ENVIRONMENTAL SETTING

IN THIS SECTION:

- Regulatory Setting
- City Water Service Area
- City Water Service System
- Water Demand in City Water Service Area
- Water Supply Limitations
- Water Supply Planning & Strategies
- UCSC Water Service & Demand

REGULATORY SETTING

City Plans and Ordinances

Pursuant to State Water Code requirements, water suppliers providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually, must prepare and adopt an urban water management plan and update it every five years. The Act requires water agencies to evaluate and describe their water resource supplies and projected needs over a twenty year planning horizon, and to address a number of related subjects including water conservation, water service reliability, water recycling, opportunities for water transfers, and contingency plans for drought events (City of Santa Cruz Water Department, February 2006). The City adopted its *2005 Urban Water Management Plan* (UWMP) in February 2006 as further discussed below in the "City Water Supply Management" subsection.

The City of Santa Cruz has enacted several ordinances regarding water conservation. Chapter 16.02 of the Municipal Code sets forth water conservation provisions to prevent the waste or unreasonable use or method of use of water. Chapter 16.03 requires that plumbing fixtures be retrofitted with "low consumption plumbing fixtures"[1] in all residential, commercial and industrial buildings served by the City of Santa Cruz Water Department that use water in showers, toilets and urinals whenever a property is sold. Chapter 16.16 sets forth requirements for water-efficient landscaping and also is intended to comply with the California Government Code section 65591, et seq., the Water Conservation in Landscaping

[1] Section 16.03.030 defines "low consumption plumbing fixtures" as any showerhead rated to use a maximum of 2.5 gallons of water per minute, any toilet rated to use a maximum of 1.6 gallons per flush, and any urinal and associated flush valve rated to use a maximum of 1.0 gallons per flush.

Act. The regulations are applicable to applicants for new, increased or modified water service within the city water service area.

Water Supply Assessments

In 2001, Senate Bill (SB) 610 amended California law regarding review of water availability for large projects (Section 10910 et seq. of the Water Code, Section 21151.9 of the Public Resources Code [CEQA] and Section 15155 of the State CEQA Guidelines). Pursuant to SB 610, preparation of "water supply assessments" (WSA) is required for projects subject to CEQA that meet specified criteria regarding project size (e.g., for projects of 500 or more residential units, 500,000 square feet or more of retail commercial space, 250,000 square feet or more of office commercial space, 500 or more hotel rooms, specified industrial uses or a project that would result in a water demand equal to or greater than the amount needed to serve a 500-unit residential project). These assessments, prepared by "public water systems" responsible for service, address whether there are adequate existing or projected water supplies available to serve proposed projects over a 20-year period, in addition to existing demand and other anticipated development in the service area. Where a WSA concludes that insufficient supplies are available, the WSA must lay out steps that would be required to obtain the necessary supply. The content requirements for the assessment include, but are not limited to, identification of the existing and future water suppliers and quantification of water demand and supply by source in five-year increments over a 20-year projection for average normal, single-dry, and multiple-dry years. The absence of an adequate current water supply does not preclude project approval, but does require a lead agency to address a water supply shortfall in its project approval findings.

Local Agency Formation Commission Requirements

Pursuant to State law (Government Code section 56430), the Local Agency Formation Commission (LAFCO) is required to review all municipal services in the county once every five years. The Santa Cruz LAFCO completed and accepted its report in August 2005. LAFCO's findings and conclusions are presented in the LAND USE (Chapter 4.3) section of this EIR.

CITY WATER SERVICE AREA

The City of Santa Cruz Water Department provides water service to an approximately 30-square-mile area that includes lands within existing city limits, the portion of UCSC that is within city limits, adjoining unincorporated areas of Santa Cruz County (including Live Oak and residential subdivisions along Graham Hill road), a small part of the City of Capitola and coastal agricultural lands outside city limits (City of Santa Cruz Water Department, February 2006). In November 2006, LAFCO adopted a water service boundary map for the City's

service area that includes properties that are currently provided water service or are within the city or county urban service areas (see Figure 6[2]). The City currently serves nearly 25,000 connections of which 88% are residential (Santa Cruz LAFCO, June 2005). In addition to domestic demand, the City supplies approximately 300 acre-feet of water per year for agricultural uses along the North Coast outside of city limits.

The City of Santa Cruz Water Department is a municipal utility that is owned and operated by the City of Santa Cruz. The governing body for the Water Department is the City Council, and the department is led by a Director who is appointed by the City Manager. A seven-member Water Commission advises the Council on policy matter involving operations and management of the water system. The Department operates financially as an enterprise in which all costs of running the system are paid by water rates, service charges, and related revenues. The Water Fund receives no tax or general fund revenues (City of Santa Cruz Water Department, February 2006).

The City currently imposes a "System Development Charge" (SDC) on all new connections, based on meter size; the purpose of an SDC is to charge new customers an equitable share of the cost of the infrastructure necessary to provide new water service. The fee is assessed at the time of connection to the water system and provides for payment of the capital costs incurred to provide service.

CITY WATER SERVICE SYSTEM

The City has four primary water sources that are described below. The City's water supply has limited capacity to serve additional users under normal conditions and has insufficient supplies to meet existing demand under drought conditions. Major facilities include a 24-million-gallon per day (mgd) water treatment plant, several pump stations, 16 distribution reservoirs, and about 300 miles of water pipelines throughout the service area (City of Santa Cruz Water Department, February 2006).

Water Supply Sources

The City of Santa Cruz water system is comprised of four main sources of water supply:

- North Coast Sources;
- San Lorenzo River Diversions;
- Loch Lomond Reservoir; and
- Live Oak Wells.

[2] All EIR figures are included in Chapter 8.0 at the end of the EIR (before appendices) for ease of reference as some figures are referenced in several sections.

NORTH COAST SOURCES

The North Coast sources consist of surface diversions from three coastal streams and a natural spring located approximately 6-8 miles northwest of downtown Santa Cruz. These sources are Liddell Spring, Laguna Creek, Reggiardo Creek and Majors Creek. The North Coast system has been in operation since the 1880s. The City has pre-1914 appropriative rights for surface diversion from Liddell Spring, Laguna Creek, Reggiardo Creek, and Majors Creek. As pre-1914 sources, the North Coast diversions are least affected by water rights limitations. Diversion from these sources is limited primarily by flows (City of Santa Cruz Water Department, February 2006).

SAN LORENZO RIVER DIVERSIONS

The San Lorenzo River is the City's largest water supply source, and the City diverts water from the San Lorenzo River at two locations: the Tait Street Diversion, near the City limits just north of Highway 1, and the Felton Diversion located about 6 miles upstream from the Tait Street Diversion. The City is the largest user of water from the San Lorenzo River basin; however, three 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 (EKI, September 2009).

The main surface water diversion is located at Tait Street near the city limits just north of Highway 1. The Tait Street diversion is supplemented by two shallow, auxiliary wells located on the east side of the river, which are hydraulically connected to the river and tied to the City's appropriative rights for surface diversion. The other San Lorenzo River diversion is the Felton Diversion Station, 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 (City of Santa Cruz Water Department, February 2006). Pursuant to current permits, this water must be diverted to the Loch Lomond Reservoir and cannot be sent directly to the Graham Hill water treatment plant. Thus, the City's ability to utilize water from the Felton Diversion is dependent on the volume of available storage in Loch Lomond Reservoir, and as a result, the Felton Diversion is operated only intermittently, as needed to augment storage in Loch Lomond Reservoir when natural inflow from Newell Creek to the reservoir is low (EKI, August 2009).

The City has rights to divert up to 12.2 cubic-feet-per-second (cfs) year-round from the San Lorenzo River at the Tait Street Diversion and adjacent wells (State Water Resources Control Board [SWRCB] Permit 2738 and License 7200). During periods of high flow, water from the Felton Diversion Dam on the San Lorenzo River is pumped up to the Loch Lomond Reservoir for storage. Under the City's current SWRCB permits (16123 and 16601), the City may divert up to 3,000 AFY (or 977 MGY) of water from the San Lorenzo River at the Felton Diversion

between September and May (City of Santa Cruz Water Department, February 2006). The City's SWRCB permits for the Felton Diversion also restrict diversions based on minimum instream flow requirements. In order to protect fish habitat in the San Lorenzo River, diversions at Felton may occur only when instream flow exceeds the prescribed flow. These minimum average daily flow requirements for instream flow are 10 cfs in September, 25 cfs in October, and 20 cfs from November to May (Ibid.). After fish flow requirements are met, the City has rights to divert 7.8 CFS during September, and 20 CFS from October to May, to an annual maximum of 2,998 acre-feet (977 million gallons) (Dudek & Associates, June 2005).

LOCH LOMOND RESERVOIR

Loch Lomond Reservoir (also referred to as Newell Creek Reservoir in the City's operating permit) is located near the town of Ben Lomond in the Santa Cruz Mountains. Constructed in 1960, the reservoir collects water from the Newell Creek watershed and has a maximum capacity of 2,810 million gallons. In addition to the City, the San Lorenzo Valley Water District is entitled to receive a portion of the water stored in Loch Lomond (City of Santa Cruz Water Department, February 2006). The City and the San Lorenzo Valley Water District both have rights to the water stored in the reservoir; the City's annual withdrawal limit is 1,042 million gallons.

LIVE OAK WELLS

Although groundwater constitutes only approximately 4% of the City's entire water supply, it has been a crucial component of the water system for meeting peak season demands and during periods of drought. The Live Oak Well system consists of three production wells (known as the "Beltz" wells located in the southeast portion of the City's water service area (City of Santa Cruz Water Department, February 2006). The average annual production is approximately 160 MGY, but the system was operated at its full 2 mgd capacity at times during the 1987-1992 drought during which time annual production reached 430 MGY (Ibid.). The City is actively pursuing replacement wells in the Live Oak area to restore full capacity of 2 mgd (Almond, City of Santa Cruz Water Department, personal communication, September 2009).

The water produced from the Live Oak Well system is derived from the Purisima Formation, which is the primary source of groundwater in the mid-Santa Cruz County region. Groundwater from the Purisima Formation is used by the City of Santa Cruz, the Soquel Creek Water District, Central Water District and numerous private wells. Total annual extraction from the Purisima aquifer by all pumpers is estimated at nearly 2,000 million gallons per year (MGD) of which the City produces approximately 167 MGD (8% of total) (City of Santa Cruz Water Department, February 2006). Groundwater level data collected over the past 15 years indicate that water levels across the Purisima Formation have been lowered by a combination of changes in recharge and the gradual increase in overall groundwater production from the aquifer. The City's *Urban Water Management Plan* indicates

that there is a potential for saltwater intrusion to jeopardize the safe production of groundwater from the Purisima aquifer, but also notes that at this time, under normal operations, there appears to be no imminent threat of seawater intrusion and the State Department of Water Resources has not identified the basin as overdrafted or projected to be overdrafted (Ibid.).

Water System Operations and Reliability

In general, the City's water supply system is managed to take advantage of the better quality and least expensive water sources as a first priority and to retain the maximum amount of water possible in Loch Lomond Reservoir to safeguard against future droughts. In addition to considerations for cost, water quality, and storage, there are legal constraints on the diversion of surface waters contained in the City's water rights that govern the operation of the water system. Water supplies are generally dispatched to meet daily demands in the following order: North Coast, San Lorenzo River, Live Oak Wells, Loch Lomond reservoir (City of Santa Cruz Water Department, February 2006).

The North Coast sources are used to the greatest extent possible due to excellent water quality and the lowest production cost, and as previously indicated, these diversions are least affected by water rights limitations. Additional water needed to meet daily demands is pumped from the San Lorenzo River at Tait Street. During the summer and fall when the City's flowing sources are inadequate to meet peak season daily demands, supplemental water is brought in from the Live Oak Wells and Loch Lomond Reservoir (City of Santa Cruz Water Department, February 2006).

On average, about 79% of the City's annual water supply needs are met by surface diversions from the coastal streams (32%) and San Lorenzo River (47%), while approximately 17% is supplied by Loch Lomond Reservoir and 4% of the supply is derived from the Live Oak Well system (City of Santa Cruz, February 2006). With current facilities and normal water conditions, the North Coast streams, San Lorenzo River and Live Oak Wells are capable of producing an average of 3,270 MGY (approximately 10,000 acre-feet per year [AFY]) as summarized in Table 2-1. With Loch Lomond production, limited by the City's water rights to a maximum of 1,042[3] MGY (approximately 3,200 AFY), existing water supply availability totals 4,300 MGY (approximately 13,200 AFY) (City of Santa Cruz Water Department, February 2006).

