2015 URBAN WATER MANAGEMENT PLAN

for the City and County of San Francisco

Prepared by: The San Francisco Public Utilities Commission

June 2016

San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ABAG	Association of Bay Area Governments
AF	acre-feet (volume of water, equivalent to 325,851 gallons)
Act	California Urban Water Management Planning Act
ACWD	Alameda County Water District
AMI	Area Median Income
AWWA	American Water Works Association
BACWA	Bay Area Clean Water Agencies
BAIRWMP	Bay Area Integrated Regional Water Management Plan
BARR	Bay Area Regional Reliability
BAWSCA	Bay Area Water Supply and Conservation Agency
BDPL	Bay Division Pipeline
BG	billion gallons
BMP	Best Management Practice
Castlewood CSA	Castlewood County Service Area
CCF	hundred cubic feet (volume of water, equivalent to 748 gallons)
CCWD	Contra Costa Water District
CEQA	California Environmental Quality Act
cfs	cubic feet per second (flow rate of water)
CII	commercial, industrial, and institutional
Cordilleras MWC	Cordilleras Mutual Water Company
City	City and County of San Francisco
CUWA	California Urban Water Agencies
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
DMMs	demand management measures
DRIP	Tier 2 Drought Implementation Plan for Wholesale Customers
DSOD	Division of Safety of Dams
DWR	California Department of Water Resources
EBMUD	East Bay Municipal Utility District
EIR	Environmental Impact Report
EOP	Emergency Operations Plan
ERRP	Emergency Response and Recovery Plan
FERC	Federal Energy Regulatory Commission
FY	fiscal year
GPCD	gallons per capita per day
gpm	gallons per minute
Groveland CSD	Groveland Community Services District
HET	high-efficiency toilet

HTWTP	Harry Tracy Water Treatment Plant
IRWM	Integrated Regional Water Management
ISA	Interim Supply Allocation
ISG	Individual Supply Guarantee
MG	million gallons
mgd	million gallons per day (flow or usage rate of water)
MID	Modesto Irrigation District
MOU	Memorandum of Understanding
NSMCSD	North San Mateo County Sanitation District, a subsidiary of the City of Daly City
PEIR	Programmatic Environmental Impact Report
RWS	Hetch Hetchy Regional Water System, RWS watersheds
RWSAP	Retail Water Shortage Allocation Plan
SB	Senate Bill
SB X7-7	Senate Bill Seven of the Senate's Seventh Extraordinary Session of 2009 (a.k.a., Water Conservation Act of 2009)
SCVWD	Santa Clara Valley Water District
SFDBI	San Francisco Department of Building Inspection
SFDPH	San Francisco Department of Public Health
SFPUC	San Francisco Public Utilities Commission
SFUSD	San Francisco Unified School District
SFO	San Francisco International Airport
State	State of California
SVWTP	Sunol Valley Water Treatment Plant
SWRCB	State Water Resources Control Board
SWRCB DDW	SWRCB Division of Drinking Water, formerly the California Department of Public Health Drinking Water Program
TID	Turlock Irrigation District
U.S.	United States
USEPA	U.S. Environmental Protection Agency
UV	ultraviolet
UWMP	Urban Water Management Plan
WaterMAP	SFPUC 2040 Water Management Action Plan
WPCP	water pollution control plant
WSA	2009 Water Supply Agreement between SFPUC and its Wholesale Customers
WSAP	Water Shortage Allocation Plan
WSIP	Water System Improvement Program
WUEdata	DWR Water Use Efficiency data online submittal tool
Zone 7	Zone 7 Water Agency

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SECTION 1: INTRODUCTION AND OVERVIEW

The San Francisco Public Utilities Commission (SFPUC) is pleased to present this 2015 update to the Urban Water Management Plan (UWMP) for the City and County of San Francisco (City).

The City owns and operates the Hetch Hetchy Regional Water System (RWS), a public asset that plays a key role in delivering high-quality drinking water to 2.6 million residents and businesses in the San Francisco Bay Area. The system collects water from the Tuolumne River in the Sierra Nevada and from protected local watersheds in the East Bay and Peninsula.

With the RWS, the SFPUC delivers water to 28 wholesale customers in Alameda, Santa Clara, and San Mateo Counties, including the Groveland Community Services District (Groveland CSD) in Tuolumne County. The Bay Area Water Supply and Conservation Agency (BAWSCA) represents the interests of 26 of the wholesale customers and also coordinates their water conservation programming. The SFPUC also provides retail water service to customers in San Francisco and a small number of customers outside of San Francisco that are located along the RWS transmission system. Additionally, some retail customers are supplied with local groundwater and recycled water supplies.

The State of California (State) is currently in the fourth year of a severe drought, one that is said to be the driest in the hydrologic record. The unprecedented dry weather conditions prompted Governor Jerry Brown to declare a drought State of Emergency in January 2014, which remains in effect. Subsequent Statewide conservation mandates spurred the SFPUC to request that all customers of the RWS voluntarily reduce water use by at least 10%. As the drought continued, the State Water Resources Control Board (SWRCB) issued rationing requirements to all water agencies in the State with the goal of achieving 25% statewide reductions in water use. The SFPUC and its customers have been required to reduce water use by 8 to 36% depending on pre-drought use. The SFPUC's customers are meeting this call and continue to be among the lowest water consumers in the State. In fact, consumption has reached a historic low. However, the SFPUC remains committed to comprehensive water efficiency efforts that will help sustain a continued reduction in water use.

The current drought underscores the need to continue developing local water supplies and water conservation programs, both in the wholesale and retail service areas. While local supplies often require a significant amount of time to plan and implement, the SFPUC is more committed than ever to developing a comprehensive water portfolio that balances future needs. Additionally, the SFPUC continues to work with other Bay Area water agencies to explore regional water supply opportunities such as transfers, desalination, and potable reuse that can be jointly developed.

This 2015 UWMP update presents the latest information on the SFPUC's retail and wholesale service areas, RWS and other water systems operated by the SFPUC, system supplies and demands, water supply reliability, Water Conservation Act of 2009 compliance, water shortage contingency planning, and demand management. In addition, this update includes the SFPUC's current (Fiscal Year 2014-15) and projected demands and supplies for its retail and wholesale customers over the next 25 years. Retail demand projections have been updated to reflect population and employment growth, socioeconomic factors, and the latest conservation forecasts. This 2015 UWMP update coincides with additional planning efforts conducted by the SFPUC, including its 2015 Retail Conservation Plan update.

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SECTION 2: PLAN PREPARATION AND IMPLEMENTATION

This section summarizes the actions taken by the San Francisco Public Utilities Commission (SFPUC) to assure agency coordination and public participation throughout the development of this 2015 Urban Water Management Plan (UWMP).

2.1 BASIS FOR PREPARING A PLAN

The SFPUC has prepared this 2015 UWMP for the City and County of San Francisco (City) in accordance with the requirements of the 1983 California Urban Water Management Planning Act (Act), California Water Code (CWC) Division 6, Part 2.6, Sections 10610 through 10656, as last amended in 2015. A copy of the Act is provided in **Appendix A**. The purpose of the Act is to assure that water suppliers plan for long-term reliability, conservation, and efficient use of California's water supplies to meet existing and future demands. The Act requires that planning projections extend at least 20 years beyond the year of the UWMP, i.e., through 2035 for the 2015 UWMP cycle. The planning horizon for the SFPUC 2015 UWMP is 25 years, i.e., through 2040.

The Act requires all urban water suppliers to prepare an UWMP every five years. The 2015 UWMPs are due to the California Department of Water Resources (DWR) by July 1, 2016. As defined by CWC Section 10617, an urban water supplier is a supplier (either publicly or privately owned) that provides water for municipal purposes to more than 3,000 customers (either directly or indirectly) or that supplies more than 3,000 acre-feet (AF) of water annually. The SFPUC meets these criteria as both a retail and wholesale supplier of water.

The SFPUC has prepared this individual UWMP specifically for the City, and is not participating in the preparation of a regional UWMP.

2.2 FISCAL OR CALENDAR YEAR AND UNITS OF MEASURE

The data provided throughout this 2015 UWMP and the accompanying standardized tables are reported on a fiscal year (FY) basis. The SFPUC operates on a fiscal year from July 1 through June 30. The "current" fiscal year reported in this 2015 UWMP corresponds to FY 2014-2015, which represents the period from July 1, 2014 through June 30, 2015. Similarly, the projected year of 2020 denotes FY 2019-2020, 2025 denotes FY 2024-2025, and so on. Best efforts are made to convert data that are originally collected on a calendar year basis to a fiscal year basis. However, in a few cases, fiscal year quantities are approximated based on calendar year quantities and are noted as such.

The SFPUC's water supply planning, contracts, and related documents primarily use units of million gallons per day (mgd) when quantifying volumes of water. However, the standardized tables prescribed by DWR only allow volumetric water data to be reported in units of acre-feet (AF), million gallons (MG), or hundred cubic feet (CCF) per year. Therefore, volumetric water data are reported in units of acre-feet (AF) rounded to the nearest 10 AF in the standardized tables (see **Appendix B**). The corresponding data in the body of this 2015 UWMP are reported in units of mgd unless otherwise noted. Although reported in different units of measure, the quantities between both sets of tables are equal. This approach has been discussed with and accepted by DWR staff.

2.3 COORDINATION AND OUTREACH

2.3.1 Agency Coordination

2.3.1.1 Coordination with City Agencies

The SFPUC coordinated with City agencies in developing elements of this 2015 UWMP and the documents referenced herein. The SFPUC consulted with the San Francisco Planning Department in developing water demand projections based on the City's growth projections. City agencies were notified of the SFPUC's intent to review the 2010 UWMP and prepare the 2015 UWMP update. The notice included instructions for viewing the draft 2015 UWMP, as well as the date, time, and location of the public hearing on the draft 2015 UWMP. Comments received from these agencies on the proposed 2015 UWMP were reviewed and addressed, as appropriate. Documentation relating to these efforts and communications is provided in **Appendix C**.

2.3.1.2 Regional Interagency Coordination

The SFPUC coordinated on the development of this 2015 UWMP with its wholesale customers in addition to BAWSCA, which is a public agency representing 26 member agencies—24 cities and water districts, as well as two private utilities—in Alameda, Santa Clara, and San Mateo counties that purchase water on a wholesale basis from the RWS. The SFPUC has individual wholesale contracts with 27 agencies, 26 of which are members of BAWSCA. Cordilleras Mutual Water Company (Cordilleras MWC) is also a wholesale customer but not a member of BAWSCA. Groveland Community Services District (Groveland CSD) is considered a retail customer by the SFPUC, but for the purposes of this 2015 UWMP, is recognized as a wholesale customer. Throughout this document, references to Wholesale Customers generally mean the 26 wholesale customers that are members of BAWSCA. For more information about the SFPUC's wholesale customers, see **Section 3.3**.

The SFPUC provided water supply reliability information for distribution to all BAWSCA members. Supplies were projected in five-year increments from 2015 through 2040 for normal, single dry, and multiple dry years. These projections are provided in **Appendix C.** The SFPUC also worked with all of its wholesale customers, either individually or through BAWSCA, to obtain population and purchase projections in five-year increments through the year 2040. Wholesale customers that are urban water suppliers are concurrently preparing their own 2015 UWMP updates; therefore, the data provided for use in the SFPUC's 2015 UWMP are subject to change.

Special coordination was also conducted with North Coast County Water District and the City of Daly City, two Wholesale Customers that also supply recycled water to SFPUC retail customers.

In addition to coordinating with its wholesale customers, the SFPUC also communicated with other Bay Area water agencies, including the East Bay Municipal Utility District (EBMUD), Santa Clara Valley Water District (SCVWD), Contra Costa Water District (CCWD), and Zone 7 Water Agency (Zone 7); and counties in which the SFPUC provides water, which are the counties of San Francisco, San Mateo, Alameda, Santa Clara, San Joaquin, and Tuolumne.

All wholesale customers, Bay Area water agencies, and counties in which SFPUC provides water were notified of the SFPUC's intent to review the 2010 UWMP and prepare the 2015 UWMP update. The notice included instructions for viewing the draft 2015 UWMP, as well as the date, time, and location of the public hearing on the draft 2015 UWMP. Comments received from these agencies on the proposed 2015 UWMP were reviewed and addressed, as appropriate. Documentation relating to these efforts and communications is provided in **Appendix C**.

2.3.2 Public Participation

The SFPUC has always actively encouraged public participation in its urban water management planning efforts. Public outreach activities for the 2015 UWMP update are listed below. Further documentation is included in **Appendix C**.

Notification of the 2015 UWMP update was electronically mailed on January 29, 2016, with an additional mailing on March 8, 2016, to all cities and counties within which the SFPUC provides water, as well as to other interested parties. The notification letter served as both (1) a notice to cities and counties about the 2015 UWMP update, and (2) a notice of the time and place of the corresponding public hearing, as required by the CWC. A list of notified organizations and individuals is provided in **Appendix C**.

The SFPUC met with two stakeholder groups, the Citizens Advisory Committee and Bay Area Water Stewards, to present on the 2015 UWMP update. The Citizens Advisory Committee meeting held on March 22, 2016, which was publicly noticed on the SFPUC website at **www.sfwater.org**, took place before the draft 2015 UWMP was made available for public comment. However, committee members were encouraged to participate in the public review process when the draft became available for review. The draft 2015 UWMP was presented and discussed at the Bay Area Water Stewards meeting on May 5, 2016.

The draft 2015 UWMP was made available for review prior to the public hearing at the San Francisco Main Public Library and the main offices of the SFPUC. An electronic copy was also posted at **www.sfwater.org**.

A public hearing was held on May 10, 2016 during an SFPUC Commission meeting. A notice of the hearing was advertised in the local newspaper on April 25, 2016 and May 2, 2016 in accordance with California Government Code 6066. The notice was printed in multiple languages to reach a more diverse local population. Copies of newspaper advertisements of the public hearing are provided in **Appendix C**. Public comments on the draft 2015 UWMP were taken during the public hearing, as well as for an approximately one month period prior to the public hearing.

For 2015 UWMP adoption, submittal, and implementation, see **Section 10.1**.

2.4 ACCOUNTING FOR GROVELAND CSD

Groveland CSD serves approximately 3,500 customers in Groveland, primarily of residential and commercial uses, located in a semi-rural area of southern Tuolumne County. Previous updates to the SFPUC's UWMP had reported Groveland CSD as a retail customer since Groveland CSD had not prepared its own UWMP until 2010. Furthermore, Groveland CSD is considered by the SFPUC to be a retail customer and is accounted as such in the SFPUC's contractual obligations and supply planning. However, for the purposes of the 2015 UWMP update, the SFPUC was directed by DWR to report Groveland CSD as a wholesale customer. In order to accommodate both the SFPUC's planning needs and DWR's requirements, this 2015 UWMP accounts for Groveland CSD differently depending on the context:

- For the purposes of describing the wholesale service area, population, demands, and supplies as directed by DWR, and to avoid potential double counting during regional or Statewide aggregation of UWMP data, Groveland CSD is considered a wholesale customer and reported as such in **Section 3** of the body of this UWMP and the standardized tables in **Appendix B**.

- For the purposes of describing contractual obligations and RWS supply allocations between the SFPUC and its Wholesale Customers, Groveland CSD is considered a retail customer and is reported as such in the body of this 2015 UWMP, specifically **Sections 4, 6, 7, and 8**.

- For the purposes of calculating per capita baselines and targets in accordance with the Water Conservation Act of 2009, also known as Senate Bill (SB) X7-7, Groveland CSD is not considered a retail customer. Therefore, **Section 5** of the body of this 2015 UWMP and the corresponding SB X7-7 Verification Form tables in **Appendix D** do not include Groveland CSD.

The SFPUC obtained actual and projected population and demand data from Groveland CSD. As Groveland CSD is currently preparing its 2015 UWMP update, the data provided for use in the SFPUC's 2015 UWMP are subject to change.

Any discrepancies between corresponding tables in the body of this 2015 UWMP and **Appendix B** resulting from the difference in Groveland CSD accounting will be noted. This approach has been discussed with and deemed appropriate by DWR staff.

SECTION 3: SYSTEM DESCRIPTION

This section describes the SFPUC's water system (including the RWS and in-City distribution system), retail and wholesale service areas, climate, and demographic features.

3.1 SFPUC WATER SYSTEM OVERVIEW

Over 2.6 million people in San Francisco and throughout the Bay Area rely on water supplied by the SFPUC to meet their daily water needs. The RWS is a municipally-owned utility operated by the SFPUC, a department of the City and County of San Francisco, and serves both retail and wholesale customers. The RWS supplies high-quality drinking water from the Tuolumne River watershed and from local reservoirs in the Alameda and Peninsula watersheds. The RWS draws an average of 85% of its supply from the Tuolumne River watershed, collected in Hetch Hetchy Reservoir in Yosemite National Park. This water feeds into an aqueduct system delivering water 167 miles by gravity to Bay Area reservoirs and customers. The remaining 15% of the RWS supply is drawn from local surface waters in the Alameda and Peninsula watersheds. The split between these resources varies from year to year depending on the water year hydrology and operational circumstances.

Separate from the RWS, the in-City distribution system is also owned and operated by the SFPUC and serves a population of nearly 850,000 in San Francisco. In-City retail customers are primarily served with RWS supply, but a few customers receive groundwater and recycled water. Similarly, suburban retail customers are primarily served with RWS supply, but a few customers receive groundwater. The RWS, in-City distribution system, and other localized systems are described in the following sections.

3.1.1 Historical Development of the RWS

The RWS evolved through the development of two separate water systems: the Spring Valley Water Company and the Hetch Hetchy Project. The Spring Valley Water Company was established in 1858 as it developed a spring and several creeks into a local water system. It expanded over the years with the construction of the Pilarcitos, San Andreas, and Upper and Lower Crystal Springs Dams on the Peninsula. Further expansions included the development of the Pleasanton Well Field, the Sunol Filter Gallery, and Calaveras Dam in southern Alameda County.

Very early in San Francisco's development, it was recognized that the local water resources would be inadequate to support a burgeoning metropolis; thus, plans for importing water from the Sierra Nevada were born. In the late 1800s, the City's decision to develop its own water supply system culminated in the planning, financing, and construction of the Hetch Hetchy Project. Because many of the Hetch Hetchy Project facilities were to be located on public land within Yosemite National Park and Stanislaus National Forest, Congressional approval of the use of federal land was required. That approval was granted by the Raker Act of 1913. For more information about the Raker Act and the City's water rights under State law, see **Section 6.1.2**.

The construction of the Hetch Hetchy Project began in earnest in 1914. After almost 20 years of construction (including building of Hetch Hetchy Reservoir and the 1930 acquisition of the Spring Valley Water Company by the City), Tuolumne River water began flowing into Upper Crystal Springs Reservoir in October 1934. Through the operation of the two systems, the SFPUC has been able to provide the residents of the City and its neighboring communities with a supply of high-quality potable water from protected sources.

Since the 1930s, the major additions to the RWS have included the raising of O'Shaughnessy Dam and the development of Lake Lloyd (a.k.a., Cherry Lake); the construction of additional pipelines across the San Joaquin Valley; and the local construction of San Antonio Reservoir in Alameda County and Bay Division Pipelines (BDPL) Nos. 2, 3, and 4. Other local projects have included Crystal Springs Pipeline No. 3, Sunol Valley and San Andreas (now Harry Tracy) Filtration Plants, the Crystal Springs Bypass Tunnel and Balancing Reservoir, and the Tesla Treatment Facility.

3.1.2 Water Distribution

This section further describes how water is distributed by the RWS and the in-City distribution system.

3.1.2.1 Regional Water System

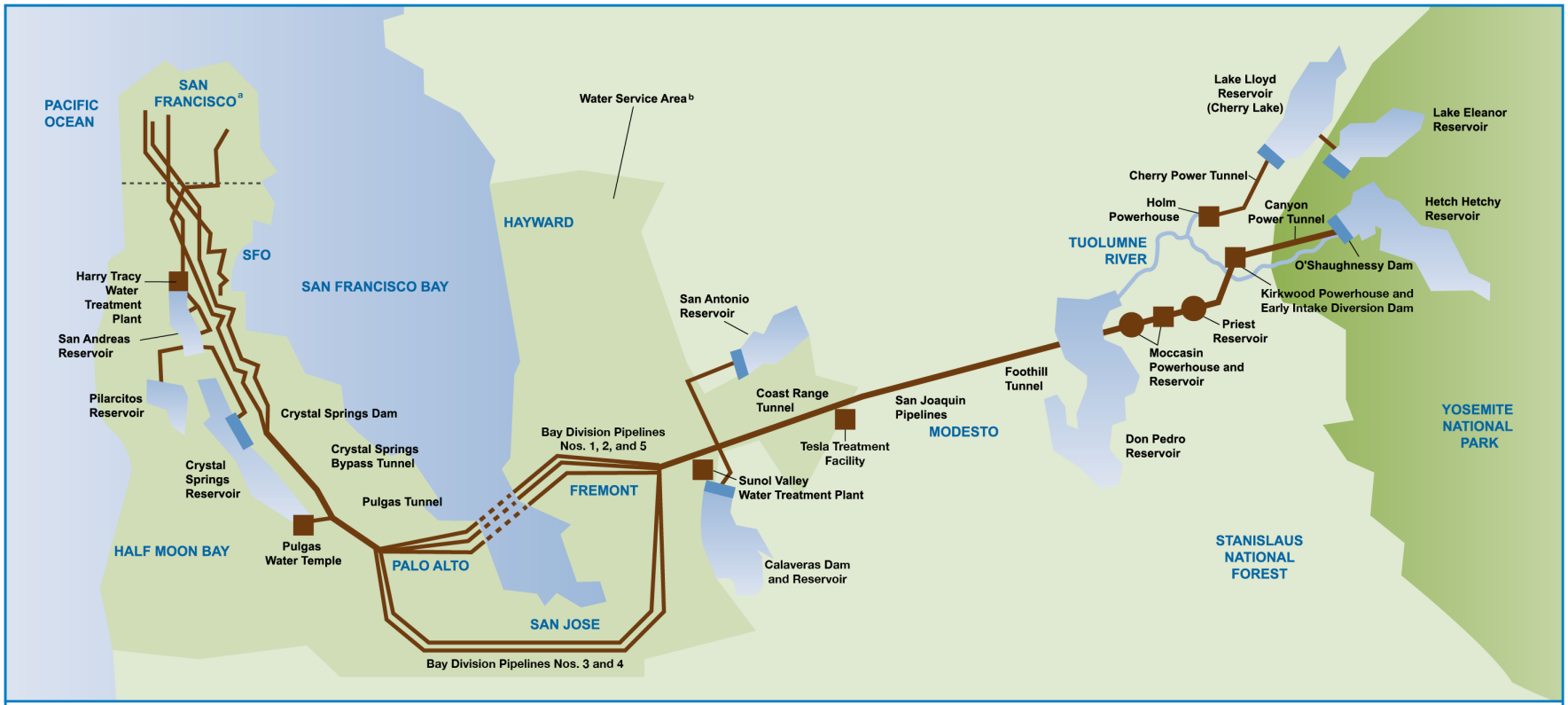
The RWS, shown in **Figure 3-1**, consists of more than 280 miles of pipeline and 60 miles of tunnels, 11 reservoirs, five pump stations, and two water treatment plants. It is geographically delineated between the Hetch Hetchy Project and the Bay Area water system facilities. The Hetch Hetchy Project is generally composed of the reservoirs, hydroelectric generation and transmission facilities, and water transmission facilities from the Hetch Hetchy Valley west to the Alameda East Portal of the Coast Range Tunnel in Sunol Valley. Water system components of the Hetch Hetchy Project are also referred to as the Hetch Hetchy System. The local Bay Area water system is comprised of two parts—the Alameda System and the Peninsula System—generally consisting of the facilities west of Alameda East Portal, including the 63,000-acre Alameda and Peninsula watersheds, storage reservoirs, two water treatment plants, and the distribution system that delivers water to retail and wholesale customers. The Hetch Hetchy, Alameda, and Peninsula Systems are described in more detail below.

- **Hetch Hetchy System:** In the Hetch Hetchy System, water is diverted from Hetch Hetchy Reservoir into a series of tunnels and aqueducts from the Sierra Nevada to the San Joaquin Pipelines that cross the San Joaquin Valley to the Coast Range Tunnel, which connects to the Alameda System at the Alameda East Portal. Hetch Hetchy System water is disinfected at the Tesla Treatment Facility.

- **Alameda System:** The Alameda System includes two reservoirs, San Antonio Reservoir and Calaveras Reservoir, which collect water from the San Antonio Creek, Upper Alameda Creek, and Arroyo Hondo watersheds in Alameda County. San Antonio Reservoir also receives water from the Hetch Hetchy System. Conveyance facilities in the Alameda System connect the Hetch Hetchy System and Alameda water sources to the Peninsula System. The BDPLs cross the South Bay to the Peninsula System delivering water to customers along the pipeline route. The Sunol Valley Water Treatment Plant (SVWTP) filters and disinfects water supplied from San Antonio Reservoir and Calaveras Reservoir.

- **Peninsula System:** The Peninsula System includes conveyance facilities connecting the BDPLs to the in-City distribution system and to other customers on the Peninsula. Two reservoirs, Crystal Springs Reservoir and San Andreas Reservoir, collect runoff from the San Mateo Creek watershed. Crystal Springs Reservoir also receives water from the Hetch Hetchy System. A third reservoir, Pilarcitos Reservoir, collects runoff from the Pilarcitos Creek watershed and directly serves one of the Wholesale Customers, the Coastside County Water District (which includes the City of Half Moon Bay), along with delivering water to Crystal Springs and San Andreas Reservoirs. The Harry Tracy Water Treatment Plant (HTWTP) filters and disinfects water supplied from Crystal Springs Reservoir and San Andreas Reservoir before it is delivered to customers on the Peninsula and the in-City distribution system.

Figure 3-1. Regional Water System



a Three pump stations on Treasure Island are not depicted.

b The water service area shown is approximate and for illustrative purposes only. For more accurate boundaries of the retail and wholesale service areas, see Figures 3-3 and 3-4, respectively.

3.1.2.2 In-City Distribution System

San Francisco's in-City distribution system (Public Water System No. CA3810011) was originally developed during the 100-year period between 1860 and 1960, reflecting the patterns and rates of growth in the City. Several major pipelines convey RWS supply from the Peninsula System to the City. Water to the eastside of the in-City distribution system is fed by two pipelines that terminate at University Mound Reservoir. Water to the westside of the in-City distribution is fed by two pipelines that terminate at Sunset Reservoir and one that terminates at Merced Manor Reservoir. As shown in **Figure 3-2**, the in-City distribution system also includes 10 reservoirs and eight water tanks that store water supplied by the RWS. Seventeen pump stations[1] and approximately 1,250 miles of pipelines move water throughout the system and deliver water to homes and businesses in the City.

3.1.3 Water Treatment

The Hetch Hetchy Reservoir is the largest unfiltered water supply on the West Coast, and one of only a few large unfiltered municipal water supplies in the nation. The water originates from spring snow melt flowing down the Tuolumne River to Hetch Hetchy Reservoir, where it is stored. This high-quality water source comes from well-protected wilderness areas in Yosemite National Park and meets or exceeds all federal and State criteria for watershed protection. Water from Hetch Hetchy Reservoir is protected in pipes and tunnels as it is conveyed to the Bay Area, and requires pH adjustment to control pipeline corrosion and disinfection for bacteria control. Based on the SFPUC's disinfection treatment practice, extensive bacteriological quality monitoring, and high operational standards, the U.S. Environmental Protection Agency (USEPA) and the SWRCB Division of Drinking Water (DDW) determined that the Hetch Hetchy water source meets federal and State drinking water quality requirements without the need for filtration.

A new USEPA regulation took effect in 2012 requiring secondary disinfection for all unfiltered drinking water systems to control the waterborne parasite cryptosporidium. To comply with this regulation, the SFPUC completed construction of a new ultraviolet (UV) treatment facility in 2011. The Tesla Treatment Facility is a key component of the Water System Improvement Program (WSIP) and enhances the Hetch Hetchy System's high water quality. The facility has a capacity of 315 mgd, making it the third largest UV drinking water disinfection facility in the U.S.

All water derived from sources other than Hetch Hetchy Reservoir is treated at one of two treatment plants: the SVWTP or the HTWTP. The SVWTP primarily treats water from the Alameda System reservoirs and has both a peak capacity and sustainable capacity of 160 mgd. Treatment processes include coagulation, flocculation, sedimentation, filtration, and disinfection. Fluoridation, chloramination, and corrosion control treatment are provided for the combined Hetch Hetchy System and SVWTP water at the Sunol chloramination and fluoridation facilities. The HTWTP treats water from the Peninsula System reservoirs and has a peak capacity of 180 mgd and a sustainable capacity of 140 mgd. Treatment processes include ozonation, coagulation, flocculation, filtration, disinfection, fluoridation, corrosion control treatment, and chloramination. Major upgrades to the SVWTP were completed in 2013 and to the HTWTP in 2015.

[1] This number of pump stations does not include three pump stations on Treasure Island, which are not operated by the SFPUC.

Figure 3-2. In-City Distribution System

3.1.4 Water Storage

The majority of the water delivered by the SFPUC is supplied by runoff from the upper Tuolumne River watershed on the western slope of the central Sierra Nevada. Three major reservoirs collect runoff: Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor (**Table 3-1**). A "water bank" in Don Pedro Reservoir is integrated into system operations.[2] Don Pedro Reservoir is jointly owned and operated by Modesto Irrigation District and Turlock Irrigation District (the Districts), and is located on the Tuolumne River downstream of the Hetch Hetchy System.

As a by-product of water delivery and water supply management, hydroelectric power is generated by the Hetch Hetchy Water and Power System. Water stored in Hetch Hetchy Reservoir is used for hydroelectric generation and also satisfies instream flow requirements when released downstream. Normally, only Hetch Hetchy Reservoir water supplies are exported to the Bay Area, while releases from Lake Eleanor and Lake Lloyd are used to satisfy instream flow requirements, satisfy Raker Act entitlements to the Districts downstream, and produce hydroelectric power. The Hetch Hetchy Water and Power System is comprised of three major hydroelectric powerhouses along the Tuolumne River—Holm, Kirkwood, and Moccasin—that have a collective generating capacity of nearly 400 megawatts.

Downstream of the Hetchy Hetchy System, the SFPUC utilizes local watersheds in the Bay Area. On the Peninsula, the Crystal Springs, San Andreas, and Pilarcitos Reservoirs located in San Mateo County capture local watershed runoff. In the Alameda Creek watershed in Alameda County, the SFPUC operates Calaveras and San Antonio Reservoirs. In addition to using these facilities to capture local runoff, San Andreas, San Antonio, and Crystal Springs Reservoirs also provide storage for the Hetch Hetchy System and, along with Calaveras Reservoir, are an important water supply in the event of an interruption to Hetch Hetchy System deliveries.

Calaveras Reservoir is currently operating at one-third of its capacity due to restrictions imposed by the Division of Safety of Dams (DSOD). The Calaveras Dam Improvement Project is currently in construction to return the reservoir to its full capacity.

The in-City reservoirs and tanks have the capacity to hold approximately 413 MG of water. The SFPUC estimates this capacity to be a five-day supply at the current average water consumption rate for the City. In addition, there is an emergency supply of existing non-potable water immediately available within the City at Lake Merced. Lake Merced currently holds approximately 1.9 billion gallons of water. **Table 3-2** summarizes the storage capacity of in-City reservoirs and storage tanks, not including Lake Merced.

[2] Turlock and Modesto Irrigation Districts have senior water rights to the SFPUC for the Tuolumne River water and are entitled to the first increment of flow in the basin. Water bank provides a credit and debit system which allows the SFPUC to divert water upstream while meeting its obligations to Modesto and Turlock Irrigation Districts. Through this mechanism the SFPUC may pre-deliver the Districts entitlements and credit the water bank so that at other times the SFPUC may retain water upstream while the Districts debit water bank.

Table 3-1. Regional Water System Storage Capacity

[Standardized Table: Not Applicable]

RWS Reservoir	Storage	
	Acre-Feet (AF)	Billions of Gallons (BG)
Up-Country[a]		
Hetch Hetchy	360,360	117.4
Lake Lloyd[b]	273,300	89.1
Lake Eleanor	27,100	8.8
Subtotal Up-Country	**660,760**	**215.3**
Local		
Calaveras (East Bay)[c]	96,800	31.5
San Antonio (East Bay)	50,500	16.5
Crystal Springs (Peninsula)[d]	69,300	22.6
San Andreas (Peninsula)	19,000	6.2
Pilarcitos (Peninsula)	3,100	1.0
Subtotal Local	**238,700**	**77.8**
Total RWS Storage[e]	**899,460**	**293.1**

a Three other regulating reservoirs are also part of the RWS: Early Intake, Priest, and Moccasin Reservoirs.

b Storage capacity shown includes flashboards, which are structures placed in a spillway to increase the capacity of a reservoir.

c Calaveras Reservoir was constructed with a storage capacity of 96,800 AF. Since December 2001, in response to safety concerns about the seismic stability of the dam and a directive from the Division of Safety of Dams (DSOD), the SFPUC has held the maximum water level at approximately 37,800 AF (roughly 40% of its maximum capacity), pending construction of a new comparably sized replacement dam downstream, expected to be completed in 2018.

d Crystal Springs Reservoir has a maximum storage capacity of 22.1 BG (at 291.8 feet). When the Lower Crystal Springs Dam Improvement is complete, the reservoir will be operated normally at 287.8 feet (4 feet below capacity) based on permit conditions.

e This includes 63,700 AF in dead storage (i.e., the volume in a reservoir below the lowest controllable level). In addition, the SFPUC may draw against a credit of up to 570,000 AF in storage in a water bank account in Don Pedro Reservoir, for total storage for planning purposes of 1,469,460 AF.

Table 3-2. In-City Potable Water System Storage Capacity

[Standardized Table: Not Applicable]

In-City Reservoir	Storage	
	Acre-Feet (AF)	Millions of Gallons (MG)
Sunset	542	177
University Mound	432	141
Sutro	96	31
Summit	43	14
College Hill	41	13
Stanford Heights	40	13
Merced Manor	29	10
Lombard	8	3
Potrero	3	1
Hunters Point	3	1
Storage Tanks	29	9
Total In-City Storage	**1,267**[a]	**413**

a Rows above do not sum to total due to rounding.

3.1.5 Other Retail Water Systems

3.1.5.1 Groundwater and Recycled Water Systems

While the in-City distribution system is the primary system serving San Francisco customers, several customers receive either groundwater or recycled water. The San Francisco Recreation and Park Department operates and maintains groundwater wells serving irrigation and other non-potable uses (e.g., lake filling, water exhibits) at Golden Gate Park, the San Francisco Zoo, and landscaped medians along the Great Highway. More information about this groundwater supply is provided in **Section 6.2.1.1**.

