SAN FRANCISCO PUBLIC UTILITIES COMMISSION

DRAFT ALTERNATIVE WATER SUPPLY PLAN

JUNE 2023

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

CONTENTS

TABLES

FIGURES

ACRONYMS & ABBREVIATIONS

$ mil	Dollars in millions
$/AF	Dollars per acre-foot
1984 Agreement	1984 Settlement Agreement and Master Water Sales Contract
AACE	Association for the Advancement of Cost Engineering
ACWD	Alameda County Water District
ACRP	Alameda Creek Recapture Project
AFY	Acre-foot per year
AWS	Alternative Water Supply
AWTF	Advanced Water Treatment Facility
AWS Plan or Plan	Alternative Water Supply Plan
AWS Projects	Alternative Water Supply Projects
BAWSCA	Bay Area Water Supply and Conservation Agency
Bay-Delta Plan Amendment	2018 Amendment to the Water Quality Control Plan for San Francisco Bay/Sacramento-San Joaquin Delta Estuary
BDPLs	Bay Division Pipelines
Cal Water	California Water Service Company
CCWD	Contra Costa Water District
CDD	City Distribution Division
CEQA	California Environmental Quality Act
CIP	Capital Improvement Plan
Coastside CWD	Coastside County Water District
DPR	Direct potable reuse
DWR	California Department of Water Resources
EBMUD	East Bay Municipal Utility District

FERC	Federal Energy Regulatory Commission
FY	Fiscal year
gpcd	Gallons per capita per day
gpm	Gallons per minute
HHWP	Hetch Hetchy Water and Power
IPR	Indirect potable reuse
ISG	Individual Supply Guarantee
ISL	Interim Supply Limitation
JPA	Joint Powers Authority
LOS	Level of Service
LTVA	Long-term Vulnerability Assessment
LVE	Los Vaqueros Expansion Project
mgd	million gallons per day
NEPA	National Environmental Policy Act
NGO	Non-governmental organizations
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PEIR	Programmatic Environmental Impact Report
RGSR	Regional Groundwater Storage and Recovery
RWS	Regional Water System
San Francisco	City and County of San Francisco
SBA	South Bay Aqueduct
SFPUC	San Francisco Public Utilities Commission
SPRP	San Francisco-Peninsula Regional PureWater Project

continued on next page

ACRONYMS & ABBREVIATIONS

State	State of California
SVCW	Silicon Valley Clean Water
SWP	State Water Project
SWRCB	State Water Resources Control Board
The Peninsula	San Francisco Peninsula
USBR	United States Bureau of Reclamation
USD	Union Sanitary District
UWMP	Urban Water Management Plan
Westside Project	Westside Enhanced Water Recycling Project
WQD	Water Quality Division
WSA	Water Supply Agreement
WSIP	Water System Improvement Program
WSTD	Water Supply and Treatment Division
WTP	Water treatment plant
WWTP	Wastewater treatment plant

Blue text within this document indicates key terms that are defined in the glossary. They are not highlighted every time they appear, or necessarily even the first time they appear, rather only when it serves to emphasize a main theme of the section.

Information and assumptions contained in this document are based on the latest available data as of May 2023. As information changes, the document will be periodically updated.

Executive Summary

The San Francisco Public Utilities Commission (SFPUC) is the third largest municipal utility in California, providing drinking water for more than 2.7 million residents and businesses within San Francisco and three other Bay Area counties by way of the San Francisco Regional Water System (RWS). The RWS draws approximately 85% of its water from Hetch Hetchy Reservoir in the Sierra Nevada's Tuolumne River watershed and the remaining 15% of its water supply from local surface waters in the Alameda and Peninsula watersheds.

RWS supplies serve both retail and wholesale customers. These include retail customers located within the City of San Francisco (in-City retail customers), retail customers located outside San Francisco (suburban retail customers), and 27 wholesale customers located in Alameda, Santa Clara, and San Mateo counties. Of the wholesale customers, 26 are represented by the Bay Area Water Supply and Conservation Agency (BAWSCA).

Crystal Springs Reservoir, 2019

While the SFPUC serves as both a wholesale and retail water supplier, the SFPUC is undertaking the development of the Alternative Water Supply Program (AWS Program) with a regional focus as the operator and steward of the RWS responsible for delivering reliable supplies to customers throughout its service area.

The SFPUC is undertaking the Water Supply Program for two main reasons.

First, the SFPUC faces potential future reductions to its existing water supply that could require the development of new supplemental sources to improve long-term water supply reliability. Climate change and future regulatory uncertainties could exacerbate the need for new diversified and distributed supply sources.

Second, the SFPUC Commission faces a policy decision by December 31, 2028 of whether or not to make the cities of San Jose and Santa Clara permanent customers of the SFPUC; these two cities have held temporary, interruptible status with the SFPUC since the 1970s. By identifying a supply source(s) to address San Jose and Santa Clara's demands, the AWS Program can help provide relevant information to the SFPUC Commission to make this decision.

This AWS Plan is intended to guide decision-making and provide recommendations on project implementation and areas for future analysis.

The AWS Plan includes:

- Identification of the anticipated water supply gap through the 2045 planning horizon
- Description of ongoing efforts to reduce demands and optimize RWS supply availability
- Description of AWS Projects that can augment RWS supply and address the future water supply gap
- Recommendations that will further advance the AWS Program

Addressing the Water Supply Gap

The SFPUC's water supply planning reflected in the AWS Program is based on anticipated supplies compared to obligations and projected demands in 2045. By comparing factors both on the supply side, which affect future water availability, and on the demand side, which consider obligations and future demands, the SFPUC can identify and address a potential water supply shortfall or water supply gap. **The AWS Program identifies a future water supply gap in dry years, both to meet existing and potential obligations to its customers, and to meet future customer demands.**

Water Availability – (Obligations / 2045 Customer Demands) = Future Water Supply Gap

The most pronounced driver affecting water availability is the potential implementation of the 2018 Amendment to the State Water Resources Control Board's San Francisco Bay/Sacramento-San Joaquin Delta Estuary Water Quality Control Plan (Bay-Delta Plan Amendment). **The Bay-Delta Plan Amendment, if implemented as adopted in 2018, would result in new instream flow requirements that would reduce projected water availability from the RWS in dry years from 257 mgd to 152 mgd.** This reduction in water availability would result in a significant water supply gap in dry years. However, the requirements of the Bay-Delta Plan Amendment are still under review as part of a Proposed Voluntary Agreement and may change as a result of on-going negotiations between the SFPUC and the State. The results of these negotiations will impact water availability, which will in turn impact future water supply gap estimates.

For this AWS Plan, the future water supply gap is characterized as a range of 92 mgd to meet 2045 customer demands to 122 mgd to meet obligations. Based on the SFPUC's adopted rationing policy, rationing could contribute to filling approximately 12% of the water supply gap. The remaining gap would need to be addressed through the development of new regional alternative water supply projects (AWS Projects).

Water Availability through the RWS[a]

152 mgd
(assumes implementation of the Bay-Delta Plan Amendment)

Total Existing and Potential Obligations	Total 2045 Demands on the RWS
265 mgd (existing Retail and Wholesale) **+ 9 mgd** (San Jose and Santa Clara)	**244 mgd** (including Retail, Wholesale, San Jose and Santa Clara)
Water Supply Gap[b]	**Water Supply Gap[b]**
-122 mgd (to meet obligations)	**-92 mgd** (to meet 2045 demands)

a Represents the total system yield. The total system yield is the sum of the firm yield of the RWS plus rationing (134 mgd firm yield and 18 mgd of demands addressed by implementing the rationing policy [see Chapter 2 for additional detail]).

b The water supply gap estimates: 1) the total difference between water availability and obligations and 2) the difference between water availability and customer demands on the RWS in 2045.

Project and Programmatic Recommendations

To avoid overbuilding new water supply projects, the approach reflected in the AWS Program is to *Plan for Obligations and Build for Demands*. This approach recognizes the importance of developing water supplies to meet obligations while prioritizing investments that focus on the most imminent need of meeting customer demands. Furthermore, the AWS Program outlines a dynamic planning process that is adaptive to changing conditions and challenges. As water availability and demand projections continue to be updated, the approach requires that the projected gap and AWS Plan be revisited periodically as changes occur, thereby enabling the AWS Plan to move forward in a stepwise manner. This allows recommendations to be phased in order to balance forward action and progress of project development, while minimizing the risk of overcommitting financial resources.

The goal of the AWS Program is to identify water supply projects that increase the dry-year reliability of RWS supplies and address the long-term water supply gap in alignment with the Level of Service Goals and Objectives.

As summarized in the table below, **this AWS Plan describes the six AWS Projects that are currently being planned and evaluated to address the water supply gap**: one recycled water project that offsets groundwater pumping, three regional purified water projects, and two storage expansion projects with associated conveyance alternatives and supply, as needed. **Based on current planning estimates, these projects can augment supplies of 22 mgd to 48 mgd in future dry years.** Each of the projects are at different stages of planning and design, and their need for funding and commitment for implementation will be staggered. The dry-year supply benefit they can provide for the SFPUC may also continue to change. Measured project-specific recommendations can help advance the AWS Projects so they can continue being planned while limiting financial and operational risks of overbuilding or overcommitting financial resources.

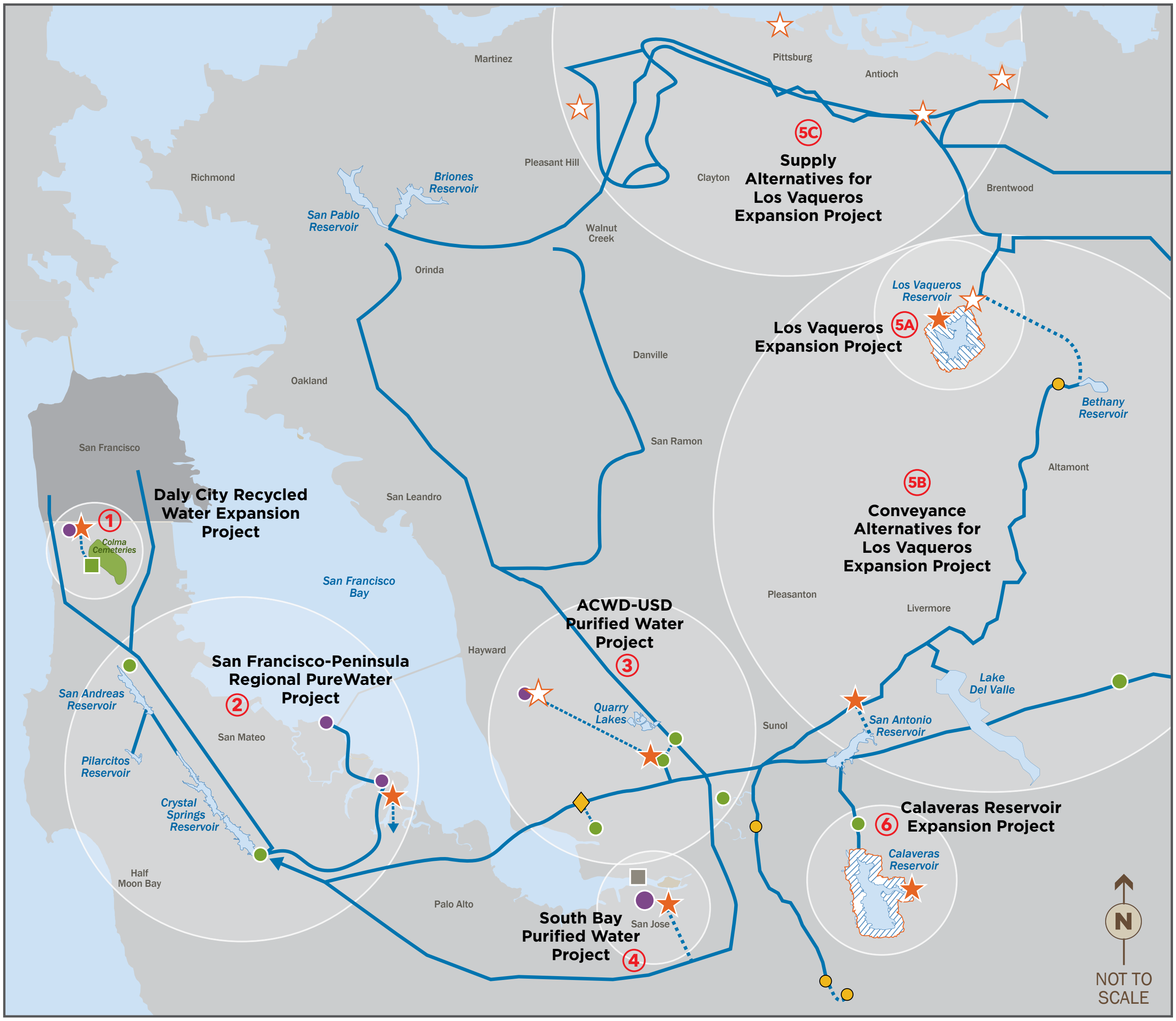

San Antonio Reservoir, 2008

Alternative Water Supply Projects

Project	Project Type	Project Status	Earliest Online Date
1. Daly City Recycled Water Expansion	Recycled Water/ Groundwater	Design	2030
2. San Francisco-Peninsula Regional PureWater	Purified Water (Potable Reuse)	Planning	2039
3. ACWD-USD Purified Water	Purified Water (Potable Reuse)	Planning	2039
4. South Bay Purified Water	Purified Water (Potable Reuse)	Planning	2039
5A. Los Vaqueros Expansion (LVE)	Storage	Planning	2030
5B. Conveyance Alternatives for LVE	Conveyance	Design	2030
5C. Supply Alternatives for LVE	Transfers and/or Alternative Supply	Planning	2030 (for transfers) to 2040 (for alternative supplies)
6. Calaveras Reservoir Expansion	Storage (with conveyance)	Planning	2035 to 2039*

* Online date and supply depend on which of the Calaveras Dam raise options is selected, the range shown represents the smallest and largest dam raise options

<table>
<tr><th>Regional Supply Assumed</th><th>AWS Plan Recommendations</th></tr>
<tr><td>0.7 mgd</td><td>Pursue completion of final design and construction
Work with Capital Planning and Finance to include this as a project proposal for up to $104M in capital costs and $12M in operating costs in the FY 2025-2034 Capital Improvement Plan (CIP) development process</td></tr>
<tr><td>6 mgd</td><td>Continue planning through environmental review and 30% design
This project has funding to support continued planning efforts</td></tr>
<tr><td>5.4 mgd</td><td>Continue planning through environmental review and 30% design
Work with Capital Planning and Finance teams to propose up to $3M for planning, environmental review, and 30% design in the FY 2025-2034 CIP development process</td></tr>
<tr><td>3.5 mgd</td><td>Include as a new project in the FY 2025-2034 CIP; work with Capital Planning and Finance teams to propose up to $10 million develop this project through environmental review and 30% design</td></tr>
<tr><td>3.9 mgd</td><td rowspan="3">Develop water supply strategy for LVE Supply Options
Based on supply strategy, AWS staff will recommend whether to approve participation in the LVE the project by early 2024
Funding of $31M in capital and $36M in operating costs would be needed in the FY 2025-2034 CIP
AWS staff should work with Capital Planning and Finance teams to include this as a project proposal in the FY 2025-2034 CIP development process</td></tr>
<tr><td>--</td></tr>
<tr><td>--</td></tr>
<tr><td>2.7 – 28.6 mgd*</td><td>Continue planning through environmental review and 30% design
Work with Capital Planning and Finance teams to propose up to $7.6M for planning, environmental review, and 30% design in the FY 2025-2034 CIP development process</td></tr>
</table>



LEGEND *All locations and sizes shown are approximate and represent the general vicinity for potential facilities. Shaded circles serve to indicate project facilities associated with each project; they do not indicate project size or volume of water produced.*

- Existing Pipeline
- Potential/Proposed Pipeline
- Potential/Proposed Project Facility
- Alternate Potential/Proposed Project Facility
- Water Treatment
- Water Storage
- Potential New Outfall
- Wastewater Treatment
- Intertie
- Turnout

1. **Daly City Recycled Water Expansion Project**
2. **San Francisco-Peninsula Regional PureWater Project**
3. **ACWD-USD Purified Water Project**
4. **South Bay Purified Water Project**

5A **Los Vaqueros Expansion Project**

5B **Conveyance Alternatives for Los Vaqueros Expansion Project**

5C **Supply Alternatives for Los Vaqueros Expansion Project**

6 **Calaveras Reservoir Expansion Project**

AWS Planning Challenges and Areas of Future Focus

Many of the planning challenges with developing new and alternative water supplies are different from those faced for traditional water supply planning at the SFPUC. From introducing new supply sources to treating purified recycled water under a new regulatory regime for drinking water—and addressing the institutional considerations associated with the partnerships central to many of the projects—the AWS Projects will require new approaches for implementation and operation. With projects largely still in the early stages of planning, costs will also be further developed and affordability for SFPUC customers will be a key issue to address. As such, **the AWS Plan also includes programmatic recommendations in the following key areas: operations planning, purified water planning, and financing and affordability.** Programmatic recommendations are specific to the current phase of program development, and additional programmatic recommendations will likely be identified in the future as planning progresses.


Turner Dam Condition Assessment, 2022

While the recommendations included in this AWS Plan are intended to address the water supply gap that the SFPUC faces, several have financial implications for the SFPUC and cannot be evaluated without the full context of all other capital investment and financial sustainability priorities of the SFPUC. Therefore, for any new funding associated with recommendations contained in the AWS Plan, project management staff will work with Capital Planning and Finance teams to include specific recommendations as project proposals in the FY 2025-2034 Capital Improvement Plan (CIP) development process. Each proposal will be evaluated by staff considering broader priorities and may be included in the CIP as a staff recommendation when the CIP is presented to the Commission for adoption in February 2024.

Lake Eleanor, 2011

Chapter 1: Introduction

The San Francisco Public Utilities Commission (SFPUC), a department of the City and County of San Francisco (San Francisco), is the third largest municipal utility in California, providing drinking water for more than 2.7 million residents and businesses within San Francisco and three other Bay Area counties by way of the San Francisco **Regional Water System (RWS)**. The RWS draws approximately 85% of its water from **Hetch Hetchy Reservoir** in the Sierra Nevada's **Tuolumne River watershed**, which it delivers 167 miles by gravity through an aqueduct system to Bay Area reservoirs to serve SFPUC customers. The RWS draws the remaining 15% of its water supply from local surface waters in the **Alameda and Peninsula watersheds**. In addition to enabling the SFPUC to manage deliveries during normal water years, the RWS's network of reservoirs allow the SFPUC to store water during wet years for use during dry periods This storage-based approach is integral to the operation and reliability of the RWS.

SFPUC MISSION

The SFPUC's mission is to provide our customers with high quality, efficient and reliable water, power, and sewer services in a manner that is inclusive of environmental and community interests, and that sustains the resources entrusted to our care.

RWS supplies serve both SFPUC retail and wholesale customers throughout the Bay Area. The SFPUC provides water to 27 wholesale customers in Alameda, Santa Clara, and San Mateo counties. Together, these customers comprise approximately two-thirds of RWS demand. Retail customers, who are located primarily in San Francisco, but also include a small number of customers outside of San Francisco, make up the remaining one-third of demand on the RWS.

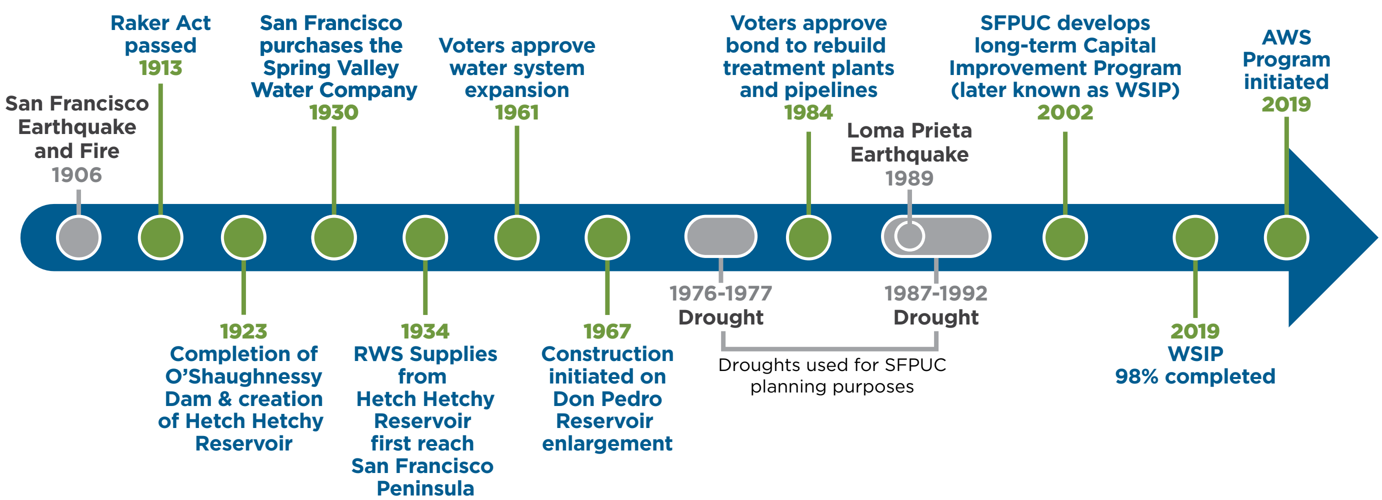
The SFPUC's **Alternative Water Supply Program (AWS Program)** is the focus of this Alternative Water Supply Plan (AWS Plan or Plan) and supports the SFPUC's mission. Specifically, the AWS Program enhances the SFPUC's ability to reliably meet customers' future water supply demands in a manner that is consistent with its **legal and contractual obligations** and **Level of Service (LOS) Goals and Objectives**, as well as environmental and regulatory requirements.

This chapter introduces the AWS Program and Plan in the larger context of the SFPUC's water supply planning history.

1.1 Planning History

San Francisco's water system developed over time from local streams and groundwater wells within its borders during its earliest days to today's complex system of dams, reservoirs, tunnels, and pipelines. This system brings water from the Sierra Nevada by gravity across California together with supplies from Bay Area watersheds and groundwater sources. Many extraordinary events and milestones have shaped the RWS, and thanks to its original planners' exceptional foresight, the SFPUC is able to provide today's Bay Area with high quality drinking water supplies and fulfill its role as a regional water purveyor as the RWS's designers intended. The SFPUC has a long history of water supply planning and providing water for the Bay Area through the RWS (Figure 1-1).

Figure 1-1: SFPUC's History of Water Supply Planning




Pulgas Water Temple, 1934

San Francisco's need for reliable public water supplies became very apparent after the devastation of the San Francisco Earthquake and Fire of 1906. The creation of the SFPUC by 1932 City Charter followed San Francisco's purchase of the Spring Valley Water Company for $39.96 million in 1930. The Spring Valley Water Company's system included over 40,000 acres of watershed lands on the San Francisco Peninsula and in the Alameda Creek watershed, as well as Pilarcitos, San Andreas, Lower Crystal Springs, and Calaveras dams and reservoirs. Congressional approval of the Raker Act in 1913 (38 Stat. 242) allowed San Francisco to construct Hetch Hetchy

Reservoir and related infrastructure on National Park and Forest lands between 1914 and the early 1930s. Construction of the RWS facilities during this period required hydraulic engineering across more than 160 miles of mountain wilderness, San Joaquin Valley farmlands, and the Coast Range. San Francisco developed new technologies and construction techniques, mastered impassable terrain, and overcame financial challenges to complete the monumental RWS. Supplies from Hetch Hetchy Reservoir first reached the **San Francisco Peninsula (the Peninsula)** in 1934, representing the culmination of an investment by the people of San Francisco of more than $100 million.

Throughout the mid-1900s, the SFPUC and its ratepayers made critical and strategic investments in the RWS so it could continue to provide reliable water service to its Bay Area customers. In 1961, voters approved general obligation bonds for the construction of **San Antonio Reservoir**, Bay Division Pipeline No. 4, and San Francisco's share of the **Don Pedro Reservoir** and other projects to keep pace with the growing water demands of its Bay Area customers. The SFPUC's $45 million investment in the Don Pedro Reservoir, owned and operated by the Modesto and Turlock Irrigation Districts, enabled San Francisco to utilize 570,000 acre-feet of additional water storage in lieu of building numerous smaller mountain reservoirs. This storage, which is key to the SFPUC's storage-based system, allows the SFPUC to pre-pay the water the SFPUC owes the Districts under the Raker Act. The **water bank** also allows the SFPUC to divert, deliver, and/or store Tuolumne River water during times it would have had to bypass those flows to meet its obligations to the Districts.

Don Pedro Filling Ceremony, 1970

In addition to keeping pace with the Bay Area's growing population, the SFPUC and its ratepayers have invested in the RWS's emergency and disaster preparedness. Emergencies and disasters are a reality in California, and the 1970s and 1980s brought both prolonged drought and a major seismic event. In 1976 and 1977, the Bay Area experienced two extremely dry years, which compelled the SFPUC to impose mandatory rationing of water supplies. One decade later, 1987 marked the first year of a prolonged, six-year drought that lasted through 1992, stressed the RWS's ability to deliver reliable water supplies, and again necessitated mandatory customer rationing of water supplies. In 1984, voters approved a $104 million bond measure to upgrade water treatment plants and pipelines. In 1992, the SFPUC expanded water treatment capacity on the Peninsula with an additional investment of $55 million.


Loma Prieta Earthquake Damage, 1989

On October 17, 1989, the Loma Prieta Earthquake struck. Centered in Santa Cruz County about 60 miles south-southeast of San Francisco on the San Andreas Fault, the magnitude 6.9 earthquake gave San Francisco a major jolt and a field test of the water system's structural integrity and reliability under severe seismic strain. Although water mains in the Marina District failed, and there were pockets of low pressure in certain areas of San Francisco caused by power failure, 97% of customers in San Francisco had no loss of water supply. On the Peninsula, the RWS dams and transmission lines were unaffected.

Following the Loma Prieta Earthquake, the SFPUC began taking steps to further upgrade its water infrastructure, build new facilities with operational flexibility, and create interconnections with neighboring water systems to provide needed water supplies in an emergency. In 2002, Assembly Bill 1823, the Wholesale Regional Water System Security and Reliability Act, required the SFPUC to complete a capital improvement program to improve the reliability of the RWS. In response to the legislation, the SFPUC developed an ambitious long-term capital improvement program that became the **Water System Improvement Program (WSIP)**, along with strategic business and financial plans for its implementation. Through WSIP, the SFPUC has significantly upgraded its regional and local water systems to protect its ability to reliably provide water to its customers. The WSIP regional projects were over 98% complete as of 2019, when the SFPUC established the AWS Program, and is continuing to progress toward 100% completion. WSIP's total cost is estimated to be $4.8 billion.

As demonstrated through this history, the SFPUC places a high priority on maintaining reliable delivery systems and disaster preparedness while adapting to changing needs through investments in RWS infrastructure. Looking ahead, the SFPUC is focusing its planning efforts to address both existing and emerging challenges, which will be particularly evident during dry years, including potential loss of water supply availability due to proposed environmental flow requirements and regulatory changes; changes in customer demand; the impacts of droughts, wildfires, earthquakes, and other emergencies; and additional uncertainties related to climate change. The SFPUC faces an urgent and pressing need to address these water supply planning challenges, which are discussed in greater detail in the following section and later chapters of this Plan.

In 2019, the SFPUC established the AWS Program to evaluate new and diverse water supply options to improve the RWS's ability to reliably meet demands through 2045. Implementing the AWS Program is a critical next step in the SFPUC's water supply planning. The SFPUC assembled a new AWS planning team to develop the AWS Program, evaluate drivers that impact future water supply uncertainty, and make recommendations on how the SFPUC can position itself to be prepared to proactively address challenges expected to impact the RWS.

Construction of Irvington Tunnel as part of WSIP, 2011

1.2 Water Supply Planning Challenges

Providing high quality and reliable water supplies for Bay Area residents and businesses is critical to the economic vitality, health and safety, and social well-being of the region. For nearly a century, the SFPUC has served a growing Bay Area population primarily with surface water sourced from the upper portions of the Tuolumne River watershed combined with water collected in local Bay Area watersheds. Sustained stewardship of the environment from which RWS supplies are drawn is vital to the work of the SFPUC and a part of its mission. RWS supplies are increasingly vulnerable as the frequency and severity of droughts due to climate change reduces the amount of water available.

Water supply management in California is adapting to drier conditions in a changing climate. **Instream flow requirements**, for example, may increase in order to protect river ecosystems and other environmental resources, which would have a more significant impact on drinking water supplies during dry years when surface water supplies are naturally more limited. Storage-based water systems like the RWS can enhance dry-year reliability by leveraging **carryover storage** from wet and normal years for use during dry years. In the California Water Supply Strategy released by the Governor in August 2022, storage is identified as a key focus area for climate change adaptation.

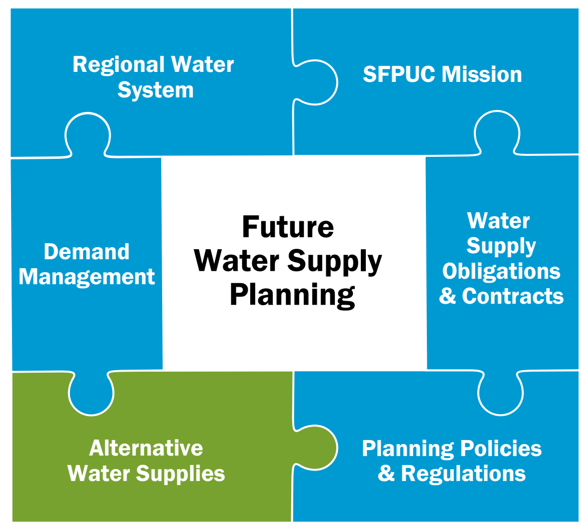
The implementation of the 2018 Amendment to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (referred to as the **Bay-Delta Plan Amendment**) by the State Water Resources Control Board (SWRCB) could have a pronounced impact on future RWS dry-year water supply availability. The SFPUC and the Modesto and Turlock Irrigation Districts are involved in ongoing negotiations with the State on a Proposed Voluntary Agreement for the Tuolumne River that would implement the Bay-Delta Plan Amendment for an 8- to 15-year period.

The results of these negotiations, and the ecological response to changes in the river flow regime over the term of the ultimate agreement, will determine the impact of the Bay-Delta Plan Amendment on the SFPUC's future water supply. Based on current RWS supply and demand projections, if the Bay-Delta Plan Amendment is implemented as it was adopted in 2018, the SFPUC could immediately experience a water supply shortfall for meeting customer demands in dry years. As a result, while the AWS Plan uses a **planning horizon** of year 2045, impacts to water supply could occur much sooner, creating an urgency to find new sources of dry-year supply to address the projected gap between supply and demand.

THE BAY-DELTA PLAN

The Bay-Delta Plan establishes water quality objectives for which the State Water Resources Control Board may assign a measure of responsibility to upstream water rights holders to protect the beneficial uses of the San Francisco Bay/Sacramento-San Joaquin River Delta Estuary tributary watersheds.

Figure 1-2: Elements of SFPUC Future Water Supply Planning



As shown in **Figure 1-2**, future water supply planning will require a planning approach that relies on a variety of strategies that include both institutional considerations and water supply planning and development actions. The uncertainties and challenges that affect the continued availability of RWS supplies require the SFPUC to broaden its water supply planning approach to include additional **demand management** and supply-side actions. Demand management actions, which aim to reduce customer demands on the RWS, include activities such as increased and expanded customer conservation and implementation of water projects at the local and individual customer level. Supply-side actions aim to address the availability of existing system supplies and augment RWS supplies with new, alternative water supplies at a regional scale.

Addressing the water supply planning challenges and filling the projected gap between future demands and system supplies will not happen quickly or easily. On the demand side, for example, water conservation efforts to achieve reduced demands on the RWS require broad participation by retail and wholesale customers and ongoing implementation to realize sustained benefits. On the supply side, development of new alternative water supply projects requires large infrastructure investments with long-term planning and implementation horizons, some extending decades. Therefore, there is an underlying urgency to plan thoughtful and diverse projects that can increase the reliability of SFPUC supplies in dry years.

1.3 Alternative Water Supply Program and Plan

The AWS Program looks beyond the RWS's existing infrastructure, surface water supplies, and local groundwater sources to identify new and diverse **Alternative Water Supply Projects (AWS Projects)** such as projects involving expanded surface water storage, groundwater banking, transfers, purified water, and desalination, as well as technological innovations and other tools that can increase systemwide supply availability.

> ***The goal of the AWS Program is to identify water supply projects that increase the dry-year reliability of RWS supplies and address the long-term water supply gap in alignment with the LOS Goals and Objectives.***

The AWS Program includes projects that help enable the SFPUC to meet more of its instream flow requirements and customer obligations, including legal and contractual obligations. The Program also includes a project that can assist the SFPUC's decision-making on potentially bringing on new permanent customers, while preparing for future climate effects.

On June 23, 2020, by Resolution No. 20-0138, the **SFPUC Commission** directed SFPUC staff to "complete development of an Alternative Water Supply Plan to implement a collection of projects to achieve a water supply goal established through the AWS Planning Program [...] no later than July 1, 2023." In accordance with Resolution No. 20-0138, this AWS Plan is intended to guide the AWS Program decision-making process and provide recommendations on project implementation and areas for future analysis.

This AWS Plan includes:

- Identification of the anticipated water supply gap through the 2045 planning horizon
- Description of ongoing efforts to reduce demands and optimize RWS supply availability
- Description of AWS Projects that can augment RWS supply and address the future water supply gap
- Recommendations that will further advance the AWS Program

The AWS Projects included in this Plan are mostly in the early planning stages. This Plan recommends actions to advance projects so they may address the water supply gap with limited financial and operational risks of overbuilding or overcommitting financial resources. This is reinforced in the AWS planning principle of "plan for obligations, build for demands," discussed further in Chapter 4 (AWS Program Role in Addressing the Future Water Supply Gap), which recognizes the importance of developing water supplies to meet obligations while prioritizing investments that focus on the most imminent need of meeting customer demands.

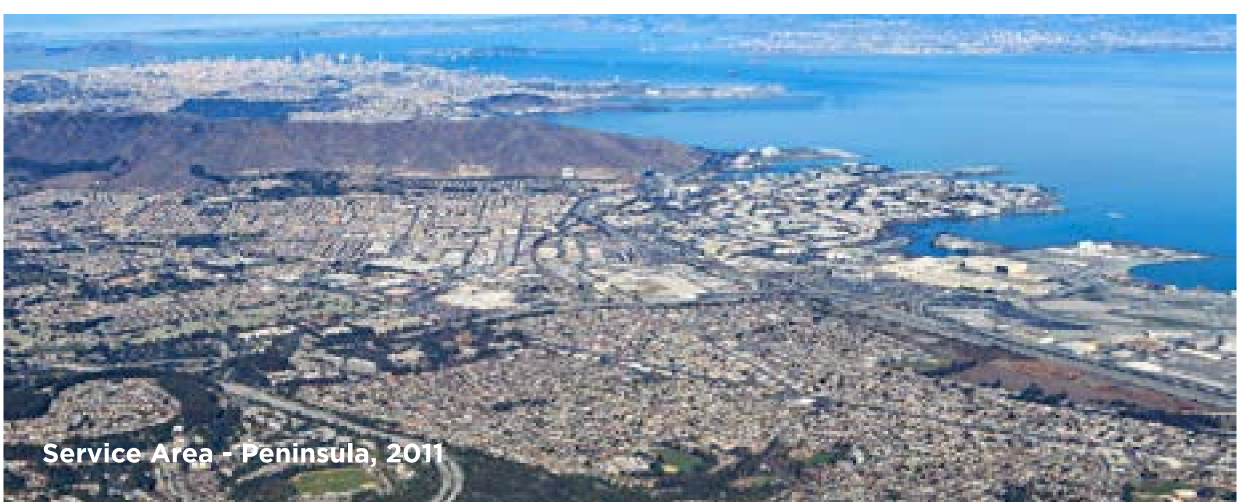
1.3.1 The SFPUC's Regional Focus for the AWS Program

While the SFPUC serves as both a wholesale and retail water supplier, the SFPUC is undertaking the AWS Program with a regional focus as the operator and steward of the RWS responsible for delivering reliable supplies to customers throughout its service area, including San Francisco and locations in other Bay Area counties. Consistent with its mission statement, the SFPUC intends to continue to provide all of its customers with high quality, efficient, and reliable water, in a manner that is inclusive of environmental and community interests, and that sustains the resources entrusted to its care. This requires both securing and maintaining the reliability of the RWS. As such, the AWS Program focuses on supply options that can provide a regional benefit to customers throughout the SFPUC service area.

The SFPUC will balance utilizing available resources with exploring new and different options in its efforts to plan for long-term water supply reliability in the face of numerous challenges and uncertainties. As the AWS Program aims to help fill the projected water supply gap, it will be thoughtful and adaptive, recognizing that some of the drivers that impact the water supply gap may change in the future.

1.3.2 Role of Wholesale Customers and BAWSCA in the AWS Program Development and Implementation

As a regional supplier, the SFPUC has a responsibility to keep its wholesale customers informed of the actions and progress of the AWS Program. In considering the planning, funding, and implementation of this AWS Plan and AWS Projects, the SFPUC will continue to engage with its wholesale customers, and with the Bay Area Water Supply and Conservation Agency (BAWSCA), which represents 26 of the SFPUC's 27 wholesale customers (see Section 2.1). The SFPUC will also continue to solicit and consider BAWSCA's input and recommendations in the AWS Program planning efforts.


Service Area - Peninsula, 2011

1.4 Organization of the AWS Plan

The AWS Plan is organized into six chapters.

- **Chapter 1: Introduction** – Describes the role of the AWS Program and this Plan in the SFPUC's water supply planning efforts
- **Chapter 2: Background** – Includes relevant background information that provides the context related to the SFPUC's water supply sources, service area, customers, and agreements that frame the SFPUC's water supply obligations, water use and demands, and factors affecting future water supplies
- **Chapter 3: Future Water Supply Gap** – Quantifies the future water supply gap by comparing the SFPUC's water supply obligations and projected future demands against water availability
- **Chapter 4: AWS Program Role in Addressing the Future Water Supply Gap** – Outlines the local and regional activities the SFPUC is undertaking throughout its service area that impact long-term water supply planning and details the elements of the AWS Program planning approach
- **Chapter 5: AWS Projects** – Provides details on AWS Projects that would diversify SFPUC water supplies and help address the future water supply gap
- **Chapter 6: AWS Recommendations** – Outlines AWS Project and AWS Program level recommendations

O’Shaughnessy Dam, 2022

Chapter 2: Background

This chapter provides relevant context for the AWS Program, including background on the SFPUC service area and customers, an overview of the RWS, water supplies, and the SFPUC's obligations and demands.

2.1 SFPUC Service Area and Customers

The SFPUC is the third-largest municipal utility in California, providing drinking water that serves more than 2.7 million residents and businesses in the San Francisco Bay Area.

The SFPUC currently delivers water to 27 wholesale customers in the Bay Area that purchase water for resale to retail customers in their individual service areas. BAWSCA represents the collective interests of 26 of these 27 wholesale customers. The one wholesale customer not represented by BAWSCA is the Cordilleras Mutual Water Company, a small water association serving 18 single-family homes located in Redwood City in San Mateo County. Throughout this Plan, references to the **Wholesale Customers** mean the 26 wholesale customers that are members of BAWSCA. For more detailed information on each of the SFPUC's 26 Wholesale Customers, see **Appendix A**.

The SFPUC also provides direct retail water service to a population of nearly 900,000 customers in San Francisco (referred to as **in-City** retail customers) and a number of retail customers outside San Francisco (referred to as suburban retail customers). The suburban retail customers are generally located right off of RWS transmission pipelines and do not form one contiguous service area. Some of the SFPUC's suburban retail customers include the Town of Sunol, San Francisco International Airport, Lawrence Livermore National Laboratory, Moffett Federal Airfield, Castlewood County Service Area, and Groveland Community Services District[1], among others. This Plan refers to the in-City and suburban retail customers collectively as **Retail Customers**.

Table 2-1 provides an overview of the SFPUC's 27 wholesale customers and the SFPUC's Retail Customers.

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1 Groveland Community Services District can be characterized as either a suburban retail customer or a wholesale customer. This Plan treats Groveland Community Services District as a suburban retail customer, as RWS supplies to Groveland Community Services District are accounted for in the retail supply allocation of 81 mgd.

Table 2-1: Overview of SFPUC Customers

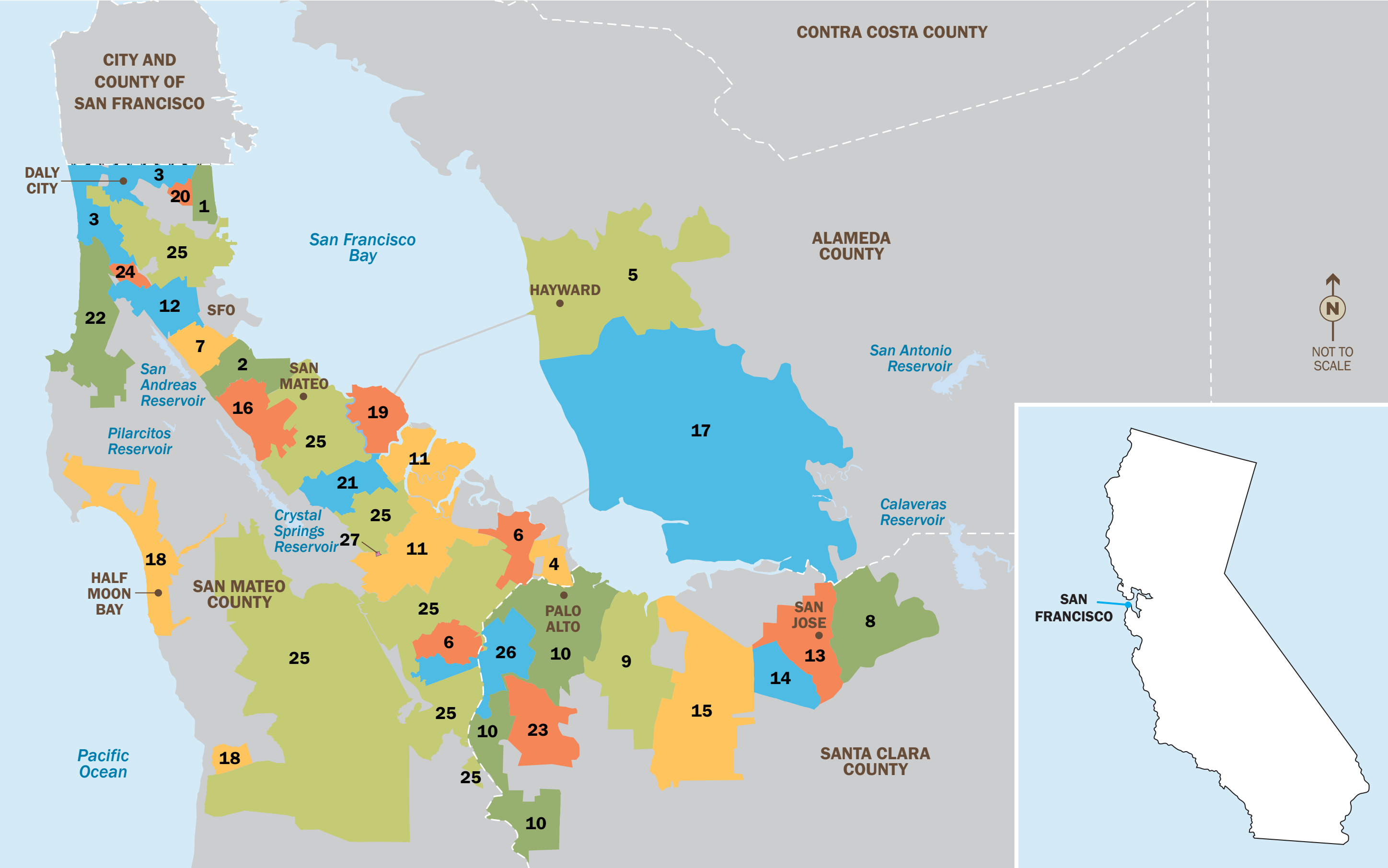
Customers	Location
Wholesale	26 Wholesale Customers in Alameda, Santa Clara, and San Mateo counties (represented by BAWSCA)
	1 wholesale customer in Redwood City (Cordilleras Mutual Water District)
Retail	Customers in the City of San Francisco (in-City retail)
	Customers in Alameda, Santa Clara, San Mateo, and San Joaquin counties (suburban retail)

Historically, the SFPUC has met approximately 96% of the Retail Customers' collective demands with RWS supplies, supplemented by local groundwater for irrigation and recycled water for wash-down operations at municipal facilities. More recently, it has also provided recycled water for irrigation at two public golf courses owned and operated by San Francisco. The SFPUC has a responsibility to meet the water demands of its Retail Customers through a combination of regional and local supplies. Consistent with other planning efforts, the AWS Program assumes that 81 million gallons per day (mgd) will be available to Retail Customers in non-drought years (**Retail Allocation**). In 2012, the SFPUC began to implement a number of new local water supply projects for its Retail Customers. The SFPUC is currently planning and implementing additional conservation, groundwater, and recycled water projects to help meet future Retail Customer demand.

Figure 2-1 shows the location of the SFPUC wholesale service area and its 27 wholesale customers, and Figure 2-2 shows the location of the SFPUC Retail Customers.

Upper Crystal Springs Reservoir, 2019

Figure 2-1: SFPUC Wholesale Service Area and Customers



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 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

OTHER WATER SUPPLIERS

25 California Water Service Company[b]
26 Stanford University
27 Cordilleras Mutual Water Company[c]

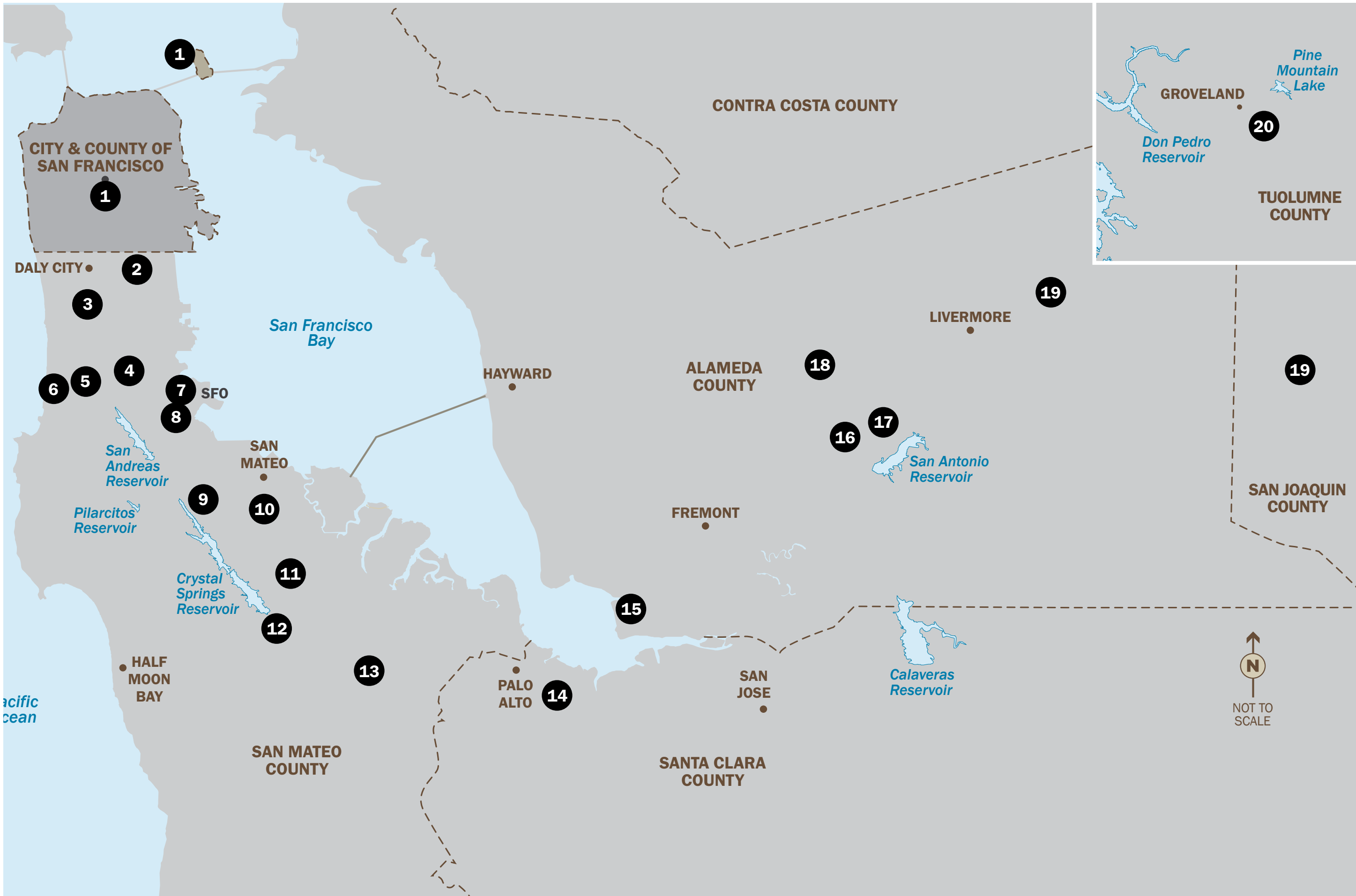
Source: FY 2021-22 BAWSCA Annual Survey

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

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

Figure 2-2: SFPUC Retail Customer Locations



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)
20 Groveland Community Services District

The suburban retail customers shown above represent the majority of water use in the suburban retail service area, but are not comprehensive. This Plan treats Groveland Community Services District as a suburban retail customer.

2.2 Regional Water System Overview

The RWS is owned by San Francisco and operated by the SFPUC. The RWS collects water from the Tuolumne River watershed and from local reservoirs in the Alameda and Peninsula watersheds, delivering high-quality drinking water to residents and businesses in the Bay Area. The RWS draws an average of 85% of its water from the Tuolumne River watershed supply collected in Hetch Hetchy Reservoir in Yosemite National Park, which feeds an aqueduct system that delivers water 167 miles by gravity to Bay Area reservoirs to serve the SFPUC's customers. The RWS draws the remaining 15% of its water supply from local surface waters in the Alameda and Peninsula watersheds. The RWS system consists of more than 280 miles of pipelines, 60 miles of tunnels, 11 reservoirs, five pump stations, and two water treatment plants. Figure 2-3 shows the RWS and some of its main facilities.

2.2.1 Operational Organization of the RWS

The SFPUC manages the RWS through its Water Enterprise operating divisions:

- **Hetch Hetchy Water and Power (HHWP)**, which manages water supply and treatment for the Upcountry portion of the RWS, which is the portion of the RWS east of the Alameda East Portal

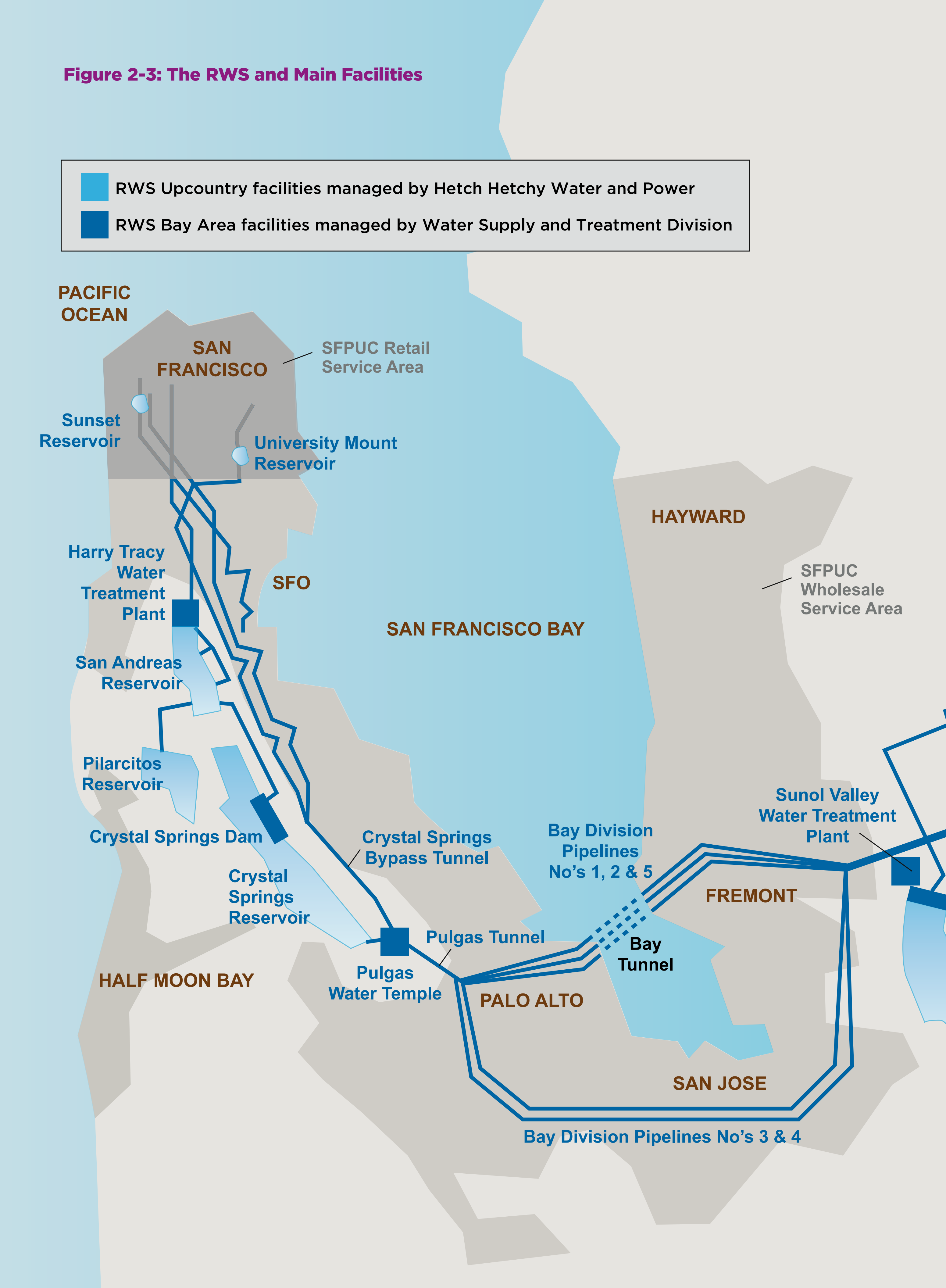
- **Water Supply and Treatment Division (WSTD)**, which delivers water to the wholesale and suburban retail customers located primarily in Alameda, Santa Clara, and San Mateo counties

- **Water Quality Division (WQD)**, which provides technical water quality, compliance, and regulatory support for both HHWP and WSTD in operation of the RWS

- **Natural Resources and Lands Management Division (NRLMD)**, which oversees the operation and maintenance (O&M) of Bay Area watershed and right-of-way (ROW) lands and is responsible for environmental regulatory compliance for O&M of the RWS, watershed, and ROW lands in the Upcountry and Bay Area portions of the RWS as well as in San Francisco

- **City Distribution Division (CDD)**, which manages the portion of the RWS that extends beyond San Mateo County into San Francisco as well as the distinct in-City distribution system that solely serves customers located in San Francisco

Figure 2-3: The RWS and Main Facilities




Lake Lloyd Reservoir (Cheery Lake)
Lake Eleanor Reservoir
Cherry Power Tunnel
Holm Powerhouse
Canyon Power Tunnel
Hetch Hetchy Reservoir
TUOLUMNE RIVER
O'Shaughnessy Dam
San Antonio Reservoir
Kirkwood Powerhouse & Early Intake Diversion Dam
Foothill Tunnel
San Joaquin Pipelines
Priest Reservoir
Coastal Range Tunnel
Moccasin Powerhouse and Reservoir
YOSEMITE NATIONAL PARK
Tesla Treatment Facility
Alameda East Portal
Don Pedro Reservoir
MODESTO
Calaveras Dam & Reservoir

While the SFPUC is responsible for overseeing duties as both a wholesale and retail water supplier, it is undertaking the AWS Program in its capacity as the system operator of the RWS. The AWS Program is focused on the regional water supply and the SFPUC's role in serving that supply system-wide. Therefore, the in-City distribution system is not discussed in detail as part of the AWS Plan.

2.2.2 Upcountry Portion of the RWS

The Upcountry portion of the RWS, also known as the Hetch Hetchy System, provides on average about 85% of the water that the SFPUC delivers to its customers. This portion of the system, managed by HHWP, begins with Hetch Hetchy Reservoir, which collects water from well-protected wilderness areas in Yosemite National Park in the upper portions of the Tuolumne River watershed. The National Park Service in Yosemite National Park manages Hetch Hetchy Reservoir watershed. The SFPUC also utilizes nearby RWS reservoirs, Lake Lloyd (Cherry Lake) and Lake Eleanor, most often to meet downstream Raker Act flow obligations to the Districts, while Hetch Hetchy Reservoir typically stores water delivered to the SFPUC's customers. To support RWS operations during dry periods, the SFPUC also maintains a water bank account in Don Pedro Reservoir, per the terms of the 1966 **Fourth Agreement** between San Francisco and the reservoir's owners and operators, Modesto and Turlock Irrigation Districts. The Fourth Agreement governs the responsibilities for and operations of Don Pedro Reservoir as it pertains to the water bank. The Fourth Agreement also contains provisions that may require the SFPUC to contribute to instream flows required by the Federal Energy Regulatory Commission (FERC).

Supply from Hetch Hetchy Reservoir undergoes initial corrosion control at Rock River Lime Plant and is then diverted into a series of tunnels and aqueducts that carry the water from the Sierra Nevada to the San Joaquin Pipelines, which cross the San Joaquin Valley and feed into the Coast Range Tunnel, which then connects to the Bay Area portion of the RWS at the Alameda East Portal.


