City of
Santa Clara

2020 Urban Water Management Plan

Adopted June 22, 2021

HydroScience

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2020

Urban Water Management Plan

City of Santa Clara Water and Sewer Utilities

Santa Clara's mission is to provide our customers with a dependable supply of potable water and recycled water for irrigation and industrial purposes; environmentally-sound, wastewater collection, treatment and disposal; with all programs and services designed and implemented with economic and environmental benefits in mind.

City of Santa Clara

1500 Warburton Avenue

Santa Clara, California 95050

Adopted June 22, 2021

City of Santa Clara Resolution Number 21-8983

City of Santa Clara

1500 Warburton Avenue

Santa Clara, California 95050

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Acknowledgements

The 2020 Urban Water Management Plan is the result of many hours of hard work and collaboration. It is with much appreciation that we acknowledge Hydroscience Engineers, Inc who prepared the 2020 Urban Water Management Plan in coordination with the following City of Santa Clara staff members:

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We would also like to thank the numerous individuals within the City of Santa Clara whose knowledge, experience, insights and comments were instrumental in the preparation of the 2020 UWMP.

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TABLE OF CONTENTS

APPENDICES

Appendix M: Utilization Factor for Individual Wells (2016-2020)

Appendix N: Santa Clara County Operational Area Hazard Mitigation Plan Vol 1&2, 2017

Appendix O: Water Service and Use Rules and Regulations for Water Conservation in Landscaping

FIGURES

TABLES

ACRONYMNS AND ABBREVIATIONS

AB	Assembly Bill
ABAG	Association of Bay Area Governments
ACS	American Community Survey
ACWD	Alameda County Water District
AF	acre-feet, acre-foot
AFY	acre-feet per year
AWIA	America's Water Infrastructure Act
AWSP	Alternative Water Supply Planning
AWWA	American Water Works Association
BAIRWMP	Bay Area Integrated Regional Water Management Plan
BARDP	Bay Area Regional Desalination Project
BARR	Bay Area Regional Reliability
BAWSCA	Bay Area Water Supply and Conservation Agency
BayQWEL	Bay Area Qualified Water Efficient Landscaper Training
Cal Water	California Water Service Company
CalWEP	California Water Efficiency Partnership
CAP	Climate Action Plan
CCF	hundred cubic feet
CCWD	Contra Costa Water District
CII	commercial, industrial, and institutional
City	City of Santa Clara
COVID-19	Coronavirus
CPC	California Plumbing Code
CVP	Central Valley Project
CWRMP	Countywide Water Reuse Master Plan
DCR	Delivery Capability Report
Demand Study	BAWSCA Regional Water Demand and Conservation Projections, June 2020 report
DMMs	Demand Management Measures
DOF	Department of Finance
DOSD	Division of Safety of Dams
DRA	Drought Risk Assessment
DSS Model	Demand Side Management Least Cost Planning Decision Support System model
DWR	Department of Water Resources

ACRONYMNS AND ABBREVIATIONS

EBMUD	East Bay Municipal Utilities District
EIR	Environmental Impact Report
EO	education outreach
ERP	Emergency Response Plan
FEMA	Federal Emergency Management Agency
FT	Feet, Foot
FY	Fiscal Year
GHG	Greenhouse Gas
GMP	Groundwater Management Plan
gpcd	gallon per day per capita
gpf	gallon(s) per flush
GSA	Groundwater Sustainability Agency
GSI	Green Stormwater Infrastructure
GSP	Groundwater Sustainability Plan
GSR	Groundwater Storage and Recovery
Guidebook	Final Draft 2020 Urban Water Management Plans: Guidebook for Urban Water Suppliers
HET	High-Efficiency Toilet
HEU	High-Efficiency Urinal
HydroScience	HydroScience Engineers, Inc
IPCC	International Panel on Climate Change
IRP	Infrastructure Reliability Plan
ISG	Individual Supply Guarantee
JPA	Joint Powers Authority
kWh	kilowatt-hour
L2L	Graywater Laundry to Landscape
LCSD	Lower Crystal Springs Dam
LHMP	Local Hazard Mitigation Plan
LOS	Level of Service
LVE	Los Vaqueros Reservoir Expansion
MAP	Monitoring and Assessment Program
MCL	Maximum Contaminant Level
MGD	million gallons per day
MMWD	Marin Municipal Water District
MRP	Municipal Regional Stormwater Permit

ACRONYMNS AND ABBREVIATIONS

NPDES	National Pollutant Discharge Elimination System
OCF	Our City Forest
PREP	Potable Reuse Exploratory Plan
PRSV	Pre-Rinse Spray Valves
PSI	Pounds Per Square Inch
RCP	Representative Concentration Pathways
Region	Bay Area Region
RWF	SJ-SC Regional Wastewater Facility
RWS	City and County of San Francisco's Regional Water System
SB	Senate Bill
SBX7-7	Senate Bill Seven of the Senate's Seventh Extraordinary Session of 2009
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFPUC	San Francisco Public Utilities Commission
SGMA	Sustainable Groundwater Management Act
sq ft	Square Feet
State	State of California
STEAM	Science, Technology, Engineering, the Arts and Mathematics
STORMS	Strategy to Optimize Resource Management of Stormwater
SVCW	Silicon Valley Clean Water
SWAP	Shared Water Access Program
SWP	State Water Project
SWRCB	State Water Resources Control Board
U.S.	United States
USD	Union Sanitary District
UWMP	Urban Water Management Plan
Valley Water	Santa Clara Valley Water District
WCIP	Water Conservation Implementation Plan
WET	Water Efficient Technology
WSA	Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County and Santa Clara County
WSAP	Water Shortage Allocation Plan
WSCP	Water Shortage Contingency Plan
WSIP	Water System Improvement Program
WSMP	Water Supply Master Plan

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EXECUTIVE SUMMARY

Since 1895, the City of Santa Clara (City) has been providing safe, clean and reliable supplies of water for the residents and businesses in Santa Clara. Over the years, increasing demand for water has been met by finding new supplies: primarily by adding new wells from which to tap our groundwater resources and, since the 1960's, by delivery from the two suppliers of imported water - San Francisco Public Utilities Commission (SFPUC) and Santa Clara Valley Water District (Valley Water). The City also pursued and, since 1997, provided the use of recycled water for non-potable use in landscape irrigation and industrial processes to further decrease the potable water demand.

In response to the last drought and Governor Jerry Brown's drought State of Emergency, statewide water reduction targets needed to be met by 2020 and presented in this Plan. In 2015, the City accomplished its water reduction target and continued to decrease its water use rate (gallons per capita per day) in 2020 by an additional 2% for an overall 33% reduction from its confirmed 2020 goal. The City will continue to implement strategies to conserve water supplies while meeting the needs of the community, as it has done for decades.

This 2020 Urban Water Management Plan (UWMP) update presents the latest information from the City's wholesale suppliers and City owned supplies. Although the City can meet the demands of our service area for the foreseeable future, we plan to continue to expand and implement methods to conserve water usage and increase utilization of recycled water. The City's commitment to continue to provide a reliable and safe water supply also involves transparency and communication with the community, coordination in regional efforts, and evaluating other water supply opportunities.

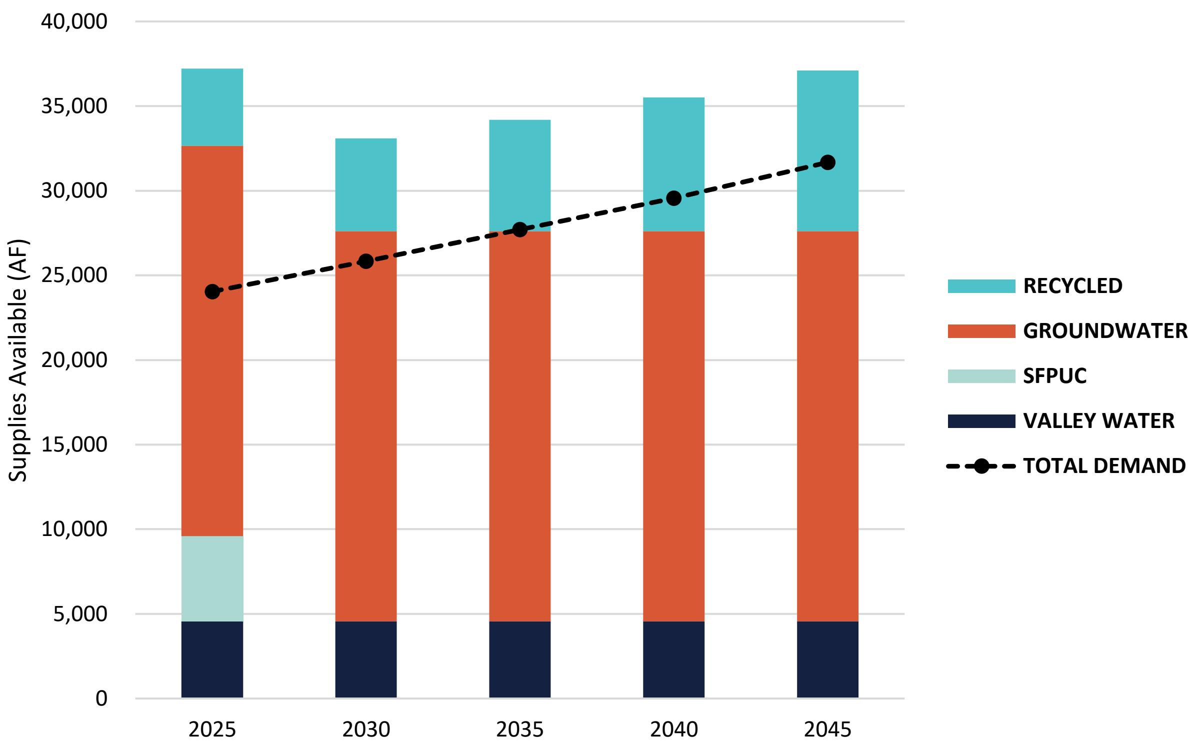
Several areas of concern and challenges must be successfully managed to continue meeting the needs of the community. These areas of concern fall primarily under three broad categories: water supply (quantity), health and safety (quality), and infrastructure replacement (system reliability).

Water Supply and Demand

The City is primarily built out and future developments are typically mixed-use developments on existing sites or conversion to multi-family units. Projections for water demand used in this study anticipate a 1.2% average annual growth for the next five years and less than 1% growth thereafter. Climate change is also considered and addressed throughout our UWMP as it affects water supplies and demands for the region. The City will continue to provide sufficient water availability from our four water sources (three potable water and one recycled water source) to deliver water to our community. Future supplies are projected to be sufficient during normal, single dry and multiple dry consecutive years.

In response to the last drought and history of dry years in the State of California, the Water Code required the addition of a Drought Risk Assessment (DRA) in this 2020 UWMP. The purpose of the DRA is to determine the reliability and capacity of the current water supply system to provide potable water during a five-year consecutive drought under projected demands for the same five years. The Water Code also increased the number of years needed to be evaluated under a multiple dry consecutive drought for future years 2025, 2030, 2040 and 2045. Under all hydrological conditions, the City is able to meet demands. In addition, recycled water is a drought proof supply and is expected to meet projected demands. The figures presented below assume that the City's contract allocation with SFPUC terminates in 2028 (worst-case condition). **Figure ES-1**, **Figure ES-2** and **Figure ES-3**, present the projected potable and non-potable water demands and supplies available during a normal year, single dry year, and five-year consecutive drought, respectively.

Figure ES-1: Normal Year Supply and Demand



Valley Water in their 2020 UWMP has projected no shortfalls during a single and multiple-dry year scenario. Valley Water has indicated that cutbacks would be required if estimated benefits from planned projects are not fully realized. Under dry year conditions, the City, as a good steward, would likely implement voluntary cutbacks and encourage water conservation among its customers. In conjunction with Valley Water's 2040 Water Supply Master Plan, both documents help define the future water supply for Santa Clara County including quantities to be available to the City. The current supply from Valley Water is 22% of the City's total potable water supply. Portions of their plans are incorporated in this UWMP, as well as information from their 2016 Groundwater Management Plan. Valley Water's sources of supply will be particularly important in the event of the loss of SFPUC water, either from natural disaster, policy change, contractual agreement termination and/or climate change impacts.

Figure ES-2: Single Dry Year Supply and Demand

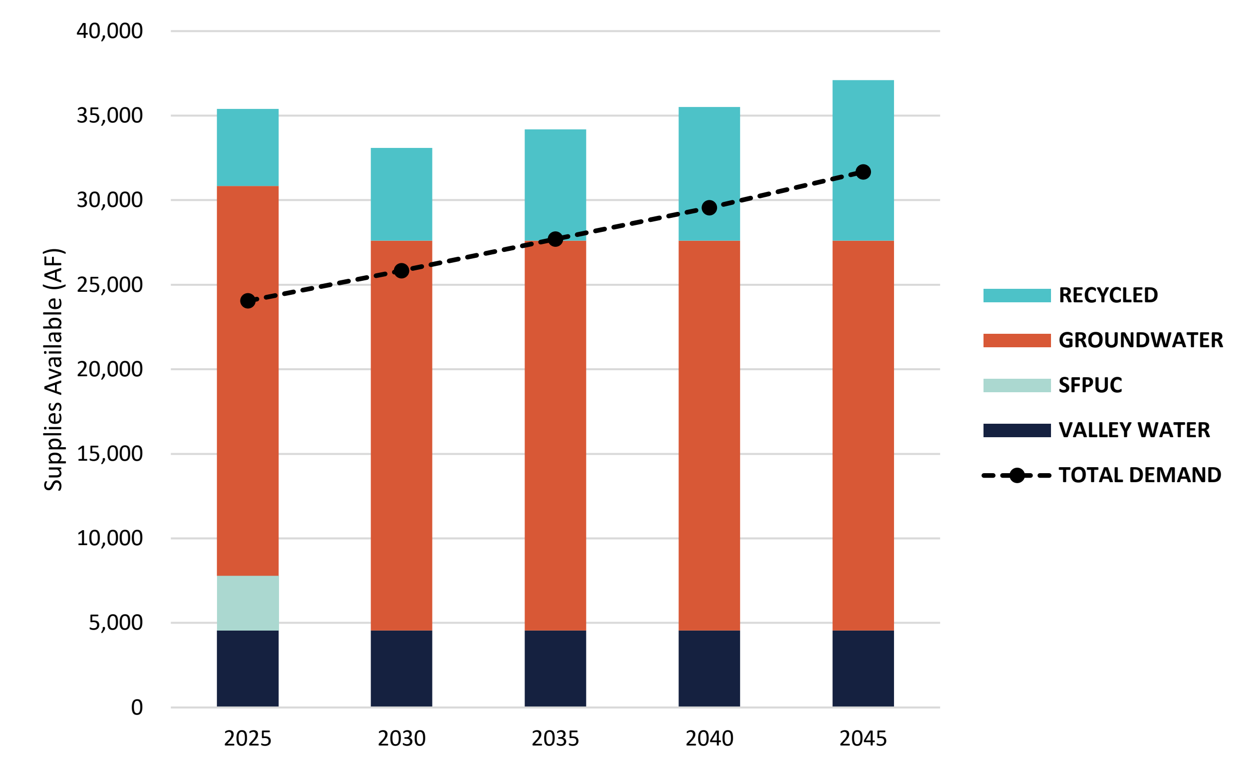
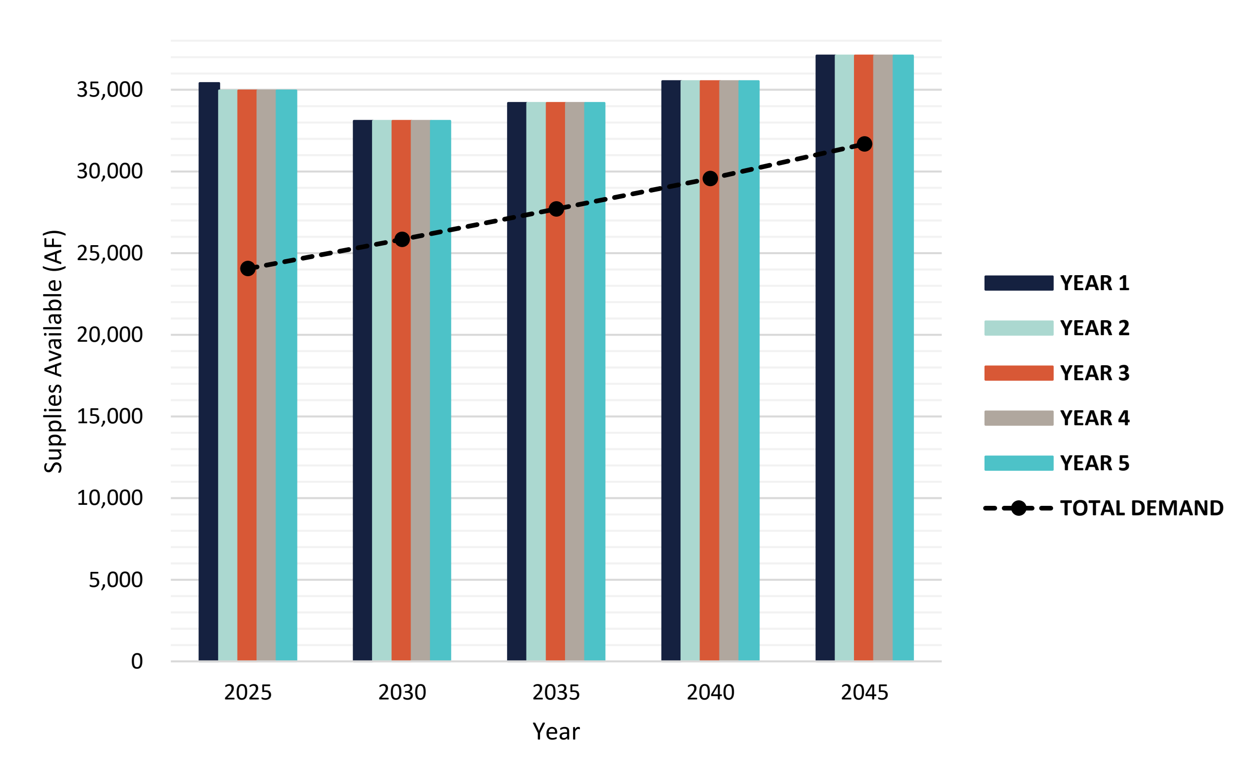


Figure ES-3: Consecutive Dry Five-Year Supply and Demand



SFPUC projections indicate a system wide water shortage in a single and multiple year drought under current average conditions, regulatory changes, climate change projections and future demands. Although the City has an interruptible contract for water deliveries from SFPUC, the current agreement with SFPUC provides the City with a share of the City's usual supply from SFPUC during system wide water shortages up to 20%. The current supply from SFPUC is currently 19% of the City's total potable water supply.

Deficiencies in wholesaler supplies would result in the City increasing pumping from the groundwater basin to offset any short-term reduction, however there are limits to groundwater pumping and the City would need to participate in regional efforts towards water rationing to minimize land subsidence and other negative impacts caused from overdraft of the groundwater basin. The City currently provides 59% of the total potable water supply with groundwater from City owned wells.

A fourth source of water for the City and the region is recycled water that is primarily used for irrigation of large turf areas and other non-potable applications. The recycled water system is owned by the South Bay Water Recycling (SBWR) which is funded primarily by sewer utilities tributary to the San Jose-Santa Clara Regional Wastewater Facility (RWF). While recycled water is not intended to replace potable in all types of uses, it does provide a reliable drought-proof supply. It is approved by the State for "unrestricted use" and, as such, it does replace potable supplies for landscape irrigation and certain industrial uses. With the current distribution system, approximately 16% of the City's total annual water demand is being met with recycled water.

In addition to the City providing the financial incentive of an overall lower rate than potable water for customers using recycled water for irrigation and industrial process purposes, the City Code also requires new developments use recycled water if suitable and economically feasible. In addition, the City is planning to upgrade and extend the recycled water system to provide an opportunity for new developments and city's parks to use recycled water and minimize the demand on potable water supplies.

Water Supply Challenges

While water supplies are projected to be available through all types of hydrologic years, the cost for new supplies for our region will be ever increasing as water becomes progressively scarcer throughout the State of California. In addition, both SFPUC and Valley Water are expected to be replacing or improving aging infrastructure and water treatment facilities. These expenditures are needed to improve both reliability and capacity in the system.

Interruption from SFPUC

Any decision to reduce or eliminate SFPUC supplies will pose new challenges in obtaining added supplies from the City's two other potable water sources: groundwater and Valley Water treated water. Although the City is able to meet projected water demands without water supplies from SFPUC, as shown the figures above, it is imperative they continue to pursue other options to offset excessive groundwater pumping. Since the last UWMP two new interties have been completed to provide flexibility of water supplies with the Cities of San Jose and Sunnyvale. In addition, the City is planning to construct two new groundwater wells and increase redundancy within the distribution system. The City is also working with Valley Water to increase the size of the treated water turnout in order to procure a larger volume of treated water.

Climate Change

The issue of climate change has become a prominent factor in water resources planning in California and is an important consideration in the urban water management planning process. Evidence shows that increasing concentrations of greenhouse gasses have caused and will continue to cause a rise in temperatures around the world, which will result in a wide range of changes in climate patterns. Moreover, observational data show that a warming trend occurred during the latter part of the 20th century and virtually all projections indicate this will continue through the 21st century. These changes will have a direct effect on water resources in California, and numerous studies have been conducted to determine what those potential impacts might be. Based on these studies, climate change impacts to water resources, including impacts on the watersheds in the Bay Area could include:

- Reductions in the average annual snowpack due to a rise in the snowline and a shallower snowpack in the low and medium elevation zones, such as in the Tuolumne River basin, and a shift in snowmelt runoff to earlier in the year;
- Changes in the timing, annual average, intensity and variability of precipitation, and an increased amount of precipitation falling as rain rather than snow;
- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality and quantity;
- Sea level rise and an increase in saltwater intrusion;
- Increased water temperatures with accompanying potential adverse effects on some fisheries and water quality;
- Increases in evaporation and consequently increased irrigation need; and
- Changes in urban and agricultural water demand.

The greatest risk to the water supply system is drought, such that projected increases in ambient temperatures and reductions in rainfall are used to analyze and determine future demands and supplies, as presented in this UWMP.

Bay Delta Plan

In December 2018, the State Water Resources Control Board (SWRCB) adopted amendments to establish water quality objectives to maintain the health of the Bay-Delta ecosystem. This amendment affects both SFPUC and Valley Water since they both import water from Bay-Delta supplies. It is assumed that the required release is 40% of unimpaired flow for both SFPUC and Valley Water.

If the Bay-Delta Plan Amendment is implemented, the SFPUC will be able to meet the projected water demands presented in this UWMP in normal years but would experience supply shortages in single dry years or multiple dry years. Implementation of the Bay-Delta Plan Amendment will require rationing in all single dry years and multiple dry years. The SFPUC has initiated an Alternative Water Supply Planning Program to address projected dry years shortages, and limit rationing to a maximum 20% system-wide in accordance with adopted SFPUC policies and the Water Supply Agreement between City and County of San Francisco and Bay Area Water Supply and Conservation Agency (BAWSCA) agencies that include Santa Clara.

Valley Water's complex water supply and management system is based on the conjunctive management of groundwater and surface water (both local and imported). Therefore, it is very difficult to demonstrate reduced Delta reliance at a retailer level:

- Valley Water uses water from the State Water Project (SWP), Central Valley Project (CVP) and local watershed runoff to meet groundwater recharge and water treatment plant needs, which in turn produce water for use by retailers and other users. The interconnected nature of the groundwater basins and blended use of sources in Valley Water infrastructure like reservoirs and pipelines make it infeasible to quantify imported water use at the retailer level.
- Valley Water manages most of the water conservation programs for the County with the support of retailers. Retailers support the conservation programs through water rates and cost share agreements.
- Valley Water and local retailers have recycled water goals for the future but the projected future split between potable and non-potable is not yet determined. Potable reuse would be managed by Valley Water and either directly augment groundwater or treated surface water. In both instances, it would get blended with several other sources before being used by retailers so it would be infeasible to determine the proportion of potable recycled water going to each retailer compared to Delta supplies.
- Valley Water projects an increased use of supplies captured locally, which can contribute to reduced reliance on the Delta. But given Valley Water's conjunctive water management, these reductions cannot be allocated to individual retailers.

To address potential water supply shortfalls, the City has developed a Water Shortage Contingency Plan (WSCP) which is included in this UWMP. The WSCP identifies six stages of action the City will take in the event of decreasing supplies. These actions range from voluntary cutbacks to mandatory restrictions and water allocation with increased rates and surcharges.

Water Quality

All water provided by the City from the three potable sources continues to meet or exceed all State and Federal drinking water quality standards. As stated above, the recycled water meets “unrestricted use” as defined by Title 22 of the California Code of Regulations. Drinking water standards have historically been growing ever more stringent with the addition of per-and poly-fluoroalkyl substances (PFAS) and 1,2,3-Trichloropropane (1,2,3-TCP) within the last five years. Future regulations and standards may require more extensive and expensive water treatment. While the City’s groundwater continues to provide excellent quality water without any treatment, future State or Federal regulations could be imposed that would mandate some treatment, such as chlorination and/or fluoridation.

System Reliability

All of the City’s supplies have some possibility of interruption and differing degrees of reliability. According to engineering studies, a major seismic (earthquake) event could interrupt the delivery of water from the SFPUC for three to four months. The SFPUC is currently undertaking a multi-billion dollar capital improvement program to improve seismic reliability, and is in its final stages of completion. A similar review of Valley Water’s potable and raw water delivery systems indicates the potential for several months of interruption of potable treated water deliveries to the City. Current planned projects include major capital improvements to both regional water systems for increased reliability. The reliability of Valley Water’s imported supplies (State and Federal water projects) is also threatened by possible failure of the Sacramento delta’s levee systems, with interruptions possible for several months. Regional power supplies could also be interrupted; however, the City has sufficient back-up power generation capacity to provide the expected potable water demand from City wells and water storage tanks. The local groundwater source can sustain the entire City’s water demand for months, for a limited period.

The recycled water system serves primarily irrigation and some industrial customers. In an emergency that may interrupt the recycled water service, most industrial customers have back-up potable water services. Interruption of available recycled water used for landscape irrigation is not considered detrimental and landscaping may survive the time required for reinstatement of recycled water service.

The City’s internal distribution system could also be compromised by a major seismic event. Most of the City’s growth has already occurred over the past 40 to 50 years, with the distribution pipelines networked throughout the City. Existing redundancy and reliability of the system should limit any major interruptions of water service to those users that are nearest to any one pipeline break. An assessment of the vulnerability of the City’s water system conducted in 2004 and 2019/2020 Risk and Resilience Assessment (RRA) gave the water system fairly high marks for system security and reliability. In addition, a well assessment study was completed in 2015. The recommendations of the 2015 well assessment study determined which City wells were in need of cleaning, wells with notable casing breaks, electric panel upgrade, inefficient wells (based on a pump efficiency standard), and which wells were recommended for destruction. The City five-year Capital Improvement Plan (CIP) includes the replacement of wells that are no longer serviceable to maintain the adequacy of the water supply.

The City has the ability to meet the needs of the community for the foreseeable future. The community must in turn be prepared to meet the fiscal requirements to support and fund the utility with retail water rates that are sufficient for these requirements.

1. INTRODUCTION

Since 1895, the City of Santa Clara (City) has been providing safe, clean and abundant supplies of water for the residents and businesses in Santa Clara. Over the years, increasing demand for water has been met by finding new supplies: primarily by adding new wells from which to tap our groundwater resources and, since the 1960’s, by delivery from the two suppliers of imported water - San Francisco Public Utilities Commission (SFPUC) and Santa Clara Valley Water District (Valley Water). The City also pursued and, since 1997, provided the use of recycled water for non-potable use in landscape irrigation and industrial processes to further decrease the potable water demand.

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Several areas of concern and challenges must be successfully managed to continue meeting the needs of the community. These areas of concern fall primarily under three broad categories: water supply (quantity), health and safety (quality), and infrastructure replacement (system reliability).

For the purposes of providing the public and interested agencies consistency and a clear understanding of the main terms that will be used in this UWMP the following subjects (related to potable water) will be described:

- **Sales:** The actual volume of potable water billed by the Utility.
- **Demands:** The actual volume of potable water billed by the Utility (or projected usage) including system water loss.
- **Supplied:** The volume of potable water metered by the Utility (or projected supplies) from all sources (imported treated water from Wholesale suppliers and City wells).
- **Produced:** The volume of potable water metered by the Utility from City/locally owned wells.

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2. PLAN PREPARATION

2.1 Basis for Preparing a Plan

California Water Code (CWC) 10617 defines an urban water supplier as “a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually.” As shown in **Table 2-1** the City of Santa Clara (City) is well beyond this threshold, and as an urban water supplier, is required to prepare an Urban Water Management Plan (UWMP) every five years.

Table 2-1 Retail Only: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020
CA4310012	City of Santa Clara	25,828	18,302
TOTAL		25,828	18,302
NOTE: Unit for volume of water supplied is acre-feet.			

2.2 Regional Coordination

The City takes part in regional water supply planning efforts in coordination with its wholesale suppliers, the San Francisco Public Utilities Commission (SFPUC) the Santa Clara Valley Water District (Valley Water), and South Bay Water Recycling (SBWR), as well as the other retail agencies within the region. A regional UWMP is an option provided to all urban water suppliers but is not required. This UWMP is prepared in coordination with the aforementioned regional partners, but was developed as an individual UWMP as show in **Table 2-2**.

Table 2-2 Plan Identification		
Select Only One	Type of Plan	Name of RUWMP or Regional
X	Individual UWMP	
	Water Supplier is also a member of a RUWMP	
	Water Supplier is also a member of a Regional Alliance	
	Regional Urban Water Management Plan (RUWMP)	

2.3 Units of Measure

This UWMP was prepared utilizing data represented in calendar years and water volumes in acre-feet (AF) as shown in **Table 2-3.**

Table 2-3 Supplier Identification	
Type of Supplier (select one or both)	
	Supplier is a wholesaler
X	Supplier is a retailer
Fiscal or Calendar Year (select one)	
X	UWMP Tables are in Calendar Years
	UWMP Tables are in Fiscal Years
If Using Fiscal Years Provide Month and Date that the Fiscal Year Begins (mm/dd)	
Units of Measure used in UWMP (select from Drop down)	
Unit	Acre Feet

2.4 Coordination of the UWMP Preparation

This UWMP was prepared in coordination with the two water wholesalers (SFPUC and Valley Water) from which the City purchases treated water, and with neighboring cities and water retailers. A summary of the information exchange is provided in **Table 2-4**. In the preparation of this UWMP, the City provided each wholesale supplier with water use projections as documented in **Section 7.2.1**.

The City notified surrounding cities, the county, and the wholesale water suppliers of its intention to update the UWMP. A notice was sent electronically to each of these entities notifying them of the opportunity to participate in the development process and the availability of the draft UWMP for comments. A copy of the notice is included in **Appendix A**.

Coordination during development of this 2020 UWMP occurred during a series of joint meetings and working sessions with representatives from the two wholesale water suppliers, neighboring cities and the Bay Area Water Supply and Conservation Agency (BAWSCA) meetings. Staff attended multiple UWMP meetings hosted by BAWSCA in February 2021. SFPUC and BAWSCA also provided updated common language for inclusion in retails supplier's UWMP.

Table 2-4 Retail: Water Supplier Information Exchange
The retail supplier has informed the following wholesale supplier(s) of projected water use in accordance with Water Code Section 110631.
Wholesale Water Supplier Name
Santa Clara Valley Water District (Valley Water)
San Francisco Public Utilities Commission (SFPUC)
South Bay Water Recycling (SBWR)

3. SYSTEM DESCRIPTION

3.1 General Description

The City is located in Santa Clara County at the south end of the San Francisco Bay. The City is bounded by the Cities of San Jose to the east, north, and south; Sunnyvale to the west; and Cupertino to the southwest. The City encompasses 18.41 square miles and is located about 45 miles southeast of San Francisco (see **Figure 3-1**).

The City occupies part of an alluvial plain, which stretches across the width of the south bay region. The City is approximately three miles wide by seven miles long. Ground elevations vary rather uniformly from near sea level at the north end of the City to 175 feet above sea level at the south end. The South San Francisco Bay area has a high concentration of high technology industry and is known as the "Silicon Valley."

The City retails potable drinking water and non-potable water within the City limits through the City's Department of Water and Sewer Utilities. The Department is a utility enterprise which provides the planning, design, construction, maintenance and operation of the City's water production, distribution, metering and water quality monitoring. The Water Utility currently has an operating budget of $55.1 million for Fiscal Year 2020/21 with approximately 73 employees both at City Hall and in the field headed by a Department Director.[1] In 2020, the Water Utility had approximately 25,828 water service connections[2] with an average potable water demand of 16.3 MGD (18,302 AF) and 3.1 MGD (3,499 AF) recycled water demand.

3.2 Sources of Water Supply

The water supply system consists of 335 miles of water mains, 21 active groundwater wells, seven storage tanks with more than 28.8 million gallons (MG) (88.4 AF) of water storage capacity, and three booster pump stations. Sources available to the City include an extensive local underground aquifer and imported water supplies delivered by two wholesale water agencies: SFPUC and Valley Water. In 2020, water purchased from the wholesale water agencies comprised nearly 41% of the potable water supply and over 59% of the City's drinking water was supplied by the network of groundwater wells.

[1] 2020-2021 City of Santa Clara Annual Budget

[2] Department of Water Resources - City of Santa Clara Report 2020

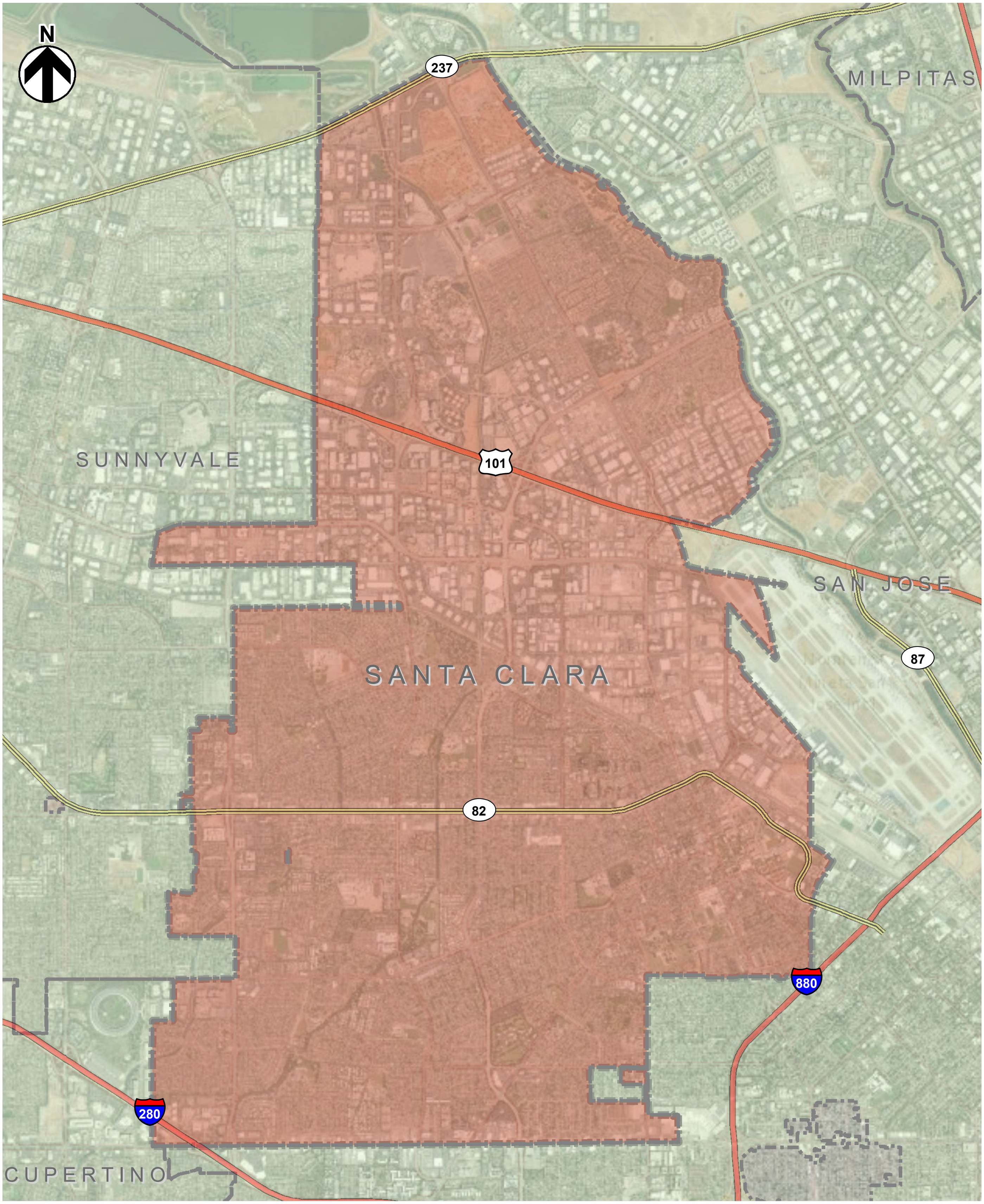
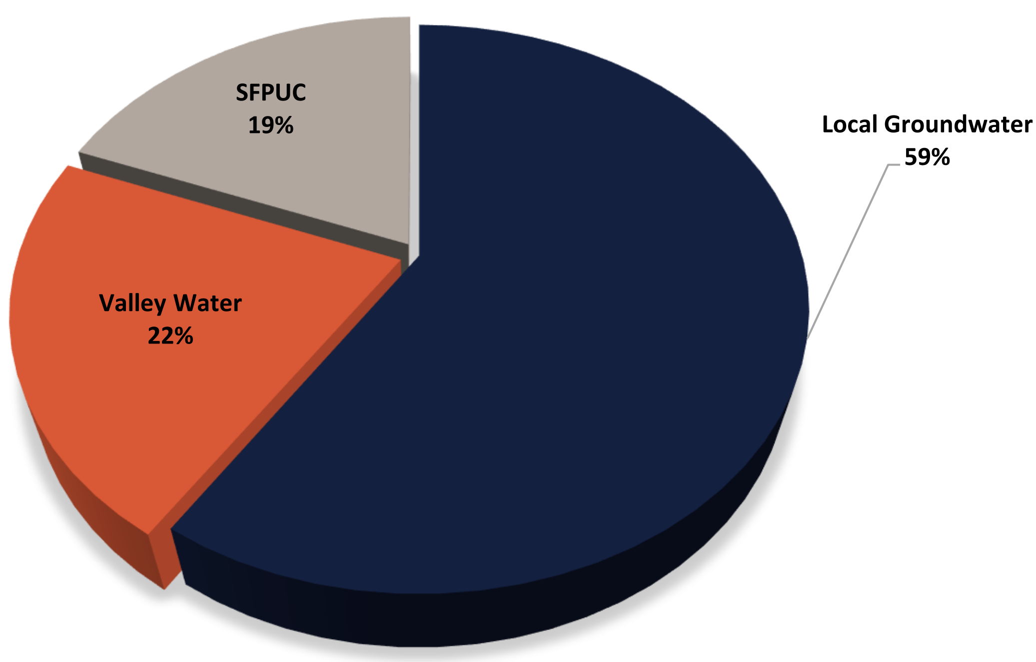


FIGURE 3-1
CITY OF SANTA CLARA
URBAN WATER MANAGEMENT PLAN
PROJECT LOCATION MAP

The City imports recycled water for non-potable use from SBWR. The recycled water system has been in operation since 1989. In 2020, roughly 16% of the City's overall water supply was recycled water purchased from SBWR. Currently there are approximately 33-miles of recycled water pipelines situated within the city limits. Recycled water comes from the San Jose-Santa Clara Regional Wastewater Facility (RWF), an advanced tertiary treatment facility located in San Jose near Alviso. Since March 2014, some of the recycled water from the RWF has been supplied to Valley Water's Silicon Valley Advanced Water Purification Center for advanced treatment (microfiltration, reverse osmosis, and advanced oxidation) to create a blend of high quality recycled water.

Figure 3-2 shows the breakdown in water supply sources in 2020. **Figure 3-3** illustrates the sources of potable supply (local groundwater, SFPUC, and Valley Water) within the City. The recycled water distribution system is shown in **Figure 3-4**.

Figure 3-2: Percentage of Potable Water Supply Sources (2020)



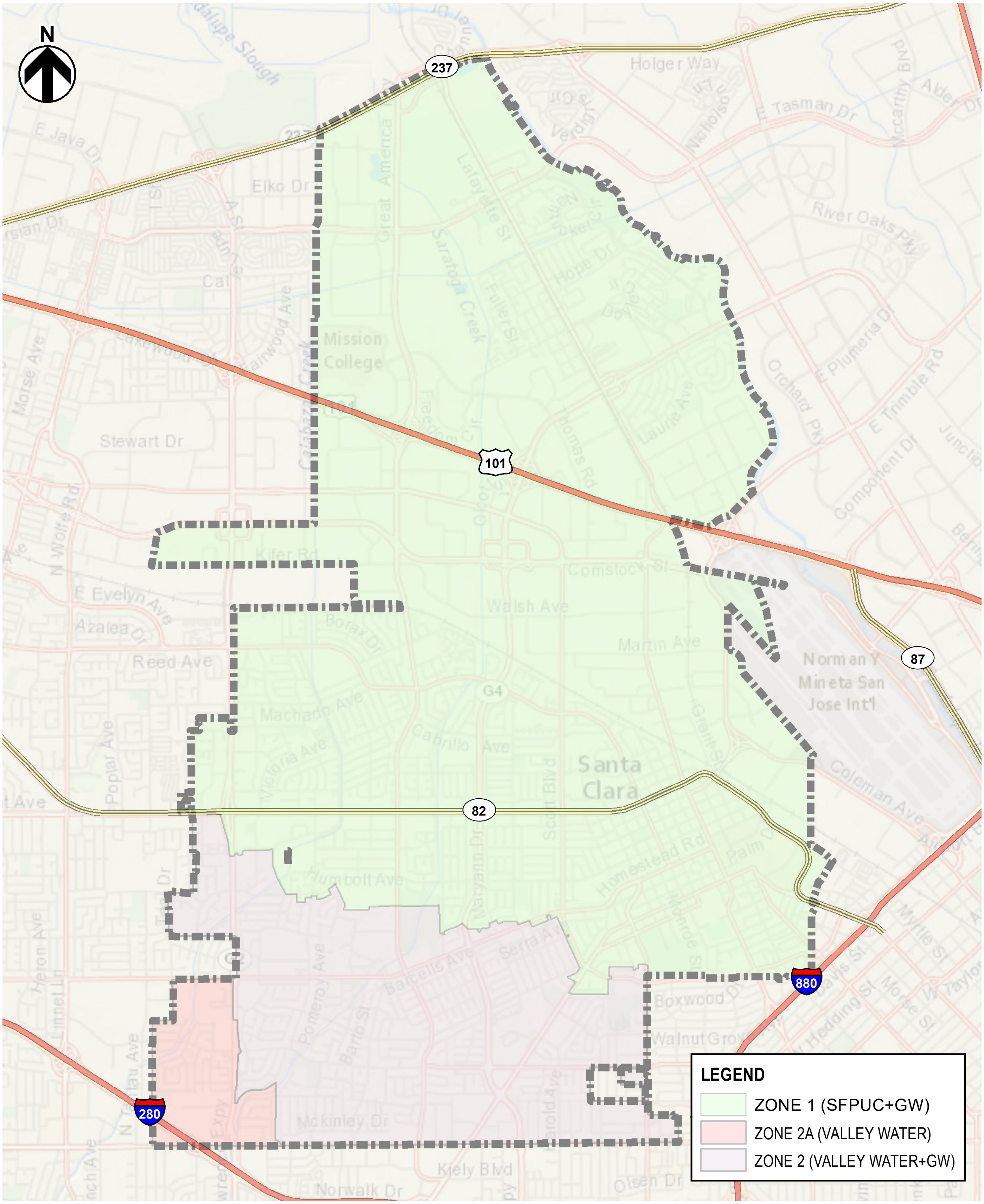


FIGURE 3-3
CITY OF SANTA CLARA
URBAN WATER MANAGEMENT PLAN
WATER SUPPLY SOURCES

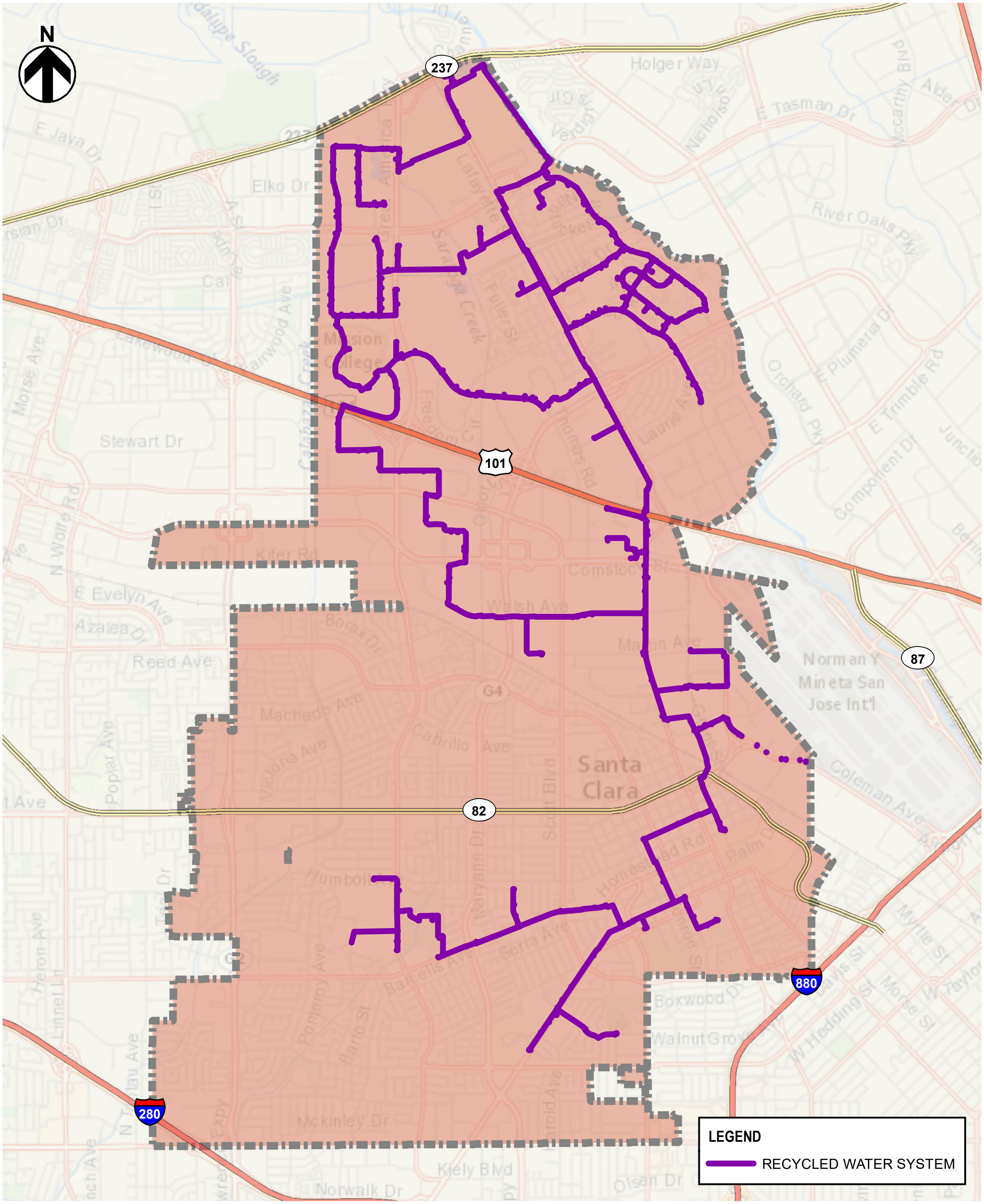


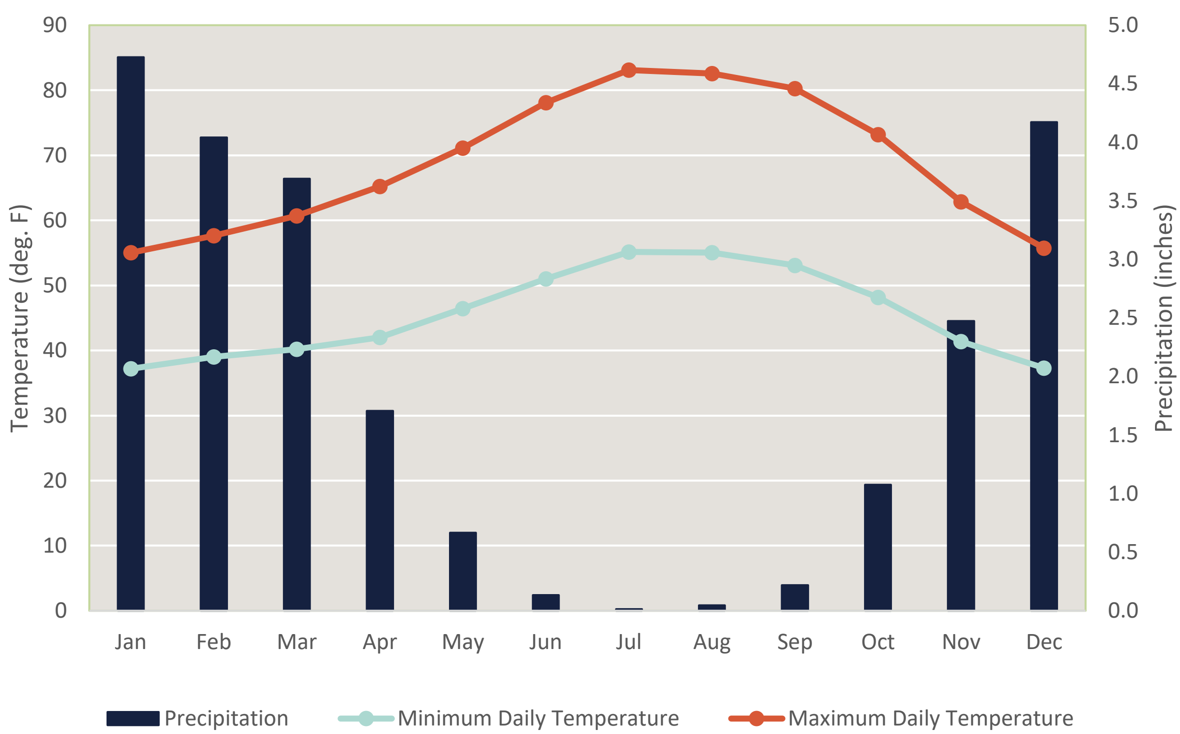
FIGURE 3-4
CITY OF SANTA CLARA
URBAN WATER MANAGEMENT PLAN
RECYCLED WATER DISTRIBUTION SYSTEM

3.3 Service Area Climate Characteristics

The climate in Santa Clara is semi-arid with warm and dry weather lasting from late spring through early fall. The average annual precipitation is 23 inches per year which falls mostly between November and April. Average monthly rainfall from May to October is less than 1 inch per month and drops to essentially zero in July and August. The average monthly temperature is 57.2 degrees Fahrenheit. Detailed monthly data is listed in **Figure 3-5**[3] below.

The data summarized below is based on data obtained from the National Oceanic and Atmospheric Administration (NOAA) for the years 1895-2020. The average annual temperature shows an increasing trend since 1895 to 2020 for Santa Clara County. Climate change concerns due to a melting snowpack, warmer temperatures and increasing sea level, have led to extreme events that will affect the County and City of Santa Clara water supplies and demands. In response to changing climate conditions and potential impacts on water demands, supply and reliability, climate change will be addressed interchangeably throughout this UWMP. Climate changes and impacts on water demands, supply, and reliability will be addressed in Chapters 4, 6, and 7.

Figure 3-5: Average Monthly Precipitation and Temperature



[3] Data from National Oceanic and Atmospheric Administration (1985-2020)

3.4 Service Area Population and Demographics

According to the U.S. Census, Santa Clara's population grew 49% between 1960 and 1980. Since that time, constraints on available land for residential development have limited housing development and population growth. During the 20-year period between 1980 and 2000, the City's population grew 17%, from 87,700 to 102,361. Despite some of the highest rents and home prices in the nation, Silicon Valley continues to attract new residents and experience continuing increases in population. The Association of Bay Area Governments (ABAG) projects that the City will grow at a moderate rate over the next five years, resulting in a population of approximately 137,215 by 2025. The historic and projected population for the City through 2040 is based on the 2019 ABAG projections. The population projection for 2045 was based on the Bay Area Water Supply and Conservation Agency Regional Water Demand and Conservation Projections report. The report assumed a linear relationship between the 2035-2045 population projections. For the purposes of maintaining consistency, the same 2045 projection will be used in the table below. **Table 3-1** presents the projected City population based on the above information and assumptions.

Table 3-1 Retail: Population - Current and Projected						
Population Served	2020	2025	2030	2035	2040	2045
	131,655	137,215	142,425	151,715	159,500	167,285
NOTES: Current Population Source - Department of Finance. Projections Source: 2019 ABAG.						

The population projections discussed above are based on the populous found within the City limits. The City's water service area covers all and only those water services connections found within the City limits, therefore the population projections above reflect the entire water service area.

3.4.1 Service Area Demographic Factors

The City is a diverse community. According to the 2019 American Community Survey,[4] the racial makeup of the City is as follows:

- 34.7% White
- 46.5% Asian
- 16.3% Hispanic or Latino
- 2.9% Black or African American
- 0.6% American Indian and Alaska Native
- 1.9% Native Hawaiian and Other Pacific Islander

[4] United States Census: 2019 American Community Survey 1-Year Estimates for City of Santa Clara, as of 2/26/2021

- 13.4% from some other race alone or two or more races

Given the diversity, languages spoken at home other than English also exist. Approximately 58.4% of the population, over 5 years of age, speak a language other than English. About 17% of the population that speak a language other than English, speak it less than "very well."[5] Almost half of the City population is within the ages of 25 – 54, with approximately 62% of the population, ages 25 and up, attaining a bachelor's degree or higher.

3.4.2 Other Social, Economic, and Demographic Factors

According to the 2019 US Census American Community Survey, 65% of City households have incomes over $100,000, another 21% have incomes between $50,000 and $100,000, and the remaining households have incomes below $50,000. Seven percent of people in the City are considered in a condition of poverty. [6]

The ABAG estimated that there were 143,565 jobs in the City in 2020, which is an 8.1% increase than the previous estimate. The ABAG also estimated that the number of jobs in Santa Clara will increase to nearly 171,000 by 2040. The civilian labor force (age 16 and older) is primarily employed in Management, Business, Science and Art occupations (63.2%), Sales and Office (11.1%) and Service (12.1%), with the remainder of the civilian population in Production, Transportation and Construction occupations, among others. This can be attributed to the variety of industries available in the City, as shown in **Table 3-2** below. The primary industries of civilian employment are Professional, Scientific, Management/Administrative services (24.3%), Manufacturing (18.1%) and Educational, Health Care and Social Assistance Services (18.8%).

The estimated number of employable individuals, not in the labor force, constitute 27.9% of the population. This includes retired individuals, students, persons taking care of children or other adults, ill or disabled persons or other reasons for not being employed or seeking work.

The inclusion of social and economic data provides information on the level of the diversity of the service area. Understanding the social and economic diversity of the City and the effect on water use patterns and demands, can allow a water supplier to estimate and manage the demands of the system more accurately and effectively.

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[5] United States Census: 2019 American Community Survey 1-Year Estimates for City of Santa Clara, as of 2/26/2021, https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/

[6] 2019 U.S. Census Bureau Quick Facts for City of Santa Clara, online source accessed 10/1/2020

Table 3-2: Industries		
Type of Industry[7]	Quantity	% of Total
Agriculture, forestry, fishing and hunting, and mining	258	0.3%
Construction	3,155	4.1%
Manufacturing	13,873	18.1%
Wholesale trade	656	0.9%
Retail trade	5,648	7.4%
Transportation and warehousing, and utilities	4,121	5.4%
Information	4,118	5.4%
Finance and insurance, and real estate and rental and leasing	2,146	2.8%
Professional, scientific, and management, and administrative and waste management services	18,615	24.3%
Educational services, and health care and social assistance	14,407	18.8%
Arts, entertainment, and recreation, and accommodation and food services	6,225	8.1%
Other services, except public administration	2,135	2.8%
Public administration	1,272	1.7%
TOTAL	**68,053**	**100%**

3.5 Service Area Land Use

The present area of the City is 11,782 acres or 18.41 square miles. Santa Clara is built out, with over 97% of its land area developed primarily in a low density, suburban form. New businesses and residences will need to intensify existing development.

Although the City is essentially built out, a significant potential remains for redevelopment and on-site expansion. Some industrial facilities in the City have reserved land for future expansion on their current sites, and single story development has potential for conversion to higher density, multi-story development. Redevelopment of existing residential or commercial land use also creates the potential of water conservation measures to be implemented in buildings constructed before January 1, 1994. Per California Civil Code 1101.1, this would require residential or commercial buildings to be equipped with water conserving plumbing fixtures. According to the 2019 US Census American Community Survey, the percentage of housing units built before year 1990 constitute approximately 76% of the total units.

[7] United States Census: 2019 American Community Survey 1-Year Estimates for City of Santa Clara, as of 2/26/2021

Between 2015 and 2020, the number of housing units in Santa Clara increased from 45,828 to over 48,975 (approximately 7%). The majority of existing units, 40%, are single-family detached units, however, the vast majority of new units approved under the City's 2010 General Plan have been multi-family in character.[8] The remainder of developable land uses in the City, excluding roads, highways and rights of way, are primarily for employment uses, including Industrial and Office/Research and Development as shown in **Table 3-3**.

Table 3-3: General Plan Land Use[9]		
Land Use Type	Acres	% of Total Developable
Residential	3,933	40%
Commercial	527	5%
Mixed use	575	6%
Office/Research and Development	1,746	18%
Industrial	1,028	10%
Public/Quasi Public	855	9%
Parks, Open Space and Recreation	719	7%
Station Area Plan	182	2%
Vacant/Unassigned	366	4%
SUBTOTAL (DEVELOPABLE LAND)	**9,930**	**100%**
Roads and other Rights of Way (including creeks)	1,852	
TOTAL	**11,782**	
NOTES: Percentages may not add up to 100 due to rounding.		

[8] State of California, Department of Finances, E-5 Population and Housing Estimates for Cities, Counties, and the State – updated 9/28/2020
[9] City of Santa Clara GIS Public Portal, General Plan – updated 1/29/2021,
[City of Santa Clara General Plan | City of Santa Clara Enterprise GIS Public Portal (arcgis.com)]

4. SYSTEM WATER USE

4.1 Water Demands

4.1.1 Past and Current Demands

The City's water accounts are categorized into six broad categories of users: single-family residential, multi-family residential, industrial, commercial, institutional, and municipal. Although separate landscape irrigation meters do exist within the City, these accounts are coded the same as the general account for each facility. Therefore, water delivered through an irrigation meter at a site is included as usage within that site category (e.g., industrial). A more detailed discussion of landscape demand appears under the section below entitled Landscape Irrigation.

Water use is inherently variable and is dependent on several factors including weather, season, day, hour, customer category and, for certain industries, business climate and the economy. Seasonal patterns can be obvious, such as irrigation increasing during summer months. Long-term trends in overall usage are valuable in projecting future supply requirements for different user categories.

Figure 4-1 shows the historic water demands by each user category. Since the last UWMP there has been an overall increase in commercial water use, although historic demands show a gradual decrease. Except for commercial use, water use in all other categories remains relatively consistent even with overall growth in the City. There have been slight deviations, which can be attributed to an economic- and/or weather-based response. Beginning in 2014, overall potable water demand decreased due to drought conditions and the issuance of Drought Emergency Water Conservation Regulation in 2015.

The lowest annual water sales were in 2016, which decreased by 3% from 2015 water sales. Additionally, single family residential water use has seen a decline since its peak in the late 1990s with the lowest water use in 2016 and a slight increase in the last three years. Multi-family residential water use shows similar trending as single-family residential use since 2015 with a flatter increase. This may be attributed to the lifting of the drought state of emergency status in most California counties including Santa Clara following the 2016/2017 winter season.[10] Commercial water use has shown more variability over the years than other water use categories, and has increased in demand since 2015. Industrial water use has seen a sharp decline since peak usage in 1996 and since 2015 has shown a steady decline in demand. This may be attributed to changes in the electronics industry as well as increases in the use of recycled water for industrial and commercial purposes. Institutional and municipal water use has been relatively flat for the past 15 years.

[10] California's Emergency Drought Declaration is Lifted Fact Sheet, online source accessed 12/30/2020 https://www.ca.gov/archive/gov39/wp-content/uploads/2017/08/Fact_Sheet_-_Drought_Lifted.pdf

Figure 4-1: Historic Water Demands by Category

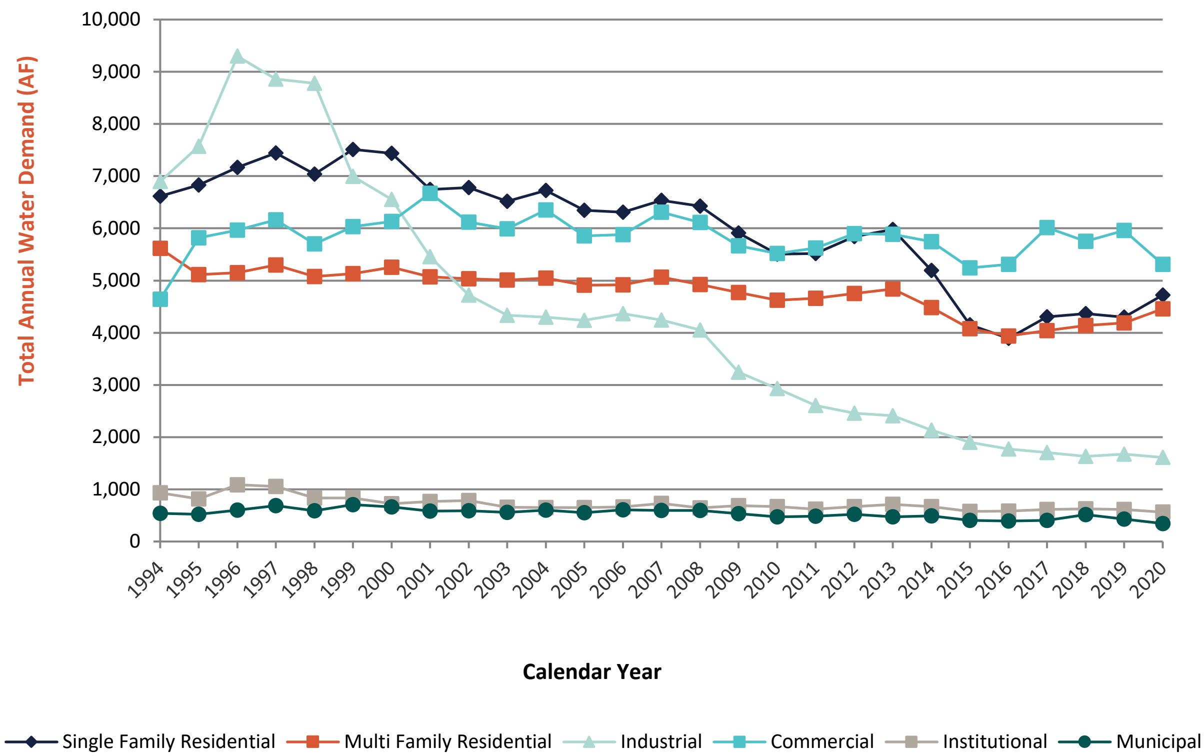


Figure 4-1 shows that water use across most user categories were slightly lower in 2020 when compared to 2015, except for residential water use. Total annual water sales decreased by approximately 650 AF from 2015 to 2020. Most notably, there is a 952 AF increase in residential water use (includes residential and multi-family); with 60% of the increase attributed to single-family water use. The last drought and subsequent emergency regulations and water conservation measures have contributed to the overall decline in water use and steady trend.

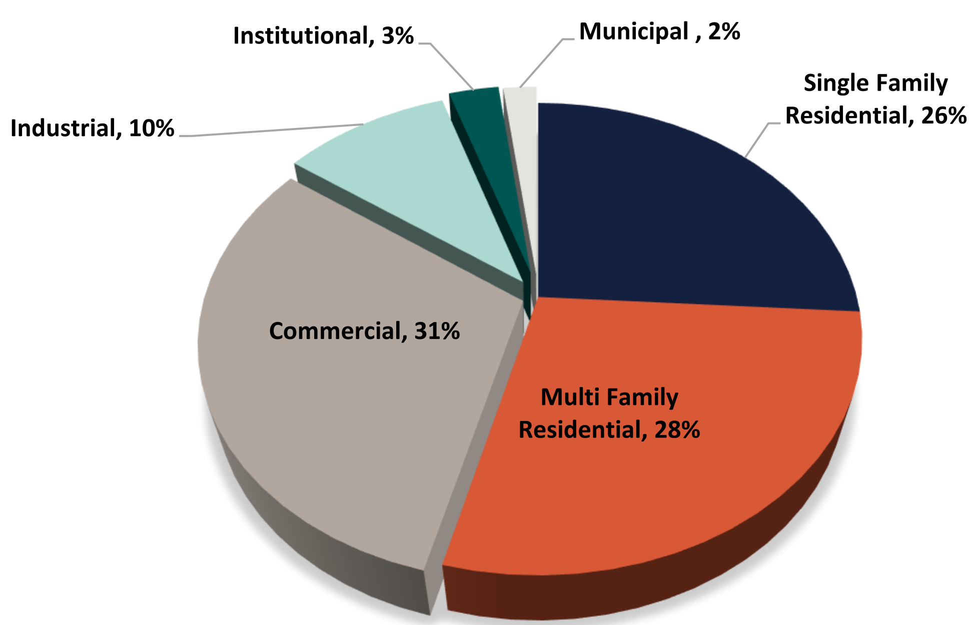
Water use patterns for 2020 were greatly affected by the Coronavirus (COVID-19) pandemic that began in early 2020. In response to regional Shelter-In-Place/Stay-at-Home Orders and local emergency restrictions that began in March of 2020, water demand patterns gradually dispersed from other sectors to residential use. Many people lost their jobs because of the COVID-19 pandemic, and non-essential businesses were forced to close. Businesses with a drive-up window remained open and restaurants continued with the option of take-out and delivery services only (if they offered it), although business activity declined for many. While the annual water demand was less in 2020 than in the previous three years, the monthly water usage of the residential sector increased substantially. Single-family water use showed the highest monthly usage in 2020 for most months compared to 2016-2019 data. Multi-family water use showed a significant peak in May when compared to the previous five years in the same month.

Table 4-1 shows the total water sales per user including losses for 2020.

Table 4-1 Retail: Demands for Potable Water - Actual			
Use Type	2020 Actual		
Drop down list	Additional Description	Level of Treatment When Delivered	Volume
Single Family		Drinking Water	4,458
Multi-Family		Drinking Water	4,722
Commercial		Drinking Water	5,307
Industrial		Drinking Water	1,610
Institutional/Governmental	Institutional	Drinking Water	562
Institutional/Governmental	Municipal	Drinking Water	345
Losses		Drinking Water	1,299
TOTAL			18,302
NOTES: Losses for 2020 are calculated as the difference between water sales and total potable water supplied (imported treated water and City wells).			

Figure 4-2 shows the total water sales by user classification for 2020. In 2020, residential use accounted for approximately 54% of total water sales while the commercial/industrial sectors combined to account for approximately 41% of water sales. Municipal and Institutional sales accounted for 5% of water sold.

Figure 4-2: Water Sales by User Type (2020)



4.1.2 Projecting Demands

One of the goals of the UWMP is to forecast the future water demand to determine whether there is adequate water supply to meet projected future needs and provide a plan to address shortage and risk to assure that the City is prepared to meet the water needs of the community. In order to project future water demand, a model or methodology must be selected.

In June 2020, BAWSCA completed the Regional Water Demand and Conservation Projections Report (Demand Study).[11] The goal of the Demand Study was to develop transparent, defensible, and uniform demand and conservation savings projections for each wholesale customer using a common methodology to support both regional and individual agency planning efforts and compliance with the new statewide water efficiency targets required by Assembly Bill (AB) 1668 and Senate Bill (SB) 606.

As part of the Demand Study process, BAWSCA and the wholesale customers collaborated to (1) quantify the total average-year water demand for each BAWSCA member agency through 2045, (2) quantify passive and active conservation water savings potential for each individual wholesale customer through 2045, and (3) identify 24 conservation programs with high water savings potential and/or member agency interest. Implementation of these conservation measures, along with passive conservation, is anticipated to yield an additional 37.3 MGD (41,781 AFY) of water savings by 2045. Based on the revised water demand projections, the identified water conservation savings, increased development and use of other local supplies by the wholesale customers, and other actions, the collective purchases of the BAWSCA member agencies from the SFPUC are projected to stay below 184 MGD (206,107 AFY) through 2045.

Each wholesale customer received a copy of the demand model to be used to support ongoing demand and conservation planning efforts, as well as UWMP preparation. For the full report see **Appendix D**.

The Demand Study projections were developed using the Demand Side Management Least Cost Planning Decision Support System model (DSS Model) developed by Maddaus Water Management for long-term projections. The DSS Model (also "end use" model type) projected long-term demand based on expected service area growth for population and employment. The model also considers conservation measures using benefit-cost analysis and benefit-to-cost ratio as economic indicators. Demands were also projected based on savings from the plumbing code and active conservation programs. Another model used in the study was the Econometric Model, which was used to develop future rebound water demands associated with short term effects. The Econometric Model projects future demands based on historical post-drought recovery demands considering factors such as economy, rate increases, conservation activity and weather. The Econometric Model was used to forecast the City's baseline demand through 2023 as part of the Demand Study. For the purpose of this

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[11] Phase III Final Report:
http://bawsca.org/uploads/pdf/BAWSCA_Regional_Water_Demand_and_Conservation%20Projections%20Report_Final.pdf

chapter's projected demands, only the DSS model will be discussed. The Econometric Model will be discussed in **Chapter 7** to evaluate near term demands for the Drought Risk Assessment.

The data collected for the Demand Study included: service area data, service area demographics, economy, weather data, conservation data and other pertinent information including new development ordinances. The basic methodology of the DSS Model required forecasting demands based on customer billing data categorized by user type. The model was calibrated by comparing water use data with available demographic data to characterize water usage for each user type in terms of number of users per account and per capita water use.[12] In order to calibrate the volume of water allocated to specific end uses in each customer category, published data on average per capita indoor water use and average per capita end uses were combined with the number of water users. After calibration was completed, the projected population and employment projections were incorporated. The population and employment projection data in models utilized 2019 ABAG data provided by the City's Community Development Department. The model also quantifies savings from passive and active conservation programs, which is addressed in **Section 4.4**. For the UWMP, the demand projections are inclusive of passive water conservation savings.

As noted earlier the projected water demands for each category of user were prepared using data from the Econometric and DSS Model. The resulting projected water demand by category is shown in **Table 4-2** and only includes potable water demands.

Table 4-2 Retail: Demands for Potable Water - Projected						
Use Type	Additional Description	Projected Water Use Report to the Extent that Records are Available				
		2025	2030	2035	2040	2045 (opt)
Single Family		4,683	4,893	5,076	5,206	5,336
Multi-Family		4,458	4,659	4,833	4,957	5,080
Commercial		6,184	6,461	6,704	6,875	7,046
Industrial		1,748	1,826	1,895	1,943	1,991
Institutional/Governmental	Institutional	672	702	729	747	766
Institutional/Governmental	Municipal	560	585	607	623	638
Losses	6.0% Losses (5-yr average)	1,168	1,221	1,267	1,299	1,331
TOTAL		19,473	20,348	21,111	21,649	22,189
NOTES: Total sum may not be exact due to rounding.						

[12] Bay Area Water Supply and Conservation Regional Water Demand and Conservation Projections, June 2020

Table 4-3 shows total water demands including both potable and recycled water. Recycled water demands were estimated based on anticipated growth in recycled water use due to new development (landscape irrigation, data centers, dual plumbing), including proposed infrastructure upgrades to supply new developments, and historical demand. Recycled water is discussed further in **Chapter 6**.

Table 4-3 Retail: Total Gross Water Demands (Potable and Non-Potable)

	2020	2025	2030	2035	2040	2045 (opt)
Potable Water Demand From **Table 4-1 Table 4-2**	18,302	19,473	20,348	21,111	21,649	22,189
Recycled Water Demand From **Table 6-4**	3,499	4,570	5,489	6,586	7,908	9,488
TOTAL WATER DEMAND	21,801	24,043	25,836	27,697	29,557	31,676
NOTES: Units of volume in AF.						

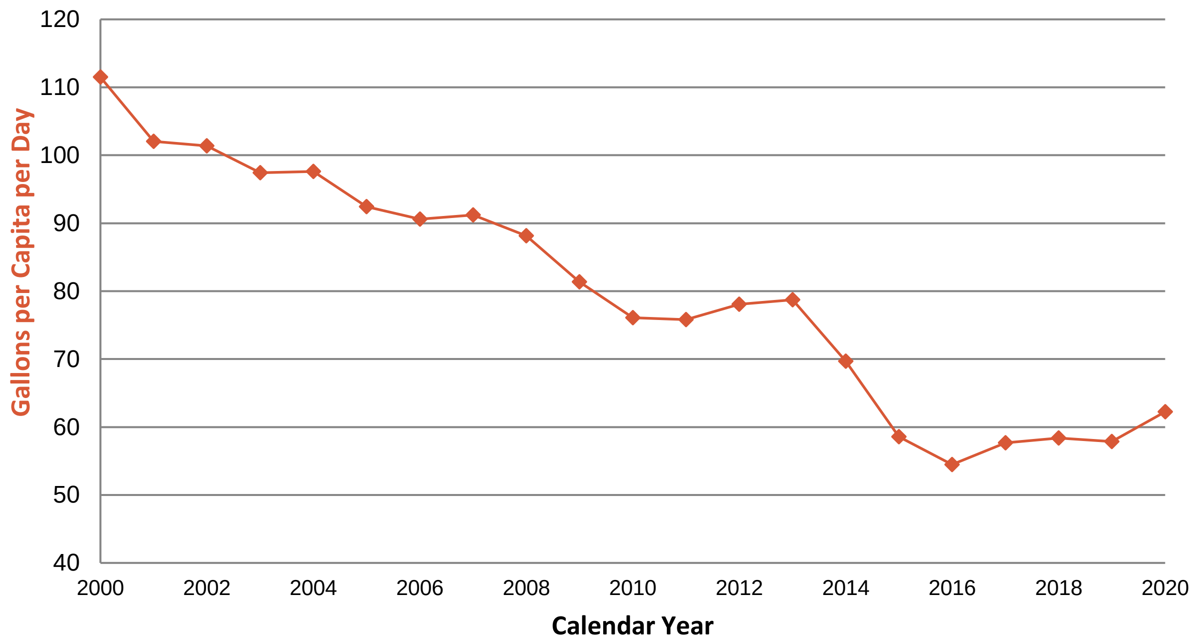
4.2 Water Uses by Sector

4.2.1 Residential

The water usage data for single and multi-family dwellings can be reduced to a per capita value by dividing the total residential water sales by the population of the City for that year. Since 2000, the per capita residential water use has been declining at a gradual rate due to water conservation and water efficiency standards for devices such as ultra-low flush toilets and low-flow showerheads. Since the last UWMP per capita residential water use has remained fairly steady and under 60 gallons per capita per day (gpcd). As discussed previously, 2020 water use data showed an increase in residential water demand due to the COVID-19 pandemic and Shelter-In-Place/Stay-at-Home Orders for the region. However, the five-year average residential gpcd for 2016-2020 remains the same, at less than 60 gpcd (see **Figure 4-3)**. Although residential water demand increased (higher gpcd) for 2020, it did not affect SBX7-7 compliance , since the total volume supplied by the City (including losses) per capita decreased due to an increase in estimated population. SBX7-7 compliance is detailed in **Chapter 5** and **Appendix E**.

Projections were separated for single family and multi-family homes in the residential sector. ABAG Silicon Valley Projections were used for establishing population in conjunction with the DSS Model to estimate future residential water demand.

Figure 4-3: Average Residential Per Capita Water Usage



4.2.2 Single-Family Residential

Single-family residential units, for the purposes of this UWMP, are defined as attached and detached single-family homes. Since the 2015 UWMP, the number of single-family homes has increased slightly (1.1%) and make up 49% of the total housing sector for 2020.[13] Similarly, single-family homes make up approximately half of the total water usage in the residential sector.

Monthly usage for single-family homes shows a similar trend for 2016-2020 data; higher usage in summer months with peaks observed in the months of July or August. This is attributed to water usage for landscape irrigation, which is highly dependent on existing climate conditions. Compared to 2015 (4,153 AF), the annual water usage for this sector increased by approximately 14% in 2020 (4,721 AF). This can partially be attributed to recovery from the drought which lasted from 2012-2016. In addition, water use patterns for 2020 were greatly affected by the Coronavirus (COVID-19) pandemic. Relative to 2019, the increase was 3.4% (4,296 AF) in this sector. The pandemic began in early 2020 and led to several Regional Shelter-In-Place/Stay-at-Home Orders and local emergency restrictions. These restrictions caused a shift in water demand from all sectors to mainly residential use. Most non-essential businesses shifted to remote work, and several businesses were unable to continue operation due to

[13] State of California, Department of Finances, E-5 Population and Housing Estimates for Cities, Counties, and the State – updated 12/30/2020

the Shelter-In-Place/Stay-at-Home Orders. It is expected that water use patterns will return to historical trends in the future, once returning to normal (post-pandemic) conditions.

4.2.3 Multi-Family Residential

Multi-family residential units are defined as duplexes, apartments, and condominiums for the purposes of this UWMP. Although multi-family units currently consume half of the total water usage within the residential sector, usage is projected to increase based on current water supply assessments for new construction and redevelopment projects.

Monthly usage for multi-family homes shows a similar trend for 2016-2020 data with steady usage across all months and slightly higher usage in summer months. Since most multi-family units are in higher density or mixed-use areas, there is generally less landscape requiring irrigation. Water consumption between the highest (August) and lowest (February) monthly usage from year to year between 2015 and 2020, show a difference of 29 MG (88 AF) on average. Compared to 2015 (4,074 AF), the annual water usage for multi-family residential units increased by approximately 9.4% for similar reasons as mentioned above.

4.2.4 Industrial

For the purposes of this UWMP, the industrial sector is composed of food manufacturers and processors, paper product manufacturers, industrial chemical manufacturers, metal finishing facilities, machinery manufacturers, electronics industry, and measuring equipment manufacturers. The predominant industry within the City is electronics manufacturing.

Water use for 2020 (1,610 AF) compared to 2015 (1,903 AF), decreased by 15.4%. This may be attributed to redevelopment, and/or increased usage of recycled water. The water usage within the industrial category is related most significantly to production levels within the electronics industry, which represents 9.5% of the total water demand within the City, based on water sales for 2020. Monthly usage within this sector shows a relatively constant trend for the years 2016-2020, with slightly higher usage in summer months.

Additionally, the expansion of the recycled water distribution system within the City will allow more industrial customers access to recycled water for cooling towers and processing, thus reducing industrial sector potable water demands. Recycled water is addressed in detail in **Chapter 6**.

4.2.5 Commercial

The commercial sector is defined as all non-residential accounts that are also not classified as municipal, institutional, or industrial. The types of facilities that are included in this category are hotels, automotive repair, gas stations, automotive dealerships, retail stores, and restaurants. This category also includes facilities for tourist and entertainment uses such as the stadium and amusement park, as well as professional or medical offices.

In 2020, water use for this sector decreased by 11% (5,307 AF in 2020) from the previous year (5,960 AF in 2019) due to the impact of the COVID-19 pandemic. Stay-at-home orders for the region and closures of non-essential business caused water use in this sector to decrease, although past water use trends show a gradual annual increase. Water demand in 2020 is considered an anomaly and commercial water demands are expected to continue to increase through 2025 and beyond after recovery from the COVID-19 pandemic. Although there was not a significant increase in the number of accounts added since the last UWMP, there was a 14% increase in total water demand through 2019 when compared to 2015 (5,240 AF). Monthly usage of this sector shows the most variability than any other sector. As is the case with the industrial category, recycled water use is anticipated to meet an increasing amount of demand for non-potable applications.

4.2.6 Institutional

The institutional base consists of the colleges/universities and hospitals within the City. This category is relatively stable compared to other categories such as the commercial sector where a certain degree of business turnover is expected. Monthly usage from 2016-2020 data shows a consistent pattern of usage with highest demand during summer months.

4.2.7 Municipal

This category includes City, county, and state buildings that are in the City, as well as parks, street medians, and school district facilities. Although annual municipal water use has remained relatively constant. This sector was typically less than 3% of the total water sales for the City from 2016-2020. This category is typified by large green space, such as parks and school play fields. This is evident from the percentage of water demand that is attributable to external use. Additions (new accounts) to the municipal category have been offset by use of recycled water for landscape irrigation.

4.2.8 Landscape Irrigation

As noted earlier in this UWMP, landscape irrigation is not a separate category. As of February 2021, the City has 683 dedicated landscape meters but the usage through these meters is categorized under the main water meter (i.e., sector) for the related facility.

4.3 System Losses

Water loss within the distribution system can occur due to leaks, breaks, malfunctioning valves, fire suppression, and differences between the actual and measured quantities from water meter inaccuracies. A certain amount of loss is anticipated and considered normal. Some water losses are legitimate unmetered uses such as for mainline flushing, tests of fire suppression systems, and street cleaning. **Figure 4-4** shows the distribution system losses (specifically water loss as defined by the American Water Works Association [AWWA] software) as a percentage of total sales over the last five years.

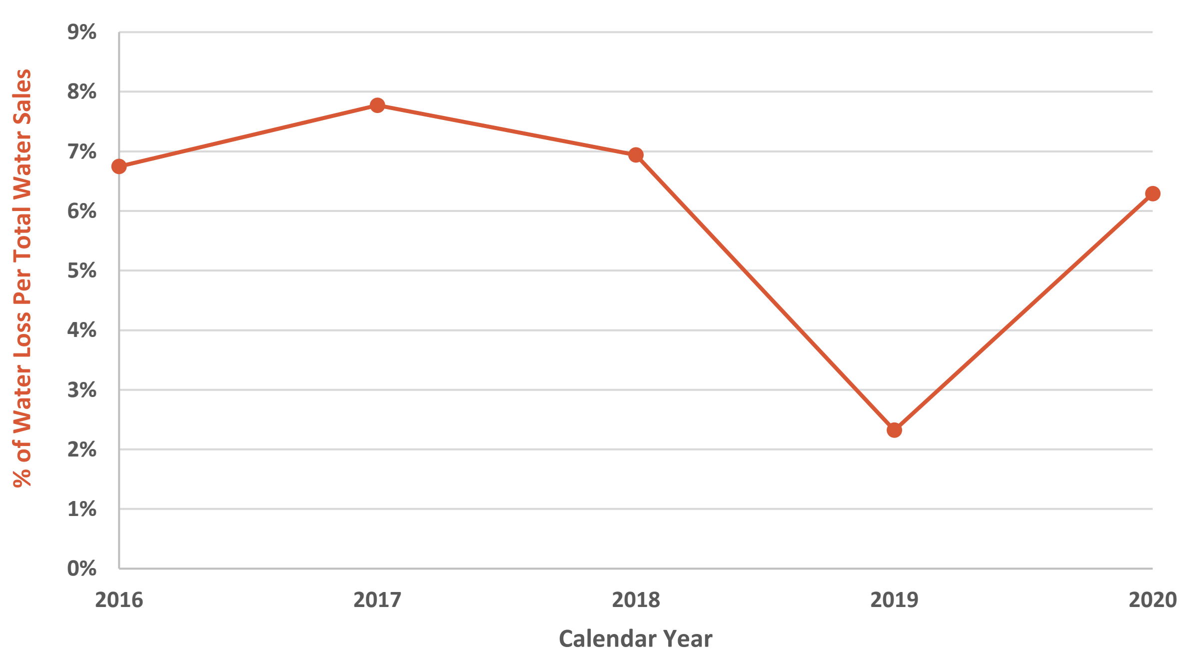
The DSS Model used in the total demand projections estimated system water losses at 6.6% of total water sales. The model estimated the system water loss using the average non-revenue water data for 2016-2018. However, for the purposes of this UWMP and consistent with the AWWA audit software report, a system water loss of 6.0% will be used, which is the 5-year (2016-2020) average water loss for the Utility. Since the 2020 water loss audit report is not available yet, the 2020 water loss was estimated using the difference between water sales (billed metered authorized consumption) and potable water supplied for the year, including loss for authorized consumption of unbilled unmetered usage. Over the last three years (2016-2019 water audits), unbilled unmetered usage has been estimated at 1.25% of the total annual water supply; this assumption was used to estimate water loss for 2020.

For purposes of projecting future demand, system losses will be calculated at 6.0% of the total of the water demand projections for all user categories.

Figure 4-4 shows an increase in system losses as a percentage of total water sales. In the last UWMP, declines in total water sales contributed to a higher percentage of unaccounted for water in recent years in part due to successful conservation efforts in response to the drought.

Senate Bill 555 (SB 555) was approved in October 2015, requiring each urban water retail supplier to submit a completed and validated water loss audit report for the previous calendar year on or before October 1, 2017, and on or before October 1 of each year thereafter. The 2020 UWMP now requires the supplier to quantify system water loss for each of the five years preceding the UWMP (Per Water Code Section 10631(d)(3)). The code also requires the supplier include data showing a reduction in system

Figure 4-4: Distribution System Losses by Year



water loss per Water Loss Standard (if adopted before the 2020 UWMP). The purpose of reducing water loss has many benefits including reducing energy use for water treatment, improving infrastructure maintenance, and preventing breaks that would otherwise cause property damage and water outages.[14] The City is awaiting regulatory guidance before adopting the Water Loss Standard.

The City completed the water loss audit reports for 2016-2020 utilizing the American Water Works Association (AWWA) software, as required. The volume of water loss for 2020 was estimated as the difference between actual water sales and water supplied for the year. As shown in **Table 4-4** the estimated water loss for 2020 was 1,070 AF (348.6 MG) for the year, which is consistent with prior years except for 2019.

Table 4-4 Retail: Last Five Years Water Loss Audit Reporting	
Reporting Period Start Date:	Volume of Water Loss*
01/2016	1,072
01/2017	1,328
01/2018	1,182
01/2019	398
01/2020	1,070
NOTES: Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet. Water loss for 2020 was estimated.	

If the City maintains system water loss (real loss) below the reporting threshold (under 16 gallons per connection per day or 1,184 gallons per mile per day or roughly 465 AFY) the City would not be required to further reduce water loss[15]. In 2019, water loss was estimated below this threshold. AWWA water loss audits and reports for each utility are publicly available online (https://wuedata.water.ca.gov/awwa_plans). The City will utilize the same software in compliance with SB 555.

4.4 Estimating Future Water Savings

In projecting the City's water demands over the planning horizon of this UWMP, the DSS Model accounted for estimated water savings due to the existing water conservation programs in place (passive and active) which are further outlined in **Chapter 9**. The results of these savings as projected in the Demand Study are shown in **Table 4-5** below.

[14] California Water Boards Water Loss Performance Standards Fact Sheet, updated 11/28/2020

[15] State Water Resources Control Board. Water Loss Performance Standard Fact Sheet. Online accessed 1/28/2021. https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/docs/waterlosscontrol/2020/waterlossperformancestandards_factsheet_18november2020.pdf

Table 4-5: Estimating Future Savings					
	2025	2030	2035	2040	2045 (opt)
Active Conservation Savings	293	381	430	504	561
NOTES: Units of volume in AF.					

The model also incorporates the effects of the current plumbing code (California Plumbing Code 403) including state and federal standards (CALGreen, Senate Bill 407 and Assembly Bill 715) on appliances such as; toilets (1.28 gal/flush), showerheads (1.8 gal/minute), and faucets (1.8 gal/minute, residential). Current state and federal standards also require replacement of non-water conserving plumbing fixtures with high-efficiency appliances on existing and future accounts.

The active conservation measures that were selected, were based on the potential for high water savings and specific member agency interest. The Demand Study further evaluated the potential of future implementation of these measure and benefit-cost analysis. For a complete list of water conservation measures included in the DSS Model and method of analysis, see **Appendix D**.

4.5 Water Use for Lower Income Households

Projected lower income water demands were calculated using data from Table 8.12-3-16 in the Housing element section of the 2010-2035 General Plan. ABAG 2019 projections provided total household projections for 2020-2040. Estimated lower income household numbers were available for the years 2000 and 2006 through the 2010-2035 General Plan. Lower income households are defined as having an annual income no greater than 80% of the area median family income (AMI), adjusted by household size. Lower income housing households as a percentage of total households remained the same for 2000 and 2006 (32%). The percentage was then extrapolated through 2045.

The total projected residential water demand is multiplied by the percentage of lower income households in the City. Per unit lower income water demand was calculated by dividing the projected residential water use by the total number of households. The per unit lower income water demand was then multiplied by the number of projected lower income households to calculate total lower income water demand. Total household projections for 2020-2040 were taken from ABAG 2019. The water demand forecasts are generated by the DSS Model and thus, the lower income water demand is already accounted for in the demand projections shown previously in **Table 4-2**.

Table 4-6 Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	Yes
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found.	Section 4.1.2
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes

4.6 Climate Change

Global climate change is generally due to increasing greenhouse gases (GHGs) from human activity that are being produced faster than can naturally be absorbed by nature. Climate change effects include, but are not limited to, the following: increased frequency of warmer days, heavy precipitation events, longer droughts, and high sea level rise. Droughts pose the greatest risk to water supply reliability. Even a single dry year can affect the reliability of the water supply system if water demands increase. Additional regulatory requirements can also reduce the quantity of supplies available (i.e., creek/stream augmentation). Although demand can be offset by reduction measures addressed in the Water Shortage Contingency Plan, or State mandated water reduction measures during a drought emergency, it is often difficult to quantify the extent of these measures. **Chapter 7** addresses the water system reliability for the City during a single dry year and extended drought for future projected demands and near-term conditions.

The International Panel on Climate Change (IPCC) identified several climate change scenarios for future conditions in the Bay Area. Due to a predicted increase in temperature in the future, it is assumed that California and the Bay Area will experience longer and deeper droughts.[16] Although the effects of climate change can vary, suppliers are encouraged to determine the short- and long-term degradation effect on water system supplies and demands. In response to the State Assembly Bill (AB) 32 in 2006 which directs public agencies in California to reduce GHG emissions to 1990 levels by 2020, the City developed a locally based approach to reduce emissions within the community and from government operations, as discussed in the 2013 Climate Action Plan (CAP). In 2016, SB 32 extended the goals of AB 32 and established a mid-term 2030 goal of reducing emissions 40% from 2020 levels and a long-term goal of reducing emissions 80% by 2050. In 2018, Executive Order B-55-18 set the target of statewide carbon neutrality by 2045. The City is still in the process of determining the GHG reduction target that will be used in developing the updated CAP.

The City is currently in the process of a comprehensive CAP update to extend the City's GHG reduction goals through 2030 and to address new State requirements. As of March 2020, 7 out of the 19 measures implemented in the 2013 CAP have been completed; which includes the water conservation goal presented in the 2010 UWMP to reduce per capita water use by 2020, which saved approximately 6,328 AF (2,060 MG) of water from 2008 through 2016. In developing the updated CAP, an initial list of actions was presented for five focus areas which were developed based on stakeholder, public and City input, review of current City planning documents and activities, consideration of peer city and industry best practices, and a qualitative multi-criteria prioritization analysis. The initial action list includes a strategy for improving water supply and conservation through the following actions: providing incentives for community water fixture retrofits, fixture replacement, water data accessibility, water efficient landscaping requirements, diversity of the community water portfolio and requiring recycled water connections for new developments (per City Code 13.15.160).

[16] Bay Area Water Supply and Conservation Regional Water Demand and Conservation Projections, June 2020

The Demand Study also analyzed the effects of weather and climate change data in developing the demand projections for the next 25 years. Climate change data was obtained from the IPCC which developed future climate change scenarios based on global CO_2 emissions in a “business-as-usual” scenario to estimate projected mean maximum temperatures in the Bay Area. According to California’s Fourth Climate Change Assessment San Francisco Bay Area Summary Report, the Bay Area’s annual mean maximum temperature is predicted to increase by 1 to 2 degrees Fahrenheit in years 2006 through 2039 and increase an additional 3.3 degrees Fahrenheit from 2040 through 2069. The two time periods were combined to determine an overall temperature change of 1.7 degrees Fahrenheit (annual mean increase) in the demand forecast for the 2019-2045 period.

Valley Water’s 2040 Water Supply Master Plan (Valley Water Plan) also discusses the effect of climate change on water supply reliability. The Plan outlines several vulnerabilities of the water supply due to climate change, including decreases in quantity of imported water supplies; increases in seasonal irrigation demands; increases in cooling water demands; decrease in utilization of local surface water supplies; decreases in water quality and increase in severity and duration of drought. The Valley Water Plan also addresses changes to demands, regulatory requirements and other uncertainties that could affect water demand management and water supply reliability.

5. WATER USE BASELINES, TARGETS, AND 2020 COMPLIANCE WITH SBX7-7

5.1 Baselines and Targets

In November 2009, the California state legislature passed the Water Conservation Act of 2009 (also known as SBX7-7). SBX7-7 requires the State of California to achieve a 20% reduction in urban per capita water use by the end of 2020. The reduction is based on the selected baseline as described in the subsequent paragraphs. As part of this bill, the City was required to set water use targets to be met by 2020. The City is committed to meeting all requirements set forth in SBX7-7.

In 2010, the City established a historic water use baseline to formulate a target water use goal for 2020. The baseline was calculated by first establishing the annual gross water use in the City. This was done by taking monthly meter readings at all sources of potable water within the City water system. Meters were also read at connections with Valley Water, SFPUC, and at all groundwater wells supplying potable water to the City. The annual gross water use was divided by 365 days and the result was divided again by population estimates given by the California Department of Finance to calculate a daily per capita water use. The average of the 10-year (1995-2004) daily per capita water use is the established 10-year water use baseline.

After consideration of all four methods defined in SBX7-7, the City selected to set its water use target by adopting Method 1 of SBX7-7. This method allowed the City to set water use targets in compliance with SBX7-7 while allowing it to best utilize staff time. Additionally, it ensured the City contributes to a cumulative 20% reduction of water use in the State of California by the end of 2020.

Method 1 of SBX7-7 states that the 2020 water use goal shall be 80% of the historic 10-year baseline of the water agency. This resulted in a 2020 target of 187 gallons per capita per day (gpcd). This target was compared with 95% of a 5-year water use baseline. The lower number was used as the 2020 water use goal. The 5-year baseline was established following the same methodology as the 10-year baseline. The 5-year baseline was selected (as seen in **Table 5-1**) as the 5-year period which best represents the utility's peak historic water use, ending between 2004 and 2010. The 5-year baseline was taken from 2003-2007 and was calculated to be 196 gpcd. The maximum allowable water use target for 2020 is 95% of this 5-year baseline, which resulted in a goal of 186 gpcd for the City. Since this target was less than the target generated by Method 1, the City adopted 186 gpcd as its 2020 water use target.

Additionally, an interim water target goal was also set for 2015. The goal was the midpoint between the historic 10-year baseline water usage and the 2020 goal. The City's 2015 goal was 210 gpcd, which was achieved and exceeded by 2015. As of 2015, the City had achieved a 127 gpcd, exceeding the previously established 2015 target. The City declined the opportunity to adjust the targeted 2015 gpcd as the target has already been met. A summary of the baseline water use and water use targets are shown in Table 5-1. The City declined the opportunity to adjust the targeted 2020 gpcd since the target has already been met. **Table 5-2** below summarizes the City's SBX7-7 compliance, and additional SBX7-7 calculation and verification tables can be found in **Appendix E**.

Table 5-1: Baselines and Targets Summary

Baseline Period	Start Year	End Year	Average Baseline GPCD*	Confirmed 2020 Target*
10-15 year	1995	2004	235	
5 Year	2003	2007	196	186
*All values are in gallons per capita per day (gpcd)				

Table 5-2: 2020 Compliance

Actual 2020 GPCD*	Optional Adjustments to 2020 GPCD					2020 GPCD* (Adjusted if applicable)	Did Supplier Achieve Targeted Reduction for 2020? Y/N
	Extraordinary Events*	Economic Adjustment*	Weather Normalization*	TOTAL Adjustments*	Adjusted 2020 GPCD*		
124	0	0	0	0	0	124	Yes
*All values are in gallons per capita per day (gpcd)							

6. SYSTEM SUPPLIES

6.1 Water Sources

The sources of water supply in the City include local groundwater, imported water from the SFPUC Hetch-Hetchy system, imported treated water from Valley Water, and recycled water from SBWR. The City water system is separated into three interconnected zones (Zone 1, 2 and 2A) in order to provide optimum pressures throughout the City. The zones are shown in **Figure 6-1**. The normal pressure ranges within the system are maintained between 45 psi and 85 psi; in any one area the pressures do not normally fluctuate more than 5 to 10 psi.

The predominant source of potable water within the City is groundwater from wells that are owned and operated by the City. Various areas within the City receive potable water from one or more sources depending on location. **Figure 6-1** shows the approximate boundaries of the various sources. The northwest portion of the City (designated portion of Zone 1) is designed to receive water from SFPUC's Hetch-Hetchy system and is also served by groundwater wells as well as Valley Water water blends. The area of the City north of Bayshore Freeway is primarily served by SFPUC as it currently has only one operational well, one existing inactive well and one well permitted for use as an emergency water supply.

The area south of Bayshore is also partially served by the SFPUC Hetch-Hetchy system as needed through operational changes to water supplies and demands and receives a blend of water from City wells and treated water from Valley Water. The boundaries indicated on **Figure 6-1** are approximate. The zones of influence from the various water sources are dynamic and will change depending on changes in supply and the overall demands on the system.

6.2 Groundwater

The City's source of groundwater is supplied by the Santa Clara subbasin (DWR Basin 2-9.02[17]). The Santa Clara subbasin is part of the Santa Clara Valley Basin which is divided into four subbasins, including the Santa Clara subbasin. The Santa Clara subbasin extends from the Coyote Narrows near Metcalf Road to the southern San Francisco Bay as the northern boundary. It is bounded on the west by the Santa Cruz Mountains and on the east by the Diablo Range. The two mountain ranges converge at the Coyote Narrows to form the southern limit of the subbasin. The Santa Clara subbasin covers a surface area of 189,581 acres. The subbasin is further divided into two groundwater management areas based on differences in hydrogeology, land use and water supply management: Santa Clara Plain and Coyote Valley with the City overlaying the Santa Clara Plain (**Figure 6-2**).

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[17] https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/2003-Basin-Descriptions/2_009_02_SantaClaraSubbasin.pdf

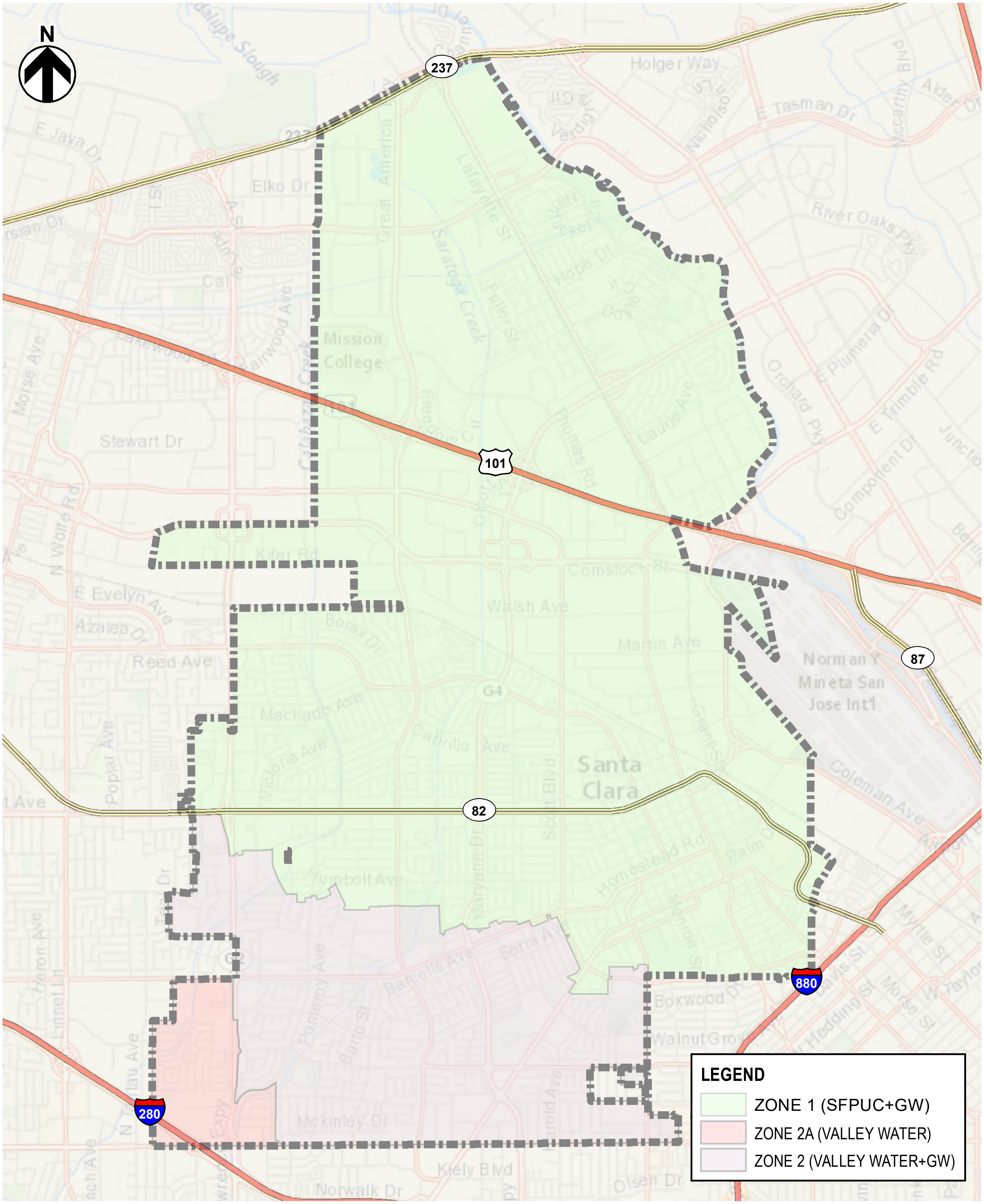

FIGURE 6-1
CITY OF SANTA CLARA
URBAN WATER MANAGEMENT PLAN
WATER SUPPLY SOURCES

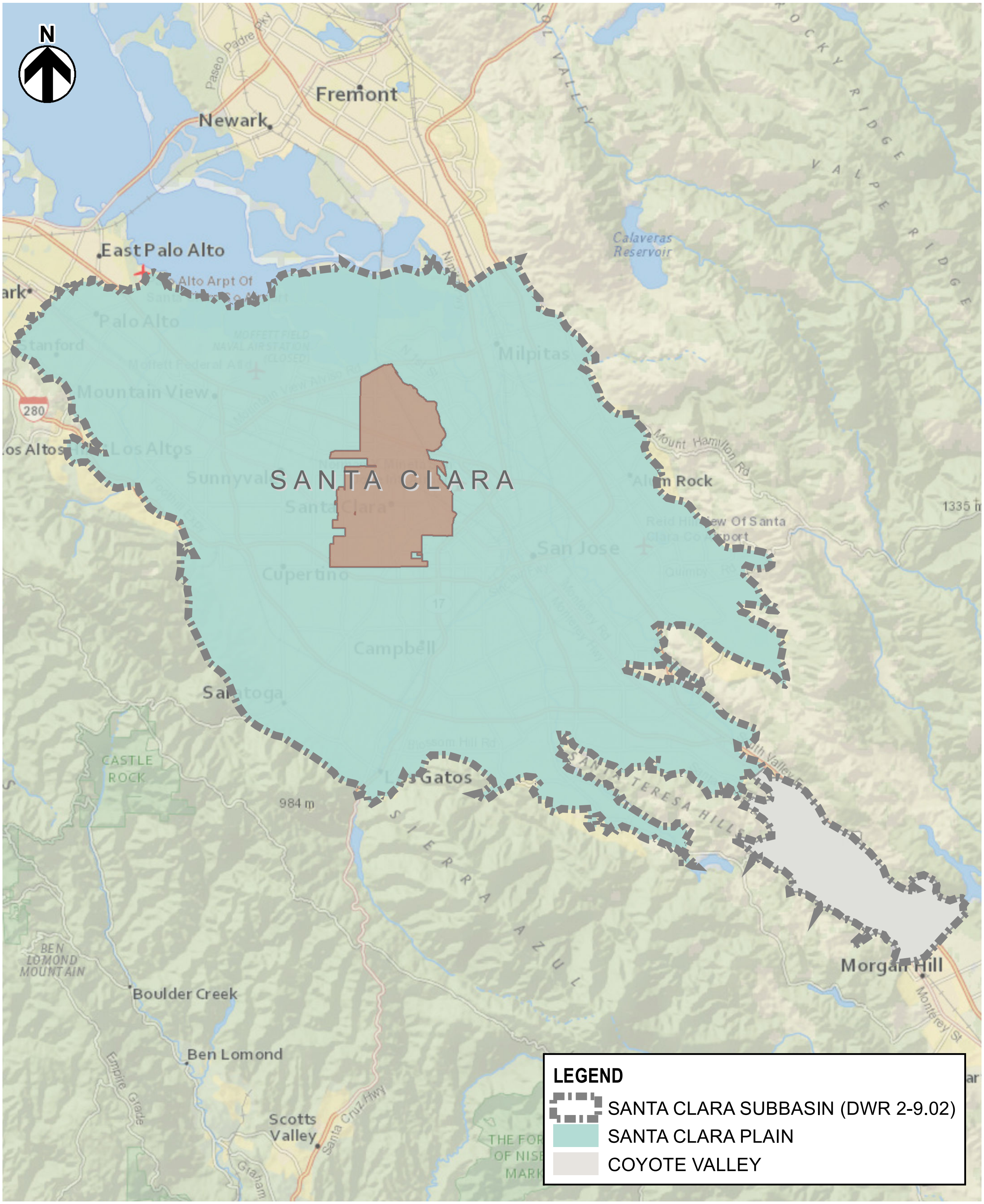

FIGURE 6-2
CITY OF SANTA CLARA
URBAN WATER MANAGEMENT PLAN
MAP OF GROUNDWATER BASIN

In the 2015 UWMP, the Santa Clara subbasin was designated as a medium-priority subbasin, however the most recent information from DWR indicates that the Santa Clara subbasin is now a high-priority subbasin. Basin prioritization was previously based on the 2015 Sustainable Groundwater Management Act (SGMA) Basin Prioritization program, which included overlying population, projected growth, number of public wells, number of total wells, irrigation acreage, groundwater reliance, and documented groundwater impacts as criteria for basin priority designation. The current version, updated in 2019, includes the addition and emphasis of "adverse impacts on local habitat and local streamflows" as a specific component for the designation of basin priority.[18] This component only adds a maximum of two points toward the total points used to designate subbasin priority. With a total of 24.5 points, the Santa Clara subbasin falls above the minimum threshold of 21 points for high-priority designation. This also signifies that even without the addition of the new criteria used in the 2019 SGMA Basin Prioritization process, the Santa Clara subbasin has increased (negative impact) in another area.

Valley Water manages the groundwater supply in Santa Clara County and works with various water retailers in the area to prevent subsidence and overdraft of the basin to ensure reliable water supplies. The Santa Clara Valley Basin is not adjudicated or currently listed as overdrafted.[19] This can be attributed to Valley Water's network of imported surface water supplies, groundwater recharge system, water supply long-term planning, and aggressive conservation efforts through community outreach and rebate programs. The Santa Clara Valley Basin is shown in **Figure 6-3** and is the largest of three interconnected groundwater basins occupying approximately 246,000 acres of the 835,000 acres of Santa Clara County.

Development and agricultural needs in the 1920s increased the water demand within the Santa Clara Valley. This increased extraction of groundwater led to subsidence in several of the aquifers. The Santa Clara Valley Water Conservation District (currently Santa Clara Valley Water District and referred to as Valley Water) was originally formed in 1929 to alleviate land surface subsidence and stop groundwater overdraft. The rapid development of Santa Clara County occurred again in the 1960s and the corresponding increased demand on the water supply again resulted in groundwater level decline, land subsidence and observed salt water intrusion of shallow aquifers adjacent to San Francisco Bay.[20]

The continued overdrafting of the basin resulted in a significant lowering of the groundwater table, significant subsidence of the land in the northern portion of the valley and compaction of several aquifers. When an aquifer is compacted the storage capacity of the aquifer can be substantially reduced. Once lost, storage capacity cannot be regained.

[18] Department of Water Resources, SGMA 2019 Basin Prioritization Results – https://water.ca.gov/Programs/Groundwater-Management/Basin-Prioritization

[19] Department of Water Resources, California's Groundwater Interim Update 2016, DWR Bulletin 118

[20] Valley Water 2016 Groundwater Management Plan

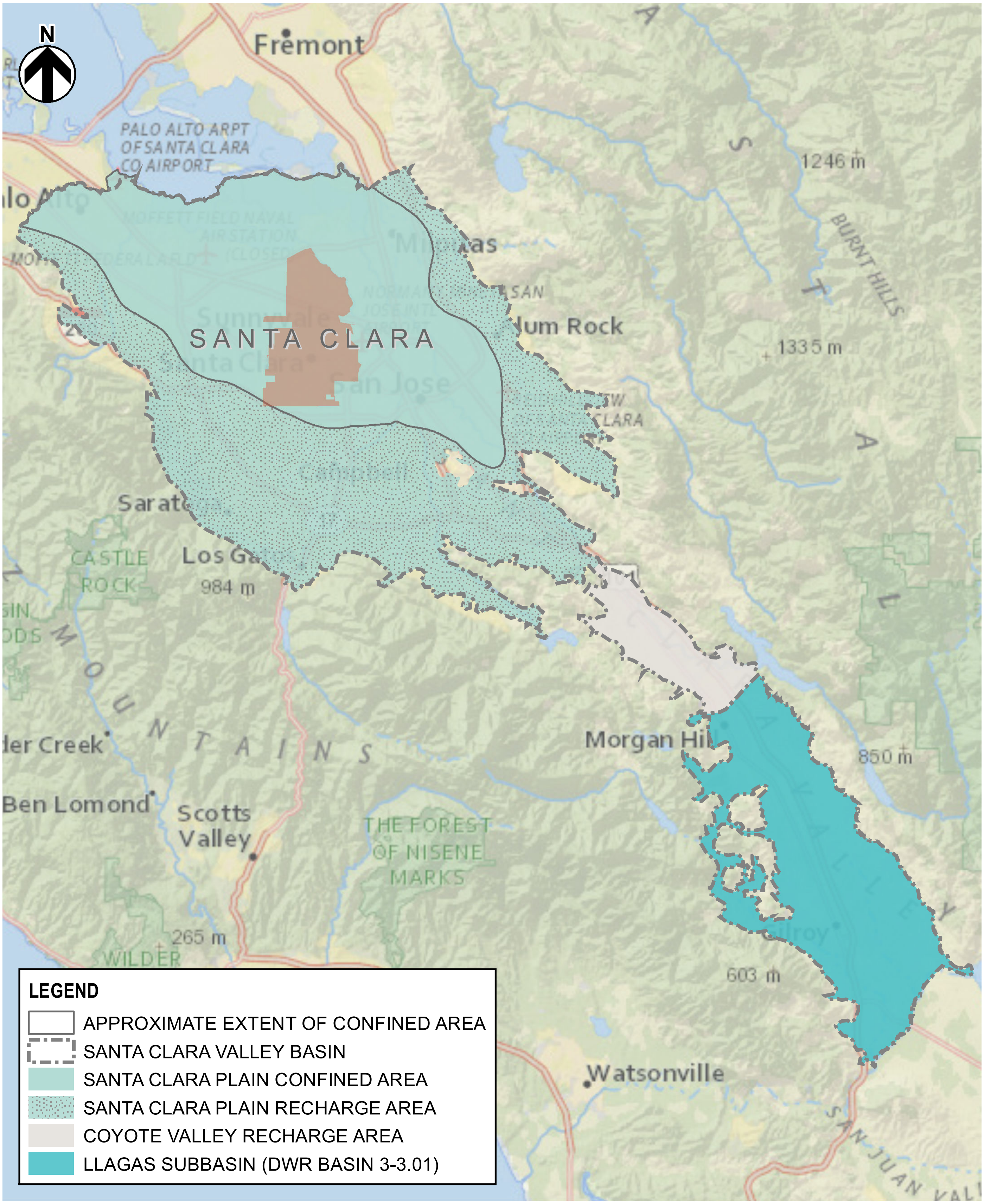

FIGURE 6-3
CITY OF SANTA CLARA
URBAN WATER MANAGEMENT PLAN
MAP OF SANTA CLARA VALLEY BASIN

To avoid any further subsidence and loss of aquifer capacity, Valley Water has attempted to operate the basin to maintain or increase groundwater storage through managed recharge with local supplies augmented with imported raw water. In the late 1960s Valley Water's conjunctive management of surface water and groundwater effectively halted overdrafting and resulting subsidence. Valley Water is currently using projected supply, carryover capacity and anticipated demand to predict potential water shortages. The 2016 Santa Clara Valley Water District Groundwater Management Plan (GMP) describes the groundwater recharge program in detail. The link to the most recent adopted GMP is included in **Appendix F**.

The Santa Clara subbasin currently provides about 60% of the City's potable water supply. The City's wells are strategically distributed around the City adding to the reliability of the water system and minimizes the possibility of localized subsidence due to overdrafting. To minimize the possibility of long-term overdraft conditions, the City monitors groundwater levels and meters the groundwater pumping for all City owned production wells. To further ensure that no overdrafting is occurring the City operates a recycled water system and requires new development along the recycled water distribution system to use recycled water for approved irrigation and industrial uses. The City also encourages and promotes water conservation to minimize groundwater usage.

The FY 2021-22 Valley Water Protection and Augmentation of Water Supplies (PAWS) report states that the condition of the ground water basin is estimated to remain good at 331,000 AF at the end of 2020. Total storage at the end of 2020 is projected to be in Stage 1 (Normal) of Valley Water's Water Shortage Contingency Plan. Valley Water's Semitropic groundwater bank reserves are at approximately 95% of capacity, or 333,165 AF, as of December 31, 2020.

Appendix G shows the City's individual well production and the depth to water for calendar years 2016 - 2020. **Appendix G** also shows the pressure zone in the distribution system within which the well is located. Seasonal fluctuations in the depth to water are seen in the groundwater table but there is no evidence of declining water table or overdrafting. The pressure zone designation gives an approximate geographic distribution for the wells. The exact location of the wells is not included in this UWMP for security reasons.

The allowable withdrawal or safe yield of groundwater by the City is dependent upon multiple factors including withdrawals by other water agencies, quantity of water recharged and the carry over storage from the previous year. Valley Water's current (2019) groundwater report shows the City as being the second highest user of groundwater pumping, at 17%, for the Santa Clara Plain subbasin designated as North County (Zone W-2).[21]

[21] 2019 Valley Water Annual Groundwater Report.

Table 6-1 shows the City's annual groundwater pumping volumes in acre-feet from 2016 to 2020. In 2020 a total of 10,835 AF was pumped from the current active 21 production wells within the City. In 2020, groundwater from wells accounted for 49.7% of all water used in the City (including recycled water) and 59.2% of the total potable water supply.

Table 6-1: Retail Groundwater Volume Pumped – Potable						
Groundwater Type	Location or Basin Name	2016	2017	2018	2019	2020
Alluvial Basin	Santa Clara Valley	10,115	12,224	10,658	9,779	10,835
TOTAL		10,115	12,224	10,658	9,779	10,835
NOTES: Units of volume in AF.						

6.3 Surface Water

6.3.1 Treated Surface Water from Valley Water

Valley Water's current sources of potable water supply are primarily imported water supplies, with the remaining water supplied from local groundwater and surface water. Based on historic data, imported water supplied from SFPUC makes up 15% of the total water supply and 40% is Delta-conveyed from the State Water Project (SWP) and Central Valley Project (CVP). Valley Water also utilizes recycled water for non-potable reuse, which historically makes up 5% of the total water supply. For 2020, Valley Water estimated SFPUC supplies at 16% and SWP and CVP supplies at 37% of total managed supplies.[22] Estimated production for recycled water through December 2020 was 843 AF with a year-to-date of 16,800 AF or 92% of the five-year average.

As stated in Valley Water's 2040 Water Supply Master Plan, more than 70% of the Delta-conveyed supply is delivered to Valley Water's three potable water treatment plants. Valley Water's current contractual allocation from Delta-conveyed supplies is 252,500 AFY, although actual water allocated is typically less since it depends on hydrology and regulatory restrictions. The Valley Water 2040 Water Supply Master Plan projected an average allocation of 171,000 AF for 2020 of Delta-conveyed supplies. Due to actual low imported water allocations for 2020 from Delta-conveyed supplies, Valley Water was forced to withdraw supplies from banked groundwater supplies. Valley Water also expects the current average allocation from Delta-conveyed supplies to decline from 171,000 AFY to 133,000 AFY by 2040 if no additional investments are made.[23] Among other strategies to secure water supplies and increase flexibility, Valley Water's Board has also decided to participate in the Delta Conveyance Project (formally known as the California WaterFix) as of 2018. The projects goals are to construct an alternate tunnel to divert water from the Sacramento River to the southern end of the Delta and improve the average available Delta-conveyed water supply to 170,000 AFY from 133,000 AFY.

[22] FY 2021-22 Valley Water Protection and Augmentation of Water Supplies. February 2021.

[23] Valley Water Water Supply Master Plan 2040

The City receives treated surface water from Valley Water's Rinconada Water Treatment Plant (WTP) via the Santa Clara "distributary" (pipeline) at the Serra Tank site located at the southwest corner of the City. The City currently takes about 2,200 to 3,000 gallons per minute (gpm) from this supply. A modification of the current Valley Water connection would allow for greater flows than the current 4,000 gpm flow limit. The City is investigating an upgrade of the existing turnout connection, which would allow increased capacity to take this treated water and greater flexibility of operations. In 2015, Valley Water began a large-scale modernization of the Rinconada WTP to increase the reliability of the plant and increase the treatment capacity to 100 MGD (112,014 AFY). The work is currently in Phase 2 and is scheduled to be fully completed by 2027.[24] In 2020 imported treated water from Valley Water was the source of 3,982 AF (1,298 MG) or 21.8% of the total potable water supply.

6.3.2 Treated Surface Water from SFPUC

BAWSCA provides regional water reliability planning and conservation programming for the benefit of its 26 member agencies, including the City that purchase wholesale water supplies from the San Francisco Public Utilities Commission (SFPUC). Collectively, the BAWSCA member agencies deliver water to over 1.8 million residents and nearly 40,000 commercial, industrial and institutional accounts in Alameda, San Mateo and Santa Clara Counties.

BAWSCA also represents the collective interests of these wholesale water customers on all significant technical, financial, and policy matters related to the operation and improvement of the SFPUC's Regional Water System (RWS).

SFPUC obtains its water from the Tuolumne River watershed in the Sierra Nevada Mountains, from the Calaveras and San Antonio Reservoirs in Alameda and Santa Clara Counties, and from the Crystal Springs Reservoir on the San Francisco Peninsula. The water delivered direct from the Sierras along with local supplies from the Calaveras and San Antonio Reservoirs, are delivered to the San Francisco Bay Area through the Hetch-Hetchy Aqueduct. A branch of the aqueduct traverses the northern portion of the City. This branch of the Hetch-Hetchy system is called the Bay Division Pipelines and consists of two pipelines (96" and 72") under high pressure. Within Santa Clara County, the Cities of Milpitas, San Jose, Sunnyvale, Palo Alto, Mountain View, Los Altos and Los Altos Hills obtain some or all of their water from the Hetch-Hetchy system.

The City has two connections to the Hetch-Hetchy system to receive water from SFPUC. The combined capacity of these two turnouts is 7,500 gpm or 10.8 MGD (12,098 AFY), although current contractual arrangements limit the City's use to a maximum rate of 4.5 MGD (5,041 AFY). The City's current understanding with SFPUC is that this source can supply any portion within the City. The City currently takes about 1,300 to 3,300 gpm from this supply. This supply is pressurized and no additional pumping is needed. Water can also be taken into the City's Northside Storage Tanks, which requires the use of a

[24] Valley Water Website. The Rinconada Water Treatment Plant Reliability Improvement Project - https://www.valleywater.org/project-updates/infrastructure-improvement-projects/rinconada-water-treatment-plant-reliability

booster pump station. In 2020, SFPUC's Hetch-Hetchy system was the source of 3,485 AF (1,136 MG) or 19% of the potable water supplied to the City.

In the 2009 WSA, the SFPUC committed to make three decisions before 2018 that affect water supply development:

- Whether or not to make the cities of San Jose and Santa Clara permanent customers,
- Whether or not to supply the additional unmet supply needs of the Wholesale Customers beyond 2018, and
- Whether or not to increase the wholesale customer Supply Assurance above 184 MGD (206,107 AFY).

Events since 2009 made it difficult for the SFPUC to conduct the necessary water supply planning and CEQA analysis required to make these three decisions before 2018. Therefore, in the 2018 Amended and Restated WSA, the decisions were deferred for 10 years to 2028.

If the City were required to eliminate the usage of treated water from SFPUC, the City would consider increasing groundwater utilization, increasing treated surface water supply from Valley Water, or a combination of the two supplies.[25] The City would consider increasing the use of recycled water where applicable, to reduce demand on imported treated water also.

In 2002, the California legislature enacted AB 1823, mandating that the SFPUC Hetch-Hetchy System be rebuilt to withstand a future large earthquake that could threaten the health, safety, and economic well-being of those people, businesses, and communities. Section 73504(a) of that Act also required the SFPUC to report to the State annually about "the progress made during the previous calendar year on securing supplemental sources of water to augment existing supplies during dry years". SFPUC is focused on looking for and developing additional supplies to make Santa Clara a permanent customer. As mentioned, SFPUC provides an annual report of its progress on developing these supplies with quarterly updates to the report and meetings with BAWSCA and the City to discuss progress on the projects. The SFPUC must make a decision by 2028 about permanent customer status for San Jose and Santa Clara and the development of new supplies will be key in this decision. The SFPUC is focused on developing new sources of water supply with a budgeted CIP and a focused and dedicated team to plan for a successful program. BAWSCA along with Santa Clara is supporting the SFPUC efforts to develop new supplies as it did in the implementation of the WSIP.

[25] City of Santa Clara 2002 Water Master Plan

6.4 Stormwater

The City has been a member of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) since the early 1990s. The program and member agencies, which consist of thirteen cities in Santa Clara Valley, the County of Santa Clara, and Valley Water, share a common National Pollutant Discharge Elimination (NPDES) permit to discharge to the South San Francisco Bay. The purpose of the program is to reduce pollution in stormwater runoff and protect water quality and the beneficial uses of San Francisco Bay and Santa Clara Valley creeks and rivers.

As a result of the 2014 California Water Action Plan, the State Water Board created the "Strategy to Optimize Resource Management of Stormwater" (STORMS). The purpose of this program was to promote stormwater as a valuable resource, support policies for collaborative watershed-level stormwater management and pollution prevention, provide funding opportunities, develop resources, and integrate regulatory and non-regulatory interests.[26] This program influenced Bay Area municipal stormwater NPDES permits to establish new stormwater management requirements.

The City does not currently utilize stormwater capture within its system for reuse in commercial, industrial or for irrigation. The City's stormwater drainage system discharges via gravity outfalls and pump stations into three ephemeral creeks (Calabazas, Saratoga and San Tomas Aquino Creek). Since 2016, the City along with 75 other municipalities and local agencies, is subject to the requirements of Phase I of Order R2-2015-0049 Municipal Regional Stormwater NPDES Permit (MRP). The current MRP implements new requirements and targets related to reducing trash loads from stormwater, developing and implementing a trash monitoring program for creeks and shorelines, meeting mercury and PCB (Polychlorinated Biphenyls) stormwater reduction goals, and developing and implementing Green Stormwater Infrastructure (GSI) Plans.[27]

The City's approved GSI Plan was developed as part of the new requirements of the 2016 MRP. The purpose of the GSI Plan is to demonstrate the City's commitment to promote green stormwater infrastructure over traditional storm drainage infrastructure while reducing or eliminating the effects of urban runoff. Implementing GSI facilities and measures have multiple benefits, including reducing urban heat island effect and serving as a means of stormwater capture for later use as a non-potable water supply. For the full report, see **Appendix H**. Since stormwater capture is not currently utilized by the City, it will not be considered as a source of non-potable water supply for the purpose of the UWMP.

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[26] City of Santa Clara 2019 Green Stormwater Infrastructure Plan

[27] Santa Clara Valley Urban Runoff Pollution Prevention Program Website - https://scvurppp.org/about-scvurppp/

6.5 Wastewater and Recycled Water

6.5.1 Wastewater Collection, Treatment and Disposal

The wastewater collection system within the City is owned and operated by the City. Over 270 miles of sewer mains and seven pump stations are used to convey wastewater to the San Jose-Santa Clara Regional Wastewater Facility (RWF).

The Cities of San Jose and Santa Clara own the RWF. The City of San Jose is the administrative agency who operates the RWF under a 1959 Agreement (subsequently amended). The RWF also treats wastewater from the cities of Milpitas, Campbell, Cupertino, Los Gatos, Monte Sereno, and Saratoga, as well as several unincorporated areas of Santa Clara County. The RWF service area covers 300 square miles and a population of over 1.4 million people.

The RWF is an advanced tertiary treatment plant that treats an average of 110 MGD (123,216 AFY) of wastewater. Currently, approximately 13%[28] of the effluent from the RWF is re-chlorinated and distributed by SBWR at which point it meets the requirements of California Code of Regulations (CCR) Title 22 for unrestricted non-potable reuse. Since March 2014, the RWF also supplies the Silicon Valley Advanced Water Purification Center with secondary wastewater for advanced purification treatment. The remainder of the wastewater is discharged to the Artesian Slough, which leads to the southern portion of the San Francisco Bay.

In 2020, the RWF collected and treated 113,393 AF (36,949 MG) of wastewater (**Table 6-2**) of which 12,571 AF (4,092 MG) was treated to meet Title 22 standards for unrestricted non-potable reuse.

Table 6-2: Retail: Wastewater Collected Within Service Area in 2020						
Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
San Jose-Santa Clara RWF	Estimated	113,393	City of San Jose	San Jose-Santa Clara RWF	No	Yes
Total Wastewater Collected from Service Area in 2020:		113,393				
NOTES: Volume of wastewater collected was estimated by SBWR.						

[28] San Jose-Santa Clara Regional Wastewater Facility Website. Fact Sheet accessed on November 23, 2020 - https://www.valleywater.org/project-updates/infrastructure-improvement-projects/rinconada-water-treatment-plant-reliability

Table 6-3 shows the approximate volume of wastewater treated and discharge methods within the service area.

Table 6-3: Retail: Wastewater Treatment and Discharge Within Service Area in 2020						
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number (optional)	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level
San Jose-Santa Clara RWF	Artesian Slough	Tributary to South San Francisco Bay via Coyote Creek	2438014001	Bay or estuary outfall	No	Advanced
Total 2020 Volumes						
Wastewater Treated		Discharged Treated Wastewater		Recycled Within Service Area	Recycled Outside of Service Area	Instream Flow Permit Requirement
113,393		92,845		3,499	9,072	0
NOTES: City does not currently have Instream Flow requirements.						

6.5.2 Recycled Water

Recycled water within the City is supplied from the jointly owned San Jose-Santa Clara RWF. This recycled water meets the requirements of the CCR Title 22, Division 4. The City and all users of recycled water must ensure that a number of regulatory requirements specified in CCR Title 22 are met. CCR Title 22 specifies the types of use and the conditions under which the use of recycled water is allowed.

The SBWR Program was initiated to reduce the discharge of treated wastewater flowing from the RWF into the San Francisco Bay. A past NPDES discharge permit placed a discharge limit of 120 MG each day during the summer (“dry-weather flow”) to help maintain the salt marsh habitat of the south bay. As a result, the RWF formed SBWR, which purchased the City’s recycled water system and now is the regional recycled water wholesaler within the RWF service area.

SBWR provides oversight, promotes recycled water, operates the recycled water distribution system, and provides technical guidance to recycled water customers. The second driving force behind the water recycling efforts was changes in the California Water Code. In 1991, the state passed the Water Recycling Act of 1991, which is contained in Sections 13575-13583 of the Water Code. The Water Recycling Act instructs water retailers to "identify potential uses for recycled water within their service areas, potential customers for recycled water service within their service area, and, within a reasonable time, potential sources of recycled water."[29] Within certain technical and financial considerations, water

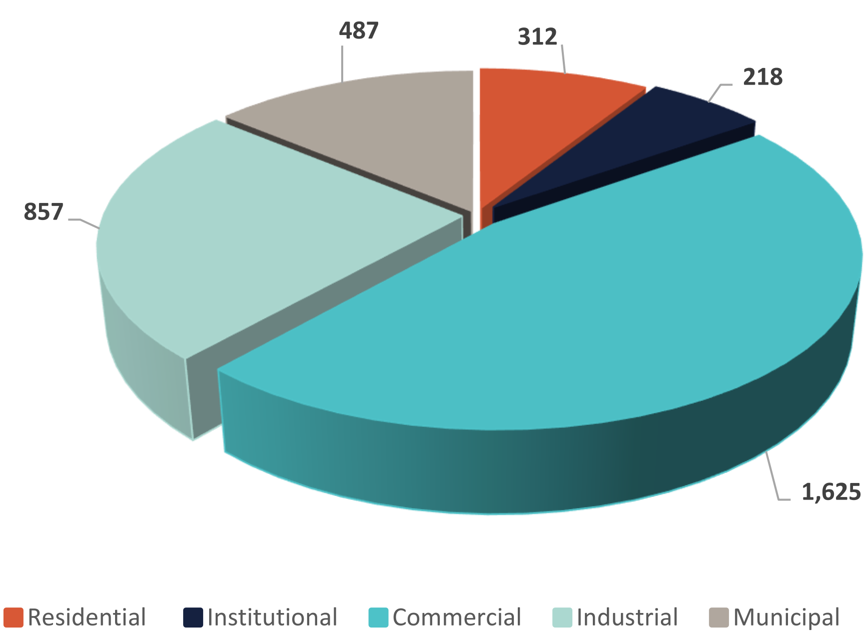
[29] California Water Code Section 13579(a)

retailers are instructed by the Water Recycling Act to provide recycled water to customers that request it. To further encourage the use of recycled water, the Water Code was also changed to prohibit the use of potable water for certain uses, if recycled water is available.[30]

Recycled water is primarily used for landscape irrigation within the City, commercial, and industrial uses. Recycled water uses include: toilet flushing in dual plumbed buildings, commercial building landscaping, or cooling towers The City's electric utility operates the Don Von Raesfeld 147 mega-watt power plant, which uses recycled water exclusively for cooling water and steam for power production. In 2020, recycled water offset approximately 19% of water use that could have otherwise been potable water.

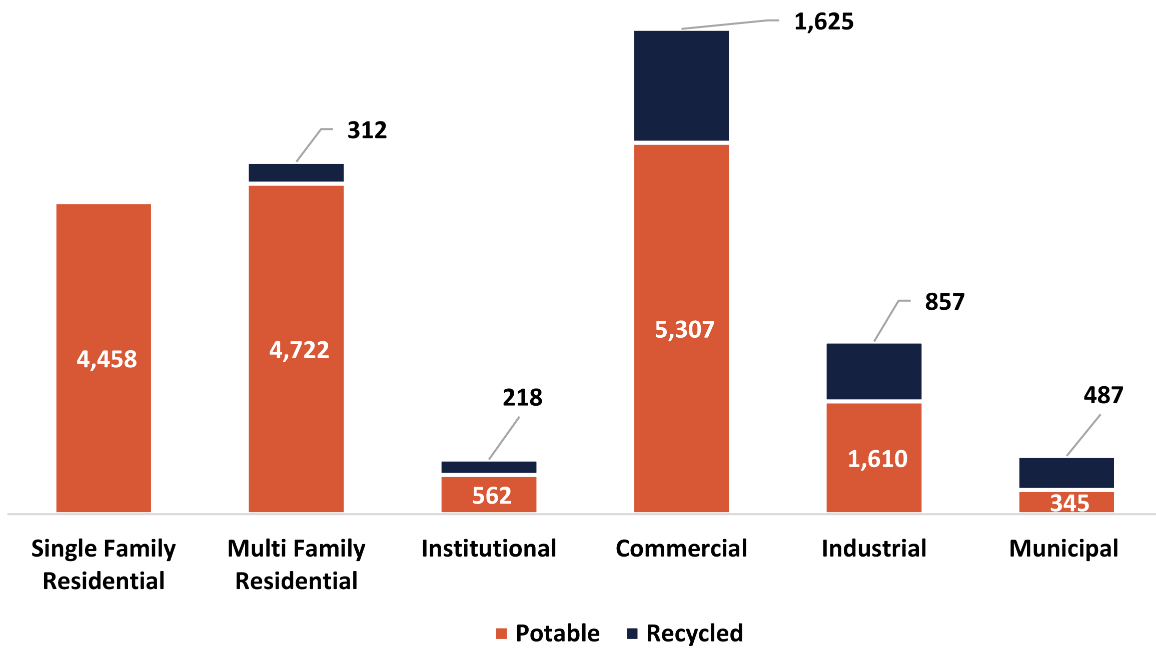
The City maintains the portion of the SBWR system within its boundaries under an agreement with the City of San Jose, pursuant to which San Jose functions as lead administrative agency. In 2020, 3,499 AF (1,140 MG) of recycled water was supplied to the City which is a 1% reduction in usage compared to 2015 (3,529 AF). Although recycled water demands increased compared to 2015 for the residential, commercial and industrial sector, municipal demands decreased by approximately 54% in 2020. **Figure 6-4** provides the breakdown of 2020 recycled water use by user type. Recycled water represented 16% of the total water used within the City. **Figure 6-5** shows the relative use of recycled water to potable water by user type.

Figure 6-4: Recycled Water Use by User Type 2020 (AF)



[30] California Water Code Section 13550-13551

Figure 6-5: Recycled and Potable Water Sales by Category 2020 (AF)



Since the last UWMP, recycled water use decreased by about 1% (2020) as stated previously; with the highest annual use of 4,239 AF (1,381 MG) in 2018. The City's recycled water use is expected to increase and projected demands are addressed in the next section.

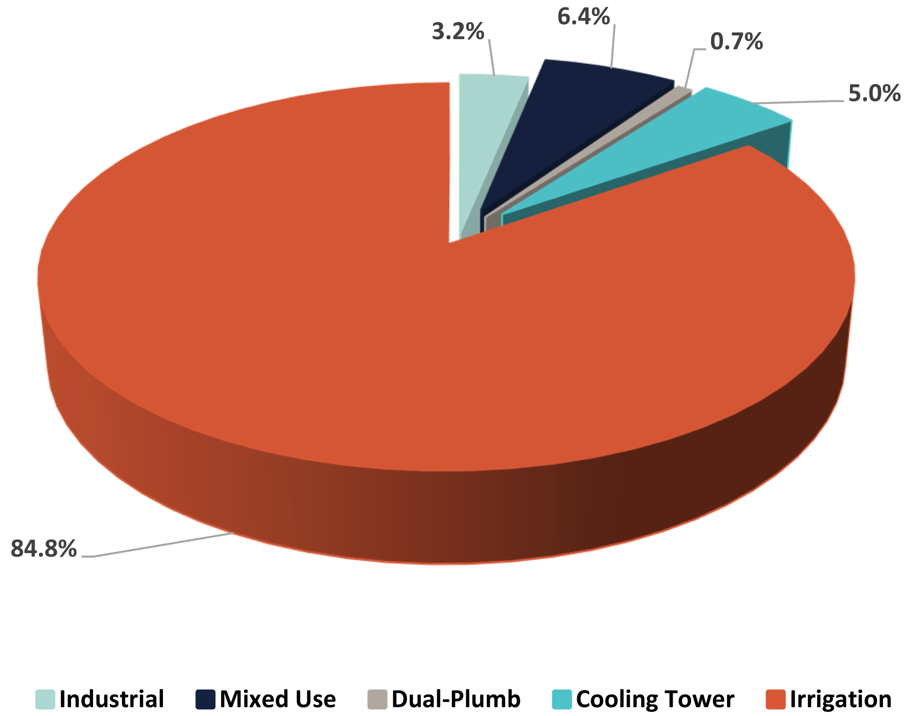
Although recycled water has been used in some large commercial/industrial processes, the predominant users of recycled water remains landscape irrigation.

6.5.3 Current Recycled Water Use

The City's recycled water system has been in operation since 1989. The City has pursued the use of recycled water including use in industrial processes, residential irrigation and dual plumbed buildings for toilet and urinal flushing. The City has also pursued more traditional uses for recycled water as a drought proof water source for large turf area irrigation in commercial settings.

Currently, the City services 282 recycled water accounts. **Figure 6-6** provides a breakdown of recycled water service accounts for industrial process use, mixed, dual-plumbing, cooling tower and irrigation use only. Mixed use accounts for sites that use recycled water for both irrigation and/or dual-plumbing or industrial use with dual-plumbing on-site.

Figure 6-6: Recycled Water Accounts by Service Type 2020



Recycled water is currently used within the City for irrigation at parks, landscape street medians, multi-family residential units and schools. Several industries use recycled water in industrial processes, cooling towers and for toilet flushing in dual plumbed buildings. The largest users of recycled water are California Paperboard, Great America, Digital Realty, Santa Clara University, and the Don Von Raesfeld Power Generation Facility combining for 1,131 AF (369 MG) in 2020.

The existing recycled water distribution system was laid out to maximize service to large potential recycled water customers. The recycled water distribution system is shown in **Figure 6-7** below. Recycled water sales have remained fairly steady since 2015, with the highest water sale in 2018 as shown in **Figure 6-8** below. Since the last UWMP, expansion of the recycled water distribution system infrastructure has not changed, however more accounts have been added since the last UWMP and pending projects show a continued growth of recycled water.

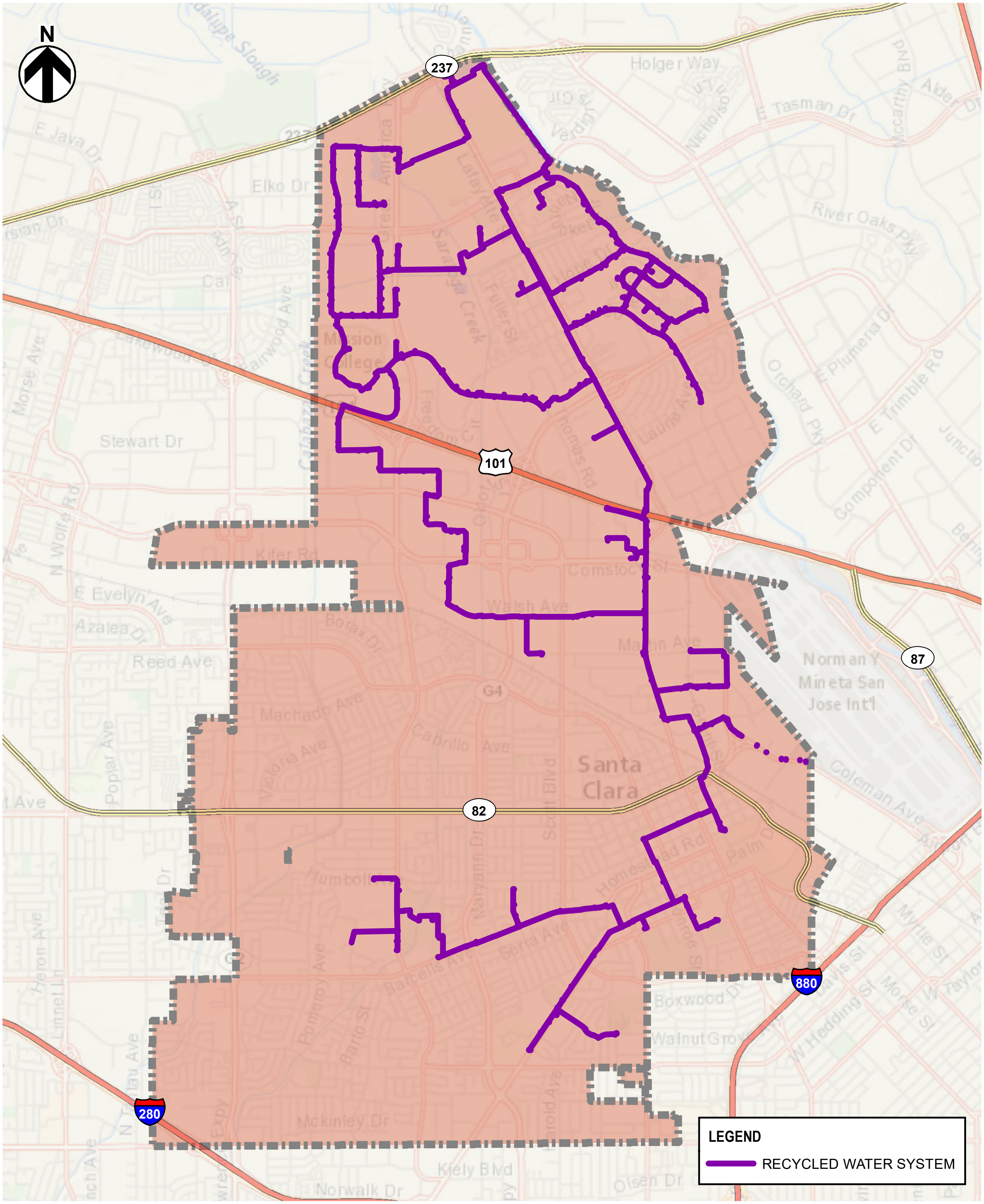
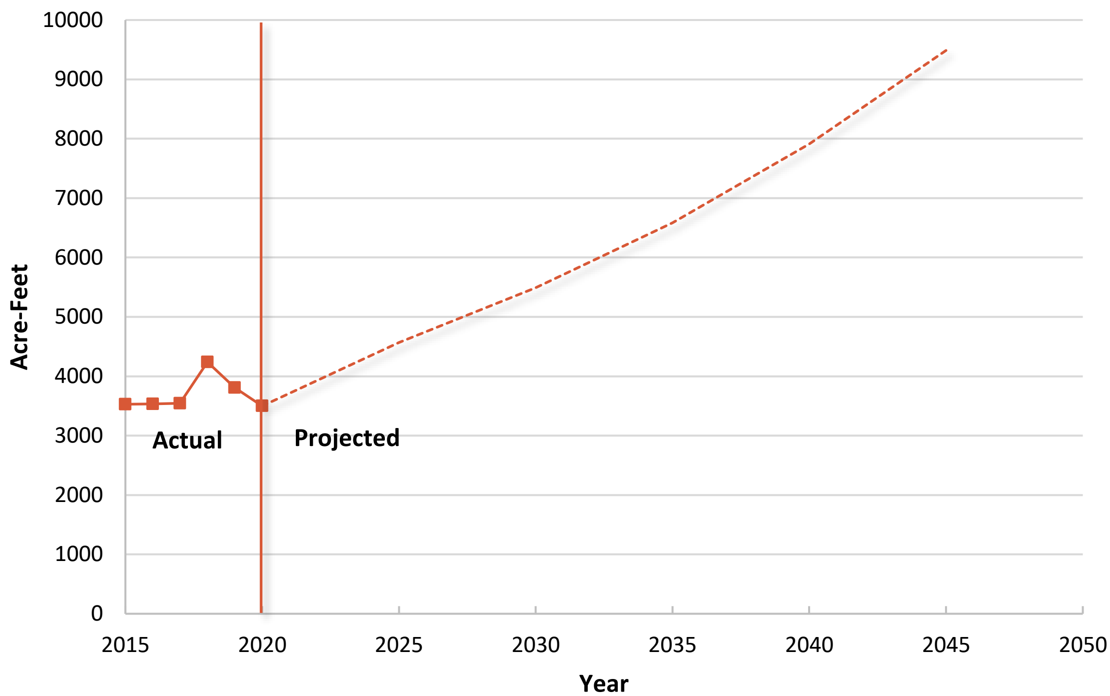


FIGURE 6-7
CITY OF SANTA CLARA
URBAN WATER MANAGEMENT PLAN
RECYCLED WATER DISTRIBUTION SYSTEM

Figure 6-8: Actual and Projected Recycled Water Sales



Since the 2015 UWMP, there has been an increase in data center construction and proposed projects underway, which was anticipated in the 2015 UWMP. Although the actual recycled water demand for 2020 was almost 26% lower than the projected demand from the 2015 UWMP, there is an increased demand for recycled water for landscape irrigation in recent projects, thus the projected usage shown in the table is highly feasible. Approximately 50% of City parks are already irrigated with recycled water. The City plans to extend recycled water infrastructure out to connect the remaining parks to offset potable water use. **Table 6-4** below shows projected increases in recycled water use through 2045, based on the projected future recycled water usage shown in **Figure 6-8**.

The City and SBWR are working with potential customers along the pipeline extensions to encourage, and in some instances, require recycled water use for irrigation and/or cooling towers. Current projects, that have been completed since the last UWMP, are in construction, or are scheduled to be completed within the UWMP reporting period (2020-2045) are estimated to increase the total recycled water demand (see **Appendix I**). Projects that are within the vicinity of recycled water and where service is available are noted in **Appendix I**.

Some additional customers may be provided with recycled water once additional recycled water distribution mainline extensions are completed. The current five-year Capital Improvement Plan (CIP) includes upgrading the recycled water system and extending the water main to offset potable water demands (where applicable) for new proposed developments. Due to the high cost of distribution system extensions and retrofit costs, it is usually not cost effective to convert smaller potential users to recycled water use.

Table 6-4: Retail: Recycled Water Direct Beneficial Uses Within Service Area								
Name of Agency Producing (Treating) the Recycled Water:			Cities of San Jose and Santa Clara					
Name of Agency Operating the Recycled Water Distribution System:			City of Santa Clara					
Source of 2020 Supplemental Water			San Jose-Santa Clara RWF					
Beneficial Use Type	General Description of 2020 Uses	Level of Treatment	2020	2025	2030	2035	2040	2045 *(opt)*
Landscape irrigation (excludes golf courses)	Parks, schools, cemeteries, churches, residential, other public facilities	Tertiary	1,017	1,328	1,595	1,914	2,299	2,758
Commercial use	Landscaping, toilets, HVAC, car washes, laundries, nurseries, etc.	Tertiary	1,625	2,122	2,549	3,059	3,673	4,406
Industrial use	Cooling Towers	Tertiary	857	1,119	1,344	1,613	1,937	2,324
Total:			3,499	4,570	5,489	6,586	7,908	9,488
NOTES: No supplemental water was added in 2020.								

The table below (**Table 6-5**) shows actual 2020 recycled water use compared to the 2015 UWMP projected 2020 use.

Table 6-5: Retail: 2015 UWMP Recycled Water Use Projection Compared to 2020 Actual		
Use Type	2015 Projection for 2020	2020 Actual Use
Agricultural irrigation	0	0
Landscape irrigation (excludes golf courses)	2,081	1,017
Golf course irrigation	0	0
Commercial use	1,537	1,625
Industrial use	1,082	857
Other Type of Use	0	0
Total	4,700	3,499

6.5.4 Recycled Water Quality

To produce recycled water, wastewater is tertiary treated at the San Jose-Santa Clara Regional Wastewater Facility (RWF) and delivered by South Bay Water Recycling (SBWR) which is managed by the City of San Jose. DDW establishes water quality standards and treatment reliability criteria for water recycling under Title 22 of the California Code of Regulations. Title 22 sets bacteriological water quality standards based on the expected degree of public contact with recycled water. Recycled water produced by the RWF meets the “unrestricted use” standard as defined by Title 22. Recycled water from the RWF frequently surpasses requirements for this standard. State standards have historically been growing ever more stringent. Future regulations and standards may require more extensive and expensive recycled water treatment.

6.5.5 Potential Uses of Recycled Water

The potential future uses of recycled water are similar to the current uses: landscape irrigation and industrial processes. Through the expansion of the recycled water distribution system within the City, there is potential to retrofit existing large landscape systems like city parks to recycled water and also convert existing industrial processes that had previously been out of reach of the recycled water system. New non-residential projects located near recycled water mains are able to utilize recycled water for toilet flushing and cooling tower water by dual plumbing the development. Since the 2015 UWMP, the City has made few improvements to the current recycled water infrastructure. However, the City plans to include the extension/expansion to the city parks and upgrade of the recycled water system main[31] in the development of the 2019/20-2024/25 Capital Improvement Plan (CIP).

6.5.6 Projected Use of Recycled Water

All new developments that occur within a reasonable distance of the existing or proposed recycled water distribution system will be required to accommodate recycled water for landscape irrigation and/or cooling towers (i.e., dual-plumbing). The City is also requiring developers to be ready to use recycled waterif it is available in the future. Several infill projects may be developed along the recycled water distribution system that is currently in place. In addition to the facilities listed in **Appendix I**, the City is projecting increased use by the current recycled water customers and added customers due to new development and redevelopment along the existing recycled water pipelines. While the largest potential recycled water users have already been converted to recycled water use, the City is becoming home to a large data center industry and the data centers can use large volumes of water in cooling towers. SBWR and the City are encouraging new projects to use recycled water for landscape irrigation, dual plumbing and cooling towers. Based on sites already utilizing recycled water, and expected demands of projects currently in the permitting process to use recycled water, future recycled water use

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[31] City of Santa Clara, “2020 UWMP – Water and RW Projects”, October 20, 2020.

in the City is expected to grow to nearly 9,488 AFY by 2045. A list of these projects can be found in **Appendix I**, as noted in **Table 6-6**.

Table 6-6: Retail: Methods to Expand Future Recycled Water Use	
☐	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.
X	Some or all of the supplier's plans for future expansion of recycled water use are not compatible with his table and are described in a narrative format.
pg. 50, Appx I	Provide page location of narrative in UWMP

6.5.7 Description of Actions and Financial Incentives

Recycled water rates are approximately 42% below the comparable rate for potable water, currently $3.74 per HCF versus $6.43 for potable water. City staff are educating City residents and businesses of the benefits of using recycled water and encouraging attendance at environmental fairs hosted by the City as well as local businesses promoting recycled water use. In addition, City staff also reach out to businesses along the recycled water pipeline to educate and encourage conversion to recycled water.

The City's General Plan encourages new developments to use recycled water. In addition, the City offers technical assistance for the design of retrofits, horticultural and landscaping problems, and for the permit process through the State Water Board – Division of Drinking Water for each recycled water use location.

The City Code, Section 13.15.160(a), states that it is the purpose and intent of City Council to prohibit the use of potable water for landscape irrigation where recycled water is made available and meets all applicable standards. Section 13.15.160(b) states that it is also the purpose and intent of City Council to require the use of recycled water for all other non-potable uses where recycled water is made available and meets all applicable standards for those uses and is determined to be suitable and economically feasible therefore. The goals of City Council are sustainability and offset potable water use by using recycled water.

Valley Water and the RWF completed construction of an Advanced Water Treatment Facility adjacent to the RWF in 2014. The Silicon Valley Advanced Water Purification Center (SVAWPC) was constructed to enhance the quality of the recycled water currently produced by the RWF for potable reuse in the augmentation of groundwater or surface water supplies. The SVAWPC produces up to 8.0 MG of highly purified recycled water per day. The facility has been designed so that it can be expanded in the future to four times its initial size.

Water that has undergone two levels of treatment at the adjacent RWF will undergo three additional advanced treatment stages: microfiltration, reverse osmosis, and ultra-violet disinfection. The SVAWPC produces water that is as pure as, or purer than, many potable water sources. The water that is produced is blended with recycled water from the SBWR program. The enhanced blend of water will help industrial users reduce operating costs, and it can be used on a wider variety of landscapes, due to a much lower level of salinity.[32] In areas of the City served by groundwater, industrial customers will find the quality of treated recycled water to be more consistent than groundwater for cooling towers. Those cooling towers that receive groundwater could also receive a blend of multiple water sources based on system demand (e.g., groundwater blended with imported surface water) with slight variations in water quality, whereas those that receive recycled water would receive one consistent water source.

Valley Water is in the process of completing the Countywide Water Reuse Master Plan (CWRMP) to integrate and expand the use of recycled water for non-potable and potable reuse. The goals of the CWRMP are, but not limited to identification of feasible opportunities to expand water reuse; development of partnerships with other recycled water producers/supplier to promote potable reuse through the development of purified water systems; and evaluating potential regional integration to improve system reliability and flexibility and optimize use of supply and infrastructure.

6.6 Desalinated Water Opportunities

The opportunities for the City to use desalination as a potential source of water are limited. These limitations are due to geographic location and logistics. The City is located inland from the San Francisco Bay and other sources of seawater or brackish water. In addition, the City lacks a practical means of brine disposal from a desalination process. The distance from a suitable location for an outfall is significant and the cost would be prohibitive. However, Valley Water is a partner in the Bay Area Regional Desalination Project. Under the project concept, Valley Water would receive 5,600 AF in critical dry years through exchanges with other agencies.

In 2017, Valley Water and participating agencies finalized the Bay Area Regional Reliability (BARR) Drought Contingency Plan to identify all the available opportunities to optimize water supply reliability through the sharing of water resources across the region. This includes the use of existing supplies as well as new supply through desalination. By taking a more holistic and regional approach to water supply planning, the agencies hope to make the best use of existing resources to serve the future needs of the Bay Area.

The SFPUC is increasing and accelerating its efforts to acquire additional water supplies and explore other projects that would increase overall water supply resilience through the Alternative Water Supply Planning Program. The drivers for the program include: (1) the adoption of the Bay-Delta Plan Amendment and the resulting potential limitations to RWS supply during dry years, (2) the net supply shortfall following the implementation of WSIP, (3) San Francisco's perpetual obligation to supply 184 MGD (206,107 AFY) to the Wholesale Customers, (4) adopted Level of Service Goals to limit rationing to no more than 20% system-wide during droughts, and (5) the potential need to identify water supplies that would be required to offer permanent status to interruptible customers. Developing additional supplies through this program would reduce water supply shortfalls and reduce rationing associated with such shortfalls. Capital projects under consideration to develop additional water supplies include

[32] http://purewater4u.org/advanced-water-treatment-facility

surface water storage expansion, recycled water expansion, water transfers, desalination, and potable reuse. A more detailed list and descriptions of these efforts are provided in **Chapter 7**.

6.7 Transfer Opportunities

The July 2009 Water Supply Agreement, between the City and County of San Francisco and wholesale customers in Alameda County, San Mateo County and Santa Clara County outlines the ability for permanent transfers of Individual Supply Guarantees (ISG). Currently, the City does not have an ISG since it is not the permanent customer of SFPUC and SFPUC provides them with a interruptible supply. However, they are still eligible to receive transfers per the agreement which specifies that a wholesale customer that has an ISG may transfer a portion of it to one or more other wholesale customers. Such a transfer must be a permanent transfer and no less than 1/10th of 1.0 MGD (1,120 AFY). Recent proposed amendments in 2020 for minimum purchases will primarily allow ACWD, Milpitas, Mountain View and Sunnyvale who have minimum purchase requirements, and other permanent customers with ISGs to transfer a portion of their allocated water supply to other wholesale customers with ISGs with certain guidelines. The 2020 proposed amendments provide a “contractual vehicle” to allow permanent transfer of Minimum Annual Purchase. This effort is an important first step towards allowing those without ISG’s to participate in future transfers. This amendment lays the groundwork for potential future transfers to the City from other SFPUC retailers, greatly increasing the City’s supply reliability during a drought.

Ten interties exist for emergency transfers with neighboring agencies (City of Sunnyvale, San Jose Municipal Water, San Jose Water and California Water Service Company). These connections are intended only for water supply emergencies and are not intended for long-term water transfers.

During times of drought and subsequent reduced water supply, the Interim Water Shortage Allocation Plan (IWSAP) developed by BAWSCA and ratified by SFPUC, and each of its wholesale contractors allows for voluntary water shortage allocations for SFPUC wholesale customer agencies. Also, water “banked” by a SFPUC wholesale customer, through reductions in usage greater than required for a given shortage, may be transferred between agencies.

6.8 Future Water Projects

This section describes water supply projects and programs that are expected to be undertaken in the near future to help increase the amount of water supply available to the City in average, single-dry, and multiple-dry water years. The format of these projects or programs is described as a narrative in this section, as noted in **Table 6-7**.

Table 6-7: Retail: Expected Future Water Supply Projects or Programs	
	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.
X	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.
pg. 53	Provide page location of narrative in the UWMP

The existing 21 wells together with the water supplied by the two imported water wholesalers can provide the delivery capacity needed to supply the City's expected water demand for the next 25 years. In the future, additional imported supply will likely be required and purchased from Valley Water. The City is investigating opportunities to upgrade the Valley Water turnout to increase the flexibility of the water supply system by allowing the City to increase treated surface water from Valley Water's Rinconada Water Treatment Plant and decrease groundwater usage, if necessary. The work is still in its planning stages. The City completed the addition of two new interties – the San Jose-Santa Clara intertie and the Santa Clara-Sunnyvale intertie.

In addition to the 21 active wells, Well 32 is permitted as a standby source. Well 32 may only be used for short-term emergencies of five consecutive days or less, and for less than a total of 15 calendar days per year.

The City plans to construct two new groundwater wells with a potential increase of 4,800 AF per year to the City's supply. Construction of these wells are anticipated to be completed in 2023 and therefore this increase in future supply is not incorporated into the supply projections for this UWMP.

6.9 Summary of Existing and Planned Sources of Water

6.9.1 Existing Supply Volumes

Historically, groundwater has been the predominant source of water used to meet water demand in the City. In 2020 groundwater represented 50% of total water sales. Since the last UWMP, the amount of recycled water used within the City has risen steadily. In 2020 recycled water represented 19% of total water sales. Purchased treated water from SFPUC and Valley Water represented 34% of the total water sales during this period. There are efforts to minimize reliance on purchased water and maximize resources, which is covered in **Section 7.2.4**. **Table 6-8** shows the volume of water supplied for 2020.

Table 6-8 Retail: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2020		
		Actual Volume	Water Quality	Total Right or Safe Yield *(opt)*
Purchased or Imported Water	Valley Water	3,982	Drinking Water	4,560
Purchased or Imported Water	SFPUC	3,485	Drinking Water	5,041
Groundwater (not desalinated)	Wells	10,835	Drinking Water	23,048
Recycled Water	SBWR	3,499	Recycled Water	--
Total		21,801		32,649
NOTES: Purchased water from Valley Water is based on current contractual amount (total right). Purchased water from SFPUC is based on current contract allocation (total right). Groundwater safe yield is system capacity.				

6.9.2 Existing Sources

Table 6-9A and **Table 6-9B** below show the City's projected potable water supplies for 2025 to 2045. **Table 6-9A** accounts for the possibility of an interruption of the City's SFPUC water supply, which is discussed in **Section 6.3.2**.

Table 6-9A Retail: Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply				
		2025	2030	2035	2040	2045 (opt)
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	Valley Water	4,560	4,560	4,560	4,560	4,560
Purchased or Imported Water	SFPUC	5,041	0	0	0	0
Groundwater (not desalinated)	Wells	23,048	23,048	23,048	23,048	23,048
Recycled Water	SBWR	4,570	5,489	6,586	7,908	9,488
Total		37,219	33,097	34,194	35,516	37,096
NOTES: Assumes interruption of SFPUC water supply after 2028.						

Table 6-9B Retail: Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply				
		2025	2030	2035	2040	2045 (opt)
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	Valley Water	4,560	4,560	4,560	4,560	4,560
Purchased or Imported Water	SFPUC	5,041	5,041	5,041	5,041	5,041
Groundwater (not desalinated)	Wells	23,048	23,048	23,048	23,048	23,048
Recycled Water	SBWR	4,570	5,489	6,586	7,908	9,488
Total		37,219	38,138	39,235	40,557	42,137
NOTES: Assumes no interruption of SFPUC water supply after 2028.						

6.10 Energy Consumption

This section addresses the new requirement of Water Code section 10631.2.(a) - Energy. It requires that all suppliers provide information on the amount of energy used to extract, divert, convey, distribute, treat and store treated or non-treated water supplies, based on the data that is readily obtainable by the supplier. DWR recommends for the supplier to breakdown the energy consumption of each individual asset (i.e., pump, meter, building, etc.) to determine where inefficiencies lie in the water system. This would help the supplier determine the water-energy efficiency of their system and locate potential sites for improvement or investigation to reduce energy consumption and thus operational costs.

For the purposes of this UWMP and based on the information available, energy consumption obtained from utility bills for each site was included. In addition to the City's wells used to extract groundwater, four booster pump stations were included to determine the quantity of energy used for water management processes; Serra Tanks, Northside Tank (NST), Downtown Tank (DTT), and Corp Yard Tank booster pump stations. The Serra Tank site consists of three 60 HP booster pumps and three storage tanks with a combined capacity of 13.2 MG, DTT site consists of four 60 HP booster pumps and one storage tank with a 4.2 MG capacity, the NST site consists of four 100 HP booster pumps and two tanks with a combined capacity of 9.4 MG. The Corp Yard site was constructed in 2017 to provide additional emergency storage for potable water. The Corp Yard side consists of three 100 HP booster pumps and one 2.1 MG capacity storage tank. However, individual supply volumes from the booster pump stations is not readily available, so the total utility approach was used to determine the energy intensity of the distribution system. The information used in developing the energy use table was based on bi-monthly metered electric usage. The reporting period required for the 2020 UWMP is one year, the following **Table 6-10** shows the energy intensity of the water distribution system.

Table 6-10 Retail: Energy Intensity – Total Utility Approach				
Start Date for Reporting Period	1/1/2020	Urban Water Supplier Operational Control		
End Date	12/31/2020			
		Sum of All Water Management Processes	Non-Consequential Hydropower	
		Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (AF)		18,302	0	18,302
Energy Consumed (kWh)		5,507,356	0	5,507,356
Energy Intensity (kWh/Vol. converted to MG)		923.5	0	923.5

When observing the annual energy consumption from 2015 to 2020, the highest energy usage was observed in 2015. The higher energy usage was due to a higher annual well production. The data also shows that the highest well production over the 2015-2020 period was in 2017, although the highest annual energy usage was in 2015. The difference of energy usage in 2015 was mainly affected by the energy consumption of Well 4. In 2017 the annual total energy usage for Well 4 dropped by almost 53% compared to 2015 usage, although the volume produced by the well only decreased by approximately 9%. The data also shows that although annual well production in 2017 was higher than 2015, the total annual energy consumption decreased due to increased utilization of other wells.

The energy consumed from the booster pumps stations was mainly from the NST site, which was on average approximately 69% of the total energy usage in 2015-2020. The NST site, although primarily an emergency water supply and storage for treated water from SFPUC, houses the highest capacity pumps and is located at the lowest elevation in the water supply system. This pump station is also located in Zone I, where the majority of treated water is distributed. The City currently does not utilize non-consequential hydropower, so it was not included in the table above.

6.11 Climate Change Impacts to Supply

Climate change presents a significant long-term threat to water resources in Silicon Valley. Water supplies are vulnerable to changing temperatures, varying levels of snow pack, and changing run off and precipitation patterns which can all cause a potential decrease in water supplies. The City relies on its wholesalers to address constraints on water supplies and long-term planning efforts to continually develop and improve water supplies and strategies that account for changing and uncertain conditions.

The City is in the process of updating its current Climate Action Plan (CAP) which was adopted in 2013 to define the City’s path toward creating a more sustainable, healthy, and livable community. The 2013 CAP aimed to reduce future Green House Gas (GHG) emissions consistent with California’s Global Warming Solutions Act of 2006 (Assembly Bill 32).

New laws and requirements passed in 2016 by State Legislature (SB32) codified a GHG emissions reduction target of 40% lower than 1990 levels by 2030. The City anticipates updating the CAP to comply with new regulations and update the City's current progress towards meeting targets, assessing state and local activities that have been implemented already to reduce emissions, quantifying the net benefit of these actions, identifying further actions that the City can undertake to further reduce emissions, and implementing new strategies to meet new targets. See **Appendix J** for the City's current CAP.

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7. WATER SUPPLY RELIABILITY

The City relies on three sources of potable water and one of recycled water. All supplies have some possibility of interruption and differing degrees of reliability. According to engineering studies a major seismic (earthquake) event could interrupt the delivery of water from the SFPUC Hetch-Hetchy system for three to four months. The SFPUC is currently undertaking a multi-billion-dollar capital improvement program to improve seismic reliability and is in its final stages of completion with overall completion forecasted for May 2023.[33] A similar review of Valley Water's potable and raw water delivery systems indicates the potential for several months of interruption of potable treated water deliveries to the City. Current planned projects include major capital improvements to both regional water systems for increased reliability. The reliability of Valley Water's imported supplies (State and Federal water projects) is also threatened by possible failure of the Sacramento Delta's levee systems, with interruptions possible for several months. Regional power supplies could also be interrupted; however, the City has sufficient back-up power generation capacity to provide the expected potable water demand from City wells and water storage tanks. The local groundwater source can sustain the entire City's water demand for a limited period.

The recycled water system serves landscape irrigation and industrial customers. In an emergency that may interrupt the recycled water service, some industrial customers have back-up potable water services. Interruption of available recycled water used for landscape irrigation is not considered detrimental and landscaping may survive the time required for reinstatement of recycled water service.

The City conducted a Risk and Resiliency study in FY 2019/2020. The purpose of the Risk and Resilience Assessment (RRA) is to meet the America's Water Infrastructure Act (AWIA) compliance requirements and to secure the long-term resilience of the City of Santa Clara Water and Sewer Utilities Department (City) water infrastructure. The RRA identifies and characterizes both asset-specific and system-wide vulnerabilities and threats and quantifies the consequences of disruption. The RRA and associated Emergency Response Plan (ERP) chart a course for water system resilience. The ERP analysis will evaluate the risk mitigation options listed in the RRA to support executive decisions as to which options to fund and implement with the ERP ultimately being updated as part of this assessment.

The assessment process was initiated with a review of documents by a third-party consultant. The documents pertained to the water system, programs, policies, finances, and emergency planning. This review was performed for the purposes of informing and orienting the team on the City's water supplies and demands, key assets, and relevant programs and policies, as well as to evaluate the City's current compliance status relative to the AWIA. As part of the analysis, the City also conducted three days of workshops. The first was a Threat-Asset Workshop which discussed pairing of critical and representative assets with designated threats. This was followed by a Consequence-Vulnerability-Threat Analysis Workshop which characterized likely outcomes. An Out Brief with management was also held to review

[33] 2019-2020 Annual Report Water System Improvement Program Letter. https://sfwater.org/modules/showdocument.aspx?documentid=16077

preliminary findings. In general, the City was found to be very adept in switching from one source to another based on supply considerations. The flexibility, redundancy, and local water sources reduce risk levels and provide enhanced resilience for the City. Additionally, connections / interties to other neighboring districts add resilience to the system. This simplicity, flexibility, and redundancy provide inherent resilience to the system. City findings and recommendations were provided by the third- party consultant and will be addressed by the organization.

This chapter discusses in detail the reliability of each supply source under single- and multi-year dry conditions and the potential constraints and impacts to each source. Also discussed is the availability of water under a five-consecutive year drought occurring in the next year (Drought Risk Assessment or DRA).

7.1 Constraints on Water Supply Sources

7.1.1 Groundwater Supply

Groundwater supply is largely constrained by hydrologic variability and the estimated 548,000 AF of total operational storage capacity within the subbasins. Valley Water has about 144,000 AFY of managed recharge capacity, including more than 90 miles of in-stream recharge and 102 off-stream recharge ponds. Maintaining Valley Water's managed recharge program requires ongoing operational planning for the distribution of local and imported water to recharge facilities; maintenance and operation of reservoirs, diversion facilities, distribution systems, and recharge ponds; and the maintenance of water supply contracts, water rights, and relevant environmental clearance. Valley Water's managed recharge program is critical to maintaining groundwater supply because natural recharge is insufficient to meet groundwater demands. However, protecting natural recharge capacity is also important. Valley Water's District Act and Board policy help preserve open space that supports agriculture and natural recharge capacity.

Additional details about constraints on groundwater supply and quality and Valley Water's comprehensive groundwater management strategies are described in the 2016 Groundwater Management Plan.[34]

[34] 2016 Groundwater Management Plan Valley Water. https://www.valleywater.org/your-water/where-your-water-comes-from/groundwater/sustainable-groundwater-management

7.1.2 Groundwater Quality

The City has historically relied on groundwater for most of the City's water supply. Therefore, any contamination of those supplies poses a significant risk to the City's overall water supply reliability. The City's production wells consistently meet all State and Federal applicable water quality criteria. In contrast to other areas adjacent to San Francisco Bay where saltwater intrusion has been an issue, total dissolved solids (TDS) is not a concern for the City. While the City's wells continue to provide excellent quality water, future State or Federal regulations could be imposed that may mandate additional treatment. Public water supply wells throughout the City deliver high quality water to consumers, almost always without the need for treatment.

Valley Water monitors groundwater quality in the Santa Clara Subbasin in support of Valley Water's Board Water Supply Objective 2.2.1 to: "Aggressively protect groundwater from the threat of contamination and maintain and develop groundwater to optimize reliability and to minimize land subsidence and saltwater intrusion." Groundwater quality in Santa Clara County is generally very good. Cleanup is ongoing at a number of contamination sites and elevated concentrations of nitrate and perchlorate have been observed in some areas. The 2019 Groundwater Quality Report is the most recent water quality monitoring completed by Valley Water and includes a general evaluation of water quality conditions. The Santa Clara Subbasin has significant confining layers, so data for this subbasin is analyzed for both the principal and shallow aquifer zones. The 2019 median concentrations for common inorganic constituents were generally well below Division of Drinking Water (DDW) standards for each subbasin and aquifer zone.

1,2,3-Trichloropropane (1,2,3-TCP)

In 2017, 1,2,3-Trichloropropane (1,2,3-TCP) became a State regulated contaminant with a maximum contaminant level (MCL) of 0.005 ug/L. Per the 2019 Valley Water Groundwater Quality Report, 1,2,3-TCP is currently not detected in the Santa Clara Subbasin. All compliance monitoring conducted at City wells has confirmed no detection of 1,2,3-TCP.

Nitrate

Nitrate in the environment comes from both natural and anthropogenic sources. Small amounts of nitrate in groundwater (less than 10 mg/L) are normal, but higher concentrations suggest an anthropogenic origin. Common anthropogenic sources of nitrate in groundwater are fertilizers, septic systems, and animal waste. In general, the Santa Clara and Llagas Subbasins have high-quality groundwater, except for nitrate, which is elevated in some wells in the Coyote Valley and Llagas Subbasin from historic and ongoing sources including fertilizers, septic systems, and animal waste. However, nitrate concentrations are generally stable or declining and Valley Water has many programs to protect groundwater quality, including several targeted to improve nitrate in groundwater.

The drinking water MCL for nitrate is 10 mg/L as nitrogen. Currently the City monitors all wells for nitrate concentration annually. Four wells show concentrations of nitrate at or slightly above half the MCL. An existing nitrate plume is apparently a result of historic agricultural practices and the past use of septic tanks in Santa Clara Valley. Nitrate does not currently pose a threat to the availability of groundwater. Nitrate trends at detected wells are generally stable; however, if existing nitrate levels begin to increase then monitoring frequency will also increase, and if any wells test above the MCL, affected wells would need to be removed from service.

Manganese

Manganese, a naturally occurring metal in groundwater, is limited to a "secondary" MCL of 50 ppb. Water with manganese concentrations above the MCL can cause stains to plumbing fixtures and laundry. Although manganese does not pose a health risk, water with elevated manganese levels can only be delivered to the public water supply with the acceptance of the users.

Well 32, currently permitted for use as an emergency standby well, has naturally occurring manganese present at levels that exceed the current SMCL. Onsite manganese treatment is available, but the City is currently not operating the treatment system since the well is classified as standby. Seven active City wells have historically shown detectable levels of manganese under the MCL, as far back as the 1980s and 1990s and an eighth well has shown detectable levels in the early 2000s; however, none of the active wells have documented levels above the Detection Limit for Purposes of Reporting (DLR) of 20 ppb since 2008.[35] Manganese affects the availability of groundwater due to the cost to provide treatment and operations to an acceptable level. The total annualized capital and O&M costs for treatment can be up to $300 per AF[36]. Additional staff certification is also required to operate the treatment facility.

7.1.3 Assessment of Other Impacts to Groundwater Supply Reliability

In 2004 the City completed a Source Water Assessment that includes detailed review of all potential sources of contamination to each of the City's 26 drinking water wells. The result of this work is on file with DDW as a part of their Drinking Water Source Assessment and Protection Program. Although the City's groundwater supply lies below a number of potential sources of contamination (industrial facilities, underground fuel tanks and the by-products of suburban living), the water quality testing has shown the City's groundwater supply meets or exceeds all State and Federal regulations for drinking water.

On May 31, 2017, the Superior Court of Sacramento County issued a judgment invalidating the hexavalent chromium MCL for drinking water. While hexavalent chromium is no longer regulated by a

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[35] https://sdwis.waterboards.ca.gov/PDWW/

[36] Association of California Agencies (ACWA) Suggested Guidelines for Preparation of Required Reports on PUBLIC HEALTH GOALS (PHGs) to satisfy requirements of California Health and Safety Code Section 116470(b), April 2019 Attachment No. 3, Table 1, Cost Estimates for Treatment Technologies

separate MCL, it continues to be regulated under the total chromium MCL. All active drinking water wells in the City have been tested for chromium-6 with results ranging from 0.26 to 2.5 ppb, well below the prior hexavalent chromium MCL. Any inactive wells that return to active status will be tested for hexavalent chromium even though a separate MCL has not been adopted by the State.

In 2015, the Office of Environmental Health Hazard Assessment (OEHHA) revised the perchlorate public health goal (PHG) from 0.006 mg/L to 0.001 mg/L, which has prompted the lowering of the DLR to match the PHG in order for the State Water Board to gather data and evaluate the occurrence of perchlorate at concentrations lower than the current DLR of 0.004 mg/L and ultimately determine whether technology can achieve a materially greater protection of public health or attainment of the PHG and the economic feasibility of lowering the MCL.[37] The State Water Board proposes to initially lower the perchlorate DLR from 0.004 mg/L to 0.002 mg/L (Phase I) then from 0.002 mg/L to 0.001 mg/L (Phase II) effective January 1, 2024. Perchlorate has not been detected in the City's groundwater supply at or above the current DLR.

Emerging contaminants have the potential to constrain the use of groundwater. Emerging contaminants of concern include pharmaceuticals and personal care products, industrial chemicals, and endocrine disrupting compounds. In 2020, Valley Water expanded efforts to determine the extent and occurrence of per- and polyfluoroalkyl substances (PFAS) in groundwater throughout Santa Clara County. According to the 2019 Annual Groundwater Report, Valley Water detected PFAS in some of the wells but not above current State health-advisory levels. In the future, new understanding of the risks of constituents in drinking water could result in more stringent drinking water standards and more constraints on the use of groundwater. The City conducted monitoring of PFAS per State Order and all results were non-detect.

7.1.4 Surface Water Quality

Valley Water provides treated surface water to local municipalities and private water retailers who deliver the water directly to homes and businesses in Santa Clara County. Valley Water's surface water is mainly imported from the South Bay Aqueduct, Dyer Reservoir, Lake Del Valle, and San Luis Reservoir, which all draw water from the Sacramento - San Joaquin Delta watershed. Valley Water's local water sources include Anderson and Calero Reservoirs. Water from imported and local sources is pumped to and treated at three water treatment plants located in Santa Clara County. Valley Water's source waters are vulnerable to potential contamination from a variety of land use practices, such as agricultural and urban runoff, recreational activities, livestock grazing, and residential and industrial development. The imported sources are also vulnerable to wastewater treatment plant discharges, seawater intrusion, and wildfires in open space areas. In addition, local sources are also vulnerable to potential contamination from commercial stables and historic mining practices. No contaminant associated with any of these

[37] https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/perchlorate2.html

activities has been detected in Valley Water's treated water. The water treatment plants provide multiple barriers for physical removal of contaminants and disinfection of pathogens.

The SFPUC provides safe, high quality drinking water, most of which originates from the upper Tuolumne River Watershed high in the Sierra Nevada, remote from human development and pollution. This water is referred to as Hetch-Hetchy water and is protected and conveyed through pipes and tunnels. Water from the Hetch Hetchy Reservoir is exempt from state and federal filtration requirements but receives the following treatment: ultraviolet light and chlorine disinfection, pH adjustment for optimum corrosion control, fluoridation for dental health protection, and chloramination for maintaining disinfectant residual and minimizing the formation of regulated disinfection byproducts. The SFPUC regularly collects and tests water samples from reservoirs and designated sampling points throughout the sources and the transmission system to ensure the water delivered to its customers meets or exceeds federal and State drinking water standards. In 2020, the SFPUC conducted more than 47,200 drinking water tests in the sources and the transmission system. This is in addition to the extensive treatment process control monitoring performed by SFPUC's certified operators and online instruments.

The SFPUC conducts watershed sanitary surveys for the Hetch Hetchy source annually and for non-Hetch Hetchy surface water sources every five years. The latest sanitary surveys for the non-Hetch Hetchy watersheds were completed in 2021 for the period of 2016-2020. The purposes of the surveys are to evaluate the sanitary conditions and water quality of the watersheds and to review results of watershed management activities conducted in the preceding years. Wildlife, stock, and human activities continue to be the potential contamination sources.

Both wholesalers conducted water quality analyses to measure the level of various contaminants present in the water. Both source and treated water supplies continue to meet the MCLs and treatment standards set by the Environmental Protection Agency and the State Water Board DDW.

7.1.5 Imported Water Supply Constraints

As discussed previously, the City relies on imported water from Valley Water and the SFPUC. The City's contract with the SFPUC is interruptible and may be unavailable after 2028. The SFPUC is scheduled to decide whether to make the City a permanent customer by December 2028. If the SFPUC supplies are interrupted, the City may need to increase use of Valley Water supplies.

In December 2018, the State Water Resources Control Board (SWRCB) adopted amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary Bay-Delta Plan (BDP) to establish water quality objectives to maintain the health of the Bay-Delta ecosystem. The SWRCB is required by law to regularly review this plan. The adopted Bay-Delta Plan was developed with the stated goal of increasing salmonid populations in three San Joaquin River tributaries (the Stanislaus, Merced, and Tuolumne Rivers) and the Bay-Delta. The BDP requires the release of 30-50% of the "unimpaired flow" on the three tributaries from February through June in every year type. In SFPUC modeling of the new flow standard, it is assumed that the required release is 40% of unimpaired flow.

If the Bay-Delta Plan is implemented, the SFPUC will be able to meet the projected water demands presented in this UWMP in normal years but would experience supply shortages in single dry years or multiple dry years. Implementation of the Bay-Delta Plan will require rationing in all single dry years and multiple dry years. The SFPUC has initiated an Alternative Water Supply Planning Program to ensure that San Francisco can meet its Retail and Wholesale Customer water needs, address projected dry years shortages, and limit rationing to a maximum 20% system-wide in accordance with adopted SFPUC policies. This program is in early planning stages and is intended to meet future water supply challenges and vulnerabilities such as environmental flow needs and other regulatory changes; earthquakes, disasters, and emergencies; increases in population and employment; and climate change. As the region faces future challenges – both known and unknown – the SFPUC is considering this suite of diverse non-traditional supplies and leveraging regional partnerships to meet Retail and Wholesale Customer needs through 2045.

Valley Water's long-term ability to import water from the Delta will be affected by two primary constraints: 1) State Water Project (SWP) and Central Valley Project (CVP) pumping restrictions, and 2) altered hydrologic conditions due to climate change. Imported water supplies are subject to hydrologic variability. Local and out-of-county storage can help mitigate the impacts of hydrologic variability. Valley Water's SWP and CVP water supplies are also subject to a number of additional constraints including regulatory requirements to protect fisheries and water quality in the Delta, and conveyance limitations. Delta-conveyed supplies are also at risk from Delta levee failures due to seismic threats and flooding, sea level rise and climate change, declining populations of protected fish species, and water quality variations (including algal blooms). A reduction in Valley Water's imported water supply would, in turn, have implications for the City's surface water contract with Valley Water and Valley Water groundwater recharge program for the Santa Clara Sub-Basin, of which the City is one of many users.

7.2 General System Reliability

The City has conducted a supply reliability analysis for normal, single-dry, and consecutive multi-dry year conditions based on imported water supply availability from each water wholesaler and local groundwater supplies. The following sections present the results of the analysis followed by a discussion of each supply and related reliability.

7.2.1 Reliability by Type of Year

Both Valley Water and the SFPUC has developed supply conditions for average, single, and multiple (five) dry years based on hydrologic and water supply conditions. These years, as shown in **Table 7-1**, are used in conjunction with City water supply data to plan for future water supply reliability.

Table 7-1 Retail: Basis of Water Year Data (Reliability Assessment)			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available	% of Average Supply
Average Year	2020	32,649	100%
Single-Dry Year	1977	31,293	96%
Consecutive-Dry Years 1st Year	1988	31,293	96%
Consecutive-Dry Years 2nd Year	1989	31,529	97%
Consecutive-Dry Years 3rd Year	1990	29,686	91%
Consecutive-Dry Years 4th Year	1991	29,686	91%
Consecutive-Dry Years 5th Year	1992	29,686	91%
NOTES: All City water sources combined. Base years represent the year for which Valley Water's analysis is based. Volume available and percent of average supply is calculated based on the combination of available sources.			

The projected demands reported in the BAWSCA Demand Study, were coordinated with the City and are inclusive of water losses, recycled water demands, and passive conservation savings.

The supply reliability analysis considers the supply reliability of the two wholesale supplies (Valley Water and the SFPUC) as well as the supply reliability of local groundwater. Savings through anticipated and implemented active conservation programs are not initially considered unless there are shortage conditions necessitating the implementation of the water shortage contingency plan. The following projections also include recycled water supply and demand volumes, however since recycled water is a drought-proof source of supply, it does not affect the reliability outcome of the water supply system. The City has incorporated the following conditions in the analysis:

- Due to the uncertainty of the interruptible supply from the SFPUC, the City has analyzed supply reliability under two primary scenarios:
  - Scenario 1: supply interruption due to contract termination in 2028.
  - Scenario 2: continued SFPUC supply beyond 2028.
- The analysis includes a reduced supply from SFPUC related to the implementation of the BDP. The BDP, currently in negotiation, would require 30-50% unimpaired flow beginning in 2023. The SFPUC has conducted an analysis of the SFPUC's Regional Water System (RWS) supply reliability under both conditions, with and without 40% unimpaired flow. To be conservative, the City has assumed SFPUC

supply reduction due to the BDP for both scenarios. The BDP and the SFPUC supply reliability are further detailed later in this section.

- The SFPUC modeled two separate cutback scenarios: one based on the actual projected retail and wholesale demands through 2045 and another scenario based on the wholesale contract amount of 184 MGD. The SFPUC UWMP is based on the projected demands. As such, the City is reporting the modeled scenario based on projected demands for consistency. However, the SFPUC acknowledges the contractual obligation to supply 184 MGD to the wholesale customers during non-drought years and thus has retained the second modeled scenario for planning purposes. Both SFPUC modeled scenarios are provided in **Appendix D**.

- Valley Water's supply reliability analysis is based on historic hydrology, as described in the previous section. Projected supplies are based on Valley Water's Water Supply Master Plan 2040 (WSMP) recommended projects per Board direction, which include Transfer Bethany Pipeline (2025); Anderson dam seismic retrofit and potable reuse (2030); Guadalupe, Calero, and Almaden dam seismic retrofits and Pacheco Reservoir Expansion (2035); Recycled/Expedited Purified Water Program (24,000 AFY) by 2040 and an additional 35,000 AF of conservation. Valley Water acknowledges that there is uncertainty associated with projected project benefits – some WSMP projects and/or their yields may not be realized as currently expected and Valley Water is still evaluating impacts of climate change to local supplies and those analyses are not included in the UWMP. The DCR 2019 dataset does not include future regulations, which Valley Water expects will result in up to a 25% or more reduction in imported water deliveries. Projected demands are based on the 2020 Monitoring and Assessment Program (MAP) projection, which are significantly lower than what was used in previous UWMPs and the WSMP. Valley Water's demands are within 1% - 5% difference with retailer demands from 2025 to 2040, and 10% for 2045. For both the WSMP and MAP, Valley Water used a dataset with significantly reduced Delta supplies (25% less imported water) and plans to continue to use that dataset in the 2021 MAP. If some WSMP projects are not implemented or provide fewer benefits than currently expected and imported supplies are reduced by 25%, then Valley Water does expect to have drought shortages of up to 20% in the future. Valley Water modeled data is provided in **Appendix K**.

- Valley Water has indicated that there are no shortages based on their system-wide supply reliability analysis. Valley Water has indicated that cutbacks would be required if estimated benefits from planned projects are not fully realized. Under dry year conditions, the City, as a good steward, would likely implement voluntary cutbacks and encourage water conservation among its customers. For the purpose of the analysis and consistency with Valley Water's analysis, no cutbacks have been applied to single- and multi-dry year analyses.

Normal Year

Table 7-2A represents Scenario 1 which assumes supply interruption in 2028 and reduced flows associated with the BDP in 2023 with no cutbacks from Valley Water. BDP implementation is not projected to impact either wholesalers' ability to meet retailer demands in a normal year, such that existing contract allocation amounts from SFPUC and Valley Water will remain unchanged. **Table 7-2B**, represents Scenario 2, which assumes continued supply from SFPUC beyond 2028 with BDP implementation in 2023.

Table 7-2A Retail: Normal Year Supply and Demand Comparison - (Scenario 1)					
	2025	2030	2035	2040	2045 (Opt)
Supply totals (autofill from Table 6-9A)	37,219	33,097	34,194	35,516	37,096
Demand totals (autofill from Table 4-3)	24,043	25,836	27,697	29,557	31,676
Difference	13,176	7,261	6,497	5,959	5,420
NOTES: Assumes SFPUC supply does *not* exist beyond 2028 and BDP implementation in 2023.					

Table 7-2B Retail: Normal Year Supply and Demand Comparison - (Scenario 2)					
	2025	2030	2035	2040	2045 (Opt)
Supply totals (autofill from Table 6-9B)	37,219	38,137	39,235	40,557	42,136
Demand totals (autofill from Table 4-3)	24,043	25,836	27,697	29,557	31,676
Difference	13,176	12,301	11,538	11,000	10,460
NOTES: Assumes continued allocation from SFPUC beyond 2028 and BDP implementation in 2023.					

During normal water years, there are no reductions in supplies to retailers due to BDP implementation and water supplies should be adequate to meet projected demands in the 2025 to 2045 planning period as shown in the tables.

Single-Dry Year

During a single dry year, the City projects no reduction in supplies from groundwater.

SFPUC has indicated that during a single critical dry year it will follow the Tier 2 reduction plan described later in this document. Under Scenario 1, the City can expect up to a 36% cutback in SFPUC supply through 2028 before supply termination. Under Scenario 2, the City can expect up to a 46% cutback in a single-dry year through 2045 (see SFPUC modeled tables in **Appendix L**).

Per Valley Water's water supply reliability tables to Retailers (**Appendix K**) and 2020 UWMP, treated surface water is not expected to be reduced in a single dry year event.

Recycled water use and water conservation are projected to remain unchanged or potentially increase due to public awareness, during a critical dry year. The resulting analysis of available supplies is shown in **Table 7-3A** and **Table 7-3B** below.

Table 7-3A Retail: Single Dry Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045 (Opt)
Supply totals	35,404	33,097	34,194	35,516	37,096
Demand totals	24,043	25,836	27,697	29,557	31,676
Difference	11,361	7,261	6,497	5,959	5,420
NOTES: Assumes SFPUC supply does *not* exist beyond 2028 and reduced allocation from SFPUC due to BDP in 2023.					

Table 7-3B Retail: Single Dry Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045 (Opt)
Supply totals	35,404	36,323	37,420	38,692	39,818
Demand totals	24,043	25,836	27,697	29,557	31,676
Difference	11,361	10,486	9,723	9,135	8,141
NOTES: Assumes continued allocation from SFPUC beyond 2028 and reduced allocation from SFPUC due to BDP in 2023.					

During a single critical dry year, there are no projected shortfalls in total available water supplies independent of whether the City receives or does not receive SFPUC water after contract negotiations with SFPUC in 2028.

Multiple-Dry Year

During a multiple dry year event, the City projects no reduction in supplies from groundwater. Valley Water is expected to continue to manage groundwater recharge for the sub-basin.

Based on supply reductions to the SFPUC RWS, during multiple dry years under Scenario 1, the City can expect a reduction of up to 45% by 2028. Under Scenario 2, the City can expect a cutback as much as 54% of normal by the 4th and 5th years of a dry consecutive period beginning in 2045 (see SFPUC modeled tables in **Appendix L**).

Per the Valley Water WSMP[38] , Valley Water treated surface water is not expected to experience cutbacks in a consecutive five critical dry year event due in large part to Valley Water's planned supply reliability project implementation intended to mitigate potential water supply shortfalls.

Recycled water use and water conservation are projected to remain unchanged during a consecutive five dry year event. The resulting analysis of all available supplies is shown in **Table 7-4A** and **Table 7-4B** below.

[38] Valley Water - Water Supply Master Plan 2040

During a multiple dry year event, there is no projected shortfall in available water supplies in either Scenario given both the implementation of the BDP and potential SFPUC supply termination in 2028, as shown below in **Table 7-4A**. However, it is noted that in order to meet projected demands, groundwater pumping is anticipated to increase from the current average of 10,845 AFY (2015-2020) but still within the safe yield of each groundwater well. Supply can also be made-up through water provided by future water supply projects as discussed in **Section 6.8** and active conservation measures. These assumptions also yield a conservative estimate since during a critical five dry year event, the ability to implement voluntary conservation measures and increase recycled water usage would be expected to reduce potable water demand.

Table 7-4A Retail: Multiple Dry Years Supply and Demand Comparison						
		2025	2030	2035	2040	2045 (Opt)
First year	Supply totals	35,404	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	11,361	7,261	6,497	5,959	5,420
Second year	Supply totals	34,951	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	7,261	6,497	5,959	5,420
Third year	Supply totals	34,951	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	7,261	6,497	5,959	5,420
Fourth year	Supply totals	34,951	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	7,261	6,497	5,959	5,420
Fifth year	Supply totals	34,951	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	7,261	6,497	5,959	5,420
NOTES: Assumes SFPUC supply does not exist beyond 2028 and reduced allocation from SFPUC due to BDP in 2023.						

Table 7-4B Retail: Multiple Dry Years Supply and Demand Comparison						
		2025	2030	2035	2040	2045 (Opt)
First year	Supply totals	35,404	36,323	37,420	38,692	39,818
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	11,361	10,486	9,723	9,135	8,141
Second year	Supply totals	34,951	35,869	36,916	38,238	39,818
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	10,033	9,219	8,681	8,141
Third year	Supply totals	34,951	35,869	36,916	38,238	39,818
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	10,033	9,219	8,681	8,141
Fourth year	Supply totals	34,951	35,869	36,916	37,936	39,414
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	10,033	9,219	8,379	7,738
Fifth year	Supply totals	34,951	35,869	36,715	37,936	39,414
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	10,033	9,018	8,379	7,738
NOTES: Assumes continued allocation from SFPUC beyond 2028 and reduced allocation from SFPUC due to BDP in 2023.						

With the uncertainties inherent in future imported water supplies, the City plans to meet future demand growth by pumping additional groundwater, relying on more recycled water, and increased conservation. Given the potential for decreased SFPUC imported surface water deliveries, California Environmental Quality Act (CEQA) requires disclosure of the environmental impacts, if any, of meeting future demand growth with increased supplies coming from pumping more groundwater. There are not any reasonably foreseeable impacts associated with increased use of recycled water and conservation, which is anticipated to occur through replacement of more water-efficient appliances, i.e. clothes washers, dishwashers, toilets, etc., and programs to encourage drought-tolerant landscaping on private property and on City properties.

Mandatory conservation during a multiple year drought may also require prohibitions on outdoor use (irrigation, car washing, washing down pavement, etc.) and water rationing. As noted above, numerous conservative assumptions were made regarding both water supply and demand. Therefore, it is the conclusion of the City that adequate water supplies are available to meet the water demand projected until 2045.

7.2.2 Impacts of Increased Groundwater Pumping

Valley Water is the Groundwater Sustainability Agency (GSA) for the Santa Clara and Llagas Subbasins, which are both identified as high priority basins by DWR. The City's water supply includes groundwater pumped from the conjunctively managed Santa Clara Subbasin. The groundwater basins in Santa Clara County span nearly 400 square miles, with thousands of well users pumping groundwater for beneficial use. As a retailer in Santa Clara County that uses groundwater, the City relies on Valley Water activities to maintain sustainable supplies, including managed groundwater recharge and in-lieu groundwater recharge (e.g., treated surface water deliveries, demand management programs, and SFPUC supply). Currently, Valley Water does not have an established safe yield for the Santa Clara Sub-Basin. In addition, there is not a detailed groundwater budget for the Santa Clara Sub-Basin, nor have groundwater rights in the basin been adjudicated by a court. The City, in conjunction with other water retailers utilizing groundwater from the Santa Clara Sub-Basin, works with Valley Water to operate groundwater wells in a manner which will prevent subsidence from occurring and preserve the integrity of the groundwater basin.

A groundwater basin is a complex natural resource and cannot be equated to a bathtub in which water drained from the bathtub affects all water levels equally. Given the large geographic scope of the Santa Clara Sub-Basin and the multiple users drawing from the aquifer, conditions vary across the sub-basin based on elevation, recharge conditions, and pumping activity. It should not be assumed that groundwater pumping from a specific location will necessarily have a uniform effect on groundwater conditions and levels throughout the sub-basin. Therefore, in such a large and complex groundwater basin, pumping at one end of the groundwater basin will not necessarily affect groundwater levels at the other end.

Groundwater conditions throughout the county are sustainable, with managed and in-lieu recharge programs maintaining adequate storage to meet annual water supply needs and provide a buffer against drought or other shortages. Although groundwater levels declined during the recent (2012-2016) statewide drought, groundwater levels in the Santa Clara and Llagas subbasins quickly recovered after the drought due largely to Valley Water's proactive response and comprehensive water management activities. Valley Water monitors water levels and water quality at wells throughout the county. In addition, it evaluates data from local water suppliers to assess regional groundwater quality and identify potential threats so they can be appropriately addressed. Valley Water also monitors the quality of water used for groundwater recharge to ensure groundwater resources are protected.

If portions of the Santa Clara Sub-Basin were to return to overdraft conditions, the likely environmental consequences, based on past observations, would be land subsidence, unproductive wells, water loss (negative balance) from rivers/creeks as the groundwater table drops, which in the worst-case would lead to de-watering, and associated riparian impacts as the vegetation loses access to sufficient water. However, as discussed previously, a primary responsibility of Valley Water is to recharge groundwater basins to prevent overdraft. Even when the City was at the historic peak for groundwater production in FY1986/87, the basin was not approaching overdraft. Therefore, the City's projected pumping falls within the range of historically sustainable pumping, given Valley Water's reasonably foreseeable recharge and groundwater management programs.

There is an inherent level of uncertainty in predicting water supply availability decades into the future. Providing absolute supply certainty is only possible in the near-term and at a much later point in the land use planning and approval process. However, the City's progressively phased 2010-2035 General Plan will allow reconsideration of available water supplies concurrent with each phase of planned development, coordinated with each successive City UWMP and Valley Water's regional wholesale UWMP, which are updated every five years, including adjusted imported water quantities to account for pumping restrictions and climate change. Therefore, the City's land use planning processes will serve to mitigate potential future overdraft conditions by specifically addressing the City's contribution to cumulative pumping demands on the aquifer.

Future pumping by the City, in combination with the multiple other users of the Santa Clara Sub-Basin, would not be expected to contribute to cumulative groundwater pumping impacts, i.e. withdrawals above the basin's safe yield, given Valley Water's reasonably foreseeable recharge and groundwater management programs.

7.2.3 Reliability and Vulnerability of Groundwater

In Santa Clara County, nearly half of all water used comes from groundwater. The county's groundwater basins have vast storage capacity, estimated to be three times the capacity of all Valley Water's ten surface reservoirs combined. However, groundwater is vulnerable to seasonal or climatic shortages due to droughts and/or shortages of water used for groundwater recharge. As stated in their 2020 UWMP, Valley Water sustainably manages local groundwater basins to support beneficial use by water retailers, private well users, and the environment. Since the 1930s, Valley Water's water supply strategy has been to maximize conjunctive use of surface water and groundwater supplies to enhance water supply reliability and avoid land subsidence. Local groundwater resources make up the foundation of the county's water supply, but they need to be augmented by Valley Water's comprehensive water management activities to reliably meet the needs of county residents, businesses, agriculture, and the environment. These activities include managed recharge of imported and local supplies and in-lieu groundwater recharge through the provision of treated surface water and raw water, acquisition of supplemental water supplies, and water conservation and recycling. Other programmatic specifics are detailed in the Valley Water's 2016 Groundwater Management Plan.

As noted earlier in this UWMP the City's groundwater production wells are strategically located throughout the City. Locating the wells throughout the City increases the overall reliability of the City's water system. The addition of portable emergency generators also increases the reliability of this water source. These generators are discussed in detail in **Chapter 8** of this UWMP.

The City is not currently using all available well capacity. The utilization factor for the City's wells is on average 20% for 2016-2020 with approximately 40% of wells currently being used at less than 10% of their rated capacity. Therefore, additional capacity exists which could be used to offset losses from either of the City's imported water supplies. However, the City will continue to coordinate with Valley Water to monitor and prevent groundwater pumping beyond the safe yield of the groundwater aquifer. Valley Water has not determined a resource limit to the City's use of groundwater, rather they represent their ability to obtain sufficient quantities of water supply for the overall water requirements as stated in this Plan.

7.2.4 Efforts to Minimize Imported Water and Maximize Resources

The City has adopted several management strategies to minimize imported water use and maximize local resources in order to be more self-reliant. The use of recycled water to offset water demand resulting from growth is one of the key management strategies used by the City to reduce the reliance on imported water.

Recycled water has provided the City a drought proof water supply for customers who have acceptable uses. Recycled water has been used to offset growth of potable water demand and has a secondary benefit of reducing the potable demand during the high demand summer months. This reduction in the overall demand reduces dependence on imported water sources and groundwater (and provides greater reliability from the existing potable storage volumes). Recycled water currently accounts for 19%% of the City's overall water supply.

The City's use of imported treated water at a relatively constant contract rate allows for a controlled and predictable use of imported water. The City's use of local groundwater supplies to meet the variable demand (diurnal and seasonal) mitigates peak demands to the maximum extent practicable. It is noted that some imported water is used by Valley Water to augment local supplies for groundwater recharge to ensure that the local supplies (mostly recharged to the groundwater basin) are not over used.

7.2.5 Proposed City Policies to Ensure Future Water Supply

The City's 2010-2035 General Plan includes a range of policies to ensure a reliable, safe supply of potable water adequate to meet present and future needs through promotion of water conservation, expansion of the use of recycled water, and appropriate coordination with Valley Water. The 2010-2035 General Plan policies that provide program-level mitigation to ensure adequate water supply within the City are identified below in **Table 7-5**.

Table 7-5: Water Supply Reliability Policies to Ensure Future Water Supply	
Water Policies	
5.10.4-P1	Promote water conservation through development standards, building requirements, landscape design guidelines, education, compliance with the State water conservation landscaping ordinance, and other applicable City- wide policies and programs.
5.10.4-P2	Expand water conservation and reuse efforts throughout the City in order to meet the conservation goals in the City's adopted Urban Water Management Plan and CAP to reduce per capita water use by 2020.
5.10.4-P3	Promote water conservation, recycled water use and sufficient water importation to ensure an adequate water supply.
5.10.4-P4	Require an adequate water supply and water quality for all new development.
5.10.4-P5	Prohibit new development that would reduce water quality below acceptable State and local standards.
5.10.4-P6	Maximize the use of recycled water for construction, maintenance, irrigation and other appropriate applications.
5.10.4-P7	Require installation of native and low-water consumption plant species when landscaping new development and public spaces to reduce water usage.
5.10.4-P8	Require all new development within a reasonable distance of existing or proposed recycled water distribution systems to connect to the system for landscape irrigation.
5.10.4-P9	Work with Valley Water to improve the Santa Clara Distributary.
5.10.4-P10	Work with Valley Water to minimize undesirable compaction of aquifers and subsidence of soils.

7.2.6 Loss of Wells

The possibility of losing the production from a single or several wells is slight but could occur due to a catastrophic event such as an earthquake (causing well collapse) or contamination. The City wells are all constructed to current standards to prevent possible contamination of the City's drinking water. The City has an ongoing CIP program to rehabilitate existing wells and identify locations for new wells. The City completed an update to its Emergency Response Plan in FY 19/20. This Emergency Response Plan (ERP) is a key component in the City of Santa Water and Sewer Utilities (Department) emergency management planning process and supports the Department's intent to respond to any emergency situation in a safe, effective and timely manner. The ERP establishes policies, procedures and organizational structure for response to emergencies that cause a significant disruption to the operation of the Department. As emergencies are often sudden and without warning, these procedures, while providing guidance, are designed to be flexible in order to permit the Department staff to respond to any given situation. The City's ERP is discussed further in **Section 8.5**.

The City has also completed a Source Water Assessment Program that examined potential sources of contamination. Currently four wells have shown a detectable level of nitrates (equal to or exceeding half of the 10 mg/L MCL). The potential exists that nitrates could render several wells unusable if the level increased to a concentration in excess of the MCL. However, the recorded nitrate levels across the aquifer have not shown increasing levels or levels above the MCL, so the probability of the nitrate level increasing up to and beyond the MCL is extremely remote.

Earthquakes have the potential to damage a well by collapsing the well casing or changing the yield of the aquifer from which the well draws. The wells are geographically distributed throughout the City such that the loss of one or two wells within a pressure zone will not affect the system's ability to meet the water demand since production from other wells will increase and feed the network of distribution pipes that interconnects the wells. As noted in **Appendix M**, the wells within the City have an average utilization factor of 20% with some wells utilized at less than 10% of their rated capacity. Therefore, sufficient capacity exists for the City to maintain consistent water deliveries even with the loss of multiple wells due to an earthquake or other factors.

7.2.7 Loss of Imported Water Supplies

The City's water system can offset the temporary loss of either (or both) imported water supplies by increased pumping of groundwater. The long-term loss (for more than a year) of either or both imported supplies would, however, potentially contribute to the eventual overdraft of the groundwater basin. The City's water system can accommodate the increased use of groundwater through increased operation of storage tanks and their associated booster pumps during periods of increased water demand. This mode of operation would increase the use of pumping equipment and thereby making it more vulnerable to equipment failure.

The sudden loss of imported SFPUC supply could be replaced in short term with well water; long-term replacement would likely require a new connection and a new agreement with Valley Water. In an emergency, it may be possible for the SFPUC to redirect flow through the Bay Division pipeline from the Harry Tracy Water Treatment Plant to serve the City and other retailers. Wells in zone 1 would also be critical in replacing the potential loss of SFPUC supply.

The temporary loss of imported Valley Water supply could be replaced in the short term by a combination of increased groundwater well production and an increase in SFPUC supply (within contract limits). The areas of the City served by the Valley Water connection could be served via the existing booster pumps at Serra Tanks that have a diesel-powered back-up generator. Some additional optimizations of Zone 2 and Zone 2A zone valves would be required to mitigate an extended loss of Valley Water supply.

The City's water distribution system has been shown to be very robust in its ability to meet all demands for the peak day and peak hour, for now and for the future expected demands. Fire flow analyses for certain sections of the City indicate minor improvements in system piping would improve pressures for fighting a major fire. The loss of SFPUC water can be accommodated with the existing system for short-term loss including a potential three- to four-month outage that could be expected from a major earthquake.

7.2.8 Loss of Electrical Power

The City, like most water utilities is dependent on electrical power to pump water from wells, into and out of storage tanks, and at several points in the distribution system. The City purchases electrical power from Silicon Valley Power (SVP), the City's municipal electric utility. SVP has taken steps to ensure the reliability of the local power supply including the completion of the DVR Power plant, which can generate one-third of the City's total electric demand. The DVR Power Plant increases the reliability of the electrical power to the water utility since the power plant is located within the City limits.

Despite the reliability of SVP, the water utility has placed back up power supplies at nine strategic water supply facilities around the City. Five of these back up power supplies are portable and can be moved as needed to other locations within the water utility. Electrical connections at the various well sites and booster pump stations are standardized to allow for quick connection of the portable generators at each location. These combined sources (wells with backup power) are sufficient to meet the low expected system demand during a regional or citywide power outage. The City also has sufficient supply of diesel fuel for several weeks of such operations.

7.2.9 Financial Impact Mitigation

To mitigate the financial impacts of reduced water sales during a drought, the City Council has the authority to impose a drought surcharge on water rates. This surcharge could be a flat fee per hundred cubic feet (CCF) that is intended to provide the City's water utility with dependable revenues when water use reduction plans are in effect. Senate Bill 814 (SB 814) approved in August 2016, requires urban water retail suppliers to establish a method to identify and discourage excessive water use through either: 1) the establishment of a rate structure that may include block tiers, water budget, or rate surcharges over and above base rates for excessive water use by a residential water customer or 2) establishment of an excessive water use ordinance, rule, or tariff condition, that includes a definition of, or a procedure to identify and address, excessive water use.

The City has traditionally used a "postage stamp" rate for all water sales. With reduction in sales, the fixed costs will remain, imposing a loss on the utility (expenses in excess of revenues). An advantage to the drought surcharge is that it is designed and set to allow sufficient revenue to meet all costs for the utility while also achieving conservation.

The water utility also has reserves that it has used in the past as a rate stabilization fund. These reserves are being used to help reduce the rate impact from ever-increasing wholesale costs and the lower water sales due to the recent drought and slow recovery of water use. Additionally, the Utility is currently developing a long range financial and rate stabilization plan. The water utility's reserves are intended to be at the level that is sufficient to cover short-term loss of revenues due to a drought or other short-term catastrophic loss of sales. Reserves are adequately funded as part of the rate setting process.

The 2020-2021 Water, Sewer, and Recycled Water Operating Budget is $132.7 million, which represents an increase of 45.6% over the prior year.[39] Most of this increase is due to increases in capital costs at the jointly owned Regional Wastewater Facility. The Utility will continue to manage, plan, and allocate resources to achieve City Council goals of maintaining the lowest combined utility rates (water, sewer,

[39] City of Santa Clara Budget.

and electric) in the nine bay area counties, stabilizing rates and reducing the need for rate increases to the extent practical, ensuring the financial viability of the Water and Sewer Utilities, and ensure the long term viability of and preserve the value of the utility infrastructure.

7.2.10 Effects of Climate Change on Water Supply Reliability

Climate change is discussed in **Section 6.11.**

7.3 Regional Supply Reliability

One of the common factors affecting supply reliability for both Valley Water and the SFPUC is the adoption of the Bay Delta Plan Amendment (BDP Amendment or BDP). In December 2018, the SWRCB adopted amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (BDP Amendment) to establish water quality objectives to maintain the health of the Bay-Delta ecosystem. The SWRCB is required by law to regularly review this plan. The adopted BDP Amendment was developed with the stated goal of increasing salmonid populations in three San Joaquin River tributaries (the Stanislaus, Merced, and Tuolumne Rivers) and the Bay-Delta. The BDP Amendment requires the release of 30-50% of the "unimpaired flow"[40] on the three tributaries from February through June in every year type.

The following sections discuss the reliability and vulnerability of treated surface water to each wholesaler and further details the more specific impacts of the BDP Amendment.

7.3.1 Reliability and Vulnerability of Treated Surface Water from Valley Water

Valley Water manages an integrated water resources system to provide a reliable supply of clean, safe water, flood protection, and stewardship of streams on behalf of Santa Clara County's nearly two million residents and 13 water retailers. Water supplies include local surface water and groundwater, imported water, and recycled water. Water conservation is also an important part of the of the water supply mix, which helps reduce water demands and improve reliability during droughts.

Valley Water works to maintain high groundwater storage in normal and wet years through a comprehensive managed recharge program and by providing treated water in lieu of groundwater pumping. Excess supplies are stored in the Semitropic Groundwater Bank, and Valley Water can carryover imported supplies in some years in San Luis Reservoir. During a dry year, Valley Water can use these stored supplies without having to call on the public to reduce demands. During an extended drought, Valley Water would need to pursue additional water shortage actions. Valley Water uses a combination of options to bring in additional water supplies to support local demands, including:

[40] "Unimpaired flow represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds." (Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary [Dec. 12, 2018] p.17, fn. 14, available at https://www.waterboards.ca.gov/plans_policies/docs/ 2018wqcp.pdf)

- Recovery and import of Valley Water's supplies stored in groundwater banking and exchange programs.
- Use of existing multi-year agreements between Valley Water and other water agencies that provide options to call on pre-negotiated transfer/exchange water.
- Collaboration with water agencies that have available resources to develop and implement agreements for the transfer/exchange of water to Valley Water.
- Participation in pooled water transfer programs with other SWP and CVP contractors.

The quantities of water available through these options are variable and depend on hydrology, pumping capacity, environmental restrictions, and demands from other agencies. These supplemental supplies help Valley Water mitigate the impact of a drought. For example, in 2015 Valley Water secured approximately 69,000 acre-feet in supplemental supplies through transfers, exchanges, public health and safety allocations, and Semitropic banking withdrawals, which helped mitigate the impact of the severely low imported water allocation that year.

Valley Water Outage Scenarios

Valley Water completed its first Infrastructure Reliability Plan (IRP) in 2005 and updated it in 2016. The IRP analyzes several outage scenarios for Valley Water's system, including an earthquake, extreme storm, Delta outage, and power outage. Valley Water and retailers agreed on a reliability target during an emergency that Valley Water should be able to restore treated water deliveries to meet the equivalent of a winter month's demand (i.e., February) within 30 days after a major disaster event. Modeling and analyses estimated service restoration time of Valley Water's existing system for minimum winter demands in each of the outage scenarios.

- The worst-case outage scenario was a magnitude 7.9 earthquake on the San Andreas fault, which would result in an estimated 30-day outage time before Valley Water can provide minimum treated water demands to retailers.
- In the Delta outage scenario, modeling demonstrated Valley Water can continue limited service (at an assumed 20% demand reduction) for a 24-month period with no imported water supplies if it occurred in a normal hydrologic year and started with normal groundwater supplies. The analysis assumed that all local infrastructure remains intact, as an earthquake or flood in the Delta is unlikely to badly damage local infrastructure. The impacts of such an outage are largely operational as retailers would be required to use groundwater instead of their usual treated water supplies and Valley Water would actively manage the groundwater recharge program to meet countywide needs.
- In a regional power outage, Valley Water can operate facilities on backup fuel storage for an estimated three to ten days, or longer given regular external fuel deliveries.

Ultimately, Valley Water and retailers determined that targeting specific vulnerable areas for improvement will effectively address identified reliability needs. A total of 20 projects are identified in the 2016 IRP to improve reliability in these specific areas. Some projects were identified for retailer implementation, some for Valley Water implementation, and others for joint implementation. Valley Water has been working to complete the identified projects since 2016.

Imported water diverted from the Delta is an important component of Valley Water's current water supply portfolio, accounting for approximately 40% of its annual supply. Valley Water uses water from the SWP, CVP, and local watersheds runoff to meet groundwater recharge and water treatment plant needs. Scientists estimate that global warming will increase the mean sea level between one and three feet over the next 100 years, placing greater pressure on the levee system and increasing the likelihood and impacts of levee failures. Regional climate changes may also result in an increase in the magnitude and frequency of extreme rainfall events, further stressing the stability of the Delta levee system. The Delta Flood Emergency Management Plan (DWR, 2018) provides strategies for responses to Delta levee failures, including earthquake-induced numerous levee failures during dry conditions with multiple flooded islands and extensive saltwater intrusion, resulting in curtailment of export operations. Under these severe conditions, an emergency freshwater pathway would be established from the central Delta along Middle River and Victoria Canal to the export pumps in the south Delta. Using pre-positioned materials, multiple earthquake-generated levee breaches and levee slumping along the freshwater pathway can be repaired in less than six months. Significant improvements to the central and south Delta levee systems along the emergency freshwater pathway began in 2010 and are continuing. Continued efforts under analysis strive to mitigate not only flood and earthquake risk but also meet future sea-level rise risk.

The temporary loss of Valley Water imported supply could be replaced in the short term by a combination of increased well production of groundwater and an increase in SFPUC supply (within contract limits). The areas of the City served by the Valley Water connection could be served via the existing booster pumps at Serra Tanks that have a back-up diesel-powered generator. Some additional optimizations of Zone 2 and Zone 2A zone valves would be required to mitigate an extended loss of District supply.[41]

Current Valley Water demand projections show that there are no anticipated shortages based on current modeling and retailer projected demands. Current modeling incorporates projects identified in the WSMP to improve water supply reliability and to meet increasing demands through 2045. Valley Water adopted the WSMP to determine water supply adequacy to meet future demand beyond 2020 considering population projections, aging infrastructure, climate change, regulatory and policy changes, and current Master Plan projects. The WSMP presented a strategy to improve reliability of existing supplies and the addition of new infrastructure and operations for optimization of the current system and the development of potable reuse for groundwater recharge. The WSMP was updated in 2019.

[41] City of Santa Clara 2002 Water Master Plan.

Valley Water's Reduced Bay Delta Reliance

Because Valley Water imports over half of its current water supply from regions outside the Santa Clara Valley, issues related to regions such as the Sacramento River/San Joaquin Bay-Delta have enormous potential impact on water supply. The Delta is in peril, putting much of the Bay Area's water supply at risk, and threatening the ecosystem, recreation, energy supplies, transportation corridors and shipping routes. Valley Water's complex water supply and management system is based on the conjunctive management of groundwater and surface water (both local and imported). Therefore, it is very difficult to demonstrate reduced Delta reliance at a retailer level: However, Valley Water has implemented strategies in order to reduce their reliance on the Delta on behalf of its retailers. The City's ability to demonstrate reduced Delta Reliance is hindered by the following:

- Valley Water uses water from the SWP, CVP, and local watershed runoff to meet groundwater recharge and water treatment plant needs, which in turn produce water for use by retailers and other users. The interconnected nature of the groundwater basins and blended use of sources in Valley Water infrastructure like reservoirs and pipelines make it infeasible to quantify imported water use at the retailer level.
- Valley Water manages most of the water conservation programs for the County with the support of retailers. Retailers support the conservation programs through water rates and cost share agreements.
- Valley Water and local retailers have recycled water goals for the future but the projected future split between potable and non-potable is not yet determined. Potable reuse would be managed by Valley Water and either directly augment groundwater or treated surface water. In both instances, it would get blended with several other sources before being used by retailers so it would be infeasible to determine the proportion of potable recycled water going to each retailer compared to Delta supplies.
- Valley Water projects an increased use of supplies captured locally, which can contribute to reduced reliance on the Delta. But given Valley Water's conjunctive water management, these reductions cannot be allocated to individual retailers.

Valley Water, with the support of all retailers including the City, has made significant investments in demand management and local supplies to reduce Santa Clara County's and thus the City's reliance on the Delta. These investments include:

- Conservation and Demand Management
- Recycled and Purified Water
- Stormwater Capture
- Dam Improvements/Seismic Retrofits of Local Reservoirs
- Regional Collaborations to Increase Regional Self-reliance

Through careful management and conjunctive use of local surface water and groundwater supplies, and increasing conservation and use of recycled water, Santa Clara County (and by extension the City) is reducing reliance on the Delta and supporting overall water supply reliability. The investments are described further below:

- **Conservation and Demand Management.** Over time, Valley Water has implemented a wide range of Demand Management Measures (DMMs) that help reduce water use countywide. Valley Water's conservation programs include metering, public education and outreach, rebates for residential and commercial users, landscape rebate for lawn conversion, free water use audits and consultation, and many more (See Chapter 9 for a detailed description). Collectively, conservation and stormwater capture accounted for about 75,000 AFY in 2020 water savings over a 1992 baseline. In 2019, Valley Water updated its WSMP 2040 (WSMP), which includes a range of water conservation programs as well as stormwater capture/recharge programs that are designed to achieve a goal of increasing these savings to 110,000 AFY by 2040. Both Valley Water and City DMMs are discussed further in Chapter 9.

- **Recycled and Purified Water.** Valley Water has also actively promoted the use of recycled and purified water. Over the past decade, Valley Water has advanced water reuse in the county by leading water reuse planning efforts, developing wholesale recycled water programs, and constructing new infrastructure. Currently, recycled water is about 5% (17,000 AFY, CY 2020) of the county's water supply that is distributed for non-potable uses. In addition, Valley Water is in the process of developing 10 MGD (11,200 AFY production capacity) of potable reuse supply by 2028.

  Valley Water completed a Countywide Water Reuse Master Plan (CoRe Plan) in 2021 to identify feasible opportunities to expand water reuse, improve water supply reliability, and increase regional self-reliance. The CoRe Plan outlines Valley Water's opportunities and strategies toward achieving up to 24,000 AFY for potable water reuse. Potable reuse would be managed by Valley Water and either directly augment groundwater or treated surface water. In both instances, it will be blended with several other sources before being used by retailers making it infeasible to determine the proportion of potable recycled water going to each retailer compared to water supplies imported through the Delta.

- **Stormwater Capture.** Through its water supply master planning, Valley Water also plans to increase stormwater capture and reuse as part of its 'ensure sustainability strategy'. Valley Water's stormwater projects for the next 20 years include investments in green infrastructure, flood-managed aquifer recharge (Flood-MAR), and centralized stormwater capture project.

- **Dam Improvements/Seismic Retrofits of local reservoirs.** Currently, five (Almaden, Anderson, Calero, Coyote, Guadalupe) of Valley Water's ten reservoirs are operating under various level of restricted capacity. Future average use of local surface water supply is projected to increase over the planning horizon as Valley Water's dams are seismically retrofitted, allowing operating capacity restrictions to be lifted. The seismic retrofit of these reservoirs (except Coyote) is expected to be completed around 2030 to 2035 and will allow them to reassume their full operating capacity by that time.

- **Regional Collaborations to Increase Regional Self-Reliance.** Valley Water has partnered with seven water agencies in the Bay Area (Alameda County Water District, Bay Area Water Supply and Conservation Agency, Contra Costa Water District, East Bay Municipal Utility District, Marin Municipal Water District, SFPUC, and Zone 7 Water Agency) to investigate opportunities for regional collaboration. The purpose of this planning effort, known as Bay Area Regional Reliability (BARR), is to identify projects and processes to enhance water supply reliability across the region, leverage existing infrastructure investments, facilitate water transfers during critical shortages, and improve climate change resiliency. Projects to be considered include interagency interties and pipelines; treatment plant improvements and expansion; groundwater management and recharge; potable reuse; desalination; and water transfers. While no specific capacity or supply has been identified, this program may result in the addition of future supplies that would benefit Santa Clara County.

  Valley Water is also an active participant in the Bay Area and Pajaro River Watershed Integrated Regional Water Management (IRWM) programs. The Bay Area IRWM Plan was completed in 2006 and updated in 2013 and 2020. The Pajaro River Watershed IRWM Plan was completed in 2007 and updated in 2014 and 2020. The plans describe the regions' water supply and water quality, wastewater and water recycling, storm water and flood protection, and habitat protection and ecosystem restoration objectives and efforts. To date, Valley Water has received $86.3 million in IRWM grant funding awards to support various water resource management projects, including water recycling, water conservation, flood protection, and dam seismic retrofits.

7.3.2 Reliability and Vulnerability of Treated Surface Water from SFPUC

Bay Area Water Supply and Conservation Agency (BAWSCA)

BAWSCA provides regional water reliability planning and conservation programming for the benefit of its 26 member agencies that purchase wholesale water supplies from the SFPUC. Collectively, the BAWSCA member agencies deliver water to over 1.8 million residents and nearly 40,000 commercial, industrial and institutional accounts in Alameda, San Mateo and Santa Clara Counties.

BAWSCA also represents the collective interests of these wholesale water customers on all significant technical, financial, and policy matters related to the operation and improvement of the SFPUC's RWS.

BAWSCA's role in the development of the 2020 UWMP updates is to work with its member agencies and the SFPUC to seek consistency among UWMP documents.

Tier One Drought Allocations

In July 2009, San Francisco and its Wholesale Customers in Alameda County, Santa Clara County, and San Mateo County (Wholesale Customers) adopted the Water Supply Agreement (WSA), which includes a Water Shortage Allocation Plan (WSAP) that describes the method for allocating water from the Regional Water System (RWS) between Retail and Wholesale Customers during system-wide shortages of 20% or less. The WSAP, also known as the Tier One Plan, was amended in the 2018 Amended and Restated WSA.

The SFPUC allocates water under the Tier One Plan when it determines that the projected available water supply is up to 20% less than projected system-wide water purchases. The following table (**Table 7-6**) shows the SFPUC (i.e., Retail Customers) share and the Wholesale Customers' share of the annual water supply available during shortages depending on the level of system-wide reduction in water use that is required. The Wholesale Customers' share will be apportioned among the individual Wholesale Customers based on a separate methodology adopted by the Wholesale Customers, known as the Tier Two Plan, discussed further below.

Table 7-6: Annual Water Supply Available During Shortages

Level of System-Wide Reduction in Water Use Required	Share of Available Water	
	SFPUC Share	Wholesale Customers Share
5% or less	35.5%	64.5%
6% through 10%	36.0%	64.0%
11% through 15%	37.0%	63.0%
16% through 20%	37.5%	62.5%

The Tier One Plan allows for voluntary transfers of shortage allocations between the SFPUC and any Wholesale Customer as well as between Wholesale Customers themselves. In addition, water "banked" by a Wholesale Customer, through reductions in usage greater than required, may also be transferred.

As amended in 2018, the Tier One Plan requires Retail Customers to conserve a minimum of 5% during droughts. If Retail Customer demands are lower than the Retail Customer allocation (resulting in a "positive allocation" to Retail[42]) then the excess percentage would be re-allocated to the Wholesale Customers' share. The additional water conserved by Retail Customers up to the minimum 5% level is deemed to remain in storage for allocation in future successive dry years.

The Tier One Plan will expire at the end of the term of the WSA in 2034, unless mutually extended by San Francisco and the Wholesale Customers.

The Tier One Plan applies only when the SFPUC determines that a system-wide water shortage exists and issues a declaration of a water shortage emergency under California Water Code Section 350. Separate from a declaration of a water shortage emergency, the SFPUC may opt to request voluntary cutbacks from its Retail and Wholesale Customers to achieve necessary water use reductions during drought periods.

[42] Water Supply Agreement, Water Shortage Allocation Plan (Attachment H), Section 2.1.

Tier Two Drought Allocations

The Wholesale Customers have negotiated and adopted the Tier Two Plan, which allocates the collective Wholesale Customer share from the Tier One Plan among each of the 26 Wholesale Customers. These Tier Two allocations are based on a formula that takes into account multiple factors for each Wholesale Customer including:

- Individual Supply Guarantee (ISG);
- Seasonal use of all available water supplies; and
- Residential per capita use.

The water made available to the Wholesale Customers collectively will be allocated among them in proportion to each Wholesale Customer's Allocation Basis, expressed in MGD, which in turn is the weighted average of two components. The first component is the Wholesale Customer's ISG, as stated in the WSA, and is fixed. The second component, the Base/Seasonal Component, is variable and is calculated using the monthly water use for three consecutive years prior to the onset of the drought for each of the Wholesale Customers for all available water supplies. The second component is accorded twice the weight of the first, fixed component in calculating the Allocation Basis. Minor adjustments to the Allocation Basis are then made to ensure a minimum cutback level, a maximum cutback level, and a sufficient supply for certain wholesale customers.

The Allocation Basis is used in a fraction, as numerator, over the sum of all Wholesale Customers' Allocation Bases to determine each Wholesale Customer's Allocation Factor. The final shortage allocation for each Wholesale Customer is determined by multiplying the amount of water available to the Wholesale Customers' collectively under the Tier One Plan, by the Wholesale Customer's Allocation Factor.

The Tier Two Plan requires that the Allocation Factors be calculated by BAWSCA each year in preparation for a potential water shortage emergency. As the Wholesale Customers change their water use characteristics (e.g., increases or decreases in SFPUC purchases and use of other water sources, changes in monthly water use patterns, or changes in residential per capita water use), the Allocation Factor for each Wholesale Customer will also change. However, for long-term planning purposes, each Wholesale Customer shall use as its Allocation Factor, the value identified in the Tier Two Plan when adopted.

Per WSA Section 3.11, the Tier One and Tier Two Plans will be used to allocate water from the RWS between Retail and Wholesale Customers during system-wide shortages of 20% or less. For RWS shortages in excess of 20%, San Francisco shall (a) follow the Tier One Shortage Plan allocations up to the 20% reduction, (b) meet and discuss how to implement incremental reductions above 20% with the Wholesale Customers, and (c) make a final determination of allocations above the 20% reduction. After the SFPUC has made the final allocation decision, the Wholesale Customers shall be free to challenge the allocation on any applicable legal or equitable basis. For purposes of the 2020 UWMPs, for RWS shortages in excess of 20%, the allocations among the Wholesale Customers is assumed to be equivalent among them and to equal the drought cutback to Wholesale Customer by the SFPUC.

The Tier Two Plan, which initially expired in 2018, has been extended by the BAWSCA Board of Directors every year since for one additional calendar year. In November 2020, the BAWSCA Board voted to extend the Tier Two Plan through the end of 2021.

Under the Water Supply Agreement between the City and County of San Francisco and wholesale customers, Tier 1 and Tier 2 requires San Francisco to provide no more than a 20% reduction in supply.

Individual Supply Guarantee (ISG)

San Francisco has a perpetual commitment (Supply Assurance) to deliver 184 MGD (206,107 AFY) to the 24 permanent Wholesale Customers collectively. San Jose and Santa Clara are not included in the Supply Assurance commitment and each has temporary and interruptible water supply contracts with San Francisco.

The City's current contract allocation with SFPUC is 4.5 MGD (5,041 AF).

2028 SFPUC Decisions (formerly 2018 SFPUC Decisions)

In the 2009 WSA, the SFPUC committed to make three decisions before 2018 that affect water supply development:

- Whether or not to make the cities of San Jose and Santa Clara permanent customers,
- Whether or not to supply the additional unmet supply needs of the Wholesale Customers beyond 2018, and
- Whether or not to increase the wholesale customer Supply Assurance above 184 MGD (206,107 AFY).

Events since 2009 made it difficult for the SFPUC to conduct the necessary water supply planning and CEQA analysis required to make these three decisions before 2018. Therefore, in the 2018 Amended and Restated WSA, the decisions were deferred for ten years to 2028.

Additionally, there have been recent changes to instream flow requirements and customer demand projections that have affected water supply planning beyond 2018. As a result, the SFPUC has established an Alternative Water Supply Planning program to evaluate several regional and local water supply options. Through this program, the SFPUC will conduct feasibility studies and develop an Alternative Water Supply Plan by July 2023 to support the continued development of water supplies to meet future needs.

Reliability of the Regional Water System

In 2008, the SFPUC adopted Level of Service (LOS) Goals and Objectives in conjunction with the adoption of the Water System Improvement Program (WSIP). The SFPUC updated the LOS Goals and Objectives in February 2020. **Table 7-7** details the SFPUC's LOS Goals and Objectives related to water supply.

Table 7-7: SFPUC's LOS Goals and Objectives Related to Water Supply	
Program Goal	System Performance Objective
Water Supply – meet customer water needs in non-drought and drought periods	• Meet all state and federal regulations to support the proper operation of the water system and related power facilities. • Meet average annual water demand of 265 MGD from the SFPUC watersheds for retail and Wholesale Customers during non–drought years for system demands consistent with the 2009 Water Supply Agreement. • Meet dry-year delivery needs while limiting rationing to a maximum 20% system-wide reduction in water service during extended droughts. • Diversify water supply options during non-drought and drought periods. • Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers.

Long-Term Reliable Water Supply Strategy

BAWSCA's Long-Term Reliable Water Supply Strategy (Strategy), completed in February 2015, quantified the water supply reliability needs of the BAWSCA member agencies through 2040, identified the water supply management projects and/or programs (projects) that could be developed to meet those needs, and prepared an implementation plan for the Strategy's recommendations.

When the 2015 Demand Study concluded it was determined that while there is no longer a regional normal year supply shortfall, there was a regional drought year supply shortfall of up to 43 MGD (48,166 AFY). In addition, key findings from the Strategy's project evaluation analysis included:

- Water transfers represent a high priority element of the Strategy.
- Desalination potentially provides substantial yield, but its high effective costs and intensive permitting requirements make it a less attractive drought year supply alternative.
- Other potential regional projects provide tangible, though limited, benefit in reducing dry-year shortfalls given the small average yields in drought years.

Since 2015, BAWSCA has completed a comprehensive update of demand projections and engaged in significant efforts to improve regional reliability and reduce the dry-year water supply shortfall.

- **Water Transfers.** BAWSCA successfully facilitated two transfers of portions of ISG between BAWSCA agencies in 2017 and 2018. Such transfers benefit all BAWSCA agencies by maximizing use of existing supplies. BAWSCA is currently working on an amendment to the Water Supply Agreement between the SFPUC and BAWSCA agencies to establish a mechanism by which member agencies that have an ISG may participate in expedited transfers of a portion of ISG and a portion of a

Minimum Annual Purchase Requirement. In 2019, BAWSCA participated in a pilot water transfer that, while ultimately unsuccessful, surfaced important lessons learned and produced interagency agreements that will serve as a foundation for future transfers. BAWSCA is currently engaged in the Bay Area Regional Reliability Partnership[43] (BARR), a partnership among eight Bay Area water utilities (including the SFPUC, Alameda County Water District, BAWSCA, Contra Costa Water District, Santa Clara Valley Water District) to identify opportunities to move water across the region as efficiently as possible, particularly during times of drought and emergencies.

- **Regional Projects.** Since 2015, BAWSCA has coordinated with local and State agencies on regional projects with potential dry-year water supply benefits for BAWSCA's agencies. These efforts include storage projects, indirect/direct water reuse projects, and studies to evaluate the capacity and potential for various conveyance systems to bring new supplies to the region.

  BAWSCA continues to implement the Strategy recommendations in coordination with BAWSCA member agencies. Strategy implementation will be adaptively managed to account for changing conditions and to ensure that the goals of the Strategy are met in an efficient and cost-effective manner. On an annual basis, BAWSCA will reevaluate Strategy recommendations and results in conjunction with development of the BAWSCA's FY 2021-22 Work Plan. In this way, actions can be modified to accommodate changing conditions and new developments.

  BAWSCA, Santa Clara and San Jose representatives meet monthly to discuss long term water supply planning in order to ensure permanent status standing for Santa Clara, water supply reliability and limit rationing to no more than 20% system-wide in accordance with SFPUC adopted policies. Specifically, meetings focus on SFPUC's Alternative Water Supply Program which is currently funded with $288M.

Making Conservation a Way of Life Strategic Plan

Following the 2012-2016 drought, the State developed the "Making Water Conservation a California Way of Life" framework to address the long-term water use efficiency requirements called for in executive orders issued by Governor Brown. In May of 2018, AB 1668 and SB 606 (collectively referred to as the efficiency legislation) went into effect, which built upon the executive orders implementing new urban water use objectives for urban retail water suppliers.

BAWSCA led its member agencies in a multi-year effort to develop and implement a strategy to meet these new legislative requirements. BAWSCA's Making Conservation a Way of Life Strategic Plan (Strategic Plan) provided a detailed roadmap for member agencies to improve water efficiency. BAWSCA implementing the following elements of the Strategic Plan:

- Conducted an assessment of the agencies' current practices and water industry best practices for three components of the efficiency legislation that, based on a preliminary review, present the

[43] https://www.bayareareliability.com/

greatest level of uncertainty and potential risk to the BAWSCA agencies. The three components were:

1. Development of outdoor water use budgets in a manner that incorporates landscape area, local climate, and new satellite imagery data.
2. Commercial, Industrial, and Institutional (CII) water use performance measures.
3. Water loss requirements.

- Organized an Advanced Metering Infrastructure symposium to enable information exchange, including case studies, implementation strategies, and data analysis techniques.
- Initiated a regional CII audit pilot program, which BAWSCA aims to complete in 2021.[44]
- Implemented a regional program for water loss control to help BAWSCA agencies comply with regulatory requirements and implement cost-effective water loss interventions.
- Engaged with the SFPUC to audit meter testing and calibration practices for SFPUC's meters at BAWSCA agency turnouts.

Finally, BAWSCA's Demand Study developed water demand and conservation projections through 2045 for each BAWSCA agency. These projects are designed to provide valuable insights on long-term water demand patterns and conservation savings potential to support regional efforts, such as implementation of BAWSCA's Long-Term Reliable Water Supply Strategy.

Adoption of the 2018 Bay-Delta Plan Amendment.

In SFPUC modeling of the new flow standard (i.e. 30-50% of the "unimpaired flow"), it is assumed that the required release is 40% of unimpaired flow.

If the BDP Amendment is implemented, the SFPUC will be able to meet the projected water demands of the Wholesale Customers in normal years but would experience supply shortages in single dry years or multiple dry years necessitating a cutback to the Wholesale Customers. Implementation of the BDP Amendment will require rationing in all single dry years and multiple dry years. The SFPUC has initiated an Alternative Water Supply Planning Program to ensure that San Francisco can meet its Retail and Wholesale Customer water needs, address projected dry years shortages, and limit rationing to a maximum 20% system-wide in accordance with adopted SFPUC policies. This program is in early planning stages and is intended to meet future water supply challenges and vulnerabilities such as environmental flow needs and other regulatory changes; earthquakes, disasters, and emergencies; increases in population and employment; and climate change. As the region faces future challenges –

[44] Efforts on the CII audit pilot program stalled in March 2020 due to the COVID 19 pandemic and related shelter-in-place orders.

both known and unknown – the SFPUC is considering this suite of diverse non-traditional supplies and leveraging regional partnerships to meet Retail and Wholesale Customer needs through 2045.

The SWRCB has stated that it intends to implement the BDP Amendment on the Tuolumne River by the year 2022, assuming all required approvals are obtained by that time. But implementation of the BDP Amendment is uncertain for multiple reasons:

- First, since adoption of the BDP Amendment, over a dozen lawsuits have been filed in both state and federal courts, challenging the SWRCB's adoption of the BDP Amendment, including a legal challenge filed by the federal government, at the request of the U.S. Department of Interior, Bureau of Reclamation. This litigation is in the early stages and there have been no dispositive court rulings as of this date.
- Second, the BDP Amendment is not self-implementing and does not automatically allocate responsibility for meeting its new flow requirements to the SFPUC or any other water rights holders. Rather, the BDP Amendment merely provides a regulatory framework for flow allocation, which must be accomplished by other regulatory and/or adjudicatory proceedings, such as a comprehensive water rights adjudication or, in the case of the Tuolumne River, may be implemented through the water quality certification process set forth in section 401 of the Clean Water Act as part of the Federal Energy Regulatory Commission's licensing proceedings for the Don Pedro and La Grange hydroelectric projects. It is currently unclear when the license amendment process is expected to be completed. This process and the other regulatory and/or adjudicatory proceedings would likely face legal challenges and have lengthy timelines, and quite possibly could result in a different assignment of flow responsibility (and therefore a different water supply impact on the SFPUC).
- Third, in recognition of the obstacles to implementation of the BDP Amendment, the SWRCB Resolution No. 2018-0059 adopting the BDP Amendment directed staff to help complete a "Delta watershed-wide agreement, including potential flow measures for the Tuolumne River" by March 1, 2019, and to incorporate such agreements as an "alternative" for a future amendment to the BDP to be presented to the SWRCB "as early as possible after December 1, 2019." In accordance with the SWRCB's instruction, on March 1, 2019, SFPUC, in partnership with other key stakeholders, submitted a proposed project description for the Tuolumne River that could be the basis for a voluntary substitute agreement with the SWRCB ("March 1st Proposed Voluntary Agreement"). On March 26, 2019, the Commission adopted Resolution No. 19-0057 to support the SFPUC's participation in the Voluntary Agreement negotiation process. To date, those negotiations are ongoing under the California Natural Resources Agency and the leadership of the Newsom administration.[45]

[45] California Natural Resources Agency, "Voluntary Agreements to Improve Habitat and Flow in the Delta and its Watersheds," available at https://files.resources.ca.gov/voluntary-agreements/.

Water Supply – All Year Types

The SFPUC historically has met demand in its service area in all year types from its watersheds, which consist of:

- Tuolumne River watershed
- Alameda Creek watershed
- San Mateo County watersheds

In general, 85% of the supply comes from the Tuolumne River through Hetch Hetchy Reservoir and the remaining 15% comes from the local watersheds through the San Antonio, Calaveras, Crystal Springs, Pilarcitos and San Andreas Reservoirs. The adopted WSIP retains this mix of water supply for all year types.

WSIP Dry Year Water Supply Projects

The WSIP authorized the SFPUC to undertake a number of water supply projects to meet dry-year demands with no greater than 20% system-wide rationing in any one year. Those projects include the following:

- **Calaveras Dam Replacement Project.** Calaveras Dam is located near a seismically active fault zone and was determined to be seismically vulnerable. To address this vulnerability, the SFPUC constructed a new dam of equal height downstream of the existing dam. Construction on the project occurred between 2011 and July 2019. The SFPUC began impounding water behind the new dam in accordance with California Division of Safety of Dams (DSOD) guidance in the winter of 2018/2019.
- **Alameda Creek Recapture Project.** As a part of the regulatory requirements for future operations of Calaveras Reservoir, the SFPUC must implement bypass and instream flow schedules for Alameda Creek. The Alameda Creek Recapture Project will recapture a portion of the water system yield lost due to the instream flow releases at Calaveras Reservoir or bypassed around the Alameda Creek Diversion Dam and return this yield to the RWS through facilities in the Sunol Valley. Water that naturally infiltrates from Alameda Creek will be recaptured into an existing quarry pond known as SMP (Surface Mining Permit)-24 Pond F2. The project will be designed to allow the recaptured water to be pumped to the Sunol Valley Water Treatment Plant or to San Antonio Reservoir. Construction of this project will occur from spring 2021 to fall 2022.
- **Lower Crystal Springs Dam Improvements.** The Lower Crystal Springs Dam (LCSD) Improvements were substantially completed in November 2011. The joint San Mateo County/SFPUC Bridge Replacement Project to replace the bridge across the dam was completed in January 2019. A WSIP follow up project to modify the LCSD Stilling Basin for fish habitat and upgrade the fish water release and other valves started in April 2019. While the main improvements to the dam have been completed, environmental permitting issues for reservoir operation remain significant. While the reservoir elevation was lowered due to DSOD restrictions, the habitat for the Fountain Thistle, an

endangered plant, followed the lowered reservoir elevation. Raising the reservoir elevation now requires that new plant populations be restored incrementally before the reservoir elevation is raised. The result is that it may be several years before pre-project water storage volumes can be restored.

- **Regional Groundwater Storage and Recovery Project.** The Groundwater Storage and Recovery (GSR) Project is a strategic partnership between SFPUC and three San Mateo County agencies – the California Water Service Company (serving South San Francisco and Colma), the City of Daly City, and the City of San Bruno – to conjunctively operate the South Westside Groundwater Basin. The project sustainably manages groundwater and surface water resources in a way that provides supplies during times of drought. During years of normal or heavy rainfall, the project would provide additional surface water to the partner agencies in San Mateo County in lieu of groundwater pumping. Over time, reduced pumping creates water storage through natural recharge of up to 20 billion gallons of new water supply available during dry years.

  The project's Final Environmental Impact Report (EIR) was certified in August 2014, and the project also received Commission approval that month. Phase 1 of this project consists of construction of thirteen well sites and is over 99% complete. Phase 2 of this project consists of completing construction of the well station at the South San Francisco Main site and some carryover work that has not been completed from Phase 1. Phase 2 design work began in December 2019.

- **2 MGD Dry-year Water Transfer.** In 2012, the dry-year transfer was proposed between the Modesto Irrigation District and the SFPUC. Negotiations were terminated because an agreement could not be reached. Subsequently, the SFPUC had discussions with the Oakdale Irrigation District for a one-year transfer agreement with the SFPUC for 2 MGD (2,240 AFY). No progress towards agreement on a transfer was made in 2019, but the irrigation districts recognize SFPUC's continued interest and SFPUC will continue to pursue transfers.

In order to achieve its target of meeting at least 80% of its customer demand during droughts with a system demand of 265 MGD (296,838 AFY), the SFPUC must successfully implement the dry-year water supply projects included in the WSIP.

Furthermore, the permitting obligations for the Calaveras Dam Replacement Project and the LCSD Improvements include a combined commitment of 12.8 MGD (14,338 AFY) for instream flows on average. When this is reduced for an assumed Alameda Creek Recapture Project recovery of 9.3 MGD (10,417 AFY), the net loss of water supply is 3.5 MGD (3,921 AFY).

SFPUC's Efforts to Develop Alternative Water Supplies

With the adoption of the BDP Phase 1 by the SWRCB in December of 2018, coupled with the uncertainties associated with litigation and the development of Voluntary Agreements that, if successful, would provide an alternative to the 40% unimpaired flow requirement that is currently required by the BDP, BAWSCA redoubled its efforts to ensure that the SFPUC took necessary action to develop alternative water supplies such that they would be in place to fill any potential gap in supply by implementation of the BDP and that the SFPUC would be able to meet its legal and contractual obligations to its Wholesale Customers.

In 2019, BAWSCA held numerous meetings with the SFPUC encouraging them to develop a division within their organization whose chief mission was to spearhead alternative water supply development. On June 25, 2019, BAWSCA provided a written and oral statement to the Commissioners urging the SFPUC to focus on developing new sources of supply in a manner similar to how it addressed the implementation of the WSIP. BAWSCA urged that a new water supply program was called for, with clear objectives, persistent focus, a dedicated team, adequate funding, and a plan for successful execution. The SFPUC Commission supported BAWSCA's recommendation and directed staff to undertake such an approach.

In early 2020, the SFPUC began implementation of the Alternative Water Supply Planning Program (AWSP), a program designed to investigate and plan for new water supplies to address future long-term water supply reliability challenges and vulnerabilities on the RWS. Included in the AWSP is a suite of diverse, non-traditional supply projects that, to a great degree, leverage regional partnerships and are designed to meet the water supply needs of the SFPUC Retail and Wholesale Customers through 2045.

The SFPUC is increasing and accelerating its efforts to acquire additional water supplies and explore other projects that would increase overall water supply resilience through the AWSP Program. The drivers for the program include: (1) the adoption of the BDP Amendment and the resulting potential limitations to RWS supply during dry years, (2) the net supply shortfall following the implementation of WSIP, (3) San Francisco's perpetual obligation to supply 184 MGD (206,107 AFY) to the Wholesale Customers, (4) adopted LOS Goals and Objectives to limit rationing to no more than 20% system-wide during droughts, and (5) the potential need to identify water supplies that would be required to offer permanent status to interruptible customers. Developing additional supplies through this program would reduce water supply shortfalls and reduce rationing associated with such shortfalls. The planning priorities guiding the framework of the AWSP Program are as follows:

1. Offset instream flow needs and meet regulatory requirements;
2. Meet existing obligations to existing permanent customers;
3. Make interruptible customers permanent;
4. Meet increased demands of existing and interruptible customers.

In conjunction with these planning priorities, the SFPUC considers how the program fits within the LOS Goals and Objectives related to water supply and sustainability when considering new water supply opportunities. The key LOS Goals and Objectives relevant to this effort can be summarized as:

- Meet dry-year delivery needs while limiting rationing to a maximum of 20% system-wide reduction in water service during extended droughts;
- Diversify water supply options during non-drought and drought periods;
- Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers;
- Meet, at a minimum, all current and anticipated legal requirements for protection of fish and wildlife habitat;
- Maintain operational flexibility (although this LOS Goals and Objectives were not intended explicitly for the addition of new supplies, it is applicate here).

Together, the planning priorities and LOS Goals and Objectives provide a lens through which the SFPUC considers water supply options and opportunities to meet all foreseeable water supply needs.

In addition to the Daly City Recycled Water Expansion project[46], which was a potential project identified in the 2015 UWMP and had committed funding at that time, the SFPUC has taken action to fund the study of potential additional water supply projects. Capital projects under consideration to develop additional water supplies include surface water storage expansion, recycled water expansion, water transfers, desalination, and potable reuse. A more detailed list and descriptions of these efforts are provided below.

The capital projects that are under consideration would be costly and are still in the early feasibility or conceptual planning stages. Because these water supply projects would take 10 to 30 years to implement, and because required environmental permitting negotiations may reduce the amount of water that can be developed, the yield from these projects are not currently incorporated into SFPUC's supply projections. State and federal grants and other financing opportunities would be pursued for eligible projects, to the extent feasible, to offset costs borne by ratepayers.

- **Daly City Recycled Water Expansion (Regional, Normal- and Dry-Year Supply).** This project can produce up to 3 MGD (3,360 AFY) of tertiary recycled water during the irrigation season (~7 months). On an average annual basis, this is equivalent to 1.25 MGD (1,400 AFY). The project is envisioned to provide recycled water to 13 cemeteries and other smaller irrigation customers, offsetting existing groundwater pumping from the South Westside Groundwater Basin; this will free up groundwater, enhancing the reliability of the Basin. The project is a regional partnership between the SFPUC and Daly City. The irrigation customers are located largely within Cal Water's service area.

[46] While this potential project was identified in the 2015 UWMP, it has since been approved by Daly City following environmental review and has a higher likelihood of being implemented.

RWS customers will benefit from the increased reliability of the South Westside Basin for additional drinking water supply during droughts. In this way, this project supports the GSR Project, which is under construction.

- **ACWD-USD Purified Water Partnership (Regional, Normal- and Dry-Year Supply).** This project could provide a new purified water supply utilizing Union Sanitary District's (USD) treated wastewater. Purified water produced by advanced water treatment at USD could be transmitted to the Quarry Lakes Groundwater Recharge Area to supplement recharge into the Niles Cone Groundwater Basin or put to other uses in Alameda County Water District's (ACWD) service area. With the additional water supply to ACWD, an in-lieu exchange with the SFPUC would result in more water left in the RWS. Additional water supply could also be directly transmitted to the SFPUC through a new intertie between ACWD and the SFPUC.

- **Crystal Springs Purified Water (Regional, Normal- and Dry-Year Supply).** The Crystal Springs Purified Water (PREP) Project is a purified water project that could provide 6-12 MGD (6,721-13,442 AFY) of water supply through reservoir water augmentation at Crystal Springs Reservoir, which is a facility of the RWS. Treated wastewater from Silicon Valley Clean Water (SVCW) and/or the City of San Mateo would go through an advanced water treatment plant to produce purified water that meets state and federal drinking water quality standards. The purified water would then be transmitted 10-20 miles (depending on the alignment) to Crystal Springs Reservoir, blended with regional surface water supplies and treated again at Harry Tracy Water Treatment Plant. Project partners include the SFPUC, BAWSCA, SVCW, Cal Water, Redwood City, Foster City, and the City of San Mateo. Partner agencies are contributing financial and staff resources towards the work effort.

- **Los Vaqueros Reservoir Expansion (Regional, Dry Year Supply).** The Los Vaqueros Reservoir Expansion (LVE) Project is a storage project that will enlarge the existing reservoir located in northeastern Contra Costa County from 160,000 AF to 275,000 AF. While the existing reservoir is owned and operated by the Contra Costa Water District (CCWD), the expansion will have regional benefits and will be managed by a Joint Powers Authority (JPA) that will be set up prior to construction. Meanwhile, CCWD is leading the planning, design, and environmental review efforts. CCWD's Board certified the EIS/EIR and approved the LVE Project on May 13, 2020. The additional storage capacity from the LVE Project would provide a dry year water supply benefit to the SFPUC. BAWSCA is working in concert with the SFPUC to support their work effort on the LVE project.

    - Conveyance Alternatives: The SFPUC is considering two main pathways to move water from storage in a prospective LVE Project to the SFPUC's service area, either directly to RWS facilities or indirectly via an exchange with partner agencies. The SFPUC is evaluating potential alignments for conveyance.

- Bay Area Regional Reliability Shared Water Access Program (BARR SWAP): As part of the BARR Partnership, a consortium of eight Bay Area water utilities (including ACWD, BAWSCA, CCWD, East Bay Municipal Utilities District (EBMUD), Marin Municipal Water District (MMWD), SFPUC, Valley Water, and Zone 7 Water Agency) are exploring opportunities to move water across the region as efficiently as possible, particularly during times of drought and emergencies. The BARR agencies are proposing two separate pilot projects in 2020-2021 through the Shared Water Access Program (SWAP) to test conveyance pathways and identify potential hurdles to better prepare for sharing water during a future drought or emergency. A strategy report identifying opportunities and considerations will accompany these pilot transfers and will be completed in 2021.

- **Bay Area Brackish Water Desalination (Regional, Normal- and Dry-Year Supply).** The Bay Area Brackish Water Desalination (Regional Desalination) Project is a partnership between CCWD, the SFPUC, Valley Water, and Zone 7 Water Agency. EBMUD and ACWD may also participate in the project. The project could provide a new drinking water supply to the region by treating brackish water from CCWD's existing Mallard Slough intake in Contra Costa County. While this project has independent utility as a water supply project, for the current planning effort the SFPUC is considering it as a source of supply for storage in LVE. While the allocations remain to be determined among partners, the SFPUC is considering a water supply benefit of between 5 (5,601 AFY) and 15 MGD (16,802 AFY) during drought conditions when combined with storage at LVE.

- **Calaveras Reservoir Expansion (Regional, Dry Year Supply).** Calaveras Reservoir would be expanded to create 289,000 AF additional capacity to store excess Regional Water System supplies or other source water in wet and normal years. In addition to reservoir enlargement, the project would involve infrastructure to pump water to the reservoir, such as pump stations and transmission facilities.

- **Groundwater Banking.** Groundwater banking in the Modesto Irrigation District and Turlock Irrigation District service areas could be used to provide some additional water supply to meet instream releases in dry years reducing water supply impacts to the SFPUC service area. For example, additional surface water could be provided to irrigators in wet years, which would offset the use of groundwater, thereby allowing the groundwater to remain in the basin rather than be consumptively used. The groundwater that remains in the basin can then be used in a subsequent dry year for irrigation, freeing up surface water that would have otherwise been delivered to irrigators to meet instream flow requirements.

  A feasibility study of this option is included in the proposed Tuolumne River Voluntary Agreement. Progress on this potential water supply option will depend on the negotiations of the Voluntary Agreement.

- **Inter-Basin Collaborations.** Inter-Basin Collaborations could provide net water supply benefits in dry years by sharing responsibility for in-stream flows in the San Joaquin River and Delta more broadly among several tributary reservoir systems. One mechanism by which this could be accomplished would be to establish a partnership between interests on the Tuolumne River and those on the Stanislaus River, which would allow responsibility for streamflow to be assigned variably based on the annual hydrology.

  As is the case with Groundwater Banking, feasibility of this option is included in the proposed Tuolumne River Voluntary Agreement.

If all the projects identified through the current planning process can be implemented, there would still be a supply shortfall to meet projected needs. Furthermore, each of the supply options being considered has its own inherent challenges and uncertainties that may affect the SFPUC's ability to implement it.

Given the limited availability of water supply alternatives - unless the supply risks are significantly reduced or our needs change significantly - the SFPUC will continue to plan, develop, and implement all project opportunities that can help bridge the anticipated water supply gaps during droughts. In 2019, the SFPUC completed a survey among water and wastewater agencies within the service area to identify additional opportunities for purified water. Such opportunities remain limited, but the SFPUC continues to pursue all possibilities.

As of the most recent AWSP Quarterly Update, SFPUC has budgeted $288 million over the next ten years to fund water supply projects. BAWSCA is heavily engaged with the SFPUC on its AWSP efforts.

7.3.3 Climate Change

The issue of climate change has become an important factor in water resources planning in the State and is an important consideration in urban water management planning. The evidence shows that increasing concentrations of greenhouse gasses have caused and will continue to cause a rise in temperatures around the world, which will result in a wide range of changes in climate patterns. Moreover, observational data show that a warming trend occurred during the latter part of the 20th century and virtually all projections indicate this will continue through the 21st century. These changes will have a direct effect on water resources in California, and numerous studies have been conducted to determine impacts might be. Based on these studies, climate change impacts to water resources, including impacts on the watersheds in the Bay Area, could include:

- Reductions in the average annual snowpack due to a rise in the snowline and a shallower snowpack in the low and medium elevation zones, such as in the Tuolumne River basin, and a shift in snowmelt runoff to earlier in the year;
- Changes in the timing, annual average, intensity and variability of precipitation, and an increased amount of precipitation falling as rain rather than snow;
- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality and quantity;

- Sea level rise and an increase in saltwater intrusion;
- Increased water temperatures with accompanying potential adverse effects on some fisheries and water quality;
- Increases in evaporation and concomitant increased irrigation need; and
- Changes in urban and agricultural water demand.

Both the SFPUC and BAWSCA participated in the 2020 update of the Bay Area Integrated Regional Water Management Plan (BAIRWMP), which includes an assessment of the potential climate change vulnerabilities of the region's water resources and identifies climate change adaptation strategies. In addition, the SFPUC continues to study the effect of climate change on the RWS. These works are summarized below.

Bay Area Integrated Regional Water Management Plan

Climate change adaptation continues to be an overarching theme for the 2019 BAIRWMP update. As stated in the BAIRWMP, identification of watershed characteristics that could potentially be vulnerable to future climate change is the first step in assessing vulnerabilities of water resources in the Bay Area Region (Region). Vulnerability is defined as the degree to which a system is exposed to, susceptible to, and able to cope with or adjust to, the adverse effects of climate change. A vulnerability assessment was conducted in accordance with the DWR's Climate Change Handbook for Regional Water Planning and using the most current science available for the Region. The vulnerability assessment, summarized in **Table 7-8** below, provides the main water planning categories applicable to the Region and a general overview of the qualitative assessment of each category with respect to anticipated climate change impacts.

Table 7-8: Summary of BAIRWMP Climate Change Vulnerability Assessment	
Vulnerability Areas	General Overview of Vulnerabilities[47]
Water Demand	**Urban and Agricultural Water Demand** – Changes to hydrology in the Region as a result of climate change could lead to changes in total water demand and use patterns. Increased irrigation (outdoor landscape or agricultural) is anticipated to occur with temperature rise, increased evaporative losses due to warmer temperature, and a longer growing season. Water treatment and distribution systems are most vulnerable to increases in maximum day demand.
Water Supply	**Imported Water** – Imported water derived from the Sierra Nevada sources and Delta diversions provide 66% of the water resources available to the Region. Potential impacts on the availability of these sources resulting from climate change directly affect the amount of imported water supply delivered to the Region. **Regional Surface Water** – Although future projections suggest that small changes in total annual precipitation over the Region will not change much, there may be changes to when precipitation occurs with reductions in the spring and more intense rainfall in the winter. **Regional Groundwater** – Changes in local hydrology could affect natural recharge to the local groundwater aquifers and the quantity of groundwater that could be pumped sustainably over the long-term in some areas. Decreased inflow from more flashy or more intense runoff, increased evaporative losses and warmer and shorter winter seasons can alter natural recharge of groundwater. Salinity intrusion into coastal groundwater aquifers due to sea-level rise could interfere with local groundwater uses. Furthermore, additional reductions in imported water supplies would lead to less imported water available for managed recharge of local groundwater basins and potentially more groundwater pumping in lieu of imported water availability.
Water Quality	**Imported Water** – For sources derived from the Delta, sea-level rise could result in increases in chloride and bromide (a disinfection by-product [DBP] precursor that is also a component of sea water), potentially requiring changes in treatment for drinking water. Increased temperature could result in an increase in algal blooms, taste and odor events, and a general increase in DBP formation. **Regional Surface Water** – Increased temperature could result in lower dissolved oxygen in streams and prolong thermocline stratification in lakes and reservoirs forming anoxic bottom conditions and algal blooms. Decrease in annual precipitation could result in higher concentrations of contaminants in streams during droughts or in association with flushing rain events. Increased wildfire risk and flashier or more intense storms could increase turbidity loads for water treatment. **Regional Groundwater** – Sea-level rise could result in increases in chlorides and bromide for some coastal groundwater basins in the Region. Water quality changes in imported water used for recharge could also impact groundwater quality.
Sea-Level Rise	Sea-level rise is additive to tidal range, storm surges, stream flows, and wind waves, which together will increase the potential for higher total water levels, overtopping, and erosion. Much of the bay shoreline is comprised of low-lying diked baylands which are already vulnerable to flooding. In addition to rising mean sea level, continued subsidence due to tectonic activity will increase the rate of relative sea-level rise. As sea-level rise increases, both the frequency and consequences of coastal storm events, and the cost of damage to the built and natural environment, will increase. Existing coastal armoring (including levees, breakwaters, and other structures) is likely to be insufficient to protect against projected sea-level rise. Crest elevations of structures will have to be raised or structures relocated to reduce hazards from higher total water levels and larger waves.

Table 7-8: Summary of BAIRWMP Climate Change Vulnerability Assessment	
Vulnerability Areas	General Overview of Vulnerabilities[47]
Flooding	Climate change projections are not sensitive enough to assess localized flooding, but the general expectation is that more intense storms would occur thereby leading to more frequent, longer, and deeper flooding. Changes to precipitation regimes may increase flooding. Elevated Bay elevations due to sea-level rise will increase backwater effects exacerbating the effect of fluvial floods and storm drain backwater flooding.
Ecosystem and Habitat	Changes in the seasonal patterns of temperature, precipitation, and fire due to climate change can dramatically alter ecosystems that provide habitats for California's native species. These impacts can result in species loss, increased invasive species ranges, loss of ecosystem functions, and changes in vegetation growing ranges. Reduced rain and changes in the seasonal distribution of rainfall may alter timing of low flows in streams and rivers, which in turn would have consequences for aquatic ecosystems. Changes in rainfall patterns and air temperature may affect water temperatures, potentially affecting coldwater aquatic species. Bay Area ecosystems and habitat provide important ecosystem services, such as: carbon storage, enhanced water supply and quality, flood protection, food and fiber production. Climate change is expected to substantially change several of these services. The Region provides substantial aquatic and habitat-related recreational opportunities, including fishing, wildlife viewing, and wine industry tourism (a significant asset to the Region) that may be at risk due to climate change effects.
Hydropower	Currently, several agencies in the Region produce or rely on hydropower produced outside of the Region for a portion of their power needs. As the hydropower is produced in the Sierra, there may be changes in the future in the timing and amount of energy produced due to changes in the timing and amount of runoff as a result of climate change. Some hydropower is also produced within the region and could also be affected by changes in the timing and amount of runoff.

[47] Source: 2019 Bay Area Integrated Regional Water Management Plan (BAIRWMP), Table 16-3.

SFPUC Climate Change Studies

The SFPUC views assessment of the effects of climate change as an ongoing project requiring regular updating to reflect improvements in climate science, atmospheric/ocean modeling, and human response to the threat of greenhouse gas emissions. Climate change research by the SFPUC began in 2009 and continues to be refined. In its 2012 report "Sensitivity of Upper Tuolumne River Flow to Climate Change Scenarios," the SFPUC assessed the sensitivity of runoff into Hetch Hetchy Reservoir to a range of changes in temperature and precipitation due to climate change. Key conclusions from the report include the following:

- With differing increases in temperature alone, the median annual runoff at Hetch Hetchy would decrease by 0.7-2.1% from present-day conditions by 2040 and by 2.6-10.2% from present-day by 2100. Adding differing decreases in precipitation on top of temperature increases, the median annual runoff at Hetch Hetchy would decrease by 7.6-8.6% from present-day conditions by 2040 and by 24.7-29.4% from present-day conditions by 2100.
- In critically dry years, these reductions in annual runoff at Hetch Hetchy would be significantly greater, with runoff decreasing up to 46.5% from present day conditions by 2100 utilizing the same climate change scenarios.
- In addition to the total change in runoff, there will be a shift in the annual distribution of runoff. Winter and early spring runoff would increase, and late spring and summer runoff would decrease.
- Under all scenarios, snow accumulation would be reduced, and snow would melt earlier in the spring, with significant reductions in maximum peak snow water equivalent under most scenarios.

Currently, the SFPUC is conducting a comprehensive assessment of the potential effects of climate change on water supply using a wide range of plausible increases in temperature and changes in precipitation to address the wide uncertainty in climate projections over the planning horizon 2020 to 2070. There are many uncertain factors such as climate change, changing regulations, water quality, growth and economic cycles that may create vulnerabilities for the RWS's ability to meet levels of service. The uncertainties associated with the degree to which these factors will occur and how much risk they present to the water system is difficult to predict, but nonetheless they need to be considered in SFPUC planning. To address this planning challenge, the project uses a vulnerability-based planning approach to explore a range of future conditions to identify vulnerabilities, assess the risks associated with these vulnerabilities that could lead to developing an adaptation plan that is flexible and robust to a wide range of future outcomes.

7.3.4 Reliability and Vulnerability of Recycled Water

Recycled water is not vulnerable to seasonal or climatic shortage. The volume of influent to the San Jose-Santa Clara RWF far exceeds the recycled water system's delivery capability and there is not currently a requirement for a minimum discharge volume from the RWF. Even in the event of multiple dry years, the projected recycled water deliveries would still be a fraction of the influent volume. The RWF currently produces 100 MGD (112,014 AFY) of water that meets recycled water standards, however system-wide recycled water sales are approximately 14 MGD (15,682 AFY). Therefore, recycled water is assumed to be a drought-proof water supply.

7.3.5 Future Imported Water Deliveries

The DWR has estimated potential SWP deliveries under future conditions in 2040 based on Delta pumping restrictions and climate change scenarios.[48] Future water deliveries are estimated using probabilities; the probability that deliveries will exceed a certain quantity of water in a given year. Both the state and federal systems' watersheds are expected to experience similar hydrological changes due to climate change, and both face similar Delta pumping restrictions, therefore it is reasonable to assume similar future reductions to CVP deliveries.

7.4 Drought Risk Assessment

7.4.1 Drought Risk Assessment Description

The new provision of the Water Code requires water suppliers to prepare a Drought Risk Assessment (DRA). The purpose of the DRA is to determine the reliability of a supplier's water system during stressed hydrologic conditions. The DRA is intended to be a stand-alone section of the UWMP and thus, information regarding supply and demand are duplicated herein. The DRA addresses the reliability of the City's water sources over a five consecutive-year drought occurring in 2021-2025 under different water shortage conditions and provides an opportunity for the City to determine the feasibility of the shortage response actions from the adopted Water Shortage Contingency Plan (WSCP), if necessary. The DRA evaluation was developed with a base year of 2020 using data and modeling provided by SFPUC and Valley Water for a five-year consecutive drought.

The DRA will be updated if needed, based on the results of the annual water supply and demand assessment which will utilize current population data, supply and demand data and unforeseen regulatory changes to determine if a water shortage is anticipated and identify the proper shortage response action based on the existing WSCP.

[48] CA Dept. of Water Resources, Bay-Delta Office Final State Water Project Delivery Capability Report, 2019. Available at https://water.ca.gov/Library/Modeling-and-Analysis/Central-Valley-models-and-tools/CalSim-2/DCR2019

7.4.2 Data, Methods and Basis for Water Shortage Conditions

The total supplies projected for the DRA were developed using actual 2019 metered supplies. For demand projections 2021 - 2025, it was assumed that a linear relationship existed between 2019 (actual water supplies) and the 2025 demand projection. For the purposes of the DRA, the demand projections used include passive conservation savings and system water losses. The gross water use projection for 2025 was based on the Bay Area Water Supply and Conservation Agency (BAWSCA) Regional Water Demand and Conservation Projections (Demand Study). The Demand Study projections were recently amended by the City for years 2025-2045. The new projections used for the DRA will be evaluated annually and compared to projected values to determine whether any major discrepancy exists. This will help the City Utility anticipate any water shortage in the following year and adjust the DRA if needed.

The percentage of water supply volume available during a five-year consecutive drought based on an average year were based on the information provided by the SFPUC and Valley Water, which is addressed in **Section 7.4.3** and found in **Appendix X** and **L**. The percent reduction of average year supplies and projected deliveries from SFPUC during a five-year consecutive drought were provided by SPFUC and shown below in **Table 7-9**. Reduction in supplies based on implementation of the BDP are also included for supplies from Valley Water and SFPUC; however, no cutbacks are expected by Valley Water. In SFPUC modeling of the new flow standard (i.e., 30-50% of the “unimpaired flow”), it is assumed that the required release is 40% of unimpaired flow. For SFPUC and Valley Water supplies it was assumed the BDP was in effect beginning in 2023.

Table 7-9: Anticipated Percent Supply Reductions from Wholesale Suppliers					
Wholesale Supplier	Year 1 (2021)	Year 2 (2022)	Year 3 (2023)	Year 4 (2024)	Year 5 (2025)
Valley Water	0%	0%	0%	0%	0%
SFPUC	0%	0%	47%	47%	47%
NOTES:					

Although groundwater pumping is expected to make up the remaining water supply volume need, for the purposes of the DRA it is assumed that groundwater will only be pumped up to the volume needed or the City’s groundwater capacity, whichever is less.

7.4.3 Water Source Reliability

Reliability of Treated Surface Water from Valley Water

Current Valley Water demand projections show that there are no anticipated shortages based on current modeling and retailer projected demands. Current modeling incorporates projects identified in the WSMP to improve water supply reliability and to meet increasing demands through 2045. Valley Water adopted the WSMP to determine water supply adequacy to meet future demand beyond 2020 considering population projections, aging infrastructure, climate change, regulatory and policy changes, and current Master Plan projects. The WSMP presented a strategy to improve reliability of existing supplies and the addition of new infrastructure and operations for optimization of the current system and the development of potable reuse for groundwater recharge. The WSMP was updated in 2019.

The City receives treated surface water from Valley Water's Rinconada Water Treatment Plant (WTP) via the Santa Clara "distributary" (pipeline) at the Serra Tank site located at the southwest corner of the City. The City currently takes about 2,000 to 3,300 gallons per minute (GPM) from this supply, although the current Valley Water connection allows for flows up to 4,000 GPM.

Reliability of Treated Surface Water from SFPUC

SFPUC has a perpetual commitment (Supply Assurance) to deliver 184 MGD (206,107 AFY) to the 24 permanent Wholesale Customers collectively. San Jose and Santa Clara are not included in the Supply Assurance commitment and each has temporary and interruptible water supply contracts with San Francisco. The Supply Assurance is allocated among the 24 permanent Wholesale Customers through Individual Supply Guarantees (ISGs), which represent each Wholesale Customer's allocation of the 184 MGD (206,107 AFY) Supply Assurance.

The City's current contract allocation with SFPUC is 4.5 MGD (5,041 AF).

The City has two connections to the Hetch-Hetchy system to receive water from SFPUC. The combined capacity of these two turnouts is 7,500 gpm or 10.8 MGD (12,098 AFY), although current contractual arrangements limit the City's use to a maximum rate of 4.5 MGD (5,041 AFY). The City's current understanding with SFPUC is that this source can supply any portion within the City. The City currently takes about 1,800 to 3,300 gpm from this supply. This supply is pressurized and no additional pumping is needed.

Tier One Drought Allocations

In July 2009, San Francisco and its Wholesale Customers in Alameda County, Santa Clara County, and San Mateo County (Wholesale Customers) adopted the Water Supply Agreement (WSA), which includes a Water Shortage Allocation Plan (WSAP) that describes the method for allocating water from the Regional Water System (RWS) between Retail and Wholesale Customers during system-wide shortages of 20% or less. The WSAP, also known as the Tier One Plan, was amended in the 2018 Amended and Restated WSA.

The SFPUC allocates water under the Tier One Plan when it determines that the projected available water supply is up to 20% less than projected system-wide water purchases. The following table (**Table 7-10**) shows the SFPUC (i.e., Retail Customers) share and the Wholesale Customers' share of the annual water supply available during shortages depending on the level of system-wide reduction in water use that is required. The Wholesale Customers' share will be apportioned among the individual Wholesale Customers based on a separate methodology adopted by the Wholesale Customers, known as the Tier Two Plan, discussed further below.

Table 7-10: Annual Water Supply Available During Shortages		
Level of System-Wide Reduction in Water Use Required	Share of Available Water	
	SFPUC Share	Wholesale Customers Share
5% or less	35.5%	64.5%
6% through 10%	36.0%	64.0%
11% through 15%	37.0%	63.0%
16% through 20%	37.5%	62.5%

The Tier One Plan allows for voluntary transfers of shortage allocations between the SFPUC and any Wholesale Customer as well as between Wholesale Customers themselves. In addition, water "banked" by a Wholesale Customer, through reductions in usage greater than required, may also be transferred.

As amended in 2018, the Tier One Plan requires Retail Customers to conserve a minimum of 5% during droughts. If Retail Customer demands are lower than the Retail Customer allocation (resulting in a "positive allocation" to Retail[49]) then the excess percentage would be re-allocated to the Wholesale Customers' share. The additional water conserved by Retail Customers up to the minimum 5% level is deemed to remain in storage for allocation in future successive dry years.

The Tier One Plan will expire at the end of the term of the WSA in 2034, unless mutually extended by San Francisco and the Wholesale Customers.

The Tier One Plan applies only when the SFPUC determines that a system-wide water shortage exists and issues a declaration of a water shortage emergency under California Water Code Section 350. Separate from a declaration of a water shortage emergency, the SFPUC may opt to request voluntary cutbacks from its Retail and Wholesale Customers to achieve necessary water use reductions during drought periods.

Tier Two Drought Allocations

The Wholesale Customers have negotiated and adopted the Tier Two Plan, which allocates the collective Wholesale Customer share from the Tier One Plan among each of the 26 Wholesale Customers. These Tier Two allocations are based on a formula that takes into account multiple factors for each Wholesale Customer including:

- ISG;
- Seasonal use of all available water supplies; and
- Residential per capita use.

The water made available to the Wholesale Customers collectively will be allocated among them in proportion to each Wholesale Customer's Allocation Basis, expressed in MGD, which in turn is the

[49] Water Supply Agreement, Water Shortage Allocation Plan (Attachment H), Section 2.1.

weighted average of two components. The first component is the Wholesale Customer's ISG, as stated in the WSA, and is fixed. The second component, the Base/Seasonal Component, is variable and is calculated using the monthly water use for three consecutive years prior to the onset of the drought for each of the Wholesale Customers for all available water supplies. The second component is accorded twice the weight of the first, fixed component in calculating the Allocation Basis. Minor adjustments to the Allocation Basis are then made to ensure a minimum cutback level, a maximum cutback level, and a sufficient supply for certain wholesale customers.

The Allocation Basis is used in a fraction, as numerator, over the sum of all Wholesale Customers' Allocation Bases to determine each Wholesale Customer's Allocation Factor. The final shortage allocation for each Wholesale Customer is determined by multiplying the amount of water available to the Wholesale Customers' collectively under the Tier One Plan, by the Wholesale Customer's Allocation Factor.

The Tier Two Plan requires that the Allocation Factors be calculated by BAWSCA each year in preparation for a potential water shortage emergency. As the Wholesale Customers change their water use characteristics (e.g., increases or decreases in SFPUC purchases and use of other water sources, changes in monthly water use patterns, or changes in residential per capita water use), the Allocation Factor for each Wholesale Customer will also change. However, for long-term planning purposes, each Wholesale Customer shall use as its Allocation Factor, the value identified in the Tier Two Plan when adopted.

Per WSA Section 3.11, the Tier One and Tier Two Plans will be used to allocate water from the RWS between Retail and Wholesale Customers during system-wide shortages of 20% or less. For RWS shortages in excess of 20%, San Francisco shall (a) follow the Tier One Shortage Plan allocations up to the 20% reduction, (b) meet and discuss how to implement incremental reductions above 20% with the Wholesale Customers, and (c) make a final determination of allocations above the 20% reduction. After the SFPUC has made the final allocation decision, the Wholesale Customers shall be free to challenge the allocation on any applicable legal or equitable basis. For purposes of the 2020 UWMPs, for RWS shortages in excess of 20%, the allocations among the Wholesale Customers is assumed to be equivalent among them and to equal the drought cutback to Wholesale Customer by the SFPUC.

The Tier Two Plan, which initially expired in 2018, has been extended by the BAWSCA Board of Directors every year since for one additional calendar year. In November 2020, the BAWSCA Board voted to extend the Tier Two Plan through the end of 2021.

Under the Water Supply Agreement between the City and County of San Francisco and wholesale customers, Tier 1 and Tier 2 requires San Francisco to provide no more than a 20% reduction in supply.

2028 SFPUC Decisions (formerly 2018 SFPUC Decisions)

In the 2009 WSA, the SFPUC committed to make three decisions before 2018 that affect water supply development:

- Whether or not to make the cities of San Jose and Santa Clara permanent customers,
- Whether or not to supply the additional unmet supply needs of the Wholesale Customers beyond 2018, and
- Whether or not to increase the wholesale customer Supply Assurance above 184 MGD (206,107 AFY).

Events since 2009 made it difficult for the SFPUC to conduct the necessary water supply planning and CEQA analysis required to make these three decisions before 2018. Therefore, in the 2018 Amended and Restated WSA, the decisions were deferred for ten years to 2028.

Additionally, there have been recent changes to instream flow requirements and customer demand projections that have affected water supply planning beyond 2018. As a result, the SFPUC has established an Alternative Water Supply Planning program to evaluate several regional and local water supply options. Through this program, the SFPUC will conduct feasibility studies and develop an Alternative Water Supply Plan by July 2023 to support the continued development of water supplies to meet future needs.

7.4.4 Reliability of Groundwater Sources

The Santa Clara subbasin currently provides about two thirds of the City's potable water supply. The City's wells are strategically distributed around the City adding to the reliability of the water system and minimizes the possibility of localized subsidence due to overdrafting. To eliminate the possibility of long-term overdraft conditions, the City monitors groundwater levels and meters the groundwater pumping for all City owned production wells. To further ensure that no overdrafting is occurring the City operates a recycled water system and requires new development along the recycled water distribution system to use recycled water for approved irrigation and industrial uses. The City also encourages and promotes water conservation to minimize groundwater usage.

The allowable withdrawal or safe yield of groundwater by the City is dependent upon multiple factors including withdrawals by other water agencies, quantity of water recharged and the carry over storage from the previous year.

The City has well capacity that is not currently being used. The average utilization factor for the City's wells for 2016-2020 was 20% with several wells being used at less than 10% of their rated capacity. Therefore, additional capacity exists which could be used to replace the loss of either of the City's imported water supplies. Valley Water has not determined a resource limit to the City's use of groundwater, rather they represent their ability to obtain sufficient quantities of water supply for the overall water requirements.

7.4.5 Reliability of Recycled Water

Recycled water is not vulnerable to seasonal or climatic shortage. The volume of influent to the San Jose-Santa Clara RWF far exceeds the recycled water system's delivery capability and there is not currently a requirement for a minimum discharge volume from the RWF. Even in the event of multiple dry years, the projected recycled water deliveries would still be a fraction of the influent volume. The RWF currently produces 100 MGD (112,014 AFY) of water that meets recycled water standards, however system-wide recycled water sales are approximately 14 MGD (15,682 AFY). Therefore, recycled water is assumed to be a drought-proof water supply.

7.4.6 Water Supply and Use Comparison

As stated previously, the City has the capacity to cover a short-term loss of supply from Valley Water and SFPUC if a water shortage occurs. However, prolonged groundwater pumping beyond the allowable withdrawal or safe yield can have detrimental effects on the underlying groundwater basin.

In addition to addressing the potential for shortages (or surplus), the DRA also allows the City to evaluate the mitigation action that would be triggered from the City's adopted WSCP which can be found in **Chapter 8**. As shown in **Table 7-11**, a shortage in supply is not expected in the next five years with current projected demands in gross water use.

Table 7-11: Five-Year Drought Risk Assessment					
	2021	2022	2023	2024	2025
Gross Water Use	18,498	18,693	18,888	19,083	19,473
Total Supplies	31,293	31,529	29,686	29,686	29,686
Surplus/Shortfall w/o WSCP Action	12,795	12,836	10,798	10,603	10,213
Planned WSCP Actions (use reduction and supply augmentation)					
WSCP - supply augmentation benefit	0	0	0	0	0
WSCP - use reduction savings benefit	0	0	0	0	0
Revised Surplus/Shortfall	12,795	12,836	10,798	10,603	10,213
Resulting % Use Reduction from WSCP action	0%	0%	0%	0%	0%
NOTES: Recycled water is considered a drought proof supply and therefore is not included in the projections.					

8. WATER SHORTAGE CONTINGENCY PLAN

A water shortage is defined as a case where the available water supply is insufficient to meet normally expected customer water use. A water shortage contingency plan (WSCP) is a detailed proposal for how a Supplier intends to act in the case of an actual water shortage condition. This plan is essential to a sound drought policy even if a Supplier appears to have low risk of water supply shortage conditions. As required by §10632(a) of the Water Code, this chapter presents the City's WSCP including:

- A summary of the City's water supply reliability analysis presented in **Chapter 7**;
- The City's procedure for conducting and submitting its annual water supply and demand assessment beginning in 2022;
- The legal authority that the City has for implementation and enforcement of its WSCP;
- The water shortage levels of the WSCP and the demand reduction measures, supply augmentation measures, and/or operational changes implemented in each stage as it relates to the six stages required by the Water Code;
- The methods for monitoring and reporting a water shortage condition and water use reductions;
- The methods for ensuring compliance and enforcing demand reduction measures;
- The protocols for communicating a water shortage condition and the measures implemented;
- The financial consequences of implementing the WSCP and methods for mitigating revenue losses; and
- A summary of the WSCP adoption, submittal, and refinement procedures.

Beginning in the 2020 UWMP reporting period, each Supplier is now required to adopt its WSCP as part of its Urban Water Management Plan (UWMP) and as a standalone document that can be refined and updated outside of the five-year UWMP planning cycle. For this reason, some of the information summarized in this chapter of the UWMP is duplicated from previous chapters for clarity such that the chapter can serve as the standalone document.

8.1 Water Supply Reliability Analysis

The analysis of water supply reliability assessment is based on three different analyses: annual, near-term (5 years), and long-term (20 years). The following summarizes the analyses that were included in **Chapters 4, 6, and 7**. It is a summary of:

- The methods for projecting water demands (**Chapter 4**),
- The methods for projecting water supply (**Chapter 6**), and
- The results of the water service reliability assessment (**Chapter 7**).

8.1.1 Demand Projections

The potable water use projections were developed using the Demand Side Management Least Cost Planning Decision Support System model (DSS Model) developed by Maddaus Water Management, Inc. for long-term projections. The DSS Model considered expected service area population and economic growth as well as passive conservation from plumbing codes. The data collected to develop the model included monthly water demand from 1995 through 2018, historical conservation, weather data, unemployment, and several other water use factors. The full description of the DSS Model is included in the Demand Study (**Appendix D**).

Projected City potable water use is summarized by customer classification in **Table 8-1**. Because the City is largely built-out, it is expected that water use will continue to rise in future years primarily due to increasing population.

Table 8-1: Projected Potable Water Use by Customer Type (AFY)

Use Type	Additional Description	Projected Water Use Report to the Extent that Records are Available				
		2025	2030	2035	2040	2045 (opt)
Single Family		4,683	4,893	5,076	5,206	5,336
Multi-Family		4,458	4,659	4,833	4,957	5,080
Commercial		6,184	6,461	6,704	6,875	7,046
Industrial		1,748	1,826	1,895	1,943	1,991
Institutional/Governmental	Institutional	672	702	729	747	766
Institutional/Governmental	Municipal	560	585	607	623	638
Losses	6.0% Losses (5-yr average)	1,168	1,221	1,267	1,299	1,331
TOTAL		19,473	20,348	21,111	21,649	22,189

8.1.2 Supply Projections

The City relies on four water supply sources; surface water from San Francisco Public Utilities Commission (SFPUC), treated surface water from Santa Clara Valley Water District (Valley Water), groundwater, and recycled water. Surface water from the two wholesalers, SFPUC and Valley Water, provides less than half of the City's water supply, averaging about 34% since 2015 while City owned- and operated-wells provide approximately 49% of the total water supply. Since 2015, approximately 17% of the City's total water supply was recycled water. Since a portion of the City's water supply is reliant on SFPUC and Valley Water, the City is directly affected by the water supply conditions faced by each wholesaler.

SFPUC Supply

The City receives surface water from the City and County of San Francisco's Regional Water System (RWS), operated by SFPUC. This supply is predominantly from the Tuolumne River watershed in the Sierra Nevada Mountains, delivered through the Hetch-Hetchy aqueduct, but also includes treated water produced by SFPUC from local watersheds and facilities in Alameda and Santa Clara counties. The Alameda watershed, located in Alameda county, is designed to capture local runoff.

The amount of imported water available to SFPUC's retail and wholesale customers is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River. Due to these constraints, SFPUC is dependent on reservoir storage to ensure ongoing water supply.

The business relationship between the SFPUC and its wholesale customers is largely defined by the "Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County and Santa Clara County" (WSA), effective since July 2009. This 25-year WSA replaced the Settlement Agreement and Master Water Sales Contract that expired in June 2009. The WSA addresses the rate-making methodology used by the SFPUC in setting wholesale water rates for its customers in addition to addressing water supply and water shortages for the RWS.

The WSA provides for a 184 MGD (expressed on an annual average basis) Supply Assurance to the SFPUC's wholesale customers. This Assurance is subject to reduction, to the extent and for the period made necessary by reason of water shortage, due to drought, emergencies, or by malfunctioning or rehabilitation of the RWS. The WSA does not guarantee that San Francisco will meet peak daily or hourly customer demands when their annual usage exceeds the Supply Assurance. The SFPUC's wholesale customers have agreed to the allocation of the 184 MGD Supply Assurance among themselves, with each entity's share of the Supply Assurance set forth on Attachment C to the WSA.

San Jose and Santa Clara are not included in the Supply Assurance commitment and each has temporary and interruptible water supply contracts with San Francisco. The City's current contract allocation with SFPUC is 4.5 MGD (5,041 AF).

Additional information regarding SFPUC supply reliability can be found below in the summary of SFPUC's WSCP. For more detailed information, please refer to SPFUC's current UWMP and/or WSCP.

Valley Water Supply

Valley Water supplies the City with treated surface water through an entitlement of imported water that is Delta-conveyed from the Central Valley Project (CVP) and State Water Project (SWP), as well as surface water from local reservoirs. The City has a 70-year contractual agreement with Valley Water, effective 1981 to 2051.

Valley Water's imported water is conveyed through the Sacramento-San Joaquin Delta and pumped and delivered to the county through three main pipelines: the South Bay Aqueduct, which carries water from the SWP, and the Santa Clara Conduit and Pacheco Conduit, which convey water from the federal CVP. More than 70% of this supply is delivered to treatment plants and almost 30% is used for recharge. Any excess Delta-conveyed supplies is stored in the local Anderson and Calero Reservoirs or the Semitropic Groundwater Bank and San Luis Reservoir in the Central Valley[50].

Valley Water has a contract for 100,000 AFY from the SWP and 152,500 AFY from the CVP. However, the actual amount of water delivered is typically less than these contractual amounts and depends on hydrology, conveyance limitations, and environmental regulations. Nearly all the imported water supply is used for municipal and industrial needs. Valley Water expects average allocations of Delta-conveyed water to decline over time due to climate change and regulatory requirements, averaging around 133,000 AFY in 2040. However, over the years, Valley Water has attempted to sustain overall existing supplies by participating in projects that would offset the predicted decline of Delta-conveyed imported water supplies. In October 2019, Valley Water voted to support the Delta Conveyance Project, which is a proposed plan to improve the infrastructure that conveys water through the Sacramento-San Joaquin Delta. This plan would potentially increase the average available Delta-conveyed imported supply from 133,000 AFY to 170,000 AFY.

Local runoff is captured in local reservoirs for recharge into the groundwater basin or treatment at one of Valley Water's three water treatment plants. The total storage capacity of the ten Valley Water operated reservoirs in Santa Clara County is approximately 170,000 AF without the California Division of Safety of Dams (DSOD) restrictions. Water stored in local reservoirs provides up to 25% of Santa Clara County's water supply. Reservoir operations are coordinated with imported Bay-Delta water received from the SWP and the CVP.

For more detailed information regarding Valley Water's supply reliability, please refer to Valley Water's current UWMP and/or WSCP.

Groundwater

The City owns and operates 21 active wells and one well on stand-by for emergencies. Groundwater makes up a significant percentage of the City's total water supply and is also used to supplement imported SFPUC and Valley Water supply.

Valley Water provides basin-wide groundwater and conservation planning. Local groundwater supplies up to half of the county's water supply during normal years and is crucial to the region's future water supply reliability. Valley Water uses conjunctive use management, a practice by which the groundwater basin is pumped more in drier years and then replenished (or recharged) during wet and average years, to ensure the sustainability of groundwater basins. Groundwater is replenished naturally from rainfall and augmented by Valley Water-operated recharge. Conjunctive use helps to protect the groundwater

[50] 2019 Valley Water 2040 WSMP

basin from overdraft, land subsidence, and saltwater intrusion, and provides critical groundwater storage reserves.

Recycled Water

Recycled water within the City is supplied from the jointly owned San Jose-Santa Clara RWF. This recycled water meets the requirements of the CCR Title 22, Division 4. The City and all users of recycled water must ensure that a number of regulatory requirements specified in CCR Title 22 are met. CCR Title 22 specifies the types of use and the conditions under which the use of recycled water is allowed.

The SBWR Program was initiated to reduce the discharge of treated wastewater flowing from the RWF into the San Francisco Bay. A past NPDES discharge permit placed a discharge limit of 120 MG each day during the summer ("dry-weather flow") to help maintain the salt marsh habitat of the south bay. As a result, the RWF formed SBWR, which purchased the City's recycled water system and now is the regional recycled water wholesaler within the RWF service area. The City maintains the portion of the SBWR system within its boundaries under an agreement with the City of San Jose, pursuant to which San Jose functions as lead administrative agency.

Supply availability projections for the City's four sources of potable and non-potable water provide a basis for assessing water supply reliability. The breakdown of total supply by source was determined using the City's contractual agreements with each wholesaler and historical production trends. Current and projected water supply is listed by source in **Table 8-2A** and **Table 8-2B** Since contractual allocation with SPUC is not permanent and interruptible, **Table 8-2A** presents water supplies under this scenario.

Table 8-2A Retail: Water Supplies - Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply				
		2025	2030	2035	2040	2045 (opt)
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	Valley Water	4,560	4,560	4,560	4,560	4,560
Purchased or Imported Water	SFPUC	5,041	0	0	0	0
Groundwater (not desalinated)	Wells	23,048	23,048	23,048	23,048	23,048
Recycled Water	SBWR	4,570	5,489	6,586	7,908	9,488
Total		37,219	33,097	34,194	35,516	37,096
NOTES: Assumes interruption of SFPUC water supply after 2028.						

Table 8-2B Retail: Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply				
		2025	2030	2035	2040	2045 (opt)
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	Valley Water	4,560	4,560	4,560	4,560	4,560
Purchased or Imported Water	SFPUC	5,041	5,041	5,041	5,041	5,041
Groundwater (not desalinated)	Wells	23,048	23,048	23,048	23,048	23,048
Recycled Water	SBWR	4,570	5,489	6,586	7,908	9,488
Total		37,219	38,138	39,235	40,557	42,137
NOTES: Assumes no interruption of SFPUC water supply after 2028.						

In the event of a decrease in wholesaler supplies, the City would increase the use of groundwater supplies and respond by pursuing demand reduction programs in accordance with the severity of the supply shortage. Any supply deficit would be compensated for by increased groundwater supply, conservation levels, and restrictions in consumption.

8.1.3 Water Supply Reliability Assessment

The water service reliability assessment requires the comparison of supply and demand projections for three scenarios: (1) a normal year, (2) a single dry year, and (3) five consecutive dry years. The percent of total annual supply available for each scenario is based on projected availability of water supplies identified and cutbacks determined by the City's wholesalers (**Appendix K** and **L**). The City has elected to use 2020 water supply data as a base year. Because allowable groundwater pumping is based only on the sustainable yield, groundwater supply availability is not expected to decrease during dry years. Additionally, recycled water is not dependent on climatic effects and is assumed to be unaffected by any drought conditions.

Table 8-3 presents the base years for each of the three conditions described above as well as the corresponding percentages of average water supply available during each year under these conditions.

Table 8-3 Retail: Basis of Water Year Data (Reliability Assessment)

Year Type	Base Year	Available Supplies if Year Type Repeats	
		Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available	% of Average Supply
Average Year	2020	32,649	100%
Single-Dry Year	1977	31,293	96%
Consecutive-Dry Years 1st Year	1988	31,293	96%
Consecutive-Dry Years 2nd Year	1989	31,529	97%
Consecutive-Dry Years 3rd Year	1990	29,686	91%
Consecutive-Dry Years 4th Year	1991	29,686	91%
Consecutive-Dry Years 5th Year	1992	29,686	91%

NOTES: All City water sources combined. Base years represent the year for which Valley Water's analysis is based. Volume available and percent of average supply is calculated based on the combination of available sources.

Using the water supply and demand projections and the portion of supplies available during normal year, single dry year, and five consecutive dry year conditions summarized above, this section presents the comparison between projected supply and projected demand for each condition in five-year increments through 2045. It is noted that the effects of climate change were not explicitly addressed in this water service reliability assessment but are considered in the subsequent DRA.

Table 8-4A/B through **Table 8-6A/B** presents the service supply reliability assessment for each condition.

Table 8-4A Retail: Normal Year Supply and Demand Comparison - (Scenario 1)					
	2025	2030	2035	2040	2045 (Opt)
Supply totals (autofill from Table 6-9A)	37,219	33,097	34,194	35,516	37,096
Demand totals (autofill from Table 4-3)	24,043	25,836	27,697	29,557	31,676
Difference	13,176	7,261	6,497	5,959	5,420
NOTES: Assumes SFPUC supply does *not* exist beyond 2028 and BDP implementation in 2023.					

Table 8-4B Retail: Normal Year Supply and Demand Comparison - (Scenario 2)					
	2025	2030	2035	2040	2045 (Opt)
Supply totals (autofill from Table 6-9B)	37,219	38,137	39,235	40,557	42,136
Demand totals (autofill from Table 4-3)	24,043	25,836	27,697	29,557	31,676
Difference	13,176	12,301	11,538	11,000	10,460
NOTES: Assumes continued allocation from SFPUC beyond 2028 and BDP implementation in 2023.					

Table 8-5A Retail: Single Dry Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045 (Opt)
Supply totals	35,404	33,097	34,194	35,516	37,096
Demand totals	24,043	25,836	27,697	29,557	31,676
Difference	11,361	7,261	6,497	5,959	5,420
NOTES: Assumes SFPUC supply does *not* exist beyond 2028 and reduced allocation from SFPUC due to BDP in 2023.					

Table 8-5B Retail: Single Dry Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045 (Opt)
Supply totals	35,404	36,323	37,420	38,692	39,818
Demand totals	24,043	25,836	27,697	29,557	31,676
Difference	11,361	10,486	9,723	9,135	8,141
NOTES: Assumes continued allocation from SFPUC beyond 2028 and reduced allocation from SFPUC due to BDP in 2023.					

Table 8-6A Retail: Multiple Dry Years Supply and Demand Comparison						
		2025	2030	2035	2040	2045 (Opt)
First year	Supply totals	35,404	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	11,361	7,261	6,497	5,959	5,420
Second year	Supply totals	34,951	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	7,261	6,497	5,959	5,420
Third year	Supply totals	34,951	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	7,261	6,497	5,959	5,420
Fourth year	Supply totals	34,951	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	7,261	6,497	5,959	5,420
Fifth year	Supply totals	34,951	33,097	34,194	35,516	37,096
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	7,261	6,497	5,959	5,420
NOTES: Assumes SFPUC supply does not exist beyond 2028 and reduced allocation from SFPUC due to BDP in 2023.						

Table 8-6B Retail: Multiple Dry Years Supply and Demand Comparison						
		2025	2030	2035	2040	2045 (Opt)
First year	Supply totals	35,404	36,323	37,420	38,692	39,818
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	11,361	10,486	9,723	9,135	8,141
Second year	Supply totals	34,951	35,869	36,916	38,238	39,818
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	10,033	9,219	8,681	8,141
Third year	Supply totals	34,951	35,869	36,916	38,238	39,818
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	10,033	9,219	8,681	8,141
Fourth year	Supply totals	34,951	35,869	36,916	37,936	39,414
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	10,033	9,219	8,379	7,738
Fifth year	Supply totals	34,951	35,869	36,715	37,936	39,414
	Demand totals	24,043	25,836	27,697	29,557	31,676
	Difference	10,908	10,033	9,018	8,379	7,738
NOTES: Assumes continued allocation from SFPUC beyond 2028 and reduced allocation from SFPUC due to BDP in 2023.						

Given the supply and demand comparison presented previously, the results of the supply reliability assessment can be summarized as follows:

- **Normal Year** – The City can anticipate meeting all water demands through 2045 under normal year supply conditions given the stated assumptions.
- **Single Dry Year** – The City can anticipate meeting all water demands through 2045 under single dry year supply conditions given the stated assumptions.
- **Five Consecutive Dry Years** – The City can anticipate meeting all water demands through 2045 under consecutive five dry-year supply conditions given the stated assumptions.

As shown in the tables above, the City would be able to increase the amount of groundwater pumped to meet reasonably anticipated deficiencies from other sources, thus supply is projected to be sufficient to meet demand out to 2045. The Santa Clara groundwater basin is not adjudicated, which means the right to pump groundwater from the basin has not been given by judgment of a court or board.

For each of the five-year increments presented above, the five-year dry period indicates that supplies will be able to meet demands through increased groundwater pumping and implementation of drought conservation programs. The City will be able to address the projected demands without rationing.

8.1.4 Drought Risk Assessment

For the near-term water supply reliability, the DRA requires the analysis of five consecutive dry years beginning in 2021 including the consideration of climate change effects and any potential regulatory or other locally applicable conditions in conjunction with WSCP implementation. For this assessment, the same procedures described above were used to develop supply and demand projections for the next five years (2021-2025). The percentages of average supply summarized in **Table 8-3** were also used for the DRA.

The projected demands used in this analysis were based on the DSS model, which accounts for potential effects of climate change. Background data for the Demand Study model is sourced from International Panel on Climate Change (IPCC) climate change scenarios, which are referred to as Representative Concentration Pathways (RCP). These scenarios provide estimates of global temperature based on CO2 emissions under a variety of mitigation conditions. Under a "business as usual" condition, which represents minimal mitigation and higher emissions, the Demand Study estimated an annual mean temperature increase of 1.7 degrees Fahrenheit for the 2019-2045 period. This temperature increase was incorporated into all water use projections. The Demand Study is included as **Appendix D**.

The DRA total water supply and use comparison is presented in **Table 8-7**.

Table 8-7 Retail: Five-Year Drought Risk Assessment					
	2021	2022	2023	2024	2025
Gross Water Use	18,498	18,693	18,888	19,083	19,473
Total Supplies	31,293	31,529	29,686	29,686	29,686
Surplus/Shortfall w/o WSCP Action	12,795	12,836	10,798	10,603	10,213
Planned WSCP Actions (use reduction and supply augmentation)					
WSCP - supply augmentation benefit	0	0	0	0	0
WSCP - use reduction savings benefit	0	0	0	0	0
Revised Surplus/Shortfall	12,795	12,836	10,798	10,603	10,213
Resulting % Use Reduction from WSCP action	0%	0%	0%	0%	0%
NOTES: Recycled water is considered a drought proof supply and therefore is not included in the projections.					

The DRA indicates that the City will be able to meet demands in the event of a five-year drought. Although the results indicate no shortfalls, the City will work closely with SFPUC, Valley Water, and other water retail agencies to implement any stages of action to reduce the demand for water during water shortages. In the event of a decrease of local supplies, the City would respond by pursuing demand reduction programs (see **Chapter 9**) in accordance with the severity of the supply shortage. Any supply deficit would be compensated for by increased conservation levels and restrictions in consumption.

8.2 Annual Water Supply and Demand Assessment Procedures

In accordance with Water Code §10632.1, beginning in 2022, every Supplier is required to conduct an annual water supply and demand assessment (Assessment) and submit an Assessment Report to DWR on or before July 1st of each year. The purpose of the Assessment is to evaluate the reliability of the water supplier's water supply system on a short-term basis. This will aid the Supplier in identifying near-term (yearly or monthly) water shortages and implement the appropriate shortage response actions as laid out in the WSCP. The Assessment will also allow the City to determine the effectiveness of the WSCP and update the plan accordingly.

The Assessment will be based on the previous year's available supply and measured demand. First, the anticipated unconstrained demand for the current year will be developed. Then, any anticipated climatic variations, population growth, demographic changes, current and/or proposed development, State or local regulations, and existing infrastructure capabilities will be considered in altering the unconstrained demand. Considering each of these factors and how they may affect anticipated supply and/or demand, a supply and demand comparison will be completed for the current year under normal hydrologic conditions and under dry conditions. This comparison will allow the City to identify any potential water shortages and obtain City Council approval to activate the appropriate WSCP stage.

8.2.1 Decision-Making Process

On an annual basis, the City's Water & Sewer Utilities will perform the Assessment once data has been received from the wholesalers, SFPUC and Valley Water in mid-April. The wholesalers will inform the City if they will be able to meet water supply commitments for the City or if they will be requesting voluntary or mandatory reductions. If the projected unconstrained demands can be met by the City, then approval of the Assessment by City Council will not be required. When water supply shortfalls trigger the need for demand reduction, then approval of the Assessment by City Council shall be obtained no later than May 31st. City Council approval of the Assessment which shall include the recommended stage for cutbacks as described in **Section 8.3** below, will allow implementation of the recommended stage and no additional approval shall be required. Removal or elevation of the stages will require City Council approval.

For example, data from wholesalers for Fiscal Year (FY) 2021-2022 will be received by April 15, 2021. The Assessment will be prepared by Water & Sewer Utilities to determine if the supply for the projected demand for FY 2021-2022 will trigger the need for shortage response actions as identified in **Section 8.3,** Stages 1 – 6 will require City Council approval by May 31, 2021 for it to be effective by July 1, 2021 through June 30, 2022. The Assessment Report will be finalized and submitted to DWR on or before July 1st on an annual basis.

8.2.2 Data and Methodology

The methodology that will be used by the City to determine water demands for the Assessment year will be similar to the Econometric Model and the DSS Model as described in the BAWSCA 2020 Demand Study completed in June 2020 and amended in 2021 (**Appendix D**). The Econometric Model and DSS Model (the Model) projects future demands based on historical post-drought recovery considering each agency's unique factors such as economy, rate increases, conservation activity, and weather. The Model was used to forecast the City's baseline demand through 2023 as part of the Demand Study. The Model used in the Demand Study and current demands will be used to calibrate, evaluate, and accurately estimate the demands for the next year under normal and dry hydrological conditions.

Supply data from Valley Water and SFPUC will also be used to determine the reliability of the water supply system. The City will use the projected demand and supplies to assess whether shortfalls will exist under normal and dry hydrological conditions due to unanticipated changes not projected in the 2020 UWMP. The shortfalls will be quantified and correlated with the appropriate WSCP stages to identify the shortage level response action that will be triggered to offset the shortage in water supplies and determine if other actions are necessary (i.e., increase groundwater pumping or other water conservation measures).

Using a report template to be developed for the purposes of this Assessment, the City will draft a report presenting the data available and detailing the processes used to project the supplies and demands for the current year and complete the analysis. The report will identify any anticipated water supply shortfalls and the corresponding WSCP stage along with any WSCP actions proposed to mitigate the supply shortfalls. This report will be presented at a City Council meeting in or before June of each year if implementation of a WSCP stage is required and any WSCP actions will be implemented beginning by or before July. The report will then be submitted to DWR no later than July 1st.

Based on the processes described above, **Table 8-8** presents the timeline the City will adhere to for the process of completing the annual Assessment and submitting the Assessment Report.

Table 8-8: Assessment Completion Timeline		
Month	Activities	Completed By
February	Obtain monthly water use data by customer type from Finance Department for previous year.	Water & Sewer Utility
February	Determine monthly water production data (surface water, potable groundwater, non-potable irrigation groundwater, recycled water) for previous year.	Water & Sewer Utility
February	Obtain population estimates for previous year from DOF (https://www.dof.ca.gov/Forecasting/Demographics/Estimates/).	Water & Sewer Utility
March	Complete analysis for previous year (supply and demand comparison, hydrologic and regulatory conditions, infrastructure constraints, etc.).	Water & Sewer Utility
March	Calculate projected unconstrained demand for current year and identify/describe projection methods (projected population growth, etc.).	Water & Sewer Utility
April	Identify projected hydrologic conditions for current year and obtain any anticipated surface water supply constraints from wholesalers for current year.	Water & Sewer Utility
April	Determine current conditions of groundwater supply and groundwater table to anticipate any groundwater supply constraints for current year.	Water & Sewer Utility
April	Complete analysis for current year based on a "dry year." Determine the anticipated monthly water supply reliability for the current year using calculation spreadsheet.	Water & Sewer Utility
April	Determine if/when water supply shortages will occur and what WSCP stage the shortage will fall into. Determine what (if any) WSCP actions will need to be implemented to mitigate supply shortage.	Water & Sewer Utility
May	Prepare Assessment Report presenting the findings of the Assessment and WSCP actions to be implemented.	Water & Sewer Utility
May/ June	Present findings and Assessment Report to City Council.	Water & Sewer Utility
by July	Implement the WSCP actions as approved by City Council.	Water & Sewer Utility
July	Submit final Assessment Report to DWR by July 1st.	Water & Sewer Utility
Note: Months are approximate and can be adjusted as needed.		

8.3 Standard Water Shortage Levels

In response to the severe drought of 2012-2016, new legislation in 2018 created a WSCP mandate replacing the water shortage contingency analysis under former law. Suppliers are authorized to continue using their own water shortage levels that may have been included in past WSCPs provided the Supplier includes a narrative or graphic describing the Supplier's water shortage levels in relationship to the six standard water shortage levels prescribed by statute - six standard water shortage levels corresponding to progressive ranges of up to 10-, 20-, 30-, 40-, and 50-percent shortages and greater than 50-percent shortage.

This section provides a general description of the water shortage contingency plan for each of the water wholesalers and a detailed description of the City's water shortage stages. For more information regarding each wholesaler's response to water shortage, please refer to the wholesaler's most current WSCP.

8.3.1 SFPUC WSCP

Tier One Drought Allocations

In July 2009, San Francisco and its Wholesale Customers in Alameda County, Santa Clara County, and San Mateo County (Wholesale Customers) adopted the Water Supply Agreement (WSA), which includes a Water Shortage Allocation Plan (WSAP) that describes the method for allocating water from the Regional Water System (RWS) between Retail and Wholesale Customers during system-wide shortages of 20% or less. The WSAP, also known as the Tier One Plan, was amended in the 2018 Amended and Restated WSA.

The SFPUC allocates water under the Tier One Plan when it determines that the projected available water supply is up to 20% less than projected system-wide water purchases. **Table 8-9** shows the SFPUC (i.e, Retail Customers) share and the Wholesale Customers' share of the annual water supply available during shortages depending on the level of system-wide reduction in water use that is required. The Wholesale Customers' share will be apportioned among the individual Wholesale Customers based on a separate methodology adopted by the Wholesale Customers, known as the Tier Two Plan, discussed further below.

Table 8-9: SFPUC Water Shortage Allocation Plan

Level of System-Wide Reduction in Water Use Required	Share of Available Water	
	SFPUC Share	Wholesale Customers Share
5% or less	35.5%	64.5%
6% through 10%	36.0%	64.0%
11% through 15%	37.0%	63.0%
16% through 20%	37.5%	62.5%

The Tier One Plan allows for voluntary transfers of shortage allocations between the SFPUC and any Wholesale Customer as well as between Wholesale Customers themselves. In addition, water "banked" by a Wholesale Customer, through reductions in usage greater than required, may also be transferred.

As amended in 2018, the Tier One Plan requires Retail Customers to conserve a minimum of 5% during droughts. If Retail Customer demands are lower than the Retail Customer allocation (resulting in a "positive allocation" to Retail[51]) then the excess percentage would be re-allocated to the Wholesale

[51] See Water Supply Agreement, Water Shortage Allocation Plan (Attachment H), Section 2.1.

Customers’ share. The additional water conserved by Retail Customers up to the minimum 5% level is deemed to remain in storage for allocation in future successive dry years.

The Tier One Plan will expire at the end of the term of the WSA in 2034, unless mutually extended by San Francisco and the Wholesale Customers.

The Tier One Plan applies only when the SFPUC determines that a system-wide water shortage exists and issues a declaration of a water shortage emergency under California Water Code Section 350. Separate from a declaration of a water shortage emergency, the SFPUC may opt to request voluntary cutbacks from its Retail and Wholesale Customers to achieve necessary water use reductions during drought periods.

SFPUC Tier Two Drought Allocations

The Wholesale Customers have negotiated and adopted the Tier Two Plan, referenced above, which allocates the collective Wholesale Customer share from the Tier One Plan among each of the 26 Wholesale Customers. These Tier Two allocations are based on a formula that takes into account multiple factors for each Wholesale Customer including:

- Individual Supply Guarantee;
- Seasonal use of all available water supplies; and
- Residential per capita use.

The water made available to the Wholesale Customers collectively will be allocated among them in proportion to each Wholesale Customer’s Allocation Basis, expressed in millions of gallons per day (MGD), which in turn is the weighted average of two components. The first component is the Wholesale Customer’s Individual Supply Guarantee, as stated in the WSA, and is fixed. The second component, the Base/Seasonal Component, is variable and is calculated using the monthly water use for three consecutive years prior to the onset of the drought for each of the Wholesale Customers for all available water supplies. The second component is accorded twice the weight of the first, fixed component in calculating the Allocation Basis. Minor adjustments to the Allocation Basis are then made to ensure a minimum cutback level, a maximum cutback level, and a sufficient supply for certain Wholesale Customers.

The Allocation Basis is used in a fraction, as numerator, over the sum of all Wholesale Customers’ Allocation Bases to determine each wholesale customer’s Allocation Factor. The final shortage allocation for each Wholesale Customer is determined by multiplying the amount of water available to the Wholesale Customers’ collectively under the Tier One Plan, by the Wholesale Customer’s Allocation Factor.

The Tier Two Plan requires that the Allocation Factors be calculated by BAWSCA each year in preparation for a potential water shortage emergency. As the Wholesale Customers change their water use characteristics (e.g., increases or decreases in SFPUC purchases and use of other water sources, changes in monthly water use patterns, or changes in residential per capita water use), the Allocation Factor for each Wholesale Customer will also change. However, for long-term planning purposes, each Wholesale Customer shall use as its Allocation Factor, the value identified in the Tier Two Plan when adopted.

The Tier Two Plan, which initially expired in 2018, has been extended by the BAWSCA Board of Directors every year since for one additional calendar year. In November 2020, the BAWSCA Board voted to extend the Tier Two Plan through the end of 2021.

Interim Supply Allocation

San Francisco has a perpetual commitment (Supply Assurance) to deliver 184 MGD (206,107 AFY) to the 24 permanent Wholesale Customers collectively. San Jose and Santa Clara are not included in the Supply Assurance commitment and each has temporary and interruptible water supply contracts (Interim Supply Allocation) with San Francisco. The Supply Assurance is allocated among the 24 permanent Wholesale Customers through Individual Supply Guarantees (ISG), which represent each Wholesale Customer's allocation of the 184 MGD (206,107 AFY) Supply Assurance.

The City's Interim Supply Allocation is 4.5 MGD (5,040 AFY).

2028 SFPUC Decisions (formerly 2018 SFPUC Decisions)

In the 2009 WSA, the SFPUC committed to make three decisions before 2018 that affect water supply development:

- Whether or not to make the cities of San Jose and Santa Clara permanent customers,
- Whether or not to supply the additional unmet supply needs of the Wholesale Customers beyond 2018, and
- Whether or not to increase the wholesale customer Supply Assurance above 184 mgd.

Events since 2009 made it difficult for the SFPUC to conduct the necessary water supply planning and CEQA analysis required to make these three decisions before 2018. Therefore, in the 2018 Amended and Restated WSA, the decisions were deferred for 10 years to 2028.

Additionally, there have been recent changes to instream flow requirements and customer demand projections that have affected water supply planning beyond 2018. As a result, the SFPUC has established an Alternative Water Supply Planning program to evaluate several regional and local water supply options. Through this program, the SFPUC will conduct feasibility studies and develop an Alternative Water Supply Plan by July 2023 to support the continued development of water supplies to meet future needs.

Adoption of the 2018 Bay-Delta Plan Amendment

In December 2018, the State Water Resources Control Board (SWRCB) adopted amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan Amendment) to establish water quality objectives to maintain the health of the Bay-Delta ecosystem. The SWRCB is required by law to regularly review this plan. The adopted Bay-Delta Plan Amendment was developed with the stated goal of increasing salmonid populations in three San Joaquin River tributaries (the Stanislaus, Merced, and Tuolumne Rivers) and the Bay-Delta. The Bay-Delta Plan Amendment requires the release of 30-50% of the "unimpaired flow"[52] on the three tributaries from February through June in every year type. In SFPUC modeling of the new flow standard, it is assumed that the required release is 40% of unimpaired flow.

If the Bay-Delta Plan Amendment is implemented, the SFPUC will be able to meet the projected water demands presented in this UWMP in normal years but would experience supply shortages in single dry years or multiple dry years. Implementation of the Bay-Delta Plan Amendment will require rationing in all single dry years and multiple dry years. The SFPUC has initiated an Alternative Water Supply Planning Program to ensure that San Francisco can meet its Retail and Wholesale Customer water needs, address projected dry years shortages, and limit rationing to a maximum 20% system-wide in accordance with adopted SFPUC policies. This program is in early planning stages and is intended to meet future water supply challenges and vulnerabilities such as environmental flow needs and other regulatory changes; earthquakes, disasters, and emergencies; increases in population and employment; and climate change. As the region faces future challenges – both known and unknown – the SFPUC is considering this suite of diverse non-traditional supplies and leveraging regional partnerships to meet Retail and Wholesale Customer needs through 2045.

The SWRCB has stated that it intends to implement the Bay-Delta Plan Amendment on the Tuolumne River by the year 2022, assuming all required approvals are obtained by that time. But implementation of the Plan Amendment is uncertain for multiple reasons.

First, since adoption of the Bay-Delta Plan Amendment, over a dozen lawsuits have been filed in both state and federal courts, challenging the SWRCB's adoption of the Bay-Delta Plan Amendment, including a legal challenge filed by the federal government, at the request of the U.S. Department of Interior, Bureau of Reclamation. This litigation is in the early stages and there have been no dispositive court rulings as of this date.

Second, the Bay-Delta Plan Amendment is not self-implementing and does not automatically allocate responsibility for meeting its new flow requirements to the SFPUC or any other water rights holders. Rather, the Bay-Delta Plan Amendment merely provides a regulatory framework for flow allocation, which must be accomplished by other regulatory and/or adjudicatory proceedings, such as a

[52] "Unimpaired flow represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds." (Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Dec. 12, 2018) p.17, fn. 14, available at https://www.waterboards.ca.gov/plans_policies/docs/2018wqcp.pdf.)

comprehensive water rights adjudication or, in the case of the Tuolumne River, may be implemented through the water quality certification process set forth in section 401 of the Clean Water Act as part of the Federal Energy Regulatory Commission's licensing proceedings for the Don Pedro and La Grange hydroelectric projects. It is currently unclear when the license amendment process is expected to be completed. This process and the other regulatory and/or adjudicatory proceedings would likely face legal challenges and have lengthy timelines, and quite possibly could result in a different assignment of flow responsibility (and therefore a different water supply impact on the SFPUC).

Third, in recognition of the obstacles to implementation of the Bay-Delta Plan Amendment, the SWRCB Resolution No. 2018-0059 adopting the Bay-Delta Plan Amendment directed staff to help complete a "Delta watershed-wide agreement, including potential flow measures for the Tuolumne River" by March 1, 2019, and to incorporate such agreements as an "alternative" for a future amendment to the Bay-Delta Plan to be presented to the SWRCB "as early as possible after December 1, 2019." In accordance with the SWRCB's instruction, on March 1, 2019, SFPUC, in partnership with other key stakeholders, submitted a proposed project description for the Tuolumne River that could be the basis for a voluntary substitute agreement with the SWRCB ("March 1st Proposed Voluntary Agreement"). On March 26, 2019, the Commission adopted Resolution No. 19-0057 to support the SFPUC's participation in the Voluntary Agreement negotiation process. To date, those negotiations are ongoing under the California Natural Resources Agency and the leadership of the Newsom administration.[53]

Bay-Delta Plan Implementation Starting Year

Because of the uncertainty surrounding implementation of the Bay-Delta Plan Amendment, the water service reliability assessment presented in the SFPUC's draft UWMP looks at two future supply scenarios, both with and without implementation of the Bay-Delta Plan Amendment.

Although the SWRCB has stated it intends to implement the Bay-Delta Plan Amendment on the Tuolumne River by the year 2022, given the current level of uncertainty, it is assumed for the purposes of the SFPUC's draft UWMP that the Bay-Delta Plan Amendment will be fully implemented starting in 2023.

SFPUC's Efforts to Develop of Alternative Water Supplies

With the adoption of the Bay-Delta Plan Phase 1 (Bay-Delta Plan) by the State Water Resources Control Board in December of 2018, coupled with the uncertainties associated with litigation and the development of Voluntary Agreements that, if successful, would provide an alternative to the 40% unimpaired flow requirement that is required by the Bay-Delta Plan, BAWSCA redoubled its efforts to ensure that the SFPUC took necessary action to develop alternative water supplies such that they would

[53] California Natural Resources Agency, "Voluntary Agreements to Improve Habitat and Flow in the Delta and its Watersheds," available at https://files.resources.ca.gov/voluntary-agreements/

be in place to fill any potential gap in supply by implementation of the Bay-Delta Plan and that the SFPUC would be able to meet its legal and contractual obligations to its Wholesale Customers.

In 2019, BAWSCA held numerous meetings with the SFPUC encouraging them to develop a division within their organization whose chief mission was to spearhead alternative water supply development. On June 25, 2019, BAWSCA provided a written and oral statement to the Commissioners urging the SFPUC to focus on developing new sources of supply in a manner similar to how it addressed the implementation of the Water System Improvement Program (WSIP). BAWSCA urged that a new water supply program was called for, with clear objectives, persistent focus, a dedicated team, adequate funding, and a plan for successful execution. The SFPUC Commission supported BAWSCA's recommendation and directed staff to undertake such an approach.

In early 2020, the SFPUC began implementation of the Alternative Water Supply Planning Program (AWSP), a program designed to investigate and plan for new water supplies to address future long-term water supply reliability challenges and vulnerabilities on the RWS.

Included in the AWSP is a suite of diverse, non-traditional supply projects that, to a great degree, leverage regional partnerships and are designed to meet the water supply needs of the SFPUC Retail and Wholesale Customers through 2045. As of the most recent Alternative Water Supply Planning Quarterly Update, SFPUC has budgeted $264 million over the next ten years to fund water supply projects. BAWSCA is heavily engaged with the SFPUC on its AWSS efforts.

Rate Impacts of Water Shortages

The SFPUC includes a variable component to water rates for most customer classes. As a result, as sales decrease, revenues are lost on a per unit basis. Because the marginal cost of water production is relatively small, as production is reduced, the cost of service remains the same. For both retail and wholesale customers, a reduction in water purchases – whether voluntary or mandated – would require the SFPUC to raise rates, cut costs, or use existing fund balance reserves to cover its expenses. The financial planning and rate-setting process is complex and iterative. While major impacts of a water shortage on rates are described below, the full process, especially for large water shortages, would incorporate significant stakeholder discussion about tradeoffs and financial impacts.

The SFPUC's current retail water rates have a provision for a "drought surcharge" that automatically increases adopted rates in the event of a declared water shortage. The drought surcharge is calculated so that, accounting for the expected reduction in retail water usage, total revenues are equal to what they would have been without the reduction. The drought surcharge protects the SFPUC's financial stability during water shortages, and provides customers an incentive to meet conservation targets.

For wholesale customers, the rate-setting process is governed by the terms of the WSA, which provides that, in the event of a water shortage emergency, the Commission may adjust wholesale rates in an expedited way concurrently with the imposition of drought surcharges on retail customers. Beyond drought rate setting and emergency rate setting, rates are set annually in coordination with the SFPUC annual budget process and are based on the forecasted wholesale share of regional water system expenditures and total purchases. If wholesale customer usage is expected to decrease – either voluntarily, or due to shortages – this would be incorporated into the wholesale rate forecast, and rates may increase.

8.3.2 Valley Water's WSCP

Valley Water's basic water supply strategy to compensate for supply variability is to store excess wet year supplies in the groundwater subbasins, local reservoirs, San Luis Reservoir, and Semitropic Groundwater Bank, then to draw on these stored supplies during dry years to help meet demands. Based on projected demands, and Valley Water's existing and planned sources of supply, Valley Water will be able to meet countywide demands through 2045 under normal, a single dry, and five consecutive dry year conditions.

The DRA indicates that if a five-year drought were to occur under existing conditions, Valley Water will need to employ a range of response actions, including using supplies stored in the local groundwater, local reservoirs, and Semitropic groundwater bank, as well as augmenting supplies with supplemental sources such as water transfers and exchanges, to meet potential shortage.

Valley Water uses five stages to categorize its water supply shortage. The stages are based on projected countywide end-of-year groundwater storage and include a normal stage and four progressive levels of water shortage. **Figure 8-1** below, describes how the stage correspond to DWR's six standard water shortage levels.

Figure 8-1: Valley Water's Stages to Standard Stages Crosswalk

Valley Water WSCP:					Six Standard Stages:	
Stage	Title	Projected End-of-Year Groundwater Storage (AF)	Short-term reduction in water use	Corresponding Relationship ("crosswalk")	Stage	DWR 6 standard water shortage levels
1	Normal	> 300,000	None			
2	Alert	< 300,000	0-10%		1	Up to 10%
3	Severe	< 250,000	10-20%		2	10 to 20%
4	Critical	< 200,000	20-40%		3	20 to 30%
5	Emergency	< 150,000	Over 40%		4	30 to 40%
					5	40 to 50%
					6	Greater than 50%

- Stage 1 is normal water supply availability when groundwater storage is substantially full and no water shortage actions are necessary.
- Stage 2 is the alert stage that is meant to warn the public that current water use is tapping groundwater reserves. This stage is triggered when groundwater storage is projected to drop below 300,000 AF and the Board may request the public and retailers reduce water use by up to 10%.
- Stage 3 is the severe stage. Shortage conditions are worsening, requiring close coordination with retailers and cities to enact ordinances and water use restrictions. This stage is triggered when groundwater storage falls below 250,000 AF. The Board may pass a resolution that requests the public and retailers to reduce water use by 20%.
- Stage 4 represents critical conditions. This is typically the most severe stage in a multi-year drought. This stage is triggered when groundwater storage is projected to fall below 200,000 AF. The Board may increase the demand reduction request up to 40%.
- Stage 5 is for emergency situations. It is meant to address an immediate crisis such as a major infrastructure failure when water supply may only be available to meet health and safety needs. Stage 5 can also be triggered in a deep drought when groundwater levels are projected to fall below 150,000 AF. Water reduction may need to exceed 40%.

Water supply shortages can occur for a variety of reasons including droughts; loss in ability to capture, divert, store, or utilize local supplies; and/or facility outages. As a wholesale agency, Valley Water does not have direct authority over retail customer water use or retail rates and generally does not employ staff to enforce water restrictions. Therefore, Valley Water's water shortage response actions are focused mainly on public education and coordination with municipalities and retailers in the County. During droughts or shortages, Valley Water considers all available tools, including balancing demands for treatment plants and recharge facilities, incentives or requests for retailers to use either groundwater or treated water, and community outreach to maximize the use of available supplies. The collective response actions between Valley Water, municipalities, and retailers preceding and during a water supply shortage are described below (**Table 8-10**).

Table 8-10: Water Shortage Response Actions		
Stage	Requested Short-Term Water Use Reduction	Actions
Stage 1 Normal	None	Valley Water continues ongoing outreach strategies aimed toward achieving long-term water conservation targets. Messages in this stage focus on services and rebate programs Valley Water provides to facilitate water use efficiency for residents, agriculture, and business. While other stages are more urgent, successful outcomes in Stage 1 are vital to long-term water supply reliability.
Stage 2 Alert	0 – 10%	This stage is meant to warn customers that current water use is tapping groundwater reserves. Work begins to coordinate ordinances with cities and prepare for Stage 3. Additional communication tools are employed to augment Stage 1 efforts, promote immediate behavioral changes, and set the tone for the onset of shortages. Specific implementation plans are developed in preparation of a drought deepening such as identifying supplemental funding to augment budgeted efforts and initiation of discussions with local, state, and federal agencies to call on previously negotiated options, transfers, and exchanges.
Stage 3 Severe	10 – 20%	Shortage conditions are worsening, requiring close coordination with retailers and cities to enact ordinances and water use restrictions. Significant behavioral change is requested of water users. The intensity of communication efforts increases with the severity of the shortage. Messages are modified to reflect more dire circumstances. Water supplies are augmented through the implementation of options, transfers, exchanges, and withdrawals from groundwater banks.
Stage 4 Critical	20 – 40%	This is generally the most severe stage in a multi-year drought. Stage 3 activities are expanded and Valley Water will encourage retailers and cities to increase enforcement of their water shortage contingency plans, which could include fines for repeated violations.
Stage 5 Emergency	40 to 50%	Stage 5 is meant to address an immediate crisis such as a major infrastructure failure but may also be needed in exceptional multi-year drought. Water supply may only be available to meet health and safety needs. Valley Water activates its Emergency Operations Center, coordinates closely with municipalities and retailers, and provides daily updates on conditions.

8.3.3 City's Water Shortage Levels

The City's water system benefits from flexibility due to multiple distributed sources. With 21 production wells currently in operation, two imported water suppliers and an extensive recycled water system the City's water system has been historically very reliable. The loss of a single supply, storage tank, well, or imported water connection can be offset, in most cases by relying on the other remaining sources. Backup power supplies (diesel generators) have been strategically located throughout the City for wells and booster pumps. In addition, five of these backup generators are portable and can be moved as necessary to other locations within a matter of hours. However, circumstances beyond the control of even the best water managers can lead to water supply shortages.

In the event of water supply shortages, the City WSCP outlines the actions to be taken to decrease system demands and conserve available water supplies. **Table 8-11** below outlines the stages of the City's WSCP and crosswalk to DWR's six standard shortage levels.

Table 8-11: WSCP Levels					
2020 WSCP Mandated Shortage Levels		2015 WSCP Water Shortage Levels		Water Shortage Condition	Shortage Response Actions *Narrative Description*
Shortage Level	% Shortage Range	Shortage Level	% Shortage Range		
1	≤ 10%	1	Up to 10%	Advisory/ Voluntary	Voluntary conservation Increase public information campaigning Increase educational programs
2	10-20%	2	Up to 20%	Mandatory	Water use restrictions Allocations and mandatory conservation Required reductions Drought surcharges and increased rates Increase production monitoring Increase use of non-potable water Reduce system flushing
3	20-30%	3	Up to 49%		
4	30-40 %				
5	40-50%				
6	> 50%	4	Greater than 50%	Emergency Curtailment	Water use for decorative water features prohibited Prohibit landscape irrigation Increase use of non-potable water
NOTES: One Stage in the WSCP must address a water shortage of 50%. Table based on DWR Guidebook Table 8-1 Retail.					

8.4 Shortage Response Actions

The Water Code requires documentation of the specific actions to be undertaken during a water shortage. The City has developed a set of demand reduction measures, as well as supply augmentation options and operational changes, to be undertaken in response to each shortage level identified in **Table 8-11**. The WSCP information presented herein is based on the City's response to the 2012-2016 drought conditions and can be updated, as necessary.

City Council must approve the activation of the City's WSCP, and it is prepared to act in a timely manner to impose any water use restrictions and regulations deemed necessary in a water supply shortage emergency. Before imposing mandatory water use restrictions, the water shortage would be assessed based on the relative severity of the current drought/water shortage condition and the implementation of any State mandated water use cutbacks. A water shortage level would be recommended by the Director of Water & Sewer Utilities and approved by City Council based on the levels listed in **Table 8-11**, and a water shortage declaration would be issued by the City Council. City Council would then determine the overall strategy and specific mix of voluntary and mandatory water consumption reduction measures to be implemented.

The steps required to activate and implement the City's WSCP are summarized as follows:

STEP 1: The City identifies that water shortage conditions exist (due to supply shortfalls, state cutbacks, or emergency conditions).

STEP 2: The City identifies the appropriate water shortage response measures to be considered in response to the water shortage level in the following three categories of demand management:

- **Advisory/Voluntary Conservation Measures** – The City authorizes implementation of voluntary demand reduction measures – implemented in Stage 1.
- **Mandatory Conservation Measures** – The City authorizes implementation of mandatory demand reduction measures, including enforcement actions and fines – implemented in Stages 2-6.
- **Allocation/Rate-Based Measures** – The City authorizes implementation of water allocation and/or drought surcharge-based measures as deemed necessary to meet water shortage demand reduction targets while maintaining adequate water system revenues to operate the water system – implemented in Stages 2-6.

Actual demand management measures may be adjusted based on activation of any supply augmentation measures in parallel with demand reduction measures as well as the need to meet water system revenue requirements that are not being met due to the water shortage condition.

STEP 3: City Council approves activation of the City's WSCP and the suite of voluntary, mandatory, and/or allocation/rate-based measures to be implemented in response to a given water shortage level. The City must request approval of additional demand reduction measures as necessary to meet shortage level water use reduction targets.

STEP 4: City Council deactivates or downgrades the implemented WSCP measures as water shortage levels decrease or the need no longer exists.

The actions to be undertaken during each stage cannot be implemented until necessary City Council approvals have been executed. The types of measures that may be implemented in each stage are described below. These measures may be updated/altered based on City Council direction and approval, state policy directives, emergency conditions, and/or to improve customer response. This six-stage response approach provides the City with the flexibility to address any given water shortage as it comes, as conditions are constantly changing.

Table 8-12 details the use restrictions for each stage of reduction declared by the City and outlines the penalties and charges associated with water use violations.

Table 8-12: Restrictions and Prohibitions on End Uses			
Shortage Level (Stage)	**Demand Reduction Actions**	**Reduction in Shortage Gap (%)**	**Penalty, Charge, or Enforcement**
Normal	*Permanent water use prohibitions please refer to City's Water Service and Use Rules and Regulations, Section 1C (incorporated by Reference in City Municipal Code 13.15.080)* • Allowing plumbing fixtures to leak • Using potable water in a manner where it floods premises and runoff into the street • Using a hose to wash vehicles without shut off valve. • Using a hose to wash driveways, sidewalks and other hard surfaces (except for health and safety). • Service of water to restaurant patrons without being requested. • Installation of single-pass cooling system in new construction • Sprinkler irrigation between the hours of 9 AM – 6 PM • Irrigation with potable water during and within 48 hours after measureable rainfall is prohibited. • Irrigation with potable water of ornamental turf on public street medians. • Operators of hotels and motels shall provide guests with the option of choosing not to have towels and linens laundered daily. • Use of decorative fountains without recirculation • Installation of a non-recirculating conveyer car wash is prohibited • Irrigation of landscapes outside of newly constructed homes and buildings in a manner inconsistent with regulations or other requirements established by California Building Standards Commission and the Department of Housing and Community Development • Offer water use surveys and home water use reports for residents • Provide rebates on plumbing fixtures and devices, landscape irrigation efficiency, graywater systems and turf replacement or conversion to recycled water if available • Require covers for pools and spas	<10	• 1st and 2nd violation: $0 – written warning • Subsequent violations: Warning, citation, $100-$1,000 fine, flow restrictor • Cost for removal of 1st flow restrictor: $50 • Cost for removal of 2nd flow restrictor: $100
Stage 1 up to 10%	• All of the above • Expand public information campaign • Enforcement of permanent water use restriction Ordinance (Muni Code 13.15.080) • Increase water waste patrols	10	• 1st and 2nd violation: $0 – written warning • Subsequent violations: Warning, citation, $100-$1,000 fine, flow restrictor • Cost for removal of 1st flow restrictor: $50 • Cost for removal of 2nd flow restrictor: $100

Table 8-12: Restrictions and Prohibitions on End Uses			
Shortage Level (Stage)	**Demand Reduction Actions**	**Reduction in Shortage Gap (%)**	**Penalty, Charge, or Enforcement**
Stage 2 up to 20%	• All of the above • Increase water waste patrols and enforcement of permanent water use restriction Ordinance (Muni Code 13.15.080) • Reduce System Water Loss • Decrease hydrant/line flushing (unless for public health or safety) • Decorative water features restricted to filling except to sustain aquatic life • Decorative water features must use recirculating water • Potable water used for construction and dust control is restricted to recycled water if available • Pool construction restricted • New irrigation connections restricted to recycled water • Irrigation of golf courses restricted to recycled water • Outdoor watering days may be restricted based on water supply conditions	20	• 1st and 2nd violation: $0 – written warning • Subsequent violations: Warning, citation, $100-$1,000 fine, flow restrictor • Cost for removal of 1st flow restrictor: $50 • Cost for removal of 2nd flow restrictor: $100
Stage 3 up to 30%	• All of the above • Potable water use for decorative water features prohibited • Irrigation of golf courses except greens and tees restricted, shall use recycled water if available • Implement or modify drought rate structure or surcharge • Increase frequency of meter reading	30 - 50	• 1st violation: Warning, citation, up to $500 fine • 2nd violation: Warning, citation, $100-$1,000 fine • Subsequent violations: Warning, citation, $100-$1,000 fine, flow restrictor, termination of service • Cost for removal of 1st flow restrictor: $50 • Cost for removal of 2nd flow restrictor: $100
Stage 4 up to 40%	• Same as above		• Same as above
Stage 5 Up to 50%	• Same as above		• Same as above
Stage 6 Greater than 50%	• All of the above • New pool construction and filling prohibited • New irrigation connections prohibited, recycled water allowed without restriction	>50	• 1st violation: Warning, citation, up to $500 fine • 2nd violation: Warning, citation, $100-$1,000 fine • Subsequent violations: Warning, citation, $100-$1,000 fine, flow restrictor, termination of service • Cost for removal of 1st flow restrictor: $50 • 2nd restrictor remains for duration of Stage 6

8.4.1 Supply Augmentation

In addition to the demand reduction actions noted in **Table 8-12**, the City may consider implementing the following supply augmentation methods detailed in **Table 8-13** to meet demands.

Table 8-13: Supply Augmentation and Other Actions		
Shortage Level	Supply Augmentation Methods and Other Actions by Water Supplier	Reduction in shortage gap (%)
Stage 1	Increase groundwater use if needed	10
Stage 2	Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient	20
Stage 3	Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient	30
Stage 4	Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient	40
Stage 5	Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient	50
Stage 6	Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient	>50

8.4.2 Operational Changes

As shown in **Table 8-12**, the City's intent to reduced potable water use also includes operational changes for the Utility such as: increased monitoring of potable water usage, decreased line flushing (except for health and safety or water quality issues), and in some cases unrestricted use of recycled water (Stage 6).

8.5 City Emergency Response Plan (ERP)

In response to the America's Water Infrastructure Act of 2018 Section 2013(b), as amendment to Section 1433 of the Safe Drinking Water Act, the City prepared an Emergency Response Plan (ERP) to determine an "all hazards response and recovery protocol to prevent, minimize, and mitigate injury and damage resulting from emergencies or disasters of man-made or natural origin". [54] The ERP addresses a variety of specific hazards including natural hazards, technology hazards and hazards caused from malevolent or human acts. More specifically, it addresses responses for water system losses including current water emergency interconnections, water demands under earthquake emergency conditions and non-earthquake emergencies. The ERP also identifies seven categories of response and the criteria that triggers that specific response to occur. The communication procedures are also outlined in the ERP. In response to a drought, the ERP outlines the procedures the City is recommended to follow

[54] 2020 City of Santa Clara All-Hazards Emergency Response Plan.

which includes: initial actions, continuous assessment and response procedures and after action monitoring and reporting. Steps for deactivation and demobilization of activated triggers and response actions are also identified to facilitate recovery procedures and return to normal operation. In addition, the effectiveness of the ERP is evaluated by the Department staff on a periodic basis. This is to ensure that procedures and practices developed in the ERP are adequate and implemented properly.

8.6 Seismic Risk Assessment and Mitigation Plan

8.6.1 City of Santa Clara Local Hazard Mitigation Plan

In December 2017, City Council adopted Volume 1 and the City's portion of Volume 2 of the Santa Clara County Operations Area Hazardous Mitigation Plan, both volumes comprise Annex L of the City's Emergency Operations Plan. In July of 2016, the City participated in a coalition of Santa Clara County cities and special districts that embarked on a planning process to prepare for and lessen the impacts of specified natural hazards by updating the Santa Clara County Operational Area Hazard Mitigation Plan. Responding to federal mandates in the Disaster Mitigation Act of 2000 (Public Law 106- 390), the partnership was formed to pool resources and to create a uniform hazard mitigation strategy that can be consistently applied to the defined planning area and used to ensure eligibility for specified grant funding success. This effort represents the third comprehensive update to the initial hazard mitigation plan, approved by the Federal Emergency Management Agency (FEMA) in November of 2005 and developed in partnership with the ABAG, as well as a return to a truly regional effort following the 2010 planning process. The 16 member coalition of partners involved in this program includes unincorporated Santa Clara County, 14 city and town governments and the Santa Clara County Fire District. The planning area for the hazard mitigation plan was defined as the Santa Clara County Operational Area. The result of the organizational effort will be a FEMA and California Office of Emergency Services (Cal OES) approved multijurisdictional, multi-hazard mitigation plan. Mitigation is defined in this context as any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event. Mitigation planning is the systematic process of learning about the hazards that can affect the community, setting clear goals, identifying appropriate actions and following through with an effective mitigation strategy. Mitigation encourages long-term reduction of hazard vulnerability and can reduce the enormous cost of disasters to property owners and all levels of government. Mitigation can also protect critical community facilities, reduce exposure to liability, and minimize post-disaster community disruption.

The hazard identification and profiling in the hazard mitigation plan addresses the following hazards of concern within the planning area: 1) Dam failure, 2) Drought, 3) Earthquake, 4) Flood, 5) Landslide, 6) Severe weather, 7) Tsunami, and 8) Wildfire.

A City Hazard Mitigation Review Committee, with Water & Sewer Utilities staff present, meets quarterly to review and provide updates to the Local Hazard Mitigation Plan.

8.6.2 SFPUC Seismic Risk Assessment and Mitigation Plan

As part of the Facilities Reliability Program and the Water System Improvement Program (WSIP), the SFPUC performed an extensive multi-year evaluation of seismic risks to its water system that resulted in major capital improvements to increase seismic reliability. The goals of WSIP include enhancing the ability of the SFPUC water system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply. One of the original goals of WSIP was to limit rationing to no more than 20% on a system-wide basis; the WSIP was developed to reduce the likelihood of shortages, thereby reducing the likelihood of needing to implement the WSCP.

The WSIP projects include several projects located in San Francisco to improve the seismic reliability of the in-City distribution system, including more wells that can be used as emergency drinking water sources. The WSIP also incorporates many projects related to the RWS to address both seismic reliability and overall system reliability. As of August 2018, the WSIP is over 96% complete. Local San Francisco projects are 100% complete as of June 2020. The current forecasted date to complete the overall WSIP is December 2021.

WSIP seismic levels of service (LOS) informed development of capital projects and guided program implementation. The LOS established post-earthquake delivery and recovery objectives under the following seismic scenarios:

- Magnitude 7.9 event on the San Andreas fault
- Magnitude 7.3 event on the Hayward fault
- Magnitude 6.9 event on the Calaveras fault

An assessment of seismic risk and resilience is contained in the body of analysis performed to support the WSIP. The risks associated with the seismic scenarios considered are reflected in the delivery objectives established in the LOS, specifically:

- Delivery of winter month demand 24 hours after a major earthquake, and
- Delivery of average day demand 30 days after a major earthquake

In addition to the improvements that have or will come from the WSIP, the City has already constructed system interties for use during catastrophic emergencies, short-term facility maintenance and upgrade activities, and times of water shortages. These are listed below:

- A 35 MGD intertie with the EBMUD allowing EBMUD to serve the City of Hayward's demand and/or supply the SFPUC directly (and vice versa);
- A 40 MGD system intertie between the SFPUC and SCVWD; and,
- One permanent and one temporary intertie to the South Bay Aqueduct, which would enable the SFPUC to receive State Water Project water.

The WSIP also includes projects related to standby power facilities at various locations. These projects provide for standby electrical power at six critical facilities to keep them in operation during power outages and other emergency situations. Permanent engine generators are located at four locations (San Pedro Valve Lot, Millbrae Facility, Alameda West, and HTWTP), while hookups for portable engine generators are at two locations (San Antonio Reservoir and Calaveras Reservoir).The City of San Francisco also has a Hazard Mitigation Plan which was last updated in June 2014 and includes sections describing earthquakes hazards and mitigation for assets within the City's boundary, including state-regulated reservoirs (Sutro, Sunset North and South, and University Mound North and South).

8.6.3 Valley Water Local Hazard Mitigation Plan

Valley Water's 2017 Local Hazard Mitigation Plan (2017 LHMP) identifies capabilities, resources, information, and strategies for building resilience and reducing physical and social vulnerabilities to disasters. It also coordinates mitigation actions, providing essential guidance for Valley Water to reduce its vulnerability to disasters. Valley Water developed the 2017 LHMP to be consistent with current legislation, conditions, and best available science. This ensures that hazards are accurately profiled; policies are consistent with current Valley Water standards and relevant federal, state, or regional regulations; and Valley Water has an updated LHMP consistent with Federal Emergency Management Agency (FEMA) Emergency Response Plan (ERP) requirements. The 2017 LHMP also includes strategies to reduce vulnerability to disaster through education and outreach programs, foster the development of partnerships, and implement risk reduction activities.

8.7 Consumption Reduction Methods

8.7.1 Prohibitions on End Uses

The City has had water waste prohibitions in place since the 1989-1992 drought. These prohibitions, in conjunction with additional water use restrictions enacted due to the Governor's drought declaration, resulted in an 18% city-wide reduction at the end of 2015 when compared to usage in 2013. Below is an excerpt from the City Water Service and Use Rules and Regulations prohibiting water waste (City Municipal Code 13.15.080 section 1C). Section 1C was amended and adopted in 2017 in response to the recent drought.

WATER USE RESTRICTIONS AND PROHIBITIONS

The following list of Water Use Restrictions and Prohibitions are specific measures which prevent water waste and achieve reasonable, yet substantial, reductions in water use by all users in the City.

The following uses of water are prohibited by the City:

(a) *Wasting water, which includes but is not limited to, the flooding or runoff on City sidewalks, gutters, and streets.*

(b) *Cleaning of sidewalks, driveways, patios, parking lots, or other paved or hard-surfaced areas.*

(c) Washing cars, buses, boats, trailers, or any vehicle by use of a hose unless that hose is fitted with an operating automatic shut-off valve.

(d) Water waste due to broken or defective plumbing, fire system, irrigation system, or any appurtenance thereto; or to open or to leave open any stopcock or faucet so as to permit water waste.

(e) Service of water by any restaurant unless requested by a patron.

(f) Installation of a single-pass cooling system.

(g) Installation of a non-recirculating, decorative fountain.

(h) Construction of a non-recirculating conveyor car wash.

(i) Watering lawns during or within 48 hours after measurable precipitation.

(j) Irrigating ornamental turn on public street medians

(k) Irrigation of landscapes outside of newly constructed homes and buildings in a manner inconsistent with regulations or other requirements established by the California Building Standards Commission and the Department of Housing and Community Development.

(l) Irrigation between the hours of 9AM and 6PM.

In addition to the above water use prohibitions and to promote efficient water use, hotels/motels shall provide guests with the option of choosing not to have towels and linens laundered daily.

When water waste is reported and verified, attempts to contact the resident are made (phone, e-mail, site visit), if necessary, a warning letter is sent to the party responsible for the water waste. If water waste continues the City can take further action including additional warning notices, administrative penalties consistent with the WSCP, or termination of water service. The City has also terminated water service in the case of egregious water waste.

8.8 Communication Protocols

Timely and effective communication is a key element of WSCP implementation to ensure that customers are aware of the water shortage condition, the measures in place, and the potential for additional charges such as drought surcharges and water waste fines. During normal conditions, water conservation information, water waste prohibitions, rules, and enforcement are detailed on the City's website (https://www.santaclaraca.gov/our-city/departments-g-z/water-sewer-utilities). During a water shortage condition, **Table 8-14** presents the main methods of communication with water use customers by the City to convey the most up-to-date information, rules, and enforcement activities.

Table 8-14: WSCP Communication Protocols	
Stage	Summary of Actions
1	Increased public information campaigning including: • Distribution of literature explaining City policies, • Speaking engagements, • Website updates, • Utility bill inserts, and • Conversation messages and notices printed in local newspapers. • Educational programs in area schools.
2	• All stage 1 actions. • Additional public outreach. • Increase communications with Board, Wholesalers, Cities and County for drought preparation.
3 - 5	• All stage 2 actions. • Frequent communications with Board, Wholesalers, Cities and County for drought preparation. • Coordination with local, state and federal emergency agencies.
6	• All stage 3-5 actions. • Activate emergency response plan procedures. • Weekly meeting with Board, Wholesalers, Cities and County for drought preparation. • Frequent updates to press and public on conditions.

8.9 Compliance and Enforcement

The City's existing water waste program was increased in 2015 due to drought conditions throughout the State of California. Community members can report water waste through the City's website, a dedicated water waste hotline, or through Valley Water which also released a smartphone app to aid in reporting. The City also added dedicated staff to manage the program.

Upon receiving a water waste complaint, staff will investigate the offending site's water use history and make site visits to determine the cause of the waste. Staff will then reach out to the site to educate them on the City's water waste policies and help them get into compliance. In addition, staff uses this opportunity to further educate businesses and residents on current water conservation programs and what opportunities there may be to increase their water efficiency. While outreach and education typically brings most water wasters into compliance, the City does retain the ability to levy fines of up to $1,000 and the installation of a flow restrictor to frequent offenders. **Table 8-15** outlines these penalties.

Table 8-15: Enforcement Actions						
Stage	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
First violation	Warning		Warning, Citation, up to $500 fine			
Second violation	Warning		Warning, Citation, $100 to $1,000 fine			
Subsequent violations	Warning, citation, $100 to $1,000 fine, flow restrictor		Warning, citation, $100 to $1,000 fine, flow restrictor, termination of service			
Restrictor removal charge	$50					
Second restrictor removal charge	$100					Remains for duration

8.10 Legal Authority

The City Council has full authority to establish and adjust water rates because the City operates a municipally owned water utility. Approval of the Public Utilities Commission is not required to raise or establish water rates, fees, or surcharges. Typically, City Council reviews and approves all WSCP policies and programs as part of the UWMP planning process before they can be implemented and placed into practice. However, because the WSCP is a standalone document, it can be modified and updated as a separate process as described further in this section.

When a water shortage is suspected, the City will work with its wholesalers and other regional partners to discuss the possible proclamation of a local emergency per the California Government Code, California Emergency Services Act (Article 2, §8558). The Director of Water & Sewer Utilities will identify and recommend a water shortage level to be acknowledged, and upon approval, City Council shall declare a water shortage emergency, in accordance with Water Code Division 1, §350.

8.11 Revenue and Expenditure Impacts

To mitigate the financial impacts of reduced water sales during a drought, the City Council has the authority to impose a drought surcharge on water rates. This surcharge could be a flat fee per hundred cubic feet (HCF) that is intended to provide the City's water utility with dependable revenues when water use reduction plans are in effect.

The City has traditionally used a "postage stamp" rate for all water sales. With reduction in sales, the fixed costs will remain, imposing a loss on the utility (expenses in excess of revenues). An advantage to the drought surcharge is that it is designed and set to allow sufficient revenue to meet all costs for the utility while also achieving conservation.

The water utility also has reserves that it has used in the past as a rate stabilization fund. These reserves are being used to help reduce the rate impact from ever-increasing wholesale costs and the lower water sales due to the recent drought and slow recovery of water use. Additionally, the Utility is currently developing a long range financial and rate stabilization plan. The water utility's reserves are intended to be at the level that is sufficient to cover short-term loss of revenues due to a drought or other short-term catastrophic loss of sales. Reserves are adequately funded as part of the rate setting process.

The 2020-2021 Water, Sewer, and Recycled Water Operating Budget is $132.7 million, which represents an increase of 45.6% over the prior year.[55] Most of this increase is due to increases in capital costs at the jointly owned Regional Wastewater Facility. The Utility will continue to manage, plan, and allocate resources to achieve City Council goals of maintaining the lowest combined utility rates (water, sewer, and electric) in the nine bay area counties, stabilizing rates and reducing the need for rate increases to the extent practical, ensuring the financial viability of the Water and Sewer Utilities, and ensure the long term viability of and preserve the value of the utility infrastructure.

8.12 Monitoring and Reporting

Water Code §10632(a)(9) requires the description of the monitoring and reporting procedures that will ensure data is collected, tracked, and analyzed for purposes of monitoring customer compliance with, and effectiveness of, WSCP measures implemented during a drought/water shortage. All water sources and services are metered allowing for data to be collected and tracked. The utility currently uses a number of standardized reports to track water usage, production and revenues. The City utility billing system can generate custom reports that can be used for tracking water usage by users or by customer class. Custom reports can be requested and such reports are generally available within a day or two of the request being made. Reports are emailed to the requestor as a spreadsheet for ease of additional data analysis. In the event that the consumption reduction methods outlined above became necessary, these reports would be used to determine and track actual reductions in water consumption.

Table 8-16 lists the mechanisms available for the City to monitor water use and determine actual reductions in water use, as well as the type and quality of data expected.

Table 8-16: Water Use Monitoring Mechanisms	
Mechanisms for Determining Actual Reductions	Type and Quality of Data Expected
Customer meter readings	Monthly water consumption data for all users except municipal use (bi-monthly)
Production meter readings	Hourly/daily/monthly water production data depending on frequency of readings; includes customer water use plus system losses Monthly water data for imported supply meters

During a drought/water shortage, these data would be analyzed with increased frequency as the water shortage condition worsens, and any concerns would be brought to City Council to support the need for implementation of additional water conservation measures as needed.

[55] City of Santa Clara Budget.

8.13 WSCP Refinement Procedures

This WSCP has been developed to act as a set of guidelines for steps to take during a drought/water shortage. Given the variable nature of water and the climate and the intersection of many different factors, no two drought situations will be identical, and therefore, there must be room for improvement/alteration in the way that the City responds to each individual water shortage condition as it is encountered. This WSCP is an adaptive framework that is based on the City's response to the 2012-2016 drought, but it is open to refinement and amendment as the effectiveness of current practices is evaluated, new and different conditions are experienced, and new options for drought mitigation measures (demand management, supply augmentation, etc.) become available.

Based on the results of monitoring and reporting processes described in **Section 8.11**, the City can amend the procedures outlined in this WSCP pending the approval of City Council. The process for making any amendments to the WSCP is described below in the next section.

8.14 Plan Adoption, Submittal, and Availability

As part of the 2020 UWMP planning cycle, the City's 2020 WSCP was adopted together with the 2020 UWMP. However, because the Water Code now requires that the WSCP be adopted as a standalone plan, the WSCP can be amended or updated as necessary outside of the five-year UWMP planning cycle. This section describes the steps taken by the City to meet the requirements of the Water Code pertaining to public availability, adoption, submittal, and availability of the 2020 WSCP as well as the steps needed to amend the WSCP. The resolution approving the 2020 WSCP for the City is included in **Appendix B**.

8.14.1 Notice of Public Hearing

The City provided notice to cities, counties, and the community of the public hearing held prior to adoption of the 2020 WSCP. All public input received was considered before final adoption.

8.14.2 Notice to Cities and Counties

Notifications indicating preparation of the City's 2020 WSCP were provided to the cities and counties listed in **Table 8-17** at least 60 days in advance of the public hearing as required by the Water Code; a copy of the notice is included in **Appendix A**. Copies of the draft plan were available for review on the City's website (https://www.santaclaraca.gov/our-city/departments-g-z/water-sewer-utilities/water-utility/urban-water-management-plan).

Table 8-17: Notification to Cities and Counties	
Agency Name	
City of Brisbane	San Jose Water Company
City of Burlingame	Town of Hillsborough
City of Daly City	Santa Clara County
City of Gilroy	Alameda County Water District
City of Hayward	California Water Service Company
City of Menlo Park	BAWSCA
City of Milpitas	Coastside County Water District
City of Morgan Hill	Mid-Peninsula Water District
City of Mountain View	Estero Municipal Improvement District
City of Millbrae	North Coast County Water District
City of Palo Alto	Purissima Hills Water District
City of Redwood City	Santa Clara Valley Water District
City of San Bruno	San Francisco Public Utilities Commission
City of Sunnyvale	Stanford University
City of East Palo Alto	Westborough Water District
San Jose Municipal Water System	

8.14.3 Notice to the Public

The public hearing notice for the 2020 UWMP and WSCP was sent to the following agencies listed above and the public prior to the hearing. On two occasions, the City also published announcements of the public hearing for both this UWMP, and WSCP, in a notice conforming with Government Code Section 6066 and 7290 in *Santa Clara Weekly*, a newspaper of general circulation distributed free of charge to all Santa Clara residents.

A copy of the notice is included in **Appendix A**.

8.14.4 Public Hearing and Adoption

The City has sought public input and comments in the preparation process for this WSCP. Drafts of the WSCP were made available as part of the UWMP for public review and comment online at (https://www.santaclaraca.gov/our-city/departments-g-z/water-sewer-utilities/water-utility/urban-water-management-plan), from February 19, 2021.

The public hearing was held on June 22, 2021 followed by formal adoption by City Council. A copy of the adoption resolution is included as **Appendix B**.

8.14.5 Plan Submittal

No later than 30 days following the adoption of the WSCP, and no later than July 1, 2021, the City Water Utility will submit these plans electronically to DWR through the DWR Water Use Efficiency (WUE) Data Portal (wuedata.water.ca.gov).

No later than 30 days following the adoption of the plan, the City Water Utility will submit a copy on CD to the California State Library.

No later than 30 days following the adoption of these plans, the City Water Utility will submit electronic copies to the SFPUC, Valley Water, and both the City and County of Santa Clara.

8.14.6 Public Availability

No later than 30 days following submittal to DWR, the adopted UWMP and WSCP will be posted on the City's website for public viewing at: https://www.santaclaraca.gov/our-city/departments-g-z/water-sewer-utilities/water-utility/urban-water-management-plan.

8.14.7 Amending an Adopted WSCP

This WSCP has been developed to act as a set of guidelines for steps to take during a drought/water shortage. Given the variable nature of water and the climate and the intersection of many different factors, no two drought situations will be identical, and therefore, there must be room for improvement/alteration in the way that the City responds to each individual water shortage condition as it is encountered. This WSCP is an adaptive framework that is based on the City's response to the 2012-2016 drought, but it is open to refinement and amendment as the effectiveness of current practices is evaluated, new and different conditions are experienced, and new options for drought mitigation measures (demand management, supply augmentation, etc.) become available.

Based on the results of monitoring and reporting processes described in **Section 8.12**, the City can amend the procedures outlined in this WSCP pending the approval of City Council. The City's 2020 WSCP will only be modified following notification, public hearing, adoption, and submittal as prescribed in the Water Code.

9. DEMAND MANAGEMENT MEASURES

The City has demonstrated a commitment to water conservation and recycling. The Demand Management Measures (DMMs) offered by the City are programs implemented by the City directly, in conjunction with Valley Water, or administered by Valley Water on behalf of the City. The programs administered by Valley Water are funded through the wholesale water rates paid by the City. **Table 9-1** below lists each program discussed in this chapter and indicates whether the City or Valley Water administers the program. The table also indicates programs that Valley Water administers but the City augments through local efforts. Each DMM is discussed in this chapter. An estimate of the amount of water conserved is included where a reasonable and generally accepted method of developing such an estimate exists.

Table 9-1: Demand Management Measures Implementation Matrix

Demand Management Measure	City Program	Valley Water Program Augmented by the City	Valley Water Program
Water audits and incentives		X	
Residential plumbing retrofits		X	
Distribution system	X		
Metering and commodity rates	X		
Large landscapes	X	X	
Public information	X	X	
School education	X	X	
Commercial, industrial, and institutional accounts	X		X
Conservation pricing	X		
Conservation Staff	X		X
Water waste prohibitions	X		
Home Water Use Reports	X		X
Rainwater capture	X		X
Graywater Systems	X	X	

9.1 Demand Management Measures for Wholesale Agencies

Both Valley Water and SFPUC implement DMMs to promote conservation and reduce demand on water supply: specifically, through metering, public education and outreach, and water conservation program coordination.

9.1.1 BAWSCA Conservation Programs

BAWSCA manages a Regional Water Conservation Program comprised of several programs and initiatives that support and augment member agencies' and customers' efforts to use water more efficiently. These efforts extend limited water supplies that are available to meet both current and future water needs; increase drought reliability of the existing water system; and save money for both the member agencies and their customers.

The implementation of the Regional Water Conservation Program builds upon both the Water Conservation Implementation Plan (WCIP, completed in September 2009) and the Regional Demand and Conservation Projections Project (Demand Study, completed in June of 2020). These efforts include both Core Programs (implemented regionally throughout the BAWSCA service area) and Subscription Programs (funded by individual member agencies that elect to participate and implement them within their respective service areas).

BAWSCA's Core Conservation Programs include organizing classes open to the public on topics such as water efficient landscape education and water-wise gardening, assistance related to automated metering infrastructure, and other associated programs that work to promote smart water use and practices. BAWSCA's Subscription Programs include numerous rebate programs, educational programs that can be offered to area schools, technical assistance to member agencies in evaluating water loss, and programs to train and certify contractors employed to install water efficient landscape. In total, BAWSCA offers 22 programs to its member agencies and that number continues to grow over time.

Each fiscal year, BAWSCA prepares an Annual Water Conservation Report that documents how all of BAWSCA's 26 member agencies have benefitted from the Core Conservation Programs. Additionally, the report highlights how all 26 member agencies participate in one or more of the Subscription Programs offered by BAWSCA, such as rebates, water loss management and large landscape audits. The Demand Study indicates that through a combination of active and passive conservation, 37.3 MGD (41,781 AFY) will be conserved by BAWSCA's member agencies by 2045.

9.2 Demand Management Measures for Retail Agencies

9.2.1 Legal Authority to Implement Demand Management Measures

The City Water Utility, as a municipally owned water utility, has the legal authority to implement DMMs by ordinance or resolution approved by City Council. This authority has been exercised through past implementation of DMMs and enforcement of fees and penalties.

9.2.2 Water Waste Prevention Ordinances

In July 2017, the City Council adopted a resolution and amended the City's Water Services and Use Rules and Regulations out of concern for potential drought conditions, groundwater depletion, and land subsidence. The City's resolution instituted prohibitions for irrigating ornamental turf on public street medians, irrigation of landscapes outside of newly contrasted homes and buildings in a manner inconsistent with regulations or other requirements established by the California Building Standards Commission and the Department of Housing and Community Development, outside irrigation within 48 hours of rainfall, between 9AM and 6PM, and requires hotels to give patrons the option of having linens laundered daily. Prohibitions implemented by the City previous to this resolution include:

- Serving water in restaurants except upon request
- The application of potable water to outdoor landscapes in a manner that causes runoff.
- The application of potable water to driveways and sidewalks
- The use of potable water in a decorative fountain unless the water is part of a recirculating system
- Installation of a single-pass cooling system
- Construction of a non-recirculating conveyor car wash
- Using a hose without a positive shutoff valve to wash cars, buses, boats, or trailers
- Water waste due to broken or defective plumbing, sprinkler, watering, or irrigation systems.

Violation of these provisions may escalate to installation of a flow restricting device upon the water service lines and cumulative fines. The Municipal Code is included as **Appendix O.**

9.2.3 Metering

The City requires meters on all connections to both the potable and recycled water distribution systems. Currently, there are no known unmetered connections to either distribution system.

All new commercial, industrial, and multi-family developments are required to have dedicated water meters and separate accounts and meters for landscape irrigation. Retrofit assistance has been offered for those facilities that wish to convert mixed-use water services to separate metering for landscape and indoor water use. The retrofit assistance includes a rebate for the cost of the water meter and is offered through Valley Water.

9.2.4 Conservation Pricing

The City Water Utility charges a set price per unit of potable water, referred to as a uniform volume charge. Residential, multi-family, commercial, institutional, and industrial customers (26,000 service connections) currently all pay the same rate per hundred cubic feet (HCF) of potable water. A monthly minimum charge varies based on meter size. The current potable water rate and minimum charges for each meter size are available on the City's website.

The City Water Utility has 33 miles of recycled water pipe with approximately 280 recycled water customers and also charges a set price per unit of recycled water. Recycled water is priced substantially lower than potable water to encourage its use. The City encourages and requires use of recycled water for irrigation and facilities when applicable such as dual plumbed facilities, irrigation for residential front yards, parks, schools, golf courses industrial/commercial applications for cooling. Similar to potable water services, a monthly minimum charge varies based on recycled meter size. The current minimum charges for each recycled meter size are available on the City's website. All recycled water customers pay the same rate per hundred cubic feet (HCF) of recycled water, pricing information is available on the City's website. In 2018, the City was recognized by California Municipal Utilities Association for its Recycled Water Program Retrofit for Development.

This existing rate structure for both potable and recycled water facilitates conservation since customer bills vary directly with the level of water usage.[56]

9.2.5 Water Conservation Staffing

The City's water conservation staffing resides within the Compliance division of the Water and Sewer Utilities department. Within the Compliance division, four specific positions perform water conservation duties. These positions are Compliance Manager, Water Resource Planner, Code Enforcement Technician, and Staff Aide. The proposed as-needed Water Conservation Technician position will develop outreach and coordinate with Valley Water, SFPUC, BAWSCA, internal Sustainable working group, Sustainability Manager and Water and Sewer Utilities staff to ensure water conservation policies are properly implemented.

- **Compliance Manager:** The Compliance Manager position is responsible for managing the following programs: demand side management programs for the water utility; water quality program; and environmental, health, and safety programs.
- **Water Resource Planner:** The Water Resource Planner is responsible for control and administration of existing water supply programs; long range water supply planning; drought contingency planning; supervision and promotion of conservation programs directed to private and commercial customers; as well as financing and budgeting for the water conservation programs.

[56] Principles of Water Rates, Fees and Charges, AWWA M1 Manual, Fifth Ed., p. 87

- **Code Enforcement Technician:** The Code Enforcement Technician's primary responsibility is to assist with promote promotion of recycled water, including program outreach, marketing, and assisting with permitting sites for recycled water use and code enforcement. This staff member also investigates water waste complaints in the City.
- **Staff Aide:** This position assists with administrative function and program of the Compliance division. The position provides administrative support and customer service.

City of Santa Clara Public Information Campaigns

The City has an active public education and information program to promote water conservation, which augments Valley Water's very active public information program. This program takes the form of bill inserts, information on the customer bill, educational displays, special events, and articles and information posted on the City's Water Utility web site and included in educational materials. Permanent displays offer free literature and information about water conservation and are located at City Hall. These displays are prominently located in highly visible areas and are maintained on a daily basis. In addition, the City includes informational and educational articles in both the City-based publication *Mission City Scenes, Inside Santa Clara, City Hall Newsletter, City Manager Biweekly Report, social media notifications to residents* as well as the City newspaper *Santa Clara Weekly*. These articles cover a variety of topics including water conservation.

All utility bills include a water usage comparison to previous year's usage. In addition, each bill contains a chart showing the water usage over the previous 13 months. The utility bills have been redesigned to make the information more concise and customer friendly.

The Water Utility participates in numerous public events per year including Arbor Day/Earth Day Events, Art & Wine Festival, Public Works Week, Comic Con, elementary school events, and private company events. Due to the COVID-19 outbreak, the Utility was unable to participate in public events in 2020 due to cancellations and in the interest of public health and safety. The Water Utility has a number of educational displays that are used in conjunction with educational handouts, games, and interactions with staff to raise awareness around water conservation. The Water Utility also uses public events as an opportunity to distribute conservation devices. The Water Utility will reinitiate participation in these events once they resume and it is safe to do so.

Additionally, the Water & Sewer Utilities have participated in the promotion of water conservation through things like the US Environmental Protection Agency's "Fix-a-Leak Week" and Imagine a Day Without Water, as well as Water Professionals Appreciation Week. Through social media posts and articles in City publications, the Utilities are reaching out to employees, residents and businesses regarding the efforts by the City to conserve this precious resource and giving customers concrete tools to conserve water.

Valley Water Public Information Campaigns

Valley Water participates in outreach activities which include multi-media marketing campaigns directed at the diverse county population, website development and maintenance, social media, publications, public meetings, staff participation at community events, interagency partnerships, corporate environmental fairs, professional trade shows, water conservation workshops and seminars, and a speaker's bureau. Outreach efforts focus on supporting customers and key stakeholders to minimize adverse impacts resulting from drought conditions, as well as advancing community knowledge, awareness, and understanding of the conservation and water supply services provided by Valley Water.

Valley Water implemented broad-based advertising programs, participated in community events, collaborated with water retailers to develop outreach materials, and reached non-English speaking residents to ensure they were informed about water issues. Valley Water's multi-ethnic outreach expanded beyond translating existing outreach materials to targeting media stories, coverage, and paid advertisements specifically to their communities.

Valley Water's public outreach efforts also include social media and updates to its water conservation program website (www.watersavings.org). The website is updated throughout the year to include the latest program information, new reports/studies, and updates on our workshops. In addition, Valley Water produced and distributed collateral material, including program flyers, free shower timers and other conservation devices, posters, yard and garden signs, restaurant signs for only serving water upon request, and hotel signs encouraging the occupant to reuse their linens.

The most recent outreach campaign that Valley Water promoted ("Yards Have Evolved") focused on encouraging residents to take out their high-water using plants and replace them with low-water using plants. This campaign, which was developed in 2019, featured ads in English, Spanish, Vietnamese and Chinese and included print, online/mobile, social media and radio ads.

In the spring of 2018, Valley Water embarked on an effort to establish a Community-Based Social Marketing strategy to supplement the Conservation campaign. Community-Based Social Marketing, or CBSM for short, is a strategy designed by behavioral scientists (sociologists, psychologists, etc.) to obtain behavior change by removing barriers and establishing social norms. CBSM was initially designed to enhance sustainable and environmentally conscious behaviors. Valley Water's Conservation CBSM Campaign had two objectives: to increase the number of participants in the Landscape Rebate Program (discussed in **Section 9.4.2**) and specifically increase lawn conversions; and to increase the number of Graywater Rebate Program (discussed in **Section 9.4.2**) participants. Valley Water employed a variety of outreach methods. An evaluation of these methods is expected to be completed in 2021.

Landscape Summit. Starting in 2016, Valley Water has annually held the Landscape Summit, an event developed through Valley Water's Landscape Committee as a forum for landscape professionals to learn about water issues in the county and California as a whole, and how water relates to the landscaping industry. It is also an opportunity for Valley Water to get valuable feedback from landscape professionals, and for attendees to collaborate and exchange ideas. The 6th Annual Landscape Summit was held virtually on February 25, 2021.

Nursery Program. To increase the public's awareness of water-efficient gardening techniques, Valley Water developed the Nursery Program in 1995. This program distributes, at least quarterly, a series of educational materials to nurseries, irrigation supply stores, and box store retailers throughout the county. To display the materials, the program includes literature racks offering free informational materials about water-wise gardening, efficient irrigation techniques, drought-resistant plants, drip irrigation, and Valley Water's water conservation programs. In future program years, the literature racks may ultimately be replaced or supplemented with digital resources that would not need to be replenished as regularly. The Nursery Program literature is currently being distributed to and displayed at more than 30 participating nurseries and vendors. The display, however, has been placed on a temporary hold due to COVID-19 restrictions.

Watershed Approach to Landscaping. Valley Water is partnering with a vendor to develop a comprehensive sustainable landscaping guide, Watershed Approach to Landscaping, that is targeted toward residential audiences, landscapers, and irrigation professionals new to sustainable landscape practices. This guide will be ready in early 2021 and will cover how-to and best practice information on building a healthy living soil, selecting local, climate-appropriate, water-wise plants, upgrading to high-efficiency irrigation equipment, capturing rainwater, and reusing graywater.

Demonstration Gardens. Demonstration gardens can inspire community members to incorporate sustainable, ecological, or water-wise plants and techniques into their landscaping. Valley Water has maintained a list of water-wise and California-native plant demonstration gardens to help guide community members in converting their own gardens to be more water-efficient. In 2017, Valley Water created an interactive map that is regularly maintained. This map allows anyone to find demonstration gardens near their home or work by entering an address.

In 2013, Valley Water converted all rotors and sprinklers to in-line drip as part of an on-site demonstration garden on Valley Water's campus. This garden includes plant signs informing the public of the species name and water requirements of the plants on campus. An interactive map, which geotags the labeled plants, was also created for Valley Water's demonstration garden. Visitors can use the interactive map while doing a self-guided walking tour of Valley Water's campus. In the future, Valley Water plans to launch an upgrade of its current demonstration garden to emphasize water-wise, California-native plants and rainwater capture techniques, in addition to efficient irrigation on site.

Workshops. Over the last five years, Valley Water promoted water conservation through workshops and trainings throughout the community. Examples of these include Graywater Laundry to Landscape workshops (see **Section 9.4.2**) and presentations to schools, local universities, industry association gatherings, nursery staff, community gardens, native plant society members, corporate events, local Master Gardeners, PG&E's Water Conservation Showcase, and many more. On average, Valley Water conservation staff give about thirty presentations each year.

Because so many sustainable landscaping events take place throughout Santa Clara County and are sponsored by multiple agencies, Valley Water was instrumental in developing and administering the South Bay Green Gardens website (www.southbaygreengardens.org). This site was started as a place where all of the public agencies and organizations in the county could promote their events, workshops, etc. The page has become a one-stop shop for information not just on these events, but on all aspects of sustainable landscaping such as pest management, rainwater management, soils and composting, and much more. Valley Water helps fund this site and co-chairs the committee which manages it. The committee includes information about multiple benefits in the site, such as pesticide reduction, water conservation, waste reduction through composting, and stormwater management, in order to show integration of these issues. Additionally, Valley Water staff update the site and make sure the events pages are current.

Bay Area Qualified Water Efficient Landscaper Trainings. In 2019, Valley Water joined with a number of other Bay Area water agencies and the California Water Efficiency Partnership (CalWEP) to create the Bay Area Qualified Water Efficient Landscaper Training (BayQWEL). This regional effort is a professional certification program designed for landscape designers, landscape supervisors, maintenance and irrigation technicians, and park maintenance staff with a focus on water-saving sustainable landscaping techniques. The trainings were initially offered in-person from 2019 to early 2020 in English and Spanish, then adapted to an online curriculum following COVID-19 Shelter-in-Place restrictions later in 2020. Those who become QWEL certified by passing the exam and completing the irrigation audit will be listed as an industry pro on the QWEL website. A total of four online trainings have been offered in 2020, with two more scheduled for early 2021. Additional classes will be scheduled throughout 2021, including the first online Spanish version in March.

Going Native Garden Tour. To showcase exemplary native plant gardens, Valley Water has been a sponsor of the Going Native Garden Tour every spring since 2003. Each year, thousands of participants visit upwards of 60 gardens. These native plant gardens demonstrate the beauty and efficiency of well-maintained native gardens to residents of Santa Clara and San Mateo counties. In addition to showcasing native plants, at least one garden offers native plants for sale each year. In 2020, the tour went completely online, with live garden tours which subsequently were posted as videos online.

Community Events. Each year, Valley Water staff education booths and activities at public events, libraries and STEAM (Science, Technology, Engineering, the Arts and Mathematics) fairs, providing water education to over 12,800 members of the public. During 2020, Valley Water's Education Outreach program developed a series of virtual presentations and transformed ten hands-on programs into distance-learning presentations. This has enabled Valley Water to continue to engage with public audiences and deliver water education during the COVID-19 pandemic.

School Education Programs

Valley Water's Education Outreach (EO) program was established in 1995 and has a team of two full-time and 4 part-time staff and student interns that develop and implement water education programs. EO provides free grade-level appropriate classroom presentations, puppet shows, and tours of Valley Water facilities to schools, visitor groups and residents within Santa Clara County. The objective is to educate pre-school through college students and residents about water with a focus on water conservation, water supply, watershed stewardship, pollution reduction, flood preparedness, and careers in the water field. EO also provides free education materials to educators, including workbooks and videos, as well as providing hands-on water education training. These educator trainings include both Project WET (Water Education for Teachers) and EO programs that enable educators to lead their own classroom activities to inform their students on water-related topics.

Over the last five years, Valley Water's EO program has reached an average of 15,000 students per year, engaging a total of 75,698 students between 2016 – 2020. EO has supported over 2,900 educators through classroom presentations and tours and provided 20 educator trainings that focus on hands-on water-based science. Students from over 2,300 classrooms have participated in hands-on, Next Generation Science Standards-aligned programs and tours of Valley Water's Outdoor Classrooms and facilities. Examples include lessons using puppet shows and storytelling for pre-K and early elementary students and using hands-on science activities and career development information for middle school, high school, and college students.

9.2.6 Distribution System

The City tracks the difference between water produced or purchased and the amount of water billed to its customers. The difference is referred to as billed authorized consumption. Authorized consumption also includes water used for hydrant flushing, leaks, firefighting, street cleaning, and reservoir overflow, quantities that are typically estimated. Apparent losses are water losses due to unauthorized consumption, customer metering inaccuracies, and systematic data handling errors. Real losses are the difference between authorized water losses and apparent losses, which results in estimated losses due to leaks in the distribution system or service connections. The City has an aggressive response to reports of leaks within the distribution system. Leaks are repaired generally within eight hours or less upon discovery.

In addition, the City has an aggressive program for potable water main rehabilitation. Areas where leaks and main breaks occur at a higher frequency are put on a list and prioritized for replacement. The City replaced 45,900 feet of water mains between 2016 and 2020 as part of the Utility's Capital Improvement Program (CIP). The City plans to replace 10,000 feet annually, on average, of distribution system pipeline as part of the next five-year CIP. This includes replacing backflow preventers, hydrants, meters, and related appurtenances. These improvements will continue to maintain a low percentage of unaccounted for water system wide and assure safe, high-quality drinking water is delivered to customers.

Suppliers must report their distribution system water losses in the UWMP consistent with the AWWA method as described earlier in **Chapter 4**. Water loss being the difference between water supplied and authorized consumption (unbilled and billed) as outlined in the audit reports submitted to DWR. The total water loss is reported as a percentage of total water supplied. These programs have resulted in an average water loss of 6.0% for the last five years.

California Water Code section 10608.34 requires urban retail water suppliers to submit a water loss audit report for the previous calendar/fiscal year. In conjunction with the water loss audit report, the code also adresses the need to implement water loss detection programs to minimize water waste through system leaks. The SWRCB is reponsible for developing water loss performance standards for retail water suppliers. However, suppliers that have already achieved low levels of real loss, based on criteria determined by the SWRCB, will not be required to submit responses to questionnaires on water loss or further reduce water loss. As discussed in **Chapter 4**, the current proposed standards for low real loss require a supplier to maintain loss: at or below 16 gallons per connection per day or 1,184 gallons per mile per day.[57] Based on real losses reported in previous water loss audits and current unaccounted for water for 2020, the City, as with most water retailers, would be required to participate in SWRCB's developing water loss performance standards.

9.3 Implementation over the Past Five Years

Implementation of DMMs over the past five years is discussed in **Section 9.4**.

9.4 Planned Implementation to Achieve Water Use Targets

9.4.1 Water Audits and Incentives

Residential Surveys

Water Use Reports. Water use reports have been shown to be effective at encouraging residents to save water. In Fiscal Year (FY) 2013-14, Valley Water started a program to share costs with the local water retailers City of Palo Alto Utilities Department, City of Santa Clara Water Department, City of Morgan Hill, Gilroy Community Services Department, and San José Municipal Water System on home water use reports. Since the start of this cost sharing program, over 300,000 sites have received water use reports in the City. The City plans to continue to participate in this program with Valley Water.

Water Wise House Call Program. Valley Water is the administrator for the City and County residential Water Wise Survey Program, formerly known as the Water Wise House Call Program. As the administrator of this program, Valley Water developed and implemented a strategy to target and market water-use surveys to single-family and multi-family residential customers throughout most of Santa Clara County including the City. The City's Water Wise Outdoor Surveys from FY16-17 to FY19-20 are shown in **Table 9-2** below.

Table 9-2: Water Wise Outdoor Survey Program					
Water Wise Outdoor Surveys					
Fiscal year	2016/2017	2017/2018	2018/2019	2019/2020	Total
Total	9	24	18	5	56

[57] California Water Board. Water Loss Performance Standards Fact Sheet. https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/docs/waterlosscontrol/2020/waterlossperformancestandards_factsheet_18november2020.pdf

Valley Water's program included educating the customer on how to read a water meter; checking flow rates of showerheads, faucet aerators, and toilets; installing low-flow showerheads, faucet aerators and toilet flappers if necessary; checking for leaks; checking the irrigation system for efficiency (including leaks); measuring landscaped area; developing an efficient irrigation schedule for different seasons; and providing the customer with evaluation results, water savings recommendations, and other educational materials. In 2004, Valley Water began programming a homeowner's controllers as well (i.e., if allowed by the homeowner, the surveyor will input the recommended schedules into the controller). Valley Water increased program efficiency and participation by using landscape measurements from this program as an initial qualifying step for the Landscape Rebate Program, for those who chose to participate in both programs.

In 2017, Valley Water's free water audit program was replaced by a two-part program, the Water Wise Survey Program. The two-part program offers in-person Water Wise Outdoor Surveys and Do-It-Yourself (DIY) Water Wise Indoor Surveys, as described below.

Water Wise Survey Program. The outdoor portion of the Water Wise Survey Program is similar in concept to the Water Wise House Call Program's outdoor water audit. Water Wise Outdoor Survey Program offers a free, comprehensive consultation from a trained irrigation professional to single-family and small multi-family sites (under ½ acre of landscape area) in Santa Clara County, including the City, with a working irrigation system. The consultation includes evaluating the irrigation system, flagging issues onsite, identifying rebate programs for which participants may also qualify, and creating a custom report detailing the survey findings.

The DIY Water Wise Indoor Surveys Program offers free showerheads, aerators, and toilet flappers to anyone who completes a companion survey form. A physical kit is available in English, Spanish, Chinese, and Vietnamese; additionally, a virtual kit is available. Companion videos are offered to guide customers through the DIY survey steps. Customers must first share their current fixtures that are high water use before Valley Water sends them a free low-flow device. Due to low response rates, Valley Water may cease this requirement to encourage greater participation in this program. The DIY kits are available to single-family and multi-family residential properties throughout Santa Clara County, including the City. More than 200 kits have been distributed by the City since 2016.

Fixture Distribution. Valley Water also distributes high-quality, low-flow showerheads and faucet aerators to community members through water retailers, including the City, and public events. Since FY14-15, more than 3,000 low-flow showerheads and aerators have been distributed throughout the City.

Valley Water plans to continue offering free showerheads and aerators through its DIY Water Wise Indoor Surveys, its water retailers, and various outreach events to meet the region's long-term water conservation goals.

Residential and Commercial Landscapes

Residential irrigation surveys are an integral part of the Water Wise Survey Program, as described above in detail.

Through the Valley Water Landscape Rebate Program, the City's residential (and commercial) properties with qualifying high water consuming landscape can receive rebates for converting to qualifying low water consuming landscape. The Valley Water Landscape Rebate Program is discussed further in **Section 9.4.2**.

The City is also on the cutting edge of using recycled water for irrigation of common areas and the front yards of single-family homes. Since September of 2004, the Rivermark development, a planned community of over 3,000 residences, has been irrigating the common area landscaping and front yards of all the homes with recycled water.

The City offers various programs to residents and those that maintain single family landscapes to promote water conservation and to serve as a means of ensuring that single-family dwellings are irrigating in an efficient manner. These programs are available through Valley Water and discussed previously in **Section 9.2.5**.

The programs described above are expected to continue as a means of ensuring that single-family dwellings are irrigating in an efficient manner.

Residential Water Leak Check

The City offers free leak checks to residential customers. A trained technician is sent to the residence to assist in determining if a leak exists at the property. Although the City has offered free leak checks for its residents for many years, the City only began tracking the number of leak checks performed since 2003. Since 2015, the City has performed 2,383 leak checks.

The City Finance department monitors customer accounts for higher-than-average water usage. Accounts that are found to have a higher-than-average water usage are referred to the Water Utility for follow up. Water meter readers also report accounts with obvious signs of leakage, or if the water meter appears to be running when the residence does not appear to be occupied. Follow up typically consists of one or more of the following: the water meter is re-read to confirm the high usage, a phone call to the resident to advise them of the higher-than-average usage, and/or the resident is offered a free leak check.

Residential Plumbing Retrofits

The City has distributed free low flow showerheads, faucet aerators, dye tablets for detecting toilet leaks, and automatic shut-off hose nozzles. These items are distributed through public events, field technicians, the Water Wise Survey program, and at the Water Utility offices in City Hall.

Since 2015 the City has distributed 911 water conservation devices through direct distribution. Additional water conservation devices were distributed through the Water Wise House Call program detailed above. The City plans to continue the distribution of free water conservation devices to residents that request them.

Large Landscapes

Large Landscape Program. The Large Landscape Program (formerly known as the Landscape Water Use Evaluation Program or LWUEP) launched in May 2014. All sites enrolled in the program receive a monthly water usage report. The reports provide an objective evaluation of a site's water use at a glance for every billing period. Various data inputs, including irrigated area, vegetation types, type of irrigation system, and daily weather (evapotranspiration minus effective rainfall) are included in a detailed calculation to develop the water budgets. Sites are encouraged to share the monthly reports with everyone involved in landscape decision making at the site, including the bill payer, site manager, landscape contractor and board members. Sites are also eligible to receive a complimentary on-site landscape field survey by an irrigation expert and receive a thorough investigation of the site's irrigation issues.

A total of 557 sites were enrolled in the program at its outset from the following water retailer service areas: Cities of Gilroy, Mountain View, Palo Alto, Sunnyvale, and Santa Clara. By the end of mid-2015, 1,050 sites were active in this program. In 2020, there are 3,000 active sites that include both potable and recycled water landscapes. Representing 91% of Valley Water's service area, the full list of participating water retailers includes the original five service areas mentioned above as well as the Cities of Milpitas and Morgan Hill, San José Municipal Water, and San Jose Water. Nearly 122,000 water-use reports and monthly budgets have been distributed. Valley Water's vendor works closely with participating water retailers to market and leverage the services offered through this program for participating sites.

As of the end of 2019, the sites enrolled in Valley Water program were saving 31% on irrigation usage compared to 2013 usage. Valley Water will continue to offer and expand this program in the future to reach the region's long-term water conservation goals, particularly with regards to opportunities for this program to assist compliance with elements of AB 1668/SB 606.

Recycled Water Retrofits. In addition, the City evaluates large area landscapes for conversion to recycled water. Large landscapes are typically the most economical to convert to recycled water. The routes of recycled water mains were determined in part by the concentration of potential customers along the pipeline routes. Since 2016, the City has reduced potable water demands by approximately 400 AF through recycled water retrofits.

The City also has Water Service and Use Rules and Regulations ordinance regulating conservation in landscaping. This ordinance applies to all new and rehabilitated landscaping for public agency projects and private development projects that require a permit and developer-installed landscaping for single-family and multi-family projects. A copy of this ordinance is included in **Appendix O**.

The City plans to continue to offer both Valley Water's Landscape Water Use Evaluation Program and recycled water to customers with large landscape areas.

Lawn Busters Program

In September 2015, Valley Water executed an Agreement with Our City Forest (OCF), a local non-profit organization, to provide $340,000 to fund OCF's Lawn Conversion Program (Lawn Busters Program). Lawn Busters Program is designed to provide a low cost, expedient option for low-income, elderly, disabled or veteran homeowners and institutions within disadvantaged communities throughout Santa Clara County who wish to convert their lawns to low-water using landscape. In targeting these hard-to-reach sectors, the Lawn Busters Program is intended to help Valley Water meet its short-term drought response goals as well as its long-term water conservation goals. By partnering with OCF, Valley Water combines resources and implements the program more cost-effectively than would be possible otherwise.

Since the start of the Lawn Busters Program, Valley Water added $110,000 to the contract, for a total of $450,000, and OCF has converted roughly 200,000 square feet of lawn to low-water using landscape.

Landscape Maintenance Consultation Program

The Landscape Maintenance Consultation Program, started in May of 2018 by Valley Water, was developed based on recommendations from Valley Water's Landscape Committee as a way to help Landscape Rebate Program (see **Section 9.4.2**) participants learn how to properly maintain their newly converted low water use gardens. To date, 715 residential rebate customers have participated in the program, with 27 of the consultations due to City customers. During the free, one-hour consultation, the customer has an opportunity to walk through their garden with a landscape professional, reviewing site specific recommendations for plant maintenance and pruning, soil health, pest management, and irrigation scheduling and maintenance. The Landscape Maintenance Consultation Program will continue to be offered to new rebate program participants whose gardens are at least one year established.

Financial incentives

The City currently offers rebates to encourage the implementation of water efficient fixtures and landscape. A number of Valley Water programs are also offered either through the City or directly by Valley Water to customers across Santa Clara County. Both City and Valley Water rebate programs are discussed in more detail in the following section.

9.4.2 Rebate Programs

During the previous drought, the City and Valley Water allocated additional funding to increase select rebate programs: Landscape Rebate Program, Graywater Program, and Commercial Rebate Program. These increases remained in place until funding was depleted and accomplished their goals of increasing program participation as described within this chapter.

High Efficiency Clothes Washer Rebate

Valley Water offered a residential high-efficiency washer rebate between July 1995 and December 2016. In October 2001, Valley Water began participating in the regional Bay Area Water Utility Clothes Washer Rebate Program, which has been successfully partnering with PG&E between January 2008 and December 2016. To address concerns for local water quality, washers that utilized silver-ion technology did not qualify for this program regardless of their efficiency. In mid-2014, a multi-tiered combined rebate was implemented to transition program participants to more stringent fixture standards:

- Purchasing Energy Star Most Efficient (ESME) washers resulted in the combined rebate increasing to $200 ($125 of which was from Valley Water).
- Purchasing the Consortium for Energy Efficiency's (CEE's) Tier 3 washers received a reduced Valley Water contribution of only $50 with the goal of promoting washers that qualify for the more efficient standard.

In January 2015, qualifying standards were adjusted to streamline requirements to only rebate for qualifying ESME washers at a combined rebate of $150 ($100 of which was from Valley Water) until the program ended on December 31, 2016.

Valley Water approved more than 177,000 rebates during the program's history. In the final 18 months of the program, nearly 9,000 rebates were approved. From FY14-15 until the end of the program, approximately 560 residential rebates were distributed in the City. The program ended in response to the vast improvement of federal Energy Star program's efficiency standards over the years. By the end of the program, Valley Water's Water Conservation Savings Model estimated nearly 60% of all single-family homes had efficient clothes washers within its service area.

High Efficiency Toilet Rebate Program

Valley Water had provided incentives for the retrofit of approximately 244,000 residential toilets from 1992 through June 2003. In 2004, Valley Water shifted to a high-efficiency toilet (HET) program, and between 2004 (the first year of the program) and 2013, Valley Water rebated approximately 16,000 HETs. In response to the State of California's new requirement that all toilets sold or installed in the state flush at 1.28 gallons per flush (gpf) or less, January 2014 marked the beginning of Valley Water's strictest standard yet for HETs to qualify for the rebate program - only Premium HETs would qualify for the $125 rebate. Premium HETs save nearly 15% more water than the state standard of 1.28 gpf by using only 1.1 gpf with superior flush performance (at least 600 grams per flush as evaluated by an independent group under standardized conditions).

Between 2004 and 2016, Valley Water issued over 26,400 HET rebates in total since this iteration of Valley Water's high-efficiency toilet rebate began in 2004. From FY14-15 until the end of the program in 2016, 51 HET rebates were issued in the City. The program was phased out in 2016 to reprioritize funds to other programs with greater opportunities for water savings.

Submeter Rebate Program

Beginning as a pilot in 2001 and extended in 2008, this program provides a rebate (in FY16, the rebate amount increased from $100 to $150) for every submeter installed at multi-family housing complexes, such as mobile home parks and condominium complexes. Individual well owners and homes on a shared well also qualify.

Water use records from participating mobile home parks showed an average water savings of 23% per mobile home in a pilot study. This program has issued over 7,170 rebates to date. Valley Water plans to continue to offer this program in the future to reach the region's long-term water conservation goals.

Landscape Rebate Program

In 2019, the City started funding with $100,000 annually for the landscape rebate program in partnership with Valley Water. The Landscape Rebate Program is designed to assist homeowners and commercial, industrial and institutional property owners increase their outdoor water use efficiency by converting qualifying high water use landscape and/or upgrading to qualifying high efficiency irrigation equipment. Simple changes in plant type and irrigation methods can greatly reduce the water required for an attractive landscape. There are many plants that use surprisingly little water. There are also several irrigation equipment upgrades that can increase your irrigation system's efficiency which can result in saving water and saving money. Valley Water's Landscape Conversion Rebate Program offers $1.00 per sq. ft. for converting high water using landscape (i.e. irrigated turf or functional swimming pool) to low water using landscape. The City offers an additional $1.00 per sq. ft. for conversion of high water using landscape.

Valley Water began to focus on water efficient landscapes by launching a version of the program in early 2005. The original program offered rebates to residential and commercial sites for the replacement of approved high-water using landscape with low-water use plants, mulch and permeable hardscape. Participants could receive up to $0.75 per sq. ft. of irrigated turf grass with a maximum rebate of $1,000 and $10,000 for residential and commercial sites respectively. In an effort to expedite program participation, Valley Water's Board approved doubling the maximum rebate from $1,000 to $2,000 for residents and from $10,000 to $20,000 for commercial sites in March 2009. The rebate cap for commercial, institutional, and multi-family (5 or more units) sites was then increased to $50,000 on January 1, 2020. Cost sharing agreements increase the rate per square foot and rebate cap in some areas.

Currently, any qualified property in Santa Clara County with qualifying high-water using landscape can receive rebates for converting to qualifying low water using landscape with a minimum of 50% qualifying plant coverage; 2 to 3 inches of mulch; and a conversion from overhead irrigation to drip, micro spray, bubbler, or no irrigation. In January 2014, the Landscape Conversion rebate was increased from $0.75 per sq. ft. to $1.00 per sq. ft. However, in April of 2014 in direct response to the drought, Valley Water's Board approved adding funding to the program to support a rebate of $2.00 per sq. ft. with no maximum rebate. On July 1, 2016, the rebate rate returned to $1 per sq. ft. and the rebate caps were reinstituted.

Valley Water continued to experience unprecedented increases in terms of rebate amounts as well as participation and interest from the community through the end of the drought and into FY2020. From July 2015 to June 2020, over $14.3 million dollars was rebated for approximately 8.3 million square feet of conversion. Through June 2020, Valley Water has rebated for over 12.7 million square feet of landscape conversion. In the City alone, more than 400,000 sq. ft. of turf was replaced with water efficient landscapes since FY14-15. The City, in partnership with Valley Water, plans to continue to offer this rebate in the future in order to reach the region's long-term water conservation goals.

Graywater Laundry to Landscape Rebate Program

In the last five years, Valley Water issued 40 graywater rebates (launched in 2014) and funded the direct installation of 71 graywater systems (launched in 2019). Since the program launched, 124 total graywater systems have been installed. In the City alone, 7 graywater rebates were issued and 9 graywater systems were directly installed.

Valley Water's Graywater Laundry to Landscape (L2L) Rebate Program rebate amount started at $100 in 2014, and in response to the drought, increased to $200 a few months later. In addition to providing a rebate for properly connecting a clothes washer to a laundry-to-landscape system, the graywater program also provides information, resources, and workshops on graywater. Resources include maintenance steps, detergent information, finding contractors, increasing awareness of local nonprofit organizations that specialize in graywater, and educating constituents on important factors to consider with more complicated graywater systems (e.g., branched-drain graywater and whole house graywater systems) even though rebates for those options are not currently offered.

Graywater use in irrigated landscapes decreases potable water use by approximately 17 gallons per person per day or 14,565 gallons per household (on average), depending on the site and system design. California Plumbing Code (CPC) does not require a permit for installing an L2L system. However, the CPC is specific as to how L2L systems can be installed, and Valley Water's rebate's eligibility requirements are framed to meet those specifications. Additionally, to protect public health and safety, prior to giving project approval, Valley Water checks each applicant's property's depth to groundwater. At post inspections, applicants must demonstrate adherence to the CPC's specifications to help ensure graywater does not pool or drain to their neighbors' properties.

In 2019, Valley Water in partnership with a local non-profit organization, Ecology Action, launched a training program for landscape professionals and a Graywater Direct Installation Program for underserved community members, including low-income individuals, people 60 years or older, US veterans, and people with disabilities. The Green Gardener Graywater Installer Certification Program trained 20 professionals to install L2L graywater systems. Between June 2019 and June 2020, the direct installation service assessed 307 properties and installed 71 L2L graywater systems. Over 31,660 square feet of medium- and high-water use landscapes were converted from potable irrigation to graywater.

Rain Barrel Rebate

In March of 2018, the City began offering the Rain Barrel Rebate to promote the capture of rainwater for use on lawns, gardens, and indoor plants. Currently City residential property owners can receive up to $100 of direct reimbursement or utility bill credit for rain barrels with a minimum capacity of 50 gallons. Since the start of the program in 2018 the City has issued 17 rain barrel rebates. The City plans to continue to offer this rebate in the future to achieve the region's long term water conservation goals.

In-Line Drip Irrigation Rebate

Valley Water also provides an irrigation rebate for Santa Clara residential and commercial properties for converting from overhead sprinklers to inline drip irrigation systems. The purpose of the rebate is to encourage the use of in-line drip irrigation in existing shrub, perennial or annual planting beds instead of inefficient overhead sprinklers. The current rebate amount for converting to in-line drip irrigation is $0.25 per sq. ft. Since the start of the program in FY17-18 the City has provided more than 2,000 rebates for conversion to inline drip irrigation systems. The City plans to continue to offer this rebate in the future to achieve the region's long term water conservation goals.

Irrigation Equipment Upgrades Rebate

Valley Water provides rebates for irrigation equipment as summarized in **Table 9-3**.

Table 9-3: Valley Water Landscape Rebate Program Irrigation Equipment Rebates

Qualifying Hardware and Rainwater Capture Projects	Maximum Rebate Amount per Unit
Rain Sensors	$50
High-Efficiency Nozzles	$5
Rotor Sprinklers or Spray Bodies equipped with Pressure Regulation or Check Valves	$20
Dedicated Landscape Meters, Flow Sensors, or Hydrometers	$1,000
WBICs, 1-12 Stations	$300
WBICs, 13-24 Stations	$1,000
WBICs, 25+ Stations	$2,000
In-Line Drip Irrigation[1] (converting from sprinklers in existing shrub, perennial, or annual planting beds)	$0.25 per square foot
Cisterns (200 gallons or more)	$0.50 per gallon
Rain Gardens	$1 per sf of root area converted[2]

Notes:
[1] Converts sprinklers in existing shrub, perennial, or annual planting beds
[2] Up to $300 per site

Similar to landscape conversion, Valley Water's Board of Directors approved adding funding to the program during the drought to support higher rebate amounts for many of the items listed above. Due to these higher rebate amounts as well as the effects of the drought, Valley Water experienced unprecedented increases in interest and participation from the community over the last few years. While participation rates have slowed compared to the height of the drought years, FY19 and FY20 combined still show over 48,000 irrigation equipment pieces upgraded compared to pre-drought FY12 and FY13 combined numbers of 8,236 a more than 500% increase.

In the City alone, over 15,000 irrigation equipment pieces have been upgraded since FY14-15. Additionally, approximately 280 Weather-Based Irrigation Controllers (WBICs) have been installed since FY14-15. Sometimes referred to as “smart controllers”, WBICs utilize the principles of evapotranspiration or “ET” to automatically calculate a site-specific irrigation schedule based on several factors, including plants and soil type. The controller then adjusts the irrigation schedule as local weather changes to regulate unnecessary irrigation, saving up to 20% of irrigation water use when used properly. The City plans to continue to participate in Valley Water’s offer rebates for WBICs in the future in order to reach the region’s long-term water conservation goals.

9.4.3 Commercial, Industrial, and Institutional Accounts

Commercial, Industrial, and Institutional (CII) Programs

Pre-Rinse Spray Valve (PRSV) Retrofit Program. The City’s commercial PRSV retrofit program is fully administered through Valley Water. Pre-rinse spray valves are designed to remove food waste from dishes prior to dishwashing, and are often used in commercial kitchens. In previous years, Valley Water partnered with other agencies to offer a direct installation program for high-efficiency pre-rinse spray valves (PRSVs). In 2010 Valley Water purchased a quantity of PRSVs with a flow rate of 1.15 gallons per minute for distribution to commercial sites, especially those identified through Valley Water’s previous CII Water Survey Program. Since July 2015, nearly 360 pre-rinse spray valves were retrofitted, and nearly 4,950 have been installed since Valley Water began promoting these devices in 2003. Valley Water plans to continue distributing these devices to meet the region’s long-term water conservation goals.

Commercial Toilet and Urinal Programs. Valley Water has been replacing inefficient toilets in CII sites since 1994. The CII toilet rebate programs have frequently been offered in tandem with various iterations of high-efficiency urinal (HEU) programs, HET and HEU direct install programs, and retrofit programs for urinal valve installation. Since July 2015, over 7,300 HETs were installed or rebated. Additionally, since 2005, Valley Water has had a program to replace urinal flush valves of old, inefficient 1.0 gpf or more urinals with a flush valve that uses only a 0.5 gpf. Since the program was started, approximately 2,580 urinals had been retrofitted or rebated, with 464 installed in the last five years. Since FY14-15 over 800 HET’s were installed in the City and more than 130 HEU’s.

In order to increase efficiency and cost effectiveness, Valley Water created a successful pilot program in 2020 which replaced fifty-nine (59) 1.6 gpf toilets with 0.8 gpf toilets in a low-income apartment complex. This pilot will serve as the basis for a new Fixture Replacement Program to launch in 2021 to replace or retrofit toilets, urinals, and more for multi-family residences and commercial, industrial, and institutional properties.

Commercial Faucet Aerator Program. Since 2010, Valley Water has offered free 0.5 gallon per minute faucet aerators to qualifying businesses and schools. Nearly 26,800 faucet aerators have been distributed through this program, with 18,143 being distributed during the last five years. In the City alone, 151 faucet aerators were distributed since FY14-15. Much of the recent distribution is due to a direct distribution program called WaterLink, discussed below.

WaterLink Program. In collaboration with Ecology Action, Valley Water funded a program called WaterLink, a water/energy savings program that provided turnkey water/energy upgrades to residents, businesses, schools, and public agencies throughout Santa Clara County. Efforts were focused within Disadvantaged Community Census tracts (defined by scoring 76% and above using California Environmental Screening Tools version 2.0). To achieve significant water and energy savings, the WaterLink program delivered a suite of direct installation projects that produced persistent water/energy savings and tangible economic benefits by reducing utility bills. Direct installation equipment included efficient showerheads and aerators, clothes washers, pre-rinse spray valves, and ozone laundry systems. Additionally, the program included replacing turfgrass with low-water using landscape. In the City alone, over 3,700 sq. ft. of turfgrass was converted to water efficient landscape between FY16-17 and FY17-18. The WaterLink program has concluded.

Water Efficient Technology Rebate Program. The Water Efficient Technology Rebate (WET Rebate or WET Program; formerly known as the Custom/Measured Rebate Program) provides rebates for process, technology, and equipment retrofits that save water. To encourage all commercial and industrial businesses to implement permanent water reduction measures, unique projects that meet program requirements are eligible for a rebate of either $4 per hundred cubic feet (CCF) of water saved or 50% of equipment costs excluding taxes and labor, whichever is less, up to $50,000. Projects must save at least 100 cubic feet of water annually. Examples of such projects are generally unique to specific industries such as ozone laundry systems or technologies to reduce potable water use when maintaining ice rinks, with myriad other examples. In January 2014, these rebates were temporarily increased to $8 per CCF to promote participation during the drought before returning to $4 per CCF. Cost sharing agreements increase the rate and maximum rebate in some areas.

To date, Valley Water has funded 110 projects, saving approximately 680,663 CCF/year (1,563 AFY). Since 2015, the WET Rebate has helped save over 28,440 CCF per year from 12 completed projects. In 2021, Valley Water will adjust the program so that the rebate will be based on either the lesser of $4 per CCF or up to 100% of equipment costs excluding taxes and labor, up to $100,000. This doubles the potential proportion of equipment costs covered by the rebate in addition to doubling the maximum rebate. The WET Rebate continues to be one of Valley Water's most cost-effective programs in meeting the region's long-term water conservation goals.

9.5 Future Water Use Objectives

In 2018, California legislature and Governor Brown passed into law Senate Bill 606 (Hertzberg) and Assembly Bill 1668 (Friedman) which were attributed from the Making Water Conservation a Way of Life Executive Order from 2016. The purpose of these bills was to improve water conservation and drought planning through the development of new standards for indoor residential water use; outdoor residential water use; commercial, industrial, and institutional water use for landscape irrigation with dedicated meters; and water loss. These standards are currently in development by the DWR and SWRCB, and retail water suppliers will be required to stay within annual water budgets based on the standards for their service area.

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10. PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

This 2020 UWMP was prepared in 2020-2021 in accordance with the DWR Guidebook for Urban Water Suppliers (March 2021). The plan was adopted on June 22, 2021, by the City of Santa Clara City Council at a public hearing and will serve as the required UWMP for submission to the DWR, per California Water Code section 10642. See **Appendix B** for the resolutions approving the 2020 UWMP for the City.

This plan shall be implemented through the continued commitment of City Staff and Council to support and adhere to the various requirements set forth in this UWMP. This will be accomplished by continued implementation of DMMs.

10.1 Inclusion of All 2020 Data

The City's 2020 data is included in this UWMP.

10.2 60-Day Notification

The Water Code states that cities and counties must be notified that the Supplier will be reviewing the UWMP and considering amendments to the Plan. This notice must be sent at least 60 days prior to the public hearing. The City provided notices on February 19, 2021 to the agencies listed below in **Table 10-1**.

A copy of the notification is included in **Appendix A.**

10.3 Notice of Public Hearing

The public hearing notice for the 2020 UWMP was sent to the following agencies listed in **Table 10-1** and the public prior to the hearing. On two occasions, the City also published announcements of the public hearing for both this UWMP, in a notice conforming with Government Code Section 6066 and 7290 in *Santa Clara Weekly*, a newspaper of general circulation distributed free of charge to all Santa Clara residents.

A copy of the notice is included in **Appendix C**.

Table 10-1 Retail: Notification to Cities and Counties		
Agency Name	60 Day Notice	Notice of Public Hearing
City of Brisbane	☑	☑
City of Burlingame	☑	☑
City of Daly City	☑	☑
City of Gilroy	☑	☑
City of Hayward	☑	☑
City of Menlo Park	☑	☑
City of Milpitas	☑	☑
City of Morgan Hill	☑	☑
City of Mountain View	☑	☑
City of Millbrae	☑	☑
City of Palo Alto	☑	☑
City of Redwood City	☑	☑
City of San Bruno	☑	☑
City of Sunnyvale	☑	☑
City of East Palo Alto	☑	☑
San Jose Municipal Water System	☑	☑
San Jose Water Company	☑	☑
Town of Hillsborough	☑	☑
Santa Clara County	☑	☑
Alameda County Water District	☑	☑
California Water Service Company	☑	☑
BAWSCA	☑	☑
Coastside County Water District	☑	☑
Mid-Peninsula Water District	☑	☑
Estero Municipal Improvement District	☑	☑
North Coast County Water District	☑	☑
Purissima Hills Water District	☑	☑
Santa Clara Valley Water District	☑	☑
San Francisco Public Utilities Commission	☑	☑
Stanford University	☑	☑
Westborough Water District	☑	☑

10.4 Public Hearing and Adoption

The City has sought public input and comments in the preparation process for this UWMP. Drafts of the UWMP were made available for public review and comment online at (https://www.santaclaraca.gov/our-city/departments-g-z/water-sewer-utilities/water-utility/urban-water-management-plan), from February 19, 2021.

The public hearing was held on June 22, 2021 followed by formal adoption by City Council. A copy of the adoption resolution is included as **Appendix B**.

10.5 Plan Submittal

No later than 30 days following the adoption of this UWMP, and no later than July 1, 2021, the City Water Utility will submit the plan electronically to DWR through the DWR Water Use Efficiency (WUE) Data Portal (wuedata.water.ca.gov).

No later than 30 days following the adoption of the plan, the City Water Utility will submit a copy on CD to the California State Library.

No later than 30 days following the adoption of these plans, the City Water Utility will submit electronic copies to the SFPUC, Valley Water, and both the City and County of Santa Clara.

10.6 Public Availability

No later than 30 days following submittal to DWR, the adopted UWMP will be posted on the City's website for public viewing at: http://www.santaclaraca.gov/our-city/departments-g-z/water-sewer-utilities/water-utility/urban-water-management-plan.

10.7 Amending an Adopted UWMP

This UWMP will only be modified following notification, public hearing, adoption, and submittal as prescribed in the Water Code.

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11. 2020 UWMP CHECKLIST

Table 11-1 UWMP Checklist				
CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10615	A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities.	Introduction and Overview	Chapter 1	Executive Summary and Chapter 1
10630.5	Each plan shall include a simple description of the supplier's plan including water availability, future requirements, a strategy for meeting needs, and other pertinent information. Additionally, a supplier may also choose to include a simple description at the beginning of each chapter.	Summary	Chapter 1	Executive Summary and Chapter 1
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.2	Section 2.1
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.6	Section 2.2
10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan and contingency plan.	Plan Preparation	Section 2.6.2	Section 2.4; App C
10631(h)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) - if any - with water use projections from that source.	System Supplies	Sections 2.6 and 6.1	Sections 2.4 and 6.9.2
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	Section 3.1
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	Section 3.3
10631(a)	Provide population projections for 2025, 2030, 2035, 2040 and optionally 2045.	System Description	Section 3.4	Section 3.4
10631(a)	Describe other social, economic, and demographic factors affecting the supplier's water management planning.	System Description	Section 3.4.2	Sections 3.4.1 and 3.4.2
10631(a)	Describe the land uses within the service area.	System Description	Sections 3.5	Section 3.5
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	Section 3.4
10631(d)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	Sections 4.1 and 4.2

Table 11-1 UWMP Checklist				
CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10631(d)(3)(A)	Report the distribution system water loss for each of the 5 years preceding the plan update.	System Water Use	Section 4.3.2.4	Section 4.3
10631(d)(3)(C)	Retail suppliers shall provide data to show the distribution loss standards were met.	System Water Use	Section 4.2.4	Section 4.3
10631(d)(4)(A)	In projected water use, include estimates of water savings from adopted codes, plans, and other policies or laws.	System Water Use	Section 4.2.6	Section 4.4
10631(d)(4)(B)	Provide citations of codes, standards, ordinances, or plans used to make water use projections.	System Water Use	Section 4.2.6	Section 4.1.2; App D
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.4	Section 4.5
10635(b)	Demands under climate change considerations must be included as part of the drought risk assessment.	System Water Use	Section 4.5	Section 4.6
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5	Section 5.1; App E
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5% of base daily per capita water use of the 5-year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.5	Section 5.1; App E
10608.24(a)	Retail suppliers shall meet their water use target by December 31, 2020.	Baselines and Targets	Chapter 5	Section 5.1; App E
10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.2	Section 5.1; App E
10608.4	Retail suppliers shall report on their compliance in meeting their water use targets. The data shall be reported using a standardized form in the SBX7-7 2020 Compliance Form.	Baselines and Targets	Section 5.5 and App E	Section 5.1; App E
10631(b)	Identify and quantify the existing and planned sources of water available for 2020, 2025, 2030, 2035, 2040 and optionally 2045.	System Supplies	Section 6.2.8	Section 6.9
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	Section 6.2
10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought.	System Supplies	Section 6.1 and 6.2	Section 7.2

Table 11-1 UWMP Checklist				
CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought, including changes in supply due to climate change.	System Supplies	Section 6.1	Section 7.2
10631(b)(2)	When multiple sources of water supply are identified, describe the management of each supply in relationship to other identified supplies.	System Supplies	Section 6.1	Sections 6.3 and 6.5.2
10631(b)(3)	Describe measures taken to acquire and develop planned sources of water.	System Supplies	Section 6.1.1	Section 6.8
10631(b)(4)(A)	Indicate whether a groundwater sustainability plan or groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	Section 6.2; App F
10631(b)(4)(B)	Describe the groundwater basin.	System Supplies	Section 6.2.2	Section 6.2
10631(b)(4)(B)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	Section 6.2
10631(b)(4)(B)	For unadjudicated basins, indicate whether or not the department has identified the basin as high or medium priority. Describe efforts by the supplier to coordinate with sustainability or groundwater agencies to achieve sustainable groundwater conditions.	System Supplies	Section 6.2.2.1	Section 6.2
10631(b)(4)(C)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years.	System Supplies	Section 6.2.2.4	Section 6.2
10631(b)(4)(D)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2.2	Section 6.9.2
10631(c)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.2.7	Section 6.7
10631(f)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and for a period of drought lasting 5 consecutive years.	System Supplies	Section 6.2.8 and 6.3.7	Sections 6.8, 7.2, and 7.3
10631(g)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.2.6	Section 6.6

Table 11-1 UWMP Checklist				
CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.2.5	Section 6.5.1
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.2.5	Section 6.5.2
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.2.5	Section 6.5.4
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.2.5	Section 6.5.2
10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.2.5	Section 6.5.5
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.2.5	Section 6.5.6
10631.2(a)	The UWMP must include energy intensity information, as stated in the code, that a supplier can readily obtain.	System Supplies, Energy Intensity	Section 6.4 and Appendix O	Section 6.10
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.2.4	Section 7.2.4
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability.	Water Supply Reliability Assessment	Chapter 7.2	Section 7.1
10635(a)	Service Reliability Assessment: Assess the water supply reliability during normal, dry, and a drought lasting five years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.3	Section 7.2
10635(b)	Provide a drought risk assessment as part of information considered in developing the demand management measures and water supply projects.	Water Supply Reliability Assessment	Section 7.3	Section 7.4
10635(b)(1)	Include a description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts 5 consecutive years.	Water Supply Reliability Assessment	Section 7.3	Section 7.4.2

Table 11-1 UWMP Checklist				
CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10635(b)(2)	Include a determination of the reliability of each source of supply under a variety of water shortage conditions.	Water Supply Reliability Assessment	Section 7.3	Section 7.2 and 7.3
10635(b)(3)	Include a comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.	Water Supply Reliability Assessment	Section 7.3	Section 7.2
10635(b)(4)	Include considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.	Water Supply Reliability Assessment	Section 7.3	Section7.3
10632(a)	Provide a water shortage contingency plan (WSCP) with specified elements below.	Water Shortage Contingency Planning	Chapter 8	Chapter 8
10632(a)(1)	Provide the analysis of water supply reliability (from Chapter 7 of Guidebook) in the WSCP	Water Shortage Contingency Planning	Chapter 8	Section 8.1
10632(a)(10)	Describe reevaluation and improvement procedures for monitoring and evaluation the water shortage contingency plan to ensure risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented.	Water Shortage Contingency Planning	Chapter 8.10	Section 8.13
10632(a)(2)(A)	Provide the written decision-making process and other methods that the supplier will use each year to determine its water reliability.	Water Shortage Contingency Planning	Section 8.2	Section 8.2
10632(a)(2)(B)	Provide data and methodology to evaluate the supplier's water reliability for the current year and one dry year pursuant to factors in the code.	Water Shortage Contingency Planning	Section 8.2	Section 8.2
10632(a)(3)(A)	Define six standard water shortage levels of 10, 20, 30, 40, 50% shortage and greater than 50% shortage. These levels shall be based on supply conditions, including percent reductions in supply, changes in groundwater levels, changes in surface elevation, or other conditions. The shortage levels shall also apply to a catastrophic interruption of supply.	Water Shortage Contingency Planning	Section 8.3	Section 8.3
10632(a)(3)(B)	Suppliers with an existing water shortage contingency plan that uses different water shortage levels must cross reference their categories with the six standard categories.	Water Shortage Contingency Planning	Section 8.3	Section 8.3.3
10632(a)(4)(A)	Suppliers with water shortage contingency plans that align with the defined shortage levels must specify locally appropriate supply augmentation actions.	Water Shortage Contingency Planning	Section 8.4	Section 8.4
10632(a)(4)(B)	Specify locally appropriate demand reduction actions to adequately respond to shortages.	Water Shortage Contingency Planning	Section 8.4	Section 8.4

Table 11-1 UWMP Checklist				
CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10632(a)(4)(C)	Specify locally appropriate operational changes.	Water Shortage Contingency Planning	Section 8.4	Section 8.4
10632(a)(4)(D)	Specify additional mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and are appropriate to local conditions.	Water Shortage Contingency Planning	Section 8.4	Section 8.7
10632(a)(4)(E)	Estimate the extent to which the gap between supplies and demand will be reduced by implementation of the action.	Water Shortage Contingency Planning	Section 8.4	Section 8.4
10632.5	The plan shall include a seismic risk assessment and mitigation plan.	Water Shortage Contingency Planning	Section 8.4.6	Section 8.6; App N
10632(a)(5)(A)	Suppliers must describe that they will inform customers, the public and others regarding any current or predicted water shortages.	Water Shortage Contingency Planning	Section 8.5	Section 8.8
10632(a)(5)(B) 10632(a)(5)(C)	Suppliers must describe that they will inform customers, the public and others regarding any shortage response actions triggered or anticipated to be triggered and other relevant communications.	Water Shortage Contingency Planning	Section 8.5 and 8.6	Section 8.8
10632(a)(6)	Retail supplier must describe how it will ensure compliance with and enforce provisions of the WSCP.	Water Shortage Contingency Planning	Section 8.6	Section 8.9
10632(a)(7)(A)	Describe the legal authority that empowers the supplier to enforce shortage response actions.	Water Shortage Contingency Planning	Section 8.7	Section 8.10
10632(a)(7)(B)	Provide a statement that the supplier will declare a water shortage emergency Water Code Chapter 3.	Water Shortage Contingency Planning	Section 8.7	Section 8.10
10632(a)(7)(C)	Provide a statement that the supplier will coordinate with any city or county within which it provides water for the possible proclamation of a local emergency.	Water Shortage Contingency Planning	Section 8.7	Section 8.10
10632(a)(8)(A)	Describe the potential revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	Section 8.8	Section 8.11
10632(a)(8)(B)	Provide a description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	Section 8.8	Section 8.11
10632(a)(8)(C)	Retail suppliers must describe the cost of compliance with Water Code Chapter 3.3: Excessive Residential Water Use During Drought.	Water Shortage Contingency Planning	Section 8.8	Section 8.11

Table 11-1 UWMP Checklist				
CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10632(a)(9)	Retail suppliers must describe the monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance.	Water Shortage Contingency Planning	Section 8.9	Section 8.12
10632(b)	Analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas.	Water Shortage Contingency Planning	Section 8.11	Section 8.4 Table 8-12
10635(c)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 30 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Sections 8.12 and 10.4	Section 8.14
10635(c)	Make available the Water Shortage Contingency Plan to customers and any city or county where it provides water within 30 after adopted the plan.	Water Shortage Contingency Planning	Section 8.14	Section 8.14
10631(e)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2 and 9.3	Sections 9.2 and 9.4
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets (recommended to discuss compliance).	Plan Adoption, Submittal, and Implementation	Chapter 10	Section 10.3
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Reported in Table 10-1.	Plan Adoption, Submittal, and Implementation	Section 10.2.1	Section 10.2
10621(f)	Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.	Plan Adoption, Submittal, and Implementation	Section 10.4	Section 10.5
10642	Provide supporting documentation that the urban water supplier made the plan and contingency plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan and contingency plan.	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	Sections 8.14, 10.3 and 10.4
10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.2	Appendix A
10642	Provide supporting documentation that the plan and contingency plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.2	Appendix B

Table 11-1 UWMP Checklist				
CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4	Section 10.5
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4	Section 10.5
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections 10.4.1 and 10.4.2	Section 10.5
10645(a)	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	Section 10.6
10645(b)	Provide supporting documentation that, not later than 30 days after filing a copy of its water shortage contingency plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	Section 8.14
10621(c)	If supplier is regulated by the Public Utilities Commission, include its plan and contingency plan as part of its general rate case filings.	Plan Adoption, Submittal, and Implementation	Section 10.6	N/A
10644(b)	If revised, submit a copy of the water shortage contingency plan to DWR within 30 days of adoption.	Plan Adoption, Submittal, and Implementation	Section 10.7.2	Section 8.14

Appendix A: Letter Notifying Cities and Counties of UWMP Revision

City of Santa Clara
The Center of What's Possible

***Notice sent via e-mail**

February 19, 2021

[NAME]
[AGENCY]
[ADDRESS]

The Urban Water Management Plan Act (California Water Code §10608 & §10610-10656) requires all urban water suppliers providing water for municipal purposes to more than 3,000 customers or serving more than 3,000 acre-feet annually, to adopt an Urban Water Management Plan (UWMP) every five years demonstrating water supply reliability in normal, single dry, and multiple dry years. We are currently reviewing our UWMP and Water Shortage Contingency Plan (WSCP), which were last updated in 2016 and are considering revisions to each plan. We invite your Agency's participation in this process. We are preparing a draft of the 2020 UWMP and WSCP and will make the revised plans available for public review. In the meantime, If you would like more information regarding the 2020 UWMP and WSCP updates, including the public hearing date please visit https://www.santaclaraca.gov/ourcity/departments-g-z/water-sewer-utilities/water-utility/urban-water-management-plan or contact:

Diane Asuncion, Compliance Manager
City of Santa Clara
1500 Warburton Ave.
Santa Clara, CA 95050
408.615.2009
DAsuncion@SantaClaraCA.gov

Sincerely,

Gary Welling | Director
Water & Sewer Utilities
1500 Warburton Ave. | Santa Clara, CA 95050
D: 408.615.2018 | F: 408.247.0784
GWelling@SantaClaraCA.gov

City of Santa Clara
The Center of What's Possible

Appendix B: Resolutions Adopting the 2020 Urban Water Management Plan and Water Shortage Contingency Plan for the City of Santa Clara

RESOLUTION NO. 21-8983

A RESOLUTION OF THE CITY OF SANTA CLARA, CALIFORNIA APPROVING THE 2020 URBAN WATER MANAGEMENT PLAN

BE IT RESOLVED BY THE CITY OF SANTA CLARA AS FOLLOWS:

WHEREAS, the California Urban Water Management Planning Act requires that urban water suppliers annually providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre feet of water adopted and periodically update an Urban Water Management Plan ("UWMP") to assess the reliability of its water sources over a 20-year planning horizon;

WHEREAS, the City of Santa Clara last prepared an UWMP in November 2016, filed with the California Department of Water Resources;

WHEREAS, the City of Santa Clara has prepared the 2020 Urban Water Management Plan (2020 UWMP) in accordance with applicable sections of the California Water Code;

WHEREAS, the City of Santa Clara provided notice via e-mail on February 19, 2021 to local cities and agencies that the City will be reviewing its current UWMP and considering amendments or changes;

WHEREAS in May 2011, the City prepared Water Use Goals and adopted applicable methodology for meeting those Water Use Goals under Senate Bill 7 (7th Extraordinary Session), also known as "Senate Bill x7-7" or "Water Conservation Act of 2009", a final update regarding progress towards meeting those Water Use Goals is contained within the 2020 UWMP; and,

WHEREAS, on June 22, 2021, the City Council conducted a public hearing on the proposed 2020 UWMP at a regularly scheduled meeting, at which time all interested persons were given an opportunity to present verbal and written testimony and evidence.

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NOW THEREFORE, BE IT FURTHER RESOLVED BY THE CITY OF SANTA CLARA AS FOLLOWS:

1. Approval of 2020 Urban Water Management Plan. The Council has reviewed the 2020 UWMP at a regular public meeting conducted on June 22, 2021. Based upon the data and conclusions set forth therein, and the evidence and testimony presented at the public meeting, the Council hereby finds that there is adequate water to supply without creating a negative impact on the groundwater basin and that the City has an adequate supply to provide water for the City during single or multiple dry years for at least a 20-year projection. The Council hereby approves and adopts the 2020 Urban Water Management Plan. The 2020 Urban Water Management Plan will be filed with the California Department of Water Resources within 30 days of adoption.

2. Effective date. This resolution shall become effective immediately.

I HEREBY CERTIFY THE FOREGOING TO BE A TRUE COPY OF A RESOLUTION PASSED AND ADOPTED BY THE CITY OF SANTA CLARA, CALIFORNIA, AT A REGULAR MEETING THEREOF HELD ON THE 22ND DAY OF JUNE, 2021, BY THE FOLLOWING VOTE:

AYES:	COUNCILORS:	Becker, Chahal, Hardy, Jain, Park, and Watanabe, and Mayor Gillmor
NOES:	COUNCILORS:	None
ABSENT:	COUNCILORS:	None
ABSTAINED:	COUNCILORS:	None

ATTEST: Natalmeil

NORA PIMENTEL, MMC
ASSISTANT CITY CLERK
CITY OF SANTA CLARA

Attachments incorporated by reference: None

RESOLUTION NO. 21-8984

A RESOLUTION OF THE CITY OF SANTA CLARA, CALIFORNIA APPROVING A WATER SHORTAGE CONTINGENCY PLAN

BE IT RESOLVED BY THE CITY OF SANTA CLARA AS FOLLOWS:

WHEREAS, in response to the severe drought of 2012-2016, new legislation in 2018 created a Water Shortage Contingency Plan (WSCP) mandate replacing the water shortage contingency analysis under former law;

WHEREAS, permanent water waste prohibitions contained in the City's Water Service and Use Rules and Regulations remain in effect at all times;

WHEREAS, the City of Santa Clara provided notice via e-mail on February 19, 2021 to local cities and agencies that the City will be updating its existing WSCP;

WHEREAS, the City of Santa Clara prepared an updated WSCP to include six standard water shortage levels per California Water Code Section 10623; and,

WHEREAS, on June 22, 2021, the City Council conducted a public hearing on the proposed WSCP at a regularly scheduled meeting, at which time all interested persons were given an opportunity to present verbal and written testimony and evidence.

NOW THEREFORE, BE IT FURTHER RESOLVED BY THE CITY OF SANTA CLARA AS FOLLOWS:

1. Approval of the City's Water Shortage Contingency Plan. The Council has reviewed the WSCP at a regular public meeting conducted on June 22, 2021. Based on the evidence and testimony presented at the public meeting, the Council hereby approves adoption of the WSCP for utilization during times of drought or catastrophic supply shortages as recommended by Water Department staff.

//

//

//

2. Effective date. This resolution shall become effective immediately.

I HEREBY CERTIFY THE FOREGOING TO BE A TRUE COPY OF A RESOLUTION PASSED AND ADOPTED BY THE CITY OF SANTA CLARA, CALIFORNIA, AT A REGULAR MEETING THEREOF HELD ON THE 22ND DAY OF JUNE, 2021, BY THE FOLLOWING VOTE:

AYES:	COUNCILORS:	Becker, Chahal, Hardy, Jain, Park, and Watanabe, and Mayor Gillmor
NOES:	COUNCILORS:	None
ABSENT:	COUNCILORS:	None
ABSTAINED:	COUNCILORS:	None

ATTEST: Nora Pimentel

NORA PIMENTEL, MMC
ASSISTANT CITY CLERK
CITY OF SANTA CLARA

Attachments incorporated by reference: None

Appendix C: Advertisement of Public Meeting

CITY OF SANTA CLARA
Notice of Public Hearing Regarding Proposed 2020 Urban Water Management Plan City's Water Use Goals, and Water Shortage Contingency Plan

Notice is hereby given that the City Council of the City of Santa Clara has determined and fixed its regularly scheduled meeting of June 22, 2021 at 6:00 p.m., or as soon thereafter as the matter may be heard, virtually via zoom as the location, date and time to conduct a public hearing to receive comment on the proposed 2020 Urban Water Management Plan and the proposed Water Shortage Contingency Plan. The 2020 Urban Water Management Plan includes the water use goals required under the Water Conservation Act of 2009, for the City of Santa Clara. If adopted, the 2020 Urban Water Management Plan will remain in effect until the next update in 2026.

Copies of the proposed 2020 Urban Water Management Plan and Water Shortage Contingency Plan are available on the City Website: http://www.santaclaraca.gov/our-city/departments-g-z/water-sewer-utilities/water-utility/urban-water-management-plan..

Pursuant to the provisions of California Governor's Executive Order N-29-20, issued on March 17, 2020, to prevent the spread of COVID-19, the City of Santa Clara has implemented methods for the public to participate remotely:

- Via Zoom:
  - Meeting ID: 997-0675-9306
  - Joining via computer, visit https://zoom.us/join
    - To address the Council on an agenda item, click "raise hand."
  - Joining via phone: 1-669-900-6833
    - To address the Council on an agenda item, hit *9 on the phone.
- Via the City's eComment (available during the meeting)
- Via email to PublicComment@santaclaraca.gov

- As usual, the public can view the meetings on SantaClaraCA.gov, Santa Clara City Television (Comcast cable channel 15 or AT&T U-verse channel 99), or the livestream on the City's YouTube channel or Facebook page.

Americans with Disabilities Act (ADA)

In accordance with the requirements of Title II of the Americans with Disabilities Act of 1990 ("ADA"), the City of Santa Clara will not discriminate against qualified individuals with disabilities on the basis of disability in its services, programs, or activities, and will ensure that all existing facilities will be made accessible to the maximum extent feasible. The City of Santa Clara will generally, upon request, provide appropriate aids and services leading to effective communication for qualified persons with disabilities including those with speech, hearing, or vision impairments so they can participate equally in the City's programs, services, and activities. The City of Santa Clara will make all reasonable modifications to policies and programs to ensure that people with disabilities have an equal opportunity to enjoy all of its programs, services, and activities.

Agendas and other written materials distributed during a public meeting that are public record will be made available by the City in an appropriate alternative format. Contact the City Clerk's Office at 1 408-615-2220 with your request for an alternative format copy of the agenda or other written materials.

Individuals who require an auxiliary aid or service for effective communication, or any other disability-related modification of policies or procedures, or other accommodation, in order to participate in a program, service, or activity of the City of Santa Clara, should contact the City's ADA Coordinator at 408-615-3000 as soon as possible but no later than 48 hours before the scheduled event

Please see the above-mentioned options citizens may participate in the upcoming hearing. Submit written and/or oral comments directly to Gary Welling, Director of Water and Sewer Utilities, 1500 Warburton Avenue, Santa Clara, California, 95050; telephone (408) 615-2000; e-mail water@santaclaraca.gov

Appendix D: Bay Area Water Supply and Conservation Agency Regional Water Demand and Conservation Projections

BAWSCA
Bay Area Water Supply & Conservation Agency

Bay Area Water Supply & Conservation Agency's Regional Water Demand and Conservation Projections

FINAL

June 26, 2020

PREPARED BY:

Maddaus Water Management Inc.

IN ASSOCIATION WITH:

Brown and Caldwell

Western Policy Research

TABLE OF CONTENTS PAGE

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

The authors of this report would like to thank the participants for supporting the Regional Water Demand and Conservation Projections Project report. The project was developed as a partnership between BAWSCA staff, its member agencies and stakeholders, and Maddaus Water Management Inc.

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- CWS – Mid Peninsula District
- CWS – South San Francisco District
- Coastside County Water District
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- East Palo Alto, City of
- Estero MID/Foster City
- Hayward, City of
- Hillsborough, Town of
- Menlo Park, City of
- Mid-Peninsula Water District
- Millbrae, City of
- Milpitas, City of
- Mountain View, City of
- North Coast County Water District
- Palo Alto, City of
- Purissima Hills Water District
- Redwood City, City of
- San Bruno, City of
- San Jose, City of
- Santa Clara, City of
- Stanford University
- Sunnyvale, City of
- Westborough Water District

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- San Mateo County Office of Sustainability
- San Mateo Countywide Water Coordination Committee
- Sustainable Silicon Valley
- Tuolumne River Trust

LIST OF ABBREVIATIONS AND ACRONYMS

2014 Project	2014 BAWSCA Regional Water Demand and Conservation Projections
AB	Assembly Bill
ABAG	Association of Bay Area Governments
acct	Account
AF	acre-feet
AFY	acre-feet per year
AMI	Advanced Metering Infrastructure
AWWA	American Water Works Association
AWWARF	American Water Works Association Research Foundation
BAM	Bay Area Management
BAWSCA	Bay Area Water Supply and Conservation Agency
BC	Brown and Caldwell
CalWEP	California Water Efficiency Partnership
CEC	California Energy Commission
COM	Commercial
CI	Commercial Institutional
CII	Commercial, Industrial, and Institutional
CUWCC	California Urban Water Conservation Council
CWS	California Water Service
DOF	Department of Finance
DSS Model	Demand Side Management Least Cost Planning Decision Support System
DWR	California Department of Water Resources
EO	Executive Order
ETo	Evapotranspiration
GPCD	gallons per capita per day
gpd	gallons per day
gpf	gallons per flush
gpm	gallons per minute
GVMID	Guadalupe Valley Municipal Improvement District
HET	high efficiency toilet
HEU	high efficiency urinal
HEW	high efficiency commercial washer
ILI	Infrastructure Leakage Index
INS	institutional
IPCC	International Panel on Climate Change
IRR	irrigation
MAF	million acre-feet
MF	multifamily
MID	Municipal Improvement District
MUR	Multi-Unit Residential
MWELO	Model Water Efficient Landscape Ordinance
MWM	Maddaus Water Management
N/A	not applicable
NOAA	National Oceanic and Atmospheric Administration
NRW	non-revenue water
OTH	Other
PPIC	Public Policy Institute of California
psi	pounds per square inch
R-GPCD	Residential gallons per capita per day
R^2	R-Squared
RCP	Representative Concentration Pathways
SB	Senate Bill
SB X7-7	Water Conservation Act of 2009
SF	Single Family
SFPUC	San Francisco Public Utilities Commission
SFR	Single Family Residential
SWP	State Water Project
SWRCB	State Water Resources Control Board
TM	technical memorandum
ULFT	ultra-low flush toilet
UWMP	Urban Water Management Plan
Valley Water	Santa Clara Valley Water District
WCDB	Water Conservation Database
WCIP	Water Conservation Implementation Plan
WSA	Water Supply Assessment
WUE	Water Use Efficiency

EXECUTIVE SUMMARY

The Regional Water Demand and Conservation Projections Project (Demand Study) developed water demand and conservation projections through 2045 for each Bay Area Water Supply and Conservation Agency (BAWSCA) member agency and the region overall. The purpose of the Demand Study is to provide valuable insights on long-term water demand patterns and conservation savings potential for the BAWSCA agencies to support regional efforts, such as implementation of BAWSCA's Long-Term Reliable Water Supply Strategy. In addition, the intent of the Demand Study is to provide necessary information to support individual agency efforts, such as compliance with the new state water efficiency requirements and completion of Urban Water Management Plans (UWMPs). The results will support agencies in preparing to comply with new statewide water use efficiency requirements as required by Assembly Bill (AB) 1668 and Senate Bill (SB) 606 (herein collectively referred to as "legislation"[1]).

Background

BAWSCA actively works with its member agencies to develop comprehensive water demand projections for the region. Most recently, in 2014, BAWSCA completed the *BAWSCA Regional Water Demand and Conservation Projections* report (2014 Project) to support the development of its Long-Term Reliable Water Supply Strategy. The 2014 Project developed long-term demand projections through 2040 as well as short-term demand projections accounting for rebound in water demand associated with economic recovery from the 2008-2013 recession.

After the 2014 Project completion, the local Bay Area economy continued to recover. However, beginning in 2014, the state experienced a major drought that significantly decreased water demand for all BAWSCA member agencies. The impact of the drought reduced overall water use among the BAWSCA agencies by 27% below 2013 demand levels in 2015, the worst year of the drought. BAWSCA initiated the Demand Study in January 2019 to update water demand and conservation projections for each BAWSCA agency given the significant change in conditions following the 2014 Project. The results of the Demand Study will be used to support the 2020 Urban Water Management Plans through the 25-year planning horizon, considering the impacts of the recent drought on short-term and long-term water demand and BAWSCA's Long-Term Reliable Water Supply Strategy implementation.

The Demand Study was completed as a collaborative effort between the BAWSCA and its BAWSCA member agencies. Valley Water also provided input on assumptions associated with the conservation analysis, given its role as the wholesale water agency to eight of the BAWSCA member agencies in Santa Clara County. In addition, an external Stakeholder Workgroup consisting of representatives from 5 organizations and entities provided feedback on the conservation measure selection and analysis components of the Demand Study. Over the course of the Demand Study, input was solicited from the aforementioned groups through multiple forums, including workshops, stakeholder engagement, one-on-one communication, and web-based meetings.

Demand and Conservation Projections Development Process

The Demand Side Management Least Cost Planning Decision Support System (DSS Model), in combination with an Econometric Model, was used to determine short-term and long-term demand projections for each BAWSCA agency. The Econometric Model projected short-term demands (through 2025) based upon historical water use patterns and the projected future rebound in water demand associated with forecasts for drought recovery. The

[1] An AB 1668/SB 606 primer document explaining the legislation is available on the Department of Water Resources website: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/

DSS Model projected long-term demand (through 2045) based upon expected service area growth for both population and employment.

The data collection for this Demand Study was conducted through the use of a Data Collection and Verification File (Data Workbook), a quantitative data intensive multi-spreadsheet MS Excel file. This workbook was an update to the Data Collection and Verification File developed during the 2014 Project. The data collected included monthly water demand and water conservation from 1995 through 2018, unemployment, water rates, historical conservation and more items as described in Section 2.

Service Area Population and Employment Growth Projections

The total BAWSCA service area population and employment projections are presented in Table ES-1. These projections are based upon each member agency's population and employment projections, using Association of Bay Area Governments (ABAG) Plan Bay Area 2040 data, including projections released in 2017, or other adopted data sources.

Table ES-1. Total BAWSCA Service Area Population and Employment Projections

	2020	2025	2030	2035	2040	2045
Population	1,858,392	1,941,725	2,032,304	2,187,849	2,311,562	2,438,515
Employment	1,156,613	1,209,770	1,270,096	1,329,806	1,379,449	1,430,112

Demand Projections

Demand forecasts were developed for each agency to account for conservation from passive (i.e., from codes/standards) and active conservation programs. Based upon this analysis, water demands are projected to increase 25% from 2020 to 2045 after accounting for the effects of the existing plumbing code, future active conservation savings, and climate change. These results are shown in Table ES-2. By comparison, the population and employment projections noted in Table ES-1 above show growth rates of 31% and 24% respectively between 2020 and 2045.

Table ES-2. Total BAWSCA Demand Projections

Demand Forecast (MGD)	2020	2025	2030	2035	2040	2045
Total Demand without Plumbing Code Savings	210.8	240.3	251.1	266.7	280.0	293.6
Total Demand with Plumbing Code Savings	205.6	228.9	234.3	244.3	253.1	262.4
Total Demand with Active Measure Savings	204.3	225.1	229.2	238.8	247.0	256.3

Note: Total water demand accounts for the total projected demand in a service area water system regardless of source, which could be from San Francisco Public Utilities Commission (SFPUC), groundwater, surface water, recycled water, desalination, State Water Project (SWP), or Valley Water.

Potential New Conservation Measures

Through this analysis, 24 conservation measures with high water savings potential and/or member agency interest were identified. BAWSCA further evaluated these measures for potential future implementation and incorporated feedback from a Stakeholder Workgroup feedback, including ideas for measure implementation and co-benefits described in Section 4. Implementation of these conservation measures, along with passive conservation, is anticipated to yield an additional 37.3 MGD of water savings by 2045 beyond what has already been achieved.

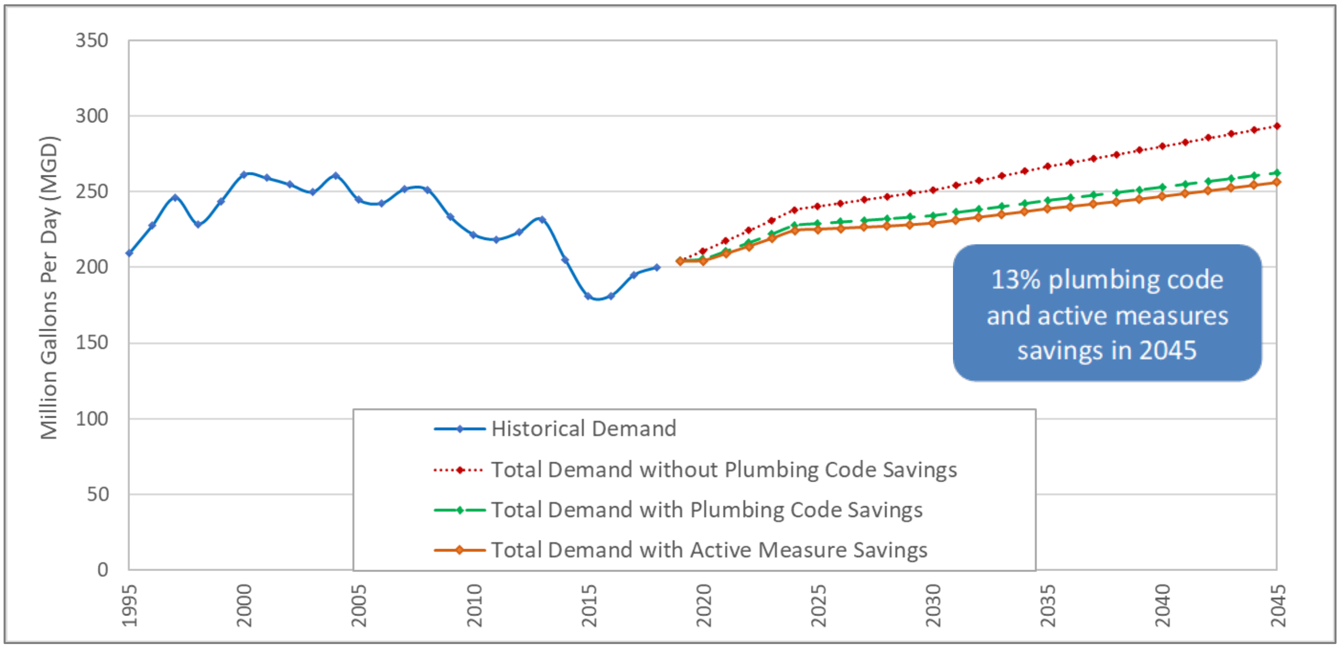
Figure ES-1. Potential Conservation Measures

BAWSCA Planned Conservation Measure Implementation

Measure Name	# of Agencies Planning to Implement
Commercial	
CII Water Survey	13
CII Water Efficient Technology (WET) Rebate	10
School Building Retrofit	6
Fixture Retrofit on Resale or Water Account Change (Commercial)	2
Irrigation	
Residential Outdoor Water Surveys	16
Large Landscape Outdoor Water Surveys	20
Large Landscape (Waterfluence) Program	14
Lawn Be Gone! and Rainwater Capture Rebates	19
Financial Incentives for Irrigation and Landscape Upgrades	14
Landscape Irrigation and Codes	10
Residential	
Residential Indoor Water Surveys	9
Residential Water-Savings Devices Giveaway	20
Flowmeter Rebate	7
Leak Repair and Plumbing Emergency Assistance	9
Multifamily HET Direct Install	2
Multifamily Submetering for Existing Accounts	5
New Development Submetering	8
New Development Hot Water On Demand	4
Low Impact New and Remodeled Development	3
Fixture Retrofit on Resale or Water Account Change (Residential)	2
Community & Education	
Public and School Education	22
Billing Report Educational Tool Non-AMI	10
AMI Customer Portal	14
System Water Loss	
Water Loss	20

Figure ES-2 presents the combined BAWSCA region-wide water demand projections with and without passive and active conservation. Total water demand is defined as total water consumption plus non-revenue water. Water consumption is defined as water delivered to individual customers for use. Figure ES-3 compares historical and projected water use and population. Figure ES-4 presents historical and projected gross per capita water use and residential per capita water use in the BAWSCA region through 2045.

Figure ES-2. BAWSCA Region-Wide Demands with Active Conservation Savings to 2045*



** Water demands are based on data provided from 1995 through 2018. This analysis was completed before the COVID-19 pandemic and does not incorporate any of the new changes in water use profiles, population, employment, or vacancies as the data was not yet available and was outside the scope of the current project. However, it is recognized that the water demands may need review or modification depending on the impact of recent events.*

Figure ES-3. Historical and Projected Population and Demand

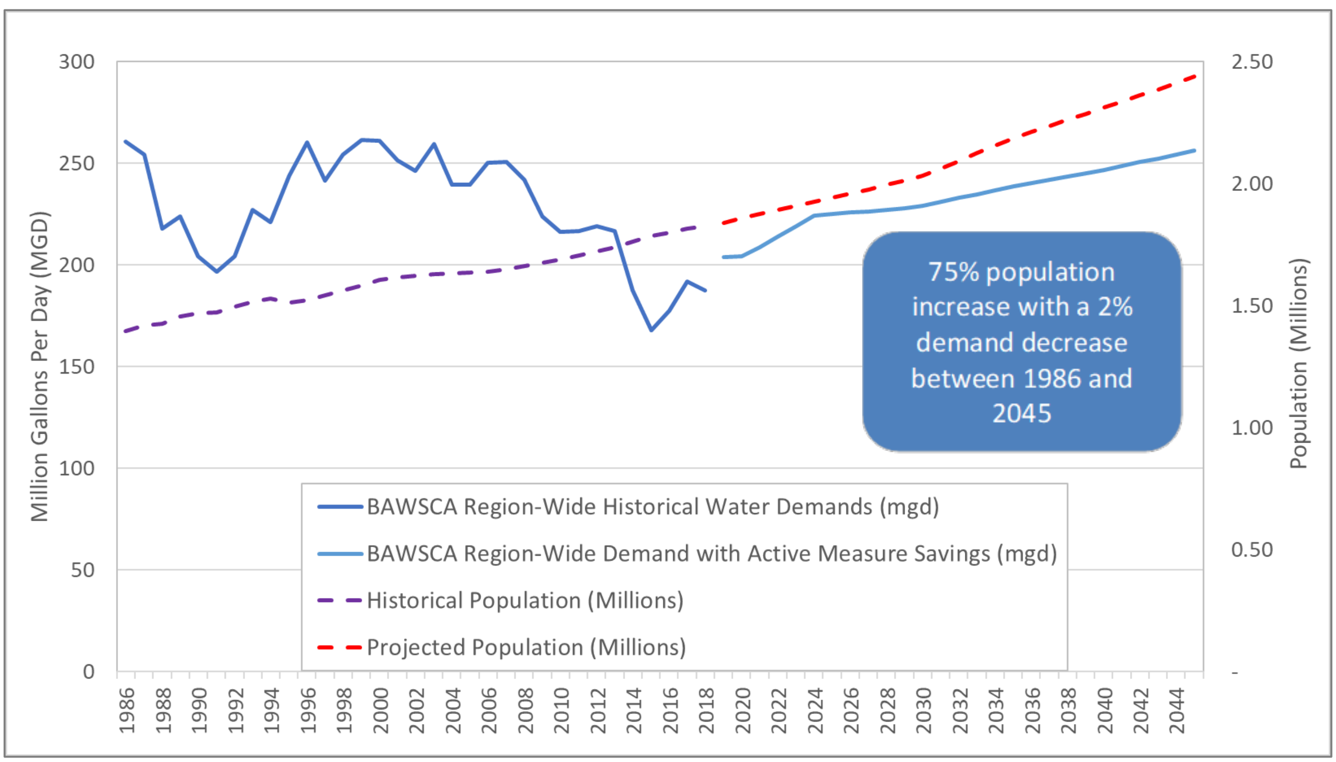
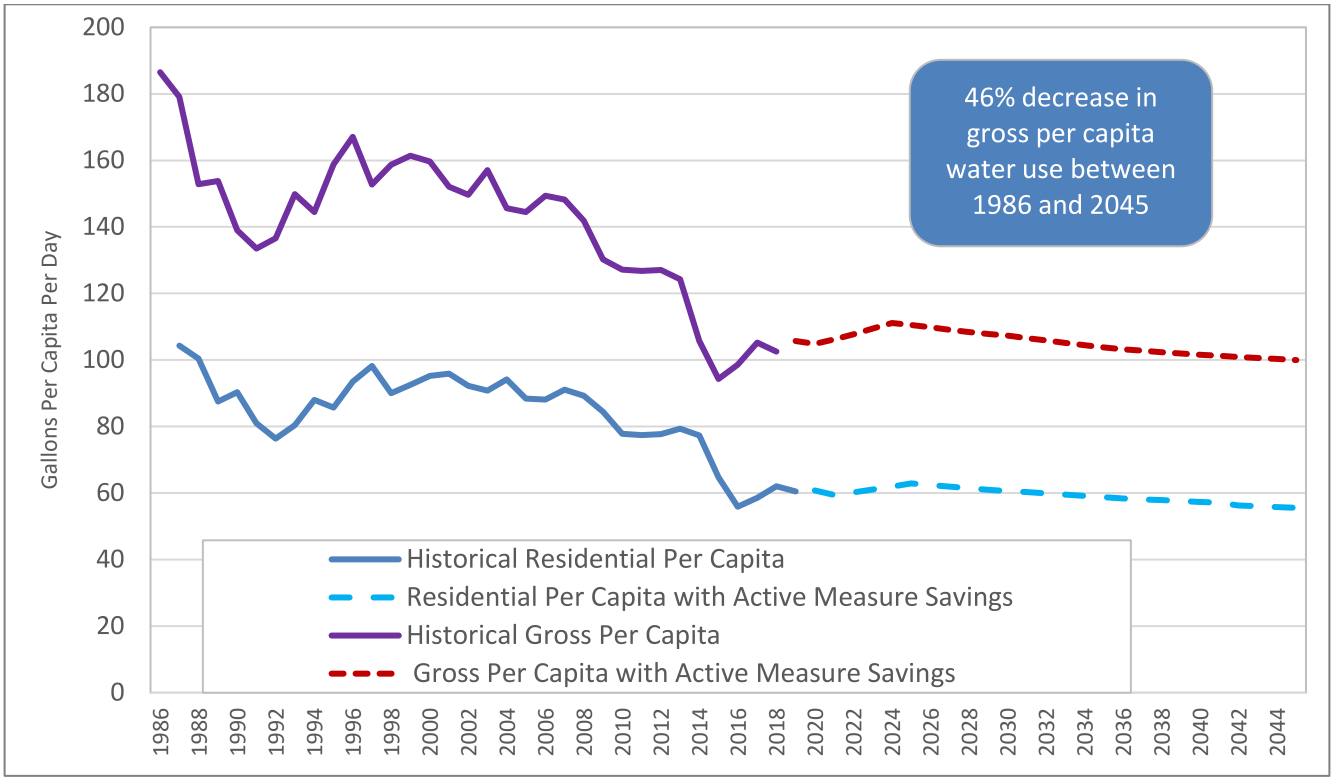


Figure ES-4. Gross and Residential Per Capita Water Use



Note: To be consistent with the BAWSCA methodology for the BAWSCA Annual Survey, recycled water has been removed from the per capita calculations. Therefore, the above information is a potable-only per capita value. Note that residential water use includes some irrigation as not all agencies have dedicated irrigation meters.

Recommendations and Next Steps

The majority of the BAWSCA member agencies meet the definition of an urban water supplier[2] and therefore are required to prepare 2020 UWMPs, which must be submitted to the California Department of Water Resources (DWR) by July 1, 2021. Member agencies may elect to utilize the demand and conservation savings projections developed through this Demand Study to support their UWMP development. Member agencies may also update the individual DSS Models for the upcoming UWMP submissions, if necessary, to incorporate new information for their respective service areas. It is anticipated that agencies will be formally adopting updated demand projections as part of the 2020 UWMP process.

California state laws, AB 1668 and SB 606, passed in May 2018, require each urban retail water supplier to calculate and report an urban water use objective no later than November 1, 2023, and by November 1 every year thereafter, and to compare its actual urban water use to the objective. The urban water use objectives will be calculated using individual efficiency standards set by the state for indoor residential water use, outdoor residential water use, dedicated irrigation, and water loss. In addition, the urban water suppliers may be required to implement specific performance measures for commercial, industrial and institutional (CII) water use. When more information on the state standards becomes available, BAWSCA and the member agencies may

[2] The requirements for UWMPs and definition of urban water supplier are found in two sections of the California Water Code, §10610-10656 and §10608. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually.

need to review demand projections and conservation targets to prepare for compliance with the urban water use objectives.

In addition, BAWSCA will work with the member agencies to further evaluate for regional implementation the identified conservation programs that have high water savings potential and agency interest. BAWSCA recognizes that actual implementation of water conservation is needed to achieve the identified water savings goals in support of member agencies meeting their future water use objectives. BAWSCA and its member agencies' conservation programs must be managed in concert with one another and in a very adaptive fashion. Small and large program changes will need to be made over time and, where applicable, to align with pending state regulations currently being developed in connection with AB 1668 and SB 606.

The Demand Study was initiated in January 2019 and was completed through June 2020. Given the project timeline, recent changes to water consumption patterns, population, employment, and vacancies due to the COVID-19 pandemic have not been incorporated into the analysis or demand projections. BAWSCA will continue to monitor the effects of COVID-19 response actions on water use within the region and may consider future updates to this study to reflect these changes.

1 INTRODUCTION

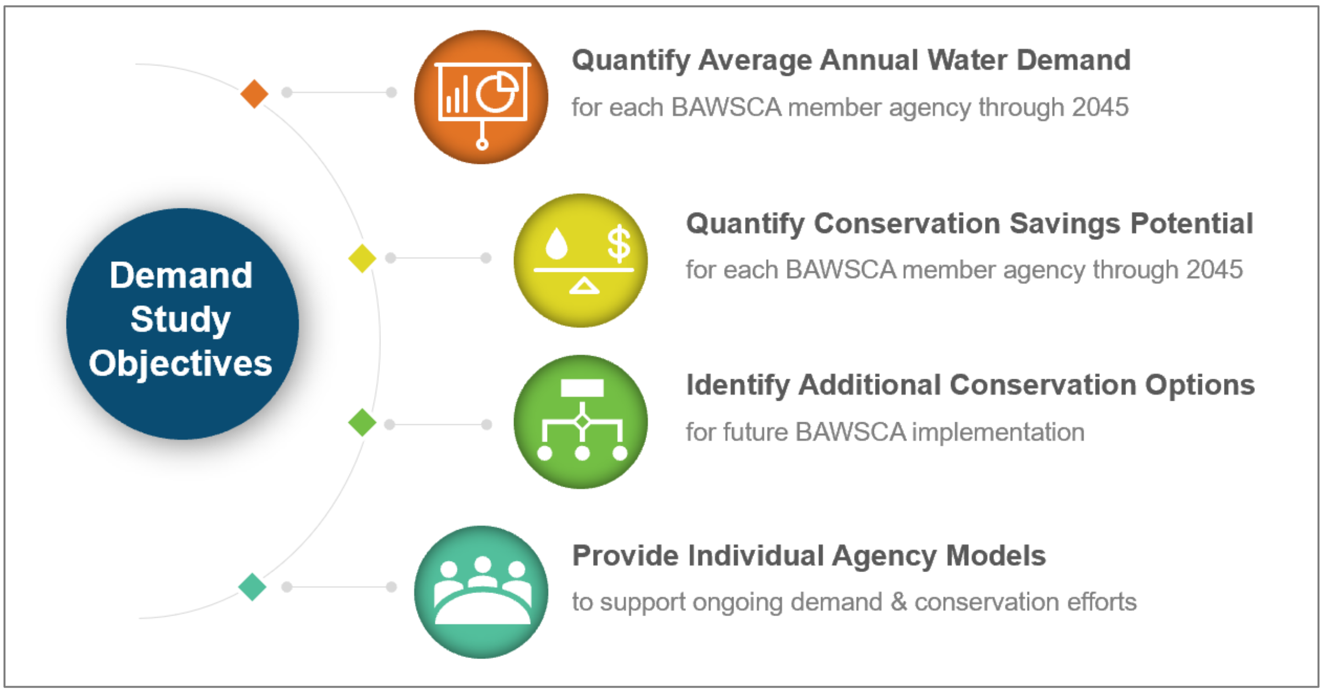
This Regional Water Demand and Conservation Projections Project (Demand Study) Final Report summarizes the water demand and conservation savings projections for each individual BAWSCA member agency and for the BAWSCA region as a whole.

1.1 Goals and Objectives

Recently, a substantial shift in the challenges and drivers for water management has occurred – in part because of the recent drought, water supply conditions, and the need to comply with pending water conservation regulations. This Demand Study will allow BAWSCA to implement additional water use conservation measures in line with current conditions regarding water sustainability and reliability. The Demand Study considers best management practices consistent with current regulations and best practices in the industry. It also considers the capabilities and practices of the BAWSCA agencies and how they may need to be further developed in relation to the new legislation.

The overall goal of the Demand Study was to develop transparent, defensible, and uniform demand and conservation projections for each BAWSCA member agency, using a common methodology that could be implemented to support regional planning efforts as well as individual agency work. Pursuant to this goal, specific objectives were developed as detailed in the following figure.

Figure 1-1. BAWSCA Demand Study Objectives



1.2 Approach and Methodology

To accomplish the above goal and objectives, each BAWSCA member agency's water demands and conservation savings were forecasted through 2045 using a combination of two different models – an Econometric Model and the DSS Model developed by Maddaus Water Management (MWM). The purpose of using two tools is to leverage the strengths of each tool to obtain the best forecast through 2045. The Econometric Modeling was initially done outside of the DSS Model then incorporated as a feature in each member agency's individual DSS Model.

Econometric Modeling is a statistical approach used to determine the impact of factors such as economic conditions, weather, rates, and conservation on water demands. The Econometric Model is used to project, based upon historical patterns, the future rebound in water demand associated with short term effects (i.e. economic recovery, drought conditions, etc.) while also taking into account other factors such as water rate increases and weather. The Econometric Model was used to forecast each agency's baseline demand through 2023.

The DSS Model prepares long-range, detailed water demand and conservation savings projections to enable a more accurate assessment of the impact of water efficiency programs on demand. The DSS Model can use either a statistical approach to forecast demands (e.g., an Econometric Model), or it can use forecasted increases in population and employment to evaluate future demands. Furthermore, the DSS Model evaluates conservation measures using benefit-cost analysis with the present value of the cost of water saved and benefit-to-cost ratio as economic indicators. The analysis is performed from various perspectives including the utility and community. The DSS Model also was used to forecast demands for the BAWSCA member agencies in prior planning efforts in 2004, 2009, and 2014.

1.3 Project Partners

The Demand Study was completed as a collaborative effort between BAWSCA staff, BAWSCA member agencies, and the Project Team, which was led by Maddaus Water Management in association with Brown and Caldwell and Western Policy Research. Over the course of the Demand Study, input was solicited from the aforementioned groups through multiple forums, including workshops, online surveys using SurveyMonkey, one-on-one communication, and web-based meetings.

Maddaus Water Management, BAWSCA staff, Valley Water, San Francisco Public Utilities Commission, and individual agencies collaborated to compile and review information, which led to the development of design parameters. Valley Water also provided input on assumptions associated with the conservation analysis, given its role as the wholesale water agency to eight of the BAWSCA member agencies located in Santa Clara County.

Each BAWSCA member agency held a critical role in the development of its individual demand and conservation projections. BAWSCA member agencies' roles in the Demand Study included the submission of technical information for use in individual agency DSS Models and the review and sign-off of interim work products. More details on the involvement of the member agencies in the completion of each Demand Study task are included in this report.

Stakeholder Workgroup

In addition to coordination with the BAWSCA agencies, BAWSCA formed a Stakeholder Workgroup to seek input from external stakeholders. Based on suggestions provided by the BAWSCA agencies, a total of twelve organizations were invited to participate in the Stakeholder Workgroup. Five organizations accepted the invitation to participate, including the Pacific Institute, San Mateo County Office of Sustainability, San Mateo Countywide Water Coordination Committee, Sustainable Silicon Valley, and the Tuolumne River Trust.

The Stakeholder Workgroup held two meetings in January and May 2020 to provide input on the conservation projections portion of the Demand Study. In particular, the Stakeholder Workgroup shared insights and perspectives on topics such as:

- Types of conservation measures BAWSCA should be considering for future implementation in the region;
- Co-benefits or secondary impacts some conservation measures have that should be considered in BAWSCA's implementation decisions;
- Opportunities for partnership and collaboration on water conservation initiatives;
- Ways to support social equity in the water conservation measure implementation; and
- New or innovative technologies to explore for conservation savings potential.

The stakeholder comments on multiple co-benefits of the conservation measures were considered during measure selection as described in Section 4.

1.4 Relationship to Other Planning Efforts

In September 2018, the BAWSCA Board unanimously approved the Strategic Plan Phase 1[3] recommendations, including the recommendation to update the water demand and conservation projections for the BAWSCA member agencies using a common methodology.

In addition to providing a critical input for the strategy, the updated demand estimates may be used by individual BAWSCA member agencies in the development of their 2020 Urban Water Management Plans.

Prior efforts have developed regional demand and conservation projections for the BAWSCA region using the DSS Model, including:

- San Francisco Public Utilities Commission *Wholesale Customer Water Demand Projections* (URS Corp. and MWM, 2004);
- San Francisco Public Utilities Commission *Wholesale Customer Water Conservation Potential* (URS Corp., MWM, Jordan Jones & Goulding, 2004);
- *Projected Water Usage for BAWSCA Agencies* (Brown and Caldwell [BC], MWM, 2006);
- *BAWSCA Water Conservation Implementation Plan* (MWM, BC, 2009); and
- *BAWSCA Regional Water Demand and Conservation Projections* (MWM, Western Policy Research, 2014).

These prior efforts proved to be a robust means to support environmental documents like the Water System Improvement Program – Program Environmental Impact Report [SFPUC, 2006]); member agency UWMPs; conservation planning (e.g., the BAWSCA Regional Water Conservation Program and development of the BAWSCA Water Conservation Database [WCDB]); and development and implementation of BAWSCA's Long-Term Reliable Water Supply Strategy.

[3] Maddaus Water Management et al. (2018). *Bay Area Water Supply and Conservation Agency's "Making Conservation A Way of Life" Strategic Plan – Phase 1*.

2 DATA COLLECTION AND VERIFICATION PROCESS

This section documents the data collection and verification process for the Demand Study, which was critical to the modeling process to ensure that the best available information was used to develop each member agency's water demand and conservation savings projections. Described herein are the types of data that were collected for the Demand Study and the steps taken to obtain and verify the data.

2.1 Preliminary Survey

In April 2019, the member agencies participated in a survey as part of their Data Workbook completion tasks. The survey provided initial service-area background information, perspectives on future water demand trends, agency feedback on the desired project outcomes, and initial interest in different types of conservation measures. The survey responses also were used to identify data items to include in the Data Workbook. The following information was collected in the Data Workbook survey:

- Key contact information for each agency
- Each agency's desired objectives or results for the Demand Study
- Description of water use trends within the agency's service area in recent years
- Source of most recent water demand projections and methodology description
- Perspective on future growth and water demand trends
- Billing system components and capabilities, including any recent changes or upgrades
- Availability of water and sewer rate history by customer class
- Potable and non-potable water reuse planning
- Source and accuracy of service area water audit data in recent years
- Current and projected usage of mixed-use meters
- Plans for water source adjustment when water conservation is active
- Additional comments or questions on the project or planning process

See Appendix A for a complete list of the Data Workbook survey questions.

2.2 Types of Data Collected

The impetus for the types of data collected was the specific data needs for the Econometric Modeling and the DSS Model. The data collected can be classified into a few major categories as discussed below and listed in Figure 2-1.

Service Area Data
Data including water production by source as well as water and sewer rates were collected to show the impact of prices on historical water demands. The service area data were used for the econometric historical analysis, the demand forecast in the DSS Model, and the conservation analysis.

Service Area Demographics
Service area demographic data were collected regarding historical and projected population using previous DSS Models, 2015 UMWPs, and the ABAG 2040 Bay Area Plan Projections. These demographics were used for the econometric analysis of historical demand and for future demand forecasting.

Economy
Data from the U.S. Bureau of Labor Statistics[4] on historical employment and unemployment were collected for the individual service areas (at the city level) to attempt to capture the change in work force during the period from 1995 to 2018 to show historical and future growth in the service area. The economic data were used for the econometric analysis of historical water demand.

[4] U.S. Bureau of Labor Statistics. Local Area Unemployment Statistics web page: https://data.bls.gov/PDQWeb/la

Weather

Data from the local National Oceanic and Atmospheric Administration (NOAA) weather stations closest to each individual agency were collected.[5] Data types included temperature maximum, temperature minimum, temperature average, and precipitation for the years 1995 to 2018. The weather data were used for the econometric analysis of historical water demand.

Conservation

Select conservation data from the WCDB back to 2004 were incorporated into the Econometric Models. The conservation data were used for the historical demand analysis, for a review of future conservation program levels of saturation, and as a benchmark of reasonable levels of implementation for future conservation programs. Fiscal Year 2016-2017 and Fiscal Year 2017-2018 conservation programs participation data for CII Survey, Residential High Efficiency Fixture Giveaway, Residential Indoor Water Surveys, Landscape Water Budget/Monitoring, and Lawn Be Gone! Turf Removal were utilized to calculate levels of saturation.

Other

Each agency was asked to provide any new information, such as new development ordinances or comments received from DWR regarding the agency's 2015 UWMP (if one was filed). These data were used for background information when analyzing each individual water agency's service area.

The individual data elements that were collected are listed categorically in the following figure.

Figure 2-1. Data Collected from Member Agencies

Data Collected from BAWSCA Member Agencies

General Information

- ☐ Agency Info
- ☐ Contact Info

Service Area Data

- ☐ Water Production by Supply Source
- ☐ Consumption and Accounts
- ☐ Top 200 CII Users
- ☐ Single Family Water Rates
- ☐ Commercial Water Rates
- ☐ Single Family Sewer Rates
- ☐ Abnormal Years
- ☐ Planning Documents
- ☐ Customer Classes

Demographic Data

- ☐ Service Area Population
- ☐ Projected Population

Conservation

- ☐ Conservation Goals
- ☐ Historical Conservation

Economy

- ☐ Service Area Employment
- ☐ Projected Jobs
- ☐ Unemployment Rates

Weather

- ☐ Historical Weather Data

Other

- ☐ Demand Analysis Survey
- ☐ New Development
- ☐ Ordinances
- ☐ DWR Comments on 2015 UWMP

[5] National Oceanic and Atmospheric Administration Climate Data Online Search web page: https://www.ncdc.noaa.gov/cdo-web/search

2.3 Data Collection Process Overview

The data collection for this Demand Study was done using the Data Workbook, which was an update to the one developed during the 2014 Project. Previously, parts of the 2014 workbook were refined for the 2017 BAWSCA "Making Conservation a Way of Life" Strategic Plan. This most recent effort initiated in 2019 was the next iteration in conservation program planning at the regional level to support the 2020 UWMPs and to guide BAWSCA and its member agencies for the next several years.

The Data Workbook was used to collect, organize, and verify the necessary input data for the econometric analysis and DSS model. The data required for the demand and conservation projections continues to be organized into individual Data Workbooks (one per BAWSCA member agency). This task was streamlined by populating the Data Workbook using a variety of existing data sources (as shown in Figure 2-1) prior to distributing the files to the individual agencies. The member agencies were then asked to verify that the information in the Data Workbook was accurate. A key source for existing data was the BAWSCA WCDB, which was specifically designed as a recommendation of the 2009 BAWSCA Water Conservation Implementation Plan (WCIP) to capture much of the required data. Other significant data sources included BAWSCA Annual Surveys, 2015 UWMPs, and the Association of Bay Area Governments (ABAG) Projections[6] (population and employment forecasts).

The Data Workbook was completed and verified by the member agencies through the following steps:

1. **Distribution of Data Workbook Files to Individual Agencies:** The files were distributed to the individual agencies in April 2019 via the BAWSCA WCDB.
2. **Instructional Webinar:** A webinar was held in April 2019 to disseminate information related to the data collection process to the member agencies. During the webinar, the Project Team reviewed the Data Workbook contents with the member agencies and provided instructions for completing the files.
3. **Data Workbook Completion by Agencies:** Each member agency reviewed and completed its individual Data Workbook, which required the following:
    - Verification of existing data that was remaining from the previous efforts as well as what was pre-populated in the file by the Project Team before distribution to the agencies
    - Data entry of missing information into the Data Workbook as needed
4. **Data Workbook Submission by Agencies:** Agencies submitted the files via the WCDB between April and mid-May 2019 after completing Step 3.
5. **Data Workbook Review and Refinement**: The Project Team reviewed the submitted individual Data Workbooks in the order submitted. If further data and refinement were required, the Project Team contacted the individual member agencies to obtain the necessary information.
6. **Data Workbook Validation through Technical Memorandum 1 (TM-1):** Each member agency reviewed and signed a confirmation letter attached to TM-1 that all the information in the data workbook was accurate and approved for use in the project analysis.

2.4 Agency Verification

The last step in the data collection process was the final agency verification of the data. Once all data had been collected and compiled, each agency received a copy of its Final Data Workbook, and the representative for that agency was asked to complete the BAWSCA Agency Population Projection Selection/Data Verification Signature Form. As part of this step, each member agency also was asked to identify an appropriate source for population and employment projections to use in the demand and conservation modeling.

[6] ABAG. Plan Bay Area 2040: http://2040.planbayarea.org/reports.

3 DEMAND PROJECTIONS

This section documents the demand projections developed for the Demand Study. This section describes: 1) the demand projection analysis methodology; 2) the demand analysis results including each BAWSCA member agency demand projections through 2045; and 3) the projections verification process to be completed and signed by each member agency.

3.1 Demand Methodology Overview

The demand projection update for each BAWSCA member agency used a combination of two different analytic models – the Econometric Model and the Demand Side Management Least Cost Planning Decision Support System (DSS Model). The purpose of using two tools was to leverage the strengths of each tool to obtain a suite of demand recovery scenarios through the year 2045.

The Econometric Model estimated the impact of various conditions on service area water demand. The model used historical patterns to project the future rebound in demand associated with post-drought recovery, while considering other factors such as economy, rate increases, conservation activity, and weather. Since the Econometric Model was calibrated using historical data, its reliability depended on the historical relationship between water demand and its influencing factors remaining constant from the calibration period to the forecasting period. Further into the future, changes in demographics, living patterns, housing stock, and industrial structure can alter the historical relationship with water demand.

The data collected for the Demand Study was used to forecast each agency's water demands and conservation savings through 2045, using the DSS Model. The model prepares long-range, detailed water demand and conservation savings projections to enable a more accurate assessment of the impact of water efficiency programs on demand. It also evaluates potential conservation measures using benefit-cost analysis with the present value of the cost of water saved ($/Million Gallons) and benefit-to-cost ratio as economic indicators. The analysis is performed from various perspectives including the utility and community (utility plus customer). This rigorous modeling approach is especially important if the projections are to be included in a document that will undergo regulatory or environmental review.

Previously, the DSS Model was used to forecast demands in the 2004 SFPUC Wholesale Demand and Conservation Analysis (URS, MWM 2004), the 2009 *BAWSCA Water Conservation Implementation Plan*, and the 2014 BAWSCA Regional Water Demand and Conservation Projections Project (2014 Project). The DSS Model has been peer reviewed by the California Urban Water Conservation Council (now known as the California Water Efficiency Partnership) and endorsed by the organization since 2006.

The DSS Model can accommodate historic service agency data and projected information; this information reflects how future service area and water use characteristics may differ from the past in each BAWSCA member service area. To accommodate all these considerations, several scenarios were generated to model the post-drought demand recovery, including a scenario generated by each agency's respective Econometric Model.

The DSS Model also has a conservation component that quantifies savings from plumbing codes and active conservation programs. In this Demand Study, only the DSS Model's estimates of future savings from plumbing codes were incorporated into the demand projections. The intent of this was to facilitate each agency's evaluation of its future water demand before implementation of active conservation programs between 2019 and 2045. Quantification of savings from active conservation programs is discussed in Section 5.

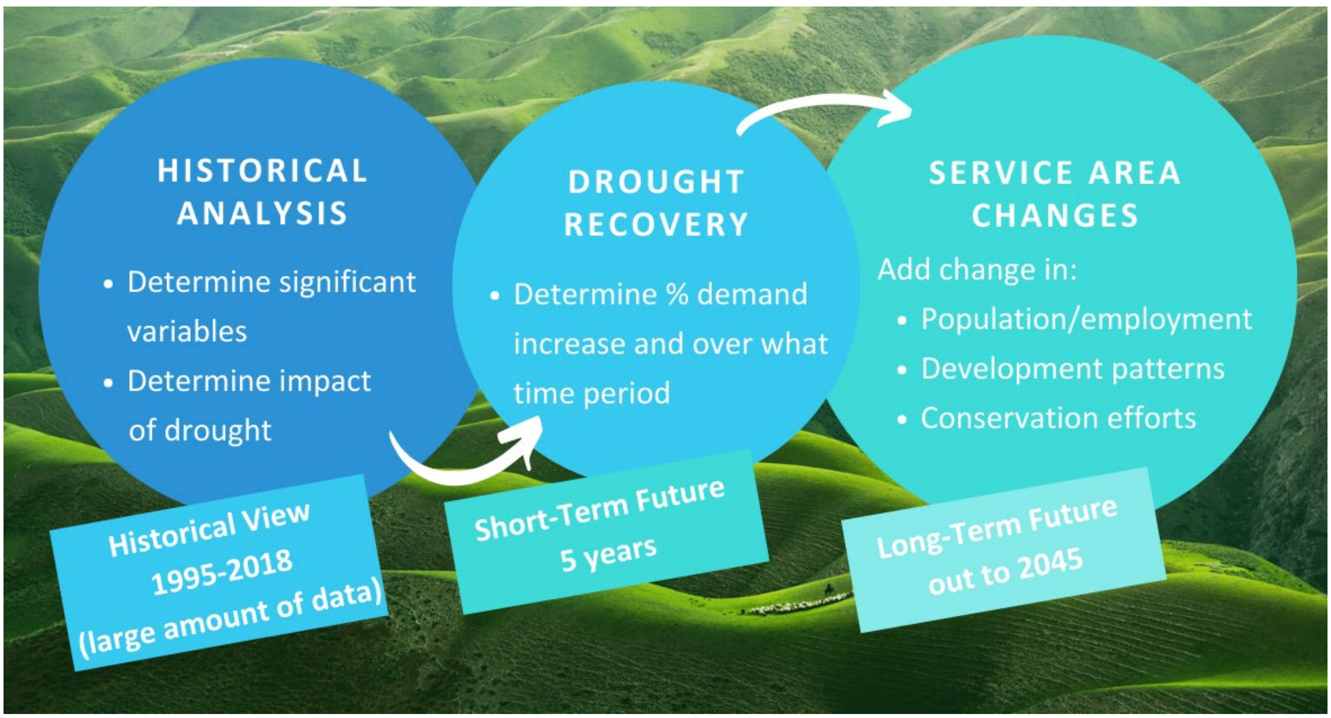
The demand analysis for each agency had three distinct parts (Figure 3-1):

1. **Historical Analysis** – This was an analysis of updated historical data between 1995 and 2018 (or a shorter window if an agency could not provide complete data back to 1995). The purpose of this analysis was to identify the impacts of factors such as water rates, economic conditions, weather, water conservation, and drought reductions on water demands. Data analyzed included historical system production,

population, water rates, weather (rainfall and temperature), unemployment rate, and drought restrictions. See Figure 2-1 for a list of the data used for this analysis.

2. **Short-Term Forecast (Post-Drought Demand Recovery)** – Forecast of demands from 2019 through 2023 was weather normalized, assumed normal economic conditions, and incorporated climate change predictions as well as population growth. Normal weather is defined as the average temperature and rainfall between 1995 and 2006. At the time the analysis was conducted in November 2019, the U.S. economy was operating at an unemployment rate that was below the historical norm. The model assumes there will be a return to the historical norm while developing a model-generated drought recovery estimate. The unemployment rate differs considerably across member agencies at any given point in time. However, movements in this metric for an agency over time parallels movement in the national unemployment rate quite well. To account for the unique conditions that exist within each member agency, it is assumed that each member agency will reach an unemployment rate that reflects the average during the 1993-2000 period, a time period that best captures normal economic conditions. Projections of population and employment growth that fed into these short-term forecasts came from the same sources as those used for the long-term forecasts. These data sources were discussed previously in Section 2.
3. **Long-Term Future** – Long-term water demand (2024-2045) was forecasted using the DSS Model, which estimated increases in each agency's demand by customer category based upon forecasted changes in population and employment. In addition, the long-term forecast incorporated climate change predictions as further detailed in Section 3.6.

Figure 3-1. Demand Forecasting



3.2 Econometric Analysis Methodology

As noted above, the Demand Study used Econometric Models to project post-drought demand recovery in the Partial Rebound – Normal Economy, Weather Normalized scenario (as described in Section 3.7). This tool was incorporated into the demand analysis to estimate the relationship between per capita water demand and factors that cause it to vary over time. Some factors are cyclical in nature and can cause per capita demand to increase or decrease over a period of time. Such factors include weather, economic conditions, and temporary drought restrictions. Other factors put one-way downward pressure on per capita demand over time. The intensity of pressure may vary from year to year, but the effects are not cyclical. Examples of such factors include water rate increases, plumbing codes, appliance efficiency standards, and active conservation programs. Relying on knowledge of past historical relationships and assuming that they continue in the near-term, this analysis provided insights into questions associated with demand such as:

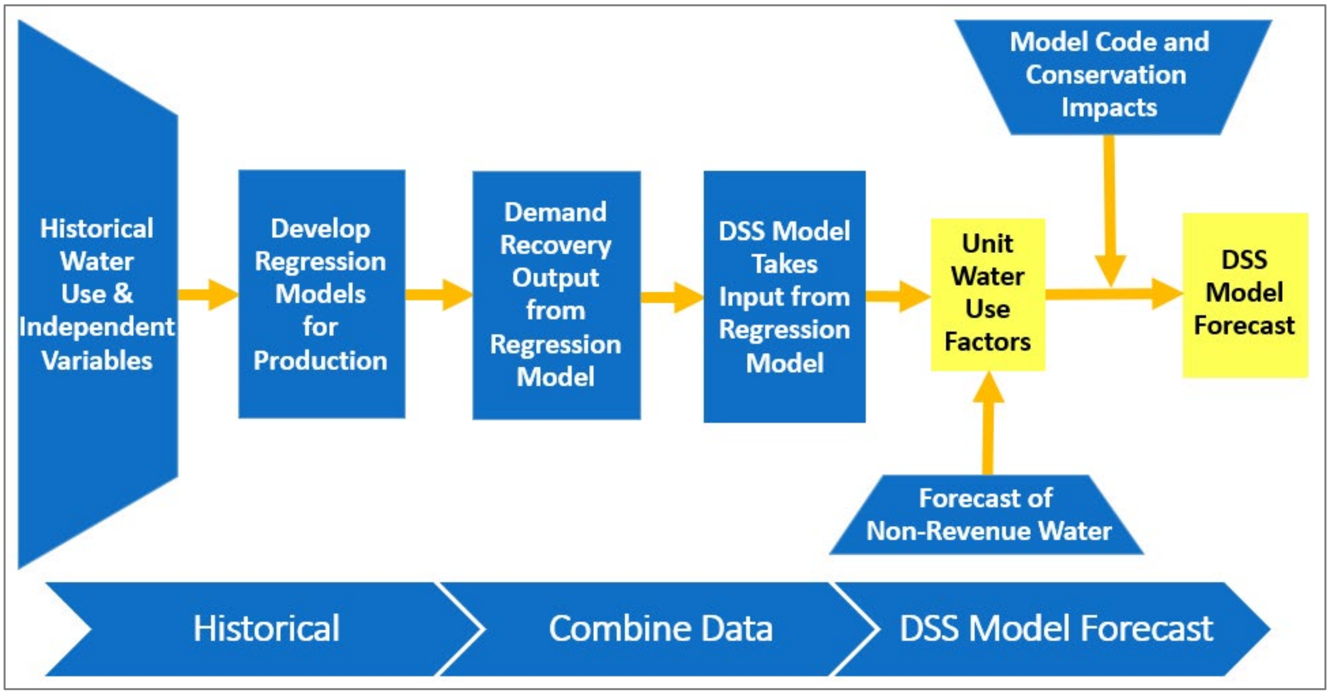
- What was the effect of drought restrictions on demand during the time period for which they were in effect (2014-2017)? Since the removal of these restrictions, demand started to increase – how much more will it rise in the future?
- How have economic conditions impacted demand in the past? Under normal economic conditions, what would fully recovered demand be?
- How has weather impacted demand in the past? Under normal weather conditions, what would fully recovered demand be? Or, under future climate conditions when the average temperature is, for example, two degrees hotter than normal, what would future demand be?

An Econometric Model of water demand was developed for each BAWSCA member agency using up to 24 years of monthly production data (where available, data from 1995 through 2018 were used). Each BAWSCA member agency's Econometric Model utilized agency-specific data to depict economic conditions, retail water rates, population, and impact of drought restrictions implemented during the 2014-2017 period. The models also included a trend variable, if necessary, to capture the long-term decline in per capita demand as a result of historical active and passive conservation. Weather data were assigned to each agency from the closest of the NOAA stations located throughout the San Francisco Bay Area. These data were submitted and verified by each BAWSCA member agency through the data collection process described in Section 2.

After development, the Econometric Model for each BAWSCA member agency was used to generate water demand forecasts to 2023. The Econometric Model assumed that temporary behavioral changes encouraged during the drought returned close to pre-drought norms. The post-drought recovery behaviors were further documented in the Alliance for Water Efficiency 2020 study titled Use and Effectiveness of Municipal Irrigation Restrictions.[7] BAWSCA helped to fund the project and was a contributing project participant which included an in-depth analysis of drought behavior changes. However, the water savings emanating from historical water rate increases and active conservation programs (e.g., non-behavior-based programs such as rebates) achieved through 2018 were assumed to be permanent and therefore did not rebound. The model assumed that the predicted demand recovery would occur gradually over an additional five years (2019-2023), based on BAWSCA's historical experience of the 1987-1992 drought. The estimated gallons per capita per day (GPCD) drought recovery was incorporated into the 27 member agency DSS Models and is further described in Appendix B. This information was reviewed and calibrated with the DSS Model to capture and reflect previous knowledge of the service area from the 2004, 2008, and 2014 BAWSCA forecasting projects. This process generated one complete model for each agency with data between 2020 and 2045 as shown in the following figure.

[7] Alliance for Water Efficiency. (2016). *The Status of Legislation, Regulation, Codes & Standards on Indoor Plumbing Water Efficiency*. http://www.allianceforwaterefficiency.org/Codes-Standards-White-Paper.aspx

Figure 3-2. BAWSCA Demand Model Flow Diagram



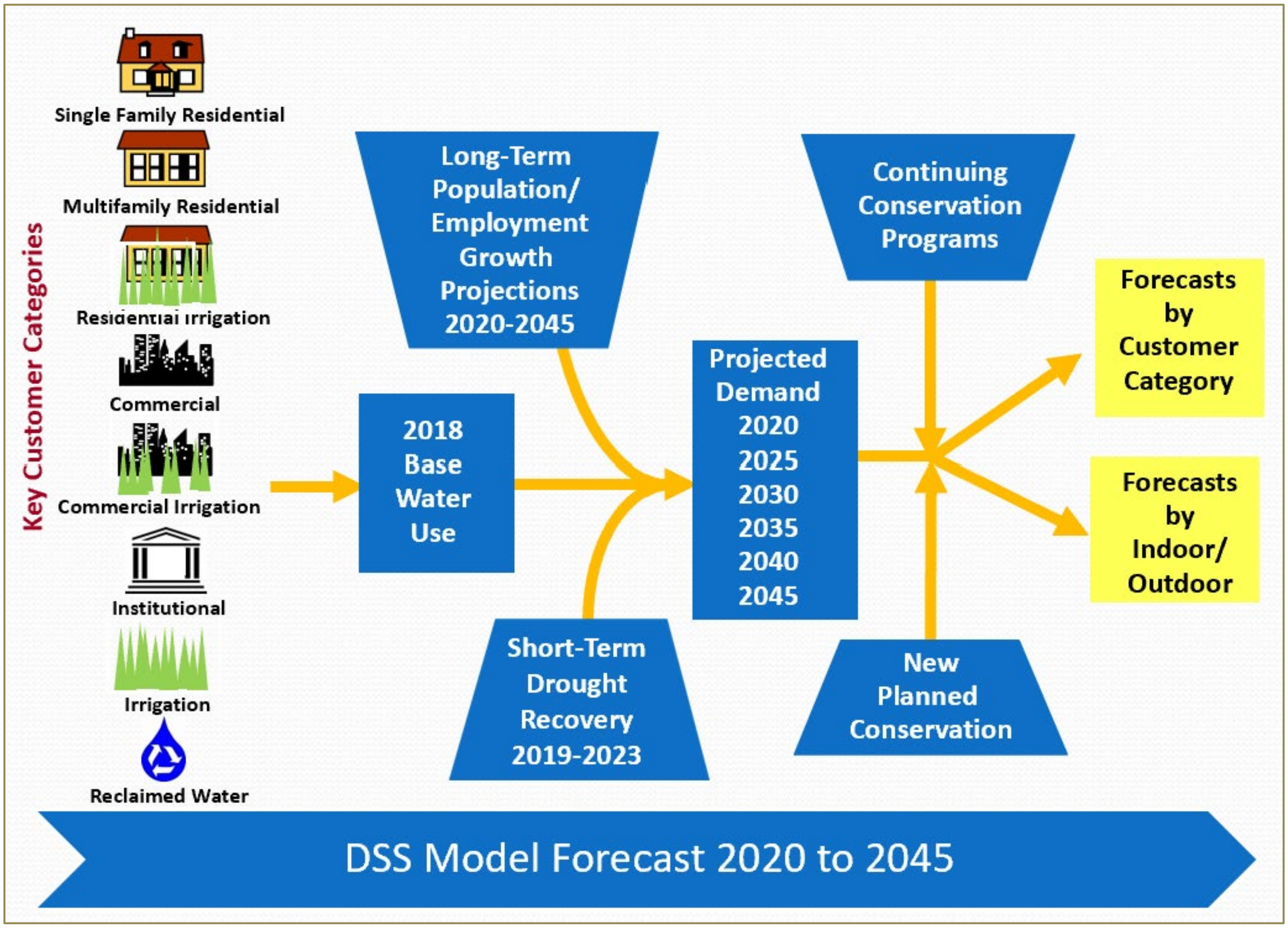
For each BAWSCA member agency, the econometric analysis estimated the relative impact of various factors on water demand. These results have been provided in Appendix C (In Table C-1 and in Figure C-1 the BAWSCA region-wide demand projections are shown with passive savings. Active conservation has not been incorporated into any of the four scenarios. These values are intended to be used for general comparison of ranges in potential future water demands if no active conservation was implemented.

Table C-1). A more detailed description of the Econometric Modeling framework can be found in Appendix B.

3.3 DSS Model Methodology

For the long-term projections (2019-2045), the DSS Model was used to generate demand forecasts for each BAWSCA member agency. The DSS Model also included a conservation component that quantified savings from passive conservation (e.g., plumbing codes) and active conservation programs. The DSS Model's conservation component covers the entire forecast period of 2019-2045. Quantification of savings from active conservation programs is covered in Section 5. Only the DSS Model's estimates of savings from plumbing codes were provided to enable each agency to evaluate what its future demand likely would be absent any active conservation programs from 2020 to 2045.

Figure 3-3. BAWSCA Demand and Conservation DSS Model Flow Diagram



As illustrated above in Figure 3-3, the first step for forecasting water demands using the DSS Model was to gather customer category billing data (e.g., single family residential, multifamily residential, commercial, institutional, etc.) from each BAWSCA member agency. The next step was to calibrate the model by comparing water use data with available demographic data to characterize water usage for each customer category in terms of number of users per account and per capita water use. During the model calibration process, data were further analyzed to approximate the indoor/outdoor split by customer category. The indoor/outdoor water usage was further divided into typical end uses for each customer category. Published data on average per capita indoor water use and average per capita end use were combined with the number of water users to calibrate the volume of water allocated to specific end uses in each customer category. In other words, the DSS Model reflects social norms from end-use studies on water use behavior (e.g., flushes per person per day).

Following the model calibration, the future population and employment projections were incorporated. Each BAWSCA member agency selected its own projection forecasts. These growth projections were used to develop a projected demand for 2019-2045.

As shown in Figure 4-2, the analyzed conservation measures were input into the DSS Model. These conservation measures were a combination of existing and new conservation measures selected by polling the BAWSCA member agencies via SurveyMonkey (an internet-based electronic survey platform). A list of the measures selected for the cost-effectiveness analysis based on this survey can be found in Appendix D.

3.4 Demand Projection – Agency Input and Review

As part of this Demand Study's collaborative approach, one instructional webinar conference call and one workshop were held to facilitate BAWSCA member agency understanding of, and involvement in, the development of the forecasting methodology and analysis. In addition, each member agency was provided with its individual results in written form and was asked to provide written approval of the results.

- **Instructional Webinar –** A webinar with the member agencies was held on April 18, 2019 to give an overview of the project, review the data collection workbook, and provide an overview of the DSS Modeling methodology. The webinar was recorded and offered to those who could not attend to maximize participation by the agencies.
- **Demand Workshop –** On November 18, 2019 a workshop was held for BAWSCA agencies to review the demand modeling approach and results and to answer agency questions. During the workshop, the methodology was reviewed using a real example with preliminary results from one of the BAWSCA agencies.
- **Agency Communication and Technical Memorandum 2 (TM-2) –** In December 2019, agencies were provided a copy of their individual results via TM-2. Agencies were able to email questions or set up virtual calls to review the demand analysis results and make any necessary modifications.
- **Written Approval of Demand Values –** In January 2020, individual agencies were asked to submit written approval that their demand values appeared reasonable. The active conservation analysis in the DSS Model did not proceed until all agencies approved their demand values in TM-2.

3.5 Future Population and Employment

Population and employment projections through 2045 were confirmed by each BAWSCA member agency through the data collection process described in Section 2. Population projections were obtained from one of the following sources:

- Association of Bay Area Governments 2040 Plan Bay Area
- 2015 Urban Water Management Plans
- Other publicly adopted sources as provided by each BAWSCA member agency

3.6 Weather and Climate Change Data

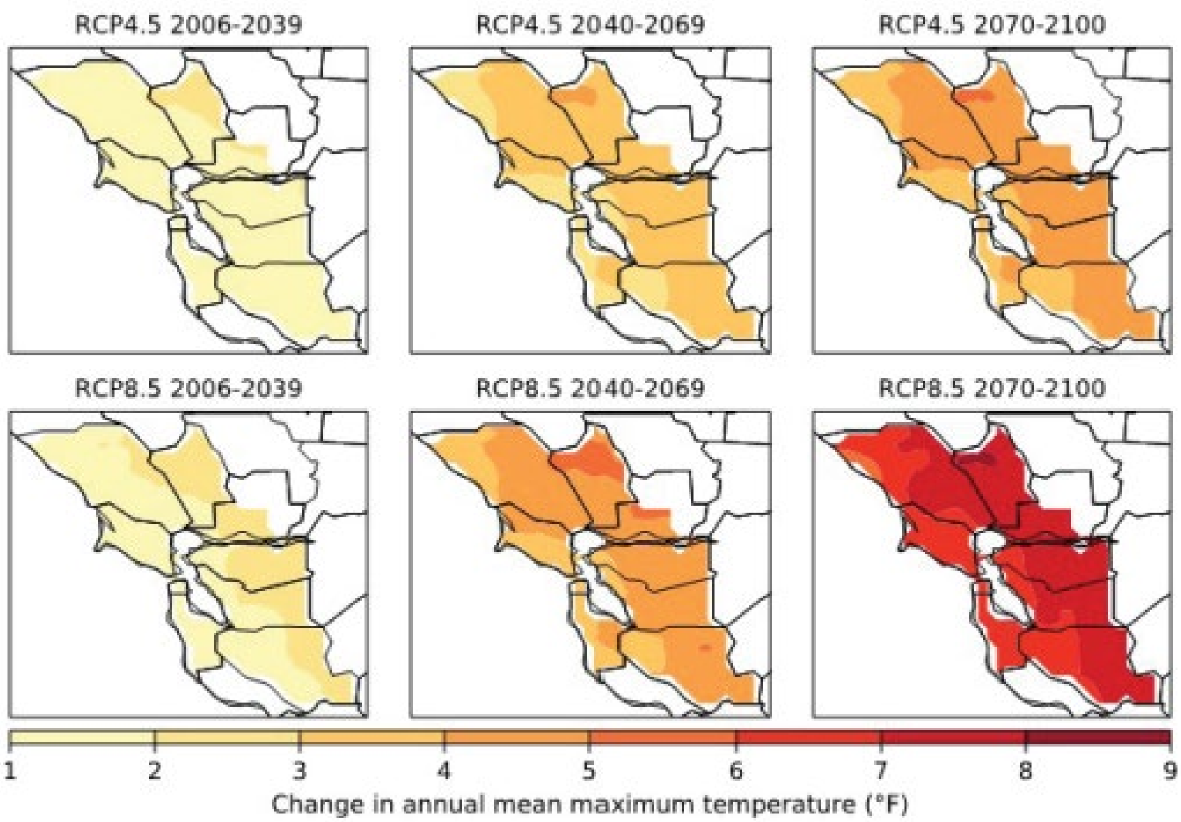
The Public Policy Institute of California has predicted that five climate pressures will impact the future of California's water management: warming temperatures, shrinking snowpack, shorter and more intense wet seasons, more variable precipitation, and rising seas.[8] As of 2019, some of these pressures are already apparent. The climate impact on water supply is predicted to significantly exceed the impact on water demand.

Precipitation in the Bay Area will continue to have high variability year to year, leading to very wet years sometimes and very dry years at other times. The largest winter storms in the Bay Area will likely become more powerful and potentially more damaging. Due to a predicted increase in temperature in the future, it is assumed that California and the Bay Area will experience longer and deeper droughts, which could impact the water supply.

The International Panel on Climate Change (IPCC) develops several future climate change scenarios referred to as Representative Concentration Pathways (RCP). RCP 4.5 represents a mitigation scenario where global CO2 emissions peak by the year 2040. RCP 8.5 represents the business-as-usual scenario where CO2 emissions continue to rise throughout the 21st century. The following figure shows the spatial changes in annual mean of maximum daily temperatures across nine Bay Area counties under RCP 4.5 and RCP 8.5.

[8] Public Policy Institute of California (PPIC). (2019). Priorities for California's Water, accessed online December 2019: https://www.ppic.org/publication/priorities-for-californias-water/

Figure 3-4. Bay Area Historical and Projected Mean Maximum Temperatures



Spatial patterns of projected model-average change in annual mean maximum temperature (unit: °F) under RCP4.5 and RCP8.5 for three time periods: 2006-2039 (early-21st century), 2040-2069 (mid-21st century), and 2070-2100 (late 21st-century). Unit is °F.

Source: Ackerly, David, Andrew Jones, Mark Stacey, Bruce Riordan. (University of California, Berkeley), 2018.

According to California's Fourth Climate Change Assessment San Francisco Bay Area Summary Report,[9] the Bay Area's historical temperature increased 1.7 degrees Fahrenheit from 1950 to 2005. It is predicted that annual mean maximum temperatures will increase by 1 to 2 degrees Fahrenheit in the early 21st century from the years 2006 to 2039, then will increase by an additional 3.3 degrees Fahrenheit in the mid-21st century from 2040 to 2069. This increment for the mid-21st century rises to 4.4 degrees Fahrenheit if the Bay Area remains under the high emissions scenario of "business-as-usual."

The above IPCC report temperature change is broken over two time periods (early-21st century and mid-21st century). For the BAWSCA Demand Study, the time period of focus was 2019-2045. Therefore, it was necessary to combine the two time periods to get an overall temperature change for the length of the BAWSCA Demand Study.

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[9] Ackerly, David, Andrew Jones, Mark Stacey, Bruce Riordan (University of California, Berkeley). (2018.) *San Francisco Bay Area Summary Report.* California's Fourth Climate Change Assessment. Publication number: CCCA4-SUM-2018-005. Accessed online December 2019: https://www.energy.ca.gov/sites/default/files/2019-07/Reg%20Report-%20SUM-CCCA4-2018-005%20SanFranciscoBayArea.pdf

Following are the considerations and methodology used to calculate the average annual temperature change for each of the IPCC report time periods:

- Early 21st Century (2006-2039) had an estimated temperature increase of 1 to 2 degrees Fahrenheit that was averaged to 1.5 degrees Fahrenheit. For the 33-year time period, this equates to an average annual temperature increase of 0.045 degrees Fahrenheit.
- Mid-Century (2040-2069) was estimated to have a temperature increase of 3.3 degrees Fahrenheit. For the 29-year time period, this equates to an average annual temperature increase of 0.114 degrees Fahrenheit.

Calculating the increase within each time period for the BAWSCA Demand Study required three steps:

- Step 1: Calculate a value for the 20 years from 2019 to 2039, which equates to an estimated temperature change of 0.95 degrees Fahrenheit.
- Step 2: Calculate a value for the five years from 2040 to 2045, which equates to an estimated temperature change of 0.68 degrees Fahrenheit.
- Step 3: Finally, the two values from Step 1 and Step 2 were added together to get a total temperature increase of 1.7 degrees Fahrenheit (rounded) for 2019-2045.

In summary, for the BAWSCA Demand Study, the previously mentioned predicted annual mean temperature increase in the early 21st century of 1.7 degrees Fahrenheit[10] was incorporated into the demand forecast for all scenarios for the time period of 2019 to 2045.

3.7 Demand Projections Scenarios

The Econometric Model and DSS Model were used in conjunction to generate water demand projection scenarios for each BAWSCA member agency for four scenarios as noted in the table below.

Table 3-1. Water Demand Recovery Scenarios

Scenario	Water Data Years	Normal Economy	Weather Normalized	Water Rates	Active Conservation	Passive Conservation Savings (Plumbing Codes)	Future Service Area Changes/ Growth Forecast
Pre-Recession and Pre-Drought Demand Level Recovery	2000-2007					✓	✓
Pre-Drought Demand Level Recovery	2004-2013					✓	✓
Partial Rebound – Normal Economy, Weather Normalized	1995-2018	✓	✓	✓	✓	✓	✓
Current Water Demand Profile – Normal Economy, Weather Normalized	2018	✓	✓			✓	✓

[10] Ibid.

Each individual member agency's historical and projected water demands are shown in Appendix A (Figure A-1) of their respective TM-2s. Those TM-2 Appendix A figures, along with Table 3-1 and Figure 3-5 in this section, contain the following curves:

- Pre-Recession and Pre-Drought Demand Level Recovery – Demand projections based on years 2000-2007 water use profile, starting with 2018 demand levels and recovering from the drought in five years.
- Pre-Drought Demand Level Recovery – Demand projections based on years 2004-2013 water use profile, starting with 2018 demand levels and recovering from the drought in five years.
- Partial Rebound – Projections developed by the Econometric Model assuming: 1) normal weather, 2) normal economy, 3) price escalation projections that vary by agency, 4) historical active conservation efforts, 5) passive conservation plumbing codes, and 6) recovery from the drought in five years.
- Current Water Demand Profile – Assuming: 1) normal economy, and 2) weather normalized. This is water demand calculated from historical 2018 water production data submitted by each BAWSCA member agency. The 2018 data were weather normalized and assumed a normal economy. This scenario does not include any additional post-drought demand recovery.

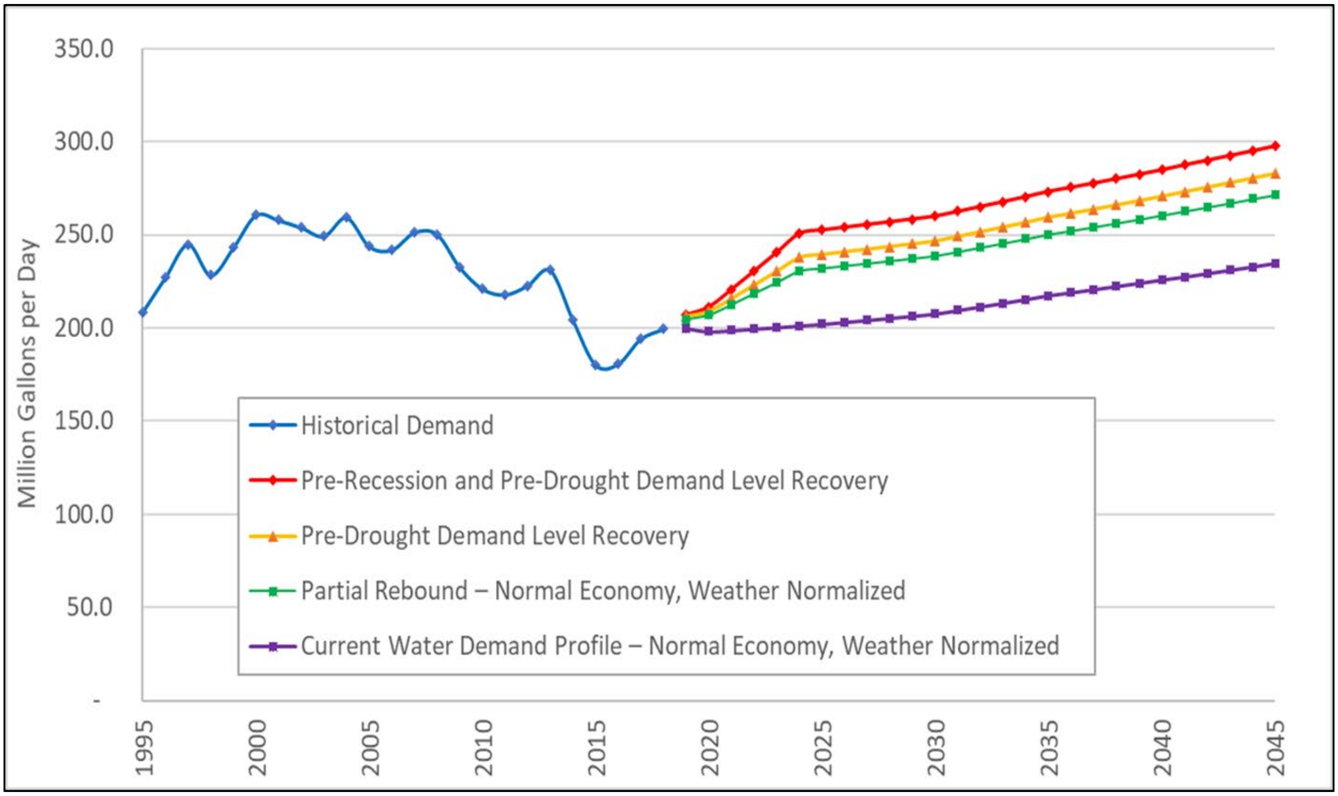
Savings from plumbing codes (also known as "passive conservation") is based on federal and state legislated efficiency standards pertaining to plumbing fixtures and appliances. The impact of codes quantified here include the Energy Policy Act of 1992, CALGreen Building Code, AB 715, and SB 407 (governs the types of fixtures available on the market for toilets, showers, washers, etc.). The plumbing code has been added into all four scenarios. Figure 3-5 presents a summary of the BAWSCA service area total demand projections through 2045 including passive conservation. These projections encompass all demands regardless of source, including non-potable water demands.

The Partial Rebound – Normal Economy, Weather Normalized scenario was used for the conservation analysis in the next phase of the BAWSCA project because it incorporated the longest time period of data (1995-2018), included weather normalization, and was adjusted for the change in water rates. The inclusion of these variables over a long time period using regression analysis was deemed by BAWSCA to be the most representative for a long-term forecast. In addition, analysis of BAWSCA data from prior droughts demonstrated that there was a significant rebound in per capita water use within seven years following the end of a drought.[11] Therefore, an assumption of a partial rebound to pre-drought demands is consistent with past experience. Taking a long-term viewpoint was found to be especially important since recent data included both recession and severe drought, as mentioned previously.

Furthermore, beginning in 2023, each urban water supplier in California, including 24 of the 27 BAWSCA member agencies, will be required to calculate and report to the State Water Resources Control Board (SWRCB) on an annual water use objective. The urban water use objective will be based upon standards of efficient water use for indoor residential, outdoor residential, and dedicated irrigation. The water efficiency standards have not been established yet by the SWRCB; however, it is anticipated that these standards, and resulting urban water use objectives, will become a key driver for water conservation planning for the BAWSCA region. Each agency's water conservation program will be designed to reduce its projected water use by, at a minimum, the amount needed to stay within its urban water use objective. To ensure that sufficient water conservation programming is planned and budgeted, it is prudent to plan and budget under the assumption that drought rebound will occur and to develop a robust water conservation program to enable agencies to meet their urban water use objectives in spite of that rebound.

[11] Analysis of residential per capita water use data from the BAWSCA *Annual Survey Fiscal Year 2018-19* (BAWSCA, 2020) for the 4 years prior to the 1987-1992 drought (1984-1988) and years 4-7 following the drought (1995-1998) showed a 23% increase in residential per capita water from the lowest drought year to the 4-year average from years 4-7 of the recovery period.

Figure 3-5. BAWSCA Region-Wide Demands to 2045 with Passive Conservation*



* *Savings from plumbing codes (also known as "passive conservation") is based on federal and state legislated efficiency standards pertaining to plumbing fixtures and appliances.*

4 WATER CONSERVATION SAVINGS PROJECTIONS

This section documents the conservation savings projections for each BAWSCA member agency and for the BAWSCA region. In addition, the conservation analysis methodology and results are detailed.

4.1 Conservation Analysis Goals and Objectives

The Demand Study included two goals related to water conservation: 1) to define how much conservation can reasonably contribute to more supply reliability for all BAWSCA member agencies and 2) to incorporate projected conservation savings into the demand projections for each agency. Pursuant to this goal, the specific objectives of the conservation analysis for the Demand Study were:

- Assist BAWSCA member agencies in evaluating the potential water savings and cost-effectiveness associated with implementing a variety of existing and potential new water conservation measures;
- Determine the projected water savings from 2020 through 2045 associated with implementing a selected suite of new conservation measures; and
- Determine which entity (i.e., BAWSCA, the member agencies, or Valley Water) should implement each conservation measure or program and when the program should be implemented in order to achieve the specified water savings goals.

To develop demand forecasts for each agency that account for conservation from both passive (plumbing code and standards) and active conservation programs, the individual agency DSS Models were designed to achieve the following two objectives:

1. Account for passive conservation savings projected through 2045
2. Analyze potential savings from a variety of water use efficiency measures to facilitate the development of individual agency conservation savings estimates through 2045

Each BAWSCA member agency's individual conservation water savings goal, where applicable, was provided by the agency during the data collection process described in Section 2 and was used in the conservation analysis.

4.2 Conservation Analysis Methodology Overview

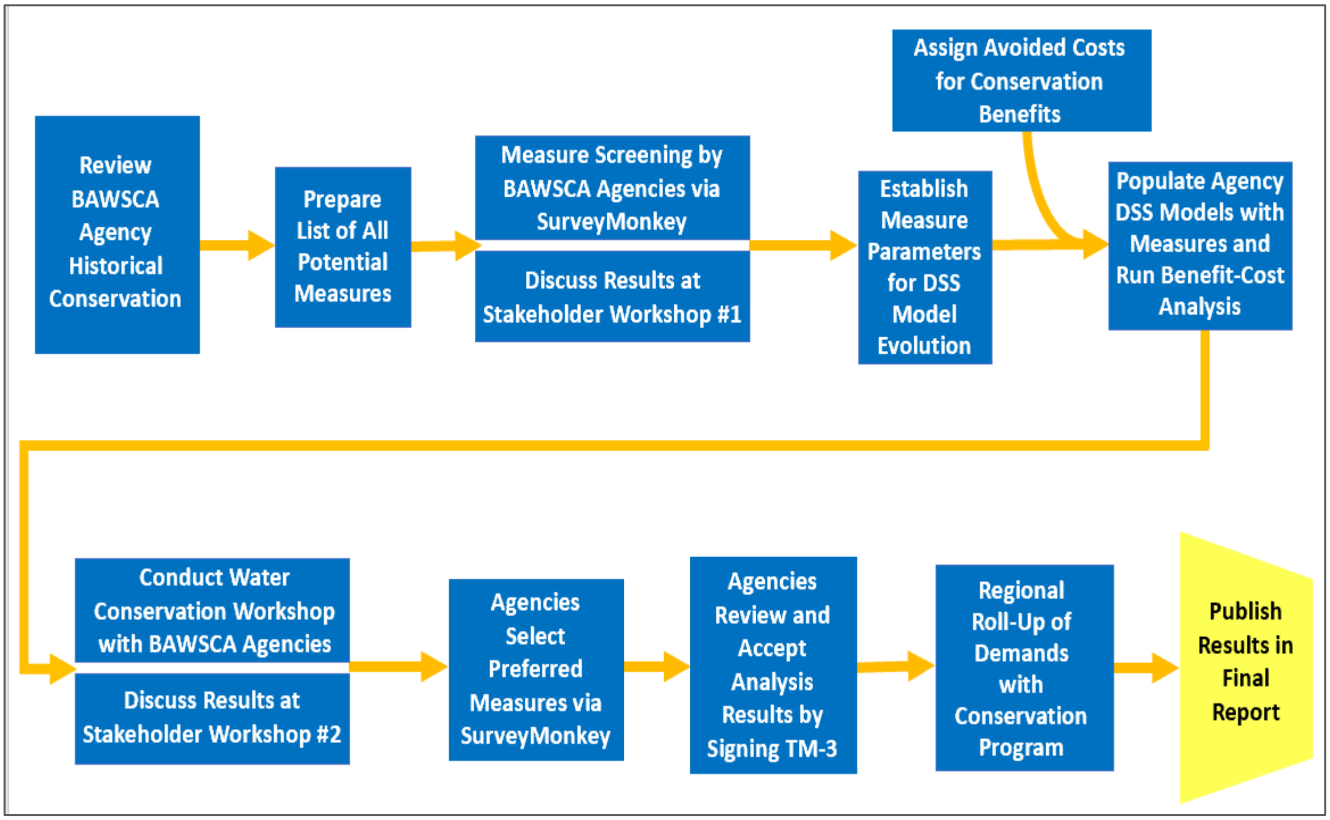
The conservation savings projections were developed through a 10-step process.

Review of Historical BAWSCA Member Agency Conservation Programs and Savings

The first step in the conservation analysis was to review historical BAWSCA member agency water conservation and savings. The purpose of this review was to look at historically successful programs, past penetration rates (activity levels) for individual measures, and the types of programs that were implemented (and for which customers – single family, multifamily, commercial, etc.) by each of the agencies since the 2014 Project. This information was reviewed on a regional and individual agency level. The participation rates were incorporated into the design of the activity levels for each of the conservation measures in the DSS Model analysis.

Figure 4-1 illustrates the 10-step conservation analysis process.

Figure 4-1. BAWSCA 10-Step Conservation Analysis Process



Selection of Conservation Measures for Analysis

Following the review of the historical conservation efforts, a list of 40 potential conservation measures was selected by BAWSCA staff. Member agencies were then asked to complete an online survey through SurveyMonkey to assist in choosing 20-25 of the 40 potential conservation measures that should be considered for further evaluation in the DSS Model. This list of measures was screened by BAWSCA and the member agencies to identify those measures with the highest level of interest, importance, and potential for implementation within the BAWSCA service area independent of which entity (BAWSCA, Valley Water, or the individual agencies) would be best suited to implement each measure. The list was also reviewed by the Stakeholder Workgroup, who provided suggestions on measure ideas and design. Through this process, a total of 24 measures were selected for analysis in the individual agency DSS models. The 24 measures that were incorporated into the DSS Models are presented in Figure 4-2, with the screening process results and further details on each measure in Appendix D.

Figure 4-2. BAWSCA Agency-Selected Water Use Efficiency Measures

BAWSCA Agency-Selected Measures

COMMERCIAL
- CII Water Survey
- CII Water Efficient Technology (WET) Rebate
- School Building Retrofit
- Fixture Retrofit on Resale or Water Account Change (Commercial)

IRRIGATION
- Residential Outdoor Water Surveys
- Large Landscape Outdoor Water Surveys
- Large Landscape (Waterfluence) Program
- Lawn Be Gone! and Rainwater Capture Rebates
- Financial Incentives for Irrigation and Landscape Upgrades
- Landscape and Irrigation Codes

RESIDENTIAL
- Residential Indoor Water Surveys
- Residential Water-Savings Devices Giveaway
- Flowmeter Rebate
- Leak Repair and Plumbing Emergency Assistance
- Multifamily HET Direct Install
- Multifamily Submetering for Existing Accounts
- New Development Submetering
- New Development Hot Water On Demand
- Low Impact New and Remodeled Development
- Fixture Retrofit on Resale or Water Account Change (Residential)

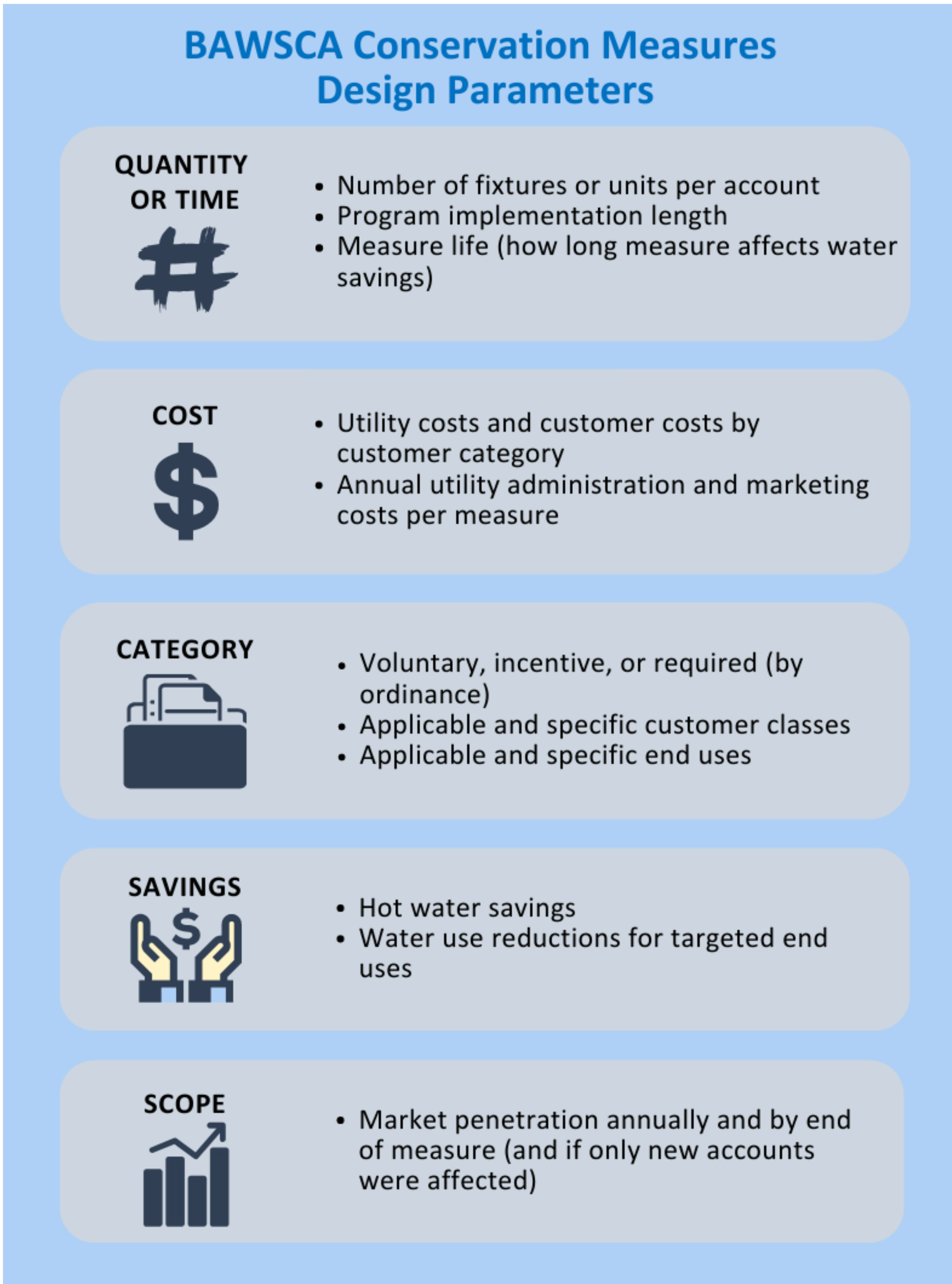
COMMUNITY AND EDUCATION
- Public and School Education
- Billing Report Educational Tool Non-AMI
- AMI Customer Portal

SYSTEM WATER LOSS
- Water Loss

Conservation Measure Design

Following the selection of the 24 conservation measures for the DSS Model, design parameters for each measure were developed for inclusion in the model (see Figure 4-3). The design parameters were developed through a collaborative effort in which information was compiled and reviewed by participants from MWM, BAWSCA staff, Valley Water, SFPUC, and the individual agencies.

Figure 4-3. Conservation Measures Design Parameters



The following assumptions were used in designing the model parameters for each conservation measure:

- Historical BAWSCA data were used in cases when the measure was already in existence.
- Valley Water data were used to design BAWSCA-led measures in cases where Valley Water was running a comparable measure at the time of the analysis.
- Design of individual "agency measures" and their parameter values came from BAWSCA member agencies.
- Other industry data and knowledge was incorporated when local data was not available.
- New measures were designed with an implementation schedule reflecting dates sometime in the future when BAWSCA or its member agencies might begin such programs.

Measure Analysis and Conservation Program Selection

The 24 conservation measures were incorporated into each agency's DSS Model for benefit-cost analysis (described below) and selection of a conservation program to meet the agency's goals. Included in each agency's DSS Model was a list of measures selected by the individual member agency. The following four key items were taken into consideration during measure selection:

- Existing agency water use efficiency measures
- Programs run by BAWSCA (with consideration for Valley Water programs)
- Measures focused on the topic areas of new state regulations (residential indoor per capita use, water loss, landscape, commercial
- New and innovative measures

Each BAWSCA member agency's DSS Model presented estimated average per capita per day savings with the plumbing codes only. Plumbing code includes current state and federal standards (including CALGreen, Senate Bill 407 and Assembly Bill 715) for items such as toilets, showerheads, faucets, pre-rinse spray valves. SB 407 and AB 715 require the replacement of non-water conserving plumbing fixtures with water-conserving fixtures as described in Appendix E.

Each BAWSCA member agency was allowed to review the conservation program options, tailor the programs to meet its needs, and select the program that fit its individual water savings goals and budgets. The reasons that each member agency selected a particular suite of measures varied but included:

- Measure cost effectiveness
- Applicability to service area
- Amount of water savings generated
- Cost
- Ease of implementation and staffing requirements
- Which agency was running the measure (BAWSCA or Valley Water)
- Local preferences

Perspectives on Benefits and Costs

The determination of the economic feasibility of water conservation programs involves comparing the costs of the programs to the benefits provided. This analysis was performed using the DSS Model developed by MWM, which calculates the cost effectiveness of conservation measure savings at the end-use level. For example, the model determines the amount of water a toilet rebate program saves in daily toilet usage for each single family account. Additional detail on the DSS Model and assumptions can be found in Appendix E.

Appendix F presents generic starting value measure assumptions used as a means for each BAWSCA member agency to tailor its DSS Model to evaluate the potential water use efficiency measures. The agencies had the option to select or unselect any measure for implementation. Assumptions were made for the following variables incorporated into the DSS Model:

- **Targeted Water User Group End Use –** Water user group (e.g., single family residential) and end use (e.g., indoor or outdoor water use)
- **Utility Unit Cost –** Cost of rebates, incentives, and contractors hired by BAWSCA and BAWSCA member agencies to implement measures
- **Retail Customer Unit Cost –** Cost for implementing measures that is paid by retail customers (i.e., remainder of a measure's cost that is not covered by a rebate or incentive)
- **Utility Administration and Marketing Cost –** The cost to the utility for staff time, general expenses, and overhead needed to implement and administer the measure, including consultant contract administration, marketing, and participant tracking. The unit costs vary greatly according to the type of customer and implementation method. For example, a measure might cost a different amount for a single family account than a multifamily account. Rebate program costs are different than costs to develop and enforce an ordinance requirement or a direct installation program. Typically, water utilities incur increased costs with achieving higher market saturation, such as more surveys per year. The model calculates the annual costs based on the number of participants each year.

  The general formula for calculating annual utility costs is:

  Annual Utility Cost = Annual market penetration rate x total accounts in category x unit cost per account x (1+administration and marketing markup percentage)

  Annual Customer Cost = Annual number of participants x unit customer cost

  Annual Community Cost = Annual utility cost + annual customer cost

Considering Co-Benefits of Water Conservation Measures

The DSS Model considers the costs and benefits of water conservation programs from a water utility perspective to determine economic feasibility. However, many of the water conservation programs evaluated through this study include additional benefits distinctly different from what a water utility would track. The value of those distinctly different impacts is not fully captured in this quantitative analysis. Examples of these co-benefits include the following items shown in Table 4-1.

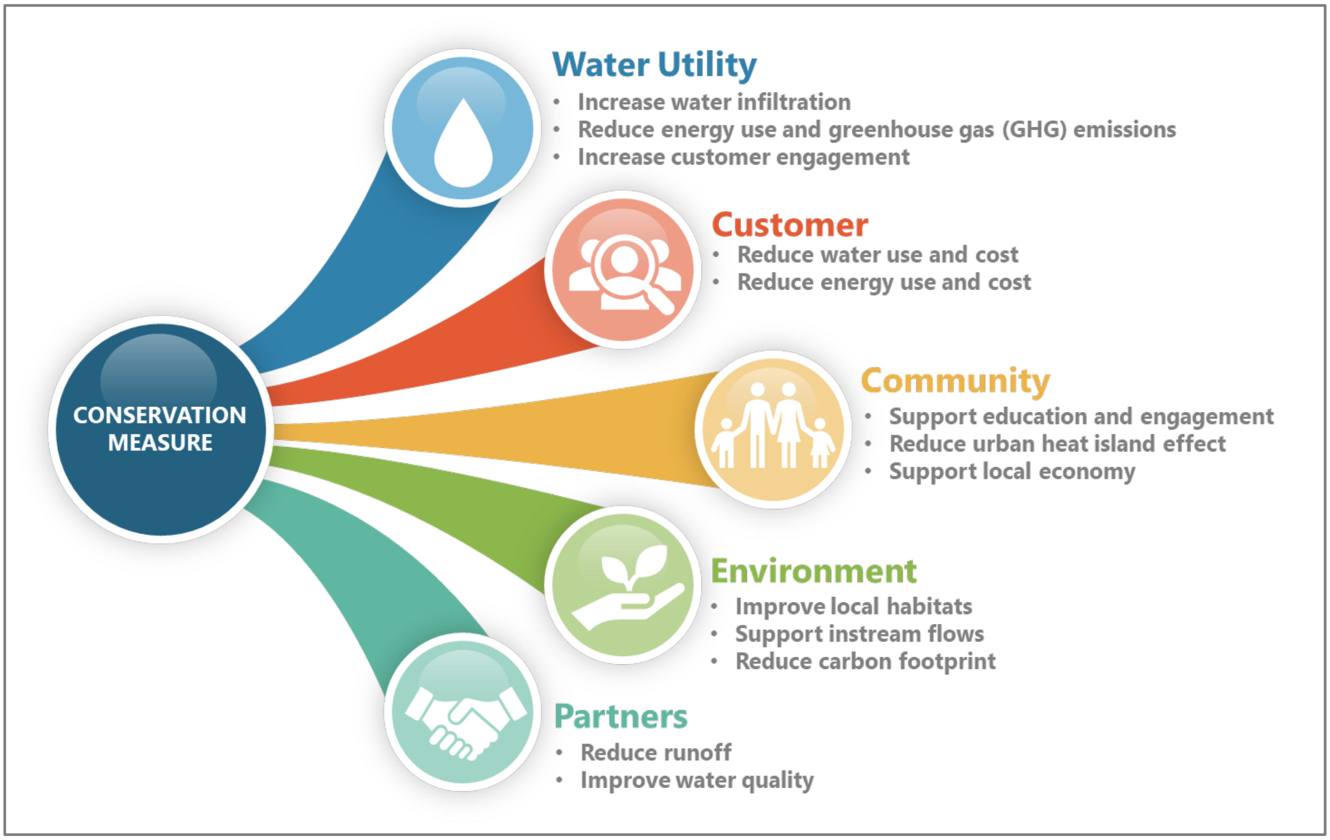
Table 4-1. Co-Benefits from Conservation Measure Implementation*

Beneficiary	Benefit
Utility	Reduce energy and GHG for pumping and treating water
Utility	Increase water infiltration (if groundwater basin)
Utility	Increase customer engagement
Partner	Reduce runoff and improve local water quality
Customer	Reduce water cost for customer
Customer	Reduce energy cost on-site
Environment	Improve local habitats
Environment	Reduce carbon footprint
Community	Reduce urban heat island effect
Community	Support education
Community	Build community cohesion and resilience
Community	Support local economy (local jobs and/or property values)

** Adapted in collaboration with Pacific Institute from Diringer et al. (2020). Incorporating Multiple Benefits into Water Projects: A Guide for Water Managers. Pacific Institute. www.pacinst.org/multiplebenefits.*

Figure 4-4 presents key co-benefits that can be achieved from various conservation measure implementation. This information may support the development of partnerships and cost sharing opportunities for measure implementation to optimize the investment of time and resources. Potential partnership opportunities may include local municipalities with stormwater permit requirements, cities implementing Climate Action Plans, energy utilities, and regenerative landscaping organizations such as ReScape.

Figure 4-4. Co-Benefits of Identified Conservation Measures



Note: Adapted in collaboration with Pacific Institute – Diringer et al. (2020). Incorporating Multiple Benefits into Water Projects: A Guide for Water Managers. Pacific Institute. www.pacinst.org/multiplebenefits.

4.3 Conservation Measures – Agency Input and Review

As part of this Demand Study's collaborative approach, two instructional webinar conference calls were held to facilitate BAWSCA member agency understanding of and involvement in the review and selection of the conservation measures and savings analysis.

- **Instructional Webinar and Conservation Survey #1 –** A webinar with the member agencies was held on an initial webinar was held on December 19, 2019, to facilitate the selection of conservation measures for analysis in the DSS Model. The webinar was recorded and offered to those who could not attend to maximize participation by the agencies. This was followed by a survey conducted in January 2020 to solicit feedback on which conservation measures BAWSCA member agencies wanted to consider as part of the conservation analysis. Results from the January 2020 survey can be found in Appendix D.
- **Conservation Workshop (virtual) and Conservation Survey #2 –** A virtual workshop was held on April 1, 2020 to facilitate BAWSCA member agency understanding of and involvement in the conservation program analysis in the DSS Model**.** The originally planned in-person workshop was changed to a virtual workshop in response to the COVID 19 pandemic. This was followed by a survey conducted in April 2020 to solicit feedback on which conservation measures BAWSCA member agencies wanted to consider as part of the conservation analysis.
- **Agency Communication and Technical Memorandum 3 (TM-3) –** In April 2020, individual agencies were provided a copy of their individual conservation saving results via a Technical Memorandum (TM-3). Following the release of the TM-3 individual agencies were able send questions via email or set up virtual calls to review the conservation savings analysis results and make any necessary modifications.

- **Written Approval of Demand Values –** In May 2020, individual agencies were requested to submit a written approval that their demand values including passive and active conservation appeared reasonable. The report includes all the values that were signed off by the individual agencies.

4.4 Comparison of Individual Conservation Measures

MWM conducted an economic evaluation of each selected water conservation measure using the DSS Model. Appendix F presents detailed results with regard to how much water each measure will save through 2045; how much each will cost; and the cost of saved water per unit volume if the measure were to be implemented on a stand-alone basis (i.e., without interaction or overlap from other measures that might address the same end use or uses). Dollar savings from reduced water demand was quantified annually and based on avoided costs. Actual measure design parameter inputs can be found in Appendix F. While each measure was analyzed independently, it is important to note that very few measures operate independently. Savings from measures which address the same end use(s) are not directly additive. The model uses impact factors to avoid double counting in estimating the water savings from programs of measures (further details in Appendix E, Section E.4).

One of the objectives of the Demand Study was to identify conservation measures for further consideration for BAWSCA region-wide implementation. Figure 4-5 presents the number of BAWSCA member agencies that selected each measure as part of their planned conservation programs.

Figure 4-5. Potential Conservation Measures

BAWSCA Planned Conservation Measure Implementation

Measure Name	# of Agencies Planning to Implement
<u>Commercial</u>	
CII Water Survey	13
CII Water Efficient Technology (WET) Rebate	10
School Building Retrofit	6
Fixture Retrofit on Resale or Water Account Change (Commercial)	2
<u>Irrigation</u>	
Residential Outdoor Water Surveys	16
Large Landscape Outdoor Water Surveys	20
Large Landscape (Waterfluence) Program	14
Lawn Be Gone! and Rainwater Capture Rebates	19
Financial Incentives for Irrigation and Landscape Upgrades	14
Landscape Irrigation and Codes	10
<u>Residential</u>	
Residential Indoor Water Surveys	9
Residential Water-Savings Devices Giveaway	20
Flowmeter Rebate	7
Leak Repair and Plumbing Emergency Assistance	9
Multifamily HET Direct Install	2
Multifamily Submetering for Existing Accounts	5
New Development Submetering	8
New Development Hot Water On Demand	4
Low Impact New and Remodeled Development	3
Fixture Retrofit on Resale or Water Account Change (Residential)	2
<u>Community & Education</u>	
Public and School Education	22
Billing Report Educational Tool Non-AMI	10
AMI Customer Portal	14
<u>System Water Loss</u>	
Water Loss	20

5 PROJECTED WATER DEMAND AND CONSERVATION SAVINGS RESULTS

This section presents the results of the water demand and conservation analysis for each individual BAWSCA member agency and for the BAWSCA region.

5.1 BAWSCA Regional Demand Projections

For the purposes of these regional projections, the demand projections for future planning are presented in Table 5-1. These demand projections were developed using the Partial Rebound demand scenario developed utilizing an Econometric Modeling approach, both of which are further described in Section 3. The Econometric Modeling approach assumed: 1) normal weather, 2) normal economy, 3) price escalation projections that vary by agency, 4) historical active conservation efforts, and 5) passive conservation plumbing codes.

Demand projections are based on data provided from 1995 through 2018. This analysis was completed before the COVID-19 pandemic Shelter in Place orders began in March 2020. Therefore, none of the new changes in water use profiles, population, employment, or vacancies resulting from the pandemic have been incorporated because the data was not yet available and was outside the scope of this project. It is recognized that, depending on the impact of recent events, the water demands may need to be reviewed and/or modified.

Table 5-1 presents the following:

- **Demand projections with no plumbing code savings** – previously verified by each member agency through the Technical Memorandum 2 signature form.
- **Demand projections with plumbing code savings** – previously verified by each member agency through the TM-2 signature form.
- **Demand projections with the plumbing code savings and active conservation program savings** – incorporates the member agency-selected active conservation program from the agency's DSS Model. The SurveyMonkey with the selected conservation program was returned to BAWSCA on April 30, 2020.

Table 5-1. Demand Projections for Partial Rebound Scenario

Demand Forecast (MGD)	2023	2025	2030	2035	2040	2045
Total Demand with No Plumbing Code Savings	231.1	240.3	251.1	266.7	280.0	293.6
Total Demand with Plumbing Code Savings	222.0	228.9	234.3	244.3	253.1	262.4
Total Demand with Active Measure Savings	219.0	225.1	229.2	238.8	247.0	256.3

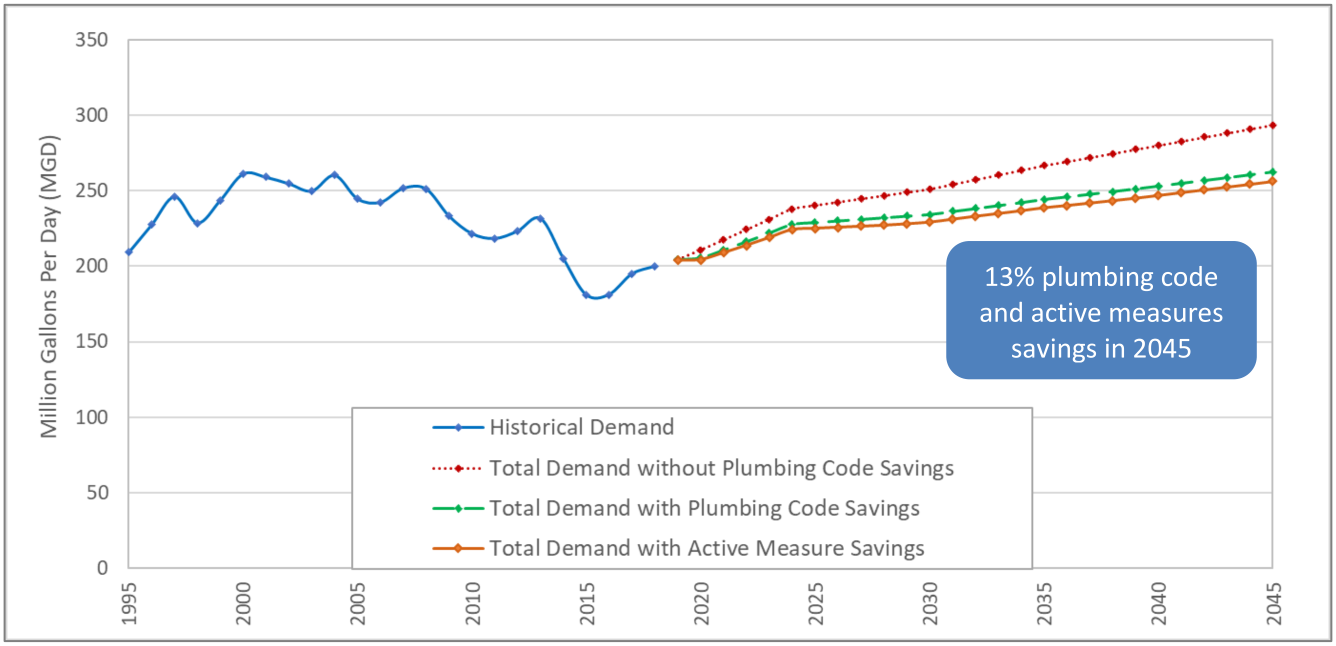
Note: Total water demand accounts for the total projected demand in a service area water system regardless of source, which could be from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water. The basis for this demand scenario was discussed previously in Section 3. AB 1668 (Friedman) and SB 606 (Hertzberg) will begin to be enforced in 2023. Therefore, projections for that particular year are included since that is when the new conservation requirements begin to take effect.

Figure 5-1 presents the combined BAWSCA region-wide water demand projections with and without passive conservation. Total water demand is defined as total water consumption plus non-revenue water. Water consumption is defined as water delivered to individual customers for use. As noted earlier in Section 3, the conservation analysis was based upon the Partial Rebound – Normal Economy, Weather Normalized scenario.

Figure 5-2 illustrates the projected 75% population increase with a 2% demand decrease between 1986 and 2045. The demand shown in this chart includes both plumbing code and active conservation measure savings.

Figure 5-3 represents the gross and residential per capita water use for BAWSCA. The gross per capita value is the total production including non-revenue water. Both the gross and residential per capita water use exclude recycled water.

Figure 5-1. BAWSCA Region-Wide Demands with Active Conservation Savings to 2045*



* *Water demands are based on data provided from 1995 through 2018. This analysis was completed before the COVID-19 pandemic and does not incorporate any of the new changes in water use profiles, population, employment, or vacancies as the data was not yet available and was outside the scope of the current project. However, it is recognized that the water demands may need review or modification depending on the impact of recent events.*

Figure 5-2. Historical and Projected Population and Demand

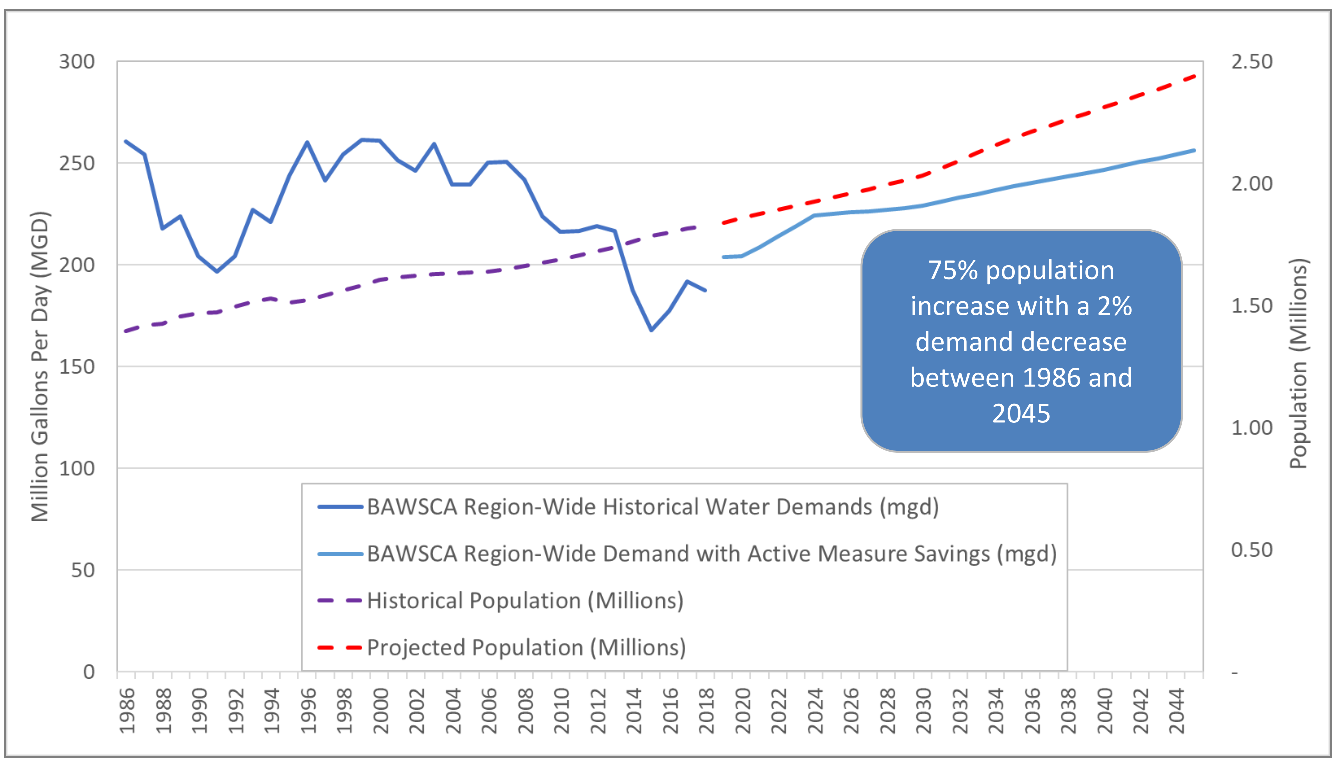
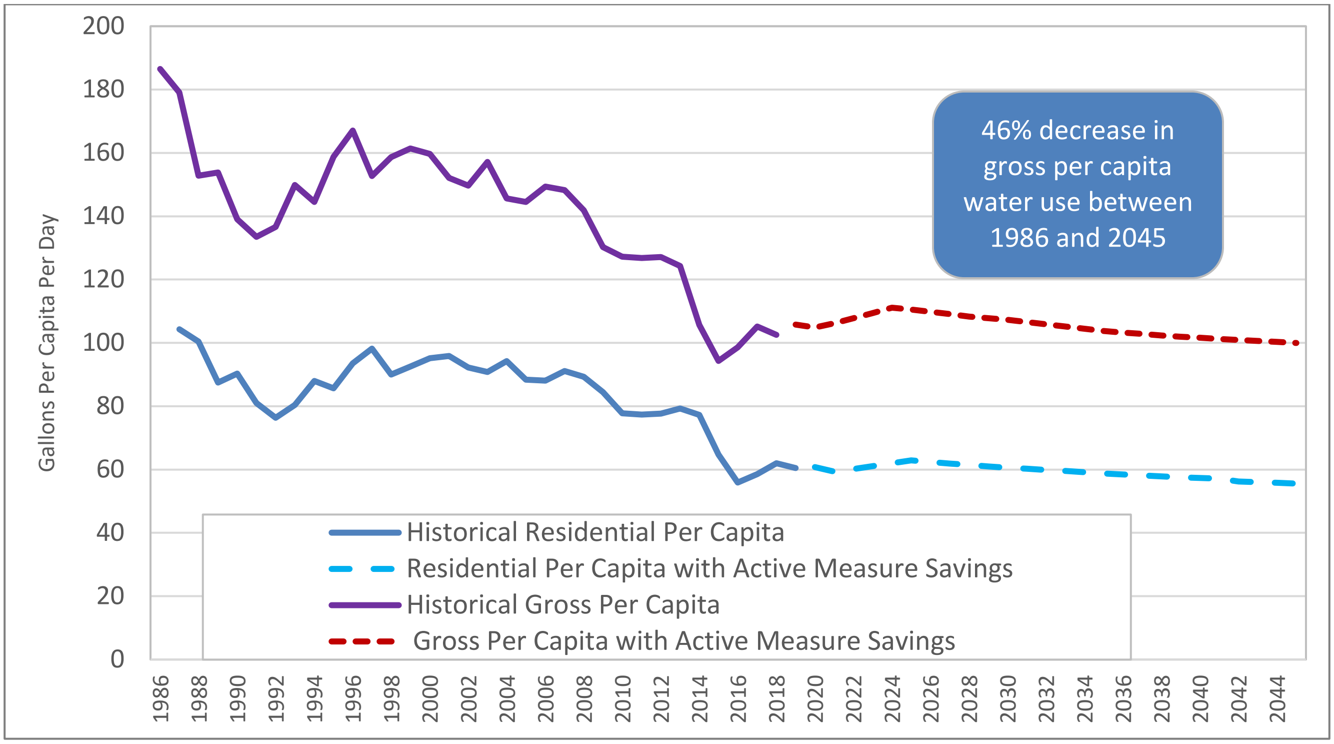


Figure 5-3. Total BAWSCA Gross Per Capita Demands



Note: To be consistent with the BAWSCA methodology for the BAWSCA Annual Survey, recycled water has been removed from the per capita calculations. Therefore, the above information is a potable-only per capita value.

5.2 Population and Employment Projections Summary

Table 5-2 presents the BAWSCA region-wide historical and projected population and employment.

Table 5-2. BAWSCA Region-Wide Historical and Projected Population and Employment

Year	Population	Employment (Jobs)
1995*	1,511,254	1,044,179
2000*	1,604,927	1,129,881
2005*	1,636,600	1,064,347
2010*	1,688,378	1,033,325
2015*	1,785,787	1,072,024
2020	1,858,392	1,156,613
2025	1,941,725	1,209,770
2030	2,032,304	1,270,096
2035	2,187,849	1,329,806
2040	2,311,562	1,379,449
2045	2,438,515	1,430,112

** Historical population and employment based on BAWSCA records as reported by individual member agencies.*

Figure 5-4 presents the BAWSCA service area population and employment projections.

Figure 5-4. Historical and Projected Population and Employment

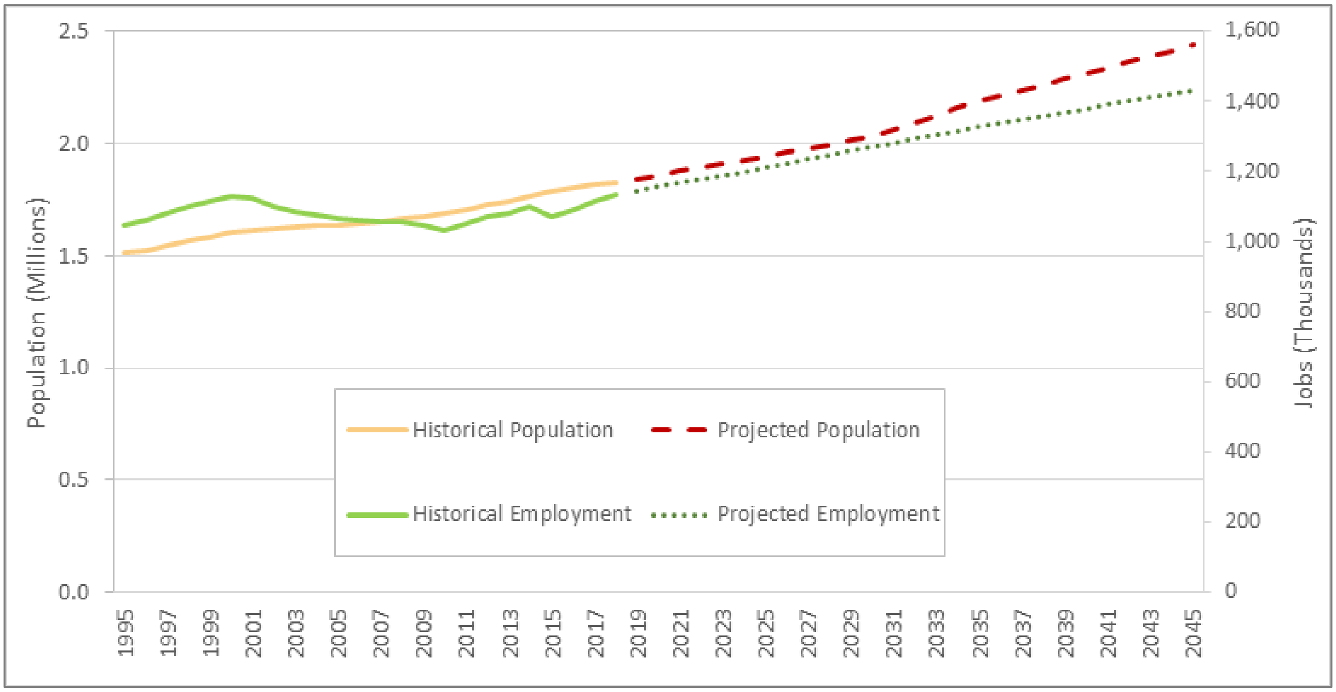


Table 5-3 presents individual BAWSCA member agency population projections. Each agency was given the ability to select the source they felt best represented their service area and other planning documents.

Table 5-3. BAWSCA Member Agency Population Projections

Service Areas	Projection Source	2023	2025	2030	2035	2040	2045
Alameda County Water District	ACWD Forecast – California Department of Finance (DOF), ABAG, BAM[1]	358,902	360,273	363,700	381,190	403,005	424,820
Brisbane/GVMID	Previous DSS Model; model updated in 2018 for WSA	4,583	4,632	4,761	4,906	5,056	5,206
Burlingame, City of	2015 UWMP	33,804	34,477	36,162	37,846	39,530	41,214
CWS – Bear Gulch District	CalWater Draft Demand Model	61,257	61,329	61,697	62,243	62,780	63,327
CWS – Mid Peninsula District	CalWater Draft Demand Model	137,332	137,623	138,350	139,077	139,804	140,531
CWS – South San Francisco District	CalWater Draft Demand Model	63,225	63,381	63,890	64,633	66,990	69,458
Coastside County Water District	Preliminary 2019 ABAG	18,890	18,991	19,238	19,371	19,472	19,573
Daly City, City of	Previous effort's DSS Model; based on ABAG 2013 subregional data; 1995 data from 2000 ABAG	114,352	115,671	119,147	123,020	127,028	131,037
East Palo Alto, City of	2015 UWMP	26,703	27,215	28,589	30,062	31,646	33,230
Estero MID/ Foster City	Updated DSS Model in 2017 for WSA effort	37,560	37,800	38,400	39,000	39,600	40,200
Hayward, City of	DOF 2019 Population; growth based on flow projections in Hayward's Sewer Master Plan	173,933	181,670	202,553	225,836	251,795	280,738
Hillsborough, Town of	2015 UWMP	10,939	10,956	11,000	11,000	11,000	11,000
Menlo Park, City of[2]	2015 UWMP	20,018	21,214	24,204	27,194	30,184	33,174
Mid-Peninsula Water District	2019 Preliminary ABAG	28,851	29,711	30,008	31,010	31,961	32,912
Millbrae, City of	2019 Preliminary ABAG	22,734	22,846	26,774	26,657	27,081	27,505

Service Areas	Projection Source	2023	2025	2030	2035	2040	2045
Milpitas, City of	2015 UWMP and 2019 Preliminary ABAG	87,160	90,400	98,100	106,000	109,100	112,200
Mountain View, City of	Provided by E. Anderson – General Plan Buildout	85,247	88,125	95,318	102,512	109,706	116,900
North Coast County Water District	Previous DSS Model	41,080	41,400	42,000	42,400	42,800	43,200
Palo Alto, City of	2015 UWMP	72,420	73,700	77,100	80,800	84,600	88,400
Purissima Hills Water District	Preliminary 2019 ABAG	6,827	6,833	6,898	7,025	7,112	7,199
Redwood City, City of	2015 UWMP	92,466	93,765	97,128	100,614	104,247	107,947
San Bruno, City of	Preliminary 2019 ABAG	42,619	43,100	44,328	47,080	51,922	56,764
San Jose, City of[3]	Preliminary 2019 ABAG	32,139	35,530	49,100	72,283	80,111	87,939
Santa Clara, City of	City of Santa Clara Community Development Department ABAG projections	134,991	137,215	142,425	151,715	159,500	167,285
Stanford University	Office of Institutional Research and Decision Support	33,912	34,748	36,922	39,226	41,342	43,525
Sunnyvale, City of	Preliminary 2019 ABAG	153,134	156,020	161,100	201,428	220,169	238,910
Westborough Water District	2015 UWMP	12,977	13,101	13,411	13,721	14,020	14,319
TOTAL		**1,908,054**	**1,941,725**	**2,032,304**	**2,187,849**	**2,311,562**	**2,438,515**

[1] California Department of Finance 2019 Population; 2020-2029 interpolation from 2019 DOF with 2017 ABAG/BAM 2030 projections; 2030-2040 from 2017 ABAG/BAM.
[2] Service area population was further reviewed and refined at the request of Menlo Park staff. Population minor update was made with support from the Project Team's analysis of census data with input from ABAG, which was then reviewed and approved by Menlo Park staff.
[3] Service area population estimates for San Jose represent San Jose Municipal Water System's northern San Jose service area, not the entire service area of the City of San Jose.

5.3 Individual Agency Water Demands with and without Conservation

Table 5-5, and Table 5-6 present BAWSCA individual member agency water demand projections through 2045, including the following for the Partial Rebound – Normal Economy, Weather Normalized scenario:

- Demands before incorporating future passive conservation savings
- Demands including projected passive conservation savings
- Demands including projected passive and active conservation savings

Table 5-4. Demand Projections Before Passive Conservation Savings (MGD)

Service Areas	2023	2025	2030	2035	2040	2045
Alameda County Water District	44.0	45.8	46.7	48.6	50.6	52.8
Brisbane/GVMID	0.9	0.9	0.9	1.0	1.0	1.0
Burlingame, City of	4.6	4.7	4.9	5.2	5.4	5.6
CWS - Bear Gulch District	12.8	13.3	13.4	13.7	13.8	13.9
CWS - Mid Peninsula District	13.4	13.6	13.7	13.8	13.9	14.0
CWS - South San Francisco District	7.1	7.4	7.5	7.6	8.4	9.1
Coastside County Water District	2.1	2.1	2.1	2.1	2.1	2.1
Daly City, City of	6.8	6.9	7.1	7.4	7.6	7.8
East Palo Alto, City of	1.9	2.1	2.2	2.4	2.9	3.4
Estero MID/Foster City	4.4	4.4	4.7	4.8	5.0	5.1
Hayward, City of	18.2	19.3	21.0	22.7	24.4	26.3
Hillsborough, Town of	3.2	3.4	3.4	3.4	3.4	3.4
Menlo Park, City of	3.9	4.2	4.7	5.2	5.6	6.1
Mid-Peninsula Water District	2.9	3.1	3.2	3.3	3.4	3.4
Millbrae, City of	2.4	2.4	2.7	2.7	3.2	3.6
Milpitas, City of	11.8	12.5	13.3	14.2	14.9	15.7
Mountain View, City of	10.6	11.3	12.0	12.7	13.5	14.2
North Coast County Water District	2.6	2.6	2.7	2.7	2.7	2.7
Palo Alto, City of	12.1	12.5	12.9	13.5	14.0	14.6
Purissima Hills Water District	2.0	2.1	2.1	2.2	2.2	2.2
Redwood City, City of	9.7	10.0	10.5	11.0	11.4	11.7
San Bruno, City of	3.5	3.6	3.7	3.9	4.2	4.5
San Jose, City of	6.0	6.3	7.2	9.0	10.0	11.0
Santa Clara, City of	21.9	22.5	24.1	25.2	25.9	26.6
Stanford University	3.0	3.2	3.4	3.6	3.9	4.1
Sunnyvale, City of	18.6	19.1	19.9	23.8	25.7	27.7
Westborough Water District	0.9	0.9	0.9	1.0	1.0	1.0
TOTAL*	231.1	240.3	251.1	266.7	280.0	293.6

** Total projections account for the total projected water demand in a service area water system regardless of source. Sources include purchases from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water.*

Table 5-5. Demand Projections with Passive Conservation Savings (MGD)

Service Areas	2023	2025	2030	2035	2040	2045
Alameda County Water District	42.4	43.7	43.7	44.6	45.8	47.3
Brisbane/GVMID	0.8	0.9	0.9	0.9	0.9	0.9
Burlingame, City of	4.4	4.5	4.6	4.7	4.8	4.9
CWS - Bear Gulch District	12.5	12.9	12.8	12.9	12.9	12.9
CWS - Mid Peninsula District	12.7	12.8	12.6	12.5	12.3	12.2
CWS - South San Francisco District	6.9	7.1	7.1	7.1	7.8	8.4
Coastside County Water District	1.9	1.9	1.9	1.9	1.8	1.8
Daly City, City of	6.4	6.4	6.3	6.4	6.4	6.5
East Palo Alto, City of	1.8	1.9	2.0	2.1	2.5	3.0
Estero MID/Foster City	4.2	4.2	4.4	4.4	4.5	4.6
Hayward, City of	17.2	18.1	19.1	20.2	21.3	22.6
Hillsborough, Town of	3.1	3.3	3.3	3.3	3.3	3.3
Menlo Park, City of	3.7	4.0	4.4	4.8	5.1	5.5
Mid-Peninsula Water District	2.8	2.9	2.9	3.0	3.0	3.0
Millbrae, City of	2.3	2.3	2.6	2.5	2.9	3.3
Milpitas, City of	11.3	11.9	12.4	13.0	13.5	14.0
Mountain View, City of	10.2	10.8	11.2	11.7	12.1	12.6
North Coast County Water District	2.4	2.4	2.4	2.3	2.3	2.3
Palo Alto, City of	11.7	12.0	12.3	12.6	13.0	13.4
Purissima Hills Water District	2.0	2.1	2.1	2.1	2.2	2.2
Redwood City, City of	9.3	9.4	9.7	9.9	10.0	10.2
San Bruno, City of	3.3	3.4	3.4	3.5	3.7	3.9
San Jose, City of	5.7	5.9	6.6	7.9	8.7	9.4
Santa Clara, City of	21.3	21.8	23.0	23.8	24.2	24.6
Stanford University	2.9	3.1	3.3	3.5	3.7	4.0
Sunnyvale, City of	17.9	18.3	18.6	21.8	23.3	24.8
Westborough Water District	0.9	0.9	0.9	0.8	0.8	0.8
TOTAL*	222.0	228.9	234.3	244.3	253.1	262.4

** Total projections account for the total projected water demand in a service area water system regardless of source. Sources include purchases from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water.*

Table 5-6. Demand Projections with Passive and Active Conservation Savings (MGD)

Service Areas	2023	2025	2030	2035	2040	2045
Alameda County Water District	41.6	42.7	42.5	43.3	44.5	46.0
Brisbane/GVMID	0.8	0.9	0.9	0.9	0.9	0.9
Burlingame, City of	4.3	4.4	4.5	4.6	4.7	4.8
CWS - Bear Gulch District	12.3	12.7	12.6	12.8	12.7	12.7
CWS - Mid Peninsula District	12.5	12.5	12.4	12.2	12.0	11.9
CWS - South San Francisco District	6.8	7.0	7.0	7.0	7.6	8.2
Coastside County Water District	1.9	1.9	1.9	1.9	1.8	1.8
Daly City, City of	6.4	6.3	6.2	6.3	6.3	6.4
East Palo Alto, City of	1.8	1.9	1.9	2.1	2.5	2.9
Estero MID/Foster City	4.1	4.1	4.1	4.2	4.2	4.4
Hayward, City of	17.0	17.9	18.7	19.8	20.8	22.1
Hillsborough, Town of	3.1	3.3	3.3	3.2	3.2	3.2
Menlo Park, City of	3.7	4.0	4.3	4.7	5.1	5.5
Mid-Peninsula Water District	2.8	2.9	2.8	2.9	2.9	2.9
Millbrae, City of	2.3	2.3	2.5	2.5	2.9	3.2
Milpitas, City of	11.1	11.6	12.0	12.6	13.0	13.6
Mountain View, City of	10.0	10.5	10.9	11.2	11.5	11.9
North Coast County Water District	2.3	2.3	2.3	2.3	2.2	2.2
Palo Alto, City of	11.5	11.8	12.0	12.3	12.6	13.0
Purissima Hills Water District	2.0	2.1	2.1	2.1	2.1	2.2
Redwood City, City of	9.1	9.2	9.3	9.5	9.6	9.8
San Bruno, City of	3.3	3.4	3.4	3.4	3.6	3.9
San Jose, City of	5.7	5.9	6.5	7.9	8.7	9.4
Santa Clara, City of	21.1	21.5	22.6	23.3	23.7	24.1
Stanford University	2.9	3.1	3.3	3.5	3.7	3.9
Sunnyvale, City of	17.9	18.2	18.5	21.6	23.0	24.5
Westborough Water District	0.8	0.9	0.9	0.8	0.8	0.8
TOTAL*	219.0	225.1	229.2	238.8	247.0	256.3

**Total projections account for the total projected water demand in a service area water system regardless of source. Sources include purchases from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water.*

6 RECOMMENDATIONS AND NEXT STEPS

BAWSCA will utilize the results of the Demand Study to support implementation of its Long-Term Reliable Water Supply Strategy. In particular, the Demand Study results will support decisions as to which new conservation measures to incorporate in BAWSCA's Regional Water Conservation Program.

This section also offers details on the California legislation regarding new water conservation requirements, the implementation schedule for the legislation, and how that relates to the recommended next steps for BAWSCA and its member agencies.

6.1 Recommendations

Recommendations to assist with future conservation program development and implementation include the following:

- Engage in the state processes to establish the requirements associated with implementation of the AB 1668 and SB 606 legislation.
- Prioritize measures for implementation with the highest priority given to those that contribute the most to meeting water saving targets, fulfill regulatory requirements, or provide opportunities for partnership. To launch implementation of a conservation program, BAWSCA may consider answering a series of key questions to determine the measures, budget and schedule. These questions include:
  - What level of support will be required from conservation staff to run the selected measures?
  - What other support (e.g., outsourced support or other sources of funding) is needed or wanted to run these programs?
- Form partnerships for cost-sharing and outreach. To identify partnership opportunities, consider co-benefits of measures prioritized for implementation and connect with organizations whose objectives are in alignment. Engage potential partners early in the design of measures. Apply for grants where appropriate.
- Consider opportunities for customer engagement to increase participation in conservation measures. Early partnership with community organizations may be beneficial in implementing measures in a manner that is accessible to customers and in effectively communicating the benefits of participation to attract customer interest.
- Continue to track and manage measure participation, cost, and other data to gauge successes and areas for improvement.
- Support BAWSCA agencies in taking steps to differentiate between residential and non-residential dedicated irrigation use in their billing systems in order to: 1) support compliance with the state requirements; and 2) improve future per capita water use forecasting.
- Continue to track the impact of the COVID-19 pandemic on employment and total water production. Revisit water demands as appropriate to incorporate recent events into planning efforts.

At this point, no formal commitment has been made at the BAWSCA region-wide or individual agency level to implement the new water conservation measures that were evaluated as part of the Demand Study. BAWSCA will work with the member agencies to further evaluate these programs and to implement new regional programs as appropriate. BAWSCA recognizes that actual implementation of water conservation to achieve the identified water savings goals must be managed in an adaptive fashion, making both small and large program changes as needed over time.

6.2 Adapting to the California Legislation and the Pending Regulations

On April 7, 2017, the California Department of Water Resources (DWR) released the "Making Water Conservation a California Way of Life, Implementing Executive Order B-37-16" Final Framework Report (California Department of Water Resources et al, 2017). The State Framework Report, which builds upon Governor Brown's call for new long-term water use efficiency requirements in Executive Order (EOs) B-37-16, provided the state's proposed approach for implementing new long-term water conservation requirements. A key element of the report was proposed new water use targets for urban water suppliers that go beyond existing Senate Bill X7-7 (SB X7-7; Steinberg)[12] requirements and are based on strengthened standards for indoor residential per capita use, outdoor irrigation, commercial, industrial and institutional water use (CII), and water loss.

On May 17, 2018, the California Legislature adopted AB 1668 (Friedman) and SB 606 (Hertzberg) to implement new long-term water use efficiency requirements, including new urban water use objectives for urban water suppliers. This legislation incorporated some key components of the State Framework Report, although some specific elements of the approach for implementing the new water use objectives were changed during the legislative process.

Adopted Legislation and Regulatory Schedule

The California legislation accomplishes the following:

- Requires the SWRCB, in coordination with DWR, to adopt long-term standards for the efficient use of water.
- Establishes specified standards for per capita daily indoor residential use; in addition to performance measures for CII water use, and with stakeholder input, the SWRCB will adopt long-term efficiency standards for outdoor water use and water loss through leaks.
- Provides SWRCB with the option to adopt long-term efficiency standards for outdoor water use and water loss through leaks, in addition to performance measures for CII water use and with stakeholder input.
- Requires each urban retail water supplier to calculate and report an urban water use objective (which is an estimate of aggregate efficient water use for the previous year based on the adopted water use efficiency standards) and compare that objective to actual water use; to be reported initially by November 1, 2023, then by November 1st every year thereafter.
- Grants SWRCB the authority to enforce compliance with the urban water use objectives, with enforcement actions increasing over the first three years of implementation.
- Establishes a schedule for state agencies to develop the methodology for implementing the requirements, as presented in the following table.

As of June 2020, current regulatory implementation schedule and details of each element of the legislation is provide in Table 6-1.

[12] SB X7-7, also known as the Water Conservation Act of 2009, was a significant amendment introduced after the drought of 2007-2009 and because of the California governor's call for a statewide 20% reduction in urban water use by the year 2020. See the California Department of Water Resources website for more information: https://water.ca.gov/Programs/Water-Use-And-Efficiency/SB-X7-7

Table 6-1. Implementation Schedule for AB 1668 and SB 606 Key Requirements

Date	AB 1668/SB 606 Key Requirement
January 1, 2021	1. DWR to recommend to CA Legislature standards for indoor residential water use. Defaults are: • 55 GPCD until 2025 • 52.5 GPCD from 2025 until January 2030 • 50 GPCD beginning in 2030 2. DWR to provide each urban retail water supplier with data regarding irrigable lands at level of detail sufficient to verify accuracy at the parcel level
October 1, 2021	1. DWR to recommend standards for outdoor residential use for adoption by SWRCB: • Incorporate Model Water Efficient Landscape Ordinance (MWELO) principles • Applies to irrigable lands • Include provisions for swimming pools, spas, etc. 2. DWR to recommend performance measures for CII water use including: • CII classification system • Minimum size thresholds for converting mixed CII meters to dedicated irrigation meters • Recommendations for CII best management practices 3. DWR to recommend variance provisions for: • Evaporative coolers • Horses and livestock • Seasonal populations • Soil compaction/dust control • Water to sustain wildlife • Water for fire protection 4. DWR to recommend standards for outdoor irrigation of landscape areas with dedicated irrigation meters: • Incorporate MWELO principles
June 30, 2022	1. SWRCB to adopt long-term standards for efficient water use: • Outdoor residential • Outdoor irrigation of landscape with dedicated irrigation meters at CII customer sites • Water loss (consistent with Senate Bill 555) 2. SWRCB to adopt performance measures for CII water use
November 1, 2023	1. Urban water supplier shall calculate its urban water use objective and its actual water use for previous calendar or fiscal year: • Efficient indoor residential water use, plus • Efficient outdoor residential water use, plus • Efficient outdoor water use through dedicated irrigation meters at CII customer sites, plus • Efficient water loss, plus • Variances as appropriate

6.3 Next Steps

Most of the BAWSCA member agencies are required to prepare 2020 UWMPs, which are due to DWR by July 2021. Member agencies may elect to utilize the demand and conservation savings projections developed through this Demand Study in completion of their respective UWMPs. Member agencies may also update these demands for the 2020 UWMPs, if necessary, to incorporate new information for their respective service areas.

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APPENDIX A. BAWSCA DEMAND ANALYSIS SURVEY QUESTIONS

Following are the April 2019 BAWSCA Demand Analysis Survey questions that were included in the Data Workbook. These are provided here for reference only. Individual agency responses are in each agency's Data Workbook file.

1.	**Please provide the name and contact information for any individuals completing this survey (including outside consultants).**
2.	What is your agency's main objective or what results would your agency like to achieve as part of this project?
3.	Does your planning department have any projected growth by land use type and/or associated land use water demands that you would like considered as part of this effort?
4.	Would you like to provide building activity from any relevant Building Departments (number of permits, value of construction, etc.) to be considered in this analysis?
5.	Does your agency's 2015 Urban Water Management Plan (UWMP) include the most recent water demand projections prepared by or for your agency? Please identify any documents (other than your agency's 2015 UWMP) that describe your service area's existing demand projection methodology on the Planning Documents tab in this workbook.
6.	Does your agency intend to update demand projections independent of this project between now and 2020 for the 2020 UWMP or any other project (e.g., Water Supply Assessment)? If yes, when and for which projects?
7.	Please describe any notable water use trends within your service area over the last five years (i.e., a decline or increase). Does your agency have any specific knowledge of why the trend occurred (e.g., a large business closed or moved into service area, significant foreclosures or large development, recent economic recovery)?
8.	What is your agency's perspective on what future trends in water demands might be? Is your agency aware of any large developments or planned changes in the service area that would increase or decrease demands in the near or long-term future that are not reflected in the current demand forecast (i.e., published in your agency's 2015 UWMP)?
9.	Please describe any major account re-classifications or billing system upgrades that took place in your service area (i.e., multifamily accounts were reclassified from CII into a class of their own). Please include the specific type of change and when the change took place.
10.	Do sewer charges appear on your agency's customers' water bills? If "Yes," please provide sewer rate histories by customer class corresponding chronologically to the water rate histories. If "No," which sanitation district serves your agency's water service area (if separate agency)? Can you assist us in obtaining sewer rate data from that agency?
11.	Do you plan to expand potable water reuse before 2045? What volume do you plan to add? Will this volume offset current potable water use?
12.	Are you planning any non-potable reuse projects that might offset potable demand?
13.	Please confirm the service area's most recent water audit data can be found on DWR's WUE site here: https://wuedata.water.ca.gov/awwa_plans. Is this accurate and representative of your system's current water loss?
14.	Do you currently have combined mixed use meters/buildings? Do you project having mixed use meters/buildings in any future development? Can you provide us with any data for this?
15.	If you save water through conservation (or your demand is lower in a year), would the water source you would cut back on be SFPUC water supplies?
16.	Do you have any additional comments, questions or concerns about this project or planning process you would like to share?

APPENDIX B. ECONOMETRIC MODEL DESCRIPTION AND FRAMEWORK

This appendix describes the Econometric Modeling process, framework, and results.

B.1 Introduction

In the past, BAWSCA has relied on projections of population and jobs to predict future baseline water demand. Residential demand was projected by multiplying per household use by population growth; Commercial, Institutional, and Industrial (CII) demand was prepared by multiplying per employee use by projected job growth. Then, these estimates of baseline demand were converted into estimates of net demand by subtracting likely savings from various plumbing codes and active conservation programs. While the simplicity of this methodology makes it appealing and easy to understand, econometric analysis studying historical data (assuming historical relationships remain valid) can provide helpful information for answering questions about changing demand patterns (i.e., How much will demand rebound as drought impacts recede and as economic and weather conditions return to normal?). To address such questions, econometric demand models have been developed for each agency to estimate the relationship between water demand and its key drivers, such as price, economic conditions, and weather (Equation 1).

Based on this analysis, the following best-fit equation was developed:

$$Ln(monthly\ GPCD) = \alpha + \beta Trend + \theta Ln(unemployment\ rate) + \delta Ln(marginal\ price) + \vartheta Temperature\ Deviation + \psi Rainfall\ Deviation + \pi monthly\ indicators + \phi drought\ restriction\ indicators + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. Eq. 1$$

Where,

Monthly production is measured in gallons per capita per day (GPCD)

α is a scaling constant. Trend is a variable that takes on a value of 0 in the first year, 1 in the second year, and so on

Unemployment rate is captured as an annual percent (for example, 7%)

Marginal price for single family customers is measured in dollars per hundred cubic feet deflated by the consumer price index

Temperature deviation is measured in degrees Fahrenheit (average maximum daily temperature in a given month minus average for the same month between 1995 and 2006)

Rainfall deviation is measured in total inches (total rainfall in a given month minus average total rainfall for same month between 1995 and 2006)

Monthly indicators are binary 0-1 variables, taking on a value of 1 for a given month in question, 0 otherwise

Drought restriction indicator variables for affected months during the 2014-2017 period

ε denotes random statistical error

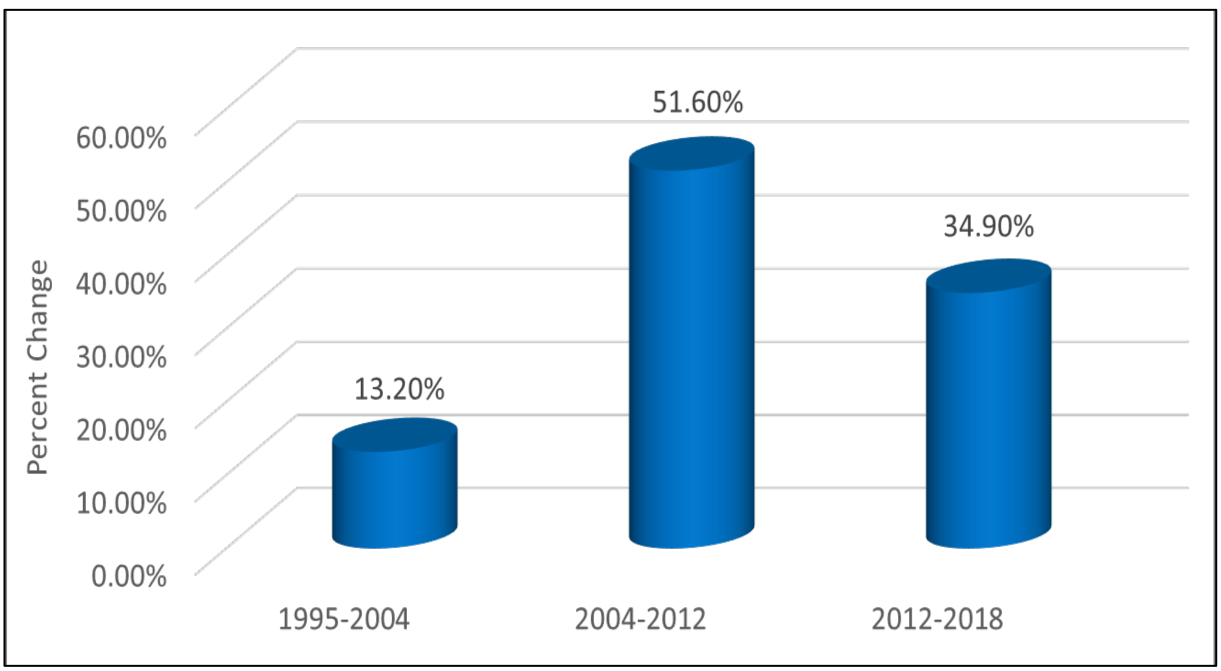
Sources for these data are indicated below:

Each variable on the right-hand side of the equation (independent variable) is preceded by a coefficient (e.g., β, etc.) that measures the strength of the impact of an independent variable on monthly demand. (The variable on the left-hand side of the equation is also known as the dependent variable.) A positive coefficient implies that increases in an independent variable will cause an increase in the dependent variable; a negative coefficient implies the opposite. The purpose of model development is both to select the elements of the equation and to estimate each independent variable's coefficient. Continuous variables, such as the marginal price and the unemployment rate, are logarithmically transformed so that their respective coefficients can be given a proportional interpretation. For example, the coefficient on logarithmically transformed marginal price becomes the price elasticity. The trend variable captures changes in GPCD over time not accounted for by price, unemployment rate, or weather.

Our basic model specification (Eq. 1) includes several features. First, agency-specific production data are modeled at a monthly, not annual, level. Estimating monthly level models allows for the impact of weather to vary by time of year. Prior research strongly indicates that abnormal temperature and abnormal rainfall do not have the same effect in January as, say, in May.[13] Working with monthly production data allows one to incorporate time-varying weather effects. Second, temperature and rainfall enter the model as deviations from their respective monthly averages, capturing directly how demand reacts to weather as it deviates from the average. Normal seasonality in monthly demand (i.e., July demand being much higher than January demand) is captured by the monthly indicator variables. Temperature and rainfall data were obtained from the closest NOAA stations throughout the San Francisco Bay Area. Third, economic conditions are captured by the unemployment rate obtained from the Bureau of Labor Statistics. This metric is available at a granular level and is useful for capturing economic cycles impacting water demand.

Finally, the models also include a measure of the marginal price of water in real terms (i.e., price deflated by the consumer price index published by the Bureau of Labor Statistics). Marginal price of water faced by the average single family customer in an agency has been used to depict price variation over time. By and large, CII and Single Family Residential (SFR) price trends appear similar. Figure B-1 shows price escalation faced by single family customers in the BAWSCA service area overall, calculated as a weighted average of each BAWSCA member agency's price data. The price and unemployment rate data are available at a water supplier level (the latter by town or city) so that these metrics can be tailored to each member agency's service area. In other words, each BAWSCA member agency has its own marginal price and unemployment rate metric, including a weather metric from the closest NOAA station.

Figure B-1. BAWSCA Region-Wide Trends in Single Family Real Price of Water



Note: The increase in price represents the BAWSCA member agency share for funding the $4.6 billion Water System Improvement Program.

[13] Bamezai, A. (2011). *GPCD Weather Normalization Methodology*, final report submitted to the California Urban Water Conservation Council.

B.2 Model Results

As shown in Equation 1, a model was developed for each agency using its unique data. To illustrate the method in general, a monthly GPCD model also was developed for all BAWSCA agencies combined; results for this “rolled-up” region-wide model are shown in Table B-1. This type of model is known as a time-series, cross-sectional model. This region-wide model incorporates agency-level fixed effects, a correction for autocorrelation in the error term, and population weighting to account for different agency sizes. Agency-specific fixed effects capture the impact of agency characteristics that do not vary much over time, such as average household income and lot size, leading to a much more robust model specification than one without these fixed effects. In other words, the model captures the impact on GPCD of income, lot size, and other unobservable time-invariant differences across agencies implicitly through these fixed effects.

In addition to the fixed effects, each agency is allowed to have its own time trend, if necessary, to capture the impact of service area dynamics that influence water use but are not fully captured by price, unemployment rate, or weather. The normal seasonality in water use also is allowed to vary across agencies. The impact of weather deviations from normal weather is allowed to vary by season and across agencies by interacting these deviation variables with an agency’s transformed seasonal peaking factor[14]. A greater summer-winter differential indicates a greater prevalence of weather-sensitive end uses, making the impact of non-normal weather correspondingly greater. The feasibility of using peaking factors to scale the impact of non-normal weather across agencies was demonstrated by the study cited earlier that was completed for the California Urban Water Conservation Council (Bamezai, 2011). Those concepts have been applied here as well.

An important goal of the Econometric Modeling is to forecast what water demand would have been in 2018 had the drought of 2014-2017 not occurred. The gap between actual 2018 demand and model-predicted demand then provides an estimate of potential rise in demand over the next several years (assumed to be 5 years: 2019-2023). This potential rise is down-corrected to account for the effect of plumbing codes and expected rate increases between 2018 and 2023 that will continue to place downward pressure on demand. The potential rise also is corrected to reflect normal weather and normal economic conditions, which then yields the expected demand for 2023 under these conditions.

It is important to test the stability of Eq. 1 by estimating it using only pre-drought data (1995-2013) excluding the drought restriction indicators; then doing so again using all the available data (1995-2018) including the drought restriction indicators. The estimated coefficients on the metrics used to capture variation in price, economic conditions, and weather should not change significantly between these two model specifications, implying that the pre-drought historical relationships are holding during the drought period. The models used here meet this stability condition. The effect of active conservation programs undertaken between 2019 and 2023 is yet to be layered into these forecasts because such layering will cause the demand forecast for the years 2019-2023 to decrease further. In addition, it will affect the post-2023 forecasts.

The estimated pre-drought region-wide model (Table B-1) has three columns: 1) the estimated coefficient, 2) the likely band of error surrounding this coefficient (referred to as standard error), and 3) the t-statistic. An independent variable’s t-statistic is the ratio of the coefficient over its standard error. A t-statistic higher than 1.96 or lower than -1.96 indicates a statistically significant relationship at 5% level of significance between the dependent and independent variable; a t-statistic between -1.96 and 1.96 indicates that the data are not able to conclusively demonstrate a relationship. The latter finding may reflect the lack of any relationship, data errors, or other problems (e.g., two or more independent variables being highly correlated with one another). The model’s R-Square value (R^2), which is indicative of the explanatory power of a statistical model, is shown at the

[14] Peaking factor is calculated by dividing maximum monthly summer demand by minimum winter monthly demand in any given year, then averaging these ratios across all years included during the baseline period. Transformed peaking factor is calculated as 1-(1/Peaking Factor).

bottom of Table B-1. It can vary between zero and a maximum of 1, with higher numbers indicating greater explanatory power.

The coefficients in Table B-1 have the following interpretations:

- A price elasticity of -0.2 indicates that a 10% real increase in the marginal price of water can be expected to reduce demand by 2%. BAWSCA's region-wide estimate of price elasticity compares well with the published literature on this topic.
- A 10% increase in the annual unemployment rate is likely to depress water demand by 0.05%, a statistically significant effect, but one weaker than price.
- All weather coefficients are significant and behave in expected ways. For an agency with a peaking factor of 2, or a transformed peaking factor of 0.5 (a typical agency peaking factor), an extra inch of rainfall per month during the spring reduces monthly demand by about 6.6%, while the same extra inch during the winter only depresses monthly demand by 0.5%.
- On the temperature dimension, if daily maximum temperature is 1 degree higher on average in a given month, monthly water demand is likely to increase by 1.0% during the spring, 0.5% during the summer, and 1.1% during late fall and winter. Lower than average temperatures would have the opposite effect.

The monthly dummy variables also exhibit the expected pattern with July showing the largest coefficient, indicating that July demand is greatest during the year. The coefficient reaches a minimum during January.

Table B-1. BAWSCA Region-Wide Pre-Drought Model Results

Dependent Variable: Ln(Monthly Baseline GPCD)

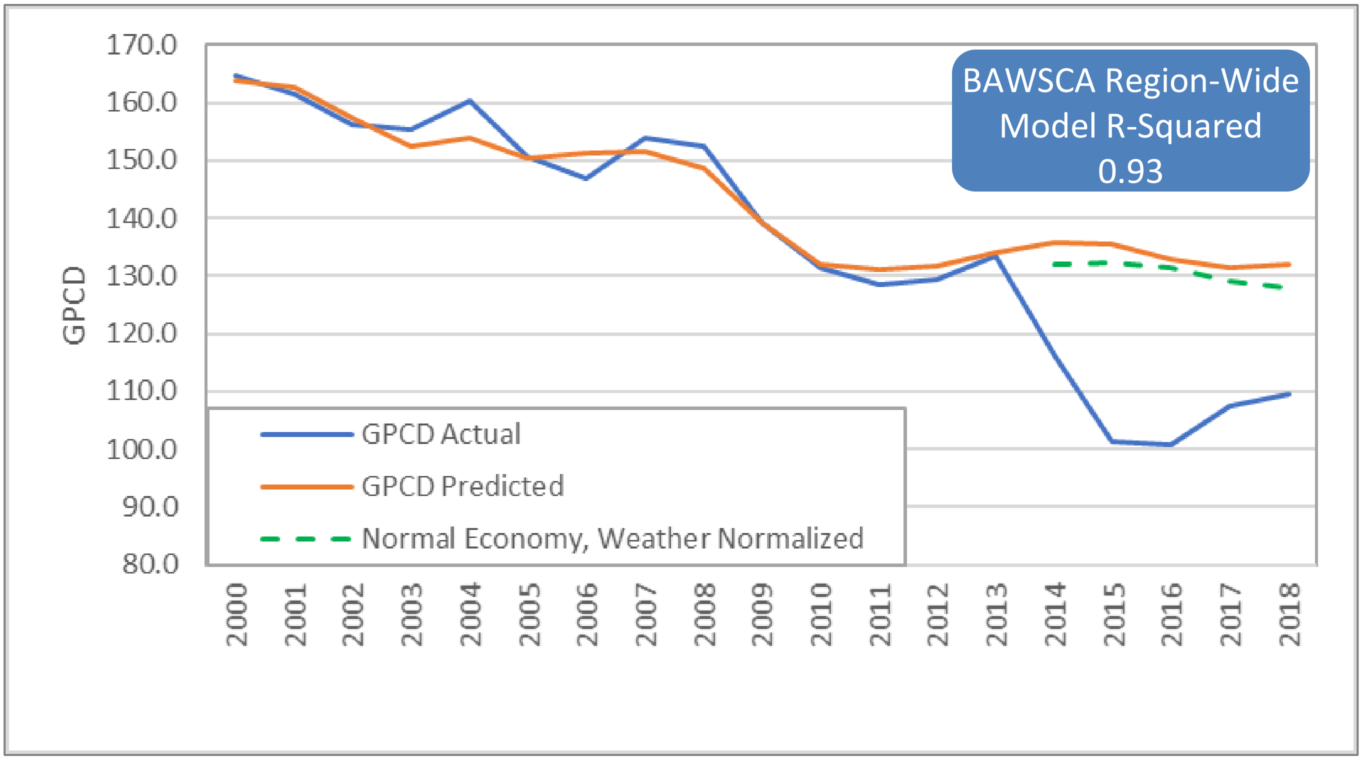
Independent Variable	Coefficient	Standard Error	t-statistic
Ln(Marginal Price)	-0.200	0.015	-13.1
Ln(Unemployment Rate)	-0.052	0.007	-7.8
Temperature Deviation (Apr-Jun) x TPF[1]	0.019	0.002	8.3
Temperature Deviation (Jul-Oct) x TPF	0.013	0.002	5.6
Temperature Deviation (Nov-Mar) x TPF	0.023	0.002	12.2
Rain Deviation (Apr-Jun) x TPF	-0.137	0.008	-17.6
Rain Deviation (Jul-Oct) x TPF	-0.054	0.009	-6.0
Rain Deviation (Nov-Mar) x TPF	-0.01	0.002	-5.7
Feb Indicator	0.017	0.014	1.2
Mar	0.104	0.016	6.5
Apr	0.271	0.017	16.0
May	0.478	0.017	27.7
Jun	0.641	0.017	36.8
Jul	0.690	0.017	39.5
Aug	0.680	0.017	39.1
Sep	0.612	0.017	35.4
Oct	0.436	0.017	25.7
Nov	0.169	0.016	10.5
Dec	0.035	0.014	2.5
Constant	4.899	0.016	311.6
Agency-Specific Fixed Effects[2]	Included		
Agency-Specific Trend Terms[2]	Included		
Agency Interactions with Monthly Dummies[2]	Included		
R-Square	0.93		

[1] *TPF denotes transformed peaking factor.*

[2] *For the sake of brevity, the large number of coefficients associated with the agency-specific fixed effects, agency-specific trend terms, and agency interactions with monthly dummies are not shown.*

Figure B-2 shows how the model prediction compares with BAWSCA's region-wide GPCD trend during the pre-drought period since that is the period from which the model is estimated. The resulting R^2 value of 0.93 shows that there is a high correlation between actual and predicted values. The model quite accurately captures the downturn in demand experienced during the Great Recession of 2008-2010 and subsequent recovery until 2013. Beyond 2013, the model is used to forecast what demand would have been without the drought, taking into account a strengthening economy tempered by ongoing rate increases and conservation. The dotted green line in Figure B-2 shows the Normal Economy, Weather Normalized model forecast. The gap between actual 2018 demand and the dotted green line provides an initial estimate of what fully rebounded demand should be. It is not logical to assume that actual demand will jump to the dotted green line within a shorter period of time (i.e., a year). Instead, it is assumed that actual demand will meet the declining dotted green line in 2023. The dotted green line's position in 2023 is calculated by factoring in the effect of plumbing codes and rate increases between 2018 and 2023.

Figure B-2. BAWSCA Region-Wide Econometric Model Fit and Forecast



APPENDIX C. BAWSCA-WIDE DEMAND PROJECTIONS

In Table C-1 and in Figure C-1 the BAWSCA region-wide demand projections are shown with passive savings. Active conservation has not been incorporated into any of the four scenarios. These values are intended to be used for general comparison of ranges in potential future water demands if no active conservation was implemented.

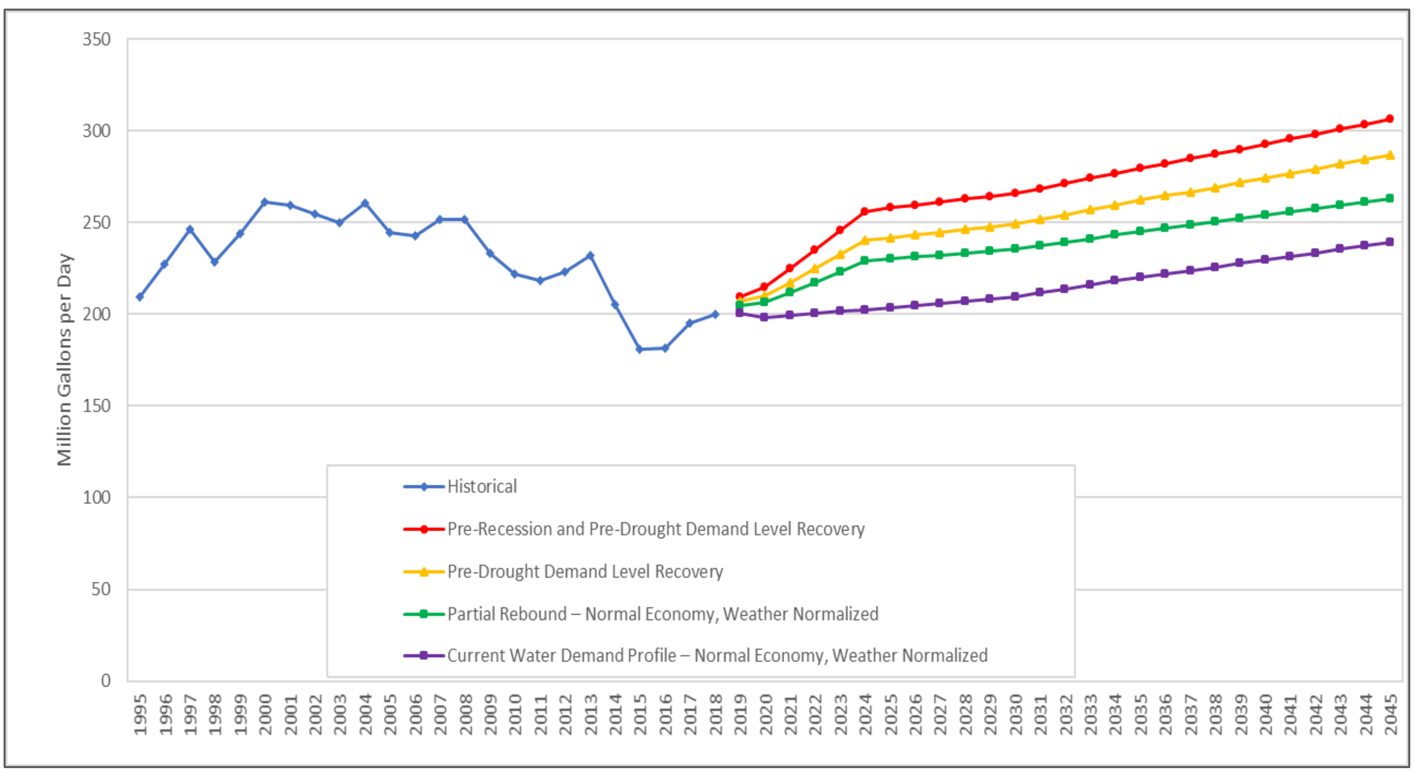
Table C-1. BAWSCA Region-Wide Demand Projections Including Passive Savings[1] in MGD

Demand Forecast Scenarios	2023	2025	2030	2035	2040	2045
Pre-Recession and Pre-Drought Demand Level Recovery	245.4	257.9	265.8	279.7	292.5	306.3
Pre-Drought Demand Level Recovery	232.3	241.8	249.1	262.2	274.0	286.8
Partial Rebound – Normal Economy, Weather Normalized[2]	222.0	229.0	234.3	244.3	253.1	262.5
Current Water Demand Profile – Normal Economy, Weather Normalized	201.4	203.5	209.7	220.3	229.6	239.3

[1] Total water demand accounts for the total projected demand in a service area water system regardless of source, which can be from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water.

[2] The Partial Rebound scenario was used for the active conservation analysis portion of the project, which was provided to all individual BAWSCA agencies for review in Technical Memorandum 3.

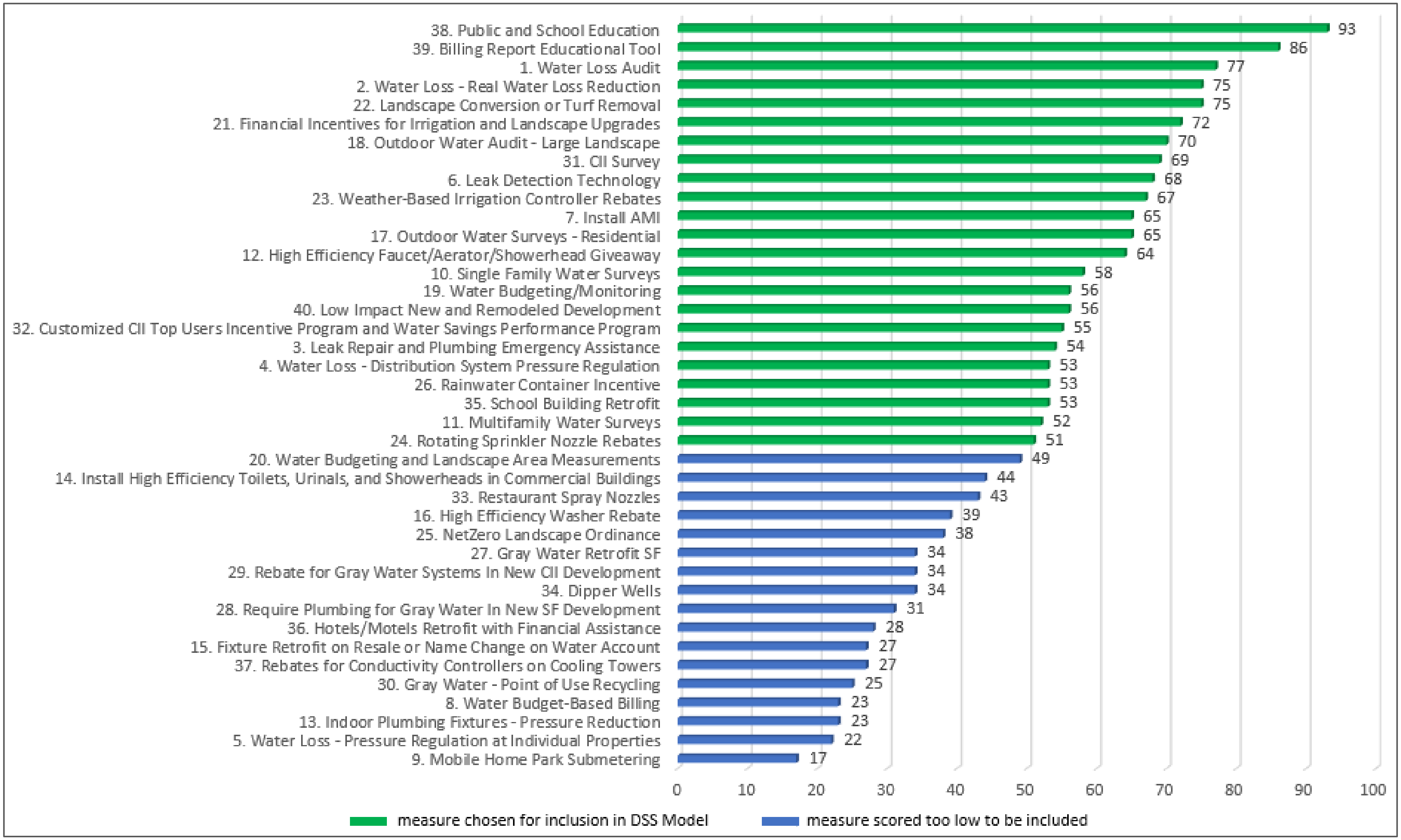
Figure C-1. BAWSCA Region-Wide Demand Projection



APPENDIX D. CONSERVATION MEASURES SCREENING RESULTS

The following figure and table present the results of the January 2020 online survey conducted through SurveyMonkey that solicited BAWSCA member agency feedback on conservation measures that would be considered in the DSS Model analysis.

Figure D-1. Summary of Online Survey Ranking of Water Use Efficiency Measures



Note: The number to the right of each measure color block is that particular measure's score based on BAWSCA member agency rankings where 5 points were given for "High Interest", 3 points were given for "Medium Interest", 1 point was given for "Low Interest", and no points were given for "No Interest" or "Not Applicable."

Table D-1. Water Use Efficiency Measure Descriptions

No.	Measure Name	Description
1	Water Loss Audit	Maintain a thorough annual accounting of water production, sales by customer class, and quantity of water produced but not sold (non-revenue water). This provides a picture of your system, including water usage patterns and trends needed to identify appropriate conservation activities. In conjunction with system accounting, include audits that identify and quantify known legitimate uses of non-revenue water in order to determine remaining non-revenue water losses. Goal would be to lower the Infrastructure Leakage Index (ILI) and non-revenue water every year by a pre-determined amount based on cost effectiveness. These programs typically pay for themselves based on savings in operational costs (and saved rate revenue can be directed more to system repairs/replacement and other costs). Continuously analyze billing data for system errors and mis-registering meters. Identify and quickly notify customers of apparent leaks. Address meter testing and repair/replacement to insure more accurate meter reads and revenue collection. Actions could include meter calibration and accelerated meter replacement.
2	Water Loss – Real Water Loss Reduction	Measure covers efforts to find and repair leaks in distribution system to reduce real water loss. Actions could include installation of data loggers and proactive leak detection. Leak repairs would be handled by existing crews at no extra cost. A ten-year program to reduce non-revenue water to a lower target level such as 10% of production or less could be proposed for a combination of this measure and actions to reduce apparent water losses. Specific goals and methods to be developed by the utility.
3	Leak Repair and Plumbing Emergency Assistance	Customer leaks can go uncorrected at properties where owners are least able to pay costs of repair. These programs may require that customer leaks be repaired, but either subsidize part of the repair and/or pay the cost with revolving funds that are paid back through water bills over time. May also include an option to replace inefficient plumbing fixtures at low-income residences.
4	Water Loss – Distribution System Pressure Regulation	Install additional pressure regulators in portions of distribution system to maintain pressure within limits so accounts do not receive excessive pressure. High correlation between high water usage and high pressure, due to higher leakage, atomization of sprinklers, and ease of using excessive water.
5	Water Loss – Pressure Regulation at Individual Properties	Install pressure regulators at properties where pressure is above a certain level and pressure regulation is found to be lacking or inadequate. Plumbing codes require installation of pressure regulation when pressure exceeds 80 psi. However, this does not always occur and/or regulators are installed improperly or in locations where they do not serve the irrigation system, resulting in significant waste. Utility could fund and facilitate appropriate installation of regulators, first targeting neighborhoods with the highest pressure. Utility may need to impose regulations to require that such installations are made and maintained thereafter.

No.	Measure Name	Description
6	Leak Detection Technology	Leak detection technology system that allows for remote shutoff with a smart phone interface. Might target second homes that are often vacant, which could leak for extensive periods while left unattended. Might require for new homes. Customer instant access to water use data by installing a flow sensor. Primarily residential. Can monitor indoor only, whole site meter use, and/or irrigation only use. Example products are listed online: www.gearbrain.com/smart-leak-and-flood-detectors-2563785823.html and www.robeau.tech/en/.
7	Install AMI	Retrofit system with AMI meters and associated network capable of providing continuous consumption data to the utility offices. Improved identification of system and customer leaks is major conservation benefit. Some costs for these systems are offset by operational efficiencies and reduced staffing, as regular meter reading and those for opening and closing accounts are accomplished without need for physical or drive-by meter reading. Also enables enhanced billing options and ability to monitor unauthorized usage (such as use/tampering with closed accounts or irrigation if time of day or days per week are regulated). Customer service is improved as staff can quickly access continuous usage records to address customer inquiries. Optional features include online customer access to usage which has been shown to improve accountability and reduce water use. A ten year change-out would be a reasonable objective.
8	Water Budget-Based Billing	Develop individualized monthly water budgets for all or selected category of customers. Water budgets are linked to a rate schedule where rates per unit of water increase when a customer goes above their budget or decreases if they are below their budget. Budgets typically are based on such factors as the size of the irrigated area and often vary seasonally to reflect weather during the billing period. These rates have been shown to be effective in reducing landscape irrigation demand (AWWARF reports). Would require rate study and capable billing software. Assume 10% of accounts receive new budgets per year and would be reviewed periodically to remain current.
9	Mobile Home Park Submetering	Require or provide a partial cost rebate to meter all sites within a mobile home park that is currently master metered. Pattern after Valley Water (Santa Clara Valley Water District) program.
10	Single Family Water Surveys	Indoor water surveys for existing single family residential customers. Target those with high water use and provide a customized report to owner. May include give away of efficient showerheads, aerators, toilet devices. Usually combined with outdoor surveys (See Irrigation Measures).
11	Multifamily Water Surveys	Indoor water surveys for existing multifamily residential customers (2 units or more). Target those with high water use and provide a customized report to owner. Usually combined with outdoor surveys (see Irrigation Measures) and sometimes with single family surveys.
12	High Efficiency Faucet/ Aerator/ Showerhead Giveaway	Utility would buy high efficiency showerheads and faucet aerators in bulk and give them away at the utility office or community events.

No.	Measure Name	Description
13	Indoor Plumbing Fixtures – Pressure Reduction	Provide incentive to install pressure regulating valve on existing properties with pressure exceeding 80 psi.
14	Install High Efficiency Toilets, Urinals, and Showerheads in Commercial Buildings	Consider direct install program, rebates, or grants for installation of high efficiency fixtures in all or selected commercial or institutional buildings. Replacements would include high efficiency toilets, showerhead, and waterless or high efficiency urinals.
15	Fixture Retrofit on Resale or Name Change on Water Account	Work with the real estate industry to require submission of a certificate of compliance to the utility verifying that a plumber has inspected the property and efficient fixtures were either already there or were installed before close of escrow. This is an upgraded enforcement approach for implementing the existing code: Require Fixture Retrofit on Resale or Name Change on Water Account or Renovation. Pattern after Los Angeles, San Diego or Santa Cruz programs.
16	High Efficiency Washer Rebate	Provide a rebate for the installation of a high efficiency commercial washer (HEW). Rebate amounts would reflect the incremental purchase cost. Program would shorter-lived as it is intended to be a market transformation measure that eventually would be stopped as efficient units reach saturation.
17	Outdoor Water Surveys – Residential	Outdoor water surveys offered for existing customers. Normally those with high water use are targeted and provided a customized report on how to save water. Can be combined with indoor surveys or focused on certain customer classes. All single family and multifamily residential would be eligible for free landscape water surveys upon request.
18	Outdoor Water Audit - Large Landscape	Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multifamily residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Tied to the Water Budget Program.
19	Water Budgeting/ Monitoring	Website that provides feedback on irrigation water use (budget vs. actual). Model after Municipal Water District of Orange County's Landscape Certification Program. Could be created by a consultant, agency, or customer on website.
20	Water Budgeting and Landscape Area Measurements	Require water budgets for targeted customer categories. Might tie water budgets to weather and/or rates. Conduct detailed landscape area measurements for targeted customer categories. Can use aerial imagery including Google Earth. Might conduct field verification. Might measure non-irrigated area that can potentially be irrigated (e.g., for water budgets or for planning and design of stormwater projects).
21	Financial Incentives for Irrigation and Landscape Upgrades	For SF, MF, CII, and IRR customers with landscape, provide a Smart Landscape Rebate Program with rebates for substantive landscape retrofits or installation of water efficient equipment upgrades. Rebates contribute towards the purchase and installation of water-wise plants, compost, mulch, and selected types of irrigation equipment upgrades. Rebate for residential accounts and up to 50% more for commercial customers. Landscape upgrades might include conversion of turf to lower-water-using turf varieties.

No.	Measure Name	Description
22	Landscape Conversion or Turf Removal	Provide a per-square-foot incentive to remove turf and replace with low-water-use plants or permeable hardscape. Landscape conversion could include conversion of turf to lower-water-use turf varieties. Rebate based on dollars per square foot removed and capped at an upper limit for single family residence, multifamily residence, and/or commercial account.
23	Weather-Based Irrigation Controller Rebates	Provide a per-station rebate for the purchase of a weather-based irrigation controller. These controllers have onsite weather sensors or rely on a signal from a central weather station that modifies irrigation times at least weekly. Requires local irrigation contractors who are competent with these products, so may require sponsoring a training program in association with this measure.
24	Rotating Sprinkler Nozzle Rebates	Provide rebates to replace standard spray sprinkler nozzles with rotating nozzles that have lower application rates. Nozzles cost about $6 each, and rebates have been about $4 each with a minimum purchase of around 20 nozzles.
25	NetZero Landscape Ordinance	This measure is an aggressive local landscape ordinance that could be a step-up from California's Model Water Efficient Landscape Ordinance. Targeting new development only, this measure aims to achieve "net-zero" outdoor water use by any method including the use of native plants, weather-based irrigation controllers, gray water systems, cisterns, and rain barrels. Could design like AWE's Net Blue Supporting Water-Neutral Community Growth. More information is available online: www.allianceforwaterefficiency.org/net-blue.aspx.
26	Rainwater Container Incentive	Provide incentive for installation of rain barrels or large rainwater catchment systems. This could involve rebates, grants, bulk purchase and giveaways of rain barrels, and/or other cost-share methods. This may include workshops on proper installation and use of captured rainwater for landscape irrigation. Might require simultaneous installation of water efficient landscaping to assure that amount of water collected is capable of lasting into the peak irrigation season.
27	Gray Water Retrofit SF	Provide a rebate to assist a certain percentage of single family homeowners per year to install gray water systems.
28	Require Plumbing for Gray Water in New SF Development	Provide a rebate or require builders of single family homes to provide plumbing for and/or install a gray water system in new homes.
29	Rebate for Gray Water Systems in New CII Development	Provide a rebate for gray water systems in new CII development.
30	Gray Water – Point of Use Recycling	Point of use water recycling will allow for toilet flushing and other possible uses with locally treated gray water. It could be considered for new homes to help shape the demand forecast curve down. Establish an ongoing maintenance and monitoring/follow-up program (back-flow device inspection). Ordinance or rebate.

No.	Measure Name	Description
31	CII Survey	CII water customers would be offered a free water survey that would evaluate ways for the business to save water and money. The surveys may target large accounts only (e.g., accounts that use more than 5,000 gallons of water per day), such as hotels, restaurants, stores, and schools. Emphasis may be on supporting the top 25 users for each individual water agency.
32	Customized CII Top Users Incentive Program and Water Savings Performance Program	After a free water use survey has been completed at the site, the utility will analyze recommendations on the findings report that is provided and determine if site qualifies for a financial incentive. Financial incentives will be provided after analyzing the benefit-cost ratio of each proposed project. Incentives are tailored to each individual site as each site has varying water savings potentials. Incentives will be granted at the sole discretion of the Utility while funding lasts. Water districts, such as the Metropolitan Water District of Southern California, provide about $3 per 1,000 gallons saved to sites within their service area. Incentive is based on the potential for savings over 5 years. Eligible project costs include labor, hardware, and up to 1 year of water management fees.
33	Restaurant Spray Nozzles	Provide free 1.15 gpm (or lower) spray nozzles and possibly free installation for the rinse and clean operation in restaurants and other commercial kitchens. Thousands have been replaced in California going door to door; very cost-effective because it saves hot water. U.S. Department of Energy requires nozzles to be less than 1.28 gpm. Fishnick recommends 1.15 gpm.
34	Dipper Wells	Provide a dipper well device incentive for relevant food service accounts. Devices save water and money using less than 600 gallons of water per year; they reduce bacteria using heated water held above 140°F. There is a programmable timer option to ensure scheduled water changeouts. A rebate may cover the $500-$600 device, installation, and any permitting. Electricity access is needed. A ConserveWell drop-in model is estimated to use ~320 gal/well/restaurant/year: https://server-products.com/ConserveWell-notdipperwell. As reported in the *Dipper Well Replacement Field Evaluation Report,* Frontier Energy Report #50115-R0 (Frontier Energy, 2017), a Los Banos site saved 176,000 gal/year and a Madera site saved 116,000 gal/year: http://www.bewaterwise.com/assets/2015icp-dipperwellfrontierenergy.pdf.
35	School Building Retrofit	School retrofit program wherein school receives a grant to replace fixtures and upgrade irrigation systems. Might target university/college campuses. Pattern after Metropolitan Water District of Southern California program.
36	Hotels/Motels Retrofit with Financial Assistance	Following a free water audit, offer hotels/motels a rebate for equipment identified that would save water. Or, provide a rebate schedule for certain efficient equipment, such as air-cooled ice machines, that hotels/motels could apply for without an audit. Pattern after San Antonio, Texas program.
37	Rebates for Conductivity Controllers on Cooling Towers	Offer a rebate ($900-$1,200 depending on type) to buildings that install conductivity controllers to reduce bleed-off water of the facility cooling towers. Provide educational brochures and a phone contact of a knowledgeable person to provide conservation information.

No.	Measure Name	Description
38	Public and School Education	Use a range of printed materials to raise awareness of conservation measures available to customers, including incentive programs offered by utility, newsletters, bill stuffers, brochures (self-developed or purchased), working with local newspapers, signage at retailers, signs on public buses. Regional participation and development can help assure consistent message. Such programs would continue indefinitely. Provide variety of conservation information on city or utility website, distribution of "videos." Also consider social media options such as cell phone apps, Facebook, interactive kiosk with view screen, etc. Conduct presentations at various venues, from radio and TV to service organizations and focused groups. Have booths at relevant community events, participate in parades, etc. Suggest a general "Use Only What You Need" message like Denver Water's program or a "Beat the Peak" message media campaign like Cary, North Carolina or Tucson, Arizona: https://www.tucsonaz.gov/water/pete-the-beak. Also consider a program like the "Take Control of your Controller" campaign for a focused, social media-based campaign. Consider determining appropriate usage and media campaign message with marketing study/focus groups. Example: Water Smart Software with online and print billing consumptions to customers. Work with local school districts to develop classroom programs that they would embrace. Consider poster contests, etc. Some programs would require dedicated utility staff to assist and present. Utility would also offer, organize, and sponsor a series of educational workshops or other means for educating homeowners, landscapers, and contractors in efficient landscaping and irrigation principals. Utilize guest speakers, native demonstration gardens, and incentives (e.g., a nursery plant coupon). Utility would sponsor bilingual training for managers and workers in landscape maintenance methods that will save irrigation water. With some of these programs, names of businesses that have obtained training are included in utility publications and/or websites as an incentive to participate. Utility would also develop or support development of a Landscape Watering Calculator and Watering Index, and actively market these. Consider cell phone app with Watering Index, following up in-person with large landscape customers on a frequent basis to encourage use of Watering Index.
39	Billing Report Educational Tool	Have a customer portal available to show customer their individualized current and historical water use pattern to help customer see their data thereby encouraging them to be more efficient with their water use. Example: Water Smart Software with online and print billing consumptions to customers.
40	Low Impact New and Remodeled Development	Utility would require developers of new/remodeled sites to follow Low Impact Development concepts/standards/best management practices for stormwater and water conservation benefits. Encourage or require use of bio-retention facilities, rainwater cisterns, gray water plumbing, etc.

APPENDIX E. KEY ASSUMPTIONS FOR THE DSS MODEL

This section presents the methodology used to determine passive water savings, information regarding national and state plumbing codes, and key inputs and assumptions used in the DSS Model including fixture replacement and estimates.

E.1 National Plumbing Code

The Energy Policy Act of 1992, as amended in 2005, mandates that only fixtures meeting the following standards can be installed in new buildings:

- Toilet – 1.6 gal/flush maximum
- Urinals – 1.0 gal/flush maximum
- Showerhead – 2.5 gal/min at 80 pounds per square inch (psi)
- Residential faucets – 2.2 gal/min at 60 psi
- Public restroom faucets – 0.5 gal/min at 60 psi
- Dishwashing pre-rinse spray valves – 1.6 gal/min at 60 psi

Replacement of fixtures in existing buildings is also governed by the Federal Energy Policy Act, which mandates that only devices with the specified level of efficiency (as shown above) can be sold as of 2006. The net result of the plumbing code is that new buildings will have more efficient fixtures and old inefficient fixtures will slowly be replaced with new, more efficient models. The national plumbing code is an important piece of legislation and must be carefully taken into consideration when analyzing the overall water efficiency of a service area.

In addition to the plumbing code, the U.S. Department of Energy regulates appliances, such as residential clothes washers, further reducing indoor water demands. Regulations to make these appliances more energy efficient have driven manufactures to dramatically reduce the amount of water these machines use. Generally, front loading washing machines use 30 to 50% less water than conventional models (which are still available).

In this analysis, the DSS Model forecasts a gradual transition to high efficiency clothes washers (using 12 gallons or less) so that by the year 2025 that will be the only type of machine available for purchase. In addition to the industry becoming more efficient, rebate programs for washers have been successful in encouraging customers to buy more water efficient models. Given that machines last about 10 years, eventually all machines on the market will be the more water efficient models. Energy Star washing machines have a water factor of 6.0 or less – the equivalent of using 3.1 cubic feet (or 23.2 gallons) of water per load. The maximum water factor for residential clothes washers under current federal standards is 9.5. The water factor equals the number of gallons used per cycle per cubic foot of capacity. Prior to the year 2000, the water factor for a typical new residential clothes washer was about 12. In March 2015, the federal standard reduced the maximum water factor for top- and front-loading machines to 8.4 and 4.7, respectively. In 2018, the maximum water factor for top-loading machines was further reduced to 6.5. For commercial washers, the maximum water factors were reduced in 2010 to 8.5 and 5.5 for top- and front-loading machines, respectively. Beginning in 2015, the maximum water factor for Energy Star certified washers was 3.7 for front-loading and 4.3 for top-loading machines. In 2011, the U.S. Environmental Protection Agency estimated that Energy Star washers comprised more that 60% of the residential market and 30% of the commercial market (Energy Star, 2011). A new Energy Star compliant washer uses about two-thirds less water per cycle than washers manufactured in the 1990s.

E.2 State Plumbing Code

This section describes California state codes applicable to each member agency service area water use.

California State Law – AB 715

Plumbing codes for toilets, urinals, showerheads, and faucets were initially adopted by California in 1991, mandating the sale and use of ultra-low flush toilets (ULFTs) using 1.6 gpf, urinals using 1 gpf, and low-flow showerheads and faucets. AB 715 led to an update to California Code of Regulations Title 20 (see below) mandating that all toilets and urinals sold and installed in California as of January 1, 2014 must be high efficiency versions having flush ratings that do not exceed 1.28 gpf (toilets) and 0.5 gpf (urinals).

California State Laws – SB 407 and SB 837

SB 407 addresses plumbing fixture retrofits on resale or remodel. The DSS Model carefully considers the overlap with SB 407, the plumbing code (natural replacement), CALGreen, AB 715 and rebate programs (such as toilet rebates). SB 407 (enacted in 2009) requires that properties built prior to 1994 be fully retrofitted with water conserving fixtures by the year 2017 for single family residential houses and 2019 for multifamily and commercial properties. SB 407 program length is variable and continues until all the older high flush toilets have been replaced in the service area. The number of accounts with high flow fixtures is tracked to make sure that the situation of replacing more high flow fixtures than actually exist does not occur. Additionally, SB 407 conditions issuance of building permits for major improvements and renovations upon retrofit of non-compliant plumbing fixtures. SB 837 (enacted in 2011) requires that sellers of real estate property disclose on their Real Estate Transfer Disclosure Statement whether their property complies with these requirements. Both laws are intended to accelerate the replacement of older, low efficiency plumbing fixtures, and ensure that only high efficiency fixtures are installed in new residential and commercial buildings.

2019 CALGreen and 2015 CA Code of Regulations Title 20 Appliance Efficiency Regulations

Fixture characteristics in the DSS Model are tracked in new accounts, which are subject to the requirements of the 2019 California Green Building Code and 2015 California Code of Regulations Title 20 Appliance Efficiency Regulations adopted by the California Energy Commission (CEC) on September 1, 2015. The CEC 2015 appliance efficiency standards apply to the following new appliances, if they are sold in California: showerheads, lavatory faucets, kitchen faucets, metering faucets, replacement aerators, wash fountains, tub spout diverters, public lavatory faucets, commercial pre-rinse spray valves, urinals, and toilets. The DSS Model accounts for plumbing code savings due to the effects these standards have on showerheads, faucets, aerators, urinals, and toilets.

- Showerheads – July 2016: 2.0 gpm; July 2018: 1.8 gpm
- Wall Mounted Urinals – January 2016: 0.125 gpf (pint)
- Lavatory Faucets and Aerator – July 2016: 1.2 gpm at 60 psi
- Kitchen Faucets and Aerator – July 2016: 1.8 gpm with optional temporary flow of 2.2 gpm at 60 psi
- Public Lavatory Faucets – July 2016: 0.5 gpm at 60 psi

In summary, the controlling law for **toilets** is Assembly Bill 715. This bill requires high efficiency toilets (1.28 gpf) to be exclusively sold in California beginning January 1, 2014. The controlling law for wall-mounted urinals is the 2015 CEC efficiency regulations requiring that ultra-high efficiency pint **urinals** (0.125 gpf) be exclusively sold in California beginning January 1, 2016. This is an efficiency progression for urinals from AB 715's requirement of high efficiency (0.5 gpf) urinals starting in 2014.

Standards for **residential clothes washers** fall under the regulations of the U.S. Department of Energy. In 2018, the maximum water factor for standard top-loading machines was reduced to 6.5.

Showerhead flow rates are regulated under the 2015 California Code of Regulations Title 20 Appliance Efficiency Regulations adopted by the CEC, which requires the exclusive sale in California of 2.0 gpm showerheads at 80 psi as of July 1, 2016 and 1.8 gpm showerheads at 80 psi as of July 1, 2018. The WaterSense specification applies to showerheads that have a maximum flow rate of 2.0 gpm or less. This represents a 20% reduction in showerhead flow rate over the current federal standard of 2.5 gpm, as specified by the Energy Policy Act of 1992.

Faucet flow rates have likewise been recently regulated by the 2015 CEC Title 20 regulations. This standard requires that the residential faucets and aerators manufactured on or after July 1, 2016 be exclusively sold in California at 1.2 gpm at 60 psi; and public lavatory and kitchen faucets/aerators sold or offered for sale on or after July 1, 2016 be 0.5 gpm at 60 psi and 1.8 gpm at 60 psi (with optional temporary flow of 2.2 gpm), respectively. Previously, all faucets had been regulated by the 2010 California Green Building Code at 2.2 gpm at 60 psi.

E.3 Key Baseline Potable Demand Inputs, Passive Savings Assumptions, and Resources

The following table presents the key assumptions and references that are used in the DSS Model in determining projected demands with plumbing code savings. The assumptions having the most dramatic effect on future demands are the natural replacement rate of fixtures; how residential or commercial future use is projected; and the percent of estimated real water losses.

Table E-1. List of Key Assumptions

Parameter	Model Input Value, Assumptions, and Key References
Model Start Year for Analysis	2019
Model End Year	2045
Non-Revenue Water	Based on individual billing
Population Projection Source	Provided by and verified by individual agencies
Employment Projection Source	Provided by and verified by individual agencies
Number of Water Accounts for Start Year	Provided by and verified by individual agencies
Avoided Cost of Water $/AF	Provided by and verified by individual agencies

Table E-2. Key Assumptions Resources

Parameter	Resource
Residential End Uses	Key Reference: CA DWR Report "California Single Family Water Use Efficiency Study," (DeOreo, 2011 – Page 28, Figure 3: Comparison of household end-uses) and AWWA Research Foundation (AWWARF) Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016). Table 2-A. Water Consumption by Water-Using Plumbing Products and Appliances - 1980-2012. PERC Phase 1 Report. Plumbing Efficiency Research Coalition. 2013. http://www.map-testing.com/content/info/menu/perc.html Model Input Values are found in the "End Uses" section of the DSS Model on the "Breakdown" worksheet.
Non-Residential End Uses, percent	Key Reference: AWWARF Report "Commercial and Institutional End Uses of Water" (Dziegielewski, 2000 – Appendix D: Details of Commercial and Industrial Assumptions, by End Use). Santa Clara Valley Water District Water Use Efficiency Unit. "SCVWD CII Water Use and Baseline Study." February 2008. Model Input Values are found in the "End Uses" section of the DSS Model on the "Breakdown" worksheet.
Efficiency Residential Fixture Current Installation Rates	U.S. Census, Housing age by type of dwelling plus natural replacement plus rebate program (if any). Key Reference: GMP Research, Inc. (2019). 2019 U.S. WaterSense Market Penetration Industry Report Key Reference: Consortium for Efficient Energy (www.cee1.org). Model Input Values are found in the "Codes and Standards" green section of the DSS Model by customer category fixtures.
Water Savings for Fixtures, gal/capita/day	Key Reference: AWWARF Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016). Key Reference: CA DWR Report "California Single Family Water Use Efficiency Study" (DeOreo, 2011 – Page 28, Figure 3: Comparison of household end-uses). WCWCD supplied data on costs and savings; professional judgment was made where no published data was available. Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014. Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model.
Non-Residential Fixture Efficiency Current Installation Rates	Key Reference: 2010 U.S. Census, Housing age by type of dwelling plus natural replacement plus rebate program (if any). Assume commercial establishments built at same rate as housing, plus natural replacement. California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014. Santa Clara Valley Water District Water Use Efficiency Unit. "SCVWD CII Water Use and Baseline Study." February 2008. Model Input Values are found in the "Codes and Standards" green section of the DSS Model by customer category fixtures.

Parameter	Resource
Residential Frequency of Use Data, Toilets, Showers, Faucets, Washers, Uses/user/day	Key Reference: AWWARF Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016). Summary values can be found in the full report: http://www.waterrf.org/Pages/Projects.aspx?PID=4309 Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014. Key Reference: Alliance for Water Efficiency, The Status of Legislation, Regulation, Codes & Standards on Indoor Plumbing Water Efficiency, January 2016. Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model and confirmed in each "Service Area Calibration End Use" worksheet by customer category.
Non-Residential Frequency of Use Data, Toilets, Urinals, and Faucets, Uses/user/day	Key References: Estimated based on AWWARF Report "Commercial and Institutional End Uses of Water" (Dziegielewski, 2000 – Appendix D: Details of Commercial and Industrial Assumptions, by End Use). Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014. Fixture uses over a 5-day work week are prorated to 7 days. Non-residential 0.5gpm faucet standards per Table 2-A. Water Consumption by Water-Using Plumbing Products and Appliances - 1980-2012. PERC Phase 1 Report. Plumbing Efficiency Research Coalition, 2012. http://www.map-testing.com/content/info/menu/perc.html Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model and confirmed in each "Service Area Calibration End Use" worksheet by customer category.
Natural Replacement Rate of Fixtures (percent per year)	Residential Toilets 2%-4%
	Non-Residential Toilets 2%-3%
	Residential Showers 4% (corresponds to 25-year life of a new fixture)
	Residential Clothes Washers 10% (based on 10-year washer life). Key References: "Residential End Uses of Water" (DeOreo, 2016) and "Bern Clothes Washer Study, Final Report" (Oak Ridge National Laboratory, 1998).
	Residential Faucets 10% and Non-Residential Faucets 6.7% (every 15 years). CEC uses an average life of 10 years for faucet accessories (aerators). A similar assumption can be made for public lavatories, though no hard data exists and since CII fixtures are typically replaced less frequently than residential, 15 years is assumed. CEC, Analysis of Standards Proposal for Residential Faucets and Faucet Accessories, a report prepared under CEC's Codes and Standards Enhancement Initiative, Docket #12-AAER-2C, August 2013.
	Model Input Value is found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model.
Residential Future Water Use	Increases Based on Population Growth and Demographic Forecast
Non-Residential Future Water Use	Increases Based on Employment Growth and Demographic Forecast

Fixture Estimates

Determining the current level of efficient fixtures in a service area while evaluating the passive savings in the DSS Model is part of the standard process and is called "initial fixture proportions." As described earlier in Section 2.2, MWM reconciled water efficient fixtures and devices installed within the BAWSCA service area and estimated the number of outstanding inefficient fixtures.

MWM used the DSS Model to perform a saturation analysis for toilets, urinals, showerheads, faucets, and clothes washers. The process included a review of age of buildings from census data, number of rebates per device, and assumed natural replacement rates. MWM presumed the fixtures that were nearing saturation and worth analysis would include residential toilets and residential clothes washers as both have been included in recommended conservation practices for over two decades.

In 2014, the Water Research Foundation updated its 1999 Residential End Uses of Water Study (DeOreo, 2016). Water utilities, industry regulators, and government planning agencies consider it the industry benchmark for single family home indoor water use. This Demand Study incorporates recent study results which reflect the change to the profile of water use in residential homes including adoption of more water efficient fixtures over the past 20 years (1999-2019). Residential End Uses of Water Study results were combined with BAWSCA historical rebate and billing data to enhance and verify assumptions made for all customer accounts, including saturation levels on the above-mentioned plumbing fixtures.

The DSS Model presents the estimated current and projected proportions of these fixtures by efficiency level within each member agency service area. These proportions were calculated by:

- Using standards in place at the time of building construction;
- Taking the initial proportions of homes by age (corresponding to fixture efficiency levels);
- Adding the net change due to natural replacement; and
- Adding the change due to rebate measure minus the "free rider effect[15]."

Further adjustments were made to initial proportions to account for the reduction in fixture use due to lower occupancy and based on field observations. The projected fixture proportions do **not** include any future active conservation measures implemented by member agencies. More information about the development of initial and projected fixture proportions can be found in the DSS Model "Codes and Standards" section.

The DSS Model is capable of modeling multiple types of fixtures, including fixtures with different designs. For example, currently toilets can be purchased that flush at a rate of 0.8 gallons per flush (gpf), 1.0 gpf or 1.28 gpf. The 1.6 gpf and higher toilets still exist but can no longer be purchased in California. Therefore, they cannot be used for replacement or new installation of a toilet. So, the DSS Model utilizes fixture replacement rates to determine what type of fixture should be used for a new construction installation or replacement. The replacement of the fixtures is listed as a percentage within the DSS Model. A value of 100% would indicate that all the toilets installed would be of one particular flush volume. A value of 75% means that three out of every four toilets installed would be of that particular flush volume. All the Fixture Model information and assumptions were carefully reviewed and accepted by BAWSCA staff.

The DSS Model provides inputs and analysis of the number, type and replacement rates of fixtures for each customer category (e.g., single family toilets, commercial toilets, residential clothes washing machines). For example, the DSS Model incorporates the effects of the 1992 Federal Energy Policy Act and AB 715 on toilet fixtures. A DSS Model feature determines the "saturation" of 1.6 gpf toilets as the 1992 Federal Energy Policy Act was in effect from 1992 to 2014 for 1.6 gpf toilet replacements. AB 715 now applies for the replacement of

[15] It is important to note that in water conservation program management the "free rider effect" occurs when a customer applies for and receives a rebate on a targeted high efficiency fixture that they would have purchased even without a rebate. In this case, the rebate was not the incentive for their purchase but a "bonus." Rebate measures are designed to target those customers needing financial incentive to install the more efficient fixture.

toilets at 1.28 gpf. Further consideration and adjustments were made to replacement rates to account for the reduction in fixture use and wear due to lower occupancy and based on field observations.

E.4 Present Value Analysis and the Utility and Community Perspective

Present value analysis using present day dollars and a real discount rate of 3% is used to discount costs and benefits to the base year. From this analysis, benefit-cost ratios of each measure are computed. When measures are put together in programs, the model is set up to avoid double counting savings from multiple measures that act on the same end use of water. For example, multiple measures in a program may target toilet replacements. The model includes assumptions to apportion water savings between the multiple measures.

Economic analysis can be performed from several different perspectives, based on which party is affected. For planning water use efficiency programs for utilities, perspectives most commonly used for benefit-cost analyses are the "utility" perspective and the "community" perspective. The "utility" benefit-cost analysis is based on the benefits and costs to the water provider. The "community" benefit-cost analysis includes the utility benefit and costs together with account owner/customer benefits and costs. These include customer energy and other capital or operating cost benefits plus costs of implementing the measure, beyond what the utility pays.

The utility perspective offers two advantages. First, it considers only the program costs that will be directly borne by the utility. This enables the utility to fairly compare potential investments for saving versus supplying increased quantities of water. Second, revenue shifts are treated as transfer payments, which means program participants will have lower water bills and non-participants will have slightly higher water bills so that the utility's revenue needs continue to be met. Therefore, the analysis is not complicated with uncertainties associated with long-term rate projections and retail rate design assumptions. It should be noted that there is a significant difference between the utility's savings from the avoided cost of procurement and delivery of water and the reduction in retail revenue that results from reduced water sales due to water use efficiency. This budget impact occurs slowly and can be accounted for in water rate planning. Because it is the water provider's role in developing a water use efficiency plan that is vital in this study, the utility perspective was primarily used to evaluate elements of this report.

The community perspective is defined to include the utility and the customer costs and benefits. Costs incurred by customers striving to save water while participating in water use efficiency programs are considered, as well as benefits received in terms of reduced energy bills (from water heating costs) and wastewater savings, among others. Water bill savings are not a customer benefit in aggregate for reasons described previously. Other factors external to the utility, such as environmental effects, are often difficult to quantify or are not necessarily under the control of the utility. They are therefore frequently excluded from economic analyses, including this one.

E.5 Present Value Parameters

The time value of money is explicitly considered. Typically, the costs to save water occur early in the planning period whereas the benefits usually extend to the end of the planning period. A long planning period of over 30 years is often used because costs and benefits that occur beyond 50 years have very little influence on the total present value of the costs and benefits. The value of all future costs and benefits is discounted to the first year in the DSS Model (the base year), at the real interest rate of 3.01%. The DSS Model calculates this real interest rate, adjusting the current nominal interest rate (assumed to be approximately 6.1%) by the assumed rate of inflation (3.0%). The formula to calculate the real interest rate is: (nominal interest rate – assumed rate of inflation)/ (1 + assumed rate of inflation). Cash flows discounted in this manner are herein referred to as "Present Value" sums.

E.6 Assumptions About Measure Costs

Appendix F presents the assumptions and inputs used in the DSS Model to evaluate each water conservation measure. Assumptions regarding the following variables were made for each measure:

- **Targeted Water User Group End Use –** Water user group (e.g., single family residential) and end use (e.g., indoor or outdoor water use)
- **Utility Unit Cost –** Cost of rebates, incentives, and contractors hired by BAWSCA and BAWSCA member agencies to implement measures
- **Retail Customer Unit Cost –** Cost for implementing measures that is paid by retail customers (i.e., remainder of a measure's cost that is not covered by a rebate or incentive)
- **Utility Administration and Marketing Cost –** The cost to the utility for staff time, general expenses, and overhead needed to implement and administer the measure, including consultant contract administration, marketing, and participant tracking. The unit costs vary greatly according to the type of customer and implementation method. For example, a measure might cost a different amount for a single family account than a multifamily account. Rebate program costs are different than costs to develop and enforce an ordinance requirement or a direct installation program. Typically, water utilities incur increased costs with achieving higher market saturation, such as more surveys per year. The model calculates the annual costs based on the number of participants each year.

Costs are determined for each of the measures based on industry knowledge, past experience and data provided by BAWSCA staff, Valley Water, SFPUC staff and the member agencies. Costs may include incentive costs, usually determined on a per-participant basis; fixed costs, such as marketing; variable costs, such as the costs to staff the measures and to obtain and maintain equipment; and a one-time set-up cost. The set-up cost is for measure design by staff or consultants, any required pilot testing, and preparation of materials that are used in marketing the measure. Measure costs are estimated each year through 2045. Costs are spread over the time period depending on the length of the implementation period for the measure and estimated voluntary customer participation levels.

Lost revenue due to reduced water sales is not included as a cost because the water use conservation measures evaluated herein generally take effect over a long span of time that is sufficient to enable timely rate adjustments, if necessary, to meet fixed cost obligations and savings on variable costs such as energy and chemicals.

E.7 Assumptions about Measure Savings

Data necessary to forecast water savings of measures include specific data on water use, demographics, market penetration, and unit water savings. Savings normally develop at a measured and predetermined pace, reaching full maturity after full market penetration is achieved. This may occur three to seven years after the start of implementation, depending upon the implementation schedule. For every water use efficiency activity or replacement with more efficient devices, there is a useful life. The useful life is called the "Measure Life" and is defined to be how long water use conservation measures stay in place and continue to save water. It is assumed that measures implemented because of codes, standards, or ordinances (e.g., toilets) would be "permanent" and not revert to an old inefficient level of water use if the device needed to be replaced. However, some measures that are primarily behavior-based, such as residential surveys, are assumed to need to be repeated on an ongoing basis to retain the water savings (e.g., homeowners move away, and the new homeowners may have less efficient water using practices). Surveys typically have a measure life on the order of five years.

E.8 Assumptions about Avoided Costs

The estimated avoided cost of water was provided by BAWSCA staff and can be found in each BAWSCA member agency's specific DSS Model. The avoided cost of water or water production operational cost is $7.75/ccf as per information from Andree Johnson at BAWSCA on April 2, 2020 based on FY 2030-31 rates from SFPUC's Wholesale Rate Projections for the 10-year horizon. Given that there are no projections beyond the 2031 mark, the 2031 data value was selected.

APPENDIX F. INDIVIDUAL CONSERVATION MEASURE DESIGN INPUTS AND RESULTS

The following figures present the DSS Model starting values for the conservation measures that were analyzed for possible inclusion into each BAWSCA member agency's conservation program.

Measure 1: CII Water Survey

Overview

Name	CII Water Survey
Abbr	1
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2019
Last Year	2045
Measure Length	27

Measure Life

Permanent	☐
Years	10
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
COM	$1,000.00	$500.00	1

Administration Costs

Method:	Percent
Markup Percentage	15%

Description

Program provides free water surveys to CII customers to evaluate ways for the business to save water and money. The surveys may target large accounts (e.g., accounts that use more than 5,000 gallons of water per day) only such as hotels, restaurants, stores and schools. Emphasis may be on supporting the top 25 users for each individual water agency.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☐	☐	☑	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets			☑						
Urinals			☑						
Lavatory Faucets			☑						
Showers			☑						
Dishwashers			☑						
Clothes Washers			☑						
Process			☑						
Kitchen Spray Rinse			☑						
Internal Leakage			☑						
Baths									
Other			☑						
Irrigation			☐						
Pools									
Wash Down									
Car Washing									
External Leakage			☐						
Outdoor									
atory/Kitchen Faucets			☑						
Cooling			☑						

Comments

> **Utility Costs** - Survey cost is ~$500-$1,500 in-house staff or $2,000-$10,000 if contracted out. Utility cost is $60 for fixtures + 2-3 hours staff time for survey. ~$500 per survey for Utility cost. Utility costs represent fixture giveaway number distributed and costs (1.5 spray valves $50/ea., 5 aerators @ $2/ea.). Approx. 1.5 nozzles can be found per CII account per Tso & Koeller 2005 report "Pre-rinse Spray Valve Programs: How are they really doing?"

> **Customer Costs** - reflects cost/time to install fixtures and address survey recommendations.

> **End Use Water Saving** - BAWSCA Phase 1 study on Making Conservation a California Way of Life found savings of 10-15% per site. Assume 15% per site and include giveaways. Giveaways assume 1.15 gpm pre-rinse spray valve replace 2.5 gpm, 0.5 gpm aerators replace 2.2 gpm in lavatories, and 1.8 gpm replace aerators replace 2.2 gpm in non-lavatory settings (kitchens, utility rooms, etc.). This is an indoor survey only. Irrigation and landscaping will not be evaluated as part of the survey. Cooling systems will be evaluated in surveys.

> **Targets** - WCWDB FY16/17 & FY17/18 average measure participation rate of: 0.11%. ~7 BAWSCA agencies reported. Per 2018 BAWSCA Phase 1 Making Conservation a California Way of Life Strategic Plan study < 1% of CII accounts are audited per year.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
COM Toilets	15.0%	agency-specific
COM Urinals	15.0%	agency-specific
COM Lavatory Faucets	15.0%	agency-specific
COM Showers	15.0%	agency-specific
COM Dishwashers	15.0%	agency-specific
COM Clothes Washers	15.0%	agency-specific
COM Process	15.0%	agency-specific
COM Kitchen Spray Rinse	15.0%	agency-specific
COM Internal Leakage	15.0%	agency-specific
COM Other	15.0%	agency-specific
COM Non-Lavatory/Kitchen Faucets	15.0%	agency-specific
COM Cooling	15.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.110%
Only Effects New Accts	☐

Measure 2: CII Water Efficient Technology (WET) Rebate

Overview

Name	CII Water Efficient Technology (WET) Rebate
Abbr	2
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2022
Last Year	2045
Measure Length	24

Measure Life

Permanent	☑

Fixture Cost per Device

	Utility	Customer	Fix/Acct
COM	$5,000.00	$5,000.00	1
IND	$5,000.00	$5,000.00	1

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Program modeled after the Valley Water program to provides rebates to commercial, industrial and institutional sites to help implement equipment changes that reduce water use. Rebate amount is $4 per ccf saved annually up to 50% of the cost of the equipment.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☐	☐	☑	☐	☑	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets			☑		☑				
Urinals			☑		☑				
Lavatory Faucets			☑		☑				
Showers			☑		☑				
Dishwashers			☑		☑				
Clothes Washers			☑		☑				
Process			☑		☑				
Kitchen Spray Rinse			☑						
Internal Leakage			☑		☑				
Baths									
Other			☑		☑				
Irrigation			☐		☐				
Pools									
Wash Down									
Car Washing									
External Leakage			☑		☑				
Outdoor									
atory/Kitchen Faucets			☑		☑				
Cooling			☑		☑				

Comments

> **Utility Costs** - Program modeled after Valley Water. Incentive value for BAWSCA program based on cost effectiveness. Pre-rinse spray valves can cost $60/ea. These are also distributed during CII surveys. https://fishnick.com/equipment/sprayvalves/
Dipper wells: Installation of electricity access can cost ~$350/ea. A health dept. permit might be ~$400/ea. A permit for electricity installation might be ~$200, though not apply to all. ConserveWell Drop-in model costs ~ $510/well. ConserveWell Wall-mount model costs ~$565/well.
> **Customer Costs** - Customer costs reflect installation.
> **End Use Water Savings** - Eligible fixtures will change based on changes in plumbing codes that would negate the need for the fixture to be rebated. Ending eligibility of certain fixtures avoids free-ridership. Savings and both utility and customer costs will vary depending on rebated fixtures. Averaged overall estimates for costs and savings are assumed to account for the variance in devices. Water savings data is provided for dipper wells as an example of one possible newer device to increase water savings indoors for businesses: https://server-products.com/ConserveWell-notdipperwell. Dipper Well Replacement Field Evaluation Report. Frontier Energy Report # 50115-R0. Nov 2017. Los Banos site saved 176,000 gal/yr & Madera site saved 116,000 gal/yr. https://fishnick.com/publications/fieldstudies/Dipper_Well_Replacement_Field_Evaluation_ICP.pdf.
> **Targets** - Assumes 0.5% of CII accounts are targeted each year.

Results

Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
COM Toilets	20.0%	agency-specific
IND Toilets	20.0%	agency-specific
COM Urinals	20.0%	agency-specific
IND Urinals	20.0%	agency-specific
COM Lavatory Faucets	20.0%	agency-specific
IND Lavatory Faucets	20.0%	agency-specific
COM Showers	20.0%	agency-specific
IND Showers	20.0%	agency-specific
COM Dishwashers	20.0%	agency-specific
IND Dishwashers	20.0%	agency-specific
COM Clothes Washers	20.0%	agency-specific
IND Clothes Washers	20.0%	agency-specific
COM Process	20.0%	agency-specific
IND Process	20.0%	agency-specific
COM Kitchen Spray Rinse	20.0%	agency-specific
COM Internal Leakage	20.0%	agency-specific
IND Internal Leakage	20.0%	agency-specific
COM Other	20.0%	agency-specific
IND Other	20.0%	agency-specific
COM External Leakage	20.0%	agency-specific
IND External Leakage	20.0%	agency-specific
COM Non-Lavatory/Kitchen Faucets	20.0%	agency-specific
IND Non-Lavatory/Kitchen Faucets	20.0%	agency-specific
COM Cooling	20.0%	agency-specific
IND Cooling	20.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Measure 3: School Building Retrofit

Overview

Name	School Building Retrofit
Abbr	3
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2019
Last Year	2028
Measure Length	10

Measure Life

Permanent	✓

Fixture Cost per Device

	Utility	Customer	Fix/Acct
COM	$5,000.00	$5,000.00	1

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Program provides site audits and customized rebates for fixture replacements and irrigation upgrades at school sites. Eligible sites may include K-12 schools as well as colleges and universities.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
		✓						

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets			✓						
Urinals			✓						
Lavatory Faucets			✓						
Showers			✓						
Dishwashers			✓						
Clothes Washers			✓						
Process			✓						
Kitchen Spray Rinse			✓						
Internal Leakage			✓						
Baths									
Other			✓						
Irrigation			✓						
Pools									
Wash Down									
Car Washing									
External Leakage			✓						
Outdoor									
atory/Kitchen Faucets			✓						
Cooling			✓						

Comments

> **Utility Costs** - $5,000 utility cost assumes replacement of high use toilets and some irrigation system improvement (where applicable).

> **Customer Costs** - Assumes cost of installation and remainder of devices.

> **End Use Water Savings** - Savings similar to CII survey and incentive measures combined.

> **Targets** - Assumes 0.1% of institutional accounts targeted each year

Results

Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
COM Toilets	15.0%	agency-specific
COM Urinals	15.0%	agency-specific
COM Lavatory Faucets	15.0%	agency-specific
COM Showers	15.0%	agency-specific
COM Dishwashers	15.0%	agency-specific
COM Clothes Washers	15.0%	agency-specific
COM Process	15.0%	agency-specific
COM Kitchen Spray Rinse	15.0%	agency-specific
COM Internal Leakage	15.0%	agency-specific
COM Other	15.0%	agency-specific
COM Irrigation	15.0%	agency-specific
COM External Leakage	15.0%	agency-specific
COM Non-Lavatory/Kitchen Faucets	15.0%	agency-specific
COM Cooling	15.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.100%
Only Effects New Accts	

Measure 4: Residential Outdoor Water Surveys

Overview

Name	Residential Outdoor Water Surveys
Abbr	4
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2023
Last Year	2045
Measure Length	23

Measure Life

Permanent	☐
Years	10
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$383.00	$50.00	1

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Outdoor water surveys offered for existing customers. Normally those with high water use are targeted and provided a customized report on how to save water. Can be combined with indoor surveys or focused on certain customer classes. Residential customers would be eligible for free landscape water surveys upon request. Typically during the surveys, the surveyor will checks for leaks, provide direction on appropriate irrigation scheduling, demonstrate how to set irrigation controllers, provide guidance on plant selection and offer additional ways to increase outdoor efficiencies (car washing, pool covers, mulch etc.). Low-cost, general-use, outdoor efficiency fixtures assumed to be handed out during the survey as needed.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☐	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐								
Urinals									
Lavatory Faucets	☐								
Showers	☐								
Dishwashers	☐								
Clothes Washers	☐								
Process									
Kitchen Spray Rinse									
Internal Leakage	☐								
Baths	☐								
Other	☐								
Irrigation	☑								
Pools	☐								
Wash Down	☑								
Car Washing	☑								
External Leakage	☑								
Outdoor									
atory/Kitchen Faucets	☐								
Cooling									

Comments

> **Utility Costs** - Time estimates includes field time, drive time, scheduling, and data entry. Assume staff avg fully burdened Rate with fringe and overhead is $136/hr., (ACWD Water Conservation Rate is $50/hr. for base rate with fringe and overhead add 1.72%). Utility fixture costs assume all surveyed accounts receive a kit with $9 of supplies including a rain gauge, an auto shut-off hose nozzle, and a soil moisture sensor. Utility Cost = ((136*2.75 hours per survey) +($9 supplies))* 25% admin markup> Administration Costs - Based on Big Bear, CA program, administration time assumes 75 min/audit (primarily 70% staff, 30% supervisor).

> **End Use Water Savings** - Savings based off of California Urban Water Agencies water Savings Study (4/13/15); Outdoor Residential Water Surveys saved on average 21 gpd per audit. Assumed 10% savings on outdoor end uses and 5% selected on pools to be conservative which total up to an approximate average savings of 21 gpd per residential audit.

> **Targets** - WCWDB FY16/17 & FY17/18 ~11 BAWSCA agencies reported. 0.8% SF survey participation.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Fixed

	Savings GPD/Acct	Avg GPD/Acct
SF Irrigation	18.0	agency-specific
SF Wash Down	0.5	agency-specific
SF Car Washing	0.5	agency-specific
SF External Leakage	2.0	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.800%
Only Effects New Accts	☐

Measure 5: Large Landscape Outdoor Water Surveys

Overview

Name	Large Landscape Outdoor Water Surveys
Abbr	5
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2019
Last Year	2045
Measure Length	27

Measure Life

Permanent	☐
Years	10
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
IRR	$1,500.00	$1,000.00	1

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multifamily residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Tied to the Water Budget Program.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☐	☐	☐	☐	☐	☐	☑	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets									
Urinals									
Lavatory Faucets									
Showers									
Dishwashers									
Clothes Washers									
Process									
Kitchen Spray Rinse									
Internal Leakage									
Baths									
Other									
Irrigation							☑		
Pools									
Wash Down									
Car Washing									
External Leakage							☑		
Outdoor									
atory/Kitchen Faucets									
Cooling									

Comments

> **Utility Costs** - Assumes all large landscape accounts can apply. Assume 3 acres cost $500/Acre, $1,500 per site.
> **Customer Costs** - Assumes cost to review/update controller programming or fix minor leaks to align water use to an appropriate level for the amount and type of landscaping at the site.
> **End Use Water Savings** - Savings based off of California Urban Water Agencies water savings study (4/13/15) of 326 gpda, average of 15% for CII landscape accounts; distributed between irrigation and external leakage. The actual savings for the DSS Model is directly tied to service area irrigation characteristics for COM or IRR accounts based on billing categories and will vary by service area. The actual water savings of 20% of irrigation and 10% of leakage is conservative but yields representative end use water savings for this measure.
> **Targets** - Customer participation based on BAWSCA Water Conservation Data Base measure record.

Results

Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
IRR Irrigation	20.0%	agency-specific
IRR External Leakage	10.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Measure 6: Large Landscape (Waterfluence) Program

Overview	
Name	Large Landscape (Waterfluence) Program
Abbr	6
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2020
Last Year	2039
Measure Length	20

Measure Life	
Permanent	☐
Years	10
Repeat	☐

Fixture Cost per Device	Utility	Customer	Fix/Acct
IRR	$1,480.00	$0.00	1

Administration Costs	
Method:	Percent
Markup Percentage	25%

Description

Website provides feedback on irrigation water use (budget vs. actual). Current Waterfluence Program.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☐	☐	☐	☐	☐	☐	☑	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets									
Urinals									
Lavatory Faucets									
Showers									
Dishwashers									
Clothes Washers									
Process									
Kitchen Spray Rinse									
Internal Leakage									
Baths									
Other									
Irrigation							☑		
Pools									
Wash Down									
Car Washing									
External Leakage							☐		
Outdoor									
atory/Kitchen Faucets									
Cooling									

Comments

> **Utility Costs** - Water Budgeting software like Waterfluence at $74 per site. Assuming a five-year investment per site, unit cost is set at $1,480 per 20 year site monitoring fee. Monitoring fee is adjusted to account for accounts coming online over the program duration.
> **Administrative Costs** - represents approximately $5,000 for staff time and an annual service fee of $2,000 to administer the program.
> **Customer Costs** - No cost to customers as these are mostly adjustments to existing controller programming or change in landscape maintenance practices.
> **End Use Water Savings** - Savings is estimated based on past experience with other utilities. Also accounts for behavior and watering schedule changes.
> **Targets** - Customer participation of 5% based on BAWSCA Water Conservation Database. Based on percent of IRR/Dedicated Landscape Accounts when available.

Results	
Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
IRR Irrigation	30.0%	agency-specific

Targets	
Target Method:	Percentage
% of Accts Targeted / yr	5.000%
Only Effects New Accts	☐

Measure 7: Lawn Be Gone! and Rainwater Capture Rebates

Overview	
Name	Lawn Be Gone! And Rainwater Capture Rebates
Abbr	7
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2019
Last Year	2045
Measure Length	27

Measure Life	
Permanent	☐
Years	5
Repeat	☐

Fixture Cost per Device	Utility	Customer	Fix/Acct
SF	$500.00	$2,000.00	1
MF	$2,500.00	$20,000.00	1
COM	$2,500.00	$20,000.00	1
IND	$2,500.00	$20,000.00	1
GOV	$2,500.00	$20,000.00	1
IRR	$2,500.00	$20,000.00	1

Administration Costs	
Method:	Percent
Markup Percentage	25%

Description

Provide a per square foot incentive for to remove turf and replace with low water use plants or permeable hardscape. Landscape conversion includes conversion of turf to lower-water-using turf varieties. Rebate based on dollars per square foot removed, and capped at an upper limit for single family residence, multifamily residence and/or commercial account.

Customer Classes	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
	☑	☑	☑	☐	☑	☑	☑	☐	☐

End Uses	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐	☐	☐		☐	☐			
Urinals			☐		☐	☐			
Lavatory Faucets	☐	☐	☐		☐	☐			
Showers	☐	☐	☐		☐	☐			
Dishwashers	☐	☐	☐		☐	☐			
Clothes Washers	☐	☐	☐		☐	☐			
Process			☐		☐				
Kitchen Spray Rinse			☐			☐			
Internal Leakage	☐	☐	☐		☐	☐			
Baths	☐	☐							
Other	☐	☐	☐		☐	☐			
Irrigation	☑	☑	☑		☑	☑	☑		
Pools	☐	☐				☐			
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☐	☐	☐		☐	☐	☐		
Outdoor									
atory/Kitchen Faucets	☐	☐	☐		☐	☐			
Cooling			☐		☐	☐			

Comments

> **Utility Costs** - Assume rebate of $1/sq foot of turf removed which equates to approximately 25% of total project cost. Assume MF/CII costs of $2,500 and SF costs of $500. Assume large sites have more than one meter. Therefore large sites can qualify for multiple rebates to make it a worthwhile effort with a higher total site incentive value.

> **Customer Cost** - Per 2013 BAWSCA effort MF/CII costs of $20,000/customer and SF cost of $2,000/customer.

> **End Use Water Savings** - Water Savings based upon Valley Water program at 31 gallons per square foot/yr. for years 2-5, and saving 48 gal/feet squared/yr. during the fifth year following conversion. Assume an average of 18% over the 5 years of the study.

> **Targets** - WCWDB FY16/17 & FY17/18 average measure participation rate of: 0.13%. ~15 BAWSCA agencies reported. Includes SF, MF and CII customer categories combined.

Results	
Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Irrigation	18.0%	agency-specific
MF Irrigation	18.0%	agency-specific
COM Irrigation	18.0%	agency-specific
IND Irrigation	18.0%	agency-specific
GOV Irrigation	18.0%	agency-specific
IRR Irrigation	18.0%	agency-specific

Targets	
Target Method:	Percentage
% of Accts Targeted / yr	0.130%
Only Effects New Accts	☐

Measure 8: Financial Incentives for Irrigation & Landscape Upgrades

Overview

Name	Financial Incentives for Irrigation & Landscape Upgrades
Abbr	8
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2023
Last Year	2045
Measure Length	23

Measure Life	
Permanent	☐
Years	10
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$250.00	$100.00	1
MF	$500.00	$500.00	1
COM	$500.00	$500.00	1
IND	$500.00	$500.00	1
GOV	$500.00	$500.00	1
IRR	$500.00	$500.00	1

Administration Costs

Method: Percent

Markup Percentage	25%

Description

For customers with landscape, provide incentives for substantive landscape retrofits or installation of water efficient equipment upgrades; Rebates can also contribute towards the purchase and installation of water-wise plants, compost, mulch and selected types of irrigation equipment upgrades.

> Rebate for residential accounts and up to 50% more for commercial customers.

> Financial incentives for: WBICs, rotating sprinkler nozzles, rainwater containers (barrels and cisterns), and greywater retrofits

> Landscape conversion and turf removal is not part of this measure.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☑	☐	☑	☑	☑	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐	☐	☐		☐	☐			
Urinals			☐		☐	☐			
Lavatory Faucets	☐	☐	☐		☐	☐			
Showers	☐	☐	☐		☐	☐			
Dishwashers	☐	☐	☐		☐	☐			
Clothes Washers	☐	☐	☐		☐	☐			
Process			☐		☐				
Kitchen Spray Rinse			☐			☐			
Internal Leakage	☐	☐	☐		☐	☐			
Baths	☐	☐							
Other	☐	☐	☐		☐	☐			
Irrigation	☑	☑	☑		☑	☑	☑		
Pools	☐	☐				☐			
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☐	☐	☐		☐	☐	☐		
Outdoor									
atory/Kitchen Faucets	☐	☐	☐		☐	☐			
Cooling			☐		☐	☐			

Comments

> **Utility Costs** - $250 for SF accounts. $500 utility cost is per non-residential account. Large sites will have more than one account and qualify for a larger total rebate per site. EBMUD and Valley Water programs offer up to $2,000-$3,000 for residential customers and up to $15,000-$60,000 for commercial customers.

> **Customer Costs** - Customer costs per account will vary significantly based on devices.

> **End Use Water Savings** - The water savings are based on the following from the 2018 Landscape Rebate Water Savings Study from Valley Water:

> The annual water savings for replacing timer-based automatic irrigation controllers with weather-based irrigation controllers with rain shut-off devices were statistically significant each year following conversion, incrementally increased each year following conversion, and were on average 9 gal/ft2/yr or an average of 27%

> The annual water savings for replacing old sprinklers with high-efficiency nozzles were 1,243 gal/unit/yr on average. or an average of 15.3%

>Annual savings for replacing old sprinklers with high-efficiency nozzles including pressure regulation and/or check valves were significant in the first year following conversion, saving 1,661 gal/unit/yr on average, or an average of 18%.

> Total average irrigation savings is 20.1%

> Soil moisture sensor savings may be 20% of irrigation use is based on more than 10 California site water use reports conducted over multiple months in years 2015-2017 as provided by Brian Holland www.sustainablewatersavings.com. Studies show a range of 20%-60% savings for trained soil moisture sensor device installation and site management. A lower savings estimate is assumed for layperson usage and non-drought normal planning years. The manufacturer claims device batteries last 10-12 years.

> **Targets** - 0.25% to keep total utility budget and staff time for this program to reasonable levels.

Results

Units: MG

Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Irrigation	20.1%	agency-specific
MF Irrigation	20.1%	agency-specific
COM Irrigation	20.1%	agency-specific
IND Irrigation	20.1%	agency-specific
GOV Irrigation	20.1%	agency-specific
IRR Irrigation	20.1%	agency-specific

Targets

Target Method: Percentage

% of Accts Targeted / yr	0.250%
Only Effects New Accts	☐

Measure 9: Landscape & Irrigation Codes

Overview

Name	Landscape & Irrigation Codes
Abbr	9
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2019
Last Year	2045
Measure Length	27

Measure Life

Permanent	☑

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$100.00	$2,000.00	1
MF	$100.00	$2,000.00	1
COM	$100.00	$2,000.00	1
IND	$100.00	$5,000.00	1
GOV	$100.00	$2,000.00	1
IRR	$100.00	$2,000.00	1

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Existing Model Water Efficient Landscape Ordinance (MWELO), as amended in 2015, which establishes specific outdoor water efficiency requirements for new accounts and existing accounts undergoing eligible site renovations.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☑	☐	☑	☑	☑	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐	☐	☐		☐	☐			
Urinals			☐		☐	☐			
Lavatory Faucets	☐	☐	☐		☐	☐			
Showers	☐	☐	☐		☐	☐			
Dishwashers	☐	☐	☐		☐	☐			
Clothes Washers	☐	☐	☐		☐	☐			
Process			☐		☐				
Kitchen Spray Rinse			☐			☐			
Internal Leakage	☐	☐	☐		☐	☐			
Baths	☐	☐							
Other	☐	☐	☐		☐	☐			
Irrigation	☑	☑	☑		☑	☑	☑		
Pools	☐	☐				☐			
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☑	☑	☑		☑	☑	☑		
Outdoor									
atory/Kitchen Faucets	☐	☐	☐		☐	☐			
Cooling			☐		☐	☐			

Comments

> **Utility Costs** - $100/fixture and 25% admin costs represent staff time for enforcement and inspection of landscapes.

> **Customer Costs** - Assume average additional cost to build landscape by MWELO standards (cost to comply versus install typical all-turf) landscape ($2000-$5000/acct). Also includes non-residential customer smart irrigation controller cost of $750 based on $700 device unit cost (per RainBird ITC-LX) and $50 unit installation cost per controller with 3 controllers needed for large sites.

> **End Use Water Savings** - The maximum applied water allowance (MAWA) has been lowered from 70% of the reference evapotranspiration (ETo) to 55% for residential landscape projects, and to 45% of ETo for non-residential projects. Savings are simplified to be the difference from the prior standard to the new MWELO standard budget difference of 70-55% for residential or 70-45% for non-residential. This water allowance reduces the landscape area that can be planted with high water use plants such as cool season turf. For typical residential projects, the reduction in the MAWA reduces the percentage of landscape area that can be planted to high water use plants from 33% to 25%. The site-wide irrigation efficiency of the previous ordinance (2010) was 0.71; for the purposes of estimating total water use, the revised MWELO defines the irrigation efficiency (IE) of drip irrigation as 0.81 and overhead irrigation and other technologies must meet a minimum IE of 0.75. Also assumed that the amount of irrigated landscape per new development for each individual parcel is reducing over time (meaning that the lot size for homes/businesses is shrinking when comparing existing homes versus new homes/businesses.) Assume some external leakage reduction (since new development would not have much) in addition to irrigation water use reduction. Assume end use savings as compared to existing account irrigation water end use.

> **Targets** - Assumes 90% of new accounts will comply. High because assumes total accounts targeted includes a number of existing account remodels that are eligible.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Irrigation	25.0%	agency-specific
MF Irrigation	25.0%	agency-specific
COM Irrigation	25.0%	agency-specific
IND Irrigation	25.0%	agency-specific
GOV Irrigation	25.0%	agency-specific
IRR Irrigation	25.0%	agency-specific
SF External Leakage	10.0%	agency-specific
MF External Leakage	10.0%	agency-specific
COM External Leakage	10.0%	agency-specific
IND External Leakage	10.0%	agency-specific
GOV External Leakage	10.0%	agency-specific
IRR External Leakage	10.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	90.000%
Only Effects New Accts	☑

Measure 10: Residential Indoor Water Surveys

Overview

Name	Residential Indoor Water Surveys
Abbr	10
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2019
Last Year	2045
Measure Length	27

Measure Life

Permanent	☐
Years	5
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$100.00	$50.00	1
MF	$100.00	$50.00	1

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Indoor water surveys for existing residential customers. Target those with high water use and provide a customized report to owner. May include give-away of efficient shower heads, aerators, toilet devices. Could be combined with Residential Outdoor Water Surveys measure.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☑	☑							
Urinals									
Lavatory Faucets	☑	☑							
Showers	☑	☑							
Dishwashers	☑	☑							
Clothes Washers	☑	☑							
Process									
Kitchen Spray Rinse									
Internal Leakage	☑	☑							
Baths	☑	☑							
Other	☑	☑							
Irrigation	☐	☐							
Pools	☐	☐							
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☐	☐							
Outdoor									
atory/Kitchen Faucets	☑	☑							
Cooling									

Comments

> **Utility Costs** - Utility costs for this measure are primarily staff time. Admin costs/time estimates includes field time, drive time, scheduling, and data entry. Portion 25% to admin in measure design. Giveaway device costs and device rebates as a result of this measure are not included since these are covered in separate measures.