The City's golf courses at Harding Park, which includes Fleming Golf Course and Sharp Park are provided recycled water for irrigation. Harding Park, an in-City retail customer, is served by the North San Mateo County Sanitation District (NSMCSD) in Daly City. Sharp Park, a suburban retail customer, is served by the North Coast County Water District (NCCWD) in Pacifica. Except for a portion of the Harding Park recycled water transmission line that is within City limits, and an onsite 700,000-gallon underground storage tank and above-ground pump station at Harding Park, the SFPUC neither owns nor operates either of these recycled water systems. More information about these recycled water supplies is provided in **Section 6.2.1.2**.

3.1.5.2 Suburban Retail Water Systems

The SFPUC serves numerous retail customers outside the City. These customers are collectively referred to as suburban retail customers or customers in the suburban retail service area. These customers are generally located right off of RWS transmission pipelines and do not form one contiguous service area. More information about the suburban retail service area is provided in **Section 3.2**. However, there are two small water systems in unincorporated Alameda County that are operated by the SFPUC as permitted by the SWRCB DDW (formerly the California Department of Public Health Drinking Water Program): the Castlewood Well System and the Town of Sunol domestic water system.

- **Castlewood Well System:** The SFPUC owns and operates the Pleasanton Well Field Water System (Public Water System No. CA0110018; herein referred to as the Castlewood Well System), which supplies about 0.4 mgd of treated (potable) groundwater to the Castlewood County Service Area (CSA), a community comprised of the Castlewood Country Club and approximately 190 homes located in unincorporated Alameda County. The Castlewood community water system itself is owned and operated by the CSA and the California Water Service Company, respectively.

  The SFPUC serves the Castlewood CSA through one metered connection with groundwater pumped from the Castlewood Well System. This system consists of four metered wells, a 3,000-gallon control tank, and a 1.0-million gallon treated water reservoir. The supply is disinfected via sodium hypochlorite injection into the transmission main between the control tank and reservoir. Water quality is monitored weekly by the SFPUC.

- **Town of Sunol Domestic Water System:** The SFPUC owns and operates the domestic water system for the Town of Sunol (Public Water System No. CA0110012), which typically serves less than 0.1 mgd to approximately 120 metered and unmetered connections in unincorporated Alameda County. These connections are primarily residential customers and are supplied with potable water from the RWS. After RWS supply is fully treated, fluoridated, and chloraminated, the supply enters Town of Sunol transmission pipeline downstream of Sunol Valley Mixing Manifold. The supply is then piped to a pump station at the SFPUC's Sunol Yard. The supply is pumped to two 130,000-gallon storage tanks. Water quality is overseen by the SFPUC.

In addition to serving customers in the Town of Sunol with RWS supply, the SFPUC also serves several customers in the larger Sunol area with supplies that are separate from the RWS. The Sunol Valley Golf Club is supplied with groundwater obtained via subsurface diversion from the Sunol Filter Gallery; however, the club was recently closed in January 2016, after the reporting period of this 2015 UWMP.

3.2 RETAIL SERVICE AREA

The SFPUC provides water to both retail and wholesale customers. A population of over 2.6 million people within the counties of San Francisco, San Mateo, Santa Clara, Alameda, San Joaquin, and Tuolumne rely entirely or in part on the water supplied by the SFPUC. Approximately two thirds of the SFPUC's water supply is delivered to wholesale customers, and the remaining one third is delivered to retail customers. This section describes the retail service area. For a description of the wholesale service area, see **Section 3.3**. Note that Groveland CSD is accounted for as a wholesale customer for the purpose of describing the wholesale service area, as explained in **Section 2.4**.

Retail customers include the residents, businesses, and industries located within City limits, referred to as the in-City retail service area. Retail service is also provided to a patchwork of customers located outside the City, such as the Town of Sunol, San Francisco International Airport (SFO), Lawrence Livermore National Laboratory, and Castlewood CSA. These areas are not contiguous and are collectively referred to as the suburban retail service area. Both the in-City and suburban retail service areas are shown in **Figure 3-3**.

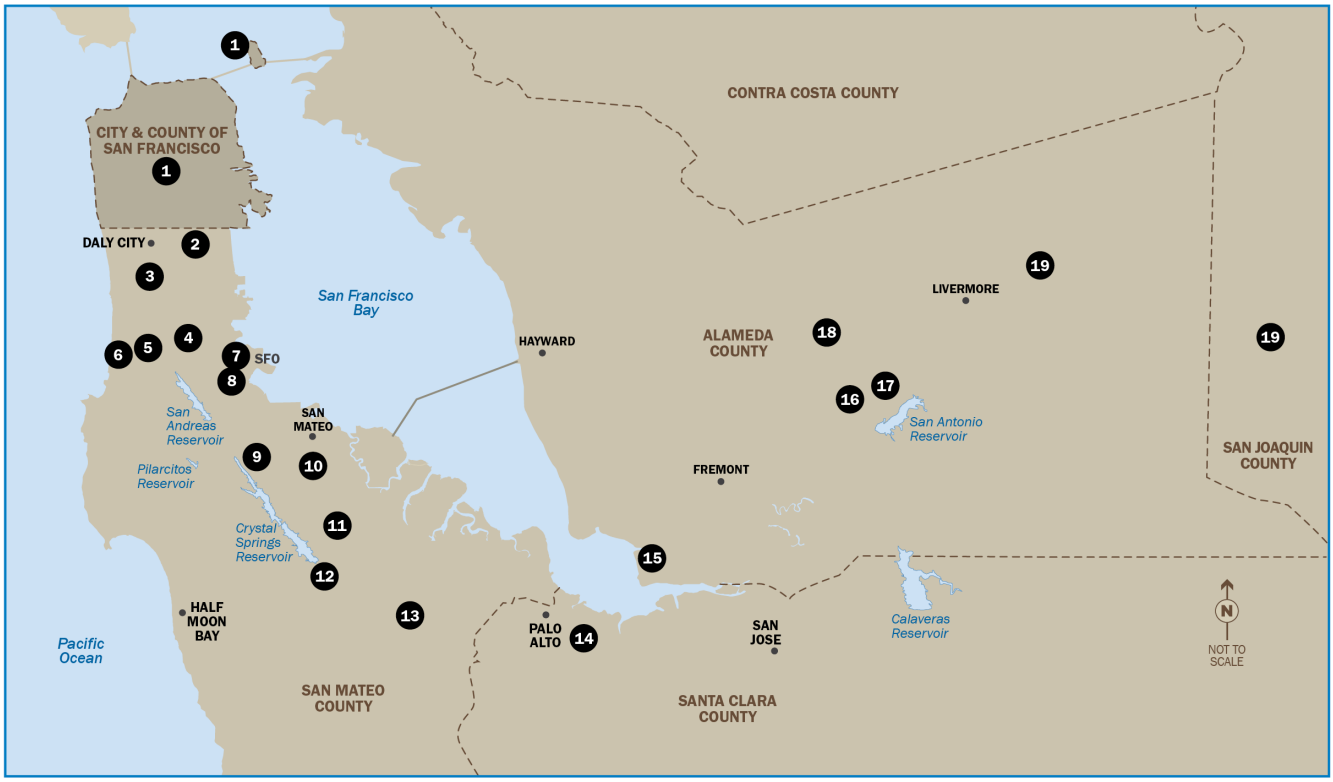
3.2.1 Climate

The San Francisco Bay Area as a whole has a Mediterranean climate. In the City and its vicinity, summers are cool and winters are mild with infrequent rainfall. Temperatures average 57 degrees Fahrenheit annually, ranging from the mid-40s in the winter to the upper 60s in the late summer. Strong onshore flow of wind in the summer keeps the air cool, generating fog through September. The warmest temperatures generally occur in September and October. Rainfall averages about 22 inches per year and is generally confined to the "wet" season from late October to early May.[3] Except for occasional light drizzles from thick marine stratus clouds, summers are nearly dry.

For a discussion of climate change and potential impacts, see **Section 6.1.6.**

[3] Average maximum and minimum temperatures and average monthly rainfall data obtained from Western Regional Climate Center, 1981-2010 data from two San Francisco monitoring stations (Mission Dolores/SF#047772 and Richmond/SF#047767). Accessed from: **www.wrcc.dri.edu**.

Figure 3-3. Retail Service Area



In-City Retail Service Area

1 City and County of San Francisco

Suburban Retail Service Area

2 Residential and Non-residential Customers in Daly City

3 Cemeteries in Colma

4 Golden Gate National Cemetery

5 San Francisco County Jail #5

6 Sharp Park Golf Course

7 San Francisco International Airport

8 SFPUC Millbrae Headquarters

9 Crystal Springs Golf Course

10 Penninsula Golf and Country Club

11 Residential Customers in Redwood City

12 Filoli Center

13 Menlo Country Club

14 NASA Ames Research Center

15 Cargill Salt

16 Residential and Non-residential Customers in Sunol

17 GE Hitachi Nuclear

18 Castlewood Country Club

19 Lawrence Livermore National Laboratory (two sites)

The suburban customers shown above represent the majority of water use in the suburban retail service area, but are not comprehensive. For the purposes of the 2015 UWMP, Groveland Community Services District is considered a retail customer in the context of the 2009 Water Supply Agreement and allocating Regional Water System supplies between retail customers and Wholesale Customers. Groveland is shown in Figure 3-4.

3.2.2 Population and Demographics

As shown in **Table 3-3** the total population in the retail service area is currently estimated to be 847,370 and is projected to increase to nearly 1.1 million by 2040. This corresponds to an average growth rate of about 1.0% per year.

Table 3-3. Retail Service Area Population

[Standardized Table 3-1 Retail: Population - Current and Projected]

Retail Service Area	Actual	Projected				
	2015	2020	2025	2030	2035	2040
In-City Retail[a]	857,508	890,400	934,800	981,800	1,032,500	1,085,700
Suburban Retail[b]	1,768	1,768	1,768	1,768	1,768	1,768
Total Retail	**859,276**	**892,168**	**936,568**	**983,568**	**1,034,268**	**1,087,468**

a County of San Francisco population for January 1, 2015 obtained from the California Department of Finance Report E-5, released May 1, 2016. County of San Francisco population projections obtained from ABAG Projections 2013.

b Actual and projected population based on the number of retail residential service connections in Redwood City, Daly City, Fremont, and Millbrae; the number of homes in Castlewood CSA; inmate population of the San Francisco County Jail #5 in San Bruno; Department of Water Resources (DWR) Population Tool for Town of Sunol; and 2000 and 2010 U.S. Census data. Methodology used to estimate population in the suburban retail service area was approved through pre-review with DWR and is detailed in **Section 5.1**. Population for Groveland CSD is not included as retail, but reported as wholesale in **Table 3-4** instead.

The retail service area, particularly the in-City portion, is highly urbanized, dense, and growing. Open space and landscaped areas are limited, as are lot sizes. Build-out is planned or already under construction at the few, large undeveloped or redevelopment areas that remain, such as Candlestick Point/Hunters Point Shipyard, Treasure Island/Yerba Buena Island, Mission Bay, and Pier 70. Most of these areas are located along the eastern shoreline of the City. The majority of current and planned development is comprised of mixed-use, multi-family residential, and commercial high-rise buildings.

Currently, the ratio of multi-family households to single family households in the City is approximately 2:1 (i.e., one third of total housing is single family). As new housing is built, the majority of which will be multi-family units, the ratio will increase to nearly 3:1 (i.e., one fourth of total housing is single family) by 2040.

Retail demand projections presented in this 2015 UWMP (**Section 4.1**) are based on demographic data and growth forecasts prepared by the California Department of Finance, Association of Bay Area Governments (ABAG), and the San Francisco Planning Department for the in-City retail service area. Additional information about demographic data sources and assumptions supporting the retail demand projections can be found in **Appendix E**.

3.3 WHOLESALE SERVICE AREA

The SFPUC sells water to 26 Wholesale Customers through the terms of the 2009 Water Supply Agreement (WSA). The SFPUC also sells water to two additional wholesale customers, Cordilleras MWC and Groveland CSD. These customers are further described below:

- **Wholesale Customers and BAWSCA:** Enabled by Assembly Bill (AB) 2058, BAWSCA was established on May 27, 2003 to represent the interests of 24 cities and water districts, as well as two other utilities in Alameda, Santa Clara and San Mateo counties that purchase water on a wholesale basis from the RWS. Sales are conducted under the terms of the WSA between the City and County of San Francisco and the Wholesale Customers, together with individual water supply contracts. Since 1970, the SFPUC has supplied approximately 65% of the total Wholesale Customers' demand. Some of the Wholesale Customers are entirely reliant on the SFPUC for their supply.

- **Cordilleras MWC:** Cordilleras MWC serves a community of 18 single family homes in Emerald Hills, located in unincorporated San Mateo County. It is not considered an urban water supplier as defined by CWC Section 10617. It is not a member of BAWSCA, and not subject to the terms of the WSA. However, Cordilleras MWC has a water supply contract with the SFPUC for 3,007 CCF (about 0.006 mgd).

- **Groveland CSD:** As described in **Section 2.4**, Groveland CSD primarily serves residential and commercial customers in Groveland, located in a semi-rural area of southern Tuolumne County. Although Groveland CSD is considered a retail customer of the SFPUC and is accounted as such in the SFPUC's contractual obligations and supply planning, the SFPUC was directed by DWR to report Groveland CSD as a wholesale customer for this 2015 UWMP update. Therefore, Groveland CSD is included in the wholesale service area for the remainder of this section. It is not a member of BAWSCA, and not subject to the terms of the WSA.

The wholesale service area encompassing the Wholesale Customers, Cordilleras MWC, and Groveland CSD, is shown in **Figure 3-4**.

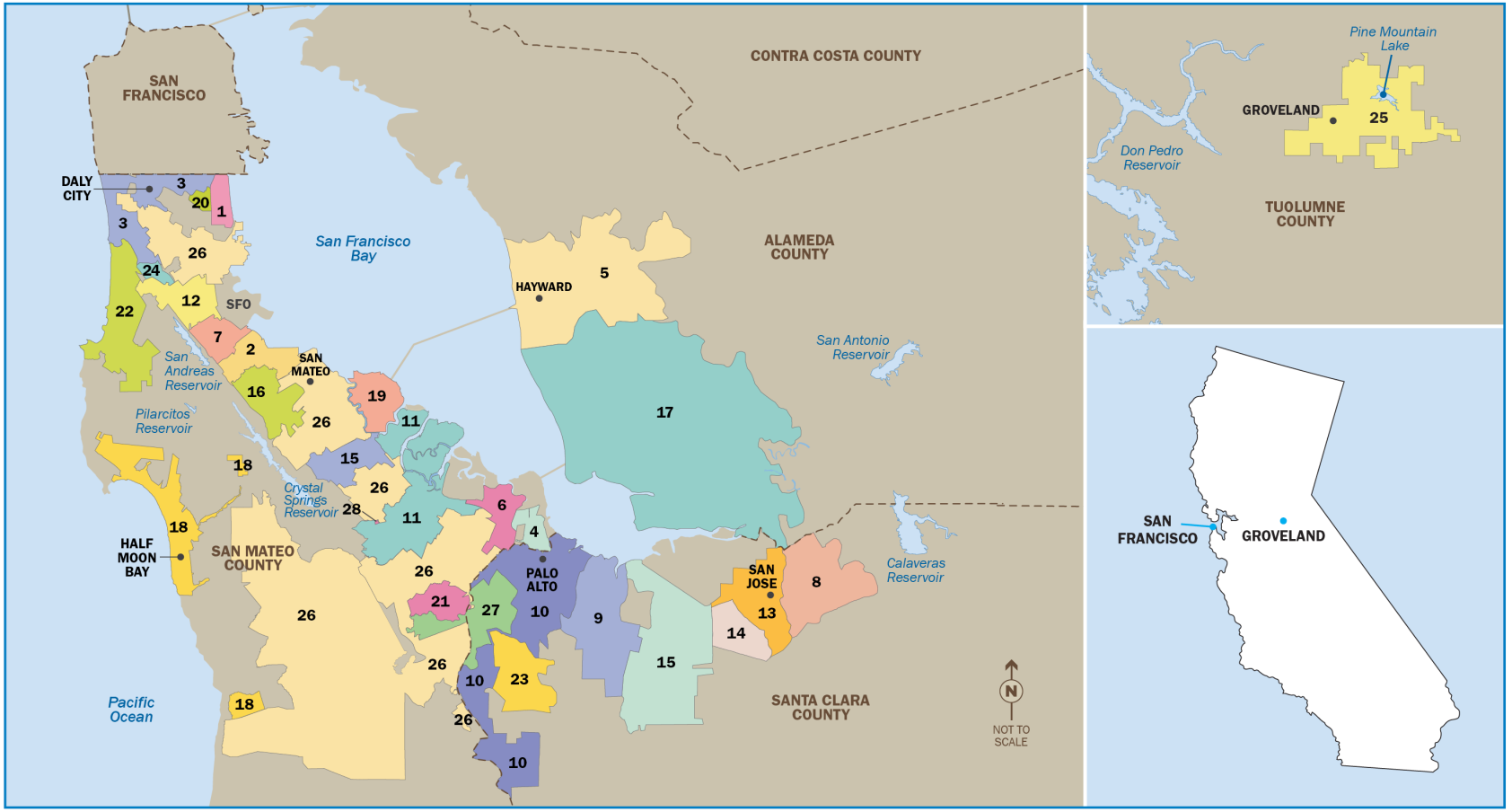
3.3.1 Climate

As described in **Section 3.2.1** for the retail service area, the San Francisco Bay Area as a whole has a Mediterranean climate. Varied topography throughout the Bay Area creates numerous microclimates dependent upon elevation, proximity to the Bay or coast, orientation with respect to the ocean, and wind patterns. These microclimates also result in different rainfall amounts and evapotranspiration rates. However, in general, the Wholesale Customers and Cordilleras MWC experience a climate similar to the in-City retail service, except for customers located in the southern and inland regions that tend to experience warmer temperatures in the summer months with less incidence of fog.

Further inland in the Sierra Nevada foothills, Groveland CSD experiences hot, dry summers and mild winters. Most of Groveland CSD's service area is located at elevations of 2,800 to 3,300 feet, so are not subjected to the long, severe winters and heavy snowfall that are experienced at higher elevations above 5,000 feet.

For a discussion of climate change and potential impacts, see **Section 6.1.6**.

Figure 3-4. Wholesale Service Area



MUNICIPALITIES

1 City of Brisbane
2 City of Burlingame
3 City of Daly City
4 City of East Palo Alto
5 City of Hayward
6 City of Menlo Park
7 City of Millbrae
8 City of Milpitas
9 City of Mountain View
10 City of Palo Alto
11 City of Redwood City
12 City of San Bruno
13 City of San Jose[a]
14 City of Santa Clara[a]
15 City of Sunnyvale
16 Town of Hillsborough

WATER PURVEYING DISTRICTS

17 Alameda County Water District
18 Coastside County Water District
19 Estero Municipal Improvement District
20 Guadalupe Valley Municipal Improvement District
21 Mid-Peninsula Water District
22 North Coast County Water District
23 Purissima Hills Water District
24 Westborough Water District
25 Groveland Community Services District[b]

OTHER ENTITIES

26 California Water Service Company[c]
27 Stanford University
28 Cordilleras Mutual Water Company[d]

a The SFPUC provides water on an interruptible basis to fixed service areas in the northern portions of the Cities of San Jose and Santa Clara.

b Groveland Community Services District is not a member of BAWSCA. For the purposes of the 2015 UWMP, Groveland is considered a retail customer in the context of the 2009 Water Supply Agreement and allocating Regional Water System supplies between retail customers and Wholesale Customers. However, Groveland is accounted for as a wholesale customer in the standardized tables provided in **Appendix B**.

c California Water Service Company, an investor-owned utility, provides water service to four separate districts: Bear Gulch (Atherton vicinity), San Carlos/San Mateo, South San Francisco, and Skyline County Water District.

d Cordilleras Mutual Water Company is not a member of BAWSCA.

3.3.2 Population and Demographics

As shown in **Table 3-4**, the total population in the wholesale service area is currently estimated to be about 1.8 million and is projected to increase to over 2.2 million by 2040. This corresponds to an average growth rate of about 0.9% per year.

Compared to the retail service area, the majority of which is comprised of the City, the wholesale service area is less dense and populated, but still fairly urbanized and built out. Single family homes are more prevalent and lot sizes are larger.

Table 3-4. Wholesale Service Area Population

[Standardized Table 3-1 Wholesale: Population - Current and Projected]

Wholesale Service Area	Actual	Projected				
	2015	2020	2025	2030	2035	2040
BAWSCA Member Agencies[a]	1,797,393	1,879,796	1,968,717	2,058,792	2,153,785	2,238,881
Cordilleras MWC[b]	64	64	64	64	64	64
Groveland CSD[c]	3,440	3,483	3,527	3,571	3,616	3,661
Total Wholesale	**1,800,897**	**1,883,343**	**1,972,308**	**2,062,427**	**2,157,465**	**2,242,606**

a Data provided by BAWSCA and reflect projections as anticipated to be reported in each agency's individual 2015 UWMP if one is to be prepared (estimates are subject to change).

b Data provided by Cordilleras MWC.

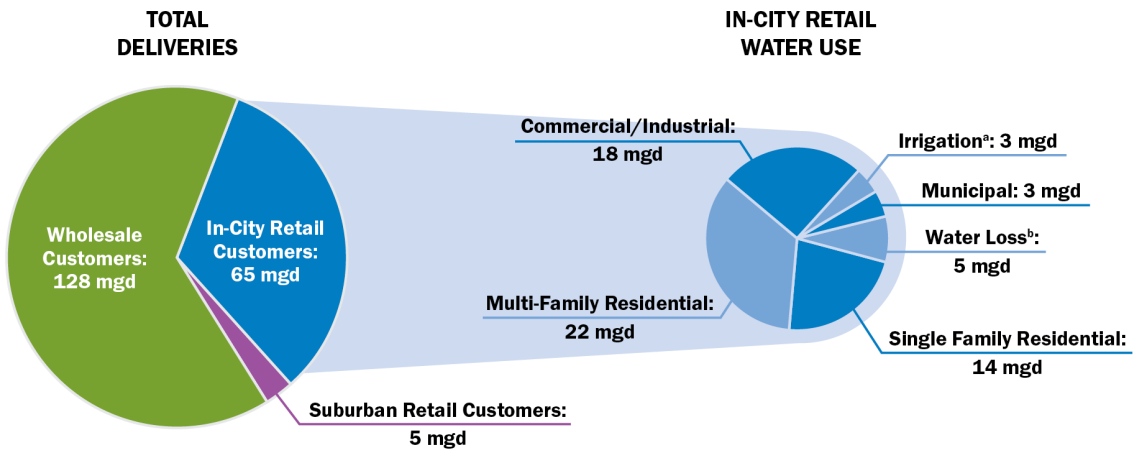
c Data provided by Groveland CSD (subject to change).

SECTION 4: SYSTEM DEMANDS

This section describes and quantifies the current and projected water uses within the SFPUC's retail and wholesale service areas. Retail demand projections are based on recent demographic information and a detailed analysis of water use characteristics. Wholesale demand projections for RWS supplies were developed by the wholesale customers. Note that the terms "use," "demand," and "consumption" are used interchangeably. Additionally, water loss is included in total retail demands unless otherwise noted.

As described previously, approximately two thirds of the SFPUC's water supply is delivered to wholesale customers, and the remaining one third is delivered to retail customers. In 2015, the SFPUC delivered approximately 196 mgd of RWS supplies to its entire water service area, with an additional 2 mgd in local groundwater and recycled water to retail customers. **Figure 4-1** shows what portions were delivered to wholesale and retail (in-City and suburban) customers. Approximate water use by sector in the in-City retail service area is also shown in **Figure 4-1**.

Figure 4-1. Total Deliveries and In-City Retail Water Use in 2015



a This data is from dedicated irrigation accounts only, and does not include irrigation use from water accounts that jointly serve both indoor and outdoor demands. Irrigation use includes use of local groundwater and recycled water.

b Water loss includes apparent (e.g., fire fighting, pipe flushing, street cleaning) and real (e.g., distribution system leaks, main breaks) losses.

Note that Groveland CSD is accounted for differently between this section of the 2015 UWMP and the corresponding standardized tables in **Appendix B**. This section includes Groveland CSD the estimation of retail demands because, in the context of RWS supply allocations between the SFPUC and its Wholesale Customers, Groveland CSD is a retail customer. Where retail demands are subsequently compared to retail supplies in **Section 7.5**, Groveland CSD will be accounted for in both the demand and supply projections. In contrast, the standardized tables in **Appendix B** include Groveland CSD in the estimation of wholesale demands, as directed by DWR and explained in **Section 2.4**.

4.1 RETAIL DEMANDS

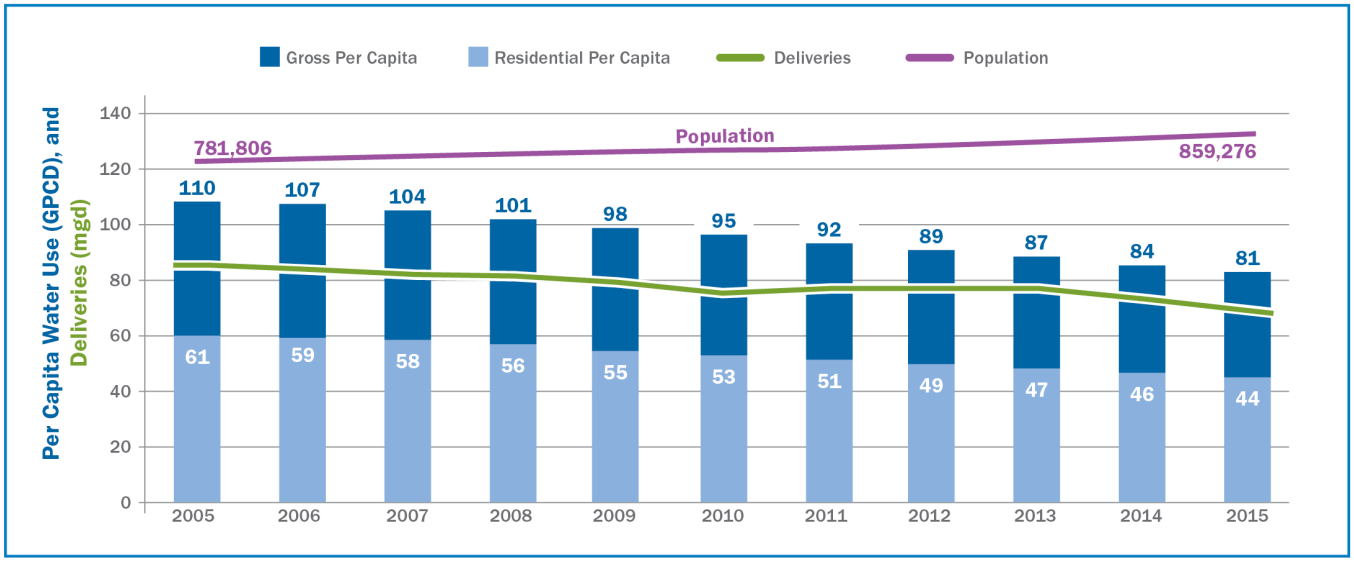
4.1.1 Current Retail Demands

Water use within San Francisco (i.e., the in-City retail service area) continues to be among the lowest in the State and below historic consumption. Both total consumption and per capita water use (i.e., gallons of water consumed per person per day [GPCD]) have been on a general decline since the mid-1970s. Many factors have contributed to this reduction in water use, including significant changes to the mix of industrial and commercial businesses and their associated water demand, and the general characteristics of water use by San Franciscans. In particular, the severe droughts of 1976-77 and 1987-92, changes in plumbing codes, and conservation programs (either voluntarily embraced by residents and businesses or mandated by the City), have affected water demands. The magnitude and duration of the effects of the current drought on demands are unknown. However, per capita water use is expected to increase after this year if the drought ends and some level of discretionary water use rebounds.

As illustrated in **Figure 4-2**, per capita water use and deliveries have declined over the past decade. Per capita water use is presented on either a gross (i.e., water use by all sectors) or residential (i.e., water use by the residential sector only) basis. Currently, gross and residential per capita water use by in-City retail customers are 77 and 44 GPCD, respectively. Taking suburban retail customers into account, gross and residential per capita water use by all retail customers are 81 and 44 GPCD, respectively. These per capita rates are among the lowest in the State.

Since the summer of 2014, the SFPUC has reported total water production and residential per capita water use on a monthly basis to the SWRCB in compliance with its emergency conservation regulations. The monthly per capita rates are consistently among the lowest reported by urban water suppliers in the State.

Figure 4-2. Trends in Retail Deliveries and Use



Total retail demand in 2015 was at a historic low of 70.1 mgd, much lower than anticipated in the 2010 UWMP update. Of this demand, in-City retail customers used approximately 65.6 mgd (94% of total retail demand), of which 1.5 mgd was met with groundwater, and 0.2 mgd was met with recycled water, and the remainder was met with RWS supplies. Suburban retail customers used approximately 4.5 mgd (6% of total retail demand), of which 0.7 mgd was met with groundwater and the remainder was met with RWS supplies. Total retail water loss, including both real and apparent losses, was estimated to be 5.3 mgd.

Much of the decrease in demand can be attributed to the strong response by retail customers to local and Statewide directives for conservation during the current, unprecedented drought. These directives included the mandatory reduction in outdoor water use imposed by both the SWRCB and SFPUC in the summer of 2014. In addition, the SFPUC has called on all its customers to reduce water use by 10% system-wide since January 2014. For more information about local and State mandates related to the current drought, see **Section 8.2** and **Appendix F**.

The SFPUC's retail demands are generally tracked and projected by each of the major sectors below. Current retail demands for each of these sectors are shown alongside projected demands in **Table 4-1**.

- **Single Family Residential:** Single family households comprise approximately one third of the total households in the City, and this proportion is declining. Approximately 40% of all water delivered to the residential sector is used by single family households. This sector represents approximately 20% of total retail demand. Due to the Bay Area's moderate climate and high density housing, especially in the City, residential water use is used almost entirely indoors. Outdoor water use is estimated to be less than 10% of single-family residential use, on average.

- **Multi-Family Residential:** Multi-family households include apartments, condominiums, and townhouses. This sector comprises approximately two thirds of the total households in the City, and this proportion is increasing. Approximately 60% of the total water delivered to the residential sector is used by multi-family households. This sector represents approximately 30% of total retail demand. Average outdoor water use is limited since outdoor space for multi-family households are generally limited to patios and shared spaces, if any.

- **Non-residential:** This sector includes all sectors of water users not designated as residential and includes commercial, industrial, institutional, and municipal uses, as well as irrigation through dedicated meters. Non-residential water use represents approximately 40% of total retail demand.

- **Water Loss:** Water loss is defined as the difference between the quantity of water supplied to customers and the quantity of water actually consumed by customers. It is comprised of both apparent losses and real losses. Water loss typically represents less than 10% of total retail demand. For more information on water loss, see **Section 4.1.3** and **Appendix G**.

4.1.2 Projected Retail Demands

4.1.2.1 Methodology Used to Project Retail Demands

Up until 2015, retail demands and conservation potential have been projected using the SFPUC Retail Demand Model. This model, which was initially developed in 2004, uses end-use methodology to forecast both demands and conservation savings. The model was updated over the years to incorporate the latest growth forecasts, extend the projection period, reflect changes to the SFPUC's conservation programming, incorporate the latest codes and ordinances, and to respond to a variety of other needs.

Projections from this model have been used in the 2005 and 2010 updates to the UWMP, as well as in the SFPUC's corresponding Retail Water Conservation Plan (Conservation Plan) updates.

The Conservation Plan provides an overview of the retail water conservation program, the factors that shaped the program, estimated water savings, and the program's effect on the overall retail water demand forecast. The Conservation Plan is a key element of the SFPUC's water supply management and planning, and is updated every five years to coincide with each UWMP update. The Conservation Plan may be accessed online at **conserve.sfwater.org**.

For the 2015 update to the UWMP and Conservation Plan, the SFPUC developed a new set of models that incorporate socioeconomic factors to project demands through 2040. By including socioeconomic factors, the models are able to capture a more complete demand picture. This demand forecasting methodology is becoming more prevalent among urban water utilities and managers. The new set of models is comprised of the following components:

- Econometric models are used to project in-City single family residential, multi-family residential, and commercial/industrial demands. Detailed information about these models is provided in **Appendix E**.

- Other in-City retail demands and suburban retail demands are estimated based on historical consumption, and supplement the demands projected by the econometric models. These supplemental demands are assumed to be constant through 2040 since no significant growth is anticipated among these sectors.

- An end-use-based water savings accounting model is used to project savings from passive (i.e., savings due to plumbing codes and standards) and active (e.g., savings due to the retail water conservation program) conservation to adjust both in-City and suburban retail demands. This model is customized for the SFPUC from the Alliance for Water Efficiency Water Conservation Tracking Tool. Additional information about this model, the SFPUC Water Conservation Tracking Model, is provided in **Appendix H**. Passive and active conservation savings are quantified in the Conservation Plan.

As with the previous retail demand models, the new set of models for 2015 segregates demands into three sectors of water use: single family residential, multi-family residential, and non-residential. See **Section 4.1.1** for a description of water use by each of these sectors. Water loss is forecasted separately and is described in **Section 4.1.3**.

The new set of models relies on household and employment forecasts provided by the San Francisco Planning Department's Land Use Allocation (LUA) 2012. The LUA 2012 forecasts are a City-specific refinement of ABAG's growth forecasts, ABAG Projections 2013, which reflect the growth that is assumed in ABAG's Plan Bay Area and Sustainable Communities Strategy Jobs-Housing Connections Scenario.

Previously, non-residential demand projections from the SFPUC Retail Demands and Conservation Potential Model accounted for employment distributed across a variety of sectors, such as manufacturing, transportation, trade, finance, and government. In the new set of models for 2015, non-residential demands are aggregated and based only on total employment, not sector-specific characteristics.

Separately, Groveland CSD prepared its own demand projections for use in its 2015 UWMP update. The projected demands were estimated by multiplying projected population by the base daily per capita water use (130 GPCD) as reported in Groveland CSD's 2010 UWMP. These projections were provided to the SFPUC to report as part of wholesale demands in the standardized tables (see **Appendix B**). However, in the body of this 2015 UWMP, Groveland CSD's demands are included in retail demands. These demand projections are subject to change as part of Groveland CSD's UWMP process.

4.1.2.2 Retail Demand Projections by Sector

Table 4-1 presents the updated retail demand projections by sector for 2020 through 2040. The updated projections result in a total retail demand of 85.9 mgd in 2035, which is 5.0 mgd higher than the corresponding projection in the 2010 UWMP. (The 2010 UWMP did not include projections for 2040.)

