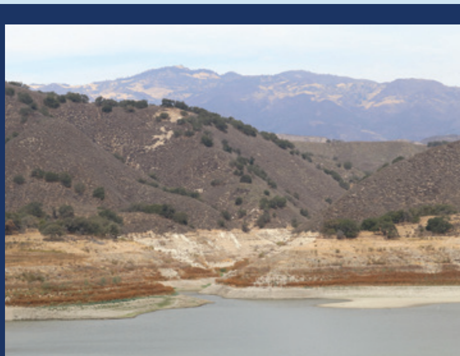
Goleta Water District

Water Supply Management Plan
2017 Update






GOLETA WATER DISTRICT

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and
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May 2017

GOLETA WATER DISTRICT

Mission

To provide an adequate supply of quality water at the most reasonable cost to the present and future customers within the Goleta Water District

Goleta Water District

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Glossary of Key Terms and Abbreviations

Cachuma Project Entitlement: The maximum amount of Cachuma Project Water the United States Bureau of Reclamation (USBR) is committed to supply the Goleta Water District on an annual basis. GWD's annual entitlement amount is 9,322 AFY.

Cachuma Trigger: Cachuma Project allocation as a percentage of full Cachuma Project Entitlement. Allocations less than the "Cachuma Trigger" will "trigger" early use of groundwater supplies in an effort to extend Cachuma supplies to ensure availability during peak demand later in the year; See Section 3.3 for further explanation.

Carryover Water: Any water not used the year in which it was allocated which has been carried forward for use in the following year(s).

CCRB: Cachuma Conservation Release Board, a joint powers agency formed in 1973 by Santa Barbara County South Coast Water Agencies to represent its members in protecting their Cachuma Project water rights and other related interests. Current members include Goleta Water District, City of Santa Barbara, and the Montecito Water District.

CCWA: Central Coast Water Authority, a joint powers agency formed in 1991 by the cities and special districts responsible for the maintenance of water resources in the North County, Santa Ynez Valley, and South Coast areas of Santa Barbara County. CCWA treats and delivers imported water to State Water Project participants in San Luis Obispo and Santa Barbara Counties.

CCWA Storage Bank: CCWA storage allowance in San Luis Reservoir that holds unused carryover water for CCWA members when conditions allow (discussed in Section 2.2.3).

COMB: Cachuma Operation and Maintenance Board, a joint powers agency formed in 1956 with the USBR that transferred to the Cachuma Member Units the responsibility to operate, repair, and maintain Cachuma Project facilities. Cachuma Member Units include GWD, City of Santa Barbara, Montecito Water District, Carpinteria Valley Water District, and Santa Ynez River Water Conservation District-Improvement District No. 1 (ID#1).

DCR: Delivery Capability Report 2015, a report issued by California Department of Water Resources (DWR) that provides estimates on current and future (2035) State Water Project (SWP) delivery capability by accounting for regulatory requirements, potential climate change and sea level rise impacts, and other factors.

Demand-hardening: Occurs as a result of longer-term water use efficiency and conservation measures (education, outdoor use restrictions, incentive programs, and price structure changes) that make it increasingly difficult for utilities to induce further reductions in water use during drought or other water shortage emergencies.

Demand reductions: The act of reducing water consumption through the use of demand management and conservation measures, water use restrictions, or other actions, which typically become necessary due to an actual or projected shortage in water supplies.

Drought Buffer: Water intended for use during drought conditions that maximizes reliability of that supply source. Refer to Sections 2.1.2.1 (groundwater drought buffer) and 2.1.3.1 (SWP drought buffer) for additional discussion.

DWR: California Department of Water Resources, which is responsible for managing and protecting California's water resources, and making annual allocations of water from the State Water Project to State Water Project Contractors (including the GWD).

Exchange Agreement: A written agreement between the GWD and Santa Ynez River Water Conservation District-Improvement District No. 1 (ID#1) under which GWD SWP water is delivered directly to ID#1 and GWD receives an equal amount of ID#1's Cachuma Project entitlement water in exchange. The purpose of this agreement is to minimize water treatment and delivery costs for the respective agencies.

Future Water Demand: Projected demand in the year 2035. The time frame was chosen to be consistent with the Urban Water Management Plan (UWMP), which requires water providers to demonstrate water supply planning over a 20-year period, in five-year increments. The methodology used to project future GWD water demand through 2035 begins with establishing normal baseline use relative to population, then applying different projection methods for each water use sector to determine future demand by sector, consistent with the UWMP Guidebook.

Hybrid Priority: Water supply management strategy that seeks to minimize the GWD's use of more expensive SWP water by using groundwater earlier in the year to preserve Cachuma Project Water for use later in the year when the system demands "peak" above the full production capacity of GWD wells.

Imported Water: Water from other areas of the state that is delivered through CCWA infrastructure to GWD; includes water from the State Water Project and supplemental water acquired from other entities outside Santa Barbara County.

IPR: Indirect Potable Reuse, the injection of advanced treated recycled water into the groundwater basin.

Mandatory Conservation: Conservation that is in addition to normal GWD conservation activities and that is mandated by the GWD pursuant to a triggered stage of water shortage emergency under the GWD's Drought Preparedness and Water Shortage Contingency Plan.

Optimal Water Supply Management Strategy: Water resource management strategy that uses the optimum combination of water sources throughout the year that maximize delivery reliability while minimizing costs. The primary purpose of the WSMP analysis is to identify the Optimal Water Supply Management Strategy.

RiverWare Model: Uses historic hydrologic data for the Santa Ynez watershed dating back to 1942, and superimposes the various water resource facilities and policies on this hydrology.

SAFE Ordinance: A local ordinance approved by GWD voters in 1991 and amended in 1994, which authorized the importation of SWP Water and set forth specific requirements for the GWD management of the Goleta Groundwater Basin.

San Luis Reservoir: A reservoir along the California Aqueduct that is used by both the state and federal governments to hold water for urban and agricultural uses, including GWD's stored state and/or imported water.

Scenarios: WSMP model runs that test the reliability of GWD's water supplies based on the use of different combinations of water sources throughout the year.

South Coast Water Agencies: Goleta Water District, City of Santa Barbara, Montecito Water District, and Carpinteria Valley Water District.

Spill Water: Surface water, such as Cachuma Project Water stored in Cachuma Reservoir and SWP Water stored in San Luis Reservoir, that is presumed lost if not immediately used in scenarios when reservoirs fill and "spill."

Supplemental Purchased Water: Additional purchased water that is not a part of GWD water entitlements. Most supplemental purchased water is imported water from other areas of the state.

Supply Optimization: Finding the appropriate balance of supply reliability and cost by varying the usage priorities of Cachuma, groundwater, and SWP supplies.

SWP: State Water Project, a state water management project under the supervision of the California Department of Water Resources (DWR), which has 29 SWP Contractors (participants), including GWD, that receive State Water supplies originating in Northern California.

SWPP: Supplemental Water Purchase Program, whereby the CCWA is authorized to represent a State Water Contractor, such as the GWD, in the identification, structuring, and negotiation of transactions for the acquisition of supplemental imported water.

Table A: Maximum entitlement amount of SWP Water for water contracting agencies, such as GWD. The GWD Table A amount is 7,000 AFY. The GWD additionally has 450 AFY of "drought buffer" to maximize reliability of its SWP supplies.

Water conservation: Reduction in the amount of water used, such as taking shorter showers, turning water off while brushing your teeth, and running the dishwasher only when it is full. Conservation measures can be mandatory (during a drought or water shortage) or voluntary.

Water use efficiency: Minimization of the amount of water used to accomplish a function, task, or result, such as using efficient water fixtures (low flow shower heads, low flow toilets, high efficiency washing machines, etc.), replacing high water use plants with drought tolerant varieties, and fixing leaky taps. Efficiency differs from water conservation in that it focuses on reducing waste to preserve water over the long-term, not restricting use.

Wright Judgment: Lawsuit filed in 1973 by private landowners for the adjudication of water rights in the North-Central Groundwater Basin (Wright v. Goleta Water District). Finalized in 1989, the Wright Judgment resulted in numerous groundwater management parameters and requirements that must be followed and reported on by the GWD.

WSMP Model: A spreadsheet model designed to simulate GWD's current and potential future water supplies. The model attempts to satisfy user-specified water demand by calculating the use of individual supplies in priority order, subject to operational capacity and regulatory constraints. The spreadsheet model was originally developed and used in the 2011 WSMP, and was updated with new information and features for this WSMP update. Refer to Section 3 for a detailed discussion on the WSMP model.

Executive Summary

Purpose

This Water Supply Management Plan (WSMP) formulates a water supply strategy for Goleta Water District (GWD) by prioritizing use of GWD's various sources of supply, evaluating the reliability GWD's water supplies, and evaluating scenarios for current and future demand, which is defined as 18 years from the present (2035). The time frame was chosen to be consistent with the Urban Water Management Plan (UWMP), which requires water providers to demonstrate water supply planning over a 20-year period, in five-year increments. While the primary purpose of this plan is to identify the optimum water supply management strategy, demand management is equally important as part of the supply/demand equation. GWD has a long-standing and continued commitment to long-term water efficiency as part of its strategy to preserve available water resources. Accordingly, ongoing policy related to improving water efficiency throughout the GWD now and into the future is a key ongoing part of the GWD water supply management strategy.

Current Supply/Demand

The work determined that GWD's current supplies exceed current demand under average conditions, with demand reductions and/or supplemental water purchases indicated only during drought periods. Current supplies combined with relatively minor supplemental water purchases are predicted to be capable of meeting current demand at least 87% of the time without requiring mandatory demand reductions. The maximum demand reduction requirement indicated by the model for all current supply/demand strategies considered is about 33%. Supplemental purchases are indicated only during the driest periods, with a maximum of 138 acre-feet per year averaged over the 95-year simulation period. Results for the optimal current water supply strategy are summarized in Table ES-1. The average cost of water for the optimal current water supply strategy is $1,670 per acre-foot in today's dollars.

Current Supply/Demand Summary under Optimal Water Supply Strategy

Current Conditions	Avg. Year Supply (AFY)	Single Dry Year (AFY)	Multiple Dry Years (AFY)
Current Demand	**13,824**	**14,657**	**14,657**
Supply Sources			
Cachuma Potable & GWC	9,811[1]	9,322	3,884
State Water	1,942	2,427	3,381
Groundwater	1,160	1,923	5,750
Recycled Water	1,061	985	985
Supplemental SWP Allocation Purchases	0	0	0
Total Supply	**13,974**	**14,657**	**14,000**
Total Surplus (Deficit)	***150***	***0***	***(657)***

[1] While the GWD's annual entitlement to Cachuma Project Water is 9,322 AFY, the long-term average reflected above includes unused carryover supplies from previous years and excess water that becomes available when Cachuma Reservoir spills (on average, every 3 years); and is therefore higher than the entitlement amount.

Table ES-1. Average water supply, single dry year supply (at the beginning of a drought period), and multiple dry years. Supplies are based on the optimal water supply strategy model run. Average year supply is the mean of all "average" years determined from historical Goleta rainfall. The single dry year was 2012 (at the beginning of current drought) and the multiple dry years were 2014-16. These results are from the WSMP model, and are not identical to the actual data from those years because Cachuma and State Water supplies from those and preceding years come from the RiverWare and State Water Project Delivery Capability Report modeling results.

Future Supply/Demand

At projected 2035 demand, GWD's full supply portfolio (Cachuma Project entitlement, State Water Project (SWP) Table A entitlement, groundwater right, and recycled water) is likely not sufficient to avoid significant and recurring demand reduction efforts during dry periods. When supplies are optimized and additional water is recharged to the groundwater basin (e.g., through injection of advance treated recycled water or storm water capture), supplies are enhanced by the availability of additional groundwater to pump With these enhancements and under average conditions, future supplies are about 16,235 acre-feet per year, with an average of 120 acre-feet per year of supplemental water from supplemental SWP Allocation purchases and/or future supply augmentation projects (storm water capture or purchase of local supplies from other water purveyors in the region). This is less than a 1% difference from future average-year demand of about 16,350.

Absent mandatory demand reductions, increased demand due to dry weather could result in supply shortfalls of about 10% of demand during dry years. The peak shortfall is about 27% during the worst year modeled. This compares to the peak conservation by GWD customers of 55% during 1991. Although this comparison suggests that customers could withstand a 27% shortfall as synthesized by the model, there has been demand-hardening since 1991 as customers adopted long-term conservation measures.

Results for the optimal future water supply strategy are summarized in Table ES-2. The average cost of water for the optimal future water supply strategy is $1,544 per acre-foot in today's dollars. It is noted that the future cost is lower than the cost reported for the optimal current water supply strategy. This occurs because there is more water being sold, so the fixed costs of existing water supplies are being spread across a larger base.

Future Supply/Demand Summary under Optimal Water Supply Strategy

2035 Conditions	Average Year Supply (AFY)	Single Dry Year (AFY)	Multiple Dry Years (AFY)
2035 Demand	**16,351**	**17,495**	**17,495**
Supply Sources			
Cachuma Potable & GWC	9,849	9,322	3,491
State Water	2,493	3,197	2,347
Groundwater	2,449	3,839	9,928
Recycled Water	1,225	1,137	1,137
Supplemental SWP Allocation & Future Supply Augmentation Projects	219	0	0
Total Supply	**16,235**	**17,495**	**16,903**
Total Surplus (Deficit)	***(116)***	***0***	***(592)***

Table ES-2. Future average water supply and supply during a single dry year (at the beginning of a drought period) and multiple dry years. Supplies are based on the optimal water supply strategy model run. The single dry year hydrology was 2012 (at the beginning of current drought) and the multiple dry year hydrology was 2014-16. Indirect potable re-use (1,500 AFY) was not included in the model as a separate source of supply, but as increased groundwater production as it will be pumped from the groundwater basin.

Any potential future reductions in Cachuma Project entitlement would reduce supplies and create larger shortfalls. For comparison, with a 40% reduction in entitlement, average-year supplies drop from 16,235 to 13,000 acre-feet per year, including 1,550 acre-feet per year of supplemental water purchases. Likewise, dry-year supplies drop from 15,600 to 12,250 acre-feet per year, including 1,800 acre-feet per year of supplemental water from supplemental SWP Allocation purchases and future supply augmentation projects.

Overall, there is a projected shortfall of future supply during more than 50% of the years in the WSMP model when current supplies are used without additional supply augmentation. To reduce both the frequency and magnitude of these shortfalls, additional water would likely be required. Purchasing supplemental SWP Allocation is the least expensive strategy, although the quantity is limited by pipeline capacity. Two additional strategies, groundwater basin augmentation via injection of advanced-treated recycled water (IPR) and implementation of future supply augmentation projects, were also considered in the WSMP modeling. The amount of additional water needed from such projects will become more apparent as the future reliability of current supplies becomes clearer.

Methodology

A combination of the RiverWare model for the Santa Ynez River for Cachuma Project deliveries and the California Department of Water Resources (DWR) State Water Project Delivery Capability Report 2015 (DCR) predictions for State Water Project deliveries was used in developing the WSMP. The existing models use historic hydrologic data for the Santa Ynez watershed and State Water Project system and superimpose the various water resource facilities and policies on this hydrology[1].

The WSMP model uses monthly time steps from 1922 through 2016. The model period includes four severe drought periods (current drought, during late 1980s/early 1990s, and two droughts in the 1920s and 1950s). The 95-year period of analysis allows the interaction of differing climate trends in northern and southern California, where drought and wet periods do not always coincide. The model has two major modes of operation – current supply/demand and future (2035) supply/demand. The WSMP spreadsheet model takes into account both the Wright Judgment and the SAFE Ordinance in its calculations. Because the SAFE Ordinance requirements are based in part on groundwater elevations in the Goleta Groundwater basin, the WSMP uses the results of the Goleta Basin Groundwater Model to predict groundwater elevations each year depending upon the amount of pumping/injection that has occurred in the basin.

Operating Plan

The WSMP recommends an operating plan for prioritizing the use of GWD's current water supplies. The optimal water supply strategy for meeting current demand involves:

(1) Using Cachuma Project water first to meet potable/raw water demand except during droughts;

(2) Injection of SWP into the Goleta Groundwater basin when possible (consistent with the SAFE Ordinance); and

(3) Optimization of groundwater and SWP supplies when Cachuma Project allocations are less than 50% such that groundwater is used earlier in the water year to ensure that Cachuma Project water is available to meet peak demand later in the year.

The above-described strategy provides very high reliability at the lowest cost and does a good job of maintaining groundwater levels compared to most other strategies. The maximum demand reduction requirement for the recommended water supply strategy is 13% and any demand reduction is required only 1% of the time.

Key Conclusions and Recommendations

This work has led to the following principal conclusions and recommendations:

1) The CCWA Bank of unused State Water stored in San Luis Reservoir is an important component in GWD's water supply reliability. The scenarios assume consistent storage of up to 6,000 acre-feet of State Water Project water in San Luis Reservoir. Without this storage, predicted supply shortfalls would be notably larger. Banking water in San Luis Reservoir should be strongly supported by GWD. Alternative banks must be examined individually – some of the existing groundwater banks are relatively expensive and have storage/delivery restrictions.

[1] The WSMP Update relies upon the baseline scenario for the WSMP scenarios that assess GWD supplies relative to current demand. For the WSMP scenarios that evaluate GWD supplies relative to potential future demand, the most conservative alternative (ECHO) is utilized pursuant to GWD Water Management and Long Range Planning Committee direction provided on July 21, 2016.

2) Injection of State Water Project water into the Goleta Groundwater Basin is important for maintenance of groundwater levels. Although some strategies that do not include SWP injection can achieve excellent reliability at a low cost, they require operating the Basin at a consistently low level. Doing so would increase O&M costs (due to increased electrical cost for higher pumping lift and increased well maintenance), increase the frequency of well rehabilitation, increase the probability of groundwater quality degradation, and increase the risk of land subsidence.

3) CCWA pipeline capacity was identified as a key constraint in maximizing the effectiveness of supplemental imported water purchases to address potential shortfalls in future supplies. It is recommended that GWD investigate opportunities to maximize pipeline capacity. The cost of additional CCWA pipeline capacity, if available, should be compared against other water supply augmentation options.

4) Increasing groundwater pumping/treatment capacity can partially offset the drought shortfalls. However, at current levels of demand, additional pumping capacity only slightly increases reliability at a significant increase in cost. Increased pumping capacity becomes more important in ensuring supply reliability at higher levels of demand in the future.

5) The WSMP model results suggest that additional local supplies may be needed to reduce both the frequency and magnitude of future supply shortfalls. Additional local supplies could potentially include injection of fully advanced-treated recycled water into the Goleta Groundwater basin, storm water capture, and/or the purchase of local supplies from other water purveyors in the region. . The amount of additional water needed will become more apparent as the future reliability of current supplies becomes clearer. In the meantime it is recommended that GWD complete the Potable Reuse Facilities Plan that is underway at the time of this WSMP update and proceed to the next tier of feasibility analysis that is recommended in that plan. If long-term contracts for local supplemental water purchases can be acquired in the near term at a reasonable cost it may be advantageous to consider pursuing them.

1 Introduction

This document presents an update to the Water Supply Management Plan (WSMP), which was originally developed and adopted in 2011. The WSMP provides a supply management tool and operating plan to guide the relative priority of use of District water supplies to maximize supply reliability at the lowest cost for the upcoming five years and forecasting over a 20-year planning horizon. The WSMP recommended updating the WSMP every five years to integrate new data from the Santa Ynez River Model and State Water Project water availability calculations, evaluate the adequacy of groundwater pumping capacity for drought protection, and reevaluate the role of drought in forecasting supply shortfalls. This update of the WSMP (WSMP Update) fulfills this recommendation and incorporates new water supply extremes witnessed during the current drought.

Goleta Water District (GWD) has multiple sources of water supply for delivery to customers. These sources include Cachuma Reservoir, groundwater, State Water Project (SWP) water, recycled water, and supplemental water purchases. Each source has its own pattern of availability during wet and dry climatic cycles. The combination of the water sources provides more delivery reliability than each source alone. To optimize GWD's overall water delivery reliability at the least cost to customers, the interplay of these water sources must be understood over a range of climatic conditions.

A key requirement of the WSMP Update is to maintain consistency between this document and the District's other water supply planning and management documents, models, and reports including the Districts Annual Budget, Infrastructure Improvement Plan, Groundwater Management Plan Update, Urban Water Management Plan (update underway), Sustainability Plan, Drought Preparedness and Water Shortage Contingency Plan (Drought Plan), Five Year Financial Plan, and the District's Water Code. As the first step in determining the optimum use of GWD's sources of water supply in the original WSMP, the Groundwater Management Plan was formulated and adopted by the Board of Directors (Board) in 2010 (GWD, 2010). This WSMP Update is similarly informed by the 2016 Groundwater Management Plan update (GWD, 2016). The Groundwater Management Plan provides guidance on how to operate the basin while meeting the requirements of the Wright Judgment and the SAFE Ordinance.

The original WSMP and this WSMP Update build on the Groundwater Management Plan by adding the other sources of supply in GWD's water portfolio to the overall supply mix. This WSMP adds the results of modeling of Cachuma Project supplies and SWP reliability over multiple wet and dry cycles to determine optimum use of the differing sources of supply and the supply reliability resulting from this optimization.

1.1 Background

During the drought of the late 1980s and early 1990s, water supplies for the south coast of Santa Barbara County reached a critically low level. An emergency regional seawater desalination plant was constructed just prior to the end of the drought, and voters subsequently passed a bond issue to build the Coastal Aqueduct of the State Water Project (SWP) to bring additional supplies into the area. These new supplies were aimed at drought-proofing the area into the future.

GWD customers reduced their water consumption significantly during this drought. Water conservation reached a peak level of 55% in 1991, concurrent with a lawn-watering ban. Groundwater played an important supply role for GWD during the drought, with increased groundwater pumping resulting in groundwater elevations reaching historical low levels. This lowering of groundwater elevations was exacerbated by the fact that pumping prior to the drought had already lowered the elevations substantially. Because of the low groundwater elevations, the GWD customers voted to restrict GWD use of groundwater reserves to drought periods or periods when groundwater elevations were high in the basin (see GWD, 2016, for further discussion of the SAFE Ordinance).

As this WSMP Update is being prepared, GWD and the region have experienced five years of historic drought conditions that began in 2012 and could be entering a sixth year of drought. The current drought has presented many new water supply management challenges that must be addressed today and for the future. In the relatively short time since the WSMP was prepared, several unforeseen water supply conditions have become reality - historically low SWP Table A allocations and the first ever zero percent Cachuma Project allocations, for at least two consecutive years. This timely WSMP update incorporates these new realities into the analysis of the District's water supply portfolio. At the time the original WSMP was prepared, it was believed that the water supply model was fairly protective for future drought periods. New water supply extremes witnessed during the current drought suggest this may not be the case. This WSMP Update is, therefore, a timely and appropriate action by the District. The current challenge for GWD is ensuring that use of its various sources of water supply are utilized in a manner that results in the desired level of water supply reliability at the lowest possible cost, both now and in the future. This WSMP Update addresses that challenge.

1.2 Purpose and Goals of Plan

The purpose of the WSMP Update is to update the analysis of the most effective use of GWD's various sources of water supply, both in terms of reliability and cost. An additional purpose is to determine the best use of the water sources to satisfy potential increases in demand in the future and maintain groundwater levels.

The goals for the original WSMP were to:

1. Optimize GWD's use of its various sources of supply to balance cost and reliability;
2. Determine the critical components of GWD's supply system;
3. Develop a plan to have sufficient supplies during drought periods as severe as any in the past one hundred years;
4. Determine the reliability of GWD's water supply under current water supply demand and potential future increases in demand.

The goals for this WSMP Update are essentially the same except that the new water supply extremes witnessed during the current drought help to define what it means to plan for a drought more severe than the drought of 1986 to 1991.

The WSMP is meant to be used by GWD to:

1. Have a "road map" for the priority of using its various sources of water supply under different climatic and groundwater conditions.

2. Determine if additional facilities need to be constructed to optimize use of its sources of water, and what current or future conditions would trigger the need for these facilities.
3. Assist in determining the amount of future demand that can be accommodated by the existing water sources.
4. Determine the reliability of its water sources in a drought and the extent of demand reductions that may be needed to avoid drought-related shortfalls in supply.
5. Provide input to other planning tools such as the Urban Water Management Plan.

1.3 Integration with Other GWD Planning Documents and Water Supply Planning Efforts

This WSMP is meant to interact with the other major planning tools that GWD uses for operations, operating and capital expenditures, and water rates. These interactions are discussed for each of the major planning and budgeting tools.

- **Groundwater Management Plan** – The Groundwater Management Plan, prepared in 2010 and updated in 2016 (GWD, 2016) explains the general rules by which the groundwater basin can be operated. This includes how to calculate the 1972 groundwater elevation that is critical for determining when groundwater can be pumped in the WSMP, the calculations for determining the amount of Annual Storage Commitment required, and tracking the storage in the basin.
- **Urban Water Management Plan (UWMP) and Drought Preparedness and Water Shortage Contingency Plan** – The State requires that Urban Water Management Plans be revised every five years; GWD is currently preparing the 2015 UWMP. Closely related to the UWMP is the Drought Preparedness and Water Shortage Contingency Plan, which describes the conditions which constitute a water shortage emergency, defines and discusses the various stages of action, and provides guidance and procedures to undertake during a declared water shortage. The WSMP modeling of water reliability and drought scenarios can be used directly in the analyses of water supply required by the UWMP and can inform the Drought Preparedness and Water Shortage Contingency Plan. Prior to the preparation of each UWMP and updating the Drought Preparedness and Water Shortage Contingency Plan, it may be prudent to update the WSMP modeling.
- **Water Supply Assessments** – These assessments may be required for future development projects within GWD. The results of WSMP modeling of the water availability with increased demand will likely be one of the key analyses used in such assessments.
- **Rate Analyses**– When rates are analyzed, the key calculations are usually how much water supplies cost, how they will increase, how these costs should be apportioned, and how rate structures should be used to encourage conservation. The WSMP calculates supply costs (in today’s dollars), what the source of supply would be with increased demand, how supply shortages may occur in the future, and the extent of such supply shortages. If projected increases in demand occur, the WSMP modeling should be updated regularly to provide feedback for periodic rate analyses.

- **GWD's Annual Budget, Five Year Financial Plan, and Infrastructure Improvement Plan**– The WSMP identifies capital and operating costs for both current water demand and incremental future demand. In particular, the WSMP links increased demand to increased capital facilities such as new wells. These analyses can be used by GWD to plan for future capital costs associated with changing water demand.

2 Water Supplies

This section provides an overview of GWD's water supplies and describes the historical use, supply reliability, delivery constraints, and cost of each supply source.

2.1 Sources of Supply

GWD has a variety of local and supplemental water supplies available to meet customers' needs. Water supplies include local surface water supplies from Lake Cachuma (Cachuma Project), groundwater from the Goleta Groundwater Basin, recycled water from the Goleta Sanitary District, and importation of SWP water. Additionally, in December of 2015, GWD acquired 2,500 AF of supplemental water from another SWP contractor through the Central Coast Water Authority (CCWA) Supplemental Water Purchase Program (SWPP) in order to augment existing supplies in response to a fourth consecutive year of drought. Although GWD has sold water to other CCWA contractors in prior years, this was the first SWPP purchase by GWD. GWD began taking delivery of the supplemental water in 2016. The proportion of each source of supply has varied considerably over time, with SWP supplies replacing groundwater use over the past 20 or so years so that the groundwater basin could recharge (Figure 2-1).