Don Pedro Reservoir, 2019

WATER RIGHTS

San Francisco holds pre-1914 appropriative water rights to store and deliver water from the Tuolumne River and from the Alameda and Peninsula watersheds. The SFPUC operates San Antonio Reservoir under a post-1914 appropriative water right. The 1913 Raker Act granted San Francisco rights-of-way for the construction and operation of RWS facilities on federally owned land.

The Raker Act recognized the senior water rights of the Modesto and Turlock Irrigation Districts to divert water from the Tuolumne River. The Raker Act specified that the SFPUC must release water to the Districts under certain conditions and included conditions for the protection of drinking water quality, road and trail construction for public recreational use, and other purposes.

Don Pedro Reservoir is owned and operated by the Districts. The 1966 Fourth Agreement between San Francisco and the Districts allows the SFPUC to access a 570,000 acre-foot water bank in Don Pedro Reservoir, which helps the SFPUC manage water supply during drought years. During multiple sequential dry years, the SFPUC's water diversions may be limited to previously stored water in RWS reservoirs and the exchange water bank account in Don Pedro Reservoir. Complying with these requirements affects the quantity of water available to the RWS.

2.2.3 Bay Area Portion of the RWS

The Bay Area portion of the RWS, which is managed by the WSTD, includes water collection, treatment, and transmission facilities from the Alameda East Portal through the wholesale service area in Alameda, San Mateo, and Santa Clara counties up to the San Francisco city and county line. Before water from Hetch Hetchy Reservoir reaches these facilities, the SFPUC treats it at the Tesla Treatment Facility, located just west of Alameda East Portal. The Tesla Treatment Facility is an ultraviolet water treatment facility built in 2011 with a capacity of 315 mgd.

The SFPUC's two reservoirs located in Alameda County, San Antonio Reservoir and Calaveras Reservoir, collect water from the San Antonio Creek, Upper Alameda Creek, and Arroyo Hondo watersheds. San Antonio Reservoir also receives water from the Hetch Hetchy System for storage. The Sunol Valley Water Treatment Plant, which filters and disinfects water from San Antonio Reservoir and Calaveras Reservoir, has a peak capacity of 160 mgd and is not operated year-round. Treatment processes include coagulation, flocculation, sedimentation, filtration, disinfection, fluoridation, corrosion control treatment, and chloramination.

The RWS conveys water from Alameda County to the Peninsula via the five Bay Division Pipelines: three delivering water across the South Bay through the Bay Tunnel near the Dumbarton Bridge and two circling the South Bay through northern Santa Clara County. The five pipelines, which deliver water to customers along the pipeline routes, converge near **Crystal Springs Reservoir** on the Peninsula and connect to **conveyance facilities** that deliver water to customers located in San Mateo and Santa Clara counties and to the in-City distribution system, which serves customers in San Francisco.

Two of the SFPUC's three reservoirs located on the Peninsula, Crystal Springs Reservoir and San Andreas Reservoir, collect runoff from the San Mateo Creek watershed. Crystal Springs Reservoir also receives and stores water from Hetch Hetchy Reservoir. The 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), and the Crystal Springs and San Andreas Reservoirs.

The Harry Tracy Water Treatment Plant filters and disinfects water supplied from Crystal Springs Reservoir and San Andreas Reservoir before it is delivered to customers on the Peninsula and the customers in San Francisco via the in-City distribution system. The Harry Tracy Water Treatment Plant has a peak capacity of 180 mgd. Treatment processes include ozonation, coagulation, flocculation, filtration, disinfection, fluoridation, corrosion control treatment, and chloramination.

Harry Tracy Water Treatment Plant, 2015

2.2.4 RWS Infrastructure and WSIP

The SFPUC's reliable water service to both Retail and Wholesale Customers can be attributed to its active maintenance and improvement of the RWS since it was first developed. In the early 2000s, the SFPUC designed an ambitious multi-year capital program, known as WSIP, to ensure that it could continue to reliably meet the projected needs of its customers through 2030.

In 2008, the SFPUC Commission adopted a phased variant of WSIP, which included water supply and facility improvement projects for both the regional and local water systems. As part of its approval of WSIP, the SFPUC Commission adopted the **Interim Supply Limitation (ISL)**, which limited total retail and wholesale water sales to an average annual of 265 mgd from the SFPUC's watersheds. It also adopted LOS Goals and Objectives for WSIP, including limiting rationing to a maximum 20% system-wide reduction in water service during extended droughts. The LOS Goals and Objectives continue to inform the SFPUC's approach to future water supply planning and the AWS Program's efforts.

2.3 Water Supply

For the purposes of the AWS Program and Plan, RWS water supply means water originating from and delivered through the RWS. As discussed in Section 2.2 above, the majority of the RWS water supply (approximately 85%) currently originates in the upper portions of the Tuolumne River watershed in the Sierra Nevada; the remaining 15% of the RWS water supply is drawn from local surface waters in the Alameda and Peninsula watersheds.

The proportion of supply drawn from each of these sources varies from year to year depending on hydrology and operational circumstances. The SFPUC operates its local watershed facilities in the Bay Area 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 the Upcountry portion of the system.

In any given year, the SFPUC delivers approximately two-thirds of the RWS supply to Wholesale Customers and the remaining one-third to Retail Customers. In fiscal year (FY) 2021-22, the SFPUC delivered approximately 182 mgd of RWS supplies to its entire water service area, with 128.1 mgd (or 70.5%) delivered to the Wholesale Customers and 53.6 mgd (or 29.5%) delivered to Retail Customers. During this period, water demand was impacted by mandatory rationing imposed due to ongoing statewide drought conditions and the continued effects of the Covid-19 pandemic.

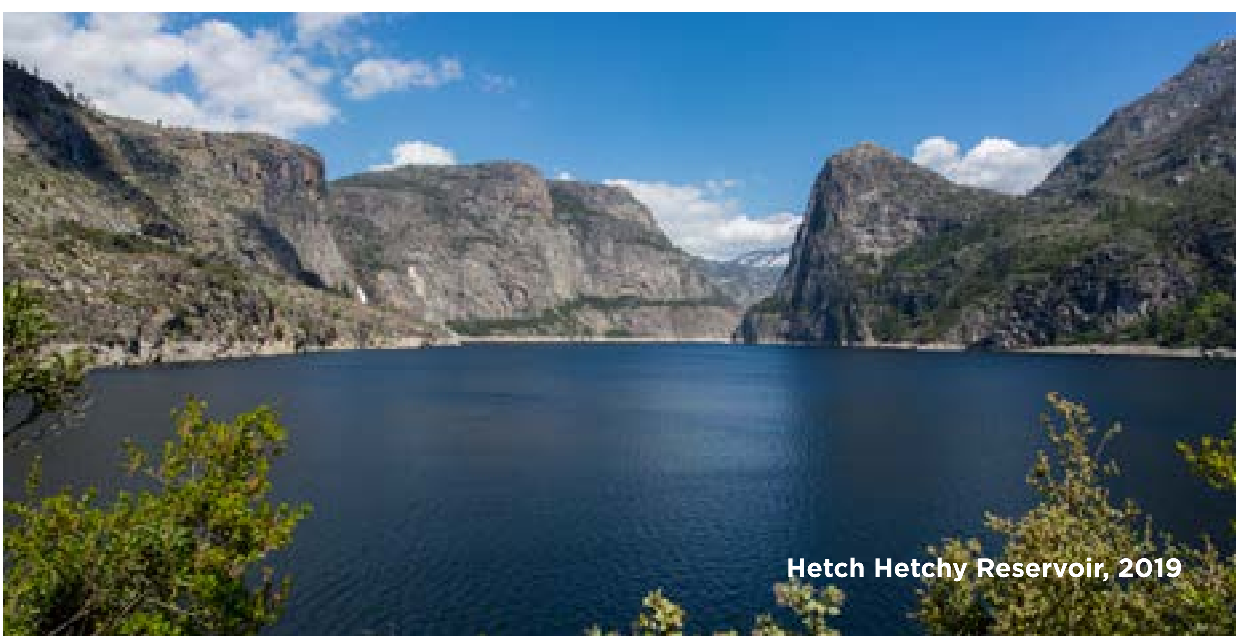
2.3.1 Current Water Availability with WSIP Implemented

Providing reliable water service requires an understanding of the availability of water supply. The amount of water available to the SFPUC from the RWS is constrained by hydrology, physical facilities, and regulatory restrictions, such as instream flow requirements on the Tuolumne River, which may limit the supply that is available in dry periods.

A normal-year RWS supply is defined as the supply that will be used to meet the full demands on the RWS. In normal or wet years, the SFPUC watersheds produce enough supply to meet current and projected future demands, and existing obligations. Under these conditions, the total volume of water that can be delivered through the RWS is limited by physical facilities. Additionally, as noted in Section 2.2.4, in 2008, as part of the action to adopt WSIP, the SFPUC made a policy decision to limit water sales from the SFPUC watersheds delivered though the RWS to an average of 265 mgd annually.

During dry years, the local watersheds produce less water, and a smaller share of the Tuolumne River supply is available to the SFPUC. To maximize the reliability of its water supplies under these circumstances, the SFPUC depends on carryover storage, or water supply in reservoirs that is stored and carried over from one water year to another. Carryover storage is critical during drought cycles because it enables the SFPUC to carry over water supply from wet years to dry years.

The SFPUC uses a water supply planning methodology to estimate the water availability and demands that can be met under dry-year conditions. This methodology takes into account both (1) **firm yield**, or the water supply available for delivery by the RWS in simulated dry-year conditions and (2) deliveries that can be reduced through implementation of a system-wide rationing policy under dry-year conditions. Using this methodology and assuming that WSIP water supply projects are implemented, the SFPUC currently estimates that the **total system yield** (or water availability) is 257 mgd. These elements are illustrated in **Figure 2-4**.



Hetch Hetchy Reservoir, 2019

Figure 2-4: Components Used to Estimate Dry-Year Water Availability

Both firm yield and rationing are estimated with the SFPUC water supply planning methodology, which includes simulation of RWS operation through a **design drought** sequence. The simulated design drought sequence consists of the extreme drought circumstances seen in 1987-1992 (the longest drought on record) followed by another two years of extremely dry conditions as experienced in 1976-1977.

Rationing is limiting the amount of water supply available to customers to reduce deliveries during droughts. In the SFPUC's water supply planning methodology, rationing is expected during extended droughts. The SFPUC estimates that the water demand addressed through rationing is 30 mgd, based on the **adopted rationing policy** that was adopted under the WSIP Programmatic Environmental Impact Report (PEIR) in 2008. This policy assumes that rationing is approximately 12% as an annual average over the 8½-year design drought sequence. Over the 8½ years of simulated drought, rationing is initially 0% and increases up to a maximum of 20%, with the annual average over the sequence being about 12%. The SFPUC is using this policy as a benchmark for the evaluation of water supply and potential water supply gap presented in this Plan. This enables the SFPUC to compare water availability with WSIP implemented and with the assumed implementation of the Bay-Delta Plan Amendment. Modifications to the SFPUC's adopted rationing policy would change the estimated total system yield and the future water supply gap presented in this Plan.

Based on the above-described water supply planning methodology, and as summarized in Table 2-2, the SFPUC estimates that the firm yield of the RWS is 227 mgd and that the adopted rationing policy can address up to 30 mgd of demand.

Table 2-2: Dry-Year Water Availability

	Annual Supply (mgd)
RWS Water Supply (Firm Yield)[a]	227
Water Demand Addressed Through Rationing[b]	30
Total Supply (Total System Yield)[c]	**257**

a Firm yield includes implemented WSIP projects and current instream flow releases (not including the Bay-Delta Plan Amendment).

b Rationing is based on the SFPUC rationing policy adopted under the WSIP PEIR in 2008, which assumes that rationing is approximately 12% as an annual average over the 8½-year design drought sequence.

c Total system yield is the sum of firm yield plus the water supply benefit from rationing.

More information on the SFPUC's planning methodology to estimate the available RWS supply and the demands that can be met under drought conditions can be found in Appendix B.

2.4 SFPUC Obligations and Demands

This section describes the SFPUC's obligations and demands, which set parameters for AWS Program planning.

2.4.1 The SFPUC's Legal and Contractual Obligations with the Wholesale Customers

The SFPUC's agreements with the 26 Wholesale Customers represented by BAWSCA include certain legal and contractual obligations that the SFPUC must consider as part of its planning under the AWS Program, as discussed below.

Water Supply Agreement (WSA)

The Water Supply Agreement (WSA) is a 25-year contract between San Francisco and the Wholesale Customers.[2] The WSA became effective on July 1, 2009, as its predecessor agreement – the 1984 Settlement Agreement and Master Water Sales Contract (1984 Agreement) – expired. The WSA, as amended and restated in January 2021[3], with subsequent approval by each of the Wholesale Customers, describes the current contractual relationship between the SFPUC and the Wholesale Customers. Pursuant to the terms of the WSA, each of the Wholesale Customers also has an Individual Water Sales Contract with San Francisco.

INDIVIDUAL WATER SALES CONTRACTS

Each of the Wholesale Customers also has an Individual Water Sales Contract with the SFPUC that describes the service area of the customer, identifies the location and size of service connections between the RWS and the customer's distribution systems, and in some instances, contains additional specific provisions unique to the particular customer. The Individual Water Sales Contracts may be amended from time to time by the SFPUC and the applicable Wholesale Customers pursuant to the terms of the WSA.

2 As noted above, Cordilleras Mutual Water Company is also a wholesale customer of the SFPUC, but it is not a party to the WSA and is not represented by BAWSCA.

3 All references to the Water Supply Agreement or WSA in this Plan are to the latest version, the 2021 Amended and Restated Water Supply Agreement.

The WSA carries forward many components of the 1984 Agreement, including the **Supply Assurance**, which requires that the SFPUC deliver a maximum of 184 mgd per year to the Wholesale Customers.[4] The SFPUC's agreement to deliver water up to the amount of the Supply Assurance is perpetual and survives the expiration of the WSA. The amount of water made available to the Wholesale Customers is, however, subject to reduction due to water shortage caused by drought, scheduled RWS maintenance activities, and emergencies.

The WSA carries forward the Supply Assurance, which requires the SFPUC to deliver a maximum of 184 mgd per year to 24 of the 26 Wholesale Customers.

The Supply Assurance is shared among 24 of the 26 Wholesale Customers (all Wholesale Customers, except the cities of San Jose and Santa Clara, which are not **permanent customers** of the SFPUC, as discussed below).

Individual Supply Guarantees (ISGs)

Twenty-three of the 24 Wholesale Customers that share in the Supply Assurance have an **Individual Supply Guarantee (ISG)**, which is their dedicated individual share of the 184 mgd Supply Assurance set forth in Attachment C of the WSA. The ISGs are also perpetual and survive the expiration of the WSA. Because San Jose and Santa Clara are temporary interruptible customers of the SFPUC under the terms of the WSA, they do not have ISGs.

The City of Hayward does not have an ISG due to the terms of its 1962 Individual Water Supply Contract with the SFPUC, which does not contain a fixed allocation of water. Hayward's water supply allocation is, however, included in the Supply Assurance as the difference between 184 mgd and the sum of the other 23 Wholesale Customers' ISGs. As described in the WSA, if the total SFPUC deliveries to Hayward and to the 23 Wholesale Customers with ISGs exceed 184 mgd over three consecutive fiscal years, then the ISGs of those 23 Wholesale Customers shall be reduced pro rata so that their total combined entitlement and the sustained use by Hayward does not exceed 184 mgd.

INDIVIDUAL SUPPLY GUARANTEES

ISGs represent each Wholesale Customer's dedicated individual share of the 184 mgd Supply Assurance.

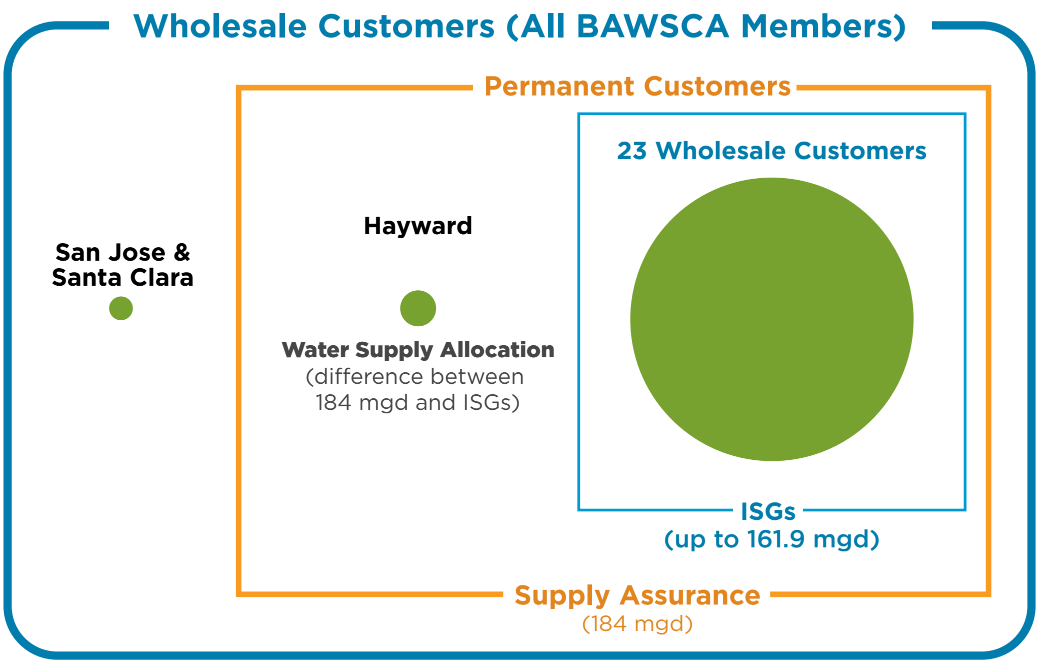
Hayward does not have an ISG due to the terms of its 1962 individual water supply contract.

4 The 184 mgd Supply Assurance is the maximum annual average metered supply of water dedicated by San Francisco to public use in the wholesale service area (not including San Jose and Santa Clara).

When combined, the ISGs of the 23 Wholesale Customers total 161.9 mgd. Thus, in the event that Hayward purchases an amount of water exceeding 22.1 mgd (184 mgd Supply Assurance minus 161.9 mgd) for three consecutive fiscal years, the ISGs of each of the 23 Wholesale Customers with ISGs would be reduced in accordance with the WSA to accommodate the demands of Hayward.

Figure 2-5 provides a visual representation of the Wholesale Customers' relationships with respect to the Supply Assurance and ISGs.

Figure 2-5: Visual Representation of Wholesale Customers



Note: Cordilleras Mutual Water Company is not a BAWSCA member and is not subject to the Water Supply Agreement

Interruptible Customers (San Jose and Santa Clara)

Prior to and during the terms of both the 1984 Agreement and the WSA, the SFPUC has provided water to San Jose and Santa Clara on a temporary, interruptible basis. As a result, the two cities are **interruptible customers** and do not have an allocated share of the Supply Assurance. Because San Jose and Santa Clara are not included in the Supply Assurance, they do not have ISGs. While the SFPUC has never interrupted water supply to San Jose and Santa Clara, the WSA allows the SFPUC to issue a conditional notice of termination of supply if sufficient long-term water supplies from the RWS are not available.

The WSA extends the temporary, interruptible status of San Jose and Santa Clara through 2028, by which time the SFPUC must decide whether or not to make the cities permanent customers of the RWS. The two cities have requested permanent status from the SFPUC with a guaranteed supply of 4.5 mgd each (9 mgd total), which the SFPUC will have to decide on by December 31, 2028. In order to support the decision-making process of making San Jose and Santa Clara permanent or not, SFPUC staff continue to include the potential additional guaranteed supply of 9 mgd for these two customers in its planning estimates. SFPUC staff also continue to encourage San Jose's and Santa Clara's active participation in developing their own local supplies to improve their resilience and ability to contribute back to the RWS in dry years to offset the additional burden on the RWS. One of the AWS Projects described in the Plan, the South Bay Purified Water Project, is designed explicitly to address this issue and could provide a pathway for the SFPUC to consider permanent status for San Jose and Santa Clara.

The SFPUC must decide whether to make the cities of San Jose and Santa Clara permanent customers by December 31, 2028.

2.4.2 Retail Service Area Obligations

The SFPUC has a responsibility to meet the needs of its Retail Customers through a combination of RWS and local supplies. As noted in Section 2.2.4, the SFPUC has limited the deliveries from the RWS watersheds to an average annual of 265 mgd, of which the Retail Customers are allocated 81 mgd and the Wholesale Customers are allocated 184 mgd, as described in the WSA between San Francisco and the Wholesale Customers discussed above. The SFPUC continues to develop demand management and local water supply projects, which are projected to reduce its reliance on the RWS. While the SFPUC is committed to reducing retail demands on the RWS even further, San Francisco could need its full Retail Allocation of 81 mgd in the years beyond 2045.

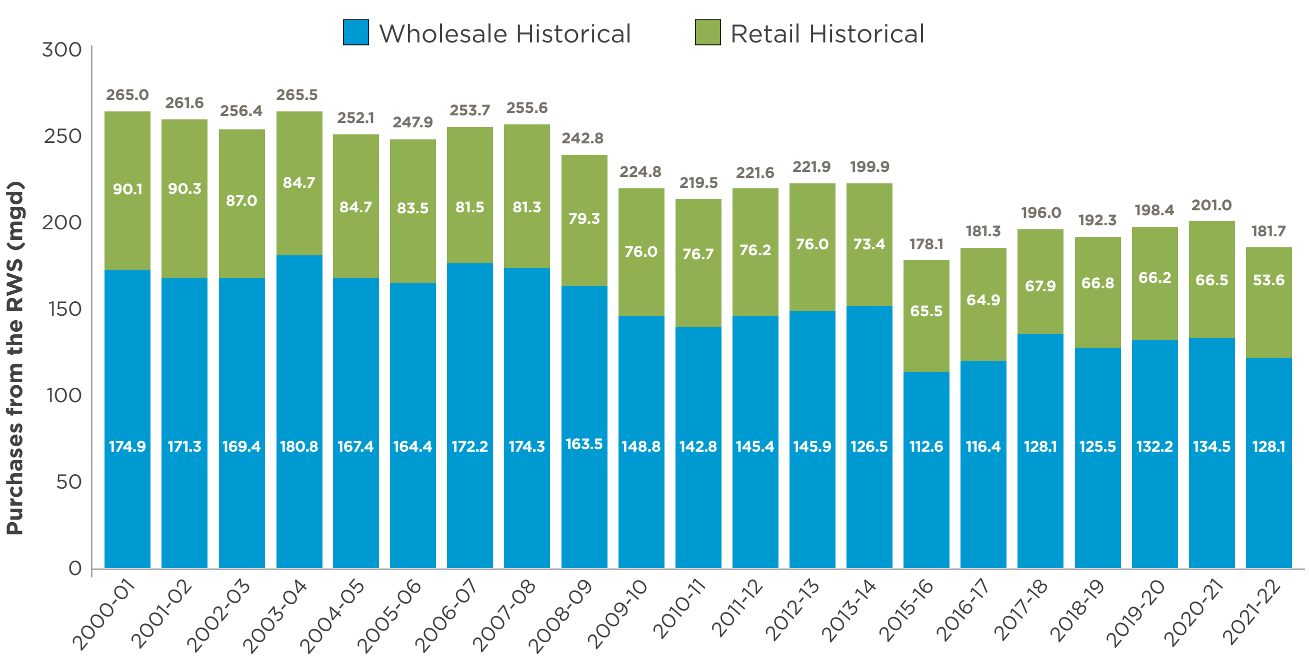
2.4.3 Current and Historical Demands

When the WSA became effective in 2009, demand projections indicated that Wholesale Customer demands on the RWS could exceed 184 mgd after 2018. However, due in part to water conservation initiatives, increased use efficiencies, the impact of droughts, and economic conditions, cumulative Wholesale Customer purchase requests continue to be significantly lower than the existing 184 mgd Supply Assurance. Still, the SFPUC's obligation to provide the Supply Assurance is perpetual and, as such, it is important that the AWS Program continues to plan for supplies to meet this obligation.

The SFPUC continues to track demands from both Retail and Wholesale Customers to better understand current and future water supply needs. For Retail Customers, about 97% of the total demand is currently met with RWS supply while the remaining portion is met with locally produced groundwater and recycled water. Approximately 65% of the total Wholesale Customer demand has been historically met by RWS supply. Individual Wholesale Customer reliance on the RWS system varies, with some Wholesale Customers relying on RWS supply to meet 100% of their total demand and others relying on RWS supply to meet a portion of their demand, while supplementing with other local and/or imported supplies, such as local groundwater, recycled water, or surface water imported from other sources. Individual Wholesale Customer water use data is compiled each year in the **BAWSCA Annual Survey**. More details on the breakdown of Wholesale Customer demands and supplies are included in **Appendix A**.

Figure 2-6 shows historical sales data from FY 2000-01 through FY 2021-22. Many factors influence demand, including socioeconomic conditions, weather, and drought. As shown, demands begin to dip after FY 2008-09, coinciding with the economic downturn in the region. FY 2015-16 was a drought year with significantly lower demands corresponding to enhanced conservation and rationing measures. In FY 2021-22, water demand was impacted by mandatory rationing imposed due to ongoing statewide drought conditions and the continued effects of the Covid-19 pandemic. It is also important to note that different factors can influence Wholesale Customers' total demand for water supplies from any available sources versus their demand on RWS supply specifically. Even when a particular Wholesale Customer's total demand for water supplies does not increase, its demand on RWS supplies specifically can increase.

Figure 2-6: Historical Retail and Wholesale Purchases from the RWS (2000-2022)



Source: BAWSCA San Francisco RWS Purchases (https://bawsca.org/water/supply/purchases)
(Wholesale Customer demands)

According to the most recent BAWSCA Annual Survey for FY 2021-22, the Wholesale Customers reported RWS purchases of 128.1 mgd, 5% lower than the total of 134.5 mgd purchased in FY 2020-21. Of the total amount of water used by these Wholesale Customers in FY 2021-22, 66.2% was RWS supply from the SFPUC and 33.8% was from other sources acquired by the Wholesale Customers including groundwater, local surface water, recycled water, and other supplies from Valley Water, the State Water Project, and Alameda County Water District's brackish water desalination.

In general, Wholesale Customer reliance on RWS supplies has increased in recent years as other supplies have become less reliable in the face of drought and regulatory uncertainties. There are also a number of conservation initiatives taking place in the wholesale service area that serve to reduce overall demand. These efforts include administering several regional water conservation programs and initiatives led by BAWSCA, including both Core Programs (implemented regionally throughout the BAWSCA service area) and Subscription Programs (funded by individual member agencies that elect to participate and implemented within their respective service areas). In addition to the BAWSCA conservation programs, many of the Wholesale Customers administer additional water conservation measures independently or through another entity, such as Valley Water. The FY 2021-22 BAWSCA Annual Survey identified an average residential per capita consumption of 60.27 **gallons per capita per day (gpcd)** across the wholesale service area, with 16 of the Wholesale Customers having a water use of less than 60 gpcd.

Total Retail Customer demand on the RWS has declined over the past decade and has remained consistently low. This is due to continued investment in efficiency improvements, conservation initiatives, and water supply diversification including the incorporation of other local water supply options such as groundwater and recycled water. Total water use within San Francisco continues to be among the lowest in

SFPUC Water Wise Evaluation

California and below historical consumption despite population growth over the same time period. Both total consumption and per capita water use 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 San Francisco) have affected water demands. During the drought in 2012-2016, per capita water use further declined. In its role as the retail water provider for San Francisco, the SFPUC has implemented aggressive conservation and demand management programs for over three decades, resulting in residential water consumption rate of 42 gpcd in San Francisco, a rate roughly half the statewide average.

2.4.4 Projected Future Demands

Identifying future demand is critical to planning for long-term supply reliability of the RWS. This AWS Plan examines projected demands through the planning horizon of 2045. Consistent with other planning efforts, the AWS Plan relies on the 2021-22 BAWSCA Annual Survey and the 2020 SFPUC Urban Water Management Plan (UWMP) to identify projected RWS demands. These sources may not fully reflect the most recent housing element updates of individual customers. BAWSCA agencies provide annual updates to the SFPUC identifying the amount of RWS water that each customer expects to request through the planning horizon. The SFPUC UWMP projects Retail Customer demands out through a 20-year planning horizon and is updated every 5 years. **Based on these sources, total projected future demands on RWS supply in 2045 are estimated to be 244.1 mgd, including 73.5 mgd from Retail Customers and 170.6 mgd from Wholesale Customers (Table 2-3).**

Table 2-3: SFPUC Customer Projected Demands on the RWS in 2045

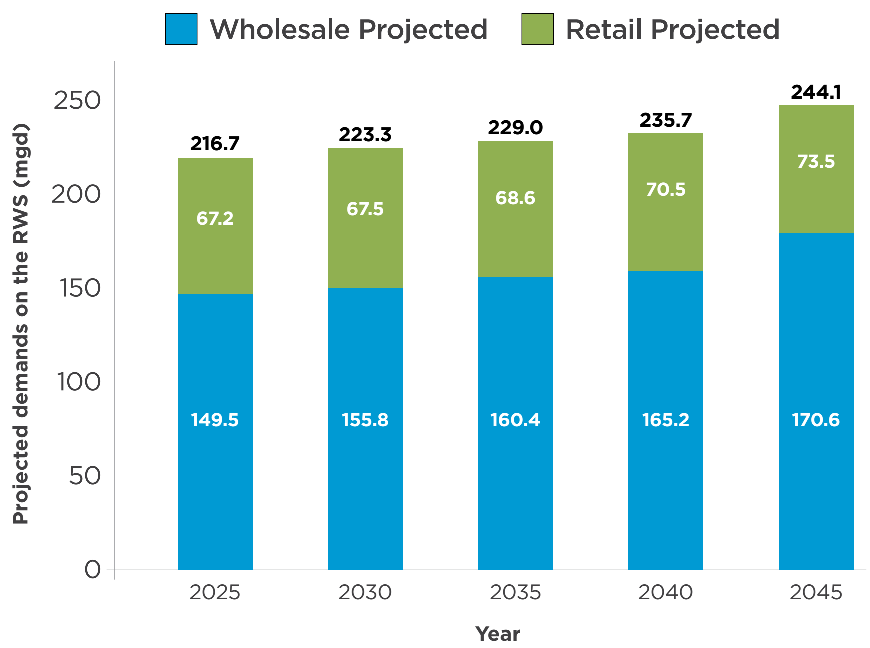
	RWS Projected Demand, 2045 (mgd)
Retail Customers	73.5[a]
Wholesale Customers	170.6
Total RWS Projected Demand	**244.1**

Source: SFPUC 2020 Urban Water Management Plan and FY 2021-22 BAWSCA Annual Survey

a The 2045 RWS projected demand for Retail Customers reflects the implementation of anticipated local supply projects and an updated savings estimate from the expansion of the Non-potable ordinance in 2021

Figure 2-7 shows demand projections through 2045 for both Wholesale and Retail Customers. Demands on the RWS are anticipated to increase through 2045. For Wholesale Customers, in addition to accounting for planned population growth within individual service areas, this may be in part due to prolonged drought and climate uncertainty which makes other non-RWS supplies that contribute to Wholesale Customers' supply portfolios less reliable given the uncertainty around availability and the potential for future State of California (State) and federal regulations. The drivers that influence projected demands on the RWS are discussed further in Chapter 3 (Future Water Supply Gap). Retail Customer demand projections assume local water supplies such as groundwater, recycled water, and onsite potable reuse will offset future RWS demand, as discussed in more detail in Chapter 4 (AWS Program Role in Addressing the Future Water Supply Gap).

Figure 2-7: Projected Retail and Wholesale Demands on the RWS (2025-2045)



Source: SFPUC 2020 Urban Water Management Plan and FY 2021-22 BAWSCA Annual Survey


San Antonio Reservoir, 2008

Chapter 3: Future Water Supply Gap

The objective of the AWS Program is to improve reliability in meeting retail and wholesale demands on the RWS in dry years through 2045. As discussed in this chapter, a shortfall in future water supply is anticipated in dry years, and this shortfall is expected to be large if the Bay-Delta Plan Amendment is implemented as adopted in 2018. This chapter describes the approach used for estimating the water supply shortfall and describes the drivers that affect the magnitude of the shortfall.

3.1 Approach for Identifying the Future Water Supply Gap

As shown in Figure 3-1, the difference between expected **water availability** from the RWS in a dry year and the **obligations** or anticipated customer[1] demands for water from the RWS can result in a water supply shortfall, or **water supply gap**.

Figure 3-1: Approach Used to Calculate the Water Supply Gap

The AWS Program identifies a future water supply gap in dry years, both to meet existing and potential obligations, and to meet customer demands. **The future water supply gap is characterized as a range of 92 mgd to meet 2045 customer demands to 122 mgd to meet obligations, including legal and contractual obligations for Wholesale Customers, the Retail Allocation, and potential future obligations for interruptible customers.**

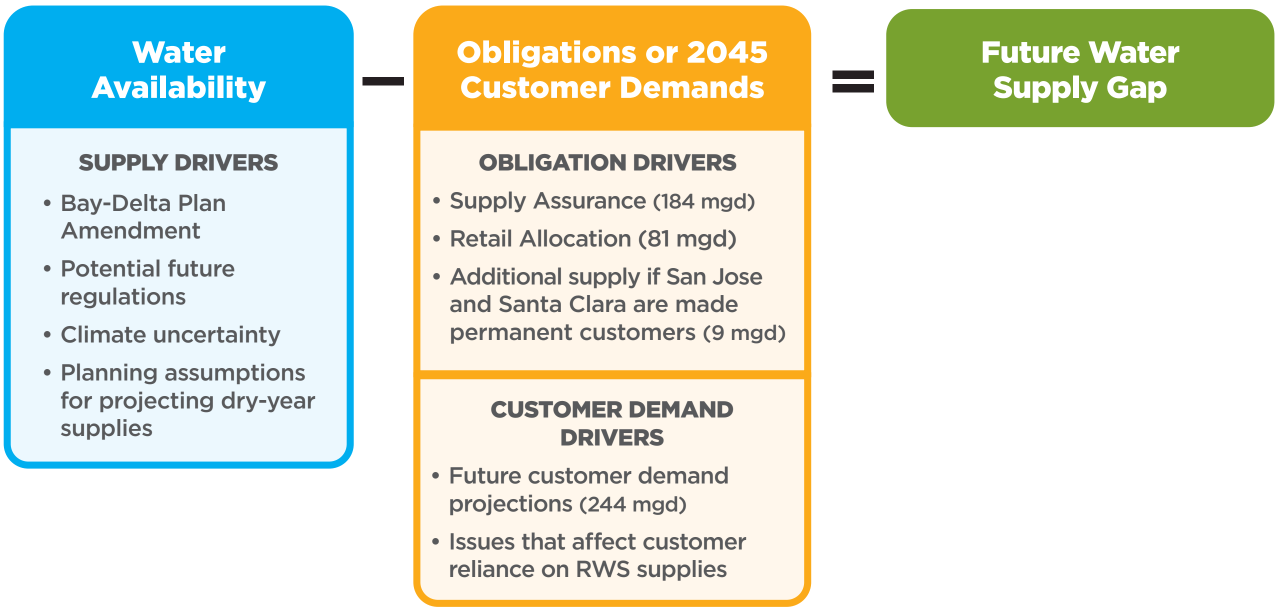
While historical and projected data indicate that customers' actual water demands on, or purchase requests from, the RWS tend to be lower than SFPUC's obligations, the AWS Program still identifies the water supply shortfall to meet obligations. This is because the Supply Assurance for the Wholesale Customers is perpetual and survives the expiration or termination of the WSA, and, as such, it is important that the AWS Program plan for supplies to meet these obligations.

The anticipated water supply gap is determined based on a number of **drivers** on both the supply side, which affect future water availability, and on the demand side, which consider obligations and future demands. These drivers, summarized in Figure 3-2, can be uncertain and some are likely to change over time. Some of the drivers

1 Customers include both Retail and Wholesale customers, including the cities of San Jose and Santa Clara.

are quantitative, and their impact on the future water supply gap can be estimated numerically. Other drivers are qualitative due to future uncertainty but are important to include in the AWS planning considerations and may be refined or quantified in the future. Details of each of the drivers are summarized in Sections 3.2 and 3.3.

Figure 3-2: Drivers which Affect the Future Water Supply Gap



3.1.1 Contribution of Rationing to Address the Future Water Supply Gap

As described in Section 2.3 (Water Supply), the future water supply gap is based on the total system yield, or what is also referred to as water availability. The total system yield includes both firm yield (water supply available during dry periods) and the portion of demand that can be addressed with rationing. Because rationing is a water resources management tool that can address demands, it is included in the estimate of water availability along with firm yield.

The estimate of how much of the water demand could be addressed through rationing is based on a rationing policy that was adopted under the WSIP PEIR in 2008. The adopted rationing policy assumes that over the 8½-year design drought, rationing is initially 0% and increases up to a maximum of 20%, with the annual average over the sequence being about 12%. This policy is being used as a benchmark for the evaluation of water availability with the implementation of the Bay-Delta Plan Amendment so that it can be compared to the prior planning estimates of water availability that were developed for WSIP. **Based on SFPUC's adopted rationing policy, rationing could contribute to filling approximately 12% of the water supply gap.** The remaining gap would need to be addressed through the development of new regional alternative water supplies, as shown in Figure 3-3.

Figure 3-3: Estimated Contributions of New Water Supplies and Rationing Needed to Fill the Future Water Supply Gap

Water Supply Gap to Meet Obligations **122 mgd**		Water Supply Gap to Meet Demands **92 mgd**	
New Regional Alternative Water Supplies Needed to Fill Gap **107 mgd**	Estimated Contribution of Rationing* **15 mgd**	New Regional Alternative Water Supplies Needed to Fill Gap **81 mgd**	Estimated Contribution of Rationing* **11 mgd**

* Note that the volume of demands that rationing can address is dependent on water supply. If estimated new water supplies to fill the future water supply gap is less than what is needed, the estimated contribution of rationing would also be proportionately less.

3.2 Drivers Affecting Water Availability

Water Availability

SUPPLY DRIVERS

- Bay-Delta Plan Amendment
- Potential future regulations
- Climate uncertainty
- Planning assumptions for projecting dry-year supplies

As described in Chapter 2 (Background), the current water supply delivered through the RWS consists of surface waters originating primarily from the Tuolumne River watershed in the Sierra Nevada (comprising approximately 85% of RWS supply) and water drawn from local surface waters in the Alameda and Peninsula watersheds (approximately 15%).

There are a number of drivers that have the potential to limit water supply from these sources in the future, including instream flow requirements, climate uncertainty, and future regulatory changes. However, **the Bay-Delta Plan Amendment is the driver that could have the most pronounced impact on water availability** through the 2045 planning horizon.

3.2.1 The Bay-Delta Plan Amendment

In December 2018, the State Water Resources Control Board (SWRCB) adopted amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (referred to as the Bay-Delta Plan Amendment) to establish water quality objectives to protect certain beneficial uses within the Bay-Delta ecosystem. The Bay-Delta Plan Amendment was developed with the goal of increasing salmonid populations in three San Joaquin River tributaries (the Stanislaus, Merced, and Tuolumne Rivers) and the Bay-Delta. The Bay-Delta Plan Amendment would require the release of 40% of the unimpaired flow on the three tributaries from February through June in every year type, with the ability to adjust unimpaired flow releases down to 30% or up to 50%, depending on conditions.

The Bay-Delta Plan Amendment, if implemented as adopted in 2018, would result in new instream flow requirements that would reduce the SFPUC's available water supply by an estimated 93 mgd per year. As summarized in Table 3-1 and discussed in Section 2.3 (RWS Water Supply), the estimated water availability (total system yield) is 257 mgd, without implementation of the Bay-Delta Plan Amendment. This calculation assumes a dry-year baseline water supply of 227 mgd with WSIP implemented and a corresponding equivalent amount of water demands addressed by imposing the SFPUC's adopted rationing policy (30 mgd) over the 8½-year design drought period. **The new instream flow requirements that would result from implementation of the Bay-Delta Plan Amendment, as adopted, would reduce the projected water availability in dry years expressed as total system yield from 257 mgd to 152 mgd.** This reduction in water availability would result in a significant water supply gap in dry years.

Table 3-1: Projected 2045 Water Availability during Dry Years, with and without the Bay-Delta Plan Amendment

	Scenario without Bay-Delta Plan Amendment	Scenario with Bay-Delta Plan Amendment
Baseline Water Supply with WSIP Implemented	227	227
New Instream Flow Release Requirements from the Bay-Delta Plan Amendment	N/A	-93
Water Supply[a] (Firm Yield)	227	134
Demands Addressed through Implementation of Rationing Policy[b]	30	18
Water Availability (Total System Yield)[c]	**257**	**152**

a Firm yield without Bay-Delta Plan Amendment implementation includes implemented WSIP Projects and current instream flow releases; with implementation of the Bay-Delta Plan Amendment the firm yield accounts for additional instream flow releases of 93 mgd.

b The water supply benefit realized through rationing represents the average annual volume of water delivery reductions in an extended drought. The volume of delivery reduction is proportional to the available water supply, or firm yield. Because the instream flow requirements called for in the Bay-Delta Plan Amendment would reduce the firm yield, the supply benefit realized through rationing would also be reduced.

c Total system yield is the sum of system firm yield plus the water demand addressed through rationing during extended drought.

The City and County of San Francisco, and other water users on the Tuolumne River, have filed pending legal and administrative challenges to SWRCB actions associated with the Bay-Delta Plan Amendment implementation. The SWRCB Resolution No. 2018-0059 adopting the Bay-Delta Plan Amendment directed staff to "provide appropriate technical and regulatory information to the California Natural Resources Agency" in completing a "Delta watershed-wide agreement, including potential flow and non-flow measures for the Tuolumne River" by March 1, 2019, and "to incorporate the Delta watershed-wide agreement, including potential amendments to implement agreements related to the Tuolumne River, as an alternative for a future, comprehensive Bay-Delta Plan update..." to be presented to the SWRCB.

On March 1, 2019, the California Natural Resources Agency and the California Fish and Wildlife Service, submitted a proposed project description for voluntary agreements in the Sacramento – San Joaquin Bay-Delta including the Tuolumne River to the SWRCB (**Proposed Voluntary Agreement**). The voluntary agreement parties, including the SFPUC, have continued to work together to provide detailed information to the SWRCB so that they may evaluate and consider the Proposed Voluntary Agreement. The SWRCB has indicated it will consider the Proposed Voluntary Agreement for adoption in 2024. The SWRCB issued a Notice of Preparation of a California Environmental Quality Act (CEQA)-equivalent document for the Tuolumne Proposed Voluntary Agreement in April 2023. The impact of the Proposed Voluntary Agreement on projected water availability (as calculated in **Table 3-1**) will remain uncertain until the SWRCB completes its evaluation which will ultimately determine the impact of the Bay-Delta Plan Amendment on the SFPUC's future water supply gap.

While the exact quantity associated with instream flow release requirements under the Bay-Delta Plan Amendment is subject to change with the Proposed Voluntary Agreement in the future, the Bay-Delta Plan Amendment is anticipated to cause a shortfall in RWS supply during dry years. Regular updates to this AWS Plan will be critical to reflect the latest information on Bay-Delta Plan Amendment requirements.


Tuolumne River, 2010

3.2.2 Potential Future Regulations

In addition to the Bay-Delta Plan Amendment, other potential future regulations or water right curtailments represent another driver that may impact water availability in the future. The SFPUC's operation of the RWS is subject to 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 water supply is managed. New instream flow requirements may result in required changes to releases or bypass flows from SFPUC facilities, which would impact water availability.

Regulatory uncertainties and their resultant impact on water availability make it difficult to definitively plan for the future. AWS planning efforts therefore do not currently assign a numerical shortfall with other potential future regulations, but rather capture them qualitatively by recognizing the risk they pose to the SFPUC's ability to meet customers' water demand. Such regulatory requirements may be quantified in the planning efforts associated with future AWS Plan updates, as necessary.

3.2.3 Climate Uncertainty

Changes in precipitation and extended droughts associated with climate change, as well as future regulations responding to a hotter, drier climate, are additional factors that can affect water supply within the SFPUC's planning horizon. Ongoing climate change assessment efforts need to be updated regularly to reflect improvements in climate science, atmospheric/ocean modeling, and reduction of greenhouse gas emissions. Climate change assessments by the SFPUC will be refined as additional information is released.

Hetch Hetchy Reservoir during a severe drought, 1991

In 2021, the SFPUC partnered with the Water Research Foundation to develop a Long-term Vulnerability Assessment (LTVA) of the RWS to better understand the potential vulnerability of the RWS to uncertain future conditions. The LTVA modeled a range of potential future climate scenarios to help assess to what extent climate change will be a threat to the RWS in comparison to, or in combination with, other external drivers of change. One finding of the assessment was that climate change exacerbates impacts from other drivers of change such as increased instream flow requirements and increased demands on the system.

Impacts related to climate change are not currently quantified in the AWS planning efforts; however, the AWS approach for long-term water supply planning includes diversifying water supplies to account for future potential impacts on the current water supply. Future updates to the AWS Plan may include numerical quantifications associated with climate change, as appropriate and available.

3.2.4 SFPUC Planning Assumptions for Projecting Dry-Year Water Availability

The SFPUC relies on planning assumptions and modeling to project future water availability in dry-year conditions. The SFPUC design drought and adopted rationing policy, which are discussed in Section 2.3 (Water Supply) and detailed in Appendix B, are assumptions that affect the estimates of water availability during dry-year conditions. Changes to the assumptions around the design drought or rationing would change total system yield estimates. For the purposes of this AWS Plan, these planning assumptions are being held constant as part of the SFPUC planning methodology for projecting future water supplies. This allows a direct comparison to the planning that was done for the WSIP program.

3.3 Drivers Affecting Obligations and Customer Demands

As described above, the future water supply gap is characterized as the difference between water availability and existing and potential future obligations and customer demands. The gap is influenced by drivers that affect water availability (discussed in Section 3.2) and drivers that affect obligations and demands. This section discusses the drivers that affect obligations and customer demands.

Obligations or 2045 Customer Demands

OBLIGATION DRIVERS

- Supply Assurance (184 mgd)
- Retail Allocation (81 mgd)
- Additional supply if San Jose and Santa Clara are made permanent customers (9 mgd)

CUSTOMER DEMAND DRIVERS

- Future customer demand projections (244 mgd)
- Issues that affect customer reliance on RWS supplies

3.3.1 Supply Assurance under the Water Supply Agreement and Retail Allocation

As described in Section 2.4, the SFPUC has a legal and contractual obligation to deliver water up to the amount of the Supply Assurance (184 mgd) to the Wholesale Customers under the terms of the WSA. The Supply Assurance, which is perpetual and survives the expiration of the WSA, is shared among 24 of the 26 Wholesale Customers because it does not include the cities of San Jose and Santa Clara, who are provided water on a temporary and interruptible basis. In addition, the SFPUC provides an allocation of up to 81 mgd to Retail Customers, which combined with the Supply Assurance, amounts to a total of 265 mgd. The Supply Assurance and the Retail Allocation are obligation drivers that affects the magnitude of the future water supply gap.


Calaveras Reservoir, 2019

3.3.2 Additional Supply if San Jose and Santa Clara are made Permanent Customers

Two Wholesale Customers, San Jose and Santa Clara, are currently temporary, interruptible customers. While they share in the costs and benefits of RWS deliveries as other Wholesale Customers do, they do not have a share of the Supply Assurance, or Individual Supply Guarantees (individual customers' allocations of the Supply Assurance). The two cities have requested permanent status from the SFPUC with a guaranteed supply of at least 4.5 mgd each (9 mgd total). The SFPUC must decide whether to make San Jose and Santa Clara permanent customers by December 31, 2028. The SFPUC, San Jose, and Santa Clara are engaged in regular discussions on this topic. One result of this collaboration is the inclusion of a project in this AWS Plan, the South Bay Purified Water Project. This project is discussed in Chapter 5 (AWS Projects).

If the SFPUC makes San Jose and Santa Clara permanent customers, it would result in a future, additional supply guarantee of 9 mgd. Although the SFPUC has not yet made a decision on the cities' future status, this AWS Plan considers what it would take to make San Jose and Santa Clara permanent. Therefore, the guaranteed supply increase required to make San Jose and Santa Clara permanent customers is a driver that affects the SFPUC's potential future obligations.

3.3.3 Projected Customer Demands

Customer demand projections are a driver that affects the SFPUC's water supply gap. Wholesale and Retail Customer projections of demands on the RWS are provided largely through urban water management planning efforts. Periodically, those projections may be updated through local and regional demand studies, BAWSCA Annual Surveys, or other policy or regulatory updates that may affect future purchase projections. Regular updates to the AWS Plan will allow inclusion of the latest customer demand projections and any resulting changes to the water supply gap.

Individual wholesale and retail customer demands are influenced by factors such as conservation measures and local water supply projects. Projected demands can be reduced through actions such as local conservation and water loss reduction measures (such as leak detection), while the degree to which customers rely on the RWS to meet total demands can be offset by local water supply projects such as groundwater or recycled water projects. Given the expected magnitude of the impact of the implementation of the Bay-Delta Plan Amendment on water availability (as described in Section 3.2.1), it is apparent that water conservation and demand management measures alone will not fill the future water supply gap.

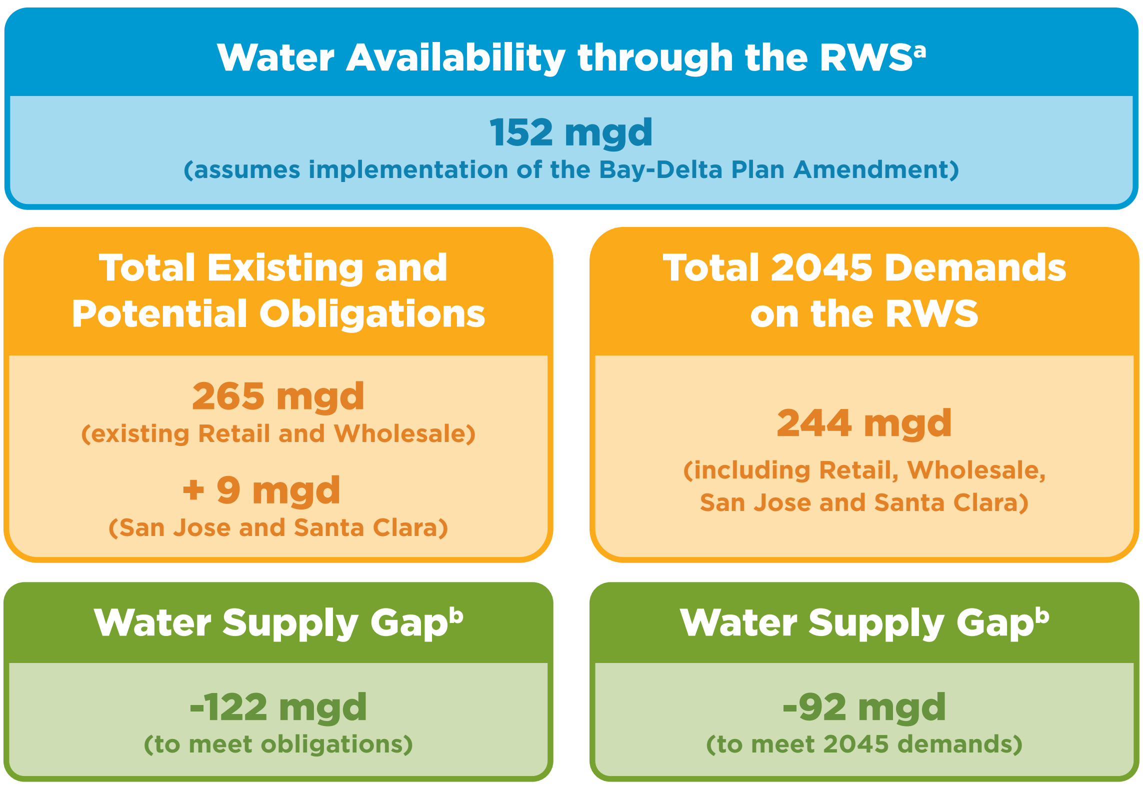
3.3.4 Customer Reliance on RWS Supplies

Recently, some SFPUC Wholesale Customers that have other non-RWS sources of supply have increased their reliance on RWS supplies. This may be in part due to prolonged drought, climate uncertainty, and the relative reliability of other non-RWS supplies, which may shift dependence on one supply source over another. Therefore, while a customer's demands may not increase, their demands on the RWS (reliance on the RWS) may. Climate uncertainty can also influence temperature and rainfall patterns that can locally impact the need for water. Purchase projections in the FY 2020-21 BAWSCA Annual Survey revealed, for example, Alameda County Water District's greater reliance on the RWS over its other supplies, even though the District's overall demands did not increase. Shifts in customer reliance on supply sources is a driver that affects future customer demands on RWS supplies.

3.4 Future Water Supply Gap (2045)

As described above, the SFPUC's future water supply gap is determined by comparing its existing and potential future obligations and 2045 customer demands against the future water availability. Implementation of the Bay-Delta Plan Amendment, as adopted, would reduce the projected water availability to 152 mgd. Figure 3-4 below shows a significant water supply gap in dry years when considering two scenarios: one based on existing and potential future obligations and a second based on projected customer demands on the RWS.

Figure 3-4: Water Supply Gap for Meeting Obligations and 2045 Demands in Dry-Year Conditions



a Represents the total system yield. The total system yield is the sum of the firm yield of the RWS plus rationing (134 mgd firm yield and 18 mgd of demands addressed by implementing the rationing policy [see Chapter 2 for additional detail]).

b The water supply gap estimates: 1) the total difference between water availability and obligations and 2) the difference between water availability and customer demands on the RWS in 2045.

For AWS planning, the following key conclusions can be drawn from the supply-demand comparison:

- As shown in Figure 3-4, in dry years, the SFPUC has identified a future water supply gap of 122 mgd to meet existing legal and contractual obligations (184 mgd), Retail Allocation to serve future retail service area obligations (81 mgd), and potential future obligations (9 mgd). Based on the projected demands of the same customer base on the RWS in 2045, the water supply gap would be 92 mgd.
- This future dry-year water supply gap is primarily driven by the potential implementation of the Bay-Delta Plan Amendment. However, the requirements of the Bay-Delta Plan Amendment are still under review as part of the Proposed Voluntary Agreement discussions and may change as a result of on-going negotiations between the SFPUC and the State. The results of these negotiations will impact water availability which will in turn impact future water supply gap estimates.
- Based on SFPUC's adopted rationing policy and consistent assumptions about rationing in future droughts, about 12% of the gap would be addressed through rationing. An additional 107 mgd of new supplies would need to be developed to meet obligations and 81 mgd of new supplies would need to be developed to meet projected 2045 demands.
- The SFPUC must implement new projects and actions that increase supply (firm yield) by augmenting RWS supplies in dry years. If less than 81 mgd of new supplies are developed, the benefit to water availability from rationing will be proportionately less.
- The drivers that affect both water availability and demands on the RWS must be reviewed regularly so that the projected water supply gap can be refined and updated as needed.
- Since 2000, SFPUC watersheds have experienced more frequent and severe dry years than in the preceding 100 years, punctuated by some wet years. Although the water supply gap is a dry-year concern, with drought frequency and severity becoming more commonplace, the utility of dry-year supply projects is likely to increase over time.
- To make San Jose and Santa Clara permanent customers, the SFPUC would need to identify the source(s) of supply that would be used to provide the additional 9 mgd of supply guarantee allocated equally between those two customers. The South Bay Purified Water Project could provide benefits to San Jose and Santa Clara in all years as well as the SFPUC in dry years.

WSIP Bay Division Pipeline Rehabilitation, 2011

Chapter 4: AWS Program Role in Addressing the Future Water Supply Gap

Long-term water supply planning requires a comprehensive approach. For the SFPUC service area, this means not only looking at new water supplies as discussed in this AWS Plan, but also expanding demand management efforts through conservation, identifying local water supply projects that can utilize local water resources to reduce demands on the RWS, and implementing other actions to strengthen the availability of existing surface water supplies.

As shown in **Figure 4-1**, some of these actions are implemented locally through BAWSCA and/or by the SFPUC as a retail water provider to San Francisco; other actions address regional water supplies and are the responsibility of the SFPUC as the operator and steward of the RWS and in coordination with BAWSCA in accordance with the WSA.

Figure 4-1: Long-Term Water Supply Planning Coordinated Approach of Local and Regional Actions

LOCAL ACTIONS		REGIONAL ACTIONS (Focus of the AWS Program)	
Conservation and Loss Reduction actions that reduce demand on the RWS such as:	**Local water supply projects that reduce reliance on the RWS** including:	**Projects and other actions that address availability of existing RWS supplies** such as:	**Regional alternative water supply projects that help address the future water supply gap** including:
Passive & active conservation Leak detection	Onsite reuse Recycled water Stormwater capture/reuse Groundwater Purified water	Existing groundwater projects Joint projects with Irrigation Districts	Groundwater Purified water Desalination Recycled water Storage expansion

4.1 Demand Reduction through Water Conservation Activities

The SFPUC as a retail service provider has long been committed to, and is a leader in, water conservation. Individual Wholesale Customers serve a parallel function of managing local water demands in their respective service areas. BAWSCA represents the interests of the Wholesale Customers and coordinates water conservation assistance regionally. Information on each customer's demand reduction efforts and per capita use are included in Appendix A.

SFPUC Retail Water Conservation Activities: The SFPUC has been implementing a retail conservation program in San Francisco for over 30 years. Despite steady population and job growth in the retail service area, the SFPUC's per capita water use rate has declined and remained low, due in large part to SFPUC's retail conservation efforts. Since 2005, San Francisco's residential per capita water use declined by 30% despite a 15% increase in population. With an average residential per capita water use of 42 gpcd, residential water use in San Francisco remains among the lowest in the State. The SFPUC continues to maximize opportunities to do more on demand management. From participating in cutting-edge research and dialogue on extreme decentralization and 50-liter challenges to inviting independent review of existing programs to identify additional actions for feasible demand reduction action, the SFPUC remains committed to water conservation. By 2025, residential per capita water use is estimated to decrease to 38.4 gpcd, well within industry ranges for what is considered highly efficient.

