service contract-holders that receive a water supply or have existing water supply entitlements, water rights, or water service contracts, to the same source of water as the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has identified as a source of water supply within its water supply assessments.

6.1 Existing City Water Supplies

The Santa Cruz water system relies predominantly on local surface water supplies, which include the North Coast sources, the San Lorenzo River, and Loch Lomond Reservoir. The balance of the City's supply comes from groundwater, all of which is extracted from wells in the Purisima Formation in the mid-County area. During the past decade, the North Coast sources represented 26 percent of the total water supply, the San Lorenzo River represented 55 percent, Newell Creek (Loch Lomond Reservoir) represented 14 percent, and Live Oak (Beltz) wells contributed the remaining 5 percent.

All of the City's water resources 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.

6.1.1 Surface Water Supplies

The City's 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. Each of the surface water sources are briefly described in the following sections.

6.1.1.1 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.

6.1.1.2 San Lorenzo River

The San Lorenzo River is the City's largest source of water supply. The main surface water diversion is located at Tait Street 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 Street Diversion is supplemented by shallow, auxiliary wells located directly across the river. These wells are potentially hydraulically connected to the river and tied to the City's appropriative rights for surface diversion. The drainage area above the Tait Street Diversion is 115 square miles.

The other diversion on the San Lorenzo River is Felton Diversion, which is an inflatable dam and intake structure built in 1974, located about six miles upstream from the Tait Street 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.

6.1.1.3 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.

6.1.2 Groundwater

Even though groundwater constitutes only up to about 5 percent of the entire City water supply on an annual basis, it has been 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 since the facilities were acquired from the Beltz Water Company in 1964.

6.1.2.1 City's Groundwater Facilities

The City's 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.

6.1.2.2 Basin Description

The easterly area of the City is located within the Santa Cruz Mid-County Groundwater Basin (which includes the Soquel-Valley Groundwater Basin), and the westerly area is within the Santa Margarita Groundwater Basin. The geographical area from which the City pumps groundwater is identified as the West Santa Cruz Terrace Groundwater Basin (Basin Number 3-26), whose western and eastern boundaries coincide roughly with the City's water service area (CA DWR, Bulletin 118).

The entire production of the City's Live Oak well field is derived from the Purisima Formation, which is the primary groundwater aquifer underlying the entire mid-county region and makes up most of what is commonly referred to elsewhere as the "Soquel-Aptos" basin. Groundwater from the Purisima Formation is used by the City, the Soquel Creek Water District (SqCWD) and Central Water District, several small water systems, and numerous private rural water wells.

6.1.2.3 Groundwater Management

The City of Santa Cruz Water Department has not itself prepared a groundwater management plan; however, a groundwater management plan has been prepared by the SqCWD and the Central Water Districts for the Soquel-Aptos area consistent with Assembly Bill 3030. This plan was originally prepared in 1996, updated in 2007, and currently serves as a living document with the most recent update having occurred in 2013.

As part of the region's compliance with the Sustainable Groundwater Management Act (SGMA), the Soquel-Aptos Groundwater Management Committee (SAGMC) was formed in 2015 and includes representatives from the County of Santa Cruz, Central Water District, SqCWD, the City of Santa Cruz and private well owners. The SAGMC established a Groundwater Sustainability Agency Formation Subcommittee and appointed six members. Following the framework provided by the state, the subcommittee was charged with creating an approved Groundwater Sustainability Agency prior to the June 2017 deadline. Additional activities recently initiated by the SAGMC include requesting a basin boundary modification, developing quarterly monitoring reports, conducting an evaluation of shallow wells, and making progress on a comprehensive groundwater model by integrating information available for the entire management area. The request for a basin boundary modification was approved in 2016 and the new basin is called the Santa Cruz Mid-County Groundwater Basin (Basin Number 3-001). This new basin includes the following previously defined basins:

- Basin Number 3-01: Soquel Valley
- Basin Number 3-02: Pajaro Valley
- Basin Number 3-21: Santa Cruz Purisima Formation
- Basin Number 3-26: West Santa Cruz Terrace

The Santa Cruz Mid-County Groundwater Sustainability Agency (GSA) has prepared a Groundwater Sustainability Plan (GSP), which covers a broad area in Santa Cruz County, including the easterly area of the City of Santa Cruz. It describes the steps needed to eliminate the adverse effects of groundwater overdraft. Adverse effects include seawater intrusion, reduction in water quality, and a reduction in streamflow. Solutions include conservation, aquifer replenishment, winter water transfers, and, potentially, a desalination plant (in Moss Landing).

The Santa Margarita GSP, covering much of North Santa Cruz County including the westerly area of the City of Santa Cruz and UC Santa Cruz, is currently in preparation, with a planned completion date of 2022.

6.1.2.4 Overdraft Conditions

In July 2015, the Soquel-Valley Groundwater Basin (Basin Number 3-01) was identified by the California Department of Water Resources as one of 21 groundwater basins to be reclassified as critically overdrafted. This was done based on seawater intrusion detected at the coastline, and the local declaration of a Groundwater Emergency by SqCWD in 2014. The Pajaro Valley Groundwater Basin (Basin Number 3-04) was already on DWR's list of critically overdrafted basins (as identified in DWR Bulletin 118-1980). Because those basins are part of the newly defined Santa Cruz Mid-County Groundwater Basin, the newly defined Santa Cruz Mid-County Groundwater Basin is now included on DWR's list of critically overdrafted basins.

6.1.2.5 Groundwater Pumping

In 2010, the City was advised by its hydrogeologist that the yield of the Live Oak (Beltz) well field was substantially less than half the 420 MGY annual production that the City had long assumed for water supply planning purposes, and that the dry season pumping rate that can be sustained without causing seawater intrusion in average years was closer to 170 MGY. As a direct result of these findings, the City relocated pumping further inland to a new well site. This unexpected loss of drought year groundwater yield is emblematic of the continuing change and uncertainty facing the City in its effort to provide a safe, reliable, and adequate municipal water supply.

Table 6-1 shows the actual volume pumped from the City’s well fields during the peak season over the last five years. Average volume over this time is 164 MGY. As a result of the hydrogeology work, the City has limited groundwater pumping to a volume far below 420 MGY level. The current agreed upon sustainable yield volume is 170 MGY and has been utilized by the City when planning for the operation of the well fields. Due to the severe drought conditions in 2014, the City did rely on groundwater for a somewhat higher volume to meet peak demand in the dry summer months.

	2011	2012	2013	2014	2015
West Santa Cruz Terrace Groundwater Basin (Basin 3-26), MGY	163	163	160	188	145

Source: City of Santa Cruz 2015 UWMP, Table 6-1.

6.2 Additional Planned Future City Water Supplies

Below is a discussion of the City’s additional planned future water supplies, including transfers and exchanges, recycled water, conservation, groundwater storage, and advanced treated recycled water or desalination.

6.2.1 Transfers and Exchanges

Following years of discussion and coordination on groundwater management, the City and the SqCWD recently signed a “Cooperative Water Transfer Pilot Project for Groundwater Recharge and Water Resource Management” agreement to transfer a small amount of water to SqCWD in the winter months when surface water from the North Coast is available. This transfer would allow the District to assess the effects of reduced pumping of the basin. The agreement is a first step in the implementation of the Water Supply Augmentation Strategy and serves to further study and determine the potential benefits of local exchanges and transfers as a groundwater management tool and supply reliability strategy.

6.2.2 Recycled Water

Over the years, the City has commissioned several engineering studies regarding the potential uses of recycled water for agricultural irrigation, landscape irrigation, groundwater recharge, direct potable reuse, and use of recycled water from neighboring water districts. The City of Santa Cruz investigated the feasibility of a recycled water program through a regional Recycled Water Facilities Planning Study published in June 2018, funded in part by a grant from the State Water Board Division of Financial Assistance, Water Recycling Funding Program. The Water Supply Advisory Committee (WSAC) agreed to water conservation measures and water supply reliability studies or non-recycled water elements to be in the Water Supply Augmentation Plan, which are being further studied. The recommended projects and reuse opportunities include the following:

- **Santa Cruz Public Works Department (SCPWD) Title 22 Project:** This project will implement a near-term non-potable reuse project to meet in-plant demands, develop a bulk water station and serve the nearby La Barranca Park and Neary Park.