Table 4-1. Retail Demands (mgd)

[Standardized Table 4-1 Retail: Demands for Potable and Raw Water - Actual]
[Standardized Table 4-2 Retail: Demands for Potable and Raw Water - Projected]
[Standardized Table 4-3 Retail: Total Water Demands]
[Standardized Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area]

Retail Sector or Use Type	Actual[a]	Projected[b]				
	2015	2020	2025	2030	2035	2040
In-City Retail						
Single Family Residential	14.5	15.5	16.3	17.8	19.5	21.1
Multi-Family Residential	22.2	22.1	22.8	24.0	25.0	26.2
Non-residential	23.6	28.9	28.9	29.5	30.4	31.6
Water Loss[c]	5.3	6.0	6.0	6.0	6.0	6.0
Subtotal In-City Retail Demand	**65.6**	**72.5**	**74.0**	**77.3**	**80.9**	**84.9**
Suburban Retail						
Single Family Residential[d]	0.1	0.1	0.1	0.1	0.1	0.1
Non-residential	4.1	4.4	4.4	4.4	4.4	4.4
Groveland CSD[e]	0.3	0.5	0.5	0.5	0.5	0.5
Water Loss[c]	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Suburban Retail Demand	**4.5**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
Total Retail Demand	**70.1**	**77.5**	**79.0**	**82.3**	**85.9**	**89.9**

a Actual consumption data are obtained from customer billing data.

b Projected single family residential, multi-family residential, and non-residential demands are obtained from the SFPUC Water Conservation Tracking Model and reflect both passive and active conservation.

c Water losses include both apparent and real losses. Suburban retail water losses are considered to be negligible. Estimate of actual water loss in 2015 is based on a draft audit under review as of the publication of this 2015 UWMP.

d Suburban retail residential demands are for single family only as no multi-family residential buildings are served.

e Groveland CSD is accounted for as a retail customer for the purpose of this table and subsequent retail supply and demand comparisons. Demand projections were provided by Groveland CSD based on its population projections and assumed per capita water use of 130 GPCD (projections are subject to change as part of its UWMP process). In the corresponding standardized tables in **Appendix B**, Groveland CSD is not reported as retail, but rather wholesale.

While the overall demand has continued to decline through 2015 due in large part to increasingly more efficient plumbing fixtures, projections show that by around 2018[4] total retail demand will reach a point at which conservation savings will no longer outpace anticipated population and job growth; thus, demand is forecasted to increase steadily through 2040. After accounting for the projected conservation savings, the retail demand (excluding water loss) is projected to increase by about 29%, from 64.8 mgd in 2015, to 83.9 mgd in 2040. In the absence of water conservation efforts, retail demand (excluding water loss) would be projected to increase by 41% over the next 25 years, from 74.4 mgd in 2015 to 104.6 mgd in 2040. Both the projected demands and conservation savings are conservative as unanticipated new building codes, standards, and programs that increase water efficiency and reduce water use will likely be implemented. A closer analysis of the estimated conservation savings is provided in the Conservation Plan. Sector-specific observations are summarized below:

- **Single Family Residential:** Single family residential water use is projected to increase by 45% between 2015 and 2040. In-City single family residential demands are modeled as a function of socioeconomic factors that include water price, household income, residential density, precipitation, and temperature. Single family residential demand is highly responsive to household income. As household income is projected to increase, water use also increases. Single family households also occupy larger lot sizes per capita that other types of developments and often have landscaping, resulting in greater outdoor water than in the multi-family residential sector.

- **Multi-Family Residential:** Multi-family residential water use is projected to increase by 18% between 2015 and 2040. In-City multi-family residential demands are modeled as a function of the price of water. However, compared to the response of single family residential demands, multi-family residential demands are not as responsive to price. Because multi-family households have relatively little outdoor water use and a variety of shared appliances, customers in this sector are more likely to direct their consumption toward higher priority uses rather than discretionary uses, such as landscaping. In addition, occupants of some multi-family households have lower incomes than single family households, and therefore may have fewer water-using appliances, resulting in less discretionary water use.

- **Non-residential:** Non-residential water use is projected to increase by 30% between 2015 and 2040. While the growth in in-City non-residential demands is directly related to the growth in employment, commercial and industrial water demands also reflect socioeconomic factors including price, precipitation, and temperature. As the price of water increases, the amount of water consumed per employee decreases.

- **Water Loss:** Water loss is projected to be a constant 6.0 mgd for planning purposes. More information on water loss projections is provided in the next section.

4.1.3 Retail Distribution System Water Losses

Water loss is defined as the difference between the quantity of water supplied to customers and the quantity of water actually consumed by customers. It is comprised of (1) apparent losses, which include unbilled, authorized consumption for operational uses (e.g., fire fighting, pipe flushing, street cleaning, dust control, and low pressure fire hydrant use) and all types of inaccuracies associated with customer metering, data handling, and theft or illegal use; and (2) real losses, which include all water physically lost due to distribution system leaks, breaks, overflows, and other unbilled, unauthorized consumption. In short, real

[4] Retail demand projections for 2018 are not provided in this 2015 UWMP, but are available in the 2015 Retail Water Conservation Plan.

losses are equivalent to distribution system water losses. Water loss in the retail service area ranges from 5 to 7 mgd annually, which is typically less than 10% of total retail demand.

The SFPUC conducted a water audit for its in-City distribution system using the American Water Works Association (AWWA) M36 method and associated worksheet. While the results of the audit are currently under review as of the publication of this 2015 UWMP, water loss in 2015 was preliminarily determined to be 5.3 mgd, of which 4.0 mgd was attributed to real losses. The draft AWWA worksheet is provided in **Appendix G**.

For its planning purposes, the SFPUC projects water loss to be a flat 6.0 mgd through 2040. This estimate reflects, among others, the anticipation of leaks and breaks due to aging infrastructure, continuance of system flushing after the drought, and active management of losses (described below). Real and apparent losses are not projected separately. Therefore, projections for water loss, rather than just the real loss portion, is used as a conservative estimate and reported as such in this 2015 UWMP.

Nearly all of the SFPUC's suburban retail customers are located immediately off of RWS transmission pipelines. Therefore, real losses in the suburban retail service area are assumed to be negligible. As described in **Section 3.1.5.2**, the SFPUC operates the Castlewood Well System and the Town of Sunol domestic water system. However, the extent of distribution in the Castlewood Well System is limited from the well field to the control tank and reservoir. There is no master meter to the Town of Sunol, so loss in the Town of Sunol system cannot be directly measured. The primary source of water loss in the Town of Sunol is system maintenance flushing, which would occur regularly at a rate of 10,000 gallons per week for 50 weeks per year, or roughly 0.001 mgd (1.5 AF). However, due to the current drought, system flushing has only been conducted as needed (e.g., customer complaints, known bad spots with poor flow or buildup) starting in December 2014. Therefore, water loss due to flushing during FY 2014-15 was substantially less than 0.001 mgd. In addition, approximately 300,000 gallons of water were lost during the commissioning and disinfection of two new storage tanks, amounting to less than 0.001 mgd (0.9 AF) during FY 2014-15. Cumulatively, these losses in the suburban retail service area are considered to be negligible.

The SFPUC manages real losses through its Automated Water Meter Program and Linear Assets Management Program. Deployment of the Automated Water Meter Program began in the spring of 2010 to upgrade all in-City retail water meters with wireless advanced metering technology, and is nearly complete. The Linear Assets Management Program replaces and renews distribution system pipelines and customer service connections for approximately 1,250 miles of drinking water mains in the City. More information about management of retail system losses is provided in **Section 9.2.5**.

4.1.4 Demands of Lower Income Households

The Act requires water suppliers to separately estimate future demands for lower income households (i.e., those with less than 80% of the area median income [AMI]). This section documents the SFPUC's best effort to do so. However, please note that the SFPUC does not use this estimate for any planning purposes. Projected water use by lower income households is estimated by multiplying the planned future housing units for lower income residents by the average number of persons per household and the estimated per capita water use. This analysis, detailed below, is only performed for the in-City retail service area as lower income demands are primarily located in the City.

As described in the 2014 Housing Element of the San Francisco General Plan[5], ABAG, in coordination with the California State Department of Housing and Community Development, determine the Bay Area's regional housing need based on regional trends, projected job growth, and existing needs. San Francisco's

[5] The 2014 Housing Element may be accessed at: **www.sf-planning.org/ftp/General_Plan**. Housing needs data are provided in Table I-38 of that document.

fair share of the regional housing need for January 2015 through June 2022 was calculated as 28,870 units, or about 3,850 units per year total. This estimate includes units for all adjusted median income (AMI) categories: very low (0-50% of AMI), low (51-80% of AMI), moderate (81-120% of AMI), and above moderate (over than 120% of AMI) categories. The corresponding annual production goal for the very low and low income categories is 831 and 619 units, respectively, for a total of 1,450 lower income housing units per year. Thus, assuming a consistent number of units are built each year, approximately 7,250 lower income housing units are planned to be built over the next five years between 2015 and 2020. This estimate accounts for both single family and multi-family residential units; projections for each residential sector are not available.

Based on ABAG Projections 2013, the average persons per household would be approximately 2.28 in 2020. As such, it is estimated that approximately 16,530 residents (2.28 persons per household multiplied by 7,250 units) will occupy planned lower income housing units by 2020. As presented later in **Section 5.4**, per capita water use in the retail service area is projected to be approximately 86 GPCD in 2020. Water use in planned lower income housing units is therefore estimated to be approximately 1.4 mgd (16,530 residents multiplied by 86 GPCD) in 2020.

This estimate of lower income water demand is reflected in the retail demand projections presented in **Table 4-1**. Lower income housing growth and demands have always been included in the SFPUC's retail demand projections and, subsequently, its related planning efforts.

4.2 WHOLESALE DEMANDS

Out of its 28 wholesale customers, the SFPUC provides water to 26 Wholesale Customers in San Mateo, Alameda and Santa Clara Counties under the 2009 Water Supply Agreement (WSA) and associated individual contracts with each Wholesale Customer. Collectively, these customers receive over two thirds of the SFPUC's supply. Of the 26 Wholesale Customers, 13 rely on the SFPUC for 95% or more of their total supply; eight rely on the SFPUC for 100% of their total supply.

In addition to the 26 Wholesale Customers, the SFPUC also provides water on a wholesale basis to Cordilleras MWC in San Mateo County and Groveland CSD in Tuolumne County. Cordilleras MWC relies entirely on the SFPUC for its supply, and Groveland CSD relies on the SFPUC for the majority of its supply.

The demands of these two wholesale customers are small compared to the collective demands of the other Wholesale Customers.

4.2.1 Wholesale Water Contractual Obligations

The following sections describe the water supply contracts that the SFPUC has with its Wholesale Customers.

4.2.1.1 2009 Water Supply Agreement and 1984 Settlement Agreement and Master Water Sales Contract

The predecessor to the WSA, the 1984 Settlement Agreement and Master Water Sales Contract (1984 Agreement) established the "Supply Assurance" of 184 mgd to the Wholesale Customers. The 1984 Agreement expired on June 30, 2009. In July 2009, the SFPUC entered into the WSA, a 25-year agreement that describes the current contractual relationship between the SFPUC and its Wholesale Customers. The WSA continued the Supply Assurance in favor of the Wholesale Customers. The 184 mgd Supply Assurance is perpetual and survives the expiration of the WSA.

The Supply Assurance is subject to reduction due to drought, scheduled maintenance activities, and emergencies. The Supply Assurance includes the demands of the City of Hayward and 23 additional Wholesale Customers (representing 24 of the 26 Wholesale Customers).[6] The Cities of San Jose and Santa Clara do not have an allocated share of the Supply Assurance due to their temporary, interruptible status under the 1984 Agreement and the WSA.

The Supply Assurance is allocated between 23 Wholesale Customers using allocations called "Individual Supply Guarantees" (ISGs). The ISGs represent each Wholesale Customer's share of the 184 mgd Supply Assurance. Separately, the City of Hayward has an unspecified supply allocation due to the terms of a 1962 individual water supply contract with the SFPUC that did not contain a fixed allocation of water. The City of Hayward's unspecified water supply allocation is included in the Supply Assurance as the difference between 184 mgd and the sum of the other Wholesale Customers' ISGs. In the event that Hayward's water use exceeds its unspecified water supply allocation, the 23 Wholesale Customers with ISGs would be required to reduce their individual ISGs to accommodate the demands of Hayward.

Each Wholesale Customer also has an individual agreement with the SFPUC that outlines the locations of service connections, service area maps, and other customer-specific details.

The WSA also describes the temporary limitation on water sales through 2018 established by the Phased WSIP (see **Section 6.1.3** for a description of the Phased WSIP). The SFPUC established an "Interim Supply Limitation" (ISL) to limit water sales from the RWS watersheds (referred to as the RWS for the remainder of this document) to an average annual amount of 265 mgd through December 31, 2018. The WSA describes the distribution of the ISL, which is allocated as follows between retail customers and Wholesale Customers:

- Wholesale supply allocation: 184 mgd
- Retail supply allocation: 81 mgd[7]

If the SFPUC projects that the ISL will not be met by June 30, 2018 as a result of Wholesale Customers' projected use exceeding 184 mgd, the SFPUC may issue a conditional five-year notice of interruption or reduction in supply of water to San Jose and Santa Clara.

The Interim Supply Allocations (ISAs), which were established by the SFPUC in December 2010, refer to each Wholesale Customer's share of the ISL. The Wholesale Customers' collective allocation of 184 mgd includes the demands of the Cities of Hayward, San Jose, and Santa Clara. Along with the ISL, the ISAs will also expire on December 31, 2018, but the ISAs do not affect the Supply Assurance or ISGs. The ISGs and ISAs are listed in both **Table 4-2** and **Table 4-3**.

As an incentive to keep RWS deliveries below the ISL of 265 mgd, the SFPUC adopted an "Environmental Enhancement Surcharge" for collective deliveries in excess of the ISL effective at the beginning of FY 2011-12. This volume-based surcharge would be unilaterally imposed by the SFPUC on individual Wholesale Customers and San Francisco retail customers, when an agency's use exceeds its ISA and when sales of water to the Wholesale Customers and San Francisco retail customers, collectively, exceed the ISL of 265 mgd. Actual charges would be determined based on each agency's respective amount(s) of excess use over its ISA. To date, no Environmental Enhancement Surcharges have been levied.

[6] The Supply Assurance as expressed in the WSA includes the City of Hayward and 24 additional Wholesale Customers. Skyline County Water District is now operated by the California Water Service Company.

[7] As explained in **Section 2.4**, Groveland CSD is considered a retail customer of the SFPUC. Thus, RWS supplies to Groveland CSD are accounted for in the retail supply allocation of 81 mgd.

4.2.1.2 2018 Water Supply Decisions

The WSA requires the SFPUC to complete necessary review under the California Environmental Quality Act (CEQA) by December 31, 2018 to support two actions that will affect future water supply planning and development:

- Whether or not to make the Cities of San Jose and Santa Clara permanent customers to the extent that the SFPUC determines that long- term RWS supplies are available, and

- Whether or not to provide water in excess of the Supply Assurance to meet the Wholesale Customers' projected future water demands until the year 2030, and whether to offer a corresponding increase in the Supply Assurance as a result of this determination.

Since the adoption of the Phased WSIP, permitting requirements for the Calaveras Dam Replacement Project and Lower Crystal Springs Dam Improvements Project resulted in additional instream flow requirements that reduced the yield of the RWS. Customer demand projections through 2040 are also below levels previously anticipated. To establish a water supply planning framework for the planning period of 2019 through 2040, the SFPUC developed the 2040 Water Management Action Plan (WaterMAP). The WaterMAP provides necessary information to address key water supply decisions. The water supply program developed as a result of the policy decisions will enable the SFPUC to continue to meet its commitments and responsibilities to the Wholesale Customers and retail customers, consistent with the priorities of the SFPUC. The WaterMAP and ensuing decision-making process are further described in **Section 7.7.1**. At this time, and for purposes of long-term planning, it is assumed that deliveries from the RWS to the Wholesale Customers will not be in excess of the 184 mgd Supply Assurance.

4.2.2 Wholesale Demands

Similar to retail demands, wholesale demands have been declining and are currently at a historic low due to the current drought. As shown in both **Table 4-2** and **Table 4-3**, RWS supplies purchased by wholesale customers in 2015 totaled 128.0 mgd.

In 2014, BAWSCA updated the demand projections of its member agencies using a combination of two different models: an econometric (or statistical) model developed particularly for each member agency and the Demand Side Management Least Cost Planning Decision Support System (a.k.a., DSS Model). Population projections were obtained from a combination of ABAG Projections 2013, individual agency 2010 UWMPs, California Department of Finance, the U.S. Census, and agency planning documents. The forecast methodology and resulting projections are documented in BAWSCA's 2014 report titled "Regional Water Demand and Conservation Projections," and support BAWSCA's Long-Term Reliable Water Supply Strategy (Strategy). The Strategy is further described in **Section 7.4.1**. The Strategy's projections indicated that demands by the Wholesale Customers for RWS supplies through 2040 will be significantly less than anticipated at the time the Phased WSIP was adopted. For BAWSCA member agencies that are urban water suppliers and preparing an individual 2015 UWMP, some agencies are using the projections developed for the Strategy, while others are using their own set of projections. Projected purchase requests for RWS supplies are provided in **Table 4-2** for each Wholesale Customer. Projections that are different from the Strategy's projections are noted as such.

However, to reflect the Supply Assurance described previously, this 2015 UWMP uses the Wholesale Customers' ISGs in lieu of their purchase request projections for planning purposes. It is assumed that the Supply Assurance of 184 mgd will remain, and that the Supply Assurance will not be increased. Subject to

the process requirements for interruption or reduction of supply provided in Section 4.05 of the WSA, the SFPUC will continue to supply water to the San Jose and Santa Clara on a temporary, interruptible basis. However, per the 2009 WSA, the SFPUC will be considering whether to increase the Supply Assurance and provide permanent supply to San Jose and Santa Clara as described in **Section 4.2.1**, above. It should be noted that San Jose's and Santa Clara's demands have been accommodated within the 184 mgd Supply Assurance and received supply from the SFPUC during the current drought. Alternate supplies will be identified to meet the long-term demands of San Jose and Santa Clara, subject to policy and planning decisions to be made by the SFPUC by 2018. The resulting wholesale demands based on contract obligations are shown in **Table 4-3**.

Regarding the two additional wholesale customers, demand projections for Cordilleras MWC are based on knowledge of the small, residential-only service area where no growth is anticipated. As noted earlier, demand projections for Groveland CSD are presented as part of retail demands in **Table 4-1** in the body of this 2015 UWMP, but as part of wholesale demands in the corresponding standardized tables in **Appendix B**.

4.2.3 Wholesale Distribution System Losses

For this 2015 UWMP, the SFPUC conducted a water audit of its wholesale transmission system for the first time. Using the AWWA M36 method and associated worksheet (**Appendix I**), the audit resulted in a negative water loss value -0.5 mgd, and is therefore considered to be inconclusive. However, this audit serves as an informative initial assessment to which future audits may be compared.

Prior to the audit, the SFPUC has commonly observed that the volume sold exceeds the volume supplied to wholesale customers. It is possible that established data collection practices could not completely capture irregular system operations during implementation of numerous WSIP projects and the current drought, resulting in the observed imbalance. If an imbalance continues after WSIP is completed, determining its source may require frequent and detailed assessments of the transmission system, such as on a monthly or quarterly basis. Water loss will continue to be addressed through asset management, which is described in **Section 9.3.4**. In addition, implementation of an advanced metering system for wholesale customers is nearly complete and will increase the SFPUC's ability to detect and repair losses. The wholesale advanced metering system is described in **Section 9.3.1**.

4.3 CLIMATE CHANGE IMPACTS TO DEMAND

While the effects of climate change on demand are not certain, it can be anticipated that the warmer temperatures and altered rainfall patterns associated with climate change would lead to greater water demands for irrigation and cooling. Compared to the rest of the State, irrigation demands in the SFPUC's service area are relatively low due to the dense urban environment, especially in the City. The potential increase in irrigation demand is low. However, the need for water to support cooling systems could increase more substantially given the growing number of high-rise buildings and large office campuses in the City and rest of the Bay Area. For additional discussion of climate change and potential impacts to water supply, see **Section 6.1.6**.

Table 4-2. Wholesale Purchase Requests (mgd)

[Standardized Table Not Applicable]

Wholesale Customer	ISG[a]	ISA[b]	Actual 2015 Purchases[c]	Purchase Request[d]				
				2020	2025	2030	2035	2040
Alameda County Water District	13.76	13.76	7.96	7.68	*8.90*	*9.64*	*9.89*	*10.06*
City of Brisbane / Guadalupe Valley Municipal Improvement District[e]	0.98	0.96	0.60	0.78	0.95	0.94	0.94	0.94
City of Burlingame	5.23	4.97	3.67	*4.94*	*5.01*	*5.10*	*5.21*	*5.42*
California Water Service Company	35.68	35.68	29.05	*33.42*	*33.46*	*33.79*	*34.24*	*34.79*
Coastside County Water District	2.18	2.18	1.53	1.70	1.73	1.77	2.03	2.03
City of Daly City	4.29	4.29	3.32	*4.29*	*4.29*	*4.29*	*4.29*	*4.29*
City of East Palo Alto	1.96	1.96	1.57	*2.01*	*2.14*	*2.30*	*2.54*	*3.05*
Estero Municipal Improvement District	5.90	5.85	3.98	*4.22*	*4.21*	*4.18*	*4.19*	*4.20*
City of Hayward	22.08	22.92	13.60	21.52	22.8	23.58	24.18	25.38
Town of Hillsborough	4.09	3.72	2.63	3.09	3.05	3.02	3.00	2.99
City of Menlo Park	4.46	4.10	2.63	*3.67*	*3.84*	*4.02*	*4.22*	*4.42*
Mid-Peninsula Water District	3.89	3.71	2.53	3.18	3.22	3.23	3.27	3.30
City of Millbrae	3.15	3.13	1.91	2.56	2.63	2.71	2.82	2.93
City of Milpitas	9.23	8.96	5.24	7.69	*8.20*	*8.79*	*8.79*	*8.79*
City of Mountain View	13.46	11.43	7.61	*8.79*	*8.92*	*9.13*	*9.37*	*9.65*
North Coast County Water District	3.84	3.67	2.92	3.04	3.03	3.01	2.99	2.98
City of Palo Alto	17.08	14.70	9.68[f]	*10.60*	*10.20*	*9.90*	*9.70*	*9.50*
Purissima Hills Water District	1.63	1.63	1.65	1.78	1.75	1.72	1.71	1.71
City of Redwood City	10.93	10.88	8.01	*9.97*	*10.25*	*10.36*	*10.54*	*10.79*
City of San Bruno	3.25	2.65	1.31	2.38	2.69	3.03	3.25	3.25
Stanford University	3.03	2.91	1.89[f]	*1.90*	*2.10*	*2.20*	*2.40*	*2.70*
City of Sunnyvale	12.58	10.59	7.79	*9.93*	*10.95*	*10.95*	*10.95*	*10.95*
Westborough County Water District	1.32	1.08	0.68	0.81	0.79	0.77	0.76	0.74
Cordilleras Mutual Water Company[g]	—	—	0.01	0.01	0.01	0.01	0.01	0.01
Subtotal Permanent Customer Purchase Requests	**184.0**	**184.0**	**121.8**	**150.0**	**155.1**	**158.4**	**161.3**	**164.9**
City of San Jose[h]	0.00	4.13	4.49	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*
City of Santa Clara[h]	0.00	4.13	1.77	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*
Total Wholesale Purchase Requests[i]	—	—	**128.0**	**159.0**	**164.1**	**167.4**	**170.3**	**173.9**

a Individual Supply Guarantee (ISG) refers to each Wholesale Customer's share of the Supply Assurance as defined in the 2009 Water Supply Agreement (WSA). The Supply Assurance is the 184 mgd maximum annual average metered supply of water dedicated by San Francisco to public use in the wholesale service area (not including the Cities of San Jose and Santa Clara). The City of Hayward's ISG is calculated as 184 mgd less the total of permanent customer ISGs (161.92 mgd).

b Individual Supply Allocation (ISA) refers to each Wholesale Customer's share of the 265 mgd Interim Supply Limitation through 2018.

c Actual demands are equivalent to purchases as reported in customer billing data.

d Purchase requests for RWS supplies as anticipated to be reported in each agency's individual 2015 UWMP if one is to be prepared (estimates are subject to change). Projections are consistent with BAWSCA's Long-Term Reliable Water Supply Strategy, unless italicized, which indicates that the agency has updated its projections for its 2015 UWMP.

e The City of Brisbane and Guadalupe Valley Municipal Improvement District are two Wholesale Customers that are jointly operated.

f Actual 2015 purchases by the City of Palo Alto include an annual average of approximately 0.11 mgd of deliveries to the Stanford Hospital, located in the City of Palo Alto service area, from Stanford University via an emergency intertie.

g Cordilleras MWC is not a member of BAWSCA, and therefore does not have an ISG or ISA.

h Projected purchase requests for San Jose and Santa Clara are shown as they currently do not have an allocated share of the Supply Assurance due to their temporary, interruptible status under the WSA.

i Groveland CSD is not accounted for as a wholesale customer for the purpose of this table and subsequent wholesale supply and demand comparisons. Refer to **Table 4-1** for Groveland CSD's current and projected demands. However, in the corresponding standardized tables in **Appendix B**, Groveland CSD is reported as wholesale rather than retail.

Table 4-3. Wholesale Contractual Obligations (mgd)

[Standardized Table 4-1 Wholesale: Demands for Potable and Raw Water - Actual]
[Standardized Table 4-2 Wholesale: Demands for Potable and Raw Water - Projected]
[Standardized Table 4-3 Wholesale: Total Water Demands]

Wholesale Customer	ISG[a]	ISA[b]	Actual 2015 Purchases[c]	Contractual Obligation[d]				
				2020	2025	2030	2035	2040
Alameda County Water District	13.76	13.76	7.96	13.76	13.76	13.76	13.76	13.76
City of Brisbane / Guadalupe Valley Municipal Improvement District[e]	0.98	0.96	0.60	0.98	0.98	0.98	0.98	0.98
City of Burlingame	5.23	4.97	3.67	5.23	5.23	5.23	5.23	5.23
California Water Service Company	35.68	35.68	29.05	35.68	35.68	35.68	35.68	35.68
Coastside County Water District	2.18	2.18	1.53	2.18	2.18	2.18	2.18	2.18
City of Daly City	4.29	4.29	3.32	4.29	4.29	4.29	4.29	4.29
City of East Palo Alto	1.96	1.96	1.57	1.96	1.96	1.96	1.96	1.96
Estero Municipal Improvement District	5.90	5.85	3.98	5.90	5.90	5.90	5.90	5.90
City of Hayward	22.08	22.92	13.60	22.08	22.08	22.08	22.08	22.08
Town of Hillsborough	4.09	3.72	2.63	4.09	4.09	4.09	4.09	4.09
City of Menlo Park	4.46	4.10	2.63	4.46	4.46	4.46	4.46	4.46
Mid-Peninsula Water District	3.89	3.71	2.53	3.89	3.89	3.89	3.89	3.89
City of Millbrae	3.15	3.13	1.91	3.15	3.15	3.15	3.15	3.15
City of Milpitas	9.23	8.96	5.24	9.23	9.23	9.23	9.23	9.23
City of Mountain View	13.46	11.43	7.61	13.46	13.46	13.46	13.46	13.46
North Coast County Water District	3.84	3.67	2.92	3.84	3.84	3.84	3.84	3.84
City of Palo Alto	17.08	14.70	9.68[f]	17.08	17.08	17.08	17.08	17.08
Purissima Hills Water District	1.63	1.63	1.65	1.63	1.63	1.63	1.63	1.63
City of Redwood City	10.93	10.88	8.01	10.93	10.93	10.93	10.93	10.93
City of San Bruno	3.25	2.65	1.31	3.25	3.25	3.25	3.25	3.25
City of San Jose[g]	0.00	4.13	4.49	0.00	0.00	0.00	0.00	0.00
City of Santa Clara[g]	0.00	4.13	1.77	0.00	0.00	0.00	0.00	0.00
Stanford University	3.03	2.91	1.89[f]	3.03	3.03	3.03	3.03	3.03
City of Sunnyvale	12.58	10.59	7.79	12.58	12.58	12.58	12.58	12.58
Westborough County Water District	1.32	1.08	0.68	1.32	1.32	1.32	1.32	1.32
Subtotal BAWSCA Demand	**184.0**	**184.0**	**128.0**	**184.0**	**184.0**	**184.0**	**184.0**	**184.0**
Cordilleras Mutual Water Company[h]	—	—	0.01	0.01	0.01	0.01	0.01	0.01
Total Wholesale Demand[i]	—	—	**128.0**	**184.0**	**184.0**	**184.0**	**184.0**	**184.0**

a Individual Supply Guarantee (ISG) refers to each Wholesale Customer's share of the Supply Assurance as defined in the 2009 Water Supply Agreement (WSA). The Supply Assurance is the 184 mgd maximum annual average metered supply of water dedicated by San Francisco to public use in the wholesale service area (not including the Cities of San Jose and Santa Clara). The City of Hayward's ISG is calculated as 184 mgd less the total of permanent customer ISGs (161.92 mgd).

b Individual Supply Allocation (ISA) refers to each Wholesale Customer's share of the 265 mgd Interim Supply Limitation through 2018.

c Actual demands are equivalent to purchases as reported in customer billing data.

d Wholesale Customer ISGs are shown in lieu of purchase request projections, which are shown in **Table 4-2**.

e The City of Brisbane and Guadalupe Valley Municipal Improvement District are two Wholesale Customers that are jointly operated.

f Actual 2015 purchases by the City of Palo Alto include an annual average of approximately 0.11 mgd of deliveries to the Stanford Hospital, located in the City of Palo Alto service area, from Stanford University via an emergency intertie.

g Projected purchase requests for San Jose and Santa Clara are shown as they currently do not have an allocated share of the Supply Assurance due to their temporary, interruptible status under the WSA.

h Cordilleras MWC is not a member of BAWSCA, and therefore does not have an ISG or ISA.

i Groveland CSD is not accounted for as a wholesale customer for the purpose of this table and subsequent wholesale supply and demand comparisons. Refer to **Table 4-1** for Groveland CSD's current and projected demands. However, in the corresponding standardized tables in **Appendix B**, Groveland CSD is reported as wholesale rather than retail.

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SECTION 5: RETAIL BASELINES AND TARGETS

With the adoption of the Water Conservation Act of 2009, also known as the SB X7-7, the State is required to set a goal of reducing urban water use by 20% by the year 2020. Each retail urban water supplier must determine baseline water use, expressed in gallons per capita per day, or GPCD, during their baseline period. Each supplier must also determine their target water use for the years 2015 and 2020 in order to help the State achieve the 20% reduction.

In the 2010 UWMP, a detailed analysis was performed to determine the baseline and target per capitas based on in-City retail service area population and water use. For this 2015 UWMP update, the analysis has been updated to (1) revise the population of its in-City retail service area to reflect the 2010 U.S. Census rather than the 2000 U.S. Census, and (2) include the population and water use of its suburban retail service area. This section describes each step of the analysis.

Note that water use presented in this section reflects gross water use (i.e., water use by all sectors, including water loss). A complete set of standardized SB X7-7 Verification Form tables prescribed by DWR is provided **Appendix D**. Additionally, Groveland CSD is not included in this section, as explained in **Section 2.4**.

5.1 PER CAPITA WATER USE BASELINES

As described in *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009)*, the Water Conservation Act of 2009 requires that each urban retail water supplier include in its UWMP an estimate of base daily per capita water use, expressed in GPCD, for a continuous multi-year base period. The CWC specifies two different base periods:

- A 10- to 15-year continuous period used to calculate baseline per capita water use per CWC Section 10608.12(b)(1) and (2).
- A continuous five-year period used to determine whether the 2020 per capita water use target meets the legislation's minimum water use reduction requirement per CWC Section 10608.12(b)(3).

Because the SFPUC's current and past recycled water use does not equal or exceed 10% of retail water demand, the 15-year baseline cannot be used. The SFPUC will utilize a 10-year baseline. Water use data from 2001 to 2010 have been used for this analysis, which is consistent with the baseline period used in the previous analysis in the 2010 UWMP.

Base daily per capita water use has been calculated for the 10-year baseline period as follows:

- **Step 1: Estimate Distribution System Area.** The distribution system area refers to the in-City and suburban retail areas, as described in **Section 3.2**.
- **Step 2: Estimate Service Area Population for Base Period.** The retail population was estimated for the period of 2001 to 2010 based on various sources depending on data availability. For the in-City retail service area, population data were obtained from the California Department of Finance for the County of San Francisco. However, the same method could not be used for the suburban retail service area since the service area does not align with municipal boundaries. Therefore, the SFPUC consulted with DWR (i.e., pre-review) on an appropriate, alternate methodology based on U.S. Census data at the census block level and persons-per-household data. Use of persons-per-household data was deemed adequate since it is assumed that all residential accounts serve single family homes in the suburban retail service area, and no multi-family residences are served. Therefore, the number of connections can be considered equivalent to number of households. For

the Town of Sunol specifically, the SFPUC used the web-based DWR Population Tool since the corresponding service area was difficult to define at the census block level (output provided in **Appendix J**). The resulting retail population estimates are shown in **Table 5-1**.

- **Step 3: Calculate Gross Water Use.** Gross water use is summarized in **Table 5-2**. Gross water use is comprised of water from the SFPUC's own water supply sources delivered to all retail customers. Changes in storage were then factored in to develop gross water use. The SFPUC compiles daily flow data for the County-line, system input, and in-line meters; and daily reservoir water level data. The meters, water level sensors, and associated metering equipment are all inspected, tested, calibrated, and maintained according to the applicable meter calibration and maintenance frequency by an independent metering consultant. These include annual pitot tube tests, quarterly secondary meter equipment testing and calibration, cleaning, flushing, inspecting, and lubricating. The flow quantities are expected to be accurate and no meter error adjustment is necessary.

- **Step 4: Calculate Annual Daily Per Capita Water Use.** Annual daily per capita water use was calculated by dividing gross water use by population. Annual daily per capita water use is shown in **Table 5-3**.

- **Step 5: Calculate Base Daily Per Capita Water Use.** Base daily per capita water use is calculated as the average of per capita water use, or 107 GPCD as shown in **Table 5-3**.