Wholesale Service Area Conservation Activities: In the wholesale service area, BAWSCA and individual Wholesale Customers offer a wide variety of water conservation programs. These efforts include several regional water conservation programs and initiatives led by BAWSCA, including both Core Programs (implemented regionally throughout the BAWSCA service area) and Subscription Programs (funded by individual Wholesale Customers that elect to participate and implement within their respective service areas). As detailed in BAWSCA's FY 2021-22 Annual Water Conservation Report, all 26 Wholesale Customers benefit from the twelve Core Programs implemented by BAWSCA, including landscape education classes, conservation workshops, and public educational materials. In FY 2021-22, 23 out of 26 Wholesale Customers participated in one or more of the fourteen Subscription Programs offered by BAWSCA, including rebates, water loss management and large landscape audits. BAWSCA continues to refine


Sunol Yard water efficient landscaping

and add to its suite of water conservation programs in an effort to reduce overall demand. The FY 2021-22 BAWSCA Annual Survey found an average residential per capita consumption of 60.27 gpcd across the wholesale service area, with 16 of the Wholesale Customers having a water use of less than 60 gpcd, all of which reflects the region's commitment to water conservation. In addition to the BAWSCA conservation programs, many of the member agencies administer additional water conservation measures independently or through another entity, such as Valley Water.

4.2 Reducing Demands on the RWS through Local Water Projects

It is important to distinguish **local water supply projects** from the **regional water supply projects**, or the AWS Projects, that are the focus of this Plan. AWS Projects are intended to augment regional supplies and have widespread water supply benefit to the SFPUC service area. In contrast, local water supply projects have the potential to reduce demands on the RWS by implementing projects that utilize non-RWS supplies within a retail service area. Examples would include a retail water agency using local groundwater resources, implementing residential- or commercial-scale graywater and stormwater capture and reuse programs, or implementing water recycling programs implemented by a local water agency to meet **non-potable demands** within its retail service area. The SFPUC implements many of these types of programs as the retail service provider for San Francisco, and BAWSCA member agencies, retail water agencies in their own right, are implementing many of these types of programs throughout the wholesale service area, consistent with their agreement to do so under the WSA.

SFPUC Retail Local Water Projects

The SFPUC has been working for years to identify and bring on new local water supply resources in the retail service area through a number of programs including:


Westside Enhanced Recycled Water pumps, 2022

Westside Enhanced Recycled Water Project which can provide up to 2 mgd of recycled water to meet non-potable demands in Golden Gate Park and other irrigated landscapes on the west side of San Francisco.

San Francisco Groundwater Supply Project that utilizes groundwater from the Westside Groundwater Basin in San Francisco as a drinking water supply. Groundwater is treated and blended with the City's RWS supplies before it is delivered to in-City retail customers. Currently, less than 1 mgd is being blended into the City's drinking water supply. Over time, pumping can be gradually increased in order to blend up to 4 mgd of treated groundwater with regional water supplies.

Onsite Water Reuse Program which is an innovative program that mandates the collection, treatment, and use of graywater, blackwater, rainwater, stormwater, and foundation drainage in new buildings over 100,000 square-feet to meet non-potable demands such as toilet flushing and irrigation. By 2040, the total potable water offset by the Onsite Water Reuse Program will be approximately 1.5 mgd.

Stormwater Capture and Reuse Program that provides rebates for the purchase of cisterns and rain barrels for residents and business to capture rainwater for irrigation use, thus saving drinking water and reducing the amount of stormwater that enters the City's combined sewer system. This program also supports capital projects that increase the beneficial reuse of stormwater such as the Vista Grande Drainage Basin Improvement Project.

Innovations Program which promotes exploration of new ways to conserve water, recover resources, and diversify the City's water supply. Efforts being explored or implemented under the program include atmospheric water generation, the use of new technologies to detect leaks and reduce losses in the City's water distribution system, and Brewery Process Water Reuse grant opportunities for breweries to collect, treat, and reuse process water generated onsite. In 2021, Anchor Brewing Company, San Francisco's oldest brewery, completed a construction of a brewery process water recycling system that has the capacity to recycle up to 20 million gallons per year.

PureWaterSF is another significant local water project in San Francisco that could reduce retail water demands. The SFPUC is exploring the potential to provide a new, local drinking water supply in San Francisco through the use of purified water. As described in the adjacent project highlight, PureWaterSF could provide up to 5.2 mgd of **purified water** in San Francisco with approximately 1.2 mgd serving non-potable uses and 4 mgd being blended with RWS supplies for distribution throughout San Francisco to serve **potable demands**.

Anchor Brewery
Water Reuse Project, 2021

PureWaterSF: San Francisco's Opportunity to Further Reduce Demand on the RWS

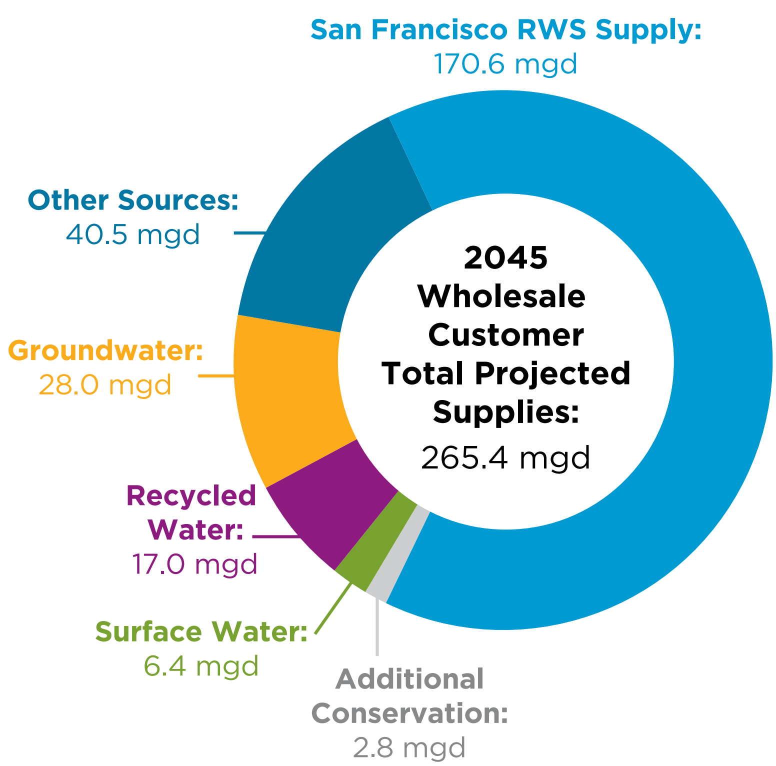
PureWaterSF is a project concept that envisions providing a new, sustainable drinking water supply in San Francisco by treating recycled water originating from the Oceanside and Southeast Treatment Plants, which treat combined flows of wastewater and stormwater. Research on this concept began in 2016 with grant funding from the U.S. Bureau of Reclamation and the Water Research Foundation. The SFPUC installed a temporary advanced treatment system at the end of an existing water recycling system at its own headquarters in San Francisco. The treatment included ultrafiltration, reverse osmosis, and disinfection with ultraviolet light and advanced oxidation. The research analyzed thousands of data points through third-party laboratories with specialized equipment to conclude that advanced water treatment produces consistently high-quality water that meets or exceeds regulatory standards, even at the building scale. The research marked the beginning of the SFPUC's investigation of purified water as a supply solution in San Francisco and throughout the service area.

In 2021-2022, after the successful completion of the research, the SFPUC conducted a feasibility study that evaluated four potential scenarios for purified water in San Francisco, including costs and infrastructure needs to meet stringent emerging regulatory requirements. As a result of this feasibility study and a related concurrent study that evaluated the potential for non-potable water supply on the east side of San Francisco, the SFPUC plans to continue developing a project concept that would consist of two parallel plants that distribute water throughout the city, one 2 mgd purified water plant on the east side and one 2 mgd purified water plant on the west side. An additional 1.2 mgd may be added to the plant on the east side to address non-potable demands. Technical studies, siting, environmental review, financial analysis, and demonstration and engagement with the public and regulators will all be needed as the project concept is developed. If implemented, this project could result in reducing San Francisco's demand from the RWS by 5.2 mgd by 2045. Meanwhile, a redesign of the existing reuse system at the SFPUC headquarters building is currently underway and the SFPUC plans to make purified water a permanent demonstrable feature at its building in the near future.

Wholesale Service Area Local Water Projects

In the wholesale service area, individual customers are implementing a variety of local water supply projects of various sizes. Plans for those projects are considered by each Wholesale Customer and are included in their respective UWMPs.[1] Demand studies, along with the BAWSCA Annual Survey, factor those local projects into consideration when calculating the projected purchases from the RWS. As shown in the FY 2021-22 BAWSCA Annual Survey, by the year 2045, Wholesale Customers will have invested locally such that 35.7% of their water demand will be met by sources other than RWS, as shown in Figure 4-2.

Figure 4-2: Wholesale Customer 2045 Demand Projections by Source



To further the discussion of collaboration on potential planned projects, BAWSCA held a One Water Reliability Series (Roundtable Series) which brought together different water professionals spanning across the BAWSCA service area including its member agencies, non-governmental organizations (NGOs), counties, wastewater agencies, and other leaders and experts in water related fields. The three primary goals of the Roundtable Series were to: (1) understand how existing and planned projects in the region fit within the One Water concept, (2) identify the potential for collaborative opportunities, and (3) offer ideas for how entities could potentially support, help finance, permit, approve, and expand projects or programs that have the potential to offer multiple benefits.

1 Wholesale Customer UWMPs can be found at www.bawsca.org/members/urban_water_management

As part of the Roundtable Series, BAWSCA obtained Project Information Forms from all Wholesale Customers regarding what types of water supply projects are being planned, in-progress, or are at a conceptual level within each agency. As of February 2023, a total of 51 potential projects have been identified that include a broad range of supply projects including recycled water, groundwater extraction, and stormwater, among others. Approximately 43% of identified potential projects are in-progress, 37% are in the planning stage, and another 20% are in the conceptual stage.

As the regional water provider, the SFPUC has a need to meet its customers' demands and its legal and contractual obligations to its customers. However, the implementation of local water supply projects can provide multiple benefits through the efficient use of local resources, including building resilience while helping to reduce demands on the RWS. To this end, the SFPUC will continue to look for opportunities to expand local projects in its own retail service area and collaborate with the Wholesale Customers to encourage ongoing implementation of local water projects throughout the wholesale service area.

4.3 Other Projects to Increase the Availability of Existing Surface Water Supplies

The surface water supplies delivered through the RWS will continue to be the backbone of the SFPUC's water supply. Therefore, the SFPUC is identifying other regional actions outside of the AWS Program that can be taken to maintain and increase the availability of supplies delivered through the RWS, especially under dry-year conditions. Examples are the Regional Groundwater Storage and Recovery (RGSR) project and the Alameda Creek Recapture Project, both of which have been initiated as part of WSIP, as well as potential future projects with irrigation districts in the San Joaquin Valley.

Regional Groundwater Storage and Recovery Project. The RGSR project involves the management of surface water and groundwater supplies in the Westside Groundwater Basin that extends through San Mateo and San Francisco counties to increase reliability for the RWS in dry years. Through a regional partnership with California Water Service Company (serving South San Francisco and Colma) and the cities of Daly City and San Bruno, the RGSR will balance groundwater and RWS supply through in-lieu deliveries and resulting groundwater recharge during wet years to increase dry-year water supplies. During normal and wet years, when surface water is plentiful, additional water from the RWS is delivered to the partner agencies, which reduces their need to pump groundwater and thus allows the groundwater basin to naturally recharge. Over time, this reduction in groundwater pumping will result in a water savings account of up to 61,000 acre-feet of water, a volume equivalent to that of the SFPUC's Crystal Springs Reservoir. This water stored in the groundwater basin can then be sustainably pumped to augment RWS supplies during a drought or other emergency. The project is currently being implemented and will include the installation of 7 to 9 wells, which can produce approximately 3.6 mgd of supply annually under dry conditions. To achieve the full 6.2 mgd annual supply originally planned for under WSIP, additional wells, associated treatment systems, and potentially storage would have to be commissioned. Prioritizing completion of this project would ensure that the RWS would be able to deliver the expected supply in future dry years and not increase the shortage further.

Alameda Creek Recapture Project. The Alameda Creek Recapture Project includes new facilities in and around an existing quarry pit in Sunol Valley to recover the loss of water supply associated with instream flow release and bypass requirements related to the Calaveras Dam Replacement Project. During the initial stage of construction, the SFPUC concluded that re-evaluation of the design is necessary before proceeding with construction of the project. It is anticipated that completion of the project can provide the 5 mgd of water supply assumed in the baseline modeling for the AWS Program.

Joint Projects with Irrigation Districts. There are currently a number of projects being investigated that would strengthen the availability of existing surface water supplies from the Tuolumne River watershed under dry-year conditions. Groundwater banking in the Modesto and Turlock Irrigation Districts could be used to provide additional water supply to meet instream flow requirements while reducing the water supply impacts to the SFPUC service area in dry years. Inter-basin collaborations, which could include establishing partnerships between interests on the Tuolumne River and those on the Stanislaus River, have the potential to address streamflow requirements in the basins based on annual hydrology and could create opportunities to beneficially use excess flow to between the two basins. These types of projects help identify collaborative approaches to provide instream flows during dry periods while helping to preserve the availability of RWS supplies. These projects are part of the Proposed Voluntary Agreement and are not the focus of the AWS Program. These projects may be included as part of future updates to the AWS Program. However, the results of Proposed Voluntary Agreement negotiations will determine how these actions may progress and potentially reduce the impact of the Bay-Delta Plan Amendment on SFPUC's future water supply gap and are therefore an essential component of the SFPUC's long-term water supply planning efforts.

4.4 AWS Planning Approach

The AWS Program looks beyond existing surface water supplies of the RWS to new and diverse or alternative water supply projects such as groundwater banking, surface water storage expansion with existing or new supply sources, water transfers, purified water, as well as technological innovations and other tools to increase the reliability of regional water supplies.

Implementating, integrating, and delivering alternative water supplies requires detailed planning that considers unique and interrelated issues. Additionally, new water supply projects take years to plan and implement and require significant capital outlay. **To minimize the financial and operational risks of overcommitting capital while ensuring that there are sufficient water supplies being developed to help fill the projected water supply gap, the SFPUC has established an approach to help guide the AWS planning process.** As described in the following sections, the process considers the planning challenges unique to alternative water supply planning, establishes a program goal to guide long term decision making, and establishes planning principles that guide identification of AWS Projects and AWS Program recommendations Furthermore, the SFPUC recognizes that the AWS Program must be a dynamic process that will require continued review and update.

AWS Program Focus

Regional alternative water supply projects that help address the future water supply gap including:

- Groundwater
- Purified water
- Desalination
- Recycled water
- Storage expansion

4.4.1 Challenges Unique to Alternative Water Supply Planning

Many of the planning challenges associated with developing new and alternative water supplies are different than those associated with traditional water supply planning at the SFPUC. While every project presents a unique set of circumstances and challenges, common issues that must be addressed for alternative water supply projects include operational considerations of integrating new supplies into existing infrastructure, water quality considerations, distribution of new supplies, institutional considerations around multi-party partnership projects, affordability, and addressing community acceptance of new water supplies.

Developing alternative water supplies presents new planning challenges that are different from those associated with traditional water supply planning.

Operational Considerations of Integrating New Supplies

The current water supply conveyed by the RWS generally flows from east to west by gravity, from the Sierra Nevada to San Francisco. The RWS relies on storage and conveyance infrastructure to distribute supplies throughout the SFPUC's service area. Tie-in locations for new supplies would need to be based on the proximity and feasibility of connecting the new supply to existing RWS facilities. **How and where new supplies are brought into the RWS can affect capacity, timing of deliveries and storage, flow rates, and operating pressures.** For example, connecting two systems with different pressures can require new infrastructure, such as pump stations. When new supplies use available capacity of major transmission pipelines, the tradeoff may be that it becomes more difficult to move existing surface water supplies within the system. The type of new water supply being brought into the system may also impact the timing of when supplies are available. For example, purified water projects that provide water every year, including in wet or normal years when surface water supplies are sufficient, may affect decisions about how storage is operated, and which supplies are prioritized. All of these considerations can impact system operations and necessitate changes in operational approaches.

Water Quality Considerations

Alternative water supply projects include the delivery of water supplies from new sources such as purified water, groundwater, and desalinated water, and also may include surface water supplies from new sources such as the Delta. The result is that water from a number of alternative supply sources may be commingled with the existing surface water supply in the RWS. Like RWS supplies, alternative supply sources will be required to meet or exceed federal and State drinking water standards and will be subject to testing and monitoring on an ongoing basis. However, **planning for the combined effect of multiple supply sources requires that water quality impacts be considered.** For example, purified water projects require careful evaluation and understanding of emerging regulatory requirements and tradeoffs of storing purified water in surface water reservoirs (**indirect potable reuse**) or of introducing purified water directly into transmission or distribution facilities (**direct potable reuse**). Utilizing surface water from new sources such as the Delta could increase the risk of introducing invasive species into Bay Area surface water reservoirs or potentially cause changes to existing treatment operations. These different types of issues will require careful evaluation of existing facility operations and potential changes to existing water quality monitoring approaches.


Crystal Springs Reservoir, 2019

Distribution of Alternative Water Supplies

Currently, the RWS supplies are relatively homogenous. That is, the RWS supplies are primarily surface water supplies distributed to customers throughout the service area. With the introduction of AWS Projects, specific tie-in locations of new supplies within the existing RWS system will determine the point at which new supplies would be introduced downstream (to the west) into the RWS and the resulting distribution to customers within the service area. This may result in different "supply portfolios" for different customers depending on their location within the SFPUC service area. While it is not possible to evenly distribute each supply source throughout the service area, the SFPUC, as part of its implementation of the AWS Program, will strive to achieve equitable distribution of supplies throughout the retail and wholesale service areas. **In planning, this means that there will need to be a conscious effort to ensure that both the increased reliability benefits that come with a more diverse water supply, and the physical distribution of new supplies, are as wide-ranging as practical across the service area.**

Institutional Issues Involving Multi-Party Partnership Projects

Implementing alternative water supply projects often involves complex partnerships with other public or private agencies. For example, purified water projects require a wastewater purveyor as a partner, and shared **storage projects** require agreements between reservoir operators and partners. Different agencies have different interests and priorities, which will shape how project agreements are developed. Project partnership agreements will require negotiations on cost and water supply allocations that could affect the SFPUC's share of water supply benefits. **While regional partnerships will be increasingly necessary to more efficiently distribute limited regional water supplies, they will require that the SFPUC approach the costs and value of these water supply investments differently from those of past water supply investments.** Historically, the SFPUC has invested largely in infrastructure that it has owned and operated. Capital investments and planning have emphasized the cost of building or enhancing assets rather than the ongoing expenditure needed to continue to operate and maintain them. In partnership projects, long-term contracts may emphasize responsibilities and costs of **operation & maintenance (O&M costs)** for assets that the SFPUC may not own. How the SFPUC values the water supply and reliability benefits associated with AWS Projects will drive how the SFPUC and its partners make investment decisions and how contracts and cost-share arrangements among parties are structured. Willingness, ability to pay, and available financing options for reliability during dry years may be different from traditional asset-based investments.

Affordability

Building large new capital infrastructure is expensive. In addition to capital costs, alternative water supplies also require development of operational capacity to manage and integrate new supplies. Project phasing is a strategy that is being included in Projects to both spread costs out over time, and to enable the SFPUC to continue to revisit planning projections and the anticipated water supply gap as they evolve before committing to additional project investments. AWS Projects may also be eligible for State and federal grant funds such as Title XVI grant funding from the U.S. Bureau of Reclamation. As planning continues at the project level, affordability remains a key programmatic challenge that has to be balanced with the need for additional supplies to improve dry year supply reliability. **Identifying creative financing solutions and approaches is an important next step in the development of the AWS Program in order to minimize the financial impact of AWS Project implementation to SFPUC customers, including it's the most vulnerable communities.**

Community Acceptance

Having diverse water supply sources improves water supply reliability. Therefore, the more water supply sources in a given part of the service area, the greater the water supply resilience in that area. However, it is not uncommon for customers to perceive that there are differences in water quality among different sources, which may impact what is considered equitable distribution of supplies. Community acceptance of varied water supplies will be important for the successful implementation of the AWS Program. For example, surface water supplies from the RWS have long been viewed as a high-quality source by SFPUC customers. While the SFPUC will maintain its high-quality standards across all supply sources, customers may not perceive alternate sources such as groundwater, transfer water, or purified water with the same regard despite those sources' meeting or exceeding the same regulatory standards and testing and monitoring requirements. **Community engagement through outreach and information sharing can help improve the deliverability of projects and distribution of supplies and will be a critical element of the AWS Program.**


WSIP Calaveras Dam Replacement Groundbreaking Ceremony, 2011

4.4.2 AWS Program Goal

The AWS Program is evaluating new projects that will address the projected future water supply gap for the SFPUC service area. The AWS Program goal was developed to align with the SFPUC's LOS Goals and Objectives. Based on the water supply gap identified in Chapter 3 (Future Water Supply Gap), there is specifically a need to address the reliability of the RWS supplies in dry years. These elements of the AWS Program are captured in the AWS Program goal. The goal defines what the AWS Program intends to achieve over the planning period.

> ***The goal of the AWS Program is to identify water supply projects that increase the dry-year reliability of RWS supplies and address the long-term water supply gap in alignment with the LOS Goals and Objectives.***

4.4.3 AWS Planning Principles

The AWS planning principles are intended to guide the identification of the AWS Projects and recommendations that advance the Program toward addressing its long-term goal, while accounting for known drivers and challenges. The planning principles, shown in Table 4-1, are written in a manner that is intended to be broad, durable, and applicable over the duration of the AWS planning period.

Successful implementation of the AWS Program requires a balance between securing future reliability and maintaining affordability, both of which are critical SFPUC goals. The AWS Program must focus on implementing water supply projects that will address long-term customer demands and obligations without over-building or overcommitting capital funding. By considering the different planning principles, AWS recommendations can be phased and prioritized to address the AWS Program goal in a balanced approach that accounts for the varying drivers and challenges. Often a project will consider many different planning principles, other times it will focus more singularly on one principle. But ultimately, by considering the principles throughout the planning process, the AWS Program recommendations will lead the SFPUC toward its long-term goal in a balanced manner without dictating a particular approach.

> ***AWS planning principles minimize the risk of overcommitting capital while ensuring that there are sufficient water supplies being developed to address the future water supply gap.***

Table 4-1: AWS Planning Principles

Planning Principle	Basis
Continue to assess opportunities to reduce water consumption	The SFPUC has a successful history of implementing aggressive conservation and demand management programs as the retail water service provider to San Francisco. These efforts have resulted in a per capita residential water consumption that is roughly half the statewide average. As the system operator of the RWS, the SFPUC recognizes the importance of conservation throughout the service area as an approach to reduce demand on the RWS. Conservation is a vital step that must be taken in conjunction with identifying alternative water supplies to ensure that the AWS Program provides long-term water resiliency while providing prudent and well-founded recommendations.
Plan for obligations and build for demands	Based on historical data and current projections, customers' actual water demands on the RWS tend to be lower than SFPUC's obligations. Still, the SFPUC's agreement to deliver water up to the amount of the Supply Assurance and the Wholesale Customers' ISGs is perpetual. In addition, the SFPUC has an obligation to provide the Retail Allocation of up to 81 mgd to Retail Customers if needed. Therefore, the AWS Program and Plan address water supplies needed to meet these obligations while prioritizing investments for meeting customer demands.
Diversify supplies	Diversifying water supply options through the use of groundwater, recycled water, desalinated water, and purified water is a long-standing objective of the SFPUC and is reflected in the LOS Goals and Objectives and other SFPUC policies such as OneWaterSF. This planning principle reinforces that diversification of supplies is central to the AWS Program and of particular importance given the long-term risks to surface water availability from factors such as potential future regulations and climate uncertainty.

Planning Principle	Basis
Maximize use of existing surface water supplies through optimizing system efficiency and operations	This planning principle recognizes that existing surface water supplies delivered through the RWS will continue to be an essential portion of the SFPUC's water supply for the foreseeable future. Continuing efforts to optimize system operations is a strategy to maintain supply and increase system resiliency.
Phase projects in a way that they can be scaled	This allows for informed decision-making that considers near-term water demands in relation to long-term goals, while minimizing the financial and operational risks of over-building or overcommitting financial resources.
Encourage partnerships that increase the reliability of water supplies throughout the service area	Planning for and implementing alternative water supplies requires consideration of different approaches from those used for traditional water supply planning at the SFPUC. This planning principle recognizes that these approaches often rely on multi-party partnerships that are needed for developing and integrating new supplies into the SFPUC water supply portfolio.
Ensure that AWS Program recommendations are consistent with the LOS Goals and Objectives and other existing SFPUC policies and standards	This planning principle recognizes that existing policies and standards set the basis for identifying the water supply gap and developing recommendations. As policies and standards change, the AWS Program would be updated to reflect how any changes impact assumptions around the water supply gap.
Update the AWS Plan so that it is responsive to changing conditions	This planning principle recognizes that the AWS Program requires a dynamic planning process that must be adaptive to changing conditions and challenges. The recommendations included in the AWS Plan must be reviewed periodically so that they continue to address the water supply gap as it is understood based on the most current conditions and changing drivers, and updated water demands on the RWS.

4.4.4 Purpose of the AWS Plan

The purpose of the AWS Plan is to:

- Identify the future water supply shortfall to meet obligations and demands through the 2045 planning period as they are currently understood
- Identify AWS Projects that can augment RWS supply
- Support the SFPUC Commission's decision-making by providing recommendations that will move the AWS Program forward, as well as other policy decisions

4.4.5 Strategies for Supporting Informed Decision-Making

For each of the proposed AWS Projects included in the AWS Plan, planning is in the early stages. **Large, complex water supply projects require a long lead time to fully develop and implement.** There is a need to progress systematically from planning to environmental review, and then to detailed design, permitting, and construction. During this time, it will be important to continually review and understand the status of different projects in relation to the current drivers, and the most up-to-date long-term water supply shortfall estimates. Doing so allows appropriate assessment of the next steps in developing the projects and helps the SFPUC make informed decisions about how to proceed with each project as more information is available.

Several of the AWS planning principles help decision making around AWS recommendations in a stepwise manner. Specifically, these principles include:

Update the AWS Plan so that it can be responsive to changing conditions. This includes setting a schedule for regular updates to the SFPUC Commission on overall program and project progress, as well as making specific updates to both water availability and customer demands that inform the water supply gap described in the Plan and making updates to project and programmatic recommendations. Ensuring these key elements of the Plan are updated on a regular basis will be a critical element to supporting decision-making and identifying key decision points on how to proceed with each project as they move from planning toward implementation.

For example, as discussed in Chapter 3 (Future Water Supply Gap), the driver with the most significant impact on water availability is the implementation of the Bay-Delta Plan Amendment. As currently proposed, the Bay-Delta Plan Amendment would reduce water availability by 93 mgd. However, the requirements of the Bay-Delta Plan Amendment are still under review as part of the Proposed Voluntary Agreement discussions and may change as a result of on-going negotiations between the SFPUC and the State. The results of these negotiations will impact water availability which will in turn impact future water supply gap estimates. Regular updates to the AWS Plan will be critical to ensure that the Plan recommendations are responsive to these, and other, changing conditions.

Phase projects in a way they can be scaled. This allows project recommendations to be phased to balance forward action and progress of project development, while minimizing the risk of overcommitting financial resources. Large new water supply projects will take years to fully plan and design before construction can begin. A phased approach allows for the planning and engineering activities associated with projects to progress in phases so that projects progress in a stepwise manner and in conjunction with the continual review and update of the drivers of the water supply gap.

Pilarcitos Reservoir, 2019

Calaveras Dam Replacement, 2012

Chapter 5: AWS Projects

This chapter describes the projects that have been identified under the AWS Program. Given the wide range and diverse nature of the projects, this chapter provides an overview of each AWS Project as it is currently understood to support decision making for the next steps of AWS Program development. A detailed discussion of programmatic and project recommendations is presented in Chapter 6 (AWS Recommendations).

As described in Chapter 4 (AWS Program Role in Addressing the Future Water Supply Gap), AWS Projects go beyond the supplies currently delivered through the RWS. The AWS Projects included in this chapter are intended to augment regional supply with new, alternative water supplies and have widespread benefit throughout the SFPUC service area. While it is understood that supply augmentation is just one part of long-term water supply planning along with conservation and implementation of local projects, this chapter does not include conservation actions or local water supply project options that would be pursued by the SFPUC in its role as the retail service provider for San Francisco, nor those local actions and projects that would be implemented by BAWSCA and the Wholesale Customers.

5.1 Characterization of AWS Projects

The SFPUC is pursuing a broad range of projects under the AWS Program. The projects are characterized by their type (supply, storage, conveyance), their supply availability (dry-year, all-year).

5.1.1 Type of Project and Water Supply

The projects included in the AWS Program are characterized as supply projects, storage projects, or conveyance projects. Supply projects are further characterized by the type of supply produced (surface water, purified water, groundwater, or recycled water).

Supply Projects

In the AWS Program, **supply projects** provide a new source of supply to the SFPUC service area. Currently the SFPUC service area is served with surface water supplies generated in the Tuolumne River watershed and from Bay Area watersheds. Adding new and different supply sources can not only help fill the water supply gap that is anticipated under future dry-year conditions, it can also diversify risks associated with relying on just a small number of water sources. The different water sources utilized by the AWS Projects include:

Surface Water - Surface water supply projects under the AWS Program utilize a surface water supply that is outside of the SFPUC's existing supplies (Tuolumne watershed and Bay Area watersheds). Surface water supplies may also include brackish water. Surface water supply projects would rely on a combination of transfers, storage, and conveyance to make the supply available within the SFPUC service area.

Purified Water – Purified water projects generate potable water through the advanced treatment of wastewater. Purified water can be made available to the SFPUC service area through indirect potable reuse (IPR) or direct potable reuse (DPR). IPR projects are those where purified water is blended in surface water reservoirs (referred to as **reservoir augmentation**) or injected into groundwater basins (**groundwater recharge**) before it is added to distribution facilities. Regulations for these processes have been in place in California as of 2018 and 2014, respectively. DPR projects are those where purified water is added directly to the distribution system. This may be done through **raw water augmentation**, which is the planned placement of purified water into a system of pipelines that deliver raw water to a drinking water treatment plant, or **treated water augmentation**, which is the planned placement of purified water into the water distribution system. Regulations for these types of projects are under development and are anticipated in December 2023, and likely to become effective by mid-2024. While it is very common for the terms IPR and DPR to be used in the water industry, the State regulations are based on the more specific treatment and delivery pathways of reservoir augmentation, groundwater recharge, raw water augmentation, and treated water augmentation.


San Francisco groundwater well, 2021

Groundwater – Groundwater can be utilized in a variety of ways. It can be used directly as a drinking water supply, and it can also be managed for storage and recovery in dry years. This **storage and recovery** approach is accomplished by offsetting groundwater use in normal or wet years with available surface water supplies or, in the case of non-potable use of groundwater, with alternatives supplies such as recycled water. The groundwater that is offset accumulates, or is stored, in the basin and then recovered for use as a potable supply in future dry years when surface water supplies are limited.

Recycled water – Recycled water is wastewater that is carefully treated to be safe for a variety of non-potable uses. The projects included in the AWS Program are aimed at increasing potable water supplies. Recycled water has a role in increasing potable water supplies when it can be used to offset potable water use, as described above in groundwater storage and recovery projects.

Storage Projects

With the growing uncertainties associated with precipitation and drought, storage forms a critical element of AWS planning. Due to extreme changes from severe weather patterns and their effect on the timing of water availability, it is important to have sufficient storage for making the water available for use in dry years. Planning for storage also needs to account for 1) water supply to fill and utilize the storage facility and 2) conveyance to ensure delivery of the water to customers. Thus, identifying and developing connectivity between the different water infrastructure elements from the source to the customer helps ensure reliable service delivery. Different types of storage options may include:

Surface water storage – Surface water storage includes expanding or building new reservoirs.


Calaveras Reservoir, 2008

Groundwater storage – Water supplies can also be stored below ground by sustainably managing groundwater aquifers as storage for future dry-year reliability. Storage can be realized by offsetting use of groundwater and thus preserving it by utilizing alternative water supplies (through storage and recovery projects, as described above) and also by percolation or injection of water supply into the aquifer for future recovery.

Conveyance Projects

Conveyance facilities connect existing or new facilities and enable deliveries of water. Conveyance projects may include making improvements to or increasing capacities of existing transmission facilities or building new tie-ins or connections between existing facilities. In addition to evaluating options for building new infrastructure as needed, the AWS Program actively considers how it may utilize existing facilities that are part of the RWS and those that are owned by other agencies that may allow for efficient and cost-effective connections and deliveries. The AWS Program continues to assess existing RWS facilities for their potential for managing new supplies.

5.1.2 Supply Availability

As discussed in Chapter 3 (Future Water Supply Gap), the AWS Program has identified a significant water supply shortfall in dry years to meet 2045 demands and existing and potential obligations. As such, the focus of the AWS Plan is to identify supplies that can meet this dry-year need. Projects with different supply availability can help fill this need in different ways.

Projects that provide dry-year supply – For these projects, supplies are available only in dry years due to the type of supply available and/or the project operations. For example, storage projects may store excess surface water in reservoirs that is then available during dry years. Groundwater storage and recovery projects operate in a similar way where groundwater is allowed to accumulate in aquifers during wet periods, and then is pumped during dry periods. These types of projects are part of an important strategy in the AWS Program to augment regional supplies and improve the reliability of the RWS in dry years.

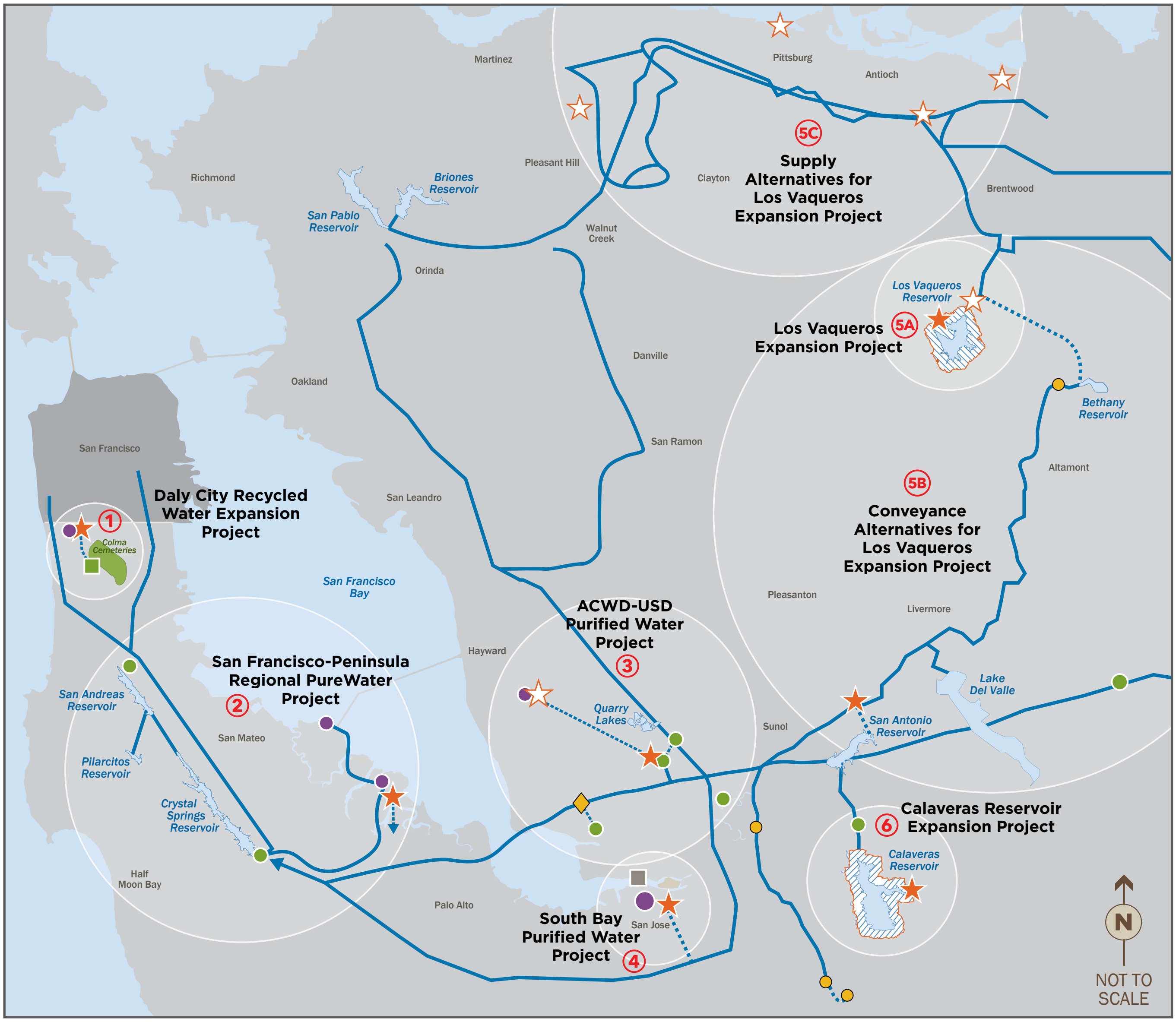
Projects that provide supplies in all years – These projects produce water in both dry years and wet/normal years. For example, purified water projects produce drinking water by taking water that has been recycled from wastewater and putting it through advanced treatment and membrane filtration processes so that it is safe to drink and meets the required health and safety standards. Because the supply is not dependent on rainfall or snowmelt, it is available in all year types. Typically, these types of membrane-based treatment projects must be operated continuously because of the sensitivity of the membranes; therefore, they provide a purified water supply regardless of need, which can create complications for storage or conveyance capacity during wet or normal periods when the RWS storage and conveyance facilities are typically at capacity with surface water supplies. So, while these projects are desirable in their ability to produce a drought-proof supply, they do have operational tradeoffs related to storage and conveyance which must be resolved to optimize their overall water supply benefit.

5.2 Overview of AWS Projects

The AWS Program has identified six projects that can address the future water supply gap. Figure 5-1 shows the general location of the AWS Projects. Of the six AWS Projects, one has three interlinked components associated with the expansion of Los Vaqueros Reservoir: storage, conveyance, and supply. These components are broken out in order to characterize the considerations and attributes of each component and are described separately as projects 5A, 5B, and 5C, respectively.

Table 5-1 provides key attributes for each of the AWS Projects, including SFPUC supply assumed for each project, estimated online date, and capital cost estimates. Each of these attributes are described further in Section 5.2.1 though Section 5.2.3. Section 5.3 provides a Project Description Table for each of the six AWS Projects.

Figure 5-1: Map of AWS Project Locations



LEGEND *All locations and sizes shown are approximate and represent the general vicinity for potential facilities. Shaded circles serve to indicate project facilities associated with each project; they do not indicate project size or volume of water produced.*

- Existing Pipeline
- Potential/Proposed Pipeline
- Potential/Proposed Project Facility
- Alternate Potential/Proposed Project Facility
- Water Treatment
- Water Storage
- Potential New Outfall
- Wastewater Treatment
- Intertie
- Turnout

1. **Daly City Recycled Water Expansion Project**
2. **San Francisco-Peninsula Regional PureWater Project**
3. **ACWD-USD Purified Water Project**
4. **South Bay Purified Water Project**

5A **Los Vaqueros Expansion Project**

5B **Conveyance Alternatives for Los Vaqueros Expansion Project**

5C **Supply Alternatives for Los Vaqueros Expansion Project**

6. **Calaveras Reservoir Expansion Project**

Table 5-1: AWS Project Summary Table

Regional AWS Project	How Project Augments RWS Dry-Year Supply	Status and Cost Estimate Classifications*	SFPUC Supply Assumed (mgd)	Estimated Online Date
RECYCLED WATER / GROUNDWATER				
1. Daly City Recycled Water Expansion	Recycled water is produced for irrigation customers, replacing groundwater pumping. In-lieu groundwater recharge will result in stored drinking water for dry years.	Design Class 3	0.7	2030
PURIFIED WATER (POTABLE REUSE)				
2. San Francisco -Peninsula Regional PureWater	Treated wastewater effluent from the City of San Mateo and Silicon Valley Clean Water can be treated to drinking water standards at a new advanced water treatment plant. A new conveyance pipeline and pump stations would deliver purified water to Crystal Springs Reservoir where it would blend with other RWS supplies. Water can be available in all years, including in dry years.	Planning Class 5	6	2039
3. ACWD-USD Purified Water	Treated wastewater effluent from Union Sanitary District can be treated to drinking water standards at a new advanced water treatment plant. A new pipeline would deliver purified water to Alameda County Water District's groundwater basin for recharge. Water can be extracted and treated again for use in dry years.	Planning Class 5	5.4	2039
4. South Bay Purified Water	Treated wastewater effluent from the Regional Wastewater Facility in San Jose can be treated to drinking water standards at a new advanced water treatment plant. The new supply would be treated in accordance with new anticipated DPR for distribution. New storage, conveyance, and pumping are included in the costs. While the project may produce water in all years for the region, the RWS is only expected to receive water in dry years.	Planning Class 5	3.5	2038

* Cost Estimate Classifications are based on generally-accepted standards of project cost estimating, used to classify the degree of project definition and maturity. This system has five classes, Class 5 being the least defined and Class 1 being the most definitive.

Project Capacity		Total Capital Costs ($ mil)		Estimated Capital Cost per Acre-Foot ($/af)	Considerations for Future Cost Estimating
mgd	acre-feet per year	Escalated	2023 $		
0.7	784	$120	$99	$4,203	• Recycled water produced is 1.06 mgd and equivalent modeled storage benefit in groundwater basin is 0.7 mgd, which represents 100% of the cost and benefit here • Total capital costs include treatment, conveyance, and storage, escalated to the mid-point of construction • No sharing of benefits among partners or cost-share determined at this time, though it is anticipated
12	13,440	$1,168	$753	$1,868	• Project includes two phases with half the water coming from each of two wastewater treatment plants • No water supply sharing has been determined among partners, but SFPUC assumes 50% supply for planning • Total capital costs include treatment, conveyance and pumping, escalated to the mid-point of construction
5.4	6,048	$1,301	$824	$4,541	• Feasibility study evaluated two distinct phases; however, the characteristics of each phase are very different and will require additional evaluation. It is unlikely that Phase 2 would be online by 2045 • Only Phase 1 was assumed for cost and water supply estimating (includes treatment and conveyance); total capital costs are escalated to mid-point of construction • 100% of the water supply attributed to the SFPUC for planning purposes
10	11,200	$658	$425	$1,264	• Project capacity of 10 mgd includes 6.5 mgd that would be delivered to San Jose and Santa Clara in all years • The SFPUC's water supply is assumed to be 3.5 mgd in dry years only • Total capital costs include treatment, storage, conveyance, and pumping for 10-mgd project • Total capital costs are escalated to the mid-point of construction

Table 5-1: AWS Project Summary Table (continued)

Regional AWS Project	How Project Augments RWS Dry-Year Supply	Status and Cost Estimate Classifications*	SFPUC Supply Assumed (mgd)	Estimated Online Date
STORAGE WITH CONVEYANCE (AND SUPPLY, AS NEEDED)				
5A. Los Vaqueros Expansion + 5B. Conveyance Alternatives + 5C. Supply Alternatives (Transfers)	This project option reflects the cost of securing the SFPUC's portion of the project (40,000 acre-feet of storage), the associated cost of conveyance infrastructure to deliver water to the RWS, and purchase of transfer water to fill storage, which is accounted here as part of capital costs.	Design Storage, Class 2 Conveyance and Supply, Class 5	3.9	2030
OR				
5A. Los Vaqueros Expansion + 5B. Conveyance Alternatives + 5C. Supply Alternatives (Desalination)	This project option reflects the cost of securing the SFPUC's portion of the project (40,000 acre-feet of storage) and a new brackish water treatment or similar water supply project that would deliver water to an expanded Los Vaqueros Reservoir through an exchange with Contra Costa Water District. Storage and conveyance components of the project would remain the same as with the transfer supply alternative.	Design Storage, Class 2 Conveyance and Supply, Class 5	3.9	2040
6. Calaveras Reservoir Expansion (Large)	This project option represents the largest Calaveras Dam raise studied, which would raise Calaveras Dam by 890 feet and provide over 290,000 acre-feet of additional storage. It is paired with a large conveyance alternative that requires new infrastructure (new Calaveras Pipeline and Calaveras Pump Station) but also relies on increasing flow through the existing Tesla Treatment Facility. Water would be stored in wet years to augment RWS dry-year supplies.	Planning Class 5	28.6	2039
OR				
6. Calaveras Reservoir Expansion (Small)	This project option represents the smallest Calaveras Dam raise studied, which would raise Calaveras Dam by 771 feet and provide over 22,000 acre-feet of additional storage. It is paired with a small conveyance alternative that requires limited infrastructure. Water would be stored in wet years to augment RWS dry-year supplies.	Planning Class 5	2.7	2035

* Cost Estimate Classifications are based on generally-accepted standards of project cost estimating, used to classify the degree of project definition and maturity. This system has five classes, Class 5 being the least defined and Class 1 being the most definitive.

Project Capacity		Total Capital Costs ($ mil)		Estimated Capital Cost per Acre-Foot ($/af)	Considerations for Future Cost Estimating
mgd	acre-feet per year	Escalated	2023 $		
3.9	4,416	$286	$225	$1,700	• Costs based on SFPUC purchase of 40,000 acre-feet of storage, not total reservoir expansion for regional benefit • Water supply estimate based on drawing down from a full reservoir and taking delivery over 7½ years of the design drought • Evaporative losses of 8% and 10% conveyance losses are assumed • No grant or loan offets included in capital cost calculations • Capital cost includes estimate for upsizing existing turnout from South Bay Aqueduct to San Antonio Reservoir and purchase of water transfers with no new infrastructure
3.9	4,416	$792	$533	$4,027	• Several new supply alteranatives are under consideration, in the event that long-term transfers are not available. Brackish water desalination is included with storage and conveyance capital costs here for illustrative purposes; no decisions have been made on the long-term source of supply for LVE • Capital cost estimates for LVE with transfers as a supply and LVE with brackish water desalination as a supply are not additive, but two alternative cost scenarios for the same project assuming two different supply scenarios
28.6	32,045	$6,011	$3,807	$3,960	• This project assumes the highest dam raise scenario and a representative conveyance alternative from the project feasibility study • As with the small Calaveras Dam raise alternative, this project assumes that the reservoir is full at the start of a drought sequence and delivered over 7½ years of a design drought sequence • The water supply estimate assumes 8% evaporative losses and an additional 10% conveyance loss • Total capital costs are escalated to mid-point of construction • No water supply cost is assumed for this project
2.7	2,970	$346	$252	$2,831	• This project assumes the lowest dam raise scenario and smallest conveyance alternative evaluated in the project feasibility study • As with the large Calaveras Dam raise alternative, this project assumes that the reservoir is full at the start of a drought sequence and delivered over 7½ years of a design drought sequence • The water supply estimate assumes 8% evaporative losses and an additional 10% conveyance loss • Total capital costs are escalated to mid-point of construction • No water supply cost is assumed for this project

5.2.1 RWS Supply Assumed and Project Capacity

The goal of the AWS Program is to increase the dry-year reliability of RWS supplies by addressing the water supply gap. The SFPUC regional water supply assumed for each AWS Project is the volume of water that would be produced in an average dry year of the design drought. For purified water projects that are operated in all years, the SFPUC's share of the project capacity can be delivered in each year of a drought. Storage projects, however, typically build up in wet/normal years and then are assumed to be delivered over the course of the design drought. As a drought is not generally declared at least until the second consecutive dry year, the total volume of storage is divided by 7½ to represent average annual availability to the SFPUC. Furthermore, because of the nature of operation of storage projects, combined evaporative and conveyance losses of 18% are assumed in the calculation of supply assumed.

Some AWS Projects may have a larger project capacity that accounts for additional water that would be produced by the project for local use by one or more project partners but not contribute to RWS supplies, or accounts for future phases of the project that are not assumed as part of current AWS planning efforts. For AWS Projects in the early planning stages, the assumed water supply produced by the project is estimated, sometimes with a range, and the assumed supply estimates will be refined as project planning proceeds.

5.2.2 AWS Staffing Considerations

Staffing for the AWS Program supports programmatic development as well as AWS Project planning, implementation, and integration with RWS operations.

WSIP project construction, 2015

Project Staffing - Staffing needs for the operation of AWS Projects have been identified at a planning level, and the timing for bringing on project staff is closely associated with the dates that projects are expected to be online. Depending on the roles and responsibilities of project partners, the need to hire staff may vary. Estimated project staffing needs to support implementation are identified in the Project Descriptions Tables that are included in Section 5.3. Where additional staff may be needed to support projects prior to implementation for planning, such as to support purified water planning in the retail service area, those specific staffing recommendations are included in Chapter 6 (AWS Recommendations). No additional staff requests are anticipated for project planning associated with the AWS Projects described in this chapter.

Programmatic Staffing - Programmatic staffing needs are required to ensure that the SFPUC has appropriate expertise to develop and implement key strategic areas of the AWS Program. These programmatic staffing needs are not specific to any one project but rather address three strategic areas: operations, purified water, and finance. Operations expertise is needed to develop approaches for integrating new supplies into the RWS. Purified water expertise is needed to ensure that the SFPUC has the specialized skills to oversee the development of purified water projects that have emerging technological and regulatory requirements and focused community engagement needs. Finance support will consider issues such as affordability and grant funding, as well as partnership cost sharing opportunities. Programmatic staffing recommendations identified for the current phase of program are outlined in Chapter 6 (AWS Recommendations).

5.2.3 AWS Cost Considerations

The cost estimates and associated estimate classifications for AWS Projects were presented previously in **Table 5-1**. The associated costs for each AWS Project, with the exception of Los Vaqueros Expansion Project and the Daly City Recycled Water Expansion Project are preliminary Class 5 Level cost estimates. Class 5 Level cost estimates may vary by -50% to +100% as these are developed during the early planning phases of a project.[1] As each AWS Project is further defined, and cost components are refined, confidence in the cost estimates will increase. Planning and design for the Los Vaqueros Expansion Project is near complete and it is classified as a Class 2 Level cost estimate. The Daly City Recycled Water Expansion Project has 30% design completed, and its costs are refined to the Class 3 Level. For a detailed description of the classifications, see **Appendix C**.

The costs presented in **Table 5-1** represent capital costs only, and do not include O&M costs or any offsets from grants or alternate financing. The total capital costs are presented in real dollar terms, escalated to the mid-point of construction, and adjusted to current 2023 dollars. The unit costs are expressed in current dollar terms, over the total capacity of a project over a 30-year period to match an assumed financing period. As described in Section 5.2.1, the volume of supply assumed for each project to calculate unit costs is generally the full capacity of a project, not only the SFPUC's assumed supply share, reflecting the fact that operations and final project benefits have not yet been determined for most projects. Additionally, storage projects are assumed to incur 8% evaporative losses, 10% conveyance losses, and then deliveries are averaged over 7½ years of an 8½-year design drought, assuming that there is no knowledge of a drought in the first year. This methodology is consistent with the water supply modeling for the RGSR project, which is an underground storage project operating in dry years currently under construction.

1 This Plan uses the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System Level 1-5 definitions, as described further in Appendix C.

Lastly, note that the costs presented in this table may differ from feasibility study estimates due to contingencies and escalation adjusted to match SFPUC's prior WSIP projects. The inconsistencies between different methodologies used by different consultants have been corrected for in this AWS Plan. As cost-share and financing are determined for projects, costs will continue to evolve and cost modeling is part of an ongoing process in the planning of the AWS Program. The costs presented in this Plan are preliminary and conservative, and represent a snapshot in the early planning process.

While some planning funds have been included in the current capital plan (described for each AWS Project in Section 5.3), the recommendations and associated costs in this Plan are for additional funds not already included in the capital plan, financial plan, or rates projections. A staff recommendation on whether and to what extent to move forward on these AWS Project and programmatic recommendations will be refined during the regular biennial budget process and brought to the SFPUC Commission for approval as part of that process. Including these recommendations without deprioritizing other projects would likely mean an increase in the capital plan and rates.

Recycled water pipeline installation, 2019

Rate Impacts

The AWS team, in coordination with Finance, evaluated the FY 2033 cumulative financial impact of implementing the recommendations in this AWS Plan on customers served by the SFPUC. The recommendations presented in Chapter 6 (AWS Recommendation) include construction and initial O&M costs for two AWS Projects (Los Vaqueros Expansion and Daly City Recycled Water Expansion), planning through environmental review and 30% design for the remaining four AWS Projects, and staffing of three program staff in strategic areas (operational integration, funding and affordability, and purified water) to support the AWS Program. In aggregate, these recommendations would result in a new funding request of up to $209 million within the 10-year period. Conservatively, this new funding request was modelled as completely cash-funded, representing the full cost of these AWS Project and programmatic recommendations for the next 10 years; they do not include any retail-only project recommendations. Based on this scenario, the AWS recommendations could result in an increase in retail rates by 0.9% and wholesale rates by 7.6% above those projected in the baseline 10-year rate projection without the AWS Projects.

It should be noted that this rate assessment is only to provide a planning level understanding of the impact from the recommendations of this AWS Plan and is intended to be illustrative. It is subject to change as more information becomes available. Several factors need to be accounted for such as the addition of any projects beyond the near-term ones recommended in this Plan; O&M costs for all projects; any changes that might occur in project feasibility including partnerships involved; as well as costs of potentially financing the recommended projects with debt, which would cause the rate impact to be different and extend past the 10-year period.

> ***AWS staff will continue to work with Finance to balance capital planning and financial planning objectives with respect to development of the AWS Program and the associated impacts to rates and affordability.***

5.3 Project Description Tables

The Project Description Tables that follow in this section provide an overview of the key attributes of each of the AWS Projects as they are understood based on their current status and the planning work completed to date. Each Project Description Table includes:

Overview of the Project – The overview provides a project description, location map, and summary of the anticipated new infrastructure needs for the project.

Water Supply Availability and Distribution – This section of the table describes the amount of water supply benefit to the RWS, the availability of the supply (dry-year or all-year availability), and a general description of how supply would be realized or distributed within the SFPUC service area.

Project Partners and Interests – As discussed in Chapter 4 (AWS Program Role in Addressing the Water Supply Gap), partnerships are an essential component of most AWS Projects and different partners may have different motivations and interests for participating in a project. Each project table provides a diagram of the different project partners and their interests.

Institutional Complexity and Considerations – Many of the AWS Projects must address certain institutional challenges. Multi-party partnership projects typically have complex institutional issues such as ownership, cost share, and governance; but other institutional challenges for alternative supply projects may include regulatory requirements and community acceptance.

Operational Considerations – There are a multitude of operational considerations when adding supplies to the RWS, as described in Chapter 4 (AWS Program Role in Addressing the Future Water Supply Gap). The project summary table provides an overview of some of the larger operational issues that have been identified to date for each of the AWS Projects.

Staffing and Workforce Development – The table summarizes some of the SFPUC staffing needs that could result if the project were to be implemented.

Status of Environmental Review – This section summarizes the status of the environmental review of the project.

Project Alternatives – This section summarizes alternatives that have been considered as part of the project development.

Pros and Cons - A summary of project benefits and considerations.

Cost and Schedule – An overview of the current cost estimates and a summary schedule are provided for each project.

Information to Support SFPUC Commission Actions – The table summarizes project recommendations, key milestones and decisions, and upcoming project activities.

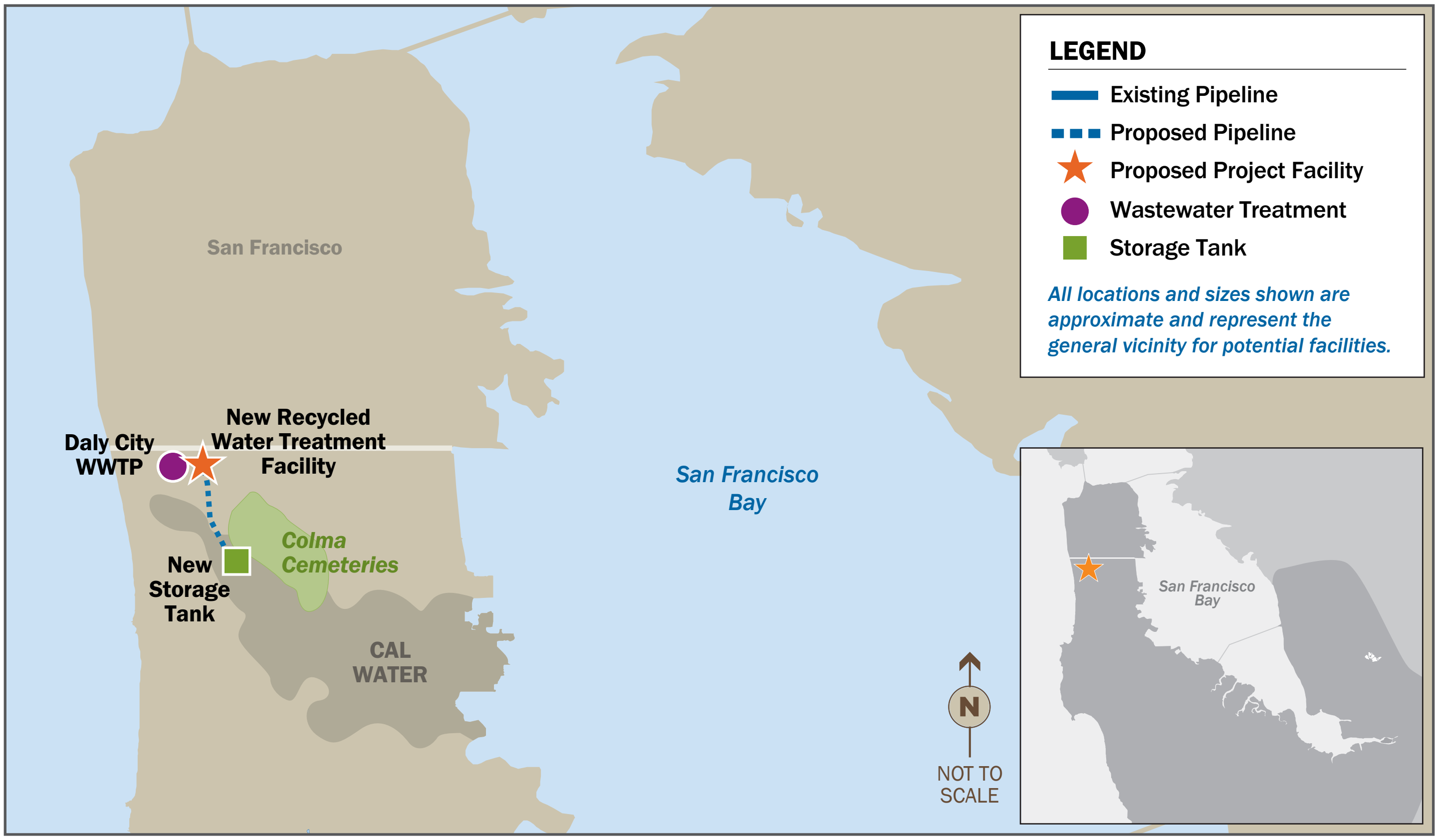
1. Daly City Recycled Water Expansion

PROJECT DESCRIPTION

This project produces recycled water for delivery to irrigation customers in the Town of Colma and Daly City. This supply will replace the irrigation customers' groundwater pumping from the South Westside Basin and result in an additional 0.7 mgd of groundwater available for dry-year supply; therefore, this project also supports the SFPUC's Regional Groundwater Storage and Recovery (RGSR) Project.