- **BayCycle Project:** This project will expand SCPWD Title 22 Project to increase production and non-potable reuse to serve customers along Bay Street including UC Santa Cruz and other City customers.
- **Coordination with Pure Water Soquel:** The City will continue to work closely with SqCWD to support the evaluation of Pure Water Soquel.
- **Groundwater Reuse Replenishment in Santa Cruz Mid County Basin:** The City will explore groundwater reuse replenishment in the Santa Cruz Mid County Basin through a collaborative project with Pure Water Soquel or as an independent City led project.
- **Groundwater Reuse Replenishment in Santa Margarita Basin:** The City will explore groundwater reuse replenishment in the Santa Margarita Basin through a regional project which has the potential to make the region more resilient in the long term.

6.2.3 Conservation

In addition to existing water conservation programs, the WSAC recommends looking at new programs, such as increased rebates and better management of peak season demand. The goal of additional programs is to further reduce demand by 200 to 250 MGY by 2035, with a particular focus on producing savings during the peak season.

6.2.4 Groundwater Storage

In normal years the SCWD receives more rainfall than is needed to meet customer demand or can be stored in Loch Lomond Reservoir. Using In-Lieu Water Exchanges, available winter flows would be delivered to SqCWD and/or Scotts Valley Water District (SVWD) customers, thus enabling reduced pumping from regional aquifers and enabling the aquifer to passively rest and recharge. Using Aquifer Storage and Recovery (ASR), available winter flows would be injected into aquifers through new and existing wells owned by the SCWD, SVWD and/or SqCWD, thereby actively recharging aquifers. A portion of the water delivered using In-Lieu or ASR would be effectively banked in the aquifers to be extracted and returned to SCWD when needed in future dry years.

6.2.5 Advanced Treated Recycled Water or Desalinated Water

Advanced treated recycled water or desalinated water would be developed as a supplemental or replacement supply in the event the groundwater storage strategies described above prove insufficient to meet the plan's goals of cost-effectiveness, timeliness or yield. If it is determined that recycled water cannot meet the City's water demands, then desalinated seawater would be used.

For a decade or more, the City had been pursuing a 2.5 mgd desalination facility as a regional project with the SqCWD to diversify both agencies' water supply portfolio. It remains a possible project for the City. In the completed Final Report on Agreements and Recommendations, the WSAC presented a supply strategy that includes desalinated water, but only as a last resort, and after exhausting several other preferred options (City of Santa Cruz, 2015). SqCWD is continuing to consider desalinated water through a Memorandum of Interest with a different regional "Deepwater Desal" project proposed at Moss Landing Harbor.

The City completed a Final Desalination Feasibility Study Update Review in August 2018. A City seawater desalination project would involve construction and operation of a seawater reverse osmosis desalination plant and related facilities to provide up to 3.3 mgd of potable water to the City. The water supply from

the project would help the City meet its water needs during periods of water supply shortages as a result of drought and reduced surface-water diversions needed to provide improved river and stream flows for fish and to plan for climate change.

6.3 Summary of Existing and Additional Planned Future City Water Supplies

Table 6-2 provides a summary of the City’s existing and projected water supplies in normal years.

Supply Source	2015	2020	2025	2030	2035
North Coast Surface Water Sources	382	637	642	671	671
San Lorenzo River	1,458	1,882	1,842	1,829	1,834
Loch Lomand Reservoir	495	595	551	540	547
Groundwater (Live Oak/Beltz Wells)	145	138	129	127	128
Total	2,480	3,252	3,164	3,167	3,180

Source: City of Santa Cruz 2015 UWMP, Tables 6-9 and 6-10.

6.4 Proposed UC Santa Cruz Recycled Water Supplies

UC Santa Cruz is currently planning site-specific non-potable water utility systems where feasible to offset the overall potable water demand of the campus.

As described above in Section 2.3.2, as part of the Student Housing West project, currently planned under the 2005 LRDP, wastewater generated in new student housing on the Heller site will be collected and treated in a wastewater treatment facility that would be located in the southeastern portion of the Heller site. The facility would be a membrane bioreactor (MBR) plant to treat the wastewater and generate recycled water for irrigation and toilet flushing use on the Heller site and, potentially, at other areas of the Campus. An MBR plant is also planned for new family student housing that would be developed on the Hagar site as part of the Student Housing West project, which would provide recycled water for toilet flushing and irrigation use on that site.

7.0 DETERMINATION OF WATER SUPPLY SUFFICIENCY BASED ON THE REQUIREMENTS OF SB 610

This section provides an overview of water supply constraints and a summary of water supply availability under Normal, Single Dry and Multiple Dry Year conditions to meet projected City water demands, including projected water demands for UC Santa Cruz. A discussion of City and UC Santa Cruz water conservation and sustainability programs is also provided.

Water Code section 10910(c)(4) states:

10910(c)(4) If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses.

7.1.1 Overview of Water Supply Constraints

The City of Santa Cruz is facing several obstacles in meeting its present and future water supply needs. While each complication presents a unique set of water management challenges, the common theme is the limitation in where, when, and how much water is available to meet the area's water service needs, particularly during years when rainfall is below average. The constraints include the following:

- **Local Supply Variability:** 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. This local variation has been a significant constraint in recent years as the Central Coast, and the State of California more generally, were held in the grip of a multi-year drought. The City's declaration of a Stage 3 Water Emergency in 2014 and 2015 underscores the effect of the drought on the City of Santa Cruz system.
- **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.
- **Source Water Quality and Treatment Capacity:** The primary issues with respect to water quality are the treatment challenges posed by future changes in the source water mix driven in part by ecosystem protection requirements. The Graham Hill Water Treatment Plant is a conventional surface water treatment plant that was commissioned in 1960 as a 12 mgd plant and has undergone an expansion and a number of improvements over the last 50 years. Except for groundwater from the Live Oak wells, 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.

- **The Water Rights Conformance Project for Water Rights and Entitlements:** The Newell Creek and San Lorenzo River permits to divert at Felton were originally granted as “diversion to storage,” rather than as “direct diversion” rights. A diversion to storage is used when the water diverted is put into storage and is retained in storage for some time prior to being used. Current State Water Resources Control Board practice, however, requires rights of “direct diversion” as well as diversion to storage for the same operations as the City originally proposed and has historically undertaken.

7.1.2 Water Supply Availability and Reliability

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 used to generate the results for the 2010 UWMP (City of Santa Cruz, 2011). 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. As described in Chapter 7 of the City’s 2015 UWMP, the results presented below provide perspective on the City’s water supply reliability based on accepted planning criteria and projected conditions in the water system.

7.1.2.1 Normal Year Supply and Demand Comparison

Although the City has not previously seen shortages in normal water years, by adding the ecosystem protection conditions likely to begin prior to 2020 (e.g., the HCP described above) a small shortage (1 to 3 percent) can be reasonably expected in future normal years. Historically in normal water years, the City experienced a slight surplus of supply and this trend can be expected to continue until the HCP agreement is approved and higher instream flows are maintained. As the City chose to create a representative average year by using the historic record, the inclusion of the dry years and critically dry years within the average may explain the predicted small deficit. It is important to note that the City predicts the supply and demand volumes to be in balance for 90 percent of all normal water years for 2020-2035.

7.1.2.2 Single Dry Year Supply and Demand Comparison

The City’s single dry year assessment in their 2015 UWMP was based on the water supply available to the City comparable to water year 2014, which was a recent critically dry year. Based on these supply assumptions, water supply during a single dry year is not sufficient to meet the demand in the near-term, although the shortage experienced is projected to decrease over time. During a single dry year, annual shortages of 16 to 21 percent are projected given the modelled supply and demand figures developed for planning and reliability purposes.

7.1.2.3 Multiple Dry Year Supply and Demand Comparison

In the City’s 2015 UWMP, the City chose to present the estimated water supply available during the multiple dry water year period of a three-year drought sequence using hydrology from 1976, 1977, and a second 1977 year. In an extreme multi-year drought similar to the 1976-77 event, the estimated water supply available to the City in the first year of that event, according to the model, ranges between 2,430 and 2,377 or an average of 25 percent less water on an annual basis than is available in a normal water year. During the second year, the average shortage over time increases to 39 percent and in the third year modeled, the average reduction compared to a normal year is over 50 percent.

Table 7-1 presents a summary of the City’s projected demands and available supplies under normal year, single dry year and multiple dry year conditions.

Table 7-1. City of Santa Cruz Water Supply and Demand in Normal Years, Single Dry Years and Multiple Dry Years, MGY					
		2020	2025	2030	2035
Normal Year					
Supply Totals		3,252	3,164	3,167	3,180
Demand Totals		3,327	3,225	3,205	3,220
Difference		(75)	(61)	(38)	(40)
Demand Served, %		97%	97%	98%	98%
Single Dry Year					
Supply Totals		2,619	2,658	2,692	2,692
Demand Totals		3,327	3,225	3,205	3,220
Difference		(708)	(567)	(513)	(528)
Demand Served, %		79%	82%	84%	84%
Multiple Dry Years					
First Year	Supply Totals	2,430	2,377	2,377	2,381
	Demand Totals	3,327	3,225	3,205	3,220
	Difference	(897)	(848)	(828)	(839)
	Demand Served, %	73%	74%	74%	74%
Second Year	Supply Totals	1,918	1,942	1,968	1,969
	Demand Totals	3,327	3,225	3,205	3,220
	Difference	(1,409)	(1,283)	(1,237)	(1,251)
	Demand Served, %	58%	60%	61%	61%
Third Year	Supply Totals	1,597	1,567	1,580	1,581
	Demand Totals	3,327	3,225	3,205	3,220
	Difference	(1,730)	(1,658)	(1,625)	(1,639)
	Demand Served, %	48%	48%	49%	49%

Source: City of Santa Cruz 2015 UWMP, Tables 7-2, 7-3 and 7-4

7.1.3 City of Santa Cruz Water Supply Advisory Committee and Water Supply Augmentation Plan

In early 2014, City Council appointed members to the WSAC. The aim of the WSAC process was to:

- Explore 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
- Develop recommendations for City Council consideration

In late 2015, consensus was achieved among WSAC members for how best to address an agreed-upon worst year gap of 1.2 billion gallons between water supply and water demand during times of extended drought. In November 2015, the City Council adopted the recommendations of the WSAC to address these challenges. These recommendations included the following:

- **Element 0 Demand Management:** Additional water conservation with a goal of achieving an additional 200 to 250 million gallons per year of demand reduction by 2035 by expanding water conservation programs.
- **Element 1 In Lieu Recharge:** Passive recharge of regional aquifers by working to develop agreements for delivering surface water as an in lieu supply to the SqCWD and/or the SVWD so they can rest their wells, help the aquifers recover, and effectively store water for use by SCWD in drought years.
- **Element 2 ASR:** Active recharge of regional aquifers by using existing infrastructure and potential new infrastructure in the regionally shared Purisima aquifer in the Soquel-Aptos Basin and/or in the Santa Margarita/Lompico/Butano aquifers in Scotts Valley area to store water that can be available for use by the City in drought years.
- **Element 3 Advanced Treatment 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 above 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.

7.1.4 City of Santa Cruz Water Shortage Contingency Plan

The City’s Water Shortage Contingency Plan has a five-stage plan to correspond with supply reductions from less than 5 percent to 50 percent. Each stage includes a set of demand reduction measures that become progressively more stringent as the shortage condition escalates.

The City’s strategy for dealing with water shortages of all levels involves the following interrelated components:

- An allocation system to establish reduction goals for different customer groups
- Demand reduction measures
- Publicity and communications
- Operating actions

The City's Water Shortage Contingency Plan includes reduction goals for UC Santa Cruz under each shortage scenario. These goals were developed in consultation with UC Santa Cruz. UC Santa Cruz reached, and even exceeded its reduction targets in 2010 and 2014 when the City implemented the Plan. In 2015, UC Santa Cruz reduced its peak season water use by almost 18 percent. In addition, UC Santa Cruz has implemented water conservation measures, including improvements to irrigation systems and retrofitting restroom fixtures, which have contributed to a 50 percent reduction in per capita (per student) water use since the late 1990s. UC Santa Cruz is planning additional fixture retrofits and infrastructure improvements which will further increase the efficiency of water use on the campus.

7.1.5 UC Santa Cruz Water Conservation Measures and Water Action Plan

Over the last 30 years, annual water consumption has remained relatively steady even though UC Santa Cruz enrollment has more than doubled over the same time period. As such, UC Santa Cruz is committed to proactively managing and efficiently using limited water resources; maintaining a positive relationship with and partnering with the City of Santa Cruz Water Department; and promoting education, research, and practice on potable water use reduction and non-potable water development. While UC Santa Cruz has been a leader among the UC campuses in sustainable water systems and watershed management, the campus remains committed to sustaining efforts and practices that support water reduction in future years.

In 2016, the UC Office of the President (UCOP) called for campuses to demonstrate leadership in the area of sustainable water systems by reducing potable water use 35 percent by 2025, as compared to a 2005-2008 baseline period. Some of the actions called out in the policy included:

- Converting potable water used for irrigation to recycled water
- Implementing efficient irrigation systems
- Drought tolerant plant selections
- Phasing out unused turf
- Replacing single-pass cooling systems or constant flow laboratory equipment

UC Santa Cruz has been proactive in water conservation through infrastructural improvements, technological upgrades including leak detection and monitoring software, advanced evapotranspiration irrigation technology, and user conservation behavior including a successful coordinated campus drought response. As a result, campus potable water usage has followed a downward trend while campus population continues to increase. UC Santa Cruz's main campus average historical use over the UCOP designated three-year baseline (FY 2005-06, 2006-07, and 2007-08) was 13,924 gallons per weighted campus user. In FY 2016-17, the campus used 8,856 gallons per weighted campus user, reaching a 36.4 percent reduction from the baseline, surpassing the UCOP's 2020 20 percent reduction and marginally exceeding the 2025 36 percent reduction goals.

As described in a May 2017 City of Santa Cruz Information Report to the City Manager (included in Appendix B of this Water Supply Evaluation), UC Santa Cruz successfully met the City's mandatory water reduction goals as a result of close collaboration between the representatives of all sectors across the campus, as well as with the City Water Department. In both 2014 and 2015, a Water Working Group led by the campus planning and sustainability offices established monthly budgets and directed efforts to reduce water use by 20 percent, or about 20 million gallons, during the peak dry season. A key to the success of this effort was an investment in new cellular-based meter reading technology that allowed individual building/facility managers to view their water consumption on an hourly basis and quickly detect leaks. This technology will

continue to help the University manage the campus water use well into the future. A water conservation student intern also helped communicate the conservation message to students and staff and helped identify and report leaks. For its efforts, UC Santa Cruz established itself as a leader in water conservation and water efficiency among the other UC and other college campuses across the State.

UC Santa Cruz's 2017 Water Action Plan (WAP) recognizes successes in water conservation and identifies implementable strategies to reduce UC Santa Cruz's potable water demand and to promote healthy watersheds on and around the campus. The 2017 WAP serves as an update to the 2013 WAP and identifies the following key opportunities to further reduce water demand:

- Develop water reduction targets across campus, by type of use, to further water conservation practices and usage reduction in non-drought conditions
- Evaluate the use of non-potable water sources for irrigation
- Identify and prioritize sections of aging piping infrastructure that may have to be replaced to proactively prevent future leakage
- Remove eligible turf irrigated by potable water
- Replace single-pass cooling systems, which draw large amounts of potable water

As described in previous sections, UC Santa Cruz is proposing to construct an MBR wastewater treatment facility as part of the proposed Student Housing West project that would treat wastewater and generate recycled water for use on the Heller site and, potentially, in existing student residence halls at Porter College. Recycled water (treated effluent) generated at the MBR plant would provide water for toilet flushing and landscape irrigation at the Heller site. Recycled water would also be conveyed north via a recycled water main that would be located in the utility corridor extending between the Kresge parking lot and the Heller site. The main would convey recycled water to Porter College where the residence halls are already fitted with dedicated purple pipes for toilet flushing and landscape irrigation. Use of recycled water for these purposes will offset or reduce potable water use, consistent with the University's policies for sustainable water use.

7.1.6 UC Santa Cruz Campus Sustainability Plan

In 2017, the campus developed a comprehensive Campus Sustainability Plan (CSP) that directly supports the University's core mission of teaching and research. The CSP guides water-related goals, strategies, and actions for implementation. The following are the water-related strategies included in the CSP, along with their current status:

- Develop a framework to define, identify, and prioritize built and natural infrastructure improvement projects
 - 2019 Update: UC Santa Cruz Natural Reserves spearheaded a successful effort to re-establish the CLUMAC (Campus Land Use and Management Action Committee) in partnership with Physical Planning, Development & Operations.
- Measure effects of human activity on campus lands, watersheds, and infrastructure
 - 2019 Update: UC Santa Cruz Natural Reserves partnered with a professional forester to conduct an Upper Campus Land Management Assessment with the support of a Campus Sustainability Plan grant. This resulting report contains a thorough review of Upper Campus vegetation communities, including information on their locations, species composition, historical and current conditions, desired future conditions, and identified

potential management actions. Additionally, the report includes sections on road and trail maintenance, an analysis of permitting options and treatment costs, and fire fuel reduction management locations.