The system is currently operating at about 93% of capacity (City of Santa Cruz Water Department, February 2006). Water production in 2005 totaled 3,580 MGY (approximately 11,000 AFY) with the majority (3,000 MGY / 9,200 AFY) gallons coming from the North Coast, San Lorenzo River, and Live Oak well sources, and 584 million gallons (approximately 1,800

[3] Of this amount, 104 MGY (approximately 320 AFY), or 10%, is technically available to the San Lorenzo Valley Water District, but it has taken no action in recent years and has no current plan to exercise its entitlement.

acre-feet) drawn from Loch Lomond reservoir (City of Santa Cruz Water Department, June 2006). This was less than production in 2004 and the average production from 1999 through 2003. The Water Department indicates that this was due to unusually cool and foggy weather conditions during the summer and somewhat from increased water rates (Ibid.). Water production in 2007 totaled 3,900 MGY (approximately 11,970 AFY) (Goddard, City of Santa Cruz Water Department, personal communication, July 2009).

TABLE 2-1: Existing City Water Supplies

Source	Million Gallons Per Year	Acre-Feet Per Year
Groundwater	187	575
Surface Diversions:		
▪ North Coast Sources	1,077	3,305
▪ San Lorenzo River	2,008	6,165
▪ Loch Lomond Reservoir	1,042	3,200
TOTAL	**4,314**	**13,245**
Source: City of Santa Cruz Water Department, February 2006		

The City's water supply system is able to meet 100% of the existing water demand in about 7 out of every 10 years and at least approximately 90% of existing demand in about 9 out 10 years. A significant shortage occurs on average about 1 out of every 10 years (City of Santa Cruz Water Department, February 2006). The total water supply estimated to be available to the City in single dry years (i.e., 1994) is 3,800 MG (approximately 11,670 AF) or approximately 12% less than is available in normal years (Ibid.). According to the City's UWMP, there would be a relatively small supply deficit in single dry years under current demand conditions. However, during an extreme two-year drought similar to the 1976-77 event, the estimated water supply available to the City in the second year of that event is 2,700 MG (approximately 8,300 AF), or about 37% less than is available during a normal year. Under this scenario, the City would experience a 46% peak season shortage in the second year (Ibid.). The peak season is between April and October since this is the period that would be most affected by a supply shortage due to peak water demand.

In average conditions, the UWMP indicates that there appears to be approximately 300 MGY of remaining water supply capacity (approximately 920 AF) with existing sources and operations (City of Santa Cruz Water Department, February 2006). However, based on an average water use of 3,900 MGY (approximately 11,970 AFY) in 2007 and historical annual averages, remaining water supply capacity is currently estimated at 400 MGY (approximately 1,230 AFY).

Under drought conditions, the City estimates a deficit of approximately 100 to 545 MG (approximately 307-1,675 AF) during a single dry year, and a deficit of approximately 1,200 to 1,645 MG (approximately 3,700-5,050 AF) during a multiple dry year condition (City of Santa

Cruz Water Department, February 2006). This multiple dry year shortfall is also expressed as the percent of supply available to meet demand during the peak season between April and October since this is the period most affected by a supply shortage. The water system was barely able to meet half of normal drought year demand during the peak season with 2005 demands, with the shortage projected to increase to as much as 56% in drought conditions in the year 2020 (Ibid.).

The City's adopted UWMP indicates that current water supplies will remain relatively unchanged with a total net production capacity of approximately 4,300 MGY (approximately 13,200 AFY) through the year 2030 assuming normal water conditions and no change to current operations or water rights. However, as further described below, existing water supplies may be reduced in the future as a result of other permit requirements and water rights issues, and the City is currently pursuing water conservation measures to reduce demand and construction of a desalination plant as a supplemental water source during drought conditions.

Facilities and Infrastructure

Major facilities include two water treatment plants, several pump stations and 16 distribution reservoirs storing almost 50 million gallons of treated water. There are also about 300 miles of water pipelines throughout the service area (City of Santa Cruz Water Department, February 2006).

The City operates two water treatment facilities. All surface water is treated at the Graham Hill Water Treatment Plant, which currently has a capacity of approximately 20 million gallons per day (mgd). The 2-mgd Live Oak Water Treatment Plant treats groundwater to remove iron and manganese. Treated water from the Graham Hill plant flows to the Bay Street Reservoir and into the distribution system. Treated water from Live Oak is pumped directly into the distribution system (City of Santa Cruz, February 2006).

The City has 16 treated water storage reservoirs throughout the service area, with Bay Street Reservoir being the largest. The City has a total treated storage capacity of 45 MG (approximately 138 AF) or about 4.5 times average day demand (Santa Cruz LAFCO, June 2005). This level has been reduced with the City's recent removal of 35-million gallon (MG) Bay Street Reservoir due to age, deterioration, and safety issues. Through a two-phase construction project, that currently is in the design phase, the replacement reservoir will consist of two 6-million gallon tanks. The first tank is expected to be in operation sometime in the year 2011 with the second tank in operation approximately on year later (Almond, City of Santa Cruz Water Department, personal communication, September 2009). [4]

[4] The original reservoir design was significantly oversized for emergency purposes. The capacity has been downsized in order to meet water quality requirements (e.g., how long treated water can be stored), but still meets demand and safety requirements.

The City's water system also includes: the 16-mile Coastal Transmission Main that pumps North Coast raw water to the Graham Hill treatment facility and the 9-mile Newell Creek Pipeline that carries water from Loch Lomond to the Graham Hill treatment plant. Additionally, the Felton Booster Pump Station is used to move water into and out of the Loch Lomond Reservoir. The Coast pump station, located next to the Tait Street Diversion, pumps raw water from the North Coast and San Lorenzo River sources to the Graham Hill Treatment Plant.

The City is in the process of implementing a long-term (10-20 year) rehabilitation and replacement program for its North Coast System pipelines and diversions. The 16-mile long North Coast System (NCS) includes five distinct pipeline reaches, and over half of the conveyance pipeline is more than 40 years old. The project includes replacement of pipelines in their current alignments or in new alignments designed to avoid sensitive habitats. Rehabilitation also includes modifications to the 100±-year old diversion structures, which are located above the anadromous reaches of the creeks (i.e., above the locations where fish return to spawn).

The first segment (High Street segment) was recently completed as part of the Bay Street Reservoir and System Transmission Improvement Project. A new 24-inch, approximately 2-mile long water transmission line was installed between the Bay Street Reservoir and Ocean Street in order to increase the daily replenishment rate at the Bay Street Reservoir by removing the hydraulic constraints that currently exist between the Graham Hill Water Treatment Plan and the Bay Street Reservoir. The second North Coast segment will complete the in-town North Coast Pipeline reach by connecting the newly installed High Street segment to the Coast Pump Station (City of Santa Cruz Water Department, October 2005). This segment is in the design phase and construction could start in fiscal year 2010 (Almond, City of Santa Cruz Water Department, personal communication, September 2009).

WATER DEMAND IN CITY WATER SERVICE AREA

Water production has fluctuated over the past 15+ years; annual production has ranged from a high of approximately 4,400 MGY (approximately 13,500 AFY) in 2000 to a low of approximately 3,400 MGY (approximately 10,450 AFY) in 1990 (City of Santa Cruz Water Department, February 2006). Between 1999 and 2004, gross water production averaged about 4,200 MG (approximately 12,900 AFY), while net production has averaged 3,900 MGY (approximately 12,000 AFY) (Ibid.). Net water production, which is the amount of produced treated water that enters the distribution system, averages about 6% less than gross production. The difference between gross and net production is due to raw water sales, maintenance, and losses from leakage (Ibid.).

Water demand forecasts developed for the City in 1997 (Maddaus Water Management, March 1998) estimated that water demand would increase to approximately 4,900 MGY (approximately 15,000 AFY) by 2005 and up to approximately 5,300 MGY (approximately 16,300 AFY) in the year 2030 (City of Santa Cruz Water Department, February 2006). The estimated future demand was based on population and employment trend information and forecasts provided by AMBAG at the time the forecasts were developed, and demographic and land use information in the General Plans for the City of Santa Cruz, Santa Cruz County and Capitola from which water demand was analyzed for each major customer category. The total annual water demand projections (including metered demand and unmetered use) are outlined below. Unmetered uses include fire hydrants, main flushing and system losses related to leaking water lines.

- 2005: 4,867 MGY (approximately 14,940 AFY)
- 2010: 5,029 MGY (approximately 15,440 AFY)
- 2015: 5,094 MGY (approximately 15,640 AFY)
- 2020: 5,157 MGY (approximately 15,330 AFY)
- 2025: 5,239 MGY (approximately 16,100 AFY)
- 2030: 5,326 MGYR (approximately 16,350 AFY)

Actual total water use in recent years has been substantially lower than was predicted in the 1998 study (City of Santa Cruz Water Department, February 2006). All user groups were lower than had been projected, except for agriculture, which increased by a significant percentage (103% or 63 MGY [about 195 AFY] over actual use) relative to the forecast amount of 31 MGY (95 AFY) (Ibid.). As indicated above, annual net water demand has averaged 3,900 MGY (approximately 12,000 AFY), compared to approximately 4,900 MGY (approximately 15,000 AFY) predicted for the year 2005 (City of Santa Cruz Water Department, February 2006).

Reasons for lower actual demand than was previously forecast include: decrease in residential use due to participation in water conservation programs; fluctuation in economic conditions with opening and closing of businesses, closure of one large industrial account (Texas Instruments); lower UCSC usage than was forecast in the 1997 demand study, which was based on assumptions about higher on-campus student housing than had occurred; and lower water losses than had been predicted. Water conservation programs warrant the bulk of the credit for reducing indoor residential use. The difference in business use is thought to be a combination reflecting local economic conditions, business closures, and forecast error (City of Santa Cruz Water Department, February 2006).

Based on actual use, the city-adopted "Urban Water Management Plan" (UWMP) indicates that it is more plausible that water use within the entire service area would likely increase at a rate of between approximately 0.4% and 0.8% per year through 2020 (City of Santa Cruz Water Department, February 2006). The higher rate assumes that the City's three largest customer classes (single- and multi-family residential and business) grow at an annual rate of

0.8% and UCSC water use would increase as predicted in its LRDP by the year 2020. The lower rate is based on actual residential growth rates experienced since 1997 and carried out to 2020 and the assumption that UCSC water use increase would be about half of the 2020 prediction. Both scenarios were adjusted downward to account for 130 MGY of remaining conservation savings. Based on these percentages, the UWMP estimates a water demand of about 4,365 MGY (approximately 13,400 AFY) in the year 2020. These scenarios were not carried beyond the year 2020 in the UWMP because they were considered too speculative. As discussed below under the "Impacts and Mitigation Measures" subsection, the UWMP water demand projections for the City's water service area were reviewed and updated as part of the preparation of the Water Supply Assessment and project impact analysis conducted for this EIR.

WATER SUPPLY LIMITATIONS

The primary water management problem currently facing the City of Santa Cruz is the lack of adequate water supply during droughts due to the wide range in the yield of surface water sources from year to year and limited storage capacity. As previously indicated, in average conditions, there appears to be approximately 300-400 MGY (approximately 920-1,230 AFY) of remaining water supply capacity with existing sources and operations. Current city plans estimate that water demand under normal conditions will exceed water system capacity at some time between 2015 and 2020 (City of Santa Cruz Water Department, February 2006).

A basic assumption of the City's *Integrated Water Plan* and UWMP is that the City will continue to use its existing water supply sources in the future without change in current production levels. However, the City faces a series of ongoing challenges that potentially could lead to some loss of existing supply in the future, although it is uncertain at this time to what extent and which supplies might be affected. These considerations are summarized below from the UWMP.

- **North Coast Streams and San Lorenzo River – HCP.** Continued access to the same amount of North Coast supply sources will depend on the outcome of a Section 10 "incidental take" permit application and accompanying Habitat Conservation Plan (HCP) for city activities that are designed to prevent take of a listed federal species. The permit and plan must be approved by the U.S. Fish and Wildlife Service and NOAA Fisheries. The goal of the HCP is to minimize and mitigate to the maximum extent practicable the effects of city activities on listed and other sensitive species. The conservation measures associated with the HCP may result in changes in the City's operation and management activities and potentially affect the timing and use of this component of the City's existing water supply. However, the effect, if any, on the City's water supply is yet to be determined.

- **Water Rights Conformance Proposal.** The City is also in the process of developing and submitting filings to the State Water Resources Control Board (SWRB) to rectify a historical technical deficiency in the water rights on Newell Creek. Based upon the original filings, which were thought to be adequate due to the anticipated use of Loch Lomond Reservoir, these water rights allow only for diversion to storage and not for direct diversion, i.e., into the City's water supply distribution system. This circumstance makes the water supply technically unavailable as a source for City use during times when, for example, the reservoir is receiving more inflow from Newell Creek than is released downstream. The water rights filings by the City are intended to correct this historical deficiency and bring the water rights and current operations into conformance. The proposed direct diversion rights are limited to the same volume of water, purposes and places of use as the existing rights such that they match the existing rights to the extent possible while allowing direct diversion, consistent with historic practice. This petition is currently being protested by the California Department of Fish and Game, and a decision from the SWRB is pending (EKI, September 2009).

- **Felton Diversion Water Rights Time Extension Project.** Pursuant to the City's permits to divert water at Felton for storage in Loch Lomond Reservoir, the City must put all 3,000 AFY (approximately 977 MGY) of its entitlement to full beneficial use by December 2006, in order to maintain its appropriative rights to the water. While the City has been diligently putting water from the Felton Diversion to beneficial use over the years, to date the City has used just half the permitted amount on an annual basis. In the future, however, the City expects to need the full 3,000 AFY and, therefore, has filed petitions with the SWRCB to extend the time allowed for putting the full 3,000 AFY to beneficial use. The water supplied from the Felton Diversion is considered critical to meeting the City's projected future demand, in particular during operational outages, changes in operations in response to environmental concerns, and during dry years (Santa Cruz, 2006). This petition is currently being protested by the California Department of Fish and Game, and a decision from the SWRB is pending (EKI, September 2009).

- **Live Oak Wells System Reliability.** The City's ability to produce water from the Live Oak wells, in drought years and potentially all years, may be compromised by continued deterioration of the groundwater basin conditions due to region-wide over-pumping of the Purisima Formation. The City is currently in the process of pursuing installation of replacement wells to restore their original capacity of 2 mgd.

There has been increasing attention paid to the issue of global climate change and its potential effects on existing water resources and supplies. However, studies prepared to date by the State of California do not provide sufficient or specific information with respect to predicted effects on coastal water supplies to allow the City to reach a reliable conclusion of how global climate change may affect the City's water supplies. These studies have instead focused on

potential effects on the Sierra Nevada snowpack, and how a reduced snowpack could affect water supplies dependent on runoff from that snowpack (e.g., water supplies dependent on the operation of either the federal Central Valley Project or the State Water Project). Nor have specific studies been conducted by the City to address this issue.

General studies prepared by the State of California indicate that climate change may seriously affect the State's water resources as a result of temperature increases, changes in timing and amount of precipitation, and sea level rise that could adversely affect coastal areas (California Department of Water Resources, July 2006). It is possible that coastal watersheds such as the one above Santa Cruz could experience changes in frequency and amounts of precipitation (they currently don't receive much snow), which could affect the amounts of water available for diversion and storage in the City's existing facilities. Another study indicates that sea level is expected to rise an additional 22 to 35 inches by the end of the century (California Climate Change Center, July 2006). Generally, there are two ways it is thought that the Santa Cruz water supply system may be impacted: 1) sea level rise that would create greater likelihood of groundwater contamination from seawater intrusion; and 2) rainfall events that would likely be heavier and less frequent, thus affecting storage in Newell Creek Reservoir.

WATER SUPPLY PLANNING & STRATEGIES

The City of Santa Cruz has been actively considering possible new water supplies for the past 20± years due to chronic, insufficient water supplies to meet existing demand during drought events (Gary Fiske & Associates, June 2003). The City's 1989 Water Master Plan identified alternatives to increase the City's water supply based on water demand projections developed at that time. Subsequently, nine projects were evaluated in a 1994 study (Camp Dresser & McKee, Inc., January 1994) that was overseen by a Technical Advisory Committee comprised of City Water Commission members, City Council members and Water Department staff. Of the evaluated projects identified below, the new wells at Thurber Lane and treatment of brackish groundwater in the Majors Creek area were selected as the highest ranking projects.

- Four new reservoir projects – two in the San Lorenzo River watershed and two on North Coast creeks;
- Three projects involving the expansion of Loch Lomond and treatment of brackish groundwater in the Majors Creek area;
- One groundwater project including new wells at Thurber Lane in Live Oak and treatment of brackish groundwater in the Majors Creek area; and
- One smaller reservoir project with groundwater wells at Thurber Lane and reclaimed water from the Scotts Valley Wastewater Treatment Plant.

Integrated Water Plan (IWP)

In 1997, the City initiated an "integrated water planning" approach to consider all practical options for decreasing demand and increasing supply, which included preparation of studies related to water demand, water conservation, water curtailment, alternative water supplies, and evaluation of regional water supply alternatives. As part of this effort, a series of background studies were undertaken, including the following (City of Santa Cruz Water Department, EDAW, June 2005):

- Water Demand Investigation (Maddaus Water Management 1998)
- Water Conservation Plan (Gary Fiske & Associates 2000)
- Water Curtailment Study (Gary Fiske & Associates 2001)
- Alternative Water Supply Study (Carollo Engineers November 2000)
- Evaluation of Regional Water Supply Alternatives (Carollo Engineers March 2002)

An Integrated Water Plan (IWP) was prepared utilizing the results of these studies. The purpose of the IWP is to:

> "to respond to the current drought-related crisis and plan for future growth. Specifically, it must help the City: 1) reduce near-term drought year shortages; and 2) provide a reliable supply that meets long-term needs while ensuring protection of public health and safety" (Gary Fiske & Associates, June 2003).

The IWP evaluated options for balancing water supply and demand that included conservation, curtailment, and new water supplies and infrastructure. Based on the water supply studies conducted since the mid-1980s, the water supply options considered in the IWP focused on the four following options:

- Seawater desalination was considered with construction of reverse osmosis, pretreatment and ancillary facilities. A specific location was not identified, although it was indicated that probable locations would be in the industrial area of Santa Cruz (southwest area of city) or on the University's Long Marine Lab site (now known as the Coastal Marine Science Campus). A sequence of desalination sizing increments was reviewed for three curtailment profiles and for a facility serving only the City of Santa Cruz and for a facility serving the City and Soquel Creek Water District.
- Reclamation with a coast groundwater exchange arrangement was considered, which involved construction of a 4-5 mgd tertiary wastewater treatment plant, and associated facilities to deliver that water to North Coast farmers for irrigation purposes in exchange for City access to the groundwater supplies currently being used by the farmers.

- Development of the Santa Margarita Aquifer in Live Oak was also considered as a potential small source of supply. The aquifer is below the Purisima aquifer from which the current Beltz wells draw supply. However, little information was available regarding this supply when the IWP was prepared, although it assumed that this source will yield 100 million gallons annually (approximately 2,307 AF).

Based on evaluation of these options and combination thereof, under various drought curtailment options, the IWP determined that Strategies D-1 and D-2 (City-Only and Regional Desalination) at Curtailment Profile 2 (15% worst-year curtailment) as the preferred alternative. The final choice between the City-Only and Regional Desalination strategies was deferred to completion of the Environmental Impact Report on the IWP. For the desalination options, the IWP (and EIR) considered a 2.5-mgd desalination facility that could be upgraded by 1.0 mgd in two increments for a total capacity of 4.5 mgd. In November 2005, the City Council certified the IWP EIR and unanimously adopted the IWP as the City's long-term water resource strategy that includes the following three components (City of Santa Cruz Water Department, February 2006):

- Water conservation programs to maximize the use of the existing water resources.
- Customer water use curtailment (water use cutback) of up to 15% in times of shortage.
- Additional water supply provided by a 2.5 mgd seawater desalination facility that would be expandable in 1.0 mgd increments up to 4.5 mgd, if needed in future years.

Urban Water Management Plan (UWMP)

In 2006, the City adopted the *2005 Urban Water Management Plan* (UWMP) that was prepared in accordance with state law requirements. The plan evaluates and describes water resource supplies and projected needs over a twenty-year planning horizon, and addresses a number of related subjects, including water conservation, water service reliability, water recycling, opportunities, water transfers, and contingency plans for drought events. As previously indicated, the City's UWMP estimates that water demand under normal conditions will exceed water system capacity at some time between 2015 and 2020.

The UWMP noted the following three primary components of the IWP. These measures and other supplemental water supply sources considered in the UWMP are summarized below.

- Conservation
- Curtailment
- Desalination

CONSERVATION

The IWP calls for continued implementation of a broad set of conservation programs. Conservation programs include water survey programs, plumbing retrofits, water audits and leak detection and repair, large landscape conservation programs and incentives, high-efficiency clothes washer rebate program, and other public information programs.

The UWMP provides a description of these programs and indicates that a long-term water savings of nearly 300 MGY (approximately 920 AFY) could be achieved. A savings of approximately 153 MGY (approximately 470 AFY) had been achieved by 2005 (City of Santa Cruz Water Department, February 2006). The plumbing fixture retrofit program has produced the most water savings of any program, totaling about 11 MGY (approximately 34 AFY). As a result, conservation programs continue to offset new water demand from development and growth in new accounts, and then some, for the time being (Ibid.). As previously indicated, the remainder of the potential conservation savings has been taken into account in adjusted future demand estimates discussed above.

CURTAILMENT

The IWP calls for supplying 85% of normal demand in critical drought years (e.g., the 1976-77 event), and for a corresponding reduction in peak season water use of up to 15%. This cutback would be achieved through temporary watering restrictions or rationing that target landscape irrigation and other outdoor uses..

The UWMP includes a "Water Shortage Contingency Plan" that was updated in March 2009. This plan was developed to fulfill two fundamental purposes:

- To establish the procedures and actions necessary to achieve the up-to-15% percent cutback in system-wide demand established in the City's Integrated Water Plan, and
- To describe how the City would respond if faced with much larger shortages in water supply ranging as high as 50%.

The updated Water Shortage Contingency Plan uses a staged approach that classifies a shortage event into one of five levels spanning a water shortage range from 5-50%. The overall concept is that water shortages of different magnitudes require different measures to overcome the deficiency. Because there is so little the City can do in the short run to increase the supply of water, the focus of this plan is primarily on measures that reduce demand. Each stage includes a set of demand reduction measures that become progressively more stringent as the shortage condition escalates. Normally, only one of these five stages would be put into effect early in the year at the recommendation of the Water Director and remain in force for the entire dry season (City of Santa Cruz Water Department, March 2009). These stages include:

Stage	Magnitude of Water Shortage Stage	Title
1	0-5%	Water Shortage Alert
2	5-15%	Water Shortage Warning
3	15-25%	Water Shortage Emergency
4	25-35%	Severe Water Shortage Emergency
5	35-50%	Critical Water Shortage Emergency

Stages 1 and 2 represent a level of curtailment that is envisioned as being necessary to balance water supply and demand from time to time under the City's Integrated Water Plan. Shortages of 15% or less, while inconvenient, do not directly threaten public safety or pose undue economic impact. Stages 3-5 are characterized as emergency water shortages since they result in more widespread hardships being felt throughout the community, may threaten public health and welfare, and cause more economic harm. Customer demand reduction goals were established for major water demand groups based on the following priorities: 1) health/safety, i.e., all domestic and sanitary uses, 2) business and industrial uses and, 3) irrigation and other outdoor uses) (City of Santa Cruz Water Department, March 2009).

SUPPLEMENTAL WATER SUPPLY - DESALINATION

The IWP identified seawater desalination as the most feasible alternative for a backup supply of drinking water in times of drought (City of Santa Cruz Water Department, February 2006). Thus, the City is planning to construct a seawater desalination plant as a backup water supply in times of drought. The desalination plant capacity of 2.5 mgd would be for drought protection, and the plant would only be used by the City intermittently during the dry seasons of dry and critically dry years when existing supplies fall short (Ibid.). The desalination facility could be expanded at a future time to provide additional supply up to 4.5 mgd in two increments of 1 mgd; the potential expansion is also intended for drought protection that could be exacerbated by future growth (Ibid.). The UWMP indicates that after 2015, "up to 1.25 mgd of water from the desalination plant may be needed on a regular basis as a supplemental water supply for the City, depending on the actual water demands at that time stemming from the physical expansion and enrollment growth at the University and the amount of growth allowed in the City and County of Santa Cruz and the City of Capitola under future General Plans" (Ibid.).

