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FINAL REPORT

2021 Water Supply Reliability Plan Update

Prepared for

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Project CWR0610

July 13, 2021

This report is an update to a prior report developed by Kennedy/Jenks Consultants, and the model used for the analysis is an update of the original Water Operations Model developed by MBK Engineers on behalf of SCV Water, 2017.

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ACRONYMS AND ABBREVIATIONS

2019 DCR	2019 DWR State Water Project Delivery Capability Report
AF	acre-feet
AFY	acre-feet per year
Agency	Castaic Lake Water Agency
ASR	Aquifer Storage and Recovery
AVEK	Antelope Valley-East Kern Water Agency
Basin	Santa Clara River Valley Groundwater Basin, East Subbasin
BO	Biological Opinion
BVRRB	Buena Vista-Rosedale Rio Bravo
BVWSD	Buena Vista Water Storage District
Cal OES	California Office of Emergency Services
CLWA	Castaic Lake Water Agency
cm	centimeter
CVP	Central Valley Project
DCR	Delivery Capability Report
DSS Model	Decision Support System Model
DDW	California Division of Drinking Water
Delta	Sacramento-San Joaquin Delta
DWR	California Department of Water Resources
Edison	Southern California Edison
gpm	Gallons per minute
GSA	Groundwater Sustainability Agency
GSI	GSI Water Solutions
GSP	Groundwater Sustainability Plan
KCWA	Kern County Water Agency
LACWWD 36	Los Angeles County Waterworks District No. 36
LADWP	Los Angeles Department of Water and Power
Metropolitan	Metropolitan Water District of Southern California
MAF	million acre-feet
MG	million gallons
MGD	million gallons per day
MWM	Maddaus Water Management Inc.

NCWD	Newhall County Water District
NLF	Newhall Land and Farming Company
NWD	Newhall Water Division
OVOV	One Valley-One Vision
PFAS	per- and polyfluoroalkyl substances
Plan	Water Supply Reliability Plan
Purveyor	Supplier of drinking water at the retail level (also retail purveyor)
RL	Reporting Limit
RRBWSD	Rosedale-Rio Bravo Water Storage District
RWMP	Recycled Water Master Plan
SCADA	Supervisory Control and Data Acquisition
SCV	Santa Clarita Valley
SCV-GSA	Santa Clarita Valley Groundwater Sustainability Agency
SCV Water	Santa Clarita Valley Water Agency
SCWD	Santa Clarita Water Division
Semitropic	Semitropic Water Storage District
Study	Water Resources Reconnaissance Study
SWP	State Water Project
SWRCB	State Water Resources Control Board
SWRU	Stored Water Recovery Unit
UWCD	United Water Conservation District
UWMP	Urban Water Management Plan
VWC	Valencia Water Company
VWD	Valencia Water Division
WRP	Water Reclamation Plant

EXECUTIVE SUMMARY

The Santa Clarita Valley Water Agency (SCV Water) periodically updates its Water Supply Reliability Plan (Plan) to identify current and future storage capacity and emergency storage needs and options for managing its water supplies. The previous Plan was prepared in 2017 for the Castaic Lake Water Agency (CLWA) service area which, at the time, included four retail water purveyors: the Santa Clarita Water Division of CLWA (SCWD); Newhall County Water District (NCWD); Valencia Water Company (VWC); and Los Angeles County Waterworks District 36 (LACWWD 36).

On January 1, 2018, CLWA, NCWD, SCWD, and VWC merged to become SCV Water. SCV Water is made up of three water divisions: Newhall Water Division (NWD); Santa Clarita Water Division (SCWD); and Valencia Water Division (VWD). SCV Water also continues to serve LACWWD 36. This Plan was developed as an individual update for the SCV Water service area.

This Plan evaluates six supply scenarios driven by varying assumptions regarding projected local supply availability and reliability, with each supply scenario evaluated against two demand sets (projected demands with and without active conservation).

Overview of the Plan Methodology

This Plan uses an analytic spreadsheet model developed for SCV Water by MBK Engineers and updated by Geosyntec Consultants in 2021 to assess the reliability of SCV Water's water supplies. The model performs annual water operations for the SCV Water service area over a specified study period (2021 through 2060), using projected increases in demands to reflect the uncertainty in the hydrology over this period, using supplies that would be available under multiple hydrologic sequences. For each hydrologic sequence, the model steps through each year of the study period, comparing annual supplies to demands and operating SCV Water storage programs as needed, adding to storage in years when supplies exceed demand, and withdrawing from storage when demand exceeds supplies. Results from the multiple hydrologic sequences are then compiled and summarized to provide a statistical assessment of the reliability of SCV Water's supplies and storage programs to meet its projected demands over the study period.

In addition to the hydrologic reliability of the Santa Clarita Valley's overall water supply, this Plan also discusses the physical reliability of the water delivery system in place to deliver its groundwater, imported water, and recycled water supplies. Deliveries of these supplies are dependent on an extensive network of State Water Project (SWP) facilities used to pump, store, and convey SWP and other imported supplies, and SCV Water and purveyor facilities to treat, pump, and distribute supplies. Supply delivery can be interrupted or constrained in a number of ways, and the Plan includes an assessment of the ability to meet demands during an extended 12-month outage.

Supply and Demand Scenarios Evaluated

For this Plan update, the study period analyzed is 2021 through 2060 (which is 10 years after the assumed development buildout in the SCV Water's service area assumed in the 2020 Urban Water Management Plan (UWMP)). The analysis starts with a Base Scenario and evaluates five additional scenarios, with and without active conservation, described generally as follows:

- **Base Scenario:** Evaluates SCV Water's portfolio based on existing supplies, including recovered groundwater pumping capacity as treatment is installed and existing banking programs. This scenario determines SCV Water's current supplies' reliability before the addition of new dry year supplies.
- **Scenario 1:** Represents the supplies used in the 2020 UWMP's Section 7 reliability analysis. It builds on the Base Scenarios by adding additional Saugus Formation pumping capacity for use in dry periods and developing an additional 10,000 acre-feet per year (AFY) of extraction capacity under the existing water banking agreement with Rosedale Rio-Bravo Water Storage District (RRBWSD).
- **Scenario 2:** Similar to Scenario 1, but the dry supply from Saugus Formation Wells 5 through 8 is replaced with participation in the Antelope Valley-East Kern Water Agency's (AVEK's) High Desert Water Bank.
- **Scenario 3:** Similar to Scenario 1, but the dry supply from Saugus Formation Wells 5 through 8 is replaced with participation Sites Reservoir.
- **Scenario 4:** Assumes that all of the new Saugus Formation Wells 3 through 8 are not constructed and replaced with a combination of Sites Reservoir and the AVEK High Desert Water Bank.
- **Scenario 5:** Similar to Scenario 4, assumes no new Saugus Formation Wells and also eliminates the new recovery capacity from the Rosedale banking program. It replaces these with the AVEK High Desert Bank and Sites Reservoir, as well as the participation in the McMullin GSA Aquaterra Water Bank.

These scenarios represent 12 different views of what the future supply situation might look like. Each supply scenario is evaluated in the Plan to determine the reliability of that scenario in meeting projected demands in SCV Water's service area. The reliability for all future scenarios (1 through 5) is greater than 95 percent.

Recommendations

The analysis shows that current supplies along with active conservation would be sufficient until 2040. However, this assumes no safety margin if a supply disruption were to occur, such as supply impacts from per- and polyfluoroalkyl substances (PFAS) contamination. To achieve reliability in subsequent years, additional investments in those facilities identified in Scenarios 1 through 5 would be required. When these facilities and programs are put in place on the schedule identified, reliability is achieved. The analysis shows that for Scenarios 1 through 5, there is a supply surplus that greatly exceeds any projected shortfall throughout the study period.

As in any planning analysis, a number of assumptions have been made regarding projected demands and the availability of various supplies. The future may very well evolve somewhat differently than assumed, but will hopefully lie somewhere within the bounds of the scenarios analyzed. However, conditions should continue to be monitored, and water supply reliability should be reassessed as changing conditions, such as updated SWP reliability analyses that incorporate differing climate change assumptions or different Delta regulatory constraints, warrant.

SCV Water has adequate existing and planned supplies to meet SCV Water service area demands throughout the 40-year planning period. Furthermore, SCV Water has alternative paths to reliability should planned supplies prove not to be viable.

Based on the water supply reliability analysis, a 95 percent reliability goal, and physical reliability considerations, the following recommendations are made:

Near Term (through 2040)

Supply Reliability

- The results indicate that current supplies along with active conservation would be sufficient until 2040. However, this assumes no safety margin if a supply disruption were to occur, such as supply impacts from PFAS contamination. Accordingly, SCV Water should consider accelerating implantation of programs necessary to achieve longer-term reliability, as discussed below.

Physical Reliability

- *Emergency storage for extended outage:*
  - Reserve use of SWP flexible storage for emergency storage (rather than for dry-year supply).
  - Pursue a further of analysis of emergency storage to establish criteria for and better quantify near- and long-term storage needs.

Longer Term (2040 through 2060)

Supply reliability

There are multiple pathways to achieving long-term reliability, as demonstrated in Scenarios 1 through 5. SCV Water will have to make decisions in the near-term on future supply investments that will ensure that the Agency continues to be able to provide a reliable water supply portfolio. However, these scenarios do not contain a safety margin for unforeseen supply disruptions such as groundwater contamination impacts recently experienced by SCV Water. The resource mixes evaluated in each scenario are described below:

- Scenario 1 represents the supplies used in the 2020 UWMP's reliability analysis. It builds on SCV Water's base supplies by adding additional Saugus Formation pumping capacity, through Saugus Wells 3 through 8, for use in dry periods, and developing an additional 10,000 AFY of extraction capacity under the existing water banking agreement with RRBWSD. One of the perceived risks to achieving reliability with Scenario 1 is the extent to which new Saugus Formation wells can be permitted and installed. As noted in this Plan, permitting of Saugus Wells 3 and 4 is currently delayed, pending permitting by California Division of Drinking Water (DDW) as it relates to proximity to abandoned oil wells. If the current sites prove not to be viable, the most likely course of action would be to relocate these proposed wells. If replacement well sites cannot be located, or if Saugus pumping is limited because of potential subsidence, there are alternative paths to reliability as demonstrated by Scenarios 2 through 5.
- Scenario 2 achieves reliability through the addition of Saugus Wells 3 and 4 only, an additional extraction capacity of 10,000 AFY with RRBWSD, and participation in the AVEK High Desert Bank.
- Scenario 3 achieves reliability through the addition of Saugus Wells 3 and 4 only, an additional extraction capacity of 10,000 AFY with RRBWSD, and participation in Sites Reservoir.
- Scenario 4 is more challenging as it assumes the further deletion of Saugus Wells 3 and 4. This scenario requires an additional extraction capacity of 10,000 AFY from RRBWD and additional investments in the AVEK bank along with Sites Reservoir to achieve reliability.
- Scenario 5 is similar to Scenario 4 in that none of the Saugus Wells 3 through 8 are constructed. This scenario assumes no additional extraction capacity from RRBWSD is made and instead, investments in Sites Reservoir, the AVEK bank, and the McMullin GSA Aquaterra Bank are made to achieve reliability.

Physical reliability

- *Location of new dry-year supply program(s):* For any new storage programs pursued, look first to programs located within SCV Water's service area or at least south of the Tehachapi Mountains.
- *Emergency storage for extended outage:* Reserve use of SWP flexible storage for emergency storage (rather than for dry-year supply). Consider up-sizing any new local or near-local storage programs to include storage reserved for emergencies.

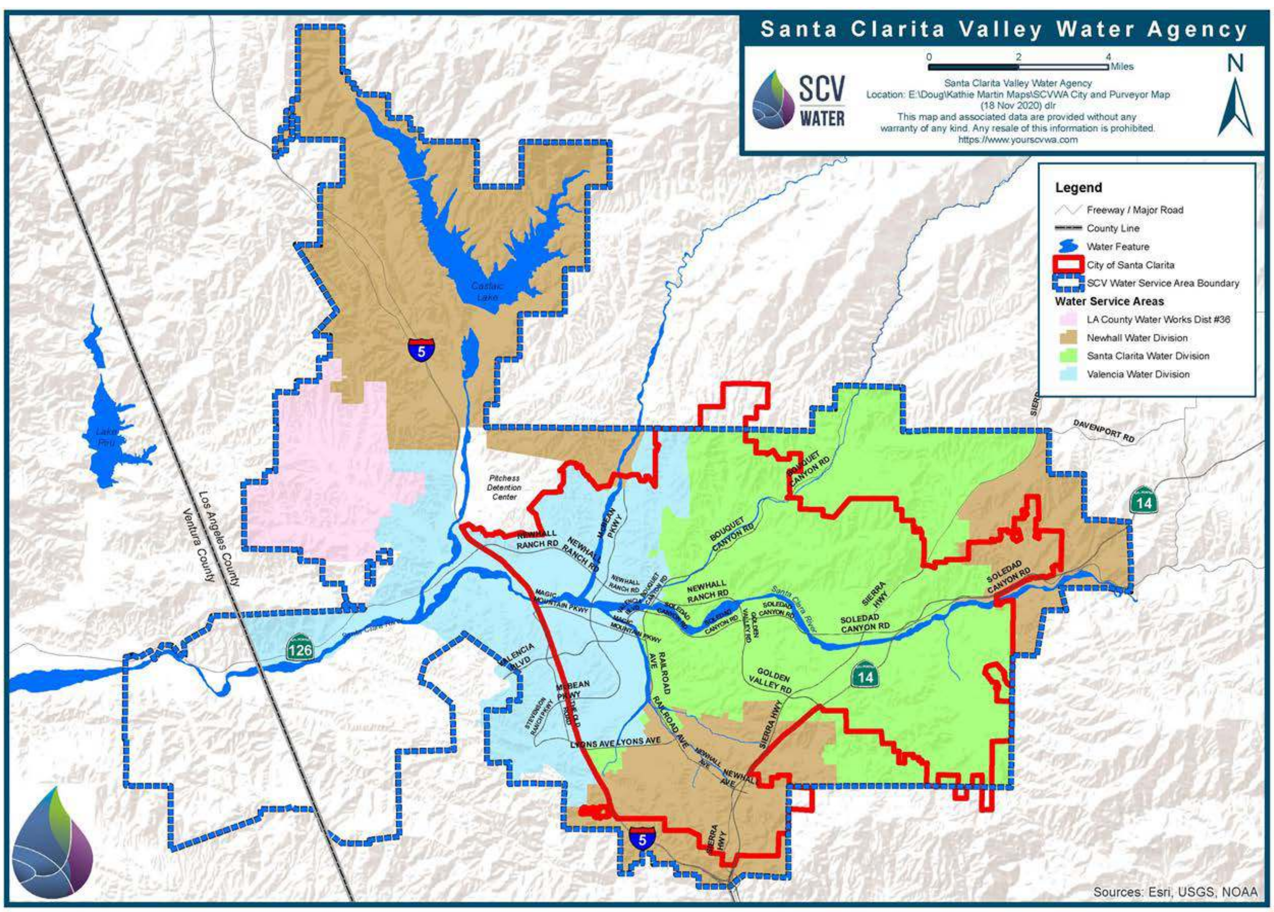
1. INTRODUCTION

This section presents a brief background of the water supply reliability issues of SCV Water as well as the need for an update to SCV Water's Water Supply Reliability Plan. The objectives, scope of services, and conduct of study are also summarized.

1.1 Background

SCV Water was formed on January 1, 2018 when CLWA, NCWD, SCWD, and VWC merged to become a single agency. The SCV Water service area is shown in Figure 1-1. The formation of SCV Water occurred through a collaborative process and was formalized by Senate Bill 634. Until the merger, SCV Water served as the regional wholesaler to the Santa Clarita Valley, encompassing a service area of 195 square miles in Los Angeles and Ventura Counties. SCV Water now serves the same service area and is made up of three water divisions with separate, but interconnected distribution systems: NWD; SCWD; and VWD. Those divisions cover nearly the entire City of Santa Clarita and unincorporated portions of Los Angeles County. In addition, SCV Water serves LACWWD 36 whose service area includes the Hasley Canyon area in the Los Angeles County unincorporated community of Val Verde.

Figure 1-1: SCV Water Service Area



Adequate planning for, and the procurement of, a reliable water supply is a fundamental function of SCV Water. The agency's water supplies are made up of approximately equal amounts of imported water and local groundwater, as well as a small portion of recycled water.

SCV Water has a long-term SWP water supply contract (SWP Contract) with the California Department of Water Resources (DWR) for 95,200 acre-feet (AF) of SWP Table A Amounts[1]. However, the availability of SWP supply is variable. It fluctuates from year to year depending on precipitation, regulatory restrictions, legislative restrictions, and operational conditions and is subject to substantial curtailment during dry years. A more detailed discussion of factors having the potential to affect SWP deliveries is provided in Sections 4.2.1 and 4.2.2 of the 2020 SCV Water UWMP.

The primary additional imported supply is surface supply from the Buena Vista Water Storage District (Buena Vista or BVWSD) and the (Rosedale-Rio Bravo or RRBWSD) in Kern County. This supply, which is developed from Buena Vista's high-flow Kern River entitlements, was first delivered to SCV Water in 2007 and is available as a firm annual supply delivered to SCV Water through SWP facilities. SCV Water is also able to manage some of the variability in its SWP supplies under certain provisions of its SWP Contract, including the use of flexible storage at Castaic Lake, as well as through its participation in several groundwater banking/exchange programs in Kern County.

All imported water is delivered to Castaic Lake through SWP facilities. From Castaic Lake, which serves as the terminal reservoir of the SWP's West Branch, the water is treated at either SCV Water's Earl Schmidt Filtration Plant or Rio Vista Water Treatment Plant and delivered to the SCV Water service area through transmission lines owned and operated by SCV Water.

SCV Water can meet over half of the Valley's urban demand with imported water. The balance of demands is primarily met with local groundwater and a small amount of recycled water. In the 2020 UWMP, SCV Water evaluated the long-term water needs (water demand) within its service areas and has compared these needs against existing and potential water supplies. Demand projections are based on applicable population projections and county and city land use plans and account for conservation as well as climate change impacts and other relevant factors.

Results of the 2020 UWMP indicate that the total projected water supplies available to the SCV Water service area over the 30-year projection during normal, single-dry, and multiple-dry year (5-year drought) periods are sufficient to meet the total projected water demands throughout the Valley, provided that SCV Water continues to utilize available SWP Table A Amounts and will continue to incorporate conjunctive use, water conservation, water transfers, recycled water, and water banking as part of the total water supply portfolio and management approach to long-term water supply planning and strategy.

[1] Table A is a schedule of the annual volume of water that can be requested by an SWP contractor in a given year under regular contract provisions without consideration of surplus SWP water deliveries or other supplies available to an SWP contractor.

1.1.1 SCV Water's Water Supply Reliability Plans

In 2003, SCV Water developed a Water Supply Reliability Plan (2003 Plan). The primary objectives of that plan were to identify and evaluate supply opportunities and recommend a water supply reliability strategy. The plan was based on then-current DWR estimates of SWP delivery reliability and water demands provided by the retail purveyors. Since the preparation of the 2003 Plan, DWR has prepared biennial updates of its SWP delivery reliability report, and the Agency has updated its local supply plans and demand projections and prepared four UWMP updates. Based upon recommendations in previous reliability plan updates (2009, 2011, and 2017 Plans), SCV Water has developed additional water supplies, as well as capacity in groundwater banks and exchange programs. Together with its Table A amounts and flexible storage allowed under the Monterey Amendment to the SWP Contract, these additional water management options have created a portfolio of water supplies and programs, which require periodic reassessment to maximize water supplies and minimize water supply costs.

To incorporate updated information and additional supplies and programs, SCV Water periodically updates its 2003 Plan. The most recent of these periodic reliability plan updates is the 2017 Water Supply Reliability Plan (2017 Plan), which identified current and future storage capacity and emergency storage needs and options.

1.1.2 Summary of 2017 Plan and Recommendations for Implementation

The 2017 Plan evaluated four scenarios, each consisting of a different projection of available supplies through 2050, as summarized below:

- **Base Scenario:** Based on 2015 UWMP demand, supply, and storage program assumptions. This includes planned increases in recycled water, conversion of Alluvium groundwater use from agricultural to municipal use, and dry-year increases in Saugus groundwater pumping.
- **Scenario A:** Similar to the Base Scenario, but includes SWP supplies anticipated to be available with proposed California WaterFix facilities.
- **Scenario B:** Moderate supply reductions relative to the Base Scenario, with a reduction in SWP supply reliability and less increase in Saugus pumping capacity and recycled water use.
- **Scenario C:** Larger supply reductions relative to the Base Scenario, with a larger reduction in SWP supply reliability and additional limits on groundwater supplies and recycled water use.

Each of the four scenarios had a variation in results, which highlighted the range in additional supply actions that could have been required to achieve a 95-percent reliability goal. For example, based on the supply reliability analysis, if the future supply situation evolved similar to the Base Scenario or Scenario A, no additional actions would have been needed during the study period through 2050, beyond the planned increases in Alluvial, Saugus, and recycled water supplies described in the 2015 UWMP.

Similarly, for a future that may have evolved more like Scenario B, no additional actions beyond those planned would have been needed through at least 2045, and perhaps through 2050. In 2050, the 95 percent reliability goal was just met. An additional dry-year supply of about 5,000 AFY – to replace the dry-year supply from the Semitropic Water Storage District (Semitropic) Banking Program that would end in 2045 – would have provided a bit of buffer for the last five years of the study period and beyond.

If, however, the future evolved more like Scenario C, additional water management measures would have been needed by about 2035. An additional dry-year supply of 10,000 AFY would have been needed by about 2035, and a second increment of dry-year supply of 10,000 AFY by about 2045.

For all four scenarios, the supply surplus greatly exceeded any shortfall throughout the study period. This was true even for Scenario C with its assumed supply reductions. Given this, storage of surplus amounts of existing and planned supplies through the expanded use of existing storage programs or new storage programs, rather than acquiring additional base or dry-year supply, appeared to be the more effective use of resources.

Dry-year supplies from storage programs could have come from an expanded take capacity of the Rosedale-Rio Bravo Banking Program and/or from new storage program(s). An expanded ability to withdraw storage from the Rosedale-Rio Bravo Banking Program would have allowed the existing investment in this program to be more effectively used. Any new storage programs could have been located in or near the SCV Water service area, providing not only water supply, but potential benefits related to concerns regarding physical reliability of conveyance facilities.

1.2 Authorization

Since the preparation of the 2017 Plan Update, a number of things have changed. Updated information has become available, including more recent demand projections, SWP reliability estimates, groundwater production projections, and recycled water use estimates, all as documented in the 2020 UWMP. New water exchange programs have been implemented, including the AVEK and the United Water Conservation District (UWCD) Exchange.

In recognition of the need to re-evaluate and update the issues associated with potential water supply reliability projects and current reliability conditions, SCV Water has authorized Geosyntec Consultants, in cooperation with the Agency's water resources planning staff, to update its Water Supply Reliability Plan (Plan).

1.2.1 Scope of Services

To accomplish the objectives of this Plan update, the following scope of services was developed:

1. Meet with SCV Water staff to discuss objectives of the plan.
2. Summarize SCV Water's current and projected water supplies as provided for in the 2020 UWMP.

3. Identify the hydrological reliability requirements of SCV Water's water supply.
4. Update the spreadsheet model prepared by MBK with additional supplies and modified logic and to provide a quantitative assessment of the water supply reliability and risk of 12 pre-determined water supply scenario portfolios.
5. Prepare a draft report and submit to SCV Water for review. After incorporating SCV Water staff comments, a final draft report will be prepared.

1.2.2 Conduct of Study

The information developed for this study is based on a review of existing sources of information, contact with SCV Water staff, and update of the Water Supply Operations Model. Initial phases of the study involved the research and documentation of information regarding existing and planned water supplies, demands, and water management opportunities. Subsequent phases of the study evaluated the supply reliability situation facing SCV Water and updated and utilized the water supply operations model to evaluate reliability and help identify if future management actions are needed.

1.2.3 Comparison with 2017 Plan

Differences between the 2017 Plan and this Plan include differing demand and supply assumptions used in the analyses, analysis of different scenarios, and the use of an updated analytic tool and methodology to conduct the analysis. The 2017 Plan and this Plan are discussed further below.

The 2017 Plan relied on demand and supply information from the 2015 UWMP, while this Plan uses updated information from the 2020 UWMP. The more significant changes between the 2015 and 2020 UWMPs are the reduction of Alluvial Aquifer supplies due to 18 Alluvial wells exceeding the response levels for PFAS. The gradual recovery of this lost pumping capacity during the remainder of this decade is incorporated into this analysis. Additionally, updated schedules for recovered Saugus Formation wells and new dry-year Saugus Formation wells were incorporated into this Plan. This plan also incorporates a new SWP Delivery Capability Report analysis that reflects updated climate change data, a new endangered species interim take permit, and a new coordinated operating agreement with the federal Central Valley Project (CVP). Furthermore, this plan reflects the completion of Rosedale Rio Bravo and West Kern exchanges in 2000 along with incorporating new exchange programs with AVEK and UWCD.

Additionally, the 2017 Plan evaluated four supply scenarios (supplies per the 2015 UWMP, and supplies with varying assumptions regarding projected SWP and local supply availability and reliability), with each supply scenario evaluated against one demand scenario (projected demands with active conservation programs per the 2015 UWMP). This Plan evaluates six scenarios with varying assumptions regarding projected local supply reliability and availability, while incorporating new potential water management programs. Each supply scenario is evaluated against two demand scenarios: 1) demand without active conservation; and 2) demand with active conservation.

2. WATER SUPPLIES AND DEMANDS

This Plan evaluates the reliability of existing and planned water supplies in meeting projected demands in SCV Water's service area during the study period from 2021 through 2060 (ten years after the full development buildout in the service area assumed in the 2020 UWMP). The evaluation starts with a Base Scenario, which is based on existing water supplies, storage programs, and the demand projections presented in detail in the 2020 UWMP and summarized in this section.

The Base Scenario serves as the starting point to assess the reliability of existing supplies, programs, and long-term water needs, which is then used to develop Scenario 1, where planned supplies shown in the 2020 UWMP are added to the portfolio. Four additional water supply scenarios are evaluated (Scenarios 2 through 5). These additional four scenarios involve different program mixes and are analyzed to determine if there are other viable paths to achieving reliability if some of the planned supplies assumed in Scenario 1 cannot be developed. Scenarios 2 through 5 include varying assumptions regarding the availability of planned supplies: groundwater; imported; and banking water supplies and are described in Section 3.

The focus in a UWMP is on supplies under normal conditions, in a single dry year, and in a multiple dry-year period. In this Plan, supply reliability is assessed under a full range of hydrologic conditions. Some supplies available to meet SCV Water service area demands vary, depending on hydrologic conditions – in particular, SWP and groundwater supplies. For these two supply sources, the data presented below represent a full range of hydrology, rather than the normal and dry-year focus of a UWMP. While the data look different from the 2020 UWMP, they are taken from the same reports and studies used as sources for the 2020 UWMP. For the remaining supply sources, the descriptions and supply data presented in this section are directly from the 2020 UWMP (with a few minor exceptions noted below).

2.1 Existing and Planned Water Supplies

SCV Water's existing water supplies include imported supplies, local groundwater, recycled water, and water from existing exchange and groundwater banking programs. Planned supplies include local restored, replaced, and new groundwater production and expanded existing and planned banking programs. These existing (2020) and planned supplies are provided in Table 2-1 and are described in more detail in the sections that follow.

TABLE 2-1
SCV WATER'S PROJECTED AVERAGE/NORMAL YEAR SUPPLIES AND DEMANDS (AF)

	2025	2030	2035	2040	2045	2050
Existing Supplies						
Existing Groundwater[a]						
Alluvial Aquifer	8,900	8,180	7,300	7,300	7,300	7,300
Saugus Formation	14,440	7,110	7,110	7,110	7,110	7,110
Total Groundwater	**23,340**	**15,290**	**14,410**	**14,410**	**14,410**	**14,410**
Recycled Water[b]						
Total Recycled	**450**	**450**	**450**	**450**	**450**	**450**
Imported Water						
State Water Project[c]	55,220	53,310	51,410	49,500	49,500	49,500
Flexible Storage Accounts[d]	-	-	-	-	-	-
Buena Vista-Rosedale	11,000	11,000	11,000	11,000	11,000	11,000
Nickel Water - Newhall Land[e]	-	-	1,607	1,607	1,607	1,607
Yuba Accord Water[f]	1,000	-	-	-	-	-
Total Imported	**67,220**	**64,310**	**64,017**	**62,107**	**62,107**	**62,107**
Existing Banking and Exchange Programs[g]						
Rosedale Rio-Bravo Bank[g]	-	-	-	-	-	-
Semitropic Bank[g]	-	-	-	-	-	-
Semitropic – Newhall Land Bank[g]	-	-	-	-	-	-
Antelope Valley East Kern Water Agency Exchange[g]	-	-	-	-	-	-
United Water Conservation District Exchange[g]	-	-	-	-	-	-
Total Bank/Exchange	**0**	**0**	**0**	**0**	**0**	**0**
Total Existing Supplies	**91,010**	**80,050**	**78,877**	**76,967**	**76,967**	**76,967**
Planned Supplies						
Future and Recovered Groundwater[h]						
Alluvial Aquifer[i]	12,530	19,870	23,490	23,490	23,490	23,490
Saugus Formation[j]	3,010	2,790	2,790	2,790	2,790	2,790
Total Groundwater	**15,540**	**22,660**	**26,280**	**26,280**	**26,280**	**26,280**

	2025	2030	2035	2040	2045	2050
Recycled Water[k]						
Total Recycled	**1,849**	**3,696**	**5,091**	**6,498**	**7,499**	**8,511**
Planned Banking Programs						
Rosedale Rio-Bravo Bank[h][l]	-	-	-	-	-	-
Total Banking	**0**	**0**	**0**	**0**	**0**	**0**
Total Planned Supplies	**17,389**	**26,356**	**31,371**	**32,778**	**33,779**	**34,791**
Total Supplies (Existing and Planned) [m]	**108,399**	**106,406**	**110,248**	**109,745**	**110,746**	**111,758**
Demands[n]						
Demands with passive conservation[m]	82,100	89,300	97,600	104,300	109,600	115,100
Demands with passive and active conservation[m]	76,400	81,700	88,700	93,600	97,500	101,000

Notes:

(a) Existing groundwater supplies represent the quantity of groundwater available to be pumped with existing wells. Declines from 2025 pumping levels reflect transfer of normal year
(b) pumping from existing wells to future and recovered wells.
(c) Existing Recycled Water is based on current average annual use.
(d) SWP supplies are based on average deliveries from DWR's 2019 DCR (58% - 52% at buildout due to climate change).
(e) Supplies not needed in average years.
(f) Existing Newhall Land supply committed under approved Newhall Ranch Specific Plan. Water is available from 2021 -2034 to meet supply shortfalls associated with the Newhall Ranch Specific Plan. Assumed to be transferred to SCV Water once Newhall Ranch development is completed around 2035.
(g) Supply available for purchase every year; however, shown is the amount available in dry periods, after delivery losses. This supply would typically be used only during dry years and is available through 2025.
(h) Supplies not needed in average years.
(i) Future and Recovered groundwater supplies include recovered impacted wells and new groundwater well capacity that may be required by SCV Water's production objectives in the Alluvial Aquifer and the Saugus Formation. When combined with existing Agency and non-Agency groundwater supplies, total groundwater production remains within the sustainable ranges identified in Tables 4-9 and 4-10 of the 2020 UWMP and is within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo (GSI 2020) and the updated Basin Yield Analysis (LSC & GSI 2009).
(j) Future Category includes all wells restored from PFAS and perchlorate water quality issues, and other future alluvial wells including those associated with development under the Newhall Ranch Specific Plan. Schedule for recovered well capacity based on Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks 2021 Appendix M.
(k) Future and Recovered Saugus wells include perchlorate-impacted Well 205, two replacement wells (Saugus 3 & 4), and up to four new wells (Saugus 5-8) planned to provide additional dry-year supply. New dry-year wells would not typically be operated during average/normal years.
(l) Planned recycled water is the total projected recycled water use from Table 5-3 of the 2020 UWMP less existing use. Projections reflect demands that can be cost-effectively served with projected supplies. Refer to Section 5 for additional details on recycled water demands and supplies.
(m) Firm withdrawal capacity under existing Rosedale Rio-Bravo Banking Program to be expanded by 10,000 AFY by 2030 (for a combined total of 20,000 AFY).
(n) For completeness, LAWWD36 sales are included in demands and supplies. Breakdown of LACWWD 36 and SCV Water Demands are shown in Table 2-10 of the 2020 UWMP. Further, LACWWD 36's Saugus groundwater supplies shown in Table 4-8A of the 2020 UWMP.
(o) Total demands with passive and active conservation from Table 2-10 of the 2020 UWMP.

2.1.1 Imported Water Supplies – SWP

2.1.1.1 SWP Facilities

The SWP is the largest state-built, multi-purpose water project in the country. Construction of most initial SWP facilities was completed by 1973 and today includes 28 dams and reservoirs, 26 pumping and generating plants, and approximately 660 miles of aqueducts. The primary water source for the SWP is the Feather River, a tributary of the Sacramento River. Storage released from Oroville Dam on the Feather River flows down natural river channels to the Sacramento-San Joaquin River Delta (Delta). While some SWP supplies are pumped from the northern Delta, the vast majority of SWP supplies are pumped from the southern Delta into the 444-mile-long California Aqueduct. Water pumped from the southern Delta may be temporarily stored in San Luis Reservoir for delivery later in the year or conveyed further south in the California Aqueduct. The California Aqueduct conveys water along the west side of the San Joaquin Valley to Edmonston Pumping Plant, where water is pumped over the Tehachapi Mountains, and the aqueduct then divides into the East and West Branches. SCV Water takes delivery of its SWP water at Castaic Lake, a terminal reservoir of the West Branch. From Castaic Lake, SCV Water delivers its SWP supplies to the local retail water purveyors through SCV Water's transmission pipeline system.

2.1.1.2 SWP Contract Water Supply Provisions

SCV Water's primary imported water supply is from the SWP. The SWP is operated by DWR, which provides SWP water supplies to SCV Water and 28 other urban and agricultural public water supply agencies in California. In the early 1960s, DWR entered into substantially uniform long-term SWP water supply contracts (SWP Contracts) with each of these water agencies (referred to as "contractors") that spelled out the terms for water service and payment.

SWP Water Supplies

Each SWP contractor's SWP Contract contains a "Table A," which lists the maximum amount of contract water supply, or "Table A water," an agency may request each year throughout the life of the contract. Table A Amounts are used in determining each contractor's proportionate share, or "allocation," of the total SWP water supply DWR determines to be available each year. Currently, SCV Water's annual Table A Amount is 95,200 AF.

The primary supply of SWP water made available under the SWP Contracts is allocated Table A supply. While Table A identifies the maximum annual amount of Table A water an SWP contractor may request, the amount of SWP water actually available and allocated to SWP contractors each year is dependent on a number of factors and can vary significantly from year to year. The primary factors affecting SWP supply availability include hydrology, the amount of water in SWP storage at the beginning of the year, and regulatory and operational constraints, as is discussed further in Section 2.1.1.3.