- Increase the use of non-potable water on campus
 - 2018 Update: The consideration of feasible sources of non-potable water is being incorporated into the development of campus utility studies, in conjunction with the Long Range Development Planning process.
- Explore feasibility of all potential non-potable water sources for the campus as part of the Long Range Development Planning process.
 - 2019 Update: As part of the current LRDP development, the campus is exploring opportunities for purple pipe (recycled water) connections across campus. Specifically, Porter has installed purple pipe and is ready to utilize recycled water when it becomes available and Kresge is designed to collect stormwater into a treatment facility to feed back into its water closets.
- Reduce potable water use through technological innovations and physical improvements
 - 2019 Update: Multiple campus units collaborated throughout the drought response years in 2014 and 2015 to create a centralized list of water efficiency improvements and executed upgrades to reduce water consumption. Opportunities and capacity for updating the list will be considered at a future date when campus priorities align with this need.
- Improve communication about water management, use, and conservation to the campus and local community
 - 2019 Update: The campus Energy Department has developed a new process for creating work orders that swiftly address leaks as they are detected. The UC Santa Cruz Arboretum also increased utilization of the Beacon leak detection software to implement water infrastructure upgrades with the support of Campus Sustainability Plan grant funding. These improvements will save the University thousands of gallons of water annually, and new real-time texts will alert Arboretum staff to future leaks.
- Identify new sources of funding for both potable water reduction and non-potable sourced development projects
 - 2019 Update: UC Santa Cruz's sustainability staff have partnered with staff from the UCOP Design and Construction Department to create a Life Cycle Cost Analysis tool in 2019-20.

8.0 WATER SUPPLY EVALUATION FINDINGS

The purpose of this Water Supply Evaluation was to perform an evaluation of the availability and reliability of water supplies to serve the proposed development under the UC Santa Cruz 2021 LRDP based on existing UC Santa Cruz water demands and projected water demands for proposed development under the 2021 LRDP. Key findings of this Water Supply Evaluation are summarized as follows:

- Water demands on the UC Santa Cruz Main Campus have dropped dramatically in recent years as a result of water conservation measures in response to the recent drought. Many of the water conservation measures have resulted in permanent reductions in water use (e.g., plumbing fixture retrofits, improvements in leak detection, etc.).
- In the recent drought years, UC Santa Cruz successfully met the City’s mandatory water reduction goals as a result of proactive water conservation, improved water use efficiency, and drought response measures, together with close collaboration between representatives of all sectors across campus, as well as with the City Water Department.
- The projected potable water demands for proposed development under the UC Santa Cruz proposed 2021 LRDP are approximately 289 MGY by 2040, which includes the existing and projected water demands for the Main Campus and the Westside Research Park.
- The projected potable water demands for the UC Santa Cruz Coastal Science Campus are 17.4 MGY, which includes the existing water demand and projected future water demand for the Coastal Science Campus. Although the Coastal Science Campus is not part of the proposed 2021 LRDP, it is considered part of the UC Santa Cruz overall water demand to be served by the City.
- The UC Santa Cruz projected future water demand of approximately 307 MGY (including the proposed 2021 LRDP and the Coastal Science Campus) is lower than the previously projected buildout demand of 349 MGY, and the 2035 primary projection for UC Santa Cruz water demands included in the City’s 2015 UWMP.
- As described in Section 7 of this Water Supply Evaluation, the City predicts the supply and demand volumes to be in balance for 90 percent of all normal water years for 2020-2035. However, in single dry years and multiple dry years, the City does project water supply shortages. As a City water customer, UC Santa Cruz is subject to these potential water shortages and is subject to the City’s water supply allocation system and demand reduction measures. As described, UC Santa Cruz has been very successful in reducing water use in recent years in response to the drought and has updated its Water Action Plan to implement additional measures to reduce potable water use.

9.0 REFERENCES

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Appendix A

UC Santa Cruz Long Range Development Plan
Water Demand Projections
Sherwood Design Engineers
November 2020

Technical Memorandum

November 3, 2020

To: Barbara Maloney, Christine Thompson—Page
Cc: Jolie Kerns, Oxo Slayer, Courtney Trask, Zachary Teske—UCSC
From: John Leys, Maika Nicholson and Kelly Archer—Sherwood
Project Name/No: UCSC Long Range Development Plan / 17-039

Subject: UC Santa Cruz Long Range Development Plan Water Demand Projections

1.0 EXECUTIVE SUMMARY

UCSC's Long-Range Development Plan (LRDP) projects increases in student enrollment, faculty and staff employment, and the associated expansion of student housing, employee housing, and academic space to accommodate this growth over the University's 2020-2040 planning horizon. The purpose of this memorandum is to provide the technical basis for the water demand projections presented in the LRDP. The analysis considers UCSC's main campus and 2300 Delaware property (West Side Research Park).¹

The water demand analysis projects an increase from the existing (FY17/18) baseline² of 154.6 million gallons per year (MGY) to 289.1 MGY in 2040, representing an 87% increase over existing water-use.

2.0 LRDP PROGRAM

To accommodate the planned increase in student and employee population, the total non-residential assignable square-feet (ASF) is projected to increase from 2.09 million to 5.17 million ASF. Student housing is proposed to increase from 1.35 to 3.23 million ASF, and employee housing is proposed to increase from 0.32 to 0.98 million ASF.³ Tables 1 and 2 provide the Baseline (FY18/19) and 2040 LRDP program assumptions for student and employee populations and housing, respectively.

The water demand analysis in Section 3 uses the projected increases in student and employee populations (reported as full-time equivalents, FTEs), and housing capacity (reported as beds), to estimate future water demands. Projecting water demand based on FTEs and population housed on campus, instead of by growth in ASF, is considered more accurate because water demand is better correlated to the number of building users than the size of a building.

¹ The UCSC Coastal Science Campus and other satellite properties are outside of the LRDP scope of work and therefore not included in the analysis.

² FY17/18 campus water use data was used as the baseline instead of FY18/19 because it was the most accurate full fiscal year of data available at the time of this analysis. The University recently modified the way in which sub-metered water data is collected and some anomalies were found in the FY 18/19 sub-meter data. Accurate sub-meter data is needed to categorize water demands by end-use (irrigation, housing, academic buildings, etc.). Using FY 17/18 water data allows for a more reliable estimate of future water demands, projecting by each end-use category as described in this memo.

³ Baseline and 2040 Program is based on "200619_UCSC_LRDP_PROGRAM_CONDITIONS_FINAL_rev1.xlsx" provided via email by Oxo Slayer on 10/29/2020.

Table 1 - Student and Employee Population

Student and Employee Population¹	Baseline (FY 18/19)	Net New	2040 LRDP
Student Enrollment FTE	18,518	9,482	28,000
Employee (Faculty + Staff) FTE	2,800	2,200	5,000
Total Campus FTE	21,318	11,682	33,000

1. Baseline and 2040 student enrollment and employee numbers are based on "200619_UCSC_LRDP_PROGRAM_CONDITIONS_FINAL_rev1.xlsx" provided via email by Oxo Slayer on 10/29/2020.

Table 2 - Student and Employee Housing

Employee Housing¹	Baseline (FY 18/19)	Approved but Non-Operational	Net New	2040 LRDP
Employee (Main Campus)	270	39	358	667
Dependent (Main Campus) ²	386	56	512	954
Main Campus Sub-Total	656	95	871	1,621
Employee (2300 Delaware)	0	0	200	200
Dependent (2300 Delaware) ²	0	0	286	286
2300 Delaware Sub-Total	0	0	486	486
On-Campus Employee Total	270	39	558	867
On-Campus Dependent Total ²	386	56	798	1,240
Total Employee Beds	656	95	1,357	2,107
Student Housing¹	Baseline (FY 18/19)	Approved but Non-Operational	Net New	2040 LRDP
Student Beds	9,283	2,175	8,500	19,958

1. Baseline and 2040 housing information is based on "200619_UCSC_LRDP_PROGRAM_CONDITIONS_FINAL_rev1.xlsx" provided via email by Oxo Slayer on 10/29/2020.