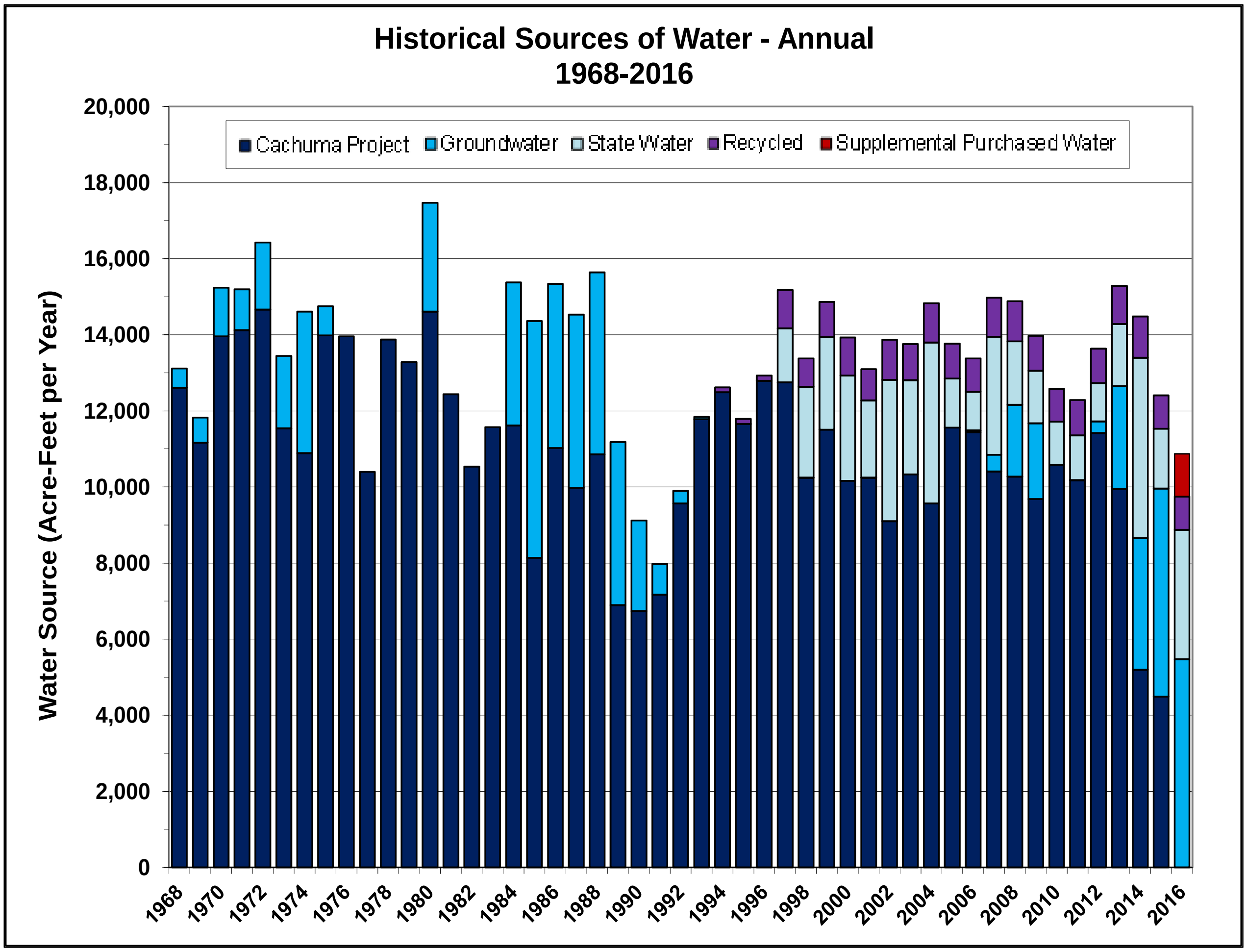

Figure 2-1. Historical sources of GWD water 1968-2016. Of these supplies, about 9% were for non-potable uses (recycled water, Goleta West Conduit). Note that "Cachuma Project" does not include water injected into the Goleta Groundwater Basin

In the last ten years, GWD has obtained approximately 60% of its water supplies from Lake Cachuma, 15% from the SWP (direct delivery and exchange water), 7% from recycled, 17% from groundwater, and 1% from supplemental water purchases. Of those supplies, about 14% were recycled water and non-potable Goleta West Conduit deliveries.

Monthly water deliveries are highest during July of most years (Figure 2-2, Figure 2-3), with Cachuma supplying an increasing amount of supply during the summer months.

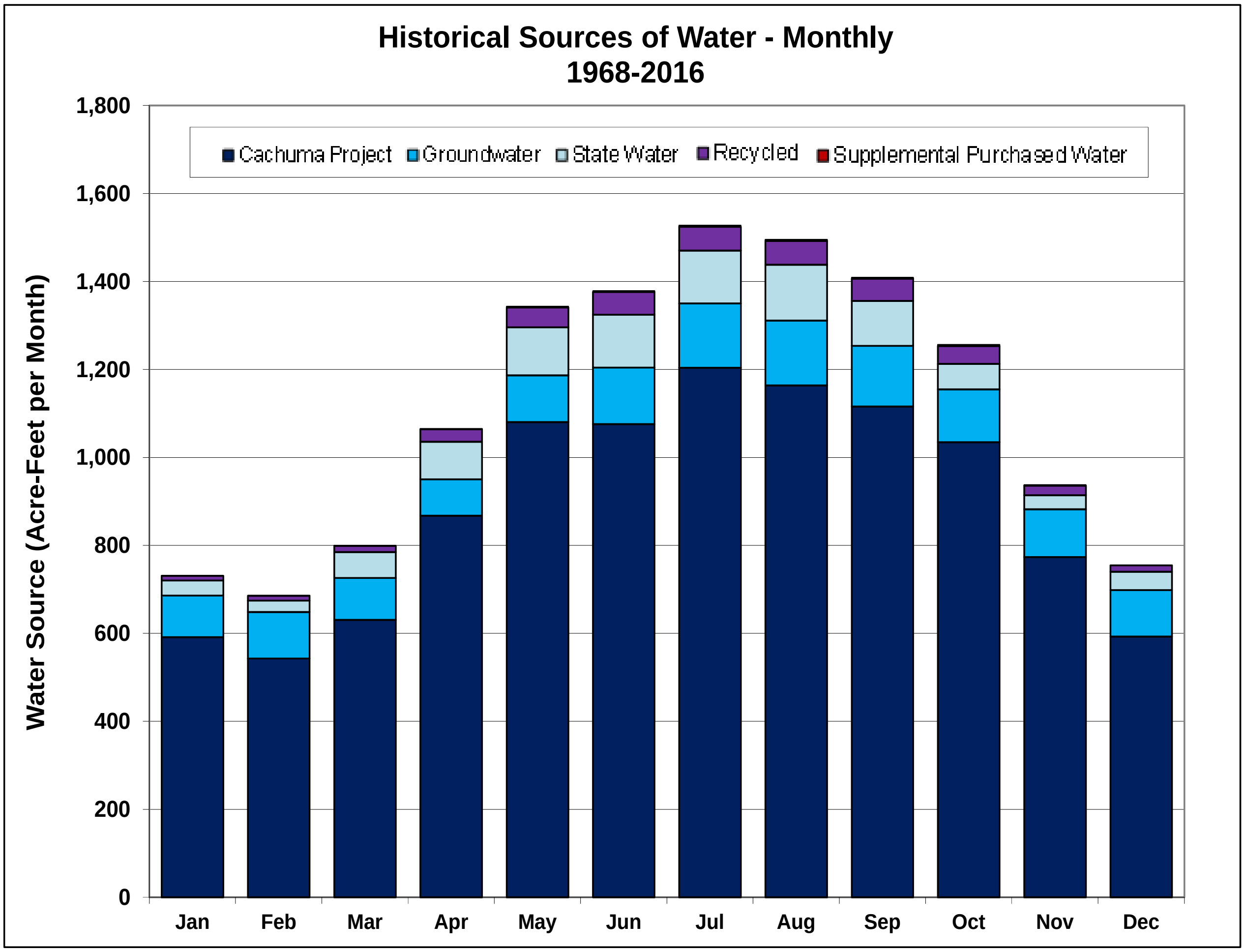

Figure 2-2. **Sources of water supply by month for period 1968 to 2016. Note that State Water was not available for the entire period and groundwater was not pumped for over a decade as the basin was allowed to refill; "Cachuma Project" does not include water injected into the Goleta Groundwater Basin. Note that Supplemental Purchased Water may not be visible because the average monthly amount over during 1968-2016 is very small.**

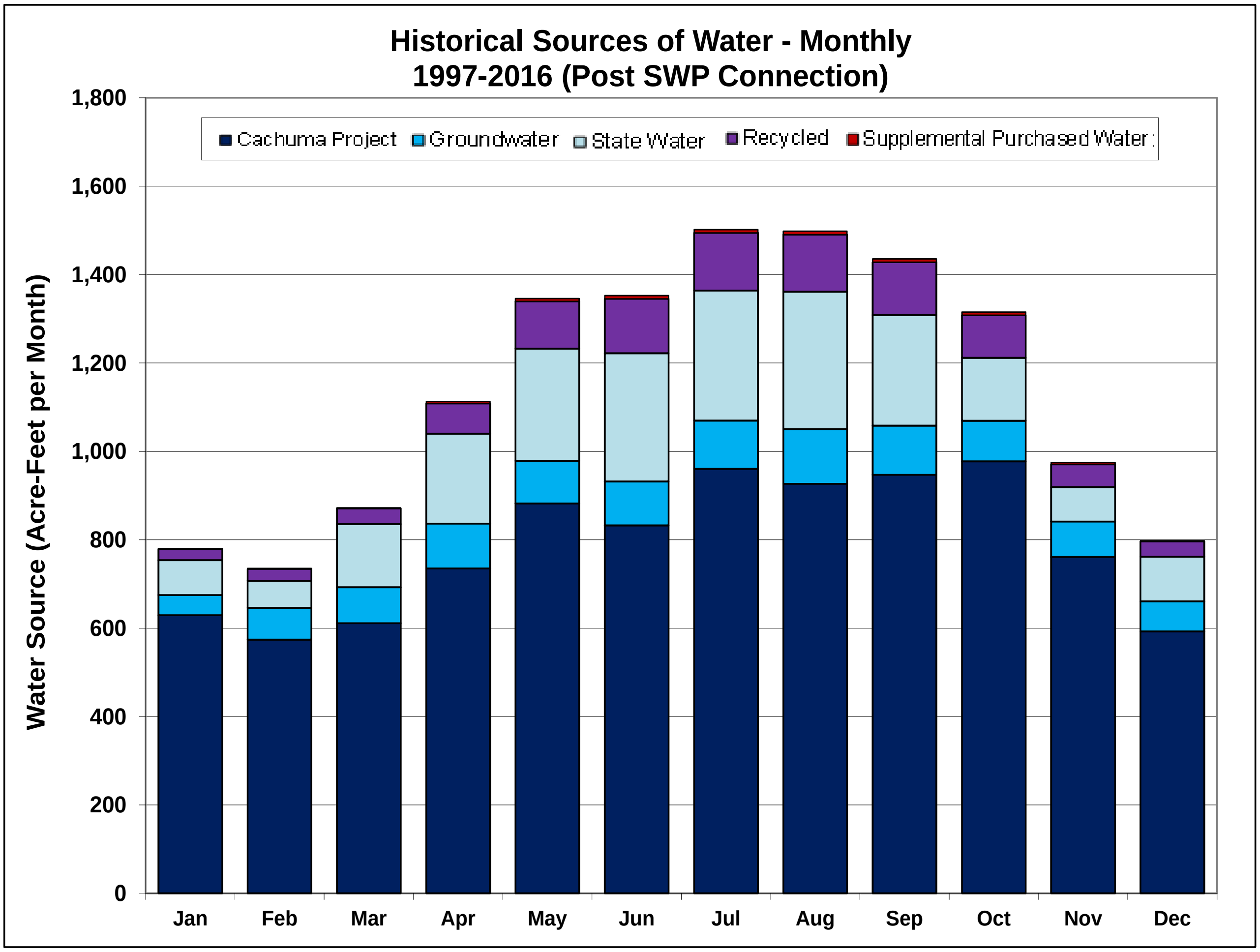

Figure 2-3. **Sources of water supply by month for period since connection to the SWP (1997- 2016). Note that groundwater was not pumped for over a decade as the basin was allowed to refill; "Cachuma Project" does not include water injected into the Goleta Groundwater Basin. Note that Supplemental Purchased Water may not be visible because the average monthly amount over during 1997-2016 is very small.**

2.1.1 Cachuma Reservoir

The majority of GWD's water supply is from the Cachuma Project, which was constructed by the United States Bureau of Reclamation (USBR) on the Santa Ynez River in the early 1950's. The Cachuma Project consists of Bradbury Dam, Tecolote Tunnel, South Coast Conduit, Lake Cachuma, and various water conveyance facilities. Lake Cachuma has an estimated capacity of approximately 190,000 AF[2] and is operated by the Cachuma Operation and Maintenance Board (COMB) under contract with USBR. Entitlements, costs, constraints, and reliability are summarized in Table 2-1.

[2] Santa Barbara County Flood Control District, Rainfall and Reservoir Summary, 1/21/2016

2.1.1.1 Cachuma Project Supply

There are three categories of Cachuma Project water: regular entitlement water, carryover water, and spill water. Each category is described below.

- **Entitlement** – GWD is contractually entitled to 9,322 AFY of water from Lake Cachuma under the existing contract, which is set to expire in 2020. Over the 86-year period before the current drought began, an average of 97% of its Cachuma entitlement was available to GWD. Yet, for the first time in history, the GWD and other Cachuma Member Agencies received a zero percent (0%) allocation of Cachuma water for the 2015-16 and 2016-17 water years. The annual average of Cachuma deliveries in the last ten years has been 8,217 AFY (see Figure 2-7, page 16).

  Over the past 20 years, circumstances surrounding the Cachuma Project have changed, including reduced reservoir capacity due to sedimentation, increased downstream releases required by the National Marine Fisheries Service (NMFS) under the 2000 Biological Opinion (2000 BO), and implementation of the Settlement Agreement with downstream water rights interests. In 2014, the NMFS and U.S. Bureau of Reclamation (USBR) formally initiated reconsultation of the Biological Opinion for Oncorhynchus mykiss (Steelhead Trout) and the operation of the Cachuma Project. A draft revised Biological Opinion is pending. Additionally, the State Water Resources Control Board (SWRCB) in late 2016 issued its Draft Water Rights Order, providing further clarity on potential long-term reductions in Cachuma Project yield and potential impacts to District entitlement.

  Given these changes, Santa Barbara County hydrologists are currently modeling the potential for new safe yields of the Cachuma Project in preparation for contract renewal negotiations ahead of 2020. While no currently published evidence supports a long-term reduction in Cachuma Project yield and reduction in GWD entitlements, GWD should conservatively prepare to account for such potential reductions. Thus, this WSMP Update includes several scenarios specifically designed to account for a range of potential impacts from the pending Biological Opinion and other factors, should they occur.

Cachuma supplies consist of a basic entitlement that is 9,322 AFY for Goleta. As the reservoir is drawn down during drought periods, that entitlement can be reduced. The average annual delivery over the past ten years has been 8,217 AFY.

Unused entitlement can be carried over to the next year, as long as the reservoir does not spill. When Cachuma spills, the District can use all the water it can treat and deliver during the spill period.

Ongoing consultation with fisheries agencies may further reduce the availability of future Cachuma water for the District.

- **Carryover Water** – Entitlement that is not used in any Cachuma water year (October through September) is carried over to the following years. When Cachuma spills, all carryover water is considered to have been spilled and the accounting for carryover water is returned to zero (spill frequency is shown graphically in Figure 2-4). Thus, it is important to use carryover water as soon as possible, giving it the highest priority of use.
- **Spill Water** – When Cachuma spills, GWD can take as much water as it can use, without debiting its entitlement for that year. The amount of spill water that GWD can actually use for customer demand and for groundwater injection is largely limited by GWD's treatment and injection capacity. Once the spill ceases, further use of Cachuma water by GWD is debited against its annual entitlement. The WSMP model calculates the additional Cachuma yield from spill water by allocating spill water to customer demand in each month that Cachuma spills. The average amount of spill water allocated

to customer demand over the 95-year model period was 846 acre-feet per year. An additional 270-390 acre-feet per month of spill water was allocated to injection in each month that Cachuma spilled, depending upon the spill month. The average amount of spill water allocated to injection over the 95-year model period was 330 acre-feet per year of water. The occurrence of spills during the 95 years of the combined RiverWare and Santa Ynez River Models[3] is indicated in Figure 2-4. Spills generally occur during the months of January through May (Figure 2-5) and are typically two to three months in duration (Figure 2-6).

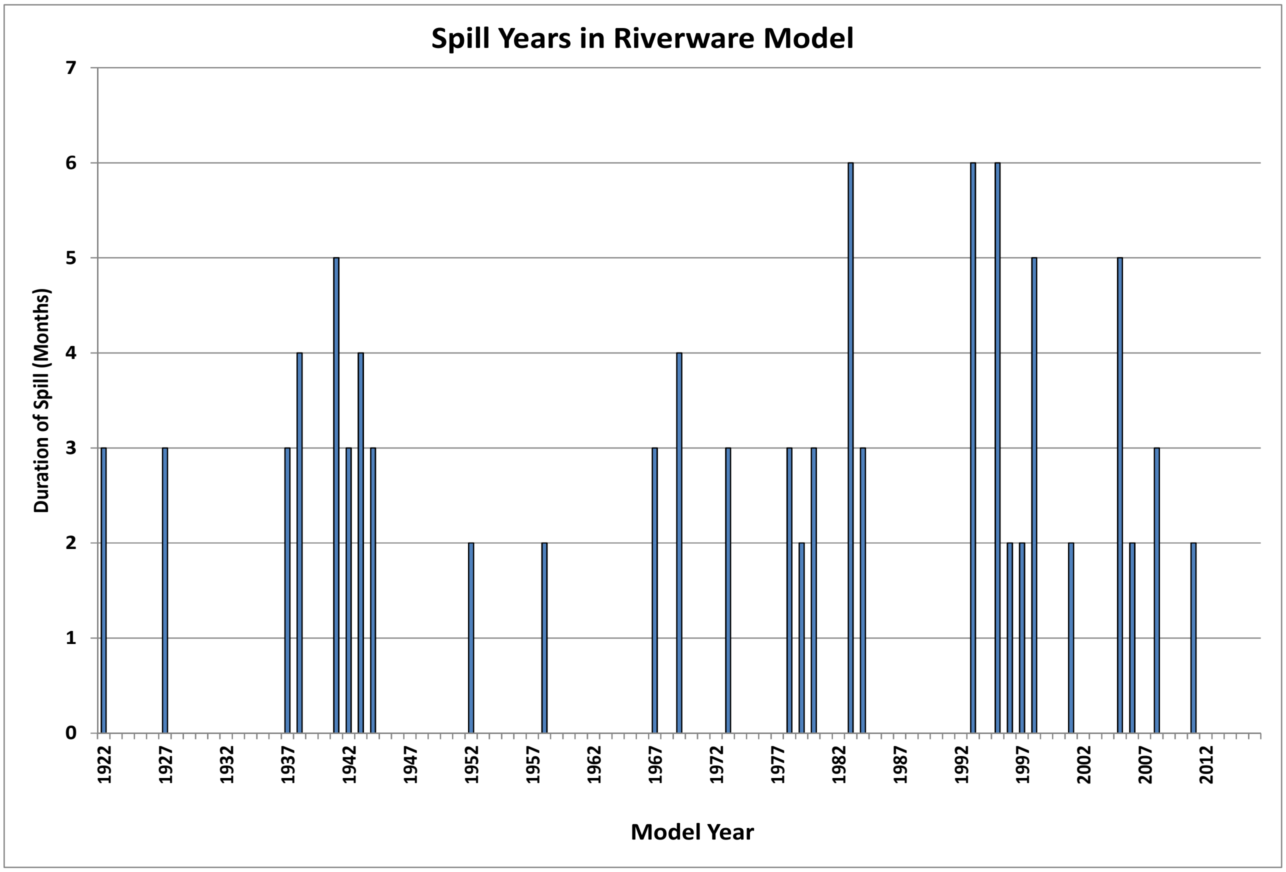

Figure 2-4. Years in which there is a Cachuma spill in the RiverWare model. Note: data for 1922-1941 are from Santa Ynez River Model.

[3]RiverWare model begins in 1942. Data for 1922 – 1941 are from the Santa Ynez River Model.

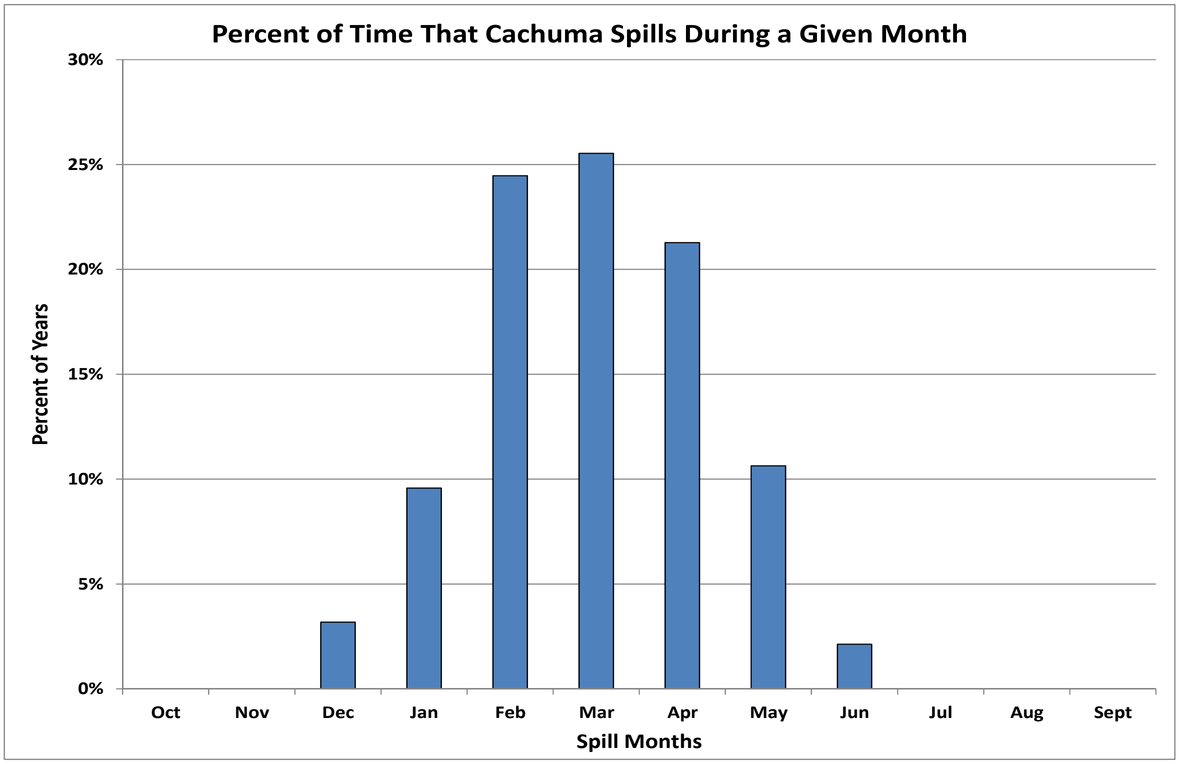

Figure 2-5. Months during which Cachuma spills, based on RiverWare Model augmented with Santa Ynez River Model for 1922-1941.

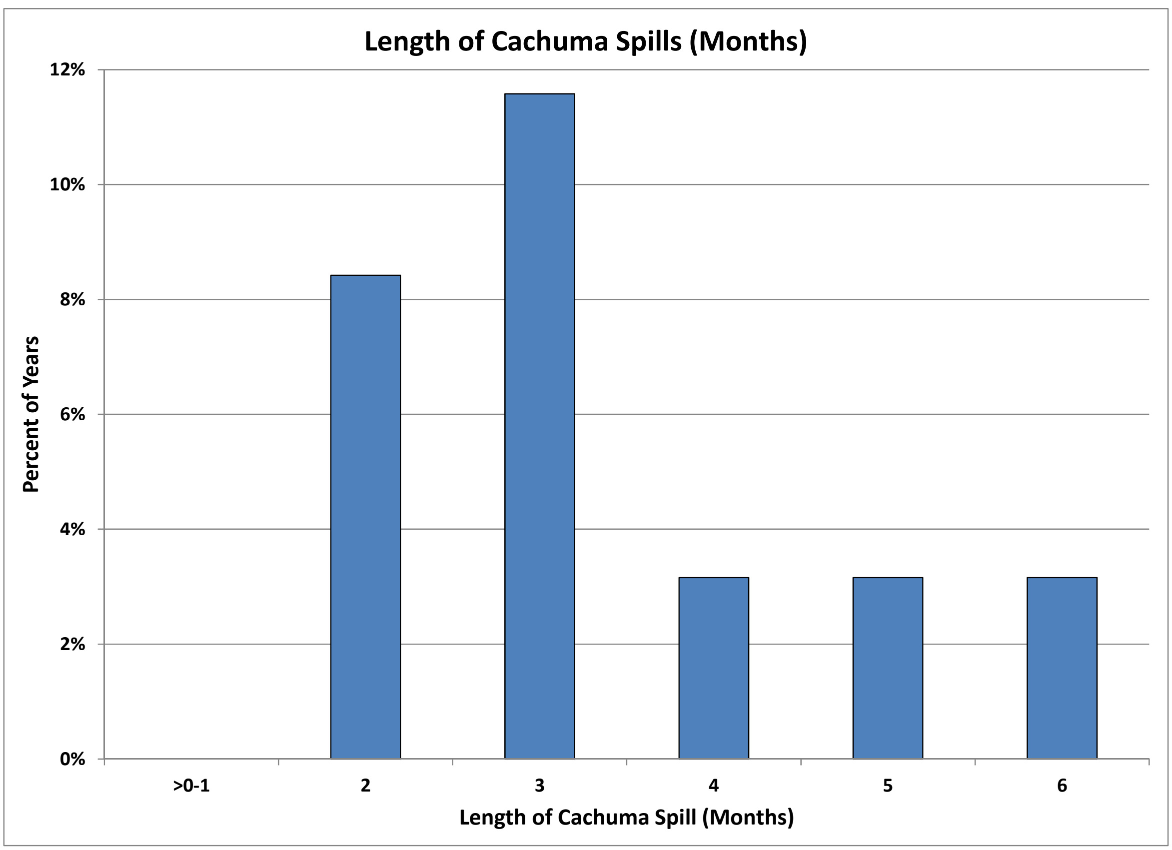

Figure 2-6. Length of Cachuma spills, based on RiverWare Model augmented with Santa Ynez River Model for1922-1941.

2.1.1.2 Cachuma Reliability

Each Cachuma Project Member Unit has an entitlement to a specific amount of water, but the amount of Cachuma Project water delivered to member units varies from year to year depending on winter runoff, lake storage, water demand, downstream releases for fish, and other water supply sources. Historically, delivery reductions have only occurred during severe droughts and have been mutually agreed to by the Cachuma member agencies. For example, the Cachuma entitlements for all water purveyors were reduced by 40% in 1991, during the 1987-92 drought, and 55% and 100%, respectively, in water years 2014-2015 and 2015-2016 during the current drought.

Cachuma has been a reliable source of supply for decades, and has been the primary source of water for Goleta Water District. However, fish releases and other regulatory requirements have lessened the amount of water available to water agencies. With no Cachuma deliveries in 2016, assumptions about deliveries have also been modified. Updated modeling of the Santa Ynez River was used to forecast current and future supplies from Cachuma.

Future reliability of Cachuma Project supplies is evaluated using the recently developed RiverWare model of the Santa Ynez River. The RiverWare model was developed under agreement of eight local water agencies and local government over the past decade to simulate flow rates along the river and dozens of tributaries, as well as capture and spilling of water from the three reservoirs along the river. The numerical model has been used for reservoir studies, to determine water rights issues, to plan conservation releases, and to assist in issues related to fish flows. The RiverWare model is replacing the older Santa Ynez River Model that was used in the 2011 Water Supply Management Plan.

The RiverWare model runs over the 75 water-year period from 1942 through 2016 in daily time steps. Measured and estimated historic stream flows, rainfall, evaporation, and tunnel infiltration values provide the database for a set of algorithms that simulate reservoir and river-course conditions. Changes in one portion of the model (such as increasing annual deliveries from a reservoir) result in changes throughout the model. The results of "Alternative 5C" of the Bureau of Reclamation's Final Environmental Impact Report for Draft Order dated September 7, 2016 were used in this study. Under the mode of operations and water releases per Alternative 5C, there is substantially more water released downstream for fish habitat purposes in wet years as compared to the current mode of operations pursuant to the existing 2000 Biological Opinion for O. Mykiss. Thus, utilization of Alternative 5C is conservative for water supply planning purposes. Output from the RiverWare model used in this study includes Cachuma Reservoir storage (to determine when spills were forecast to occur) and forecasted Cachuma delivery amounts.

Over the 95-year period of the WSMP[4], 91% of its Cachuma entitlement was available to GWD. Carryover water is generated only in a few years when Cachuma spills and GWD's entitlement is not used during those spill months.

Whenever there is a large storm event or following a fire in the Cachuma watershed, material is washed down the river and is caught behind Bradbury Dam. This "siltation" slowly fills the reservoir and decreases the yield of the Cachuma Project. River models take this into account for current conditions; some predict future siltation. The RiverWare model uses current

[4] The WSMP model period is 1922 to 2016. The original Santa Ynez River Model was used for the period 1922-1941

conditions. From an operational standpoint, sediment-laden water also reduces the capacity of GWD's Corona del Mar Water Treatment Plant, which can result in a temporary reduction in the availability of Cachuma Project water to GWD customers.

2.1.1.3 Cachuma Costs

In fiscal year (FY) 2015-16, GWD paid an annual fixed cost of $3,120,800 to COMB and $425,000 to the Cachuma Conservation Release Board (CCRB) for its share of Cachuma Reservoir operational costs. These costs paid to COMB and CCRB are referred to as "Agency Fees." For potable water deliveries, additional fixed costs associated with operation of GWD's potable water delivery system and Corona del Mar Water Treatment Plant include GWD debt service, capital spending with operating funds, labor, operations and maintenance, and laboratory testing. For non-potable deliveries via the Goleta West Conduit, additional fixed costs associated with operation of the conduit include labor and operations and maintenance. The total fixed costs in FY 2015-16 for potable and non-potable delivery of Cachuma water were $843 and $413 per acre-foot, respectively, based on the GWD's normal supply assumptions[5]. The variable cost for GWD to treat the water delivered from Cachuma for potable use was $84 per acre foot in FY 2015-16. The variable cost for non-potable delivery via Goleta West Conduit was $28 per acre foot in FY 2015-16. Fixed and variable costs are illustrated in Figure 2-8 through Figure 2-10.

Costs in this report are "all-in costs," which include both fixed and variable costs. By doing this, any future supply projects can be directly compared to the cost of current supply sources.

[5] COMB and CCRB fixed costs are based on GWDs Cachuma Project entitlement of 9,322 AFY. Remaining fixed costs are based on normal deliveries through Corona del Mar Water Treatment Plant of 10,595 (Cachuma plus SWP water) for potable and 1,341 AFY of non-potable deliveries via Goleta West Conduit.

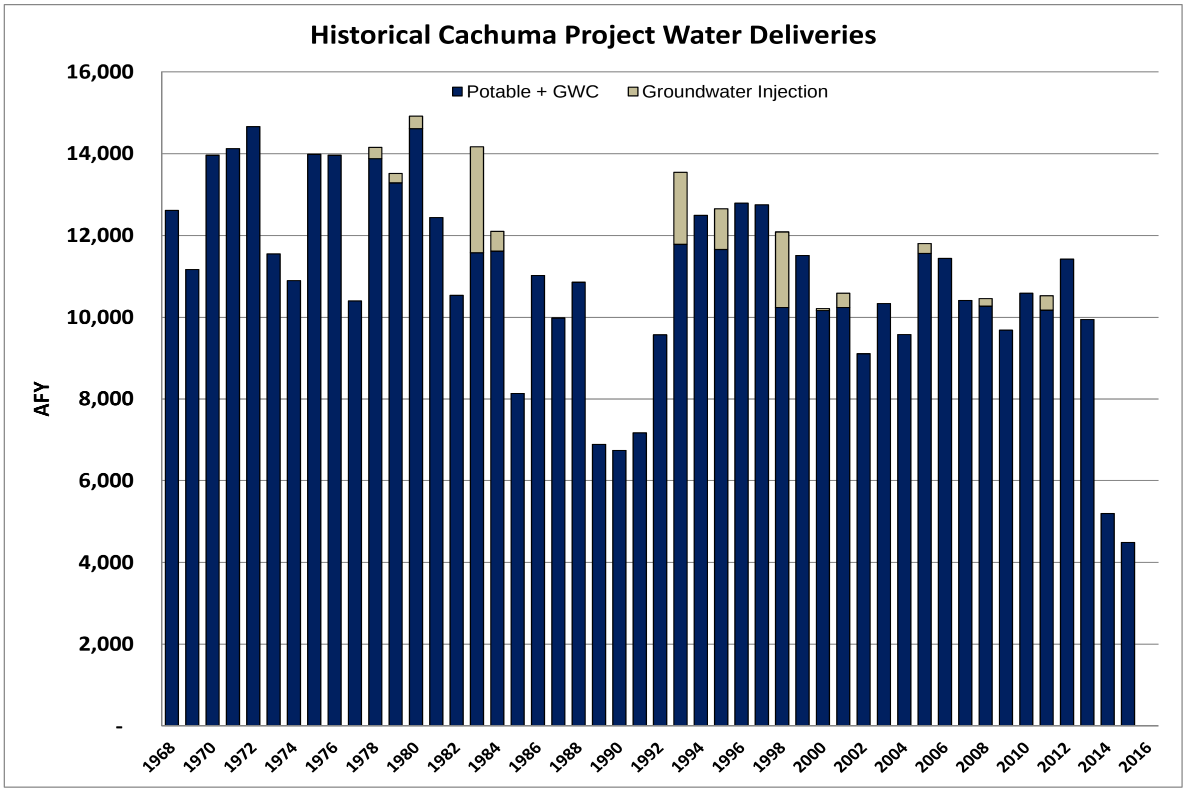

Figure 2-7. Historical Cachuma Project deliveries to GWD for direct potable use, non-potable uses on the Goleta West Conduit, and groundwater injection.

2.1.2 Groundwater

Groundwater used by GWD is pumped from its own wells within the Goleta Groundwater basin, with both the amount and timing of the pumping determined in part by the Wright Judgment and GWD's SAFE Ordinance. Water rights, costs, constraints, and reliability are summarized in Table 2-1.

2.1.2.1 Groundwater Supply and Constraints

- **Wright Judgment**– GWD has a current water right to 2,350 AFY of groundwater from the Goleta Groundwater basin under the terms of the Wright Judgment. Unexercised groundwater rights at the end of a year convert to a stored water right in the basin. GWD can also store water by injecting water in the basin for later extraction. The amount of water stored in the basin is reported annually by GWD; as of 2015, GWD storage in the basin was 45,959 acre-feet (GWD, 2016). The details of how both the Wright Judgment and the SAFE Ordinance affect groundwater use by GWD are contained in the Groundwater Management Plan for the Goleta Groundwater Basin (GWD, 2016).

- **SAFE Ordinance**– How this groundwater is used is regulated by GWD's SAFE Ordinance, which specifies conditions under which groundwater is either pumped or stored. The key determining factors are groundwater elevations in the basin and the availability of Cachuma water in any year. When groundwater elevations are below those measured in 1972, groundwater cannot be pumped and a pre-determined amount of water must be stored annually in the basin as a drought buffer. The exception to this rule is when there are reduced deliveries of Cachuma water – SAFE allows for pumping of groundwater during these "drought" conditions. The Groundwater Management Plan specifies which wells to use in determining groundwater elevations in 1972 and in subsequent years (GWD, 2016) (Figure 2-8). A copy of the SAFE Ordinance is included in Appendix B.

Groundwater supplies have also been important for Goleta. The use of groundwater is prescribed by both the Wright Judgment (legal adjudication of water rights in the basin) and the SAFE Ordinance (passed by voters). How groundwater can be used each year is determined by average groundwater elevations. The governing groundwater elevation is based on levels in 1972 – if elevations are below 1972 levels, then the basin must be recharged instead of pumped. An exception to this is during a drought period.

The District has a current right to pump 2,350 AFY. Groundwater has been an important supply source during drought periods.

- **Groundwater Elevations Below 1972 Levels** – When groundwater elevations are below 1972 levels, SAFE requires certain actions to be taken. As discussed above, groundwater cannot be pumped below 1972 levels unless Cachuma supplies have been reduced. In addition, an "Annual Storage Commitment" of at least 2,000 acre-feet per year is required under the SAFE Ordinance for replenishment to 1972 levels (this has risen to 2,477 acre-feet per year in 2016 as new customers have been connected) (GWD, 2016). Any excess State Water delivered that is beyond the supplies needed to serve existing customers that is over 3,800 acre-feet per year shall be stored in the Central subbasin until the basin is replenished to its 1972 level. Additionally, there can be no new service connections unless all the obligations for water service and the Annual Storage Commitment are met.

- **Physical Facilities**– GWD currently has eleven groundwater production wells with various capacities and statuses. Well extraction and treatment capacity based on recent operations is approximately 517 acre-feet per month[6]. GWD wells are located in the North and Central subbasins of the Goleta Groundwater basin.

  The same wells used for extracting groundwater can also be used for injection. Historically, the source water for injection has been spill water from Cachuma. This

[6]Personal communication with District staff, November 9, 2016.

injection of Cachuma spill water occurs in both GWD's wells and in La Cumbre Mutual Water Company's wells. The injection capacity during spill events is controlled by the capacity of treatment facilities (raw water cannot be introduced in the distribution system), water demand during the spill event, and well injection capacity. GWD's injection capacity is currently about 314 acre-feet per month (3.4 mgd). Injection of Cachuma entitlement water or State Water could also be accomplished during non-spill periods when the wells are not used for extraction. This possibility is investigated in this WSMP. Notably, because existing wells are used for potable water supply, current regulations would prohibit their use as injection wells for recycled water or untreated storm water.

- **Groundwater in Storage Above 1972 Groundwater Elevations** –The Groundwater Management Plan (GWD, 2016) provides an estimate of how much water can be pumped from above 1972 groundwater elevations. It takes roughly 10,000 acre-feet of cumulative pumping to drop from high groundwater elevations to the 1972 elevation (-26 ft msl) during drought conditions. GWD can expect to pump approximately 6,300 to 8,100 acre-feet of the 10,000 acre-feet, because GWD is not the only groundwater producer in the Basin.
- **Pumping from the Drought Buffer** – The Drought Buffer can only be used for delivery to existing customers when a drought on the South Coast causes a reduction in GWD's annual deliveries from Lake Cachuma, and cannot be used as a supplemental supply for new or additional water demand. The amount of water that can be pumped from the Drought Buffer has been calculated in the Groundwater Management Plan (GWD, 2016), the results of which have incorporated into the WSMP. It takes roughly 24,000 acre-feet of cumulative pumping to drop from the 1972 elevation (-26 ft msl) to the historical low level (-84.6 ft msl) during drought conditions. GWD can expect to pump approximately 16,900 to 21,600 acre-feet of the 24,000 acre-feet because of the shared use of the basin and the limited groundwater recharge during a drought.

2.1.2.2 Groundwater Reliability

Prior to the Wright Judgment and SAFE Ordinance, GWD used groundwater as an important source of its water supply, with groundwater elevations dropping to historical lows during the drought of 1986-1991 (left portion of Figure 2-8). Following that drought, GWD pumped very little, which allowed the basin to rise to near-historical high groundwater elevations (right side of Figure 2-8). Beginning in 2013, GWD began pumping significant quantities of groundwater due to the onset of the current drought. Ongoing drought conditions and pumping from the Drought Buffer have resulted in declining groundwater levels and, as of December 2016, roughly half of the Drought Buffer had been utilized. Thus, the reliability of groundwater is currently adequate, but could quickly become a concern if the drought continues.

Groundwater is a less expensive source of water than State Water, but its use must be balanced by the need to maintain a drought buffer of groundwater to ensure a reliable supply when Cachuma and/or State Water supplies are reduced in a drought. Determining this balance is one of the primary purposes of this WSMP.

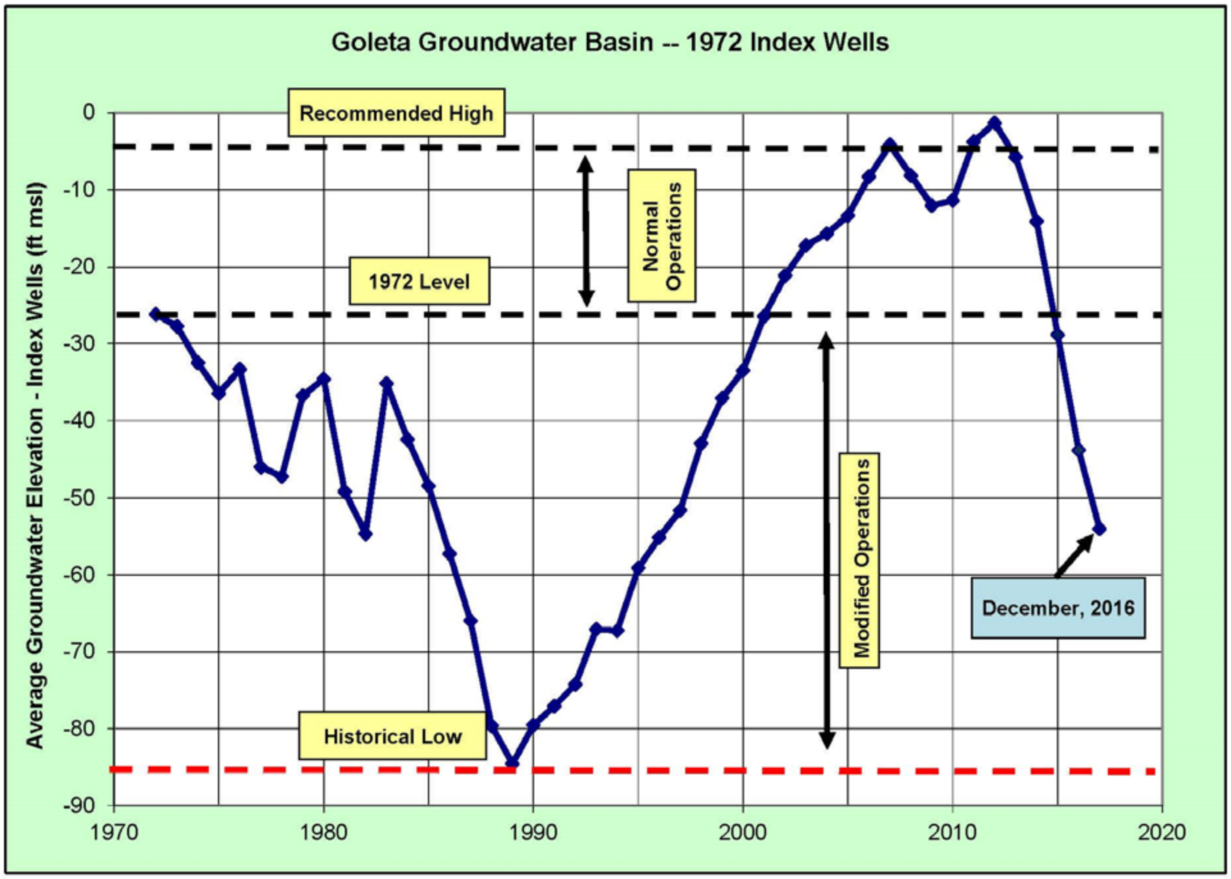

Figure 2-8. Groundwater elevations in the Goleta Groundwater basin, as indicated by the seven-well 1972 Index Wells average. The 1972 groundwater elevation used in the SAFE Ordinance is indicated at -27 ft elevation.

2.1.2.3 Groundwater Costs

- **Extraction of Groundwater** – The cost to extract and treat groundwater (variable cost) is about $119 per acre-foot. The fixed costs of groundwater production are about $830 per acre-foot per year, spread across GWD's 2,350 acre-feet annual water right in the basin.
- **Groundwater Injection** – The cost for groundwater injection of spill water is the treatment cost for the source water. These treatment costs are about $84 per acre-foot. When the water is pumped back out for use, the $119 for groundwater extraction must be added, resulting in an overall variable cost of $203 per acre-foot.

Fixed and variable costs are illustrated in Figure 2-8 through figure 2-10.

2.1.3 State Water

In 1991, voters within the service area of GWD chose to purchase an allocation of State Water to increase water supply reliability during drought. In 1994, voters increased the amount of State Water purchased (but not the pipeline capacity) so that the reliability of State Water could be increased. Treated State Water is delivered to GWD by the Central Coast Water Authority (CCWA) using the Coastal Branch of the California Aqueduct. The terminus of the Coastal Branch is Lake Cachuma, where de-chlorinated State Water is mixed with untreated Cachuma water. The physical mixture of State and Cachuma water must be re-treated before delivery to customers. State Water allocations, costs, constraints, and reliability are summarized in Table 2-1 at the end of Section 2.

2.1.3.1 State Water Supply and Constraints

- **Allocation** – GWD has a State Water allocation of 7,000 acre-feet per year, plus an additional allocation of 450 acre-feet per year through the CCWA Drought Buffer. However, GWD only purchased 4,500 acre-feet per year of capacity in the Coastal Branch of the California Aqueduct. The higher allocation than carrying capacity reflects the reality that the State Project cannot on average deliver the full amount of its customers' allocations.

Goleta has a State Water allocation of 7,000 AFY plus an additional 450 AFY of Drought Buffer. Pipeline capacity to deliver the water is 4,500 AFY, which is less than the allocation because Sate Water cannot regularly deliver the full entitlement. If a State Water allocation is not all used by customers in any given year, the District stores unused "carryover" water in San Luis Reservoir (in the Central Valley along the State Water Aqueduct), for use in future years. There is some risk in this storage, because if San Luis Reservoir fills to the point of spilling, carryover water will be lost, or "spilled," first.

- **Storage** – GWD currently uses two means of storing State Water –Cachuma Reservoir and CCWA storage in San Luis Reservoir (an off-aqueduct reservoir along the California Aqueduct). Long-term storage of State Water (such as for drought protection) in Cachuma Reservoir is problematic because Cachuma spills on average every three years, with State Water considered the first water over the spillway.

  CCWA stores State Water that has been ordered by its member agencies but is unused at the end of the year in San Luis Reservoir. Stored water can also be "spilled" from San Luis when DWR moves a large amount of water into the reservoir for temporary storage and displaces the CCWA stored water. Although no storage limits have been set, the WSMP model sets an upper limit of 6,000 acre-feet of storage for GWD. The reason for a practical limit is that San Luis can "spill" its CCWA storage if DWR fills the reservoir with its own water. Such may be the case in winter 2017, where 18,000 acre-feet of CCWA water stored for South Coast water agencies, including GWD, is being threatened by such a "spill."

  During a serious drought, banking State and/or Supplemental Water in San Luis Reservoir is very helpful in the early stages of the drought; when banked water is depleted, it is not likely to be re-filled until the drought is over.

- **Exchange Water** – Since1997 (when SWP deliveries to the Central Coast began), about 44% of GWD's State Water delivery has been "exchanged" for Cachuma water with Santa Ynez River Water Conservation District-Improvement District No. 1 (ID#1). Under the Exchange Agreement, which is meant to minimize water treatment and delivery costs for the respective agencies, GWD SWP water is delivered directly to ID#1 and GWD receives an equal amount of ID#1's Cachuma Project entitlement water in exchange.

2.1.3.2 State Water Reliability

Delivery of water from the SWP varies with climatic conditions in northern California and environmental/regulatory issues in the Sacramento Delta. The annual allocation is based each year on State reservoir levels, the amount of snow runoff expected, and constraints on pumping from the Delta into the California Aqueduct.

The California Department of Water Resources (DWR) has calculated probabilities of water delivery over a range of climatic conditions and environmental constraints. These probabilities are reported in DWR's State Water Project Delivery Capability Report (DCR). The DCR uses a sophisticated flow model, called CalSim II, to estimate the current and future volumes of water that can potentially be made available from the SWP. The DCR is based on computer models using data from between 1922-2003; according to its authors, these models were recalibrated to account for changes in land use and reduced snowpack due to climate change experienced in recent years. The DCR is widely considered the authoritative document in projecting future supply reliability, and also provides estimated delivery data that is specific to Santa Barbara County. For example, the CalSim II model was used to calculate the volumes of water that could be provided by the SWP under "current conditions" and various future conditions within the watersheds supplying the SWP. The DCR is currently being updated every two years. The reason that these simulations have to be updated so frequently is that judicial/environmental restrictions on the SWP continue to change almost annually. The latest update and the version used in this WSMP was published in 2015 (DWR, 2015).

State Water reliability is influenced by a number of factors, including climatic cycles, environmental constraints, and climate change. DWR evaluates this reliability every two years using a sophisticated stream flow model. In general, State Water reliability has decreased with each update.

This WSMP report uses two results from the 2015 reliability report – current and future. For Goleta, 61% of allocation is the current overall reliability, ranging from 11% in the driest year to 100% in the wettest year.

DWR uses a set of differing assumptions for future reliability of State Water. Using the most conservative assumptions (more environmental water requirements and the highest impact from climate change), reliability for Goleta in 2035 was modeled by DWR as an average of 39%, ranging from 8% in the driest year to 82% in the wettest year.

The DCR includes a baseline scenario representative of current delivery capabilities and four alternatives that explore various assumptions for future SWP delivery capabilities.

The four future alternatives include:

- Early Long-Term (ELT)
- Existing Conveyance High Outflow (ECHO)
- Existing Conveyance Low Outflow (ECLO)
- Bay-Delta Conservation Plan (BDCP) Alternative 4 H3 study (Alt 4)

The SWP predicted Table A deliveries for Santa Barbara County simulated over the length of the State Water model period for the baseline scenario and each alternative are depicted in Figure 2-9.

The baseline scenario is used in the WSMP model for scenarios that evaluate current supply and demand. The baseline scenario average predicted Table A deliveries to Santa Barbara County over the length of the State Water model period is 61%, with a low of 11% during the driest year to a high of 100% during the wettest year (DWR, 2015).

The ELT alternative adds long-term climate change assumptions, which cause a slight reduction in predicted SWP reliability for Santa Barbara County. The ECHO and ECLO alternatives add different Delta outflow assumption requirements, which result in significant reductions in predicted reliability. The BDCP alternative, as the name suggests, assumes implementation of the BDCP with ELT climate change assumptions, which results in improved reliability relative to current operations despite the slight reductions predicted to result from climate change.

For the WSMP scenarios that evaluate GWD supplies relative to potential future demand, the most conservative alternative (ECHO) is utilized pursuant to GWD Water Management and Long Range Planning Committee direction provided on July 21, 2016. The ECHO alternative assumes early long-term climate change conditions (2025 emission levels) with a 15 cm sea level rise, no Bay Delta Conservation Plan, South Delta operating restrictions, and enhanced spring outflow requirements in the Delta that may further restrict SWP deliveries south of the Delta. Under the ECHO assumptions, SWP reliability for the District would be 39%, with a maximum of 82% and a minimum single year low of 8%. A long-term projected reliability of 39% equates to an annual delivery of 2,905.5 AF under the District's 7,450 AF of contractual allocation.

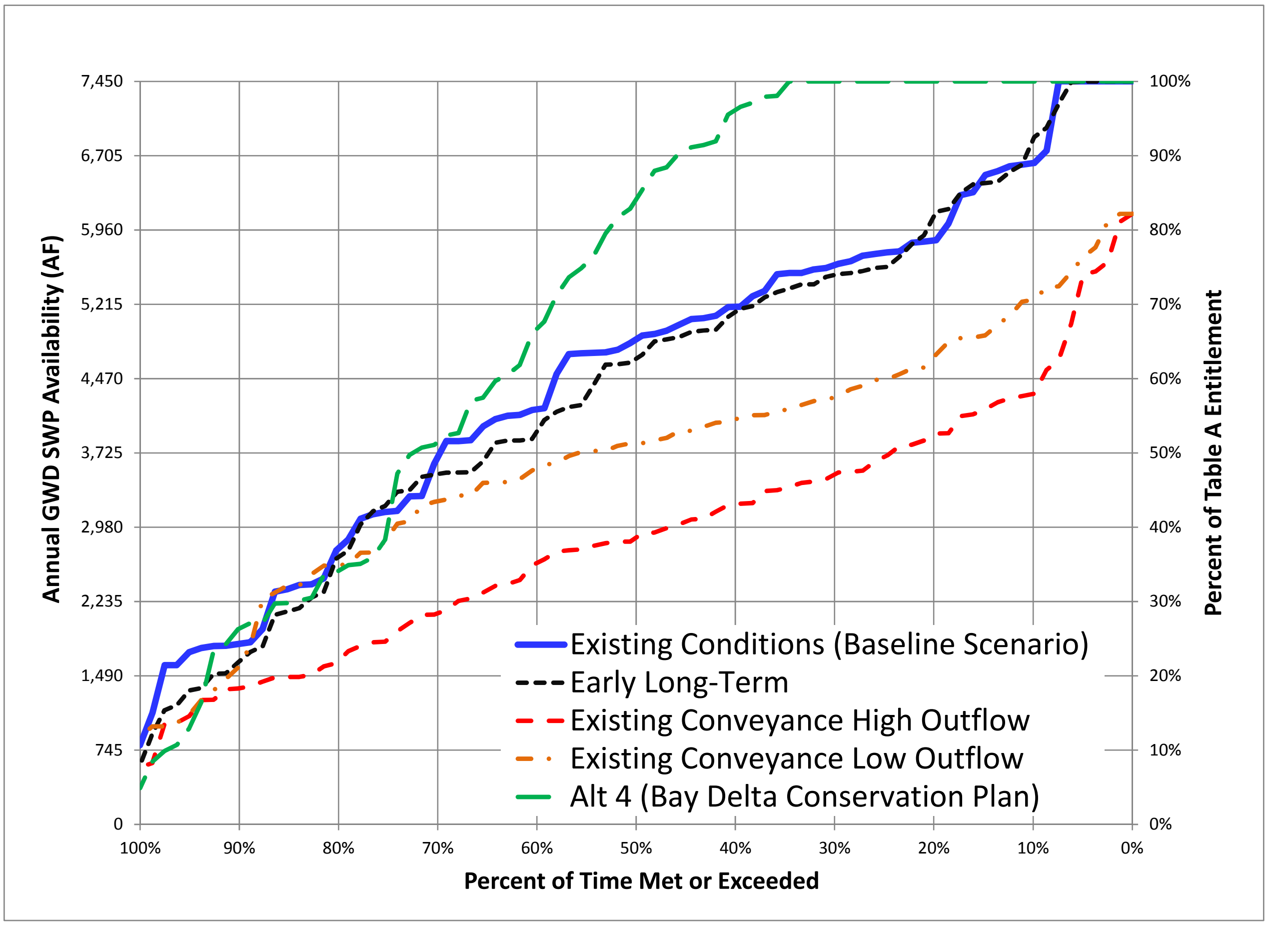

Figure 2-9. Results of simulation of State Water availability for Santa Barbara County under current conditions (solid blue line) and for four future alternatives (various color dashed lines) (DWR, 2015). Dry years are represented on the left side of the chart and wet years on the right side. To read the chart, choose the percent of annual Table A delivery on the right scale, move over horizontally to intersect the alternative of interest, and read the probability of delivering that amount of water on the bottom scale. For instance, the probability of 50% of Table A water being available in any year is about 70% under current (baseline conditions).

2.1.3.3 State Water Costs

State Water costs are divided into fixed (capital) and variable (operational) costs. GWD currently pays $7,594,231 a year to CCWA for its share of the fixed costs for State Water. The variable rate is discussed below.

- **Table A Water Delivered to Cachuma** – The variable cost of State Water delivered to Cachuma Reservoir and subsequently treated for GWD customers is $392 per acre-foot. The fixed cost per acre-foot is $3,077 when it is apportioned across 2,905 acre-feet per year of normal SWP deliveries[7].

- **Exchange Water with ID#1** – The variable cost of State Water delivered and treated through the exchange agreement with ID#1 is $263. The fixed cost per acre-foot is $3,077 when it is apportioned across 2,905 acre-feet per year of normal SWP deliveries.

- **Storage** – There is currently no supplemental charge for storing State Water in either Cachuma Reservoir or San Luis Reservoir.

Fixed and variable costs are illustrated in Figures 2.8 through 2-10.

Recycled water is currently being delivered to customers to reduce demand for District water. The amount of recycled delivery is limited by irrigation demand patterns – 2,300 AFY of recycled water is currently unused.

Recycled water is a very reliable source of supply. The District is currently working on a potable reuse plan for the future. If this use is deemed feasible, Goleta may be able to significantly increase recycled water use in the future.

2.1.4 Recycled Water

Through an agreement with the Goleta Sanitary District, GWD distributes recycled water within its service area for non-potable uses, such as landscape irrigation. This water would otherwise have been discharged into the ocean. Capacities, costs, constraints, and reliability are summarized in Table 2-1 at the end of Section 2.

2.1.4.1 Supply and Constraints

- **Current Capacity** – The recycled water project (treatment and distribution) currently has a treatment and distribution capacity of approximately 3,300 AFY. The recycled water plant has a design capacity of 3 million gallons per day (mgd), which is about 9 acre-feet per day (GSD, 2006). The ability to fully utilize recycled water, however, is limited by outdoor irrigation recycled water demand patterns, which are typically condensed into a 12-hour period rather than a 24-hour period, and are driven by the irrigation season. While storage is available to address daily needs, storage is not available to address seasonal variability in irrigation demand between the wet winter months and dry summer months. GWD is currently delivering approximately 1,000 to 1,150 AFY to the University of California Santa Barbara campus, several golf courses, and other irrigation users, most of whom were previously using the District potable water for irrigation. Infrastructure improvements and expansion of the existing recycled water distribution system would be needed before significant increases in recycled water deliveries could be made.

[7]Personal communication with District staff, January 18, 2017.

- **Future Capacity** – There is currently about 2,300 acre-feet per year of unused recycled water treatment capacity. In 2016, GWD received grant funding through the Water Recycling Funding Program of the State Water Resources Control Board (SWRCB) for a Goleta Potable Reuse Facilities Plan. The Plan, underway at the time of this WSMP update, will examine the feasibility of expanded use of recycled water within GWD. If the Plan determines that indirect or direct potable reuse is feasible for implementation, GWD may be able to increase future recycled water use significantly.

2.1.4.2 Recycled Water Reliability

Recycled water is generally considered a very reliable source of supply because the amount of wastewater flowing into the Goleta Sanitary District, even in severe drought conditions, exceeds the recycled water demand.

2.1.4.3 Recycled Water Costs

Recycled water currently costs $2,473 per acre-foot when fixed costs are distributed across the 962 acre-feet per year of normal deliveries[8]. Fixed and variable costs are illustrated in Figures 2-8 through 2-10.

2.1.5 Supplemental Water

The CCWA contractors can also sell and exchange water among themselves, or among other SWP contractors through the Supplemental Water Purchase Program (SWPP). A member agency wishing to participate in the program indicates the amount of water desired, and CCWA will attempt to find water to meet those needs. In December of 2015, GWD acquired 2,500 AF of supplemental water from another contractor through the CCWA SWPP in order to augment existing supplies in response to a fourth consecutive year of drought. GWD has also sold water to other CCWA contractors in prior years. Purchased Cachuma Project or SWP water would have similar reliability constraints as discussed above. The cost for supplemental water is highly variable depending on market conditions. Currently, based on recent purchases by GWD, the variable cost for supplemental SWP purchases is $892 per acre-foot. Fixed costs for the SWP supplies are already factored into the model. While current costs are unavailable, storm water capture projects may also be a viable source of supplemental supplies.

Goleta's water supply reliability is largely controlled by several critical factors: Cachuma supplies in a drought; State Water in a drought or emergency; capacity in the Coastal Aqueduct; restrictions on timing of use of groundwater; and treatment/pumping capacities. All of these critical factors are included in the WSMP modeling.

[8]Personal communication with District staff, January 18, 2017.

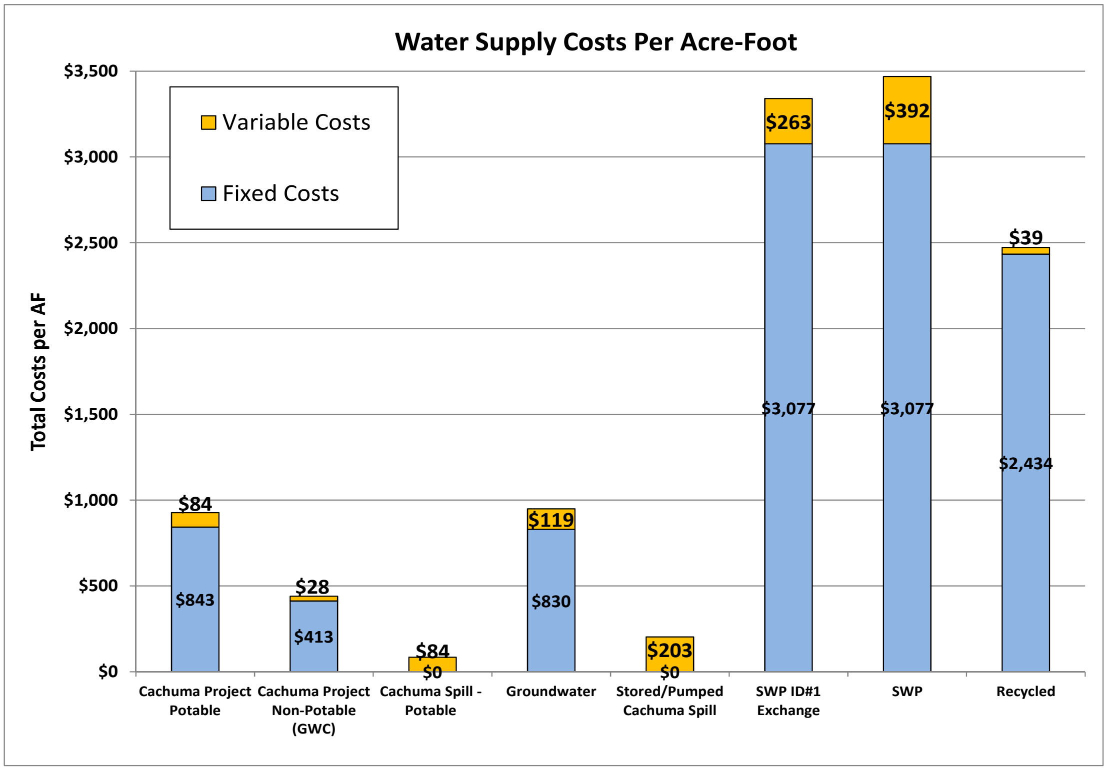

Figure 2-10. Cost per acre-foot of GWD's water supplies. See text for assumptions.

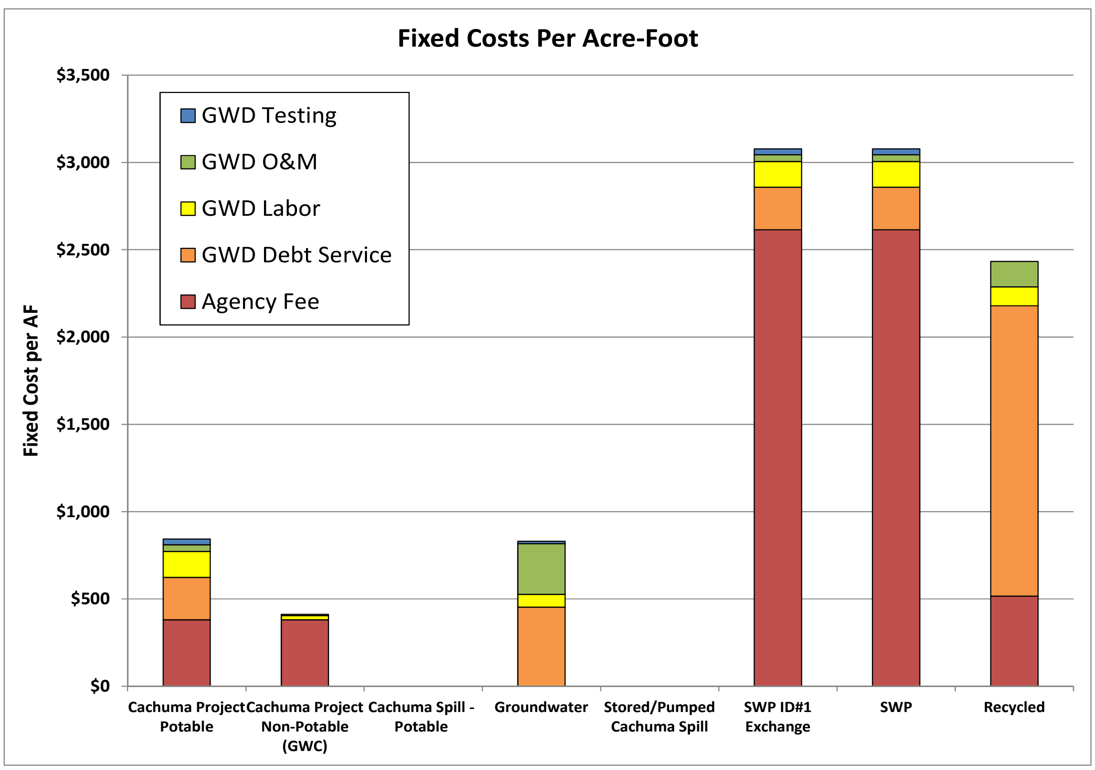

Figure 2-11. Elements in fixed costs per acre-foot for GWD's water supply sources. Fixed costs for Cachuma are not reflected in the cost of spill water because these costs are accrued irrespective of whether there is a spill. See text for assumptions.

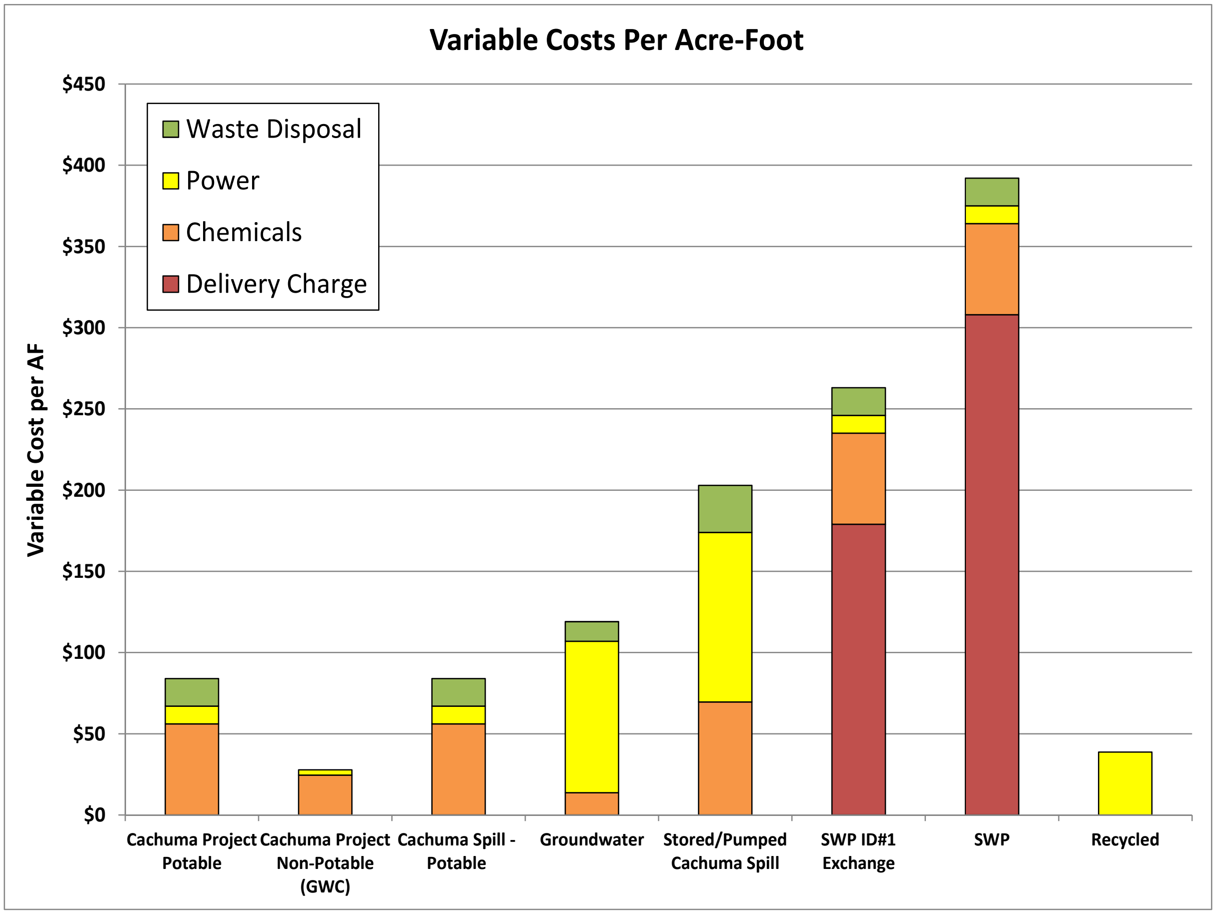

Figure 2-12. Variable costs per acre-foot for GWD's water supply sources.

2.2 Critical Supply Components

There are several critical supply components that affect the reliability of GWD's water supplies. These include: 1) Cachuma supplies availability in a severe drought; 2) State Water availability during droughts or emergencies; 3) GWD capacity in the Coastal Aqueduct of the State Water Project; 4) restrictions on timing of use of groundwater; and 5) treatment/pumping limitations.

2.2.1 Cachuma Reliability

Historically, Cachuma Reservoir has been a reliable source of water for GWD. In the 1986-92 drought, Cachuma Project water deliveries were only reduced by 40% during the last year of the drought. During the current drought, Cachuma Project water deliveries were reduced by 55% and 100%, respectively, in water years 2014-2015 and 2015-2016. Given that Cachuma is normally GWD's principal source of supply, these reductions have had a significant impact on GWD's water supplies. The WSMP modeling incorporates these newly experienced extremes.

2.2.2 State Water Reliability

SWP reliability is a concern for all State Water customers. To determine the effect of highly-variable annual deliveries on GWD, all scenarios in the WSMP modeling used the year-by-year current reliability modeling in DWR's DCR. A detailed discussion of SWP reliability assumptions for the current and future demand scenarios is provided in Section 3.2.

2.2.3 CCWA Storage Bank

The CCWA Bank in San Luis Reservoir is subject to a "spill" when DWR displaces the storage with its own water. This can happen when early-winter rains and snowmelt cause DWR to move water out of its Sierra reservoirs to ensure that there is adequate space for flood control and to maximize runoff capture if the Sierra reservoirs spill. Thus, the CCWA Bank, which can have a very positive effect on GWD reliability, does have an element of risk as a storage facility due to the fact that such water can spill in wet years. This risk is offset somewhat by the possible availability of Article 21 Water at no cost during such a spill event.

2.2.4 GWD Capacity in Coastal Aqueduct

GWD purposely acquired a larger State Water allocation (7,450 AFY) than its acquired capacity in the Coastal Aqueduct (4,500 acre-feet per year). This was done because the average reliability of the State Project is significantly less than 100% of allocation (and is continuing to decline). The WSMP modeling used the aqueduct capacity as the limiting amount of State Water and Supplemental Purchased Water that GWD could receive in any given year. The effect of this limitation was evaluated in the modeling.

2.2.5 Groundwater Reliability

The SAFE Ordinance was enacted to ensure that there would be adequate groundwater supplies during a drought to supplement reduced Cachuma and State Water deliveries. SAFE requires that pumping of groundwater below 1972 levels only occurs when Cachuma supplies are reduced – if State Water supplies are reduced but Cachuma supplies are not, groundwater pumping of the Drought Buffer is not allowed. The WSMP modeling examined the effects of the SAFE Ordinance over the modeling period, with the perspective both from building an adequate drought buffer and from subsequent pumping of that drought buffer.

2.2.6 Facilities Limitations

There are necessary limitations on water production and treatment facilities within GWD – overbuilding of facilities is not an efficient or effective use of resources. However, it is also important to ensure that these limitations do not adversely affect water supply reliability. Facility limitations that could affect reliability include: 1) groundwater well pumping capacity during drought periods of increased pumping; 2) groundwater well injection capacity when large amounts of water are available during a Cachuma spill event or via storm water catchment; 3) capacity to treat the available Cachuma spill water, or storm water, prior to injection; and 4) GWD's share of Coastal Aqueduct capacity.

The WSMP modeling uses current facility capacities to determine if they are limiting factors in optimizing the use of the various water supplies.

2.3 Historical Priorities for Use of Supplies

GWD has varied its priorities in the use of its various supplies over time, partly related to drought conditions and partly related to the purchase of SWP allocation in the 1990s. This history of water use was discussed earlier in this section and illustrated in Figure 2-1. Prior to the importation of State Water, GWD relied heavily upon groundwater during drought periods, resulting in historical low groundwater elevations in the basin. Following the importation of State Water, the Wright Judgment, and the passage of the SAFE Ordinance, groundwater pumping was reduced or eliminated in many years. This allowed the groundwater basin to refill to historical highs, well above 1972 groundwater elevations. Groundwater should largely be preserved for drought protection, but if groundwater is allowed to rise too high, flooding and other adverse effects could occur. Thus, a balanced approach for using State Water and groundwater is necessary.

2.4 Summary of GWD Water Supplies

Table 2-1, below, provides a summary of all sources of GWD water supplies, including the costs, constraints, and reliability of each source. As discussed above, availability of these sources varies annually, and is regularly assessed by the District throughout any given year.

Supply Source	Annual Allocation, Entitlement, or Water Right (AFY)	Fixed Costs (per AF)	Variable Costs (per AF)	Constraints	Reliability (% of Full Supply)
Cachuma Potable[9]	9,322	$843	$84	None	91%
Cachuma – Goleta West Conduit	Included above	$413	$28	None	91%
Cachuma – Spill Water to Customers	N/A	$0	$84	None; Irregular Reliability	N/A
Cachuma – Spill Water to Injection, Later Extraction[10]	N/A	$0	$203	314 AF/month	N/A
Groundwater[11]	2,350	$830	$119	517 AF/month SAFE	Varies according to SAFE
State Water – Table A[12]	4,500	$3,077	$392	4,500 AFY Pipeline	61%
State Water – ID#1 Exchange	Included above	$3,077	$263	Included above	61%
Recycled Water[13]	3,000	$2,434	$39	Only ~1,000 AFY demand	100%

Table 2-1. Summary of all sources of GWD water supply. This table does not reflect total system losses.

[9] Reliability is percent of full entitlement available over 95 years of WSMP Model.

[10] Constraint is well injection capacity. Water treatment capacity for spill water can be a slightly more restrictive constraint for spills during mid- to late Spring (approximately 274 AF/month) due to increased potable water demand as compared to spills that occur during Winter or early Spring (only spill water in excess of potable demand is used for injection).

[11] Reliability reflects that groundwater right is always available over 95 years of WSMP Model, but SAFE requires storage but no pumping in some years.

[12] 4,500 AFY is GWD's portion of the Coastal Aqueduct. Fixed costs spread over 2,905 acre-feet per year of normal SWP deliveries.

[13] Amount is current capacity. Current deliveries are approximately 1,000 AFY. Fixed cost calculated on 962 AFY.

3 Water Supply Management Plan Model

The following sections provide a description of the WSMP model and its key features.

3.1 WSMP Model Description

The WSMP model is a spreadsheet model designed to simulate GWD's current and potential future water supplies. The model attempts to satisfy user-specified water demand by calculating the use of individual supplies in priority order, subject to operational capacity and regulatory constraints. The spreadsheet model was originally developed and used in the 2011 WSMP. The spreadsheet model was updated through 2016 and the functionality was expanded to include evaluation of potential future reductions in Cachuma Project Allocations, groundwater basin augmentation with advanced-treated recycled water, and future water supply augmentation projects.

The WSMP model is a spreadsheet that uses monthly time steps over a 95-year period to track the availability and use of the District's supplies. The model incorporates all the constraints in the use of its supplies (e.g., pipeline or treatment capacity, rules on use of groundwater, etc.), as well as current and future projections of Cachuma and State Water supplies.

The model is designed so that priorities of use can be altered (e.g., when does groundwater pumping start in drier years). Future potential water supplies can also be added to the model to determine their effect in preventing shortages and how much they might cost.

The model runs over a series of wet and dry cycles, so such aspects as drought shortages and speed of recovery of the groundwater basin following drought can be analyzed.

The results of the model are supply reliability (how often is there a supply shortage and what is its magnitude), cost of each supply source, and groundwater elevations in the basin through the 95-year model period.

The model uses monthly time steps from 1922 through 2016. The period coincides with the periods of overlap of the local and state-wide watershed models discussed in Section 2. For Cachuma Project availability and spills, the original Santa Ynez River Model was used for the period 1922-1941 and the RiverWare model was used for 1942-2016. For State Water Project projections, the DCR results were used for the years that it simulates (1922-2003) and historical data was used for 2004-2016. To mesh the results of these models, the period 1922 to 2016 was used in this Plan. In both the RiverWare and DWR models, current and future water resource facilities, policies, and flow restrictions were superimposed on the historical hydrology of the Santa Ynez River and the rivers within the State Water Project. The results of these models were then incorporated into the monthly WSMP spreadsheet model for the 95-year period that simulates GWD's operations.

The 95-year period of analysis allows the interaction of differing climate trends in northern and southern California, where drought and wet periods do not always coincide. The 95-year period of the WSMP model represents several local wet and dry periods (Figure 3-1). All of the droughts of the 20th and 21st centuries are included in the modeling period except the 1901 through 1904 portion of a dry period which began in the mid-1890s.

The WSMP spreadsheet model takes into account both the Wright Judgment and the SAFE Ordinance in its calculations (see description of these in GWD's Groundwater Management Plan – GWD, 2016). Because the SAFE Ordinance requirements are based in part on groundwater elevations in the Goleta Groundwater basin, the WSMP uses the results of the Goleta Basin Groundwater Model to predict groundwater elevations each year depending upon the amount of pumping/injection that has occurred in the basin.

The model has two major modes of operation – current supply/demand and future (2035) supply/demand. Current and future demand assumptions are presented in Sections 4 and 5. The model uses one set of operational criteria and constant customer demand over the entire hydrologic period – the model does not sequentially increase demand as if it was a time series through 95 years. To determine the results for future demand, a new model run must be performed with the new demand applied over the 95-year period. To predict the availability of supplies and the groundwater elevations in a drought (as required in an Urban Water Management Plan), a drought period can be selected during the 95-year period.

As detailed in Sections 4 and 5, the spreadsheet model was used to experiment with potential future reductions in Cachuma Project Allocations, priorities of water supply options, expansion of injection/extraction capabilities, Indirect Potable Reuse (IPR), and future supply augmentation projects, including storm water catchment. The model evaluated the reliability and costs of various water supply management strategies under various conditions.

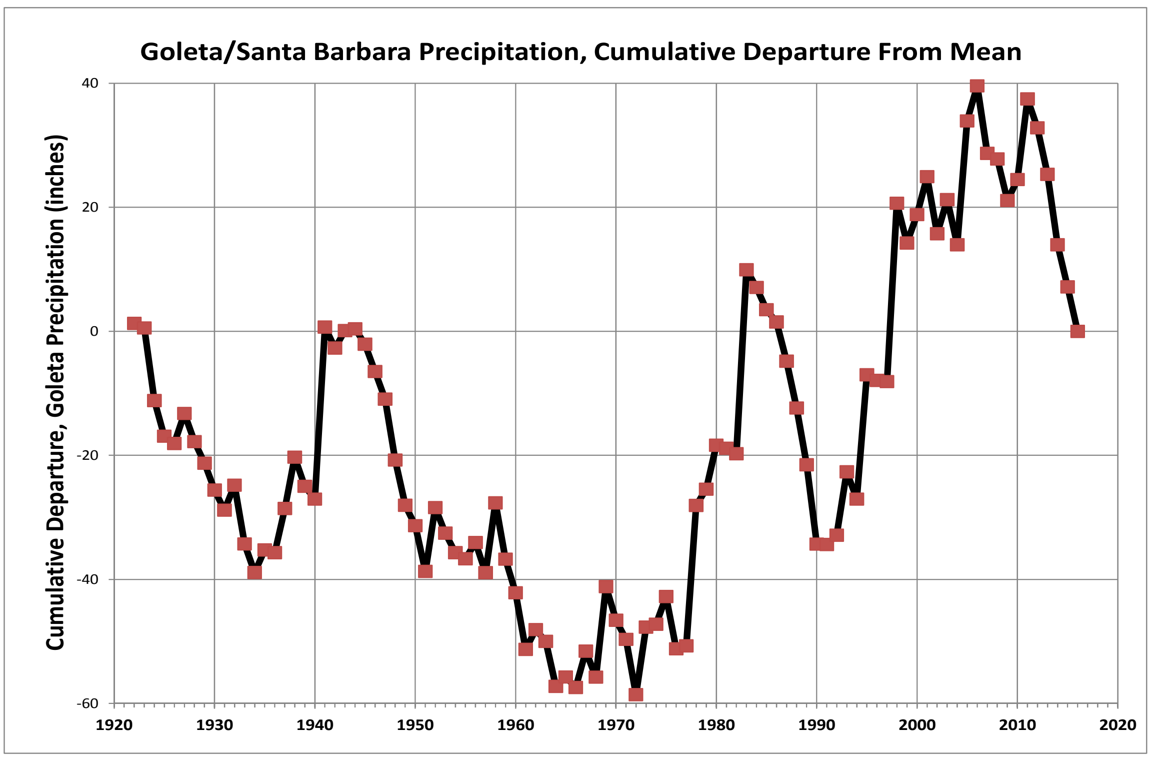

Figure 3-1. Cumulative departure of rainfall (Goleta Fire Station, extended by correlation with Santa Barbara data) that includes the 1922 to 2016 period of WSMP. Wet periods are indicated by rising values, whereas dry periods are indicated by falling values.

3.2 WSMP Model Supply Priorities

A key function of the WSMP model is its ability to prioritize the simulated use of GWD's water supplies. This allows GWD to evaluate how water supply reliability and costs vary with different supply priorities.

In all cases, the model first satisfies non-potable recycled water demand with recycled water and then proceeds to satisfy potable/raw water demand. Cachuma Project water is utilized first to meet potable/raw water demand because this is the least expensive supply and because reservoir spills result in loss of carryover water. The three classifications of Cachuma Project water are prioritized in the following order, consistent with the COMB rules: 1) spill water (the quantity of spill water usually far exceeds water supply and environmental needs); 2) carry-over water (unused entitlement from previous years which is lost when the reservoir spills); and 3) annual Cachuma entitlement.

Supply priorities in the WSMP model are important in testing potential methods for the District's use of its supplies. Cachuma supplies are used first in the model, with groundwater and State Water use prioritized differently in various model scenarios. For current supply/demand scenarios, supplemental State Water purchased from other contractors is used last.

For future supply/demand scenarios, the above priorities are used, adding a last priority of additional "future supply augmentation projects".

In order to meet demand during peak demand months, use of groundwater earlier in the year during drier periods was also tested in the model.

For current supply/demand scenarios, the third supply priority varies with scenario, as detailed in Section 4. The fifth water supply used to serve customers is supplemental SWP Allocation purchased from other SWP contractors.

For future supply/demand scenarios, the third, fourth and fifth supply priorities are always groundwater, SWP water, and supplemental SWP allocation purchased from other SWP contractors. The future supply/demand scenarios also consider a sixth supply called "Future Supply Augmentation Projects." This lowest priority supply is a catch-all for future potential local water supplies that may be available to the District. Such projects might include storm water capture or purchase of local supplies from other water suppliers in the region. The District is currently preparing a Storm Water Resources Plan that will identify potential opportunities for supply augmentation via storm water capture. This supply source and other local possibilities will warrant a timely review as their cost/benefit profiles could prove to be attractive relative to other sources analyzed in this report.

3.3 Optimization of Supplies During Peak Demand Months

A number of scenarios considered implement a "Hybrid Priority" strategy that seeks to minimize the use of more expensive SWP Water for peaking during high demand months, particularly during periods when Cachuma Project allocations are reduced. The approach is to begin using groundwater early in the water year, concurrently with Cachuma Project water, so that Cachuma Project supplies may be extended later in the year to help meet peak demand. If Cachuma Project supplies are exhausted early in the water year, groundwater capacity will be is insufficient to meet peak demand and more expensive SWP water will be needed to supply unmet demand.

The WSMP model allows the user to define a percentage of Cachuma Project Entitlement that will "trigger" the "Hybrid Priority" functionality in the model. This is referred to as the

"Cachuma Trigger." For example, if a given scenario calls for the "Hybrid Priority" whenever Cachuma Project Allocations are 30% less than GWD's Cachuma Project Entitlement, the user would enter a "Cachuma Trigger" value of 70%.

3.4 Groundwater Drought Buffer Augmentation

The WSMP provides two options for augmenting the groundwater Drought Buffer.

3.4.1 SWP Water Injection

The WSMP model provides the option to increase groundwater storage via injection of SWP water. When this option is used, SWP is injected if groundwater levels are below 1972 levels, CCWA pipeline capacity is not exceeded, and demand has been met.

3.4.2 Indirect Potable Reuse

For future supply/demand scenarios, the WSMP also includes the option to increase groundwater storage via injection of advanced-treated recycled water (a.k.a. indirect potable reuse [IPR]).

3.5 SWP Water Storage

In all scenarios (current and future), GWD's SWP Allocation is used to maintain GWD's portion of the CCWA bank in San Luis Reservoir. The storage is capped at 6,000 acre-feet (discussed in Section 2.1.3). The reason for a practical limit is that San Luis can "spill" its CCWA storage if DWR fills the reservoir with its own water. There is no existing analysis or report that evaluates the likelihood or frequency of San Luis Reservoir spilling. However, since GWD has owned an entitlement to SWP water, San Luis has spilled twice in the last twenty years. As such, certain assumptions on the frequency of spill events were made based on the best available information. The model assumes that San Luis Reservoir will spill 4 times every 27 years, based upon observed conditions back to 1977.

Methods of augmenting the groundwater drought buffer were also considered in the WSMP model. When groundwater elevations recover more quickly from a drought, groundwater supplies are more readily available as a supply option.

Augmentation methods tested include injection of State Water when it is not needed to meet demand and injection of advanced-treated recycled water.

4 Current Reliability of Water Supplies

To test the reliability of current supplies under current customer demand, a series of WSMP model runs (scenarios) were performed. Twenty scenarios were modeled to test the reliability and cost of GWD's water supplies against current water demand. The scenarios explore different priorities-of-use and well capacities.

4.1 Assumptions for Current Supply/Demand Scenarios

4.1.1 Current Water Demand

Annual demand under current conditions was developed based on recent actual deliveries, as detailed in Table 4-1. The figures show that demand fluctuates by an average of 12% between wet and drought climatic conditions. Specifically, demand increases by approximately 6% above normal demand during drought conditions (warm, dry weather) when water use restrictions are *not* in place, due primarily to increased landscape and agricultural irrigation; and demand drops by approximately 6% under wet conditions, when very little irrigation is occurring.

Both demand and supply need to be established to determine the current reliability of Goleta's water supplies.

Current customer demand was based on recycled water use, system losses, and water deliveries over the past decade, adjusted for wet, average, and drought conditions.

Water supplies were based on Santa Ynez River modeling (Cachuma), State Water availability reports, constraints on when groundwater can be pumped from the basin, and the recent history of purchasing additional State Water when available.

Demand Category	Average Conditions (AFY)	Drought Conditions (AFY)	Wet Conditions (AFY)	Basis for Demand
Potable + Raw	12,186	13,095	11,513	Based on actual deliveries: Average = most recent normal precipitation year (2010) Dry = first year of drought (2013) Wet = most recent wet year (2011)
System Loss	577	577	577	2015 system loss estimate (draft 2015 UWMP)
Recycled Water	1,061	985	892	Based on last 10 yrs. of deliveries: Average = 2008 deliveries Dry = average of dry yr. deliveries Wet = average of wet yr. deliveries
Total	**13,824**	**14,657**	**12,982**	

Table 4-1. Current demand assumptions used in the WSMP model.

4.1.2 Supply Priorities

Table 4-2 lists and describes the water supply priorities utilized in the current water supply/demand scenarios.

Supply Priority	Water Supply	Description	Current Supply/Demand Scenarios
1	Non-Potable Recycled Water	The model first satisfies non-potable recycled water demand with recycled water and then proceeds to satisfy potable/raw water demand	All
2	Cachuma Project	Cachuma Project water is normally utilized first to meet potable/raw water demand	1, 1a, 2, 2a
3& 4	Groundwater or SWP Water	Depending on the scenario, groundwater and SWP Water are prioritized 3rd or 4th. Groundwater is utilized in accordance with the SAFE Ordinance. When implemented, the "Hybrid Priority" allows groundwater to be used concurrently with Cachuma Project earlier in the year to minimize volume of SWP needed during peak demand months.[14] SWP supply is from GWD's SWP Allocation or SWP water stored in San Luis Reservoir.	Groundwater 3rd Priority: All scenarios except 2 & 2a SWP Water 3rd Priority: 2 & 2a
5	Purchase SWP Allocation	Temporary purchase of supplemental SWP Allocation during droughts.	All

Table 4-2. Water Supply Priorities for Current Supply/Demand Scenarios

[14] During years with low Cachuma Project allocations, using groundwater concurrently with Cachuma Project earlier in the year extends Cachuma supplies and, therefore, minimizes the quantity of SWP water required to meet peak demand later in the water year.

4.1.3 Supply Costs

The cost of each supply used in the model is based on the current cost for that supply. The supply costs are discussed in Section 2 and summarized in Table 2-1 at the end of Section 2.

4.2 Current Supply/Demand Scenarios

Optimizing water supplies involves finding the appropriate balance of cost and reliability. Usually the tradeoff is that increased reliability costs more. For this WSMP, both individual water sources and combinations of sources were analyzed. As described above, the combinations always prescribed using Cachuma Project sources first to meet potable/raw water demand because of their lower cost and vulnerability to reservoir spillage. Thus, the analysis of the optimum combination of water sources involves varying the priorities of groundwater and SWP supplies, increased treatment and well capacities. The supply optimization concepts evaluated are described below.

Current supply-demand reliability was determined by using a series of combinations (20 scenarios) of supplies over the 95 years of the WSMP model. These scenarios can be categorized into four groups:

Groundwater Priority – Groundwater used first after recycled and Cachuma;

State Water Priority – State Water used first after recycled and Cachuma;

Hybrid Priority – Groundwater used earlier in year to minimize State Water peaking later in year;

Hybrid with Increased Pumping/Injection Capacity – Increase well and treatment capacity.

Each of the scenario groups was also tested in the model with and without injection of State Water (when available after meeting customer demand).

Scenarios:

- **<u>1/1a</u> ("Groundwater Priority"):** Evaluate utilization of groundwater as the first supply after recycled water and Cachuma Project water.

- **<u>2/2a</u> ("SWP Priority"):** Evaluate utilization of SWP as the first supply after recycled water and Cachuma Project water.

- **<u>Series 3/3a</u> ("Hybrid Priority"):** Evaluate a hybrid that seeks to minimize the use of more expensive SWP Water for peaking during high demand months, particularly during periods when Cachuma Project availability is reduced. The approach is to begin using groundwater early in the water year, concurrently with Cachuma Project water, so that Cachuma Project supplies may be extended later in the year to help meet peak demand. If Cachuma Project supplies are exhausted early in the water year, groundwater capacity is insufficient to meet peak demand and more expensive SWP water will be needed to supply unmet demand. This series of scenarios considers a range of Cachuma Project allocation percentages (termed "Cachuma Triggers") that "trigger" the "Hybrid Priority" functionality in the model. The "Cachuma Triggers" evaluated range from 30% to 100% of GWD Cachuma Project entitlement.

- **<u>Series 4/4a</u> ("Hybrid Priority with Increased Pumping/Injection Capacity**"): Same as Series 3/3a, but with increased pumping and injection capacity. These scenarios utilize a "Cachuma Trigger" of 90%.

Number-only scenarios (i.e. scenario numbers *without* the letter “a”) evaluate the use of SWP water for injection. In these scenarios, SWP is injected if groundwater levels are below 1972 levels, CCWA pipeline capacity is not exceeded, and demand has been met. Scenarios that include the letter “a” in the scenario number do not include SWP injection and are, therefore, more consistent with historical operations.

In all scenarios, any remaining SWP Allocation is used to increase GWD’s portion of the CCWA bank in San Luis Reservoir. The modeled maximum San Luis Reservoir storage is 6,000 acre-feet of GWD water (discussed in Section 2.1.3). As discussed above, there is no existing analysis or report that evaluates the likelihood or frequency of San Luis Reservoir spilling, so certain assumptions were made based on the best available information.

The elements in each of the 20 scenarios are summarized in the matrix below (Table 4-3).

Scenario or Series of Scenarios	**Uses GW Before SWP**	**Uses SWP Before GW**	**”Hybrid Priority” Cachuma Trigger Value[1]**	**Pumping/ Injection at Current Capacity**	**Pump & Inject Increased Capacity**	**SWP Water Injection to Augment Drought Buffer**
#1	√			√		√
#1a	√			√		
#2		√		√		√
#2a		√		√		
#3 (series)			30%/50%/70%/ 90%/100%	√		√
#3a (series)			30%/50%/70%/ 90%/100%	√		
#4 (series)			90%		+10%/+20 %/+30%	√
#4a (series)			90%		+10%/+20 %/+30%	

Notes: (1) “Cachuma Trigger” = Cachuma Allocation as a percentage of full Cachuma Project Entitlement. Allocations less than the “Cachuma Trigger” will “trigger” early use of groundwater supplies in an effort to extend Cachuma supplies to help meet peak demand later in the year; See Section 3.3 for further explanation.

Table 4-3. Matrix of Water Supply Management Plan model scenarios for current demands.

4.3 Results of Current Supply/Demand Scenarios

WSMP modeling used the results from the RiverWare model, DWR DCR modeling predictions for SWP availability, and operating requirements for the Goleta Groundwater Basin for a 95-year period from 1922 through 2016 to a examine GWD’s various sources of water supply relative to current demand. Importantly, even though these models are very sophisticated, actual results will vary from model predictions because future hydrology will certainly not be identical to the 1922-2016 period and water supply constraints will continue to evolve over time. As with any planning exercise, the models used in the WSMP are intended to inform the decision-making process using the best available information and analytical techniques.

The current supply/demand scenarios were evaluated using four criteria:

1. Cost;
2. Reliability;
3. Impact on Groundwater Levels; and
4. Supplemental Water Needs

4.3.1 Cost Results

The metric for evaluating costs is the average cost per acre-foot of water for the entire 95-year simulation period. Costs included in the evaluation include both variable and fixed costs, as used in GWD accounting methods. The average cost for all supply strategies evaluated ranges from $1,670 to $1,807 per acre-foot, as shown in the Cost versus Reliability graph below (Figure 4-1).

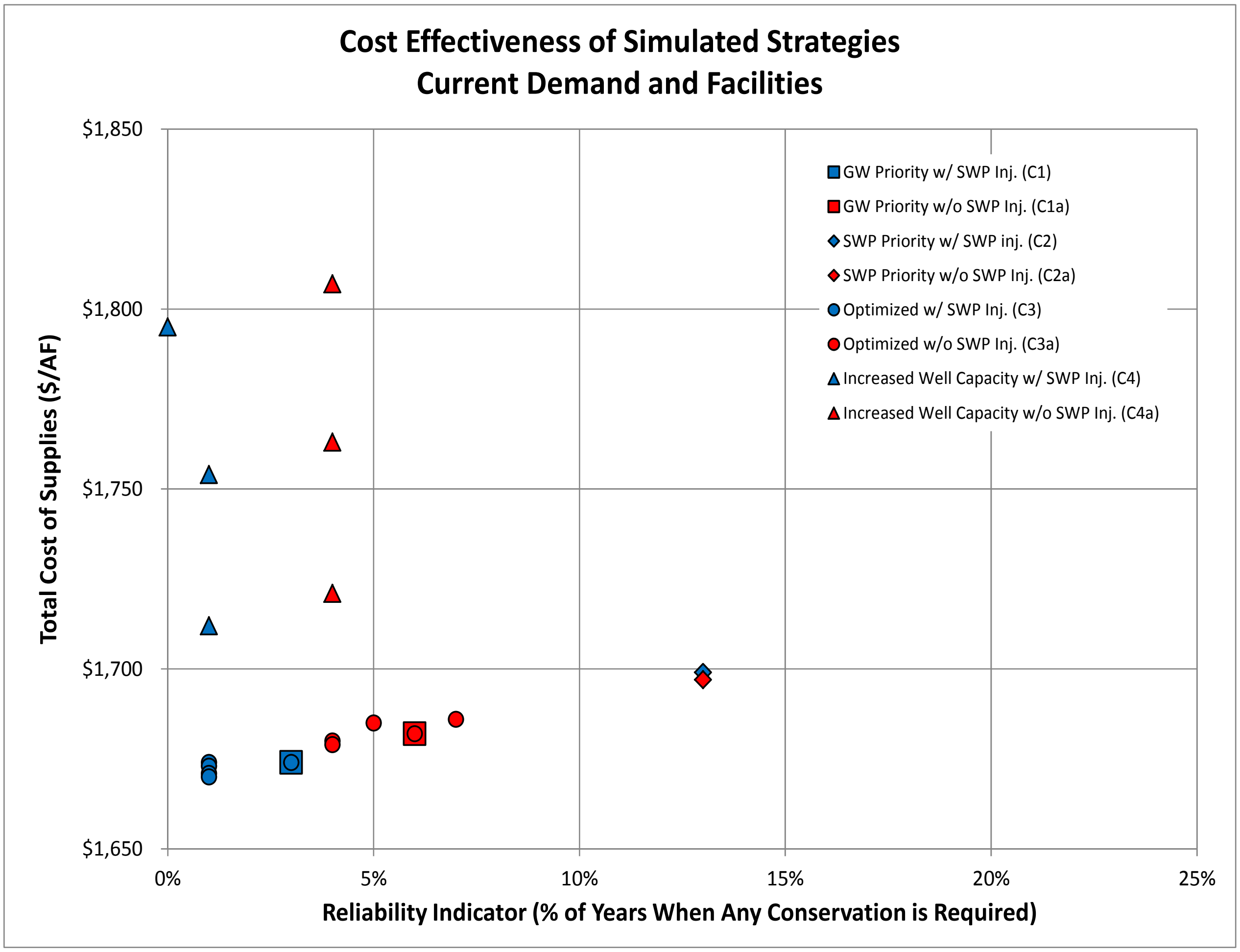

Figure 4-1. Cost versus reliability for current Supply/Demand scenarios.

The lowest cost strategies are associated with the Hybrid Priority strategy used in the Series 3 Scenario. This strategy also provides the highest reliability, as discussed in the next section.

The highest cost strategy is the Hybrid Priority with Increased Well/Treatment Capacity strategy, with or without SWP injection into the Goleta Groundwater Basin (Series 4 and 4a Scenarios). Increasing well capacity is more expensive than other options because the extra capacity would not be used frequently under current water demands; however, this needs to be weighed against the added benefit of installing new wells and increased capacity as replacement wells as existing wells age and decline in performance and reliability.

4.3.2 Reliability Results

Two metrics were developed to evaluate reliability of the water supply strategies:

1. Percent of years during the 95-year simulation period when mandatory conservation is required (Figure 4-1 and Table 4-4). Lower percentages indicate higher supply reliability.

2. Maximum conservation required (Table 4-4). Lower percentages indicate higher supply reliability.

The most cost effective and reliable scenarios for current supply/demand were those using the hybrid groundwater –State Water priority and injection of State Water.

The least cost effective scenarios were those where well capacity was increased but State Water was not injected.

The least reliable scenarios were those where State Water was prioritized over groundwater.

The most cost effective and reliable scenarios required mandatory conservation during only a small percent of the modeled years.

The percentage of years with mandatory conservation required ranges from 0% to 13%, as shown in the Cost versus Reliability chart above (Figure 4-1). Two supply strategies are notably less reliable than the others. These are the SWP Priority strategies (Scenarios 2 and 2a), which involve prioritizing SWP water as the first supply after recycled water and Cachuma Project water. The WSMP model indicates that demand reductions would be required 13% of the time for SWP Priority strategies. The WSMP model indicates that demand reductions would only be required 7% or less of the time for all other strategies evaluated. Of the remaining strategies, those strategies that include SWP water injection into the Goleta Groundwater Basin are more reliable than the counterpart scenario than does not. The WSMP model indicates that 100% reliability (demand reductions never required) may be achieved by increasing GWD's total well capacity by 30% and injecting SWP water into the Goleta Groundwater Basin (Scenario 4). However, as mentioned above, this is the most expensive strategy evaluated and slightly lower levels of reliability can be achieved with the Hybrid Priority with Increased Well/Treatment Capacity strategies (Series 3 Scenario) at a much lower cost.

The highest level of demand reduction required ranges from 0% to 33%, as shown in Table 4-4. The WSMP model suggests that the highest demand reduction levels would occur when implementing the SWP Priority strategies (Scenarios 2 and 2a) and the Hybrid Priority strategy with high Cachuma Triggers (Cachuma Project Allocations) and no SWP injection (Series 3a Scenario with Cachuma Triggers of 90% and 100%). The estimated maximum conservation is 13% or less for all other scenarios. The lowest maximum conservation may be achieved by increasing GWD's well/treatment capacity (Series 4 or 4a Scenarios). However, increasing well capacity is the most expensive strategy and other strategies offer achievable conservation requirements at a lower cost.

Scenario or Series of Scenarios	Percent of Years With Any Demand Reductions Required	Maximum Demand Reductions Required in Any Year
#1	3%	13%
#1a	6%	13%
#2	13%	31%
#2a	13%	31%
#3 (series)	1-3%	13%
#3a (series)	4-7%	13-33%
#4 (series)	0-1%	0-9%
#4a (series)	4%	10%

Table 4-4. Supply reliability metrics for current Supply/Demand scenarios.

4.3.3 Groundwater Level Results

A quantitative metric for evaluating groundwater levels was not developed; rather, the WSMP model groundwater level results were qualitatively evaluated. The simulated groundwater levels are shown in Figure 4-2 and Figure 4-3. Figure 4-2 shows the results of scenarios that include injection of SWP water into the Goleta Groundwater Basin. Figure 4-3 shows the results of scenarios that do not include injection.

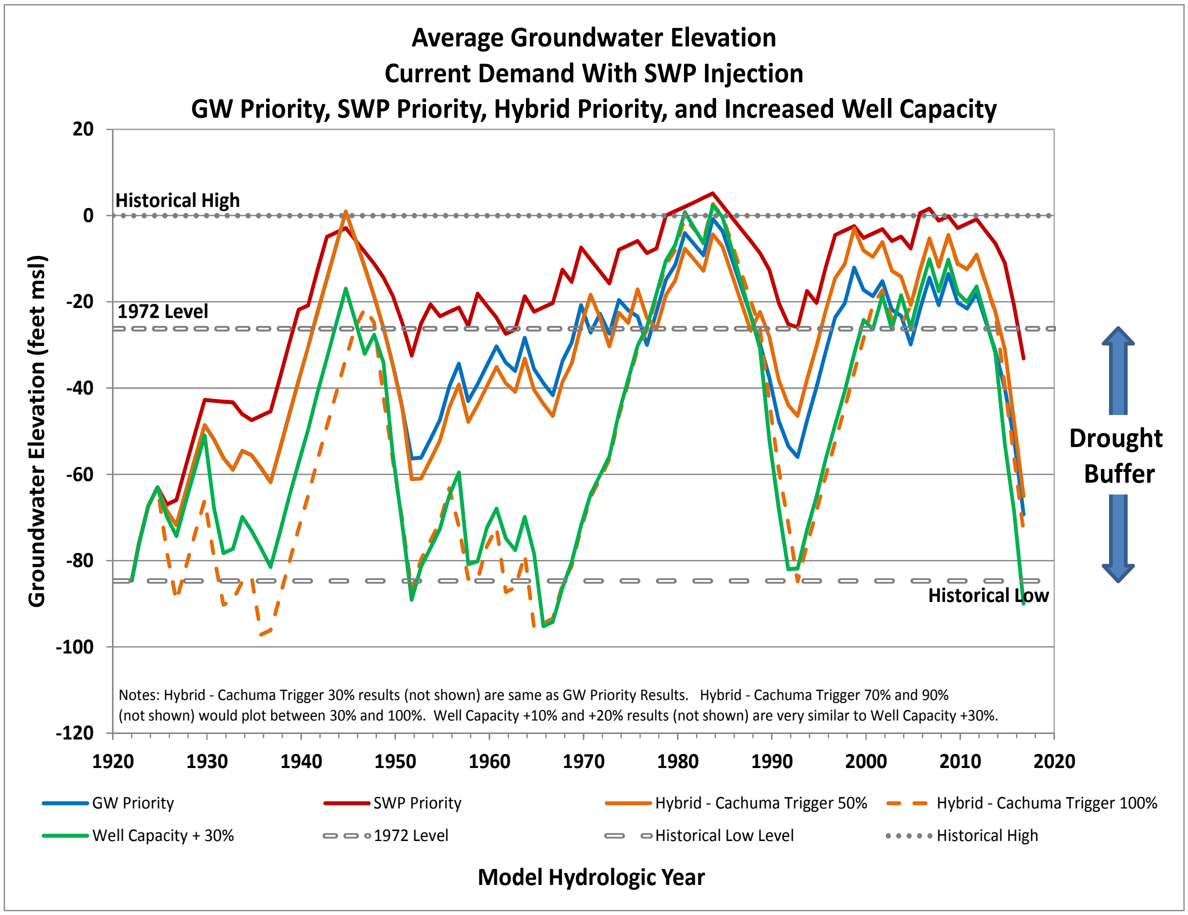

Figure 4-2. Groundwater levels for Current Supply/Demand Scenarios with SWP.

For scenarios that include injection of SWP water into the Goleta Groundwater Basin Figure 4-2), groundwater levels are highest under the SWP Priority strategy because groundwater utilization is very limited compared to other strategies. However, as discussed above, the SWP Priority strategy provides the lowest reliability and is more expensive than other strategies that provide higher reliability. Groundwater levels are predicted to be lowest for strategies that include high Cachuma Triggers (Hybrid - Cachuma Trigger 100% and Well Capacity +30% on Figure 4-2). Groundwater levels for the Groundwater Priority strategy and strategies with lower Cachuma Triggers all fall in-between.

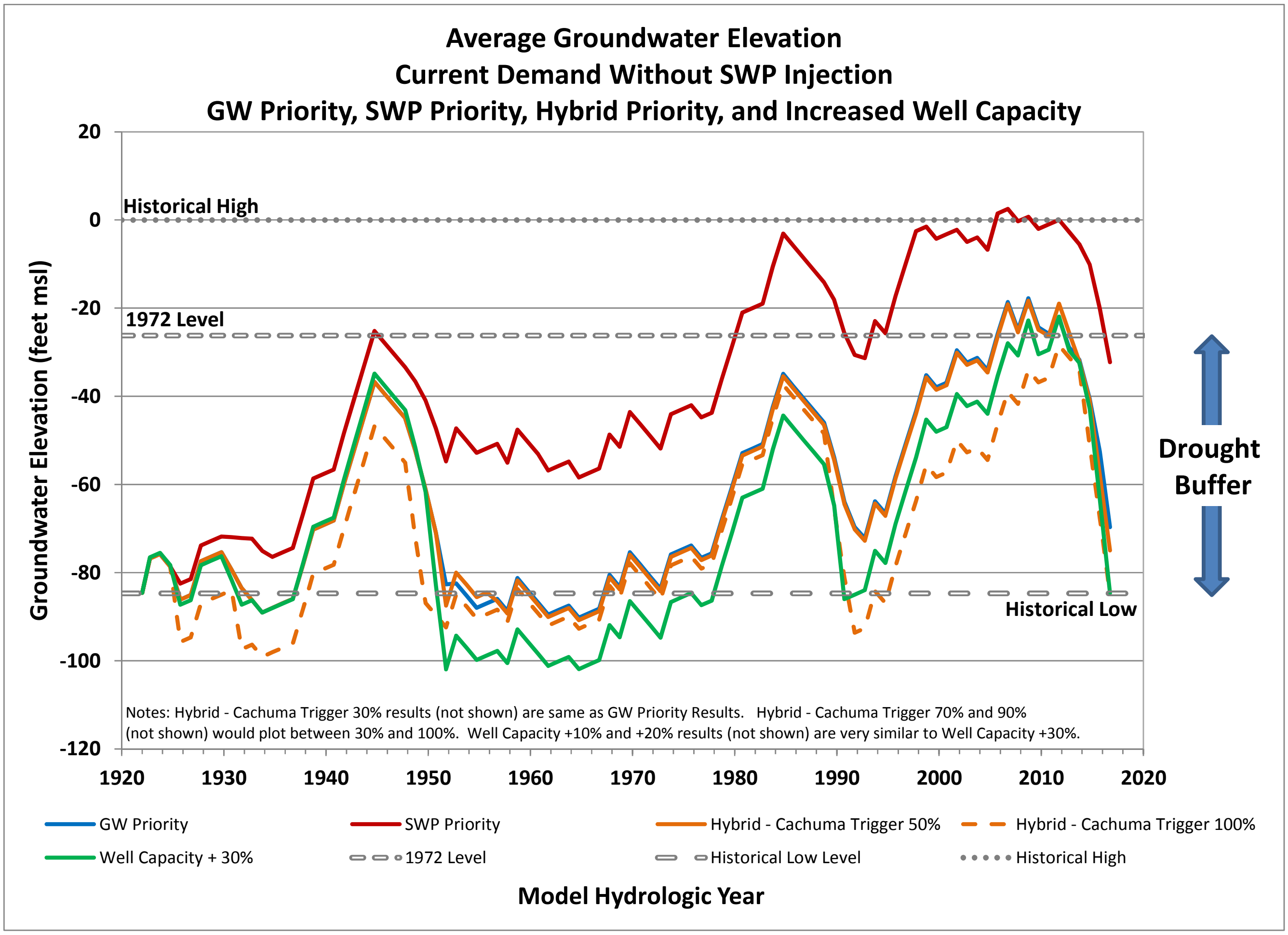

Figure 4-3. Groundwater levels for Current Supply/Demand Scenarios without SWP injection.

Groundwater elevations during the modeled period varied considerably by scenario. Groundwater elevations were significantly lower when State Water was not injected – below historical lows for more than a decade in some scenarios.

As would be expected, scenarios that either use groundwater earlier in the year or where well capacity was increased had the lowest overall average groundwater elevations.

For all scenarios that do not include injection of SWP water into the Goleta Groundwater Basin (Figure 4-3), the *relative* relationships described above are similar. More importantly, comparison of Figure 4-2 and Figure 4-3 indicates that groundwater levels are typically much lower for strategies that do not include injection of SWP water into the Goleta Groundwater basin.

4.3.4 Supplemental Water Use

Supplement SWP Allocation purchases are evaluated because scenarios that utilize greater amounts of supplemental water may actually be less reliable than indicated on Figure 4-1 if supplemental water is not available when it is needed. The metric for evaluating supplemental water purchases is the average annual supplement water purchase during the 95-year simulation period. The simulated average annual supplemental water purchases are shown in Table 4-5.

Scenario or Series of Scenarios	**Average Supplemental SWP Allocation Purchase (AFY)**
#1	7
#1a	51
#2	138*
#2a	138*
#3 (series)	0 (for Cachuma Trigger = 100%) to 7 (for Cachuma Trigger = 30%)
#3a (series)	0 (for Cachuma Trigger = 100%) to 51 (for Cachuma Trigger = 30%)
#4 (series)	0 for all well capacities simulated
#4a (series)	12 (for Well Capacity +30%) to 18 (for Well Capacity +10%)
*Value is likely higher than would be necessary under actual operations because supplies would be utilized in such a way as to increase supply reliability during high demand months, such as using SWP water *and* groundwater together to meet demands.	

Table 4-5. Annual Supplemental Water purchases for Current Supply/Demand scenarios.

Predicted supplemental SWP Allocation purchases are relatively low for all scenarios. The estimated supplemental SWP Allocation needs for SWP Priority strategies (Scenarios 2 and 2a) are higher than would be expected under actual operations. This occurs because the model uses all SWP water before any groundwater, resulting in supply capacity limitations in years with low Cachuma Project allocations (i.e. once Cachuma and SWP supplies are exhausted, the groundwater pumping capacity is insufficient to meet demand). Under actual operations, SWP and groundwater supplies would be used together in a manner that increases the supply capacity during higher demand months. Supplemental SWP Allocation purchases are not needed for Hybrid Priority strategies with 100% Cachuma Triggers, with or without SWP injection (Series 3 Scenario and 3a – 100% Cachuma Trigger) and the Hybrid Priority with Increased Well/Treatment Capacity strategy with SWP injection (Series 3 Scenario).

Supplemental water purchases are generally made year-by-year as water becomes available. Thus, scenarios that required a significant amount of these purchases were considered less reliable.

Supplemental water purchases were low for all current supply/demand scenarios, with the average varying from 0 to 130 acre-feet per year.

4.3.5 Recommended Current Supply Strategy for Current Demand

The optimal water supply strategy for meeting current demand is the Hybrid Priority strategy with injection (Scenario 3). This strategy (1) injects SWP into the Goleta Groundwater basin when groundwater levels are below 1972 levels, CCWA pipeline capacity is not exceeded, and demand has been met and (2) seeks to optimize the use of groundwater and SWP supplies, particularly during periods when Cachuma Project allocations are reduced. This series considered a range of Cachuma Project allocations that trigger use of groundwater earlier in the water year so that Cachuma Project water is available later in the year to meet peak demand.

The optimum water supply strategy for meeting current demand is the Hybrid strategy for groundwater-State Water combined with the injection of State Water when it is available in excess of customer demand.

The Hybrid Priority strategy with injection (Scenario 3) provides the lowest cost and very high reliability (up to 99%). Cachuma Triggers (Cachuma Project Allocations) above 30% provide the nearly identical reliability at almost the same costs and require relatively low amounts of supplemental water. Therefore, the distinguishing factor between the different Cachuma Triggers is groundwater levels. The WSMP model indicates that supply management using higher Cachuma Triggers would result in lower groundwater levels on average, with all other factors equal (Figure 4-1). Therefore, the recommended Cachuma Trigger is 50%.

5 Future Reliability of Water Supplies

To test the reliability of GWD's water supplies under future customer demand, a series of 33 WSMP model runs (scenarios) were performed. The scenarios explore different priorities-of-use, different well capacities, advanced-treated recycled water (indirect potable reuse [IPR]), supplemental SWP Allocation purchases, and future supply augmentation projects. Continued demand management will also be an equally important component of future supply reliability, much as it has been in the past. Specifically, community growth will correlate with improved water efficiency, which will help offset future increases in water demand and minimize the need for additional supply augmentation.

5.1 Assumptions for Future Supply/Demand Scenarios

5.1.1 Future Water Demand

Annual demand under future conditions was developed based on GWD planning documents (as detailed in Table 5-1), which include climatic type (wet, average, dry years) using historical ratios for the District.

Demand Category	Average Conditions (AFY)	Dry Conditions (AFY)	Wet Conditions (AFY)	Basis for Demand
Total Demand	16,351	17,495	15,533	GWD Draft UWMP 2015, Table 3-6 for average; historical ratios 1.07 for dry years, 0.95 for wet years.
Recycled Water Portion	1,225	1,137	1,029	GWD Draft UWMP 2015, Table 3-7 for average; historical ratios 0.93 for dry years, 0.84 for wet years

Table 5-1. Future demand used in the WSMP Model.

5.1.2 Supply Priorities

Table 5-2 lists and describes the water supply priorities utilized in the future water supply/demand scenarios presented in Section 5.

Supply Priority	Water Supply	Description	Future Supply/Demand Scenarios
1	Non-Potable Recycled Water	The model first satisfies non-potable recycled water demand with recycled water and then proceeds to satisfy potable/raw water demand	All
2	Cachuma Project	Cachuma Project water is utilized first to meet potable/raw water demand	All
3	Groundwater	Groundwater is utilized in accordance with the SAFE Ordinance. When implemented, the "Hybrid Priority" allows groundwater to be used concurrently with Cachuma Project earlier in the year to minimize volume of SWP needed during peak demand months.	All
4	SWP Water	SWP supply is from GWD's SWP Allocation or SWP water stored in San Luis Reservoir.	All
5	Purchase SWP Allocation	Temporary purchase of supplemental SWP Allocation during droughts.	All
6	Future Supply Augmentation Projects	Catch-all for future potential local water supplies that may be available to or developed by the District.	All

Table 5-2. Water Supply Priorities for Future Supply/Demand Evaluation.

Supplemental SWP Allocation purchases are made whenever Cachuma, groundwater, and State Water supplies are insufficient to meet demand. GWD's contracted capacity in the Coastal Aqueduct is commonly a limiting factor in the amount of drought supplies that can be imported to GWD.

The term "future supply augmentation projects" is a catch-all for future potential local water supplies that may be available to the District to meet future demand. Such projects might include storm water capture or purchase of local supplies from other water purveyors in the region. These supplies are assumed to be available only during wet and average precipitation years and are always the last supply used due to the high anticipated cost.

5.1.3 Supply Costs

The cost of each supply used in the model is based on the current cost for that supply. The supply costs are described in Section 2 and summarized in Table 2-1 at the end of Section 2. Potential future supplies considered in the scenarios include supplemental SWP Allocation purchases, future supply augmentation projects and IPR. The variable cost for supplemental SWP Allocation purchases is $892 per acre-foot, based on recent purchases by GWD (fixed costs for SWP are already factored into the model). The all-in cost for future supply augmentation project supplies and IPR is assumed to be $1,840 to $2,140 per acre-foot.

5.2 Future Supply/Demand Scenarios

Future WSMP supply/demand scenarios use the same strategies as for current supply/demand, as discussed in Section 4.2. In addition, two other potential sources of supply are evaluated – injection of advanced-treated recycled water (IPR) into the basin and future supply augmentation projects during non-drought periods when they might become available. The scenarios also evaluate the reliability of these supplies if Cachuma entitlements are reduced in the future because of environmental/regulatory constraints.

Future supply-demand reliability was determined by using a series of combinations (33 scenarios) of supplies over the 95 years of the WSMP model. These scenarios were the same as for current supply-demand, with the addition of two other potential sources of supply:

Injection of advanced-treated recycled water; and

Future supply augmentation projects, which are local water supplies that may be available to or developed by the District during non-drought periods.

The scenarios also evaluate the reliability of these supplies if Cachuma entitlements are reduced in the future.

Unlike the current supply/demand scenarios, all future supply/demand scenarios evaluate the use of SWP water for injection. SWP is injected if groundwater levels are below 1972 levels, CCWA pipeline capacity is not exceeded, and demand has been met. Any remaining SWP Allocation is used to increase GWDs portion of the CCWA bank in San Luis Reservoir. The modeled maximum San Luis Reservoir storage is 6,000 acre-feet. The model does not evaluate the frequency of San Luis Reservoir "spillage." Thus, SWP availability may be slightly overstated by the model and SWP costs may be somewhat understated.

The analysis of the optimum combination of water sources involves evaluating the benefits and costs of increasing well capacities, implementing IPR, supplemental SWP Allocation water purchases, and future supply augmentation projects. The supply optimization concepts evaluated are described below:

Scenarios:

1 and 2: Not used for evaluation of future supply/demand. Used for evaluation of current supply/demand only (Section 4).

Future Series 3 ("Hybrid Priority"): Evaluate a hybrid that seeks to minimize the use of more expensive SWP Water for peaking during high demand months, particularly during periods when Cachuma Project availability is reduced. The approach is to begin using groundwater early in the water year, concurrently with Cachuma Project water, so that Cachuma Project supplies may be extended later in the year to help meet peak demand. If Cachuma Project supplies are exhausted early in the water year, groundwater capacity will be is insufficient to meet peak demand and more expensive SWP water will be needed to supply unmet demand. This series of scenarios considers a range of Cachuma Project allocation percentages (termed "Cachuma Triggers") that "trigger" the Hybrid Priority functionality in the model. The "Cachuma Triggers" evaluated range from 30% to 100% of GW Cachuma Project entitlement.

Future Series 4 ("Hybrid Priority with Increased Well/Treatment Capacity"): This series is the same as the Future Series 3 with a 90% Cachuma Trigger, except that treatment/well capacity is increased.

<u>Future Series 5</u> ("Hybrid Priority with Increased Well/Treatment Capacity and Indirect Potable Reuse"): Same as Future Series 4 with a 40% increase in well capacity, but adds varying capacities of advanced treatment/injection of recycled water.

Each scenario series described above was repeated multiple times to evaluate different potential future reductions in Cachuma allocations, with and without future supply augmentation projects. Table 5-3 summarizes all of the scenarios considered. The results of a subset of 33 representative scenarios are presented in the following sections.

Scenario Series[1]	"Hybrid Priority" Cachuma Trigger Value[2]	Pumping/Injection Capacity	Inject Advanced Treated Recycled	Future Supply Augmentation Projects	Reduction in Cachuma Entitlement
Future 3	30%/50%/70%/90%/100%	Current Capacity	None	No/Yes	0%/20%/30%/40%
Future 4	90%	+20%/+30%/+40%/+50%/+60%	None	No/Yes	0%/20%/30%/40%
Future 5	90%	+40%	500, 1000, 1500, 2000AFY	No/Yes	0%/20%/30%/40%

Notes:

(1) All runs include injection of SWP Allocation if groundwater levels are below 1972 levels, CCWA pipeline capacity is not exceeded, and demand has been met. Any remaining SWP Allocation is used to increase GWD's portion of the CCWA bank in San Luis Reservoir.

(2) "Cachuma Trigger" = Cachuma Allocation as a percentage of full Cachuma Project Entitlement. Allocations less than the "Cachuma Trigger" will "trigger" early use of groundwater supplies in an effort to extend Cachuma supplies to help meet peak demand later in the year; See Section 3.3 for further explanation.

Table 5-3. Matrix of Water Supply Management Plan model scenarios for future demand.

5.3 Results of Future Supply/Demand Scenarios

WSMP modeling used the results from the RiverWare model, DWR ECHO modeling predictions for future SWP availability, and operating requirements for the Goleta Groundwater basin for a 95-year period from 1923 through 2016 to examine GWD's various sources of water supply and potential future sources relative to future demand. Even though these models are very sophisticated, actual results will vary from model predictions because future hydrology will certainly not be identical to the 1923-2016 period and water supply constraints will continue to evolve over time. As with any planning exercise, the models used in the WSMP are intended to inform the decision-making process using the best available information and analytical techniques.

As with the current supply/demand scenarios, future scenarios were also evaluated using four criteria:

1. Cost (in today's dollars);
2. Reliability;
3. Impact on Groundwater Levels; and
4. Supplemental Water Needs

5.3.1 Cost Results

The metric for evaluating costs is the average cost per acre-foot of water for the entire 95-year simulation period. Costs included in the evaluation include both variable and fixed costs, as used in GWD accounting methods. The average cost for all supply strategies that were evaluated for future supply/demand (no changes in Cachuma entitlement) ranges from $1,544to $1,774 per acre-foot in today's dollars, as shown in the Cost versus Reliability graph below (Figure 5-1). When potential future reductions in Cachuma entitlement are factored in, the average cost of supplies ranges from $1,679 to $2,182 per acre-foot (Figure 5-2).

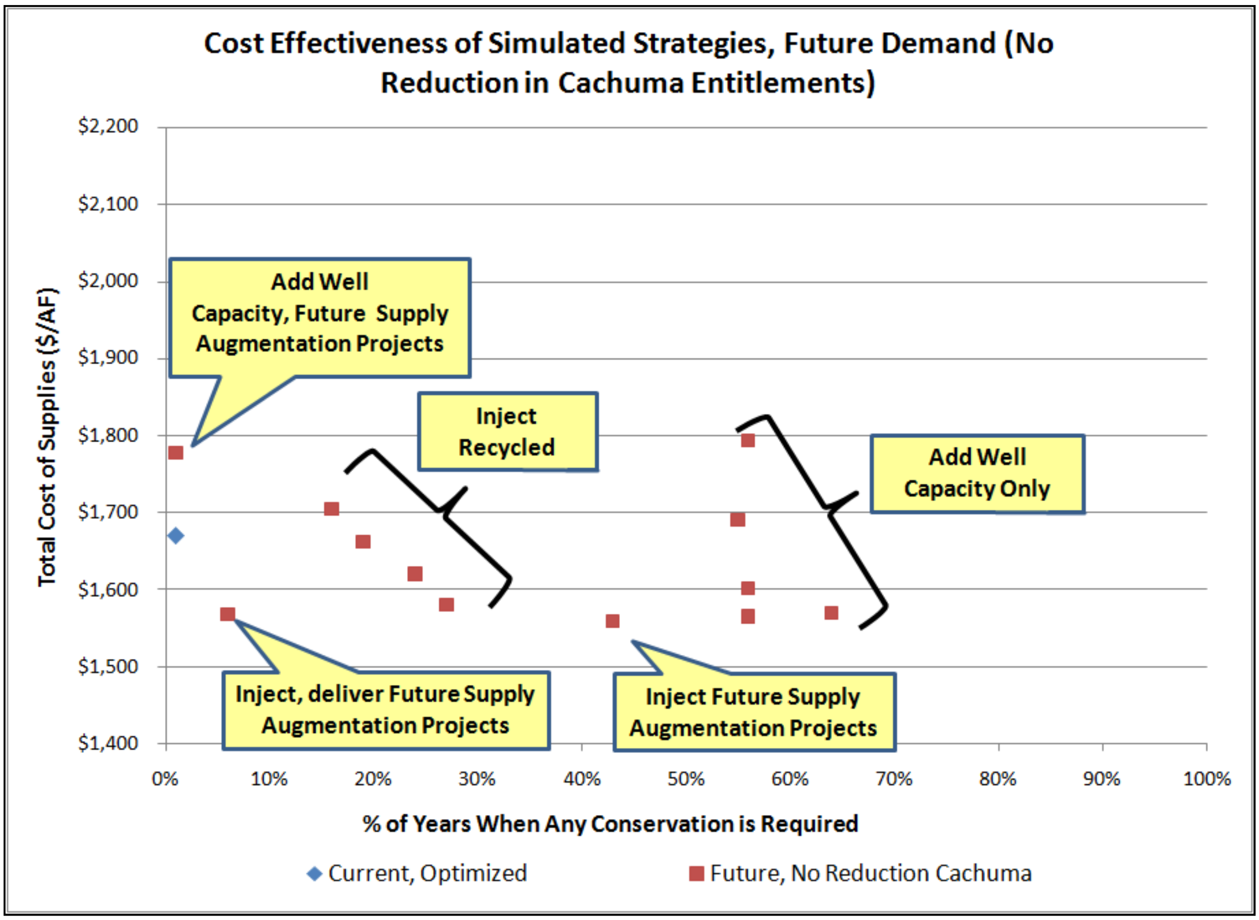

Figure 5-1. Cost versus reliability for future Supply/Demand scenarios with no reductions in Cachuma entitlement. The most cost effective scenario with current supply/demand is also indicated for comparison.

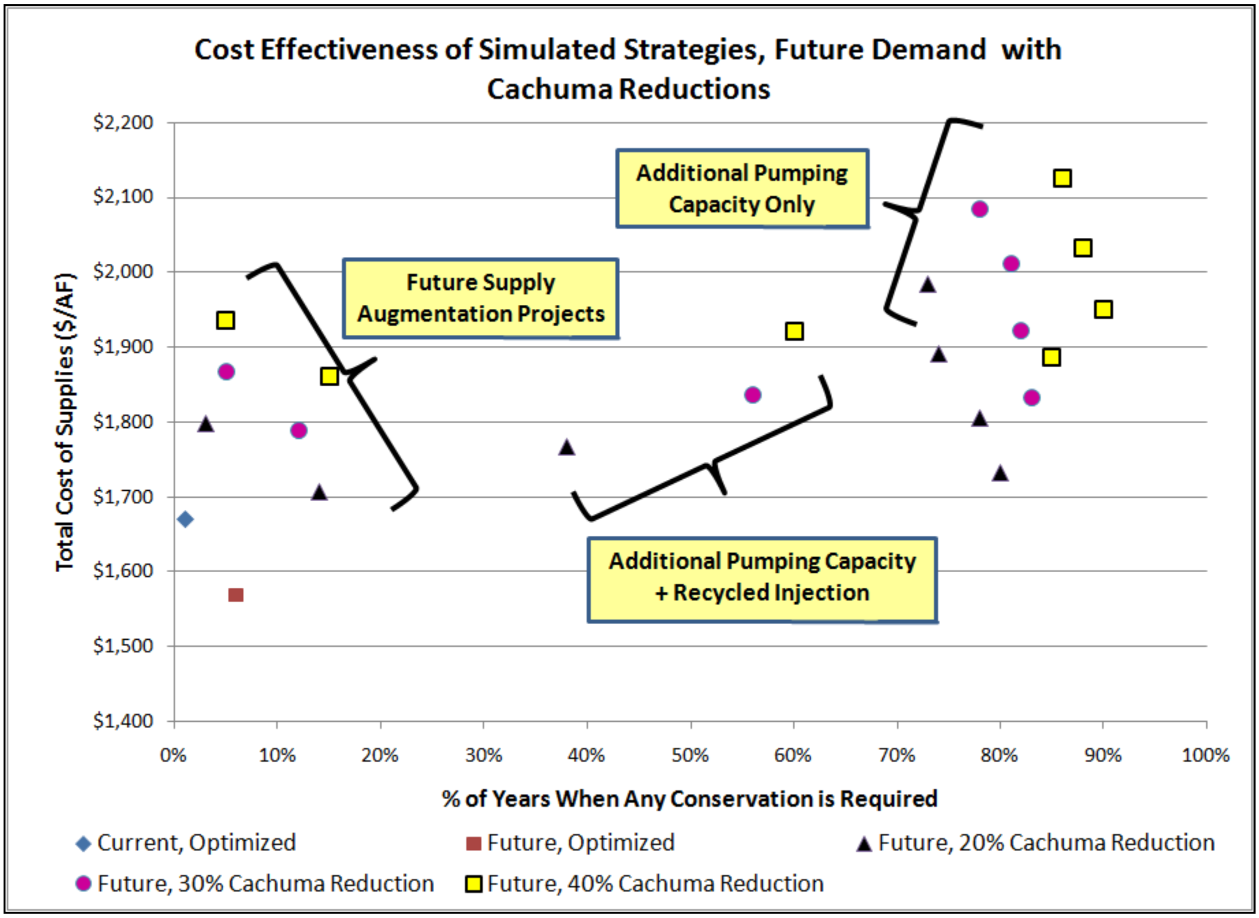

Figure 5-2. **Cost versus reliability for future Supply/Demand scenarios with potential future reductions in Cachuma entitlement. The most cost effective scenarios with current supply/demand and with future supply/demand with no changes in Cachuma entitlement are also indicated for comparison.**

The lowest cost strategies are associated with the future supply augmentation projects. Even though the cost of this supply is estimated at $1,750 per acre-foot in today's dollars, it is still less expensive than the combined fixed and variable costs of other supplemental supplies. Although this is the lowest cost strategy, it is important to recognize that the water supplies from future supply augmentation projects may not always be available when needed or desired.

The highest cost strategy is generally the addition of well/treatment capacity, as in current supply/demand scenarios. Increasing well capacity is more expensive than other options because the extra capacity would not be used as frequently as other supplies under future water demand (however, installing new wells and increasing capacity may serve as replacement wells as existing wells age and decline in performance and reliability). Injection of advanced treated recycled water (IPR) is also relatively expensive, however, this potential source is very reliable because it is generally not affected by drought or other supply interruptions.

5.3.2 Reliability Results

Two metrics were developed to evaluate reliability of the future water supply strategies:

1. Percent of years during the 95-year simulation period when any mandatory demand reduction is required (Figure 5-1, Figure 5-2, Table 5-4 to Table 5-7). Lower percentages indicate higher supply reliability.
2. Maximum mandatory demand reduction required (Table 5-4 to Table 5-7). Lower percentages indicate higher supply reliability.

The most cost effective and reliable scenarios for future supply/ demand were injection of advanced-treated recycled water and injection/delivery of water from future supply augmentation projects.

The least cost effective and reliable scenarios were those where well capacity was increased without any additional water supplies.

The most cost effective and reliable scenarios required mandatory conservation up to 20% of the modeled years. This was also true when any future reductions in Cachuma entitlement were considered – although the cost of water increased as the percentage of Cachuma water decreased.

The percentage of years with any demand reductions required ranges from 1% to 90%, as shown in the Cost versus Reliability charts above (Figure 5-1 and Figure 5-2). With no future reductions in Cachuma entitlement, that range is 1% to 64% of years requiring demand reductions, with maximum conservation in the driest year ranging from 4% to 43% (Table 5-4). The reliability metrics can best be viewed by comparing the WSMP reliability numbers with the historical reliability of GWD supplies. Since 1985, mandatory conservation has been required in 20% of the years, with maximum conservation of 55% achieved in 1991.

With Cachuma entitlement remaining the same, the future strategies that provided the highest reliability were injection and delivery of water from future supply augmentation projects, and injection of advanced treatment recycled water (IPR) (Table 5-4). It was assumed that the water from future supply augmentation projects would only be available for purchase in average and wet years; thus, this water was used to replenish the groundwater basin for use later during a drought by both direct injection and reduced groundwater pumping when the purchased water was delivered directly to customers. The reliability metrics of 6% of years when demand reductions are required and maximum reductions of 27% is better than historical experience. When increased pumping capacity combined with water from future supply augmentation projects, reliability metrics are improved to 1% of years and 4% maximum demand reductions (Table 5-4).

Advanced treatment and injection of recycled water also provided good reliability, with reliability metrics of 16-27% of years and a 15% demand reduction (Table 5-4). These strategies were similar in cost to other supply options analyzed (Figure 5-1).

When potential future reductions in Cachuma entitlement were considered, reliability of supply options decreases except for the two options of future supply augmentation projects during non-drought periods and injecting advanced treated recycled water. Using those supply strategies, the percentage of years when demand reductions would be required is as low as 3%, with maximum-year demand reductions as low as 11% (Table 5-5 to Table 5-7).

Scenario Series No Cachuma Allocation Reduction	Percent of Years With Any Demand Reduction Required	Maximum Demand Reduction Required in Any Year
Future 3 (“Hybrid Priority”)	56-64%	27-43%
Future 3Plus Inject Supplies from Future Supply Augmentation Projects Supplies	43%	27%
Future 3 Plus Inject and Deliver Supplies from Future Supply Augmentation Projects	6%	27%
Future 4(“Hybrid Priority” and 40% Increase in Well Capacity)	56%	36-43%
Future 4Plus Supplies from Future Supply Augmentation Projects	1%	4%
Future 5(Future 4 and IPR)	16-27%	15%

Table 5-4. Supply reliability metrics for future Supply/Demand scenarios with Cachuma entitlement unchanged.

Scenario Series With 20% Cachuma Allocation Reduction	Percent of Years With Any Demand Reduction Required	Maximum Demand Reduction Required in Any Year
Future 3(“Hybrid Priority”)	80%	48%
Future 3PlusSupplies from Future Supply Augmentation Projects	14%	27%
Future 4 (“Hybrid Priority” and 40% Increase in Well Capacity)	73-78%	48%
Future 5 (Future 4 and IPR)	38%	26%
Future 5Plus Supplies from Future Supply Augmentation Projects	3%	11%

Table 5-5. Supply reliability metrics for future Supply/Demand scenarios with Cachuma entitlement reduced 20%.

Scenario Series With 30% Cachuma Allocation Reduction	Percent of Years With Any Demand Reduction Required	Maximum Demand Reduction Required in Any Year
Future 3("Hybrid Priority")	83%	51%
Future 3Plus Supplies from Future Supply Augmentation Projects	12%	27%
Future 4("Hybrid Priority" and 40% Increase in Well Capacity)	78-82%	51%
Future 5(Future 4 and IPR)	56%	31%
Future 5Plus Supplies from Future Supply Augmentation Projects	5%	11%

Table 5-6. Supply reliability metrics for future Supply/Demand scenarios with Cachuma entitlement reduced 30%.

Scenario Series With 40% Cachuma Allocation Reduction	Percent of Years With Any Demand Reduction Required	Maximum Demand Reduction Required in Any Year
Future 3("Hybrid Priority")	90%	53%
Future 3Plus Supplies from Future Supply Augmentation Projects	15%	32%
Future 4("Hybrid Priority" and 40% Increase in Well Capacity)	82-88%	53-68%
Future 5(Future 4 and IPR)	60%	53%
Future 5Plus Supplies from Future Supply Augmentation Projects	5%	11%

Table 5-7. Supply reliability metrics for future Supply/Demand scenarios with Cachuma entitlement reduced 40%.

5.3.3 Groundwater Level Results

A quantitative metric for evaluating groundwater levels was not developed; rather, the WSMP model groundwater level results were qualitatively evaluated. The simulated groundwater levels are show in Figure 5-3 and Figure 5-4. Figure 5-3 shows the results of scenarios for future supply/demand with no reductions in Cachuma entitlement. Figure 5-4 shows the results of scenarios for a future potential 40% reduction in Cachuma entitlement. The water levels for a 20% and 30% reduction in Cachuma entitlement are similar in shape to Figure 5-4, but shifted upwards slightly.

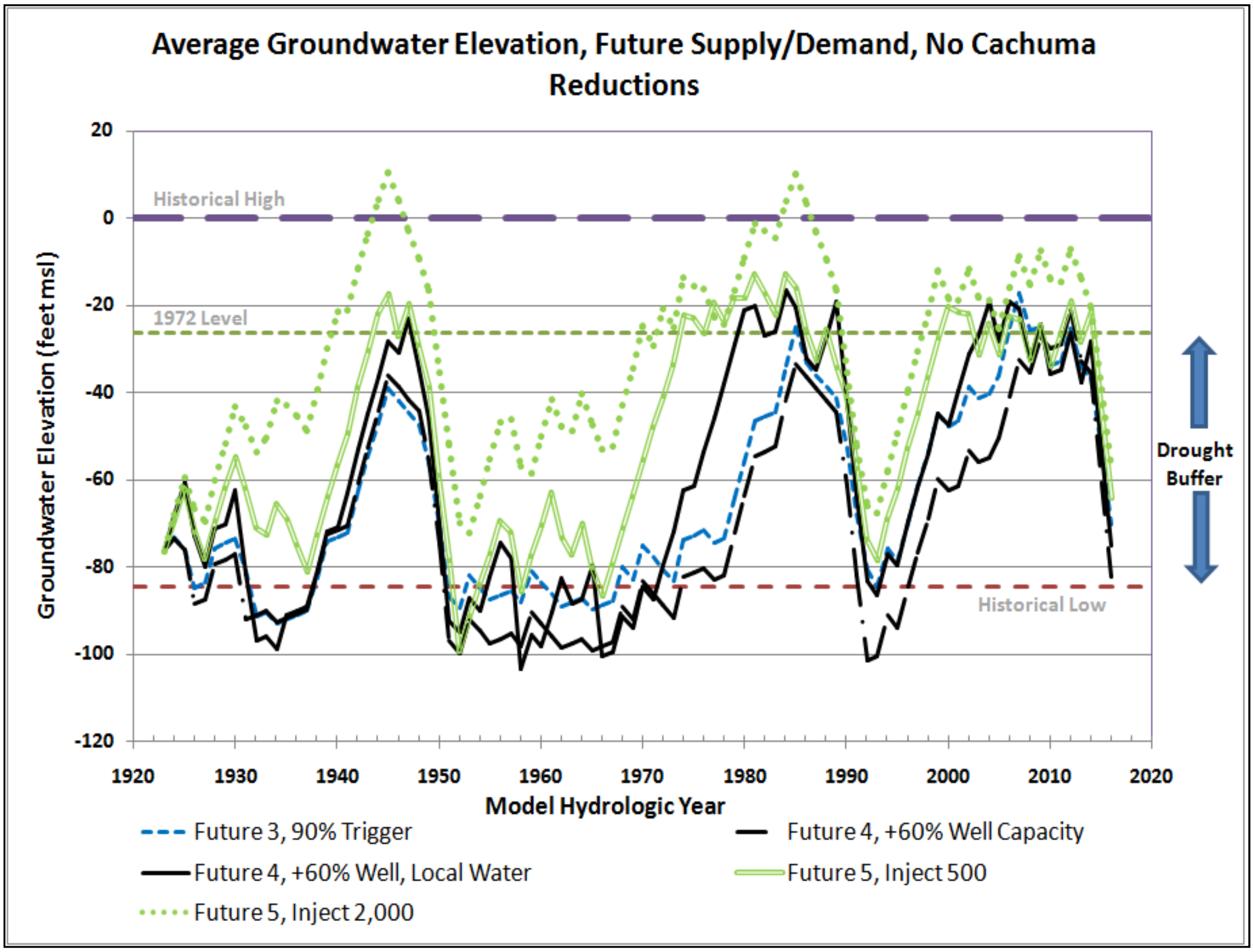

Figure 5-3. Groundwater levels for Future Supply/Demand scenarios.

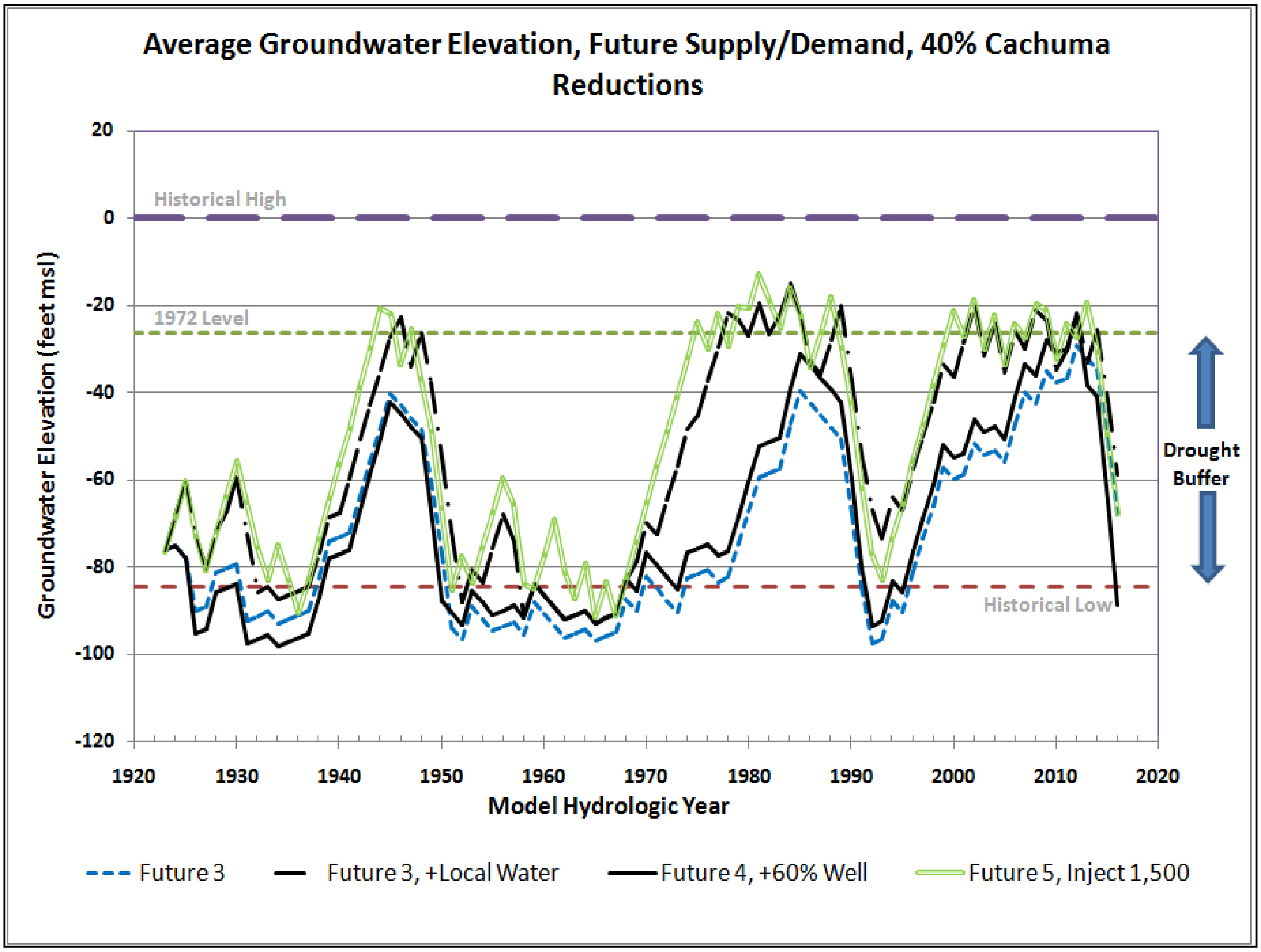

Figure 5-4. Groundwater levels for Future Supply/Demand scenarios, 40% reduction in Cachuma entitlement.

As groundwater is used more extensively during future supply-demand scenarios, groundwater elevations also rise and fall significantly. Groundwater elevations in many of the scenarios drop below historical elevations during dry periods and recover slowly.

Scenarios that increase pumping capacity without increasing recharge have the most impact on groundwater elevations. In contrast, scenarios where injection is increased result in higher levels in the basin.

Groundwater elevations in many of the future scenarios drop below historical low elevations during dry periods. The WSMP model recommends against pumping in any year when groundwater elevations at the beginning of the year are below historical levels. However, the groundwater elevations may remain below historical levels for several years if there is insufficient water for the basin to recharge (as in a continuing dry period). Likewise, the model recommends that no injection occur when groundwater elevations are above historical high levels – such high levels may cause flooding and discharge of basin groundwater into streams.

Scenarios that increase pumping without increasing recharge tend to cause groundwater elevations to remain low during dry periods and not reach 1972 levels during wet periods (e.g., scenario Future 4 with 60% pumping capacity increase in Figure 5-3 and Figure 5-4). In contrast, scenarios where injection is increased tend to cause groundwater elevations to be higher in the basin (e.g., scenario Future 5). The most effective scenarios in terms of reliability (Section 5.3.2) are also the scenarios that recharge water into the aquifer, so there is consistency between reliability of water supply and overall health of the groundwater basin.

5.3.4 Supplemental Water Use

As in the discussion of current supply/demand, supplement water use is evaluated because scenarios that utilize greater amounts of supplemental water may actually be less reliable than indicated on Figure 5-1 and Figure 5-2 if supplemental water is not be available when it is needed. The metric for evaluating supplemental water purchases is the average annual supplement water purchase during the 95-year simulation period. For the future supply/demand scenarios, supplemental water was considered to be the purchase of drought supplies and use of future supply augmentation projects when available – both of these supplies are interruptible because contracts are generally for a short period of time and, in the case of storm water capture, may not be available during droughts. Additional storm water capture opportunities may be available, however, during periodic intense storms that can punctuate extended dry periods or droughts. The simulated average annual supplemental water purchases are shown in Table 5-8 and Table 5-9.

Scenario Series	Average Supplemental SWP Allocation & Supplies from Future Supply Augmentation Projects (AFY)
Future 3, Cachuma Trigger	718-938
Future 3, Inject Supplies from Future Supply Augmentation Projects	1,037
Future 3, Inject, Deliver Supplies from Future Supply Augmentation Projects	1,829
Future 4, Add Well Capacity	608-698
Future 4, Add Well Capacity, Supplies from Future Supply Augmentation Projects	1,606
Future 5, Recycled Injection	107-137

Table 5-8. Annual Supplemental Water purchases for Future Supply/Demand scenarios, no reduction in Cachuma entitlement.

Scenario Series	Average Supplemental SWP Allocation & Supplies from Future Supply Augmentation Projects (AFY)
Future 3, Cachuma Trigger	1,137-1,457
Future 3, Add Supplies from Future Supply Augmentation Projects	3,075-4,937
Future 4, Add Well Capacity	933-1,416
Future 5, Add Recycled Injection	490-1,026
Future 5, Add Recycled Injection and Supplies from Future Supply Augmentation Projects	2,049-3,670

Table 5-9. Annual Supplemental Water purchases for Future Supply/Demand scenarios with reductions in Cachuma entitlement. The supplemental water amount on the left in the table is for a Cachuma reduction of 20%; the number on the right is for a 40% Cachuma reduction.

Predicted supplemental water purchases are significantly higher in the Future Supply/Demand scenarios than for Current scenarios. The lowest use of supplemental water occurs in scenarios using injection of advanced treatment recycled water and increasing well capacity. It is noted that, all other factors equal, injecting advanced treated recycled water would likely be more reliable than supplies from future supply augmentation projects, because these supplies may not be available consistently.

5.3.5 Recommended Supply Strategies for Future Demand

For future supply/demand with an unchanged Cachuma entitlement, the results of the WSMP model suggest that additional water source(s) would be required to prevent significant, recurring demand reduction efforts (more than half the years). Either obtaining supplies from future supply augmentation projects or injecting advanced treated recycled water would increase water supply reliability to better than historical levels. Injection of recycled water is the more expensive option (by about $100 per acre-foot, according to the GWD Draft Potable Reuse Facilities Plan underway), but the reliability of obtaining supplies from future supply augmentation projects is unclear. Therefore, injected recycled water (1,000 to 1,500 AFY) is the recommended supply option. The other recommended components of the supply strategy include a 90% Cachuma Trigger (Cachuma Project Allocation; described in Section 8) and a 40% increase in well capacity/treatment.

For future supply-demand, additional water source(s) would be required to prevent the need for significant, recurring demand reduction.

Injection of 1,000 to 1,500 AFY of advanced treated recycled water is the recommended supply option, largely because of its reliability. This is coupled with a 40% increase in well capacity/treatment to allow injection and recovery of the recycled water.

If Cachuma entitlement is reduced in the future, supply augmentation projects would also be required to prevent recurring demand reduction efforts.

If future reductions in Cachuma entitlement occur, both future supply augmentation projects and injected recycled water would be required to prevent significant, recurring demand reduction efforts. The amount of such additional water required would depend upon the extent of Cachuma reductions – 1,500 AFY of recycled injection provides water supply reliability better than historical levels. Costs would be ~$200 per acre-foot higher than recommended strategies for future demand without Cachuma reductions.

6 Summary of Key Findings and Conclusions

Current Supply/Demand

Under current supply/demand conditions, this work has led to the following principal findings and conclusions:

1. GWD's full supplies (Cachuma Project entitlement, SWP Table A entitlement, groundwater right, and recycled water[15]) can yield about 17,200 acre-feet per year with current infrastructure and entitlements, compared to current demand for water, which ranges from about 13,000 to 14,700 acre-feet per year. With the exception of recycled water, GWD's normal supplies are subject to reductions, particularly during droughts. The WSMP model suggests that supplies during average hydrologic years are about 14,000 acre-feet per year (Table 6-1)

With full allocations and entitlements, the District has more supply than demand under current conditions. However, there are few years when the full supply is available.

With optimized supply strategies, current supplies combined with relatively minor supplemental water purchases are predicted to meet current demand 99% of the time – demand reduction would only be required during drought periods and would not exceed 13% of demand.

The optimum water supply strategy includes using Cachuma first, using groundwater earlier in the year when Cachuma supplies are reduced, and injecting State Water in the basin when possible.

The CCWA bank in San Luis Reservoir is an important component of the District's supply strategy – even if water is lost from a "spill" once every few decades.

Increasing pumping capacity in the basin only slightly increases supply reliability at current demand. It is important at higher demand.

2. Depending on how groundwater and SWP are prioritized, GWD's normal supplies are simulated to drop as low as 9,500 acre-feet per year. When these supplies are optimized, the lowest single-year supply in the WSMP model is 12,685 acre-feet per year. Should a drought that is more severe than simulated occur, water supplies would be further constrained, thereby increasing the volume of supplement water and/or demand reduction needed.

3. Demand reduction and/or supplemental water purchases are indicated only during drought periods. Current supplies combined with relatively minor supplemental water purchases are predicted to be capable of meeting current demand at least 87% of the time without requiring some level of demand reduction. The maximum demand reduction requirement indicated by the model for all strategies considered is about 33%. Supplemental purchases are indicated only during the driest periods, with a maximum of 138 acre-feet per year averaged over the 95-year simulation period. When supplies are optimized, there is no necessity to purchase supplemental supplies because there is either sufficient supply or the Coastal Aqueduct capacity has been reached.

4. The optimal water supply strategy for meeting current demand involves: (1) using Cachuma Project water first to meet potable/raw water demand except as noted below; (2) injection of SWP supplies into the Goleta Groundwater basin when possible; and (3) optimization of groundwater and SWP supplies when Cachuma Project allocations are less than 50% such that groundwater is used earlier in the water year to ensure that Cachuma Project water is available to meet peak demand later in the year (Scenario 3 with a 50% Cachuma Trigger). This strategy provides very high reliability at the lowest cost and maintains better groundwater elevations when compared to most other

[15] Recycled water supply capability exceeds current recycled water demand. Average recycled water demand is used in the calculation presented in this paragraph.

strategies. The maximum demand reduction requirement for the recommended water supply strategy is 13% and any level of demand reduction is required only 1% of the time.

5. The CCWA Bank of unused State Water stored in San Luis Reservoir is an important component in GWD's water supply reliability. Alternative banks should also be examined individually, recognizing that some of the existing groundwater banks are relatively expensive and have storage/delivery restrictions.

6. Injection of SWP Water into the Goleta Groundwater Basin is important for maintenance of groundwater levels. Although some strategies that do not include SWP injection can achieve excellent reliability at a low cost, they require operating the Basin at a consistently low level. Doing so would increase O&M costs (due to increased electrical cost for higher pumping lift and increased well maintenance), increase the frequency of well rehabilitation, increase the probability of groundwater quality degradation, and increase the risk of land subsidence.

7. Increasing groundwater pumping capacity can partially offset the drought shortfalls. However, at current levels of demand, additional pumping capacity only slightly increases reliability at a significant increase in cost. Increased pumping capacity becomes more important in ensuring supply reliability at higher levels of demand.

The District's current supplies are likely not sufficient in the future (2035) to avoid the need for significant and recurring demand reduction. Supplemental water purchased from other State Water participants cannot by itself make up the shortfall because of limited capacity in the Coastal Aqueduct.

With optimized supply strategies and the addition of indirect potable re-use of recycled water and future supply augmentation projects, mandatory demand reductions are only required after multiple dry years in a row. The maximum demand reduction required in that situation is about 11% of demand.

If there are reductions in Cachuma entitlements in the future, there would be a significant shortfall of future supplies. These shortfalls could be reduced by maximizing the use of recycled water through indirect potable re-use and by implementing non-drought supply augmentation projects.

Future Supply/Demand

Under future supply/demand conditions, this work has led to the following principal findings and conclusions:

1. GWD's full supply portfolio (Cachuma Project entitlement, SWP Table A entitlement, groundwater right, and recycled water) is likely not sufficient in the future (2035) to avoid significant and recurring demand reduction efforts during dry periods. Supplemental water was included in the model as necessary to make up for any shortfalls in supply; however, the 4,500 acre-foot per year GWD share of the Coastal Aqueduct's capacity is commonly a limiting factor in how much supplemental can be imported in any year. Average year supplies from the future modeling are about 15,620 acre-feet per year with current infrastructure and entitlements, compared to future average-year demand of about 16,350. Of the average supply of 15,620 acre-feet, 810 acre-feet per year would be from supplemental water.

2. During dry rainfall years, supplies from the future modeling are about 15,815 acre-feet per year with current infrastructure and entitlements, compared to future dry-year demand of about 17,500. This results in shortfalls of about 10% of demand during dry years. Of the average supply of 15,600 acre-feet, 990 acre-feet per year would be from supplemental water.

3. During the worst drought year for supplies within the 95-year modeling period (2016 hydrology), supplies totaled just over 12,840 acre-feet per year, compared to dry-year future demand of 17,495. This results in a shortfall of about 27% of demand during the worst year. This compares to the peak conservation by GWD customers of 55% during 1991. Although this comparison suggests that customers could withstand a 27% shortfall as synthesized by the model, there has been demand-hardening since 1991 as customers adopted long-term conservation measures. Of the annual supply of 12,840 acre-feet, 1,520 acre-feet would be from supplemental water.

4. When supplies are optimized and additional water is recharged to the groundwater basin (e.g., through injection of advance treated recycled water or storm water capture), supplies are enhanced by the availability of additional groundwater to pump. These scenarios provide a different supply picture, where supply shortfalls are much less significant. In these scenarios, supplies during the worst drought year in the 95-year modeling period would be about 15,000 acre-feet per year, compared to demand of 17,495. This could result in a shortfall of 14% of demand during the worst year.

5. For planning purposes, the scenario used in the above paragraph was used to determine average year and drought year supplies (Table 6-2). During three consecutive years of drought within the 95-year modeling period (2014-16 hydrology), supplies totaled about 16,900 acre-feet per year, compared to dry-year future demand of 17,495. The only supplemental water required during the modeled drought would be the 1,500 acre-feet of advance treatment recycled water (indirect potable reuse).

6. Any potential future reductions in Cachuma entitlement would reduce supplies and create larger shortfalls. For comparison, with a 40% reduction in entitlement, average-year supplies drop from 16,350 to 13,000 acre-feet per year, with supplemental water making up 1,550 of the latter total. Likewise, dry-year supplies drop from 15,600 to 12,250 acre-feet per year, with supplemental water making up 1,800 of the latter total.

7. The optimal water supply strategy for meeting future demand involves: (1) using Cachuma Project water first to meet potable/raw water demand except as noted below; (2) injection of SWP into the Goleta Groundwater basin when available; and (3) optimization of groundwater and SWP supplies when Cachuma Project allocations are less than 90% such that groundwater is used earlier in the water year to ensure that Cachuma Project water is available to meet peak demand later in the year (Scenario Future 3 with a 90% Cachuma Trigger). This strategy provides reliability at the lowest cost and maintains groundwater elevations.

8. An increase in pumping capacity/treatment is likely to be required in the future. However, additional pumping capacity only slightly increases reliability at a significant increase in cost. Increased pumping capacity is most likely to be required if additional injection projects are required (see below).

9. There is a shortfall of future supply during more than 50% of the years in the WSMP model when current supplies are used without additional supply augmentation. To reduce both the frequency and magnitude of these shortfalls, additional water would likely be required. Purchasing supplemental imported water is the least expensive strategy, although the quantity is limited by pipeline capacity. Two additional strategies, injection using IPR and future supply augmentation projects during non-drought periods,

were also used in the WSMP modeling. The amount of additional water needed from such projects will become more apparent as the future reliability of current supplies becomes clearer.

Current Conditions	Average Year Supply (AFY)	Single Dry Year (AFY)	Multiple Dry Years (AFY)
Current Demand	**13,824**	**14,657**	**14,657**
Supply Sources			
Cachuma Potable & GWC	9,811[(1)]	9,322	3,884
State Water	1,942	2,427	3,381
Groundwater	1,160	1,923	5,750
Recycled Water	1,061	985	985
Supplemental SWP Allocation	0	0	0
Total Supply	**13,974**	**14,657**	**14,000**
Total Surplus (Deficit)	***150***	***0***	***(657)***

(1) While the GWD's annual entitlement to Cachuma Project Water is 9,322 AFY, the long-term average reflected above includes unused carryover supplies from previous years and excess water that becomes available when Cachuma Reservoir spills (on average, every 3 years); and is therefore higher than the entitlement amount.

Table 6-1. Average water supply, single dry year supply (at the beginning of a drought period), and multiple dry years. Supplies are based on the optimal water supply strategy model run. Average year supply is the mean of all "average" years determined from historical Goleta rainfall. The single dry year was 2012 (at the beginning of the current drought) and the multiple dry years were 2014-2016. These results are from the WSMP model. They are not identical to the actual data from those years because Cachuma and State Water supplies for those and preceding years come from the RiverWare and State Water Project Delivery Capability Report modeling results.

2035 Conditions	Average Year Supply (AFY)	Single Dry Year (AFY)	Multiple Dry Years (AFY)
2035 Demand	**16,351**	**17,495**	**17,495**
Supply Sources			
Cachuma Potable & GWC	9,849	9,322	3,491
State Water	2,493	3,197	2,347
Groundwater	2,449	3,839	9,928
Recycled Water	1,225	1,137	1,137
Supplemental SWP Allocation & Future Supply Augmentation Projects	219	0	0
Total Supply	**16,235**	**17,495**	**16,903**
Total Surplus (Deficit)	***(116)***	***0***	***(592)***

Table 6-2. Future average water supply, single dry year supply (at the beginning of a drought period), and multiple dry years. Supplies are based on the optimal water supply strategy model run with indirect potable re-use and increased well capacity. The single dry year hydrology was 2012 (at the beginning of current drought) and the multiple dry year hydrology was 2014-16. Indirect potable re-use (1,500 AFY) was not included in the model as a separate source of supply, but as increased groundwater production as it will be pumped from the groundwater basin.

7 Recommendations

Recommendations developed from this WSMP Update are divided into segments based on the potential timing of implementation and type of recommendation.

7.1 Immediate Actions

1. Implement Hybrid Priority strategy with SWP injection for use of GWD's various sources of water supply, as detailed further in Section 8. This strategy includes (1) using groundwater and State Water in a manner that balances drought storage against supply costs and optimizes GWD's groundwater well capacity during drought periods and (2) injection of SWP into the Goleta Groundwater basin when groundwater levels are below 1972 levels, CCWA pipeline capacity is not exceeded, and demand has been met.

Recommendation are divided into immediate actions, ongoing actions, and planning actions.

***Immediate actions** recommended include using groundwater and State Water in the suggested priority, inject State Water into the basin under certain conditions, and using this Plan as input to the Urban Water Management Plan.*

***Ongoing actions** recommended include continuing to fund semi-annual collection of groundwater elevations, annual analysis of those elevations through calculation of the Index Wells average, and continuing maintenance of the District's wells.*

***Planning actions** include investigation of increasing the District's capacity in the Coastal Aqueduct, complete the Potable Re-Use study, examine the enhancement of storm water capture, update this plan every five years, and periodically determine whether the District's groundwater pumping capacity should be increased.*

2. Use the findings in this Plan as input to appropriate portions of Urban Water Management Plan currently under development and in any assessments of GWD's water supplies.

7.2 Ongoing Actions

1. Continue to fund the semi-annual collection of groundwater elevation data so that average groundwater elevations in the basin can be calculated to assist in determining water supply priorities.

2. Calculate average spring groundwater elevations each year using wells designated in Groundwater Management Plan. Plot this average on Index wells chart to determine where current groundwater conditions are relative to 1972 and historical low groundwater elevations.

3. Continue to maintain the District's wells. Each well should be operated periodically to maintain operational readiness of all mechanical equipment. The District should continue tracking the specific capacity of each well and perform well rehabilitation when a notable decline in specific capacity occurs. Wells should be replaced, as needed, to maintain current production and injection capacities.

7.3 Planning Actions

1. CCWA pipeline capacity was identified as a key constraint in maximizing the effectiveness of supplemental imported water purchases to address potential shortfalls in future supplies. It is recommended that GWD investigate opportunities to maximize pipeline capacity. The cost of additional CCWA pipeline capacity, if available, should be compared against other water supply augmentation options.

2. The WSMP model results suggest that additional local supplies may be needed to reduce both the frequency and magnitude of future supply shortfalls. Additional local supplies could potentially include injection of fully advanced-treated recycled water into the Goleta Groundwater basin, storm water capture, and/or the purchase of local supplies from other water purveyors in the region. The amount of additional water needed will become more apparent as the future reliability of current supplies becomes clearer. In the meantime it is recommended that GWD complete the Potable Reuse Facilities Plan (feasibility study) that is underway at the time of this WSMP update and proceed to the next tier of feasibility analysis that is recommended in that plan.

3. The WSMP model results suggest that additional local supplies may be needed to reduce both the frequency and magnitude of future supply shortfalls. Additional local supplies could potentially include injection of fully advanced-treated recycled water into the Goleta Groundwater basin, storm water capture, and/or the purchase of local supplies from other water purveyors in the region. The amount of additional water needed will become more apparent as the future reliability of current supplies becomes clearer. However, if long-term contracts for local supplemental water purchases can be acquired in the near term at a reasonable cost it may be advantageous to consider pursuing them. The cost of additional supplemental local supplies, if available, should be compared against other water supply augmentation options.

4. Update the WSMP to reflect changes in the Santa Ynez RiverWare Model and SWP DCR projections and State Water Resources Control Board and DWR actions to implement Executive Order B-37-16 "Making Water Conservation a California Way of Life." It is recommended that these updates be implemented every five years, or more often if the input information changes significantly.

5. At intervals of every five years, determine whether GWD's groundwater pumping capacity is adequate for drought protection. This can be accomplished using the updated WSMP and water supply demand projections. Consideration should also be given to recalibrating the Groundwater Model if basin conditions differ from historical.

6. Modify the WSMP every five years, preferably in the year prior to the Urban Water Management Plan being prepared.

8 Management Plan

The section presents a recommended plan for managing current water supplies relative to current customer demand. As discussed in Section 4.3.5, the optimal water supply strategy for meeting current demand is the Hybrid Priority strategy with SWP injection (Scenario 3). This management strategy involves several management actions:

1. SWP water is purchased when available to keep GWD's portion of the CCWA bank in San Luis Reservoir maximized. The model places a 6,000 acre-feet limit on banked water.

2. Injection of SWP into the Goleta Groundwater basin when groundwater levels are below 1972 levels, CCWA pipeline capacity is not exceeded, and demand has been met.

3. Optimization of groundwater and SWP supplies, particularly during periods when Cachuma Project allocations are reduced. Groundwater is used earlier in the water year when Cachuma Project allocations are reduced, thereby allowing Cachuma Project water to be available later in the year to meet peak demand. This optimization approach reduces the amount of more expensive SWP water used for peaking. The recommended Cachuma Trigger (Cachuma Project Allocation) is 50% because the modeling results suggest that this level provides high reliability at a low cost and does a good job of helping maintain groundwater levels. Higher Cachuma Triggers would result in lower groundwater levels on average without providing a significant cost or reliability benefit.

The recommended Hybrid Priority strategy with SWP injection is shown visually in the flowchart in Figure 8-1, and described below in priority order:

1. Recycled water is used to meet recycled water demand. Recycled water is not shown on the flow chart. The remaining steps are for raw/potable demand.
2. Cachuma water sources are used first until their entitlement is exhausted for the year, in the following order, consistent with the COMB rules: 1) spill water; 2) carry-over water; and 3) annual Cachuma entitlement.
3. However, if there is a local drought such that Cachuma deliveries are reduced below 50%, then groundwater is pumped beginning early in the water year as a supplement to Cachuma water if groundwater levels are above the historical low level. This extends the availability of Cachuma water later into the water year so that less SWP water is needed to meet peak demand during higher demand months. This approach also allows longer pumping of the limited-capacity groundwater wells.
4. Determine the average spring groundwater elevations from the Index Wells. Use the following logic sequence to ensure operations in accordance with the SAFE Ordinance:
    a. If groundwater elevations are higher than -26.2 ft msl (1972 groundwater elevation), pump groundwater at capacity. Then supplement with SWP water, as needed to fully meet demand.

b. If groundwater elevations are lower than -84.6 ft msl (historical low elevation), use SWP water to meet demand.

c. If groundwater elevations are between -26.2 ft and -84.6 ft msl, use the following logic sequence:

   i. If Cachuma deliveries are at 100%, use SWP water to meet demand.

   ii. If Cachuma deliveries have been reduced, use groundwater first at its capacity, supplemented by SWP water to meet demand.

5. Utilize supplement water purchased from the Supplemental Water Purchase Program and/or implement appropriate demand reduction measures set forth in the Drought Preparedness and Water Shortage Contingency Plan. It is noted that considerable lead time may be required to secure supplemental water and/or implement demand reduction measures.

Unused SWP Allocation is injected into the Goleta Groundwater basin if groundwater levels are below -26.2 ft msl. SWP Allocation remaining after injection is used to increase GWDs portion of the CCWA bank in San Luis Reservoir up to a limit of 6,000 acre-feet (not shown on flowchart).

Hierarchy of Water Supply Use

Recommended Hybrid Priority Strategy

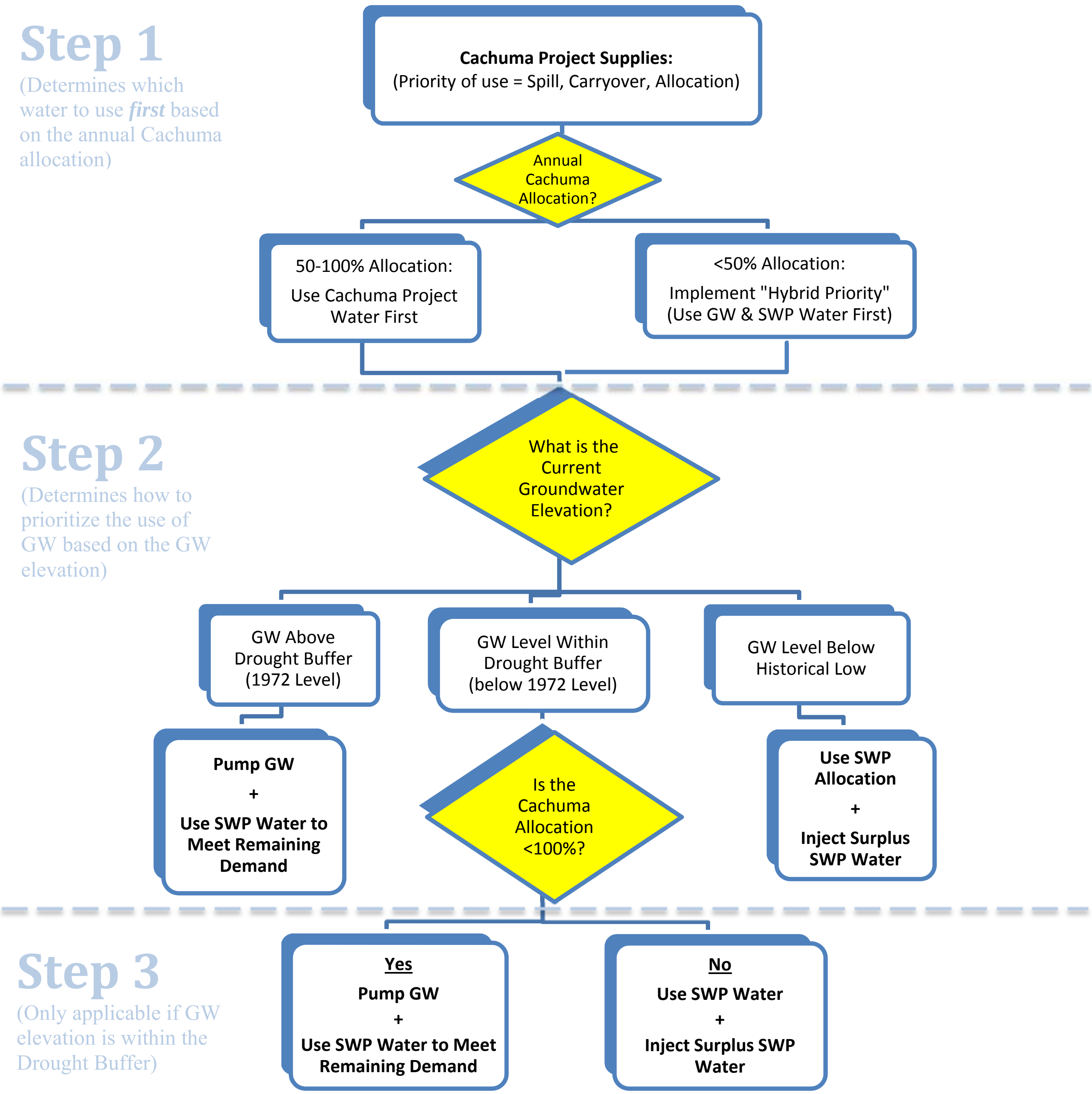

Figure 8-1. Hierarchy of water supply use in the recommended Hybrid Priority strategy with SWP injection (see Section 8, above, for detailed description of the hierarchy of use).

NOTE: All water supplies are used progressively down from the top of the diagram until they are depleted or until capacities are equaled.

= Decision points where groundwater elevations or Cachuma deliveries need to be assessed. Groundwater elevations are the average Spring elevations in the Index Wells in the Goleta groundwater basin (GWD, 2016). Any remaining SWP increases GWD's portion of the CCWA bank in San Luis Reservoir up to 6,000 acre-feet (not shown). Supplemental SWP Allocation purchases should be pursued during droughts, as needed to address extraordinary supply shortfalls (not shown).

9 Limitations of the WSMP

This WSMP is based on knowledge of the water supply sources as they are now understood (including the projection to 2035 of State Water conditions). There are several factors that could affect the conclusions in this study:

1. If there were an emergency within the State Water project – failure of Delta levees or system dams, risk to San Luis Reservoir due to potential seismic vulnerabilities, damage to aqueducts from earthquakes or other disasters – deliveries could be reduced or curtailed for a period of time.
2. A local earthquake could disable the Tecolote Tunnel for a period of time, leaving groundwater pumping and recycled water as the remaining sources of water.
3. Issues with endangered species could further affect either State Water or Cachuma deliveries.
4. Seawater intrusion or a contaminant release could reduce the ability to pump a portion of the groundwater basin.
5. Climate change could produce, and is likely to produce future conditions that are dramatically different than past conditions.
6. Regional decisions regarding CCWA pipeline capacity or COMB water delivery operations could affect delivery reliability and GWD costs.
7. Continuing study of stormwater catchment and other local sources could lead to strategy modifications.

10 References

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Appendix A – Model Results

Current Supply/Demand

Current Demand	State Water Injected to Meet ASC						
	Current #1 (GW Priority)	Current #2 (State Priority)	Current #3 (GW-State Optimized)				
Cachuma Trigger	None	None	30%	50%	70%	90%	100%
% of Years Addtl Conservation	3%	13%	3%	1%	1%	1%	1%
% of Years Addtl Conservation >20%	0%	1%	0%	0%	0%	0%	0%
Maximum Year Addtl Conservation	13%	31%	13%	13%	13%	13%	13%
Cachuma Deliveries (AFY)	9,638	9,638	9,638	9,638	9,638	9,638	9,614
Avg Groundwater Pumped (AFY)	1,269	282	1,269	1,336	1,427	1,642	1,787
Avg State Water (AFY)	2,016	2,748	2,016	1,956	1,873	1,658	1,538
Recycled Water (AFY)	977	977	977	977	977	977	977
Purchase of Drought Supplies (AFY)	7	139	7	8	0	0	0
Annual Cost	$ 23,287,188	$ 23,424,890	$23,287,188	$ 23,289,583	$ 23,279,498	$23,250,545	$ 23,236,829
Cost ($/AF)	$ 1,674	$ 1,699	$ 1,674	$ 1,674	$ 1,673	$ 1,671	$ 1,670

Current Demand	No State Water Injected						
	Current #1a (GW Priority)	Current #2a (State Priority)	Current #3a (GW-State Optimized)				
Cachuma Trigger	None	None	30%	50%	70%	90%	100%
% of Years Addtl Conservation	6%	13%	6%	4%	4%	5%	7%
% of Years Addtl Conservation >20%	0%	1%	0%	0%	0%	1%	1%
Maximum Year Addtl Conservation	13%	31%	13%	13%	13%	33%	33%
Cachuma Deliveries (AFY)	9,638	9,638	9,638	9,638	9,638	9,638	9,638
Avg Groundwater Pumped (AFY)	619	282	619	688	685	736	736
Avg State Water (AFY)	2,597	2,748	2,597	2,555	2,586	2,467	2,468
Recycled Water (AFY)	977	977	977	977	977	977	977
Purchase of Drought Supplies (AFY)	51	139	51	32	3	12	0
Annual Cost	$ 23,346,759	$ 23,399,909	$ 23,346,759	$23,331,573	$ 23,327,232	$ 23,298,916	$23,293,293
Cost ($/AF)	$ 1,682	$ 1,697	$ 1,682	$ 1,680	$ 1,679	$ 1,685	$ 1,686

	Current #4 (Add Well Capacity)			Current #4a (Add Well Capacity)		
Additional Well Capacity	10%	20%	30%	10%	20%	30%
Cachuma Trigger	90%	90%	90%	70%	70%	70%
% of Years Addtl Conservation	1%	1%	0%	4%	4%	4%
% of Years Addtl Conservation >20%	0%	0%	0%	0%	0%	0%
Maximum Year Addtl Conservation	9%	4%	0%	10%	10%	10%
Cachuma Deliveries (AFY)	9,638	9,638	9,638	9,638	9,638	9,638
Avg Groundwater Pumped (AFY)	1,749	1,777	1,863	736	760	776
Avg State Water (AFY)	1,558	1,538	1,458	2,527	2,516	2,496
Recycled Water (AFY)	977	977	977	977	977	977
Purchase of Drought Supplies (AFY)	0	0	0	18	13	12
Annual Cost	$ 23,837,269	$ 24,429,432	$25,015,066	$ 23,922,836	$ 24,520,600	$ 25,116,738
Cost ($/AF)	$ 1,712	$ 1,754	$ 1,795	$ 1,721	$ 1,763	$ 1,807

Future Supply/Demand

	Future #3 (GW-State Optimized)						
Cachuma Reduction	0%	0%	0%	0%	0%	0%	0%
Cachuma Trigger	**30%**	**50%**	**70%**	**90%**	**100%**	**90%**	**90%**
Local Water to Inject	**no**	**no**	**no**	**no**	**no**	**yes**	**yes**
Local Water to Customers	**no**	**no**	**no**	**no**	**no**	**no**	**yes**
% of Years Addtl Conservation	63%	64%	62%	56%	56%	43%	6%
% of Years Addtl Conservation >20%	1%	2%	2%	3%	3%	1%	1%
Maximum Year Addtl Conservation	27%	27%	27%	43%	43%	27%	27%
Cachuma Deliveries (AFY)	9,805	9,805	9,805	9,805	9,805	9,805	9,805
Avg Groundwater Pumped (AFY)	829	804	865	985	984	1,527	1,527
Avg State Water (AFY)	2,807	2,807	2,807	2,807	2,825	2,750	2,750
Recycled Water (AFY)	1,128	1,128	1,128	1,128	1,128	1,128	1,128
Purchase of Drought Supplies (AFY)	938	952	916	762	718	659	659
Purchase Local Water (AFY)	0	0	0	0	0	0	792
Annual Cost	$23,997,680	$23,983,069	$23,989,828	$ 23,949,273	$ 23,927,640	$24,508,872	$ 25,894,710
Cost ($/AF)	$ 1,547	$ 1,548	$ 1,546	$ 1,546	$ 1,548	$ 1,544	$ 1,554

	Future #3 (Cachuma Reduction)						
Cachuma Reduction	**20%**	**20%**	**30%**	**30%**	**40%**	**40%**	**40%**
Cachuma Trigger	90%	90%	90%	90%	90%	90%	90%
Local Water to Inject	no	yes	no	yes	no	yes	yes
Local Water to Customers	no	yes	no	yes	no	no	yes
% of Years Addtl Conservation	80%	14%	83%	12%	90%	85%	15%
% of Years Addtl Conservation >20%	52%	2%	60%	2%	63%	48%	2%
Maximum Year Addtl Conservation	48%	27%	51%	27%	53%	39%	32%
Cachuma Deliveries (AFY)	8,036	8,036	7,159	7,159	6,282	6,282	6,282
Avg Groundwater Pumped (AFY)	825	1,677	802	1,539	770	1,595	1,595
Avg State Water (AFY)	2,954	2,930	2,953	2,948	2,943	2,942	2,942
Recycled Water (AFY)	1,128	1,128	1,128	1,128	1,128	1,128	1,128
Purchase of Drought Supplies (AFY)	1,184	1,096	1,341	1,252	1,448	1,413	1,413
Purchase Local Water (AFY)	0	1,672	0	2,491	0	367	3,092
Annual Cost	$23,989,143	$27,772,470	$23,967,518	$ 29,010,505	$ 23,923,038	$24,622,325	$ 30,032,851
Cost ($/AF)	$ 1,698	$ 1,679	$ 1,791	$ 1,756	$ 1,903	$ 1,843	$ 1,825

	Future #4 (Add Well Capacity)						
Cachuma Reduction	0%	0%	0%	0%	0%	0%	0%
Additional Well Capacity	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**60%**
Cachuma Trigger	90%	90%	90%	90%	90%	90%	90%
Local Water to Inject	no	no	no	no	no	no	yes
Local Water to Customers	no	no	no	no	no	no	yes
% of Years Addtl Conservation	56%	55%	55%	56%	56%	56%	1%
% of Years Addtl Conservation >20%	3%	2%	2%	2%	2%	2%	0%
Maximum Year Addtl Conservation	43%	43%	43%	43%	43%	36%	4%
Cachuma Deliveries (AFY)	9,805	9,805	9,805	9,805	9,805	9,805	9,805
Avg Groundwater Pumped (AFY)	1,034	1,085	1,106	1,143	1,156	1,162	1,969
Avg State Water (AFY)	2,808	2,821	2,797	2,785	2,780	2,770	2,615
Recycled Water (AFY)	1,128	1,128	1,128	1,128	1,128	1,128	1,128
Purchase of Drought Supplies (AFY)	698	650	640	618	611	608	278
Purchase Local Water (AFY)	0	0	0	0	0	0	938
Annual Cost	$24,524,157	$25,100,711	$25,686,997	$ 26,269,599	$ 26,860,891	$27,453,435	$ 29,600,882
Cost ($/AF)	$ 1,585	$ 1,620	$ 1,660	$ 1,697	$ 1,735	$ 1,774	$ 1,769

	Future #4 (Cachuma Reduction)								
Cachuma Reduction	20%	20%	20%	30%	30%	30%	40%	40%	40%
Additional Well Capacity	20%	40%	60%	20%	40%	60%	20%	40%	60%
Cachuma Trigger	90%	90%	90%	90%	90%	90%	90%	90%	90%
Local Water to Inject	no	no	no	no	no	no	no	no	no
Local Water to Customers	no	no	no	no	no	no	no	no	no
% of Years Addtl Conservation	78%	74%	73%	82%	81%	78%	88%	86%	82%
% of Years Addtl Conservation >20%	52%	52%	52%	59%	60%	60%	62%	63%	63%
Maximum Year Addtl Conservation	48%	48%	48%	51%	51%	51%	53%	53%	68%
Cachuma Deliveries (AFY)	8,036	8,036	8,036	7,159	7,159	7,159	6,282	6,282	6,282
Avg Groundwater Pumped (AFY)	936	1,086	1,037	912	1,005	1,124	869	949	1,015
Avg State Water (AFY)	2,954	2,954	2,954	2,953	2,953	2,953	2,943	2,943	2,943
Recycled Water (AFY)	1,128	1,128	1,128	1,128	1,128	1,128	1,128	1,128	1,128
Purchase of Drought Supplies (AFY)	1,098	992	933	1,283	1,192	1,088	1,416	1,319	1,228
Purchase Local Water (AFY)	0	0	0	0	0	0	0	0	0
Annual Cost	$ 25,157,200	$ 26,343,468	$27,504,446	$ 25,154,232	$ 26,337,489	$27,513,748	$ 25,123,696	$ 26,297,052	$ 27,484,601
Cost ($/AF)	$ 1,777	$ 1,856	$ 1,952	$ 1,872	$ 1,960	$ 2,045	$ 1,988	$ 2,083	$ 2,182

	Future #5 (Add Well Capacity, Inject Recycled)			
Cachuma Reduction	0%	0%	0%	0%
Recycled Injection (AFY)	**500**	**1,000**	**1,500**	**2,000**
Additional Well Capacity	40%	40%	40%	40%
Cachuma Trigger	90%	90%	90%	90%
Local Water to Inject	no	no	no	no
Local Water to Customers	no	no	no	no
% of Years Addtl Conservation	27%	24%	19%	16%
% of Years Addtl Conservation >20%	0%	0%	0%	0%
Maximum Year Addtl Conservation	15%	15%	15%	15%
Cachuma Deliveries (AFY)	9,805	9,805	9,805	9,805
Avg Groundwater Pumped (AFY)	2,557	2,718	2,939	3,130
Avg State Water (AFY)	2,538	2,473	2,357	2,243
Recycled Water (AFY)	1,128	1,128	1,128	1,128
Purchase of Drought Supplies (AFY)	137	129	113	107
Purchase Local Water (AFY)	0	0	0	0
Annual Cost	$ 25,483,247	$ 26,280,546	$27,115,562	$ 27,930,061
Cost ($/AF)	$ 1,576	$ 1,617	$ 1,659	$ 1,702

	Future #5 (Cachuma Reduction)					
Cachuma Reduction	**20%**	**20%**	**30%**	**30%**	**40%**	**40%**
Recycled Injection (AFY)	1,500	1,500	1,500	1,500	1,500	1,500
Additional Well Capacity	40%	40%	40%	40%	40%	40%
Cachuma Trigger	90%	90%	90%	90%	90%	90%
Local Water to Inject	no	yes	no	yes	no	yes
Local Water to Customers	no	yes	no	yes	no	yes
% of Years Addtl Conservation	38%	3%	56%	5%	60%	5%
% of Years Addtl Conservation >20%	24%	0%	29%	0%	33%	0%
Maximum Year Addtl Conservation	26%	11%	31%	11%	53%	11%
Cachuma Deliveries (AFY)	8,036	8,036	7,159	7,159	6,282	6,282
Avg Groundwater Pumped (AFY)	3,042	2,963	3,043	2,986	3,092	3,055
Avg State Water (AFY)	2,874	2,874	2,903	2,911	2,922	2,941
Recycled Water (AFY)	1,128	1,128	1,128	1,128	1,128	1,128
Purchase of Drought Supplies (AFY)	490	513	881	825	1,026	1,045
Purchase Local Water (AFY)	0	1,203	0	1,700	0	2,248
Annual Cost	$ 27,320,564	$ 29,862,892	$27,419,907	$ 30,889,131	$ 27,377,001	$31,914,545
Cost ($/AF)	$ 1,755	$ 1,786	$ 1,814	$ 1,848	$ 1,895	$ 1,911

Appendix B - SAFE Ordinance

APPENDIX B

SAFE Water Supplies Ordinance

Adopted by the electorate in November, 1994
Ordinance No. 94-03

and

Adopted by the electorate in June, 1991
Ordinance No. 91-01

FULL TEXT OF MEASURE J94
GOLETA WATER DISTRICT

AN AMENDMENT TO THE SAFE WATER SUPPLIES ORDINANCE

THE PEOPLE OF THE GOLETA WATER DISTRICT, COUNTY OF SANTA BARBARA, STATE OF CALIFORNIA, DO ORDAIN AND ENACT THE FOLLOWING ORDINANCE WHICH SHALL BE AN AMENDMENT TO THE SAFE WATER SUPPLIES ORDINANCE:

RECITALS:

WHEREAS, the voters of the Goleta Water District ("District") enacted the SAFE Water Supplies Ordinance ("SAFE") in June 1991 authorizing the participation by the District in the State Water Project and providing for the bond financing to develop the Project Facilities necessary for delivery of that water to the District; and

WHEREAS, the District is now a member of the Central Coast Water Authority, the members of which are cooperating collectively to develop the Project Facilities which are now under construction; and

WHEREAS, SAFE provides for the creation of a Drought Buffer of water stored in the Goleta groundwater basin to protect against future drought emergencies and a Water Supply Distribution Plan to protect the District's water supplies against new demands until deliveries from the State Water Project are available; and

WHEREAS, this proposed amendment to SAFE maintains all the provisions regarding the protection of water supplies provided by the Drought Buffer and the Water Supply Distribution Plan; and

WHEREAS, pursuant to provisions of the judgment in the lawsuit known as Wright v. Goleta Water District, the District is required to develop a Water Plan to provide the necessary water supplies to achieve a balance between supply and demand for water within the District. The District's Water Plan is based on continuing to use the maximum amount of water available from the Cachuma Project; prudent management of the Goleta groundwater basin; use of the newly constructed wastewater reclamation project to replace existing use of potable water for turf irrigation; a continuing water conservation planning effort; participation in the State Water Project; and the necessary level of commitment to a desalinated seawater project. As a result of the long-term water supply deficit in the District, the District has been operating under a water connection moratorium for over twenty years. Once fully implemented the District's Water Plan should provide adequate supplies to meet long-term water demand in the District; and

WHEREAS, the forty year water service contract with the United States Bureau of Reclamation for delivery of water from the Cachuma Project will expire in May 1995. Negotiations are currently under way to renew that contract. The Bureau of Reclamation has required that the Cachuma Project be subjected to an environmental review process which is now being undertaken. It appears likely that the District's yield from the Cachuma Project after contract renewal will be less than the current yield as a result of the dedication of water for environmental enhancement purposes on the lower Santa Ynez River; and

WHEREAS, the Southern California Water Company is a Santa Barbara County water purveyor which currently holds rights to an entitlement to 3,000 acre feet per year of water from the State Water Project and has given notice of its intent to sell 2,500 acre feet of that entitlement. The Goleta Water District has identified itself as a potential purchaser of the entitlement. It is the intent of this Ordinance to authorize the acquisition and use of that entitlement; and

WHEREAS, the District estimates the annual cost of the Southern California Water Company entitlement to be $500 per acre foot of water delivered to the District. The entitlement acquisition is intended to reduce the long-term costs of water to the District and its customers in that alternative supplies that would be available, and necessary to meet the District's long-term demand would be more expensive than the water available from Southern California Water Company. The District's cost analysis of the acquisition is available at the District office.

NOW, THEREFORE, THE FOLLOWING ORDINANCE IS ENACTED INTO LAW:

1. The District is authorized to acquire an additional entitlement to the State Water Project in an amount of up to 2,500 acre feet per year, which is currently available from the Southern California Water Company. This entitlement will supplement the 4,500 acre feet per year authorized by the voters in originally adopting the SAFE Water Supplies Ordinance. This authorization shall provide for the payment of all costs of the acquisition and use of any additional entitlement acquired. Due to the controversy concerning the physical ability of the State Water Project to deliver its full contractual commitments, the District shall plan for the delivery of 3,800 acre feet per year of water as the amount of firm average long-term yield. The District's total State Water Project entitlement includes the basic entitlement of 4,500 acre feet per year, the District's share of the drought buffer held by the Central Coast Water Authority and the entitlement acquired pursuant to this authorization. Any excess water actually delivered over 3,800 acre feet per year

shall be stored in the Goleta groundwater Central basin until the basin is replenished to its 1972 level, for use during drought conditions.

2. Enactment of this Ordinance shall comply with all applicable law, including the California Environmental Quality Act.

3. If adopted, this Ordinance shall be an amendment to the SAFE Water Supplies Ordinance adopted by the electorate in June, 1991, which amended and superseded the Responsible Water Policy Ordinance, originally adopted by the electorate in 1973. Paragraph 1 of this Ordinance shall amend and fully supersede paragraph 6 of the SAFE Water Supplies Ordinance. All other provisions of the SAFE Ordinance shall remain in full force and effect. If adopted, this Ordinance may not be modified except pursuant to a vote of the electorate of the District.

4. This Ordinance shall be liberally construed and applied in order to fully promote its underlying purposes. If any word, sentence, paragraph or section of this Ordinance is determined to be unenforceable by a court of law, it is the intention of the District that the remainder of the Ordinance shall be enforced.

FULL TEXT OF MEASURE H91
GOLETA WATER DISTRICT
Ordinance 91-01
SAFE WATER SUPPLIES ORDINANCE

THE PEOPLE OF THE GOLETA WATER DISTRICT, COUNTY OF SANTA BARBARA, STATE OF CALIFORNIA, DO ORDAIN AND ENACT THE FOLLOWING ORDINANCE WHICH SHALL BE KNOWN AS THE *SAFE WATER SUPPLIES ORDINANCE*:

RECITALS:
Whereas, the Goleta Water District ("District") faces a significant shortage of water to meet current long-term water demands of its customers as determined by the State Department of Water Resources and the Santa Barbara County Flood Control and Water Conservation District in their 1985 Santa Barbara County Water Project Alternatives study; and

Whereas, a drought emergency was declared in Santa Barbara County in 1990 following four years of below normal precipitation within Santa Barbara County and, in the future, the District will continue to be subject to recurring drought cycles which will threaten the ability of the District to meet the health and safety needs of its customers unless new and diversified, long term water projects are developed; and

Whereas, the District relies exclusively on local water supplies to meet its current water demand, which supplies originate entirely within Santa Barbara County and which supplies are all subject to the same climatic conditions; and

Whereas, in the absence of a system limiting the District's authority to provide new and/or additional water service connections without first mandating groundwater storage of water in wet years for use in dry years (a "drought buffer program") District customers may face severe water shortage in the future; and

Whereas on October 1, 1990 the Board of Directors of the Goleta Water District adopted a Water Supply Management Plan which includes use of water supplies from both a desalting plant and the State of Water Project; and;

Whereas, the District is a party to an agreement with the Santa Barbara County Flood Control and Water Conservation District entitled "Water Supply Retention Agreement" dated December 11, 1984 which it executed on June 28, 1986 (the "WSRA") entitling the District to 4,500 acre feet per year from the State Water Project, and has executed amendments thereto; and

Whereas, the District is also a party to a "Contract for Preliminary Studies for Financial Feasibility, Preliminary Design and Environmental Review Under State Water Supply Contract" (the "Design and EIR Agreement") dated June 2, 1986 but did not identify itself as a proposed participant in the preliminary studies in response to the "Notice of Intent to Request Preliminary Studies" for the Coastal Branch and the Mission Hills Extension of the California Aqueduct given by the city of Santa Maria on or about May 24, 1986; and

Whereas, the WSRA and its amendments and the Design and EIR Agreement contain the ways and means to provide for a long term solution to the existing drought emergency and to the ongoing water shortage within the County of Santa Barbara; and

Whereas, the District has a duty to provide a permanent, reliable water supply to its residents.

NOW, THEREFORE, THE FOLLOWING ORDINANCE IS ENACTED INTO LAW:

I Drought Buffer

1. In each year, commencing in the first year the State Water Project makes deliveries to the District, the District shall, after providing service to its existing customers, commit at least 2,000 acre feet of its water supply (the "Annual Storage Contribution") to the Goleta Central Basin either by direct injection or by reduction in groundwater pumping. The water so stored in the Central Basin shall constitute the District's "Drought Buffer".

2. The Drought Buffer may be pumped and distributed by the District only to existing customers and only in the event that a drought on the South Coast causes a reduction in the District's annual deliveries from Lake Cachuma. The Drought Buffer cannot, under any circumstances, be used by the District as a supplemental water supply to serve new or additional demands for water within the District.

3. Unless and until the Central Basin water level rises to 100% of its 1972 levels, the District shall be required to make its Annual Buffer Commitment. Thereafter, for so long as the District maintains the Central Basin at or above 1972 levels, the District may utilize the yield of the Central Basin to lower the cost of water service to existing customers.

II Water Supply Distribution Plan

4. The District shall be forbidden from providing new or additional potable water service connections to any property not previously served by the District until all of the following conditions are met:

a. District is receiving 100% of its deliveries normally allowed from the Cachuma Project;

b. The District has met its legal obligations required by the judgment in Wright v Goleta Water District;

c. Water rationing by the District is eliminated;

d. The District has met its obligation to make its Annual Storage Commitment to the Drought Buffer.

5. For each year in which the conditions of paragraph 4, have been met, the District shall be authorized to release 1% of its total potable water supply to new or additional service connections and if such new releases are authorized, the District shall permanently increase the size of the Annual Storage Commitment made to the Drought Buffer by 2/3 of the amount of any release for new or additional uses so that safe water supplies in times of drought shall not be endangered by any new or additional demands.

III State Water Supply

6. Due to controversy concerning the physical ability of the State Water Project to deliver its full contractual commitments, District shall plan for delivery of only 2,500 acre feet per year as the amount of the firm new yield from the State Water Project. Any excess water actually delivered shall be stored in the Goleta Groundwater basin for use in drought.

7. The District shall immediately either (a) give Notice of its Intention to Request Construction of Described Project Facilities under the State Water Contract, as provided for in Section 5(a)(1) of the WSRA or (b) respond to any such notice previously given by any other Contractor as provided for in Section 5(a)(2) of the WSRA that it wishes to participate in the described project.

8. The Project Facilities to be constructed pursuant to the Notice of Intention shall be the Mission Hills and Santa Ynez Extensions of the Coastal Branch of the California Aqueduct and required water treatment facilities and other appurtenant facilities (herein the "Project Facilities").

9. The District agrees, pursuant to section Section 5(a)(2) of the WSRA, that the time for determination of participation and sizing of the Project Facilities may be any date on or after September 1, 1992 agreeable to the other participants.

10. The District shall, in the shortest time lawfully possible, exercise all of its rights and fulfill all of its obligations under the WSRA, including the payment of any monies required thereunder.

11. The District shall file a Late Request to Amend, pursuant to Secton 3(f) of the Design and EIR Agreement, and agrees to pay its proportionate share of all costs required by said Section 3(f) and any amounts required under Section 3(g) of said Design and EIR Agreement.

12. The District, or the Santa Barbara Water Purveyors Agency, or any other joint powers agency of which the District is a member or may become a member for such purposes, may issue revenue bonds ("bonds") from time to time in an amount not to exceed Forty-Two Million Dollars ($42,000,000.00) to provide funds to finance the District's pro rata share of the costs and expenses under the WSRA and the Design and EIR Agreement. Said bonds shall be used for the purposes of constructing the Project Facilities, including without limitation, any and all necessary facilities required for the delivery of State Project Water pursuant to the WSRA to the District through the Coastal Branch of the California Aqueduct, including any and all expenses incidental thereto or connected therewith, and shall include, without limitation, the cost of acquiring rights of way, the cost of constructing and/or acquiring all buildings, equipment and related personal and real property required to complete the Project Facilities, and the engineering, environmental review, inspection, legal and fiscal agent's fees, costs incurred by the District or joint powers agency in connection with the issuance and sale of such bonds, and reserve fund and bond interest estimated to accrue during the construction period and for a period of not to exceed twelve (12) months after completion of construction, such bonds to be payable from the District's water revenues, to bear interest at a rate or rates not to exceed the legal maximum from time to time, and to mature in not more than forty (40) years from the date of issuance.

13. This Ordinance shall be submitted to a vote of the people of the District in compliance with the requirements of Section 5(a)(4)(1) of the WSRA and pursuant to Elections Code Section 5201.

14. All actions taken pursuant to this Ordinance shall be in compliance with all local, state and federal environmental protection laws. Nothing in the Ordinance shall be construed to require such compliance prior to the election provided for herein.

15. This Ordinance shall be liberally construed and applied in order to fully promote its underlying purposes. If any word, sentence, paragraph or section of this Ordinance is determined to be unenforceable by a court law, it is the intention of the District that the remainder of the Ordinance shall be enforced.

16. If adopted, this ordinance shall be an amendment to the Responsible Water Policy Ordinance adopted by the people in May, 1973, and may not be modified except pursuant to the vote of the electorate of the District. To the extent that the provisions of this ordinance conflict with that ordinance or any prior ordinance or measure previously enacted by the District or the voters of the District, the provisions of this ordinance shall control. To the extent that the provisions of this Ordinance conflict with any other ordinance or measure adopted at the same election, the ordinance or measure receiving the highest number of affirmative votes shall control.

17. Nothing herein is intended to affect the rights of any parties nor the obligations of the District pursuant to the judgment in the action know as Wright v Goleta Water District, Santa Barbara Superior Court Case No. SM57969.

18. This ordinance shall take effect immediately upon being approved by a majority vote of the votes cast at the election.

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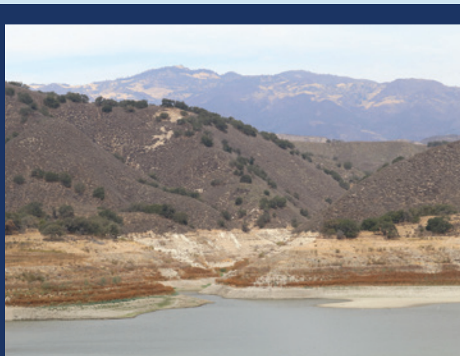




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