Table 5-1. Retail Population for 10-Year and Five-Year Baselines

[SB X7-7 Verification Form Table 3: Service Area Population]

10-Year Baseline	Five-Year Baseline	Year	Service Area Population		
			In-City Retail[a]	Suburban Retail[c]	Total Retail
Year 1	—	2001	780,614	1,634	**782,248**
Year 2	—	2002	782,765	1,633	**784,398**
Year 3	—	2003	782,599	1,630	**784,229**
Year 4	—	2004	781,308	1,626	**782,934**
Year 5	—	2005	780,187	1,619	**781,806**
Year 6	Year 1	2006	781,295	1,611	**782,906**
Year 7	Year 2	2007	787,127	1,786	**788,913**
Year 8	Year 3	2008	795,002	1,773	**796,775**
Year 9	Year 4	2009	800,239	1,751	**801,990**
Year 10	Year 5	2010	805,235	1,747	**806,982**
2015 Compliance Year			**857,508[b]**	**1,768**	**859,276**

a In-City population estimated as County of San Francisco population obtained from the California Department of Finance Report E-8: Historical Population and Housing Estimates for Cities, Counties, and the State, 2000-2010, released September 2012. Population data for 2001 through 2009 are for January 1 of the applicable year, whereas population data for 2010 is for April 1, 2010 per the revised 2010 decennial census count.

b In-City population estimated as County of San Francisco population obtained from the California Department of Finance Report E-5: Population and Housing Estimates for Cities, Counties, and the State, 2011-2016 with 2010 Census Benchmark, released May 2016. Population data corresponds to January 1, 2015.

c Suburban retail population based on estimates for the Town of Sunol, Redwood City, Daly City, Fremont, Millbrae, Castlewood CSA, and San Francisco County Jail #5. Groveland CSD is not included.

1) Population of retail customers in the Town of Sunol was estimated using the DWR Population Tool. Output from the tool is provided in **Appendix J**.
2) Populations of retail customers in Redwood City, Daly City, Fremont, Millbrae, and Castlewood were estimated using data from the 2000 and 2010 U.S. Census at the census block level.
3) Inmate population of the San Francisco County Jail #5 in San Bruno was provided by staff of the San Francisco Sheriff's Department.
4) Other suburban customers include individual research and commercial facilities, such as the Lawrence Livermore National Lab, San Francisco International Airport, National Aeronautics and Space Administration, etc. Because these are non-residential facilities, their population is assumed to be zero.

Table 5-2. Retail Gross Water Use for 10-Year and Five-Year Baselines (mgd)

[SB X7-7 Verification Form Table 4: Annual Gross Water Use]

10-Year Baseline	Five-Year Baseline	Year	Volume Into Distribution System[a]	Deductions					Annual Gross Water Use
				Exported Water	Change in Storage[b]	Indirect Recycled Water	Water Delivered for Agricultural Use	Process Water	
Year 1	—	2001	90.9	0	-0.01	0	0	0	91.0
Year 2	—	2002	91.2	0	0.00	0	0	0	91.2
Year 3	—	2003	88.0	0	0.15	0	0	0	87.9
Year 4	—	2004	85.6	0	0.02	0	0	0	85.6
Year 5	—	2005	85.6	0	-0.09	0	0	0	85.7
Year 6	Year 1	2006	83.9	0	0.00	0	0	0	84.0
Year 7	Year 2	2007	82.3	0	0.03	0	0	0	82.3
Year 8	Year 3	2008	80.6	0	0.00	0	0	0	80.6
Year 9	Year 4	2009	78.8	0	-0.01	0	0	0	78.8
Year 10	Year 5	2010	76.9	0	0.06	0	0	0	76.8
10-Year Baseline Average Gross Water Use									**84.4**
Five-Year Baseline Average Gross Water Use									**80.5**
2015 Compliance Year									**69.6**

a All sources are metered, and all meters are calibrated annually.

b Changes in distribution system storage were estimated based on storage records of all in-City storage. Most suburban retail systems do not have storage facilities or the changes in storage were found to be negligible.

Table 5-3. Retail Per Capita Water Use for 10-Year and Five-Year Baselines

[SB X7-7 Verification Form Table 5: Gallons Per Capita Per Day (GPCD)]

10-Year Baseline	Five-Year Baseline	Year	Service Area Population	Annual Gross Water Use (mgd)	Daily Per Capita Water Use (GPCD)
Year 1	—	2001	782,248	91.0	116
Year 2	—	2002	784,398	91.2	116
Year 3	—	2003	784,229	87.9	112
Year 4	—	2004	782,934	85.6	109
Year 5	—	2005	781,806	85.7	110
Year 6	Year 1	2006	782,906	84.0	107
Year 7	Year 2	2007	788,913	82.3	104
Year 8	Year 3	2008	796,775	80.6	101
Year 9	Year 4	2009	801,990	78.8	98
Year 10	Year 5	2010	806,982	76.8	95
10-Year Baseline Average GPCD					**107**
Five-Year Baseline Average GPCD					**101**
2015 Compliance Year					**81**

5.2 PER CAPITA WATER USE TARGETS

Consistent with its 2010 UWMP, the SFPUC has elected to continue to use Method 3 of the four approved methods provided by the Water Conservation Act of 2009 for determining urban water use targets. The retail service area is contained entirely within the San Francisco Bay hydrologic region. The hydrologic region baseline, interim, and 2020 targets are 157, 144, and 131 GPCD, respectively. To calculate the urban water use targets using Method 3, 95% of the 2015 interim and 2020 targets are calculated, yielding 2015 interim and 2020 targets of 137 and 124 GPCD, respectively.

5.3 CONFIRMATION OF WATER USE TARGET

The base daily per capita water use must be confirmed using a five-year base period to assure that the target meets a minimum threshold. Calculation of daily per capita water use for the five-year period is performed in the same way as for the 10-year period. Consistent with its 2010 UWMP, the SFPUC used the period between 2006 through 2010 as its five-year target confirmation period. As shown in **Table 5-2** and **Table 5-3** respectively, the five-year baseline average gross water use is 80.5 mgd, and the five-year average baseline per capita water use is 101 GPCD.

Subsequently, an urban retail water supplier's 2020 target shall be at least 5% of the five-year baseline per capita water use. The SFPUC's daily per capita water use for the five-year period from 2006 to 2010 is 101 GPCD. Because it is above a 100-GPCD threshold specified by the CWC, the 2020 target must be adjusted to reduce water use by a minimum of 5% of the five-year baseline, or 5 GPCD (101 GPCD multiplied by 5%). As such, the SFPUC's highest allowable 2020 target is 96 GPCD (initial 2020 target of 101 GPCD minus the adjustment of 5 GPCD). Since the highest allowable 2020 target is less than the target calculated using Method 3, the SFPUC's 2020 target is therefore adjusted to 96 GPCD. The resulting 2015 interim target is 102 GPCD (i.e., the midpoint between the 10-year baseline of 107 GPCD and the 2020 target of 96 GPCD) (see **Table 5-4**).

Table 5-4. Baselines and Targets Summary (GPCD)

[Standardized Table 5-1: Baselines and Targets Summary]

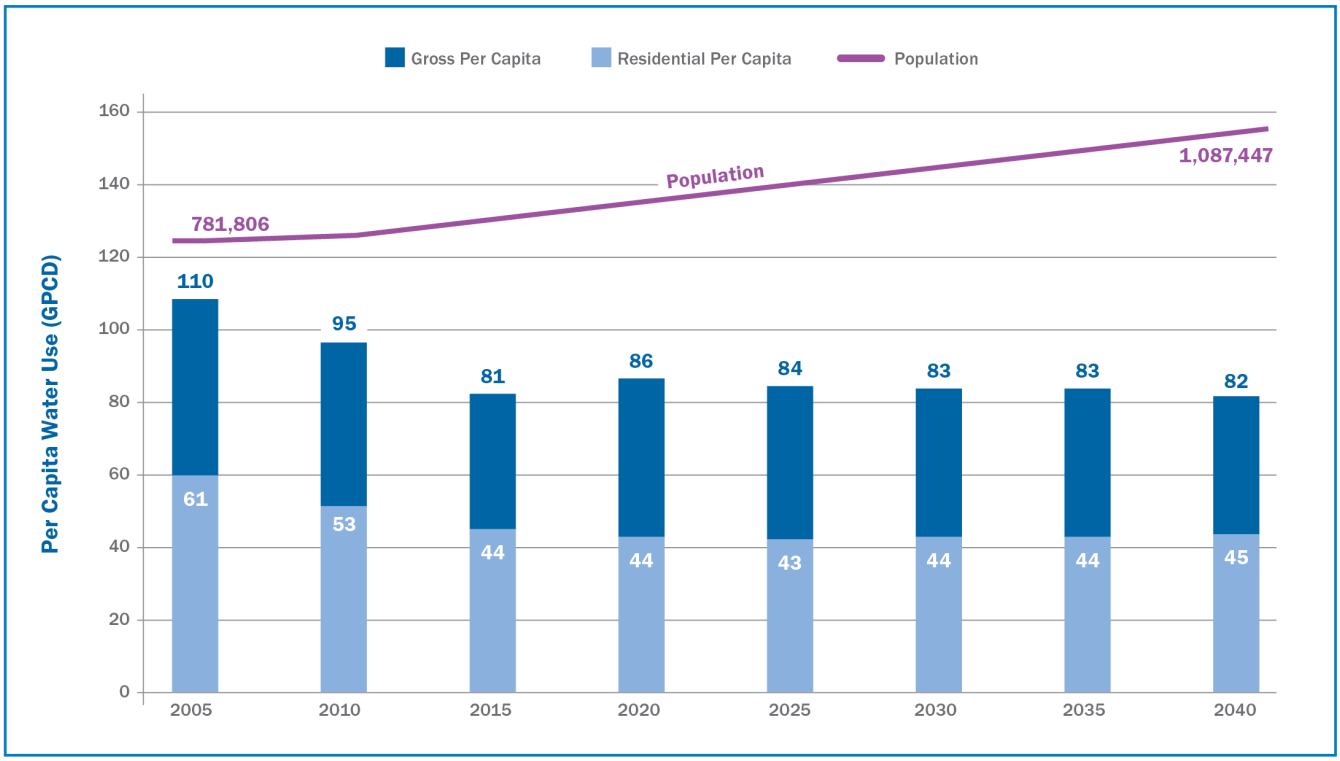
Baseline Period	Start Year	End Year	Average Baseline	Interim 2015 Target	Confirmed 2020 Target
10–Year Baseline	2001	2010	107	102	96
Five-Year Baseline	2006	2010	101	—	—

5.4 COMPLIANCE WITH 2015 WATER USE TARGET

As shown in **Table 5-3**, with a 2015 per capita water use of 81 GPCD, the SFPUC is in compliance with its 2015 interim target of 102 GPCD. No adjustments were needed.

The SFPUC recently completed the Retail Water Conservation Plan, in which an analysis was performed to project its daily per capita water use taking into consideration the impact of population and employment growth, as well as passive and active conservation efforts. The analysis projected that, with its continued water conservation program, the SFPUC's per capita water use in 2020 would be approximately 86 GPCD, indicating that it is also on track of meeting the final 2020 target of 96 GPCD. Furthermore, **Figure 5-1** shows gross and residential per capita water use through 2040 as estimated in the Conservation Plan.

Figure 5-1. Historic and Projected Per Capita Water Use



5.5 ASSISTANCE TO WHOLESALE CUSTOMERS

BAWSCA is the only entity of its kind to have authority to perform regional water supply reliability planning for its member agencies. Among other services, it also has the authority to coordinate water conservation programs and services for its member agencies. BAWSCA manages a Regional Water Conservation Program that is composed of several different conservation measures and is designed to support and augment its member agencies' customer efforts to use water more efficiently. These efforts include the administration of several regional water conservation measures, including measures designed to educate member agency customers about water-efficient landscaping and incentivize irrigated turf removal.

Under the terms of the WSA, the SFPUC cannot provide direct financial assistance for conservation programs to an individual Wholesale Customer and add this expense to the wholesale revenue requirement for that year. The SFPUC can provide staff to assist and, through agreement with BAWSCA, can develop service area-wide conservation programs funded jointly by retail customers and Wholesale Customers. To this end, the SFPUC works closely with BAWSCA as opportunities arise to jointly develop outreach and communications related to the RWS and conservation. For example, the SFPUC and BAWSCA partnered to launch regional campaigns in the summers of 2014 and 2015 to heighten awareness of the drought and encourage conservation. The regional campaigns appeared in the form of billboards and advertisements at transit stations, on television, in newspapers, and in online videos. The SFPUC also provides technical and administrative assistance to the Wholesale Customers on preparing information to the public as requested.

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SECTION 6: SYSTEM SUPPLIES

This section describes current and projected water supplies, as well as the various sources of supplies available to meet retail and wholesale water demands. Potential recycled water uses and supply availability are addressed. This section also summarizes the options used, or being considered, by the SFPUC to maximize resources and minimize the need to import water from the RWS watersheds.

As explained in **Section 2.4**, Groveland CSD is accounted for as a retail customer in this section, but as a wholesale customer in the corresponding standardized tables in **Appendix B**.

6.1 RWS SUPPLIES FOR RETAIL AND WHOLESALE CUSTOMERS

The SFPUC serves its retail and wholesale customers through the integrated operation of local Bay Area water production facilities and the Hetch Hetchy System. The local watershed facilities are operated to conserve local runoff for delivery, and to maintain enough stored water to meet demands in the event of an emergency that affects the supply of water from Hetch Hetchy. Demands that are not met by local runoff are met with water diverted from the Tuolumne River through the Hetch Hetchy System. On average, the Hetch Hetchy System provides approximately 85% of the water delivered by the SFPUC. During dry years, the water received from the Hetch Hetchy System can amount to over 90% of the total water delivered.

The amount of water available to the SFPUC is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River. Due to these constraints, the SFPUC is very dependent on reservoir storage to maximize the reliability of its water supplies. More importantly, reservoir storage provides water supply carry-over capability. During dry years, a very small share of the Tuolumne River supply is available to the SFPUC and the local watersheds produce very little water. Reservoir storage is critical during drought cycles because it enables the SFPUC to carry-over water supply from wet years to dry years.

6.1.1 Water Rights

The City and County of San Francisco holds both pre-1914 appropriative water rights and post-1914 water rights to store and deliver water from the Tuolumne River and local watersheds. Appropriative water rights allow the holder to divert from a source not connected to its place of use. These rights are based on seniority and the use of water must be reasonable, beneficial, and not wasteful. In 1914, California established a formal water rights permit system (by the 1913 Water Commission Act) administered by the SWRCB. The SWRCB does not have permitting jurisdiction over pre-1914 appropriative water rights.

With the Raker Act of 1913, Congress granted San Francisco rights of way for the construction and operation of Hetch Hetchy facilities, which are predominantly located on federally owned land in Yosemite National Park and Stanislaus National Forest. The Raker Act recognized the senior water rights of Turlock Irrigation District (TID) and Modesto Irrigation District (MID) (collectively, the Districts) to divert water from the Tuolumne River, and specified conditions for the release of water to the Districts and other conditions imposed by Congress for the protection of recreation in Yosemite and other purposes.

Under the Raker Act Section 9(c) and the subsequent Fourth Agreement between San Francisco and the Districts, the Districts are entitled to the natural flow of the Tuolumne River (2,416 cubic feet per second [cfs] between June 13 and April 15 of each year and 4,066 cfs between April 15 and June 13, the spring snowmelt period). These flows are computed on a daily basis based on unimpaired conditions at La Grange Dam below

Don Pedro. During multiple drought years, the SFPUC's water diversions may be limited to previously stored (carry-over) water in system reservoirs and the water bank account in Don Pedro reservoir.[8]

6.1.2 Water System Improvement Program

The WSIP is a $4.8 billion, multi-year, capital program to upgrade the RWS and is approximately 90% complete to date. The SFPUC undertook the WSIP to ensure the ability of the RWS to meet Level of Service goals for water quality, seismic reliability, delivery reliability, and water supply. The Water Supply LOS goal stated in WSIP is to meet customer water needs in non-drought and drought periods. **Figure 6-1** lists the WSIP projects and their locations. The goals and objectives of the WSIP are presented in **Table 6-1**.

6.1.3 Programmatic Environmental Impact Report and Phased WSIP Variant

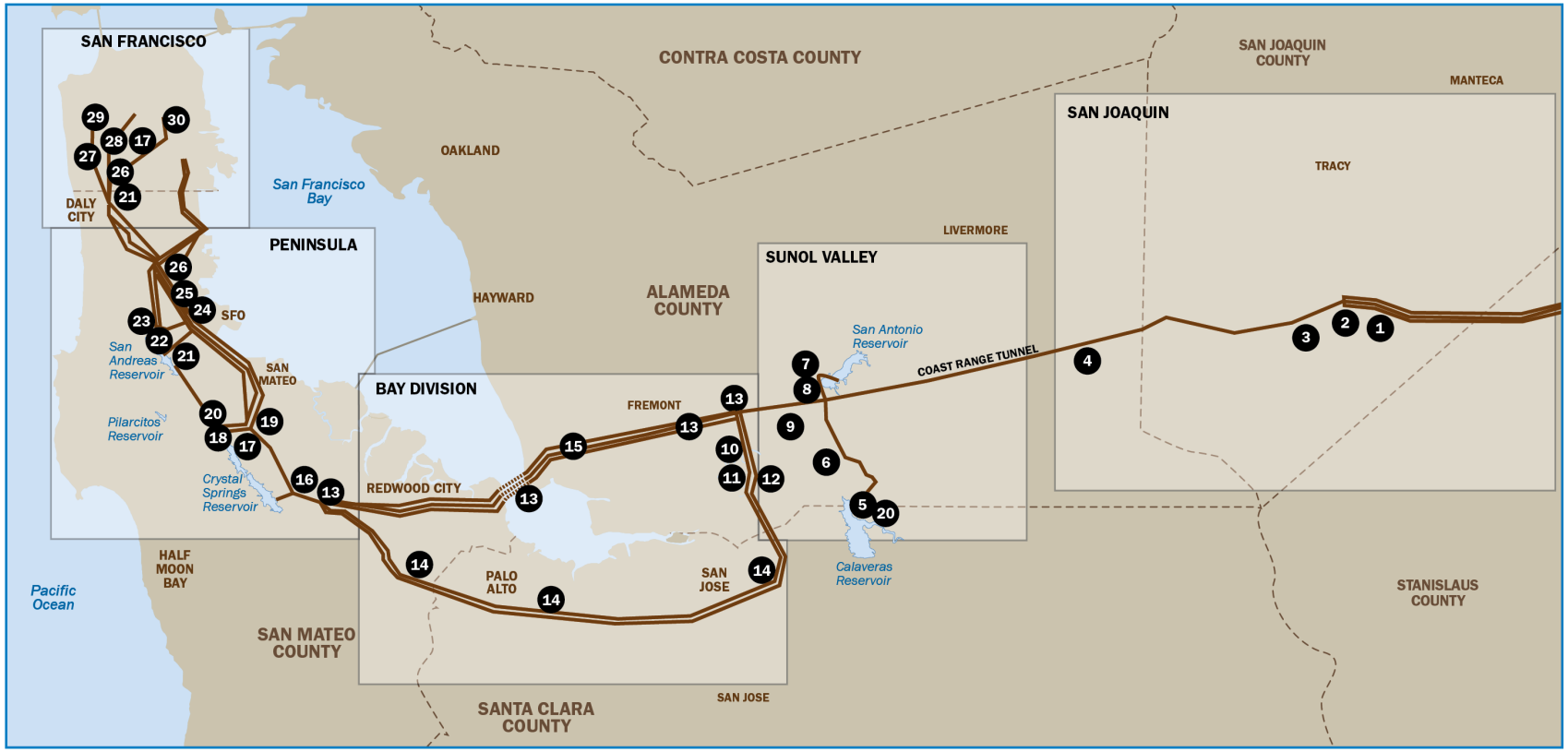
As required under CEQA, the San Francisco Planning Department prepared a Programmatic Environmental Impact Report (PEIR) for the WSIP. The PEIR evaluated the potential environmental impacts of the proposed WSIP projects and identified potential mitigations to those impacts. The PEIR also evaluated several alternatives to meet the SFPUC service area's projected increase in water demand through 2030. The water supply improvement options that were investigated included 10 alternatives using various water supply combinations from the local watersheds; the Tuolumne and Lower Tuolumne River; ocean desalination; and additional recycled water, groundwater, and conservation. The PEIR was certified by the San Francisco Planning Commission on October 30, 2008. On the same day, the SFPUC adopted the Phased WSIP Variant option in Resolution No. 08-200.

At the request of the SFPUC, the San Francisco Planning Department studied the Phased WSIP Variant as part of the environmental analysis. The SFPUC identified this variant to consider a program scenario that involved full implementation of all proposed WSIP facility improvement projects to achieve public health, seismic safety, and delivery reliability goals as soon as possible, but with phased implementation of a water supply program to meet projected water purchases through 2030. Deferring the 2030 water supply element of the WSIP until 2018 would allow the SFPUC and its Wholesale Customers to focus first on implementing additional local recycled water, groundwater, and demand management actions while minimizing additional diversions from the watersheds.

The Phased WSIP Variant establishes a mid-term planning milestone in 2018 when the SFPUC will reevaluate water demands through 2030 in the context of then-current information, analysis, and available water resources. The SFPUC has historically made annual average deliveries ranging from 285 mgd in 1987 to 265 mgd in 2005 from the RWS. Annual average deliveries in 2005 provided the baseline year for the Phased WSIP. The Phased WSIP Variant would meet the projected 2018 purchase requests of 285 mgd from the RWS by capping purchases at 265 mgd (i.e., the ISL of 265 mgd established in the WSA); the remaining 20 mgd would be met through water efficiencies and conservation, water recycling and local groundwater use: 10 mgd by Wholesale Customers and 10 mgd in the City. By December 31, 2018, the SFPUC will reevaluate water system demands and supply options and conduct additional studies and environmental reviews necessary to address water supply needs after 2018 (further described in **Section 4.2.1.2**). Additionally, in response to the SFPUC's adoption of the Phased WSIP Variant, BAWSCA, on behalf of the Wholesale Customers, began developing a Long-Term Reliable Water Supply Strategy to identify appropriate water management actions to increase the long-term water supply reliability of its member agencies and their customers under normal and drought conditions through 2040. The Strategy is further described in **Section 7.4.1**.

[8] Turlock and Modesto Irrigation Districts have senior water rights to the SFPUC for the Tuolumne River water and are entitled to the first increment of flow in the basin. Water bank provides a credit and debit system which allows the SFPUC to divert water upstream while meeting its obligations to Modesto and Turlock Irrigation Districts. Through this mechanism the SFPUC may pre-deliver the Districts entitlements and credit the water bank so that at other times the SFPUC may retain water upstream while the Districts debit water bank.

Figure 6-1. Water System Improvement Program



1 San Joaquin Pipeline System
2 Rehabilitation of Existing San Joaquin Pipelines
3 Tesla Treatment Facility
4 Lawrence Livermore Water Quality Improvement
5 Calaveras Dam Replacement
5 Calaveras Reservoir Upgrades
5 San Antonio Backup Pipeline
6 SVWTP Expansion & Treated Water Reservoir
7 Alameda Creek Recapture Project
8 Alameda Siphon #4
8 San Antonio Pump Station Upgrade
9 New Irvington Tunnel
10 BDPL No. 4 Condition Assessment PCCP Sections
11 Seismic Upgrade of BDPL Nos. 3 &4
12 BDPL Nos. 3 & 4 Crossover/Isolation Valves
13 BDPL Reliability Upgrade - Tunnel
13 BDPL Reliability Upgrade - Pipeline
13 BDPL Reliability Upgrade - Relocation of BDPL Nos. 1 & 2
14 BDPL Nos. 3 &4 Crossovers
15 SFPUC/EBMUD Intertie
16 Pulgas Balancing - Inlet/Outlet Work
16 Pulgas Balancing - Discharge Channel Modifications
16 Pulgas Balancing - Structural Rehabilitation & Roof Replacement
16 Pulgas Balancing - Modifications of Existing Dechlorination Facility
17 Crystal Springs Pipeline No. 2 Replacement
18 Lower Crystal Springs Pipeline No. 2 Replacement
19 New Crystal Springs Bypass Tunnel
20 Adit Leak Repair - Crystal Springs/Calaveras
21 Crystal Springs/San Andreas Transmission Upgrade
22 HTWTP Long-Term Improvements
23 HTWTP Short-Term Improvements - Coagulation & Flocculation/Remaining Filters
24 Capuchino Valve Lot Improvement
25 Peninsula Pipelines Seismic Upgrade
26 Baden and San Pedro Valve Lots Improvements
27 Regional Groundwater Storage & Recovery
28 San Andreas Pipeline No. 3 Installation
29 Sunset Reservoir - North Basin
30 University Mound Reservoir - North Basin

WSIP Projects in Various Locations

Standby Power Facilities - Various Locations
Pipeline Repair & Readiness Improvements
SCADA System - Phase II
System Security Upgrades
Peninsula Pipelines Security Upgrade
Cross Connection Controls
Programmatic EIR
Watershed Environment Improvement Program
Bioregional Habitat Restoration
Vegetation Restoration of WSIP Construction Sites
Long Term Mitigation Endowment

Table 6-1. Water System Improvement Program Goals and Objectives

[Standardized Table Not Applicable]

Program Goal	System Performance Objective
Water Quality: maintain high water quality	• Design improvements to meet current and foreseeable future federal and state water quality requirements. • Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filtered water from local watersheds. • Continue to implement watershed protection measures.
Seismic Reliability: reduce vulnerability to earthquakes	• Design improvements to meet current seismic standards. • Deliver basic service to the three regions in the service area (East/South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for design of the regional system is 229 mgd. The performance objective is to provide delivery to at least 70% of the turnouts in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco, respectively. • Restore facilities to meet average-day demand of up to 300 mgd within 30 days after a major earthquake.
Delivery Reliability: increase delivery reliability and improve ability to maintain the system	• Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. • Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. • Provide operational flexibility and system capacity to replenish local reservoirs as needed. • Meet the estimated average annual demand of 300 mgd under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage due to a natural disaster, emergency, or facility failure/upset.
Water Supply: meet customer water needs in non-drought and drought periods	• Meet average annual demand of 265 mgd from the SFPUC watersheds for retail and Wholesale Customers during non-drought years for system demands through 2018. • Meet dry-year delivery needs through 2018 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.
Sustainability: enhance sustainability in all system activities	• Manage natural resources and physical systems to protect watershed ecosystems. • Meet, at a minimum, all current and anticipated legal requirements for protection of fish and wildlife habitat. • Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness: achieve a cost-effective, fully operational system	• Ensure cost-effective use of funds. • Maintain gravity-driven system. • Implement regular inspection and maintenance program for all facilities.

The Phased WSIP Variant includes the following water supply elements:

- Water supply delivery to RWS customers through 2018 only of 265 mgd average annual target delivery. This includes 184 mgd for the Wholesale Customers and 81 mgd for retail customers.[9]

- Water supply sources include 265 mgd average annual from the RWS and 20 mgd of water conservation[10], recycled water and local groundwater developed within the SFPUC's service area (10 mgd in the retail service area and 10 mgd in the wholesale service area);

- Water supply projects to meet dry-year demands with no greater than 20% system-wide rationing in any one year:
    - Restoration of Calaveras Reservoir capacity;
    - Restoration of Crystal Springs Reservoir capacity;
    - Westside Basin Groundwater Conjunctive Use;
    - Water Transfer with MID/TID;

- Reevaluation of 2030 demand projections, potential RWS purchase requests, and water supply options by December 31, 2018 and a separate SFPUC decision no later than 2018 regarding RWS future water deliveries after 2018.

Dry year water supply projects are detailed in **Section 7.2**.

6.1.4 Future Regional Supplies

In addition to the supply projects discussed above, the SFPUC is exploring a range of additional options to improve water supply reliability in future years for the purposes of managing the water supply loss associated with instream flow release requirements and possibly to meet the long-term demands of the Cities of San Jose and Santa Clara. In adopting the Calaveras Dam Replacement Project and the Lower Crystal Springs Dam Improvements Project, the SFPUC committed to providing instream flow releases (a.k.a., fishery flows) below Calaveras Dam and Lower Crystal Springs Dam, as well as bypass flows around Alameda Creek Diversion Dam. The fishery flow schedules for Alameda Creek and San Mateo Creek represent a potential decrease in available average annual water supply of 9.3 mgd and 3.5 mgd, respectively, for a total of 12.8 mgd average annually. The Alameda Creek Recapture Project[11] is proposed to replace the 9.3 mgd of supply lost to Alameda Creek fishery flows. The Draft EIR for this project is scheduled to be published in the fall of 2016. If this is implemented, 3.5 mgd of instream flow releases into San Mateo Creek will create a shortfall in meeting the target delivery of 265 mgd and slightly increase dry-year water supply needs. **Section 7.3** describes this shortfall in more detail.

The SFPUC is committed to meeting its contractual obligation to its Wholesale Customers of 184 mgd and its delivery reliability goal of 265 mgd with no greater than 20% rationing in any one year of a drought. Through the WaterMAP, which is further described in **Section 7.7.1**, the SFPUC addresses the 3.5 mgd shortfall and how to meet new demands that may occur should San Jose and Santa Clara become permanent customers.

[9] As explained in **Section 2.4**, Groveland CSD is considered a retail customer of the SFPUC. Thus, RWS supplies to Groveland CSD are accounted for in the retail supply allocation of 81 mgd.
[10] Water conservation is accounted for as a demand reduction.
[11] The project formerly known as the Upper Alameda Creek Filter Gallery Project in the WSIP was later reconfigured as the Alameda Creek Recapture Project.

6.1.5 Water Quality of RWS Supplies

As described in **Section 3.1**, the RWS delivers high-quality water. The current surface water supplies available to the RWS include the Tuolumne River and supplies from local Bay Area reservoirs. The majority of the water supply originates in the upper Tuolumne River watershed high in the Sierra Nevada, remote from human development and pollution. This high-quality Hetch Hetchy water is protected in pipes and tunnels as it is conveyed to the Bay Area, requiring only primary disinfection and pH adjustment to control corrosion in the pipelines. In addition, Hetch Hetchy water undergoes UV disinfection at the Tesla Treatment Facility, further ensuring high water quality.

The USEPA and SWRCB DDW have approved the use of this drinking water source without requiring filtration at a treatment plant. However, local water from the local watersheds requires filtration to meet drinking water quality requirements. The filtered and treated water from the local watersheds is blended with Hetch Hetchy water, and most customers receive this blended water supply. System water quality, including both raw water and treated water, is continuously monitored and tested to assure that water delivered to customers meets or exceeds federal and State drinking water and public health requirements.

The SFPUC will continue to rely on these high-quality water sources. No degradation of water quality is anticipated in the future.

An annual water quality report (i.e., Consumer Confidence Report) is prepared by the SFPUC for its customers each spring and is available at **www.sfwater.org/qualitymatters**.

6.1.6 Climate Change Impacts to RWS Supplies

The issue of climate change has become an important factor in water resources planning in the State, and is frequently being considered in urban water management planning, although the extent and precise effects of climate change remain uncertain. There is convincing evidence that increasing concentrations of greenhouse gases 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 shows that a warming trend occurred during the latter part of the 20th century and will likely 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 the potential impacts to water resources. Based on these studies, climate change could result in the following types of water resource impacts, some of which are likely to affect the Tuolumne River watershed and local watersheds in the Bay Area:

- Reductions in the average Sierra Nevada annual snowpack due to a rise in the snowline elevation and a shallower snowpack at lower elevations, and a shift in snowmelt runoff to earlier in the year;
- Changes in the timing, intensity and variability of precipitation, and an increased amount of precipitation falling as rain instead of as snow;
- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality;
- 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 2013 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 has studied and continues to study the effects of climate change on the RWS. These works are summarized below.

6.1.6.1 Bay Area Integrated Regional Water Management Plan

Climate change adaptation was established as an overarching theme for the 2013 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 6-2**, 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.

6.1.6.2 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 planning to conduct a comprehensive assessment of the potential effects of climate change on water supply. The assessment will incorporate an investigation of new research on the current drought and is anticipated to be completed in the next few years.

Table 6-2. Summary of BAIRWMP Climate Change Vulnerability Assessment

[Standardized Table Not Applicable]

Vulnerability Areas	General Overview of Vulnerabilities
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) as a result of temperature rise, increased evaporative losses due to warmer temperature, and a longer growing season are also expected. 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 changes in total annual precipitation over the Region may not occur, 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, the 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.

Vulnerability Areas	General Overview of Vulnerabilities
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.

Source: Adapted from 2013 Bay Area Integrated Regional Water Management Plan (BAIRWMP), Table 16-3.

6.1.7 Summary of Existing and Future RWS Supplies

As discussed earlier, deliveries from the RWS are limited to an average annual of 265 mgd through 2018. As a decision on future water deliveries beyond 2018 has not yet been made, this 2015 UWMP assumes that the 265 mgd delivery extends to 2040. Although up to 81 mgd of RWS supplies are available in normal years, the SFPUC is committed to developing local supplies to meet retail demands. Therefore, the SFPUC would use local groundwater, recycled water, and non-potable water supplies before using RWS supplies to meet retail demands. Current and projected supplies from the RWS for both retail and wholesale customers are shown in **Table 6-3**.

Table 6-3. Regional Water System Supplies in Normal Years (mgd)

[Standardized Table 6-9 Retail: Water Supplies – Projected]

[Standardized Table 6-9 Wholesale: Water Supplies – Projected]

RWS Supply by Customer	Actual	Projected				
	2015	2020	2025	2030	2035	2040
Retail Customers[a, b]	67.7	70.5	71.9	73.2	76.7	80.6
Wholesale Customers[c, d]	184.0	184.0	184.0	184.0	184.0	184.0
Total RWS Supplies	**265.0**	**265.0**	**265.0**	**265.0**	**265.0**	**265.0**

a Assuming that the retail supply allocation of 81 mgd per the WSA is extended to 2040, up to 81 mgd of RWS supply may be used.

b Groveland CSD is reported as a wholesale customer for the purposes of this 2015 UWMP, but is considered a retail customer of the SFPUC solely for purposes of allocating RWS supplies between retail customers and Wholesale Customers. Its demands would be met by the retail supply allocation of 81 mgd.

c Projected Wholesale Customer deliveries are limited to 184 mgd. Prior to 2018, 184 mgd includes the demands of the Cities of San Jose and Santa Clara. After 2018, San Jose and Santa Clara will be supplied on a temporary and interruptible basis, with their total supply not exceeding 9 mgd assuming supply is available (decision to be made by end of 2018).

d Cordilleras MWC is not subject to the WSA, nor to the wholesale supply allocation of 184 mgd. The demands of Cordilleras MWC are minor (projected to be less than 0.01 mgd) and are anticipated to be met with RWS supplies through 2040.

6.2 LOCAL SUPPLIES FOR RETAIL CUSTOMERS

The RWS comprises about 97% of total retail water supplies, while the remaining portion is from locally-produced groundwater, recycled water, and non-potable water. These local supplies are described in the following sections.

6.2.1 Existing Local Supplies

Existing supplies of groundwater, recycled water, and non-potable water are described below. Future supplies are described in **Section 6.2.2**.

6.2.1.1 Local Groundwater

San Francisco overlies all or part of seven un-adjudicated groundwater basins. These groundwater basins include the Westside, Lobos, Marina, Downtown, Islais Valley, South, and Visitation Valley basins. The Lobos, Marina, Downtown, and South basins are located wholly within City limits, while the remaining three extend south into San Mateo County. The portion of the Westside Basin aquifer located within the City is referred to as the North Westside Groundwater Basin (or North Westside Basin). With the exception of the Westside and Lobos basins, all of the basins are generally inadequate to supply groundwater for municipal supply due to low yield, contamination, or potential subsidence concerns.