2. All employee housing assumes 2.43 Residents/Unit (1.43 additional dependents per each employee)

3.0 WATER DEMAND ANALYSIS

FY17/18 campus water use data is used as the baseline instead of FY18/19 because it was the most accurate full fiscal year of data available at the time of this analysis. The University recently modified the way in which sub-metered water data is collected and some anomalies were found in the FY 18/19 sub-meter data and therefore not included in the historic campus water data analysis below. Accurate sub-meter data is needed to categorize water demands by end-use (irrigation, housing, academic buildings, etc.). Using FY 17/18 water data allows for a more reliable estimate of future water demands, projecting by each end-use category as described below.

Historic Campus Water Data Analysis

UCSC provided Sherwood with Excel spreadsheets for calendar years 2012-2018.⁴ As noted above, 2019 data was not available at the time of this analysis. The spreadsheets included:

- Sub-metered data collected by the University, provided as monthly consumption data by water-use category. Table 3 provides a description of the water-use categories and sub-categories provided in the water dataset;
- Total water consumption billed by the City of Santa Cruz at the main campus water meter.

Table 3 – Water-Use Categories

Category	Sub-Category
Interior Water Demands	
Non-Residential	General Academic
	Admin
	Dining and Kitchen
	Lab
	Recreational
	OPERS
Residential	Faculty Housing
	Student Housing
Mechanical ¹	
Irrigation	
Grounds	General Landscape
	Recreation Field
	Sand Field
Non-Grounds	Arboretum
	Employee Irrigation
	Farm Irrigation
	Garden
	Greenhouse
	Landscape

1. Make-up water supplied to cooling towers

Figure 1 presents the annual Main Campus water consumption for the six years of data provided, comparing campus-collected sub-meter data against billed consumption based on City of Santa Cruz billing information. 'Main Campus' water consumption does not include the 2300 Delaware property. The data is consistent with the analysis presented in the 2017 Water Action Plan (2017 WAP), showing the downward trend in water consumption that has resulted from proactive water conservation, efficiency, and drought response measures. Much of the conservation efforts were stimulated by the statewide drought in 2013-2017. During the 2014 and 2015 drought years, the City of Santa Cruz declared a Stage 3 Water Emergency and requested the campus to reduce domestic water-use by 20%, as metered and billed by the City, compared to a 2013 baseline, which UCSC accomplished (2017 WAP).

⁴ Water data was received from Patrick Testoni via email on 8/9/18. A subsequent correction to the mechanical water-use sub-category was received from Mr. Testoni via email on 1/29/19.

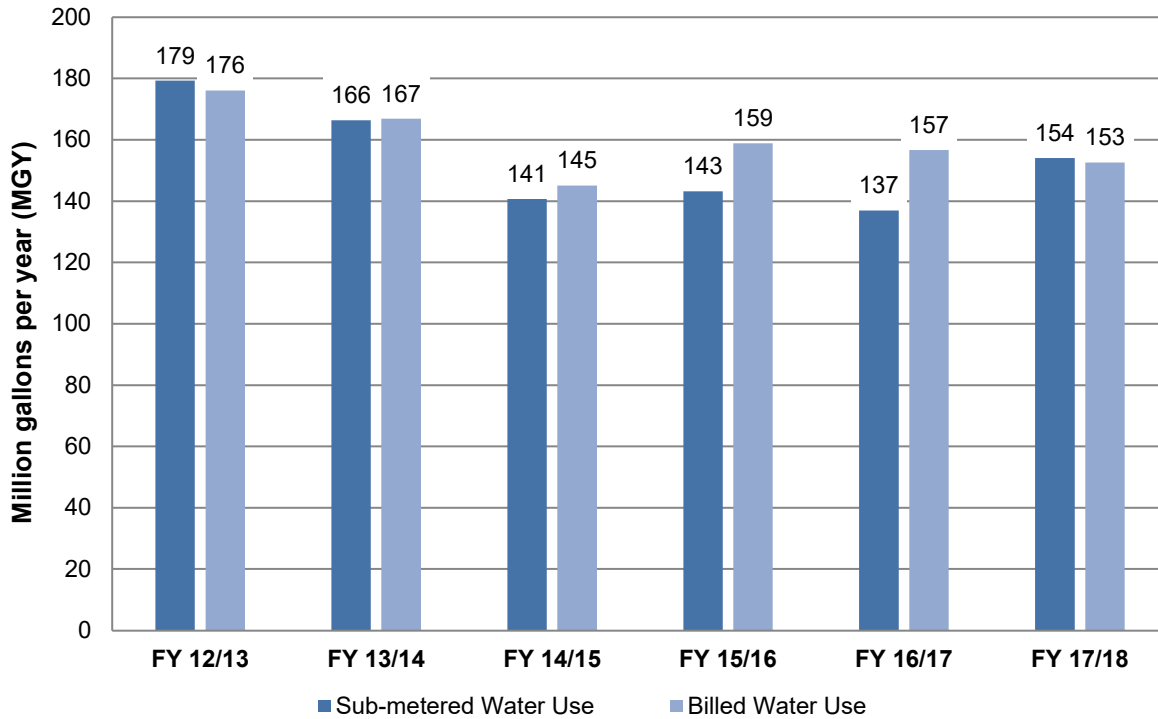


Figure 1 – Main Campus Annual Water-Use (2012-2018)

Water-use data was analyzed over time and by the water-use categories presented in Table 3. The most recent years of data are considered a more accurate reflection of the campus’s efficiency improvements, which should be sustained and improved upon into the future.⁵ Key efficiency gains noted in the 2017 WAP included smart-metering system and leak detection, irrigation reductions, efficiency audits, fixture replacement and behavior change campaigns.

Similar water-use patterns are observed across the two most recent years of data (FY16/17 and FY17/18). Sub-metered water data from the most recent FY17/18 is used as the baseline for projecting future water demands by category (Figure 2).

FY17/18 is a conservative but representative baseline for irrigation demands because it occurred after the primary drought years when irrigation was highly suppressed and spans a relatively dry water-year that experienced lower than average rainfall. FY16/17 is not considered because the sub-metered data was almost 13% lower than the total billed water usage (Figure 1), suggesting errors in the sub-meter data.

⁵ It is noted that irrigation (outdoor) water uses were greatly restricted in the 2013-2016 multi-year drought and the University has expressed the desire to allow for more lenient irrigation practices. Further discussion is included in the demand projections section of this memorandum.

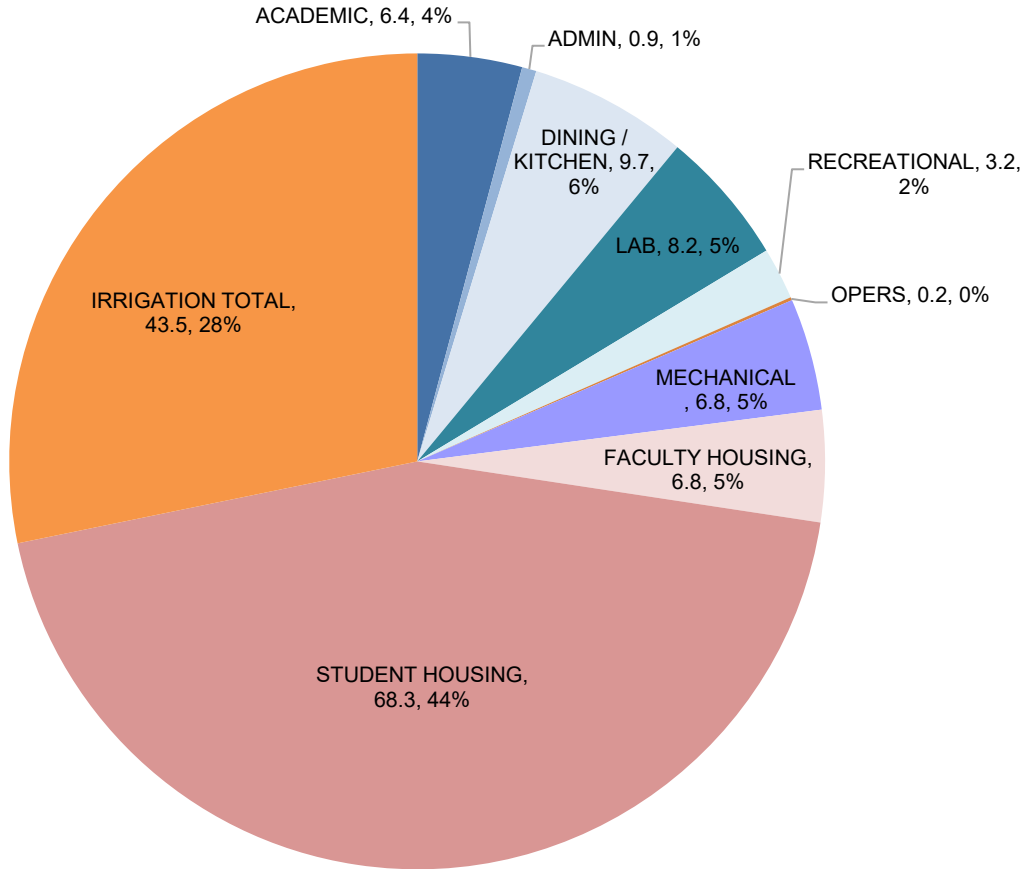


Figure 2 – Main Campus Water-Use by Category, MGY (FY 17/18)