In addition to Table A supplies, the SWP Contracts provide for additional types of water that may periodically be available, including "Article 21" water [2]. The availability of Article 21 water is uncertain, and as a result, supplies of this type of SWP water are not included in this Plan.

While not specifically provided for in the SWP Contracts, DWR has in critically dry years created Dry-Year Water Purchase Programs, where water is purchased by DWR from willing sellers with available supplies and is then sold by DWR to interested contractors. The availability of these supplies is uncertain and are therefore not included in this Plan.

Flexible Storage Account

As part of its SWP Contract with DWR, SCV Water has access to a portion of the storage capacity of Castaic Lake. SCV Water has used this storage for dry-year use, but it is not strictly limited as such. The Flexible Storage Account allows SCV Water to utilize up to 4,684 AF of the storage in Castaic Lake. Any of this amount that SCV Water borrows must be replaced by the Agency within five years of its withdrawal. SCV Water manages this storage by keeping the account full in normal and wet years, delivering all or a portion of the stored amount during dry periods, and refilling it during the next year SCV Water has surplus supplies. SCV Water currently has an agreement with Ventura County SWP contractor agencies to obtain the use of their Flexible Storage Account, which allows SCV Water access to another 1,376 AF of storage in Castaic Lake. SCV Water access to this additional storage is available through 2025. While it is expected that SCV Water and Ventura County will extend the existing flexible storage agreement beyond the 2025 term, for planning purposes here, it is not assumed to be available beyond 2025.

Water Management Provisions

The SWP Contract includes a number of provisions that give each contractor flexibility in managing the supplies that are available to it in a given year. For example, a contractor may take delivery of its allocated SWP supplies for direct use or storage within its service area, store that water outside its service area for later withdrawal and use within its service area, carry over a portion of that supply for storage on an as-available-basis in SWP reservoirs for delivery in following years (commonly referred to as "carryover"), or exchange a portion of that supply with others for return in a future year. The SWP Contract also provides for DWR to deliver non-SWP water supplies for contractors through SWP conveyance facilities.

SCV Water takes advantage of each of these water management provisions. It participates in several groundwater banking programs in Kern County, has entered into several water exchanges, and has non-SWP supplies delivered to it through SWP conveyance facilities. These programs are described in more detail in Section 2.1.5. At current demand levels, SCV Water also regularly

[2] Article 21 water is water that may be made available by DWR when excess flows are available in the Delta. It is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the late winter. The Turnback Pool is a program through which contractors with allocated Table A supplies in excess of their needs in a given year may "turn back" that excess supply for purchase by other contractors who need additional supplies that year.

stores a portion of any surplus SWP supply as carryover in San Luis Reservoir. Carryover is an easily and quickly accessible supply and is a valuable resource if the next year is dry. However, carryover water may be lost when SWP reservoirs fill, which can occur in wetter years. Because of uncertainty in projecting the amount and frequency of San Luis Reservoir space available to store contractor carryover, carryover is not included in the supply projections in this Plan.

2.1.1.3 Factors Affecting SWP Table A Supplies

As noted above, while Table A identifies the maximum annual amount of Table A water an SWP contractor may request, the amount of SWP water actually available and allocated to SWP contractors each year is dependent on a number of factors and can vary significantly from year to year. The primary factors affecting SWP supply availability include: the availability of water at the source of supply in northern California; and the ability to transport that water from the source to the primary SWP diversion point in the southern Delta.

Availability of SWP Source Water

SWP supplies originate in northern California, primarily from the Feather River watershed. The availability of these supplies is dependent on the amount of precipitation in the watershed, water use by others in the watershed, and the amount of water in storage in Lake Oroville at the beginning of the year. Variability in the location, timing, amount and form (rain or snow) of precipitation, as well as how wet or dry the previous year was, produces variability from year to year in the amount of water that flows into Lake Oroville. Lake Oroville acts to regulate some of that variability, storing high inflows in wetter years that can be used to supplement supplies in dry years with lower inflows.

Climate change adds another layer of uncertainty in estimating the future availability of SWP source water. While different climate change models show differing effects, potential changes could include more precipitation falling in the form of rain rather than snow and earlier snowmelt, which would result in more runoff occurring in the winter rather than spread out over the winter and spring.

Ability to Convey SWP Source Water

Water released from Lake Oroville flows down natural river channels into the Delta, which is a network of channels and reclaimed islands at the confluence of the Sacramento and San Joaquin rivers. The SWP and the CVP use Delta channels to convey water to the southern Delta for diversion, making the Delta a focal point for water distribution throughout the state.

A number of issues affecting the Delta can impact the ability to divert water supplies from the Delta, including water quality, fishery protection, and levee system integrity. Water quality in the Delta can be adversely affected by both SWP and CVP diversions, which primarily affect salinity, as well as by urban discharge and agricultural runoff. The Delta also provides a unique estuarine habitat for many resident and migratory fish species, some of which are listed as threatened or endangered. Delta islands are protected from flooding by an extensive levee system. Levee failure and subsequent island flooding can lead to increased salinity, requiring the temporary shutdown of SWP pumps.

SWP and CVP operations in the Delta are limited by a number of regulatory and operational constraints. These constraints are primarily incorporated into the State Water Resources Control Board (SWRCB) Water Rights Decision 1641 (D-1641), which establishes Delta water quality standards and outflow requirements that the SWP and CVP must comply with. In addition, SWP and CVP operations are further constrained by requirements included in Biological Opinions (BOs) mandated by the federal Endangered Species Act for the protection of threatened and endangered fish species in the Delta. The requirements in the BOs are based on real-time physical and biological phenomena, which results in additional uncertainty in estimating SWP supplies.

2.1.1.4 SWP Table A Supply Assessment

DWR prepares a biennial report to assist SWP contractors and local planners in assessing the near- and long-term availability of supplies from the SWP. DWR issued its most recent update, the 2019 DWR State Water Project Delivery Capability Report (2019 DCR), in August 2020. The 2019 DCR includes DWR's estimates of SWP water supply availability under both current (2020) and future (2040) conditions.

Analysis Assumptions

DWR's estimates of SWP deliveries are based on modeling studies using CalSim, a computer model that simulates monthly operations of the SWP and CVP systems. Key assumptions and inputs to the model include the facilities included in the system, hydrologic inflows to the system, regulatory and operational constraints on system operations, and contractor demands for SWP water.

In the 2019 DCR, DWR uses the following assumptions to model current conditions: existing facilities; hydrologic inflows to the model based on 82 years of historical inflows (1922 through 2003), adjusted to reflect current levels of development in the supply source areas; current regulatory and operational constraints, including 2018 COA Amendment, 2019 BOs, and 2020 Incidental Take Permit; and contractor demands for SWP water. The long-term average allocation reported in the 2019 DCR for the existing conditions study provide appropriate estimates of the SWP water supply availability under current conditions.

To evaluate SWP supply availability under future conditions, the 2019 DCR included a model study representing hydrologic and sea level rise conditions in the year 2040. The future condition study used all of the same model assumptions as the study under existing conditions, but reflected changes expected to occur from climate change, specifically, projected temperature and precipitation changes centered around 2035 (2020 to 2049) and a 45-centimeter (cm) sea level rise.

For the long-term planning purposes of this Plan, the long-term average allocations reported for the future conditions study from 2019 DCR is the most appropriate estimate of future SWP water supply availability.

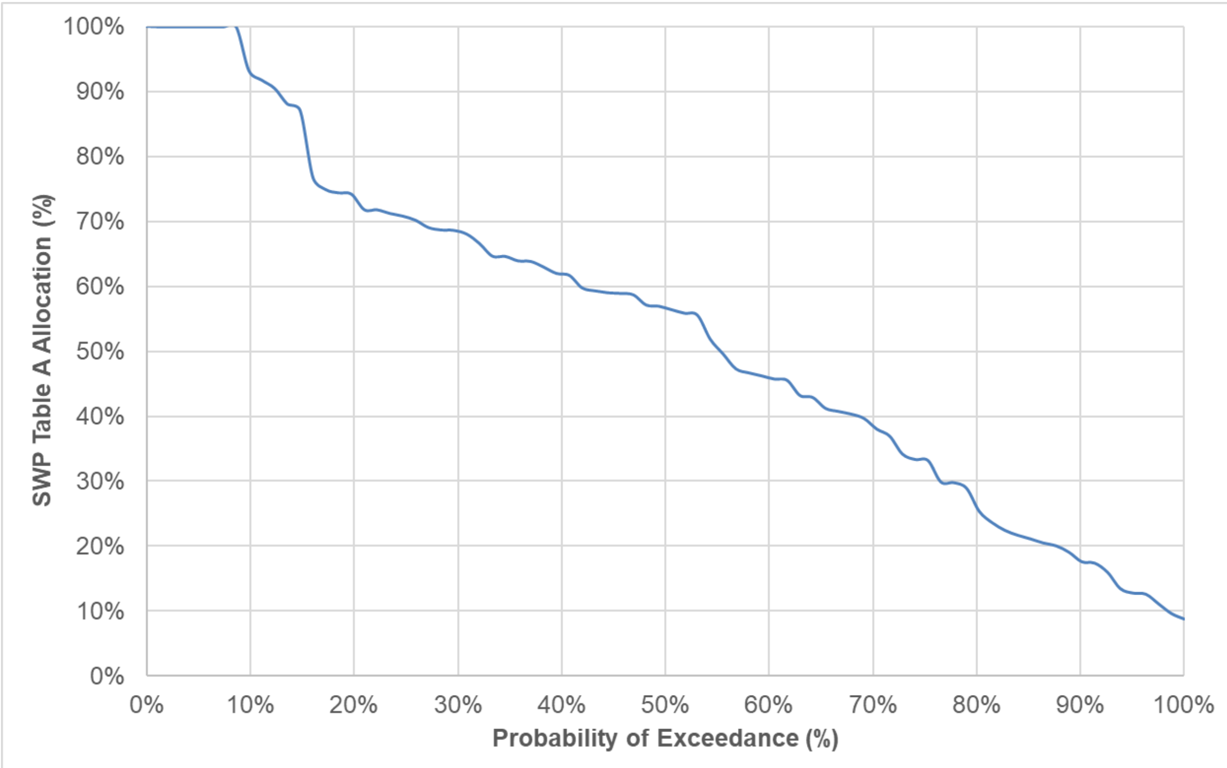
Analysis Results

In the 2019 DCR, DWR estimates that for all contractors combined, the SWP can deliver on a long-term average basis, a total Table A supply of 58 percent of total maximum Table A Amounts under existing conditions and 52 percent under future conditions.

DWR's 2019 DCR indicates that the modeled single dry-year SWP water supply allocation is 7% under the existing conditions. However, historically, the lowest SWP allocations were at 5% in 2014. Due to extraordinarily dry conditions in 2013 and 2014, the initial 2014 SWP allocation was a historically low 5% of Table A Amounts, was later reduced to 0% in January 2014, and was later raised back to 5%, the lowest ever final total SWP water supply allocation.

In this Plan, reliability analyses are conducted using the entire 82-year hydrologic period used in DWR's model studies. DWR's model study results for the future (2040) conditions are included in Figure 2-1, which shows SWP Table A supply allocations projected to be available to SWP contractors. The graph can be interpreted as the probability of SWP Table A allocations exceeding a given percentage. For example, for this scenario, there is about a 42 percent probability that SWP allocations would be 60 percent or higher. SCV Water's Table A Amount of 95,200 AFY is multiplied by these allocation percentages to determine the amount of Table A supplies projected to be available to SCV Water.

FIGURE 2-1
SWP TABLE A SUPPLY RELIABILITY



Note: 2019 DWR model study results for SWP Table A allocations for the future (2040) conditions.

2.1.2 Other Imported Supplies

In addition to its SWP supplies, SCV Water has an imported surface supply from BVWSD and RRBWSD in Kern County. SCV Water has also entered into the Yuba Accord Agreement, under which it may access a north-of-Delta surface supply in dry years. Additionally, Newhall Land and Farming Company (NLF) has acquired a water transfer supply from a source in Kern County. This supply, referred to as Nickel Water, is assumed to be available to SCV Water beginning in 2035 and in every subsequent year. These supplies are part of the imported supplies available to the service area.

2.1.2.1 Buena Vista-Rosedale Rio Bravo (BVRRB)

SCV Water has executed a long-term transfer agreement for 11,000 AFY with BVWSD and RRBWSD. These two districts, both located in Kern County, developed a program that provides both a firm water supply and a water banking component. Both districts are member agencies of the Kern County Water Agency (KCWA), an SWP contractor, and both districts have contracts with KCWA for SWP Table A Amounts. The supply is based on existing long-standing Kern River water rights held by BVWSD and is delivered by exchange of the two districts' SWP Table A supplies or directly to the California Aqueduct via the Cross Valley Canal. This water supply is firm; that is, the total amount of 11,000 AFY is available in all water year types based on the Kern River water right. SCV Water began taking delivery of this supply in 2007.

SCV Water has entered into agreements that reserved 3,378 AF of the BVRRB water for potential annexations into its service area. 389 AF is reserved for the second phase of the Tesoro Del Valle development. This development is scheduled to be completed by the end of 2025. 489 AF has been reserved for the Tapia Ranch development with development estimated to be completed in the late 2020s. 2,500 AF is reserved for the planned Legacy Village development. This development is assumed to occur after 2030, but before 2035. During the periods before demands for these developments occur, or if these developments occur, but do not use all of the amounts reserved for them in any year or years, the remaining supply would be available to the entire SCV Water service area.

2.1.2.2 Nickel Water - Newhall Land

Newhall Land acquired a water transfer in 2002 from Kern County sources known as Nickel Water. This supply totals 1,607 AFY and comes from a firm source of supply. This supply was acquired in anticipation of the development of Newhall Ranch and is a supply that is contractually committed by Newhall Land under the Newhall Ranch Specific Plan approved by the Los Angeles County Board of Supervisors. Newhall Land currently stores its annual supply of Nickel Water in its Semitropic Water Banking Program. Upon completion of the Newhall Ranch Specific Plan, Newhall Land will transfer its rights to this supply to SCV Water. In the 2020 UWMP, it was assumed for planning purposes that Newhall Ranch would be developed at some time in the future and this water supply would be transferred to SCV Water in 2035 (i.e., the assumed completion of the Newhall Ranch Specific Plan), thereby, becoming available as an annual supply to SCV Water. Prior to any permanent transfer to SCV Water, Newhall Land may make this supply available to SCV Water for purchase. However, because there is no history of such purchases, this Plan does not assume this Nickel Water will be generally available to meet SCV Water demands until 2035. Beginning in 2035, it is also assumed that Nickel Water from the Semitropic-NLF Water Bank may be transferred to SCV Water to make up a shortfall.

2.1.2.3 Yuba Accord Water

In 2008, SCV Water entered into the Yuba Accord Agreement, which allows for the purchase of water from the Yuba County Water Agency through DWR to 21 SWP contractors (including SCV Water) and the San Luis and Delta-Mendota Water Authority. Yuba Accord water comes from north of the Delta, and the water purchased under this agreement is subject to losses associated with transporting it through the Delta. These losses can vary from year to year, depending on Delta conditions at the time the water is transported. In 2021, with a current SWP allocation of 5% of Table A Amount, a minimum supply of 1,700 AF north of the Delta is available to SCV Water. Under the agreement, an estimated average of up to 1,000 AFY of non-SWP supply (after losses) is available to SCV Water in dry years, through 2025. Under certain hydrologic conditions, additional water may be available to SCV Water from this program.

2.1.3 Groundwater

This section presents a summary of information about the purveyors' groundwater supplies from the Alluvial Aquifer and the Saugus Formation in the Santa Clara River Valley Groundwater Basin, East Subbasin (Basin) that underlies the Santa Clarita Valley. A more thorough discussion is provided in the 2020 UWMP Sections 4, 6, and 7 and in Appendix C of this Plan. (Kennedy Jenks, 2021).

As described in Sections 4.3 and 6 of the 2020 UWMP, SCV Water's current and proposed groundwater supplies from the Alluvial Aquifer and the Saugus Formation are sustainable. This analysis is consistent with 2020 Santa Clarita Valley Groundwater Sustainability Agency (SCV-GSA) Draft Water Budget Development Tech Memo and the updated Basin Yield Analysis (LSC & GSI 2009), as shown in Tables 2-2 and 2-3. The 2020 SCV-GSA Draft Water Budget Development Tech Memo incorporated an updated climate change analysis consistent with DWR guidance for preparation of groundwater sustainability plans (GSPs). Consistent with the operating plan, available supplies vary with hydrology, as illustrated in Figures 2-2 and Figure 2-3.

TABLE 2-2
GROUNDWATER OPERATING PLAN FOR THE SANTA CLARITA VALLEY

Aquifer	**Groundwater Production (AF)**			
	Normal Years	**Dry Year 1**	**Dry Year 2**	**Dry Year 3**
Alluvium	30,000 to 40,000	30,000 to 35,000	30,000 to 35,000	30,000 to 35,000
Saugus Formation	7,500 to 15,000	15,000 to 25,000	21,000 to 25,000	21,000 to 35,000
Total	**37,500 to 55,000**	**45,000 to 60,000**	**51,000 to 60,000**	**51,000 to 70,000**

Geosyntec consultants

TABLE 2-3
PROJECTED GROUNDWATER PRODUCTION (NORMAL YEAR) (AF)

Basin Name	Groundwater Pumping (AF) 2025	2030	2035	2040	2045	2050
Santa Clara River Valley East Subbasin						
Purveyor						
Alluvium[a]	21,430	28,050	30,790	30,790	30,790	30,790
Saugus Formation[b]	17,450	9,900	9,900	9,900	9,900	9,900
Total Purveyor	**38,880**	**37,950**	**40,690**	**40,690**	**40,690**	**40,690**
Non Purveyor (Agricultural and Other)[c]						
Alluvium[d]	11,540	9,150	6,410	6,410	6,410	6,410
Saugus Formation	1,200	1,200	1,200	1,200	1,200	1,200
Total Agricultural and Other	**12,740**	**10,350**	**7,610**	**7,610**	**7,610**	**7,610**
Basin						
Alluvium	32,970	37,200	37,200	37,200	37,200	37,200
Saugus Formation	18,650	11,100	11,100	11,100	11,100	11,100
Total Basin	**51,620**	**48,300**	**48,300**	**48,300**	**48,300**	**48,300**

Notes:

(a) Includes existing, future (associated with the assumed development under the Newhall Ranch Specific Plan) and recovered pumping capacity after PFAS and perchlorate treatment.
(b) Saugus Normal Year pumping in 2025 is higher than normal to mitigate for lost alluvial pumping capacity due to impacted PFAS wells.
(c) Non-purveyor pumping includes Five Point (Newhall Ranch Agriculture), Pitches Detention Center, and Small Private Domestic pumping and irrigation at Sand Canyon Country Club, private irrigation pumping from Valencia Country Club and Vista Valencia Golf Course, as well as projected Whittaker-Bermite pumping for perchlorate treatment.
(d) Reflects reduction of up to 7,038 AF associated with the assumed development under the Newhall Ranch Specific Plan.

FIGURE 2-2
ALLUVIAL AQUIFER SUPPLY RELIABILITY

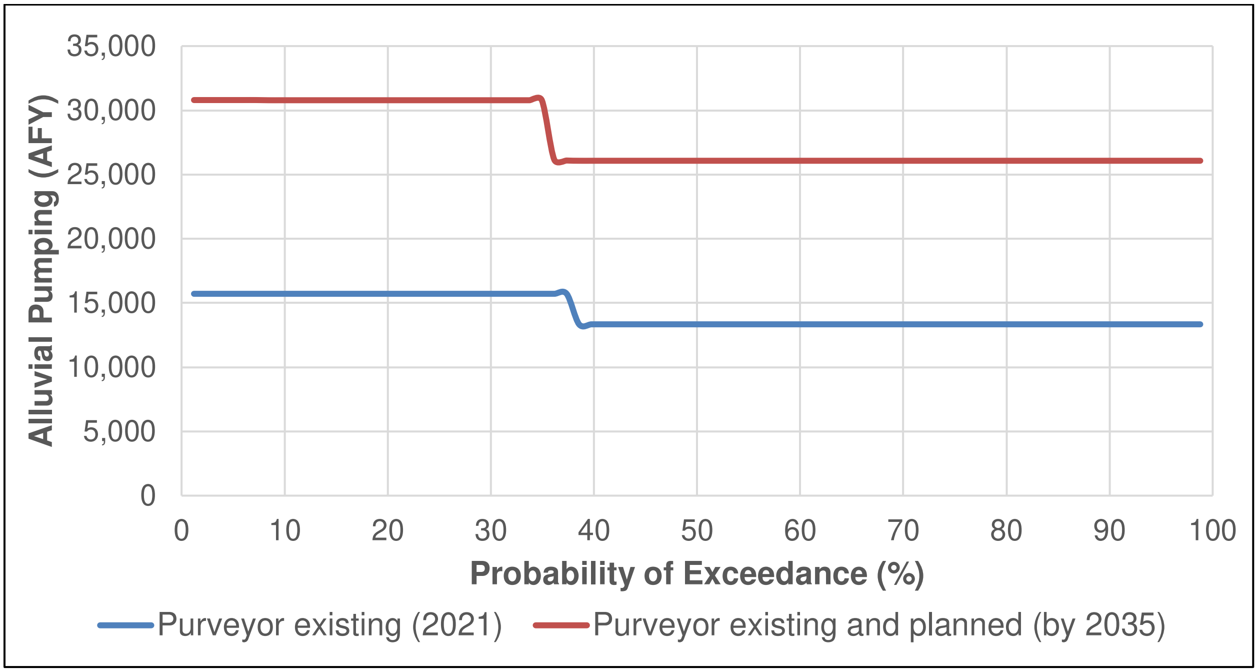
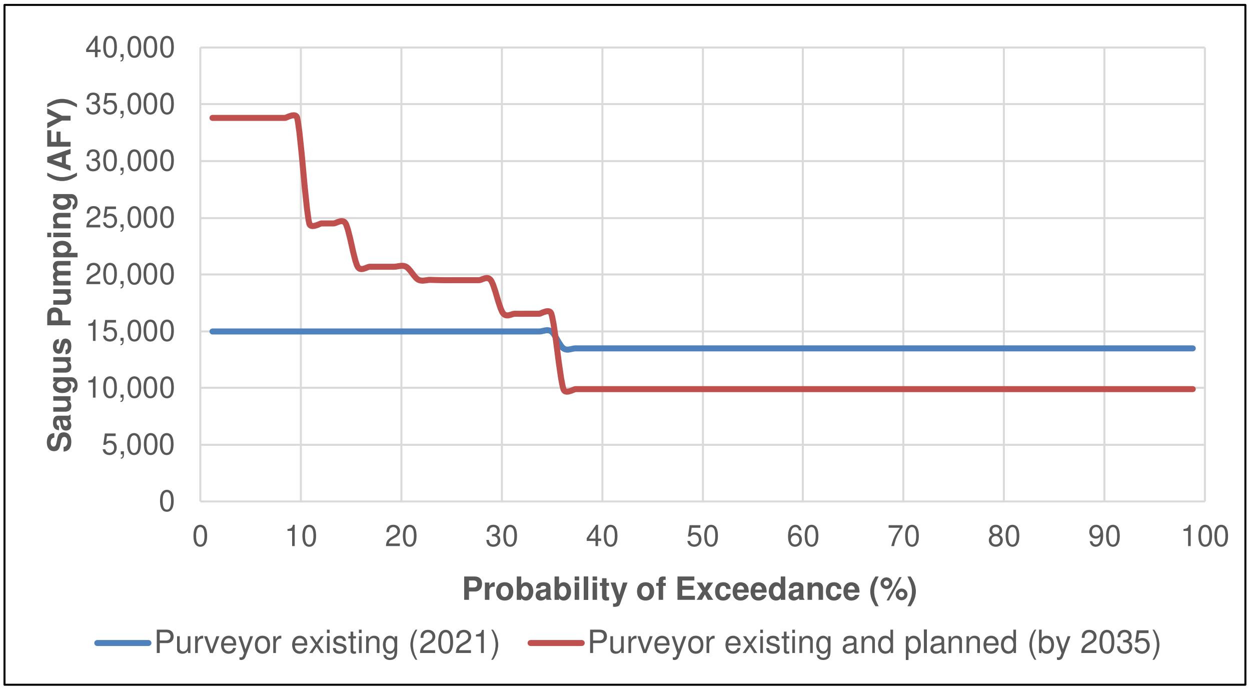


FIGURE 2-3
SAUGUS FORMATION SUPPLY RELIABILITY



To achieve the planned groundwater supplies, installation of groundwater quality treatment facilities on existing wells along with installation of additional wells will be required, as indicated in Table 2-4A for Alluvial wells and Table 2-5A for Saugus Formation Wells. To achieve dry-year Saugus Formation objectives, installation of six new wells is planned. The timing for installation of new groundwater treatment and new wells is discussed in greater detail in Section 4.3 of the 2020 UWMP. A summary of Alluvial Aquifer and Saugus Formation pumping is shown in this Plan in Tables 2-4B and 2-4C for Alluvial wells and Tables 2-5B and 2-5C for Saugus Formation wells. Further discussion of the feasibility of installing treatment is contained in Appendix C: Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks, 2021.

With the installation of groundwater treatment facilities and new wells, estimated to occur in 2035, SCV Water estimates its Alluvial pumping to be 30,790 AFY during normal years and when combined with 6,410 AFY of pumping by others, totals 37,200 AFY. This is within the 30,000- to 40,000-AF operating range for the basin shown in Table 2-2. For locally dry years, SCV Pumping is reduced to 26,090 AFY and when combined with 6,401 AFY of pumping by others, totals 32,500. This is within the operating range of 30,000- to 35,000-AFY operating range for dry years.

With the installation of groundwater treatment facilities and new wells, estimated to occur in 2035, SCV Water estimates its Saugus Formation pumping to be 9,900 AFY during normal years and when combined with 1,200 AFY of pumping by others, totals 11,100 AFY. This is within the 7,500- to 15,000-AF operating range for the basin. For a single dry-year scenario, SCV Pumping increases to 33,800 AFY and when combined with 1,200 AFY of pumping by others, totals 35,000. This is at the top of the 21,000- to 35,000-AFY operating range shown in Table 2-2.

TABLE 2-4 A
ACTIVE MUNICIPAL GROUNDWATER SOURCE CAPACITY — ALLUVIAL AQUIFER WELLS[(a)]

Well	Permitted Capacity (gpm)	Max. Annual Capacity (AF)	GSP Water Budget Analysis[(b)] Normal Year (AF)	Dry Year (AF)
Existing Wells[(c)]				
Castaic 1	640	1,030	430	420
Castaic 2	500	810	220	220
Castaic 4	330	530	-	-
Castaic 6	600	970	-	-
Castaic 7	2,000	3,230	580	730
Pinetree 3	550	890	310	-
Pinetree 4	500	810	-	-
Guida	1,000	1,610	560	560
Lost Canyon 2[(d)]	800	1,290	410	250
Lost Canyon 2A[(d)]	1,000	1,610	420	160
N. Oaks West	750	1,210	-	-
Sand Canyon	1,200	1,940	730	310
Well E-15[(d)]	1,400	2,260	725	620
Well W9	800	1,290	1,010	700
Well W11	1,000	1,610	1,180	1,000
Well E-17[(d)]	1,200	1,940	725	620
Existing Subtotal	*14,270*	*23,030*	*7,300*	*5,590*
Future[(e)] and Recovered Wells				
Pinetree 1[(f)]	300	480	190	0
Pinetree 5[(f)]	500	810	200	0
Clark[(f)]	550	890	380	270
Honby[(f)]	950	1,530	760	110
Mitchell 5B[(f)]	1,000	1,610	200	60
N. Oaks Central[(f)]	1,200	1,940	500	340
N. Oaks East[(f)]	950	1,530	500	220
Santa Clara[(f)]	1,500	2,420	770	250
Sierra[(f)]	1,000	1,610	400	60
Valley Center[(f)]	1,200	1,940	1,000	610
Well D[(f)]	1,050	1,690	1,210	920
Well N[(f)]	1,250	2,020	630	1,060
Well N7[(f)]	2,500	4,040	1,470	1,680

Well	Permitted Capacity (gpm)	Max. Annual Capacity (AF)	GSP Water Budget Analysis[b] Normal Year (AF)	Dry Year (AF)
Well N8[f]	2,500	4,040	1,430	1,680
Well Q2[g]	1,200	1,940	770	850
Well S6[f]	2,000	3,230	640	2,080
Well S7[f]	2,000	3,230	620	780
Well S8[f]	2,000	3,230	610	760
Well T7[f]	1,200	1,940	880	360
Well U4[f]	1,000	1,610	940	570
Well U6[f]	1,250	2,020	1,050	660
Well W10[f]	1,500	2,420	1,700	1,490
Well E-14[h]	1,200	1,940	725	610
Well E-16[h]	1,200	1,940	725	610
Well G-45[h]	1,200	1,940	1,670	1,430
Well C-11[h]	2,000	3,230	1,600	1,360
Well C-12[h]	2,000	3,230	1,600	1,360
S9 (Mitchell 5A Replacement)[h]	1,000	1,610	320	320
Future Subtotal	*37,200*	*60,060*	*23,490*	*20,500*
Total	**51,470**	**83,090**	**30,790**	**26,090**

Notes:

(a) The quantities of groundwater extracted by existing or future and recovered well capacity will vary depending on operating conditions. However, overall pumping remains within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo (GSI 2020) and the updated Basin Yield Analysis (LSC & GSI 2009).
(b) Production for Normal and Dry years represented in this table represent the period after all impacted wells (PFAS and Perchlorate impacts) are recovered. See Tables 4-7B and 4-7C in Appendix E for anticipated production from 2021 through 2030. Dry-year production represents anticipated maximum dry-year production. Schedule for recovered well capacity based on Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks 2021 in Appendix C.
(c) Existing Category includes all wells currently on line and in use.
(d) E wells and Lost Canyon have not come below the reporting limit (RL) so are not impacted wells, but are anticipated to be connected into central treatment systems.
(e) Future Category includes all wells restored from PFAS and perchlorate water quality issues and other future alluvial wells, including those associated with development under the Newhall Ranch Specific Plan.
(f) PFAS-impacted well.
(g) Perchlorate-impacted well.
(h) Future wells.

TABLE 2-4 B
ACTIVE MUNICIPAL GROUNDWATER SOURCE CAPACITY — EXISTING, FUTURE, AND RECOVERED ALLUVIAL AQUIFER WELLS[a]
NORMAL YEAR DETAIL (2021-2030)

Well	Permitted Capacity (gpm)	Max. Annual Capacity (AF)	Normal Year (AF)[b]									
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Existing Wells[c]												
Castaic 1	640	1,030	430	430	430	430	430	430	430	430	430	430
Castaic 2	500	810	220	220	220	220	220	220	220	220	220	220
Castaic 4	330	530	-	-	-	-	-	-	-	-	-	-
Castaic 6	600	970	-	-	-	-	-	-	-	-	-	-
Castaic 7	2,000	3,230	580	580	580	580	580	580	580	580	580	580
Pinetree 3	550	890	310	310	310	310	310	310	310	310	310	310
Pinetree 4	500	810	-	-	-	-	-	-	-	-	-	-
Guida	1,000	1,610	560	560	560	560	560	560	560	560	560	560
Lost Canyon 2[d]	800	1,290	410	410	410	410	410	410	410	410	410	410
Lost Canyon 2A[d]	1,000	1,610	420	420	420	420	420	420	420	420	420	420
N. Oaks West	750	1,210	-	-	-	-	-	-	-	-	-	-
Sand Canyon	1,200	1,940	730	730	730	730	730	730	730	730	730	730
Well E-15[d]	1,400	2,260	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,600	1,600
Well W9	800	1,290	1,030	1,030	1,030	1,030	1,030	1,030	1,030	1,030	1,010	1,010
Well W11	1,000	1,610	1,240	1,240	1,240	1,240	1,240	1,240	1,180	1,180	1,180	1,180
Well E-17[d]	1,200	1,940	1,290	1,290	1,290	1,290	1,290	1,290	1,290	1,290	730	730
Existing Subtotal	*14,270*	*23,030*	*8,900*	*8,900*	*8,900*	*8,900*	*8,900*	*8,900*	*8,840*	*8,840*	*8,180*	*8,180*
Future[e] and Recovered Wells												
Pinetree 1[f]	300	480	-	-	-	-	-	-	-	-	-	190
Pinetree 5[f]	500	810	-	-	-	-	-	-	-	-	-	200
Clark[f]	550	890	-	-	-	-	-	-	-	-	-	380
Honby[f]	950	1,530	-	-	760	760	760	760	760	760	760	760
Mitchell 5B[f]	1,000	1,610	-	-	-	-	-	-	-	-	-	200
N. Oaks Central[f]	1,200	1,940	-	-	-	-	-	-	-	-	-	500
N. Oaks East[f]	950	1,530	-	-	-	-	-	-	-	-	-	500
Santa Clara[f]	1,500	2,420	-	-	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010
Sierra[f]	1,000	1,610	-	-	-	-	-	-	-	-	-	400
Valley Center[f]	1,200	1,940	-	1,190	1,190	1,030	1,030	1,030	1,030	1,030	1,030	1,030
Well D[f]	1,050	1,690	-	-	-	-	-	-	-	1,210	1,210	1,210
Well N[f]	1,250	2,020	980	870	870	630	630	630	630	630	630	630

Well	Permitted Capacity (gpm)	Max. Annual Capacity (AF)	Normal Year (AF)[b]									
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Well N7[f]	2,500	4,040	2,600	2,180	2,180	1,470	1,470	1,470	1,470	1,470	1,470	1,470
Well N8[f]	2,500	4,040	2,600	2,180	2,180	1,430	1,430	1,430	1,430	1,430	1,430	1,430
Well Q2[g]	1,200	1,940	-	940	940	770	770	770	770	770	770	770
Well S6[f]	2,000	3,230	-	-	-	640	640	640	640	640	640	640
Well S7[f]	2,000	3,230	-	-	-	620	620	620	620	620	620	620
Well S8[f]	2,000	3,230	-	-	-	610	610	610	610	610	610	610
Well T7[f]	1,200	1,940	-	-	-	750	750	750	750	750	750	750
Well U4[f]	1,000	1,610	-	-	-	700	700	700	700	700	700	700
Well U6[f]	1,250	2,020	-	-	-	800	800	800	800	800	800	840
Well W10[f]	1,500	2,420	-	-	-	-	-	-	1,650	1,650	1,650	1,650
Well E-14[h]	1,200	1,940	-	-	-		740	740	740	740	740	740
Well E-16[h]	1,200	1,940	-	-	-		250	650	650	650	650	650
Well G-45[h]	1,200	1,940	-	-	-	-	-	-	-	-	1,670	1,670
Well C-11[h]	2,000	3,230	-	-	-	-	-	-	-	-	-	-
Well C-12[h]	2,000	3,230	-	-	-	-	-	-	-	-	-	-
S9 (Mitchell 5A Replacement)[h]	1,000	1,610	-	-	-	320	320	320	320	320	320	320
Future Subtotal	*37,200*	*60,060*	*6,180*	*7,360*	*9,130*	*11,540*	*12,530*	*12,930*	*14,580*	*15,790*	*17,460*	*19,870*
Total	**51,470**	**83,090**	**15,080**	**16,260**	**18,030**	**20,440**	**21,430**	**21,830**	**23,420**	**24,630**	**25,640**	**28,050**

Notes:

(a) The quantities of groundwater extracted by existing or future and recovered well capacity will vary depending on operating conditions. However, overall pumping remains within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo (GSI 2020) and the updated Basin Yield Analysis (LSC & GSI 2009).
(b) Production for Normal years represented in this table represent the period after all impacted wells (PFAS and Perchlorate impacts) are recovered. Schedule for recovered well capacity based on Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks 2021 in Appendix C.
(c) Existing Category includes all wells currently on line and in use.
(d) E wells and Lost Canyon have not come below the RL so are not impacted wells, but are anticipated to be connected into central treatment systems.
(e) Future Category includes all wells restored from PFAS and perchlorate water quality issues and other future alluvial wells, including those associated with development under the Newhall Ranch Specific Plan.
(f) PFAS-impacted well.
(g) Perchlorate-impacted well.
(h) Future wells.