The project is envisioned to serve 7 cemeteries and other smaller irrigation customers with new recycled water supply. The project is a regional partnership between the SFPUC and two of the SFPUC's Wholesale Customers –Daly City and the California Water Service Company (Cal Water) – in coordination with the Town of Colma and the irrigation customers who are located largely within Cal Water's service area. As a private water utility, Cal Water's participation in the project is subject to approval by the California Public Utilities Commission. SFPUC customers will benefit from the increased reliability of the South Westside Basin for additional drinking water supply during droughts.

PROJECT LOCATION The project facilities would be located in San Mateo County. Treatment would occur at the Daly City Wastewater Treatment Plant (WWTP). Water would be conveyed to storage and distributed to customers in the Town of Colma.



NEW INFRASTRUCTURE NEEDS

- Tertiary recycled water treatment facility co-located at the Daly City WWTP.
- Recycled water pipeline from the new treatment building to the new storage tank.
- Storage tank at or near Holy Cross Cemetery.
- Pipeline or connections with the distribution systems in Daly City and Cal Water service area (Colma).

1. Daly City Recycled Water Expansion - *continued*

WATER SUPPLY AVAILABILITY & DISTRIBUTION

The project would generate recycled water that primarily meets the non-potable demands of users over a 7-month irrigation period each year. This supply would offset existing groundwater pumping by Colma cemeteries from the South Westside Groundwater Basin. The groundwater would thus remain in storage in the basin for dry-year use, modeled to be 0.7 mgd on average. The new recycled water supply may also be made available for additional customers and replace some potable water used for irrigation (currently estimated to be 0.05 mgd of the total).

PROJECT AT A GLANCE

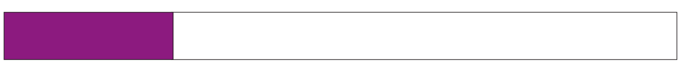
Supply Type	Recycled Water
SFPUC Regional Supply Assumed	0.7 mgd (groundwater stored)
Project Capacity	0.7 mgd (recycled water produced
Earliest Service Date	2030
Estimated Capital Cost per Acre-Foot	$4,203
Current Status	Design

PROJECT PARTNERS & INTERESTS

SFPUC	DALY CITY (SANITATION DISTRICT)	CAL WATER
Increase drought supply reliability	Reduce ocean discharges	Develop local supplies

INSTITUTIONAL COMPLEXITY

SFPUC only



Multi-Party Partnership

Institutional complexity is a relative measure that takes into account project service area, project facilities ownership, number of project partners, cost share, and whether SFPUC is construction and design lead.

INSTITUTIONAL CONSIDERATIONS

The project has been planned as a regional partnership between the SFPUC, Daly City, and Cal Water, in coordination with the Town of Colma and the irrigation customers who are located largely within Cal Water's service area.

Each project partner, as a user of the South Westside Groundwater Basin, has a vested interest in ensuring its sustainability and reliability in dry years. However, each partner has individual constraints and priorities that will impact partner agreements. Additionally, agreements between project partners and each cemetery will vary in institutional complexity, level of interest, and ability to implement. Planning-level discussions indicate support for the project by partners and customers; however, agreements will depend on agreement on costs and allocation of project benefits.

OPERATIONAL CONSIDERATIONS

Recycled water treatment needed for the project would be through a new treatment process co-located with Daly City's existing WWTP, staffed and operated by Daly City. The project would be operated during the irrigation season (April through November) in all (wet, normal, and dry) years. For planning purposes, it is anticipated that recycled water would not be produced during the wet season. This is consistent with Daly City's current recycled water treatment operations.

The majority of potential irrigation customers for this project are located within Cal Water's service area, in the Town of Colma. The distribution of recycled water could be led by Cal Water or the SFPUC, or through a new administrative structure for the governance of this project. Operational agreements will depend on the structure and allocation of benefits for the project.

STAFFING & WORKFORCE DEVELOPMENT

The project will need up to three new staff for operation and maintenance. Any specific staffing needs for the SFPUC will be determined once the partner roles and responsibilities are established, as outlined under Operational Considerations. No SFPUC staffing needs are identified at this time.

STATUS OF ENVIRONMENTAL REVIEW

Environmental impacts and mitigation associated with the construction and operation of the project were described in the Initial Study/ Mitigated Negative Declaration prepared under the California Environmental Quality Act (CEQA) by Daly City in 2017. Environmental review may be required for new components not previously covered under the CEQA document.

PROJECT ALTERNATIVES

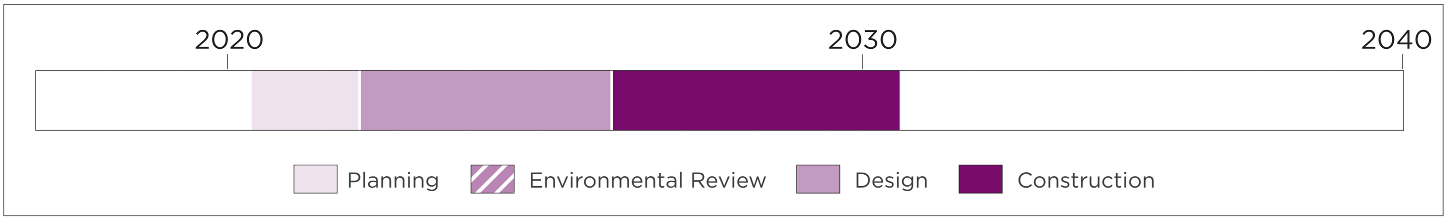
A second project configuration that was considered involved production of purified water that could be injected directly into the groundwater basin. However, there is insufficient space for the additional treatment requirements for purified water at the Daly City site. Furthermore, siting and operating injection wells in the groundwater basin is not feasible at this time. This may be a future opportunity if space and operational needs can be addressed.

+ PROS	- CONS
Dry-year supply reliability. By offsetting groundwater pumping, the project helps increase available dry-year storage in the Westside Groundwater Basin.	**Cost sensitivity of customers.** Groundwater pumping costs are low relative to the cost of producing recycled water, and the potential recycled water customers cannot absorb significant cost increases.
Right water for the right use. The project replaces potable groundwater supplies with reliable non-potable recycled water supply for irrigation in Colma and Daly City.	**Institutional complexity with partners.** The allocation of benefits and costs among the partner agencies will require agreement before project design can proceed.
Reduced wastewater discharges. The project would provide beneficial reuse for wastewater that would otherwise likely be discharged to the ocean.	

COST

The total capital cost for this project is estimated to be $120 million, or the equivalent of $99 million in 2023 dollars. Appropriated and budgeted funds in the current Capital Improvement Plan (CIP) total $16.2 million through 2026. Additional capital funding of up to $104 million would be needed to construct the project, notwithstanding any cost-share that has yet to be determined. Additionally, O&M costs are estimated to be $12 million within the next 10-year period.

CURRENT STATUS & SCHEDULE



INFORMATION TO SUPPORT SFPUC COMMISSION ACTIONS

PROJECT RECOMMENDATION

- Proceed with planning and coordination.
- Continue developing agreement terms with partners and potential customers and work with Capital Planning and Finance teams to propose funding for capital costs of up to $104 million and O&M costs of $12 million through the biennial CIP budget development process, subject to SFPUC's capital investment and financial sustainability priorities.

KEY MILESTONES/DECISIONS

- Irrigation customers (cemeteries) must agree to use the recycled water produced for this project to proceed.
- Establish construction, O&M and cost-share agreements between the SFPUC and Cal Water before proceeding with project design.
- *Risk of not meeting milestones:* If agreements are not in place, the project cannot move forward and neither the new recycled water supply nor the 0.7 mgd of groundwater supply stored for dry-year use will be realized.

UPCOMING PROJECT ACTIVITIES

- Determine cost- and benefit-sharing with Cal Water and Daly City and work on establishing agreement with project partners on allocation of benefits and apportionment of costs.
- Develop cost proposal for cemeteries and come to agreement on term sheets and cemeteries by 2024.

2. San Francisco-Peninsula Regional PureWater

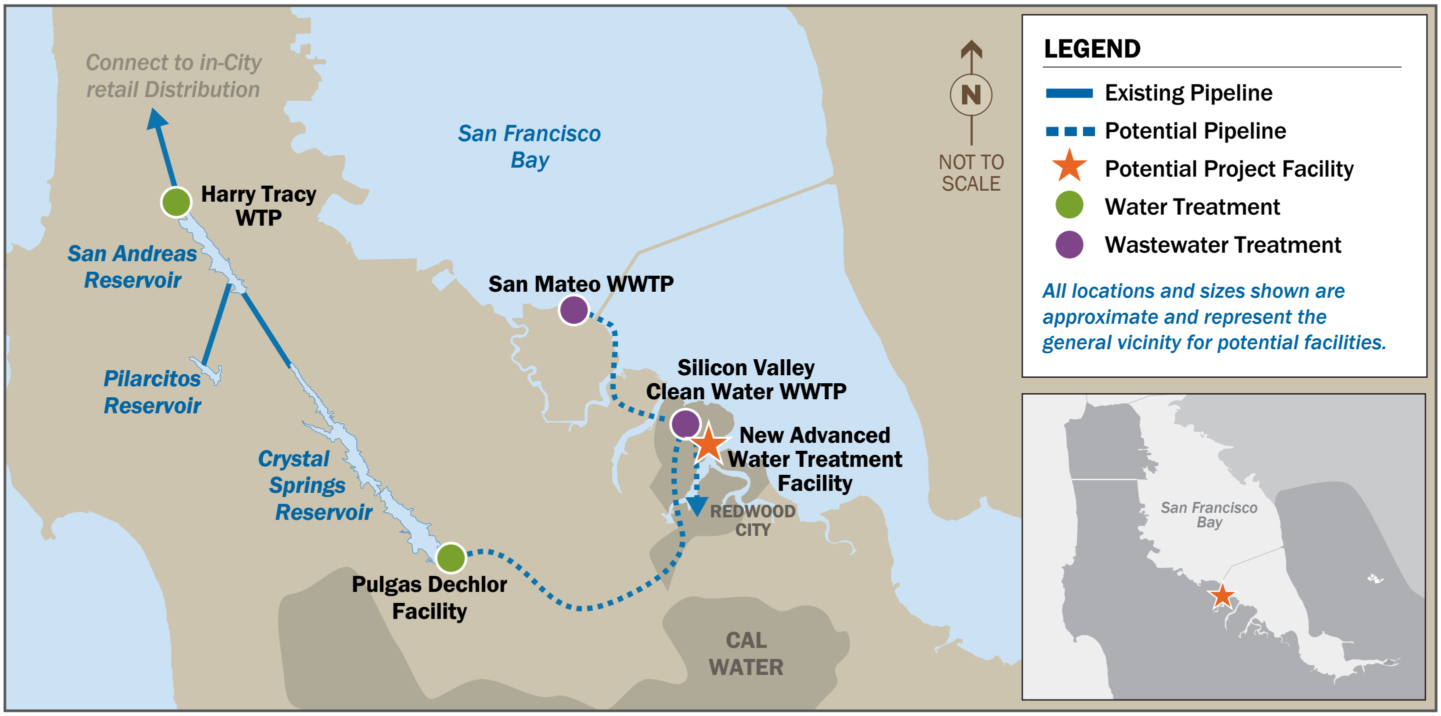
PROJECT DESCRIPTION

The San Francisco-Peninsula Regional PureWater Project (SPRP), formerly known as the Crystal Springs Purified Water Project, would generate up to 12 mgd of purified water. This project would convey treated wastewater from Silicon Valley Clean Water (SVCW) and the City of San Mateo to a new advanced water treatment facility (AWTF) to produce purified water that meets State and federal drinking water quality standards.

There are currently two project alternatives. The first would likely be implemented in two phases. In Phase 1, the project would produce up to 8 mgd of purified water, which would be conveyed to the SFPUC's Crystal Springs Reservoir where it would be blended with regional surface water supplies and then treated again at the SFPUC's Harry Tracy Water Treatment Plant (WTP). In Phase 2, up to an additional 4 mgd of purified water would be produced and further treated at the advanced water treatment plant and then added directly to the distribution systems of other project partners in the region, who are SFPUC Wholesale Customers, through treated water augmentation. The second alternative to this two-phase concept is a single-phased project producing up to 12 mgd of purified water that can all be added directly to the RWS through treated water augmentation.

PROJECT LOCATION

The project facilities would be located in San Mateo County. Treatment would occur at facilities adjacent to existing Silicon Valley Clean Water facilities and purified water would be conveyed to Crystal Springs Reservoir and/or directly to Wholesale Customers' distribution systems on the Peninsula or the RWS transmission system.



NEW INFRASTRUCTURE NEEDS

- New AWTF (needed for all alternatives).
- Raw water pipeline: SVCW and/or San Mateo wastewater treatment plants to the new AWTF (all alternatives).
- Purified water pipeline: AWTF to Pulgas Dechloramination Facility (Alternative 1, Phase 1).
- Modifications to Pulgas Dechloramination Facility within the existing building (Alternative 1, Phase 1).
- Pipeline or a connection/ turnout between the AWTF to the distribution systems in the region (Alternative 1, Phase 2 and Alternative 2).

2. San Francisco-Peninsula Regional PureWater - *continued*

WATER SUPPLY AVAILABILITY & DISTRIBUTION

In the first alternative, the project is anticipated to provide dry-year water supply of up to 8 mgd in Phase 1 and up to an additional 4 mgd in Phase 2 for a total of 12 mgd (13,440 acre-foot per year (AFY)). A second alternative for this project would provide 12 mgd (13,440 AFY) directly to the RWS transmission system with no phasing. Under both alternatives the project will provide a new drought-resistant water supply.

Under Alternative 1 in the first phase, the project would connect with the RWS through the Crystal Springs Reservoir. Water from the Crystal Springs Reservoir would be distributed for further treatment to 1) Coastside County Water District, and 2) Harry Tracy WTP. From Harry Tracy WTP, treated water would be distributed to San Francisco (75%) and Peninsula (25%) customers. In the second phase of Alternative 1, purified water would be blended with supplies directly in the distribution systems of partner agencies including Redwood City and Cal Water. Alternative 2 for this project envisions the production and distribution of 12 mgd of purified water directly into the RWS transmission system.

PROJECT AT A GLANCE

Supply Type	Purified Water
SFPUC Supply Assumed	6 mgd
Project Capacity	12 mgd
Earliest Service Date	2039
Estimated Capital Cost per Acre-Foot	$1,868
Current Status	Planning

PROJECT PARTNERS & INTERESTS

SFPUC	SVCW CITY OF SAN MATEO	CAL WATER	BAWSCA REDWOOD CITY MID-PENINSULA WD
Increase dry-year supply or supply for San Jose / Santa Clara	Reduce Bay discharges	Develop local supplies	Increase dry-year supply

INSTITUTIONAL COMPLEXITY

SFPUC only

Multi-Party Partnership

Institutional complexity is a relative measure that takes into account project service area, project facilities ownership, number of project partners, cost share, and whether SFPUC is construction and design lead.

INSTITUTIONAL CONSIDERATIONS

The SFPUC is partnering with multiple agencies on this project, including some of its Wholesale Customers. Water supply benefits from the project would be subject to sharing among the partners proportionately, which remain to be determined. For planning purposes, it is assumed that the SFPUC RWS would receive approximately 50% of the water supply from the project. The SFPUC would be the Lead Agency for environmental review, and since the project would deliver water directly to the RWS, the SFPUC would likely take an active ownership and operational role in the project implementation.

OPERATIONAL CONSIDERATIONS

SFPUC Operations - Water Quality

A critical consideration for storing purified water in Crystal Springs Reservoir would be the nutrient load of the new supply. To meet nutrient levels in the reservoir, the purified water would potentially need additional treatment, possibly breakpoint chlorination. Before being discharged to the reservoir, the water would undergo dechloramination at the Pulgas facility, with frequency dependent on storage time. Water quality would be tested and monitored in compliance with reservoir augmentation regulations. After meeting retention time requirements in the reservoir, the water would then be conveyed through the Harry Tracy WTP.

SFPUC Operations - Storage & Water Conveyance

Typically, the SFPUC's operating strategy in the summer would be to rely primarily upon water originating from Hetch Hetchy Reservoir and minimize drawing from local reservoirs. With the implementation of the Bay-Delta Plan Amendment and the associated shortfall in the dry-year water supply, it is anticipated that Crystal Springs Reservoir will provide the storage capacity required for purified water produced as an alternative water supply, especially during the dry periods. Operating the SPRP project in wet months – at a maximum of 50% capacity – would generate 4 to 6 mgd of purified water. At the end of summer, typically, storage levels at the reservoir would be reviewed to determine what adjustments need to be made to allow sufficient capacity to receive local rainy season runoff. Consistent with current operations, the storage levels would help determine the flow rate of the incoming purified water.

In the event that Crystal Springs Reservoir levels cannot accommodate additional water from the SPRP project, surface water from the Alameda watershed would be stored in Calaveras Reservoir, instead of being delivered to Crystal Springs, or additional storage would be needed.

STAFFING & WORKFORCE DEVELOPMENT

The project operations would shift some of the operational protocol at Pulgas Dechloramination Facility and Crystal Springs Reservoir. The project would require 17 additional staff to operate the new AWTF and/or coordinate and manage its operations with the current operations including at the current facilities. Staff training on purified water facility operations and maintenance such as Advanced Water Treatment Operator Certification would be needed. If the SFPUC takes the lead in implementing and operating this project, most or all of the staff additions would be at the SFPUC.

STATUS OF ENVIRONMENTAL REVIEW

The project is anticipated to be subject to environmental requirements associated with project facilities and operations. The project would be subject to environmental review including CEQA; possibly National Environmental Policy Act (NEPA) compliance; depending on whether federal funding would be obtained; and federal and State regulatory permits.

PROJECT ALTERNATIVES

The two primary project alternatives are described above and would be analyzed further under environmental review.

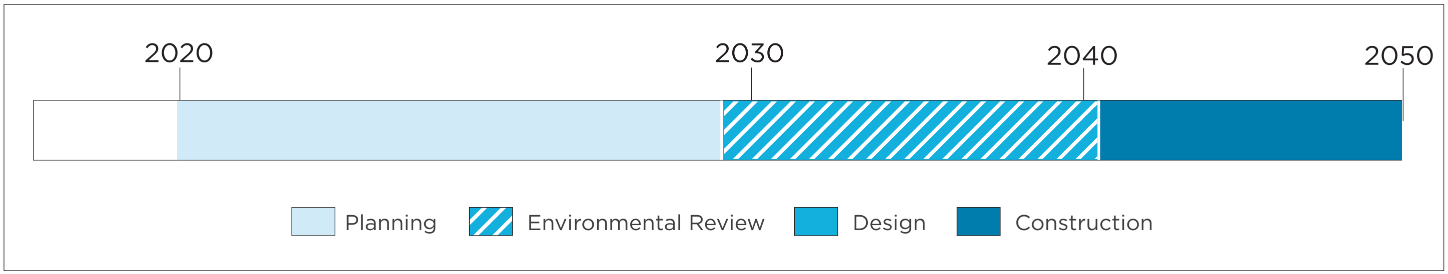
2. San Francisco-Peninsula Regional PureWater - *continued*

+ PROS	- CONS
Drought-resistant supply. The project provides a new drought-resistant water supply.	**Water quality challenges.** Potential water quality challenges in Crystal Springs Reservoir or in the transmission and distribution system would need to be analyzed further and may result in operational changes.
Reduce wastewater discharges. The project reduces wastewater discharge to the San Francisco Bay.	**Operational impacts.** During non-dry years, there is insufficient storage in the RWS to accommodate both existing supplies and new purified water supplies without also expanding storage. Reoperation of facilities or displacement of supplies may be necessary.
	Community Acceptance. Purified water projects require implementation of a sustained communications and outreach program in order to facilitate information sharing and collaboration within the community.

COST

The total capital cost for this project is estimated to be $1.2 billion, or the equivalent of $753 million in 2023 dollars. The annual O&M cost will be determined once there is more information on operating parameters, delivery mechanisms, and water supply sharing among partners. Appropriated and budgeted funds in current CIP total $11.8 million through 2026. To complete planning, environmental review and 30% design, no additional funding is estimated to be needed in the next 10-year period.

CURRENT STATUS & SCHEDULE



INFORMATION TO SUPPORT SFPUC COMMISSION ACTIONS

PROJECT RECOMMENDATION

- Proceed with feasibility analysis, Basis of Design, conceptual design, environmental review, and outreach.
- Continue planning environmental review and 30% design with existing funds allocated in the CIP.

KEY MILESTONES/DECISIONS

- Upon completion of CEQA (expected in 2028), the SFPUC must commit to taking a leadership role in the project for it to move forward. It is required for a water agency to own and operate the project.
- *Risk of not meeting key milestones:* If the SFPUC does not commit to leading the project once additional planning and environmental review are complete, the project would not likely proceed and the 6 mgd water supply for the SFPUC would not be realized.

UPCOMING PROJECT ACTIVITIES

- Complete feasibility analysis, Basis of Design Study, and initiate CEQA. Engage in water quality modeling for Crystal Springs Reservoir and distribution impacts.
- To proceed beyond CEQA: model SFPUC operational impacts, complete water quality analysis for blending and for disruption, define beneficiaries and cost-sharing, identify funding opportunities and rate impacts and seek approval from leadership of partners.

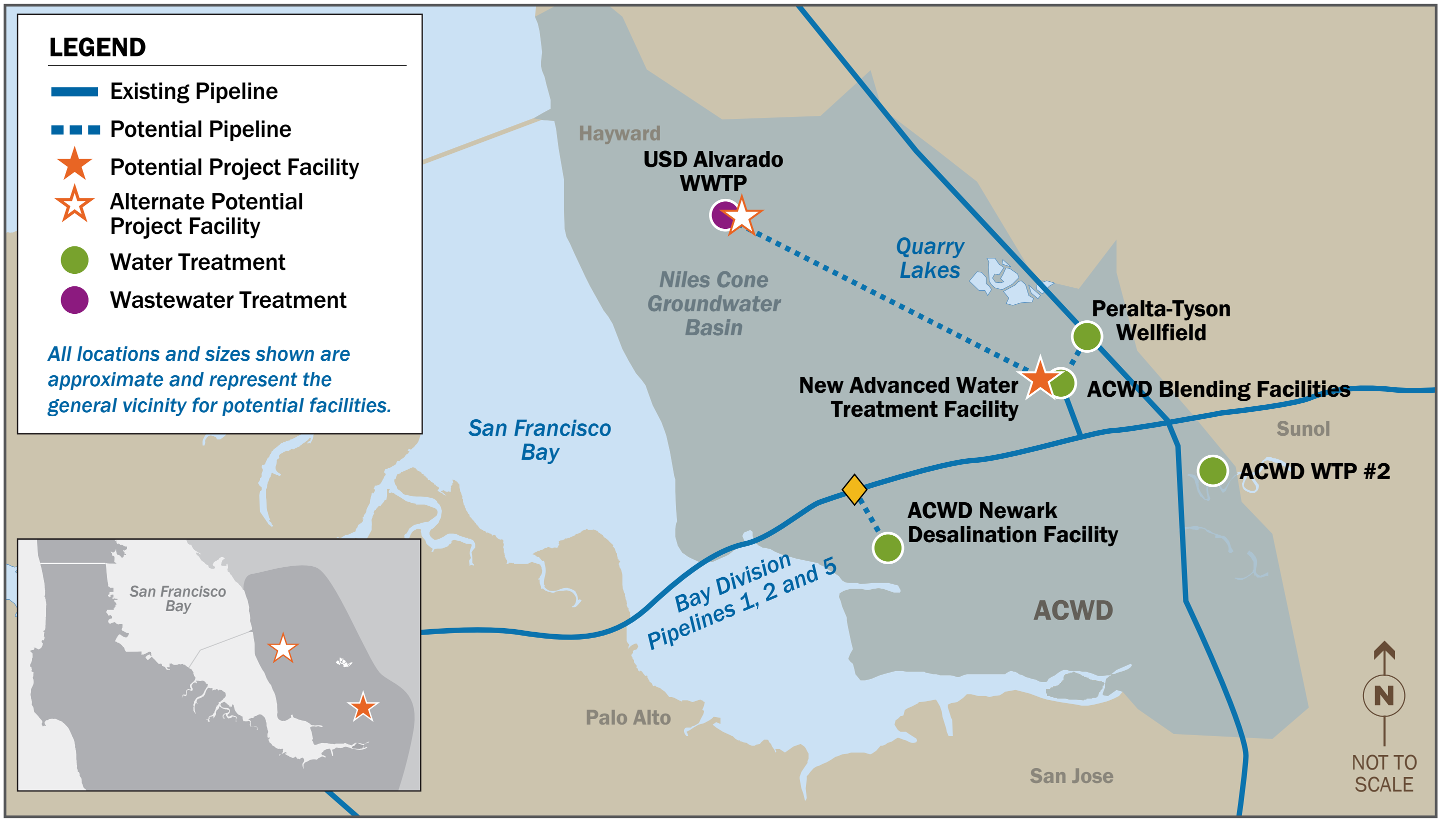
3. ACWD-USD Purified Water Project

PROJECT DESCRIPTION

This project could provide a new purified drinking water supply utilizing Union Sanitary District (USD)'s treated wastewater. Purified water produced by advanced water treatment could be transmitted to the Quarry Lakes Groundwater Recharge Area to supplement recharge into the Niles Cone Groundwater Basin. With the additional water supply produced by the project provided to Alameda County Water District (ACWD), an in-lieu exchange with the SFPUC could result in more water left in the RWS. Additional water supply could also be directly transmitted within ACWD's service area, or to the SFPUC through a new intertie between ACWD and the SFPUC's Bay Division Pipelines (BDPLs). Two alternatives, each with two phases, have been evaluated in the preliminary technical feasibility study for the project.

PROJECT LOCATION

The project facilities would be located in ACWD's service area.



NEW INFRASTRUCTURE NEEDS

- New AWTF at ACWD-owned site OR in the vicinity of USD.
- Pretreatment for denitrification at USD (Alternative B only).
- Pipeline to ACWD's Peralta-Tyson well site (Phase 1 of both alternatives).
- Purified water pipeline to ACWD's WTP #2 OR intertie to SFPUC BDPLs (Phase 2 of both alternatives).

WATER SUPPLY AVAILABILITY & DISTRIBUTION

The project is anticipated to provide up to 5.4 mgd (6,048 AFY) in Phase 1 and an additional 4.9 mgd (5,488 AFY) in a potential Phase 2 for a maximum of 10.3 mgd (11,536 AFY) of purified water across two phases. Because the second phase would require additional infrastructure and outreach, only the Phase 1 is assumed for water supply planning purposes at this time. Phase 1 of the project can provide a new water supply source through utilization of purified water from USD that would be blended in the groundwater basin and delivered in the ACWD service area.

PROJECT AT A GLANCE

Supply Type	Purified Water
SFPUC Supply Assumed	5.4 mgd (Phase 1 only)
Project Capacity	5.4 mgd
Earliest Service Date	2039
Estimated Capital Cost per Acre-Foot	$4,541
Current Status	Planning

PROJECT PARTNERS & INTERESTS

SFPUC	ACWD	USD
Increase dry year supply	Reduce dependence on RWS	Reduce Bay discharges

INSTITUTIONAL COMPLEXITY

Institutional complexity is a relative measure that takes into account project service area, project facilities ownership, number of project partners, cost share, and whether SFPUC is construction and design lead.

INSTITUTIONAL CONSIDERATIONS

The project partners include ACWD, a Wholesale Customer of the SFPUC, and USD, a wastewater utility. Each partner agency has slightly different drivers for participation, which can affect the need and timing for the project. While the goals of the water utilities are generally aligned, the SFPUC has a need to identify solutions for systemwide dry-year shortfalls in the near-term in order to address potential shortages from the implementation of the Bay-Delta Plan Amendment and to support the SFPUC Commission's decision on whether to make San Jose and Santa Clara permanent customers. ACWD decision making may be tied to their water supply planning efforts being conducted by 2025. USD is evaluating improvements to its secondary treatment processes and considering future needs to reduce Bay discharges that are not linked to water supply needs.

Institutional considerations also play a part in the introduction of a new water supply source through purified water. While a number of purified water projects are planned throughout the region, this is the only one currently being pursued in ACWD's service area. For project implementation, internal and external outreach and engagement will be important.

OPERATIONAL CONSIDERATIONS

Given the location of facilities and distribution, the project components would likely be operated by ACWD and USD. Therefore, operation of the project will require the leadership and staffing of partner agencies, with financial support from the SFPUC. No operational impacts to the SFPUC are anticipated, except if a new intertie is constructed and direct deliveries to one or more of the BDPLs is made in the Phase 2 of the project.

Phase 1 is a groundwater recharge project that will require groundwater injection in the vicinity of Quarry Lakes, an East Bay recreational area. Both phases of the project would rely on membrane-based treatment, which requires some level of continuous operation.

STAFFING & WORKFORCE DEVELOPMENT

Given the operational needs of the project, ACWD would likely incur new staffing needs for the advanced treatment facility and the operation of the distribution system. Secondary treatment improvements and operations would be carried out by USD. A total of eight new staff are anticipated for the project. No staffing needs for the SFPUC are expected at this time.

STATUS OF ENVIRONMENTAL REVIEW

The project would be subject to environmental requirements associated with project facilities and operations. This may include CEQA review and National Pollutant Discharge Elimination System (NPDES) permit-related requirements. Federal requirements may apply if federal funds are sought to support project development and construction. No environmental review has been initiated at this time.

PROJECT ALTERNATIVES

Phase 2 is a DPR project that would treat and distribute purified water with other surface water supplies. Because of the additional infrastructure and outreach needs of the project, Phase 2 of the project is not assumed for water supply planning purposes at this time. In Phase 2, purified water would be blended at the treatment plant and delivered either in ACWD's service area or the SFPUC's distribution system. The project relies on membrane-based treatment, which requires some level of continuous operation. Phase 2 operations may not be needed in non-drought periods due to a lack of storage potential. Variable operations may impact staffing needs, fixed costs, and general treatment plant efficiency. These operational considerations, as well as infrastructure and outreach needs, will need to be evaluated further before Phase 2 proceeds.

There are also two alternatives under review in the project feasibility. The primary difference between the two alternatives is the level of secondary treatment that is assumed prior to the project start. If less treatment has been done by USD for the project feedwater, more treatment will be required as part of the project. This more conservative assumption is the baseline case assumed for cost and facility planning purposes (Alternative B).

3. ACWD-USD Purified Water Project - *continued*

+ PROS

Use of existing facilities. The project prioritizes use of existing wastewater treatment and groundwater extraction infrastructure.

Diversification of supplies. The project diversifies water supply, primarily in the ACWD service area.

Dry-year reliability. The project improves long-term dry year reliability locally in ACWD's service area and in the broader SFPUC service area.

Reduced wastewater discharges. The project reduces wastewater discharge to the San Francisco Bay.

- CONS

Infrastructure uncertainty. Wastewater treatment plant capital improvements are uncertain.

Water quality challenges. Potential water quality change to Quarry Lakes.

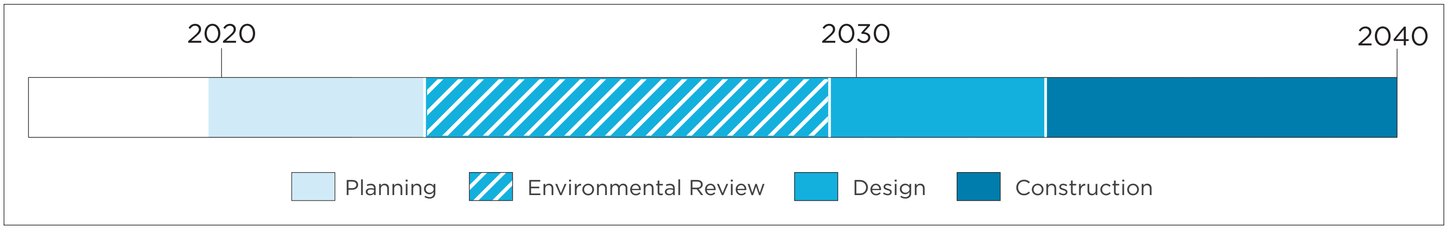
Institutional alignment. The needs and timing of commitment to the project from the partners vary.

Community Acceptance. Purified water projects require implementation of a sustained communications and outreach program in order to facilitate information sharing and collaboration within the community.

COST

The capital cost is estimated to be $1.3 billion, or the equivalent of $824 million in 2023 dollars. Appropriated and budgeted funds in the current CIP total $7.4 million through 2026. To complete planning, environmental review and 30% design, additional funding of $3 million is estimated to be needed in the next 10-year period.

CURRENT STATUS & SCHEDULE



INFORMATION TO SUPPORT SFPUC COMMISSION ACTIONS

PROJECT RECOMMENDATION

- Proceed with planning, alternatives analysis, and CEQA.
- To proceed beyond CEQA, seek direction from the SFPUC Commission.
- Work with Capital Planning and Finance teams to propose funding of up to $3 million for planning, environmental review and 30% design through the biennial CIP budget development process, subject to the SFPUC's capital investment and financial sustainability priorities.

KEY MILESTONES/DECISIONS

- Realizing the water supply benefit relies on partnerships with ACWD and USD. The project is still in planning stages and partnership commitments are being pursued as part of the project planning activities.

UPCOMING PROJECT ACTIVITIES

- Complete preliminary feasibility study and continue with associated technical studies. Identify potential funding opportunities. Continue to track and coordinate partner commitments to pursuing the project.

4. South Bay Purified Water Project

PROJECT DESCRIPTION

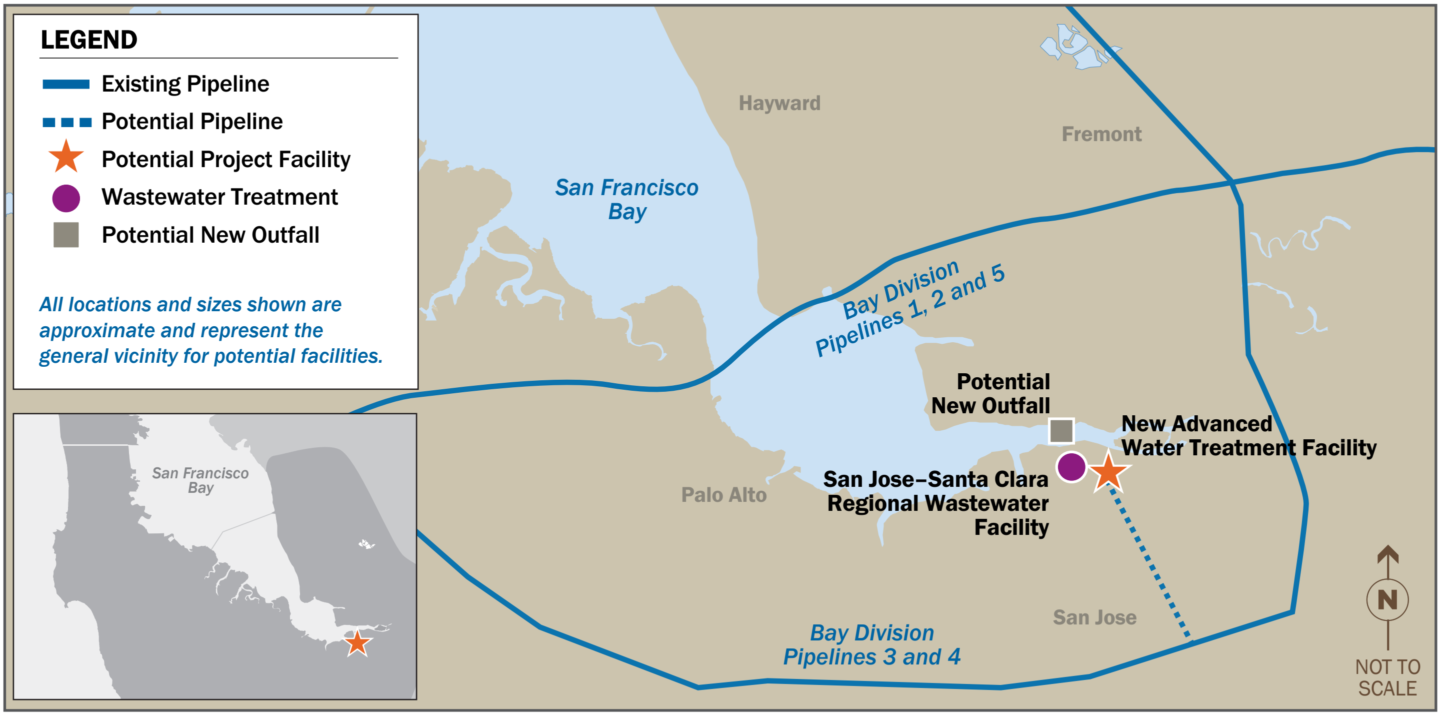
In collaboration with the cities of San Jose and Santa Clara, the SFPUC is evaluating a joint purified water project. Under the AWS Plan, this project will provide a dry-year supply of 3.5 mgd to the RWS. Additionally, this project will provide a local benefit to San Jose and Santa Clara by providing 6.5 mgd to the two cities during all water years to serve demands in their retail service areas beyond what the two cities have requested from the SFPUC as a future supply guarantee from the RWS. Only the 3.5 mgd to the RWS is considered as a regional supply under the AWS Plan. This regional benefit would be realized only if San Jose and Santa Clara are made permanent customers of the SFPUC, a decision which is to be made by the SFPUC by 2028. If San Jose and Santa Clara are not made permanent customers of the SFPUC, the regional element of this project will not be part of the AWS Plan and the 3.5 mgd water supply benefit to the RWS will not be realized.

San Jose and Santa Clara jointly own a Regional Wastewater Facility in San Jose that would provide the source water for the advanced treatment project as well as the land needed for project facilities. The parties are currently evaluating the feasibility of the project in a study that will include review of the potential capacity, sharing of supply, operations and distribution.

This project is subject to the new DPR regulations that are anticipated by December 2023, and likely to become effective by the middle of 2024. The feasibility study analysis is being conducted on the basis of draft DPR regulations and may need to be revised once they are finalized.

PROJECT LOCATION

The project facilities would be located in San Jose and Santa Clara.



NEW INFRASTRUCTURE NEEDS

- AWTF, including feed water pipeline.
- New pipeline or connections from the new facility to San Jose and Santa Clara distribution systems.
- New pipeline or connections from the new facility with the RWS.
- Storage and blending tank.
- Potentially new discharge outfall from the new facility to San Francisco Bay (not yet evaluated).

WATER SUPPLY AVAILABILITY & DISTRIBUTION

During normal and wet years, the project could operate at 65% capacity, producing 6.5 mgd of purified water to serve San Jose and Santa Clara beyond the two cities' purchases from the SFPUC and other sources of supply. During dry years, the facility would ramp up to 100% capacity producing 10 mgd of purified water out of which 6.5 mgd would continue to be delivered to San Jose and Santa Clara. The additional 3.5 mgd of purified water produced would serve as a new dry-year supply for the SFPUC and its other customers through the RWS.

The purified water from the project will thus deliver 1) 6.5 mgd in all years to the northern service areas of San Jose and Santa Clara via their distribution systems and 2) 3.5 mgd in dry years only via BDPLs 3 and 4 to the SFPUC's customers in the South Bay, the Peninsula and in-City retail service area.

PROJECT AT A GLANCE

Supply Type	Purified Water
SFPUC Supply Assumed	3.5 mgd
Project Capacity	10 mgd
Earliest Service Date	2038
Estimated Capital Cost per Acre-Foot	$1,264
Current Status	Planning

PROJECT PARTNERS & INTERESTS

SFPUC	CITY OF SAN JOSE / CITY OF SANTA CLARA
Increase dry year supply	Develop local supplies, increase all-year and dry-year supplies

INSTITUTIONAL COMPLEXITY

Institutional complexity is a relative measure that takes into account project service area, project facilities ownership, number of project partners, cost share, and whether SFPUC is construction and design lead.

INSTITUTIONAL CONSIDERATIONS

The cities of San Jose and Santa Clara are currently interruptible customers of the SFPUC and have requested permanent status, as discussed in Chapter 2 (Background). The two cities' combined projected demand is 15.5 mgd for the planning horizon. They have requested a guaranteed supply from the SFPUC of 9 mgd (total). In order for the SFPUC to consider granting San Jose and Santa Clara permanent status and to minimize impacts to the existing permanent Wholesale Customers, the two cities must secure a reliable supply to meet their additional demands beyond the 9 mgd that they have requested as a guarantee. This project would produce 6.5 mgd of purified water to serve the needs of San Jose and Santa Clara beyond the cities' purchases from the SFPUC, while augmenting RWS supplies by 3.5 mgd in dry years. Implementation of this project would support the SFPUC's decision to make San Jose and Santa Clara permanent customers.

Another institutional consideration for this project is the discharge of the reverse osmosis concentrate, or brine, from the new AWTF to San Francisco Bay. At this time, it appears unlikely that the existing outfall and corresponding NPDES permit for the Regional Wastewater Facility can accommodate the brine. Therefore, a new, dedicated outfall may need to be constructed and a separate NPDES permit may need to be acquired. San Jose and Santa Clara are also considering alternative brine management solutions, however regulatory requirements are unknown at this time.

OPERATIONAL CONSIDERATIONS

The new AWTF would be co-located at the existing Regional Wastewater Facility and is anticipated to be co-owned and operated by San Jose and Santa Clara. The operation of the facility will be coordinated with the operations of the RWS transmission system.

The project will be subject to the regulations governing DPR, and the purified water generated would be in compliance with federal and State drinking water standards. This project includes a storage and blending tank upstream of the connection to the SFPUC's BDPLs 3 and 4, which would provide adequate response time for operators should the purified water or resulting blend with RWS supply not meet specifications.

The AWS team will continue to work closely with the Operations and Water Quality teams within the SFPUC and San Jose and Santa Clara to identify and address any challenges and make sure that existing infrastructure can accommodate the anticipated water volume and quality from this project as well other potential purified water projects that will be supplementing RWS supply. Detailed water quality and distribution studies will be needed to determine (1) if the anticipated purified water volumes during wet, normal, and dry years can be accommodated by existing infrastructure; (2) to which portions of the service areas water will be delivered; (3) water quality measures and mitigations that will be needed; and (4) if any new infrastructure will be needed to reach desired areas of delivery.

STAFFING & WORKFORCE DEVELOPMENT

While the new AWTF is anticipated to be co-owned and operated by San Jose and Santa Clara, SFPUC staff (or a responsible entity on the SFPUC's behalf) will need to operate and maintain the storage tank, pipeline, and connection from the advanced treatment facility to BDPLs 3 and 4. While the project will likely require approximately 20 new staff to operate and maintain, SFPUC staffing would likely be 20% (4) of that total.

STATUS OF ENVIRONMENTAL REVIEW

The project is anticipated to be subject to environmental requirements associated with project facilities and operations.

PROJECT ALTERNATIVES

The feasibility of a larger facility, producing up to 20 mgd of purified water, is being studied, but the primary option is the 10-mgd facility. Aside from the production capacity, other alternatives that will be considered are brine discharge methods and locations, pipeline crossing methods, and potentially storage tank capacity and locations for San Jose, Santa Clara, and the SFPUC.

4. South Bay Purified Water Project - *continued*

+ PROS

Drought-resistant supply. The project provides a new drought-resistant water supply.

Local supply. The project provides a new local supply for the cities of San Jose and Santa Clara.

Supports decision making. Assists SFPUC with its decision to make San Jose and Santa Clara permanent customers. If San Jose and Santa Clara are not made permanent customers of the SFPUC, the regional element of the project will not move forward.

– CONS

Water quality challenges. Potential water quality challenges in the transmission and distribution system would need to be analyzed further and may result in operational changes.

Operational impacts. During non-dry years, there is insufficient storage in the RWS to accommodate both existing supplies and new purified water supplies without also expanding storage. Reoperation of facilities or displacement of supplies may be necessary. Operations may need to be adjusted to accommodate changes to water quality.

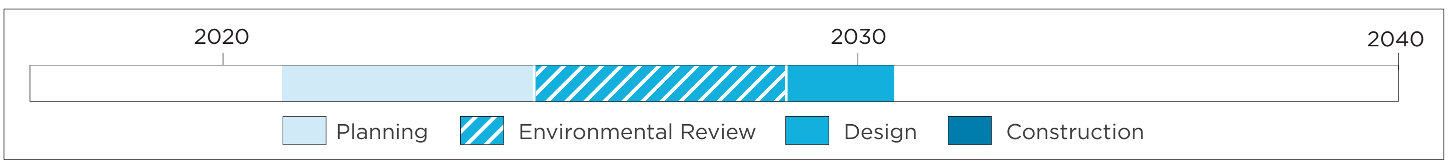
Community Acceptance. Purified water projects require implementation of a sustained communications and outreach program in order to facilitate information sharing and collaboration within the community.

COST

The capital cost for the project is estimated to be $658 million, equivalent to $425 million in 2023 dollars. This is a new project that is being recommended for inclusion in the CIP for the first time, so there are no appropriated or budgeted funds explicitly for this project in the current CIP. To complete planning, environmental review and 30% design, additional funding of $10 million is estimated to be needed in the next 10-year period. This project represents a partnership with the cities of San Jose and Santa Clara, and it is anticipated that they would share the costs, which is reflected in the proposed planning and design funding.

The SFPUC would be a partial owner of the new facilities—particularly the new storage tank, pipeline, and connection from the advanced treatment facility to BDPLs 3 and 4—and would be bearing an estimated 35% of the total capital costs. While the portion of the SFPUC's contribution to capital and O&M costs has not yet been determined, the SFPUC's contribution will likely be limited to costs associated with constructing, operating, and maintaining a storage tank, pipeline, and BDPL connection. San Jose and Santa Clara will together bear the majority of costs for the project.

CURRENT STATUS & SCHEDULE



INFORMATION TO SUPPORT SFPUC COMMISSION ACTIONS

PROJECT RECOMMENDATION

- Proceed with feasibility analysis, conceptual design, CEQA, and outreach.
- To proceed beyond CEQA: seek commitment from project partners to contribute resources for developing detailed design (100%), seek direction from the SFPUC Commission by end of 2028 to make San Jose and Santa Clara permanent customers with the condition that this project completes construction and starts operation, and identify SFPUC staff responsible for future O&M of new SFPUC assets. Plan for operating budget accordingly.
- Work with Capital Planning and Finance teams to propose funding of up to $10 million for the SFPUC's share of planning, environmental review and 30% design through the biennial CIP budget development process, subject to the SFPUC's capital investment and financial sustainability priorities.

KEY MILESTONES/DECISIONS

- The SFPUC is committed to making a decision about whether to make San Jose and Santa Clara permanent customers by December 31, 2028.
- *Risk of not meeting key milestone:*
  If San Jose and Santa Clara are not made permanent customers of the SFPUC, the regional water supply element of this project would not move forward, and the dry year water supply of 3.5 mgd would not be realized.

UPCOMING PROJECT ACTIVITIES

- Complete feasibility studies. Conduct detailed analyses on water quality and supply distribution. Explore expansion of partnerships (e.g., other potential purified water customers in the South Bay).

5A. Los Vaqueros Expansion (LVE) Project

PROJECT DESCRIPTION

The Los Vaqueros Expansion (LVE) Project is a storage project that will enlarge the capacity of the existing reservoir located in Contra Costa County from 160,000 acre-feet to 275,000 acre-feet. While the existing reservoir is owned and operated by Contra Costa Water District (CCWD), the proposed expansion will have regional benefits, as other water agencies will be able to share in the additional capacity. A Joint Powers Authority (JPA) that was formed in 2021 will manage the expansion and provide the governance and administration for the project, and the JPA's members (which include the SFPUC) will assist in the design, construction, operation, and administration of the project, in coordination with CCWD.

The SFPUC's potential 40,000 acre-foot share of the project's additional storage capacity would provide a dry-year water supply benefit to the SFPUC. However, in order to realize the full water supply benefit of the project, the SFPUC must: 1) identify and secure a water supply to store in the reservoir and 2) enable conveyance from storage to SFPUC customers. The critical issues are considered as two separate AWS Projects (5B. Conveyance Alternatives for LVE and 5C. Supply Alternatives for LVE), which would ultimately need to be implemented along with this 5A. LVE Project.

PROJECT LOCATION

The LVE Project is located in eastern Contra Costa County.

NEW INFRASTRUCTURE NEEDS

- Raise the Los Vaqueros Reservoir to increase storage by 115,000 acre-feet, of which the SFPUC's share would be 30,000 – 40,000 acre-feet.
- Transfer-Bethany Pipeline to connect project facilities to the California Aqueduct.
- Upgrade and expand existing pump stations and conveyance infrastructure (not shown).

WATER SUPPLY AVAILABILITY & DISTRIBUTION

The SFPUC is contemplating a purchase of up to 40,000 acre-feet of storage in the expanded Los Vaqueros Reservoir. While costs and conveyance modeling are based on this volume of storage, as of June 2023, LVE storage is oversubscribed and the SFPUC's final allocation may be less than 40,000 acre-feet.

Los Vaqueros Reservoir experiences evaporative losses of up to 8% on an annual basis. Depending on the supply source (5C. Supply Alternatives for LVE) and conveyance pathway selected for the SFPUC (5B. Conveyance Alternatives for LVE), additional transmission and transfer losses may be incurred. Stored water would be delivered to SFPUC customers in dry years through the proposed Transfer-Bethany Pipeline and then subsequently through one of the conveyance options being examined, which could include partnerships with South Bay Aqueduct contractors, or a direct connection to SFPUC facilities, as discussed under 5B. Conveyance Alternatives for LVE.

PROJECT AT A GLANCE

Supply Type	Storage
SFPUC Regional Supply Assumed	3.9 mgd
Project Capacity	3.9 mgd
Earliest Service Date	2030
Estimated Capital Cost per Acre-Foot	$1,626
Current Status	Design

For planning purposes, it is assumed that the SFPUC could divert 4,416 AFY into its allocated storage at LVE, in wet years only. The SFPUC would then take delivery of that stored water in critical dry years, which are assumed to be two to three out of every ten years. Water deliveries would be a maximum of 20,000 acre-feet in any single year, limited by modeled conveyance constraints under 5B. Conveyance Alternatives for LVE. Based on supply and operating assumptions, the project could provide an average annual dry year benefit to the SFPUC of approximately 3.9 mgd over the design drought.

PROJECT PARTNERS & INTERESTS

Partners	Interests
CCWD, **EBMUD**, **ACWD**, **ZONE 7 WATER AGENCY**, **VALLEY WATER**	Increase water supply reliability
SFPUC (with BAWSCA)	Increase Dry-Year Supply
SAN LUIS & DELTA MENDOTA WATER AUTHORITY	Increase water supply for irrigation
GRASSLAND WATER DISTRICT	Protect wildlife refuges
DWR (State), **USBR** (Federal)	Provide approvals and funding

INSTITUTIONAL COMPLEXITY

SFPUC only

Multi-Party Partnership

Institutional complexity is a relative measure that takes into account project service area, project facilities ownership, number of project partners, cost share, and whether SFPUC is construction and design lead.

INSTITUTIONAL CONSIDERATIONS

The SFPUC is one of eight partner agencies in the LVE Project, and one of the six partner agencies that are urban water suppliers, including CCWD, East Bay Municipal Utility District (EBMUD), ACWD, Zone 7 Water Agency, and Valley Water. The other two partners represent agricultural users (San Luis & Dela Mendota Water Authority) and wildlife refuges (Grassland Water District). The wildlife refuges provide a significant environmental benefit for the project. Depending on the filling and delivery needs of individual partners, there may be times when there is insufficient capacity for all partners to move water in or out of LVE storage at the optimal time. Agreements will need to be negotiated to determine operational priorities. The majority of decisions made by the JPA will be by a simple majority, as provided in the 2021 JPA Agreement signed by the partners as JPA members, including the SFPUC. Some decisions will require a greater majority. The financial closing for the project will be achieved when the partners enter into a long-term Service Agreement with the JPA. This is a requirement for the project to secure grant funds. A JPA member's decision to sign onto the Service Agreement represents a commitment to financial participation in the project, as it represents one of the last opportunities to exit the project prior to construction. While SFPUC staff are concurrently pursuing outstanding water supply and conveyance agreements to support its participation in LVE, the decision to enter into the Service Agreement will come before those projects are fully resolved. The SFPUC will have to consider the relative risk of participating in a regional storage project outside of the SFPUC service area and without complete information about long-term water supply and conveyance. While some risks may remain, and staff continue to make progress to minimize them, securing a storage opportunity near the southern Delta would provide the SFPUC with strategic access to short- and long-term water transfers.

OPERATIONAL CONSIDERATIONS

SFPUC facilities are not directly connected to Los Vaqueros Reservoir facilities. As a result, filling its share of LVE storage and taking deliveries from LVE will require partnerships, exchanges, and close coordination with CCWD and regulating agencies. Maintaining operational flexibility in the timing of deliveries will be important to maximizing water supply benefits.

Many of the operational considerations related to new supplies from LVE are dependent on which conveyance option is selected (as discussed in 5B. Conveyance Alternatives for LVE). If direct deliveries to SFPUC facilities are made, which is the current planning assumption, Delta supplies would be introduced to the RWS. Potential for water quality challenges and the risk of introducing invasive species to the RWS will increase with project deliveries. A study completed in 2021 showed that while no additional treatment upgrades may be needed, additional monitoring and management will be needed. Furthermore, if new Delta supplies are introduced locally in the RWS, it will likely require modifications to the operations of the RWS during droughts.

STAFFING & WORKFORCE DEVELOPMENT

The project will be operated and managed by the JPA with CCWD providing technical, administrative and other support as needed. As a member of the JPA, the SFPUC will need to engage in ongoing close coordination with the JPA and CCWD staff and maintain representation on the JPA Board. It is expected these coordination activities would be handled by existing staff resources and there would be no need for additional staffing.

STATUS OF ENVIRONMENTAL REVIEW

CEQA and NEPA reviews were completed for the LVE Project in 2020.

PROJECT ALTERNATIVES

Alternatives for water sources for the 5A. LVE Project are being examined as part of 5C. Supply Alternatives for LVE, and alternatives for conveyance of supplies from LVE storage are being examined as part of 5B. Conveyance Alternatives for LVE.

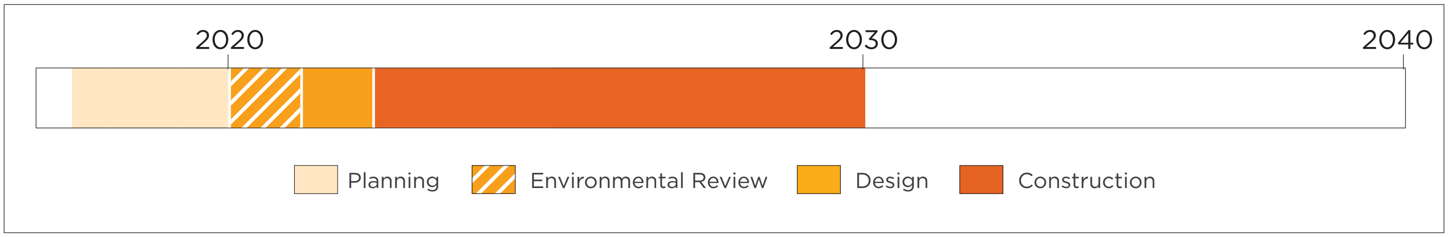
5A. Los Vaqueros Expansion Project - *continued*

+ PROS	- CONS
Dry-Year Supply reliability. The project provides water storage for delivery in dry years. **Leveraging existing partner facilities.** The project enables regional benefits by expanding CCWD's existing reservoir. **Supply Implementation.** Delivery can wait until the need is imminent. **Operational stability.** The project does not impact SFPUC's ability to use existing supplies in wet/normal years. **Strategic storage potential.** The project is located outside of the SFPUC's service area and can provide a strategic location for storage and access to potential new water supplies. **Incremental water supply benefits.** A source of supply that is available in both wet and dry years can increase the yield of this project. **Project commitments.** Planning and environmental reviews are complete. The project has secured preliminary commitments for significant grant funding.	**Water quality/invasive species.** Introduction of Delta supplies to the RWS would require additional management and monitoring of water quality and invasive species. **Operational uncertainty.** Filling and delivery will require reliance on Delta operations, which would be new for the SFPUC and would have some inherent uncertainty. **Allocation of grant benefits.** Grant funds may be allocated based on project benefits rather than proportionate share of project costs, which can reduce the cost savings to the SFPUC. **Use of project facilities.** Capacity of conveyance facilities may be limited and there may be competition at times when partner demands are high. **Dependence on multiple partners.** SFPUC facilities are not physically connected to Los Vaqueros Reservoir. To put water into storage or take deliveries, additional partnerships will be needed. **Dependence on other projects.** This project is dependent on identifying a supply source and securing conveyance pathways for filling and delivery.