LRDP Water Demand Projections

Non-Residential Buildings:

Interior campus water consumption from FY17/18 is used to create baseline “unit demand factors” for the non-residential water-use categories specified in Table 3. The baseline demand factor (gal/day/FTE) is determined by dividing the total water demand for non-residential buildings by the sum of student and employee FTEs. The unit demand factors are then applied to the projected 2040 program to estimate the future campus water-use based on the growth in the campus population. Water-use is conservatively projected linearly with growth (i.e., unit demand factors remain constant), which does not account for reductions that might result from efficiency retrofits to existing buildings or improved efficiency in new buildings.

Table 4 – Non-Residential Projections

NON-RESIDENTIAL INTERIOR WATER DEMANDS							
Category	Baseline (FY 17/18)¹			Demand Factor (gal/d/FTE)	Projected 2040		
	Annual Demand (MGY)	Ave. Daily Demand (gal/d)	Existing FTE		Proposed FTE	Annual Demand (MGY)	Ave. Daily Demand (gal/d)
Main Campus, Non-Residential ^{2,3}	28.5	78,195	21,318	3.668	33,000	44.2	121,045
2300 Delaware ⁴	0.5	1,463	-	-	-	0.5	1,463
Total	29.1	79,658	21,318	-	33,000	44.7	122,508

Notes:

1. Baseline annual water demands calculated from sub-metered water use data provided by Patrick Testoni by email on 8/9/18.
2. Projected water demands are scaled linearly based on increase in student and employee FTEs.
3. Non-residential includes the following categories from the 2040 LRDP Program: Classroom, Teaching Lab, Academic Student Support, Research, Offices, Library, Student Support/Health & Wellness, Athletics, Community Amenities, and Miscellaneous.
4. Demand at existing 2300 Delaware research building assumed to remain constant.

Housing:

Unit demand factors for student and employee housing are derived by dividing water-use by the number of beds or residents for each category. Employee housing assumes an average 2.43 beds per unit (1.43 dependents for each employee). As with the non-residential category, projections conservatively assume no reduction in unit demand for future conditions.

Table 5 - Housing Projections

STUDENT AND EMPLOYEE HOUSING							
Category	Baseline (FY 17/18)¹			Demand Factor (gal/bed/day)	Projected 2040²		
	Annual Demand (MGY)	Ave. Daily Demand (gal/d)	Beds		Beds	Annual Demand (MGY)	Ave. Daily Demand (gal/d)
Student Housing	68.3	187,241	9,283	20.2	19,958	146.9	402,560
Employee Housing - Main Campus	6.8	18,672	656	28.5	1,621	16.8	46,145
Employee Housing - 2300 Delaware	-	-	-		486	5.0	13,831
Total	75.2	205,913	9,939	-	22,065	168.8	462,535

Notes:

1. Baseline annual water demands calculated from sub-metered water use data provided by Patrick Testoni by email on 8/9/18.
2. Projected water demands are scaled linearly based on increase in beds.

Irrigation:

Irrigation demand projection methods vary by category and are based on program information as well as conversations with University about expected operational changes:

- Grounds irrigation is assumed to increase by 50% to accommodate the newly proposed colleges and academic infill (corresponding roughly to the ratio of future to existing FTE).
- Employee housing irrigation increases by the percent increase in total employee beds (221% increase),
- Farm and garden irrigation are assumed to increase by 25% assuming expansion facilities to new colleges.
- Arboretum irrigation is assumed to increase by 25% to allow for increasing post-drought irrigation.
- Athletic Fields (Recreation and Sand Field) are assumed to remain constant.
- Minor categories (Green House and "Non-Grounds" Landscape) are assumed to remain constant.

Table 6 - Irrigation Projections

IRRIGATION						
		Baseline (FY 17/18)		Projected 2040		
Category		Annual Demand (MGY) ¹	Average Daily Demand (gal/d)	Increase in Irrigation Demand (%)	Annual Demand (MGY)	Average Daily Demand (gal/d)
Grounds	Grounds Landscape ²	16.0	43,937	50%	24.1	65,906
	Recreation Field	8.7	23,905	(None)	8.7	23,905
	Sand Field	4.7	12,798	(None)	4.7	12,798
Non-Grounds	Arboretum ³	5.0	13,828	25%	6.3	17,285
	Employee Irrigation	2.4	6,489	221%	7.6	20,839
	Farm Irrigation ³	4.6	12,502	25%	5.7	15,627
	Garden ³	1.6	4,376	25%	2.0	5,470
	Green House	0.0	62	(None)	0.0	62
	"Non-grounds" Landscape	0.4	1,226	(None)	0.4	1,226
Subtotal "Grounds"		29.4	80,640		37.5	102,609
Subtotal "Non-Grounds"		14.0	38,483		22.1	60,510
Total		43.5	119,123		59.5	163,118

Notes:

1. Baseline demands are based on sub-metered water use data provided by Patrick Testoni by email on 8/9/18.
2. Grounds landscape projected increase is 50% based on proposed development of two new colleges.
3. Arboretum, Farm and Garden demands assumed to increase by 25% to allow for increased irrigation in post-drought years based on conversations with the University.

Mechanical:

Limited expansion of the existing central cooling system is anticipated, with approximately ten new buildings within the academic core proposed to connect to the system based on their proximity to the cooling tower loop and amount of excess cooling tower capacity. The anticipated increase in cooling tower make-up water demand is projected by linearly scaling the existing make-up water-use by the increase in building area to be served by the centralized cooling systems as, unlike other indoor water uses, spaces are cooled rather than individual occupants.

Table 7 - Mechanical Projections

MECHANICAL							
	Baseline (FY 17/18)			Projected 2040			
	Existing Building Area Served by Cooling Towers (sf) ²	Annual Demand (MGY) ¹	Average Daily Demand (gal/d)	Future Building Area Served by Cooling Towers (sf) ²	Increase in Area	Annual Demand (MGY)	Average Daily Demand (gal/d)
Mechanical	1,005,960	6.8	18,763	2,357,784	234%	16.1	43,977

Notes:

1. Baseline annual water demands calculated from sub-metered water use data provided by Patrick Testoni by email on 1/29/19.
2. Baseline and proposed square footage of buildings served by the central cooling towers is based on the 2020-2040 Long Range Development Plan (LRDP) Campus Cooling Water Master Plan by Stantec Consulting Services, Inc. (Draft, April 2020), provided by Zachary Teske via email on 6/22/2020.

2040 LRDP Water Demand Summary

The current and projected total annual water demand can be found in Table 8. The projected water demand for the 2040 planning horizon is 289.1 MGY, an 87% increase from the FY17/18 baseline water demand. Comparing the distribution of water demand on campus from Baseline (FY17/18) to 2040 by end-use (Figure 3), it is clear that the planned increase in on-campus housing (both student and employee) is a major driver the projected increase in water consumption by 2040.

It should be noted that these projections do not consider further increases in water-use efficiency and conservation. While options to increase building water-use efficiency should continue to be explored, the University has been highly proactive to-date and is already achieving efficient demand factors. In addition, the University plans to explore the development of non-potable water sources as a pathway to offset potable water-use as the campus grows.