The desalination concept adopted by the City involves constructing a seawater intake system using an existing, abandoned wastewater outfall, building a new desalination plant and installing the associated pipelines and pump stations for delivering treated water to the Bay Street Reservoir and conveying seawater concentrate to the City's wastewater facilities, where it would be blended with municipal wastewater flows and disposed via a deep ocean outfall (City of Santa Cruz Water Department, February 2006). A full-scale desalination facility site was proposed to be located in the industrial area along Delaware. The certified IWP EIR evaluates impacts of the construction of a desalination facility and associated pipelines on a

programmatic level for the initial construction of a 2.5 mgd facility for drought protection and two subsequent expansions (3.5 and 4.5 mgd).

The proposed desalination facility is a joint partnership between the City of Santa Cruz and the Soquel Creek Water District (SqCWD), which is also looking for a long-term supplemental water source to reduce its reliance on well water and avert the threat of seawater intrusion in local groundwater aquifers. Currently, the SCWD obtains all its water from groundwater sources and operates 16 active production wells with an estimated capacity of over 14 million gallons per day. The current annual water use for the SqCWD exceeds the available water supply by 15% even during non-drought conditions. The SqCWD would use up to 1 mgd of the future plant's capacity when the City doesn't need it, and would share in the cost of building and operating the plant. In early 2006, the SqCWD adopted the Integrated Resources Plan (IRP) that identified a regional seawater desalination plant with the City of Santa Cruz as the preferred conjunctive use project to be investigated. (City of Santa Cruz Water Department, 2008, desalination web site at: http://www.scwd2desal.org/).

The City recently completed a pilot desalination plant to gather information to establish the optimal design and operating parameter for the future construction and operation of a 2.5 mgd seawater desalination plant. The pilot plant, which was in operation between March 2008 and April 2009, was funded by a State grant and funds from the SqCWD and was a joint venture between the City of Santa Cruz and SqCWD. The 13 months of testing provided a full range of performance information that will be used to plan the full-scale seawater desalination facility. Additional technical studies are currently underway, and design planning for a permanent facility are likely to begin in 2010, followed by environmental review. A permanent facility is expected to be constructed and in operation by the year 2015, pending completion of project-level environmental review and regulatory permit approvals, i.e. approval of a coastal development permit from the California Coastal Commission.[5] At this time, it is not known when or if the plant would be further expanded to serve future planned growth.

OTHER WATER SUPPLIES CONSIDERED IN UWMP

Recycled Water. The City of Santa Cruz owns and operates a regional wastewater treatment facility providing service to the cities of Santa Cruz and Capitola and parts of unincorporated Santa Cruz County. The City's treated wastewater is potentially suitable for some agricultural applications and for limited public access irrigation. However, the level of treatment is not sufficient for general irrigation or unrestricted use on playgrounds, parks, schoolyards, etc. Additional treatment above that currently provided would be needed to meet the state public health and safety requirements. In addition to the treatment upgrades, a distribution system,

[5] Other potential permits, approvals and/or consultations for a permanent desalination plant and supporting infrastructure (i.e., intake facility and distribution pipeline) may be required from various agencies, including, but not limited to U.S. Fish and Wildlife Service, State Lands Commission, and California Department of Health Services.

including pumps, meters, storage facilities, and separate piping, would be required to convey the recycled water to customers (City of Santa Cruz Water Department, February 2006).

The potential for using recycled water as a supplemental water supply was examined in the City's Alternative Water Supply Study (Carollo Engineers, 2000) and Evaluation of Regional Water Supply Alternatives (Carollo Engineers, 2002) during the IWP process. The following five project concepts for recycled water use were evaluated in the two reports (City of Santa Cruz Water Department, February 2008):

- The UWMP provides a description of these programs and indicates that a long-term water savings of nearly 300 MGY (approximately 920 AFY) could be achieved.
- Recycled water for groundwater recharge,
- Recycled water for direct use,
- Recycled water from Scotts Valley,
- Recycled water for landscape irrigation in the City, and
- Recycled water for North Coast agricultural application.

Of these concepts, two were determined to be viable projects: recycled water for in-City landscape irrigation, and recycled water for North Coast agricultural application. The other three projects were determined to be infeasible, unacceptable, or of too little benefit to pursue further. Even though these two recycled water concepts were carried forward in the supply studies, only the one involving the use of recycled groundwater for agricultural irrigation was developed further. The use of recycled water for landscape irrigation was eliminated due to a number of reasons, including the limited yield and high cost. The potential users of the recycled water were determined to be parks, schools, cemeteries, golf courses, and UCSC, with an estimated outdoor irrigation demand of approximately 170 to 230 MGY (approximately 520-700 AFY). This amount was considered too small by itself to meet the City's drought-year needs and also had a high capital cost. The City also considered the high cost of investing in a recycled water system to maintain turf areas during times of drought versus instituting drought management measures and curtailing those same outdoor uses of water at a relatively low cost when supplies fall short. Coupled with the fact that the recycled water concept did nothing to add to the supply of potable water, curtailment was favored in developing alternative strategies for the City's IWP (City of Santa Cruz Water Department, February 2006).

The evaluation of the option to exchange groundwater with recycled wastewater (for agricultural irrigation on State Park lands north of the City) estimated groundwater availability of about 400 MGY (approximately 1,230 AFY). However, this concept ultimately proved to be infeasible for a number of reasons. The additional supply would have been limited given the estimated yield from the groundwater basin. Coupled with costs as high as desalination, this option was not considered the superior option. Additionally, the California

Department of Parks and Recreation, the landowner of the agricultural lands to be irrigated with recycled water, opposed the exchange given legal and policy issues that could affect the entire state (City of Santa Cruz Water Department, February 2006). Some of the farmers, mostly organic growers, also opposed the concept of irrigation with reclaimed water.

Recycled water for landscape irrigation remains a viable alternative that could be pursued in the future. However, currently it is not the City's preferred water supply strategy. The 2005 UWMP indicates that the steps and actions to encourage and optimize recycled water will be defined in the future if and when recycling is selected and pursued to diversify the City's water supply portfolio (City of Santa Cruz Water Department, February 2006).

Other Water Supply Alternatives. The 2005 UWMP indicates that in addition to pursuing desalination, the City remains open to exploring other water supply alternatives that would not be feasible to develop in the short-term, but may be useful to consider over a 20-year or longer time frame. The UWMP identifies the possible longer term options as:

- Recycled water
- Groundwater recharge
- Reservoir expansion
- Aquifer storage and recovery
- Off-stream storage.

Other IWP-Evaluated Supplemental Water Supplies

As part of the IWP process, ten potential water supply alternatives were identified and evaluated (Carollo Engineers, November 2000). These included:

- Groundwater Options
  1. Brackish groundwater supply from wells in the San Lorenzo River Alluvial Plain near the mouth of the river.
  2. Fresh groundwater supply from wells in the San Lorenzo Alluvial Plain.
  3. Groundwater supply from the Purisima Aquifer near the Beltz wells.
  4. Groundwater supply from the Santa Margarita Aquifer.
  5. Groundwater supply near the Wilder Ranch gravel quarry.

- Other Supplemental Sources
  6. Seawater desalination.
  7. Wastewater reclamation.
  8. Reservoir storage in the Olympia Quarry in the San Lorenzo Valley.

- Other Options
  9. Maximized use of existing sources and storage in Loch Lomond Reservoir. This alternative includes increased capture and/or storage of surface water from existing north coast and San Lorenzo River supplies, in conjunction with optimized use of existing diversions.
  10. Conjunctive use with Soquel Water District.

A screening of these alternatives was conducted as part of the 2000 Carollo Engineers study; screening criteria included whether the source would be reliable and sustainable during a multi-year drought and whether the alternative is feasible to be implemented, taking into account cost, environmental constraints and other public acceptance and regulatory concerns. A conceptual engineering analysis was then completed for each of the potentially viable alternatives. Table 2-2 summarizes the evaluated alternatives and associated constraints.

Based on this screening process, the following alternatives were determined not to be viable: brackish and fresh groundwater from the San Lorenzo River alluvial plain (1 and 2), conjunctive use with Soquel Creek Water District (SCWD) (10), and reservoir storage in Olympia Quarry (8) (Carollo Engineers, November 2000). The primary constraints on the brackish and fresh groundwater from the San Lorenzo River alluvial plain included: 1) potential impacts to riparian habitat or introduction of seawater into the aquifer as a result of pumping; 2) water rights issues since the brackish groundwater is likely hydraulically linked to the San Lorenzo River and may result in conflicts with the City's other water rights related to its Tait Street diversion; and 3) high treatment costs. In addition, the yield from these sources was expected to be limited (Ibid.). Conjunctive use with Soquel Creek Water District was not viable due to limited surface water supplies potentially available to SCWD, water rights issues, and continued groundwater pumping. Lastly, numerous technical and institutional issues were identified that deemed the storage at Olympia Quarry to not be viable (Ibid.).

The other groundwater options ultimately were determined not to be viable because as groundwater sources they are also affected during drought conditions and storage is not readily replenished. The analysis also estimated that the maximum reliable yield from four combined groundwater sources was estimated at 300 MGY (approximately 920 AFY) or less during drought conditions (Carollo Engineers, November 2000b). Thus, while overall, groundwater is potentially available in a limited quantity, none of the groundwater resources could provide a significant portion of the projected drought demand shortfall (Ibid.). Additionally, there were other environmental, regulatory and/or cost issues associated with some groundwater options that would affect overall feasibility for implementation. For example, the two biggest aquifers analyzed in the study (Santa Margarita aquifer near Wilder Ranch and Purisima aquifer) have existing users. The available (reliable) yield during a prolonged drought is also uncertain because the yield from the aquifers will likely decrease as other users increase their reliance on this supply (Carollo Engineers, September 2000).

TABLE 2-2: City Water Supply Alternatives Summary

Alternative	Recommend Further Evaluation	Comment
Groundwater Options		
Fresh Groundwater from the San Lorenzo Alluvium	No	▪ Quantity limited ▪ Potential conflict with existing water rights at Tait Street ▪ Supply not reliable or sustainable during drought
Brackish Groundwater from the San Lorenzo Alluvium	No	▪ Quantity uncertain ▪ Potential conflict with existing water rights at Tait Street ▪ Supply not reliable or sustainable during drought
Groundwater Supply from Purisma Aquifer near Beltz Wells	No	▪ Existing users present institutional constraints ▪ Quantity uncertain ▪ Supply not reliable or sustainable during drought
Groundwater Supply from Santa Margarita Aquifer near Belz	No	▪ Quantity uncertain ▪ Supply not reliable or sustainable during drought
Groundwater from Santa Margarita Aquifer near Wilder Ranch	No	▪ Existing users present institutional constraints ▪ Quantity uncertain ▪ Supply not reliable during drought
Other Supplemental Sources		
Desalination	Yes	▪ Reliable or sustainable supply of needed capacity
Wastewater Reclamation	Yes	▪ Net supply may be limited and cost high; additional work required to quantify these elements
Reservoir Storage in Olympia Quarry	No	▪ Numerous technical and institutional issues to be addressed
Other Options		
Maximize Use of Existing Sources and Storage in Loch Lomond Reservoir	Yes	▪ Benefit in drought and nondrought years ▪ Improves system reliability and operation
Conjunctive Use with Soquel Creek Water District	No	▪ Water rights constraint ▪ Quantity uncertain ▪ Supply not reliable or sustainable during drought
Source: Carollo Engineers, November 2000		

Artificial groundwater recharge was considered as a means to improve reliability/sustainability during a drought, but was not found to be a viable alternative as there are no surplus water sources available for recharge. Even if the City's surface water supplies were available for recharge, a water rights change (from diversion for direct use to diversion for storage) would be required, which would effectively preclude all conjunctive use alternatives with surface water and groundwater (Carollo Engineers, September 2000).

Groundwater recharge with reclaimed water was also considered. However, state guidelines stipulate that approximately 50% of the recharge water be reclaimed wastewater, thus requiring other water sources to be blended with the reclaimed water. Additionally, as indicated above, groundwater availability would be limited. The analysis found that even in a favorable scenario, approximately 100 MG (approximately 300 AF) would be available for blending that would result in about 200 MG (approximately 600 AF) of groundwater supply during a drought, which was considered low. Furthermore, state guidelines require that reclaimed water for potable use remain in the ground 6-12 months prior to use depending on the level of treatment and method of discharge. Lastly, the City's wastewater treatment plant would need to be upgraded to produce the quality of reclaimed water required for recharge, along with construction of associated pipelines.