COST

While the total capital cost of the project is estimated to be over $1.2 billion, SFPUC's share of the cost for up to 40,000 acre-feet of storage is $275 million, or in 2023 dollars, $215 million. However, the project is expected to receive State and federal funding to offset some of the costs and reduce the SFPUC's share based on proportional benefits. SFPUC's O&M costs will vary significantly based on use of the conveyance facilities to move water into or out of storage in any given year. Overall, the SFPUC's share of conveyance facilities is expected to be less than 10% due to anticipated use in dry years only. The SFPUC's current appropriated budget for this project is $12 million and another $18.7 million is requested before the start of construction in 2025. Because debt financing is expected to be secured by the project and not separately by the SFPUC at this time, the SFPUC's annual expenditures are likely to be cast-funded capital debt repayments over time. In the next 10-year period capital expenditures are expected to be $62 million. Accounting for funds appropriated or budgeted in the current CIP, additional capital funding of $31 million would be needed to construct the project. Additionally, O&M costs within the next 10-year period are expected to total $36 million. To fully realize the benefit of this project, funding for 5B. Conveyance Alternatives for LVE and 5C. Supply Alternatives for LVE must be secured in parallel.

CURRENT STATUS & SCHEDULE



INFORMATION TO SUPPORT SFPUC COMMISSION ACTIONS

PROJECT RECOMMENDATION

- Proceed with planning and coordination on all LVE related projects.
- Continue developing a water supply strategy and agreement terms for conveyance and work with Capital Planning and Finance teams to propose funding for capital costs of up to $31 million and O&M costs of $36 million through the CIP budget development processes, subject to the SFPUC's capital invest and financial sustainability priorities. If State and federal grant funds are secured, annual expenditures may decrease or be deferred. Grant and loan receipts will not be confirmed until after financial commitments to the project by all partners are secured.
- Operating costs will need to be budgeted beyond 2030, when the project is in service. Operating costs will vary depending on how and when the SFPUC fills its storage allocation and takes deliveries of water.

KEY MILESTONES/DECISIONS

- The Service Agreement, which financially commits the SFPUC to the project, must be approved for the project to proceed. The Service Agreement is expected to come before the SFPUC Commission in early 2024.
- A water supply strategy is being developed as part of 5C. Supply Alternatives for LVE to support decision-making on the Service Agreement.
- *Risk of not meeting key milestone:* If the Service Agreement is not approved, this project will not move forward and the estimated 3.9 mgd water supply benefit would not materialize.

UPCOMING PROJECT ACTIVITIES

- Develop financial scenarios and work with SFPUC Capital Planning and Finance to refine annual expenditure estimates. Continue planning for related 5C. Supply Alternatives for LVE and 5B. Conveyance Alternatives for LVE and present outstanding risks to the Commission ahead of decision-making on participating in the Service Agreement for this LVE Project.

5B. Conveyance Alternatives for Los Vaqueros Expansion

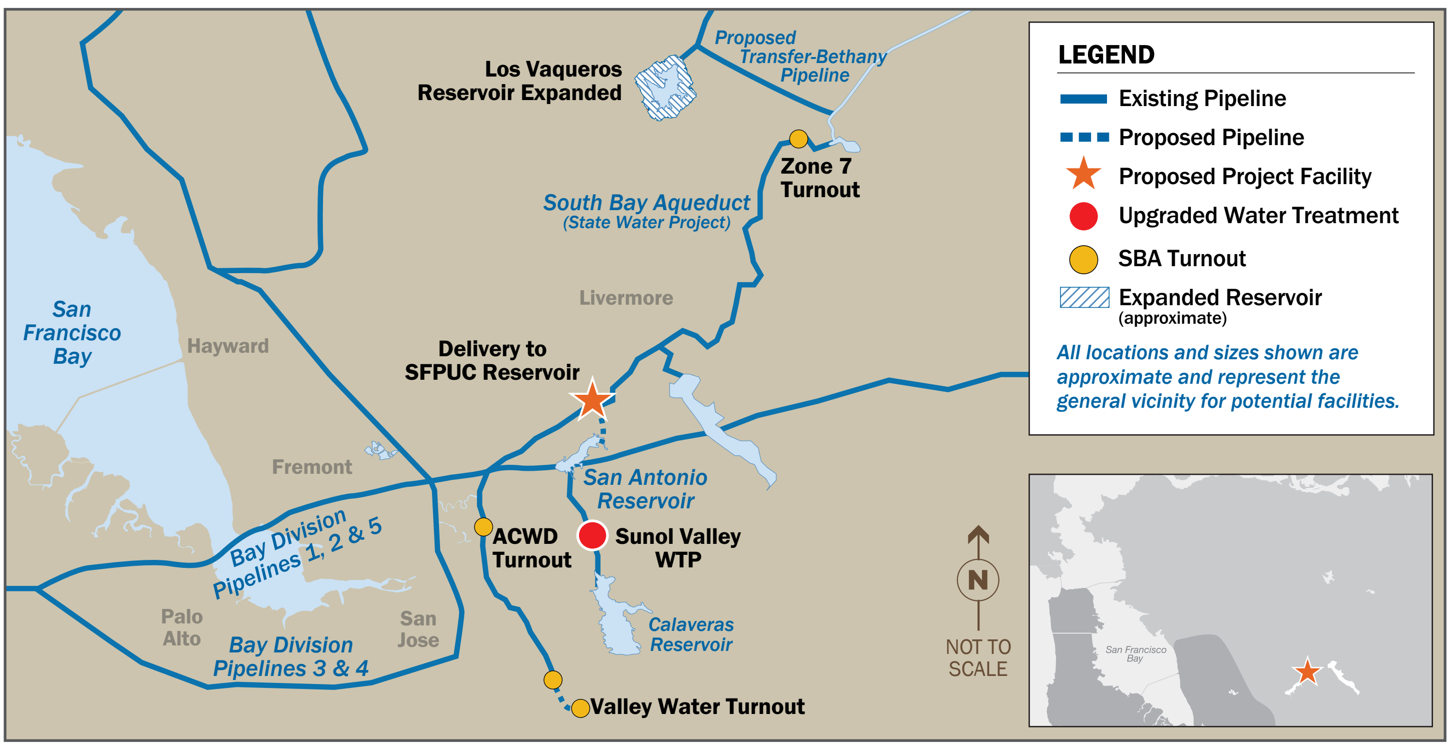
PROJECT DESCRIPTION

The SFPUC is considering its participation in the 5A. LVE Project as a storage project that can enable carryover storage in wet years for delivery in dry years. However, the reservoir is not connected to the SFPUC's RWS facilities. Therefore, additional pathways are needed both to fill the SFPUC's share of LVE storage and subsequently to deliver water from project facilities and into SFPUC's service area. The main pathway being considered for delivery is through the South Bay Aqueduct (SBA).

The SBA is a 49-mile aqueduct, which is part of the State Water Project, owned by the California Department of Water Resources (DWR). SBA Contractors maintain contract capacity for use of the SBA: Zone 7 Water Agency, ACWD, and Valley Water. The SFPUC could enter into exchanges with one or more of the SBA Contractors, who are also LVE JPA members and partner agencies. Additionally, the SFPUC's San Antonio Reservoir and Sunol Valley WTP are very close to the SBA. A connection between the SBA and San Antonio Reservoir that was constructed toward the end of the 1987-1992 drought remains in place. This connection could be upgraded to deliver LVE supplies directly to the SFPUC. For planning purposes, this is assumed to be the primary pathway for project deliveries.

PROJECT LOCATION

Conveyance Alternatives are being explored in connection with the SFPUC's participation in the 5A. LVE Project in Contra Costa County.



NEW INFRASTRUCTURE NEEDS

- Expand existing SBA connection with San Antonio Reservoir (planning assumption).

WATER SUPPLY AVAILABILITY & DISTRIBUTION

The potential conveyance alternatives do not serve as a water supply; rather they would facilitate delivery of water from the expanded Los Vaqueros Reservoir for the benefit of SFPUC customers. Since the conveyance alternatives discussed here support the separate but related 5A. LVE Project (outlined in the preceding project description section), the water supply benefit is accounted for through 5A. LVE Project, and no additional water supply benefit is accounted for in this conveyance project.

The SBA conveyance pathway can enable exchanges between the SFPUC and one of the SBA Contractors. While there is limited synergy with Zone 7, ACWD is a Wholesale Customer of the SFPUC and there are eight customers located in Valley Water's service area that are also served by the SFPUC. Any of those agencies could be a potential exchange partner that could take delivery of the SFPUC's stored LVE water and free up an equivalent supply to the SFPUC in its service area. The SFPUC can also take direct deliveries into San Antonio Reservoir from the SBA. Modeling analysis done by the SBA Contractors confirmed available capacity in the SBA to accommodate deliveries for the SFPUC in future dry years.

PROJECT AT A GLANCE

Supply Type	–
SFPUC Regional Supply Assumed	See 5A. LVE Project
Project Capacity	See 5A. LVE Project
Earliest Service Date	2030
Estimated Capital Cost per Acre-Foot	$38
Current Status	Planning

PROJECT PARTNERS & INTERESTS

Partners in the project will depend on the conveyance pathway implemented. To modify the connection between the SBA and San Antonio Reservoir, the SFPUC will work with DWR (owner and operator of the SBA) and the SBA Contractors. For a new intertie alternative, the SFPUC would partner with EBMUD. Because this project is contemplated only to deliver 5A. LVE Project supplies on behalf of the SFPUC, it is assumed that the incremental supply accruing from the project will be for the SFPUC only.

INSTITUTIONAL COMPLEXITY

Institutional complexity is a relative measure that takes into account project service area, project facilities ownership, number of project partners, cost share, and whether SFPUC is construction and design lead.

INSTITUTIONAL CONSIDERATIONS

The SFPUC seeks to prioritize the use of existing infrastructure and minimizing costs where possible. Therefore, conveyance through the SBA is preferred over building a new intertie with EBMUD. Exchanges with ACWD and Valley Water, or direct deliveries to San Antonio Reservoir are possible. For exchanges with ACWD or Valley Water, new agreements would be needed and would have institutional complications. Because ACWD is a Wholesale Customer of the SFPUC, for example, the parties may determine that existing agreement terms should be modified to enable ACWD to take deliveries from 5A. LVE Project in lieu of RWS deliveries. An exchange with Valley Water may require modified use of the emergency intertie that connects the SFPUC and Valley Water systems at Milpitas (Milpitas Intertie). Valley Water could also deliver supplies directly to common customers, which would require the modification of individual customer contracts.

OPERATIONAL CONSIDERATIONS

SFPUC staff have worked closely with SBA Contractors to determine that there would be sufficient capacity available in the SBA to also deliver stored water from the 5A. LVE Project in dry years, however, the timing of those deliveries may vary across the year. Deliveries to the SFPUC would have a lower priority than deliveries to SBA Contractors. Because the SFPUC is able to be flexible in timing of deliveries into its system, this pathway is feasible.

Direct delivery to RWS at San Antonio Reservoir

In addition to storing local runoff, San Antonio Reservoir is currently used to store water from the Hetch Hetchy Aqueduct. Water from San Antonio Reservoir is conveyed through the San Antonio Pipeline to the Sunol Valley WTP, where it is filtered and disinfected before delivery to SFPUC customers. Addition of water from Los Vaqueros Reservoir will constitute a new source of supply and would a) potentially introduce new invasive species to the RWS and b) pose a water quality challenge. At a minimum, the introduction of a new supply will require additional water quality testing and monitoring on an ongoing basis. It would also require a change to dry-year operations of the RWS.

Exchange with ACWD

ACWD's ability to take delivery of supplies from the 5A. LVE Project in lieu of supplies from the RWS is limited by a) demand b) existing treatment capacity and c) water quality and blending requirements. It is estimated that the potential for exchange with ACWD is currently limited to 2 to 4 mgd and cannot fully replace the need for RWS supplies. Furthermore, treatment of raw water conveyed through the SBA will be required.

Exchange with Valley Water

Valley Water's turnout from the SBA is at the southern end of the existing pipeline. To enable an exchange with the SFPUC, Valley Water would have to take more deliveries from the SBA – which is in relatively poor condition in its southern reaches – and then treat that water at one of its water treatment plants. Delivery of treated water to the RWS could be at the Milpitas Intertie or to common customers. For the latter, distribution system modifications to individual customers would be required.

STAFFING & WORKFORCE DEVELOPMENT

As noted above, the various conveyance alternatives would affect staffing needs differently. In all cases, additional coordination would be required. The greatest direct implications to SFPUC operations would be in the scenario of direct deliveries to San Antonio Reservoir. Exchanges would result in new operational needs for our partners.

STATUS OF ENVIRONMENTAL REVIEW

Implementation of the conveyance alternatives is anticipated to be subject to environmental requirements associated with the proposed facilities and operations. The infrastructure improvements and construction of facilities will vary with the conveyance alternative.

PROJECT ALTERNATIVES

An alternative of conveying water from LVE through EBMUD's system has been explored. While it appeared feasible based on a preliminary study, it would be significantly more expensive and require more infrastructure to be constructed and operated. EBMUD and the SFPUC have an existing emergency intertie, located at Hayward, which is not available for drought use; however, the two agencies evaluated a possible new intertie that could enable deliveries. This conveyance alternative would require a large new pipeline. While it would avoid any need for reoperation of Hayward's distribution system, the challenges of the alignment make it significantly more costly than using SBA for deliveries from the 5A. LVE Project.

5B. Conveyance Alternatives for Los Vaqueros Expansion - *continued*

+ PROS

Use of existing assets. The project prioritizes use of existing infrastructure.

Multiple feasible pathways for delivery. Although there is no direct connection between 5A. LVE Project and SFPUC facilities, there are both direct and indirect conveyance alternatives that are feasible.

Partners with experience. LVE introduces a new supply source to the SFPUC, but the potential exchange partners have historically used the same supply sources.

- CONS

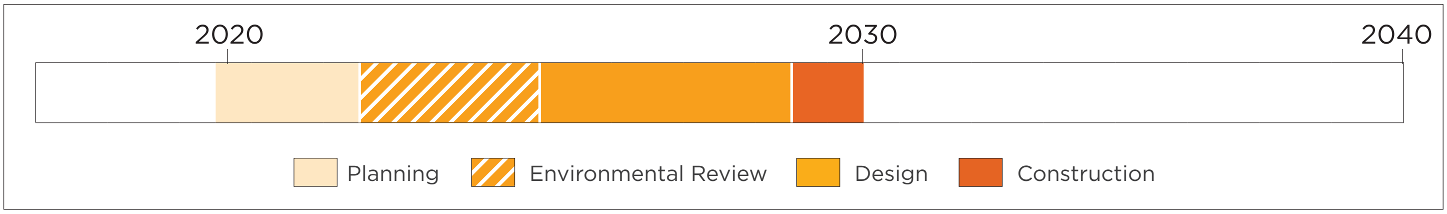
Institutional agreements. Terms of the partnership agreements needed for conveyance may not be favorable to the SFPUC, such as lower priority for a) use of the SBA or b) treatment capacity needed for exchanges.

Water quality challenges. In the case of direct delivery to San Antonio Reservoir, the new water supply into the RWS could introduce invasive species and present new water quality challenges that will require additional monitoring and potentially operational modifications.

COST

The total capital cost for this project is estimated to be $6.2 million, or the equivalent of $5.1 million in 2023 dollars. Appropriated and budgeted funds in the current CIP total $2.9 million through 2026. No additional funding is being requested for this project in the next 10-year period until a better cost estimate is prepared to complete the necessary capital improvements.

CURRENT STATUS & SCHEDULE



INFORMATION TO SUPPORT SFPUC COMMISSION ACTIONS

PROJECT RECOMMENDATION

- Continue pursuing all SBA pathway alternatives, including exchanges and the potential for direct deliveries.

KEY MILESTONES/DECISIONS

- This project would be implemented with 5A. LVE Project, which requires an approved Service Agreement to proceed. The Service Agreement is expected to come before the SFPUC Commission in early 2024.
- Details of a water supply source must be identified before the SFPUC can enter into an agreement with DWR for use of capacity in the SBA in dry years.
- *Risk of not meeting key milestone:* If the Service Agreement is not approved, this project will not move forward and the estimated 3.9 mgd of water supply associated with the 5A. LVE Project would not materialize.

UPCOMING PROJECT ACTIVITIES

- Continue work toward securing a short-term water supply agreement with a transfer partner as a precursor for a conveyance agreement with DWR for use of the SBA.
- Pursue planning and preliminary design to upgrade the SBA connection to San Antonio Reservoir, and simultaneously continue working with ACWD and Valley Water to pursue exchange opportunities.
- Continue work toward determining outstanding risks related to conveyance and present them to the SFPUC Commission prior to decision-making to participate in the Service Agreement.

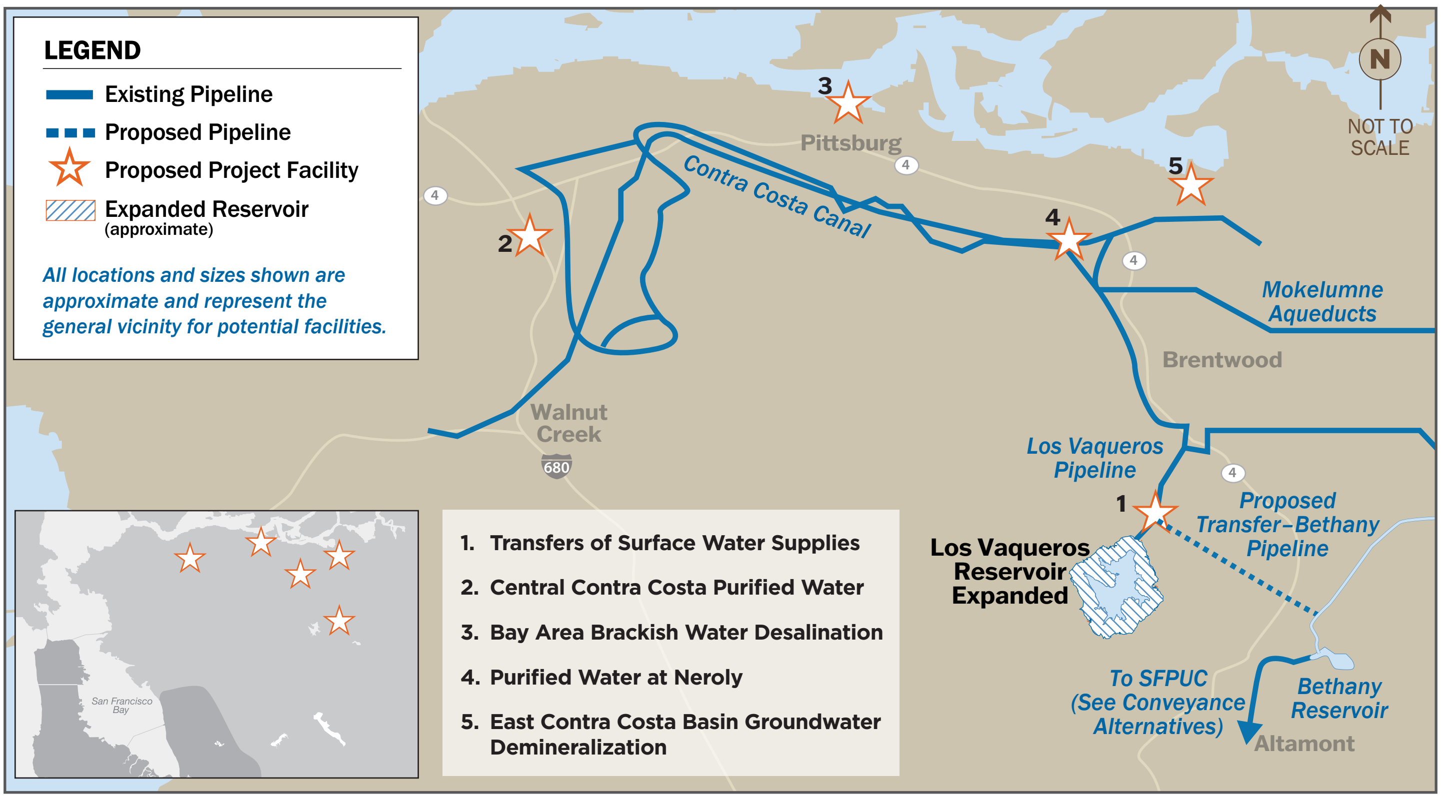
5C. Supply Alternatives for Los Vaqueros Expansion

PROJECT DESCRIPTION

This project is intended to support the SFPUC's participation in the 5A. LVE Project. Unlike other LVE project partners, the SFPUC has no direct physical connection to the LVE facilities and no water supply that can readily be stored in the proposed regional storage project. However, because the regional storage opportunity would provide benefits for the SFPUC as described in the companion project, the SFPUC is evaluating water supply alternatives that can help fill the proposed storage capacity of up to 40,000 acre-feet for use in dry years.

There are five potential supplies: 1) transfers of surface water supplies (short- or long-term), 2) new water supplies generated by advanced treatment of wastewater (Central Contra Costa Sanitary District Purified Water), 3) treatment of brackish water through Bay Area Brackish Water Desalination, 4) treatment of brackish water through Purified Water at Neroly, or 5) groundwater extraction (East Contra Costa Groundwater Demineralization). Depending on the location and conveyance pathway for the supply, it may be subject to transmission losses and capacity limitations, or subject to an additional exchange with CCWD. Regardless of the alternative, a supply of 4 to 5 mgd is needed in wet and normal years to fill the proposed storage for dry-year availability to the SFPUC.

PROJECT LOCATION



NEW INFRASTRUCTURE NEEDS

- Treatment facility (for new supply alternatives, not transfers).
- Pipelines (connecting to partners' existing infrastructure, as needed).

WATER SUPPLY AVAILABILITY & DISTRIBUTION

Storage at LVE is expected to be available by the end of 2030. Associated conveyance facilities such as the Transfer-Bethany Pipeline may be available sooner. Meanwhile, developing a new water supply capital project can take 10 to 20 years. Therefore, SFPUC staff are simultaneously evaluating short- (within 10 years) and long-term (beyond 10 years) solutions that can optimize a potential investment in the storage project.

PROJECT AT A GLANCE

Supply Type	Transfers and alternative supplies (TBD)
SFPUC Regional Supply Assumed	See 5A. LVE Project
Project Capacity	See 5A. LVE Project
Earliest Service Date	Transfers (2030); new alternative water supply (2040)
Estimated Capital Cost per Acre-Foot	$2,319 (based on 10 mgd regional brackish desalination)
Current Status	Planning

Water supply strategy: transfers

Purchasing transfer water upstream of the CCWD's intakes in the Delta in wet and above normal years could provide a source of water for the SFPUC's participation in the 5A. LVE Project. The water would flow to Los Vaqueros via Delta tributary streams and be pumped into Los Vaqueros at CCWD's intakes. With more frequent droughts and limited supply options anticipated in the future, competition for transfer opportunities may also increase over time. Therefore, pursuing transfers may be a short-term water supply strategy while the SFPUC seeks a new water supply source for long-term reliability. However, since transfers would not require large new capital investments or infrastructure, SFPUC staff are prioritizing opportunities for both short- and long-term transfers that may be feasible. Timing of the transfers, availability from year to year, and the associated transmission losses that may occur would vary by source. Discussions with potential transfer partners are ongoing.

Water supply strategy: brackish desalination, purified water, or groundwater demineralization

Between 3 and 5 mgd of average annual supplies may be available through treatment of wastewater, brackish water or groundwater. Production of these sources are likely to be in all year types. Other LVE project partners are also interested in pursuing these supply options and the SFPUC may pursue them jointly. Each potential water supply option is currently under study. Costs for a regional brackish water desalination supply are indicated as illustrative because it has been studied the most and has more data available than other alternatives currently under study.

PROJECT PARTNERS & INTERESTS

Each project alternative has different partners with varying interests. The SFPUC is at an exploratory stage for long-term water supply. However, short-term transfers can provide an interim solution to ensure that the storage in Los Vaqueros Reservoir can be fully utilized once it is completed by 2030. CCWD is working with the SFPUC on securing both short- and long- term water supply opportunities.

INSTITUTIONAL COMPLEXITY

Institutional complexity is a relative measure that takes into account project service area, project facilities ownership, number of project partners, cost share, and whether SFPUC is construction and design lead.

INSTITUTIONAL CONSIDERATIONS

Any water supply to be stored in Los Vaqueros Reservoir would require exchanges with CCWD and potential partnership with other agencies. SFPUC staff have begun having exploratory discussions with potential partners but recognize that securing agreements will require additional study and negotiations. As with any new infrastructure project, this process could take over 10 years, in which time the storage would be available to fill. As such, staff are simultaneously pursuing short-term transfers as a way to optimize use of storage and related facilities as they come online. CCWD is assisting the SFPUC in identifying and securing transfer opportunities as well as long-term supply options.

OPERATIONAL CONSIDERATIONS

The water supply options under consideration are outside of the SFPUC's service area. No direct operational impacts are anticipated. However, there would be operational impacts to our partners, depending on the alternative(s) pursued.

STAFFING & WORKFORCE DEVELOPMENT

The water supply options under consideration are outside of the SFPUC's service area. No direct staffing needs are anticipated for the SFPUC at this time. The SFPUC does not have experience in securing short-term transfers that can be stored in Los Vaqueros Reservoir. Expertise in this area through a contractor would be valuable support for SFPUC planning.

STATUS OF ENVIRONMENTAL REVIEW

Environmental review will be completed, as needed, based on the water supply alternative(s) pursued.

PROJECT ALTERNATIVES

There are several water supply alternatives, as described in the project description. The strategy to pursue water supply for storage in Los Vaqueros Reservoir is further broken down into long-term and short-term opportunities. The long-term supply options include desalination, purified water, and groundwater demineralization. As these are all large capital projects, they would take 10 years or more to implement. Therefore, SFPUC staff are simultaneously pursuing water transfers as a way to provide short-term water supply for the proposed storage. At this time, water transfer agreements are envisioned with willing sellers around the Delta. Short term, annual transfers are authorized through the SWRCB process and are CEQA exempt while long-term transfers that guarantee supply availability for 10 years require more rigorous analysis, including CEQA.

5C. Supply Alternatives for Los Vaqueros Expansion - *continued*

+ PROS

Drought-resistant supply. The project provides several alternatives of drought-resistant water supply.

Reduce wastewater discharges. Some long-term supply alternatives result in reduced wastewater discharge to San Francisco Bay.

Limiting infrastructure needs (transfers). Transfers can be accomplished without the need for additional infrastructure.

Access to transfer water. Beyond the advantages of stored water, participation in the project improves the SFPUC's access to the water transfer market through the Delta.

- CONS

New partnerships. Long-term water supply alternatives rely primarily on working with new partners, many of whom the SFPUC has not previously worked with.

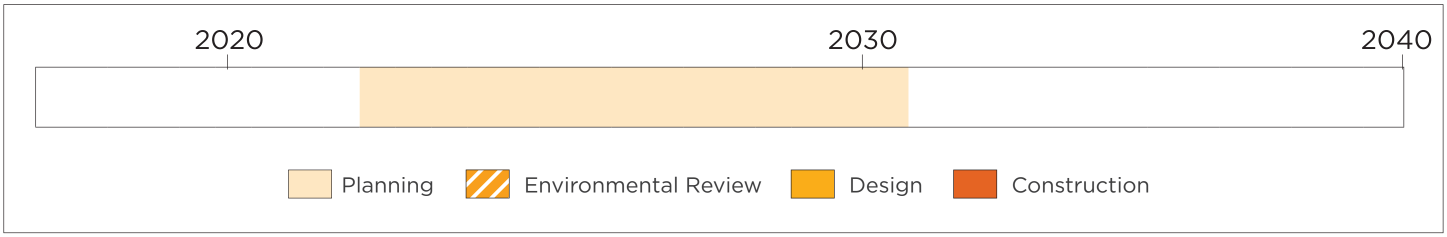
Assets outside the SFPUC's service area. Long-term water supplies will result in infrastructure being built for the SFPUC's benefit, outside the SFPUC's service area and operated by partner agencies.

Reliance on exchanges. To convey water to Los Vaqueros Reservoir, the SFPUC would have to rely on exchanges and be subject to capacity and priority constraints and regulatory approvals.

COST

The total capital cost for a new long-term supply for storage such as brackish water desalination is $511 million for a 10 mgd project (partnership) or $255 million for a 5 mgd project (for the SFPUC). A 10-mgd project at $511 million is estimated to be the equivalent of $313 million in 2023 dollars. Appropriated and budgeted funds in the current CIP total through 2026. No additional funding is needed in the next 10-year period at this time. A new water supply capital project is not anticipated until 2040 so only funds for continued planning are anticipated in the 10-year CIP budget. Pursuing transfers in the near-term will require operating budget allocation, which will be negotiated prior to LVE storage construction.

CURRENT STATUS & SCHEDULE



INFORMATION TO SUPPORT SFPUC COMMISSION ACTIONS

PROJECT RECOMMENDATION

- Continue planning long-term water supply opportunities while simultaneously securing short-term water transfers.

KEY MILESTONES/DECISIONS

- Identify short- and long-term water supply strategy and initiate agreements for exchanges and conveyance. (Being developed under 5C. Supply Alternatives for LVE and 5B. Conveyance Alternatives for LVE).
- *Risk of not meeting key milestone:* If a water supply strategy is not developed to support approving the Service Agreement, it could jeopardize approval of the Service Agreement and 5A. LVE Project would not proceed.

UPCOMING PROJECT ACTIVITIES

- Continue feasibility analysis of all water supply options. Engage in discussions with potential partners to assess interest in synergies.
- Continue coordinating with recommendations associated with the 5A. LVE Project.

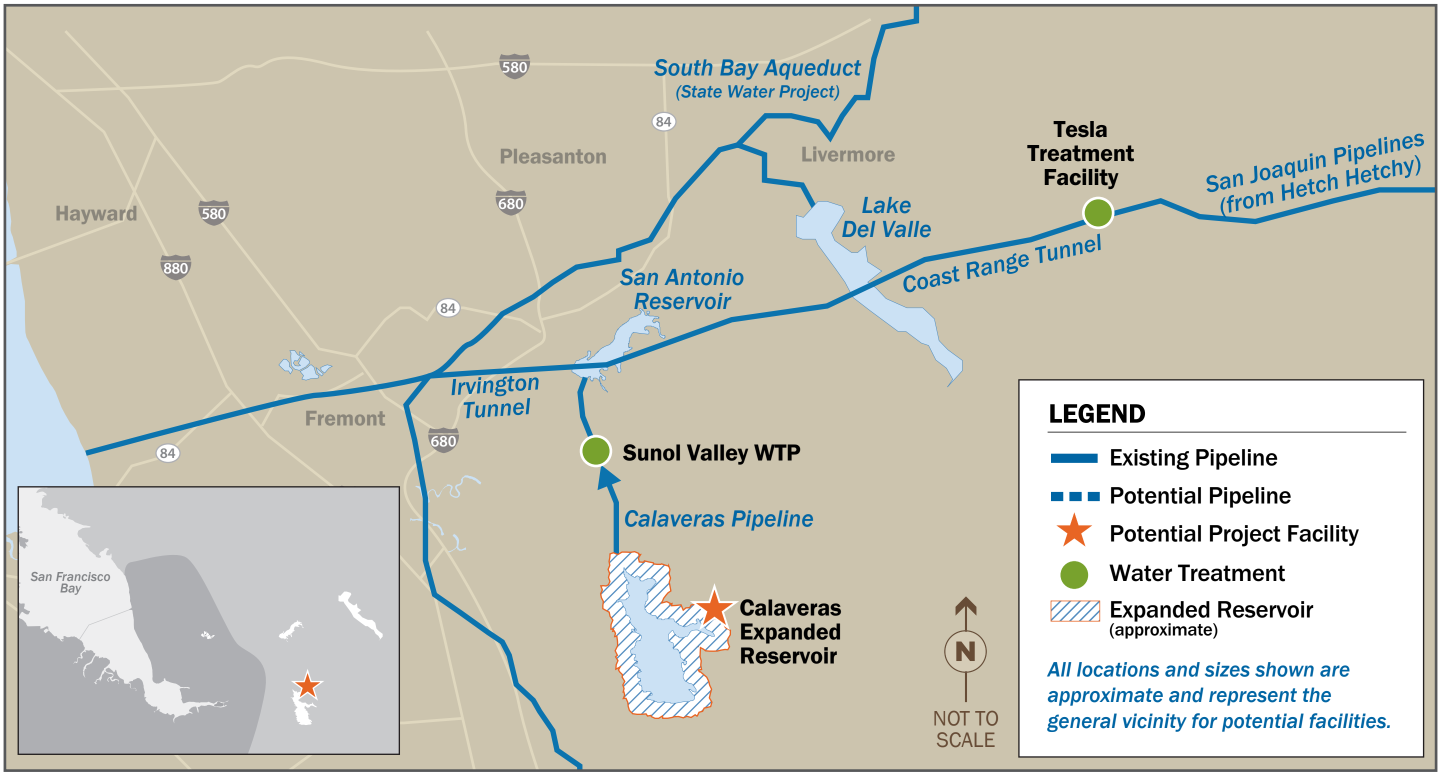
6. Calaveras Reservoir Expansion Project

PROJECT DESCRIPTION

This storage project envisions the expansion of the SFPUC's Calaveras Reservoir to store excess RWS supplies or other source water in wet/normal years. No expansion of water rights from the local watershed is anticipated. With the Calaveras Dam Replacement Project complete, Calaveras Dam currently impounds a capacity of 96,850 acre-feet or 31 billion gallons of water. By raising the dam height up to 890 feet, from its current height of 220 feet, an additional 290,000 acre-feet of storage could be realized. A smaller alternative would raise the dam to 771 feet, providing an additional 22,000 acre-feet of storage. Calaveras Reservoir is owned and operated by the SFPUC for the benefit of RWS customers. Unlike all other regional projects under review in this program, no external partners are anticipated at this time.

PROJECT LOCATION

The Calaveras Reservoir Expansion Project involves expansion of the existing Calaveras Reservoir located in Sunol Valley, Alameda County.



NEW INFRASTRUCTURE NEEDS

- Raise Calaveras Dam.
- Calaveras pipeline (construct new or reverse flow).
- San Joaquin pipeline bypass.
- Pump station.
- Upgraded dechlorination facility.
- Modifications to the Coast Range Tunnel (depending on conveyance alternative).

WATER SUPPLY AVAILABILITY & DISTRIBUTION

Four dam raise options and eight conveyance alternatives have been studied initially. Taking the smallest and largest of each as the planning bookends, the project is anticipated to provide between 2.7 mgd and 28.6 mgd of additional stored water for the SFPUC in a future dry year. The project would redirect water from the RWS downstream into storage for use during dry years. The sources of surplus water would include overflow or "spills" from the SFPUC's Moccasin Reservoir to the Modesto and Turlock Irrigation Districts' Don Pedro Reservoir that exceed the SFPUC's maximum storage allocation in Don Pedro Reservoir, and secondarily, spills from the SFPUC's Kirkwood Powerhouse. By expanding existing RWS storage, these existing sources of supply can be captured for use in dry years. The water stored in an enlarged Calaveras Reservoir will continue to be distributed to the SFPUC's customers through the RWS.

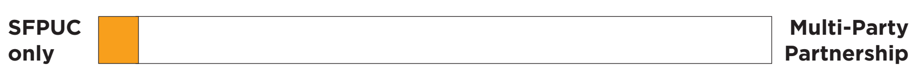
PROJECT AT A GLANCE

Supply Type	Storage (with conveyance)
SFPUC Supply Assumed	2.7 to 28.6 mgd
Project Capacity	2.7 to 28.6 mgd
Earliest Service Date	2035 or 2039 depending on size
Estimated Capital Cost per Acre-Foot	$2,831 to $3,960
Current Status	Planning

PROJECT PARTNERS & INTERESTS

Calaveras Reservoir is an RWS facility. There are no additional partners.

INSTITUTIONAL COMPLEXITY



Institutional complexity is a relative measure that takes into account project service area, project facilities ownership, number of project partners, cost share, and whether SFPUC is construction and design lead.

INSTITUTIONAL CONSIDERATIONS

The SFPUC has no external partners for this project and the project entirely serves the SFPUC service area with the SFPUC as the design and construction lead. Therefore, compared to other projects, the project has lower institutional complexity.

OPERATIONAL CONSIDERATIONS

Calaveras Reservoir collects local runoff from the Alameda Creek Watershed primarily through rainfall events. Through this project, the reservoir will receive water from additional sources within the RWS and possibly alternative water supplies in the future. Consistent with current operations, water from the expanded Calaveras Reservoir will be conveyed by gravity to the Sunol Valley WTP before blending with water originating from Hetch Hetchy Reservoir through the Calaveras Pipeline.

There are several alternatives that continue to be under consideration in planning. Water from the Tuolumne River could be conveyed through the Upcountry system via the Coast Range Tunnel, through the new San Joaquin Pipeline 4 and Tesla Treatment Facility in Tracy. A dechlorination facility or process could potentially be added to the existing Sunol Dechlorination Facility to treat the expanded flow, which could then potentially be conveyed through the Calaveras pump station and Calaveras Pipeline before entering the Calaveras Reservoir. Existing facilities have constraints for which alternatives are also being evaluated through multiple scenarios. The project would be operated to capture water supplies under existing water rights and conveyed and treated through new infrastructure facilities. Upcountry system operations may need to be modified to accommodate deliveries to an expanded Calaveras Reservoir. This could require realigning some operational objectives such as routing a portion of the water originating from Hetch Hetchy Reservoir to the Alameda System instead of the Don Pedro Water Bank, for example.

The project would provide operational flexibility, particularly in dry years, by allowing the SFPUC to utilize Tuolumne River and other wet/normal year supply available through the increased storage, as well as additional water supply such as purified water from AWS Projects that might be stored in an expanded Calaveras Reservoir.

STAFFING & WORKFORCE DEVELOPMENT

Operation of the expanded reservoir and related facilities would be by SFPUC staff. It is estimated that six new staff would need to be added for the implementation of this project.

STATUS OF ENVIRONMENTAL REVIEW

The project is anticipated to be subject to environmental requirements associated with project facilities and operations. The project would require environmental review and permits for construction and operation of the project at least including Section 401 Water Quality Certification and for protection of special-status species and habitat. The project is also subject to Least Environmentally Damaging Practicable Alternative analysis under section 404 of the Clean Water Act and resultant State section 401 determination.

PROJECT ALTERNATIVES

SFPUC is studying feasible dam raise scenarios; conveyance alternatives, including infrastructure and operational considerations, for an expanded Calaveras Reservoir; and different water supply alternatives to be integrated to maximize efficient use of expanded storage at Calaveras.

6. Calaveras Reservoir Expansion Project - *continued*

+ PROS

Dry-year reliability and supply utilization. The project significantly increases storage capacity within the RWS, enabling the SFPUC to capture more of its system supplies in wet and normal years for use in dry years.

Operational flexibility. The SFPUC operates a storage-based system; additional storage provides greater flexibility, particularly in dry years.

Local Control. No external partnerships are required to implement this project.

- CONS

Supply availability. Tuolumne River supply to divert to storage is uncertain.

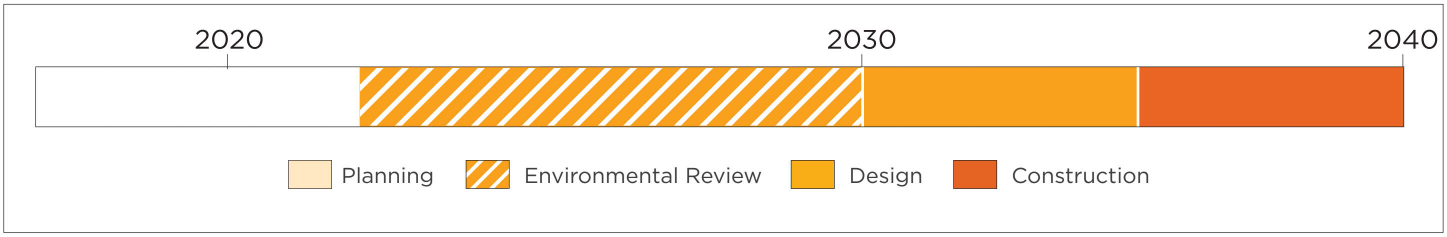
Cost and new infrastructure needs. Raising the Calaveras Dam and building associated conveyance infrastructure would have a substantial ratepayer impact and be a major infrastructure project that would likely have significant impacts.

Permitting. Expanding the Calaveras Dam and constructing the associated conveyance infrastructure would likely include complex permitting.

COST

The capital cost range for the dam raise from the minimum to the maximum possible height is estimated to be between $265 million ($182 million in 2023 dollars) and $3.6 billion, or $2.3 billion in 2023 dollars. The associated capital cost for the new conveyance would similarly range from $81 million ($70 million in 2023 dollars) to $2.4 billion ($1.5 billion in 2023 dollars). The total capital cost for the project is therefore between $346 million ($252 million in 2023 dollars) and $6 billion ($3.8 billion in 2023 dollars). Appropriated and budgeted funds in the current CIP total $7.5 million through 2026. To complete planning, environmental review and 30% design, additional funding of $7.6 million is estimated to be needed in the next 10-year period.

CURRENT STATUS & SCHEDULE



INFORMATION TO SUPPORT SFPUC COMMISSION ACTIONS

PROJECT RECOMMENDATION

- Proceed with planning, alternatives analysis and CEQA.
- To proceed beyond CEQA, seek direction from the SFPUC Commission.
- Work with Capital Planning and Finance teams to propose funding of up to $7.6 million for planning, environmental review and 30% design through the biennial CIP budget development process, subject to SFPUC's capital investment and financial sustainability priorities.

KEY MILESTONES/DECISIONS

- This project is still in planning stages. Key milestones and decisions that affect project success and implementation will be identified as additional planning and analysis is completed.

UPCOMING PROJECT ACTIVITIES

- Initiate Request for Proposals for alternatives study and narrow down both dam raise and conveyance scenarios.

Lower Crystal Springs Reservoir, 2022

Chapter 6: AWS Recommendations

Dating back to the early 1900s, San Francisco has a history of thoughtful planning that takes a long view toward creating a sustainable water supply while being a good steward of the natural resources entrusted to its care. In addition to the ongoing risks of disruptions and emergencies, future uncertainties that may result from challenges such as new regulatory requirements to climate change are driving the need to consider investing in alternative water supplies and expanding storage.

The potential for a significant future water supply gap, combined with the lengthy development process for large new alternative water supply projects, highlights the need for urgent commitment to proactive planning, investment, and coordination to achieve the following:

1. Avoid widening the water supply gap
2. Fill the water supply gap
3. Reduce the water supply gap

The AWS Program is focused on planning and developing regional alternative water supply and storage expansion projects to fill the water supply gap (the second objective), however, investing resources in all the areas listed is important for the continued long-term sustainability of the RWS. Changes to either water availability or demand will affect the water supply gap and future planning goals.

In the sections below, specific recommendations associated with each of these three key objectives are described. Section 6.2 (Fill the Water Supply Gap) presents recommendations related to AWS Program development, including both project-specific and programmatic recommendations. Finally, there is discussion of the broader decision-making timeline for projects and the AWS Program to provide guidance for future planning activities and timing of future AWS Plan updates.

While the recommendations included here are intended to address the future water supply gap, several have financial implications for the SFPUC and cannot be evaluated without the full context of all other capital investment and financial sustainability priorities of the SFPUC. Therefore, for any new funding associated with recommendations contained in this Plan, project management staff will work with Capital Planning and Finance teams to include specific recommendations as project proposals in the FY 2025-2034 Capital Improvement Plan (CIP) development process. Each proposal will be evaluated by staff considering broader priorities and may be included in the CIP as a staff recommendation when the CIP is presented to the SFPUC Commission for adoption in February 2024. Including funding for these recommendations could result in deprioritizing other projects or an increase in the capital plan and rates.

6.1 Avoid Widening the Water Supply Gap

6.1.1 Water Supply Benefits of Existing WSIP Projects

The water supply gap that is being addressed through the AWS Program is based on the difference between water availability in the RWS and obligations and 2045 customer demand projections. Water availability in the RWS is determined by modeling system deliveries with several baseline assumptions including the implementation of WSIP projects and the impact of rationing in dry years. In addition, assumed implementation of the Bay-Delta Plan Amendment would impact both the water supply and rationing components of water availability in the RWS.

If **WSIP Regional Projects** including 1) the Regional Groundwater Storage and Recovery (RGSR) Project; 2) Irrigation District Dry-Year Water Transfer in the San Joaquin Valley (Dry-Year Transfer); and 3) the Alameda Creek Recapture Project (ACRP) do not achieve the dry-year water supply benefits that they were expected to achieve, water availability may be further reduced, thereby widening the water supply gap that is the focus of the AWS Plan.

In the baseline modeling of water availability for the AWS Program, the RGSR project has been assumed to deliver 6.2 mgd of average annual dry-year supply before 2045 and the ACRP is assumed to provide 5 mgd to offset instream flow requirements related to the WSIP Calaveras Dam Replacement Project within the planning horizon. No water supply has been assumed in the modeling for the Dry-Year Transfer. Meanwhile, because both the RGSR project and ACRP are in construction and could achieve the assumed dry-year benefits by 2045, recommendations for their completion are included below. The SFPUC will continue to demonstrate progress on these projects through the WSIP reporting process and their ultimate yield will be verified and coordinated with the modeling of water availability for the AWS Program.

Regional Groundwater Storage and Recovery Project

Supply from the RGSR Project is expected to be available for use starting in 2026. During construction, following the installation of production wells, some water quality challenges were identified that will require treatment. Additionally, a storage buffer prior to distribution may be needed to accommodate the timing and range of water quality and operational needs. Additional funding for further treatment, potential storage, and staffing for operation is needed to deliver the dry-year supply benefits that have been contemplated. Without this investment in infrastructure and resources, the water supply from this project may be reduced to 3.6 mgd.

RECOMMENDATION 1

Evaluate alternatives for treatment and infrastructure and associated staffing needed to achieve 6.2 mgd of dry-year supply by 2045 from the RGSR project. The project management team (Water Enterprise and Infrastructure) will develop cost estimates and work with Capital Planning and Finance teams to include this as a project proposal in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

Alameda Creek Recapture Project

In the spring of 2023, during the initial stage of construction, the SFPUC concluded that the segment of the proposed project that captures water collected in a quarry downstream of Calaveras Reservoir and conveys it back into Calaveras Reservoir needed substantial re-evaluation of the design. The construction effort has been paused until that design re-evaluation is completed.

RECOMMENDATION 2

At the completion of the re-evaluation of the design for the ACRP, determine if there is an impact on the CIP for FY 2025-2034. Work with SFPUC's Finance team to identify ways to balance capital planning and financial planning objectives in order to include necessary funding for this project in the CIP.

6.1.2 Other Actions Affecting Water Availability from the RWS

Proposed Voluntary Agreement

As described in Section 3.2.1 of this Plan, the SWRCB has indicated it will consider the Proposed Voluntary Agreement for adoption in 2024. The impact of the Proposed Voluntary Agreement on projected water availability will remain uncertain until the SWRCB completes its evaluation, which will ultimately determine the impact of the Bay-Delta Plan Amendment on the SFPUC's future water supply gap. While the exact quantity associated with instream flow release requirements under the Bay-Delta Plan Amendment is subject to change with the Proposed Voluntary Agreement in the future, the Bay-Delta Plan Amendment is anticipated to cause a shortfall in RWS supply during dry years. Monitoring developments related to the Proposed Voluntary Agreement will be critical to understanding the future water supply gap.

Transfers and Other San Joaquin Valley Projects

The SFPUC has pursued long-term agreements to transfer 2 mgd from Modesto Irrigation District and subsequently from Oakdale Irrigation District in dry years only. While no dry-year transfer has been secured or implemented, the SFPUC is continuing to explore potential transfer opportunities on the Tuolumne River and other collaborative projects throughout the San Joaquin Valley in conjunction with the Proposed Voluntary Agreement negotiations related to the Bay-Delta Plan Amendment. No investment is needed at this time, and staff will continue reporting developments, as appropriate. As additional planning is required, resource and funding needs will also be identified. Projects related to negotiations of the Proposed Voluntary Agreement could impact water availability which would in turn impact future water supply gap estimates.

RECOMMENDATION 3

Continue reporting progress on negotiations related to the Proposed Voluntary Agreement and potential transfers and projects in the San Joaquin Valley that could contribute to instream flow releases. Identify resource and funding needs, as and when appropriate. No new funding or additional resources are needed to support this recommendation at this time.

Rationing

Rationing is a component of water availability and is dependent on water supply. As new supplies are added to the RWS, continuing to monitor the effects of rationing can help determine how much additional supply is needed to fill the water supply gap.

Potential Future Regulations and Climate Uncertainty

Both regulatory and climate uncertainties and their resultant impact on water supply availability make it difficult to definitively plan for the future. AWS planning efforts therefore do not currently assign a numerical shortfall with other potential future regulations but rather capture them qualitatively by recognizing the risk they pose to the SFPUC's ability to meet customers' water demand. Such regulatory requirements may be quantified in the planning efforts associated with future AWS Plan updates, as necessary.

AWS Planning Updates

Recognizing that the AWS Program is a dynamic planning process, it is intended that it will go through periodic review and update. Water availability and demand drivers will be reviewed, and the anticipated supply gap will be updated if significant changes have emerged (Chapter 3 of the AWS Plan). AWS Project data will be reviewed and updated to reflect current activities and planning, and project recommendations and next steps will be updated (Chapters 5 and 6 of this Plan). Finally, AWS Program recommendations will be reviewed and updated as needed in response to significant changes to regulations, policies, or other conditions (Chapter 6 of this Plan). The first scheduled update would be in 2026 after the SFPUC's 2025 UWMP is developed. After that, the AWS Plan could be updated periodically to align with the biennial budget cycle of the SFPUC and anticipated AWS Project milestones.

RECOMMENDATION 4

Provide updates to the AWS Plan, beginning in 2026 and periodically thereafter to align with AWS Project milestones, changes to regulatory requirements, and CIP planning. No new funding or resource allocation for this effort is anticipated at this time.

6.1.3 Baseline Demands on the RWS

Maximizing opportunities for conservation and development of local non-potable and potable supplies helps reduce water demands from the RWS and has been a top priority for the SFPUC. In 2008, when the SFPUC Commission adopted WSIP by Resolution 08-0200, it included direction for the SFPUC to develop 10 mgd locally in San Francisco and for the Wholesale Customers to develop another 10 mgd locally in the wholesale service area through conservation, recycled water, and groundwater. As the SFPUC plans for future reliability, reducing demands on the RWS continues to be important to reducing the future water supply gap.

Local Projects - San Francisco Retail Service Area

Over the past several years, within the retail service area, the SFPUC has expanded its conservation efforts, developed and expanded an onsite water reuse program, invested in recycled water and groundwater projects, and established an innovations program. These efforts have contributed to reducing retail demands from the RWS to a projected 73.5 mgd in 2045. While the SFPUC is committed to reducing demands on the RWS, San Francisco could need its full retail allocation of 81 mgd in the years beyond 2045.

Like WSIP Regional Projects, implementation of local water supply projects and estimated conservation savings have an effect on the presumed gap based on current modeling. Rather than water availability, however, they are included on the demand side of the gap equation. If local projects do not result in the yield that was anticipated, demands that would have been met with local supplies may shift to the RWS, resulting in higher demands on the RWS and a larger gap to fill.

In addition to ongoing conservation, the Onsite Water Reuse Program, and local water supply projects including Harding Park Recycled Water Project and Sharp Park Recycled Water Project that are operational, there are two WSIP Local Projects that are currently in construction. These projects are the San Francisco Groundwater Supply Project, which is assumed will provide 4 mgd of local supply before 2045 and the Westside Enhanced Water Recycling Project (Westside Project) that is expected to offset potable water use of 1.8 mgd before 2045. The San Francisco Groundwater Supply Project will require treatment to address organic compounds detected at three locations. In addition to meeting water quality objectives, increased operator staffing will be needed to deliver the water supply assumed for the project.

RECOMMENDATION 5

Evaluate infrastructure and operational needs and estimate new funding necessary to achieve 4 mgd of dry-year supply by 2045 from the San Francisco Groundwater Supply Project, which is a retail project in San Francisco. The project management team (Water Enterprise and Infrastructure) will work with Capital Planning and Finance teams to include this as a project proposal in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

Local Projects - Wholesale Service Area

Within the wholesale service area, agencies are developing and expanding their recycled water efforts, investing in the development of groundwater resources, and continuing to implement aggressive water conservation measures, resulting in an average residential per capita consumption of approximately 60.3 gpcd in FY 2021-22, 5% less than the year before. This is 48% less than the estimated peak residential per capita consumption of 114.9 gpcd in FY 1975-76.

Harding Park Recycled Water Project, 2015

6.2 Fill the Water Supply Gap

6.2.1 AWS Projects

As described in Chapter 5 (AWS Projects), the AWS Program is currently evaluating six projects: two storage expansion projects with associated conveyance alternatives and supply, as needed; one recycled water project that offsets groundwater pumping; and three regional purified water projects. Each of the AWS Projects increase the reliability of regional supplies in dry years when surface water supplies are most vulnerable. These projects are at different stages of planning and design, and their need for funding and commitment for implementation will be staggered. The near-term recommendations for the AWS Projects and the AWS Program are described below.

Los Vaqueros Expansion Project

The Los Vaqueros Expansion (LVE) Project is a storage project that can provide up to 40,000 acre-feet of additional carryover storage for the SFPUC. Located outside of the SFPUC's service area, it can provide a strategic location for storage and access to potential new water supplies. Environmental review for the LVE is complete, and conditional funding for the project has been approved by the State. Additional federal loans and grants are likely to become available. The project provides both urban water supply benefits as well as environmental benefits. Based on early modeling, dry-year conveyance capacity in the DWR-owned South Bay Aqueduct is expected to be sufficient to accommodate SFPUC deliveries into the RWS at San Antonio Reservoir or by exchange with partner agencies. The greatest risk with this project is not having a water supply source secured for filling allocated storage. To mitigate this risk, AWS staff are pursuing both short- and long-term transfer opportunities, and simultaneously assessing opportunities to develop a new water supply project as part of the Supply Alternatives for LVE Project. A water supply strategy will be presented to the SFPUC Commission in early 2024, prior to seeking commitment to participate in the LVE Project. To meet external funding requirements, a decision on whether to participate in this storage project would need to be made before the proposed March 2024 schedule for financial closing. Debt for the project will likely be issued by the JPA on behalf of the project and low interest loans are likely to be secured. As such, cash outlay for debt repayment within the 10-year financial plan horizon may be limited. To participate in LVE, new funds of $31 million for capital and $36 million for operating costs will need to be included in the FY 2025-2034 CIP budget.

Approval of participation in the LVE Project would also necessitate implementation of the companion projects: Supply Alternatives for LVE and Conveyance Alternatives for LVE, both of which are in the early planning stages of development. Because the SFPUC's system is not hydraulically connected to the Los Vaqueros Reservoir, both a supply source and delivery mechanism are critical to realizing the benefits of storage from LVE.

RECOMMENDATION 6

Following development of a water supply strategy, AWS staff will recommend whether to approve participation in the LVE Project by early 2024. Based on feasibility analysis to date, staff expect to recommend participation in the project. Participation in the LVE Project will also require implementing the companion projects: Conveyance Alternatives for LVE and Supply Alternatives for LVE.

To participate in the construction and operation of the LVE Project, funding of $31 million for capital and $36 million for operating costs would need to be included in the FY 2025-2034 CIP. AWS staff should work with Capital Planning and Finance teams to include this as a project proposal (up to $67 million) in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

Daly City Recycled Water Expansion Project

This project provides recycled water to users who largely pump groundwater from the South Westside Basin to meet their irrigation needs. By replacing their source of supply for irrigation, there can be 0.7 mgd available in the South Westside Basin in a dry year, on an average annual basis. Another important benefit of this project is that it supports the RGSR project by minimizing the risk that use of the South Westside Basin by irrigation customers could affect availability of supplies and groundwater operations in dry years when water is scarce. Competition for supplies and the need for mitigation of potential impacts in the South Westside Basin in dry years can be reduced or eliminated by providing an alternate supply source for non-potable uses in the South Westside Basin. Environmental review and 30% design for this project are complete. To proceed with design, agreements among the project partners and with the prospective customers are necessary. Discussions are ongoing and terms of agreement are expected to be finalized in the coming year. Once those terms of agreement are finalized, the SFPUC can better determine costs and operational impacts, if any, and pursue cost-sharing and grant funding to reduce the cost of project implementation. The prospective customers are in Cal Water's service area.

RECOMMENDATION 7

Continue developing terms of agreement with project partners and prospective recycled water customers. Pursue completion of final design and construction of the Daly City Recycled Water Expansion Project. In anticipation of near-term approval, AWS staff should work with Capital Planning and Finance teams to include this as a project proposal for up to $104 million in capital costs and $12 million in operating costs in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

South Bay Purified Water Project

This purified water project is being explored in coordination with the cities of San Jose and Santa Clara as a means of delivering 3.5 mgd in dry years to the SFPUC. Separately, the project provides 6.5 mgd combined total water supply in all years to San Jose and Santa Clara directly as described in Chapter 5. By delivering dry-year supply to the SFPUC, the project can offset some of the impact of potentially providing permanent status to these interruptible customers. The SFPUC Commission has to make a decision regarding their permanent status designation by December 2028. To have the option to make that determination, environmental review of potential supplies would need to be completed prior to that decision.

This project would be operated by the cities of San Jose and Santa Clara in all years for their own use and provide water to the RWS only in dry years when there is a projected shortfall to meet the demands of SFPUC customers. While the initial feasibility study for this project is positive, additional studies such as the evaluation of brine discharge options are needed to fully determine its viability. Regulations for this type of purified water project will also not be finalized until the end of 2023 and approved in 2024.

This is a new project in the AWS Program and is not currently budgeted in the CIP. Including it and funding continued planning will help provide more information to support decision-making in 2028.