Early in its history, the City made use of local groundwater, springs, and spring-fed surface water ranging from approximately 6.0 to 8.5 mgd prior to 1934. After imports of water from the Hetch Hetchy Reservoir began in October 1934, municipal supplies began to rely almost exclusively on surface water from the RWS.

Local groundwater use, however, has continued in the City. In addition, groundwater has been used and continues to be used in the suburban retail service area. These local groundwater basins are described below.

Westside Groundwater Basin. With an area of about 45 square miles, the Westside Groundwater Basin is the largest groundwater basin in San Francisco and is currently used to meet retail water demands for some irrigation customers. The Westside Groundwater Basin is separated from the Lobos Basin to the north by a northwest-trending bedrock ridge through the northeastern part of Golden Gate Park. San Bruno Mountain

and San Francisco Bay form the eastern boundary, and the San Andreas Fault and Pacific Ocean form the western boundary. The southern limit of the Westside Groundwater Basin is defined by an area of high bedrock that separates it from the San Mateo Plain Groundwater Basin. The basin opens to the Pacific Ocean on the northwest and San Francisco Bay on the southeast. Portions of the Westside Groundwater Basin, primarily starting at Lake Merced in the north and going south, contain three aquifers known as the Shallow Aquifer, Primary Production Aquifer, and Deep Aquifer. The Shallow and Primary Production Aquifers also occur north of Lake Merced depending on the presence or absence of subsurface clay layers. The basin has not been adjudicated nor has it been identified by DWR as overdrafted, or as projected to be overdrafted in the future.

The Westside Groundwater Basin is subdivided for management purposes into northern and southern portions by the county line separating San Francisco and San Mateo counties. The county-line boundary between the North and South Westside Groundwater Basins does not have hydrogeological significance other than influencing the jurisdictional distribution of groundwater pumping. No geologic features restrict groundwater flow between the northern and southern parts of the groundwater basin.

Within San Mateo County, the South Westside Groundwater Basin (or South Westside Basin) encompasses 30 miles and extends southeast across the San Francisco Peninsula south of San Bruno Mountain from the ocean near Daly City to San Francisco Bay in Burlingame. It is described in the South Westside Basin Groundwater Management Plan.[12] Municipal water demand within the South Westside Basin is served by the City of San Bruno, California Water Service Company, City of Daly City, and SFPUC as a wholesaler to those entities.

The North Westside Basin has a land surface area of slightly more than 14 square miles encompassing much of the western third of the City, including Lake Merced and most of Golden Gate Park. The North Westside Basin is about 75% residential and commercial, including the Sunset and Parkside districts; and at least 25% park and open space, most notably Golden Gate Park, Lake Merced, golf clubs, and hilltop parks along the basin's eastern boundary. The North Westside Basin land surface extends from sea level along Ocean Beach to nearly 1,000 feet above sea level along a bedrock ridge three to four miles inland. The North Westside Basin is bounded on the north by a mostly buried bedrock ridge extending from Point Lobos southeast through Golden Gate Park and northeast through Lone Mountain. The basin boundary encompasses the panhandle of Golden Gate Park, then extends south-southwest through Twin Peaks and Mount Davidson, crossing south into San Mateo County a little more than a mile east of Lake Merced. The San Andreas Fault Zone trends offshore to the northwest of Daly City and is interpreted to bound the basin on the west. Existing retail groundwater sources are pumped from the North Westside Basin.

The SFPUC has implemented a groundwater monitoring program to evaluate groundwater elevations and quality, along with water elevations at Lake Merced. The monitoring system includes a single well or clusters of two or more wells at 19 locations. Groundwater levels in each well are monitored continuously using pressure transducers or are measured quarterly by hand. Based on regular groundwater monitoring conducted in the North Westside Basin since 2004, groundwater levels along the Pacific Coast and north of Lake Merced have generally remained above sea level in the Shallow and Primary Production Aquifers.

The SFPUC samples groundwater at five monitoring well locations semiannually to monitor general water quality in the groundwater basin, including four locations near Lake Merced and one at the West Sunset Playground. Three of the locations near Lake Merced include both a Shallow Aquifer and Primary Production Aquifer monitoring well. The monitored parameters include total alkalinity, calcium, magnesium, sodium, potassium, bicarbonate, hardness, chloride, nitrate, sulfate, TDS, pH, and specific conductance. In addition, some wells have been monitored for iron and manganese.

[12] City of San Bruno, California Water Service Company, Daly City, and Hetch Hetchy Regional Water System. 2012. *South Westside Basin Groundwater Management Plan*.

Since 1926, groundwater has been pumped from wells located in Golden Gate Park and the San Francisco Zoo. Based on flow meter data, about 1.5 mgd is produced by these wells. The groundwater is mostly used by the San Francisco Recreation and Park Department for irrigation and other non-potable uses (e.g., lake filling, water exhibits) at Golden Gate Park, the San Francisco Zoo, and landscaped medians along the Great Highway.

There are currently no adopted groundwater management plans for any of the groundwater basins in the City. However, in March 2015, SFPUC was established as the Groundwater Sustainability Agency for the seven groundwater basins in San Francisco. In addition, the SFPUC is currently preparing a Groundwater Sustainability Plan for the North Westside Basin in compliance with the California Sustainable Groundwater Management Act of 2014. The overall goal of the Groundwater Sustainability Plan for the North Westside Basin will be to assure a long-term, high quality, local water supply for current and future uses.

Livermore Valley Basin, Central Groundwater Sub Basin. In the suburban retail service area, about 0.4 mgd of groundwater is delivered to the Castlewood CSA from the Castlewood Well System operated by the SFPUC (this system is described in **Section 3.1.5.2**). Groundwater is drawn from the Central Groundwater Sub Basin in the Livermore Valley Basin. DWR has not identified this basin as overdrafted, nor as projected to be overdrafted in the future. These wells are metered and have been in operation for several decades. The system serving Castlewood is not connected to the RWS.

Sunol Filter Gallery Subsurface Diversions. The Sunol Filter Gallery (Gallery) is located adjacent to Alameda Creek in Sunol, south of the SFPUC's Sunol Pump Station. The Gallery is approximately 2,000 feet long and consists of a concrete box structure 10 feet 8 inches in height and 6 feet wide. The sides of the box structure are perforated by pipes to allow infiltration of the underflow of Alameda Creek. A 30-inch perforated pipe section in the bed of Alameda Creek also feeds the Gallery, which discharges into the Sunol Aqueduct at the Sunol Water Temple. About 0.3 mgd of groundwater[13] is available from the Gallery, which was used to irrigate the Sunol Valley Golf Club through January 2016. This supply remains available for future potable and irrigation uses.

The volumes of groundwater pumped during 2011 to 2015 from the three sources described above are shown in **Table 6-4.**

Table 6-4. Groundwater Pumped (mgd)

[Standardized Table 6-1 Retail: Groundwater Volume Pumped]

Groundwater Source	2011	2012	2013	2014	2015
Westside Groundwater Basin[a]	1.3	1.2	1.5	1.5	1.5
Livermore Valley Basin, Central Groundwater Sub Basin[b]	0.4	0.4	0.3	0.4	0.3
Sunol Filter Gallery Subsurface Diversions[c]	0.3	0.4	0.4	0.4	0.4

a Data are obtained from the 2014 Annual Groundwater Monitoring Report, Westside Basin (SFPUC, April 2015). Pumping volumes are reported on a calendar year basis, but are used to approximate fiscal year data for this table. Data for 2015 were not available as of the publication of this document, so data for calendar year 2014 is applied to 2015.

b This basin is the source of water for the Castlewood Well System. Pumping volumes are assumed to be equivalent to billed consumption for Castlewood CSA; obtained from customer billing data.

c Pumping volumes are assumed to be equivalent to billed consumption for Sunol Valley Golf Course; obtained from customer billing data.

[13] Although termed groundwater in this section, Gallery supplies are considered to be groundwater under the influence of surface water subject to surface water permitting and water right requirements.

6.2.1.2 Local Recycled Water

From 1932 to 1981, the City's McQueen Treatment Plant provided recycled water to Golden Gate Park for irrigation and flow augmentation of its streams and lakes. Due to changes in State regulations, the plant could no longer meet required standards. Subsequently, the City closed the McQueen Treatment Plant and discontinued use of recycled water in Golden Gate Park, however, a limited volume of recycled water is currently used in the retail service area as described below.

Southeast Water Pollution Control Plant. Disinfected secondary-treated recycled water from the Southeast WPCP is used on a limited basis for wash-down operations at the plant. Recycled water is also provided to construction contractors, City departments, and other interested parties for use within the City via the truck-fill station. Permitted uses include soil compaction, dust control, landscape irrigation, street cleaning, and sewer flushing. In 2015, over 739,000 gallons (about 0.002 mgd) were distributed from the truck-fill station for these uses. However, this volume of recycled water use does not materially contribute to overall retail demands.

Harding Park. The Harding Park Recycled Water Project, a partnership between the SFPUC and NSMCSD, was completed in October 2012 and provides tertiary-treated recycled water for irrigating the Harding Park and Fleming Golf Courses in San Francisco. In 2015, 0.24 mgd of recycled water was delivered to Harding Park, a retail customer of the SFPUC.

Sharp Park. The Pacifica Recycled Water Project provides recycled water to several irrigation customers in Pacifica including the Sharp Park Golf Course, a retail customer of the SFPUC. This project was developed and constructed through a partnership between the SFPUC and NCCWD. A new automated irrigation system was installed on the east side of the golf course, and recycled water delivery began in October 2014. In 2015, recycled water deliveries were estimated to be 5 MG (about 0.01 mgd). The remainder of the golf course is currently supplied with potable water. When completed, recycled water deliveries to Sharp Park will be approximately 30 MG per year (about 0.1 mgd).

Projections of recycled water use in the retail service area were provided in the 2010 UWMP. At that time, it was estimated that 0.3 mgd of recycled water would be used in 2015. Actual use in 2015 was approximately 0.3 mgd. A comparison of projected and actual recycled water uses is shown in **Table 6-5**.

Table 6-5. Projected and Actual Recycled Water Use for 2015 (mgd)

[Standardized Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual]

Use Type	2010 Projection for 2015	Actual Use in 2015
Irrigation[a]	0.3	0.3
Lake Fill[b]	0	0
Commercial/Industrial	0	0

a Irrigation includes both golf course and other landscape irrigation.

b Lake fill includes wildlife habitat enhancement, wetland recharge, and groundwater recharge.

6.2.1.3 Wastewater Assessment

The SFPUC operates the City's wastewater collection, treatment, and disposal system, which consists of a combined sewer system (which collects both sewage and storm water), three water pollution control plants, and outfalls to San Francisco Bay and the Pacific Ocean. The collection and conveyance systconsists of approximately 900 miles of various sizes of underground sewer pipes, transport/storage

structures, and pump stations located throughout the City. Two of the City's water pollution control plants, the Southeast WPCP and Oceanside WPCP, provide secondary treatment and operate year-round; while the third plant, the North Point Wet Weather Facility, operates only during wet weather and provides primary treatment. Ultimate disposal of treated wastewater effluent is currently through outfalls to both San Francisco Bay and the Pacific Ocean. **Table 6-6** summarizes the current volumes of wastewater collected, treated, discharged, and recycled within the retail service area.

As mentioned previously, suburban retail water use in 2015 was 4.5 mgd, which was about 6% of total retail demand. As such, the volume of wastewater generated within the SFPUC's water retail service area is assumed to be small compared to in-City wastewater generation. However, notable large suburban retail customers are included in **Table 6-6**.

Table 6-6. Wastewater Operations within Retail Service Area

[Standardized Table 6-2 Retail: Wastewater Collected Within Service Area]

[Standardized Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015]

Treatment Plant	Operator	Location	Volume of Wastewater in 2015 (mgd)				Recycled Water Delivered within Retail Service Area in 2015 (mgd)
			Collected	Treated (Level)	Discharged	Recycled	
Southeast WPCP[a]	SFPUC	San Francisco	60.8	60.8 (secondary, undisinfected)	51.0[b]	0[c]	0[c]
Oceanside WPCP	SFPUC	San Francisco	12.9	12.9 (secondary, undisinfected)	13.4[d]	Not recycled	Not recycled
Mel Leong Treatment Plant[e, f]	City and County of San Francisco	San Francisco International Airport	0.6	0.6 (secondary, disinfected-23)	0.6	See note f	See note f

a The Southeast Water Pollution Control Plant (WPCP) and North Point Wet Weather Facility are grouped together as one facility because they are hydraulically connected (both plants receive influent from the same collection system) and their discharges are covered by the same permit.

b The volume discharged is less than the volume collected because a small volume of the discharged wastewater is treated to secondary, disinfected-23 level and used for other purposes, such as the recycled water truck-fill station.

c About 739,000 gallons (0.002 mgd) of recycled water treated to a secondary, disinfected-23 level were dispensed from the truck-fill station in 2015. However, this volume is not considered large enough to be reported in the 2015 UWMP.

d The volume discharged is higher than the volume collected because the discharged volume includes additional plant recycle streams.

e The Mel Leong Treatment Plant is the only wastewater facility that treats and discharges wastewater generated by a suburban retail water customer within the suburban retail service area. Wastewater utilities serving other suburban retail customers do not treat or dispose of wastewater within the suburban retail service area.

f Volumetric data for Mel Leong Treatment Plant are obtained from its NPDES permit, which provides estimates of volumes in 2011. Per the permit, up to 0.72 mgd can be diverted from the treatment plant to an onsite recycled water facility, which provides tertiary-treated recycled water for irrigation and other non-potable uses at SFO as needed.

6.2.2 Future Local Supplies

The SFPUC anticipates that the existing supplies described above will be available in the future. However, to reliably and sustainably meet the future water needs of its retail customers, the SFPUC is supplementing and diversifying its water supply portfolio through the development of local water supplies, such as increasing groundwater, recycled water, and non-potable water production. Projects related to these efforts are described below, and projected volumes are later provided in **Table 6-7**. For water supply projects specific to dry years, see **Section 7.2**.

6.2.2.1 San Francisco Groundwater Supply Project

The San Francisco Groundwater Supply Project involves the construction of six deep well pumping stations to extract up to 4 mgd of water from the Westside Groundwater Basin, as well as over five miles of pipelines to distribute the groundwater to in-City reservoirs for blending with the municipal drinking water supply. The groundwater will be disinfected and blended with RWS supplies before entering the in-City distribution system. Two of the six wells will also serve as emergency drinking water supplies following an earthquake or other natural disaster, and will include a distribution system to fill emergency water tankers.

Construction of the first phase of the project (four wells and pipelines) began in August 2014 and is expected to be completed in early 2017. Construction of the second phase of the project (two wells and pipelines) is expected to begin in late 2016 and coincide with the Westside Recycled Water Project, which is described in the next section.

Although this project would yield a total of 4 mgd, 1.2 mgd is existing supply that is currently being used for irrigation as described in **Section 6.2.1.1**. With the Westside Recycled Water Project, this irrigation demand will be met with recycled water instead, thereby freeing up 1.2 mgd of groundwater for potable use. Thus, 2.8 mgd of net new supply will be generated by this project.

6.2.2.2 Westside Recycled Water Project

As described earlier, two recycled water projects were completed and began deliveries in the last five years: the Harding Park and the Pacifica Recycled Water Projects. A third project, the Westside Recycled Water Project, will include construction of a tertiary recycled water plant and associated pipelines to replace RWS and groundwater supplies currently used to irrigate Golden Gate Park, Lincoln Park and Golf Course, the Presidio Golf Course, as well as other landscaping in the Presidio. The plant will be constructed on the west side of the City at the Oceanside WPCP. For planning purposes, this project is estimated to produce and deliver an annual average of 1.6 mgd (about 0.24 mgd, or 15%, of which will be used for golf course irrigation), but it is designed to deliver an annual average of up to 2 mgd.

Design is expected to be completed in the spring of 2016, with construction scheduled to begin in the fall of 2017, and deliveries beginning in 2019. The project Environmental Impact Report (EIR) was certified by the San Francisco Planning Commission and approved by the SFPUC's Commission in September 2015. The project team is continuing field assessments of the proposed customer irrigation systems to identify necessary modifications to bring the systems into compliance with regulations related to the distribution and application of recycled water.

6.2.2.3 Eastside Recycled Water Project

In addition to the Westside Recycled Water Project that will provide recycled water to portions of the west side of the City, the SFPUC is planning an Eastside Recycled Water Project to serve a portion of the

east side of the City. This project would consist of treatment, storage, and delivery of up to 2 mgd, annual average, of high-quality recycled water to a variety of customers for non-potable irrigation, commercial, and industrial uses. This project is being coordinated with major construction at the Southeast WPCP that is scheduled in the coming years.

6.2.2.4 Non-potable Water

In September 2012, the City adopted the Onsite Water Reuse for Commercial, Multi-family, and Mixed Use Development Ordinance (Ordinance 195-12[14]). Commonly known as the Non-potable Water Ordinance, it added Article 12C to the San Francisco Health Code, allowing for the collection, treatment, and use of alternate water sources for non-potable applications; as well as establishing the Non-potable Water Program. The program provides grant funding for projects meeting specific eligibility criteria.

In October 2013, the ordinance was amended to allow district-scale water systems consisting of two or more buildings sharing non-potable water. Article 12C was further amended in July 2015 to mandate the installation of onsite water systems in new developments meeting specified criteria. Beginning November 1, 2015, all new development projects of 250,000 square feet or more of gross floor area located within the boundaries of San Francisco's designated recycled water use areas, as defined by the Recycled Water Ordinance, must install onsite water systems to treat and reuse available alternate water sources for toilet and urinal flushing and irrigation. This requirement expands to the entire City the following year, on November 1, 2016. While not required to install an onsite water system under Article 12C, developments between 40,000 and 250,000 square feet of gross floor area must submit a water budget application and accompanying Water Use Calculator to the SFPUC.

As of March 2016, there are 43 large commercial or multifamily buildings in San Francisco that have installed or shall install an onsite water system in compliance with the Non-potable Water Ordinance. It is anticipated that these 43 buildings will cumulatively result in a potable water offset of 0.14 mgd by 2020. To estimate future potable offset due to compliance with the Non-potable Water Ordinance, SFPUC staff utilized the San Francisco Planning Department's Pipeline Report. The Pipeline Report serves as a barometer for short- and long-term development in San Francisco. Staff determined that there are 24 projects that will be required to comply with the Non-potable Water Ordinance. These 24 projects are estimated to cumulatively result in a potable water offset of approximately 0.26 mgd by 2040. Collectively, the 67 projects will result in a potable water offset of 0.4 mgd by 2040.

For this 2015 UWMP update, this potable water offset is considered a part of the SFPUC's water supply portfolio and is included in **Table 6-7** as non-potable water supplies. However, per direction from DWR, these supplies cannot be reported in the corresponding standardized tables in **Appendix B** because they are not municipally-supplied by the SFPUC.

6.2.2.5 Other Actions to Expand Recycled Water Use

The SFPUC is actively involved in encouraging and expanding recycled water use and onsite water reuse, not only in San Francisco, but throughout the U.S. and internationally. These efforts are described below.

Projects and Partnerships. As demonstrated by the Harding Park and Pacifica Recycled Water Projects, the SFPUC has and will continue to explore opportunities for regional recycled water partnerships with other Bay Area agencies. Through these partnerships, the SFPUC aims to develop recycled water projects

[14] San Francisco Health Code, Article 12C, Sections 850-861. Note that this ordinance was amended in October 2013 by Ordinance 208-13 to allow district-scale water systems, and in July 2015 by Ordinance 109-15 to mandate installation of onsite water systems in new development meeting specified criteria.

that will benefit the SFPUC and partners by reducing demands for RWS supplies and/or freeing up groundwater that could be used for potable supplies.

- **Daly City Recycled Water Expansion:** The SFPUC and NSMCSD have been exploring ways to increase recycled water treatment capacity at the Daly City wastewater treatment plant to serve additional customers and decrease water withdrawals from the Westside Groundwater Basin, both in San Francisco and south of Daly City. A feasibility study identified the capital requirements that would be needed to produce additional capacity at the existing treatment plant location. The study demonstrated that a new tertiary treatment facility located at the wastewater treatment plant would be required to produce additional capacity of up to 3.4 mgd. Currently, flows that exceed the capacity of the existing treatment plant are discharged into the Pacific Ocean. Through this project, some of the discharge may be used beneficially.

Ordinances, Programs, and Services. The SFPUC administers or helps to administer the following ordinances, programs, and services in the City related to recycled water and water reuse. The majority of these ordinances, programs, and services has been established for many years and are ongoing, resulting in increased water reuse.

- **Recycled Water Program and Ordinance:** To encourage the use of recycled water in San Francisco, the City adopted Ordinances 390-91 and 391-91[15]. Collectively referred to as the Recycled Water Ordinance, it requires the installation of dual-plumbed systems within designated areas of the City for new, remodeled or converted buildings; all subdivisions of 40,000 square feet or more; and for new, modified, or existing irrigated areas of 10,000 square feet or more. The number of dual-plumbed systems installed as required by the ordinance continues to increase with the increase of new construction and rehabilitation projects in the City.

- **Soil Compaction and Dust Control Ordinance:** In 1991, the City also passed Ordinance 175-91[16], which restricts the use of potable water for soil compaction and dust control activities for construction and demolition projects. To facilitate the use of non-potable water for these activities, the SFPUC installed a recycled water truck-fill station at its Southeast WPCP. Construction contractors, City departments, and other interested parties may fill water trucks at the station after receiving a permit from the SFPUC.

- **Recycled Water Truck-Fill Station:** Although the truck-fill station had been in place since the 1990s, interest in the station increased during the current drought. In response, the SFPUC constructed an automated fill station in 2014. The station can be accessed 24 hours a day, seven days a week; offers both top- and side-fill options; and dispenses recycled water at 400 gallons per minute. The automated fill station allows access to larger tanker trucks and more users at their convenience. Informational and permitting materials were also updated to clarify what uses are permitted, and how to appropriately handle and use recycled water. As a result, the volume of recycled water dispensed increased from about 300,000 to 739,000 gallons between 2014 and 2015.

- **Large Landscape Grant Program:** The SFPUC initiated a Large Landscape Grant Program in 2009. In-City retail customers with 2.5 acres or more of irrigated landscape are eligible to apply. Grant funding is available for water-saving and recycled water retrofits that reduce potable water use for

[15] San Francisco Public Works Code, Article 22, Sections 1200-1210. Note that this ordinance was amended in 1994 by Ordinance 393-94, which expanded the designated recycled water use area to include Treasure Island, Yerba Buena Island, and Hunters Point Shipyard.
[16] San Francisco Public Works Code, Article 21, Sections 1100-1107.

landscape irrigation. The SFPUC also provides technical assistance in implementing retrofits. The recycled water irrigation system retrofits at both Harding Park and Sharp Park received grant funding through this program.

- **Non-potable Water Program and Ordinance:** As described in **Section 6.2.2.4**, the City adopted the Non-potable Water Ordinance in 2012 to allow for the collection, treatment, and use of alternate water sources for non-potable applications. The Non-potable Water Program outlines the oversight of the SFPUC, the SFDPH, and the San Francisco Department of Building Inspection (SFDBI) during the review process. The ordinance has since been amended to mandate the installation of onsite water systems in new development meeting specified criteria.

- **Public Outreach**: The SFPUC actively promotes its programs to conserve, diversify, and supplement RWS supplies. Marketing campaigns, factsheets, and articles are developed and shared with media, customers, and public officials.

Research and Knowledge Sharing. The SFPUC is a member of the Bay Area Clean Water Agencies (BACWA) Recycled Water Committee. BACWA is composed of Bay Area wastewater agencies that discharge into the San Francisco Bay estuary. The purpose of the Recycled Water Committee is to provide a forum to share recycled water information and expertise to support and advance regional water recycling efforts. SFPUC staff participates in this committee, and in 2014 through 2015, managed the preparation of the BACWA Recycled Water Truck Facility Location Guide for the Bay Area to help reduce potable water use in the Bay Area

The City is also an active member of the International, California Section, and Northern California Chapters of the WateReuse Association and WateReuse Research Foundation. In addition, SFPUC staff participates on a variety of committees and subcommittees associated with various WateReuse entities. The mission of the WateReuse Association is to educate the public on the importance of reusing water and to advocate for policy, laws, and funding to increase water reuse in communities across the U.S. The mission of the WateReuse Research Foundation is to build support for water reuse through research and education. The California Section focuses on promoting these missions in California.

In May 2014, the SFPUC convened the Innovation in Urban Water Systems Meeting with research institutions and state and municipal government agencies from across North America to discuss the barriers, opportunities, and research needs for onsite water systems with non-potable applications. The group discussed targeted achievable solutions that will provide a path forward toward widespread application of onsite water systems. As a result of the meeting, a document entitled *Blueprint for Onsite Water Systems: A Step-by-Step Guide for Developing a Local Program to Manage Onsite Water Systems* was created. The document serves as a how-to guide for communities interested in implementing an onsite water treatment program.

Currently, the SFPUC is leading a project with the National Water Research Institute to develop recommendations for public health standards for treated alternate water sources for non-potable applications, including water quality criteria, monitoring regimes, and permitting strategies for onsite water systems. The project, Technical Guidance for Public Health Standards for Onsite Water Systems, is sponsored by Water Research Foundation, WateReuse Research Foundation, and Water Environment Research Foundation. The goal of the project is to establish a set of guidelines that can be used by public officials in developing programs to manage and oversee onsite water systems.

Additionally, as a participant in the California Urban Water Agencies' (CUWA) Recycled Water Committee, the SFPUC contributed to the development of the CUWA white paper titled "Potable Reuse Operator Training and Certification Framework." The paper, released in January 2016, summarizes current practices for training and certifying operators of drinking water, wastewater, and potable reuse facilities, and outlines the challenges to implementing standards for certification. The paper also recommends that the SWRCB DDW adopt a standard approach to certification for operators of potable reuse facilities.

6.2.3 Water Quality of Local Supplies

Local groundwater, recycled water, and non-potable water supplies are primarily used for irrigation and other non-potable uses. The SFPUC strives to meet or exceed the quality standards established by State agencies for these end uses, and works closely with regulatory agencies and partners to achieve the highest standards. Water quality of each supply is further described below.

6.2.3.1 Local Groundwater Quality

This section describes the water quality of existing and future groundwater supplies.

Westside Groundwater Basin. Based on semi-annual monitoring, the groundwater currently used for irrigation and other non-potable uses in the City meets or exceeds the quality standards established by State agencies for these end uses.

Groundwater from the Westside Groundwater Basin has been supplying drinking water to Daly City, San Bruno, and South San Francisco for over 60 years, and will soon also serve drinking water to San Francisco. As described previously, the San Francisco Groundwater Supply Project will extract groundwater from the northern portion of the basin for potable supply beginning in 2017. The groundwater will be disinfected and blended with RWS supplies before entering the in-City distribution system. Disinfection with sodium hypochlorite and pH adjustment for corrosion control will be conducted, as is done in the RWS. The quality of the blended water will surpass all health-based drinking water standards set forth by the SWRCB DDW.

A series of groundwater monitoring wells have been installed since 2004 along the Pacific Coast to collect data on the basin's water levels and quality. In addition, the SFPUC has been collecting data from a network of groundwater monitoring wells surrounding Lake Merced since 2001. The SFPUC will continue to monitor these wells when the San Francisco Groundwater Supply Project is put into service to assess how the basin is responding to project operations. All groundwater supplied will meet all health-based drinking water standards after treatment.

The SFPUC's Westside Basin Groundwater Monitoring Program provides information summarizing basin-wide groundwater pumping, groundwater levels, and quality in the different aquifer systems within the basin. This program publishes an annual monitoring report, which may be accessed at **www.sfwater.org/groundwater**. In addition, the SFPUC is currently preparing a Groundwater Sustainability Plan for the North Westside Basin in compliance with the California Sustainable Groundwater Management Act of 2014 to assure a long-term, high-quality, local water supply for current and future uses.

Castlewood Well System. Groundwater supplies from the Castlewood Well System are disinfected via sodium hypochlorite injection and are potable when delivered to Castlewood CSA. Water quality is monitored weekly by the SFPUC.

Sunol Filter Gallery Subsurface Diversions. Subsurface diversions from the Sunol Filter Gallery are used for irrigation at the Sunol Valley Golf Club and are not treated.

6.2.3.2 Local Recycled Water Quality

This subsection describes the water quality of existing and future recycled water supplies.

Southeast Water Pollution Control Plant. Recycled water produced at the Southeast WPCP is used for in-plant operations and is dispensed via a truck-fill station to construction contractors, City departments, and other interested parties for use within the City. Permitted uses include soil compaction, dust control, landscape irrigation, street cleaning, and sewer flushing. This recycled water is treated to secondary disinfected-23 level and meets the Title 22 California Code of Regulations requirements for approved non-potable uses.

Harding Park. Recycled water produced by NSMCSD's wastewater treatment plant in Daly City is used for irrigation at the Harding Park and Fleming Golf Courses. This tertiary-treated recycled water meets the Title 22 California Code of Regulations (Title 22) requirements for approved non-potable uses.

Sharp Park. Recycled water produced by the City of Pacifica's Calera Creek Water Recycling Plant is used to irrigate a portion of the Sharp Park Golf Course. This tertiary-treated recycled water meets the Title 22 requirements for approved non-potable uses.

Westside Recycled Water Project. Recycled water produced by the Westside Recycled Water Project treatment facility will undergo tertiary treatment, resulting in water quality that meets Title 22 requirements and the needs of the project's planned end uses, including irrigation at Golden Gate Park, Lincoln Park and Golf Course, the Presidio Golf Course, and other landscaped areas at the Presidio.

Eastside Recycled Water Project. Tertiary-level recycled water that would be produced through the Eastside Recycled Water Project would be treated to meet Title 22 requirements and the needs of non-potable end uses, including irrigation, commercial, industrial, and municipal uses.

6.2.3.3 Local Non-potable Water Quality

Onsite water systems are operated, maintained, and monitored by the property owner. Under the Non-potable Water Program, the San Francisco Department of Public Health (SFDPH) has established ongoing monitoring requirements and water quality standards that are protective of public health. Different treatment levels are required depending on the alternate water source and end use. The frequency of monitoring and reporting also vary depending on the alternate water source, and are identified in the SFDPH's *Director's Rules and Regulations Regarding the Operation of Alternate Water Source Systems* and the operating permit for the onsite water system issued by the SFDPH.

6.2.4 Climate Change Impacts to Local Supplies

The SFPUC's primary concern related to climate change is the potential impact to RWS supplies, as addressed in **Section 6.1.6**. Current use of local groundwater, recycled water, and non-potable water supplies is limited. However, implementation of the Groundwater Sustainability Plan for the North Westside Basin will ensure that in-City groundwater supplies are maintained for current and future uses. Recycled water is considered a drought-resistant supply that is not influenced by precipitation or hydrologic year type. Regarding non-potable supplies, rainwater and stormwater are influenced by climate. However, the majority (about 95%) of onsite non-potable reuse achieved through compliance with the Non-potable Water Ordinance is anticipated to be through the use of graywater and blackwater, which are not influenced by climate.

6.2.5 Summary of Existing and Future Local Supplies

Table 6-7 provides a breakdown of current and projected water supply sources for meeting retail water demand through 2040.

Table 6-7. Retail Supplies (mgd)

[Standardized Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial uses Within Service Area]

[Standardized Table 6-8 Retail: Water Supplies – Actual]

[Standardized Table 6-9 Retail: Water Supplies – Projected]

Retail Supply	Actual	Projected				
	2015	2020	2025	2030	2035	2040
RWS[a]	**67.7**	**70.5**	**71.9**	**73.2**	**76.7**	**80.6**
Groundwater						
San Francisco Groundwater Supply Project[b]	—	4.0	4.0	4.0	4.0	4.0
Westside Groundwater Basin for In-City Irrigation[b]	1.5	0.3	0.3	0.3	0.3	0.3
Castlewood Well System[c]	0.3	0.4	0.4	0.4	0.4	0.4
Sunol Filter Gallery[d]	0.4	0.3	0.3	0.3	0.3	0.3
Subtotal Groundwater	**2.2**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
Recycled Water						
Westside Recycled Water Project	—	1.6	1.6	1.6	1.6	1.6
Eastside Recycled Water Project	—	—	—	2.0	2.0	2.0
Harding Park Recycled Water Project[e]	0.2	0.2	0.2	0.2	0.2	0.2
Pacifica Recycled Water Project[f]	0.0	0.1	0.1	0.1	0.1	0.1
Subtotal Recycled Water[g]	**0.2**	**1.9**	**1.9**	**3.9**	**3.9**	**3.9**
Non-potable Water[h]	**0.0**	**0.1**	**0.2**	**0.2**	**0.3**	**0.4**
Total Retail Supply	**70.1**	**77.5**	**79.0**	**82.3**	**85.9**	**89.9**

a Assuming that the retail supply allocation of 81 mgd per the WSA is extended to 2040, up to 81 mgd of RWS supply may be used.

b About 1.5 mgd of groundwater currently serves irrigation at Golden Gate Park, the San Francisco Zoo, and the Great Highway medians. A reserve of 0.3 mgd for irrigation purposes will remain as part of the non-potable groundwater supply, while 1.2 mgd will be converted to potable supply under the San Francisco Groundwater Supply Project.

c Castlewood CSA is served by the Castlewood Well System.

d Irrigation uses in Sunol (currently the Sunol Valley Golf Club) are served by subsurface diversions from the Sunol Filter Gallery.

e Irrigation at Harding Park and Fleming Golf Courses is provided recycled water from NSMCSD.

f Irrigation at Sharp Park Golf Course is provided recycled water from NCCWD. Approximately 0.01 mgd was provided in 2015 after deliveries began in October 2014.

g A small amount of recycled water is dispensed from the Southeast Water Pollution Control Plan recycled water truck-fill station for various approved uses, but the annual volume is not considered large enough to be reported in the 2015 UWMP (about 739,000 gallons, or 0.002 mgd, in 2015).

h Non-potable water indicates onsite water reuse as mandated by the Non-potable Water Ordinance. Non-potable water is not supplied by the SFPUC, and is therefore not included in the corresponding standardized tables in **Appendix B**.

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SECTION 7: WATER SUPPLY RELIABILITY

This section describes the reliability of the RWS and local supplies to meet retail and wholesale demands through the year 2040. As described previously, supplies to meet retail demands come from the RWS and local water supply sources, including groundwater and recycled water. Approximately one third of the SFPUC's RWS supply is delivered to retail customers, and the remaining two thirds is delivered to wholesale customers. Water supply reliability is described for normal year (i.e., average year), single dry year, and multiple dry year conditions.

As explained in **Section 2.4**, Groveland CSD is accounted for as a retail customer in this section, but as a wholesale customer in the corresponding standardized tables in **Appendix B**.