As a result of this screening and evaluation process, three alternatives were recommended for further review: desalination, wastewater reclamation, and maximizing use of existing sources and storage in Loch Lomond Reservoir. A refined regional analysis of desalination and wastewater reclamation as a potential joint project with the Soquel Creek Water District was conducted in 2002. The IWP identified seawater desalination as the most feasible alternative for a backup supply of drinking water during a drought.

Improvements to maximize use of existing water sources and storage were identified that collectively could provide approximately 600 MGY (approximately 1,840 AFY) during a two-year drought. The upgrades could include additional treatment for turbidity on the North Coast supply; capacity upgrades of the North Coast pipeline; treatment and/or facility upgrades for turbidity at the Tait Street intake; capacity upgrades at the Coast pump station; and/or upgrading the hydraulic capacity of the Felton/Loch Lomond supply system. The upgrades would provide additional supply during drought and non-drought years and would also improve operational reliability and flexibility, but shortfalls during multiple dry year scenarios would continue to occur (Carollo Engineers, November 2000).

Ongoing Water Demand / Supply Planning

As previously indicated, pursuant to state law, the City of Santa Cruz Water Department must prepare and adopt an urban water management plan and update it every five years. The City's existing 2005 UWMP will be updated and adopted by the end of 2010. The 2005 UWMP recommends that the water demand projections for the service area be reviewed and updated

once updates to the City of Santa Cruz, County of Santa Cruz, and City of Capitola General Plans have been completed. The City is currently in process of updating its General Plan. Thus, the City's water resource supplies and projected needs over a 20-year planning horizon will be assessed and updated every five years, which will enable the City to review water demand trends and review its water supply management and options.

UCSC WATER SERVICE AND DEMAND

UCSC Water Service

The City of Santa Cruz Water Department supplies water to the UCSC campus for domestic use, fire flow and irrigation on campus. The City currently provides water service to UCSC through nine (9)[6] connections at the western and southern margins of the campus (see Figure 12).[7] The northernmost connection, which is north of the City's limits, was installed by the City in 1973. Water is pumped from the City's Bay Street Reservoir to three consecutive reservoirs at different elevations on the UCSC campus that provide water service to different portions of the campus (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume II). The domestic water service improvements that exist on campus are shown on Figure 12. The campus also has an emergency water storage reservoir (a 1-million 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 (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume II).

Future campus development likely would require improvements to the on-campus water infrastructure, including additional water storage capacity and a new booster pump in the North Campus area. The addition of new pumps or replacement of existing pumps at the City's pump stations serving UCSC also may be necessary in order to provide greater pumping capacities (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume I). At this time, there are no site-specific plans to extend infrastructure into this area. However, the 2005 LRDP includes a conceptual plan to extend water lines to the project area within a new planned roadway in the North Campus area as shown on Figure 12.

Currently, all campus water use is served by the City of Santa Cruz Water Department. However, the University's 2005 LRDP EIR includes a mitigation measure (UTIL-9I) that states during drought situations, the University will utilize water from its existing supply well in Jordan Gulch for non-potable irrigation uses. The campus will also initiate a feasibility study on measures for utilization of reclaimed water (including rainwater, grey water, cooling tower

[6] There are double meters in four locations and one small service to the barn.

[7] UCSC has nine existing service accounts with the City of Santa Cruz Water Department.

blowdown water and/or recycled water) in new development. Potential uses of reclaimed water include cooling, irrigation, and toilet flushing (UTIL-9G).

Existing and Future UCSC Water Demand

The UCSC campus used approximately 206 MGY (approximately 635 AFY) of water in 2003 that was slightly reduced to approximately 190 MGY (approximately 585 AFY) in 2005 (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume IV). The most recent available data indicates that the campus used approximately 200 MGY (approximately 615 AFY) of water in 2007 (University of California Santa Cruz, May 2009), which represents approximately 5% of the City Water Department's total demand. Approximately 28% of the total campus water demand is used for irrigation. (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume II).

Total on-campus water demand in 2020 with growth anticipated in the UCSC 2005 Long-Range Development Plan (2005 LRDP), including summer session, was estimated at 338 MGY (1,040 AFY) in the 2005 LRDP Final EIR (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume IV). Total UC demand, including off-campus facilities, was estimated at 361 MGY (1,100 AFY) in the year 2020. As part of the Comprehensive Settlement Agreement, additional student housing will be provided on campus and implementation of additional water conservation measures will be undertaken, which would result in a total on-campus water demand of 322 MGY (approximately 990 AFY) and total UC demand of 345 MGY (approximately 1,060 AFY) in the year 2020 as summarized on Table 2-3.

Water demand projections for the University were included in the City's 2005 Urban Water Management Plan (UWMP) based on the water projections developed for the Integrated Water Plan (IWP) (Maddaus Water Management 1998). The UWMP included up to 408 MGY (approximately 1,250 AFY) of water use by UCSC in the year 2020, an increase of 87 MGY (approximately 270 AFY) over the estimated water use of 321 MGY (approximately 985AFY) in the year 2005. As with other service area projections as previously discussed, the UCSC estimate proved to be high, with UCSC's actual water use in 2005 averaging approximately 200 MGY (approximately 615 AFY) instead of the projected 321 MGY.

Campus Water Conservation Efforts

The UCSC campus has implemented a range of water conservation programs over the last 20+ years. Past and ongoing water conservation activities at UCSC include:

- Retrofit of campus toilets, showerheads and sink faucets with water- efficient fixtures.
- Use of predominantly drought-tolerant plant species in campus landscaping to reduce irrigation needs.

- Installation of drip and computerized irrigation systems.
- Adjustments to irrigation systems to reduce overspray or migration of water onto unlandscaped areas or hardscape.
- Use of mulch for landscaping.
- Installation of irrigation water meters.

TABLE 2-3: UCSC Existing and Future Water Demand

Location	Recent & Existing UCSC-Related Water Demand			Estimated 2020 Demand [4]
	2003 [1]	**2005** [2]	**2007** [3]	
2005 LRDP				
▪ Main Campus (w/o summer student residents)	206	190	200	328
▪ Summer Session (with summer student residents)	0	0	0	10
Additional On-Campus Housing per Settlement Agreement [5]				14
Water Conservation per Settlement Agreement [6]				(-30)
On-Campus SUBTOTAL	*206*	*190*	*200*	*322*
2300 Delaware Avenue	0	0	2	3
LRDP SUBTOTAL	*206*	*190*	*202*	*325*
Marine Science Campus	7	9	10	20
UCSC TOTAL	***213***	***199***	***212***	***345***

[1] 2005 LRDP DEIR base year
[2] 2005 LRDP FEIR base year
[3] Existing use provided by UCSC
[4] Per 2005 LRDP Final EIR (September 2006, Volume IV) except for additional on-campus housing and water conservation as noted below.
[5] 935 student beds; water demand estimate provided by UCSC
[6] Maddaus Water Management, December 2007

The 2005 LRDP EIR includes five mitigation measures that call for implementation of additional water conservation strategies to reduce water demand (UTIL-9A, 9B, 9C, 9E, 9H) and two measures that call for water audits to identify additional feasible measures that can be implemented (UTIL-9D, 9F). The 2005 LRDP Final EIR also indicates that due to continuing water shortages during a drought, the University anticipates that the campus would: 1) further develop conservation measures already in effect, including continued conservation education and use of ultra-low flow fixtures in new development; 2) explore the use of

rainwater and/or recycled water, as feasible, for irrigation; and 3) consider the viability of using existing on-campus wells to supply water for irrigation purposes (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume V-Master ResponseUTIL-2).

In December 2007, a water efficiency survey was completed for the University that identified high priority water conservation programs measures (Maddaus Water Management, December 2007). Implementation of these recommended projects is estimated to result in a 15% savings in total water use (Ibid.). As part of the Comprehensive Settlement Agreement, UCSC agreed to implement these measures within five years of execution of the Agreement.

Campus Groundwater Use

At this time, groundwater is not extracted on the campus for any purpose, and the campus depends on the City's domestic water supply for both domestic and irrigation water. The UCSC campus is roughly divided into two hydrogeologic systems: upper/north campus system and central/lower campus system. Groundwater studies conducted by UCSC in 2000 (Nolan Associates) in the North Campus area indicated that the North Campus has a relatively uniform shallow groundwater system. Due to its limited thickness and extent, and moderate permeabilities, the upper/north campus groundwater system is not considered a viable source for long-term groundwater supply for the campus.

The southern two-thirds of the campus is underlain almost entirely by marble and schist that are characterized by a relative absence of surface streams and drainage channels with most precipitation discharging to the subsurface through fractures, and the presence of sinkholes, closed depressions, and swallow holes. It is estimated that approximately 40% of the surface runoff on the campus is intercepted by the marble aquifer system (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume II). Four exploratory wells have been drilled on the campus in the past, all of which were on the lower campus. In 1989, a 7-day pumping test conducted at Well #3 indicated that the well could produce 100 gallons per minute (gpm) for long-term pumping without causing significant water level declines in the marble aquifer, and without affecting springs and spring–fed streams near the lower campus (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume II). To date, Well #3 has not been used for any purpose other than to periodically monitor groundwater levels and groundwater quality. See the GROWTH INDUCEMENT (Chapter 5.0) section of this EIR for further discussion of campus groundwater sources.

Although campus groundwater sources have not been used to date, the University adopted a mitigation measure as part of its 2005 LRDP EIR that indicates that during drought conditions, the campus would extract groundwater for non-potable uses from the karst aquifer underlying the lower half of the campus to offset campus water demand in drought years (LRDP Mitigation UTIL-9I). Under this measure, it was assumed that groundwater would be

extracted from Well #3 during the eight driest months and would be used for irrigation on the Center for Agroecology and Sustainable Food Systems (CASFS) and at the UCSC Arboretum. The University estimated a total of 1.1 MGY (approximately 3.4 AF) of water would be extracted (University of California Santa Cruz, September 2006, 2005 LRDP Final EIR, Volume II). Existing average annual demand at these facilities is approximately 10 MGY (University of California Santa Cruz, May 2009).

RELEVANT PROJECT ELEMENTS

The proposed project consists of an amendment to the City of Santa Cruz Sphere of Influence (SOI) to include a 374-acre portion of the UCSC "North Campus" as shown on Figures 1 and 3 for the purpose of providing extraterritorial water and sewer services. Applications to LAFCO were made by the City and UCSC in accordance with provisions of the "Comprehensive Settlement Agreement" regarding the University's 2005 Long Range Development Plan EIR. The Agreement indicates that "to assist UCSC in achieving its on-campus housing capacity commitment", the City will continue to provide water service to the Campus through its existing connections (section 2.7 of the Agreement). .

Implementation of the proposed project would adjust the City's probable physical boundaries and service area for water and sewer service to include the project area in which UCSC proposes development in its adopted 2005 LRDP and as set forth in the Comprehensive Settlement Agreement. The 2005 LRDP estimates an on-campus enrollment of 19,500 students by the academic year 2020. UCSC's 2005 LRDP designates the project area for a mix of college, housing, physical education, academic facilities, campus reserve and protected landscape/resource land uses, which are further described in the LAND USE (Chapter 4.3) section of this EIR. Maximum new development under the 2005 LRDP is estimated to be 3,175,000 gross square feet, which may occur within the project area under provisions of the Comprehensive Settlement Agreement.

At this time, no annexation of land is proposed, nor has the University proposed site-specific development in the North Campus area. As previously indicated, there are no site-specific plans to extend infrastructure into this area. However, the 2005 LRDP includes a conceptual plan to extend water lines to the project area primarily within a new planned roadway in the North Campus area as shown on Figure 12.

IMPACTS AND MITIGATION MEASURES

CRITERIA FOR DETERMINING SIGNIFICANCE

In accordance with CEQA, State CEQA Guidelines (including Appendix G), City of Santa Cruz plans and policies, and agency and professional standards, a project impact would be considered significant if the project would:

- Have insufficient water supplies available to serve the project from existing entitlements and resources and/or require new or expanded entitlements to serve the project; or
- Require or result in the construction of new water treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

The following analysis assesses impacts to the City of Santa Cruz water supplies as a result of the proposed Sphere of Influence amendment to provide extraterritorial water and sewer service to the project area. The City Water Department indicates that the proposed project will not result in the need to construct or expand its water treatment facility or other water infrastructure/facilities to accommodate future water demand resulting from the proposed project (Kocher, City of Santa Cruz Water Department, personal communication, August 2009).

The City of Santa Cruz Water Department reviewed the project and determined that preparation of a Water Supply Assessment (WSA) was necessary as the project would indirectly result in a water demand greater than the equivalent of 500 or more residential units, which under state law requires the preparation of a WSA. A 500-unit residential development within the City of Santa Cruz would use between approximately 26 and 42 MGY (approximately 80-130 AFY), and the project water demand is estimated as 100 MGY as further discussed below. Thus, the City determined that a WSA was required for the proposed project in accordance with state law. The WSA is included in Appendix B of this EIR, and is summarized in the following impact analyses.

On October 27, 2009, the Santa Cruz City Council approved the WSA in accordance with California Water Code requirements. A number of letters of comment were submitted to the Council regarding the WSA. Pursuant to the Council's directive, these letters are included in Appendix F of this EIR. Preliminary responses have been provided by the City Water Department. However, all comments received on the WSA will be considered and responded to as part of the Final EIR and response to all comments received on the Draft EIR.

The indirect, secondary effect of campus development on campus groundwater resources is addressed in the GROWTH INDUCEMENT (Chapter 5.0) section of this EIR.

IMPACT ANALYSIS

Impact 1-1: The proposed project would result in future provision of water service to the North Campus portion of the UCSC campus that would support new planned development and growth to the year 2020. There are adequate supplies to serve the project water demand in normal years, but there are inadequate water supplies to serve the project under existing and future dry year (drought) conditions. This is considered a potentially significant impact.

Project Water Demand

Portions of the proposed SOI amendment project area are designated for development of colleges, housing, and physical education and recreation uses in the UCSC 2005 LRDP. Maximum new development square footage under the 2005 LRDP is estimated to be 3,175,000 square feet for the entire campus, but this could be developed in the North Campus under provisions of the Comprehensive Settlement Agreement. The LRDP does not specify how much development will be in the North Campus, and the Comprehensive Settlement Agreement section 2.8 says UCSC will apply for extraterritorial water and sewer service for development of 3,175,00 gsf. Thus, for the worst-case CEQA analysis and estimating water demand, all LRDP development was assumed to occur in the project area, except for approved projects on main (central) campus that were deducted as discussed below, although it is not likely that all new LRDP development will occur in North Campus. Thus, implementation of the proposed project would enable UCSC to move forward with plans to develop the North Campus as set forth in its adopted 2005 LRDP with accompanying water demand.

Campus water demand was assessed as part of the WSA based on water demand estimates developed for the 2005 LRDP Final EIR, existing water demand, and provisions of the Comprehensive Settlement Agreement. Project water demand is summarized in Table 2-4, which shows that in the year 2020, project water demand is estimated to increase by 100 MGY (approximately 310 AFY) over existing demand. The total increase in water use by 2020 for all of the UCSC properties is projected to be 126 MGY (approximately 390 AFY).

Additional development associated with the 2005 LRDP was based on estimates prepared for UCSC (ARUP, 2006) that accounted for historical water use and new and approved facilities and water conservation with use of low-flow fixtures in new developments. The WSA concluded that the ARUP conservation projections appear reasonable based on measured historical on-campus water use and the percent savings documented by EPA retrofit studies. The projections in Table 2-4 also consider a number of projects that have been proposed or recently approved that would fall under the estimates for additional campus development, but are actually located on the main campus outside the proposed SOI project area. These projects are subtracted from the project water use, but included for other UCSC facilities as shown on Table 2-4.

The UCSC water demand estimates provided in Table 2-4 also account for provisions of the Comprehensive Settlement Agreement that stipulates construction of additional on-campus student housing (beds) and implementation of conservation measures (per Maddaus Water Management study, December 2007). The additional housing (935 student beds above what was estimated in the 2005 LRDP Final EIR) is estimated to have a water demand of 14 MGY (approximately 45 AFY). UCSC's implementation of high-priority conservation measures is estimated to reduce water use by 30 MGY (approximately 90 AFY) (EKI, September 2009) based on an estimated 15% reduction over existing uses. This savings reflects implementation of measures that address existing campus development and do not include water savings with new development as identified in the ARUP study.

Water demands associated with other future UCSC facilities (such as 2300 Delaware and the Marine Science Campus) are also listed in Table 2-4 in order to provide a complete estimate of future increases in UCSC's water use for the purpose of updating the City's service area-wide demands. The total UCSC-related water demand in the year 2020 is estimated as 338 MGY (approximately 1,040 AFY).

Water Supply Assessment

The findings and conclusions of the WSA regarding project water demand and availability are summarized below. UCSC water demand was included in the City's 2005 Urban Water Management Plan (UWMP) based on a draft LRDP available at the time the UWMP was prepared, which envisioned a total campus enrollment of 21,000 students. As such, information from the 2005 UWMP was used in the WSA to fulfill requirements outlined in Water Code Section 10910 (d), (e), (f), and (g) and supplemented with new information provided by city staff (EKI, September 2009).

Water demand projections used to prepare the 2005 UWMP (Maddaus Water Management, 1998) included up to 408 MGY (approximately 1,250 AFY) of water use by UCSC, an increase of 87 MGY (approximately 270 AFY) over the 2005 water use of 321 MGY (approximately 985 AFY) projected for UCSC. The water service area projection was based on local population and employment trends published by AMBAG in 1997, demographic data and land use information from the City and County of Santa Cruz and the City of Capitola general plans, and estimates of water conservation savings from recent plumbing code changes. This projection proved to be a high estimate of demand growth, with UCSC's actual water use in 2005 averaging approximately 205 MGY (approximately 630 AFY) instead of the projected 321 MGY (City of Santa Cruz Water Department, February 2006). Additionally, as previously mentioned, the demand projections were high for all user groups.

TABLE 2-4: Project Water Demand Summary
(IN MILLION GALLONS PER YEAR [MGY])

Area	Subtotal	TOTAL
UCSC – SOI Amendment Project [1]		
▪ UCSC LRDP Additional Development – Main and North Campus [2]	122	
▪ UCSC LRDP-Summer Session	10	
▪ Plus 935 new beds per Settlement Agreement	14	
▪ Less Conservation Savings per Settlement Agreement	-30	
▪ Less Approved/Proposed New LRDP Development located outside SOI Amendment area [3]	-16	
Subtotal		**100**
UCSC – Other Growth		
▪ Approved/Proposed New LRDP Development located ▪ outside SOI Amendment area [3]	16	
▪ UCSC LRDP-Delaware (2007-2020) [4]	1	
▪ UCSC Marine Science Campus (2007-2020) [4]	9	
Subtotal		**26**
UCSC – Existing Water Demand – 2007 [5]		
▪ Main Campus	200	
▪ UCSC LRDP-Delaware	2	
▪ UCSC Marine Science Campus	10	
Subtotal		**212**
UCSC TOTAL to 2020		**338**

[1] Developed by Erler & Kalinbowski, Inc. (EKI) as part of the project "Water Supply Assessment" based on proposed development square footages and water use factors identified by ARUP for UCSC (August 28, 2006) and as modified by Settlement Agreement as shown below.
[2] Additional development was estimated by ARUP (2006) as part of 2005 LRDP FEIR and were based on the area of previously approved projects and proposed new land uses from the 2005 LRDP multiplied by water use factors derived from historical UCSC water use and incorporation of water-efficient fixtures in new development.
[3] Projects under construction/proposed under adopted 2005 LRDP that are located outside of SOI Amendment area (Infrastructure Improvements, Porter Housing, Biomed Facility, Health Center, East Campus Infill Housing) (University of California Santa Cruz, July 2009).
[4] Based on UCSC water use demand projections (year 2020) less existing use (year 2007).
[5] Provided by UCSC.

Water demands for the City's entire service area was updated as part of the WSA. Projections for the City's water service area were developed for two separate demand scenarios (low/historic and high water use growth) as set forth in the UWMP. The UWMP water demand projections were updated from the 2005 UWMP as part of the WSA for the following two reasons: 1) to extend the projections out to the year 2030 (pursuant to state law requiring that a 20-year period be reviewed); and 2) to incorporate changes to UCSC's future demand projections in accordance with the 2005 LRDP Final EIR and provisions of the Comprehensive Settlement Agreement. The updated projections also are based on current AMBAG population projections (June 2008) that were multiplied by the average per capita water use projected for the years 2010 through 2020 in the UWMP for a 0.4% (low/historic) and 0.8% (high) annual water demand growth rate. The 0.8% annual increase (Scenario 1 in the WSA) reflects a high growth in the City's three largest customer classes (residential, business, and irrigation), which is consistent with general plans for the City's service area. The 0.4% annual increase (Scenario 2 in the WSA) reflects historical trends in water demand growth. Both of these growth rates are used in the city's existing UWMP. The updated and extended water demands are included in Appendix B and further discussed in the "Cumulative Impacts" subsection of the CEQA CONSIDERATIONS (Chapter 5.0) section of this EIR.

CONCLUSION – SUPPLY AVAILABILITY

Normal Year. The WSA concludes that the City's supplies are sufficient to meet the City's existing and project water demands in a normal year through the year 2030 based on a 0.4% annual increase in customer classes, which is consistent with historical trends in growth. This includes other existing and planned future uses in the City's water service area through the year 2030 (i.e., the 20 year evaluation horizon for this WSA). The proposed project would accommodate water service in the project area for development under UCSC's 2005 LRDP projected through academic year 2020-2021. Therefore, there are sufficient City water supplies to meet project water demands under historical growth conditions.

However, the WSA concludes that the City could potentially face a supply shortfall during normal years after the year 2025 with existing, project and other water demand growth in the City's water service area. This assumes a 0.8% annual increase in the City's three largest customer classes and is consistent with general plans for the City's service area, The magnitude of this potential supply shortfall is estimated as 42 MGY (approximately 130 AFY), and would not occur until at least 2025.[8] However, water supplies are sufficient to serve the proposed project in a normal year during the 20-year horizon based on existing water demand without other significant growth in the water service area; impacts with other development and water demand are further addressed in the "Cumulative Impacts" subsection of the CEQA CONSIDERATIONS (Chapter 6.3) section of this EIR.

[8] The City's existing adopted IWP and UWMP predict that a shortfall during normal years could occur after the year 2015. The new finding cited in the WSA reflects an updated projection based on current AMBAG population projections, as well as reduced demand throughout the water service area that has occurred since adoption of these plans and since the former growth projections used to develop these plans.

Dry Years. The WSA concludes that the City does not have sufficient water to meet current or future projected water demand during dry years, irrespective of the proposed project, under either the low or high growth scenario This finding is consistent with the 2005 UWMP findings and the conclusions presented in the 2003 Integrated Water Plan ("IWP"), which state that: "The City's water system is grossly inadequate to meet current demand under drought conditions" (Gary Fiske & Associates, 2003).

Supply deficits are projected to be the greatest during the second year of a multiple-year drought. Supply deficits projected for 2010 range from 30% (WSA "Scenario 2"-0.8% annual demand growth) to 31% (WSA "Scenario 1"-0.4% annual demand growth). In 2030 this shortfall is projected to range from 36% (WSA Scenario 2) to 38% (WSA Scenario 1). Thus, the maximum projected supply shortfall presented in the WSA occurs in the year 2030 under Scenario 1, with a total supply deficit of 1,656 MGY (approximately 5,100 AFY). Compared to the project demand of 100 MGY and a maximum estimated future new development demand of 356 MGY (WSA Scenario 1), it is evident that most of the City's dry-year supply shortfall is due to existing uses. Even in the "worst-case scenario" multiple-year drought, (i.e., WSA Scenario 1), implementation of the proposed project accounts for only 6% of dry-year supply shortfall (100 MGY out of 1,656 MGY), while other new development accounts for 21% of the supply shortfall (356 MGY out of 1,656 MGY) and existing users account for 72% of the supply shortfall (1,200 MGY) (EKI, September 2009).

It is important to note that the discussion above focuses on annual water supply shortfalls, and does not address peak season cutbacks, which can be significantly greater than the annual supply shortfall due to seasonal variations in demand and supply, and limitations on the City's water storage facilities (EKI, September 2009).