Table 8 – Total Water Demand: Existing and 2040 Projection

DEMAND PROJECTION SUMMARY				
	Baseline (FY 17/18)		Projected 2040	
Category	Annual Demand (MGY)	Ave. Daily Demand (gal/d)	Annual Demand (MGY)	Ave. Daily Demand (gal/d)
Main Campus	154.0	421,994	283.5	776,827
2300 Delaware	0.5	1,463	5.6	15,294
Total	154.6	423,457	289.1	792,121

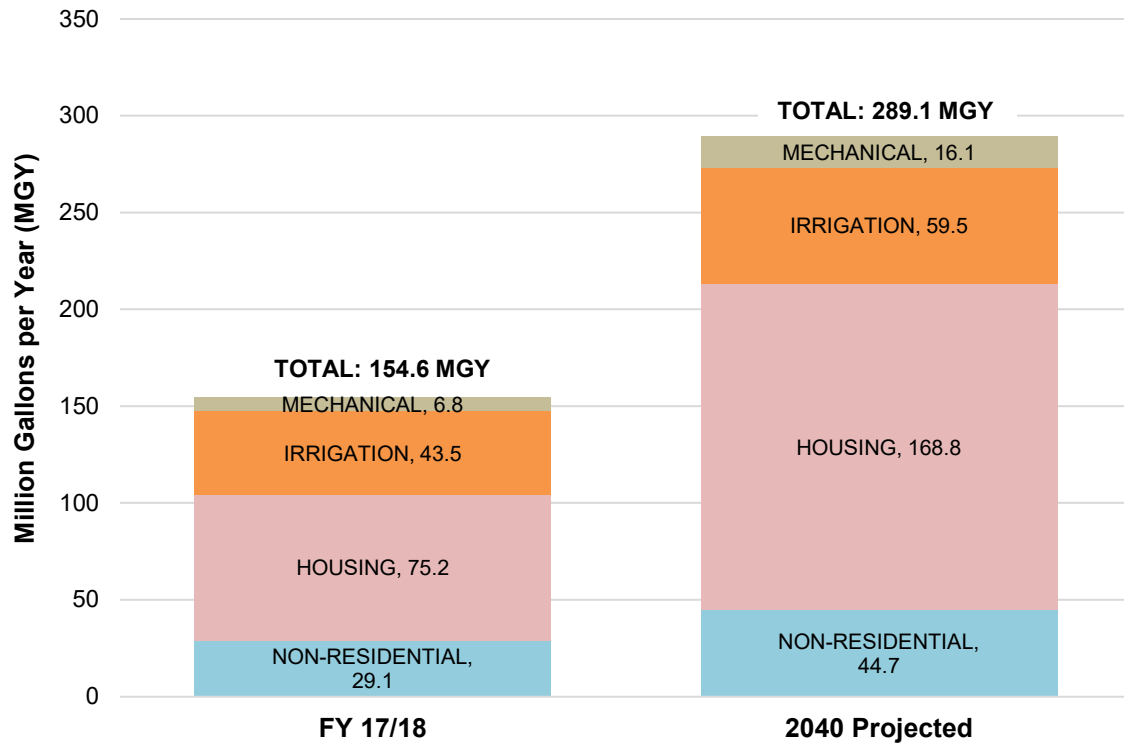


Figure 3 – Water-Use by Category, FY 17/18 and 2040

Appendix B

Water Use Efficiency at the University of California
City of Santa Cruz Information Report
May 2017



INFORMATION REPORT

COUNCIL MEETING

MAY 23, 2017

DATE: May 2, 2017

TO: City Manager
DEPARTMENT: Water
SUBJECT: Water Use Efficiency at the University of California

APPROVED:

DATE:

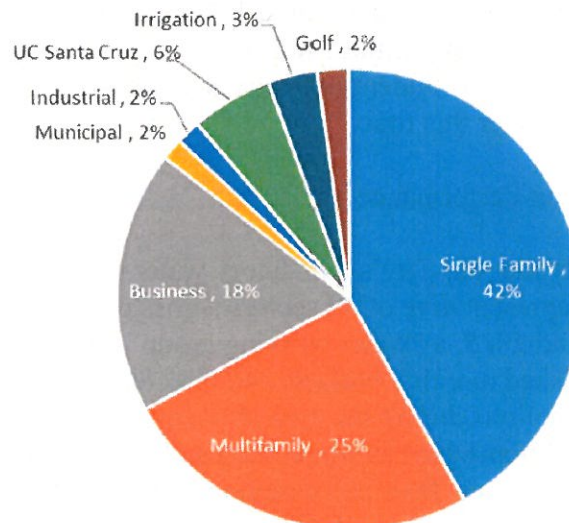
5/8/17

On April 25, 2017, City Council addressed the subject of the next University Long Range Development Plan (LRDP). A few weeks before, Chancellor Blumenthal had announced that the planning process was just beginning and was inviting the community to provide its input. The next LRDP will serve as a blueprint for the future of UC Santa Cruz.

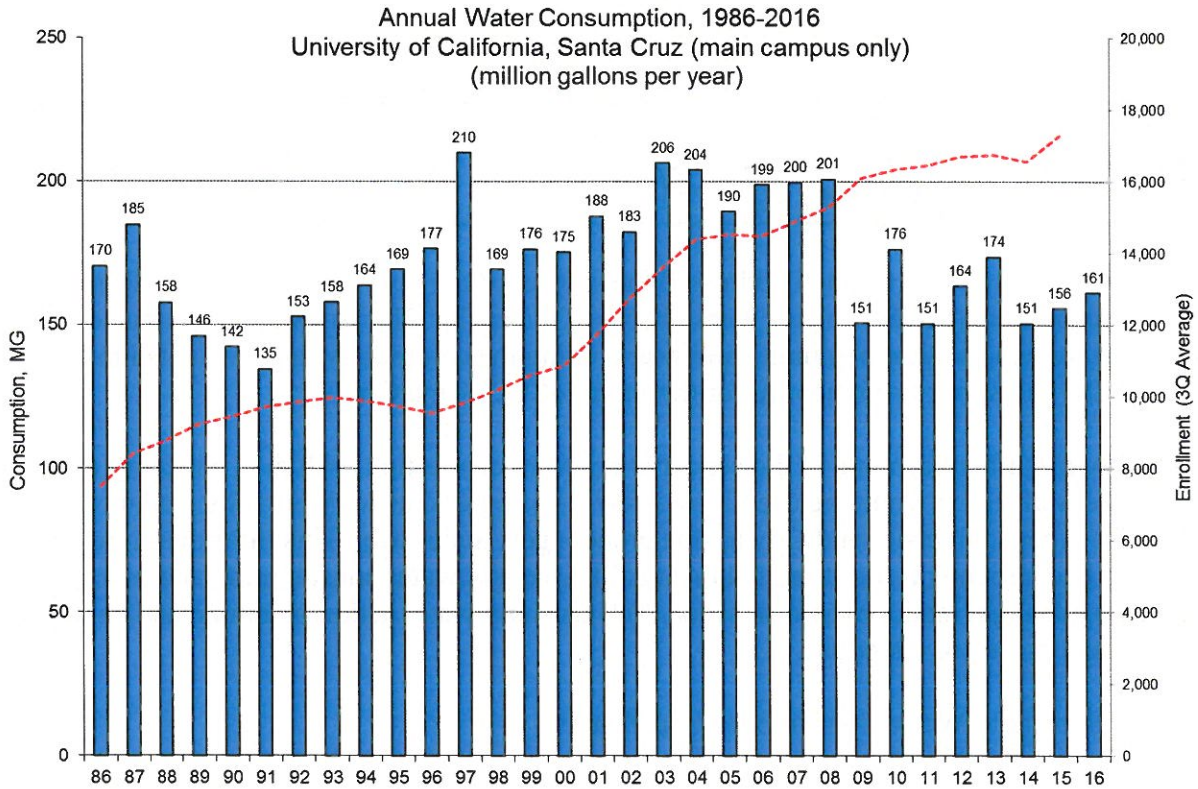
Water use has often been one of the concerns raised in connection with the University campus. Therefore, staff felt it would be useful to review the progress made through the collaborative efforts between University and City as this process gets under way. This information report provides background on four topics: 1) Annual University water consumption and trends, 2) University drought reduction performance, 3) University water action planning, and 4) Water Department projected water use.

Annual University Water Consumption and Trends

The chart below shows University water use in proportion to other City customer categories. It accounts for approximately six percent of the total annual consumption in any given year. This figure represents both the main campus as well as the Coastal Science Campus site on the west side of the City.



Annual water consumption on the main campus extending back to 1986 is illustrated in the chart below. Also shown is the change in student enrollment over this period. Note that despite a doubling in enrollment, annual water use remains relatively steady in the 30 years between 1986 and 2016. Stated another way, the amount of water use per enrolled student has declined during this period from about 60 gallons per student per day back in 1986 to about 25 gallons per student per day today.



One of the provisions of the 2008 Comprehensive Settlement Agreement was that the University would pay a fee equivalent to the City’s system development charge for water used over 206 million gallons per year (mg). This requirement to contribute funding has never been triggered since campus consumption has remained continuously below that threshold. A campus-wide efficiency survey, extensive plumbing fixtures retrofits, completion of all “high priority” conservation projects, and extensive student outreach and engagement have all helped in controlling campus water use over this time.

University Drought Reduction Performance

The campus has successfully met the City’s mandatory water reduction goals because of close collaboration between the representative of all sectors across campus as well as with the Water Department. In both 2014 and 2015, a “water working group” led by the campus planning and sustainability offices established monthly budgets and directed efforts to reduce water use by 20 percent or about 20 million gallons during the peak dry season. Key to the success of this effort was an investment in new cellular-based meter reading technology that allowed individual building or facility managers to view their consumption on an hourly basis and quickly detect leaks. This technology will continue to help the University manage the campus’ water use well

into the future. A water conservation student intern team also helped communicate the conservation message to students and staff and helped identify and report leaks. For its efforts, the Santa Cruz campus established itself as a leader in water conservation and water efficiency among the University of California and other college campuses around the state.

University Water Action Planning

Consistent with state law that set a goal to reduce per capita water use by 20 percent in 2020, the UC Board of Regents in 2011 set a similar policy directing each campus to strive to reduce potable water consumption adjusted for campus population growth by 20 percent in 2020. To this end, the University in 2013 prepared a Water Action Plan that recognizes the limited nature of water resources in our region and the campus' role as a responsible steward in the community. The plan uses a "weighted campus user" baseline that normalizes for differences in water use between the number of on- and off-campus students, and full time vs part time students, faculty, and staff.

In 2016, the UC Office of the President adopted a more ambitious goal mirroring a 2015 Executive Order covering federal facilities. It calls for campuses to demonstrate leadership in the area of sustainable water systems by reducing potable water use 35 percent by 2025, as compared to a 2005 - 2008 baseline period, using the same weighted campus user approach. Some of the actions called out in the policy include:

- Converting potable water used for irrigation to recycled water,
- Implementing efficient irrigation systems ,
- Drought tolerant plant selections,
- Phasing out unused turf, and
- Replacing single pass cooling systems or constant flow laboratory equipment

The campus is currently in the process of preparing this updated Water Action Plan that will address how it intends to meet this goal, and the actions included in that plan will extend through at least part of the time frame for the next LRDP.

Santa Cruz Water System 2015 – 2035 Projected Water Use

One of the first very requests made by the Water Supply Advisory Committee (WSAC) in 2014 was for the Water Department to update the system's demand forecast to reflect current information on water usage and to account for effects of conservation, water rates, and other factors expected to impact the future demand for water. Accordingly, the Water Department contracted with M.Cubed to develop two products: 1) an interim forecast to assist the early stages of the WSAC process, and 2) a separate, newly developed econometric demand forecast for the service area extending to the year 2035.

At the time of the University's last LRDP, its projected demand was estimated to be 349 million gallons per year (mgy). The 349 mgy figure was based in part on the 2005 LRDP, along with the Coastal Science Campus and Delaware Street facilities.

In developing the new long term demand forecast for the water system, an independent estimate of UCSC future demand was not made. Rather, after consulting with University staff, a decision

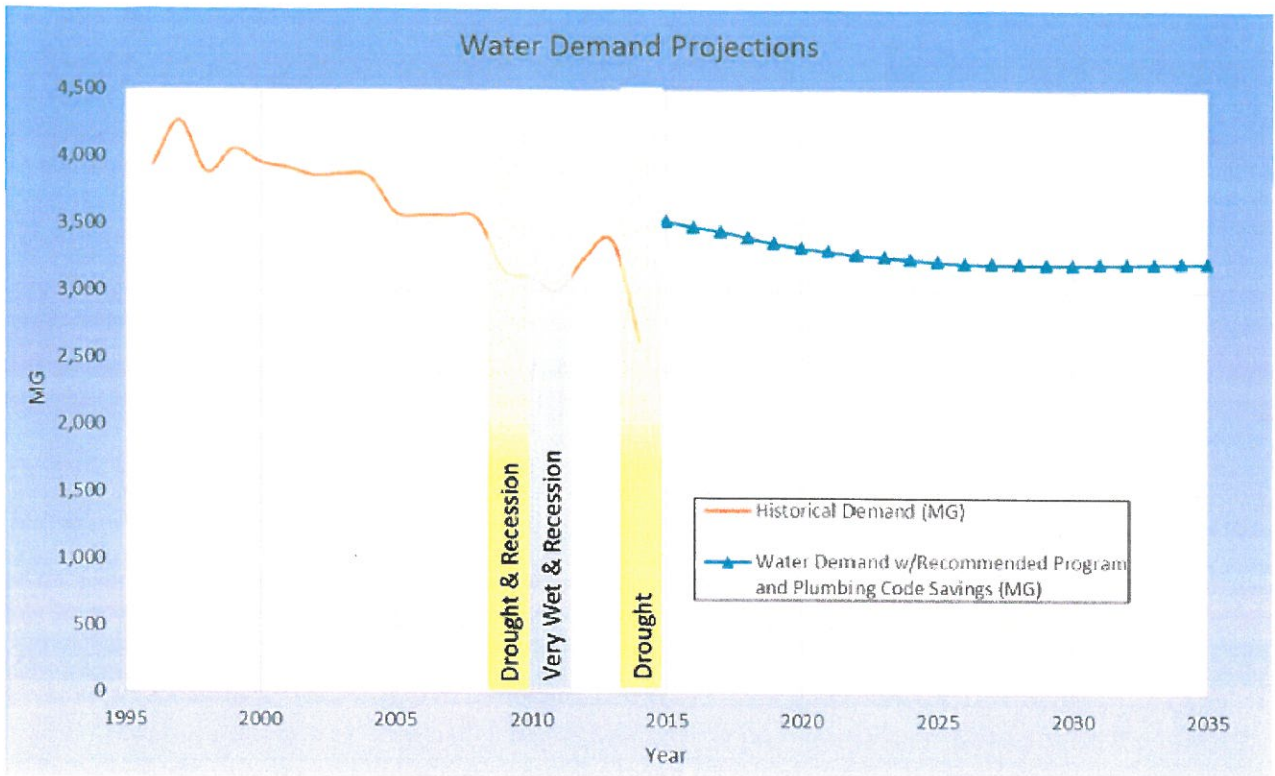
was made to extend the University’s previous forecast of 349 mgd in 2030 further out into the future to reflect a lower, more realistic rate of growth. Two endpoints were considered: a higher forecast ending with the full 349 mgd build out demand being achieved by 2035 and a lower forecast with the 349 mgd being achieved by 2050. The University demand forecast that was ultimately used for the econometric demand forecast, and later incorporated and adopted as part of the City’s 2015 Urban Water Management Plan (UWMP), represents the mid-point between these two bounds.

As seen in the table below taken from the 2015 UWMP, and accompanying chart, the Water Department is planning for a future in which the University water use is projected to reach 308 mgd in 2035. Even still, the overall trend in system-wide water use according to this forecast is one in which total water use is expected to decline between 2020 and 2025 and then stabilize at a level of about 3.2 billion gallons per year.

Use Type	Additional Description	Projected Water Use (mgd)				
		2020	2025	2030	2035	2040-opt
Single Family	Individually metered dwellings	1,277	1,223	1,191	1,170	n/a
Multi-Family	2 or more dwelling units	772	714	690	678	n/a
Commercial		574	541	525	519	n/a
Industrial		56	59	60	61	n/a
Institutional/ Governmental	Municipal (city) accounts	46	42	40	40	n/a
Landscape	Dedicated Irrigation	112	119	134	144	n/a
Landscape	Golf Irrigation	58	52	47	47	n/a
Other	UC Santa Cruz	196	234	271	308	n/a
Water Losses		236	241	247	253	n/a
TOTAL		3,327	3,225	3,205	3,220	n/a

NOTES: David Mitchell, M Cubed, October 2015, and by Maddaus Water Management, February 2016

While the next LRDP will raise legitimate concerns about the role the University plays in the community and how its plans for growth in enrollment may impact the community, it is clear that the University has a successful track record when it comes to keeping its share of the City’s overall water use in check. One reason for the University’s success is that many of the people that wrestle with this vital subject on a daily basis are also City residents or live within the water service area; they care about the surrounding community and share in its values for environmental stewardship and protection of our natural resources.



Staff will continue to work collaboratively with the University, in the spirit of the comprehensive settlement agreement, as the next LRPD process unfolds.

Submitted by:

Rosemary Menard

Rosemary Menard
Water Director