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TABLE 2-4 C
ACTIVE MUNICIPAL GROUNDWATER SOURCE CAPACITY — EXISTING, FUTURE, AND RECOVERED ALLUVIAL AQUIFER WELLS[a]
DRY YEAR DETAIL (2021-2030)

Well	Permitted Capacity (gpm)	Max. Annual Capacity (AF)	Dry Year (AF)[b]									
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Existing Wells[c]												
Castaic 1	640	1,030	420	420	420	420	420	420	420	420	420	420
Castaic 2	500	810	220	220	220	220	220	220	220	220	220	220
Castaic 4	330	530	-	-	-	-	-	-	-	-	-	-
Castaic 6	600	970	-	-	-	-	-	-	-	-	-	-
Castaic 7	2,000	3,230	730	730	730	730	730	730	730	730	730	730
Pinetree 3	550	890	0	0	0	0	0	0	0	0	0	0
Pinetree 4	500	810	-	-	-	-	-	-	-	-	-	-
Guida	1,000	1,610	560	560	560	560	560	560	560	560	560	560
Lost Canyon 2[d]	800	1,290	250	250	250	250	250	250	250	250	250	250
Lost Canyon 2A[d]	1,000	1,610	160	160	160	160	160	160	160	160	160	160
N. Oaks West	750	1,210	-	-	-	-	-	-	-	-	-	-
Sand Canyon	1,200	1,940	310	310	310	310	310	310	310	310	310	310
Well E-15[d]	1,400	2,260	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,360
Well W9	800	1,290	940	940	940	940	940	940	940	940	940	700
Well W11	1,000	1,610	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,000
Well E-17[d]	1,200	1,940	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	620
Existing Subtotal	*14,270*	*23,030*	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	6,330
Future[e] and Recovered Wells												
Pinetree 1[f]	300	480	-	-	-	-	-	-	-	-	-	0
Pinetree 5[f]	500	810	-	-	-	-	-	-	-	-	-	0
Clark[f]	550	890	-	-	-	-	-	-	-	-	-	270
Honby[f]	950	1,530	-	-	110	110	110	110	110	110	110	110
Mitchell 5B[f]	1,000	1,610	-	-	-	-	-	-	-	-	-	60
N. Oaks Central[f]	1,200	1,940	-	-	-	-	-	-	-	-	-	340
N. Oaks East[f]	950	1,530	-	-	-	-	-	-	-	-	-	220
Santa Clara[f]	1,500	2,420	-	-	250	250	250	250	250	250	250	250
Sierra[f]	1,000	1,610	-	-	-	-	-	-	-	-	-	60
Valley Center[f]	1,200	1,940	-	800	800	610	610	610	610	610	610	610
Well D[f]	1,050	1,690	-	-	-	-	-	-	-	920	920	920
Well N[f]	1,250	2,020	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060

Well	Permitted Capacity (gpm)	Max. Annual Capacity (AF)	Dry Year (AF)[(b)]									
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Well N7[(f)]	2,500	4,040	2,310	2,310	2,310	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Well N8[(f)]	2,500	4,040	2,310	2,310	2,310	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Well Q2[(g)]	1,200	1,940	-	1,110	1,110	850	850	850	850	850	850	850
Well S6[(f)]	2,000	3,230	-	-	-	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Well S7[(f)]	2,000	3,230	-	-	-	780	780	780	780	780	780	780
Well S8[(f)]	2,000	3,230	-	-	-	760	760	760	760	760	760	760
Well T7[(f)]	1,200	1,940	-	-	-	360	360	360	360	360	360	360
Well U4[(f)]	1,000	1,610	-	-	-	570	570	570	570	570	570	570
Well U6[(f)]	1,250	2,020	-	-	-	660	660	660	660	660	660	660
Well W10[(f)]	1,500	2,420	-	-	-	-	-	-	1,030	1,030	1,030	1,490
Well E-14[(h)]	1,200	1,940	-	-	-		620	620	620	620	620	620
Well E-16[(h)]	1,200	1,940	-	-	-		580	580	580	580	580	580
Well G-45[(h)]	1,200	1,940	-	-	-	-					650	690
Well C-11[(h)]	2,000	3,230	-	-	-	-	-	-	-	-	-	-
Well C-12[(h)]	2,000	3,230	-	-	-	-	-	-	-	-	-	-
S9 (Mitchell 5A Replacement)[(h)]	1,000	1,610	-	-	-	320	320	320	320	320	320	320
Future Subtotal	*37,200*	*60,060*	*5,680*	*7,590*	*7,950*	*11,770*	*12,970*	*12,970*	*14,000*	*14,920*	*15,570*	*17,020*
Total	**51,470**	**83,090**	**12,980**	**14,890**	**15,250**	**19,070**	**20,270**	**20,270**	**21,300**	**22,220**	**22,870**	**23,350**

Notes:

(a) The quantities of groundwater extracted by existing or future and recovered well capacity will vary depending on operating conditions. However, overall pumping remains within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo (GSI 2020) and the updated Basin Yield Analysis (LSC & GSI 2009).

(b) Production for dry years represented in this table represent the period after all impacted wells (PFAS and perchlorate impacts) are recovered. Dry-year production represents anticipated maximum dry-year production. Schedule for recovered well capacity based on Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks 2021 in Appendix C.

(c) Existing Category includes all wells currently on line and in use.

(d) E wells and Lost Canyon have not come below the RL so are not impacted wells, but are anticipated to be connected into central treatment systems.

(e) Future Category includes all wells restored from PFAS and perchlorate water quality issues and other future alluvial wells, including those associated with development under the Newhall Ranch Specific Plan.

(f) PFAS-impacted well.

(g) Perchlorate-impacted well.

(h) Future wells.

TABLE 2-5 A
MUNICIPAL GROUNDWATER SOURCE CAPACITY- EXISTING, FUTURE, AND RECOVERED SAUGUS FORMATION WELLS[a]

Well		Permitted Capacity (gpm)	Max. Annual Capacity (AF)	GSP Water Budget Analysis[b] Normal Year (AF)	GSP Water Budget Analysis[b] Dry Year (AF)
Existing Wells[c]					
LACWWD36[d]					
	Palmer	2,000	3,220	500	1,250
SCV Water					
	12[i]	2,500	4,030	530	2,280
	13	2,500	4,030	540	2,280
	160	2,000	3,230	0	680
	201[e]	2,000	3,230	2,420	2,900
	206	2,500	4,030	180	2,830
	207	2,500	4,030	140	2,860
	Saugus 1	1,100	1,770	1,450	1,450
	Saugus 2	1,100	1,770	1,350	1,350
SCV Water Subtotal		*16,200*	*26,120*	*6,610*	*16,630*
Existing Purveyor Subtotal		*18,200*	*29,340*	*7,110*	*17,880*
Future[f] and Recovered Wells					
	205[g]	2,700	4,360	2,610	2,920
	Saugus 3[h]	2,500	4,030	30	2,620
	Saugus 4[h]	2,500	4,030	30	2,620
	Saugus 5[h]	2,000	3,230	30	1,940
	Saugus 6[h]	2,000	3,230	30	1,940
	Saugus 7[h]	2,000	3,230	30	1,940
	Saugus 8[h]	2,000	3,230	30	1,940
Future Subtotal		*15,700*	*25,340*	*2,790*	*15,920*
Total Purveyors		**33,900**	**54,680**	**9,900**	**33,800**

Notes:

(a) The quantities of groundwater extracted by existing or future and recovered well capacity will vary depending on operating conditions. However, overall pumping remains within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo (GSI 2020) and the updated Basin Yield Analysis (LSC & GSI 2009).
(b) Production for normal and dry years represented in this table represent the period after all impacted wells (PFAS and perchlorate impacts) are recovered. See Tables 4-8B and 4-8C in Appendix E of the 2020 UWMP for anticipated production from 2021 through 2030. Dry-year production represents anticipated maximum dry-year production. Schedule for recovered well capacity based on Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks 2021 in Appendix C.
(c) Existing Category includes all wells currently on line and in use.
(d) LAWWD36 anticipated production for normal and dry years.
(e) Well 201 is awaiting DDW permitting, returning to service in 2021.
(f) Future Category includes one well restored from perchlorate water quality issues and other future Saugus wells.
(g) Well 205 is impacted by perchlorate and is expected to return to service in 2024.
(h) Future wells, Saugus 3 & 4, are planned replacement wells. Saugus 5 through 8 are new dry-year wells. The new dry-year wells would not typically be operated during average/normal years.
(i) Permitted at 2,500 gallons per minute (gpm), but capacity was reduced to 2,000 gpm during last rehab.

TABLE 2-5 B
MUNICIPAL GROUNDWATER SOURCE CAPACITY- EXISTING, FUTURE, AND RECOVERED SAUGUS FORMATION WELLS[(a)]
NORMAL-YEAR DETAIL (2021-2030)

Well	Permitted Capacity (gpm)	Max. Annual Capacity (AF)	Normal Year[(b)] 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Existing Wells[(c)]												
LACWWD36[(d)]												
Palmer	2,000	3,220	500	500	500	500	500	500	500	500	500	500
SCV Water												
12[(i)]	2,500	4,030	2,220	2,220	2,220	2,220	2,220	530	530	530	530	530
13	2,500	4,030	2,280	2,280	2,280	2,280	2,280	540	540	540	540	540
160	2,000	3,230	-	-	-	-	-	-	-	-	-	-
201[(e)]	2,000	3,230	-	2,580	2,580	2,580	2,580	2,480	2,420	2,420	2,420	2,420
206	2,500	4,030	2,830	2,830	2,830	2,020	2,020	200	200	200	200	180
207	2,500	4,030	2,860	2,860	2,860	2,040	2,040	180	180	180	180	140
Saugus 1	1,100	1,770	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
Saugus 2	1,100	1,770	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350
SCV Water Subtotal	*16,200*	*26,120*	*12,990*	*15,570*	*15,570*	*13,940*	*13,940*	*6,730*	*6,670*	*6,670*	*6,670*	*6,610*
Existing Purveyor Subtotal	*18,200*	*29,340*	*13,490*	*16,070*	*16,070*	*14,440*	*14,440*	*7,230*	*7,170*	*7,170*	*7,170*	*7,110*
Future[(f)] and Recovered Wells												
205[(g)]	2,700	4,360	-	-	-	3,010	2,610	2,610	2,610	2,610	2,610	2,610
Saugus 3[(h)]	2,500	4,030	-	-	-	-	200	30	30	30	30	30
Saugus 4[(h)]	2,500	4,030	-	-	-	-	200	30	30	30	30	30
Saugus 5[(h)]	2,000	3,230	-	-	-	-	-	-	30	30	30	30
Saugus 6[(h)]	2,000	3,230	-	-	-	-	-	-	30	30	30	30
Saugus 7[(h)]	2,000	3,230	-	-	-	-	-	-	-	-	-	30
Saugus 8[(h)]	2,000	3,230	-	-	-	-	-	-	-	-	-	30
Future Subtotal	*15,700*	*25,340*	*0*	*0*	*0*	*3,010*	*3,010*	*2,670*	*2,730*	*2,730*	*2,730*	*2,790*
Total Purveyors	**33,900**	**54,680**	**13,490**	**16,070**	**16,070**	**17,450**	**17,450**	**9,900**	**9,900**	**9,900**	**9,900**	**9,900**

Notes:

(a) The quantities of groundwater extracted by existing or future and recovered well capacity will vary depending on operating conditions. However, overall pumping remains within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo (GSI 2020) and the updated Basin Yield Analysis (LSC & GSI 2009).
(b) Production for normal years represented in this table represent the period after all impacted wells (PFAS and perchlorate impacts) are recovered. Schedule for recovered well capacity based on Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks 2021 in Appendix C.
(c) Existing Category includes all wells currently on line and in use.
(d) LAWWD36 anticipated production for normal and dry years.
(e) Well 201 is awaiting DDW permitting, returning to service in 2021.
(f) Future Category includes one well restored from perchlorate water quality issues and other future Saugus wells.
(g) Well 205 is impacted by perchlorate and is expected to return to service in 2024.
(h) Future wells, Saugus 3 & 4, are planned replacement wells, Saugus 5 through 8 are new dry-year wells. The new dry-year wells would not typically be operated during average/normal years.
(i) Permitted at 2,500 gpm, but capacity was reduced to 2,000 gpm during last rehab.

TABLE 2-5 C
MUNICIPAL GROUNDWATER SOURCE CAPACITY- EXISTING, FUTURE, AND RECOVERED SAUGUS FORMATION WELLS[(a)]
DRY-YEAR DETAIL (2021-2030)

Well	Permitted Capacity (gpm)	Max. Annual Capacity (AF)	Dry Year[(b)] 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Existing Wells[(c)]												
LACWWD36[(d)]												
Palmer	2,000	3,220	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
SCV Water												
12[(i)]	2,500	4,030	2,280	2,280	2,280	2,280	2,280	2,280	2,280	2,280	2,280	2,280
13	2,500	4,030	2,280	2,280	2,280	2,280	2,280	2,280	2,280	2,280	2,280	2,280
160	2,000	3,230	680	680	680	680	680	680	680	680	680	680
201[(e)]	2,000	3,230	-	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
206	2,500	4,030	2,830	2,830	2,830	2,830	2,830	2,830	2,830	2,830	2,830	2,830
207	2,500	4,030	2,860	2,860	2,860	2,860	2,860	2,860	2,860	2,860	2,860	2,860
Saugus 1	1,100	1,770	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
Saugus 2	1,100	1,770	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350
SCV Water Subtotal	*16,200*	*26,120*	*13,730*	*16,630*	*16,630*	*16,630*	*16,630*	*16,630*	*16,630*	*16,630*	*16,630*	*16,630*
Existing Purveyor Subtotal	*18,200*	*29,340*	*14,980*	*17,880*	*17,880*	*17,880*	*17,880*	*17,880*	*17,880*	*17,880*	*17,880*	*17,880*
Future[(f)] and Recovered Wells												
205[(g)]	2,700	4,360	-	-	-	3,050	3,050	3,050	3,050	3,050	3,050	2,920
Saugus 3[(h)]	2,500	4,030	-	-	-	-	3,020	3,020	2,620	2,620	2,620	2,620
Saugus 4[(h)]	2,500	4,030	-	-	-	-	3,020	3,020	2,620	2,620	2,620	2,620
Saugus 5[(h)]	2,000	3,230	-	-	-	-	-	-	2,420	2,420	2,420	1,940
Saugus 6[(h)]	2,000	3,230	-	-	-	-	-	-	2,420	2,420	2,420	1,940
Saugus 7[(h)]	2,000	3,230	-	-	-	-	-	-	-	-	-	1,940
Saugus 8[(h)]	2,000	3,230	-	-	-	-	-	-	-	-	-	1,940
Future Subtotal	*15,700*	*25,340*	*0*	*0*	*0*	*3,050*	*9,090*	*9,090*	*13,130*	*13,130*	*13,130*	*15,920*
Total Purveyors	**33,900**	**54,680**	**14,980**	**17,880**	**17,880**	**20,930**	**26,970**	**26,970**	**31,010**	**31,010**	**31,010**	**33,800**

Notes:

(a) The quantities of groundwater extracted by existing or future and recovered well capacity will vary depending on operating conditions. However, overall pumping remains within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo (GSI 2020) and the updated Basin Yield Analysis (LSC & GSI 2009).
(b) Production for dry years represented in this table represent the period after all impacted wells (PFAS and perchlorate impacts) are recovered. Dry-year production represents anticipated maximum dry-year production. Schedule for recovered well capacity based on Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks 2021 in Appendix C.
(c) Existing Category includes all wells currently on line and in use.
(d) LAWWD36 anticipated production for normal and dry years.
(e) Well 201 is awaiting DDW permitting, returning to service in 2021.
(f) Future Category includes one well restored from perchlorate water quality issues and other future Saugus wells.
(g) Well 205 is impacted by perchlorate and is expected to return to service in 2024.
(h) Future wells, Saugus 3 & 4, are planned replacement wells, Saugus 5 through 8 are new dry-year wells. The new dry-year wells would not typically be operated during average/normal years.
(i) Permitted at 2,500 gpm, but capacity was reduced to 2,000 gpm during last rehab.

2.1.4 Recycled Water

SCV Water recognizes that recycled water is an important and reliable source of additional water that should be pursued as an integral part of the Valley's water supply portfolio. Recycled water enhances reliability in that it provides an additional source of supply and allows for more efficient utilization of groundwater and imported water supplies. A more detailed discussion of recycled water demands and supplies can be found in Section 5 of the 2020 UWMP.

SCV Water currently projects providing up to 8,961 AFY of treated (tertiary) recycled water at buildout, suitable for reuse on golf courses, landscaping, and other non-potable uses in the Santa Clarita Valley, to the extent those supplies are available. Projected increases in recycled water demand is based on development projects to serve existing customers through Phase 2 projects identified in the 2016 Draft Recycled Water Master Plan (RWMP) (Kennedy/Jenks 2016) and those demands associated with the Newhall Ranch Specific Plan. Those demands are shown in Table 2-6 A below.

Current sources of recycled water provide 450 AFY. The remainder of the recycled water supply is based on SCV Water's New Drop program where new interior water use is used to meet new recycled water demands. Projections of planned increases in supplies are shown in Table 2-6 B (below).

TABLE 2-6 A
EXISTING AND PROJECTED RECYCLED WATER DEMAND

Phase/Project	Demand (AFY)	Timeframe for Coming Online	Source of Recycled Water	Location of Use/Water Service Area
Phase 1	450	Existing	Valencia Water Reclamation Plant (WRP)	VWD
Phase 2A	560	2029	Valencia WRP	NCWD, VWD
Phase 2B	300	2021-2023	Vista Canyon Water Factory	SCWD
Phase 2C	759	2021-2023	Valencia WRP	NCWD, VWD
Phase 2C – Golf Course[a]	600	2023	Valencia WRP	Valencia Golf Course
Phase 2D	221	2021-2023	Valencia WRP	VWD
FivePoint[b]	5,174-6,505	2021-2043	Newhall Ranch/ Valencia WRP	Newhall Ranch/Five Point
Total	**8,064-9,395**	2050	As shown above	As shown above

TABLE 2-6 B
AVERAGE/NORMAL YEAR EXISTING AND PLANNED RECYCLED WATER USAGE (AF)

	2025	2030	2035	2040	2045	2050
Existing Recycled Water Use	450	450	450	450	450	450
New Recycled Water Use	1,849	3,696	5,091	6,498	7,499	8,511
Total Projected Recycled Water Use[(a)]	**2,299**	**4,146**	**5,541**	**6,948**	**7,949**	**8,961**
Total Potential Recycled Water Demand[(b)]	**4,559**	**6,514**	**8,441**	**9,191**	**9,469**	**9,749**

Notes:
(a) Total projected water use is equal to total projected recycled water supply as total potential recycled water demand exceeds total projected supply.
(b) Difference in recycled water supply and total potential recycled water demand will be made up by potable water supplies, i.e., make-up water. See Table 2-12 of the 2020 UWMP.

2.1.5 Groundwater Banking and Exchange Programs

SCV Water has improved the overall reliability of its water supplies through the coordinated operation of its multiple water supply sources. These coordinated operations include participation in groundwater banking programs, where surface supplies are stored in groundwater basins in times of surplus for withdrawal in years when other supplies are limited, as well as in water exchanges, where water is provided to an exchange partner in years of surplus for return of supply in a future year.

SCV Water is a partner in two existing groundwater banking programs: the Semitropic Banking Program; and RRBWSD Banking Program, discussed below in Sections 2.1.5.1 and 2.1.5.2, respectively. Newhall Land is also a partner in the Semitropic Banking Program, as discussed in Section 2.1.5.3, with its supplies assumed to be available to SCV Water. In addition, SCV Water has updated its plan to enhance its overall supply reliability, including the need for additional banking programs, discussed in Sections 2.1.5.4 and 2.1.5.5. SCV Water is a partner in several water exchanges, discussed in Sections 2.1.5.6 and 2.1.5.7.

2.1.5.1 Semitropic Banking Program

Semitropic is a member agency of KCWA and has a contract with KCWA for SWP water, which it provides to farmers for irrigation. Semitropic is located in the San Joaquin Valley in the northern part of Kern County immediately east of the California Aqueduct. Using its available groundwater storage capacity (approximately 1.65 million acre-feet [MAF]), Semitropic has developed a groundwater banking program, in which it takes available SWP supplies from banking partners in wet years and returns that water to them in dry years. For its dry-year returns, Semitropic can either leave its SWP water in the Aqueduct for delivery to a banking partner and increase its groundwater production for its farmers, or Semitropic can pump groundwater that can be pumped into a Semitropic canal and, through reverse pumping plants, be delivered to the California Aqueduct. The total amount of storage capacity under contract in the original banking program is 1 MAF, with approximately 700,000 AF currently in storage. Under its original program, Semitropic can pump back a maximum of 90,000 AFY of water into the California Aqueduct.

Semitropic has recently expanded its groundwater banking program to incorporate its Stored Water Recovery Unit (SWRU). This supplemental program includes an additional storage capacity of 650,000 AF and an expansion of pumpback recovery capacity by 200,000 AFY. That pumpback capacity includes well connections and conveyance facility improvements to increase the existing Semitropic pumpback capacity to the California Aqueduct by an additional 50,000 AFY and the future development of a new well field with approximately 65 wells along with new collection and transmission facilities to convey an additional 150,000 AFY to the California Aqueduct.

In 2015, the Agency entered into an agreement with Semitropic to participate in the SWRU. Under this agreement, the two short-term accounts containing 35,970 AF were transferred into this new program. Under the SWRU agreement, the Agency can store and recover additional Water within a 15,000-AF account. The term of the Semitropic Banking Program extends through 2035, with the option of a 20-year renewal. The Agency may withdraw 5,000 AFY from its account. Current operational planning includes the use of the water stored in Semitropic for dry-year supply. It was assumed that 5,000 AFY of supplies would be available in both single dry-year and multiple dry-year periods, through 2055.

2.1.5.2 Rosedale-Rio Bravo Banking Program

Also located in Kern County, immediately adjacent to the Kern Water Bank, RRBWSD has developed a Water Banking and Exchange Program. SCV Water has entered into a long-term agreement with RRBWSD with a total storage capacity of 100,000 AF. Over the life of this project, SCV Water may store a total of 200,000 AF in the program. SCV Water began storing water in this program in 2005. At the beginning of 2014, the recoverable storage in the program after groundwater and other losses was 100,000 AF. At the beginning of 2021, approximately 98,800 AF was available for withdrawal.

SCV Water's existing firm withdrawal capacity in this program is 3,000 AFY. To enhance dry-year recovery capacity, in 2015, SCV Water, in cooperation with RRBWSD and Irvine Ranch Water District, initiated construction of additional facilities that became available in 2018. With these facilities, the firm extraction capacity is estimated to increase to 10,000 AFY even in exceptionally dry conditions such as those experienced in 2014 and 2015. In addition, SCV Water has the right under the contract to develop four additional wells, which would bring the firm recovery capacity to 20,000 AFY. This additional capacity is anticipated to be available by 2030. In addition to this firm recovery capacity, in moderately dry years, Rosedale is required to use up to 20,000 AFY of other available recovery capacity to meet its recovery obligations under the banking agreement.

2.1.5.3 Semitropic Banking Program – Newhall Land

One of Semitropic's long-term groundwater banking partners is Newhall Land. As was the case for Nickel Water, the banking program was entered into by the developer of the Newhall Ranch project to firm up the reliability of the water supply for the project, which is in the SCV Water service area. In its agreement with Semitropic, Newhall Land has available to it a pumpback capacity of 4,950 AFY and a storage capacity of 55,000 AF. At the end of 2020, Newhall Land had 38,330 AF stored in this program. It is anticipated that, through a water exchange, this supply will be available to the Agency.

SCV Water plans to use the extraction capacity of program in dry years. For the single dry year, supplies were assumed at the program's maximum withdrawal capacity of 4,950 AFY. For the multiple dry-year period, supplies in each year of the dry period were assumed at the program's maximum withdrawal capacity of 4,950 AFY and that additional supplies would be banked during wetter years to allow withdrawal of this amount.

2.1.5.4 Antelope Valley-East Kern Water Agency High Desert Water Bank

This is a project proposed by AVEK, an SWP wholesaler located in the Antelope Valley area of southeastern Kern County and northern Los Angeles County. The proposed groundwater banking project would be developed and operated by AVEK and would be located adjacent to the East Branch of the California Aqueduct. AVEK is actively seeking banking partners for Phase 2 of their water banking program. The preliminary Phase 2 program gives SCV Water options for up to 80,000 AF of storage and up to 20,000 AF of recovery capacity.

2.1.5.5 McMullin GSA Aquaterra Water Bank

SCV Water's potential participation in this program is assumed to be similar to the AVEK Bank.

2.1.5.6 Antelope Valley-East Kern Water Exchange

In 2019, SCV Water also executed a Two-for-One Water Exchange Program with AVEK, whereby SCV Water could recover one acre-foot of water for every two acre-feet that SCV Water delivered to AVEK. SCV Water delivered 7,500 AF to the program in 2019 and has 3,750 AF of recoverable water. In 2020, 1,406 AF of water was withdrawn from this exchange program, leaving a balance of 2,344 AF. The term for this agreement is for ten years.

2.1.5.7 United Water Conservation District Water Exchange

In 2019, SCV Water also executed a Two-for-One Water Exchange Program with UWCD, whereby SCV Water could recover one acre-foot of water for every two acre-feet that SCV Water delivered to UWCD. SCV Water delivered 1,000 AF to the program in 2019 and has 500 AF of recoverable water. The term for this agreement is for ten years.

2.2 Existing and Projected Water Demands

Potable water use projections are based on a combination of SCV Water and LACWWD 36 demands. For SCV Water's three water divisions (NWD, SCWD, and VWD), the potable demand forecast was determined from land-use-based estimates from 2020 through 2050 (buildout). The land-use-based estimates were determined in a land-use analysis that compiled data from planned development contracts and the One Valley-One Vision (OVOV) General Plan. In addition, weather and water conservation effects on water usage were considered in the evaluation.

The LACWWD 36 potable demand projections relied on a population-based approach using OVOV-based population estimates. Based on these estimates for SCV Water and LACWWD 36, potable demand projections were developed using a Least Cost Planning Decision Support System Model (DSS Model), which incorporates econometric-based adjustments to better develop an accurate forecast through the year 2050. The DSS Model accounts for existing and future potable water consumption by water customers and estimated passive and active water conservation savings. Demand adjustments include accounting for climate change, drought rebound, weather normalization, work-at-home trends, and overwatering/irrigation equipment efficiency degradation.

In addition, recent legislation provides that, where available, demand projections "shall" display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area. If such information is reported, the assessment will provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections. The UWMP must indicate the extent that the demand projections consider savings from codes, standards, ordinances, or transportation and land use plans (referred to as savings from passive conservation).

The active conservation savings analysis included SCV Water's current active water conservation measures. There are three codes and 17 measures included in the active conservation portion of the DSS Model, adding savings to the indoor plumbing code measures included in the passive savings section of the modeling.

Non-potable demands (i.e., recycled water demands) were also estimated as part of the 2021 Maddaus Water Management Water Demand Study (MWM 2021). Demand projections were based on volumes and schedules for recycled water use reported in the 2016 RWMP, updates provided by SCV Water, and new estimates for the Westside Communities. Recycled water supply projections were estimated based on projected indoor water use available for recycled water supply.

In comparison, the potential recycled water demand estimates exceed the total projected recycled water supply. A major reason for this is a lag in supply as new development builds out to generate new recycled water. As such, future recycled water use is limited by supply availability. Therefore, non-potable water use accounted for in the total demand table (Table 2-7) reflects recycled water use volumes that are projected to be met by recycled water supply. The difference, which would be met with potable water supplies, is captured as "make-up" water in the demand tables below.

The results of this analysis, presented in more detail in the 2020 UWMP, are summarized below. Table 2-5 provides a summary of projected total water demands, including projected savings from passive conservation and active conservation, through 2050. The active conservation savings analysis included SCV Water's current active water conservation measures. There are three codes and 17 measures included in the active conservation analysis, adding savings to the indoor plumbing code measures included in the passive savings. These measures are described in more detail in Section 2.7 of the 2020 UWMP. In this Plan, it is the demands with plumbing code savings and both with and without active conservation that are used to evaluate supply reliability.

TABLE 2-7
SUMMARY OF PROJECTED WATER USE (AF)[(a)(b)]

Water Use Type	2025	2030	2035	2040	2045	2050
SCV Water						
Potable[(c)]	72,900	76,100	81,600	84,800	87,500	89,900
Non-Potable[(d)]	2,300	4,100	5,500	6,900	7,900	9,000
LACWWD 36[(e)]						
Potable	1,300	1,400	1,600	1,800	2,000	2,200
Non-Potable	0	0	0	0	0	0
Total Use[(f)]	**76,400**	**81,700**	**88,700**	**93,600**	**97,500**	**101,000**

Notes:

(a) Based on MWM 2021.
(b) Values rounded to the nearest hundred.
(c) Demands include savings from plumbing code and standards, and active conservation. Demands account for estimated increase from climate change.
(d) Projected non-potable water use based on available supply. Additional details in Section 5 of 2020 UWMP.
(e) LACWWD 36 is included for purposes of providing regional completeness; however, it is not required to prepare a UWMP. Demands account for passive conservation, but do not include active conservation savings. SCV efforts that target LACWWD 36 customers are included in SCV active conservation savings.
(f) Due to rounding, total use values may not equal the sum of the individual line items.

3. WATER SUPPLY RELIABILITY ANALYSIS

For this Plan, an analytic spreadsheet model was used to evaluate the reliability of existing and planned water supplies in meeting projected demands in the SCV Water service area during the study period of 2021 through 2060. The model is described generally in Section 3.1 and in more detail in Appendix A.

Twelve supply scenarios are evaluated in this Plan, including a Base Scenario, based on existing water supplies and storage programs, demand projections described in the 2020 UWMP, and five additional scenarios with differing supply assumptions. These scenarios are discussed in more detail in Section 3.2.

Analysis results include an initial assessment of supply reliability for each of the four scenarios evaluated. For any scenario in which reliability was less than the 95-percent reliability goal, additional supply programs were included as needed to achieve that reliability goal. The results of initial scenario supply reliability, the discussion of any additional supply programs needed, and the resulting improvement in reliability are discussed in Section 3.3.

3.1 Water Operations Model

3.1.1 General Methodology

The Water Operations Model (or "Model") is an analytic spreadsheet model developed for SCV Water by MBK Engineers that was used to analyze water supply reliability for this Plan. The Model performs annual water operations for the SCV Water service area over a specified study period, which for this Plan is the 40-year period from 2021 through 2060 (the year assumed in the 2020 UWMP for development buildout in the service area, as shown in adopted local land use plans).

Inputs to the Model include:

- Annual service area demands, as they are projected to increase over the study period;
- Annual base supplies (existing and planned) anticipated to be available to meet those demands, including any planned changes in supply during the study period;
- Storage programs available to SCV Water, including maximum storage and extraction capacities and beginning (2021) storages; and
- Various combinations of future water supply reliability projects, including those incorporated into the 2020 UWMP, as well as additional scenarios to ensure that there are alternative programs that can be substituted for those in the 2020 UWMP.

The Model steps through each year of the study period, compares annual base supplies to demands, and operates SCV Water storage programs as needed, adding to storage in years when base supplies exceed demand and withdrawing from storage when demand exceeds base supplies.

To reflect the uncertainty in what hydrology might occur over the study period, the Model looks at multiple hydrologic sequences. In this Plan, the sequences are based on historical hydrology from 1922 through 2003, and the Model uses 82 hydrologic sequences, as is discussed further in Subsection 3.1.2. The hydrologic sequences affect certain supplies (i.e., SWP and groundwater), as well as demands during the study period. The Model steps through annual operations over the study period for each of the 82 hydrologic sequences. The results from the 82 sequences are then compiled by year during the study period and are summarized to provide a statistical assessment of various parameters.

For example, the reliability of SCV Water's supplies and storage programs to meet its projected demands for a particular year, such as year 2030, would be assessed by compiling the overall supply surplus or shortfall that occurred in Model results for 2030 from each of the 82 hydrologic sequences. Those 82 supply results for 2030 would then be sorted from large to small to provide a probability of exceedance distribution for overall supplies for that year.

3.1.2 Hydrologic Variability

Of the many factors affecting this reliability analysis, the factor with the greatest degree of variability and with the largest impact on supplies (and to a lesser degree, demands) is hydrology. Hydrology in northern California significantly affects the availability of SWP supplies; local hydrology affects the availability of Alluvial groundwater supplies, as well as demands; and dry-year reductions in SWP supplies affect the need for additional Saugus groundwater pumping.

The SWP supply data used in this analysis are based on the results of SWP modeling studies conducted by DWR using CalSim, a computer model that simulates monthly operations of the SWP and CVP systems. Among other model inputs, CalSim uses hydrologic inflows to the SWP and CVP systems based on 82 years of historical monthly inflows from 1922 through 2003, adjusted to reflect current levels of development in the water supply source areas.

To reflect the potential variability in hydrology over the study period, for this analysis, a number of hydrologic sequences are used, based on the same historical hydrologic period used in the CalSim studies. Based upon the 82 years of hydrologic record used in CalSim, a series of 82 hydrologic "traces" is used. Each trace consists of 40 years of sequential hydrology, with the beginning year of each trace lagging the beginning year of the previous trace by one year. For example, the first trace begins with 1922 hydrology assumed for the first year of the study period of 2021, 1923 hydrology for 2022, etc., through 1955 hydrology for the last year of the study period of 2060. The hydrology is shifted by one year for the second trace, beginning with 1923 hydrology for 2021, 1924 hydrology for 2022, etc., through 1956 hydrology for 2060. This one-year shift continues until the end of the hydrologic period (2003) is reached, where the data begins "wrapping" back to 1922 hydrology. The end result of this process is 82 traces of hydrology.

Each hydrologic trace is used to analyze SCV Water supply and demand performance over the study period – in other words, if that sequence of hydrology were to occur again, how adequate would the supplies associated with that hydrology and the storage programs in place be in meeting demands over the study period? Annual results during the study period from each of the 82 hydrologic traces are compiled and summarized and are used to provide a statistical assessment of SCV Water supply reliability.

SWP Supplies

As mentioned above, the SWP supply data used in this analysis are taken from SWP modeling studies conducted by DWR using their CalSim computer model, which simulates monthly operations of the SWP and CVP systems. In addition to the 82 years of historical monthly inflows discussed above, input to the CalSim model includes the facilities in the system and regulatory and operational constraints on system operations. CalSim studies use a fixed set of facilities, operating requirements/constraints, and water demands, operated over a number of years using historical hydrology. The resulting supply deliveries from a CalSim study provide an indication of the potential supply reliability of the SWP system, based on the particular set of facilities and operating constraints assumed in that study.

Hydrology is the factor with the largest impact on SWP supplies. A given CalSim study captures the hydrologic variability in SWP supplies, but not the effect of changes in SWP facilities or operating constraints. For changes in SWP facilities or operations, separate CalSim studies are conducted.

For this Plan, what is desired are potential supplies over a study period (i.e., the 40-year period from 2021 through 2060) with conditions such as SCV Water demands, supplies, and storage programs changing over the study period. The use of the 82 hydrologic sequences is employed in this Plan to capture the hydrologic variability in SWP supplies.

The CalSim studies used in this Plan also reflect changes to hydrology expected to result from climate change, specifically, projected temperature and precipitation changes centered around 2035 emission levels and a 45-cm sea level rise. For the long-term planning purposes of this Plan, the long-term average allocations reported for the future conditions study from 2019 DCR are the most appropriate estimates of future SWP water supply availability.

Groundwater Supplies

In accordance with the groundwater operating plan for the basin, groundwater supplies for all uses from the Alluvial Aquifer are planned to be in the range 30,000 to 40,000 AFY in average years and 30,000 to 35,000 AFY in dry years; supplies from the Saugus Formation are projected to be 7,500 to 15,000 AFY in average years and 15,000 to 35,000 AFY in dry years. The updated Basin Yield analysis (LSC & GSI, 2009) concluded pumping in those ranges to be sustainable. While with treatment, there is sufficient Alluvial pumping capacity to achieve the Alluvial groundwater supply (Table 2-4A), it is planned that SCV Water will develop some future capacity as it constructs municipal supplies for the Newhall Ranch Specific Plan, as agricultural is retired. Existing Saugus pumping capacity is sufficient for normal years and after six additional wells are in place, there is sufficient capacity to achieve about 33,800 AFY (Table 2-5A), which when combined with non-purveyor pumping, is at the upper end of the Saugus Operating Plan.

The existing and planned groundwater supplies used in this Plan are generally the pumping rates, within the operating plan ranges, that were analyzed in the Basin Yield update. As such, they tend toward the upper ends of the respective ranges except for normal year Saugus pumping, which is closer to mid-range of the Saugus Operating Plan. For the multiple-dry year periods, it was assumed that pumping from the Saugus Formation would be governed by the groundwater operating plan summarized in Table 2-2, with average purveyor pumping from existing and planned wells averaging 26,830 AFY over a five-year dry period. Total projected Alluvial and Saugus pumping, including pumping by the purveyors and by agricultural and other users, is shown by year type in Tables 4-9 through 4-11 in Section 4 of the 2020 UWMP. As shown in those tables, the total pumping in each year type remains within the pumping ranges in the groundwater Operating Plan.

Demands

Demands are also affected by local weather, with lower or higher than normal demands occurring when local conditions are either wet or dry, respectively. As with supplies, the hydrologic effects on demands are incorporated into the Model through use of the 82 hydrologic traces. When a dry year occurs in a particular hydrologic trace, demand is increased from normal-year amounts, and in a wet year, is reduced.

3.1.3 Reliability Determination

For this Plan, SCV Water specified a reliability goal of 95 percent. The manner in which a reliability goal is applied to the Water Operations Model is as follows:

- The Model steps through each year of the study period, compares annual base supplies to demands, and operates SCV Water storage programs as needed, adding to storage in years when base supplies exceed demand and withdrawing from storage when demand exceeds base supplies.
- The resulting annual supply surplus or shortfall is determined for each year during the study period.
- This is done for each of the 82 hydrologic sequences.
- The supply surplus/shortfall from all 82 sequences is compiled for each year during the study period. For example, annual supply surplus/shortfall results for study period year 2040 are pulled from each of the 82 hydrologic sequences, and those data are then used to determine the reliability for year 2040.

As the 95 percent reliability goal is applied to the Water Operations Model, this is defined as the ability to meet demand in a given year in 95 percent of the hydrologic sequences analyzed. Based on the number of hydrologic sequences analyzed, this means that to meet the 95-percent reliability goal for a given year, demands for that year must be met in at least 78 of the 82 sequences (95 percent of 82 sequences). This is illustrated and described in more detail in Appendix B.

3.2 Scenarios Analyzed

3.2.1 Scenario Descriptions

This Plan analyzed various scenarios composed of different water supply components discussed below. The mix of component water supplies is summarized in Table 3-1 below. Common to all scenarios are the Alluvium Water Supplies, along with normal year pumping from the Saugus Formation. Alluvial Supplies used in the analysis are consistent with those found in the 2020 UWMP and in Table 2-4 B for normal and Table 2-4 C for locally dry years in this Plan. Existing Saugus supplies include pumping from existing wells along with V205. Saugus 3 and 4, along with Saugus 5 through 8 pumping, are consistent with Table 2-5 B for normal and Table 2-5 C for dry-year in this Plan, where SWP supplies are significantly reduced. SWP supplies throughout the 40-year study period are based on DWR's Delivery Capability Report (DCR) using the 2040 climate change study. Existing banking programs are consistent with Table 2-1 of this Plan, and Tables 7-3 and 7-4 of the 2020 UWMP. Sites Reservoir supplies are based on the CalSim study provided by the Sites Reservoir Authority. The new or additional Rosedale Banking recovery capacity is 10,000 AFY. The AVEK High Desert Banking program is assumed to be 70,000 AF of storage with 20,000 AFY of extraction capacity. The McMullin Aquaterra Bank is assumed to be sized similarly to the AVEK Bank.

This Plan includes an evaluation of six scenarios, each run twice: 1) using demand with active conservation; and 2) using demand without active conservation. The scenarios are described generally as follows:

- **Base Scenario:** Represents those elements of the SCV Water portfolio that currently exist. As the analysis moves through the study period, restoration of well capacity temporarily taken out for water quality concerns takes place consistent with Tables 2-4 B, 2-4 C, 2-5 B, and 2-5 C. The well case contains the existing and restored groundwater supplies. Imported supplies include SWP supplies based on 2040 climate conditions pursuant to DWR's CalSim modeling for the 2019 Delivery Capability Report, the firm Buena Vista Rosedale Transfer, and if necessary, in dry years, SWP Flexible Storage, Nickel Water, Yuba Accord water. The Base case also includes the existing banking programs, specifically existing Rosedale Banking supplies at the existing 10,000 AFY of recovery, SCV Water Semitropic and access to the Newhall Land and Farming withdrawal capacity, that are drawn on during years when the other previously mentioned supplies are insufficient to meet demands.
- **Scenario 1:** Represents the supplies used in the 2020 UWMP's reliability analysis. It builds on the Base scenarios by adding additional Saugus Formation pumping capacity for use in dry periods and developing an additional 10,000 AFY of extraction capacity under the existing water banking agreement with RRBWSD.
- **Scenario 2:** Similar to Scenario 1, but the dry supply from Saugus Formation Wells 5 through 8 is replaced with participation in the AVEK's High Desert Water Bank.
- **Scenario 3:** Similarly replaces Saugus Formation Wells 5 through 8 with participation in the Sites Reservoir.

- **Scenario 4:** Assumes all of the new Saugus Formation Wells 3 through 8 are not constructed and replaced with a combination of Sites Reservoir and the AVEK High Desert Water Bank.
- **Scenario 5:** Like Scenario 4 assume no new Saugus Formation Wells and also eliminates the new recovery capacity from the Rosedale banking program. It replaces these two water supply components with the AVEK High Desert Bank and Sites Reservoir, as well as the participation in the McMullin Aquaterra Water Bank.

TABLE 3-1
RELIABILITY PLAN UPDATE SCENARIOS

	Base	1	2	3	4	5
Alluvial Pumping	✓	✓	✓	✓	✓	✓
Existing Saugus	✓	✓	✓	✓	✓	✓
SWP and BVRRB	✓	✓	✓	✓	✓	✓
Existing Banking Programs	✓	✓	✓	✓	✓	✓
Saugus Wells 3 and 4		✓	✓	✓		
Saugus Wells 5 - 8		✓				
New Rosedale Bank Capacity		✓	✓	✓	✓	
Sites Reservoir				✓	✓	✓
AVEK High Desert Bank			✓		✓	✓
McMullin GSA Aquaterra Bank						✓

3.2.2 Scenario Assumptions

The Base Scenario serves as the starting point to assess the reliability of current supplies. Base Scenario demand and supply assumptions are described in detail in Section 2. Scenarios 1 through 5 include varying assumptions regarding the availability of groundwater and water supplies and are discussed further below. The supply assumptions for all six scenarios are summarized in Table 3-2. A more detailed listing of assumptions is included in Appendix A

3.2.2.1 Base Scenario

The Base Scenario is based on those elements of the SCV Water supply portfolio that currently exist. Base Scenario assumptions are summarized in Table 3-2.

3.2.2.2 Scenario 1

Scenario 1 is based on the same demand, supply, and storage program assumptions included in the 2020 UWMP. It builds on the Base scenario by adding additional Saugus Formation pumping capacity in dry periods and developing an additional 10,000 AFY of extraction capacity with RRBWSD. Assumptions for Scenario 1 are summarized in Table 3-2 and differ from the Base Scenario as follows:

- **Saugus supplies:** Scenario 1 includes increased Saugus Formation pumping capacity through the addition of Wells 3 through 8.
- **Dry-year supply programs:** Scenario 1 includes the development of an additional 10,000 AFY of extraction capacity under the existing water banking agreement with RRBWSD.

3.2.2.3 Scenario 2

Similar to Scenario 1, but replaces some of the dry-year supply from Saugus Formation wells with participation in the AVEK's High Desert Water Bank. Assumptions for Scenario 2 are summarized in Table 3-2 and differ from the Scenario 1 as follows:

- **Saugus supplies:** Assumes that only Saugus Formation Wells 3 and 4 are available.
- **Dry-year supply programs:** Scenario 2 includes participation in the AVEK High Desert Water Bank, which has a storage capacity of 70,000 AF and take and put capacities of 20,000 AFY.

3.2.2.4 Scenario 3

Similar to Scenario 1, but replaces some of the dry-year supply from Saugus Formation wells with participation in the Sites Reservoir. Assumptions for Scenario 3 are summarized in Table 3-2 and differ from Scenario 1 as follows:

- **Saugus supplies:** Assumes that only Saugus Formation Wells 3 and 4 are available.
- **Dry-year supply programs:** Scenario 3 replaces Saugus Formation Wells 5 through 8 with participation in Sites Reservoir.

3.2.2.5 Scenario 4

Similar to Scenario 1, but assumes that all Saugus Formation wells are not constructed and replaced with a combination of the AVEK High Desert Bank and Sites Reservoir. Assumptions for Scenario 4 are summarized in Table 3-2 and differ from Scenario 1 as follows:

- **Saugus supplies:** Assumes that Saugus Wells 3 through 8 are not developed.
- **Dry-year supply programs:** Scenario 4 replaces Saugus Formation Wells 3 through 8 with participation in Sites Reservoir and AVEK High Desert Bank.

3.2.2.6 Scenario 5

Similar to Scenario 4, but eliminates new recovery capacity from the RRBWSD banking program and substitutes it with participation in the McMullin GSA Aquaterra Water Bank. Assumptions for Scenario 5 are summarized in Table 3-2 and differ from Scenario 4 as follows:

- **Saugus supplies:** Assumes that Saugus Wells 3 through 8 are not developed.
- **Dry-year supply programs:** Replaces new RRBWSD recovery capacity with participation in the McMullin GSA Aquaterra Water Bank.

TABLE 3-2
SCENARIO ASSUMPTION SUMMARY

	BASE SCENARIO	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
DEMANDS						
Demand without active conservation: • per UWMP	X	X	X	X	X	X
Demand with active conservation: • per UWMP	X	X	X	X	X	X
SUPPLIES						
Groundwater						
Alluvium: • per UWMP	X	X	X	X	X	X
Saugus: • Existing wells	X				X	X
• Existing, restored, replacement, and new wells 3 & 4			X	X		
• existing, restored, replacement, and new wells 3 - 8 (per UWMP)		X				
Recycled Water						
Recycled water: • per UWMP (up to 8,960 AFY)	X	X	X	X	X	X
Imported Supply						
SWP Table A: • per UWMP – SWP supplies based on average deliveries from DWR's 2019 DCR for Future Conditions (52% at buildout due to climate change).	X	X	X	X	X	X
SWP flexible storage: • per UWMP	X	X	X	X	X	X

	BASE SCENARIO	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
Buena Vista – Rosedale: • per UWMP	X	X	X	X	X	X
Nickel Water: • available 2035-2060	X	X	X	X	X	X
Yuba Accord: • per UWMP	X	X	X	X	X	X
Sites Reservoir: • Dry year supplies available starting in 2030				X	X	X
Banking/Exchange Programs						
Semitropic Bank: • per UWMP	X	X	X	X	X	X
Semitropic – NL Bank: • per UWMP	X	X	X	X	X	X
Rosedale Bank: • per UWMP (up to 20,000 AFY take capacity by 2030)		X	X	X	X	
• Take capacity up to 10,000 AFY	X					X
New AVEK Bank: • per UWMP (70,000 AF storage capacity and 20,000 AFY take capacity in 2023)			X		X	X
New Aquaterra Bank: • per UWMP (70,000 AF storage capacity and 20,000 AFY take capacity in 2023)						X
Antelope Valley East Kern Exchange: • per UWMP	X	X	X	X	X	X
Rosedale & W Kern Exchange: • per UWMP	X	X	X	X	X	X

3.3 Analysis Results

3.3.1 Initial Reliability Results

An initial analysis was conducted to determine the reliability of each of the six supply scenarios, based on the specific scenario assumptions identified in Section 3.2.

3.3.1.1 Summary Results

Based on the assumptions in each scenario, the 95-percent reliability goal is met over the entire study period for Scenarios 1 through 5, with active conservation. The analyses show that SCV Water has adequate existing and planned supplies to meet SCV Water service area demands throughout the 40-year planning period. Furthermore, SCV Water has alternative paths to reliability should planned supplies prove not to be viable.

In the subsections that follow, more detailed results are presented for each scenario, including the full range of probability for available supplies, for years 2021, 2030, 2040, 2050, and 2060. Note that the supply results presented below are "Supply after storage puts and takes."

3.3.1.2 Base Scenario

The results of the base scenario indicate that current supplies under demand without active conservation show small fluctuations in reliability in early years, as groundwater production is ramping up and demand is increasing. These values fluctuate between 94 percent and 100 percent and maximum shortfalls range between 0 and 1,800 AF until 2027, when reliability is at 95 percent with a supply shortfall as high as 4,000 AF. The results for 2030, 2040, 2050, and 2060 show a probability of a shortfall as high as 7,400 AF, 12,300 AF, 29,600 AF, and 37,100 AF, respectively. The reliability for 2030 is 90 percent, 2040 is 88 percent, 2050 is 71 percent, and for 2060 is 69 percent. These results are shown in Figure 3-1.

The adequacy of current supplies increases reliability to 2040 when demand under active conservation is implemented. The reliability for 2040 is 100 percent. The results for 2041 show a minor probability of a small shortfall of about 200 AF and a reliability of 98%. The results for 2045 and 2047 show shortfalls of 2,500 AF and 4,700 AF, respectively. The reliabilities for 2045 is 96 percent and for 2047 is 95 percent, which meet or exceeds the reliability goal of 95 percent. The year 2049 is the first year in which reliability decreases below the 95% reliability goal. The results for 2049 indicate a reliability of 93% and a supply shortfall of 5,800 AF. The results for 2050 and 2060 show a probability of a shortfall as high as about 6,800 AF and 10,100 AF, respectively. The reliability for 2050 is 93 percent and for 2060 is 88 percent. These results are shown in Figure 3-2.

The base scenarios assume no safety margin if a supply disruption were to occur, such as supply impacts from PFAS contamination. To achieve reliability in subsequent years, additional investments in those facilities identified in Scenarios 1 through 5 would be required. When these facilities and programs are put in place on the schedule identified in this Plan, reliability is achieved.

FIGURE 3-1
BASE SCENARIO WITHOUT ACTIVE CONSERVATION RELIABILITY

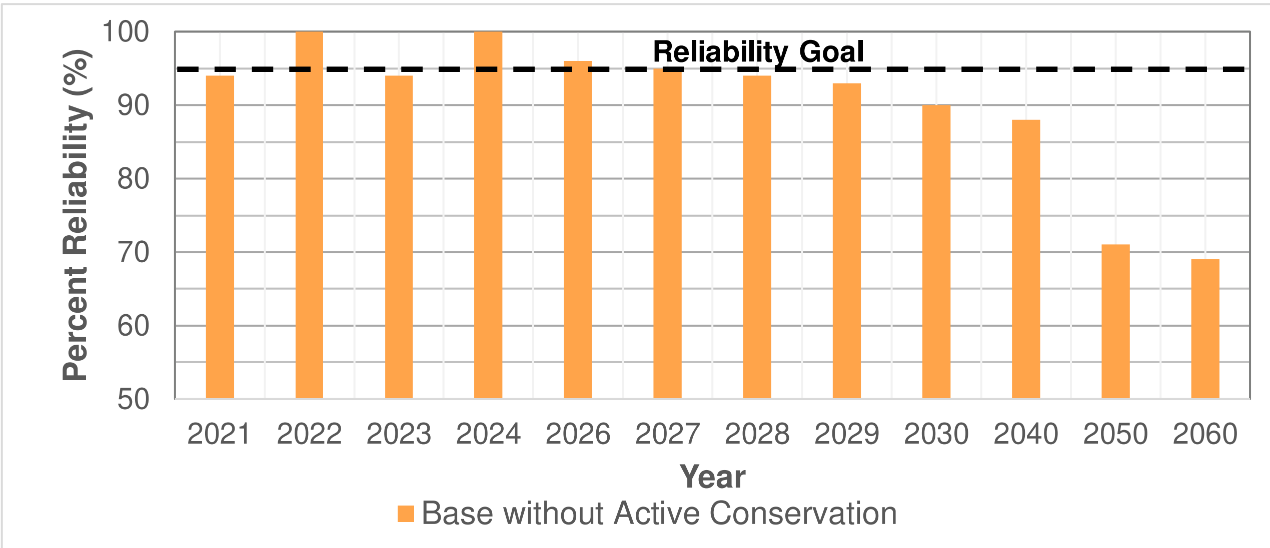
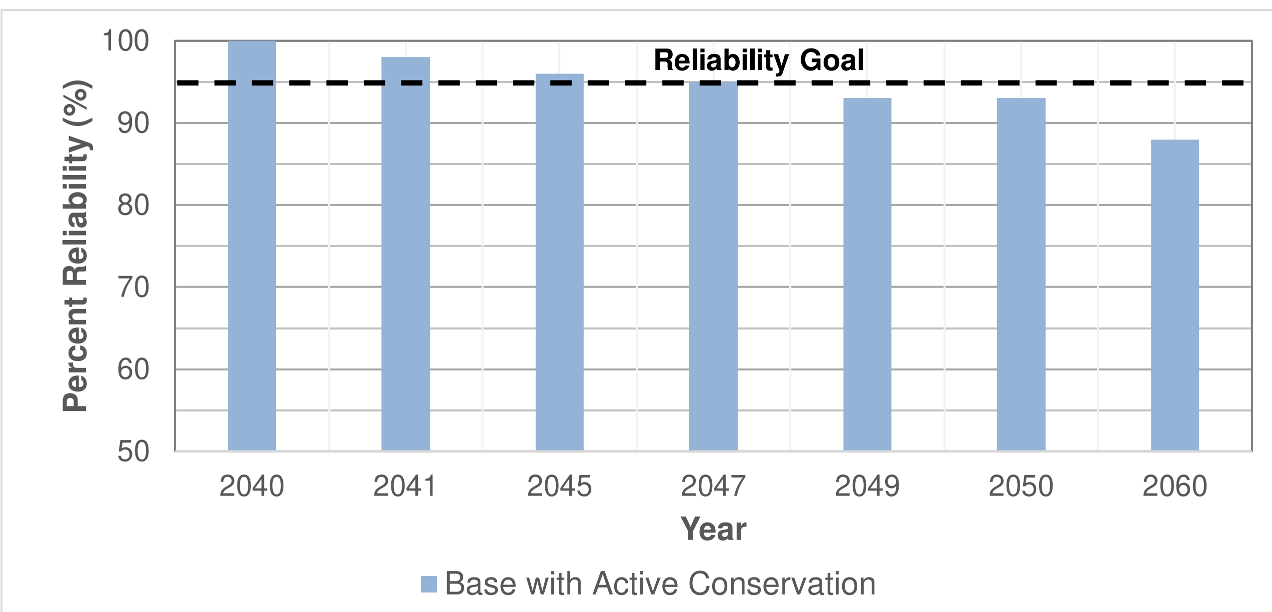


FIGURE 3-2
BASE SCENARIO WITH ACTIVE CONSERVATION RELIABILITY



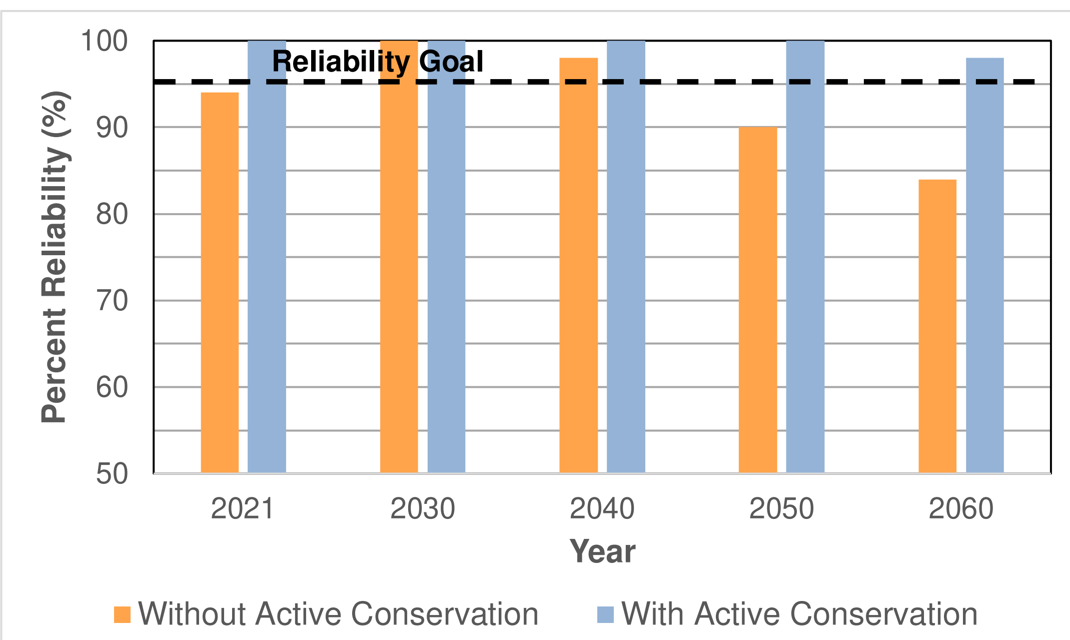
3.3.1.3 Scenario 1

The results for Scenario 1 with demand under no active conservation indicate that for the demand and supply assumptions included in this scenario, there is a small supply shortfall of 1,800 AF for 2021 and no supply shortfall for 2030, which is expected as groundwater pumping increases and there is increased extraction capacity at the RRBWSD. The reliability for 2021 is 94 percent and for 2030 is 100 percent. The results for 2040 show a minor probability of a small shortfall of about 400 AF. The reliability for 2040 is 98 percent. The years 2050 and 2060 show a supply shortfall as high as 12,800 AF and 22,200 AF, respectively. The reliability for 2050 is 90%, and reliability for 2060 is 84%.

When Scenario 1 is evaluated under demand with active conservation, the results show no supply shortfalls for 2021, 2030, 2040, or 2050. The reliability for these four years is 100%. The results for 2060 show a minor probability of shortfall of about 100 AF with a reliability of 98%. The reliability for all five years exceeds the reliability goal of 95 percent. These results are shown in Figure 3-3.

One risk of the perceived risks to achieving reliability with Scenario 1 (2020 UWMP) is the extent to which new Saugus Formation wells can be permitted and installed. As noted in Section 4 of the 2020 UWMP, permitting of Saugus 3 and 4 is currently delayed, pending permitting by DDW as it relates to proximity to abandoned oil wells. If the current sites prove not to be viable, the most likely course of action would be to relocate these proposed wells. If replacement well sites cannot be located or if Saugus Pumping is limited because of potential subsidence, there are alternative paths to reliability, as demonstrated by Scenarios 2 through 5.

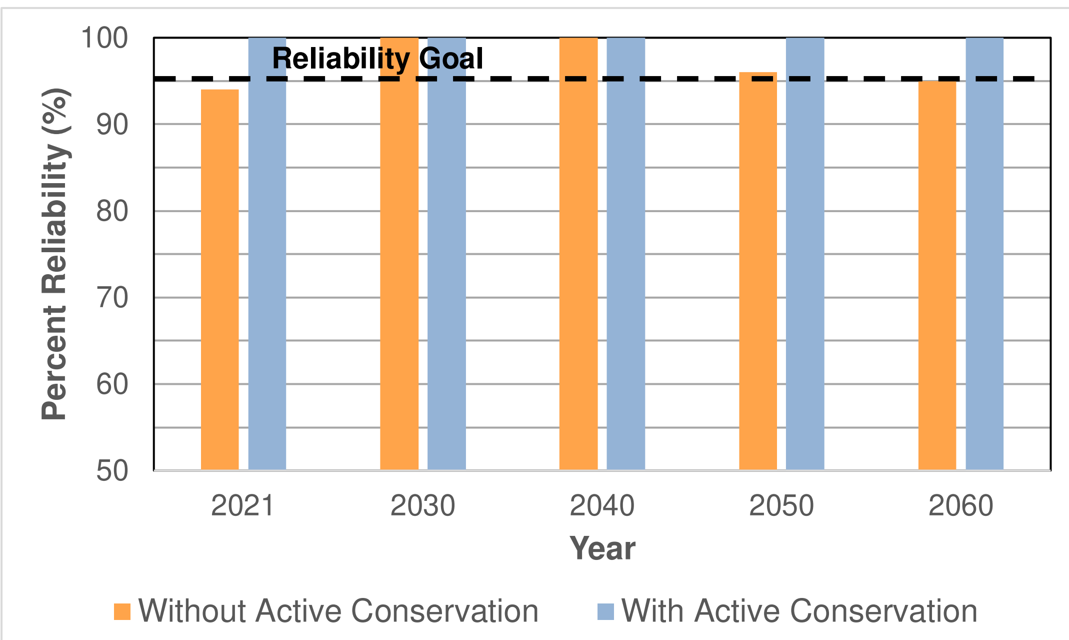
FIGURE 3-3
SCENARIO 1 RELIABILITY



3.3.1.4 Scenario 2

Scenario 2 replaces Saugus Wells 5 through 8 with the AVEK High Desert Bank. Results for Scenario 2 indicate that for the demand under no active conservation, there is a small supply shortfall of 1,800 AF in 2021 and no supply shortfalls for 2030 and 2040. As groundwater production increases, participation in the AVEK bank comes on line, and extraction capacity at the RRBWSD is increased, shortfalls in 2030 and 2040 are eliminated. The reliability for 2021 is 94 percent, and the reliability for both 2030 and 2040 is 100 percent. As demands increase, the results for 2050 and 2060 show a probability of a shortfall as high as about 9,700 AF and 34,400 AF, respectively. The reliability for 2050 is 96 percent and for 2060 is 95 percent. The reliability 2030, 2040, 2050, and 2060 exceeds or meets the reliability goal of 95 percent. When Scenario 2 is run with demand under active conservation, the reliability for all five of these years is 100 percent, with no supply shortfall. These results are shown in Figure 3-4.

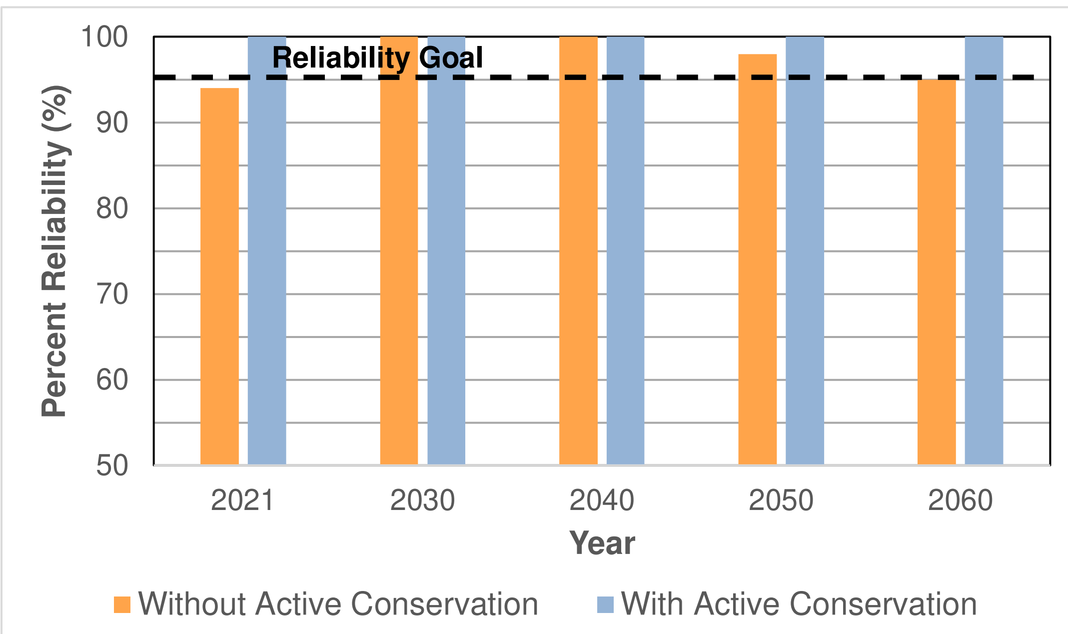
FIGURE 3-4
SCENARIO 2 RELIABILITY



3.3.1.5 Scenario 3

Scenario 3 substitutes Sites Reservoir for the AVEK High Desert Bank. Results for Scenario 3 with demand under no active conservation indicate there is a small supply shortfall of 1,800 AF in 2021 and no supply shortfalls for 2030 and 2040. Shortfalls in 2030 and 2040 are eliminated due to increased groundwater production, the availability of Sites Reservoir dry-year supplies, and increased extraction capacity at the RRBWSD. The reliability for 2021 is 94 percent, and the reliability for both 2030 and 2040 is 100 percent. As demands increase, the results for 2050 and 2060 show a probability of a shortfall as high as about 9,700 AF and 28,100 AF, respectively. The reliability for 2050 is 98 percent and for 2060 is 95 percent. The reliability for 2030, 2040, 2050, and 2060 exceeds or meets the reliability goal of 95 percent. When Scenario 3 is run with demand under active conservation, the reliability for all five of these years is 100 percent, with no supply shortfall. These results are shown in Figure 3-5.

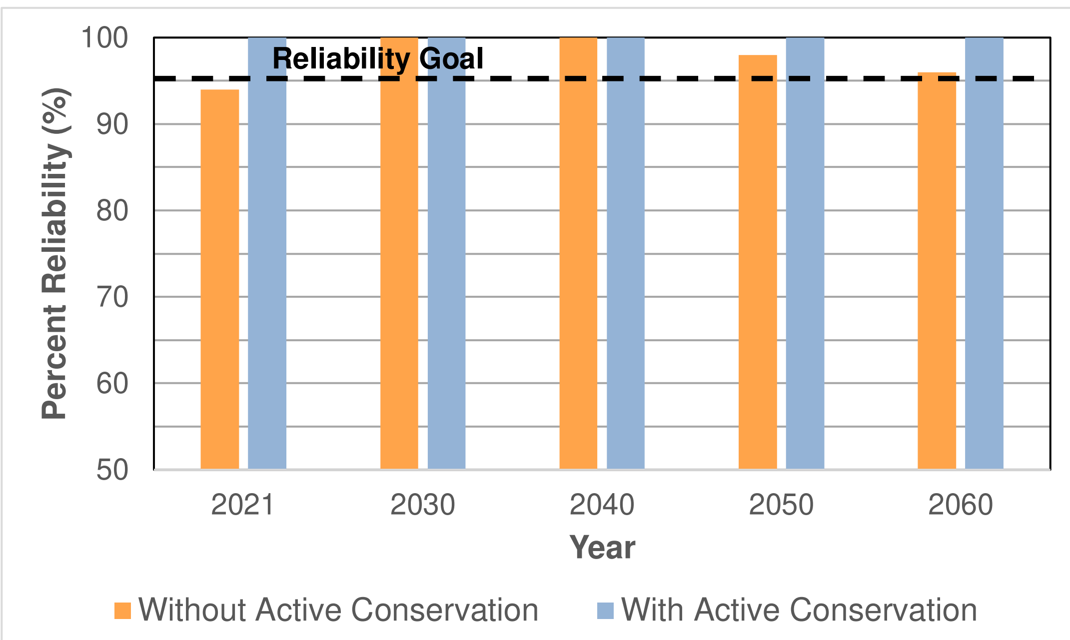
FIGURE 3-5
SCENARIO 3 RELIABILITY



3.3.1.6 Scenario 4

Scenario 4 is more challenging as it assumes the further deletion of Saugus Wells 3 and 4. This scenario requires additional investments in the Rosedale and AVEK banks along with Sites Reservoir to achieve reliability. The results indicate a small supply shortfall of 1,800 AF in 2021 and no supply shortfalls for 2030 and 2040. Shortfalls in 2030 and 2040 are eliminated due to the availability of banked water from the AVEK bank, the availability of Sites Reservoir dry-year supplies, and increased extraction capacity at the RRBWSD. The results for 2050 and 2060 show a supply shortfall as high as 8,700 AF and 13,400 AF, respectively. The reliability for 2050 is 98 percent and for 2060 is 96 percent. The reliability for 2030, 2040, 2050, and 2060 exceeds or meets the reliability goal of 95 percent. Reliability increases to 100 percent when demand under active conservation is run and there are no supply shortfalls in each of the five years 2021, 2030, 2040, 2050, and 2060. These results are shown in Figure 3-6.

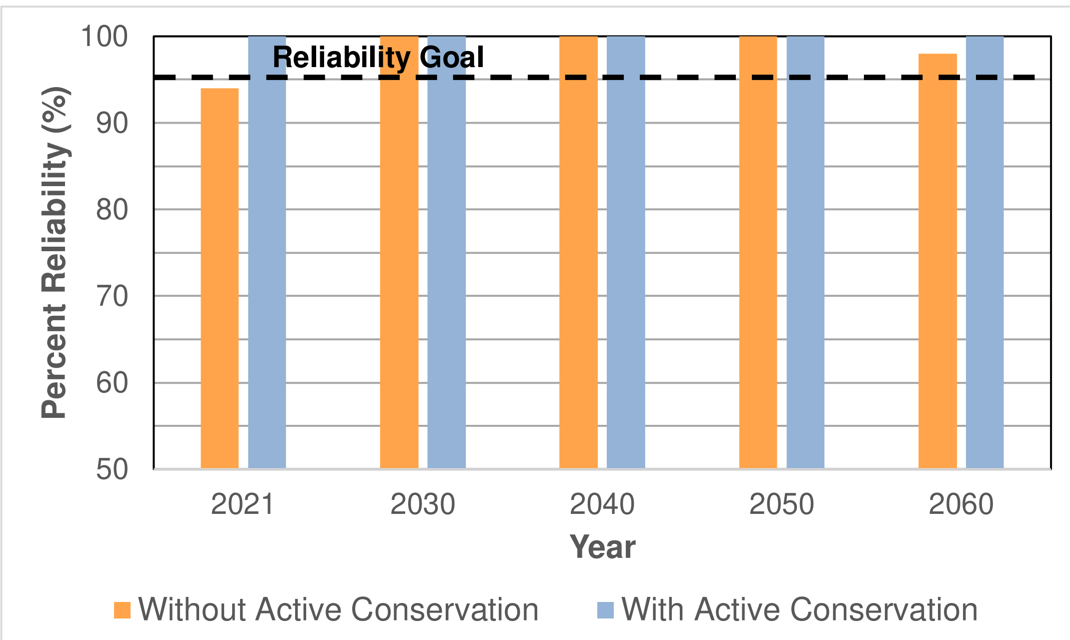
FIGURE 3-6
SCENARIO 4 RELIABILITY:



3.3.1.7 Scenario 5

Scenario 5 is similar to Scenario 4, but substitutes the additional RRBWSD recovery capacity with participation in McMullin GSA Aquaterra Bank. The results show a small supply shortfall of 1,800 AF in 2021 and no supply shortfalls for 2030, 2040, and 2050. Shortfalls in 2030, 2040, and 2050 are eliminated due to availability of banked water from the AVEK and Aquaterra banks and the availability of Sites Reservoir dry-year supplies. The results for 2060 shows a reliability of 98 percent with a supply shortfall as high as 23,400AF. The reliability for 2030, 2040, 2050, and 2060 exceeds or meets the reliability goal of 95 percent. Reliability increases to 100 percent when demand under active conservation is run and there are no supply shortfalls in each of the five years 2021, 2030, 2040, 2050, and 2060. These results are shown in Figure 3-7.

FIGURE 3-7
SCENARIO 5 RELIABILITY:



3.3.1.8 Summary

The scenarios show how the base scenario is used as a starting point to assess the need for additional supplies. The subsequent scenarios build on the base scenario and are run under the assumptions of both demand without conservation and demand with conservation. The demand without conservation scenarios provide insight on the importance of conservation for maintaining supply reliability. As shown in the analyses above, SCV Water has adequate existing and planned supplies to meet SCV Water service area demands under active conservation throughout the 40-year planning period. Furthermore, SCV Water has alternative paths to reliability should planned supplies prove not to be viable. The results all summarized in Figures 3-8 and 3-9.

FIGURE 3-8
SUMMARY OF RELIABILITY OF ALL SCENARIOS UNDER DEMAND WITHOUT ACTIVE CONSERVATION

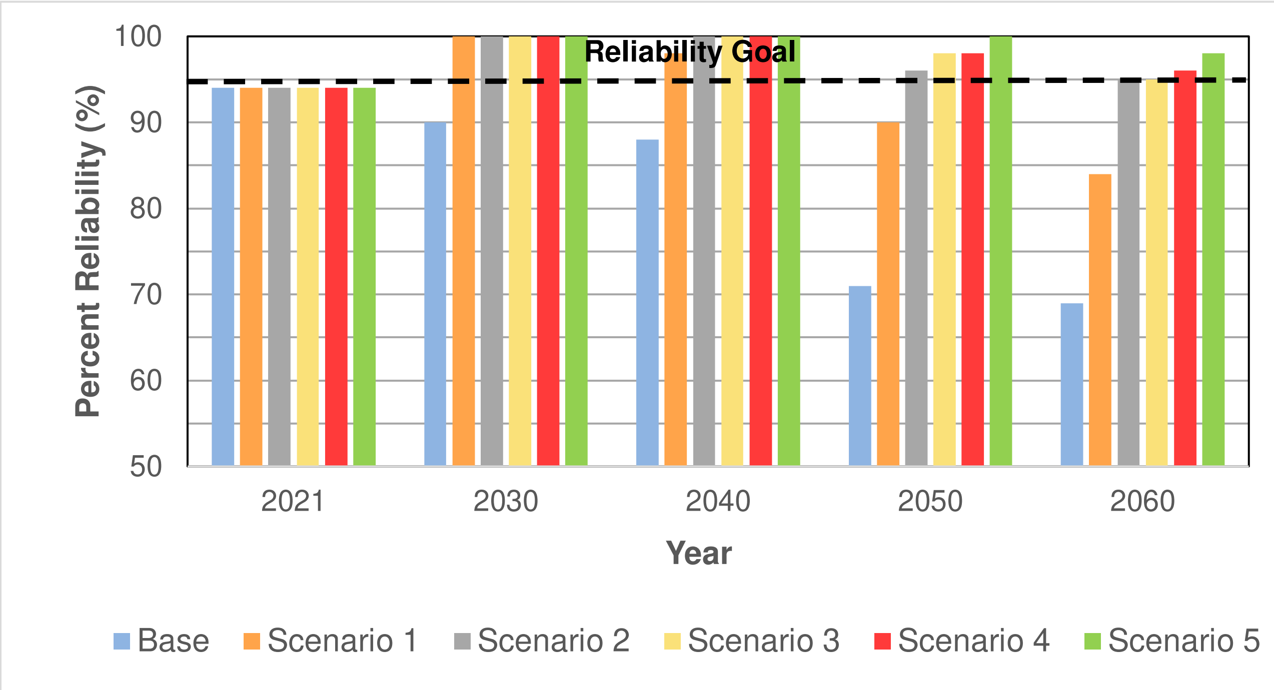
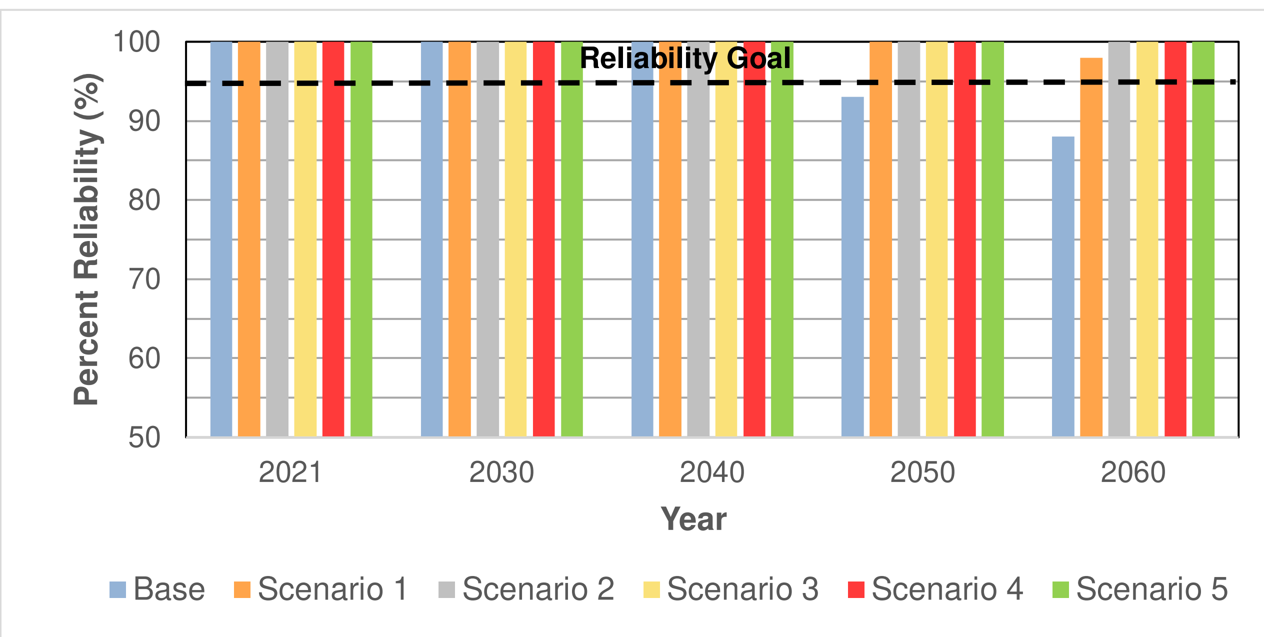


FIGURE 3-9
SUMMARY OF RELIABILITY OF ALL SCENARIOS UNDER DEMAND WITH ACTIVE CONSERVATION



4. PHYSICAL RELIABILITY CONSIDERATIONS

The reliability of the Santa Clarita Valley's overall water supply is dependent upon the reliability of its groundwater, imported water, and recycled water supplies. Deliveries of these supplies are dependent on an extensive network of SWP and SCV Water conveyance facilities; thus, there is a physical reliability constraint to consider in addition to the hydrologic reliability of the supplies.

4.1 Physical Reliability

Physical reliability refers to constraints associated with the water delivery system, including treatment, pumping, and pipeline capacity and structural stability. Imported water supplies may be interrupted or reduced significantly in a number of ways, such as a catastrophic failure in the Sacramento-San Joaquin Bay-Delta system that results in a complete disruption in Delta exports of SWP supplies, an earthquake that damages facilities for water delivery or storage between the Delta and SCV Water's Castaic Lake turnout, subsidence along the California Aqueduct which reduces conveyance capacity, or extended outages required to maintain aging infrastructure.

Reliability may also be impacted by locally caused impacts to SCV Water's water treatment plants, disruption of the purveyor's distribution systems, or interruptions to wastewater treatment systems and to SCV Water's recycled water system. These types of disruptions could be caused by earthquakes, regional power failure, or other factors. The 2020 UWMP details the contingency plans of the purveyor to cope with these sorts of scenarios and includes staged imposition of demand reduction measures to meet basic health and safety needs during the outage.

4.2 Physical Constraints

4.2.1 Local Infrastructure Constraints

Local infrastructure that SCV Water relies upon includes water treatment plants, SCV Water's distribution systems, wastewater treatment systems, and recycled water distribution systems that could be disrupted due to undesirable events. Events that could cause a disruption could include: loss of a facility; loss of control of a facility (offices, pump stations, wells, etc.); loss of supply (power failure, pipeline break, etc.); degradation of water quality; loss of staff (injury or accident, etc.); environmental spill (spill, earthquake, etc.); malevolent event (vandalism, terrorism, etc.); and loss of public confidence.

SCV Water has been proactive in identifying and addressing vulnerabilities to local infrastructure from these types of disruptions, which are described in the following sections.

4.2.1.1 Identified Vulnerabilities

A 2004 study regarding potential vulnerabilities was performed to provide a systematic evaluation of SCV Water's water systems to determine what issues would make the systems vulnerable to not fulfilling their objectives (i.e., water supply, water quality, etc.) and how these issues could be addressed to ensure the utilities are more likely to meet their objectives.

In the study, objectives and priorities were identified, which included water supply (the quantity of water distributed), water quality, financial implications, and critical customers (service priorities at critical locations in the distribution system).

The 2004 study provided a number of recommendations to mitigate or lessen the potential impact of disruption from a vulnerability. Many of the recommendations are confidential in nature and not meant to be publicly reported to protect the security of the infrastructure and operations. However, general recommendations include, but are not limited to: site security; sufficient day/night lighting; advanced Supervisory Control and Data Acquisition (SCADA) systems; separate chemical storage areas with their own precautions; gates; closed circuit television; signage; doors/windows/locks; and engagement with local law enforcement.

Since the 2004 study, SCV Water's distribution system has grown. Consideration of vulnerability now includes this additional infrastructure.

It is noted that SCV Water has also undertaken multiple seismic vulnerability assessments dating back to 1989 that evaluated specific portions of SCV Water's utilities and provided recommendations for continued safety and risk evaluation.

SCV Water also prepares every two to three years a Facility Capacity Fee Study by which it prioritizes upgrades to existing infrastructure and determines revenue sources to, among other things, address potential vulnerabilities. This study eventually influences the implementation of SCV Water's Capital Improvement Program.

4.2.2 SWP Conveyance Constraints

Most SWP supplies are pumped from the southern Delta into the California Aqueduct. Water pumped from the southern Delta may be temporarily stored in San Luis Reservoir for delivery later in the year or conveyed further south in the California Aqueduct. The California Aqueduct conveys water along the west side of the San Joaquin Valley to the Edmonston Pumping Plant, where water is pumped over the Tehachapi Mountains and the aqueduct then divides into the East and the West Branches. Water in the West Branch is conveyed through Pyramid Lake to Castaic Lake, a terminal reservoir of the West Branch from which SCV Water takes delivery of its SWP water and other imported supplies.

SWP conveyance structures were sized to deliver full Table A supplies (i.e., 100 percent SWP allocation) to SWP contractors. Conveyance sizing included consideration for peak summer deliveries, either through the inclusion of additional conveyance capacity or, for certain southern California contractors such as SCV Water, additional storage (i.e., "regulatory" storage) in terminal reservoirs. Generally, there is adequate capacity for delivery of SCV Water's supplies, including the additional SWP Table A Amount SCV Water acquired, as well as its other imported supplies from the Central Valley. With SWP Table A allocations often less than 100 percent, there generally is capacity to transport SCV Water's supplies within its own capacity or within the unused capacity of other SWP contractors. Furthermore, DWR uses the regulatory storage at

Castaic Lake to even out any differences in the availability of conveyance capacity and deliveries to SCV Water.

SWP facilities from the Delta to Castaic Lake include: 338 miles of canal, pipeline, tunnel, and channel; six pumping plants; two power plants; and numerous canal gate structures. Construction of most of these facilities was completed by 1973, so these facilities are at or nearing 50 years in age. As this infrastructure continues to age, keeping these facilities maintained and running at full capacity will become more challenging and costly. Repair or replacement of facilities, which may result in temporary conveyance constraints or complete but temporary outages, are likely to occur more frequently. However, even for unplanned or emergency conveyance constraints or outages, significant interruptions in deliveries to SCV Water are not anticipated due primarily to regulatory storage at Castaic Lake.

An issue with potentially greater impact on long-term conveyance capacity is subsidence in the San Joaquin Valley, particularly in areas adjacent to the northern portion of the California Aqueduct. Subsidence in the San Joaquin Valley from groundwater pumping has been observed since the 1920s. A recent report involving NASA satellite technology (Farr et al. 2016) has shown that subsidence continues to occur in areas of the San Joaquin Valley putting both state (i.e., the SWP) and federal water infrastructure at risk. The report shows that subsidence due to groundwater pumping, which accelerated with heavy pumping during the recent drought, has caused the Aqueduct to drop more than two feet in some areas. As a result of the sinking, the Aqueduct in these reaches is showing a reduction in capacity of up to 20 percent (Farr et al. 2016). Actions to restore capacity would include raising the canal lining and raising the canal gate structures, which would be costly. DWR is assessing the situation and analyzing whether these impacts will affect deliveries to southern California water districts, like SCV Water.

The California Aqueduct traverses the Tehachapi Mountains north of SCV Water’s service area. Due to the numerous fault lines crossing the mountain range (including the San Andreas and White Wolf faults), water users located south of the mountains are at greater risk of supply disruption due to earthquake than users located north of the mountains. For this and other reasons, the terminal reservoirs located on the West and East Branches of the California Aqueduct include emergency storage.

If an earthquake or other disruption were to occur, pipelines, canals, or pump stations conveying water across the mountains might become inoperable, making SWP deliveries to SCV Water and the other downstream contractors dependent on the supplies then available in the terminal reservoirs. This possible situation is a major concern, considering that nearly 50 percent of the Santa Clarita Valley’s current water supply is imported from the SWP. Although pipelines that traverse fault lines are reinforced, damage can still occur depending on the magnitude of the earthquake. Therefore, as identified in previous reliability plan updates, water banking opportunities south of the Tehachapi Mountains have a high value to SCV Water.

4.3 Catastrophic Interruption – Potential Outage Scenarios

The Valley is located approximately 20 miles southwest of the San Andreas Fault, which traverses the length of the southern San Joaquin Valley. A major earthquake along this portion of the San Andreas Fault could affect water supplies available to the Santa Clarita Valley. The California Division of Mines and Geology has stated that two of the aqueduct systems that import water to southern California (including the California Aqueduct) could be ruptured by displacement on the San Andreas Fault. The situation could be further complicated by physical damage to pumping equipment and local loss of electrical power.

DWR has an Aqueduct Outage Plan for restoring the California Aqueduct to service should a major break occur, which it estimates could take approximately four months to repair.

Limitations on supplies of groundwater and/or imported water for an extended period, due to power outages and/or equipment damage, could result in severe water shortages until the supplies could be restored.

Water storage within the Agency's service area totals approximately 190 million gallons (MG) of water in storage tanks, which can be gravity fed to Valley businesses and residences, even if there is a power outage. The public would be asked to reduce consumption to minimum health and safety levels, extending the supply to a minimum of seven days. This would provide sufficient time to restore a significant amount of groundwater production. After the groundwater supply is restored, the pumping capacity of the four retail purveyors could meet the reduced demand until such time that the imported water supply was reestablished.

The Valley's sources are generally of good quality, and no insurmountable problems resulting from industrial or agricultural contamination are foreseen. If contamination did result from a toxic spill or similar accident, the contamination would be isolated and should not significantly impact the total water supply. In addition, such an event would be covered by the purveyors' Emergency Response Plans.

4.3.1 SWP Emergency Outage Scenarios

In addition to earthquakes, the SWP could experience other emergency outage scenarios. Past examples include slippage of aqueduct side panels into the California Aqueduct near Patterson in the mid-1990s, the Arroyo Pasajero flood event in 1995 (which also destroyed part of Interstate 5 near Los Banos) and various subsidence repairs needed along the East Branch of the Aqueduct since the 1980s. More recently, DWR has taken the California Aqueduct temporarily out of service to repair the aqueduct liner in the San Joaquin Valley at mile post 62 and intermittent sections between mile posts 244 and 248. These repairs took place in Spring of 2018 and winter of 2016, respectively, and the Aqueduct was out of service for approximately six weeks. All these outages were short term in nature (on the order of weeks) and DWR's Operations and Maintenance Division worked diligently to devise methods to keep the Aqueduct in operation while repairs were made. Thus, the SWP contractors experienced no interruption in deliveries.

One of the SWP's important engineering design features is the ability to isolate parts of the system. The Aqueduct is divided into "pools." Thus, if one reservoir or portion of the California Aqueduct is damaged in some way, other portions of the system can still remain in operation. The principal SWP facilities are shown in Figure 4-1.

FIGURE 4-1
PRIMARY SWP FACILITIES

Other events could result in significant outages and potential interruption of service. Examples of possible nature-caused events include a levee breach in the Delta near the Harvey O. Banks Pumping Plant, a flood or earthquake event that severely damages the Aqueduct along its San Joaquin Valley traverse, or an earthquake event along either the West or East Branches. Such events could impact some or all SWP contractors south of the Delta.

The response of DWR, SCV Water, and other SWP contractors to such events would be highly dependent on the type and location of any such events. In typical SWP operations, water flowing through the Delta is diverted at the SWP's main pumping facility, located in the southern Delta, and is pumped into the California Aqueduct. During wet years (the relatively heavier runoff period in the winter and early spring), Delta diversions generally exceed SWP contractor demands and the excess is stored in San Luis Reservoir. Storage in SWP aqueduct terminal reservoirs, such as Pyramid and Castaic Lakes, is also refilled during this period. During the summer and fall, when diversions from the Delta are generally more limited and less than contractor demands, releases from San Luis Reservoir are used to make up the difference in deliveries to contractors. The SWP share of maximum storage capacity at San Luis Reservoir is 1,062,000 AF.

SCV receives its SWP deliveries through the West Branch of the California Aqueduct at Castaic Lake. The only other contractors receiving deliveries from the West Branch are the Metropolitan Water District of Southern California (Metropolitan) and the Ventura County Watershed Protection District (formerly known as the Ventura County Flood Control District). The West Branch has two terminal reservoirs, Pyramid Lake and Castaic Lake, that were designed to provide emergency storage and regulatory storage (i.e., storage to help meet peak summer deliveries) for SCV Water and the other two West Branch contractors. Maximum operating capacity at Pyramid and Castaic lakes is 171,200 and 323,700 AF, respectively.

In addition to SWP storage south of the Delta in San Luis and the terminal reservoirs, a number of contractors have stored water in groundwater banking programs in the San Joaquin Valley, and many also have surface and groundwater storage within their own service areas.

Three scenarios that could impact the delivery of SWP supply, previously banked supplies, or other supplies delivered to it through the California Aqueduct are described below. SCV Water's ability to meet demands during the worst of these scenarios is presented following the scenario descriptions.

4.3.1.1 Scenario 1: Emergency Freshwater Pathway

It has been estimated by DWR that in the event of a major earthquake in or near the Delta, water supplies could be interrupted for up to three years, posing a substantial risk to the California business economy. A post-event strategy has been coordinated through DWR, Corps of Engineers (Corps), Bureau of Reclamation (Reclamation), California Office of Emergency Services (Cal OES), Metropolitan, and the State Water Contractors.

Assuming that the Banks Pumping Plant would be out of service for six months, DWR could continue making at least some SWP deliveries to all southern California contractors from water stored in San Luis Reservoir. The water available for such deliveries would be dependent on the storage in San Luis Reservoir at the time the outage occurred and could be minimal if it occurred in the late summer or early fall when San Luis Reservoir storage is typically low. In addition to supplies from San Luis Reservoir, water from the West Branch terminal reservoirs would also be available to the three West Branch contractors, including SCV Water. SCV Water-water stored in groundwater banking programs in the San Joaquin Valley may also be available for withdrawal and delivery to the Agency.

4.3.1.2 Scenario 2: Complete Disruption of the California Aqueduct in the San Joaquin Valley

The 1995 flood event at Arroyo Pasajero demonstrated vulnerabilities of the California Aqueduct (the portion that traverses the San Joaquin Valley from San Luis Reservoir to Edmonston Pumping Plant). Should a similar flood event or an earthquake damage this portion of the aqueduct, deliveries from San Luis Reservoir could be interrupted for a period of time. DWR has informed the SWP contractors that a four-month outage could be expected in such an event.

Arroyo Pasajero is located downstream of San Luis Reservoir and upstream of the primary groundwater banking programs in the San Joaquin Valley. Assuming an outage at a location near Arroyo Pasajero that takes the California Aqueduct out of service for six months, supplies from San Luis Reservoir would not be available to those SWP contractors located downstream of that point. However, SCV Water's stored water in groundwater banking programs in the San Joaquin Valley could be withdrawn and delivered to the Agency, and water from the West Branch terminal reservoirs would also be available to the three West Branch contractors, including SCV Water. Assuming an outage at a location on the California Aqueduct south of the groundwater banking programs in the San Joaquin Valley, these supplies would not be available to the agency, but water from the West Branch terminal reservoirs would be available to the three West Branch contractors, including SCV Water.

4.3.1.3 Scenario 3: Complete Disruption of the West Branch of the California Aqueduct

The West Branch of the California Aqueduct begins at a bifurcation of the Aqueduct south of Edmonston Pumping Plant that pumps SWP water through and across the Tehachapi Mountains. From the point of bifurcation, the West Branch is an open canal through Quail Lake, a small flow regulation reservoir, to the Peace Valley Pipeline, which conveys water into Pyramid Lake. From Pyramid Lake, water is released into the Angeles Tunnel, through Castaic Powerplant into Elderberry Forebay, and then into Castaic Lake.

If a major earthquake (an event similar to or greater than the 1994 Northridge earthquake) were to damage a portion of the West Branch, deliveries could be interrupted. The exact location of such damage along the West Branch would be key to determining emergency operations by DWR and the three West Branch SWP contractors. A recent report by a joint DWR, Metropolitan, and Los Angeles Department of Water and Power (LADWP) Seismic Resilience Water Supply Task Force estimated that it could take 6 to 12 months to restore partial deliveries from the West Branch after a major earthquake (DWR, Metropolitan, LADWP, 2017).

For this scenario, it was assumed that the West Branch would suffer a break, and deliveries of water from north of the Tehachapi Mountains, including SWP water and SCV Water's water that is stored in groundwater banking programs in the San Joaquin Valley, would not be available. While at least partial deliveries could be available sooner, it was assumed for purposes of this Plan that deliveries through the West Branch would be disrupted for 12 months. However, it was assumed that Pyramid and Castaic dams would not be damaged by the event and that water in Pyramid and Castaic Lakes would be available to the three West Branch SWP contractors, including SCV Water.

In any of these three SWP emergency outage scenarios, DWR and the SWP contractors would coordinate operations to minimize supply disruptions. Depending on the particular outage scenario or outage location, some or all of the SWP contractors south of the Delta might be affected. But even among those contractors, potential impacts would differ, given each contractor's specific mix of other supplies and available storage. During past SWP outages, the SWP contractors have worked cooperatively to minimize supply impacts among all contractors. Past examples of such cooperation have included certain SWP contractors agreeing to rely more heavily on alternate supplies, allowing more of the outage-limited SWP supply to be delivered to other contractors, and exchanges among SWP contractors, allowing delivery of one contractor's SWP or other water to another contractor, with that water being returned after the outage was over.

4.3.1.4 Assessment of Worst-Case Scenario

Of these three SWP outage scenarios, the West Branch outage scenario presents the worst-case scenario for the SCV Water service area. In this scenario, SCV Water and the purveyors would rely on local supplies and water available to the Agency from Pyramid and Castaic Lakes. An assessment of the supplies available to meet demands in SCV Water's service area during a 12-month West Branch outage and the additional levels of conservation and/or emergency storage projected to be needed are presented in Table 4-1 for 2025 through 2050.

During an outage, the local supplies available would consist of groundwater from the Alluvial Aquifer and the Saugus Formation, as well as recycled water to the extent available. It was assumed that local well production would be unimpaired by the outage and that the outage would occur during a year when average/normal supplies would be available from the Alluvial Aquifer. Pumping from the Saugus Formation was assumed to be equivalent to the higher pumping planned for a single-dry year. Note that adequate well and aquifer capacity exists to pump at levels higher than those assumed in this assessment, particularly during a temporary period such as an outage. However, to be conservative, groundwater production was assumed to be the planned annual supplies. Furthermore, based on the assumption that additional voluntary and/or mandatory conservation could reduce the amount of waste discharge, and therefore, reduce the amount of recycled water produced by the WRPs, the amount of recycled water potentially available for non-potable use is assumed to be at least 25 percent less than during normal conditions.

The water available to SCV Water from Pyramid and Castaic Lakes includes flexible storage available to the Agency at Castaic Lake and emergency and potentially regulatory storage available in both Pyramid and Castaic Lakes. Regulatory storage, which is used to help meet high peak summer deliveries, may or may not be available depending on what time of year an outage occurs. For this assessment, regulatory storage was assumed to be unavailable. The amount of emergency storage assumed to be available to the Agency was based on its proportionate share of usable storage in each reservoir, where usable storage is maximum operating storage and less regulatory and dead pool storage. At Castaic Lake, this usable storage determination also excludes the three West Branch contractors' total Flexible Storage Accounts. SCV Water's proportionate share of usable storage was assumed to be slightly less than three percent, based on its share of capital cost repayment at each reservoir. On this cost repayment basis, the proportionate shares of Metropolitan and Ventura County Watershed Protection District are about 96 percent and one percent, respectively.

As shown in Table 4-1, for a 12-month emergency outage, supply projections would not meet the projected demands. Supply shortfalls in such an emergency would need to be met with additional conservation (beyond the levels of conservation already planned for). As evidenced during the recent drought, these levels of additional conservation may be readily achievable, particularly during an emergency such as this.

In an emergency outage such as this, there is the potential that cooperation among SWP contractors and/or temporarily increased local groundwater production could increase supplies and reduce any supply shortfalls.

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TABLE 4-1
PROJECTED SUPPLIES AND DEMANDS DURING TWELVE MONTHS DISRUPTION OF IMPORTED SUPPLY (AF)[(a)]

	2025	2030	2035	2040	2045	2050
Existing Supplies						
Existing Groundwater						
Alluvial Aquifer(b)	8,900	8,180	7,300	7,300	7,300	7,300
Saugus Formation(c)	17,880	17,880	17,880	17,880	17,880	17,880
Recycled Water(d)(e)	338	338	338	338	338	338
Planned Supplies						
Future and Recovered Groundwater						
Alluvial Aquifer(b)	12,530	19,870	23,490	23,490	23,490	23,490
Saugus Formation(c)	9,090	15,920	15,920	15,920	15,920	15,920
Recycled Water(d)(e)	1,387	2,772	3,818	4,874	5,624	6,383
Total Existing and Planned Supplies	50,125	64,960	68,746	69,802	70,552	71,311
SWP West Branch Storage Available						
Flexible Storage Accounts (f)	6,060	4,680	4,680	4,680	4,680	4,680
Emergency Storage						
Pyramid Lake(g)	4,370	4,370	4,370	4,370	4,370	4,370
Castaic Lake(h)	3,370	3,370	3,370	3,370	3,370	3,370
Total West Branch Storage	13,800	12,420	12,420	12,420	12,420	12,420
Total Supplies and West Branch Storage	63,925	77,380	81,166	82,222	82,972	83,731

Demands(i)						
Demand w/ Plumbing Code Savings and Active Conservation	76,400	81,700	88,700	93,600	97,500	101,000
Additional Conservation Required	12,475	4,320	7,534	11,378	14,528	17,269
Additional Conservation as Percent of Demand	16%	5%	8%	12%	15%	17%

Notes:

(a) Assumes complete disruption in SWP supplies and in deliveries through the California Aqueduct for 12 months.
(b) From Table 4-9 of the 2020 UWMP.
(c) From Table 4-10 of the 2020 UWMP.
(d) Based on Table 5-2 of the 2020 UWMP.
(e) Assumes 25% reduction in waste discharge, and therefore in recycled water availability, due to additional voluntary conservation.
(f) Includes both SCV Water and Ventura County entities flexible storage accounts. Extended term of agreement with the Ventura County entities expires after 2025.
(g) SCV Water's share of usable storage at Pyramid Lake, based on its 2.817% proportionate share of capital cost repayment of the reservoir, and assumed usable storage of 155,100 AF.
(h) SCV Water's share of usable storage at Castaic Lake, based on its 2.927% proportionate share of capital cost repayment of the reservoir, and assumed usable storage of 115,100 AF.
(i) From Table 2-10 of the 2020 UWMP

4.4 Recommendations for Extended Outage Emergency Storage

The various outage scenarios highlight the benefit of SCV Water having water stored in multiple banking programs south of the Delta. Banking programs located in Kern County, which have access to the California Aqueduct, are ideally suited to meet at least part of SCV Water's emergency needs. The worst-case scenario described above (a complete disruption on the West Branch of the aqueduct during an extended outage) demonstrates the desirability that SCV Water also has water stored in at least one water banking program geographically located south of the Tehachapi Mountains.

Alternatives for storage located south of the Tehachapi Mountains could involve an exchange with another West Branch contractor so that the contractor could be served from SCV Water's banked water and the Agency could be served by a portion of the contractor's water in Pyramid or Castaic Lake (in addition to SCV Water's existing Flexible Storage Account in Castaic Lake and West Branch emergency storage).

The most likely and utilizable arrangement would be with Metropolitan, which pays for a significant portion of the storage capacity in Castaic Lake. SCV Water could store varying amounts of its water in groundwater storage or banking programs within or adjacent to Metropolitan's service area. In the event of an outage or other emergency, Metropolitan would serve its customers with the Agency's stored water, and SCV Water would serve its customers with a like amount of Metropolitan's water in Castaic Lake.

In addition to exchange arrangements with others, potential projects within the SCV Water service area have been explored. SCV Water prepared the Water Resources Reconnaissance Study (Study) (Carollo, 2015). The Study evaluated a series of supply measures that could provide an additional 10,000 AFY of supply to the service area. The study identified two measures that might be able to go at least part way to that goal: (1) an imported water injection project during wet years to augment Saugus formation groundwater storage; and (2) a groundwater recharge project using recycled water. Both projects would be located south of the Tehachapi Mountains and so would provide an added benefit of supply availability in an emergency. Both projects were evaluated at the conceptual level, but significantly more investigation would need to be completed before either would be implemented.

Potential banking programs, in which SCV Water could be served by a portion of the contractor's water in Pyramid or Castaic Lake for a potential exchange of emergency outage storage, or which could be located within SCV Water's service area, include the following:

- **Willow Springs Water Bank, Antelope Valley:** This project is located in eastern Kern County, in the northern portion of the Antelope Valley. It is adjacent to both the East Branch of the California Aqueduct and the Los Angeles Aqueduct. This program is active and is seeking participants.

- **Antelope Valley-East Kern Water Agency High Desert Water Bank:** This is a project proposed by AVEK, an SWP wholesaler located in the Antelope Valley area of southeastern Kern County and northern Los Angeles County. The proposed groundwater banking project would be developed and operated by AVEK and would be located adjacent to the East Branch of the California Aqueduct. AVEK is actively seeking banking partners for Phase 2 of their water banking program. The preliminary Phase 2 program gives SCV Water options for up to 80,000 AF of storage and up to 20,000 AF of recovery capacity. The Phase 2 project is contemplating a direct connection to the West Branch of the California Aqueduct.
- **Saugus Formation Aquifer Storage and Recovery (ASR) Program:** The feasibility of implementing an ASR program in the Saugus Formation has been evaluated through field testing and groundwater modeling simulations. Reconnaissance-level analysis indicates that such a program is feasible. In addition to water reliability benefits, a Saugus ASR program could provide other operational benefits (e.g., higher groundwater levels) and local storage.

4.5 Recommendations for Short-Term Emergency and Operational Storage

SCV Water recently evaluated local short-term emergency and operational storage requirements to sustain deliveries for a seven-day period. In 2013, a hydraulic modeling and system evaluation study was completed to analyze the Agency's distribution system and determine capital improvement projects necessary to mitigate existing and future system deficiencies and improve system operations. The 2013 report recommended further studies be conducted to evaluate both emergency and operational storage requirements and assist with siting and preliminary design of required storage reservoirs.

In 2017, an emergency and operational storage study was completed based on the 2013 hydraulic system report, and others, with input from the purveyors and local landowners. The goals of the study were to identify emergency storage requirements, identify sites for storage facilities, and develop conceptual facility layouts and preliminary costs. The primary vulnerabilities that formed the basis of the evaluation included earthquakes (including liquefaction and landslides) and streambed scour (from Santa Clara River and tributaries and flooding events).

The study identified five emergency storage zones within SCV Water's service area, shown in Figure 4-2.

FIGURE 4-2
EMERGENCY STORAGE AREAS

Within each storage zone, an assessment of how much supply would be necessary to sustain a seven-day demand period was calculated; demands were based on the 2015 UWMP and assumed that irrigation and other non-essential water uses would be prohibited (i.e., non-interruptible demand). Demands that could not be met by local groundwater pumping by the purveyors would then be served by the identified emergency storage facilities located within each emergency zone. Table 4-2 shows the results of the study, which identifies the current SCV Water storage capability within each zone, the additional near-term storage needed, and the storage needed by 2050. Overall, it shows that SCV Water must make investments in storage projects (reservoirs and pump stations) to increase SCV Water's existing storage within the service area of 47 MG by 58.5 MG for an Agency total of 105.5 MG of storage by 2050[3]. The total cost for the additional facilities (in 2017 dollars) is projected to range from $38 million to $57 million.

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[3] In addition to SCV Water's existing storage of 47 MG, the Agency also maintains storage in the SCV Water service area. The existing service area storage of SCV Water totals approximately 190 MG.

TABLE 4-2
EMERGENCY AND OPERATIONAL STORAGE STUDY RESULTS

Storage Zone	Existing Storage (MG)	Additional Near-Term Storage (MG)	Additional Storage Year 2050 (MG)	Total Storage in Year 2050 (MG)
Earl Schmidt Filtration Plant (A)	10	0	2	12
Magic Mountain (B)	0	12.5	13	25.5
Rio Vista Water Treatment Plant (C)	30	0	4	34
Southern Service Area (D)	0	12	3	15
Sand Canyon (E)	7	7	5	19
Total	**47**	**31.5**	**27**	**105.5**

An update to the emergency and operational storage is planned for in the next several years, which will include an evaluation that includes purveyor facilities in addition to the regional/import system.

4.6 Regional Power Outage Scenarios

For a major emergency such as an earthquake, Southern California Edison (Edison) has declared that in the event of an outage, power would be restored within a 24-hour period. Following the Northridge earthquake, Edison was able to restore power within 19 hours. Edison experienced extensive damage to several key power stations, yet was still able to recover within a 24-hour timeframe.

To specifically address the concern of water outages due to loss of power, SCV Water has equipped its two treatment plants with generators to produce power for treating water to comply with the California Safe Drinking Water Act and the Health and Safety Code. The Rio Vista Water Treatment Plant and Intake Pump Station emergency generator system provides electrical power to treat 30 million gallons per day (MGD) for 72 hours without fuel replacement. The Earl Schmidt Filtration Plant emergency generator system provides electrical power to treat 33 MGD for 72 hours without fuel replacement.

In addition, SCV Water maintains multiple mobile generators with capacities that provide the capability to run any facility within SCV Water's service area. All primary pumping facilities are equipped with emergency transfer switches, and all employees are trained regularly to maximize the speed to install and operate the generators. The generator run time is only limited by the amount of available diesel fuel.

Additionally, SCV Water has multiple aboveground diesel fuel storage tanks. Multiple crew trucks are equipped with diesel tanks and the necessary fueling equipment to refill the generators. The Agency would respond to power outages on a prioritized basis and would continue its response to the power emergency as long as necessary. In addition to the generators, SCV Water has gasdriven pumps and diesel-driven pumps capable of delivering water when needed. All pumping facilities have been equipped with the necessary appurtenances to quickly connect the portable pumps to restore pumping operations.

The Agency conducts annual preparedness activities, which include the mobilization and operations of certain emergency equipment. The Agency also has emergency contractors available to both transport and fuel equipment.

5. RELIABILITY RECOMMENDATIONS

5.1 Summary of Supply Reliability Analysis

This Plan includes evaluation of six scenarios, each run twice: 1) using demand with active conservation; and 2) using demand without active conservation. As discussed in Section 3, scenarios are described generally as follows:

- **Base Scenario:** Represents those elements of the SCV Water portfolio that currently exist. As the analysis moves through the study period, restoration of well capacity temporarily taken out for water quality concerns takes place consistent with Tables 2-4 B, 2-4 C, 2-5 B and 2-5 C well case containing the existing and restored groundwater supplies. Imported supplies include SWP supplies based on 2040 climate conditions pursuant to DWR's CalSim modeling for the 2019 Delivery Capability Report, the firm Buena Vista Rosedale Transfer, and if necessary, in dry years, SWP Flexible Storage, Nickel Water, and Yuba Accord water. The Base case also includes the existing banking programs, specifically, the existing Rosedale Banking supplies at the existing 10,000 AFY of recovery, SCV Water Semitropic and access to the Newhall Land and Farming withdrawal capacity, that are drawn on during years when the other previously mentioned supplies are insufficient to meet demands.
- **Scenario 1:** Represents the supplies used in this UWMP's reliability analysis. It builds on the Base scenarios by adding additional Saugus Formation pumping capacity for use in dry periods and developing an additional 10,000 AFY of extraction capacity under the existing water banking agreement with RRBWSD.
- **Scenario 2:** Similar to Scenario 1, but the dry supply from Saugus Formation Wells 5 through 8 is replaced with participation in the AVEK's High Desert Water Bank.
- **Scenario 3:** Similarly replaces Saugus Formation Wells 5 through 8 with participation in the Sites Reservoir.
- **Scenario 4:** Assumes all of the new Saugus Formation Wells 3 through 8 are not constructed and replaced with a combination of Sites Reservoir and the AVEK High Desert Water Bank.
- **Scenario 5:** Like Scenario 4, assumes no new Saugus Formation Wells and also eliminates the new recovery capacity from the Rosedale banking program. It replaces these with the AVEK High Desert Bank and Sites Reservoir, as well as the participation in the McMullin Aquaterra Water Bank.

The demand and supply assumptions included in each scenario are summarized in Table 3-1. Besides the base scenario, each of the other scenarios provides a different pathway to achieving reliability. A summary of the results of the supply analysis, which is presented in more detail in Section 3, is shown in Table 5-1.

As shown in the analyses above, SCV Water has adequate existing and planned supplies to meet SCV Water service area demands throughout the 30-year planning period. Furthermore, SCV Water has alternative paths to reliability should planned supplies prove not to be viable.

TABLE 5-1
SUMMARY OF SUPPLY RELIABILITY RESULTS

	2021	2030	2040	2050	2060
BASE SCENARIO					
Without Active Conservation					
Reliability (%)	94	90	88	71	69
Supply Shortfall (AF)					
- @ 95% Reliability	500	1,700	8,200	19,200	21,900
- Maximum	1,800	7,400	12,300	29,600	37,100
With Active Conservation					
Reliability (%)	100	100	100	93	88
Supply Shortfall (AF)					
- @ 95% Reliability	0	0	0	2,400	7,300
- Maximum	0	0	0	6,800	10,100
SCENARIO 1					
Without Active Conservation					
Reliability (%)	94	100	98	90	84
Supply Shortfall (AF)					
- @ 95% Reliability	500	0	0	1,600	14,200
- Maximum	1,800	0	400	12,800	22,200
With Active Conservation					
Reliability (%)	100	100	100	100	98
Supply Shortfall (AF)					
- @ 95% Reliability	0	0	0	0	0
- Maximum	0	0	0	0	100
SCENARIO 2					
Without Active Conservation					
Reliability (%)	94	100	100	96	95
Supply Shortfall (AF)					
- @ 95% Reliability	500	0	0	0	0
- Maximum	1,800	0	0	9,700	34,400
With Active Conservation					
Reliability (%)	100	100	100	100	100
Supply Shortfall (AF)					
- @ 95% Reliability	0	0	0	0	0
- Maximum	0	0	0	0	0

	2021	2030	2040	2050	2060
SCENARIO 3					
Without Active Conservation					
Reliability (%)	94	100	100	98	95
Supply Shortfall (AF)					
- @ 95% Reliability	500	0	0	0	0
- Maximum	1,800	0	0	8,100	28,100
With Active Conservation					
Reliability (%)	100	100	100	100	100
Supply Shortfall (AF)					
- @ 95% Reliability	0	0	0	0	0
- Maximum	0	0	0	0	0
SCENARIO 4					
Without Active Conservation					
Reliability (%)	94	100	100	98	96
Supply Shortfall (AF)					
- @ 95% Reliability	500	0	0	0	0
- Maximum	1,800	0	0	8,700	13,400
With Active Conservation					
Reliability (%)	100	100	100	100	100
Supply Shortfall (AF)					
- @ 95% Reliability	0	0	0	0	0
- Maximum	0	0	0	0	0
SCENARIO 5					
Without Active Conservation					
Reliability (%)	94	100	100	100	98
Supply Shortfall (AF)					
- @ 95% Reliability	500	0	0	0	0
- Maximum	1,800	0	0	0	23,400
With Active Conservation					
Reliability (%)	100	100	100	100	100
Supply Shortfall (AF)					
- @ 95% Reliability	0	0	0	0	0
- Maximum	0	0	0	0	0

5.2 Summary of Physical Reliability Considerations

As discussed in Section 4, the reliability of the overall water supply is dependent on the physical reliability of the water delivery system, including SWP facilities used to pump, store, and convey SWP and other imported supplies and SCV Water and purveyor facilities to treat, pump, and distribute supplies. Supply delivery can be interrupted or constrained in a number of ways, such as due to Delta levee failure or other disruption of Delta exports, earthquake-caused facility damage, subsidence-related capacity impacts, or extended or more frequent facility outages required to maintain aging infrastructure.

The assessment in Section 4.3 shows that in the event of a 12-month outage of SWP facilities, including a complete disruption of the West Branch of the California Aqueduct, service area demands can be met with local supplies (groundwater and recycled water) and West Branch storage (SWP flexible storage in Castaic Lake and emergency storage in Pyramid and Castaic Lakes) through 2030.

To help ensure that SWP flexible storage is indeed available for use in an emergency outage, it is recommended that all or a portion of SWP flexible storage be reserved for emergency use. Reserving all of this storage for emergency use may result in moving up in time by about five years any need for additional dry-year supply. However, this emergency storage would be located close to the service area and easily accessible. It could provide a benefit now, but could prove to be necessary later in the study period to meet demands during an extended outage.

To better quantify emergency storage needs during an extended outage, it is recommended that SCV Water undertake a further analysis of such storage. While this Plan includes an assessment based on certain assumptions, it would be advisable to evaluate in more detail what the range of potential needs are and establish goals and/or criteria to quantify emergency storage needs (e.g., duration of outage to plan for, acceptable level of additional conservation, etc.).

As shown in the supply reliability analysis, additional dry-year supplies may be needed depending on how the supply situation evolves. The potential for SWP facility disruptions is likely to increase as the SWP continues to age. Therefore, an important consideration in any new programs pursued should be location, with preference given to programs located within the SCV Water service area, or at least south of the Tehachapi Mountains.

5.3 Recommendations

As noted above, there are multiple pathways to achieving the 95 percent reliability goal. As in any planning analysis, a number of assumptions have been made regarding projected demands and the availability of various supplies. The future may very well evolve somewhat differently than assumed, but will hopefully lie somewhere within the bounds of the scenarios analyzed. However, conditions should continue to be monitored, and water supply reliability should be reassessed as changing conditions, such as updated SWP reliability analyses that incorporate differing climate change assumptions or different Delta regulatory constraints, warrant. Additionally, further analysis to determine the benefits and drawbacks of each new supply program is recommended so that the Agency is better informed when faced with making decisions regarding future investments.

Based on the water supply reliability analysis with demand under active conservation and a 95 percent reliability goal and on physical reliability considerations, the following recommendations are made:

Near Term (through 2040)

Supply Reliability

- The results indicate that current supplies along with active conservation would be sufficient until 2040. However, this assumes no safety margin if a supply disruption were to occur, such as supply impacts from PFAS contamination. Accordingly, SCV Water should consider accelerating implantation of programs necessary to achieve longer-term reliability as discussed below.

Physical Reliability

- *Emergency storage for extended outage:*
    - Reserve use of SWP flexible storage for emergency storage (rather than for dry-year supply); and
    - Pursue further analysis of emergency storage to establish criteria for and better quantify near and long-term storage needs.

Longer Term (2040 through 2060)

Supply reliability

As noted previously, there are multiple pathways to achieving long-term reliability, as demonstrated in Scenarios 1 through 5. SCV Water will have to make decisions in the near term on future supply investments that will ensure that the Agency continues to be able to provide a reliable water supply portfolio. Consistent with the discussion above, these scenarios do not contain a safety margin for unforeseen supply disruptions, such as groundwater contamination impacts recently experienced by SCV Water. The resource mixes evaluated in each scenario are described below:

- Scenario 1 represents the supplies used in the 2020 UWMP's reliability analysis. It builds on SCV Water's base supplies by adding additional Saugus Formation pumping capacity, through Saugus Wells 3 through 8, for use in dry periods, and developing an additional 10,000 AFY of extraction capacity under the existing water banking agreement with RRBWSD. One of the perceived risks to achieving reliability with Scenario 1 is the extent to which new Saugus Formation wells can be permitted and installed. As noted previously, permitting of Saugus 3 and 4 is currently delayed, pending permitting by DDW as it relates to proximity to abandoned oil wells. If the current sites prove not to be viable, the most likely course of action would be to relocate these proposed wells. If replacement well sites cannot be located, or if Saugus Pumping is limited because of potential subsidence, there are alternative paths to reliability, as demonstrated by Scenarios 2 through 5.
- Scenario 2 achieves reliability through the addition of Saugus Wells 3 and 4 only, additional extraction capacity of 10,000 AFY with RRBWSD, and participation in the AVEK High Desert Bank.

- Scenario 3 achieves reliability through the addition of Saugus Wells 3 and 4 only, additional extraction capacity of 10,000 AFY with RRBWSD, and participation in Sites Reservoir.
- Scenario 4 is more challenging as it assumes the further deletion of Saugus Wells 3 and 4. This scenario requires additional extraction capacity of 10,000 AFY from RRBWSD and additional investments in the AVEK bank along with Sites Reservoir to achieve reliability.
- Scenario 5 is similar to Scenario 4 in that none of the Saugus Wells 3 through 8 are constructed. This scenario assumes that no additional extraction capacity from RRBWSD is made and instead, investments in Sites Reservoir, the AVEK bank, and the McMullin GSA Aquaterra Bank are made to achieve reliability.

Physical reliability

- *Location of new dry-year supply program(s):* For any new storage programs pursued, look first to programs located within SCV Water's service area or at least south of the Tehachapi Mountains.
- *Emergency storage for extended outage:* Reserve use of SWP flexible storage for emergency storage (rather than for dry-year supply). Consider up-sizing any new local or near-local storage programs to include storage reserved for emergency storage.

REFERENCES

CLWA et al., 2015. Santa Clarita Valley 2015 Urban Water Management Plan.

Castaic Lake Water Agency. 2003. Water Supply Reliability Plan Update, prepared by Kennedy/Jenks Consultants.

Castaic Lake Water Agency. 2009. Water Supply Reliability Plan Update, prepared by Kennedy/Jenks Consultants.

Castaic Lake Water Agency. 2011. Water Supply Reliability Plan Update, prepared by Kennedy/Jenks Consultants.

Castaic Lake Water Agency. 2017. Water Supply Reliability Plan Update, prepared by Kennedy/Jenks Consultants.

DWR. The State Water Project Delivery Reliability Report. 2019. State of California. Department of Water Resources.

DWR, MWD, LADWP. 2017. Seismic Resilience Water Supply Task Force; Presentation to the OME Committee Meeting. September 2017.

Farr et al. 2016. Progress Report: Subsidence in California, March 2015 - September 2016. Available at: http://www.water.ca.gov/waterconditions/docs/2017/JPL%20subsidence%20report%20final%20for%20public%20dec%202016.pdf

GSI Water Solutions, Inc. 2020. Water Budget Development for the Santa Clara River Valley East Groundwater Subbasin, Draft Technical Memorandum. Available at: https://yourscvwater.com/uwmp/

Kennedy/Jenks Consultants. 2021. Santa Clarita Valley Water Agency Groundwater Treatment Implementation Plan. April.

Kennedy/Jenks Consultants. 2016a. Recycled Water Master Plan Update.

Luhdorff & Scalmanini (LSC) and GSI Water Solutions. August 2009. Analysis of Groundwater Supplies and Groundwater Basin Yield, Upper Santa Clara River Groundwater Basin, East Subbasin

Maddaus Water Management (MWM), Inc. 2021. Draft 2021 SCV Demand Study: Land-Use Based Demand Forecast Analysis. April.

SCV Water et al., 2020. Santa Clarita Valley 2020 Urban Water Management Plan.

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APPENDIX A
SCV Water - Water Operations Model Description

APPENDIX B
Additional Reliability Results

APPENDIX C
Groundwater Treatment Implementation Plan Memorandum

APPENDIX A

Santa Clarita Valley Water Agency Water Operations Model

General Methodology

An analytic spreadsheet model ("Model") developed for CLWA by MBK Engineers and updated by Geosyntec Consultants for SCV Water was used in this analysis to update SCV Water's Reliability Plan. The Model performs annual water operations for the SCV Water service area over a specified study period, using demands as they are projected to increase over the study period and, to reflect the uncertainty in the hydrology over the study period, using supplies that would be available under multiple hydrologic sequences. For each hydrologic sequence, the Model steps through each year of the study period, comparing annual supplies to demands and operating SCV Water storage programs as needed, adding to storage in years when supplies exceed demand and withdrawing from storage when demand exceeds supplies. Results from the multiple hydrologic sequences are then compiled and summarized to provide a statistical assessment of the reliability of SCV Water's supplies and storage programs to meet its projected demands over the study period.

Hydrologic Variability

Of the many factors affecting this reliability assessment, the factor with the greatest degree of variability and with the largest impact on supplies (and to a lesser degree, demands) is hydrology. Hydrology in northern California significantly affects the availability of SWP supplies; local hydrology affects the availability of Alluvial groundwater supplies (as well as demands); and dry-year reductions in SWP supplies affect the need for additional Saugus groundwater pumping.

The SWP supply data used in this analysis are based on the results of SWP modeling studies conducted by DWR using CalSim, a computer model that simulates monthly operations of the SWP and CVP systems. Among other model inputs, CalSim uses hydrologic inflows to the model based on 82 years of historical monthly inflows from 1922 through 2003, adjusted to reflect current levels of development in the supply source areas. All CalSim studies used in this analysis also reflect changes to temperature and precipitation centered around 2035 (2020 to 2049) and a 45-cm sea level rise.

CalSim studies are essentially a "snapshot-in-time" type of analysis. That type of study uses a fixed set of facilities, operating requirements/constraints, and water demands, operated over a number of years using historical hydrology. The resulting supply deliveries from a CalSim study provide an indication of the potential supply reliability of the SWP system, as that system is assumed to exist and be operating at a given point in time. However, for this Reliability Plan analysis, what is desired is potential supplies over a study period (i.e., the 40-year period from 2021 through 2060) with conditions such as demands, supplies, and storage programs changing over the study period.

To reflect the potential variability in hydrology over the study period, for this analysis, a number of hydrologic sequences are used, based on the same historical hydrologic period used in the CalSim studies. Based upon the 82 years of hydrologic record used in CalSim, a series of 82 hydrologic "traces" is used. Each trace consists of 30 years of sequential hydrology, with the beginning year of each trace lagging the beginning year of the previous trace by one year. For example, the first trace begins with 1922 hydrology assumed for year 2021, 1923 hydrology for 2022, etc., through 1961 hydrology for 2060. The hydrology is shifted by one year for the second trace, beginning with 1923 hydrology for 2021, 1924 hydrology for 2022, etc., through 1962 hydrology for 2060. This one-year shift continues until the end of the hydrologic period (2003) is reached, where the data begins "wrapping" back to 1922 hydrology. The end result of this process is 82 traces of hydrology.

Each hydrologic trace is used to analyze SCV Water's supply and demand performance over the study period – in other words, if that sequence of hydrology were to occur again, how adequate would the supplies associated with that hydrology and the storage programs in place be in meeting demands over the study period? Study period results from each of the 82 hydrologic traces are then compiled and summarized and are used to provide a statistical assessment of the reliability of SCV Water's supplies and storage programs to meet its projected demands over the study period.

SCV Water – Water Operations

Demand and Supplies

As mentioned above, the SCV Water model performs annual water operations for the SCV Water service area over a specified study period, using demands as they are projected to increase over the study period and using supplies that would be available under the multiple hydrologic traces described above. For each hydrologic trace analyzed, the model steps through each year of the study period, comparing annual supplies to demands. Input to the model allows demands and supplies to change during the study period, so specific input data for these parameters is entered for each year during the study period.

The annual supplies included in the model to meet demands in the SCV Water service area are: groundwater (both Alluvial and Saugus); recycled water; SWP water; and Buena Vista-Rosedale water. The availability of some of these supplies is projected to increase over the study period (i.e., recycled water and municipal groundwater use), while other supplies are either constant each year (Buena Vista-Rosedale water), or are assumed to be independent of year during the study period (i.e., SWP water). Data input to the model is for normal-year conditions over the study period.

In addition to changes over time, some supplies are also affected by hydrology (i.e., groundwater and SWP water). Hydrologic effects are incorporated into the model through use of the 82 hydrologic traces described above. In the case of groundwater, for example, when a dry year occurs in the local watershed in a particular hydrologic trace, Alluvial pumping is assumed to decrease from normal-year pumping amounts. In contrast, Saugus pumping does not necessarily increase at the same time, because its pumping is tied to hydrology in northern California and the availability of SWP supplies. SWP supplies are taken directly from CalSim model results for each year in the hydrologic trace.

Similarly, demands in the SCV Water service area are assumed to increase over the study period, and projected normal-year demands are input into the model. Demands are also affected by local weather, with lower or higher than normal demands occurring when local conditions are either wet or dry, respectively. As with supplies, the hydrologic effects on demands are incorporated into the model through the use of the 82 hydrologic traces. When a dry year occurs in a particular hydrologic trace, demand is increased from normal-year amounts, and in a wet year is reduced.

The demand and supply parameters included in the SCV Water model and whether they are assumed to change over time or be affected by hydrology are summarized in Table A-1.

Storage Programs

As mentioned previously, the annual water operations included in SCV Water's model also include operation of its storage programs. For each hydrologic trace analyzed, the model steps through each year of the study period, comparing annual supplies to demands and operating SCV Water storage programs as needed over the study period, adding to storage in years when supplies exceed demand and withdrawing from that storage when demand exceeds supplies. The model keeps track throughout the study period of the amount of water stored within each program, beginning with a starting storage amount, and then adding to and subtracting from storage as it operates the programs over the study period. Input to the SCV Water model includes storage and capacity data for each storage program, including: beginning (2021) storage; total storage capacity; capacity for annual additions to storage ("put" capacity); and capacity of annual withdrawals ("take" capacity). The capacities are entered for each year during the study period, and so can easily reflect planned changes to programs, such as a planned increase in take capacity, or a program that begins or ends at some point during the study period.

The storage programs in the SCV Water model include: SWP flexible storage; SWP carryover in San Luis Reservoir; Rosedale-Rio Bravo Banking Program; Semitropic Banking Program; and Semitropic – Newhall Land Banking Program; potential participation Antelope Valley East Kern Banking Program; and potential participation in the Aquaterra Banking Program. Exchanges, which are essentially a form of storage program, include the Antelope Valley East Kern Exchange and the United Water Conservation District Exchange. In addition to these programs, the model also includes dry-year supplies available for purchase under the Yuba Accord and Nickel Water and potential participation in Sites Reservoir. In addition to these identified programs, the model includes placeholders for new banking programs and for new exchanges.

The priorities for use of these programs in any year when there is a surplus or shortfall in supplies is identified in Table A-2. In a year when total annual supplies exceed demand, the model adds the surplus supply to these storage programs, within the capacity constraints identified in model input. The model starts with the first program listed in Table A-2 under Supply Surplus and adds the surplus (up to that program's put capacity) to storage in that program (up to the program's total storage capacity). Any remaining surplus supply is added to the second program, and so on, until all the supply is stored or there are no more programs in which to store it. Conversely, in a year when total annual supplies are less than the demand, the model withdraws the shortfall from available storage programs. The model starts with the first program listed in Table A-2 under Supply Shortfall and withdraws the shortfall (up to that program's take capacity) from any available storage in that program. Any remaining shortfall is withdrawn from the second program, and so on, until the shortfall is eliminated or there are no more programs to draw from. Any remaining annual supply surplus or shortfall is tracked in the model and totaled over the study period, and those totals are then used to assess system performance and reliability.

Assumptions Used in this Reliability Plan

For this Reliability Plan update, the study period analyzed is 2021 through 2060 (ten years after year of development buildout in the service area assumed in the 2020 UWMP). Six scenarios were evaluated, each run twice: 1) using demand with active conservation; and 2) using demand without active conservation. The scenarios are described generally as follows:

- **Base Scenario:** Represents those elements of the SCV Water portfolio that currently exist. As the analysis moves through the study period, restoration of well capacity temporarily taken out for water quality concerns takes place consistent with 2020 UWMP Tables 4-7B, 4-7C, 4-8B, and 4-8C well case containing the existing and restored groundwater supplies. Imported supplies include SWP supplies based on 2040 climate conditions pursuant to DWR's CalSim modeling for the 2019 Delivery Capability Report, the firm Buena Vista Rosedale Transfer, and if necessary, in dry years, SWP Flexible Storage, Nickel Water, and Yuba Accord water. The Base case also includes the existing banking programs, specifically, existing Rosedale Banking supplies at the existing 10,000 AFY of recovery, SCV Water Semitropic, and access to the Newhall Land and Farming withdrawal capacity, that are drawn on during years when the other previously mentioned supplies are insufficient to meet demands.
- **Scenario 1:** Represents the supplies used in the 2020 UWMP's reliability analysis. It builds on the Base scenarios by adding additional Saugus Formation pumping capacity for use in dry periods and developing an additional 10,000 AFY of extraction capacity under the existing water banking agreement with the Rosedale Rio-Bravo Water Storage District.
- **Scenario 2:** Similar to Scenario 1, but the dry supply from Saugus Formation Wells 5 through 8 is replaced with participation in the AVEK's High Desert Water Bank.
- **Scenario 3:** Similarly, replaces Saugus Formation Wells 5 through 8 with participation in the Sites Reservoir.
- **Scenario 4:** Assumes all of the new Saugus Formation Wells 3 through 8 are not constructed and replaced with a combination of Sites Reservoir and the AVEK High Desert Water Bank.
- **Scenario 5:** Like Scenario 4, assumes no new Saugus Formation Wells and also eliminates the new recovery capacity from the Rosedale banking program. It replaces these with the

AVEK High Desert Bank and Sites Reservoir, as well as the participation in the McMullin Aquaterra Water Bank.

See Table A-3 for more details on specific assumptions included in each scenario.

Approach Used in this Reliability Plan

The approach used in this Reliability Plan is similar to the 2017 update of the Reliability Plan. This approach retains the exact same wet and dry periods that occurred during the 82-year period of hydrologic record, with the effect of those periods on SWP deliveries taken directly from CalSim model runs. It is not reliant on how well a regression analysis reflects hydrologic wet or dry periods or their effects on SWP deliveries. In this Reliability Plan update, six different scenarios are analyzed, each of which is based on a different CalSim model run. Under the previous approach, this would have required a separate regression analysis for each scenario.

Since the first Reliability Plan was prepared in 2003 (for formerly CLWA), the length of the hydrologic record used in CalSim has increased from 73 years to 82 years of hydrologic record. Under the approach used in this Reliability Plan update, the longer the hydrologic record used in CalSim, the more sequences of hydrology can be developed and used for analysis of SCV Water system operations. The use of the 82 hydrologic sequences developed is considered to be adequate to assess system performance and reliability for the purposes of this Reliability Plan update.

Furthermore, the SCV Water model actually operates SCV Water's storage programs over the study period. This allows an assessment not only of whether there is adequate take capacity to meet demands in supply-limited years, but whether there is adequate supply and put capacity in years of excess to store those supplies for eventual dry-year withdrawals.

TABLE A-1
SCV WATER – WATER OPERATIONS MODEL:
VARIABILITY IN DEMAND AND SUPPLIES

Parameter	STUDY PERIOD VARIATIONS		HYDROLOGIC VARIATIONS	
	Change over Study Period?	Reason for Change	Variation due to Hydrology?	Reason for Variation
DEMANDS				
Demands	Yes	Increases due to population growth	Yes	Higher outdoor use in locally dry years, and lower use in wet years
SUPPLIES				
Alluvial pumping	Yes	Increases due to conversion of agricultural pumping to M&I use	Yes	Reduced availability in locally dry years
Saugus pumping	Yes	Increased capacity due to restored, replacement, and planned wells	Yes	Increased usage in years that are dry in northern California
Recycled water	Yes	Increases resulting from planned distribution system and use	No	
SWP Table A	No		Yes	Northern California hydrology effects on supply availability and Delta requirements
Sites Reservoir	No		Yes	Northern California hydrology effects on supply availability and Delta requirements
Buena Vista-Rosedale	No		No	
Nickel Water – Newhall Land	No		No	

TABLE A-2
SCV WATER – WATER OPERATIONS MODEL:
STORAGE PROGRAM USE PRIORITIES

SUPPLY SURPLUS	SUPPLY SHORTFALL
Priorities for Additions to Storage In year when Supplies exceed Demand	**Priorities for Withdrawals from Storage In year when Supplies less than Demand**
1. SWP flexible storage	1. Yuba Accord (dry-year water purchase)
2. SWP carryover in San Luis Reservoir	2. SWP carryover in San Luis Reservoir
3. Rosedale-Rio Bravo Banking Program	3. Antelope Valley East Kern Exchange
4. Antelope Valley East Kern Banking Program	4. United Water Conservation District Exchange
5. AquaTerra Banking Program	5. New exchange(s)
6. Semitropic Banking Program	6. Semitropic Banking Program surcharge[(1)]
7. Semitropic – Newhall Land Banking Program	7. Semitropic Banking Program
8. New banking program(s)	8. Antelope Valley East Kern Banking Program
9. New exchange(s)	9. Aquaterra Banking Program
	10. Rosedale-Rio Bravo Banking Program
	11. SWP flexible storage
	12. Nickel Water
	13. Semitropic – Newhall Land Banking Program
	14. New banking program(s)

Note:

(1) Semitropic Banking Program surcharge is the remaining balance of water SCV Water stored in 2002 and 2004 under a temporary storage agreement with Semitropic. In 2015, SCV Water entered into a long-term banking program with Semitropic (labeled here as "Semitropic Banking Program") with specified storage, put, and take capacities. The balance of the previously stored water was transferred into the Semitropic Banking Program and is in addition to the water that may be stored under that new program (thus the label here as "surcharge"). This water is still available for withdrawal by SCV Water, but uses Semitropic Banking Program withdrawal capacity. Furthermore, there can be no additions to the amount "surcharged" in the Semitropic Banking Program.

TABLE A-3
SCV WATER - WATER OPERATIONS MODEL: RELIABILITY PLAN SCENARIO ASSUMPTIONS

	BASE SCENARIO	SCENARIO 1 (~2020 UWMP)	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
Study Period	2021 - 2060	same as Base	same as Base	same as Base	Same as Base	Same as Base
HYDROLOGY						
Hydrologic period included	1922 - 2003	same as Base	same as Base	same as Base	Same as Base	Same as Base
Climate change	• SWP hydrology: Includes effects of 2035 emission level and 45-cm sea level rise • Local hydrology: None	same as Base	same as Base	Same as Base	Same as Base	Same as Base
DEMANDS						
Demand w/ plumbing code savings	• Increases from 72,063 AFY in 2021 to 115,083 AFY by 2050 • Normal demands are adjusted for weather by a multiplier ranging from 0.93 to 1.06[1]	same as Base	same as Base	same as Base	Same as Base	Same as Base
Demand w/ active conservation	• Increases from 69,831 AFY in 2021 to 101,030 AFY by 2050 *[UWMP Table 2-13]*[2] • Normal demands are adjusted for weather by a multiplier ranging from 0.93 to 1.06 [1]	same as Base	same as Base	same as Base	Same as Base	Same as Base

	BASE SCENARIO	SCENARIO 1 (~2020 UWMP)	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
***SUPPLIES**						
Groundwater[3][4][5]						
Alluvium	• Normal year pumping increases from 15,714 AFY in 2021 to 30,797 AFY by 2035, based on existing or future recovered wells *[UWMP Table 4-9]* • Compared with normal-year pumping, total aquifer pumping is reduced to 13,338 AFY in 2021 and 26,070 AFY by 2035 during locally dry years, per the basin yield analysis[6]	same as Base	same as Base	same as Base	same as Base	same as Base
Saugus	Existing Saugus assuming that Saugus Well 201 is returned to service in 2022 and Saugus Well 205 is returned to service in 2024. • Normal year pumping decreases from between 13,490 AFY in 2021 to 9,400 AFY by 2035. • Dry year pumping increases from 14,980 AFY in 2021 to 20,814 AFY by 2035, per the basin yield analysis	Same as Base plus additional Saugus Wells 3 through 8 that would provide: • Normal year pumping of 13,490 AFY in 2021 and 9,900 AFY by 2035. • Dry year pumping increase to 14,980 AFY in 2021 and 33,800 AFY by 2030. [7]	Same as Base, plus additional Saugus Wells 3 and 4, providing: • Normal year pumping of 13,490 AFY in 2021 and 9,642 AFY by 2035. • Dry year pumping of 14,980 AFY in 2021, increasing to 26,056 AFY by 2035. [7]	same as Scenario 2	same as Scenario 2	same as Base

	BASE SCENARIO	SCENARIO 1 (~2020 UWMP)	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
Recycled Water						
Recycled water	Increases from 860 AFY in 2021 to max of 8,960 AFY by 2050 *[UWMP Table 2-4.2]*(8)	same as Base	same as Base	same as Base	same as Base	same as Base
Imported Supply						
SWP Table A	• From CalSim run ELT under future conditions with: o updated climate change data o new endangered species interim take permit o new coordinated agreement with CVP • Deliveries to SCV Water average 51,158 AFY, ranging from 8,298 AFY to 95,200 AFY, depending on hydrologic year *[2019 DCR Technical Addendum]*(9)	same as Base	same as Base	same as Base	same as Base	same as Base
SWP carryover	none	none	none	none	none	none
SWP flexible storage	Max capacity: • 2017-25: 6,060 AF2026-50: • 4,684 AF (10) *[UWMP pp. 4-2]*	same as Base	same as Base	same as Base	same as Base	same as Base
Buena Vista - Rosedale	11,000 AFY every year *[UWMP p. 4-2]*	same as Base	same as Base	same as Base	same as Base	same as Base
Nickel Water	• 1,607 AFY every year for storage in Semitropic-NLF bank. Takes of Nickel Water available to SCV Water starting in 2035 *[UWMP pp. 4-2]* • Available 2022-50(11)	same as Base	same as Base	same as Base	same as Base	same as Base

	BASE SCENARIO	SCENARIO 1 (~2020 UWMP)	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
Yuba Accord	• 1,000 AFY available for purchase during dry periods • Available 2021-25[12] *[UWMP pp. 4-2]*	same as Base	same as Base	same as Base	same as Base	same as Base
Banking/Exchange Programs						
Semitropic Bank surcharge	• Max capacities: ○ Storage: 35,970 AF ○ Put: 0 AFY ○ Take: 5,000 AFY[13] [14] • Available through 2045 *[UWMP pp. 4-2]*	same as Base	same as Base	same as Base	same as Base	same as Base
Semitropic Bank	• Max capacities: ○ Storage: 15,000 AF ○ Put: 5,000 AFY ○ Take: 5,000 AFY[13] [14] • Available through 2045 *[UWMP pp. 4-2]*	same as Base	same as Base	same as Base	same as Base	same as Base
Semitropic – Newhall Land Bank	Max capacities: • Storage: 55,000 AF • Put: 4,950 AFY • Take: 4,950 AFY starting in 2035[14] *[UWMP pp. 4-2]*	same as Base	same as Base	same as Base	same as Base	same as Base
Rosedale Bank	Max capacities: • Storage: 100 TAF • Put: 20 TAFY • Take: ○ 2021-50: 10,000 AFY *[UWMP pp. 4-2]*	same as Base, except: • Take: ○ 2021-29: 10,000 AFY ○ 2030-50: 20,000 AFY[15]	same as Scenario 1	same as Scenario 1	same as Scenario 1	same as Base
New Bank	none	none	none	none	none	none

	BASE SCENARIO	SCENARIO 1 (~2020 UWMP)	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
Antelope Valley East Kern Exchange	• Max capacities: o Storage: 2,250 AF o Put: 0 AFY o Take: 2,250 AFY when SWP Table A Allocation > 30% • Available through 2030(16) *[UWMP pp. 4-2]*	same as Base	same as Base	same as Base	same as Base	same as Base
United Water Conservation District Exchange	• Max capacities: o Storage: 500 AF o Put: 0 AFY o Take: 500 AFY when SWP Table A Allocation > 30% • Available through 2030(16) *[UWMP pp. 4-2]*	same as Base	same as Base	same as Base	same as Base	same as Base
Antelope Valley East Kern Bank	none	none	Max capacities: • Storage: 70,000 AF • Put: 20,000 AFY • Take: 20,000 AFY Available beginning in 2023	none	same as Scenario 2	same as Scenario 2
Aquaterra Bank	none	none	none	none	none	Max capacities: • Storage: 70,000 AF • Put: 20,000 AFY • Take: 20,000 AFY Available beginning in 2023

	BASE SCENARIO	SCENARIO 1 (~2020 UWMP)	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
Sites Reservoir	None	None	None	Alt 3 used available beginning in 2030, with long-term average of 2.8 TAF/year and dry and critically dry years average of 7.1 TAF/year. Dry-year deliveries range between 0.1-16.3 TAF/year	Same as Scenario 3	Same as Scenario 3

Notes:

(1) "Wet" and "dry" years for demand impact determination are based on local precipitation and temperature for water years from 1928 through 2003, with the demand multiplier ranging between 0.93 and 1.06.

(2) Normal demands for 2021 through 2060 based on demands from *SCV Demand Study Update, Final Technical Memorandum #2 (Maddaus Water Management, March 2021).*

(3) Existing groundwater supplies represent the quantity of groundwater available to be pumped with existing wells. Schedule for recovered well capacity based on Groundwater Treatment Implementation Plan Technical Memorandum, Kennedy Jenks 2021 Appendix C, and reflected in Tables 2-4 A and 2-5 A. Overall pumping remains within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo (GSI 2020) and the updated Basin Yield Analysis(LSC & GSI 2009).

(4) Future and Recovered groundwater supplies include recovered impacted wells and new groundwater well capacity that may be required by SCV Water's production objectives in the Alluvial Aquifer and the Saugus Formation. When combined with existing Agency and non-Agency groundwater supplies, total groundwater production remains within the sustainable ranges identified in Tables 4-10 and 4-11 of the 2020 UWMP and is within the groundwater basin yields per the 2020 SCV-GSA Draft Water Budget Development Tech Memo(GSI 2020) and the updated Basin Yield Analysis(LSC & GSI 2009).

(5) Reduction in existing supply reflects pumping being shifted from existing wells to well capacity recovered after installation of PFAS treatment.

(6) Future Category includes all wells restored from PFAS and perchlorate water quality issues, and other future alluvial wells including those associated with development under the Newhall Ranch Specific Plan.

(7) Future and Recovered Saugus wells include perchlorate-impacted Well 205, two replacement wells (Saugus 3 & 4), and up to four new wells (Saugus 5-8) planned to provide additional dry-year supply. New dry-year wells would not typically be operated during average/normal years.

(8) Existing recycled Water is based on current average annual use.

(9) SWP supplies are based on average deliveries from DWR's 2019 DCR (58% - 52% at buildout due to climate change). 2019 DCR assumptions include: updated climate change data (based on 2035 emissions and 45-cm sea level rise), a new endangered species interim take permit and a new coordinated operating agreement with the CVP.

(10) Includes both SCV Water and Ventura County entities flexible storage accounts through 2025 and only SCV Water portion beyond 2025.

(11) Existing Newhall Land supply committed under approved Newhall Ranch Specific Plan. Assumed to be transferred to SCV Water during Newhall Ranch development, and available for annual purchase prior to that.

(12) Supply shown is amount available in dry periods, after delivery losses. This supply would typically be used only during dry years and is available through 2025.

(13) Banking programs labeled here as "Semitropic Bank surcharge" and "Semitropic Bank" share the same 5,000 AFY take capacity, so withdrawals from both programs combined cannot exceed 5,000 AF in a given year.

(14) Existing Newhall Land supply. Assumed to be transferred to SCV Water during Newhall Ranch development, with firm withdrawal capacity made available to SCV Water prior to that.

(15) Firm withdrawal capacity under existing Rosedale Rio-Bravo Banking Program to be expanded by 10,000 AFY by 2030 (for a combined total of 20,000 AFY).

(16) Supplies shown are totals recoverable under the exchange and would typically be recovered only during dry years.

APPENDIX B

Santa Clarita Valley Water Agency 2021 Water Supply Reliability Update Additional Results

1. WATER OPERATION MODEL

1.1 General Methodology

The Water Operations Model (or "Model") is an analytic spreadsheet model developed for SCV Water by MBK Engineers that was used to analyze water supply reliability for this Plan. The Model performs annual water operations for the SCV Water service area over a specified study period, which for this Plan is the 40-year period from 2021 through 2060 (the year assumed in the 2020 UWMP for development buildout in the service area, as shown in adopted local land use plans).

Inputs to the Model include:

- Annual service area demands, as they are projected to increase over the study period;
- Annual base supplies (existing and planned) anticipated to be available to meet those demands, including any planned changes in supply during the study period;
- Storage programs available to SCV Water, including maximum storage and extraction capacities and beginning (2021) storages; and
- Various combinations of future water supply reliability projects, including those incorporated into the 2020 UWMP, as well as additional scenarios, to ensure that there are alternative programs that can be substituted for those in the 2020 UWMP.

The Model steps through each year of the study period, compares annual base supplies to demands, and operates SCV Water storage programs as needed, adding to storage in years when base supplies exceed demand and withdrawing from storage when demand exceeds base supplies.

To reflect the uncertainty in what hydrology might occur over the study period, the Model looks at multiple hydrologic sequences. In this Plan, the sequences are based on historical hydrology from 1922 through 2003, and the Model uses 82 hydrologic sequences. The hydrologic sequences affect certain supplies (i.e., SWP and groundwater), as well as demands during the study period. The Model steps through annual operations over the study period for each of the 82 hydrologic sequences. The results from the 82 sequences are then compiled by year during the study period and are summarized to provide a statistical assessment of various parameters.

For example, the reliability of SCV Water's supplies and storage programs to meet its projected demands for a particular year, such as year 2030, would be assessed by compiling the overall supply surplus or shortfall that occurred in Model results for 2030 from each of the 82 hydrologic sequences. Those 82 supply results for 2030 would then be sorted from large to small to provide a probability of exceedance distribution for overall supplies for that year.

1.2 Reliability Determination

For this Plan, SCV Water specified a reliability goal of 95 percent. The manner in which a reliability goal is applied to the Water Operations Model is as follows:

- The Model steps through each year of the study period, compares annual base supplies to demands, and operates SCV Water storage programs as needed, adding to storage in years when base supplies exceed demand and withdrawing from storage when demand exceeds base supplies.
- The resulting annual supply surplus or shortfall is determined for each year during the study period and is done for each of the 82 hydrologic sequences.
- The supply surplus/shortfall from all 82 sequences is compiled for each year during the study period. For example, annual supply surplus/shortfall results for study period year 2040 are pulled from each of the 82 hydrologic sequences, and that data are then used to determine the reliability for year 2040.

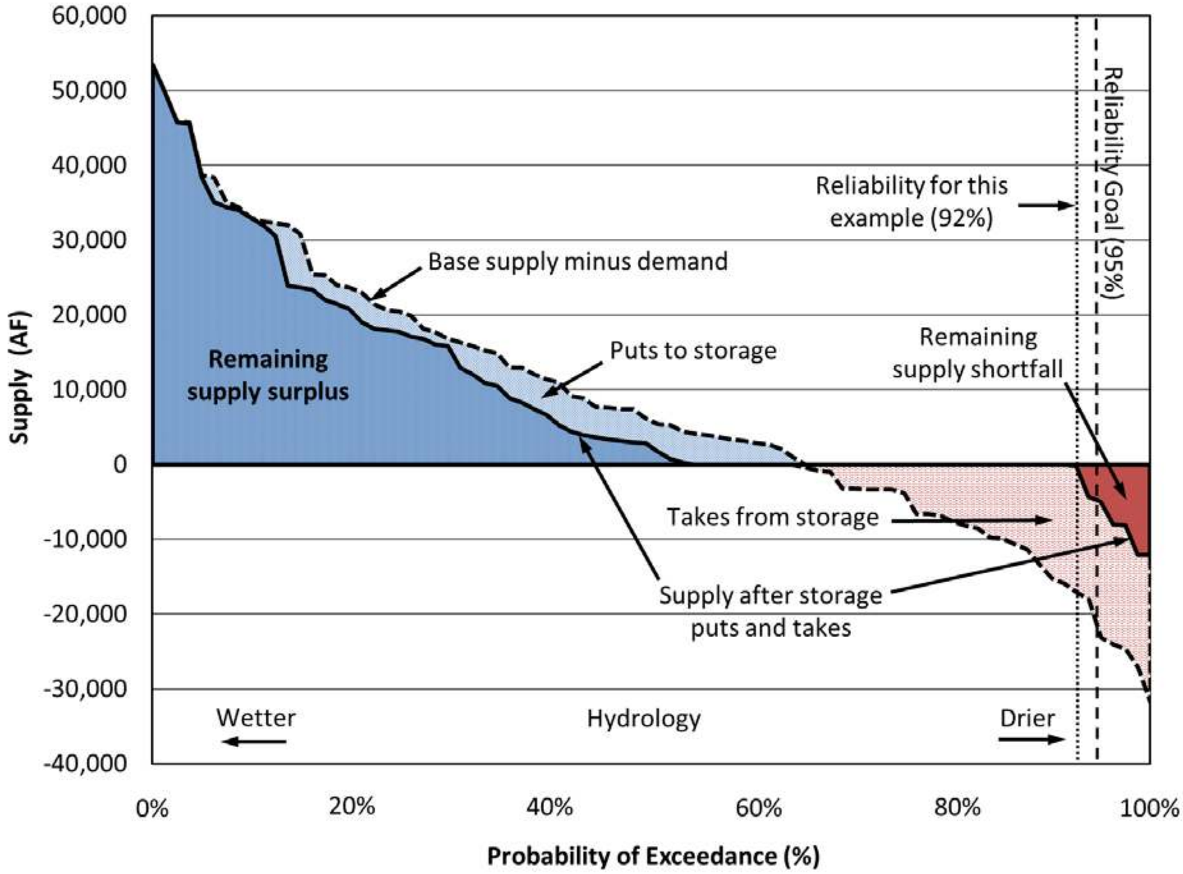
As the 95 percent reliability goal is applied to the Water Operations Model, this is defined as the ability to meet demand in a given year in 95 percent of the hydrologic sequences analyzed. Based on the number of hydrologic sequences analyzed, this means that to meet the 95 percent reliability goal for a given year, demands for that year must be met in at least 78 of the 82 sequences (95 percent of 82 sequences). This is illustrated and described in more detail in Appendix B.

1.3 Interpretation of Water Operations Model Results

The Model produces graphs for a number of parameters calculated within the Model, generally presented in the form of probability of exceedance graphs. The parameters of primary interest for this Plan include: (1) Base supply minus demand (i.e., the supply surplus or shortfall for a given year after summing all base supplies and subtracting weather-adjusted demand); and (2) Supply after storage program puts and takes (i.e., the remaining supply surplus or shortfall for a given year after any additions to (puts) or withdrawals from (takes) storage programs). Base supplies are considered to be supplies that are available every year, such as supplies from the SWP, groundwater, recycled water, Buena Vista/Rosedale-Rio Bravo, and Nickel Water. Storage programs, as used here, include SWP flexible storage, groundwater banking programs, and any other dry-year supplies, such as water under the Yuba Accord.

An example of these two parameters for a given year in the study period is shown in Figure B-1, with “Base supply minus demand” represented by the black dashed line, and “Supply after storage puts and takes” represented by the solid black line. The area between these two lines that is above zero on the supply (vertical) axis represents the amount of water put into storage programs; whereas, the area between the two lines that is below zero represents the amount of takes from storage programs. The darker blue area (below the “Supply after storage puts and takes” line that is above zero on the supply axis) indicates the amount of surplus water that remains after all possible puts to storage programs, where puts may be constrained by vacant storage space available or by put capacity. This remaining supply would be available for water sales, exchanges, or storage in new programs, or would otherwise remain unused. The darker rust-colored area (above the "Supply after storage puts and takes" line that is below zero on the supply axis) indicates the amount of supply shortfall that remains after all possible takes from storage programs, where takes may be constrained by the amount of water stored or by take capacity. The reliability for this scenario is the probability of exceedance at the point where the left side of the darker rust-colored area crosses zero on the supply axis (shown as the dotted vertical line in this graph). For this particular example, that occurs at about 92 percent and is interpreted as a 92-percent probability that remaining supplies after puts and takes would be zero or greater for this example's supply and demand scenario and study period year; or in other words, has a reliability of 92 percent. The reliability in this example does not meet the 95-percent reliability goal (shown as the dashed vertical line in this graph), and so would require additional programs or supplies to achieve that goal.

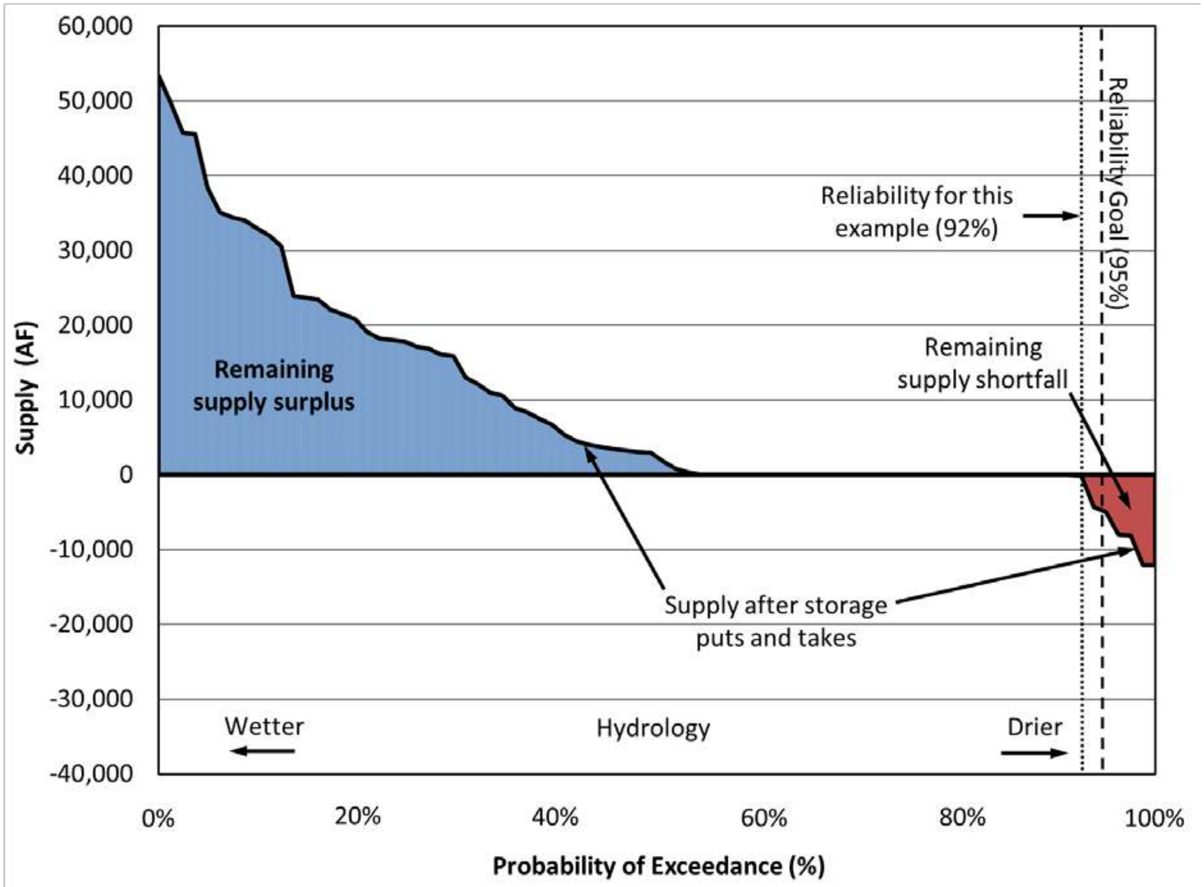
FIGURE B-1
INTERPRETATION OF MODEL RESULTS



Note: Example results for a given year during the study period.

In this Plan, it is the supply that remains after operation of the storage programs that is of primary interest. Therefore, the figures throughout the remainder of this section showing supplies show only the "Supply after storage puts and takes" line and so are of the form shown in Figure B-2. The supply figures in the rest of this section do not include the shading of surplus and shortfall, as shown in Figure B-2, but are interpreted as shown here.

FIGURE B-2
FORM OF MODEL RESULTS PRESENTED



Note: Example results for a given year during the study period.

2. SCENARIOS ANALYZED

2.1 Scenario Descriptions

This Plan analyzed six scenarios composed of different water supply components discussed below. Each scenario was run twice: 1) using demand with active conservation; and 2) using demand without active conservation. The mix of component water supplies is summarized in Table B-1 below, and the scenarios are described generally as follows:

- **Base Scenario:** Represents those elements of the SCV Water portfolio that currently exist. As the analysis moves through the study period, restoration of well capacity temporarily taken out for water quality concerns takes place consistent with the 2020 UWMP Tables 4-8 B, 4-8 C, 4-9 B, and 4-9 C well case containing the existing and restored groundwater supplies. Imported supplies include SWP supplies based on 2040 climate conditions pursuant to DWR's CalSim modeling for the 2019 Delivery Capability Report, the firm Buena Vista Rosedale Transfer, and if necessary, in dry years, SWP Flexible Storage, Nickel Water, and Yuba Accord water. The Base case also includes the existing banking programs, specifically existing Rosedale Banking supplies at the existing 10,000 AFY of recovery, SCV Water Semitropic and access to the Newhall Land and Farming withdrawal capacity, that are drawn on during years when the other previously mentioned supplies are insufficient to meet demands.

- **Scenario 1:** Represents the supplies used in the 2020 UWMP's reliability analysis. It builds on the Base scenarios by adding additional Saugus Formation pumping capacity for use in dry periods and developing an additional 10,000 AFY of extraction capacity under the existing water banking agreement with the Rosedale Rio-Bravo Water Storage District.
- **Scenario 2:** Similar to Scenario 1, but the dry supply from Saugus Formation Wells 5 through 8 is replaced with participation in the AVEK's High Desert Water Bank.
- **Scenario 3:** Similarly, replaces Saugus Formation Wells 5 through 8 with participation in the Sites Reservoir.
- **Scenario 4:** Assumes all of the new Saugus Formation Wells 3 through 8 are not constructed and replaced with a combination of Sites Reservoir and the AVEK High Desert Water Bank.
- **Scenario 5:** Like Scenario 4, assumes no new Saugus Formation Wells and also eliminates the new recovery capacity from the Rosedale banking program. It replaces these with the AVEK High Desert Bank and Sites Reservoir, as well as participation in the McMullin Aquaterra Water Bank.

TABLE B-1
RELIABILITY PLAN UPDATE SCENARIOS

	Base	**1**	**2**	**3**	**4**	**5**
Alluvial Pumping	✓	✓	✓	✓	✓	✓
Existing Saugus	✓	✓	✓	✓	✓	✓
SWP and BVRRB	✓	✓	✓	✓	✓	✓
Existing Banking Programs	✓	✓	✓	✓	✓	✓
Saugus Wells 3 and 4		✓	✓	✓		
Saugus Wells 5 - 8		✓				
New Rosedale Bank Capacity		✓	✓	✓	✓	
Sites Reservoir				✓	✓	✓
AVEK High Desert Bank			✓		✓	✓
McMullin GSA Aquaterra Bank						✓

2.2 Scenario Assumptions

The Base Scenario serves as the starting point to assess the reliability of current supplies. Base Scenario demand and supply assumptions are described in detail in Section 2. Scenarios 1 through 5 include varying assumptions regarding the availability of groundwater and water supplies and are discussed further below. The supply assumptions for all six scenarios are summarized in Table B-2. A more detailed listing of assumptions is included in Appendix A.

2.2.1 Base Scenario

The Base Scenario is based on those elements of the SCV Water supply portfolio that currently exist. Base Scenario assumptions are summarized in Table B-2.

2.2.2 Scenario 1

Scenario 1 is based on the same demand, supply, and storage program assumptions included in the 2020 UWMP. It builds on the Base scenario by adding additional Saugus Formation pumping capacity in dry periods and developing an additional 10,000 AFY of extraction capacity with the Rosedale Rio-Bravo Water Storage District. Assumptions for Scenario 1 are summarized in Table B-2 and differ from the Base Scenario as follows:

- **Saugus supplies:** Scenario 1 includes increased Saugus Formation pumping capacity through the addition of Wells 3 through 8.
- **Dry-year supply programs:** Scenario 1 includes the development of an additional 10,000 AFY of extraction capacity under the existing water banking agreement with the Rosedale Rio-Bravo Water Storage District.

2.2.3 Scenario 2

Similar to Scenario 1, but replaces some of the dry-year supply from Saugus Formation wells with participation in the AVEK's High Desert Water Bank. Assumptions for Scenario 2 are summarized in Table B-2 and differ from the Scenario 1 as follows:

- **Saugus supplies:** Assumes that only Saugus Formation Wells 3 and 4 are available.
- **Dry-year supply programs:** Scenario 2 includes participation in the AVEK High Desert Water Bank, which has a storage capacity of 70,000 AF and take and put capacities of 20,000 AFY.

2.2.4 Scenario 3

Similar to Scenario 1, but replaces some of the dry-year supply from Saugus Formation wells with participation in the Sites Reservoir. Assumptions for Scenario 3 are summarized in Table B-2 and differ from Scenario 1 as follows:

- **Saugus supplies:** Assumes that only Saugus Formation Wells 3 and 4 are available.

- **Dry-year supply programs:** Scenario 3 replaces Saugus Formation Wells 5 through 8 with participation in Sites Reservoir.

2.2.5 Scenario 4

Similar to Scenario 1, but assumes that all Saugus Formation wells are not constructed and replaced with a combination of the AVEK High Desert Bank and Sites Reservoir. Assumptions for Scenario 4 are summarized in Table B-2 and differ from Scenario 1 as follows:

- **Saugus supplies:** Assumes that Saugus Wells 3 through 8 are not developed.
- **Dry-year supply programs:** Scenario 4 replaces Saugus Formation Wells 3 through 8 with participation in Sites Reservoir and AVEK High Desert Bank.

2.2.6 Scenario 5

Similar to Scenario 4, but eliminates the new recovery capacity from the RRB banking program and substitutes it with participation in the McMullin GSA Aquaterra Water Bank. Assumptions for Scenario 5 are summarized in Table B-2 and differ from Scenario 4 as follows:

- **Saugus supplies:** Assumes that Saugus Wells 3 through 8 are not developed.
- **Dry-year supply programs:** Replaces new RRB recovery capacity with participation in the McMullin GSA Aquaterra Bank.

TABLE B-2
SCENARIO ASSUMPTION SUMMARY

	BASE SCENARIO	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
DEMANDS						
Demand without active conservation: • per UWMP	X	X	X	X	X	X
Demand with active conservation: • per UWMP	X	X	X	X	X	X
SUPPLIES						
Groundwater						
Alluvium: • per UWMP	X	X	X	X	X	X
Saugus: • Existing wells	X				X	X
• Existing, restored, replacement, and new Wells 3 and 4			X	X		
• existing, restored, replacement, and new Wells 3 through 8 (per UWMP)		X				
Recycled Water						
Recycled water: • per UWMP (up to 8,960 AFY)	X	X	X	X	X	X
Imported Supply						
SWP Table A: • per UWMP – SWP supplies based on average deliveries from DWR's 2019 DCR for Future Conditions (52% at buildout due to climate change).	X	X	X	X	X	X
SWP flexible storage: • per UWMP	X	X	X	X	X	X
Buena Vista – Rosedale: • per UWMP	X	X	X	X	X	X

	BASE SCENARIO	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5
Nickel Water: • available 2022-2060	X	X	X	X	X	X
Yuba Accord: • per UWMP	X	X	X	X	X	X
Sites Reservoir: • Dry-year supplies available starting in 2030				X	X	X
Banking/Exchange Programs						
Semitropic Bank: • per UWMP	X	X	X	X	X	X
Semitropic – NL Bank: • per UWMP	X	X	X	X	X	X
Rosedale Bank: • per UWMP (up to 20,000 AFY take capacity by 2030)		X	X	X	X	
• Take capacity up to 10,000 AFY	X					X
New AVEK Bank: • per UWMP (70,000 AF storage capacity and 20,000 AFY take capacity in 2023)			X		X	X
New Aquaterra Bank: • per UWMP (70,000 AF storage capacity and 20,000 AFY take capacity in 2023)						X
Antelope Valley East Kern Exchange: • per UWMP	X	X	X	X	X	X
Rosedale & W Kern Exchange: • per UWMP	X	X	X	X	X	X

2.3 Scenario Results

2.3.1 Initial Reliability Results

An initial analysis was conducted to determine the reliability of each of the six supply scenarios, based on the specific scenario assumptions identified in the section above.

2.3.2 Summary Results

Based on the assumptions in each scenario, the 95-percent reliability goal is met over the entire study period for Scenarios 1 through 5, with active conservation. The analyses show that SCV Water has adequate existing and planned supplies to meet SCV Water service area demands throughout the 40-year planning period. Furthermore, SCV Water has alternative paths to reliability should planned supplies prove not to be viable.

In the subsections that follow, more detailed results are presented for each scenario, including the full range of probability for available supplies, for years 2021, 2030, 2040, 2050, and 2060. Note that the supply results presented below are "Supply after storage puts and takes."

(a) Base Scenario

The results of the Base scenario indicate that current supplies under demand without active conservation show small fluctuations in reliability in early years, as groundwater production is ramping up and demand is increasing. These values fluctuate between 94 percent and 100 percent, and maximum shortfalls range between 0 and 1,800 AF until 2027, when reliability is at 95 percent with a supply shortfall as high as 4,000 AF. The results for 2030, 2040, 2050, and 2060 show a probability of a shortfall as high as 7,400 AF, 12,300 AF, 29,600 AF, and 37,100 AF, respectively. The reliability for 2030 is 90 percent, 2040 is 88 percent, for 2050 is 71 percent, and for 2060 is 69 percent. These results are shown in Figure B-3.

The adequacy of current supplies increases reliability to 2040 when demand under active conservation is implemented. The reliability for 2040 is 100 percent. The results for 2041 show a minor probability of a small shortfall of about 200 AF and a reliability of 98%. The results for 2045 and 2047 show shortfalls of 2,500 AF and 4,700 AF, respectively. The reliabilities for 2045 is 96 percent and for 2047 is 95 percent, which meet or exceed the reliability goal of 95 percent. The year 2049 is the first year in which reliability decreases below the 95% reliability goal. The results for 2049 indicate a reliability of 93% and a supply shortfall of 5,800 AF. The results for 2050 and 2060 show a probability of a shortfall as high as about 6,800 AF and 10,100 AF, respectively. The reliability for 2050 is 93 percent and for 2060 is 88 percent. These results are shown in Figure B-4.

The Base scenarios assume no safety margin if a supply disruption were to occur, such as supply impacts from PFAS contamination. To achieve reliability in subsequent years, additional investments in those facilities identified in Scenarios 1 through 5 would be required. When these facilities and programs are put in place on the schedule identified in this Pan, reliability is achieved.

FIGURE B-3
BASE SCENARIO WITHOUT ACTIVE CONSERVATION RELIABILITY

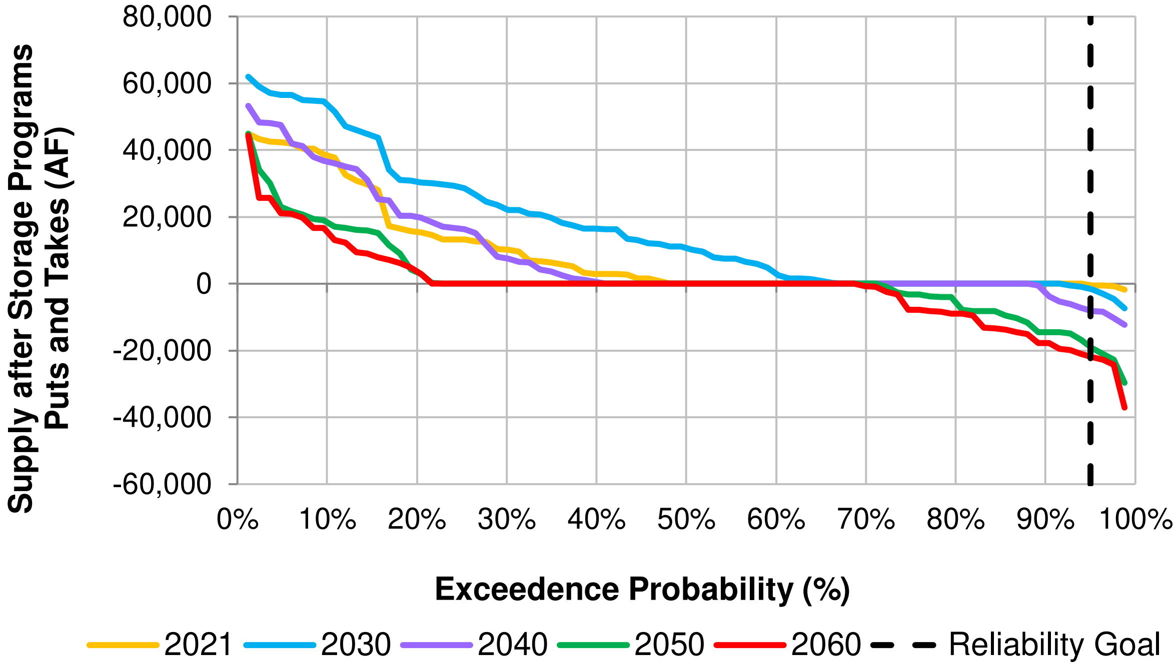
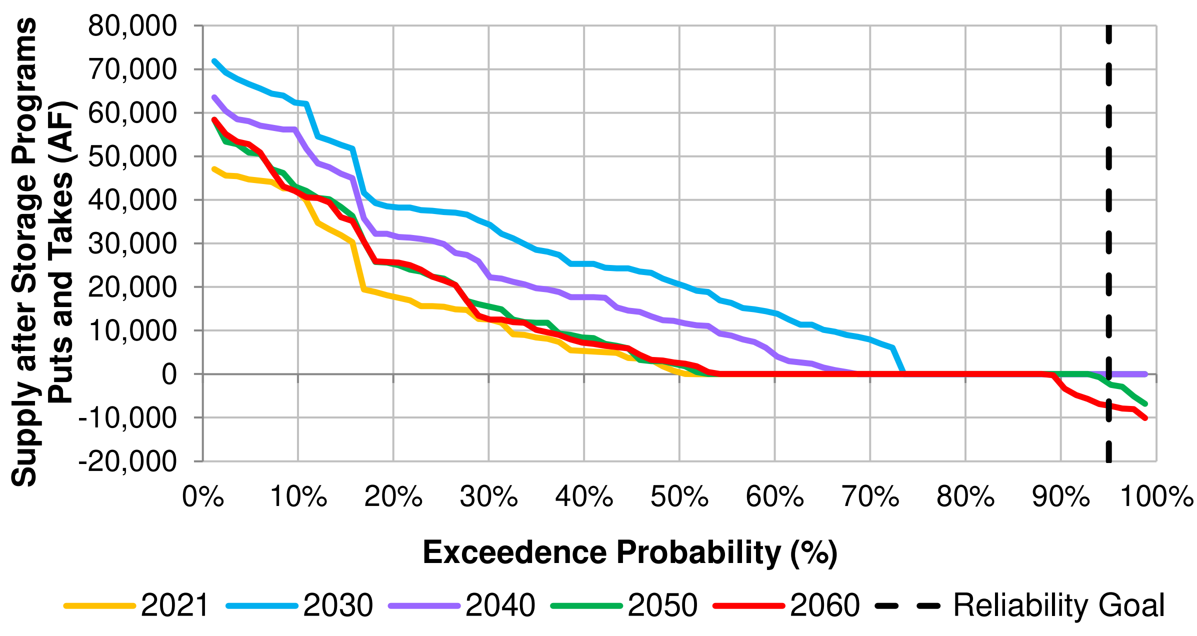


FIGURE B-4
BASE SCENARIO WITH ACTIVE CONSERVATION RELIABILITY



(b) *Scenario 1*

Results for Scenario 1 with demand under no active conservation indicate that for the demand and supply assumptions included in this scenario, there is a small supply shortfall of 1,800 AF for 2021 and no supply shortfall for 2030, which is expected as groundwater pumping increases and there is increased extraction capacity at the Rosedale Rio-Bravo Water Storage District. The reliability for 2021 is 94 percent and for 2030 is 100 percent. The results for 2040 show a minor probability of a small shortfall of about 400 AF. The reliability for 2040 is 98 percent. The years 2050 and 2060 show a supply shortfall as high as 12,800 AF and 22,200 AF, respectively. The reliability for 2050 is 90 percent and reliability for 2060 is 84 percent. These results are shown in Figure B-5.

When Scenario 1 is evaluated under demand with active conservation, the results show no supply shortfalls for 2021, 2030, 2040, and 2050. The reliability for these four years is 100 percent. The results for 2060 show a minor probability of shortfall of about 100 AF with a reliability of 98 percent. The reliability for all five years exceeds the reliability goal of 95 percent. These results are shown in Figure B-6.

One risk of the perceived risks to achieving reliability with Scenario 1 (2020 UWMP) is the extent to which new Saugus Formation wells can be permitted and installed. As noted in Section 4 of the 2020 UWMP, permitting of Saugus 3 and 4 is currently delayed pending permitting by DDW as it relates to proximity to abandoned oil wells. If the current sites prove not to be viable, the most likely course of action would be to relocate these proposed wells. If replacement well sites cannot be located, or if Saugus Pumping is limited because of potential subsidence, there are alternative paths to reliability, as demonstrated by Scenarios 2 through 5.

FIGURE B-5
SCENARIO 1 RELIABILITY WITHOUT ACTIVE CONSERVATION

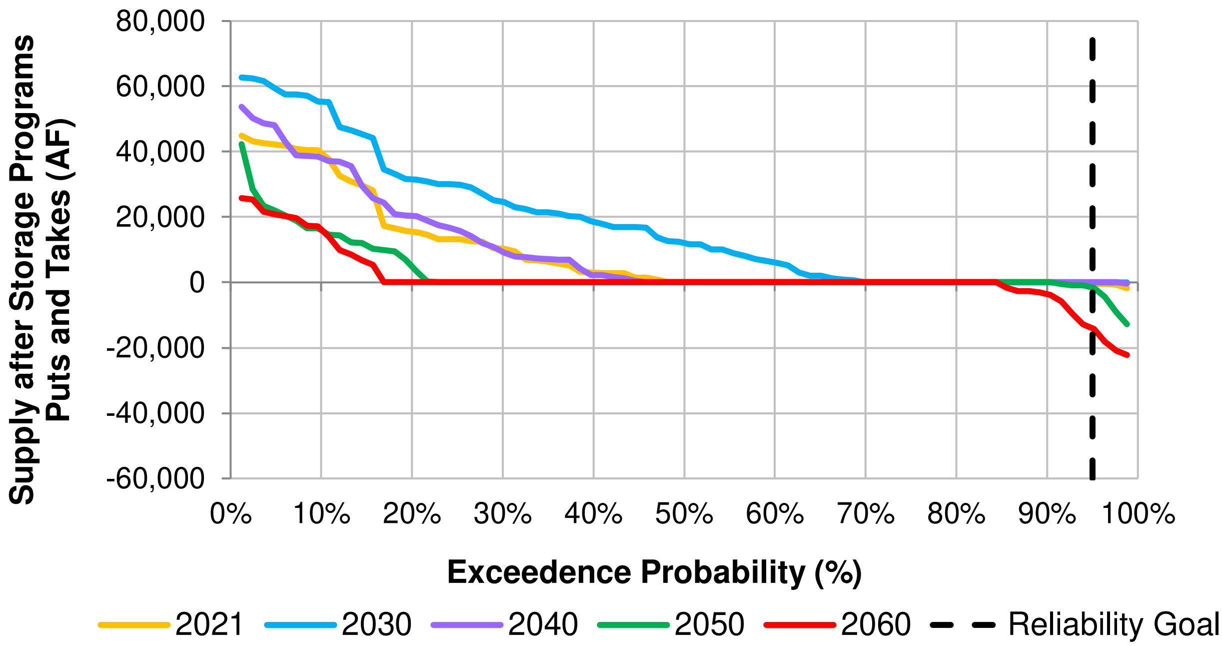
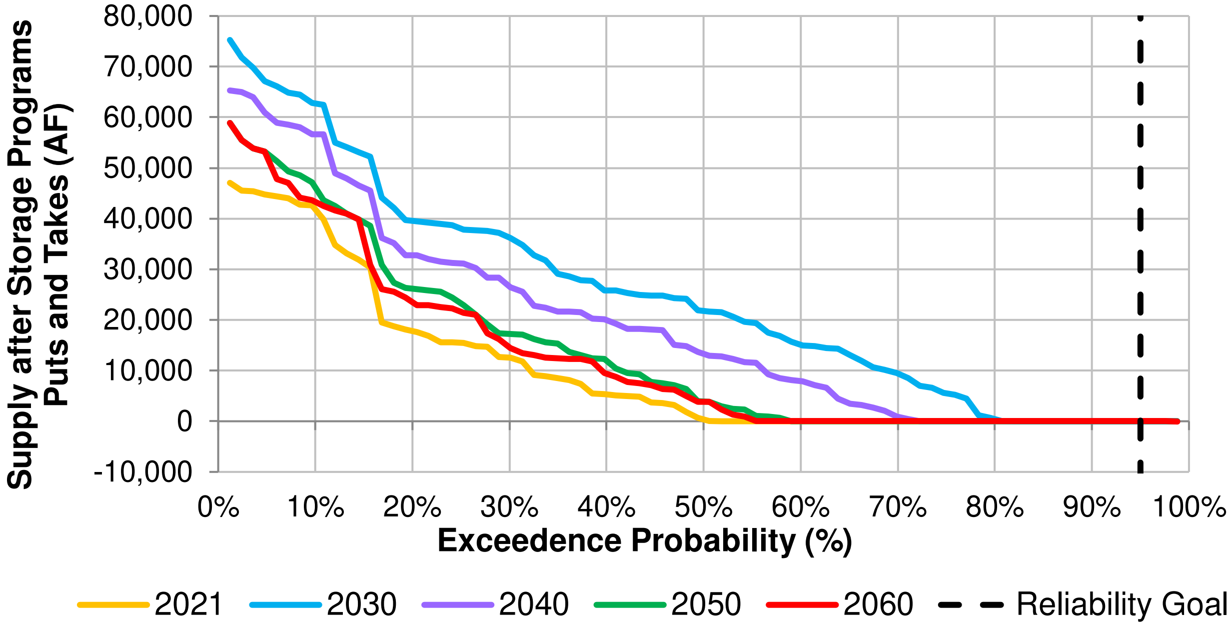


FIGURE B-6
SCENARIO 1 RELIABILITY WITH ACTIVE CONSERVATION



(c) Scenario 2

Scenario 2 replaces Saugus Wells 5 through 8 with the AVEK High Desert Bank. Results for Scenario 2 indicate that for demand under no active conservation, there is a small supply shortfall of 1,800 AF in 2021 and no supply shortfalls for 2030 and 2040. As groundwater production increases, participation in the AVEK bank comes on line and extraction capacity at the Rosedale Rio-Bravo Water Storage District is increased, shortfalls in 2030 and 2040 are eliminated. The reliability for 2021 is 94 percent, and the reliability for both 2030 and 2040 is 100 percent. As demands increase, the results for 2050 and 2060 show a probability of a shortfall as high as about 9,700 AF and 34,400 AF, respectively. The reliability for 2050 is 96 percent and for 2060 is 95 percent. The reliability for 2050 is 98 percent and for 2060 is 96 percent. The reliability for 2030, 2040, 2050, and 2060 years exceeds or meets the reliability goal of 95 percent. When Scenario 2 is run with demand under active conservation, the reliability for all five of these years is 100 percent, with no supply shortfall. These results are shown in Figures B-7 and B-8.

FIGURE B-7
SCENARIO 2 RELIABILITY WITHOUT ACTIVE CONSERVATION

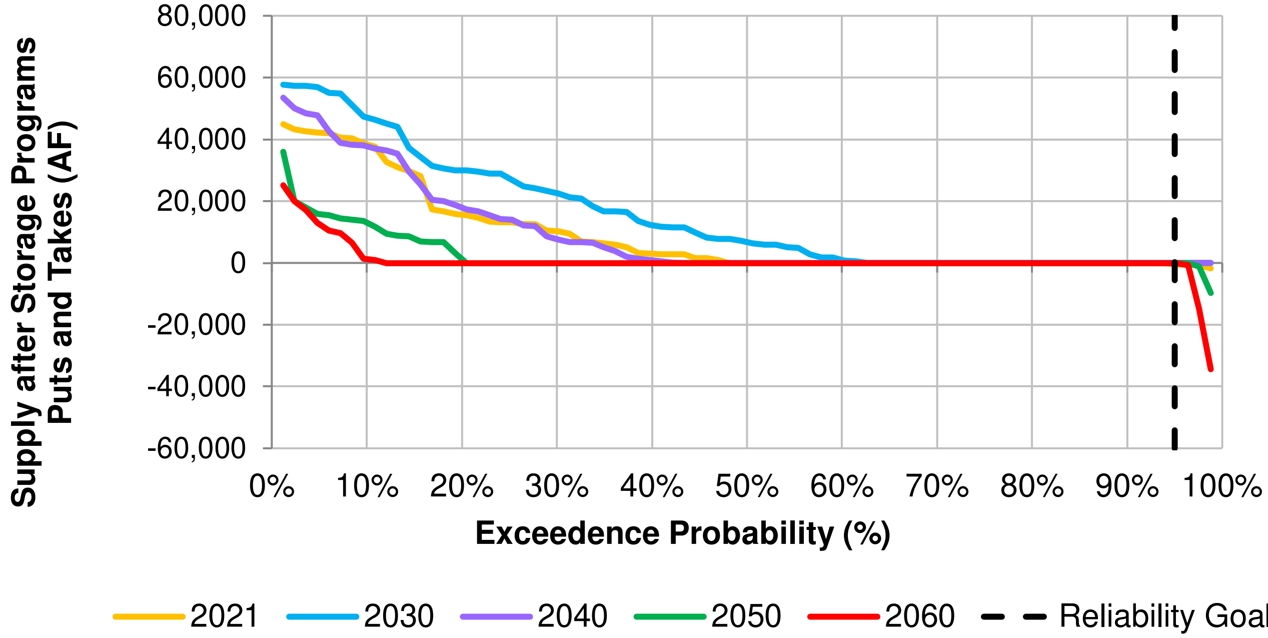
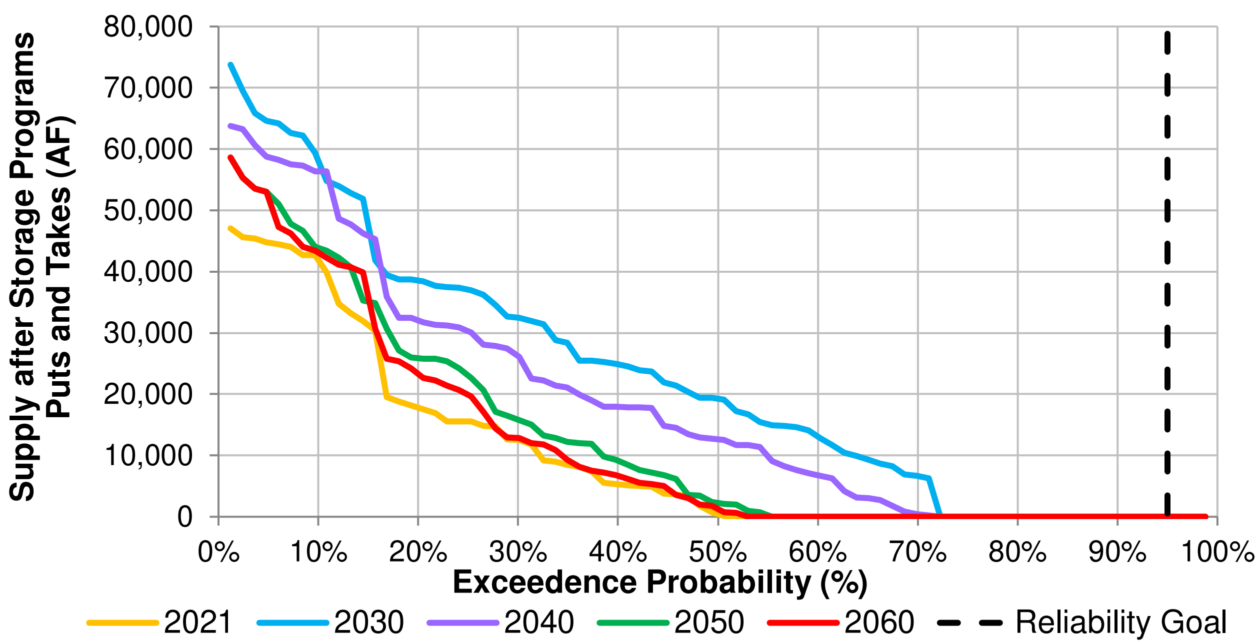


FIGURE B-8
SCENARIO 2 RELIABILITY WITH ACTIVE CONSERVATION



(d) Scenario 3

Scenario 3 substitutes Sites Reservoir for the AVEK High Desert Bank. Results for Scenario 3 with demand under no active conservation indicate there is a small supply shortfall of 1,800 AF in 2021 and no supply shortfalls for 2030 and 2040. Shortfalls in 2030 and 2040 are eliminated due to increased groundwater production, availability of Sites Reservoir dry-year supplies, and increased extraction capacity at the Rosedale Rio-Bravo Water Storage District. The reliability for 2021 is 94 percent, and the reliability for both 2030 and 2040 is 100 percent. As demands increase, the results for 2050 and 2060 show a probability of a shortfall as high as about 8,100 AF and 28,100 AF, respectively. The reliability for 2050 is 98 percent and for 2060 is 95 percent. The reliability for 2050 is 98 percent and for 2060 is 96 percent. The reliability for 2030, 2040, 2050, and 2060 years exceeds or meets the reliability goal of 95 percent. When Scenario 3 is run with demand under active conservation, the reliability for all five of these years is 100 percent, with no supply shortfall. These results are shown in Figures B-9 and B-10.

FIGURE B-9
SCENARIO 3 RELIABILITY WITHOUT ACTIVE CONSERVATION

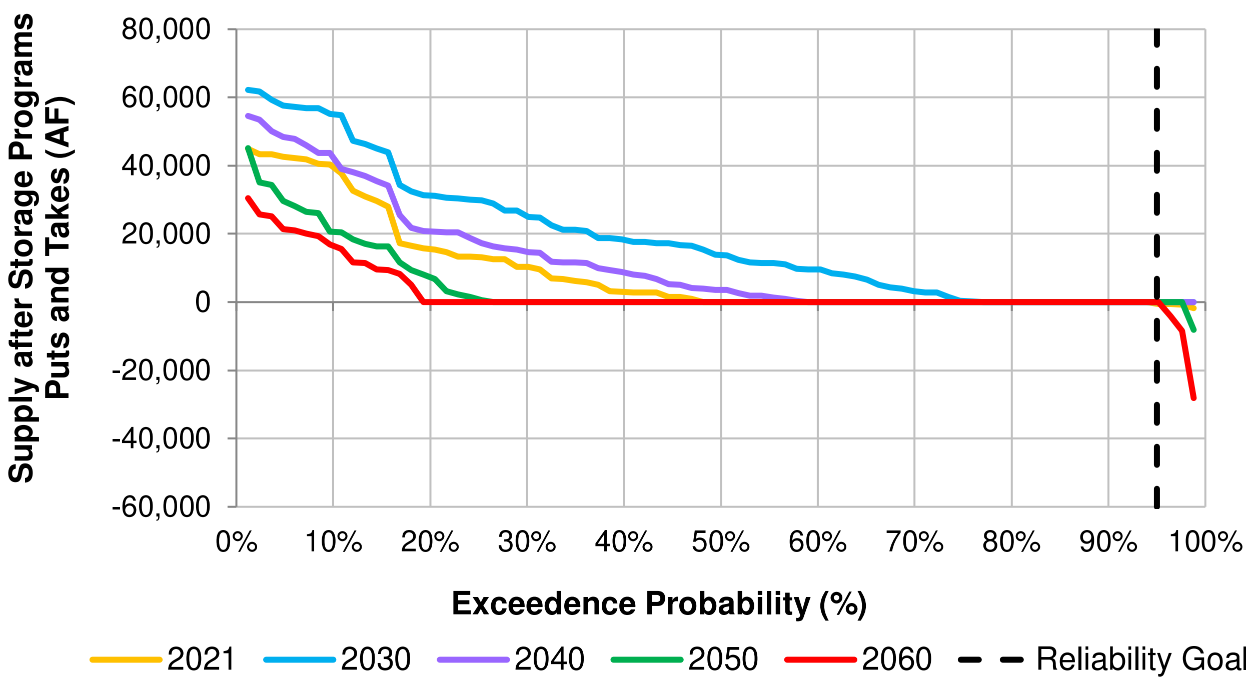
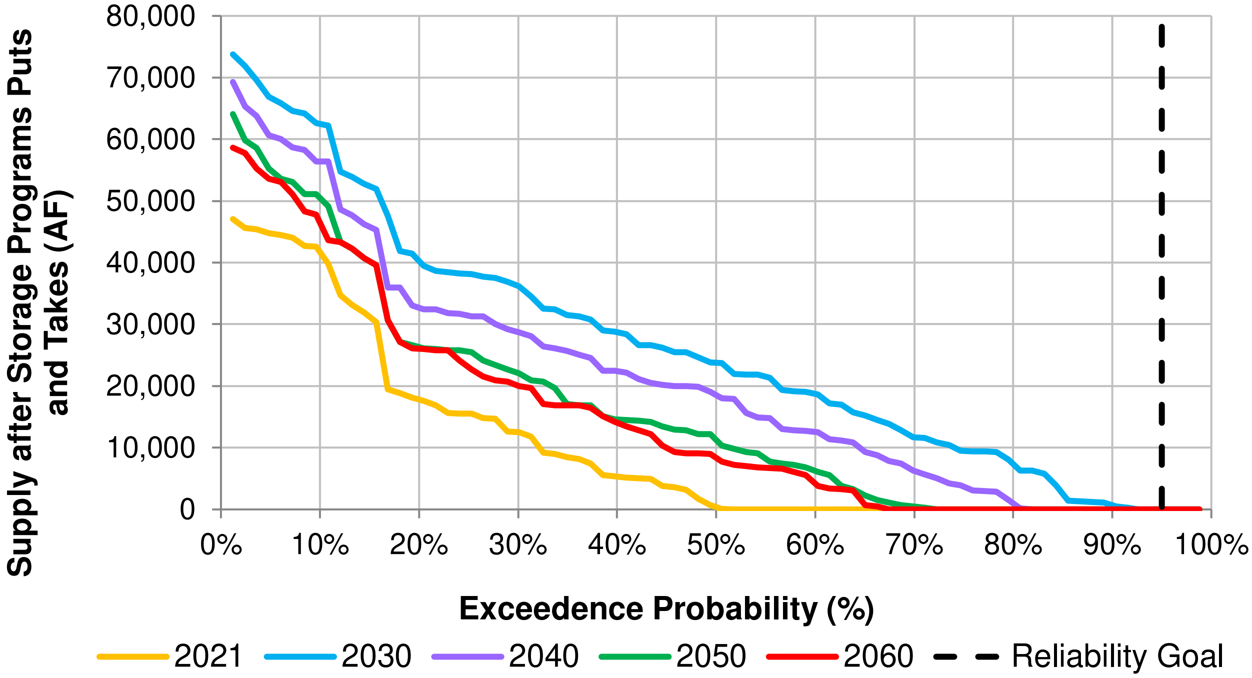


FIGURE B-10
SCENARIO 3 RELIABILITY WITH ACTIVE CONSERVATION



(e) Scenario 4

Scenario 4 is more challenging, as it assumes the further deletion of Saugus Wells 3 and 4. This scenario requires additional investments in the Rosedale and AVEK banks along with Sites Reservoir to achieve reliability. The results indicate a small supply shortfall of 1,800 AF in 2021 and no supply shortfalls for 2030 and 2040. Shortfalls in 2030 and 2040 are eliminated due to availability of banked water from the AVEK bank, availability of Sites Reservoir dry-year supplies, and increased extraction capacity at the Rosedale Rio-Bravo Water Storage District. The results for 2050 and 2060 show a supply shortfall as high as 8,700 AF and 13,400 AF, respectively. The reliability for 2050 is 98 percent and for 2060 is 96 percent. The reliability for 2030, 2040, 2050, and 2060 years exceeds or meets the reliability goal of 95 percent. Reliability increases to 100 percent when demand under active conservation is run and there are no supply shortfalls in each of the five years 2021, 2030, 2040, 2050, and 2060. These results are shown in Figures B-11 and B-12.

FIGURE B-11
SCENARIO 4 RELIABILITY WITHOUT ACTIVE CONSERVATION

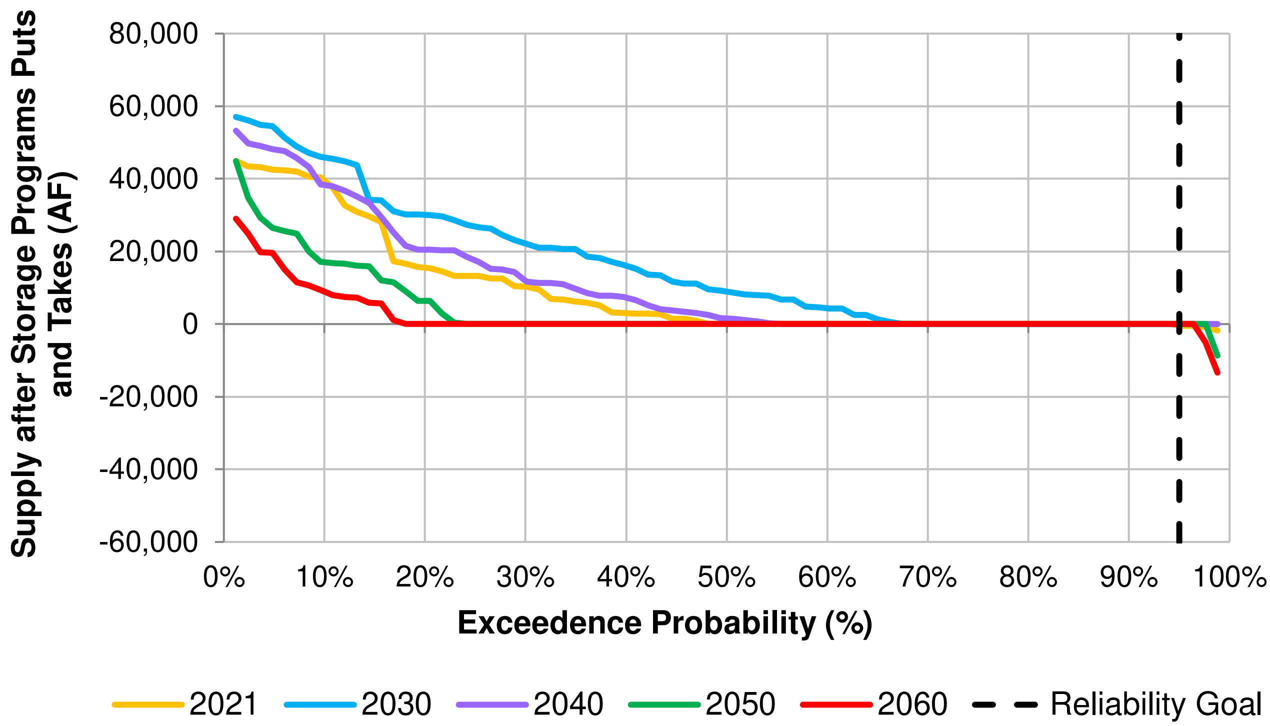
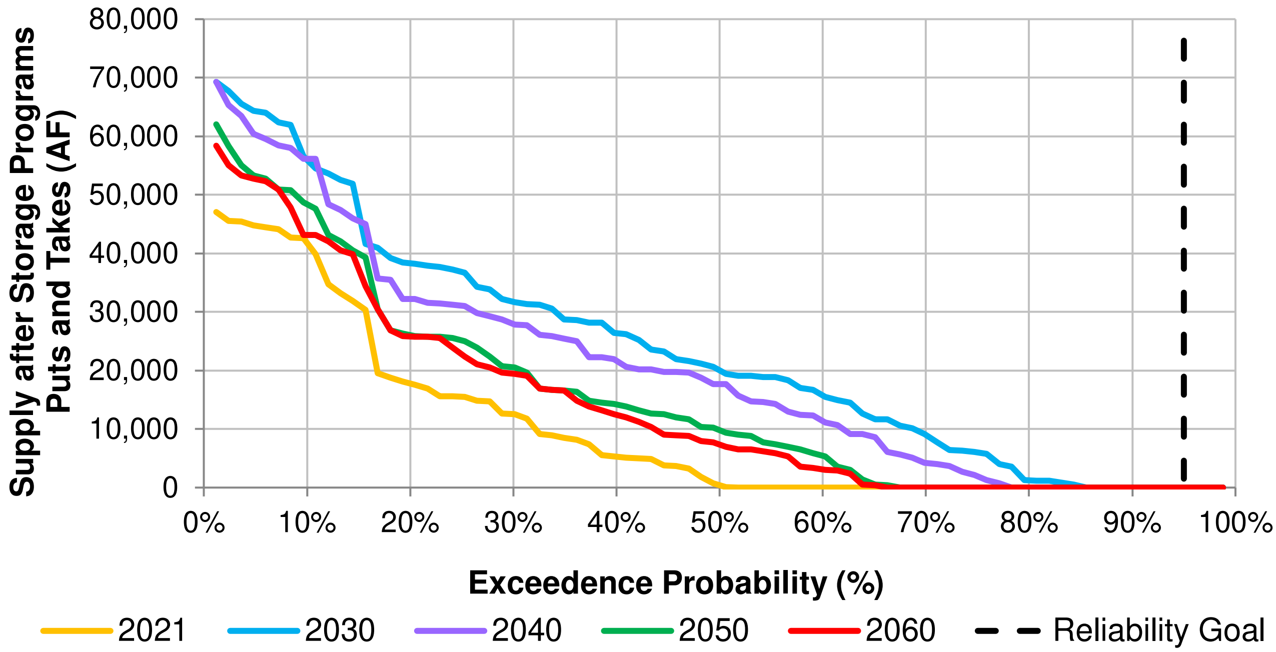


FIGURE B-12
SCENARIO 4 RELIABILITY WITH ACTIVE CONSERVATION



(f) Scenario 5

Scenario 5 is similar to Scenario 4, but substitutes the additional RRB recovery capacity with participation in the McMullin GSA Aquaterra Bank. The results show a small supply shortfall of 1,800 AF in 2021 and no supply shortfalls for 2030, 2040, and 2050. Shortfalls in 2030, 2040, and 2050 are eliminated due to availability of banked water from the AVEK and Aquaterra banks and availability of Sites Reservoir dry-year supplies. The results for 2060 shows a reliability of 98 percent with a supply shortfall as high as 23,400AF. The reliability for 2030, 2040, 2050, and 2060 exceeds or meets the reliability goal of 95-percent. Reliability increases to 100 percent when demand under active conservation is run and there are no supply shortfalls in each of the five years 2021, 2030, 2040, 2050, and 2060. These results are shown in Figures B-13 and B-14.

FIGURE B-13
SCENARIO 5 RELIABILITY WITHOUT ACTIVE CONSERVATION

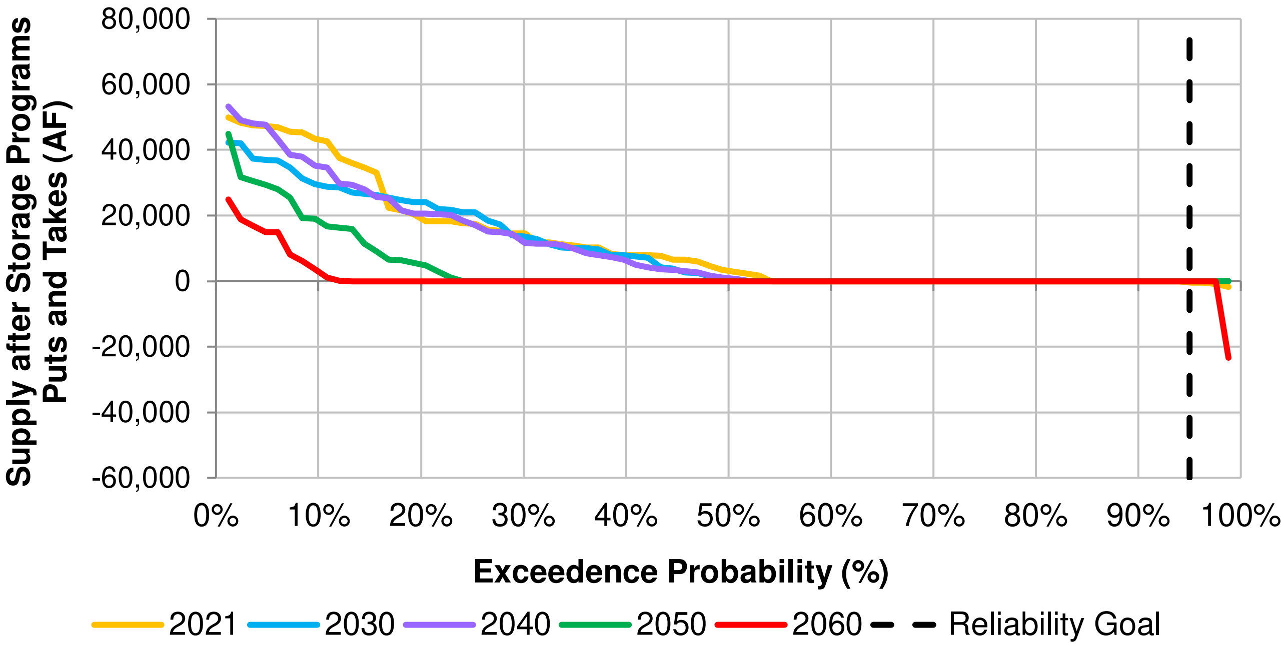
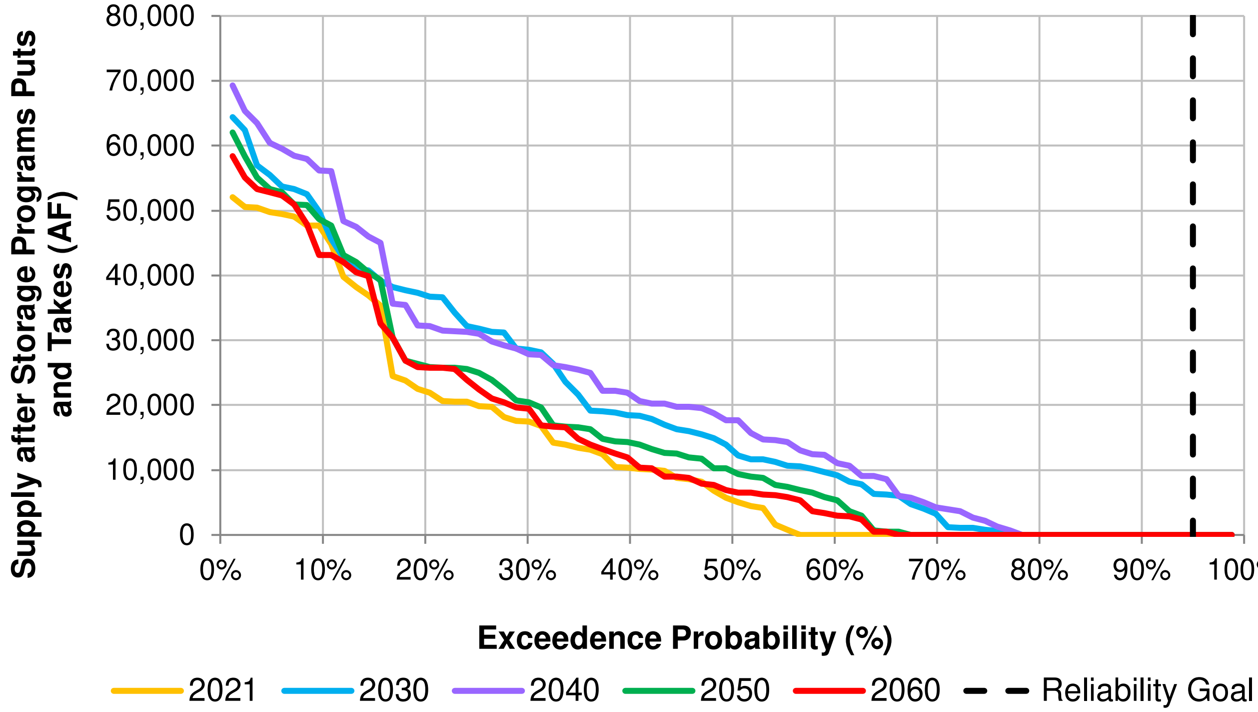


FIGURE B-14
SCENARIO 5 RELIABILITY WITH ACTIVE CONSERVATION



(g) Summary

The scenarios show how the Base scenario is used as a starting point to assess the need for additional supplies. The subsequent scenarios build on the Base scenario and are run under the assumptions of both demand without conservation and demand with conservation. The demand without conservation provides insight on the importance of conservation for maintaining supply reliability. As shown in the analyses above, SCV Water has adequate existing and planned supplies to meet SCV Water service area demands under active conservation throughout the 40-year planning period. Furthermore, SCV Water has alternative paths to reliability should planned supplies prove not to be viable. These results are summarized in Figures B-15 and B-16.

FIGURE B-15
SUMMARY OF RELIABILITY OF ALL SCENARIOS UNDER DEMAND WITHOUT ACTIVE CONSERVATION

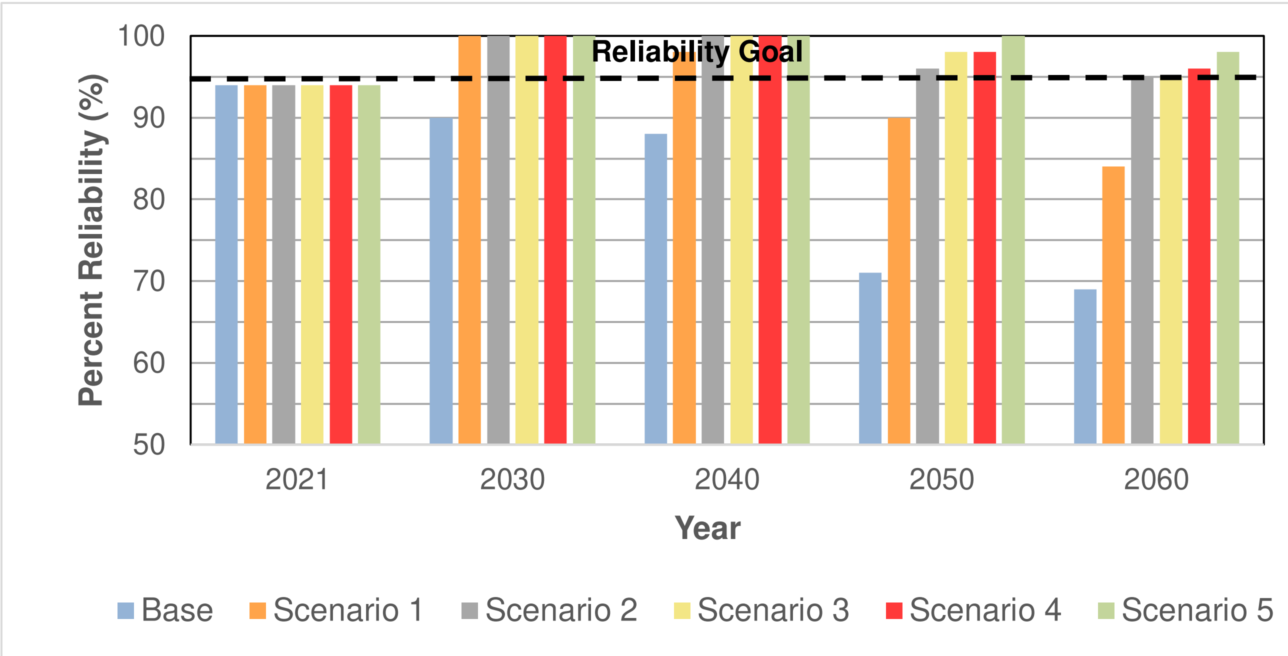


FIGURE B-16
SUMMARY OF RELIABILITY OF ALL SCENARIOS UNDER DEMAND WITH ACTIVE CONSERVATION