Conclusion. Water supplies are sufficient to serve the proposed project in a normal year with existing water demand. Water supplies in a normal year may be insufficient after the year 2025 with other new development and growth in the City's water service area under a "high" water demand growth (0.8% per year) scenario, which is further addressed in the "Cumulative Impacts" subsection of the CEQA CONSIDERATIONS (Chapter 6.3) section of this EIR.

Water supplies are not sufficient under existing conditions in dry years. Due to existing insufficient water supplies during dry waters, additional demand from the proposed project would be considered significant. Even though implementation of the proposed project accounts for only 1% of dry-year supply shortfalls in 2030, due to the size of the demand and the fact that the UCSC is the largest water customer in the service area, the additional project demand could potentially result in bringing the City into a more severe curtailment stage. Therefore, this is considered a significant impact.

The City Water Department estimates that approximately 64% of service area demand occurs over an approximate 7-month period of the year, during which time water supplies would be constrained during dry years. Based on this percentage, the proposed project's water demand during dry years would result in an additional demand of 64 MG or approximately 299,000 gpd prior to implementation of UCSC's required LRDP mitigation measures and Comprehensive Settlement Agreement commitments as discussed further below. This could potentially require the City to move into a more severe curtailment stage. With implementation of the LRDP mitigation measures and Comprehensive Settlement Agreement commitments, project water demand during the peak season in dry years is estimated at 53 MGY, which could result in additional per connection curtailments of 11 gpd than it otherwise would have been reached.

As previously mentioned, the City is pursuing construction of a desalination plant to provide a supplemental water supply in dry years, which is necessary even without the proposed project. This is further addressed below.

Reasonably Foreseeable City Water Supply Sources

DESALINATION

The City is actively pursuing construction of a desalination plant as the preferred supplemental water source identified in the City's adopted IWP and UWMP. The City's adopted IWP reviewed six alternatives and identified seawater desalination as the only feasible alternative for a backup supply of drinking water during a drought to meet demand with a 15% curtailment level set forth in the adopted IWP. The other alternatives would not provide the yield needed to accommodate existing and future drought demands during a multiple-dry year period. As currently envisioned, the desalination facility would initially provide 2.5 mgd for supplemental supply during a drought and could be expanded to 4.5 mgd.

As a preliminary step, the City recently completed operation of a "pilot project" to gather information to establish the optimal design and operating parameters for a permanent facility. Based on these results, the City is moving forward with design plans and environmental review for a permanent facility for drought protection, which is expected to be constructed and in operation by the year 2015, pending completion of project-level environmental review and regulatory permit approvals, i.e., approval of a coastal development permit.

The City acknowledges some uncertainty related to the approval and timing of the permanent desalination plant construction and operation. The likelihood of construction of a permanent plant is currently uncertain as design plans have not been completed, as well as uncertainty as to whether the Coastal Commission would issue the necessary approvals. The project would be subject to further environmental review and permit approvals, which themselves create additional uncertainty. For these reasons, the City concludes that it cannot "confidently

determine" that this source is "reasonably likely," as spelled out in the guidance provided by the California Supreme Court in its decision in *Vineyard Area Citizens et al. v. City of Rancho Cordova* (2007) 40 Cal.4th 412. Nonetheless, the City has identified a desalination plant as its best option to alleviate shortages in drought conditions, and therefore has committed to pursuing this option in the hope that it will obtain all necessary regulatory approvals. Thus, the future desalination facility, which is planned and being pursued, is considered to be the most likely future water source, although it nonetheless remains somewhat uncertain until design, environmental review and regulatory approvals are completed.

Another consideration regarding whether a desalination plant is likely to be constructed and operated is the fact that the City and Soquel Creek Water District (SqCWD) are pursuing the desalination plant as a joint project. The SqCWD would use some or all of the future plant's capacity when the City doesn't need it to reduce reliance on groundwater and potential seawater intrusion. The SqCWD would share in the cost of building and operating the plant. In 2006, the SqCWD Board adopted its updated Integrated Resource Plan, which identifies this regional desalination plan as its preferred use alternative, and the District has provided assistance with funding for the pilot desalination plant.

POTENTIAL IMPACTS OF DESALINATION FACILITY

The desalination concept adopted by the City involves constructing a seawater intake system using an existing, abandoned wastewater outfall, building a new desalination plant and installing the associated pipelines and pump stations for delivering treated water to the Bay Street Reservoir and conveying seawater concentrate to the City's wastewater facilities, where it would be blended with municipal wastewater flows and disposed via a deep ocean outfall (City of Santa Cruz Water Department, February 2006). A desalination facility site was identified along the Delaware corridor. The certified IWP EIR evaluates impacts of the construction of a desalination facility and associated pipelines on a programmatic level for the initial construction of a 2.5 mgd facility for drought protection (Alternative D-1) and the same with participation of the SqCWD (Alternative 2) and two subsequent expansions (3.5 and 4.5 mgd) for each alternative. The EIR document, which consists of the following two documents, is hereby incorporated by reference in accordance with the provisions of the State CEQA Guidelines section 15150.[9]

- City of Santa Cruz Water Department. June 2005. *Draft Integrated Water Plan Program Environmental Impact Report.* State Clearinghouse #2003102140. Prepared by EDAW.

[9] The EIR documents are available for review at the City of Santa Cruz Water Department, 809 Center Street, Room 102, Santa Cruz, California 95060; phone: 831-420-5200 and are also available for review online at: http://www.ci.santa-cruz.ca.us/.

- City of Santa Cruz Water Department. October 2005. *Final Program Environmental Impact Report, Response to Comments Document.* State Clearinghouse #2003102140. Prepared by EDAW.

Construction of a desalination plant could have physical environmental effects, and the IWP EIR identified potentially significant impacts that could be mitigated to a less-than-significant level, except for temporary construction noise, which was found to be a significant unavoidable impact. Potentially significant impacts that could be mitigated are summarized in Chapter 1 of the Draft EIR and updated in Chapter 3 of the Final EIR and include the following: hydrology and water quality, marine resources, land use, biological resources, air quality, noise, geology and soils, cultural resources, public services and utilities, visual resources, hazardous materials, and traffic. The identified impacts included both impacts of plant operation and construction. These are summarized below. It should be noted, however, that further project-specific environmental review will be conducted once permanent plant design plans are prepared.

Potentially significant desalination plant operational impacts include:

- *Water Quality Degradation* (5.1-2) due to discharge of seawater concentrate from the desalination plant and improper storage, use and disposal of chemicals at the desalination plant (5.1-3). The seawater concentrate produced from the desalination plant is proposed to be mixed with the effluent from the City's wastewater treatment plant. The analysis found that this combination would not exceed the City's wastewater plant discharge requirements and the salinity level would be lower than that of the ambient ocean water. With proper management, impacts would be reduced to a less-than-significant level. This includes construction of concentrate storage at the treatment plant for times when effluent flow is not adequate for mixing with the concentrate being generated by the desalination facility and control of mixing with automatic and continuous monitoring. Chemicals would be required to be properly stored and disposed, and the facility would be designed to prevent disposal of chemicals into the concentrate waste stream.
- *Impacts to Marine Resources* due to operation of the seawater intake which could entrap marine organisms (5.2-1). Construction of intakes, pumps and other facilities could result in disturbance to marine and/or nearshore habitat and species (5.2-4, 5.2-9). The impacts of the intake were determined to probably not be significant because the maximum daily intake is much lower than volumes that have been found to have significant adverse impacts on marine organisms and because the intake would be designed to reduce losses. However, this issue would require more detailed studies and analyses for a 4.5 mgd facility. Construction of facilities would proceed after site-specific reviews determine that none are located in sensitive areas.

- *Exposure to Flood* (5.1-4), *Seismic Hazards* (5.7-1), and/or *Soils Limitations* due to project siting (including distribution facilities) and operation that could be mitigated by implementation of recommended engineering and design measures to withstand and minimize damage from these hazards.
- *Impacts to Cultural Resources* due to inadvertent disturbance of potential or unknown cultural resources during (5.8-1, 5.8-2, 5.8-3) that can be mitigated by pre-construction and during construction surveys and protection.
- *Removal of Emergency Wastewater Discharge Pipeline* (5.9-4) with use of the wastewater plant's abandoned outfall line for the intake system that would be mitigated with upgrades to the treatment plant facilities.
- *Visual Impacts* (5.10-2, 5-10.3) that can be mitigated with proper design and vegetative screening.
- *Hazardous Exposure* to workers due to accidental spills and/or release of chemicals (5.11-1, 5.11-3) or disturbance of contaminated soils during construction (5.11-2) that can be mitigated with implementation of proper storage, containment, and emergency controls.

Construction impacts include:

- *Water Quality Degradation* (5.1-1) due to construction of the pipeline in locations close to surface water bodies and potential erosion during construction (5.7-2). These would be mitigated with implementation of construction controls and best management practices.
- *Impacts to Biological Resources* due to construction that may disturb sensitive habitat or special status species (5.4-1, 5.4-2, 5.4-3, 5.4-4, 5.4-5) or result in indirect impacts related to sedimentation (5.4-6). These impacts can be mitigated with standard pre-construction surveys, siting to avoid sensitive resources, establishment of construction buffer zones, and other construction controls and best management practices to prevent indirect impacts.
- *Air Emissions*, primarily related to air emissions during construction (5.5-2), that would be mitigated with standard dust control measures during construction.
- *Construction Traffic* for temporary periods during construction (5.12-1, 5.12-2) that can be mitigated with implementation of traffic control plans and measures.
- *Solid Waste Generation* (5.9-3) that would be mitigated with construction specifications regarding excavation reuse and recycling.
- *Construction Disturbance to Adjacent Land Uses* (5.3-1) due to construction noise, dust, etc. and potential interference with utility lines (5.9-1) that could be mitigated to some extent, although not to a less-than-significant level, with construction controls, such as limits on hours of operation.

The EIR also found that the first construction increment for both alternatives would have no growth-inducing impacts, and that the subsequent plant expansion increments would require further review of population projections and City/County land use planning documents prior to any expansion of a plant to ensure that development of an additional water supply is consistent with planned growth projections (City of Santa Cruz Water Department & EDAW, June 2005). In most cases, the EIR concluded that the CEQA significance level of impact between Alternatives D-1 and D-2 is similar (with D-1 being the City building a desal plant exclusively for its own use and D-2 being a joint project between the city and the SqCWD), except for the impact on local and regional groundwater supply. For this environmental issue area, Alternative D-2 is likely to provide a beneficial impact on the groundwater basin. The delivery of desalination water to SqCWD during normal and wet years would allow reduced pumping in the district and potentially contribute to additional groundwater in storage (Ibid.).

Project-level environmental review will be conducted once conceptual design plans are completed for a permanent facility, but based on the programmatic review conducted as part of the IWP, nearly all physical impacts are expected to be minimized or adequately mitigated. Expansion to provide additional capacity for planned growth would involve minimal physical expansion to add additional filters, but would also be subject to additional environmental review to further analyze growth inducement potential based on review of City, County and Capitola General Plans.

Global climate change is predicted to result in a sea level rise. The area in which a desalination plant is being considered is located approximately 20 feet above sea level, and not within areas that have been estimated to be affected by sea level rise within the City. Nonetheless, project design plans and future site-specific environmental reviews will need to assess and address this issue.

ADDITIONAL CONTINGENT CITY WATER SOURCES

As previously discussed, several possible water supply options were carefully evaluated, including drilling more wells, upgrades to the North Coast system, and a water transfer involving exchange of groundwater with recycled wastewater for agricultural use on State Park lands north of the City. Both the wells and groundwater exchange concept ultimately proved infeasible, leaving seawater desalination as the only practicable solution available to the City (City of Santa Cruz Water Department, February 2006). Recycled wastewater was determined to be potentially feasible for agricultural irrigation, but would produce high cost, limited yields that were too small to meet the City's drought-year needs (Ibid.).

Recycled water for landscape irrigation remains a viable alternative that could be pursued in the future. However, currently it is not the City's preferred water supply strategy. The use of recycled water for landscape irrigation was eliminated due to a number of reasons, including the limited yield and high cost. The potential users of the recycled water (i.e., parks, schools,

cemeteries, golf courses, UCSC) have an estimated outdoor irrigation demand of approximately 170 to 230 MGY (approximately 520-700 AFY). This amount was considered too small by itself to meet the City's drought-year needs and also had a high capital cost. Additionally, water recycling would be as expensive as desalination and would not provide a sustainable yield for a multiple-year drought scenario, and thus, would not be cost-effective.

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Improvements to maximize use of existing water sources and storage also were identified, that collectively could provide approximately 600 MGY during a two-year drought. The upgrades would provide additional supply during drought and non-drought years and would also improve operational reliability and flexibility, but shortfalls during multiple-dry year scenarios would continue to occur. These upgrades have been or are being pursued, and the production estimates for all such projects, e.g., rehabilitation of the North Coast pipeline, were assumed to be completed and incorporated into the drought "savings" built into the IWP.

The City's UWMP indicates that, in addition to pursuing desalination, the City remains open to exploring other water supply alternatives that would not be feasible to develop in the short-term, but may be useful to consider over a 20-year timeframe, such as water recycling, groundwater recharge, reservoir expansion, aquifer storage and recovery and off-stream storage. These potential alternatives have not yet been fully studied and consideration of such sources would occur at some point further in the long-term.

Potential UCSC Water Sources

The 2005 LRDP EIR includes an adopted mitigation measure (UTIL-9G) that requires UCSC to prepare a study on feasible measures for utilization of reclaimed water (including rainwater, grey water, cooling tower blowdown water and/or recycled water) in new development. A draft report was completed for the University in 2008 (ARUP, March 2008) that reviews three new supply alternatives including: rainwater harvesting; greywater recycling; and blackwater recovery. The study was submitted to the City during the preparation of this EIR and its findings are summarized below. It should be noted, however, that the City has not conducted an independent review of the report to determine whether or not its assumptions and conclusions are accurate. However, the information is being presented to disclose the water source alternatives that are being independently evaluated by UCSC.

Potential sources of rainwater include rain collected from existing and new building roofs and parking lots. Downspouts can be constructed or retrofitted to discharge to below-ground storage tanks where the water can be treated for reuse. A combination of primary settling and disinfection is generally required for reuse of rainwater depending on its end use (ARUP, March 2008). Greywater recycling involves collection of drain water from showers, sinks, laundry, and laboratory equipment which do not accept organic matter. Treatment may vary depending on end use and the types of pollutants in collection areas. Typically, treatment would involve primary grit and surfactant removal, followed by additional disinfection (Ibid.). Blackwater recycling is the collection and recovery of water from all domestic wastewater drains, including showers, sinks, laundry, laboratory equipment, toilets, urinals,

and kitchen sink facilities. Though they result in substantially greater water recovery compared to greywater or rainwater treatment systems, blackwater treatment systems are considerably more costly (Ibid.).

The study concluded that the studied alternatives could result in a water source of approximately 88 MGY when applied to new development with a further increase if existing facilities were retrofitted. The non-potable new water demand was estimated at approximately 62 MGY, including both indoor (55 MGY) and outdoor (7 MGY) demand (ARUP, March 2008). Rainwater harvesting and greywater recycling were identified as priorities for new North Campus buildings and new Family Student Housing, that would result in a water savings of about 28 MGY (Ibid.).

The study does not identify costs, nor has UCSC identified a schedule for implementation. Since the City does not have control over UCSC development and water use, these non-potable alternative water systems are not considered reasonably foreseeable City water sources for the purposes of this EIR's analysis. However, to the extent that UCSC develops a program for implementation, especially for new buildings, the SOI project water demand on City supplies would be correspondingly reduced. It is noted that rainwater harvesting in the North Campus area may need to be carefully reviewed in light of the adopted 2005 LRDP Mitigation Measure HYD-5A (via implementation of Mitigation Measure HYD-3D) that requires that runoff from new impervious areas in the north campus would still be allowed to infiltrate and thereby recharge the local groundwater system. The City expects that if the University were to develop any projects to augment its water supplies, further environmental review would be conducted.

Mitigation Measures

Construction of a desalination plant, as planned by the City of Santa Cruz, will provide a sufficient supplemental water supply during drought conditions for both existing and future demand. However, the project impact on water supply during dry years is considered significant and unavoidable because of the inherent uncertainty about the City's ability to obtain all necessary approvals for, and completion of, the planned desalination plant to provide adequate water supplies during a drought.

Implementation of the nine mitigation measures adopted by The Regents of the University of California in approving the 2005 LRDP (as listed below), which are binding as part of the University's adopted Mitigation Monitoring and Reporting Program (MMRP), would reduce the severity of the impact. The implementation of the Comprehensive Settlement Agreement includes several provisions regarding UCSC water demand as set forth in Mitigation Measures 1-1 and 1-2, which are also binding and enforceable through judicial enforcement of the final judgment.

UCSC 2005 LRDP FEIR MITIGATION MEASURES

UTIL-9A The Campus shall continue to implement and improve all current water conservation strategies to reduce demand for water, including the following:

- Continue the leak detection and repair program.
- Install an individual water meter in each new employee housing unit to encourage residential water conservation.
- Install waterless urinals in all new buildings.
- Require that new contracts for washing machines in student residences be certified by the Consortium on Energy Efficiency 6 to have a water factor of 5.5 or less or meet an equivalent standard. New washing machines purchased for use in athletic facilities shall meet applicable standards for water-efficiency for institutional machines.
- Incorporate water-efficient landscaping practices in all new landscape installations. Water-conservative landscaping practices shall include, but will not be limited to the following: use of water-efficient plants, temporary irrigation systems for plant establishment areas where mature plants will be able to survive without regular irrigation, grouping of plants according to their water requirements, design of planting areas to maximize irrigation pattern efficiency, and mulch covering in planting areas.
- To facilitate monitoring of water usage in all new development, the Campus shall: (1) install separate meters on water lines for individual buildings and (2) install meters on irrigation lines where one point of connection irrigates 5,000 square feet or more.

UTIL-9B As new technologies become available, the Campus shall continue to conduct pilot programs for high-efficiency plumbing fixtures including, but not limited to, dual-flush toilets. If a piloted technology proves to be successful (i.e., the high-efficiency fixtures are effective in water savings and do not require more frequent or expensive maintenance than the existing standard), the Campus shall revise its standards to require use of the fixtures in all new buildings and in existing buildings as existing fixtures need to be replaced.

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UTIL-9C Within one year following approval of the 2005 LRDP, the Campus shall implement a water conservation education program for campus residents. This will include but would not be limited to:

- Distribution to residents of employee housing of educational materials covering the following topics: basic home water conservation practices, plumbing retrofits and replacements, and strategies to conserve landscape irrigation.
- Designation of a staff member who will be responsible for developing and implementing a water conservation education and awareness

program to reduce water consumption in student residences, dining halls, and student affairs facilities.

UTIL-9D Within one year following approval of the 2005 LRDP, the Campus shall consult with the City of Santa Cruz regarding the appropriate scope of and initiate, an engineering audit of campus water use. The audit will assess existing campus water uses, identify options for reducing water consumption, prioritize feasible improvements based on the amount of potential water savings and cost effectiveness, and recommend top priority measures for implementation within the succeeding five years, and lower priority measures for potential subsequent implementation. The Campus will re-evaluate the lower priority measures during subsequent updates of the audit. The audit will include, but will not be limited to the following:

- An inventory of plumbing fixtures in all facilities on campus, which will identify the number and locations of fixtures and identify those that do not meet current campus standards for water efficiency. (Regarding retrofit of plumbing fixtures in student housing, see LRDP Mitigation UTIL-9H.)
- An inventory of irrigation systems on the campus, including identification of systems that are not metered, the methods used to control the irrigation schedule, and potential for improvement.
- An inventory of locations on campus where buildings and irrigation are on the same meter.
- An analysis of potential water conservation measures for the campus cooling water system.
- Identification of landscaped areas on campus that have plants that are high water-use.
- An engineering estimate of the additional water savings that would be achieved through implementation of the "high priority" measures and a re-evaluation of the University's projected 2020 water demand.

UTIL-9E The Campus shall begin implementation of the top priority recommendations of the water audit conducted under UTIL-9D within one year of completion of the audit and complete implementation of the top priority recommendations within five years after completing the audit.

UTIL-9F The Campus shall, at intervals of no more than five years, during the term of the 2005 LRDP, revisit the results of the water audit conducted under LRDP Mitigation UTIL-9D, consult with the City of Santa Cruz Water Department, conduct round table discussions with representatives of relevant campus departments, and conduct additional study of new technologies as needed to identify additional feasible and effective water conservation measures for

implementation on the campus during the subsequent five year period. The following are among the measures that shall be considered:

- Adding existing irrigation systems to the campus's central control system.
- Retrofitting existing water meters such that building use and irrigation are separately metered.
- Replacing natural turf on athletic fields with artificial turf.
- Installing timers on showers in student residences.

UTIL-9G Within two years following approval of the 2005 LRDP, the Campus shall initiate a study on feasible measures for utilization of reclaimed water (including rainwater, grey water, cooling tower blowdown water and/or recycled water) in new development. Potential uses of reclaimed water include cooling, irrigation, and toilet flushing. The study shall contain a plan to utilize reclaimed water in new development as feasible and effective in water conservation, and shall include an implementation schedule.

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UTIL-9H Within five years following approval of the 2005 LRDP, the Campus shall complete the retrofit of all plumbing fixtures in student housing not meeting the efficiency standards current in 2005 (1.6 gallons per flush for toilets). The new fixtures installed under the retrofit program shall conform to the campus standard for new buildings current at the time of the retrofit.

UTIL-9I If and when the City implements drought emergency management measures, the University will implement the following measures for the duration of the drought emergency:

- Reduce use of potable water for irrigation on the campus landscape, the CASFS and the Arboretum in accordance with reductions required by the City for similar users.
- Utilize water from the existing supply well in Jordan Gulch for non-potable uses. The Campus shall implement a program of monitoring flow at downgradient springs during the time when the well is being used.
- Require that residential water use on campus be reduced consistent with the City's target for multifamily residential facilities.

COMPREHENSIVE SETTLEMENT AGREEMENT PROVISIONS

The implementation of the Comprehensive Settlement Agreement includes several provisions regarding UCSC water demand and development of a supplemental water source for dry-year conditions. UCSC's Settlement Agreement commitments are reflected in mitigation measures 1-1 and 1-2 below, and are judicially enforceable under the Settlement Agreement. UCSC agrees to reduce and restrict its water use during any periods of restriction or moratorium

imposed upon the City's water service area. UCSC also agrees to implement identified high priority water conservation measures, which have been factored into the project water demand analysis. The Settlement Agreement also acknowledges the City's intention to implement its Integrated Water Plan, including additional water conservation, use curtailment in droughts, and construction of a desalination plant, and UCSC will contribute funds equivalent to the City's "System Development Charges" that will serve as its "fair share" contribution to finance improvements.

1-1 Water Restrictions and/or Moratoriums:

- Except with regard to any UCSC housing projects under development, if the City establishes a service area-wide moratorium on new connections because of a water shortage emergency condition under State Water law, UCSC will not increase its water demands on the City water system from any University-owned properties, while the moratorium remains in effect.
- UCSC will comply with any service area-wide water restrictions or mandatory use curtailment imposed by the City in response to a declaration of water shortage emergency condition under State Water law.

Responsibility for Implementation: University of California Santa Cruz.

1-2 Contribution of Funds Equivalent to the City's "System Development Charges": For every increment of 85,000/gallons of water used over 206 MGY (2005 LRDP baseline year for the UCSC main campus, each incremental payment resets the baseline), UCSC will contribute funds to the City as follow.

- UCSC will pay a fee equivalent to the City's System Development Charges ("SDC") for Equivalent Residential Units ("ERU") in its service area at a rate in effect on the date of payment;
- Payments represent UCSC's proportionate share of use of City developed new water source capacity.

Responsibility for Implementation: University of California Santa Cruz.

CONCLUSION

Despite the City's intent to pursue an additional water supply for dry-year conditions, UCSC adopted mitigation measures, and UCSC's agreement to participate in city-wide curtailments and restrictions, there are some uncertainties with these future actions. The City acknowledges the inherent uncertainty about its ability to obtain all necessary approvals for, and completion of, the planned desalination facility. Furthermore, the exact timing of implementation of UCSC conservation efforts (beyond the "high priority" measures specified in the Comprehensive Settlement Agreement for implementation within 5 years) and potential

supplemental campus water sources, as well as the potential level of demand reduction, is not known. Therefore, a conservative conclusion is that the project impact on water supply during dry year conditions is significant and unavoidable, even with implementation of the identified mitigation measures.