7.1 RWS AND LOCAL SUPPLY RELIABILITY

Reliability of the RWS is expressed in terms of the system's ability to deliver water during droughts. Reliability may be quantified by the amount and frequency of water delivery reductions (i.e., deficiencies) required to balance customer demands with available supplies. The SFPUC plans deliveries under the premise that a drought more severe than the worst drought on record may occur. Potential system-wide and retail deficiencies are described in this section.

7.1.1 Constraints on Supplies

The list below summarizes the legal, environmental, water quality, climatic, and other factors potentially resulting in inconsistent supply.

- **RWS:** As described previously, RWS supplies may be reduced due to required instream flow releases (see **Section 6.1.4**) as well as climate change (see **Section 6.1.6**).

- **Water Transfers:** Institutional arrangements governing potential water transfers may affect their availability, and climatic variability may impact the availability of surface water in some years.

- **Groundwater:** Groundwater supplies are typically limited by the quality and quantity of available supplies. However, the probability of these impacts occurring is low with proper management of the Westside Groundwater Basin as described in **Section 6.2.1.1**. Additionally, to maintain consistent water quality in the blended supply produced by the San Francisco Groundwater Supply Project, groundwater supplies will be proportionate with RWS supplies (i.e., if RWS supplies are reduced, groundwater supplies will also be reduced).

- **Recycled Water:** Recycled water is limited by water quality requirements that legally restrict recycled water supply for some uses. However, recycled water supplies discussed herein are treated, or are planned to be treated, to the standards established by State agencies that are required for each designated end use. As a result, no limitations on use of recycled water for designated purposes are expected to occur.

- **Non-potable Water:** Similar to recycled water, non-potable water is limited by water quality requirements that legally restrict non-potable water supply for some uses. However, non-potable water supplies discussed herein are treated, or are planned to be treated, to the standards established by the SFPDH required for each designated end use. Therefore, no water quality

limitations on non-potable water supplies are expected to occur. However, climate change may influence the availability of rainwater and stormwater as alternate water sources. The majority (about 95%) of potable offset anticipated due to non-potable reuse is from alternate water sources, such as graywater and blackwater, which are not impacted by climate change, and therefore a minimal reduction in offset is expected during dry years. Furthermore, make-up water for onsite water systems that are located within the boundaries of San Francisco's designated recycled water use areas would by supplied by municipal potable water or recycled water through the Westside and Eastside Recycled Water Projects when available.

7.1.2 Estimating the Frequency and Magnitude of RWS Supply Deficiencies

The total amount of water the SFPUC can deliver to retail and wholesale customers depends on several factors, including the amount of water that is available to the SFPUC from natural runoff, the amount of water in reservoir storage, and the amount of that water that must be released from the RWS for purposes other than customer deliveries (e.g., required instream flow releases below RWS reservoirs). For planning purposes, the SFPUC "normal year" is based on historical hydrology under conditions that allow the reservoirs to be filled over the course of the snowmelt season, allowing full deliveries to customers.

In the 1987-92, a shortfall developed between the SFPUC's supplies and its customers' demands such that significant rationing of water supply became necessary. Other than during the drought of 1976-77, drought sequences in the past did not seriously affect the ability of the RWS to sustain full deliveries to its retail and wholesale customers. Following the 1987-92 drought experience, the SFPUC includes the concept of its "firm" capability in water supply planning, which is defined as the amount of water the RWS can be expected to deliver during drought periods.

7.1.3 Design Drought

The SFPUC uses a hypothetical drought that is more severe than what the RWS has historically experienced. This drought sequence is referred to as the "design drought" and serves as the basis for planning and modeling of future scenarios. The design drought consists of the 1987-92 drought, followed by an additional 2.5 years of dry conditions from the hydrologic record which include the 1976-77 drought. While the current drought (2012 through 2015, and potentially ongoing) consists of some of the driest years on record for the SFPUC's watersheds, the design drought still represents a more severe drought in duration and overall water supply deficit.

The design drought sequence used by the SFPUC for reliability planning is an 8.5-year period composed of the following elements:

- **Historical Hydrology:** A six-year sequence of hydrology from the historical drought (July 1986 to June 1992);
- **Prospective Drought:** A 2.5-year period which includes the 1976-77 drought (to represent a drought sequence worse than historical); and
- **System Recovery Period:** The last six months of the design drought are the beginning of the system recovery period. The precipitation begins in the fall, and by approximately the month of December, inflow to RWS reservoirs exceeds customer demands and SFPUC system storage begins to recover.

The SFPUC plans its water deliveries using indicators for water supply rationing that are developed through analysis with this design drought sequence. As a result, the SFPUC system operations are designed to provide sufficient carry-over water in SFPUC reservoirs to continue delivering water, although at reduced levels, during and after multiple-year droughts.

The levels of water supply deficiency presented for this 2015 UWMP update were estimated using the design drought methodology discussed above. The results are presented in the standardized format prescribed by DWR for use in the 2015 UWMPs. **Table 7-1** summarizes the expected availability of RWS and local groundwater, recycled water, and non-potable water supplies under normal, single dry, and multiple dry year conditions. The SFPUC currently operates under a plan that anticipates multiple stages of response to water supply shortages, ranging from use of dry year water supplies (when available) and voluntary customer water reductions to enforced rationing. The single dry year results were selected from the design drought simulations for periods in which rationing of RWS supply is necessary. This does not represent a single year with dry hydrology, which is first met with water deliveries from storage and use of available dry year supplies; it represents a year in which the total SFPUC system storage has become reduced to the point in which rationing is necessary. The results for the three-year sequence of dry years were selected to show the progressive levels of rationing that would be expected in an extended dry period. Assuming the availability of existing supplies at current demand levels, the SFPUC system can expect shortages of at least 10 to 22% in a sequence of multiple dry years. Implementation of WSIP, discussed in the next section and shown in **Table 7-3**, will improve the SFPUC's water supply reliability, particularly in the earlier years of the design drought. However, in extended drought periods, the SFPUC will continue to experience multiple years of 10 to 20% rationing.

Table 7-1. Water Supply Availability During Normal and Dry Years

[Standardized Table 7-1 Retail: Bases of Water Year Data]

[Standardized Table 7-1 Wholesale: Bases of Water Year Data]

Water Supply	Normal Year	Single Dry Year	Multiple Dry Years		
			Year 1	Year 2	Year 3
Base Year 2015 (substantial WSIP completion)					
RWS[a]	100%	90%	90%	78%	78%
Local Groundwater[b]	100%	100%	100%	100%	100%
Local Recycled Water[b]	100%	100%	100%	100%	100%
Non-potable Water[b, c]	100%	<100%	<100%	<100%	<100%
Projected Years 2020 through 2040 (post-WSIP completion)					
RWS[a]	100%	90%	90%	80%	80%
Local Groundwater[b]	100%	100%	100%	100%	100%
Local Recycled Water[b]	100%	100%	100%	100%	100%
Non-potable Water[b, c]	100%	<100%	<100%	<100%	<100%

Normal, single dry, and multiple dry year conditions are on a water year basis. Dry year availability is presented in terms of percentage of normal year availability.

a RWS supplies are available to meet both retail and wholesale demands. Retail and wholesale allocations are provided in **Section 8.3** (**Table 8-2** and **Table 8-5**, respectively)

b Local supplies are available only to meet retail demands.

c Non-potable water supplies would be minimally affected by dry year conditions as the majority of the supplies is anticipated to be comprised of graywater and blackwater.

7.2 DRY YEAR WATER SUPPLY PROJECTS

As an established major water supplier for the Bay Area region, the SFPUC is responsible for securing and managing its existing system supplies and planning for future needs, as well as securing its own retail supply.

The WSIP provides goals and objectives to improve the supply reliability and delivery reliability of the RWS, presented previously in **Table 6-1**. The goal and objectives related to water supply are highlighted in **Table 7-2**.

Table 7-2. Water System Improvement Program Goals and Objectives Related to Water Supply
[Standardized Table Not Applicable]

Program Goal	System Performance Objective
Water Supply: meet customer water needs in non-drought and drought periods	• Meet average annual demand of 265 mgd from the SFPUC watersheds for retail and Wholesale Customers during nondrought years for system demands through 2018. • Meet dry-year delivery needs through 2018 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.

The adopted WSIP included several water supply elements to address the WSIP water supply goals and objectives, which together will allow the SFPUC to meet at least 80% of its customer demand during droughts. The SFPUC will continue to rely on rationing up to no more than 20% in any one year of a drought. Dry year water supply projects identified in the WSIP were subsequently evaluated in the PEIR. Descriptions and the current status of each of these projects are provided in the sections below. Supply availability for each project is summarized in **Table 7-3.**

Table 7-3. Availability of WSIP Dry Year Water Supply Projects (mgd)
[Standardized Table Not Applicable]

Water Supply[a]	Actual	Projected				
	2015	2020	2025	2030	2035	2040
Calaveras Reservoir at Full Capacity	—	7.0	7.0	7.0	7.0	7.0
Alameda Creek Recapture	—	9.3	9.3	9.3	9.3	9.3
Crystal Springs Reservoir at Full Capacity[b]	—		0.5	0.5	0.5	0.5
Regional Groundwater Storage and Recovery Project	—	7.2	7.2	7.2	7.2	7.2
Water Transfers	—	2.0	2.0	2.0	2.0	2.0

a The Lake Merced Water Level Restoration Project is not listed in this table. For more information, see **Section 7.2.5**.
b Schedule for restoration of Crystal Springs Reservoir storage is tied to permitting requirements for endangered plants.

In addition, specific actions to expand recycled water use, described previously in **Section 6.2.2.5**, would help offset retail demands on RWS supplies if implemented.

7.2.1 Calaveras Dam Replacement Project

The adopted WSIP includes the Calaveras Dam Replacement Project, which will replace the seismically-deficient Calaveras Dam and restore the reservoir capacity from 38,100 AF to 96,850 AF, returning nearly 60,000 AF of reservoir storage to the RWS. The restored capacity will restore up to 7 mgd per year of storage for emergency and drought water supplies in each of the last 7.5 years of the design drought. Once key project milestones are reached, the SFPUC must adhere to a flow release schedule established through Biological Opinions and permits with the National Marine Fisheries Service and the California Department of Fish and Wildlife. As described in **Section 6.1.4**, an average annual rate of 9.3 mgd of instream flows will be needed to meet water release requirements at Calaveras Dam and bypass of flow at Alameda Creek Diversion Dam, which diverts water from Upper Alameda Creek to storage in Calaveras Reservoir.

The project EIR was certified in 2011, and construction is now underway. Construction of the new dam is slated for completed in 2018, while the entire project should be completed in 2019.

7.2.2 Alameda Creek Recapture Project

The Alameda Creek Recapture Project[17] would recapture the 9.3 mgd of RWS yield lost due to instream flow released at Calaveras Dam 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 would be recaptured into an existing quarry pond. The project is designed to allow the recaptured water to be pumped to the SVWTP or to San Antonio Reservoir. The project Draft EIR is anticipated to be released in the spring of 2016, with construction occurring between spring 2017 and fall 2018.

7.2.3 Lower Crystal Springs Dam Improvements Project

The Lower Crystal Springs Dam Improvements Project will restore 7,400 AF of capacity in Lower Crystal Springs Reservoir that was formerly achieved through the use of stop logs in the reservoir spillway. The restored capacity will serve as storage for emergency and drought water supplies, providing up to an additional 0.5 mgd in each of the last 7.5 years of the design drought. The Biological Opinion issued by the National Marine Fisheries Service resulted in an annual average release of 3.5 mgd to San Mateo Creek to satisfy modified instream flow release requirements, as described in **Section 6.1.4**. The SFPUC began making the required flow releases to San Mateo Creek in January 2015.

The Lower Crystal Springs Dam Improvements were substantially completed in November 2011. However, reservoir permitting issues have become significant. While the reservoir elevation was lowered due to DSOD restrictions, the habitat for the Fountain Thistle, an endangered plant species, followed the lowered reservoir elevation. Raising the reservoir elevation now requires that new plant populations be restored incrementally before proceeding with the raise. As a result, it may be several years before the original elevation can be restored.

7.2.4 Regional Groundwater Storage and Recovery Project

The Regional Groundwater Storage and Recovery Project is an in-lieu conjunctive use project that will balance the management of both groundwater and surface water resources in a way that safeguards supplies during times of drought. It is a strategic partnership between the SFPUC and three partner

[17] The project formerly known as the Upper Alameda Creek Filter Gallery Project in the WSIP was later reconceived as the Alameda Creek Recapture Project.

agencies in San Mateo County that pump water from the South Westside Groundwater Basin: the California Water Service Company (serving South San Francisco and Colma), the City of Daly City, and the City of San Bruno. The partner agencies currently purchase RWS supplies on a wholesale basis from the SFPUC and also independently operate groundwater production wells for drinking water and irrigation.

The project will extract stored groundwater from the South Westside Basin for delivery to the RWS and the partner agencies. During years of normal or wet hydrologic years, the project will provide RWS supplies to the partner agencies to reduce the amount of groundwater pumped, resulting in in-lieu recharge of the aquifer. Over time, the reduced pumping will result in the storage of up to 61,000 AF of water; this volume is more than the supply contained in the Crystal Springs Reservoir. The project consists of installing up to 16 new wells to pump the stored groundwater during a drought, in addition to construction of well pumps, disinfection units, and piping. The new wells would allow recovery of the stored water at a rate of up to 7.2 mgd in each of the last 7.5 years of the design drought.

The project EIR was certified in April 2014, and construction began in April 2015. This project is expected to be online in 2018.

7.2.5 Lake Merced Water Level Restoration Project

This project consists of two proposed design alternatives which are under review by the SFPUC and the City of Daly City. The Lake Merced Alternative (i.e., the Vista Grande Drainage Basin Improvement Project) is intended to manage Daly City stormwater and provide treated and untreated stormwater to augment water levels in Lake Merced. In 2012, the SFPUC entered into a Memorandum of Understanding with the City of Daly City to assist in a detailed assessment of environmental impacts of various target lake levels, and to evaluate lake management and operational strategies. In February 2013, Daly City issued a Notice of Preparation/Notice of Intent, declaring the intent by both Daly City as the Lead Agency under the CEQA, and the National Park Service as the Lead Agency under the National Environmental Policy Act (NEPA), to prepare a joint Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The SFPUC completed review of Daly City's Administrative Draft EIR/EIS document in the spring of 2015. Daly City currently anticipates release of the Draft EIR/EIS document in December 2015.

The SFPUC is also proposing the installation of an Aeration Mixing System in Lake Merced to assist in improving dissolved oxygen levels in the lower portion of the lake which are currently low as a result of seasonal lake stratification. The SFPUC is currently evaluating alternatives and will begin required environmental review once an alternative has been identified. A full re-evaluation of the project's status, description, schedule and costs will be undertaken once the alternatives have been sufficiently evaluated.

7.2.6 Water Transfers

The proposed WSIP evaluated in the PEIR included a drought year water transfer with MID and/or TID of 25 mgd on an average annual basis during the design drought to meet drought year water delivery under the scenario in which demand was expected to be 300 mgd. The Phased WSIP, however, only included a 2 mgd dry year transfer as that was the dry year need associated with meeting a demand of 265 mgd.

The SFPUC initially pursued a long-term agreement to transfer 2 mgd from MID in dry years only. The negotiations were terminated in 2012. Subsequently, the SFPUC has initiated discussions with the Oakdale Irrigation District (OID) to secure a similar dry year transfer for 2 mgd. While no transfer has been secured to date, the SFPUC continues to pursue discussions with partners to explore potential transfer

opportunities on the Tuolumne River and throughout the San Joaquin Valley. For the purpose of this 2015 UWMP, it is assumed that a 2 mgd dry year transfer will be secured as part of the implementation of the Phased WSIP.

7.3 INSTREAM FLOW RELEASE AND BYPASS REQUIREMENTS

As described previously, implementation of the Calaveras Dam Replacement Project and Lower Crystal Springs Dam Improvements Project will require the SFPUC to adhere to specific flow schedules in accordance with permit requirements. The current instream flow release and bypass requirements for Alameda Creek and San Mateo Creek will result in the release of flows at an average annual rate of 9.3 mgd and 3.5 mgd, respectively. These releases are greater than what was previously planned for in the Phased WSIP, and could result in a corresponding unanticipated decrease in available RWS supplies over the course of the design drought. However, the Alameda Creek Recapture Project is proposed to recapture the average annual volume of water that will be released from storage in Calaveras Dam and bypassed from diversion at the Alameda Creek Diversion Dam. If, following the project-level environmental review for the Alameda Creek Recapture Project, the SFPUC approves implementation of the project as designed, the revised flow schedules would result in a net decrease in available water supply of 3.5 mgd associated with the flow schedule for the Lower Crystal Springs Dam Improvements Project.

The SFPUC's participation in Bay Area efforts to improve regional water supply reliability, which are described in the next section, may help make up for this 3.5 mgd shortfall. Furthermore, actions resulting from the WaterMAP, described in **Section 7.7.1**, may include the development of a new water supply program with additional supply projects beyond those identified in the adopted WSIP.

7.4 BAY AREA REGIONAL EFFORTS TO IMPROVE WATER SUPPLY RELIABILITY

The following projects and efforts are currently underway or completed and will help the RWS meet its water supply reliability needs. Some of these projects are reflected in the SFPUC's current strategy for meeting water supply needs. As the remainder of these projects move through the planning stages, they will continue to inform water supply strategy.

7.4.1 Long-Term Reliable Water Supply Strategy

In 2009, BAWSCA, on behalf of the Wholesale Customers, began developing a Strategy to identify appropriate water management actions to increase the long-term water supply reliability of its member agencies and their customers under normal and drought conditions.

BAWSCA's Strategy was developed to quantify the water supply reliability needs of the BAWSCA member agencies through 2040, identify the water supply management projects and/or programs that could be developed to meet those needs, and prepare an implementation plan for the Strategy's recommendations. Successful implementation of the Strategy is critical to ensuring that there will be sufficient and reliable water supplies for the BAWSCA member agencies and their customers in the future.

The project evaluation analysis done as part of the Strategy resulted in the following key findings:

- Water transfers score consistently high across the various performance measures and within various portfolio constructs and thus represent a high priority element of the Strategy.

- Desalination of brackish supplies also potentially provides substantial yield, but its high effective costs and intensive permitting requirements make it a less attractive drought year supply alternative. However, given the limited options for generating significant yield for the region, desalination warrants further investment in information as a hedge against the loss of local or other imported supplies.

- The other potential regional projects provide tangible, though limited, benefit in reducing dry year shortfalls given the small average yields in drought years.

BAWSCA is now implementing 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 efficiently and cost-effectively.

7.4.2 Bay Area Regional Reliability

The SFPUC is working with seven water agencies in the Bay Area (ACWD, BAWSCA, CCWD, EBMUD, MMWD, SCVWD and Zone 7 Water Agency) to investigate opportunities for 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 will 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 SFPUC customers.

7.4.3 Regional Interties

Regional interties help increase the reliability of the RWS by allowing for water exchanges during emergencies, water shortages, or maintenance.

- **EBMUD-Hayward-SFPUC Intertie:** In 2002, the SFPUC formed a partnership with EBMUD and the City of Hayward to construct Skywest Pump Station and 1.5 miles of pipeline to link their systems. These facilities are now completed and can convey up to 30 mgd among these three agencies to boost water supply reliability when needed. EBMUD and the SFPUC own these facilities jointly, while the City of Hayward maintains and operates them in coordination with EBMUD and the SFPUC.

- **SCVWD Intertie:** The SFPUC and SCVWD constructed a 40-mgd intertie between their two systems to exchange water during emergencies and planned maintenance. The intertie has been used during maintenance of one of SCVWD's water treatment plants.

- **South Bay Aqueduct Interties:** In the past, the SFPUC used one permanent and one temporary intertie to the South Bay Aqueduct for water transfers, which, if reactivated, would enable the SFPUC to receive supplies from the State Water Project.

7.4.4 Bay Area Integrated Regional Water Management Plan

The SFPUC is an active participant in the nine-county Bay Area Integrated Regional Water Management planning process. The BAIRWMP was first completed in November 2006 and most recently updated in September 2013. The BAIRWMP describes the region's water supply and water quality, wastewater and water recycling, storm water and flood protection, and habitat protection and ecosystem restoration objectives and efforts. The BAIRWMP also identifies integrated and collaborative projects among Bay Area agencies. To date, the Bay Area has received $148.5 million in Propositions 50 and 84 Integrated Regional Water Management (IRWM) implementation grant funding. More recently, the Bay Area received $65 million in Proposition 1 IRWM grant funding for implementation, planning, and disadvantaged community involvement efforts.

7.5 RETAIL WATER SUPPLY AND DEMAND COMPARISON

Table 7-4 summarizes the projected retail supplies and demands during normal, single dry, and multiple dry years. Total retail demands are estimated in **Section 4.1** and reflect passive and active conservation, as well as water loss. Supplies are listed by source: RWS, groundwater, recycled water, and non-potable water. The difference between supply and demand, resulting in either a supply surplus or deficit, is also provided for each projected year and dry year scenario.

Procedures to allocate RWS supplies between retail and wholesale customers during system shortages are specified in the SFPUC's Water Shortage Allocation Plan (WSAP) Among Suburban Customers, which is described in **Section 8.3**. As noted earlier, Groveland CSD is accounted for as a retail customer in this section, but, but as a wholesale customer in the corresponding standardized tables in **Appendix B**.

The SFPUC would use local groundwater, recycled water, and non-potable water supplies before using RWS supplies to meet retail demands. Although up to 81 mgd of RWS supplies are available in normal years, the SFPUC is committed to developing local supplies to meet retail demands.

In general, **Table 7-4** demonstrates the following:

- **Normal Years:** During normal precipitation years, the SFPUC will have adequate supplies to meet its projected retail water demands.
- **Single Dry Year:** During single dry years, there would be no shortage in RWS deliveries. The SFPUC would have sufficient supplies to meet retail demands in single dry years.
- **Multiple Dry Years:** If a multiple dry year event occurs, the SFPUC would experience shortages in RWS deliveries in 2040 during years 2 and 3 without development of additional supply concepts. A shortfall of 1.1 mgd, or 1.2% of demand, would be experienced.

Table 7-4. Retail Supply and Demand Comparison for Projected Normal & Dry Year Scenarios (mgd)

[Standardized Table 7-2 Retail: Normal Year Supply and Demand Comparison]

[Standardized Table 7-3 Retail: Single Dry Year Supply and Demand Comparison]

[Standardized Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison]

Year	Retail Supply and Demand	Normal Year	Single Dry Year[a]	Multiple Dry Years		
				Year 1[a]	Year 2[b]	Year 3[b]
2020	Total Retail Demand[c]	77.5	77.5	77.5	77.5	77.5
	RWS Supply[d]	70.5	70.5	70.5	70.5	70.5
	Groundwater Supply[e]	5.0	5.0	5.0	5.0	5.0
	Recycled Water Supply[f]	1.9	1.9	1.9	1.9	1.9
	Non-potable Water Supply[g]	0.1	0.1	0.1	0.1	0.1
	Total Retail Supply	77.5	77.5	77.5	77.5	77.5
	Difference (Surplus or Shortfall)	**0**	**0**	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**	**0%**	**0%**
2025	Total Retail Demand[c]	79.0	79.0	79.0	79.0	79.0
	RWS Supply[d]	71.9	71.9	71.9	71.9	71.9
	Groundwater Supply[e]	5.0	5.0	5.0	5.0	5.0
	Recycled Water Supply[f]	1.9	1.9	1.9	1.9	1.9
	Non-potable Water Supply[g]	0.2	0.2	0.2	0.2	0.2
	Total Retail Supply	79.0	79.0	79.0	79.0	79.0
	Difference (Surplus or Shortfall)	**0**	**0**	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**	**0%**	**0%**
2030	Total Retail Demand[c]	82.3	82.3	82.3	82.3	82.3
	RWS Supply[d]	73.2	73.2	73.2	73.2	73.2
	Groundwater Supply[e]	5.0	5.0	5.0	5.0	5.0
	Recycled Water Supply[f]	3.9	3.9	3.9	3.9	3.9
	Non-potable Water Supply[g]	0.2	0.2	0.2	0.2	0.2
	Total Retail Supply	82.3	82.3	82.3	82.3	82.3
	Difference (Surplus or Shortfall)	**0**	**0**	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**	**0%**	**0%**
2035	Total Retail Demand[c]	85.9	85.9	85.9	85.9	85.9
	RWS Supply[d]	76.7	76.7	76.7	76.7	76.7
	Groundwater Supply[e]	5.0	5.0	5.0	5.0	5.0
	Recycled Water Supply[f]	3.9	3.9	3.9	3.9	3.9
	Non-potable Water Supply[g]	0.3	0.3	0.3	0.3	0.3
	Total Retail Supply	85.9	85.9	85.9	85.9	85.9
	Difference (Surplus or Shortfall)	**0**	**0**	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**	**0%**	**0%**

Year	Retail Supply and Demand	Normal Year	Single Dry Year[a]	Multiple Dry Years		
				Year 1[a]	Year 2[b]	Year 3[b]
2040	Total Retail Demand[c]	89.9	89.9	89.9	89.9	89.9
	RWS Supply[d]	80.6	80.6	80.6	79.5	79.5
	Groundwater Supply[e]	5.0	5.0	5.0	5.0	5.0
	Recycled Water Supply[f]	3.9	3.9	3.9	3.9	3.9
	Non-potable Water Supply[g]	0.4	0.4	0.4	0.4	0.4
	Total Retail Supply	89.9	89.9	89.9	88.8	88.8
	Difference (Surplus or Shortfall)	**0**	**0**	**0**	**-1.1**	**-1.1**
	Difference as % of Demand	**0%**	**0%**	**0%**	**-1.2%**	**-1.2%**

Normal, single dry, and multiple dry year conditions are on a water year basis.

a During a single dry year and multiple dry year 1, a system-wide shortage of 10% is in effect. Under the WSAP, the retail supply allocation at this stage of shortage is 36.0% of available RWS supply, or 85.9 mgd. However, due to the Phased WSIP Variant, only 81 mgd of RWS supply can be delivered. RWS supply is capped at this amount.

b During multiple dry years 2 and 3, a system-wide shortage of 20% is in effect. Under the WSAP, the retail supply allocation at this stage of shortage is 37.5% of available RWS supply, or 79.5 mgd. RWS supply is capped at this amount.

c Total retail demands correspond to those in **Table 4-1**, and reflect both passive and active conservation, as well as water loss. Groveland CSD is included in the table above. However, in the corresponding standardized tables in **Appendix B**, Groveland CSD is accounted for as a wholesale customer instead of a retail customer, as explained in **Section 2.4**.

d Procedures for RWS allocations and the WSAP are described in **Section 8.3**. Groundwater and recycled water are assumed to be used before RWS supplies to meet retail demand. However, if groundwater and recycled water supplies are not available, up to 81 mgd of RWS supply could be used.

e Groundwater supplies are assumed to be equivalent to projected demands for the San Francisco Groundwater Supply Project (4.0 mgd), San Francisco Zoo (0.3 mgd), Castlewood CSA (0.4 mgd), and subsurface diversions in Sunol (0.3 mgd). Groundwater availability would not be affected by dry year conditions.

f Recycled water supplies are assumed to be equivalent to projected demands related to the Westside Recycled Water Project (1.6 mgd), Eastside Recycled Water Project (2.0 mgd), Harding Park and Fleming Golf Courses (0.23 mgd), and Sharp Park Golf Course (up to 0.08 mgd by 2020). Recycled water availability would not be affected by dry year conditions.

g Non-potable water indicates onsite water reuse as mandated by the Non-potable Water Ordinance. Non-potable water availability would be minimally affected by dry year conditions. Non-potable water is not supplied by the SFPUC, and is therefore not included in the corresponding standardized tables in **Appendix B**.

7.6 WHOLESALE WATER SUPPLY AND DEMAND COMPARISON

Table 7-5 summarizes the projected wholesale supplies and demands during normal, single dry, and multiple dry years. Total wholesale demands, are estimated in **Section 4.2** and reflect the Supply Assurance of 184 mgd for Wholesale Customers. The difference between supply and demand, resulting in either a supply surplus or deficit, is also provided for each projected year and dry year scenario.

As noted previously, procedures to allocate RWS supplies between retail and wholesale customers during system shortages are specified in the WSAP described in **Section 8.3**. Groveland CSD is accounted for as a retail customer in **Table 7-4**, above, but as a wholesale customer in the corresponding standardized tables in **Appendix B**.

Table 7-5 does not reflect decisions specified in the WSA that will be made in 2018 regarding additional supplies to Wholesale Customers in excess of the Supply Assurance of 184 mgd or converting the Cities of San Jose and Santa Clara to permanent customers. If the SFPUC determines that it will serve more than 184 mgd to the Wholesale Customers, this, in combination with supplies to retail customers, may result in a demand above 265 mgd. Thus, the SFPUC would need to develop the additional water supplies to continue meeting the water supply Levels of Service. As these decisions have not yet been made, the SFPUC's reliability analysis carries the current Supply Assurance forward through 2040 and does not factor either the development of additional water supplies beyond those necessary to meet demands through 2018 or meeting demands in excess of the Supply Assurance.

In general, **Table 7-5** demonstrates the following:

- **Normal Years:** During normal hydrologic years, the SFPUC will have adequate supplies to meet its projected wholesale water demands.

- **Single Dry Year:** During single dry years, there would be shortages in RWS deliveries to wholesale customers for all projected years. The resulting shortfall would be 31.4 mgd, or 17.1% of demand.

- **Multiple Dry Years:** In a multiple dry year event, wholesale customers would collectively experience shortages in RWS deliveries for all projected years. The shortage in year 1 would be equivalent to that during a single dry year, resulting in a shortfall of 31.4 mgd, or 17% of demand. A greater level of shortage would be experienced in years 2 and 3, resulting in a shortfall of 51.5 mgd, or 28.0% of demand.

Table 7-5. Wholesale Supply and Demand Comparison for Projected Normal and Dry Year Scenarios (mgd)

[Standardized Table 7-2 Wholesale: Normal Year Supply and Demand Comparison]

[Standardized Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison]

[Standardized Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison]

Year	Wholesale Supply and Demand	Normal Year	Single Dry Year[a]	Multiple Dry Years		
				Year 1[a]	Year 2[b]	Year 3[b]
2020	Total Wholesale Demand[c]	184.0	184.0	184.0	184.0	184.0
	Total Wholesale RWS Supply[d]	184.0	152.6	152.6	132.5	132.5
	Difference (Surplus or Shortfall)	**-0.0**	**-31.4**	**-31.4**	**-51.5**	**-51.5**
	Difference as % of Demand	**0.0%**	**-17.1%**	**-17.1%**	**-28.0%**	**-28.0%**
2025	Total Wholesale Demand[c]	184.0	184.0	184.0	184.0	184.0
	Total Wholesale RWS Supply[d]	184.0	152.6	152.6	132.5	132.5
	Difference (Surplus or Shortfall)	**-0.0**	**-31.4**	**-31.4**	**-51.5**	**-51.5**
	Difference as % of Demand	**0.0%**	**-17.1%**	**-17.1%**	**-28.0%**	**-28.0%**
2030	Total Wholesale Demand[c]	184.0	184.0	184.0	184.0	184.0
	Total Wholesale RWS Supply[d]	184.0	152.6	152.6	132.5	132.5
	Difference (Surplus or Shortfall)	**-0.0**	**-31.4**	**-31.4**	**-51.5**	**-51.5**
	Difference as % of Demand	**0.0%**	**-17.1%**	**-17.1%**	**-28.0%**	**-28.0%**
2035	Total Wholesale Demand[c]	184.0	184.0	184.0	184.0	184.0
	Total Wholesale RWS Supply[d]	184.0	152.6	152.6	132.5	132.5
	Difference (Surplus or Shortfall)	**-0.0**	**-31.4**	**-31.4**	**-51.5**	**-51.5**
	Difference as % of Demand	**0.0%**	**-17.1%**	**-17.1%**	**-28.0%**	**-28.0%**
2040	Total Wholesale Demand[c]	184.0	184.0	184.0	184.0	184.0
	Total Wholesale RWS Supply[d]	184.0	152.6	152.6	132.5	132.5
	Difference (Surplus or Shortfall)	**-0.0**	**-31.4**	**-31.4**	**-51.5**	**-51.5**
	Difference as % of Demand	**0.0%**	**-17.1%**	**-17.1%**	**-28.0%**	**-28.0%**

Normal, single dry, and multiple dry year conditions are on a water year basis.

Groveland CSD is not accounted for as a wholesale customer for the purpose of this table. Refer to **Table 7-4** the retail supply and demand comparison including Groveland CSD. However, in the corresponding standardized tables **in Appendix B**, Groveland CSD is reported as wholesale rather than retail.

a Single dry year and multiple dry year 1 reflect a system-wide shortage of 10%. Under the WSAP, the wholesale supply allocation at this stage of shortage is 64.0% of available RWS supply, or 152.6 mgd.

b Multiple dry years 2 and 3 reflect a system-wide shortage of 20%. Under the WSAP, wholesale supply allocation at this stage of shortage is 62.5% of available RWS supply, or 132.5 mgd.

c Total wholesale demands correspond to those in **Table 4-3**. It is assumed that 265 mgd demand will extend beyond 2018, and projected Wholesale Customer demands are limited to the Supply Assurance of 184 mgd. The 184 mgd assumes that San Jose and Santa Clara remain temporary, interruptible customers.

d Procedures for RWS allocations and the WSAP are described in **Section 8.3**.

7.7 FUTURE ACTIONS AFFECTING WATER SUPPLY AND DEMAND

The supply and demand comparisons above are based on assumptions that reflect decisions made to date. There are a multitude of upcoming actions that affect RWS supplies and may increase demands on the RWS. These actions are described below.

7.7.1 2018 Water Supply Decisions

As noted in **Section 4.2.1.2**, the SFPUC committed to making certain decisions by December 31, 2018 under the 2009 WSA. Additionally, changes to instream flow requirements and customer demand projections that surfaced after the effective date of the WSA will redirect water supply planning beyond 2018. As a result, the SFPUC has developed the WaterMAP to provide necessary information to address the 2018 decisions and to begin developing a water supply program for the 2019 to 2040 planning horizon. The water supply program will enable the SFPUC to continue to meet its commitments and responsibilities to the Wholesale Customers and retail customers, consistent with the priorities of the SFPUC.

The WaterMAP poses the following questions to help guide the decision-making process:

- **How should the SFPUC maintain delivery reliability while addressing reductions in supply availability caused by new instream flow requirements?**

  The SFPUC must secure an additional average annual water supply of 3.5 mgd to meet the shortfall resulting from instream flow requirements for San Mateo Creek. This 3.5 mgd shortfall is based on the assumption that the Alameda Creek Recapture Project will replace any supply lost to Alameda Creek fishery flows. While this shortfall may not pose an immediate threat to reliability, additional supplies will be necessary to resolve this shortfall in the long run.