RECOMMENDATION 8

Include the South Bay Purified Water Project as a new project in the FY 2025-2034 CIP. To continue developing this project through environmental review and 30% design with the cities of San Jose and Santa Clara, funding of up to $10 million is needed. AWS staff should work with Capital Planning and Finance teams to include this as a project proposal in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

San Francisco-Peninsula Regional PureWater, ACWD-USD Purified Water, and Calaveras Reservoir Expansion Projects

The two purified water projects, San Francisco-Peninsula Regional PureWater and ACWD-USD Purified Water, as well as the Calaveras Reservoir Expansion project are progressing through initial planning. Alternatives analyses and other technical studies are needed, and the projects will need to undergo environmental review. The two purified water projects are estimated to provide 11.4 mgd to augment RWS supplies in dry years. The potential expansion of Calaveras Reservoir can provide between 22,000 acre-feet and 290,000 acre-feet of additional storage depending on the size of the dam raise. That storage can result in available supplies of up to 2.7 to 28.6 mgd in a dry year, on average over 7½ years of an 8½-year design drought. Additional investigation is needed to make specific project recommendations. New funding needed for project planning through 30% design and environmental review for these three projects is estimated to be $10.6 million in aggregate.

RECOMMENDATION 9

To continue planning through environmental review and 30% design for the San Francisco-Peninsula Regional PureWater, ACWD-USD Purified Water, and Calaveras Reservoir Expansion projects, combined new funding of $10.6 million would be needed. AWS staff should work with Capital Planning and Finance teams to include these as project proposals in the FY 2025-2034 CIP development process. The proposals will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when the CIP is before the SFPUC Commission for adoption in February 2024.

6.2.2 AWS Program

AWS Projects are different from projects that the SFPUC has undertaken in the past in many ways. From introducing new supply sources to the RWS to treating recycled water under a new regulatory regime for drinking water and implementing multi-party partnerships where ownership and operational responsibilities may vary, these projects will require new approaches to implementation and operation. The following recommendations will support the successful implementation of AWS Projects at a programmatic level. These recommendations are specific to the current phase of AWS Program development, and additional programmatic recommendations will likely be identified in the future as planning progresses.

Operations Planning

Successful implementation of the AWS Program will require careful planning and coordination from an operational standpoint. This includes designing and integrating the new system with existing infrastructure, ensuring adequate and appropriately skilled staffing and resources, establishing maintenance protocols and schedules, and implementing quality control measures. Additionally, operational plans will have to be in place for emergencies and contingencies, particularly during droughts or system failures. AWS operators may be organizationally separate from RWS operations, but close coordination will be required. Ongoing monitoring and evaluation of performance and effectiveness will also be necessary to ensure long-term sustainability.

To begin planning the implementation and operation of future AWS Projects, hiring an Operations Planning Manager is an important step. The manager would serve as a liaison between the AWS and RWS systems and plan operational needs such as staffing, maintenance and logistics. Without an Operational Planning Manager in place during the planning phase of the AWS Program, the implementation of AWS Projects could face significant operational challenges, leading to delays, cost overruns, and potential water quality risks.

RECOMMENDATION 10

Support hiring an Operations Planning Manager to begin preparing for system integration, staffing, maintenance, and planning to support development of the AWS Program. AWS staff should work with Capital Planning and Finance teams to include this new capital-funded position in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

Purified Water Planning

A significant part of the AWS Program relies on implementing purified water projects throughout the SFPUC service area. Purified water projects will require a specialized set of technical, regulatory, and communication skills for successful implementation. Throughout California, implementing purified water projects is gaining traction and the SFPUC will also likely implement multiple purified water projects over the planning horizon. Hiring a Purified Water Program Manager can ensure that the SFPUC is tracking new regulations to ensure an understanding of compliance needs, establishing consistent coordination and communication with stakeholders, and establishing a technical advisory panel that can provide guidance and expertise in the design and quality control of future project demonstration and implementation.

RECOMMENDATION 11

Support hiring a Purified Water Program Manager who will be responsible for tracking and ensuring compliance with new regulations, coordination with stakeholders, and establishing a technical advisory panel to support the successful demonstration and implementation of purified water projects within the AWS Program. AWS staff should work with Capital Planning and Finance teams to include this new capital-funded position in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

Financing and Affordability

Based on preliminary estimates, the capital investment associated with the suite of regional AWS Projects could be on the order of $4 billion to $10 billion (escalated to the mid-point of construction) over the planning horizon, varying largely based on the size of the expansion of Calaveras Reservoir and the preferred conveyance facilities.

Some of the key challenges ahead will be developing a financing strategy for AWS Projects and ensuring the resulting rate impacts remain affordable for SFPUC customers. To maintain access to high-quality water while keeping water rates affordable for all, in addition to prudent planning the SFPUC will also need to investigate creative and alternative methods of financing projects such as securing grants and low interest rate loans to fund projects, and considering public-private partnerships to design, build, and operate projects. Uncertainties in ownership, financing and project operations can significantly impact the cost estimates and timing of anticipated expenditures for large water supply projects. As the AWS Projects are better defined over the course of planning, costs will continue to evolve.

AWS staff have worked with the Finance team to evaluate the rate impact of adding the AWS Project and Programmatic recommendations in this Plan, which would add approximately $209 million in capital and operating expenses between FY 2025 and 2034.

This cost estimate includes:

- Cash-funding capital expenditures for the LVE group of projects (storage, supply and conveyance) and the Daly City Recycled Water Expansion Project
- Planning through environmental review and 30% design for three purified water projects and the Calaveras Reservoir Expansion Project (with conveyance)
- Staffing to support continued planning for the AWS Program
- Operational costs for the LVE Storage and the Daly City Recycled Water Expansion projects

These preliminary costs were incorporated into the SFPUC 10-Year Plan financial model to evaluate the rate adjustments needed to maintain the SFPUC Water Enterprise's conformance with financial policies and obligations. The financial modeling showed that retail rates would need to increase by about 0.9% above the current projected rate plan by FY 2033 and wholesale rates would increase by 7.6% in the same time period. It should be noted that this preliminary rate assessment is based solely on the available information during this early phase of program development and its purpose is only to provide a planning level understanding of the impact from the recommended program. It is only a planning level estimate for a subset of AWS Projects in this specific 10-year CIP window and is subject to change. Implementation of the full AWS Program, or alternate financing of the recommended projects using debt would have different rate impacts than those presented here. Rate impacts would also extend past the 10-year timeframe analyzed. These will have to be analyzed as planning progresses in the coming years.

AWS staff should work in closer collaboration with the Finance team going forward to explore project-specific financing options (grant funding, debt issuance, cash funding, and public-private partnerships) and rate impacts based on more data. It is important to evaluate the financial implications of these projects to ensure that ratepayers are not unduly burdened. Hiring a staff person who can help with coordination and help the AWS Program pursue and obtain low-interest loans and grants can help the SFPUC reduce the financial burden of implementing AWS Projects and ensuring that they are affordable and sustainable.

RECOMMENDATION 12

Support hiring an AWS Funding and Financing Analyst to help track and address long-term project financing options and affordability, in coordination with the Capital Planning and Finance teams and the SFPUC Loans and Grants Manager. AWS staff should work with Capital Planning and Finance teams to include this new capital-funded position in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

6.3 Reduce the Water Supply Gap

6.3.1 New Local Supplies

There are opportunities to do more than has already been planned in San Francisco and throughout the region to potentially reduce demands on the RWS. Non-potable demands in San Francisco are limited and dispersed, which makes serving more of them challenging and costly. In recent years, the SFPUC has begun exploring the potential to reuse treated wastewater effluent through advanced purification to meet stringent drinking water standards as a potential sustainable water supply. This project concept is referred to as PureWaterSF. PureWaterSF could increase local supplies in San Francisco and thereby further reduce demands on the RWS in 2045.

PureWaterSF

PureWaterSF envisions producing 4 mgd of purified water and meeting up to 1.2 mgd of non-potable supply across two treatment plants. One treatment plant on the east side of San Francisco could deliver 2 mgd of drinking water in addition to 1.2 mgd to meet the non-potable demands associated with existing dual-plumbed buildings. A parallel plant on the west side of San Francisco could deliver up to 2 mgd of drinking water into the distribution system. To advance this project, planning funds and project management staff would need to be assigned. This is a local project in the retail service area.

RECOMMENDATION 13

Support hiring a Project Manager to plan the technical analyses, demonstration, and outreach for PureWaterSF, a local supply project in the retail service area. As this would be a new retail-only position, the Water Enterprise will work with the Capital Planning and Finance teams separately to include this as a new capital funded position in the FY 2025-2034 CIP development process. It will be evaluated by staff taking into consideration all other retail capital investment and financial sustainability priorities and may be included in the CIP as a staff recommendation when it is before the SFPUC Commission for adoption in February 2024.

Regional Fund for Local Supplies

While local supply projects do not change the SFPUC's legal and contractual obligations to the Wholesale Customers or the Retail Allocation to Retail Customers, they can help improve water supply reliability and provide benefits to the entire service area when demands on the RWS are reduced. Any regional investment in local supply projects would necessarily impact individual Wholesale Customers, and therefore BAWSCA will play a significant role in planning.

The SFPUC will collaborate with BAWSCA to explore the feasibility of a regional grant program that can provide investment dollars collected through the Wholesale Revenue Requirement to support the implementation of local supply projects. Local water supply projects have the potential to reduce demand on the RWS but remain within the control of the local jurisdiction.

Examples of other incentive programs, both in California and nationwide, can be reviewed to help inform an outline for a program in the SFPUC's service area. Elements of a program to consider would include program objective(s), eligibility criteria, application and selection process, incentives, reporting, verification, funding sources and the potential role of the San Francisco Bay Area Regional Water System Financing Authority.

If feasible, the program could expand water-use efficiency programs and technologies that reduce water consumption, promote sustainable water management practices, and ultimately benefit the environment and the communities throughout the service area.

RECOMMENDATION 14

In partnership with BAWSCA, explore the feasibility of a grant program to support local projects that reduce demands on the RWS. No funding or additional resources are needed for this effort at this time.

6.4 Summary of Recommendations

This section summarizes the recommendations described above, which are based on current planning and anticipated project milestones by 2024.

Table 6-1: Summary of Recommendations

Recommendations to Avoid Widening the Water Supply Gap
1. Evaluate alternatives for infrastructure and associated staffing needed to achieve 6.2 mgd of dry-year supply by 2045 from the RGSR project. The project management team (Water Enterprise and Infrastructure) will develop cost estimates and work with Capital Planning and Finance teams to include this as a new project proposal in the FY 2025-2034 CIP development process.
2. At the completion of the re-evaluation of the design for the ACRP, determine if there is an impact on the CIP for FY 2025-2034. The project management team (Water Enterprise and Infrastructure) will develop cost estimates and work with Capital Planning and Finance teams to include this as a new project proposal in the FY 2025-2034 CIP development process.
3. Continue reporting progress on negotiations related to the Proposed Voluntary Agreement and on potential transfers and projects in the San Joaquin Valley that could contribute to instream flow releases. Identify resource and funding needs, as and when appropriate. No new funding or resources are needed to support this recommendation at this time.
4. Provide updates to the AWS Plan, beginning in 2026 and periodically thereafter to align with project milestones, changes to regulatory requirements, and CIP planning. No new funding or resource allocation for this effort is anticipated at this time.
5. Evaluate infrastructure and operational needs to achieve 4 mgd of dry-year supply by 2045 from the San Francisco Groundwater Supply Project, which is a retail project in San Francisco. The project management team (Water Enterprise and Infrastructure) will develop cost estimates and work with Capital Planning and Finance teams to include this as a new project proposal in the FY 2025-2034 CIP development process.

Recommendations to Fill the Water Supply Gap (AWS Project and Program Recommendations)

AWS Project Recommendations

6. By early 2024, AWS staff will develop a water supply strategy and will recommend whether to approve participation in the LVE Project. Based on feasibility analysis to date, staff expect to recommend participation in the **LVE Project**. Participation in the project will also require implementing the companion projects: Conveyance Alternatives for LVE and Supply Alternatives for LVE.

   To participate in the construction and operation of the LVE Project, funding of $31 million for capital and $36 million for operating costs would need to be included in the FY 2025-2034 CIP. AWS staff should work with Capital Planning and Finance teams to include this as a project proposal (up to $67 million) in the FY 2025-2034 CIP development process.

7. Continue developing terms of agreement with project partners and prospective customers of the **Daly City Recycled Water Expansion Project** and pursue completion of final design and construction of the project. In anticipation of near-term approval, AWS staff should work with Capital Planning and Finance teams to include this as a new project proposal for up to $104 million in capital costs and $12 million in operating costs in the FY 2025-2034 CIP development process.

8. Include the **South Bay Purified Water Project** as a new project in the FY 2025-2034 CIP. To continue developing this project through environmental review and 30% design with the cities of San Jose and Santa Clara, funding of up to $10 million would be needed. AWS staff should work with Capital Planning and Finance teams to include this as a new project proposal in the FY 2025-2034 CIP development process.

9. Continue planning through environmental review and 30% design for the **San Francisco-Peninsula Regional PureWater, ACWD-USD Purified Water, and Calaveras Reservoir Expansion projects**, which would require combined new funding of $10.6 million. AWS staff should work with Capital Planning and Finance teams to include a new project proposal in the FY 2025-2034 CIP development process.

Implementation of the AWS Project Recommendations 6 through 9 would require approximately $155 million in new capital funding and $48 million in new operating funds over the 10-year CIP window.

Table 6-1: Summary of Recommendations (continued)

Recommendations to Fill the Water Supply Gap (AWS Project and Program Recommendations)
AWS Programmatic Recommendations
10. Support hiring an **Operations Planning Manager** to begin preparing for system integration, staffing, maintenance, and planning to support development of the AWS Program. AWS staff should work with Capital Planning and Finance teams to include this new capital-funded position in the FY 2025-2034 CIP development process.
11. Support hiring a **Purified Water Program Manager** who will be responsible for tracking and ensuring compliance with new regulations, coordination with stakeholders, and establishing a technical advisory panel to support the successful demonstration and implementation of purified water projects within the AWS Program. AWS staff should work with Capital Planning and Finance teams to include this new capital-funded position in the FY 2025-2034 CIP development process.
12. Support hiring an **AWS Funding and Financing Analyst** to help track and address long-term project financing options and affordability, in coordination with the Capital Planning and Finance teams and the SFPUC Loans and Grants Manager. AWS staff should work with Capital Planning and Finance teams to include this new capital-funded position in the FY 2025-2034 CIP development process.
Implementation of AWS Programmatic Recommendations 10 through 12 as well as continued program management, exploratory studies, outreach, reporting, and coordination with other departments and partners would require $6 million in new funding over the 10-year CIP window.
Recommendations to Reduce the Water Supply Gap
13. Support hiring a Project Manager to plan the technical analyses, demonstration, and outreach for PureWaterSF, a local supply project in the retail service area. As this would be a new retail-only position, the Water Enterprise will work with the Capital Planning and Finance teams separately to include this as a new capital funded position in the FY 2025-2034 CIP development process.
14. In partnership with BAWSCA, explore the feasibility of a grant program to support local projects that reduce demands on the RWS. No funding or additional resources are needed for this effort at this time.

6.5 Planning Beyond 2024

While the near-term recommendations outlined above are appropriate for the current phase of project planning and development, the planning objectives of the AWS Program may change over time as more information becomes available. Therefore, it is important to recognize that the near-term recommendations discussed in this Plan are part of a longer decision-making timeline for the AWS Program. Taking a long view also allows SFPUC staff time to plan responsibly by taking an adaptive approach and making recommendations around investments in a phased and measured pace, while continuing to aggressively plan for alternative water supplies. This approach also involves periodically revisiting the water supply gap and its drivers periodically as planning decisions are made. Longer-term decision making will inform future recommendations for the AWS Program.

Historically-occurring patterns are changing – whether it is the frequency of drought occurrences, regulatory curtailments, or a shift in water demands on the RWS. In response, the SFPUC must take a more forward-looking approach to water supply planning. Through the AWS Program, the SFPUC is taking steps toward mitigating and managing the risk of uncertain water availability so it can continue to provide reliable water service to its customers. Projects are being planned in phases so that they can be scaled; implementation will be prioritized based on demands over obligations, and the SFPUC is committed to updating information as new data on supply availability or demands become available. Continuing to build and plan a robust AWS Program can help prepare the SFUPC to meet the water supply challenges that lay ahead.


San Francisco Bay Area, 2020

GLOSSARY

1984 Settlement Agreement and Master Water Sales Contract (1984 Agreement) refers to the 1984 agreement between the City and County of San Francisco and certain Suburban Purchasers (Wholesale Customers) in San Mateo County, Santa Clara County, and Alameda County that expired on June 30, 2009. The 1984 Agreement memorialized the parties' settlement of the civil action entitled City of Palo Alto, et al. v. City and County of San Francisco (9th Cir. 1977) 548 F.2d 1374.

Adopted rationing policy refers to the level of rationing that the SFPUC developed during planning of WSIP to reflect water supply conditions simulated over the duration of the design drought. Over the 8½-year design drought, rationing is initially 0% and increases up to a maximum of 20%, with the annual average over the sequence being about 12%.

Alameda and Peninsula watersheds refers the two Bay Area watersheds that supply the RWS: the Alameda Creek watershed, which is located in Alameda and Santa Clara counties, and the Peninsula watershed, which is located in San Mateo County.

Alternative Water Supply Program (AWS Program) refers to the SFPUC water supply planning program established in 2019 to develop and evaluate new long-term alternative water supply projects that address future demands in the SFPUC service area.

Alternative Water Supply Projects (AWS Projects) are projects involving new and diverse water supply options beyond the SFPUC's existing infrastructure, surface water supplies, and local groundwater sources, such as projects involving expanded surface water storage, groundwater banking, transfers, purified water (potable reuse), and desalination, as well as technological innovations and other tools that can increase supply.

BAWSCA Annual Survey is the annual publication compiled by BAWSCA containing individual Wholesale Customer service area information, water use data, and purchase projections.

Bay Area Water Supply and Conservation Agency (BAWSCA) refers to the entity established pursuant to Division 31 of the California Water Code (Water Code §§81300-81461), which represents the interests of 26 cities, water districts, and private utilities, who purchase water wholesale from the SFPUC.

Bay-Delta Plan Amendment refers to the 2018 Amendment to the Water Quality Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary that establishes water quality objectives for which the State Water Resources Control Board may assign a measure of responsibility to upstream water rights holders to protect the beneficial uses of the San Francisco Bay/Sacramento-San Joaquin River Delta Estuary (Bay-Delta Estuary) tributary watersheds.

Calaveras Reservoir refers to the RWS reservoir located in Alameda County that collects water from the local Alameda Creek watershed.

Capital costs are one-time costs needed to plan, design, and construct a capital project to bring it to operational status.

Carryover storage refers to water stored in reservoirs that may be carried over from one water year to the next. In California's variable climate, maintaining carryover storage can help ensure a minimum level of water supply in case the next year is dry.

Conveyance facilities refers to infrastructure that connects existing or new infrastructure to enable deliveries of water.

Crystal Springs Reservoir refers to the RWS reservoir that is located in San Mateo County, collects runoff from the San Mateo Creek watershed, and also receives water from Hetch Hetchy Reservoir. The Reservoir consists of two lakes, Lower Crystal Springs Reservoir to the north, and Upper Crystal Springs Reservoir to the south.

Demand management is a water supply management approach that aims to conserve water by influencing customer demand through increased water efficiency and reduced use.

Design drought refers to the SFPUC's basis for planning and modeling of future drought scenarios, which is based on historic droughts and hydrology. The design drought is a hypothetical 8½-year sequence, which consists of the six-year drought from 1987-1992, followed by an additional 2½-year drought period from 1976-1977.

Direct potable reuse (DPR) is the planned introduction of highly treated recycled water that meets stringent regulatory standards into a drinking water distribution system. The two forms of DPR in California are raw water augmentation, which includes treatment at a drinking water treatment plant prior to connecting to the drinking water distribution system and treated water augmentation, which delivers the highly treated water directly into the drinking water distribution system.

Don Pedro Reservoir refers to the reservoir located in Tuolumne County that is owned and operated by the Modesto and Turlock Irrigation Districts, in which the SFPUC utilizes capacity as a water bank under the terms of the Fourth Agreement to support SFPUC operations during dry periods.

Drivers means factors that influence future water availability and projected demands on the RWS. The anticipated water supply gap is determined based on a number of drivers on both the supply side, which affect future water availability, and on the demand side, which consider obligations and future demands.

Extreme decentralization refers to the practice of integrating building-scale water recycling within cities with existing centralized water systems. Extreme decentralization is one example of how demand reduction efforts can be implemented to help to reduce demand and support resilient urban water systems.

Firm yield means the annual average amount of water that the RWS could deliver to the SFPUC service area under dry-year conditions over the design drought sequence.

Fourth Agreement is the 1966 agreement between the City and County of San Francisco and the Modesto and Turlock Irrigation Districts that governs the operation of the Don Pedro Reservoir water bank and other matters.

Gallons per capita per day (gpcd) is a unit of measure for the average daily consumption of water per person in gallons.

Groundwater recharge refers to the replenishment of a groundwater basin or an aquifer. Groundwater recharge can occur naturally with time or can be accomplished by spreading water at the surface of the groundwater aquifer or by directly injecting water into the groundwater basin.

Hetch Hetchy Reservoir refers to the RWS reservoir that is located in the Sierra Nevada's Tuolumne River watershed, which provides approximately 85% of RWS supplies, on average.

in-City refers to the portion of the SFPUC's retail service area located within the City and County of San Francisco.

Indirect potable reuse (IPR) is the planned blending of highly treated recycled water into a natural water source (i.e., groundwater basin or reservoir) prior to using the water for potable purposes. In California, the accepted forms of IPR include groundwater augmentation and reservoir (or surface water) augmentation.

Individual Supply Guarantee (ISG) refers to each Wholesale Customer's share of the Supply Assurance set forth in Attachment C of the WSA.

Individual Water Sales Contract refers to the individual contract between each of the Wholesale Customers and San Francisco that details customer-specific matters such as location of service connections, service area maps, and other matters specific to that customer consistent with the terms of the WSA.

Instream flow requirements represent regulated minimum flows or releases necessary to maintain the environmental health of an ecosystem. Instream flows requirements are often referred to as environmental flow requirements.

Interim Supply Limitation (ISL) refers to the 265 million gallons per day annual average limitation on water deliveries from RWS watersheds imposed by the SFPUC in its approval of the WSIP in Resolution No. 08-0200, dated October 30, 2008.

Interruptible customers refers to the cities of San Jose and Santa Clara, which San Francisco provides water to on a temporary and interruptible basis pursuant to the terms of the WSA.

Joint Powers Authority (JPA) is a legally created entity that allows two or more public agencies to jointly exercise common powers.

Legal and contractual obligations refers to obligations described in certain agreements between the City and County of San Francisco and the Wholesale Customers.

Level of Service (LOS) Goals and Objectives refers to the "Phased WSIP Goals and Objectives" adopted by the SFPUC Commission on October 30, 2008, by Resolution No. 08-0200 as part of the approval of WSIP and any amendments subsequently adopted by the Commission.

Local water supply projects refer to water supply projects and actions that increase the availability of non-RWS supplies for local use, including projects implemented by the SFPUC within the boundaries of San Francisco as well as projects implemented by Wholesale Customers to serve their respective retail service areas.

Non-potable demands are customer demands that can be met with supplies from non-potable water sources, such as recycled water, that do not meet drinking water quality requirements.

Obligations refer to commitments of the SFPUC, including: 1) legal and contractual obligations to Wholesale Customers; 2) retail service area obligations to San Francisco and suburban retail customers that are provided for through a Retail Allocation; and 3) potential future obligations for interruptible customers of the SFPUC.

Operation & Maintenance costs (O&M costs) refer to the annual operations and maintenance costs of projects, including costs related to staffing and ongoing maintenance.

Per capita water use is the average volume of water consumed per person in a given area on a daily basis.

Permanent customers refers to 24 of the 26 Wholesale Customers (excluding the cities of San Jose and Santa Clara) that share in the Supply Assurance under the terms of WSA.

Planning horizon is the length of time into the future that is accounted for in a planning document. The AWS Plan examines projected supplies and demands through a planning horizon of 2045.

Potable demands are customer demands that must be met with potable water supplies, which are treated to drinking water standards.

Pre-1914 appropriative water rights are legal entitlements authorizing water to be diverted from a specified source established prior to the adoption of the State Water Commission Act in 1914.

Proposed Voluntary Agreement refers to the proposed agreement that the SFPUC, the State, and the Modesto and Turlock Irrigation Districts are negotiating for the Tuolumne River that would implement the Bay-Delta Plan Amendment for an 8 to 15-year period, and, along with the ecological response to changes in the river flow regime over the term of the agreement, determine the impact of the Bay-Delta Plan Amendment on the SFPUC's future water supply.

Purified water is highly treated wastewater that is used for potable purposes and includes indirect potable reuse and direct potable reuse.

Raker Act refers to the Raker Act, 38 Stats. 242, the Act of Congress, enacted in 1913, that authorized the construction of the Hetch Hetchy System on federal lands.

Rationing refers to limiting the amount of water supply available to customers to reduce demand during extended droughts.

Raw water augmentation is the planned placement of purified water into a system of pipelines or aqueducts that deliver raw water to a drinking water treatment plant that provides water to a public water system. Raw water augmentation can also refer to purified water added to a surface water body with insufficient residence time to be considered reservoir augmentation.

Regional water supply projects refer to water supply projects and actions that can provide benefits to customers throughout the SFPUC service area, including both retail and wholesale customers.

Regional Water System (RWS) means the water storage, transmission, and treatment system operated by the SFPUC in Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco counties, including projects constructed under WSIP, but excluding assets providing water service solely to Retail Customers or solely to one or more Wholesale Customers.

Reservoir augmentation is the introduction of purified water into a surface water reservoir that is used as a source of domestic drinking water supply.

Retail Allocation refers to the SFPUC's retail service area obligations of up to 81 mgd average annual supply to San Francisco and suburban retail customers.

Retail Customers means any customers that purchase water from the SFPUC that are not wholesale customers, whether located inside or outside of San Francisco.

San Antonio Reservoir refers to the RWS reservoir located in Alameda County that collects water from the local Alameda watershed and receives and stores water from other portions of the RWS.

San Francisco Peninsula (the Peninsula) refers to the peninsula in the San Francisco Bay Area that separates San Francisco Bay from the Pacific Ocean.

SFPUC Commission refers to the five-member decision-making body of the San Francisco Public Utilities Commission.

Storage and recovery refers to projects that coordinate the management of surface water and groundwater supplies to store groundwater in normal or wet years so it may be made available for use in dry years when surface water supplies are limited.

Storage projects are projects that focus on storing water so it is available for later use in dry years and can include surface water storage or groundwater storage.

Supply Assurance means the 184 mgd maximum annual average metered supply of water dedicated by San Francisco to public use in the wholesale service area (not including San Jose and Santa Clara) in the 1984 Agreement and the WSA.

Supply projects means projects that would provide a new source of water supply to the SFPUC service area, which may include surface water, purified water, groundwater, and recycled water projects.

Total system yield represents the total water supply that the RWS can commit to provide while remaining consistent with the adopted rationing policy. In wet or normal years, the total system yield can be provided to the service area, and additional water supply may also be available in the RWS. In dry years, the total system yield may include a combination of water supply deliveries and rationing (water availability).

Treated water augmentation is the planned placement of purified water into the water distribution system of a public water system's potable water pipelines or tanks for distribution.

Tuolumne River watershed is the watershed for the river system that includes the Tuolumne River, Cherry Creek, Eleanor Creek, and a portion of Moccasin Creek and encompasses Hetch Hetchy Reservoir, Lake Lloyd, Lake Eleanor, and Don Pedro Reservoir.

Upcountry portion of the RWS refers to the portion of the RWS east of the Alameda East Portal.

Urban Water Management Plan (UWMP) refers to the plan that an urban water supplier prepares and updates on a regular basis, in accordance with California Water Code §§10610-10656, which supports its long-term resource planning to ensure that adequate water supplies are available to meet existing and future water demands.

Water availability means the amount of water available to the SFPUC from the RWS; in dry years, it refers to water supply as well as rationing that can be assumed to address a portion of demands over the design drought (total system yield).

Water bank refers to the accounting system used by San Francisco and the Modesto and Turlock Irrigation Districts at Don Pedro Reservoir, which is owned and operated by the Districts. San Francisco can provide water supply credits at times when surplus supply is available and can later draw against credits to divert water at Hetch Hetchy Reservoir.

Water conservation is a reduction in water demand resulting from policies and programs such as rebates, surveys, and other incentives offered to customers.

Water Supply Agreement (WSA) refers to the agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County, and Santa Clara County, dated July 1, 2009, as amended from time to time, which sets forth the terms and conditions under which the SFPUC supplies water to the Wholesale Customers.

Water supply gap refers to the water supply shortfall calculated as the difference between expected water supply availability from the RWS in a future dry year and the contractual obligations and anticipated demands for water supply from the RWS for all SFPUC customers.

Water System Improvement Program (WSIP) refers to the voter-approved, multi-year capital program to upgrade the SFPUC's regional and local water systems to protect its ability to reliably provide water, as approved by the SFPUC Commission on October 30, 2008, by Resolution No. 08-0200.

WSIP Local Projects refers to projects included as part of the WSIP Program that are located in San Francisco and only benefit San Francisco residents.

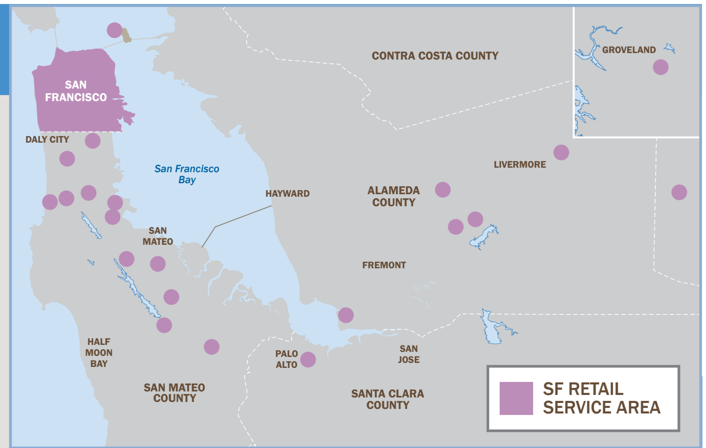
WSIP Regional Projects refers to projects included in the WSIP Program that are located from the Sierra foothills to San Francisco. WSIP Regional Projects benefit both in-City customers and the wholesale agencies that receive water from the SFPUC.

Wholesale Customers means one or more of the 26 wholesale customers that purchase water from the SFPUC pursuant to the WSA and are represented by BAWSCA.

Appendix A: Customer Profiles

Information included in customer profiles is based on data available from the FY 2021-22 BAWSCA Annual Survey unless otherwise specified.

San Francisco Retail



Dots represent approximate locations of suburban retail customers. The customers shown represent a majority of water use in the suburban retail service area but are not comprehensive.

CUSTOMER OVERVIEW[1,2]:

The San Francisco retail service area includes over 177,000 in-City retail customers within the City of San Francisco along with suburban retail customers located outside San Francisco. The total population of the retail service area is about 900,000 people. About two-thirds of the total demands in the retail service area are residential customers and one-third are commercial and industrial customers. Suburban retail customers account for 7% of the total demand.

RETAIL ALLOCATION[1]: 81 mgd

VULNERABILITIES & OPPORTUNITIES:

San Francisco is located at the western end of the RWS and is the largest customer of the system. The east side of San Francisco is characterized by large commercial and mixed-use developments while the west side has larger irrigated spaces and smaller, dispersed residential areas. Given the density and built nature of San Francisco, opportunities for centralized recycled water are limited and best suited for large parks and golf courses. San Francisco has a robust conservation program and has also pioneered a decentralized onsite water reuse program focused on minimizing water demands from new developments and commercial and industrial applications. Additional water supply opportunities are being explored through purified water.

CURRENT & FUTURE LOCAL SUPPLIES:

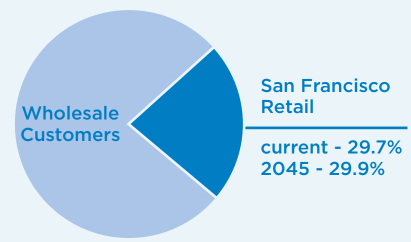
San Francisco local supplies include groundwater, recycled water and treating alternative water supplies onsite for reuse. The San Francisco Groundwater Supply Project utilizes groundwater from the Westside Groundwater Basin in the City as a potable water supply by blending it with RWS supplies. Currently less than 1 mgd is blended but pumping can be increased to blend up to 4 mgd. The Harding Park Recycled Water Project was completed in 2012 and the Pacifica Recycled Water Project began supplying water for irrigation in 2014. Starting in 2024, the Westside Recycled Water Program will provide 1.6 mgd of recycled water to meet non-potable demands in Golden Gate Park and other areas on the west side of San Francisco, and the project is designed to deliver an annual average of up to 2 mgd by 2045. The PureWaterSF program is exploring the potential to provide a new, local drinking water supply to San Francisco through the use of purified water. San Francisco also has water savings from the onsite water reuse program.

WATER CONSERVATION INSIGHTS[2,3]

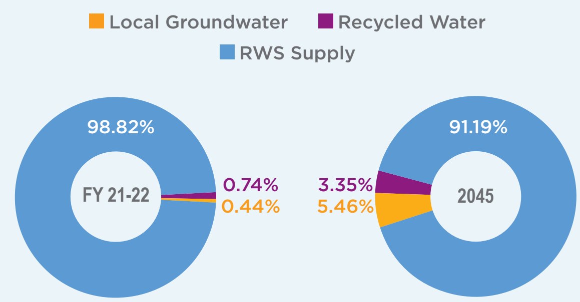
21% decrease in residential gallons per capita demand (R-GPCD) since 2010.

In 2021-2022, water conservation activities were estimated to have a potential 30-year water savings of 237 million gallons.

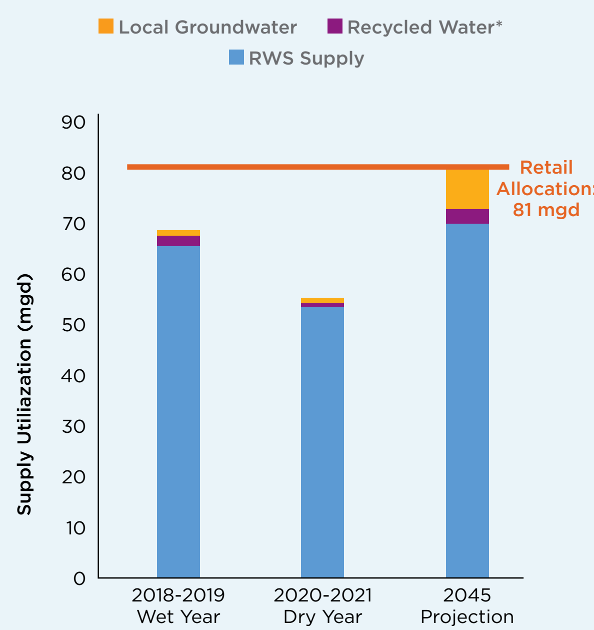
SHARE OF RWS DELIVERIES[1]



CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY UTILIZATION[1]



Sources: (1) 2020 SFPUC UWMP
(2) FY21-22 SFPUC Water Resources Annual Report
(3) FY18-19 SFPUC Water Resources Annual Report

Notes: *Recycled water includes centralized recycled water and onsite water reuse.

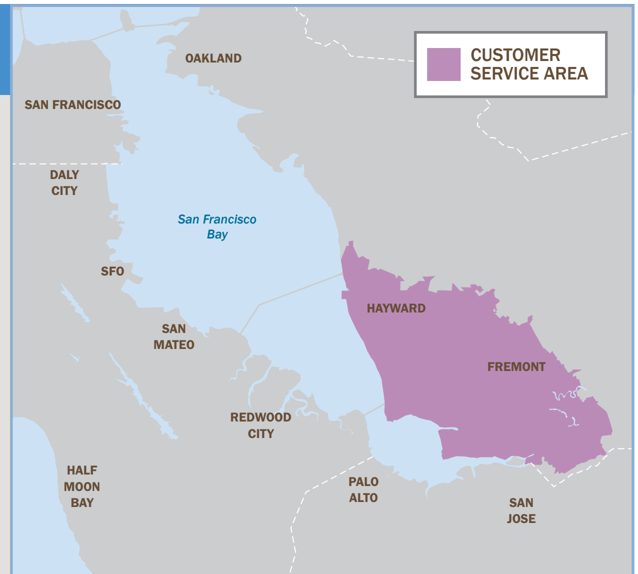
Alameda County Water District

CUSTOMER OVERVIEW[1]:

Alameda County Water District (ACWD) is the SFPUC's largest wholesale customer and serves approximately 344,855 people within a service area that covers 105 square miles, which includes the cities of Fremont, Newark, Union City, and the southern portions of the City of Hayward. The customer base is mainly comprised of a mix of single-family residential, multi-family residential, commercial, and industrial customers.

INDIVIDUAL SUPPLY GUARANTEE[2]: 13.76 mgd

MINIMUM PURCHASE REQUIREMENT[2]: 7.648 mgd



VULNERABILITIES & OPPORTUNITIES[3]:

SFPUC RWS and State Water Project (SWP) supplies are anticipated to be significantly affected in dry year and multi-dry year conditions according to upcoming regulatory requirements. Reservoir and fresh groundwater sources vary widely from year to year, depending primarily on hydrologic conditions and availability of local runoff. The Newark Desalination Facility enables ACWD to treat brackish groundwater in the Niles Cone Groundwater Basin for potable supply while simultaneously contributing to aquifer reclamation efforts. ACWD also diverts freshwater supplies to recharge groundwater to increase short-term supply resilience during dry years and to mitigate saltwater intrusion.

AWS SYNERGIES:

Purified water, Los Vaqueros Reservoir Expansion, SBA conveyance

CURRENT & FUTURE LOCAL SUPPLIES:

To ensure long-term water supply reliability for its customers ACWD is evaluating water supply options through its Climate Adaptation Plan and the Purified Water Feasibility Evaluation in partnership with SFPUC.

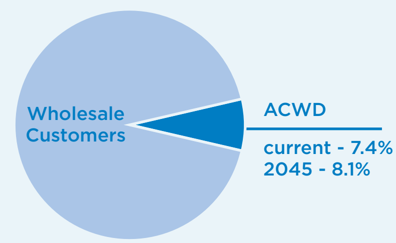
64
R-GPCD

WATER CONSERVATION INSIGHTS[1,4]

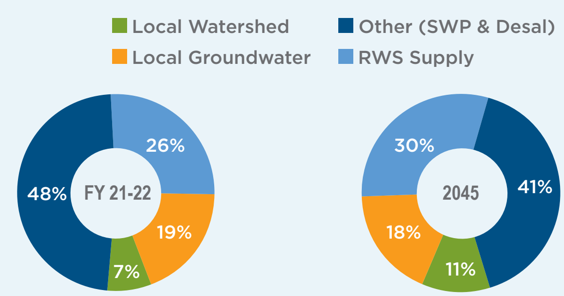
ACWD residential gallons per capita demand (R-GPCD) has decreased by 20% since 2010 and has not returned to pre drought consumption levels. ACWD developed a Water Efficiency Master Plan which is a road map for water use efficiency out to 2050.

ACWD is deploying Automated Metering Infrastructure (AMI) to all its customers to encourage water conservation. Customers with AMI receive leak and high use alerts.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

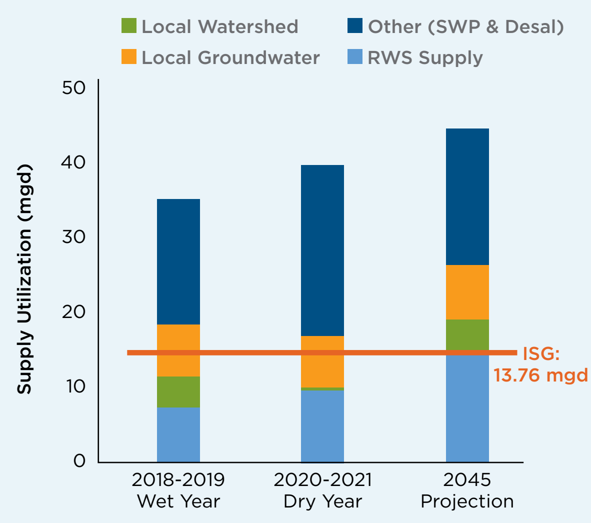


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



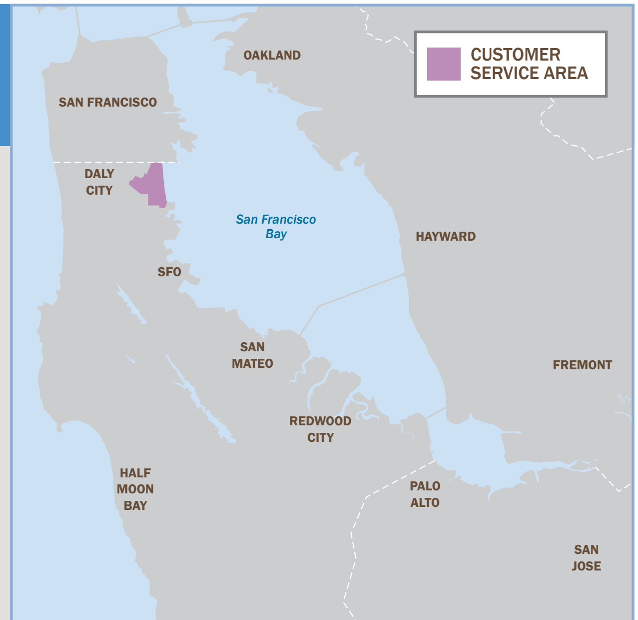
SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Reductions in SWP supplies will result in an increased use of RWS supplies.



Sources: (1) 21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) ACWD 2020 UWMP
(4) '10-11 BAWSCA Annual Survey

City of Brisbane & Guadalupe Valley Municipal Improvement District

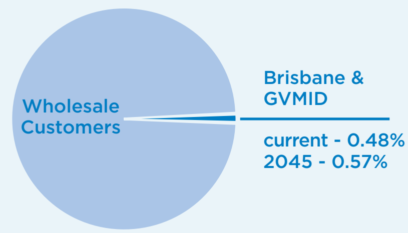


CUSTOMER OVERVIEW[1]:

The City of Brisbane operates the Brisbane Water District and the Guadalupe Valley Municipal Improvement District (GVMID). The City serves 4,851 people over a 3.4-square-mile service area, which in addition to the original primarily residential city core also includes an industrial park with a small adjoining residential neighborhood, and an office development on a closed landfill. While residential connections account for approximately 32% of total water usage, commercial and industrial customers represent 28% of water use, followed by dedicated irrigation connections with an average of 24% of water use.

INDIVIDUAL SUPPLY GUARANTEE[2]: 0.98 mgd

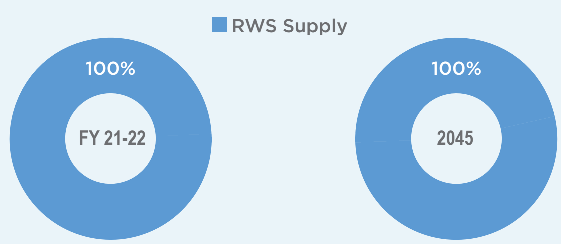
SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]



VULNERABILITIES & OPPORTUNITIES[3]:

The City of Brisbane & GVMID rely exclusively on RWS supplies for it's water needs. Due to the service area's geographical location and the absence of underlying productive aquifers, access to alternative water supplies such as groundwater or surface water is limited. New large developments to be located within the service area are in the planning stages and Brisbane is considering alternative water supplies that would improve system reliability and supply the anticipated increase in water demands.

CURRENT & FUTURE SUPPLY PORTFOLIOS[1]

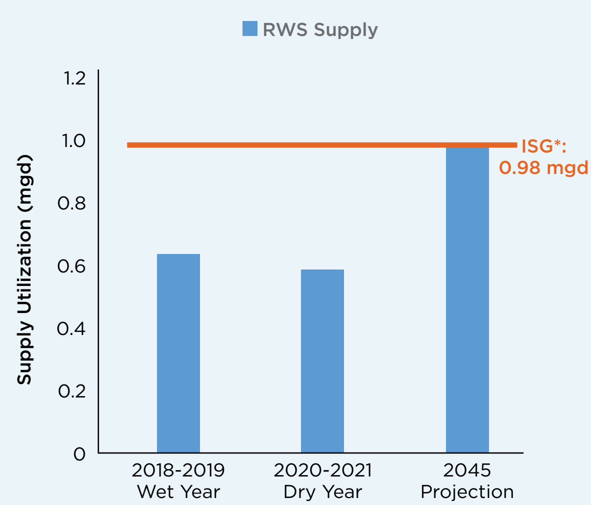


CURRENT & FUTURE LOCAL SUPPLIES:

The City of Brisbane & GVMID continue to participate in various studies investigating the viability of limited alternative water resources in order to supplement future potable water supply.

SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Reliance on RWS supply will increase to meet increasing demands and will reach ISG by 2045.



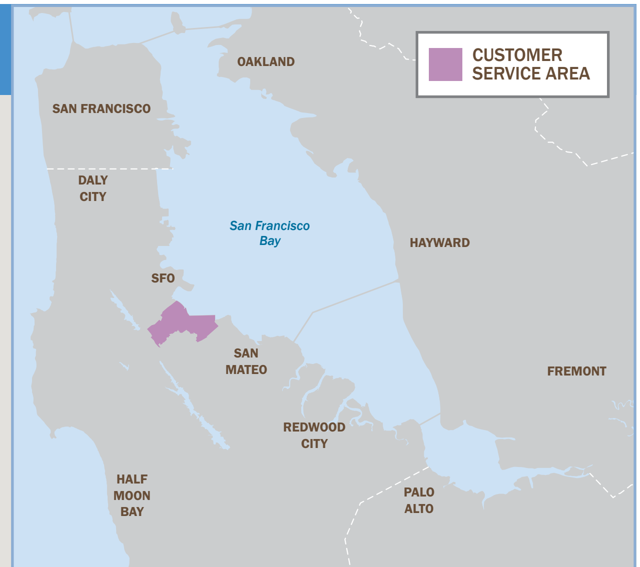
WATER CONSERVATION INSIGHTS[1,4]

There has been a 19% reduction in per residential gallons per capita per day (R-GPCD) since 2010-2011 due to continued conservation savings.

Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Sierra Point Phase 3 Project SB 610 Water Supply Assessment
(4) '10-'11 BAWSCA Annual Survey

Notes: * ISG represents the sum of the City of Brisbane ISG (0.46 mgd) and GVMID ISG (0.52 mgd)

City of Burlingame



CUSTOMER OVERVIEW[1]:

The City of Burlingame is a municipal utility that serves 32,407 people over an area of 5.5 square miles located within the Burlingame city limits, unincorporated areas in the Burlingame Hills and a few properties in the City of San Mateo and the Town of Hillsborough. The system supplies approximately 57% of its water usage to residential connections, and 22% to commercial and industrial customers.

INDIVIDUAL SUPPLY GUARANTEE[2]: 5.23 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

The City of Burlingame relies on RWS supplies to fulfill its water needs. Burlingame is continuing to evaluate the feasibility of expanding recycled water supplies within its supply portfolio, but this water supply alternative is not currently included in long-term supply planning.

AWS SYNERGIES:

Purified water, Los Vaqueros Reservoir Expansion, SBA conveyance

CURRENT & FUTURE LOCAL SUPPLIES:

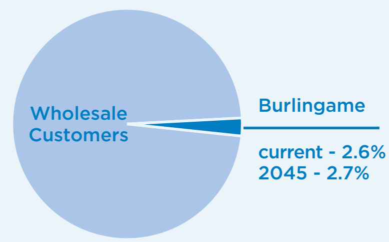
Recycled water use was evaluated as part of the City of Burlingame's Wastewater Treatment Plant Master Plan in 2016. Burlingame is continuing to evaluate the feasibility of implementing this project or partnering with a neighboring jurisdiction to supply recycled water. However, there are no definitive plans to date.

WATER CONSERVATION INSIGHTS[1,4]

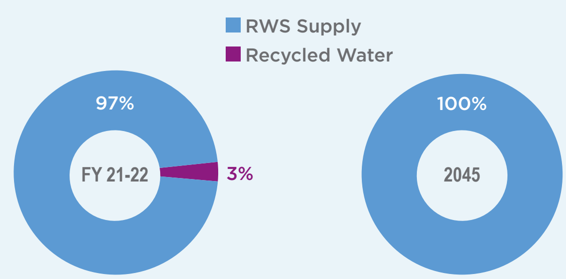
61 R-GPCD

23% decrease in residential gallons per capita demand (R-GPCD) since 2010. While the city population has continued to grow, per capita water usage has not returned to pre-2015 drought levels.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[3]

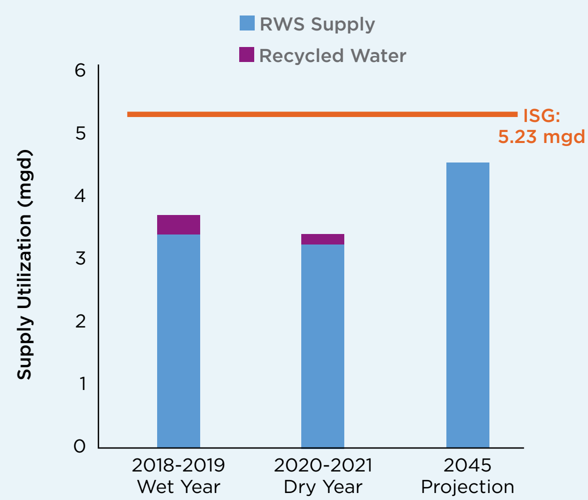


CURRENT & FUTURE SUPPLY PORTFOLIOS[3]



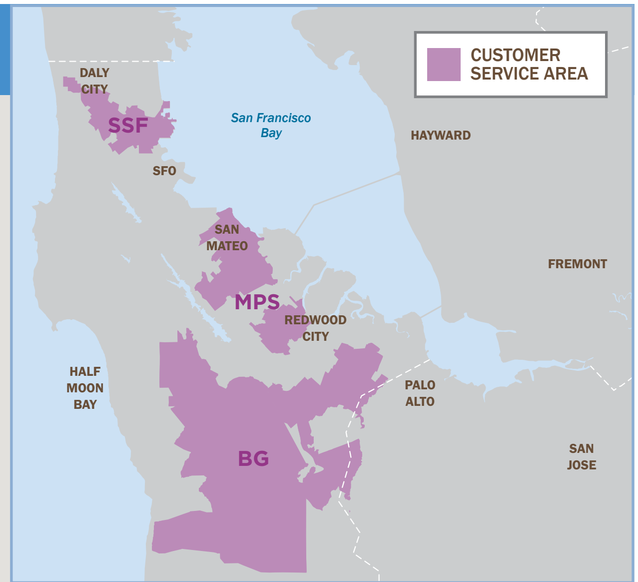
SUPPLY MIX IN MULTIPLE YEAR TYPES[3]

RWS supply is anticipated to increase by 2045 to match water demands.



Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of Burlingame 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

California Water Service



CUSTOMER OVERVIEW[1,3]:

California Water Service (Cal Water) is a regulated utility that operates water systems throughout California, three of which are SFPUC wholesale customers – Cal Water Bear Gulch (BG), Cal Water South San Francisco (SSF) and Cal Water Mid-Peninsula (MPS). Cal Water is the largest SFPUC wholesale customer, which supplies 262,095 people and relies on a mix of local surface water and groundwater supplies. Cal Water BG and MPS mainly serve residential customers, while commercial and industrial connections represent up to 53% of Cal Water SSF's demand.

INDIVIDUAL SUPPLY GUARANTEE[2]: 35.68 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

Supply sources for the Cal Water BG water system include the perennial Bear Gulch Creek, which are constrained by drought conditions, diversion limits and minimum instream flow requirements. Cal Water SSF has 8 groundwater wells tapping into the Westside Basin, which are operated based on hydrologic conditions and can feed up to 20% of the system's demand. Cal Water SSF is part of the pilot conjunctive use program with SFPUC and has been receiving supplemental RWS deliveries in lieu of pumping groundwater in order to preserve groundwater supplies for use during dry periods and increase the aquifer's resilience.

AWS SYNERGIES:

Daly City Recycled Water Expansion,
SF-Peninsula Regional PureWater Project

CURRENT & FUTURE LOCAL SUPPLIES:

Cal Water has established a Development Offset Program to account for projected delivery shortfalls during dry years and the need for new local water supplies. The Development Offset Program includes a new, non-refundable special facilities fee that will be used to accelerate local water supply projects and expand conservation programs designed to offset the net demand increase of proposed developments.

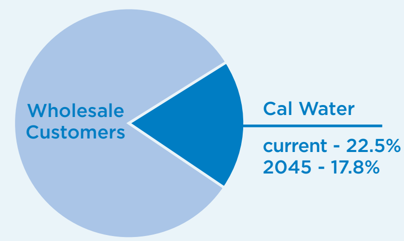
Cal Water is planning on developing a well in the Bear Gulch District to provide local supply for the system and is investigating water transfers and the potential of a brackish water desalination project, among other supply options.

83
R-GPCD*

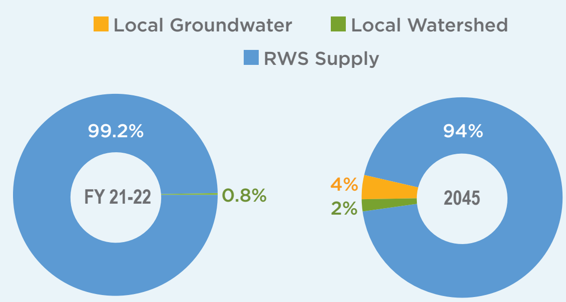
WATER CONSERVATION INSIGHTS[1,4]

The average residential gallons per capita demand (R-GPCD) of the three Cal Water service areas has reduced by 18% since 2010.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

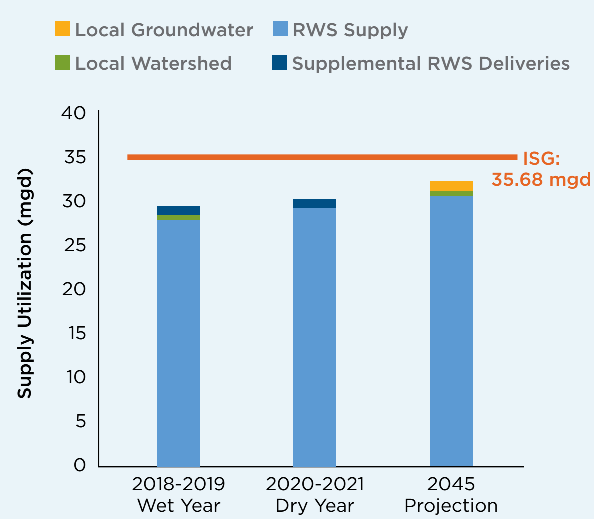


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Local groundwater supplies can support reduced reliance on RWS.



Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Cal Water 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

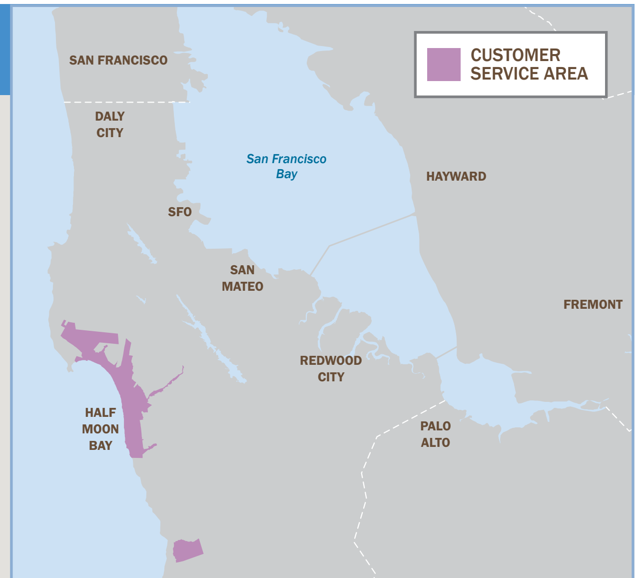
Note: * The average R-GPCD of Cal Water BG, Cal Water SSF, and Cal Water MPS service areas is shown here.

Coastside County Water District

CUSTOMER OVERVIEW[1,3]:

Coastside County Water District (Coastside CWD) is a special district that serves the City of Half Moon Bay and the unincorporated coastal communities of El Granada, Miramar, Moonridge, and Princeton in San Mateo County. Coastside CWD supplies water to 18,839 people located within a 14-square-mile service area. Coastside CWD serves various types of water demands, with an average of 55% of its water usage serving residential customers.

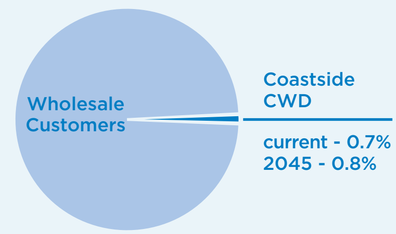
INDIVIDUAL SUPPLY GUARANTEE[2]: 2.18 mgd



VULNERABILITIES & OPPORTUNITIES[3]:

Production yields from local watersheds, which include a surface water diversion on Denniston Creek and surface water infiltration wells on Pilarcitos Creek, are impacted by drought conditions and water rights limitations. Coastside CWD plans to invest in its groundwater facilities in the Half Moon Bay Terrace basin and to explore the feasibility of developing water reuse to improve water supply resilience.

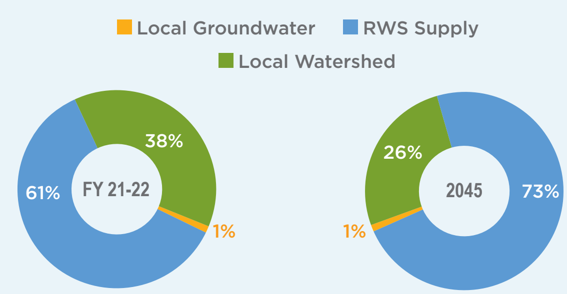
SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]



CURRENT & FUTURE LOCAL SUPPLIES:

Coastside CWD continues to invest in local water resources, including efforts to perfect secondary water rights on San Vicente Creek and Denniston Creek. Coastside CWD is replacing aging infrastructure and ancillary facilities to reduce water loss and upgrading water treatment facilities to improve treatment efficiency for both local and RWS supplies.

CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



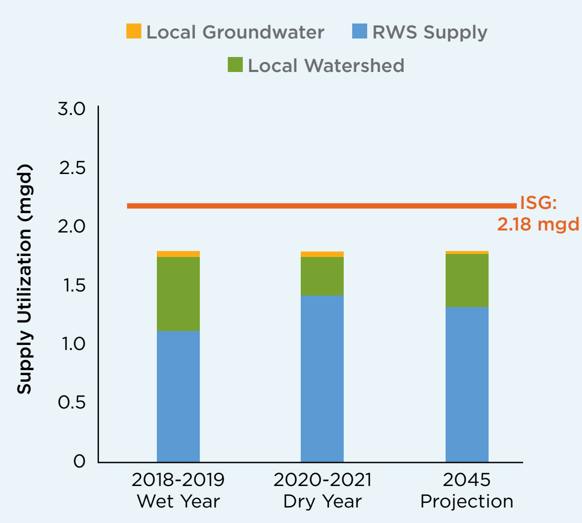
WATER CONSERVATION INSIGHTS[1,4]

47 R-GPCD

Coastside CWD has seen a 15% decrease in residential gallons per capita demand (R-GPCD) since 2010 and an 11.8% decrease in gross per capita water use since 2015 due to continued conservation savings.

SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

There will be continued reliance on local watershed supplies.



Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Coastside CWD 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

City of Daly City

CUSTOMER OVERVIEW[1]:

The City of Daly City is a municipal utility that serves 107,197 people within Daly City and designated unincorporated areas in San Mateo County. The system's service area covers approximately 7.4 square miles and primarily includes residential connections, which account for 67% of total water usage.

INDIVIDUAL SUPPLY GUARANTEE[2]: 4.29 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

Daly City's supply portfolio includes RWS supply, five groundwater wells from the Westside Basin aquifer, and recycled water from the North San Mateo County Sanitation District (NSMCSD) for irrigation purposes. Daly City has been receiving supplemental RWS deliveries in lieu of utilizing their groundwater supplies from the Westside Basin aquifer in accordance with agreements with SFPUC and other local municipal pumpers to increase the aquifer's drought resilience. Daly City serves recycled water for irrigation purposes to golf courses, city parks, public landscaping and is planning the expansion its recycled water production, which would limit reliance on RWS supply, serve irrigation customers in Colma and provide supplies for groundwater recharge.

AWS SYNERGIES:

Daly City Recycled Water Expansion

CURRENT & FUTURE LOCAL SUPPLIES:

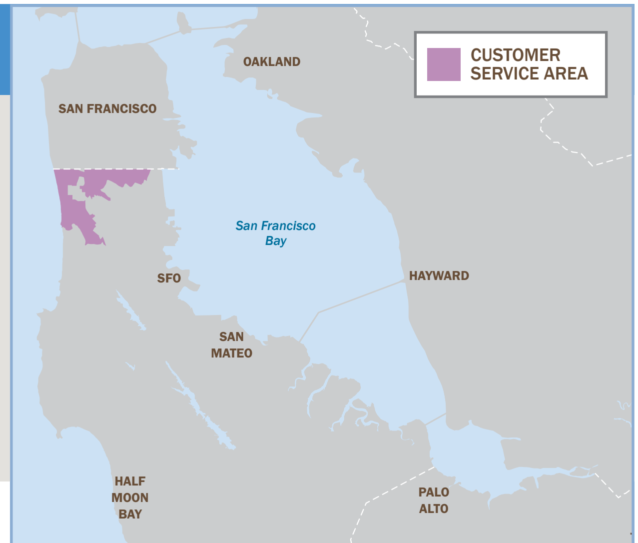
Daly City operates four groundwater wells and one emergency well that produce approximately 2 million gallons per day (mgd). Daly City has two groundwater capital projects that are projected to increase local supplies by approximately 1.0 mgd.

Daly City agreed to accept an increased amount of surplus RWS supply at a reduced rate and reduce groundwater from the Westside Basin to study the response of the basin recharge.

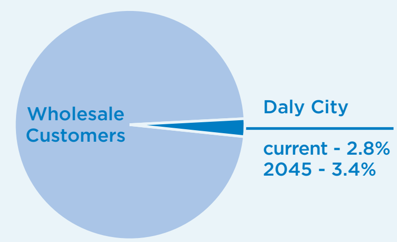
WATER CONSERVATION INSIGHTS[1,4]

Daly City has had a 19% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to continued water conservation savings.

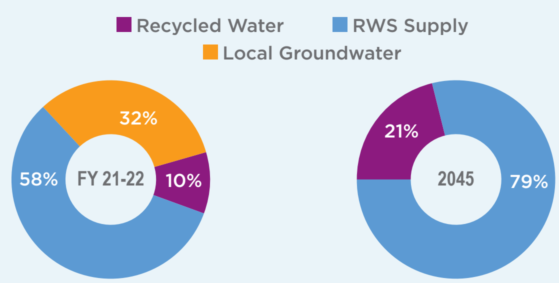
Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Daly City 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey



SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

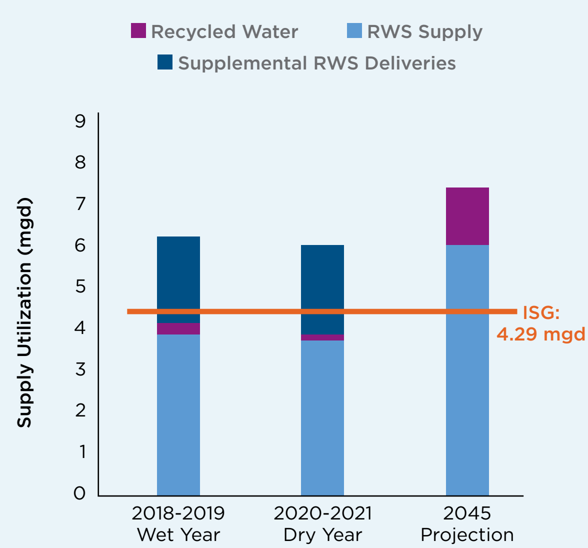


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]

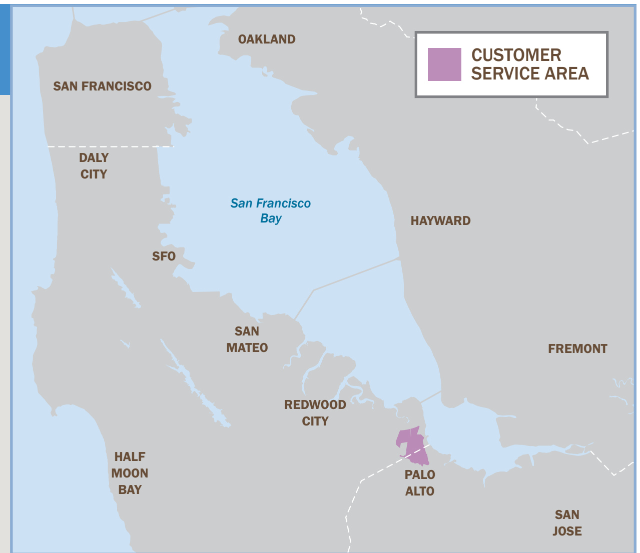


SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Expansion of recycled water supplies will limit reliance on RWS and supplemental deliveries will help protect local groundwater supplies.



City of East Palo Alto

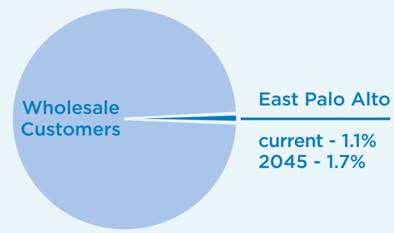


CUSTOMER OVERVIEW[1]:

The City of East Palo Alto's water utility is managed and operated by a private contractor (Veolia North America). East Palo Alto serves 25,935 people over a 2.5-square-mile service area. Residential and commercial/industrial connections account for approximately 78% and 16% of total water demand, respectively. Supply portfolio includes RWS supply and one active production well as alternate potable water supply.

INDIVIDUAL SUPPLY GUARANTEE[2]: 3.46 mgd

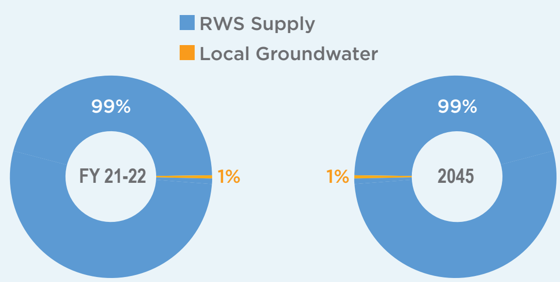
SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]



VULNERABILITIES & OPPORTUNITIES[3]:

East Palo Alto currently relies almost exclusively on RWS supply. The city is planning the implementation of new groundwater supply sources from the relatively underutilized and stable San Mateo Plain Subbasin, and is committed to the long-term sustainable management of the basin in collaboration with neighboring overlying cities. East Palo Alto negotiated permanent ISG transfers of 1 mgd and 0.5 mgd from the City of Mountain View and the City of Palo Alto, respectively. East Palo Alto has also established an agreement with the City of Mountain View to assume 0.25 mgd of their Minimum Purchase Obligation in exchange for the right of first refusal on any drought transfers by the City of Mountain View.

CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



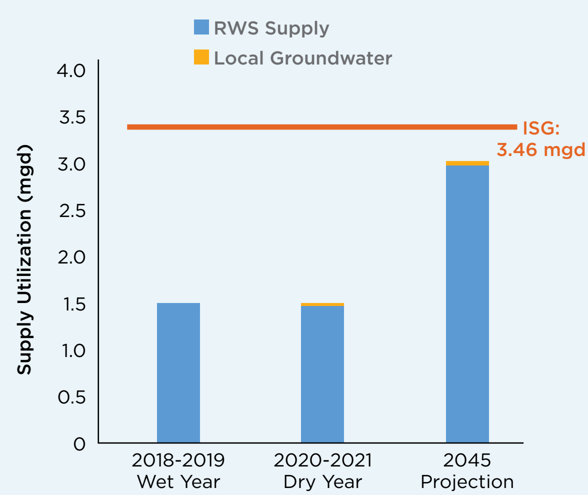
CURRENT & FUTURE LOCAL SUPPLIES:

East Palo Alto has identified a project to construct a 500 gallons per minute (gpm) groundwater well and associated iron-manganese treatment system to supplement the city's existing water supply. This project will create an emergency source of water supply for the city by drawing groundwater from the Santa Clara Valley Groundwater Basin and San Mateo Sub-Basin. Treatment of the groundwater would be necessary to enable its use for domestic purposes.

Implementation of this project would provide a secondary source of water in the event that the city's existing water supply is unable to meet demand during drought events or emergency conditions. The project is fully designed and CEQA is complete. The city is seeking construction funding for the project.

SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

RWS and groundwater supplies will address the anticipated increase in commercial water use by 2045.

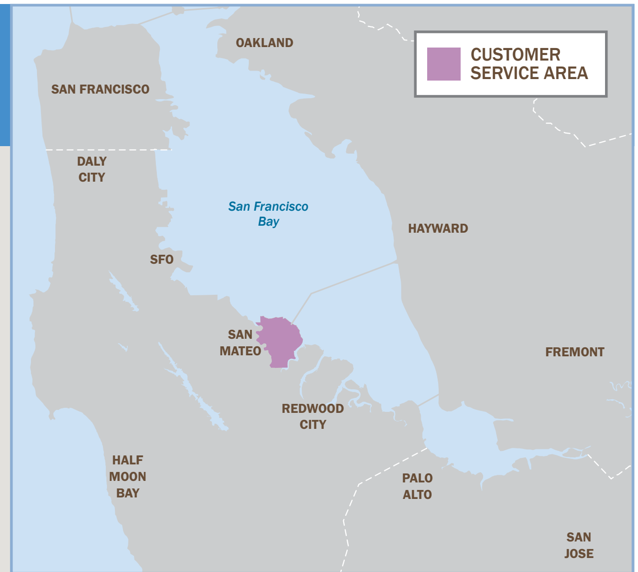


WATER CONSERVATION INSIGHTS[1,4]

15% reduction in residential gallons per capita demand (R-GPCD) since 2010 due to continued conservation savings.

Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) East Palo Alto 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

Estero Municipal Improvement District



CUSTOMER OVERVIEW[1]:

The Estero Municipal Improvement District (EMID) serves 36,556 people in Foster City and a section of the City of San Mateo. The service area spans 4 square miles and is bound by the San Francisco Bay, the Seal Slough and the Belmont Slough. Residential customers account for approximately 57% of water usage, and irrigation demands represent up to 26% of water use.

INDIVIDUAL SUPPLY GUARANTEE[2]: 5.9 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

EMID has limited local hydrologic resources and has been relying solely on RWS supply to feed water demands. EMID has been committed to improve supply reliability through its water conservation program and is exploring the feasibility of recycled water opportunities within its service area and on a regional level in collaboration with the City of San Mateo.

CURRENT & FUTURE LOCAL SUPPLIES:

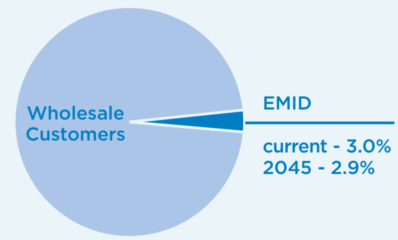
EMID relies solely on the RWS and plans to continue conservation efforts to reduce demands.

WATER CONSERVATION INSIGHTS[1,4]

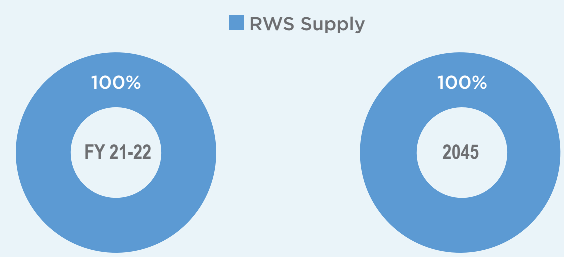
17% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to post-drought conservation savings.

EMID has several helpful water conservation and water saving tips available for the public online.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

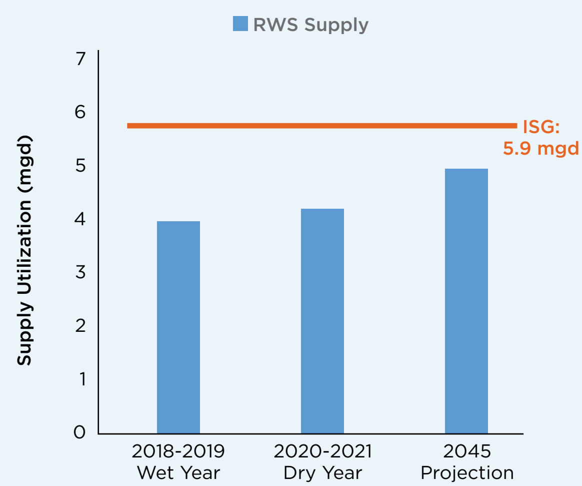


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



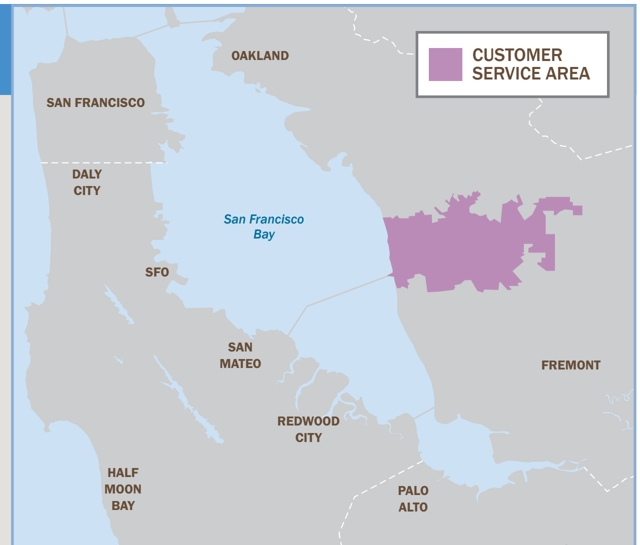
SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Reliance on RWS supply will remain below ISG level and is not planned to increase, mainly due to anticipated conservation savings.



Sources: (1) '21-'22 BAWSCA Annual Survey, updated population provided by EMID (June 2023)
(2) Amended and Restated Water Supply Agreement, 2021
(3) EMID 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

City of Hayward



CUSTOMER OVERVIEW[1]:

The City of Hayward owns and operates its water system, which currently serves a population of 160,591 people within a 62.5-square-mile service area, including the City of Hayward and a small unincorporated area in Alameda County. Residential connections account for approximately 53% water usage. The municipality's supply portfolio includes RWS supply and recycled water.

INDIVIDUAL SUPPLY GUARANTEE[2]: N/A

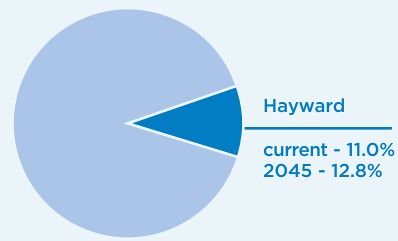
VULNERABILITIES & OPPORTUNITIES[3]:

Hayward relies primarily on RWS supply to meet its water demands and is not limited by a specific ISG level. The Hayward Water Pollution Control Facility has been supplying secondary level wastewater to the Russell City Energy Center, which further treats the water to a tertiary level and utilizes it for cooling and washdown. Phase 1 of Hayward's Recycled Water Project was initiated in March 2022 and currently delivers an average of 0.2 mgd of tertiary treated recycled water to about 30 irrigation customers, with future potential expansion phases. Hayward currently has groundwater supplies for short-term emergency use and is a Groundwater Sustainability Agency in collaboration with East Bay Municipal Utility District for the stewardship of the East Bay Plain Subbasin aquifer.

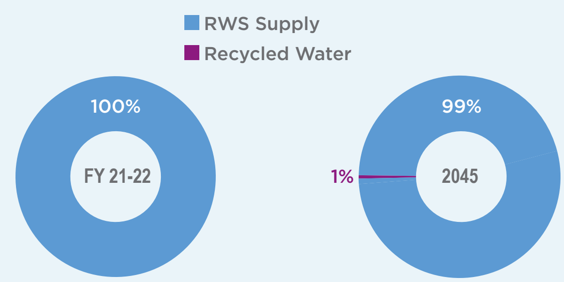
CURRENT & FUTURE LOCAL SUPPLIES:

Hayward anticipates continuing to rely primarily on the RWS to supply its water demands, supplemented by recycled water for some irrigation and industrial use. The city will be preparing a Recycled Water Plan to evaluate potential future customers, demand, and infrastructure needs.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

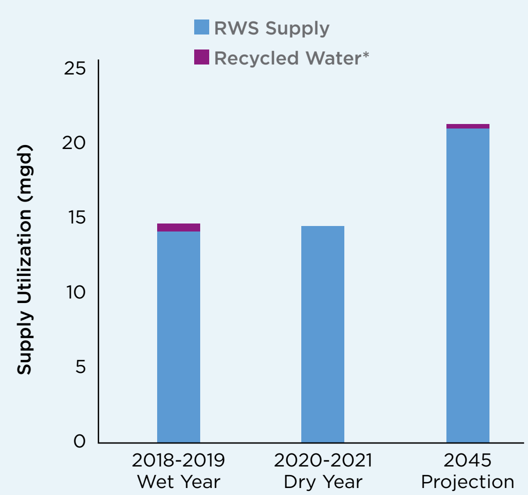


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Need for RWS supply is anticipated to increase by approximately 8 mgd to meet anticipated residential and industrial growth.



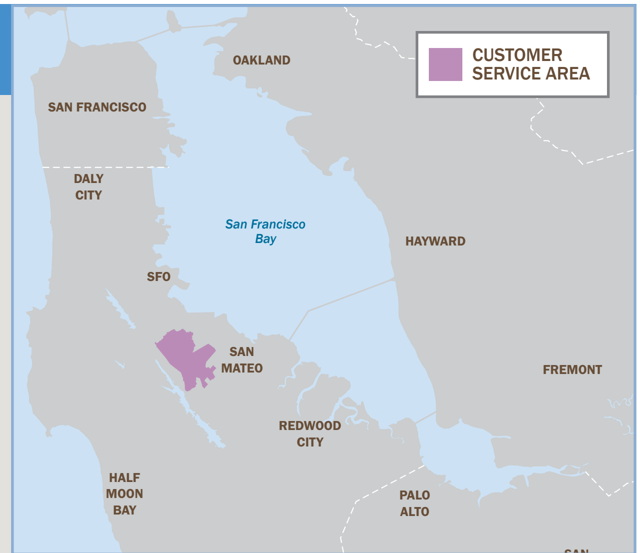
WATER CONSERVATION INSIGHTS[1,4]

23% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to continued conservation savings. Hayward's per capita usage is among the lowest of all agencies that purchase water from the RWS.

Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Hayward 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

Note: * Recycled water deliveries in 2018-2019 included deliveries of secondary-treated wastewater to Russell City Energy Center and Skywest Golf Course. These deliveries are no longer included in Hayward's recycled water data.

Town of Hillsborough



CUSTOMER OVERVIEW[1]:

The Town of Hillsborough operates its water utility and serves 11,397 people living within the Town of Hillsborough and unincorporated areas of San Mateo County. The utility's service area covers 6.25 square miles of highly varied topography. The utility serves a residential community, with approximately 93% of water usage attributed to single-family homes connections.

INDIVIDUAL SUPPLY GUARANTEE[2]: 4.09 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

The service area's high variability of topography represents a challenge. A 2016 study indicated that Hillsborough has a lack of availability of groundwater supplies adequate for municipal use. Recycled water/non-potable water reuse opportunities within Hillsborough are limited due to the almost exclusively residential water usage and its wastewater flows being treated at two wastewater treatment plants that are outside of its jurisdiction and that do not produce recycled water.

CURRENT & FUTURE LOCAL SUPPLIES:

Hillsborough is 100% reliant on RWS supplies for potable water and does not have viable access to current or future local supplies.

WATER CONSERVATION INSIGHTS[1,4]

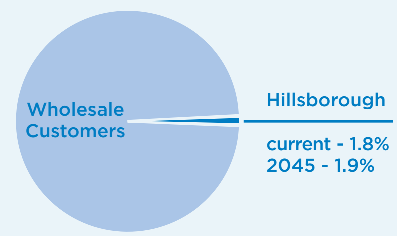
27% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to continued water conservation savings.

Hillsborough replaced its aging water meters with advanced metering infrastructure (AMI) in 2017. Nearly 90% of its water customers use the AMI customer service portal to respond to leak alerts and to monitor their water use – an industry-wide best.

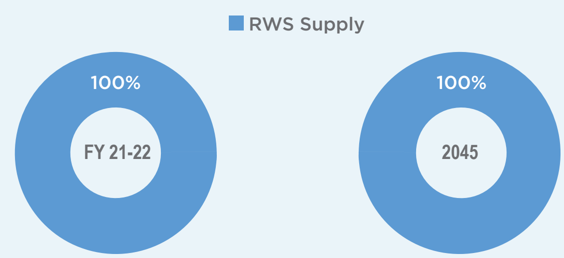
Hillsborough also purchased the first of its kind mobile water flushing and filtration unit called NO-DES. Traditional water flushing activities result in millions of gallons of water being discharged from fire hydrants into storm drains. Hillsborough's NO-DES unit captures, filters, treats and returns that water back into the water distribution system for use instead of discharging it into storm drains.

Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Hillsborough 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

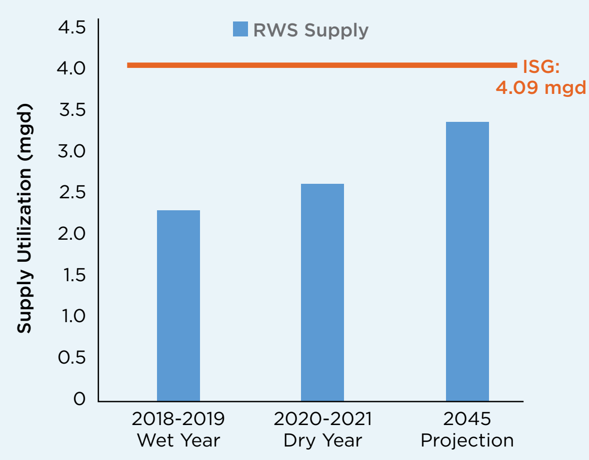


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]

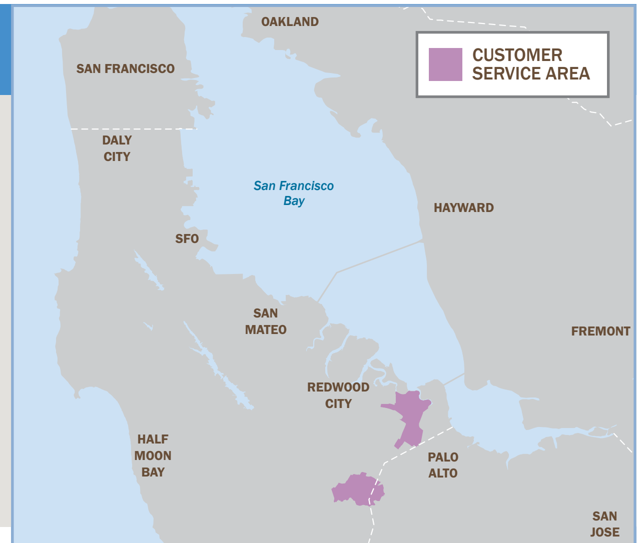


SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Supply projections follow the stable predicted population increase based on the planned addition of housing units. RWS supply needs will remain below ISG.



Menlo Park Municipal Water



CUSTOMER OVERVIEW[1]:

The City of Menlo Park owns and operates Menlo Park Municipal Water. Menlo Park supplies water to approximately half of the City to about 21,000 residents over a 4-square-mile service area located within City limits. Residential and commercial/industrial water demands account for an average of 43% and 35% of the City's water usage, respectively.

INDIVIDUAL SUPPLY GUARANTEE[2]: 4.46 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

Menlo Park receives 100% of its supply from RWS supply and has purchased between 52% and 66% of its ISG between 2016 and 2020. Menlo Park currently has one emergency groundwater well and is planning to double its groundwater emergency supply (up to 3,000 gpm capacity) in the medium term. The West Bay Sanitary District (WBSD) Recycled Water Facility started supplying 20 million gallons to the Sharon Heights Golf and Country Club in 2020 and an expansion of the WBSD's recycled water capacity is in the planning stages.

CURRENT & FUTURE LOCAL SUPPLIES:

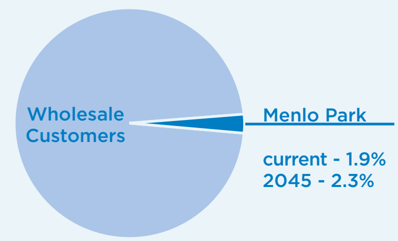
Menlo Park is implementing an AMI project that is capable of automatically transmitting hourly meter reads. Doing so will improve meter read accuracy, enhance customer service, enable staff and water users to identify leaks earlier so corrective actions can be taken, and reduce water loss. With AMI, Menlo Park will also implement a new customer user-friendly WaterSmart portal. Menlo Park is also planning to construct one or two more wells in order to meet the 3,000 gpm capacity goal and is in the process of evaluating other possible well locations. Menlo Park expects water demands to decrease after WBSD expands their recycled water system, as current potable water users convert to recycled water for irrigation use.

WATER CONSERVATION INSIGHTS[1,4]

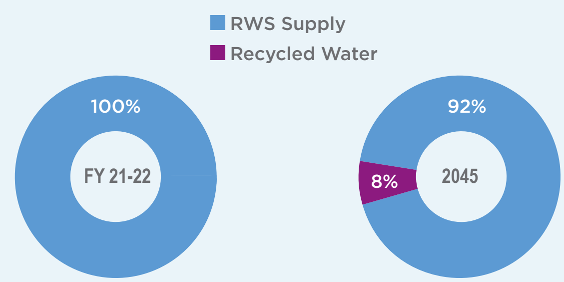
With the addition of recycled water, irrigation water demand decreased from 12% in 2019 to 9% in 2022 of Menlo Park's total water usage.

50% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to continued water conservation savings.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

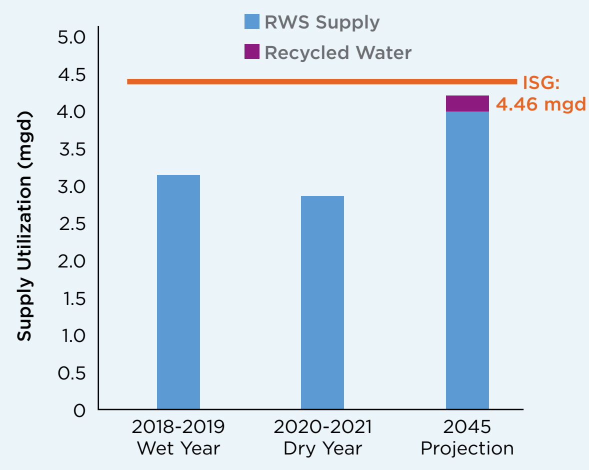


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



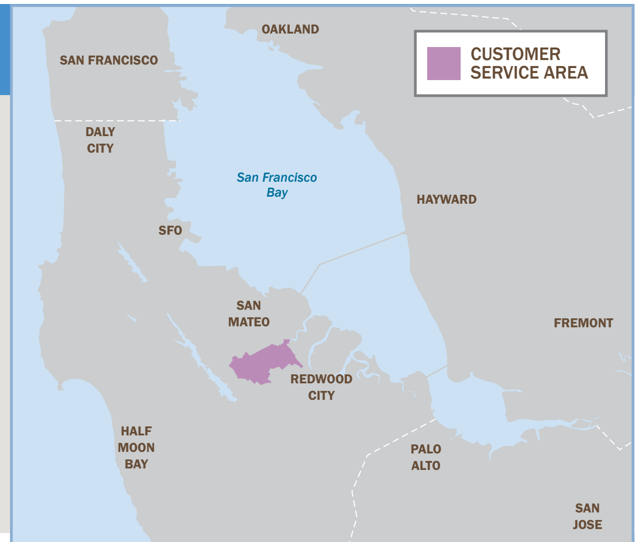
SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Potable water demands are anticipated to increase by 28% by 2040, led by a boom in multi-family and commercial water usage. Increased RWS supply use will remain below the ISG.



Sources: (1) '21 -'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Menlo Park 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

Mid-Peninsula Water District



CUSTOMER OVERVIEW[1,3]:

Mid-Peninsula Water District (MPWD) is a special district that serves 31,159 people within a 5-square-mile service area that covers the City of Belmont, portions of the City of San Carlos, and unincorporated county areas within San Mateo County. Residential connections account for 71% of water usage.

INDIVIDUAL SUPPLY GUARANTEE[2]: 3.89 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

MPWD relies on RWS supplies for 100% of its water needs. The District is anticipating an increase in multi-family residential and commercial developments. Due to its location and relatively small urban service area, access to alternative groundwater or surface water supplies is limited. MPWD has assessed opportunities for recycled water use within its service area, and has encountered financial and constructability constraints.

CURRENT & FUTURE LOCAL SUPPLIES:

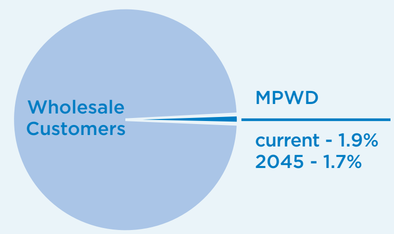
In September 2022, MPWD joined as a partner to the San Francisco-Peninsula Regional PureWater Project and continues to move forward in support of this project. In 2021, MPWD conducted a preliminary assessment of groundwater production potential, which found that limited potential for groundwater development may exist in a portion of its service area, particularly as an emergency drought supply. MPWD intends to continue to evaluate the potential use of groundwater and the funding sources available to support such development.

WATER CONSERVATION INSIGHTS[1,4]

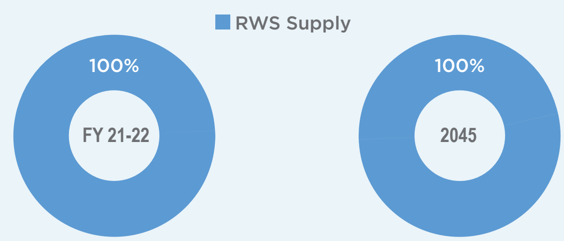
28% decrease in residential gallons per capita demand (R-GPCD) since 2010.

In response to the current drought, customers have reduced their gross water use to 85 GPCD, consistent with 2015.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

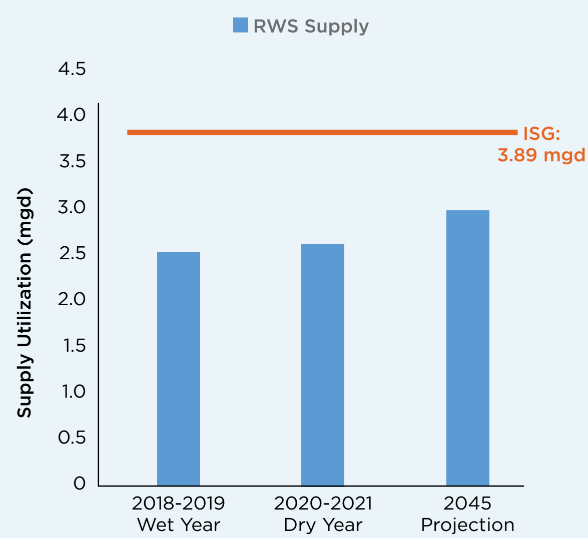


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



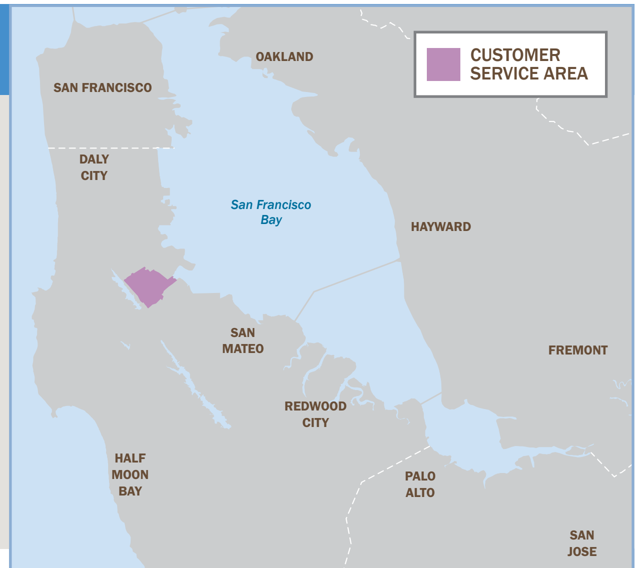
SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Despite the expected growth from the residential and CII sectors, demands on RWS supplies are projected to remain below MPWD's ISG.



Sources: (1) '21 -'22 BAWSCA Annual Surve, updated population provided by MPWD (June 2023)
(2) Amended and Restated Water Supply Agreement, 2021
(3) Mid-Peninsula Water District 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

City of Millbrae



CUSTOMER OVERVIEW[1]:

The City of Millbrae owns and operates its water system, which serves 22,277 people. The 3.2-square-mile service area is primarily residential, with residential connections and commercial/industrial customers that account for approximately 61% and 8% of Millbrae's total water usage, respectively.

INDIVIDUAL SUPPLY GUARANTEE[2]: 3.15 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

The City of Millbrae relies almost exclusively on RWS supply to serve its water demands. A groundwater exploration study was conducted in the mid-1990s, but no potential viable groundwater supplies were identified. The City of Millbrae operates the Waste Pollution Control Plant (WPCP), and the limited amount of recycled water produced is used for onsite maintenance applications. The City is evaluating the feasibility of expanding its recycled water production and use to include irrigation, construction dust control and commercial applications, depending on resources and funding availability.

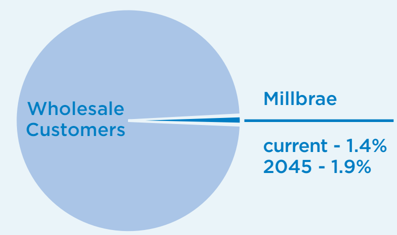
CURRENT & FUTURE LOCAL SUPPLIES:

The City of Millbrae is in the early planning phase of a new recycled water program. Millbrae is preparing a feasibility study to be completed in 2023 to evaluate implementation of a city-wide recycled water program. The City would produce and deliver recycled water for the irrigation of existing landscape sites and future development. A recycled water market assessment has been completed and estimated potential recycled water demands of city parks and schools, as well as a privately-owned golf course and planned new development within Millbrae. A total city-wide demand of 62 million gallons was identified. A regional partnership with neighboring communities is also being explored.

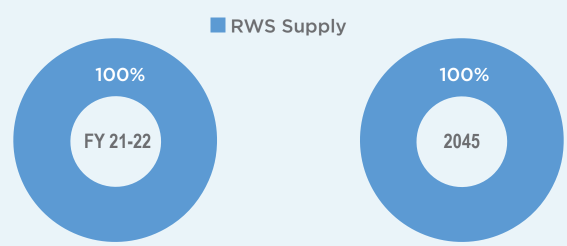
WATER CONSERVATION INSIGHTS[1,4]

26% decrease in residential gallons per capital demand (R-GPCD) since 2010.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

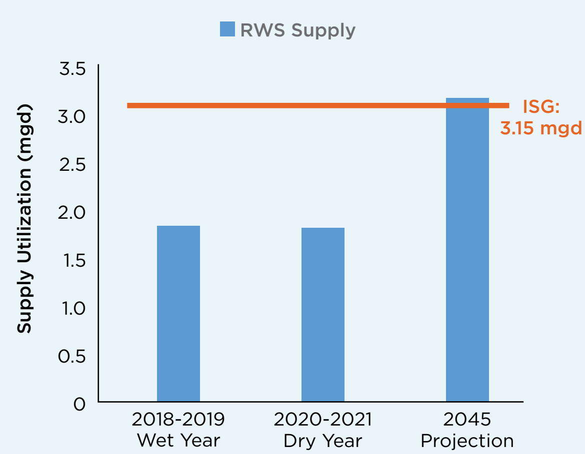


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



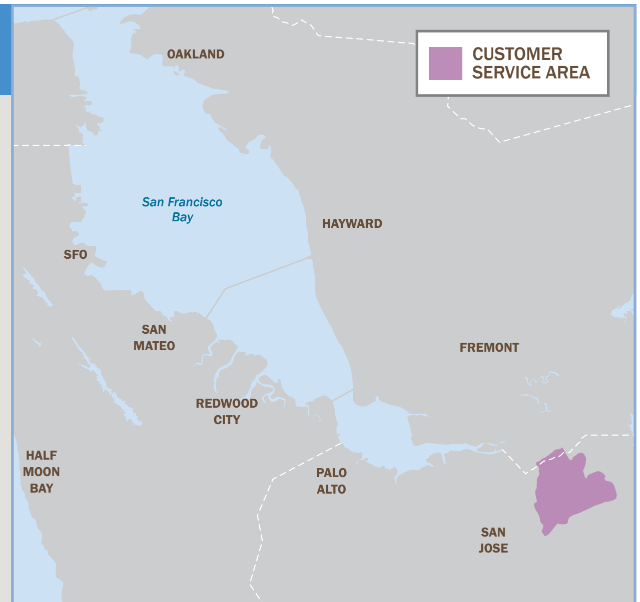
SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

The anticipated increase in multi-family residential and commercial connections will result in an increase in RWS supply purchases.



Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of Millbrae 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

City of Milpitas



CUSTOMER OVERVIEW[1]:

The City of Milpitas is a municipal water utility, which serves 80,839 people, over 13.6 square miles within Santa Clara County. The utility's customer base includes approximately 85% of residential connections and 5% of commercial and industrial connections. Supply sources include imported water from the RWS and Valley Water, recycled water and groundwater for emergency and drought conditions.

INDIVIDUAL SUPPLY GUARANTEE[2]: 9.23 mgd

MINIMUM PURCHASE REQUIREMENT[2]: 5.341 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

Milpitas receives up to 90% of its supply from RWS and Valley Water, which feed their respective areas of the system. Both of these supply sources are sensitive to hydrologic variability, conveyance limitations, water quality variations and environmental regulations. Milpitas has a diverse supply portfolio, including one existing standby well and two additional wells coming online by 2040 for emergency conditions and dry-year conditions. Milpitas uses non-potable recycled water from the South Bay Water Recycling Program (SBWRP) for landscape irrigation and industrial purposes. There are opportunities to expand its recycled water use (cooling towers, irrigation uses, etc.) but they are limited by the SBWRP's future supply allocations.

CURRENT & FUTURE LOCAL SUPPLIES:

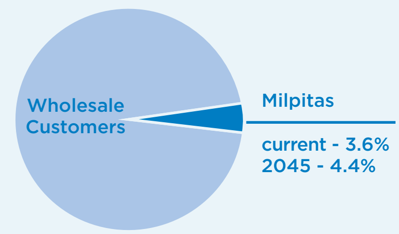
Currently, Milpitas gets its potable water supply from RWS and Valley Water, and non-potable supply from SBWRP. The City has emergency interties with San Jose Water and Alameda County Water District (ACWD). Milpitas currently has one groundwater well, Pinewood Well, which has a capacity of 1.7 mgd and is activated only during emergencies. In 2020, the City began redesigning Curtis Well and early construction of McCandless Well, which are both expected to be completed by 2040. The initial estimated capacity from both wells is 0.58 mgd and both will only operate under emergency or dry-year conditions.

WATER CONSERVATION INSIGHTS[1,4]

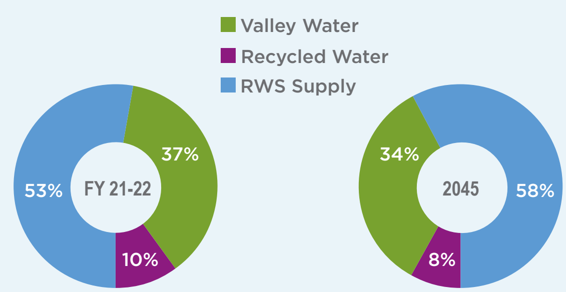
18% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to continued water conservation savings.

In 2022, Milpitas implemented AMI and launched the WaterSmart Customer Portal.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

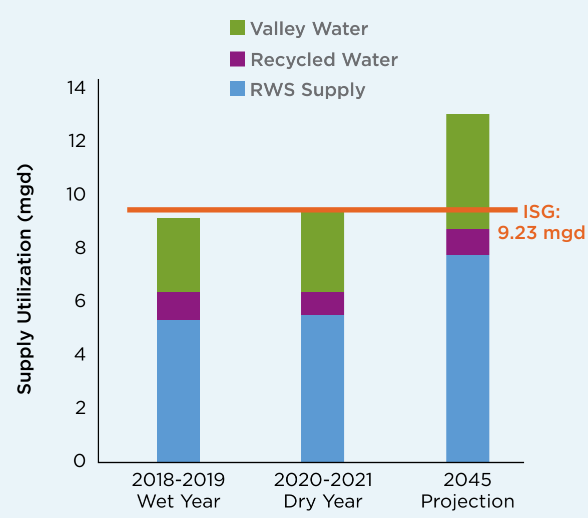


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



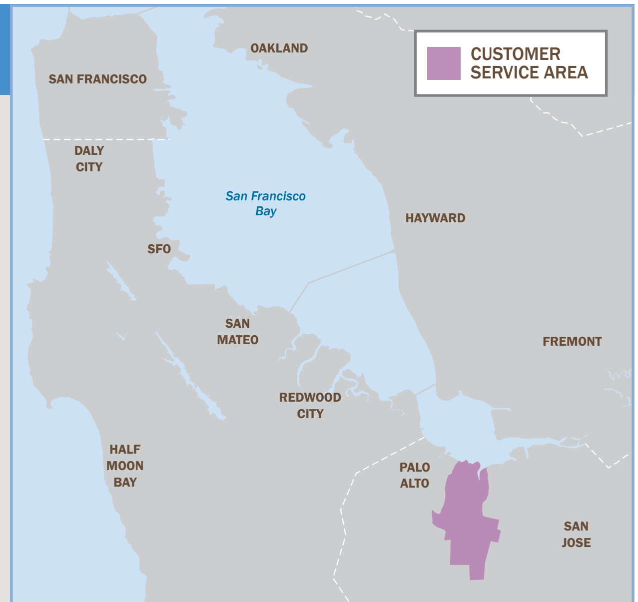
SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

The City's growth is anticipated to occur within areas served by Valley Water, therefore increasing the need for Valley Water supply.



Sources: (1) '21 -'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of Milpitas 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

City of Mountain View



CUSTOMER OVERVIEW[1]:

The City of Mountain View owns and operates the municipal utility covering a 12-square-mile service area on the peninsula in north Santa Clara County. The utility serves 81,764 people and supplies 57% of its total water usage to residential connections and 27% to irrigation connections, and 15% to commercial, industrial, and institutional connections.

INDIVIDUAL SUPPLY GUARANTEE[2]: 12.46 mgd

MINIMUM PURCHASE REQUIREMENT[2]: 8.930 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

Mountain View has a diversified supply portfolio. The RWS is its largest water supply. Mountain View also operates four active groundwater wells from the Santa Clara Basin aquifer and purchases treated water from Valley Water. Mountain View receives recycled water from the Regional Water Quality Control Plant (RWQCP) in Palo Alto for non-potable uses in the North Bayshore area (such as irrigation and toilet flushing). Mountain View is a signatory to the Partnership Agreement with Palo Alto and Valley Water, which aims to advance water reuse programs in Santa Clara County.

CURRENT & FUTURE LOCAL SUPPLIES:

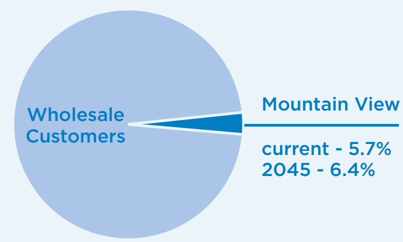
Mountain View recently updated its Recycled Water Feasibility Study and continues to build-out its recycled water distribution system to serve new customers.

WATER CONSERVATION INSIGHTS[1,4]

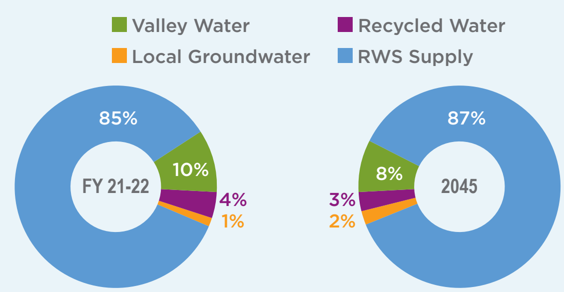
20% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to continued conservation.

Mountain View partners with Valley Water on conservation programs such as rebates for lawn replacement. The City is also pursuing advanced metering infrastructure.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

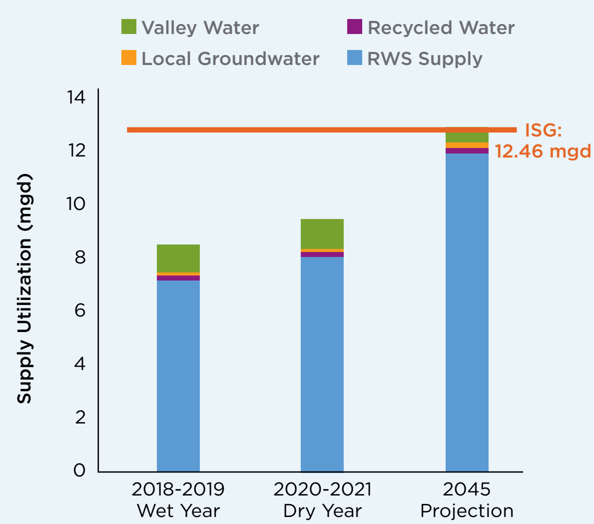


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Alternative supplies will partly serve the anticipated 46% increase in population by 2045. RWS supply use will remain below ISG.



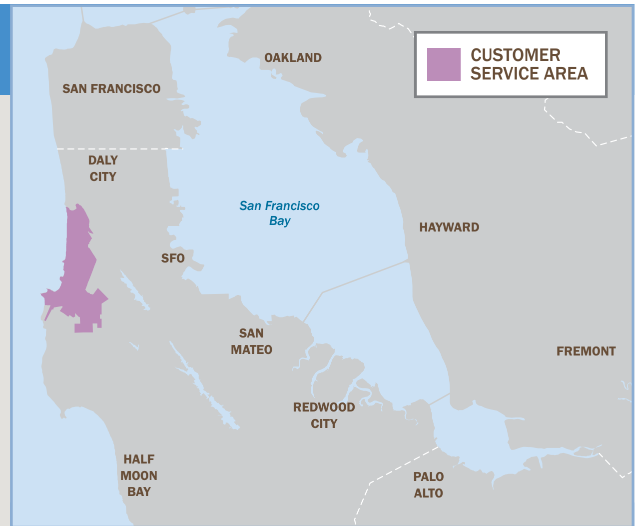
Sources: (1) '21 -'22 BAWSCA Annual Surve, updated sector demand percentages provided by Mountain View (June 2023)
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of Mountain View 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

North Coast County Water District

CUSTOMER OVERVIEW[1]:

The North Coast County Water District (NCCWD) is a special district that serves 37,533 people in San Mateo County. NCCWD's service area covers 13.6 square miles, including the City of Pacifica and small unincorporated areas within San Mateo County. For FY 2021-2022, residential connections account for 74% of total potable water use, while commercial connections represent only 8% of potable water usage.

INDIVIDUAL SUPPLY GUARANTEE[2]: 3.84 mgd



VULNERABILITIES & OPPORTUNITIES[3]:

NCCWD relies heavily on the RWS supply but is exploring multiple opportunities to further diversify its supply portfolio. As such, NCCWD is working to develop groundwater supplies from the San Pedro Valley Basin. In 2022, the District was awarded a grant from the Department of Water Resources to pursue its groundwater project. The District's surface water rights to South Fork San Pedro Creek are currently being conserved, but could represent an alternative supply source in future years. NCCWD also distributes tertiary recycled water from the Calera Creek Water Recycling Plant for landscape irrigation purposes and supplies recycled water to two schools, a ballfield, highway medians and Sharp Park Golf Course, a SFPUC retail customer. In addition, the District operates a residential recycled water fill station for customers to utilize at no charge. The expansion of NCCWD's recycled water use is also being considered.

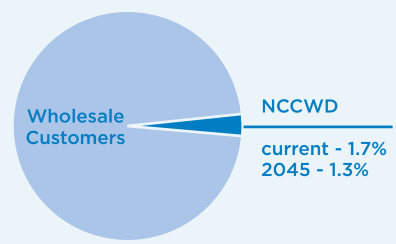
CURRENT & FUTURE LOCAL SUPPLIES:

The District's groundwater project is estimated to be able to supply 70 acre-feet annually to supplement potable water received from the RWS. Information from the test well phase of the project is anticipated to further define the potential quantity of water available. Given the District's location within foggy Pacifica, it is also exploring fog water collection with researchers at University of California Santa Cruz and California State University Monterey Bay. While using fog water for potable purposes may not be feasible, it could be used as a supplemental non-potable supply in the service area. Work is being done to quantify the amount of water that can be collected and define the per unit costs.

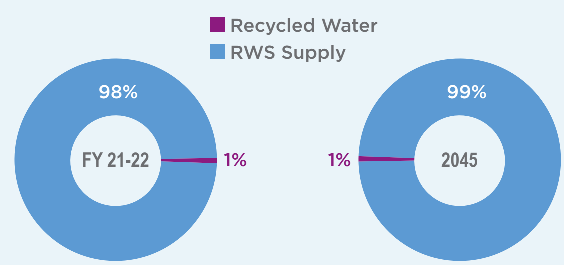
WATER CONSERVATION INSIGHTS[1,4]

35% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to conservation efforts.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

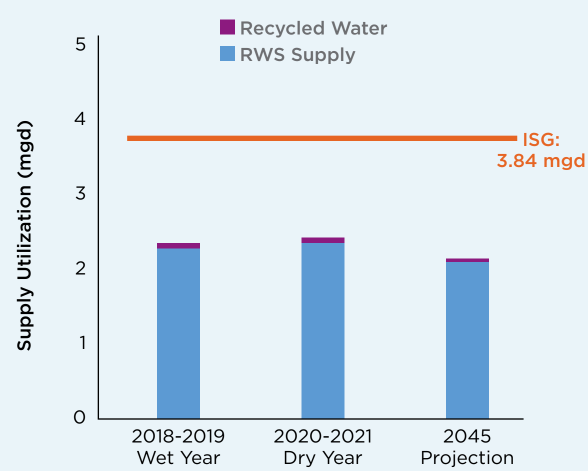


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



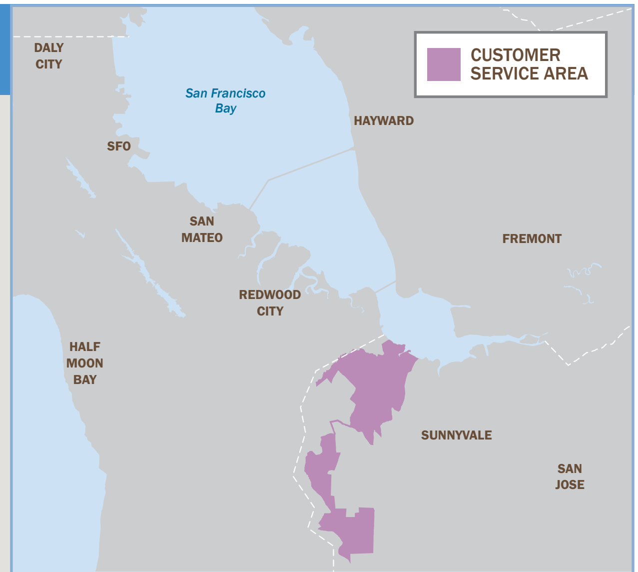
SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

The need for RWS supply is planned to slightly decrease due to the continued passive conservation savings and use of recycled water supplies.



Sources: (1) '21 -'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, November2021
(3) NCCWD 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

City of Palo Alto

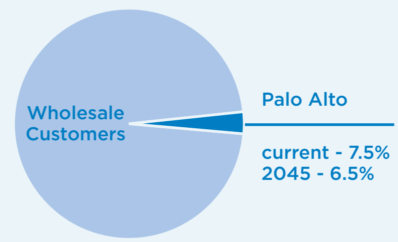


CUSTOMER OVERVIEW[1]:

The City of Palo Alto owns and operates its water system and serves approximately 68,000 people located within a 26-square-mile service area, which includes the City of Palo Alto and a few connections in Los Altos Hills and Portola Valley. Approximately 53% of total water (potable water, recycled water and non-revenue water) is used by residential customers, 16% by commercial and industrial customers, and 14% by irrigation-only customers. The remaining 17% of water includes recycled water used primarily for irrigation purposes and industrial process use, city and public agency uses of water as well as other and non-revenue water. Palo Alto completed a permanent ISG transfer of 0.5 mgd to the City of East Palo Alto in 2018.

INDIVIDUAL SUPPLY GUARANTEE[2]: 16.57 mgd

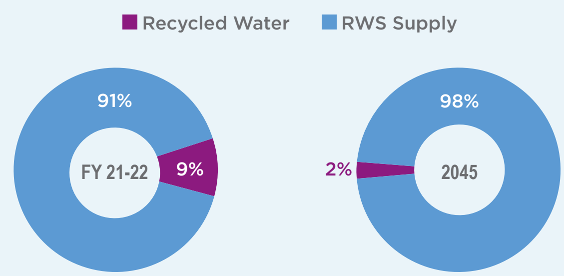
SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]



VULNERABILITIES & OPPORTUNITIES[3]:

Palo Alto relies on RWS supply for 100% of its potable water supply. Palo Alto currently has standby groundwater wells available for emergency purposes and as a possible supplemental temporary drought supply. The groundwater basin is managed by Valley Water. Palo Alto operates the Regional Water Quality Control Plant (RWQCP), which supplies recycled water to mostly irrigation customers in Palo Alto and Mountain View. A Partnership Agreement between Palo Alto, Mountain View and Valley Water provides funding for a small salt removal facility at the RWQCP in Palo Alto to improve the quality and enable increased use of non-potable recycled water used in Palo Alto and Mountain View and provides Valley Water an option to receive about half of the treated wastewater from the RWQCP for use in the county south of Mountain View.

CURRENT & FUTURE SUPPLY PORTFOLIOS[1]

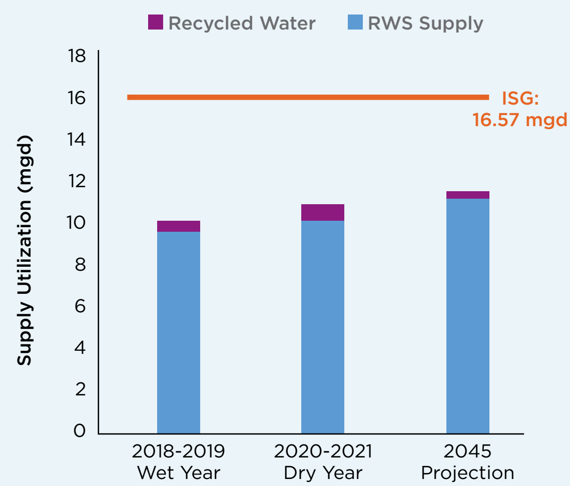


CURRENT & FUTURE LOCAL SUPPLIES:

Palo Alto currently receives 100% of its potable water from the SFPUC through the RWS. In case of emergency, a system of local groundwater wells and storage can be utilized. The City is currently developing a One Water Plan, which will take a broad, comprehensive look at water supply options over a 20-year planning horizon. The One Water Plan is currently considering various alternative water supply options including direct and indirect potable reuse, graywater capture and reuse, stormwater capture, desalination, and other non-potable water sources to supplement and preserve the potable water supply. The One Water Plan will produce a recommended supply and conservation portfolio which will be taken to council for consideration of adoption. The One Water Plan is expected to be completed by Fall of 2023.

SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Recycled water use and conservation savings will limit the increase in RWS supply, which will remain below ISG.



WATER CONSERVATION INSIGHTS[1,4]

Palo Alto has reduced residential gallons per capita demand (R-GPCD) by 16% since 2010 and continues to realize water conservation savings. Palo Alto partners with Valley Water to offer a variety of water efficiency rebate programs and resources.

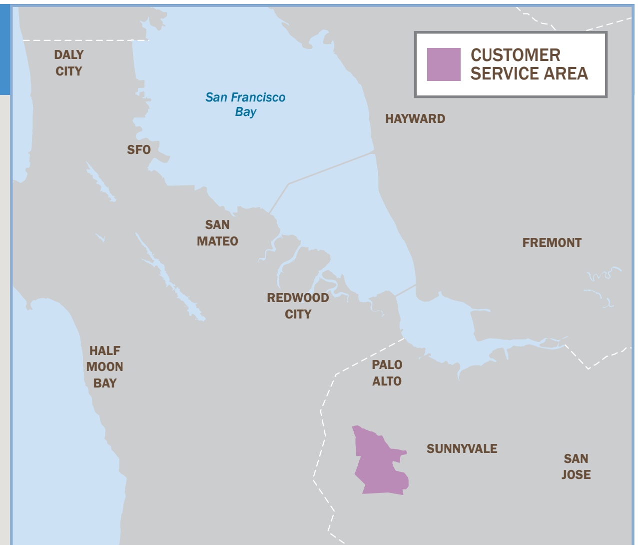
Sources:
(1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of Palo Alto 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

Purissima Hills Water District

CUSTOMER OVERVIEW[1]:

Purissima Hills Water District (PHWD) is the smallest SFPUC wholesale customer, which serves a population of 6,150 located within two-thirds of the Town of Los Altos Hills and an unincorporated area to the south. Its service area spans a relatively rural area of approximately 7.2 square miles spread over a high elevation differential. The customer base is mainly comprised of single-family homes, with residential connections accounting for over 90% of water demand.

INDIVIDUAL SUPPLY GUARANTEE[2]: 1.62 mgd



VULNERABILITIES & OPPORTUNITIES[3]:

PHWD relies exclusively on RWS supply for its water demands. Due to its small service area, the District is limited in the viable alternative water supply alternatives. Its small customer base renders the implementation of recycled water opportunities within its service area challenging. Based on the estimated residential water usage, PHWD has implemented a conservation campaign focused on outdoor water use and targeting the customers with highest usage, with a 32% reduction target over 2020-2021.

CURRENT & FUTURE LOCAL SUPPLIES:

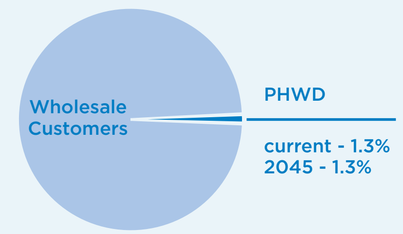
PHWD is working with EKI, Inc. to research groundwater and opportunities of multiple working wells in the District. PHWD is exploring an ISG purchase with another Wholesale Customer. Additionally, PHWD is in discussions with Valley Water assessing "wheeling water" through Cal Water Los Altos as well as becoming a permanent customer of Valley Water.

WATER CONSERVATION INSIGHTS[1,4]

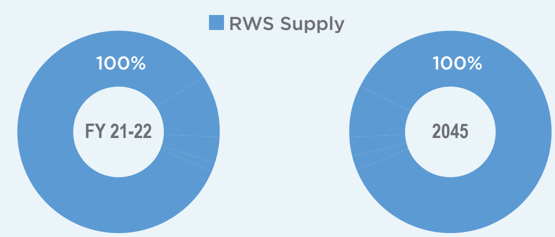
5% decrease in residential gallons per capita demand (R-GPCD) since 2010.

PHWD's conservation efforts have resulted in a 13% usage reduction in FY21-22.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

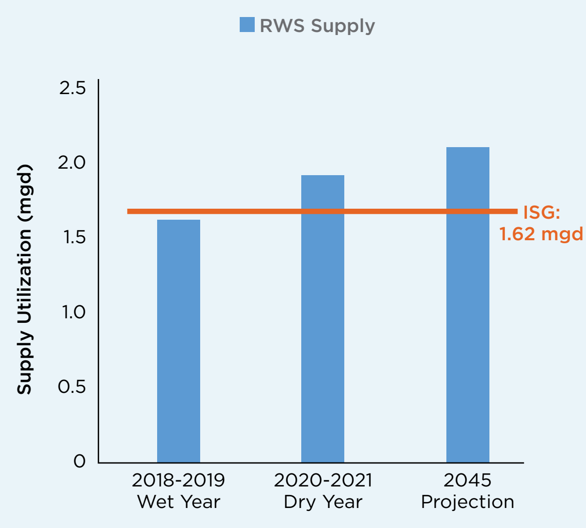


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



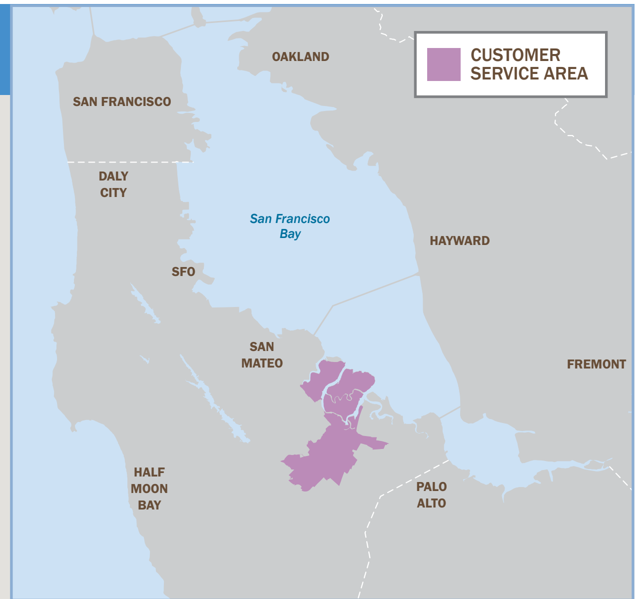
SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Limited water supply alternatives and increasing water demands will lead to a RWS supply need that exceeds ISG by 0.53 mgd.



Sources: (1) '21 -'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Purissima Hills Water District 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

City of Redwood City



CUSTOMER OVERVIEW[1]:

The City of Redwood City owns and operates its water system, which covers 35 square miles and serves approximately 90,000 people located within Redwood City, portions of the Town of Woodside, the City of San Carlos and unincorporated areas of San Mateo County. The utility's water system primarily serves residential connections, which account for 61% of water usage. Commercial and industrial customers account for 14% and dedicated irrigation accounts of 15% of the system's potable water usage.

INDIVIDUAL SUPPLY GUARANTEE[2]: 10.93 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

Redwood City relies on RWS supply for the majority of its water demands and is exploring alternative water supplies options. The utility is evaluating groundwater supplies from San Mateo Plain Subbasin as a potential future emergency and backup supply source. The water system receives recycled water from Silicon Valley Clean Water and has been expanding its recycled water distribution system. Redwood City is planning to build flexibility into the system to facilitate the reach of additional identified non-potable water customers.

AWS PROJECT SYNERGIES:

San Francisco-Peninsula Regional PureWater Project

CURRENT & FUTURE LOCAL SUPPLIES:

Redwood City intends to leverage its local supply of recycled water to maximize non-potable uses within its Recycled Water Service Area and reduce reliance on imported drinking water from the RWS. To promote this goal city code requires the use of recycled water for landscape irrigation and toilet flushing for new development projects. Planning efforts to expand the recycled water system throughout the downtown area to meet the needs of new and existing water users and growth within the city are ongoing.

WATER CONSERVATION INSIGHTS[1,4]

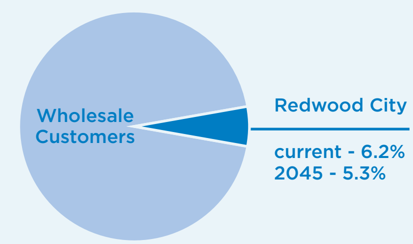
59 R-GPCD

21% decrease in residential gallons per capita demand (R-GPCD) since 2010.

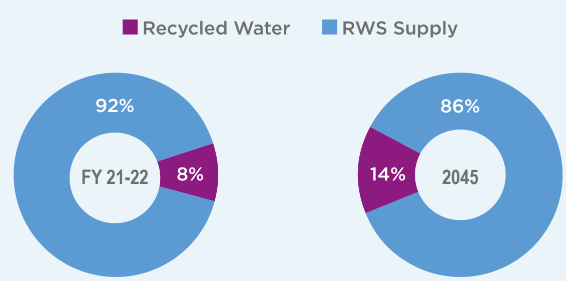
Redwood City has long been a champion in water conservation and offers many programs promoting water use efficiency and education. This includes a poster contest for grades K-5th since 1995.

Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of Redwood City 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

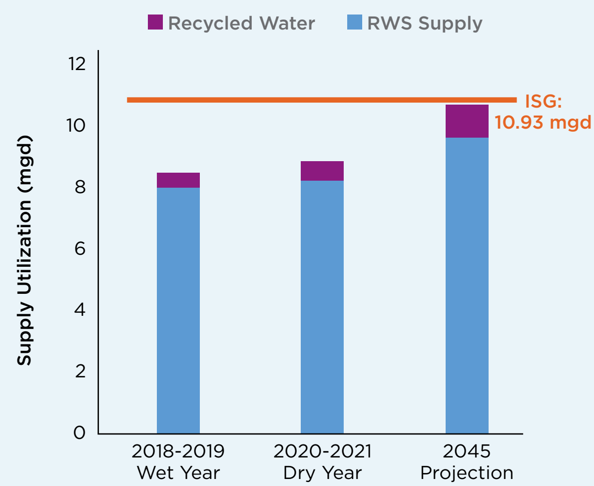


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Expansion of recycled water and conservation savings will limit Redwood City's use of RWS supply, which will remain below ISG.



City of San Bruno

CUSTOMER OVERVIEW[1]:

The City of San Bruno owns and operates its water system which serves 44,409 people located within a 6.1-square-mile service area covering the city limits and unincorporated areas of San Mateo County. The system's water supplies primarily serve residential and commercial/industrial connections, which represent 70% and approximately 18% of the system's water usage, respectively.

INDIVIDUAL SUPPLY GUARANTEE[2]: 3.25 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

San Bruno's supply portfolio includes RWS supply, supply from North Coast County Water District (NCCWD), and local groundwater supplies. The City of San Bruno owns multiple wells that extract groundwater from the Westside Basin. San Bruno has reduced its groundwater use (from 50% to 10% of total water use after 2016) and has been receiving RWS supplemental deliveries in lieu of utilizing its local groundwater supplies to preserve the aquifer's drought resilience. San Bruno is assessing future use of local groundwater supplies based on groundwater quality, sea water intrusion risks and agreements with local municipal utilities. San Bruno has explored the feasibility of implementing recycled water supplies, which will be considered depending on future water supply availability and costs.

CURRENT & FUTURE LOCAL SUPPLIES:

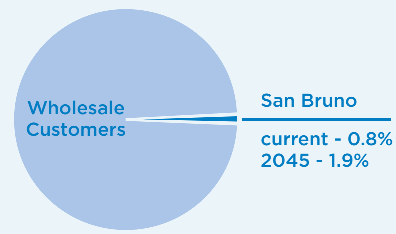
San Bruno's water supply comes from three different sources – surface water purchased from SFPUC, surface water purchased from NCCWD, and local groundwater produced from City owned wells. San Bruno is already working to maximize use of existing supplies, researching potential new sources, encouraging conservation and investing in infrastructure. The City of San Bruno is investing in the future of water supply, to meet growing projected demands and reliability by increasing its groundwater sources.

WATER CONSERVATION INSIGHTS[1,4]

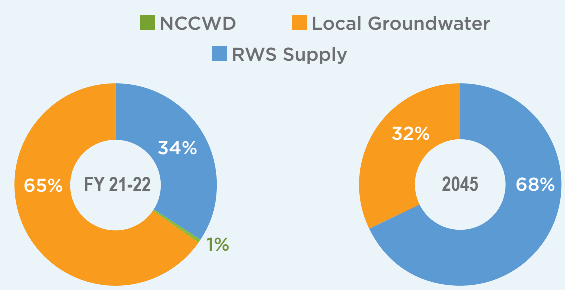
48 R-GPCD

San Bruno has reduced the residential gallons per capita demand (R-GPCD) by 20% since 2010 due to continued water conservation savings.

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

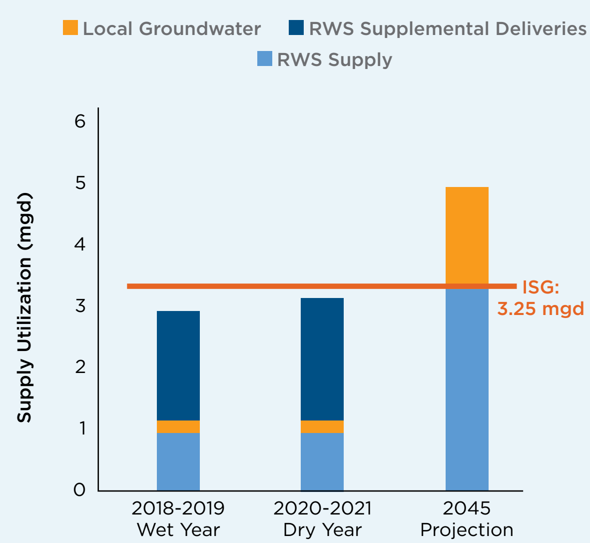


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Sustainable use of groundwater supplies and RWS supply will fulfill the anticipated increase in water demand.



Sources: (1) '20-'21 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of San Bruno 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

City of San Jose - North

CUSTOMER OVERVIEW[1]:

The City of San Jose Municipal Water System (SJMWS) serves two public water systems, including the North San Jose/Alviso water system, which receives RWS supply. The North San Jose/Alviso water system serves 40,514 people within the northern area of City of San Jose. The 5.3-square-mile service area includes a large industrial customer base, in addition to residential and commercial customers. SJMWS does not currently have an ISG and receives up to 4.5 mgd of interruptible RWS supply, since it is not a permanent wholesale customer (SFPUC decision pending in 2028).

INDIVIDUAL SUPPLY GUARANTEE[2]: N/A

VULNERABILITIES & OPPORTUNITIES[3]:

Supply sources include RWS supply, four local groundwater sources (two active production sources and two sources for emergency use purposes) from the Santa Clara Basin and recycled water from the South Bay Water Recycling Program (SBWRP) produced at the San Jose-Santa Clara Regional Wastewater Facility. The use of groundwater supplies is limited by the aquifer's hydrologic conditions and the groundwater basin's available supply is based on Valley Water's groundwater recharge efforts. The City of San Jose is exploring expanding production of its existing water supply alternatives to cater to the anticipated industrial water demand growth.

AWS PROJECTS SYNERGIES: South Bay Purified Water

CURRENT & FUTURE LOCAL SUPPLIES:

SJMWS relies on multiple sources of supply: surface water from SFPUC, groundwater from the Santa Clara groundwater basin, and recycled water from the SBWRP. Supply sources received by SJMWS are generally considered consistent sources in normal years. SJMWS is planning to construct additional groundwater wells to support increased demands due to development, as well as to provide emergency supply availability to the existing customer base.

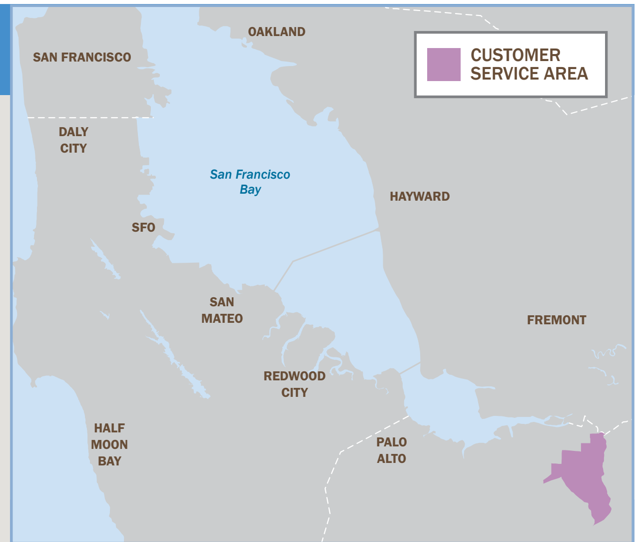
Climate change poses challenges in water resources management, although the full extent and associated impacts are uncertain. Statewide and local changes in precipitation and temperature could significantly impact wholesaler-managed supplies and water usage patterns.

38 R-GPCD

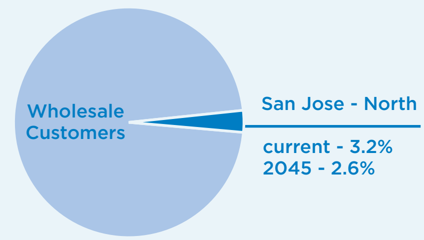
WATER CONSERVATION INSIGHTS[1,4]

47% decrease in residential gallons per capita demand (R-GPCD) since 2010. SJMWS is transitioning to an Advanced Metering Infrastructure and encouraging customers to convert to low water use landscapes.

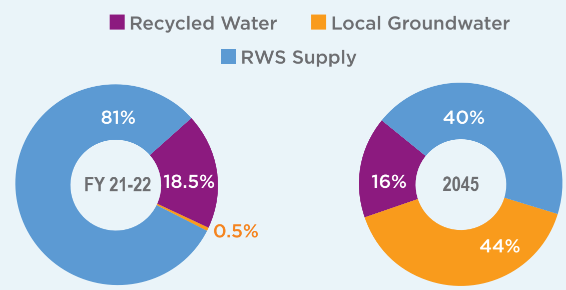
Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of San Jose 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey



SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

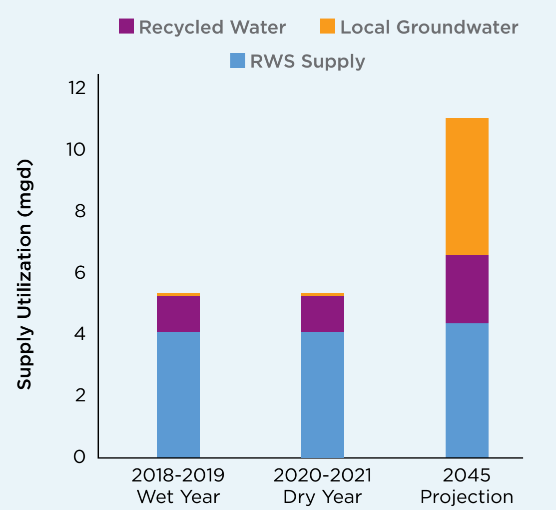


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

The expansion of groundwater and recycled water supplies will support the increased water demands caused by new developments and growing industrial demands.

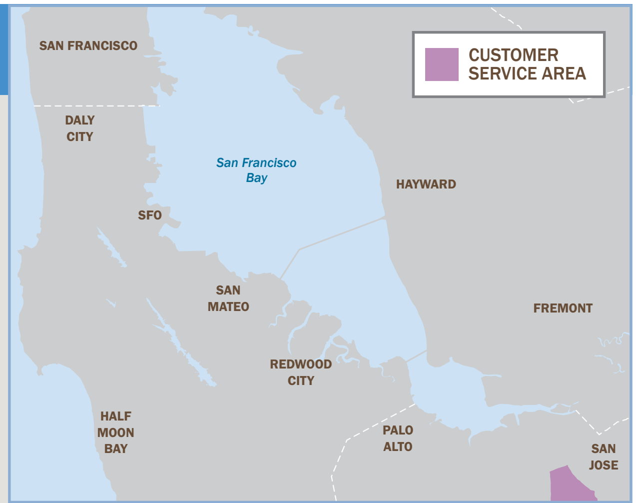


City of Santa Clara

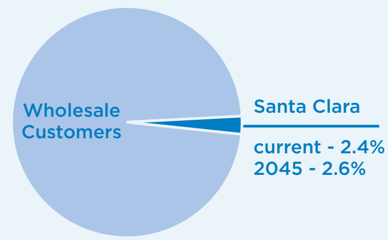
CUSTOMER OVERVIEW[1]:

The City of Santa Clara owns and operates its water utility, which serves 130,746 people over a 19.3-square-mile urban and suburban service area. The City of Santa Clara has a large commercial and industrial customer base, which accounts for 47% of its total water use. Santa Clara does not currently have an ISG since it is not a permanent wholesale customer (SFPUC decision pending in 2028) and receives up to 4.5 mgd of interruptible RWS supply.

INDIVIDUAL SUPPLY GUARANTEE[2]: N/A



SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]



VULNERABILITIES & OPPORTUNITIES[3]:

The City of Santa Clara has a diversified water supply portfolio, which includes imported water from SFPUC and Valley Water, recycled water from the Regional Wastewater Facility under the South Bay Water Recycling Program (SBWRP) and 21 local groundwater wells (19 active) that tap into the Santa Clara subbasin. The local groundwater supplies are managed by Valley Water and their use is constrained to prevent excessive subsidence and promote long-term resilience of the aquifer. Recycled water uses in Santa Clara include irrigation, industrial processes, cooling purposes and toilet flushing. The existing recycled water distribution system facilitates the expansion of the service to new large potential customers.

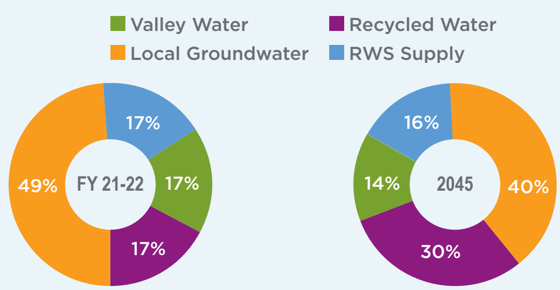
AWS PROJECTS SYNERGIES:

South Bay Purified Water Feasibility Study

CURRENT & FUTURE LOCAL SUPPLIES:

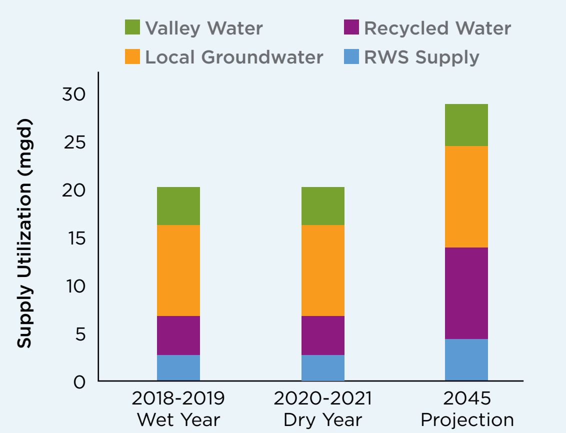
Santa Clara takes part in regional water supply planning efforts in coordination with its wholesale and regional partners that include SFPUC, Valley Water and BAWSCA. The City embraces a One Water approach to a water supply planning, providing a roadmap for implementing real world strategies to secure and maintain current water supplies and developing new supplies with key programs focused on well rehabilitation, potable reuse, recycled water and conservation. The City has made substantial efforts towards expanding the use of recycled water for irrigation, industrial uses and dual plumbed facilities. As part of the City's overall sustainability strategy, the City is working with regional partners on the use of purified water to supplement local water supplies, including a feasibility study with SFPUC, City of San Jose and project with Valley Water.

CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Local existing groundwater and expanded recycled water supplies will ramp up to feed the anticipated increase in commercial water demands and limit reliance on imported supplies.



WATER CONSERVATION INSIGHTS[1,4]

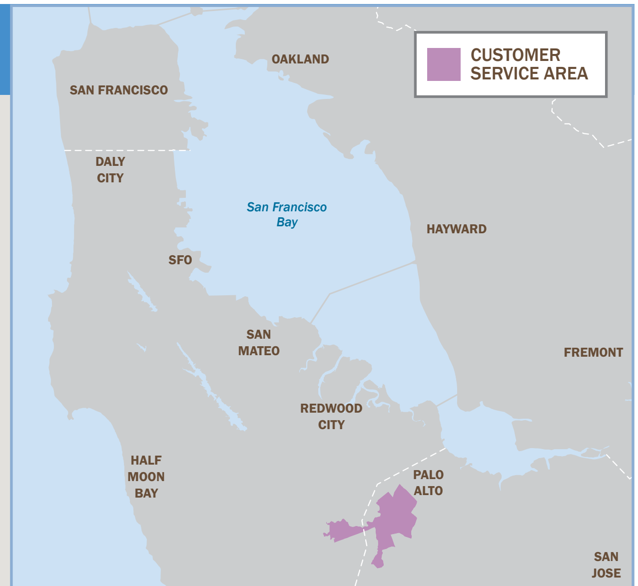
56 R-GPCD

27% reduction in residential gallons per capita demand (R-GPCD) since 2010 due to continued water conservation savings.

The City is partnering with Valley Water on programs such as rebates for lawn replacements, using the WaterSmart customer portal, hiring permanent Utility Conservation/Efficiency Coordinator position to promote water conservation.

Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) City of Santa Clara 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

Stanford University

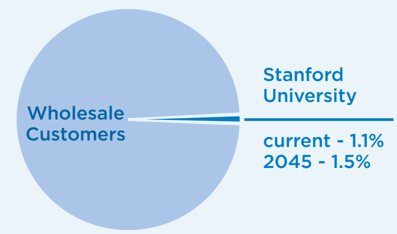


CUSTOMER OVERVIEW[1]:

The Water Resources and Civil Infrastructure Group within the Sustainability and Energy Management Department manages the Stanford University water systems. The domestic water system covers approximately 3.1 square miles and serves approximately 30,000 people on the Stanford campus and nearby unincorporated areas. Stanford University's unique customer base is reflected in its water usage; dedicated irrigation and single family connections represent approximately 9% and 24% of total domestic water usage, respectively. Local supply sources include local surface water, groundwater and stormwater capture for non-potable water uses and are conveyed in a separate non-potable water system (primarily irrigation of the golf course, sports fields, and campus landscaping).

INDIVIDUAL SUPPLY GUARANTEE[2]: 3.03 mgd

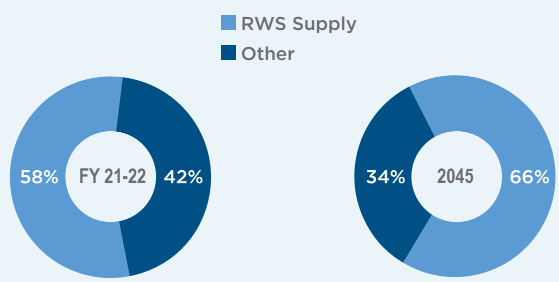
SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]



VULNERABILITIES & OPPORTUNITIES[3]:

Stanford relies on RWS supply to fulfill its potable drinking water demands and is utilizing multiple water supply alternatives to feed most of its irrigation needs. Stanford diverts surface water from San Francisquito Creek and Los Trancos Creek and stores water in Felt Lake. Five groundwater wells feed into the non-potable water system and supplement local surface water supplies during dry conditions. Since 2019, two stormwater capture and use facilities have been installed, which capture and filter storm runoff which is then pumped into the non-potable irrigation system and Felt Lake for storage. Four of the groundwater supply wells could be used in the domestic system in the event of an emergency. Regular use of groundwater in the domestic system, through blending with SFPUC supplied water, is being studied.

CURRENT & FUTURE SUPPLY PORTFOLIOS[1]

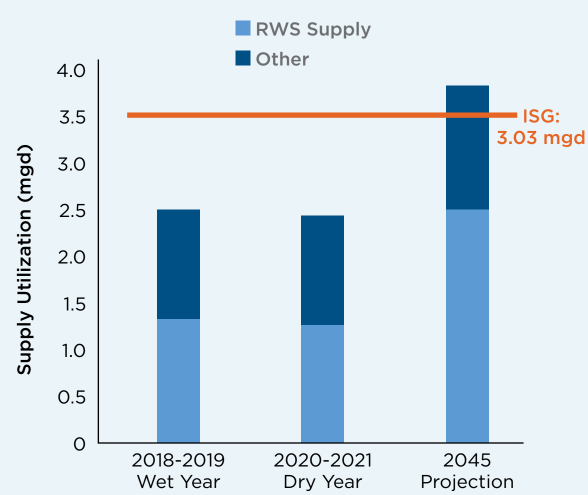


CURRENT & FUTURE LOCAL SUPPLIES:

Stanford is currently using half of its RWS allocation and potable demand projections show adequate supply until 2059 without additional sources or additional water conservation. Stanford will continue to minmize water demand with conservation programs. Stanford has established a graywater policy and will continue to explore conversion of some irrigated areas to recycled water. Additionally, Stanford will begin expanding stormwater capture and use facilities to increase the capture volume of water used in the non-potable irrigation system.

SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

RWS reliance will remain below ISG and local supplies will expand and continue to fulfill growing non-potable irrigation demands.



WATER CONSERVATION INSIGHTS[1,4*]

Despite campus growth, Stanford has reduced potable water demand by 50% since 2001 through water conservation, source shifting, and significantly improved efficiency for campus heating and cooling which minimizes the use of cooling towers.

Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Stanford University Water Resources Website
(4) '10-'11 BAWSCA Annual Survey

Note: *Due to abnormal campus populations during COVID-19, gross per capita water demand is calculated using potable water use.

City of Sunnyvale

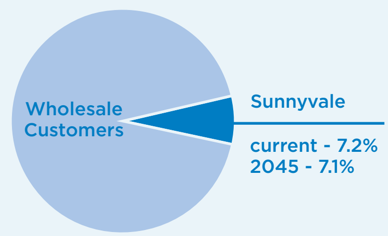
CUSTOMER OVERVIEW[1]:

The City of Sunnyvale, located at the north end of Santa Clara County, owns and operates its water utility which serves 156,317 people within a 24-square-mile service area. The water system supplies a majority of residential connections. The utility's supply sources include imported surface water from the RWS, Valley Water, local groundwater sources and recycled water.

INDIVIDUAL SUPPLY GUARANTEE: 12.58 mgd

MINIMUM PURCHASE REQUIREMENT[2]: 8.93 mgd

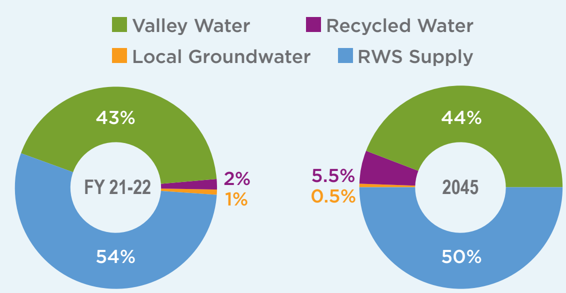
SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]



VULNERABILITIES & OPPORTUNITIES[3]:

The City of Sunnyvale has a diversified water supply portfolio. The imported surface water from the RWS and Valley Water is subject to future restrictions due to climate change impacts, drought conditions and potential regulatory changes. Sunnyvale's groundwater wells are not used in priority but provide an alternative water source during drought conditions or in the event of imported supply interruption. The production of recycled water at the Sunnyvale's Water Pollution Control Plant supplies irrigation and landscaping needs at parks, golf courses, and specific industrial customers, and will be expanded to increase the Sunnyvale's supply resilience.

CURRENT & FUTURE SUPPLY PORTFOLIOS[1]

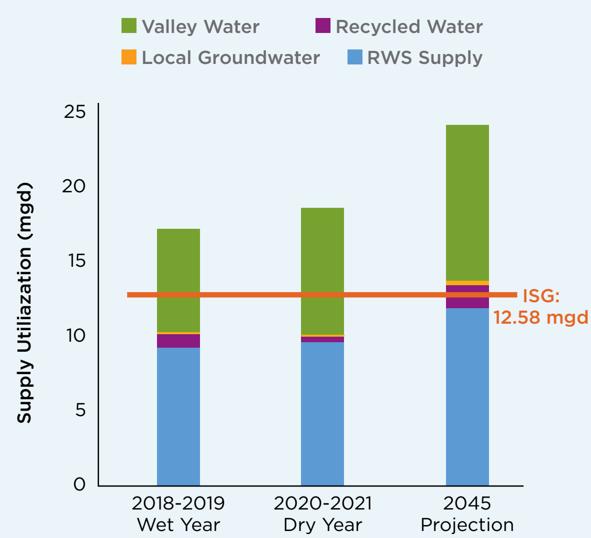


CURRENT & FUTURE LOCAL SUPPLIES:

Sunnyvale has a project underway to prepare a Recycled Water Master Plan to evaluate opportunities to expand recycled water use. In addition, Sunnyvale has $3.5 million budgeted in 2027-29 for the construction of a new well at the Central Water Plant.

SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

An increase in imported water from Valley Water will cover most of the planned increase in water demands

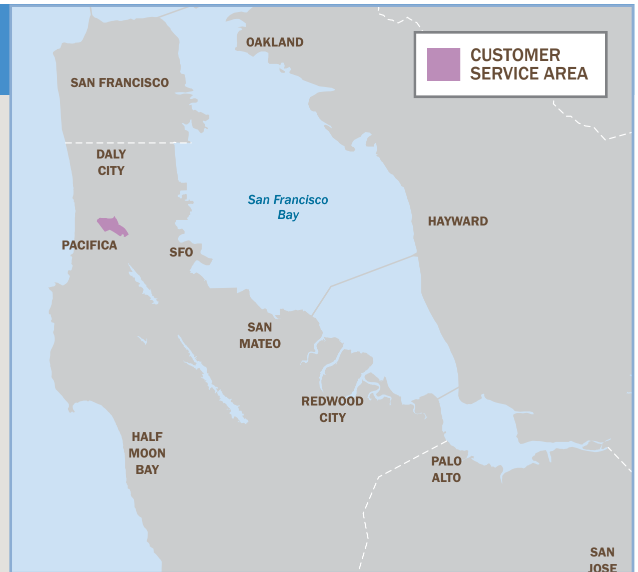


WATER CONSERVATION INSIGHTS[3,4]

27% decrease in residential per capita (R-GPCD) water use since 2010.

Sources: (1) '21-'22 BAWSCA Annual Survey, updated population provided by Sunnyvale (June 2023)
(2) Amended and Restated Water Supply Agreement, 2021
(3) Sunnyvale 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

Westborough Water District



CUSTOMER OVERVIEW[1]:

Westborough Water District supplies 13,486 people within the Westborough area, which represents approximately 20% of the City of South San Francisco. Residential use accounts for approximately 83% of total water usage. Westborough relies on RWS supply as its only supply source.

INDIVIDUAL SUPPLY GUARANTEE[2]: 1.32 mgd

VULNERABILITIES & OPPORTUNITIES[3]:

Westborough has limited opportunities for alternative water supply within its service area and relies on RWS supply for 100% of its water use. However, Westborough purchased between 56% and 68% of its ISG between 2016 and 2020. Since Westborough's service area is almost fully built-out, the system is therefore not anticipating significant growth in the residential or commercial sectors in the long-term and is not currently in urgent need of additional supplies based on their long-term planning

CURRENT & FUTURE LOCAL SUPPLIES:

Westborough is 100% reliant on RWS Supply, as it has limited opportunities for alternative water.

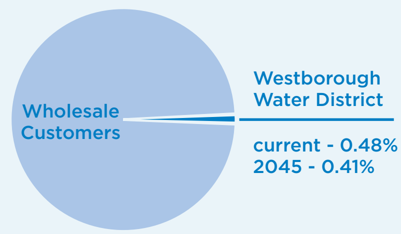
WATER CONSERVATION INSIGHTS[1,4]

5% decrease in residential gallons per capita demand (R-GPCD) since 2010 due to a post-drought rebound in water usage.

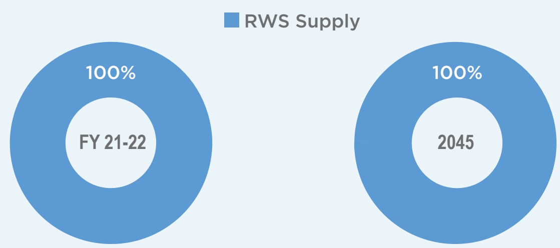
Due to the drought and a continuous call for conservation including implementation of Stage 2 of the 2020 WSCP calling for a voluntary 15% reduction, for the FY 20-21, the gross GPCD went down to 57 R-GPCD.

Sources: (1) '21-'22 BAWSCA Annual Survey
(2) Amended and Restated Water Supply Agreement, 2021
(3) Westborough Water District 2020 UWMP
(4) '10-'11 BAWSCA Annual Survey

SHARE OF RWS DELIVERIES TO WHOLESALE CUSTOMERS[1]

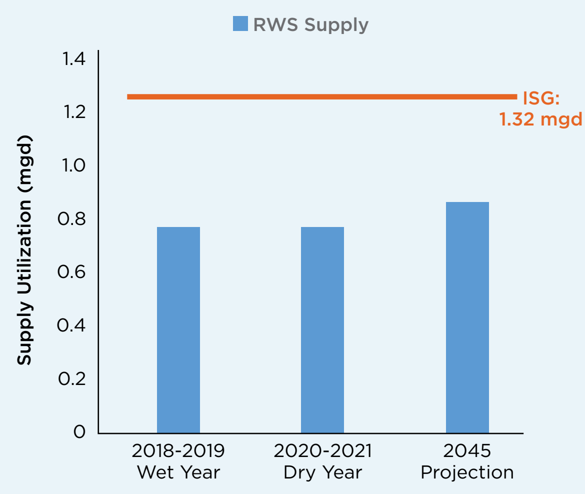


CURRENT & FUTURE SUPPLY PORTFOLIOS[1]



SUPPLY MIX IN MULTIPLE YEAR TYPES[1]

Anticipated passive conservation savings will lead to a decrease in the RWS supply needs, which will remain below ISG.



Appendix B: Water Availability Modeling

APPENDIX B. WATER AVAILABILITY MODELING

Purpose of this Appendix

This appendix presents supporting information and relevant details for modeling associated with Water Availability described in Chapters 2 and 3 of the AWS Plan.

Water System Modeling

The SFPUC uses a water supply planning methodology that was developed during and after the six-year drought that occurred in California from 1987 – 1992. This methodology includes using a water system simulation model (Hetch Hetchy/Local Simulation Model) and also includes the use of a planning drought simulation referred to as the "design drought". Excerpts from Hetch Hetchy/Local Simulation Model) documentation are presented below to describe the model and the design drought simulation procedure.

Model Overview (Excerpted from Hetch Hetchy/Local Simulation Model)

> The SFPUC has developed a computerized mathematical model to simulate system operations. The model, known as the Hetch Hetchy/Local Simulation Model, simulates the operation of San Francisco's Hetch Hetchy facilities, the Don Pedro Project, and the Bay Area reservoir, conveyance, and treatment systems.
>
> The model simulates system operations over the course of an 82-year sequential hydrologic period from July 1920 through September 2002 [now extended to 2017]. The model incorporates actual historical information about the hydrology (the amount of runoff as snowmelt and rainfall) that occurred in each year over the [97]-year record for each of the three watershed areas under consideration: the Tuolumne River system, the Alameda Creek system, and the Peninsula watershed system. This [97]-year period includes many different types and sequences of actual hydrological events that have occurred ranging from flood events to droughts of different magnitude and duration. The long-term [97]-year historical record is used in the model to represent the range of hydrologic conditions that could occur in the future. The model is used to assess how the system would perform as the result of an assumed system configuration and assumed operational objectives.
>
> The model uses actual historical hydrology for the depiction of runoff within the watersheds. However, the model is not expected to explicitly replicate observed historical operations in all cases. The past operation of the system in an actual year will differ to some degree from the operations simulated by the model for that year as a result of many factors. These factors include the anomalies in past operation that required system operators to adjust operations throughout the year to respond to prevailing, changing conditions of weather, demand, and facility conditions (maintenance or unplanned facility outages). Also, the model does not incorporate the dynamic physical and institutional changes that have occurred to the system throughout history. Rather, the model is intended to depict operations with an assumed consistent set of systematic operational

rules and objectives with a defined system configuration. This steady state of system configuration and operation is then evaluated over a broad range of hydrologic conditions. The utility of the model is the comparison of system performance that changes due to altering the assumptions for the operational rules and objectives, and system configuration.

Planning Methodology and Design Drought (Excerpted from Hetch Hetchy/Local Simulation Model)

Under normal conditions there are sufficient water supplies from rainfall, snowmelt, and storage such that water deliveries fulfill customer purchase requests and no systemwide water delivery reduction (rationing) is required.

System operations during drought periods require more complex planning and system management than during non-drought years. SFPUC drought planning uses as a backdrop the concepts of a “design drought” and “system firm yield.” System firm yield is a measure of the amount of water that can be delivered to customers without shortages during all anticipated hydrologic sequences, including drought periods when rainfall, snowmelt, and/or streamflow conditions are substantially below normal for consecutive years. For planning purposes, the SFPUC uses a design drought that contemplates a more severe drought than historical events and evaluates the system firm yield assuming the system is experiencing the design drought. This premise is founded on experience that illustrates that drought sequences can get more extreme as our hydrologic record lengthens. The design drought is a planning tool developed by the SFPUC used to anticipate and plan for drought; the SFPUC uses a design drought based on the hydrology of the six years of the worst sequential historical drought (1987-1992) plus the 2½ years of the 1976-1977 drought for a combined total of an 8½ year design drought sequence.

The Regional Water System has experienced drought periods in the last 30 years: most notable are the droughts that occurred from 1976 through 1977, and from 1987 through 1992. [More recently, droughts have occurred in 2012-2016 and 2020 – 2022.] During the 1987–1992 drought, even with the implementation of customer rationing, the amount of carryover storage in the regional system was more severely depleted than during any previous period of time, and the SFPUC had to adjust its normal operating procedures to avoid ‘running out of water’.

The 1987–1992 drought began at the end of the 1986 rainy season. Subsequent annual flows in the Tuolumne River were about 50 percent of average. The SFPUC’s entitlement to Tuolumne River flow was reduced to about 16 percent of the total river flow, and less than 50 percent of the normal amount of water delivered to customers was available from the river. As the drought progressed, the SFPUC developed and implemented short-term procedures to impose rationing on customers that resulted in a near 25 percent annual systemwide reduction in water deliveries. The extended drought resulted in the SFPUC adopting a mandatory rationing program from 1988 to 1989 and again from 1990 to 1993. Based on the experience of the 1987–1992 drought, the SFPUC modified its operational procedures with regard to drought planning.

The SFPUC system operations currently include a process for declaring a water shortage and a method for allocating reductions. The general protocol links total reservoir storage conditions to suggested delivery reductions. Each year, during the spring snowmelt period, the SFPUC evaluates the amount of total water storage throughout the system and determines if there is enough water available to serve full deliveries to customers within the context of the current year's supply and the design drought. At a certain reservoir storage, the SFPUC may impose delivery reductions. If reservoir storage becomes further depleted in a following year, the SFPUC may need to impose further delivery reductions. Currently with existing purchase requests there are three stages of delivery reduction: the first stage involves a 5 to 10 percent systemwide delivery reduction and is achieved by voluntary rationing; the second stage imposes an 11 to 20 percent systemwide delivery reduction and requires mandatory rationing; and, at the third stage of response, a 20 percent or greater systemwide delivery reduction would result in mandatory rationing with further reduced allocations. Prior to the initiation of any water delivery reductions, the SFPUC would hold a public meeting, open for public comment, to outline the water supply situation, the proposed water use reduction objectives, alternatives to water use reduction, and compliance monitoring methods.

The SFPUC quantifies water availability through the performance of two types of analyses. Each of these analyses provides a statement of the ability of the SFPUC Regional Water System to deliver water. The first type of analysis defines the system firm yield of the SFPUC system. As stated above, system firm yield is a measure of the amount of water that can be delivered to customers without shortages during all anticipated hydrologic sequences. System firm yield is the average annual water delivery that can be sustained without shortage throughout the 8½ year design drought. The second type of analysis identifies the reliability of the SFPUC Regional Water System during a recurrence of a long record of hydrologic conditions. The hydrologic record used for these analyses is the [97]-year sequence of hydrology previously described. A system firm yield study will identify the rules of operation and delivery rationing that maximizes water deliveries during the design drought. Those rules are then applied within a system performance study to identify the reliability of water deliveries and system operation over a long sequence of hydrology.

The system firm yield study is focused on operations and water deliveries during drought sequences. As described previously, the SFPUC uses a design drought that contemplates a more severe drought than historical events and defines the system firm yield assuming the system is experiencing the design drought. To quantify the system firm yield, operation of the SFPUC system is tested during the design drought with increasing levels of delivery and varying protocols for rationing until useable reservoir storage is depleted at the end of the design drought. These deliveries are the metric of the amount of water available after satisfying all of the other commitments of the system such as required stream releases and flow obligations to the Districts. Since the level of delivery (percentage of full purchase request) can vary year to year within the design drought, the system firm yield is expressed as the average annual water delivery that can be sustained throughout the entire 8½ year design drought. The analysis that defines system firm yield simulates system reservoir storage being fully depleted at the end of the design drought sequence.

In 2020, SFPUC developed the Water Supply and Demand Worksheet, which provides a simplified presentation of some important elements of the water supply planning methodology; it was developed to make the water supply planning methodology more accessible to decision-makers and interested members of the public. The Alternative Water Supply Program has used some of the presentation metrics from the worksheet for the evaluation of water availability. The worksheet allows users to view and modify assumptions about RWS system demand, water supply projects and obligations, and RWS operation during the design drought, to see the effect on available RWS water supply and rationing. Links to the Water Supply and Demand Worksheet and companion Worksheet User Guide can be found on the SFPUC website (https://www.sfpuc.org/programs/future-water-supply-planning/planning-tools-and-documents).

Appendix C:
AWS Program Cost Development Approach

APPENDIX C. AWS PROGRAM COST DEVELOPMENT APPROACH

Purpose of this Appendix

This appendix presents supporting information and relevant details for the AWS Program costs shown in the AWS Plan.

AWS Proforma Modeling

To begin to understand the level of investment needed for the AWS Program, the SFPUC has undertaken financial analysis to evaluate the costs for implementing the AWS Program. In conjunction with preliminary feasibility analyses and cost estimates that are being prepared for individual projects within the AWS Program, a Proforma Model is being developed to assess the costs for the AWS Program (AWS Proforma Model) over the 2045 planning horizon. The intent of the model is to use a uniform set of planning assumptions to provide a framework that would allow staff to incorporate updates on a continuing basis including adding new projects in the AWS Program portfolio.

While development of the AWS Proforma Model is not complete at the time of publication of this AWS Plan, initial estimates derived from the model have been used to reflect potential capital costs and unit costs for each AWS project, where the costs represent a snapshot as of May 2023.

Cost Estimating Considerations for the AWS Plan

The AWS Program portfolio includes a diverse set of projects. The projects vary widely in terms of their location, water production, operation, and capital infrastructure needs. The range of complexity also varies among projects, with one (Calaveras Reservoir Expansion) undertaken entirely by the SFPUC to those such as the Los Vaqueros Expansion (LVE) Project that include multiparty arrangements between various agencies with different interests. Further, the projects are in different stages of planning and vary in their individual schedules to deliver water. The projects thus present a unique set of challenges for cost estimating.

Project-level planning, including feasibility studies and alternatives' analyses, are ongoing and continue to proceed in parallel with the development of the AWS Proforma Model. As costs are updated in project planning, those changes are reflected in the AWS Proforma Model, but there may be a lag. Additionally, the cost estimate for a project in its feasibility study may be based on different or incomplete assumptions compared to the AWS Proforma Model, which uses some uniform assumptions, which were standardized to the extent possible, based on past SFPUC infrastructure projects.

As noted previously, five of six AWS Projects involve multiparty partnerships. For most, cost-sharing among partners and other offsets such as state and federal grants have not been determined at this time and will only be available as project-level planning proceeds. The intent of the financial analysis at the present time is generally to develop the total capital costs or

100% of the costs for capital investment toward the projects, notwithstanding the potential cost-sharing and cost offsets or cost of integrating or operating projects in the future.

Cost Estimate Classifications

The cost estimates developed at the project-level are generally based on Association for the Advancement of Cost Engineering (AACE, Inc., 2005)[1] standards of project cost estimating used to classify the degree of project definition and maturity (see **Table C-1**). As each AWS Project is further defined and cost components are refined, the expected range of cost accuracy will also continue to improve, moving the project into a different cost classification. The cost estimates for the AWS Projects are currently predominantly Class 5 estimates except for the LVE Project and Daly City Recycled Water Expansion Projects, which are further along in planning and therefore have a higher degree of specificity. The cost estimate for the LVE Project is a Class 2 cost estimate and that for the Daly City Recycled Water Expansion Project is a Class 3 cost estimate. The table below describes the standard classifications for infrastructure cost estimating.

Table C-1: COST ESTIMATE CLASSES

Cost Estimate Class	Description	Expected Range of Accuracy*
Class 5	Class 5 estimates are prepared for any number of strategic business planning purposes, such as but not limited to market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location studies, and long-range capital planning. They are generally prepared based on very limited information and subsequently have wide accuracy ranges.	- 20% to -50% on the low side, and +30% to +100% on the high side
Class 4	Class 4 estimates are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. They are generally prepared based on limited information and subsequently have fairly wide accuracy ranges.	-15% to -30% on the low side, and +20% to +50% on the high side
Class 3	Class 3 estimates are generally prepared to form the basis for budget authorization, appropriation, and/or	-10% to -20% on the low side, and

[1] AACE, Inc. AACE International Recommended Practice No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries, 2005.

	funding. As such, they typically form the initial control estimate against which all actual costs and resources will be monitored. Class 3 estimates are typically prepared to support full project funding requests and become the first of the project phase "control estimates" against which all actual costs and resources will be monitored for variations to the budget. They are used as the project budget until replaced by more detailed estimates.	+10% to +30% on the high side
Class 2	Class 2 estimates are generally prepared to form a detailed control baseline against which all project work is monitored in terms of cost and progress control. For contractors, this class of estimate is often used as the "bid" estimate to establish contract value.	-5% to -15% on the low side, and +5% to +20% on the high side
Class 1	Class 1 estimates are generally prepared for discrete parts or sections of the total project rather than generating this level of detail for the entire project. Class 1 estimates are typically prepared to form a current control estimate to be used as the final control baseline against which all actual costs and resources will now be monitored for variations to the budget and form a part of the change/variation control program.	-3% to -10% on the low side, and +3% to +15% on the high side

* Expected range of accuracy provided depends on the technological complexity of the project, appropriate reference information, and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed these shown in unusual circumstances.
Source: AACE, Inc, 2005

AWS Project Cost Calculations

The **bolded** terms described in this section are the terms used in **Table 5-1** of the AWS Plan.

Each AWS Project has its own schedule with anticipated phases including planning, engineering design, environmental review and permitting, construction, and construction management The AWS Plan provides a **Status** for each project by stating the phase the project is in as of May 2023 (at the time the AWS Plan was prepared) with the **Cost Estimate Classification** as described in **Table C-1**. The table then identifies the **SFPUC Supply Assumed**, which estimates the volume of water that may be available to address dry year needs for the SFPUC toward the identified gap. For most projects, this supply assumed demonstrates a current assumption of potential benefit and is not used in the calculation of costs. The **Estimated Online Date** identifies a projected date when the project could begin deliveries. This date and the corresponding schedule for construction help determine the level of escalation costs assumed for a project, which is typically to the mid-point of construction. If the project construction schedule is delayed, additional escalation costs may be incurred.

The **Total Capital Costs** are presented in two ways in **Table 5-1** of the AWS Plan. First, the **Escalated** costs reflect the real costs anticipated over multiple years of planning and construction. As broken down in **Table C-2** below, the capital costs include Construction Costs, Owner's Administrative Costs, and Development Costs. These categories of costs include contingencies and escalation factors, as shown. For the Daly City Recycled Water Project, which has a Class 3 cost estimate a 30% contingency is assumed. For other projects that have Class 5 cost estimates, a 35% contingency is assumed. The Los Vaqueros Expansion Storage project utilizes a different contingency calculation based on its project proforma model.

Total capital cost is the sum of Construction, Owner's Administrative Costs, and Development Costs. It includes contingency and escalation factors as part of construction cost estimating and other costs (Owner's Administrative and Development) are based on percentages of those total construction costs.

Table C-2: CALCULATION OF ESCALATED CAPITAL COSTS

Cost Component	Definition	Cost Basis and Calculation
Construction Cost	Cost associated with building a project. Components:	Based largely on project-level feasibility studies and may include additional assumptions for land, etc. if not included in study
	Direct costs associated with construction of proposed project facilities and connections and updates to existing structures or facilities, as applicable and	
	Indirect costs associated with construction such as contractor general conditions, overhead and profit, and insurance	
Contingency	A contingency is intended to account for changes in costs over a project timeline	A contingency of 30% applied to construction cost for Class 3 estimate
		A contingency of 35% applied for Class 5 estimates

		Additional contingency of 10% on the escalated construction cost described below
Escalation	Escalation accounts for planning and construction anticipated to occur in the future and varies with the project schedule.	Escalation factor is applied to construction cost after a contingency of 30% or 35%
		Escalation factor is based on project schedule and SFPUC's standard rates (i.e., yearly escalation rate of 6% for 2023 and 2024 and 4% for 2025 and thereafter)
Owner's Administrative Cost	Costs associated with administration during construction. Components:	Calculated as 22.1% of escalated construction cost with contingencies
	Environmental avoidance & mitigation (0.1%)	
	Security upgrades (0.5%)	
	Project management (3%)	
	Environmental construction compliance (0.5%)	Cost components based on past SFPUC infrastructure projects
	Construction management - engineering support (4%)	
	Construction management - contract management and administration (12%)	
	Legal project support (0.5%)	
	Operations and water quality support (1.5%)	

Development Cost	Costs associated with developing and planning a project anticipated to be incurred prior to construction.	Calculated as 15% of the construction cost Cost components based on past SFPUC infrastructure projects and standard industry practice
	Components:	
	Land and right-of-way (ROW) acquisition (0.5%)	
	Project management (1%)	
	Pre-design planning (2%)	
	Environmental review and permitting (1%)	
	Engineering design (10%)	
	Legal ROW support (0.5%)	

The calculation of **Estimated Capital Cost per Acre-Foot** is the unit cost based on the total capital cost in current terms or the **2023 $ Capital Costs** divided by the **Project Capacity** in acre-feet over a period of 30 years. While the project life of many of these projects may be greater than 30 years, convention on SFPUC-financed projects has been to consider costs over the standard 30-year financing period.

$$\textit{Capital Cost Per Acre-Foot} = \frac{\textit{Total Capital Cost in 2023 \$ X 1,000,000}}{\textit{Project Capacity in Acre-Feet per Year X 30 (financing period)}}$$

For most projects, the Project Capacity represents the maximum yield of the project, regardless of whom may receive deliveries as that may not be confirmed. In some instances, assumptions have been made for the purpose of this Plan. For the ACWD-USD Purified Water Project, only the first phase evaluated in the Feasibility Study is assumed in the AWS Plan although a subsequent phase could be implemented. However, due to the complexity of the project and the distinct nature of the second phase relative to the first phase, it is not assumed. The LVE Project, as an exception, only reflects costs and capacity related to the presumed SFPUC share of the regional storage project. This is because the project is further along in identifying cost allocations and potential benefits. While these costs and volumes may still change as the project progresses, key cost components are known and the project has its own detailed proforma model that has been reviewed and vetted among project partners. Because the SFPUC will definitively not lead project construction or operation on its own, applying SFPUC standard cost metrics was not appropriate for this project.

For storage projects, the project capacity is the annual average water supply available over 7½ years of the SFPUC's 8½ year design drought accounting for evaporative (8%) and conveyance (10%) losses. As has been assumed for the Regional Groundwater Storage and Recovery Project, dry year storage is not typically drawn down in the first years of a drought when a drought is not yet declared, so available supply is assumed over 7½ years. As an example, the 3.9 mgd capacity for the LVE Project represents average annual deliveries of a full reservoir over 7½ years of the design drought.

Future AWS Project Cost Factors

The AWS Proforma Model remains under development. Meanwhile, project planning will continue to progress in parallel and costs will continue to be updated and detailed. This could include information that is not available as of May 2023 such as, but not limited to, the following cost categories:

- ***Grants and Loans:*** The estimated costs for the AWS Program do not account for or include any reductions from grants or other funding sources.
- ***Operations & Maintenance (O&M) costs:*** The costs shown in the AWS Plan do not include (O&M costs, which will be estimated for AWS Projects as part of the continuing financial analysis for the AWS Program. **Table C-3** shows potential O&M costs anticipated for an AWS Project.
- ***Ownership and Financing:*** The estimated costs do not account for or include plan of financing. Actual financing strategies, financing instruments, and cost of funds are yet to be determined and may be dependent on the ownership structure for a project. The costs will be updated to incorporate the ownership structure and financing mechanisms for the project as they are known. AWS staff will continue to work with the Finance team to identify capital planning and budgeting options.
- ***Cost share:*** Except for the Calaveras Reservoir Expansion Project, all AWS Projects involve multiparty partnerships. The costs estimated at this time represent total capital costs and do not represent the share of individual partners. The cost share is not known at this time and will be determined in collaboration with project partners. As the financial analysis continues, additional costs will also be included such as those associated with the connection of the AWS Projects with the local systems, project operations and benefits from the projects and as they are apportioned among partners.
- ***Project operations and benefits:*** Details on project operations and benefits are not available for most projects. Delivery schedules of water would vary significantly with time, precipitation (dry or wet years), type of project (e.g., water supply, storage, conveyance), and other factors which will need to be coordinated with project partners and assessed for benefits and operations. As planning progresses, cost-shares for projects will also reflect the benefits for the SFPUC associated with project implementation.

- ***Alternatives' Analyses:*** For most projects, several scenarios are being assessed. As alternatives are selected, the infrastructure and operational requirements will likely shift affecting the costs and schedule for projects.

Table C-3: POTENTIAL O&M COSTS

Total O&M Cost	
O&M Costs: Costs to operate the project to produce and deliver water, here assumed over 30 years and the maintenance of facilities and equipment.	
Calculated as total of components listed above over the 30-year project operation (components based mostly on industry practices and SFPUC's past project data)	Chemicals usage
	Staffing
	Insurance costs
	Electricity
	O&M contingencies
	Renewal and Replacement
Contingencies and Escalation	