> **Customer Costs** - Customer costs represent average customer cost to implement any survey suggestions.

> **End Use Water Savings** - Savings represents average account savings. Savings based off of California Urban Water Agencies water savings study (4/13/15). Approximate 5.8% savings for indoor. Slightly lower value of 5% water savings were selected to account for efficient devices installed during the recent CA drought, and more efficient homes built to CALGreen on the market in the past 5 years.

> **Targets** - WCWDB FY16/17 & FY17/18 average measure participation rate of: 2.71%. ~11 BAWSCA agencies reported. 0.8% SF survey participation and 4.6% MF survey participation.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Toilets	5.0%	agency-specific
MF Toilets	5.0%	agency-specific
SF Lavatory Faucets	5.0%	agency-specific
MF Lavatory Faucets	5.0%	agency-specific
SF Showers	5.0%	agency-specific
MF Showers	5.0%	agency-specific
SF Dishwashers	5.0%	agency-specific
MF Dishwashers	5.0%	agency-specific
SF Clothes Washers	5.0%	agency-specific
MF Clothes Washers	5.0%	agency-specific
SF Internal Leakage	5.0%	agency-specific
MF Internal Leakage	5.0%	agency-specific
SF Baths	5.0%	agency-specific
MF Baths	5.0%	agency-specific
SF Other	5.0%	agency-specific
MF Other	5.0%	agency-specific
SF Non-Lavatory/Kitchen Faucets	5.0%	agency-specific
MF Non-Lavatory/Kitchen Faucets	5.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	2.710%
Only Effects New Accts	☐

Measure 11: Residential Water-Savings Devices Giveaway

Overview		
Name	Residential Water-Savings Devices Giveaway	
Abbr	11	
Category	Default	
Measure Type	Standard Measure	

Time Period	
First Year	2019
Last Year	2045
Measure Length	27

Measure Life	
Permanent	☑

Fixture Cost per Device			
	Utility	Customer	Fix/Acct
SF	$12.00	$15.00	2
MF	$12.00	$15.00	8

Administration Costs	
Method:	Percent
Markup Percentage	25%

Description

Utility would buy high efficiency showerheads and faucets, aerators in bulk and give them away at Utility office or community events.

Customer Classes

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
	☑	☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐	☐							
Urinals									
Lavatory Faucets	☑	☑							
Showers	☑	☑							
Dishwashers	☐	☐							
Clothes Washers	☐	☐							
Process									
Kitchen Spray Rinse									
Internal Leakage	☐	☐							
Baths	☐	☐							
Other	☐	☐							
Irrigation	☐	☐							
Pools	☐	☐							
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☐	☐							
Outdoor									
atory/Kitchen Faucets	☑	☑							
Cooling									

Comments

> **Utility Costs** - Devices are ordered in bulk. Devices are given away individually, and not necessarily as a "kit". Average cost for devices: 1.2 gpm bathroom aerators ($1/ea.), 1.8 gpm kitchen aerators ($2.10/ea.), 1.8 gpm showerheads ($4.60/ea.). Admin costs for tracking of program

> **Customer Costs** - Assumes minimal cost for installation.

> **End Use Water Savings** - Assume kits save 27.6% (reduced to be conservative) by assuming only 25% of kits are actually installed in the homes and yield water savings. Assumed Kit savings of 27.6% * 0.25 installed = 6.9% actual savings

> **Targets** - WCWDB FY16/17 & FY17/18 average measure participation rate of: 1.24%. ~12 BAWSCA agencies reported.

Results	
Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement		
Method: Percent		
	% Savings/Acct	Avg GPD/Acct
SF Lavatory Faucets	6.9%	agency-specific
MF Lavatory Faucets	6.9%	agency-specific
SF Showers	6.9%	agency-specific
MF Showers	6.9%	agency-specific
SF Non-Lavatory/Kitchen Faucets	6.9%	agency-specific
MF Non-Lavatory/Kitchen Faucets	6.9%	agency-specific

Targets	
Target Method:	Percentage
% of Accts Targeted / yr	1.250%
Only Effects New Accts	☐

Measure 12: Flowmeter Rebate

Overview

Name	Flowmeter Rebate
Abbr	12
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2020
Last Year	2024
Measure Length	5

Measure Life

Permanent	☐
Years	10
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$200.00	$400.00	1
MF	$200.00	$400.00	1
COM	$200.00	$400.00	1
IND	$200.00	$400.00	1
GOV	$200.00	$400.00	1

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Program provides rebates for flow measuring devices which inform customers of their water use and provide leak detection and remote shutoff with a smart phone interface. Devices are targeted to residential users and can monitor indoor only, whole site meter use, and/or irrigation only use.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☑	☐	☑	☑	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐	☐	☐		☐	☐			
Urinals			☐		☐	☐			
Lavatory Faucets	☐	☐	☐		☐	☐			
Showers	☐	☐	☐		☐	☐			
Dishwashers	☐	☐	☐		☐	☐			
Clothes Washers	☐	☐	☐		☐	☐			
Process			☐		☐				
Kitchen Spray Rinse			☐			☐			
Internal Leakage	☑	☑	☑		☑	☑			
Baths	☐	☐							
Other	☐	☐	☐		☐	☐			
Irrigation	☑	☑	☑		☑	☑			
Pools	☐	☐				☐			
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☑	☑	☑		☑	☑			
Outdoor									
atory/Kitchen Faucets	☐	☐	☐		☐	☐			
Cooling			☐		☐	☐			

Comments

> Focus of Program: non-irrigation accounts

> **Utility Costs** - $200 rebate amount based off of EBMUD flowmeter rebate program https://www.ebmud.com/water/conservation-and-rebates/rebates/flowmeter-rebate/

> **Administration Costs** - Assume 25% admin to cover management of measure.

> **Customer Costs** - Customer costs assume half the customers would install more-costly remote or auto-shut-off device and half the less-costly sensor. Product examples: Flume, Flo, Buoy, Phyn Flume sensor straps around water meter and provides intelligent leak detection and real-time water use via mobile app. No pipes cut. ($200).
Water Hero Leak Detection & Automatic Water Shut Off System ($650). Plumbed components last 20+ years; electronics last ~10 yrs.

> **End Use Water Savings** - Savings based on study results from EBMUD, San Antonio, and WaterNow Alliance savings of 7% of total SF account use provided Feb 2020.

> **Targets** - Assume 0.5% of accounts targeted each year.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Internal Leakage	35.0%	agency-specific
MF Internal Leakage	35.0%	agency-specific
COM Internal Leakage	35.0%	agency-specific
IND Internal Leakage	35.0%	agency-specific
GOV Internal Leakage	35.0%	agency-specific
SF Irrigation	15.0%	agency-specific
MF Irrigation	15.0%	agency-specific
COM Irrigation	15.0%	agency-specific
IND Irrigation	15.0%	agency-specific
GOV Irrigation	15.0%	agency-specific
SF External Leakage	35.0%	agency-specific
MF External Leakage	35.0%	agency-specific
COM External Leakage	35.0%	agency-specific
IND External Leakage	35.0%	agency-specific
GOV External Leakage	35.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Measure 13: Leak Repair & Plumbing Emergency Assistance

Overview

Name	Leak Repair & Plumbing Emergency Assistance
Abbr	13
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2023
Last Year	2045
Measure Length	23

Measure Life

Permanent	☐
Years	10
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$200.00	$100.00	1
MF	$200.00	$100.00	2

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Program provides leak identification and possible rebates and/or pre-negotiated pricing with approved plumbers to assist customers in locating and repair leaks.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐	☐							
Urinals									
Lavatory Faucets	☐	☐							
Showers	☐	☐							
Dishwashers	☐	☐							
Clothes Washers	☐	☐							
Process									
Kitchen Spray Rinse									
Internal Leakage	☑	☑							
Baths	☐	☐							
Other	☐	☐							
Irrigation	☐	☐							
Pools	☐	☐							
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☑	☑							
Outdoor									
atory/Kitchen Faucets	☐	☐							
Cooling									

Comments

> **Utility Costs** - Utility costs might represent staff time for account leak identification, multiple notifications and a possible site survey (incl drive time) and reporting.
> **Customer Costs** - Cost to fix the leak.
> **End Use Water Savings** - Savings might be over 200% if based on a targeted account's using 2-4 times the amount of the previous year's water use. Assume 50% of internal leaks are fixed. Assume 1 leak per SF, 2 leaks per MF (typically duplex owners), as these programs typically are for owner-occupied residences.
> **Targets** - Assume 0.1% of accounts per year need leak repair and plumbing assistance.

Results

Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Internal Leakage	50.0%	agency-specific
MF Internal Leakage	50.0%	agency-specific
SF External Leakage	50.0%	agency-specific
MF External Leakage	50.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.100%
Only Effects New Accts	☐

Measure 14: Multifamily HET Direct Install

Overview

Name	Multifamily HET Direct Install
Abbr	14
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2023
Last Year	2027
Measure Length	5

Measure Life

Permanent	☑

Fixture Cost per Device

	Utility	Customer	Fix/Acct
MF	$350.00	$25.00	25

Administration Costs

Method:	Percent
Markup Percentage	20%

Description

Program provides property owners and managers of multi-family housing direct installation of high-efficiency toilets.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☐	☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets		☑							
Urinals									
Lavatory Faucets		☐							
Showers		☐							
Dishwashers		☐							
Clothes Washers		☐							
Process									
Kitchen Spray Rinse									
Internal Leakage		☐							
Baths		☐							
Other		☐							
Irrigation		☐							
Pools		☐							
Wash Down		☐							
Car Washing		☐							
External Leakage		☐							
Outdoor									
atory/Kitchen Faucets		☐							
Cooling									

Comments

> **Utility Cost** - Cost reflects cost of 1.1 gpf or lower toilet and installation fees based upon City of Santa Monica, CA program. https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Water/DirectInstall_Toilet.pdf
> **Administrative Cost** - reflects utility staff time to track and run program.
> **Customer Cost** - Minimal customer cost.
> **End Use Water Savings** - Savings estimates assume the difference between 0.8 gpf and 1.6 gpf or 50% savings on average.
> **Targets** - Assumes 0.1% of multifamily accounts targeted per year.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
MF Toilets	50.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.100%
Only Effects New Accts	☐

Measure 15: Multifamily Submetering for Existing Accounts

Overview

Name	Multifamily Submetering for Existing Accounts
Abbr	15
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2020
Last Year	2045
Measure Length	26

Measure Life

Permanent	☑

Fixture Cost per Device

	Utility	Customer	Fix/Acct
MF	$150.00	$450.00	20

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Provide submeters for individual units in condos developments and mobile home parks. This program is intended to be modeled after the existing Valley Water program.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☐	☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets		☑							
Urinals									
Lavatory Faucets		☑							
Showers		☑							
Dishwashers		☑							
Clothes Washers		☑							
Process									
Kitchen Spray Rinse									
Internal Leakage		☑							
Baths		☑							
Other		☐							
Irrigation		☐							
Pools		☐							
Wash Down		☐							
Car Washing		☐							
External Leakage		☐							
Outdoor									
atory/Kitchen Faucets		☑							
Cooling									

Comments

> **Utility Cost** - Utility costs for this measure are primarily staff time and $150 rebate modeled off the Valley Water submeter rebate program.

> **Customer Cost** - Customer cost is for the meter (~$600/acct) minus the rebate amount.

> **End Use Water Savings** - Savings based on estimated metering retrofit projects and education measure estimated savings. Leak savings are higher since submetering should make leaks easier to identify and locate. Assume savings on indoor only. No outdoor because it would have a separate meter likely. Assumed average 15-30% water savings per meter based off of Valley Water 2007 Pilot Study on mobile homes which saved an average of 23% per meter.

> **Targets** - assumes only 0.1% of accounts targeted each year

Results

Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
MF Toilets	20.0%	agency-specific
MF Lavatory Faucets	20.0%	agency-specific
MF Showers	20.0%	agency-specific
MF Dishwashers	20.0%	agency-specific
MF Clothes Washers	20.0%	agency-specific
MF Internal Leakage	20.0%	agency-specific
MF Baths	20.0%	agency-specific
MF Non-Lavatory/Kitchen Faucets	20.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.100%
Only Effects New Accts	☐

Measure 16: New Development Submetering

Overview	
Name	New Development Submetering
Abbr	16
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2019
Last Year	2045
Measure Length	27

Measure Life	
Permanent	☑

Fixture Cost per Device			
	Utility	Customer	Fix/Acct
MF	$20.00	$600.00	20

Administration Costs	
Method:	Percent
Markup Percentage	25%

Description

This is an existing code that, as of January 1, 2018, requires the metering of individual units in new multifamily, condos, townhouses, mobile-home parks and business centers (less than four stories and with water heater in the units).

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☐	☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets		☑							
Urinals									
Lavatory Faucets		☑							
Showers		☑							
Dishwashers		☑							
Clothes Washers		☑							
Process									
Kitchen Spray Rinse									
Internal Leakage		☑							
Baths		☐							
Other		☐							
Irrigation		☐							
Pools		☐							
Wash Down		☐							
Car Washing		☐							
External Leakage		☐							
Outdoor									
atory/Kitchen Faucets		☑							
Cooling									

Comments

> This is a CA regulation as of 1/1/2018

> **Utility Costs** - For this measure cost is staff time for enforcement for plan checks and random inspections. Assume no fixture costs to the utility. Assume average of 20 submeters per MF account (i.e. 20 apartment units per utility meter). The time per submeter verification could be averaged across smaller sites if the service area has smaller or fewer apartments.

> **Customer Costs** - Cost of submeter which would be purchased by the customer.

> **Administration Costs** - Cost for staff to administer and track participants.

> **End Use Water Savings** - Valley Water has an existing submetering program since 2001 that was analyzed. Measure saved 22% when analyzed on mobile home parks in 2007. This program on new development starting in 2020 and into the future is modified to new accounts which use less water due to newer building standards, therefore there are less savings by adding individual submeters. To be conservative, assume savings on indoor only. No outdoor savings are assumed because typically large sites have separate irrigation meters.

> **Targets** - Per code this applies to mixed-use accounts, assume that 50% of new MF accounts are eligible.

Results	
Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
MF Toilets	5.0%	agency-specific
MF Lavatory Faucets	5.0%	agency-specific
MF Showers	5.0%	agency-specific
MF Dishwashers	5.0%	agency-specific
MF Clothes Washers	5.0%	agency-specific
MF Internal Leakage	5.0%	agency-specific
MF Non-Lavatory/Kitchen Faucets	5.0%	agency-specific

Targets	
Target Method:	Percentage
% of Accts Targeted / yr	50.000%
Only Effects New Accts	☑

Measure 17: New Development Hot Water On Demand

Overview	
Name	New Development Hot Water On Demand
Abbr	17
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2019
Last Year	2045
Measure Length	27

Measure Life	
Permanent	☑

Fixture Cost per Device			
	Utility	Customer	Fix/Acct
SF	$50.00	$500.00	1
MF	$50.00	$500.00	3

Administration Costs	
Method:	Percent
Markup Percentage	25%

Description

Existing code which requires new residential development to include efficient hot water on demand systems. Systems reduce hot water waiting times. Coordination with building department and tracking.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐	☐							
Urinals									
Lavatory Faucets	☑	☑							
Showers	☑	☑							
Dishwashers	☐	☐							
Clothes Washers	☐	☐							
Process									
Kitchen Spray Rinse									
Internal Leakage	☐	☐							
Baths	☐	☐							
Other	☐	☐							
Irrigation	☐	☐							
Pools	☐	☐							
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☐	☐							
Outdoor									
atory/Kitchen Faucets	☑	☑							
Cooling									

Comments

> **Utility Costs** - Utility costs represent time to monitor implementation.
> **Customer Costs** - Customer costs represent new development installation and device (less than existing retrofit costs).
> **End Use Water Savings** - Water savings based on Jim Lutz paper and information from Gary Klein and David Grieshop. See spreadsheet titled "Hot Water On Demand Water Savings Estimate_2013" which purports that a 1750 sq. ft house saves ~ 1600 gallons per year or 4.3 gpd. Assumes equivalent percentage savings on shower and faucet end uses. Conservatively assumes 3 units or homes per MF account. More information for example system by ACT on www.gothotwater.com.
> **Targets** - Assume applies to all new residential accounts

Results	
Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Lavatory Faucets	4.0%	agency-specific
MF Lavatory Faucets	4.0%	agency-specific
SF Showers	4.0%	agency-specific
MF Showers	4.0%	agency-specific
SF Non-Lavatory/Kitchen Faucets	4.0%	agency-specific
MF Non-Lavatory/Kitchen Faucets	4.0%	agency-specific

Targets	
Target Method:	Percentage
% of Accts Targeted / yr	90.000%
Only Effects New Accts	☑

Measure 18: Low Impact New & Remodeled Development

Overview

Name	Low Impact New & Remodeled Development
Abbr	18
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2020
Last Year	2029
Measure Length	10

Measure Life

Permanent	☑

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$400.00	$2,000.00	1
MF	$500.00	$5,000.00	1

Administration Costs

Method: Percent

Markup Percentage	25%

Description

Utility would require developers of new/remodeled sites to follow low impact development concepts, standards, and Best Management Practices for stormwater and water conservation benefits. Encourage or require use of bio-retention facilities, rain water cisterns, gray water plumbing, etc.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☑	☑							
Urinals									
Lavatory Faucets	☑	☑							
Showers	☑	☑							
Dishwashers	☑	☐							
Clothes Washers	☑	☑							
Process									
Kitchen Spray Rinse									
Internal Leakage	☑	☑							
Baths	☑	☑							
Other	☑	☑							
Irrigation	☐	☐							
Pools	☐	☐							
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☐	☐							
Outdoor									
atory/Kitchen Faucets	☑	☑							
Cooling									

Comments

> **Utility Costs** - Assume utility costs for plan checks and inspection time. Assume administrative costs for scheduling, follow-up, and reporting.
> **Customer Costs** - Customer costs represent fees and device upgrade costs.
> **End Use Water Savings** - Depending on ordinance design (site budget or matching average of last 5 years of site use), etc., assume reduction to all end uses. Up to 100% if a totally water neutral site, but assume 50% of all end uses saved as compared to average account use since these are water-efficient measures taken to above and beyond existing plumbing codes. 5% savings is conservative at this early stage of measure design. Savings include rainwater catchment and graywater, which historically do not yield high water savings.
> **Targets** - Targeting 50% of new development, as not all will qualify; some redevelopment will be subject. Affects new development for all customer categories except irrigation only accounts.
> Program is assume to end in 10 years to account for saturation of efficient fixtures due to new housing regulations in California.

Results

Units: MG

Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Toilets	5.0%	agency-specific
MF Toilets	5.0%	agency-specific
SF Lavatory Faucets	5.0%	agency-specific
MF Lavatory Faucets	5.0%	agency-specific
SF Showers	5.0%	agency-specific
MF Showers	5.0%	agency-specific
SF Dishwashers	5.0%	agency-specific
SF Clothes Washers	5.0%	agency-specific
MF Clothes Washers	5.0%	agency-specific
SF Internal Leakage	5.0%	agency-specific
MF Internal Leakage	5.0%	agency-specific
SF Baths	5.0%	agency-specific
MF Baths	5.0%	agency-specific
SF Other	5.0%	agency-specific
MF Other	5.0%	agency-specific
SF Non-Lavatory/Kitchen Faucets	5.0%	agency-specific
MF Non-Lavatory/Kitchen Faucets	5.0%	agency-specific

Targets

Target Method: Percentage

% of Accts Targeted / yr	50.000%
Only Effects New Accts	☑

Measure 19: Fixture Retrofit on Resale or Water Account Change

Overview

Name	Fixture Retrofit on Resale or Water Account Change
Abbr	19
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2019
Last Year	2045
Measure Length	27

Measure Life

Permanent	☑

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$272.00	$100.00	1
MF	$408.00	$100.00	3
COM	$408.00	$200.00	3
IND	$408.00	$200.00	3
GOV	$408.00	$200.00	3

Administration Costs

Method:	Percent
Markup Percentage	10%

Description

This is an existing code requiring fixture retrofit upon resale or permitted alteration. Model assumes agencies will take active role in ensuring compliance, in participation by sending retrofit letters to new accounts holders who do not have a certificate on file. Random inspections would be conducted by utility staff to ensure process is valid and yields fixture replacements.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☑	☐	☑	☑	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☑	☑	☑		☑	☑			
Urinals			☑		☑	☑			
Lavatory Faucets	☑	☑	☑		☑	☑			
Showers	☑	☑	☑		☑	☑			
Dishwashers	☐	☐	☐		☐	☐			
Clothes Washers	☐	☐	☐		☐	☐			
Process			☐		☐				
Kitchen Spray Rinse			☐			☐			
Internal Leakage	☐	☐	☐		☐	☐			
Baths	☐	☐							
Other	☐	☐	☐		☐	☐			
Irrigation	☐	☐	☐		☐	☐			
Pools	☐	☐				☐			
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☐	☐	☐		☐	☐			
Outdoor									
vatory/Kitchen Faucets	☑	☑	☑		☑	☑			
Cooling			☐		☐	☐			

Comments

> **Utility Costs** - Random inspections would be conducted by utility staff to ensure process is valid and yields fixture replacements. Assume staff avg fully burdened Rate with fringe and overhead is $136/hr, (ACWD Water Conservation Rate is $50/hr for base rate with fringe and overhead add 1.72%) Assuming 2 hours for single family and 3 for MF/CII on average per site, assuming inspections are random. Assume a typical unit has 2 toilets, 1 showerhead, 2 bath aerators, and 1 kitchen aerator replaced as needed. Non-residential units are assume to have 1 urinal too. Assume multiple units per non-SF account.

> **Customer Costs** - Represent any fixture cost to comply with California standards. CII cost accounts for urinals too.

> **Administration Costs** - 10% costs represent staff time to administer the measure.

> **End Use Water Savings** - Savings from this code measure assume 2.2 gpm faucets, 2.5 showerheads, 1.6 gpf toilets and 1.0 gpf urinals are replaced with 1.2 gpm bathroom aerators ($1/ea), 1.8 gpm kitchen aerators ($2.10/ea), 1.8 gpm showerheads ($4.60/ea), 1.28 gpf ($100/ea), and 0.125 gpf urinals ($150/ea).

> **Targets** - Target % percent of accounts is a conservative assumption for recent resale and water account change rates.

> This measure is modeled through the full analysis period in order to reach ALL pre-1992 housing stock.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Toilets	20.0%	agency-specific
MF Toilets	20.0%	agency-specific
COM Toilets	20.0%	agency-specific
IND Toilets	20.0%	agency-specific
GOV Toilets	20.0%	agency-specific
COM Urinals	87.5%	agency-specific
IND Urinals	87.5%	agency-specific
GOV Urinals	87.5%	agency-specific
SF Lavatory Faucets	45.5%	agency-specific
MF Lavatory Faucets	45.5%	agency-specific
COM Lavatory Faucets	45.5%	agency-specific
IND Lavatory Faucets	45.5%	agency-specific
GOV Lavatory Faucets	45.5%	agency-specific
SF Showers	28.0%	agency-specific
MF Showers	28.0%	agency-specific
COM Showers	28.0%	agency-specific
IND Showers	28.0%	agency-specific
GOV Showers	28.0%	agency-specific
SF Non-Lavatory/Kitchen Faucets	18.2%	agency-specific
MF Non-Lavatory/Kitchen Faucets	18.2%	agency-specific
COM Non-Lavatory/Kitchen Faucets	18.2%	agency-specific
IND Non-Lavatory/Kitchen Faucets	18.2%	agency-specific
GOV Non-Lavatory/Kitchen Faucets	18.2%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.200%
Only Effects New Accts	☐

Measure 20: Public & School Education

Overview

Name	Public & School Education
Abbr	20
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2019
Last Year	2045
Measure Length	27

Measure Life

Permanent	☐
Years	2
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$1.00	$0.00	1

Administration Costs

Method:	Percent
Markup Percentage	15%

Description

Program includes in-person and online outreach to residential customers, schools and all CII customers, landscapers and contractors. Outreach includes tools and resources specific to outdoor water use efficiency (e.g. WaterWise gardening tool and landscape watering calculator) as well as general information on water conservation through community events, websites, and social media.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☐	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☑								
Urinals									
Lavatory Faucets	☑								
Showers	☑								
Dishwashers	☑								
Clothes Washers	☑								
Process									
Kitchen Spray Rinse									
Internal Leakage	☑								
Baths	☑								
Other	☑								
Irrigation	☑								
Pools	☑								
Wash Down	☑								
Car Washing	☑								
External Leakage	☑								
Outdoor									
atory/Kitchen Faucets	☑								
Cooling									

Comments

> **Utility Cost** - Cost based off of BAWSCA FY17/18 Water Wise School Education summary. Program Cost ($90,669) + BAWSCA Admin Cost ($2,315) / Number of Agencies. 8 agencies are participating so total cost is $11,623 per agency. Assume a total of $1.00 per account per agency to cover cost of all BAWSCA public information activities including school education.

> **Customer Costs** - Assume no cost to customers.

> **End Use Water Savings** - Public information water savings is assumed at 0.5% on all end uses.

> **Targets** - Target 50% of accounts every year. Assumes a service area reaches half of their customers each year on average.

Results

Units	MG
Average Water Savings (mgd)	
agency-specific	
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Toilets	0.1%	agency-specific
SF Lavatory Faucets	0.5%	agency-specific
SF Showers	0.5%	agency-specific
SF Dishwashers	0.5%	agency-specific
SF Clothes Washers	0.5%	agency-specific
SF Internal Leakage	0.5%	agency-specific
SF Baths	0.5%	agency-specific
SF Other	0.5%	agency-specific
SF Irrigation	0.5%	agency-specific
SF Pools	0.5%	agency-specific
SF Wash Down	0.5%	agency-specific
SF Car Washing	0.5%	agency-specific
SF External Leakage	0.5%	agency-specific
SF Non-Lavatory/Kitchen Faucets	0.5%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	50.000%
Only Effects New Accts	☐

Measure 21: Billing Report Educational Tool Non-AMI

Overview

Name	Billing Report Educational Tool Non-AMI
Abbr	21
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2019
Last Year	2028
Measure Length	10

Measure Life

Permanent	☐
Years	4
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$2.00	$20.00	1

Administration Costs

Method:	Percent
Markup Percentage	15%

Description

Program provides a customer portal and optional water use reports to show customers their individualized current and historical water use patterns and relative efficiency (e.g. BAWSCA WaterSmart Software Program). Modeled for agencies with monthly meter reads and billing, not AMI meter data.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☐	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☑								
Urinals									
Lavatory Faucets	☑								
Showers	☑								
Dishwashers	☑								
Clothes Washers	☑								
Process									
Kitchen Spray Rinse									
Internal Leakage	☑								
Baths	☐								
Other	☐								
Irrigation	☑								
Pools	☐								
Wash Down	☑								
Car Washing	☑								
External Leakage	☑								
Outdoor									
atory/Kitchen Faucets	☑								
Cooling									

Comments

> **Utility Cost** - Includes a set up fee of $9,000 per Agency. $1.75/account for email notification per year. This cost was increased by $.25/account for set up fees.

> **Customer Cost** - Reflects cost of minor action. Would on average be very small for behavior change or fixing minor leaks based on access to their billing data. If customer takes action for a significant change assume the costs and savings are captured in other active conservation programs.

> **Administration Costs** - Cost for utility staff to track and monitor program ran by WaterSmart software.

> **End Use Water Savings assumptions** - Water savings of 4% for residential customers was developed through a 2017 WaterSmart program analysis for BAWSCA agencies is an average across the 85% of accounts targeted. The analysis was conducted during the end of a drought period and savings can overlap other active and passive conservation programs. For long term water savings, the savings has been reduced to 1% which is still very cost effective.

> **Targets** - The target % is based on the BAWSCA's agreement for WaterSmart software which includes and estimated customer target range of 50%-85%. According to 2020 efforts, the BAWSCA agencies select to target 85% of their customers.

> **Measure length** - Assume this measure lasts 10 years, as after that time most BAWSCA agencies will have switched to AMI meters and AMI water data portals to share information with their customers.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Toilets	1.0%	agency-specific
SF Lavatory Faucets	1.0%	agency-specific
SF Showers	1.0%	agency-specific
SF Dishwashers	1.0%	agency-specific
SF Clothes Washers	1.0%	agency-specific
SF Internal Leakage	1.0%	agency-specific
SF Irrigation	1.0%	agency-specific
SF Wash Down	1.0%	agency-specific
SF Car Washing	1.0%	agency-specific
SF External Leakage	1.0%	agency-specific
SF Non-Lavatory/Kitchen Faucets	1.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	85.000%
Only Effects New Accts	☐

Measure 22: AMI Customer Portal

Overview

Name	AMI Customer Portal
Abbr	22
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2020
Last Year	2045
Measure Length	26

Measure Life

Permanent	☐
Years	10
Repeat	☐

Fixture Cost per Device

	Utility	Customer	Fix/Acct
SF	$110.00	$300.00	1
MF	$110.00	$300.00	1
COM	$110.00	$1,000.00	1
IND	$110.00	$1,000.00	1
GOV	$110.00	$1,000.00	1

Administration Costs

Method:	Percent
Markup Percentage	25%

Description

Program provides customer portal for accounts with AMI meters capable of providing continuous consumption data to customers and utility. System provides identification and notification of suspected customer leaks as well as improved customer service and enhanced ability to identify water theft. This measure is only applicable to agencies that already have AMI.

Customer Classes

SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
☑	☑	☑	☐	☑	☑	☐	☐	☐

End Uses

	SF	MF	COM	INST	IND	GOV	IRR	FIRE	REC
Toilets	☐	☐	☐		☐	☐			
Urinals			☐		☐	☐			
Lavatory Faucets	☐	☐	☐		☐	☐			
Showers	☐	☐	☐		☐	☐			
Dishwashers	☐	☐	☐		☐	☐			
Clothes Washers	☐	☐	☐		☐	☐			
Process			☐		☐				
Kitchen Spray Rinse			☐			☐			
Internal Leakage	☑	☑	☑		☑	☑			
Baths	☐	☐							
Other	☐	☐	☐		☐	☐			
Irrigation	☑	☑	☑		☑	☑			
Pools	☐	☐				☐			
Wash Down	☐	☐							
Car Washing	☐	☐							
External Leakage	☑	☑	☑		☑	☑			
Outdoor									
vatory/Kitchen Faucets	☐	☐	☐		☐	☐			
Cooling			☐		☐	☐			

Comments

> **Utility Costs** - Basis for the starting value cost estimate is $200 per AMI customer where assumes (a) customer AMI portal cost: $1.75/account for 5 years, equals $9/account based on WaterSmart Portal cost for AMI meter. This cost was increased by $1/acct to account for set up fees.; (b) cost estimate includes an average of $100 leak repair for those customer-side leaks found and fixed; (c) $200 meter cost estimated by Valley Water staff assumed to be covered by other utility departments. Cost estimate does not include service leak repair (assume included in Water Loss measure).

> **Administration Costs** - This is for utility staff to track and monitor program ran by WaterSmart software.

> **Customer Costs** - Customer cost includes leak repair.

> **End Use Water Savings** - AMI savings based on significant reductions to leakage and irrigation end uses. Savings based on SFPUC case study per Julie Ortiz ppt at 2019 Peer-to-Peer "AMI: Everything you need to know to run a successful program." Savings are estimated to be 20%-50% on leakage (internal and external) with a potential additional 5% savings on all other end uses due to behavioral changes, 5% savings to irrigation.

> **Targets** - Assumes 0.5% per year take action to actually save water based on information provided by AMI customer portal, ether by behavior or leak repair.

Results

Units	MG
Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

End Use Savings Per Replacement

Method: Percent

	% Savings/Acct	Avg GPD/Acct
SF Internal Leakage	20.0%	agency-specific
MF Internal Leakage	20.0%	agency-specific
COM Internal Leakage	20.0%	agency-specific
IND Internal Leakage	20.0%	agency-specific
GOV Internal Leakage	20.0%	agency-specific
SF Irrigation	5.0%	agency-specific
MF Irrigation	5.0%	agency-specific
COM Irrigation	5.0%	agency-specific
IND Irrigation	5.0%	agency-specific
GOV Irrigation	5.0%	agency-specific
SF External Leakage	20.0%	agency-specific
MF External Leakage	20.0%	agency-specific
COM External Leakage	20.0%	agency-specific
IND External Leakage	20.0%	agency-specific
GOV External Leakage	20.0%	agency-specific

Targets

Target Method:	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Measure 23: Water Loss

Overview

Name	Water Loss
Abbr	23
Category	Default
Measure Type	Water Loss Measure

Time Period

First Year	2019

Backlog Costs

Total Backlog Work Costs	$1,000,000
Years to Complete Backlog	10

Maintenance Costs

Annual Maintenance Costs	$50,000

Target

Total GPCD Reduction	0.3

Description

> Water Loss Audit - Based on SB 555 requirements, maintain a thorough annual accounting using AWWA water system audit software submitted to California DWR. Includes accounting for production, sales by customer class and quantity of water produced but not sold (non-revenue water). This provides a picture of your system, including water usage patterns and trends needed to identify appropriate conservation activities. In conjunction with system accounting, include audits that identify and quantify known legitimate uses of non-revenue water in order to determine remaining non-revenue water losses. Goal would be to lower the Infrastructure Leakage Index (ILI) and non-revenue water every year by a pre-determined amount based on cost-effectiveness. Continuously analyze billing data for system errors and mis-registering meters. Identify and quickly notify customers of apparent leaks. Address meter testing and repair/replacement to insure more accurate meter reads and revenue collection. Actions could include meter calibration and accelerated meter replacement.

> Real Water Loss Reduction - Measure covers efforts to find and repair leaks in the distribution system to reduce real water loss. Actions could include installation of data loggers and proactive leak detection. Leak repairs would be handled by existing crews at no extra cost.

> Distribution System Pressure Regulation - Install additional pressure regulators in portions of distribution system to maintain pressure within limits so accounts do not receive excessive pressure.

Results

Units: MG

Average Water Savings (mgd)	
	agency-specific
Lifetime Savings - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Lifetime Costs - Present Value ($)	
Utility	agency-specific
Community	agency-specific
Benefit to Cost Ratio	
Utility	agency-specific
Community	agency-specific
Cost of Savings per Unit Volume ($/mg)	
Utility	agency-specific

Comments

> **Backlog cost and years basis** - based on agency information.

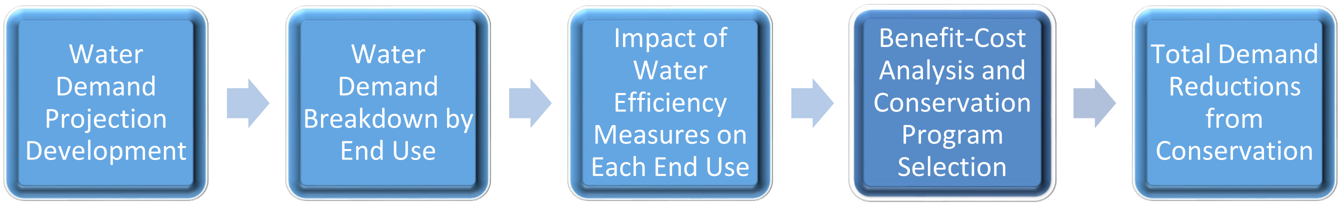
> **Annual maintenance cost basis** - based on agency information.

> **Savings target basis** - based on agency information.

> The savings is over the life of the measure which is tied to the agency current Non-Revenue Water percentage which can be found in the GREEN "Non-Revenue Water" portion of the DSS Model. All measures are advised to have “Annual Maintenance Costs” inputted to allow for budget estimates for complete program. Additional water savings of “NRW” real water losses may be available when technically feasible. Rule of thumb is minimum system water losses below approximately 6% (as defined as the difference between production and consumption or alternatively as a percent of System Input Volume using AWWA Water System Audit definitions). For NRW below 6% (which can be found in the GREEN "NRW" portion of the DSS Model), input “0%” for new real water savings and “$0” in the Backlog Cost section. For NRW above 6%, a GPCD savings input volume can be computed (an estimate of annual savings volume divided by total population). For example a 4.0 GPCD is equivalent to a 2% reduction for the system with a 150 GPCD water use.

> Additional Water Loss Control Program budget to achieve these water savings is inputted into the “Backlog Cost” section along with the duration of the years to accomplish the estimated reduction. In other words, $250,000 over 5 years would add $50,000 per year to assist with meeting NRW reduction goals.

APPENDIX G – DSS MODEL OVERVIEW



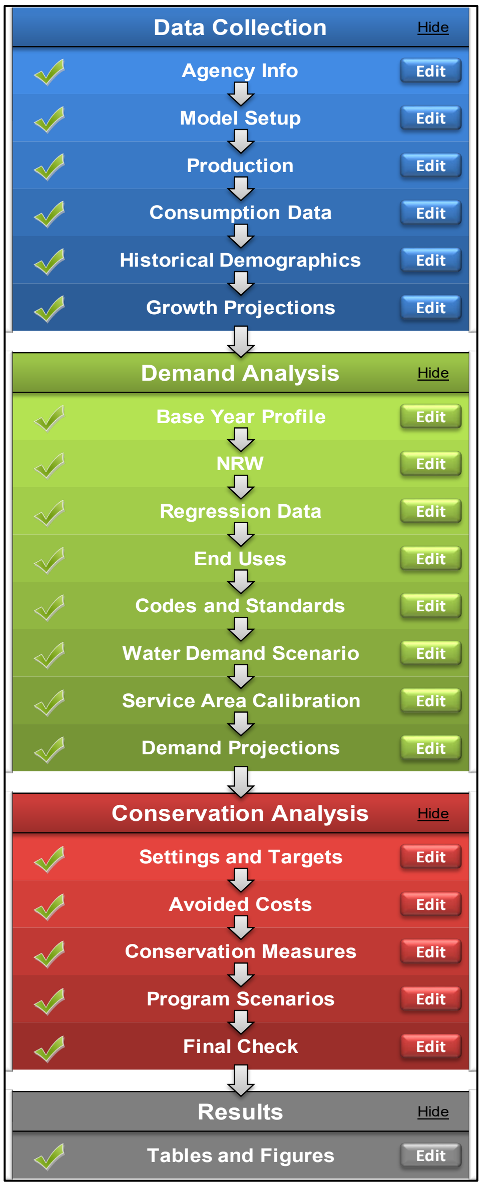


Figure G-1 DSS Model Main Page

DSS Model Overview: The Demand Side Management Least Cost Planning Decision Support System Model (DSS Model) as shown in Figure G-1 is used to prepare long-range, detailed demand projections. The purpose of the extra detail is to enable a more accurate assessment of the impact of water efficiency programs on demand and to provide a rigorous and defensible modeling approach necessary for projects subject to regulatory or environmental review.

Originally developed in 1999 and continuously updated, the DSS Model is an "end-use" model that breaks down total water production (water demand in the service area) to specific water end uses, such as plumbing fixtures and appliance uses. The model uses a bottom-up approach that allows for multiple criteria to be considered when estimating future demands, such as the effects of natural fixture replacement, plumbing codes, and conservation efforts. The DSS Model may also use a top-down approach with a utility-prepared water demand forecast.

Demand Forecast Development and Model Calibration: To forecast urban water demands using the DSS Model, customer demand data is obtained from the water agency being modeled. Demand data is reconciled with available demographic data to characterize water usage for each customer category in terms of number of users per account and per capita water use. Data is further analyzed to approximate the split of indoor and outdoor water usage in each customer category. The indoor/outdoor water usage is further divided into typical end uses for each customer category. Published data on average per capita indoor water use and average per capita end use is combined with the number of water users to calibrate the volume of water allocated to specific end uses in each customer category. In other words, the DSS Model checks that social norms from end studies on water use behavior (e.g., flushes per person per day) are not exceeded or drop below reasonable use limits.

Passive Water Savings Calculations: The DSS Model is used to forecast service area water fixture use. Specific end-use type, average water use, and lifetime are compiled for each fixture. Additionally, state and national plumbing codes and appliance standards are modeled by customer category. These fixtures and plumbing codes can be added to, edited, or deleted by the user. This process yields two demand forecasts, one with plumbing codes and one without plumbing codes.

Active Conservation Measure Analysis Using Benefit-Cost Analysis: As shown in Figure G-2, the DSS Model evaluates active conservation measures using benefit-cost analysis with the present value of the cost of water saved ($/Million Gallons or $/Acre-Feet). Benefits are based on savings in water and wastewater facility operations and maintenance (O&M) and any deferred capital expenditures.

Figure G-2. Sample Benefit-Cost Analysis Summary

Conservation Measures

Benefit Cost Analysis

Review Data

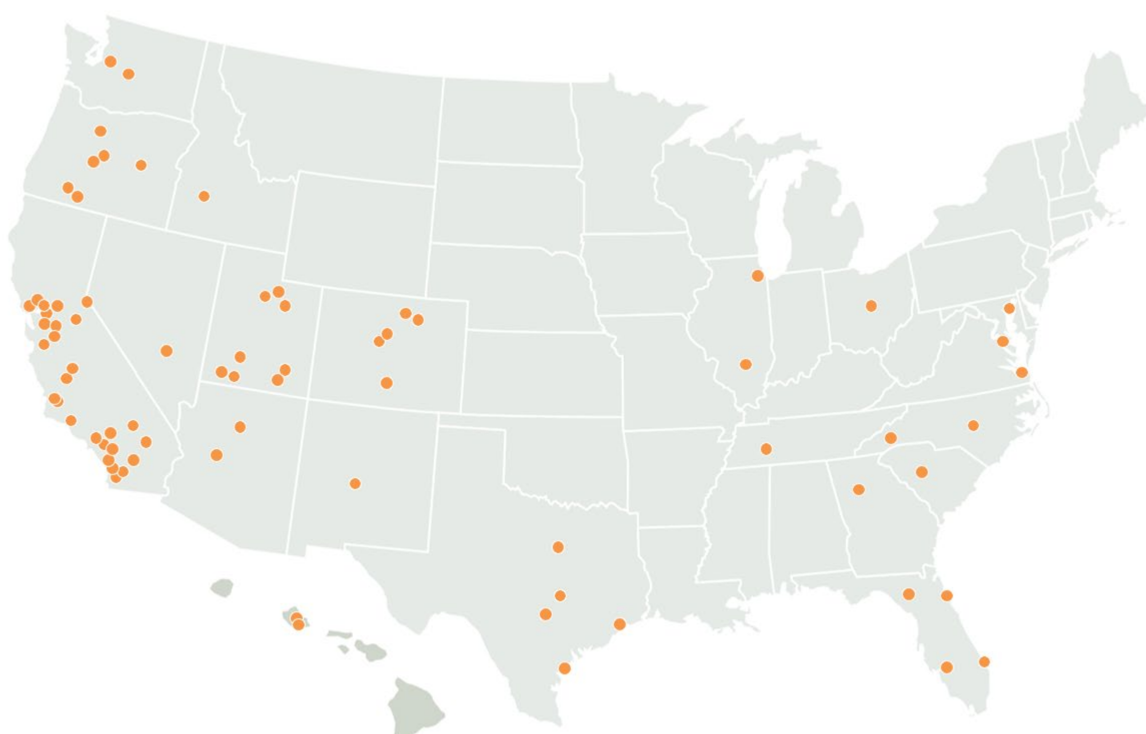
Benefit Cost Analysis

Util Cost Five Year Start Year 2020 | Water Savings Year 2030 | Units AF

	Measure	Present Value of Water Utility Benefits	Present Value of Community Benefits	Present Value of Water Utility Costs	Present Value of Community Costs	Water Utility Benefit to Cost Ratio	Community Benefit to Cost Ratio	Five Years of Water Utility Costs 2020-2025	Water Savings in 2030 (afy)	Cost of Savings per Unit Volume ($/af)
AMI	Full AMI Implementation	$3,976,434	$16,635,194	$1,566,069	$5,893,340	2.54	2.82	$320,000	133.764878	$324
RESH	Residential Rebates for HECW	$139,312	$365,447	$95,879	$200,665	1.45	1.82	$50,325	5.124572	$824
WC	Water Checkup	$7,648,165	$30,288,419	$6,005,949	$7,665,564	1.27	3.95	$1,382,995	239.652915	$877
IRRE\	Irrigation Evaluations	$1,589,488	$1,589,488	$1,918,184	$4,332,779	0.83	0.37	$443,824	98.051821	$646
CIIRe	CII Water Survey Level 2 and Customized Rebate	$910,720	$3,313,109	$915,904	$2,581,185	0.99	1.28	$193,725	18.753753	$1,055
NOZZ	Free Sprinkler Nozzle Program	$277,886	$277,886	$329,386	$455,933	0.84	0.61	$103,145	23.005687	$680
MULC	Mulch Program	$80,739	$80,739	$287,676	$287,676	0.28	0.28	$66,932	4.554625	$2,000
LDS	Water Conserving Landscape and Irrigation Codes	$1,055,819	$1,055,819	$350,316	$7,979,608	3.01	0.13	$78,568	46.098525	$161
PRV	Pressure Reduction Valve Rebate	$102,170	$193,972	$49,161	$132,223	2.08	1.47	$37,818	8.503521	$425
LEAK	Leak Detection Device Rebate	$174,130	$847,416	$306,843	$1,288,743	0.57	0.66	$80,053	6.065394	$1,895
UHET	Ultra-High Efficiency Toilet Rebate	$538,624	$538,624	$405,529	$761,556	1.33	0.71	$362,736	16.287780	$921

Model Use and Validation: As shown in Figure G-3, the DSS Model has been used for over 20 years for practical applications of conservation planning in over 300 service areas representing 60 million people, including extensive efforts nationally and internationally in Australia, New Zealand, and Canada.

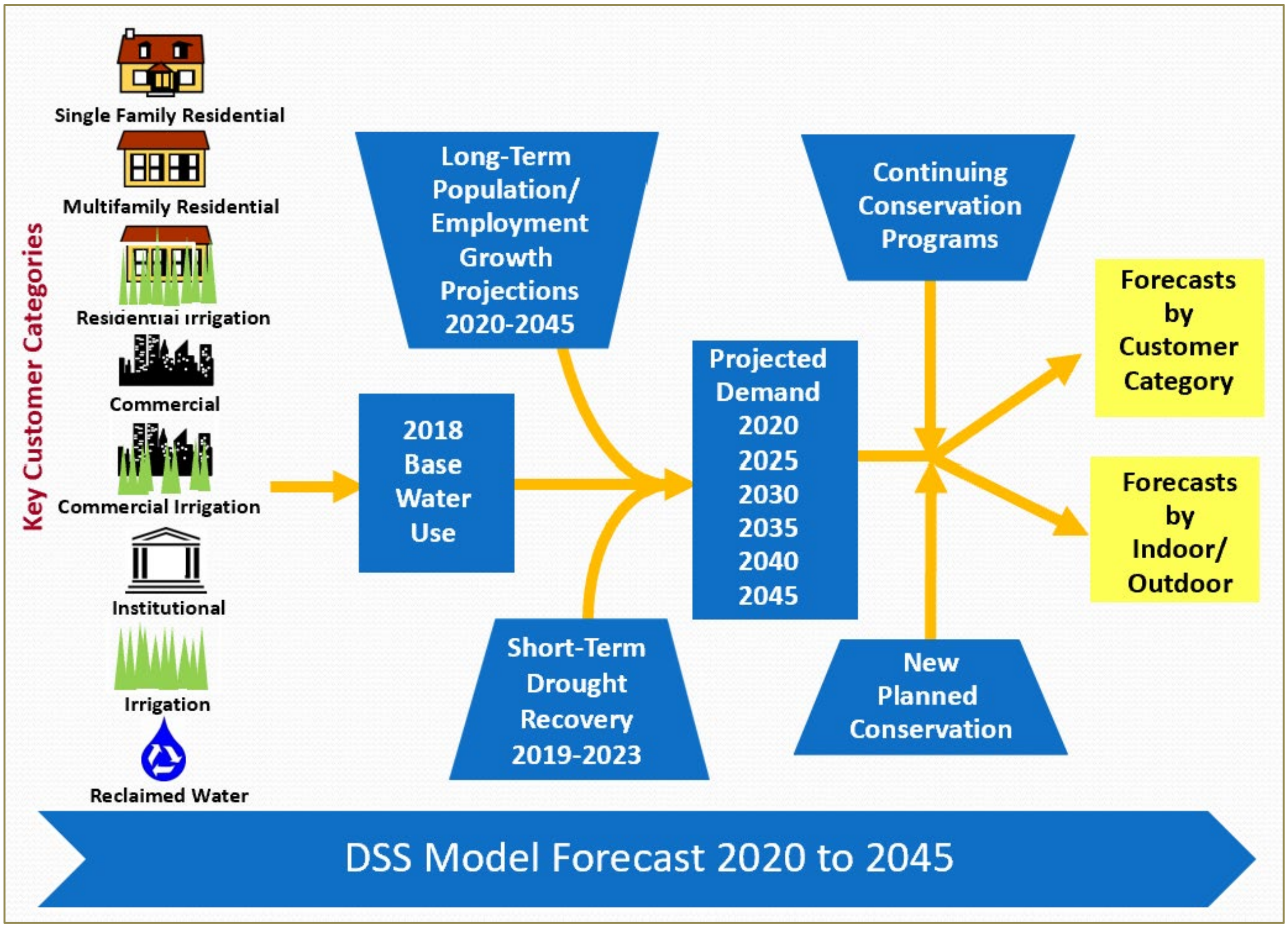
Figure G-3. DSS Model Analysis Locations in the U.S.



The California Urban Water Conservation Council, (now known as theCalifornia Water Efficiency Partnership) has peer reviewed and endorsed the model since 2006. It is offered to all CalWEP members for use to estimate water demand, plumbing code, and conservation program savings.

The DSS Model can use one of the following: 1) a statistical approach to forecast demands (e.g., an Econometric Model); 2) a forecasted increase in population and employment; 3) predicted future demands; or 4) a demand projection entered into the model from an outside source. The following figure presents the flow of information in the DSS Model Analysis.

Figure G-4. **DSS Model Analysis Flow**



Appendix E: SBX7-7 Forms

SB X7-7 Table 0: Units of Measure Used in 2020 UWMP* *(select one from the drop down list)*
Acre Feet
**The unit of measure must be consistent throughout the UWMP, as reported in Submittal Table 2-3.*
NOTES:

SB X7-7 Table 2: Method for 2020 Population Estimate	
Method Used to Determine 2020 Population (may check more than one)	
☑	**1. Department of Finance** (DOF) or **American Community Survey** (ACS)
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: 2020 Service Area Population	
2020 Compliance Year Population	
2020	131,655
NOTES:	

SB X7-7 Table 4: 2020 Gross Water Use

Compliance Year 2020	2020 Volume Into Distribution System *This column will remain blank until SB X7-7 Table 4-A is completed.*	2020 Deductions					2020 Gross Water Use
		Exported Water *	Change in Dist. System Storage* (+/-)	Indirect Recycled Water *This column will remain blank until SB X7-7 Table 4-B is completed.*	Water Delivered for Agricultural Use*	Process Water *This column will remain blank until SB X7-7 Table 4-D is completed.*	
	18,302			-		-	**18,302**

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Groundwater Well

This water source is *(check one)* **:**

☑	The supplier's own water source
☐	A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
	10,835	-	10,835

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.* [2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s) Meter Error Adjustment

Complete one table for each source.

Name of Source	Santa Clara Valley Water District

This water source is *(check one)* **:**

☐	The supplier's own water source
☑	A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
	3,982		3,982

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.* [2] ***Meter Error Adjustment -*** *See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	San Francisco Public Utilities Commission

This water source is *(check one)* :	
☐	The supplier's own water source
☑	A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
	3,485		3,485

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.* [2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 4

This water source is *(check one)* :	
☐	The supplier's own water source
☐	A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
			0

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.* [2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	Enter Name of Source 5

This water source is *(check one)* :	
☐	The supplier's own water source
☐	A purchased or imported source

SB X7-7 Table 5: 2020 Gallons Per Capita Per Day (GPCD)		
2020 Gross Water ***Fm SB X7-7 Table 4***	**2020 Population** ***Fm SB X7-7 Table 3***	**2020 GPCD**
18,302	131,655	**124**

NOTES:

SB X7-7 Table 9: 2020 Compliance

Actual 2020 GPCD[1]	Optional Adjustments to 2020 GPCD					2020 Confirmed Target GPCD [1, 2]	Did Supplier Achieve Targeted Reduction for 2020?
	Enter "0" if Adjustment Not Used			TOTAL Adjustments[1]	Adjusted 2020 GPCD [1] *(Adjusted if applicable)*		
	Extraordinary Events[1]	Weather Normalization[1]	Economic Adjustment[1]				
124	-	-	-	-	124	186	**YES**

[1] *All values are reported in GPCD*

[2] ***2020 Confirmed Target GPCD*** *is taken from the Supplier's SB X7-7 Verification Form Table SB X7-7, 7-F.*

NOTES:

SB X7-7 Table 3: Service Area Population		
Year		Population
10 to 15 Year Baseline Population		
Year 1	1995	96,915
Year 2	1996	97,774
Year 3	1997	99,201
Year 4	1998	100,602
Year 5	1999	101,307
Year 6	2000	101,605
Year 7	2001	103,386
Year 8	2002	104,031
Year 9	2003	105,581
Year 10	2004	107,616
5 Year Baseline Population		
Year 1	2003	105,581
Year 2	2004	107,616
Year 3	2005	108,717
Year 4	2006	110,682
Year 5	2007	113,575
2015 Compliance Year Population		
2015		123,752
NOTES:		

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)				
Complete one table for each source.				
Name of Source		Groundwater Well		
This water source is:				
☑	The supplier's own water source			
☐	A purchased or imported source			
Baseline Year Fm SB X7-7 Table 3		Volume Entering Distribution System	Meter Error Adjustment* Optional (+/-)	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1995	5975.5		5976
Year 2	1996	6652.8		6653
Year 3	1997	6682.6		6683
Year 4	1998	5926.7		5927
Year 5	1999	5600.7		5601
Year 6	2000	6008.8		6009
Year 7	2001	5611.7		5612
Year 8	2002	5187.4		5187
Year 9	2003	5002.9		5003
Year 10	2004	5194.6		5195
5 Year Baseline - Water into Distribution System				
Year 1	2003	5002.9		5003
Year 2	2004	5194.6		5195
Year 3	2005	4728.8		4729
Year 4	2006	4793.1		4793
Year 5	2007	5034.2		5034
2015 Compliance Year - Water into Distribution System				
2015		3731		3731
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				
NOTES:				

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)

Complete one table for each source.

Name of Source	Santa Clara Valley Water District

This water source is:

☑	The supplier's own water source
☐	A purchased or imported source

Baseline Year Fm SB X7-7 Table 3		Volume Entering Distribution System	Meter Error Adjustment* Optional (+/-)	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1995	1,405		1,405
Year 2	1996	1,408		1,408
Year 3	1997	1,409		1,409
Year 4	1998	1,463		1,463
Year 5	1999	1,469		1,469
Year 6	2000	1,390		1,390
Year 7	2001	1,356		1,356
Year 8	2002	1,347		1,347
Year 9	2003	1,363		1,363
Year 10	2004	1,376		1,376
5 Year Baseline - Water into Distribution System				
Year 1	2003	1,363		1,363
Year 2	2004	1,376		1,376
Year 3	2005	1,292		1,292
Year 4	2006	1,386		1,386
Year 5	2007	1,431		1,431
2015 Compliance Year - Water into Distribution System				
2015		1,206		1,206

** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)

Complete one table for each source.

Name of Source		San Francisco Public Utilities Commission		
This water source is:				
☐	The supplier's own water source			
☑	A purchased or imported source			
Baseline Year Fm SB X7-7 Table 3		Volume Entering Distribution System	Meter Error Adjustment* Optional (+/-)	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1995	1,573.5		1,574
Year 2	1996	1,415.9		1,416
Year 3	1997	1,618.8		1,619
Year 4	1998	1,801.5		1,802
Year 5	1999	1,676.5		1,677
Year 6	2000	1,529.0		1,529
Year 7	2001	1,396.3		1,396
Year 8	2002	1,451.7		1,452
Year 9	2003	1,352.2		1,352
Year 10	2004	1,379.0		1,379
5 Year Baseline - Water into Distribution System				
Year 1	2003	1,352.2		1,352
Year 2	2004	1,379.0		1,379
Year 3	2005	1,651.2		1,651
Year 4	2006	1,630.7		1,631
Year 5	2007	1,415.6		1,416
2015 Compliance Year - Water into Distribution System				
2015		805		805

** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)

Baseline Year		Service Area Population	Annual Gross Water Use	Daily Per Capita Water Use (GPCD)
Fm SB X7-7 Table 3		Fm SB X7-7 Table 3	Fm SB X7-7 Table 4	
10 to 15 Year Baseline GPCD				
Year 1	1995	96,915	8,954	253
Year 2	1996	97,774	9,477	266
Year 3	1997	99,201	9,711	268
Year 4	1998	100,602	9,191	250
Year 5	1999	101,307	8,747	237
Year 6	2000	101,605	8,928	241
Year 7	2001	103,386	8,364	222
Year 8	2002	104,031	7,986	210
Year 9	2003	105,581	7,718	200
Year 10	2004	107,616	7,949	202
10-15 Year Average Baseline GPCD				**235**
5 Year Baseline GPCD				
Baseline Year		**Service Area Population**	**Gross Water Use**	**Daily Per Capita Water Use**
Fm SB X7-7 Table 3		Fm SB X7-7 Table 3	Fm SB X7-7 Table 4	
Year 1	2003	105,581	7,718	200
Year 2	2004	107,616	7,949	202
Year 3	2005	108,717	7,672	193
Year 4	2006	110,682	7,809	193
Year 5	2007	113,575	7,881	190
5 Year Average Baseline GPCD				**196**
2015 Compliance Year GPCD				
2015		123,752	5,742	127

NOTES:

SB X7-7 Table 6: Gallons per Capita per Day Summary From Table SB X7-7 Table 5	
10-15 Year Baseline GPCD	235
5 Year Baseline GPCD	196
2015 Compliance Year GPCD	127
NOTES:	

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 YearBaseline GPCD From SB X7-7 Table 5	Maximum 2020 Target[1]	Calculated 2020 Target[2]	Confirmed 2020 Target
196	186		186

[1]*Maximum 2020 Target is 95% of the 5 Year Baseline GPCD*
[2]*2020 Target is calculated based on the selected Target Method, see SB X7-7 Table 7 and corresponding tables for agency's calculated target.*

NOTES:

SB X7-7 Table 7: 2020 Target Method		
Select Only One		
Target Method		Supporting Documentation
☑	Method 1	SB X7-7 Table 7A
☐	Method 2	SB X7-7 Tables 7B, 7C, and 7D Contact DWR for these tables
☐	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator
NOTES:		

SB X7-7 Table 8: 2015 Interim Target GPCD

Confirmed 2020 Target Fm SB X7-7 Table 7-F	10-15 year Baseline GPCDFm SB X7-7 Table 5	2015 Interim Target GPCD
186	235	210

NOTES:

SB X7-7 Table 9: 2015 Compliance

<table>
<tr><th rowspan="3">Actual 2015 GPCD</th><th rowspan="3">2015 Interim Target GPCD</th><th colspan="5">Optional Adjustments (in GPCD)</th><th rowspan="3">2015 GPCD (Adjusted if applicable)</th><th rowspan="3">Did Supplier Achieve Targeted Reduction for 2015?</th></tr>
<tr><th colspan="3">Enter "0" if Adjustment Not Used</th><th rowspan="2">TOTAL Adjustments</th><th rowspan="2">Adjusted 2015 GPCD</th></tr>
<tr><th>Extraordinary Events</th><th>Weather Normalization</th><th>Economic Adjustment</th></tr>
<tr><td>127</td><td>210</td><td>0</td><td>0</td><td>0</td><td>0</td><td>127</td><td>127</td><td>YES</td></tr>
</table>

NOTES:

SB X7-7 Table 10

Year ID	Year Ending	Service Area Population	Annual Recycled Water Use	Recycled Water Use Percent (%)	Annual Gross Water Use (gallons)	Per Capita Water Use (gpcd)	GPCD 10-year Period Ending						
							Dec-04	Dec-05	Dec-06	Dec-07	Dec-08	Dec-09	Dec-10
1	1990	93,613	138	2%	7,989	234							
2	1991	93,433	171	2%	7,006	205							
3	1992	94,583	106	1%	7,661	222							
4	1993	95,697	133	2%	8,044	230							
5	1994	96,259	114	1%	8,365	238							
6	1995	96,915	125	1%	8,954	253	253						
7	1996	97,774	63	1%	9,477	266	266	266					
8	1997	99,201	235	2%	9,711	268	268	268	268				
9	1998	100,602	164	2%	9,191	250	250	250	250	250			
10	1999	101,307	292	3%	8,747	237	237	237	237	237	237		
11	2000	101,605	415	5%	8,928	241	241	241	241	241	241	241	
12	2001	103,386	560	7%	8,364	222	222	222	222	222	222	222	222
13	2002	104,031	592	7%	7,986	210	210	210	210	210	210	210	210
14	2003	105,581	672	9%	7,718	200	200	200	200	200	200	200	200
15	2004	107,616	771	10%	7,949	202	202	202	202	202	202	202	202
16	2005	108,717	918	12%	7,672	193		193	193	193	193	193	193
17	2006	110,682	895	11%	7,809	193			193	193	193	193	193
18	2007	113,575	1001	13%	7,881	190				190	190	190	190
19	2008	114,988	909	12%	7,640	182					182	182	182
20	2009	117,237	794	11%	7,074	165						165	165
21	2010	118,830	785	12%	6,540	151							151
Calculated Baseline/Current Water Use (Period Average)							235	229	222	214	207	200	191

SB X7-7 Table 11

Year ID	Year Ending	Service Area Population	Annual Recycled Water Use	Recycled Water Use Percent (%)	Annual Gross Water Use (gallons)	Per Capita Water Use (gpcd)	GPCD 5-year Period Ending			
							Dec-07	Dec-08	Dec-09	Dec-10
1	1990	93,613	138	2%	7,989	234				
2	1991	93,433	171	2%	7,006	205				
3	1992	94,583	106	1%	7,661	222				
4	1993	95,697	133	2%	8,044	230				
5	1994	96,259	114	1%	8,365	238				
6	1995	96,915	125	1%	8,954	253				
7	1996	97,774	63	1%	9,477	266				
8	1997	99,201	235	2%	9,711	268				
9	1998	100,602	164	2%	9,191	250				
10	1999	101,307	292	3%	8,747	237				
11	2000	101,605	415	5%	8,928	241				
12	2001	103,386	560	7%	8,364	222				
13	2002	104,031	592	7%	7,986	210				
14	2003	105,581	672	9%	7,718	200	200			
15	2004	107,616	771	10%	7,949	202	202	202		
16	2005	108,717	918	12%	7,672	193	193	193	193	
17	2006	110,682	895	11%	7,809	193	193	193	193	193
18	2007	113,575	1001	13%	7,881	190	190	190	190	190
19	2008	114,988	909	12%	7,640	182		182	182	182
20	2009	117,237	794	11%	7,074	165			165	165
21	2010	118,830	785	12%	6,540	151				151
Calculated Baseline/Current Water Use (Period Average)							196	192	185	176

Appendix F: Santa Clara Valley Water District, 2016 Groundwater Management Plan

The 2016 Santa Clara Valley Water District Groundwater Management Plan can be downloaded at:

2016 Valley Water GMP

https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable

Appendix G: Annual Well Production and Depth to Water Table (2016-2020)

Annual Well Production and Depth to Water Table (2016-2020)

Calendar Year	2016		2017		2018		2019		2020	
Well No.	**Production (AF)**	**Depth to Water (ft)**	**Production (AF)**	**Depth to Water (ft)**	**Production (AF)**	**Depth to Water (ft)**	**Production (AF)**	**Depth to Water (ft)**	**Production (AF)**	**Depth to Water (ft)**
ZONE I										
02-02	128	42.7	213	25.6	147	27.3	137	31.3	73	51.6
03-02	92	20.2	66	11.1	1448	2.4	1345	3.9	158	27.2
04	1012	44.5	959	104.9	648	82.9	232	39.9	342	54.5
05-02	217	12.4	119	4.9	0	*	0	*	0	29.0
07	508	41.1	796	63.1	369	42.4	331	28.6	831	47.6
12	1173	16.9	1214	9.7	231	3.1	310	-0.8	874	21.3
13-02	388	51.2	647	46.6	210	44.1	487	27.9	957	45.0
18-02	624	21.1	828	26.3	505	8.8	626	0.1	1046	27.7
21	0	9.9	0	2.1	638	-2.2	927	-9.1	922	43.3
22-02	317	52.3	351	40.0	538	35.0	332	31.5	420	50.4
25	172	35.5	247	38.4	209	34.8	152	38.3	113	54.2
28	187	44.8	279	35.3	117	26.9	146	27.7	83	47.9
30	209	16.3	208	10.7	156	0.2	87	3.7	77	27.9
32	0	-27.5	0	-37.0	0	-45.4	0	-41.5	0	-23.5
34	543	-24.2	863	-33.3	348	-46	205	-33.1	193	-22.9
ZONE II										
08	329	79.4	670	19.0	439	70.0	387	72.7	209	*
09-02	543	91.2	436	106.4	647	96.3	665	89.1	640	103.1
10	1210	73.0	1197	72.5	1099	56.1	1472	49.6	1922	70.9
11	288	61.6	272	57.5	320	46.2	236	47.7	80	76.8
17-02	633	77.2	692	63.8	663	53.6	458	61.1	453	77.2
23	635	85.9	391	85.7	344	77.0	0	60.6	0	82.5
24	714	73.5	1178	69.6	1063	61.1	696	53.7	1030	64.3
29	0	84.6	371	70.4	426	64.5	420	70.0	307	90.6
ZONE IIA										
15	171	85.7	226	77.5	93	72.2	131	77.3	92	89.6
NOTES: Well 32 is a standby well. Cells marked with an * indicate no information for water depth for the calendar year was reported.										

Appendix H: City of Santa Clara Green Stormwater Infrastructure Plan

City of Santa Clara

Green Stormwater Infrastructure Plan

Approved on: August 20, 2019

Approved by: City Council of Santa Clara

Prepared by:

City of Santa Clara, 1500 Warburton Avenue, Santa Clara, CA 95050

In compliance with Provision C.3.j.i.(2) of Order No. R2-2015-0049,

NPDES Permit No. CAS612008

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- Reena Brilliot
- John Davidson

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- Jill Bicknell, P.E.
- Vishakha Atre
- Liesbeth Magna

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABBREVIATIONS

ABAG	Association of Bay Area Governments
BASMAA	Bay Area Stormwater Management Agencies Association
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CIP	Capital Improvement Program
EPA	Environmental Protection Agency
FY	Fiscal Year
GI	Green Infrastructure
GIS	Geographic Information System
GSI	Green Stormwater Infrastructure
LID	Low Impact Development
MRP	Municipal Regional Stormwater NPDES Permit
MS4	Municipal Separate Storm Sewer System
NPDES	National Polluant Discharge Elimination System
O&M	Operation and Maintenance
PDA	Priority Development Areas
ROW	Right of Way
RWQCB	San Francisco Bay Regional Water Quality Control Board
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SCVWD	Santa Clara Valley Water District, now known as Valley Water
State Board	State Water Resource Control Board
SWRP	Storm Water Resource Plan
SWRCB	State Water Resource Control Board
TMDL	Total Maximum Daily Load
Valley Water	Santa Clara Valley Water District
Water Board	San Francisco Bay Regional Water Quality Control Board

EXECUTIVE SUMMARY

Urban development has traditionally involved replacing natural landscapes with solid pavements and buildings, and using storm drain systems to carry increased amounts of stormwater runoff and pollutants directly into local streams. To reduce the impact of urban development on waterways, Bay Area municipalities are augmenting traditional stormwater conveyance systems with Green Stormwater Infrastructure (GSI) features.

GSI features mimic nature, and use plants, soils, and/or pervious surfaces to collect stormwater, allowing it soak into the ground, and be filtered by soil. This reduces the quantity of water and pollutants flowing into local creeks.

The City of Santa Clara has prepared this GSI Plan to guide the siting, implementation, tracking, and reporting of GSI projects on City-owned land over the next several decades. Development of the GSI Plan is required by the City's Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit.

The GSI Plan describes the City's methodology to identify and prioritize areas for implementing GSI, and estimates targets for the extent of the City's area that will be addressed by GSI through 2040. The Plan includes maps of the City's prioritized areas, and lays out the City's GSI implementation strategy. Key elements of the strategy include: identification of GSI opportunities in capital projects; coordination with private development; exploring opportunities as Focus Areas are redeveloped; and creating projects that achieve multiple benefits and provide safer, sustainable, and attractive public streetscapes. The Plan contains guidance and standards for GSI project design and construction, and describes how the City will track and map constructed GSI projects and make the information available to the public. Lastly, it explains existing legal mechanisms to implement the GSI Plan, and identifies potential sources of funding for the design, construction, and maintenance of GSI projects.

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1. INTRODUCTION

Urban development has traditionally involved replacing natural landscapes with solid pavements and buildings, and using storm drain systems to carry increased amounts of stormwater runoff and pollutants directly into local streams. Green stormwater infrastructure (GSI), however, uses plants and soils to mimic natural watershed processes, capture stormwater and create healthier environments. Bay Area cities and counties are required by State and regional regulatory agencies to move from traditional (grey) stormwater conveyance systems to GSI systems over time. This GSI Plan serves as an implementation guide for the City of Santa Clara (City) to incorporate GSI into storm drain infrastructure on public and private lands where feasible over the next several decades.

1.1 Purpose and Goals of the GSI Plan

The purpose of the City's GSI Plan is to demonstrate the City's commitment to augment its traditional storm drainage infrastructure to green stormwater infrastructure. The GSI Plan will guide the identification, implementation, tracking, and reporting of green stormwater infrastructure projects within the City. The GSI Plan will be coordinated with other City plans, such as its General and Specific Plans, Bicycle/Pedestrian Plan, and Storm Drain Master Plan, to achieve multiple potential benefits to the community, including improved water and air quality, reduced local flooding, increased water supply, traffic calming, safer pedestrian and bicycle facilities, climate resiliency, improved wildlife habitat, and a more pleasant urban environment.

Specific goals of the GSI Plan are to:

- Align the City's goals, policies and implementation strategies for GSI with the General Plan and other related planning documents;
- Identify and prioritize GSI opportunities throughout the City;
- Establish targets for the extent of City area to be addressed by GSI over certain timeframes;
- Provide a workplan and legal and funding mechanisms to implement prioritized projects; and
- Establish a process for tracking, mapping, and reporting completed projects.

1.2 City Description

Incorporated in 1852, the City of Santa Clara is located in Santa Clara County, and has a jurisdictional area of 11,628 acres. According to the 2010 Census, the City has a population of 116,468[1], with a population density of 6,327.3 people per square mile and an average household size of 3.18. The City is home to Intel, Applied Materials, NVIDIA, and many other technology companies; Westfield Valley Fair Mall; Levi's Stadium (the San Francisco 49ers professional football team headquarters); and California's Great America Theme Park.

1.2.1 Land Use

Land use within the City of Santa Clara can be classified into six primary land uses -- Commercial and Services, Industrial, Residential, Retail, K-12 Schools, and Urban Parks – with remaining land use, such as open space, classified as "other". The area within each of these land use categories within the City of Santa Clara depicted in ABAG (2005)[2] are provided in Table 1-1.

[1] The California Department of Finance estimates the City's population to be 128,717 as of January 1, 2019.

[2] Source - ABAG 2005 and SCVURPPP.

Table 1-1 Percentages of City of Santa Clara's Jurisdictional Area within ABAG Land Use Classes

Land Use Category	Jurisdictional Area (Acres)	% of Jurisdictional Area
Commercial and Services	1,912.0	17.5%
Industrial	1,983.9	18.2%
Residential	5,065.9	46.4%
Retail	570.7	5.2%
K-12 Schools	378.2	3.5%
Urban Parks	269.2	2.5%
Other	745.2	6.8%

The City is currently close to build-out with very few undeveloped lots. The majority of future development will involve redevelopment, often at higher densities, along major transportation corridors.

The City contains 38 parks, playgrounds and open space that total nearly 450 acres, including the Golf and Tennis Club's 155 acres. The Ulistac Natural Area, a 40-acre open space park on the former Fairway Glen golf course, opened in 2001. There are currently over 10,500 street trees within the City, and the City has been designated a Tree City USA since 1987.

1.2.2 Transportation

Five State highways, including El Camino Real, and three County expressways serve Santa Clara. In addition, three light and heavy rail corridors, as well as VTA bus service and future BART service, enhance transit options for residents, visitors, and employees. These transit services offer an opportunity for new, concentrated growth that minimizes impacts on existing neighborhoods and provides choices for living and working with less reliance on the automobile for every trip. As these transportation corridors are redeveloped, they may offer opportunities for implementing GSI.

1.2.3 Stormwater Drainage System

The City has an estimated 195 linear miles of storm drains and 8,452 nodes (including manholes, catch basins, pump stations, detention basins, and outfalls). Runoff captured by the storm drain network is discharged through a combination of gravity outfalls and pump stations into three ephemeral creeks (Calabazas Creek, Saratoga Creek, and San Tomas Aquino Creek) and the Guadalupe River. Calabazas Creek and San Tomas Aquino Creek are primarily conveyed through the City via concrete-lined channels, whereas Saratoga Creek (upstream of its confluence with San Tomas Aquino Creek) and the Guadalupe River consist of natural earthen channels.

A variety of agencies maintain storm drainage systems within the study area. The most significant of these is Valley Water (formerly called the Santa Clara Valley Water District), which has jurisdiction over the creeks and river running through the City. County roads (including Central Expressway, Lawrence Expressway, and San Tomas Expressway) and many of the storm drain collection systems within them fall within Santa Clara County’s jurisdiction. Projects that cross or connect to County roads require coordination with the County Roads and Airports Department. Likewise, Caltrans maintains State roads, including Highway 101 and El Camino Real, and requires coordination for projects within their jurisdiction.

1.2.4 Geographic Characteristics

The City is relatively flat with little geographic relief. Depths to first groundwater range from 30-50 feet in the southern part of the City to 0-10 feet in the northern part. The soils within the City's boundaries consist of 1.1% Group A soils, 13.9% Group C soils, and 84.9% Group D soils[3] (City of Santa Clara Storm Drain Master Plan, 2015). Given the high percentage of Group D soils, it is likely that most GSI facilities within the City will be landscape-based stormwater "biotreatment" areas with limited infiltration.

1.2.5 Water Supply

The City receives its potable surface water supply from the San Francisco Public Utilities Commission and Valley Water, and groundwater from City-owned wells. The City's Water and Sewer Utilities serve to provide these supplies, as well as recycled water, to City residents and businesses.

Valley Water's 2010 Urban Water Management Plan commits to meeting water demands for Santa Clara County (including the City) though 2025. However, water conservation and capture and use of rainwater to offset potable water supplies are important strategies for protecting City supplies during drought years.

1.2.6 Growth Projections

The City of Santa Clara developed growth/development forecasts as part of its General Plan, and updated them through approved General Plan Amendments. In 2010, the City of Santa Clara contained approximately 43,021 households[4]. The General Plan predicts the number of households to increase to 175,001 by 2040. The City is expected to have approximately 88,542 housing units and 91 million square feet of non-residential building space by 2040. This is an increase from 44,166 housing units and 58.8 square feet non-residential building space in 2008.

1.3 Regulatory Context

1.3.1 Federal and State Regulations and Initiatives

The U.S. Environmental Protection Agency (EPA) has authority under the Clean Water Act to promulgate and enforce stormwater related regulations. For the State of California, EPA has delegated the regulatory authority to the State Water Resources Control Board (State Water Board), which in turn, has delegated authority to the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) to issue National Pollutant Discharge Elimination System (NPDES) permits in the San Francisco Bay Region. Stormwater NPDES permits allow stormwater discharges from municipal separate storm sewer systems (MS4s) to local creeks, San Francisco Bay, and other water bodies as long as they do not adversely affect the beneficial uses of or exceed any applicable water quality standards for those waters. Since the early 2000's, the EPA has recognized and promoted the benefits of using GSI in protecting

[3] The NRCS has classified soils into four hydrologic soil groups (A, B, C, and D) according to their infiltration rates. Group A soils have low runoff potential when thoroughly wet and typically consist of sand or gravel type soils. Group B soils are moderately well draining when thoroughly wet and consist of loamy sand or sandy loam textures. Group C soils have moderately high runoff potential when thoroughly wet and consist of loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Group D soils have high runoff potential when thoroughly wet and consist of clayey textures.

[4] The Census Bureau defines a household as a person or group of persons living in a housing unit, as opposed to persons living in group quarters, such as dormitories, convalescent homes, or prisons.

drinking water supplies and public health, mitigating overflows from combined and separate storm sewers and reducing stormwater pollution, and it has encouraged the use of GSI by municipal agencies as a prominent component of their MS4 programs.

The State and Regional Water Boards have followed suit in recognizing not only the water quality benefits of GSI but the opportunity to augment local water supplies in response to the impacts of drought and climate change as well. The 2014 California Water Action Plan called for multiple benefit stormwater management solutions and more efficient permitting programs. This directive created the State Water Board's "Strategy to Optimize Resource Management of Stormwater" (STORMS). STORMS' stated mission is to "lead the evolution of storm water management in California by advancing the perspective that storm water is a valuable resource, supporting policies for collaborative watershed-level storm water management and pollution prevention, removing obstacles to funding, developing resources, and integrating regulatory and non-regulatory interests."[5]

These Federal and State initiatives have influenced approaches in Bay Area municipal stormwater NPDES permits, as described in Section 1.3.2.

1.3.2 Municipal Regional Stormwater Permit

The City is subject to the requirements of the Municipal Regional Stormwater NPDES Permit (MRP) for Phase I municipalities and agencies in the San Francisco Bay area (Order R2-2015-0049), which became effective on January 1, 2016. The MRP applies to 76 municipalities and flood control agencies that discharge stormwater to San Francisco Bay, collectively referred to as permittees.

Over the last 13 years, under Provision C.3 of the MRP and previous permits, new development and redevelopment projects on private and public property that exceed certain size thresholds ("regulated projects") have been required to mitigate impacts on water quality by incorporating "Low Impact Development" (LID) measures, including site design, pollutant source control, stormwater treatment and flow control measures as appropriate. LID treatment measures, such as rainwater harvesting and use, infiltration, and biotreatment, have been required on most regulated projects since December 2011.

Provision C.3.j of the 2016 MRP requires the City to develop and implement a long-term GSI Plan[6] for the inclusion of LID measures into storm drain infrastructure on public and private lands, including streets, roads, storm drains, parking lots, building roofs, and other elements. The GSI Plan must be completed and submitted to the Regional Water Board by September 30, 2019.

While Provision C.3.j of the MRP contains the GSI program planning and analysis requirements, other provisions (C.11 and C.12) establish a linkage between public and private GSI features and required reductions of pollutants in stormwater discharges. Permittees in Santa Clara County (County), collectively, must implement GSI on public and private property to achieve specified pollutant load reduction goals by the years 2020, 2030, and 2040. These efforts will be integrated and coordinated countywide for the most effective and resource-efficient program. As an indication as to whether these load reductions will be met, Permittees must include in their GSI Plans estimated "targets" for the amounts of impervious surface to be "retrofitted" (i.e., redeveloped or changed such that runoff from

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[5] https://www.waterboards.ca.gov/water_issues/programs/stormwater/storms/

[6] Although the MRP uses the term green infrastructure (GI), the agencies within Santa Clara County, including the City of Santa Clara, prefer to use the term green stormwater infrastructure (GSI). Therefore, the term GSI is used in this document.

those surfaces will be captured in a stormwater treatment system or GSI measure) as part of public and private projects over the same timeframes (2020, 2030, and 2040).

A key part of the GSI definition in the MRP is the inclusion of GSI systems at both private and public property locations. This has been done in order to plan, analyze, implement and credit GSI systems for pollutant load reductions on a watershed scale, as well as recognize all GSI accomplishments within a municipality. The focus of the GSI Plan is the integration of GSI systems into public buildings, parks, parking lots, and rights-of-way (e.g. road or bike path). However, the GSI Plan may also establish opportunities to include GSI facilities at private properties or in conjunction with private development, so they can contribute to meeting the target load reductions on a county-wide level as well as implement GSI on a larger scale.

1.4 GSI Plan Development Process

1.4.1 GSI Plan Development and Adoption

The GSI Plan development process began with the preparation of the City's GSI Plan Framework (Framework), a work plan describing the goals, approach, tasks, and schedule needed to complete the GSI Plan. Development of the Framework was a regulatory requirement (Provision C.3.j.i(1) of the MRP) to demonstrate the City's commitment to completing the GSI Plan by September 30, 2019. The City completed the Framework and City Council approved it on June 6, 2017.

The City established a GSI Work Group, consisting of staff from the City's Public Works and Planning Departments. The GSI Work Group worked with a consultant team to develop the GSI Plan. The Plan was presented to the City Council in August 2019.

1.4.2 Regional Collaboration

The City is a member of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), an association of thirteen cities and towns in the Santa Clara Valley, the County of Santa Clara, and the Water District that collaborate on stormwater regulatory activities and compliance. The City's GSI Plan was developed in collaboration with SCVURPPP; SCVURPPP input included technical guidance, templates, and completion of certain GSI Plan elements at the countywide level. SCVURPPP guidance and products are discussed in more detail in relevant sections of the GSI Plan.

The City, via SCVURPPP, also coordinated with the Bay Area Stormwater Management Agencies Association (BASMAA) on regional GSI guidance and received feedback through BASMAA from MRP regulators on GSI expectations and approaches. BASMAA members include other countywide stormwater programs in Alameda, Contra Costa, and San Mateo Counties, and area-wide programs in the Vallejo and Fairfield-Suisun portions of Solano County, whose participating municipalities are permittees under the MRP.

1.4.3 Education and Outreach

To get support and commitment to the Plan and this new approach to urban infrastructure, educating department staff, managers, and elected officials about the purposes and goals of green stormwater infrastructure, the required elements of the GSI Plan, and the steps needed to develop and implement the GSI Plan was an important step in the development of the GSI Plan. Another important step was local community and stakeholder outreach to gain public support. The City began this process in fiscal year FY 2016-2017 by completing the following tasks.

- Public Works staff attended the SCVURPPP GSI workshop on developing and implementing municipal GSI Plans, review of public projects for identifying GSI opportunities, and a group exercise to review an example CIP project list for GSI opportunities.
- Planning department staff attended the SCVURPPP annual C.3 workshop covering basic C.3 training, new requirements in the MRP, and presentations on GSI materials and design, construction and maintenance considerations for pervious paving.
- The City provided in-house training to Planning and Public Works Department staff on GSI requirements, strategies, and opportunities and convened interdepartmental meetings with affected department staff and management to discuss GSI requirements.
- Public Works department staff attended a presentation on the City's progress in developing a GSI plan during the bi-monthly department meeting in June 2019.
- Staff from Public Works and Parks & Recreation departments discussed a few funding options for GSI in June 2019. Alternative compliance and in-lieu fee area among viable options to further studied.

In addition, the City has coordinated with SCVURPPP on a countywide outreach and education program about GSI for the general public[7], which includes a GSI website, public presentations, and radio and online advertising to promote GSI features.

The City of Santa Clara will continue to conduct internal and external education and outreach about GSI as the GSI Plan is implemented and seek community input as specific projects are designed and constructed.

1.5 GSI Plan Structure and Required Elements

The remainder of the GSI Plan is structured as follows:

- Chapter 2 describes the definition, purpose, and benefits of GSI, and describes the different types of GSI facilities.
- Chapter 3 describes the relationship of the GSI Plan to other planning documents and how those planning documents have been updated or modified, if needed, to support and incorporate GSI requirements. For documents whose desired updates and modifications have not been accomplished by the completion of the GSI Plan, a work plan and schedule are laid out to complete them.
- Chapter 4 outlines the materials being developed by SCVURPPP and the City to provide guidelines, typical details, specifications and standards for municipal staff and others in the design, construction, and operation and maintenance of GSI measures.
- Chapter 5 presents the methodology and results for identifying and prioritizing areas for potential GSI projects.
- Chapter 6 outlines the City's strategy for implementing prioritized potential GSI projects within the next ten years and through 2040, presents targets for the amounts of impervious surface to be "retrofitted" with GSI within the City by 2020, 2030, and 2040, and discusses the variety of mechanisms to be employed by the City in order to implement the GSI Plan, including future planning, tracking, and funding.

[7] http://www.mywatershedwatch.org/residents/green-streets/

The GSI Plan elements required by Provision C.3.j.i.(2) of the MRP and the section of the document in which each component can be found are summarized in Table 1-2 below.

Table 1-2 Summary of GSI Plan Elements required by Provision C.3.j.i of the MRP

MRP Provision	GSI Plan Elements	GSI Plan Section
C.3.j.i.(2)(a)	Project Identification and Prioritization Mechanism	Chapter 5
C.3.j.i.(2)(b)	Prioritization Outputs	Section 5.3
C.3.j.i.(2)(c)	Impervious Surface Targets	Section 6.6
C.3.j.i.(2)(d)	Completed Project Tracking System	Section 6.7
C.3.j.i.(2)(e,f)	Guidelines and Specifications	Chapter 4
C.3.j.i.(2)(g)	Alternative Sizing Requirements for Green Street Projects	Section 4.1
C.3.j.i.(2)(h,i)	Integration with Other Municipal Plans	Chapter 3
C.3.j.i.(2)(i)	Workplan for Integration of GSI Language into City Planning Documents	Section 3.2
C.3.j.i.(2)(j)	Workplan to Complete C.3.j Early Implementation Projects	Chapter 6.3
C.3.j.i.(2)(k)	Evaluation of Funding Options	Section 6.5
C.3.j.i.(3)	Legal and Implementation Mechanisms	Section 6.4

2. WHAT IS GREEN STORMWATER INFRASTRUCTURE?

In natural landscapes, most of the rainwater soaks into the soil or is taken up by plants and trees. However, in developed areas, building footprints and paved surfaces such as driveways, sidewalks, and streets prevent rain from soaking into the ground. As rainwater flows over and runs off these impervious surfaces, this “urban runoff” or “stormwater runoff” can pick up pollutants such as motor oil, sediment, metals, pesticides, pet waste, and litter. It then carries these pollutants into the City’s storm drains, which flow directly to local creeks and San Francisco Bay, without any cleaning or filtering to remove pollutants. Stormwater runoff is therefore a major contributor to water pollution in urban areas.

As urban areas develop, the increase in impervious surface also results in increases in peak flows and volumes of stormwater runoff from rain events. Traditional “gray” stormwater infrastructure, like most of the City’s storm drain system, is designed to convey stormwater flows quickly away from urban areas. However, the increased peak flows and volumes can cause erosion, flooding, and habitat degradation in downstream creeks to which stormwater is discharged, damaging habitat, property, and infrastructure.

2.1 Green Stormwater Infrastructure

A new approach to managing stormwater is to implement green stormwater infrastructure. GSI uses vegetation, soils, and other elements and practices to capture, treat, infiltrate and slow urban runoff and thereby restore some of the natural processes required to manage water and create healthier urban environments. GSI facilities can also be designed to capture stormwater for uses such as irrigation and toilet flushing.

GSI integrates building and roadway design, complete streets, drainage infrastructure, urban forestry, soil conservation and sustainable landscaping practices to achieve multiple benefits. At the city or county scale, GSI is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the neighborhood or site scale, GSI comprises stormwater management systems that mimic nature and soak up and store water.[8]

2.2 Benefits of Green Stormwater Infrastructure

GSI can provide multiple benefits beyond just managing rainfall and runoff. These benefits include environmental, economic, and social improvements.

GSI measures can mitigate localized flooding and reduce erosive flows and quantities of pollutants being discharged to local creeks and the San Francisco Bay. Vegetated GSI systems can beautify public places and help improve air quality by filtering and removing airborne contaminants from vehicle and industrial sources. They can also reduce urban heat island effects by providing shade and absorbing heat better than paved surfaces, and provide habitat for birds, butterflies, bees, and other local species. When GSI facilities are integrated into traffic calming improvements such as curb extensions and bulb-outs at intersections, they can help increase pedestrian and bicycle safety and promote active transportation, which in turn can result in improved human health.

GSI facilities designed with extra storage can capture stormwater for later use as irrigation water or non-potable uses such as toilet flushing and cooling tower supply, thus conserving potable water supplies.

[8] https://www.epa.gov/green-infrastructure/what-green-infrastructure

Widespread implementation of GSI potentially offers significant economic benefits, such as deferring or eliminating the need for some gray infrastructure projects. By providing more storage within the watershed, GSI can help reduce the costs of conveyance and pumping of stormwater. When cost-benefit analyses are performed, GSI is often the preferred alternative due to the multiple benefits provided by GSI as compared to conventional infrastructure.

2.3 Types of Green Stormwater Infrastructure Facilities

Integrating GSI into public spaces typically involves construction of stormwater capture and treatment measures in public streets, parks, and parking lots or as part of public buildings. Types of GSI measures that can be constructed in public spaces include: (1) bioretention; (2) stormwater tree well filters; (3) pervious pavement, (4) infiltration facilities, (5) green roofs, and 6) rainwater harvesting and use facilities. A description of these facility types is provided below.

Biotreatment/Bioretention

Bioretention areas are depressed landscaped areas that consist of a ponding area, mulch layer, plants, and a special biotreatment soil media composed of sand and compost, underlain by drain rock and an underdrain, if required. Bioretention is designed to retain stormwater runoff, filter stormwater runoff through biotreatment soil media and plant roots, and either infiltrate stormwater runoff to underlying soils as allowed by site conditions, or release treated stormwater runoff to the storm drain system, or both. They can be of any shape and are adaptable for use on a building or parking lot site or in the street right-of-way. Parking lots can accommodate bioretention areas in medians, corners, and pockets of space unavailable for parking.

Figure 2-1 Stormwater curb extension, Rosita Park, Los Altos (Source: City of Los Altos)

Bioretention systems in the streetscape have specific names: stormwater planters, stormwater curb extensions (or bulb-out), and stormwater tree well filters (described in the next section).

A stormwater curb extension (Figure 2-1) is a bioretention system that extends into the roadway and involves modification of the curb line and gutter. Stormwater curb extensions may be installed midblock or at an intersection. Curb bulb-outs and curb extensions installed for pedestrian safety, traffic calming, and other transportation benefits can also provide opportunities for siting bioretention facilities.

A stormwater planter is a linear bioretention facility in the public right-of-way along the edge of the street, often in the planter strip between the street and sidewalk. They are typically designed with vertical (concrete) sides. However, they can also have sloped sides depending on the amount of space that is available.

Stormwater Tree Well Filters and Suspended Pavement Systems

Stormwater tree well filters and suspended pavement systems are especially useful in settings between existing sidewalk elements where available space is at a premium. They can also be used in curb extensions or bulb-outs, medians, or parking lots if surrounding grades allow for drainage to those areas. The systems can be designed to receive runoff through curb cuts or catch basins or allow runoff to enter through pervious pavers on top of the structural support.

Figure 2-2 Stormwater tree well filter conceptual examples: modular suspended pavement system (left), column suspended pavement system (right). (Courtesy of City of Philadelphia Water Department)

Pervious Pavement

Pervious pavement is hardscape that allows water to pass through its surface into a storage area filled with gravel prior to infiltrating into underlying soils. Types of pervious pavement include permeable interlocking concrete pavers, pervious concrete, porous asphalt, and grid pavement. Pervious pavement is often used in parking areas or on streets where bioretention is not feasible due to space constraints or if there is a need to maintain parking. Pervious pavement does not require a dedicated surface area for treatment and allows a site to maintain its existing hardscape.

Figure 2-3 Permeable Interlocking Concrete Pavers, Mayfield Playing Fields, Palo Alto (Source: EOA)

There are two types of pervious pavers: Permeable Interlocking Concrete Pavers (PICP) and Permeable Pavers (PP). PICP (Figure 2-3) allow water to pass through the joint spacing between solid pavers, and PP allow water to pass through the paver itself and therefore can have tighter joints. Porous asphalt and pervious concrete are similar to traditional asphalt and concrete, but do not include fine aggregates in the mixture, allowing water to pass through the surface. All types are supported by several layers of different sizes of gravel to provide structural support and water storage.

Infiltration Facilities

Where soil conditions permit, infiltration facilities can be used to capture stormwater and infiltrate it into native soils. The two primary types are infiltration trenches and subsurface infiltration systems.

An infiltration trench is an excavated trench backfilled with a stone aggregate and lined with a filter fabric. Infiltration trenches collect and detain runoff, store it in the void spaces of the aggregate, and allow it to infiltrate into the underlying soil. Infiltration trenches can be used along roadways, alleyways, and the edges or medians of parking lots. An example of an infiltration trench is shown in Figure 2-4.

Figure 2-4 Infiltration Trench, San Jose (Source: City of San Jose)

Subsurface infiltration systems are another type of GSI measure that may be used beneath parking lots or parks to infiltrate larger quantities of runoff. These systems, also known as infiltration galleries, are underground vaults or pipes that store and infiltrate stormwater while preserving the uses of the land surface above parking lots, parks and playing fields. An example is shown in Figure 2-5. Storage can take the form of large-diameter perforated metal or plastic pipe, or concrete arches, concrete vaults, plastic chambers or crates with open bottoms. Prefabricated, modular infiltration galleries are available in a variety of shapes, sizes, and material types that are strong enough for heavy vehicle loads.

Figure 2-5 Subsurface infiltration system (Source: Conteches.com)

Green Roofs

Green roofs are vegetated roof systems that filter, absorb, and retain or detain the rain that falls upon them. Green roof systems are comprised of a layer of planting media planted with vegetation, underlain by other structural components including waterproof mem branes, synthetic insulation, geofabrics, and underdrains. A green roof can be either "extensive", with 3 to 7 inches of lightweight planting media and low-profile, low-maintenance plants, or "intensive", with a thicker (8 to 48 inches) of media, more varied plantings, and a more garden-like appearance. Green roofs can provide high rates of rainfall retention via plant uptake and evapotranspiration and can decrease peak flow rates in storm drain systems because of the storage that occurs in the planting media during rain events. An example of a green roof is provided in Figure 2-6.

Figure 2-6 Green Roof at Fourth Street Apartments, San José (Source: EOA)

Rainwater Harvesting and Use

Rainwater harvesting is the process of collecting rainwater from impervious surfaces and storing it for later use. Storage facilities that can be used to capture stormwater include rain barrels, above-ground cisterns (Figure 2-7), below-ground cisterns, open storage reservoirs (e.g., ponds), and various underground storage devices (tanks, vaults, pipes, and proprietary storage systems). The captured water is then fed into irrigation systems or non-potable water plumbing systems, either by pumping or by gravity flow. Uses of captured water may include irrigation, vehicle washing, and indoor non-potable use such as toilet flushing, heating and cooling, or industrial processing.

Figure 2-7 Rainwater harvesting cistern, Environmental Innovation Center, San José (Source: City of San Jose)

The two most common applications of rainwater harvesting are:
1) collection of roof runoff from buildings; and 2) collection of runoff from at-grade surfaces or diversion of water from storm drains into large underground storage facilities below parking lots or parks. Rooftop runoff usually contains lower quantities of pollutants than at-grade surface runoff and can be collected via gravity flow. Underground storage systems typically include pre-treatment facilities to remove pollutants from stormwater prior to storage and use.

Figure 2-8 Subsurface vault under construction (Source: Conteches.com)

3. INTEGRATION WITH OTHER PLANNING DOCUMENTS

To ensure the success of the GSI Plan and its implementation, its goals, policies and implementation strategies should align with the City's General Plan and other related planning documents. The MRP requires that municipal agencies review such documents and include in their GSI Plans a summary of any planning documents aligned with the GSI Plan or updated or modified to appropriately incorporate GSI requirements. The GSI Plan must also include a workplan identifying how GSI measures will be included in future plans.

3.1 City Planning Document Review

The City completed a review of its existing planning documents to determine the extent to which GSI-related language, concepts and policies have been incorporated. The planning documents that were reviewed are listed below:

- General Plan - Goals and Policies
- General Plan – Housing Element
- General Plan – Climate Action Plan
- Tasman East Specific Plan
- El Camino Real Specific Plan
- Lawrence Station Area Plan
- Bicycle Plan Update
- Storm Drain Master Plan

The following sections provide a brief discussion for each planning document. A prioritized workplan for the integration of GSI language into existing and future City planning documents is provided in Section 3.2.

3.1.1 General Plan - Goals and Policies

The General Plan describes the long-term goals for the City's future and guides decision-making in many different areas. The current General Plan was adopted November 2010; the timeframe of the plan is 2010-2035. The Goals and Policies section of the General Plan does not include language specific to GSI, but does contain language to support GSI concepts, including the following:

> ***Section 1.3.2 (and Section 3.3.2) Vision for the Future****: Encourage sustainability to protect energy, water supplies and air quality.*
>
> ***Section 4.3 Promote Sustainability****: Policies encourage sustainability measures for both new and existing development, ranging from those that help reduce water and energy consumption to those that promote redevelopment of infill sites as a healthy, cost-effective way to improve the local environment.*
>
> ***Policy 5.10.5-P11:*** *Require that new development meet stormwater and water management requirements in conformance with State and regional regulations.*
>
> ***Policy 5.10.5-P15:*** *Require new development to minimize paved and impervious surfaces and promote on-site Best Management Practices for infiltration and retention, including grassy swales, pervious pavement, covered retention areas, bioswales, and cisterns, to reduce urban water run-off.*

> ***Policy 5.10.5-P16:*** *Require new development to implement erosion and sedimentation control measures to maintain an operational drainage system, preserve drainage capacity and protect water quality.*

3.1.2 General Plan - Housing Element

The Housing Element of the General Plan focuses on ways to promote residential infill development and provide safe, appropriate and well-built housing for residents of the City. It was last updated in December 2014 and integrated into the General Plan.

Regulated development projects are subject to MRP Provision C.3 requirements for low impact development (LID) site design, source control, and stormwater treatment measures; however, there is an opportunity in the Housing Element to emphasize the City's commitment to sustainable development to protect water quality.

3.1.3 General Plan - Climate Action Plan

The City Council adopted the Climate Action Plan in 2013, and it was incorporated into the General Plan. It does not include language specific to GSI. The current plan does contain some language to support GSI concepts, including the following

> ***7.2 Urban Cooling Performance metric:*** *All new uncovered parking lots and spaces utilize light-colored and/or permeable pavements.*

The next update of the Climate Action Plan is planned for 2021.

3.1.4 Tasman East Specific Plan

The Tasman East project area is an existing industrial neighborhood 45 acres in size, bounded by Tasman Drive to the south, the Guadalupe River to the East, the Santa Clara golf course to the north, and Lafayette Street to the west. The purpose of the Tasman East Specific Plan is to create a framework for the development of a high-density transit-oriented neighborhood (currently proposed to be up to 100 dwelling units per acre), along with supportive retail services. The Specific Plan lays out allowed uses, densities, height limits and design criteria in the Tasman East area. Connections to the existing Guadalupe River trail, potential locations for parkland, and strategies for better access to transit are also incorporated into the plan. The Santa Clara City Council adopted the Tasman East Specific Plan on November 13, 2018. The plan includes the following language to support GSI:

> ***Section 3.4 Sustainability Framework – Stormwater*** *On an area-wide basis, "Green Streets" concepts should be integrated into street designs to minimize the impacts of polluted runoff. For the purpose of this Specific Plan, green streets may include biotreatment areas in the form of stormwater curb extensions, stormwater planters and stormwater tree systems, to drain and treat runoff from curb flowlines, or equivalent technology. Other systems, such as pervious pavement may also achieve this objective.*
>
> *Stormwater related measures that promote sustainability on a project-by-project basis include:*
> *• Connect rooftop drain and hardscape surface drainage systems to landscape swale areas;*
> *• Design landscape features that capture and infiltrate initial runoff flows into grounds/soil; and*
> *• Design landscape swales to capture and treat runoff waters that flow to river outfalls.*

Section 4.7 Stormwater Management *The integration of stormwater management in public open spaces lowers infrastructure costs, increases space efficiency, provides ecological benefits, and creates opportunities for public interaction. Stormwater areas should be designed amenities that function effectively and contribute aesthetically to the site as a whole, integrating with the architecture and streetscape design of the surrounding context. For example, raised planters can function as seating or stormwater treatment can be a feature within the pavement.*

Guidelines: *Designed treatment systems such as bioswales, flow-through planters, permeable paving, and green roofs should be utilized as part of a comprehensive approach to stormwater management.*

3.1.5 El Camino Real Specific Plan

The El Camino Real Specific Plan is currently under development and is scheduled to be completed in Spring 2020. The El Camino Real is the City's most visible and identifiable commercial corridor. The City's General Plan vision for El Camino Real is to transform the area from a series of automobile-oriented strip malls to a tree-lined, pedestrian and transit-oriented corridor with a mix of residential and retail uses. The City will ensure that the El Camino Real Specific Plan is consistent with the GSI Plan and will look for opportunities to incorporate GSI into the plan area.

3.1.6 Lawrence Station Area Plan

On November 29, 2016, the City Council adopted the Lawrence Station Area Plan (LSAP), along with the associated General Plan and Zoning Ordinance Amendments. The plan includes language to support GSI, including the following:

Chapter 6 Landscape Master Plan

Section 6.1 Overview *- The LSAP encourages high-performing landscapes that simultaneously embrace social, recreational, ecological, and aesthetic values. A driving factor behind the planning and design of the landscape is the interdependence between aesthetic and recreational outdoor environments and green infrastructure, like green roofs and vegetated structures (trellis, green screens), that deliver ecological benefits.*

Section 6.3 Landscape Design Guidelines, Recommendation OSD 4.1 *- Hardscape is to be used to provide a durable, all-weather surface to accommodate pedestrian activity and outdoor gatherings and activities. Wherever possible, hardscape materials should be chosen to maximize pervious surface area to reduce stormwater runoff volume, rate, and pollutants.*

Chapter 7 Streetscape Master Plan

Section 7.1 General Design Objectives *- Provide generous sidewalks with sufficient width to accommodate clear pedestrian passage while allowing sufficient room for street trees, planters, stormwater facilities, and other streetscape amenities.*

Section 7.3 Streetscape Design Guidelines, Street Parking Design *- Use water permeable materials for stormwater capture.*

Chapter 9 Infrastructure Program

Section 9.1 Grading *- Fine grading will address new landscape features, and stormwater runoff from hardscape areas shall be directed toward planted landscape zones for treatment per the San Francisco Bay Regional Water Quality Control Board requirements.*

Section 9.3 Stormwater, Sustainable Infrastructure *- Sustainable design measures will help ensure that runoff generated by development under the LSAP does not increase runoff amounts above existing levels. Site development will incorporate planted landscape zones dedicated to stormwater infiltration, such as at-grade rain gardens and bio-swales. Moreover, impervious hardscape areas will be designed to drain to these landscape zones and other pervious surfaces so as to comply with regional permitting requirements.*

3.1.7 Bicycle Plan Update

The City's Bicycle Plan Update, completed in September 2009, presents a "blueprint for expanding the bicycle network that will promote safer alternative modes of transportation and help position the City for future funding for bicycle projects and roadway improvements benefiting the cycling community" (Plan Background and Goals). The 2009 update to the Bicycle Plan does not include language related to GSI.

3.1.8 Storm Drain Master Plan

The City's Storm Drain Master Plan (SDMP) establishes a prioritized capital improvements program to reduce the risk of flooding within the City of Santa Clara. It was last updated in December 2015 and does not include language relevant to GSI. However, all CIP projects including those from the SDMP are reviewed by the City for GSI opportunities (see Chapter 6, GSI Implementation).

3.2 Workplan for Integration of GSI Language into Existing and Future City Planning Documents

Although several City plans are generally aligned with and support the GSI Plan, others could benefit from the inclusion of additional GSI-related language. Table 3-1 below summarizes the plans that will be updated and the schedule for completion.

Table 3-1 Workplan for Integration of GSI Language into Existing City Planning Documents

Name of Plan To Be Updated	Anticipated Date of Completion/Update
General Plan - Goals and Policies	FY 2023-24
General Plan – Housing Element	FY 2023-24
General Plan – Climate Action Plan	2021
Bicycle Plan Update	Fall 2019

When preparing new planning documents, such as the Pedestrian and Parks-specific Master Plans, and Specific Plans for the Freedom Circle area, the Patrick Henry Drive area, and the Downtown area, the City will ensure that GSI requirements and policies are incorporated. Examples of GSI related language can be found in existing City plans, and in references such as SCVURPPP's Model Green Infrastructure Language for Incorporation into Municipal Plans (2016).

3.3 GSI Plan Relationship to Regional Plans

The City of Santa Clara participates in the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), an association of 13 cities, the County of Santa Clara, and Valley Water that are permittees under the MRP. This partnership allows sharing of resources toward permit compliance and collaboration on projects of mutual benefit.

The City is collaborating with SCVURPPP, Valley Water, and other agencies on several large-scale planning efforts including those described below.

3.3.1 Santa Clara Basin Stormwater Resource Plan

A collaboration between SCVURPPP and the Water District during 2017 and 2018, the Santa Clara Basin Storm Water Resources Plan (SWRP) supports municipal GSI Plans by identifying and prioritizing potential multi-benefit GSI opportunities on public parcels and street rights-of-way throughout the Basin (i.e., Santa Clara Valley) and allows them to be eligible for State bond-funded implementation grants. The SWRP includes a list of prioritized GSI opportunity locations for each SCVURPPP agency, including Los Altos. As described in Section 5.2, the City's GSI Plan builds on the SWRP output to further identify, evaluate, and prioritize potential projects.

3.3.2 Valley Water's One Water Plan

Valley Water's Watershed Division is leading an effort to develop an Integrated Water Resources Master Plan to identify, prioritize, and implement activities at a watershed scale to maximize established water supply, flood protection, and environmental stewardship goals and objectives. The "One Water Plan" establishes a framework for long-term management of Santa Clara County water resources, which eventually will be used to plan and prioritize projects that maximize multiple benefits. The One Water Plan incorporates knowledge from past planning efforts, builds on existing and current related planning efforts; and coordinates with relevant internal and external programs. The One Water Plan has five goals:

1. "Valued and Respected Rain" – Manage rainwater to improve flood protection, water supply, and ecosystem health.
2. "Healthful and Reliable Water" – Enhance the quantity and quality of water to support beneficial uses.
3. "Ecologically Sustainable Streams and Watersheds" – Protect, enhance and sustain healthy and resilient stream ecosystems.
4. "Resilient Baylands" – Protect, enhance and sustain healthy and resilient baylands ecosystems and infrastructure.
5. "Community Collaboration" – Work in partnership with an engaged community to champion wise decisions on water resources.

Tier 1 of the effort, for which a draft plan was completed in 2016 [9], is a countywide overview of major resources and key issues along with identified goals and objectives. Tier 2 (2016 to 2020) will include greater detail on each of the County's five major watersheds, including the West Valley and Guadalupe watersheds in which the City of Santa Clara is located. The City's GSI Plan aligns with the goals of the

[9] Santa Clara Valley Water District. 2016. One Water Plan for Santa Clara County. An Integrated Approach to Water Resources Management. Preliminary Draft Report 2016. https://onewaterplan.wordpress.com/

One Water Plan and may be able to coordinate with specific projects yet to be identified in the West Valley and Guadalupe Watershed areas.

3.3.3 Bay Area Integrated Regional Water Management Plan

The Bay Area Integrated Regional Water Management Plan [10] (IRWMP) is a comprehensive water resources plan for the Bay region that addresses four functional areas: 1) water supply and water quality; 2) wastewater and recycled water; 3) flood protection and stormwater management; and 4) watershed management and habitat protection and restoration.

It provides a venue for regional collaboration and serves as a platform to secure state and federal funding. The IRWMP includes a list of over 300 project proposals, and a methodology for ranking those projects for the purpose of submitting a compilation of high priority projects for grant funding. The Santa Clara Basin SWRP was submitted to the Bay Area IRWMP Coordinating Committee and incorporated into the IRWMP as an addendum. As SWRP projects are proposed for grant funding, they will be added to the IRWMP list using established procedures.

[10] http://bayareairwmp.org/

4. GSI DESIGN GUIDELINES, DETAILS, AND SPECIFICATIONS

The MRP requires that the GSI Plan include general design and construction guidelines, standard specifications and details (or references to those documents) for incorporating GSI components into projects within the City. These guidelines and specifications should address the different street and project types within the City, as defined by its land use and transportation characteristics, and allow projects to provide a range of functions and benefits, such as stormwater management, bicycle and pedestrian mobility and safety, public green space, and urban forestry.

The City, along with other SCVURPPP agencies, helped fund and provided input to the development of countywide guidelines by SCVURPPP to address the MRP requirements and guide the implementation of GSI Plans. The resulting SCVURPPP GSI Handbook (Handbook) is a comprehensive guide to planning and implementation of GSI projects in public streetscapes, parking lots and parks. The Handbook consists of two parts, the contents of which are described in the following sections. The City intends to use this Handbook as a reference when creating City-specific guidelines and specifications to meet the needs of the various departments.

4.1 Design Guidelines

Part 1 of the Handbook provides guidance on selection, integration, prioritization, sizing, construction, and maintenance of GSI facilities. It includes sections describing the various types of GSI, their benefits, and design considerations; how to incorporate GSI with other uses of the public right-of-way, such as bicycle and pedestrian infrastructure and parking; and guidelines on utility coordination and landscape design for GSI. In addition, the Handbook also provides guidance on post-construction maintenance practices and design of GSI to facilitate maintenance.

Part 1 also contains a section on proper sizing of GSI measures. Where possible, GSI measures should be designed to meet the same sizing requirements as Regulated Projects, which are specified in MRP Provision C.3.d. In general, the treatment measure design standard is capture and treatment of 80% of the annual runoff (i.e., capture and treatment of the small, frequent storm events). However, if a GSI measure cannot be designed to meet this design standard due to constraints in the public right-of-way or other factors, the City may still wish to construct the measure to provide some runoff reduction and water quality benefit and achieve other benefits. For these situations, the Handbook describes regional guidance on alternative design approaches developed by the Bay Area Stormwater Management Agencies Association (BASMAA) for use by MRP permittees.

4.2 Details and Specifications

Part 2 of the Handbook contains typical details and specifications that have been compiled from various sources within California and the U.S. and modified for use in Santa Clara County. The Handbook includes details for pervious pavement, stormwater planters, stormwater curb extensions, bioretention in parking lots, infiltration measures, and stormwater tree wells, as well as associated components such as edge controls, inlets, outlets, and underdrains. It also provides typical design details for GSI facilities in the public right-of-way that address utility protection measures and consideration of other infrastructure in that space.

4.3 Incorporation of SCVURPPP Details and Specifications into City Standards

The City will refer to the GSI Handbook for typical details as needed. Over time, the City may choose to customize some commonly used details and incorporate these into the City standards.

5. GSI PROJECT PRIORITIZATION

To meet the requirements of the MRP, the City's GSI Plan must contain a project identification and prioritization mechanism. The mechanism must include the criteria for prioritization and outputs that can be incorporated into the City's long-term planning and capital improvement processes.

This chapter describes different GSI project categories considered within the City, followed by a description of the process employed by the City to identify public lands that offer opportunities to implement GSI and prioritize those opportunities, and the results of the process.

5.1 Project Types

GSI project types that have been or may be implemented in the City fall into the following categories: Early Implementation Projects, C3 Regulated Projects, green streets, LID Retrofits, and Regional Projects. Green streets, LID Retrofits, and Regional Projects are types of GSI capital projects that the City may implement to meet the water quality goals in the MRP and multi-benefit objectives defined in the GSI Plan. GSI capital projects are typically not regulated projects (although they must conform to the sizing and design requirements contained in Provision C.3, except under certain circumstances) and they are primarily public projects under control of the City. Green streets, LID Retrofits, and Regional Projects are the focus of the prioritization process described in Section 5.2, but all five GSI project types are considered as part of the City-wide GSI strategy presented in Chapter 6. Several factors, such as change in scope of work, funding, site conditions, etc. determine the ability of the City to implement GSI capital projects.

5.1.1 Early Implementation Projects

Early Implementation Projects are GSI projects that have already been implemented by the City, or are planned for implementation during the permit term (i.e., before December 2020), or have been identified as the City as having potential for GSI. The City has already implemented one GSI project, as discussed in Section 2.4. The City identified additional Early Implementation projects through a review of its Capital Improvement Program (CIP), as discussed in Section 5.2.2 below

5.1.2 Regulated Projects

C3 Regulated Projects are those implemented as part of new and redevelopment within the City, both private and public, that must meet the post-construction stormwater treatment requirements per Provision C.3 of the MRP. Regulated projects include private development or redevelopment projects, such as multi-family residential buildings, commercial office buildings, or shopping plazas, as well as public projects, such as libraries, police stations, and parking lots, that exceed the impervious surface thresholds.

5.1.3 LID Projects

LID projects mitigate stormwater impacts by reducing runoff through capture and/or infiltration and treating stormwater on-site before it enters the storm drain system. LID projects may include bioretention facilities, infiltration trenches, pervious pavement, green roofs, and systems for rainwater harvesting and use. For the purposes of the GSI Plan, LID projects are GSI facilities that treat runoff generated from a publicly-owned parcel <u>on that parcel</u>.

5.1.4 Regional Projects

Regional projects capture and treat stormwater runoff from on-site and off-site sources, including surface runoff and diversions from storm drains. The benefits of regional stormwater capture projects can include flood risk reduction, stormwater treatment and use, and groundwater recharge. These projects may take a variety of forms such as detention and retention basins and subsurface vaults and infiltration galleries. The site characteristics will determine what types of regional projects are feasible, e.g., whether a project is on-line or off-line from the storm drain network, whether it is desirable to change the functionality of the site, whether the project is above ground or underground, and the size of the project.

5.1.5 Green Street Projects

Green street projects are GSI opportunities in the public right-of-way that capture runoff from the street and adjacent areas that drain to the street. The technologies used for green streets are similar to those used in LID projects but are limited to designs that can be used in the right-of-way. Green street projects may include bioretention (e.g., stormwater planters, stormwater curb extensions or stormwater tree filters), pervious pavement, and/or infiltration trenches. Green street GSI features can be incorporated into other improvements in the right-of-way, including complete streets designs and improvements for pedestrian and cyclist safety.

5.2 Identification and Prioritization Process

The City of Santa Clara GSI opportunity identification and prioritization process involved two steps. The first step was the screening and prioritization methodology used in the Santa Clara Basin SWRP (see Section 3.3.1) to identify and prioritize GSI opportunities on public parcels and street segments within the City's jurisdictions. The second step in the process involved overlaying City-specific priorities, planning areas, and upcoming City projects onto the regional prioritization results to align the results of the SWRP prioritization process with the City's priorities. These steps are described in detail below.

5.2.1 Step 1: Stormwater Resource Plan Prioritization

Building on existing documents that describe the characteristics and water quality and quantity issues within the Santa Clara Basin (i.e., the portion of Santa Clara County that drains to San Francisco Bay), the SWRP identified and prioritized multi-benefit GSI opportunities throughout the Basin, using a metrics-based approach for quantifying project benefits such as volume of stormwater infiltrated and/or treated, and quantity of pollutants removed. The metrics-based analysis was conducted using hydrologic/ hydraulic and water quality models coupled with Geographic Information System (GIS) resources and other tools. The products of these analyses were a map of opportunity areas for GSI projects throughout the watershed, an initial prioritized list of potential project opportunities, and strategies for implementation of these and future projects.

The process began by identifying and screening public parcels and public rights-of-way that can support GSI. Project opportunities were split into the three categories described above – LID, regional, and green streets projects -- because of fundamental differences in GSI measures used, project scale, and measures of treatment efficiency. Screening factors are presented in Table 5-1.

After the identification of feasible GSI opportunity locations, screened streets and parcels were prioritized to aid in the selection of project opportunities that would be the most effective and provide the greatest number of benefits. In addition to physical characteristics, several special considerations were included in the prioritization methodology to consider coordination with currently planned projects provided by agencies, as well as consideration of additional benefits that projects could provide. A discussion of the screening and prioritization process for each project category is presented in the subsequent sections. Figures 5-1 through 5-3 present the results of the various steps.

Table 5-1 Screening factors for parcel-based and right-of-way project opportunities

Screening Factor	Characteristic	Criteria	Reason
Parcel-based			
Public Parcels	Ownership	County, City, Town, SCVWD, State, Open Space Agencies	Identify all public parcels for regional stormwater capture projects or onsite LID retrofits
	Land Use	Park, School, Other (e.g., Golf Course)	
Suitability	Parcel Size	≥ 0.25 acres	Opportunity for regional stormwater capture project
		< 0.25 acres	Opportunity for on-site LID project
	Site Slope	< 10 %	Steeper grades present additional design challenges
Right-of-Way			
Selection	Ownership	Public	Potential projects are focused on public right-of-way opportunities
Suitability	Surface	Paved	Only roads with paved surfaces are considered suitable. Dirt roads were not considered.
	Slope	< 5%	Steep grades present additional design challenges; reduced capture opportunity due to increased runoff velocity
	Speed	≤ 45mph	Excludes higher speed roads such as major arterials and highways

LID and Regional Stormwater Capture Project Opportunities

The screening criteria for LID and regional project opportunities were ownership (focusing only on public parcels), land use, parcel size and site slope. As shown in Table 5-1, parcel size was used to determine whether a location could support a regional or LID project.

Parcels that met the screening criteria were prioritized based on physical characteristics such as soil group, slope, and percent impervious area, proximity to storm drains, proximity to flood-prone creeks and areas, proximity to potential pollutant sources, whether they were in a priority development area, whether they were within a defined proximity to a planned project, and whether the project was expected to have other benefits such as augmenting water supply, providing water quality source control, re-establishing natural hydrology, creating or enhancing habitat, and enhancing the community. Prioritization metrics for LID project scoring and regional project scoring are shown in separate tables in Appendix A. The result of the parcel prioritization was a list and map of potential project locations based on the above criteria.

Green Street Project Opportunities

The screening criteria for green streets project opportunities in the public right-of-way were ownership, surface material, slope, and speed limit (Table 5-1). The screened public right-of-way street segments (approximately one block in length) were then prioritized based on physical characteristics, proximity to storm drains, proximity to flood-prone creeks and areas, proximity to potential pollutant sources, whether they were in a priority development area, whether they were in proximity to a planned project, and whether the project was expected to have other benefits (similar to LID and regional projects). Prioritization metrics for green streets projects are shown in Appendix A.

The initial prioritization process resulted in a large number of potential green streets project opportunities within the Santa Clara Basin. In order to identify the optimal locations for green street projects, the street segments in each municipality's jurisdiction with scores in the top 10 percent of ranked green street opportunities were identified and mapped.

The City-owned parcel-based and top ten percent green street opportunities for the City of Santa Clara are shown in Figure 5-1. This subset of project opportunities from the SWRP was carried over into Step 2 City-Specific Prioritization (Section 5.2.2).

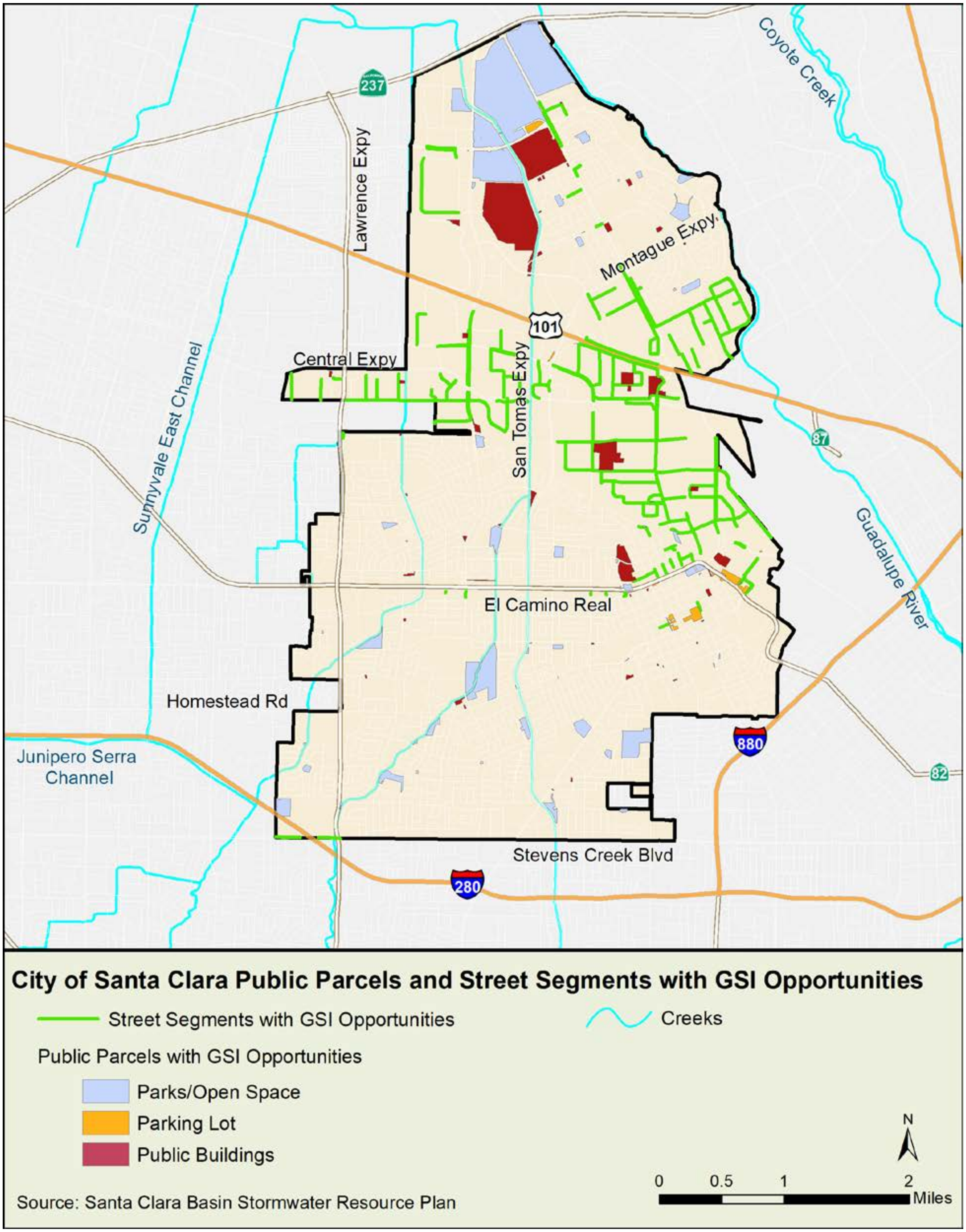


Figure 5-1 City of Santa Clara Public Parcels and Street Segments with GSI Opportunities (Source: Santa Clara Basin Stormwater Resource Plan)

5.2.2 Step 2: City-Specific Prioritization

The City's local priorities for project implementation include: 1) upcoming capital improvement projects that can be combined with GSI projects, 2) opportunities to implement GSI projects in conjunction with anticipated Focus Areas of private development and 3) opportunities to address pollutants in runoff from old industrial areas.

Upcoming Capital Improvement Projects with Potential for GSI

As required by the MRP, the City reviews its Capital Improvement Program (CIP) project list annually to identify opportunities for GSI. Based on this review, the City prepares and maintains a list of any public GSI projects that are planned for implementation during the permit term and public projects that have potential for GSI measures. As part of this process, the City identified the Machado Park Rehabilitation project as a planned GSI project. The project design includes bioretention areas for stormwater treatment. The project location is shown in Figure 5-4.

Focus Areas

The City of Santa Clara's General Plan identifies eleven Focus Areas that represent locations with opportunities for more intense development with limited impact on existing neighborhoods.

The current Near-term and Future Focus Areas are:

Near-term Focus Areas:

- El Camino Real Focus Area
- Downtown Focus Area
- Santa Clara Station Focus Area
- Stevens Creek Boulevard Focus Area
- Lawrence Station Focus Area (East of Lawrence Expressway)
- Tasman East Focus Area
- Freedom Circle Focus Area
- Patrick Henry Focus Area

Future Focus Areas:

- Central Expressway Focus Area
- De La Cruz Focus Area
- Lawrence Station Future Focus Area (West of Lawrence Expressway)

The City has completed the development of the Lawrence Station Area Plan (for the Lawrence Station Focus Area located east of Lawrence Expressway). The El Camino Real Specific Plan and the Freedom Circle Area Specific Plan are under development. The specific/area plans will provide detailed guidelines for development in these Focus Areas. Because a high level of development is expected to occur within the Focus Areas, they have a high potential for opportunities to construct GSI facilities. The GSI projects could be part of private redevelopment projects or public improvement projects. In addition, the City has identified one Master Planned Community, called City Place Santa Clara. Redevelopment of this area may also offer opportunities for constructing GSI. The Focus Areas and the Master Planned Community are shown in Figure 5-2.

Priority Development Areas

In 2008, ABAG and the Metropolitan Transportation Commission created a regional initiative, called Plan Bay Area, to support local efforts linking job opportunities with housing to create sustainable communities. Plan Bay Area identifies Priority Development Areas (PDAs) within existing communities. PDAs are locally-identified, infill development opportunity areas. They are generally areas where there is local commitment to developing more housing along with amenities and services to meet the day-to-day needs of residents in a pedestrian friendly environment served by transit. PDA's are within an existing community, near existing or planned fixed transit or served by comparable bus service, and planned for more housing.

Plan Bay Area 2040, an updated, long-range Regional Transportation Plan and Sustainable Communities Strategy for the nine-county San Francisco Bay Region, was adopted by the executive bodies of MTC and ABAG on July 26, 2017. It identifies two PDAs in the City of Santa Clara. These PDAs lie within the El Camino Real and Santa Clara Station Focus Areas. The PDAs are shown in Figure 5-2.

Old Industrial Areas

Stormwater runoff from industrial areas can contain more pollutants than runoff from other land uses. GSI installations in public streets near industrial areas may help remove these pollutants from stormwater runoff. Old industrial areas (i.e., industrial areas developed before 1980) located in the City of Santa Clara are shown in Figure 5-3. As these industrial areas are redeveloped, the City will explore installing GSI features in the public right-of-way.

Storm Drain Rehabilitation Projects

The City's Storm Drain Master Plan (SDMP), updated in 2015, establishes a prioritized capital improvement program to reduce the risk of flooding within the City. Storm drain rehabilitation projects provide an opportunity for simultaneous installation of green stormwater infrastructure to help reduce peak flows and the frequency of local flooding. The highest priority storm drain projects from the City's SDMP are mapped on Figure 5-4.

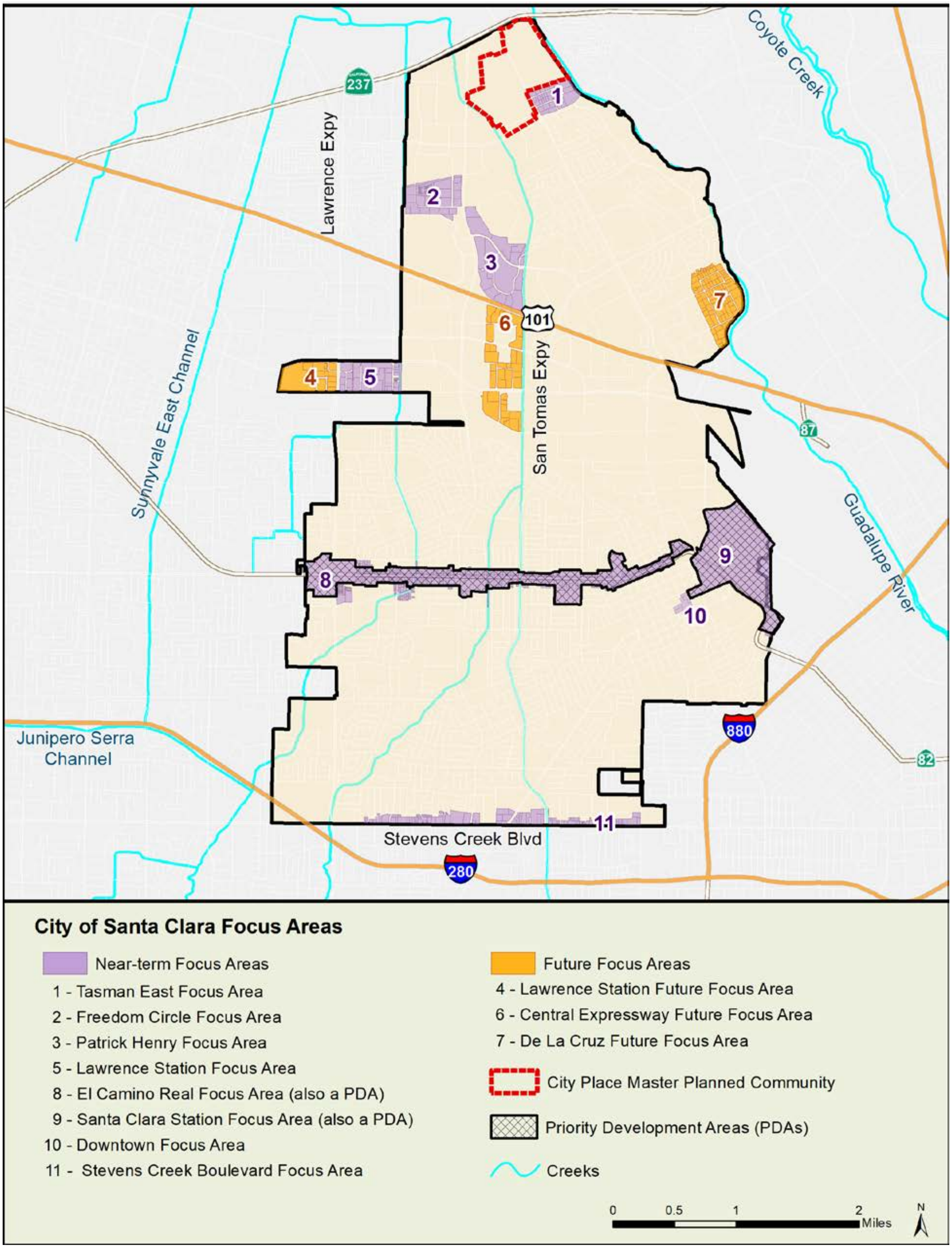


Figure 5-2 City of Santa Clara Focus Areas, Master Planned Community, and Priority Development Areas (Source: City of Santa Clara General Plan)

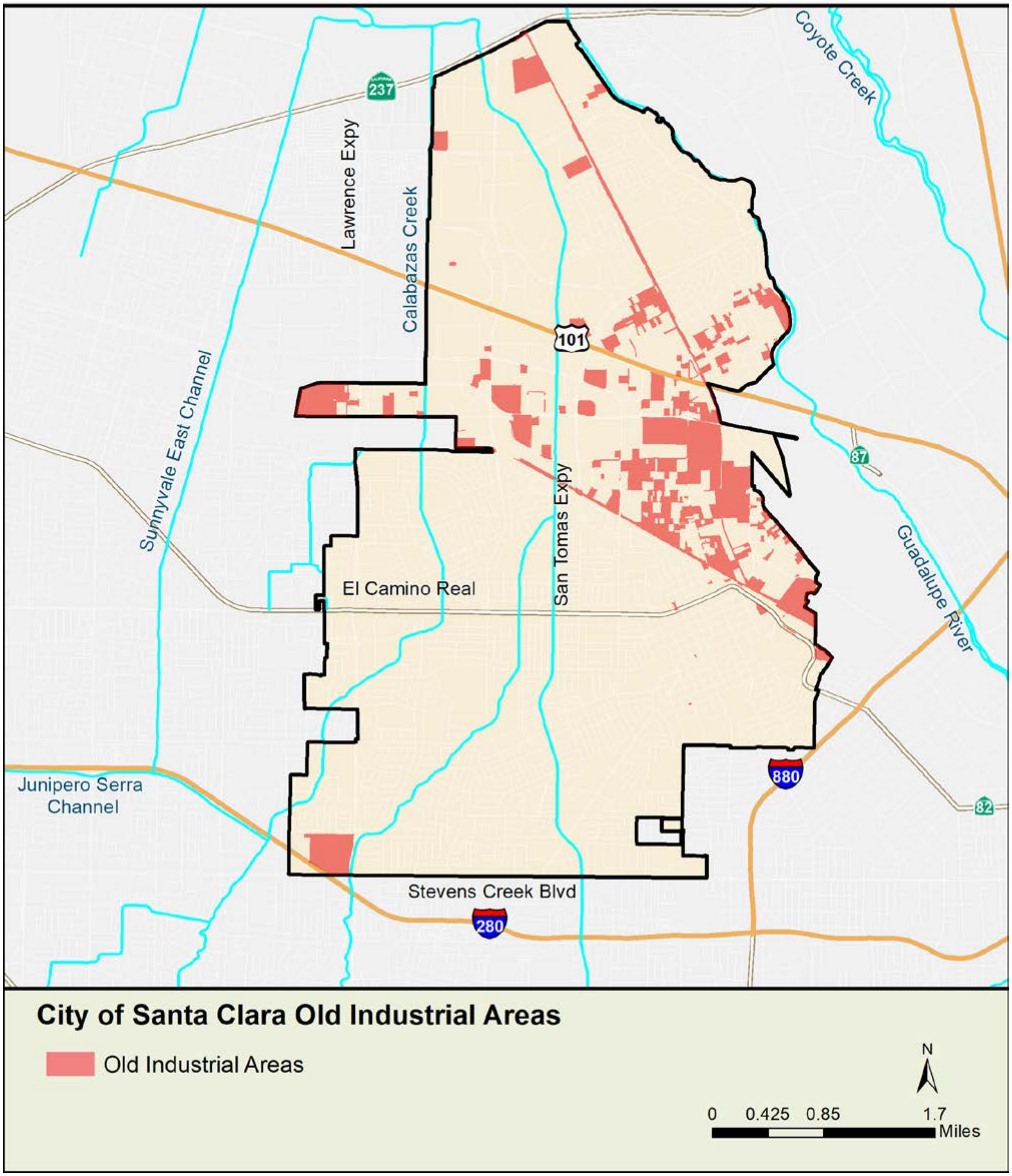


Figure 5-3 City of Santa Clara Old Industrial Areas (Source: SCVURPPP)

5.3 Prioritization Results

The map in Figure 5-4 shows a compilation of the factors involved in prioritizing the City's opportunities for GSI projects. The City-owned parcel-based and top 10 percent of green street project opportunities identified by the SWRP prioritization are overlaid here with the City's prioritization factors including Focus Areas, old industrial areas, priority storm drain projects, and the City's planned GSI project. The location of the City's completed GSI project is also shown on Figure 5-4 to demonstrate the City's efforts towards the implementation of GSI. An implementation plan is described in Chapter 6 to guide the City's development and implementation of GSI projects.

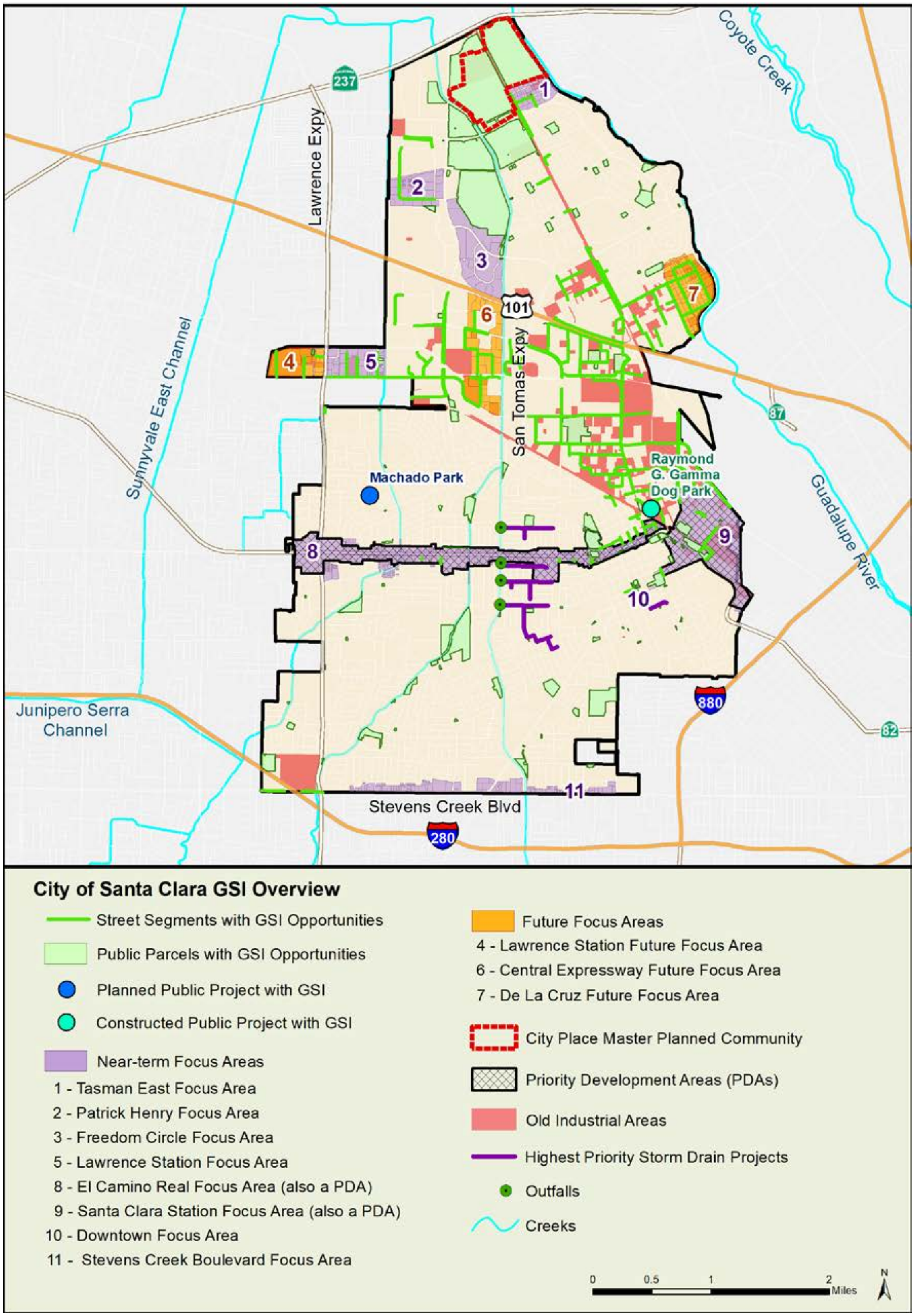


Figure 5-4 City of Santa Clara GSI Prioritization Overview

6. GSI IMPLEMENTATION PLAN

This chapter provides an overall strategy and steps for implementing GSI within the City of Santa Clara over the long term. The implementation plan has the following main components: (1) the citywide GSI strategy; (2) a process for identifying and evaluating GSI opportunities, (3) a workplan to complete Early Implementation Projects, (4) the legal and funding mechanisms that enable implementation, (5) estimated targets for the amounts of impervious surface to be "retrofitted" (i.e., redeveloped with GSI facilities to treat runoff from impervious surfaces) within the City, and (6) the technical tools that ensure the tracking of implemented projects.

6.1 Citywide GSI Strategy

The City of Santa Clara's approach to GSI planning will be consistent with the City's General Plan, which provides direction for sustainable, environmentally sensitive development to accommodate the City's growth. Identification of potential GSI projects will be based on the following priorities:

- Evaluation of CIP projects for opportunities – The City will continue to review its CIP list annually for opportunities to incorporate GSI into CIP projects and evaluate the feasibility of such projects. The City has established a process for CIP review to avoid missing GSI opportunities (see Section 6.2).
- Evaluation of non-CIP project opportunities – As awareness of GSI increases, municipal staff or local community members may also identify and recommend GSI projects opportunities. These projects will be considered using the methodology described in Section 6.2.
- Focus Areas of future development – As Specific Plans for the Focus Areas of future development are prepared, the City will explore and identify opportunities for implementing GSI.
- Coordination with private development – The City of Santa Clara will explore working with private property developers to install green infrastructure facilities in public rights-of-way near the properties they are developing, such as along street frontages.
- Evaluation of opportunities identified in the Stormwater Resource Plan – The public parcels and street segments identified in the SWRP are opportunity areas for GSI projects. The City will use the SWRP list to help identify potential project locations for GSI implementation.
- Redevelopment in old industrial areas– GSI installations are designed to remove pollutants from stormwater runoff, and they can be especially effective in treating runoff from old industrial areas that may generate more pollutants than other land uses. The City's GSI planning process will explore installing GSI facilities in industrial areas as they are redeveloped.
- Coordination with BART, VTA, and Caltrans – The City with coordinate with BART, VTA, and Caltrans on local projects to identify GSI opportunities.

The City will also continue to require future development projects to comply with C.3 requirements of the Municipal Regional Permit (MRP), and include site design, source control, treatment control, and hydromodification management measures as applicable.

6.2 Process for Identifying and Evaluating Potential GSI Projects

The City will use the various mechanisms described in its strategy (Section 6.1) to identify GSI opportunities in public projects.

The City will use the guidance developed by BASMAA[11] (See Appendix B) and the SWRP prioritization criteria to evaluate public projects to determine the potential for the inclusion of GSI measures at the project planning level. The evaluation may include site reconnaissance, drainage area delineation, and cost analysis. If not already on the CIP list, projects identified through this process will be added to the CIP list when it is updated. Projects with a GSI component may be included in the CIP as funded or unfunded projects. An unfunded project's inclusion in the CIP demonstrates that it is a City priority pending adequate funding. The City prepares the CIP budget biennially. The next biennial CIP budget will be prepared in 2020 covering FY 2020-21 and FY 2021-22.

The City will map all potential GSI project opportunities to determine their proximity to green street or parcel-based project opportunities identified in the SWRP (Section 5.2.1). Potential GSI projects that are adjacent to SWRP opportunity areas may be eligible for state bond funding. Projects with opportunities for GSI may be submitted to the SWRP during the SWRP update process if they are not already included in the SWRP. This will allow those projects to be eligible for future state bond funding. The SWRP will likely be updated in the 2022-2023 timeframe. At this time, SCVURPPP will reach out to all member agencies to provide their project lists for prioritization and inclusion in the updated SWRP.

6.3 Work Plan for Completing Early Implementation Projects

Provision C.3.j. of the MRP requires that the City identify, prepare, and maintain a list of GSI projects that are planned for implementation during the permit term, and infrastructure projects that have potential for GSI measures. The list is reviewed and submitted with each Annual Report to the Regional Water Board. Table 6-1 includes information on the City's planned GSI project.

Table 6-1 Workplan for City of Santa Clara's Planned GSI Project

Project Name	Description	Status	Timeframe for Construction
Machado Park Rehabilitation	Rehabilitation of playground equipment and surfacing, walkway, landscaping, and irrigation system. Installation of new sewer and water lines for new drinking fountains at park. The runoff from Machado park's two playground areas and concrete walkways will be treated by a bioretention area located near a picnic area.	Under Construction	Summer 2019

[11] BASMAA Development Committee (2016) Guidance for Identifying Green Infrastructure Potential in Municipal Capital Improvement Program Projects. May.

6.4 Legal Mechanisms

Provision C.3.j.i.(3) of the MRP requires permittees to "Adopt policies, ordinances, and/or other appropriate legal mechanisms to ensure implementation of the Green Infrastructure Plan in accordance with the requirements of this provision."

As described in Section 1.3.2, the City of Santa Clara and other municipalities subject to Provision C.3 of the MRP must require post-construction stormwater control measures on regulated development projects. Post-construction stormwater controls reduce pollutants from flowing to streams, creeks, and the Bay and reduce the risk of flooding by managing peak flows. Section 13.20.080 of the City's Municipal Code provides broad legal authority for the City to require regulated private development projects to comply with MRP requirements.

GSI projects are typically not regulated projects (although they must conform to the sizing and design requirements contained in Provision C.3, except under certain circumstances) and they are primarily public projects under control of the City. As part of the GSI Plan process, the City reviewed its existing policies, ordinances, and other legal mechanisms related to the implementation of stormwater NPDES permit requirements and found that it has sufficient legal authority to implement the GSI Plan. Approval of the GSI Plan by the City's Council will further strenghten this authority.

6.5 Evaluation of Funding Options

Implementation of GSI projects is contingent upon the City identifying funding sources for GSI planning, design, construction, and maintenance.

The total cost of GSI includes costs for planning, capital (design, engineering, construction) and ongoing expenditures, including operations and maintenance (O&M), utility relocation, and feature replacement. It is likely that no single source of revenue will be adequate to fund implementation of GSI, and a portfolio of funding sources will be needed. There are a variety of approaches available to help fund up-front and long-term investments. This section discusses the City's current stormwater management funding sources and then describes additional funding strategies available to implement GSI that are being considered by the City for future funding.

Current Funding Sources for GSI Program Elements

The City of Santa Clara currently uses a combination of federal and state grants and general funds to fund construction of projects in its capital improvement program (CIP) and other projects. General funds are used for public street, parking lot and building maintenance; maintenance of stormwater control measures installed at public projects; and maintenance of other landscaped areas (e.g., parks, medians, public plazas, etc.) The City has a Storm Drain Environmental Compliance Fee that is used to implement its Urban Runoff Pollution Prevention Program.

Potential Future Funding Options

As required by the MRP, the City analyzed possible funding options to raise additional revenue for design, construction, and long-term O&M of GSI projects. The City used the guidance on stormwater funding options developed by SCVURPPP (2018) as a reference for conducting its analysis. Table 6-2 summarizes the funding options that will be considered by the City as the Plan is implemented. For each type of funding mechanism, the table provides a brief overview and specifics related to GSI, pros and cons, and applicability to funding planning, capital, and/or long-term O&M costs.

Table 6-2 Potential GSI Funding Options

Section/Overview	GSI Specifics	Pros	Cons	Type of Funding
Parcel Taxes: Revenue stream through taxing property or other system.	Can be used to set up, fund and maintain a stormwater program and MRP compliance.	• Well understood tax • Stable revenue stream over many years • Legally reliable • Can also be done by mail.	• High political threshold • Vulnerable to competition with other measures on the ballot. • Considerable effort and resources required with uncertain odds of success.	• Planning • Capital • O&M
Property-related Fees: Fees on real property.	• Fee on property contributing stormwater runoff to MS4. • Can be used to set up, fund and maintain a stormwater program and MRP compliance.	• Most-commonly used mechanism for funding stormwater programs. • Easier to pass with 50% threshold and mailing process.	• Property-based fees must use a standardized methodology for calculating the fee. • Considerable effort and resources required with uncertain odds of success. • Approval process is more time consuming and expensive for staff. • Schools may have large fees and public schools may be exempt from fees depending on the agency's specific ordinance.	• Planning • Capital • O&M
Development Impact Fees: Fees paid by an applicant seeking approval of a development project.	Could potentially be used to fund retrofits of adjacent public right-of-way areas with GSI as part of development or redevelopment projects.	Cost for retrofitting streets can be leveraged through development activities.	If a fee is found to not relate to the impact created by the development project, or to exceed the reasonable cost of providing the public service, then the fee may be declared a "special tax" subject to approval by a two-thirds majority of voters.	• Planning • Capital

Section/Overview	GSI Specifics	Pros	Cons	Type of Funding
Grants: One-time funds that require an application from a funding agency.	Could be used to plan, design and/or build GSI.	Can fund programs or systems that would otherwise take up significant general fund revenues.	• Usually a one-time source of funding only. • May need to create new programs and systems for each grant. • Usually have strings attached for matching funds and other requirements. • Little control over timing of applications and payment can lead to difficulties in coordination with other programs and grants. • Can be very competitive and resource intensive to apply. • No guarantee of success. • Post-project O&M costs must be borne by the agency.	• Planning • Capital
Integration with Transportation Projects: Leveraging transportation funding to cost-effectively include stormwater quality elements.	Installation and maintenance of GSI facilities as part of integrated roadway programs.	• Roadway projects have more funding than stormwater programs and are generally more popular with the public. • Complete and green streets may be more popular with the public than traditional car-focused streets. • Green streets may be less expensive than traditional streets based on a life cycle cost analysis.	• Roadways have been designed in certain ways with expectations of costs and purposes for decades. • Many roadways are in poor condition and there is not enough funding to fix them all. • GSI is perceived as an “added” cost which, could reduce the number of roadways that can be maintained. • Transportation funding is often restricted to certain roadway construction elements.	• Planning • Capital

Section/Overview	GSI Specifics	Pros	Cons	Type of Funding
Alternative Compliance: Allows developers the flexibility to build, or fund through payment of an in-lieu fee, off-site stormwater treatment systems for regulated projects or set up credit trading programs.	Leveraging development activities to build and maintain GSI systems. In lieu fees can be used by developers who would rather make a lump sum payment and quickly complete their compliance requirements. Credit trading programs can incentivize non-regulated properties to retrofit impervious surfaces.	• Gives flexibility to site GI systems in locations that optimize pollutant loading reduction and other benefits to the community. • Allows for off-site stormwater treatment when stormwater management requirements can't be met within a regulated project site. • An in-lieu fee and/or credit trading system can be used to achieve additional retrofits and installation of GSI.	• Can be difficult to come up with viable alternative locations for GSI installations. • Can be difficult to quantify how much a developer should pay upfront for long-term maintenance costs that the municipality will bear. • May require agencies to modify the stormwater sections of their municipal codes to allow for the creation and/or use of the desired options/programs.	• Planning • Capital • O&M
Public-Private Partnerships (P3s): Agreements or contracts between a municipality and a private company to perform specific tasks.	Can provide for the design, construction and maintenance of GSI systems over a long period.	• Leverages public funds while minimizing impacts to a municipality's debt capacity. • Access to advanced technologies. • Improved asset management. • Draws on private sector expertise and financing. • Benefits local economic development and "green jobs." • Relieves pressure on internal local government resources.	• Stormwater fee or other source of stable revenue over the life of the P3 contract is required. • Contracts out to the private sector the construction and maintenance of GSI systems, possibly removing some municipal control.	• Planning • Capital • O&M

Section/Overview	GSI Specifics	Pros	Cons	Type of Funding
In-Lieu Fee - An option to pay a fee in-lieu of treating a portion of runoff onsite.	Can provide for the design, construction and maintenance of GSI systems over a long period.	• The City's list of priority projects in strategic locations can provide opportunities for GSI implementation. • Can result in a net environmental benefit compared to the developer meeting C.3.d requirements onsite. • The regulated project developer would benefit through maximized area of economically productive development on the property.	• The risk of collecting insufficient fees to implement projects and fees being use for purposes other than project delivery. • The City's focus on establishing the fee to cover all project-related costs is likely to result in a fee that is high enough that it would only be an economically attractive option for high-value real estate development.	• Planning • Capital • O&M

6.6 Impervious Area Targets

As mentioned in Section 1.2, the focus of the GSI Plan is the integration of GSI systems into public rights-of-way. However, other provisions of the MRP (C.11 and C.12) establish a linkage between public and private GSI features and required reductions of pollutants in stormwater discharges. To help estimate the pollutant load reductions that can be achieved by GSI during the 2020, 2030, and 2040 timeframes, the MRP requires that Permittees include in their GSI Plans estimated targets for the amounts of impervious surface to be "retrofitted" (i.e. redeveloped with GSI facilities to treat runoff from impervious surfaces) as part of public and private projects during the same timeframes.

The City worked with SCVURPPP staff to develop a methodology to predict the extent and location of privately- and publicly-owned land areas that will be redeveloped in their jurisdictions and whose stormwater runoff will be addressed via GSI facilities, and to derive impervious surface targets for GSI retrofits associated with these redevelopment projects. The methodology and results are described in Sections 6.6.1 and 6.6.2 below.

6.6.1 Methodology

The first step in the process used historic development trends and City staff's knowledge of planned/projected redevelopment in the City to estimate the acres of redevelopment that will occur in the City by 2020, 2030, and 2040 via redevelopment of privately- and publicly-owned parcels that would trigger C.3 requirements under the current MRP (i.e. C.3 regulated projects). Stormwater runoff associated with these parcels will be addressed via GSI measures, as required by the permit.

The second step was to estimate the acres of impervious surface associated with future redevelopment of these privately and publicly-owned parcels. To do this, it was necessary to predict the likely locations and types of land areas that are anticipated to be addressed by GSI in the future. Growth patterns and time horizons for development, along with algorithms to identify which parcels were likely to redevelop, resulted in preliminary estimates of the extent of land area predicted to be addressed by GSI facilities in the City of Santa Clara by 2020, 2030, and 2040. Using the current land use of the predicted locations of GSI implementation and associated impervious surface coefficients for each land use type, estimates of the amount of impervious surface that will be retrofitted with GSI on privately and publicly-owned parcels were developed.

The methodology focused on parcel-based redevelopment as the location and timing of projects in the public right-of-way is uncertain and the contribution to overall impervious surface treated by GSI expected to be minor relative to the acreage projected to be treated by C.3 projects.

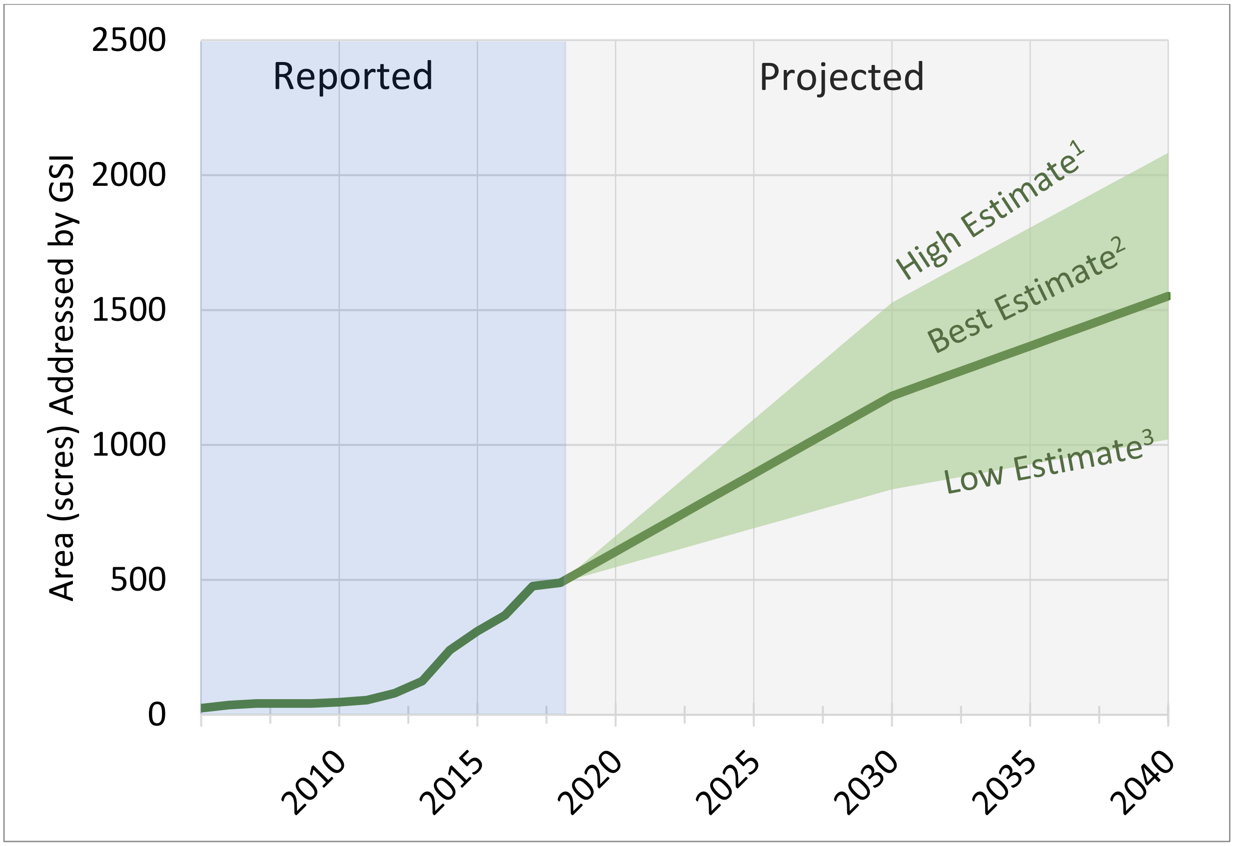
6.6.2 Results

Using the methodology described above, a predicted redevelopment rate of 57.7 acres per year was calculated for the City of Santa Clara for the 2020-2030 timeframe. A lower rate of 37 acres per year was projected for the 2031-2040 timeframe. The higher rate for the 2020-2030 timeframe is based on the high level of development that is currently happening and likely to happen over the next 10 years due to the expected redevelopment of Focus Areas like Tasman East, Freedom Circle, Patrick Henry Drive and City Place.

"Best" estimates of the magnitude of land areas that is predicted to be addressed by future GSI facilities by the 2020, 2030, and 2040 milestones were calculated using the two rates. "High" (i.e., 50% > "best") and "Low" (i.e., 50% < "best") estimates of future GSI implementation were also calculated to provide a range of potential redevelopment levels and to account for uncertainty in the “Best” estimate. Figure 6-1 and Table 6-3 present the outputs of the analysis and represent the total acreage known to be addressed by GSI in the City of Santa Clara through 2018, and the best estimate of the cumulative land area that will be addressed by 2020 (605 acres), 2030 (1,182 acres), and 2040 (1,552 acres).

6.6.3 Impervious Surface Retrofit Targets

Table 6.4 lists the impervious surface percentage for each land use class, based on impervious surface coefficients typically utilized, and the estimated impervious surfaces for private and public parcel-based projects that are predicted to be retrofitted by 2020 (487 acres), 2030 (732 acres) and 2040 (1,019 acres) in the City of Santa Clara via GSI implementation. Note that these predictions do not include impervious surface that may be addressed by projects in the public right-of-way, and that these predictions have a high level of uncertainty because future redevelopment rates may increase or decrease relative to the historic development trends that the rate for Santa Clara was based on. Therefore, actual impervious surface addressed by GSI by the various milestones may increase or decrease relative to what is presented in Table 6.4.



[1]High estimate – projected from 150% of "Best Estimate; [2]Best estimate – rate of redevelopment based on 10-year average (2009-2018) and active/planned projects; and [3]Low estimate – projected from 50% of "Best Estimate"

Figure 6-1 Existing and projected cumulative land area (acres) anticipated to be addressed via Green Stormwater Infrastructure facilities installed via private redevelopment in the City of Santa Clara by 2020, 2030, and 2040

Table 6-3 Projected cumulative land area (acres) anticipated to be addressed via Green Stormwater Infrastructure facilities via private redevelopment in the City of Santa Clara by 2020, 2030, and 2040

Year	Low[1]	Best[2]	High[3]
Existing GSI[4]	-	**489**	-
2020	547	**605**	662
2030	835	**1,182**	1,528
2040	1,020	**1,552**	2,083

[1] Low estimate – projected from 50% of "Best Estimate"; [2]Best estimate – rate of redevelopment based on 10-year (2009-2018) and adjusted following City staff input; and [3]High estimate – projected from 150% of "Best Estimate"; [4]Total area addressed by parcel-based redevelopment projects with GSI completed as of 2018 (excludes non-jurisdictional and green street and regional projects).

Table 6-4 Actual (2002-2018) and predicted (2019-2040) extent of impervious surface retrofits via GSI implementation on privately-owned parcels in the City of Santa Clara by 2020, 2030, and 2040

Previous Land Use	% of Area Impervious [a]	Retrofits via GSI Implementation									
		2002-2018		2019-2020		2021-2030		2031-2040		Total (2002-2040)	
		Total Area (acres)	Impervious Area (acres)	Total Area (acres)[c]	Impervious Area (acres)	Total Area (acres)	Impervious Area (acres)	Total Area (acres)	Impervious Area (acres)	Total Area (acres)	Impervious Area (acres)
Colleges and Universities	47%	1	1	0	0	2	1	23	11	26	12
Commercial	83%	198	165	59	49	126	104	121	100	504	418
Industrial	91%	103	94	76	70	77	70	106	97	363	330
K-12 Private Schools	67%	0	0	0	0	0	0	45	30	45	30
Residential - High Density	82%	32	26	25	21	1	1	24	20	82	68
Residential - Low Density	47%	7	3	1	0	6	3	2	1	15	7
Retail	96%	40	39	19	19	66	63	28	27	154	148
Urban Parks	20%	5	1	0	0	0	0	5	1	11	2
Open Space[b]	1%	102	1	0	0	234	2	15	0	351	4
Totals		489	329	181	158	512	245	370	287	1,552	1,019
Cumulative[d]		489	329	670	487	1,182	732	1,552	1,019		

[a] Source: Existing Land Use in 2005: Data for Bay Area Counties, Association of Bay Area Governments (ABAG), January 2006

[b] Development totals from 2002-2018 may include new development of open space and vacant properties.

[c] The total area for 2019-2020 is based on facilities that are currently under construction or planned to occur prior to 2020 and not the calculated redevelopment rate and may therefore deviate from the "Best" acres presented for 2020 in Table 6-3.

6.7 Project Tracking System

A required component of the GSI Plan is to develop a process for tracking and mapping completed public and private GSI projects and making the information available to the public. The City will continue to implement existing internal tracking procedures for processing public and private projects with GSI, meeting MRP reporting requirements, and managing inspections of stormwater treatment facilities. In addition, the City will provide data to SCVURPPP for countywide tracking of completed public and private GSI projects. This countywide tracking tool can be used to document a project's pollutant reduction performance as well as overall total progress toward city or county-level stormwater goals

6.7.1 SCVURPPP Project Tracking System

SCVURPPP has developed a centralized, web-based data management system (GSI Database) with a connection to GIS platforms, for tracking and mapping all GSI projects in the Santa Clara Valley. The GSI Database provides a centralized, accessible platform for municipal staff to efficiently and securely upload and store GSI project data, and enhances SCVURPPP's ability to efficiently and accurately calculate and report a variety of performance metrics associated with GSI projects. It also allows portions of the GSI project information to be made publicly available.

6.7.2 City Project Tracking System (Regulated and GSI)

The City currently utilizes an internal tracking system to manage information about installed stormwater treatment measures (including GSI), O&M of public facilities, O&M verification program inspections, and enforcement actions. Tracking of post-construction O&M inspections and enforcement actions for private projects is through an electronic stormwater inspection system. Tracking of operation and maintenance of public stormwater facilities is currently paper based. The City is developing an inventory of its storm drain assets in GIS and plans to activate the storm drain maintenance module later in 2019 or in early 2020.

City staff will continue to collect and manage information on GSI projects and submit it annually to the SCVURPPP GSI Database through a web-based data entry portal for individual projects or upload data for multiple projects in batch on an annual basis, using standardized formats.

Appendix A
Prioritization Metrics for Scoring GSI Project Opportunities

Table A-1. Prioritization Metrics for LID Project Opportunities

Metric	Points						Weighting Factor
	0	1	2	3	4	5	
Parcel Land Use			Schools/ Golf Courses	Park / Open Space	Public Buildings	Parking Lots	
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	2
Hydrologic Soil Group		C/D		B		A	
Slope (%)		10 > X > 5	5 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X	
Within flood-prone storm drain catchments	No					Yes	
Contains PCB Interest Areas	None			Moderate		High	2
Within Priority Development Area	No					Yes	
Co-located with another agency project	No					Yes	
Augments water supply	No	Opportunity for capture and use				Above groundwater recharge area and not above groundwater contamination area	2
Water quality source control	No	Yes					
Reestablishes natural hydrology	No	Yes					
Creates or enhances habitat	No	Yes					
Community enhancement	No	Opportunities for other enhancements				Within DAC or MTC Community of Concern	

Table A-2. Prioritization Metrics for Regional Stormwater Capture Project Opportunities

Metric	Points						Weighting Factor
	0	1	2	3	4	5	
Parcel Land Use			Schools/Golf Courses	Public Buildings	Parking Lot	Park / Open Space	
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	2
Parcel Size (acres)	0.25 ≤ X < 0.5	0.5 ≤ X < 1	1 ≤ X < 2	2 ≤ X < 3	3 ≤ X < 4	4 ≤ X	
Hydrologic Soil Group		C/D		B		A	
Slope (%)		10 > X > 5	5 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X	
Proximity to Storm Drain (feet)	X > 1,000	1,000 ≥ X > 500		500 ≥ X > 200		200 ≥ X	
Within flood-prone storm drain catchments	No					Yes	
Contains PCB Interest Areas	None			Moderate		High	2
Within Priority Development Area	No					Yes	
Co-located with another agency project	No					Yes	
Augments water supply	No	Opportunity for capture and use				Above groundwater recharge area and not above groundwater contamination area	2
Water quality source control	No	Yes					
Reestablishes natural hydrology	No	Yes					
Creates or enhances habitat	No	Yes					
Community enhancement	No	Opportunities for other enhancements				Within DAC or MTC Community of Concern	

Table A-3. Prioritization Metrics for Green Street Project Opportunities

Metric	Points						Weighting Factor
	0	1	2	3	4	5	
Imperviousness (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	2
Hydrologic Soil Group		C/D		B		A	
Slope (%)		5 > X > 4	4 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X > 0	
Within flood-prone storm drain catchments	No					Yes	
Contains PCB Interest Areas	None			Moderate		High	2
Within Priority Development Area	No					Yes	
Co-located with another agency project	No					Yes	
Augments water supply	No	Opportunity for capture and use				Above groundwater recharge area and not above groundwater contamination area	2
Water quality source control	No	Yes					
Reestablishes natural hydrology	No	Yes					
Creates or enhances habitat	No	Yes					
Community enhancement	No	Opportunities for other enhancements				Within DAC or MTC Community of Concern	

Appendix B

Guidance for Identifying Green Infrastructure Potential in Municipal Capital Improvement Program Projects

BASMAA Development Committee

Guidance for Identifying Green Infrastructure Potential
in Municipal Capital Improvement Program Projects
May 6, 2016

Background

In the recently reissued Municipal Regional Stormwater Permit ("MRP 2.0"), Provision C.3.j. requires Permittees to develop and implement Green Infrastructure Plans to reduce the adverse water quality impacts of urbanization on receiving waters over the long term. Provisions C.11 and C.12 require the Permittees to reduce discharges of Mercury and PCBs, and portion of these load reductions must be achieved by implementing Green Infrastructure. Specifically, Permittees collectively must implement Green Infrastructure to reduce mercury loading by 48 grams/year and PCB loading by 120 grams/year by 2020, and plan for substantially larger reductions in the following decades. Green Infrastructure on both public and private land will help to meet these load reduction requirements, improve water quality, and provide multiple other benefits as well. Implementation on private land is achieved by implementing stormwater requirements for new development and redevelopment (Provision C.3.a. through Provision C.3.i.). These requirements were carried forward, largely unchanged, from MRP 1.0.

MRP 2.0 defines Green Infrastructure as:

> Infrastructure that uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water.

In practical terms, most green infrastructure will take the form of diverting runoff from existing streets, roofs, and parking lots to one of two stormwater management strategies:

1. Dispersal to vegetated areas, where sufficient landscaped area is available and slopes are not too steep.
2. LID (bioretention and infiltration) facilities, built according to criteria similar to those currently required for regulated private development and redevelopment projects under Provision C.3.

In some cases, the use of tree-box-type biofilters may be appropriate[1]. In other cases, where conditions are appropriate, existing impervious pavements may be removed and replaced with pervious pavements.

In MRP 2.0, Provision C.3.j. includes requirements for Green Infrastructure planning and implementation. Provision C.3.j. has two main elements to be implemented by municipalities:

1. Preparation of a Green Infrastructure Plan for the inclusion of LID drainage design into storm drain infrastructure on public and private land, including streets, roads, storm drains, etc.
2. Early implementation of green infrastructure projects ("no missed opportunities"),

This guidance addresses the second of these requirements. The intent of the "no missed opportunities" requirement is to ensure that no major infrastructure project is built without assessing the opportunity for incorporation of green infrastructure features.

Provision C.3.j.ii. requires that each Permittee prepare and maintain a list of green infrastructure projects, public and private, that are already planned for implementation during the permit term (not including C.3-regulated projects), and infrastructure projects planned for

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[1] Standard proprietary tree-box-type biofilters are considered to be non-LID treatment and will only be allowed under certain circumstances. Guidance on use and sizing of these facilities will be provided in a separate document.

implementation during the permit term that have potential for green infrastructure measures. The list must be submitted with each Annual Report, including:

> "… a summary of how each public infrastructure project with green infrastructure potential will include green infrastructure measures to the maximum extent practical during the permit term. For any public infrastructure project where implementation of green infrastructure measures is not practicable, submit a brief description for the project and the reasons green infrastructure measures were impracticable to implement".

This requirement has no specified start date; "during the permit term" means beginning January 1, 2016 and before December 31, 2020. The first Annual Report submittal date will be September 30, 2016.

Note that this guidance primarily addresses the review of proposed or planned public projects for green infrastructure opportunities. The Permittee may also be aware of proposed or planned private projects, not subject to LID treatment requirements, that may have the opportunity to incorporate green infrastructure. These should be addressed in the same way as planned public projects, as described below.

Procedure for Review of Planned Public Projects and Annual Reporting

The municipality's Capital Improvement Program (CIP) project list provides a good starting point for review of proposed public infrastructure projects. Review of other lists of public infrastructure projects, such as those proposed within separately funded special districts (e.g., lighting and landscape districts, maintenance districts, and community facilities districts), may also be appropriate. This section describes a two-part procedure for conducting the review.

Part 1 – Initial Screening

The first step in reviewing a CIP or other public project list is to screen out certain types of projects from further consideration. For example, some projects (e.g., interior remodels, traffic signal replacement) can be readily identified as having no green infrastructure potential. Other projects may appear on the list with only a title, and it may be too early to identify whether green infrastructure could be included. Still others have already progressed past the point where the design can reasonably be changed (this will vary from project to project, depending on available budget and schedule).

Some "projects" listed in a CIP may provide budget for multiple maintenance or minor construction projects throughout the jurisdiction or a portion of the jurisdiction, such as a tree planting program, curb and sidewalk repair/upgrade, or ADA curb/ramp compliance. It is recommended that these types of projects not be included in the review process described herein. The priority for incorporating green infrastructure into these types of projects needs to be assessed as part of the Permittees' development of Green Infrastructure Plans, and standard details and specifications need to be developed and adopted. During this permit term, Permittees will evaluate select projects, project types, and/or groups of projects as case studies and develop an approach as part of Green Infrastructure planning.

The projects removed through the initial screening process do not need to be reported to the Water Board in the Permittee's Annual Report. However, the process should be documented and records kept as to the reason the project was removed from further consideration. Note that projects that were determined to be too early to assess will need to be reassessed during the next fiscal year's review.

The following categories of projects may be screened out of the review process in a given fiscal year:

1. **Projects with No Potential -** The project is identified in initial screening as having no green infrastructure potential based on the type of project. For example, the project does not include any exterior work. Attachment 1 provides a suggested list of such projects that Permittees may use as a model for their own internal process.

2. **Projects Too Early to Assess –** There is not yet enough information to assess the project for green infrastructure potential, or the project is not scheduled to begin design within the permit term (January 2016 – December 2020). If the project is scheduled to begin within the permit term, an assessment will be conducted if and when the project moves forward to conceptual design.
3. **Projects Too Late to Change –** The project is under construction or has moved to a stage of design in which changes cannot be made. The stage of design at which it is too late to incorporate green infrastructure measures varies with each project, so a "percent-complete" threshold has not been defined. Some projects may have funding tied to a particular conceptual design and changes cannot be made even early in the design process, while others may have adequate budget and time within the construction schedule to make changes late in the design process. Agencies will need to make judgments on a case-by-case basis.
4. **Projects Consisting of Maintenance or Minor Construction Work Orders –** The "project" includes budgets for multiple maintenance or minor construction work orders throughout the jurisdiction or a portion of the jurisdiction. These types of projects will not be individually reviewed for green infrastructure opportunity but will be considered as part of a municipality's Green Infrastructure Plan.

Part 2 – Assessment of Green Infrastructure Potential

After the initial screening, the remaining projects either already include green infrastructure or will need to go through an assessment process to determine whether or not there is potential to incorporate green infrastructure. A recommended process for conducting the assessment is provided later in this guidance. As a result of the assessment, the project will fall into one of the following categories with associated annual reporting requirements. Attachment 2 provides the relevant pages of the FY 15-16 Annual Report template for reference.

- **Project is a C.3-regulated project and will include LID treatment.**

  Reporting: Follow current C.3 guidance and report the project in Table C.3.b.iv.(2) of the Annual Report for the fiscal year in which the project is approved.

- **Project already includes green infrastructure and is funded**.

  Reporting: List the project in "Table B-Planned Green Infrastructure Projects" in the Annual Report, indicate the planning or implementation status, and describe the green infrastructure measures to be included.

- **Project may have green infrastructure potential** pending further assessment of feasibility, incremental cost, and availability of funding.

  Reporting: If the feasibility assessment is not complete and/or funding has not been identified, list the project in "Table A-Public Projects Reviewed for Green Infrastructure" in the Annual Report. In the "GI Included?" column, state either "TBD" (to be determined) if the assessment is not complete, or "Yes" if it has been determined that green infrastructure is feasible. In the rightmost column, describe the green infrastructure measures considered and/or proposed, and note the funding and other contingencies for inclusion of green infrastructure in the project. Once funding for the project has been identified, the project should be moved to "Table B-Planned Green Infrastructure Projects" in future Annual Reports.

- **Project does not have green infrastructure potential.** A project-specific assessment has been completed, and Green Infrastructure is impracticable.

  Reporting: In the Annual Report, list the project in "Table A-Public Projects Reviewed for Green Infrastructure". In the "GI Included?" column, state "No." Briefly state the reasons for the determination in the rightmost column. Prepare more detailed documentation of the reasons for the determination and keep it in the project files.

Process for Assessing Green Infrastructure Potential of a Public Infrastructure Project

Initial Assessment of Green Infrastructure Potential

Consider opportunities that may be associated with:

- Alterations to roof drainage from existing buildings
- New or replaced pavement or drainage structures (including gutters, inlets, or pipes)
- Concrete work
- Landscaping, including tree planting
- Streetscape improvements and intersection improvements (other than signals)

Step 1: Information Collection/Reconnaissance

For projects that include alterations to building drainage, identify the locations of roof leaders and downspouts, and where they discharge or where they are connected to storm drains.

For street and landscape projects:

- Evaluate potential opportunities to substitute pervious pavements for impervious pavements.
- Identify and locate drainage structures, including storm drain inlets or catch basins.
- Identify and locate drainage pathways, including curb and gutter.

Identify landscaped areas and paved areas that are adjacent to, or down gradient from, roofs or pavement. These are potential facility locations. *If there are any such locations, continue to the next step.* Note that the project area boundaries may be, but are not required to be, expanded to include potential green infrastructure facilities.

Step 2: Preliminary Sizing and Drainage Analysis

Beginning with the potential LID facility locations that seem most feasible, identify possible pathways to direct drainage from roofs and/or pavement to potential LID facility locations—by sheet flow, valley gutters, trench drains, or (where gradients are steeper) via pipes, based on existing grades and drainage patterns. Where existing grades constrain natural drainage to potential facilities, the use of pumps may be considered (as a less preferable option).

Delineate (roughly) the drainage area tributary to each potential LID facility location. Typically, this requires site reconnaissance, which may or may not include the use of a level to measure relative elevations.

Use the following preliminary sizing factor (facility area/tributary area) for the potential facility location and determine which of the following could be constructed within the existing right-of-way or adjacent vacant land. Note that these sizing factors are guidelines (not strict rules, but targets):

- Sizing factor ≥ 0.5 for dispersal to landscape or pervious pavement[2] (i.e., a maximum 2:1 ratio of impervious area to pervious area)
- Sizing factor ≥ 0.04 for bioretention
- Sizing factor ≥ 0.004 (or less) for tree-box-type biofilters

For bioretention facilities requiring underdrains and tree-box-type biofilters, note if there are potential connections from the underdrain to the storm drain system (typically 2.0 feet below soil surface for bioretention facilities, and 3.5 feet below surface for tree-box-type biofilters).

---

[2] Note that pervious pavement systems are typically designed to infiltrate only the rain falling on the pervious pavement itself, with the allowance for small quantities of runoff from adjacent impervious areas. If significant runoff from adjacent areas is anticipated, preliminary sizing considerations should include evaluation of the depth of drain rock layer needed based on permeability of site soils.

If, in this step, you have confirmed there may be feasible potential facility locations, *continue to the next step*.

Step 3: Barriers and Conflicts

Note that barriers and conflicts do not necessarily mean implementation is infeasible; however, they need to be identified and taken into account in future decision-making, as they may affect cost or public acceptance of the project.

Note issues such as:

- Confirmed or potential conflicts with subsurface utilities
- Known or unknown issues with property ownership, or need for acquisition or easements
- Availability of water supply for irrigation, or lack thereof
- Extent to which green infrastructure is an "add on" vs. integrated with the rest of the project

Step 4: Project Budget and Schedule

Consider sources of funding that may be available for green infrastructure. It is recognized that lack of budget may be a serious constraint for the addition of green infrastructure in public projects. For example, acquisition of additional right-of-way or easements for roadway projects is not always possible. Short and long term maintenance costs also need to be considered, and jurisdictions may not have a funding source for landscape maintenance, especially along roadways. The objective of this process is to identify opportunities for green infrastructure, so that if and when funding becomes available, implementation may be possible.

Note any constraints on the project schedule, such as a regulatory mandate to complete the project by a specific date, grant requirements, etc., that could complicate aligning a separate funding stream for the green infrastructure element. Consider whether cost savings could be achieved by integrating the project with other planned projects, such as pedestrian or bicycle safety improvement projects, street beautification, etc., if the schedule allows.

Step 5: Assessment—Does the Project Have Green Infrastructure Potential?

Consider the ancillary benefits of green infrastructure, including opportunities for improving the quality of public spaces, providing parks and play areas, providing habitat, urban forestry, mitigating heat island effects, aesthetics, and other valuable enhancements to quality of life.

Based on the information above, would it make sense to include green infrastructure into this project—*if funding were available for the potential incremental costs of including green infrastructure in the project?* Identify any additional conditions that would have to be met for green infrastructure elements to be constructed consequent with the project.

Attachment 1

Examples of Projects with No Potential for Green Infrastructure

- ☐ Projects with no exterior work (e.g., interior remodels)
- ☐ Projects involving exterior building upgrades or equipment (e.g., HVAC, solar panels, window replacement, roof repairs and maintenance)
- ☐ Projects related to development and/or continued funding of municipal programs or related organizations
- ☐ Projects related to technical studies, mapping, aerial photography, surveying, database development/upgrades, monitoring, training, or update of standard specs and details
- ☐ Construction of new streetlights, traffic signals or communication facilities
- ☐ Minor bridge and culvert repairs/replacement
- ☐ Non-stormwater utility projects (e.g., sewer or water main repairs/replacement, utility undergrounding, treatment plant upgrades)
- ☐ Equipment purchase or maintenance (including vehicles, street or park furniture, equipment for sports fields and golf courses, etc.)
- ☐ Irrigation system installation, upgrades or repairs

Attachment 2

Excerpts from the C.3 Section of the FY 15-16 Annual Report Template: Tables for Reporting C.3-Regulated Projects and Green Infrastructure Projects

C.3.b.iv.(2) ►Regulated Projects Reporting Table (part 1) – Projects Approved During the Fiscal Year Reporting Period

Project Name **Project No.**	**Project Location**[9]**, Street Address**	**Name of Developer**	**Project Phase No.**[10]	**Project Type & Description**[11]	**Project Watershed**[12]	**Total Site Area** (Acres)	**Total Area of Land Disturbed** (Acres)	**Total New Impervious Surface Area** (ft^2)[13]	**Total Replaced Impervious Surface Area** (ft^2)[14]	**Total Pre-Project Impervious Surface Area**[15](ft^2)	**Total Post-Project Impervious Surface Area**[16](ft^2)
Private Projects											
Public Projects											

Comments:
Guidance: If necessary, provide any additional details or clarifications needed about listed projects in this box. Do not leave any cells blank.

---

[9]Include cross streets
[10]If a project is being constructed in phases, indicate the phase number and use a separate row entry for each phase. If not, enter “NA”.
[11]Project Type is the type of development (i.e., new and/or redevelopment). Example descriptions of development are: 5-story office building, residential with 160 single-family homes with five 4-story buildings to contain 200 condominiums, 100 unit 2-story shopping mall, mixed use retail and residential development (apartments), industrial warehouse.
[12]State the watershed(s) in which the Regulated Project is located. Downstream watershed(s) may be included, but this is optional.
[13]All impervious surfaces added to any area of the site that was previously existing pervious surface.
[14]All impervious surfaces added to any area of the site that was previously existing impervious surface.
[15]For redevelopment projects, state the pre-project impervious surface area.
[16]For redevelopment projects, state the post-project impervious surface area.

C.3.b.iv.(2) ►Regulated Projects Reporting Table (part 2) – Projects Approved During the Fiscal Year Reporting Period (public projects)

Project Name Project No.	Approval Date[29]	Date Construction Scheduled to Begin	Source Control Measures[30]	Site Design Measures[31]	Treatment Systems Approved[32]	Operation & Maintenance Responsibility Mechanism[33]	Hydraulic Sizing Criteria[34]	Alternative Compliance Measures[35/36]	Alternative Certification[37]	HM Controls[38/39]
Public Projects										

Comments:

Guidance: If necessary, provide any additional details or clarifications needed about listed projects in this box. Note that MRP Provision C.3.c. contains specific requirements for LID site design and source control measures, as well as treatment measures, for all Regulated Projects. Entries in these columns should not be "None" or "NA". Do not leave any cells blank.

[29] For public projects, enter the plans and specifications approval date.
[30] List source control measures approved for the project. Examples include: properly designed trash storage areas; storm drain stenciling or signage; efficient landscape irrigation systems; etc.
[31] List site design measures approved for the project. Examples include: minimize impervious surfaces; conserve natural areas, including existing trees or other vegetation, and soils; construct sidewalks, walkways, and/or patios with permeable surfaces, etc.
[32] List all approved stormwater treatment system(s) to be installed onsite or at a joint stormwater treatment facility (e.g., flow through planter, bioretention facility, infiltration basin, etc.).
[33] List the legal mechanism(s) (e.g., maintenance plan for O&M by public entity, etc…) that have been or will be used to assign responsibility for the maintenance of the post-construction stormwater treatment systems.
[34] See Provision C.3.d.i. "Numeric Sizing Criteria for Stormwater Treatment Systems" for list of hydraulic sizing design criteria. Enter the corresponding provision number of the appropriate criterion (i.e., 1.a., 1.b., 2.a., 2.b., 2.c., or 3).
[35] For Alternative Compliance at an offsite location in accordance with Provision C.3.e.i.(1), on a separate page, give a discussion of the alternative compliance site including the information specified in Provision C.3.b.v.(1)(m)(i) for the offsite project.
[36] For Alternative Compliance by paying in-lieu fees in accordance with Provision C.3.e.i.(2), on a separate page, provide the information specified in Provision C.3.b.v.(1)(m)(ii) for the Regional Project.
[37] Note whether a third party was used to certify the project design complies with Provision C.3.d.
[38] If HM control is not required, state why not.
[39] If HM control is required, state control method used (e.g., method to design and size device(s) or method(s) used to meet the HM Standard, and description of device(s) or method(s) used, such as detention basin(s), biodetention unit(s), regional detention basin, or in-stream control).

C.3.j.ii.(2) ► Table A - Public Projects Reviewed for Green Infrastructure

Project Name and Location[43]	Project Description	Status[44]	GI Included?[45]	Description of GI Measures Considered and/or Proposed or Why GI is Impracticable to Implement[46]
EXAMPLE: Storm drain retrofit, Stockton and Taylor	Installation of new storm drain to accommodate the 10-yr storm event	Beginning planning and design phase	TBD	Bioretention cells (i.e., linear bulb-outs) will be considered when street modification designs are incorporated

C.3.j.ii.(2) ► Table B - Planned Green Infrastructure Projects

Project Name and Location[47]	Project Description	Planning or Implementation Status	Green Infrastructure Measures Included
EXAMPLE: Martha Gardens Green Alleys Project	Retrofit of degraded pavement in urban alleyways lacking good drainage	Construction completed October 17, 2015	The project drains replaced concrete pavement and existing adjacent structures to a center strip of pervious pavement and underlying infiltration trench.

[43] List each public project that is going through your agency's process for identifying projects with green infrastructure potential.
[44] Indicate status of project, such as: beginning design, under design (or X% design), projected completion date, completed final design date, etc.
[45] Enter "Yes" if project will include GI measures, "No" if GI measures are impracticable to implement, or "TBD" if this has not yet been determined.
[46] Provide a summary of how each public infrastructure project with green infrastructure potential will include green infrastructure measures to the maximum extent practicable during the permit term. If review of the project indicates that implementation of green infrastructure measures is not practicable, provide the reasons why green infrastructure measures are impracticable to implement.
[47] List each planned (and expected to be funded) public and private green infrastructure project that is not also a Regulated Project as defined in Provision C.3.b.ii. Note that funding for green infrastructure components may be anticipated but is not guaranteed to be available or sufficient.

Appendix I: City of Santa Clara List of Potential Recycled Water Use

List of Potential Recycled Water Use Projects (With Completion Dates Between 2015-2045)

Project	Use	Water Demand (AF)	Existing Demand (AF)	Demand Delta (AF)	Recycled Water Available?	Buildout Completion Date
Patrick Henry Drive Specific Plan - Scenario A	Residential	596.3	79.6	1,649.90	No	2020-2025
	Retail	4.7			No	2020-2025
	Flex/Community /Library	7.6			No	2020-2025
	Irrigation	24.3			Yes	2020-2025
	Residential	664.1			No	2030-2035
	Retail	1.5			No	2030-2035
	Flex/Community	3.5			No	2030-2035
	Irrigation	30.8			Yes	2030-2035
	Residential	366			No	2035-2040
	Flex/Community /School	13.6			No	2035-2040
	Irrigation	17.1			Yes	2035-2040
Patrick Henry Drive Specific Plan - Scenario B	Residential	366		1,491.10	No	2020-2025
	Retail	4.7			No	2020-2025
	Office	79.1			Yes	2020-2025
	Flex/Community /Library	7.6			No	2020-2025
	Irrigation	16.8			Yes	2020-2025
	Residential	664.1			No	2030-2035
	Retail	1.5			No	2030-2035
	Flex/Community	3.5			No	2030-2035
	Irrigation	30.8			Yes	2030-2035
	Residential	366			No	2035-2040
	Flex/Community /School	13.6			No	2035-2040
	Irrigation	17.1			Yes	2035-2040
El Camino Real Specific Plan	Residential	494.2	224.1	662	No	2025-2030
	Retail	17.8			No	2025-2030
	Irrigation	6.8			Yes**	2025-2030
	Residential	232.6			No	2030-2035
	Retail	9.2			No	2030-2035
	Irrigation	5.1			Yes**	2030-2035
	Residential	115.1			No	2035-2040
	Retail	2.4			No	2035-2040
	Irrigation	3			Yes**	2035-2040
2825 Lafayette Street	Data Center	65.1	62	28.1	Yes	2027
	Office	7.2			Yes	2027
	Irrigation	17.8			Yes	2027

Tasman East Specific Plan	Residential	609.9	35.7	627.3	No	2035
	Retail	5.9			No	2035
	School	10.1			No	2035
	Irrigation	37.1			Yes	2035
3625 Peterson Way	Office	67.7	26.4	54.1	Yes	2020
	Irrigation	12.8			Yes	2020
2305 Mission College Boulevard	Office	2.5	12	216.4	Yes	2018
	Data Center	225.8			Yes	2018
Gateway Crossings	Retail	1.8	14.7	320.3	No	2019-2025
	Hotel	97.9			No	2025
	Residential	216.9			No	2019-2022
	Irrigation	18.4			Yes	2019-2025
BART Santa Clara Station and Joint Development WSA	Retail	1.7	6.7	80.6	No	2025
	Office	50.4				
	BART Station/Maintenance Yard	5.4				
	Residential	29.8				
Santa Clara University Development Plan	Institutional	82.9	43	60.4	No	2016-2019
	Residential	20.5				
Lawrence Station Area Plan (Phase I)	Retail	3	45.4	232.7	No	2020
	Amenity	1.6				
	Irrigation	31.6				
	Residential	241.9				
Lawrence Station Area Plan (Phase II)	Retail	1.9	28.5	146	No	2030
	Amenity	1				
	Irrigation	19.8				
	Residential	151.8				
Lawrence Station Area Plan (Phase III)	Retail	1	15.1	77.5	No	2035
	Amenity	0.5				
	Irrigation	10.5				
	Residential	80.6				
Santa Clara Square Apartments	Office	0.5	119.5	168.3	Yes	2018
	Retail	2.2				
	Amenity	4.7				
	Irrigation	36.4				
	Residential	244				
City Place Parcel 5 (Phase 1)	Office	26	311.3	-95.3	Yes	2019
	Retail	4.9				
	Hotel	150.5				
	Irrigation	7.5				
	Residential	27.1				

City Place Parcel 4 (Phases 2-4)	Office	139.8	0*	656.6	Yes	2020-2023
	Retail	79.2				
	Hotel	160.2				
	Irrigation	120.2				
	Residential	157.2				
City Place Parcel 3 (Phase 5)	Office	72.6	0*	152.6	Yes	2025
	Irrigation	80				
City Place Parcel 1 (Phase 6)	Office	121	0*	192.8	Yes	2027
	Irrigation	71.8				
City Place Parcel 2 (Phase 7)	Office	108.9	0*	164.1	Yes	2029
	Irrigation	55.2				
City Place Parcel 2 (Phase 8)	Office	108.9	0*	164.1	Yes	2031
	Irrigation	55.2				
Santa Clara Square	Retail	7.7	46.8	207.7	Yes	2014-2015
	Office	189.7				
	Irrigation	57.1				
3515 Monroe St.	Residential	158	6.1	179.2	No	2015-2017
	Amenity	1.3				
	Retail	0.9				
	Market	5.4				
	Restaurant	5.8				
	Irrigation	13.9				
3333 Scott Blvd.	Office	137	9.5	154.5	Yes	2015-2017
	Irrigation	27				
3700 El Camino Real	Residential	159.6	1.2	283.7	No	2016-2019
	Retail	4.8				
	Irrigation	120.5				
2200 Lawson Lane	Office	30.2	5.8	110.8	No	2014-2016
	Irrigation	86.4				
3000 Bowers Avenue	Office	30.2	0.7	113.7	No	2013-2015
	Irrigation	84.2				

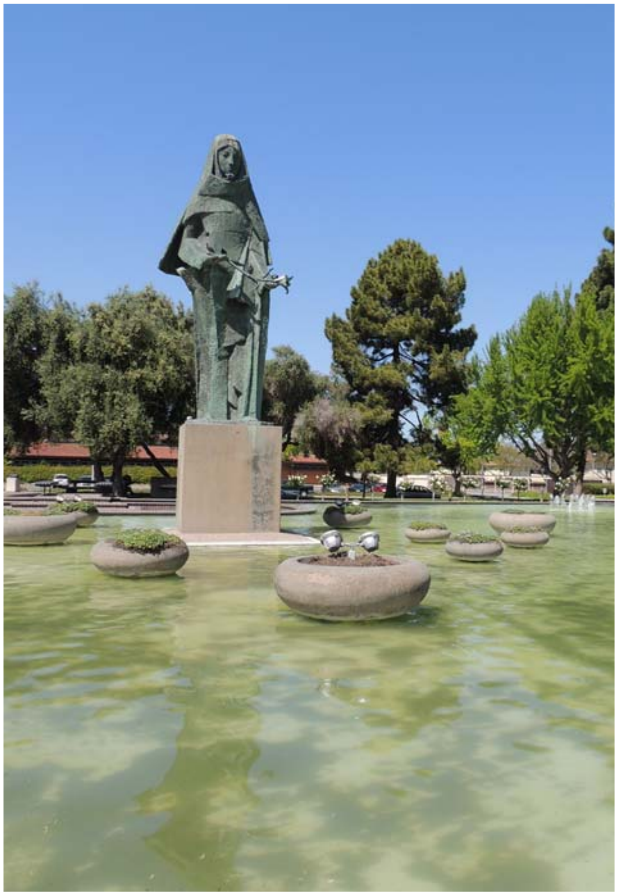
NOTES:

City Park Irrigation – Potential Conversion to Recycled Water

Agnew Park
Bowers Park
Bracher Park
Central Park
City Plaza Park
Civic Center Park
Earl Carmichael Park
Homeridge Park
Jenny Strand Park
Machado Park
Mary Gomez Park
Maywood Park
Memorial Cross Park
Parkway Park
The Park at Midtown Village
Rotary Park
Sesquicentennial Park
Warburton Park
Westwood Oaks Park

Appendix J: City of Santa Clara, 2013 Climate Action Plan

City of Santa Clara
Climate Action Plan



Santa Clara Climate Action Plan

Adopted
December 3, 2013

Table of Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Definition
AB	Assembly Bill
ABAG	Association of Bay Area Governments
BAAQMD	Bay Area Air Quality Management District
btu	British thermal units
CALGreen	California Green Building Standards Code
CAP	Climate Action Plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
EPA	Environmental Protection Agency
EV	electric vehicle
GHG	greenhouse gas
GWP	global warming potential
ICLEI	Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change
kW	kilowatt
kWh	kilowatt-hour
LGOP	Local Government Operations Protocol
MG	million gallons
$MTCO_2e$	metric tons of carbon dioxide equivalents
MW	megawatt
MWh	megawatt hours
N_2O	nitrous oxide
OPR	California Governor's Office of Planning and Research
PG&E	Pacific Gas and Electric Company
PV	photovoltaic
RASS	Residential Appliance Saturation Study
RPS	Renewables Portfolio Standard
SB	Senate Bill
SCCC	Santa Clara City Code
SCVWD	Santa Clara Valley Water District
SVP	Silicon Valley Power
TDM	transportation demand management
UWMP	Urban Water Management Plan
VMT	vehicle miles traveled
VTA	Santa Clara Valley Transportation Authority

Executive Summary

This Climate Action Plan (CAP; Plan) defines the City of Santa Clara's path toward creating a more sustainable, healthy, and livable community. The strategies outlined in this Plan will reduce greenhouse gas (GHG) emissions and provide energy, fuel, and monetary savings while improving quality of life for the Santa Clara community.

Organization

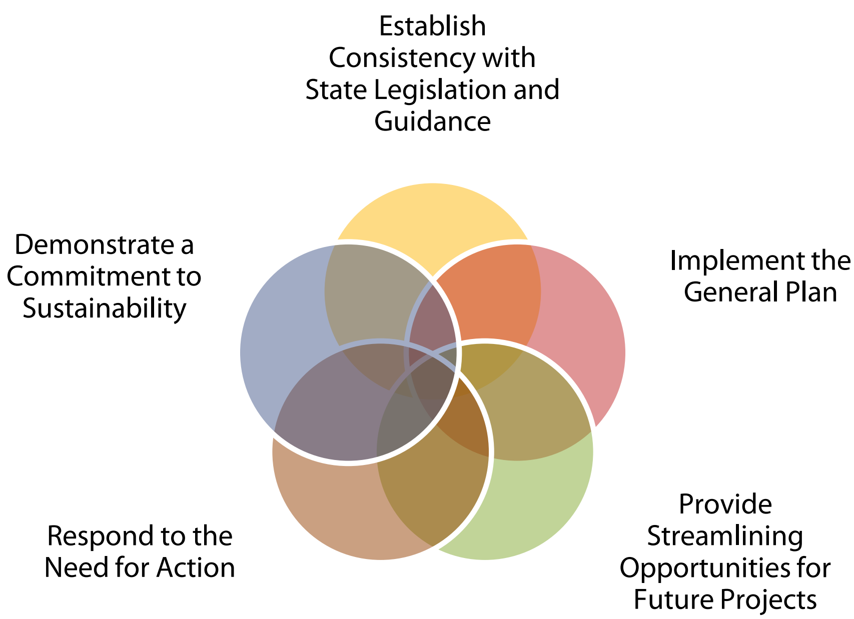
To align with the recommended steps in the climate action planning process, the CAP is broken into the following chapters and appendices:

- An introduction to the regulatory and scientific framework and the City's motivations for preparing this plan (Background – Chapter 1).
- 2008 GHG emissions inventory and 2020 and 2035 forecasts for community sources and government operations (Measuring Our Emissions – Chapter 2).
- An assessment of state and local activities that have been implemented since 2008 to reduce emissions (Tracking Early Success – Chapter 3).
- Santa Clara's proposed future actions to reduce emissions (Reducing Emissions – Chapter 4).
- The path necessary to successfully implement this CAP (Achieving Our Goals – Chapter 5).
- Technical memo on GHG emissions inventory results and methodologies (Appendix A).
- Summary of methodology and assumptions for GHG quantification (Appendix B).

Climate Action Plan Motivations

This CAP celebrates Santa Clara's past efforts to integrate sustainable practices into community life, and demonstrates the City's continued commitment to be a leader in sustainability and to reduce GHG emissions. **Chapter 1** identifies Santa Clara's CAP motivations and provides a brief overview of climate change and the climate action planning process. As identified in **Figure ES-1**, motivating forces for the City of Santa Clara to prepare a CAP include consistency with state guidance, mitigating future projects, implementing the General Plan, promoting environmental leadership, and providing educational resources.

Figure ES-1: Climate Action Plan Motivations



Background

Environmental Leadership

Santa Clara has a proven history of environmental commitment as evident in the "Green, Greener, Greenest" publication,[1] and this CAP will further embed the City's environmental responsibility efforts in everyday practice. In addition, the CAP may also allow the City to streamline future environmental review of development projects in Santa Clara by following the California Environmental Quality Act (CEQA) Guidelines and meeting the Bay Area Air Quality Management District's (BAAQMD) expectations for a Qualified GHG Reduction Strategy. The CAP identifies how the City will achieve the state-recommended GHG emissions reduction target of 15% below 2008 levels by the year 2020 (equivalent to 1990 emissions). The CAP provides

[1] http://santaclaraca.gov/index.aspx?page=1218

goals and emissions reduction measures to address energy use, transportation, land use, water, solid waste, and off-road equipment.

The City has a long-standing commitment to implementing environmental programs and proactively working to reduce GHG emissions. The adoption and implementation of this Plan will reinforce and build upon these policies and programs.

Imperative to Act

Members of the Intergovernmental Panel on Climate Change (IPCC) assert that the atmospheric carbon dioxide (CO_2) concentration must be at or below 350 parts per million to maintain an environment similar to the one humans have thrived in. Atmospheric concentrations of CO_2 have not been near 350 parts per million since 1990, and surpassed 400 parts per million in May 2013.

Research suggests that failing to decrease atmospheric concentrations of GHG emissions will have a profound impact both globally and locally. California will experience hotter and drier conditions, reduced winter snow, and increased winter rain, sea level rise, changes to the water cycle, and more extreme weather events. These conditions will affect economic, ecological, and social systems throughout California communities. While uncertainty surrounds the scale, timing, and duration of long-term climate change effects, most climate models identify a best-case scenario, if the global community were to immediately stop emitting GHG emissions, and a worst-case scenario, if emissions continue to increase at historic rates. The anticipated long-term effects of climate change in Santa Clara County under both low- and high-emissions scenarios are described in **Figure ES-2.**

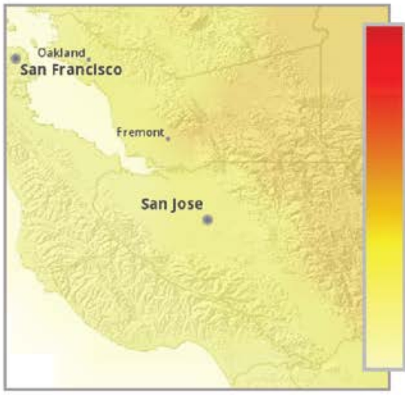
Leaders in Sustainability

Actions taken by City leadership to demonstrate Santa Clara's commitment to addressing climate change include:

- *Joining more than 1,000 other U.S. Mayors in signing the U.S. Mayors Climate Protection Agreement.*
- *Joining more than 850 CEOs of Silicon Valley companies in signing a pledge to promote clean energy at a 2006 "CEO Summit on Alternative Energy."*
- *Participating in Sustainable Silicon Valley. A coalition of businesses, governments and non-government organizations to reduce regional emissions.*

Figure ES-2: Long-Term Climate Change Effects in Santa Clara County

Temperature



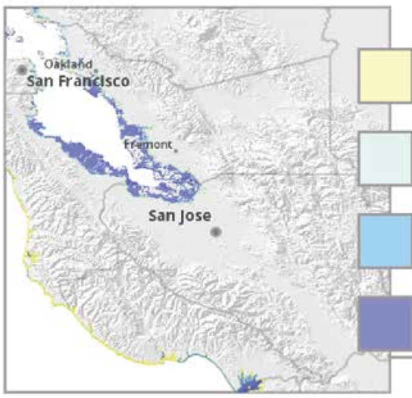
+7.3 °F

+4.8 °F

Projected increases in average annual temperature by 2070-2099 compared to historical averages (1960-1991).

Historical Average:	59.5 °F	
Low Emissions Scenario:	62.7 °F	+ 3.2 °F
High Emissions Scenario:	65.1 °F	+ 5.6 °F

Sea Level Rise



55 inches

39 inches

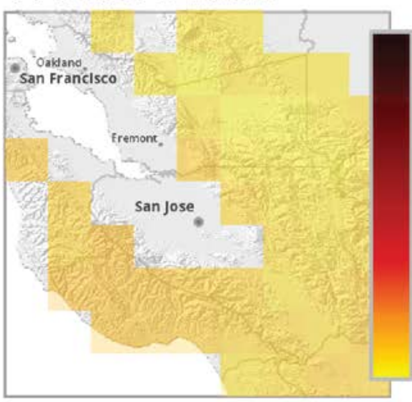
19 inches

Current

Land vulnerable to 100-year flood event by 2100 compared to 2000 levels with a 55 inch rise in sea levels.

Vulnerable Land in 2000:	9,647
Vulnerable Land in 2100:	14,201
Percent Change:	+ 32%

Wildfire Risk



10.0

0.1

Wildfire risk relative to 2010 levels by 2020, 2050, 2085

Year:	2020	2050	2085
Low Emissions Scenario:	1.04	1.01	0.83
High Emissions Scenario:	1.05	0.98	0.88

Source: CalAdapt 2013.

The detrimental effects of climate change are already being observed around the globe. While weather events such as drought, flooding, and severe storms have been a normal occurrence in many parts of the world, the increased concentrations of GHG emissions have increased the frequency and severity of these events, and are expected to have additional detrimental effects in the future if the concentration of global emissions are not stabilized and reduced.

A Sustainable Step for Santa Clara

With the adoption of the General Plan in 2010, the City set into motion a Major Strategy to promote sustainability through the conservation of resources and reducing the impacts of both existing and new development on the local and regional environment. As part of the General Plan phasing schedule, the development of a climate action plan is a required prerequisite for Phase II. The CAP will be integrated into Appendix 8.13 upon completion.

As a member of the global community, Santa Clara has a responsibility to reduce future GHG emissions and be a leader in addressing the effects of climate change. As a first step, implementing this CAP will position Santa Clara to decrease emissions consistent with California's Global Warming Solutions Act of 2006 (Assembly Bill (AB) 32).

As a municipal utility, the City is uniquely positioned to lead community efforts to reduce GHG emissions. Eliminating the use of electricity from GHG-intensive sources such as coal from Silicon Valley Power's (SVP) electric portfolio is an important first step. The advantages of Santa Clara's coal-free energy portfolio would be numerous. By using more renewable energy sources, the City can improve future energy security as fossil fuel supplies drop and associated prices rise.

Some U.S. (Seattle, Boulder, Austin) and international communities have set their sight on or adopted goals to become completely carbon-neutral, or to eliminate GHG-emitting sources from their energy portfolio. While Santa Clara has committed to reducing GHG emissions, the City's role as an electricity provider for the community, its significant investments in energy infrastructure, need for technology advancements, and regulations outside of the City's control make adopting a carbon-neutral goal infeasible at this time.

Community Engagement

Community members were engaged throughout the climate action planning process in a variety of ways. The events held provided a forum for community members to voice their ideas about emissions reduction and ways to make Santa Clara a more environmentally sustainable place to live and work. The events were hosted by staff to solicit input from the community and are listed in **Figure ES-3.**

Figure ES-3: Community Input Opportunities

Measuring Our Emissions

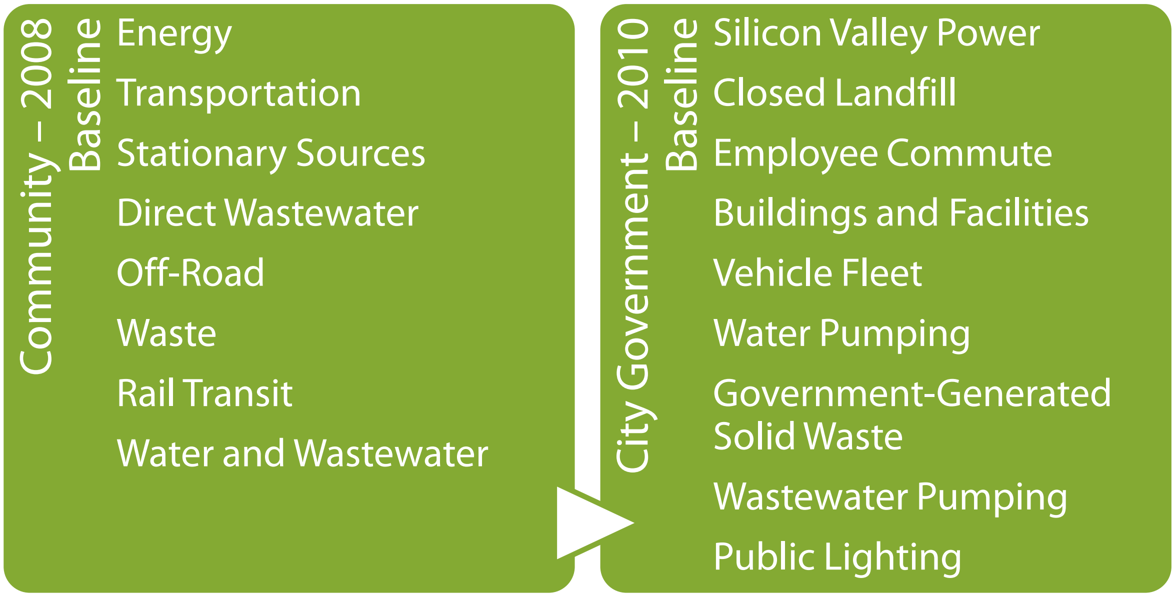
The GHG emissions inventory and forecast lays the groundwork for the entire CAP planning process. The inventory catalogues community GHG emissions for 2008 and City government emissions for 2010, and projects total emissions levels for 2020 and 2035. The inventory was prepared using protocols and best practices identified within the Local Government Operations Protocol, the ICLEI-Local Governments for Sustainability (ICLEI) Community-wide Protocol, and BAAQMD's GHG Plan Level Guidance. The inventory considers the community and City government sources presented in **Figure ES-4**.

Calculating Emissions

Due to the varying degrees of influence over different GHG emissions sources, there is often overlap in accounting for GHG emissions. For the City of Santa Clara, this overlap occurs between the direct emissions produced at facilities generating electricity for SVP, and again indirectly as SVP electricity is used in homes and businesses. SVP's direct emissions are calculated and included in the baseline inventory and forecast in two different ways, maintaining consistency with national GHG emissions protocols. First, the direct emissions associated with the two power plants located within city limits are calculated using verified emissions numbers from the California Air Resources Board (CARB). Second, the indirect emissions associated with each business and household consuming SVP electricity are calculated based on the amount of electricity consumed, whether or not it is generated within the city limits.

To avoid double-counting these emissions, the direct emissions from the power plants located within the city are excluded from future discussions of the government operations inventory.

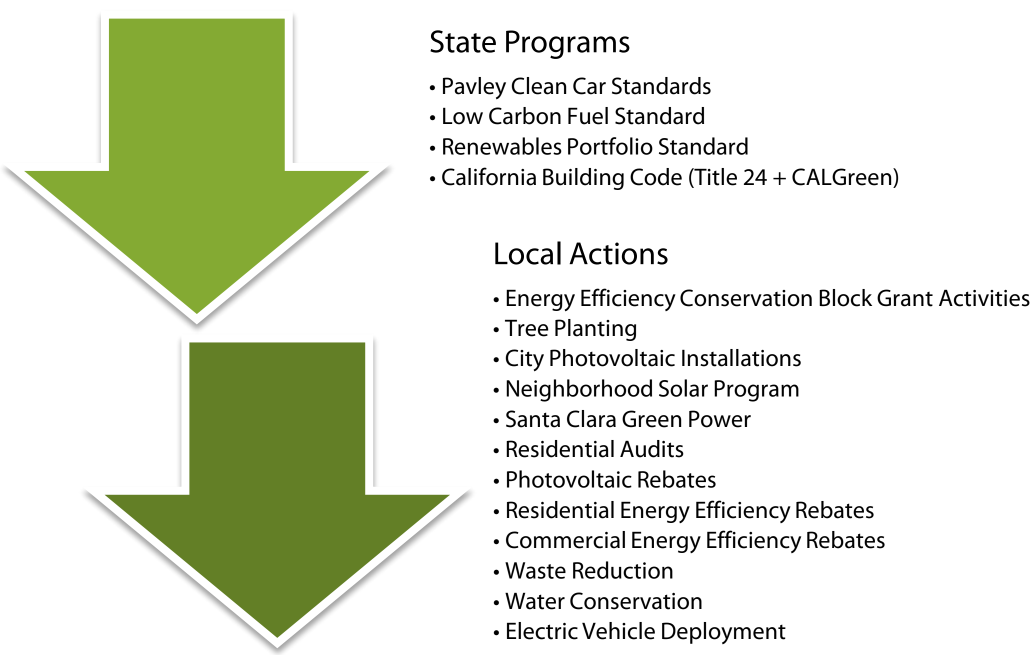
Figure ES-4: Greenhouse Gas Emissions Inventories and Activities



Tracking Early Success

The City and the State of California have proud track records of supporting environmental initiatives and reducing emissions. **Chapter 3** builds on the emissions inventories and forecasts, identifying activities and requirements implemented at the state and local levels since 2008 and their benefits to reducing local emissions. As identified in **Figure ES-5**, these activities and requirements have already set the City on a path to achieve its GHG reduction goals.

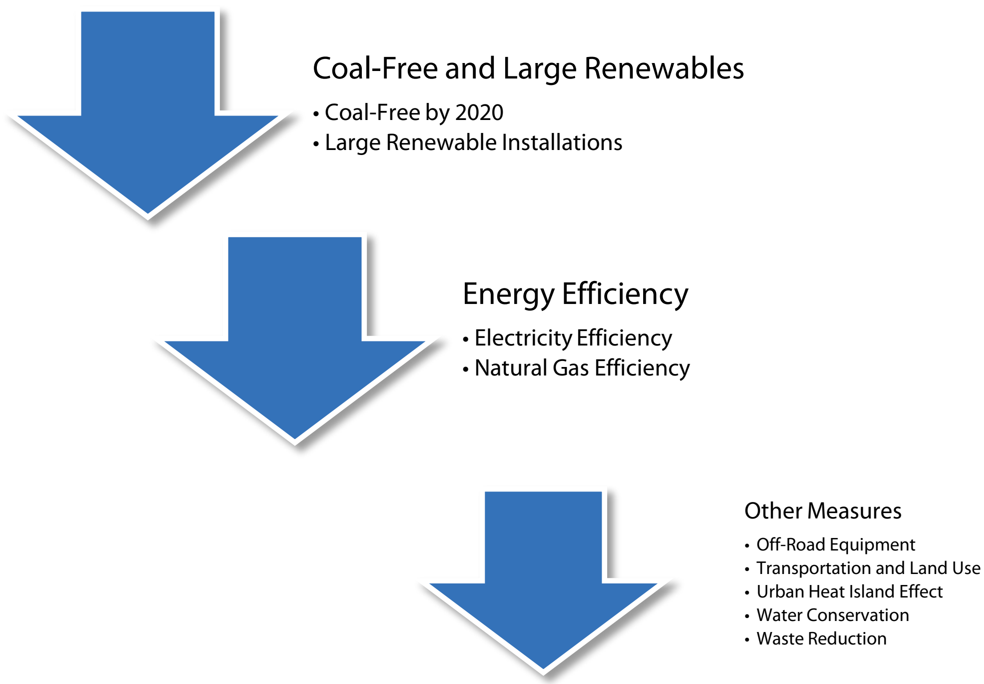
Figure ES-5: State Programs and Local Actions to Reduce Emissions



Reducing Emissions

The reduction measures included in this plan are a diverse mix of incentives, education, and regulations applicable to both new and existing development. The measures are designed to reduce emissions from each source to avoid relying on any one strategy or sector to achieve the target. **Chapter 4** describes the process used to develop, refine, and quantify the emissions reduction goals, measures, and actions identified to achieve Santa Clara's reduction targets. The measures included in the CAP are grouped into three main categories, which are identified in **Figure ES-6**.

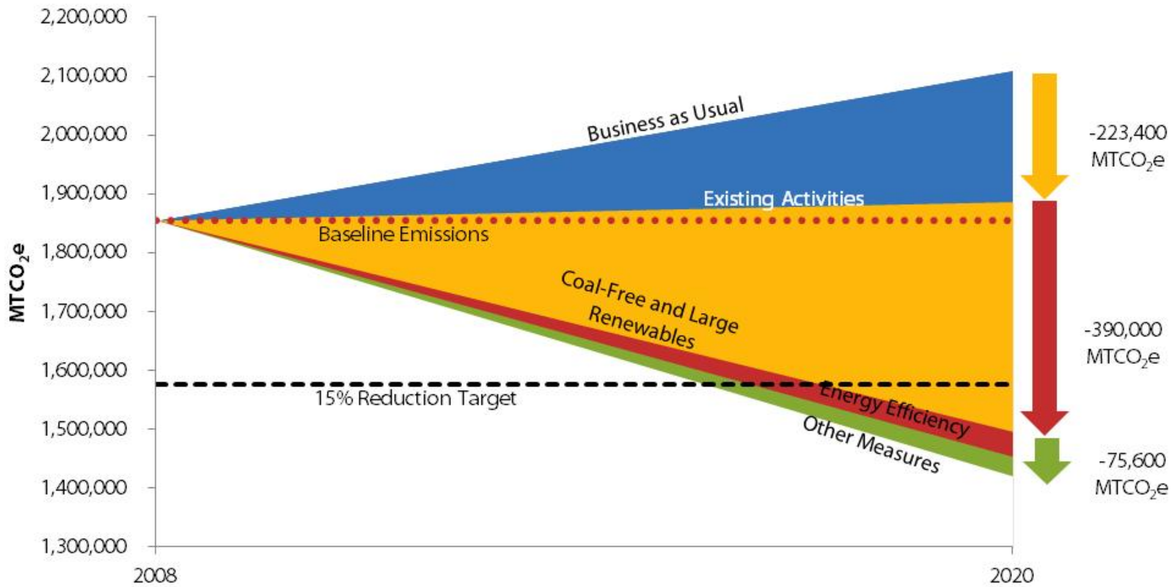
Figure ES-6: Emissions Reduction Focus Areas



Reduction Summary

Implementing the CAP measures would enable the community to reduce emissions by 23.4% below 2008 levels by 2020. **Figure ES-7** illustrates the City's ability to achieve and exceed the reduction target by 2020.

Figure ES-7: Emissions Reduction Scenario and Target Achievement



Reach Measures

Recognizing that the challenges presented by GHG emissions will continue beyond 2020, the City has also identified next steps or reach measures to reduce emissions beyond 2020 levels. Proposed CAP measures and associated performance metrics identify emissions reductions to be achieved by 2020. Recognizing the need to look beyond 2020, the City has established a series of reach measures that will be implemented after 2020 to continue decreasing the City's emissions. These reach measures are described in **Chapter 4.**

Achieving Our Goals

To ensure successful achievement of the City's reduction target, **Chapter 5** identifies implementation strategies and supporting actions. The chapter includes an implementation work plan, which details emissions reductions, lead departments, and community partners by measure. **Chapter 5** provides critical tools for monitoring the City's implementation progress.

1. Background

Climate Change

Scientists agree that the world's population is releasing greenhouse gases (GHGs) faster than the earth can absorb by its natural systems, resulting in higher measured and projected surface temperatures.[2] GHGs occur naturally within earth's atmosphere. Without them, the earth's average surface temperature would be at about freezing levels.[3] **Figure 1** illustrates how GHGs trap incoming solar radiation and infrared radiation from the earth's surface in the atmosphere. While natural levels of GHGs bring the earth to comfortable temperatures, GHGs are also byproducts of fossil fuel combustion, waste disposal, energy use, land use changes, and other human economic activities. The continued release of GHGs at or above current rates will increase average global surface temperatures and will alter our planet's climate, creating substantial long-term local, regional, and global effects.

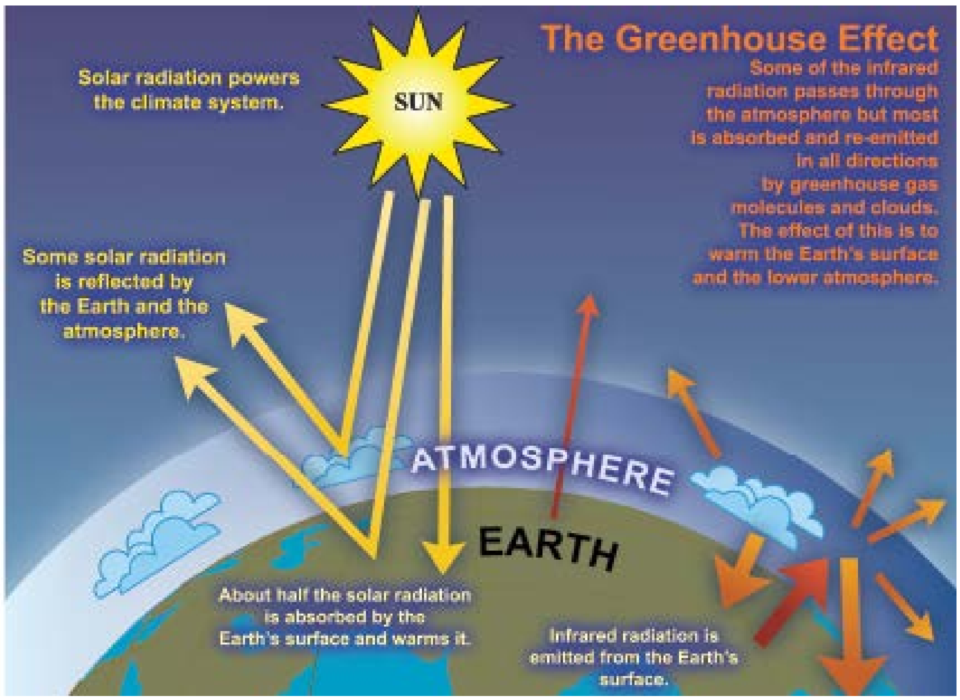
[2]A recent study of nearly 12,000 peer-reviewed journal articles on climate change concluded that 97% of climate change scientists endorsed the consensus position that humans are causing climate change.

[3] Without GHGs, Earth's annual average surface temperature would be zero degrees Fahrenheit.

Imperative to Act

Members of the Intergovernmental Panel on Climate Change (IPCC) assert that the atmospheric carbon dioxide (CO_2) concentration must be at or below 350 parts per million to maintain an environment similar to the one humans have thrived in.[4] Atmospheric concentrations of CO_2 have not been near 350 parts per million since 1990, and surpassed 400 parts per million in May 2013. Without local action, continued GHG emissions will induce changes in the global climate system, posing greater risks to our state and community. This Climate Action Plan represents the City of Santa Clara's local response to climate change.

Figure 1: The Greenhouse Effect



Source: Intergovernmental Panel on Climate Change 2007.

Global Climate Change Effects

The IPCC's Fourth Assessment Report provides a comprehensive summary of the world's best climate models. Assuming current emission patterns, the IPCC projects a wide range of global climate change effects, including the following:

- Warmer days, fewer cold days and nights, and more frequent hot days and nights
- Increased frequency of warm spells/heat waves
- Increased frequency of heavy precipitation events
- Increased area affected by drought

[4] Parts per million is an air quality standard measurement used to describe the amount of pollutants per million molecules of air.

- Increased intense tropical cyclone activity
- Increased incidence of high sea levels

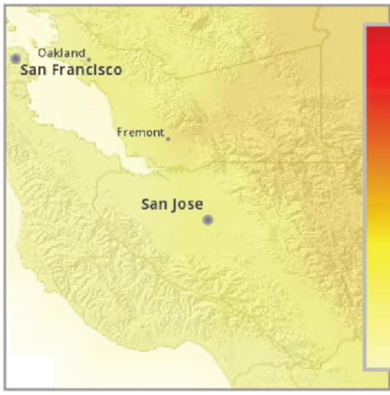
These effects will worsen extreme weather events and can lead to further effects such as shifting agricultural zones, increased disease vectors, and altered animal migration patterns. If trends remain unchanged, GHG emissions above current rates will induce further warming of the global climate system and pose greater risks. Given the scientific basis of climate change and expected trends, it is imperative that the City prepare for climate change and mitigate GHG emissions through deliberate action.

Localized Climate Change Effects

While uncertainty surrounds the scale, timing, and duration of long-term climate change effects, most climate models identify a best-case scenario, if the global community were to immediately stop emitting GHG emissions, and a worst-case scenario, if emissions continue to increase at historic rates. **Figure 2** summarizes the potential long-term climate change effects in Santa Clara County under low- and high-emissions scenarios. Overall, research suggests that California will experience hotter and drier conditions, reduced winter snow, and increased winter rain, sea level rise, changes to the water cycle, and more extreme weather events. These conditions will affect economic, ecological, and social systems in California communities.

Figure 2: Long-Term Climate Change Effects in Santa Clara County

Temperature



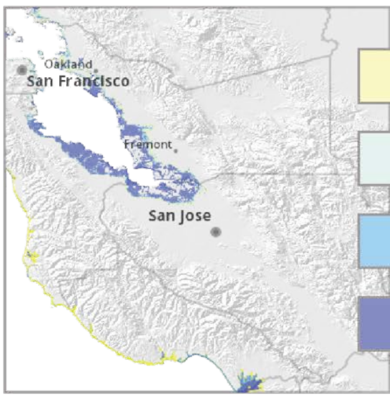
+7.3 °F

+4.8 °F

Projected increases in average annual temperature by 2070-2099 compared to historical averages (1960-1991).

Historical Average:	59.5 °F	
Low Emissions Scenario:	62.7 °F	+ 3.2 °F
High Emissions Scenario:	65.1 °F	+ 5.6 °F

Sea Level Rise



55 inches

39 inches

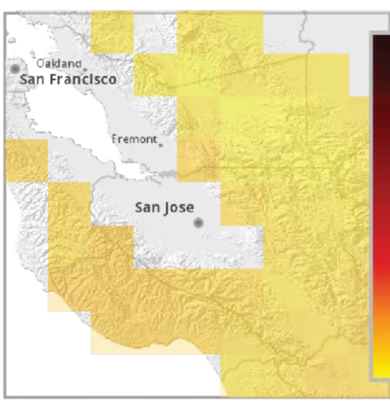
19 inches

Current

Land vulnerable to 100-year flood event by 2100 compared to 2000 levels with a 55 inch rise in sea levels.

Vulnerable Land in 2000:	9,647
Vulnerable Land in 2100:	14,201
Percent Change:	+ 32%

Wildfire Risk



10.0

0.1

Wildfire risk relative to 2010 levels by 2020, 2050, 2085

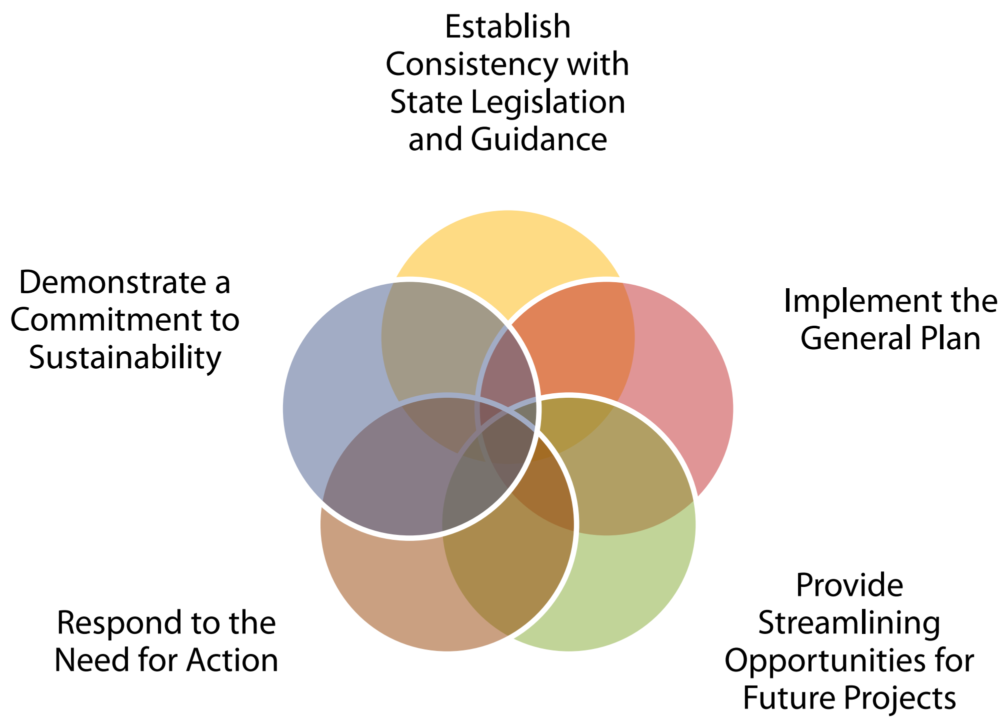
Year:	2020	2050	2085
Low Emissions Scenario:	1.04	1.01	0.83
High Emissions Scenario:	1.05	0.98	0.88

Source: CalAdapt 2013.

Climate Action Plan Motivations

In developing this CAP, the City recognizes the compelling need for a locally based approach to reduce emissions within the community and from government operations. **Figure 3** identifies some of the City's motivations to prepare the CAP. With this plan, the City charts a comprehensive strategy to reduce emissions in a manner consistent with state guidelines and regulations, and to afford cost-effective opportunities to existing and future residents, businesses, and development projects to contribute to a more sustainable community.

Figure 3: Climate Action Plan Motivations



State Legislation and Guidance

State Assembly Bill (AB) 32 (2006), the Global Warming Solutions Act, directs public agencies in California to support the statewide goal of reducing GHG emissions to 1990 levels by 2020. Preparing a CAP supports AB 32 at the local level. The CAP provides a policy framework for how Santa Clara can do its part to reduce emissions. While compliance with AB 32 is not a requirement for local jurisdictions, demonstrating consistency with statewide reduction goals can help Santa Clara to qualify for incentives such as grant funding. Efforts to address climate change, reduce consumption of resources, and improve energy efficiency led by state legislation or programs are briefly described below and identified in **Figure 4**.

Assembly Bill 32 – California Global Warming Solutions Act of 2006

AB 32, known as the California Global Warming Solutions Act, was approved by the legislature and signed by Governor Schwarzenegger in 2006. The landmark legislation requires the California Air Resources Board (CARB) to develop regulatory and market mechanisms that will reduce GHG emissions to 1990 levels by 2020. Mandatory actions under the legislation to be completed by CARB include:

- Identification of early action items that can be quickly implemented to achieve GHG reductions. These early action items were adopted by CARB in 2007 and include regulations affecting landfill operations, motor vehicle fuels, car refrigerants, and port operations, among other regulations.
- Development of a scoping plan to identify the most technologically feasible and cost-effective measures to achieve the necessary emissions reductions to reach 1990 levels by 2020. The scoping plan employs a variety of GHG reduction measures that include direct regulations, alternative compliance mechanisms, incentives, voluntary actions, and market-based approaches like a cap-and-trade program. The plan identifies local governments as strategic partners to achieving the state goal and translates the reduction goal to a 15% reduction of current emissions by 2020.
- Creation and adoption of regulations to require the state's largest industrial emitters of GHGs to report and verify their emissions on an annual basis.

Senate Bill 97 – California Environmental Quality Act Guideline Amendments of 2007

Senate Bill (SB) 97 was adopted in 2007 by the State of California and directed the Governor's Office of Planning and Research (OPR) to amend the California Environmental Quality Act (CEQA) Guidelines to address GHG emissions. The CEQA Guidelines prepared by OPR were adopted in December 2009 and went into effect March 18, 2010. Local governments may use adopted plans consistent with the CEQA Guidelines to assess the cumulative impacts of projects on climate change, if the adopted plan includes a certified environmental impact report (EIR) or adoption of an environmental document. In order to benefit from the streamlining provisions of the CEQA Guidelines, a plan for the reduction of GHG emissions must accomplish the following:

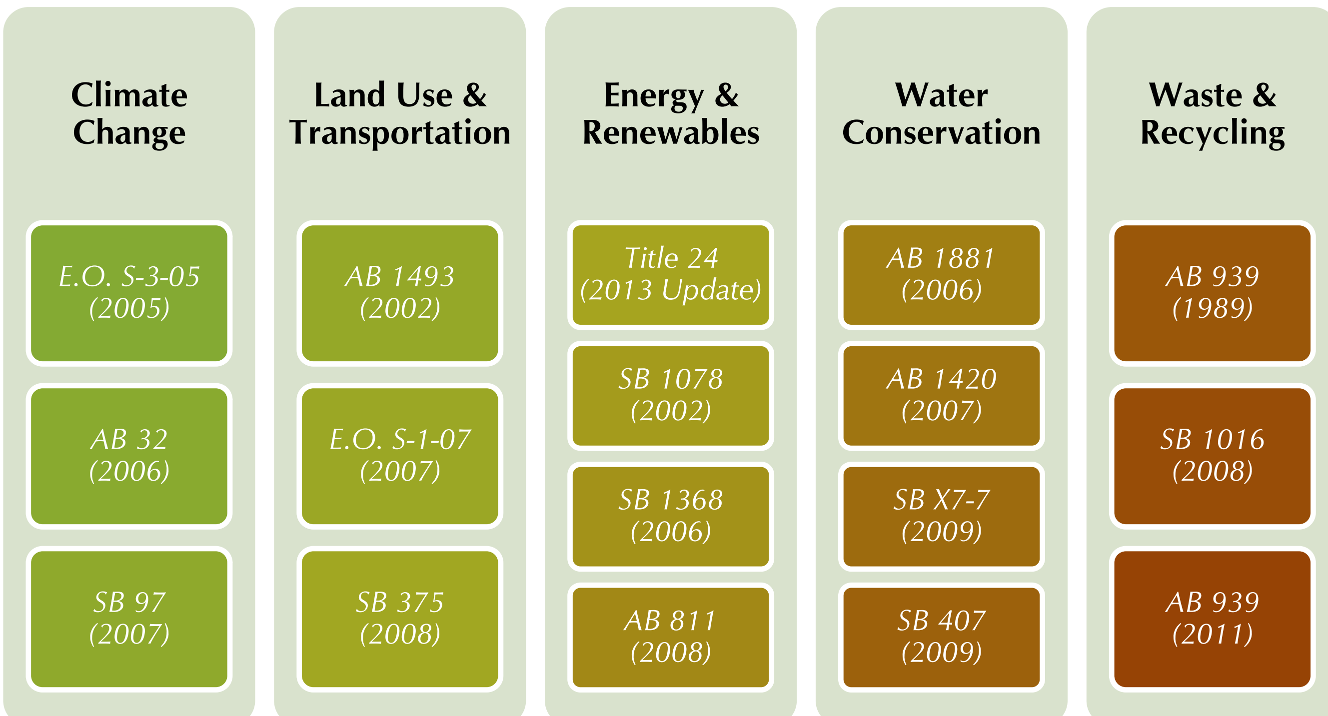
- Quantify GHG emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area.
- Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable.
- Identify and analyze the GHG emissions resulting from specific actions or categories of actions anticipated within the geographic area.
- Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level.
- Establish a mechanism to monitor the plan's progress toward achieving the level and to require an amendment if the plan is not achieving specified levels.
- Be adopted in a public process following environmental review.

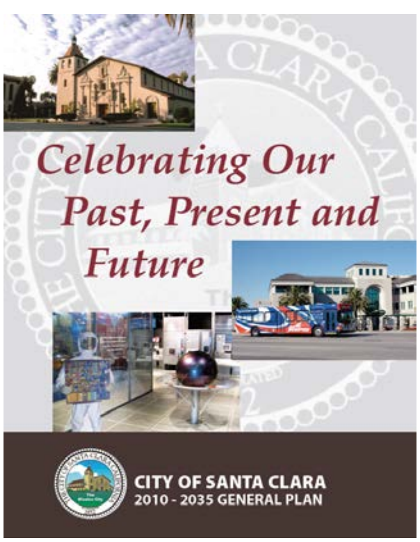
In response to the updated CEQA Guidelines, the Bay Area Air Quality Management District (BAAQMD) has adopted thresholds of significance for GHG emissions. These thresholds may be used in the environmental review process for plans and projects by local governments in the Bay Area.

SB 375 – Sustainable Communities and Climate Protection Act of 2008

SB 375 builds off of AB 32 and aims to reduce GHG emissions by linking transportation funding to land use planning. It requires metropolitan planning organizations (MPO) to create a sustainable communities strategy (SCS) in their regional transportation plans (RTP) for the purpose of reducing urban sprawl. The SCS will demonstrate how the region will achieve the GHG emissions reduction target set by CARB for 2020 and 2035.

Figure 4: Regulatory Framework for Climate Change





Implementing the General Plan

Santa Clara's 2010–2035 General Plan includes goals, policies, and programs to address climate change and improve environmental sustainability, including a requirement to develop this CAP. City policies that further the City's sustainability goals are in Appendix 13 of the General Plan.

Upon adoption of the CAP, the City intends to amend the General Plan to fully integrate the goals and policies. Similar to other portions of the General Plan, the City will implement CAP goals, measures, and actions and monitor its progress over time.

Streamlining Environmental Review

Developing a CAP can also provide streamlined environmental review for new projects subject to CEQA. SB 97 (2007) directed OPR to amend the State CEQA Guidelines to address GHG emissions. OPR adopted the CEQA in December 2009 and they went into effect March 18, 2010. The updated guidelines include provisions for local governments to use adopted plans for the reduction of GHG emissions to address the cumulative impacts of individual future projects on GHG emissions (see State CEQA Guidelines Section 15183.5(b)(1)).

In response to the updated CEQA Guidelines, BAAQMD amended Section 4 of the BAAQMD Air Quality CEQA Guidelines, allowing a lead agency to prepare a Qualified GHG Reduction Strategy that reduces emissions to a level that is not cumulatively considerable. If the local agency then determines that a project is determined to be consistent with an adopted Qualified GHG Reduction Strategy, the project is assumed to not have a significant GHG emissions impact under CEQA.

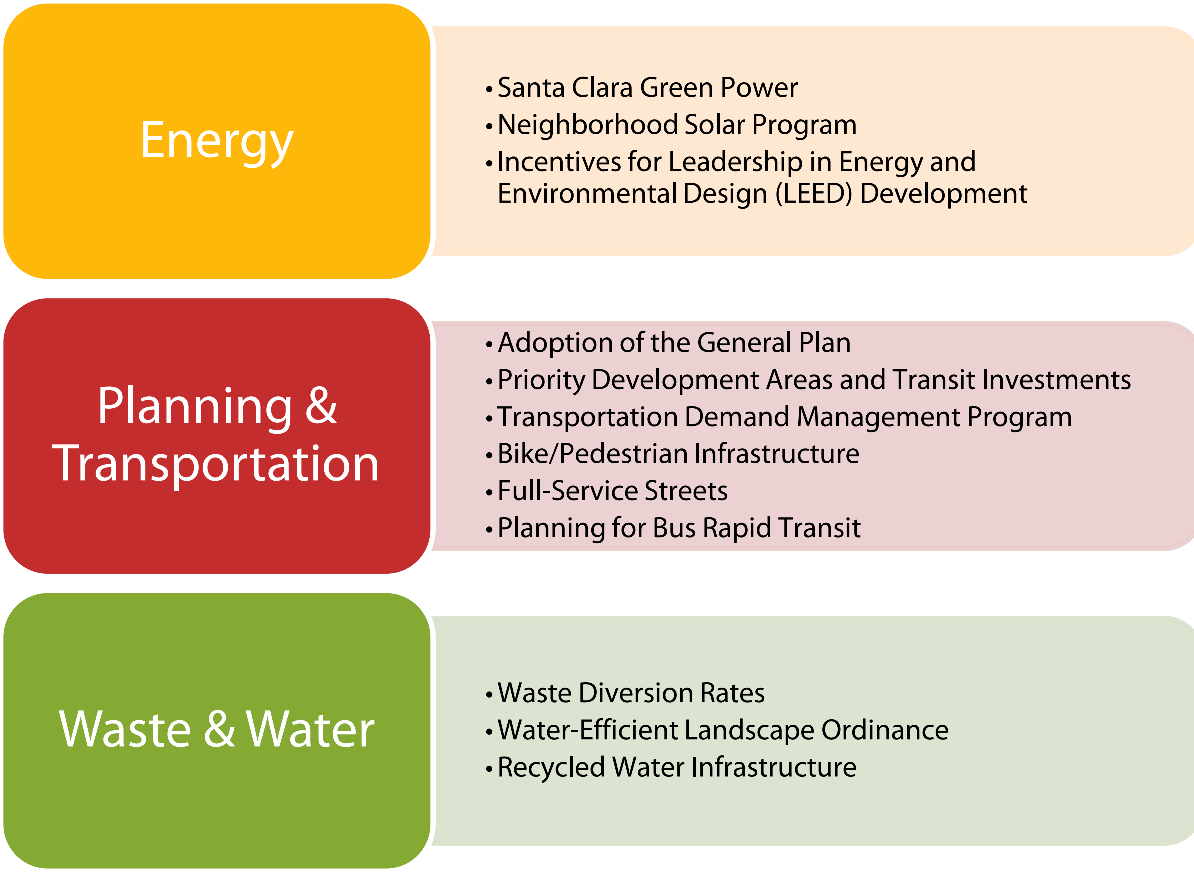
The Santa Clara CAP and accompanying environmental documentation are consistent with the guidelines set forth by BAAQMD for a Qualified GHG Reduction Strategy (which parallel and elaborate upon criteria established in State CEQA Guidelines Section 15183.5(b)(1)), as presented in the chapters referenced below.

- Quantify emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area (see **Chapter 2**).
- Establish a level, based on substantial evidence, below which the contribution of emissions from activities covered by the plan would not be cumulatively considerable (see **Chapter 2**).
- Identify and analyze the emissions resulting from specific actions or categories of actions anticipated within the geographic area (see **Chapter 3** and **Chapter 4**).
- Specify measures or a group of measures, including performance standards that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level (see **Chapter 4**).
- Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specific levels (see **Chapter 5**).
- Adopt the GHG Reduction Strategy in a public process following environmental review.

Commitment to Sustainability

Recognizing the need to comply with state requirements and a desire to serve as environmental leaders in the community, the City and its electric utility, Silicon Valley Power, have provided leadership on issues that affect the natural and built environments within the city and throughout the region. Specific actions taken by the City to support environmental sustainability are described in **Figure 5** and quantified in **Chapter 3**.

Figure 5: Recent Sustainability Efforts in Santa Clara

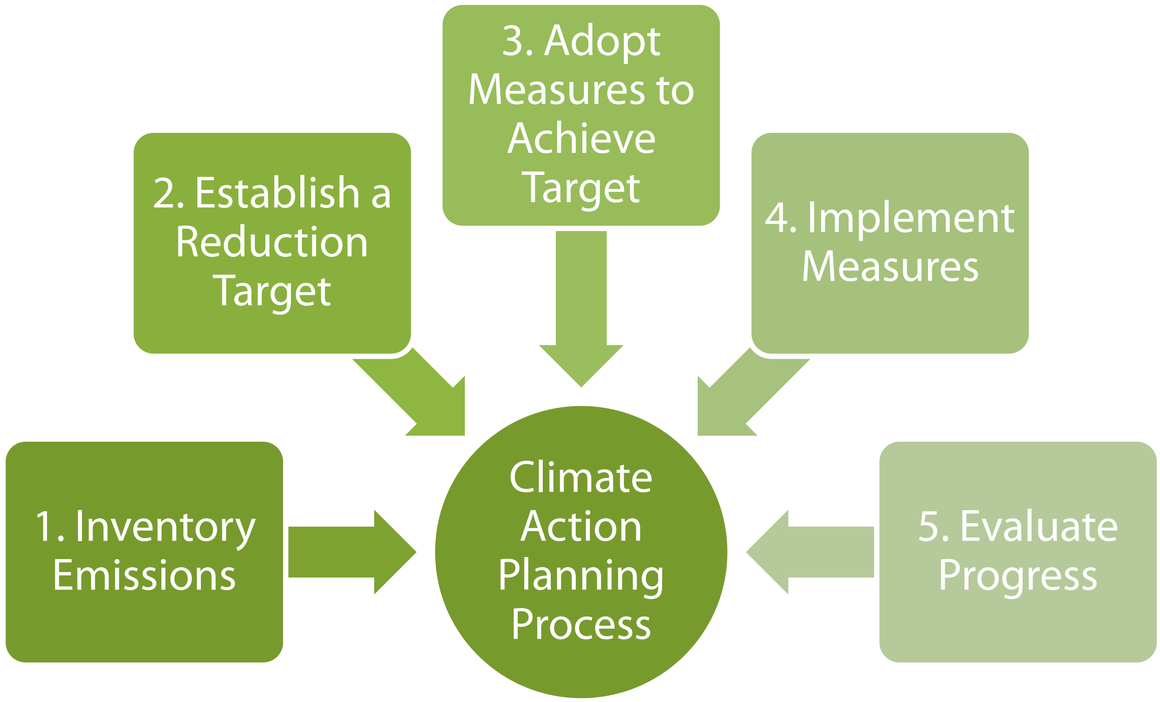


Climate Action Planning Process

The City developed this CAP using the internationally accepted[5] and iterative five-step process described in **Figure 6**. The initial chapters fulfill steps one through three and provide a structure to complete steps four to five. Step five is essential to a successful CAP as is the point when the City estimates the effectiveness of the CAP determines if additional measures need to be implemented.

[5]See ICLEI's Five Milestones for Climate Mitigation (http://www.icleiusa.org/action-center/getting-started/iclei2019s-five-milestones-for-climate-protection)

Figure 6: Five-Step Climate Action Planning Process



Community Engagement

Community members were engaged throughout the climate action planning process in a variety of ways. Events held to engage Santa Clara residents and businesses included pop-up workshops, stakeholder meetings, an online survey, an open house, and several study sessions and public hearings before the Planning Commission and City Council. These events provided a forum for community members to voice their ideas to reduce emissions and to make Santa Clara a more environmentally sustainable place to live and work.

Community Input Opportunities

Pop-Up Workshops

The City hosted two mobile workshops at the Senior Center and the Public Library on Tuesday, February 19, 2013. At each mobile workshop, participants were asked to provide feedback on the CAP through interactive posters, a children's activity, and a community survey. The mobile workshops gave the public an opportunity to learn about and participate in the project.

Throughout the day, 70 adults and 45 children interacted with the project team in some way. **Figure 7** describes comments received and results from activities at the pop-up workshops.

Figure 7: Pop-Up Workshop Key Takeaways

Participants already:

- Carpool, ride the bus, bicycle, or walk from home
- Replace older fixtures, bulbs, or appliances with more energy-efficient models
- Recycle common materials (office paper, cardboard, plastic, glass)

Participants are willing to:

- Collect stormwater or install a greywater system
- Replace or remove water-intensive landscaping
- Install alternative energy devices on their roof or property

Business Stakeholder Meeting

The City hosted multiple business stakeholder meetings throughout the CAP development process. Interested stakeholders from the business community were invited to participate in events held on Thursday, March 28, 2013 and Thursday, July 25, 2013.

Figure 8 describes the topics discussed at each meeting and identifies key themes expressed during the meetings.

Figure 8: Business Stakeholder Meeting Key Takeaways

Discussion Topics:

- Energy efficiency
- Liquid-cooled server
- Renewable energy
- Commute programs
- Water and waste

Key Takeaways:

- Incentivize innovation and creativity
- Offer alternatives to on-site renewable energy
- Recognize efforts already under way
- Recognize gains in efficiency from new technology
- Emphasize cost-saving opportunities/payback

Website and Online Survey

For those that were not able to participate in the CAP through an in-person meeting, the City created a web page where meeting materials and an online survey were posted. The City promoted the webpage and survey using SVP customer utility billings, announcements at public hearings, and notifications from the City's social media outlets. **Figure 9** summarizes survey responses and key takeaways.

Figure 9: Online Survey Key Takeaways

Respondents:

- 68 respondents
  - 55 residents
  - 29 employed in Santa Clara

Key Takeaways:

- Improve access to affordable and efficient transit or active transportation
- Provide incentives for clean, renewable energy
- Support electric vehicle charging stations
- Expand waste reduction programs

Community Open House

The City hosted a community open house in advance of a regularly scheduled Planning Commission meeting on Wednesday, April 10, 2013. Open house participants provided feedback on the CAP using interactive posters and a community survey.

A number of community members participated in the activities and filled out the community survey during the open house. In addition, community members who attended the Planning Commission meeting received a summary presentation describing the project. No public comments or questions were discussed during the Planning Commission meeting. Key takeaways from open house participants are described in **Figure 10**.

Figure 10: Community Open House Key Takeaways

Participants already:

- Carpool, bicycle, or take transit to work
- Make housing choices based on proximity to services and transportation options
- Are involved with solid waste reduction efforts: recycling, compost, avoiding plastic and Styrofoam

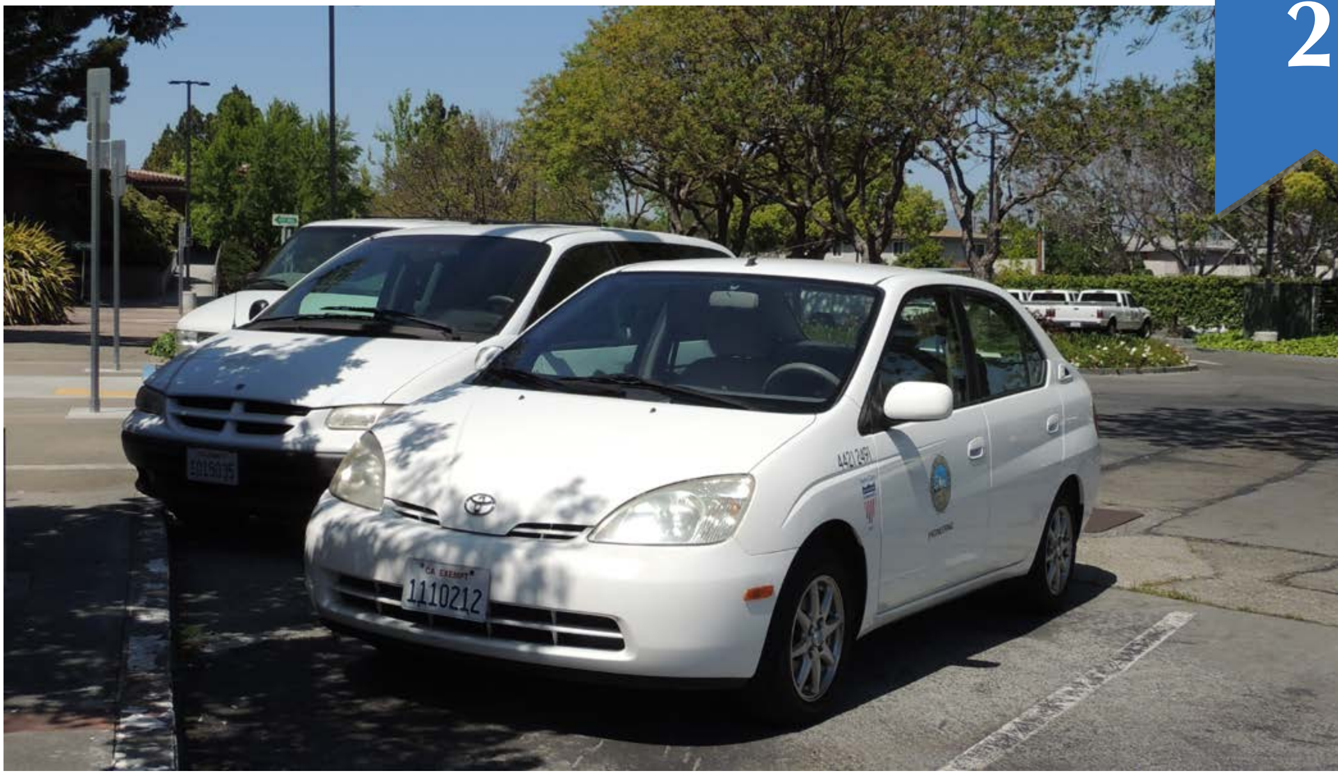
Participants are willing to:

- Support incentives for energy efficiency activities over any other category
- Support requiring the removal of water-intensive landscaping

Key Findings

The Santa Clara community provided valuable input through a variety of communication methods during the climate action planning process. This input and feedback assisted staff with developing a plan that not only meets the criteria for a qualified GHG reduction strategy, but created greater support for the goals and measures of the CAP. The following measures were included as a direct result of community input:

- Requirements for electric vehicle charging stations (see **Measure 6.3**)
- Improve access to affordable and efficient transit or active transportation (see **Measure 6.1**)
- Provide incentives for clean, renewable energy (see **Measure 2.4**)
- Expand waste reduction programs (see **Measures 4.1** and **Measure 4.2**)
- Recognize efforts already under way (see **Chapter 3**)
- Recognize gains in efficiency from new technology (see **Measures 2.1-2.3**, and **Measure 2.5**)
- Emphasize cost-saving opportunities/payback (see **Measure 2.5)**
- Install alternative energy devices on their roof or property (see **Measure 2.4**)



2. Measuring Our Emissions

A GHG emissions inventory and forecast lays the groundwork for the entire CAP planning process. This inventory catalogues community GHG emissions for 2008 and City government emissions for 2010, and projects total emissions levels for 2020 and 2035. Consistent with state guidance, the City has identified an emissions reduction target for the forecast years (see **Chapter 3**). The difference between the emissions forecast and the reduction target represents the necessary reduction in GHG emissions and sets the focus for the reduction measures presented in **Chapter 4**. Additional information on the inventory is provided in **Appendix A.**

Inventory Background and Methods

This inventory was prepared using protocols and best practices identified within the Local Government Operations Protocol, the ICLEI-Local Governments for Sustainability (ICLEI) Community-wide Protocol, and the BAAQMD GHG Plan Level Guidance. The inventory considers the community and City government emissions sources presented in **Figure 11**.

Figure 11: Community and City Government GHG Emissions Sectors

Community – 2008 Baseline

- Energy – Residential, commercial, and industrial electricity and natural gas consumed in the community.
- Transportation – Vehicle miles traveled (VMT) to, from, or within the community.
- Stationary Sources* – Direct emissions from industrial, commercial, and office processes in the community that are permitted by BAAQMD.
- Direct Wastewater – Methane and nitrous oxide emissions from wastewater treatment.
- Off-Road – Emissions from construction and from lawn and garden equipment used in the community.
- Waste – Methane emissions from waste sent to landfills from the community.
- Rail Transit* – Emissions from Caltrain and Santa Clara Valley Transportation Authority (VTA) light rail transit use by community residents and employees.
- Water and Wastewater – Energy required to extract, filter, move, and treat water consumed and/or treated in the community.

City Government – 2010 Baseline

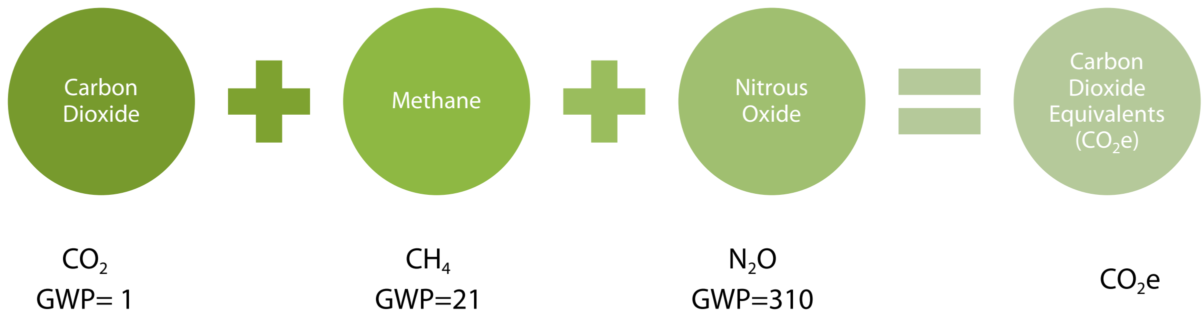
- Silicon Valley Power – Natural gas and other stationary fuels used to generate electricity for the Santa Clara community.
- Closed Landfill – Direct methane emissions from the closed landfill owned by the City.
- Employee Commute – Commute travel to and from work by City employees.
- Buildings and Facilities – Electricity, natural gas, and other stationary fuels used in City-owned and operated buildings and facilities.
- Vehicle Fleet – Diesel and gasoline use in City-owned vehicles.
- Water Pumping – Energy used by City-owned wells, distribution pumps, and irrigation systems.
- Government-Generated Solid Waste – Solid waste generated by City employees or community members at City facilities.
- Wastewater Pumping – Energy used to collect and distribute wastewater and stormwater to the San Jose/Santa Clara Water Pollution Control Plant.
- Public Lighting – Electricity used for outdoor street lighting, traffic signals, parks, and other community facilities.

**These emissions are presented as information items. They are excluded from the community-wide forecast and target.*

Emissions Calculations

Each activity identified in **Figure 11** has a corresponding emissions factor that estimates the emissions generated per unit of activity. For more detail on the emissions factors used for each emissions source, see Appendix A. Emissions factors are typically reported on an annual basis for each type of GHG. Greenhouse gas emissions trap heat in the earth's atmosphere and include CO_2, methane (CH_4), and nitrous oxide (N_2O). CO_2e is the common unit used to equate the different GHGs and is calculated by converting each gas into an equivalent unit of CO_2 using its global warming potential. Each GHG has a different global warming potential as identified in **Figure 12**. For example, CH_4 has a GWP of 21 which means that the emissions of one CH_4 molecule is equivalent to releasing 21 CO_2 molecules in terms of potential to heat the atmosphere.

Figure 12: Global Warming Potentials



Baseline Community Emissions

Community sources created 2,037,800 metric tons of carbon dioxide equivalent emissions ($MTCO_2e$) in baseline year 2008. As shown in **Table 1**, nonresidential energy was the largest contributor, producing approximately 1,110,100 $MTCO_2e$. Transportation was the next largest contributor, generating approximately 523,000 $MTCO_2e$. Emissions from community point sources represented the third largest source, generating approximately 173,500 $MTCO_2e$. Residential energy, off-road equipment, waste, rail transit, water and wastewater energy, and direct wastewater accounted for the remaining 11% of inventoried emissions in 2008.

Table 1: 2008 Community Emissions by Sector

Sector	2008 $MTCO_2e$	Percentage of Total
Nonresidential Energy	1,110,100	54%
Transportation	523,000	26%
Community Point Sources	173,500	9%
Residential Energy	153,200	8%
Off-Road Equipment	31,300	2%
Waste	27,500	1%
Rail Transit	10,000	<1%
Water and Wastewater Energy	7,400	<1%
Direct Wastewater	1,800	<1%
Total	**2,037,800**	**100%**
** Due to rounding, the total may not equal the sum of component parts.*		

Table 1 includes community point source emissions, and rail transit emissions, which are considered informational items. Point sources are fixed emitters of air pollutants, such as industrial manufacturing plants, stationary generators, petrochemical plants, and other heavy industrial sources. Proxy data for 2010 is used for point source emissions, as 2008 baseline information was not available. Since community point source emissions are influenced by market forces beyond the City's local influence and are best regulated by BAAQMD or through federal and state programs, they are reported in this inventory as informational items. As the agency responsible for regulating community point sources of air pollution in the San Francisco Bay Area Air Basin, BAAQMD's primary objective is to ensure the region meets the health-protective air quality

standards set by the state and federal government through the permitting and regulation of industrial sources throughout the region.

Rail transit emissions are also included as informational items because the City has little to no control over the operation of Caltrain and the Santa Clara Valley Transportation Authority (VTA) light rail system. The inventory guides future local policy decisions that relate to emissions within the City's influence; therefore, community point sources, and rail transit are excluded from further discussion. **Figure 13** and **Table 2** reflect Santa Clara's jurisdictional baseline of 1,854,300 $MTCO_2e$.

Due to the varying degrees of influence over different GHG emissions sources, there is often overlap in accounting for GHG emissions. For the City of Santa Clara, this overlap occurs between the direct emissions produced at facilities generating electricity for SVP, and again indirectly as SVP electricity is used in homes and businesses. SVP's direct emissions are calculated and included in the baseline inventory and forecast in two different ways, maintaining consistency with national GHG emissions protocols. First, the direct emissions associated with the two power plants located within city limits are calculated using verified emissions numbers from CARB. Second, the indirect emissions associated with each business and household consuming SVP electricity are calculated based on the amount of electricity consumed, whether or not it is generated within city limits.

To avoid double-counting these emissions, the direct emissions from the power plants located within the city are excluded from future discussions of the government operations inventory.

Figure 13: 2008 Community Jurisdictional Emissions by Sector

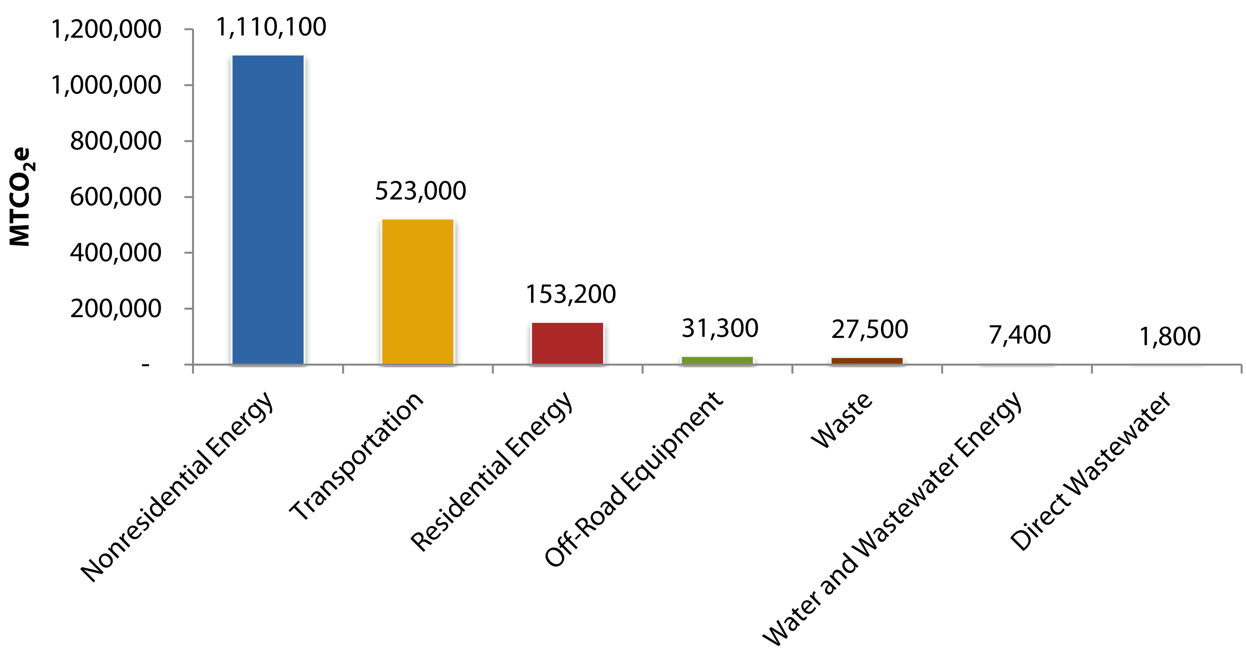


Table 2: 2008 Community Jurisdictional Emissions by Sector

Sector	2008 $MTCO_2e$	Percentage of Total
Nonresidential Energy	1,110,100	60%
Transportation	523,000	28%
Residential Energy	153,200	8%
Off-Road Equipment	31,300	2%
Waste	27,500	1%
Water and Wastewater Energy	7,400	<1%
Direct Wastewater	1,800	<1%
Total*	**1,854,300**	**100%**
*** Due to rounding, the total may not equal the sum of component parts.**		

Baseline City Government Emissions

Emissions from City government operations totaled 247,900 $MTCO_2e$ in the baseline year 2010.[6] As shown in **Table 3**, SVP contributed 222,300 $MTCO_2e$ to City government emissions. The remaining emissions, about 25,600 $MTCO_2e$, came from other City government operations including energy use at buildings and facilities, public lighting, water pumping, wastewater pumping, vehicle fleet fuel use, employee commutes, and government-generated solid waste.

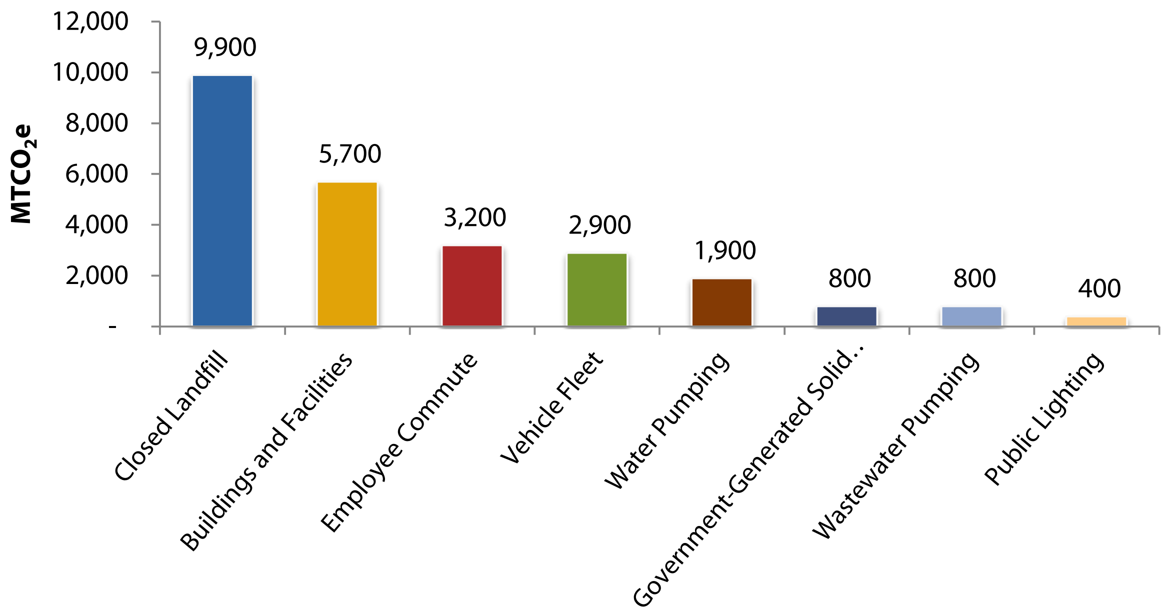
Table 3: 2010 City Government Emissions by Sector

Sector	2010 $MTCO_2e$	Percentage of Total
Silicon Valley Power – Energy Generation	222,300	90%
Closed Landfill	9,900	4%
Buildings and Facilities	5,700	2%
Employee Commute	3,200	1%
Vehicle Fleet	2,900	1%
Water Pumping	1,900	<1%
Government-Generated Solid Waste	800	<1%
Wastewater Pumping	800	<1%
Public Lighting	400	<1%
Total*	**247,900**	**100%**
** Due to rounding, the total may not equal the sum of component parts.*		

6 This is not consistent with the community baseline year as the City Government baseline was prepared as part of a program initiated by Join Venture Silicon Valley.

SVP's energy generation facilities contributed the overwhelming majority of City government emissions in 2010. Since SVP's regulatory requirements differ from those of other City government emissions sources, and to inform meaningful and effective emissions reduction policies, SVP emissions are addressed separately. **Figure 14** shows the breakdown of emissions from City government operations that are not associated with SVP energy generation.

Figure 14: 2010 City Government Emissions for Non-SVP Operations



Community Emissions Forecast

The community emissions forecast estimates how emissions will grow if no reduction efforts are taken at the federal, state, or local level. The Santa Clara emissions forecast assumes energy, transportation, waste disposal, and water use remain at baseline rates through 2020. The forecast uses indicators from the 2010–2035 General Plan to determine how expected population, household, and jobs growth will affect future emissions. On-road transportation is forecast using vehicle miles traveled (VMT) estimates developed by Fehr & Peers Transportation Consultants based on the General Plan. **Table 4** identifies the growth indicators, sectors, and sources used to forecast emissions in Santa Clara.

Table 4: Community 2020 and 2035 Forecast Growth Indicators

Indicator	Emissions Sector	2008	2020	2035	Percentage Change, 2008–2035
Housing Units	Residential Energy, Off-Road	44,166	52,408	60,395	+37%
Population	n/a	115,000	131,000	155,000	+35%
Jobs	Nonresidential Energy	107,000	125,000	153,000	+43%
Service Population	Waste, Water, and Wastewater	222,000	256,000	308,000	+49%
Vehicle Miles Traveled (millions)	On-Road Transportation	1,106	1,191	1,298	+17%

Using the community growth indicators shown above, **Table 5** and **Figure 15** summarize the emissions growth forecast by activity sector. Without actions or policies to reduce GHGs, community emissions in Santa Clara would grow by 16% to 2,148,600 $MTCO_2e$ in 2020 and by 37% to 2,531,400 $MTCO_2e$ in 2035.

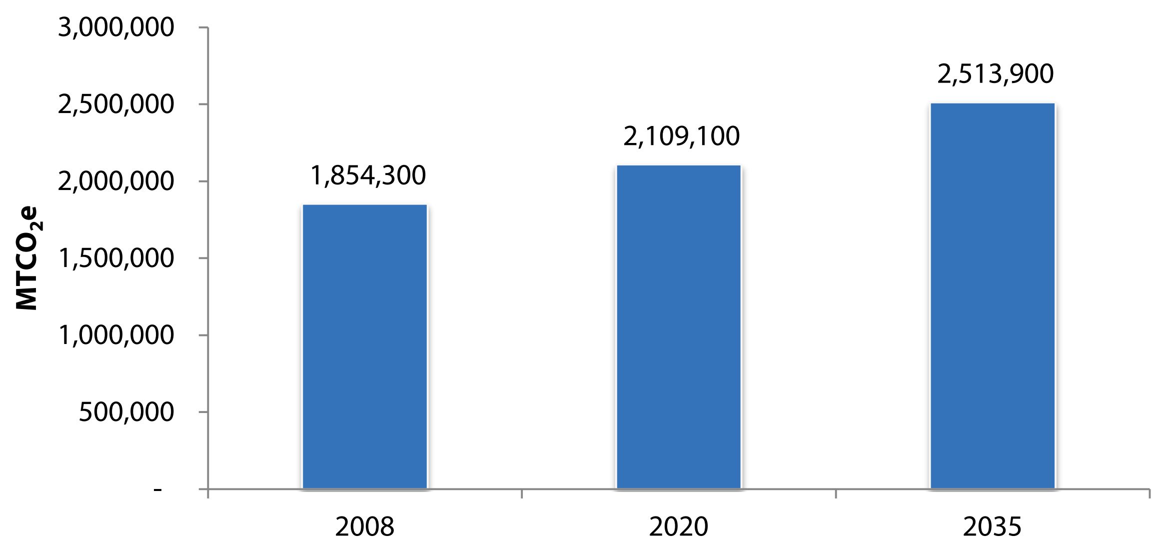
Table 5: 2008–2035 Community Business-as-Usual Emissions by Sector

Sector	2008 $MTCO_2e$	2020 $MTCO_2e$	2035 $MTCO_2e$	Percentage Change, 2008–2020	Percentage Change, 2008–2035
Nonresidential Energy	1,110,100	1,280,100	1,540,200	15%	39%
Transportation	523,000	563,200	660,800	8%	26%
Residential Energy	153,200	182,700	211,200	19%	38%
Off-Road Equipment	31,300	82,400	65,000	163%	108%
Waste	27,500	31,700	44,000	15%	60%
Water and Wastewater	7,400	8,500	10,200	15%	38%
Direct Wastewater	1,800	2,100	2,900	17%	39%
Total*	1,854,300	2,109,100	2,513,900	14%	36%

** Due to rounding, the total may not equal the sum of component parts.*

The large growth in off-road equipment from 2008 and 2020, and slightly decreased growth from 2020 to 2035, results from anticipated increases in housing unit construction over those periods.

Figure 15: 2008–2035 Community Business-as-Usual Emissions by Sector



City Government Emissions Forecast

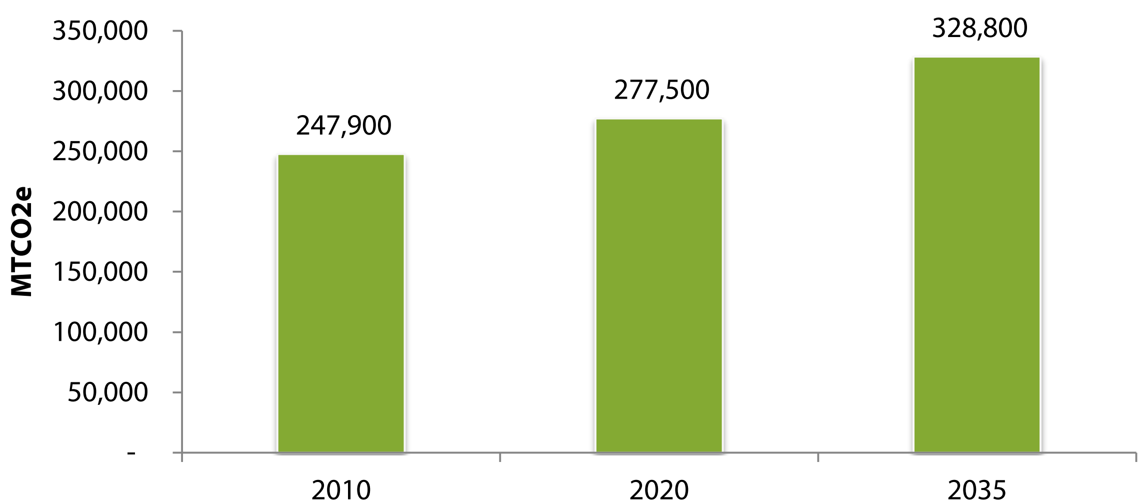
Using service population growth from 2010 to 2035, SVP energy generation, water pumping, and wastewater pumping emissions were forecast to increase. All other sectors would remain static at 2010 levels. **Table 6** and **Figure 16** summarize the emissions growth forecast for City government emissions. Emissions are estimated to grow by 12% to 277,500 $MTCO_2e$ in 2020 and by 33% to 328,800 $MTCO_2e$ in 2035.

Table 6: 2010–2035 City Government Emissions Forecast by Sector

Sector	2010 $MTCO_2e$	2020 $MTCO_2e$	2035 $MTCO_2e$	Percentage Change, 2010–2020	Percentage Change, 2010–2035
Silicon Valley Power – Energy Generation	222,300	251,500	302,600	13%	36%
Closed Landfill	9,900	9,900	9,900	0%	0%
Employee Commute	3,200	3,200	3,200	0%	0%
Buildings and Facilities	5,700	5,700	5,700	0%	0%
Vehicle Fleet	2,900	2,900	2,900	0%	0%
Water Pumping	1,900	2,200	2,300	16%	21%
Government-Generated Solid Waste	800	800	800	0%	0%
Wastewater Pumping	800	900	1,000	13%	25%
Public Lighting	400	400	400	0%	0%
Total*	**247,900**	**277,500**	**328,800**	**12%**	**33%**

** Due to rounding, the total may not equal the sum of component parts.*

Figure 16: 2010–2035 City Government Emissions Forecast by Sector



3

3. Tracking Early Success

Before considering new policies or programs to include in the Climate Action Pl, it is important to assess how emissions have already been reduced since 2008 through implementation of state regulations and local reduction efforts. Building upon the emissions inventory and forecasts presented in **Chapter 2**, this chapter identifies and describes activities and requirements implemented at the state and local levels since 2008 and the associated effect on local emissions. These activities and requirements have already set the City on a path toward achieving emissions reduction goals.

State Regulations

The State of California has proactively adopted and implemented legislation to reduce emissions that have local benefits in Santa Clara. These actions include implementation of vehicle fuel efficiency standards (Pavley), statewide building codes and standards (Title 24 updates), and directives to utility providers to increase the amount of renewable energy provided to California consumers.

Quantified State Regulations

Key state programs and requirements that affect local emissions in Santa Clara are described below and credited toward the 2020 emissions reduction target.

Pavley Clean Car Standards

AB 1493 (Pavley, 2002) requires carmakers to reduce GHG emissions from new passenger cars and light trucks beginning in 2011. The California Air Resources Board (CARB) anticipates that the Pavley standards will reduce emissions from passenger vehicles by about 22% in 2012 and by about 30% in 2016, while improving fuel efficiency and reducing costs. These standards for more efficient vehicles would reduce transportation emissions in Santa Clara by 93,300 $MTCO_2e$ in 2020.

Low Carbon Fuel Standard

Executive Order S-01-07 (2007) established the Low Carbon Fuel Standard (LCFS) to reduce the carbon intensity of transportation and construction equipment fuels 10% by 2020. According to the May 2011 Updated BAAQMD CEQA Air Quality Guidelines, the LCFS is likely to reduce emissions locally by 7.2%, due to the exclusion of upstream emissions and reductions. LCFS reductions apply to on-road transportation and off-road equipment. LCFS would reduce transportation emissions in Santa Clara by 43,500 $MTCO_2e$ in 2020.

Renewables Portfolio Standard

Over the last 10 years, several legislative bills have been adopted to set renewable portfolio standards for California's utility providers. While the specific requirements have changed with each bill signed into law, the goal of the renewable portfolio standards is to increase the share of electricity delivered by California investor-owned and publicly-owned utilities from renewable sources like solar, wind, and geothermal.

Adopted in 2002, SB 1078 (2002) required utilities to deliver 20% of their electricity from eligible renewable energy sources no later than 2017. This renewable portfolio requirement was accelerated in 2006 with the adoption of SB 107, moving the 20% requirement deadline up to 2010. In 2011, SB X1-2 (2011) changed the compliance deadlines to 33% by 2020. This Renewables Portfolio Standard (RPS) was extended to municipal and publicly owned utilities (including SVP) by AB 2196 (2012). While SVP is responsible for determining the content of its energy portfolio, because achievement of the 33% RPS is mandated by the State, these emissions reductions are attributed to implementing state legislation. In 2008, Santa Clara's eligible renewable energy sources (as defined by the California Energy Commission) made up 30% of the utility's portfolio. As of 2012, SVP's electricity portfolio consisted of 25.9% renewable energy sources. In 2020, SVP's achievement of the 33% minimum RPS would reduce energy emissions an additional 29,600 $MTCO_2e$ beyond 2008 levels.

California Building Code

Title 24 of the California Code of Regulations is a statewide standard applied by local agencies through building permits. It includes requirements for the structural, plumbing, electrical, and mechanical systems of buildings and for fire and life safety, energy conservation, green design, and accessibility in and around buildings. Part 6 (the California Energy Code) and Part 11 (the California Green Building Standards Code) include prescriptive and performance-based standards to reduce electricity and natural gas use in every new building constructed in California. The GHG reduction benefits of these standards to Santa Clara include the net energy benefit of new Title 24 requirements that did not exist in the 2008 baseline year. As Title 24 standards are regularly updated, anticipated advances in energy efficiency requirements are included. In 2020, energy saved in new buildings resulting from Title 24 would reduce emissions by 10,200 $MTCO_2e$.

State Reduction Summary

As shown in **Table 7**, ongoing implementation of state programs and requirements would reduce emissions by approximately 176,600 $MTCO_2e$ in 2020. Most of these reductions result from implementation of the Pavley

Clean Car standards and LCFS. Achieving a 33% RPS and continuing to implement Title 24 and CALGreen standards would reduce emissions from the community's built environment.

Considering the 2020 business-as-usual emissions forecast of 14% above 2008 baseline emissions levels identified in **Chapter 2**, the local benefit of these state reductions would reduce 2020 emissions in Santa Clara to about 4% above 2008 levels.

Table 7: Local Emissions Reductions from State Activities

	2008 $MTCO_2e$	2020 $MTCO_2e$
Business-as-Usual Forecast	1,854,300	2,109,200
Pavley Clean Car Standards	-	-93,300
Low Carbon Fuel Standard	-	-43,500
Renewables Portfolio Standard	-	-29,600
California Building Code (Title 24 + CALGreen)	-	-10,200
Total State Reductions	-	-176,600
Resulting Emissions Level	**-**	**1,932,600**
Change Since Baseline	**-**	**4%**

Local Accomplishments

Beyond complying with state requirements, the City has undertaken numerous activities to reduce emissions since 2008. This section highlights specific actions taken by the City since 2008 to reduce emissions and quantifies reductions that will result from continued implementation of those actions through 2020. When combined with reductions from state programs, reductions from local accomplishments further reduce emissions in Santa Clara.

Local accomplishments initiated or completed since 2008 that the City can count toward the reduction target include further implementing energy efficiency and renewable energy programs, planting trees to provide shade, and reducing waste and water consumption. Although Santa Clara has reduced emissions through other local accomplishments since 2008, this section describes local accomplishments that can be quantified using existing, generally accepted methods.

Quantified Local Accomplishments

Energy Efficiency and Conservation Block Grant Activities

In 2009, the City was awarded an Energy Efficiency and Conservation Block Grant from the US Department of Energy as part of the American Recovery and Reinvestment Act. The City utilized $1.2 million in grant funding to upgrade various outdoor lighting equipment, retrocommission City facilities, install photovoltaic systems, and weatherize low-income multi-family buildings. These activities have saved 1.3 million kilowatt-hours (kWh) in electricity use annually and will continue to reduce energy emissions by 230 $MTCO_2e$ in 2020.

Tree Planting

While primarily an aesthetic amenity, trees also provide valuable shade and sequestration benefits that reduce energy use and resulting emissions in Santa Clara. The City has planted between 120 and 150 new trees annually since 2008, totaling 665 new trees to date. These trees will continue to reduce energy emissions by an estimated 10 $MTCO_2e$ in 2020.

City Photovoltaic Installations

Santa Clara has installed photovoltaic technology (PV) or executed power purchase agreements for PV at two City facilities. The systems range in size from 100 kilowatts (kW) at the Jenny Strand R&D Park to 400 kW at the City parking garage. They have a combined capacity of 500 kW, generating an estimated 717,500 kWh per year, and will continue to reduce energy emissions by 120 $MTCO_2e$ in 2020.

Neighborhood Solar Program

As a voluntary program, the Neighborhood Solar Program allows SVP customers to contribute funds as part of their monthly utility bill to install PV systems at nonprofits in Santa Clara. Since 2008, SVP has worked with five organizations to use these funds to install PV systems. These systems have a combined capacity of 60 kW, generating an estimated 85,000 kWh per year, and will reduce energy emissions by 10 $MTCO_2e$ in 2020.

Santa Clara Green Power

While SVP's portfolio consists of more than 30% renewable energy, utility customers can choose to receive 100% of their electricity from renewable sources by participating in the Santa Clara Green Power program. Customers participating in the program pay 1.5 cents more per kWh to participate, which costs the average customer about $7.50 extra per month. Participation in the Green Power program has increased by more than 30% from 58 million kWh sold in 2008 to nearly 83 million kWh sold in 2012. These increases in green power sales will reduce local energy emissions by an additional 32,130 $MTCO_2e$ in 2020.

Solar Santa Clara

Nearly 220 homes and over 20 businesses have installed solar PV in Santa Clara since 2008. The electricity generated from these systems is enough to power about 2,100 homes.

To ensure the energy generation benefits of PV systems installed throughout the city are not outweighed by other environmental impacts, the City is in the process of updating the design guidelines to incorporate best practices to minimize the visual impacts of highly reflective PV systems.

Residential Audits

SVP offers free home energy audits to residential customers, providing information regarding household energy use and identifying opportunities to improve residential energy efficiency. Since 2008, SVP has made 640 house calls and conducted approximately 480 audits. These audits often result in modest energy savings from changes in consumption and can result in greater savings when recommended retrofits are completed. Energy savings from this program since 2008 total about 88,000 kWh, which will continue to reduce energy emissions by 90 $MTCO_2e$ in 2020.

Photovoltaic Rebates and Expedited Permitting

Rebates reduce the overall cost of the equipment needed to generate on-site renewable energy. Through SVP's photovoltaic rebate program, approximately 220 residential and 22 nonresidential customers have installed PV systems. The effectiveness of these rebates is supported by the City's "one-stop" expedited permitting process for residential and nonresidential PV systems. The combined capacity of systems installed using rebates between 2008 and 2012 is 7,300 kW, resulting in an estimated 10.5 million kWh per year. In 2020, the effect of PV systems installed through these rebates will reduce energy emissions by 1,830 $MTCO_2e$.

Residential Energy Efficiency Rebates

SVP offers a wide variety of additional energy efficiency incentives and rebates to support residential energy conservation. Between 2008 and 2012, SVP provided more than 3,700 rebates to customers. The types of programs and technologies that are incentivized vary from year to year. These rebates have saved an estimated 3 million kWh per year since 2008. Continued implementation of these rebate programs will reduce energy emissions by 570 $MTCO_2e$ in 2020.

Commercial Energy Efficiency Rebates

Similarly, SVP provides incentives and rebates to support commercial and industrial energy conservation. The types of programs and technologies that are incentivized vary from year to year. These rebates have saved an estimated 19 million kWh per year since 2008. Continued implementation of these rebate programs will reduce energy emissions by 3,320 $MTCO_2e$ in 2020.

Waste Reduction

Solid waste disposal accounted for 1% of baseline 2008 community emissions. At that time, the City was able to divert approximately 58% of the total waste generated from landfills through various recycling and green waste collection programs. Since 2008, the community has increased the diversion rate to 65%, decreasing the amount of waste sent to landfills by more than 40,000 tons per year. Continued implementation of a 65% diversion rate through 2020 would decrease waste emissions by 8,190 $MTCO_2e$.

Water Conservation

In coordination with the Santa Clara Valley Water District, the City has implemented water conservation programs described in the 2010 Urban Water Management Plan (UWMP). The UWMP sets a goal of reducing per capita water use 20% by 2020, consistent with state law. Since 2008, the community has saved nearly 202 million gallons per year below projected water consumption, reducing the energy needed to supply and treat water. In 2020, continued implementation of these water savings will reduce water emissions by 110 $MTCO_2e$.

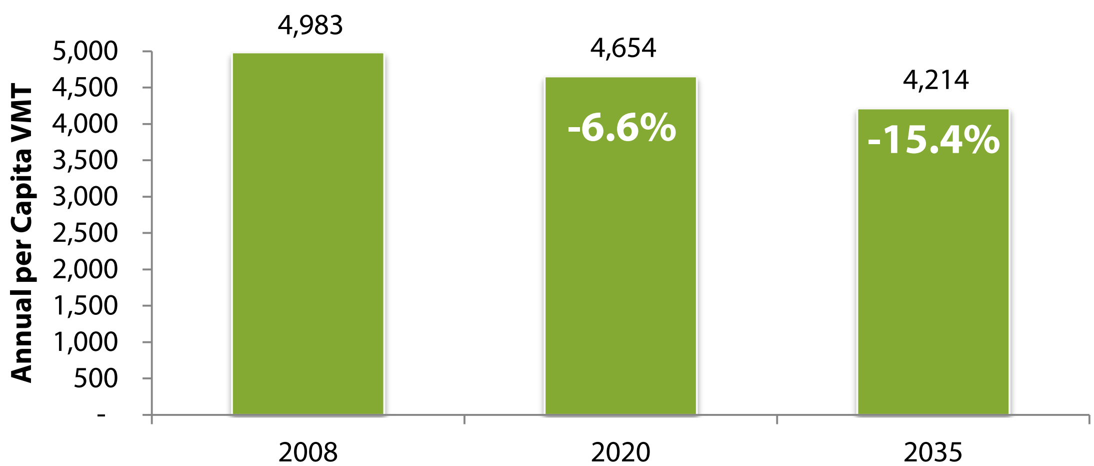
Electric Vehicle Deployment

The Center for Sustainable Energy in California, in partnership with the California Air Resources Board, currently tracks the sales of electric vehicles through the Clean Vehicle Rebate Project (CVRP). From June 2011 to December 2012, about 80 electric vehicles (EVs) were sold to customers within the Silicon Valley Power territory. The impact of the use of these EVs in 2020 is the reduction of 180 $MTCO_2e$.

Transportation and Land Use

Numerous General Plan goals and policies will improve the efficiency of the local transportation network and provide expanded transportation options for alternative modes. Santa Clara's Travel Demand Model was used to estimate the cumulative number of vehicle miles traveled in the community in 2008 and the anticipated amount with implementation of the General Plan through 2035. The travel demand model is based on land use and transportation plans contained in the General Plan and assumes a decrease in per capita VMT of 6.6% by 2020 and 15.4% by 2035 (**Figure 17**). Because many of the sustainability oriented policies associated with land use and transportation are already factored into the growth forecast, they are not separately called out and quantified as an existing accomplishment in this chapter.

Figure 17: Annual per Capita Vehicle Miles Traveled



Local Accomplishments Summary

Continued implementation of local accomplishments described in this chapter will reduce 2020 emissions by approximately 46,800 $MTCO_2e$. When combined with the effects of state programs, these additional reductions will reduce community emissions in 2020 to 2% above baseline 2008 levels. Emissions reduction benefits of each local action are listed in **Table 8**.

Table 8: Emissions Reductions from Local Accomplishments

Existing Accomplishments	2020 $MTCO_2e$
Energy Efficiency Conservation Block Grant Activities	-230
Tree Planting	-10
City Photovoltaic Installations	-120
Neighborhood Solar Program	-10
Santa Clara Green Power	-32,130
Residential Audits	-90
Photovoltaic Rebates	-1,830
Residential Energy Efficiency Rebates	-570
Commercial Energy Efficiency Rebates	-3,320
Waste Reduction	-8,190
Water Conservation	-110
Electric Vehicle Deployment	-180
Total Local Reductions*	-46,800
Resulting Emissions Level	**1,885,800**
Change Since Baseline	**2%**
Total may not equal the sum of component parts due to rounding.	

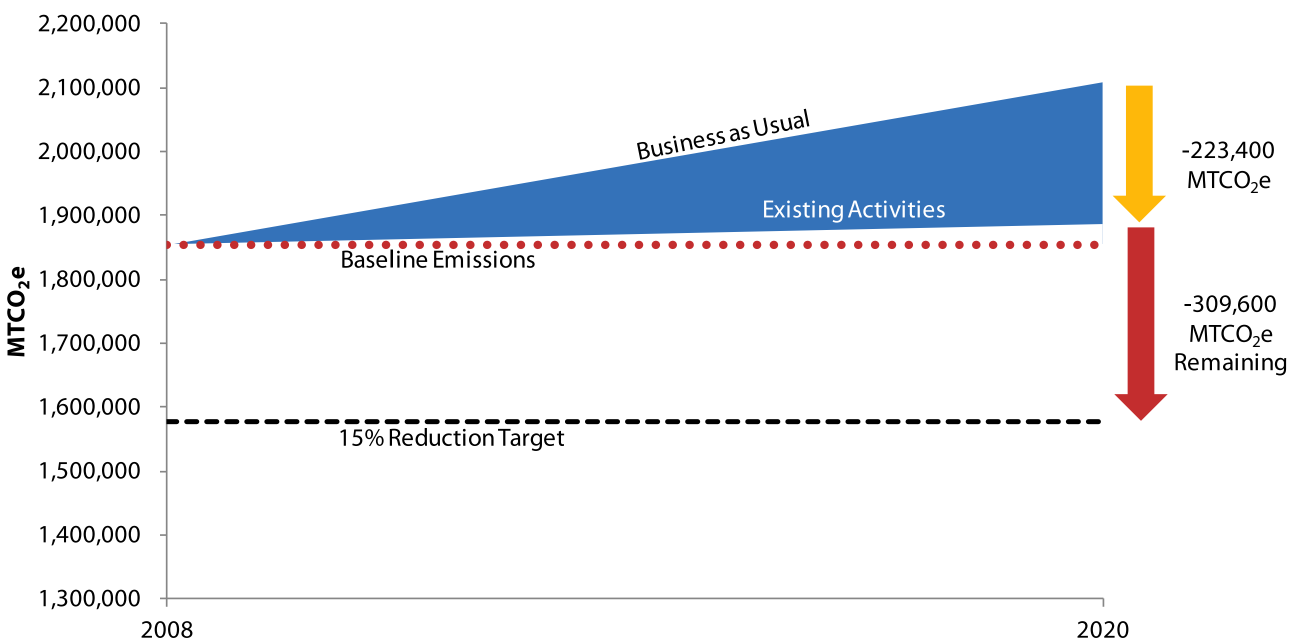
Emissions Reduction Target and Remaining Gap

Prior to identifying new policies to implement, the next step in the climate action planning process is to evaluate emissions reduction target options and determine an appropriate level of emissions reductions to be achieved. Many jurisdictions throughout California have adopted goals and targets to reduce emissions in a CAP or emissions reduction strategy, typically motivated by the community's desire to develop comprehensive sustainability strategies and/or in response to AB 32, Executive Order S-3-05, and SB 375, Attorney General comment letters on general plans, the State CEQA Guidelines, and air district guidance.

Santa Clara reviewed existing targets and emissions reduction actions taken by similar jurisdictions and considered various agency (CARB, California Attorney General's Office, and BAAQMD) recommendations to determine the appropriate emissions reduction target. This CAP recommends a GHG reduction target of 15% below the 2008 baseline level by 2020 and includes measures to exceed the target. **Figure 18** demonstrates the gap to be closed by local CAP measures to reduce emissions from the 2020 forecast levels to 15% below baseline levels by 2020.

Assessing the benefit of state and local accomplishments gives the City credit for steps taken to date and helps the community better understand anticipated emissions reductions from resident, employee, business, and government activities. As listed in **Table 8** and illustrated in **Figure 18**, after accounting for reductions from state regulations and local actions, the Santa Clara community needs to reduce emissions by an additional 309,600 $MTCO_2e$ by 2020 to achieve the emissions target (15% below 2008 baseline levels).

Figure 18: Remaining Gap to Achieve Emissions Reduction Target



4. Reducing Emissions

The reduction measures included in this plan comprise a diverse mix of incentives, public information, and regulations applicable to both new and existing development. This chapter describes the process used to develop, refine, and quantify the emissions reduction goals and measures identified to achieve Santa Clara's emissions reduction target.

Reduction Strategy Structure

Proposed measures to fill the local emissions reduction gap and achieve an emissions reduction target consistent with AB 32 are identified below.

Focus Areas

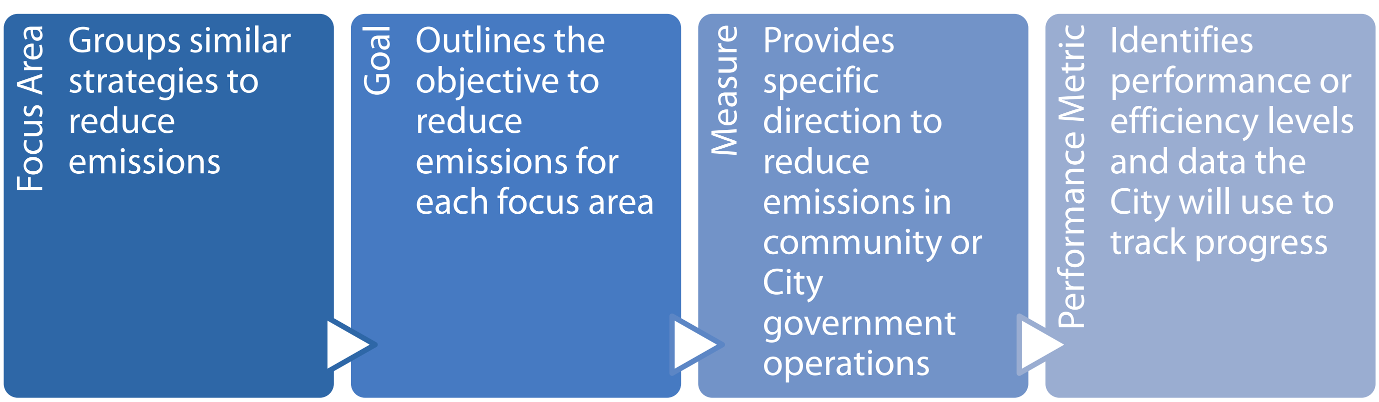
Proposed measures are split into focus areas as follows: Coal-Free and Large Renewables, Energy Efficiency, Water Conservation, Waste Reduction, Off-Road Equipment, Transportation and Land Use, and Urban Heat Island Effect (**Figure 19**). Similar to emissions sectors described in previous chapters, the focus areas group goals and measures into categories.

Figure 19: Climate Action Plan Focus Areas

Goals and Measures

For each focus area, a series of goals and measures is identified. *Goals* outline the general purpose or objective for each focus area. *Measures* address specific topics within each focus area at a greater level of detail than goals (e.g., alternative transportation strategies, energy efficiency programs). Emissions reductions are estimated at the measure level using performance metrics. *Performance metrics* provide specific participation or efficiency levels for implementation of each measure (e.g., number of participating households, total renewable energy installed). **Figure 20** summarizes these components of emissions reduction measures.

Figure 20: Reduction Measure Components



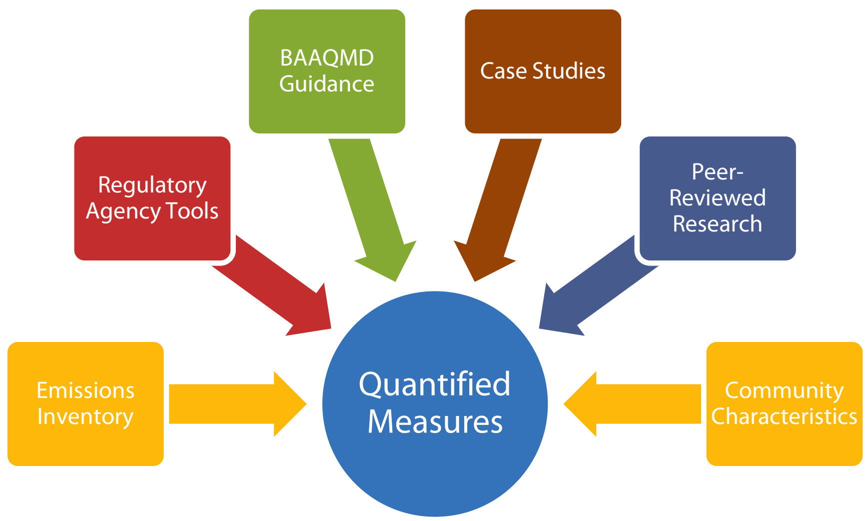
Quantification Methods

Emissions reduction estimates are identified for each measure for the year 2020. The emissions reduction benefit of each measure is determined by changes in operation, activity, or efficiency. In general, three types of reductions are provided by the CAP:

- Avoided emissions (e.g., walk instead of drive)
- Greater efficiency (e.g., drive an electric vehicle)
- Sequestration (e.g., increase carbon storage by planting trees)

Figure 21 summarizes information used to estimate emissions reductions. The 2008 baseline inventory and 2020 forecast serve as the foundation for quantifying reduction measures. Activity data from the inventory (e.g., VMT, kWh of electricity) is used with performance metrics to calculate the emissions reduction potential of each measure. This approach ensures that emissions reductions relate to activities in the community.

Figure 21: Emissions Quantification Sources and Tools



Where possible, emissions reduction estimates are based on tools and reports provided by government agencies such as the US Environmental Protection Agency (EPA), California EPA, California Energy Commission (CEC), CARB, California Air Pollution Control Officers Association (CAPCOA), and BAAQMD. If accurate reduction estimates are not available using these tools, a case study with comparable characteristics may be used. Finally, for more long-range reduction measures that lack actual on-the-ground testing or analysis, current scholarly and peer-reviewed research is combined with knowledge of existing City practices to create a defensible estimate of future emissions reductions.

Measure Evaluation

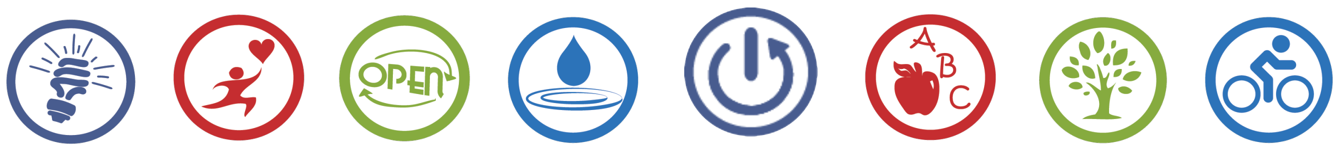
Many methods are used by jurisdictions to reduce GHG emissions. While Santa Clara has considered best practices in similar or nearby communities, the use of a measure by another community does not necessarily mean that it is practical or appropriate for Santa Clara. This is particularly true given Santa Clara's unique emissions profile and role as an electricity provider to residential, commercial, and industrial uses. Therefore, a set of criteria was developed to evaluate each measure and identify those most appropriate for Santa Clara.

1. Effectiveness

The primary goal of the CAP is to identify and quantify the emissions reduction benefit of each measure to achieve the target. The emissions reduction effectiveness of each measure is presented following each measure description. All emissions reduction benefits are identified for the year 2020, unless otherwise noted, and are represented in $MTCO_2e$.

2. Community Benefits

Beyond reducing emissions, many measures can also improve quality of life for residents and businesses in Santa Clara. Additional community benefits are identified for each measure as follows.



Energy | Health | Economy | Water | Technology | Education | Resources | Mobility

3. Lead Department

Specific City departments will implement each CAP measure, as outlined below. Additional staff time and resources may be needed or may already be budgeted to implement each measure.

Electric Utility	Planning & Inspection	Public Works	Water & Sewer Utility	Parks & Recreation

4. Time and Resources

An estimate of the likely expense and staff time that may be necessary to implement each measure can help determine if the measure is a good use of City resources. Three cost ranges are presented for each measure. Additionally, each measure identifies if part or all of a measure is already factored into a department's budget.

Range	Description	Annual Staff Hours
$ Low	Minimal staff effort and no consultant assistance would be needed to complete analytical work, coordinate stakeholder/public outreach, or implement the program.	<500
$$ Medium	Significant staff effort, some consultant assistance, or supplemental funding for operations or capital projects would be needed to complete analytical work, coordinate stakeholder/public outreach, or implement the program.	500–1,000
$$$ High	Major staff effort, consultant assistance, or supplemental funding for operations or capital projects would be needed to complete analytical work, coordinate stakeholder/public outreach, or implement the program.	1,000+

Emissions Reduction Strategies

Focus Area 1: Coal-Free and Large Renewables

Goal: Eliminate coal from SVP's portfolio and increase use of natural gas and renewable energy.

The City of Santa Clara operates Silicon Valley Power, a publicly owned utility that provides electricity for the community of Santa Clara. By operating SVP, the City has control over the emissions associated with the sources of electricity delivered to its customers. The measures in this Coal-Free and Large Renewables focus area concentrate on reducing the GHG intensity of the electricity delivered in Santa Clara.

SVP's provision of low-cost electricity to customers plays a critical role in sustaining Santa Clara's industrial and high-tech economy. Opportunities to reduce emissions from energy in the city are focused on reducing overall electricity use and achieving greater reliance on electricity sources with lower GHG intensities. Since nearly half (48%) of Santa Clara's emissions result from electricity use, removing GHG-intensive sources of electricity such as coal are effective approaches to achieving the City's GHG reduction goals.

1.1 Coal-free by 2020

Replace the use of coal in Silicon Valley Power's portfolio with natural gas by 2020.

This measure encapsulates Santa Clara's long-term vision to deliver clean and sustainable electricity. By switching generation capacity from coal (about 136 MW in 2008) to natural gas, SVP would reduce generation emissions by about 40%. In addition, natural gas is one of the cleanest fossil fuel sources of electricity available and would be the sole GHG-emitting source in SVP's portfolio. With implementation of this measure, Santa Clara's electricity portfolio would be one of the cleanest in the state at 380 pounds CO_2/MWh. This measure represents an important first step toward a future where most electricity delivered by SVP comes from renewable or non-GHG emitting sources.

- **Performance metric:** 100% of coal power replaced with natural gas.

1.1 Coal-free by 2020

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
388,800 $MTCO_2e$	Resources	***Silicon Valley Power***	***$$$***

1.2 Renewable energy resources

Investigate the use of City-owned property for large-scale renewable energy projects.

The City of Santa Clara owns several properties outside of the city limits that could be used in the future to support large-scale renewable energy projects. The City will investigate such use of these lands through a focused study of the generation capacity, potential environmental effects, and transmission capacity. Any proposed renewable energy project, including PV systems will be designed and installed in a manner that minimizes solar reflectance and is consistent with the City's design guidelines, or with applicable design codes if located outside of the City.

1.2 Renewable energy resources

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
No Reductions by 2020	Economy Resources Technology	***Silicon Valley Power***	***$$$***

1.3 Utility-installed renewables

Develop up to five solar PV projects with a total installed capacity of 3 to 5 MW.

Another way Santa Clara will reduce the GHG intensity of electricity delivered by SVP is to install up to 5 megawatts (MW) of solar PV systems within the city limits. In order to install these systems by 2020, SVP will develop a feed-in-tariff program or other incentives to encourage installation of distributed renewable generation. Any proposed PV systems will be designed and installed in a manner consistent with the City's design guidelines to minimize solar reflectance. The City should also collaborate with local businesses, organizations, and landowners to identify privately-owned opportunities to meet the 5 MW goal by 2020.

- **Performance metric:** New solar PV projects generating a total of 5 MW.

1.3 Utility-installed renewables

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
1,200 $MTCO_2e$	Economy Resources	***Silicon Valley Power***	***$$***

Focus Area 2: Energy Efficiency Programs

Goal: Maximize the efficient use of energy throughout the community.

Santa Clara will take a mixed approach to reducing energy emissions using the ability of SVP to control sources of electricity and leveraging efficiency. This focus area identifies reductions associated with increasing energy efficiency in existing and new development through incentives, rebates, and new technologies. This focus area also expands beyond electricity use and efficiency to address natural gas use and efficiency.

2.1 Community electricity efficiency

Achieve City-adopted electricity efficiency targets to reduce community-wide electricity use by 5% through incentives, pilot projects, and rebate programs.

SVP has established annual electricity efficiency targets for fiscal years 2013–2021, and these targets are updated every three years. On an annual basis, SVP reviews both the residential and nonresidential electricity efficiency programs and evaluates new opportunities to incentivize additional efficiency projects and programs in the community. Rather than dictate specific energy efficiency programs or actions, this measure demonstrates the emissions reduction benefits of SVP achieving the established energy efficiency targets. As currently established, the reduction targets would reduce community-wide electricity use by 5% by 2020.

The City should consider expanding this target reduction to 10% by 2035. The recommended efficiency targets, reductions, and implications relative to the 2035 reduction target are presented in **Table 10**.

- **Performance metric (2020):** 159,100 MWh electricity savings.

2.1 Community electricity efficiency

Effectiveness	Community Benefits	Lead Department	Time & Resources
27,600 $MTCO_2e$	Energy Economy Technology	***Silicon Valley Power***	***$$***

2.2 Community natural gas efficiency

Work with community and social services agencies to provide information from Pacific Gas & Electric (PG&E) to promote voluntary natural gas retrofits in 5% of multi-family homes, 7% of single-family homes, and 7% of nonresidential space through strategic partnerships connecting residents and business owners to available financing resources.

Buildings in Santa Clara use natural gas for heating, cooking, and operating appliances. This measure identifies reductions associated with increasing natural gas efficiency in existing development. The City will achieve these reductions through a multifaceted approach of outreach, education, and advertising rebate programs provided by PG&E (the natural gas utility serving Santa Clara). The City can work with community groups to help actively promote and advertise energy efficiency financing for residential and commercial properties and develop energy efficiency outreach and education programs for renter-occupied households. Another outreach is developing an energy audit checklist property owners can use to identify simple natural gas efficiency upgrades.

- **Performance metric:** 1,700 single-family homes, 1,000 multi-family homes, 410 commercial accounts, and 130 industrial accounts complete natural gas efficiency upgrades.

2.2 Community natural gas efficiency

Effectiveness	*Community Benefits*	*Lead Department*	*Time & Resources*
12,100 $MTCO_2e$	Energy Economy Technology	***Silicon Valley Power with PG&E***	***$***

2.3 Data centers

Encourage new data centers with an average rack power rating of 15 kW or more to identify and implement cost-effective and energy-efficient practices.

Data centers constitute a large portion of the electricity used in Santa Clara. On average, 28% of total electricity consumed in the community is used by data centers. Recognizing both the economic benefit and the climate effects of data centers is an essential part of this CAP. To respond to the effects of this electricity use, the City will require new data centers with an average rack power rating of 15 kW or more to complete a feasibility study identifying techniques to achieve a power usage effectiveness (PUE) rating of 1.2 or lower. Where determined feasible, the City will encourage applicants to utilize such techniques. To aid industry stakeholders in this feasibility analysis, the City will provide guidance and examples of successful and feasible techniques, and will evaluate on an annual basis the incentives available through SVP to improve the cost-effectiveness of this measure.

- **Performance metric:** 10% of new data centers utilizing energy-efficient practices.

2.3 Data centers

Effectiveness	Community Benefits	Lead Department	Time & Resources
400 $MTCO_2e$	Energy, Technology	***Planning & Inspection***	***$***

2.4 Customer-installed solar

Incentivize and facilitate the installation of 6 MW of customer-owned residential and nonresidential solar PV projects.

The purpose of this measure is to increase the number of solar PV projects on residential and nonresidential buildings and facilities. Many households and businesses in Santa Clara have installed solar PV panels using SVP's rebate program. This measure directs the City to facilitate additional solar PV installations by providing incentives for and information about the benefits of solar PV to residents and business owners. Information provided by staff to residents and businesses proposing to install solar PV systems will include reference to the City's design guidelines, ensuring that all PV systems are designed and installed in a manner to minimize solar reflectance. The Planning & Inspection Department will continue to assist SVP's incentive program by facilitating the existing "one-stop" expedited permitting process for customer-owned solar PV systems. Similarly, the Planning & Inspection Department can provide outreach to owners of key nonresidential land and businesses ideal for solar PV power, such as parking lots and garages, warehouses, and large retail buildings.

- **Performance metric:** New solar PV projects generating 6 MW in total installed capacity on homes, nonresidential buildings, parking garages, parking lots, and other feasible areas. Equivalent to 900 residential and 330 nonresidential installations.

2.4 Customer-installed solar

Effectiveness	Community Benefits	Lead Department	Time & Resources
1,500 $MTCO_2e$	 Economy  Resources	SVP with Planning & Inspection	$$

2.5 Municipal energy efficiency

Reduce municipal electricity use by 10% through comprehensive energy retrofits of existing equipment and implementation of previously identified energy efficiency projects with a benefit-cost ratio of one or greater.

The City government of Santa Clara will serve as an example of energy efficiency in the community by reducing electricity use by 10% by upgrading equipment in City-owned facilities. The City will reach this efficiency goal through a two-tiered approach: (1) tie-up loose ends by completing all cost-effective energy efficiency projects identified in historic energy audits, and (2) continue to upgrade equipment, including computers and packaged HVAC units, to new and efficient models.

The City contracted with energy auditors to identify cost-effective energy efficiency projects in 29 City-owned facilities, and completed projects identified in the audit with a simple payback period of less than three years. In order to reach the emissions reductions identified in this measure, the City will also now implement projects which were not implemented before, and which have a lifetime benefit-cost ratio of one or greater.

The second tier in this energy efficiency measure is the continual replacement of aging and inefficient equipment with new and efficient models. To initiate and sustain successful equipment replacement, the City should:

- Benchmark energy use in City facilities using a normalization process, such as that offered through the EPA's Portfolio Service Manager.
- Identify facilities appropriate for an in-depth energy audit and retrocommissioning site visit.
- Bundle any and all identified projects to reach an attractive payback period, generally less than five years.

    - **Performance metric:** Replace inefficient equipment in 50% of municipal buildings and facilities. Complete all previously identified cost-effective identified energy efficiency projects.

2.5 Municipal energy efficiency

Effectiveness	Community Benefits	Lead Department	Time & Resources
600 $MTCO_2e$	Energy, Economy	Public Works	$$

2.6 Municipal renewables

Install 1 MW of solar or other renewables at City-owned facilities.

By installing more solar PV systems on City-owned facilities outside of the operations of SVP, the City of Santa Clara will lead the community by example to help meet the 2020 reduction target. The City will pursue 1,000 kW of future solar PV projects on City-owned facilities. In order to successfully complete this task, the Public Works department will need to work closely with SVP to identify proper sites, lock in a sustainable financing mechanism, implement construction, and continually monitor performance to achieve the total potential annual electricity production of the system(s). PV systems proposed for City-owned facilities will be designed and installed in a manner consistent with the community design guidelines to minimize potential for solar reflectance.

- **Performance metric:** New solar PV projects generating 1,000 kW in total installed capacity.

2.6 Municipal renewables

Effectiveness	Community Benefits	Lead Department	Time & Resources
300 $MTCO_2e$	Economy, Resources	Public Works	$$

Focus Area 3: Water Conservation

Goal: Reduce GHG-intensive water use practices.

Water use in the community requires large amounts of energy to convey and treat water, both before and after it reaches the end-user. The primary goal for this focus area is to minimize the amount of energy used for these purposes through increased conservation efforts, improved water efficiency, and the continued and growing use of recycled water.

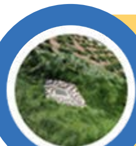
3.1 Urban Water Management Plan targets

Meet the water conservation goals presented in the 2010 Urban Water Management Plan to reduce per capita water use by 2020.

The City's 2010 UWMP identifies policies and programs to achieve water conservation targets required by the state's SBx7-7 goals. With implementation of this reduction target, the average annual water use per capita would be 186 gallons. Steps the City should take to reach this reduction target include:[7]

- Promote water conservation in new development through the use of development standards and building requirements.
- Revisit the currently adopted landscape design guidelines to increase efficiency in outdoor water use in new development.
- Provide information to residents and businesses about the economic and environmental benefits of water conservation and low-cost retrofit opportunities.

  - **Performance metric:** Achieve 100% compliance of the SB X7-7 reduction goal to save 1,362 acre-feet.



3.1 Urban Water Management Plan targets

Effectiveness	Community Benefits	Lead Department	Time & Resources
140 $MTCO_2e$	Water, Resources	Water & Sewer Utilities & Planning and Inspection	$

[7] For more actions to reach the City's water conservation goal, see Table 36 in the 2010 UWMP

Focus Area 4: Waste Reduction

Goal: Increase recycling opportunities for all disposed materials.

Waste disposed by the community generates methane as it decomposes after being deposited in landfills. During decomposition, food waste emits twice as much methane per pound than any other material disposed in landfills.[8] The following waste reduction measures focus on efforts to launch a food waste collection program with local restaurants and achieve an 80% waste diversion rate by 2020.

4.1 Food waste collection

Support the expansion of existing food waste and composting collection routes in order to provide composting services to 25% of existing restaurants.

Currently a pilot food waste collection route exists in Santa Clara. This measure expands on this effort to reach 25% of existing restaurants. To successfully do this, the City Street & Auto Services Department will work closely with current food waste collection contractors to identify how to properly expand the existing routes to reach new customers without expanding services beyond a reasonable area. A directed outreach campaign and survey can gauge several key participation factors, including the amount of food waste generated by the prospective business, the restaurant's level of interest, and any existing composting or food waste separation practices. The survey can provide the City a clear idea regarding which restaurants would be most likely to successfully adopt curbside food waste collection.

- **Performance metric:** Participation of 120 restaurants in Santa Clara.

4.1 Food waste collection

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
150 $MTCO_2e$	Economy Technology Resources	***Public Works***	***$***

[8] See Table 8 of the California Air Resources Board Landfill Emissions Tool v1.3.

4.2 Increased waste diversion

Work with regional partners to increase solid waste diversion to 80% through increased recycling efforts, curbside food waste pickup, and construction and demolition waste programs.

In 2008, most waste generated within Santa Clara (58%) was diverted from landfills through recycling, green waste, and other collection programs. This measure recommends increasing the waste diversion percentage from 58% to 80%. To do this, the City should:

- Update the Santa Clara City Code (SCCC) to lower the threshold for construction and demolition collection requirements.
- Adopt recycling ordinances that incorporate new standards for trash, recycling, and composting collection enclosures. For example, require enclosures to accommodate two 4-yard containers.
- Work with trash collection providers to increase the types of recyclables and organic materials that collection services will accept for recycling.
- Work with apartment building owners and managers to implement recycling programs.

    - **Performance metric:** Increase the waste diversion rate from 58% to 80%.

4.2 Increased waste diversion

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
20,500 $MTCO_2e$	Education Resources	***Public Works***	***$$***

Focus Area 5: Off-Road Equipment

Goal: Ensure efficient operations of off-road equipment.

Fuel used in off-road equipment for construction and lawn or garden equipment can be reduced through operations that are more efficient and by transitioning to alternative fuel sources to power off-road equipment. This focus area identifies best practices and opportunities for fuel-efficient equipment operations. BAAQMD currently provides guidance and resources to developers, residents, and businesses on viable and economical ways to retrofit or replace off-road equipment.

5.1 Lawn and garden equipment

Support and facilitate a community-wide transition to electric outdoor lawn and garden equipment through outreach, coordination with BAAQMD, and outdoor electrical outlet requirements for new development.

Lawn and garden equipment powered by electricity or battery packs has become more advanced and effective over time, but the industry standard still relies on gasoline-powered machinery. The Planning & Inspection Department will work to encourage the turnover of existing lawn and garden equipment, namely lawn mowers and leaf blowers, to electric alternatives. By amending development standards, the City can also ensure that new homes and businesses are equipped with outdoor electrical outlets necessary to use electric lawn and garden equipment. To do this, the City should:

- Encourage and support local and regional retrofit and replacement programs using pamphlet materials and the City's website, and at public events.
- Support BAAQMD efforts to re-establish a voluntary exchange program for residential lawn mowers and backpack-style leaf blowers.
- Require new buildings to provide outdoor electrical outlets in accessible locations to charge or power electric lawn and garden equipment.
- Require the use of on-site grid power and limit the use of diesel generators, with exceptions for projects where grid power is not available or to mitigate unusual circumstances.

    - **Performance metric:** Exchange 1,170 leaf blowers and 130 lawn mowers with electric models.

5. 1 Lawn and garden equipment

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
100 $MTCO_2e$	 Health Resources	***Planning & Inspection***	***$***

5.2 Alternative construction fuels

Require construction projects to comply with BAAQMD best management practices, including alternative-fueled vehicles and equipment.

Construction vehicles and equipment can be powered by cleaner alternative technologies, including biodiesel, electricity, gasoline hybrid, or compressed natural gas. These alternative options emit fewer GHGs and are consistent with BAAQMD guidelines and requirements. Depending on the scope of a project under CEQA, the City may impose these best management practices as mitigation measures on discretionary projects. BAAQMD-recommended basic construction mitigation measures include limiting idling times to five minutes or less, limiting vehicle speeds to 15 miles per hour or less, and proper equipment maintenance and tuning in accordance with manufacturer specifications. The City will work to implement this measure by relying on existing BAAQMD grant and rebate programs included in the Carl Moyer Memorial Air Quality Standards Attainment Program.

- **Performance metric:** 30% of construction equipment switches from conventional technologies to hybrid, compressed natural gas (CNG), electric, or biodiesel.

5.2 Alternative construction fuels

Effectiveness	Community Benefits	Lead Department	Time & Resources
6,100 $MTCO_2e$	Health, Resources	Planning & Inspection	$

Focus Area 6: Transportation and Land Use

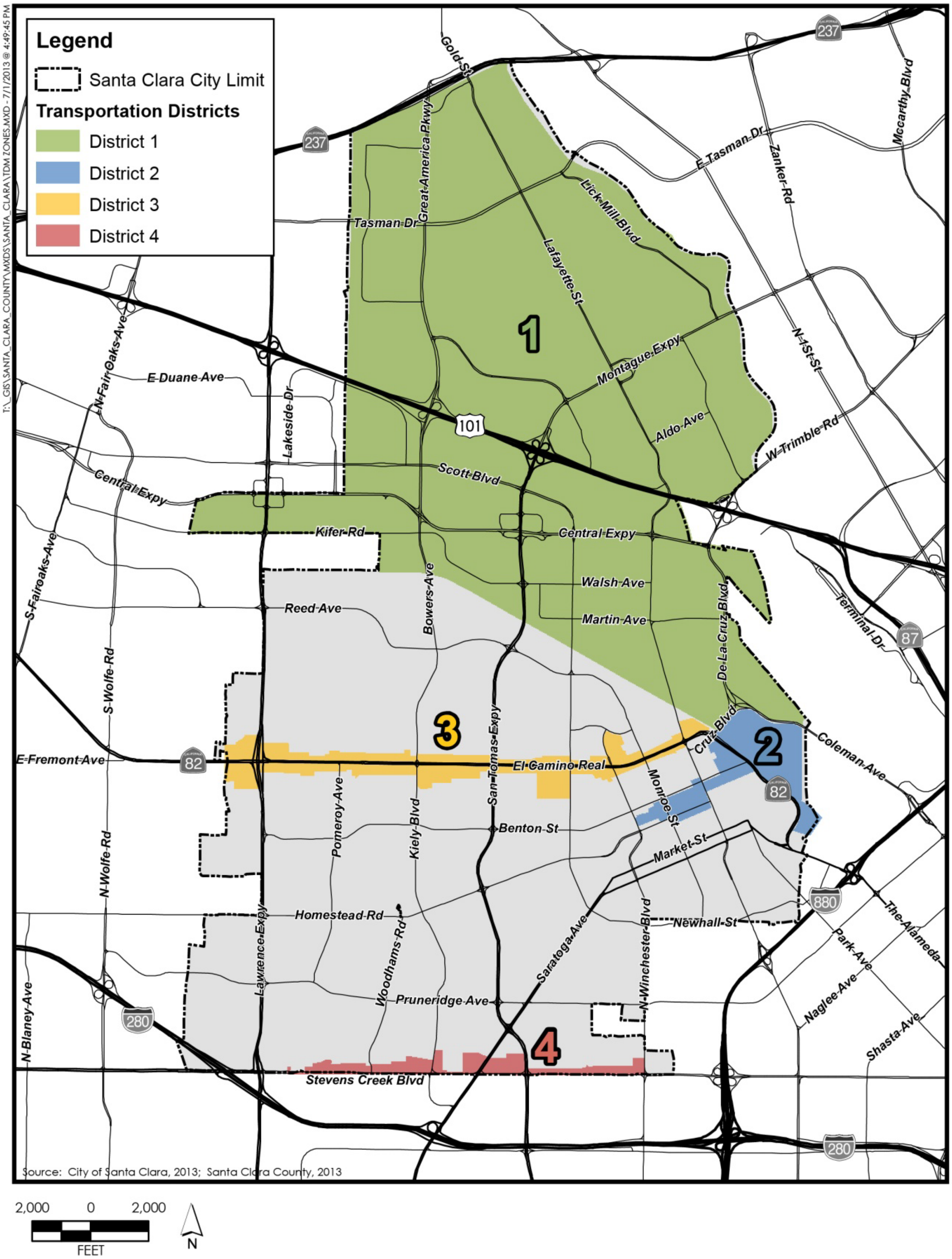
Goal: Establish land uses and transportation options that minimize single-occupant vehicle use.

Every year, the Santa Clara community drives more than one billion miles on local and regional roads. Transportation by single-occupant vehicle can be reduced through a greater mix and diversity of land uses and expanded options to use alternative modes of travel.

As described in Chapter 3, the 2010–2035 City of Santa Clara General Plan includes forward-thinking land use and transit policies that, when implemented, would reduce per-service population vehicle miles traveled (VMT) by 6.6% by 2020. To identify additional land use-related and transit service measures in this CAP would double-count the estimated VMT reductions. This focus area identifies opportunities, beyond those already identified in the General Plan or captured in the City's travel model, through a suite of recommended transportation demand management (TDM) measures supporting a complete network of multimodal travel options. These measures identify an additional 1% reduction in per-service population VMT. Combined with the policies already contained in the General Plan, implementing these measures would reduce per-service population VMT by 7.6% by 2020.

While many TDM approaches could be implemented throughout the city, each is not necessarily applicable or effective in all locations. To maximize the effectiveness of each approach, the City has identified four transportation management districts, identified in **Figure 22**. The TDM measures applicable to each district vary based on the planned mix of land uses, the transportation services provided, and the estimated effectiveness of each measure in each district. **Table 9** identifies the districts, applicable TDM measures, and the range of anticipated VMT reductions. Each measure is discussed in further detail below.

Figure 22: Santa Clara Transportation Management Districts



The City's General Plan identifies specific land use assumptions that anticipate the type and amount of new development to occur within each district identified in **Figure 22**. The amount and type of new development identified in the General Plan directly correlates to the anticipated increases in VMT with the various districts anticipating an increase in daily VMT by 2020 between 4.2% and 37.5%. A detailed summary of the growth in VMT by district is presented in **Appendix B.**

It is also anticipated that the land uses within each district will vary in their ability and approach to implementing programs that reduce VMT and associated emissions. To facilitate project level implementation of the TDM program, **Table 9** identifies the minimum required VMT reductions by transportation district and General Plan land use designation. Each proposed project located in the transportation districts identified in **Figure 22** consisting of greater than 25 housing units or more than 10,000 nonresidential square feet will be required to achieve a minimum VMT reduction. The VMT reductions may be achieved through project design characteristics, land use, parking, access, or TDM best practices. In most cases, a minimum level of VMT reduction must be achieved through the application of TDM best practices.

Table 9: Minimum Vehicle Miles Traveled Reduction Requirements by Transportation District and Land Use Designation

	General Plan Land Use Designation							
	Medium-Density Residential	High-Density Residential	Regional Commercial	Neighborhood Mixed Use	Community Mixed Use	Regional Mixed Use	Low Intensity Office/R&D	High Intensity Office/R&D
Average trip generation rate [1,2]	6	7	8	8	8	8	11	7
Transportation Districts	**Minimum % VMT reduction per project [3,4,5] (Minimum % VMT reduction per project from TDM) [6,7]**							
1 - North of Caltrain	15% (5%)	20% (10%)					25% (10%)	20% (10%)
2 - Downtown					20% (10%)			
3 - El Camino Real Corridor		15% (5%)			20% (10%)	20% (10%)		
4 - Stevens Creek Blvd			5% (n/a)		15% (5%)			

Notes:

1. *Average trip generation rates represent the number of daily trips per housing unit (for residential projects) or per 1,000 square feet (for nonresidential projects).*
2. *For commercial and mixed-use designations, average trip generation rates describe employee and resident trips rather than retail visitor trips.*
3. *Highlighted cells indicate that the General Plan land use designation is present in the transportation district.*
4. *The VMT reductions for each land use in each district exceed the total cumulative VMT reductions anticipated for each district in Appendix B, as projects consisting of less than or equal to 25 dwelling units or 10,000 nonresidential square feet would typically be considered exempt.*
5. *All projects subject to minimum vehicle miles traveled reduction requirements are subject to annual reporting requirements.*
6. *Staff retains discretion to require a TDM program as a condition of approval for discretionary projects not located in one of the four identified districts.*
7. *TDM reductions are expressed as minimum requirements. However, staff retains discretion to require greater levels of TDM as a condition of approval for discretionary projects.*

Sources:

City of Santa Clara General Plan. 2010. http://santaclaraca.gov/ftp/csc/pdf/general-plan/SantaClara_Ch8-6_1-3-11_Final.pdf

Fehr & Peers. 2013. VMT+ Tool http://www.fehrandpeers.com/vmt/

6.1 Transportation demand management program

Require new development located in the city's transportation districts to implement a TDM program to reduce drive-alone trips.

The City will require all new developments greater than 25 housing units or more than 10,000 nonresidential square feet to draft and implement a VMT reduction strategy that reduces drive-alone trips. The degree to which each project implements a TDM program as part of the VMT reduction strategy will be based on the location and land use of the proposed project, as shown in **Table 9**.

The City will offer both a prescriptive and a performance method for projects to demonstrate compliance to minimize the need for additional analysis but provide flexibility for projects proposing alternative methods. To help projects comply using the prescriptive method, the City will prepare checklists for representative project types (residential, commercial, mixed use, office/R&D). Each checklist will identify applicable actions and the estimated VMT reductions to occur through implementation. The applicable actions are grouped into the following categories:

- Land Use and Location
- Neighborhood/Site Enhancements
- Parking Policy
- Resident/Commute Trip Reduction Programs

Each project subject to the requirements will be required to submit an annual TDM monitoring report to City staff to evaluate the progress of TDM goals.

- **Performance metric:** TDM reporting results in a 1% overall reduction in citywide VMT, with individual projects achieving a minimum 5% to 10% reduction in VMT based on implementation of TDM best practices.

6.1 TDM program

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
4,240 $MTCO_2e$	Mobility, Education, Resources	***Planning & Inspection***	***$$$***

6.2 Municipal transportation demand management

Develop and implement a transportation demand management program for City employees to encourage alternative modes of travel and reduce single-occupant vehicle use.

The City has a responsibility to take a leading role in reducing emissions in the community. As transportation is the second leading source of GHG emissions in Santa Clara, the City can help to reduce those emissions by implementing its own TDM program. The TDM program will also serve a dual purpose as an example to other businesses in the community.

- Performance metric: Achieve a 20% reduction in commute-related VMT from City employees.

6.2 Municipal TDM program

Effectiveness	Community Benefits	Lead Department	Time & Resources
400 $MTCO_2e$	Mobility, Education, Resources	***Planning & Inspection***	***$***

6.3 Electric vehicle parking

Revise parking standards for new multi-family residential and nonresidential development to allow that a minimum of one parking space, and a recommended level of 5% of all new parking spaces, be designated for electric vehicle charging.

As demonstrated in Chapter 3, many Santa Clara residents are early adopters of new technologies, including electric vehicles. The availability of public electric vehicle (EV) charging stations, and requirements ensuring that new development is equipped to provide such infrastructure in the future, would substantially increase the likelihood of EV adoption, reducing local GHG emissions and other harmful pollutants associated with gasoline and other fuel use. To do this, the City should:

- Install EV charging stations in public parking lots.
- At the time of the next comprehensive Zoning Code update, amend Sections 18.74.020(f) and 18.74.020(i) of the Santa Clara City Code (SCCC) to require a portion of new nonresidential parking spaces to include EV charging facilities, consistent with the SCCC.
- At the time of the next comprehensive Zoning Code update, amend Section 18.18.130 of the SCCC to require that all new multi-family residential and nonresidential development contain at least one new EV charging station and to encourage a recommended maximum of 5% of all new multi-family parking spaces include EV charging stations.
  - **Performance metric:** 430 parking spaces in new commercial, industrial, and multi-family development that utilize EV charging stations.

6.3 Electric vehicle parking

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
1,400 $MTCO_2e$	Economy Technology Resources	***Planning & Inspection***	***$$***

Focus Area 7: Urban Heat Island Effect

Goal: Mitigate the heat island effect through shading and cooling practices.

Dark pavements and surfaces typically represent up to 25% of a community's land area. These surfaces can contribute to increased temperatures in the community, known as the urban heat island effect, requiring additional energy use to keep buildings cool. Using lighter-colored surfaces, providing shade structures, and planting trees to provide shade near buildings can reduce the degree to which the urban heat island effect increases building energy use.

7.1 Urban forestry

Create a tree-planting standard for new development and conduct a citywide tree inventory every five years to track progress of the requirements.

Trees provide multiple benefits to residents, business owners, and the community at large. If placed strategically near south- or west-facing windows trees can help reduce the amount of air conditioning needed during high-heat days by reducing the greenhouse effect within buildings. This is a long-term strategy, as trees take time to mature before providing maximum benefits. For example, the City of Cupertino operates a Tree4Free program in which the City covers the cost of a new tree for interested residents and businesses. To do this, the City should:

- At the time of the next comprehensive Zoning Code update, amend the SCCC to require a portion of new development to plant shade trees.
- Review other City tree planting programs, and determine whether to implement an incentive program and/or an educational campaign.
- Collaborate with local environmental or community organizations to fund program costs or outreach.
- Identify and promote desirable tree types and locations for plantings to minimize the effect of root systems on infrastructure.

    - **Performance metric:** Each new development incorporates a minimum of two shade trees near south-facing windows for a total tree-planting goal of 2,500.

7. 1 Urban forestry

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
70 $MTCO_2e$	Health, Energy	***Planning & Inspection***	***$***

7.2 Urban cooling

Require new parking lots to be surfaced with low-albedo materials to reduce heat gain, provided it is consistent with the Building Code.

The City will phase in adoption of a requirement for new nonresidential parking lots to mitigate the urban heat island effect. The urban heat island effect occurs when large paved areas, usually dark in color, increase surrounding temperatures. According to the EPA, the urban heat island effect is responsible for 5–10% of peak electricity demand for cooling buildings in cities.[9] Strategies such as requiring or encouraging the use of "cool" surfaces for paving greatly reduce this effect, in turn reducing the energy required to cool nearby buildings. Reducing the urban heat island effect is also an important strategy for climate adaptation, since increasing temperatures are expected to exacerbate the effect.

Cool Roofs

CALGreen, also known as the California Green Building Standards Code, includes the installation of a cool roof as a voluntary measure. Santa Clara could adopt these voluntary measures to go beyond the mandatory building code.

- **Performance metric:** All new uncovered parking lots and spaces utilize light-colored and/or permeable pavements.

7. 2 Urban cooling

Effectiveness	***Community Benefits***	***Lead Department***	***Time & Resources***
10 MTCO$_2$e	Technology, Energy	***Planning & Inspection***	***$***

[9] EPA 2013.

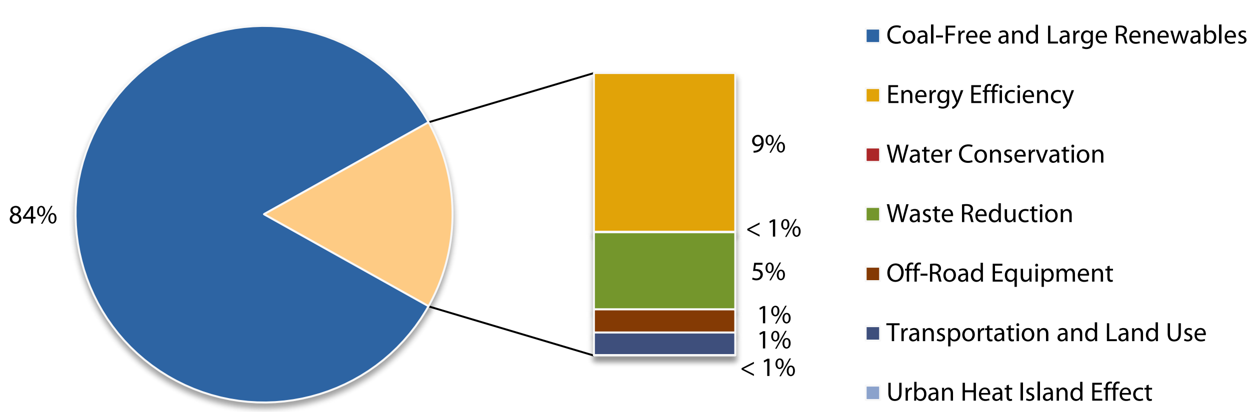
2020 Emissions Reduction Summary

The reduction measures included in this CAP identify policies and programs that can be implemented to reduce emissions and achieve the reduction target by 2020. Most emissions reductions come from the Coal-Free and Large Renewables focus area, which corresponds to the largest sources of emissions in Santa Clara. **Table 10** and **Figure 23** summarize anticipated emissions reductions in 2020.

Table 10: Anticipated 2020 Emissions Reductions from CAP Measures

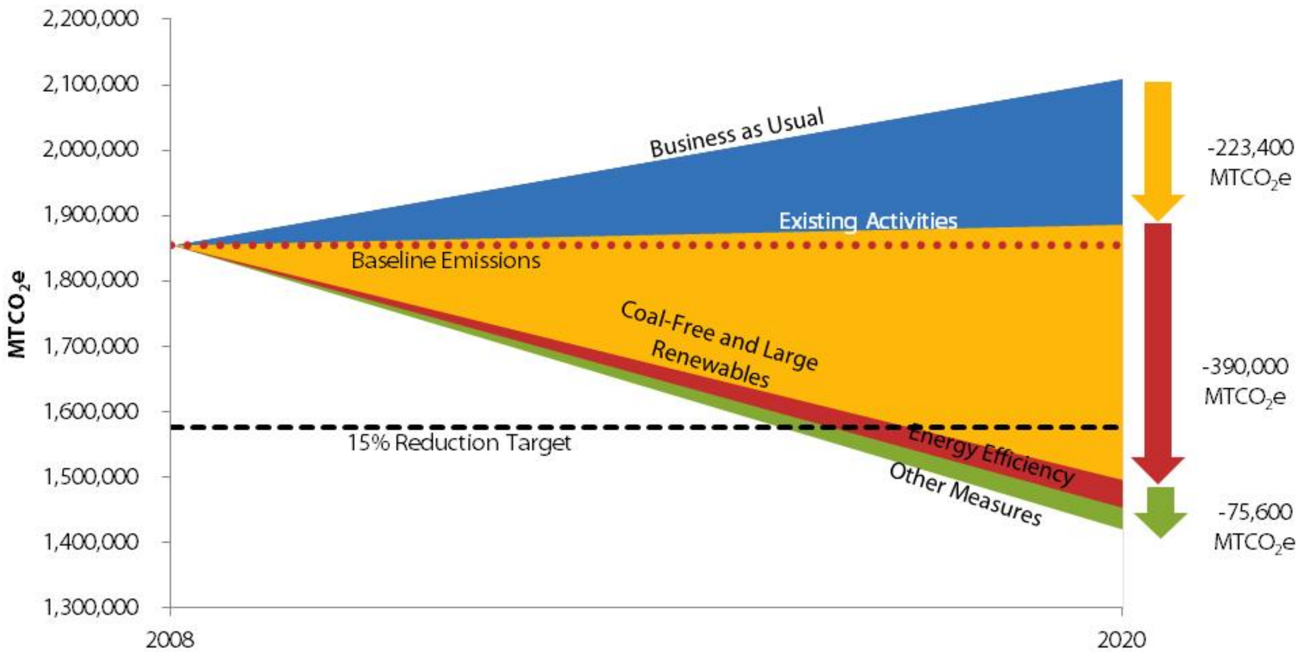
Focus Area	2020 ($MTCO_2e$)
2008 Baseline Emissions	1,854,300
2020 Business as Usual Emissions	2,109,200
State Activities	-176,600
Local Activities	-46,800
2020 Emissions with Existing Activities	1,885,800
Emissions Reduction Measures	
Coal-Free and Large Renewables	-390,000
Energy Efficiency	-42,500
Water Conservation	-140
Waste Reduction	-20,650
Off-Road Equipment	-6,200
Transportation and Land Use	-6,040
Urban Heat Island Effect	-80
Total Reductions from new measures*	**-465,610**
2020 Emissions Level with CAP	**1,420,200**
% Reduction below Baseline	**-23.4%**
*Total may not equal the sum of component parts due to rounding.	

Figure 23: Anticipated 2020 Emissions Reductions by Focus Area



Implementing the CAP measures would enable the community to reduce emissions by 23.4% below 2008 levels by 2020. **Figure 24** illustrates anticipated progress toward achieving and exceeding the reduction target by 2020.

Figure 24: Anticipated 2020 Emissions Reductions



Beyond 2020

Recognizing that the challenges presented by GHG emissions will continue beyond 2020, the City has also identified next steps or reach measures to reduce emissions beyond 2020 levels. Proposed CAP measures and associated performance metrics identify emissions reductions to be achieved by 2020. To continue sustained reductions in GHG emissions, it is recommended that the City adopt a 2035 reduction target. A commonly adopted target for 2035 is 55% below baseline levels and is based on Executive Order (EO) S-3-05, which established a 2050 reduction target for California to reduce GHG emissions 80% below 1990 levels.

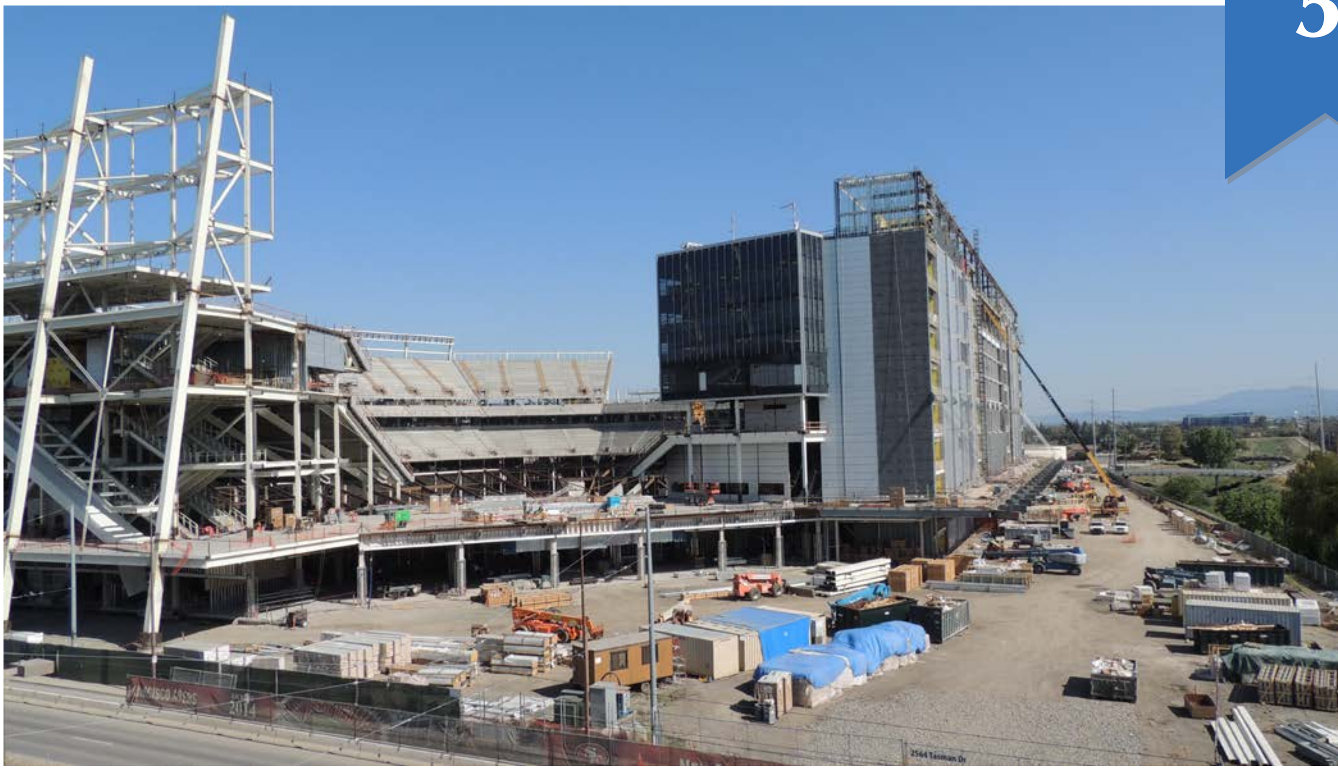
In order to meet this goal, the City would need to facilitate reductions totaling 1,391,800 $MTCO_2e$. Meeting this reduction target by 2035 would result in the emissions of 834,400 $MTCO_2e$ per year. Additional actions must be considered to achieve these reductions by 2035. **Table 11** presents a list of reach measure topics derived from measures proposed for 2020. The reach measure topics rely on increased levels of participation and performance than those proposed for 2020 to achieve greater reductions by 2035.

Table 11: 2035 Reach Measures

#	Measure Topic	CAP Participation Level in 2020	CAP Reductions in 2035 ($MTCO_2e$)	Reach Participation Level in 2035	Reach Reduction in 2035 ($MTCO_2e$)[1]
1.1	Coal-free by 2020	100% of coal power replaced with natural gas	480,100	100% of coal power replaced with an even mix of renewables and natural gas	806,200
1.3	Utility-installed renewables	New solar PV projects generating 5 MW in total installed capacity	1,200	New solar PV projects generating 25 MW or more in total installed capacity	3,100
2.1	Community electricity efficiency	Residential savings: 3,600 MWh Commercial savings: 44,400 MWh Industrial savings: 111,100 MWh	27,600	Residential savings: 7,200 MWh Commercial savings: 88,800 MWh Industrial savings: 222,200 MWh	27,600
2.4	Customer-installed solar	Installation of 6,000 kW of solar on about 1,000 residential homes, nonresidential buildings, parking garages, parking lots, and other feasible areas	1,500	Installation of 10,000 kW of solar on about 2,000 residential homes, nonresidential buildings, parking garages, parking lots, and other feasible areas	1,300
Total CAP Reductions in 2035 =			**510,400**	**Total Reach Reductions in 2035 =**	**838,200**
				Total Reductions Needed to Reach 2035 Target =	**1,408,600**
				Further Reductions Needed =	**570,400**

Notes:

1. As SVP implements ways to reduce emissions associated with the electricity sources contained in their portfolio (measure 1.1), the emissions reduction effectiveness of measures aimed at reducing electricity used decreases (measures 2.1, 2.4).



5. Achieving Our Goals

To ensure the success of this CAP, the City will integrate the goals and strategies of this plan into other local and regional plans, and implement the programs and activities identified herein. As the City moves forward with updating other planning documents such as the General Plan, Santa Clara City Code, or Specific Plans, staff will ensure that these documents support and are consistent with the CAP.

Implementing the CAP will require City leadership to execute these measures and report progress. This plan identifies a responsible department and offers time frames and relative costs associated with each measure. Staff will monitor implementation progress using an implementation and monitoring tool on an annual basis and will report to the Planning Commission and City Council on annual progress. As part of annual progress reports, staff will evaluate the effectiveness of each measure to ensure that anticipated emissions reductions are occurring. In the event that reductions do not occur as expected, the City can modify and add additional measures to the CAP to ensure the reduction target is achieved.

The following programs are designed to ensure City success in implementing the CAP.

Implementation Program 1: Monitor and report progress toward target achievement.

Actions to support Implementation Program 1:

- Identify key staff responsible for annual reporting and monitoring.
- Use the monitoring and reporting tool to assist with annual reports.
- Prepare a progress report for review and consideration by the Planning Commission and City Council.

Implementation Program 2: Update the baseline emissions inventory and Climate Action Plan every five years.

Actions to support Implementation Program 2:

- Prepare a 2013 emissions inventory no later than 2015.
- Update the CAP no later than 2017 to incorporate new technology, and measures to reduce emissions.
- Update and amend the CAP, as necessary, should the City find that specific measures are not achieving intended emissions reductions.

Implementation Program 3: Continue to develop collaborative partnerships with agencies and community groups that support Climate Action Plan implementation.

Action to support Implementation Program 3:

- Continue formal membership and participate in local and regional organizations that provide tools and support for energy efficiency, energy conservation, GHG emissions reductions, adaptation, public information, and implementation of this plan.

Implementation Program 4: Secure necessary funding to implement the Climate Action Plan.

Actions to support Implementation Program 4:

- Identify funding sources and levels for reduction measures as part of annual reporting.
- Include emissions reduction measures in department budgets, the capital improvement program, and other plans as appropriate.
- Pursue local, regional, state, and federal grants to support implementation.

Tracking Success

Implementation and Monitoring Tool

To support effective monitoring and implementation of the CAP, an Excel-based monitoring tool has been developed to identify the lead department and funding needs to implement each measure. It also allows the City to track its progress in reducing emissions, VMT, waste generation, and energy use over time using readily available data. The tool is used to collect data, track GHG emissions, and assess the effectiveness of CAP measures. It enables the City to sort measures based on timing, responsible department, and level of success, progress, or completion.

Work Plan

The work plan in **Table 12** contains information to support staff and community implementation of the measures to effectively integrate them into budgets, the capital improvement program, and other programs and projects. The time frames included in **Table 12** are defined as follows:

Near-Term:	0-2 Years (by 2015)	Mid-Term:	2-6 Years (before 2020)	Long-Term:	6+ Years (after 2020)

Table 12: Implementation Matrix

#	Measure	2020 GHG Reductions ($MTCO_2e$)	City Costs	Budgeted Costs?	Time Frame	Lead Department	Beneficiaries
1.1	Coal-free by 2020	388,800	$$$	Yes	Mid-Term	Silicon Valley Power	☒ Existing Development ☒ New Development ☒ City Government
1.2	Renewable energy resources	No reductions by 2020 – Supportive	$$$	No	Long-Term	Silicon Valley Power	☒ Existing Development ☒ New Development ☒ City Government
1.3	Utility-installed renewables	1,200	$$	No	Mid-Term	Silicon Valley Power	☒ Existing Development ☒ New Development ☒ City Government
2.1	Community electricity efficiency	27,600	$$	Yes	Near-Term	Silicon Valley Power	☒ Existing Development ☐ New Development ☒ City Government
2.2	Community natural gas efficiency	12,100	$	n/a	Near-Term	Silicon Valley Power (in coordination with PG&E)	☒ Existing Development ☐ New Development ☒ City Government
2.3	Data centers	400	$	No	Near-Term	Planning & Inspection	☒ Existing Development ☒ New Development ☐ City Government
2.4	Customer-installed solar	1,500	$$	Yes	Near-Term	Silicon Valley Power, Planning & Inspection	☒ Existing Development ☒ New Development ☐ City Government
2.5	Municipal energy efficiency	600	$$	No	Mid-Term	Public Works	☐ Existing Development ☐ New Development ☒ City Government
2.6	Municipal renewables	300	$$	No	Mid-Term	Public Works	☐ Existing Development ☐ New Development ☒ City Government
3.1	Urban Water Management Plan targets	140	$	Yes	Mid-Term	Water and Sewer Utilities; Planning and Inspection	☒ Existing Development ☒ New Development ☐ City Government
4.1	Food waste	150	$	Yes	Near-Term	Public Works	☒ Existing Development ☒ New Development ☐ City Government
4.2	Increased waste diversion	20,500	$$	Partially	Mid-Term	Public Works	☒ Existing Development ☒ New Development

#	Measure	2020 GHG Reductions ($MTCO_2e$)	City Costs	Budgeted Costs?	Time Frame	Lead Department	Beneficiaries
							☒ City Government
5.1	Lawn and garden equipment	100	$	No	Mid-Term	Planning and Inspection	☒ Existing Development ☒ New Development ☐ City Government
5.2	Alternative construction fuels	6,100	$	No	Near-Term	Planning and Inspection	☒ Existing Development ☒ New Development ☒ City Government
6.1	TDM program	4,240	$$$	No	Near-Term	Planning and Inspection	☐ Existing Development ☒ New Development ☐ City Government
6.2	Municipal TDM	400	$	No	Ongoing	Planning and Inspection	☐ Existing Development ☐ New Development ☒ City Government
6.3	Electric vehicle parking	1,400	$$	Partially	Near-Term	Planning and Inspection	☐ Existing Development ☒ New Development ☒ City Government
7.1	Urban forestry	70	$	Yes	Mid-Term	Planning and Inspection	☒ Existing Development ☒ New Development ☒ City Government
7.2	Urban cooling	10	$	No	Near-Term	Planning and Inspection	☒ Existing Development ☒ New Development ☒ City Government

Glossary

Association of Bay Area Governments (ABAG): The regional planning agency for the nine counties and 101 incorporated cities in the San Francisco Bay Area.

California Environmental Quality Act (CEQA): A state law requiring state and local agencies to regulate activities with consideration for environmental protection. If a proposed activity has the potential for a significant adverse environmental impact, an environmental impact report (EIR) must be prepared and certified as to its adequacy before action can be taken on the proposed project. General plans require the preparation of a program EIR.

California Green Building Standards Code (CALGreen): The 2010 California Green Building Standards Code, commonly referred to as the CALGreen Code, is a statewide mandatory construction code that was developed and adopted by the California Buildings Standards Commission and the Department of Housing and Community Development. The CALGreen standards require new residential and commercial buildings to comply with mandatory measures under the topics of planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. CALGreen also provides voluntary tiers and measures that local governments may adopt that encourage or require additional measures in the five green building topics.

Carbon Dioxide Equivalent (CO2e): A metric measure used to compare the emissions from various greenhouse gases based on their global warming potential (GWP).The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP.

Clean Car Fuel Standards (AB 1493, Pavley): Signed into law in 2002 and commonly referred to as Pavley standards. Requires carmakers to reduce GHG emissions from new passenger cars and light trucks beginning in 2011. CARB anticipates that the Pavley standards will reduce emissions from new California passenger vehicles by about 22% in 2012 and about 30% in 2016, all while improving fuel efficiency and reducing motorists' costs.

Construction and Demolition Waste (C&D): C&D materials consist of the waste generated during the construction, demolition, or renovation of buildings, roads, and other construction projects. C&D materials may include heavy, bulky materials such as concrete, glass, wood, and metal, among other materials.

Cool Roof: A roof with high solar reflectivity is considered a cool roof. Cool roofs reduce heat transfer into the indoors and can reduce indoor energy demand.

Eligible Renewables: As defined by the California Energy Commission, the following energy sources may be counted in an electric utility's portfolio to meet the terms of the Renewables Portfolio Standard: solar thermal electric, photovoltaics, landfill gas, wind, biomass, geothermal electric, municipal solid waste, energy storage, anaerobic digestion, small hydroelectric, tidal energy, wave energy, ocean thermal, biodiesel, fuel cells using renewable fuels.

Energy Conservation: Reducing energy waste, such as turning off lights, heating, and motors when not needed.

Energy Efficiency: Doing the same or more work with less energy, such as replacing incandescent light bulbs with compact fluorescent light bulbs or buying an Energy Star appliance to use less energy for the same or greater output.

Global Warming Potential (GWP): An index used to translate the level of emissions of various gases into a common measure in order to compare the relative potency of different gases without directly calculating the changes in atmospheric concentrations. GHGs are expressed in terms of carbon dioxide equivalent.

Greenhouse Gas or Greenhouse Gases (GHG): Gases which cause heat to be trapped in the atmosphere, warming the earth. GHGs are necessary to keep the earth warm, but increasing concentrations of these gases are implicated in global climate change.

Green Waste: Refers to lawn, garden, or park plant trimmings and materials and can be used in home-composts or picked up curbside by municipal waste haulers.

Mixed Use: Properties on which various uses such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with significant functional interrelationships and a coherent physical design. A single site may include contiguous properties.

Ordinance: A law or regulation set forth and adopted by a governmental authority, usually a city or county.

Recycled Water: Treatment of wastewater to a quality suitable for non-potable uses such as landscape irrigation; not intended for human consumption.

Reduction Measure: A goal, strategy, program, or set of actions that target and reduce a specific source of GHG emissions.

Renewable Energy: Energy from sources that regenerate and are less damaging to the environment, such as solar, wind, biomass, and small-scale hydroelectric power.

Renewables Portfolio Standard (RPS): A regulation requiring utility companies in California to increase the production of renewable energy from solar CEC Eligible Renewables.

Vehicle Miles Traveled (VMT): A key measure of overall street and highway use. Reducing VMT is often a major objective in efforts to reduce vehicular congestion and achieve regional air quality goals.

Water Conservation: Reducing water use, such as turning off taps, shortening shower times, and cutting back on outdoor irrigation.

Water Efficiency: Replacing older technologies and practices in order to accomplish the same results with less water; for example, by replacing toilets with new low-water-using models and by installing "smart controllers" in irrigated areas.

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A. GHG Inventory & Forecast Technical Appendix

Inventory Update Purpose

In 2010, Sierra Research, Inc. prepared an inventory of 2008 community-wide GHG emissions for the community of Santa Clara as part of the City's General Plan Update and EIR. Also, in 2012, ICLEI created a 2010 inventory of municipal operations GHG emissions. Changes to the regulatory structure since the creation of this initial inventory, including an update to the State CEQA Guidelines, have prompted the City to re-inventory emissions from community-wide and municipal sources. This inventory is an updated assessment of GHG emissions in the community and from municipal operations.

To create a Qualified GHG Reduction Strategy in compliance with the CEQA Guidelines, the City has updated the 2008 community and City government operations baseline inventories. In the process of completing the inventory, new calculations using the most up-to-date tools and resources have been employed.

The General Plan EIR inventory estimated that 1.915 million $MTCO_2e$ were generated in 2008 in Santa Clara. The updated GHG emissions inventory estimates that approximately 1.852 million $MTCO_2e$ were generated in 2008 in Santa Clara (3.2% lower). The primary changes between the inventories include the use of updated emissions factors for the transportation sector, recalculation of the direct wastewater treatment emissions, and exclusion of sources outside of the City's jurisdictional control.

Community Baseline Activity Data

Activity data was obtained from utility providers, state agencies, and City staff to determine the extent to which each activity occurs annually. This activity data was used to calculate GHG emissions for 2008. **Table A1** lists the activity data used in the 2008 baseline inventory analysis along with all activity data, units, and sources. Data sources include PG&E, BAAQMD, the US Department of Housing and Urban Development (HUD), the California Department of Resources Recycling and Recovery (CalRecycle), SCVWD, CEC, and the City of Santa Clara's 2010 Urban Water Management Plan.

Table A1: Community Activity Data and Sources

Sector	Subsector	Activity Data	Unit	Data Source(s)
Nonresidential Energy	Commercial Electricity	95,230,530	kWh	*City of Santa Clara, PG&E*
	Nonresidential Natural Gas	57,176,860	Therms	*PG&E*
	Industrial Electricity	2,502,703,510	kWh	*City of Santa Clara*
Transportation	Gasoline Vehicles	1,055,543,930	VMT	*Fehr & Peers Transportation Consultants*
	Diesel Vehicles	50,697,270	VMT	
Community Point Sources		173,500	*$MTCO_2e$*	*BAAQMD*
Residential Energy	Single-Family Electricity	113,132,050	kWh	*City of Santa Clara, PG&E*
	Multi-Family Electricity	108,862,880	kWh	*City of Santa Clara, PG&E*
	Residential Natural Gas	15,841,850	Therms	*PG&E*
Off-Road Equipment	Construction Equipment	250	Permits Issued	*HUD State of the Cities Data System*
	Lawn and Garden Equipment	44,166	Housing Units	*City of Santa Clara*
Waste	Solid Waste	145,440	Tons	*CalRecycle*
	Green Waste	2,600	Tons	
Rail Transit	*Caltrain*	*100*	*Daily Trips*	*City of Santa Clara*
	VTA Light Rail	680	Daily Trips	
Water and Wastewater Energy	Water Energy Use	7,390	Million Gallons	*City of Santa Clara UWMP*
		13,644,390	kWh Electricity	*CEC, SCVWD*
	Wastewater Energy Use	5,760	Million Gallons	*City of Santa Clara UWMP*
		10,682,490	kWh Electricity	*CEC, SCVWD*
Direct Wastewater		*5,760*	*Million Gallons Treated*	*City of Santa Clara UWMP*

City Government Baseline Activity Data

The majority of the activity data used to calculate the City government baseline inventory for 2010 was provided by ICLEI. This information was updated with new emissions coefficients and additional point source emissions such as the closed landfill. Details on the activity data used in the City government baseline inventory is shown in **Table A2**.

Table A2: City Government Activity Data and Sources

Sector	Subsector	Activity Data	Unit	Data Source(s)
Silicon Valley Power	Cogeneration Plant 1 – Electricity	60,020	kWh	ICLEI, City of Santa Clara
	Cogeneration Plant 1 – Natural Gas Donald Von Raesfeld Power Plant	4,856,050	Therms	
	Gianera Plant – Electricity	100,520	kWh	
Closed Landfill		9,900	$MTCO_2e$	BAAQMD
Buildings and Facilities	Electricity	8,745,190	kWh	ICLEI, City of Santa Clara, PG&E
	Natural Gas	519,850	Therms	
	Backup Generators	190	$MTCO_2e$	
Employee Commute		6,288,470	VMT	ICLEI, City of Santa Clara
Vehicle Fleet	Diesel	102,080	Gallons	ICLEI, City of Santa Clara
	Gasoline	199,050	Gallons	
Water Pumping	Water Delivery Pumps	271,080	kWh	ICLEI, City of Santa Clara
	Sprinklers/Irrigation Control	11,010	kWh	
	Well Pumping	5,927,540	kWh	
Government-Generated Solid Waste		4,620	Tons of Solid Waste	ICLEI, City of Santa Clara
Wastewater Pumping	Wastewater Pumping Electricity	2,566,610	kWh	ICLEI, City of Santa Clara, PG&E
	Wastewater Pumping Natural Gas	120	Therms	
Public Lighting	Streetlighting	98,280	kWh	ICLEI, City of Santa Clara, PG&E
	Park Lighting	865,970	kWh	
	Other Public Lighting	184,190	kWh	

Emissions Factors and Sources

Table A3 shows the emissions factors used to translate activity data into GHG emissions for the community baseline inventory, while **Table A4** shows the same information for the City government inventory. When a specific emissions coefficient is not applicable, the total emissions reported are given for reference.

Table A3: Community Emissions Factors and Sources

Sector	Subsector	Emissions Factor	Unit	Factor Source
Nonresidential Energy	Commercial Electricity	0.000310	$MTCO_2e$/kWh	GP EIR Appendix A
	Nonresidential Natural Gas	0.005320	$MTCO_2e$/Therm	LGOP v1.1
	Industrial Electricity	0.000310	$MTCO_2e$/kWh	GP EIR Appendix A
Transportation	Gasoline Vehicles	0.000431	$MTCO_2e$/VMT	EMFAC 2011
	Diesel Vehicles	0.001344	MTCO2e/VMT	EMFAC 2011
Residential Energy	Single-Family Electricity	0.000310	$MTCO_2e$/kWh	GP EIR Appendix A
	Multi-Family Electricity	0.000310	$MTCO_2e$/kWh	GP EIR Appendix A
	Residential Natural Gas	0.005320	$MTCO_2e$/Therm	LGOP v1.1
Off-Road Equipment	Construction Equipment	29,000	$MTCO_2e$	GP EIR Appendix A
	Lawn and Garden Equipment	0.029073	$MTCO_2e$/Piece	CARB OFFROAD
Waste	Solid Waste	0.186537	$MTCO_2e$/Ton	CARB Landfill Tool
	Green Waste	0.153846	$MTCO_2e$/Ton	CARB Landfill Tool
Rail Transit	Caltrain	0.251359	$MTCO_2e$/Trip	GP EIR Appendix A
	VTA Light Rail	0.003117	$MTCO_2e$/Trip	GP EIR Appendix A
Water and Wastewater Energy	Water Energy Use	1,846.33	kWh/MG	CEC
		0.000310	$MTCO_2e$/kWh	GP EIR Appendix A
	Wastewater Energy Use	1,855	kWh/MG	CEC
		0.000310	$MTCO_2e$/kWh	GP EIR Appendix A
Direct Wastewater		0.303819	$MTCO_2e$/MG	LGOP v1.1

Table A4: City Government Emissions Factors and Sources

Sector	Subsector	Emissions Factor	Unit	Factor Source
Buildings and Facilities	Electricity	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
	Natural Gas	0.00532	$MTCO_2e$/Therm	LGOP v1.1
	Backup Generators	0.01027	$MTCO_2e$/Gallon of Diesel	LGOP v1.1
Public Lighting	Streetlighting	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
	Park Lighting	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
	Other Public Lighting	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
Water	Water Delivery Pumps	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
	Sprinklers/ Irrigation Control	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
	Well Pumping	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
Municipal Fleet	Diesel	0.01078	$MTCO_2e$/Gallon	LGOP v1.1
	Gasoline	0.00924	$MTCO_2e$/Gallon	LGOP v1.1
Employee Commute	Employee Commute	0.00060	$MTCO_2e$/VMT	EMFAC 2011
Waste	Government-Generated Solid Waste	0.18182	$MTCO_2e$/Ton	CARB Landfill Tool
Wastewater	Wastewater Pumping Electricity	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
	Wastewater Pumping Natural Gas	0.00532	$MTCO_2e$/Therm	LGOP v1.1
Silicon Valley Power	Cogeneration Plant 1 – Electricity	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A
	Cogeneration Plant 1 – Natural Gas	0.04576	$MTCO_2e$/Therm	GP EIR Appendix A
	Donald Von Raesfeld Power Plant			GP EIR Appendix A
	Gianera Plant – Electricity	0.00031	$MTCO_2e$/kWh	GP EIR Appendix A

B. Quantification Appendix

Overview and Purpose

This appendix summarizes data sources, assumptions, and performance metrics used to calculate GHG emissions reductions for the City of Santa Clara CAP. The sources and metrics are organized by measure and rely on four primary types of data and research: (1) the City's GHG emissions inventory and forecast, (2) government agency tools and reports, (3) case studies in similar jurisdictions, and (4) scholarly research.

Further, the quantification approaches are consistent with guidance provided by BAAQMD for development of a Qualified GHG Reduction Strategy. The baseline GHG inventory and forecast serve as the foundation for the quantification of the City's GHG reduction measures. Activity data from the inventory forms the basis of measure quantification, including VMT, kWh of electricity or therms of natural gas consumed, and tons of waste disposed. Activity data was combined with the performance targets and indicators identified by the City and consultants. The activity data and performance targets and indicators were used throughout the quantification process to calculate the emissions reduction benefit of each measure. This approach ensures that Santa Clara's GHG reductions are tied to the baseline and to future activities occurring within the city.

Common Emissions Factors

Table B1 lists common emissions factors used to quantify emissions reductions in the CAP. With the exception of the coal-free electricity factor, coefficients are for 2020 after existing state and local programs have been implemented. For example, the on-road transportation factor represents the emissions from vehicles in 2020 after the Pavley standards are implemented.

Table B1: Common Emissions Factors

Applicability	Value	Unit	Source
On-Road Transportation with Pavley Implemented	3.60E-04	$MTCO_2e$ per mile driven (with Pavley)	EMFAC 2011
Electricity with RPS Implemented	3.01E-04	$MTCO_2e$/kWh	General Plan EIR Appendix A
Electricity with Measure 1.1 Implemented (Coal-Free)	8.68E-05	$MTCO_2e$/kWh	PMC
Natural Gas	5.32E-03	$MTCO_2e$/Therm	LGOP v1.1
Solid Waste	1.87E-01	$MTCO_2e$ per Ton of Solid Waste	CARB Landfill Emissions Tool v1.3
Green Waste	1.53E-01	$MTCO_2e$ per Ton of Green Waste	

Technical Data for Quantified Measures

1.1 Coal-free by 2020

Replace the use of coal in Silicon Valley Power's portfolio with natural gas by 2020.

Assumptions and Indicators:

Metric	2020	Sources
Percentage of baseline electricity coming from coal	23.6%	SVP Power Content Label
Percentage of baseline electricity coming from natural gas	26.1%	SVP Power Content Label
$MTCO_2e$/MWh for electricity produced from coal	0.324	LGOP v1.1
$MTCO_2e$/MWh for electricity produced from natural gas	0.187	LGOP v1.1
Percent reduction in $MTCO_2e$/MWh	-42%	Calculated
MWh of coal electricity offset	718,300	Calculated
GHG reduction ($MTCO_2e$)	388,800	Calculated
Costs and Savings:		
City costs	$$$	
Budgeted?	Yes	

Method:
This measure calculates the change in SVP's emissions factor ($MTCO_2e$/kWh) when switching from coal to natural gas. There are two changes considered in this quantification: the reduction in CO_2e emissions when moving to natural gas, and the reduction in kWh of electricity use through energy efficiency measures found in other CAP measures. A decrease in $MTCO_2e$ emissions leads to a lower emissions factor. However, a decrease in kWh delivered (an increase in efficiency and conservation) leads to an increase in the emissions factor. The amount of electricity delivered in the baseline year 2008 and in 2020 (with efficiencies taken into account) was used to calculate the kWh delivered by source under the baseline scenario using the power content label provided by SVP. The amount of coal electricity delivered in 2020, under the forecast scenario, equated to 718,000,000 kWh. This same amount was then assumed to be generated by natural gas as described in the measure. When moving this coal electricity over to natural gas, natural gas becomes the only GHG-producing source of SVP electricity. The percentage change in emissions factors from LGOP for coal (mixed electric utility) and natural gas (greater than 1,110 btu) was used to calculate the reduced emissions factor and the resulting reduction in GHG emissions.

Sources:
CARB (California Air Resources Board), et al. 2010. Local Government Operations Protocol. Table G.3

City of Santa Clara. 2013. SVP Power Content Label.

1.2 Renewable energy resources

Investigate the use of City-owned property for large-scale renewable energy projects.

Assumptions and Indicators:

No reductions by 2020 – supportive measure	
Costs and Savings:	
City costs	$$$
Budgeted?	No
Method:	
Supportive Measure – Not Applicable	
Sources:	
Supportive Measure – Not Applicable	

1.3 Utility-installed renewables

Develop up to five solar PV projects with a total installed capacity of 3 to 5 MW.

Assumptions and Indicators:

Metric	2020	Sources
kW installed	5,000	Assumed
kWh produced per kW installed	1,440	National Renewable Energy Laboratory (NREL) PVWatts
kWh produced	7,200,000	Calculated
GHG reduction ($MTCO_2e$)	1,200	Calculated
Costs and Savings:		
City costs	$$	
Budgeted?	No	

Method:

An assumed amount of installed PV solar power, in the unit of kilowatts (kW), was applied to the kWh produced per kW installed factor generated using the NREL PVWatts calculator. This calculator is geographically based and takes DC to AC conversion, weather, precipitation, and other factors into account to generate an accurate portrayal of actual electricity generation in PV systems. The kWh produced by the assumed total size of the systems was applied to the emissions factor generated in Measure 1.1 to produce GHG emissions under SVP's coal-free scenario.

Sources:

NREL (National Renewable Energy Laboratory). 2012. PVWatts Calculator. http://www.nrel.gov/rredc/pvwatts/.

2.1 Community electricity efficiency

Achieve City-adopted electricity efficiency targets to reduce community-wide electricity use by 5% through incentives, pilot projects, and rebate programs.

Assumptions and Indicators:

Metric	2020	Sources
Total MWh savings	159,032	Correspondence with SVP, May 22, 2013
GHG reduction ($MTCO_2e$)	27,600	Calculated
Costs and Savings:		
City costs	$$	
Budgeted?	Yes	

Method:

City staff identified the 2013 adopted electricity efficiency goals for SVP in terms of MWh of electricity. These goals were assumed to be fully implemented through 2020. The kWh reductions were converted into $MTCO_2e$ using the coal-free emissions factor generated in Measure 1.1.

Sources:

City of Santa Clara, Silicon Valley Power. 2013. Correspondence with Ann Hatcher. May 22.

2.2 Community natural gas efficiency

Work with community and social services agencies to provide information from PG&E to promote voluntary natural gas retrofits in 5% of multi-family homes, 7% of single-family homes, and 7% of nonresidential space through strategic partnerships, connecting residents and business owners to available financing resources.

Assumptions and Indicators:

Metric	2020	Sources
Therms saved per single-family home retrofit	390	ABAG
Therms saved per multi-family home retrofit	780	ABAG
Single-family homes participating	1,700	Assumed
Multi-family homes participating	1,000	Assumed
Therms saved	1,443,000	Calculated
GHG reduction ($MTCO_2e$)	7,680	Calculated
Reduction in natural gas use per retrofit	35%	Brown et al.
Therms saved per commercial account	140	Calculated
Number of commercial accounts participating	410	General Plan EIR, Table A-3
Therms saved	58,000	Calculated
GHG reduction ($MTCO_2e$)	300	Calculated
Reduction in natural gas use per retrofit	20%	Assumed based on Brown et al.
Therms saved per industrial account	5,900	Calculated
Number of industrial accounts participating	130	General Plan EIR, Table A-3
Therms saved	767,300	Calculated
GHG reduction ($MTCO_2e$)	4,100	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	n/a	

Method:

ABAG provided average natural gas savings seen through the Retrofit Bay Area Program for both single-family and multi-family projects. These assumed savings were applied to the assumed number of participating homes by type to calculate the total therms saved. The total therms saved was converted into $MTCO_2e$ using the emissions factor used in the baseline inventory and forecast.

Sources:

ABAG (Association of Bay Area Governments). April 2012. Retrofit Bay Area Final Report.

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. U.S. Building-Sector Energy Efficiency Potential. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://enduse.lbl.gov/info/LBNL-1096E.pdf.

2.3 Data centers

Encourage new data centers with an average rack power rating of 15 kW or more to identify and implement cost-effective and energy-efficient practices.

Assumptions and Indicators:

Metric	2020	Sources
Percentage reduction in cooling electricity use	31%	CEC 2013 Public Interest Energy Research (PIER) Report
Percentage of electricity used for cooling	54%	Tschudi et al.
Effective reduction in total electricity use	16.7%	Calculated
Percent of industrial electricity from data centers	32%	Correspondence with SVP
Electricity from data centers added from baseline to 2020	122,655,000	Calculated from forecast
Electricity from new data centers subject to measure	12,265,500	Calculated using 10% participation rate
kWh saved	2,053,200	Calculated
GHG reduction ($MTCO_2e$)	400	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	No	

Method:

Data provided by the City of Santa Clara showed that 28% of electricity used in the city is from data centers. The amount of additional industrial electricity from 2014 to 2020 was then calculated from the inventory and forecast and the 32% factor was applied to obtain the additional electricity use from future data centers. It was assumed that 10% of new data centers would use energy-efficient technologies such as liquid-cooled technology, and in turn, 10% of future additional data center electricity use would be subject to reductions. The CEC and Tschudi sources were used to calculate the effective reduction in total electricity use when going from air-cooled to liquid-cooled technology. The kWh reductions were converted into $MTCO_2e$ using the coal-free emissions factor generated in Measure 1.1.

Sources:

California Energy Commission. 2013. Public Interest Energy Research 2012 Annual Report. Pg. 41. CEC-500-2013-013-CMF.

City of Santa Clara, Silicon Valley Power. 2013. Personal correspondence with Ann Hatcher. April 4.

Tschudi,William, Priya Sreedharan, Tengfang Xu, David Coup, and Paul Roggensack. 2003. Data Centers and Energy Use – Let's Look at the Data. ACEEE 2003 Paper #162.

2.4 Customer-installed solar

Incentivize and facilitate the installation of 6 MW of customer-owned residential and nonresidential solar PV projects.

Assumptions and Indicators:

Metric	2020	Sources
kW installed	6,000	Assumed
kWh produced per kW installed	1,440	NREL PVWatts
kWh produced	8,640,000	Calculated
GHG reduction ($MTCO_2e$)	1,500	Calculated
Costs and Savings:		
City costs	$$	
Budgeted?	Yes	

Method:

An assumed amount of installed PV solar power, in the unit of kW, was applied to the kWh produced per kW installed factor generated using the NREL PVWatts calculator. This calculator is geographically based and takes DC to AC conversion, weather, precipitation, and other factors into account to generate an accurate portrayal of actual electricity generation in PV systems. The kWh produced by the total size of the systems was applied to the emissions factor generated in Measure 1.1 to produce GHG emissions under SVP's coal-free scenario.

Sources:

NREL (National Renewable Energy Laboratory). 2012. PVWatts Calculator. http://www.nrel.gov/rredc/pvwatts/.

2.5 Municipal energy efficiency

Reduce municipal electricity use by 10% through comprehensive energy retrofits of existing equipment, and implementation of previously identified energy efficiency projects with a benefit-cost ratio of one or greater.

Assumptions and Indicators:

Metric	2020	Sources
Projects identified	11	City of Santa Clara
Estimated kWh savings from identified projects	254,335	City of Santa Clara
Percentage reduction in electricity use per participating building	30%	Brown et al.
Percentage reduction in natural gas use per participating building	28%	Brown et al.
Percentage of City government square footage undergoing energy upgrades	50%	Assumed
kWh reductions	1,311,800	Calculated
Therms reduced	72,800	Calculated
GHG reduction ($MTCO_2e$)	600	Calculated
Costs and Savings:		
City costs	$$	
Budgeted?	No	

Method:

The City of Santa Clara provided a list of energy efficiency projects identified in energy audits of City facilities. These audits also provided kWh reductions for each prospective project. The kWh reductions were converted into $MTCO_2e$ using the coal-free emissions factor generated in Measure 1.1.

To go beyond the reductions from previously identified projects, it was assumed that space responsible for at least 50% of City government building energy use would undergo an audit and retrofit of equipment. The assumed savings for electricity and natural gas were provided by Brown et al. The kWh reductions were converted into $MTCO_2e$ using the coal-free emissions factor generated in Measure 1.1, and natural gas savings were converted into $MTCO_2e$ using the emissions factor from the baseline inventory and forecast.

Sources:

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. U.S. Building-Sector Energy Efficiency Potential. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://enduse.lbl.gov/info/LBNL-1096E.pdf.

City of Santa Clara. n.d. List of prospective energy efficiency projects.

2.6 Municipal renewables

Install 1 MW of solar or other renewables at City-owned facilities.

Assumptions and Indicators:

Metric	2020	Sources
kW installed	1,000	Assumed
kWh produced per kW installed	1,440	NREL PVWatts
kWh produced	1,440,000	Calculated
GHG reduction ($MTCO_2e$)	300	Calculated
Costs and Savings:		
City costs	$$	
Budgeted?	No	

Method:
An assumed amount of installed PV solar power, in the unit of kW, was applied to the kWh produced per kW installed factor generated using the NREL PVWatts calculator. This calculator is geographically based and takes DC to AC conversion, weather, precipitation, and other factors into account to generate an accurate portrayal of actual electricity generation in PV systems. The kWh produced by the total size of the systems was applied to the emissions factor generated in Measure 1.1 to produce GHG emissions under SVP's coal-free scenario.

Sources:
NREL (National Renewable Energy Laboratory). 2012. PVWatts Calculator. http://www.nrel.gov/rredc/pvwatts/.

3.1 Urban Water Management Plan targets

Meet the water conservation goals presented in the 2010 Urban Water Management Plan to reduce per capita water use by 2020.

Assumptions and Indicators:

Metric	2020	Sources
Projected water savings in UWMP (acre-feet)	1,362	2010 UWMP, Table 16
mg water saved	444	Calculated
kWh/mg	1,846	Calculated
kWh saved	819,120	Calculated
GHG reduction ($MTCO_2e$)	140	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	Yes	

Method:
Table 16 of the 2010 UWMP provided projected potable water conservation savings in acre-feet per year for 2020. These savings were converted into million gallons using the USGS source below. The savings in million gallons was converted into kWh using the kWh/mg factor used in the baseline inventory and forecast. The kWh reductions were converted into $MTCO_2e$ using the coal-free emissions factor generated in Measure 1.1.

Sources:

City of Santa Clara. 2010 Urban Water Management Plan. Table 16.

USGS (United States Geological Survey). 2013. Water Science School. http://ga.water.usgs.gov/edu/mgd.html.

4.1 Food waste collection

Support the expansion of existing food waste and composting collection routes in order to provide composting services to 25% of existing restaurants.

Assumptions and Indicators:

Metric	2020	Sources
Pounds of waste generated per restaurant/ seat per year	1	CalRecycle, Waste Characterization
Percentage of waste from food	59%	Cascadia Consulting Group, Table 3 and 4
Number of participating restaurants	120	Calculated, 25% of estimated number of restaurants
Emissions generated from composting ($MTCO_2e$/ton food waste)	0.119	CARB, Composting, Table 3.1.4
Emissions avoided from composting ($MTCO_2e$/ton food waste)	0.54	CARB, Composting, Table 7
Effective emissions reduction from composting ($MTCO_2e$/ton food waste)	0.421	Calculated
GHG reduction ($MTCO_2e$)	150	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	Yes	

Method:

The number of restaurants in Santa Clara was estimated using a focused search of Yelp.com. An assumed participation rate was applied to yield the number of participating restaurants. The amount of food waste generated per restaurant was calculated using a combination of sources: CalRecycle and Cascadia Consulting. The CARB-provided protocol on emissions generated and reduced from food waste composting was used to calculate total GHG reductions from the collected food waste.

Sources:

CalRecycle (California Department of Resources Recycling and Recovery)). 2013. Waste Characterization: Service Sector. http://www.calrecycle.ca.gov/wastechar/wastegenrates/Service.htm.

CARB (California Air Resources Board). 2011. Method for estimating greenhouse gas emission reductions from compost from commercial organic waste.
http://www.arb.ca.gov/cc/protocols/localgov/pubs/compost_method.pdf.

Cascadia Consulting Group. 2006. Targeted Statewide Characterization Study: Waste Disposal and Diversion Findings for Selected Industry Groups.

Yelp.com. 2013. Restaurants in Santa Clara.

4.2 Increased waste diversion

Work with regional partners to increase solid waste diversion to 80% through increased recycling efforts, curbside food waste pickup, and construction and demolition waste programs.

Assumptions and Indicators:

Metric	2020	Sources
Forecasted tons of waste landfilled in 2020	167,360	Calculated
Baseline diversion rate assumed in forecast	58%	Correspondence with City staff, April 11, 2013.
Forecasted tons of waste generated in 2020	288,550	Calculated
Estimated tons of waste landfilled with 80% diversion rate	57,710	Calculated
Tons of avoided landfill waste in 2020	109,650	Calculated
GHG reduction ($MTCO_2e$)	20,500	Calculated
Costs and Savings:		
City costs	$$	
Budgeted?	Partially	

Method:

The amount of waste landfilled, with the baseline diversion rate, was forecasted as part of the inventory and forecast. The target diversion rate was used to calculate the additional amount of waste diverted in tons by 2020. The tons diverted when moving from 58% diversion (baseline) to 80% (target) was converted to GHG reductions using the baseline $MTCO_2e$/ton of waste used in the inventory and forecast.

Sources:

City of Santa Clara. 2013. Personal correspondence with City staff. April 11.

5.1 Lawn and garden equipment

Support and facilitate a community-wide transition to electric outdoor lawn and garden equipment through outreach, coordination with BAAQMD, and outdoor electrical outlet requirements for new development.

Assumptions and Indicators:

Metric	2020	Sources
Annual emissions per conventional leaf blower ($MTCO_2e$)	0.0262	CARB OFFROAD
Annual emissions per electric leaf blower ($MTCO_2e$)	0.0104	BAAQMD Clean Air Plan
Effective reduction per electric leaf blower ($MTCO_2e$)	0.0158	Calculated
Percentage of leaf blowers exchanged	25%	Assumed
Number of leaf blowers exchanged	1,170	Calculated
GHG reduction ($MTCO_2e$)	20	Calculated
Annual emissions per conventional lawn mower ($MTCO_2e$)	0.0319	CARB OFFROAD
Annual emissions per electric lawn mower ($MTCO_2e$)	0.0058	BAAQMD Clean Air Plan
Effective reduction per electric lawn mower ($MTCO_2e$)	0.0261	Calculated
Percentage of lawn mowers exchanged	25%	Assumed
Number of lawn mowers exchanged	130	Calculated
GHG reduction ($MTCO_2e$)	100	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	No	

Method:

The annual emissions per leaf blower and lawn mower were provided by the CARB OFFROAD software. The annual emissions for electric leaf blowers and lawn mowers were provided by BAAQMD, and the difference between the conventional and electric emissions was used as the per-unit reduction when converting from conventional to electric energy.

Sources:

BAAQMD (Bay Area Air Quality Management District). 2010 Clean Air Plan. http://www.baaqmd.gov/~/media/Files/Board%20of%20Directors/2010/brd_agenda_091510_p4.ashx.

CARB (California Air Resources Board). 2007. OFFROAD Software.

EPA (US Environmental Protection Agency). 2009. Potential for Reducing Greenhouse Gas Emissions in the Construction Sector. http://www.epa.gov/sectors/pdf/construction-sector-report.pdf.

5.2 Alternative construction fuels

Require construction projects to comply with BAAQMD best management practices including alternative-fueled vehicles and equipment.

Assumptions and Indicators:

Metric	2020	Sources
Percentage reduction when converted to hybrid	5%	Assumed, industry best practice
Percentage reduction when converted to CNG	7%	EPA 2009
Percentage reduction when converted to electric	9%	Assumed, industry best practice
Percentage reduction when converted to B100	4%	EPA 2009
Percentage of equipment converted to hybrid, CNG, electric, or B100 technology	30%	Assumed; reductions assumed an even distribution between the four categories
GHG reduction ($MTCO_2e$)	6,100	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	No	

Method:
A target conversion rate to alternative fuels of 30% was assumed for all construction equipment used in Santa Clara. An even distribution was used for the four fuels listed in the measure, meaning each will have a market penetration of 8%. Emissions factors from Table 4 in the EPA report "Potential for Reducing Greenhouse Gas Emissions in the Construction Sector" were used to calculate the reduction from converting diesel vehicles to CNG fuel; Table 5 was used for conversion to biodiesel and assumed reductions were used for electric and hybrid conversions.

Sources:
EPA (US Environmental Protection Agency). 2009. Potential for Reducing GHG Emissions in the Construction Sector. http://www.epa.gov/sectors/pdf/construction-sector-report.pdf.

6.1 Transportation demand management program

Require new development located in the city's transportation districts to implement a transportation demand management (TDM) program to reduce drive-alone trips.

Assumptions and Indicators:

Metric	2020	Sources
Percentage increase in VMT from all new development	13.8%	Fehr & Peers, CAPCOA
District 1 minimum daily VMT reduction	17,100	Fehr & Peers, CAPCOA
District 2 minimum daily VMT reduction	8,000	Fehr & Peers, CAPCOA
District 3 minimum daily VMT reduction	8,400	Fehr & Peers
District 4 minimum daily VMT reduction	400	Fehr & Peers
Overall minimum daily VMT reduction	33,900	Fehr & Peers
GHG reduction ($MTCO_2e$)	4,240	Calculated
Costs and Savings:		
City costs	$$$	
Budgeted?	No	

Method:

The City will require all new developments to implement a TDM program that reduces drive-alone trips based on the project's size, location, and land use. The City will recommend a suite of TDM strategies that each project may implement to achieve the goal. These recommended strategies will include transit subsidy passes, employer rideshare assistance, transit and bicycle subsidies, emergency ride home services, telecommute/flex commute options, car- and bike-sharing solutions, and others.

The minimum VMT reductions by transportation district and land use presented in **Table 9** in the measure description are based on an analysis prepared by Fehr & Peers (see Table B-1 below and technical memorandum). For the City to achieve the minimum daily VMT reductions with a TDM program that requires new development over a certain size (25 multi-family units or 10,000 nonresidential square feet) to comply, new projects in each transportation district would need to achieve between 5% and 10% reduction in VMT through the implementation of TDM strategies.

Since different land use types and projects influence VMT at different rates, the percentage VMT reductions expected from each project type have been adjusted relative to anticipated trip generation rates for each General Plan land use designation. Requiring applicable projects in certain General Plan land use designations to achieve a percentage VMT reduction greater than the average for the transportation district as a whole accounts for a certain number of exempt projects generating VMT being exempt, and allows the City to meet GHG emissions reduction estimates for this measure.

Table B-1 – Vehicle Miles Traveled and Reductions Needed by District

Transportation District	2008 Baseline Daily VMT	2020 BAU Daily VMT	VMT Growth 2008–2020	% Growth 2008–2020	Minimum Daily VMT Reduction	% VMT Reduction from *all* VMT	% Reduction Needed from *new* VMT
1 - North of Caltrain	1,815,000	1,900,500	85,500	4.5%	17,100	0.9%	20.0%
2 - Downtown	74,900	119,900	45,000	37.5%	8,000	6.7%	17.8%
3 - El Camino Real Corridor	303,500	351,200	47,700	13.6%	8,400	2.4%	17.6%
4 - Stevens Creek Blvd	177,500	185,200	7,700	4.2%	400	0.2%	5.2%
Remainder of City	817,100	876,500	59,400	6.8%	-	0.0%	0.0%
City of Santa Clara Total	3,188,000	3,433,300	245,300	7.1%	33,900	1.0%	13.8%
Source: Fehr & Peers 2013.							

The minimum percent reductions identified by transportation district and land use in Table 9 were identified using a combination of:

- overall VMT reductions needed from new development in each district (see **Table B-1**),
- average trip generation rate for each land use, and
- CAPCOA estimates of the VMT reduction potential for each land use type.

The minimum VMT reduction requirements identified in the table above are on average slightly higher than the reductions needed from new development to account for projects less than or equal to 25 residential units or 10,000 square feet being exempt from TDM requirements, though still contributing a small portion of the VMT from new development. Finally, the percentages in the table above are rounded to the nearest 5% increment to support staff implementation and enforcement of the TDM program.

Sources:

CAPCOA (California Air Pollution Control Officers Association). 2010. Quantifying GHG Mitigation Measures.

City of Santa Clara General Plan. 2010. http://santaclaraca.gov/ftp/csc/pdf/general-plan/SantaClara_Ch8-6_1-3-11_Final.pdf.

Fehr & Peers Transportation Consultants. 2013. Quantification Workbook of Santa Clara CAP Measures.

———. 2013. VMT+ Tool http://www.fehrandpeers.com/vmt/.

6.2 Municipal transportation demand management

Develop and implement a transportation demand management program for City employees to encourage alternative modes of travel and reduce single-occupant vehicle use.

Assumptions and Indicators:

Metric	2020	Sources
Percentage of employees participating	50%	Fehr & Peers, CAPCOA
VMT savings (million VMT)	1.18	Fehr & Peers, CAPCOA
GHG reduction ($MTCO_2e$)	400	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	No	

Method:

See Measure 6.1 for strategy detail. This strategy is considered a similar version of the TDM requirements with the City attempting to achieve a 20% reduction in employee commute–related VMT, but is applicable to City facilities and employees

Sources:

CAPCOA (California Air Pollution Control Officers Association). 2010. Quantifying GHG Mitigation Measures.

Fehr & Peers Transportation Consultants. 2013. Quantification Workbook of Santa Clara CAP Measures.

6.3 Electric vehicle parking

Revise parking standards for new multi-family residential and nonresidential development to require that a minimum of one parking space, and a recommended level of 5% of all new parking spaces, be designated for electric vehicle charging.

Assumptions and Indicators:

Metric	2020	Sources
VMT driven per EV parking spot per month	727	Cullen et al.
Additional commercial square footage (2014–2020)	437,134	General Plan EIR
Zoning requirement (square feet per parking space)	300	Santa Clara Zoning Code, Section 18.74.020(f)
Number of parking spots to have EV charging station	40	Calculated, 2.5% of future commercial spots
VMT from new electric vehicles	348,000	Calculated
Additional kWh from electric vehicles (kWh/mile)	0.34	Plugincars.com
Additional kWh from electric vehicles (kWh)	118,320	Calculated
Additional GHG emissions from electric vehicles ($MTCO_2e$)	20	Calculated
GHG reductions from electric vehicles	130	Calculated
Net GHG reduction ($MTCO_2e$)	110	Calculated
VMT driven per EV parking spot per month	727	Cullen et al.
Additional commercial square footage (2014–2020)	4,435,650	General Plan EIR
Zoning requirement (square feet per parking space)	600	Santa Clara Zoning Code, Section 18.74.020(l)
Number of parking spots to have EV charging station	180	Calculated, 2.5% of future industrial spots
VMT from new electric vehicles	1,566,000	Calculated
Additional kWh from electric vehicles (kWh/mile)	0.34	Plugincars.com
Additional kWh from electric vehicles (kWh)	532,440	Calculated
Additional GHG emissions from electric vehicles ($MTCO_2e$)	90	Calculated
GHG reductions from electric vehicles	560	Calculated
Net GHG reduction ($MTCO_2e$)	470	Calculated
VMT per EV per year in Santa Clara County	11,000	EMFAC 2011
Multi-family units added (2014–2020)	4,236	Santa Clara General Plan
Parking spots required per unit	2	Santa Clara Zoning Code, Section 18.18.130
Number of parking spots to have EV charging station	212	Calculated, 2.5% of future multi-family spots
VMT from new electric vehicles	2,329,900	Calculated
Additional kWh from electric vehicles (kWh/mile)	0.34	Plugincars.com
Additional kWh from electric vehicles (kWh)	792,200	Calculated
Additional GHG emissions from electric vehicles ($MTCO_2e$)	100	Calculated
GHG reductions from electric vehicles	800	Calculated
Net GHG reduction ($MTCO_2e$)	800	Calculated
Costs and Savings:		
City costs	$$	
Budgeted?	Partially	

Method:
A 2.5% participation rate was applied to new commercial, industrial, and multi-family development for the number of additional parking spaces designated for electric vehicles. The number of required spaces per each development type was provided in the City's Zoning Code. The amount of new space was calculated from 2014 to 2020 using the 2010–2035 General Plan. The typical amount of VMT by space for nonresidential sectors was provided by Cullen et al., while multi-family EV driving patterns were provided by EMFAC 2011. The net decrease in emissions is the difference between the total reductions from taking a conventional vehicle off the road and the slight increase in use of electricity. Electricity used per EV mile was provided by Plug-In Cars and conventional GHG emissions from EMFAC 2011.

Sources:
CARB (California Air Resources Board). 2011. EMFAC 2011 Online Database.

City of Santa Clara. Zoning Code, Section 18.74.020(f). 18.18.130.

Cullen, Michael, Donny Katz, Allie Looft, Lucrecia Martinez, and Erin Rosintoski. 2009. Parking Policy and Transportation-Oriented Development.

Plug-In Cars. 2010. Nissan LEAF Finally Gets Official EPA Fuel Economy Label. http://www.plugincars.com/nissan-leaf-finally-gets-official-epa-label-106486.html.

7.1 Urban forestry

Create a tree-planting standard for new development and conduct a citywide tree inventory every five years to track progress of the requirements.

Assumptions and Indicators:

Metric	2020	Sources
New Trees Added per year	500	Assumed
Years Program Implemented	5	Assumed
kg CO_2e sequestered per tree	25	Donovan and Butry
GHG reduction ($MTCO_2$e)	60	Calculated
kWh used per home for cooling	468	KEMA; represents 9% of average electricity use
kWh saved per participating home	20	ICLEI CAPPA
GHG reduction ($MTCO_2$e)	10	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	Yes	

Method:

A certain number of trees per year were assumed to be planted for each year the program is implemented. GHG benefits result from both the reduced load on air conditioning units from window shading and the sequestration of CO_2 by the tree itself. Sequestration savings were provided by Donovan and Butry and converted to $MTCO_2$e per tree using a simple conversion factor. The savings from reduced air conditioning load were calculated using a combination of sources. The Residential Appliance Saturation Study (RASS) was used to estimate the kWh used per year per home in Santa Clara on air conditioning. Donovan and Butry was then used to estimate the reductions in air conditioning electricity from shading. The kWh reductions were converted into $MTCO_2$e using the coal-free emissions factor generated in Measure 1.1.

Sources:

City of Santa Clara. 2010. 2010–2035 General Plan.

Donovan, G., and D. Butry. 2009. The value of shade: Estimating the effect of urban trees on summertime electricity use. http://naldc.nal.usda.gov/download/31642/PDF.

ICLEI-Local Governments for Sustainability. 2010. CAPPA: Climate and Air Pollution Planning Assistant.

KEMA, Inc. 2010. 2009 California Residential Appliance Saturation Study, Volume 2: Results. CEC 200-2010-004.

7.2 Urban cooling

Require new parking lots to be surfaced with low-albedo materials to reduce heat gain, provided it is consistent with the Building Code.

Assumptions and Indicators:

Metric	2020	Sources
Additional nonresidential square feet (2014–2020)	437,100	Calculated from General Plan EIR
Parking space requirement for new nonresidential development (parking sq ft/building sq ft)	300	Santa Clara Zoning Code, Section 18.74.020(f)
Additional square feet of parking lots	638,750	Calculated; included 125% inflation factor to account for lanes
kWh saved per square meter of cool pavement	0.162	Akbari, H. et al., CEC Energy Almanac
kWh saved from cool pavement	9,623	Calculated
GHG reduction ($MTCO_2e$)	10	Calculated
Costs and Savings:		
City costs	$	
Budgeted?	No	

Method:
The additional nonresidential square footage planned from 2014 to 2020 was used with the Santa Clara Zoning Code to estimate the total new area of parking lots in the city. It was assumed that all of these surfaces would have a lower than normal albedo to reflect more sunlight back into space. Akbari et al. was used to estimate the kWh saved per square foot of cool pavement. The kWh reductions were converted into $MTCO_2e$ using the coal-free emissions factor generated in Measure 1.1.

Sources:
Akbari, H., et al. Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas. Section 6.1.1: Electric power savings in Los Angeles.

CEC (California Energy Commission). 2011. Electricity Rates. http://energyalmanac.ca.gov/electricity/Electricity_Rates_Combined.xls.

City of Santa Clara. 2010. 2010–2035 General Plan.

Reach Measures

Expansion of 1.1 Coal-free by 2020

Replace the use of coal in Silicon Valley Power's portfolio with an even mix of renewable energy and natural gas by 2035.

Assumptions and Indicators:

Metric	2035	Sources
Percentage of baseline electricity coming from coal	24%	SVP Power Content Label
Percentage of baseline electricity coming from natural gas	26%	SVP Power Content Label
$MTCO_2e$/MWh for electricity produced from coal	0.324	LGOP v1.1
$MTCO_2e$/MWh for electricity produced from natural gas	0.187	LGOP v1.1
$MTCO_2e$/MWh for electricity produced from renewable energy	0.000	LGOP v1.1
$MTCO_2e$/MWh for 50/50 mix of renewables and natural gas	0.093	Calculated average
Percent reduction in $MTCO_2e$/MWh	-71%	Calculated
GHG reduction ($MTCO_2e$)	806,200	Calculated

Method:

This measure calculates the change in SVP's emissions factor ($MTCO_2e$/kWh) when switching from coal to an even mix of renewable energy and natural gas. In Measure 1.1, the only GHG-producing source of electricity is natural gas. Since this reach measure replaces half of that natural gas electricity with emissions free renewable energy, the emissions coefficient for 2035 is exactly half of the one calculated for 2020 in Measure 1.1.

Sources:

CARB (California Air Resources Board), et al. 2010. Local Government Operations Protocol. Table G.3.

City of Santa Clara. 2012. SVP Power Content Label.

Expansion of 1.3 Utility-installed renewables

Develop up to five solar PV projects with a total installed capacity of 25 MW.

Assumptions and Indicators:

Metric	2035	Sources
kW installed	25,000	Assumed
kWh produced per kW installed	1,440	NREL PVWatts
kWh produced	36,000,000	Calculated
GHG reduction ($MTCO_2e$)	3,100	Calculated

Method:

An assumed amount of installed PV solar power, in the unit of kW, was applied to the kWh produced per kW installed factor generated using the NREL PVWatts calculator. This calculator is geographically based and takes DC to AC conversion, weather, precipitation, and other factors into account to generate an accurate portrayal of actual electricity generation in PV systems. The kWh produced by the assumed total size of the systems was applied to the emissions factor generated in Reach Measure 1.1 to produce GHG emissions under SVP's coal-free scenario.

Sources:

NREL (National Renewable Energy Laboratory). 2012. PVWatts Calculator. http://www.nrel.gov/rredc/pvwatts/.

Expansion of 2.1 Community electricity efficiency

Achieve twice the City-adopted 2020 electricity efficiency targets to reduce community-wide electricity use by 10% through incentives, pilot projects, and rebate programs.

Assumptions and Indicators:

Metric	2035	Sources
Total MWh savings	318,064	Assumed, correspondence with SVP, May 22, 2013
GHG reduction ($MTCO_2e$)	27,600	Calculated

Method:

The 2013 adopted electricity efficiency goals for SVP (in terms of MWh of electricity) were assumed to be fully implemented through 2020. It was also assumed that by 2035, two times the savings would occur. The kWh reductions were converted into $MTCO_2e$ using the coal-free emissions factor generated in Reach Measure 1.1.

Sources:

City of Santa Clara, Silicon Valley Power. 2013. Personal correspondence with Ann Hatcher. May 22.

Expansion of 2.4 Customer-installed solar

Incentivize and facilitate the installation of 10,000 kW of customer-owned residential and nonresidential solar PV projects.

Assumptions and Indicators:

Metric	2035	Sources
kW installed	10,000	Assumed
kWh produced per kW installed	1,440	NREL PVWatts
kWh produced	14,400,000	Calculated
GHG reduction ($MTCO_2e$)	1,250	Calculated

Method:

An assumed amount of installed PV solar power, in the unit of kW, was applied to the kWh produced per kW installed factor generated using the NREL PVWatts calculator. This calculator is geographically based and takes DC to AC conversion, weather, precipitation, and other factors into account to generate an accurate portrayal of electricity generation in PV systems. The kWh produced by the total size of the systems was applied to the emissions factor generated in Reach Measure 1.1 to produce GHG emissions under SVP's coal-free scenario.

Sources:

NREL (National Renewable Energy Laboratory). 2012. PVWatts Calculator. http://www.nrel.gov/rredc/pvwatts/.

Appendix K: Supply Reliability Tables for Retailer, Valley Water

Table 1. Normal Year Supplies and Demand Comparison

Water Supply	2025	2030	2035	2040	2045
Local Surface water	30,000	70,000	185,000	185,000	185,000
Recycled water	16,000	19,000	22,000	25,000	28,000
Imported water	130,000	134,000	136,000	139,000	142,000
SFPUC Supply	55,000	56,000	59,000	61,000	63,000
Local groundwater storage	140,000	164,000	163,000	162,000	162,000
Supply from Storage	75,000	75,000	75,000	70,000	70,000
Supply Total	**446,000**	**518,000**	**640,000**	**642,000**	**650,000**
Demand Total	**330,000**	**320,000**	**330,000**	**335,000**	**345,000**
Difference	**116,000**	**198,000**	**310,000**	**307,000**	**305,000**

NOTES: Recycled water and SFPUC supply are rounded to the nearest 1,000 AF. All other supplies are rounded to the nearest 5,000 AF. Supplies shown are based on modeled estimates of available supplies. Actual availability during any given year depends on hydrology, groundwater recharge operations and conditions, and other factors. Groundwater storage shown assumes groundwater can be drawn down to the severe stage of the Water Shortage Contingency Plan. This does not represent a sustainable long-term groundwater condition, but these supplies represent water that may be needed to get through a prolonged drought. Imported water allocations are provided by DWR in their Delivery Capability Report (DCR) 2019, which does not include projected future regulations nor the hydrologic sequence for the most recent 2012-2016 drought. For comparison, the lowest total annual imported delivery during the 1987-1992 drought in the DCR 2019 dataset is 83,200AF, while the actual lowest annual imported delivery during the 2012-2016 drought was 60,320 AF. However, through Valley Water's Monitoring and Assessment Program, Valley Water is conservatively planning for investments by considering severe droughts, such as the 2012-2016 drought, will occur in the future. Projects included in the supply projections include transfer Bethany pipeline (2025); Anderson dam seismic retrofit and potable reuse (2030); Guadalupe, Calero, and Almaden dam seismic retrofits and Pacheco Reservoir Expansion (2035); and an additional 35,000 AF of conservation (to reach Valley Water's goal of 109,000 AF by 2040 with a 1992 baseline).

Table 2. Single Dry Year Supply and Demand Comparison

Water Supply	2025	2030	2035	2040	2045
Supply Total	355,000	373,000	497,000	503,000	505,000
Demand Total	330,000	320,000	330,000	335,000	345,000
Difference	25,000	53,000	167,000	168,000	160,000

NOTES: All numbers are rounded to the nearest 5,000 AF. The available groundwater is based on modeled estimates if the 1977 hydrology was repeated in the future. Supplies available for the single year drought represent water needed not only for that single drought year, but also water that may be needed for a prolonged drought. Valley Water would manage the supplies reported in the table assuming the drought may continue beyond a single year, and thus not all supplies are expected to be used by retailers during the single year drought. Imported water allocations are provided by DWR in their DCR 2019, which does not include projected future regulations nor the hydrologic sequence for the most recent 2012-2016 drought. For comparison, the lowest total annual imported delivery during the 1987-1992 drought in the DCR 2019 dataset is 83,200AF, while the actual lowest annual imported delivery during the 2012-2016 drought was 60,320 AF. However, through Valley Water's Monitoring and Assessment Program, Valley Water is conservatively planning for investments by considering severe droughts, such as the 2012-2016 drought, will occur in the future. Projects included in the supply projections include transfer Bethany pipeline (2025); Anderson dam seismic retrofit and potable reuse (2030); Guadalupe, Calero, and Almaden dam seismic retrofits and Pacheco Reservoir Expansion (2035); and an additional 35,000 AF of conservation (to reach Valley Water's goal of 109,000 AF by 2040 with a 1992 baseline).

Table 3. Multiple Dry Years Supply and Demand Comparison

		2025	2030	2035	2040	2045
First Year	Supply Totals	345,000	349,000	491,000	483,000	487,000
	Demand Totals	330,000	320,000	330,000	335,000	345,000
	Difference	15,000	29,000	161,000	148,000	142,000
Second Year	Supply Totals	370,000	376,000	477,000	482,000	501,000
	Demand Totals	330,000	320,000	330,000	335,000	345,000
	Difference	40,000	56,000	147,000	147,000	156,000
Third Year	Supply Totals	340,000	349,000	443,000	450,000	448,000
	Demand Totals	330,000	320,000	330,000	335,000	345,000
	Difference	10,000	29,000	113,000	115,000	103,000
Fourth Year	Supply Totals	347,000	341,000	416,000	421,000	429,000
	Demand Totals	330,000	320,000	330,000	335,000	345,000
	Difference	17,000	21,000	86,000	86,000	84,000
Fifth Year	Supply Totals	341,000	365,000	430,000	440,000	444,000
	Demand Totals	330,000	320,000	330,000	335,000	345,000
	Difference	11,000	45,000	100,000	105,000	99,000

NOTES: All numbers are rounded to the nearest 5,000 AF. WEAP model output for hydrologic years 1988-1992 was used to represent years 1 through 5 of the drought. Imported water allocations are provided by DWR in their DCR 2019, which does not include projected future regulations nor the hydrologic sequence for the most recent 2012-2016 drought. For comparison, the lowest total annual imported delivery during the 1987-1992 drought in the DCR 2019 dataset is 83,200AF, while the actual lowest annual imported delivery during the 2012-2016 drought was 60,320 AF. However, through Valley Water's Monitoring and Assessment Program, Valley Water is conservatively planning for investments by considering severe droughts, such as the 2012-2016 drought, will occur in the future. Projects included in the supply projections include transfer Bethany pipeline (2025); Anderson dam seismic retrofit and potable reuse (2030); Guadalupe, Calero, and Almaden dam seismic retrofits and Pacheco Reservoir Expansion (2035); and an additional 35,000 AF of conservation (to reach Valley Water's goal of 109,000 AF by 2040 with a 1992 baseline).

Appendix L: Supply Reliability Tables for Retailer, San Francisco Public Utilities Commission

San Francisco
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March 30, 2021

Danielle McPherson
Senior Water Resources Specialist
Bay Area Water Supply and Conservation Agency
155 Bovet Road, Suite 650
San Mateo, CA 94402

Dear Ms. McPherson,

Attached please find additional supply reliability modeling results conducted by the SFPUC. The SFPUC has conducted additional supply reliability modeling under the following planning scenarios:

- Projected supply reliability for years 2020 through 2045, assuming that demand is equivalent to the sum of the projected retail demands on the Regional Water System (RWS) and Wholesale Customer purchase request projections provided to SFPUC by BAWSCA on January 21st (see Table 1 below).
- Under the above demand conditions, projected supply reliability for scenarios both with and without implementation of the Bay-Delta Plan Amendment starting in 2023.

The SFPUC will be using this supply modeling in the text of its draft UWMP and moving the original modeling results into an appendix.

Table 1: Retail and Wholesale RWS Demand Assumptions Used for Additional Supply Reliability Modeling (mgd)

	2020	2025	2030	2035	2040	2045
Retail	66.5	67.2	67.5	68.6	70.5	73.7
Wholesale[1, 2]	132.1	146.0	147.9	151.9	156.3	162.8
Total	**198.6**	**213.2**	**215.4**	**220.5**	**226.8**	**236.5**

[1] Wholesale purchase request projections provided to the SFPUC by BAWSCA on January 21st, 2021

[2] Includes demands for Cities of San Jose and Santa Clara

Please note the following about the information presented in the attached tables:

- Assumptions about infrastructure conditions remain the same as what was provided in our January 22nd letter.
- The Tier 1 allocations were applied to the RWS supplies to determine the wholesale supply, as was also described in the January 22nd letter; for any system-wide shortage above 20%, the Tier 1 split for a 20% shortage was applied.
- The SFPUC water supply planning methodology, including simulation of an 8.5-year design drought, is used to develop these estimates of water supply available from the RWS for five dry years. In each demand scenario for 2020 through 2045, the RWS deliveries are estimated using the standard SFPUC procedure, which includes adding increased levels of rationing as needed to balance the demands on the RWS system with available water supply. Some simulations may have increased levels of rationing in the final years of the design drought sequence, which can influence the comparison of results in the first five years of the sequence.
- Tables 7 and 8 in the attached document provide RWS and wholesale supply availability for the five-year drought risk assessment from 2021 to 2025. SFPUC's modeling approach does not allow for varying demands over the course of a dry year sequence. Therefore, the supply projections for 2021 to 2025 are based on meeting 2020 levels of demand. However, in years when the Bay-Delta Plan Amendment is not in effect, sufficient RWS supplies will be available to meet the Wholesale Customers' purchase requests assuming that they are between the 2020 and 2025 projected levels. This is not reflected in Tables 7 and 8 because SFPUC did not want to make assumptions about the growth of purchase requests between 2020 and 2025.

In our draft UWMP, we acknowledge that we have a Level of Service objective of meeting average annual water demand of 265 mgd from the SFPUC watersheds for retail and Wholesale Customers during non-drought years, as well as a contractual obligation to supply 184 mgd to the Wholesale Customers. Therefore, we will still include the results of our modeling based on a demand of 265 mgd in order to facilitate planning that supports meeting this Level of Service objective and our contractual obligations. The results of this modeling will be in an appendix to the draft UWMP. As will be shown in this appendix, in a normal year the SFPUC can provide up to 265 mgd of supply from the RWS. The RWS supply projections shown in the attached tables are more accurately characterized as supplies that will be used to meet projected retail and Wholesale Customer demands.

It is our understanding that you will pass this information on to the Wholesale Customers. If you have any questions or need additional information, please do not hesitate to contact Sarah Triolo, at striolo@sfwater.org or (628) 230 0802.

Sincerely,

Paula Kehoe

Paula Kehoe
Director of Water Resources

Table 2: Projected Total RWS Supply Utilized and Portion of RWS Supply Utilized by Wholesale Customers in Normal Years [For Table 6-9]:

Year	2020	2025	2030	2035	2040	2045
RWS Supply Utilized (mgd)	198.6	213.2	215.4	220.5	226.8	236.5
RWS Supply Utilized by Wholesale Customers[a] (mgd)	132.1	146.0	147.9	151.9	156.3	162.8

[a] RWS supply utilized by Wholesale Customers is equivalent to purchase request projections provided to SFPUC by BAWSCA on January 21, 2021, and includes Cities of San Jose and Santa Clara.

Basis of Water Supply Data: With Bay-Delta Plan Amendment

Table 3a: Basis of Water Supply Data [For Table 7-1], Base Year 2020, With Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2020	198.6	100%	132.1	
Single dry year		198.6	100%	132.1	
Consecutive 1st Dry year		198.6	100%	132.1	
Consecutive 2nd Dry year		198.6	100%	132.1	
Consecutive 3rd Dry year[1]		119.2	60%	74.5	• At shortages 20% or greater, wholesale allocation is assumed to be 62.5%
Consecutive 4th Dry year		119.2	60%	74.5	• Same as above
Consecutive 5th Dry year		119.2	60%	74.5	• Same as above

[1] Assuming this year represents 2023, when Bay Delta Plan Amendment would come into effect.

Table 3b: Basis of Water Supply Data [For Table 7-1], Base Year 2025, With Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2025	213.2	100%	146.0	
Single dry year		149.2	70%	93.3	• At shortages 20% or greater, wholesale allocation is assumed to be 62.5%
Consecutive 1st Dry year		149.2	70%	93.3	• Same as above
Consecutive 2nd Dry year		127.9	60%	80.0	• Same as above
Consecutive 3rd Dry year		127.9	60%	80.0	• Same as above
Consecutive 4th Dry year		127.9	60%	80.0	• Same as above
Consecutive 5th Dry year		127.9	60%	80.0	• Same as above

Table 3c: Basis of Water Supply Data [For Table 7-1], Base Year 2030, With Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2030	215.4	100%	147.9	
Single dry year		150.8	70%	94.2	• At shortages 20% or greater, wholesale allocation is assumed to be 62.5%
Consecutive 1st Dry year		150.8	70%	94.2	• Same as above
Consecutive 2nd Dry year		129.2	60%	80.8	• Same as above
Consecutive 3rd Dry year		129.2	60%	80.8	• Same as above
Consecutive 4th Dry year		129.2	60%	80.8	• Same as above
Consecutive 5th Dry year		129.2	60%	80.8	• Same as above

Table 3d: Basis of Water Supply Data [For Table 7-1], Base Year 2035, With Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2035	220.5	100%	151.9	
Single dry year		154.4	70%	96.5	• At shortages 20% or greater, wholesale allocation is assumed to be 62.5%
Consecutive 1st Dry year		154.4	70%	96.5	• Same as above
Consecutive 2nd Dry year		132.3	60%	82.7	• Same as above
Consecutive 3rd Dry year		132.3	60%	82.7	• Same as above
Consecutive 4th Dry year		132.3	60%	82.7	• Same as above
Consecutive 5th Dry year		121.3	55%	75.8	• Same as above

Table 3e: Basis of Water Supply Data [For Table 7-1], Base Year 2040, With Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2040	226.8	100%	156.3	
Single dry year		158.8	70%	99.2	• At shortages 20% or greater, wholesale allocation is assumed to be 62.5%
Consecutive 1st Dry year		158.8	70%	99.2	• Same as above
Consecutive 2nd Dry year		136.1	60%	85.1	• Same as above
Consecutive 3rd Dry year		136.1	60%	85.1	• Same as above
Consecutive 4th Dry year		120.2	53%	75.1	• Same as above
Consecutive 5th Dry year		120.2	53%	75.1	• Same as above

Table 3f: Basis of Water Supply Data [For Table 7-1], Base Year 2045, With Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2045	236.5	100%	162.8	
Single dry year		141.9	60%	88.7	• At shortages 20% or greater, wholesale allocation is assumed to be 62.5%
Consecutive 1st Dry year		141.9	60%	88.7	• Same as above
Consecutive 2nd Dry year		141.9	60%	88.7	• Same as above
Consecutive 3rd Dry year		141.9	60%	88.7	• Same as above
Consecutive 4th Dry year		120.6	51%	75.4	• Same as above
Consecutive 5th Dry year		120.6	51%	75.4	• Same as above

Table 3g: Projected RWS Supply Availability [Alternative to Table 7-1], Years 2020-2045, With Bay-Delta Plan Amendment

Year	2020	2025	2030	2035	2040	2045
Average year	100%	100%	100%	100%	100%	100%
Single dry year	100%	70%	70%	70%	70%	60%
Consecutive 1st Dry year	100%	70%	70%	70%	70%	60%
Consecutive 2nd Dry year	100%	60%	60%	60%	60%	60%
Consecutive 3rd Dry year[1]	60%	60%	60%	60%	60%	60%
Consecutive 4th Dry year	60%	60%	60%	60%	53%	51%
Consecutive 5th Dry year	60%	60%	60%	55%	53%	51%

[1] Assuming that at base year 2020, this year represents 2023, when Bay Delta Plan Amendment would come into effect.

Basis of Water Supply Data: Without Bay-Delta Plan Amendment

Table 4a: Basis of Water Supply Data [For Table 7-1], Base Year 2020, Without Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2020	198.6	100%	132.1	
Single dry year		198.6	100%	132.1	
Consecutive 1st Dry year		198.6	100%	132.1	
Consecutive 2nd Dry year		198.6	100%	132.1	
Consecutive 3rd Dry year		198.6	100%	132.1	
Consecutive 4th Dry year		198.6	100%	132.1	
Consecutive 5th Dry year		198.6	100%	132.1	

Table 4b: Basis of Water Supply Data [For Table 7-1], Base Year 2025, Without Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2025	213.2	100%	146.0	
Single dry year		213.2	100%	146.0	
Consecutive 1st Dry year		213.2	100%	146.0	
Consecutive 2nd Dry year		213.2	100%	146.0	
Consecutive 3rd Dry year		213.2	100%	146.0	
Consecutive 4th Dry year		213.2	100%	146.0	
Consecutive 5th Dry year		213.2	100%	146.0	

Table 4c: Basis of Water Supply Data [For Table 7-1], Base Year 2030, Without Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2030	215.4	100%	147.9	
Single dry year		215.4	100%	147.9	
Consecutive 1st Dry year		215.4	100%	147.9	
Consecutive 2nd Dry year		215.4	100%	147.9	
Consecutive 3rd Dry year		215.4	100%	147.9	
Consecutive 4th Dry year		215.4	100%	147.9	
Consecutive 5th Dry year		215.4	100%	147.9	

Table 4d: Basis of Water Supply Data [For Table 7-1], Base Year 2035, Without Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2035	220.5	100%	151.9	
Single dry year		220.5	100%	151.9	
Consecutive 1st Dry year		220.5	100%	151.9	
Consecutive 2nd Dry year		220.5	100%	151.9	
Consecutive 3rd Dry year		220.5	100%	151.9	
Consecutive 4th Dry year		220.5	100%	151.9	
Consecutive 5th Dry year		220.5	100%	151.9	

Table 4e: Basis of Water Supply Data [For Table 7-1], Base Year 2040, Without Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2040	226.8	100%	156.3	
Single dry year		226.8	100%	156.3	
Consecutive 1st Dry year		226.8	100%	156.3	
Consecutive 2nd Dry year		226.8	100%	156.3	
Consecutive 3rd Dry year		226.8	100%	156.3	
Consecutive 4th Dry year		226.8	100%	156.3	
Consecutive 5th Dry year		226.8	100%	156.3	

Table 4f: Basis of Water Supply Data [For Table 7-1], Base Year 2045, Without Bay-Delta Plan Amendment

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2045	236.5	100%	162.8	
Single dry year		236.5	100%	162.8	
Consecutive 1st Dry year		236.5	100%	162.8	
Consecutive 2nd Dry year		236.5	100%	162.8	
Consecutive 3rd Dry year		236.5	100%	162.8	
Consecutive 4th Dry year		212.8	90%	139.1	• At a 10% shortage level, the wholesale allocation is 64% of available supply • The retail allocation is 36% of supply, which resulted in a positive allocation to retail of 2.9 mgd, which was re-allocated to the Wholesale Customers
Consecutive 5th Dry year		212.8	90%	139.1	• Same as above

Table 4g: Projected RWS Supply [Alternative to Table 7-1], Years 2020-2045, Without Bay-Delta Plan Amendment

Year	2020	2025	2030	2035	2040	2045
Average year	100%	100%	100%	100%	100%	100%
Single dry year	100%	100%	100%	100%	100%	100%
Consecutive 1st Dry year	100%	100%	100%	100%	100%	100%
Consecutive 2nd Dry year	100%	100%	100%	100%	100%	100%
Consecutive 3rd Dry year	100%	100%	100%	100%	100%	100%
Consecutive 4th Dry year	100%	100%	100%	100%	100%	90%
Consecutive 5th Dry year	100%	100%	100%	100%	100%	90%

Supply Projections for Consecutive Five Dry Year Sequences

Table 5: Projected Multiple Dry Years Wholesale Supply from RWS [For Table 7-4], With Bay-Delta Plan Amendment

	2025	2030	2035	2040	2045
First year	93.3	94.2	96.5	99.2	88.7
Second year	80.0	80.8	82.7	85.1	88.7
Third year	80.0	80.8	82.7	85.1	88.7
Fourth year	80.0	80.8	82.7	75.1	75.4
Fifth year	80.0	80.8	75.8	75.1	75.4

Table 6: Projected Multiple Dry Years Wholesale Supply from RWS [For Table 7-4], Without Bay-Delta Plan Amendment

	2025	2030	2035	2040	2045
First year	146.0	147.9	151.9	156.3	162.8
Second year	146.0	147.9	151.9	156.3	162.8
Third year	146.0	147.9	151.9	156.3	162.8
Fourth year	146.0	147.9	151.9	156.3	139.1
Fifth year	146.0	147.9	151.9	156.3	139.1

Table 7: Projected Regional Water System Supply for 5-Year Drought Risk Assessment [For Table 7-5], With Bay-Delta Plan Amendment. This table assumes Bay Delta Plan comes into effect in 2023.

Year	2021	2022	2023	2024	2025
RWS Supply (mgd)	198.6	198.6	119.2	119.2	119.2
Wholesale Supply (mgd)	132.1	132.1	74.5	74.5	74.5

Table 8: Projected Regional Water System Supply for 5-Year Drought Risk Assessment [For Table 7-5], Without Bay Delta Plan

Year	2021	2022	2023	2024	2025
RWS Supply (mgd)	198.6	198.6	198.6	198.6	198.6
Wholesale Supply (mgd)	132.1	132.1	132.1	132.1	132.1

Section 1: Basis for Calculations. Projected Wholesale RWS Purchases Through 2045

Table A: Wholesale RWS Actual Purchases in 2020 and Projected Purchases for 2025, 2030, 2035, 2040, and 2045 (mgd)[a]

Agency	2020 Actual	Projected Wholesale RWS Purchases 2025	2030	2035	2040	2045
ACWD	7.87	7.68	7.68	7.68	7.68	9.11
Brisbane/GVMID	0.64	0.89	0.89	0.88	0.89	0.89
Burlingame	3.48	4.33	4.40	4.47	4.58	4.69
Coastside	1.02	1.40	1.38	1.36	1.33	1.33
CalWater Total	29.00	29.99	29.74	29.81	30.27	30.70
Daly City	3.97	3.57	3.52	3.49	3.46	3.43
East Palo Alto	1.57	1.88	1.95	2.10	2.49	2.89
Estero	4.34	4.07	4.11	4.18	4.23	4.38
Hayward	13.92	17.86	18.68	19.75	20.82	22.14
Hillsborough	2.62	3.26	3.25	3.26	3.26	3.26
Menlo Park	2.96	3.55	3.68	3.87	4.06	4.29
Mid-Peninsula	2.66	2.86	2.84	2.88	2.89	2.93
Millbrae	1.90	2.29	2.50	2.45	2.82	3.20
Milpitas	5.92	6.59	6.75	7.03	7.27	7.53
Mountain View	7.67	8.60	8.90	9.20	9.51	9.93
North Coast	2.37	2.34	2.33	2.34	2.34	2.34
Palo Alto	9.75	10.06	10.15	10.28	10.51	10.79
Purissima Hills	1.75	2.09	2.09	2.12	2.13	2.15
Redwood City	8.76	8.46	8.49	8.64	8.74	8.90
San Bruno	0.95	3.24	3.22	3.20	3.20	3.21
San Jose	4.26	4.50	4.50	4.50	4.50	4.50
Santa Clara	3.27	4.50	4.50	4.50	4.50	4.50
Stanford	1.43	2.01	2.18	2.35	2.53	2.70
Sunnyvale	9.33	9.16	9.30	10.70	11.44	12.10
Westborough	0.82	0.86	0.85	0.85	0.84	0.84
Total	**132.22**	**146.01**	**147.87**	**151.90**	**156.31**	**162.76**

[a] Wholesale RWS purchase projections for 2025, 2030, 2035, 2040, and 2045 were provided to BAWSCA between July 2020 and January 2021 by the Member Agencies following the completion of the June 2020 Demand Study.

Table B: Basis for the 5-Year Drought Risk Assessment Wholesale RWS Actual Purchases in 2020 and 2021-2025 Projected Purchases (mgd)

Agency	2020 Actual	Projected and Estimated Wholesale RWS Purchases 2021[b]	2022[b]	2023[c]	2024[c]	2025[c]
ACWD	7.87	9.44	9.46	9.46	9.46	9.46
Brisbane/GVMID	0.64	0.62	0.65	0.65	0.65	0.65
Burlingame	3.48	3.34	3.35	3.35	3.35	3.35
Coastside	1.02	1.54	1.23	1.23	1.23	1.23
CalWater Total	29.00	29.66	29.81	29.81	29.81	29.81
Daly City	3.97	4.00	4.01	4.01	4.01	4.01
East Palo Alto	1.57	1.63	1.69	1.69	1.69	1.69
Estero	4.34	4.48	4.51	4.51	4.51	4.51
Hayward	13.92	14.47	15.12	15.12	15.12	15.12
Hillsborough	2.62	2.95	3.05	3.05	3.05	3.05
Menlo Park	2.96	2.92	2.93	2.93	2.93	2.93
Mid-Peninsula	2.66	2.65	2.80	2.80	2.80	2.80
Millbrae	1.90	1.95	2.15	2.15	2.15	2.15
Milpitas	5.92	5.88	5.34	5.34	5.34	5.34
Mountain View	7.67	7.80	8.05	8.05	8.05	8.05
North Coast	2.37	2.58	2.66	2.66	2.66	2.66
Palo Alto	9.75	9.44	9.66	9.66	9.66	9.66
Purissima Hills	1.75	1.97	2.02	2.02	2.02	2.02
Redwood City	8.76	8.72	9.07	9.07	9.07	9.07
San Bruno	0.95	3.39	3.40	3.40	3.40	3.40
San Jose	4.26	4.31	4.51	4.51	4.51	4.51
Santa Clara	3.27	3.29	3.50	3.50	3.50	3.50
Stanford	1.43	1.40	1.54	1.54	1.54	1.54
Sunnyvale	9.33	9.35	9.45	9.45	9.45	9.45
Westborough	0.82	0.84	0.81	0.81	0.81	0.81
Total	**132.22**	**138.61**	**140.77**	**140.77**	**140.77**	**140.77**

[b] Wholesale RWS purchase projections for 2021 and 2022 were provided to Christina Tang, BAWSCA's Finance Manager, by the Member Agencies in January 2021.

[c] The SFPUC's supply reliability tables assume the Bay-Delta Plan takes effect in 2023. In the event of a shortage, the Tier 2 Plan specifies that each agencies' Allocation Factor would be calculated once at the onset of a shortage based on the previous year's use and remains the same until the shortage condition is over. Therefore, for the purpose of drought allocations for the 5-year Drought Risk Assessment, wholesale RWS demand is assumed to remain static from 2022 through the drought sequence.

Section 2: Drought Allocations ***With*** Bay-Delta Plan

Table C: RWS Supply Available to the Wholesale Customers (Combined Tables 3a-3f from the SFPUC's March 30th letter) *With* Bay-Delta Plan (mgd)

	2020[e]	2025	2030	2035	2040	2045
Projected Purchases[d]	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 1st Dry Year	138.6	93.3	94.2	96.5	99.2	88.7
Consecutive 2nd Dry Year	140.8	80.0	80.8	82.7	85.1	88.7
Consecutive 3rd Dry Year	74.5	80.0	80.8	82.7	85.1	88.7
Consecutive 4th Dry Year	74.5	80.0	80.8	82.7	75.1	75.4
Consecutive 5th Dry Year	74.5	80.0	80.8	75.8	75.1	75.4

[d] Values for 2020 are actual purchases. This row aligns with what is labeled as an "Average Year" in Tables 3a-3f in the SFPUC's March 30th letter. However, these values do not represent an average year and instead are actual purchases for 2020 or projected purchases for 2025 through 2045.

[e] In years when the Bay-Delta Plan is not in effect, sufficient RWS supplies will be available to meet the Wholesale Customers' purchase requests assuming that they are between the 2020 and 2025 projected levels. As such, RWS supply available to the Wholesale Customers in the 1st and 2nd consecutive dry years under base year 2020 is equal to the cumulative projected wholesale RWS purchases for 2021 and 2022, respectively.

Table D: Wholesale RWS Demand (Combined Totals from Tables A and B) (mgd)[f]

	2020	2025	2030	2035	2040	2045
Projected Purchases[d]	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 1st Dry Year	138.6	146.0	147.9	151.9	156.3	162.8
Consecutive 2nd Dry Year	140.8	146.0	147.9	151.9	156.3	162.8
Consecutive 3rd Dry Year	140.8	146.0	147.9	151.9	156.3	162.8
Consecutive 4th Dry Year	140.8	146.0	147.9	151.9	156.3	162.8
Consecutive 5th Dry Year	140.8	146.0	147.9	151.9	156.3	162.8

[f] The SFPUC's modeling approach does not allow for varying demands over the course of a dry year sequence. Additionally, the Tier 2 Plan calculates each agencies' Allocation Factor once at the onset of a drought and it remains the same until the shortage condition is over. When system-wide shortages are projected, wholesale RWS demand is assumed to be static for the remainder of the drought sequence.

Table E: Percent Cutback to the Wholesale Customers *With* Bay-Delta Plan[g]

	2020	2025	2030	2035	2040	2045
Projected Purchases[d]	0%	0%	0%	0%	0%	0%
Consecutive 1st Dry Year	0%	36%	36%	36%	37%	46%
Consecutive 2nd Dry Year	0%	45%	45%	46%	46%	46%
Consecutive 3rd Dry Year	47%	45%	45%	46%	46%	46%
Consecutive 4th Dry Year	47%	45%	45%	46%	52%	54%
Consecutive 5th Dry Year	47%	45%	45%	50%	52%	54%

[g] Agencies that wish to use new or different projected RWS purchases may use the percent cutbacks listed in this table to determine their drought allocation.

Table F1: Basis of Water Supply Data [For Tables 7-1 and 7-5], Base Year 2020, *With* Bay-Delta Plan (mgd)

Year Consecutive Dry Year	2020 Actual	2021 1st	2022 2nd	2023 3rd	2024 4th	2025 5th
Wholesale RWS Demand	132.2	138.6	140.8	140.8	140.8	140.8
Wholesale RWS Supply Available	132.2	138.6	140.8	74.5	74.5	74.5
Percent Cutback	0%	0%	0%	47%	47%	47%

Table F2: Individual Agency Drought Allocations [For Tables 7-1 and 7-5], Base Year 2020, *With* Bay-Delta Plan (mgd)

Agency	2020 Actual	Wholesale RWS Drought Allocations 2021	2022	2023	2024	2025
ACWD	7.87	9.44	9.46	5.01	5.01	5.01
Brisbane/GVMID	0.64	0.62	0.65	0.34	0.34	0.34
Burlingame	3.48	3.34	3.35	1.77	1.77	1.77
Coastside	1.02	1.54	1.23	0.65	0.65	0.65
CalWater Total	29.00	29.66	29.81	15.78	15.78	15.78
Daly City	3.97	4.00	4.01	2.12	2.12	2.12
East Palo Alto	1.57	1.63	1.69	0.89	0.89	0.89
Estero	4.34	4.48	4.51	2.39	2.39	2.39
Hayward	13.92	14.47	15.12	8.00	8.00	8.00
Hillsborough	2.62	2.95	3.05	1.61	1.61	1.61
Menlo Park	2.96	2.92	2.93	1.55	1.55	1.55
Mid-Peninsula	2.66	2.65	2.80	1.48	1.48	1.48
Millbrae	1.90	1.95	2.15	1.14	1.14	1.14
Milpitas	5.92	5.88	5.34	2.83	2.83	2.83
Mountain View	7.67	7.80	8.05	4.26	4.26	4.26
North Coast	2.37	2.58	2.66	1.41	1.41	1.41
Palo Alto	9.75	9.44	9.66	5.11	5.11	5.11
Purissima Hills	1.75	1.97	2.02	1.07	1.07	1.07
Redwood City	8.76	8.72	9.07	4.80	4.80	4.80
San Bruno	0.95	3.39	3.40	1.80	1.80	1.80
San Jose	4.26	4.31	4.51	2.39	2.39	2.39
Santa Clara	3.27	3.29	3.50	1.85	1.85	1.85
Stanford	1.43	1.40	1.54	0.82	0.82	0.82
Sunnyvale	9.33	9.35	9.45	5.00	5.00	5.00
Westborough	0.82	0.84	0.81	0.43	0.43	0.43
Total	**132.2**	**138.6**	**140.8**	**74.5**	**74.5**	**74.5**

Table G1: Basis of Water Supply Data [For Tables 7-1 and 7-4], Base Year 2025, *With* Bay-Delta Plan (mgd)

Consecutive Dry Year	1st	2nd	3rd	4th	5th
Wholesale RWS Demand	146.0	146.0	146.0	146.0	146.0
Wholesale RWS Supply Available	93.3	80.0	80.0	80.0	80.0
Percent Cutback	36%	45%	45%	45%	45%

Table G2: Individual Agency Drought Allocations [For Tables 7-1 and 7-4], Base Year 2025, *With* Bay-Delta Plan (mgd)

	Wholesale RWS Drought Allocations				
Consecutive Dry Year	1st	2nd	3rd	4th	5th
ACWD	4.91	4.21	4.21	4.21	4.21
Brisbane/GVMID	0.57	0.49	0.49	0.49	0.49
Burlingame	2.76	2.37	2.37	2.37	2.37
Coastside	0.89	0.77	0.77	0.77	0.77
CalWater Total	19.16	16.43	16.43	16.43	16.43
Daly City	2.28	1.96	1.96	1.96	1.96
East Palo Alto	1.20	1.03	1.03	1.03	1.03
Estero	2.60	2.23	2.23	2.23	2.23
Hayward	11.41	9.78	9.78	9.78	9.78
Hillsborough	2.08	1.79	1.79	1.79	1.79
Menlo Park	2.27	1.95	1.95	1.95	1.95
Mid-Peninsula	1.83	1.57	1.57	1.57	1.57
Millbrae	1.46	1.25	1.25	1.25	1.25
Milpitas	4.21	3.61	3.61	3.61	3.61
Mountain View	5.49	4.71	4.71	4.71	4.71
North Coast	1.49	1.28	1.28	1.28	1.28
Palo Alto	6.43	5.51	5.51	5.51	5.51
Purissima Hills	1.33	1.14	1.14	1.14	1.14
Redwood City	5.40	4.63	4.63	4.63	4.63
San Bruno	2.07	1.77	1.77	1.77	1.77
San Jose	2.88	2.47	2.47	2.47	2.47
Santa Clara	2.88	2.47	2.47	2.47	2.47
Stanford	1.28	1.10	1.10	1.10	1.10
Sunnyvale	5.85	5.02	5.02	5.02	5.02
Westborough	0.55	0.47	0.47	0.47	0.47
Total	**93.3**	**80.0**	**80.0**	**80.0**	**80.0**

Table H1: Basis of Water Supply Data [For Tables 7-1 and 7-4], Base Year 2030, *With* Bay-Delta Plan (mgd)

Consecutive Dry Year	1st	2nd	3rd	4th	5th
Wholesale RWS Demand	147.9	147.9	147.9	147.9	147.9
Wholesale RWS Supply Available	94.2	80.8	80.8	80.8	80.8
Percent Cutback	36%	45%	45%	45%	45%

Table H2: Individual Agency Drought Allocations [For Tables 7-1 and 7-4], Base Year 2030, *With* Bay-Delta Plan (mgd)

	Wholesale RWS Drought Allocations				
Consecutive Dry Year	1st	2nd	3rd	4th	5th
ACWD	4.89	4.20	4.20	4.20	4.20
Brisbane/GVMID	0.56	0.48	0.48	0.48	0.48
Burlingame	2.80	2.40	2.40	2.40	2.40
Coastside	0.88	0.75	0.75	0.75	0.75
CalWater Total	18.94	16.25	16.25	16.25	16.25
Daly City	2.24	1.92	1.92	1.92	1.92
East Palo Alto	1.24	1.07	1.07	1.07	1.07
Estero	2.62	2.24	2.24	2.24	2.24
Hayward	11.90	10.21	10.21	10.21	10.21
Hillsborough	2.07	1.78	1.78	1.78	1.78
Menlo Park	2.35	2.01	2.01	2.01	2.01
Mid-Peninsula	1.81	1.55	1.55	1.55	1.55
Millbrae	1.59	1.37	1.37	1.37	1.37
Milpitas	4.30	3.69	3.69	3.69	3.69
Mountain View	5.67	4.86	4.86	4.86	4.86
North Coast	1.48	1.27	1.27	1.27	1.27
Palo Alto	6.47	5.55	5.55	5.55	5.55
Purissima Hills	1.33	1.14	1.14	1.14	1.14
Redwood City	5.41	4.64	4.64	4.64	4.64
San Bruno	2.05	1.76	1.76	1.76	1.76
San Jose	2.87	2.46	2.46	2.46	2.46
Santa Clara	2.87	2.46	2.46	2.46	2.46
Stanford	1.39	1.19	1.19	1.19	1.19
Sunnyvale	5.92	5.08	5.08	5.08	5.08
Westborough	0.54	0.47	0.47	0.47	0.47
Total	**94.2**	**80.8**	**80.8**	**80.8**	**80.8**

Table I1: Basis of Water Supply Data [For Tables 7-1 and 7-4], Base Year 2035, *With* Bay-Delta Plan (mgd)

Consecutive Dry Year	1st	2nd	3rd	4th	5th
Wholesale RWS Demand	151.9	151.9	151.9	151.9	151.9
Wholesale RWS Supply Available	96.5	82.7	82.7	82.7	75.8
Percent Cutback	36%	46%	46%	46%	50%

Table I2: Individual Agency Drought Allocations [For Tables 7-1 and 7-4], Base Year 2035, *With* Bay-Delta Plan (mgd)

	Wholesale RWS Drought Allocations				
Consecutive Dry Year	**1st**	**2nd**	**3rd**	**4th**	**5th**
ACWD	4.88	4.18	4.18	4.18	3.83
Brisbane/GVMID	0.56	0.48	0.48	0.48	0.44
Burlingame	2.84	2.44	2.44	2.44	2.23
Coastside	0.86	0.74	0.74	0.74	0.68
CalWater Total	18.94	16.23	16.23	16.23	14.88
Daly City	2.22	1.90	1.90	1.90	1.74
East Palo Alto	1.33	1.14	1.14	1.14	1.05
Estero	2.66	2.28	2.28	2.28	2.09
Hayward	12.55	10.75	10.75	10.75	9.86
Hillsborough	2.07	1.78	1.78	1.78	1.63
Menlo Park	2.46	2.10	2.10	2.10	1.93
Mid-Peninsula	1.83	1.57	1.57	1.57	1.44
Millbrae	1.56	1.34	1.34	1.34	1.22
Milpitas	4.47	3.83	3.83	3.83	3.51
Mountain View	5.84	5.01	5.01	5.01	4.59
North Coast	1.49	1.27	1.27	1.27	1.17
Palo Alto	6.53	5.60	5.60	5.60	5.13
Purissima Hills	1.34	1.15	1.15	1.15	1.06
Redwood City	5.49	4.70	4.70	4.70	4.31
San Bruno	2.03	1.74	1.74	1.74	1.60
San Jose	2.86	2.45	2.45	2.45	2.25
Santa Clara	2.86	2.45	2.45	2.45	2.25
Stanford	1.49	1.28	1.28	1.28	1.17
Sunnyvale	6.80	5.83	5.83	5.83	5.34
Westborough	0.54	0.46	0.46	0.46	0.42
Total	**96.5**	**82.7**	**82.7**	**82.7**	**75.8**

Table J1: Basis of Water Supply Data [For Table 7-1 and 7-4], Base Year 2040, *With* Bay-Delta Plan (mgd)

Consecutive Dry Year	1st	2nd	3rd	4th	5th
Wholesale RWS Demand	156.3	156.3	156.3	156.3	156.3
Wholesale RWS Supply Available	99.2	85.1	85.1	75.1	75.1
Percent Cutback	37%	46%	46%	52%	52%

Table J2: Individual Agency Drought Allocations [For Tables 7-1 and 7-4], Base Year 2040, *With* Bay-Delta Plan (mgd)

	Wholesale RWS Drought Allocations				
Consecutive Dry Year	1st	2nd	3rd	4th	5th
ACWD	4.87	4.18	4.18	3.69	3.69
Brisbane/GVMID	0.56	0.48	0.48	0.43	0.43
Burlingame	2.91	2.49	2.49	2.20	2.20
Coastside	0.85	0.73	0.73	0.64	0.64
CalWater Total	19.21	16.48	16.48	14.54	14.54
Daly City	2.20	1.88	1.88	1.66	1.66
East Palo Alto	1.58	1.36	1.36	1.20	1.20
Estero	2.69	2.30	2.30	2.03	2.03
Hayward	13.21	11.34	11.34	10.00	10.00
Hillsborough	2.07	1.78	1.78	1.57	1.57
Menlo Park	2.58	2.21	2.21	1.95	1.95
Mid-Peninsula	1.84	1.58	1.58	1.39	1.39
Millbrae	1.79	1.53	1.53	1.35	1.35
Milpitas	4.62	3.96	3.96	3.49	3.49
Mountain View	6.03	5.18	5.18	4.57	4.57
North Coast	1.49	1.27	1.27	1.12	1.12
Palo Alto	6.67	5.72	5.72	5.05	5.05
Purissima Hills	1.35	1.16	1.16	1.03	1.03
Redwood City	5.55	4.76	4.76	4.20	4.20
San Bruno	2.03	1.74	1.74	1.54	1.54
San Jose	2.86	2.45	2.45	2.16	2.16
Santa Clara	2.86	2.45	2.45	2.16	2.16
Stanford	1.61	1.38	1.38	1.22	1.22
Sunnyvale	7.26	6.23	6.23	5.49	5.49
Westborough	0.54	0.46	0.46	0.41	0.41
Total	**99.2**	**85.1**	**85.1**	**75.1**	**75.1**

Table K1: Basis of Water Supply Data [For Tables 7-1 and 7-4], Base Year 2045, *With* Bay-Delta Plan (mgd)

Consecutive Dry Year	1st	2nd	3rd	4th	5th
Wholesale RWS Demand	162.8	162.8	162.8	162.8	162.8
Wholesale RWS Supply Available	88.7	88.7	88.7	75.4	75.4
Percent Cutback	46%	46%	46%	54%	54%

Table K2: Individual Agency Drought Allocations [For Tables 7-1 and 7-4], Base Year 2045, *With* Bay-Delta Plan (mgd)

	Wholesale RWS Drought Allocations				
Consecutive Dry Year	1st	2nd	3rd	4th	5th
ACWD	4.97	4.97	4.97	4.22	4.22
Brisbane/GVMID	0.49	0.49	0.49	0.41	0.41
Burlingame	2.56	2.56	2.56	2.17	2.17
Coastside	0.72	0.72	0.72	0.61	0.61
CalWater Total	16.73	16.73	16.73	14.22	14.22
Daly City	1.87	1.87	1.87	1.59	1.59
East Palo Alto	1.58	1.58	1.58	1.34	1.34
Estero	2.39	2.39	2.39	2.03	2.03
Hayward	12.07	12.07	12.07	10.26	10.26
Hillsborough	1.78	1.78	1.78	1.51	1.51
Menlo Park	2.34	2.34	2.34	1.99	1.99
Mid-Peninsula	1.59	1.59	1.59	1.36	1.36
Millbrae	1.74	1.74	1.74	1.48	1.48
Milpitas	4.11	4.11	4.11	3.49	3.49
Mountain View	5.41	5.41	5.41	4.60	4.60
North Coast	1.28	1.28	1.28	1.09	1.09
Palo Alto	5.88	5.88	5.88	5.00	5.00
Purissima Hills	1.17	1.17	1.17	1.00	1.00
Redwood City	4.85	4.85	4.85	4.12	4.12
San Bruno	1.75	1.75	1.75	1.49	1.49
San Jose	2.45	2.45	2.45	2.08	2.08
Santa Clara	2.45	2.45	2.45	2.08	2.08
Stanford	1.47	1.47	1.47	1.25	1.25
Sunnyvale	6.59	6.59	6.59	5.61	5.61
Westborough	0.46	0.46	0.46	0.39	0.39
Total	**88.7**	**88.7**	**88.7**	**75.4**	**75.4**

Section 3: Drought Allocations ***Without*** Bay-Delta Plan

Table L: RWS Supply Available to the Wholesale Customers (Combined Tables 4a-4f from the SFPUC's March 30th letter) *Without* Bay-Delta Plan (mgd)[h]

	2020	2025	2030	2035	2040	2045
Projected Purchases[i]	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 1st Dry Year	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 2nd Dry Year	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 3rd Dry Year	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 4th Dry Year	132.2	146.0	147.9	151.9	156.3	139.1
Consecutive 5th Dry Year	132.2	146.0	147.9	151.9	156.3	139.1

[h] The SFPUC's modeling approach does not allow for varying demands over the course of a dry year sequence. However, the SFPUC has indicated that sufficient supplies are available to meet wholesale RWS demand so long as they reasonably stay within 2020 and 2040 levels. The SFPUC's modeling does not indicate cutbacks will be required till the 4th and 5th consecutive dry year at 2045 levels.

[i] Values for 2020 are actual purchases. This row aligns with what is labeled as an "Average Year" in Tables 4a-4f in the SFPUC's March 30th letter. However, these values do not represent an average year and instead are actual purchases for 2020 or projected purchases for 2025 through 2045.

Table M: Wholesale RWS Demand (Combined Totals from Tables A and B) (mgd)

	2020	2025	2030	2035	2040	2045
Projected Purchases[i]	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 1st Dry Year	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 2nd Dry Year	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 3rd Dry Year	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 4th Dry Year	132.2	146.0	147.9	151.9	156.3	162.8
Consecutive 5th Dry Year	132.2	146.0	147.9	151.9	156.3	162.8

Table N: Percent Cutback to the Wholesale Customers *Without* Bay-Delta Plan

	2020	2025	2030	2035	2040	2045
Projected Purchases[i]	0%	0%	0%	0%	0%	0%
Consecutive 1st Dry Year	0%	0%	0%	0%	0%	0%
Consecutive 2nd Dry Year	0%	0%	0%	0%	0%	0%
Consecutive 3rd Dry Year	0%	0%	0%	0%	0%	0%
Consecutive 4th Dry Year	0%	0%	0%	0%	0%	15%
Consecutive 5th Dry Year	0%	0%	0%	0%	0%	15%

Table O1: Basis of Water Supply Data [For Tables 7-1 and 7-4], Base Year 2045, *Without* Bay-Delta Plan (mgd)

Consecutive Dry Year	1st	2nd	3rd	4th	5th
Wholesale RWS Demand	162.8	162.8	162.8	162.8	162.8
Wholesale RWS Supply Available	162.8	162.8	162.8	139.1	139.1
Percent Cutback	0%	0%	0%	Tier 2 Plan	Tier 2 Plan

Table O2: Individual Agency Drought Allocations [For Tables 7-1 and 7-4], Base Year 2045, *Without* Bay-Delta Plan (mgd)

	Wholesale RWS Drought Allocations					Tier 2 Drought
Consecutive Dry Year	1st	2nd	3rd	4th	5th	Cutback
ACWD	9.11	9.11	9.11	8.20	8.20	10.0%
Brisbane/GVMID	0.89	0.89	0.89	0.74	0.74	16.8%
Burlingame	4.69	4.69	4.69	4.02	4.02	14.3%
Coastside	1.33	1.33	1.33	1.19	1.19	10.0%
CalWater Total	30.70	30.70	30.70	26.73	26.73	12.9%
Daly City	3.43	3.43	3.43	3.01	3.01	12.4%
East Palo Alto	2.89	2.89	2.89	2.68	2.68	7.3%
Estero	4.38	4.38	4.38	3.94	3.94	10.0%
Hayward	22.14	22.14	22.14	18.67	18.67	15.7%
Hillsborough	3.26	3.26	3.26	2.93	2.93	10.2%
Menlo Park	4.29	4.29	4.29	3.58	3.58	16.5%
Mid-Peninsula	2.93	2.93	2.93	2.63	2.63	10.0%
Millbrae	3.20	3.20	3.20	2.54	2.54	20.7%
Milpitas	7.53	7.53	7.53	6.55	6.55	13.1%
Mountain View	9.93	9.93	9.93	8.91	8.91	10.3%
North Coast	2.34	2.34	2.34	2.11	2.11	10.0%
Palo Alto	10.79	10.79	10.79	9.71	9.71	10.0%
Purissima Hills	2.15	2.15	2.15	1.41	1.41	34.5%
Redwood City	8.90	8.90	8.90	7.92	7.92	11.1%
San Bruno	3.21	3.21	3.21	2.60	2.60	19.1%
San Jose	4.50	4.50	4.50	2.95	2.95	34.5%
Santa Clara	4.50	4.50	4.50	2.95	2.95	34.5%
Stanford	2.70	2.70	2.70	2.27	2.27	16.0%
Sunnyvale	12.10	12.10	12.10	10.11	10.11	16.5%
Westborough	0.84	0.84	0.84	0.76	0.76	10.0%
Total	**162.8**	**162.8**	**162.8**	**139.1**	**139.1**	

San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission

525 Golden Gate Avenue, 13th Floor
San Francisco, CA 94102
T 415.554.3155
F 415.554.3161
TTY 415.554.3488

TO: SFPUC Wholesale Customers

FROM: Steven R. Ritchie, Assistant General Manager, Water

DATE: June 2, 2021

RE: Regional Water System Supply Reliability and UWMP 2020

This memo is in response to various comments from Wholesale Customers we have received regarding the reliability of the Regional Water System supply and San Francisco's 2020 Urban Water Management Plan (UWMP).

As you are all aware, the UWMP makes clear the potential effect of the amendments to the Bay-Delta Water Quality Control Plan adopted by the State Water Resources Control Board on December 12, 2018 should it be implemented. Regional Water System-wide water supply shortages of 40-50% could occur until alternative water supplies are developed to replace those shortfalls. Those shortages could increase dramatically if the State Water Board's proposed Water Quality Certification of the Don Pedro Federal Energy Regulatory Commission (FERC) relicensing were implemented.

We are pursuing several courses of action to remedy this situation as detailed below.

Pursuing a Tuolumne River Voluntary Agreement

The State Water Board included in its action of December 12, 2018 a provision allowing for the development of Voluntary Agreements as an alternative to the adopted Plan. Together with the Modesto and Turlock Irrigation Districts, we have been actively pursuing a Tuolumne River Voluntary Agreement (TRVA) since January 2017. We believe the TRVA is a superior approach to producing benefits for fish with a much more modest effect on our water supply. Unfortunately, it has been a challenge to work with the State on this, but we continue to persist, and of course we are still interested in early implementation of the TRVA.

Evaluating our Drought Planning Scenario in light of climate change

Ever since the drought of 1987-92, we have been using a Drought Planning Scenario with a duration of 8.5 years as a stress test of our Regional Water System supplies. Some stakeholders have criticized this methodology as being too conservative. This fall we anticipate our Commission convening a workshop regarding our use of the 8.5-year Drought Planning Scenario, particularly in light of climate change resilience assessment work that we have funded through the Water Research Foundation. We look forward to a valuable discussion with our various stakeholders and the Commission.

Pursuing Alternative Water Supplies

The SFPUC continues to aggressively pursue Alternative Water Supplies to address whatever shortfall may ultimately occur pending the outcome of negotiation and/or litigation. The most extreme degree of Regional Water System supply shortfall is modeled to be 93 million gallons per day under implementation of the Bay-Delta Plan amendments. We are actively pursuing more than a dozen projects, including recycled water for irrigation, purified water for potable use, increased reservoir storage and conveyance, brackish water desalination, and partnerships with other agencies, particularly the Turlock and Modesto Irrigation Districts. Our goal is to have a suite of alternative water supply projects ready for CEQA review by July 1, 2023.

In litigation with the State over the Bay-Delta Plan Amendments

On January 10, 2019, we joined in litigation against the State over the adoption of the Bay-Delta Water Quality Control Plan Amendments on substantive and procedural grounds. The lawsuit was necessary because there is a statute of limitations on CEQA cases of 30 days, and we needed to preserve our legal options in the event that we are unsuccessful in reaching a voluntary agreement for the Tuolumne River. Even then, potential settlement of this litigation is a possibility in the future.

In litigation with the State over the proposed Don Pedro FERC Water Quality Certification

The State Water Board staff raised the stakes on these matters by issuing a Water Quality Certification for the Don Pedro FERC relicensing on January 15, 2021 that goes well beyond the Bay-Delta Plan amendments. The potential impact of the conditions included in the Certification appear to virtually double the water supply impact on our Regional Water System of the Bay-Delta Plan amendments. We requested that the State Water Board reconsider the Certification, including conducting hearings on it, but the State Water Board took no action. As a result, we were left with no choice but to once again file suit against the State. Again, the Certification includes a clause that it could be replaced by a Voluntary Agreement, but that is far from a certainty.

I hope this makes it clear that we are actively pursuing all options to resolve this difficult situation. We remain committed to creating benefits for the Tuolumne River while meeting our Water Supply Level of Service Goals and Objectives for our retail and wholesale customers.

cc.: SFPUC Commissioners
Nicole Sandkulla, CEO/General Manager, BAWSCA

Appendix M: Utilization Factor for Individual Wells (2016-2020)

Utilization Factor for Individual Wells (2016-2020)

Well No.	Capacity (AFY)	Production in AF 2016	2017	2018	2019	2020	Utilization Factor
ZONE I							
02-02	3,315	128	213	147	137	73	4%
03-02	2,936	92	66	1,448	1,345	158	21%
04	1,694	1,012	959	648	232	342	38%
05-02	2,815	217	119	0	0	0	2%
07	2,161	508	796	369	331	831	26%
12	2,307	1,173	1,214	231	310	874	33%
13-02	1,807	388	647	210	487	957	30%
14	Destroyed	23	0	0	0	0	-
16-02	Destroyed	0	0	0	0	0	-
18-02	2,153	624	828	505	626	1,046	34%
21	1,452	0	0	638	927	922	34%
22-02	1,992	317	351	538	332	420	20%
25	1,540	172	247	209	152	113	12%
26	Not Used	0	0	0	0	0	-
28	3,291	187	279	117	146	83	5%
30	2,353	209	208	156	87	77	6%
32	1,774	0	0	0	0	0	0%
34	1,492	543	863	348	205	193	29%
ZONE II							
06	Destroyed	0	0	0	0	0	-
08	1,702	329	670	439	387	209	24%
09-02	1,682	543	436	647	665	640	35%
10	2,632	1,210	1,197	1,099	1,472	1,922	52%
11	1,734	288	272	320	236	80	14%
17-02	3,412	633	692	663	458	453	17%
23	3,078	635	391	344	0	0	9%
24	2,694	714	1,178	1,063	696	1,030	35%
29	2,971	0	371	426	420	307	10%
ZONE IIA							
15	1,282	171	226	93	131	92	11%
Totals:	**54,268**	**10,115**	**12,224**	**10,658**	**9,779**	**10,823**	**20%**

NOTE: Well No. 32 is a standby well. Individual well full capacity per 2015 UWMP.

Appendix N: Santa Clara County Operational Area Hazard Mitigation Plan Vol 1&2, 2017

The 2017 Santa Clara County Operational Area Hazard Mitigation Plans can be downloaded at:

[2017 Hazard Mitigation Plan Vol 1&2]

https://emergencymanagement.sccgov.org/partners

Appendix O: Water Service and Use Rules and Regulations for Water Conservation in Landscaping

WATER SERVICE AND USE
RULES AND REGULATIONS

CITY OF SANTA CLARA

TABLE OF CONTENTS

WATER SERVICE AND USE
RULES AND REGULATIONS

CITY OF SANTA CLARA

1. GENERAL STATEMENT AND DEFINITIONS

1.A **ESTABLISHMENT OF RULES AND REGULATIONS**

The following rules and regulations, rates and charges governing Water Service furnished by the City of Santa Clara, California are hereby established.

1.B **GENERAL STATEMENT**

The City of Santa Clara shall furnish Water Service including distribution Main extensions in accordance with Municipal Services Division Rules and the regulations hereinafter set forth, and in accordance with all other applicable ordinances, to any property within the corporate limits of the City and to such areas outside the City limits as the City Council may designate.

All water used must be taken through a water meter unless a permit is first obtained in compliance with the regulations contained in these Rules and Regulations.

Applications for service to Premises for which a Service Connection has already been installed may be made in accordance with the Municipal Services Division Rules and Regulations, which are incorporated herein by reference as though set forth in full. Such applications will signify the Customer's willingness and intention to comply with all applicable Rules and Regulations and rates duly adopted, and to make payment for Water Service rendered.

1. **GENERAL STATEMENT AND DEFINITIONS (Continued)**

If application is made for service to property where no Service Connection has been installed, but a distribution Main is adjacent to the property, the applicant, in addition to making application for service, shall comply with the regulations governing the installation of Service Connections. Where an extension of the distribution Main is necessary or a substantial investment is required to furnish service, the applicant shall be informed by the City of the applicable provisions of the Code and these Rules and Regulations governing the extension of distribution Main and facilities.

1.C **WATER USE RESTRICTIONS AND PROHIBITIONS**

The following list of Water Use Restrictions and Prohibitions are specific measures which prevent water waste and achieve reasonable, yet substantial, reductions in water use by all users in the City.

The following uses of water are prohibited by the City:

(a) Wasting water, which includes but is not limited to, the flooding or runoff on City sidewalks, gutters, and streets.

(b) Cleaning of sidewalks, driveways, patios, parking lots, or other paved or hard-surfaced areas.

(c) Washing cars, buses, boats, trailers, or any vehicle by use of a hose unless that hose is fitted with an operating automatic shut-off valve.

(d) Water waste due to broken or defective plumbing, fire system, irrigation system, or any appurtenance thereto; or to open or to leave open any stopcock or faucet so as to permit water waste.

(e) Service of water by any restaurant unless requested by a patron.

(f) Installation of a single-pass cooling system.

(g) Installation and/or use of a non-recirculating, decorative fountain.

(h) Construction of a non-recirculating conveyor car wash.

(i) Watering lawns during or within 48 hours after measureable precipitation.

(j) Irrigating ornamental turf on public street medians

(k) Irrigation of landscapes outside of newly constructed homes and buildings in a manner inconsistent with regulations or other requirements established by the California Building Standards Commission and the Department of Housing and Community Development.

(l) Irrigation between the hours of 9AM and 6PM

In addition to the above water use prohibitions and to promote efficient water use, hotels/motels shall provide guests with the option of choosing not to have towels and linens laundered daily. Notice of this option shall be displayed prominently in each guestroom using easily understood terms and language.

1. GENERAL STATEMENT AND DEFINITIONS (Continued)

1.D INCORPORATION OF MUNICIPAL SERVICES DIVISION RULES AND REGULATIONS

These Rules and Regulations hereby incorporate by reference all Rules and Regulations of the Municipal Services Division of the Department of Finance of the City of Santa Clara. Rules governing the establishment of credit, rendering and payment of bills, financial aspects of temporary service or discontinuance of service for water are contained in the Municipal Services Division Rules and Regulations.

1.E DEFINITIONS

Terms appearing with an initial letter capitalized, are defined terms. The definitions set forth in the Rules and Regulations for the Municipal Services Division, Department of Finance, are incorporated by reference as set forth in full, and those definitions are not repeated here; reference should be made to Section 1.B of Municipal Services Division Rules and Regulations. Unless the particular provision or context otherwise requires, the definitions and provisions contained in the Water Service and Use Rules and Regulations Section 1.E. and the Municipal Services Division Rules and Regulations Section 1.B, shall govern the construction, meaning, and application of words and terms used in these Rules and Regulations. The singular of a word or term shall include the plural and the plural shall include the singular. Such words or terms as defined in these Rules and Regulations Section 1.B shall be initially capitalized when used in context of these Rules and Regulations.

Backflow: The reverse flow of water or any other fluid or substance or any combination or mixture thereof from the Customer's system into the City's water distribution system.

Backflow Prevention Device: A City-approved device that prevents Backflow into the City's water distribution system.

Best Management Practice ("BMP"): A policy, program, practice or rule aimed at more efficient use or conservation of the water resources of the City and State.

City: The City of Santa Clara, California, acting through its elected officials or its duly authorized officers, employees, agents, or fictitious business names.

City Equipment: Any property, facility, apparatus, or material associated with providing one or more Utility Services including, but not limited to, City's electric distributions system, water distribution system, pipes, ducts, conduits, valves, meters, backflow prevention devices, transformers, protective devices, wiring,

1. GENERAL STATEMENT AND DEFINITIONS (Continued)

switches, meters and other appurtenances required to provide a Utility Service to Customer's Premises.

City Employee: Any authorized City employee, agent or representative.

City's Operating Convenience: The utilization of facilities or practices which contribute to the overall efficiency, safety or reliability of the water utility operations. City's Operating Convenience does not refer to Customer convenience or adoption of practices required to comply with applicable ordinances, rules and regulations, or similar requirements of public authorities.

City's Water System: The water supply and distribution system and all appurtenances thereto owned and operated by the City, including all Service Connections to the City's water mains.

City Code: The Code of the City of Santa Clara, California.

Commercial Service: Provision of water to Premises where the Customer is engaged in trade.

Cross-Connection: Cross-connection means an unprotected actual or potential connection between a potable water system used to supply water for drinking purposes and any source or system containing unapproved water or a substance that is not or cannot be approved as safe, wholesome, and potable. Bypass arrangements, jumper connections, removable sections, swivel or changeover devices, or other devices through which Backflow could occur, shall be considered to be cross-connections.

Customer: The Person, Persons, firm, association, governmental agency, corporation or other legal entity who use, are entitled to use, or benefit from the use of City of Santa Clara Utilities.

Domestic Service: Water Services to single- or multiple-dwelling Premises for use by residents and residential associations, including water for irrigation and other similar and customary purposes.

Fire Service - Private: Provision of water to Premises for automatic fire sprinkler service.

Fire Service - Public: Public fire protection service through fire hydrants connected to the water distribution system and made available to the City Fire Department.

Industrial Service: Provision of water to Premises for use in manufacturing or processing activities.

1. GENERAL STATEMENT AND DEFINITIONS (Continued)

Main Extensions: Extension of distribution pipelines, exclusive of Service Connections, beyond existing facilities.

Mains: Distribution pipelines, which are used to service the general public, and are located in streets, highways, public rights of way or easements through private lands.

Meter Rate Service: Provision of water in measured quantities through metered service.

Municipal Or Public Use: Provision of water to municipal departments or for other public uses.

Owner: Property or building Owner and authorized agents

Service Connection: The connection of City of Santa Clara water, sewer or electric equipment to Customer equipment for the purpose of providing Utility Services. This includes, but is not limited to, all or any portion of the water pipe and appurtenances, including the meter, between the City distribution line and an individual Customer’s system. All or any portion of the water pipe and appurtenances, including meter, between the City distribution line and an individual Customer’s system.

Service Order: Customer request for the connection or discontinuance of Water Service.

Tamper: To rearrange, bypass, damage, alter, interfere with, break, prevent normal function of equipment in any way, prevent access to equipment, or hinder a City Employee in the performance of their duties.

Temporary Water Service: Service for an enterprise or activity which is temporary in character, where it is known in advance that service will be of limited duration, or the permanency of which has not been established.

Total Cost: The sum of all fully located expenses including overheads, all labor, material and use of City Equipment to complete a particular repair or addition to the system, and the cost of associated resources consumed.

Utility Connection Point: Point of delivery determined by the City Water Department.

Water Service: Provision of water, either potable or recycled, to property or Premises through a Service Connection.

2. NOTICES

2.A NOTICES TO THE CUSTOMER

Notice, under and pursuant to the effective Rules and Regulations of the City, from the City to a Customer may be given by written notice, either delivered by the City or properly enclosed in a sealed envelope and deposited in any United States Post Office postage prepaid, addressed to the Customer's last known address.

2.B NOTICES TO THE CITY

Requests for permits or licenses pursuant to the effective Rules and Regulations of the City and notices from any Water Service Customer to the City regarding a relocation of Water Service, an increase in size of Water Service, or any material change either in the amount or character of appliances or equipment installed upon the Premises may be presented by the Customer or authorized agents, in person, or sent to:

City of Santa Clara
Water and Sewer Utilities
1500 Warburton Ave.
Santa Clara, CA 95050

3. CONTRACTS

3.A Contracts will not be required as a condition prior to Water Service except:

3.A.1 As conditions in the regular schedule of rates approved or accepted by the City;

3.A.2 As may be required for water extensions for Temporary Water Service or speculative projects;

3.A.3 As may be required for construction purposes as a condition prior to Water Service;

3.A.4 Any Customer Application for Water Service which in the judgment of the City is not a standard practice;

3.A.5 A contract may be required for special operating conditions or other circumstances as may be required for the City's Operating Convenience.

4. APPLICATION FOR WATER SERVICE

4.A **SERVICE ORDER APPLICATIONS**

Application is required by the Municipal Services Division Office when Water Service is desired. By applying for any Water Service, an applicant indicates their willingness and intention to comply with these Rules and Regulations, and applicable rates. Application for Water Service does not in itself bind the City to serve any applicant except under reasonable conditions as determined by the City, nor does it bind the applicant to take Water Service for a longer period than the minimum requirements of the appropriate rate schedule(s).

Applications for residential, commercial, and industrial service will be accepted by telephone or in person at the Municipal Services Division.

4.B **CHANGES IN WATER SERVICE**

When a Customer intends to make any material change either in the amount or character of the equipment installed upon the Premises to be supplied with water by the City, the Customer shall immediately provide written notice to the City Water Utility. Failure to comply may result in a discontinuance of Water Service without notice.

Customer will be liable for damages to City Equipment and facilities resulting from the Customer's failure to provide written notification to, and approval of, the City Water Utility prior to the addition of water demand.

Customer may be subject to reassessment of rate schedule qualification as provided by these Rules and Regulations.

5. RATES

5.A **RATES**

The rates to be charged by and paid to the City for Water Service shall be the rates legally in effect and on file with the City Clerk, where they shall be available for public inspection.

5.B **TEMPORARY RATE SCHEDULE**

An Applicant for Water Service may be assigned a temporary rate schedule until qualification parameters for a customary rate schedule are met. The qualification period shall not exceed twelve (12) months and any change in rate schedule due to new Water Service qualification will apply retroactive to the date of qualification under applicable rate schedule then in effect. The selection of the temporary rate shall be made by the Municipal Services Division and based on historical usage for the Premises, historical usage of the Customer, (an estimate if historical usage is not available), or as provided for by these Rules and Regulations.

5.C **ESTABLISHMENT OF NEW OR OPTIONAL RATES**

If the City adopts new or optional schedules or rates, the City shall take such measures as may be reasonable to advise those of its Customers who may be affected by the change.

In the case where the City adopts new rate schedules, which allows a Customer to qualify for more than one rate or schedule, the Customer may request which applicable rate or schedule is desired. Upon request, the Municipal Services Division shall assist the Customer to select the most appropriate rate or schedule, or in the absence of a request, the Municipal Services Division shall have the authority to make the selection based on the available information.

5.D **REASSESSMENT OF RATE SCHEDULE QUALIFICATION**

A Customer may request a reassessment of their qualification for a particular rate schedule. A change to a different applicable schedule, as approved by the Municipal Services Division, shall become effective for service rendered after the next regular meter reading following the date of approval by the City. The effective date may be delayed if a change in Water Service hardware, watermeter or other associated equipment is required. Notices shall be served as indicated in Water Service and Use Rules and Regulations Section 2 herein.

5.E **SERVICE BY FACILITIES PURCHASED FROM OTHER UTILITIES**

Where the City has purchased Water Service facilities from other water utilities, the Customer shall be placed on the applicable City rate schedule.

6. METER TEST AND ADJUSTMENT OF BILLS FOR METER ERROR

6.A **<u>METER TEST</u>**

Each meter will be tested at regular intervals which shall be determined by the Water Utility. In no case shall the interval between tests exceed 20 years.

6.B **<u>METER TEST - CUSTOMER REQUEST</u>**

6.B.1 Any Customer may, after giving not less than one (1) week's notice, request the City to test the meter serving his/her Premises.

6.B.2 Except as provided herein, the City may require from the Customer a fee to cover the cost of the test.

6.B.3 The fee will be refunded to the Customer if the meter is found, upon test, to register more than two (2%) percent fast under conditions of normal operation. The deposit will be retained by the City to cover test costs if the meter is less than two (2%) percent fast. The Customer will be notified, not less than five (5) days in advance of the time and place of the test.

6.B.4 A Customer shall have the right to require the City to conduct the test in his presence, or in the presence of his representative. A written report giving the results of the test will be supplied to the Customer within ten (10) days after completion of the test.

6.C **<u>ADJUSTMENT OF BILLS FOR METER ERROR</u>**

6.C.1 Fast Meters

When, as a result of any test, a meter is found to be registering more than two (2%) percent fast, under conditions of normal operation, the City will make necessary adjustments to the Customer's bill (credit or charge) to correct the overcharge based on corrected meter readings (0% greater than actual consumption) for the period in which the meter was in use in accordance with Municipal Services Division Rules and Regulations Section 6.H.3.

6.C.2 Slow Meters

6.C.2.(a) Upon testing, if a meter under normal conditions is found to register less than ninety-eight percent (98%) of the actual consumption, Municipal Services Division may bill the Customer for the undercharge based on the corrected meter

6. METER TEST AND ADJUSTMENT OF BILLS FOR METER ERROR (Continued)

readings (100% actual consumption) for the period in which the meter was in use in accordance with Municipal Services Division Rules and Regulations Section 6.H.3.

6.C.2.(b) Upon testing, a meter used for other than domestic service is found to register less than ninety-eight percent (98%) of the actual consumption, Municipal Services Division may bill the Customer for the undercharge based upon the corrected meter readings (100% actual consumption) for the period in which the meter was in use in accordance with Municipal Services Division Rules and Regulations Section 6.H.3

6.C.3 Non-Registering Meters

Municipal Services Division may bill the Customer for water consumed while the meter was not registering. At Municipal Services Division's option, the bill will be computed on an estimate of consumption based on the Customer's use during the same season of the preceding year or based on an alternate method of estimation determined by Municipal Services Division, which includes, but is not limited to, the City's experience with Customer's usage on the same rate schedule; and the general characteristics of the Customer's operations.

7. APPEAL FROM THE APPLICATION, REQUIREMENTS, OR INTERPRETATION OF THESE RULES AND REGULATIONS

7.A Unless California law, this Code, or an ordinance or resolution of the City prescribes an alternative procedure, any Customer may request an appeal from an interpretation, requirement or application of the Rules and Regulations. The appeal may be made by submitting a written Request for Appeal to the Director of Water and Sewer Utilities. Upon receipt of a Request for Appeal, the Director shall review the request and notify the appellant in writing of his/her decision within forty-five (45) days of the request. Appeal from the application, requirements or interpretation of the Municipal Services Division Rules and Regulations shall be made in accordance with those Rules and Regulations.

7.B A Customer may further appeal the Director's determination regarding the appeal from the application, requirements, and/or interpretation of these Rules and Regulations to the City Manager. Such a subsequent appeal must be made in writing and received by the City Clerk within seven (7) calendar days after receipt of the written decision by the Director.

7.C The appeal to the City Manager shall consist of a written notice of the appeal, written details explaining the grounds on which the appeal is based, and the payment of an appeal fee of twenty-five dollars ($25.00) or an amount otherwise modified or set from time to time by resolution of the City Council.

7.D The appeal to the City Manager shall be heard within forty-five (45) days from the filing of said notice. If an address is not provided in the notice of appeal, such notice need not be given to the Customer.

7.E Written notice of such hearing informing the appellant of the date and time of the hearing shall be personally served upon the appellant, or on any person employed in the place where the business in question, or activity, is maintained. If service cannot be made in the foregoing manner, then a copy of such notice may be mailed to the appellant at his or her place of business or his or her last address known to the City Clerk, at least five (5) days prior to the hearing. The time of such notice may be shortened by the City Manager with the written consent of the appellant.

7.F At the hearing, an opportunity will be afforded to the appellant and the City to make statements for the record regarding the facts in dispute and the circumstances surrounding the matter being appealed. A record of the hearing will be established.

7.G The City Manager shall render his/her decision within forty-five (45) days after the conclusion of said hearing. In his/her decision, the City Manager may reverse, set aside, affirm, amend or modify the decision of the Director. The decision of the City Manager shall be final insofar as the administrative hearing process is concerned.

8. CITY DISTRIBUTION SYSTEM ON CUSTOMER PREMISES

8.A **NEW DEVELOPMENTS**

8.A.1. Prior to submitting any projects for Water Service, the Developer shall submit a site plan showing all existing utilities, trees, structures and easements to the Water Utility. Developer shall then contact City Electric Department and Water Utility for requirements and prepare the site plan resolving coordination of all utilities. Charges for new Service Connections are payable in advance and shall be in accordance with applicable sections of the City Code.

8.A.2 Most Water Service Connections will normally be furnished and installed by City between the street curb and the property line.

8.A.3 Subject to the approval of the Director of Water and Sewer Utilities, and providing there is no depressed-grade condition planned or existing on the Premises, water needs may be served by an on-site water distribution system and individual meters installed (either by City or Developer) and maintained by City in an easement (minimum width 15 feet) granted for that purpose. Developer must contact the Water Utility for the water infrastructure design criteria prior to designing the on-site utilities.

8.A.4 All trees, existing and proposed, shall maintain a minimum clearance of 10 feet from any existing or proposed Water facilities. Existing trees that conflict will have to be removed. Trees shall not be planted in water easements or public utility easements.

8.B **RELOCATION OF EXISTING FACILITIES**

Any relocation of existing City facilities shall be paid for by the requesting party.

8.C **RIGHTS OF WAY**

Water easements shall be provided by Customer for all City water utility facilities. City will determine the location of easements and prepare document(s) at customer’s expense, for Customer’s signature, unless easements are dedicated on a Tract or Parcel map.

9. ACCESS, INTERFERENCE, TAMPERING, AND THEFT

9.A CITY RIGHT OF ACCESS

The City shall have immediate and unhindered access, without notice, to and from a Customer's Premises for any purpose reasonably connected with the furnishing of Water Services, including but not limited to the abatement of water waste, inspection, reading, testing, maintenance, removal, and replacement of City Equipment. The Water Utility and Municipal Services Division jointly and singly retain the authority to enforce these provisions.

When access is not immediate and unhindered, the City may issue citations with the following graduated levels: notice of denied access, warning of impending citation, citation, warning of impending civil/criminal action, or any other enforcement remedy provided for in the City Code. The City may require the Customer to provide, without cost to the City, a new approved location for equipment or to re-establish the immediate and unhindered access to the previously approved location.

9.B WORK OUTSIDE CITY'S OPERATING CONVENIENCE

When requested by the Customer, and where circumstances permit some flexibility in scheduling of necessary repairs or improvements, the City may at its sole option perform the work during other than normal City working hours for the increased convenience of the Customer, providing that the Customer acknowledges in writing, prior to the performance of said work, their willingness to pay for any costs incurred by the City as a result of performing said work at other than during normal City working hours.

9.C INTERFERENCE

Any person preventing or interfering with any City Employee in the lawful discharge of duties is subject to penalties, prosecution, and punishment.

9.D TAMPERING

To rearranging, bypassing, damaging, altering, breaking, preventing normal function of equipment in any way, or preventing access to Service Connection or other City owned facilities may be considered Tampering. It shall be unlawful for, and the City may immediately discontinue Water Service and bring a criminal action against, any person, firm, corporation or association that commits, authorizes, solicits, aids, abets or attempts to:

9.D.1 Change the intended course or path of Water Services without authorization from the City.

9. ACCESS, INTERFERENCE, TAMPERING, AND THEFT (Continued)

9.D.2 Make, or cause to be made, any connection or restoration with property owned or used by the City to provide Water Services.

9.D.3 Prevent any water meter, or other device used to determine the amount of water consumed by a Customer, from accurately performing its measuring function.

9.D.4 Tamper with, or otherwise access without permission from the City Water Utility, any property owned or used by the City to provide Water Services.

9.D.5 Use or receive the Water Service without consent of the City or payment of all lawful charges.

9.E **FRAUD**

The City may discontinue the Service Connection without notice if a Customer's actions or the conditions of the Premises indicate the Customer's intent to defraud the City.

9.F **LIABILITY, PENALTY, PROSECUTION AND PUNISHMENT FOR VIOLATION**

9.F.1 Legal liability and responsibility, for violation of these Rules and Regulations, lies with the Customer of record and/or any additional recipient who benefits from the Water Service.

9.F.2 For violation of the Rules and Regulations set forth regarding interference, Tampering or theft, the City shall levy a charge set forth in the City of Santa Clara Municipal Fee Schedule, adopted by resolution of the City Council.

9.G **CIVIL ACTION**

In any civil action brought, the City may recover three times the amount of actual damages, plus the cost of the suit, reasonable attorney's fees and any other amounts allowed by law. In addition, the City may bring an action to enjoin and restrain any violation of these Rules and Regulations.

10. TEMPORARY WATER SERVICE

Temporary water service, as herein considered, refers to service of a temporary nature or of questionable permanency. The City shall, if no undue hardships result therefrom, furnish temporary service under the following conditions:

10.A **TIME LIMIT**

Temporary Service Connections shall be disconnected and terminated within twelve (12) months after installation unless an extension of time is granted in writing by the City. (See Chapter 31, Article II of the City Code for rules and regulations concerning temporary service from fire hydrants.)

10.B **CHARGE FOR WATER SERVED**

Charges for water furnished through a temporary water Service Connection shall be at the established rates for regular Customers.

10.C **INSTALLATION CHARGE AND DEPOSITS**

The applicant for temporary service will be required:

10.C.1 To pay to the City in advance the estimated cost of installing and removing all facilities necessary to furnish such service, unless other arrangements are approved by the City Council. If service is supplied through a fire hydrant and hydrant meter, the applicant will be charged in accordance with the established rate schedule in effect at the time application is made.

10.C.2 To deposit with the Municipal Services Division an amount sufficient to cover bills for water during the entire period such temporary service may be used, and as set forth in the City's Municipal Fee Schedule service deposits in effect at the time.

10.C.3 Nothing in these Rules and Regulations shall limit or affect the right of the City to collect from the Customer any other or additional sums of money which may become due and payable to the City from the Customer by reason of the Temporary Water Service furnished or to be furnished. The City may refuse Water Service if, in the judgment of the City, unsafe or hazardous conditions exist.

10.D **REFUNDS**

A refund of the Temporary Water Service deposit less applicable fees or charges will be applied to the Temporary Water Service closing bill. An Owner of a Premises, executive officer of corporation, or business, with an unpaid closing bill can transfer the outstanding balance to any existing or future accounts without regard to Customer class.

10.E **TEMPORARY WATER PERMIT**

10.E.1 Any person or company desiring to use water drawn from a fire hydrant for the purpose of spraying, jetting or dust control or for any other reason must first obtain a temporary water permit by applying to the Water Utility. (See Section 17.E.)

10.E.2 It is specifically prohibited to operate the valve of any fire hydrant other than by the use of a spanner wrench designed for this purpose.

11. SHORTAGE OF SUPPLY AND INTERRUPTION OF DELIVERY

11.A The City will exercise reasonable diligence and care to furnish and deliver a continuous and sufficient supply of Water Services to the Customer, but does not guarantee continuity or sufficiency of supply. The City will not be liable for any damage resulting from the interruption, shortage, or insufficient supply of Water Services to the Customer.

11.B The City will have the right to suspend temporarily the delivery of Water Service whenever necessary to make repairs or improvements to its system. Reasonable notice, as circumstances permit, will be given to the Customers, and the repairs or improvements will be completed as rapidly as possible during normal City working hours, and where possible, with the least inconvenience to the Customers.

11.C If a shortage of supply occurs, the City will make an apportionment of the available supply of water among Customers as ordered or directed by the City Council. In the absence of an order or direction by the City Council, the City Manager will apportion the available supply of water among Customers in a reasonable manner.

12. DESCRIPTION OF STANDARD WATER SERVICE

12.A **NUMBER OF SERVICES TO SEPARATE PREMISES**

Separate Premises under single control or management shall normally be supplied through a single Service Connection. The Customer may request separate individual services, whereupon the City shall evaluate Customer's request and, at City's option, may provide separate services.

12.B **SERVICE TO MULTIPLE UNITS**

Separate residential houses, apartments or other multi-family accommodations, or business establishments on the same Premises or on adjoining Premises under a single control or management may be served by either of the following methods, at the option of the City, taking into consideration the Customer's preference:

12.B.1 Through a single metered Service Connection to the entire Premises, as provided in Rate Schedule.

12.B.2 Through separate metered Service Connections to each or any group of units, provided that the system from each service is independent and not interconnected with any others.

12.C **SINGLE METER SERVICE TO MULTIPLE TENANTS/UNITS**

When separate domestic and/or commercial services are served on the same Premises through a single-metered Service Connection, the Owner may resell water to tenants of the Premises at rates identical with the rates of the City that would apply if that Water Service was supplied to the individual tenants or units directly by the City, regardless of the rate the Owner is charged, provided the Owner complies with either 12.C.1(a) or 12.C.1(b). Within thirty (30) days upon written request by the City, the Owner must submit four (4) consecutive quarterly water billing summaries to the City for compliance auditing purpose.:

12.C.1(a) Water is separately metered to the individual tenants or units.

12.C.1(b) Water is not separately metered. The Owner shall be responsible for purchase of all water used for landscape irrigation and other common area uses. The tenants shall receive separate bills for the water used by the tenants alone without any incremental charges (service or handling) billed to tenants' accounts. For residential accounts, the charge to the tenants for water shall be derived from a consistent formula for allocation that includes the number of individuals in each household (e.g., 100% occupancy or 50% occupancy and 50% square footage). For non-residential master-metered accounts, the amount allocated to each tenant shall be consistently calculated based on a formula that includes a

12. DESCRIPTION OF STANDARD WATER SERVICE (Continued)

reasonable standard for water use at each business type and square footage of each tenant's unit.

12.C.2 The charge to the tenants for such water is absorbed in the rental charges for that individual tenant or unit with no separate identifiable charge for water, and the rent does not vary with water consumption.

12.C.3 If water is resold otherwise than provided for above, the City may Discontinue service to the Owner, or furnish water directly to the individual tenants or units through separate meters installed at the sole cost of the Owner.

12.C.4 The responsibility for payment for all Water Services furnished to individual tenants or units on the same Premises, under these Rules and Regulations and supplied through a single Service Connection, shall be the obligation of the Owner. It shall further be the responsibility of the Owner to inform individual tenants or units of the method of metering Water Services. The City will have no contractual relationship with tenants of individual units, where a Customer receives service through a single metered connection, nor a relationship created by payments made directly to the City on behalf of the Owner by tenants or other third parties.

12.C.5 As a condition of service for single metered service, the Owner has agreed to be governed by the applicable City Rules and Regulations. As a further condition of service for single metered service, the Owner has agreed that the City may inspect and examine the Owner's billing procedures from time to time to determine that such service is made in accordance with these Rules and Regulations, or as otherwise may be authorized by the City.

13. RESPONSIBILITY FOR EQUIPMENT AND PROTECTIVE DEVICES

13.A **RESPONSIBILITY FOR EQUIPMENT**

13.A.1 The Customer shall, at the Customer's risk and expense, furnish, install and keep in good and safe condition equipment and suitable housings that may be required for receiving, controlling, applying and utilizing water, regardless of the location of the meters, or other City Equipment, and the City shall not be responsible or liable for any loss or damage caused by the improper installation of such water equipment, or the negligence, want of proper care or wrongful act of the Customer or of any of the Customer's tenants, agents, employees, contractors, licensees or permitees in installing, maintaining, using, operating, Tampering, or interfering with such equipment. The City shall not be responsible or liable for damage to Customer's property and/or equipment, either when the water is turned on originally or when turned on after a temporary shutdown, during normal operating conditions, times of local or system trouble and/or after Restoration. The City shall not be responsible or liable for damage to, or the failure of, any component of the Customer's equipment due to a defect in Customer's equipment or failure to maintain adequate protection as described in these Rules and Regulations.

13.A.2 The Customer shall exercise reasonable care to prevent City Equipment on the Customer's Premises from being Tampered or interfered with, damaged, or destroyed. The Customer shall be liable for damage to City Equipment arising from negligence, want of proper care, or wrongful act of the Customer or Customer's tenants, agents, employees or contractors. If any defect is discovered by the Customer, the Customer shall promptly notify the City.

13.B **PROTECTIVE DEVICES**

13.B.1 It is the Customer's responsibility to furnish, install, inspect and keep in good and safe condition at that Customer's own risk and expense, all appropriate protective devices of any kind or character, which may be required to properly protect the Customer's facilities and equipment from any event caused without negligence by the City or from any event caused by another Customer. The City is not responsible or liable for any loss or damage occasioned or caused by the negligence, or wrongful act of the Customer, or of any of that person's agents, employees or licensees in omitting, installing, maintaining, using, operating or interfering with any such protective devices.

13. RESPONSIBILITY FOR EQUIPMENT AND PROTECTIVE DEVICES (Continued)

13.B.2 It is the Customer's responsibility to select and install such protective devices as may be necessary to coordinate properly with the City's protective devices to avoid exposing other Customers to unnecessary water service interruptions. Failure to provide appropriate protective devices or to properly coordinate said equipment with the City's protective devices may result in discontinuance of Water Service.

14. SERVICE CONNECTIONS AND METERS

14.A **SERVICE CONNECTIONS**

Water Service Connections will be installed in the size and at the location desired by the applicant where such requests are reasonable. Service Connections will be made only to property abutting on public streets or to such distribution Mains as may be constructed in alleys or rights-of-way at the convenience of the City. Service Connections installed in the new subdivisions prior to the construction of streets or in advance of street improvements must be accepted by the applicant in the installed location. Charges for new Service Connections are payable in advance and shall be in accordance with applicable sections of the Code.

14.B **METERS**

14.B.1 When an authorized service entrance has been established, meters will normally be furnished and installed between the curb and the property line. The charges for meters shall be in accordance with applicable sections of the Code.

14.B.2 No rent, or other charge, will be paid by the City for a meter or other facility, including housing and connections, located on a Customer's Premises.

14.B.3 All meters will be sealed by the City at the time of installation, and no seal shall be Tampered with or broken by the Customer at any time thereafter.

14.B.4 The City reserves the right to meter any and all services and to apply the established metered rates to the quantity of water measured by them.

14.C **CHANGES IN LOCATION OF METERS AND SERVICE CONNECTIONS**

Meters or services moved for the convenience of the Customer will be relocated at the Customer's expense. Meters or services moved to protect the City's property will be moved at the City's expense.

14.D **CHANGES IN SIZE OF METER**

Upon request of a Customer, the size of an existing meter may be changed. Charges for meter changes shall be made by applying the rates shown in the Code to the applicable situation as follows:

14. SERVICE CONNECTIONS AND METERS (Continued)

14.D.1 When an existing meter is replaced in size by a larger meter, the Customer shall be given a credit for the rate established for the existing meter. Said credit shall be applied against the rate established for the larger meter, and the differential cost shall be paid to the City by the Customer.

14.D.2 When an existing meter is replaced in size by a smaller meter, the Customer shall be given a credit for 70% of the rate established for the existing meter. Said credit shall be applied against the rate established for the smaller meter and the differential cost, if any, shall be paid to the City or refunded to the Customer as the case may be.

14.E **OWNERSHIP**

The Service Connection, whether located on public rights-of-way or easements through private property, is the property of the City, and the City reserves the right to repair, replace and maintain it, as well as to remove it upon discontinuance of service.

14.F **MAINTENANCE**

The Service Connection, including the meter and the meter box, will be repaired and maintained by the City at its expense except for damages as set forth in Section 13. The City is not responsible for the installation and/or maintenance of water lines beyond the end of its Service Connections and/or meter.

14.G **SPLIT SERVICE CONNECTIONS**

The City, in several locations, has installed in residential subdivisions two meters on a common service, known as a "split service." In the event that a Customer wishes a single service to replace the split service, the charges will be in accordance with the City Code for a new 1" service including street opening fees.

15. MAIN EXTENSIONS

15.A **EXTENSIONS**

Main extensions and Service Connections for Applicants, sub-dividers or property developers shall be made in accordance with the applicable provisions of the Code.

15.B **RIGHT TO CHANGE POLICY**

It is understood that the policy stated herein may be changed by the City Council at such time or times as it may deem advisable or necessary. In no instance is this policy to apply retroactively to any subdivision, development, or Service Connection previously approved by the City Council and for which an agreement covering Water Service has been executed.

16. AUTOMATIC FIRE SERVICE

16.A **PURPOSE**

An automatic fire Service Connection of 4" diameter or larger, up to the size of the connected Main, will be furnished only if adequate provision is made to prevent the use of water from such Service Connection for purposes other than fire extinguishing.

16.B **REQUEST AND APPLICATION**

16.B.1 All requests for automatic fire Service Connection shall be referred to the Water Utility.

16.B.2 A location map with a job title and the date the service is needed shall accompany each request.

16.B.3 The contractor or Owner shall make application for the fire service at the Utilities Office.

16.C **INSTALLATION CHARGES**

The applicant will be required to make payment of the fees as specified in the Code for the automatic fire service in advance of installing the Service Connection.

16.D **QUANTITATIVE CHARGES**

16.D.1 Water for Fires

No charge will be made for water used to extinguish fires.

16.D.2 Water for Fire Storage Tanks

Occasionally water may be obtained from an automatic sprinkler service for filling a storage tank connected with fire service, but only if written permission is secured from the Water Utility in advance and an approved means of measurement is available. The rates for general use will be applied.

16.D.3 Other

Water lost through leakage or in unauthorized testing or used in violation of these Rules and Regulations shall result in an imposition of regular Water Service rates on the fire service account for a minimum of three billing cycles or longer, until such time as illicit use of water through the fire Service Connection is discontinued.

16. AUTOMATIC FIRE SERVICE (Continued)

16.E **VIOLATION OF AGREEMENT**

If water is used from a fire service in violation of the agreement or of these Rules and Regulations, the City may, at its option, discontinue and remove the service.

16.F **OWNERSHIP OF CONNECTION**

The Service Connection and all equipment appurtenant thereto shall be the sole property of the City, and no part of the cost thereof will be refunded to the applicant.

16.G **PRESSURE AND SUPPLY**

The City assumes no responsibility for loss or damage because of lack of water or pressure and merely agrees to attempt to furnish such quantities and pressures as are available in its general distribution system. The service is subject to shutdowns and variations required by the operation of the system or due to accidents beyond the ability of the City to control.

16.H **RATES**

Monthly charges furnished for automatic fire sprinkler service shall be at the established rates.

17. FIRE HYDRANTS

17.A **USE OF AND DAMAGE TO FIRE HYDRANTS**

No person or persons, other than those designated and authorized by proper authority, shall open any fire hydrant, attempt to draw water from it or in any manner damage or Tamper with it. Any violation of this regulation is punishable by law, and in accordance with City Code.

17.B **INSTALLATION OF FACILITIES ON PRIVATE PROPERTY**

Fire hydrants and other facilities will be installed for use on private Premises by the City under agreement entered into by the parties concerned and the City.

17.C **MARKING OR COLOR CODING OF HYDRANTS**

17.C.1 Public Hydrants

All public hydrants including, but not limited to, hydrants which are municipally installed, operated, controlled and maintained shall have white barrels or bodies with the color coding, marking, or stenciling as required by the State Fire Marshal.

17.C.2 Private Hydrants

All private hydrants shall have the barrel, top, and nozzle caps painted "safety yellow" to distinguish them from public hydrants.

17.D **MODIFICATION OR RELOCATION OF FIRE HYDRANTS**

If a property Owner, or other party of a developed or redeveloped Premises, desires a change in the size, type or location of an existing fire hydrant, said Owner or other party shall bear all costs of such changes, without refund. If a fire hydrant is installed by the City which precedes the development of the Premises and the location of said fire hydrant interferes with the development of the Premises, the City, at its sole expense, shall move the existing fire hydrant to a new location on the Premises. Any change in the location of a fire hydrant must be approved by the Fire Chief.

17. FIRE HYDRANTS (Continued)

17.E **WATER FROM FIRE HYDRANTS**

17.E.1 Permit to Extract Water Required

It shall be unlawful for any person to take water from any City fire hydrant, except the City Fire Department, without first obtaining a permit and complying with the regulations contained in these Rules and Regulations.

17.E.2 Application; Issuance and Deposit

After application to and approval of the Water Utility, permits required by the preceding section will be issued by the Municipal Services Division Office upon application and payment of a deposit, a portion of which is non-refundable. (The refundable portion of a deposit is not normally required of other public agencies or utilities.)

17.E.3 Denial or Revocation

The City shall have the right to refuse or revoke any permit issued pursuant to these Rules and Regulations when the use of same results in surging or pressure complaints due to careless operation of the fire hydrant valve or for any other cause.

17.E.4 Issuance of Equipment; Manner of Extracting Water; Water Meters Generally

The applicant filing for a permit under the preceding section shall then report to the Water and Sewer Utilities corporation yard, where a portable water meter with hose adapter for connection to the City fire hydrants and a spanner wrench will be issued. No other equipment, tools or accessories shall be furnished by the City. All water used must be taken through the water meter. The permittee shall notify the Santa Clara Fire Department upon the issuance of the water meter and before the use of the hydrants. The water meter shall be immediately removed and disconnected from the fire hydrant after hydrant use has concluded. The permittee shall notify the Santa Clara Fire Department at the time the hydrant is no longer being used.

17.E.5 Reading of Water Meters and Rendering of Accounts; Water Drawn for Use Outside City

17.E.5.(a) Meters provided for in the preceding section shall be read monthly. The meter reading can be performed during working hours at the Water and Sewer Utilities corporation yard, between

17. FIRE HYDRANTS (Continued)

the twenty-fifth and the last day of each month. Or the meter reading can be recorded on a card issued with the meter and mailed to the Municipal Services Division Office by the twentieth of each month.

17.E.5.(b) Accounts whose meters are not read during this period shall be billed the monthly minimum for a three inch (3”) meter and this amount shall not be applicable as payment toward water used, either previously or thereafter. In addition to the monthly minimum, the permittee remains responsible for the full amount of water actually used. Accounts shall be billed monthly for water used at the rates established therefore by the City. Water drawn for use in projects outside the City shall be billed and paid for at one and one-half times the established City rates.

17.E.6 Return of Equipment to City; Final Billing, etc.

When water is no longer required, the water meter and other equipment shall be returned to the Water and Sewer Utilities corporation yard and checked in. The deposit, less the cost of any damage to the meter or hydrant that was used and less the final billing on water usage, shall be returned to the permittee.

17.E.7 Additional Penalty for Violation of Article; Duties of Director of Water and Sewer Utilities

In addition to the penalty provided in the City Code, any person violating any provision of the article may be required to pay two times the rate for the water taken, based on an estimate of the quantity of water taken. Such estimate shall be made by the Director of Water and Sewer Utilities.

18. POOLS AND TANKS

18.A When an abnormally large quantity of water is desired for filling a swimming pool or for other purposes, arrangements may be required prior to taking such water. Permission to take water in unusual quantities will be given only if it can be safely delivered through the City's facilities, if other Customers are not inconvenienced, and if there is no mandatory water rationing in effect at the time of the request. All water used shall be metered and billed for in accordance with prevailing rate schedules.

19. CONTROL VALVES

19.A The Customer shall install a suitable square or a tee head stop on the riser to the building (or, for multiple buildings, as close to the meter location as practicable) which will operate to control the entire water supply from the Service Connection.

19.B Operation by the Customer of the curb stop in the meter box is not permitted except in extreme emergencies. Should the Customer damage the curb stop, they shall reimburse the City for any and all cost of repair or replacement.

20. CROSS CONNECTIONS

20.A **HEALTH REGULATIONS**

Regulations of the California State Department of Public Health and the Drinking Water Standards of the United States Public Health Service prohibit unprotected Cross Connections between the public water supply and any unapproved source of water.

20.B **CITY REQUIREMENTS**

Backflow Prevention Devices shall be required at the Service Connection or at a location approved by the City for Premises receiving water from the City and falling in one or more of the following categories:

20.B.1 Premises having an auxiliary water supply;

20.B.2 Premises on which any substance is handled under pressure in such a fashion as to permit possible entry into the City's water distribution system, including water originating in the City's system that is then boosted in pressure;

20.B.3 Premises where the Customer's system has more than one Service Connection coming from different streets, or having internal Cross-Connections that cannot be permanently corrected to meet State and local standards;

20.B.4 Premises and/or Customer's systems where, in the opinion of the City or its representative, there is the potential for pollution or contamination of the City water system in the event of Backflow or back-siphonage.

20.B.5 Premises receiving Water Service other than from the City are exempt from the requirements until they receive Water Service from the City.

20.C **APPROVED BACKFLOW PREVENTION DEVICES**

Only approved Backflow Prevention Devices will be accepted. An approved device is any device that has been manufactured and installed in full conformance with the standards established by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California and that has received the approval of the City for use in Santa Clara.

20.D **PLUMBING CHANGES REQUIRED**

In special circumstances, when the Customer is engaged in the handling of especially dangerous or corrosive liquids or industrial or process waters, the City may require the Customer to eliminate certain plumbing or piping connections as an additional precaution and protection to the Backflow preventive devices. In making the required plumbing connections, the Customer shall comply with local or state plumbing ordinances and codes.

20.E **RELIEF VALVE REQUIRED**

Suitable pressure relief valves shall be installed and maintained by the Owner in accordance with the requirements of local or state plumbing codes and ordinances.

20.F **BACKFLOW PROTECTION ON ADDITIONAL WATER SUPPLY LINES**

Whenever Backflow protection has been found necessary on a water supply line entering a Customer's Premises, then any and all water supply lines from the City's Main entering such Premises, buildings or structures shall be protected by an approved Backflow device unless Director of Water and Sewer Utilities determines otherwise.

20.G **INSPECTION OF BACKFLOW PREVENTION DEVICES**

The City will be responsible for inspecting and testing all Backflow Prevention Devices, as well as making any necessary repairs identified through inspection and testing. Inspection and testing will be done on at least an annual basis. Fees for this service will be established from time to time.

20.H **INSTALLATION OF BACKFLOW PREVENTION DEVICES**

20.H.1 New Service Connections. At the time an application for a new service is made by a potential Customer, in accordance with City's policies and regulations, the City will review said application to determine the need for a Backflow Prevention Device on the Customer's service. If Backflow prevention is determined to be required, the Customer shall pay the City in advance in accordance with City's established installation fee schedule.

20.H.2 Existing Service Connections without Backflow Prevention Devices. The City will inspect, from time to time, the Premises of existing Service Connections that, in the opinion of the City or its representative, may require Backflow prevention. If it is determined that a Backflow Prevention Device is required, such determination by the City shall be final, and the installation of a Backflow Prevention Device shall be a condition of continued Water Service.

20.H.3 The City will install the Backflow Prevention Device and charge the Customer the entire cost of the device and its installation. If, in the opinion of the City there was no change in the land use from when the Water Service was first installed, the City may absorb the entire installation cost.

20.H.4 Upgrading the existing Backflow Prevention Device. An existing Backflow Prevention Device that, in the opinion of the City, does not provide adequate protection, shall be upgraded at the Customer's expense following the procedures in subparagraph 2 above. Upgrading may include repair, complete replacement of the Backflow Prevention Device, or correction on-site or cross-connection hazards.

20.I **INSTALLATION OF FACILITIES ON PRIVATE PROPERTY**

Backflow Prevention Devices may be installed on private Premises by the City under agreement entered into by the Customer and the City.

20.J **REMOVAL OR MODIFICATION OF BACKFLOW PREVENTION DEVICES**

Backflow Prevention Devices shall not be removed or modified by the water user unless approved in advance by the City.

20.K **DISCONTINUANCE OF SERVICE FOR DEFECTIVE APPARATUS**

The service of water to any Premises may be immediately discontinued by the City if defects are found in any protective device installation, or if it is found that unprotected Cross-Connections exist. Service will not be restored until necessary corrections are made.

21. RECYCLED WATER USE

Certain uses of Recycled Water are permitted by the State of California. The requirements for such use are defined by CCR, Title 22, Division 4, of the California Administrative Code. The use of Recycled Water within the City is further defined under a permit issued by the California Regional Water Quality Control Board. Wherever the City Rules and Regulations are inconsistent or in conflict with the requirements of Title 22 or of the RWQCB permit, these Rules and Regulations shall be subordinate.

Since codes, laws, statutes and regulations can change without prior approval or knowledge of the City or South Bay Water Recycling (Program), the City, Program or Water Utility do not assume any liability for errors in this document. It is the responsibility of the Customer to check with the Program before initiating any operational or physical changes to the Recycled Water system.

21.A ABBREVIATIONS

Abbreviations used throughout Sections 21, 22 and 23 are listed below for reference. Definitions for terms are listed in Section 21.B (below).

AG: Air Gap

AWWA: American Water Works Association

County EHS: County of Santa Clara Environment Health Services

DC Assembly: Double Check Backflow Prevention Assembly

Program: South Bay Water Recycling Program, administered by City of San Jose for the San Jose - Santa Clara Water Pollution Control Plant

RP Device: Reduced Pressure Principal Backflow Prevention Device

State DHS: State of California Department of Health Services, Drinking Water Field Operations Branch - Monterey District

State RWQCB: California Regional Water Quality Control Board

21.B **<u>DEFINITIONS</u>**

Whenever the following terms, or pronouns used in their place, occur in Sections 21, 22 or 23 herein, the intent and meaning shall be interpreted as follows:

Air Gap: A physical separation between the free flowing discharge end of a water supply pipeline and an open or non-pressure receiving vessel. An approved air gap shall be at least twice the diameter of the water supply pipe measured vertically above the overflow rim of the vessel (in any case, no less than one inch).

Applicant: Any entity that applies for Recycled Water Service under terms of the appropriate regulations. The approved Customer may be a different party than the Applicant, but must be specified in the Recycled Water Use License.

Application for Recycled Water Services: An agreement issued by the Water Utility to a Recycled Water Service Applicant after the satisfactory completion of the service application procedures. This Agreement forms a service agreement between the Customer and the Water Utility that legally binds the Customer to all conditions stated in the Agreement and all applicable Regulatory Agency requirements.

Approved Backflow Prevention Assembly: A device approved by the State of California which is installed to protect any water supply (recycled, potable, Public, private, or on-site) from contamination through Backflow of a substance containing a potential hazard.

Approved Use: An application of Recycled Water in a manner, and for a purpose, designated in a Recycled Water Use License issued by the Program and in compliance with all applicable Regulatory Agency requirements.

Approved Use Area: A site with well-defined boundaries, designated on the approved On-Site Recycled Water Service Plans, to receive Recycled Water for an approved use and acknowledged by all applicable Regulatory Agencies.

Cross Connection: A physical connection between any part of a water system used or intended to supply water for drinking purposes and any source or system containing water or substance that is not or cannot be approved as safe, wholesome and potable for human consumption. This includes direct piping between the two systems, regardless of the presence of valves, Backflow Prevention Devices, or other appurtenances.

Customer: Any person, persons or firm including any Public utility, municipality or other Public body or institution issued a Recycled Water Use License by the Program. The Customer may be the Owner, tenant, or property manager as appropriate. The City's Rules and Regulations for the Use of Recycled Water apply to all Customers located within the City's boundaries.

Customer Supervisor: The Customer shall designate a Customer Supervisor with the approval of the Program to provide a liaison with the Program, the City, and Water Utility. This person shall be available to the Program at all times, shall have the authority to carry out any requirements of the Water Utility, the City and the Program, and shall be responsible for the installation, operation and maintenance of the Recycled and Potable Water systems and also prevention of potential hazards.

Infiltration Rate: The rate at which the soil will accept water as applied during irrigation, expressed in inches per hour.

Inspector: Any person authorized by the Water Utility, the City, the Program or the local health agencies to perform inspections on or off the Customer's site before construction, during construction, after construction and during operation.

Intermittently Pressurized Line: Any irrigation piping downstream of the last valve.

Irrigation Period: The time, from start of water flow to cessation, which a specific area receives Recycled Water by direct irrigation application, no matter how often the specific area is irrigated, e.g., length of the duty cycle.

Irrigation Use: An approved use of Recycled Water for landscape irrigation as defined under the California Code of Regulations ["CCR"], Title 22, Division 4, Article 4.

Landscape Impoundment: A body of recycled used for aesthetic enjoyment or which otherwise serves a function not intended to include routine Public contact.

Non-Potable Water: Water that has not been treated for human consumption in conformance with the latest edition of the United States Public Health Service Drinking Water Standards, the California Safe Drinking Water Act, or any other applicable standards.

Off-Site: Designates or relates to Recycled Water facilities up to and including the water meter.

On-Site: Designates or relates to facilities owned and operated by a Customer.

Operations Personnel: Any employee of a Customer, whether permanent or temporary, or any contracted worker whose regular or assigned work involves the supervision, operation or maintenance of equipment on any portion of On-Site facilities using Recycled Water.

Operator: Any person, persons or firm, who, by entering into an agreement with a Customer, is responsible for operating On-Site facilities.

Owner: Any holder of legal title, contract purchaser, or lessee under a lease with an unexpired term of more than one (1) year, for property for which Recycled Water Service has been requested or established.

Point of Connection: This is the point where the Customer's system ties to the Water Utility's system. This is usually at the water meter at the Service Connection.

Ponding: Retention of Recycled Water on the surface of the ground or other natural or manmade surface for a period following the cessation of an approved Recycled Water use activity.

Potable Water: That water that is pure and wholesome, does not endanger the lives or health of human beings, and conforms to the latest edition of the California Safe Drinking Water Act, or other applicable standards. Potable Water includes potable fire service without an approved Backflow prevention assembly.

Public: Any person or persons at large who may come in contact with facilities and/or areas where Recycled Water is approved for use.

Rate and Fee Schedule: The schedule of all rates, charges, fees and assessments to be made concerning the use of Recycled Water served by the Water Utility as approved or as amended by the City Council.

Recycled Water: Non-Potable Water that is highly treated to the CCR, Title 22, Division 4, of the Environmental Health Water Reclamation Criteria and used for approved purposes other than drinking water.

Recycled Water Use License: A license issued by the Program to the Customer, which outlines monitoring, self-inspection, reporting, and site-specific requirements. This license is required by the California RWQCB for the use of Recycled Water.

Reduced Pressure Principal Backflow Prevention Device: A type of Backflow Prevention Device, usually installed near a water meter, which prevents Backflow by a combination of two check valves and a pressure differential relief valve.

Regulatory Agencies: Those Public agencies legally constituted to protect the Public health and water quality, such as the State DHS, the State RWQCB and the County EHS.

Restrained Joint: Mechanically restrained pipe joint; also, solvent welded for PVC joints.

Runoff: When Recycled Water is allowed to drain outside the approved irrigation area.

Santa Clara County Environmental Health Services: This agency is the local health protection agency for most areas of Santa Clara County.

Service: The furnishing of Potable or Recycled Water to a Customer through a metered connection to the on-site facilities.

Standard Pipe Length: 18 to 20 feet.

State of California Department of Health Services. Shall be the State of California Department of Health Services, Drinking Water Field Operations Branch - Santa Clara District.

Unauthorized Discharge: Any release of Recycled Water that violates the Rules and Regulations of the Water Utility, the City, the Program or any applicable Federal, State or local statutes, regulations, ordinances, contracts or other requirements.

Violation: Non-compliance with any condition or conditions of the User Agreement by any person, action or occurrence, whether willfully or by accident.

Water Utility: The Water Utility and the City are one and the same.

Windblown Spray: Dispersed, airborne particles of Recycled Water that can be transmitted through the air to locations other than those approved for the direct application of Recycled Water.

21.C <u>SUMMARY OF ON-SITE INSTALLATION REQUIREMENTS</u>

21.C.1 On-Site installation requirements are described in detail in the Program's Rules and Regulations for Design and Operation of On-Site Recycled Water Facilities. However, the following is a summary of the basic requirements:

21.C.2 **No Cross-Connections.** No Cross-Connections are allowed between the Recycled Water system and the potable water system.

21.C.3 **Backflow Preventers.** In order to protect the Public drinking water system from accidental Cross-Connections, a reduced pressure principal Backflow Prevention Device is required at all **potable** meters on a site where Recycled Water is present.

In most cases, Backflow Prevention Devices are **not** required on the **Recycled Water** Service. However, where there is a particular threat to the quality of the Recycled Water, such as a direct connection to an industrial process or an impoundment of water, the Program may require a Backflow Prevention Device on the Recycled Water Service.

21.C.4 **No Hose Bibs.** Generally, hose bibs are not allowed on the Recycled Water system. In most cases, hose bibs can be replaced by quick coupling valves.

21.C.5 **No Runoff.** The irrigation system must be configured and operated to prevent runoff outside the Approved Use Area (the boundaries of the site).

21.C.6 **No Ponding.** The irrigation system must be configured and operated so that Ponding does not occur. This does not apply to approved and intended impoundments.

21.C.7 **No Windblown Spray.** The irrigation system must be configured and operated to prevent Windblown Spray from passing outside the approved area.

21.C.8 **Pipe Identification.** All new Recycled Water piping below or above grade and all existing piping above grade must be labeled with purple tape with the imprinted words "CAUTION - RECYCLED WATER". Purple colored pipe with the required wording is an acceptable alternative.

21.C.9 New above grade Potable Water piping used for drinking water systems must also be labeled with blue tape and the words "**POTABLE WATER**."

21.C.10 **Horizontal Pipe Separation.** Where possible, a minimum horizontal separation of ten feet between parallel buried Recycled and Potable Water pipelines should be maintained. If a ten foot horizontal separation cannot be maintained, then four foot minimum separation is allowed with Restrained Joint pipe. In no case shall a horizontal separation of less than four feet or same trench construction be allowed.

21.C.11 **Vertical Pipe Separation.** Recycled Water constant water pressure pipelines must be a minimum of 12 inches below the Potable Water pipelines. Recycled Water constant pressure pipelines are allowed over potable pipelines with a minimum of 12 inches vertical separation if a full standard pipe length is centered over the crossing, or the recycled pipeline is sleeved for the same length. Intermittently pressurized Recycled Water pipelines are allowed over potable pipelines with a minimum of 12 inches vertical separation.

21.C.12 **Signs.** Signs must be posted in conspicuous areas On-Site which contain the words “RECYCLED WATER - DO NOT DRINK - NO TOMAR” indicating that Recycled Water is used for irrigation (or other) purposes. Generally, signs must be located at all entrances to the facility or use area.

21.C.13 **Warning Tags, Stickers and Labels.** All valve boxes (automatic and manual), quick couplers, Recycled Water storage tanks, air/vacuum relief valves, pressure reducing valves, pumps, Backflow Prevention Devices, system controller boxes, or other appurtenances on the Recycled Water system must be labeled with warning tags, stickers or other labels. The labels, tags or stickers must include the words “RECYCLED WATER - DO NOT DRINK - NO TOMAR” on a purple background.

21.C.14 **On-Site (Land) Observation Reports.** At least once a year the site must be inspected for the items listed below while the system is in use. The observations must be submitted to the Program on a report form. The Customer may be required to perform this inspection, or, in some cases, the Program may perform the inspection. The items for the inspection are as follows:

21.C.14.(a) Is there evidence of runoff of Recycled Water from the site? Show affected area on a sketch and estimate volume.

21.C.14.(b) Is there an odor of wastewater origin at the irrigation site? If yes, indicate apparent source, characterization, direction of travel, and any Public use areas or Off-Site facilities affected by the odors.

21.C.14.(c) Is there evidence of Ponding of Recycled Water, and/or evidence of mosquitoes breeding within the irrigation due to ponded water?

21.C.14.(d) Are warning signs, tags, stickers, and above ground pipe markings properly posted to inform the Public that irrigation water is Recycled Water, which is not suitable for drinking?

21.C.14.(e) Is there evidence of leaks or breaks in the irrigation system piping or tubing?

21.C.14.(f) Is there evidence of broken or otherwise faulty drip irrigation system emitters or spray irrigation sprinklers?

21.C.14.(g) What corrective actions are being taken to correct any problems noted above?

21.C.15 The Customer may also be required to conduct a visual inspection of the system during the off-season. Specific requirements will be included in the Recycled Water Use License.

21.C.16 **Emergency Cross-Connection Response Plan.** If a Cross-Connection or Backflow incident occurs between the Potable and Non-Potable Water systems, an emergency response plan must be implemented.

21.D <u>FEES AND LICENSE</u>

21.D.1 **Recycled Water Use License.** The State RWQCB requires that a Recycled Water Use License be issued by the Program to all Recycled Water Customers within the Program area. The Recycled Water Use License indicates any special site-specific requirements in addition to the requirements specified in this document. The Application for a Recycled Water Use License is submitted to the City or the Program with the On-Site Recycled Water Service Plans. The Program processes the application and issues a Recycled Water Use License with final approval for the use of Recycled Water at the site. The Applicant is responsible to obtain all necessary permits and pay all associated fees. The Applicant should contact the City for information on the cost of permits.

21.D.2 **Application for Recycled Water Services.** The Water Utility also requires an Application for Recycled Water Service, similar to application for potable Water Service.

21.E <u>THE CITY AS THE LOCAL AUTHORITY</u>

21.E.1 The City is the entity that has the responsibility of enforcing these Rules and Regulations for the end use of Recycled Water. The City has authority to issue plumbing permits, building requirements, and planning criteria.

21.E.2 The Rules and Regulations enforced by the City are derived from those established by the State RWQCB, the State DHS, County EHS, the Program and the City. These Rules and Regulations govern certain permitted uses of Recycled Water. All facilities using Recycled Water shall be designed and operated to meet the standards of the local governing codes, rules and regulations.

21.F AUTHORIZED USES FOR RECYCLED WATER

The uses of Recycled Water may include, but not by way of limitation: landscape irrigation; agricultural irrigation; construction water; industrial process water; water for flushing toilets and urinals in high-rise buildings; replacement water in cooling towers; and recreational impoundments. Each such use must be considered for approval by the City on a case-by-case basis, and the City may determine in its discretion whether it is necessary or desirable to furnish Recycled Water for the specific use involved. Determinations as to specific uses to be allowed shall be in accordance with the standards of treatment and water quality requirements set forth in CCR, Title 22, Division 4, of the California Administrative Code. Prior to approving such uses, the City may, in its discretion, set forth specific requirements as conditions to providing such services and/or require specific prior approval from the appropriate Regulatory Agencies.

21.G NON-APPROVED USE AREAS

21.G.1 **Runoff Conditions.** The irrigation systems shall be designed, constructed and operated to prevent runoff outside the Approved Use Area.

21.G.2 **Ponding Conditions.** The irrigation systems shall be designed, constructed and operated to minimize Ponding outside or within the Approved Use Area. This does not apply to approved impoundments such as decorative water features, golf course water-hazards or lakes. At no time shall Recycled Water be applied at a rate greater than the soil infiltration rate.

21.G.3 **Windblown Spray Conditions.** The irrigation systems shall be designed, constructed and operated to minimize Windblown Spray from passing outside the Approved Use Area.

21.G.4 **Unapproved Uses.** Use of Recycled Water for any purposes other than those explicitly approved by the Water Utility in conformance with the Rules and Regulations of the Program, the State DHS, the County EHS, or the State RWQCB, or use of Recycled Water in areas other than those specifically shown on the approved plans, is strictly prohibited.

21.G.5 **Disposal in Unapproved Areas.** Disposal of Recycled Water for any purpose, including approved uses, in areas other than those explicitly approved in the current effective Recycled Water Use License issued by the Program and without the prior knowledge and approval of the appropriate Regulatory Agencies, is strictly prohibited.

21. RECYCLED WATER USE (Continued)

21.H **AMENDMENTS**

From time to time there may be amendments to the existing Rules and Regulations and design manual. These amendments may be made without the consent of the Customer. These amendments will be enforced upon their effective date.

21.I **PROTECTION OF PUBLIC HEALTH**

The Water Utility, the City and the Program reserve the right to take any action necessary with respect to the operation of the Customer's Recycled Water system to safeguard the Public health.

21.J **RIGHT TO TERMINATE SERVICE**

21.J.1 If at any time during construction or operation of the Recycled Water system, real or potential hazards are evidenced, such as Cross-Connections with the potable system, improper tagging, signing, or marking, or unapproved/prohibited uses, the Water Utility reserves the right and has the authority to terminate immediately, without notice, Recycled Water Service in the interest of protecting the Public health. The Water Utility may elect to temporarily replace the Recycled Water supply water with potable water only after the Customer's Recycled Water system has been disinfected and approval has been granted by the Program and the State DHS. All modifications required to replace the Recycled Water supply with Potable Water shall be at the Customer's expense.

21.J.2 The Customer has the right to terminate service if there are no longer suitable uses at that site. The Customer cannot substitute Potable Water where Recycled Water can be used.

21.K **SEVERABILITY**

If any section, subsection, clause, or phrase of these Rules and Regulations is for any reason held to be invalid or unconstitutional, such decision shall not affect the remaining portions of these Rules and Regulations. The City Council declares that it would have passed said Rules and Regulations by section, subsection, sentence, clause, or phrase thereof.

22. DESIGN, INSTALLATION AND INSPECTION OF SYSTEMS FOR USE OF RECYCLED WATER

22.A **DESIGN APPROVAL**

Before the construction of any new Recycled Water system, major modifications of an existing Recycled Water system, or retrofit of an existing system for Recycled Water use, On-Site Recycled Water Service Plans must be prepared by the Customer and approved by the Program and the State DHS. Approval shall be contingent upon evidence that all applicable design requirements, rules and regulations for a Recycled Water system are satisfied (see *Basis for Design Review Criteria* below).

22.B **REQUIRED ON-SITE RECYCLED WATER SERVICE PLANS**

Plans must be stamped by a registered landscape architect or civil engineer and include, but not be limited to, the following:

22.B.1 Site plan drawn to scale which clearly shows the boundaries of the intended use area, adjacent streets, and locations of all major improvements on the site, water meters (Recycled Water and Potable Water), Backflow Prevention Devices, drinking fountains, and all Public facilities supplied with Recycled or Potable Water Service. Public facilities include, but are not limited to, restrooms, outdoor eating areas, snack bars, swimming pools, wading pools, decorative fountains and showers. If there are no Public facilities located in the defined use area, then a note on the plans must indicate that no Public facilities exist. Additionally, any wells, lakes, ponds, reservoirs, or other water impoundments located On-Site or within 100 feet of the site must be shown on the site plan.

22.B.2 Piping plan which shows the complete potable and Recycled Water systems. All sources of Recycled Water and Potable Water must be indicated on the plan. The location and type of all existing and new Backflow Prevention Devices and water meters must be clearly marked on the piping plan. For existing facilities converting to Recycled Water use, the piping plan must indicate which piping and other devices are existing and which piping and other devices will be installed as part of the retrofit work. The proper separation requirements between Potable and Recycled Water lines (for new piping) must be indicated. The piping plan can be combined with the site plan if space permits.

22.B.3 Detail drawings of areas where special installation or retrofit procedures are required, such as cutting and capping to separate potable and recycled systems, installation of Backflow Prevention Devices, special construction where pipe separation criteria cannot be met, etc.

22. DESIGN, INSTALLATION AND INSPECTION OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

22.B.4 Any other items required by the Design, Installation, and Inspection Criteria section of the Customer On-Site Manual, and Section 24. C. of this document.

22.B.5 Preparation of On-Site Recycled Water Service Plans does not exempt the Applicant from submitting other On-Site improvement plans normally required by the City. Other improvement plans required by the City must still be submitted in accordance with the City's standard procedures.

22.C **BASIS FOR DESIGN REVIEW CRITERIA**

22.C.1 Review of On-Site Recycled Water Service Plans conducted by the Program and the State DHS will consist of checking for conformance with various regulations and guidelines governing distribution of Recycled Water. Even though the City/Program and the State DHS perform a plan check, the Applicant is not relieved of responsibility to meet all requirements. A brief description of this criteria is provided below. Copies of these criteria will be provided by the City or the Program upon request.

22.C.2 ***CCR, Title 22, Division 4, Chapter 3, "Water Reclamation Criteria".*** These regulations are written by the State DHS and specify the Approved Uses and use area requirements, such as hose bib restrictions, prohibition of irrigation near wells, etc. These regulations govern both the Water Utility's distribution system as well as the Customer's On-Site system.

22.C.3 ***CCR, Title 17, "Drinking Water Supply - Backflow Prevention"*** CCR, Title 17 specifies requirements intended to protect the Public drinking water supply from contamination. Some requirements specified in CCR, Title 17 include Backflow Prevention Devices, designation of a Customer Supervisor, and Cross-Connection testing requirements.

22.C.4 ***American Water Works Association (AWWA), California-Nevada Section, Guidelines for Distribution of Non-potable Water.*** This document provides recommended guidelines for planning, designing, constructing, and operating Non-Potable Water systems, including Recycled Water systems. The guidelines themselves are not regulations but many agencies have adopted them as general requirements. The document covers both installation of the Water Utility distribution systems and On-Site use systems.

22.C.5 **International Association of Plumbing and Mechanical Officials (IAPMO) Uniform Plumbing Code, Appendix J.** Appendix J of the Uniform Plumbing Code sets forth requirements when Recycled Water is used within buildings in a dual-plumbed system for non-potable domestic uses such as toilet and urinal flushing. This section of the Uniform Plumbing Code does not apply to irrigation sites, where the Recycled Water system is located outside buildings, or industrial sites, where the Recycled Water is used for non-domestic industrial purposes. In addition, the pipe separation regulations indicated in this Guide are different than and take precedence over the Appendix J requirements. NOTE: Appendix J has not been adopted by Santa Clara and serves only as a reference.

22.D **SUMMARY OF DESIGN REVIEW CRITERIA**

Although the plan review conducted by the Program, the State DHS and/or the City may include checking for compliance with any of the existing regulations or guidelines referenced above, the following summaries are provided to give the designer of the Recycled Water system a general idea of the major items which will be checked during plan review. The summary is compiled as a "punch list" so that it can easily be referenced by the plan designer. However, compliance with every item on the punch list does not guarantee that the plans will be approved without comment since regulations and policies may change and some sites may require special provisions. In addition, even though the Program, the State DHS and/or the Local Authorities perform a plan review, the Applicant is still responsible for meeting all applicable requirements, even if those requirements are not shown on the approved plans. Please note that the plan requirements are slightly different for new facilities and existing facilities converting to Recycled Water use.

22.D.1 Do plans include a site/piping plan and details of connection points as indicated under *Required Plans* (Section 22.B)?

22.D.2 Are all items listed under *Required Plans* (Section 22.B) shown on the site/piping and details plans?

22.D.3 Is the use area shown on the site an Approved Use Area?

22.D.4 Is the total Recycled Water irrigation area included to the nearest 10th of an acre?

22.D.5 At **new facilities**, are all On-Site Recycled Water pipelines located ten feet horizontally from Potable Water pipelines where possible (minimum of four foot horizontal separation allowed if special construction details are incorporated)?

22.D.6 At **new facilities**, where Recycled and Potable Water lines cross, are the

22. DESIGN, INSTALLATION AND INSPECTION OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

pressurized Recycled Water pipelines located at least one foot below the Potable Water lines?

22.D.7 At **existing facilities** converting to Recycled Water use, does all new piping meet the Potable/Recycled Water pipeline separation criteria indicated above?

22.D.8 Do the plans indicate that Recycled Water and Potable Water systems are completely separated and there is no common trenching?

22.D.9 At **existing facilities** converting to Recycled Water use, are all locations where future Recycled Water piping must be separated from the Potable Water piping clearly indicated on the plans?

22.D.10 Are the proper Backflow Prevention Devices shown in the proper location for protection of the Public Potable Water system? Reduced Pressure (RP) principal Backflow prevention assemblies should be shown located as close as possible to all Potable Water meters and at least 12 inches above grade.

22.D.11 If the On-Site Recycled Water system is interconnected with industrial process piping, fertilizer injection systems, or a non-potable drinking water source (such as an irrigation water storage pond), is the proper Backflow Prevention Device shown in the proper location for protection of the Public Recycled Water distribution system? In such cases, usually an RP device is required at the Recycled Water meter, at least 12 inches above grade.

22.D.12 Are the proper Backflow Prevention Devices shown in the proper locations for protection of On-Site Potable Water supply per standard UPC and CCR, Title 17 requirements? Though not specifically related to Recycled Water, these devices should be shown on the plans. Backflow Prevention Devices are required at non-air-gap Points of Connection to ponds, wading pools, swimming pools, fountains, etc., where the impoundment is supplied by the potable water on-site piping. Usually atmospheric vacuum breakers located near the Point of Connection are adequate, unless there is a valving downstream of the protection device, in which case pressure vacuum breakers are required.

22.D.13 If there are wells located On-Site or near the use site, are the wells separated from all Recycled Water irrigation use areas by at least 50 feet and from all Recycled Water impoundments by at least 100 feet?

22. DESIGN, INSTALLATION AND INSPECTION OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

22.D.14 If plans are used for construction, do plans show all necessary details to properly construct the system?

22.D.15 Do plans identify that materials are appropriate for Recycled Water use? (For example, purple pipe, proper signing and tagging, etc.)

22.D.16 Do plans identify works requiring inspection by the Program representatives?

22.D.17 Do plans include a detail for Air Gap if a backup source is used?

22.D.18 Do plans specify no hose bibs on the Recycled Water system?

22.E **PRELIMINARY CROSS-CONNECTION TEST EXISTING SITES**

At all existing sites which are converting to Recycled Water use, a preliminary Cross-Connection test may be required and shall be coordinated by the Customer prior to retrofit work or construction. The Customer must notify the Program prior to the Cross-Connection test so that the Program, the Water Utility, the City, and regulatory agency representatives can be present if they wish. The preliminary Cross-Connection test should follow the general cross-connection testing guidelines outlined in Section 22.I. The purpose of the test is to determine if there are any unknown connections between the existing irrigation system and the domestic water system prior to construction. If unknown connections are discovered, then further testing or potholing must be conducted in order to determine where the connections are located. The retrofit plans must be revised to reflect any changes required to eliminate the connections, and the revised plans must be resubmitted to the Program and the State DHS for review. At new development sites, a preliminary Cross-Connection test is generally not necessary since the systems have been designed for Recycled Water use.

22.F **CONSTRUCTION INSPECTION**

The State RWQCB requires that the Program, the City, or designated representatives conduct On-Site inspections during the construction phase to ensure that materials, installation and procedures are in accordance with the approved plans, specifications, and all applicable regulations. Accordingly, the Customer shall notify the Program of the schedule for all phases of planning, construction and start up so that inspections can be scheduled.

22.G **FIELD TESTING AND INSPECTION**

All systems shall conform to the requirements of the UPC Sections 103.5.1 through 103.5.4.2 except intermittent pressure piping. During the coverage test with Recycled Water, the irrigation system shall be inspected for proper use of full, half, and quarter sprinkler heads, proper atomizing, and irrigation spray on non-Approved Use Areas.

22.H **TEMPORARY CONNECTION TO POTABLE SERVICE**

A jumper to the potable system is allowed up to and during the final Cross-Connection test. At that time the jumper shall be replaced by the Recycled Water meter. Jumpers providing water from the Public Recycled Water system into the On-Site Recycled Water system are prohibited at all times.

22.I **FINAL CROSS-CONNECTION TEST**

The Customer must conduct a final Cross-Connection test before connecting the Customer's Recycled Water system to the Water Utility's Recycled Water system at any use-site where both Recycled and Potable Water are present in separate piping systems. This test is to ensure the absolute separation of the recycled and potable water systems. The Customer must notify the Program at least 48 hours prior to the test so that members of the appropriate agencies may be present. The Cross-Connection test shall be done under the supervision of the Program representatives by an AWWA-certified Cross-Connection control specialist hired by the Applicant. The Customer Supervisor (see *Designation of Customer Supervisor,* herein) must be present at the test. Periodic testing must be performed after that (see *Periodic Cross-Connection Testing Program,* herein). A written report documenting the test results shall be submitted by the certified Cross-Connection control specialist to the Customer Supervisor and the Program following completion. The following are general test guidelines and may be modified with the approval of the Program.

22.I.1 **General Cross-Connection Test Procedures**

Cross-Connection tests shall be performed as specified in the UPC Appendix J 8 (2) and J 8 (3), with the exception that intermittent piping will not be activated and pressurized as specified in Appendix J 8 (2)(vi), and that the required pressurization time will be one (1) hour or as otherwise specified by the Cross-Connection specialist. The City of Santa Clara's Cross-Connection test procedures are summarized as follows:

22.I.2 **Minimum Requirements for Cross-Connection Testing:**

The Cross-Connection test shall be done with the Customer's Site Supervisor present, under the supervision of a City representative by an AWWA-certified Cross-Connection control specialist. The Cross-Connection test shall include the following steps:

22.I.2.(a) For Premises with irrigation systems originally constructed with a potable service, all Potable Water supply points to the irrigation system are to be disconnected and capped. These points shall remain open to view until after a visual inspection by the City. This step may be deferred until after the following steps are completed, that is, the Cross-Connection test may be completed with Potable Water being supplied to the recycled piping.

22.I.2.(b) When the recycled service is ready to be activated, while still OFF: City Inspectors shall determine that there is no water being supplied to the irrigation system. This may be by use of a pressure gauge installed on the normally pressurized portion of the irrigation system, or by a visual inspection of the irrigation sprinkler heads. This procedure is to insure no potable water source is supplying water to the irrigation system.

22.I.2.(c) After the Recycled Water service is activated and turned ON, the potable service to the property is to be turned OFF and de-pressurized. A pressure gauge will be connected to the potable service at the building to measure the potable system pressure during this test. While the potable system is not in use, there shall be no observed increase in pressure for at least 15 minutes. For multi-story buildings, maximum pressure at the ground floor is not to exceed static pressure equal to elevation pressure to the top floor or roof of the building (the highest point of the internal plumbing).

22.J <u>**FINAL INSPECTION**</u>

The State DHS requires a final On-Site inspection to be conducted by the Program or its designated representatives. Accordingly, a final inspection will be performed by the Program or its designated representatives before the Recycled Water system is connected to ensure all requirements have been met. This inspection will be coordinated with the final Cross-Connection test so that the inspection can be done with Potable Water charging the irrigation system at Recycled Water pressure prior

22. DESIGN, INSTALLATION AND INSPECTION OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

to connection of Recycled Water. The Program's inspector will check to see that the proper equipment was used and that all required tags, labels, and signs are in place. This inspection shall precede the coverage test which will be performed with Recycled Water. This will allow the inspector to determine if conditions which create runoff or Windblown Spray outside the Approved Use Area, Ponding within the use area do not exist. Spray patterns will be checked to see they do not encroach upon Public facilities such as drinking fountains, outside eating areas, or areas outside the Approved Use Area.

22.K **FINAL APPROVAL**

Final approval must be granted by the Program before Recycled Water can be supplied to the site. Final approval will be granted when construction has been completed in accordance with approved plans and specifications, all Cross-Connection tests have been performed, a final On-Site inspection has been conducted, and all requirements have been met satisfactorily. After the Recycled Water Use License has been finalized by the Program, the Water Service Agreement is approved by the Water Utility, and all applicable fees have been paid, the Water Utility will authorize the installation of the Recycled Water meter. (The coverage test will be performed after the meter has been set) the State DHS will be forwarded a copy of all test and inspection reports as well as notification that Recycled Water Service has been started. During the lifetime of the Recycled Water system, the City or the Program will periodically inspect the Recycled Water system to ensure compliance with all applicable rules and regulations (see *Annual Self-Inspections*, herein). Additionally, the Customer shall conduct a Cross-Connection test every four years if required by the Recycled Water Use License.

22.L **RECORD DRAWINGS**

All conceptual or major design changes shall be approved before implementing the change in the construction contract. Record drawings shall be prepared to show the recycled system as constructed and shall include all changes in work constituting departures from the original contract drawings including those involving both constant pressure and Intermittent-Pressure Lines and appurtenances.

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER

23.A **CONDITIONS OF SERVICE**

All requirements outlined in this section shall be Conditions of Service, unless modified in the Recycled Water Use License. By accepting Recycled Water Service, the Customer agrees to comply with all Conditions of Service.

23.B **SYSTEM RESPONSIBILITY**

23.B.1 It shall be the responsibility of the Customer to maintain and operate their Recycled Water system downstream of the Service Connection. It is the responsibility of the Customer to ensure that the Recycled Water is being applied in accordance with all rules and regulations regarding the use of Recycled Water. The Customer is also responsible for the following:

23.B.1.(a) Maintaining the On-Site Recycled Water system, signs, markings, and tags in accordance with all rules and regulations.

23.B.1.(b) Ensuring all materials used during the repair and maintenance of the system are approved or recommended for Recycled Water use.

23.B.1.(c) Obtaining all permits and payment of all fees required for the operation and maintenance of the Customer's Recycled Water system. Permitting and/or fee assistance may be available from the City or the Program.

23.B.1.(d) Reporting all Violations and emergencies to the required local governing agencies.

23.B.1.(e) Obtaining prior authorization from the Water Utility and the Program before making any modifications to the approved Recycled Water system. This includes converting any piping used at any time for conveyance of Recycled Water back to Potable Water, that is switching a Recycled Water system to a backup Potable Water system. The Program will notify the Customer if approval is also required from any additional regulatory agencies and if disinfection procedures are required.

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

23.C **HOURS OF OPERATION**

Hours of operation shall be specified in the Recycled Water Use License.

23.D **DESIGNATION OF CUSTOMER SUPERVISOR**

It is the responsibility of the Customer to provide surveillance and supervision of the Recycled Water system in a way that assures compliance at all times with current regulations. In order to accomplish this, the Customer shall designate, with the approval of the Program, a Customer Supervisor to provide liaison with the City, the Water Utility and the Program. This person may represent the Owner, tenant, or property manager as appropriate; however he/she must be a permanent employee responsible for the Recycled Water system at the site who is available at all times and has the authority to carry out any requirements of the Program, the City, and the Water Utility. The Customer Supervisor should be permanently stationed at the use site, or at a minimum make frequent visits to the use site as specified in the Recycled Water Use License. Installation, operation, maintenance, and prevention of potential hazards on the Recycled and Potable Water systems are the responsibility of the Customer Supervisor. The Customer Supervisor's primary responsibility is to ensure that there are no Cross-Connections made between the Potable and Recycled Water systems. The Customer Supervisor must be present at the final cross-connection test and periodic Cross-Connection tests. The Customer Supervisor shall inform the Program of all failures, Violations, and emergencies that occur involving the Recycled or Potable Water systems. The Customer Supervisor is also responsible to be knowledgeable of the provisions contained in CCR, Title 17 and CCR, Title 22 relating to the safe use of Recycled Water and the maintenance of accurate records. The Customer Supervisor must be familiar with the basic concepts of Backflow and Cross-Connection prevention, system testing and relating emergency procedures. The Customer must notify the Program immediately of any change in personnel for the Customer Supervisor position.

23.E **PERSONNEL TRAINING**

It is the responsibility of the Customer to train all operations personnel, in order to be familiar with the use of Recycled Water. Any training program should include, but not limited to, the following:

23.E.1 Operations personnel must be aware of the emergency procedure.

23.E.2 Operations personnel must be aware that Recycled Water, though highly treated, is Non-Potable Water.

23.E.3 Operations personnel must understand the requirements and restrictions pertaining to Ponding, Windblown Spray and Runoff.

23.E.4 Good personal hygiene must be followed.

23.E.5 **Recycled Water shall never be used for human consumption.**

23.E.6 Operations personnel must understand that working with Recycled Water is safe if good common sense is used and appropriate regulations are followed.

23.E.7 Operations personnel must understand that there is **never** to be a connection between the Recycled Water system and the Potable Water system.

23.E.8 Operations personnel must understand the health/safety aspects of CCR, Title 17 and CCR, Title 22 requirements.

23.E.9 All new employees shall be trained in the proper use of Recycled Water. Supervisory personnel and the Customer Supervisor should be held accountable to ensure that employees are not using Recycled Water carelessly or hazardously.

23.F **VEHICLE IDENTIFICATION**

23.F.1 Any vehicle used to transport Recycled Water shall be clearly marked with labels or signs. These labels or signs shall contain the words “RECYCLED WATER - DO NOT DRINK - NO TOMAR” in black two-inch high minimum letters on a purple background. The Program may also require the label to include translations into foreign language(s) if appropriate, as specified in the Recycled Water Use License. One label or sign shall be placed on the tank closest to the driver’s door. One label or sign shall be placed on the rear surface of the tank. All labels and signs shall be placed where they can easily be seen by the personnel using the vehicle.

23.F.2 The “Do Not Drink” symbol (refer to the Customer On-Site Design Manual) shall be present on all vehicles used to carry Recycled Water. Any vehicles use for the transportation or storage of Recycled Water must not be reused for the transportation or storage of Potable Water.

23.G **MAINTENANCE**

23.G.1 To ensure the Recycled Water system ways remains in compliance, the Customer shall begin a preventative maintenance program to include, but not limited to, the following:

23.G.1.(a) Regular inspections shall be conducted by the Customer of the entire Recycled Water system including sprinkler heads, drip irrigation emitters, spray patterns, lakes, piping and valves, pumps, storage facilities, controllers, etc. Immediately correct any leaks, breaks, or discrepancies in license requirements.

23.G.1. (b) All warning signs, tags, stickers, and above grade pipe markings shall be checked for their proper placement and legibility. Replace damaged, unreadable or missing signs, tags, stickers, and pipe markings.

23.G.1.(c) Special attention should be given to spray patterns to eliminate Ponding, Runoff and Windblown Spray conditions. If runoff is noted, affected areas should be indicated on a sketch and the volume should be estimated. If unauthorized Ponding is detected, evidence of mosquitoes breeding within the Ponding should be noted and immediately eliminated.

23.G.1.(d) Establish and maintain an accurate record keeping system of all inspections, modifications and repair work.

23.G.1.(e) Broken sprinkler heads, faulty spray patterns, leaking pipes or valves, or any other noted condition which violates the use requirements shall be repaired immediately after the malfunction or condition becomes apparent.

23.H <u>ANNUAL SELF-INSPECTIONS AND REPORTS</u>

23.H.1 **Standard On-Site (Land) Observation Report.** The State RWQCB requires that the Recycled Water Customers in the Program conduct a standard observation inspection at least once a year at a time when the Recycled Water system is in use. In general, the standard observations correlate with the preventative maintenance self-inspections. The Customer must submit the results of the observations along with a description of any corrective actions taken in a written report to the Program (see *Sample Forms*). The schedule and deadlines for submittal of this report is indicated in the Recycled Water Use License. The seven items for inspection are as follows:

23.H.1.(a) Is there evidence of Runoff of Recycled Water from the site? Show affected area on a sketch and estimate volume.

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

23.H.1.(b) Is there an odor of wastewater origin at the irrigation site? If yes, indicate apparent source, characterization, direction of travel, and any Public use areas or Off-Site facilities affected by the odors.

23.H.1.(c) Is there evidence of Ponding Recycled Water, and/or evidence of mosquitoes breeding within the irrigation area due to ponded water?

23.H.1.(d) Are warning signs, tags, stickers, and above ground pipe markings properly posted to inform the Public that irrigation water is Recycled Water, which is not suitable for drinking?

23.H.1.(e) Is there evidence of leaks or breaks in the irrigation system piping or tubing?

23.H.1.(f) Is there evidence of broken or otherwise faulty drip irrigation system emitters or spray irrigation sprinklers?

23.H.1.(g) What corrective actions are being taken to correct any problems noted above?

23.H.2 **Off-Season Inspection Report.** The State RWQCB also requires that the Program Customers conduct a thorough inspection of all irrigation lines, sprinklers, and drip system emitters at least once a year during the dormant season. The findings of this inspection, along with any significant repairs or modifications must be submitted in a report to the Program (see *Sample Forms*). The schedule and deadlines for submittal of this report are indicated in the Recycled Water Use License.

23.I **PERIODIC PROGRAM INSPECTIONS**

23.I.1 The State RWQCB also requires that the Program conduct periodic inspections of Customer Recycled Water use sites. These inspections shall include, at a minimum, the visual inspection of all Backflow Prevention Devices, pump rooms, exposed piping, valves, pressure reducing stations, Points of Connection, sprinklers, drip system emitters, controllers, lakes, storage facilities, signs, labeling, tags, etc. The Customer Supervisor’s maintenance records shall be inspected to review all maintenance since the last inspection. The Program, the Local Authority, and RWQCB reserve the right to make unannounced inspections of the facility during reasonable hours of operation.

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

23.I.2 Upon completion of the inspection, a report form will be signed and dated by both the Customer Supervisor and the Program Inspector. The original shall be maintained by the Program with copies to the Customer Supervisor, the City, the Water Utility and any required regulatory agency.

23.I.3 Should a Cross-Connection be discovered during any inspection by the Customer or an outside Inspector, the **Emergency Cross-Connection Response Plan** shall be immediately invoked by the Customer Supervisor.

23.J **MODIFICATIONS**

23.J.1 No modifications shall be made by the Customer to any Recycled Water system without the prior approval of the Program. This includes modifications to the approved plans, or to an operational system. Detailed plans of any modifications must be submitted to the Program and the modifications inspected by the Program before being completed.

23.J.2 Emergency modifications or repairs can be made by the Customer to the system without the prior approval of the Program to prevent contamination, damage or a Public health hazard. As soon as possible after the modification but not to exceed three days, the Customer must notify the Program of the emergency modifications and file a written report.

23.K **PERIODIC CROSS-CONNECTION TESTING**

23.K.1 At dual-plumbed use sites (sites where the Recycled Water is used within a building in conjunction with a Potable Water system), the Customer shall be responsible for conducting a periodic Cross-Connection test as required in the Recycled Water Use License unless visual inspections reveal a requirement for more frequent testing. Generally the periodic Cross-Connection test for a dual-plumbed use site is required once every four years. This test shall be done by an AWWA-certified Cross-Connection specialist. The Program must be notified at least 48 hours in advance of the test so that a Program representative can be present. The Customer Supervisor must be present at the test. A sample Test Notification Form is located in *Sample Forms.* The following are general guidelines for periodic cross-testing and may be modified with the approval of the Program.

23.K.2 **Periodic Cross-Connection Test Procedures** Cross-connection tests shall be performed as specified in the UPC Appendix J 8 (2) and J 8 (3), with the exception that intermittent piping will not be activated and pressurized as specified in Appendix J 8 (2)(vi), and that the required pressurization time will be one (1) hour or as otherwise specified by the Cross-Connection specialist.

23.L **SYSTEM NOT IN COMPLIANCE**

If at any time the Recycled Water system is found to be out of compliance, the Program shall issue an Order specifying the corrections required to bring the system into compliance. A site inspection shall be scheduled after a reasonable period of time to ensure compliance with the Order. If it is known or suspected that a Backflow incident or contamination has occurred, then the *Emergency Cross-Connection Response Plan* shall be invoked.

23.M **NOTIFICATION**

It is the responsibility of the Customer Supervisor to notify the Program of any failure or Cross-Connection in said Recycled Water or potable water system, whether or not he/she believes a Violation has occurred. It is also the responsibility of the Customer Supervisor to notify the Program of any violation that might occur because of any action the Customer personnel might take during the operation of said Recycled Water or Potable Water systems. If there are any doubts whether a Violation has occurred, it is the responsibility of the Customer Supervisor to report each occurrence to the Program so a decision can be made.

23.N **EMERGENCY PROCEDURE**

23.N.1 In case of a major earthquake, flood, fire, tornado, structural failure, or other incident which could likely damage the Recycled or Potable Water systems, the Customer Supervisor should inspect the domestic and Recycled Water systems for damage, as soon as, it is safe to do so. If either system appears damaged, the domestic or Recycled Water system with damage should be shut off at their Point of Connection. If the Customer Supervisor cannot inspect the site and damage is expected, then both water systems should be shut off at their points of connection. The Supervisor should immediately contact the Program for further instruction.

23.N.2 **Emergency Modifications.** Emergency modifications or repairs can be made by the Customer to said system without the prior approval of the Program to prevent contamination, damage or a Public health hazard. As soon as possible after the modification but not more than three days after the modification, the Customer shall notify the Program of the emergency modifications and file a written description of action taken.

23.N.3 **Unauthorized Discharge.** It is the responsibility of the Customer to report to the City all system failures that result in an unauthorized discharge of Recycled Water. An immediate oral report is required at which time the City will specify if a written report is required. The Customer must make every effort to contain the unauthorized discharge prior to discharge to the storm drains. Contact the Program for field review and disposal instructions.

23.N.4 **Contamination of Drinking Water.** In case of contamination of the Potable Water system due to a Cross-Connection on the Customer's Premises, the Program and State DHS shall be immediately notified by Customer. The Customer is to immediately invoke the *Emergency Cross-Connection Response Plan*.

23.O EMERGENCY CROSS-CONNECTION RESPONSE PLAN

In the event that a Backflow incident or Cross-Connection is suspected or occurs, the following procedures shall be implemented immediately.

23.O.1 Notify the Water Utility and the State DHS by phone. This notification is to be followed by written notice within 24 hours. The written notice is to include an explanation of the nature of the Cross-Connection, date and time discovered, and the steps taken to mitigate the Cross-Connection(s).

23.O.2 Keep the Potable Water system pressurized and post "Do Not Drink" signs at all Potable Water fixtures and outlets.

23.O.3 Immediately shut down the Recycled Water supply to the facility at the meter.

23.O.4 Provide bottled water for employees until the Potable Water system is deemed safe to drink.

23.O.5 Collect water samples from the Potable Water system and perform a 24-hour bacteriological analysis. Water samples should be collected from the closest acceptable point to the Cross-Connection. The Water Utility may supply the appropriate sample bottles, obtain the samples, and arrange for laboratory analysis. See the *Water Utility Supplementary Guidelines* for additional information.

23.O.6 Identify the cause and location of Backflow and eliminate the Cross-Connection(s).

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

23.O.7 Conduct a Cross-Connection test as outlined in Section 22.E-K to verify that all Cross-Connections were eliminated.

23.O.8 Obtain approval from the Program and the State DHS before bringing the Recycled Water system back into service.

23.O.9 If the bacteriological analysis conducted in Step 5 is positive, chlorinate the Potable Water system maintaining a chlorine residual of at least 50 mg/l for 24 hours. Otherwise proceed to Step 11.

23.O.10 Flush the Potable Water system after 24 hours and perform standard bacteriological analysis.

23.O.11 If the results from Step 10 are acceptable, proceed to Step 12. Otherwise, repeat Steps 9-10.

23.O.12 Obtain final approval from the Program and the State DHS before removing signs.

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

LOCAL CONTACTS

Site:____
____
____

Location:____
____
____
____
____
____

Customer Supervisor:____

Work Phone:____

Title:_____ ____

Home Phone:____

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

CROSS-CONNECTION TEST NOTIFICATION FORM

(Sent by the Program)

Test Date:

Test Time:

Site Name:

Site Address:

CITY OF SANTA CLARA WATER UTILITY

Contact Person:

Phone:

Agencies Notified: California Department of Health Services, Drinking Water Field Operations Branch - Monterey District

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

CROSS-CONNECTION NOTIFICATION RSVP FORM

(Returned by Customer)

Site Address:

Test Date:

Agency/Company:

Representatives Attending:

(Please return to requesting party within 48 hours prior to scheduled test)

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

ANNUAL SELF-INSPECTION REPORT

Standard On-Site (Land) Observation Report

OR

Off-Season Inspection Report

Site:
Date:
Inspected by:
Title:
==

1. Is there evidence of runoff of recycled water from the site? Show affected area on a sketch and estimate volume:
2. Is there an odor of wastewater origin at the irrigation site? If yes, indicate apparent source, characterization, direction of travel, and any public use areas or off-site facilities affected by the odors.
3. Is there evidence of ponding of recycled water, and/or evidence of mosquitoes breeding within the irrigation area due to ponded water?
4. Are warning signs, tags, stickers, and above ground pipe markings properly posted to inform the public that irrigation is recycled water, which is not suitable for drinking?
5. Is there evidence of leaks or breaks in the irrigation system piping or tubing?
6. Is there evidence of broken or otherwise faulty drip irrigation system emitters or spray irrigation sprinklers?
7. What corrective actions are being taken to correct any problems noted above?

Signed: ____

Dated: ____

23. OPERATION AND MAINTENANCE OF SYSTEMS FOR USE OF RECYCLED WATER (Continued)

RECYCLED WATER USE LICENSE - CUSTOMER APPLICATION

Today's Date:			
Tract No./APN:			
Facility Name:			
Location or Brief Legal Description:			
Mailing Address:			
Type of Development:			
Expected date to commence recycled Water Service (Month/Year)			
Owner:		Proposed Customer Supervisor:	
Address:		Address:	
City:		City:	
State:	Zip:	State:	Zip:
Phone: (___)		Work Phone (___)	
Contact:		Home Phone (___)	
		Alternate:	
Estimated Water Requirements	Acres	Average (AF/YR)	Peak Demand (GPM)
Landscape Irrigation:			
Park:			
Open Space:			
School:			
Industrial Use:			
Athletic Field:			
Brief description of use(s):			
Brief description of proposed Customer Supervisor's current responsibilities and familiarity with the future recycled water system:			

This is a new retrofitted system.
For retrofitted systems: Water Utility: CITY OF SANTA CLARA
Account Number: ___________________________
On-Site pumping **is not** required.
Is the potable system designed to operate as back-up: Yes No

24. WATER CONSERVATION IN LANDSCAPING

24.A **PURPOSE**

The purpose of these Rules and Regulations is to promote efficient water use in landscaping by promoting use of region-appropriate plants that require minimal supplemental irrigation, and by establishing standards for irrigation efficiency. Irrigation efficiencies are accomplished through proper landscape design, installation and management techniques appropriate to Santa Clara's growing conditions. These Rules and Regulations implement the California Water Conservation in Landscaping Act, Government Code Section 65591 et. seq.

24.B **APPLICABILITY**

24.B.1 Except as provided in Subsection 24.B.2. below, these Rules and Regulations shall apply to:

24.B.1.(a) New construction projects with an aggregate landscape area equal to or greater than 500 square feet requiring a building or landscape permit, plan check, or design review

24.B.1.(b) Rehabilitated landscape projects with an aggregate landscape area equal to or greater than 2,500 square feet requiring a building or landscape permit, plan check, or design review

24.B.1.(c) Existing landscapes limited to Sections 493, 493.1, 493.2 in Division 2, Title 23 of the California Code of Regulations; all other existing landscapes shall only be subject to the provisions for existing landscapes provided for in section 24.O

24.B.1.(c) New and rehabilitated cemeteries, are limited to sections 24.I, 24.L, and 24.O of these Rules and Regulations

24.B.2 Any project with an aggregate landscape area of 2,500 square feet or less may comply with the performance requirements of this ordinance or conform to the prescriptive measures contained in Appendix D.

24.B.3 These Rules and Regulations shall not apply to:

24.B.3.(a) New construction with irrigated landscape areas less than 500 square feet, rehabilitated landscapes with irrigated landscape areas less than 2,500 square feet, or landscapes that do not require a building or landscape permit, plan check or design review, or new or expanded water service;

24.B.3.(b) Landscapes, or portions of landscapes, that are only irrigated for an establishment period;

24.B.3.(c) Registered local, state or federal historical sites;

24.B.3.(d) Mine reclamation projects that do not require a permanent irrigation system;

24.B.3.(e) Any ecological restoration project that does not require a permanent irrigation system;

24.B.3.(f) Community gardens or plant collections, as part of botanical gardens and arboretums open to the public;

24.B.3.(g) Any commercial cultivation or agricultural products, including by not limited to products of farms, orchards, production nurseries and forests;

24.B.3.(h) Any project that uses, primarily, Recycled Water for irrigation purposes;

24.C **DEFINITIONS**

The terms used in this Section of these Rules and Regulations have the meaning set forth below:

Applied Water: The portion of water supplied by the irrigation system to the landscape.

Automatic (Irrigation) Controller: An automatic mechanical or solid-state timing device, capable of remotely controlling valve stations that operate an irrigation system. Automatic irrigation controllers schedule irrigation events using evapotranspirtion or soil moisture data to set days and length of time of irrigation.

Backflow Prevention Device: A City-approved device that prevents pollution or contamination of the water supply due to the reserve flow of water into the City's water distribution system.

Certificate of Completion: The document required under Section 492.9

Certified Irrigation Designer: A person certified to design irrigation systems by an accredited academic institution, a professional trade organization, or other program such as the U.S. Environmental Protection Agency's WaterSense irrigation designer certification program, or the Irrigation Association's Certified Irrigation Designer program.

Certified Landscape Irrigation Auditor: A person certified to perform landscape irrigation audits by an accredited academic institution, a professional trade organization or other program such as the US Environmental Protection Agency's WasterSense irrigation auditor certification program and Irrigation Association's Certified Landscape Irrigation Auditor Program.

Certified Professional: A certified irrigation designer, certified landscape irrigation auditor, licensed landscape architect, licensed landscape contractor, licensed professional engineer, or any other person authorized by the State of California to design a landscape, an irrigation system or authorized to complete a water budget.

Check Valve or Anti-Drain Valve: A valve located under a sprinkler head, or other location in the irrigation system, to hold water in the system to prevent drainage from sprinkler heads when the sprinkler is off.

Common Interest Developments: Community apartment projects, condominium projects, planned developments, and stock cooperatives per Civil Code Section 4000 et seq.

Compost: The safe and stable product of controlled biologic decomposition of organic materials that is beneficial to plant growth.

Conversion Factor (0.62): A number that converts the maximum applied water allowance from acre-inches per acre per year to gallons per square foot per year. The conversion factor is calculated as follows:

(325,829 gallons/43,560 sq. ft./12 inches = 0.62)
325,829 gallons = 1 acre-foot
43,560 square feet = 1 acre
12 inches = 1 foot

To convert gallons per year to 100 cubic feet per year, the City's billing unit for water, divide gallons per year by 748 (748 gallons = 100 cubic feet).

Distribution Uniformity: The measure of the uniformity of irrigation water over a defined area.

Drip Irrigation: any non-spray low volume irrigation system utilizing emission devices with a flow rate measures in gallons per hour. Low volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

Ecological Restoration Project: A project where the site is intentionally altered to establish a defined, indigenous, historic ecosystem.

Effective Precipitation (Eppt) or Usable Rainfall: The portion of total precipitation that is available for plants. Precipitation is not a reliable source of water but can contribute to some degree toward the water needs of the landscape. For the purpose of this document, "effective precipitation" is twenty-five percent (25%) of local annual mean precipitation.

Emitters: Drip irrigation fittings that deliver water slowly from the system to the soil.

Established Landscape: The point at which plants in the landscape have developed roots into the soil adjacent to the root ball.

Establishment Period: The first year after installing the plant in the landscape.

Estimated Applied Water Use: The portion of the Estimated Total Water Use that is derived from applied water. The Estimated Applied Water Use shall not exceed the Maximum Applied Water allowance. The Estimated Applied Water Use may be the sum of the water recommended through the irrigation schedule as referenced herein.

Estimated Total Water Use (ETWU): The annual total amount of water estimated to be needed to keep the plants in the landscaped area healthy. It is based upon such factors as the local evapotranspiration (ET) rate, the size of the landscaped area, the types of plants, and the efficiency of the irrigation system, as described herein.

Evapotranspiration Adjustment Factor (ETAF): A factor of 0.55 for residential areas and 0.45 for non-residential areas, that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape. The ETAF for new and existing (non-rehabilitated) Special Landscape Areas shall not exceed 1.0. The ETAF for existing non-rehabilitated landscapes is 0.8.

A combined plant mix with a site-wide average of 0.5 is the basis of the plant factor portion of this calculation. The irrigation efficiency for the purpose of the ET Adjustment Factor is 0.71.

Evapotranspiration Rate: A quantity of water evaporated from adjacent soil and other surfaces and transpired by plants during a specific time.

Flow Rate: The rate at which water flows through the pipes, valves and emission devices. (gallons per minute, cubic feet per second, gallon per hour).

Flow Sensor: An inline device installed at the supply point of the irrigation system that produces a repeatable signal proportional to flow rate. Flow sensors must be connected to an automatic irrigation controller, or flow monitor capable of receiving flow signals and operating master valves. This combination flow sensor/controller may also function as a landscape water meter or submeter.

Friable: A soil condition that is easily crumbled or loosely compacted down to a minimum depth per planting material requirements, whereby the root structure of newly planted material will be allowed to spread unimpeded.

Fuel Modification Plan Guideline: Guidelines from a local fire authority to assist residents and businesses that are developing land or building structures in a fire hazard severity zone.

Graywater: Untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. "Graywater" includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers. Health and Safety Code Section 17922.12.

Hardscape: Any constructed feature in a landscape built of concrete, stone, wood, or other such pervious or non-pervious durable material. Includes, but is not limited to, patios, walkways, and retaining walls.

Hydrozone: A portion of the landscaped area having plants with similar water needs that are served by a valve or set of valves with the same schedule. A Hydrozone may be irrigated or non-irrigated. For example, a naturalized area planted with native vegetation that will not need supplemental irrigation once established is a non-irrigated Hydrozone.

Infiltration Rate: The rate of water entry into the soil expressed as a depth of water per unit of time (e.g. inches per hour).

Invasive Plant Species: Species of plants not historically found in California that spread outside cultivated areas and can damage environmental or economic resources. Invasive species may be regulated by agricultural agencies as noxious species. “Noxious weeds” means any weed designated by the Weed Control Regulations in the Weed Control Act and identified on a Regional District noxious weed control list. List of invasive plants are maintained at the California Invasive Plant Inventory and USDA invasive and noxious weeds database.

Irrigation Audit: An in-depth evaluation of the performance of an irrigation system conducted by a Certified Landscape Irrigation Auditor. An irrigation audit includes, but is not limited to: inspection, system tune-up, system test with distribution uniformity or emission uniformity, reporting overspray or runoff that causes overland flow, and preparation of an irrigation schedule. The audit must be conducted in a manner consistent with the Irrigation Association’s Landscape Irrigation Auditor Certification program or other U.S. Environmental Protection Agency “Watersense” labeled auditing program

Irrigation Efficiency (IE): The measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. The minimum irrigation efficiency for purposes of this ordinance is 0.71. Greater Irrigation Efficiency can be expected from well-designed and well-maintained systems.

Irrigation Survey: An evaluation of an irrigation system that is less detailed than an irrigation audit. An irrigation survey includes, but is not limited to: inspection, system test, and written recommendations to improve performance of the irrigation system.

Irrigation Water Use Analysis: An analysis of water use data based on meter readings and billing data.

Landscape Architect: A person who holds a license to practice landscape architecture in California as defined by the California Business and Professions Code, Section 5615.

Landscape Area: The entire parcel less the building footprint, driveways, sidewalks, gravel or stone walks, non-irrigated portions of the parking lot, hardscape such as decks and patios, and other pervious or nonpervious hardscapes. Water features are included in the calculation of the landscaped area. Areas dedicated to edible plants such as orchards or vegetable gardens are not included. Landscape area does not include other non-irrigated areas designated for non-development (e.g., open spaces and existing wildland vegetation).

Landscape Contractor: A person licensed by the State of California to construct, maintain, repair, install, or subcontract the development of landscape systems.

Landscape Irrigation Audit: A process to perform site inspection, evaluate irrigation systems, and develop efficient irrigation schedules.

Landscape Installation Report: The report, per section 24.K of these rules and regulations, documenting the landscape installation assessment for new and rehabilitated landscape and irrigation system(s) have been installed.

Landscape Project: An undertaking of landscape design and installation on a particular area of land. A landscape project may be associated with an individual lot, a building project, or a multi-phased development. It may also be a larger, comprehensive landscape scheme that is not coupled with an individual building project.

Lateral Line: The water delivery pipeline that supplies water from the water source to the valve or outlet.

Local Mean Precipitation: The State Department of Water Resources' 20-year historical rainfall data.

Local Water Purveyor: Any entity, including a public agency, city, county, or private water company that provides retail water service

Low-volume Irrigation: The application of irrigation water through a system of tubing or lateral lines and low-volume emitters such as drip and bubblers. Certain rotary emitters designed for highly efficient water distribution, and situated to irrigate low water use plants, may also be included in this definition at the discretion of the City.

Low Water Use Plant: A plant species whose demonstrated water needs are compatible with local climate and soil conditions such that regular supplemental irrigation is not required to sustain the plant after it has become established. Any species classified as “very low water use” and “low water use” by WUCOLS, having a regionally adjusted plant factor of 0.0 through 0.3, shall be categorically deemed a low water use plant.

Main Line: The pressurized pipeline that delivers water from the water source to the valve or outlet.

Master Shut-off-Valve: An automatic valve installed at the irrigation supply point which controls water flow into the irrigation system. When this valve is closed water will not be supplied to the irrigation system. A master valve will greatly reduce any water loss due to a leaky station valve.

Maximum Applied Water Allowance (MAWA): For design purposes, the upper limit of annual applied water for the established landscaped area as specified in Section 24I., Water Budget Calculation. It is based upon the area’s reference Evapotranspiration rate, the ET Adjustment Factor, and the size of the landscaped area. The Estimated Applied Water Use shall not exceed the Maximum Applied Water allowance (gallons per year).

Median: Area between opposing lanes of traffic that may be unplanted or planted with trees, shrubs, perennials, and ornamental grasses.

Microclimate: The climate of a small, specific area that may contrast with the climate of the overall landscape area due to factors such as wind, sun exposure, plant density, or proximity to reflective surfaces.

Mined Reclamation Projects: Any surface mining operation with a reclamation plan approved in accordance with the Surface Mining and Reclamation Act of 1975.

Mulch: Any material such as leaves, bark, straw, or other materials left loose and applied to the soil surface to reduce evaporation, suppressing weeds, moderating soil temperature and preventing soil erosion.

Native Plant: A plant indigenous to a specific area of consideration. For the purposes of these Rules and Regulations division, the term will refer to plants indigenous to the costal ranges of Centeral and Northern California, and more specifically to such plants that are suited to the ecology of the present or historic natural community of the project's vicinity.

New Construction: For the purposes of this ordinance, a new building with a landscape or other new landscape, such as a park, playground, or greenbelt without an associated building.

Non-Residential Landscape: Landscapes in commercial, institutional, industrial and public settings that may have areas designated for recreation or public assembly. It also includes portions of common areas of common interest developments with designated recreational areas and multifamily homes where landscaping is managed by a homeowners association or other common interest development.

No-Water Using Plant: A plant species with water needs that are compatible with local climate and soil conditions such that regular supplemental irrigation is not required to sustain the plant after it has become established.

Operating Pressure: The pressure at which a system of sprinklers is designed to operate, usually indicated at base of sprinkler.

Overhead sprinkler irrigation system: A system that delivers water through the air (e.g., spray heads and rotors).

Overspray: The water which is delivered beyond the landscape area, wetting pavements, walks, structures, or other non-landscaped areas.

Permit: An authorizing document issued by local agencies for new construction or rehabilitated landscapes.

Pervious: Any surface or material that allows the passage of water through the material and into the underlying soil.

Plant Factor: A factor that, when multiplied by reference Evapotranspiration, estimates the amount of water used by plants. For purposes of these Rules and Regulations, the average plant factor of very low water use plants is 0 to 0.1, the plant factor range for low water-using plants ranges from 0.1 to 0.3; for average water-using plants the range is 0.4 to 0.6, and for high water-using plants the range is 0.7 to 1.0. Plant Factors are based on the Department of Water Resources 2000 publication "Water Use Classification of Landscape Species" (WUCOLS).

Project Applicant: The individual or entity submitting a Landscape Documentation Package required to request a permit, plan check, or design review from the local agency. A project applicant may be the property owner or his or her designee

Precipitation Rate: means the rate of application of water measured in inches per hour.

Rain Sensing Device: A system which automatically shuts off the irrigation system when it rains.

Record Drawing or As-Builts: A set of reproducible drawings which show significant changes in the work made during construction and which are usually based on drawings marked up in the field and other data furnished by the contractor.

Recreational Areas: Areas of active play or recreation, such as sports fields, school yards, picnic grounds, or other areas with intense foot traffic.

Recycled Water or Reclaimed Water: Treated or recycled wastewater of a quality suitable for non-potable uses, such as landscape irrigation and water features; not intended for human consumption.

Reference Evapotranspiration or **ETo**: A standard measurement of environmental parameters, which affect the water use of plants. ETo is given in inches per day, month, or year (as represented in Section 24.I Water Budget Calculation) and is an estimate of the Evapotranspiration of a large field of four to seven inch tall, cool-season grass that is well watered. Reference Evapotranspiration is the Maximum Applied Water Allowance so that regional differences in climate can be accommodated.

Regional Water Efficient Landscape Ordinance: A local Ordinance adopted by two or more local agencies, water suppliers and other stakeholders for implementing a consistent set of landscape provisions throughout a geographical region. Regional ordinances are strongly encouraged to provide a consistent framework for the landscape industry and applicants to adhere to.

Rehabilitated Landscape: Any re-landscaping project that requires a permit.

Residential Landscape: Landscapes surrounding single family homes or multifamily homes where landscapes are managed by individual homeowners.

Runoff: Water that is not absorbed by the soil or landscape to which it is applied and flows from the landscape area. For example, runoff may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or when there is a severe slope.

Soil Moisture Sensing Device: A device that measures the amount of water in the soil. The device may also initiate or suspend irrigation.

Soil Texture: The classification of soil based on the percentage of sand, silt, and clay in the soil.

Special Landscape Area (SLA): An area of the landscape dedicated solely to edible plants, areas irrigated with recycled water, water features using recycled water and areas dedicated to active play or high-volume foot traffic such as parks, cemeteries, sports fields, golf courses, and where turf provides a playing surface.

Sprinkler Head or Spray Head: A device which delivers water through a nozzle.

Static Water Pressure: The pipeline or municipal water supply pressure when water is not flowing.

Station: An area served by one valve or by a set of valves that operate simultaneously.

Swimming Pool: Any structure intended for swimming, recreational bathing or wading that contains water over 24 inches (610 mm) deep. This includes in-ground, above ground, and on-ground pools; hot tubs; spa and fixed in place wading pools

Submeter: A metering device to measure water applied to the landscape that is installed after the primary utility water meter.

Turf: A ground cover surface of mowed grass. Some examples of turf include annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and Tall fescue are cool-season grasses. Bermudagrass, kikuyugrass, Seashore Paspalum, St. Augustinegrass, Zoysiagrass, and Buffalo grass are warm-season grasses.

Valve: A device used to control the flow of water in the irrigation system.

Water Conserving Plant Species: A plant species identified as having a very low or low plant factor.

Water Feature: A design element where open water performs an aesthetic or recreational function. Water features include ponds, lakes, waterfalls, fountains, artificial streams, spas, and swimming pools (where water is artificially supplied). The surface area of water features is included in the high water use hydrozone of the landscape area. Constructed wetlands used for on-site wastewater treatment or stormwater best management practices that are not irrigated and used solely for water treatment or stormwater retention are not water features and, therefore, are not subject to the water budget calculation.

Watering Window: The Time of day irrigation is allowed.
Wet Surface Area: The surface area of that portion of a water feature that functions to contain water, such as the water surface of a swimming pool, spa or garden pond. For a fountain or other feature with flowing water, wet surface area shall be measured as a two dimensional plane bounded by the perimeter of the area where water has been designed to flow.

WUCOLS: The current version of the Water Use Classification of Landscape Species current edition published by the University of California Cooperative Extension and the Department of Water Resources, available at: http://ucanr.edu/sites/WUCOLS/Download_WUCOLS_IV_List/

24.D **WATER-EFFICIENT DESIGN CHECKLIST**

24.D.1 A water-efficient design checklist shall serve as a preliminary summation of select landscape components to determine whether a proposed landscape is generally consistent with the water efficiency goals of these rules and regulations.

24.D.1.(a) All Landscape Projects identified in Santa Clara City Code Section 18.88, Landscaping Permit, shall include a completed water efficient design checklist. Building permits for new dwellings shall also include a completed water efficient design checklist.

24.D.1.(b) The checklist shall be completed by a property owner or certified landscape professional, and shall be submitted to the Planning Division along with the associated Planning Application.

24.E **COMPONENTS OF A LANDSCAPE PROJECT SUBMITTAL**

24.E.1 Landscape project submittal consists of the following items.

24.E.1.(a) Water-Efficient Design Checklist (section 24.D).

24.E.1.(b) Landscape and Irrigation Design Plans which are required for landscape projects greater than 500 square feet (see section 24.H).

24.E.1.(c) Landscape and Irrigation Maintenance Schedule (section 24.L).

24.E.1.(d) Landscape Installation Report (section 24.K). Shall be submitted following installation of landscaping materials and irrigation hardware.

24.E.1.(e) Water Budget Calculations (Section 24.I). Not required if plant type restriction option (section 24.F.1.(a)) is utilized.

24.E.1.(f) Soil Analysis Report (section 24.J). Only required when requested by City as a condition of permit approval.

24.E.1.(g) Landscape Audit Report (Section 24.O)

24.E.1.(h) Grading Design Plan

24.E.1.(i) Landscape Permit Fee is required when submitting a Landscape Permit.

24.E.1.(j) Application with Project information, Date, Project applicant name, telephone, and mailing address, project address, project type, total landscape area in square feet, water supply type, checklist of all documents in the Landscape Documentation Package, project contacts to include in contact information for the project applicant and property owner, and Applicant signature with the statement, "I agree to comply with the requirements of the water efficient landscape ordinance and submit a complete Landscape Documentation Package"

24.E.2 The City shall:

24.E.2.(a) Provide the project applicant with the Landscape Project Application and Documentation Package requirements

24.E.2.(b) Provide procedures for permits, plan checks, design reviews, or new or expanded water service;

24.E.2.(c) Review the Landscape Project Application;

24.E.2.(d) Approve or deny the project applicant's Landscape Project Application submittal;

24.E.2.(e) Issue or approve a permit, plan check or design review that complies with the approved Landscape Project Application or approve a new or expanded water service application that complies with the approved Landscape Project Application;

24.E.3 The Project Applicant shall:

24.E.3.(a) Prior to construction, submit all portions of the Landscape Project Application, except the Landscape Audit Report

24.E.3(b) Upon approval of the Landscape Project Application by the City, (1) receive a permit or approval of the plan check or design review and record the date of the permit in the Certificate of Completion; and (2); submit a copy of the approved Landscape Documentation Package along with the record drawings, and other information to the property owner or his/her designee

24.F **DEMONSTRATION OF LANDSCAPE WATER EFFICIENCY**

24.F.1 Applicants of projects subject to these rules and regulations may choose one of the following two options to demonstrate that a landscape proposal meets water-efficiency goals.

24.F.1.(a) Plant Type restriction option: The plan, checklist and any accompanying documentation must demonstrate all of the following as a means of achieving water efficiency.

24.F.1.(a)(i) The total turf area shall not exceed 25% of the landscape area, or 1,250 square feet, whichever is lesser in area.

24.F.1.(a)(ii) Turf or high-water using plants are prohibited outside of the allowed turf area.

24.F.1.(a)(iii) Within non-turf areas, at least 80% of the plants shall be native, low water-using or no-water using.

24.F.1.(a)(iv) All other applicable design criteria of Section 24.G, Water-Efficient Design Elements, shall be met.

24.F.1.(b) Water Budget option: Project applicants may elect to prepare a water budget calculation, per the provisions of Section 24.I, Water Efficient Design Checklist, as a means of demonstrating water efficiency.

24.G **<u>WATER EFFICIENT DESIGN ELEMENTS</u>**

24.G.1 The elements of a landscape project shall be designed to achieve water efficiency consistent with the intent of these Rules and Regulations.

24.G.1.(a) Plant Material:

24.G.1.(a)(i) Plants shall be chosen and arranged appropriately based upon the site's climate, soil characteristics, sun exposure, wildfire susceptibility, topographical conditions and other factors. Plants with similar water needs shall be grouped within hydrozones. Methods to achieve water efficiency shall include one or more of the following: use the Sunset Western Climate Zone System which takes into account temperature, humidity, elevation, terrain, latitude, and varying degrees of continental and marine influence on local climate; recognize the horticultural attributes of plants to minimize damage to property or infrastructure, allow for adequate soil volume for healthy root growth; consider the solar orientation for plant placement to maximize summer share and winter solar gain.

24.G.1.(a)(ii) The turf area shall not be more than 25% of the landscape area, or 1,250 square feet, whichever is lesser in area, unless the project applicant develops a water budget per Section 24.I Water Budget Calculation.

24.G.1.(a)(iii) Turf shall not be planted on slopes greater than 25% where the toe of the slope is adjacent to an impermeable hardscape and where 25% means 1 foot of vertical elevation change for every 4 feet of horizontal length (rise divided by run x 100 = slope percent)

24.G.1.(a)(iv) No portions of turf areas shall be less than eight feet wide.

24.G.1.(a)(v) At least 80% of the plants in non-turf landscape areas shall be native plants, or low water using plants, unless the project applicant develops a water budget and the ETWU of the landscaped area does not exceed the MAWA.

24.G.1.(a)(vi) The horticultural attributes of plant species (e.g., mature plant size, invasive roots, structural attributes) shall be considered, in order to minimize the potential for damage to property or infrastructure (e.g., buildings, septic systems, sidewalks, power lines).

24.G.1.(a)(vii) Fire-prone plant materials and highly flammable mulches are strongly discouraged. In designated wildland urban interface areas, plants shall be selected, arranged and maintained to provide defensible space for wildfire protection, in conformance with Public Resources Code Section 4291.

24.G.1.(a)(viii) Installation of invasive plant species shall be prohibited.

24.G.1.(a)(ix) Existing invasive plants and noxious weeds within or adjacent to the proposed landscape area shall be removed prior to installation, to minimize potential for spread into installation area.

24.G.1.(a)(x) The architectural guidelines, conditions, covenants or restrictions of a common interest development shall not supersede this division. For example, a common interest development may not prohibit low water use plants, or include conditions that have the effect of restricting the use of low water use plants.

24.G.1.(a)(xi) High water use plants, characterized by a plant factor of 0.7 to 1.0 are prohibited on street medians

24.G.1.(a)(xIi) Methods to achieve water efficiency shall include one or more of the following: Protection and preservation of native species and natural vegetation; selection of water-conserving plant, tree and turf species, especially local native plants; selection of plants based on local climate suitability, disease, and pest resistance; selection of trees based on applicable local tree ordinances or tree shading guidelines; size at maturity as appropriate for the planting area; and selection of plants from local and regional landscape program lists; and selection of plants from local Fuel Modification Plan Guidelines.

24.G.1.(b) Irrigation System: An irrigation system shall meet all of the requirements listed in this section and the manufacturers' recommendations. The irrigation system and its related components shall be planned and designed to allow for proper installation, management and maintenance. In addition:

24.G.1.(b)(i) The irrigation system shall be designed to prevent runoff, low head drainage, overspray, or other similar conditions.

24.G.1.(b)(ii) Irrigation systems shall be designed, maintained and managed to meet or exceed an average landscape irrigation efficiency of 70%.

24.G.1.(b)(iii) Low-volume irrigation shall be required in mulched areas, in areas with slope greater than 25%, or in any narrow or irregularly shaped areas that are less than ten (10) feet in width in any direction. Irrigation emitters within 24 inches of a non-permeable surface shall be either low-volume, or designed to preclude wasteful overspray and runoff.

24.G.1.(b)(iv) The irrigation hardware for each hydrozone shall include a separate valve. Where feasible, trees shall be placed on separate valves from shrubs, groundcovers, and other plant types.

24.G.1.(b)(v) Automatic irrigation controllers utilizing either evapotranspiration or soil moisture sensor data for irrigation scheduling are required.

24.G.1.(b)(vi) Sensors (rain, freeze, wind, etc.), either integral or auxiliary, that suspend or alter irrigation operation during unfavorable weather conditions shall be required on all irrigation systems.

24.G.1.(b)(vii) Whenever possible, landscape irrigation shall occur between the hours of 6:00 p.m. and 10:00 a.m., unless climatic conditions or unfavorable weather (e.g. high wind, extreme temperature) prevents it or otherwise renders irrigation unnecessary. Operation of the irrigation system outside the normal watering window is allowed for auditing and system maintenance.

24.G.1.(c) Soil, conditioning, and mulching:

24.G.1.(c)(i) At the time of installation, a minimum of eight (8) inches of non-compacted topsoil shall be available for water absorption and root growth in planted areas. The City may waive this requirement where a landscape professional has determined that practical limitations (e.g., slope, other geotechnical factors) necessitate a lesser soil depth that is viable for the chosen plant materials.

24.G.1.(c)(ii) Soil amendments, such as compost or fertilizer, shall be appropriately added according to the soil conditions at the project site and based on what is appropriate for the selected plants.

24.G.1.(c)(iii) A minimum three (3)-inch layer of mulch shall be applied on all exposed soil surfaces of planting areas, except in areas of direct seeding application (e.g. hydro-seed).

24.G.1.(c)(iv) Stabilizing mulching products shall be used on slopes that meet current engineering standards.

24.G.1.(d)(v) Organic mulch materials made from recycled or post-consumer shall take precedence over inorganic materials or virgin forest products unless recycled or post-consumer material is not locally available. Organic mulches are not required where prohibited by local Fuel Modification Plan Guidelines or other applicable local ordinance

24.G.1.(c)(v) Prior to planting of any materials, compacted soils shall be transformed to a friable condition. On engineered slopes, only amended planting holes need meet this requirement.

24.G.1.(d) Hydrozones:

24.G.1.(d)(i) Hydrozones shall group plant materials of similar water use, and shall generally demarcate areas of similar slope, sun exposure, soil, and other site conditions appropriate for the selected plants.

24.G.1.(d)(ii) The flow of water to each hydrozone shall be controlled by a separate valve.

24.G.1.(d)(iii) Sprinkler heads and other emission devices shall be selected based on what is appropriate for the plant type within that hydrozone.

24.G.1.(d)(iv) Within a hydrozone, low and moderate water use plants may be mixed, but all plants within that hydrozone shall be classified as moderate water use for MAWA calculations. High water use plants shall not be mixed with low or moderate water use plants.

24.G.1.(e) Water Features:

24.G.1.(e)(i) Recirculating water systems shall be used for water features.

24.G.1.(e)(ii) The wet surface area of a water feature shall be counted as an area of high water use plants for purposes of a water budget calculation, except as provided in 24.G.1.(e)(iii), below.

24.G.1.(e)(iii) The wet surface area of a pool or spa with a cover shall be counted as an area of medium water use plants for purposes of a water budget calculation.

24.G.1.(e)(iv) Pool and spa covers are required on any newly constructed pool or spa.

24.G.1.(e)(v) Recycled water shall be used for decorative water features where recycled water is made available, meets all applicable standards for those uses and is determined to be suitable and economically feasible.

24.H **LANDSCAPE AND IRRIGATION DESIGN PLANS**

24.H.1 Landscape and irrigation design plans are required of landscape projects larger than 500 square feet when associated with applications for [major project permit types, e.g., design review, grading permit, or use permit], and building permits for new dwellings. The landscape and irrigation design plan shall be prepared as follows:

24.H.1.(a) The landscape and irrigation design plans shall incorporate all applicable elements of Section 24.G Water-Efficient Design Elements.

24.H.1.(b) The landscape design portion shall be prepared by, and bear the signature of, a licensed landscape architect, licensed landscape contractor, or any other person authorized by the State of California to design a landscape.

24.H.1.(c) The irrigation design portion shall be prepared by, and bear the signature of, a licensed landscape architect, certified irrigation designer, licensed landscape contractor, or any other person authorized by the State of California to design an irrigation system.

24.H.1.(d) The landscape design portion of the landscape and irrigation design plan, at a minimum, shall:

24.H.1.(d)(i) Provide basic project information, such as applicant name, site address, total landscape area and turf area (square feet), irrigation water source (e.g. municipal, well, recycled), and project contacts.

24.H.1.(d)(ii) Identify, in tabular form, all plants to be installed as part of the project. The table shall include the following:

(1) Symbol (representing the plant on the plan).

(2) Common name.

(3) Botanical name.

(4) Container size.

(5) Quantity.

(6) Type (e.g. grass, forb, succulent, vine, shrub, tree).

(7) Water-efficient species identification. All "Native" and "Low Water Use" plant species (defined in section 24.C Definitions) shall be so labeled.

(8) Unique physical specifications of plants (e.g., bare-root, field-potted, multi-trunk), if applicable.

24.H.1.(d)(iii) The landscape and irrigation design plan shall include the following:

(1) General notes, planting notes, plant layout based on size at maturity, species, and symbol legend.

(2) Spacing of proposed plantings.

(3) Topography

(4) Trunk diameter of all existing trees whose trunk circumference is greater than 18.5 inches, measured 54 inches above grade.

(5) Existing features to remain, such as trees, fencing, hardscape, etc.

(6) Existing features to be removed.

(7) Identification of pertinent site factors such as sun exposure, microclimate, property lines, buildings, underground/above-ground utilities, existing drainage features, etc.

(8) Proposed grading. For earthwork exceeding 150 cubic yards, or for cuts or fills exceeding five vertical feet, a grading permit will be required.

(9) Seed mix, if applicable.

24.H.1.(d)(iv) Delineate and label each hydrozone; Designate the areas irrigated by each valve and assign a number to each valve. Use this valve number in the Hydrozone Information Table (see Appendix B Section A).

24.H.1.(d)(v) Identify each hydrozone as low water, moderate water, high water, or mixed (low/moderate) water use, as defined by WUCOLS;

24.H.1.(d)(vi) Identify special landscape areas;

24.H.1.(d)(vii) Identify type of mulch and application depth;

24.H.1.(d)(viii) Identify soil amendments, type and quantity;

24.H.1.(d)(ix)Identify type and wet surface area of water features;

24.H.1.(d)(x) Identify hardscapes (pervious and non-pervious); and

24.H.1.(d)(x) Contain the following statement: “I have complied with the criteria of the Water Service and Use Rules and Regulations for Water Conservation in Landscaping and applied them for the efficient use of water in the landscape design plan.”

24.H.1.(e) The design of the irrigation system shall conform to the hydrozones of the landscape design plan. The irrigation design portion of the landscape and irrigation design plan, at a minimum, shall contain:

24.H.1.(e)(i) Location, type and size of all components of the irrigation system, including controllers, main and lateral lines, valves, sprinkler heads, moisture sensing devices, rain switches, quick couplers, pressure regulators, and backflow prevention devices;

24.H.1.(e)(ii) Static water pressure at the point of connection to the public water supply;

24.H.1(e)(iii) Manual shut-off valves as close as possible to the point of connection of the water supply, to minimize water loss in case of an emergency or routine repair;

24.H.1(e)(iv) Landscape water meters shall be installed at all non-residential irrigated landscapes and residential irrigation landscapes of 5,000 square feet or larger.

24.H.1(e)(v) Flow sensors that detect high flow conditions created by system damage or malfunction (for non-residential landscapes and residential landscapes of 5,000 square feet or larger)

24.H.1.(e)(vi)Flow rate (gallons per minute), application rate (inches per hour), and design operating pressure (pressure per square inch) for each station;

24.H.1.(e)(vii) Master shut-off valves for all projects except landscapes that make use of technologies that allow for the individual control of sprinklers that are individually pressurized in a system equipped with low pressure shutdown features.

24.H.1.(e)(viii)Irrigation schedule;

24.H.1.(e)(ix)Location and size of separate water meters for landscape (if applicable); and,

24.H.1.(e)(x)The following statement: "I have complied with the criteria of the Water Service and Use Rules and Regulations for Water Conservation in Landscaping and applied them accordingly for the efficient use of water in the irrigation design plan."

24.H.1.(f) Grading. If the landscape project area will be graded, then, at a minimum, grading contours and quantities shall be shown on the landscape design plan. Grading shall meet all applicable requirements of the City. A geotechnical engineer should be consulted prior to the installation of landscaping materials and irrigation hardware on slopes greater than 50%, or in any areas where slope stability may be compromised.

24.H.1.(g) Storm Water Management. Storm water best management practices shall be incorporated as appropriate into the landscape installation, the details of which shall be shown on the landscape design plan. Practices that increase rainwater capture and retention are encouraged. Installation shall be subject to the City's National Pollutant Discharge

Elimination System (NPDES) storm water discharge permit requirements.

24.I **WATER BUDGET CALCULATION**

24.I.1. A Project applicant shall complete a water budget calculation for the landscape project as required per section 24.F Demonstration of Landscape Efficiency A water budget must be completed by a certified professional who is authorized by the State of California to complete a water budget. Water budget calculations shall adhere to the following requirements:

24.I.1.(a) The plant factor used shall be from WUCOLS. The plant factor ranges from 0.0 to 0.1 for very low water using plants, 0.1 to 0.3 for low water use plants, from 0.4 to 0.6 for moderate water use plants, and from 0.7 to 1.0 for high water use plants.

24.I.1.(b) The wet surface area of a water feature shall be counted as an area of high water using plants for purposes of a water budget calculation, except as provided in section 24.I.1(c), below.

24.I.1.(c) The wet surface area of a pool or spa with a cover shall be counted as an area of medium water using plants for purposes of a water budget calculation.

24.I.1.(d) Where low and moderate water use plants are be mixed within a single hydrozone, the entire hydrozone area shall be classified as moderate water use for purposes of a water budget calculation. All water features shall be included in the high water use hydrozone and temporarily irrigated areas shall be included in the flow water use hydrozone. High water use plants shall not be mixed with low or moderate water use plants.

24.I.1.(e) All special landscape areas shall be identified and their water use included in the water budget calculations.

24.I.1.(f) The reference evapotranspiration adjustment factor (ETAF) for special landscape areas shall not exceed 1.0. The ETAF for the remaining landscaped area shall not exceed 0.55 for residential areas and 0.45 for non-residential areas.

24.I.1.(g) Irrigation system efficiency shall be greater than or equal to 70%.

24.I.1.(h) Maximum Applied Water Allowance (MAWA) shall be calculated

using the equation below:
For Residential Areas:
MAWA = (ETo) (0.62) [(0.55 x LA) + (0.45 x SLA)]
For Non-Residential Areas:
MAWA = (ETo) (0.62) [(0.45 x LA) + (0.55 x SLA)]
Where:
MAWA = Maximum Applied Water Allowance (gallons per year)
ETo = Reference Evapotranspiration (inches per year)
0.62 = Conversion Factor (acre-inches to gallons)
0.55 = Reference Evapotranspiration Adjustment Factor for residential areas
0.45 = Reference Evapotranspiration Adjustment Factor for non-residential areas
LA = Landscape Area including SLA (square feet)
0.45 = Additional Water Allowance for SLA in residential areas
0.55 = Additional Water Allowance for SLA in non-residential areas
SLA = Special Landscape Area (square feet)

24.I.1.(i) A project applicant may consider effective precipitation (25% of annual precipitation) in tracking water use and may use the following equation to calculate the MAWA:
MAWA = (ETo - Eppt) (0.62) [(0.55 x LA) + (0.45 x SLA)] for residential areas
MAWA = (ETo - Eppt) (0.62) [(0.45 x LA) + (0.45 x SLA)] for non-residential areas

ETo values from the Reference Evapotranspiration Table in Appendix A shall be used in calculating the Maximum Applied Water Allowance (MAWA) and Estimated Total Water Use (ETWU)

24.I.1.(j) Estimated Total Water Use (ETWU) shall be calculated for each hydrozone using the equation below. The sum of the ETWU calculated for all hydrozones shall not exceed the MAWA.

$$ETWU = (ETo)(0.62)\left(\frac{PF\ x\ HA}{IE} + SLA\right)$$

Where:
ETWU = Estimated Total Water Use per year (gallons)
ETo = Reference Evapotranspiration (inches)
PF = Plant Factor from WUCOLS

HA = Hydrozone Area
[high, medium, and low water use areas] (square feet)
SLA = Special Landscape Area (square feet)
0.62 = Conversion Factor
IE = Irrigation Efficiency (minimum 0.70)

24.J **SOIL ANALYSIS**

24.J.1. In order to reduce runoff and encourage healthy plant growth, The City shall have discretion to require soil analysis as a condition of approval for any [major project permit types, e.g., grading permit, or use permit], where a landscape project submittal is required (Appendix E).

24.J.2 A soil analysis report shall document the various characteristics of the soil (e.g. texture, infiltration rate, pH, soluble salt content, percent organic matter, etc), and provide recommendations for amendments as appropriate to optimize the productivity and water-efficiency of the soil. Soil samples shall be submitted to a laboratory for analysis and recommendations. Sampling shall be conducted in accordance with laboratory protocol, including protocols regarding adequate sampling depth for the intended plants. The soil analysis report shall be made available to the professionals preparing the landscape and irrigation design plans in a timely manner either before or during the design process. A copy of the soils analysis report shall be submitted to the City as part of the landscape documentation package.

24.J.3 In projects with multiple landscape installations (i.e. product home developments) a soil sampling rate of 1in 7 lots or approximately 15% will satisfy this requirement. Large landscape projects shall sample at a rate equivalent to 1 in 7 lots.

24.J.4 The project applicant or his/her designee shall comply with one of the following:

24.J.4.(a) If significant mass grading is not planned, the soil analysis report shall be submitted to the local agency as part of the Landscape Documentation; or

24.J.4.(b) If significant mass grading is planned, the soil analysis report shall be submitted to the local agency as part of the Certificate of Completion

24.J.4.(c) The soil analysis report shall be made available, in a timely manner, to the professionals preparing the landscape design plans and irrigation design plans to make any necessary adjustments to the design plans.

24.J.4.(d) The project applicant, or his/her designee, shall submit documentation verifying implementation of soil analysis report recommendations to the local agency with the Certificate of Completion.

24.K. **LANDSCAPE INSTALLATION REPORT**

24.K.1. A Landscape installation assessment for new or rehabilitated landscapes shall be conducted by a certified landscape professional after the landscaping and irrigation system have been installed. The findings of the assessment shall be consolidated into a Landscape Installation Report.

24.K.1.(a) The Landscape Installation Report shall include, but is not limited to: inspection to confirm that the landscaping and irrigation system were installed as specified in the landscape and irrigation design plan, system tune-up, system test with distribution uniformity, reporting overspray or run off that causes overland flow, and preparation of an irrigation schedule.

24.K.1.(b) The Landscape Installation Report shall include the following statement: “The landscape and irrigation system has been installed as specified in the landscape and irrigation design plan and complies with the criteria of the Water Service Rules and Regulations for Water Conservation in Landscaping.”

24.K.1.(c) The City of Santa Clara shall administer ongoing programs that may include, but not be limited to, post-installation landscape inspection, irrigation water use analysis, irrigation audits, irrigation surveys and water budget calculations to evaluate compliance with the MAWA.

24.L **LANDSCAPE AND IRRIGATION MAINTENANCE**

24.L.1. Landscapes shall be maintained to ensure successful establishment following installation, and to ensure water use efficiency consistent with these Rules and Regulations. A maintenance schedule shall be established and submitted to the City either with the landscape application package, with the Landscape Installation Report, or any time before the landscape installation report is submitted. Maintenance contract documentation shall be provided to the City if so requested.

24.L.1.(a) Maintenance shall include, but not be limited to the following: routine inspection; pressure testing, adjustment and repair of the irrigation system; aerating and de-thatching turf areas; replenishing mulch; fertilizing; pruning; replanting of failed plants; weeding; pest control; and removing obstructions to emission devices.

24.L.1.(b) Failed plants shall be replaced with the same or functionally equivalent plants that may be size-adjusted as appropriate for the stage of growth of the overall installation. Failing plants shall either be replaced, or be revived through appropriate adjustments in water, nutrients, pest control or other factors as recommended by a landscaping professional.

24.L.2. For implementation of the irrigation schedule, particular attention must be paid to irrigation run times, emission devices, flow rate, and current reference evapotranspiration, so that applied water meets the Estimated Total Water Use. Total annual applied water shall be less than or equal to Maximum Applied Water Allowance (MAWA). Actual irrigation schedules shall be regulated by automatic irrigation controllers using current evapotranspiration data or soil moisture sensor data.

24.L.3. Parameters used to set the automatic controller shall be developed and submitted for each of the following:

24.L.3.(a) Plant establishment period; established landscape; and temporarily irrigated areas

24.L.4. Each irrigation schedule shall consider for each station all of the following that apply:

24.L.4.(a) irrigation interval; irrigation run times,; number of cycle starts required for each irrigation event to avoid run off; amount of applied water scheduled to be applied on a monthly basis; application rate setting; root depth setting; plant type setting; soil type; slope factor setting; shade factor setting; and irrigation uniformity or efficiency setting.

24.M <u>**LANDSCAPE PROJECT REFERRAL**</u>

24.M.1. The City shall refer the landscape project documents to any City department or outside agency whose interests or area of expertise warrants their participation in the review process. Referral agencies may include, but are not limited to, Santa Clara Valley Water District and Santa Clara Fire Department.

24.N <u>**LANDSCAPE PROJECT REVIEW FEE**</u>

24.N. A landscape project review fee shall be required by the schedule of fees established by resolution of the City Council.

24.O **<u>AUDIT OF EXISTING LANDSCAPES</u>**

24.O.1. This section shall apply to all existing landscapes that were installed before the effective date of this Ordinance and are over one acre in size. The City shall be authorized to require audits to evaluate water use on established landscapes larger than one acre. Such audit may be also be initiated as a coordinated effort between the City and a water purveyor (e.g., Santa Clara Valley Water District, as part of the Water District's established outdoor water conservation programs). When such audit is required, it must be completed by a certified landscape irrigation auditor. All existing landscapes over one acre in size, even if installed before the enactment of this Ordinance, shall maintain landscape irrigation facilities to prevent water waste and runoff.

24.O.2. Following the findings and recommendations of the certified landscape irrigation auditor, the City may require adjustments to irrigation usage, irrigation hardware, and/or landscape materials to reduce irrigation water use. Landscape renovation or rehabilitation resulting from such audit activity shall be considered a Landscape Project, and shall be subject to applicable document submittal requirements of Section 24.E Components of Landscape Project Submittal.

24.O.3. For established landscapes that have dedicated irrigation meters, the maximum applied water allowance (MAWA) shall be calculated as follows: MAWA= (ETo) (0.62) (LA) (0.8)

Where:
MAWA = Maximum Applied Water Allowance (gallons per year)
ETo = Reference Evapotranspiration (inches per year)
0.62 = Conversion Factor (acre-inches to gallons)
LA = Landscape Area (square feet)
0.7 = Reference Evapotranspiration Adjustment Factor (ETAF)

24.O.4 Water Waste Prevention

24.O.4.(a) Restrictions regarding overspray and runoff may be modified if:

24.O.4.(a)(i) The landscape area is adjacent to permeable surfacing and no run off occurs; or

24.O.4.(b)(ii) the adjacent non-permeable surfaces are designed and constructed to drain entirely to landscaping.

24.O.5. The Landscape Audit Report shall include the following statement: "The landscape and irrigation system has been installed as specified in the Landscape and Irrigation Design Plan and complies with the criteria of the

Ordinance and the permit."

24.P **CERTIFICATE OF COMPLETION**

24.P.1 The Certificate of Completion (see Appendix C for sample certificate) Project Information sheet shall include the following six (6) elements:

24.P.1.(a) Project Information sheet contains:

24.P.1.(a)(i) Date

24.P.1.(a)(ii) Project name

24.P.1.(a)(iii) Project applicant name, telephone, and mailing address;

24.P.1.(a)(iv) Project address and location; and

24.P.1.(a)(v) Property owner name, telephone, and mailing address;

24.P.1.(b) Certification by either the signer of the landscape design plan, the signer of the irrigation design plan, or the licensed landscape contractor that the landscape project has been installed per the approved Landscape Documentation Package;

24.P.2.(b)(i) Where there have been significant changes made in the field during construction, these "as-built" or record drawings shell be included with the certification;

24.P.2.(b)(ii) A diagram of the irrigation plan showing hydrozones shall be kept with the irrigation controller for subsequent management purposes

24.P.1.(c) Irrigation scheduling parameters used to set the controller

24.P.1.(d) Landscape Irrigation Maintenance Schedule (Section 24.L)

24.P.1.(e) Irrigation Audit Report (Section 24.O)

24.P.1.(f) Soil analysis report, if not submitted with Landscape Documentation Package, and documentation verifying implementation of soil report recommendations (Section 24.J)

24.P.2 The project applicant shall:

24.P.2.(a) Submit the signed Certificate of Completion to the City for review;

24.P.2.(b) ensure the copies of the approved Certificate of Completion are submitted to the local water purveyor and property owner for his or her designee

24.P.3 The City of Santa Clara shall:

24.P.3.(a) Receive the signed Certificate of Completion from the applicant;

24.P.3.(b) approve or deny the Certificate of Completion. If the Certificate of Completion is denied, the City of Santa Clara shall provide information to the project applicant regarding reapplication, appeal; or other assistance.

24.Q **RECYCLED WATER**

24.Q.1. The installation of recycled water irrigation systems shall allow for the current and future use of recycled water

24.Q.2. All recycled water irrigation systems shall be designed and operated in accordance with all applicable local and state laws

24.Q.3 Landscapes using recycled water are considered Special Landscape Areas. The ET Adjustment Factor for new and existing (non-rehabilitated) Special Landscape Areas shall not exceed 1.0

24.R **ENVIRONMENTAL REVIEW**

24.R.1. The City must comply with the California Environmental Water Quality (CEQA), as appropriate

24.S **PUBLIC EDUCATION**

24.S.1. Education is a critical component to promote the efficient use of water in landscapes. The use of appropriate principles of design, installation, management, and maintenance to save water is encouraged in the community. The City shall provide information to all applicants regarding the design, installation, management and maintenance of water-efficient landscapes and irrigation systems. This shall include, and is not limited to, promoting the use of recycled water and the efficient use of water through water conservation incentive programs offered by the City or the Santa Clara Valley Water District.

24.S.2. All model homes that are landscaped shall have signs installed that provide information on the principles of water-efficient landscaping.

24.T **PENALTIES**

24.T.1 Non-compliance with any applicable provision of the Water Service and Use Rules and Regulations shall constitute a violation of the City Code shall be subject to enforcement action and/or permit revocation.

24. WATER CONSERVATION IN LANDSCAPING (Continued)

APPENDIX A: REFERENCE ETO TABLE

24. WATER CONSERVATION IN LANDSCAPING (Continued)

Appendix A - Reference Evapotranspiration (ETo) Table*

County and City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
ALAMEDA													
Fremont	1.5	1.9	3.4	4.7	5.4	6.3	6.7	6.0	4.5	3.4	1.8	1.5	47.0
Livermore	1.2	1.5	2.9	4.4	5.9	6.6	7.4	6.4	5.3	3.2	1.5	0.9	47.2
Oakland	1.5	1.5	2.8	3.9	5.1	5.3	6.0	5.5	4.8	3.1	1.4	0.9	41.8
Oakland Foothills	1.1	1.4	2.7	3.7	5.1	6.4	5.8	4.9	3.6	2.6	1.4	1.0	39.6
Pleasanton	0.8	1.5	2.9	4.4	5.6	6.7	7.4	6.4	4.7	3.3	1.5	1.0	46.2
Union City	1.4	1.8	3.1	4.2	5.4	5.9	6.4	5.7	4.4	3.1	1.5	1.2	44.2
ALPINE													
Markleeville	0.7	0.9	2.0	3.5	5.0	6.1	7.3	6.4	4.4	2.6	1.2	0.5	40.6
AMADOR													
Jackson	1.2	1.5	2.8	4.4	6.0	7.2	7.9	7.2	5.3	3.2	1.4	0.9	48.9
Shanandoah Valley	1.0	1.7	2.9	4.4	5.6	6.8	7.9	7.1	5.2	3.6	1.7	1.0	48.8
BUTTE													
Chico	1.2	1.8	2.9	4.7	6.1	7.4	8.5	7.3	5.4	3.7	1.7	1.0	51.7
Durham	1.1	1.8	3.2	5.0	6.5	7.4	7.8	6.9	5.3	3.6	1.7	1.0	51.1
Gridley	1.2	1.8	3.0	4.7	6.1	7.7	8.5	7.1	5.4	3.7	1.7	1.0	51.9
Oroville	1.2	1.7	2.8	4.7	6.1	7.6	8.5	7.3	5.3	3.7	1.7	1.0	51.5
CALAVERAS													
San Andreas	1.2	1.5	2.8	4.4	6.0	7.3	7.9	7.0	5.3	3.2	1.4	0.7	48.8
COLUSA													
Colusa	1.0	1.7	3.4	5.0	6.4	7.6	8.3	7.2	5.4	3.8	1.8	1.1	52.8
Williams	1.2	1.7	2.9	4.5	6.1	7.2	8.5	7.3	5.3	3.4	1.6	1.0	50.8
CONTRA COSTA													
Brentwood	1.0	1.5	2.9	4.5	6.1	7.1	7.9	6.7	5.2	3.2	1.4	0.7	48.3
Concord	1.1	1.4	2.4	4.0	5.5	5.9	7.0	6.0	4.8	3.2	1.3	0.7	43.4
Courtland	0.9	1.5	2.9	4.4	6.1	6.9	7.9	6.7	5.3	3.2	1.4	0.7	48.0
Martinez	1.2	1.4	2.4	3.9	5.3	5.6	6.7	5.6	4.7	3.1	1.2	0.7	41.8
Moraga	1.2	1.5	3.4	4.2	5.5	6.1	6.7	5.9	4.6	3.2	1.6	1.0	44.9
Pittsburg	1.0	1.5	2.8	4.1	5.6	6.4	7.4	6.4	5.0	3.2	1.3	0.7	45.4
Walnut Creek	0.8	1.5	2.9	4.4	5.6	6.7	7.4	6.4	4.7	3.3	1.5	1.0	46.2
DEL NORTE													
Crescent City	0.5	0.9	2.0	3.0	3.7	3.5	4.3	3.7	3.0	2.0	0.9	0.5	27.7
EL DORADO													
Camino	0.9	1.7	2.5	3.9	5.9	7.2	7.8	6.8	5.1	3.1	1.5	0.9	47.3
FRESNO													
Clovis	1.0	1.5	3.2	4.8	6.4	7.7	8.5	7.3	5.3	3.4	1.4	0.7	51.4
Coalinga	1.2	1.7	3.1	4.6	6.2	7.2	8.5	7.3	5.3	3.4	1.6	0.7	50.9
Firebaugh	1.0	1.8	3.7	5.7	7.3	8.1	8.2	7.2	5.5	3.9	2.0	1.1	55.4
FivePoints	1.3	2.0	4.0	6.1	7.7	8.5	8.7	8.0	6.2	4.5	2.4	1.2	60.4
Fresno	0.9	1.7	3.3	4.8	6.7	7.8	8.4	7.1	5.2	3.2	1.4	0.6	51.1
Fresno State	0.9	1.6	3.2	5.2	7.0	8.0	8.7	7.6	5.4	3.6	1.7	0.9	53.7
Friant	1.2	1.5	3.1	4.7	6.4	7.7	8.5	7.3	5.3	3.4	1.4	0.7	51.3
Kerman	0.9	1.5	3.2	4.8	6.6	7.7	8.4	7.2	5.3	3.4	1.4	0.7	51.2
Kingsburg	1.0	1.5	3.4	4.8	6.6	7.7	8.4	7.2	5.3	3.4	1.4	0.7	51.6
Mendota	1.5	2.5	4.6	6.2	7.9	8.6	8.8	7.5	5.9	4.5	2.4	1.5	61.7
Orange Cove	1.2	1.9	3.5	4.7	7.4	8.5	8.9	7.9	5.9	3.7	1.8	1.2	56.7
Panoche	1.1	2.0	4.0	5.6	7.8	8.5	8.3	7.3	5.6	3.9	1.8	1.2	57.2
Parlier	1.0	1.9	3.6	5.2	6.8	7.6	8.1	7.0	5.1	3.4	1.7	0.9	52.0

24. WATER CONSERVATION IN LANDSCAPING (Continued)

Appendix A - Reference Evapotranspiration (ETo) Table*

County and City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
FRESNO													
Reedley	1.1	1.5	3.2	4.7	6.4	7.7	8.5	7.3	5.3	3.4	1.4	0.7	51.3
Westlands	0.9	1.7	3.8	6.3	8.0	8.6	8.6	7.8	5.9	4.3	2.1	1.1	58.8
GLENN													
Orland	1.1	1.8	3.4	5.0	6.4	7.5	7.9	6.7	5.3	3.9	1.8	1.4	52.1
Willows	1.2	1.7	2.9	4.7	6.1	7.2	8.5	7.3	5.3	3.6	1.7	1.0	51.3
HUMBOLDT													
Eureka	0.5	1.1	2.0	3.0	3.7	3.7	3.7	3.7	3.0	2.0	0.9	0.5	27.5
Ferndale	0.5	1.1	2.0	3.0	3.7	3.7	3.7	3.7	3.0	2.0	0.9	0.5	27.5
Garberville	0.6	1.2	2.2	3.1	4.5	5.0	5.5	4.9	3.8	2.4	1.0	0.7	34.9
Hoopa	0.5	1.1	2.1	3.0	4.4	5.4	6.1	5.1	3.8	2.4	0.9	0.7	35.6
IMPERIAL													
Brawley	2.8	3.8	5.9	8.0	10.4	11.5	11.7	10.0	8.4	6.2	3.5	2.1	84.2
Calipatria/Mulberry	2.4	3.2	5.1	6.8	8.6	9.2	9.2	8.6	7.0	5.2	3.1	2.3	70.7
El Centro	2.7	3.5	5.6	7.9	10.1	11.1	11.6	9.5	8.3	6.1	3.3	2.0	81.7
Holtville	2.8	3.8	5.9	7.9	10.4	11.6	12.0	10.0	8.6	6.2	3.5	2.1	84.7
Meloland	2.5	3.2	5.5	7.5	8.9	9.2	9.0	8.5	6.8	5.3	3.1	2.2	71.6
Palo Verde II	2.5	3.3	5.7	6.9	8.5	8.9	8.6	7.9	6.2	4.5	2.9	2.3	68.2
Seeley	2.7	3.5	5.9	7.7	9.7	10.1	9.3	8.3	6.9	5.5	3.4	2.2	75.4
Westmoreland	2.4	3.3	5.3	6.9	8.7	9.6	9.6	8.7	6.9	5.0	3.0	2.2	71.4
Yuma	2.5	3.4	5.3	6.9	8.7	9.6	9.6	8.7	6.9	5.0	3.0	2.2	71.6
INYO													
Bishop	1.7	2.7	4.8	6.7	8.2	10.9	7.4	9.6	7.4	4.8	2.5	1.6	68.3
Death Valley Jct	2.2	3.3	5.4	7.7	9.8	11.1	11.4	10.1	8.3	5.4	2.9	1.7	79.1
Independence	1.7	2.7	3.4	6.6	8.5	9.5	9.8	8.5	7.1	3.9	2.0	1.5	65.2
Lower Haiwee Res.	1.8	2.7	4.4	7.1	8.5	9.5	9.8	8.5	7.1	4.2	2.6	1.5	67.6
Oasis	2.7	2.8	5.9	8.0	10.4	11.7	11.6	10.0	8.4	6.2	3.4	2.1	83.1
KERN													
Arvin	1.2	1.8	3.5	4.7	6.6	7.4	8.1	7.3	5.3	3.4	1.7	1.0	51.9
Bakersfield	1.0	1.8	3.5	4.7	6.6	7.7	8.5	7.3	5.3	3.5	1.6	0.9	52.4
Bakersfield/Bonanza	1.2	2.2	3.7	5.7	7.4	8.2	8.7	7.8	5.7	4.0	2.1	1.2	57.9
Bakersfield/Greenlee	1.2	2.2	3.7	5.7	7.4	8.2	8.7	7.8	5.7	4.0	2.1	1.2	57.9
Belridge	1.4	2.2	4.1	5.5	7.7	8.5	8.6	7.8	6.0	3.8	2.0	1.5	59.2
Blackwells Corner	1.4	2.1	3.8	5.4	7.0	7.8	8.5	7.7	5.8	3.9	1.9	1.2	56.6
Buttonwillow	1.0	1.8	3.2	4.7	6.6	7.7	8.5	7.3	5.4	3.4	1.5	0.9	52.0
China Lake	2.1	3.2	5.3	7.7	9.2	10.0	11.0	9.8	7.3	4.9	2.7	1.7	74.8
Delano	0.9	1.8	3.4	4.7	6.6	7.7	8.5	7.3	5.4	3.4	1.4	0.7	52.0
Famoso	1.3	1.9	3.5	4.8	6.7	7.6	8.0	7.3	5.5	3.5	1.7	1.3	53.1
Grapevine	1.3	1.8	3.1	4.4	5.6	6.8	7.6	6.8	5.9	3.4	1.9	1.0	49.5
Inyokern	2.0	3.1	4.9	7.3	8.5	9.7	11.0	9.4	7.1	5.1	2.6	1.7	72.4
Isabella Dam	1.2	1.4	2.8	4.4	5.8	7.3	7.9	7.0	5.0	3.2	1.7	0.9	48.4
Lamont	1.3	2.4	4.4	4.6	6.5	7.0	8.8	7.6	5.7	3.7	1.6	0.8	54.4
Lost Hills	1.6	2.2	3.7	5.1	6.8	7.8	8.7	7.8	5.7	4.0	2.1	1.6	57.1
McFarland/Kern	1.2	2.1	3.7	5.6	7.3	8.0	8.3	7.4	5.6	4.1	2.0	1.2	56.5
Shafter	1.0	1.7	3.4	5.0	6.6	7.7	8.3	7.3	5.4	3.4	1.5	0.9	52.1
Taft	1.3	1.8	3.1	4.3	6.2	7.3	8.5	7.3	5.4	3.4	1.7	1.0	51.2
Tehachapi	1.4	1.8	3.2	5.0	6.1	7.7	7.9	7.3	5.9	3.4	2.1	1.2	52.9
KINGS													
Caruthers	1.6	2.5	4.0	5.7	7.8	8.7	9.3	8.4	6.3	4.4	2.4	1.6	62.7

24. WATER CONSERVATION IN LANDSCAPING (Continued)

Appendix A - Reference Evapotranspiration (ETo) Table*

County and City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
KINGS													
Corcoran	1.6	2.2	3.7	5.1	6.8	7.8	8.7	7.8	5.7	4.0	2.1	1.6	57.1
Hanford	0.9	1.5	3.4	5.0	6.6	7.7	8.3	7.2	5.4	3.4	1.4	0.7	51.5
Kettleman	1.1	2.0	4.0	6.0	7.5	8.5	9.1	8.2	6.1	4.5	2.2	1.1	60.2
Lemoore	0.9	1.5	3.4	5.0	6.6	7.7	8.3	7.3	5.4	3.4	1.4	0.7	51.7
Stratford	0.9	1.9	3.9	6.1	7.8	8.6	8.8	7.7	5.9	4.1	2.1	1.0	58.7
LAKE													
Lakeport	1.1	1.3	2.6	3.5	5.1	6.0	7.3	6.1	4.7	2.9	1.2	0.9	42.8
Lower Lake	1.2	1.4	2.7	4.5	5.3	6.3	7.4	6.4	5.0	3.1	1.3	0.9	45.4
LASSEN													
Buntingville	1.0	1.7	3.5	4.9	6.2	7.3	8.4	7.5	5.4	3.4	1.5	0.9	51.8
Ravendale	0.6	1.1	2.3	4.1	5.6	6.7	7.9	7.3	4.7	2.8	1.2	0.5	44.9
Susanville	0.7	1.0	2.2	4.1	5.6	6.5	7.8	7.0	4.6	2.8	1.2	0.5	44.0
LOS ANGELES													
Burbank	2.1	2.8	3.7	4.7	5.1	6.0	6.6	6.7	5.4	4.0	2.6	2.0	51.7
Claremont	2.0	2.3	3.4	4.6	5.0	6.0	7.0	7.0	5.3	4.0	2.7	2.1	51.3
El Dorado	1.7	2.2	3.6	4.8	5.1	5.7	5.9	5.9	4.4	3.2	2.2	1.7	46.3
Glendale	2.0	2.2	3.3	3.8	4.7	4.8	5.7	5.6	4.3	3.3	2.2	1.8	43.7
Glendora	2.0	2.5	3.6	4.9	5.4	6.1	7.3	6.8	5.7	4.2	2.6	2.0	53.1
Gorman	1.6	2.2	3.4	4.6	5.5	7.4	7.7	7.1	5.9	3.6	2.4	1.1	52.4
Hollywood Hills	2.1	2.2	3.8	5.4	6.0	6.5	6.7	6.4	5.2	3.7	2.8	2.1	52.8
Lancaster	2.1	3.0	4.6	5.9	8.5	9.7	11.0	9.8	7.3	4.6	2.8	1.7	71.1
Long Beach	1.8	2.1	3.3	3.9	4.5	4.3	5.3	4.7	3.7	2.8	1.8	1.5	39.7
Los Angeles	2.2	2.7	3.7	4.7	5.5	5.8	6.2	5.9	5.0	3.9	2.6	1.9	50.1
Monrovia	2.2	2.3	3.8	4.3	5.5	5.9	6.9	6.4	5.1	3.2	2.5	2.0	50.2
Palmdale	2.0	2.6	4.6	6.2	7.3	8.9	9.8	9.0	6.5	4.7	2.7	2.1	66.2
Pasadena	2.1	2.7	3.7	4.7	5.1	6.0	7.1	6.7	5.6	4.2	2.6	2.0	52.3
Pearblossom	1.7	2.4	3.7	4.7	7.3	7.7	9.9	7.9	6.4	4.0	2.6	1.6	59.9
Pomona	1.7	2.0	3.4	4.5	5.0	5.8	6.5	6.4	4.7	3.5	2.3	1.7	47.5
Redondo Beach	2.2	2.4	3.3	3.8	4.5	4.7	5.4	4.8	4.4	2.8	2.4	2.0	42.6
San Fernando	2.0	2.7	3.5	4.6	5.5	5.9	7.3	6.7	5.3	3.9	2.6	2.0	52.0
Santa Clarita	2.8	2.8	4.1	5.6	6.0	6.8	7.6	7.8	5.8	5.2	3.7	3.2	61.5
Santa Monica	1.8	2.1	3.3	4.5	4.7	5.0	5.4	5.4	3.9	3.4	2.4	2.2	44.2
MADERA													
Chowchilla	1.0	1.4	3.2	4.7	6.6	7.8	8.5	7.3	5.3	3.4	1.4	0.7	51.4
Madera	0.9	1.4	3.2	4.8	6.6	7.8	8.5	7.3	5.3	3.4	1.4	0.7	51.5
Raymond	1.2	1.5	3.0	4.6	6.1	7.6	8.4	7.3	5.2	3.4	1.4	0.7	50.5
MARIN													
Black Point	1.1	1.7	3.0	4.2	5.2	6.2	6.6	5.8	4.3	2.8	1.3	0.9	43.0
Novato	1.3	1.5	2.4	3.5	4.4	6.0	5.9	5.4	4.4	2.8	1.4	0.7	39.8
Point San Pedro	1.1	1.7	3.0	4.2	5.2	6.2	6.6	5.8	4.3	2.8	1.3	0.9	43.0
San Rafael	1.2	1.3	2.4	3.3	4.0	4.8	4.8	4.9	4.3	2.7	1.3	0.7	35.8
MARIPOSA													
Coulterville	1.1	1.5	2.8	4.4	5.9	7.3	8.1	7.0	5.3	3.4	1.4	0.7	48.8
Mariposa	1.1	1.5	2.8	4.4	5.9	7.4	8.2	7.1	5.0	3.4	1.4	0.7	49.0
Yosemite Village	0.7	1.0	2.3	3.7	5.1	6.5	7.1	6.1	4.4	2.9	1.1	0.6	41.4
MENDOCINO													
Fort Bragg	0.9	1.3	2.2	3.0	3.7	3.5	3.7	3.7	3.0	2.3	1.2	0.7	29.0
Hopland	1.1	1.3	2.6	3.4	5.0	5.9	6.5	5.7	4.5	2.8	1.3	0.7	40.9

24. WATER CONSERVATION IN LANDSCAPING (Continued)

Appendix A - Reference Evapotranspiration (ETo) Table*

County and City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
MENDOCINO													
Point Arena	1.0	1.3	2.3	3.0	3.7	3.9	3.7	3.7	3.0	2.3	1.2	0.7	29.6
Sanel Valley	1.0	1.6	3.0	4.6	6.0	7.0	8.0	7.0	5.2	3.4	1.4	0.9	49.1
Ukiah	1.0	1.3	2.6	3.3	5.0	5.8	6.7	5.9	4.5	2.8	1.3	0.7	40.9
MERCED													
Kesterson	0.9	1.7	3.4	5.5	7.3	8.2	8.6	7.4	5.5	3.8	1.8	0.9	55.1
Los Banos	1.0	1.5	3.2	4.7	6.1	7.4	8.2	7.0	5.3	3.4	1.4	0.7	50.0
Merced	1.0	1.5	3.2	4.7	6.6	7.9	8.5	7.2	5.3	3.4	1.4	0.7	51.5
MODOC													
Modoc/Alturas	0.9	1.4	2.8	3.7	5.1	6.2	7.5	6.6	4.6	2.8	1.2	0.7	43.2
MONO													
Bridgeport	0.7	0.9	2.2	3.8	5.5	6.6	7.4	6.7	4.7	2.7	1.2	0.5	43.0
MONTEREY													
Arroyo Seco	1.5	2.0	3.7	5.4	6.3	7.3	7.2	6.7	5.0	3.9	2.0	1.6	52.6
Castroville	1.4	1.7	3.0	4.2	4.6	4.8	4.0	3.8	3.0	2.6	1.6	1.4	36.2
Gonzales	1.3	1.7	3.4	4.7	5.4	6.3	6.3	5.9	4.4	3.4	1.9	1.3	45.7
Greenfield	1.8	2.2	3.4	4.8	5.6	6.3	6.5	6.2	4.8	3.7	2.4	1.8	49.5
King City	1.7	2.0	3.4	4.4	4.4	5.6	6.1	6.7	6.5	5.2	2.2	1.3	49.6
King City-Oasis Rd.	1.4	1.9	3.6	5.3	6.5	7.3	7.4	6.8	5.1	4.0	2.0	1.5	52.7
Long Valley	1.5	1.9	3.2	4.1	5.8	6.5	7.3	6.7	5.3	3.6	2.0	1.2	49.1
Monterey	1.7	1.8	2.7	3.5	4.0	4.1	4.3	4.2	3.5	2.8	1.9	1.5	36.0
Pajaro	1.8	2.2	3.7	4.8	5.3	5.7	5.6	5.3	4.3	3.4	2.4	1.8	46.1
Salinas	1.6	1.9	2.7	3.8	4.8	4.7	5.0	4.5	4.0	2.9	1.9	1.3	39.1
Salinas North	1.2	1.5	2.9	4.1	4.6	5.2	4.5	4.3	3.2	2.8	1.5	1.2	36.9
San Ardo	1.0	1.7	3.1	4.5	5.9	7.2	8.1	7.1	5.1	3.1	1.5	1.0	49.0
San Juan	1.8	2.1	3.4	4.6	5.3	5.7	5.5	4.9	3.8	3.2	2.2	1.9	44.2
Soledad	1.7	2.0	3.4	4.4	5.5	5.4	6.5	6.2	5.2	3.7	2.2	1.5	47.7
NAPA													
Angwin	1.8	1.9	3.2	4.7	5.8	7.3	8.1	7.1	5.5	4.5	2.9	2.1	54.9
Carneros	0.8	1.5	3.1	4.6	5.5	6.6	6.9	6.2	4.7	3.5	1.4	1.0	45.8
Oakville	1.0	1.5	2.9	4.7	5.8	6.9	7.2	6.4	4.9	3.5	1.6	1.2	47.7
St Helena	1.2	1.5	2.8	3.9	5.1	6.1	7.0	6.2	4.8	3.1	1.4	0.9	44.1
Yountville	1.3	1.7	2.8	3.9	5.1	6.0	7.1	6.1	4.8	3.1	1.5	0.9	44.3
NEVADA													
Grass Valley	1.1	1.5	2.6	4.0	5.7	7.1	7.9	7.1	5.3	3.2	1.5	0.9	48.0
Nevada City	1.1	1.5	2.6	3.9	5.8	6.9	7.9	7.0	5.3	3.2	1.4	0.9	47.4
ORANGE													
Irvine	2.2	2.5	3.7	4.7	5.2	5.9	6.3	6.2	4.6	3.7	2.6	2.3	49.6
Laguna Beach	2.2	2.7	3.4	3.8	4.6	4.6	4.9	4.9	4.4	3.4	2.4	2.0	43.2
Santa Ana	2.2	2.7	3.7	4.5	4.6	5.4	6.2	6.1	4.7	3.7	2.5	2.0	48.2
PLACER													
Auburn	1.2	1.7	2.8	4.4	6.1	7.4	8.3	7.3	5.4	3.4	1.6	1.0	50.6
Blue Canyon	0.7	1.1	2.1	3.4	4.8	6.0	7.2	6.1	4.6	2.9	0.9	0.6	40.5
Colfax	1.1	1.5	2.6	4.0	5.8	7.1	7.9	7.0	5.3	3.2	1.4	0.9	47.9
Roseville	1.1	1.7	3.1	4.7	6.2	7.7	8.5	7.3	5.6	3.7	1.7	1.0	52.2
Soda Springs	0.7	0.7	1.8	3.0	4.3	5.3	6.2	5.5	4.1	2.5	0.7	0.7	35.4
Tahoe City	0.7	0.7	1.7	3.0	4.3	5.4	6.1	5.6	4.1	2.4	0.8	0.6	35.5
Truckee	0.7	0.7	1.7	3.2	4.4	5.4	6.4	5.7	4.1	2.4	0.8	0.6	36.2

24. WATER CONSERVATION IN LANDSCAPING (Continued)

Appendix A - Reference Evapotranspiration (ETo) Table*

County and City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
PLUMAS													
Portola	0.7	0.9	1.9	3.5	4.9	5.9	7.3	5.9	4.3	2.7	0.9	0.5	39.4
Quincy	0.7	0.9	2.2	3.5	4.9	5.9	7.3	5.9	4.4	2.8	1.2	0.5	40.2
RIVERSIDE													
Beaumont	2.0	2.3	3.4	4.4	6.1	7.1	7.6	7.9	6.0	3.9	2.6	1.7	55.0
Blythe	2.4	3.3	5.3	6.9	8.7	9.6	9.6	8.7	6.9	5.0	3.0	2.2	71.4
Cathedral City	1.6	2.2	3.7	5.1	6.8	7.8	8.7	7.8	5.7	4.0	2.1	1.6	57.1
Coachella	2.9	4.4	6.2	8.4	10.5	11.9	12.3	10.1	8.9	6.2	3.8	2.4	88.1
Desert Center	2.9	4.1	6.4	8.5	11.0	12.1	12.2	11.1	9.0	6.4	3.9	2.6	90.0
Elsinore	2.1	2.8	3.9	4.4	5.9	7.1	7.6	7.0	5.8	3.9	2.6	1.9	55.0
Indio	3.1	3.6	6.5	8.3	10.5	11.0	10.8	9.7	8.3	5.9	3.7	2.7	83.9
La Quinta	2.4	2.8	5.2	6.5	8.3	8.7	8.5	7.9	6.5	4.5	2.7	2.2	66.2
Mecca	2.6	3.3	5.7	7.2	8.6	9.0	8.8	8.2	6.8	5.0	3.2	2.4	70.8
Oasis	2.9	3.3	5.3	6.1	8.5	8.9	8.7	7.9	6.9	4.8	2.9	2.3	68.4
Palm Desert	2.5	3.4	5.3	6.9	8.7	9.6	9.6	8.7	6.9	5.0	3.0	2.2	71.6
Palm Springs	2.0	2.9	4.9	7.2	8.3	8.5	11.6	8.3	7.2	5.9	2.7	1.7	71.1
Rancho California	1.8	2.2	3.4	4.8	5.6	6.3	6.5	6.2	4.8	3.7	2.4	1.8	49.5
Rancho Mirage	2.4	3.3	5.3	6.9	8.7	9.6	9.6	8.7	6.9	5.0	3.0	2.2	71.4
Ripley	2.7	3.3	5.6	7.2	8.7	8.7	8.4	7.6	6.2	4.6	2.8	2.2	67.8
Salton Sea North	2.5	3.3	5.5	7.2	8.8	9.3	9.2	8.5	6.8	5.2	3.1	2.3	71.7
Temecula East II	2.3	2.4	4.1	4.9	6.4	7.0	7.8	7.4	5.7	4.1	2.6	2.2	56.7
Thermal	2.4	3.3	5.5	7.6	9.1	9.6	9.3	8.6	7.1	5.2	3.1	2.1	72.8
Riverside UC	2.5	2.9	4.2	5.3	5.9	6.6	7.2	6.9	5.4	4.1	2.9	2.6	56.4
Winchester	2.3	2.4	4.1	4.9	6.4	6.9	7.7	7.5	6.0	3.9	2.6	2.1	56.8
SACRAMENTO													
Fair Oaks	1.0	1.6	3.4	4.1	6.5	7.5	8.1	7.1	5.2	3.4	1.5	1.0	50.5
Sacramento	1.0	1.8	3.2	4.7	6.4	7.7	8.4	7.2	5.4	3.7	1.7	0.9	51.9
Twitchell Island	1.2	1.8	3.9	5.3	7.4	8.8	9.1	7.8	5.9	3.8	1.7	1.2	57.9
SAN BENITO													
Hollister	1.5	1.8	3.1	4.3	5.5	5.7	6.4	5.9	5.0	3.5	1.7	1.1	45.1
San Benito	1.2	1.6	3.1	4.6	5.6	6.4	6.9	6.5	4.8	3.7	1.7	1.2	47.2
San Juan Valley	1.4	1.8	3.4	4.5	6.0	6.7	7.1	6.4	5.0	3.5	1.8	1.4	49.1
SAN BERNARDINO													
Baker	2.7	3.9	6.1	8.3	10.4	11.8	12.2	11.0	8.9	6.1	3.3	2.1	86.6
Barstow NE	2.2	2.9	5.3	6.9	9.0	10.1	9.9	8.9	6.8	4.8	2.7	2.1	71.7
Big Bear Lake	1.8	2.6	4.6	6.0	7.0	7.6	8.1	7.4	5.4	4.1	2.4	1.8	58.6
Chino	2.1	2.9	3.9	4.5	5.7	6.5	7.3	7.1	5.9	4.2	2.6	2.0	54.6
Crestline	1.5	1.9	3.3	4.4	5.5	6.6	7.8	7.1	5.4	3.5	2.2	1.6	50.8
Lake Arrowhead	1.8	2.6	4.6	6.0	7.0	7.6	8.1	7.4	5.4	4.1	2.4	1.8	58.6
Lucerne Valley	2.2	2.9	5.1	6.5	9.1	11.0	11.4	9.9	7.4	5.0	3.0	1.8	75.3
Needles	3.2	4.2	6.6	8.9	11.0	12.4	12.8	11.0	8.9	6.6	4.0	2.7	92.1
Newberry Springs	2.1	2.9	5.3	8.4	9.8	10.9	11.1	9.9	7.6	5.2	3.1	2.0	78.2
San Bernardino	2.0	2.7	3.8	4.6	5.7	6.9	7.9	7.4	5.9	4.2	2.6	2.0	55.6
Twentynine Palms	2.6	3.6	5.9	7.9	10.1	11.2	11.2	10.3	8.6	5.9	3.4	2.2	82.9
Victorville	2.0	2.6	4.6	6.2	7.3	8.9	9.8	9.0	6.5	4.7	2.7	2.1	66.2
SAN DIEGO													
Chula Vista	2.2	2.7	3.4	3.8	4.9	4.7	5.5	4.9	4.5	3.4	2.4	2.0	44.2
Escondido SPV	2.4	2.6	3.9	4.7	5.9	6.5	7.1	6.7	5.3	3.9	2.8	2.3	54.2
Miramar	2.3	2.5	3.7	4.1	5.1	5.4	6.1	5.8	4.5	3.3	2.4	2.1	47.1

24. WATER CONSERVATION IN LANDSCAPING (Continued)

Appendix A - Reference Evapotranspiration (ETo) Table*

County and City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
SAN DIEGO													
Oceanside	2.2	2.7	3.4	3.7	4.9	4.6	4.6	5.1	4.1	3.3	2.4	2.0	42.9
Otay Lake	2.3	2.7	3.9	4.6	5.6	5.9	6.2	6.1	4.8	3.7	2.6	2.2	50.4
Pine Valley	1.5	2.4	3.8	5.1	6.0	7.0	7.8	7.3	6.0	4.0	2.2	1.7	54.8
Ramona	2.1	2.1	3.4	4.6	5.2	6.3	6.7	6.8	5.3	4.1	2.8	2.1	51.6
San Diego	2.1	2.4	3.4	4.6	5.1	5.3	5.7	5.6	4.3	3.6	2.4	2.0	46.5
Santee	2.1	2.7	3.7	4.5	5.5	6.1	6.6	6.2	5.4	3.8	2.6	2.0	51.1
Torrey Pines	2.2	2.3	3.4	3.9	4.0	4.1	4.6	4.7	3.8	2.8	2.0	2.0	39.8
Warner Springs	1.6	2.7	3.7	4.7	5.7	7.6	8.3	7.7	6.3	4.0	2.5	1.3	56.0
SAN FRANCISCO													
San Francisco	1.5	1.3	2.4	3.0	3.7	4.6	4.9	4.8	4.1	2.8	1.3	0.7	35.1
SAN JOAQUIN													
Farmington	1.5	1.5	2.9	4.7	6.2	7.6	8.1	6.8	5.3	3.3	1.4	0.7	50.0
Lodi West	1.0	1.6	3.3	4.3	6.3	6.9	7.3	6.4	4.5	3.0	1.4	0.8	46.7
Manteca	0.9	1.7	3.4	5.0	6.5	7.5	8.0	7.1	5.2	3.3	1.6	0.9	51.2
Stockton	0.8	1.5	2.9	4.7	6.2	7.4	8.1	6.8	5.3	3.2	1.4	0.6	49.1
Tracy	1.0	1.5	2.9	4.5	6.1	7.3	7.9	6.7	5.3	3.2	1.3	0.7	48.5
SAN LUIS OBISPO													
Arroyo Grande	2.0	2.2	3.2	3.8	4.3	4.7	4.3	4.6	3.8	3.2	2.4	1.7	40.0
Atascadero	1.2	1.5	2.8	3.9	4.5	6.0	6.7	6.2	5.0	3.2	1.7	1.0	43.7
Morro Bay	2.0	2.2	3.1	3.5	4.3	4.5	4.6	4.6	3.8	3.5	2.1	1.7	39.9
Nipomo	2.2	2.5	3.8	5.1	5.7	6.2	6.4	6.1	4.9	4.1	2.9	2.3	52.1
Paso Robles	1.6	2.0	3.2	4.3	5.5	6.3	7.3	6.7	5.1	3.7	2.1	1.4	49.0
San Luis Obispo	2.0	2.2	3.2	4.1	4.9	5.3	4.6	5.5	4.4	3.5	2.4	1.7	43.8
San Miguel	1.6	2.0	3.2	4.3	5.0	6.4	7.4	6.8	5.1	3.7	2.1	1.4	49.0
San Simeon	2.0	2.0	2.9	3.5	4.2	4.4	4.6	4.3	3.5	3.1	2.0	1.7	38.1
SAN MATEO													
Hal Moon Bay	1.5	1.7	2.4	3.0	3.9	4.3	4.3	4.2	3.5	2.8	1.3	1.0	33.7
Redwood City	1.5	1.8	2.9	3.8	5.2	5.3	6.2	5.6	4.8	3.1	1.7	1.0	42.8
Woodside	1.8	2.2	3.4	4.8	5.6	6.3	6.5	6.2	4.8	3.7	2.4	1.8	49.5
SANTA BARBARA													
Betteravia	2.1	2.6	4.0	5.2	6.0	5.9	5.8	5.4	4.1	3.3	2.7	2.1	49.1
Carpenteria	2.0	2.4	3.2	3.9	4.8	5.2	5.5	5.7	4.5	3.4	2.4	2.0	44.9
Cuyama	2.1	2.4	3.8	5.4	6.9	7.9	8.5	7.7	5.9	4.5	2.6	2.0	59.7
Goleta	2.1	2.5	3.9	5.1	5.7	5.7	5.4	5.4	4.2	3.2	2.8	2.2	48.1
Goleta Foothills	2.3	2.6	3.7	5.4	5.3	5.6	5.5	5.7	4.5	3.9	2.8	2.3	49.6
Guadalupe	2.0	2.2	3.2	3.7	4.9	4.6	4.5	4.6	4.1	3.3	2.4	1.7	41.1
Lompoc	2.0	2.2	3.2	3.7	4.8	4.6	4.9	4.8	3.9	3.2	2.4	1.7	41.1
Los Alamos	1.8	2.0	3.2	4.1	4.9	5.3	5.7	5.5	4.4	3.7	2.4	1.6	44.6
Santa Barbara	2.0	2.5	3.2	3.8	4.6	5.1	5.5	4.5	3.4	2.4	1.8	1.8	40.6
Santa Maria	1.8	2.3	3.7	5.1	5.7	5.8	5.6	5.3	4.2	3.5	2.4	1.9	47.4
Santa Ynez	1.7	2.2	3.5	5.0	5.8	6.2	6.4	6.0	4.5	3.6	2.2	1.7	48.7
Sisquoc	2.1	2.5	3.8	4.1	6.1	6.3	6.4	5.8	4.7	3.4	2.3	1.8	49.2
Solvang	2.0	2.0	3.3	4.3	5.0	5.6	6.1	5.6	4.4	3.7	2.2	1.6	45.6
SANTA CLARA													
Gilroy	1.3	1.8	3.1	4.1	5.3	5.6	6.1	5.5	4.7	3.4	1.7	1.1	43.6
Los Gatos	1.5	1.8	2.8	3.9	5.0	5.6	6.2	5.5	4.7	3.2	1.7	1.1	42.9
Morgan Hill	1.5	1.8	3.4	4.2	6.3	7.0	7.1	6.0	5.1	3.7	1.9	1.4	49.5
Palo Alto	1.5	1.8	2.8	3.8	5.2	5.3	6.2	5.6	5.0	3.2	1.7	1.0	43.0

24. WATER CONSERVATION IN LANDSCAPING (Continued)

Appendix A - Reference Evapotranspiration (ETo) Table*

County and City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
SANTA CLARA													
San Jose	1.5	1.8	3.1	4.1	5.5	5.8	6.5	5.9	5.2	3.3	1.8	1.0	45.3
SANTA CRUZ													
De Laveaga	1.4	1.9	3.3	4.7	4.9	5.3	5.0	4.8	3.6	3.0	1.6	1.3	40.8
Green Valley Rd	1.2	1.8	3.2	4.5	4.6	5.4	5.2	5.0	3.7	3.1	1.6	1.3	40.6
Santa Cruz	1.5	1.8	2.6	3.5	4.3	4.4	4.8	4.4	3.8	2.8	1.7	1.2	36.6
Watsonville	1.5	1.8	2.7	3.7	4.6	4.5	4.9	4.2	4.0	2.9	1.8	1.2	37.7
Webb	1.8	2.2	3.7	4.8	5.3	5.7	5.6	5.3	4.3	3.4	2.4	1.8	46.2
SHASTA													
Burney	0.7	1.0	2.1	3.5	4.9	5.9	7.4	6.4	4.4	2.9	0.9	0.6	40.9
Fall River Mills	0.6	1.0	2.1	3.7	5.0	6.1	7.8	6.7	4.6	2.8	0.9	0.5	41.8
Glenburn	0.6	1.0	2.1	3.7	5.0	6.3	7.8	6.7	4.7	2.8	0.9	0.6	42.1
McArthur	0.7	1.4	2.9	4.2	5.6	6.9	8.2	7.2	5.0	3.0	1.1	0.6	46.8
Redding	1.2	1.4	2.6	4.1	5.6	7.1	8.5	7.3	5.3	3.2	1.4	0.9	48.8
SIERRA													
Downieville	0.7	1.0	2.3	3.5	5.0	6.0	7.4	6.2	4.7	2.8	0.9	0.6	41.3
Sierraville	0.7	1.1	2.2	3.2	4.5	5.9	7.3	6.4	4.3	2.6	0.9	0.5	39.6
SISKIYOU													
Happy Camp	0.5	0.9	2.0	3.0	4.3	5.2	6.1	5.3	4.1	2.4	0.9	0.5	35.1
MacDoel	1.0	1.7	3.1	4.5	5.9	7.2	8.1	7.1	5.1	3.1	1.5	1.0	49.0
Mt Shasta	0.5	0.9	2.0	3.0	4.5	5.3	6.7	5.7	4.0	2.2	0.7	0.5	36.0
Tule lake FS	0.7	1.3	2.7	4.0	5.4	6.3	7.1	6.4	4.7	2.8	1.0	0.6	42.9
Weed	0.5	0.9	2.0	2.5	4.5	5.3	6.7	5.5	3.7	2.0	0.9	0.5	34.9
Yreka	0.6	0.9	2.1	3.0	4.9	5.8	7.3	6.5	4.3	2.5	0.9	0.5	39.2
SOLANO													
Benicia	1.3	1.4	2.7	3.8	4.9	5.0	6.4	5.5	4.4	2.9	1.2	0.7	40.3
Dixon	0.7	1.4	3.2	5.2	6.3	7.6	8.2	7.2	5.5	4.3	1.6	1.1	52.1
Fairfield	1.1	1.7	2.8	4.0	5.5	6.1	7.8	6.0	4.8	3.1	1.4	0.9	45.2
Hastings Tract	1.6	2.2	3.7	5.1	6.8	7.8	8.7	7.8	5.7	4.0	2.1	1.6	57.1
Putah Creek	1.0	1.6	3.2	4.9	6.1	7.3	7.9	7.0	5.3	3.8	1.8	1.2	51.0
Rio Vista	0.9	1.7	2.8	4.4	5.9	6.7	7.9	6.5	5.1	3.2	1.3	0.7	47.0
Suisun Valley	0.6	1.3	3.0	4.7	5.8	7.0	7.7	6.8	5.3	3.8	1.4	0.9	48.3
Winters	0.9	1.7	3.3	5.0	6.4	7.5	7.9	7.0	5.2	3.5	1.6	1.0	51.0
SONOMA													
Bennett Valley	1.1	1.7	3.2	4.1	5.5	6.5	6.6	5.7	4.5	3.1	1.5	0.9	44.4
Cloverdale	1.1	1.4	2.6	3.4	5.0	5.9	6.2	5.6	4.5	2.8	1.4	0.7	40.7
Fort Ross	1.2	1.4	2.2	3.0	3.7	4.5	4.2	4.3	3.4	2.4	1.2	0.5	31.9
Healdsburg	1.2	1.5	2.4	3.5	5.0	5.9	6.1	5.6	4.5	2.8	1.4	0.7	40.8
Lincoln	1.2	1.7	2.8	4.7	6.1	7.4	8.4	7.3	5.4	3.7	1.9	1.2	51.9
Petaluma	1.2	1.5	2.8	3.7	4.6	5.6	4.6	5.7	4.5	2.9	1.4	0.9	39.6
Santa Rosa	1.2	1.7	2.8	3.7	5.0	6.0	6.1	5.9	4.5	2.9	1.5	0.7	42.0
Valley of the Moon	1.0	1.6	3.0	4.5	5.6	6.6	7.1	6.3	4.7	3.3	1.5	1.0	46.1
Windsor	0.9	1.6	3.0	4.5	5.5	6.5	6.5	5.9	4.4	3.2	1.4	1.0	44.2
STANISLAUS													
Denair	1.0	1.9	3.6	4.7	7.0	7.9	8.0	6.1	5.3	3.4	1.5	1.0	51.4
La Grange	1.2	1.5	3.1	4.7	6.2	7.7	8.5	7.3	5.3	3.4	1.4	0.7	51.2
Modesto	0.9	1.4	3.2	4.7	6.4	7.7	8.1	6.8	5.0	3.4	1.4	0.7	49.7
Newman	1.0	1.5	3.2	4.6	6.2	7.4	8.1	6.7	5.0	3.4	1.4	0.7	49.3
Oakdale	1.2	1.5	3.2	4.7	6.2	7.7	8.1	7.1	5.1	3.4	1.4	0.7	50.3

24. WATER CONSERVATION IN LANDSCAPING (Continued)

Appendix A - Reference Evapotranspiration (ETo) Table*

County and City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
STANISLAUS													
Patterson	1.3	2.1	4.2	5.4	7.9	8.6	8.2	6.6	5.8	4.0	1.9	1.3	57.3
Turlock	0.9	1.5	3.2	4.7	6.5	7.7	8.2	7.0	5.1	3.4	1.4	0.7	50.2
SUTTER													
Nicolaus	0.9	1.6	3.2	4.9	6.3	7.5	8.0	6.9	5.2	3.4	1.5	0.9	50.2
Yuba City	1.3	2.1	2.8	4.4	5.7	7.2	7.1	6.1	4.7	3.2	1.2	0.9	46.7
TEHAMA													
Corning	1.2	1.8	2.9	4.5	6.1	7.3	8.1	7.2	5.3	3.7	1.7	1.1	50.7
Gerber	1.0	1.8	3.5	5.0	6.6	7.9	8.7	7.4	5.8	4.1	1.8	1.1	54.7
Gerber Dryland	0.9	1.6	3.2	4.7	6.7	8.4	9.0	7.9	6.0	4.2	2.0	1.0	55.5
Red Bluff	1.2	1.8	2.9	4.4	5.9	7.4	8.5	7.3	5.4	3.5	1.7	1.0	51.1
TRINITY													
Hay Fork	0.5	1.1	2.3	3.5	4.9	5.9	7.0	6.0	4.5	2.8	0.9	0.7	40.1
Weaverville	0.6	1.1	2.2	3.3	4.9	5.9	7.3	6.0	4.4	2.7	0.9	0.7	40.0
TULARE													
Alpaugh	0.9	1.7	3.4	4.8	6.6	7.7	8.2	7.3	5.4	3.4	1.4	0.7	51.6
Badger	1.0	1.3	2.7	4.1	6.0	7.3	7.7	7.0	4.8	3.3	1.4	0.7	47.3
Delano	1.1	1.9	4.0	4.9	7.2	7.9	8.1	7.3	5.4	3.2	1.5	1.2	53.6
Dinuba	1.1	1.5	3.2	4.7	6.2	7.7	8.5	7.3	5.3	3.4	1.4	0.7	51.2
Lindcove	0.9	1.6	3.0	4.8	6.5	7.6	8.1	7.2	5.2	3.4	1.6	0.9	50.6
Porterville	1.2	1.8	3.4	4.7	6.6	7.7	8.5	7.3	5.3	3.4	1.4	0.7	52.1
Visalia	0.9	1.7	3.3	5.1	6.8	7.7	7.9	6.9	4.9	3.2	1.5	0.8	50.7
TUOLUMNE													
Groveland	1.1	1.5	2.8	4.1	5.7	7.2	7.9	6.6	5.1	3.3	1.4	0.7	47.5
Sonora	1.1	1.5	2.8	4.1	5.8	7.2	7.9	6.7	5.1	3.2	1.4	0.7	47.6
VENTURA													
Camarillo	2.2	2.5	3.7	4.3	5.0	5.2	5.9	5.4	4.2	3.0	2.5	2.1	46.1
Oxnard	2.2	2.5	3.2	3.7	4.4	4.6	5.4	4.8	4.0	3.3	2.4	2.0	42.3
Piru	2.8	2.8	4.1	5.6	6.0	6.8	7.6	7.8	5.8	5.2	3.7	3.2	61.5
Port Hueneme	2.0	2.3	3.3	4.6	4.9	4.9	4.9	5.0	3.7	3.2	2.5	2.2	43.5
Thousand Oaks	2.2	2.6	3.4	4.5	5.4	5.9	6.7	6.4	5.4	3.9	2.6	2.0	51.0
Ventura	2.2	2.6	3.2	3.8	4.6	4.7	5.5	4.9	4.1	3.4	2.5	2.0	43.5
YOLO													
Bryte	0.9	1.7	3.3	5.0	6.4	7.5	7.9	7.0	5.2	3.5	1.6	1.0	51.0
Davis	1.0	1.9	3.3	5.0	6.4	7.6	8.2	7.1	5.4	4.0	1.8	1.0	52.5
Esparto	1.0	1.7	3.4	5.5	6.9	8.1	8.5	7.5	5.8	4.2	2.0	1.2	55.8
Winters	1.7	1.7	2.9	4.4	5.8	7.1	7.9	6.7	5.3	3.3	1.6	1.0	49.4
Woodland	1.0	1.8	3.2	4.7	6.1	7.7	8.2	7.2	5.4	3.7	1.7	1.0	51.6
Zamora	1.1	1.9	3.5	5.2	6.4	7.4	7.8	7.0	5.5	4.0	1.9	1.2	52.8
YUBA													
Browns Valley	1.0	1.7	3.1	4.7	6.1	7.5	8.5	7.6	5.7	4.1	2.0	1.1	52.9
Brownsville	1.1	1.4	2.6	4.0	5.7	6.8	7.9	6.8	5.3	3.4	1.5	0.9	47.4

* The values in this table were derived from:

1) California Irrigation Management Information System (CIMIS);
2) Reference EvapoTranspiration Zones Map, UC Dept. of Land, Air & Water Resources and California Dept of Water Resources 1999; and
3) Reference Evapotranspiration for California, University of California, Department of Agriculture and Natural Resources (1987) Bulletin 1922;
4) Determining Daily Reference Evapotranspiration, Cooperative Extension UC Division of Agriculture and Natural Resources (1987), Publication Leaflet 21426

APPENDIX B: WATER EFFICIENT LANDSCAPE WORKSHEET

This worksheet is filled out by the project applicant and it is a required element of the Landscape Documentation Package.

Reference Evapotranspiration (ETo) ____________

Hydrozone # /Planting Description[a]	**Plant Factor (PF)**	**Irrigation Method[b]**	**Irrigation Efficiency (IE)[c]**	**ETAF (PF/IE)**	**Landscape Area (sq, ft,)**	**ETAF x Area**	**Estimated Total Water Use (ETWU)[e]**
Regular Landscape Areas							
				Totals	(A)	(B)	
Special Landscape Areas							
				1			
				1			
				1			
				Totals	(C)	(D)	
						ETWU Total	
						Maximum Allowed Water Allowance (MAWA)[e]	

[a]***Hydrozone #/Planting Description***
E.g
1.) front lawn
2.) low water use plantings
3.) medium water use planting

[b]***Irrigation Method***
overhead spray
or drip

[c]***Irrigation Efficiency***
0.75 for spray head
0.81 for drip

[d]***ETWU* (Annual Gallons Required) =** *Eto x 0.62 x ETAF x Area*
where 0.62 is a conversion factor that converts acre-inches per acre per year to gallons per square foot per year.

[e]***MAWA (Annual Gallons Allowed) = (****Eto) (0.62) [(ETAF x LA) + ((1-ETAF) x SLA)]*
where 0.62 is a conversion factor that converts acre-inches per acre per year to gallons per square foot per year, LA is the total landscape area in square feet, SLA is the total special landscape area in square feet,
and ETAF is .55 for residential areas and 0.45 for non-residential areas.

<u>ETAF Calculations</u>

Regular Landscape Areas

Total ETAF x Area	(B)
Total Area	(A)
Average ETAF	**B ÷ A**

All Landscape Areas

Total ETAF x Area	(B+D)
Total Area	(A+C)
Sitewide ETAF	**(B+D) ÷ (A+C)**

Average ETAF for Regular Landscape Areas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.

APPENDIX C: CERTIFICATE OF COMPLETION

CITY OF SANTA CLARA
CERTIFICATE OF COMPLETION & INSTALLATION

SUBMIT TO THE WATER DEPARTMENT UPON COMPLETION OF THE LANDSCAPE PROJECT:
1500 WARBURTON AVENUE, SANTA CLARA, CA 95050

Project Information

Date:	Telephone
Project Name	Email
Applicant Name (print):	Street Address
Title	State
Company	Zip

Project Owner - Declaration of Completion

Project Owner Name or Designee:

Title

Company

I certify that I have received copies of all the documents associated with the landscape project and that it is our responsibility to see that the project is maintained in accordance with the Landscape and Irrigation Maintenance Schedule.

Property Owner Signature	**Date**

Licensed Professional - Declaration of Installation

I certify that based upon periodic site observations, the work has been substantially completed in accordance with the ordinance and that the landscape planting and irrigation installation conform with the criteria and specifications of the approved Landscape Documentation Package.

Print Name and Company of Landscape Architect or Irrigation Designer	**Signature***
Email Address	**Phone Number**

*Signer of the landscape design plan, signer of the irrigation plan, or a licensed landscape contractor.

REQUIRED ATTACHMENTS:

IRRIGATION SCHEDULING
Attach parameters for setting the irrigation schedule on controller as required by the ordinance.

SCHEDULE OF LANDSCAPE AND IRRIGATION MAINTENANCE
Attach schedule of Landscape and Irrigation Maintenance.

LANDSCAPE IRRIGATION AUDIT REPORT
Attach Landscape Irrigation Audit Report as required by the MWELO ordinance.

SOIL MANAGEMENT REPORT/SOIL MANAGEMENT AND GRADING DESIGN SURVEY
Attach soil analysis report OR Soil Management and Grading Design Survey, if not previously submitted with the Landscape Documentation Package as required by the ordinance. Attach documentation verifying implementation of recommendations from soil analysis report as required.

24. WATER CONSERVATION IN LANDSCAPING (Continued)

APPENDIX D: PRESCRIPTIVE COMPLIANCE OPTION

(a) This appendix contains prescriptive requirements which may be used as a compliance option to the Model Water Efficient Landscape Ordinance.

(b) Compliance with the following items is mandatory and must be documented on a landscape plan in order to use the prescriptive compliance option:

(1) Submit a Landscape Documentation Package which includes the following elements:

(A) date

(B) project applicant

(C) project address (if available, parcel and/or lot number(s))

(D) total landscape area (square feet), including a breakdown of turf and plant material

(E) project type (e.g., new, rehabilitated, public, private, cemetery, homeowner-installed)

(F) water supply type (e.g., potable, recycled, well) and identify the local retail water purveyor if the applicant is not served by a private well

(G) contact information for the project applicant and property owner

(H) applicant signature and date with statement, “I agree to comply with the requirements of the prescriptive compliance option to the MWELO”.

(2) Incorporate compost at a rate of at least four cubic yards per 1,000 square feet to a depth of six inches into landscape area (unless contra-indicated by a soil test);

(3) Plant material shall comply with all of the following;

(A) For residential areas, install climate adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for 75% of the plant area excluding edibles and areas using recycled water; For non-residential areas, install climate adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for 100% of the plant area excluding edibles and areas using recycled water;

(B) A minimum three inch (3″) layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated.

(4) Turf shall comply with all of the following:

(A) Turf shall not exceed 25% of the landscape area in residential areas, and there shall be no turf in non-residential areas;

(B) Turf shall not be planted on sloped areas which exceed a slope of 1 foot vertical elevation change for every 4 feet of horizontal length;

(C) Turf is prohibited in parkways less than 10 feet wide, unless the parkway is adjacent to a parking strip and used to enter and exit vehicles. Any turf in parkways must be irrigated by sub-surface irrigation or by other technology that creates no overspray or runoff.

(5) Irrigation systems shall comply with the following:

(A) Automatic irrigation controllers are required and must use evapotranspiration or soil moisture sensor data and utilize a rain sensor.

(B) Irrigation controllers shall be of a type which does not lose programming data in the event the primary power source is interrupted.

(C) Pressure regulators shall be installed on the irrigation system to ensure the dynamic pressure of the system is within the manufacturers recommended pressure range.

24. WATER CONSERVATION IN LANDSCAPING (Continued)

(D) Manual shut-off valves (such as a gate valve, ball valve, or butterfly valve) shall be installed as close as possible to the point of connection of the water supply. \

(E) All irrigation emission devices must meet the requirements set in the ANSI standard, ASABE/ICC 802-2014. "Landscape Irrigation Sprinkler and Emitter Standard," All sprinkler heads installed in the landscape must document a distribution uniformity low quarter of 0.65 or higher using the protocol defined in ASABE/ICC 802-2014.

(F) Areas less than ten (10) feet in width in any direction shall be irrigated with subsurface irrigation or other means that produces no runoff or overspray.

(6) For non-residential projects with landscape areas of 1,000 sq. ft. or more, a private submeter(s) to measure landscape water use shall be installed.

(c) At the time of final inspection, the permit applicant must provide the owner of the property with a certificate of completion, certificate of installation, irrigation schedule and a schedule of landscape and irrigation maintenance.

APPENDIX E: SOIL AND GRADING DESIGN SURVEY

Project Name:
Project Location:
Project Lot Size:
Site Analysis Completed By:

Signature Date

This soil analysis and grading report form is designed to assist the applicant in reviewing existing conditions at their project site and evaluate opportunities to maximize benefits. Respond to the following questions, and submit a report detailing geographic features surrounding the site, topography, vegetation and other site features as directed below.

Soil Management Survey

☐ Laboratory soil analysis results are attached.

OR answer the following questions:

1. What is the infiltration rate in inches per hour for the site soil type?
(Instructions – in a minimum of three distinct locations dig a hole that would accommodate planting a 5-gallon plant. Fill hole with water and let drain. Fill hole again and measure the depth of the water in the hole and record the time it takes to infiltrate totally into the soil with no remaining standing water. Note the time of year and the level of existing soil saturation by touch).

2. What is the primary project site soil texture? (Example – clay, loam, silt, sand, etc)

3. What is the soil color at 2 inches depth? What is the color at 6 inches? What is the color at 12 inches? (Example – black, dark or light brown, red, gold, gray, blue, etc)

4. Has the site been previously or historically contaminated with toxic materials?

Comments:

Grading Design Survey

☐ Grading Design Plan is attached.

OR answer the following questions:

1. Does the stormwater runoff from the site discharge to (check all that apply):
- ☐ Indirectly to waters of the U.S. (i.e. discharge flows overland across adjacent properties or rights-of-way prior to discharging into water of the United States)
- ☐ Storm drain system
- ☐ Directly to the water of the U.S. (e.g. river, lake, creek, stream, bay, ocean, etc.)

2. Has a stormwater pollution prevention plan been prepared for this site?
- ☐ Yes
- ☐ No

3. Is there potential for filtering or infiltrating stormwater in the landscape areas (e.g. grassy swales, infiltration planters, bioretention areas)?
- ☐ Yes
- ☐ No

4. Is there potential to store rainwater for future use?
- ☐ Yes
- ☐ No

5. Is the proposed site within a 100 year floodplain?
- ☐ Yes
- ☐ No

6. Is a creek protection plan required for this site?
- ☐ Yes
- ☐ No

Comments:

HydroScience is a civil engineering firm that plans, designs, and manages the construction of water, wastewater, and recycled water projects. With offices in San Jose, Berkeley, Concord, and Sacramento, we understand and address the complex water and wastewater needs of Northern California.

HydroScience