- **What options should the SFPUC consider to make the City of San Jose a permanent customer of the RWS?**
- **What options should the SFPUC consider to make the City of Santa Clara a permanent customer of the RWS?**

  Converting the Cities of San Jose and Santa Clara to permanent, non-interruptible customers would require the SFPUC to secure 9 mgd of additional water supply. Currently, San Jose and Santa Clara are temporary customers with an interruptible status. The SFPUC will continue to meet the two cities' demands up to 9 mgd through 2018, but may issue a conditional five-year notice of termination or reduction in supply to San Jose and Santa Clara if water use by the Wholesale Customers is projected to exceed 184 mgd before June 30, 2018. Development of additional supplies would be necessary to offer San Jose and Santa Clara permanent status.

- **What options should the SFPUC consider to provide an additional supply to meet East Palo Alto's projected demands above the ISG?**

  Cumulatively, Wholesale Customer purchase request projections through 2040 are expected to be lower than the existing 184 mgd Supply Assurance. However, there are some individual Wholesale Customers whose purchase requests in the future are projected to exceed their respective ISGs, including East Palo Alto, Purissima Hills Water District, and Burlingame. By 2040, an additional supply of up to 1.78 mgd could be needed to meet the projected purchase requests, above the

amount of their combined ISGs. At this time, however, only East Palo Alto has requested that the SFPUC consider additional supply options to meet their projected demand increase in the planning horizon. Therefore, this question considers an additional supply request of up to 1.5 mgd. However the SFPUC will continue dialogue with each of these Wholesale Customers as planning progresses.

- **Should the SFPUC revise its current performance objective on rationing in order to increase dry year reliability of the RWS?**

  Recent drought conditions have prompted the SFPUC to revisit its drought year reliability objective. At the beginning of 2014, the SFPUC called on all customers to voluntarily reduce water use by at least 10%. Later in the year, the SFPUC called for mandatory retail water use reductions of outdoor irrigation by 10% and more recently, by 25%. Retail and Wholesale Customers exceeded the system-wide reduction target of 10% in 2014. Per capita consumption was also very low throughout the service area. There is concern that if the drought continues, additional water savings may be difficult to achieve without significant economic impacts.

The WaterMAP will be presented by SFPUC staff to its Commission in June 2016. The discussion resulting from the questions described in the WaterMAP will help guide the water supply planning objectives through 2040. While the WaterMAP is not a water supply program, it presents pertinent information that will help develop the SFPUC's future water supply planning program.

7.7.2 Potential State and Federal Regulations

The SFPUC's operation of the RWS is subject to numerous State and federal agency permits designed to protect drinking water quality and the environment. Some permit requirements have been in place for decades and influence the way that water supply is managed. Requirements for instream flows, for example, may increase the releases or bypass flow from SFPUC facilities. In the Tuolumne River watershed, the SFPUC currently maintains a specific flow release schedule downstream of Hetch Hetchy Reservoir, Cherry Lake, and Lake Eleanor. When the WSIP was analyzed in the PEIR, local system reservoirs had no formal flow release requirements, so no instream flow release and bypass requirements were reflected in the water supply program for the Calaveras Dam Replacement and Lower Crystal Springs Dam Improvements Projects. However, as noted earlier, unforeseen changes to the flow schedules for Alameda and San Mateo Creeks may impact the water supply reliability of the RWS once all of the WSIP projects have been completed.

Additionally, ongoing and future regulatory proceedings may impact water supplies in ways and amounts that currently remain unknown. Additional instream flow release or bypass requirements may also be triggered by the development of new projects or modifications to existing facilities. For example, as described in **Section 3.1.4**, the SFPUC uses a portion of Don Pedro Reservoir as a water bank under agreement with the Districts. The Federal Energy Regulatory Commission (FERC) re-licensing of the Don Pedro Reservoir Project may require additional water releases from Don Pedro for the preservation of aquatic species in the lower Tuolumne River, potentially affecting the yield of the RWS by reducing the balance of water stored in the water bank.

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SECTION 8: WATER SHORTAGE CONTINGENCY PLANNING

This section presents water shortage contingency plans, referred to by the SFPUC as Water Shortage Allocation Plans, and includes the following information:

- SFPUC's response to past water shortage experiences and the current drought;
- Procedures for allocating reduced deliveries from the RWS between wholesale and retail customers;
- Retail plan for responding to water shortages; and
- Emergency procedures in response to a catastrophic supply interruption.

8.1 PAST EXPERIENCE WITH WATER SHORTAGES

Every water system has vulnerabilities in terms of its ability to provide a safe and reliable supply of water. Water shortages can occur in a number of ways. Very localized shortages can occur due to distribution system problems, and system shortages can occur due to major facility failures. Yet, beyond system facility contingencies, there exists the potential vulnerability to drought, which limits the amount of water that is available over a series of years. This latter type of contingency is not necessarily caused by physical facility limitations. Within the past 30 years, San Francisco has experienced both localized shortages due to earthquakes and system-wide shortages due to drought.

The SFPUC's past experiences with water shortages, due to drought and earthquakes, have helped shape its current plans and policies relative to water shortage preparedness and response:

- In 1987-92 San Francisco experienced a serious drought. This 6-year drought provides an example of how various stages of action were taken in times when the operational capabilities of Hetch Hetchy and other water supplies available to the SFPUC were taxed to a point that forced drastic actions to avoid running out of water.

- Following the October 17, 1989 Loma Prieta earthquake, the SFPUC worked with the Mayor's Office of Emergency Response to reconnect service to those who were impacted by the earthquake. Most of the homes that lost water service were reconnected to the water system's lines within 72 hours.

- In April 2007, below normal precipitation and snow pack caused the SFPUC to initiate a 10% voluntary reduction in water use in the service area. The call for a voluntary reduction continued through 2009.

The 1987-92 drought illustrated the deficit between the SFPUC's supplies and its customers' demands. Other than the 1976-77 drought, drought sequences in the past did not seriously affect the ability of the SFPUC to maintain full deliveries to its customers. As the SFPUC progressed into the drought and reservoir storage continued to decline, it became evident that full deliveries could not be sustained without the risk of running out of water before the drought ended. This circumstance became a reality in early 1991 when the Hetch Hetchy Reservoir became so depleted (less than 25,000 AF of storage in a reservoir with over 360,000 AF of capacity) that minimum instream flow releases and anticipated demands required the SFPUC to initiate programs to achieve a 45% reduction in system-wide water deliveries to balance water supplies with deliveries. Fortunately, unexpected runoff provided relief from the severity of that instance of water shortage; however, the drought was far from over. **Appendix K** provides a more detailed summary of San Francisco's 1987-92 drought experience and the actions taken at the time.

8.2 EXPERIENCE WITH THE CURRENT DROUGHT

The State is currently in the fourth year of a severe drought, one that is said to be the driest in the hydrologic record. The unprecedented dry weather conditions prompted Governor Jerry Brown to declare a drought State of Emergency in January 2014, which is still in effect to date. This action spurred the SFPUC to request that all customers of the RWS voluntarily reduce water use by at least 10%. Soon after, the San Francisco Mayor's Office issued a formal executive directive requiring that all City departments develop individual water conservation plans and take immediate steps to achieve a mandatory 10% reduction in their water consumption.

In July 2014, new emergency conservation regulations issued by the SWRCB prompted the SFPUC to implement outdoor water waste restrictions and require a mandatory 10% reduction in outdoor water use. Additional emergency conservation regulations issued by the SWRCB in the spring of 2015 established more Statewide water use restrictions, a mandatory Statewide water reduction of 25% compared to 2013 water use, and conservation standards for individual urban water suppliers to meet the Statewide 25% reduction. Per these regulations, the SFPUC retail service area was assigned a conservation standard of 8% in recognition of its low residential per capita water use. In the wholesale service area, conservation standards assigned to the Wholesale Customers range from 8% to 36%. The conservation standards took effect in June 2015 and remains in effect. These emergency conservation regulations were the first of their kind, indicative of the State's desire for swift and substantial action to cope with the drought.

In addition to the State mandates, the SFPUC imposed a mandatory 10% reduction on outdoor irrigation along with water use allocations and excess use charges for all retail irrigation customers starting in August 2014. Following the additional SWRCB regulations in the spring of 2015, the SFPUC increased the mandatory reduction on retail outdoor irrigation from 10% to 25% starting in July 2015. See **Appendix F** for more detailed information about actions taken by the SFPUC during the current drought. In addition, **Sections 8.3.1.4** and **9.2** provide information about the SFPUC's actions to reduce demand during the current drought, including public education and outreach activities and conservation programming.

During the current drought to date, the SFPUC has called for, but has not mandated, a 10% system-wide reduction since January 2014. The SFPUC has not yet been compelled to declare a water shortage emergency and impose subsequent mandatory system-wide rationing and shortage allocations because its customers have exceeded the 10% voluntary system-wide reduction in conjunction with the Statewide mandatory reductions assigned by the SWRCB. If current drought conditions worsen between 2015 and 2018, and the SFPUC determines that system-wide rationing would need to be imposed, then the SFPUC would issue a declaration of a water shortage emergency in accordance with CWC Section 350 and implement rationing in accordance with the WSA and Water Shortage Allocation Plan (WSAP). The WSAP is described in the next section.

To date, retail and wholesale customers have responded positively to State and local mandates. As previously described in **Sections 4.1** and **4.2**, total retail and wholesale demands were in decline and reached historic lows in 2015.

8.3 WATER SHORTAGE ALLOCATION PLAN

Each year during the snowmelt period, the SFPUC evaluates the amount of total water storage expected to occur throughout the RWS. If this evaluation finds the projected total water storage to be less than an identified level sufficient to provide sustained deliveries during drought, the SFPUC may impose delivery

reductions or rationing in accordance with (1) the Retail Water Shortage Allocation Plan (RWSAP), which pertains to retail customers and; (2) the Water Shortage Allocation Plan (WSAP) Among Suburban Customers, which pertains to Wholesale Customers. The WSAP provides specific allocations of the available water supply between the retail and wholesale customers collectively associated with varying system-wide shortages of up to 20%, as shown in **Table 8-1**. More information about the RWSAP and WSAP are provided in the next sections.

As explained in **Section 2.4**, Groveland CSD is accounted for in the retail allocation of RWS supply and is therefore subject to the stages of action and procedures set forth in the RWSAP. However, the corresponding standardized tables in **Appendix B** include RWS supply specific to Groveland CSD, assumed to be equivalent to its demand projection of approximately 0.5 mgd as shown in **Table 4-1.**

Table 8-1. Retail and Wholesale Regional Water System Allocations during System-wide Shortage

[Standardized Table 8-1 Retail: Stages of Water Shortage Contingency Plan]

[Standardized Table 8-1 Wholesale: Stages of Water Shortage Contingency Plan]

Required Level of System-wide Reduction in Water Use	SFPUC Retail Share of Available RWS Supply[a]	Collective Wholesale Customers' Share of Available RWS Supply
5% or less	35.5%	64.5%
6 – 10%	36.0%	64.0%
11 – 15%	37.0%	63.0%
16 – 20%[b]	37.5%	62.5%

a While Groveland CSD is reported in this 2015 UWMP as a wholesale customer, it is considered a retail customer of the SFPUC solely for purposes of allocating RWS supplies between retail customers and Wholesale Customers. Thus, RWS supplies to Groveland CSD are accounted for in the retail supply allocation.

b Allocation procedures per the WSAP do not include RWS shortages above 20%. However, if a shortage of over 20% were to be experienced, the corresponding Tier 1 allocation would follow those set for the 16-20% shortage, with the final individual customer allocations greater than 20% subject to consultation and negotiation between the SFPUC and its Wholesale Customers.

8.3.1 Retail Water Shortage Allocation Plan

Based on the WSAP allocations presented earlier in **Table 8-1**, **Table 8-2** shows RWS supply schedules for retail customers during normal, single dry year, and multiple dry year periods. For the purposes of this analysis, the SFPUC assumed a delivery goal (i.e., ISL) of 265 mgd. System-wide shortages were applied to a demand of 265 mgd and the subsequent allocations between retail customers and Wholesale Customers collectively.

8.3.1.1 Stages of Action

The RWSAP was adopted in 2001[18] to formalize a three-stage program of action to be taken in the retail service area to reduce water use during a drought. In accordance with the RWSAP, prior to the initiation of any water delivery reductions to its retail customers, whether it be initial implementation of reduction delivery or increasing the severity of water shortage, the SFPUC would outline a drought response plan to address the following: the water supply situation; proposed water use reduction objectives; alternatives to

[18] SFPUC Resolution No. 01-0245 is provided in **Appendix M**.

water use reductions; methods to calculate water use allocations and adjustments; compliance methodology and enforcement measures; and budget considerations.

This drought response plan would be presented at a regularly-scheduled SFPUC Commission meeting for public input. The meeting would be advertised in accordance with the requirements of Section 6066 of the Government Code, and the public would be invited to comment on the SFPUC's intent to reduce deliveries.

Depending on the level of water demand and the desired objective for water use reduction, one, two or all three stages of the RWSAP may be required. **Table 8-3** identifies the water shortage stages of action. Additional information is provided in the RWSAP in **Appendix L**.

Table 8-2. Retail Regional Water System Allocations in Normal, Dry, and Multiply Dry Years

[Standardized Table 7-1 Retail: Bases of Water Year Data]

Year[a]	Normal Year		Single Dry Year[b]		Multiple Dry Years					
					Year 1[b]		Year 2[c]		Year 3[c]	
	mgd	%	mgd	%	mgd	%	mgd	%	mgd	%
2015	81.0	100.0	81.0	100.0	81.0	100.0	77.5	95.7	77.5	95.7
2020	81.0	100.0	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2025	81.0	100.0	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2030	81.0	100.0	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2035	81.0	100.0	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2040	81.0	100.0	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1

Normal, single dry, and multiple dry year conditions are on a water year basis. Dry year availability is presented in terms of percentage of normal year availability.

While Groveland CSD is reported in this 2015 UWMP as a wholesale customer, it is considered a retail customer of the SFPUC solely for purposes of allocating RWS supplies between retail customers and Wholesale Customers. Thus, RWS supplies to Groveland CSD are accounted for in the retail supply allocation shown above.

a RWS supply allocations for 2015 reflect current WSIP conditions (i.e., not yet fully complete). RWS supply allocations for projected years 2020 through 2040 reflect full completion of WSIP.

b Single dry year and multiple dry year 1 reflect a system-wide shortage of 10%. Under the WSAP, retail supply allocation at this stage of shortage is 36.0% of available RWS supply, or 85.9 mgd. However, due to the Phased WSIP Variant, only 81 mgd of RWS supply can be delivered, and is therefore shown above.

c Multiple dry years 2 and 3 reflect a system-wide shortage of 20% (or 22% for 2015). For this analysis, a 20% (or 22% for 2015) shortage is considered equivalent to Stage 4, 16-20% system-wide shortage. Under the WSAP, retail supply allocation at this stage of shortage is 37.5% of available RWS supply, or 79.5 mgd (or 77.5 mgd for 2015).

Table 8-3. Retail Water Shortage Stages of Action

[Standardized Table 8-3 Retail: Stages of WSCP – Consumption Reduction Methods]

Water Shortage Stage	Actions by SFPUC	Trigger Point (System-wide Shortage)	Target Water Use Reduction
1 – Voluntary	• Request voluntary rationing of customers • Alert customers to water supply conditions • Remind customers of existing water use prohibitions • Increase education on, and possibly accelerate, incentive programs (e.g., toilet rebates)	10 – 20%	5 – 10%
2 – Mandatory	• Implement all Stage 1 actions • Assign all customers an "allotment" of water based on the Inside/Outside allocation method (based on base year water usages for each account) • Subject water use above the "allocation" level to excess use charges, installation of flow restrictor devices, and shut-off of water	21 – 50%	11 – 20%
3 – Mandatory	• Implement all Stage 2 actions with further reduced allocations	> 50 %	> 20 %

8.3.1.2 Prohibitions on End Uses

Table 8-4 summarizes potential prohibitions that may be enforced during a drought, as well as permanent restrictions established in the SFPUC Rules and Regulations Governing Water Service to Customers.[19] **Appendix K** describes various measures employed during the 1987-92 drought in an attempt to achieve a 45% reduction in retail demands (as applied to the pre-drought demand). These measures included absolute limitations on water use based on residential customer classification and a proportion of historical use within the non-residential sectors. Although not anticipated to be required in the near-term, the SFPUC would employ similar procedures to accommodate system-wide water shortages in excess of 20%, if necessary.

The RWSAP identifies additional water waste prohibitions that may be imposed by the SFPUC as it deems necessary. These prohibitions could potentially be imposed during any stage of water shortage, but would be temporary for the duration of the water shortage. These potential prohibitions are included below. More information about these prohibitions is provided in **Appendix L**.

Among the emergency conservation regulations adopted by the SWRCB during the current drought, urban water suppliers were required to impose specific mandatory restrictions on outdoor irrigation as well as prohibitions on water use by businesses. For the water use restrictions that were not already addressed by the SFPUC Rules and Regulations Governing Water Service to Customers, the SFPUC took action to adopt the restrictions. These mandatory restrictions are included below. More information about these restrictions is provided in **Appendix F**.

[19] The SFPUC Rules and Regulations Governing Water Service to Customers may be accessed at: **www.sfwater.org/index.aspx?page=172**.

8.3.1.3 Penalties, Charges, and Other Enforcement of Prohibitions

The SFPUC has found that the most effective method for minimizing water waste has been through outreach, communication, and responding to water waste reports through the City's 311 service request system. The SFPUC reviews reports of potential water waste and violation of prohibitions submitted through 311. If the report contains sufficient information and reflects a restricted water use, the SFPUC issues a written notice to the water account holder, property owner, and occupant. If reports of waste continue, the SFPUC will call or visit the site to try to verify waste. If water waste is verified and continues, the SFPUC will issue additional warning letters to the account holder. Account holders that receive multiple warnings of verified water waste may be subject to additional action. For a separate description of excess use charges, see **Section 8.3.1.4**.

In addition, the water use restrictions and prohibitions listed above may be enforced using the following means:

- Per the SFPUC Rules and Regulations Governing Water Service to Customers and rate schedule, violation of any water use restriction may result in the installation of a flow-restricting device in the service line of the customer, and continued violation could result in termination of service. The customer bears the cost of any enforcement action.

- Per the SFPUC Rules and Regulations Governing Water Service to Customers, violation of water waste prevention for landscaped areas[20] is subject to a written warning, followed by possible termination of service and penalties per Chapter 100 of the San Francisco Administrative Code if the violation is not corrected.

- As part of the SWRCB emergency conservation regulations, the CWC was amended to identify violations of water use prohibitions as infractions, and therefore punishable by a fine of up to $500 for each day in which the violation occurs.

[20] SFPUC Rules and Regulations Governing Water Service to Customers, Section F, Rule 16.

Table 8-4. Water Use Restrictions

[Standardized Table 8-2 Retail Only: Restrictions and Prohibitions on End Uses]

Mandatory Restrictions	Applicable Water Shortage Stage(s)
Permanent[a]	
Water waste, including but not limited to, any flooding or runoff into the street, sidewalk or gutter	Not applicable
Using hoses for any purpose without a positive shut-off valve	Not applicable
Serving water at a restaurant, café, or food counter without waiting for a request by a customer or customers	Not applicable
Potable water was not to be used to clean, fill or maintain levels in decorative fountains.	Not applicable
Use of potable water for consolidation of backfill, dust control or other nonessential construction purposes if groundwater or recycled water is available and approved by the San Francisco Department of Public Health[b]	Not applicable
Use of single-pass cooling systems, fountains, and commercial car washes	Not applicable
Temporary (i.e., imposed during water shortage)	
Washing sidewalks, driveways, plazas and other outdoor hardscapes for reasons other than health and safety needs[c]	2, 3
Outdoor irrigation of ornamental landscapes or turf with potable water that is not reduced by at least the amount (percentage) specified in the drought response plan	2, 3
Watering outdoor landscapes with potable water during and within 48 hours after a rain event[c]	2, 3
Not providing guests the option to refuse daily laundering of towels and linens at hotels and motels, and not prominently displaying notice of this option in each guestroom[c]	2, 3
Irrigation with potable water of ornamental turf on public street medians[c]	2, 3
Use of additional water for new landscaping or expansion of existing facilities unless low water use landscaping designs and irrigation systems are employed[d]	2, 3
Water service connections for new construction not incorporating water-saving fixtures or devices into the plumbing system[d]	2, 3
Verified water waste as determined by the Water Department would serve as prima facie evidence that the allocation assigned to the water account is excessive; therefore, the allocation was subject to review and possible reduction, including termination of service[d]	2, 3
Use of supplies other than groundwater and/or recycled water for irrigation of golf courses, median strips, and similar turf areas[d]	2, 3
Use of potable water on golf courses outside irrigation of putting greens[d]	2, 3
Use of potable water for street sweepers/washers[d]	2, 3
The washing of all automobiles, motorcycles, RVS, trucks, transit vehicles, trailers, boats, trains, and airplanes outside of a commercial washing facility; unless required to clean windows on all vehicles and such commercial or safety vehicles for health and safety reasons[d]	2, 3
The filling of new swimming pools, spas, hot tubs, or the draining and refilling of existing pools, etc.[d]	2, 3

a Established in SFPUC Rules and Regulations Governing Water Service to Customers, Section E, Rule 12.

b Consistent with the Soil Compaction and Dust Control Ordinance, Ordinance 175-91 (San Francisco Public Works Code, Article 21, Sections 1100-1107).

c Imposed by the SFPUC per emergency conservation regulations adopted by the SWRCB in 2014 and 2015. To become permanent in accordance with SWRCB emergency regulations adopted in May 2016.

d Prescribed in the 1987-92 drought and/or specified in RWSAP; may be enforced during a future drought.

8.3.1.4 Consumption Reduction Methods

The following methods are employed or offered by the SFPUC to help reduce consumption in the retail service area. All of these methods, except for one, are implemented on a continuous basis or as needed, regardless of water shortage. Many of these methods are also demand management measures (DMMs) that are currently implemented. Some of these methods, though not formally enacted in the event of a shortage, are employed at the discretion of the SFPUC's operations (e.g., decrease in pipe flushing). Other methods may have an increase in application, participation, or frequency as a result of a shortage (e.g., public outreach, rebates, Water Wise Evaluations), but the increase is not necessarily triggered by a stage of shortage. The only method that is solely implemented in response to a shortage is mandatory rationing with corresponding allocations and excess use charges, as previously shown in **Table 8-3.**

- **Expand Public Information Campaign:** Through its conservation program, the SFPUC develops media campaigns and extensive informational materials, and performs widespread outreach activities to inform the public of a drought, relay information about water use reductions and prohibitions, and to promote conservation and use of SFPUC's conservation services. The SFPUC regularly notifies top residential and commercial water users of their consumption and SFPUC's services. During the current drought, high-water use letters were sent regularly to irrigation customers. See **Section 9.2.4** for more information about the DMM related to public education and outreach.

- **Improve Customer Billing:** In conjunction with deployment of its Automated Water Meter Program, the SFPUC launched a new bill management system and web portal called My Account in May 2014. This new system allows customers to view their daily water use data provided by the automated water meter reading system. The SFPUC is also planning to implement fractional billing so that customers, instead of being billed on a 1 unit (i.e., 1 CCF) basis, are billed for each 0.01 unit (i.e., 1 cubic foot) consumed. More information about My Account is provided in **Section 9.2.2** and in **Appendix F**. More information about fractional billing is provided in **Appendix F**. Additionally, transition of the billing system from bi-monthly to monthly billing for all customers was completed in July 2013.

- **Increase Frequency of Meter Reading:** In the spring of 2010, the SFPUC began deployment of the Automated Water Meter Program to upgrade all in-City retail water meters with wireless advanced metering technology. This program is described in more detail in **Section 9.2.2**.

- **Offer Water Use Surveys:** The SFPUC provides free Water Wise Evaluations for homes and businesses through its conservation program. Interest and participation in this service tends to increase during times of drought. See **Section 9.2.6** for more information about the DMM related to the conservation program.

- **Provide Rebates or Giveaways of Plumbing Fixtures and Devices:** Through its conservation program, the SFPUC provides free conservation fixtures and devices to San Francisco residents. As previously shown in **Table 8-3** incentive programs may be accelerated during a Stage 1 water shortage. During the current drought, the SFPUC expanded its device giveaway program by increasing fixture inventories, and making more fixtures available at its customer service center. Free devices include showerheads, faucet aerators, toilet leak detection tablets and standard repair parts, flow-measuring bags, pre-rinse spray valves, plumbing repair handbooks, "Brown is the New Green" landscape signage, and other items. Also, the SFPUC increased rebate amounts for flushometer toilets, urinals, and commercial-style clothes washers starting in July 2014. See **Section 9.2.6** for more information about the DMM related to the conservation program, and **Section 9.2.7** for a description of free fixtures and devices available to customers.

- **Provide Rebates for Landscape Irrigation Efficiency or Turf Replacement:** The SFPUC's Large Landscape Grant Program offers grants for large landscape irrigation efficiency improvements. During the current drought, the program also promotes the State's Save Our Water turf replacement rebate program. As previously shown in **Table 8-3,** incentive programs may be accelerated during a Stage 1 water shortage. See **Section 9.2.6** for more information about the DMM related to the conservation program.

- **Decrease Line Flushing:** Pipeline and other system flushing may be decreased at the discretion of the SFPUC's operations management. Due to the drought, starting in January 2014, the SFPUC reduced programmatic flushing of dead ends within the in-City distribution system pipelines from a scheduled program to an as-needed basis to respond to water quality issues. Also, as described in **Section 4.1.3**, regular system maintenance flushing in the Town of Sunol has been reduced to an as-needed basis during the current drought. While this method may be employed during a drought, it is not formally triggered by a water shortage stage.

- **Reduce System Water Loss:** The SFPUC conducts pressure management, collects main break data, and administers a Linear Assets Program to help control system losses. See **Section 9.2.5** for more information about the DMM related to management of system losses. For this 2015 UWMP update, a water audit was performed on the in-City distribution system; draft results are provided in **Appendix G**. In addition, to address water loss at the customer level, a Leak Detection Program was launched in April 2015 to notify single family residential customers about potential plumbing leaks that may be occurring at their homes (see **Section 9.2.2**). This program also meets State mandates requiring water suppliers to notify customers when they are aware of leaks that are within the customer's control.

- **Increase Water Waste Patrols:** SFPUC field inspectors watch for, report, and respond to potential water waste they may encounter as part of their regular travel throughout the City, and the SFPUC also encourages the general public to report potential water waste through the City's 311 service request system, as described in **Section 8.3.1.3**.

- **Implement or Modify Drought Rate Structure or Surcharge:** Mandatory rationing is imposed on all customers during a Stage 2 or 3 of water shortage. The RWSAP describes the process for allocating water to customers and levying excess use charges (see **Appendix L**). Continuous excess use is subject to installation of flow restrictors, and/or shut-off of water. As part of the 2015-2016 Drought Program and in line with State mandates to reduce outdoor water use, the SFPUC imposed mandatory rationing only on dedicated irrigation customers. Monthly water use allocations were assigned to approximately 1,600 dedicated irrigation accounts in the retail service area. For each account that exceeded its allocation during the course of the restriction period, a one-time excess use charge was applied to its bill at the end of the restriction period. The excess use charge was equivalent to 100% of the applicable water rate for each unit of excess water used. More information about this mandatory irrigation allocation program is provided in **Appendix G**.

- **Recycled Water Truck-Fill Station:** As noted in **Section 6.2.2.5**, the SFPUC operates a recycled water truck-fill station at its Southeast WPCP, which offsets the use of potable water. In response to increased interest in the station during the current drought, the SFPUC constructed an automated fill station in 2014. Informational and permitting materials were also updated to clarify what uses are permitted, and how to appropriately handle and use recycled water.

8.3.2 Wholesale Water Shortage Allocation Plan

The SFPUC's response to water shortages included the adoption of new agreements regarding how water would be allocated in future drought periods. In connection with the 2009 adoption of the WSA, the Wholesale Customers and San Francisco adopted the WSAP, based on the Interim Water Shortage Allocation Plan adopted in 2000[21], which outlines procedures for allocating water from the RWS to retail customers and Wholesale Customers during system-wide shortages of 20% or less. These procedures are referred to as the Tier 1 Plan and are provided in **Appendix N**. Furthermore, Section 3.11.C of the WSA authorizes the Wholesale Customers to adopt a methodology for allocating the collective wholesale allocation among the individual Wholesale Customers. This methodology is referred to as the Tier 2 Drought Implementation Plan, or DRIP, and is described further in **Section 8.3.2.1**.

For shortages in excess of 20%, the SFPUC will meet with the Wholesale Customers to determine if modifications to the Tier 1 Plan can be agreed upon by the SFPUC and the Wholesale Customers. If they cannot agree, the SFPUC may allocate water at its discretion, subject to challenge by the Wholesale Customers, unless all of the Wholesale Customers direct that a particular Tier 2 allocation methodology be used.

Based on the WSAP allocations presented earlier in **Table 8-1**, **Table 8-5** shows RWS supply schedules for collective wholesale customers during normal, single dry year, and multiple dry year periods. For the purposes of this analysis, the SFPUC assumed a delivery goal (i.e., ISL) of 265 mgd. System-wide shortages were applied to a demand of 265 mgd and the subsequent allocations between retail customers and Wholesale Customers collectively.

In addition to providing an allocation method, the WSAP also includes provisions for transfers, banking, and excess use charges. See **Appendix K** for the full WSAP.

8.3.2.1 Tier 2 Drought Implementation Plan (DRIP)

As described above, Section 3.11.C of the WSA authorizes the Wholesale Customers to adopt a methodology for allocating the collective wholesale allocation among the individual Wholesale Customers. The Tier 2 Drought Implementation Plan (DRIP) was adopted by the Wholesale Customers. The allocation included in the DRIP is based on a formula that takes two primary factors into account: (1) each BAWSCA Wholesale Customer's Supply Assurance from SFPUC, with certain exceptions, and (2) each BAWSCA Wholesale Customer's purchases from SFPUC during the three years preceding adoption of the DRIP.

8.3.2.2 Stages of Action

Water shortage stages applicable to the Wholesale Customers are shown in **Table 8-1**.

[21] SFPUC Resolution No. 00-0244 is provided in **Appendix M**.

Table 8-5. Wholesale Regional Water System Allocations in Normal, Dry, and Multiply Dry Years

[Standardized Table 7-1 Wholesale: Bases of Water Year Data]

Year	Normal Year		Single Dry Year[a]		Multiple Dry Years					
					Year 1[a]		Year 2[b]		Year 3[b]	
	mgd	%	mgd	%	mgd	%	mgd	%	mgd	%
2015	184.0	100.0	152.6	82.9	152.6	82.9	129.2	70.2	129.2	70.2
2020	184.0	100.0	152.6	82.9	152.6	82.9	132.5	72.0	132.5	72.0
2025	184.0	100.0	152.6	82.9	152.6	82.9	132.5	72.0	132.5	72.0
2030	184.0	100.0	152.6	82.9	152.6	82.9	132.5	72.0	132.5	72.0
2035	184.0	100.0	152.6	82.9	152.6	82.9	132.5	72.0	132.5	72.0
2040	184.0	100.0	152.6	82.9	152.6	82.9	132.5	72.0	132.5	72.0

Normal, single dry, and multiple dry year conditions are on a water year basis. Dry year availability is presented in terms of percentage of normal year availability.

While Groveland CSD is reported in this 2015 UWMP as a wholesale customer, it is considered a retail customer of the SFPUC solely for purposes of allocating RWS supplies between retail customers and Wholesale Customers. Thus, RWS supplies to Groveland CSD are accounted for in the retail supply allocation shown in **Table 8-2**.

a RWS supply allocations for 2015 reflects current WSIP conditions (i.e., not yet fully complete). RWS supply allocations for projected years 2020 through 2040 reflect full completion of WSIP.

b Single dry year and multiple dry year 1 reflect a system-wide shortage of 10%. Under the WSAP, wholesale supply allocation at this stage of shortage is 64.0% of available RWS supply, or 152.6 mgd.

c Multiple dry years 2 and 3 reflect a system-wide shortage of 20% (or 22% for 2015). For this analysis, a 20% (or 22% for 2015) shortage is considered equivalent to Stage 4, 16-20% system-wide shortage. Under the WSAP, wholesale supply allocation at this stage of shortage is 62.5% of available RWS supply, or 132.5 mgd (or 129.2 mgd for 2015).

8.3.3 Mechanisms to Determine Reductions in Water Use

Actual water savings are tracked through monthly consumption reports that are generated from the customer billing system. These consumption reports are highly accurate as all retail and wholesale customers are metered. Based on a comparison between monthly consumption data, the SFPUC is able to determine reductions in water use for both retail and wholesale customers.

8.3.4 Revenue and Expenditure Impacts During Water Shortages

If the SFPUC declares a water shortage emergency under CWC Section 350 and implements the WSAP, the SFPUC may raise water rates independently of coordination with the annual budget process to make up for lost revenue due to reduced water use (WSA Section 6.03C). The SFPUC also maintains an unappropriated fund balance that can be used to offset the effects of revenue shortfalls caused by drought.

8.4 PREPARATION FOR CATASTROPHIC SUPPLY INTERRUPTION

The SFPUC maintains various planning documents which collectively address its emergency preparedness and planned response in case of a catastrophic interruption of water supplies due to power outages, earthquakes or other disasters. Additionally, the WSIP, previously discussed in **Section 6.1.2**, includes capital projects related to seismic reliability and overall system reliability.

8.4.1 Emergency Preparedness Plans

Following the 1989 Loma Prieta Earthquake, the SFPUC created a departmental Emergency Operations Plan (EOP). The SFPUC EOP was originally released in 1992, and has been updated as necessary ever since, most recently in September 2012. The SFPUC EOP addresses a broad range of potential emergency situations that may affect the SFPUC and supplements the City's Emergency Response Plan (formerly known as the City's EOP), which was prepared by the Department of Emergency Management and most recently updated in 2010. Specifically, the purpose of the SFPUC EOP is to describe its emergency management organization, roles and responsibilities, and emergency policies and procedures.

In addition, SFPUC divisions and bureaus have their own EOPs (in alignment with the SFPUC EOP), which detail that entity's specific emergency management organization, roles and responsibilities, and emergency policies and procedures. The SFPUC tests its EOPs on a regular basis by conducting emergency exercises. Through these exercises, the SFPUC learns how well the plans and procedures will or will not work in response to an emergency. EOP improvements are based on the results of these exercises and real-world event response and evaluation. The SFPUC also has an emergency response training plan that is based on federal, State, and local standards and exercise and incident improvement plans. SFPUC employees have emergency training requirements that are based on their emergency response roles.

8.4.2 Emergency Drinking Water Planning

In February 2005, the SFPUC published the City Emergency Drinking Water Alternatives report. The purpose of this project was to develop a plan for supplying emergency drinking water in the City after damage and/or contamination of the SFPUC raw and/or treated water systems resulting from a major disaster. Since the publication of this report, the SFPUC has implemented a number of projects to increase its capability to support the provision of emergency drinking water during an emergency. These projects include:

- Completion of many WSIP projects and other capital upgrades to improve security, detection, and communication;
- Public Information and materials for home and business;
- Construction of a disinfection and fill station at the existing San Francisco Zoo well, and obtaining a permit to utilize this well as a standby emergency drinking water source;
- Planned construction of six wells under the San Francisco Groundwater Supply Project, two of which will also serve as emergency drinking water supplies, including a distribution system to fill emergency water tankers;
- Purchase and engineering of emergency-related equipment, including water tanker trucks and water distribution manifolds, to help with distribution post-disaster; and
- Coordination of planning with City departments, neighboring jurisdictions, and other public and private partners to maximize resources and supplies for emergency response.

With respect to emergency response for the RWS, the SFPUC has prepared the RWS Emergency Response and Recovery Plan (ERRP), completed in 2003 and last updated in 2006. The purpose of the ERRP is to describe the RWS emergency management organizations, roles and responsibilities within

those organizations, and emergency management procedures. This contingency plan addresses how to respond to and to recover from a major RWS seismic event, or other major disaster. The ERRP complements the other SFPUC emergency operations plans at the department, division, and bureau levels for major system emergencies.

The SFPUC has also prepared the RWS Water Quality Notifications and Communications Plan. This plan, which was first prepared in 1996 and was most recently updated in 2010, provides contact information, procedures, and guidelines to be implemented by several SFPUC divisions, wholesale customers, and BAWSCA. The plan treats water quality issues as potential or actual supply problems, which fall under the emergency response structure of the ERRP.

8.4.3 Power Outage Preparedness and Response

The SFPUC's water transmission system is primarily gravity fed from the Hetch Hetchy Reservoir to the City. Within the in-City distribution system, key pump stations have generators in place and all others have connections in place that would allow portable generators to be used.

Although water conveyance throughout the RWS would not be greatly impacted by power outages because it is gravity fed, the SFPUC has prepared for potential regional power outages as follows:

- The Tesla Treatment Facility, the SVWTP, and the San Antonio Pump Station have back-up power in place in the form of generators or diesel-powered pumps. Additionally, both the SVWTP and San Antonio Pump Station would not be impacted by a failure of the regional power grid because these facilities are powered by hydropower generated by the Hetch Hetchy Water and Power System.

- Both the HTWTP and the Baden Pump Station (part of the Peninsula System) have back-up generators in place.

- Administrative facilities that will act as emergency operation centers also have back-up power.

- The SFPUC has an emergency water supply connection with the SCVWD, the SCVWD intertie, which also has back-up generators in place.

- Additionally, as described in the next section, the WSIP includes projects that expand the SFPUC's ability to remain in operation during power outages and other emergency situations.

8.4.4 Capital Projects for Seismic Reliability and Overall System Reliability

As discussed previously, the SFPUC is also undertaking a WSIP to enhance the ability of the SFPUC water system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply.

As illustrated previously, 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. The WSIP is currently at 90% completion.

In addition to the improvements that 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 interties—the EBMUD-Hayward-SFPUC Intertie, SCVWD Intertie, and South Bay Aquaduct Interties—are described in **Section 7.4.3**.

- A 35 mgd intertie with 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 will provide for standby electrical power at six critical facilities to allow these facilities to remain in operation during power outages and other emergency situations. Permanent engine generators will be provided at four locations (San Pedro Valve Lot, Millbrae Facility, Alameda West, and HTWTP), while hookups for portable engine generators will be provided at two locations (San Antonio Reservoir and Calaveras Reservoir).

8.5 MINIMUM SUPPLY FOR NEXT THREE YEARS

The table below projects retail and wholesale supplies for the next three years, assuming the conditions of years 1, 2, and 3 of a multiple dry year event.

Table 8-6. Minimum Supplies for Next Three Years

[Standardized Table 8-4 Retail: Minimum Supply Next Three Years]

[Standardized Table 8-4 Wholesale: Minimum Supply Next Three Years]

Year	2016	2017	2018
Multiple Dry Years	**Year 1**	**Year 2**	**Year 3**
Retail Supplies[a]	83.4	79.9	79.9
Wholesale Supplies[b]	152.9	129.2	129.2

a Retail supplies are comprised of RWS (up to 81 mgd in dry year 1, and up to 77.5 mgd in dry years 2 and 3 of a multiple dry year event assuming a 2015 base year), groundwater (2.2 mgd), and recycled water (0.2 mgd). Near-term projections for non-potable supplies are not available and would be minimal, and are therefore not included in this table. This row includes supplies to Groveland CSD (approximately 0.5 mgd).

b Wholesale supplies are comprised of RWS only. The corresponding standardized table in **Appendix B** includes supplies to Groveland CSD (approximately 0.5 mgd).

SECTION 9: DEMAND MANAGEMENT MEASURES

This section describes the SFPUC's efforts to promote conservation and to reduce demand on water supply. Several demand management measures (DMMs)—including metering, public education and outreach, and water conservation program coordination—are addressed.

9.1 COMPLIANCE WITH THE CALIFORNIA URBAN WATER CONSERVATION COUNCIL

The SFPUC is a signatory of the California Urban Water Conservation Council (CUWCC). The conservation programs implemented by the SFPUC are based on the 14 Best Management Practices (BMPs) originally identified by signatories of the CUWCC Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) in 1991. Since then, the CUWCC's 14 BMPs have been updated and re-organized into five categories, offering its signatories more flexible options for meeting BMP requirements. Two categories, Utility Operations and Education, are "Foundational BMPs" considered to be essential water conservation activities by any utility and were adopted for implementation by all signatories to the MOU as ongoing practices with no time limits. The remaining BMPs are "Programmatic BMPs" and are organized into Residential; Commercial, Industrial, and Institutional (CII); and Landscape categories. Reporting on these Programmatic BMPs may be voluntary, depending on the compliance option selected by the utility.

The BMPs describe actions and activities that encourage water conservation and are a result of balanced collaboration between urban water agencies, public interest organizations, and private entities.

Under the MOU, the CUWCC was created and charged with responsibilities and authorities, including but not limited to recommending study methodologies for BMPs, collecting and summarizing information on implementation of BMPs, and submitting annual reports to the SWRCB. Signatories of the MOU are required to submit bi-annual reports to the CUWCC outlining progress toward implementing the BMPs. Compliance with the BMP water savings goals can be accomplished in one of three ways, including (1) accomplishing the specific measures listed in each BMP; (2) accomplishing a set of measures which achieves equal or greater water savings; and (3) accomplishing set water savings goals as measured in gallons per capita per day consumption, referred to as GPCD compliance. The SFPUC has used the GPCD compliance option for the last two reporting cycles. In October 2015, the SFPUC submitted its 2013 and 2014 BMP annual reports for both its retail and wholesale service areas to the CUWCC, and has been verified to be in full compliance with the MOU. See **Appendix O** for coverage reports documenting the SFPUC's compliance.

The DMMs identified in the California Urban Water Management Planning Act are included among the Foundational BMPs of the CUWCC. Implementation of each DMM is described in the following sections based on, but not limited to, information reported to the CUWCC.

9.2 RETAIL DMMs

The SFPUC has been implementing conservation programs for over several decades. Through the SFPUC's longstanding, intensive efforts to promote conservation and educate San Franciscans and its retail customers on efficient and appropriate uses of water, San Francisco has had one of the lowest per capita water uses in the State even before the onset of the current drought and despite continuous economic growth. As stated in **Section 4.1**, gross and residential per capita consumption by in-City retail water customers are 77 and 44 GPCD, respectively. Taking suburban retail use into account, gross and residential per capita consumption by all retail water customers are 81 and 44 GPCD, respectively.

9.2.1 Water Waste Prevention Ordinances

9.2.1.1 Past Implementation

Permanent water use restrictions are established in Section E of the SFPUC Rules and Regulations Governing Water Service to Customers. During the 1987-92 drought, the SFPUC enacted numerous water use restrictions and prohibitions in response to the severe water shortage. With the end of the drought in 1993, the SFPUC elected to continue certain restrictions to promote long-term conservation. These restrictions are also included as part of the RWSAP's water waste prohibitions (see **Section 8.3.1** and **Appendix L**).

Violation of any water use restriction may result in the installation of a flow-restricting device in the service line of the customer, and continued violation could result in termination of service. The customer bears the cost of any enforcement action.

Section F of the SFPUC Rules and Regulations Governing Water Service to Customers, which is implemented as part of the City's Water Efficient Irrigation Ordinance, took effect in 2010 and also prohibits water runoff from landscapes of any size due to by low head drainage, overspray, broken irrigation hardware, or other conditions where water flows onto adjacent property, walks, roadways, parking lots, or other structures.

9.2.1.2 Planned Implementation

The SFPUC will continue to implement the above water use restrictions per its Rules and Regulations Governing Water Service to Customers. While the SWRCB continues to evaluate the severity of the current drought and determines whether or not certain emergency regulations, including mandatory water use restrictions, shall become permanent, the SFPUC is prepared to comply with State mandates.

9.2.2 Metering

9.2.2.1 Past Implementation

All in-City retail customers have been metered since 1916, and are billed by volume. All suburban retail customers are also fully metered and are billed by volume. There are approximately 178,000 existing water meters in the City and approximately 220 in the suburban retail service area.

In the spring of 2010, the SFPUC began deployment of the Automated Water Meter Program to upgrade all in-City and suburban retail water meters with wireless advanced metering technology. The SFPUC is the first major water utility in the State to implement a system of this scale. As of the close of FY 2014-15, deployment was nearly complete at 96%. Full deployment is anticipated by December 2018.

The automated water meter reading system enabled the launch of tools to help monitor customer water use and identify potential high or unusual usage: My Account and the Leak Detection Program. My Account, a new bill management system and web portal, was launched in May 2014 and allows customers to view their daily water use data provided by the automated water meter reading system. The SFPUC also launched a Leak Detection Program in April 2015 to notify single family residential customers about potential plumbing leaks that may be occurring at their homes. Hourly water consumption data collected through the automated water meter reading system are analyzed, and if continuous water use is observed, the SFPUC sends a courtesy postcard to notify the customers of a potential leak.

Existing sub-metering requirements are established in the San Francisco Green Building Code and Section F of the SFPUC Rules and Regulations Governing Water Service to Customers. Per the Green Building Code, new non-residential buildings must install a separate sub-meter for each individual building tenant that would consume more than 1,000 gallons per day. For new non-residential buildings over 50,000 square feet, a sub-meter must be installed for each tenant that consumes more than 100 gallons per day. Section F of the SFPUC Rules and Regulations Governing Water Service to Customers, which is implemented as part of the Water Efficient Irrigation Ordinance, requires dedicated irrigation meters for landscape areas greater than 5,000 square feet.

9.2.2.2 Planned Implementation

Replacement of the small number of remaining old meters is anticipated by December 2018. The SFPUC is also planning upgrades to My Account and the Leak Detection Program. In 2016, the Leak Detection Program will be expanded to send alerts via e-mail, text, and phone messages and to potentially include small multi-family residential accounts. The SFPUC is also exploring including hourly data in My Account and issuing high or unusual usage alerts for non-residential customers.

9.2.3 Conservation Pricing

9.2.3.1 Past Implementation

For many years, the SFPUC has used conservation pricing as an incentive to conserve water. To promote the installation of efficient plumbing fixtures, the SFPUC implemented an incentive rate structure for its retail customers. Under the five-year rate schedule for FY 2009-10 through FY 2013-14, water rates for both single family and multi-family residential accounts were set with a two-tier increasing block rate structure, where the Tier 1 threshold was 3 CCF. Non-residential (i.e., commercial) water rates were set with a uniform rate structure. Water rates across all customer sectors were scheduled to increase annually.

The rate schedule was revised in May 2014 for FY 2014-15 through FY 2017-18. Both single family residential and multi-family residential rates were maintained as a two-tier increasing block rate structure. While the Tier 1 threshold for multi-family residential accounts stayed at 3 CCF, the Tier 1 threshold for single family residential accounts was increased from 3 to 4 CCF to more accurately represent average water consumption in the single family residential sector. Non-residential water rates were maintained as a uniform rate structure. Water rates across all customer sectors are scheduled to increase annually.

The rate schedule also addresses violation of water use restrictions. Violations may result in the installation of flow-restricting devices, and continued violation may result in discontinuance of water service. The costs of these actions are borne by the customer. These costs have increased under the latest rate schedule.

The SFPUC's current rate schedule, effective for FY 2014-15 through FY 2017-18, may be accessed at: **www.sfwater.org/modules/showdocument.aspx?documentid=7743**.

9.2.3.2 Planned Implementation

The current rate schedule is in effect through FY 2017-18. The SFPUC conducts an independent rate study every five years to inform the next rate schedule.

9.2.4 Public Education and Outreach

9.2.4.1 Past Implementation

Throughout the year, the SFPUC markets its conservation services and financial incentives through bill inserts and direct mailings, social media, local media and trade publications, and its website. For example, the SFPUC sends letters on an annual basis to the top water users in the single family residential, multi-family residential, and commercial sectors to encourage them to improve efficiency, alert them to the possibility of plumbing leaks, and offer free Water Wise Evaluations. Bill inserts often feature conservation-related articles and water-saving tips.

The SFPUC also participates in numerous community events and presentations that reach residents and businesses, as well as events that target specific audiences and industry trade groups. Water conservation staff, along with education partners, conduct in-class presentations during the school year. Program offerings are aligned with State curriculum standards, and many focus on providing placed-based or outdoor learning opportunities to supplement students' classroom work.

Between 2010 and 2015, over 11,000 top user letters were sent, encouraging customers to reduce use. In the summers of 2014 and 2015, during which mandatory irrigation reductions were in effect, four rounds of letters were sent to approximately 470 irrigation customers. Since launch of the Leak Detection Program in April 2015, approximately 1,200 postcards were sent to single-family residential customers indicating that they have continuous water usage, which may indicate they have a leak. In addition, each customer receives a newsletter with their monthly bill that includes information about conservation, reaching over 170,000 customers each edition. As described in **Section 9.2.2**, the deployment of the Automated Water Meter Program enabled the launch of My Account in May 2014. As of the close of FY 2014-15, over 13,000 customers, or 8% of the retail customer base, have registered for My Account.

For each of the last four years, the SFPUC participated in the USEPA's National Fix-A-Leak week with a local television public service announcement and website to promote plumbing leak awareness and repairs in San Francisco homes. The SFPUC also participated in over 200 local festivals, street fair events, and community presentations over the last five years. The SFPUC has a robust school education program and in the last five years, staff have participated in more than 500 classroom and field trips, reaching thousands of students. The SFPUC also offers a variety of free teacher resources and, in FY 2013-14, sent more than 60,000 multilingual drought awareness fact sheets home to San Francisco Unified School District (SFUSD) families as part of the SFUSD's backpack mail program.

Over the last five years, the SFPUC sponsored the Water Wise and Natural Plant Care demonstration garden in partnership with Garden for the Environment. During this time, the SFPUC also hosted over 50 free workshops at the garden to help San Francisco residents create and maintain beautiful, water-efficient landscapes, and learn about non-potable water supply alternatives, such as graywater and rainwater harvesting.

9.2.4.2 Planned Implementation

The SFPUC's 2015 Retail Water Conservation Plan identifies a number of conservation activities related to public education and outreach that will help the SFPUC continue to meet its conservation goals. The SFPUC anticipates that it will continue to participate in the activities as outlined above, including its school education program and support to the largest water users in each customer sector.

In addition to these continued measures, the SFPUC has also identified a number of new measures for implementation over the next five years. For instance, while the SFPUC currently provides water use updates to customers through its My Account portal for those who sign up and to customers receiving leak alerts, the SFPUC will consider ways to more proactively reach customers who don't participate in these services. The SFPUC may also expand leak alerts through its Leak Detection Program from single-family customers to multi-family buildings and consider high usage alerts for non-residential and larger sites.

9.2.5 Management of System Losses

9.2.5.1 Past Implementation

The SFPUC manages system losses mainly through pressure management. There are currently 24 distinct pressure zones in the system, with the majority being gravity-fed. A hydraulic model is used to monitor both static and residual pressures, with data inputs coming from SCADA, periodic data from eight to 10 system pressure transducers, and data collected by the San Francisco Fire Department during hydrant testing.

The SFPUC also collects and compiles main break data throughout its system. A study was recently completed to analyze main break data from 2011 to 2015 to determine what types of pipes were statistically prone to failure due to natural causes. A geographical hot-spot analysis was also conducted to identify areas in the City that are especially prone to high occurrences of main breaks.

In addition, the SFPUC's Automated Water Meter Program (described previously in **Section 9.2.2**) and Linear Assets Management Program enable improved management of system losses. The Linear Assets Management Program replaces and renews distribution system pipelines and customer service connections for approximately 1,250 miles of drinking water mains in the City. Planning analysis has demonstrated need to increase annual improvement rate from the previous 6 miles per year to an increased rate of 15 miles per year to minimize main breaks and meet customer LOS goals for uninterrupted service. Improvements include replacement, rehabilitation, re-lining, and cathodic protection of all pipe size categories to extend or renew pipeline useful life.

A renew service program renews assets at the end of their useful life between the water main and the customer's service connection. These assets include 1-inch to 8-inch diameter service pipes made of cast iron, galvanized steel, and plastic, to be replaced with copper or ductile iron; broken meter boxes; outdated or undersized meters and associated piping; and subsequent associated sidewalk and roadway restoration. No increase in cost over time is anticipated.

9.2.5.2 Planned Implementation

The SFPUC is in the process of developing an updated proactive leak detection program. A similar program was implemented around 2010, but was halted due to inadequate staffing. The initial focus of the program will be on the hot spot areas identified in the 2011 to 2015 main break study.

9.2.6 Water Conservation Program

9.2.6.1 Past Implementation

The SFPUC Water Conservation Section currently has 13 full-time time staff under the direction of the Water Conservation Section Manager. Conservation staff coordinate implementation of various residential, landscape, and CII conservation programs. The SFPUC's current retail water conservation program consists of an extensive mix of measures, including incentives, services, and educational assistance.

Incentives include rebates for high-efficiency fixtures, free toilets and installations for qualifying customers, discounts for graywater and rainwater systems, grants for large landscape irrigation efficiency improvements, and free efficient devices. Services include conservation surveys, landscape plan review, and school education programs. The SFPUC also provides a host of tools to help customers understand and manage their water use, including the previously mentioned My Account feature, high use alerts, and a bill adjustment program for leak repair.

Between 2011 and 2014, the SFPUC conducted over 29,000 evaluations; issued over 22,000 high-efficiency toilet (HET) rebates, and over 1,000 high-efficiency urinal rebates; and issued over 15,000 rebates for high-efficiency clothes washers.

In-City retail water demand has continued to decline through 2015 despite population growth, due in large part to conservation efforts. In the recently completed Conservation Plan, it was estimated that, between 2005 and 2015, 9.6 mgd of water savings have been achieved through active and passive conservation efforts. In terms of per capita water use, gross per capita water use was 95 gallons GPCD and residential per capita water use was 53 GPCD in 2010. In 2015, these figures dropped to 81 and 44 GPCD, respectively.

9.2.6.2 Planned Implementation

Moving forward, the conservation program will continue to consist of an extensive mix of incentives, services, and tools. Foundational customer assistance measures, including water evaluation surveys, site usage reports and tools, free devices, and public education and outreach will continue to be offered with no definite end date. Fixture incentive measures for toilets, urinals and washers, however, are expected to be phased out by 2020 or earlier because of new legislation and codes, as well as high market saturation rates for toilets, in particular. It is likely that the SFPUC will pursue new measures in the future, but information on these measures is not well enough defined at this time.

The focus of the SFPUC's conservation program over the next five years will be on the greatest water savings opportunities, including:

- Replacing remaining old, inefficient fixtures and equipment, particularly in multi-family dwellings and non-residential facilities;
- Improving the efficiency of irrigation systems and increasing the amount of drought-resistant vegetation in the largest landscaped areas;
- Helping the largest water users in each customers sector understand, monitor, and improve the efficiency of their water use, as feasible; and
- Helping water users across all customer sectors to understand and monitor their water use and to address leaks and water waste in an effort to achieve and maintain efficient water use.

9.2.7 Other DMMs

In addition to the DMMs, the SFPUC also seeks water savings through innovative programs that encourage the use of graywater and rainwater. In 2009, the SFPUC developed and provided a guidance manual for customers on how to design simple graywater systems, and in 2011 launched a laundry-to-landscape pilot program in 2011 for residential customers. In 2015, the SFPUC resumed a rain barrel and

cistern discount program and plans to provide a rainwater harvesting guidance manual. The SFPUC also developed stormwater design guidelines and provided technical assistance on swales, rainwater gardens, stormwater planters, green roofs, and permeable pavement that captures rainwater for irrigation and recharge purposes.

Like many other water utilities, the SFPUC provides free conservation fixtures and devices to San Francisco residents during water audits and for pick up at its customer service center, such as 1.5-gallons-per-minute (gpm) showerheads, 0.5-gpm faucet aerators, garden spray nozzles, and toilet replacement parts (e.g., flappers and fill valves). Conservation device giveaways are a simple and cost-effective way to help customers reduce their water use. From 2010 to 2015, the SFPUC estimated that it distributed over 125,000 water-efficient devices to both residential and commercial customers.

Information about additional retail DMMs implemented by the SFPUC may be found in the CUWCC BMP coverage reports (**Appendix O**). More information about the retail water conservation program is available in the Conservation Plan.

9.3 WHOLESALE DMMs

As described in **Section 5.5**, BAWSCA coordinates water conservation programs and services for its member agencies. Under the terms of the WSA, the SFPUC cannot provide direct financial assistance for conservation programs to a single Wholesale Customer. However, the SFPUC's past and planned implementation of wholesale DMMs, to the extent allowed under the WSA, are described below.

9.3.1 Metering

9.3.1.1 Past Implementation

The SFPUC's wholesale customers are fully metered. About 50 of the oldest meters were replaced in 2015. The remaining meters, approximately 160, were last replaced in the 1990s or 2000s, but are kept accurate through a regular preventative maintenance program. SFPUC staff visit all wholesale meters on a monthly basis to record a billing read, visually inspect the meter, and conduct valve maintenance. The SFPUC is currently in the process of developing a crew to continue a yearly meter calibration program which has been on hold due to intensive WSIP activities in recent years. During 2014-2015, approximately 91% of wholesale meters were outfitted with a wireless transmitter so they are able to transmit hourly water consumption through a cellular endpoint that does not require a fixed network infrastructure. The water consumption is analyzed and recorded in advanced metering software, allowing SFPUC and its wholesale customers to view hourly and daily water consumption rather than waiting for a monthly billing meter read. The software also provides custom alerts for issues in the system or unusual consumption patterns, such as leaks.

9.3.1.2 Planned Implementation

To date, deployment of the wholesale advanced metering system is nearly complete. Nearly all of the remaining 9% of wholesale meters will be installed with cellular endpoints when interfering construction projects are completed. Additionally, SFPUC is currently considering using the advanced metering system for automated billing to eliminate the need for monthly field visits to read each wholesale meter.

9.3.2 Public Education and Outreach

The SFPUC provides technical and administrative assistance for public information and school education to its Wholesale Customers as requested. In 2014 and 2015, the SFPUC prepared a regional drought awareness marketing and media campaign that covered some of Wholesale Customers' service areas. In the past, the SFPUC has provided information packets on the SFPUC water system, such as the two-piece map series of the Hetch Hetchy/Peninsula Water Supply System and San Francisco's Water Distribution System to Wholesale Customers for inclusion in their school education programs. In addition, the SFPUC completed a series of comprehensive water demand and conservation potential studies with its Wholesale Customers in 2004. These conservation studies evaluated the cost-effectiveness of 32 conservation measures and the resulting water savings potential for each individual Wholesale Customers. These studies provided informative and educational data for the Wholesale Customers about water conservation measures and associated water savings.

9.3.3 Water Conservation Program Coordination and Staffing Support

As previously described in **Section 5.5**, BAWSCA manages a Regional Water Conservation Program and represents the interests of the Wholesale Customers. The program is composed of several different conservation measures and is designed to support and augment its member agencies' customer efforts to use water more efficiently.

The SFPUC seeks opportunities to work with BAWSCA and its member agencies and other water agencies, including the SCVWD, to leverage available resources on an ongoing basis. The SFPUC's commitment to regional coordination is evident in many of its conservation programs, such as the Bay Area Clothes Washer Rebate Program, which has been ongoing since 2006. In 2007, the SFPUC, BAWSCA, and five other Bay Area water agencies secured $1 million in grant funding for a regional "Water Saving Hero" public education campaign. This campaign provided a consistent message about water supply conditions and long-term challenges, and informed customers across the region via simple and effective water conservation examples. The integrated advertising and marketing program included regional print, transit and radio ads, marketing materials, and a new website. Throughout the campaign, the SFPUC reduced system-wide water usage by more than 13% compared to historic consumption under similar hydrologic conditions.

Under the terms of the WSA with its Wholesale Customers, the SFPUC cannot provide direct financial assistance for conservation programs to an individual Wholesale Customer and add this expense to the wholesale revenue requirement for that year. The SFPUC can provide staff to assist Wholesale Customer conservation efforts and, through agreement with BAWSCA, can develop service area-wide conservation programs that can be funded as a joint expense by its retail customers and Wholesale Customers.

9.3.4 Asset Management

The SFPUC initiated a Pipeline Inspection Program in the early 1990s for the 350 miles of water transmission lines in the RWS. Routine inspections are considered preventive maintenance measures, but they also provide information on pipeline leaks. These inspections are usually conducted year-round with no more than one section of a major pipeline out of service at any time. The Pipeline Inspection Program covers the entire water transmission system over a 20-year period and then repeats. The SFPUC has a goal to inspect one section per quarter (four inspections per year), with each section averaging 4 to 6 miles. Technically, the RWS does not have any distribution system components, only transmission system

components. In addition to inspections, SFPUC staff also regularly compare production volumes with customer consumption to help identify the leakage rate.

9.3.4.1 Past Implementation

The major focus of asset management for the wholesale system in the past decade has been the WSIP. To date, the program is at approximately 90% completion. From 2011 to 2015, system improvements ranged from treatment plant expansions, pipeline repair and readiness improvements, to pipeline rehabilitation and new installations. Major pipeline work that was completed in 2011-2015 included replacement of Crystal Springs Pipeline No. 2, and installation of San Andreas Pipeline No. 3 and the Irvington Tunnel. The large pipeline work has increased system capacity which allows for greater flexibility in taking certain pipes offline for longer periods of time to do thorough inspections or other maintenance.

9.3.4.2 Planned Implementation

During implementation of the WSIP, about half of the wholesale system transmission pipelines were replaced. The SFPUC's primary focus for 2016 is on warranty inspections of the newly-installed pipelines to determine if any follow-up work is required before a new installation warranty period is complete. The other half of transmission lines that were not replaced under the WSIP are subject to a prioritization program based on material type and age. The program is informed by ongoing inspections to determine when pipelines need to be replaced. SFPUC staff meet weekly to carefully coordinate and prioritize system maintenance, inspections, and replacements.

9.3.5 Assistance to Wholesale Customers

As previously stated, under the terms of the WSA with its Wholesale Customers, the SFPUC cannot provide direct financial assistance for conservation programs to an individual Wholesale Customer and subsequently adds this expense to the wholesale revenue requirement for that year. The SFPUC can provide staff to assist Wholesale Customer conservation efforts and, through agreement with BAWSCA, can develop service area-wide conservation programs that can be funded as a joint expense by its retail customers and Wholesale Customers. Refer to **Section 9.3.2** for information on the SFPUC's collaborative efforts with BAWSCA on public education and outreach efforts.

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SECTION 10: PLAN ADOPTION AND UWMP CHECKLIST

This section describes the adoption, submittal, and implementation of this 2015 UWMP. A checklist is also provided to facilitate DWR's review of the 2015 UWMP.

10.1 PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

The SFPUC prepared this 2015 UWMP update and presented it to the SFPUC Commission for adoption on June 14, 2016. A copy of the SFPUC resolution adopting this 2015 UWMP update is provided in **Appendix P**.

Within 30 days of SFPUC Commission approval, the adopted 2015 UWMP will be submitted electronically to the DWR via its Water Use Efficiency data online submittal tool (WUEdata). Electronic copies will also be provided on compact disc to the California State Library and via e-mail to cities and counties within which the SFPUC provides water. In addition, the SFPUC will make this adopted 2015 UWMP available for public review during normal business hours by placing a copy at the San Francisco Main Public Library and main offices of the SFPUC, as well as by posting an electronic copy on the SFPUC web site at **www.sfwater.org**. The SFPUC will implement this adopted 2015 UWMP in accordance with the California Urban Water Management Planning Act. More information about adoption and submittal activities is provided in **Appendix C**.

Following adoption, the SFPUC will continue to implement water supply planning programs and projects identified in this 2015 UWMP, including those related to conservation, groundwater, and recycled water. Many of these projects are reflected in the WSIP adopted in 2008, which details project implementation schedules and budgets. The WSIP is described in **Section 6.1.2**.

10.2 UWMP CHECKLIST

The following checklist is provided to facilitate DWR's review of the completeness of this document, and is organized by subject matter. In addition, complete sets of standardized tables and SB X7-7 Verification Form tables prescribed by DWR are provided in **Appendices B** and **D**, respectively.

Table 10-1. UWMP Checklist

California Water Code Section	UWMP Requirement	UWMP Location	
		Retail	Wholesale
Plan Preparation			
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.	Section 10.1	Section 10.1
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.	Section 2.3.1 and Appendix C	Section 2.3.1 and Appendix C
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.	Appendix C	Appendix C
System Description			
10631(a)	Describe the water supplier service area.	Section 3.2	Section 3.3
10631(a)	Describe the climate of the service area of the supplier.	Section 3.2.1	Section 3.3.1
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	Table 3-3	Table 3-4
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	Section 3.2.2	Section 3.3.2
System Description and Baselines and Targets			
10631(a)	Indicate the current population of the service area.	Table 3-3 and Table 5-1	Table 3-4
System Water Use			
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	Section 4.1	Section 4.2
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	Section 4.1.3	Section 4.2.3
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	Section 4.1.4	Not applicable
Baselines and Targets			
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Section 5.2	Not applicable
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.	Section 5.1 and Appendix D	Not applicable

California Water Code Section	UWMP Requirement	UWMP Location	
		Retail	Wholesale
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 is the suppliers base GPCD is at or below 100.	Section 5.3	Not applicable
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Section 5.4	Not applicable
1608.24(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.	Not applicable	Not applicable
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions	Not applicable	Section 5.5
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Appendix D	Not applicable
System Supplies			
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	Table 6-3 and Table 6-7	Table 6-3
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	Section 6.2.1.1	Not applicable
10631(b)(1)	Indicate whether a 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.	Section 6.2.1.1	Not applicable
10631(b)(2)	Describe the groundwater basin.	Sections 6.2.1.1 and 6.2.3.1	Not applicable
10631(b)(2)	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.	Section 6.2.1.1	Not applicable
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	Section 6.2.1.1	Not applicable
10631(b)(3)	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.	Section 6.2.1.1 and Table 6-4	Not applicable
10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	Section 6.2.2.1 and Table 6-7	Not applicable
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long- term basis.	Sections 7.2.6 and 7.4.3	Sections 7.2.6 and 7.4.3

Table 10-1 (continued)

California Water Code Section	UWMP Requirement	UWMP Location	
		Retail	Wholesale
10631(g)	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 multiple-dry years.	Sections 6.2.2 and 7.2	Sections 6.1.4 and 7.2
10631(i)	Describe desalinated water project opportunities for long-term supply.	Section 7.4.2	Section 7.4.1
10631(j)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) – if any – with water use projections from that source.	Not applicable	Not applicable
10631(j)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	Not applicable	Appendix C
System Supplies (Recycled Water)			
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	Section 6.2.1.3	Not applicable
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	Section 6.2.1.3 and Table 6-6	Not applicable
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.	Table 6-6	Not applicable
10633(c)	Describe the recycled water currently being used in the supplier's service area.	Section 6.2.1.2	Not applicable
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	Section 6.2.2 and Table 6-7	Not applicable
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.	Table 6-7 and Table 6-5	Not applicable
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.	Section 6.2.2.5	Not applicable
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	Section 6.2.2.5	Not applicable

California Water Code Section	UWMP Requirement	UWMP Location	
		Retail	Wholesale
Water Supply Reliability Assessment			
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Section 6.2.2	Section 6.1.4
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Sections 7.1 and 6.2.4	Sections 7.1 and 6.1.6
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Table 7-1 and Table 8-2	Table 7-1 and Table 8-5
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source	Section 7.1	Section 7.1
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	Sections 6.1.5 and 6.2.3	Section 6.1.5
10635(a)	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Table 8-2	Table 7-5
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Table 8-1, Section 8.3.1, and Appendix L	Table 8-1, Section 8.3.2, and Appendix N
Water Shortage Contingency Planning			
10632(a)(2)	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency.	Table 8-6	Table 8-6
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Section 8.4	Section 8.4
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Table 8-4	Not applicable
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Section 8.3.1.4 and Appendix L	Section 8.3.2 and Appendix N
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Sections 8.3.1.3 and 8.3.1.4	Appendix N
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Section 8.3.4	Section 8.3.4
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Appendix M	Appendix M

Table 10-1 (continued)

California Water Code Section	UWMP Requirement	UWMP Location	
		Retail	Wholesale
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Section 8.3.3	Section 8.3.3
Demand Management Measures			
10631(f)(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.	Section 9.2	Not applicable
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Not applicable	Section 9.3
10631(j)	CUWCC members may submit their 2013- 2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Appendix O	Appendix O
Plan Adoption, Submittal, and Implementation			
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Section 10.1 and Appendix C	Not applicable
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.	Section 10.1 and Appendix C	Section 10.1 and Appendix C
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Section 10.1 and Appendix C	Section 10.1 and Appendix C
10635(b)	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 60 days after the submission of the plan to DWR.	Section 10.1 and Appendix C	Section 10.1 and Appendix C
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan.	Section 10.1 and Appendix C	Section 10.1 and Appendix C
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.	Section 10.1 and Appendix C	Section 10.1 and Appendix C
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Section 10.1 and Appendix C	Section 10.1 and Appendix C
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Section 10.1 and Appendix C	Section 10.1 and Appendix C

California Water Code Section	UWMP Requirement	UWMP Location	
		Retail	Wholesale
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.	Section 10.1 and Appendix C	Section 10.1 and Appendix C
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Section 10.1 and Appendix C	Section 10.1 and Appendix C
10645	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.	Section 10.1 and Appendix C	Section 10.1 and Appendix C

2015 URBAN WATER MANAGEMENT PLAN

for the City and County of San Francisco

Prepared by: The San Francisco Public Utilities Commission

June 2016

San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission