2026

Groundwater Management Plan

for the Santa Clara and Llagas Subbasins

Valley Water

DRAFT

Santa Clara Valley Water District

2026 Groundwater Management Plan for the Santa Clara and Llagas Subbasins

Prepared by:

Scott Elkins, P.G.
Associate Water Resources Specialist

Chanie Abuye
Senior Water Resources Specialist

Geoffrey Tick, Ph.D.
Senior Water Resources Specialist

Under the Direction of:

Jason Gurdak, Ph.D.
Groundwater Management Unit Manager

Greg Williams
Deputy Operating Officer
Raw Water Division

Aaron Baker, P.E.
Chief Operating Officer
Water Utility Enterprise

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DRAFT

Contributors:

Victoria Garcia
Marino Hernandez
Cheyne Hirota
Dana Kilsby
Jeannine Larabee
Ellie Murdoch
Malcolm Seeman
Giselle Tavarez
Gennifer Wehmeyer
Xiaoyong Zhan
Meijing Zhang

Graphic Design:

Benjamin Apolo III
Linh Hoang
Rodion Ostrovski

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District 7

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EXECUTIVE SUMMARY

Nearly half of the average annual water used in Santa Clara County (county) is pumped from the Santa Clara and Llagas subbasins, with some communities relying solely on groundwater. For over 95 years, the Santa Clara Valley Water District (Valley Water) has managed groundwater in the county per statutory authority provided by the Santa Clara Valley Water District Act (District Act).[1] Valley Water's comprehensive groundwater management programs and investments have resulted in sustainable groundwater conditions for many decades and will ensure groundwater resources are sustainable far into the future.

This 2026 Groundwater Management Plan (GWMP) describes Valley Water's comprehensive groundwater management framework, including existing and potential actions to achieve basin sustainability goals and ensure continued sustainable groundwater management. The GWMP covers the Santa Clara and Llagas subbasins, located entirely in Santa Clara County and identified by the Department of Water Resources (DWR) as Basins 2-9.02 and 3-3.01, respectively.

GROUNDWATER MANAGEMENT PLAN AUTHORITY

This 2026 GWMP is prepared pursuant to authority granted by the District Act and supersedes all previous Groundwater Management Plans. This 2026 GWMP also satisfies the objectives of the Sustainable Groundwater Management Act (SGMA).

SGMA was enacted by the State legislature in 2014. Subsequent Groundwater Sustainability Plan (GSP) Emergency Regulations have resulted in statewide requirements for basins designated as medium and high priority basins by DWR. In the basins designated by DWR as medium and high priority[2], local public agencies and Groundwater Sustainability Agencies (GSAs) are required to develop and implement GSPs or alternatives to GSPs (Alternative Plans). DWR has identified the Santa Clara and Llagas subbasins as high-priority basins, and they are not critically overdrafted basins.

SGMA lists Valley Water as one of 18 exclusive agencies with powers to comply with SGMA within its statutory boundary.[3] In May 2016, following a public hearing, the Valley Water Board of Directors (Board) adopted a resolution to become the GSA for the Santa Clara and Llagas subbasins.

Prior to the statutory deadline of January 1, 2017, Valley Water submitted the 2016 GWMP for both the Santa Clara and Llagas subbasins to DWR as an Alternative Plan. The 2016 GWMP updated technical information from Valley Water's 2012 GWMP with information functionally equivalent to elements required by Articles 5 and 7 of the GSP Emergency Regulations. The 2016 GWMP met the requirements of California Water Code (Water Code) Section 10733.6, which allows for an Alternative Plan to be submitted to DWR. The 2016 GWMP, prepared pursuant to the District Act, qualified as an Alternative Plan per Water Code Section 10733.6(b)(1), which states that an Alternative Plan can be a plan developed pursuant to other law authorizing groundwater management. The history of Valley Water's GWMP development under SGMA is explained below.

VALLEY WATER OVERVIEW

Valley Water is an independent special district that provides wholesale water supply, groundwater management, flood protection, and stream stewardship for its service area, which includes all of Santa Clara County. The mission of Valley Water is to provide Silicon Valley safe, clean water to support a healthy community, environment, and economy. Valley Water is governed by an elected Board of

1 Santa Clara Valley Water District Act, Water Code Appendix, Chapter 60.
2 https://water.ca.gov/programs/groundwater-management/basin-prioritization
3 California Water Code Section 10723 (a).

Directors (Board), comprised of seven members elected from equally divided districts drawn through a formal process.

Formed in 1929 in response to groundwater overdraft and subsidence, Valley Water has been a leader in the conjunctive management of groundwater and surface water for many decades. Under the District Act, Valley Water's objectives and authority related to groundwater management are to recharge groundwater basins, conserve, manage and store water for beneficial and useful purposes, increase water supply, protect surface water and groundwater from contamination, prevent waste or diminution of Valley Water's water supply, and do any and every lawful act necessary to ensure sufficient water is available for present and future beneficial uses.[4]

Groundwater management programs are funded by Valley Water's Water Utility Enterprise, with funding sources including charges for groundwater production, treated water, recycled water, and surface water, along with property taxes, interest earnings, reimbursements, and grants. These funds are used to operate and maintain Valley Water's complex water supply infrastructure network, maintain water supply sources and water rights, and make capital improvements as needed to ensure water supply reliability.

WATER SUPPLY AND GROUNDWATER OVERVIEW

Valley Water manages a diverse water supply portfolio, with sources including groundwater, local surface water, imported water, and recycled water. About half of the county's water supply comes from local sources and the other half comes from imported sources. Imported water includes Valley Water's State Water Project and Central Valley Project contract supplies, and supplies delivered by the San Francisco Public Utilities Commission (SFPUC) to cities in northern Santa Clara County. Local sources include natural groundwater recharge and surface water supplies. A small, but growing portion of the county's water supply is recycled water. Water conservation continues to increase its importance in the water supply mix, reducing water demands and improving reliability during droughts.

Valley Water does not pump and supply groundwater directly to customers but sustainably manages the Santa Clara and Llagas subbasins to support beneficial use by water retailers, private well users, and the environment. Valley Water supplies are distributed to recharge facilities in the Santa Clara and Llagas subbasins, drinking water treatment plants, local creeks for environmental needs, or directly to water users. The conjunctive management of surface water and groundwater maximizes water supply reliability, allowing Valley Water to store surface water in local groundwater basins to help balance pumping and provide reserves for use during dry years when surface water availability is limited.

Local groundwater resources make up the foundation of the county's water supply, but they need to be augmented by Valley Water's comprehensive water supply management activities to reliably meet the county's needs. These activities include the managed recharge of imported and local surface water and in-lieu recharge through the provision of treated surface water, acquisition of supplemental water supplies, and water conservation and recycling.

Valley Water also has programs to protect, manage, and sustain water resources. Valley Water operates and maintains a complex infrastructure network, with major features including:

- 10 surface water reservoirs
- 166,000 acre-feet total reservoir storage capacity
- 11 miles of raw surface water canals
- 98 groundwater recharge ponds covering 279 acres
- 98 miles of controlled in-stream recharge

4 District Act, Sections 4 and 5.

- 134 miles of raw and treated water pipelines
- three pumping stations
- three drinking water treatment plants
- Silicon Valley Advanced Water Purification Center
- 186 Valley Water owned groundwater monitoring wells

In addition to working to secure adequate water supplies for the county, Valley Water also has a long history of protecting groundwater resources, beginning with efforts to address seawater intrusion adjacent to San Francisco Bay in the late 1950s. In the 1980s, contamination from leaking chemical storage tanks at semiconductor manufacturing facilities brought groundwater quality issues to the forefront. Valley Water efforts to aggressively protect groundwater quality have included close coordination with regulatory agencies overseeing cleanup, the implementation of numerous programs including well construction/destruction regulations and efforts to reduce nitrate loading, the oversight of fuel leak cases, and efforts to influence statewide policy from threats such as methyl tertiary-butyl ether (MTBE), an additive formerly used in gasoline.[5] More recently, Valley Water has engaged with interested parties to develop Salt and Nutrient Management Plans and to proactively evaluate threats posed by contaminants such as Per- and Polyfluoroalkyl Substances (PFAS). Valley Water continues to work with regulatory agencies and local water retailers to better understand the potential contaminants in local groundwater and take action if needed to ensure a safe and reliable drinking water supply.

Protecting groundwater resources is a key part of Valley Water's mission as demonstrated by the following Board policy related to water supply:

- Water Supply Objective 2.1.1: Manage groundwater to ensure sustainable supplies and avoid land subsidence.
- Water Supply Objective 2.1.2: Aggressively protect groundwater from the threat of contamination.

Valley Water has been a leader in conjunctive management for many decades, using imported and local surface water to replenish groundwater and maintain reliability in dry years. Figure ES-1 shows how Valley Water's investments and conjunctive management programs have contributed to a sustainable groundwater supply and stopped the historical subsidence.

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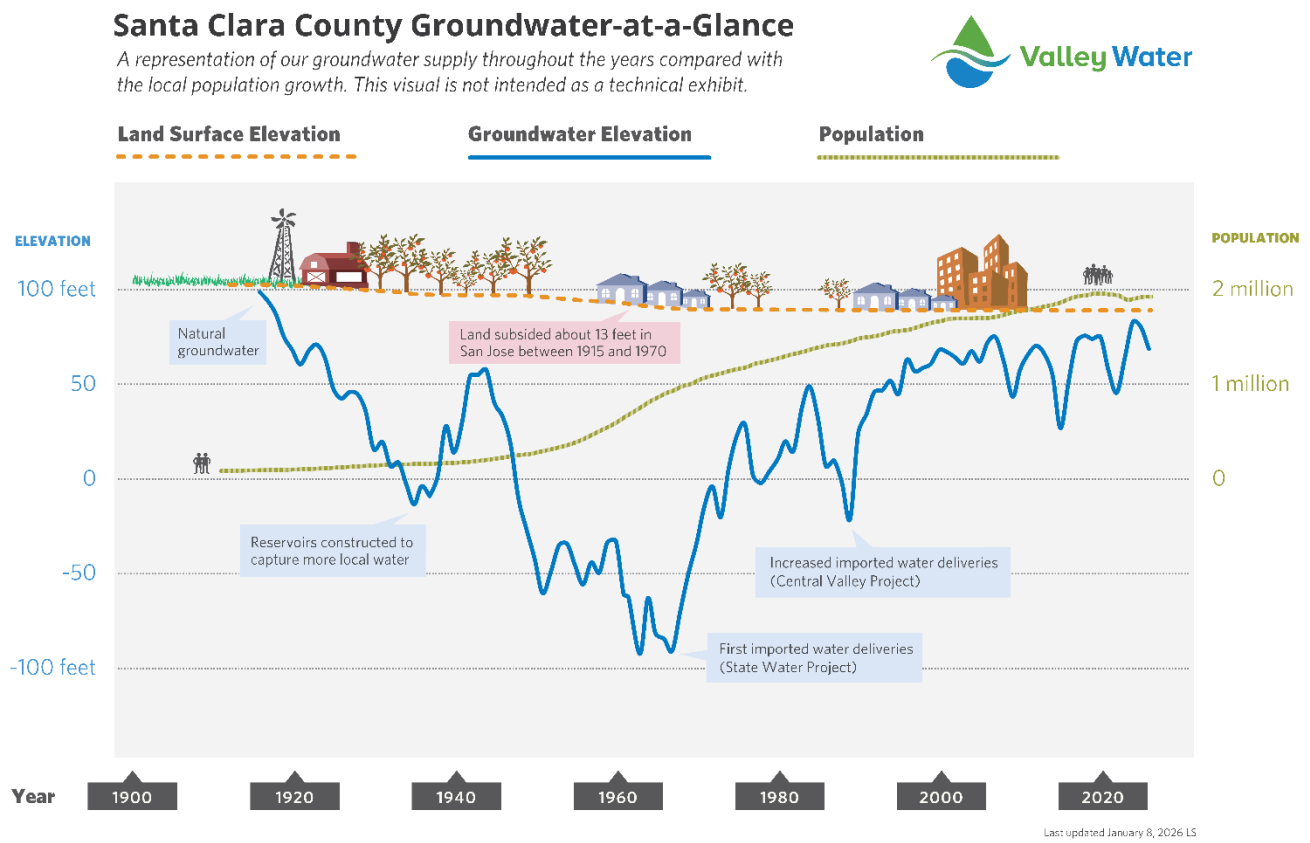
5 California History Center & Foundation, Water in the Santa Clara Valley: A History, 2005.

Figure ES- 1. Santa Clara County Groundwater History



GROUNDWATER SUBBASINS

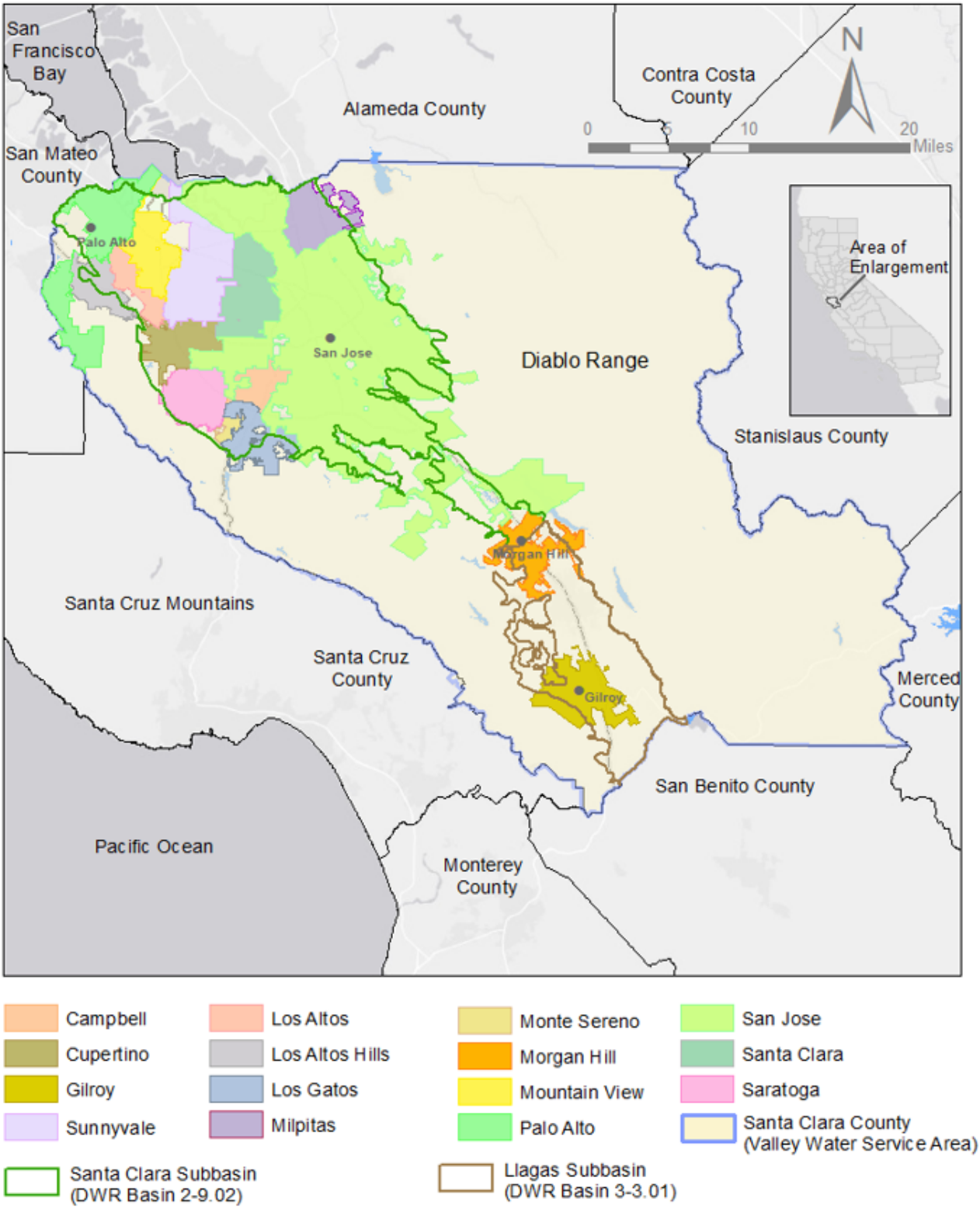
The 2026 GWMP covers the Santa Clara and Llagas subbasins, located entirely in Santa Clara County[6] and identified by DWR as Basins 2-9.02 and 3-3.01, respectively (Figure ES-2). The Santa Clara Subbasin is part of the Santa Clara Valley Basin (Basin 2-9), which extends from southern San José north into Alameda, Contra Costa, and San Mateo counties. The Llagas Subbasin is part of the Gilroy-Hollister Valley Basin (Basin 3-3), which extends from Morgan Hill into San Benito County. The Santa Clara and Llagas subbasins cover a surface area of approximately 370 square miles (Figure ES-2). Due to different land use and management characteristics, Valley Water further delineates the Santa Clara Subbasin into two groundwater management areas: the Santa Clara Plain and the Coyote Valley. The Santa Clara and Llagas subbasins, which support average pumping of about 120,000 acre-feet (AF) a year, are described in detail in Chapters 2 and 3, respectively.

The groundwater subbasins provide multiple benefits to residents and businesses in Santa Clara County. Although most of the groundwater pumped originates from Valley Water's managed recharge program, the subbasins provide some groundwater supply from the infiltration of rainfall in the recharge areas and natural seepage through local creeks and streams. In addition, the groundwater subbasins serve as an extensive conveyance network, allowing water to move from the recharge areas to individual groundwater wells. The groundwater subbasins also provide some natural filtration of surface water as it percolates through the soil and rock. The groundwater subbasins provide water storage, allowing water to be carried over from the wet season to the dry season and from wet years to dry years. Due to Valley

6 Valley Water is the GSA for a small portion of the medium-priority North San Benito Subbasin in southern Santa Clara County. A separate Groundwater Sustainability Plan (GSP) has been prepared for the North San Benito Subbasin by the San Benito County Water District, and this subbasin is not addressed in this 2026 GWMP.

Water's comprehensive groundwater management activities, the subbasins are in long-term balance. Groundwater quality is typically very good, and most public water supply wells do not require any treatment beyond disinfection.

Figure ES- 2. Santa Clara and Llagas Subbasins, Santa Clara County



2026 GROUNDWATER MANAGEMENT PLAN

Valley Water's Board-adopted 2016 GWMP described Valley Water's comprehensive groundwater management framework, including basin management objectives, strategies, groundwater management programs, and outcome measures. On July 17, 2019, DWR approved the 2016 GWMP as an Alternative Plan, finding it satisfies the objectives of SGMA. Additionally, DWR proposed recommended actions for Valley Water's consideration to enhance the Alternative Plan and facilitate DWR evaluation.

Under SGMA, periodic evaluations of approved plans are required at least every five years. Valley Water's submitted the Board-adopted 2021 GWMP to DWR in December 2021, which was approved by DWR on June 27, 2024 as the first periodic evaluation to the approved Alternative Plan. The 2021 GWMP updated and expanded on technical information in the 2016 GWMP and addressed recommendations from DWR and interested parties.

The 2026 GWMP is the second periodic evaluation to the approved Alternative Plan. Basin management goals, strategies, programs, and outcome measures in the 2026 GWMP (summarized below) are very similar to the 2021 GMWP, as they have been effective in ensuring sustainable conditions.

Valley Water will continue to review and update the GWMP as needed, but at least every five years. This will ensure compliance with SGMA requirements for Alternative Plans and provide current groundwater management information to support five-year updates of the Urban Water Management Plan as required by State law. The third periodic evaluation to the Alternative Plan is due to DWR in 2031, five years from the submittal date of the 2026 GWMP.

BASIN SUSTAINABILITY GOALS AND STRATEGIES

The following sustainability goals related to groundwater supply reliability and protection are based on Board policy:

- Manage groundwater to ensure sustainable supplies and avoid land subsidence.
- Aggressively protect groundwater from the threat of contamination.

These goals describe the overall objectives of Valley Water's groundwater management programs. The basin management strategies below are used to meet the sustainability goals. Many of these strategies (described in detail in Chapter 5) have overlapping benefits, acting to improve water supply reliability, minimize subsidence, and protect or improve groundwater quality.

1. Manage groundwater in conjunction with surface water.
2. Implement programs to protect and promote groundwater quality.
3. Maintain and develop adequate groundwater models and monitoring networks.
4. Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination.

BASIN MANAGEMENT PROGRAMS AND ACTIVITIES

Valley Water and local partners have implemented numerous programs to protect groundwater resources that support the sustainability goals and strategies. Valley Water's annual Protection and Augmentation of Water Supplies Report[7] presents detailed information on Valley Water activities to ensure sustainable groundwater supplies, as does Chapter 6 of this GWMP. Valley Water's Water Utility Enterprise operations and capital budget for fiscal year 2026-27, which supports these activities, is $907 million.

7 Available at www.valleywater.org.

The assessment of groundwater conditions relies on timely, accurate, and representative data. Valley Water's comprehensive monitoring programs related to groundwater levels, land subsidence, groundwater quality, recharge water quality, and surface water flow are described in detail in Chapter 7.

OUTCOME MEASURES

Valley Water has developed outcome measures and outcome measure – lower thresholds for each sustainability indicator in Table ES-1 to gauge performance in meeting the basin sustainability goals.

Table ES- 1. Outcome Measures and Outcome Measure – Lower Thresholds

Sustainability Indicator	Outcome Measure	Outcome Measure – Lower Threshold
Groundwater Storage	Projected end-of-year groundwater storage is greater than 278,000 acre-feet (AF) in the Santa Clara Plain, 5,000 AF in the Coyote Valley, and 17,000 AF in the Llagas Subbasin, which is a combined 300,000 AF in the Santa Clara and Llagas subbasins.	Projected end-of-year countywide groundwater storage is greater than 150,000 AF in the Santa Clara and Llagas subbasins.
Subsidence	Groundwater levels are above subsidence thresholds at the Santa Clara Subbasin subsidence index wells.	Groundwater levels are above the historical low water levels at the majority of the Santa Clara Subbasin subsidence index wells.
Groundwater Quality (Santa Clara Subbasin)	For Santa Clara Subbasin public and private water supply wells, at least 80% meet primary drinking water standards, and at least 90% have stable or decreasing trends for total dissolved solids (TDS).	At least 70% of public and private water supply wells have stable or decreasing trends for nitrate and TDS.
Groundwater Quality (Llagas Subbasin)	For Llagas Subbasin public water supply wells, at least 80% meet primary drinking water standards, and at least 75% of private water supply wells have stable or decreasing trends for TDS.	At least 65% of private water supply wells have stable or decreasing trends for nitrate and TDS.
Seawater Intrusion	In the Santa Clara Subbasin shallow aquifer, the 100 milligram per liter chloride isocontour area is less than the historical maximum extent area (57 square miles).	In the Santa Clara Subbasin shallow aquifer, the 100 milligram per liter chloride isocontour area is less than 81 square miles, which represents a one-mile radial buffer of the historical maximum extent area.

The basis for these outcome measures and a description of how they will be evaluated is presented in Chapter 5. The outcome measures were updated after the 2016 GWMP to address DWR's 2019 recommended actions and lower thresholds were included in the 2021 GWMP to indicate conditions that represent undesirable results. As part of the periodic evaluation for the 2026 GWMP, all outcome measures and outcome measure – lower thresholds were evaluated. Based on unique subbasin characteristics described in Chapter 5, the water quality outcome measures and outcome measure – lower thresholds were slightly revised to better reflect actual groundwater conditions and recent trends, as shown in Table ES-1. The groundwater storage, subsidence, and seawater intrusion outcome measures and outcome measure – lower thresholds remain unchanged from the 2021 GWMP. The outcome measures and lower thresholds will be assessed annually, with related results presented in Valley Water's Water Year Report, due each April 1 to DWR. If evaluation of the outcome measures indicates poor performance toward meeting a basin sustainability goal, Valley Water will first evaluate

potential changes to existing programs and activities prior to considering significant groundwater management changes. Any significant policy or investment decisions would be developed and evaluated in consultation with local interested parties, as Valley Water does in current planning and budgeting processes.

NEXT STEPS

Valley Water's proactive groundwater management activities have resulted in sustainable groundwater conditions in the Santa Clara and Llagas subbasins, and continued planning, investments, and coordination will be needed to address future water supply challenges. Groundwater demands may increase in the future with projected growth in the county. Through its long-range planning, Valley Water continues to work with its water retailers and interested parties to develop and evaluate various actions and investments needed to address projected future shortfalls during multi-year droughts. In 2025, Valley Water adopted the Water Supply Master Plan 2050, which provides the framework for guiding investments through 2050 to maintain a reliable and resilient water system that meets Santa Clara County's current and future needs.

To maintain the long-term sustainability of groundwater resources, the following actions are recommended:

- Maintain existing conjunctive water management programs and evaluate opportunities for enhancement or increased efficiency.
- Continue to aggressively protect groundwater quality through Valley Water's programs and collaboration with land use agencies, regulatory agencies, and other interested parties.
- Continue to incorporate groundwater sustainability in Valley Water's planning efforts.
- Maintain adequate monitoring programs and modeling tools.
- Continue and enhance groundwater management partnerships with water retailers and land use agencies.

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CHAPTER 1 – INTRODUCTION

For over 95 years, the Santa Clara Valley Water District (Valley Water) has managed groundwater in Santa Clara County (county) per statutory authority provided by the Santa Clara Valley Water District Act (District Act).[8] Valley Water's comprehensive groundwater management programs and investments have resulted in sustainable groundwater conditions for many decades. In May 2016, following a public hearing, the Valley Water Board of Directors (Board) adopted a resolution to become the Groundwater Sustainability Agency (GSA) for the Santa Clara and Llagas subbasins (2016 GWMP, Appendix A). Valley Water is also the primary water wholesaler, flood manager, and stream steward for the county.

Nearly half of the water used in the county is pumped from groundwater, with some communities relying solely on groundwater. The purpose of this 2026 Groundwater Management Plan (GWMP) is to describe basin management objectives and strategies, programs and activities that support those objectives, and outcome measures to gauge performance. This chapter provides an overview of Valley Water and the GWMP. It also describes other partners in groundwater management and participation by interested parties in the GWMP.

1.1 GROUNDWATER MANAGEMENT PLAN 2026 OVERVIEW

The Sustainable Groundwater Management Act (SGMA) was enacted by the State legislature in 2014 and subsequent Groundwater Sustainability Plans (GSPs) Emergency Regulations resulted in statewide requirements for basins designated as medium- and high-priority basins by Department of Water Resources (DWR). In the basins designated by DWR as medium and high priority, local public agencies and Groundwater Sustainability Agencies (GSAs) are required to develop and implement GSPs or alternatives to GSPs (Alternative Plans). California Water Code (Water Code) Section 10733.6(b)(1) states that an Alternative Plan can be a plan developed pursuant to other law authorizing groundwater management. DWR identified the Santa Clara and Llagas subbasins as high priority based on criteria that include overlying population, projected growth, number of wells, irrigation acreage, groundwater reliance, and groundwater impacts. Neither subbasin has been identified as being critically overdrafted.

Valley Water's Board adopted 2016 GWMP documented Valley Water's comprehensive groundwater management framework, including authorities, goals, programs, and metrics to assess performance. Prior to the statutory deadline of January 1, 2017, Valley Water submitted the 2016 GWMP to DWR as an Alternative Plan for both the Santa Clara and Llagas subbasins. On July 17, 2019, DWR approved the 2016 GWMP as an Alternative Plan that satisfies the objectives of SGMA. Additionally, DWR proposed recommended actions for the consideration of Valley Water to enhance the Alternative Plan and facilitate evaluation by DWR.

Under SGMA, periodic evaluations of approved plans are required at least every five years. Valley Water's submitted the Board-adopted 2021 GWMP to DWR in December 2021, which was approved by DWR on June 27, 2024 as the first periodic evaluation to the approved Alternative Plan. The 2021 GWMP updated and expanded on technical information in the 2016 GWMP and addressed recommendations from DWR and interested parties.

The 2026 GWMP is the second required periodic evaluation to the approved Alternative Plan. Basin management goals, strategies, programs, and outcome measures in the 2026 GWMP (summarized below) are very similar to the 2021 GMWP, as they have been effective in ensuring sustainable conditions. The 2026 GWMP is consistent with DWR's guidance for the development of periodic evaluations[9] and will be submitted to DWR before the December 17, 2026 deadline. Valley Water will

8 Santa Clara Valley Water District Act, Water Code Appendix, Chapter 60.
9 California Department of Water Resources, 2023, Groundwater Sustainability Plan Implementation: A Guide to Annual Reports, Periodic Evaluations, and Plan Amendments, 44 pages, October 2023.

continue to review and update the GWMP as needed, but at least every five years. This will ensure compliance with SGMA requirements for Alternative Plans.

1.1.1 Assessment of Plan Implementation

The 2026 GWMP is prepared pursuant to the District Act and supersedes all previous Groundwater Management Plans. The 2026 GWMP continues to meet the intent of SGMA and contains information and elements that are functionally equivalent to the elements of a GSP in accordance with Water Code Section 10733.6 (b)(1) and Article 9 of the Emergency GSP Regulations.[10] This 2026 GWMP also is functionally equivalent to requirements in Articles 5 and 7 of the Emergency GSP Regulations, as described in Appendix B.

Basin management goals, strategies, programs, and outcome measures in the 2026 GWMP are similar to the 2016 and 2021 plans, as they have been effective in ensuring sustainable conditions. Valley Water's 2021 GWMP documented numeric outcome measures and corresponding lower thresholds to assess performance in meeting basin sustainability goals. These outcome measures relate to groundwater storage, land subsidence, and water quality and are largely unchanged in this 2026 GWMP because they have been effective in avoiding undesirable results and prompting action when needed, as documented in Valley Water's 2017 to 2025 Water Year reports submitted to DWR.

Valley Water has successfully implemented the GWMP and maintained sustainable groundwater conditions during the previous five years, based on outcome measures described in Chapter 5. While the GWMP has been successfully implemented, Valley Water has updated the 2026 GWMP as part of an adaptive groundwater management approach. The 2026 GWMP updates and expands on technical information in the 2021 GWMP. These updates include revising all information in the plan to reflect the most recent ten-year period (2015–2024). The 2026 GWMP also reflects recommended actions from DWR's evaluation of the 2021 GWMP (Appendix C), as well as recommendations from Valley Water staff and interested parties, which were outlined in the 2021 GWMP (Chapter 8). Similarly, the 2026 GWMP outlines recommendations (Chapter 8) that Valley Water staff plans to address during the subsequent five-year period.

1.1.2 Contact Information

Valley Water's contact for groundwater management issues is:

Jason Gurdak
Groundwater Management Unit Manager
5750 Almaden Expressway
San José, CA 95118
Telephone: (408) 630-2971
Email: jgurdak@valleywater.org

1.2 DESCRIPTION OF PLAN AREA

The 2026 GWMP covers the Santa Clara and Llagas subbasins, located entirely in Santa Clara County and identified by DWR as Basins 2-9.02 and 3-3.01, respectively (Figure 1-1).[11] The Santa Clara Subbasin is part of the Santa Clara Valley Basin (Basin 2-9), which extends from southern San José north into Alameda, Contra Costa, and San Mateo counties. The Santa Clara Valley Basin is divided into four subbasins, including the Santa Clara Subbasin within Valley Water's service area. Due to different land use and management characteristics, Valley Water further delineates the Santa Clara Subbasin into two groundwater management areas: the Santa Clara Plain and the Coyote Valley. Coyote Valley is a unique landscape and resource of statewide significance, as recognized in California Assembly Bill No. 948 (AB-948). The Llagas Subbasin is part of the Gilroy-Hollister Valley Basin (Basin 3-3), which extends

10 California Code of Regulations, Title 23, Division 2, Chapter 1.5, Subchapter 2.
11 California Department of Water Resources, California's Groundwater: Bulletin 118 Update 2025.

from Morgan Hill into San Benito County. The Gilroy-Hollister Valley Basin has four subbasins, including the Llagas Subbasin within Santa Clara County. The Santa Clara and Llagas subbasins are described in detail in Chapter 2 and 3, respectively.

Santa Clara County is located at the southern end of the San Francisco Bay and encompasses approximately 1,300 square miles, making it the largest of the nine Bay Area counties. The county supports a population of nearly 2.0 million that is projected to increase to almost 2.7 million by 2045[12]. Most water use occurs on the valley floor between the Santa Cruz Mountains to the west and the Diablo Range to the east. The footprint of the valley floor is essentially coincident with land overlying the Santa Clara and Llagas subbasins (Figure 1-2). Northern Santa Clara County (North County) is home to Silicon Valley and is highly urbanized. Southern Santa Clara County (South County) has urban development in the cities of Morgan Hill and Gilroy, but much of the land use is still rural and agricultural. North County generally coincides with land overlying the Santa Clara Plain, while South County generally represents land over the Coyote Valley and Llagas Subbasin.

The county's Mediterranean semi-arid climate is temperate year-round, with warm and dry weather lasting from late spring through early fall. Average annual precipitation ranges from about 15 inches on the valley floor to about 45 inches along the crest of the Santa Cruz Mountains, with most precipitation occurring between the months of November and April. The county's temperature is generally moderate. Maximum daily temperature averaged by month in Santa Clara County ranges from 56.8 to 83.7 degrees Fahrenheit, with average annual evapotranspiration of 38.2 inches.[13]

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12 Valley Water, Water Supply Master Plan 2050
13 Valley Water, 2025 Urban Water Management Plan.

Figure 1-1. Santa Clara and Llagas Subbasins

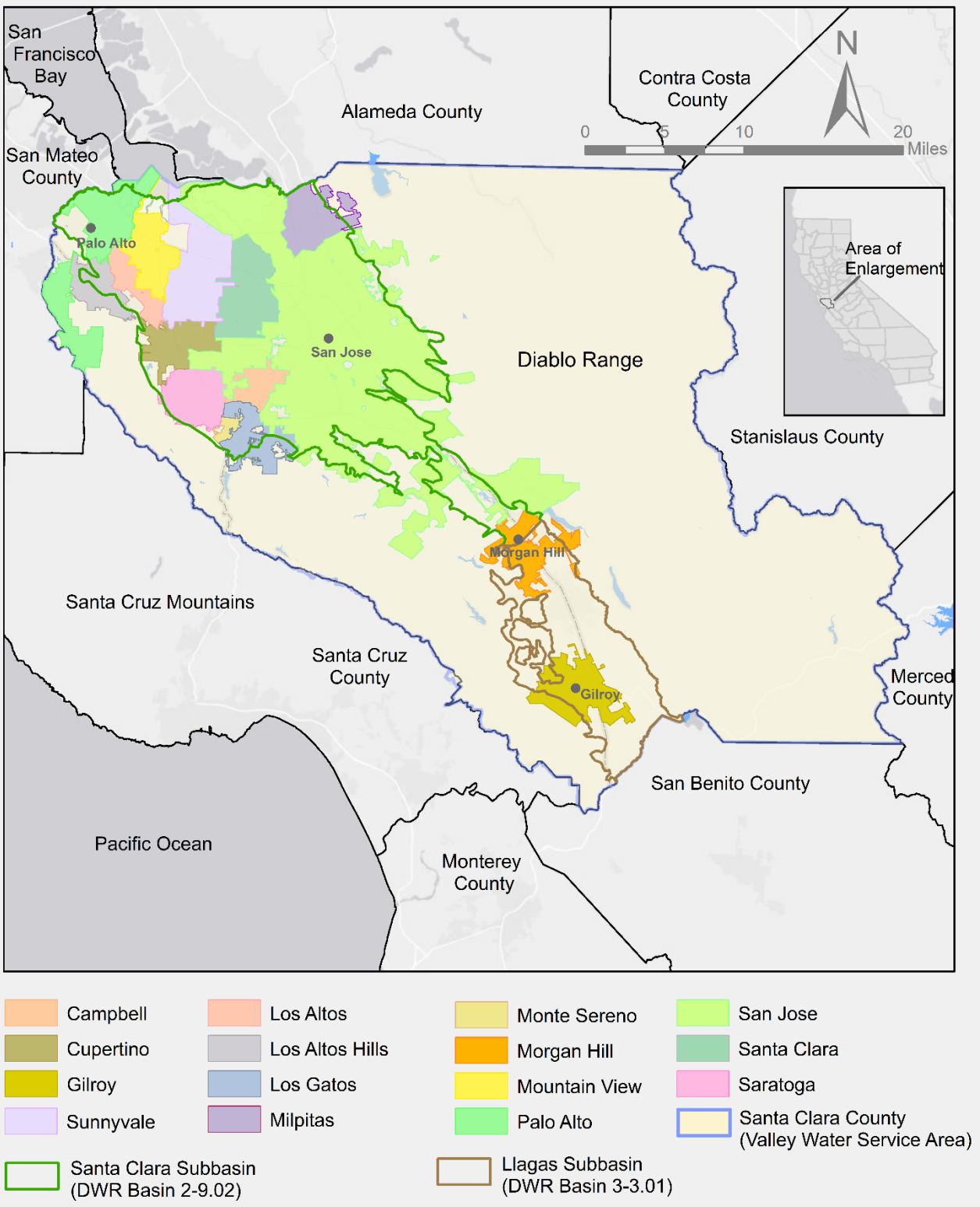

Figure 1-2. Topography of the Santa Clara and Llagas Subbasins

1.3 BASELINE AND PLANNING HORIZON

The 2026 GWMP describes the Santa Clara and Llagas subbasins based on the most recent, representative water supply, demand, and water quality conditions. Information related to groundwater budgets is presented for the period 2015 through 2024, chosen to indicate longer-term (10 year) conditions including wet, normal, and dry years, and including drought conditions from 2015 to 2016 and 2020 to 2022. The most recent year 2024 is used to display single-year groundwater supply information such as pumping distribution and groundwater elevation contours. Groundwater quality data, which is less affected by drought conditions, is also presented for the most recent data available for the ten-year period from 2015 to 2024. This approach uses a consistent range of time periods and best represents typical groundwater conditions in the Santa Clara and Llagas subbasins.

The plan also documents the effects of the recent (2020–2022) statewide drought through long-term hydrographs, annual change in groundwater storage charts, and other information such as impacts of this drought on water supply wells. The drought resulted in lower groundwater levels and storage in the Santa Clara and Llagas subbasins, prompting the Board to call for water use reduction in June 2021 through April 2023 in accordance with Valley Water's Water Shortage Contingency Plan. By 2023, groundwater levels and storage had fully recovered due to community water use reduction, retailer shifts to treated surface water, and Valley Water's increased managed recharge. Despite the drought, there were very limited impacts to countywide well users, with reports of only 9 dry water supply wells, all domestic wells near or outside the basin margins where well yield is more uncertain (Appendix D). Valley Water followed the management approach outlined in the 2021 GWMP and lessons learned from the 2012–2016 drought to sustainably manage groundwater during the 2020–2022 drought. Detailed information on more recent groundwater conditions is available in Valley Water's 2025 Water Year Report.

Valley Water ensures reliable water supplies for all types of hydrologic years through annual operations planning and long-term planning studies like the Urban Water Management Plan (UWMP)[14] and Water Supply Master Plan (WSMP)[15]. These long-term plans use 100 years (1922 -2021) of measured or correlated climate and hydrologic data, are supported by information in the GWMP, have a 25-year planning horizon, and are generally updated every five years. This GWMP relies on the UWMP and WSMP for the evaluation of water supply projections, risks, and recommended investments to ensure continued water supply reliability. Valley Water's adaptive operational decisions and proactive long-term water supply planning and investments will ensure continued, sustainable groundwater conditions long into the future.

1.4 VALLEY WATER OVERVIEW

Valley Water is an independent special district that provides wholesale water supply, groundwater management, flood protection, and stream stewardship for its service area, which includes all of Santa Clara County. The mission of Valley Water is to provide Silicon Valley safe, clean water for a healthy life, environment, and economy.

Valley Water was formed in 1929 in response to groundwater overdraft and subsidence. Valley Water has been a leader in conjunctive management for many decades, using imported and local surface water to replenish groundwater and maintain reliability in dry years. Figure 1-3 shows how Valley Water's investments and conjunctive management programs have contributed to a sustainable groundwater supply.

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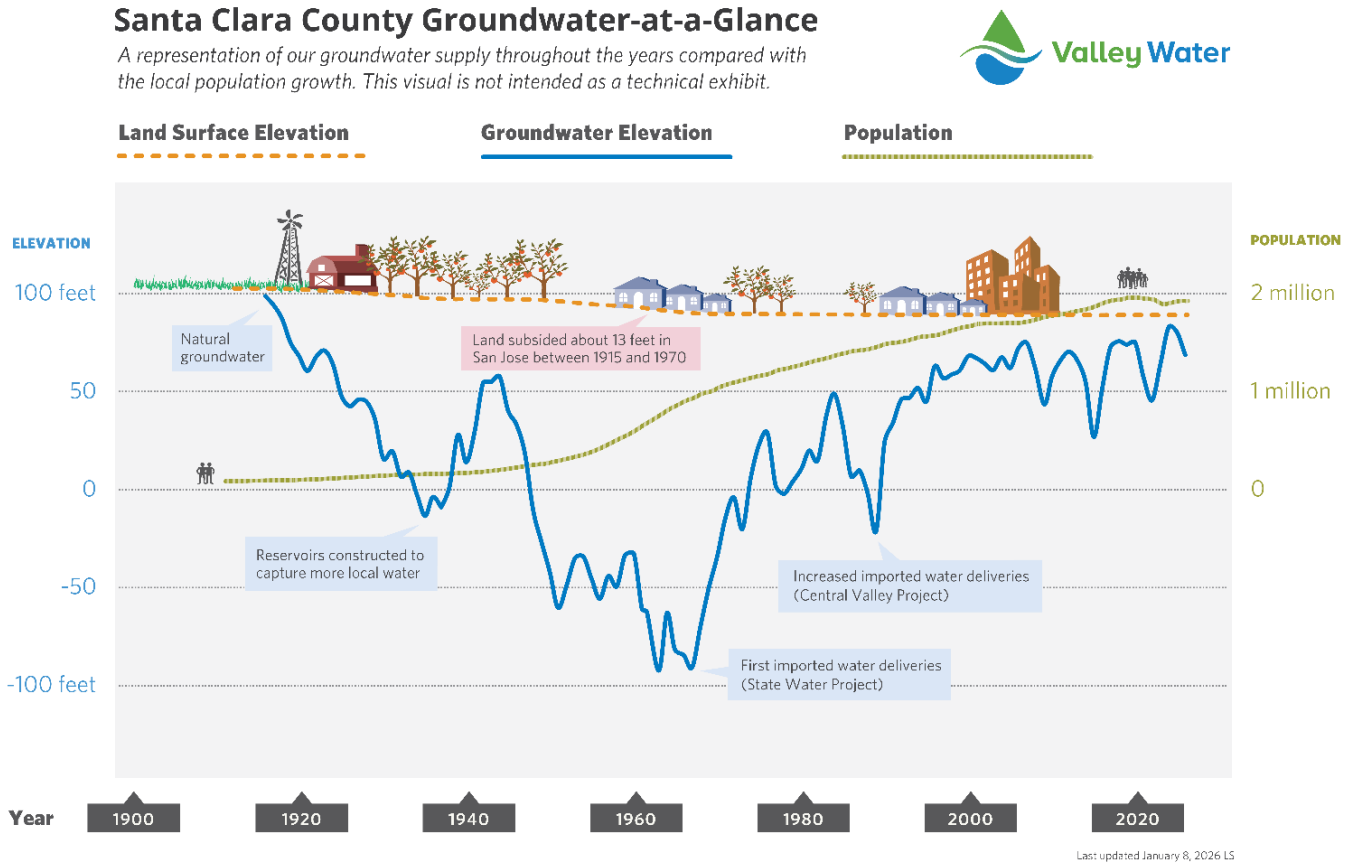
14 The 2025 Urban Water Management Plan is available at: https://www.valleywater.org/your-water/water-supply-planning/urban-water-management-plan
15 The Water Supply Master Plan 2050 is available at: https://www.valleywater.org/your-water/water-supply-planning/water-supply-master-plan

Figure 1-3. Santa Clara County Groundwater History



Valley Water manages a diverse water supply portfolio, with sources including groundwater, local surface water, imported water, and recycled water. About half of the county's water supply comes from local sources and about half comes from imported sources. Imported water includes Valley Water's State Water Project (SWP) and Central Valley Project (CVP) contract supplies, and supplies delivered by the San Francisco Public Utilities Commission (SFPUC) to cities in northern Santa Clara County. Local sources include natural groundwater recharge and surface water supplies, including surface water rights held by Valley Water, San Jose Water Company, and Stanford University. Recycled water is a small but growing portion of the county's water supply. Long-term water conservation is also a key component of Valley Water's water supply management strategy. Conservation programs saved approximately 89,000 acre-feet (AF) in 2025[16] and, if drought-level participation rates are maintained during non-drought years, are on target to reduce annual demands by nearly 110,000 AF by 2040[17] from a 1992 baseline.

Valley Water supplies are distributed to recharge facilities in the Santa Clara and Llagas subbasins, Valley Water's three drinking water treatment plants, local creeks for recharge and to meet environmental needs, or directly to surface water users. The conjunctive management of surface water and groundwater maximizes water supply reliability, allowing Valley Water to store surface water in local groundwater basins to help balance pumping and provide reserves for use during dry years when surface water availability is limited.

Valley Water operates and maintains a complex infrastructure network, integrating natural and constructed systems to capture and convey raw and treated water for a reliable water supply

16 This water conservation estimate is for calendar year 2025. About 87,400 AF was conserved in fiscal year 2025.
17 Valley Water, FY 2026-27 Protection and Augmentation of Water Supplies

(Figure 1-4). Valley Water's system delivers about 300 million gallons of raw water and 200 million gallons of treated drinking water every day (subject to water demand and hydrologic changes) and includes the following major facilities:

- 10 surface water reservoirs
- 166,000 acre-feet of total reservoir storage capacity
- 11 miles of raw surface water canals
- 98 groundwater recharge ponds covering 279 acres
- 98 miles of controlled in-stream recharge
- 134 miles of pipelines
- three pumping stations
- three drinking water treatment plants
- Silicon Valley Advanced Water Purification Center
- 186 Valley Water owned groundwater monitoring wells

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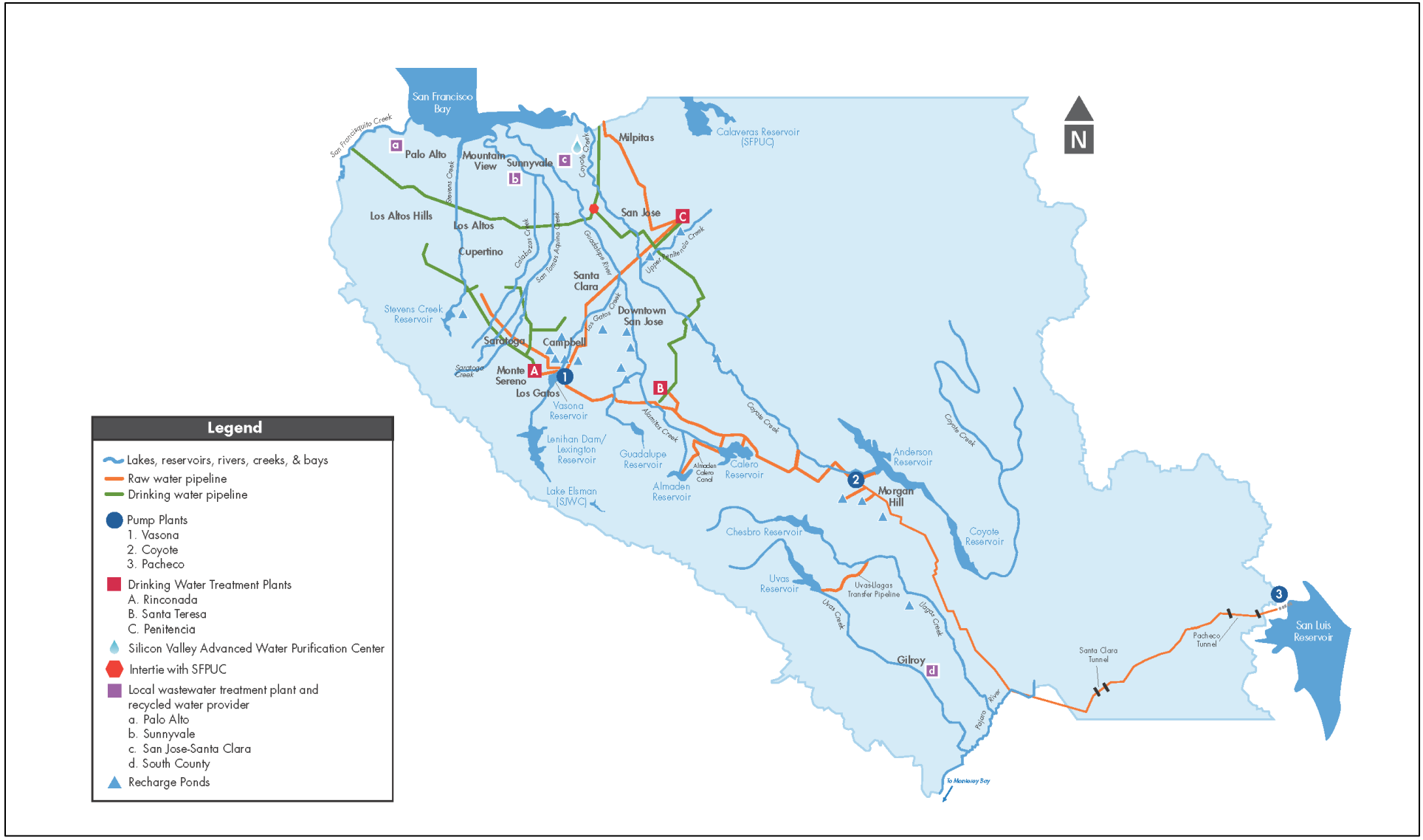
Figure 1-4. Valley Water's Water Supply Treatment and Distribution System



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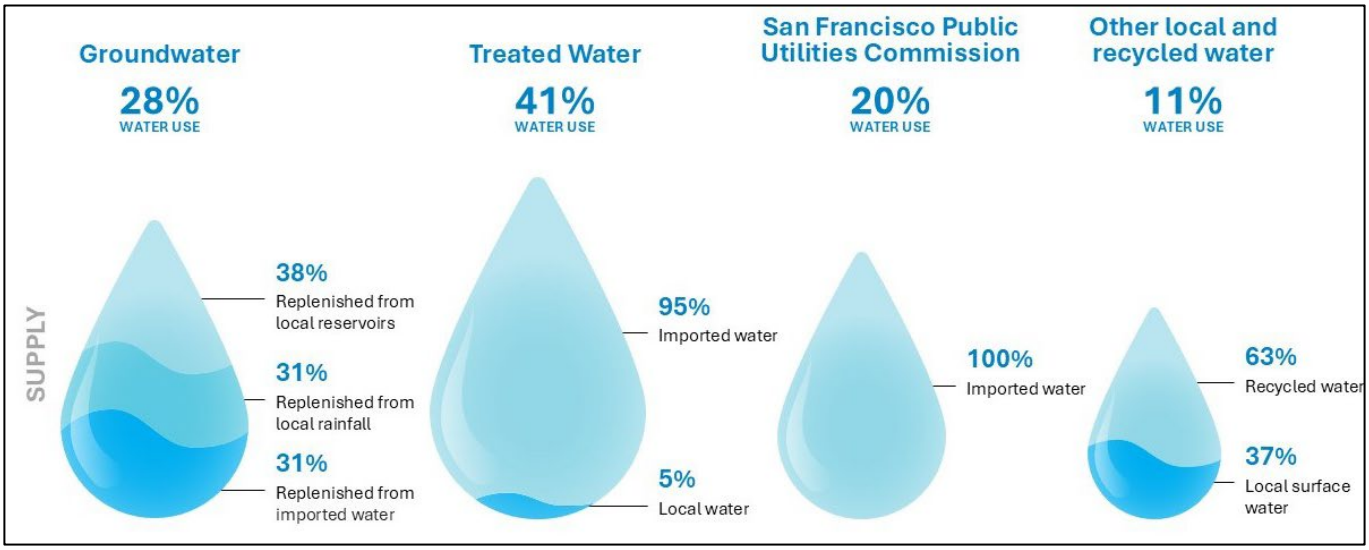
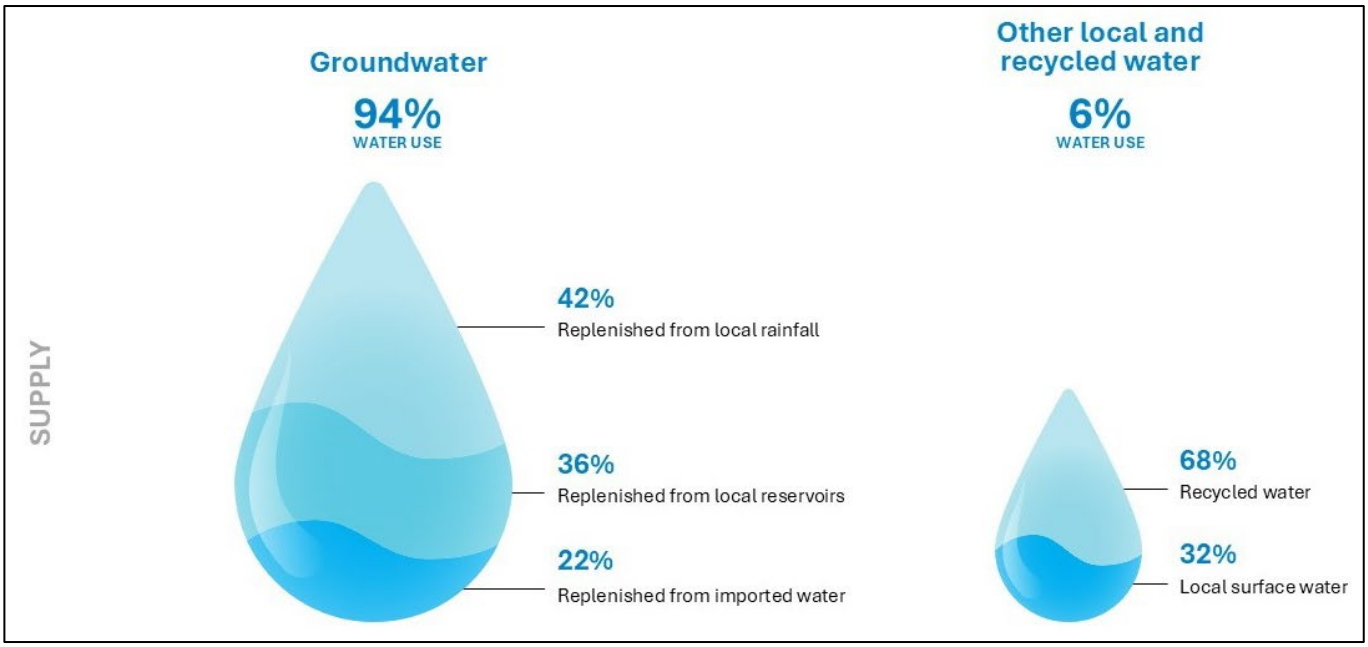
Long-term water supply and use for the North County is shown in Figure 1-5, and for the less urbanized South County in Figure 1-6.

Figure 1-5. North County Water Supply and Use (2015 to 2024)



Note: The size of each water drop is for relative comparison purposes in North County and should not be compared to the South County figure.

Figure 1-6. South County Water Supply and Use (2015 to 2024)



Note: The size of each water drop is for relative comparison purposes in South County and should not be compared to the North County figure.

1.4.1 Valley Water History

Water has played an important part in the development of the county since the Spaniards' arrival in 1776. Unlike indigenous peoples who depended upon the availability of wild food, the Spaniards cultivated food crops and irrigated with surface water. Population growth and the United States' conquest of the area in 1846 increased agricultural demands, which forced the use of groundwater. The first well in San José

was drilled in 1854. Groundwater was drawn to the surface by windmill pumps or flowed up under artesian conditions.

By 1865, there were almost 500 artesian wells in the valley and already signs of potential misuse. In the valley's newspapers, a series of editorials and letters complained about farmers and others who left their wells uncapped and blamed them for water shortages and erosion damage to the lowlands.

As a result of several dry years in the late 1890s, more wells were installed. Dry winters in the early 1900s were accompanied by a growing demand for the county's fruits and vegetables, which were irrigated with groundwater. The trend of increased irrigation and well drilling continued, causing groundwater levels to drop rapidly. In 1913, a group of farmers asked the federal government for relief from increased pumping costs due to a lower groundwater table. The farmers formed an irrigation district to investigate possible reservoir sites. However, the following year was wet and no action was taken. It was not until 1919 that the Farm Owners and Operators Association presented a resolution to the County Board of Supervisors expressing their strong opposition to the waste resulting from the use of artesian wells and again raised the issue of building dams to supplement existing water supplies. By that year, subsidence of 0.4 feet had occurred in San José.

In 1921, a report was presented to the Santa Clara Valley Water Conservation Committee showing that far more water was being pumped than nature could replace.[18] The committee planned to form a water district differing from others in the State by providing groundwater recharge. Their effort to form the water district failed, but they were able to implement several water capture and recharge programs. Continued overdraft resulted in a further decline in groundwater levels and additional land subsidence, increasing flood impacts in northern Santa Clara County. Between 1912 and 1932, subsidence ranged from 0.35 feet in Palo Alto to 3.66 feet in San José. In 1929, county voters approved the formation of the Santa Clara Valley Water Conservation District (SCVWCD), with the initial mission of stopping groundwater overdraft and subsidence.

The SCVWCD was the forerunner of today's Valley Water, which was formed through the consolidation and annexation of other flood control and water districts within Santa Clara County (Figure 1-7). By 1935, Valley Water had completed the construction of Almaden, Calero, Guadalupe, Stevens Creek, and Vasona dams. Later dams completed include Coyote in 1936, Anderson in 1950, and Lexington in 1952. The Gavilan Water District in the southern portion of the county constructed Chesbro Dam in 1955 and Uvas Dam in 1957. These dams enabled Valley Water to capture surface water runoff and release it for groundwater recharge.

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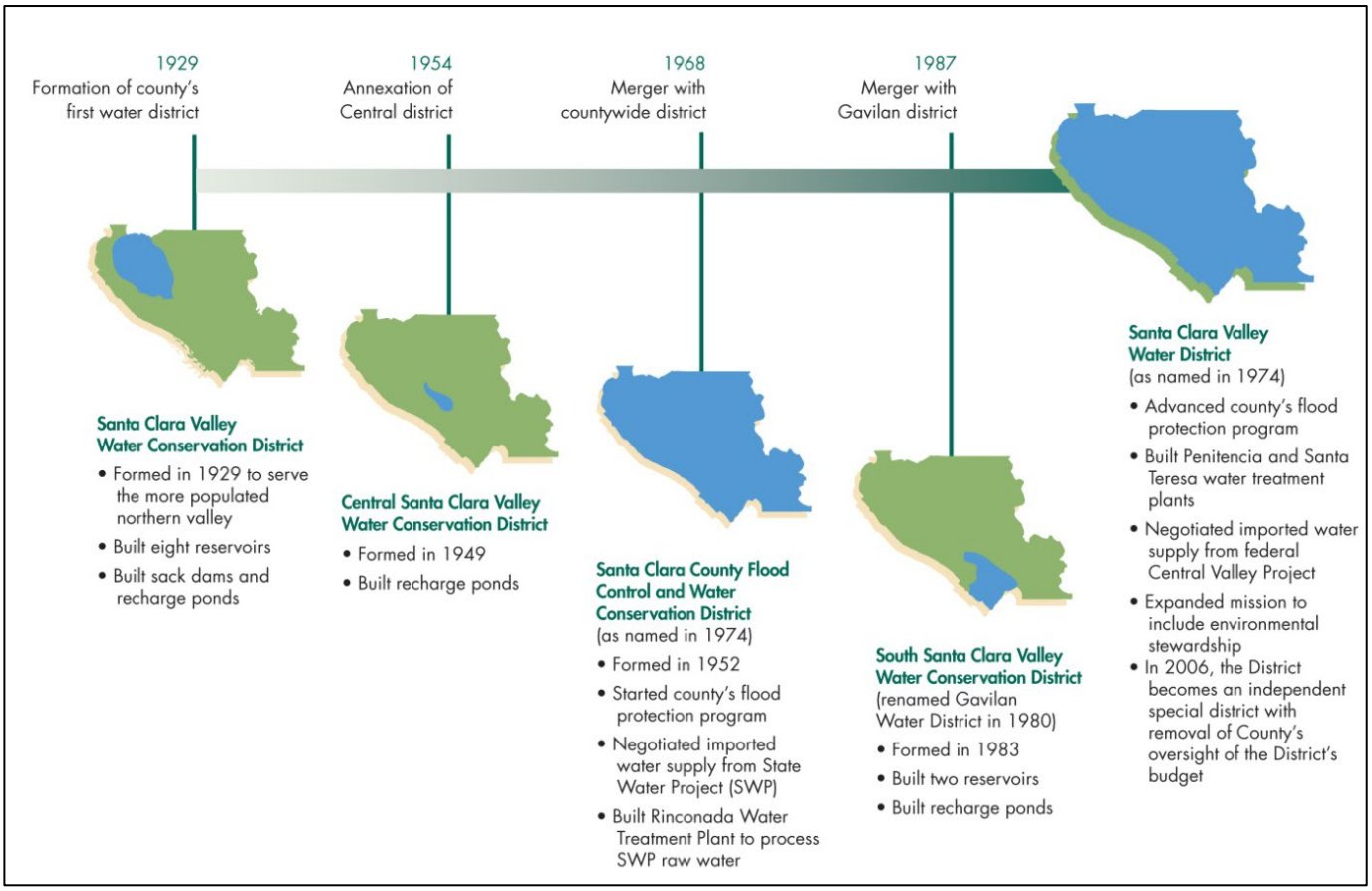
18 Tibbets F.H. and Kiefer S.E., Santa Clara Valley Water Conservation Project, Report to the Santa Clara Valley Water Conservation Committee, 1921.

Figure 1-7. Valley Water Evolution



The late 1930s to 1947 marked a period of recovery in groundwater levels that reduced the rate of land subsidence. In 1947, conditions became dry, groundwater levels declined rapidly and subsidence resumed. In 1950 almost all the county's water demands were met by water pumped from groundwater.

In 1952, the SFPUC began delivering imported water to water retailers in northern Santa Clara County through what is now called the Regional Water System;[19] however, some delivery of this supply into the county began as early as 1939.[20] By 1960, the population of the county had doubled from that of 1950. To supply this growth, groundwater pumping increased and groundwater levels continued to decline. In addition to continued land subsidence, widespread seawater intrusion of shallow aquifers was observed adjacent to San Francisco Bay in the late 1950s.[21] By the early 1960s, it was evident that the combination of Hetch Hetchy and local water supplies could not meet the area's water demands, so Valley Water entered into a contract with the State to receive up to 100,000 AF of SWP water per year through the South Bay Aqueduct (SBA).

With this new source of supply, Valley Water added a new tool to its groundwater management toolbox: treated surface water sales to offset demand that would otherwise be met through groundwater pumping. Valley Water constructed its first water treatment plant (WTP), the Rinconada WTP. In 1967, Valley Water started delivering treated surface water to North County residents, thus reducing the need for

19 The Regional Water System used to be called the Hetch Hetchy southern aqueduct.
20 Per personal communication with City of Palo Alto staff, the City of Palo Alto began receiving water from SFPUC in 1939 through a different connection.
21 Santa Clara Valley Water District, Saltwater Intrusion Investigation, September 1980.

pumping in the Santa Clara Plain. This helped lead to a recovery of groundwater levels and reduced rate of land subsidence.

From 1960 to 1970, the county's population nearly doubled yet again, with the semiconductor and computer manufacturing industries contributing over 30 percent of the job growth. The growth and prosperity of the county continued, and jobs grew nearly 40 percent between 1970 and 1980. In 1974, Penitencia (Valley Water's second WTP) started delivering treated water. In response to the 1976-1977 drought, Valley Water began its first programs related to conservation education and outreach.

The county's explosive growth and transformation from a predominantly agricultural economy was not without its problems. In the early 1980s, groundwater contamination was brought to the forefront when large underground tanks storing solvents for computer-related manufacturing processes in south San José were discovered to be leaking. In 1981, Fairchild Semiconductor Corporation notified Valley Water that "a substantial amount of chemicals were missing from their tanks and that a leak was suspected." Subsequent testing of a nearby public water supply well revealed significant contamination, which resulted in shutdown of the well. Valley Water, the Regional Water Quality Control Board, and the Department of Health Services[22] worked together to sample water supply wells in the county and search for other leaking tanks, resulting in the identification of additional contaminant release sites.

In the 1980s, Valley Water significantly increased its efforts to protect groundwater quality. Valley Water worked with the Santa Clara County Fire Chiefs Association, the City Managers Association, and environmental groups to develop a countywide Hazardous Materials Storage Permit Ordinance. The ordinance, adopted by the Santa Clara County Intergovernmental Council, set tough new standards on hazardous material storage and handling. This first- in-the-nation ordinance served as an example and the state and federal government soon passed similar laws. Valley Water also developed standards for the construction and destruction of wells, the majority of which were being installed for the investigation and cleanup at contaminant release sites. Valley Water's abandoned well program was developed to address existing wells that were no longer in use and posed a threat to groundwater resources by acting as vertical conduits that could allow contaminants to migrate directly from shallow to deep aquifers.

In the late 1980s, Valley Water began oversight of petroleum hydrocarbon leaking Underground Storage Tank (UST) sites in Santa Clara County. From 1988 through 2004, Valley Water provided oversight for the investigation and cleanup of over 2,500 UST sites. Valley Water's fuel leak program became nationally known for its proactive and innovative approaches and influenced the direction of the State's UST cleanup program. By the time Valley Water transferred the program to the Santa Clara County Department of Environmental Health (DEH) in July 2004, less than 400 fuel leak cases remained open.

Groundwater pumping accounted for about half of the total water use by the mid-1980s. The rate of inelastic land subsidence was reduced to about 0.01 feet per year compared to 1 foot per year in 1961. To provide a reliable source of supply, Valley Water contracted with the federal government for the delivery of up to 152,500 AF per year of imported water from the CVP through the San Felipe Division and related pipelines and distribution network. The county's first delivery of CVP water took place in 1987, but it was not until 1989 that Valley Water's Santa Teresa WTP began operating to fully utilize this additional source of imported supply.

The extended drought from 1987 to 1992 led to expanded Valley Water conservation programs, including more aggressive outreach campaigns and rebate programs for residents and businesses installing water saving fixtures. In the mid-1990s, Valley Water began offering financial and technical assistance to entities interested in expanding the use of recycled water. This included agreements with the cities of San José, Santa Clara, and Milpitas (the South Bay Water Recycling Program); Gilroy and Morgan Hill (the South County Regional Wastewater Authority); Sunnyvale; and Palo Alto and Mountain

22 Now the State Division of Drinking Water.

View. This commitment to supplementing local supplies with recycled water was strengthened in 1997 when Valley Water's Board established a policy supporting the expanded use of recycled water and setting numeric targets for future recycled water use.

Nitrate and methyl tertiary butyl ether (MTBE) emerged as significant groundwater quality threats in the 1990s. Elevated nitrate from agriculture, septic systems, and animal wastes was identified as early as the 1950s; however, the concern became more acute in the early 1990s as an increasing number of wells were impacted. Valley Water developed a comprehensive Nitrate Management Plan, which included public outreach programs to educate residents on fertilizer use, septic system maintenance, and well location and construction. Valley Water also offered free nitrate testing for South County residents in 1998. Later efforts included programs to reduce nitrate loading in cooperation with farmers, including programs to evaluate infield nutrient use.

In 1992, California began using oxygenates, primarily MTBE, in gasoline to satisfy federal clean air requirements, Valley Water began investigating the potential for MTBE contamination in 1995, which led to the discovery of MTBE contamination in soil at 292 sites, primarily service stations, and at low concentrations in Valley Water's reservoirs. Valley Water provided the first guidelines in the State for owners of leaking underground storage tank sites on how to identify and clean up MTBE releases in 1997. Along with many others, Valley Water's action and leadership in addressing MTBE led to a statewide ban in 2004.

In the 2000s, Valley Water again demonstrated its leadership and commitment to aggressively protecting groundwater resources. Perchlorate contamination at a former flare manufacturing facility in Morgan Hill was discovered in August 2002, and further site investigation by the responsible party indicated detections in wells several miles to the south. Due to concerns that the contamination could be larger than assumed, Valley Water sampled over 1,000 wells. Related results prompted the Central Coast Regional Water Quality Control Board to expand and expedite site investigation and cleanup activities. To ensure the safety of South County residents who rely on groundwater for their drinking water, Valley Water also initiated a temporary bottled water program for well owners impacted by perchlorate. While significant cleanup progress has been made, Valley Water continues to work with the Central Coast Regional Water Quality Control Board and local interested parties to ensure contaminated groundwater is cleaned up as soon as possible.

Recent efforts to ensure long-term water supply reliability include the construction and operation of Valley Water's Silicon Valley Advanced Water Purification Center. This facility, which began operating in 2014, produces up to 8 million gallons per day of purified water by treating tertiary-treated recycled water with microfiltration, reverse osmosis, and ultraviolet light. Purified water is blended with tertiary treated recycled water to lower the salt content of recycled water used for landscape irrigation and industrial uses. This facility supports Valley Water's goal of expanding the use of recycled water, which reduces the demand on groundwater, and sets the stage for a planned potable reuse project.

With California's passage of the Sustainable Groundwater Management Act, Water Code Section 10720 et al. ("SGMA") in 2014, Valley Water was listed as one of 18 exclusive agencies with powers to comply with SGMA within its statutory boundary.[23] In May 2016, following public hearing, the Valley Water Board adopted a resolution to become the GSA for the Santa Clara and Llagas subbasins. Valley Water's authority to sustainability manage groundwater is established in the District Act and as the designated GSA.

23 California Water Code Section 10723 (a).

1.4.2 Valley Water Authority

Valley Water is an independent special district formed by the California Legislature (through the District Act) for the primary purpose of providing comprehensive water resource management for all beneficial uses and protection from flooding within Santa Clara County.

1.4.2.1 Authorities Provided by the District Act

Pursuant to Sections 4 and 5 of the District Act, Valley Water's objectives and authority related to groundwater management are to recharge groundwater basins, conserve, manage and store water for beneficial and useful purposes, increase water supply, protect surface water and groundwater from contamination, prevent waste or diminution of Valley Water's water supply, and do any and every lawful act necessary to ensure sufficient water is available for present and future beneficial uses.

The District Act gives the Board the ability to adopt ordinances to carry out the District Act, including the objective to protect the county's groundwater resources. One such ordinance regulates the construction and destruction of wells and other deep excavations.[24]

The District Act also provides Valley Water the authority to create zones of benefit, to levy volumetric groundwater charges, and to use those revenues to pay the costs of:

- constructing, maintaining, and operating facilities that import water into the county;
- purchasing imported water;
- constructing, maintaining, and operating facilities that will conserve or distribute water within the groundwater charge zones, including facilities for groundwater recharge, surface distribution, and water purification and treatment; and
- principal or interest incurred by Valley Water for the previously listed purposes.

Per the District Act, groundwater charges are to be fixed and uniform within each zone, with the rate for agricultural water not to exceed one-quarter of the rate for non-agricultural water. A groundwater production rate may be subject to an increase in proportion to groundwater production over a prior "base period" specified by the Board upon a finding by the Board that conditions of drought and water shortage require the increase.[25] Proportional rates have not been implemented by Valley Water to date.

In addition, Valley Water's basic groundwater charges may be adjusted each fiscal year (or even within a fiscal year) when the board determines that an adjustment of the charge is necessary, e.g., to pay for increased groundwater management costs.[26]

1.4.2.2 Authorities Provided by SGMA

In addition to the broad authorities provided by the District Act, SGMA provides several additional specified powers to Valley Water. Such powers, or legal authorities, include the ability to regulate groundwater pumping and assess different types of groundwater charges as potential tools to support continued groundwater sustainability.

Regulation of Groundwater Pumping

Per Water Code Sections 10725 and 10726.4, in regulating groundwater extraction, SGMA allows a GSA with an adopted Plan to:

24 Santa Clara Valley Water District Ordinance 90-1. Available at: https://www.valleywater.org/contractors/doing-businesses-with-the-district/wells-well-owners/ordinance-90-1
25 Santa Clara Valley Water District Act §26.7 (a)(3)(c).
26 Santa Clara Valley Water District Act Section 26.7(b)(1).

- impose spacing requirements on new well construction to minimize interference;
- impose reasonable operating regulations on existing wells to minimize interference, including requiring extractors to operate on a rotation basis;
- regulate, limit, or suspend groundwater extraction, construction of new wells, enlargement of existing wells, or reactivation of abandoned wells;
- establish groundwater extraction allocations;
- authorize temporary and permanent transfers of groundwater extraction allocations; and
- establish rules to allow unused groundwater extraction allocations to be carried over from one year to another and voluntarily transferred.

While these authorities are listed in the Water Code, SGMA also acknowledges limitations related to the regulations of pumping. Several related SGMA sections state that local agencies are not authorized to make a binding determination of the water rights of any person or entity.[27] Property owners and municipalities have rights to the reasonable, beneficial use of groundwater. Other pumpers have established appropriative rights and may also claim prescriptive rights to local groundwater. The legal authorities granted by SGMA to regulate groundwater pumping have not been extensively tested in the courts yet.

Research into the use of similar authorities in other jurisdictions indicates that few agencies regulate pumping and highlights related challenges. Where used, pumping regulation has been in response to significant basin problems like long-term overdraft or seawater intrusion, most commonly through the well permitting process. These agencies have struggled with well owner concerns, enforcement, and legal challenges. Others have decided against regulation due to concerns with water rights and the potential to trigger adjudication, focusing instead on financial incentives or groundwater replenishment.

Local agencies evaluating the regulation of pumping must also consider the land use authority of cities and counties, which is not superseded by SGMA.[28] For example, any action to control extractions must be consistent with the city or county general plan unless there is insufficient sustainable yield in the basin to serve a designated land use. Groundwater extraction transfers are also subject to applicable city and county ordinances.

Valley Water's Groundwater Pumping Resolution No. 18-04

While long-term groundwater conditions in the Santa Clara and Llagas subbasins are sustainable due to a strong groundwater management framework and coordination with water retailers, risks to ongoing sustainability include prolonged drought, increased demands, reduced imported water availability, aging infrastructure, and climate change. Continued coordination and partnerships with major pumpers and other local agencies are the preferred way to deal with these and other challenges to groundwater sustainability. However, the regulation of pumping may be needed if these risks threaten to, or produce undesirable results like chronic overdraft, land subsidence, or groundwater quality impacts.

On November 22, 2016, the Board adopted the 2016 GWMP following a public hearing. Several related comment letters expressed concerns with authorities provided by SGMA, including water rights and the potential regulation of pumping, i.e., establishing groundwater pumping allocations and limiting allowable groundwater pumping. The Board referred interested parties to the Water Conservation and Demand Management Committee (Committee) to explore this issue. The Committee met nine times between December 2016 and December 2017. Through this open forum with interested parties, the Committee developed a process (an implementation framework) for groundwater extraction regulation. On February 27, 2018, Valley Water's Board of Directors adopted Resolution No. 18-04 (Appendix E), which sets forth

27 California Water Code §§10720.5(b) and 10726.8(b).
28 California Water Code §§ 10726.4, 10726.8(f), and 10726.9.

a process to regulate groundwater extraction under SGMA, if needed. Board Resolution No. 18-04 acknowledges that effective programs, investments, and coordination have resulted in sustainable groundwater conditions, and that collaboration with groundwater users and interested parties will continue to be the preferred approach to address observed or projected undesirable results. As an example of this strong collaboration, during the 2012–2016 drought, nearly all water retailers supported Valley Water's water use reduction target, which was higher than their state-mandated targets in many cases. Retailer efforts to use treated surface water and reduce pumping in certain areas were instrumental in groundwater level recovery and minimizing the risk of resumed land subsidence.

Board Resolution No. 18-04 acknowledges that the existing groundwater management framework is expected to support continued, sustainable groundwater conditions and that pumping regulation may never be needed. The resolution describes the fundamental approach to respond to worsening basin conditions, including the steps that would be taken prior to implementing SGMA authorities to regulate extraction. The focus is on providing transparency and certainty to the process, while avoiding prescriptive requirements that may not be appropriate or effective. The basic steps of the process are summarized below.

1. Normal Operations: evaluate groundwater conditions, coordinate with water retailers, and receive input from interested parties
2. Issue Identification: identify new regulatory requirement or observed/projected undesirable result
3. Preliminary Assessment: prepare memo describing issue and potential mitigation (e.g., additional supplies and/or demand reduction)
4. Initial Interested Parties Consultation: meet with affected pumpers and/or other interested parties to discuss issue and preliminary assessment
5. Action Plan: develop draft action plan with input from interested parties, including desired outcome, roles, actions, schedule, monitoring, and reporting
6. Voluntary Action (Preferred): agree to implement voluntary actions to address issue (preferred)
7. Potential Well/Pumping Regulation, if Needed: develop Board ordinance to implement SGMA authorities through Committee and public process
8. Implementation, Monitoring, and Reporting: implement voluntary and/or mandatory actions described in the action plan and/or ordinance, monitor, and report out to Board and interested parties

The Resolution also documents Valley Water's guiding principles regarding the process to regulate extraction, if needed, under the SGMA authorities.

1. Valley Water will sustainably manage local groundwater as part of our mission to provide Silicon Valley safe, clean water for a healthy life, environment, and economy.
2. Valley Water will continue to conduct comprehensive water supply planning and invest in diverse water supplies to ensure reliability and avoid chronic shortages.
3. Through ongoing water supply operations, Valley Water will continue to optimize the use of available water supplies while protecting groundwater storage.
4. Transparency in fulfilling Valley Water's mission remains an important driver and Valley Water will continue to encourage input and participation from all interested parties.
5. Valley Water will continue to seek solutions that effectively and efficiently address identified water supply issues as they arise.
6. Valley Water will work with water retailers and other interested parties to continue to improve our

understanding and management of groundwater basins and conditions, including sustainable use.

7. Strong partnerships with water retailers and other large groundwater users have been effective in avoiding undesirable results and are critical to future sustainability.
8. Collaboration with groundwater users and interested parties will continue to be the preferred approach to address observed or projected undesirable results, and Valley Water regulation of pumping will only be considered if there is no viable alternative.
9. Given the uncertainty in the timing, location, and severity of potential future undesirable results, the process to regulate groundwater extraction avoids prescriptive triggers and requirements, instead, it clarifies how to respond to worsening conditions. This will maintain maximum flexibility to respond to changing conditions and avoid unnecessary or ineffective actions.

Collection of Various Fees

Water Code Section 10730.2 allows GSAs to impose fixed fees and volumetric fees, including, but not limited to, fees that increase based on the quantity of groundwater produced, the year in which the groundwater extraction commenced, and impacts to the basin. Any proposed changes to Valley Water's rate structure would be identified as part of the annual rate setting process. This open and transparent process includes documentation of proposed rates in Valley Water's annual Protection and Augmentation of Water Supplies (PAWS) Report, notification to all owners of groundwater producing facilities, discussion with Board Advisory Committees and water retailers, and public hearings prior to rate adoption.

1.4.3 Valley Water Management Structure

Valley Water is governed by an elected Board of Directors. The Board is comprised of seven members, each elected from equally divided districts drawn through a formal process. The purpose of the Board, on behalf of Santa Clara County, is to provide Silicon Valley with safe, clean water for a healthy life, environment and economy. The Board's public webpage can be accessed at www.valleywater.org/how-we-operate/board-directors.

There are three Board Appointed Officers (BAOs): Valley Water Counsel, Clerk of the Board, and Chief Executive Officer (CEO). The executive management team is responsible for implementing the Board policies and running the day-to-day operations. At the staff level, there are two Valley Water chiefs (Chief Operating Officer for Watersheds and Chief Operating Officer for the Water Utility Enterprise) that report to the ACEO and three chiefs that report to the CEO (Chief Administrative Officer, Chief of External Affairs, and the Chief Financial Officer). The Water Utility Enterprise includes four divisions: Water Supply, Raw Water, Treated Water, and Water Utility Capital. The divisions and units within the Water Utility Enterprise manage Valley Water programs, facilities, and planning to ensure reliable, resilient, and sustainable water supplies for the county.

1.4.4 Water Utility Enterprise Financial Overview

Funding sources for the Water Utility Enterprise include charges for groundwater production, treated water, recycled water, and surface water, along with property taxes, interest earnings, reimbursements, and grants. These funds are used to operate and maintain Valley Water's complex water supply infrastructure network, maintain water supply sources and water rights, and make capital improvements as needed to ensure water supply reliability. The Water Utility Enterprise operations and capital budget for fiscal year 2026-27 is $907 million. Detailed information on Water Utility Enterprise funding is available through Valley Water's PAWS report, which is prepared each year in February and posted on Valley Water's website. Valley Water's overall budget is also available at http://www.valleywater.org.

1.4.5 Relation to Other Valley Water Programs and Plans

The 2026 GWMP provides information on basin conditions and documents groundwater management goals, strategies, related activities, and metrics for desired basin outcomes. This information supports other Valley Water planning efforts including the:

- UWMP that evaluates water supply reliability over a 25-year period as mandated by the state
- Water Shortage Contingency Plan (WSCP) that establishes actions and procedures for managing water supplies and demands during water shortages due to droughts and other emergencies
- WSMP that evaluates demand and water supplies and recommends investment and operating strategies needed to ensure long-term water supply reliability
- Annual PAWS report that presents the basis for recommended groundwater production charges in accordance with the District Act
- Planning to address specific water management issues that could affect groundwater management
- Watershed Master Planning that engages the community and uses equitable metrics to identify flood protection and stream stewardship priority actions for a sustainable future on a watershed scale

As required by the Water Code, Valley Water will update the GWMP at least every five years. The GWMP, UWMP, and WSMP are related planning documents that collectively help guide Valley Water's sustainable groundwater management activities. The UWMP and WSCP are state-mandated plans that are also on a five-year update cycle, and the 2025 UWMP and 2025 WSCP were adopted by the Board in June 2026. The WSMP builds on the information in the GWMP to update Valley Water's long-term water supply strategy and is generally updated every five years.

1.5 GROUNDWATER MANAGEMENT PARTNERS AND INTERESTED PARTIES

Although Valley Water is the groundwater management agency in Santa Clara County per the District Act and is now the GSA under SGMA, many other agencies have a significant role, including local water retailers, land use agencies, and regulatory agencies. These partners and interested parties are described next.

1.5.1 Water Retailers

Local water retailers maintain facilities to distribute water directly to local residents and businesses and meet applicable regulatory standards established by the U.S. Environmental Protection Agency (USEPA) and California Division of Drinking Water (DDW). In addition to groundwater, local retailers may also serve treated surface water from Valley Water or potable water supplied by the SFPUC. Several retailers also maintain local surface water rights and distribute recycled water for non-potable uses. The maintenance of these supplies is critical to maintaining overall water supply reliability in the county. Every five years, Valley Water and local water retailers coordinate to develop individual agencies' UWMP that evaluate water supply reliability over a 25-year period. For water retailers using groundwater, these plans show a continued reliance on groundwater in the future.

As the primary groundwater pumpers in the county, water retailers play a major part in influencing groundwater conditions through their operations. Effective coordination between Valley Water and retailers with the shared goal of protecting groundwater resources has resulted in sustainable groundwater conditions over many decades.

Valley Water and water retailers collaborate closely on operations as well as long-term planning and meet quarterly through the Water Retailer Committee. The Water Retailer Committee has established the following subcommittees, which meet regularly to discuss specific topics in more detail:

- Water Supply (joint meeting with Groundwater)
- Water Quality (joint meeting with Treated Water)
- Recycled Water
- Finance
- Treated Water (joint meeting with Water Quality)
- Water Conservation
- Emergency Management
- Groundwater (joint meeting with Water Supply)
- Communications
- Capital Improvement Program (CIP)

1.5.2 Land Use Agencies

Land use agencies, including Santa Clara County and local cities, provide land use planning and permitting functions affecting water demand and land use, which may impact groundwater quantity and quality. General Plans adopted by land use agencies reflect each agency's policy about future development and many of these plans contain goals to address water supply reliability and protection of water resources, including groundwater. Land use agencies also review and approve Water Supply Assessments for developments meeting certain growth requirements. Valley Water reviews and comments on General Plans and Water Supply Assessments to ensure alignment with Valley Water policy, water supply goals, and planning assumptions.

Land use agencies permit and inspect hazardous material and waste storage and handling facilities through the fire departments. The County Department of Environmental Health (DEH) also oversees the leaking underground fuel tank cleanup program, issues permits for septic systems, and regulates drinking water systems with 5 to 14 connections. Local land use agencies also administer stormwater management programs in compliance with National Pollutant Discharge Elimination System (NPDES) requirements.

1.5.3 Local, State, and Federal Agencies

Valley Water relies on partnerships with regulatory agencies to protect groundwater resources. Agencies, including the State Water Resources Control Board, the Department of Toxic Substances Control (DTSC), and the USEPA, regulate the cleanup of contaminants in groundwater. Regional Water Quality Control Boards also define the beneficial uses and water quality objectives for groundwater basins. The San Francisco Bay Regional Water Quality Control Board has regulatory jurisdiction over the Santa Clara Subbasin and the Central Coast Regional Water Quality Board has regulatory jurisdiction over the Llagas Subbasin.

Figure 1-8 shows the general authorities, roles, and functions of these various agencies with regard to groundwater resources. It should be noted that this figure is intended to provide a general overview rather than a comprehensive list of individual agencies and functions.

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Figure 1-8. Overview of Groundwater Management Roles

U.S. Environmental Protection Agency

- Establishes federal drinking water standards for public water systems
- Regulates cleanup of Superfund sites

California Environmental Protection Agency
Includes: State Water Resources Control Board, Regional Water Quality Control Boards, Division of Drinking Water, Department of Toxic Substances Control

- Implements environmental protection laws that ensure clean air, clean water, clean soil, safe pesticides and waste recycling and reduction
- Allocates water rights and adjudicates water right disputes
- Develops statewide water protection plans and establishes water quality standards
- Regulates groundwater if local management efforts are inadequate under the Sustainable Groundwater Management Act (SGMA)
- Establishes state drinking water standards and regulates public drinking water systems
- Permits recycled water projects
- Regulates facilities that treat, store, and dispose of hazardous waste
- Regulates cleanup of contaminated sites

California Department of Water Resources

- Develops regulations, evaluates local groundwater sustainability planning efforts, and provides technical assistance related to SGMA
- Operates the State Water Project
- Supports local and regional water management through technical and financial assistance
- Guides development and management of water resources

Santa Clara Valley Water District

- Manages the Santa Clara and Llagas Subbasins in Santa Clara County per the District Act and SGMA
- Implements programs to protect and augment groundwater
- Conducts managed recharge and in-lieu recharge programs to offset groundwater pumping
- Permits wells and other deep excavations
- Coordinates with water retailers, land use and regulatory agencies, adjacent water agencies, and interested stakeholders

Water Retailers

- Maintain facilities to deliver water to customers
- Maintain surface water rights and/or other sources of supply
- Ensure compliance with drinking water standards
- Reduce demands during shortages and modify operations to protect groundwater

Land Use Agencies

- Develop General Plans and review Water Supply Assessments
- Permit land use and administer stormwater management programs
- Permit hazardous material storage and handling facilities
- Oversee cleanup of leaking underground tanks (County)
- Regulates septic systems and small water systems (County)

Well Owners and the Community

- Maintain, construct, and properly destroy wells (well owners)
- Use water wisely and minimize the introduction of contaminants

1.5.4 Other Interested Parties

Private well owners, non-governmental organizations, and the public are also important partners in protecting groundwater supplies. Private well owners are responsible for constructing, maintaining, and properly destroying wells so they do not act as vertical pathways for contaminants. The community also has a role in protecting groundwater supplies by using water wisely and helping reduce the introduction of contaminants from activities at the land surface.

There are also numerous statewide and national organizations engaged in issues related to groundwater, including the Association of California Water Agencies and the California Urban Water Agencies. Valley Water works with these agencies and others on various proposals to protect groundwater resources.

Valley Water will continue to work closely with local partners and the public using the following methods:

- Regularly scheduled meetings, including the Water Retailer Committee and Groundwater Subcommittee
- Publicly noticed Board meetings
- Review and coordination with land use agencies on land use and development proposals as well as the development of guidelines related to specific issues (e.g., stormwater infiltration, graywater, and septic systems)
- Technical coordination with regulatory agencies on contaminant release sites and policies related to groundwater
- Coordination with basin partners and regulatory agencies on long-term resource planning efforts
- Outreach, including the development of fact sheets and web information and interaction with the public at open houses and other events

1.6 PUBLIC OUTREACH FOR THE 2026 GROUNDWATER MANAGEMENT PLAN

Under SGMA, periodic evaluations are not subject to the same level of outreach required during development and adoption of a GSP, Alternative to a GSP, or an Amendment. However, Valley Water provided interested parties numerous opportunities for input during the development of this 2026 GWMP.

Valley Water presented SGMA updates and information on the 2026 GWMP at nearly all 2025 and all 2026 joint meetings of the Water Retailers Water Supply and Groundwater Subcommittees. Valley Water has also discussed planned SGMA compliance with agencies in adjacent subbasins, including the Alameda County Water District and San Benito County Water District. Updates on SGMA compliance were presented at many of the 2025 and 2026 meetings of the Board's Water Supply and Demand Management Committee and Agricultural Water Advisory Committee, which are both publicly noticed. Valley Water also provided updates on progress and related Committee and Board items via email notifications to all members of the SGMA interested parties list that Valley Water maintains.

Valley Water held a hybrid (in-person and virtual via Zoom) public informational meeting about the 2026 GWMP on July 30, 2026, which was advertised in mailers to well owners, newspaper ads, social media, posting on Valley Water's website, and email to the SGMA interested parties list. This meeting provided the public context about the 2026 GWMP update prior to Valley Water publicly releasing its draft 2026 GWMP on August 12, 2026. The draft 2026 GWMP was posted on Valley Water's website and corresponding notification emails were sent to the interested parties list informing them of the draft report and opportunity to provide comments.

A public hearing on the 2026 GWMP was held at a regularly scheduled Board meeting on November 10, 2026 and public notice included advertisements in local newspapers in compliance with Government

Code 6066. Related notices, Board resolution, public comments received, Valley Water responses, and environmental documentation are included in Appendix A.

1.7 PLAN CONTENT AND ORGANIZATION

This 2026 GWMP brings together important information on groundwater management goals, strategies, and related activities in Santa Clara County. In addition to meeting SGMA regulatory requirements, the GWMP is intended to present information that will be useful to water retailers, land use planning agencies, agencies in adjacent subbasins, and community members interested in groundwater. The 2026 GWMP includes the following chapters:

- **Chapter 2 – Santa Clara Subbasin Description**: This chapter provides an overview of the Santa Clara Subbasin and current conditions.
- **Chapter 3 – Llagas Subbasin Description**: This chapter provides an overview of the Llagas Subbasin and current conditions.
- **Chapter 4 – Water Supplies, Demands and Budget**: This chapter describes Valley Water's conjunctive water management system, historical and current groundwater demands, and groundwater budgets.
- **Chapter 5 – Sustainable Management Criteria**: This chapter describes the sustainability goals and sustainability criteria to measure the effectiveness of the sustainability goals.
- **Chapter 6 – Basin Management Programs and Activities**: This chapter describes Valley Water programs and activities that support the sustainability goals.
- **Chapter 7 – Groundwater Monitoring and Modeling**: This chapter summarizes Valley Water programs to monitor changes in groundwater levels, groundwater quality, land subsidence, and surface water, as well as groundwater flow models.
- **Chapter 8 – Next Steps**: This chapter describes future reporting related to the GWMP and discusses potential approaches to consider if the outcome measures indicate improvement is needed or to address future risks and changing conditions. It also includes recommendations for further work.

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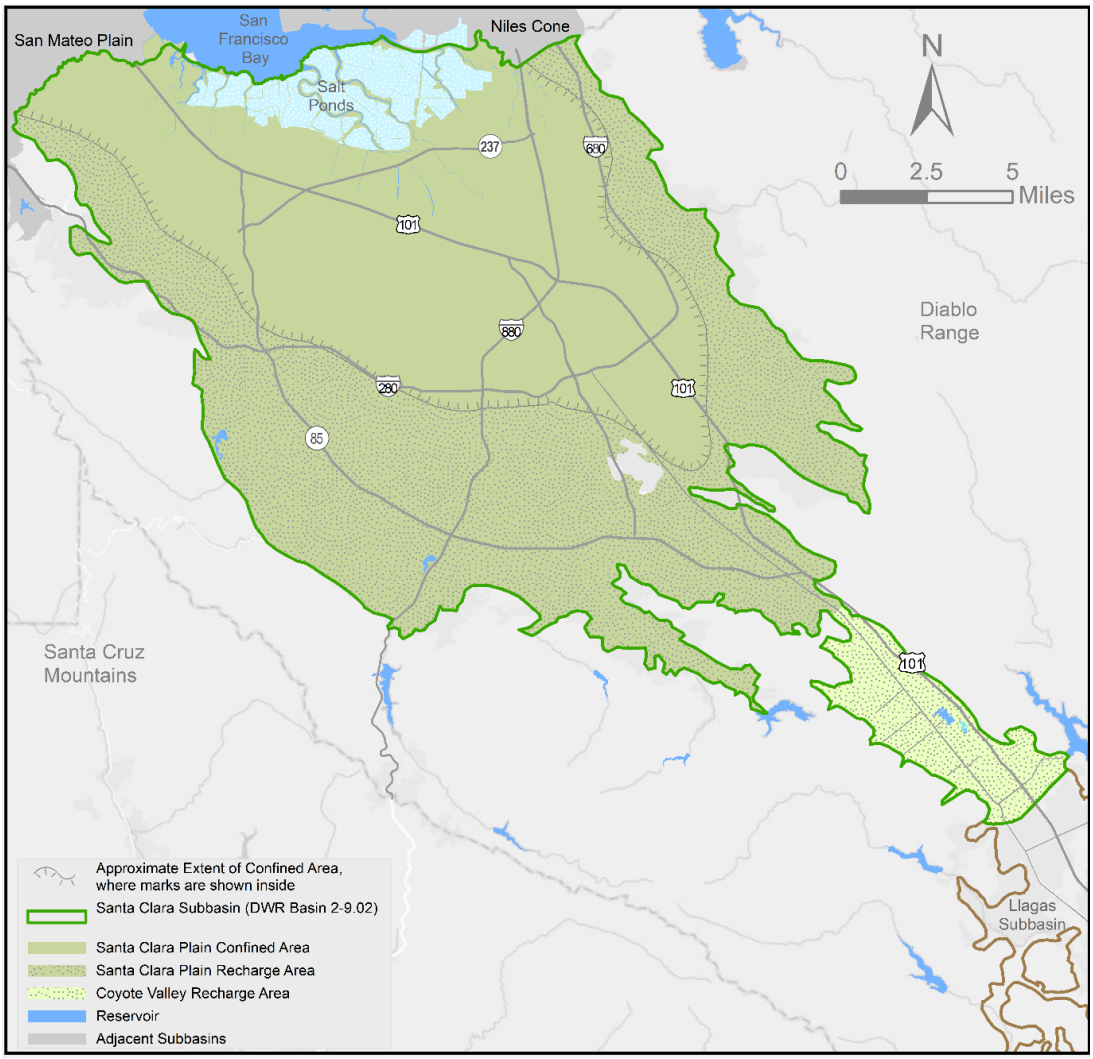
CHAPTER 2 – SANTA CLARA SUBBASIN DESCRIPTION

This chapter describes the Santa Clara Subbasin, including the physical setting and characteristics, and conditions related to groundwater elevation, water quality, land subsidence, interconnected surface water and groundwater, groundwater dependent ecosystems (GDEs), and seawater intrusion.

2.1 BASIN SETTING

The Santa Clara Subbasin (DWR Basin 2-9.02) is located within the California Coast Ranges physiographic province between the San Andreas and Hayward Faults at the southern end of the San Francisco Bay (Figure 2-1). The subbasin underlies a relatively flat valley and consists of unconsolidated alluvial sediments. The Santa Clara Subbasin is part of Basin 2-9, which extends beyond Santa Clara County into San Mateo, Alameda, and Contra Costa counties and beneath San Francisco Bay, which is fringed and underlain by the estuarine San Francisco Bay mud.[29] Due to different hydrogeologic, land use, and water supply management characteristics, Valley Water further subdivides the Santa Clara Subbasin into two groundwater management areas: the Santa Clara Plain and the Coyote Valley.

Figure 2-1. Santa Clara Subbasin



29 USGS, Physical Subdivision and Description of the Water-Bearing Sediments of the Santa Clara Valley, California, 2015.

2.1.1 Lateral Subbasin Boundaries

The Santa Clara Subbasin covers a surface area of 297 square miles and forms a northwest-trending, elongated valley bounded by the Santa Cruz Mountains to the west and the Diablo Range to the east. The basis for the lateral boundary delineation shown in Figure 2-1 is the geologic, hydrologic and topographic features in the subbasin. The western and eastern subbasin boundaries are the geologic contact between permeable to semi-permeable alluvial sediments within the Santa Clara Valley and the impermeable bedrock of the adjacent mountain ranges. These impermeable bedrock units include the Mesozoic marine formations and the Franciscan Assemblage of the Santa Cruz Mountains, and Franciscan greywacke and serpentinite bodies of the Diablo Range. The northern boundary with the San Francisco Bay is hydrologic. To the northwest and northeast, the subbasin borders the San Mateo Plain and Niles Cone subbasins, respectively, at institutional boundaries formed by county boundaries. The southern boundary with the Llagas Subbasin is the Coyote Creek alluvial fan in the Morgan Hill area, which forms a topographic and hydrologic divide between the groundwater and surface water flowing to the San Francisco Bay and water flowing to the Monterey Bay. The groundwater divide is approximately located at Cochrane Road in Morgan Hill. Based on observed water level data, the boundary moves as much as a mile to the north or south depending on local groundwater conditions.

The Santa Clara Plain covers 280 square miles, extending from southern San Francisco Bay to the Coyote Narrows, near Metcalf Road. The Coyote Valley extends from the Coyote Narrows to the boundary with the Llagas Subbasin. The Coyote Valley is much smaller than the Santa Clara Plain, covering a surface area of 17 square miles.

2.1.2 Recharge Areas

Recharge within the Santa Clara Subbasin generally occurs along the margins and southern portion of the subbasin where coarse-grained sediments predominate. The recharge area includes the alluvial fan and fluvial deposits along the edge of the subbasin where high lateral and vertical permeability allow surface water to infiltrate the aquifers. The percolation of surface water in recharge areas replenishes unconfined groundwater within the recharge area and contributes to the recharge of principal aquifers in the confined area through subsurface flow.

The Santa Clara Plain has two hydrogeologic areas, the recharge (unconfined) and confined areas (Figure 2-1). The confined area is located in the central portion where a laterally extensive, low permeability aquitard restricts the vertical flow of groundwater and contaminants. The confined area boundary is approximate and is a simplification of natural conditions based on the extent of artesian wells.[30] There is no laterally extensive aquitard in the Coyote Valley, with generally high lateral and vertical permeability throughout the management area.

2.1.3 Principal Aquifers and Aquitards

The Santa Clara Subbasin is a trough-like depression filled with Quaternary alluvium deposits of unconsolidated gravel, sand, silt and clay that eroded from adjacent mountain ranges by flowing water and were deposited into the valley (Figure 2-2). The alluvium comprises interfingering alluvial fans, stream deposits and terrace deposits.

Helley and Lajoie (1979) divided the valley fill alluvium into two major Quaternary deposits: Holocene (younger than 10,000 years old) and Pleistocene deposits (from 1.8 million to 10,000 years old). [31] The Holocene deposits consist of the most recent sediments deposited along major stream courses and bay mud deposits along the San Francisco Bay. The Holocene alluvial sediment consists mainly of clay, silt and sand occurring in discontinuous lenses. The majority of the subbasin alluvium is older, Pleistocene deposits of unconsolidated and interfingered lenses of clay, silt, sand and gravel. The base of the

30 Clark, Ground Water in Santa Clara Valley, California, 1924.
31 Helley and Lajoie, Flatland Deposits of the San Francisco Bay Region, California: Their Geology and Engineering Properties and Their Importance to Comprehensive Planning, 1979.

Pleistocene deposits overlies the Santa Clara Formation in some areas of the subbasin, such as near Stevens Creek Reservoir. The Santa Clara Formation is composed of slightly or semi-consolidated alluvial deposits washed down from the upper mountainous area and deposited along the foothills beneath the unconsolidated young alluvial sediments of the subbasin.[32] A 2015 USGS study[33] indicated that Late Pleistocene alluvium is exposed on the heads of the alluvial fans, particularly on the west side of the valley.

The thickness of aquifer materials in the Santa Clara Plain ranges from about 150 feet near the Coyote Narrows to more than 1,500 feet in the interior of the subbasin. The alluvium thins towards the western and eastern edges of the Santa Clara Plain. The central portion of the Santa Clara Plain contains a laterally extensive, low permeability aquitard that restricts the vertical flow of groundwater. This major aquitard varies in thickness from 20 to 100 feet and typically occurs at depths between 100 to 200 feet below ground surface,[34] separating shallow and principal aquifer zones. Shallow aquifer zones generally refer to aquifers that occur within 150 feet of ground surface, while principal aquifer zones generally occur at depths below 150 feet.[35] Generally, the shallow aquifer is not used for water supply. The primary confined aquifers exist at depths between 200 and 1,000 feet.[36]

The Coyote Valley is mainly composed of thick alluvial sand and gravel deposits with interbedded thin, discontinuous clays. The aquifer sediments overlying the Santa Clara Formation vary in thickness from a few feet along the west side of the valley to more than 400 feet along the east side. Cross-sections of the Santa Clara Subbasin, including the Santa Clara Plain and Coyote Valley are shown in Figures 2-3 through 2-5.

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32 Dibblee, Preliminary Geologic Map of the San Jose East Quadrangle, Santa Clara County, California, 1972.
33 USGS, Physical Subdivision and Description of the Water-Bearing Sediments of the Santa Clara Valley, California, 2015.
34 SCVWD Standards for the Construction and Destruction of Wells and Other Deep Excavations in Santa Clara County, 1989.
35 Iwamura, Hydrogeology of the Santa Clara and Coyote Valleys Groundwater Basins, California, 1995.
36 Carroll, 1991; Iwamura, 1995.

Figure 2-2. Quaternary Alluvium Geologic Map of the Santa Clara Subbasin

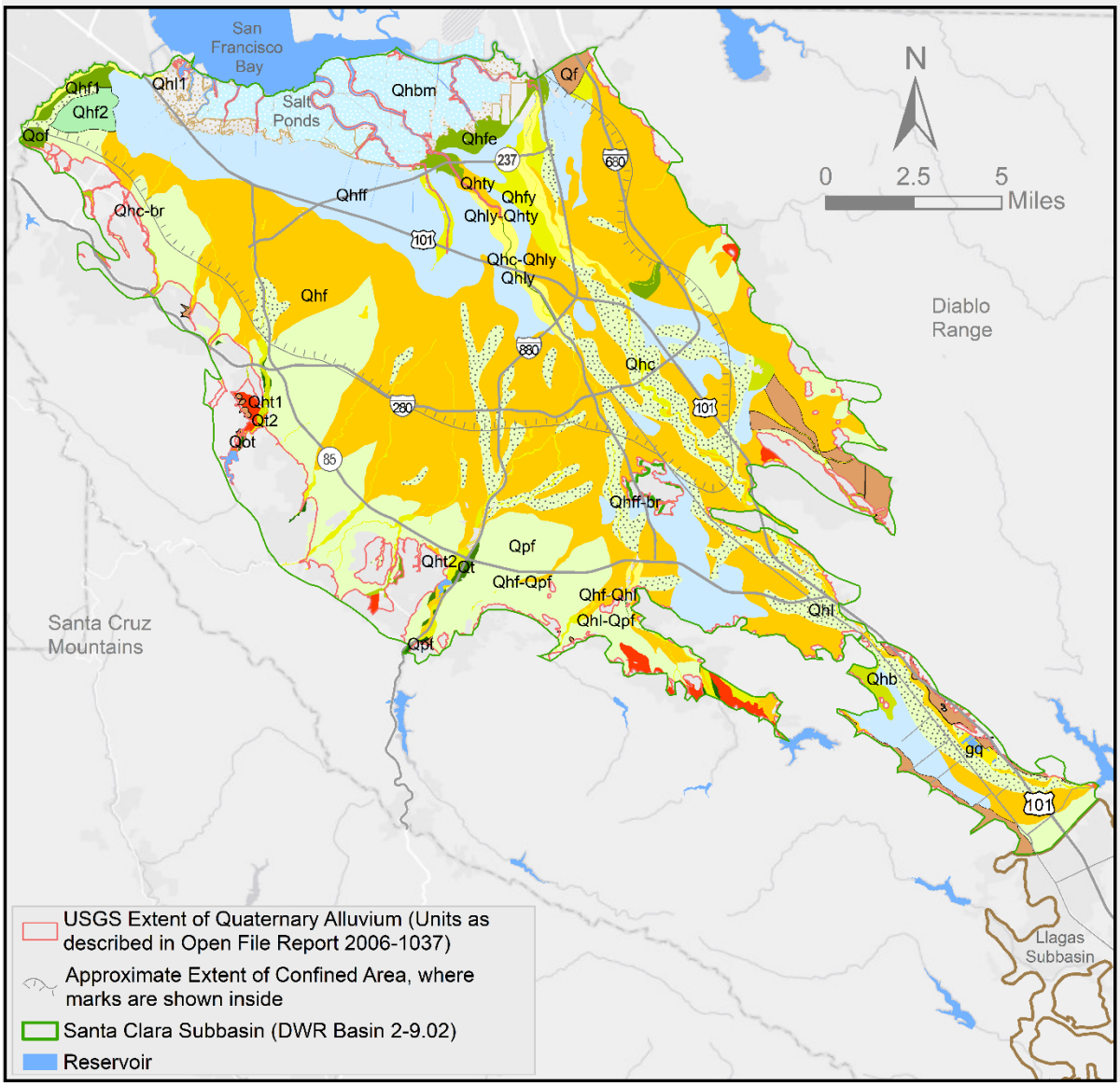

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Figure 2-3. Santa Clara Subbasin Cross-Section Locations

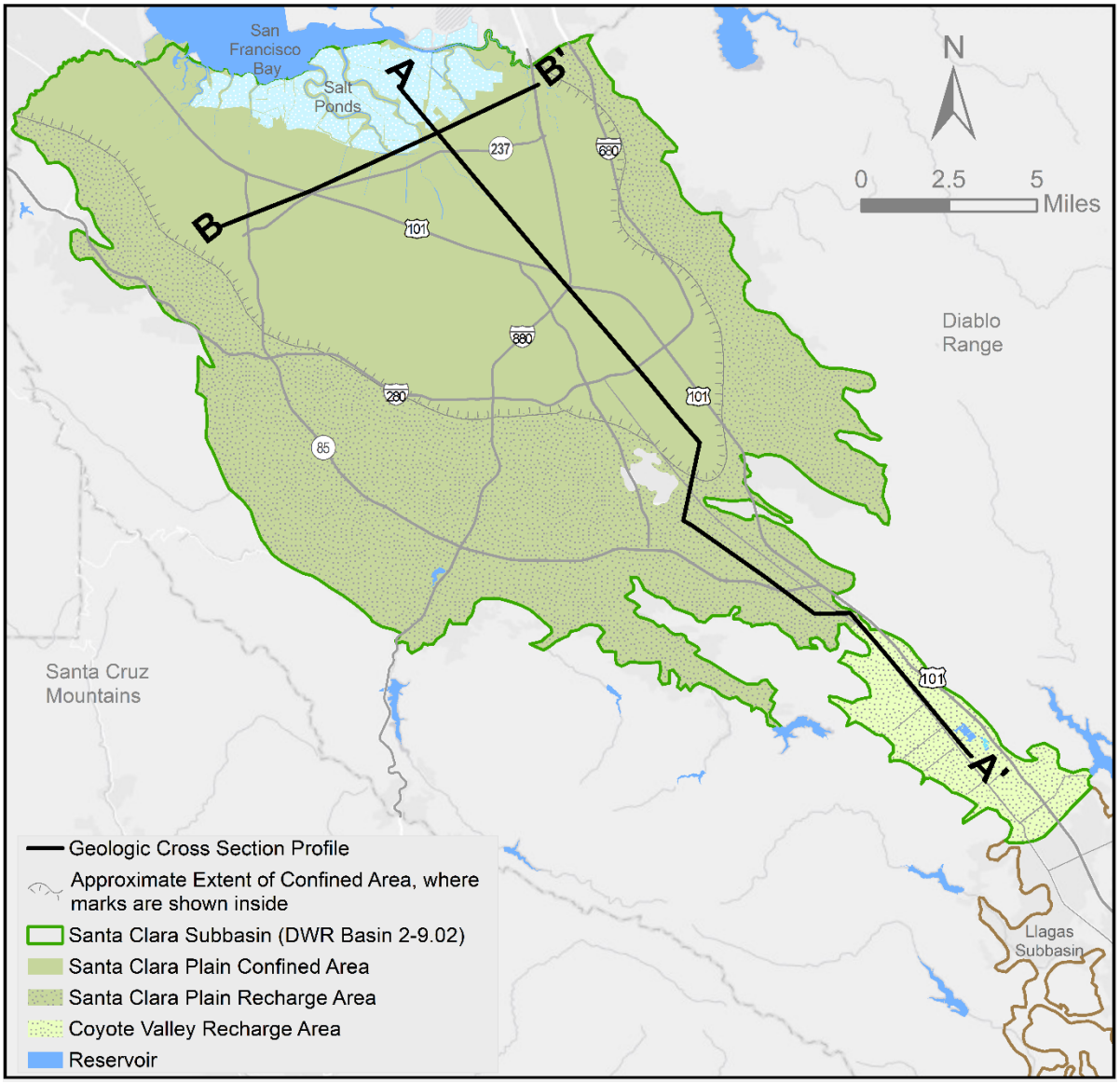

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Figure 2-4. Santa Clara Subbasin Longitudinal Cross-Section

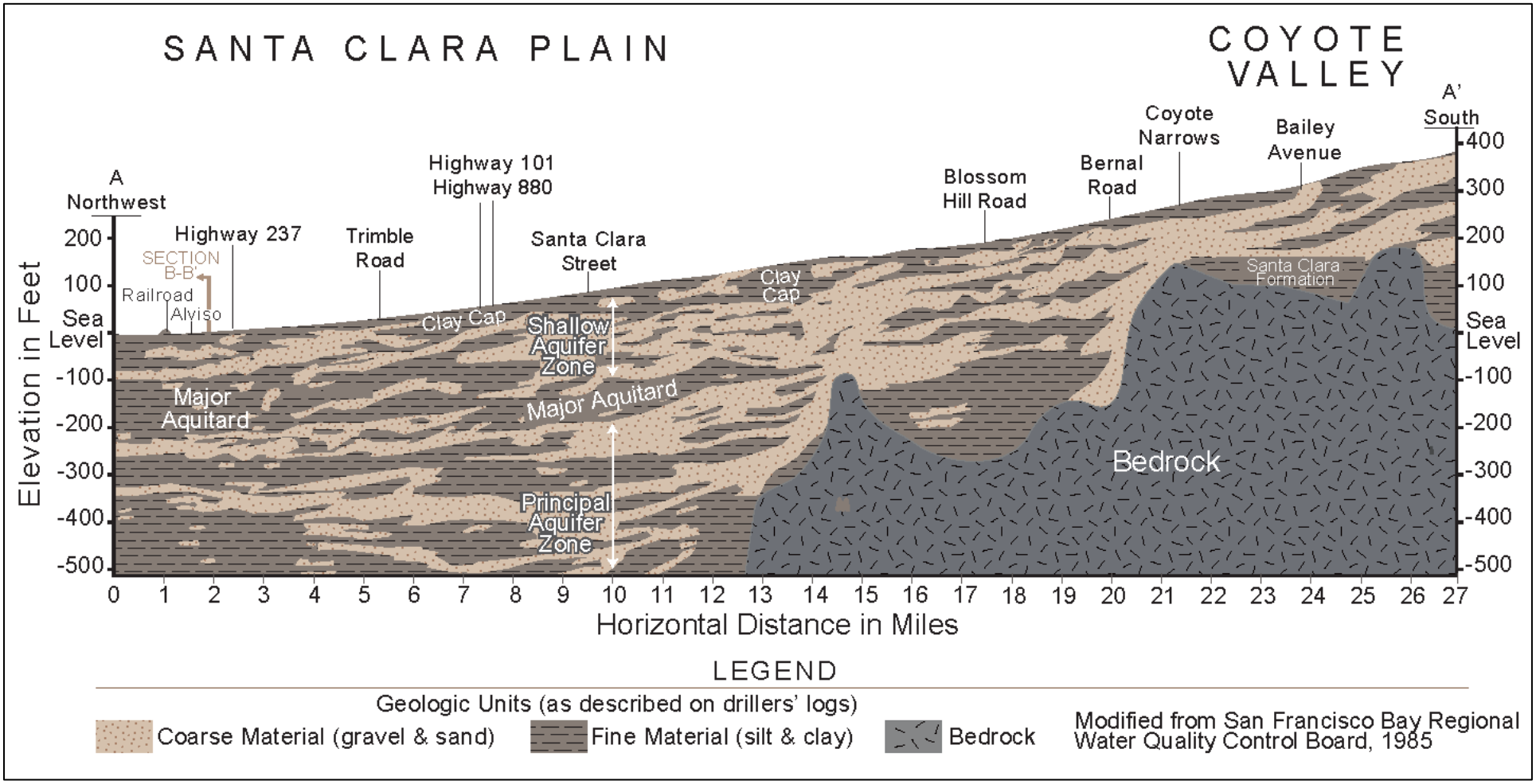

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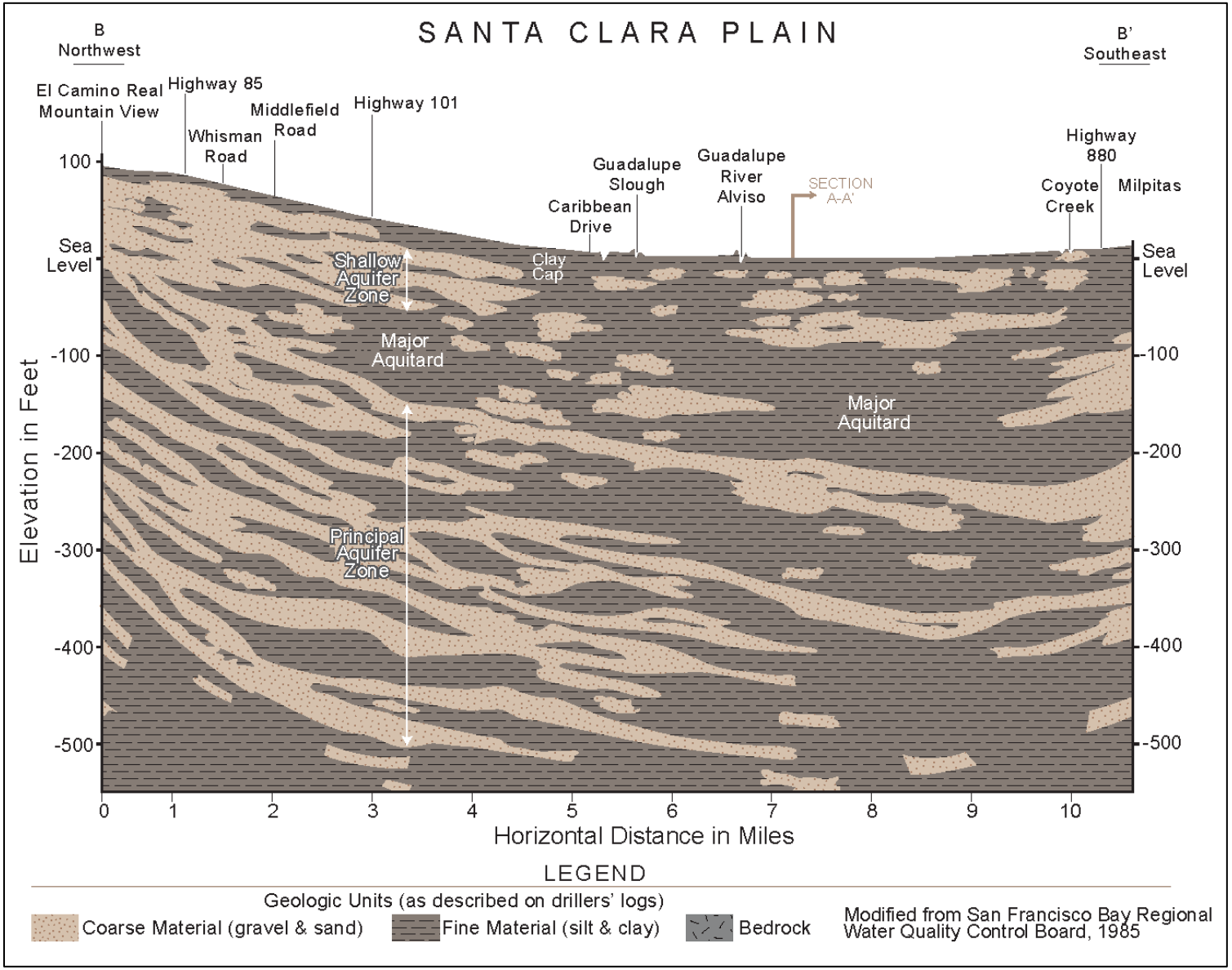
Figure 2-5. Santa Clara Subbasin Transverse Cross-Section



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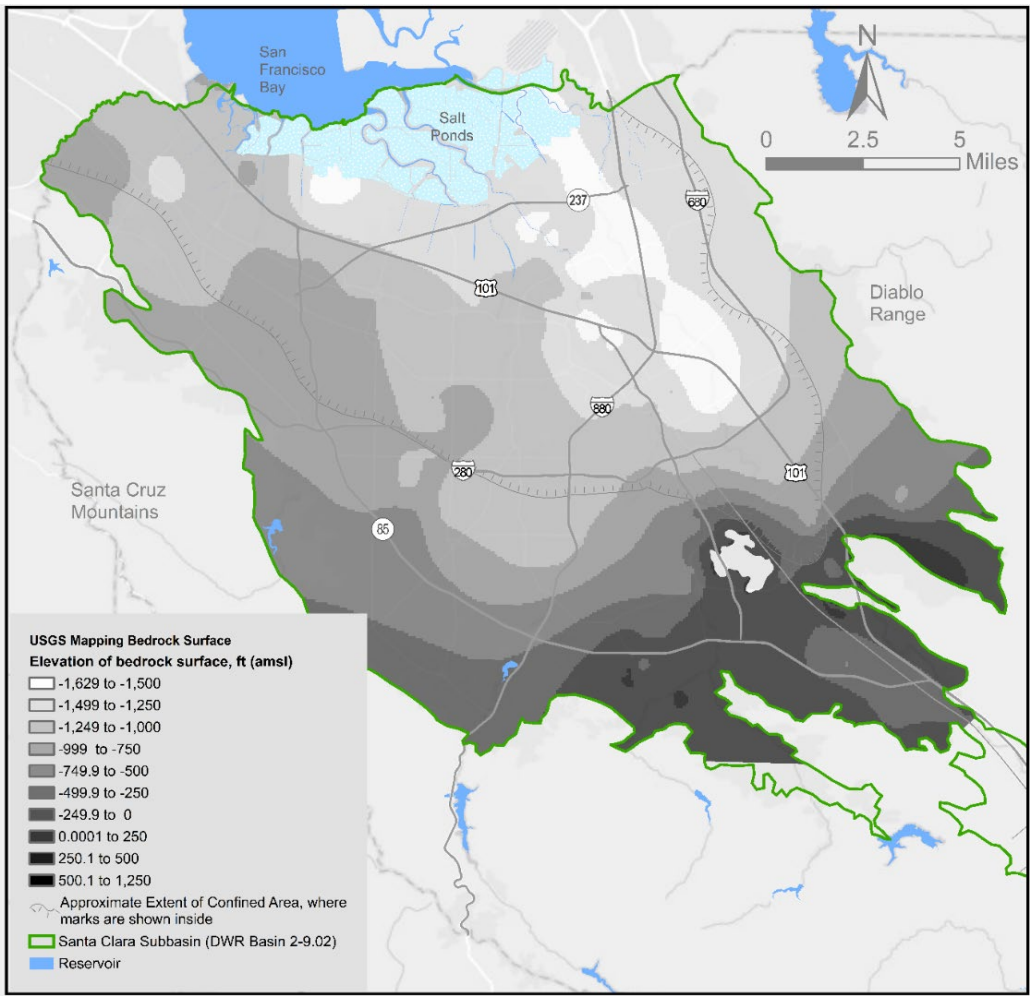
2.1.4 Subbasin Bottom

The bottom of the Santa Clara Subbasin is the contact between the unconsolidated alluvial sediments and impermeable bedrock forming an irregular surface encountered at different depths. It can be difficult to differentiate the underlying Santa Clara Formation (which may be slightly to semi-consolidated) from the overlying unconsolidated alluvial sediments based on driller's logs. Water supply wells completed at greater depths have encountered bedrock. Limited well data indicate the boundary between unconsolidated sediments and bedrock ranges from about 150 to 200 feet near the Coyote Narrows to about 1,500 feet in the interior of the subbasin. This is supported by deep wells constructed by Valley Water and the USGS.[37] A previous study[38] indicates the maximum alluvial thickness is in excess of 1,500 feet, including the Santa Clara Formation. The depth to bedrock decreases towards the western and eastern edges of the subbasin.

A 2015 USGS report[39] presents more detailed bedrock surface information for the Santa Clara Plain (Figure 2-6) based on 26 wells reaching bedrock, seismic reflection profiles, refraction profiles, and the elevation of mapped depositional contacts of alluvium and bedrock.

Figure 2-6. Santa Clara Plain Bedrock Surface

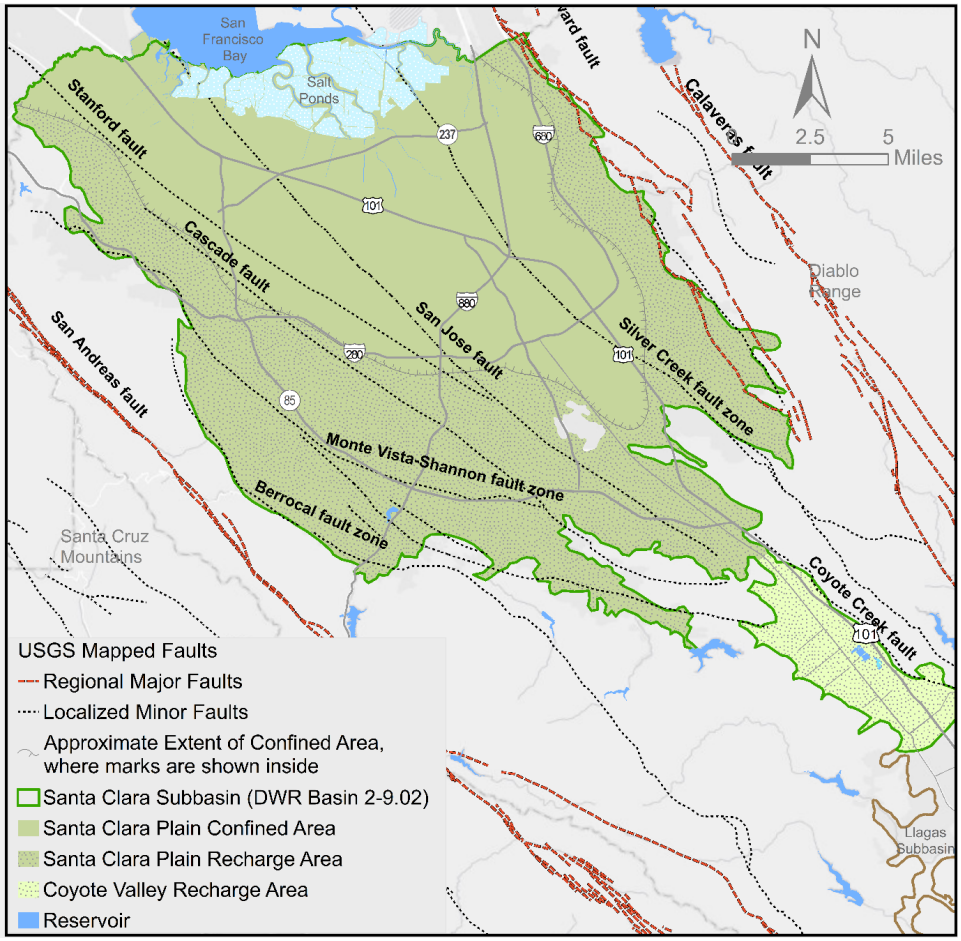


37 Newhouse et al., Geologic, Water-Chemistry, and Hydrologic Data from Multiple-Well Monitoring Sites and Selected Water-Supply Wells in the Santa Clara Valley, California, 1999–2003, 2004.
38 Iwamura, Hydrogeology of the Santa Clara and Coyote Valleys Groundwater Basins, California, 1995.
39 USGS, Physical Subdivision and Description of the Water-Bearing Sediments of the Santa Clara Valley, California, 2015.

2.1.5 Major Faults

The major faults in Santa Clara County are the San Andreas and Hayward/Calaveras faults that helped form the Santa Clara Subbasin by upthrusting adjacent mountains (Figure 2-7). These are right-lateral reverse oblique faults that remain active, creating significant displacement and deformation.[40] Much of the fault network that creates the structural depression in the Franciscan bedrock below the Santa Clara Subbasin is concealed beneath the overlying unconsolidated alluvium.[41] Several secondary faults, including strike slip, oblique and reverse faults are also present. These secondary faults, including but not limited to Silver Creek, San José, Stanford, Berrocal Monte-Vista, Shannon, Sargent, and Coyote Creek faults, help accommodate deformation from the major faults.[42] Iwamura (1995) suggested the Silver Creek fault may not be a substantial groundwater flow barrier, but a more recent USGS study[43] indicates the fault has a more active role in affecting groundwater flow. Based on recent land surveying data[44], the changes in land surface elevations on either side of the Silver Creek Fault may reflect a combined response to spatial patterns of groundwater pumping, managed recharge, and the hydrogeologic control of groundwater flow across the fault, which is consistent with Interferometric Synthetic Aperture Radar (InSAR) data from Chaussard et al. (2014).

Figure 2-7. Location of Major Fault Systems



40 Simpson et al., Seismicity and the Major Strike-Slip Faults Bordering the Santa Clara Valley, California, 2005.
41 Schmidt and Bürgmann, Time-Dependent Land Uplift and Subsidence in the Santa Clara Valley, California, from a Large Interferometric Synthetic Aperture Radar Data Set, 2003.
42 Simpson et al., Seismicity and the Major Strike-Slip Faults Bordering the Santa Clara Valley, California, 2005.
43 USGS, Physical Subdivision and Description of the Water-Bearing Sediments of the Santa Clara Valley, California, 2015.
44 Valley Water, 2025, Water Year 2024 Groundwater Report for the Santa Clara and Llagas Subbasins, Appendix A – 2024 Subsidence Data Analysis.

2.2 SUBBASIN CONDITIONS

This section describes Santa Clara Subbasin groundwater elevations, flow, quality, land subsidence, surface water/groundwater interaction, groundwater dependent ecosystems (GDEs), and seawater intrusion.

2.2.1 Groundwater Elevation and Flow

Groundwater movement in the Santa Clara Subbasin generally follows topographical and surface water patterns, flowing to the north/northwest toward the interior of the subbasin and San Francisco Bay. Groundwater also moves toward areas of intense pumping at the local scale. Groundwater occurs at different depths in the unconfined aquifer throughout the subbasin and under artesian conditions in the Santa Clara Plain confined aquifer.

In the Santa Clara Plain, regional groundwater elevations are typically highest near the margins, with elevations decreasing in the subbasin interior. Several large cones of depression are present within the confined area due to concentrated pumping. Except during periods of extended drought, the vertical gradient is upward in much of the confined area. There is a vertical downward gradient in the recharge area and near the confined area/recharge area boundary. Regional groundwater elevations in the Coyote Valley are typically highest at the groundwater divide near the Llagas Subbasin boundary, with a downward vertical gradient.

The groundwater elevation contour maps depict the groundwater table (or potentiometric surface) of the principal aquifer zone in the Santa Clara Subbasin for spring 2024 (Figure 2-8) and fall 2024 (Figure 2-9). The contour maps show a typical seasonal pattern, with higher groundwater elevations in the spring and lower elevations in the fall. This seasonal decline reflects a combination of different factors, including reduced managed recharge, drier hydrologic conditions, and increased groundwater demand during the summer months.

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Figure 2-8. Spring 2024 Principal Aquifer Groundwater Elevation Contours

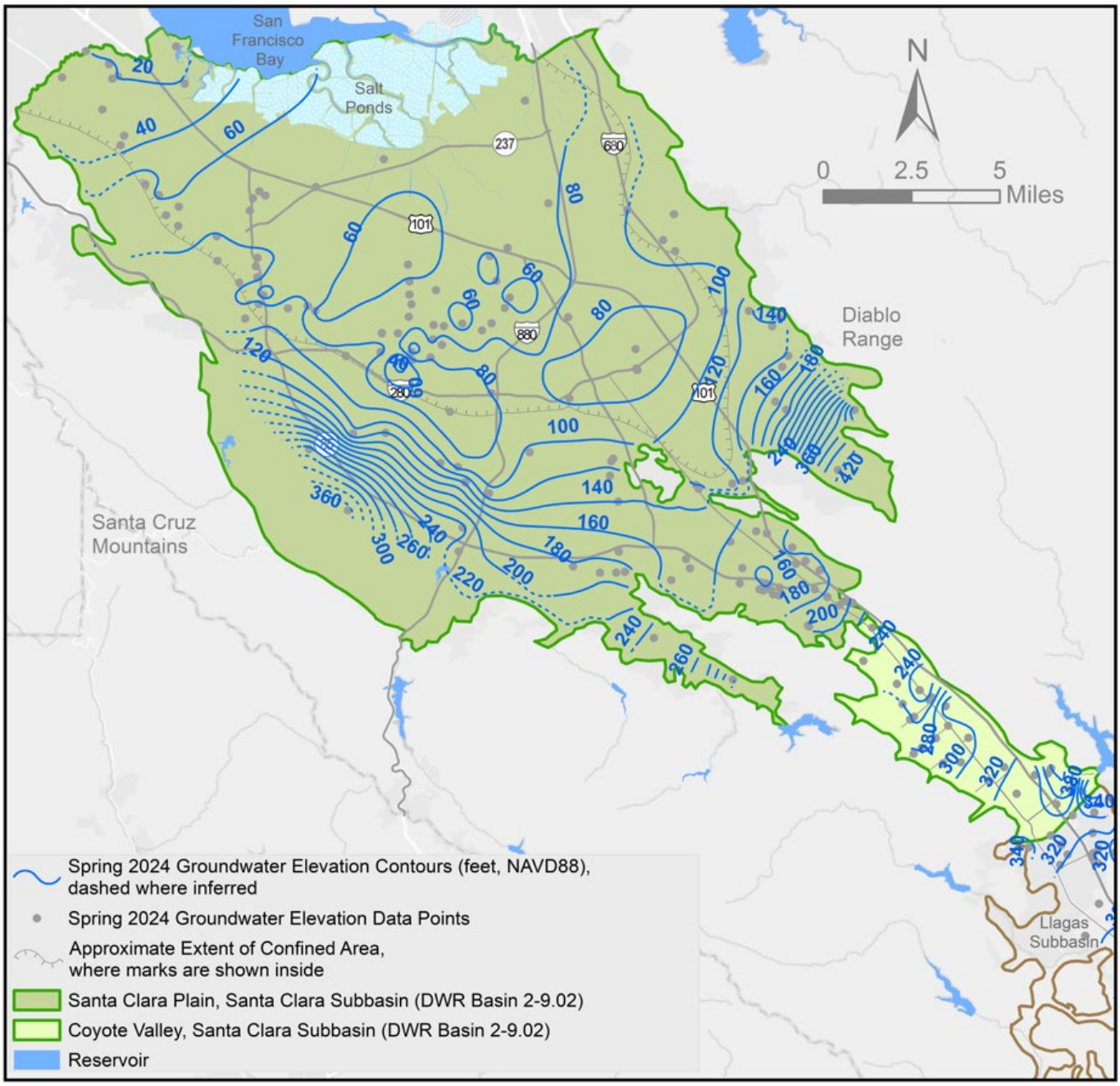

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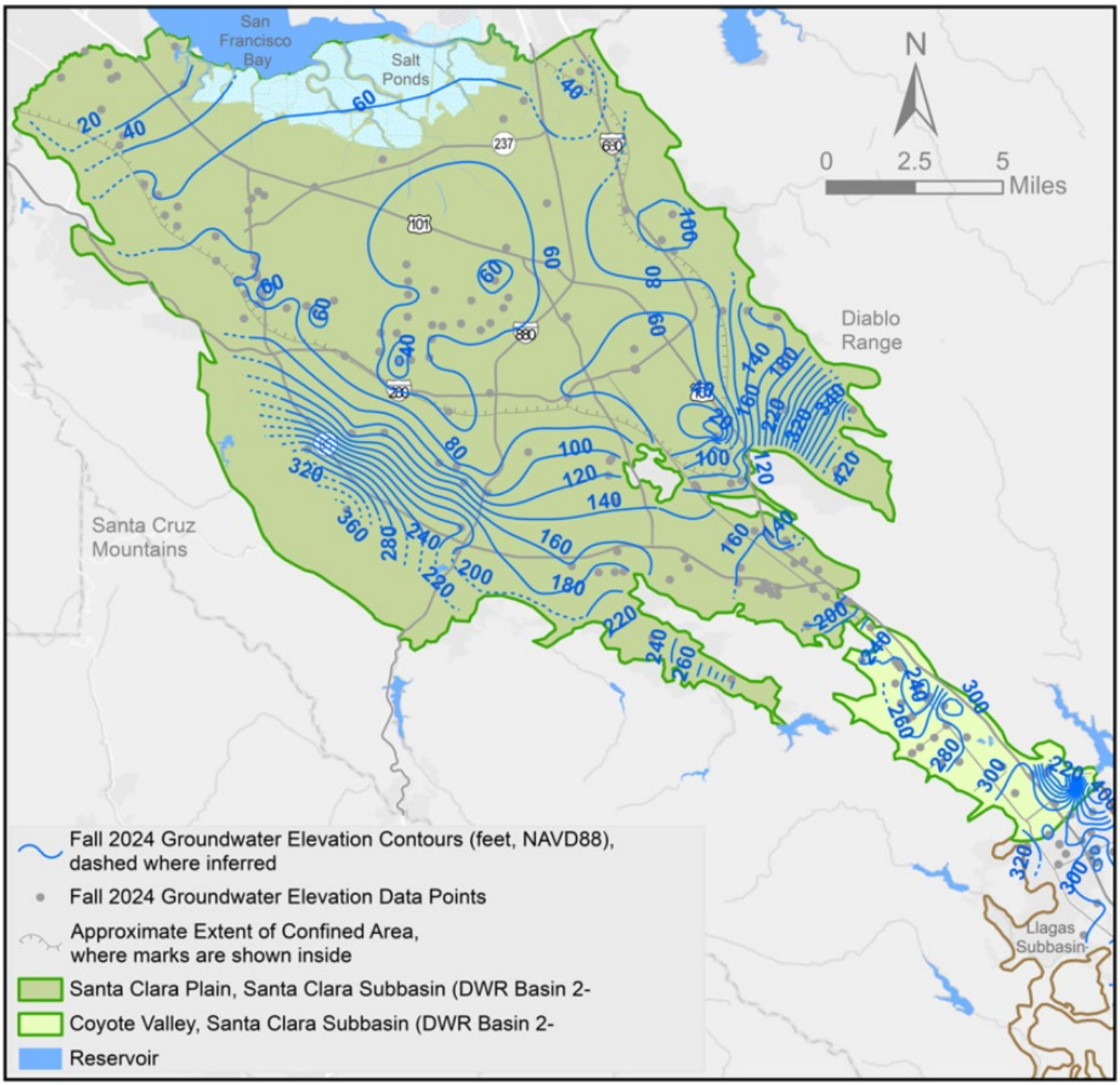
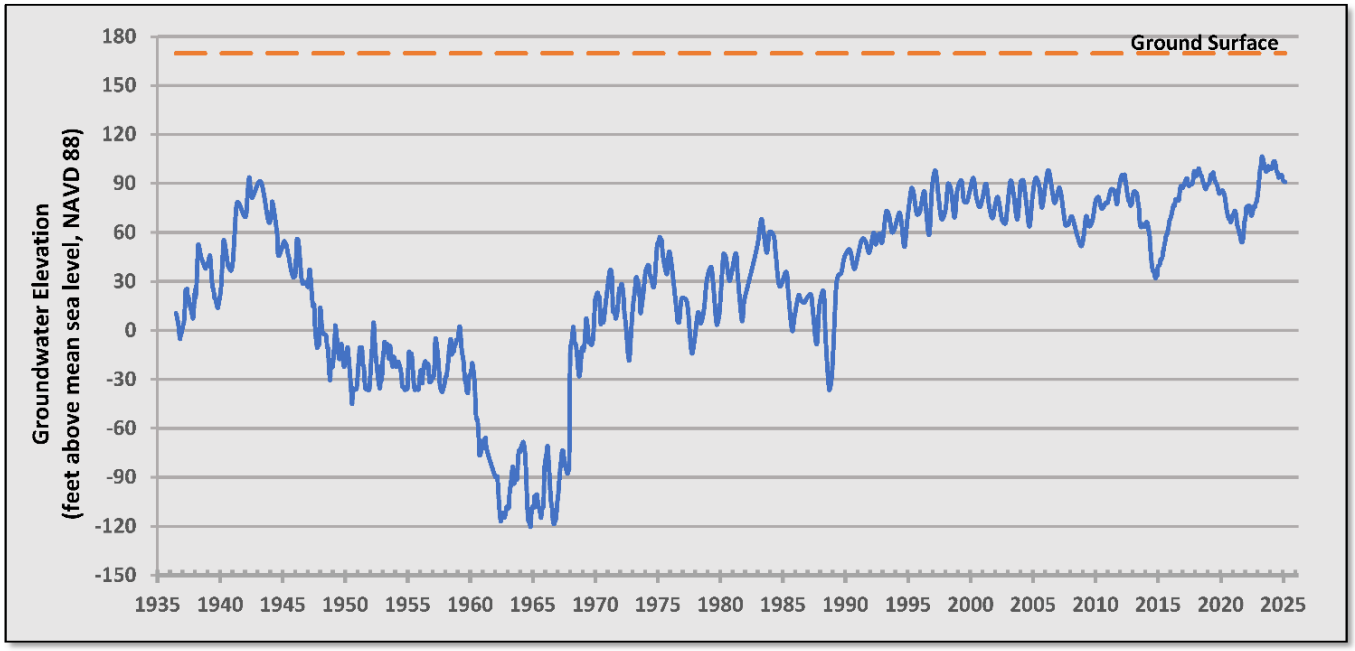
Figure 2-9. Fall 2024 Principal Aquifer Groundwater Elevation Contours



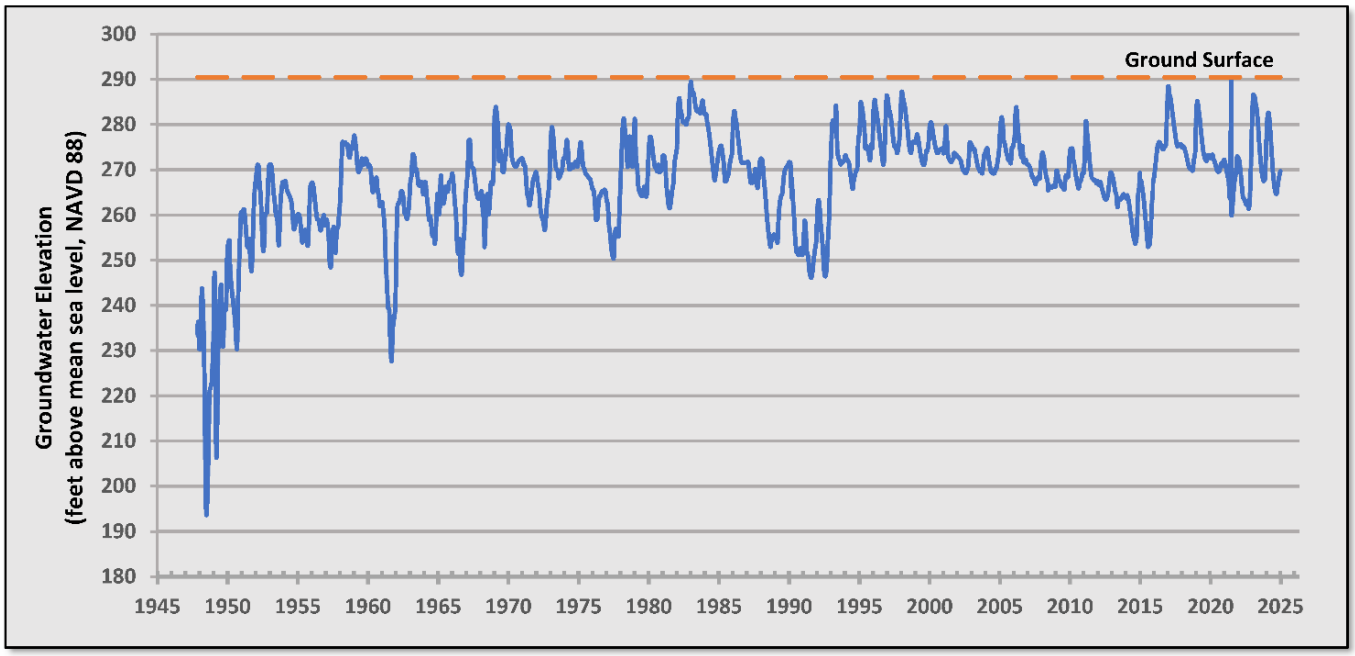
Figures 2-10 and 2-11 are long-term hydrographs for regional index wells in the Santa Clara Plain and Coyote Valley. As indicated on Figure 2-10, there has been a significant rebound in groundwater levels since the mid-1960s due to Valley Water efforts to import water and augment groundwater recharge both directly and through in-lieu recharge such as treated surface deliveries to retailers in lieu of pumping. Additionally, Valley Water's response to the 2012–2016 and 2020–2022 statewide droughts enabled a quick recovery in local groundwater levels (Figure 2-10 and 2-11).

Figure 2-10. Groundwater Elevation in the Santa Clara Plain Regional Index Well (07S01W25L001)



Note: NAVD 88 is the North American Vertical Datum of 1988.

Figure 2-11. Groundwater Elevation in the Coyote Valley Regional Index Well (09S02E02J002)



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2.2.2 Land Subsidence

The northern Santa Clara Valley was the first area in the United States where permanent land subsidence due to groundwater withdrawal was recognized.[45] From about 1915 to 1966, groundwater pumping in the Santa Clara Plain increased dramatically due to expanding agricultural use and population growth, resulting in a decline of groundwater levels by as much as 200 feet and long-term overdraft. Fluid pressure in the deeper principal aquifers was reduced, resulting in the dewatering and compression of fine-grained materials (e.g., clays) and a broad sagging of the land surface. Up to about 14 feet of inelastic (permanent) subsidence was observed in San José between 1915 and 1969. The land subsided by 3 to 6 feet over a large area encompassing north San José, Santa Clara, Sunnyvale, and Mountain View and subsidence of over a foot stretched over 100 square miles. Figure 2-12 shows contours of historical subsidence that occurred between 1934 and 1967.

Serious problems resulted from this subsidence, including flooding of lands adjacent to San Francisco Bay, decreased ability of local streams to carry away winter flood waters, and damage to utilities and infrastructure. These impacts necessitated the construction of additional dikes, levees, and flood control facilities to protect properties from flooding. The historic costs of subsidence have been estimated to be more than $756 million in 2013 dollars[46]. This amount is equivalent to about $1.095 billion in 2025 dollars (escalated based on the U.S. Bureau of Labor Statistic Consumer Price Index for the San Francisco-Oakland-Hayward Metropolitan Statistical Area from 2013 to 2025).

Significant inelastic (permanent) subsidence was essentially halted by about 1970 through Valley Water's expanded conjunctive management programs, which allowed artesian heads to recover substantially. However, some amount of elastic subsidence occurs annually in response to seasonal pumping and recharge as indicated by ground surface elevations measured by Valley Water's annual land surface elevation benchmark surveys and with Interferometric Synthetic Aperture Radar (InSAR).[47] Valley Water has established an acceptable subsidence rate of no more than 0.01 feet per year, based on multi-year average, which was endorsed by the Water Retailer Groundwater Subcommittee many decades ago. Valley Water has evaluated remaining land subsidence potential under prolonged overdraft conditions (see Figure 2-13) and has established water level thresholds at ten subsidence index wells.[48]These thresholds are the groundwater levels that must be maintained to ensure a low risk of unacceptable land subsidence, as described in Chapter 5.

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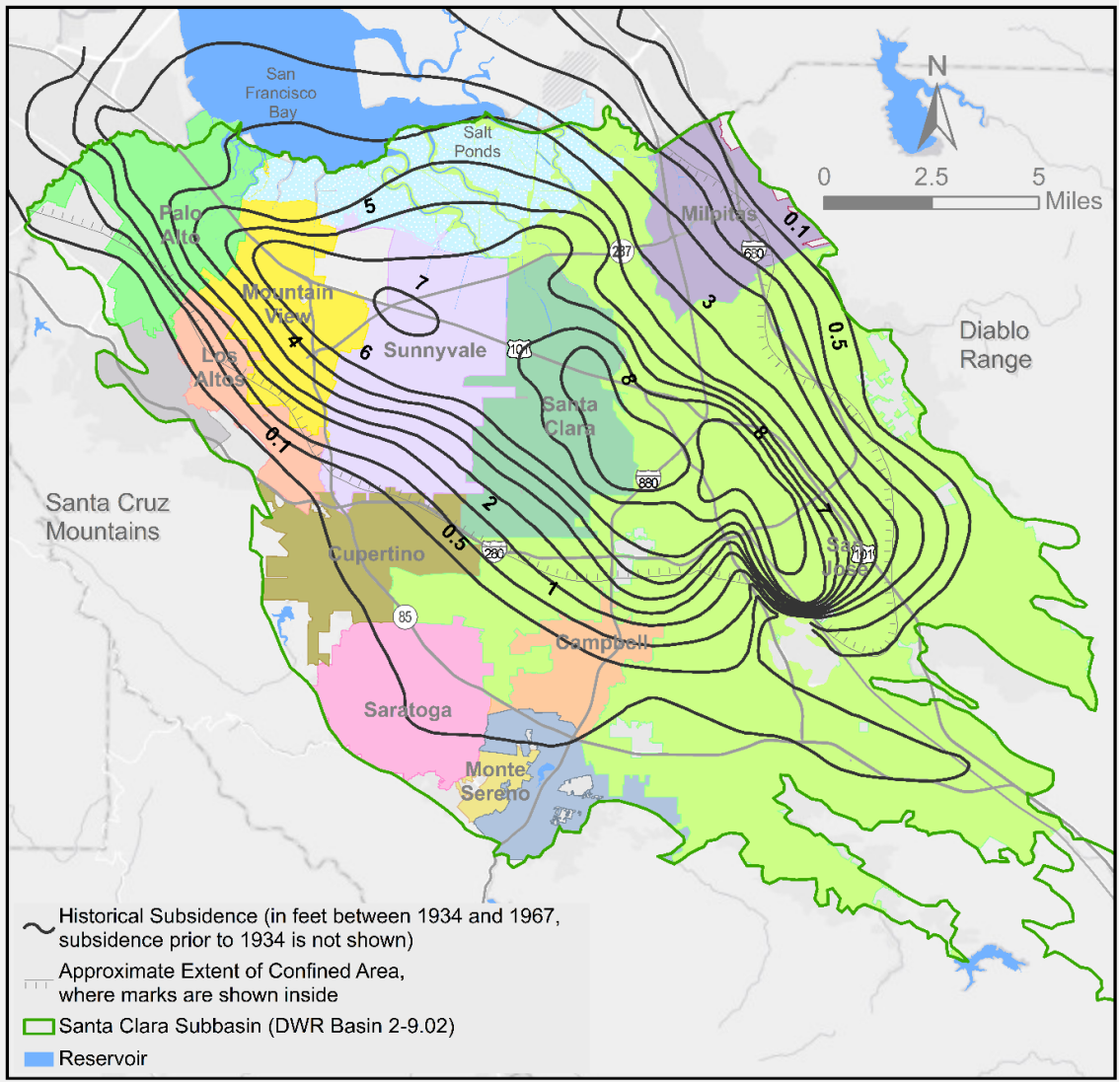
45 Poland and Ireland, Land Subsidence in the Santa Clara Valley, California, as of 1982,1988.
46 Borchers, J.W., and Carpenter, M., 2014, Land subsidence from groundwater use in California, Luhdorff & Scalmanini Consulting Engineers, 151 pages.
47 Schmidt and Burgmann, Time-Dependent Land Uplift and Subsidence in the Santa Clara Valley, California from a Large Interferometric Synthetic Aperture Radar Data Set, Journal of Geophysical Research: Solid Earth. 2003 Sep;108(B9).
48 Geoscience Support Services Inc., Subsidence Thresholds in the North County Area of Santa Clara Valley, 1991.

Figure 2-12. Historical Subsidence in the Santa Clara Plain (1934 to 1967)



Note: Historical subsidence contours from Poland and Ireland, 1988, Land Subsidence in the Santa Clara Valley, California, as of 1982, USGS Professional Paper 497-F.

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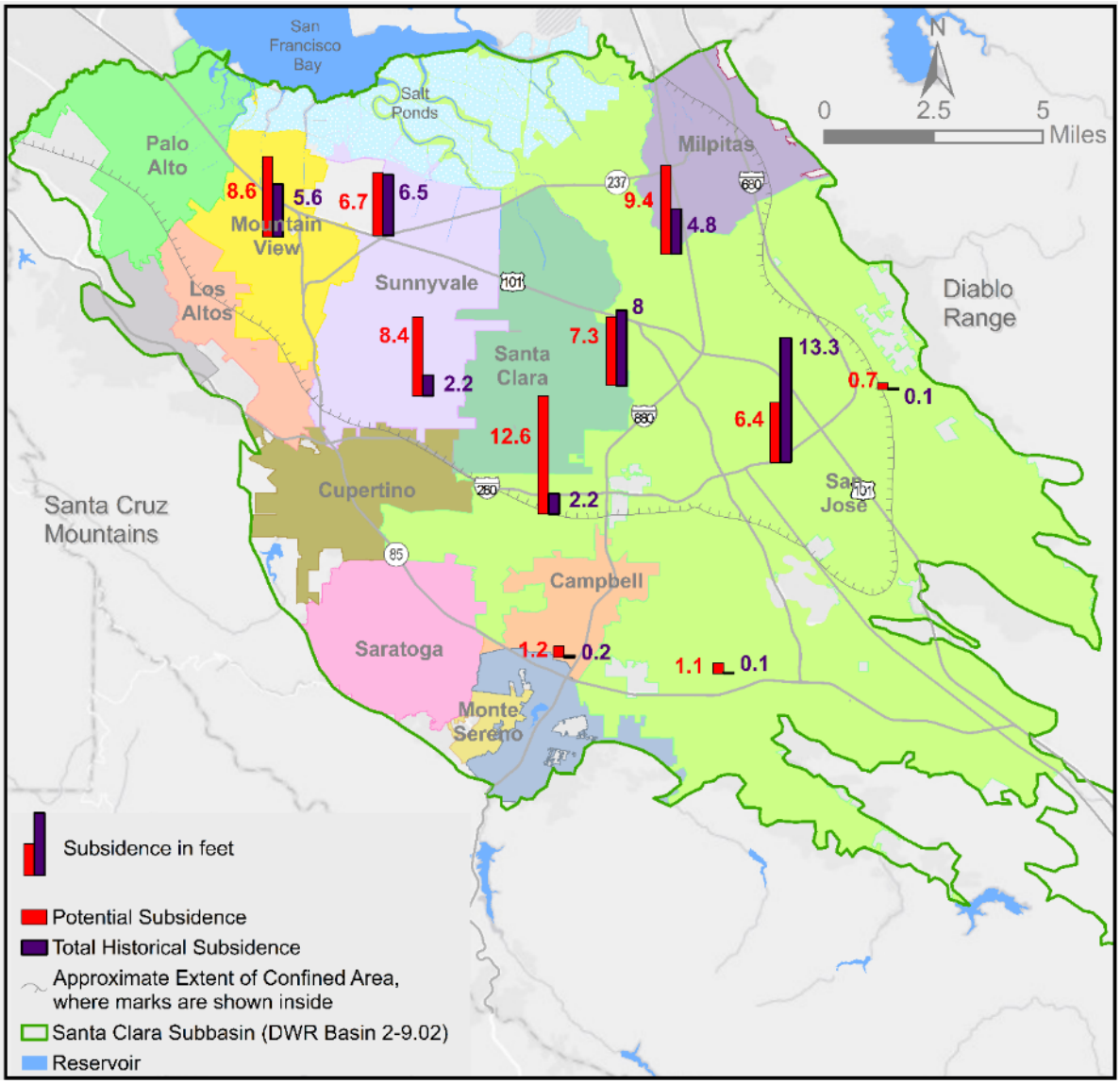
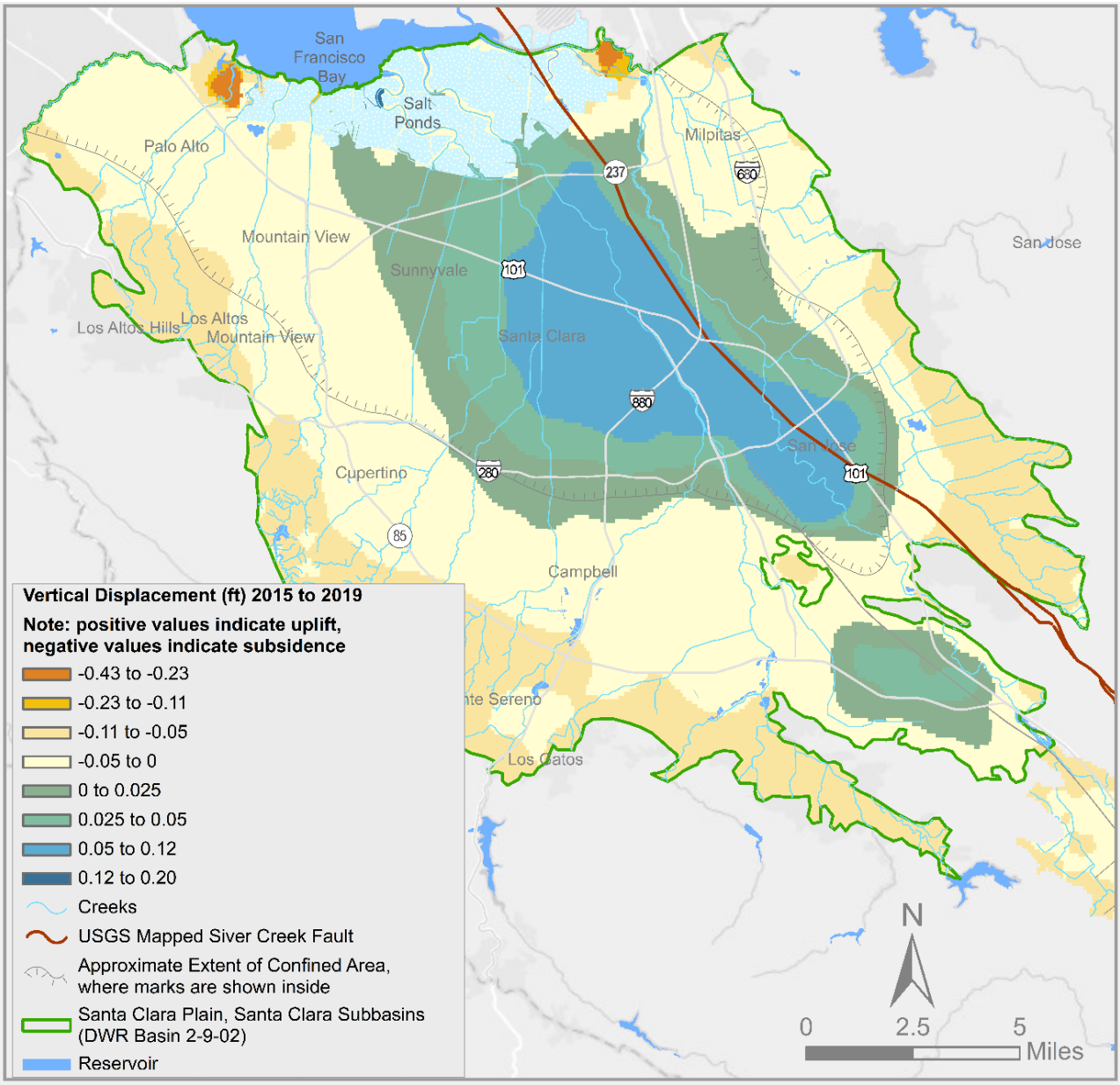
Figure 2-13. Historical and Potential Subsidence in the Santa Clara Plain



The nature of elastic subsidence and uplift in the Santa Clara Plain is illustrated by annual InSAR data. Figures 2-14 to 2-16 show vertical ground surface displacement estimates from InSAR data collected from 2015 to 2024 by the European Space Agency (ESA) Sentinel-1A satellite and processed by TRE ALTAMIRA under contract with DWR as part of DWR's SGMA technical assistance to GSAs[49]. While subsidence was measured by Valley Water's monitoring network during the 2012–2016 drought, between 2015 and 2019 groundwater levels (Figure 2-10) and storage recovered in the Santa Clara Plain, resulting in as much as 0.12 of uplift within the confined aquifer area (Figure 2-14). From 2019 to 2022, much of the confined aquifer area had subsidence (Figure 2-15) because groundwater levels and storage declined during the 2020–2022 drought. Following this drought, groundwater levels and storage recovered, resulting in as much as 0.20 feet of uplift from 2022 to 2024, because of increasing groundwater levels and recovery of groundwater storage. These patterns of subsidence during drought and subsequent uplift indicate that the subsidence was in the elastic (non-permanent) range. It is important to note that the two localized areas of subsidence on the west and east side of the salt ponds (Figure 2-14 to Figure 2-16) are likely caused by settlement of former and active landfills (Byxbee Park in Palo Alto and Newby Island landfill in San José) and not associated with groundwater pumping.

Figure 2-14. Vertical Ground Surface Displacement in the Santa Clara Plain from InSAR Data (2015 to 2019)



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49 https://data.cnra.ca.gov/dataset/tre-altamira-insar-subsidence

Figure 2-15. Vertical Ground Surface Displacement in the Santa Clara Plain from InSAR Data (2019 to 2022)

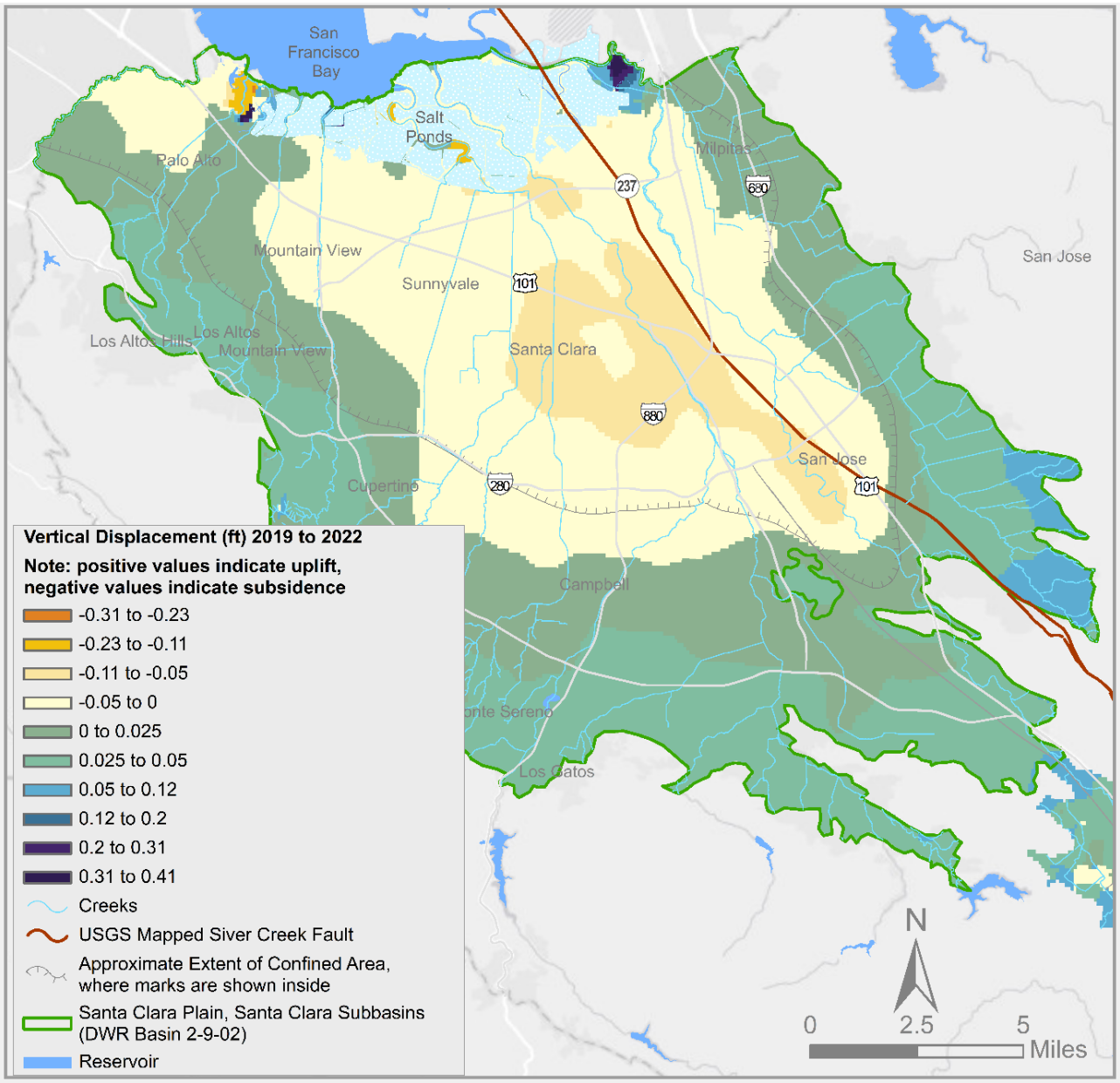

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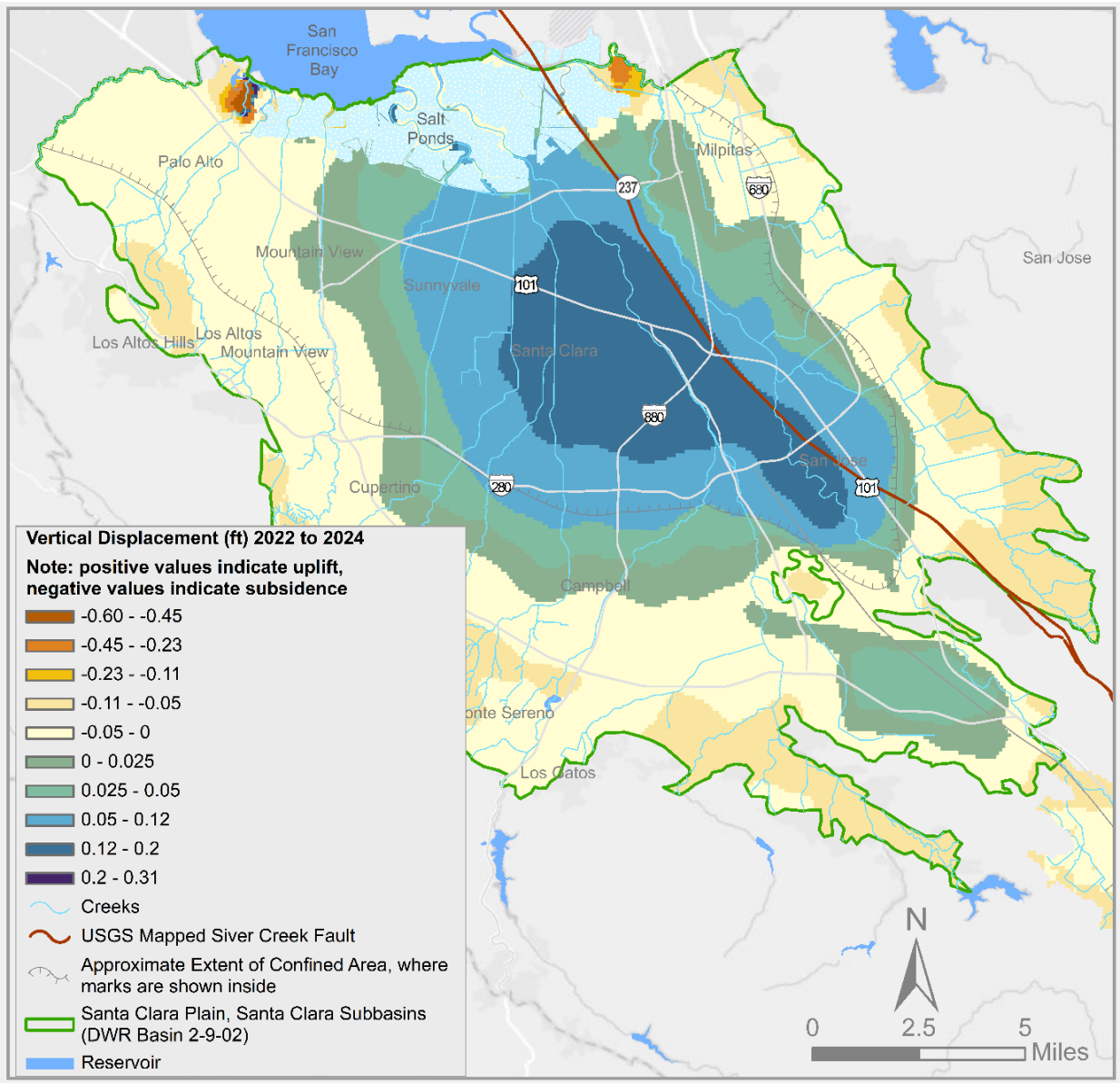
Figure 2-16. Vertical Ground Surface Displacement in the Santa Clara Plain from InSAR Data (2022 to 2024)



Even with managed recharge of local and imported water supplies, groundwater alone cannot meet the demands of the heavily urbanized Santa Clara Plain. Programs that reduce or offset groundwater pumping (e.g., treated water deliveries, water conservation, and water recycling) are critical to avoid long-term overdraft, additional subsidence, and seawater intrusion. The potential for renewed inelastic subsidence in the Santa Clara Plain is an ongoing concern, and Valley Water closely monitors and manages water supplies to minimize the risk of permanent subsidence recurring. In contrast, the Coyote Valley is predominantly composed of coarser-grained materials, and land subsidence has not been observed in that area.

2.2.3 Interconnected Surface Water and Groundwater

Valley Water's managed recharge program includes significant recharge through many miles of stream channels over the recharge area, indicating that groundwater and surface water generally are

disconnected[50] in these reaches. As described further below, the managed recharge program also helps to maintain flows in these creeks, most of which would otherwise flow only intermittently. Valley Water is not aware of any areas where groundwater pumping has a significant or unreasonable effect on interconnected surface water and groundwater.

Valley Water has a comprehensive surface water monitoring network to measure creek flows, comply with water rights reporting and reservoir restrictions, and meet environmental requirements. Stream gauging by Valley Water is discussed in Chapter 7. Surface water flow data can be used to evaluate which stream reaches are gaining or losing with regard to groundwater, as described below.

Figure 2-17 shows areas of known and suspected surface water and groundwater interaction. Identification of these areas is based on long-term field observations by Valley Water staff and is supported by differential gauging analyses. In general, an increase in stream discharge at a downstream gauge compared to an upstream gauge indicates that the reach is gaining and located in a groundwater discharge area. Conversely, a decrease in stream discharge indicates that the reach is losing and located in a groundwater recharge area. Valley Water's initial gauging analysis compared stream discharge at upstream and downstream gauges during the low-flow period of April through July 2018. Figure 2-17 has since been evaluated with additional field observations and a subsequent differential gauging analysis using an expanded dataset spanning 2015 through 2024. The updated analysis did not indicate substantial changes to the 2018 study locations or to the characterization of gaining and losing stream reaches in Figure 2-17. This evaluation was informed by the California Department of Water Resources' guidance documents for evaluating interconnected surface water and groundwater systems under SGMA.[51,52,53]

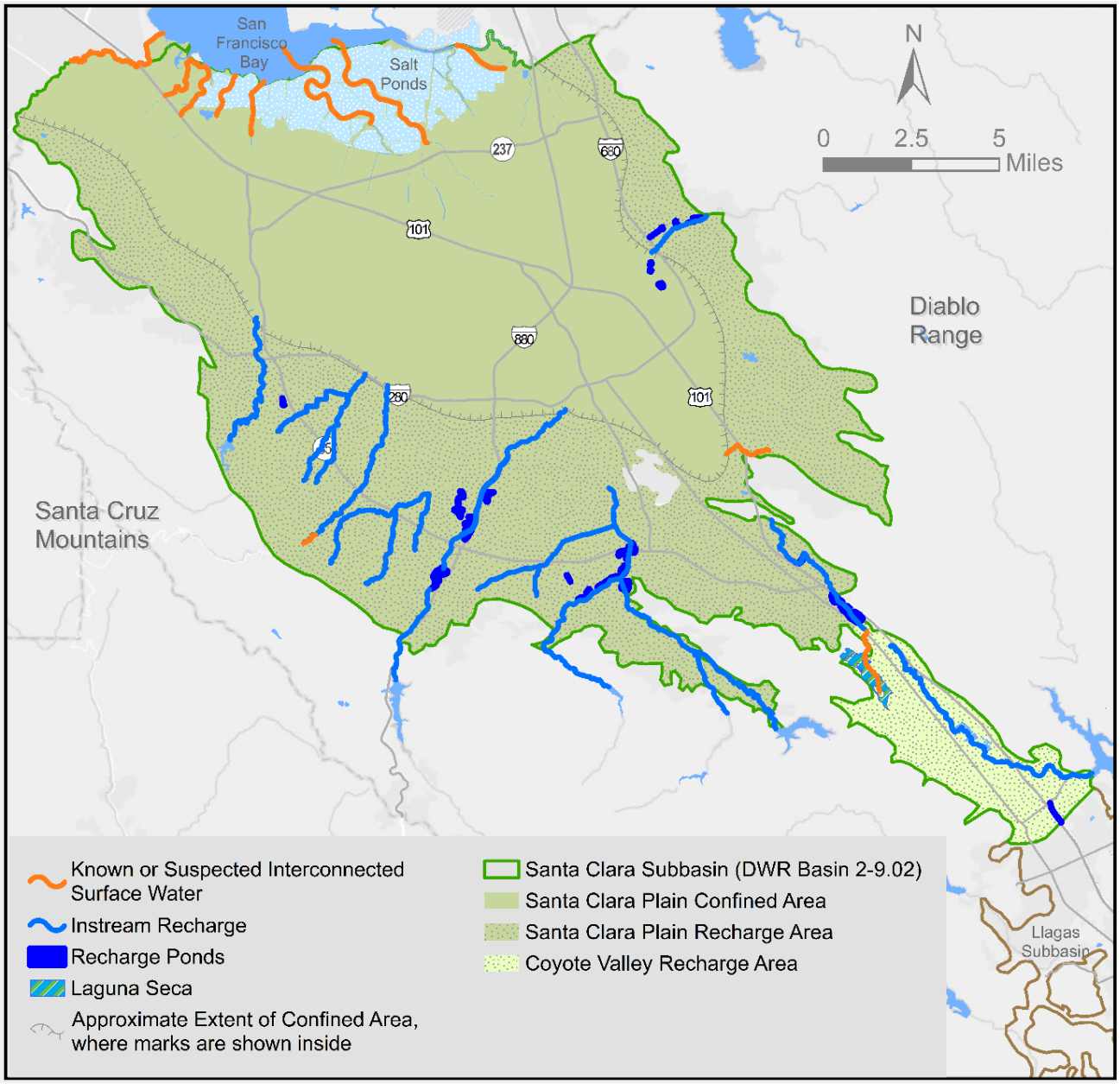
The Santa Clara Subbasin has primarily losing stream reaches that are used in Valley Water's instream managed recharge program, where stream water percolates downward through the stream channel and recharges the underlying aquifer (Figure 2-17). Natural streamflow and operational releases from Valley Water's local reservoirs provide nearly perennial flows during most years in many of the losing stream reaches, which were historically ephemeral streams prior to Valley Water's operations. Typically, under natural conditions, perennial streams are gaining streams that are supported by baseflow from groundwater discharge and thus are usually indicative of interconnected surface water and groundwater dependent ecosystems (GDEs). However, Valley Water's reservoir releases have created nearly perennial streams in losing stream reaches that are disconnected from the regional groundwater table. As a result, these reaches are not likely interconnected surface water and groundwater that supports GDEs under SGMA, as described below. Although these reaches are net losing overall, some segments may intermittently gain during the wet season.[54] Appendix F provides a more detailed discussion of surface water and groundwater interaction in the context of GDEs.

Natural stream flow in these losing reaches is augmented through Valley Water's release of local and imported water. While many of these creeks were historically dry during the summer months, the recharge program has extended the duration of flow. For example, data from the Coyote Creek Edenvale gauge (station number 5058) before and after construction of Anderson Dam indicate that, prior to the

50 A disconnected stream has an unsaturated zone that separates the streambed from the groundwater table, as shown in Figure 1, Appendix F of this 2026 GWMP.
51 Department of Water Resources (DWR), 2024a, Depletions of Interconnected Surface Water: An Introduction, draft guidance document, California Department of Water Resources, Sacramento, CA, published February 2024.
52 Department of Water Resources (DWR), 2024b, Techniques for Estimating Interconnected Surface Water Depletion Caused by Groundwater Use, draft guidance document, California Department of Water Resources, Sacramento, CA, published September 2024.
53 Department of Water Resources (DWR), 2024c, Examples for Estimating Interconnected Surface Water Depletion Caused by Groundwater Use, draft guidance document, California Department of Water Resources, Sacramento, CA, published September 2024.
54 Hanson, Hydrologic Framework of the Santa Clara Valley, 2015.

dam's construction, no flow was observed during most of May to November. After reservoir construction, flow was observed during the majority of those same months. Also, the number of months where daily flow was observed in Coyote Creek increased post-construction. This indicates that stream flows have increased due to Valley Water reservoir operation.

Figure 2-17. Santa Clara Subbasin Surface Water/Groundwater Interaction



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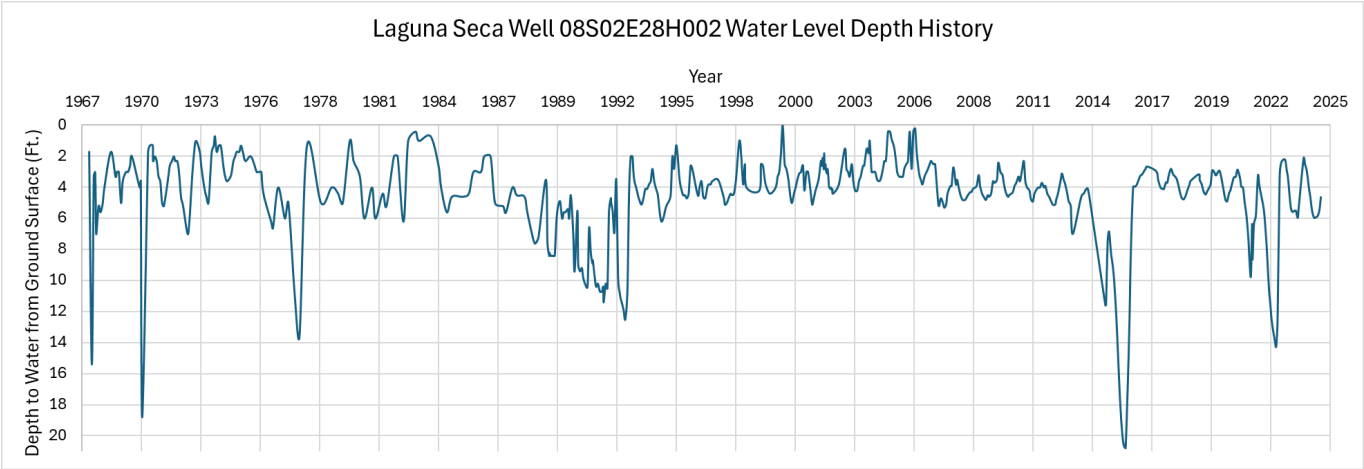
Gaining reaches in the Santa Clara Subbasin are primarily located in sections of the creeks overlying the confined area of the subbasin closer to San Francisco Bay (Figure 2-17). Exceptions to this are:

- San Francisquito Creek (northern Santa Clara Plain): Metzger (2002) studied San Francisquito Creek stream flow gains and losses between April 1996 and May 1997.[55] Stream flow losses were greatest in the reach from Sand Hill Road to Middlefield Road where the creek is underlain by coarse alluvium. Downstream of Middlefield Road, tidal effects and storm drain discharges made it difficult to quantify gains and losses. Groundwater hydrographs indicate the water table may intersect the stream bed in this reach, particularly in the winter and spring months. San Francisquito Creek was losing from Woodland Avenue to Newell Road. Downstream of Newell Road was gaining, but the source of the water could not be determined due to storm drain discharge and tidal influence. The average annual streamflow loss from San Francisquito Creek was estimated at 1,050 AF per year.
- Lower Silver Creek (eastern Santa Clara Plain): Valley Water field staff have identified a portion of Lower Silver Creek where groundwater discharges into surface water based on field observations.
- Saratoga Creek (western Santa Clara Plain): Tetrachloroethene (released into groundwater from a dry-cleaning facility) has been detected in Saratoga Creek near downtown Saratoga near the subbasin's western margin. This indicates that groundwater is seeping into the creek at least intermittently.
- Fisher Creek (western Coyote Valley): Surface water in Coyote Creek recharges groundwater along the southern and east sides of the Coyote Valley. Groundwater in the area generally flows towards the northwest, where it rises and discharges into Fisher Creek due to the complex geologic and hydrogeologic conditions of the area.
- Laguna Seca Area (northwestern Coyote Valley): Laguna Seca is an intermittent wetland caused by a combination of shallow groundwater and surface flooding. Iwamura (1976[56], 1995[57]) states that in the Laguna Seca area, before the development of agriculture and the installation of artificial drainage systems in 1916, surface flows in Fisher Creek would temporarily pond at the Laguna Seca area, creating swampy or marshy conditions as it overflowed into Coyote Creek. As surface flows in Fisher Creek ponded, groundwater levels in the fine, poorly drained shallow soils also rose and contributed to subsurface drainage to the creek and the greater Laguna Seca area. Groundwater levels in the Laguna Seca area have historically fluctuated in response to Valley Water's managed aquifer recharge along Coyote Creek and natural hydrologic conditions, declining during extended drought periods with reduced managed recharge and rebounding during wetter periods with increased Valley water managed recharge. Available groundwater monitoring data indicate that these fluctuations are temporary and reversible, with groundwater levels recovering following droughts and reduced managed recharge rather than exhibiting persistent long-term decline (Figure 2-18). As a result, the extent and duration of surface water expression in the Laguna Seca area has varied over time in response to changes in regional hydrologic conditions and Valley Water managed recharge operations.

55 Metzger, Streamflow Gains and Losses along San Francisquito Creek and Characterization of Surface-Water and Ground-Water Quality, Southern San Mateo and Northern Santa Clara Counties, California, 2002.
56 Iwamura, Shallow Groundwater Conditions Which Might Adversely Affect Land Use Planning in Southern Santa Clara County, 1976.
57 Iwamura, Hydrogeology of the Santa Clara and Coyote Valleys Groundwater Basins, California, 1995.

Figure 2-18. Laguna Seca Area Depth to Water



The historical ecology (Figure 2-19) and the depth to groundwater[58] (Figure 2-20) of the Santa Clara Subbasin can help evaluate surface water/groundwater interaction. Figure 2-19 presents historical ecology mapping developed by the San Francisco Estuary Institute (SFEI), which maps areas such as wetlands, marshes, and willow groves that may be associated with shallow groundwater. [59,60] Some of the wetland areas may have been present due to poorly draining soils rather than surface water/groundwater interaction. It is also important to note that this was the historical distribution circa the early 1800s, prior to development and does not represent current or even recent conditions. This figure also indicates that, historically, the Guadalupe River was the only perennial stream in the Santa Clara Subbasin. The other creeks were intermittent, running during the wet season, but dry in the summers.

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58 SCVWD, GIS Coverage of Depth to First Groundwater, 2021.
59 Beller, et al., Historical Vegetation and Drainage Patterns of Western Santa Clara Valley: A technical memorandum describing landscape ecology in Lower Peninsula, West Valley, and Guadalupe Watershed Management Areas, 2010.
60 Grossinger, et al., Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California, 2006.

Figure 2-19. Santa Clara Subbasin Historical Ecology

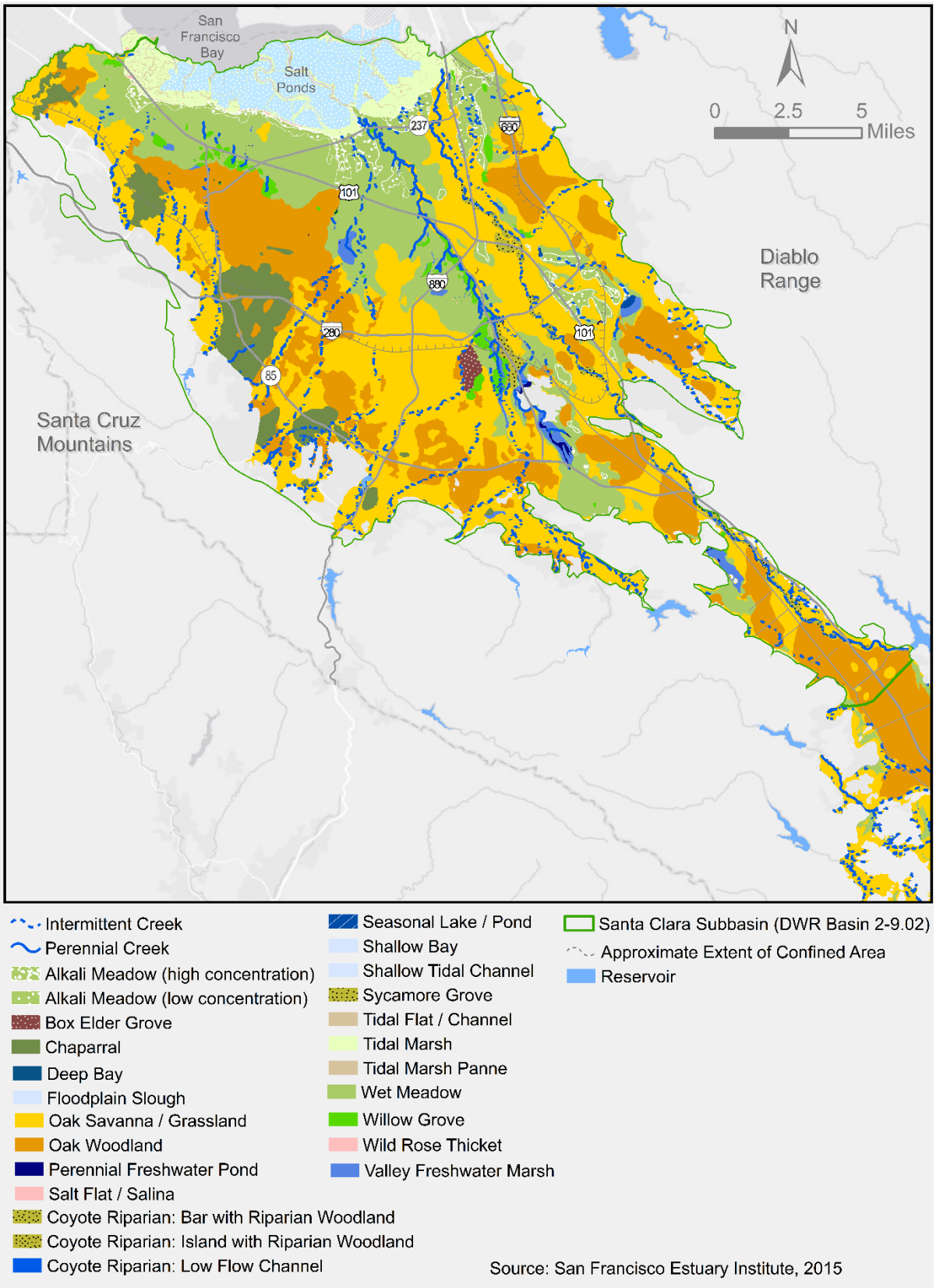
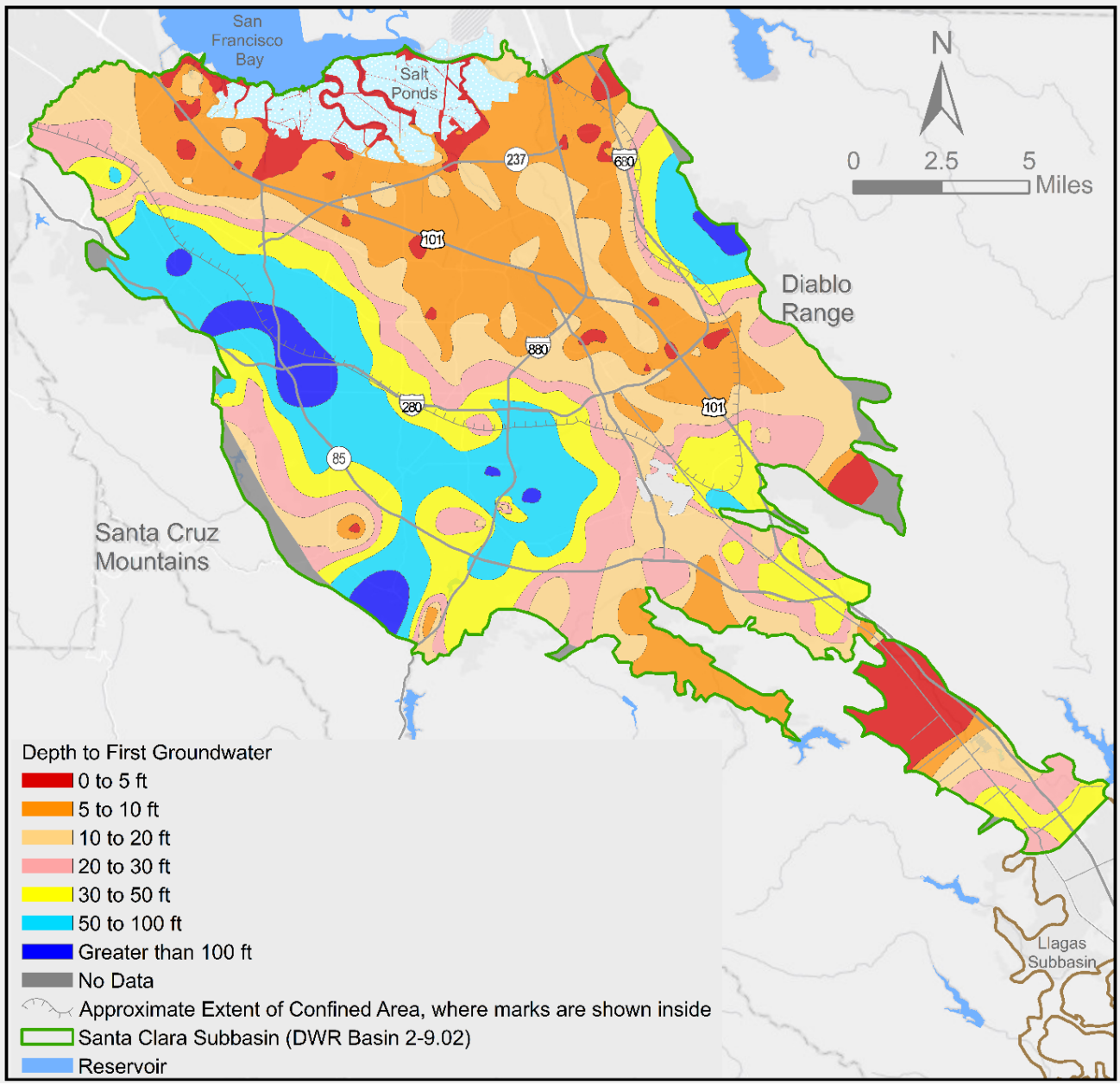


Figure 2-20 is a generalized depth to first groundwater map based primarily on data from contaminant release sites. This map reflects the shallowest groundwater encountered based on available historical water level data from 1978 to 2019, rather than a specific point in time. The data was compiled from the State Water Resources Control Board GeoTracker database and from Valley Water's monitoring programs. Areas exhibiting shallow groundwater would be more likely to have surface water/groundwater interaction and gaining stream reaches.

Figure 2-20. Depth to First Groundwater in the Santa Clara Subbasin



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2.2.4 Groundwater Dependent Ecosystems

The 2026 GWMP includes maps identifying groundwater dependent ecosystems (GDEs). Under SGMA, GDEs are "ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (23 CCR § 351(m)). GDEs in California include a wide range of natural communities, including wetlands, rivers, streams, estuaries, seeps and springs, and terrestrial vegetation. GDEs also include deep-rooted plants or plant communities that obtain water from the water table (called phreatophytes). A detailed technical memorandum that documents the current understanding, approach, and methods used to identify and map GDEs is included in Appendix F.

GDEs in the Santa Clara Subbasin are shown in Figure 2-21. This map was created by generally following The Nature Conservancy GDE guidance document[61]. Figure 2-21 is based on all California phreatophytes and identifies GDEs as likely (depth to water (DTW) less than 30 feet) and transition (DTW 30 to 50 feet). The DTW shown in Figure 2-21 was created using the median water level data between 2015 and 2024 from 758 wells and 202 Bayland point delineators in the Santa Clara Subbasin and a 30 ft LIDAR land surface elevation dataset. The GDE maps presented in the 2031 GWMP will be revised and updated as new information becomes available during each five-year Alternative Plan update cycle.

Figure 2-21 indicates that most of the GDEs in the Santa Clara Subbasin are located along stream reaches and in wetlands, such as the Laguna Seca area of northern Coyote Valley. Most of these stream reaches are losing reaches (Figure 2-17) and are actively used in Valley Water's managed in-stream recharge operations. These recharge operations rely on natural streamflow and operational releases from Valley Water's 10 local reservoirs and imported water pipelines. These releases provide nearly perennial flows during many years in losing stream reaches that were historically ephemeral (intermittent) streams (Figure 2-19) prior to Valley Water's operations. The reservoir releases have created nearly perennial flow in losing streams that are disconnected from the regional water table and thus are not interconnected surface water or GDEs. Figure 2-21 does not include phreatophytes overlying DTW greater than 50 feet because the DTW exceeds rooting depths. Many reaches downstream of reservoirs overlie likely and transition DTW categories and contain GDEs that are supported by both surface water augmented flows and groundwater. Therefore, some GDEs in Figure 2-21 are supported solely by groundwater and others are supported by a combination of surface water and groundwater. Because indicator phreatophytes are essentially identical along these reaches, it is very difficult to distinguish between the GDEs that are supported by groundwater only and those supported by a combination of surface water and groundwater.

Table 2-1 summarizes the area of GDEs in each groundwater management area of the Santa Clara Subbasins. The Santa Clara Subbasin has a total of 3,372 likely and transition acres of GDEs, including 2,318 acres in the Santa Clara Plain and 1,054 acres in the Coyote Valley. The Coyote Valley has a relatively large density of GDE area, given the management area's smaller overall area compared to the Santa Clara Plain.

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61 Rohde, M. M., S. Matsumoto, J. Howard, S. Liu, L. Riege, and E. J. Remson. 2018. Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans. The Nature Conservancy, San Francisco, California, 93 pages.

Figure 2-21. Groundwater Dependent Ecosystems in the Santa Clara Subbasin

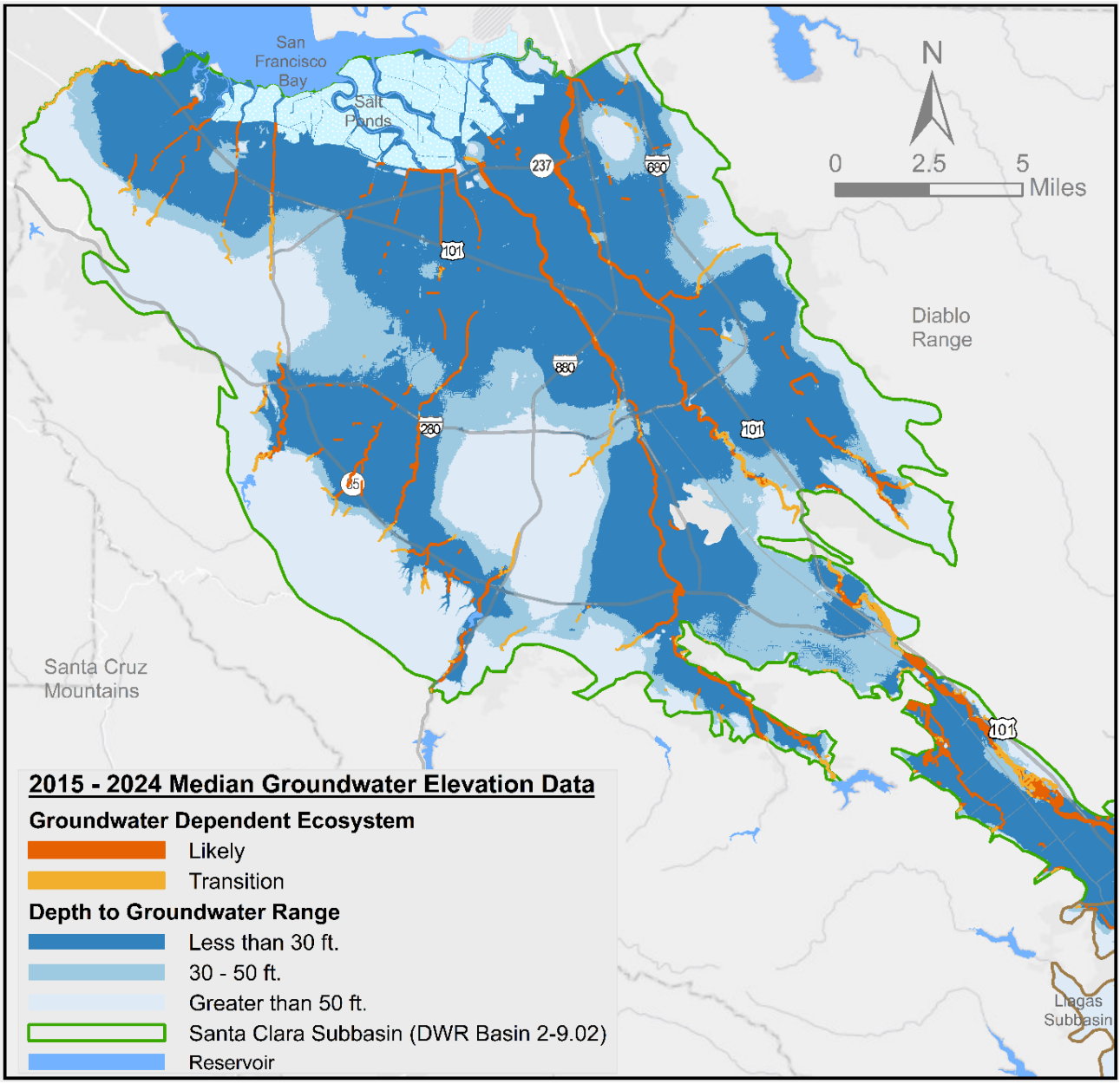

Table 2-1. Groundwater Dependent Ecosystem Area in the Santa Clara Subbasin

GDE Category	Santa Clara Subbasin		Total (Acres)
	Santa Clara Plain (acres)	Coyote Valley (acres)	
Likely GDE	1,957	697	2,654
Transition	361	357	718
Total (acres)	**2,318**	**1,054**	**3,372**

As explained in Chapter 4, the Santa Clara Subbasin has sustainable groundwater supply conditions. Many of the GDEs in the Santa Clara Subbasin (Figure 2-21) overlie the confined area of the Santa Clara Plain where most groundwater supply wells are screened in the principal aquifer zone. In the confined area, the principal and shallow aquifer zones are separated by the regional aquitard (Figure 2-4 and 2-5). Therefore, groundwater pumping from the principal aquifer in the confined area of the Santa

Clara Plain is disconnected from the shallow aquifer zone and does not affect GDEs. As explained above and in Appendix F, most GDEs in the recharge (unconfined) areas of the Santa Clara Plain and Coyote Valley are along losing stream reaches that are disconnected from the regional water table and thus are not interconnected surface water. Because these losing stream reaches are not interconnected surface water and streamflow is supported by natural runoff and in-stream recharge operations, GDEs are not affected by groundwater pumping in these recharge areas of the Santa Clara Plain and Coyote Valley. Valley Water's groundwater management activities, including managed recharge operations in Coyote Valley have maintained sustainable groundwater supply conditions in the northern Coyote Valley that support GDEs, including Laguna Seca. Long-term groundwater levels are stable, as shown in Figure 2-18, and demonstrate sustainable groundwater conditions in Coyote Valley. Droughts of limited duration may suppress the shallow water table, but effects to GDEs are expected to be minimal with continued management activities. Subsequent chapters of the GWMP describe Valley Water's extensive groundwater monitoring networks and comprehensive groundwater management activities that will continue to ensure groundwater sustainability in the Santa Clara Subbasin that help support GDEs.

2.2.5 Groundwater Quality

Valley Water has monitored and evaluated groundwater quality in the Santa Clara Subbasin for decades, with regular testing since the mid-1980s. Water quality data presented and summarized in this section represents data collected by Valley Water and other agencies from 2015 to 2024. The primary source for data collected by other agencies is compliance sampling for public water supply wells submitted by water retailers to the DDW. Valley Water's groundwater monitoring and evaluation allows for an appraisal of current conditions and offers a consistent basis for detecting near-term and long-term trends. The Santa Clara Subbasin generally produces groundwater of good quality that does not need treatment beyond disinfection. Groundwater quality data for the Santa Clara Plain and Coyote Valley groundwater management areas are discussed separately, below.

2.2.5.1 Santa Clara Plain

Groundwater in the Santa Clara Plain is typically of very good quality, with infrequent detections of water-quality parameters above health-based Maximum Contaminant Levels (MCLs). Figures 2-22 and 2-23 show concentrations in the principal aquifer relative to MCLs and aesthetic-based secondary MCLs (SMCLs) [62] for the period 2015 to 2024. The 10 years of data includes Valley Water monitoring data and water quality data acquired from DDW. Eighty-eight percent (88%) of the Santa Clara Plain principal aquifer wells evaluated meet health-based MCLs. Parameters detected above the MCL include aluminum, chromium, chromium 6, 1,1-Dichloroethene, 1,2,3-Trichloropropane, Di(2-Ethylhexyl) Phthalate, fluoride, lead, nitrite (as N), PFOA, and PFOS (Figure 2-22). No radioactive parameters were detected above the MCL.

Since the 2021 GWMP, many local water retailers have tested their wells for per- and polyfluoroalkyl Substances (PFAS), including PFOA and PFOS (Figure 2-22). All retailers, except for one, that sampled for PFAS in their wells have not found widespread PFAS detections. The one affected retailer has removed its PFAS-impacted wells from distribution and is pursuing wellhead treatment. Valley Water continues to evaluate and analyze PFAS data from all sources including public water supply wells and Valley Water's voluntary sampling programs. Since October 2020, staff from Valley Water, San José Water Company, the San Francisco Bay Regional Water Quality Control Board, and DDW have met regularly to discuss regional PFAS conditions, including impacted water supply wells. Valley Water will continue to collaborate with water retailers and regulatory agencies to better understand PFAS occurrence, evaluate potential sources, and identify any actions that may be needed to protect local water supplies.

62 Maximum Contaminant Levels (MCLs) are health-based drinking water standards established by the California Division of Drinking Water or U.S. Environmental Protection Agency. Secondary MCLs are aesthetic-based standards established by these agencies to address aesthetic issues such as taste and odor.

Some constituents also have SMCLs based on their ability to affect the aesthetic properties of water through taste, color, odor, or by causing staining or scale formation. The SMCL for these parameters may be a single value or a range with a lower (recommended) and upper threshold. Aluminum, chloride, color, iron, manganese, odor threshold, specific conductance, TDS, and turbidity were detected above the SMCL (Figure 2-23).

Tables 2-2 and 2-3 present summary statistics for all inorganic water-quality parameters in the shallow and principal aquifers, respectively. Inorganic parameters include trace elements (i.e., metals such as aluminum, chromium, and lead), major ions (fluoride), nutrients (nitrate, nitrite, phosphate), and radioactive parameters (i.e., gross alpha or beta particle activity). Inorganic constituents are typically naturally occurring and can leach from rocks and sediments in contact with groundwater. Anthropogenic sources include industrial and manufacturing facilities. Calcium, magnesium, and bicarbonate are the dominant dissolved parameters in the Santa Clara Plain. Variation from this includes groundwater with sodium bicarbonate, sodium chloride, and mixed cation-mixed anion character. The 2015 to 2024 median TDS concentration in the principal aquifer zone was 420 milligrams per liter (mg/L). TDS occurs at higher concentrations at depth in some localized areas including Evergreen (southeast San José) and Palo Alto. Nitrate is naturally occurring in groundwater at low concentrations and is likely a legacy issue from agricultural land use, which was widespread historically throughout the Santa Clara Subbasin. Nitrate (as N) and nitrite (as N) were detected in Santa Clara Subbasin wells. Some areas in the shallow aquifers adjacent to salt ponds and tidal creeks near San Francisco Bay have been affected by seawater intrusion, as indicated by higher chloride and other indicators in some shallow monitoring wells. This condition is discussed more in section 2.2.6.

Tables 2-4 and 2-5 present the organic chemicals detected in the shallow and principal aquifers, respectively. Although some organic chemicals are detected in the Santa Clara Plain, detections are infrequent and are typically low concentrations.[63] Organic compounds include Volatile Organic Compounds (VOCs), such as 1,2,3-Trichloropropane and pesticides (glyphosate, atrazine, etc.), and are present in many household, commercial, and industrial products. Groundwater quality in the principal aquifer zone is of high quality with respect to organic compounds. While there are localized detections of some VOCs in the Santa Clara Plain, there are minimal impacts to deep drinking water aquifers despite hundreds of sites with known releases in the shallow aquifer zone.

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63 Lawrence Livermore National Laboratory, California Aquifer Susceptibility, A Contamination Vulnerability Assessment for the Santa Clara and San Mateo County Groundwater Basins, 2004.

Figure 2-22. Santa Clara Subbasin Principal Aquifer Concentrations Relative to Primary Drinking Water Standards (2015–2024)

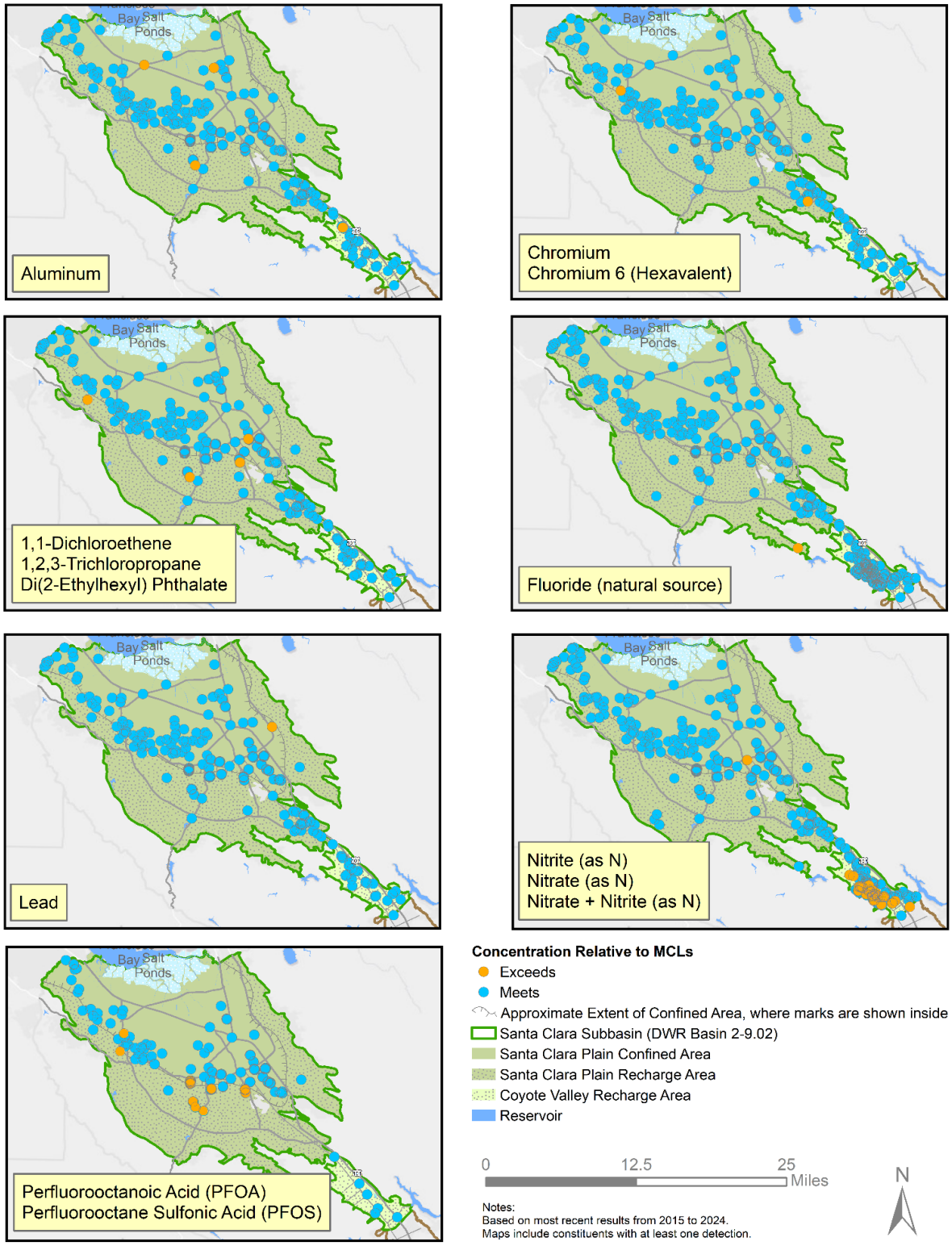
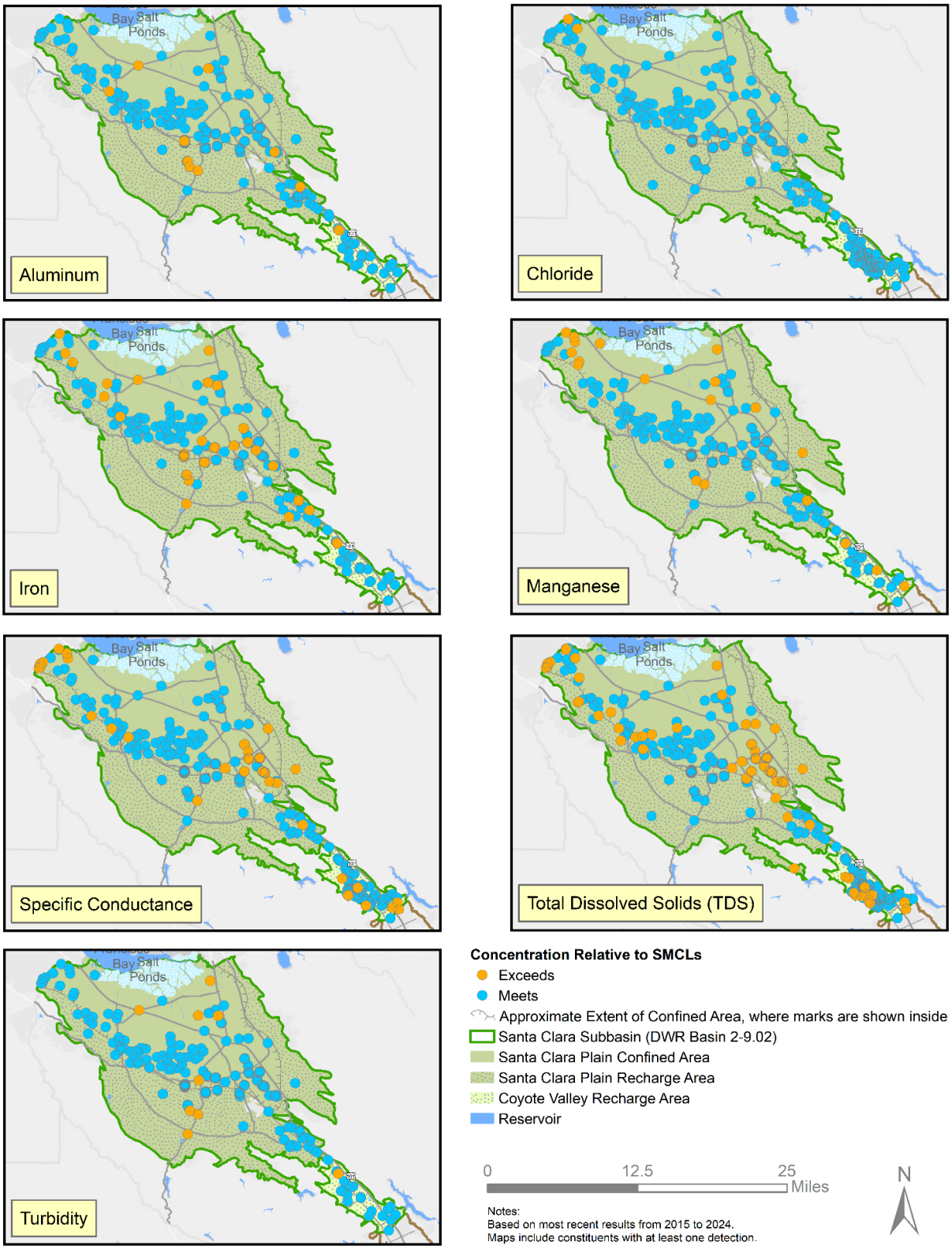


Figure 2-23. Santa Clara Subbasin Principal Aquifer Concentrations Relative to Secondary Drinking Water Standards (2015–2024)



Notes:
SCML exceedances for color and odor threshold are not depicted in this figure.

Table 2-2. Santa Clara Plain Shallow Aquifer Zone Water Quality Summary (2015–2024)

Parameter	Unit[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Aggressive Index (Corrosivity)	INDEX	-	-	13	11.7	12.3	13.0
Aluminum	µg/L	1,000	200	297	ND	6.93	3,800
Antimony	µg/L	6	-	297	ND	ND	ND
Arsenic	µg/L	10	-	297	ND	0.630	29.0
Asbestos	MFL	7	-	7	ND	ND	ND
Barium	µg/L	1,000	-	297	ND	101	980
Beryllium	µg/L	4	-	297	ND	ND	ND
Bicarbonate (as HCO3)	mg/L	-	-	245	ND	390	2,210
Bicarbonate Alkalinity (as CaCO3)	mg/L	-	-	216	ND	328	1,810
Boron	µg/L	-	-	280	ND	202	7,860
Bromate	µg/L	10	-	6	ND	ND	ND
Bromide	mg/L	-	-	227	ND	0.180	116
Cadmium	µg/L	5	-	297	ND	ND	ND
Caffeine	µg/L	-	-	15	ND	ND	ND
Calcium	mg/L	-	-	293	24.8	84.4	774
Calcium (as CaCO3)	mg/L	-	-	279	62.0	224	6,640
Carbon Dioxide	µg/L	-	-	8	ND	3,430	10,000
Carbonate (as CO3)	mg/L	-	-	209	ND	ND	ND
Carbonate Alkalinity (as CaCO3)	mg/L	-	-	204	ND	ND	2.00
Chloride	mg/L	-	(250)	318	ND	57.5	28,100
Chromium	µg/L	50	-	297	ND	0.960	20.0
Chromium 6 (Hexavalent)[7]	µg/L	10	-	249	ND	0.340	5.60
Cobalt	µg/L	-	-	134	ND	ND	10.0
Color	Color Units	-	15	11	ND	2.60	10.0
Copper[8]	µg/L	1,300	1,000	294	ND	0.320	27.3
Cyanide	µg/L	150	-	24	ND	ND	ND
Dissolved Oxygen	mg/L	-	-	251	0.320	2.78	10.6
E. Coli (MPN)	MPN/ 100 mL	-	-	7	ND	ND	ND
E. Coli (P/A)	P/A 100 mL	-	-	45	5 Present; 40 Absent		
Fluorescein	µg/L	-	-	22	ND	ND	0.0200
Fluoride (natural source)	mg/L	2	-	246	ND	0.100	1.75
Foaming Agents (MBAS)	µg/L	-	500	13	ND	ND	ND
Hardness, Total (as CaCO3)	mg/L	-	-	303	80.0	386	11,700

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Parameter	Unit[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Heterotrophic Plate Count	CFU/mL	-	-	9	280	7,440	68,000
Hydroxide (as OH)	mg/L	-	-	216	ND	ND	ND
Hydroxide Alkalinity (as CaCO3)	mg/L	-	-	130	ND	ND	ND
Iron	µg/L	-	300	294	6.00	772	44.0
Langelier Index @ 60 C	INDEX	-	-	11	0.850	1.20	1.50
Langelier Index at Source Temp	INDEX	-	-	3	0.720	0.820	0.910
Lead[8]	µg/L	15	-	295	ND	ND	13.0
Lithium	µg/L	-	-	133	ND	7.30	200
Magnesium	mg/L	-	-	294	11.4	47.9	8,640
Manganese	µg/L	-	50	294	ND	51.3	10,100
Mercury	µg/L	2	-	298	ND	ND	1.90
Molybdenum	µg/L	-	-	134	ND	1.89	32.0
Nickel	µg/L	100	-	298	ND	0.600	24.1
Nitrate (as N)	mg/L	10	-	279	ND	0.600	12.5
Nitrate + Nitrite (as N)	mg/L	10	-	18	ND	1.90	3.70
Nitrite (as N)	mg/L	1	-	124	ND	ND	0.150
Odor Threshold @ 60 C	TON	-	3	13	ND	ND	2.00
Orthophosphate (as PO4)	mg/L	-	-	238	ND	0.0660	5.39
Oxidation Reduction Potential (ORP)	mV	-	-	318	ND	130	414
Perchlorate	µg/L	6	-	234	ND	ND	ND
pH	pH Units	-	-	416	6.37	7.37	9.00
Potassium	mg/L	-	-	294	ND	1.47	639
Selenium	µg/L	50	-	298	ND	ND	110
Silica	mg/L	-	-	251	ND	23.6	36.2
Silicon	mg/L	-	-	146	ND	11.1	144
Silver	µg/L	-	100	293	ND	ND	ND
Sodium	mg/L	-	-	294	18	54.7	80,000
Source Temperature	C	-	-	359	13.8	19.9	26.2
Specific Conductance	µS/cm	-	(900)	657	2.48	928	98,500
Sulfate	mg/L	-	(250)	244	5.50	63.1	3,620
Thallium, Total	µg/L	2	-	298	ND	ND	ND
Total Alkalinity (as CaCO3)	mg/L	-	-	263	ND	316	1,810
Total Coliform (MPN)	MPN/ 100 mL	-	-	7	ND	2.57	21.6

Parameter	Unit[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Total Coliform (P/A)[9]	P/A 100 mL	-	-	45	22 Present; 23 Absent		
Total Dissolved Solids (TDS)	mg/L	-	(500)	281	182	512	94,400
Turbidity	NTU	-	5	610	ND	0.590	663
Vanadium, Total	µg/L	-	-	281	ND	1.63	13.0
Zinc	µg/L	-	5,000	293	ND	ND	100

Notes:
Table includes data for wells monitored by the Valley Water (annual monitoring network wells and water supply wells) and public water system data reported to the CA Division of Drinking Water (DDW).
Only wells with known construction information are presented in this table. Public water system wells are assumed to represent the principal zone if no construction information is available, as these are typically deep wells. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
[1] C = degrees Celsius; CFU/mL = colony-forming units per milliliter; MFL = million fibers per liter; mg/L = milligrams per liter; MPN/100 mL = most probable number per 100 milliliters; mV = millivolts; NTU = Nephelometric Turbidity Units; P/A 100 mL = present/absent per 100 milliliters; TON = threshold odor number; µg/L = micrograms per liter; µS/cm = microSiemens per centimeter.
[2] MCL = Maximum Contaminant Level specified in the Code of Federal Regulations 40CFR141 and/or Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
[3] SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per DDW or US EPA. For SMCLs having a range, the lower, recommended threshold is listed in parentheses.
[4] Some parameters may have been analyzed more than once at a particular well.
[5] For parameters with results with multiple reporting limits, the median was computed using the Maximum Likelihood Estimate (MLE) method. Reported values were rounded to three significant figures for consistency. ND = not detected at the laboratory reporting limit.
[6] The minimum shown is the lowest detected value. The lowest reporting limit (e.g., <5) is shown when there are no quantified values at the lowest reporting limit.
[7] In October 2024, an MCL of 10 parts per billion (ppb) (equivalent to 10 µg/L) for hexavalent chromium (chromium-6) in drinking water took effect.
[8] Lead and copper do not have primary MCLs but have "action levels" of 15 and 1,300 µg/L, respectively. These substances are regulated by the state for public water systems since they can adversely affect public health.
[9] Total coliform and e. coli bacteria are regulated under the US EPA Total Coliform Rule, which identifies sampling requirements and compliance criteria based on the type of public water system. All wells with data in bacteria results in this table are private, domestic wells that are not subject to federal or state drinking water requirements.

Table 2-3. Santa Clara Plain Principal Aquifer Zone Water Quality Summary (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Aggressive Index (Corrosivity)	INDEX	-	-	441	10.6	12.0	13.2
Aluminum	µg/L	1,000	200	794	ND	ND	1,700
Ammonia (NH3-N)	mg/L	-	-	10	ND	ND	0.0500
Antimony	µg/L	6	-	759	ND	ND	2.00
Arsenic	µg/L	10	-	795	ND	ND	9.00
Asbestos	MFL	7	-	203	ND	ND	0.700

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Barium	µg/L	1,000	-	757	ND	107	570
Beryllium	µg/L	4	-	756	ND	ND	ND
Bicarbonate (as HCO3)	mg/L	-	-	697	94.0	261	490
Bicarbonate Alkalinity (as CaCO3)	mg/L	-	-	167	77.0	228	436
Boron	µg/L	-	-	275	ND	115	506
Bromate	µg/L	10	-	18	ND	ND	ND
Bromide	mg/L	-	-	255	ND	0.146	0.640
Cadmium	µg/L	5	-	759	ND	ND	1.20
Caffeine	µg/L	-	-	166	ND	ND	0.0500
Calcium	mg/L	-	-	739	11.8	69.0	140
Calcium (as CaCO3)	mg/L	-	-	192	29.6	141	328
Carbon Dioxide	µg/L	-	-	289	ND	3,700	260,000
Carbonate (as CO3)	mg/L	-	-	377	ND	ND	41.0
Carbonate Alkalinity (as CaCO3)	mg/L	-	-	180	ND	ND	24.0
Chlorate	µg/L	-	-	7	27.3	43.8	220
Chloride	mg/L	-	(250)	731	6.00	50.0	790
Chromium	µg/L	50	-	781	ND	ND	52
Chromium 6 (Hexavalent)[7]	µg/L	10	-	522	ND	1.50	11.1
Cobalt	µg/L	-	-	139	ND	ND	1.70
Color	Color Units	-	15	281	ND	2.11	50.0
Copper[8]	µg/L	1,300	1,000	765	ND	ND	120
Cyanide	µg/L	150	-	562	ND	ND	77.0
Dissolved Oxygen	mg/L	-	-	199	0.0100	2.25	10.3
E. Coli (MPN)	MPN/ 100 mL	-	-	9	ND	ND	ND
E. Coli (P/A)	P/A 100 mL	-	-	33	0 Present; 33 Absent		
Fluorescein	µg/L	-	-	15	ND	ND	ND
Fluoride (natural source)	mg/L	2	-	833	ND	0.0870	2.00
Foaming Agents (MBAS)	µg/L	-	500	228	ND	ND	140
Hardness, Total (as CaCO3)	mg/L	-	-	747	ND	290	545
Heterotrophic Plate Count	CFU/mL	-	-	12	440	2,450	12,000

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Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Hydroxide (as OH)	mg/L	-	-	435	ND	ND	5.00
Hydroxide Alkalinity (as CaCO3)	mg/L	-	-	90	ND	ND	ND
Iron	µg/L	-	300	1,123	ND	12.8	11,000
Langelier Index @ 60 C	INDEX	-	-	159	ND	0.990	1.70
Langelier Index at Source Temp	INDEX	-	-	237	ND	0.128	1.90
Lead[8]	µg/L	15		750	ND	ND	16.0
Lithium	µg/L	-	-	136	ND	3.02	33.0
Magnesium	mg/L	-	-	744	ND	26.9	75.0
Manganese	µg/L	-	50	829	ND	ND	340
Mercury	µg/L	2	-	757	ND	ND	0.230
Molybdenum	µg/L	-	-	140	ND	0.635	16.0
Nickel	µg/L	100	-	759	ND	ND	41.0
Nitrate (as N)	mg/L	10	-	2,773	ND	2.68	9.70
Nitrate + Nitrite (as N)	mg/L	10	-	492	ND	2.80	7.70
Nitrite (as N)	mg/L	1	-	727	ND	ND	5.10
Odor Threshold @ 60 C	TON	-	3	521	ND	ND	4.00
Orthophosphate (as PO4)	mg/L	-	-	305	ND	0.070	2.28
Oxidation Reduction Potential (ORP)	mV	-	-	247	ND	70.6	710
Perchlorate	µg/L	6	-	794	ND	ND	3.00
pH	pH Units	-	-	922	6.07	7.50	9.08
Potassium	mg/L	-	-	674	ND	1.15	1,100
Selenium	µg/L	50	-	759	ND	ND	11.0
Silica	mg/L	-	-	209	ND	27.0	35.2
Silicon	mg/L	-	-	90	ND	12.5	16.0
Silver	µg/L	-	100	717	ND	ND	85.0
Sodium	mg/L	-	-	749	14.2	33.0	290
Source Temperature	C	-	-	388	16.0	19.7	28.0
Specific Conductance	µS/cm	-	(900)	1,110	97.0	685	4,110
Strontium	µg/L	-	-	27	130	400	730
Sulfate	mg/L	-	(250)	745	0.800	45.0	120
Thallium, Total	µg/L	2	-	756	ND	ND	ND
Total Alkalinity (as CaCO3)	mg/L	-	-	722	81.0	230	430

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Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Total Coliform (MPN)	MPN/ 100 mL	-	-	10	ND	ND	13.4
Total Coliform (P/A)[9]	P/A 100 mL	-	-	33	6 Present; 27 Absent		
Total Dissolved Solids (TDS)	mg/L	-	(500)	740	34.0	420	2,320
Total Organic Carbon (TOC)	mg/L	-	-	38	ND	ND	2.00
Turbidity	NTU	-	5	935	ND	0.300	65.0
Vanadium, Total	µg/L	-	-	262	ND	0.800	14.0
Zinc	µg/L	-	5,000	751	ND	ND	2,300

Notes:
The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.
See summary notes and descriptions at the end of Table 2-2.

Table 2-4. Santa Clara Plain Shallow Aquifer Zone Organic Parameter Detections (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
N-ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ng/L	-	-	27	ND	ND	3.60
Perfluoro Butanoic Acid (PFBA)	ng/L	-	-	13	ND	ND	3.50
Perfluorobutanesulfonic Acid (PFBS)	ng/L	-	-	34	ND	ND	33.0
Perfluoroheptanoic Acid (PFHPA)	ng/L	-	-	34	ND	ND	44.0
Perfluorohexane Sulfonic Acid (PFHxS)	ng/L	10	-	34	ND	1.70	44.0
Perfluorohexanoic Acid (PFHxA)	ng/L	-	-	34	ND	ND	76.0
Perfluorononanoic Acid (PFNA)	ng/L	10	-	34	ND	ND	4.20
Perfluorooctane Sulfonic Acid (PFOS)	ng/L	4	-	40	ND	0.481	247
Perfluorooctanoic Acid (PFOA)	ng/L	4	-	40	ND	ND	120
Perfluoropentanoic Acid (PFPEA)	ng/L	-	-	7	ND	ND	2.40
1,1,1-Trichloroethane	µg/L	200	200	84	ND	ND	3.90
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	µg/L	-	1,200	84	ND	ND	2.41
1,1-Dichloroethene	µg/L	7	6	84	ND	ND	6.10
Ethylenediamine Tetra-Acetic Acid (EDTA)	µg/L	-	-	7	ND	ND	25.0
n-Nitrosodi-n-Butylamine (NDBA)	µg/L	-	-	7	ND	ND	0.00610
Tetrachloroethene	µg/L	5	5	84	ND	ND	0.800

Notes:
Of the 215 organic parameters tested in the shallow aquifer, 199 were not detected. Only parameters with detections are included in the table. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet. See summary notes and descriptions at the end of Table 2-2.
[2] MCL = Maximum Contaminant Level specified in the Code of Federal Regulations 40CFR141 and/or Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard. In April 2024, the US EPA established MCLs for PFOA, PFOS, PFHxS, PFNA, and HFPO-DA as shown, as well as a hazard index of 1.0 for the mixture of two or more of PFHxS, HFPO-DA, PFBS, and PFNA. Public water systems have three years to complete initial PFAS monitoring and up to five years to implement solutions (if needed) to ensure water delivered to customers does not exceed these limits. Currently, there are no state MCLs for any PFAS.

Table 2-5. Santa Clara Plain Principal Aquifer Zone Organic Parameter Detections (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Aciflurfen	µg/L	-	-	65	ND	ND	0.500
DCPA (Total Di & Mono Acid Degradates)	µg/L	-	-	202	ND	ND	0.950
Diazinon	µg/L	-	-	215	ND	ND	0.100
Dimethoate	µg/L	-	-	364	ND	ND	0.100
Endrin	µg/L	2	2	757	ND	ND	0.0100
gamma-BHC (lindane)	µg/L	0.2	0.2	787	ND	ND	0.0500
Methiocarb	µg/L	-	-	264	ND	ND	2.00
Metolachlor	µg/L	-	-	395	ND	ND	0.0500
Metribuzin	µg/L	-	-	388	ND	ND	0.0500
Propoxur	µg/L	-	-	260	ND	ND	2.00
Perfluoro Butanoic Acid (PFBA)	ng/L	-	-	616	ND	ND	5.10
Perfluorobutanesulfonic Acid (PFBS)	ng/L	-	-	1,453	ND	ND	6.50
Perfluoroheptanoic Acid (PFHPA)	ng/L	-	-	1,455	ND	ND	3.40
Perfluorohexane Sulfonic Acid (PFHxS)	ng/L	10	-	1,452	ND	1.40	8.80
Perfluorohexanoic Acid (PFHxA)	ng/L	-	-	1,454	ND	ND	5.10
Perfluorononanoic Acid (PFNA)	ng/L	10	-	1,451	ND	ND	5.20
Perfluorooctane Sulfonic Acid (PFOS)	ng/L	4	-	1,472	ND	ND	9.90
Perfluorooctane Sulfonic Acid 6:2 FTS	ng/L	-	-	615	ND	ND	6.80

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Perfluorooctanoic Acid (PFOA)	ng/L	4	-	1,462	ND	ND	9.80
Perfluoropentanoic Acid (PFPEA)	ng/L	-	-	618	ND	ND	5.70
1,1,1-Trichloroethane	µg/L	200	200	996	ND	ND	4.30
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	µg/L	-	1,200	992	ND	ND	12.0
1,1,2-Trichloroethane	µg/L	5	5	989	ND	ND	3.60
1,1-Dichloroethene	µg/L	7	6	992	ND	ND	6.90
1,2,3-Trichloropropane	µg/L	-	0.005	1,449	ND	ND	0.0116
Acetone	µg/L	-	-	35	ND	ND	45.0
Bromodichloromethane (THM)	µg/L	-	-	406	ND	ND	15.1
Bromoform (THM)	µg/L	-	-	406	ND	ND	24.5
Chloroform (THM)	µg/L	-	-	407	ND	ND	42.0
Di(2-Ethylhexyl) Adipate	µg/L	400	400	760	ND	ND	0.43
Di(2-Ethylhexyl) Phthalate	µg/L	6	4	756	ND	ND	5.50
Dibromoacetic Acid (DBAA)	µg/L	-	-	23	ND	ND	3.40
Dibromochloromethane (THM)	µg/L	-	-	406	ND	ND	25.6
Dichloroacetic Acid (DCAA)	µg/L	-	-	23	ND	ND	33.0
Dichlorodifluoromethane (Freon 12)	µg/L	-	-	393	ND	ND	13.0
Diisopropyl Ether	µg/L	-	-	335	ND	ND	3.00
Di-n-butyl phthalate	µg/L	-	-	59	ND	ND	0.200
Haloacetic Acids (HAA5)	µg/L	60	60	14	ND	ND	44.6
m,p-Xylene	µg/L	-	-	464	ND	ND	0.700
Monobromoacetic Acid (MBAA)	µg/L	-	-	23	ND	ND	1.70

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
n-Nitrosodi-n-Butylamine (NDBA)	µg/L	-	-	8	ND	ND	0.00350
p-Isopropyltoluene	µg/L	-	-	295	ND	ND	0.500
Styrene	µg/L	100	100	999	ND	ND	0.690
Tertiary Butyl Alcohol (TBA)	µg/L	-	-	174	ND	ND	4.20
Toluene	µg/L	1,000	150	995	ND	ND	4.30
Total Trihalomethanes	µg/L	80	80	197	ND	ND	57.3
Trichloroacetic Acid (TCAA)	µg/L	-	-	23	ND	ND	15.0
Trichloroethene	µg/L	5	5	993	ND	ND	1.60
Xylenes, Total	µg/L	10,000	1,750	594	ND	ND	0.500

Notes:
Of the 235 organic parameters tested in the principal aquifer, 186 were not detected. Only parameters with detections are included in the table. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet. See summary notes and descriptions at the end of Table 2-4.

2.2.5.2 Coyote Valley

Groundwater in the Coyote Valley is typically of good quality. Figures 2-22 and 2-23 show concentrations in the principal aquifer relative to MCLs and SMCLs for the period 2015 to 2024. Seventy-one percent (71%) of Coyote Valley wells evaluated for the 10-year period, in the principal aquifer, meet health-based MCLs. Parameters detected above the MCL include nitrate, one exceedance of nitrate + nitrite (as N), and one exceedance of aluminum (Figure 2-22). No radioactive parameters or organic chemicals were detected above the MCL.

Nitrate was detected above the MCL in 30% of the Coyote Valley wells from 2015 to 2024 in the principal aquifer. Nitrate is naturally occurring in groundwater at low concentrations. Unlike the Santa Clara Plain, the Coyote Valley is largely rural and agricultural, with anthropogenic nitrate sources including agricultural fertilizers, septic systems, and animal waste. The 2015 to 2024 median nitrate (as N) concentration was 5.76 mg/L. Summary statistics for nitrate and all other inorganic water quality parameters in Coyote Valley between 2015 and 2024 are presented in Table 2-6.

Some constituents also have SMCLs based on their ability to affect the aesthetic properties of water through taste, color, odor, or by causing staining or scale formation. The SMCL for these parameters may be a single value, or a range, with a lower (recommended) and upper threshold. Aluminum, iron, manganese, specific conductance, TDS, and turbidity were detected above the SMCL (Figure 2-23).

Table 2-7 shows organic chemicals detected between 2015 and 2024. Although some organic chemicals are detected in the Coyote Valley, detections are infrequent and are typically low concentrations. Organic compounds include VOCs and pesticides, and are present in many household, commercial, and industrial products. Groundwater quality in Coyote Valley is excellent with respect to organic compounds. There were localized detections of some VOCs, but none exceeded the MCL.

Table 2-6. Coyote Valley Groundwater Quality Summary (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Aggressive Index (Corrosivity)	INDEX	-	-	35	11.6	12.0	13.0
Aluminum	µg/L	1,000	200	106	ND	7.15	5,400
Antimony	µg/L	6	-	103	ND	ND	ND
Arsenic	µg/L	10	-	103	ND	ND	5.20
Asbestos	MFL	7	-	11	ND	ND	ND
Barium	µg/L	1,000	-	103	ND	81.7	270
Beryllium	µg/L	4	-	103	ND	ND	ND
Bicarbonate (as HCO3)	mg/L	-	-	89	140	240	367
Bicarbonate Alkalinity (as CaCO3)	mg/L	-	-	48	146	205	352
Boron	µg/L	-	-	56	ND	131	156
Bromide	mg/L	-	-	217	ND	0.140	1.97
Cadmium	µg/L	5	-	103	ND	ND	ND
Caffeine	µg/L	-	-	12	ND	ND	ND
Calcium	mg/L	-	-	92	6.20	47.6	99.6
Calcium (as CaCO3)	mg/L	-	-	56	15.5	126	249
Carbon Dioxide	µg/L	-	-	6	ND	2,000	7,800
Carbonate (as CO3)	mg/L	-	-	60	ND	ND	ND
Carbonate Alkalinity (as CaCO3)	mg/L	-	-	47	ND	ND	ND
Chloride	mg/L	-	(250)	143	12.0	41.0	168
Chromium	µg/L	50	-	103	ND	1.64	39.0
Chromium 6 (Hexavalent)[7]	µg/L	10	-	78	ND	2.40	9.60
Cobalt	µg/L	-	-	31	ND	ND	ND
Color	Color Units	-	15	14	ND	ND	10.0
Copper[8]	µg/L	1,300	1,000	92	ND	2.08	6.30
Cyanide	µg/L	150	-	47	ND	ND	ND
Dissolved Oxygen	mg/L	-	-	39	0.510	4.84	9.66
E. Coli (P/A)	P/A 100 mL	-	-	205	2 Present; 203 Absent		
Fluoride (natural source)	mg/L	2	-	260	ND	0.130	0.470
Foaming Agents (MBAS)	µg/L	-	500	14	ND	ND	ND
Hardness, Total (as CaCO3)	mg/L	-	-	248	ND	270	605

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Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Hydroxide (as OH)	mg/L	-	-	63	ND	ND	ND
Hydroxide Alkalinity (as CaCO3)	mg/L	-	-	26	ND	ND	ND
Iron	µg/L	-	300	117	ND	ND	22,000
Langelier Index @ 60 C	INDEX	-	-	15	0.230	1.00	1.00
Langelier Index at Source Temp	INDEX	-	-	5	ND	ND	0.470
Lead[8]	µg/L	15	-	98	ND	ND	1.31
Lithium	µg/L	-	-	31	8.20	11.0	27.0
Magnesium	mg/L	-	-	92	22.0	32.4	72.0
Manganese	µg/L	-	50	92	ND	1.72	391
Mercury	µg/L	2	-	102	ND	ND	ND
Molybdenum	µg/L	-	-	31	ND	ND	15.0
Nickel	µg/L	100	-	103	ND	ND	45.0
Nitrate (as N)	mg/L	10	-	516	ND	5.76	49.0
Nitrate + Nitrite (as N)	mg/L	10	-	73	ND	1.59	12.0
Nitrite (as N)	mg/L	1	-	205	ND	ND	0.400
Odor Threshold @ 60 C	TON	-	3	33	ND	ND	2.00
Orthophosphate (as PO4)	mg/L	-	-	252	ND	0.034	1.56
Oxidation Reduction Potential (ORP)	mV	-	-	56	ND	152	398
Perchlorate	µg/L	6	-	105	ND	ND	2.02
pH	pH Units	-	-	101	6.47	7.59	9.07
Potassium	mg/L	-	-	86	ND	1.33	2.80
Selenium	µg/L	50	-	103	ND	ND	2.00
Silica	mg/L	-	-	51	14.2	22.7	41.9
Silicon	mg/L	-	-	25	9.40	10.8	19.6
Silver	µg/L	-	100	91	ND	ND	ND
Sodium	mg/L	-	-	92	17.0	27.3	114
Source Temperature	C	-	-	58	17.0	19.6	26.9
Specific Conductance	µS/cm	-	(900)	200	393	650	1,220
Sulfate	mg/L	-	(250)	250	ND	44.0	117
Thallium, Total	µg/L	2	-	103	ND	ND	ND
Total Alkalinity (as CaCO3)	mg/L	-	-	92	133	197	301
Total Coliform (P/A)[9]	P/A 100 mL	-	-	205	61 Present; 144 Absent		

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Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Total Dissolved Solids (TDS)	mg/L	-	(500)	282	210	392	1,690
Turbidity	NTU	-	5	140	ND	0.318	5.00
Vanadium, Total	µg/L	-	-	56	ND	1.40	11.0
Zinc	µg/L	-	5,000	91	ND	ND	560

Notes:
The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet. See summary notes and descriptions at the end of Table 2-2.

Table 2-7. Summary of Organic Parameters Detected in the Coyote Valley (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Perfluorobutanesulfonic Acid (PFBS)	ng/L	-	-	8	ND	ND	2.70
Perfluorooctane Sulfonic Acid (PFOS)	ng/L	4	-	8	ND	ND	2.31
Ethylbenzene	µg/L	700	300	58	ND	ND	0.700
m,p-Xylene	µg/L	-	-	36	ND	ND	4.00
o-Xylene	µg/L	-	-	36	ND	ND	1.20
Tertiary Butyl Alcohol (TBA)	µg/L	-	-	22	ND	ND	4.10
Toluene	µg/L	1,000	150	58	ND	ND	9.60
Xylenes, Total	µg/L	10,000	1,750	38	ND	ND	5.20

Notes:
Of the 183 organic parameters tested in the principal aquifer, 175 were not detected. Only parameters with detections are included in the table. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet. See summary notes and descriptions at the end of Table 2-4.

2.2.5.3 Water Quality Trends

To assess changes in water quality over time, Valley Water evaluated nitrate and TDS concentrations for water supply wells within the principal aquifer of the Santa Clara Subbasin over a 15-year period (2011-2025).[64] Mann-Kendall statistical trend tests were conducted for individual wells with at least five sample results. Trend analysis results show that most wells have stable or decreasing nitrate and TDS concentration trends, although some upward trends are observed. A total of 90% and 93% of all water supply wells evaluated have stable or decreasing concentrations of nitrate and TDS, respectively. Valley Water will assess potential causes of wells with upward trends and engage with regulatory and/or land use agencies, as needed.

Valley Water conducted a five- and ten-year statistical step-trend analysis of nitrate and TDS concentrations for the Santa Clara subbasin principal aquifer to assess whether concentrations were changing within each timeframe. The results (Table 2-8) show that there is generally no change in

64 Valley Water, Water Year 2025 Groundwater Report for the Santa Clara and Llagas Subbasins, March 2026.

concentrations or time period, with one notable exception. For the Santa Clara Plain groundwater management area, TDS concentrations were shown to increase when compared to concentrations of 5 years prior (2019). Although the step trend analyses show an increase in TDS in the Santa Clara Plain, the 2024 TDS median remains lower than the secondary MCL of 500 mg/L, at 420 mg/L. Additionally, long-term trends of TDS continue to remain stable over time within the principal aquifer of the Santa Clara Plain management area[65].

Table 2-8. Nitrate and Total Dissolved Solids (TDS) Step Trend Outcome in the Santa Clara Subbasin Principal Aquifers

Parameter	5-Year Step Trend	10-Year Step Trend
Santa Clara Plain		
Nitrate (as N) (mg/L)	No Change	No Change
Total Dissolved Solids (mg/L)	Increase	No Change
Coyote Valley		
Nitrate (as N) (mg/L)	No Change	No Change
Total Dissolved Solids (mg/L)	No Change	No Change

2.2.6 Seawater Intrusion

Due to historic high groundwater pumping and land subsidence, particularly in the years following World War II, seawater intrusion has been observed in the shallow aquifer of the Santa Clara Plain near the San Francisco Bay. To help meet groundwater sustainability goals under SGMA, Valley Water established a seawater intrusion outcome measure in the 2021 GWMP and has continued regional groundwater quality monitoring. In May 2025, Valley Water published a comprehensive report, which presents a detailed evaluation of seawater intrusion, associated mechanisms, and impacts[66]. The following section summarizes the current extent and key processes that influence seawater intrusion in the Santa Clara Plain. There is no seawater intrusion in the Coyote Valley.

Seawater intrusion (SWI) (also called saltwater intrusion) refers to the temporary or permanent flux of seawater into coastal freshwater aquifers. Seawater intrusion is a groundwater management concern because it can degrade groundwater quality and, if severe enough, result in undesirable conditions that may limit the suitability of groundwater as a water supply for municipal and industrial, agriculture, and domestic uses. Seawater intrusion may also degrade GDEs or sub-grade infrastructure. Reclaiming freshwater aquifers impacted by SWI is very costly and time-consuming, if not practically infeasible in many cases. Therefore, sustainable groundwater management programs and actions that prevent or mitigate SWI are preferred over costly remediation.

Seawater intrusion in the shallow aquifer zone of the Santa Clara Plain is largely attributed to incursion of water from San Francisco Bay into tidal reaches of creeks and subsequent transport to shallow groundwater through streambed percolation (Figure 2-24). This mechanism was exacerbated by historic land subsidence, which permanently lowered land surface elevations adjacent to San Francisco Bay and caused further inland movement of tidal incursion. The degree of SWI in the shallow aquifer zone is assessed by the chloride content in monitoring wells located in the Baylands area adjacent to southern San Francisco Bay. Valley Water uses a chloride concentration of 100 mg/L to indicate the first sign of influence from seawater (Figure 2-25). This is a conservative threshold, since the aesthetic based MCL for chloride is 250 mg/L.

65 Valley Water, Water Year 2024 Groundwater Report for the Santa Clara and Llagas Subbasins, March 2025
66 Valley Water, Groundwater Response to Tides, Seawater Intrusion, and Sea-Level Rise in Santa Clara County, California, May 2025, available at: https://www.valleywater.org/your-water/groundwater/groundwater-studies

Wells with chloride over 100 mg/L are located in a narrow band adjacent to the former salt evaporation ponds, except in the areas adjacent to Guadalupe River and Coyote Creek affected due to tidal incursion in these channels (Figure 2-24). High chloride concentrations up to several thousand parts per million (mg/L) are observed near the levee system that defines the former salt evaporation ponds and are indicative of the classic case of SWI. However, the leakance of saltwater beneath tidal stream flow has a larger influence on the spatial extent of the 100 mg/L chloride isocontour (Figure 2-25).

Figure 2-24. Conceptual Diagram of Seawater Intrusion (SWI) in the Santa Clara Subbasin by the Mechanism of Leakance of Saltwater Beneath Tidal Streamflow

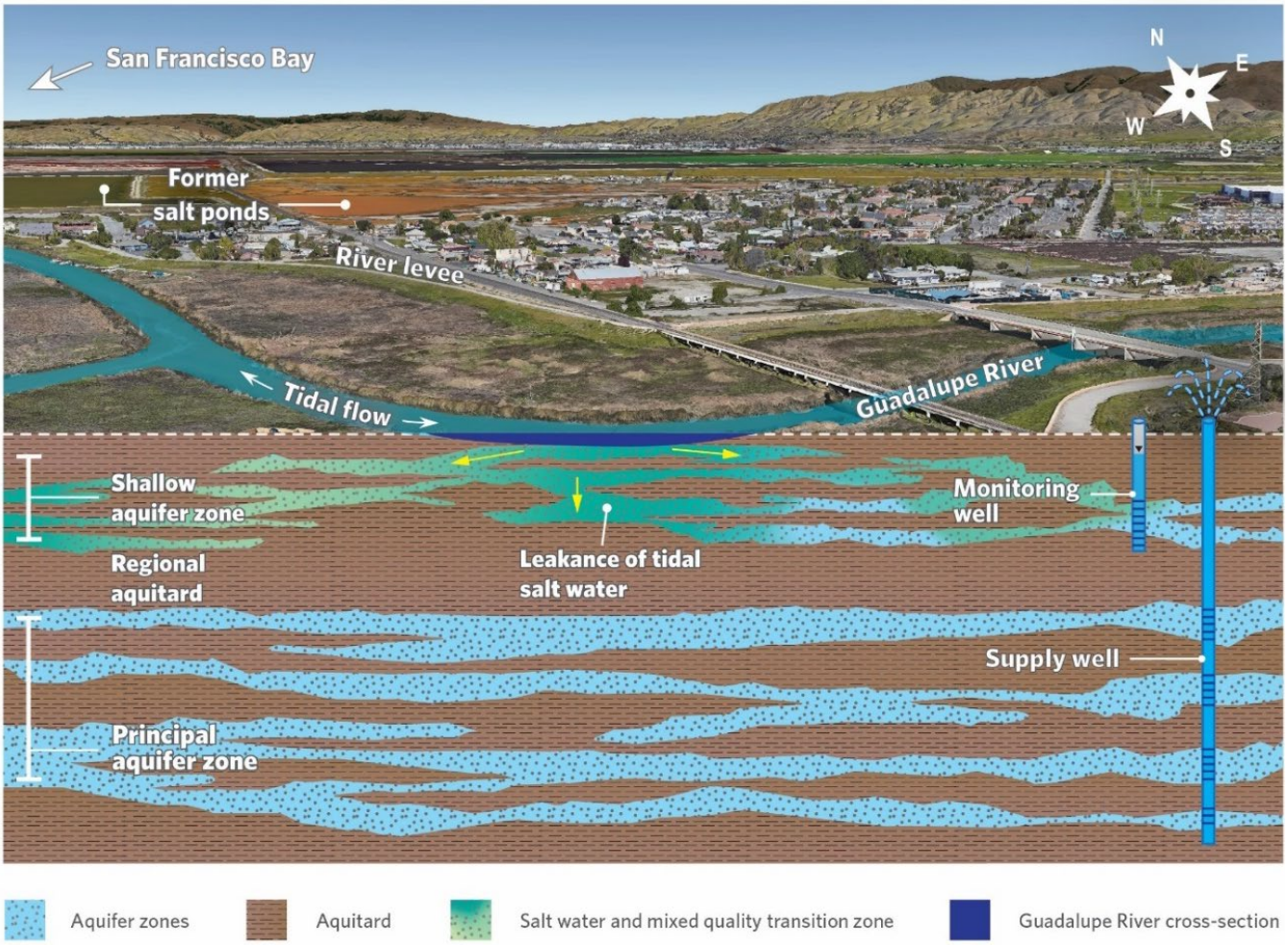

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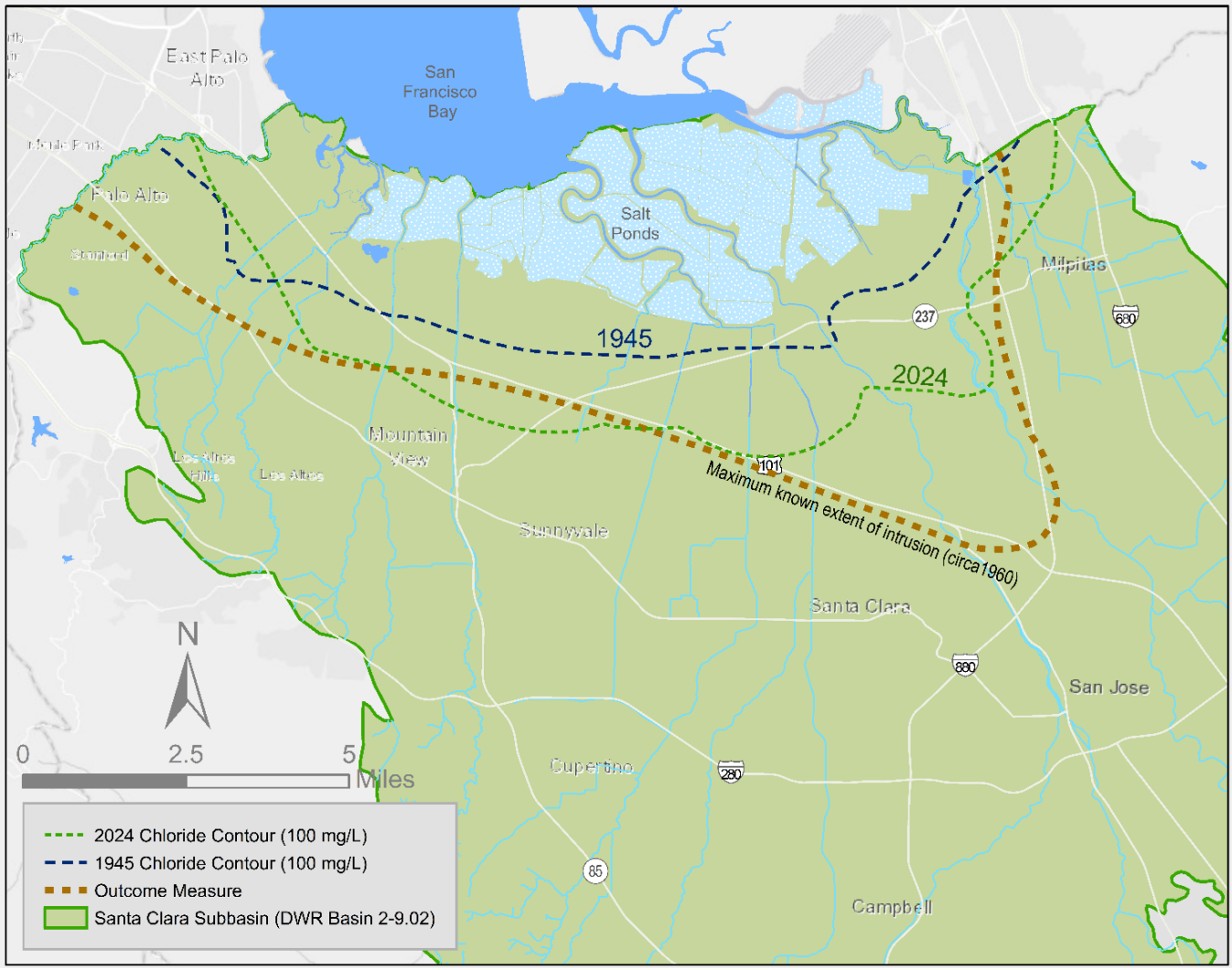
Figure 2-25. Extent of Seawater Intrusion in the Santa Clara Plain Shallow Aquifer Zone



Historically, the classic case of seawater intrusion (via direct, subsurface flow) has affected only a small portion of the shallow aquifer zone beneath and immediately adjacent to the Bay and salt ponds (Figure 2-26), and thus is a minimal threat to groundwater supply because the principal aquifer zone is protected by the regional aquitard and chloride concentrations in the principal aquifer are relatively low beneath much of the 100 mg/L chloride isocontour in the shallow aquifer zone. The relatively minor intrusion into the deeper, principal aquifer zone is believed to be due to some classic SWI mechanisms and inter-aquifer transfer through improperly destroyed wells. Presently, the monitoring network in the Baylands area has limited coverage of the principal aquifer zone.

Under present conditions, at least four mechanisms contribute in varying degrees to seawater intrusion and affect the overall extent of the 100 mg/L chloride isocontour. These mechanisms, along with the groundwater system(s) most at risk, are also summarized below:

> **"Classic" SWI**: This mechanism likely has a relatively minor role in the overall spatial extent of the 100 mg/L chloride isocontour across the Santa Clara Subbasin. This mechanism is largely constrained by the hydrogeologic setting of the subbasin, which include thick deposits of Bay mud that have very low hydraulic conductivity and create confined, semi-confined, and perched

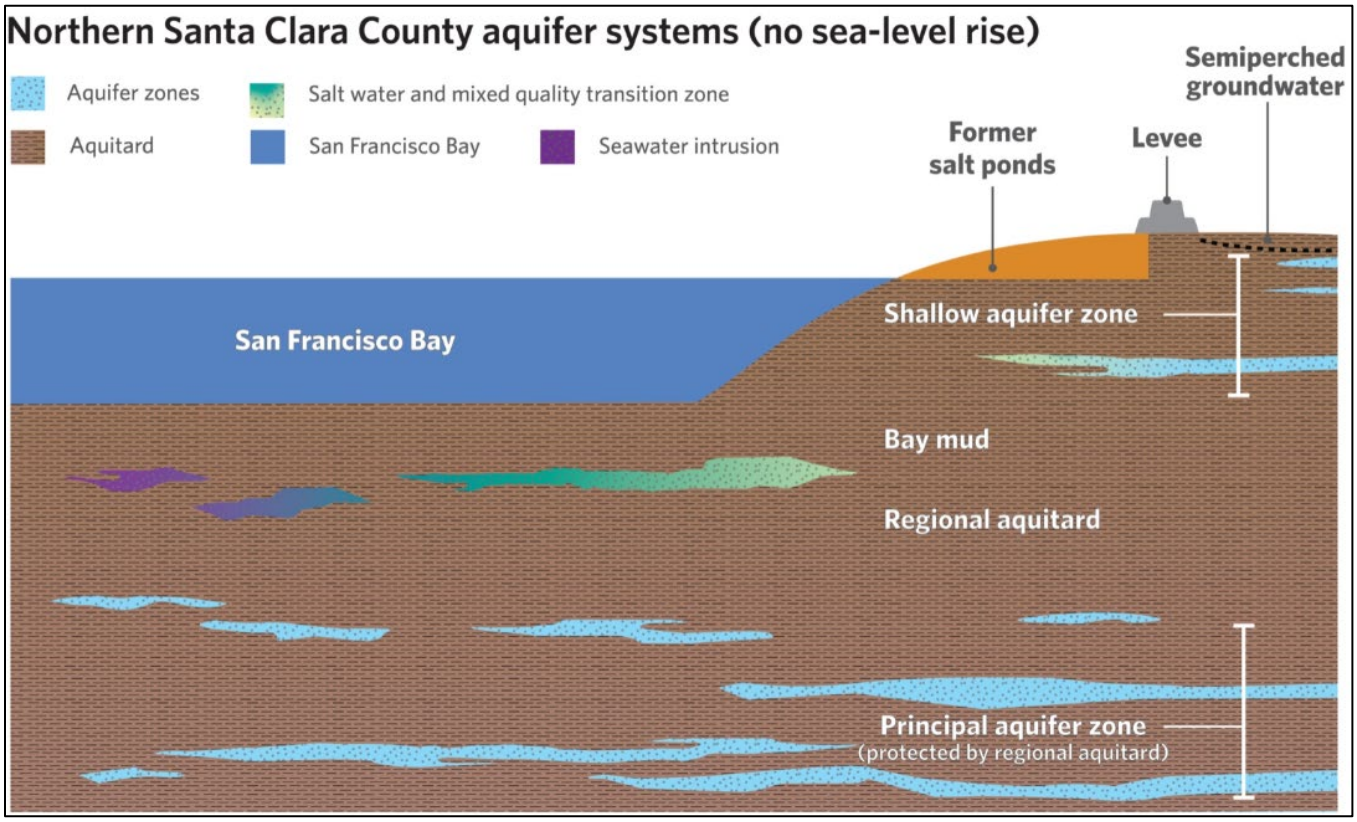
groundwater conditions. The shallow aquifer zone is the part of the system most at risk from this SWI mechanism.

Leakance of saltwater beneath tidal stream flow: This mechanism likely has a relatively major role in the overall spatial extent of the 100 mg/L chloride isocontour across the Santa Clara Subbasin. This mechanism is largely constrained to areas near tidal rivers and creeks but can migrate laterally in the shallow aquifer system. The shallow aquifer zone, especially near the Guadalupe River and Coyote Creek, is the part of the system that is most at risk from this SWI mechanism.

By-pass flow down improperly constructed or destroyed wells: This mechanism likely has a relatively minor role in the overall spatial extent of the 100 mg/L chloride isocontour across the Santa Clara Subbasin. However, if this mechanism occurs, it presents the greatest risk to groundwater quality in the principal aquifer zone.

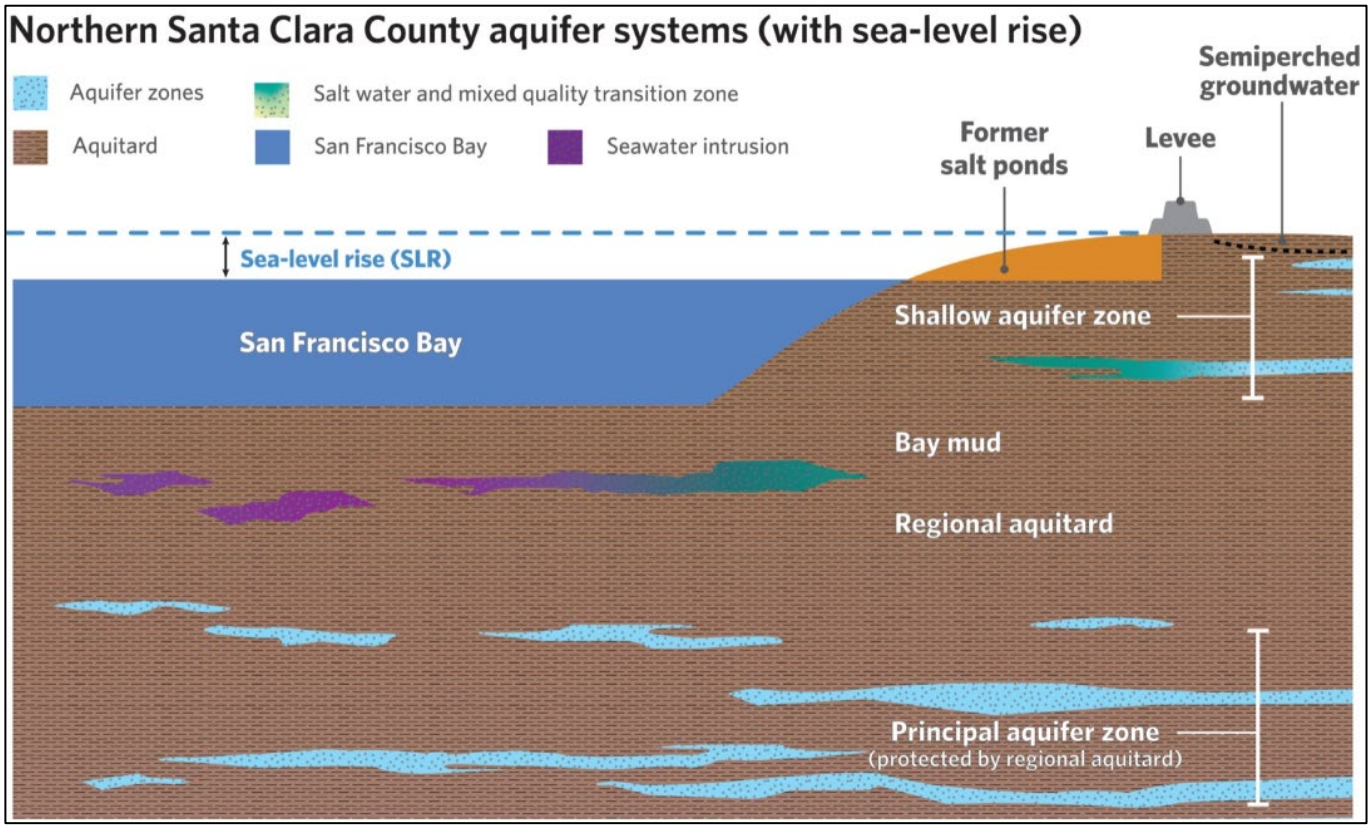
Entrapped connate water: This mechanism likely has a relatively minor role in the overall spatial extent of the 100 mg/L chloride isocontour across the Santa Clara Subbasin. This mechanism has a localized influence on groundwater quality in the shallow and principal aquifer zone near the bayfront in Palo Alto.

Figure 2-26. Classic Seawater Intrusion Beneath the South San Francisco Bay and Former Salt Ponds



Climate change and associated sea-level rise may exacerbate some of the mechanisms that affect SWI and the spatial extent of the 100 mg/L isocontour line (Figure 2-27). Sea-level rise is expected to have a relatively larger influence on the leakance of saltwater beneath the tidal stream flow as compared to classic case of SWI because of the thick deposits of Bay mud that have very low hydraulic conductivity and create confined, semi-confined, and perched groundwater conditions.

Figure 2-27. Sea-Level Rise Effects on Seawater Intrusion Beneath the South San Francisco Bay and Former Salt Ponds



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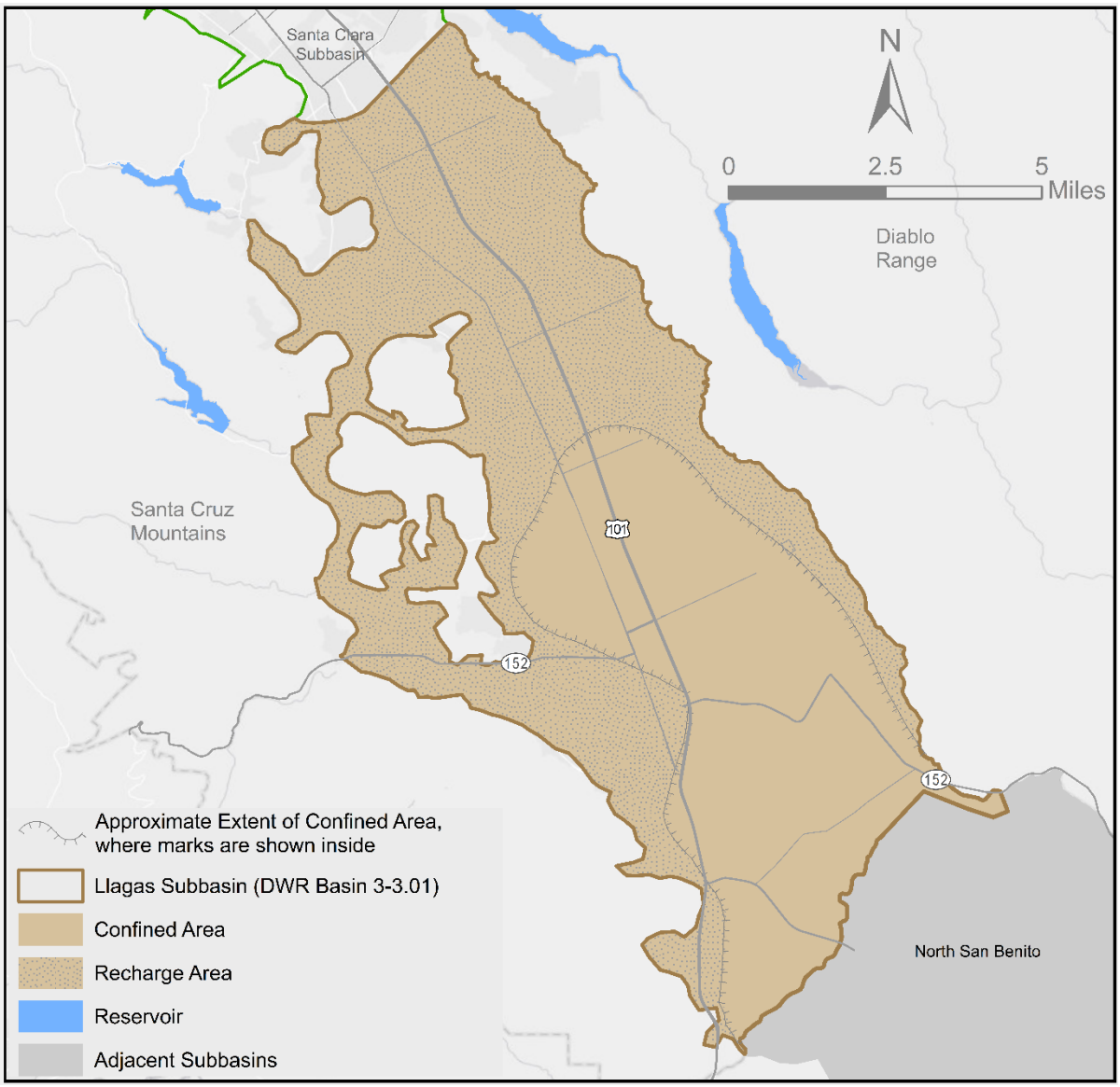
CHAPTER 3 – LLAGAS SUBBASIN DESCRIPTION

This chapter describes the Llagas Subbasin, including the physical setting and characteristics, and conditions related to groundwater elevation, water quality, land subsidence, groundwater/surface water interaction, GDEs, and seawater intrusion.

3.1 BASIN SETTING

The Llagas Subbasin (DWR Basin Number 3-3.01) is located within the California Coast Ranges physiographic province between the San Andreas and Calaveras Fault zones. The subbasin is part of the larger Gilroy-Hollister Valley Groundwater Basin (Basin 3-3), which extends into San Benito County to the south. Similar to the Santa Clara Subbasin, the Llagas Subbasin underlies a relatively flat valley and consists of unconsolidated alluvial sediments.

Figure 3-1. Llagas Subbasin



3.1.1 Lateral Subbasin Boundaries

The Llagas Subbasin covers a surface area of about 74 square miles and forms a northwest-trending, elongated valley bounded by the Santa Cruz Mountains to the west and the Diablo Range to the east. The Llagas Subbasin is about 15 miles long in the northwest/southeast direction and 3 to 6 miles wide. The basis for the lateral boundary delineation is the geologic, hydrologic and topographic features in the subbasin.

The Llagas Subbasin is the northern extension of the Gilroy-Hollister Valley Groundwater Basin, which was created by offset along the major faults. The western and eastern subbasin boundaries are the geologic contact between permeable to semi-permeable alluvial sediments within the valley and the impermeable bedrock of the adjacent mountain ranges. The Santa Cruz Mountains and Diablo Range on either side of the subbasin are primarily composed of sedimentary, metamorphic, and volcanic rocks of Jurassic, Cretaceous and Tertiary age.[67] The northern boundary with the Santa Clara Subbasin is the Coyote Creek alluvial fan in the Morgan Hill area, which forms a topographic and hydrologic divide between the groundwater and surface water flowing to the San Francisco Bay and water flowing to the Monterey Bay. The groundwater divide is approximately located at the Cochrane Road area in Morgan Hill. Based on observed water level data, the boundary moves as much as a mile to the north or south depending on local groundwater conditions. The subbasin's southern boundary is institutional, coincident with the boundary between Santa Clara and San Benito counties and adjacent to the North San Benito Subbasin (DWR Basin Number 3-003.05).

3.1.2 Recharge Areas

Like the Santa Clara Subbasin, the Llagas Subbasin has two hydrogeologic areas, the recharge area where groundwater is generally unconfined, and the confined area (Figure 3-1). The recharge area is located at the north, western, and eastern edges of the subbasin and is the area where active groundwater recharge takes place due to high lateral and vertical permeability. Fine-grained materials are not laterally continuous in the recharge area, though localized confined conditions can occur.

In the southern and central portion of the subbasin, clays and silts become more vertically and laterally extensive creating confined artesian conditions, especially in the southern portion near the Pajaro River. Within the confined area, low permeability units restrict the vertical flow of groundwater and divide the subbasin into shallow and principal aquifer zones. The boundary between the recharge and confined areas was originally defined based on flowing artesian wells.[68] The boundary is gradual and broad, and not as precise as its depiction on Figure 3-1.

3.1.3 Principal Aquifers and Aquitards

The Llagas Subbasin is a structural depression filled with Quaternary alluvium deposits of unconsolidated gravel, sand, silt and clay that eroded from adjacent mountain ranges and were deposited into the valley (Figure 3-2). As in the Santa Clara Subbasin, the alluvium comprises interfingering alluvial fans, stream deposits and terrace deposits.

The Llagas Subbasin is comprised of unconsolidated alluvial sediments, with intercalated and discontinuous layers of gravel and sand (aquifer materials) and clay and silt (confining units) at various depths beneath the ground surface. The subbasin ranges in thickness from about 500 feet at the northern boundary to over 1,000 feet thick beneath the Pajaro River. The major aquitard forming the regional confining layer is commonly encountered between 20 and 100 feet below ground surface, and ranges in thickness from 40 to 100 feet.[69] Shallow aquifer zones generally refer to aquifers that occur

67 Graymer, et al., Geologic Map of the San Francisco Bay Region, 2006.
68 Clark, Ground Water in Santa Clara Valley, California, 1924.
69 Santa Clara Valley Water District, Standards for the Construction and Destruction of Wells and Other Deep Excavations in Santa Clara County, 1989.

within 150 feet of ground surface, while principal aquifer zones generally occur at depths below 150 feet. Cross-sections of the Llagas Subbasin are presented in Figures 3-3 through 3-6.

Figure 3-2. Quaternary Alluvium Geologic Map of the Llagas Subbasin

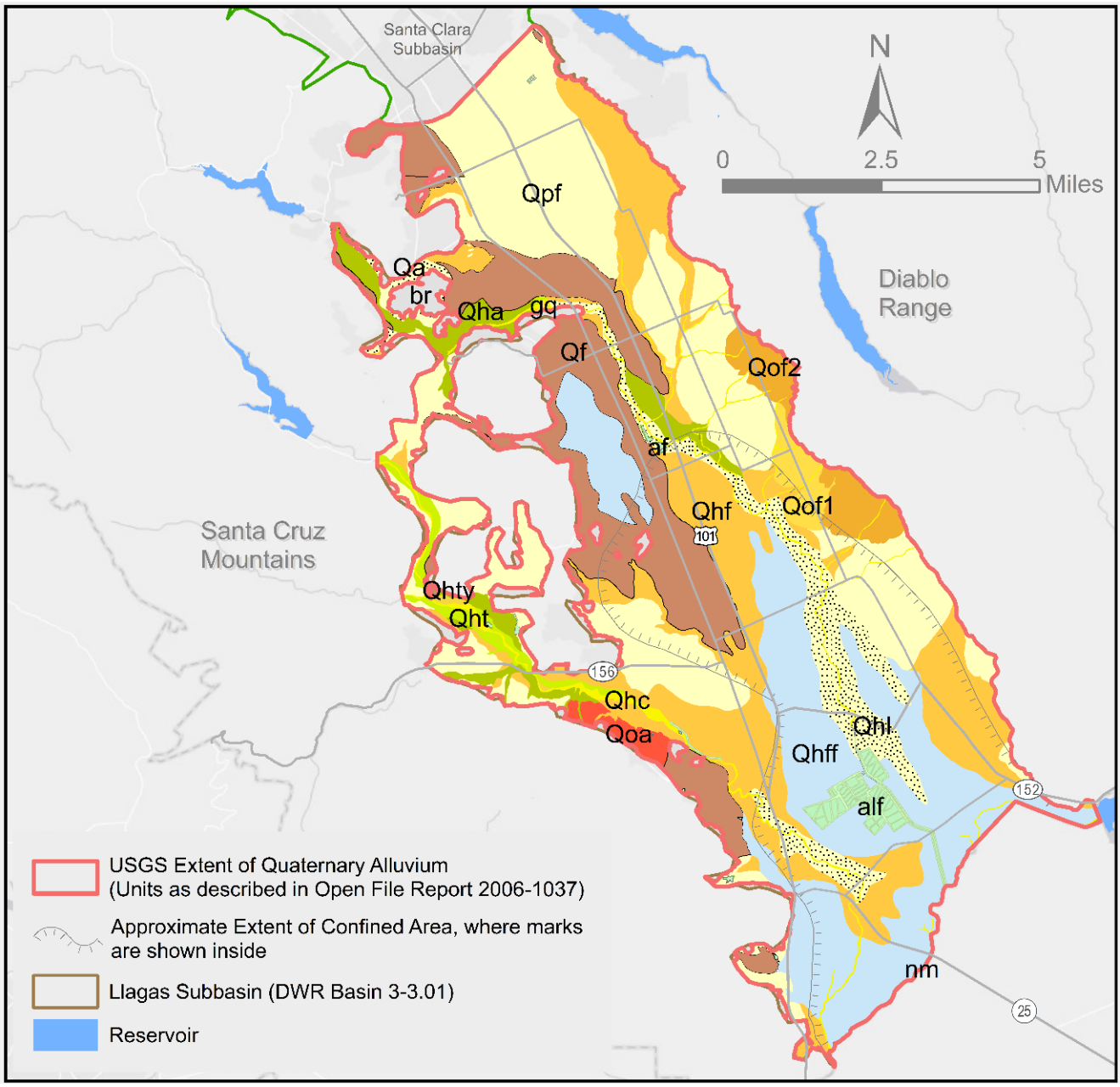


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Figure 3-3. Llagas Subbasin Cross-Section Locations

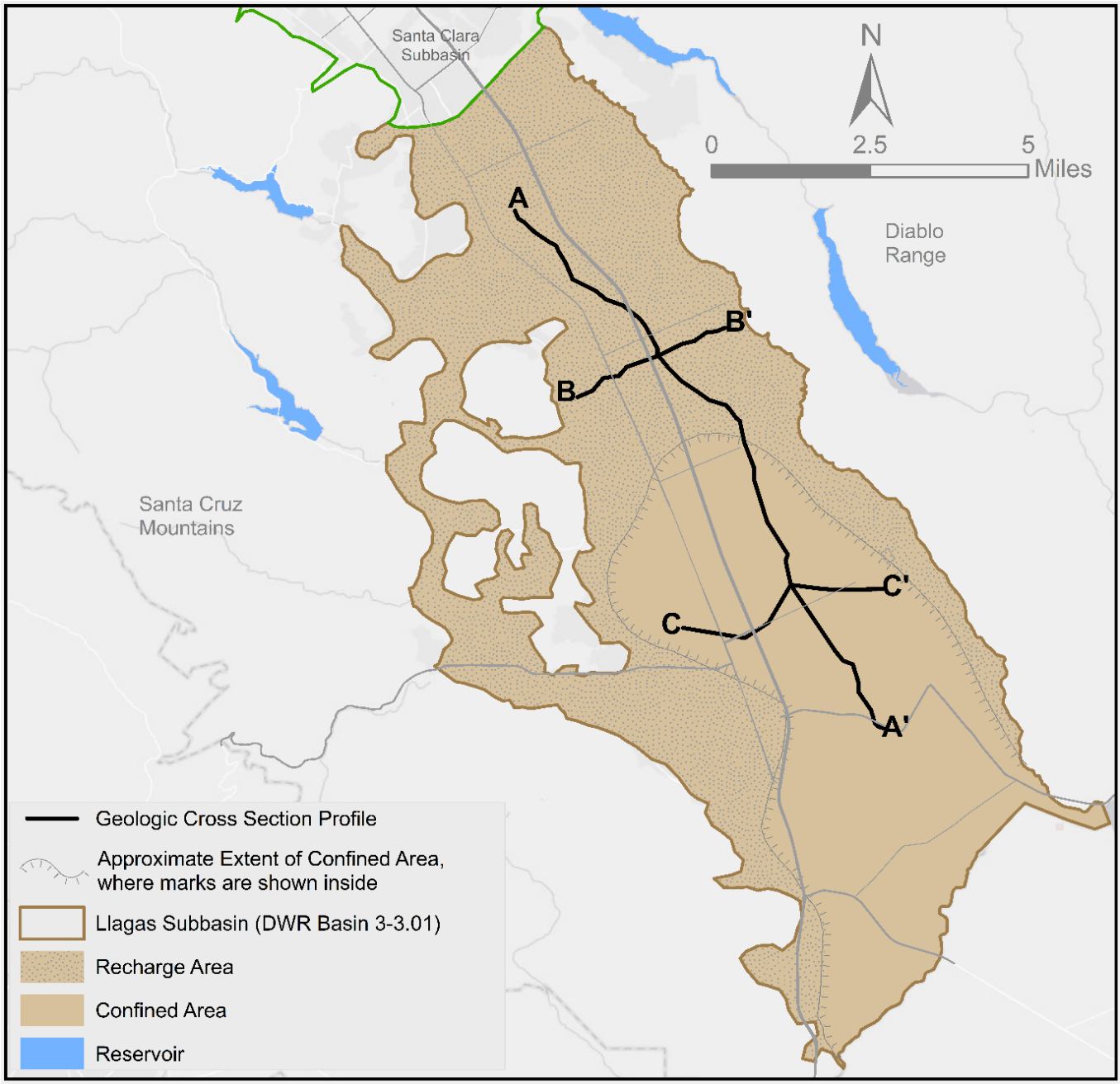

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Figure 3-4. Llagas Subbasin Longitudinal Cross-Section

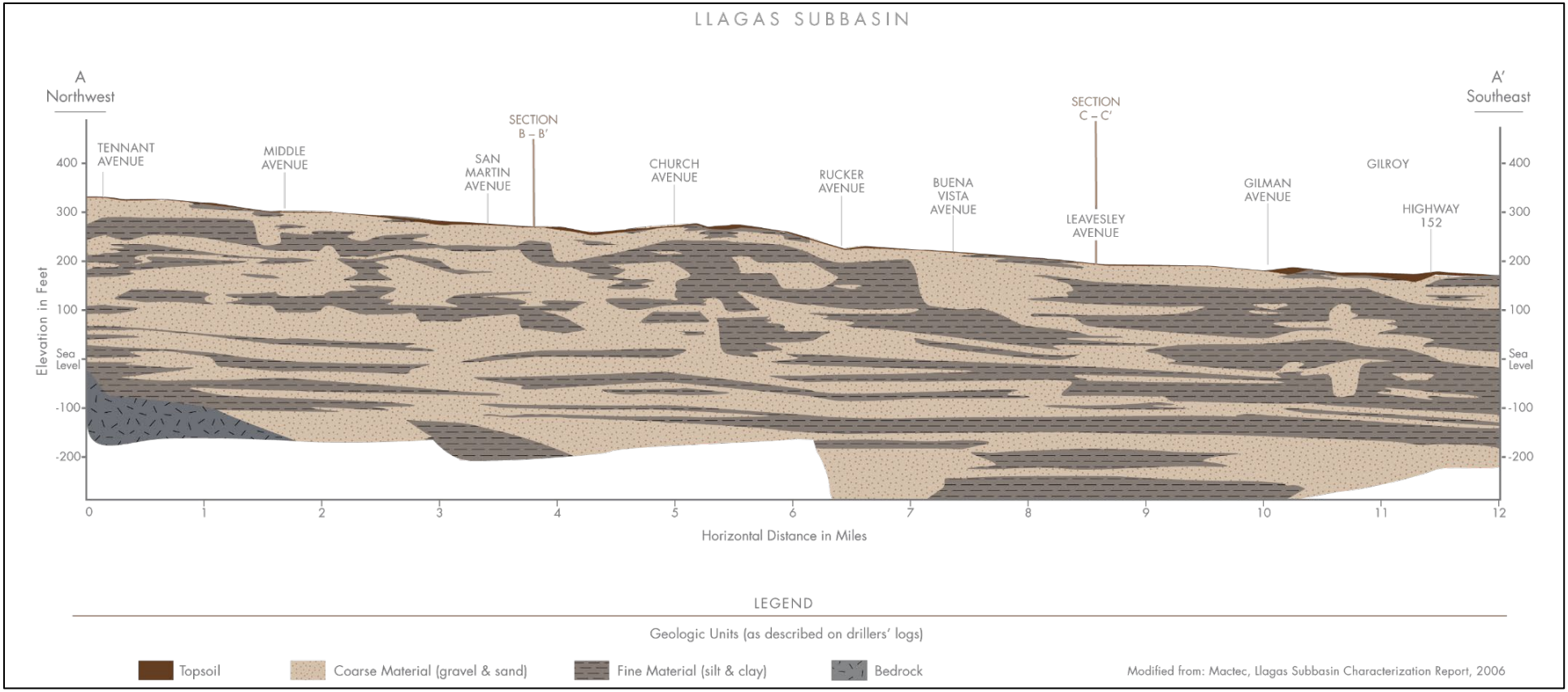

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Figure 3-5. Llagas Subbasin Northern Transverse Cross-Section

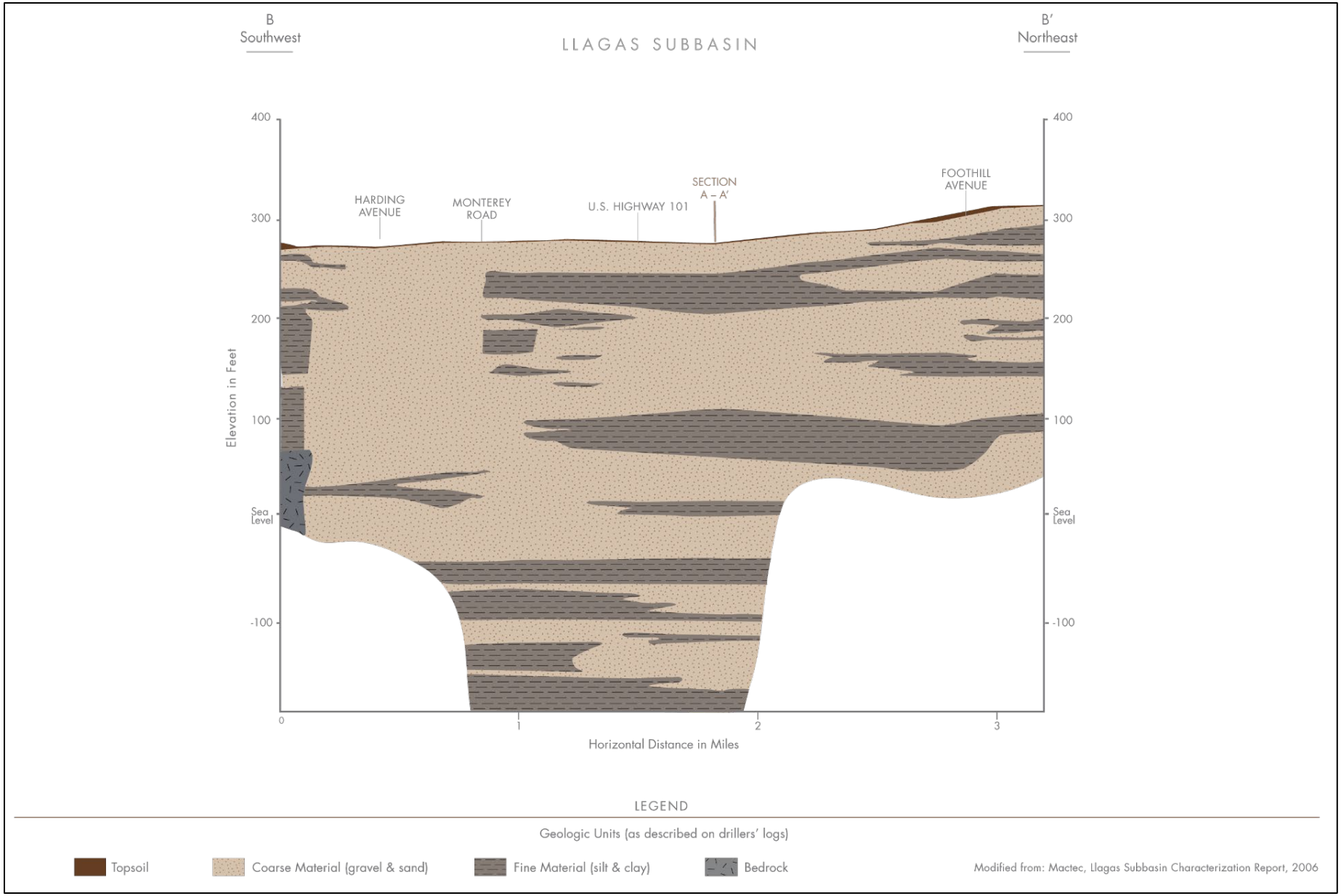

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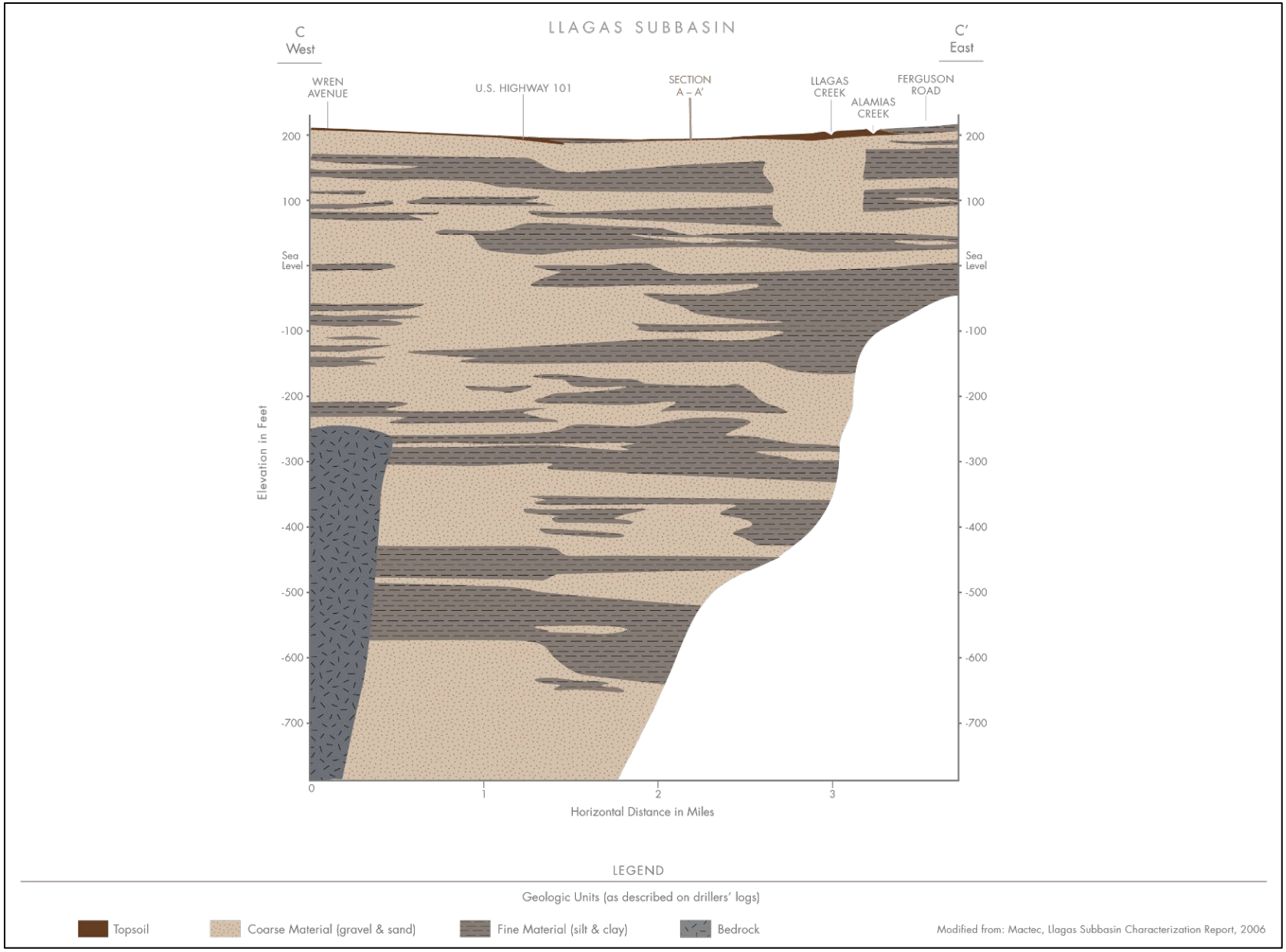
Figure 3-6. Llagas Subbasin Southern Transverse Cross-Section



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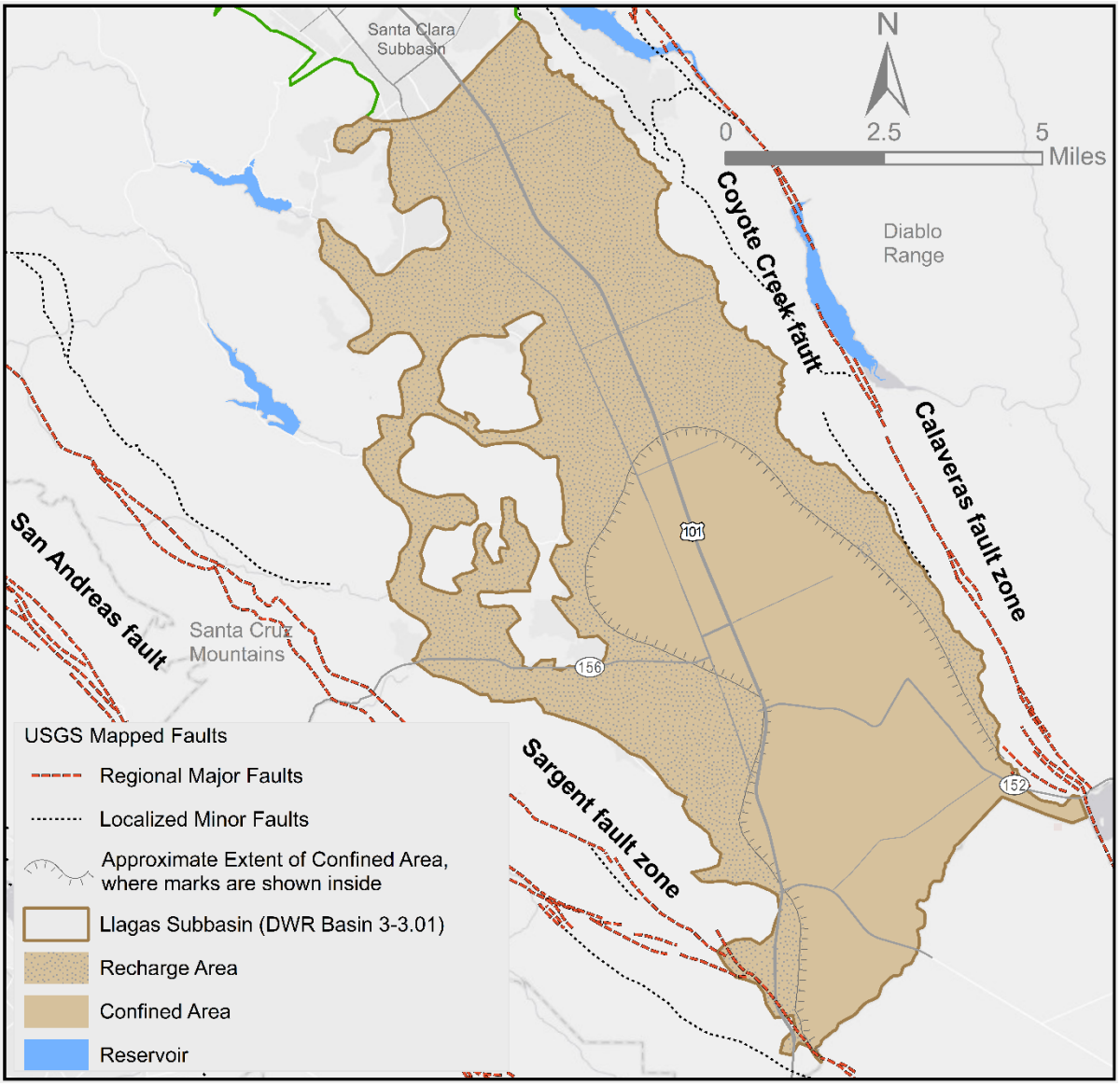
3.1.4 Subbasin Bottom

The bottom of the Llagas Subbasin is the geologic contact between unconsolidated alluvium and bedrock, an irregular surface occurring at varying depths. The alluvium thickness ranges from a few feet at the western and eastern edges of the subbasin to about 500 feet at the apex of the Coyote Creek alluvial fan in Morgan Hill and deepens to over 1,000 feet beneath the Pajaro River. Based on available drillers logs, most water supply and groundwater monitoring wells do not encounter bedrock, including a well recently drilled to a depth of 1,015 feet in the south-central area of the subbasin. Borehole data suggest that the depth to bedrock is highly variable throughout the subbasin.

3.1.5 Major Faults

Major northwest trending faults flank the structural trough that is the Llagas Subbasin, including the San Andreas Fault system in the Santa Cruz Mountains and the Calaveras and Coyote Creek Faults east of the subbasin in the Diablo Range (Figure 3-7).

Figure 3-7. Major Faults



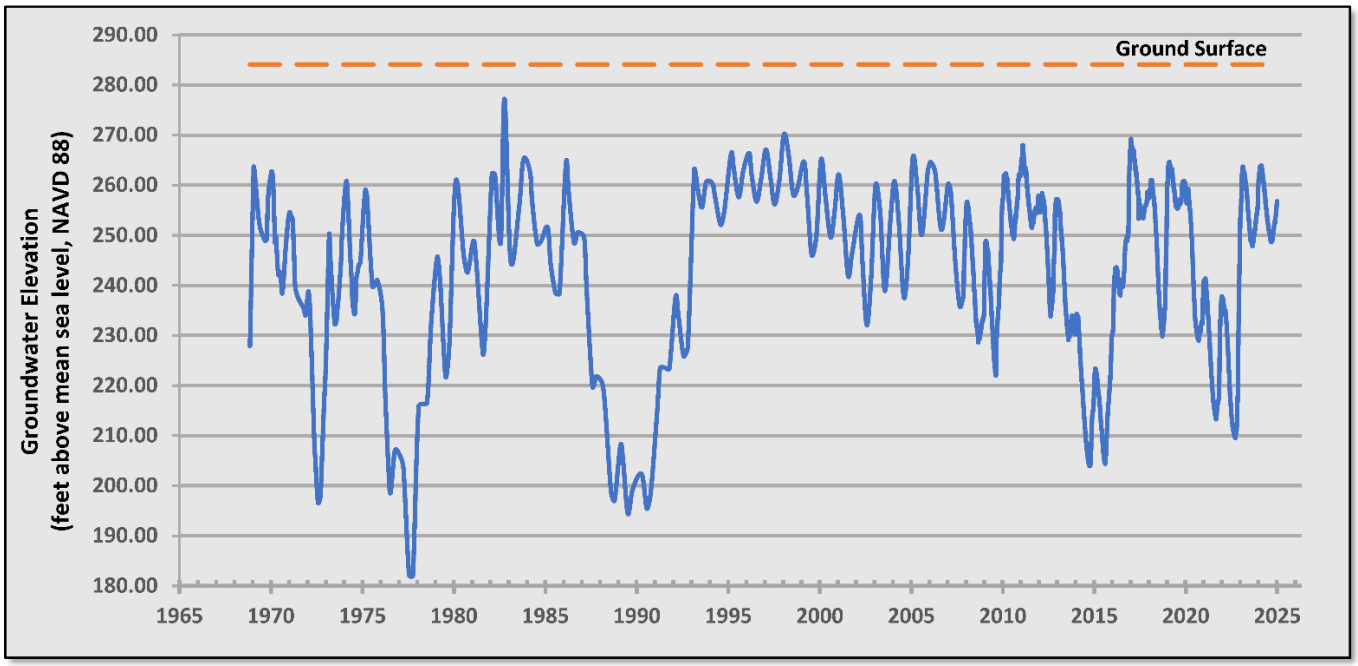
3.2 SUBBASIN CONDITIONS

This section describes Llagas Subbasin conditions with regard to groundwater elevation, flow, quality, land subsidence, interconnected surface water and groundwater, GDEs, and seawater intrusion.

3.2.1 Groundwater Elevation and Flow

Groundwater movement in the Llagas Subbasin generally follows surface water patterns, draining south toward the Pajaro River at the boundary with San Benito County. Locally, groundwater also moves toward areas of intense pumping. Vertical gradients in the subbasin are predominately downward, although several wells at the southern end of the subbasin commonly experience artesian pressure conditions during the winter and spring. Historic marshes located east of Gilroy and south of Pacheco Highway indicate an area of upward flow and groundwater discharge. Figure 3-8 is a long-term hydrograph for the regional index well in the Llagas Subbasin.

Figure 3-8. Groundwater Elevation in the Llagas Subbasin Regional Index Well (10S03E01N005)



Note: The original regional index well (10S03E13D003) was destroyed by the owner in April 2019 and was replaced in November 2019 by Valley Water with well 10S03E13E007. Due to an apparent obstruction, well 10S03E13E007 was replaced in December 2020 with 10S03E01N005, based on proximity to and similarities in the well construction and water level hydrographs as the original well 10S03E13D003.

Groundwater elevation contour maps depict the groundwater table or potentiometric surface associated with spring 2024 (Figure 3-9) and fall 2024 (Figure 3-10) for the Llagas Subbasin. Groundwater flows from north to south or slightly southeast, generally following the topography. The groundwater elevation is highest near Cochrane Road in Morgan Hill in the north, while the lowest elevation is typically found in the southernmost part of the subbasin near the Pajaro River. In the upper part of the subbasin, there are some flows from mountain or hill areas.

As indicated by the contour maps (Figures 3-9 and 3-10), typical seasonal patterns result in higher groundwater elevations in the spring and lower elevations in the fall. Contour maps for 2024 are included since that represents the year after water levels were most recently affected by drought.

Figure 3-9. Spring 2024 Principal Aquifer Groundwater Elevation Contours

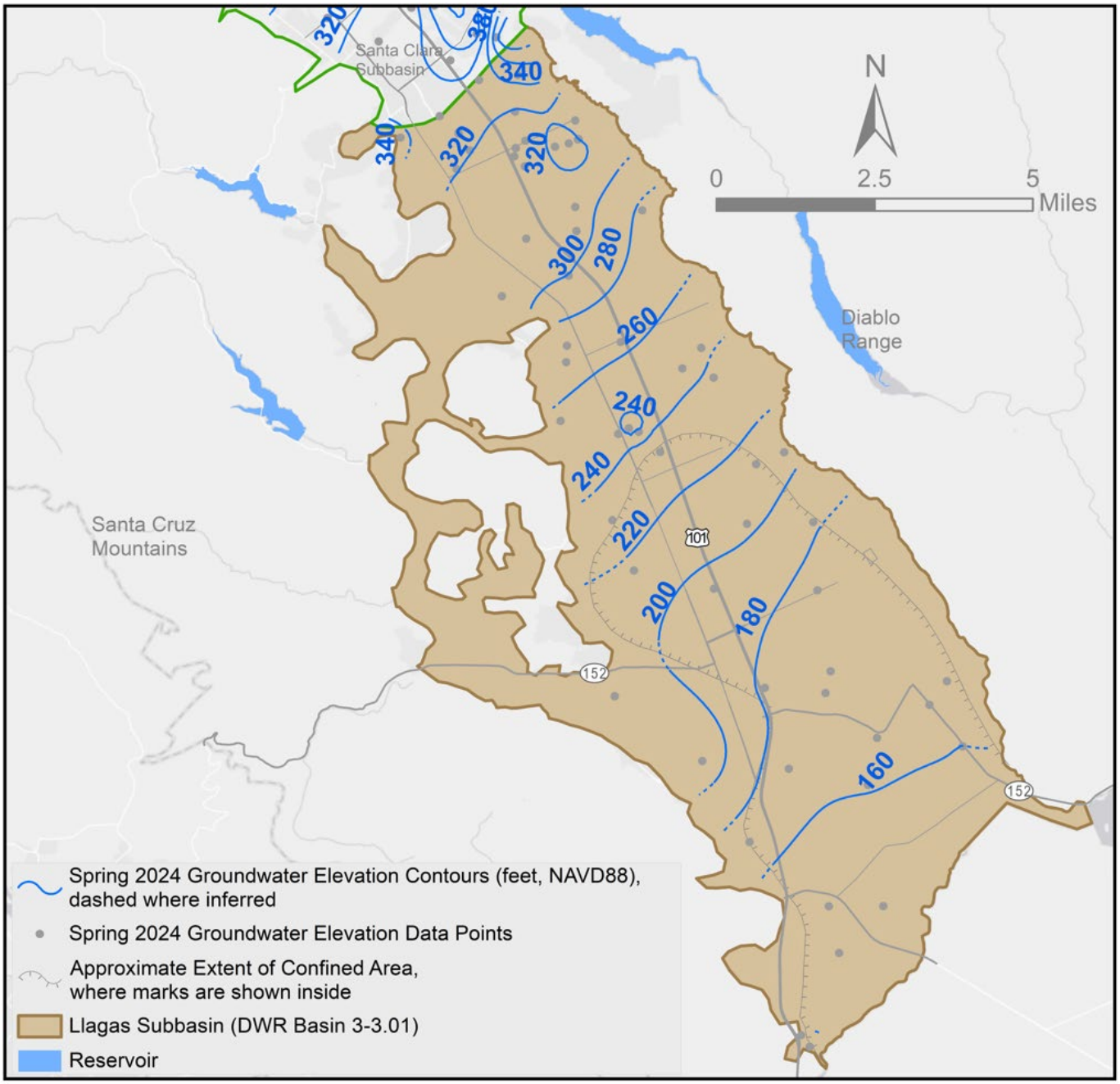


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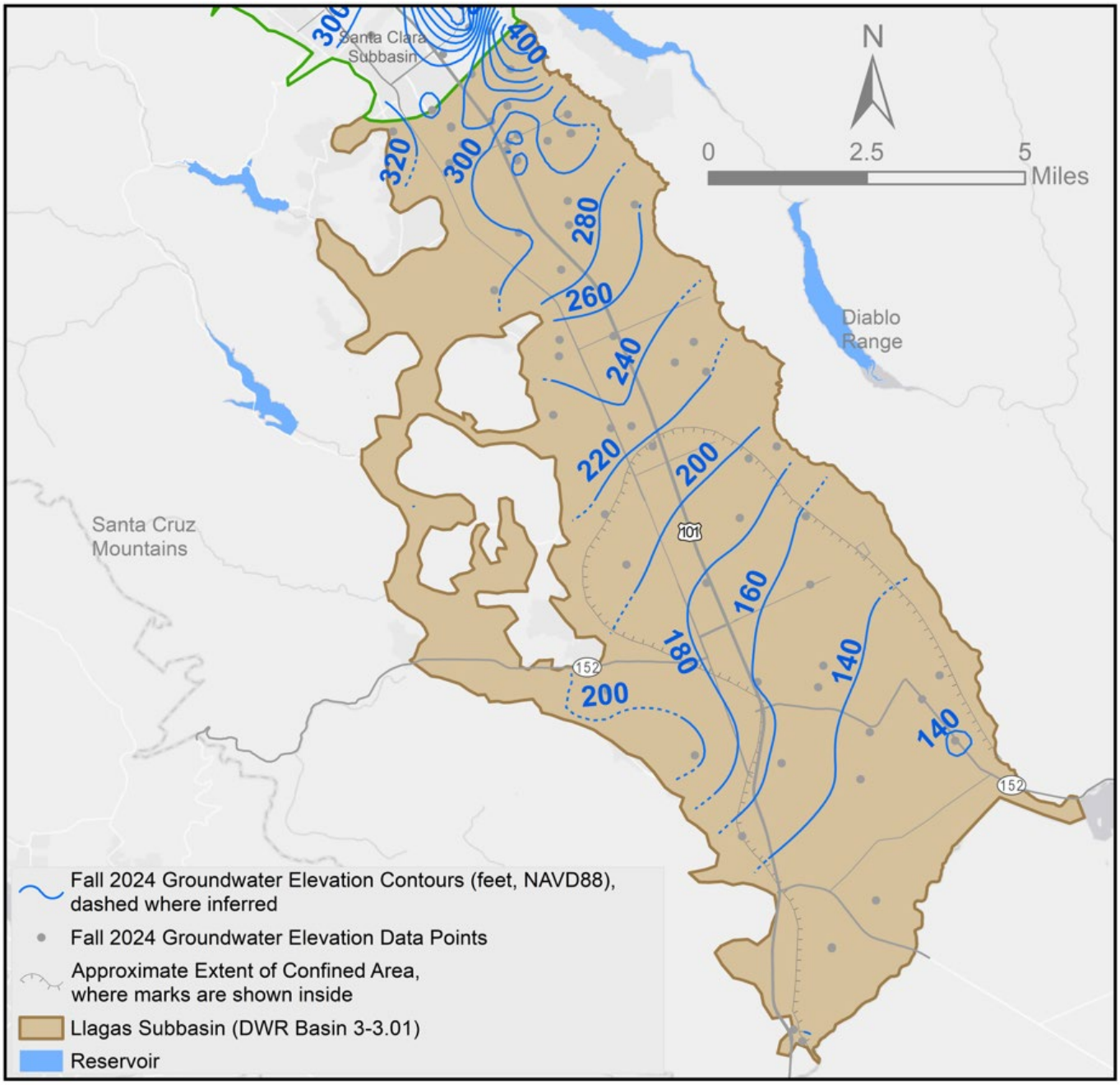
Figure 3-10. Fall 2024 Principal Aquifer Groundwater Elevation Contours



3.2.2 Land Subsidence

Inelastic land subsidence has not been observed in the Llagas Subbasin. Valley Water partnered with U.C. Berkeley researchers to use satellite imagery (InSAR) to evaluate the potential for subsidence in the Llagas Subbasin.[70] Using satellite imagery from 1992 to 2000, they concluded that there was no evidence of long-term subsidence. Seasonal ground surface movement was observed; rising and lowering by the same amount between the wet and dry seasons.

70 Bürgmann and Johanson, South County Subsidence Study – Phase I and Phase II, University of California, Berkeley, 2005.

3.2.3 Interconnected Surface Water and Groundwater

Valley Water's managed recharge program includes significant recharge through many miles of stream channels over the recharge area, indicating groundwater and surface water generally are disconnected in these reaches. As described further below, the managed recharge program helps to maintain flows in these creeks, most of which would flow only intermittently otherwise. Valley Water is not aware of any areas where groundwater pumping has a significant or unreasonable effect on interconnected surface water.

Valley Water has a comprehensive surface water monitoring network to measure creek flows, comply with water rights reporting and reservoir restrictions, and meet environmental requirements. Stream gauging by Valley Water is discussed in Chapter 7. Surface water flow data can be used to evaluate which reaches of streams are gaining or losing streams with regard to groundwater.

The portions of the Llagas Subbasin that are most likely to have surface water and groundwater interaction can be inferred through historical ecology maps prepared by the SFEI and the depth to shallow groundwater.[71] Figure 3-11 shows the historical ecology, including wetlands, marshes, and willow groves that may be associated with shallow groundwater.[72] Some of these areas may have been present due to poorly draining soils rather than surface water/groundwater interaction. It is also important to note that this was the historical distribution prior to development and does not represent current or even recent conditions. The Uvas-Carnadero wetlands are located in the southwestern corner of the Llagas Subbasin. This area is the exit for all groundwater flowing towards San Benito County. Groundwater upwells in this area and maintains the wetlands. Along the southeast side of the Llagas Subbasin in the Soap Lake area is another large area of wetlands. The wetlands in this area are believed to be primarily due to flooding and poorly draining soils.

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71 SCVWD, GIS Coverage of Depth to First Groundwater, 2003.
72 Grossinger et al., South Santa Clara Valley Historical Ecology Study, including Soap Lake, the Upper Pajaro River, and Llagas, Uvas-Carnadero, and Pacheco Creeks, 2008.

Figure 3-11. Llagas Subbasin Historical Ecology

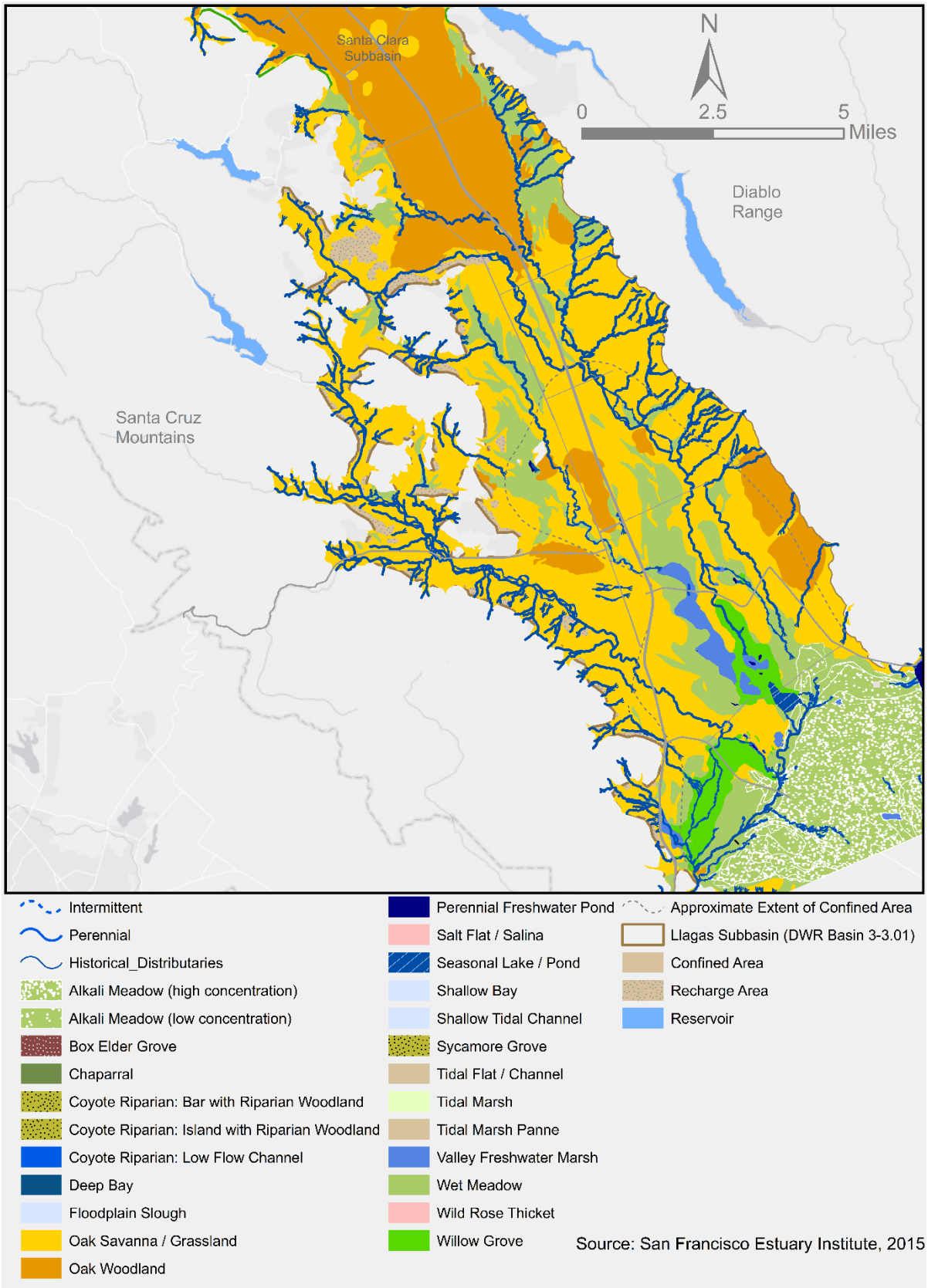
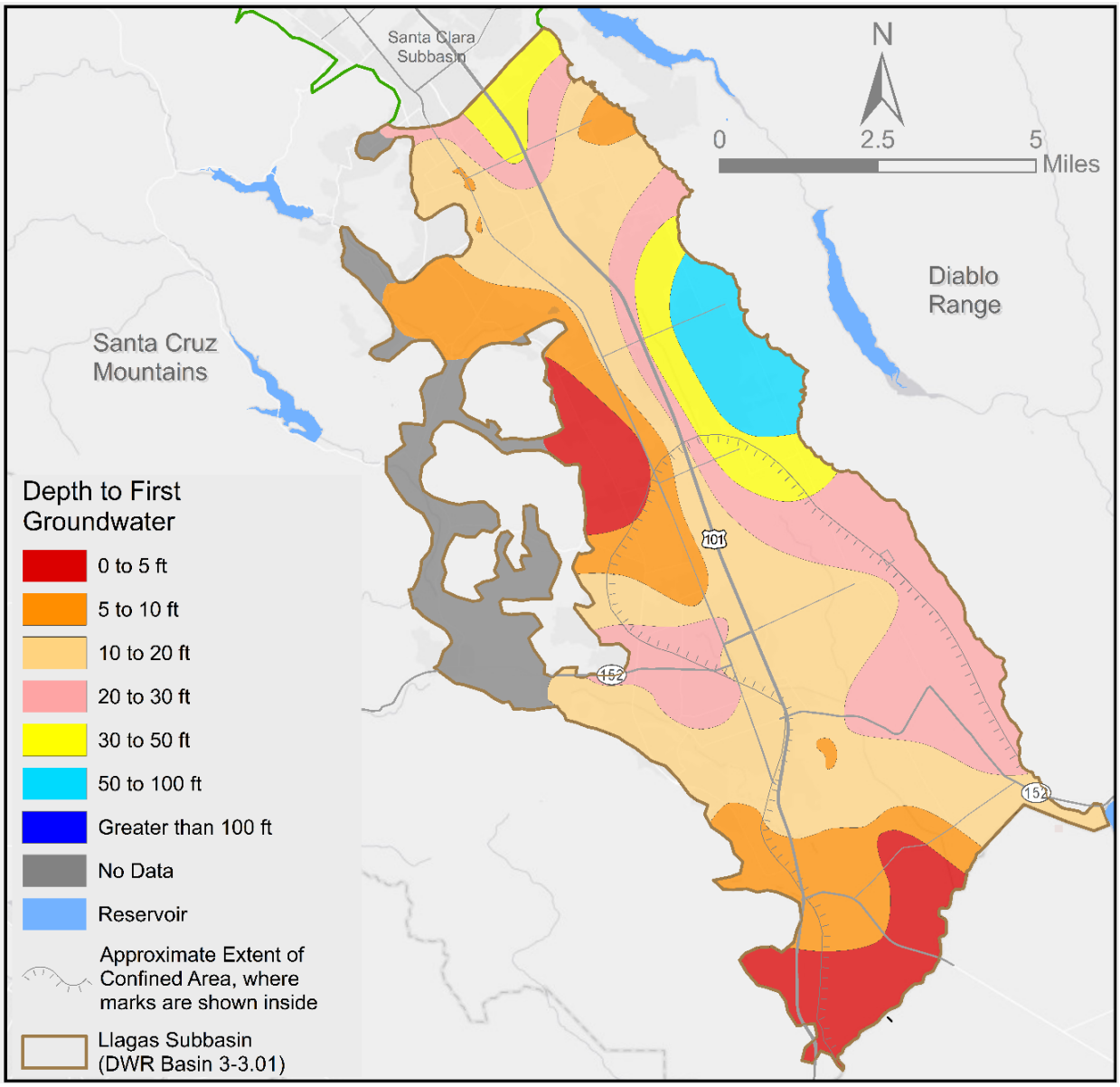


Figure 3-12 is a generalized depth to first groundwater map in the Llagas Subbasin based on data primarily from contaminant release sites. This map reflects the shallowest groundwater encountered based on available historical water level data from 1978 to 2019, rather than a specific point in time. The data was compiled from the State Water Resources Control Board GeoTracker database and from Valley Water's monitoring programs. Areas exhibiting shallow groundwater would be more likely to have surface water/groundwater interaction and gaining stream reaches.

Figure 3-12. Depth to First Groundwater in the Llagas Subbasin



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3.2.4 Groundwater Dependent Ecosystems

As noted previously, under SGMA, GDEs are "ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (23 CCR § 351(m)). GDEs in California include a wide range of natural communities, including wetlands, rivers, streams, estuaries, seeps and springs, and terrestrial vegetation. GDEs also include deep-rooted plants or plant communities that obtain water from the water table (called phreatophytes). A detailed technical memorandum that documents the current understanding, approach, and methods used to identify and map GDEs is included in Appendix F.

GDEs in the Llagas Subbasin are shown in Figure 3-13. This map was created by generally following The Nature Conservancy GDE guidance document[73]. Figure 3-13 is based on all California phreatophytes and identifies GDEs as likely (depth to water (DTW) less than 30 feet) and transition (DTW 30 to 50 feet). The DTW shown in Figure 3-13 was created using the median water level data between 2015 and 2024 from 105 wells in the Llagas Subbasin and a 30 ft LIDAR land surface elevation dataset. The GDE maps presented in the 2031 GWMP will be revised and updated as new information becomes available during each five-year Alternative Plan update cycle.

Figure 3-13 indicates that most of the GDEs in the Llagas Subbasin are along stream reaches. Most of these stream reaches are losing reaches and are actively used in Valley Water's managed in-stream recharge operations. These operations rely on natural streamflow and operational releases from Valley Water's local reservoirs and provide nearly perennial flows during many years in losing stream reaches that were historically ephemeral (intermittent) streams prior to Valley Water's operations. The reservoir releases have created nearly perennial flow in losing streams that are disconnected from the regional water table and thus are not interconnected surface water or GDEs. Figure 3-13 does not include phreatophytes overlying DTW greater than 50 feet because the DTW exceeds rooting depths. Many reaches downstream of reservoirs overlie likely and transition DTW categories and contain GDEs that are supported by both surface water augmented flows and groundwater. Therefore, some GDEs in Figure 3-13 are supported solely by groundwater and others are supported by a combination of surface water and groundwater. Because indicator phreatophytes are essentially identical along these reaches, it is very difficult to distinguish between the GDEs that are supported by groundwater only and those supported by a combination of surface water and groundwater.

Table 3-1 summarizes the area of GDEs in the Llagas Subbasin. The Llagas Subbasin has a total of 1,217 acres of GDEs, including 860 acres of likely and 357 acres of transition GDEs. The 2021 GWMP GDE analysis of the Llagas Subbasin included a "Possible" GDE category to account for phreatophytes located in areas with insufficient DTW data, primarily along the western edge of the Llagas Subbasin. Since 2021, improvements to interpolation methods and well selection criteria have addressed these DTW data gaps, as fully described in Appendix F. As a result, the updated GDE mapping no longer includes a Possible GDE category, as all areas could be classified as Likely or Transition based on available data.

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73 Rohde, M. M., S. Matsumoto, J. Howard, S. Liu, L. Riege, and E. J. Remson. 2018. Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans. The Nature Conservancy, San Francisco, California, 93 pages.

Figure 3-13. Groundwater Dependent Ecosystems in the Llagas Subbasin

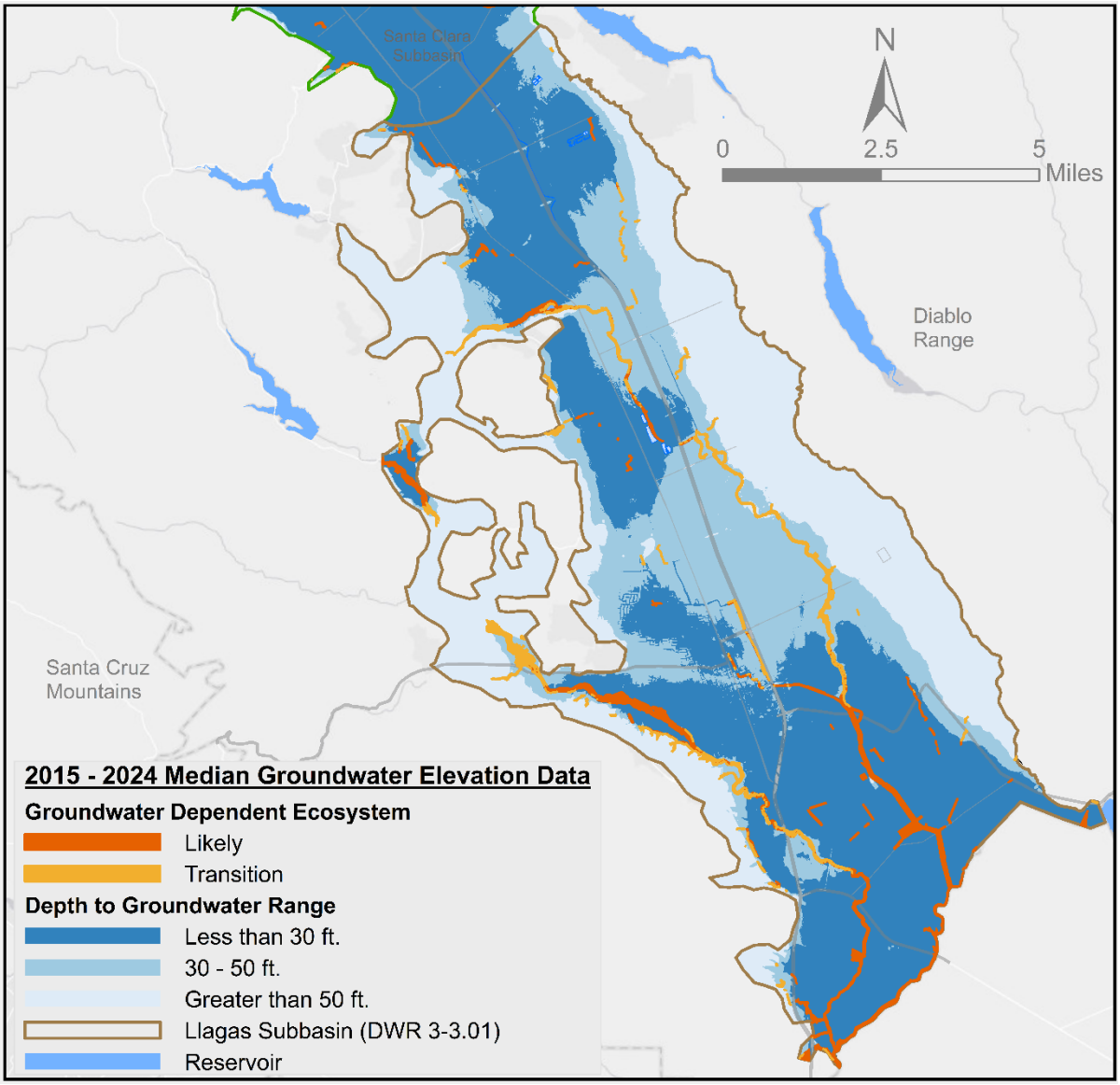

Table 3-1. Groundwater Dependent Ecosystem Area in the Llagas Subbasin

GDE Category	Llagas Subbasin (acres)
Likely GDE	860
Transition	357
Total (acres)	**1,217**

As explained in Chapter 4, the Llagas Subbasin has sustainable groundwater supply conditions. In the very southern areas of the Llagas Subbasin, where flowing artesian conditions exist in winter, groundwater pumping from the principal aquifer zone is effectively disconnected from the shallow water table and is not expected to affect GDEs. As explained in Appendix F, most GDEs in the recharge (unconfined) areas of the Llagas Subbasin are along losing stream reaches that are disconnected from the regional water table and thus are not considered interconnected surface water. Because these losing stream reaches are not interconnected and streamflow is supported by natural runoff and in-stream recharge operations via reservoir releases, GDEs are generally not affected by groundwater pumping in the recharge areas or the central portion of the Llagas Subbasin. Long-term groundwater levels are stable and demonstrate sustainable groundwater conditions (Chapter 4). Droughts of limited duration may lower the shallow water table, but effects to GDEs are expected to be minimal with continued management activities. Subsequent chapters of the GWMP describe Valley Water's extensive groundwater monitoring networks and comprehensive groundwater management activities that will continue to ensure groundwater sustainability in the Llagas Subbasin that help support GDEs.

3.2.5 Groundwater Quality

Valley Water has monitored and evaluated groundwater quality in the Llagas Subbasin for decades, with regular testing since the late 1980s when management responsibilities were transferred to Valley Water. Water quality data presented and summarized in this section represents data collected by Valley Water and other agencies from 2015 to 2024. Summary statistics for the Llagas Subbasin shallow and principal aquifer zones are presented in Tables 3-2 through 3-5. The primary source for data collected by other agencies is compliance sampling for public water supply wells submitted by water retailers to the California DDW. Valley Water's groundwater monitoring and evaluation allows for an appraisal of current conditions and offers a consistent basis for detecting near-term and long-term trends. The Llagas Subbasin generally produces groundwater of good quality that does not need treatment beyond disinfection at public water supply wells.

Groundwater in the Llagas Subbasin is typically of very good quality, with infrequent detections of water-quality parameters above MCLs. Figures 3-14 and 3-15 show concentrations in the principal aquifer relative to MCLs and SMCLs for the period 2015 to 2024. Sixty-nine (69%) of the Llagas Subbasin principal aquifer wells evaluated for the 10-year period meet health-based MCLs. Parameters detected above the MCL include antimony, asbestos, fluoride, lead, nitrate (as N), nitrite (as N), nitrate + nitrite (as N), PFOA, and PFOS (Figure 3-14). No radioactive parameters were detected above the MCL.

Elevated nitrate in the Llagas Subbasin is an ongoing groundwater protection challenge. Nitrate was detected above the MCL in approximately 31% of the Llagas Subbasin principal aquifer wells from 2015 to 2024 (Figure 3-14). Nearly all detections of nitrate above the MCL occurred in domestic wells, which are not subject to the same required testing and enforcement of state drinking water standards as municipal supply wells. Nitrate is naturally occurring in groundwater at low concentrations. Similar to Coyote Valley, the Llagas Subbasin is largely rural and agricultural, with the exceptions of the cities of Morgan Hill and Gilroy. Anthropogenic nitrate sources including agricultural fertilizers, septic systems, and animal waste. The 2015 to 2024 median nitrate (as N) concentration was 5.42 mg/L in shallow aquifer (Table 3-2) and 6.34 mg/L in the principal aquifer (Table 3-3). Valley Water works with interested parties and regulatory agencies to reduce nitrate loading to groundwater and to reduce well owner exposure to elevated nitrate in drinking water. Valley Water provides information to well owners about regular well testing and offers a free testing program for domestic well owners[74], which includes nitrate and other water quality parameters.

Some constituents also have SMCLs based on their ability to affect the aesthetic properties of water through taste, color, odor, or by causing staining or scale formation. The SMCL for these parameters

74 https://www.valleywater.org/your-water/groundwater/free-testing-domestic-well-owners

may be a single value, or a range, with a lower (recommended) and upper threshold. Aluminum, color, iron, manganese, specific conductance, TDS, and turbidity were detected above the SMCL in the Llagas Subbasin principal aquifer (Figure 3-15).

Tables 3-2 and 3-3 present summary statistics for all inorganic water-quality parameters in the shallow and principal aquifers, respectively. Inorganic parameters include trace elements (such as metals), major ions, nutrients, and radioactive parameters. Inorganic constituents are typically naturally occurring and can leach from rocks and sediments in contact with groundwater. Anthropogenic sources include industrial and manufacturing facilities. Calcium, magnesium, and bicarbonate are the dominant dissolved water-quality parameters in the Llagas Subbasin. Variation from this includes groundwater with sodium bicarbonate and mixed cation-mixed anion character. The 2015 to 2024 median TDS concentration in the principal aquifer zone was 420 mg/L.

Tables 3-4 and 3-5 present the organic chemicals detected in the shallow and principal aquifers, respectively. Although some organic chemicals are detected in the Llagas Subbasin, detections are infrequent and are typically low concentrations. Organic compounds include VOCs and pesticides, and are present in many household, commercial, and industrial products. Groundwater quality in the principal aquifer zone is excellent with respect to organic compounds. There were localized detections of some VOCs in the Llagas Subbasin, but none exceeded the MCL.

Historically, the presence of perchlorate was also of concern in Llagas Subbasin groundwater from an industrial flare manufacturing site. However, recent perchlorate concentrations in the principal aquifer are now stable or decreasing as large-scale remediation efforts continue at the former Olin Corporation site, which is overseen by the Central Coast Water Quality Control Board. As of 2024 through 2025, these trends remain consistent and aggregate perchlorate concentrations continue to attenuate. As described in the 2025 Annual Cleanup Progress Status Report, Mann-Kendall trend and plume comparison analyses reinforce that overall perchlorate concentrations are decreasing throughout the Subbasin and the plume core mass has been decreasing since 2012 [75]. The large volumes of water from Valley Water's managed recharge operations contribute to improved perchlorate conditions.

More recently, PFOS and PFOA were detected above the MCL in several wells, but overall, PFAS were below MCLs and not detected in most wells analyzed. Although PFAS in the environment are widespread and many sources can exist (i.e., consumer products, fire suppressing foams, stain and water repellants, agricultural amendments, septic discharge, etc.) no sources of PFAS have been identified in the region. Valley Water continues to lead voluntary monitoring efforts to characterize the extent and magnitude of PFAS in groundwater throughout the subbasin.

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75 GeoTracker: https://geotracker.waterboards.ca.gov/

Figure 3-14. Llagas Subbasin Principal Aquifer Concentrations Relative to Primary Drinking Water Standards (2015–2024)

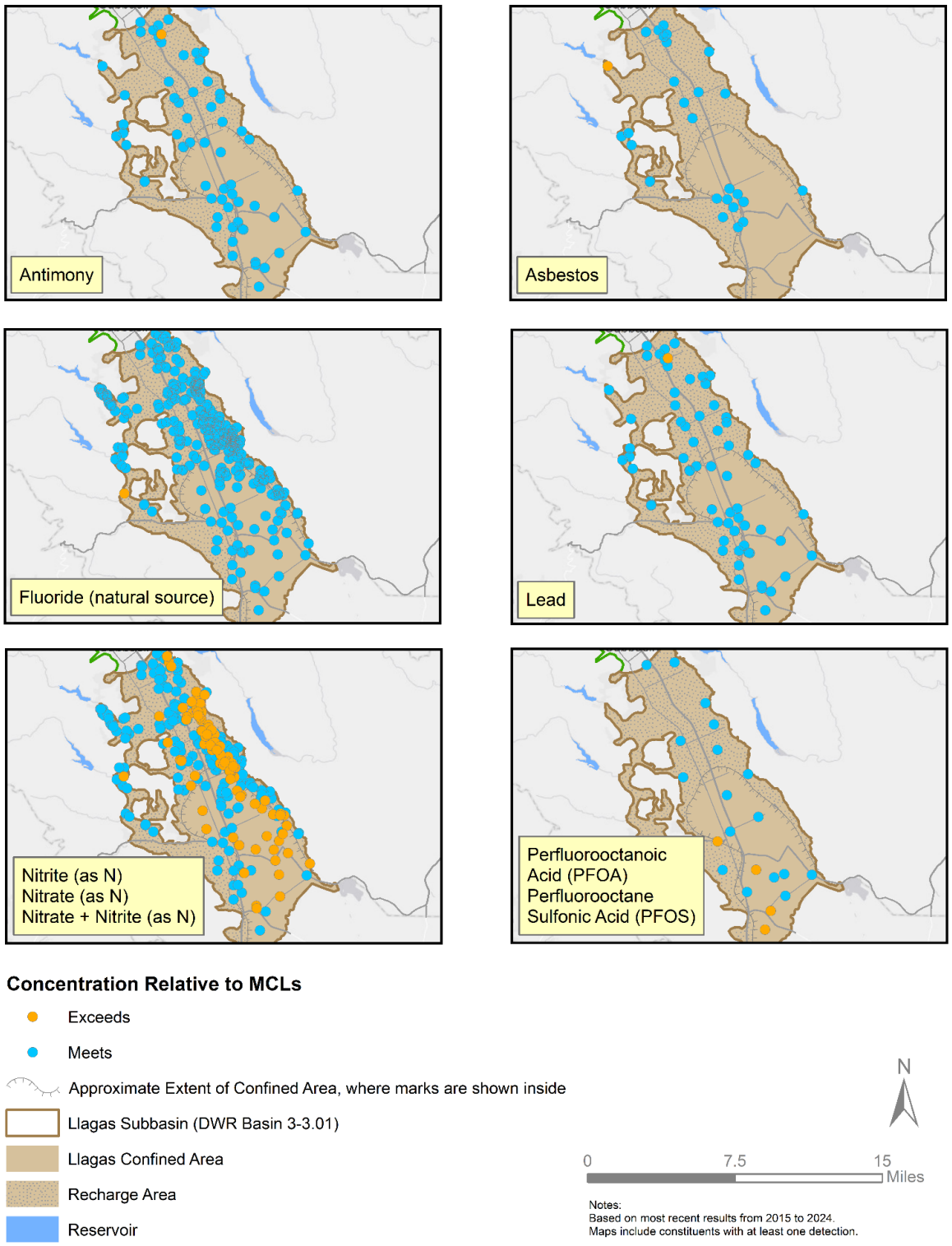
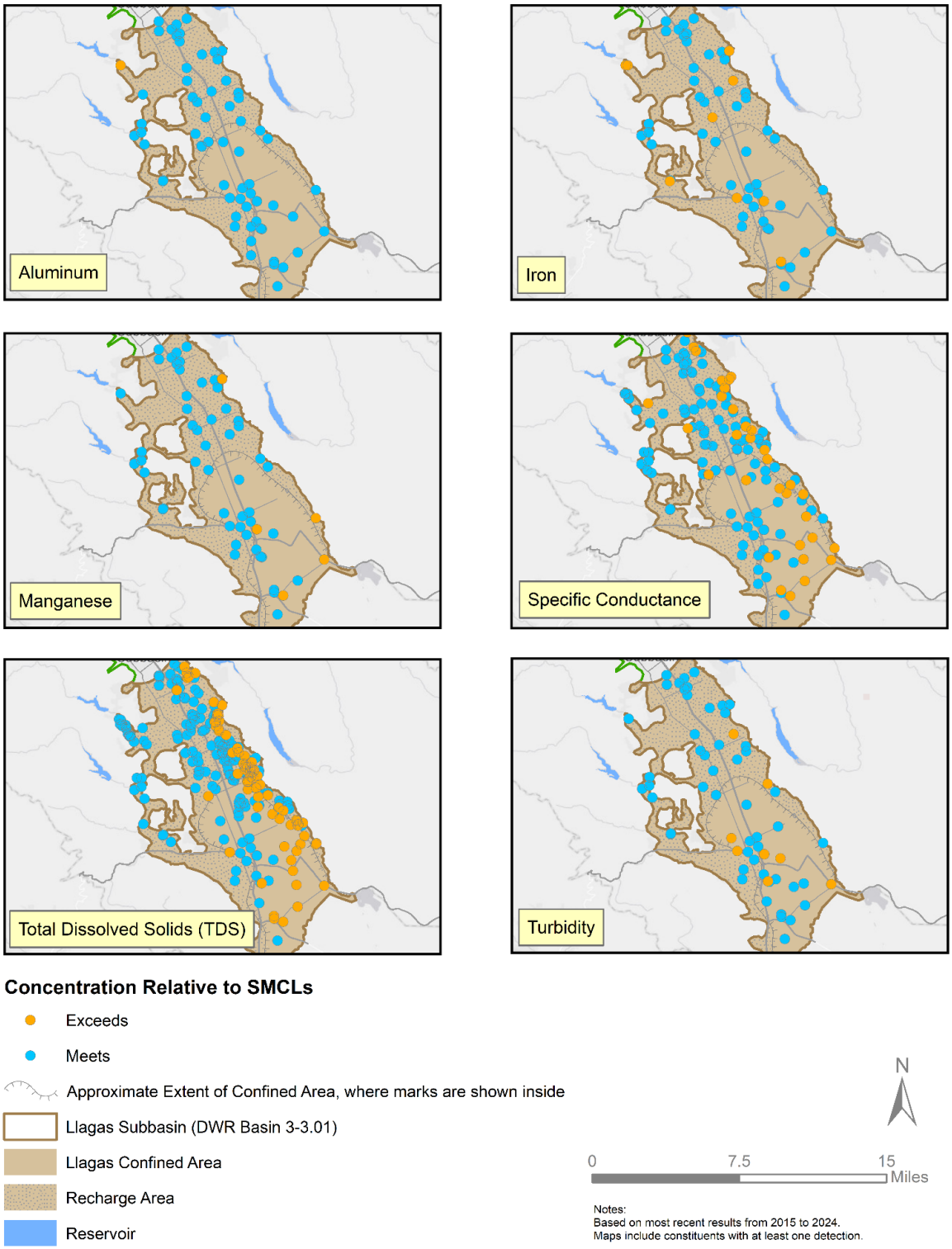


Figure 3-15. Llagas Subbasin Principal Aquifer Concentrations Relative to Secondary Drinking Water Standards (2015–2024)



Note: SMCL exceedances for color are not depicted in this figure.

Table 3-2. Llagas Subbasin Shallow Aquifer Zone Water Quality Summary (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Aggressive Index (Corrosivity)	INDEX	-	-	8	11.9	12.0	12.5
Aluminum	µg/L	1,000	200	199	ND	5.90	360
Antimony	µg/L	6	-	199	ND	ND	ND
Arsenic	µg/L	10	-	199	ND	ND	3.00
Barium	µg/L	1,000	-	199	ND	80.6	470
Beryllium	µg/L	4	-	199	ND	ND	ND
Bicarbonate (as HCO3)	mg/L	-	-	183	118	248	428
Bicarbonate Alkalinity (as CaCO3)	mg/L	-	-	163	97.0	202	423
Boron	µg/L	-	-	191	ND	94.0	219
Bromate	µg/L	10	-	6	ND	ND	ND
Bromide	mg/L	-	-	400	ND	0.0760	0.810
Cadmium	µg/L	5	-	199	ND	ND	ND
Calcium	mg/L	-	-	197	ND	55.0	105
Calcium (as CaCO3)	mg/L	-	-	187	ND	141	264
Carbonate (as CO3)	mg/L	-	-	155	ND	ND	ND
Carbonate Alkalinity (as CaCO3)	mg/L	-	-	150	ND	ND	ND
Chloride	mg/L	-	(250)	258	ND	40.7	172
Chromium	µg/L	50	-	203	ND	1.17	7.20
Chromium 6 (Hexavalent)[7]	µg/L	10	-	151	ND	0.460	5.40
Cobalt	µg/L	-	-	99	ND	ND	ND
Color	Color Units	-	15	9	ND	ND	5.00
Copper[7]	µg/L	1,300	1,000	197	ND	1.76	36.0
Cyanide	µg/L	150	-	34	ND	ND	44.0
Dissolved Oxygen	mg/L	-	-	135	0.280	6.20	10.6
E. Coli (MPN)	MPN/100 mL	-	-	24	ND	ND	1.00
E. Coli (P/A)	P/A 100 mL	-	-	310	9 Present; 301 Absent		
Fluoride (natural source)	mg/L	2	-	412	ND	0.0650	1.53
Foaming Agents (MBAS)	µg/L	-	500	21	ND	ND	54.0

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Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Hardness, Total (as CaCO3)	mg/L	-	-	401	ND	255	806
Heterotrophic Plate Count	CFU/mL	-	-	24	110	475	1,200
Hydroxide (as OH)	mg/L	-	-	155	ND	ND	ND
Hydroxide Alkalinity (as CaCO3)	mg/L	-	-	96	ND	ND	ND
Iron	µg/L	-	300	197	ND	6.67	620
Langelier Index @ 60 C	INDEX	-	-	10	ND	ND	0.530
Lead (Dissolved)[8]	µg/L	15	-	199	ND	ND	3.50
Lithium	µg/L	-	-	99	ND	5.70	36.0
Magnesium	mg/L	-	-	197	ND	34.5	80.0
Manganese	µg/L	-	50	201	ND	1.49	712
Mercury	µg/L	2	-	196	ND	ND	ND
Molybdenum	µg/L	-	-	99	ND	ND	1.50
Nickel	µg/L	100	-	199	ND	0.998	11.2
Nitrate (as N)	mg/L	10	-	484	ND	5.42	56.9
Nitrate + Nitrite (as N)	mg/L	10	-	13	0.690	2.95	5.30
Nitrite (as N)	mg/L	1	-	200	ND	ND	0.0500
Odor Threshold @ 60 C	TON	-	3	10	ND	ND	1.00
Orthophosphate (as PO4)	mg/L	-	-	447	ND	0.0220	1.09
Oxidation Reduction Potential (ORP)	mV	-	-	187	11.4	173	432
Perchlorate	µg/L	6	-	198	ND	ND	4.62
pH	pH Units	-	-	234	6.33	7.15	8.50
Potassium	mg/L	-	-	192	ND	0.370	2.10
Selenium	µg/L	50	-	199	ND	ND	7.00
Silica	mg/L	-	-	168	12.0	28.8	45.7
Silicon	mg/L	-	-	88	9.80	14.0	21.3
Silver	µg/L	-	100	197	ND	ND	3.20
Sodium	mg/L	-	-	197	11.2	24.2	164
Source Temperature	C	-	-	195	15.7	19.6	26.6
Specific Conductance	µS/cm	-	(900)	441	276	651	1,250
Sulfate	mg/L	-	(250)	410	ND	33.2	485

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Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Thallium, Total	µg/L	2	-	199	ND	ND	ND
Total Alkalinity (as CaCO3)	mg/L	-	-	201	97.0	203	351
Total Coliform (MPN)	MPN/100 mL	-	-	24	ND	ND	33.6
Total Coliform (P/A)[9]	P/A 100 mL	-	-	311	89 Present; 222 Absent		
Total Dissolved Solids (TDS)	mg/L	-	(500)	363	78.0	374	2,660
Total Organic Carbon (TOC)	mg/L	-	-	1	ND	ND	ND
Turbidity	NTU	-	5	348	ND	0.720	54.0
Vanadium, Total	µg/L	-	-	187	ND	1.76	16.0
Zinc	µg/L	-	5,000	197	ND	5.10	220

Notes:
Table includes data for wells monitored by the Valley Water (annual monitoring network wells and water supply wells) and public water system data reported to the CA Division of Drinking Water (DDW). Only wells with known construction information are presented in this table. Public water system wells are assumed to represent the principal zone if no construction information is available, as these are typically deep wells. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.

[1] C = degrees Celsius; CFU/mL = colony-forming units per milliliter; MFL = million fibers per liter; mg/L = milligrams per liter; MPN/100 mL = most probable number per 100 milliliters; mV = millivolts; NTU = Nephelometric Turbidity Units; P/A 100 mL = present/absent per 100 milliliters; TON = threshold odor number; µg/L = micrograms per liter; µS/cm = microSiemens per centimeter.

[2] MCL = Maximum Contaminant Level specified in the Code of Federal Regulations 40CFR141 and/or Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.

[3] SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per DDW or US EPA. For SMCLs having a range, the lower, recommended threshold is listed in parentheses.

[4] Some parameters may have been analyzed more than once at a particular well.

[5] For parameters with results with multiple reporting limits, the median was computed using the Maximum Likelihood Estimate (MLE) method. Reported values were rounded to three significant figures for consistency. ND = not detected at the laboratory reporting limit.

[6] The minimum shown is the lowest detected value. The lowest reporting limit (e.g., <5) is shown when there are no quantified values at the lowest reporting limit.

[7] In October 2024, an MCL of 10 parts per billion (ppb) (equivalent to 10 µg/L) for hexavalent chromium (chromium-6) in drinking water took effect.

[8] Lead and copper do not have primary MCLs but have "action levels" of 15 and 1,300 µg/L, respectively. These substances are regulated by the state for public water systems since they can adversely affect public health.

[9] Total coliform and e. coli bacteria are regulated under the US EPA Total Coliform Rule, which identifies sampling requirements and compliance criteria based on the type of public water system. All wells with data in bacteria results in this table are private, domestic wells that are not subject to federal or state drinking water requirements.

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Table 3-3. Llagas Subbasin Principal Aquifer Zone Water Quality Summary (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Aggressive Index (Corrosivity)	INDEX	-	-	107	11.4	12.0	13.6
Aluminum	µg/L	1,000	200	339	ND	ND	220
Ammonia (NH3-N)	mg/L	-	-	1	ND	ND	ND
Antimony	µg/L	6	-	339	ND	ND	9.90
Arsenic	µg/L	10	-	337	ND	ND	8.00
Asbestos	MFL	7	-	72	ND	ND	53.0
Barium	µg/L	1,000	-	337	ND	54.5	510
Beryllium	µg/L	4	-	337	ND	ND	ND
Bicarbonate (as HCO3)	mg/L	-	-	294	68.0	233	460
Bicarbonate Alkalinity (as CaCO3)	mg/L	-	-	154	90.0	222	368
Boron	µg/L	-	-	236	ND	73.4	4,600
Bromate	µg/L	10	-	6	ND	ND	ND
Bromide	mg/L	-	-	605	ND	0.189	1.15
Cadmium	µg/L	5	-	336	ND	ND	ND
Calcium	mg/L	-	-	302	2.00	52.3	120
Calcium (as CaCO3)	mg/L	-	-	180	72.8	151	299
Carbonate (as CO3)	mg/L	-	-	201	ND	ND	40.0
Carbonate Alkalinity (as CaCO3)	mg/L	-	-	152	ND	ND	24.0
Chloride	mg/L	-	(250)	440	5.90	60.0	190
Chlorite	mg/L	-	-	1	ND	ND	ND
Chromium	µg/L	50	-	341	ND	1.03	41.0
Chromium 6 (Hexavalent)[7]	µg/L	10	-	192	ND	0.729	7.80
Cobalt	µg/L	-	-	93	ND	ND	ND
Color	Color Units	-	15	68	ND	1.76	20.0
Copper[8]	µg/L	1,300	1,000	309	ND	2.12	97.0
Cyanide	µg/L	150	-	175	ND	ND	ND
Dissolved Oxygen	mg/L	-	-	122	0.750	6.38	10.4
E. Coli (MPN)	MPN/100 mL	-	-	24	ND	ND	1.00
E. Coli (P/A)	P/A 100 mL	-	-	603	594 Present; 9 Present		
Fluoride (natural source)	mg/L	2	-	741	ND	0.104	2.80
Foaming Agents (MBAS)	µg/L	-	500	66	ND	ND	0.050
Hardness, Total (as CaCO3)	mg/L	-	-	695	ND	262	662

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Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Heterotrophic Plate Count	CFU/mL	-	-	24	200	1,430	8,500
Hydroxide (as OH)	mg/L	-	-	200	ND	ND	5.00
Hydroxide Alkalinity (as CaCO3)	mg/L	-	-	95	ND	ND	ND
Iron	µg/L	-	300	345	ND	17.7	2,800
Langelier Index @ 60 C	INDEX	-	-	62	ND	0.480	1.46
Langelier Index at Source Temp	INDEX	-	-	23	ND	0.065	0.640
Lead[8]	µg/L	15	-	346	ND	ND	1,000
Lithium	µg/L	-	-	93	ND	10.1	28.0
Magnesium	mg/L	-	-	299	0.900	27.9	71.8
Manganese	µg/L	-	50	315	ND	3.33	455
Mercury	µg/L	2	-	334	ND	ND	ND
Molybdenum	µg/L	-	-	93	ND	ND	4.90
Nickel	µg/L	100	-	337	ND	ND	38.0
Nitrate (as N)	mg/L	10	-	2,252	ND	6.34	48.0
Nitrate + Nitrite (as N)	mg/L	10	-	156	ND	4.20	43.0
Nitrite (as N)	mg/L	1	-	600	ND	ND	3.20
Odor Threshold @ 60 C	TON	-	3	124	ND	ND	1.00
Orthophosphate (as PO4)	mg/L	-	-	687	ND	0.0280	1.66
Oxidation Reduction Potential (ORP)	mV	-	-	180	ND	173	404
Perchlorate	µg/L	6	-	671	ND	ND	5.60
pH	pH Units	-	-	352	6.35	7.56	9.00
Potassium	mg/L	-	-	265	ND	1.42	1,300
Selenium	µg/L	50	-	338	ND	ND	9.00
Silica	mg/L	-	-	170	12.9	27.2	51.0
Silicon	mg/L	-	-	87	10.3	13.1	21.7
Silver	µg/L	-	100	300	ND	ND	ND
Sodium	mg/L	-	-	314	9.00	28.4	197
Source Temperature	C	-	-	187	16.1	19.8	30.0
Specific Conductance	µS/cm	-	(950)	889	340	632	1,643
Sulfate	mg/L	-	(250)	720	ND	36.0	213
Thallium, Total	µg/L	2	-	335	ND	ND	ND
Total Alkalinity (as CaCO3)	mg/L	-	-	305	90.0	192	410
Total Coliform (MPN)	MPN/100 mL	-	-	24	ND	ND	8.60

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Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Total Coliform (P/A)[9]	P/A 100 mL	-	-	605	156 Present; 449 Absent		
Total Dissolved Solids (TDS)	mg/L	-	(500)	644	56.0	420	1,030
Total Kjeldahl Nitrogen (as N)	mg/L	-	-	30	ND	ND	ND
Total Nitrogen (as N)	mg/L	-	-	31	ND	0.500	2.50
Turbidity	NTU	-	5	444	ND	0.300	57.0
Vanadium, Total	µg/L	-	-	180	ND	1.18	14.0
Zinc	µg/L	-	5,000	298	ND	2.56	2,140

Notes:
The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet. See summary notes and descriptions at the end of Table 3-2.

Table 3-4. Llagas Subbasin Shallow Aquifer Zone Organic Parameter Detections (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Perfluoro Butanoic Acid (PFBA)	ng/L	-	-	14	ND	ND	4.20
Perfluoropentanoic Acid (PFPEA)	ng/L	-	-	5	ND	5.20	15.8
Perfluorobutanesulfonic Acid (PFBS)	ng/L	-	-	24	ND	ND	5.20
Perfluoroheptanoic Acid (PFHPA)	ng/L	-	-	24	ND	ND	2.60
Perfluorohexane Sulfonic Acid (PFHxS)	ng/L	10	-	24	ND	ND	3.15
Perfluorohexanoic Acid (PFHxA)	ng/L	-	-	24	ND	ND	9.30
Perfluorooctane Sulfonic Acid (PFOS)	ng/L	4	-	29	ND	ND	5.70
Perfluorooctanoic Acid (PFOA)	ng/L	4	-	33	ND	ND	16.0
n-Nitrosodi-n-Butylamine (NDBA)	µg/L	-	-	12	ND	ND	0.004
Bromodichloromethane (THM)	µg/L	-	-	77	ND	ND	2.10

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Chloroform (THM)	µg/L	-	-	77	ND	ND	9.30
Dibromochloromethane (THM)	µg/L	-	-	73	ND	ND	1.70
Total Trihalomethanes	µg/L	80	80	22	ND	ND	9.00

Notes:
Of the 144 organic parameters tested in the shallow aquifer, 131 were not detected. Only parameters with detections are included in the table. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet. See summary notes and descriptions at the end of Table 3-2.
[2] MCL = Maximum Contaminant Level specified in the Code of Federal Regulations 40CFR141 and/or Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard. In April 2024, the US EPA established MCLs for PFOA, PFOS, PFHxS, PFNA, and HFPO-DA as shown, as well as a hazard index of 1.0 for the mixture of two or more of PFHxS, HFPO-DA, PFBS, and PFNA. Public water systems have three years to complete initial PFAS monitoring and up to five years to implement solutions (if needed) to ensure water delivered to customers does not exceed these limits. Currently, there are no state MCLs for any PFAS.

Table 3-5. Llagas Subbasin Principal Aquifer Zone Organic Parameter Detections (2015–2024)

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
Endrin	µg/L	2	2	112	ND	ND	0.010
gamma-BHC (lindane)	µg/L	0.2	0.2	111	ND	ND	0.050
Perfluoro Butanoic Acid (PFBA)	ng/L	-	-	33	ND	ND	7.20
Perfluorobutanesulfonic Acid (PFBS)	ng/L	-	-	50	ND	0.880	11.2
Perfluoroheptanoic Acid (PFHPA)	ng/L	-	-	50	ND	ND	5.56
Perfluorohexane Sulfonic Acid (PFHxS)	ng/L	10	-	50	ND	ND	6.15
Perfluorohexanoic Acid (PFHxA)	ng/L	-	-	49	ND	ND	24.4
Perfluorononanoic Acid (PFNA)	ng/L	10	-	51	ND	ND	2.87
Perfluorooctane Sulfonic Acid (PFOS)	ng/L	4	-	54	ND	ND	30.6
Perfluorooctanoic Acid (PFOA)	ng/L	4	-	53	ND	ND	28.5
Perfluoropentanoic Acid (PFPEA)	ng/L	-	-	23	ND	ND	35.2
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	µg/L	-	1,200	519	ND	ND	2.90

Parameter	Units[1]	MCL[2]	SMCL[3]	Number Of Results[4]	Results[5]		
					Min[6]	50th Percentile (Median)	Max
1,1,2-Trichloroethane	µg/L	5	5	509	ND	ND	4.60
Bromoform (THM)	µg/L	-	-	243	ND	ND	0.941
Chloroform (THM)	µg/L	-	-	246	ND	ND	7.60
Chloromethane	µg/L	-	-	241	ND	ND	0.970
Formaldehyde	mg/L	-	-	35	ND	ND	0.005
Tertiary Butyl Alcohol (TBA)	µg/L	-	-	211	ND	ND	3.90
Tetrachloroethene	µg/L	5	5	519	ND	ND	2.70
Toluene	µg/L	1,000	150	515	ND	ND	20.0
Total Trihalomethanes	µg/L	80	80	30	ND	ND	7.60

Notes:
Of the 231 organic parameters tested in the principal aquifer, 210 were not detected. Only parameters with detections are included in the table. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet. See summary notes and descriptions at the end of Table 3-4.

3.2.5.1 Water Quality Trends

To assess changes in water quality over time, Valley Water evaluated nitrate and TDS concentrations over a 15-year period (2011-2025) for the Llagas subbasin[76]. Mann-Kendall statistical trend tests were conducted for individual wells with at least five sample results. Trend analysis results show that most wells have stable or decreasing nitrate and TDS concentration trends, although some upward trends are observed. A total of 90% and 85% of all supply wells evaluated have stable or decreasing concentrations of nitrate and TDS, respectively. Valley Water will assess potential causes of wells with upward trends and engage with regulatory and/or land use agencies, as needed.

Valley Water conducted a five- and ten-year statistical step-trend analysis of nitrate and TDS concentrations for the Llagas subbasin principal aquifer to assess whether concentrations were changing within each timeframe. The results (Table 3-6) show that there is generally no change in concentrations or time period. Nitrate and TDS medians remain lower than their respective MCLs.

Table 3-6. Nitrate and Total Dissolved Solids (TDS) Step Trend Outcome in the Llagas Subbasin Principal Aquifer

Parameter	5-Year Step Trend	10-Year Step Trend
Nitrate (as N) (mg/L)	No Change	No Change
Total Dissolved Solids (mg/L)	No Change	No Change

76 Valley Water, 2025 Water Year Report for the Santa Clara and Llagas Subbasin, March 2026.

3.2.6 Seawater Intrusion

There are no seawater bodies near the Llagas Subbasin. Therefore, no seawater intrusion has been observed and the subbasin is not vulnerable to seawater intrusion.

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CHAPTER 4 – WATER SUPPLIES, DEMANDS AND BUDGET

This section presents information on current water demands, supplies, and groundwater budget for the Santa Clara and Llagas subbasins, as well as future demands.

4.1 COUNTYWIDE WATER SUPPLY SOURCES

Santa Clara County has a diverse water supply portfolio, with sources including local surface water, natural groundwater, imported water, and recycled water.

4.1.1 Local Surface Water

Valley Water currently has 20 appropriative water rights licenses, 10 certificates and one permit that allows diversions of up to 227,339 acre-feet per year (AFY). Three of those licenses and the 10 certificates (which allow diversions of up to 55 AF yearly) are for 14 stockponds Valley Water acquired at Upper Penitencia Creek and Rancho Cañada de Pala for environmental mitigation. Local rainfall runoff is captured in Valley Water's reservoirs and is sent to drinking water treatment plants or diverted downstream for groundwater recharge. The total storage capacity of Valley Water's reservoirs is about 166,000 AF (Table 4-1), though several are operating at restricted capacity due to seismic stability concerns. Table 4-1 summarizes reservoir capacities, restrictions, and impacts from restrictions.

Table 4-1. Santa Clara County Reservoir Capacities

Reservoir/ Dam	Reservoir Capacity (Acre-feet)	DSOD Restricted Capacity (Acre-feet)	Restricted Capacity (%)	Year Completed	Use
Anderson**	89,278	3,485	4	1950	Groundwater recharge, Treated for drinking water
Coyote	22,541	11,843	53	1936	Groundwater recharge, Treated for drinking water
Almaden	1,555	1,443	93	1935	Groundwater recharge, Treated for drinking water
Calero	9,819	4,472	45	1935	Groundwater recharge, Treated for drinking water
Guadalupe	3,320	2,152	65	1935	Groundwater recharge
Stevens Creek	2,949	No restriction	N/A	1935	Groundwater recharge
Lexington	18,534	No restriction	N/A	1952	Groundwater recharge
Chesbro	7,967	No restriction	N/A	1955	Groundwater recharge
Uvas	9,688	No restriction	N/A	1957	Groundwater recharge
Vasona	463	No restriction	N/A	1935	Groundwater recharge
Total	166,114	62,996			

Note: Capacities above reflect most current survey results.

** Pursuant to the Federal Energy Regulatory Commission (FERC) Directive, Anderson Reservoir is currently being operated at an elevation of 492 feet (NAVD 88), which is two feet above the deadpool elevation of 490 feet (NAVD 88). This operating level is maintained to ensure the ability to provide water to Coyote Creek during outages in the imported water system.

Most of the reservoirs are sized for annual operations, storing water in winter for use in summer and fall. The exception is the Anderson-Coyote reservoir system, which historically provided valuable carryover of supplies from year to year and served as backup system to Valley Water's water treatment plants when imported water deliveries are curtailed. In addition, San Jose Water Company and Stanford University have surface water rights that contribute to local surface water availability for their customers.

4.1.2 Groundwater

The groundwater subbasins provide multiple benefits to residents and businesses in Santa Clara County. Although most of the groundwater pumped is sustained by Valley Water's managed recharge programs, the subbasins provide some groundwater supply resulting from the percolation of rainfall in the recharge areas and natural seepage through local creeks and streams (natural groundwater recharge). In addition, the groundwater subbasins serve as an extensive conveyance network, allowing water to move from the recharge areas to individual groundwater wells. The groundwater subbasins also provide some natural filtration of surface water as it percolates through the soil and rock. Unlike surface water, most groundwater in the county can be used for drinking water without treatment. Lastly, the groundwater subbasins provide water storage, allowing water to be carried over from the wet season to the dry season and from wet years to dry years.

4.1.3 Imported Water

Valley Water imported water is conveyed through the Sacramento-San Joaquin Delta and then pumped and delivered to the county through the South Bay Aqueduct, which typically carries water from the SWP, and through the San Felipe Division, which typically brings in water from the federal CVP. Additional flexibility, such as bringing SWP water through the San Felipe Division, may exist, subject to Bureau of Reclamation and DWR approval. Valley Water has a contract for 100,000 AFY from the SWP and a contract for 152,500 AFY from the CVP. The actual amount of water delivered is typically less than these contractual amounts and depends on hydrology, conveyance limitations, and environmental regulations. As shown in Table 4-2, average deliveries from 2015 to 2024 were about 61,930 AFY for the SWP and 77,160 AFY for the CVP. Supplemental imported water is acquired through transfers and exchanges as needed and available. In addition, Valley Water is able to put some imported water supplies into carryover, for example in San Luis Reservoir for the following year, and Semitropic Groundwater Bank for later withdrawal and use. Imported supplies are delivered to Valley Water's three drinking water treatment plants, groundwater recharge facilities, and about 40 untreated surface water permittees countywide.

Table 4-2. SWP and CVP Deliveries in Santa Clara County

Year	SWP Deliveries (AF)	SFD Deliveries (AF)
2015	65,800	49,600
2016	68,700	104,600
2017	45,000	70,900
2018	77,100	107,700
2019	42,900	66,800
2020	52,900	86,600
2021	51,300	88,500
2022	73,200	70,500
2023	84,000	59,300
2024	58,400	67,100
Average (AF)	**61,930**	**77,160**

Eight retailers in the county have contracts with the SFPUC to receive water from the SFPUC Regional Water System. The eight retailers, considered to be wholesale customers of SFPUC, are the cities of Palo Alto, Mountain View, Sunnyvale, Santa Clara, San José, and Milpitas; Purissima Hills Water District; and Stanford University. In addition, NASA-Ames is considered a retail customer of SFPUC. Valley

Water does not control or administer SFPUC supplies in the county, but this supply reduces the demands on Valley Water supplies.

4.1.4 Recycled and Purified Water

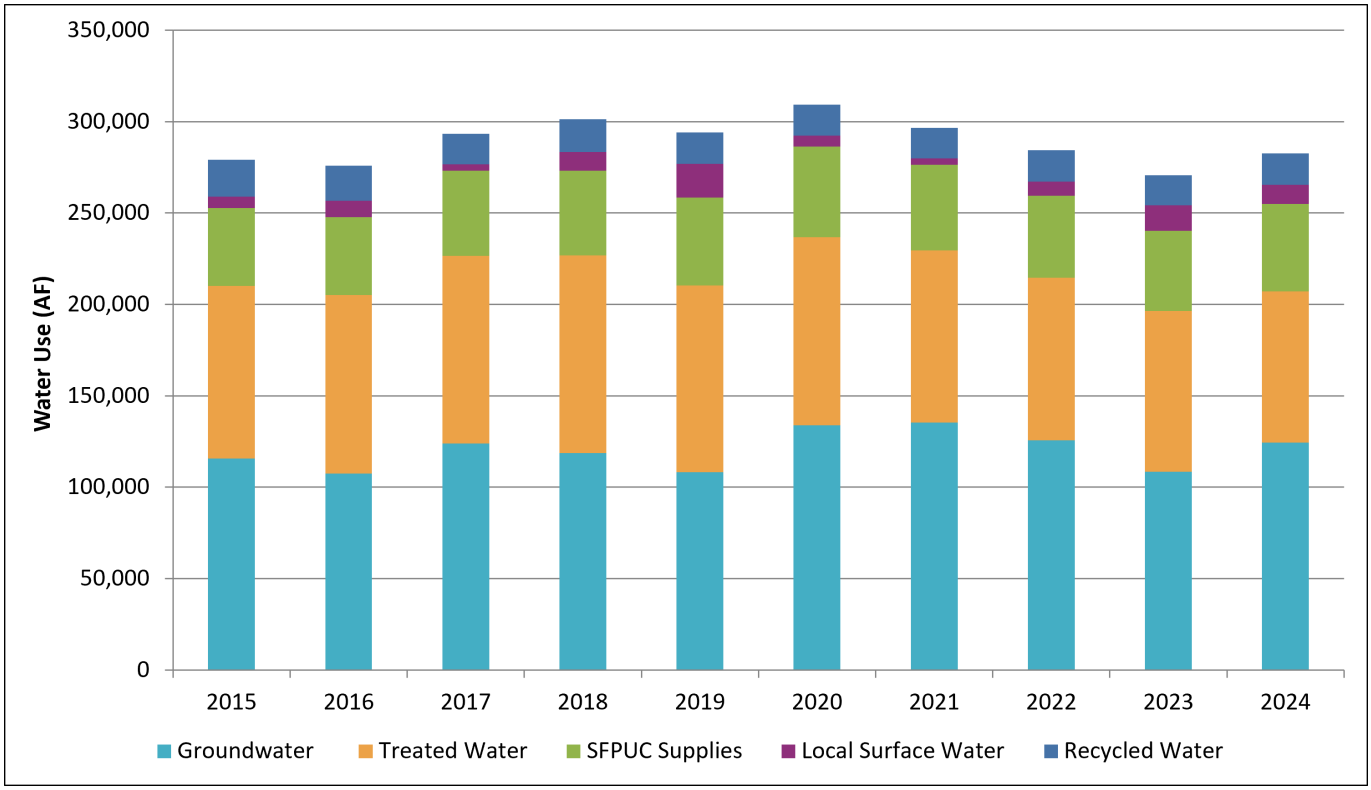
A growing source of water supply for Santa Clara County is recycled and purified water. Using recycled water helps augment water supplies through in-lieu recharge; provides a reliable, drought-proof, locally controlled water supply; and reduces reliance on imported water. Recycled water is currently about 6 percent (or about 17,000 AFY) of the county's supply and is distributed for non-potable uses such as landscape and agricultural irrigation, industrial cooling, and dual plumbed facilities. This recycled water is produced at the four wastewater plants in the county – Palo Alto, Sunnyvale, San José/Santa Clara, and South County Regional Wastewater Authority (SCRWA).

The Valley Water Board adopted a direct potable reuse goal of 24,000 acre-feet per year (AFY) by 2035 as part of the WSMP 2050. The WSMP 2050 describes Valley Water's long-term vision to expand water reuse countywide to up to 32,000 AFY by 2050 and has additional details about recycled and purified water.

4.2 WATER USE

Annual countywide water use from 2015 to 2024 averages 289,000 acre-feet, with groundwater pumping, treated water deliveries, and SFPUC supplies accounting for about 91% of water used (Figure 4-1).

Figure 4-1. Countywide Water Use by Source (2015–2024)



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4.3 CONJUNCTIVE WATER MANAGEMENT

Valley Water does not have active supply wells[77] or deliver groundwater to customers. Instead, it manages the groundwater subbasins for the benefit of its groundwater customers and the county at large. Valley Water's water supply strategy since the 1930s has been to maximize conjunctive use, the coordinated management of surface and groundwater supplies, to enhance water supply reliability and avoid undesirable results like chronic overdraft, land subsidence, and seawater intrusion.

Local groundwater resources make up the foundation of the county's water supply, but they need to be augmented by Valley Water's comprehensive water management activities to reliably meet the needs of county residents, businesses, agriculture, and the environment. These activities include managed recharge of imported and local supplies and in-lieu groundwater recharge through the provision of treated surface water and raw water, acquisition of supplemental water supplies, and water conservation and recycling.

4.3.1 Managed Recharge

Valley Water's managed recharge program uses both surface water runoff captured in local reservoirs and imported water delivered by the raw water conveyance system to recharge groundwater through 279 acres[78] of recharge ponds and 98 miles of local creeks (Figure 4-2 and 4-3).

On average, Valley Water recharged 94,900 AF of local and imported water each year between 2015 and 2024. Managed recharge accounts for the majority of groundwater pumped in the county as shown in Figure 4-4. A detailed description of Valley Water's managed recharge facilities can be found in Appendix H.

Valley Water's managed recharge capacity is up to about 149,700 AFY (Appendix H). Maintaining Valley Water's managed recharge program requires ongoing operational planning for the distribution of local and imported water to recharge facilities; maintenance and operation of reservoirs, diversion facilities, distribution systems, and recharge ponds; and the maintenance of water supply contracts, water rights, and relevant environmental clearance.

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77 As of March 6, 2026, Valley Water's three emergency supply wells in the Campbell well field are officially inactive. Valley Water has disconnected these wells from the water supply system and will develop and implement a decommissioning plan for these three wells.

78 Valley Water operates 98 managed recharge ponds (Appendix H) with a total water surface area of about 279 acres.

Figure 4-2. Managed Recharge Facilities in the Santa Clara Subbasin

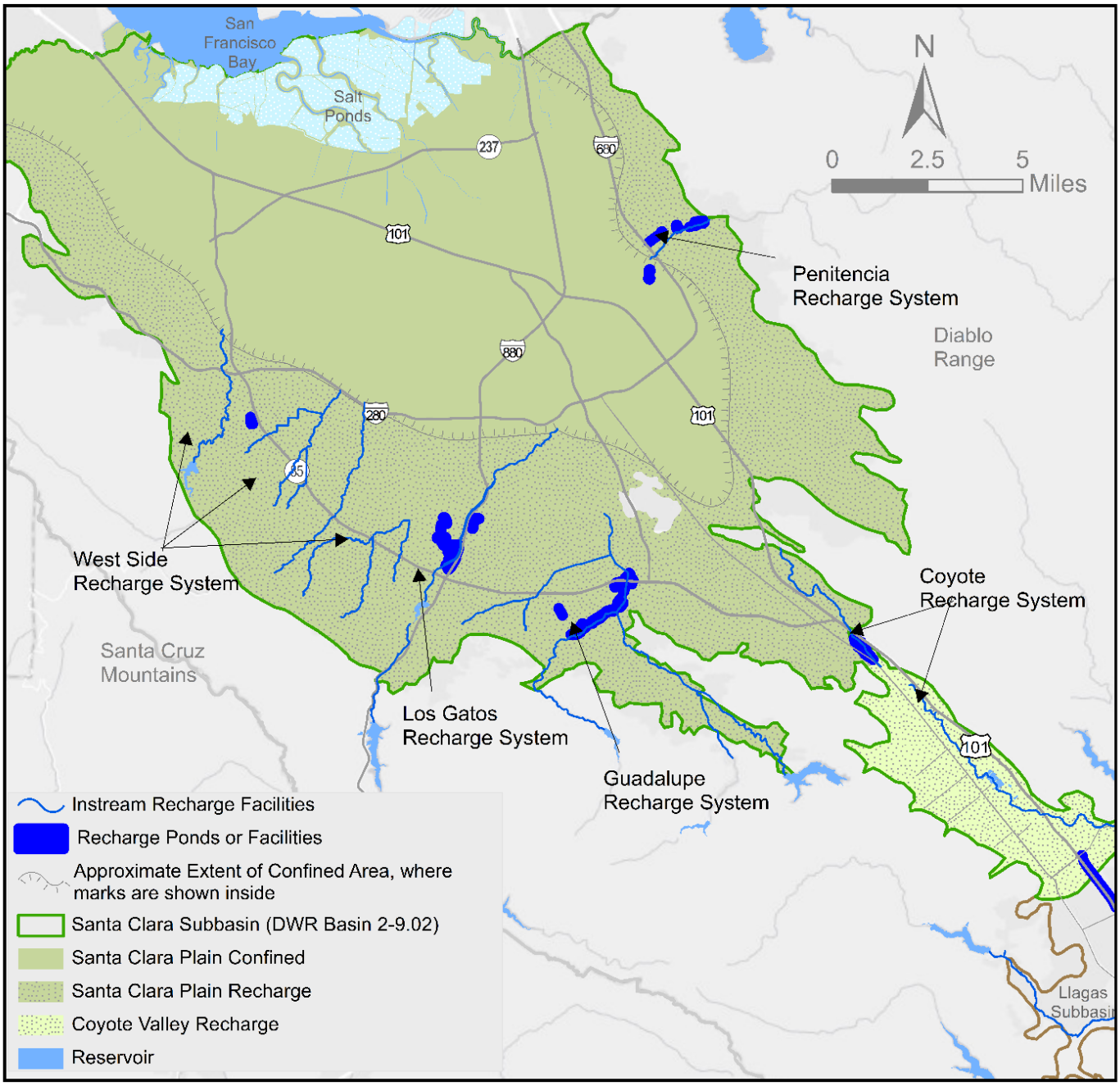

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Figure 4-3. Managed Recharge Facilities in the Llagas Subbasin

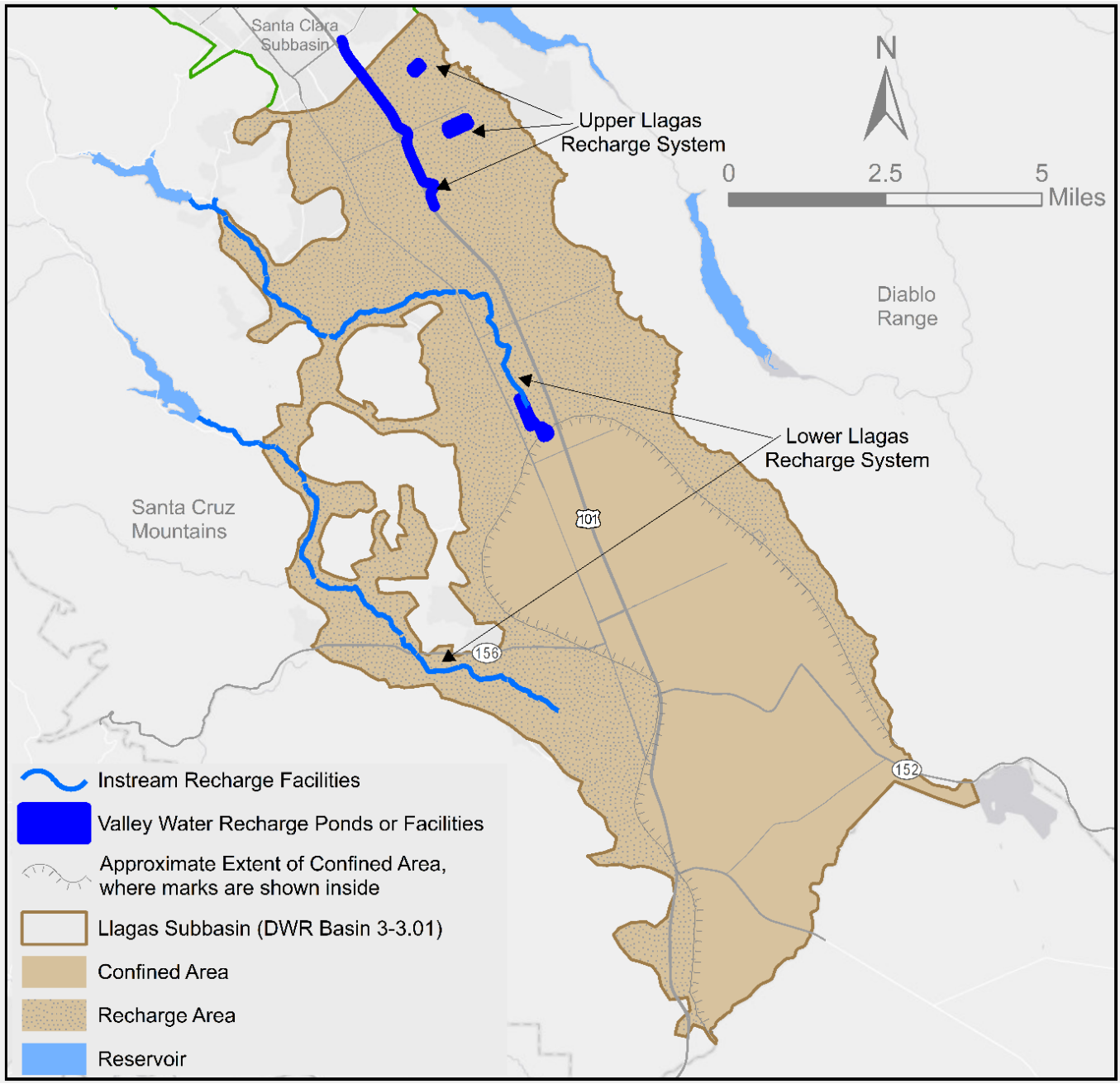

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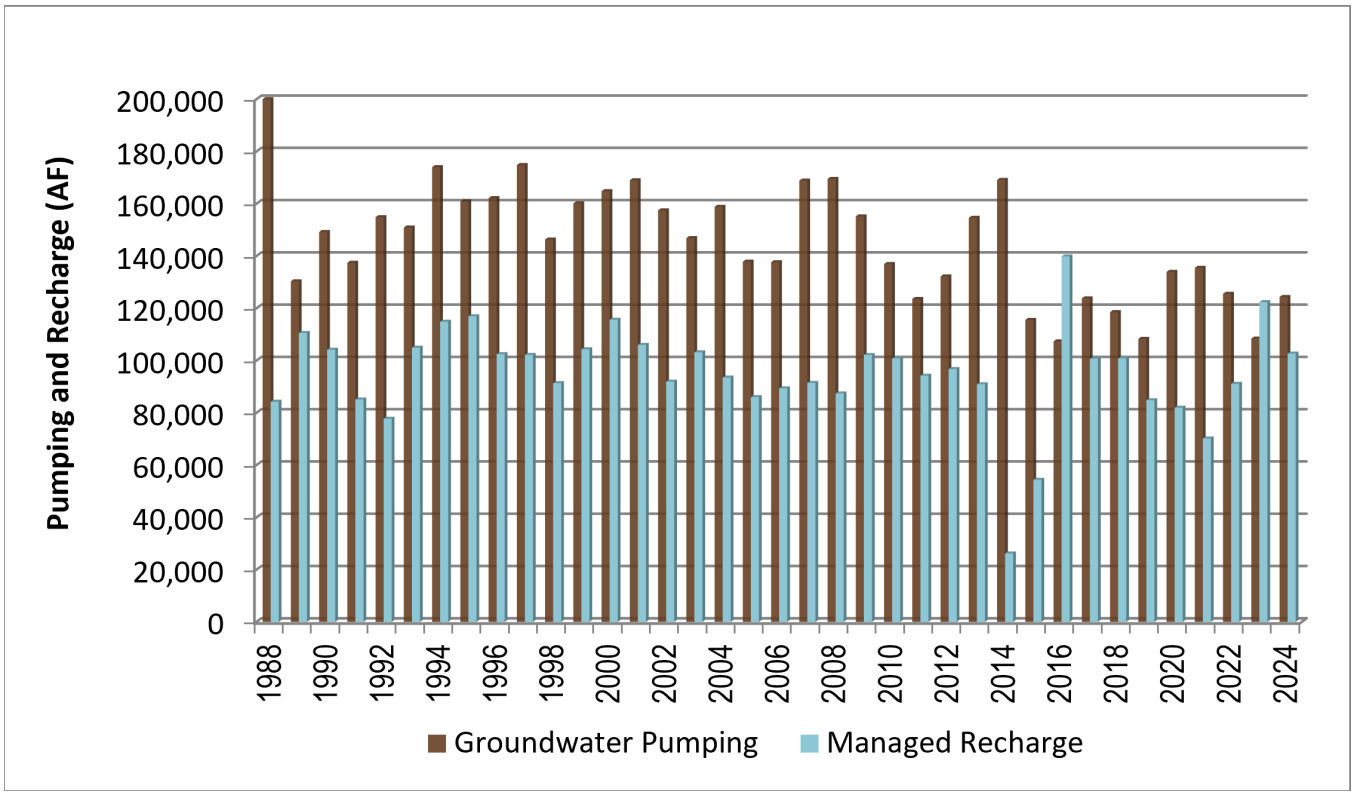
Figure 4-4. Countywide Groundwater Pumping and Managed Recharge



4.3.2 In-Lieu Recharge

Just as important as direct replenishment through managed recharge are in-lieu recharge programs, including treated water deliveries, water recycling, and water conservation. These activities help maintain groundwater levels and storage by reducing groundwater pumping demands. By meeting demands that would otherwise be met by groundwater, these programs provide in-lieu recharge as if the groundwater subbasins had been recharged by that amount.

Valley Water owns and operates three drinking water treatment plants, distributing treated surface water to 7 of the 13 water retailers in the Santa Clara Plain. Combined, Valley Water treatment plants have a processing rate of over 200 million gallons per day, with treated water deliveries up to 136,000 AFY in a normal year. SFPUC deliveries to several retailers and surface water delivered by Valley Water, San Jose Water Company, and Stanford University also reduce the need for pumping.

Valley Water encourages recycled water development in the county through partnerships with the four local wastewater agencies and through technical assistance. An estimated 17,000 AF of recycled water was used in 2024 (Figure 4-5), offsetting demands that might otherwise have been met through other potable supplies such as additional groundwater pumping. Similarly, in 2024, Valley Water's water conservation program saved an estimated 86,000 AF of water[79].

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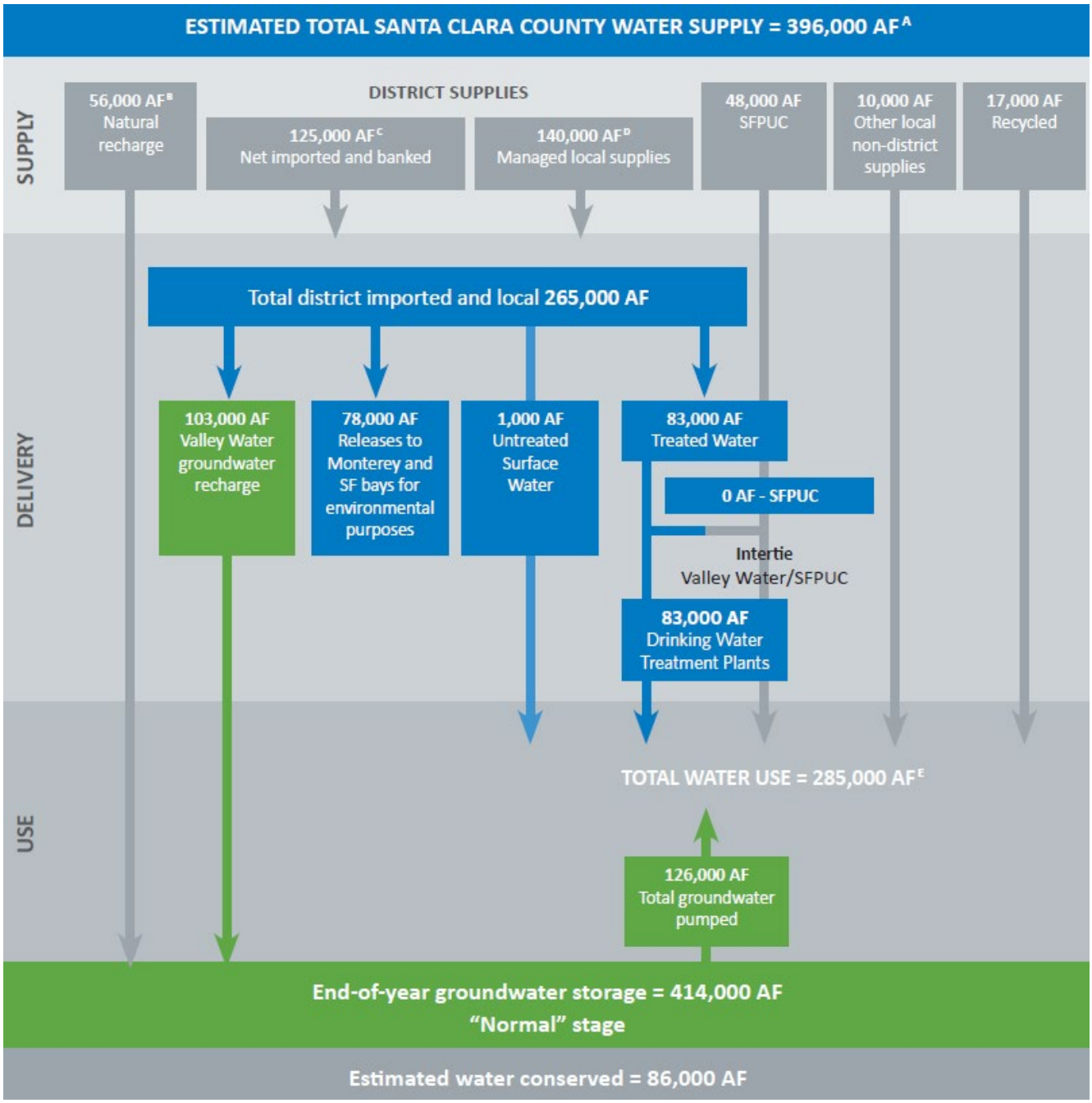
79 FY 2025-26 Protection and Augmentation of Water Supplies Report (Valley Water, 2025)

Figure 4-5. Santa Clara County Supplies and Water Use for Calendar Year 2024

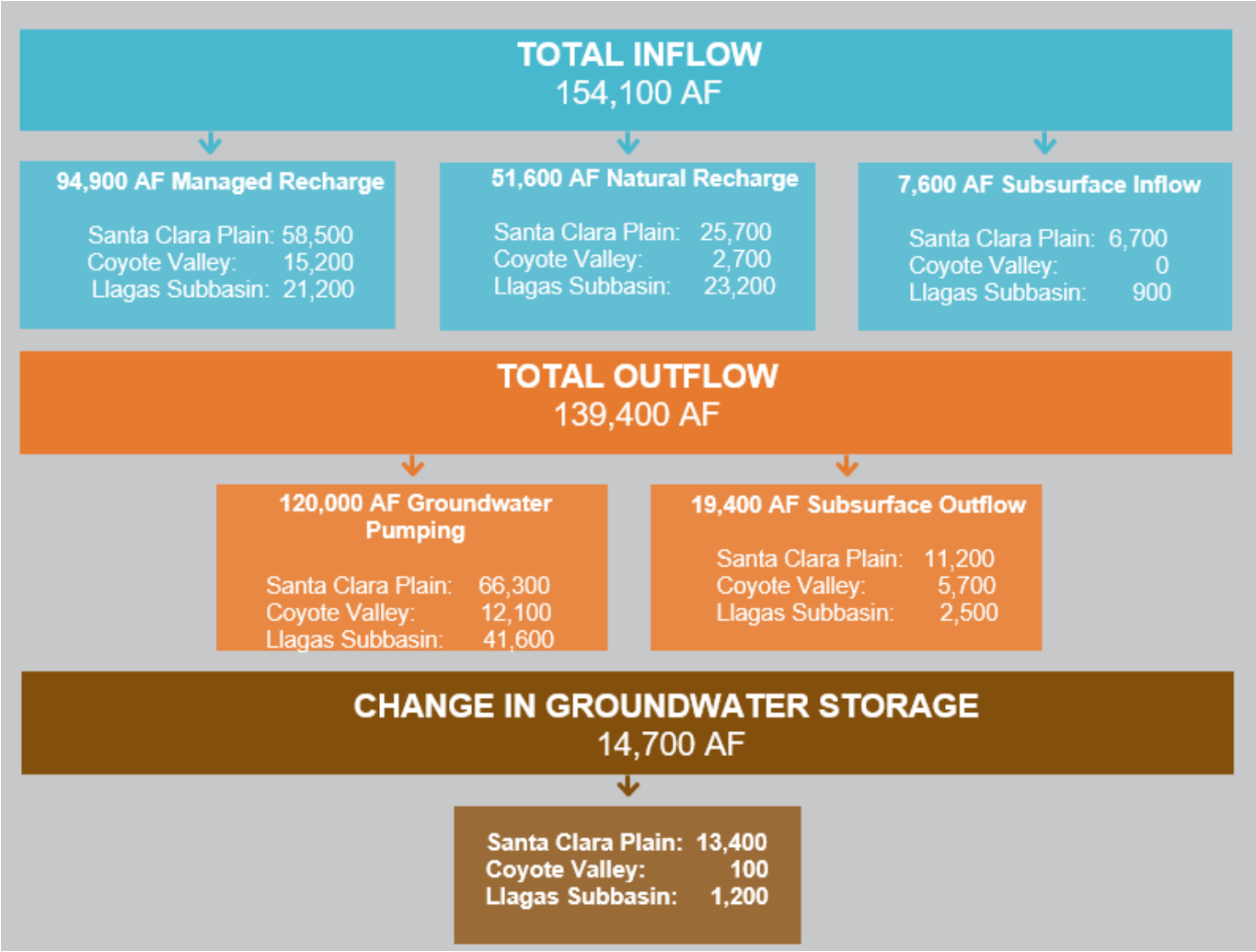


Note: From FY 2025-26 Protection and Augmentation of Water Supplies Report (Valley Water, 2025)
[A] County Water Supply includes net district and non-district surface water supplies and estimated rainfall recharge to groundwater basins.
[B] Natural recharge – Groundwater recharge not controlled by Valley Water, including rainfall and other natural seepage, irrigation return flows, and leakage from water systems, storm drains,
and sewer/septic systems.
[C] Net imported supplies – Surface water imported from the Sacramento-San Joaquin Delta that is used to replenish groundwater or to supply water treatment plants and surface water users
in Santa Clara County. This excludes water transferred into the Semitropic Water Bank in Kern County and imported water stored (i.e., carried over) for future use.
[D] Managed local supplies – Watershed rainfall/runoff captured in local reservoirs or previously stored local water that is used to replenish groundwater or to supply water treatment plants
and surface water users in Santa Clara County. This excludes estimated evaporation and local supplies stored for future use.
[E] Includes municipal, industrial, agricultural and domestic uses. All values are rounded to the nearest thousand.

4.4 GROUNDWATER BUDGET

This section presents detailed groundwater budgets for the Santa Clara and Llagas subbasins averaged for calendar years 2015 through 2024. This period was chosen to represent recent longer-term conditions that include wet, normal, and dry (drought) years. As shown in Figure 4-6, groundwater pumping far exceeds natural recharge and subsurface inflows, and Valley Water managed recharge is needed to ensure a balanced water budget and avoid chronic groundwater overdraft. The average change in storage over this period is 13,400 AF for the Santa Clara Plain, 100 AF for the Coyote Valley, and 1,200 AF for the Llagas Subbasin, indicating the subbasins are in long-term balance.

Figure 4-6. Groundwater Budget for the Santa Clara and Llagas Subbasins (2015–2024)



4.4.1 Santa Clara Subbasin

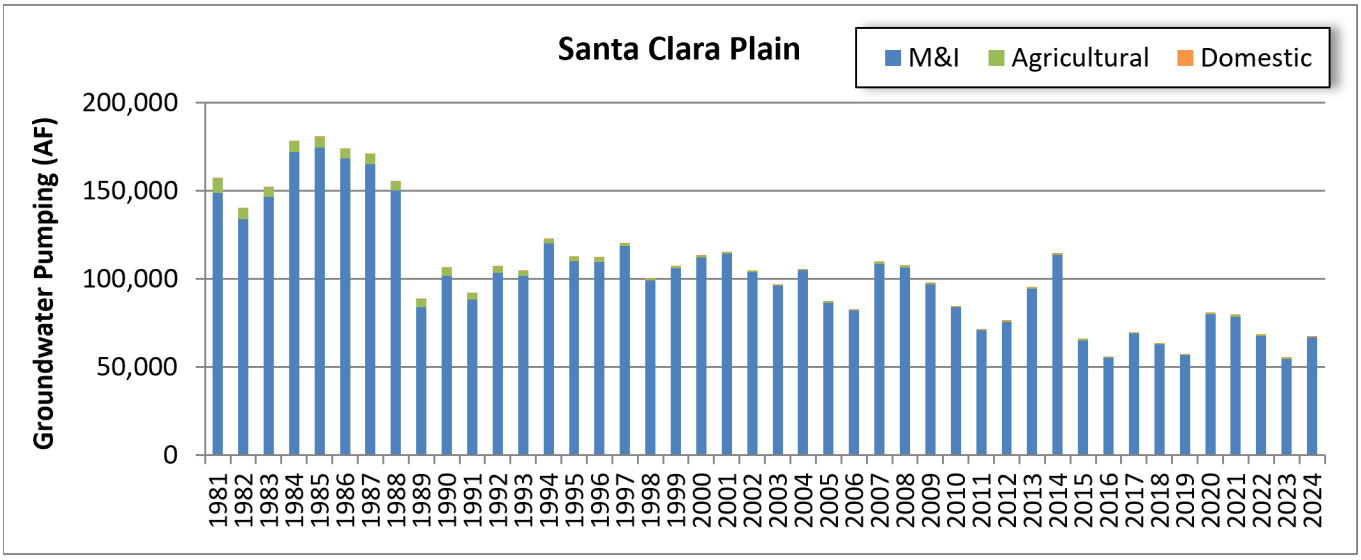
Groundwater is an important water supply source in the Santa Clara Subbasin, particularly in the Coyote Valley, which is entirely reliant on groundwater except for minor surface water use. This section presents detailed information on the water budget for the Santa Clara Subbasin.

4.4.1.1 Groundwater Pumping

The long-term average groundwater pumping in the Santa Clara Subbasin is 78,400 AFY, including the Santa Clara Plain and Coyote Valley. This is based on average pumping from 2015 to 2024, which was chosen to represent recent longer-term conditions that include wet, normal, and dry (drought) years.

Average 2015 to 2024 groundwater pumping in the Santa Clara Plain is 66,300 AFY, with maximum and minimum annual pumping of 81,000 AF in 2020 and 55,500 AF in 2023, respectively. Nearly all groundwater used in the Santa Clara Plain (99%) is for municipal and industrial uses with only 1% for agriculture and domestic purposes (Figure 4-7). Pumping by water retailers accounts for over 91% of pumping in the Santa Clara Plain.

Figure 4-7. Santa Clara Plain Groundwater Pumping by Use



Groundwater serves nearly all beneficial uses in the Coyote Valley, with only small amounts of raw surface water used. Average 2015 to 2024 pumping is 12,100 AFY, with maximum and minimum annual amounts of 14,000 AF in 2024 and 9,500 AF in 2015, respectively. Most groundwater used (72%) supports municipal and industrial uses, with 26% used for agriculture, and 2% for domestic purposes (Figure 4-8). Pumping by water retailers accounts for about 66**%** of pumping in the Coyote Valley. Figure 4-9 shows the distribution of pumping in the Santa Clara Subbasin based on 2024.

Figure 4-8. Coyote Valley Groundwater Pumping by Use

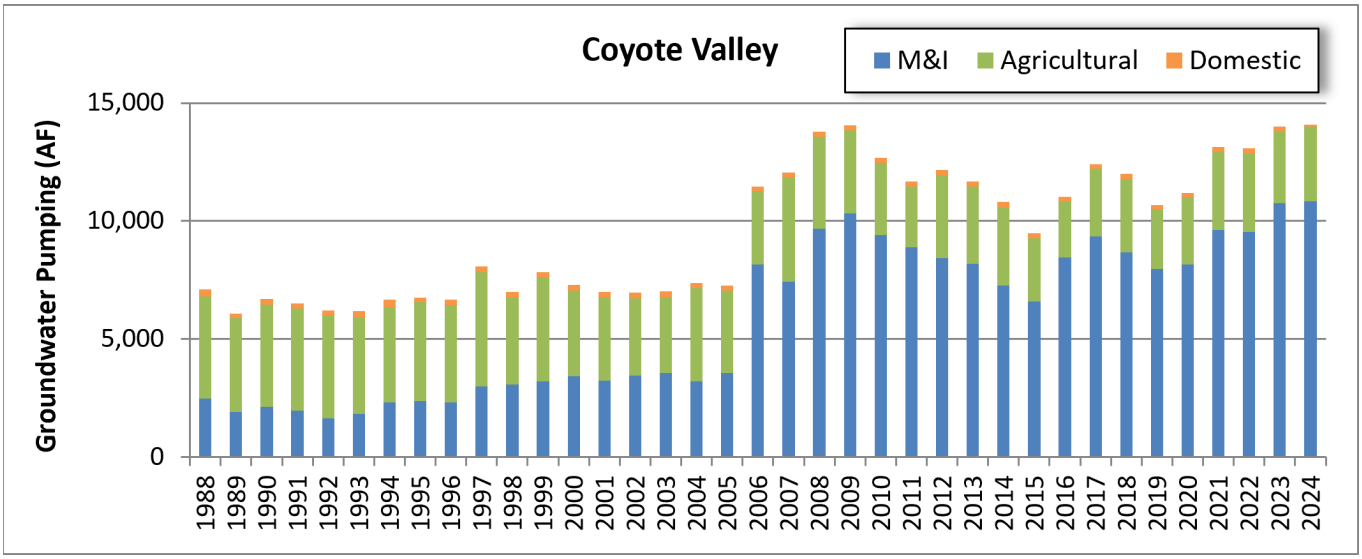
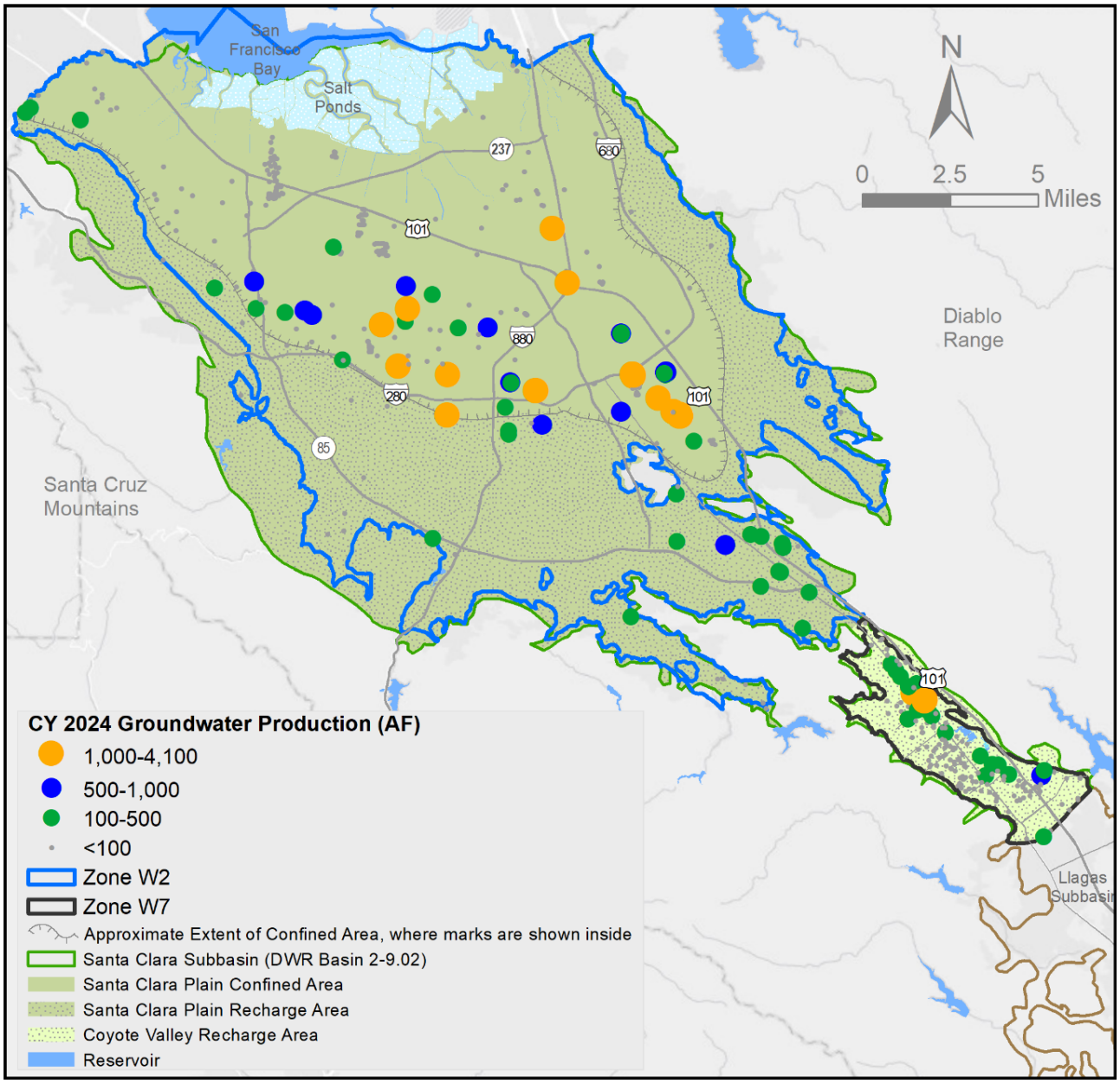


Figure 4-9. Santa Clara Subbasin Pumping Distribution (2024)



SGMA defines the sustainable yield as the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.[80] Quantifying sustainable yield is challenging as it is highly dependent on hydrology, available water supplies, managed recharge, site-specific pumping, and basin conditions. While sustainable yield is defined as the maximum amount that may be withdrawn annually, estimating this highly complex concept with a single value may imply that volume can be pumped every year while maintaining sustainable conditions. This is not the case in the Santa Clara Subbasin.

80 California State Waterboard website: https://www.waterboards.ca.gov/water_issues/programs/gmp/docs/sgma/sgma_20190101.pdf

Previous analysis has estimated that annual Santa Clara Plain pumping should not exceed 200,000 AF in any one year,[81] and current production is well below this limit. While that volume could potentially be pumped within a year without causing land subsidence, Valley Water does not rely on this estimate for annual operations or long-term water supply planning. There is no similar estimate for the Coyote Valley, which is small, relatively shallow and transmissive, with limited storage capacity.

Valley Water does not manage to a particular value for sustainable yield but instead manages groundwater to maintain sustainable conditions through annual operations and long-term water supply planning. Annual operations planning considers available water supplies and projected demands in determining the source and volume of water to be delivered for managed recharge, drinking water treatment, or other use. Each year, Valley Water conducts Annual Water Supply and Demand Assessment as required by DWR to determine if short-term water use reduction is needed in accordance with the Water Shortage Contingency Plan. Valley Water's long-term water supply planning efforts account for maintaining adequate groundwater supplies and reserves in related water system modeling and analysis.

The Santa Clara Subbasin is not in a condition of chronic overdraft due to Valley Water's managed recharge of local and imported water as well as in-lieu recharge activities. The hydrographs presented in Chapter 2 and balanced water budgets in this chapter demonstrate that long-term average yields are sustainable. Valley Water makes investments, implements programs, and modifies water supply operations as needed to maintain sustainable conditions now and in the future.

4.4.1.2 Groundwater Recharge

Recharge sources in the Santa Clara Subbasin include Valley Water managed recharge and natural, or uncontrolled, recharge from the deep percolation of rainfall, septic system and irrigation return flows, and natural seepage through creeks. Valley Water's managed recharge systems in the Santa Clara Subbasin are summarized below in Table 4-3, with more detail provided in Appendix H.

Table 4-3. Santa Clara Subbasin Managed Recharge Facility Summary

Managed Recharge System	Approximate Recharge Capacity (AFY)	Water Supply Sources	Year Operations Began
Guadalupe	25,100	Local watersheds, SWP, CVP	1932
Los Gatos	29,700	Local watersheds, SWP, CVP	1934
Penitencia	5,300	Local watersheds, SWP	1934
West Side	22,900	Local watersheds, SWP, CVP	1935
Coyote	27,000[1]	Local watersheds, CVP	1934

[1] The Coyote Recharge System can also provide water to the Llagas Subbasin.

Natural, or uncontrolled, recharge from precipitation, return flows, seepage from creeks, and mountain front recharge is estimated to range between 18,000 and 33,000 AFY for the Santa Clara Plain and between 1,500 and 3,900 AFY for Coyote based on 2015 to 2024.

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81 Santa Clara Valley Water District, Operational Storage of Santa Clara Valley Groundwater Basin, 1999.

4.4.1.3 Groundwater Storage

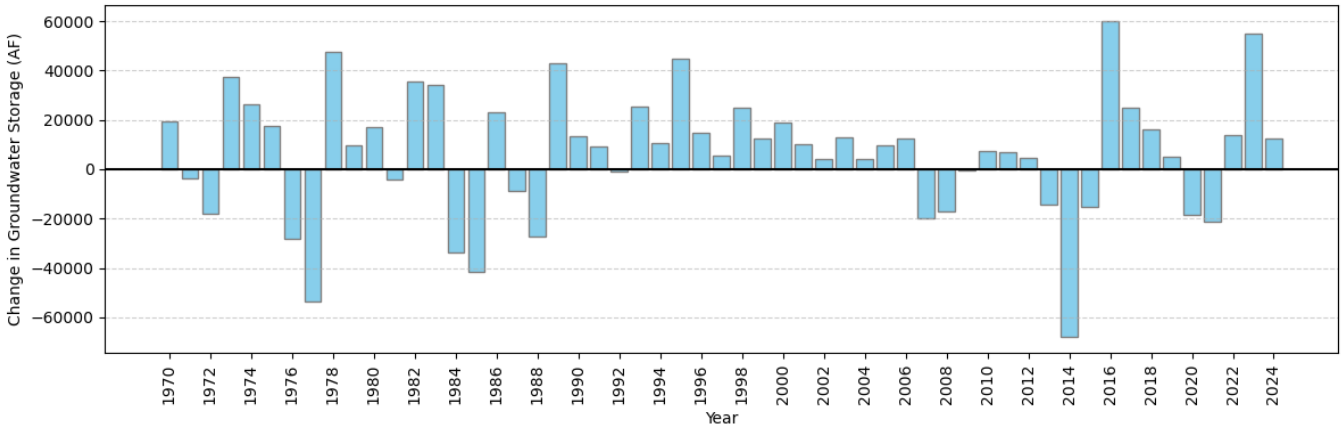
Large amounts of water can be stored in the Santa Clara Subbasin, with total storage capacity estimated to be as high as 1.9 million AF.[82] However, only a fraction of this water can be extracted practically using wells and without causing undesirable results such as land subsidence and seawater intrusion.

The estimated operational storage capacity of the Santa Clara and Llagas subbasins is up to 548,000 AF. Valley Water has estimated the operational storage capacity of the Santa Clara Plain to be 350,000 AF using iterative simulations of water supply system models and the groundwater flow model.[83] Using hydrology, demands, and operational data for the period of 1967-1996, this represents the maximum cumulative storage in the Santa Clara Plain without initiating land subsidence or causing high groundwater nuisance conditions.

Valley Water has previously estimated the operational storage capacity of the Coyote Valley to range between 23,000 and 33,000 AF.[84] This represents the product of specific yield[85], area, and the elevation difference between high and low groundwater surfaces. Groundwater level data for 1982-1983 was used for the high surface and 1976-1977 for low conditions. While Valley Water developed a groundwater flow model for the Coyote Valley since operational storage capacity was last estimated, pumping and recharge data is not available before 1987 when Valley Water assumed groundwater management of the Coyote Valley.

Figures 4-10 and 4-11 show the estimated annual change in groundwater storage in the Santa Clara Plain and Coyote Valley, respectively. The Santa Clara Plain figure starts with the year 1970 and Coyote Valley with 1987 because the data in Coyote Valley only became available after Valley Water merged with the Gavilan Water District. In the Santa Clara Plain, the average annual change in storage over the periods of 1970 to 2024 and 2015 to 2024 was about 6,500 AF and 13,400 AF, respectively. In the Coyote Valley, the average annual change in storage over the periods of 1987 to 2024 and 2015 to 2024 was about -200 AF and 100 AF, respectively.

Figure 4-10. Annual Change in Storage in the Santa Clara Plain (1970–2024)



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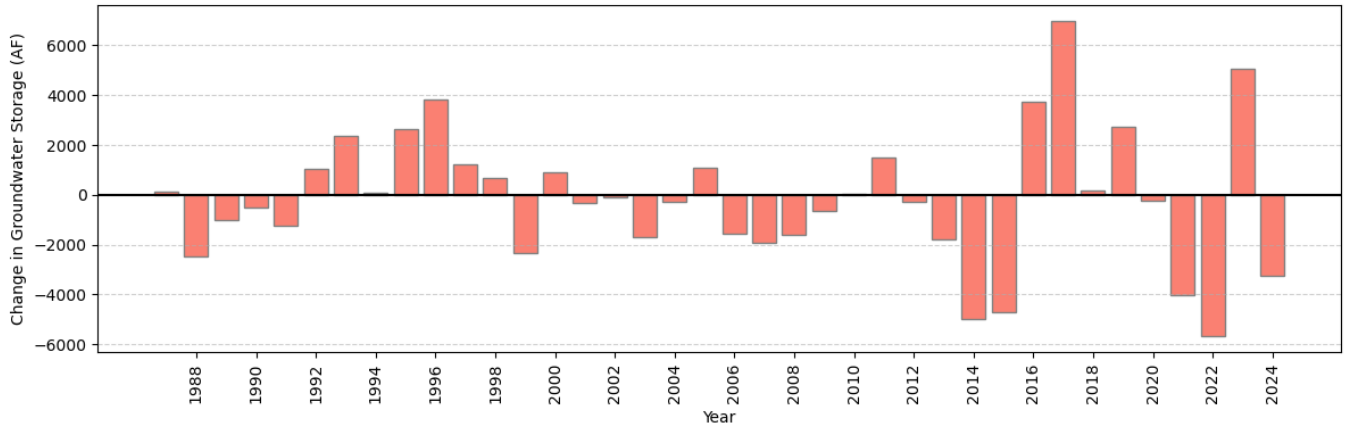
82 California State Water Resources Board, Santa Clara Valley Investigation, 1955.
83 Santa Clara Valley Water District, Operational Storage of Santa Clara Valley Groundwater Basin, 1999.
84 Santa Clara Valley Water District, Operational Storage Capacity of the Coyote and Llagas Groundwater Subbasins, April 2002.
85 Specific yield essentially represents the amount of water that can be released from a certain volume of aquifer.

Figure 4-11. Annual Change in Storage in the Coyote Valley (1987–2024)



4.4.1.4 Water Budget

A water budget for the Santa Clara Plain for calendar years 2015 through 2024 is shown in Table 4-4. The water budget is based on Valley Water groundwater flow model for the Santa Clara Plain and represents inflows and outflows for the principal aquifer. On average, about 64% of inflows to groundwater in the Santa Clara Plain come from Valley Water's managed recharge program (Table 4-4). Although the water budget can vary significantly from year to year, on average, there was an average annual increase in storage of about 13,400 AFY for the Santa Clara Plain over this 10-year period.

Table 4-4. Santa Clara Plain Principal Aquifer Budget (2015–2024)

Water Budget Component	Acre-Feet per Year
Inflow	
Managed Recharge[1]	58,500
Natural Recharge[2]	25,700
Subsurface Inflow[3]	6,700
Total Inflow	90,900
Outflow	
Groundwater Pumping[4]	66,300
Subsurface Outflow[5]	11,200
Total Outflow	77,500
Change in Storage	13,400

Notes:
[1] Managed recharge represents direct replenishment by Valley Water using local and imported water.
[2] Natural recharge includes the deep percolation of rainfall, natural seepage from creeks, and subsurface inflow from surrounding hills (mountain front recharge).
[3] Subsurface inflow represents inflow from adjacent aquifer systems, including the Coyote Valley
[4] Pumping is based on metered pumping volumes (about 94% of pumping), or pumping reported by well owners based on a table of average use.
[5] Subsurface outflow represents outflow to adjacent aquifers in San Mateo County, Alameda County, and beneath San Francisco Bay.

A water budget for the Coyote Valley for calendar years 2015 to 2024 is presented in Table 4-5. The water budget is based on Valley Water's groundwater flow model for the Coyote Valley and represents inflows and outflows for the aquifer system. Recharge from rainfall is estimated to be small compared to Valley Water's managed recharge in Upper Coyote Creek and natural recharge along Fisher Creek.

Annual inflow is estimated to be about 17,900 AFY, with approximately 85% of that coming from Valley Water's managed recharge (Table 4-5). The primary Coyote Valley outflows are groundwater pumping and flow to the Santa Clara Plain, the latter helps to maintain water levels in the Santa Teresa area of the Santa Clara Plain. The average annual change in storage between 2015 and 2024 is approximately 100, indicating that inflows and outflows are nearly balanced over the ten-year period, with a slight net inflow.

Table 4-5. Coyote Valley Budget (2015–2024)

Water Budget Component	Acre-Feet per Year
Inflow	
Managed Recharge[1]	15,200
Natural Recharge[2]	2,700
Subsurface Inflow[3]	0
Total Inflow	17,900
Outflow	
Groundwater Pumping[4]	12,100
Subsurface Outflow[5]	5,700
Total Outflow	17,800
Change in Storage	100

Notes:
[1] Managed recharge represents direct replenishment by Valley Water using local and imported water.
[2] Natural recharge includes all uncontrolled recharge, including the deep percolation of rainfall, septic system and/or irrigation return flows, and natural seepage through creeks.
[3] Subsurface inflow represents inflow from adjacent aquifer systems.
[4] Pumping is based on metered pumping volumes (about 89% of pumping), or pumping reported by well owners based on a table of average uses.
[5] Subsurface outflow represents outflow to adjacent aquifer systems, including outflow to the Santa Clara Plain.

4.4.2 Llagas Subbasin

Groundwater is the primary water supply source for nearly all beneficial use in the Llagas Subbasin and is the sole source for drinking water. A small, but growing portion of water use is served by recycled water, and there is also a small amount of raw surface water put to beneficial use. This section presents detailed information on the water budget.

4.4.2.1 Groundwater Pumping

The long-term average groundwater pumping in the Llagas Subbasin is about 41,600 AFY (Figure 4-12). This is based on average pumping from 2015 to 2024, which was chosen to represent recent longer-term conditions that include wet, normal, and dry (drought) years. The maximum annual pumping during that period was about 44,000 AF in 2022 and the minimum pumping was 39,000 AF in 2023 (Figure 4-12). Groundwater use in the Llagas Subbasin is nearly evenly split between agricultural uses (52%) and municipal and industrial uses (43%), with 5% used for domestic purposes (Figure 4-12). Pumping by water retailers accounts for about 30% of pumping in the Llagas Subbasin. Figure 4-13 shows the distribution of pumping in the Llagas Subbasin in 2024.

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Figure 4-12. Llagas Subbasin Groundwater Pumping by Use

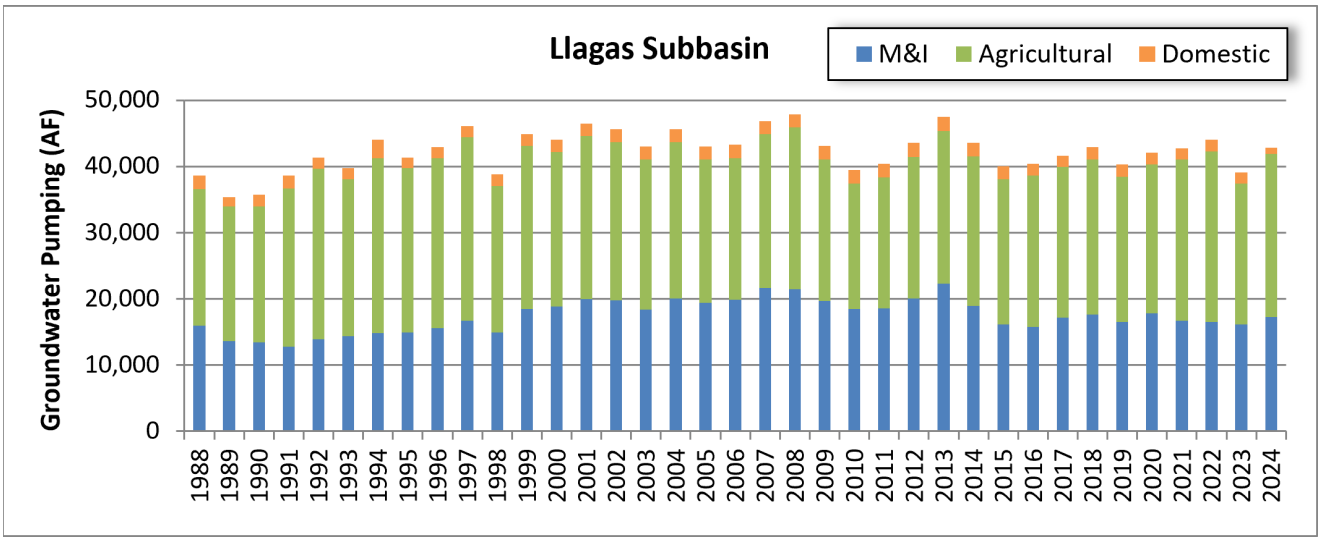
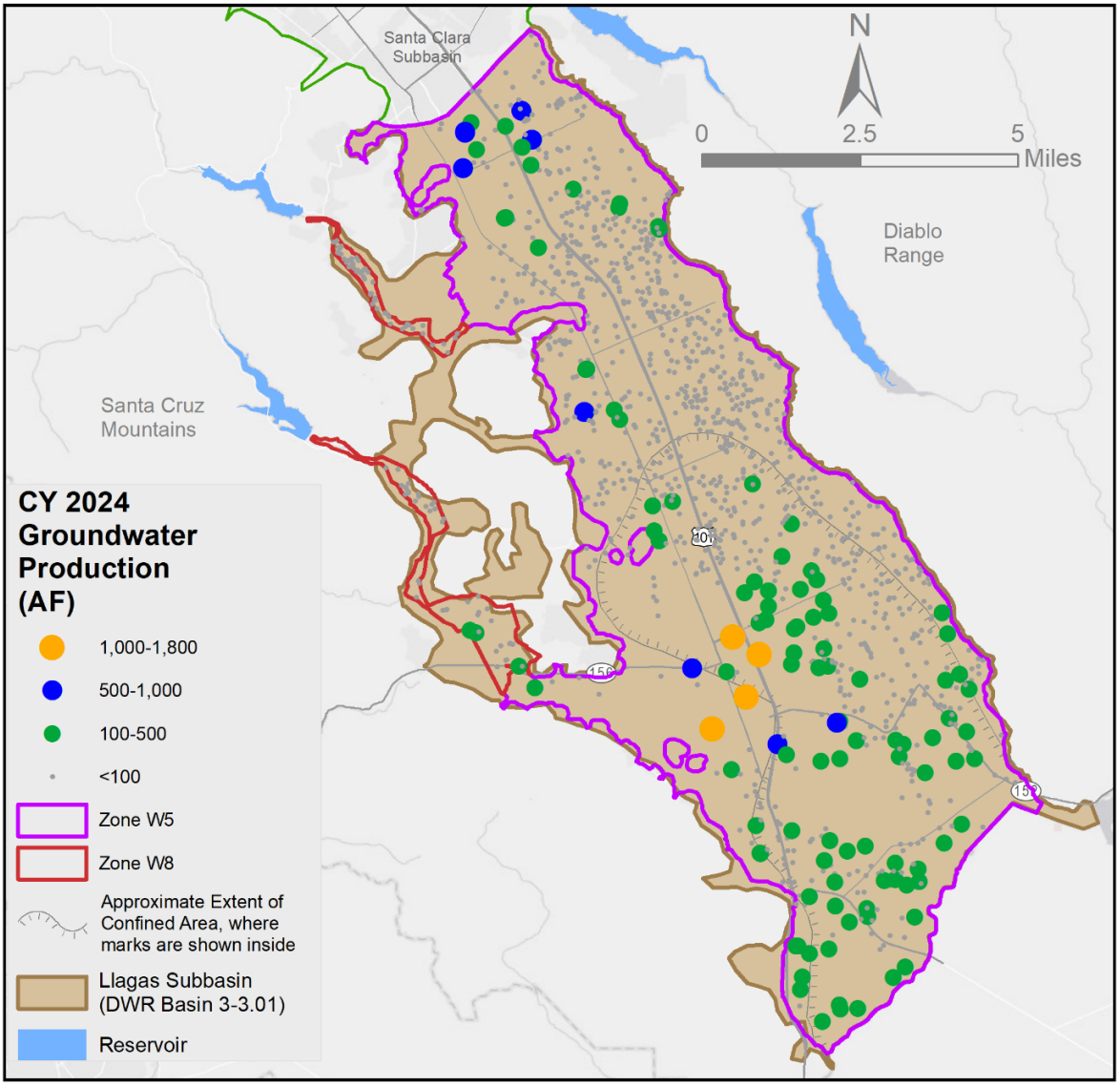


Figure 4-13. Llagas Subbasin Pumping Distribution (2024)



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Quantifying sustainable yield is challenging as it is highly dependent on hydrology, available water supplies, managed recharge, site-specific pumping, and basin conditions. While sustainable yield is defined as the maximum amount that may be withdrawn annually, estimating this highly complex concept with a single value may imply that volume can be pumped every year while maintaining sustainable conditions, which is not the case with the Llagas Subbasin.

As explained previously for the Santa Clara Subbasin, Valley Water does not manage to a particular value for sustainable yield but instead manages groundwater to maintain sustainable conditions through annual operations and long-term water supply planning. Each year, Valley Water evaluates the projected end-of-year groundwater storage to determine if short-term water use reduction is needed in accordance with the Water Shortage Contingency Plan. Valley Water's long-term water supply planning efforts account for maintaining adequate groundwater supplies and reserves in related water system modeling and analysis.

The Llagas Subbasin is not in a condition of chronic overdraft because of Valley Water's managed recharge of local and imported surface water. The hydrographs presented in Chapter 3 and balanced water budget in this chapter demonstrate that long-term average yields are sustainable. Valley Water makes investments, implements programs, and modifies water supply operations as needed to maintain sustainable conditions now and in the future.

4.4.2.2 Groundwater Recharge

Recharge sources in the Llagas Subbasin include Valley Water managed recharge and natural, or uncontrolled, recharge from the deep percolation of rainfall, septic system and/or irrigation return flows, and natural seepage through creeks. Valley Water's managed recharge systems in the Llagas Subbasin are summarized below in Table 4-6, with more detail provided in Appendix H.

Table 4-6. Llagas Subbasin Managed Recharge Facility Summary

Managed Recharge System	Approximate Recharge Capacity (AFY)	Water Supply Sources	Year Operations Began
Coyote	27,000[1]	Local watersheds, CVP	1934
Lower Llagas	21,200	Local watersheds	1955
Upper Llagas	18,500	Local watersheds, CVP	1955

[1] The Coyote Recharge System primarily provides water to the Santa Clara Subbasin.

Natural, or uncontrolled, recharge from precipitation, return flows, seepage from creeks, and mountain front recharge is estimated to range between 19,000 and 28,000 AFY for the Llagas Subbasin based on 2015 to 2024.

4.4.2.3 Groundwater Storage

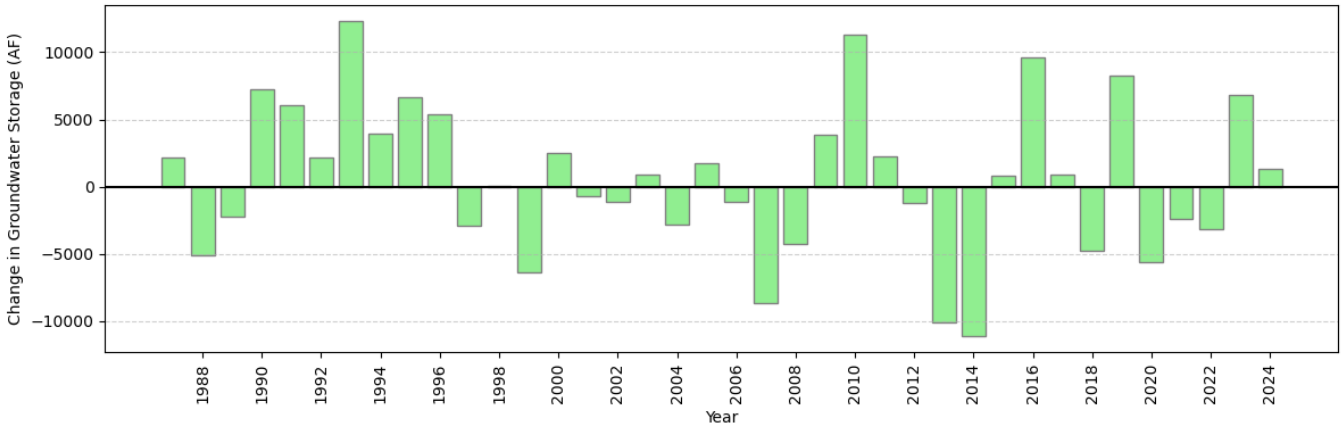
Valley Water has previously estimated the operational storage capacity of the Llagas Subbasin to range between 152,000 and 165,000 AF.[86] The operational storage capacity is less than total storage capacity as it accounts for the avoidance of adverse impacts. The operational storage capacity estimate is based on the product of specific yield, area, and the elevation difference between high and low groundwater surfaces. Groundwater level data for 1982–1983 was used for the high groundwater surface and 1976–1977 for low conditions. While Valley Water has developed a groundwater flow model for the Llagas Subbasin since its operational storage capacity was last estimated, pumping and recharge data is not

86 Santa Clara Valley Water District, Operational Storage Capacity of the Coyote and Llagas Groundwater Subbasins, April 2002.

available before 1987 when Valley Water assumed groundwater management of the Llagas Subbasin, and Valley Water has not updated its storage estimate. Valley Water will evaluate the estimate of operational storage capacity to determine whether further refinement is warranted.

Figure 4-14 shows the estimated annual change in groundwater storage in Llagas Subbasin from 1987 (the year Valley Water assumed management of the subbasin) to 2024. In the Llagas Subbasin, the average annual change in storage over the periods of 1987 to 2024 and 2015 to 2024 was about 591 AF and 1,169 AF, respectively.

Figure 4-14. Annual Change in Storage in the Llagas Subbasin (1987–2024)



4.4.2.4 Water Budget

A water budget for the Llagas Subbasin principal aquifer for calendar years 2015 to 2024 is presented in Table 4-7. This budget is based on Valley Water's groundwater flow model for the Llagas Subbasin and represents general subbasin inflows and outflows. Annual inflow is estimated to be 45,300 AFY, with about half coming from Valley Water's managed recharge of local and imported water, and the other half from natural recharge.

The major outflow is groundwater pumping, which averages 41,600 AFY (Table 4-7). The subsurface outflow, which includes flows to the North San Benito Subbasin in San Benito County, is estimated to be about 2,500 AFY. The average annual change in storage between 2015 and 2024 is approximately 1,200 AF, indicating inflows and outflows are generally balanced over the ten-year period, with a modest net inflow. (Table 4-7).

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Table 4-7. Llagas Subbasin Principal Aquifer Budget (2015–2024)

Water Budget Component	Acre-Feet per Year
Inflow	
Managed Recharge[1]	21,200
Natural Recharge[2]	23,200
Subsurface Inflow[3]	900
Total Inflow	45,300
Outflow	
Groundwater Pumping[4]	41,600
Subsurface Outflow[5]	2,500
Total Outflow	44,100
Change in Storage	1,200

Notes:
[1] Managed recharge represents direct replenishment by Valley Water using local and imported water.
[2] Natural recharge includes all uncontrolled recharge, including the deep percolation of rainfall, septic system and/or irrigation return flows, and natural seepage through creeks.
[3] Subsurface inflow represents inflow from adjacent aquifer systems, including inflow from the North San Benito Subbasin in San Benito County.
[4] Pumping is based on metered pumping volumes (about 80% of pumping), or pumping reported by well owners using a table of average uses.
[5] Subsurface outflow represents outflow to adjacent aquifer systems, including outflow to the North San Benito Subbasin in San Benito County.

4.5 FUTURE DEMANDS

Valley Water's 2025 UWMP[87] includes a comprehensive assessment of projected future water supplies and demands in Santa Clara County over the next 25 years. Estimating future demands allows Valley Water to manage the county's water supply, including the Santa Clara and Llagas subbasins and appropriately plan infrastructure investments.

Valley Water's water supply level of service goal is to meet 100% of annual water demand during non-drought years and at least 80% of annual water demand in drought years (2025 UWMP). A reliable water demand forecast is critical for determining the long-term investments necessary to meet this level of service goal.

The projected demands in the Santa Clara and Llagas subbasins for this 2026 GWMP are based on data used in Valley Water's 2025 UWMP derived from the WSMP 2050[88], which was adopted by Valley Water's Board in November 2025. Valley Water developed two demand forecasts to reflect different levels of growth and climate change impacts and serve as the basis for adaptive management, in order to address uncertainty in growth forecasts and ability to forecast climate change impacts on demands:

- **Stable demand –** This represents the lower demand forecast that assumes water use flattening starting in 2030, in part owing to the success of making water conservation a way of life and mitigating the impacts of growth on water use.

87 The 2025 Urban Water Management Plan is available on Valley Water's website at: https://www.valleywater.org/your-water/water-supply-planning/urban-water-management-plan
88 The Water Supply Master Plan 2050 is available on Valley Water's website at: https://www.valleywater.org/your-water/water-supply-planning/water-supply-master-plan

- **High demand –** This forecast assumes that the Plan Bay Area 2040 growth trends continue to 2050 and climate change impacts on demands are not fully mitigated by conservation and other measures.

The projected stable and high demand scenarios for 2050 are 330,000 AF and 350,000 AF, respectively, and are within the range of historical water use, reflecting the demand trends while providing conservative assumptions for long-range planning to reduce risks and uncertainty. Without continued conservation, countywide demand would be substantially higher. Conservation remains a cost-effective solution to reduce water demand and, consequently, limits the need for investment in additional supply or storage projects.

While two demand projections were developed, the WSMP 2050 adopted an adaptive management approach, which uses stable demand as the basis for the investment strategy and high demand to guide future adaptive management decisions. Consistent with the 2025 UWMP and WSMP 2050, this 2026 GWMP plan assumes stable water demand and corresponding future investments when estimating supply and demand. As a result, countywide demand is projected to remain steady at approximately 330,000 AFY (Table 4.8) from 2025 through 2050 (2025 UWMP). Although projected demand from 2030 to 2050 is higher than current levels, it remains below the peak observed in the 1990s and 2000s due to significant conservation efforts by Valley Water and the State. The countywide total water use is provided in Table 4-8.

Table 4-8. Projected Countywide Demands (AF)

Use Type	2030	2035	2040	2045	2050
Retailer Demand	288,000	288,000	288,000	288,000	288,000
Agricultural Irrigation	25,000	25,000	25,000	25,000	25,000
Independent Groundwater Pumping	12,000	12,000	12,000	12,000	12,000
Untreated Surface Water	2,000	2,000	2,000	2,000	2,000
Losses	3,000	3,000	3,000	3,000	3,000
Total	**330,000**	**330,000**	**330,000**	**330,000**	**330,000**

Notes: All values are rounded to the nearest 1000 AF. The numbers represent countywide demands, which are partially served by the SFPUC, recycled water, and surface water rights held by San Jose Water Company and Stanford University.

Valley Water forecasts projected average water supplies using its Water Evaluation and Planning (WEAP) model to simulate future demands, investments, and certain expected future regulations using the historical hydrology from 1922-2021 (100 years) (2025 UWMP). Valley Water maintains diverse water supply sources to meet countywide demands, including local surface water and groundwater, imported water, and recycled water (2025 UWMP). Water conservation is also an important part of the water supply planning strategy and helps improve water supply reliability. Valley Water is considering investing in projects to help mitigate potential decrease in future supply due to climate change and new regulations. Valley Water's WSMP 2050 provides a strategy for meeting future water demands, and Valley Water continuously uses an annual Monitoring and Assessment Program (MAP) to track WSMP strategy implementation. Valley Water's many supply sources are subject to hydrologic variability and additional constraints including regulatory constraints, climate change, and water quality variations.

Groundwater demand projections in the Santa Clara and Llagas subbasins are included in the use types of retailer demand, agricultural irrigation, and independent groundwater pumping (Table 4-8). Demand from the 13 water supply retailers, which represents the majority of countywide demand, is projected to remain relatively stable between 2030 and 2050 based on historical trends. Independent groundwater

pumping in the Santa Clara and Llagas subbasins includes groundwater pumping by individual domestic well owners, small and mutual water companies, businesses, non-agricultural irrigation, and environmental cleanup. This use type includes all non-retailer groundwater pumping in the Municipal and Industrial (M&I) and domestic categories. Independent groundwater is projected to remain constant between 2030 and 2050. Agricultural groundwater pumping in the Santa Clara and Llagas subbasins has been generally constant over the last twenty years at approximately 25,000 AFY and is projected to remain constant throughout 2050 (Table 4-8).

Based on Valley Water's existing and planned sources of supply, Valley Water is projected to be able to meet its level of service goal through 2050 under normal, a single dry, and five consecutive dry year conditions (2025 UWMP). If a five-year drought were to occur in the next five years, Valley Water would employ a range of response actions, including water conservation, accessing water stored in the Semitropic Groundwater Storage Bank in Kern County, imported water transfers and exchanges, and calling for short-term water use reduction. These and other response actions have been employed by Valley Water in response to the extreme drought conditions in 2021.

In addition to the 2025 UWMP, Valley Water developed an updated WSCP [89] to establish actions and procedures for managing water supplies and demands during water shortages due to droughts and other emergencies. Beginning in 2022, Valley Water submitted the Annual Water Supply and Demand Assessment (Annual Assessment) by July 1 each year, in compliance with California Water Code (CWC) Section 10632.1 requirements. The Annual Assessment is a near-term water supply reliability analysis that determines whether a water shortage may occur for next year and any shortage stage response actions in addressing perceived shortage. The Annual Assessment is primarily based on Valley Water's long-established water supply operations planning that is an ongoing process throughout the year. The operations planning involves assessing water supply and demand to evaluate water supply reliability for the current year and a broad range of hydrologic conditions for next year. These analyses are used to guide Valley Water's operation and water resources management within its service area to meet demands and adjust to changing conditions throughout the year.

The Annual Assessment will include a recommendation if WSCP actions are needed. Through its long-term practice, Valley Water has determined that projected end-of-year groundwater storage in the Santa Clara and Llagas subbasins as well as surface water availability serve as the best indicators of potential water shortages and early warning signal and therefore uses them to determine potential water supply shortage actions. In the event of prolonged droughts or other emergency situations, Valley Water considers all available tools for managing available water supplies, including public education and community outreach, coordinating response among the County's municipalities and retailers, augmenting supplies by investing in supplemental supply sources, calling for short-term water use reductions, and balancing demands for treatment plants and recharge facilities, to maximize the use of available supplies in order to meet potential shortages.

The WSCP also summarizes planning for natural disasters, drought-related revenue impacts, and Valley Water's legal authority to respond to water shortages. As described in Chapter 5 of this 2026 GWMP, the outcome measures and associated outcome measure – lower thresholds for groundwater storage are based on stages of the earlier version of the WSCP (2020 UWMP). In the 2025 UWMP and 2025 WSCP, shortage levels are defined pursuant to CWC Section 10632(a)(3). The 2025 WSCP requires six standard water shortage levels corresponding to progressively increasing shortages of up to 10%, 20%, 30%, 40%, and 50% as well as shortages greater than 50%, compared to the normal reliability conditions (Table 3, 2025 WSCP). As described in the 2025 WSCP, Valley Water determines shortage levels based on projected end-of-year groundwater storage and the availability of surface water (both imported and

89 The 2025 Water Shortage Contingency Plan is available at: https://www.valleywater.org/your-water/water-supply-planning/urban-water-management-plan

local). The shortage stages also account for catastrophic interruptions of water supplies, such as earthquakes and other emergency events.

4.6 CLIMATE CHANGE IMPACTS ON GROUNDWATER BUDGET

Climate change in California is likely to increase air temperatures, shrink snowpack, increase weather extremes, result in sea-level rise, and increase the frequency of prolonged droughts. Climate change has become an important factor in water resources planning in the State and region, although the extent and precise effects of climate change remain uncertain. Therefore, sustainable groundwater management for the Santa Clara and Llagas subbasins requires consideration of climate change. The 2026 GWMP includes a projected groundwater budget incorporating climate change and expected population growth, which is one of five recommended actions by DWR in their review and approval of the 2016 GWMP as an Alternative Plan. The projected groundwater budget considering climate change and population growth was first included in the 2021 GWMP and updated for this 2026 GWMP. The climate change information in the 2026 GWMP is generally consistent with the 2025 UWMP and WSMP 2050.

Climate change is expected to affect future water supplies and demands, which will likely affect the groundwater budget. While the effects of climate change on demand are not certain, it is anticipated that warmer temperatures and altered rainfall patterns associated with climate change could lead to greater water demands. According to a climate study conducted by Valley Water, average annual maximum temperature within Santa Clara County could increase by 2.0˚F by 2050 under the business-as-usual scenario, while precipitation in the county will continue to exhibit high year-to-year variability with very wet and very dry years. Projected future increases in temperature can lead to: 1) increased irrigation demands for outdoor landscape or agriculture; 2) increased water use in cooling towers; and 3) increased drought severity and/or length, which could increase the need to request drought-related water use reductions (2025 UWMP). Recognizing the importance of managing climate change-related vulnerabilities and risks to fulfill its mission, Valley Water has developed a Climate Change Action Plan (CCAP)[90], which includes a wide array of goals and strategies to adapt to climate change.

A modified approach based on DWR's 2018 climate change guidance document[91] was used to develop groundwater budgets for the Santa Clara and Llagas subbasins that incorporate climate change and population growth for 2050. The future climate scenario for 2050 was used to be consistent with Valley Water's other long-term water supply and operations planning, including the 2025 UWMP (Table 4-9). The groundwater modeling used spatially downscaled output of precipitation and air temperature from an ensemble of 10 general circulation models (GCMs) (also called global climate models) that were recommend by DWR's Climate Change Technical Advisory Group (CCTAG). Using an ensemble of different GCMs for planning studies is the current best scientific practice to consider the range and uncertainty of future climate projections. An ensemble of 10 GCMs is large enough where characterization of ensemble mean and variability tends to be relatively insensitive to the individual selection of GCMs[92]. The 10 GCMs simulations conducted as part of the Coupled Model Intercomparison Project – Phase 5 (CMIP5)[93] were used as recommended by DWR because they are the most appropriate projections for water resources planning and analysis in California (Table 4-9) (DWR, 2018). In support of the WSMP 2050, the ensemble of 10 recommended GCMs was evaluated to characterize the range of future climate conditions. Based on this evaluation, two representative GCMs were selected

90 https://www.valleywater.org/your-water/climate-change-action-plan
91 California Department of Water Resources (DRW), 2018, Guidance document for the sustainable management of groundwater – Guidance for climate change during groundwater sustainability plan development, July 2018. Available at: https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents
92 Maurer, E. P., L. Brekke, T. Pruitt, B. Thrasher, J. Long, P. Duffy, M. Dettinger, D. Cayan, and J. Arnold (2014), An enhanced archive facilitating climate impacts and adaptation analysis, Bulletin of the American Meteorological Society, doi:10.1175/bams-d-13-00126.1.
93 Taylor, K. E., Stouffer, R. J., and Meehl, G. A. (2012), An Overview of CMIP5 and the experiment design, Bulletin of the American Meteorological Society, 93, 485-498, doi: 410.1175/BAMS-D-1111-00094.00091.

that span the range of projected climate impacts while reducing the number of model simulations required. To be consistent with Valley Water's current long-term water planning with the WSMP 2050 and 2025 UWMP, the same subset of two GCMs, CCSM4 and CESM1-BGC, (Table 4-9) were used to calculate the projected groundwater budget in 2050.

The selected GCMs used the Intergovernmental Panel on Climate Change (IPCC) representative concentration pathway (RCP) 8.5 for the projected climate scenario in 2050. RCP 8.5 is recommended by DWR (2018) and is generally taken as the basis for the worst-case climate change scenario. The localized constructed analogs (LOCA) method[94] was used for downscaling the GCM precipitation and temperature, as recommended by DWR (DWR, 2018). The LOCA downscaling method maintains specific hydrologically important characteristics at the local scale, and it preserves the large-scale GCM precipitation trends (Pierce et al., 2014). The downscaled GCM data was used as input to Valley Water's groundwater flow and WEAP models to project the future 2050 groundwater budget. The groundwater models are described in chapter 7 of this 2026 GWMP. The WEAP model simulates the operation of the county's water supply system, including projected water demands, water supplies, infrastructure investments, conservation savings, and operating constraints such as minimum streamflow requirements. The model dynamically allocates available water supplies to meet projected demands while accounting for future planning assumptions and operational policies. Additional details about the WEAP model are available in the 2025 UWMP and WSMP 2050. The use of the groundwater and WEAP models limit the simulations to local scale processes that affect water supply within Santa Clara County.

Table 4-9. Global Climate Models (GCMs)

General Circulation Models (GCM)	Source Institution
ACCESS-1.0	Commonwealth Scientific and Industrial Research Organization (CSIRO) and Bureau of Meteorology, Australia
CanESM2	Canadian Centre for Climate Modeling and Analysis
CCSM4*	National Center for Atmospheric Research (NCAR)
CESM1-BGC*	The National Science Foundation, The U.S. Department of Energy, and National Center for Atmospheric Research
CMCC-CMS	Centro Euro-Mediterraneo per Cambiamenti I Climatici, Italy
CNRM-CM5	Centre National de Recherches Meteorologiques (CNRM), and Centre Europeen de Recherches et de Formation Avancee en Calcul Scientifique, France
GFDL-CM3	Geophysical Fluid Dynamics Laboratory, National Oceanic and Atmospheric Administration (NOAA)
HadGEM2-CC	Met Office Hadley Centre
HadGEM2-ES	Met Office Hadley Centre (additional HadGEM2-ES realizations contributed by Instituto Nacional de Pesquisas Espaciais)
MIROC5	Atmosphere and Ocean Research Institute, University of Tokyo, National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology

Note: *subset of two GCMs used to project groundwater budgets for calendar year 2050

Valley Water considers natural groundwater recharge as a source of supply for long-term water supply planning purposes because it contributes to the available groundwater supply (2025 UWMP). Natural recharge is separate from managed recharge and includes the infiltration of rainfall in the recharge areas, natural seepage through local creeks and streams, subsurface flow from the mountains, and infiltration from septic systems and/or irrigation return flow. Projected 2050 natural recharge is

94 Pierce, D.W., Cayan, D.R., Thrasher, B.L., 2014. Statistical Downscaling Using Localized Constructed Analogs (LOCA). Journal of Hydrometeorology, 15, 2558–2585. https://doi.org/10.1175/JHM-D-14-0082.1

summarized in Table 4-10. Based on the 10 GCMs, the ensemble average for natural recharge is about 39%, 32%, and 9% higher in 2050 compared to the 2015–2024 average (Tables 4-4, 4-5, and 4-7) for the Santa Clara Plain, Coyote Valley, and Llagas Subbasin, respectively. The projected natural recharge using the two GCM ensemble is similar magnitude as the 10 GCM ensemble (Table 4-10), while the two selected GCMs also represent a range of projected future climate conditions, capturing much of the variability across the full ensemble. The projected increase in 2050 natural recharge is likely the response to projected increases in average annual precipitation in Santa Clara County by the mid- to late-21st century.

The projected 2050 groundwater budget for the Santa Clara and Llagas subbasins is presented in Table 4-11. This budget is based on the subset of two GCMs (Table 4-10) and represents general subbasin inflows and outflows. The projected change in storage for 2050 is approximately 17,400 AF for the Santa Clara Subbasin and 3,850 AF for the Llagas Subbasin, indicating inflows and outflows are generally balanced in the future scenario (Table 4-11). The projected change in storage for the Santa Clara Subbasin would be closer to being balanced if these simulations considered the natural recharge from the 10 GCM ensemble and/or 2015–2024 managed recharge (Tables 4-4 and 4-5). Valley Water's 2050 managed and in-lieu recharge programs will likely have the operational flexibility to compensate for the relatively small projected shortfall in change in storage for the Santa Clara Plain (Table 4-11).

Table 4-10. Projected Natural Recharge for the Santa Clara and Llagas Subbasins (Calendar Year 2050)

Global Climate Model (GCM)	Santa Clara Subbasin		Llagas Subbasin
	Santa Clara Plain	Coyote Valley	
ACCESS-1.0	22,100	2,300	21,100
CanESM2	52,900	4,500	30,100
CCSM4*	26,200	2,200	20,700
CESM1-BGC*	47,100	4,000	27,900
CMCC-CMS	44,500	4,600	30,300
CNRM-CM5	35,800	3,900	27,600
GFDL-CM3	16,300	1,800	19,300
HadGEM2-CC	27,600	2,400	21,800
HadGEM2-ES	56,000	4,800	31,400
MIROC5	28,200	2,400	21,700
10 GCM average	**35,670**	**3,290**	**25,190**
2 GCM average*	**36,650**	**3,100**	**24,300**
2015–2024 average**	**25,700**	**2,700**	**23,200**

*subset of two GCMs used to project groundwater budgets for calendar year 2050
**average values of natural recharge from 2015 to 2024, as shown in Figure 4-6

Table 4-11. Projected Groundwater Budget for the Santa Clara and Llagas Subbasins (Calendar Year 2050)

	Santa Clara Subbasin			Llagas Subbasin
	Santa Clara Plain	Coyote Valley	Total	Total
Inflow				
Managed Recharge (AF)	26,100	14,100	40,200	22,050
Natural Recharge (AF)	36,650	3,100	39,750	24,300
Subsurface Inflow (AF)	4,800		4,800	
Total Inflow (AF)	67,550	17,200	84,750	46,350

Outflow				
Groundwater Pumping (AF)	46,350	16,200	62,550	42,500
Subsurface Outflow (AF)		4,800	4,800	
Total Outflow (AF)	46,350	21,000	67,350	42,500
Change in Storage (AF)	**21,200**	**-3,800**	**17,400**	**3, 850**

Note: Groundwater budget calculated as an average from the subset of two GCMs (CCSM4 and CESM1-BGC), which are used in Valley Water's Water Supply Master Plan (WSMP) 2050 and 2025 UWMP updates for climate change impact analysis. The 2025 UWMP and WSMP 2050 are described in Chapter 6. The projected groundwater budget was largely based on the WEAP simulations, which doesn't consider subsurface flow components for all groundwater management areas.

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CHAPTER 5 – SUSTAINABLE MANAGEMENT CRITERIA

This chapter presents Valley Water's groundwater sustainability goals, basin management strategies, outcome measures, and corresponding outcome measure – lower thresholds.

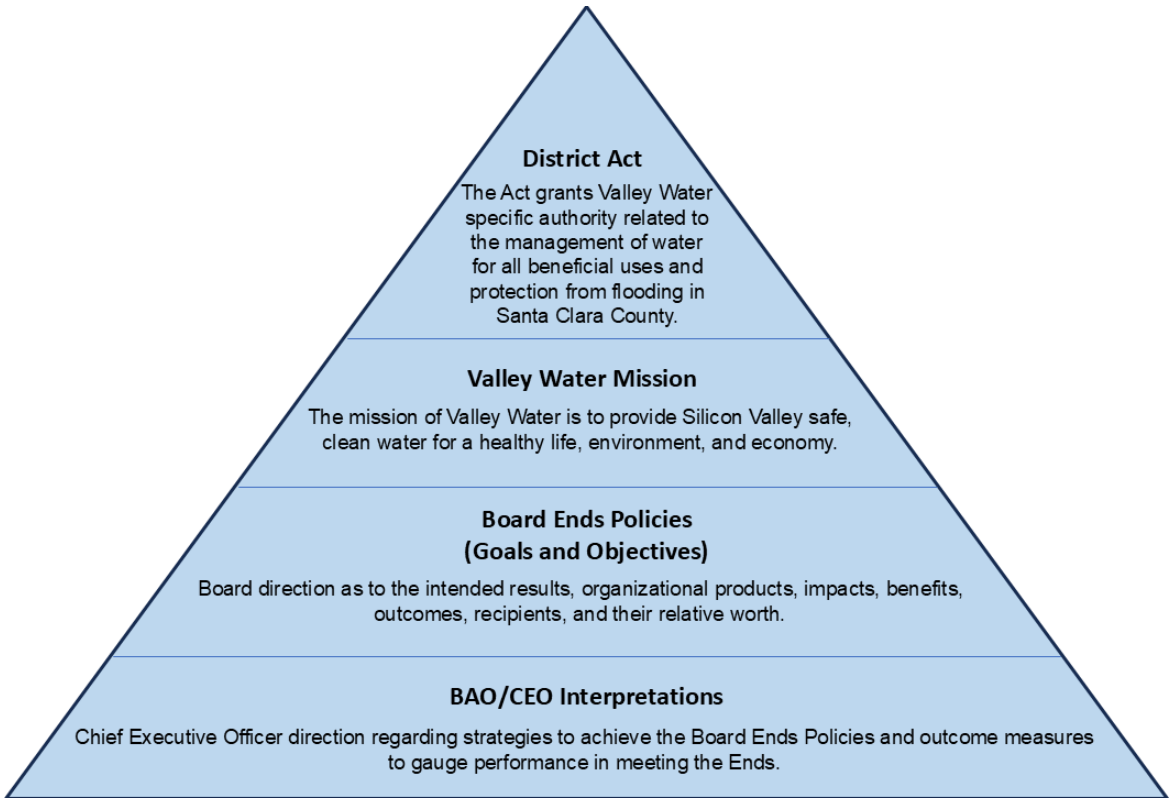
5.1 SUSTAINABLE MANAGEMENT CRITERIA

Valley Water manages the Santa Clara and Llagas subbasins as an integrated component of the overall water supply, and as such, the goals and strategies for groundwater management are based on the Board of Directors Ends Policy E-2 and the water supply goals and objectives listed below.

- Board Water Supply Goal 2.2: Protect and sustain the county's existing, diverse water supplies.
- Board Water Supply Objective 2.2.1: Manage groundwater to ensure sustainable supplies and avoid land subsidence.
- Board Water Supply Objective 2.2.2: Aggressively protect groundwater from the threat of contamination.

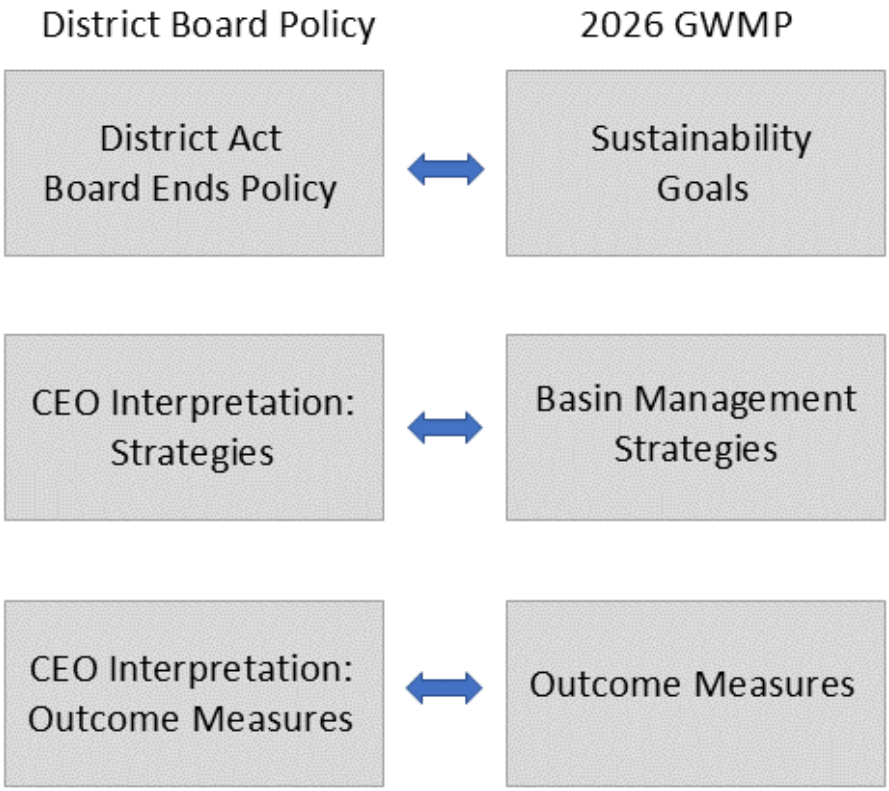
Valley Water programs and activities are developed in accordance with the District Act objectives and based on policy guidance from the Board of Directors. To achieve the Ends Policy goals and objectives, the Board of Directors policy allows for the reasonable interpretation by the CEO to develop direction, strategies, and outcome measures. Outcome measures are specific, measurable goals to gauge performance toward meeting the Board Ends Policies. The relationship between the District Act, Board policies, and CEO Interpretations is shown below in Figure 5-1 with each level taking direction from the level above. The Board of Directors governance policies are available here: https://www.valleywater.org/how-we-operate/board-governance-policies

Figure 5-1. Valley Water Policy Framework



The sustainability goals and strategies in this GWMP are developed within this policy framework and share a parallel structure. The relationship between the District Act, Valley Water Policies, the sustainability goals, and Valley Water groundwater programs are shown in Figure 5-2. The goals, strategies, and outcome measures are described below.

Figure 5-2. Relation Between Valley Water Policy and 2026 GWMP



5.2 SUSTAINABILITY GOALS

The following sustainability goals related to groundwater supply reliability and protection are identified in Valley Water Board policy:

- Manage groundwater to ensure sustainable supplies and avoid land subsidence.
- Aggressively protect groundwater from the threat of contamination.

These sustainability goals describe the overall objectives of Valley Water's groundwater management programs. The rationale and meaning of these objectives, as well as their relationship to Valley Water policies, are discussed below.

5.2.1 Groundwater Supply Reliability

Goal: Manage groundwater to ensure sustainable supplies and avoid land subsidence.

Local groundwater resources are the foundation of the county's water supply, but they need to be augmented by Valley Water's comprehensive water supply management activities to reliably meet the needs of county residents, businesses, agriculture and the environment. Valley Water relies on groundwater for a significant portion of the county's water supply, particularly in South County where groundwater provides more than 90% of supply for all beneficial uses and 100% of the drinking water

supply. Valley Water manages groundwater in conjunction with surface water to reliably meet the county's water demands now and in the future.

As described previously, significant subsidence occurred historically in the Santa Clara Plain due to chronic overdraft caused by historical groundwater pumping greatly exceeding recharge. However, subsidence was essentially halted by about 1970 through Valley Water's expanded conjunctive management programs. Valley Water's goal of minimizing land subsidence is combined with the water supply reliability goal, as management actions that address one typically address the other. Preventing additional permanent subsidence has been a major driver for Valley Water over its history given the extremely high costs associated with reduced carrying capacity of flood control structures, damage to infrastructure, and seawater intrusion.

5.2.2 Groundwater Quality Protection

Goal: Aggressively protect groundwater from the threat of contamination.

While surface water goes through significant treatment processes before being served as drinking water, groundwater from the Santa Clara and Llagas subbasins is generally of high quality and public water supply wells typically do not require any treatment other than disinfection. Although Valley Water does not pump groundwater or directly serve consumers, its role as the local groundwater management and groundwater sustainability agency is to ensure that groundwater used by the residents and businesses of Santa Clara County is of reliably high quality.

In highly urbanized areas such as the Bay Area, there are numerous threats to groundwater quality including urban runoff, industrial chemical spills, illegal dumping, and leaking underground storage tanks. Agricultural and residential use of pesticides and nitrogen-based fertilizers can also impact groundwater quality. As surface water percolates through soil layers, some natural filtration occurs; however, this natural process is not effective for all contaminants.

Groundwater quality degradation may lead to costly treatment or even make groundwater unusable, resulting in the need to secure additional supplies. Preventing groundwater contamination is more cost effective than cleaning up polluted groundwater, a process that can take many decades depending on the nature and extent of the contamination. Notable contamination sites in the county requiring significant groundwater cleanup include large solvent releases at the IBM and Fairchild sites in south San José in the 1980s and the Olin perchlorate release in Morgan Hill, which was discovered in the early 2000s.

Historically, seawater intrusion has been observed in the shallow aquifer zone of the Santa Clara Subbasin adjacent to San Francisco Bay during periods of higher groundwater pumping and land subsidence. Significant increases in groundwater pumping or sea level rise due to climate change could lead to renewed seawater intrusion.

The goal of Valley Water's groundwater quality protection programs is to ensure that groundwater is a viable water supply for current and future beneficial uses. In addition to the principal, deep drinking water aquifers, Valley Water works to protect the quality of all aquifers. Although not typically used for beneficial purposes, shallow groundwater is also a potential future source for drinking water or other beneficial use.

Section 5 of the District Act authorizes Valley Water to prevent the pollution and contamination of Valley Water surface water and groundwater supplies. This sustainability goal is consistent with the District Act and with Board Water Supply Objective 2.2.2.

5.3 BASIN MANAGEMENT STRATEGIES

The basin management strategies are the methods used to meet the sustainability goals. Many of these strategies have overlapping benefits to groundwater resources by improving water supply reliability, minimizing subsidence, and protecting groundwater quality. The strategies are listed below and described in detail in this section.

1. Manage groundwater in conjunction with surface water.
2. Implement programs to protect and promote groundwater quality.
3. Maintain comprehensive, adaptive groundwater models and monitoring networks.
4. Work with regulatory and land use agencies to protect recharge areas and prevent groundwater contamination.

Strategy 1: Manage groundwater in conjunction with surface water.

The goal of this strategy is to have a sustainable and reliable groundwater supply while minimizing the potential for seawater intrusion and land subsidence. The primary mechanisms for implementing this strategy are Valley Water's managed and in-lieu recharge programs. Santa Clara County relies on local groundwater subbasins to help meet water demands, naturally transmit water over a wide area, and provide critical storage reserves for emergencies such as droughts or other outages. Because groundwater pumping far exceeds what is replenished naturally, Valley Water manages groundwater and surface water in conjunction to ensure the groundwater subbasins remain an important component in meeting current and future water demands.

Maintaining Valley Water's comprehensive managed recharge program using both local and imported water is critical to sustaining groundwater supplies and avoiding chronic overdraft conditions, land subsidence, and other undesirable results. This requires maintaining local water rights, water supply sources, and existing recharge facilities. The strategy also relies on developing additional recharge facilities and sources to help support future needs, as identified in Valley Water's WSMP 2050.

Currently, five Valley Water reservoirs have restricted storage capacity due to limitations imposed by Division of Safety of Dam (DSOD) and dam safety directives from the Federal Energy Regulatory Commission (FERC). For example, to increase the seismic stability of Anderson Dam, Valley Water drained Anderson Reservoir to deadpool beginning in October 2020 to prepare for reconstruction of the existing earthen dam. Phase 1 of the project consisted of the construction of a large tunnel during which the reservoir was maintained at 4% of capacity. Phase 2 of the seismic reconstruction project is expected to start in 2027 and last through the end of 2033 during which period the earthen dam materials will be removed and the dam will be rebuilt. The reservoir will be fully empty during several years of Phase 2. Anderson Reservoir is expected to return to its full operating capacity once the project is completed. Resolving dam safety issues that currently restrict reservoir storage is also an essential component of this strategy.

Just as important as managed recharge is Valley Water's treated and raw water deliveries, and water conservation and water recycling programs, as well as the availability of SFPUC supplies to the county. These activities provide in-lieu recharge by reducing the need for pumping through direct delivery of other supplies and reduced groundwater supply demands. Together with managed recharge, these activities help to maintain adequate groundwater storage, keep groundwater levels above subsidence thresholds and maintain flow gradients. In turn, adequate groundwater storage supports groundwater pumping and minimizes risks related to land subsidence and seawater intrusion. Valley Water's managed and in-lieu recharge programs are described in detail in Chapter 6.

Strategy 2: Implement programs to protect and promote groundwater quality.

Groundwater in Santa Clara County is generally of very high quality, with few public water systems requiring treatment beyond disinfection prior to delivery to customers. Valley Water evaluates groundwater quality and potential threats to ensure that changes in groundwater quality are detected, and appropriate action can be taken to protect groundwater resources. These efforts include assessing regional conditions and trends, evaluating threats to groundwater quality including emerging contaminants, conducting technical studies such as vulnerability assessments, and implementing strategies to protect groundwater from contaminant sources.

Because Valley Water does not have regulatory or land use authority, this strategy is focused on identifying potential concerns through monitoring and analysis and implementing programs to reduce contaminant loading or consumer exposure. One example is Valley Water's voluntary regional sampling of domestic water supply wells for common contaminants, such as nitrate and bacteria, to evaluate the presence in local groundwater. Valley Water's free domestic well testing program is described in detail in Chapter 7. Valley Water is actively engaging with regulatory agencies and local water retailers to better understand potential sources and to take action if needed to ensure a safe and reliable drinking water supply. Other efforts to coordinate with land use and regulatory agencies are described in Strategy 4 below. Groundwater protection programs are described in detail in Chapter 6.

Strategy 3: Maintain and develop adequate groundwater models and monitoring networks.

Monitoring programs provide critical data to understand groundwater conditions and support operational decisions, including the timing and location of managed recharge. Valley Water has implemented programs to regularly monitor groundwater levels, groundwater quality (including monitoring near recycled water irrigation sites), recharge water quality, surface water flow, and land subsidence. Local water retailers also monitor groundwater levels and test groundwater quality for compliance with DDW regulations. Data from these programs is essential to evaluating current conditions and trends, preventing groundwater overdraft and subsidence, and measuring the effectiveness of basin management programs and activities. These monitoring programs and related monitoring protocols are described in Chapter 7.

Valley Water has also developed models to support operational decisions and long-term planning, including operational models, water supply system models, and groundwater flow models. Calibrated groundwater flow models have been developed for the Santa Clara Plain, Coyote Valley, and the Llagas Subbasin and are used to evaluate groundwater storage and levels under various operational, groundwater demand and hydrologic conditions. These models support decisions related to Valley Water's groundwater management, water supply operations, SGMA compliance with annual Water Year reports and GWMP periodic evaluations, annual PAWS reports, and water supply planning. Additionally, the projected end-of-year groundwater storage from the groundwater model is a key indicator for the WSCP, helping guide response actions during droughts and water shortages, and is used to evaluate the SGMA groundwater supply outcome measure, explained in section 5.4. Maintaining calibrated models that can reasonably forecast groundwater conditions is a critical component of Valley Water's groundwater management strategy. As part of ongoing modeling improvements, Valley Water will evaluate the calibration status of the current models to determine whether further refinement is needed.

Strategy 4: Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination.

Since the 1950s, land use in the Santa Clara Plain has changed from largely rural and agricultural to a highly developed urban area. The conversion of pervious areas to impervious surfaces due to urbanization and development has increased surface water runoff and reduced natural groundwater recharge. Although not as urbanized as the Santa Clara Plain, the Llagas Subbasin serves the growing cities of Morgan Hill and Gilroy, and significant development has been considered in Coyote Valley and Llagas Subbasin. This strategy emphasizes collaboration with land use agencies to maximize natural

recharge by protecting groundwater recharge areas and supporting the use of low-impact development practices.

Urbanization also increases the risk of contamination, particularly in groundwater recharge areas that are more vulnerable due to highly permeable sediments. Valley Water coordinates with land use agencies on potentially contaminating land uses and resource protection by reviewing certain land use and development proposals and General Plans, and by engaging in groundwater-related policies and projects. Regulatory agencies play a critical role in groundwater protection by establishing water quality objectives and overseeing the cleanup of contaminated sites. Valley Water will continue to work with these agencies and identify opportunities for enhanced cooperation to minimize impacts from existing contamination and prevent future contamination. This includes the development of technical studies, participation in policy development, and coordination on proposed development.

5.4 OUTCOME MEASURES

This section describes key performance measures for meeting the following sustainability goals: (1) Manage groundwater to ensure sustainable supplies and avoid land subsidence; and (2) Aggressively protect groundwater from the threat of contamination.

The outcome measures are quantifiable goals used to track sustainable management performance and are functionally equivalent to measurable objectives under SGMA. The outcome measure – lower thresholds are quantifiable values used to define undesirable results and are functionally equivalent to minimum thresholds under SGMA. The outcome measure – lower thresholds account for a reasonable margin of operational flexibility[95] below the outcome measures that accommodate drought, climate change, conjunctive use operations, and other groundwater management activities. Valley Water has a long-established history of sustainable groundwater management and will continue to proactively manage groundwater to minimize the risk of reaching the outcome measure – lower thresholds and associated undesirable results. The basis for these outcome measures, the corresponding outcome measures – lower thresholds, and a description of how they will be measured is presented below.

5.4.1 Groundwater Storage

Outcome Measure: Projected end-of-year groundwater storage is greater than 278,000 acre-feet (AF) in the Santa Clara Plain, 5,000 AF in the Coyote Valley, and 17,000 AF in the Llagas Subbasin, which is a combined 300,000 AF in the Santa Clara and Llagas subbasins.

Outcome Measure – Lower Threshold: Projected end-of-year groundwater storage is greater than 150,000 AF in the Santa Clara and Llagas subbasins.

Groundwater storage is a critical consideration in water supply reliability and is the county's best protection against drought or facility outage. The end-of-year groundwater storage is projected to support operational decisions, including the timing and location of reservoir releases and managed recharge, and decisions related to imported water such as short-term water exchanges or out of county banking. Additionally, the projected end-of-year groundwater storage is a key indicator for the 2025 WSCP and helps guide response actions during droughts and water shortages. The "normal" stage where no WSCP water shortage response action is needed occurs when the projected end-of-year groundwater storage is above 300,000 AF in the Santa Clara and Llagas subbasins.

While the groundwater storage outcome measure is 300,000 AF for the Santa Clara and Llagas subbasins, more specificity is needed regarding the management of individual subbasins and groundwater management areas. Based on groundwater storage observed historically, the end-of-year storage targets of 283,000 AF in the Santa Clara Subbasin (278,000 AF in the Santa Clara Plain and

95 California Department of Water Resources, 2017, Best Management Practices for the Sustainable Management of Groundwater, Sustainable Management Criteria BMP, 36 pages.

5,000 AF in the Coyote Valley) and 17,000 AF in the Llagas Subbasin were established and first presented in the 2021 GWMP.

From 2015 to 2024, groundwater storage in the Santa Clara and Llagas subbasins remained in the normal stage (>300,000 AF) each year, except in CY 2015 during the 2012–2016 drought, when projected storage was less than 250,000 AF, which triggered WSCP actions. Although groundwater storage declined during the 2020-2022 drought, it remained above 300,000 AF in the Santa Clara and Llagas subbasins. Despite these drought related declines in groundwater storage, there were very limited impacts to wells. Of the 6,130 water supply wells in the Santa Clara and Llagas subbasins, only 14 and 9 dry domestic wells were reported dry during the 2012-2016 and 2020-2022 droughts, respectively, primarily along the basin margins where well yield is more uncertain. See Appendix D for additional details about the evaluation of dry supply wells during drought. Additionally, no permanent subsidence was observed during either drought. Due to Valley Water's managed recharge programs, coordination with water retailers, and community water use reductions in response to Board action, groundwater storage quickly recovered to >300,000 AF in 2016 and has since remained greater than the outcome measure.

To account for a reasonable operational flexibility, including more severe future droughts or infrastructure outages, the outcome measure – lower threshold for groundwater storage is projected end-of-year groundwater storage greater than 150,000 AF in the Santa Clara and Llagas subbasins. If storage falls below this target, there will be a greatly increased risk of resumed permanent subsidence and more widespread reports of dry wells. The outcome measure – lower threshold accounts for the integrated groundwater management and operational decisions that are necessary for Valley Water to make across both Santa Clara and Llagas subbasins, particularly during a drought response. If the projected end-of-year groundwater storage is below 150,000 AF in the Santa Clara and Llagas subbasins, then the 2025 WSCP emergency (stage 6) water shortage response actions will be implemented. Additional details about the 2025 WSCP and contingency planning are in section 6.1.6.

5.4.2 Groundwater Levels and Land Subsidence

Outcome Measure: Groundwater levels are above subsidence thresholds at the Santa Clara Subbasin subsidence index wells.

Outcome Measure – Lower Threshold: Groundwater levels are above the historical low water levels at the majority of the Santa Clara Subbasin subsidence index wells.

Significant inelastic (permanent) land subsidence occurred in the Santa Clara Plain through the 1960s due to long-term overdraft, which was caused by groundwater pumping exceeding recharge. Permanent subsidence was essentially halted by about 1970 through Valley Water's expanded conjunctive water use management programs, which allowed a substantial recovery in groundwater levels. The avoidance of inelastic land subsidence has been and continues to be a major driver for Valley Water given the extremely high costs associated with damaged infrastructure, reduced carrying capacity of flood control structures, and seawater encroachment into freshwater aquifers. It is critical to prevent inelastic subsidence because it is irreversible.

In 1991, Valley Water evaluated the remaining land subsidence potential to avoid additional inelastic subsidence due to groundwater overdraft.[96] Based on the findings of this study, Valley Water has established an acceptable subsidence rate of no more than 0.01 feet per year on average, measured over a multi-year period. This rate was presented to and endorsed by the Water Retailer Groundwater Subcommittee following the 1991 study, and the related subsidence thresholds have been used historically to measure performance in meeting Board policy. Monitoring data indicates that the

96 Geoscience Support Services Inc. for Santa Clara Valley Water District, Subsidence Thresholds in the North County Area of Santa Clara Valley, 1991.

subsidence target has generally been met. Ten index wells throughout the Santa Clara Plain area of the Santa Clara Subbasin were selected as control points for subsidence model calibration and prediction and the tolerable rate of 0.01 feet per year of inelastic subsidence was applied to determine threshold groundwater levels for these wells. These subsidence thresholds (Table 5-1) are the groundwater levels that must be maintained to ensure a low risk of unacceptable land subsidence.

This outcome measure relies on continued observation of groundwater levels at the subsidence index wells and comparison to subsidence thresholds to ensure groundwater levels are maintained above these thresholds (Table 5-1). It should be noted that a few wells shown in Table 5-1 differ from those in the 1991 study due to well destruction or loss of access. Replacement wells are chosen such that they are in close proximity to and display similar water level patterns as the original well.

Table 5-1. Subsidence Thresholds

Subsidence Index Well Number	State Well ID	Location	Subsidence Threshold Elevation (feet above mean sea level, NAVD 88)	Historical Low Groundwater Elevation (feet above mean sea level, NAVD 88)
1	08S01W03K013	Near Division St./Dell Ave. in Campbell	169	166
2	08S01E10J004	Near Blossom Hill Rd./Chesbro Ave. in south San José	-20	25
3	07S01E02J021	Near Story Rd./McGinness Ave. in east San José	-143	-54
4	06S01W24H015	Near Montague Expy/Seely Ave. in Milpitas	-15	-141
5	07S01W22E002	Near San Tomas Expy/Williams Ave. in west San José	-42	-189
6	07S01W08D003	Near Kensington Ave./Lochinvar Ave. in Santa Clara	-44	-148
7	06S02W22G005	Near Middlefield Rd./Tyrella Ave. in Mountain View	-23	-95
8	06S02W24C008	Near Hwy 101/Hwy 237 in Sunnyvale	-27	-77
9	07S01W02G024	Near El Camino Real/Benton St. in Santa Clara	-32	-123
10	07S01E16C011	Near Hwy 280/12th St. in downtown San José	-37	-134

Notes: NAVD 88 is the North American Vertical Datum of 1988.
Subsidence thresholds are rounded to one foot.
Subsidence index wells 2 and 3 have subsidence threshold elevations lower than the historical low groundwater elevations due to the local geology and the minimal historical subsidence at those locations (Geosciences Support Services, 1991).

From 2015 to 2024, groundwater levels at all 10 subsidence index wells remained above their respective subsidence threshold elevations. The last time groundwater levels dropped below subsidence thresholds was during the 2012–2016 drought when water levels temporarily dropped below the subsidence

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threshold at one well (07S01W22E002) during the summer and fall of 2014. Because the water levels at two other index wells (07S01W02G024 and 07S01E16C006) were also approaching their respective thresholds, Valley Water worked with several water retailers to reduce groundwater pumping in these areas. Due to this coordinated effort, Valley Water's recharge programs, and community water use reduction, the groundwater levels at 07S01W22E002 quickly recovered to levels above the subsidence threshold in early 2015 despite continued dry conditions. Water levels at the other nine subsidence index wells had a similar response and water levels rose to healthy levels above the subsidence thresholds.

As documented in Valley Water's Water Year 2024 Groundwater Report [97], there was some elastic (recoverable) subsidence, but no inelastic (permanent) subsidence during the 2020–2022 drought in the Santa Clara Subbasin based on Valley Water's land survey and extensometer monitoring. Because of the enormous potential community costs from resumed land subsidence in the Santa Clara Plain, the outcome measures are conservative to ensure a continued low risk of permanent subsidence. To account for a reasonable operational flexibility, including more severe future droughts or infrastructure outages, the outcome measure – lower threshold for subsidence is that groundwater levels remain above the historical low water levels at the majority of the Santa Clara Subbasin subsidence index wells. If groundwater levels fall below historical low levels, widespread, permanent subsidence will resume. The outcome measure – lower threshold accounts for short-term and localized water levels dropping below the subsidence thresholds, which may not result in inelastic subsidence across the Santa Clara Subbasin. Elastic subsidence is observed annually, and unless water levels fall below historical lows, it is uncertain if observed subsidence is elastic or inelastic while it is happening. That can only be analyzed after water levels have recovered to determine whether there was complete rebound.

5.4.3 Water Quality

Santa Clara Subbasin:

Outcome Measure: For Santa Clara Subbasin public and private water supply wells, at least 80% meet primary drinking water standards, and at least 90% have stable or decreasing trends for total dissolved solids (TDS).

Outcome Measure – Lower Threshold: At least 70% of public and private water supply wells have stable or decreasing trends for nitrate and TDS.

Llagas Subbasin:

Outcome Measure: For Llagas Subbasin public water supply wells, at least 80% meet primary drinking water standards, and at least 75% of private water supply wells have stable or decreasing trends for total dissolved solids (TDS).

Outcome Measure – Lower Threshold: At least 65% of private water supply wells have stable or decreasing trends for nitrate and TDS.

Water supply reliability depends on maintaining both an adequate supply of groundwater and protecting groundwater quality. While surface water goes through significant treatment before being served as drinking water, groundwater from public water supply wells is generally of high quality and does not typically require wellhead treatment beyond disinfection before being delivered to consumers. Protecting groundwater quality is critical for ensuring clean safe water for well users and avoiding the need for treatment. The Santa Clara and Llagas subbasins have good water quality overall but maintaining that quality is not without its challenges. Threats to groundwater quality come from a variety of sources and include urban, rural, and agricultural activities. For example, elevated nitrate is widespread in groundwater of South County, and there are a few detections above maximum contaminant levels each

97 Valley Water, Water Year 2024 Groundwater Report for the Santa Clara and Llagas Subbasin, 2025.

year for other parameters such as perchlorate, PFAS, and aluminum (see Chapter 4). However, it should be noted that perchlorate concentrations have decreased as active remediation of the Olin Corporation site continues, and no MCL exceedances were reported for water supply wells in the County.

Based on DWR's 2019 Recommended Actions from the 2016 GWMP (see the 2021 GWMP, Appendix C), the 2021 GMWP included new and separate water quality outcome measures and outcome measure – lower thresholds for the Santa Clara and Llagas subbasins. As part of the periodic evaluation for this 2026 GWMP, Valley Water evaluated and further refined these water quality outcome measures and outcome measures – lower thresholds for the Santa Clara and Llagas subbasins. As described below, this evaluation and refinement was based on actual groundwater conditions and recent trends in subbasin specific criteria, including water supply well type (public and private) and land-use characteristics. These refined outcome measures and lower thresholds better characterize whether each subbasin is meeting or making progress toward the sustainability goals. As previously described in the 2021 GWMP, the water quality outcome measure for the Santa Clara Subbasin is distinctly different than the outcome measure for seawater intrusion in the subbasin.

The 2026 water quality outcome measures and outcome measure – lower thresholds were evaluated and refined based on public versus private water supply wells in each subbasin. A public water supply well supplies water to a Public Water System (PWS) regulated by the State Water Resources Control Board – Division of Drinking Water (DDW), while a private water supply well is a privately owned domestic or agriculture well that typically supplies water to an individual household or small number of users and/or for irrigation purposes, respectively. A PWS serves at least 15 service connections or at least 25 people for a minimum of 60 days per year and is required to conduct routine water quality monitoring and report compliance data to DDW that ensure water being delivered to homes and businesses meet all state and federal health-based water quality standards. Private wells are not regulated under state or federal drinking water regulations. Therefore, private well owners are not required to routinely test their water quality, report water quality data to DDW, and may not be aware of water quality issues or contaminants in their well water. Private well owners are responsible for maintaining their wells and ensuring the water is safe for drinking or other uses. To assist private well owners, Valley Water provides a free domestic well testing program, which is described in Chapter 6.

Valley Water's 2026 analysis indicates that public wells are statistically deeper in the subbasins than private wells. Therefore, the public wells may be more representative of the general groundwater quality conditions vertically within the subbasin, while the private wells may be more representative of recently recharged groundwater that is closer to the water table. Valley Water's 2026 analysis also indicates that public wells have statistically higher (better) water quality than private wells. Nitrate, PFAS, and other land-surface derived contaminants are more likely to affect the recently recharged groundwater near the water table and thus have a relatively greater impact on private wells than public wells. Therefore, separating the water quality outcome measure by well type (public versus private) can provide greater understanding of the groundwater system and feedback for management programs and actions.

The water quality samples from public supply wells are taken prior to water treatment systems. As described below, the water quality outcome measure and results reported here are less than 100% of public wells meeting state and federal health-based drinking water standards. However, the retailers and suppliers of the public water are legally required to test, treat, and meet all drinking water standards before supplying the water to their customers. Therefore, the water quality outcome measures described here for public wells do not necessarily reflect the treated water served to the public but rather the general groundwater conditions prior to treatment. In comparison, the water quality samples from private supply wells are generally taken prior to any available water treatment system. However, some but not all private well owners have water treatment systems after the well head prior to domestic use. Therefore, the water quality outcome measures described here for private wells may reflect both untreated and treated water used by domestic and other private wells owners.

In the Santa Clara Subbasin, public wells are the predominant well type and used by water retailers to supply water to residents and businesses. M&I use[98] accounts for the majority of groundwater pumped from the Santa Clara Plain (Figure 4-7) and Coyote Valley (Figure 4-8) in the Santa Clara Subbasin. Following the recent state and federal regulation of PFAS in drinking water, there have been more analyses, detections, and exceedances of PFAS from public wells. Since 2021, there has been a 33% increase in the number of water supply wells in the Santa Clara Subbasin analyzed for PFAS. In addition, shallow private wells in the more rural and agricultural Coyote Valley groundwater management area of the Santa Clara Subbasin have increased detections and exceedances of nitrate. The combination of these factors has led to the water quality outcome measure being partially met over the last two years. Therefore, the Santa Clara Subbasin water quality outcome measure was evaluated and revised.

In the Llagas Subbasin, private wells are the predominant well type and used to supply domestic or agricultural use. Agricultural and domestic use accounts for 57% of groundwater pumped from the Llagas Subbasin, while M&I use is 43% (Figure 4-12). Similar to the Santa Clara Subbasin, there have been more analyses, detections, and exceedances of PFAS from water supply wells in the Llagas Subbasin. Since 2023, there has been an approximately 150% increase in the number of water supply wells in the Llagas Subbasin analyzed for PFAS. In addition, nitrate continues to be the primary groundwater protection challenge because of the historical and current agricultural land use. The 2026 analyses indicate the water quality samples from private water supply wells in the Llagas Subbasin are disproportionally contributing to the exceedances of water quality standards [99] and is a primary reason the water quality outcome measure has not been met in recent years. Therefore, the Llagas Subbasin water quality outcome measure was evaluated and revised.

To protect the quality of groundwater for beneficial uses, the water quality outcome measures evaluate the percentage of water supply wells that meet all primary water quality standards (MCLs). These outcome measures will continue to be evaluated annually using data collected at water supply wells sampled by Valley Water and water retailers. Data from dedicated monitoring wells will not be used as it is less representative of water being pumped for beneficial use.

Given the above evaluation, the revised 2026 water quality outcome measure continues to use relatively high percentages of water supply wells meeting primary water quality standards (i.e., MCLs), while considering the relative differences between subbasin (Santa Clara versus Llagas) and well type (public versus private). For the Santa Clara Subbasin public and private water supply wells, at least 80% meet primary drinking water standards. For the Llagas Subbasin public water supply wells, at least 80% meet primary drinking water standards. These outcome measures are not 100% for several reasons. Some of the wells monitored by Valley Water are private domestic and/or agricultural wells, which may have less stringent wellhead protection, maintenance, and testing than public wells. The water quality at these private wells may be more influenced by local land use and conditions near the well as they are statistically shallower than public water supply wells. Also, DDW does not consider a single detection of a contaminant to be indicative of contamination and would not consider a single detection to be an actual finding without a follow-up detection. As described above, all public and some private water quality samples were taken prior to treatment. Therefore, water served to customers may not have a contaminant present at pre-treatment concentration because all public and some private water systems perform treatment or blending prior to service or use.

The timely identification of adverse trends is important so that appropriate action can be taken to protect groundwater resources. Therefore, the water quality outcome measures also evaluate long-term trends in TDS on an annual basis using 15 years (October 2011 – September 2025) of data from both public

98 Municipal and industrial (M&I) use shown in Chapter 4 include primarily public supply wells for municipal use but may include a small number of private supply wells for industrial uses.
99 Note – As stated previously, private wells are not subject to the regulation or enforcement of federal or state drinking water standards. However, we compare water quality from private wells to drinking water standards as a benchmark and way to help characterize groundwater conditions in the aquifer.

and private water supply wells. TDS is an indicator of salt loading and overall groundwater quality conditions. The salts from applied irrigation water remain in the soil layer and can eventually be leached into groundwater by rainfall or over-irrigation. The trend-based component of the outcome measures will help Valley Water to better understand how groundwater quality is changing over time and highlight areas that may warrant further study or action to protect the beneficial use of groundwater.

Given the above evaluation, the revised 2026 water quality outcome measure continues to use relatively high percentages of water supply wells with stable or decreasing trends for TDS, while considering the relative differences between subbasin (Santa Clara versus Llagas) and well type (public versus private). For the Santa Clara Subbasin public and private water supply wells, at least 90% have stable or decreasing trends for TDS, which is the same outcome measure from the 2021 GWMP. For the Llagas Subbasin private water supply wells, at least 75% have stable or decreasing trends for TDS. The TDS trends for the Llagas Subbasin focus on private wells because the exceedance of MCLs focus on public wells and the relatively shallow private wells in the Llagas Subbasin have the greatest historical water quality challenges. Therefore, this trend-based component of the Llagas Subbasin outcome measures will better characterize how this water quality challenge for private wells is improving over time. Also, the presence of a statistically significant increasing trend does not necessarily indicate a water quality problem because the magnitude of change also needs to be considered. Therefore, the magnitude of the trend will also be evaluated to identify potential areas of concern so that additional management action can be taken if necessary to protect groundwater resources.

If a water quality outcome measure is not met, it is important that the overall water quality trends are either stable or decreasing with time to avoid widespread degradation of groundwater quality. Therefore, the water quality outcome measure – lower thresholds focus on nitrate and TDS trends as key water quality indicators. Nitrate is the one parameter that is frequently detected above the MCL and affects the largest number of wells, particularly in the southern Santa Clara Subbasin (Coyote Valley) and across the Llagas Subbasin. Common sources of nitrate in groundwater are agricultural fertilizers, septic systems, and animal waste. Elevated nitrate is common in the Llagas Subbasin and parts of the Coyote Valley due to historic and ongoing sources and land use but there are also localized areas with nitrate concerns in the northern Santa Clara Subbasin. Recent trends (2010 to 2024) show that about 90% of public and private water supply wells in the Santa Clara Subbasin and 95% of private supply wells in the Llagas Subbasin have stable or decreasing nitrate concentrations, indicating that while elevated nitrate still exists, the trends in most wells are not getting worse. A high fraction of wells with increasing trends in either nitrate or TDS would indicate widespread degradation of groundwater quality, which could negatively impact many well users. To account for reasonable operational flexibility, including annual factors that can affect groundwater quality, the outcome measure – lower threshold for water quality is that at least 70% of public and private water supply wells in the Santa Clara Subbasin and 65% of private water supply wells in the Llagas Subbasin have stable or decreasing concentrations of nitrate and TDS.

5.4.4 Seawater Intrusion

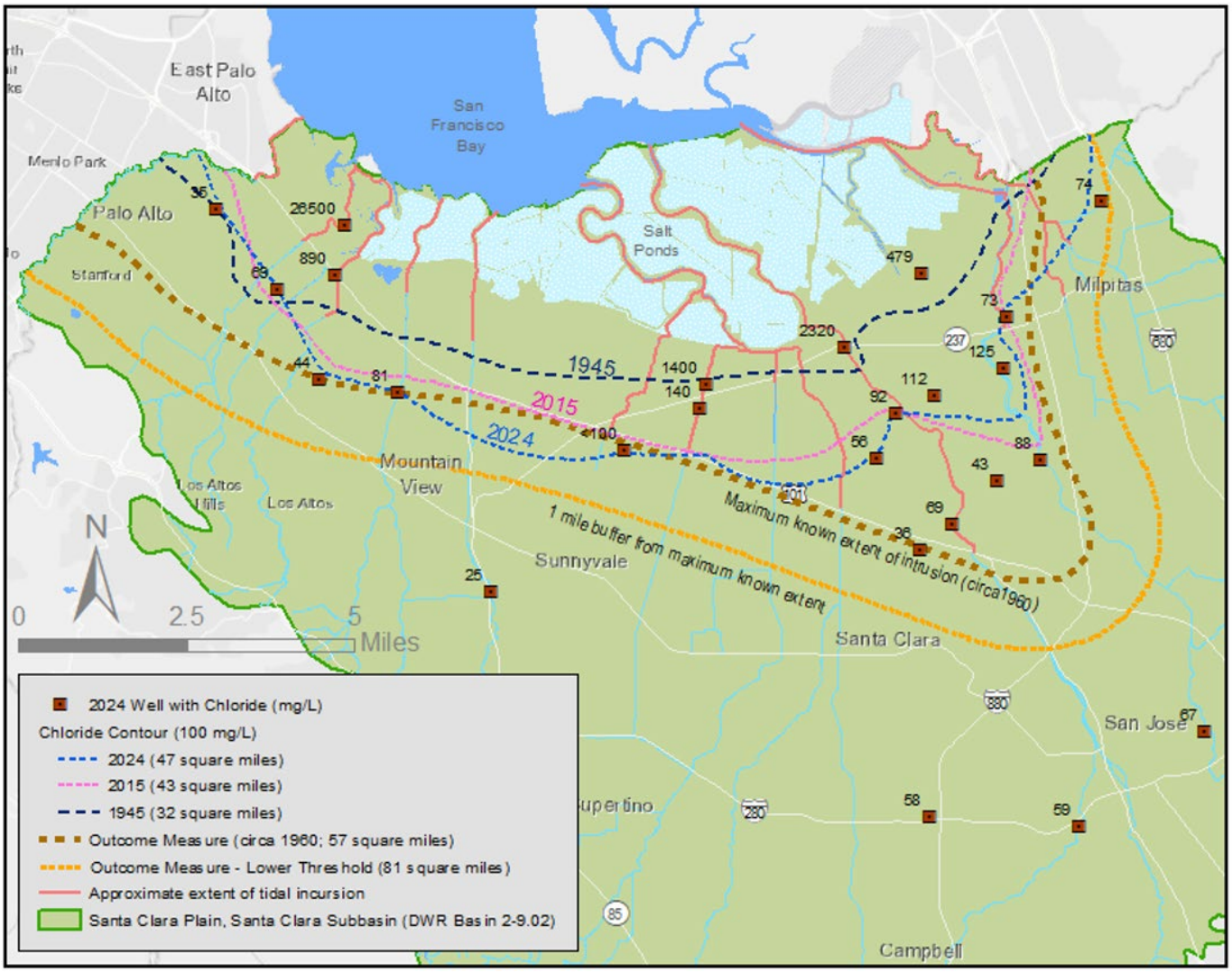
Outcome Measure: In the Santa Clara Subbasin shallow aquifer, the 100 milligram per liter chloride isocontour area is less than the historical maximum extent area (57 square miles).

Outcome Measure – Lower Threshold: In the Santa Clara Subbasin shallow aquifer, the 100 milligram per liter chloride isocontour area is less than 81 square miles, which represents a one-mile radial buffer of the historical maximum extent area.

In the 2021 GWMP, Valley Water established the SWI outcome measure of 57 square miles based on the historical maximum extent of SWI in the shallow aquifer zone of the Santa Clara Plain that occurred in the 1960s, as delineated by the 100 mg/L chloride isocontour. This period coincided with historic groundwater overdraft and land subsidence throughout much of the Santa Clara Plain. Using the 100 mg/L isocontour to define the SWI extent is an early warning of potential SWI and a conservative approach since the SMCL for chloride is 250 mg/L and because no widespread impacts to water supply

wells were associated with the maximum extent of SWI. The SWI outcome measure – lower threshold is based on a 1-mile (5,280 feet) radial buffer of the historical maximum SWI extent, which allows for reasonable operational flexibility, including annual variability in the spatial extent of the 100 mg/L chloride isocontour, especially near the Guadalupe River and Coyote Creek. The outcome measure, outcome-measure – lower threshold, and 100 mg/L isocontours for 2015 and 2024 are shown on Figure 5-3. Additional technical details that support the SWI outcome measure and outcome measure – lower threshold are in Appendix H of the 2021 GWMP and in Valley Water's 2025 report, *Groundwater Response to Tides, Seawater Intrusion, and Sea-Level Rise in Santa Clara County, California*[100].

Figure 5-3. Historical 100 mg/L Chloride Isocontours in the Shallow Aquifer Zone of the Santa Clara Plain



Valley Water has monitored groundwater quality in the Santa Clara Subbasin for decades. Chloride data from wells screened in the shallow aquifer zone were used to evaluate the extent of the 100 mg/L chloride isocontour as documented in the 2016 and 2021 GWMPs and in Valley Water's Annual Water Year Reports (formerly known as the Annual Groundwater Report). As mentioned, the furthest inland extent of the SWI occurred around 1960 during historical groundwater overdraft, land subsidence, and resulting inland tidal incursion. Leakance of saltwater from tidal streams is likely the primary mechanism

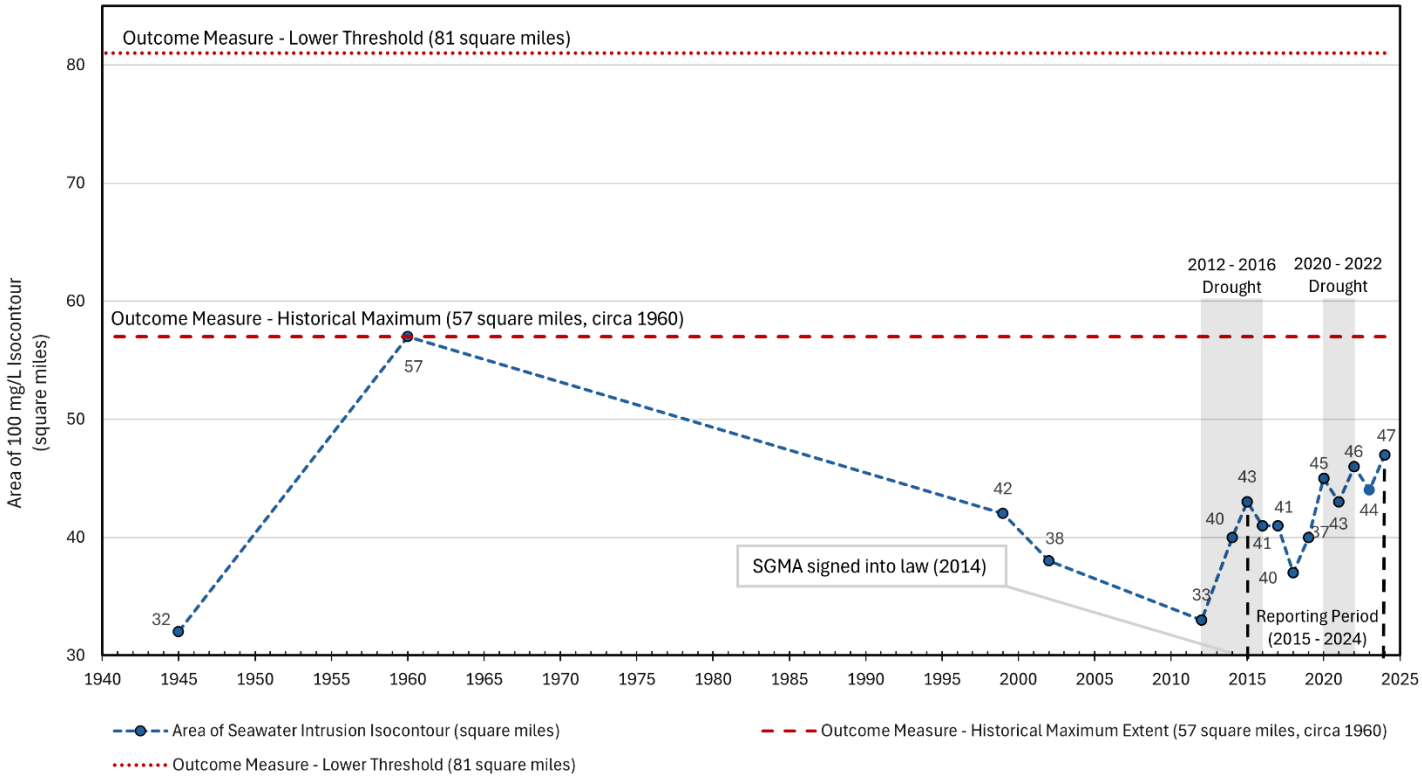
100 Available at: https://www.valleywater.org/your-water/groundwater/groundwater-studies

for SWI in the shallow aquifer (Figure 2-24) and explains why the furthest inland lobe of the 100 mg/L chloride isocontour is near the Guadalupe Rive and Coyote Creek (Figure 5-3).

In 2024, the spatial extent of the 100 mg/L chloride isocontour was about 47 square miles and less than the outcome measure of 57 square miles (Figure 5-3). As shown in Figure 5-4, the extent of the 100 mg/L chloride isocontour area has remained less than the outcome measure since the historical maximum, largely due to Valley Water's sustainable groundwater management in the years since the 1960s. Over the last decade, the extent of the 100 mg/L chloride isocontour area has increased but remains less than the outcome measure (Figure 5-4). Much of this trend may be attributed to an improvement in the interpolation methods used to draft the isocontours. Historically, the isocontours were manually drawn and later digitized into GIS but in 2021, Valley Water began using the Natural Neighbor interpolation method with GIS software. Additionally, there was considerable variability in the location of the 100 mg/L isocontour, especially during drought year in the central area of the Santa Clara Plain, likely to due to the spatial gaps in the monitoring network (Figure 5-3). To address these spatial gaps, four new SWI monitoring wells were installed in 2026, as described in Appendix G.

Most water supply wells are screened in the deeper, principal aquifer zone, where no widespread SWI has been observed. The 100 mg/L chloride isocontours are based on monitoring wells screened in the shallow aquifer zone and thus represent potential vulnerability of the deeper, principal aquifer to contamination through improperly constructed or destroyed wells that may serve as vertical conduits for lower-quality water from the shallow aquifer zone.

Figure 5-4. Historical Area of 100 mg/L Chloride Isocontour in the Shallow Aquifer Zone of the Santa Clara Plain



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CHAPTER 6 – BASIN MANAGEMENT PROGRAMS AND ACTIVITIES

As a GSA, Valley Water's programs to protect and augment water supplies are implemented under SGMA and powers granted by the District Act[101], which authorizes Valley Water to provide comprehensive water management for all beneficial uses within Santa Clara County. The District Act authorizes Valley Water to take the following actions to protect and augment water supplies:

- Conserve and manage water for beneficial and useful purposes, including spreading, storing, retaining, and groundwater recharge.
- Protect, save, store, recycle, distribute, transfer, exchange, manage, and conserve water.
- Increase and prevent the waste or diminution of the water supply.
- Obtain, retain, protect, and recycle water for beneficial uses.
- To do any and every lawful act necessary to be done that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants within the district.

Valley Water has many programs and activities that protect groundwater supplies and quality. Other agencies also implement programs to protect groundwater resources in the county. This chapter describes programs developed to maintain a reliable water supply, prevent inelastic (permanent) land subsidence, and protect groundwater quality, both now and in the future. This chapter focuses on operations projects or ongoing basin management activities and programs implemented by Valley Water and other agencies. Valley Water also implements capital projects as needed to protect and augment groundwater resources. These projects are described in Valley Water's Capital Improvement Program. Monitoring programs are described in Chapter 7.

In addition to the programs described in this chapter, Valley Water monitors emerging policies and regulations, collaborates with key decision makers and interested parties to effect policy change, cultivates relationships, and works with federal, state, and local government representatives on pending legislation and regulatory standards related to the protection of groundwater resources. The purpose of these activities is to ensure that Valley Water interests are communicated and considered in legislative and regulatory processes.

6.1 PROGRAMS TO MAINTAIN A RELIABLE GROUNDWATER SUPPLY

The Santa Clara and Llagas subbasins are a critical component of the overall water supply of Valley Water. Valley Water manages water resources, including groundwater and imported water, and wholesales treated water to water retailers in Santa Clara County to achieve overall water supply reliability. By maintaining groundwater levels and sufficient storage, these programs prevent undesirable results including long-term groundwater overdraft, inelastic land subsidence, and seawater intrusion. Related programs and activities are described in detail below.

6.1.1 Managed Recharge

To offset groundwater withdrawals and ensure the long-term sustainability of groundwater resources, Valley Water replenishes the Santa Clara and Llagas subbasins with local and imported surface waters in Valley Water recharge facilities. This section focuses on managed recharge operations. However, it should be noted that the managed recharge program depends upon many other Valley Water programs, including programs related to dam maintenance, the administration and management of imported water

101 Santa Clara Valley Water District Act, Water Code Appendix Chapter 60.

contracts, local water rights management, groundwater analysis, and maintenance of the raw water conveyance system and groundwater recharge facilities.

By releasing locally conserved and imported water from local reservoirs or Valley Water's raw water distribution system, Valley Water significantly increases groundwater recharge. On average, Valley Water's managed recharge program replenishes twice the amount of water replenished naturally. Valley Water recharge facilities are designed for rapid infiltration based on their permeability and hydraulic characteristics. Through Valley Water's managed recharge operations, an average of about 95,000 AF was recharged annually between 2015 and 2024 and about 103,000 AF in 2024. This water came from a variety of sources, including watershed stormwater runoff captured in the county's 10 local reservoirs and water imported from both the SWP and CVP. Managed recharge was scaled back during the 2012–2016 and 2020-2022 droughts due to limited surface water availability. During the peak of the droughts in 2015 and 2021, annual managed recharge was around 54,000 AF and 70,000 AF, respectively. In 2016, Valley Water substantially increased managed recharge to about 140,000 AF to help recover groundwater storage that had decreased during the drought. Similarly, in 2022 and 2023 after the drought ended, Valley Water increased managed recharge to about 91,000 AF and 122,000 AF, respectively, to help recover groundwater storage. During periods of limited surface water availability, priority for managed recharge is typically given to highly groundwater-dependent areas such as the Coyote Valley and Llagas Subbasin.

Recharge facilities are closely monitored using a computerized control system and field observation. The raw water control system enables remote operation of water distribution facilities and real-time system performance data. Water resources technicians perform daily inspections of recharge facilities and record flows and water levels. Operations include daily monitoring of forecasts, reservoir inflows, and storage levels to plan releases for water supply operations, dam safety and bank stability, habitat management, and flood potential reduction. A detailed description of Valley Water's managed recharge facilities is summarized in Appendix H.

6.1.1.1 Reservoirs and Diversions

Valley Water constructed 10 reservoirs and has five active stream diversions to enable appropriation of water supplies under Valley Water's water rights. The primary function of Valley Water's surface water reservoirs is to store local and imported water for groundwater recharge and treatment plant deliveries for water supply. Dams are operated under certificates of approval from the California Department of Water Resources, Division of Safety of Dams and reservoirs and diversions are operated in accordance with the California Fish and Game Code. Total storage capacity of Valley Water's reservoirs is 166,000 acre-feet. Valley Water is currently assessing the seismic stability of its reservoirs, and several reservoirs are currently subject to operating restrictions that reduce reservoir storage capacity until upgrades are implemented. For example, to increase the seismic stability of Anderson Dam, Valley Water drained Anderson Reservoir to about deadpool (4% of capacity) beginning in October 2020, to prepare for the reconstruction of the existing earthen Anderson Dam. The reconstruction is expected to last through the end of 2033 and will allow Anderson Reservoir to return to its full operating capacity once completed. These operating restrictions may impact groundwater recharge for facilities that depend on local water supplies since the amount of local water that can be captured is reduced. Additionally, the reservoirs are operated for incidental flood risk reduction, and many reservoirs include safety operational guidelines that limit storage during winter.

Most of the stored water released from the reservoirs is delivered to streams below the dams. As the water flows downstream, some of it percolates through the streambed and recharges the groundwater subbasins. Some water may be diverted downstream for recharge in off-stream recharge facilities. Valley Water also operates and maintains several systems that divert water to recharge facilities and enhance recharge. Additional details on Valley Water recharge facilities is in Appendix H.

6.1.1.2 In-Stream Managed Recharge

Valley Water conducts in-stream managed recharge operations in more than 98 miles of stream channel (Appendix H). During the 2015 to 2024 period, about two-thirds of Valley Water's managed recharge occurs through in-stream recharge facilities, with about 60,000 AF recharged from Valley Water releases into creeks in most years. In 2015, a drought year, in-stream managed recharge was reduced to about 33,400 AF. After the 2015 drought, in-stream recharge was back to normal and the 2023 and 2024 in-stream recharge was about 64,300 and 60,000 AF, respectively. In addition to ongoing planning, monitoring, and inspection of facilities, Valley Water also coordinates operations for flashboard dams and operable (bladder) dams with the California Department of Fish and Wildlife (CDFW) under related agreements.

In the Stevens Creek, Guadalupe, and Coyote Creek watersheds, operations at Almaden, Anderson, Calero, Coyote, Guadalupe, Lexington, and Stevens Creek reservoirs are managed under the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) program. This program includes rule curves that specify releases based on the amount of local water stored and time of year. The rule curves also include triggers for pulse flows to support. fish migration when there is adequate storage in the reservoirs. Valley Water is in the process of formally amending its water rights to include fish and wildlife as a beneficial use.

6.1.1.3 Off-Stream Managed Recharge

Valley Water conducts managed recharge operations in 87 off-stream recharge ponds that range in size from less than 1 acre to more than 20 acres. Recharge through off-stream ponds accounts for about a third of Valley Water's managed recharge, with about 35,000 AF of water delivered to recharge ponds in most years between 2015 and 2024. Ongoing maintenance of off-stream ponds is conducted by removing accumulated fine sediments to maintain optimal recharge rates.

6.1.1.4 Direct and Potable Reuse

The 2025 UWMP states that, as part of the WSMP 2050 development, the Valley Water Board adopted a potable reuse goal of 24,000 AFY by 2035 with a long-term vision to maximize water reuse in the county up to 32,000 AFY by 2050. The 24,000 AFY potable reuse is consistent with what was identified in Valley Water's Countywide Water Reuse Master Plan (CoRe plan) and can be achieved with a project in collaboration with the cities of San José and Santa Clara. The long-term vision includes additional potable and non-potable reuse, desalination, stormwater capture, and other alternative water sources. The inclusion of a 2035 goal with the long-term vision promotes a phased approach that accounts for uncertainty with future demand and wastewater availability while balancing affordability and risk of overinvestment. Valley Water is working with the cities of San José and Santa Clara on the development and expansion of water reuse in those communities, including the implementation of a regional Advanced Water Purification Facility Pure Water Silicon Valley (PWSV) adjacent to the SVAWPC for direct potable reuse, beginning with a demonstration facility and learning center to facilitate design and permitting as well as public outreach

Purified water projects would provide a locally controlled, drought-resilient source of purified water for augmenting raw surface water supplies for direct consumption or groundwater recharge in the Santa Clara Subbasin. This would increase water supply reliability for Santa Clara County, help ensure continued groundwater sustainability, and protect against land subsidence.

6.1.1.5 Treated Groundwater Reinjection Program

Over the years, hundreds of thousands of acre-feet of groundwater have been extracted in Santa Clara County to control or mitigate contamination plumes caused by spills or leaks of hazardous materials. To facilitate the cleanup of contamination sites, protect groundwater resources, and minimize the discharge of local waters to storm drains or sanitary sewers, Valley Water adopted Resolution 94-84 to encourage the reuse or recharge of treated groundwater from groundwater contamination cleanup projects. This

program includes the review of applications against specific criteria to ensure that groundwater quality is protected and provides a financial incentive for qualifying projects. The program criteria are stringent to ensure compliance with the District Act; most parties extracting groundwater for environmental remediation do not meet the criteria with only a few sites participating in this program since its inception.

6.1.2 In-Lieu Recharge

Valley Water's in-lieu recharge programs play a critical role in maintaining groundwater basin storage and preventing undesirable results by meeting water demand that would otherwise be met by groundwater pumping. These programs help stabilize groundwater levels, protect water quality, and support the long-term sustainability of the subbasins. They also provide operational flexibility during dry periods and drought conditions.

6.1.2.1 Treated Water Operations

Valley Water operates three drinking water treatment plants, which operate 24 hours a day, 7 days a week and provide in-lieu recharge by reducing groundwater demands. The Rinconada Water Treatment Plant, which was constructed in 1967, has a maximum flow rate of 80 million gallons per day (MGD) and a current expansion to 100 MGD. The Penitencia Water Treatment Plant was constructed in 1974 and has a maximum flow rate of 40 MGD. The Santa Teresa Water Treatment Plant can process 100 MGD and has been online since 1989. The long-term average treated water delivery is 96,000 AFY for the period 2015 to 2024. The annual treated water delivery ranges from a maximum of 108,000 AF in 2018 to a minimum of 83,000 AF in 2024 for the same period. During the peak of the last drought in 2015, treated water delivery was about 94,000 AF.

6.1.2.2 Groundwater Banking and Supplemental Water Supplies

Valley Water also stores imported water used for in-lieu and managed recharge in the Semitropic Groundwater Bank (Semitropic Bank) in Kern County for withdrawal when needed. Valley Water has engaged in this water banking and exchange program with the Semitropic Water Storage District since 1996 to help manage variability in Valley Water's SWP and CVP water supplies. Valley Water is one of the original banking partners and is one of the largest banking partners in Semitropic Bank at 35% share of one million AF storage capacity. The Semitropic Bank provides a place to store surplus water supplies in wet years for later withdrawal and use in dry years.

The Semitropic Bank involves conveyance of Valley Water's SWP and/or CVP water to the bank. Valley Water has the right to store up to 350,000 AF of water in the Semitropic Bank and has approximately 304,000 AF stored in the bank at the end of 2025. Due to the limited operational groundwater storage capacity of the local Santa Clara and Llagas subbasins, Valley Water's storage of water in the Semitropic Bank provides it a critical source of additional water storage. In a dry year, Valley Water is contractually able to withdraw approximately 31,500 AF from the Semitropic Bank. Depending on operating conditions, Semitropic may provide additional withdrawal if there is unused capacity by other banking partners. The largest amount of water previously withdrawn by Valley Water in a single year was 45,485 AF in 2015. In 2024, 18,000 AF of Valley Water's supplies were delivered to Semitropic for storage.

Storage in the bank occurs when water is physically delivered to recharge ponds in Semitropic's service area, or when surface water deliveries are used by landowners overlying Semitropic's service area in-lieu of local groundwater pumping. The Semitropic Bank is located south, or "downstream", of Valley Water in the state's water delivery system. Therefore, return of stored water to Valley Water is accomplished by either exchange of Semitropic's right to a portion of Kern County Water Agency's (KCWA) SWP water or through physically pump-in of groundwater into the California Aqueduct by Semitropic for use by DWR or other SWP contractors downstream; in exchange, DWR delivers to Valley Water supplies that would have otherwise been delivered to KCWA or downstream contractors.

Since 2005, Valley Water has stored approximately 473,000 AF of water in the Semitropic Water Bank and has withdrawn about 304,000 AF. During the 2020–2022 drought, the district relied on the bank for 97,000 AF of dry-year supplies at a time when supplemental water was both limited and costly. The Semitropic Bank has proven to be a valuable resource to help Valley Water manage wet year water supplies, and to provide critically important dry-year supplies to meet drinking water treatment plant demands and to protect Santa Clara County's groundwater basin from overdraft and subsequent land subsidence. Valley Water's agreement with Semitropic for the banking and exchange program ends in 2035, and the agreement must be renewed for Valley Water's continued participation in the program. Valley Water is also currently exploring other potential groundwater programs across the state to diversify its portfolio and ensure dry-year reliability of its imported supplies.

If water supplies are insufficient to meet needs, Valley Water may also purchase transfer water or participate in exchanges to supplement its supplies; both transfer and exchange supplies are conveyed to Santa Clara County from the Delta. In the critically dry year of 2021, for instance, Valley Water purchased 58,000 AF of transfer water to ensure sufficient supplies to maintain treatment plant deliveries and recharge to protect groundwater levels and reduce the risk of land subsidence.

6.1.2.3 Water Conservation

Valley Water has been a leader in water conservation since the 1990's, implementing innovative, effective, and comprehensive-in-scope programs that promote water-use efficiency throughout the county. This is consistent with Board Ends Policy E-2 that states Valley Water will "maximize utilization of all demand management tools" and "incentivize water use efficiency and water conservation." As a result, Santa Clara County is now one of the most water-efficient counties in the state.

Valley Water's long-term water conservation targets are 99,000 AFY by 2030, 110,000 AFY by 2040, and 126,000A FY by 2050. To achieve these aggressive long-term goals and requirements under the Making Conservation a California Way of Life (MCCWOL) regulatory framework, Valley Water, in partnering with its retailers, has implemented over 20 different water conservation programs that provide rebates, free device installation, home visits, site surveys, and educational outreach to reduce water consumption in homes, businesses, institutions, and agriculture.

Recent state legislation and regulations will shape how water agencies, including Valley Water, establish priorities, allocate resources, and implement water conservation programs for decades. Key developments include:

- The passage of Assembly Bill (AB) 1572 in October 2023 will prohibit the use of potable water to irrigate nonfunctional turf—generally decorative lawn—at commercial, industrial, and institutional (CII) properties and in common areas managed by homeowners' associations (HOAs). Compliance will be phased in by property type from January 2027 through January 2031.
- The State Water Resources Control Board's unanimous adoption of the MCCWOL regulatory framework in July 2024. The framework establishes individualized water-use objectives and performance measures for urban retail water suppliers, including 11 retailers in the county.

Following the state's 2022 emergency regulation to prohibit nonfunctional turf irrigation at commercial, industrial, and institutional (CII) properties, Valley Water acted to align local requirements with statewide policy. The resulting prohibition applies only to potable water supplied or managed by Valley Water, either directly or through a water retailer that uses Valley Water supplies. Valley Water generally uses an education-first approach to promote compliance; however, during periods of mandatory water-use reductions, a formal enforcement process may be implemented and may result in fines

Alongside these regulations, Valley Water's Board adopted a resolution establishing guiding principles for making water conservation a lasting, community-wide practice. Together, these actions form a new regulatory foundation for Valley Waters conservation initiatives:

- Ordinance No. 22-02 reinforces AB 1572 and other permanent water-waste prohibitions countywide, followed by Ordinance No. 23-02 (2023), making such prohibitions permanent for CII properties and multifamily common areas (e.g., homeowners' associations, mobile home parks, etc.).
- Resolution No. 23-52, *Calling for Water Conservation as a Way of Life in Santa Clara County*, establishing guiding principles for long-term, community-wide conservation.

Valley Water has taken steps to support regulatory compliance with water retailers and the community. By adapting and enhancing existing program offerings, such as the Lawn-to-Mulch rebate under the Landscape Rebate Program, and expanding irrigation budgets and landscape area mapping, Valley Water provides valuable assistance for meeting both local and statewide requirements.

More recent program developments further strengthen compliance support. These include:

- A revamped direct-installation service to retrofit qualifying indoor plumbing fixtures,
- Expanded incentives and resources for improving landscape irrigation efficiency and turf conversion, and
- Program enhancements aligned with recently established state regulations.

To further assist customers and water retailers, Valley Water launched a statewide irrigation scheduling tool at www.valleywaterscheduler.com. Partnering with the California Water Efficiency Partnership (CalWEP), Valley Water helped fund and helped develop nonfunctionalturfca.org/, which provides sector-specific guidance and requirements for AB 1572 compliance. Valley Water and the Bay Area Water Supply and Conservation Agency (BAWSCA), partnered with CalWEP and the International Association of Plumbing and Mechanical Officials (IAPMO) to develop the first-in-California leak detection and repair certificate program for plumbing professionals. Additionally, Valley Water joined BAWSCA to develop resources and workshops tailored to water retailers throughout the San Francisco Bay Area to assist with planning for and complying with MCCWOL requirements. These collaborations:

- Improve access to compliance guidance,
- Increase awareness of regulatory requirements,
- Build regional capacity through training and technical resources, and
- Support consistent implementation of statewide and Valley Water conservation policies.

Together, these programs and partnerships are designed to achieve sustainable, long-term water savings and are implemented regardless of water supply conditions. As a result, Valley Water's conservation program saved an estimated 86,000 AF of water in 2024.

6.1.2.4 Water Recycling

Recycled water is a locally controlled, drought resilient source of supply that is primarily used for non-potable uses such as landscape irrigation and industrial cooling. Valley Water partners with the four recycled water producers in the county to expand recycled water use. Approximately 17,000 AF of recycled water was used in 2024, accounting for about 6% of the county's water use. According to the 2025 UWMP, the non-potable recycled water use is projected to increase to approximately 20,000 AFY by 2030, with an additional 2,000 AFY added every five years thereafter, reaching approximately 28,000 AFY by 2050. Valley Water's Silicon Valley Advanced Water Purification Center, which uses microfiltration, reverse osmosis, and ultraviolet disinfection to produce up to 8 million gallons of purified recycled water a day, went on-line in 2014. Water from this facility is blended into recycled water provided by South Bay Water Recycling to improve overall recycled water quality for irrigation and industrial purposes. This facility also allows demonstration of advanced treatment technologies and sets the stage for planned potable reuse as described in Section 6.1.1.4.

6.1.3 Protection of Natural Recharge

Valley Water's managed recharge program augments natural recharge since natural replenishment is insufficient to meet groundwater demands. However, protecting natural recharge capacity is also important. Natural recharge is defined here as any type of recharge not controlled by Valley Water, including rainfall, subsurface seepage from surrounding hills, net irrigation return flows, net leakage from water distribution systems, storm drains, sewer lines, and septic systems, and net seepage into the groundwater basin. Natural recharge to principal drinking water aquifers is about 52,000 AFY on average based on estimates from 2015 to 2024. In 2024, natural recharge was estimated to be 59,000 AF.[102]

The preservation of open space supports agriculture and natural recharge capacity. The District Act limits agricultural groundwater production charges to no more than 25% of non-agricultural charges, and current Board policy further limits it to no more than 10% in order to preserve open space in Santa Clara County. Valley Water uses non-rate revenue (e.g., 1 percent ad valorem property tax revenue) to offset related lost agricultural revenue for each customer class. Valley Water staff reviews land use plans provided by local cities and the county, encouraging the preservation of natural infiltration and reduction of impervious surfaces in the areas that contribute groundwater recharge to the principal aquifers.

6.1.4 Groundwater Production Management

The Santa Clara and Llagas subbasins are not adjudicated and Valley Water has not historically controlled the operation of groundwater wells or the amount of groundwater that wells can produce. Valley Water is the groundwater management agency in Santa Clara County and GSA under SGMA and is responsible for ensuring the long-term sustainability of the Santa Clara and Llagas Subbasins. Water retailers, farmers, and other landowners own and operate their own wells, meaning they physically control how groundwater is pumped on their property. The groundwater recharge program, treated water sales, recycled water partnerships and aggressive water conservation programs all offset demand on groundwater resources. Valley Water's tools to influence groundwater production are discussed below.

6.1.4.1 Groundwater Production Measurement

The amount of groundwater pumped from the groundwater subbasins is recorded (Table 6-1) in accordance with the District Act. Within Valley Water's groundwater benefit zones, the owners and operators of water producing facilities must file water production statements with Valley Water on either an annual, semi-annual, or monthly basis depending on the amount of water produced.

Table 6-1. Valley Water Well Metering Summary (CY 2024)

Groundwater Benefit Zone[1]	Number of Metered Wells	Metered Well Production[2] (AF)	Number of Non-Metered Wells	Estimated Non-Metered Well Production[2] (AF)
W-2	403	61,300	254	6,100
W-5	341	34,300	2,381	8,400
W-7	67	12,500	388	1,700
W-8	44	700	197	300
Total	**855**	**108,800**	**3,220**	**16,500**

Notes:
[1] Groundwater benefit zone W-2 largely coincides with the Santa Clara Plain, W-5 and W-8 largely coincides with Llagas Subbasin, and W-7 largely coincides with Coyote Valley.
[2] Production values are rounded to the nearest 100 AF. Estimated (non-metered) production values are based on water production statements submitted to Valley Water based on tables of average use that may include acreage, types of water use on the property, and crop type(s).

102 Valley Water, FY 2025-2026 Protection and Augmentation of Water Supplies.

By Valley Water Board Resolution, meters are installed at well sites determined by staff to be economically feasible per established criteria, as required to facilitate the complete and accurate collection of groundwater production revenue, or as otherwise determined by Valley Water. Valley Water installs, calibrates, and reads meters on applicable wells, unless the well owner elects to undertake this responsibility. In the Santa Clara Plain, meters are required for facilities producing more than 20 AF of agricultural water or more than 1 AF of non-agricultural water annually. Within the Coyote Valley or Llagas Subbasin, meters are required for facilities producing more than 20 AF of agricultural water or more than 2 AF of non-agricultural water.[103] The Valley Water Board has the ability to modify the volumetric thresholds for metering as well as related responsibilities for installation, maintenance, and reading.

Metered wells extract the vast majority of the groundwater used (Table 6-1). As noted, where meters are not used, crop factors are used to determine agricultural water use and average values are used to estimate domestic use.

Valley Water also tracks raw surface water, treated water and recycled water deliveries within the county. Water charges are based on volumetric rates. Water meter testing and maintenance are performed on a regular basis to ensure meters are performing accurately. Meters are repaired or replaced as warranted, and in accordance with established preventative and corrective maintenance schedules.

6.1.4.2 Retailer Coordination on Source Shifts and Shortage Response

An essential component of water supply reliability is the cooperation between Valley Water and its water retailers, particularly in the implementation of programs that offset groundwater pumping such as treated water deliveries and water use efficiency. This cooperation has been critical during times of shortage per the examples below.

In 2014, the Board asked retail water agencies, local municipalities and the County of Santa Clara to implement mandatory measures as needed to achieve a 20 percent water use reduction compared to 2013. In the Santa Clara Plain, increased reliance on groundwater reserves caused water levels to approach or temporarily fall below subsidence thresholds at several index wells. Valley Water worked with several retailers to reduce pumping in key areas, which resulted in improved conditions.

Due to the continued extreme drought, in March 2015 the Board increased the water use reduction target to 30% compared to 2013 use and asked that outdoor watering be limited to no more than two days per week. Nearly all water retailers supported Valley Water's water use reduction target, which was higher than their state-mandated targets in many cases. Coordinated community outreach, such as consistent messaging on outdoor watering, lead to an impressive 27% countywide savings in potable water use compared to 2013. Retailer efforts to use treated surface water and reduce pumping in certain areas were also instrumental in groundwater level recovery and minimizing the risk of resumed land subsidence. Groundwater levels and storage fully recovered to pre-drought levels by 2017.

In June 2021, the Board adopted Valley Water Resolution 21-68, which declared a Water Shortage Emergency Conditions in Santa Clara County due to the extreme drought and called for a mandatory water use reduction of 15% compared to 2019. Similar to the previous (2012–2016) drought, Valley Water collaborated with water retailers to achieve the water use reduction target and communicate with their customers. In 2023, Valley Water received 100% allocations of imported water from the SWP and CVP, and by March 2023, the County was no longer in dry or drought conditions according to the U.S. Drought Monitor. In April 2023, the Board rescinded the Water Shortage Emergency Condition and mandatory water use reduction of 15% compared to 2019 due to improved water supply outlook. This was replaced with a call for voluntary water use reduction of 15% compared to 2019. In June 2023, the

103 Santa Clara Valley Water District, Board of Directors Resolution 23-83.

Board adopted a resolution to support water conservation as a way of life in Santa Clara County, and an ordinance with a set of permanent water waste prohibitions. In 2023, groundwater levels and storage fully recovered to pre-drought levels due to these conservation efforts and the availability of surface water for Valley Water's managed recharge operations.

6.1.4.3 Groundwater Zones and Groundwater Charges

Valley Water has the authority to establish a zone or zones within which it can levy charges for all groundwater-producing facilities. The purpose of these charges is to fund Valley Water activities that protect and augment the water supplies for users within the zones. Creation or modification of charge zones can allow different levels of service within Valley Water's service area, with water users in each zone paying appropriately for the services received. Per the District Act, groundwater charges can be used to pay for costs associated with the following activities, as well as the principal or interest related to these costs:

- Constructing, maintaining, and operating facilities to import water,
- Purchasing water for importation, and
- Constructing, maintaining, and operating facilities to conserve or distribute water, including facilities for groundwater recharge, surface distribution, and the purification and treatment of water.

For many decades, Valley Water had two groundwater benefit zones: Zone W-2 (North County, largely coinciding with the Santa Clara Plain) and Zone W-5 (South County, largely coinciding with the Coyote Valley and the Llagas Subbasin). In 2020, Valley Water concluded an extensive groundwater benefit zone study[104] that re-evaluated the zone boundaries and resulted in new and modified zones that became effective in July 2020:

- Modified Zone W-2 (Santa Clara Plain Valley Floor) (Figure 6-1)
- Modified Zone W-5 (Llagas Subbasin Valley Floor) (Figure 6-2)
- New Zone W-7 (Coyote Valley) (Figure 6-2)
- New Zone W-8 (areas below Uvas and Chesbro Reservoirs) (Figure 6-2)

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104 Montgomery & Associates, December 2020, Groundwater Benefit Zone Study Santa Clara County, California, prepared for Santa Clara Valley Water District, 145 pages.

Figure 6-1. Modified Groundwater Benefit Zone W-2

Note: Figure from Valley Water's FY 2025-26 Protection and Augmentation of Water Supplies (PAWS) Report.

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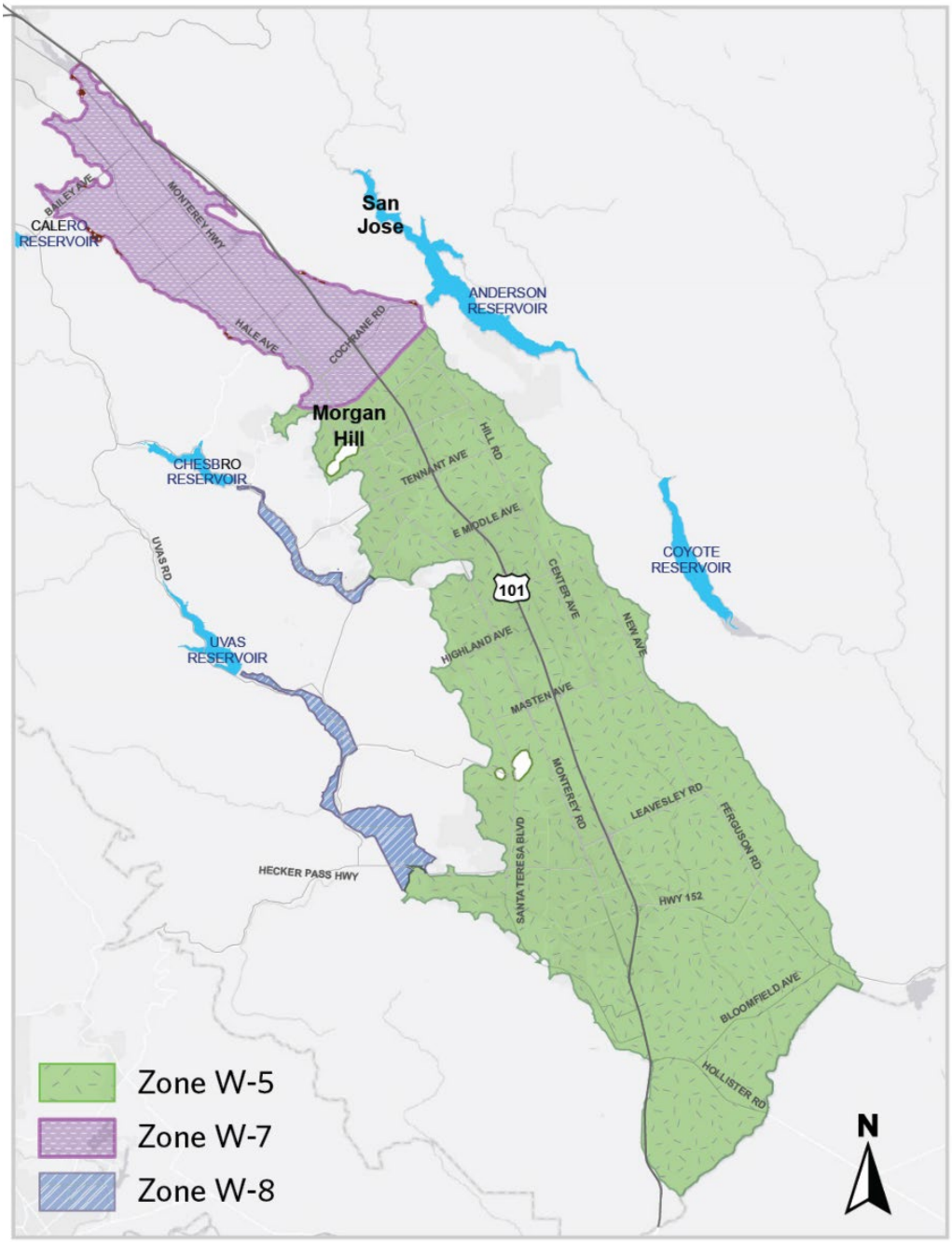
Figure 6-2. Modified Groundwater Benefit Zone W-5 and New Zones W-7 and W-8



Note: Figure from Valley Water's FY 2025-26 Protection and Augmentation of Water Supplies (PAWS) Report.

6.1.4.4 Pricing Policies

In creating zones and setting water rates, Valley Water utilizes several concepts as presented in Resolution 99-21, including water pooling and water resource management strategies. Under Valley Water's pooling approach, water is considered a single commodity irrespective of the water's source or costs since all users benefit from the availability of multiple sources of water. The costs of the treated water facilities are pooled with all other costs within the zone of benefit and recouped primarily through the basic charge assessed on all groundwater pumped from the Santa Clara and Llagas subbasins and/or provided by Valley Water in treated water deliveries.

For Valley Water's treated water retail customers, who receive treated imported surface water supplies, such customers pay the same AF charge that municipal and industrial groundwater pumpers pay per AF of water extracted as well as an additional treated water surcharge. Most of Valley Water's large retail partners distribute potable water to their customers that comes either from: (a) Valley Water surface water supplies and treatment plants; (b) SFPUC surface-water supplies, and/or (c) local groundwater pumping. San Jose Water Company and Stanford also have local surface-water supplies that are delivered to their customers. The treated water surcharge is set by Valley Water to influence its retailers in their choice between using treated water purchases versus groundwater extraction so that groundwater pumping can be better managed. A higher treated water surcharge encourages more groundwater pumping, and a lower surcharge encourages less groundwater pumping. Also, Valley Water may offer additional treated water to retailers above their contracted delivery amounts to encourage retailers to take more treated water rather than pump local groundwater. This approach allows the greatest flexibility in water resources management for the overall benefit of all water users in the county, including those that do not receive treated water.

6.1.5 Water Accounting

As described in Section 4.3.1 Valley Water uses local and imported surface water to conduct an active managed recharge program. Many other Valley Water programs are needed to support managed recharge, including those related to dam maintenance, the administration and management of imported water contracts, local water rights management, and maintenance of the raw water conveyance system.

To reconcile all measured imported water, reservoir inflows and releases, and changes in surface water storage, a periodic water balance is performed. The results of this balance become the final accounting for distribution and facility processing. The data is used for water rights reporting, accounting for usage of federal water, for facility performance measurement purposes, and for the groundwater subbasin water budget, which is integral to Valley Water's annual PAWS report. The PAWS report establishes recommended water charges for the next fiscal year based on anticipated costs to meet the projected water need.

6.1.6 Groundwater Level and Storage Assessment

Valley Water staff evaluates current groundwater levels and storage, and projects future groundwater supply conditions under various water supply scenarios. This analysis supports Valley Water's conjunctive management programs, water supply operations, and water supply planning efforts. Specific activities include the use and maintenance of groundwater models as well as groundwater level and subsidence databases.

Valley Water programs that monitor, track, and evaluate rainfall, surface flows, recharge, and reservoir operations allow the preparation of a detailed surface water balance, which provides data for groundwater models, including stream stage and flow data, managed recharge estimates, and rainfall data. Along with groundwater pumping data, these data allow Valley Water to project groundwater elevations and storage under different operations scenarios.

6.1.6.1 Operations Planning to Meet Near-Term Needs

Valley Water conducts ongoing operational planning to meet demands, protect groundwater reserves, and ensure adequate carryover supplies. Each fall, Valley Water initiates the annual operations planning process. Imported and local supplies are estimated, and operations scenarios are developed for the following calendar year, using different hydrologic projections. During the process, imported water deliveries, out-of-county water bank withdrawals or deposits, managed recharge operations, and local water releases to streams and the San Francisco and Monterey bays are projected. Typically, by late spring, there is more certainty with regard to hydrologic conditions, and therefore imported water deliveries, reservoir inflows, and local demands. Other factors that impact Valley Water's water supply include infrastructure and facility limitations; planned and unplanned facilities outages; contractual

obligations; the ability to bring in banked Valley Water supplies from Semitropic Water Storage District; and regulatory, institutional, and legal constraints. If it appears that groundwater reserves will be drawn down below operational targets, then managed recharge operations may be increased where needed or treated water deliveries may be encouraged to offset groundwater pumping. During droughts, Valley Water also works with water retailers to set demand reduction targets and increase conservation promotions to help protect the groundwater subbasins from overdraft. As the water year progresses and more information becomes available, the operations plans are revised accordingly to optimize local water supply reliability.

6.1.6.2 Contingency Planning

Valley Water's 2025 WSCP recognizes groundwater storage as a critical component of water supply reliability. As outlined in the 2025 WSCP, Valley Water's shortage levels are determined based on projected end-of-year groundwater storage and the availability of surface water, including both imported and local sources. The shortage stages could also be triggered by catastrophic interruption to water supplies caused by earthquakes or other emergency events.

An important aspect of effective shortage response is the ability to identify potential shortages before they occur, early enough so that multiple options remain available and before supplies that may be crucial later have been depleted. Given Valley Water's operational priorities, projected end-of-year groundwater storage as well as surface water availability serve as the best indicators of potential water shortages and early warning signals, and therefore, Valley Water uses them to determine a potential water supply shortage. The 2025 WSCP outlines six standard shortage stages and provides guidelines for shortage response for each stage. If the projected end-of-year groundwater storage is below 300,000 AF in the Santa Clara and Llagas subbasins, along with consideration of surface water availability, then WSCP shortage response actions will be implemented. If the projected end-of-year total groundwater storage is below 150,000 AF, then the emergency (stage 6) water shortage response actions of the WSCP will be implemented[105]. These short-term water demand reduction measures in the 2025 WSCP are in addition to ongoing water conservation programs. Chapter 5 of this GWMP includes a breakdown of the 300,000 AF storage target by groundwater management area.

In response to Senate Bill 552, Santa Clara County developed a Drought Resilience Plan (County DRP) that addresses drought planning for small water suppliers, state small water systems, and domestic well communities. The County DRP documents how to address water supply vulnerabilities for domestic wells and state small water systems, including both short-term and long-term response actions. As the GSA for the Santa Clara and Llagas subbasins, Valley Water serves on the Drought and Water Shortage Task Force and supported the development of the County DRP. The County DRP supports Valley Water's own contingency planning efforts and will ensure that all communities reliant on groundwater are included in drought management planning.

6.1.6.3 Planning to Meet Future Needs

Valley Water's UWMP and WSMP evaluate water supply reliability under future scenarios. Both UWMP and WSMP are supported by information in the 2026 GWMP.

The UWMP is a state-mandated long-range plan that is required to be updated every five years. The UWMP assesses future water demands, supplies, and potential shortfalls over the next 20 years. The 2025 UWMP is the most recent update and evaluates whether the projected groundwater use can be sustained through 2050 without risking depletion of groundwater reserves or failing to meet water supply reliability targets. Valley Water's UWMP highlights the importance of groundwater reserves, which are critical to meet demands in dry years. Multiple dry years pose the greatest challenge to Valley Water's water supply as storage reserves typically become depleted.

105 The water shortage response actions for each of the six stages of the WSCP are listed in Table 3 of the 2025 WSCP.

The purpose of Valley Water's WSMP is to identify and plan the new water supply projects and programs that will be needed to ensure future water supply reliability and groundwater sustainability over the planning horizon. Preparing the WSMP includes developing objectives based on Board policy; performing a baseline system analysis to determine water supply and infrastructure needs; developing a recommended portfolio of projects and programs to meet those needs; conducting appropriate environmental analysis; engaging water retailers and interested parties in plan development; and preparing a schedule and budget for implementing the recommended portfolio. The WSMP is generally updated at least every five years to reflect current conditions and emerging trends, and the WSMP 2050 is the current and most recent plan. The cornerstone of the WSMP 2050 is an adaptive management strategy to support investment decisions in the face of uncertainties associated with future conditions and project development. As part of that approach, an annual Monitoring and Assessment Plan (MAP) update is completed between the 5-year planning cycles.

Valley Water staff also coordinates with land use agencies to review certain Environmental Impact Reports, land use proposals, and Water Supply Assessments required for development decisions that meet certain thresholds.[106] Valley Water has been working closely with retailers and cities to address these water supply assessments and other water supply issues. Projections of future groundwater levels and storage are also performed to support other Valley Water planning efforts.

6.1.7 Asset Management

Ensuring the integrity of Valley Water's existing infrastructure is essential for water supply reliability. This includes maintaining reservoirs, pumping plants, conveyance and distribution pipelines, and recharge facilities, as well as other Valley Water facilities such as water treatment plants and an advanced water recycling and purification facility. Valley Water implements a structured asset management program to guide asset renewal strategies, minimize the total cost of asset ownership, and maintain expected service levels while operating at an acceptable level of risk. The program is designed to reduce unplanned asset failures and service disruptions and thereby improve the reliability of water supply infrastructure. The program also enables accurate financial planning to support sustainable service delivery and facilitates the capture and transfer of asset-specific knowledge.

6.2 PROGRAMS TO PROTECT GROUNDWATER QUALITY

This section describes activities by Valley Water and other entities that address groundwater quality protection in Santa Clara County. In addition, Valley Water monitors emerging policy and regulatory trends; collaborates with key decision makers and other interested parties to affect policy change; and works with federal, state, and local government representatives on pending legislation or regulatory standards related to the protection of groundwater quality. The purpose of these activities is to ensure that Valley Water interests are communicated and considered in legislative and regulatory processes.

6.2.1 Well Ordinance Program

The District Act authorizes Valley Water to prevent the contamination, pollution, or otherwise rendering unfit for beneficial use the surface or subsurface water used or useful in the county.[107] As part of its efforts in exercising this authority, Valley Water developed Well Ordinance 90-1 (Well Ordinance) to protect groundwater resources from contamination. The objective of the Well Ordinance Program is to ensure that wells and other deep excavations are properly constructed, maintained, and destroyed so that they will not allow the vertical transport of waters of poor quality into deeper aquifers used for drinking water. Abandoned wells are required to be destroyed in accordance with the Well Ordinance.[108] Valley Water is authorized to take civil action to abate a public nuisance caused by wells creating a water contamination hazard.

106 California Water Code Section 10610.
107 Santa Clara Valley Water District Act, Water Code Appendix, Chapter 60, Section 5(e).
108 Santa Clara Valley Water District Ordinance 90-1.

Each year, Valley Water permits and inspects approximately 1,000 exploratory borings, well destructions, and water supply and monitoring well installations under the Well Ordinance Program.[109] Through this program, Valley Water:

- Develops standards for the proper construction, maintenance, and destruction of wells and other deep excavations,
- Informs the public, including contractors, consultants and other government agencies about the Well Ordinance and the well standards,
- Verifies that wells are properly constructed, maintained, and destroyed using a permitting and inspection mechanism,
- Takes enforcement action against violators of the Well Ordinance, and
- Maintains a database and well mapping system to document information about well permitting, well construction and destruction details, a well's location, and well status.

6.2.2 Domestic Well Testing Program

Although public water supply systems are required to regularly test their wells for compliance with DDW regulations, no such regulation exists for private domestic wells. Elevated nitrate is an ongoing groundwater protection challenge due to historic and ongoing sources including fertilizers, septic systems, and animal waste. To better understand the occurrence of nitrate and to help well owners better understand their water quality, Valley Water has implemented a free domestic well testing program for private well owners within Valley Water's groundwater benefit zones.

In 1998, Valley Water sampled over 600 private wells to obtain data on nitrate contamination and found that over half of the wells tested provided water that exceeded the DDW Maximum Contaminant Level of 10 milligrams per liter[110] of nitrate as nitrogen. In 2011, Valley Water started the free domestic well testing program in the southern part of the county, which was subsequently expanded to the northern part of the county in 2012 and continues to be offered annually. Since the program began, over 3,000 private well tests have been conducted by Valley Water. In addition to nitrate, the program also includes other basic water quality parameters such as total dissolved solids (TDS), conductivity, hardness, and bacteria. The program benefits Valley Water by providing more localized information on nitrate and other parameters to supplement regional groundwater monitoring data.

6.2.3 Recycled Water Irrigation Evaluation

Recycled water generally has a higher concentration of salts, nutrients, disinfection byproducts, and emerging contaminants than groundwater or treated water, and these contaminants may be introduced to groundwater through landscape irrigation. Recycled water is currently used only for non-potable uses like landscape irrigation, agriculture, and industry. Recycled water undergoes tertiary treatment, except for the South Bay Water Recycling (SBWR) system as described below. With the exception of the Evergreen and Edenvale areas of San José and portions of the Llagas Subbasin in Gilroy, all current use of recycled water is limited to the confined areas, where significant clays and silts offer a measure of natural protection to deeper drinking water aquifers.

Several groundwater monitoring efforts and studies provide data to help assess potential changes to groundwater quality resulting from the irrigation of recycled water. Valley Water evaluates groundwater monitoring data collected by SBWR, which indicates increasing trends for several inorganic parameters, including chloride and boron, following recycled water application.[111]

109 Santa Clara Valley Water District, FY 2021-2025 Water Utility Enterprise Operations & Maintenance Plan.
110 Santa Clara Valley Water District, Private Well Water Testing Nitrate Data Report, 1998.
111 Santa Clara Valley Water District, City of San José South Bay Water Recycling Groundwater Data Evaluation, May 2008.

In August 2011, Valley Water completed the Recycled Water Irrigation and Groundwater Study[112] to evaluate the potential effects of recycled water used for irrigation on groundwater quality in the Santa Clara Plain and Llagas Subbasin and to identify best management practices to protect groundwater. The study included laboratory testing of soils irrigated with recycled water and an 18-month field study at a site using recycled water for irrigation in the Santa Clara Plain. The study found no significant change in groundwater quality for most parameters monitored. However, some changes were noted, including the presence of a few parameters not previously found in shallow groundwater at the site. A common by-product of the water disinfection process, N-Nitrosodimethylamine (NDMA), was detected in groundwater 30 feet below the surface at trace levels of 3 to 4 parts per trillion (ppt) during the study. Subsequent sampling has found levels of NDMA up to 18 ppt (a one-time detection). Low-level detections of PFAS as well as other emerging contaminants have been observed in shallow groundwater near other recycled water irrigation sites in the county. The study findings suggest that best management practices and/or changes in recycled water treatment may be warranted when irrigating with recycled water over sensitive parts of the Santa Clara Plain or Llagas Subbasin.

In 2014, Valley Water completed construction of the Silicon Valley Advanced Water Purification Center (SVAWPC). The advanced treated water from the SVAWPC is blended with tertiary treated water from the San José-Santa Clara Regional Wastewater Facility (SJSCRWF) to lower TDS and distributed to SBWR recycled water customers. Valley Water continues to monitor groundwater for recycled water impacts and is evaluating whether improvements to shallow groundwater are observed because of blending operations.

To ensure groundwater resources remain protected as recycled water use expands, Valley Water samples 20 monitoring wells and two turnouts at several irrigation sites in the Llagas Subbasin where recycled water is provided by the South County Regional Wastewater Authority (SCRWA). Valley Water also receives groundwater data from SBWR, which monitors groundwater at up to 11 wells near sites irrigated with recycled water in the Santa Clara Plain. In general, low concentrations of several water quality parameters related to recycled water have been detected near recycled water irrigation sites but not at levels that warrant a recommendation to modify recycled water use.[113] For both Santa Clara Plain wells and Llagas wells, past analyses show that most parameters have stable or decreasing trends over time.[114]

As the shallow and unconfined Coyote Valley is highly vulnerable to contamination, Valley Water has determined that all recycled water used for irrigation in that area must be fully advanced treated to avoid groundwater quality impacts. This determination was made during Valley Water review of the Coyote Valley Specific Plan, a large, proposed development in the Coyote Valley that has since been postponed indefinitely.

6.2.4 Vulnerability Assessment

Numerous groundwater vulnerability assessments for groundwater and wells have been conducted in the Santa Clara and Llagas subbasins as described below.

6.2.4.1 Groundwater Vulnerability Studies

In 1985, the San Francisco Bay Regional Water Quality Control Board completed a vulnerability study,[115] which rated 105 hazardous materials release sites in terms of groundwater pollution potential based on

112 Locus Technologies for Santa Clara Valley Water District, Recycled Water Irrigation and Groundwater Study, Santa Clara and Llagas Groundwater Subbasins, Santa Clara County, California, August 2011.
113 See Annual Groundwater Reports from 2014 through 2023 for detailed analyses.
114 See Annual Groundwater Reports from 2014 through 2023 for detailed analyses.
115 San Francisco Bay Regional Water Control Board, Sanitary Engineering and Environmental Health Research Laboratory, University of Berkeley, and Santa Clara Valley Water District, Assessment of Contamination from Leaks of Hazardous Materials in Santa Clara Groundwater Basin, 205j Report, June 1985.

the distance to wells and depth to water as well as the severity of the contamination. The study focused on existing contamination sites and did not consider potentially contaminating activities.

In 1999, Valley Water completed an evaluation of the sensitivity of the groundwater subbasins based on its intrinsic or hydrogeologic characteristics using the USEPA DRASTIC methodology.[116] The DRASTIC evaluation resulted in a GIS coverage that presents the relative sensitivity of different parts of the subbasins to contamination.[117]

In 2007, Valley Water completed a study partially funded by the San Francisco Bay Regional Water Quality Control Board on the potential for groundwater contamination from past dry cleaner operations. Valley Water ranked hundreds of operating and former dry-cleaning operations for their potential to contaminate water supply wells based on the age and duration of dry-cleaning operations, hydrogeologic factors, and municipal well construction. The study found that despite the high number of dry-cleaning operations in the county, the impact on deep drinking water aquifers has been very limited.[118]

In October 2010, Valley Water completed a comprehensive groundwater vulnerability study to assess the vulnerability of groundwater subbasins to land use activities.[119] This study updated the previous sensitivity study, incorporating recent hydrogeologic data and a statistical (rather than subjective) weighting approach. It also evaluated the vulnerability of the subbasins to different land uses. The study findings and related GIS tool have been used to help prioritize Valley Water work (including the review of high-threat contamination sites) and optimize the groundwater quality monitoring network. Valley Water also met with several land use and regulatory agencies to discuss the potential use of the GIS tool to assist in their groundwater protection efforts.

6.2.4.2 Drinking Water Source Assessment and Protection Program (DWSAP)

The goals of the State's DWSAP required under the 1996 reauthorization of the federal Safe Drinking Water Act are as follows:

- Protect public water systems,
- Improve drinking water quality and support effective water resources management,
- Inform public and drinking water systems of contaminants and potential contaminating activities that have the potential to affect drinking water,
- Promote a proactive approach to protecting drinking water quality and enable communities and drinking water systems to protect water quality,
- Refine and focus drinking water source monitoring requirements, and
- Focus pollution prevention and cleanup on areas that are subject to more serious threats.

Valley Water assisted many of the local water retailers in their initial compliance with the State's DWSAP requirements in 2002 and 2003. The assessments included delineating well protection areas, inventorying possible contaminating activities, and analyzing the vulnerability of the source. Valley Water developed a GIS-based application, which was used to delineate protection areas in accordance with state guidelines. In addition, Valley Water shared the application with the DWSAP data advisory committee, on which Valley Water was an active participant during development of the DWSAP

116 USEPA, DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings, 1987.
117 Santa Clara Valley Water District, An Analysis of the Sensitivity to Contamination of the Santa Clara Valley Groundwater Aquifers Based on the USEPA DRASTIC Methodology, 1999.
118 Santa Clara Valley Water District, Study of Potential for Groundwater Contamination from Past Dry Cleaner Operations in Santa Clara County, 2007.
119 Todd Engineers and Kennedy/Jenks Consultants for the Santa Clara Valley Water District, Revised Final Groundwater Vulnerability Study, Santa Clara County, California, October 2010.

implementation guidelines. Local water retailers are responsible for completing the DWSAP for all newly installed wells, and Valley Water provides assistance upon request.

6.2.5 Coordination with Land Use Agencies

As land uses intensify, so does the potential for contaminating the underlying groundwater. In highly urbanized areas such as the San Francisco Bay Area, there are numerous threats to groundwater resulting from commercial, industrial, and residential development. These threats include urban runoff, industrial chemical spills, leaking underground storage tanks, and residential and agricultural use of nitrogen-based fertilizers and pesticides. Valley Water actively coordinates with land use agencies to help ensure groundwater quality is protected.

6.2.5.1 Land Use Review

Most land use decisions fall under the authority of local cities and the county. These agencies, Valley Water, and the water retailers all desire to maintain high-quality water resources to serve current and future uses. These agencies work together to ensure that groundwater is adequately protected from potentially contaminating activities. Of particular concern are potentially contaminating activities over groundwater recharge areas, which are more vulnerable to contamination due to the presence of high permeability soils and higher groundwater flow rates.

Valley Water reviews some local land use and development plans to identify threats to groundwater and watercourses that are under Valley Water jurisdiction. Valley Water also provides review and comment on various environmental documents, and city and County General Plans. Valley Water has worked with land use agencies to develop guidelines or model ordinances for specific issues such as the permitting of graywater systems. Valley Water works with project and regulatory interested parties so that these projects are implemented in a manner that protects groundwater resources.

6.2.5.2 Onsite Wastewater Treatment Systems (Septic Systems)

The installation of Onsite Wastewater Treatment Systems (OWTS, or septic systems) is generally overseen by the County DEH under the Local Agency Management Plan (LAMP) as delegated by the Regional Water Quality Control Boards. Permits are only issued in those areas of the county where a sanitary sewer is not available within 300 feet of the property line. An OWTS cannot be used if soil conditions, topography, high groundwater table, or other factors indicate that this method of sewage disposal is unsuitable. The County DEH, in consultation with Valley Water and other partners and interested parties, developed a wastewater disposal system ordinance that describes the requirements for development, site evaluation, septic system siting, installation, maintenance, and reporting.[120] Various permits are required to install a septic system and the systems are inspected prior to approving completion of the installation.

6.2.6 Coordination with Regulatory Agencies

Sites with releases of solvents, toxics, fuels, or other contaminants pose a threat to groundwater quality. If allowed to migrate, such contamination may eventually impact water supply wells, forcing well operators to cease operation, implement expensive wellhead treatment, or blend the affected water with other sources of water to dilute the contaminant. In addition, the degradation in water quality can limit the beneficial uses and alter plans for production well siting or design.

6.2.6.1 Hazardous Material Handling and Storage Oversight

The primary causes of groundwater contamination at hazardous material release sites are the improper handling of hazardous materials or leaking storage tanks. Permitting and inspection related to the handling and storage of hazardous materials is overseen by the local or county fire department. The fire departments also oversee the installation, operation, and removal of all underground and above ground

120 County of Santa Clara Ordinance No. NS-517.85, Onsite Wastewater Treatment Systems, September 2013.

storage tanks and associated piping and notify the County DEH and/or Regional Water Quality Control Boards if contamination is discovered.

6.2.6.2 Contaminant Release Sites

According to GeoTracker[121], the State Water Resources Control Board's online data management tool, there are more than 3,400 sites with environmental releases within the Santa Clara and Llagas subbasins, as summarized in Table 6-2. Most of these releases (over 2,550) are leaking underground storage tank (LUST) sites. Fuel leak cases are overseen by the County DEH while the oversight agencies for the non-fuel leak sites vary, as shown in Table 6-3.

Table 6-2. Status of Contaminant Release Sites[122]

Case Status	Santa Clara Subbasin		Llagas Subbasin	
	Cleanup Program Site	LUST Cleanup Site	Cleanup Program Site	LUST Cleanup Site
Site Assessment	148	12	7	
Assessment and Interim Remediation	41	7	2	
Remediation	86	6	2	
Verification Monitoring	48	4	1	1
Eligible for Closure	7	10	1	1
Inactive	66			
Open	396	39	13	2
Closed	463	2,358	13	153
Total	859	2,397	26	155

Table 6-3. Oversight of Contaminant Release Sites

	Santa Clara Subbasin	Llagas Subbasin
County DEH	1,872	77
San Francisco Bay Regional Water Quality Control Board (Region 2)	763	
Central Coast Regional Water Quality Control Board (Region 3)	1	35
City of Gilroy		15
US Environmental Protection Agency	7	
Department of Toxic Substances Control	2	1
State Water Resources Control Board	2	

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121 https://geotracker.waterboards.ca.gov/.
122 Site information accurate as of December 2025.

Open and closed contaminant release sites in the Santa Clara and Llagas subbasins are shown in Figures 6-3 and 6-4, respectively. These figures include data available through the State Water Resources Control Board's GeoTracker system, and do not represent all contaminant release sites in the county. As the county's groundwater management agency, Valley Water works with these agencies to protect groundwater resources. Current Valley Water interaction with regulatory agencies on point-source cases is mainly focused on the highest threat cases in the county or is in response to specific requests from the agencies.

Figure 6-3. Contaminant Release Sites in the Santa Clara Subbasin

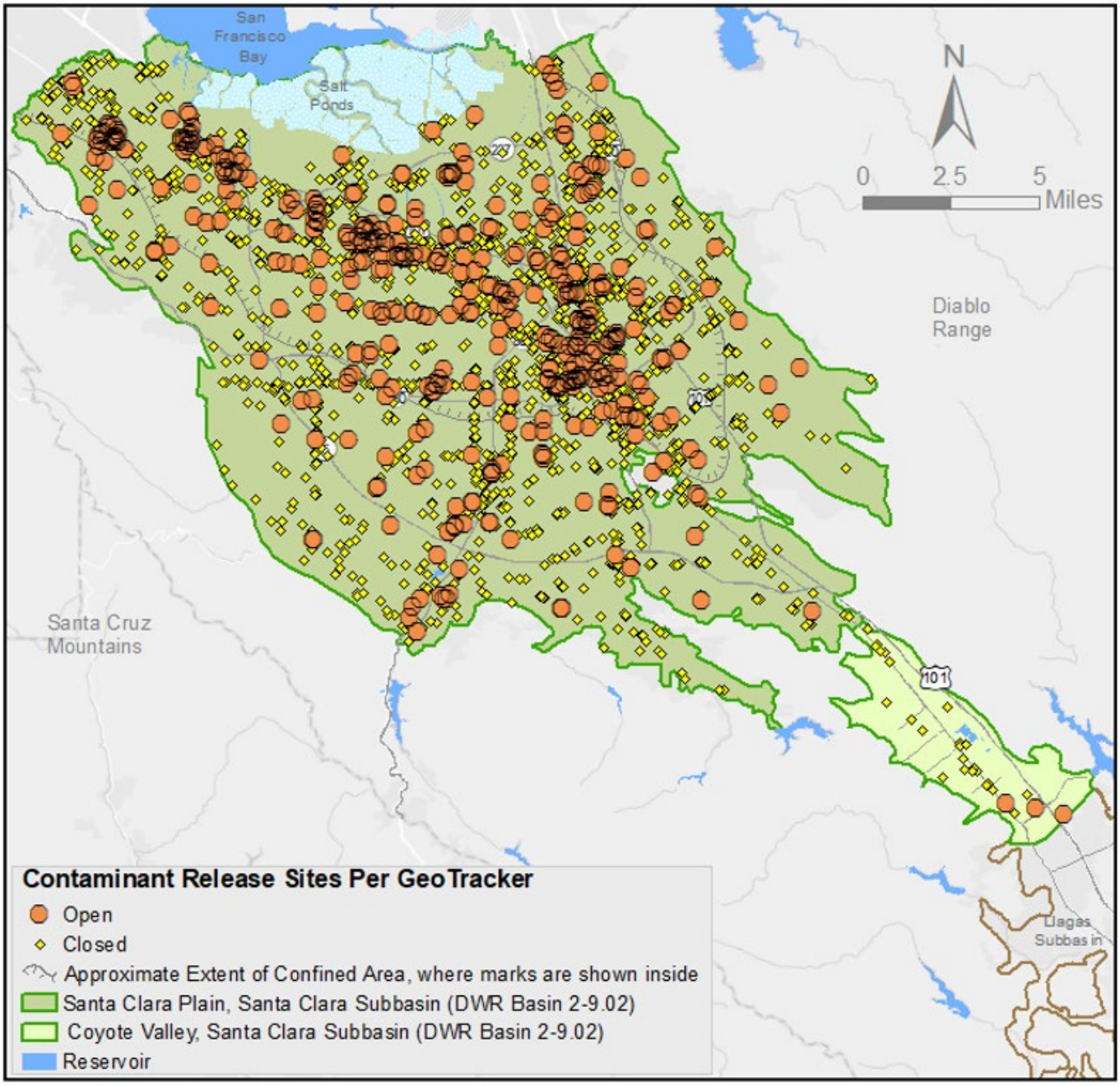
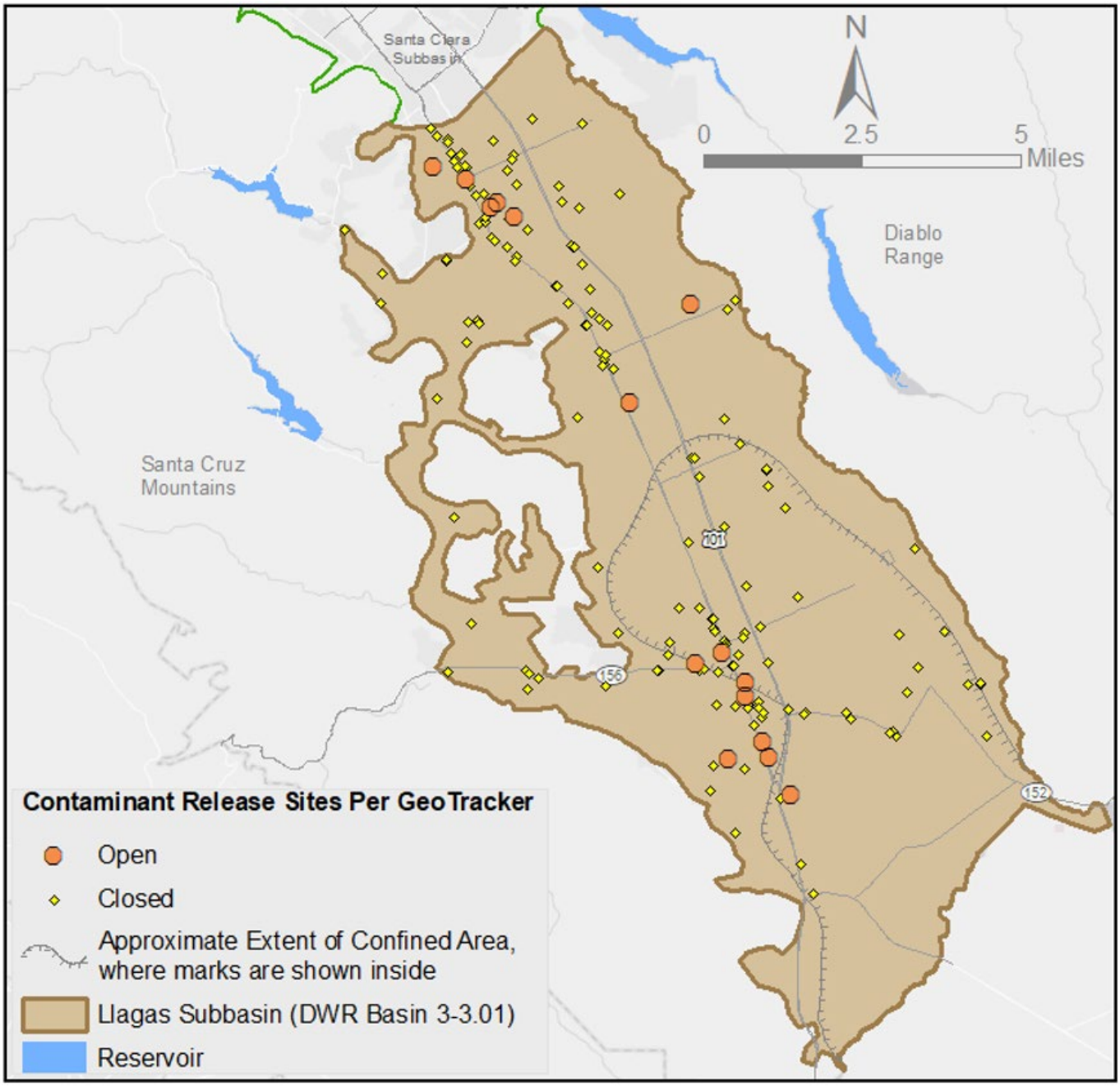


Figure 6-4. Contaminant Release Sites in the Llagas Subbasin



6.2.7 Public Outreach

Public outreach is an important component of Valley Water's groundwater protection efforts. Because groundwater is far removed from the public's view, it can be a challenge to make the connection that actions occurring on the land surface can impact groundwater quality. To increase public awareness of groundwater resources, Valley Water conducts active public outreach programs, which are described in this section. Also, each year, Valley Water celebrates Groundwater Awareness Week, which is an annual observation of the importance of groundwater and is celebrated by the National Groundwater Association, the U.S. Environmental Protection Agency, and other organizations advocating for groundwater protection.

6.2.7.1 Outreach Materials

The preparation of pamphlets, fact sheets, FAQs, and summary reports helps to transmit key messages related to groundwater. Valley Water's Guide for the Private Well Owner, which is provided to all new well owners in the county, describes the basics of proper well construction, maintenance, and testing. Valley Water also produces fact sheets and FAQs to address specific issues, such as nitrate or PFAS.

6.2.7.2 School Program

Valley Water believes it is never too early for children to begin understanding and appreciating their local water resources. To help promote that awareness, Valley Water offers a full range of educational programs for both teachers and students. From puppet plays for kindergarteners to workshops for educators, school outreach projects provide effective, hands-on learning experiences that meet new state standards. Through Valley Water's educational programs, students can tour a groundwater recharge facility, create a simulated pond or explore the plant and animal life in a creek. All activities are geared for specific grade levels, from pre-kindergarten to college.

6.2.7.3 Groundwater Guardian Program

The Groundwater Guardian Program is sponsored by the Groundwater Foundation, a not-for-profit education organization that strives to increase groundwater awareness. Groundwater Guardian is an annually earned designation for communities and affiliates that take voluntary, proactive steps toward groundwater protection. Valley Water has been designated a Groundwater Guardian based on such activities as conducting irrigation and nutrient management seminars, creating a prototype zone of contribution delineation tool for wellhead protection areas, and conducting the school program since 2000. Valley Water will continue to participate in the program by submitting annual work plans for groundwater protection activities and submitting reports documenting our groundwater protection efforts. This program was discontinued by the Groundwater Foundation in 2024.

6.3 PROGRAMS RELATED TO INTERCONNCTED SURFACE WATER AND GROUNDWATER

Valley Water has been conducting managed recharge of the Santa Clara and Llagas subbasins with locally captured and imported water for many decades. Valley Water's managed recharge program is an important management tool that has contributed to groundwater storage recovery, cessation of inelastic land subsidence, prevention of seawater intrusion, and improved water quality. A reliable water supply for the county depends on this interaction between surface water and groundwater, and as such, Valley Water closely monitors recharge operations.

The addition of water through managed or incidental recharge can change groundwater quality. This may be for the better by diluting existing contaminants in the aquifer, or for the worse by introducing contaminants. Incidental recharge includes water applied to landscape and agriculture in excess of plant uptake (irrigation return flows), as well as infiltration from stormwater and septic systems. Valley Water programs related to surface water/groundwater interaction are described below.

6.3.1 In-Stream Releases of Surface Water

As described in Section 6.1.1, Valley Water conducts active in-stream managed recharge operations along approximately 98 miles of stream channel in 20 creeks. About two-thirds of Valley Water's managed recharge occurs through in-stream recharge facilities, with over 60,000 AF recharged in most years as a result of Valley Water releases into creeks. In 2024, in-stream managed recharge was about 60,000 AF. Valley Water also coordinates operations for flashboard (wooden and steel) dams and operable (bladder) dams under agreements with the CDFW. Valley Water recharge operations along streams have been modified in recent years to reflect environmental regulations and concerns, including the protection of native fisheries.

6.3.2 Stormwater Management

To reduce the amount of pollution discharged to creeks and other surface water bodies, urban runoff programs are increasingly requiring and promoting the treatment and infiltration of stormwater into groundwater instead of facilitating its direct runoff into creeks. Retention and infiltration of runoff helps reduce peak flows and protect surface water quality. Stormwater can also be a beneficial source of groundwater recharge in some areas, but there are potential groundwater quality impacts. Stormwater can pick up pollutants as it runs over the ground surface, which can then migrate to groundwater via soil infiltration if not first treated through techniques such as bioretention.

Valley Water is part of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), which was formed in 1990 to develop and implement efficient and uniform approaches to control non-point source pollution in stormwater runoff that flows to the South San Francisco Bay and to comply with the Bay Area Municipal Regional Stormwater NPDES Permit. Valley Water has worked with the other co-permittees of SCVURPPP to develop guidelines that allow stormwater infiltration while being adequately protective of both surface water and groundwater resources.[123]

There are three main types of controls that promote infiltration. They are site design measures, indirect infiltration methods, and direct infiltration methods. Site design measures involve laying out a development site to reduce the amount of impervious area and routing drainage to landscaped areas. Indirect infiltration methods include directing runoff to bioretention areas, vegetated buffer strips, self-treating / self-retaining areas, and to unlined detention basins for infiltration purposes. These methods rely on biotreatment soil media and the shallow soil to treat and filter the water before it infiltrates to groundwater or is discharged to the storm drain system.

The third method, direct infiltration, is sometimes referred to as stormwater infiltration devices (SWIDs), uses devices that bypass the surface soils, thereby bypassing the filtration potential of the surface soils. Types of direct infiltration devices include dry wells, injection wells, and infiltration trenches (including French drains), all types of SWIDs that reduce or eliminate the vertical separation between the infiltration point and groundwater. Because they bypass natural filtering capacity of soils, dry wells are of special concern and are generally discouraged or not permitted in urban development projects within the County. Specific standards for direct infiltration devices are being developed by the State of California.[124] The purpose of revising the policy is to unify permitting and construction standards so that all devices that bypass natural protection processes are subject to standards for protecting groundwater and to simplify the process by which SWIDs are permitted.

6.3.3 Seawater Intrusion Prevention

Seawater intrusion is the movement of seawater or saline water into a freshwater aquifer. The potential for seawater intrusion exists in groundwater basins adjacent to the ocean or other bodies of saline water – in the case of the Santa Clara Subbasin, the southern portion of San Francisco Bay. Once freshwater aquifers have severe seawater intrusion, it is extremely difficult and costly to reclaim them. Classic seawater intrusion can occur in coastal aquifers and is often caused by overpumping of groundwater that reverses the normal seaward flow of groundwater. Locally, however, the classic seawater intrusion mechanism has a relatively minor influence on the Santa Clara Subbasin because the aquifers underlying the Bay do not outcrop offshore and are not directly connected to the Bay. Rather, the

123 Guidelines specific to the Bay Area Municipal Regional Stormwater NPDES Permit are published in the "C.3 Stormwater Handbook": https://scvurppp.org/2024/10/28/c-3-stormwater-handbook-2024/. Infiltration guidelines specific to groundwater are found in Appendix A of the "C.3 Stormwater Handbook".

124 The State Water Resources Control Board 2020 report (prepared by Geosyntec Consultants for the State Water Resources Control Board), "California Drywell Guidance Research and Recommendations" includes design considerations that will likely be incorporated into the State Dry Well Standards. These standards are being developed by the Department of Water Resources (DWR) as part of the update to Bulletin 74 (California Well Standards); this Bulletin will include updated standards for well construction and destruction, including drywells. DWR is scheduled to publish final standards in the Spring of 2026 (https://water.ca.gov/well-standards).

aquifers are protected by a very fine-grained fully saturated clay formation known as Bay Mud, which effectively seals the aquifers from classic seawater intrusion regardless of the direction of groundwater flow.

The northern portion of the Santa Clara Plain has a relatively greater influence from the leakance of saltwater beneath tidal stream flow. This mechanism primarily affects the shallow aquifer zone and has created a wide mixed transition zone between fresh and saline groundwater. In the decades following World War II, there was long-term groundwater overdraft that caused high rates of land subsidence and observed seawater intrusion (>100 mg/L chloride) in the shallow aquifer zone. By the 1960s, the area within the 100 mg/L chloride isocontour encompassed a substantial area bounded on the south, west, and east by Highway 101 and Interstate 880 (Figure 2-25). Flattened stream gradients caused by land subsidence resulted in increased inland migration of saline bay water through tidal creeks. This saline water was subsequently transported to the shallow groundwater through streambed percolation and the presence of abandoned wells and other deep excavations.

Historically, Valley Water conducted an extensive program of locating and properly destroying old and abandoned wells in the northern Santa Clara Subbasin along the Bay so that these wells would not act as conduits for seawater intrusion from the shallow groundwater down to the principal aquifer. Ordinance 85-1 gave Valley Water authority to require owners of wells determined to be “public nuisances” to seal and destroy the wells or upgrade them to active or standby status. A more comprehensive well sealing program was in place from 1984 to 2005 that provided financial assistance to properly destroy abandoned wells near areas of known contamination to prevent the contamination of drinking water supplies. Although this assistance program was effective and has now ended, abandoned or unused wells are still required to be sealed in accordance with Valley Water and State well standards.

The resumption of land subsidence and sea level rise are perhaps the greatest potential threat to exacerbate seawater intrusion. Land subsidence would further depress the land surface adjacent to the Bay. Both land subsidence and sea level rise could increase the inland tidal incursion of Bay water along creeks and thus increase the potential area of the shallow aquifer zone to seawater intrusion. Additionally, a lowering of the hydraulic head in the principal aquifer zone may increase the potential for seawater intrusion if there were downward leakage or by-pass flow through the Bay Mud. Valley Water’s managed recharge program is critical to maintaining adequate artesian pressure in the principal aquifer zone adjacent and underlying the southern portions of the Bay, which helps protect this important groundwater supply from seawater intrusion. As described in Chapter 7, land subsidence, groundwater elevations, and groundwater quality are actively monitored to minimize risks related to seawater intrusion.

6.3.4 Watershed Management

Valley Water captures large volumes of upper watershed runoff in ten local reservoirs and manages flows in those ten creeks. Because groundwater sustainability depends on the recharge of local watershed water, the protection of these source waters is essential. The protection of the watersheds’ water quality is also vital to assuring a healthy environment for their inhabitants. Since Valley Water does not have jurisdiction over upper watershed lands that are vital for protecting water quality, we rely on and collaborate with land management agencies such as County Parks and Open Space agencies to protect those lands. Valley Water seeks to balance watershed uses, such as the rights of private property owners and public recreational activities, with the protection and management of natural resources. Valley Water recognizes that preserving beneficial watershed uses can benefit reservoir water quality, which in turn benefits the quality of the water delivered to Valley Water treatment plants and recharged into the groundwater subbasins.

Valley Water works to protect the water quality and water supply reliability of Valley Water’s reservoirs through regular monitoring, coordination with other agencies on water quality issues, and through

activities to protect local reservoirs from potentially contaminating activities. Valley Water also implements projects to address pollutants affecting freshwater, such as mercury contamination.

Valley Water has also developed guidelines and standards for land use near streams. These guidelines were developed in cooperation with local cities, the county, local businesses, agriculture, streamside property owners, and environmental groups through the Water Resources Protection Collaborative[125]. In the upper watershed lands owned by other agencies, Valley Water supports projects that reduce erosion and protect habitat quality to reduce pollutant loads entering Valley Water's reservoirs.

Valley Water's Watershed Master Planning[126] integrates the water supply, flood protection, and stream stewardship missions of Valley Water at the watershed scale. Drawing from detailed existing programs and plans, Watershed Master Planning seeks to find the nexus among these three mission components for new opportunities in integrated water resources management. It is also Valley Water's primary flood and stream stewardship master plan, detailing opportunities to manage our water resources for flood protection and ecological enhancement. The Watershed Master Plan does not replace the substantial existing planning in place by Valley Water's Water Utility Enterprise and the Watersheds Division but instead looks for opportunities to further protect and enhance water resources. Watershed Master Planning is a long-term endeavor aimed at achieving sustained improvements in water resources management and watershed conditions, while operating in the current commitments, regulations, and restrictions that drive Valley Water operations and day-to-day work.

6.4 OTHER PROJECTS AND ACTIVITIES TO SUPPORT CONTINUED SUSTAINABILITY

As described above, Valley Water has many programs and activities that protect groundwater supplies and quality. These programs were developed to maintain a reliable water supply, prevent inelastic (permanent) subsidence, and protect groundwater quality, both now and in the future. The related monitoring programs are described in Chapter 7.

This section summarizes specific operations projects and related management activities to help support the continued sustainability of groundwater supplies and quality. The following list includes both existing and new projects and activities recommended in this 2026 GWMP.

6.4.1 Coordination with Adjacent Groundwater Sustainability Agencies (GSAs)

Coordination with adjacent GSAs on key inter-basin items is an important and ongoing activity that helps Valley Water and its partners meet groundwater sustainability goals. High-level coordination with adjacent GSAs of medium/high priority subbasins is summarized below.

6.4.1.1 Santa Clara Valley – Niles Cone

The Alameda County Water District (ACWD) is the GSA for the medium-priority Niles Cone Subbasin (DWR Basin 2-9.01) located to the northeast of the Santa Clara Subbasin. As part of ongoing coordination, Valley Water and ACWD compared approaches for modeling future groundwater conditions to support SGMA-related activities. Valley Water shared that its approach for the 2026 GWMP update incorporates a climate change–informed groundwater budget using a similar long-term hydrologic record with projected 2050 demand conditions. Climate inputs are based on downscaled precipitation and temperature data from an ensemble of global climate models, consistent with DWR's guidance and Valley Water's broader water supply planning efforts. Additionally, staff from Valley Water and ACWD routinely reach out with groundwater management related questions and have shared technical presentations on various aspects of their respective hydrogeologic conceptual models and groundwater monitoring networks. Through this close coordination, both agencies confirmed that hydrogeologic conceptual models, modeling frameworks, and hydrologic monitoring and datasets are broadly aligned.

125 https://www.valleywater.org/contractors/doing-businesses-with-the-district/permits-working-district-land-or-easement/water-resources-protection-collaborative.
126 https://www.valleywater.org/project-updates/watershed-master-plan.

Continued coordination will support consistency, transparency, and improved understanding and management of sustainable groundwater conditions in each subbasin.

6.4.1.2 Gilroy-Hollister Valley – North San Benito

The San Benito County Water District (SBCWD) is the GSA for the medium-priority North San Benito Subbasin (DWR Basin 3-3.05) located to the south of the Llagas Subbasin (3-3.01). As part of ongoing coordination, staff from Valley Water and SBCWD routinely reach out with groundwater management related questions and share groundwater level data annually for wells adjacent to the subbasin boundary. These data are important for the evaluation of groundwater flow between the North San Benito and Llagas subbasins, groundwater flow model calibration, and refinement of water budgets. Valley Water staff served on the Technical Advisory Committee (TAC) for the 2021 GSP development and for the 2026 GSP periodic evaluation of the North San Benito Subbasin. These TAC meetings facilitate close coordination between GSAs and local interested parties to ensure alignment of topics like hydrogeologic conceptual models, basin characterization, sustainability metrics, and sustainable groundwater supply planning efforts, such as the refinement of water budgets.

6.4.2 Monitoring Network Improvements

Appendix G summarizes implementation updates for Valley Water's analysis of gaps and redundancies in the groundwater monitoring networks, which was included as Appendix J in the 2021 GWMP. These improvements help to ensure these networks provide information that supports a comprehensive understanding of groundwater conditions and informed management decisions. Addressing the recommendations from the gap analysis through the installation of additional monitoring wells is important to support Valley Water's basin management strategies to meet the sustainability goals.

6.4.3 South County Managed Recharge Expansion

As part of the WSMP 2050, Valley Water is evaluating several potential projects to increase managed recharge capacity and improve water supply reliability in Coyote Valley and the Llagas Subbasin. These projects include the Butterfield Channel Managed Aquifer Recharge, Coyote Valley Recharge Pond(s), Madrone Channel Expansion, and San Pedro Ponds Improvement Project. The projects are all in the preliminary planning phase and focus on maximizing the use of existing infrastructure. Not all four projects are needed to ensure reliable groundwater supplies, and evaluations are ongoing as to which of the four projects will best support water supply needs.

6.4.4 Stormwater Projects

Valley Water's managed recharge program includes capturing local runoff in reservoirs and releasing it to groundwater recharge facilities or drinking water treatment plants. Between 2015 and 2024, an average 54,300 AFY of local runoff that is captured and stored in Valley Water reservoirs is subsequently recharged through existing recharge facilities for groundwater replenishment. Through its water supply master planning, Valley Water plans to increase stormwater capture and reuse capacity as part of its 'ensure sustainability strategy'. Valley Water's stormwater projects are summarized below.

Green Stormwater Infrastructure (GSI). As part of its water conservation program, Valley Water initiated a rebate program to incentivize the installation of rain barrels and cisterns, and the construction of rain gardens in residential and commercial landscapes (Section 6.1.2.3). Between FY 2019 and FY 2025, Valley Water incentivized the public to install 779 rain barrels; 56,555 gallons of cistern storage; and 80,451 square feet of roof area diverted into rain gardens throughout the county. Valley Water's long-term water conservation target of 110,000 AFY by 2040 includes 1,000 AFY of stormwater program savings.

Flood-Managed Aquifer Recharge (Flood-MAR). In 2023, Valley Water completed a preliminary feasibility study for capturing and recharging stormwater on open space in Santa Clara County, a process referred to as Flood-MAR. The preliminary feasibility study indicates a Flood-MAR program may

be viable for Valley Water, but it will provide a relatively small water supply benefit and need to navigate key uncertainties regarding permitting, water rights, water supply benefit, cost, and incentive structure. To address those uncertainties, Valley Water further estimated water supply benefits of potential sites and researched incentive structures that could attract and maintain partnerships with private and public landowners within South County. The hydrological analysis and lessons learned from other agencies indicate that it often takes multiple years for a Flood-MAR project to be constructed, water supply benefits are small and intermittent, and the projects require on-going management and maintenance. In early 2023, Valley Water received a $350,000 grant from Proposition 1 funding and is currently focusing on finalizing reporting, documentation, and the overall structure of the Flood-MAR feasibility effort at Valley Water.

Centralized Stormwater Capture Projects. Centralized stormwater capture projects capture stormwater from multiple parcels or roads for treatment in a single location and/or are municipal public projects, including large bioretention and "green streets" projects. The Santa Clara Basin Storm Water Resource Plan completed in December 2018 identified potential projects throughout northern Santa Clara County. These projects would likely be partnerships with other jurisdictions and require outside funding. Valley Water will continue to track project opportunities through its participation in the Santa Clara Valley Urban Runoff Pollution Prevention Program. A similar Stormwater Resource Plan was also developed for the southern portion of the County including the cities of Morgan Hill and Gilroy and the unincorporated parts of Southern Santa Clara County. As an example, Valley Water's WSMP includes the Upper Penitencia Creek flood protection project, which could include stormwater retention and infiltration components.

6.4.5 Capital Improvement Projects

Major projects in Valley Water's Fiscal Year 2027–2031 Capital Improvement Project (CIP)[127] will improve, repair, replace, or construct infrastructure that supports continued groundwater sustainability. With a significant portion of Valley Water's water supply infrastructure approaching fifty to sixty years of age, maintaining and upgrading the existing infrastructure to ensure each facility functions as intended for its useful life has become the focus of the Water Supply CIP in recent years. The CIP includes 42 water supply projects at a cost of $8.14 billion.

Major water supply capital improvements identified in the CIP include:

Storage:

- Almaden Dam Improvements
- Almaden Calero-Canal Rehabilitation
- Anderson Dam Seismic Retrofit (C1)
- Anderson Dam Tunnel
- Coyote Creek Flood Management Measures
- Coyote Creek Chillers
- Coyote Percolation Dam Replacement
- Calero Dam Seismic Retrofit - Design & Construction
- Guadalupe Dam Seismic Retrofit - Design & Construction
- Calero and Guadalupe Dams Seismic Retrofits – Planning

127 Valley Water's Fiscal Year 2027-2031 Capital Improvement Plan is available at https://www.valleywater.org/how-we-operate/five-year-capital-improvement-program.

- Coyote Dam Seismic Stability
- Coyote Pumping Plant ASD Replacement
- Dam Seismic Stability Evaluation
- Small Capital Improvements, San Felipe Reaches 1-3

Transmission:

- 10-Year Pipeline Inspection & Rehabilitation
- Pipeline Maintenance Program
- East Pipeline Inspection & Rehabilitation
- Penitencia Delivery Main and Force Main Inspection & Rehabilitation
- Santa Teresa Force Main Inspection & Rehabilitation
- Milpitas Pipeline Inspection & Rehabilitation
- Santa Clara and Campbell Distributary Inspection & Rehabilitation
- Almaden Valley Pipeline Replacement
- Distribution System Master Plan Implementation
- FAHCE Implementation
- IRP2 Additional Line Valves (A3)
- Pacheco/Santa Clara Conduit Right of Way Acquisition
- SCADA Master Plan Implementation
- SMPIP Upgrades - Phase 1
- Small Capital Improvements, Treated Water Transmission
- Small Capital Improvements, Raw Water Transmission
- Treated Water Isolation Valves
- Vasona Pump Station Upgrade

Treatment Facilities – Water Treatment Plants (WTP):

- Penitencia WTP Residuals Management
- Rinconada WTP Reliability Improvement
- Rinconada Ammonia Storage & Metering Facility Upgrade
- Small Capital Improvements, Water Treatment
- Santa Teresa WTP Infrastructure Rehabilitation Project
- WTP Electrical Improvement Project
- WTP Master Plan Implementation

Recycled Water and Purified Water Facilities:

- Pure Water Silicon Valley - Phase 1
- Pure Water Silicon Valley - Full-Scale Direct Potable Reuse (DPR) Facility

- Land Rights - South County Recycled Water Pipeline
- South County Recycled Water Pipeline

Detailed information on each of these water supply capital projects, including related description, costs, and schedule, is available in the CIP.

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CHAPTER 7 – GROUNDWATER MONITORING AND MODELING

Valley Water conducts a wide range of activities to maintain a reliable water supply, protect groundwater quality, and avoid further land subsidence. Assessing how well these activities are meeting the sustainability goals and specific outcome measure for each subbasin requires effective monitoring. This chapter describes Valley Water programs to monitor groundwater levels, land subsidence, groundwater quality, and surface water, and provides information on the availability of related data. This section also describes Valley Water modeling efforts.

Valley Water's network of water level and water quality monitoring wells is the product of an adaptive and opportunistic regional data collection effort that has evolved over many decades. The network includes new wells installed by Valley Water, existing wells Valley Water has obtained from others, and privately owned wells that Valley Water has obtained monitoring access. Consequently, the network design is different than a network designed specifically for monitoring a contaminated site, for example. While Valley Water's network covers the Santa Clara and Llagas subbasins, the wells are not evenly distributed due to the constraints of the existing built environment and the way many of the wells were obtained. Valley Water supplements data collected through this network with data collected by water retailers as further described below.

For all monitoring, Valley Water works to ensure that the monitored locations and the data collected provide adequate information to understand groundwater conditions to support informed decision-making. This includes assessments of data gaps and redundancies, monitoring protocols, and data management, evaluation, and reporting. Even when the wells or locations monitored change due to issues with well condition or access, the overall network provides strong and comprehensive data to assess conditions within the Santa Clara and Llagas subbasins. As the monitoring networks may need to be expanded or modified and access to wells can vary, the monitoring programs described below may change over time. As part of the 2021 GWMP development Valley Water conducted a comprehensive review of the wells used in each monitoring program to identify gaps and redundancies and help improve effectiveness and efficiency of the monitoring programs; recommendations from the review are summarized below. Monitoring network details are in Appendix I.

7.1 GROUNDWATER LEVEL MONITORING

This section describes the methodology, data collection, data analysis, and reporting for Valley Water's groundwater level monitoring, which includes Valley Water wells and privately owned wells. Also, Valley Water's collected data is supplemented with data provided by water retailers.

7.1.1 Groundwater Monitoring Network and Measurement Frequency

Valley Water measures water levels and receives additional water level data from water retailer wells on a regular basis from a network of several hundred wells. Monitoring locations and frequencies have evolved over time to support groundwater supply assessment and forecasting, recharge operations, efforts to monitor concentrated pumping and land subsidence, and other purposes. In some locations, Valley Water has collected regular water level data for up to 80 years while third-party data has been collected and reported to Valley Water continuously since 1936 in downtown San José. Historical data also includes several one-time measurements at many wells.

Currently, the groundwater level monitoring network has a total of 448 wells, including 175 wells in the Santa Clara Subbasin and 62 in the Llagas Subbasin that are monitored by Valley Water (Table 7-1). To assist in Valley Water's regional evaluation of groundwater conditions, several water retailers provide water level data from 211 of their production wells, most of which are measured monthly (Table 7-1). All data collected is maintained in Valley Water's database and is used in regional conditions and trend analyses. Groundwater level monitoring frequency is summarized in Table 7-1, with well locations shown

in Figures 7-1 and 7-2. Appendix I includes detailed information on well location, construction, and measurement.

Table 7-1. Groundwater Level Monitoring Frequency

Frequency	Santa Clara Subbasin		Llagas Subbasin		Total
	Valley Water-Monitored Wells	Retailer-Monitored Wells[1]	Valley Water-Monitored Wells	Retailer-Monitored Wells[1]	
Hourly	25	0	0	0	25
Daily	48	0	8	0	56
Weekly	0	4	0	0	4
Twice Monthly	0	27	0	0	27
Monthly	102	86	54	21	262
Quarterly	0	73	0	0	73
Total	175	190	62	21	448

[1] Indicates the number of retailer wells for which water level data is provided to Valley Water.

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Figure 7-1. Santa Clara Subbasin Groundwater Level Monitoring Wells

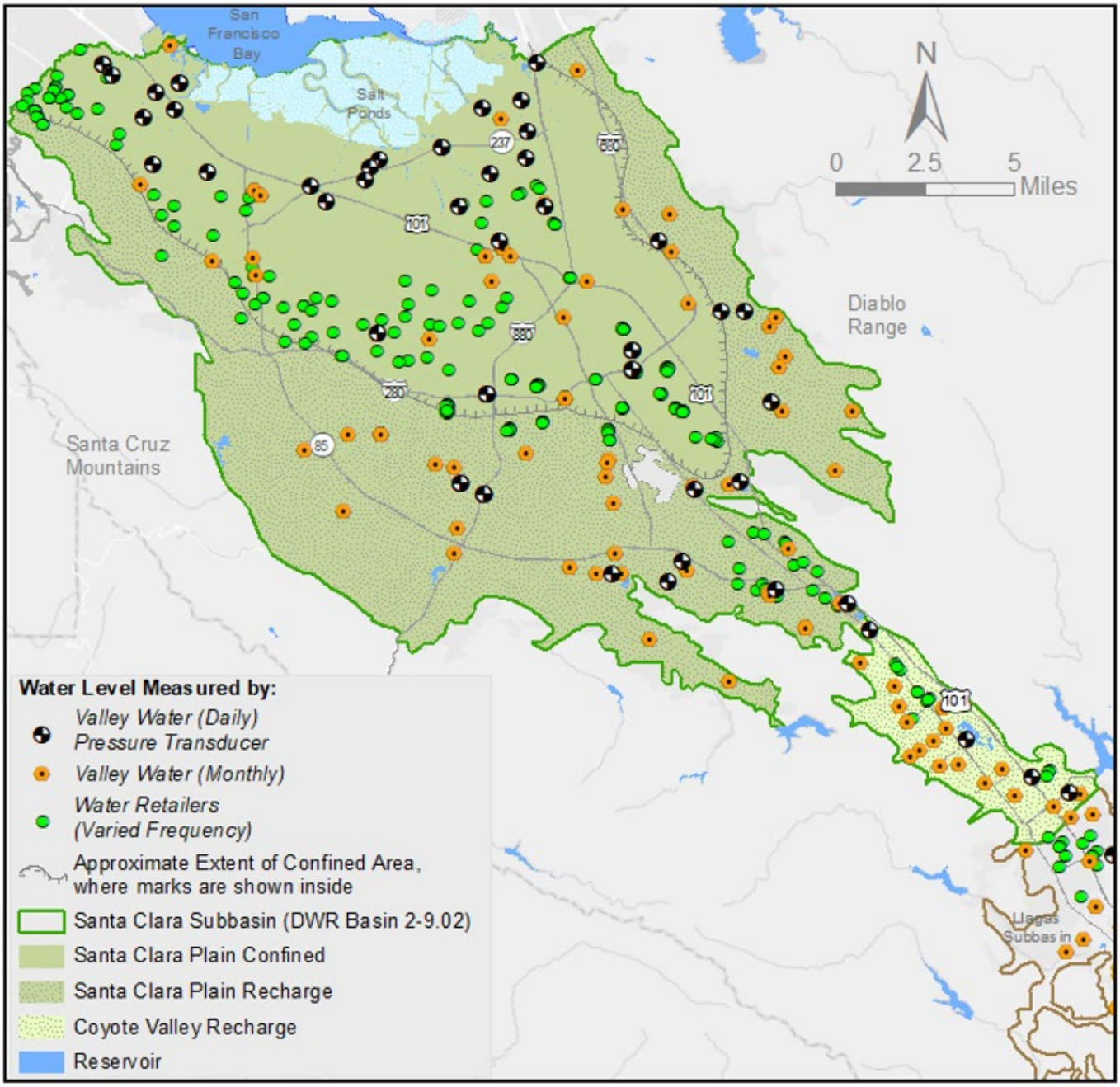

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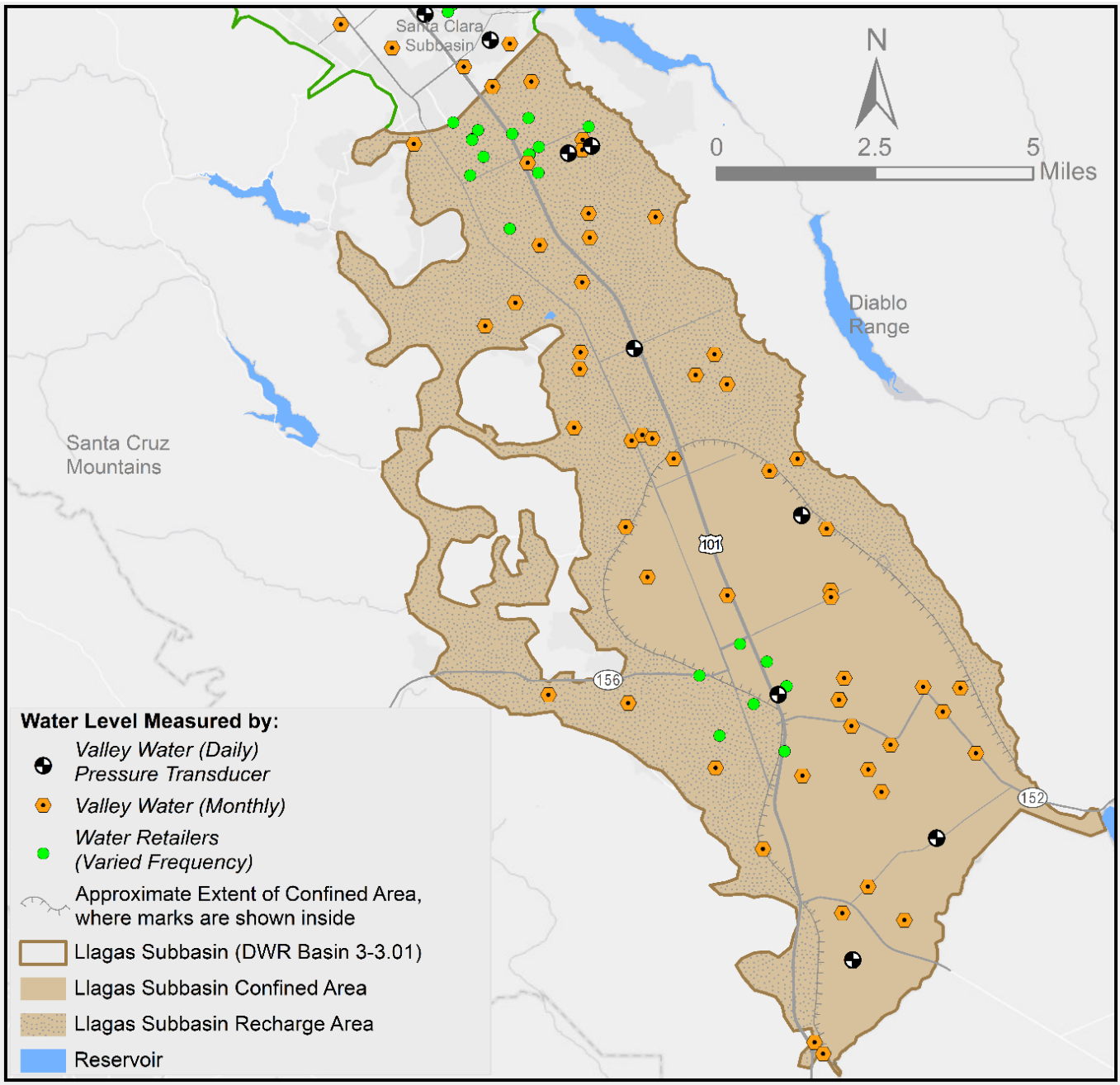
Figure 7-2. Llagas Subbasin Groundwater Level Monitoring Wells



7.1.2 Measurement Methodology

This section presents Valley Water methodology to measure groundwater levels, including information on reference points, depth to water measurements, and instrument calibration.

7.1.2.1 Ground Surface and Measuring Point Elevation Measurement

Valley Water has completed land surveys at most of the groundwater level monitoring wells in the network with an elevation accuracy of ±0.01 feet. For all other monitoring wells, ground surface elevations are derived from Light Detection and Ranging (LiDAR) data, with a vertical accuracy of approximately 0.64 feet. Valley Water continually evaluates the need for updated elevation surveys at new and existing monitoring wells and conducts new surveys as needed.

Groundwater level readings are collected from a designated measuring point at each well. Depending on the well, the measuring point may be the top of the well casing, lip of utility vault, or another established reference point. Measuring point elevations are generally measured directly by land surveying but may also be calculated relative to known ground elevations.

7.1.2.2 Manual Depth to Water Measurement

Manual depth to groundwater measurements are obtained using electric sounders, steel tapes, air lines, and pressure gauges. Whenever possible, depth to groundwater is measured in wells that have not been pumped recently; otherwise, the measurement is flagged as a pumping water level. More than 99% of the 1.1 million water level records maintained in Valley Water's database are measurements made at wells that have not been pumping. When pumping readings are obtained from water retailer wells they are categorized as a pumping reading in Valley Water's internal database. Historically, pumping readings were generally not entered into the database as a value. Instead, a code is entered to indicate that a reading was attempted. Valley Water's Standard Operating Procedure (SOP) entitled "Manually Measuring and Downloading Depth to Groundwater in Wells" is the controlling document for water level measurement and it is regularly reviewed and updated as necessary.

Table 7-2 summarizes Valley Water's measurement methods and corresponding accuracies. Valley Water most commonly uses electric sounders to obtain groundwater level readings. The accuracy of electric sounders is generally ±0.1 feet in production wells and can be within ±0.05 feet in monitoring wells. These sounders consist of a long tape measure/wire on a reel attached to a weighted electric sensor. The sensor is lowered until it contacts standing water in a well, which completes a circuit and sounds an audible alarm. Once the alarm sounds, the technician records the water depth from an established measuring point as indicated on a graduated tape.

Table 7-2. Manual Depth to Water Measurement Methods and Accuracy

Device	Accuracy (feet)
Airline	± 1
Electric Sounder	± 0.05 to ±0.1
Pressure Gauge	± 0.5
Pressure Transducer	± 0.01
Steel Tape	± 0.1

About 35 wells are under artesian pressure during at least part of the year, particularly during years with above-average rainfall or below-average pumping. Artesian pressure is measured by attaching a pressure gauge to a fitting on the wellhead. The pressure gauge is zeroed before each field measurement to compensate for atmospheric pressure. The pressure is measured in PSI (pounds per square inch) and converted to feet of equivalent head of water above the measuring point using a multiplier of 2.30667 ft per PSI. This is the level the water would rise to if the well casing extended to an equivalent elevation above the ground. However, it is not the level to which water would rise if the well were uncapped, as pressure quickly dissipates and well efficiency impedes high pressure flows. Valley Water has equipped many of the artesian monitoring wells with pressure transducers, dataloggers, and telemetry equipment. All artesian wells are equipped with fittings to allow pressure readings when they are under artesian pressure.

In a small number of actively monitored agricultural wells a layer of oil may be present on the water surface. In these wells a steel tape is used to measure depth to water beneath the oil layer since electric sounders are ineffective and become contaminated. A steel tape is marked with graduated distance lines. The oil layer thickness is not measured, but it is not expected to significantly affect the data. The end of the tape is chalked so that the field technician can confirm the water contact location and determine the water level in the well.

Air lines are used by some water retailers to apply air pressure to a calibrated tube whose end is submerged in the well. In the airline method, the water level is determined by calculating the head corresponding to the maximum air pressure required to displace water in the tube. Valley Water does not directly monitor wells via air lines.

7.1.2.3 Automated Depth to Water Measurement

Valley Water uses pressure transducers and data loggers in 76 wells throughout the Santa Clara and Llagas subbasins to measure groundwater levels daily or hourly (Appendix I). These daily levels provide a more complete picture of water level changes than can be obtained by monthly electric sounder readings. Telemetry equipment has been installed at 7 of these locations, covering 14 wells since some locations have multiple wells, allowing remote data retrieval over the cellular phone network.

The pressure measured by a transducer must be corrected to remove the influence of atmospheric pressure. Using data from a barometer connected to a data logger and telemetry system, raw pressure data is adjusted to remove the barometric pressure, resulting in the pressure exerted by the water column above the transducer. Using the known sensor depth and ground elevation, the depth to water and groundwater elevation are then determined. See Section 7.1.3 for more detail.

When desired, Valley Water's water level automation system permits the collection of nearly continuous data to observe responses to hydrologic events such as rainfall, recharge operations, and pumping, while also reducing staff time required for collecting water level data. Pressure transducer measurements are validated against manual measurements as described below.

7.1.2.4 Water Level Instrument Calibration

Water level measurement accuracy depends on the accuracy of the measuring instruments. Staff periodically inspect water measurement equipment for accuracy and perform calibrations if necessary. Electric sounders are generally highly accurate and reliable, exhibiting minimal changes in accuracy over time. If an electric sounder or pressure gauge is found to be out of calibration, the unit is sent to the manufacturer for maintenance or replacement, and a correction factor is applied to the affected measurements. Pressure transducers may exhibit instrumental measurement drift over time. Staff check for potential instrumental drift on a monthly basis by comparing pressure transducer readings to manual readings obtained from either the electric sounders or the pressure gauges, depending on whether the well is artesian. As needed, during the conversion of the pressure reading from PSI to feet, a correction factor is applied to offset the drift and align the transducer measurements with the manual depth to water readings.

7.1.3 Data Management

Water level data management includes conversion of raw measurements to groundwater elevations, data validation and approval, and storage of the data in a secure database.

Data conversion involves transforming depth to water and pressure measurements to groundwater elevations. For depth to water measurements, the field readings are subtracted from measuring point elevations to calculate groundwater elevations. For artesian wells, pressures are converted into feet of water (head) above the measurement points. These head values are then added to the measuring point elevations to calculate groundwater elevations. Converting pressure transducer measurements to groundwater elevations in non-artesian wells involves several steps. First, atmospheric pressure, recorded within an hour of the measurement, is removed from the total pressure to obtain the water pressure above the transducer. These water pressures are then converted to feet of water (head) above the sensor. Using the measured depth of the sensor and the known ground surface elevation, the head readings are converted to groundwater elevations.

To ensure data accuracy, Valley Water staff validate all groundwater level data prior to database upload. Staff compare new manual measurements to historical water levels as an initial screening criterion and

tentatively validate the measurements that are within historical norms. Values that fall outside of the historical record are further inspected to determine if there were collection errors. Groundwater elevations measured by transducers are compared to concurrent manual depth to water measurements. When discrepancies are detected, new conversion factors are generated, and the data are reprocessed to correct the data within ± 0.5 feet of the manual measurement. As a final step in validation, the new data are graphed with recent historical data to identify outliers and evaluate continuity. Outliers or questionable data are investigated for validity. The validated data are then transferred to an Electronic Data Deliverable (EDD), which are spreadsheets designed specifically for upload to Valley Water's database.

Data approval involves reviewing the EDD data for completeness and accuracy. If errors are found, the data are reprocessed. Once all known errors are corrected, the EDD is uploaded to a permanent, secure database. Valley Water's groundwater database was developed internally and is governed by standard data validation and integrity protocols.

7.1.4 Reporting and Communication

Water level data are reported or made available in a variety of formats. Valley Water's monthly Water Tracker includes high-level information on regional index wells in the Santa Clara Plain, Coyote Valley, and Llagas Subbasin. The monthly Groundwater Condition Report provides more detail, presenting water levels for 11 monitoring wells with greater spatial distribution across the subbasins, including the three regional index wells, as well as monthly estimates of pumping and recharge. Valley Water generates potentiometric surface maps (groundwater elevation contour maps) for the spring and fall each year for inclusion in Valley Water's Water Year Report, which is submitted to DWR annually by April 1 as required by SGMA. The Water Year Report also provides information on current water level conditions compared to the previous year and long-term conditions.

As the GSA for the Santa Clara and Llagas subbasins, Valley Water updates the DWR Monitoring Network Module (MNM) database on a quarterly basis with monthly water level data. Additionally, Valley Water updates well attributes in MNM, including monitoring point and reference elevations, in a timely manner. Valley Water works to ensure consistency and accuracy of the MNM database. Prior to MNM, Valley Water was the Designated Monitoring Entity for Santa Clara County under the California Statewide Groundwater Elevation Monitoring Program (CASGEM) program and updated the DWR CASGEM database with water levels from water level monitoring wells quarterly. Valley Water reports are available at www.valleywater.org. All water levels in Valley Water's water level database are also available through an online portal on the Valley Water website, which allows users to find data by entering a location or well number, or by using the map feature.[128]

7.1.5 Groundwater Emergence Monitoring

As described in Valley Water's 2025 report, *Groundwater Response to Tides, Seawater Intrusion, and Sea-Level Rise in Santa Clara County, California*[129], Valley Water conducted targeted mapping and on-going monitoring of groundwater rise and the potential for groundwater emergence at land surface in response to tides and sea-level rise. This monitoring focuses on the shallow aquifer system near the Bay and identifies areas potentially vulnerable to groundwater emergence. The groundwater emergence monitoring program strengthens understanding of shallow groundwater behavior and provides information to support infrastructure planning, sustainable groundwater management, and SGMA outcome measures.

The objectives of the groundwater emergence monitoring program are to:

- Characterize current and projected shallow groundwater conditions near the Bay,
- Identify and map areas potentially vulnerable to groundwater rise and emergence,

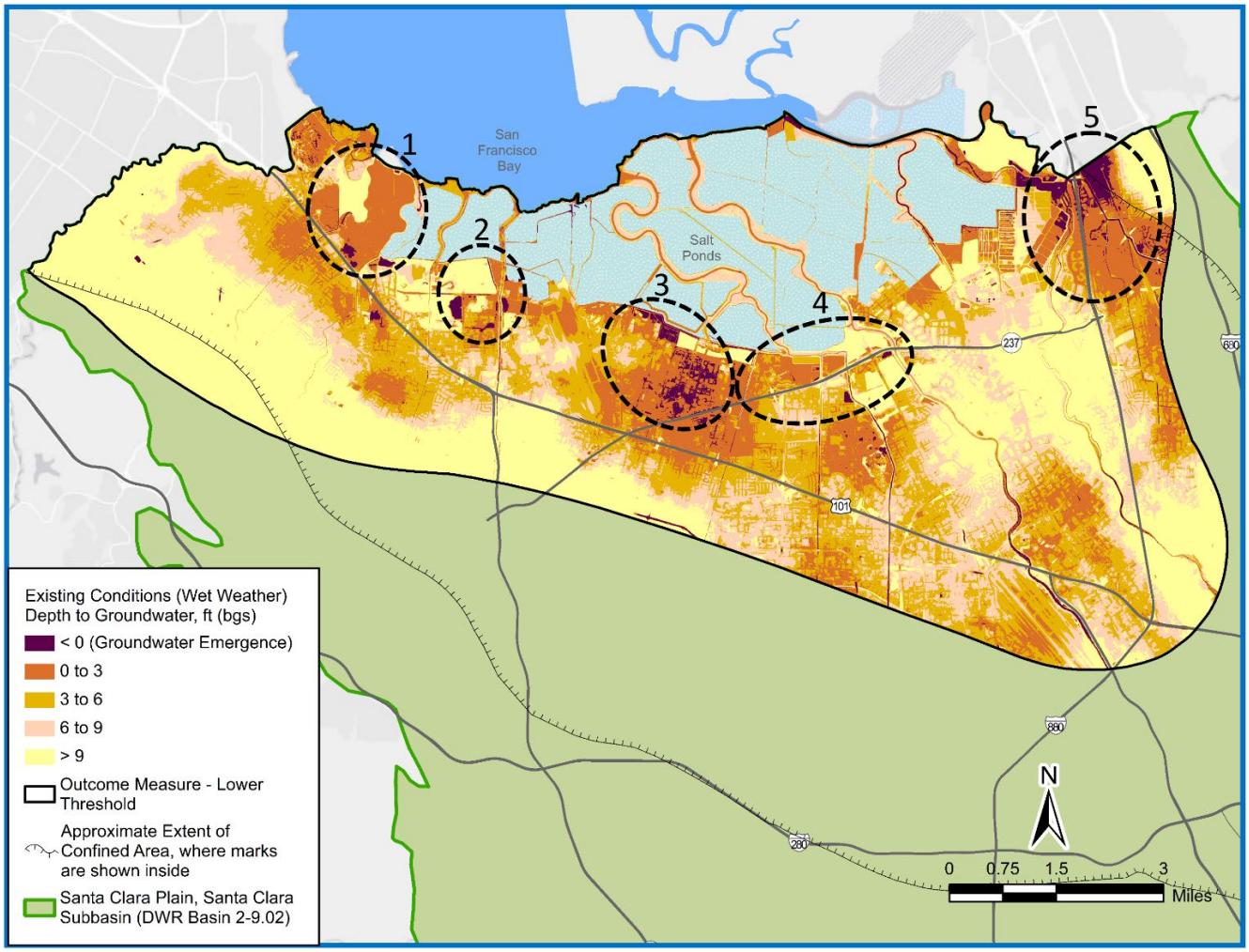
128 https://gis.valleywater.org/Wells.html.
129 Available at: https://www.valleywater.org/your-water/groundwater/groundwater-studies

- Validate mapped projections using field-based observations, and
- Inform groundwater management actions and performance evaluation under SGMA.

7.1.5.1 Mapping of High Groundwater Conditions

As described in 2025 study report on groundwater response to tides, seawater intrusion, and sea-level rise, Valley Water developed maps of "existing highest groundwater conditions" using shallow groundwater level data collected between 2000 and 2020 from the State Water Resources Control Board GeoTracker portal, along with available data from Valley Water databases. These maps are based on the minimum depth-to-water recorded at each well during that period, creating a temporal composite that represents a theoretical highest groundwater condition. Field observations at five large areas near the Bay indicate that, under current conditions, groundwater rise and emergence are not widespread across Santa Clara County (Figure 7-3).

Figure 7-3. Five Locations of Field Observations During King Tide Events



To evaluate potential future conditions, Valley Water used groundwater mapping scenarios assuming a linear (1:1) relationship between sea-level rise and groundwater rise. This conservative assumption likely overestimates the extent of groundwater rise and emergence. Maps were developed for multiple sea-level rise scenarios (e.g., 3.0 feet and 6.5 feet) to illustrate potential shallow groundwater conditions and areas where future emergence could occur. These scenarios do not incorporate future changes in precipitation, recharge, pumping, shoreline modifications, or land use and are therefore intended to inform monitoring and planning rather than serve as predictive forecasts.

7.1.5.2 Field Validation and Adaptive Management

To verify mapped conditions and better characterize uncertainty, Valley Water conducted field monitoring during king tide events, which approximate 1 to 2 feet of projected sea-level rise. Observations were completed at selected Baylands locations identified based on mapped shallow or emergent groundwater conditions and proximity to tidal streams and monitoring wells (Figure 7-3). Field monitoring indicates that mapped projections likely overestimate the spatial extent of groundwater emergence and confirms that current emergence is limited and primarily occurs in low-lying, natural open-space areas.

As part of adaptive management, the seawater intrusion monitoring network will continue to be evaluated to identify and address data gaps. Tidally influenced groundwater emergence areas will be monitored annually and formally reassessed every five years in coordination with the Groundwater Management Plan updates.

7.2 LAND SUBSIDENCE MONITORING

Valley Water maintains and monitors a land subsidence monitoring network in the northern portion of the Santa Clara Subbasin (Santa Clara Plain) to determine if land subsidence is occurring or threatening to exceed established subsidence thresholds, as described in Chapter 5. Land subsidence monitoring includes annual land elevation surveys along three established routes and continuous measurement of vertical ground movement at two extensometers (also called compaction recorders). Groundwater level monitoring is an integral part of the land subsidence monitoring program since long-term overdraft and water level decline was the driving force of historical land subsidence in the Santa Clara Plain, as described in Chapter 2. Water levels in ten subsidence index wells are measured at least monthly. Figure 7-4 presents Valley Water's land subsidence monitoring network, including the land survey circuits, extensometers, and water level wells used to track the potential for subsidence. Valley Water's subsidence monitoring program generally follows DWR's subsidence BMP (Best Management Practices of the Sustainable Management of Groundwater, 2026) on subsidence monitoring practice. Results of Valley Water's subsidence monitoring is reported in the Water Year Report that is submitted to DWR.

7.2.1 Annual Benchmark Elevation Surveys

According to the 1982 Poland and Ireland report, the first precise leveling of benchmarks within the subsiding area in Santa Clara County was conducted in 1912. Periodic level surveys of land elevation have been conducted in northern Santa Clara County to gauge land subsidence induced by groundwater overdraft since 1934.[130] Valley Water conducts annual surveys each fall to determine the elevations of about 140 survey benchmarks along two east-west circuits and one north-south circuit in the Santa Clara Plain (Figure 7-4). Changes in benchmark elevations are tracked year to year and are evaluated with data collected at extensometers and subsidence index wells.

7.2.2 Extensometer Monitoring

Valley Water collects data from two extensometers installed by the USGS in 1960 to monitor the magnitude and rate of subsidence in the Santa Clara Plain. The USGS terminated its field monitoring in 1983, at which time the extensometer monitoring was transferred to Valley Water. The extensometer sites are in Sunnyvale near Moffett Field ("Sunny") and near downtown San José ("Martha") and are continuously monitored for subsidence (Figure 7-4). Water level measurements are also recorded at both extensometer sites.

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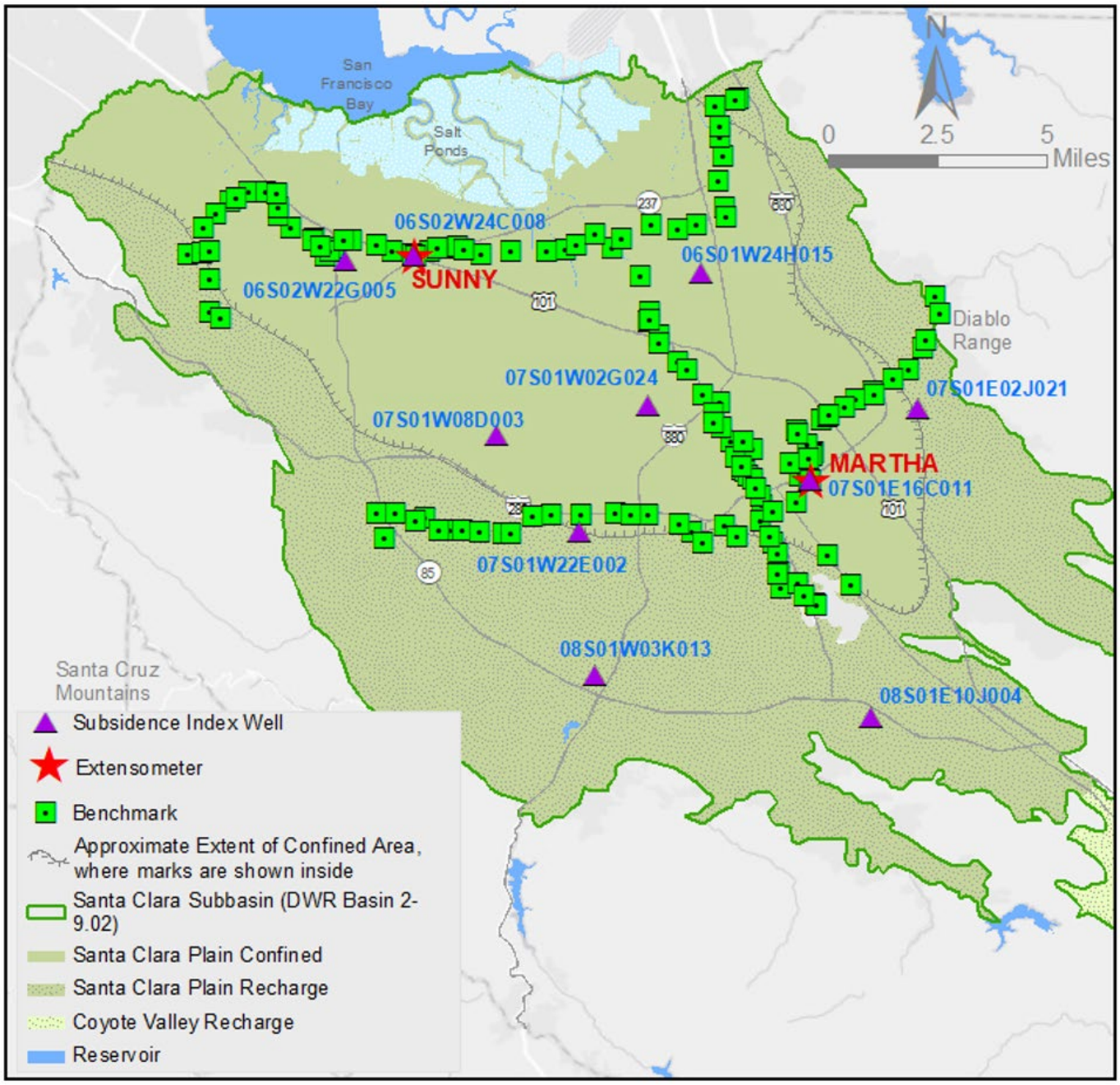
130 Poland and Ireland, Land Subsidence in the Santa Clara Valley, California, as of 1982, 1988.

Figure 7-4. Valley Water Land Subsidence Monitoring in the Santa Clara Plain



The extensometers measure vertical ground motion relative to a point 1,000 feet deep using a pipe set beneath the water-bearing aquifers that have the potential to compress and cause subsidence. To measure the change in land surface elevation, it is assumed that the pipe is fixed at the bottom and that the sediment between the pipe bottom and the land surface is expanding or compressing. To accurately measure these land surface changes, Valley Water uses several redundant instruments. The primary instrument is a linear potentiometer, which is calibrated to convert voltage readings into land surface elevation changes with an accuracy of ± 0.0001 feet. Hourly readings (averaged from 10-minute measurements) are stored in a data logger that sends the data to Valley Water via cellular-based telemetry. Valley Water also records readings from a dial gauge, which has an accuracy of ± 0.0001 feet, and a graduated tape that has an accuracy of ± 0.01 feet. Readings from the linear potentiometer and

the dial gauge are entered into a Valley Water database. Figure 7-5 shows the San José (Martha) extensometer and instrumentation.

Figure 7-5. San José ("Martha") Extensometer

7.3 GROUNDWATER QUALITY MONITORING

Valley Water conducts ongoing monitoring to assess groundwater quality in the Santa Clara and Llagas subbasins, including regional monitoring, domestic well sampling, and focused monitoring near recycled water irrigation sites and areas of historic seawater intrusion. This section describes Valley Water monitoring, including wells monitored, parameters analyzed, monitoring frequency, and reporting. It also provides information on monitoring by water retailers and other agencies.

The goal of Valley Water's groundwater quality monitoring is to collect data to support the evaluation of the following:

- Regional groundwater quality conditions for the shallow (<150 feet) and principal aquifers (>150 feet) of the Santa Clara and Llagas subbasins,
- The extent and severity of contamination, including the presence of contaminants above drinking water standards,
- Changes in water quality over time,
- Potential threats to the long-term viability of groundwater resources, and
- Groundwater Management Plan outcome measures and associated outcome measure – lower

thresholds.

7.3.1 Regional Groundwater Quality Monitoring

For regional groundwater quality monitoring, Valley Water characterizes two aquifer systems, the shallow and the principal aquifer zones. The shallow aquifer combines all water-bearing zones above a depth of 150 feet, which is approximately the base of regional confining layers in both the Santa Clara and Llagas subbasins. There are some exceptions but generally wells completed in the shallow aquifer are not used for drinking water. The principal aquifer zone is where most water supply wells are screened. A water supply well is designated as a principal aquifer zone well if 50% or more of the well screen is greater than 150 feet deep.

7.3.1.1 Valley Water Regional Groundwater Quality Monitoring Network and Frequency

Like Valley Water's water level monitoring network, wells included in the groundwater quality monitoring network include Valley Water installed monitoring wells, monitoring wells Valley Water has obtained, and privately owned wells, including active domestic, agricultural wells, and other water supply wells. Valley Water constructed multi-level nested monitoring wells at nine locations in the Santa Clara Plain in cooperation with the USGS. These wells allow depth-discrete sampling to discern water quality variation with depth, with the deepest casings at some wells extending below 1,000 feet.

The groundwater quality monitoring network in the Santa Clara Subbasin comprises 57 wells, as presented in Table 7-3 and Figures 7-6 and 7-7. The Santa Clara Plain Baylands is the area near San Francisco Bay that has historically been affected by seawater intrusion. For additional details about seawater intrusion, see Valley Water's 2025 report, *Groundwater Response to Tides, Seawater Intrusion, and Sea-Level Rise in Santa Clara County, California*. The Llagas Subbasin monitoring network is comprised of 36 wells as shown in Table 7-4 and Figures 7-8 and 7-9. This data is augmented by data collected by water retailers from about 250 wells each year as described in Section 7.3.2. Detailed information on the location and construction of all wells monitored by Valley Water is in Appendix I. Appendix G provides further discussion of updates to the groundwater quality network wells identified in the 2021 GWMP to address data gaps.

Table 7-3. Santa Clara Subbasin Regional Groundwater Quality Monitoring Summary

Area	Shallow Aquifer Zone	Principal Aquifer Zone	Total
Santa Clara Plain Chloride-Impacted Wells[1]	14	--	14
Santa Clara Plain	19	19	38
Coyote Valley[2]	--	5	5
Total	**33**	**24**	**57**

Notes:

[1] A chloride-impacted well is screened in the shallow aquifer zone of the Santa Clara Subbasin that has a historical chloride concentration greater than 100 mg/L since 1960, the greatest known extent of seawater intrusion.

[2] Coyote Valley does not have distinct shallow and principal aquifer zones due to the lack of a regional confining layer.

Table 7-4. Llagas Subbasin Groundwater Quality Monitoring Summary

Area	Shallow Aquifer Zone	Principal Aquifer Zone	Total
Llagas Subbasin	19	17	36

Valley Water collects samples from all groundwater quality monitoring wells annually in the fall. The frequency of analysis for specific parameters varies per a fixed schedule depending on persistence or variability of that parameter as shown in Table 7-5 and described further in the next section.

Table 7-5. Valley Water Regional Groundwater Quality Monitoring Analytical Schedule

Monitoring Wells	Parameters Groups Monitored and Frequency				
	Major Ions	Nutrients	Trace Elements	VOCs	Chloride, pH, EC
Regional Monitoring Wells	Annual	Annual	Annual	Triennial	Annual
Seawater Intrusion Monitoring Wells	Annual	Annual	Annual	--	Annual

Note: the seawater intrusion monitoring wells are included in Table 7-3 as the Santa Clara Plain Chloride-Impacted wells.

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Figure 7-6. Santa Clara Subbasin Shallow Aquifer Groundwater Quality Monitoring Network

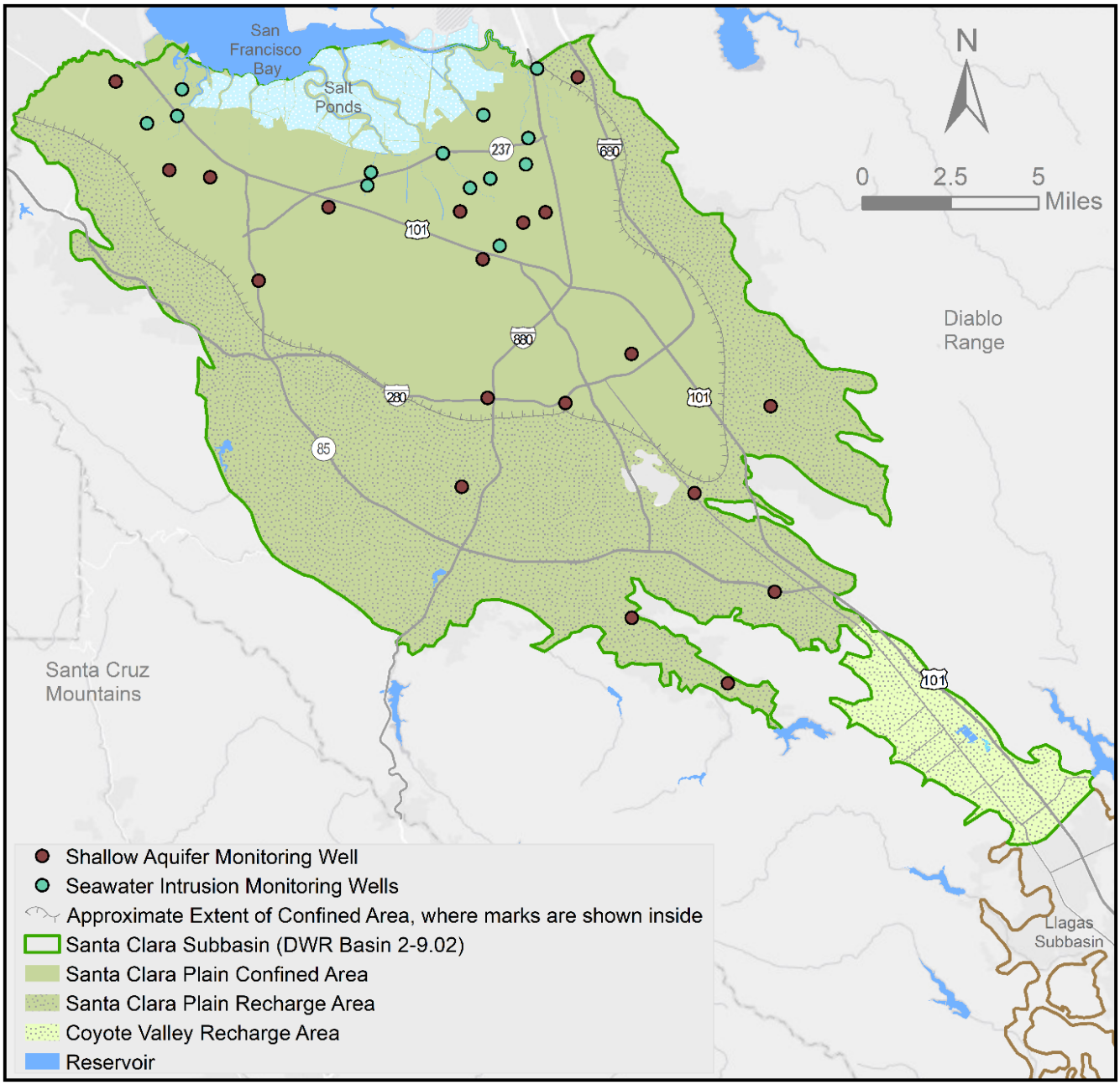

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Figure 7-7. Santa Clara Subbasin Principal Aquifer Groundwater Quality Monitoring Network

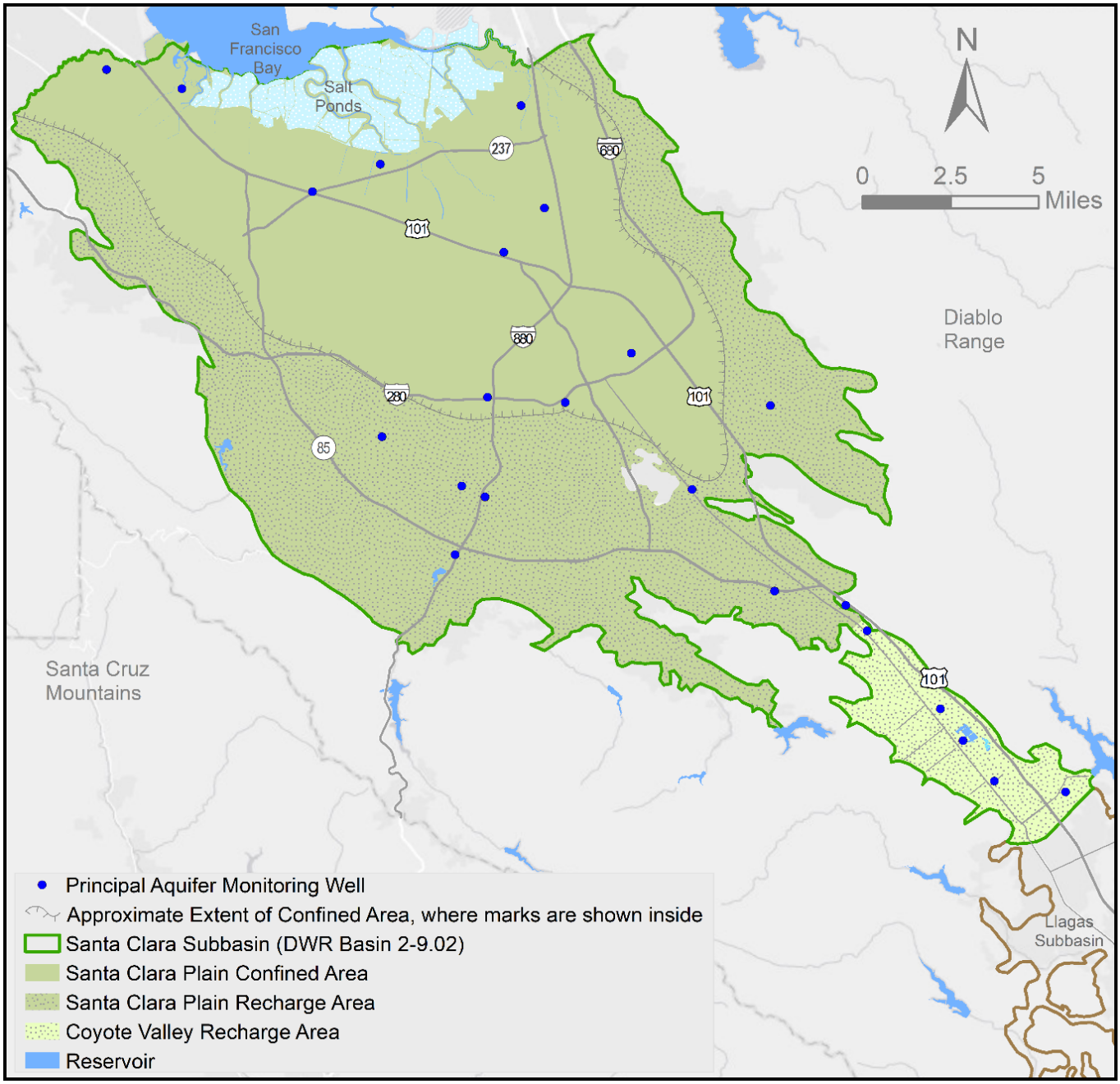

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Figure 7-8. Llagas Subbasin Shallow Aquifer Groundwater Quality Monitoring Network

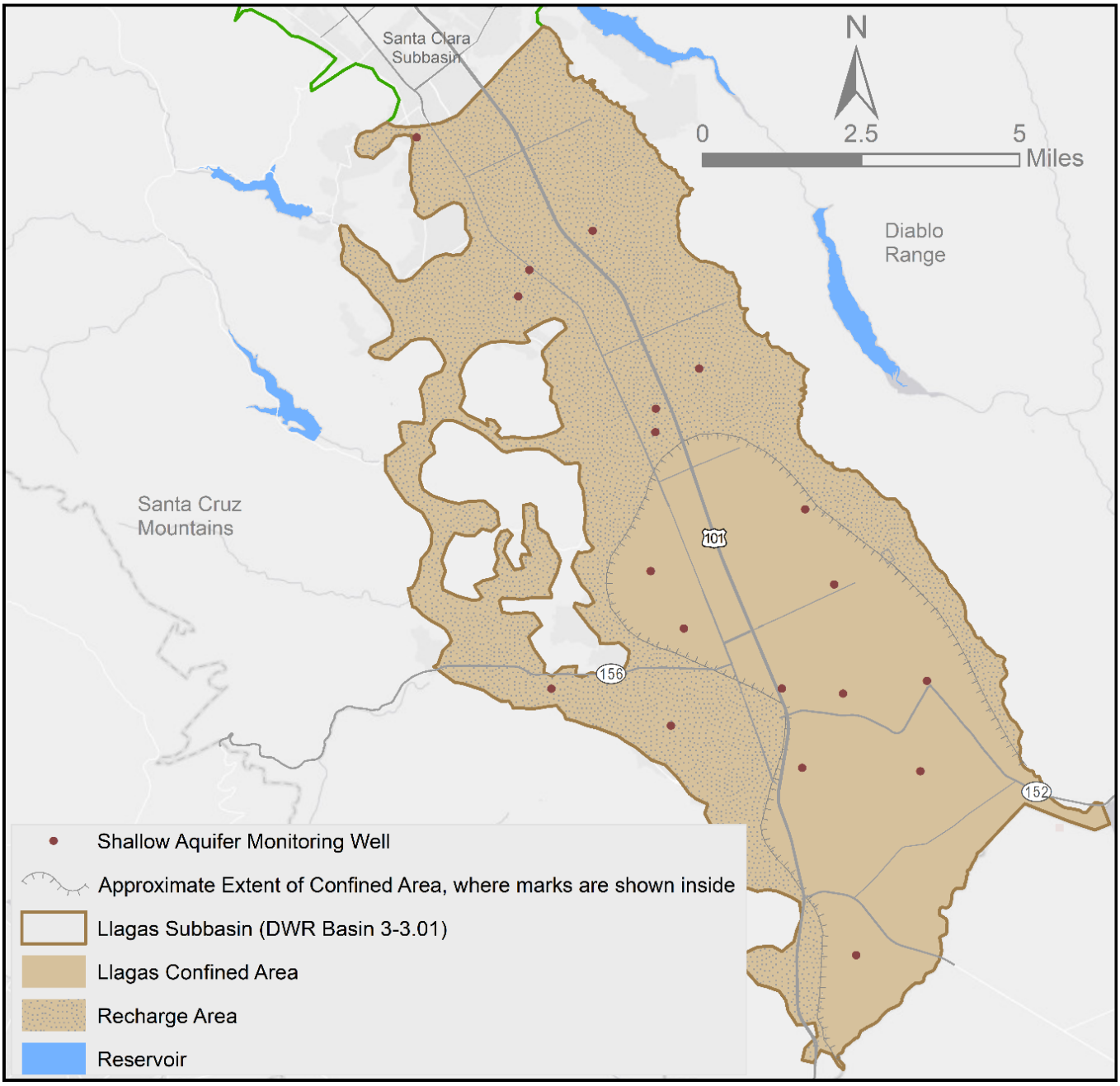

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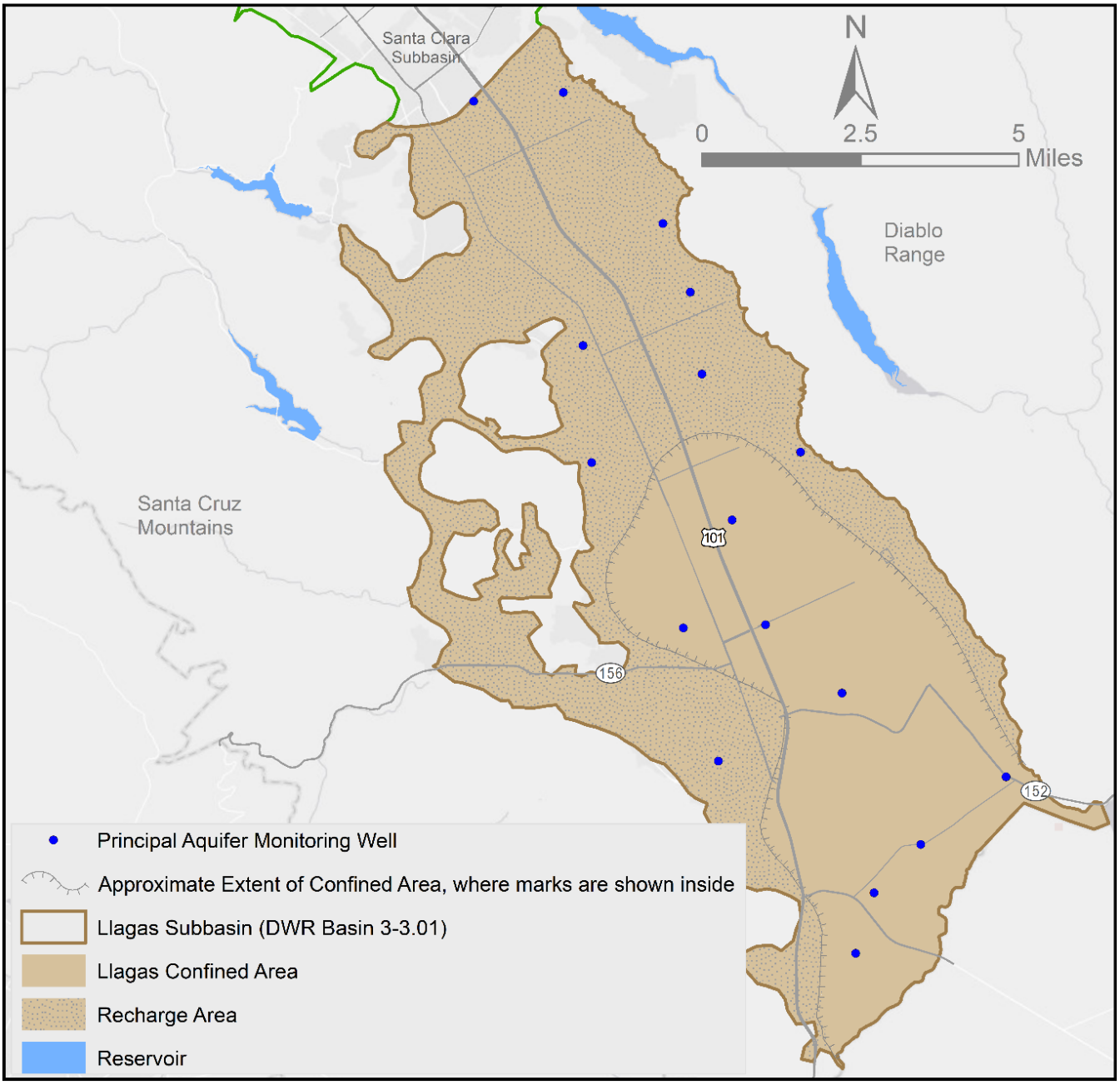
Figure 7-9. Llagas Subbasin Principal Aquifer Groundwater Quality Monitoring Network



7.3.1.2 Monitoring Parameters

Each fall, Valley Water analyzes major and minor ions and nutrients at all wells (Table 7-5). Major inorganic parameters analyzed include calcium, magnesium, sodium, potassium, bicarbonate, chloride, sulfate, and silica. These common parameters account for the vast majority of all dissolved matter in water derived from natural sources. Valley Water also analyzes common metals, nutrients, salts, and field parameters as shown in Table 7-6.

Every three years, Valley Water monitors volatile organic compounds (VOCs) at all wells (Table 7-5). Although detections of VOCs are rare in the principal aquifer zone, with many VOC contaminant release sites in the county, it is prudent to occasionally analyze the water for VOCs.

Local groundwater has been analyzed for pesticides in the past by Valley Water and water retailers. The results have been primarily non-detect with only sporadic, isolated detections at very low levels. The need for future pesticide analysis by Valley Water will be evaluated over time based on changes in drinking water standards, changes in land use, and public water system sampling results.

On April 10, 2024, the EPA established drinking water limits for six PFAS, including MCLs of 4 ppt for PFOA and PFOS and 10 ppt for PFHxS, HFPO-DA (GenX), and PFNA. The EPA also established a Hazard Index MCL of 1.0 for a mixture of two or more of the following PFAS: PFHxS, PFNA, HFPO-DA, and PFBS. Public water systems will need to monitor their water supply for these chemicals within three years and include the results in their Annual Water Quality Reports to customers. Public water systems that detect PFAS above the drinking water limits will have up to five years to implement solutions, such as treatment or other actions, to ensure water delivered to customers does not exceed these limits. Water systems must also notify the public if levels of regulated PFAS exceed these new standards. More information is available at https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas. More recently, PFAS have become an increasing concern and have been detected in both the Santa Clara and Llagas subbasins. Voluntary regional monitoring by Valley Water indicates PFAS are not widely detected above current state health-advisory levels. However, one water retailer has removed 10 water supply wells from service due to detections of PFAS in 2020. The technical knowledge and regulatory requirements for PFAS are rapidly changing. Valley Water will continue to monitor developments related to PFAS and will evaluate the need to include PFAS analysis for Valley Water monitoring wells. Since October 2020, staff from Valley Water, San Jose Water Company, the San Francisco Bay Regional Water Quality Control Board, and DDW have met regularly to discuss regional PFAS conditions, including impacted water supply wells. Valley Water will continue to collaborate with water retailers and regulatory agencies to better understand PFAS occurrence, evaluate potential sources, and identify any actions that may be needed to protect local water supplies.

On October 29, 2025, the DDW issued new and revised notification and response levels for perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and perfluorohexane sulfonic acid (PFHxS) and perfluorohexanoic acid (PFHxA). Notification levels are health-based advisory levels established by the DDW for chemicals in drinking water that lack maximum contaminant levels (MCLs). When chemicals are found at concentrations greater than their notification levels, certain requirements and recommendations apply. State law requires timely notification by drinking water systems whenever a notification level is exceeded in drinking water that is provided to consumers. PFAS with notification levels have additional requirements per state law. When a confirmed detection exceeds the response level, a community water system or a nontransient noncommunity public water system is required to report that detection in the water system's annual consumer confidence report, and take a water source where detected levels exceed the response level out of use or provide public notification within 30 days of the confirmed detection. More information is available at https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/NotificationLevels.html.

Table 7-5 presents the monitoring schedule and parameters to be tested in each regional well monitored by Valley Water, with associated analytical methods in Table 7-6. The list of monitoring parameters and relative analytical methods is expected to be somewhat dynamic over time depending on field conditions, new information or methods as regulatory requirements change, or identification of potential new water quality concerns. Additional contaminants may be analyzed as necessary to evaluate specific threats or concerns as they arise. Valley Water analyzed PFAS from 55 monitoring wells in 2020 and from 20 domestic wells in 2023. Analysis of some parameters may be discontinued if multiple sampling events show the analytes are not present. Any changes in the parameter list will be reflected in each five-year update of the GWMP.

Table 7-6. Valley Water Regional Groundwater Quality Monitoring Parameters and Analytical Methods

Parameter Group	Parameter	Analytical Method
Trace Elements	Aluminum, Boron, Iron, Lithium, Zinc	EPA 200.7
	Antimony, Arsenic, Barium, Beryllium, Chromium (Total), Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium	EPA 200.8
	Mercury	EPA 245.1
	Chromium 6	EPA 218.7
Ions	Alkalinity, Bicarbonate	SM2320B
	Total Dissolved Solids	SM2540C
	Chloride	SM4500-Cl
	Calcium, Magnesium, Potassium, Silica, Sodium	EPA 200.7
	Fluoride, Bromide, Sulfate	EPA 300.0
	Hardness	SM2340 C
	Perchlorate	EPA 314.0
Nutrients	Nitrate, Phosphate	EPA 300.0
Field	pH, Specific Conductance, Temperature, Turbidity	Field
VOCs	All VOCs included in method EPA 524 (analyzed every three years)	EPA 524
Microbiology	Total Coliform, e. Coli (applies to private domestic wells)	Coliforms P/A (24 hr)

7.3.2 Public Water Supplier Monitoring

Local water retailers and other public water suppliers serving groundwater analyze well water samples to comply with DDW requirements and support operational decisions. In general, compliance monitoring is completed at least once every three years following a schedule set by DDW. Each year, Valley Water obtains groundwater quality data from DDW for all public water systems in Santa Clara County, including water retailers and mutual water companies subject to DDW monitoring. Valley Water uploads this data to Valley Water's database and uses it with Valley Water-collected data in the annual evaluation of groundwater quality in the Santa Clara and Llagas subbasins. In Water Year 2024, Valley Water obtained DDW water quality compliance data from 251[131] production wells, as shown on Figure 7-10.

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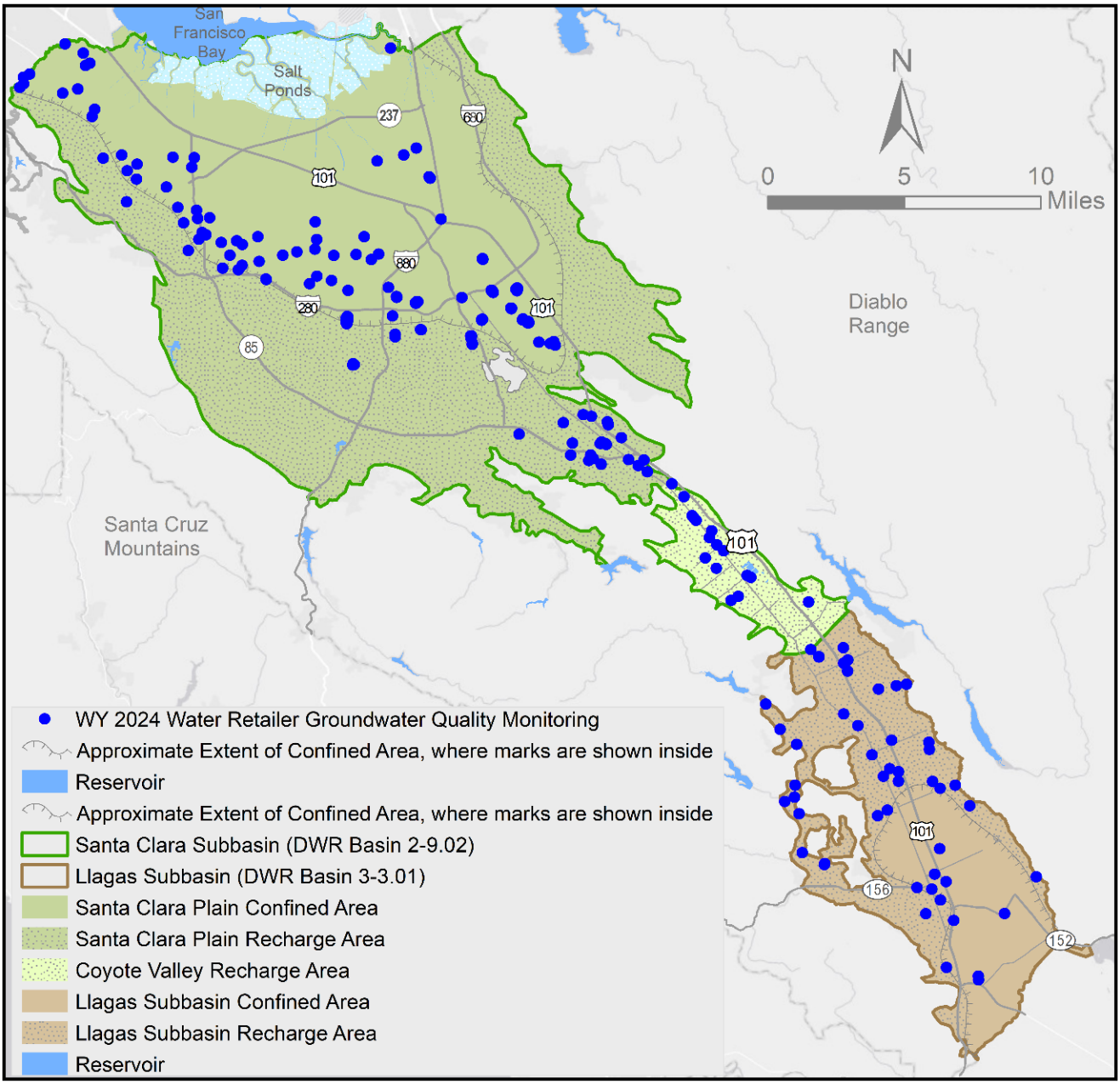
131 Ten wells are outside of the subbasin boundary (not shown in Figure 7-10).

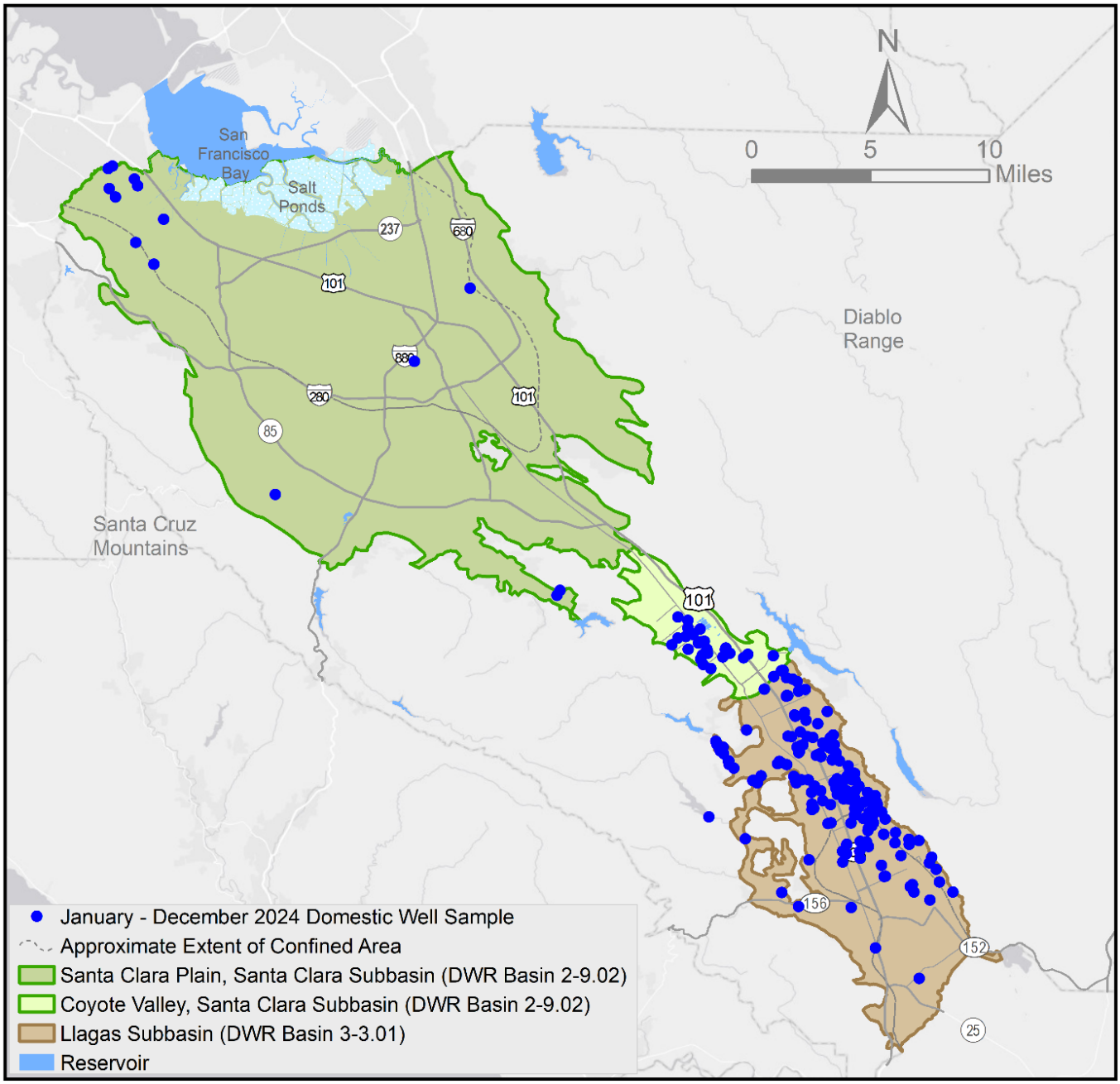
Figure 7-10. Public Water Supplier Groundwater Quality Monitoring (2024)



7.3.3 Domestic Well Testing Program

Valley Water offers free basic water quality testing once a year to eligible domestic well owners within Valley Water's groundwater benefit zones. In 2024, Valley Water tested more than 200 domestic wells for basic water quality parameters including nitrate, bacteria, total dissolved solids (TDS), and hardness. Domestic well data helps improve Valley Water's understanding of the occurrence of common contaminants and helps well owners understand their well water quality. Because it is a voluntary program, the wells tested vary each year. Figure 7-11 presents the locations sampled in calendar year 2024.

Figure 7-11. Valley Water Domestic Well Testing Locations (2024)

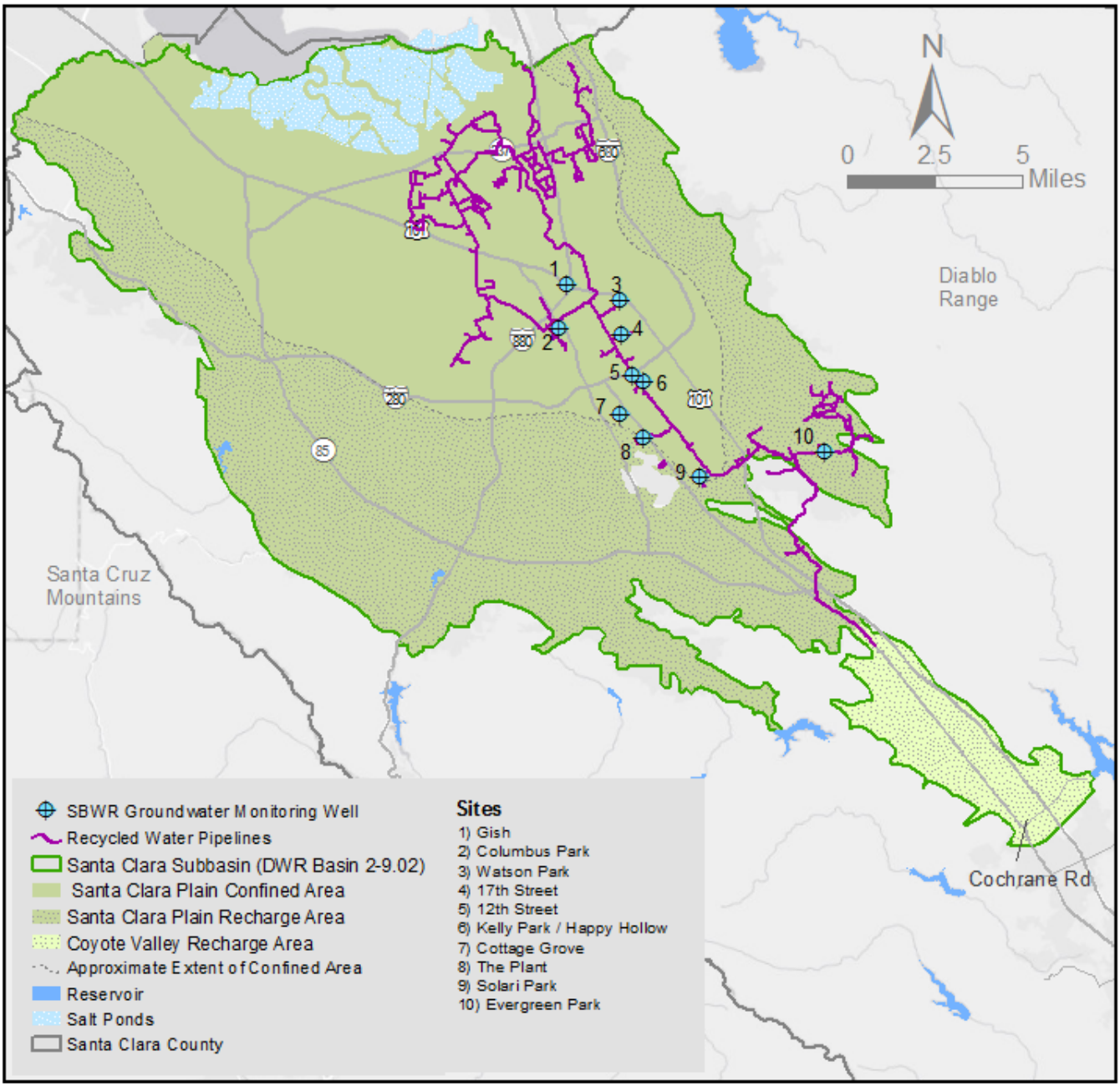


7.3.4 Monitoring Near Recycled Water Irrigation Sites

Tertiary-treated recycled water generally has a higher concentration of salts, nutrients, disinfection by-products, and emerging contaminants than local groundwater or treated potable water. Recycled water is used for non-potable uses like landscape irrigation, agriculture, and industry. To ensure groundwater resources are protected as recycled water use expands, Valley Water currently monitors wells at several recycled water irrigation sites in the Llagas Subbasin and in the past has monitored and evaluated data from monitoring wells at the Integrated Device Technology (IDT) site in the Santa Clara Subbasin. Valley Water also evaluates data collected by SBWR from monitoring wells near recycled water irrigation sites in the Santa Clara Subbasin. Figures 7-12 and 7-13 show the location of active monitoring wells.

Appendix I presents the basic well construction details for Valley Water recycled water irrigation site monitoring wells.[132]

Figure 7-12. Santa Clara Subbasin Groundwater Quality Monitoring Near Recycled Water Irrigation Sites



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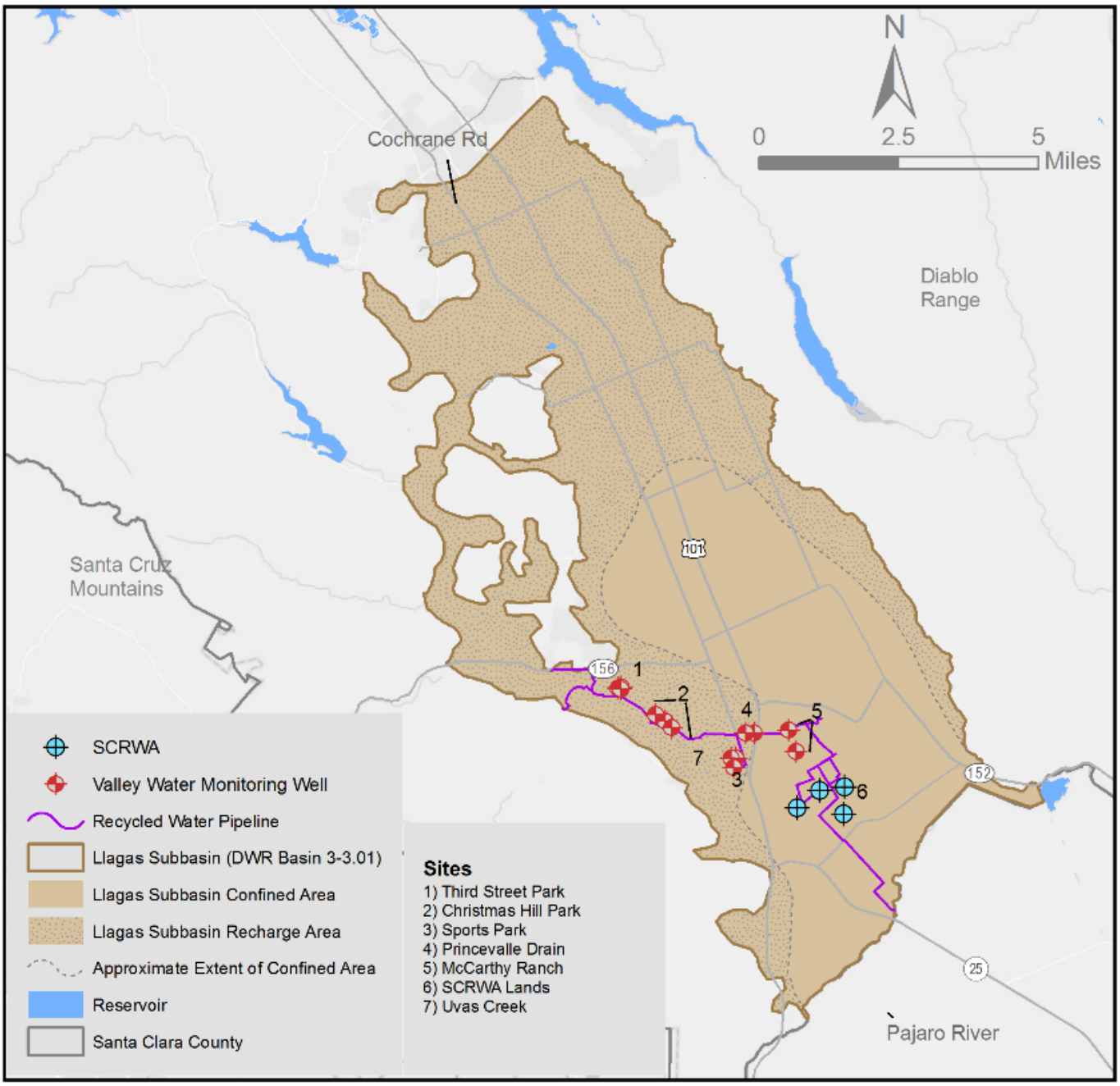
132 This section summarizes the wells, parameters, and monitoring frequency that are currently in place for the Recycled Water Monitoring Program. However, the wells, parameters, and/or monitoring frequency may change in the future depending in response to changing conditions.

Figure 7-13. Llagas Subbasin Groundwater Quality Monitoring Near Recycled Water Irrigation Sites



7.3.4.1 Valley Water Recycled Water Irrigation Site Monitoring Network and Frequency

Valley Water monitors several sites (comprising 20 monitoring wells) in the Llagas Subbasin to support expanded recycled use per the South County Recycled Water Supply Master Plan Project Environmental Impact Report (South County EIR).[133] Wells near recycled water irrigation sites in the Llagas Subbasin have been monitored quarterly since monitoring began in 2012 or later, depending on the well. Quarterly monitoring was chosen because it met (and exceeded) the terms of the South County EIR, which required semiannual monitoring for at least the first three years the groundwater monitoring wells were in operation.[134] In 2019, quarterly monitoring was reduced to semiannual as the majority of pairwise water

133 Santa Clara Valley Water District, 2011 South County Recycled Water Master Plan Project: Environmental Impact Report.
134 Final Program EIR for the South County Recycled Water Master Plan. Valley Water. March, 2011.

quality parameter comparisons (Wilcoxon statistical tests) for wet season and dry season were not statistically significant, suggesting that neither the choice of month for wet season sampling nor the choice of month for dry season sampling will significantly affect the results. More recently in 2024, semiannual monitoring has since been reduced to yearly monitoring because the terms of the South County EIR were met and a recent statistical analysis demonstrated that data quality/resolution would not be compromised.

7.3.4.2 Valley Water Monitoring Parameters

Parameters analyzed by Valley Water for groundwater wells and recycled water source samples are shown in Table 7-7. Together, these parameters have chemical characteristics that are likely to provide reliable indication of changes resulting from the use of recycled water for irrigation. The selected parameters fall into five general categories: basic water quality parameters, disinfection by-products, organic parameters, other parameters of interest, and field parameters.

Table 7-7. Valley Water Recycled Water Site Monitoring Parameters and Analytical Methods

Parameter Type	Parameter	Methods
Basic Water Quality Parameters	Metals and Trace Elements	EPA 200.7/200.8
	Inorganics	EPA 300/300.1
	Alkalinity	SM2320B
	Hardness	SM2340C
	Conductivity	SM2510B
	Total Dissolved Solids (TDS)	SM2540C
	Chloride	SM4500Cl D
Disinfection By-products	Haloacetic acids (HAA5[1])	EPA 552.3
Organic Parameters	Volatile Organic Compounds (includes THMs[2])	EPA 524.2
Other Parameters	Nitrosamines[3]	EPA 521
	PFAS[4]	EPA 533
	Ethylenediaminetetracetic acid (EDTA)	EPA 300 (MOD[5])
	Surfactants (MBAS)	SM5540C
	Nitrilotriacetic acid (NTA)	EPA 300 (MOD[5])
	Total Coliforms and E. Coli	SM9223B
Field Parameters	Oxygen	Field
	pH	Field
	Source Temperature	Field
	Specific Conductance-Field	Field
	Turbidity-Field	Field

Notes:
[1] HAA5 include the following: Dibromoacetic acid (DBAA), Dichloroacetic acid (DCAA), Monobromoacetic acid (MBAA), Monochloroacetic acid (MCAA), and Trichloroacetic acid (TCAA).
[2] THMs include the following: chloroform, bromodichloromethane, dibromochloromethane, and bromoform.
[3] Nitrosamines include the following: N-Nitrosodimethylamine (NDMA), N-Nitrosopyrolidine (NYPR), N-Nitrosodiethylamine (NDEA), N-Nitrosodibutylamine (NDBA), N-Nitrosopropylamine (NDPA), and N-Nitrosometylethylamine (NMEA). Note, after April 2, 2026, all nitrosamines analysis will be conducted using the EEA Agilent 521.1 method.
[4] PFAS method measures 25 different compounds including Perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA).
[5] MOD = modified method.

Basic water quality parameter data allows Valley Water to determine existing quality and the geochemical make-up of groundwater at each site. If recycled water is affecting shallow groundwater, this will likely shift the geochemical make-up and signature of shallow groundwater. Shallow groundwater is typically dominated by calcium, magnesium, and bicarbonate, whereas recycled water tends to be dominated by sodium, chloride, and bicarbonate. A gradual shift in the groundwater geochemical make-up to one dominated by salts could indicate changes from recycled water use.

Disinfection by-products are primarily dissolved organohalogens from the breakdown of organic substances during treatment with a chemical disinfectant. Disinfection by-products are generally harmful at low concentrations and therefore are included in the list of Valley Water monitoring parameters. They include parameters such as trihalomethanes, haloacetic acids, and NDMA.

Other parameters of interest include those introduced as part of the influent to the wastewater treatment plant (WWTP) that may not be fully removed during treatment. These include parameters like cleaning agents, herbicides, and constituents of emerging concern (CECs) such as PFAS. The four recycled water suppliers in Santa Clara County produce disinfected tertiary recycled water. Per the terms of the California Title 22 reuse requirements, disinfected tertiary recycled water is required to meet stringent standards for total coliform bacteria. Valley Water monitors several microbial parameters, including total coliform bacteria, for groundwater well and recycled water sources. Field parameters are collected for the purposes of comparing general groundwater quality trends over time.

7.3.4.3 Other Monitoring Near Recycled Water Irrigation Sites

The City of San José's SBWR Program conveys recycled water from the San -Santa Clara Water Regional Wastewater Facility to numerous sites within the Santa Clara Subbasin. As a San Francisco Bay Regional Water Quality Control Board condition to implement this program, SBWR implemented the Groundwater Mitigation and Monitoring Plan (GMMP). As part of the GMMP, SBWR monitors groundwater quality in both the confined and recharge areas. The City of San José began groundwater quality monitoring in 1997 and recycled water deliveries in the area began in 1998. SBWR currently monitors five deep water supply wells in the confined area and five shallow monitoring wells in the confined and unconfined areas (Figure 7-12).

SBWR analyzes inorganic parameters such as nitrate and TDS. Initially, sampling was conducted monthly but was reduced to a quarterly basis. As of 2006, sampling was reduced to an annual event, which occurs during the first quarter of the calendar year. SBWR provides the annual data to Valley Water to assist in water quality analysis.

7.3.5 Groundwater Quality Monitoring Programs by Other Agencies

The sections below discuss groundwater monitoring performed by agencies other than Valley Water, water retailers, or SBWR within the Santa Clara and Llagas subbasins. Valley Water does not typically use this data for annual basin evaluation and reporting but considers related findings as they become available.

7.3.5.1 GAMA

The Groundwater Ambient Monitoring and Assessment (GAMA) program was created by the Groundwater Quality Monitoring Act of 2001, with the goals of improving statewide groundwater monitoring and increasing the availability of groundwater data to the public. The State Water Resources Control Board's program was carried out by the USGS and Lawrence Livermore National Laboratory (LLNL).

The statewide program uses a consistent study design in all study areas, with spatially distributed networks producing data sets that address basin scale objectives and allow incorporation into regional and statewide assessments. GAMA networks rely primarily on existing public supply wells, with other

types of wells (irrigation, domestic supply, or monitoring wells) sampled as necessary to achieve the required spatial distribution. There are four projects under GAMA that have been completed:

- Priority Basin Project: This project initially focused on assessing the deep groundwater resource that accounts for over 95 percent of all groundwater used for public drinking. In 2012, the assessment of shallow aquifer water quality was initiated to provide information on aquifers used for domestic and small community water supplies. Areas of the State with the greatest densities of households that rely on domestic wells are prioritized into study units for this phase of the project.
- GeoTracker GAMA: GeoTracker GAMA is an on-line database providing water quality data from various sources on an interactive Google-based map. The goal of this system is to provide a centralized system that is available to the public and decision makers.
- Domestic Well Project: The Domestic Well Project collects samples from private wells on a county level. This program is offered free to well owners who volunteer. The water quality data is placed on GeoTracker GAMA without well owner identification.
- Special Studies Project: The Special Studies Project focuses on specific issues of concern to groundwater quality. These studies provide better understanding of groundwater contaminant occurrence, fate and transport.

As a special studies project, LLNL conducted a vulnerability assessment that included Santa Clara County.[135] The Santa Clara Subbasin is included in the San Francisco Bay Study Unit and was last studied in 2007.[136] The Llagas Subbasin is part of the South Coast Interior Groundwater Basins Study Unit and was last studied in 2008.[137] Reports for the State Water Resources Control Board's GAMA investigations including the Santa Clara and Llagas subbasins are available online. The State Water Resources Control Board is conducting a Statewide PFAS study focusing on drinking water, groundwater, and wastewater. Authorized by AB 178, they are testing about 3,600 wells in disadvantaged communities (DACs) (2024–2026) for 25 PFAS types. However, none of the disadvantaged communities are in Santa Clara County. [138]

An ongoing special studies project, initiated in 2024 by the State Water Resources Control Board, includes a phased statewide investigation to map and monitor PFAS in the state's water systems[139]. The investigation relies on strategic investigative orders, a major community well testing initiative, and strict monitoring to identify pollution sources and protect public health. The core initiatives and study phases include the following:

- Investigative Order (2019-present): targets facilities with high potential for PFAS use or contamination. It has issued orders to 30 airports, 196 landfills, 271 chrome plating facilities, bulk fuel storage terminals, and refineries.

- Disadvantaged Communities Well Testing Project (2024-2026): backed by Assembly Bill 178 (AB 178), the state is conducting testing for over 3,600 drinking water wells serving disadvantaged communities (DAC). Although no DACs were identified in Santa Clara County as part of this

135 Lawrence Livermore National Laboratory, California Aquifer Susceptibility, A Contamination Vulnerability Assessment for the Santa Clara and San Mateo County Groundwater Basins, 2004. http://www.waterboards.ca.gov/gama/docs/cas_llnl_santaclara_sanmateo.pdf
136 USGS, Ground-water quality data in the San Francisco Bay study unit, 2007: Results from the California GAMA program: U.S. Geological Survey Data Series 396, 2009.
137 USGS, Groundwater-quality data in the South Coast Interior Basins study unit, 2008: Results from the California GAMA program: U.S. Geological Survey Data Series 463, 2009.
138 https://www.usgs.gov/data/data-and-polyfluoroalkyl-substances-pfas-groundwater-samples-collected-california-groundwater
139 https://www.waterboards.ca.gov/pfas/

study, Valley Water works closely with the State Water Resources Control Board and DDW to understand conditions throughout the state, the evolving regulatory environment, and potential PFAS-related studies proposed into the future.

- Wastewater and Non-Drinking Water Studies: Partnering with regional entities, the State Water Resources Control Board has executed non-drinking water studies to evaluate the municipal wastewater treatment plants and biosolids using EPA method 1633.

- Mandatory initial Monitoring (December 2025): The DDW issue a General Order DW-2025-0002-DDW, requiring community and nontransient-noncommunity water systems statewide to execute initial monitoring for PFAS compounds[140].

The results of the study is expected to provide crucial information on the extent of PFAS contamination in California's environment and drinking water, and aid in identifying potential PFAS sources throughout the state.

7.3.5.2 Irrigated Lands Program

The State Water Resources Control Board created the Irrigated Lands Regulatory Program (ILRP) in 2003 to protect state waters from impairment by waste discharge from commercially irrigated lands, which may contain wastes, such as pesticides, nitrate, and pathogens. The ILRP requires all growers to provide a farm evaluation and a nitrogen management plan to identify improvements that can be implemented to protect water quality. Growers will be required to have a certified nitrogen management plan if their groundwater is impacted by or susceptible to impacts from nitrate, pesticides, or other agricultural parameters.[141]

The ILRP for the Llagas Subbasin is overseen by the Central Coast Regional Water Quality Control Board. The first Irrigated Lands Order was issued in 2004, followed by the second Irrigated Lands Order in 2012 and the third in 2017. The Central Coast Regional Water Quality Control Board finalized the fourth Irrigated Lands Order (Ag Order 4.0; No. R3-2021-0040) in April 2021, which applies to owners and operators of irrigated land used for commercial crop production. The Central Coast Regional Water Quality Control Board focuses on priority water quality issues, such as pesticides and toxicity, nutrients, and sediments, with heavy emphasis on nitrate impacts to drinking water sources. Ag Order 4.0 is protective of groundwater and surface water supplies and has an increased focus (relative to past Irrigated Lands Orders) on quantifiable objectives that must be verified through water quality monitoring within a defined time schedule. In 2023, the State Water Resources Control Board reviewed Ag Order 4.0 and directed revisions to portions of the Order. As of 2026, Ag Order 4.0 remains in effect while the Central Coast Regional Water Quality Control Board considers proposed amendments.[142] Ag Order 4.0 includes incentives to use nitrogen in irrigation water to reduce fertilizer nitrogen application and mine groundwater nitrogen from aquifers[143]. In the Llagas Subbasin, growers may participate in cooperative monitoring programs administered through Central Coast Water Quality Preservation, Inc., the approved regionwide third party program administrator for the Irrigated Lands Program.[144] These programs continue to support compliance with Ag Order 4.0. Growers not participating in the cooperative will be responsible for monitoring their own operations to meet Central Coast Regional Water Quality Control Board requirements. Participants in cooperative monitoring programs or growers conducting individual monitoring must sample groundwater and surface water for analysis of the parameters. Sample data must be entered into the State Water Resources Control Board's GeoTracker database.

140 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/pfas_ddw_general_order/
141 https://www.waterboards.ca.gov/water_issues/programs/agriculture/
142 https://www.waterboards.ca.gov/centralcoast/water_issues/programs/ilp/regulatory_information.html
143 https://www.waterboards.ca.gov/centralcoast/water_issues/programs/ilp/
144 https://www.waterboards.ca.gov/centralcoast/water_issues/programs/ilp/third_parties.html

7.3.5.3 Unregulated Contaminant Monitoring

The U.S. EPA has developed a systematic process for evaluating whether individual chemicals should be regulated to ensure that drinking water poses no significant risk to the public. Every five years, the EPA publishes a list of unregulated compounds to be analyzed in large public water systems through the Unregulated Contaminant Monitoring Rule (UCMR). The EPA uses the UCMR to collect data on contaminants that are suspected to be present in drinking water and do not have health-based standards set under the Safe Drinking Water Act. The EPA has completed several rounds of UCMR, most recently UCMR 5 with monitoring between 2023 and 2025.[145] UCMR 5 included 30 contaminants including 29 PFAS and lithium. Sampling was conducted at 109 wells in Santa Clara County. UCMR 5 constituents in Santa Clara County groundwater were generally absent or occurred at rates similar to national occurrence rates. Related data is available on the EPA website, and the local UCMR 5 results are summarized in Table 7-8.

Table 7-8. Summary of UCMR 5 Sampling Results

Parameter	Detection Rate in Groundwater		Method Reporting Limit (*µg/L*)	Santa Clara County Maximum Detection (*µg/L*)	Advisory Level (*µg/L*)
	Santa Clara County	Nationwide			
Metals					
Lithium	28%	28.3%	9	25.5	10
PFAs					
11Cl-PF3OUdS	0%	0%	0.005	ND	NA
4:2 FTS	0%	0%	0.003	ND	NA
6:2 FTS	0%	0.4%	0.005	ND	NA
8:2 FTS	0%	0%	0.005	ND	NA
9Cl-PF3ONS	0%	0%	0.002	ND	NA
ADONA	0%	0%	0.003	ND	NA
HFPO-DA	0%	NA	0.005	ND	NA
NEtFOSAA	0%	0%	0.005	ND	NA
NFDHA	0%	0.01%	0.02	ND	NA
NMeFOSAA	0%	0%	0.006	ND	NA
PFBA	0%	8.19%	0.005	ND	6
PFBS	1.8%	NA	0.003	0.0094	NA
PFDA	0%	0.05%	0.003	ND	NA
PFDoA	0%	0.01%	0.003	ND	NA
PFEESA	0%	0%	0.003	ND	NA
PFHpA	0.4%	2.33%	0.003	0.0036	NA
PFHpS	0%	0.01%	0.003	ND	NA
PFHxA	4.6%	9.19%	0.003	0.007	3
PFHxS	8.2%	NA	0.003	0.008	NA
PFMBA	0%	0%	0.003	ND	NA
PFMPA	0%	0%	0.004	ND	NA
PFNA	0%	NA	0.004	ND	NA
PFOA	2.1%	NA	0.004	0.008	NA

145 UCMR 5 monitoring and reporting extend beyond the current GWMP reporting period (through 2025). Data released to date represent approximately 95% of the total results EPA expects to receive. The final UCMR 5 data release is anticipated in fall 2026.

PFOS	1.4%	NA	0.004	0.0062	NA
PFPeA	4.6%	10.64%	0.003	0.0078	NA
PFPeS	0%	0.15%	0.004	ND	NA
PFTA	0%	0%	0.008	ND	NA
PFTrDA	0%	0%	0.007	ND	NA
PFUnA	0%	0.02%	0.002	ND	NA

7.3.6 Valley Water Groundwater Quality Monitoring Protocols

This section presents Valley Water sampling protocols for groundwater quality monitoring. These protocols are intended to ensure consistency and produce reliable, quality assured, and representative water quality data. Valley Water's sampling protocol is consistent with best industry practice, which includes following, where applicable, the USGS National Field Manual.

7.3.6.1 Valley Water Groundwater Quality Sampling Methodology

Well purging removes stagnant water from the well prior to sample collection to allow collection of water quality samples that are representative of the aquifer. When sampling a dedicated monitoring well, Valley Water purges a volume of water equivalent to at least three casing volumes with a portable electric submersible pump. During purging, field measurements of pH, electrical conductivity, temperature, dissolved oxygen, and turbidity are measured and recorded on field data sheets. Monitoring wells generally have turbidity levels of 10 nephelometric turbidity unit (NTU) or lower. When higher turbidity is encountered, the well is pumped longer to determine if lower turbidity can be obtained, and if not, samples for inorganic and metal analytes are field filtered prior to lab analysis.

Valley Water samples domestic wells by letting well water run through a designated sampling port for 2 to 10 minutes of continuous pump operation. Since domestic wells are operated frequently, the water in the well is not stagnant, so there is no need to remove a specific volume of water during purging. If a private well has sat idle for a month or more, Valley Water performs standard purging procedures.

After the required purging has been performed and field parameters have stabilized, Valley Water collects samples in pre-cleaned and prepared sample bottles, which contain preservatives when required by the analytical method. When sampling for bacteria, the outside portion of the sampling port is first cleaned with isopropyl alcohol and then samples are placed in a secondary container and stored in wet ice. All non-bacteria samples are transported in coolers with enough ice to chill samples to 4 degrees Celsius. Samples collected by Valley Water are recorded on standard chain-of-custody documents.

When collecting groundwater samples for PFAS analysis, Valley Water follows DDW's latest PFAS sampling guidelines.[146] Preventing cross-contamination and ensuring the integrity of groundwater samples are crucial to understanding the occurrence of PFAS in Santa Clara Valley. Special precautions are taken when sampling wells for PFAS including but not limited to using and wearing acceptable materials when handling and collecting samples, collecting field blanks at each location, storing samples separately on wet ice, and following DDW's recommended eating, staging, and sampling dedicated areas.

Decontamination of portable pumps used for sampling is performed under certain circumstances, which trigger action as shown in Table 7-9. In general, full decontamination with strong detergent is only performed under rare circumstances since Valley Water primarily monitors the potable water supply aquifer as opposed to wells located at or near contaminated sites. This provides a more streamlined and

146 State Water Resources Control Board, PFAS Sampling Guidance for Non-Drinking Water, September 2020. https://www.waterboards.ca.gov/pfas/non_drinking_water.html.

efficient decontamination procedure and protects equipment from corrosive conditions while still minimizing the likelihood of contaminant transfer between well sites.

Table 7-9. Equipment Decontamination Levels

Decontamination Level	Description	Triggers
Level 1	• Complete scrubbing of portable pump apparatus with 2% Alconox solution. • Circulation of detergent solution through internal pump assembly. • Complete rinsing with de-ionized (DI) water.	• After a long period of storage (> 6 months). • After encountering unusual water quality condition such as colored water, greasy or oily substances visible, known contamination. • After sampling sites with a high likelihood of contamination (e.g. fueling island, near chemical storage facilities, etc).
Level 2	• Clean and rinse outside portable pump apparatus with DI water or municipal tap water. • Rinse internal pump assembly with DI water or municipal tap water. • Clean and rinse first 5 feet of pump discharge line.	• After sampling water with high TDS (EC > 5,000 µS/cm). • After high nitrate encountered (> 50 mg/L as nitrogen).
Level 3	• Clean and rinse outside of portable pump assembly with DI water or municipal tap water. • Clean and rinse first 5 feet of pump discharge tubing.	• If dirt, mud, dried mineral salts, scum or film are visible on outside of pump assembly.

7.3.6.2 Laboratory Analysis and Data Validation

Nearly all samples collected by Valley Water are analyzed by Valley Water's water quality laboratory, which is certified under the State of California Environmental Laboratory Accreditation Program. Samples are delivered to the laboratory in the appropriate condition and are accompanied by standard chain-of-custody forms. Samples for metal analyses are field filtered and preserved after they are delivered to the laboratory when turbidity is over 1 NTU.

The laboratory commonly performs three types of Quality Control (QC) checks consisting of positive controls, negative controls, and duplicates. Examples of these checks are laboratory control samples, method blanks, and sample duplicates, respectively. The purpose of these quality control checks is to assess the accuracy, precision, and selectivity of an analytical batch. The laboratory also performs sample-specific controls such as a matrix spike and matrix spike duplicate, which can be used to evaluate environmental matrix effects on the accuracy and precision of the sample results.

Upon receipt of the data, sample results may be compared to historical data, if available. If there are QC issues or the result that appears to be an outlier when compared to historical trends, the following actions may be taken depending on the specific results and data needs:

- If sufficient sample volume is available, the laboratory may re-analyze the sample.
- The well may be re-sampled.
- If the result is determined to be invalid, it may be discarded and not used in data analysis.
- The results may be retained and used for data analysis.

7.3.6.3 Data Management

Data generated by the various Valley Water monitoring programs are quality assured prior to being stored in the database. The quality assurance (QA) procedure includes verifying that the lab QA/QC meets established standards, that the data is consistent with prior samples from the same well, and where deviations occur, that the data was collected and handled properly. Validated, approved data is transferred to a multi-user Valley Water database that allows for secure storage and 'read-only' privileges for data users. Data that does not meet standard laboratory QA/QC criteria is retained in the database with a flag to indicate data quality issues. Hard copy laboratory reports are scanned into electronic format and placed into an electronic document archival system with key identifiers that allow easy retrieval.

7.4 SURFACE WATER MONITORING

This section describes Valley Water's recharge water quality monitoring and stream-gauging, as well as surface water monitoring efforts by other agencies.

7.4.1 Valley Water Recharge Water Quality Monitoring

The purpose of Valley Water's recharge water quality monitoring is to assess the quality of water used for managed recharge at Valley Water facilities. Recharge facilities (percolation ponds, managed reaches of creeks, etc.) receive local surface water and/or imported water and may be susceptible to contamination from nearby land uses. Valley Water monitors the water quality at its recharge facilities on a rotating three-year schedule, with actual systems sampled depending on availability due to adequate water supplies and maintenance events. This section summarizes current sampling locations, parameters, and monitoring frequency. However, these may be modified in the future in response to changing conditions.

7.4.1.1 Monitoring Locations and Frequency

Recharge water quality monitoring is performed during the dry season to best capture the water quality of water used for managed recharge, with a rotating schedule designed to sample each major recharge system at least once every three years. Monitoring locations are depicted below on Figures 7-14 and 7-15, with the recommended frequency for sampling each recharge system in Table 7-10. In 2024, the sampling frequency was reduced from semiannual to yearly as analyses show that selected water quality parameters do not vary significantly across dry season sampling events, indicating bi-annual monitoring is not warranted. Overall, this sampling frequency reduction achieves the same outcome, maximizes the efficient use of limited resources, and is consistent with other monitoring programs. Staff will continue to evaluate recharge water quality and present the results in the annual Water Year Report. Staff will also continue to assess recharge sampling frequency needs based on current results and observed changes from year to year.

7.4.1.2 Monitoring Parameters

Parameters analyzed by Valley Water for the recharge facilities are shown in Table 7-11. Monitoring parameters were selected based on the program's objective to characterize water quality in the groundwater recharge facilities and to identify parameters that may impact groundwater quality. Parameters monitored include basic water quality parameters, field parameters, and organic compounds.

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Figure 7-14. Location of Valley Water Recharge Water Quality Sampling Locations in the Santa Clara Subbasin

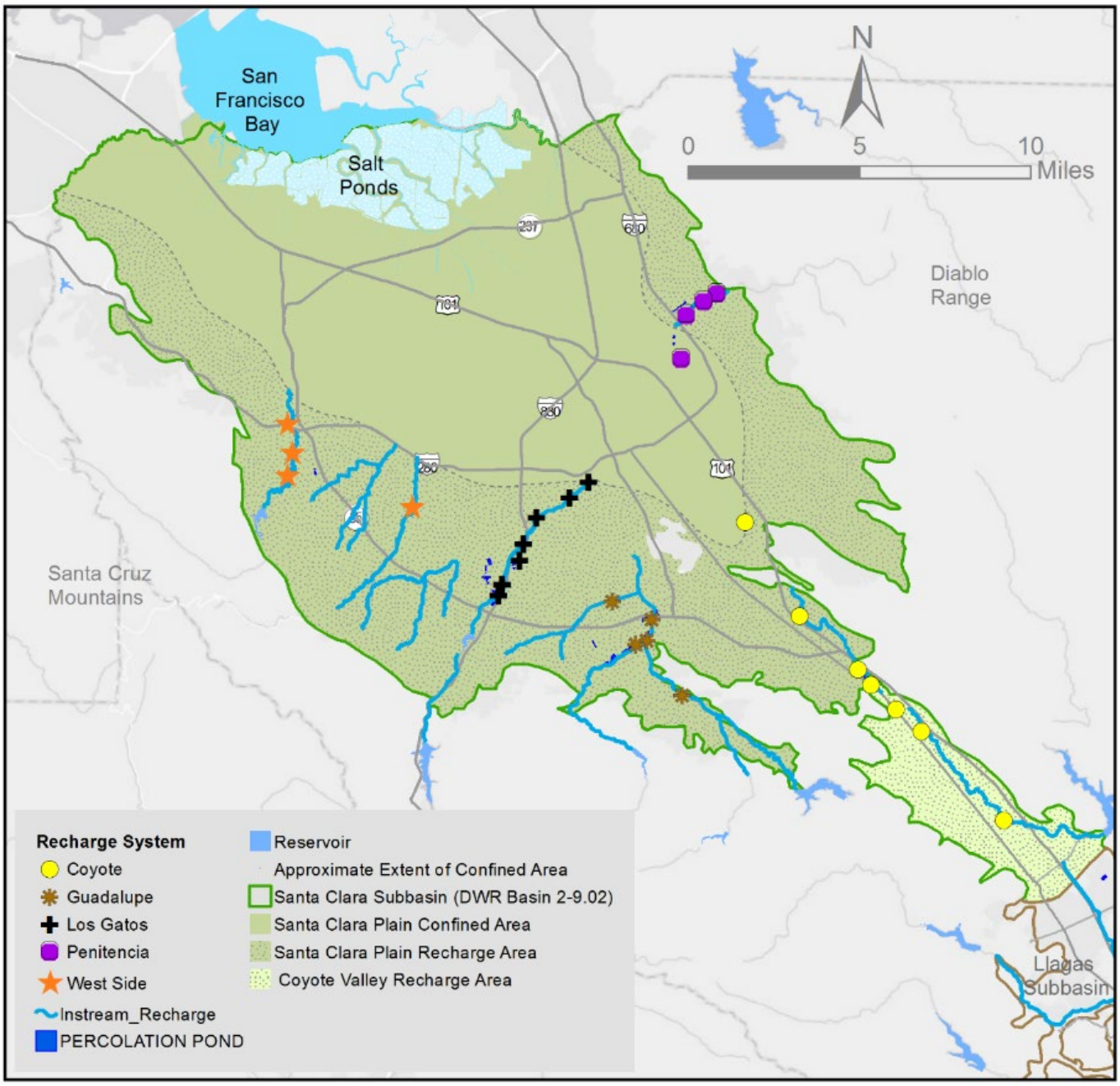

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Figure 7-15. Location of Valley Water Recharge Water Quality Sampling Locations in the Llagas Subbasin

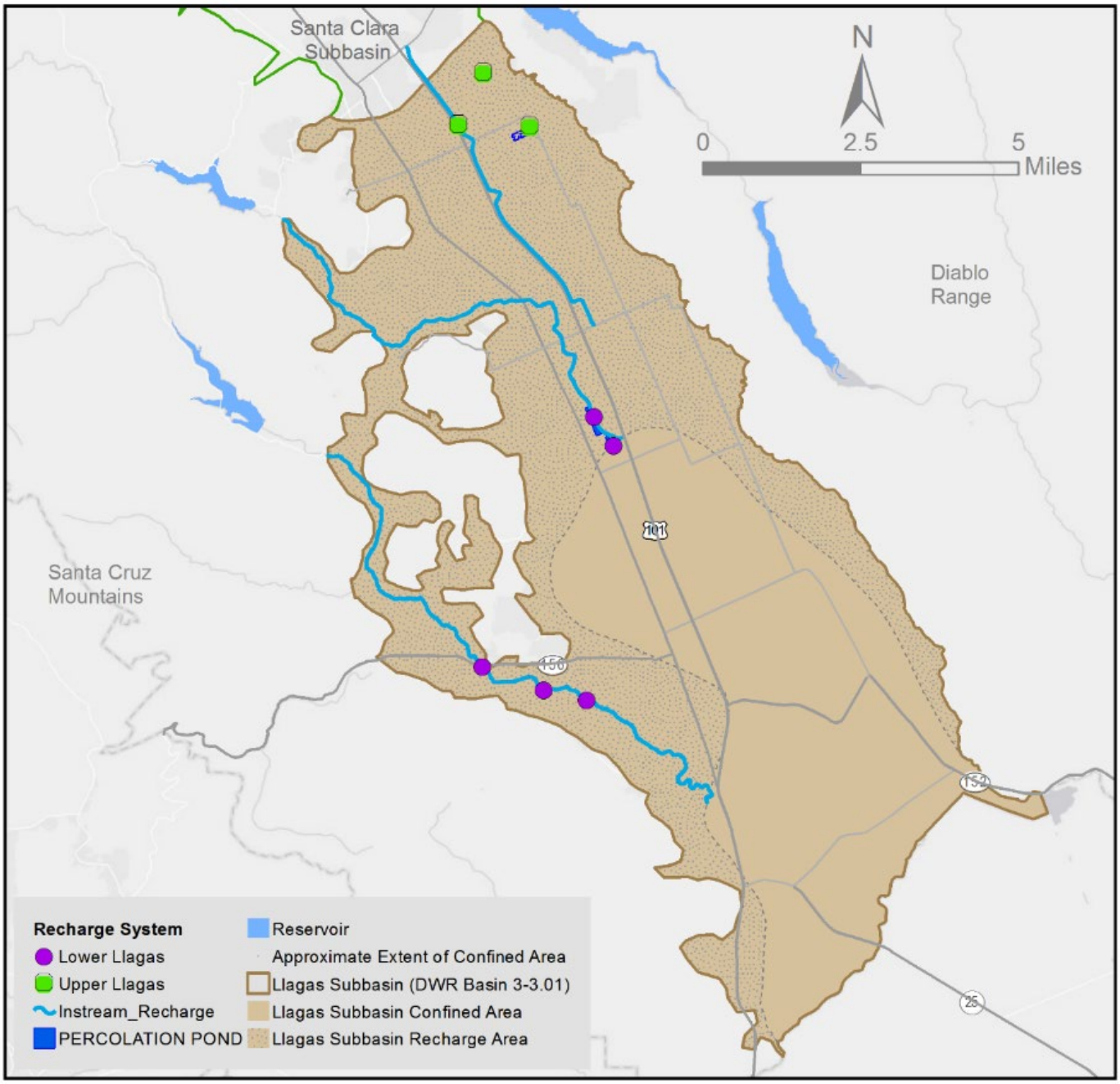

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Table 7-10. Recharge Water Quality Monitoring Schedule

Recharge System	Number of Samples per System	Number of Seasonal Events	Total	2027 and 2030	2028 and 2031	2029 and 2032
Coyote Recharge System	7	2	21		21	
Guadalupe Recharge System	5	2	15			15
Los Gatos Recharge System	7	2	21	21		
Upper Llagas Recharge System	3	2	9	9		
West Side Recharge System	4	2	12		12	
Penitencia Recharge System	4	2	12			12
Lower Llagas Recharge System	5	2	15			15
Total	**35**	**14**	**105**	**30**	**33**	**42**

Table 7-11. Recharge Water Quality Monitoring Parameters

Parameter Type	Parameter	Methods
Basic Water Quality Parameters	Metals and Trace Elements	EPA 200.7/200.8
	Mercury	EPA 245.1
	Inorganics	EPA 300/300.1
	Turbidity	SM2130B
	Alkalinity	SM2320B
	Hardness	SM2340C
	Conductivity	SM2510B
	Total Dissolved Solids	SM2540C
	Chloride	SM4500Cl D
Organic Parameters	Volatile Organic Compounds	EPA 524.2[1]
	Semi-Volatile Organic Compounds	EPA 525.2[1]
	PFAS	EPA 1633
Field Parameters	Oxygen	Field
	pH	Field
	Source Temperature	Field
	Specific Conductance-Field	Field
	Turbidity-Field	Field

Note:
[1] Only measured at select sites near higher risk land uses.

Basic water quality parameters, including inorganic water quality parameters, allow for determination of recharge water quality at each selected site. Ongoing monitoring helps identify any changes in water quality or potential adverse impacts to groundwater quality. Measured field parameters also help to identify potential changes to groundwater quality from recharge activities.

Some creeks in the Santa Clara County have been identified by the State Water Resources Control Board as impaired water bodies due to the presence of certain pesticides.[147] Herbicides, pesticides, semi-volatile organic compounds (semi-VOCs) and volatile organic compounds (VOCs) present a greater

147 State Water Resources Control Board, Total Maximum Daily Load Program: California's 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments, www.waterboards.ca.gov.

risk to groundwater contamination at recharge facilities due to high soil permeability.[148] The recharge facilities with the greatest potential for highway, industrial, and commercial facility runoff are monitored for semi-VOCs and VOCs since these are the likely sources for introducing these parameters. However, to date, semi-VOCs and VOCs have not been detected at any recharge facilities where they have been monitored.

7.4.1.3 Monitoring Protocols

Prior to collecting samples, Valley Water measures field parameters including temperature, dissolved oxygen, pH, and electrical conductivity at the water's edge and records related data. For in-stream recharge facilities, the width and depth are also measured and recorded or, if it is not possible to do so safely, these measurements are estimated. Afterwards, samples are collected from the one-foot depth horizon by inverting the sample bottle and submersing it below the surface approximately one foot and then returning the bottle to the upright position, allowing it to fill while minimizing entry of floating debris into the sample container. Prior to filling sample containers, each is tripled rinsed with water from the same recharge facility as that which is being sampled.

If access to the water's edge is difficult, a telescopic pole with a 500-milliliter cup attached to the end is used to collect samples, which are then quickly decanted into the proper sample containers. The cup is inverted as with a regular sample container prior to submersion to obtain a sample from the approximate one-foot depth interval.

7.4.1.4 Recharge Water Quality Data Management

Data generated by this program are first quality assured then transferred electronically to a multi-user database that allows for secure storage and 'read-only' privileges for users. Actual hard copy laboratory reports are scanned into electronic format and placed into a document archival system with key identifiers to allow easy retrieval.

7.4.1.5 Recharge Reporting and Communication

Data from this program reflects the quality of water contained in the raw surface water used for recharge, which is not subject to drinking water standards and may differ considerably from drinking water obtained from wells. Data collected is evaluated and reported annually in Valley Water's Water Year Report.

7.4.2 Surface Water Flow Monitoring

Valley Water measures surface water stage and flow rates in streams and channels to ensure that recharge facilities are receiving appropriate flows, to comply with water rights reporting and reservoir restrictions, and to meet environmental requirements. Surface water flow data also helps Valley Water evaluate groundwater interaction with surface water as described in Section 6.3. Real-time and archived stream gauging data are available on Valley Water's website.[149] Stream gauging locations in the Santa Clara and Llagas subbasins are presented in Figures 7-16 and 7-17.

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148 USEPA, Potential Groundwater Contamination from Intentional and Unintentional Stormwater Infiltration, 1994; and Burton, G. and Pitt, R., Stormwater Effects Handbook, 2002.
149 Valley Water, ALERT System Real-Time Data: http://alert.valleywater.org/.

Figure 7-16. Santa Clara Subbasin Stream Gauging Locations

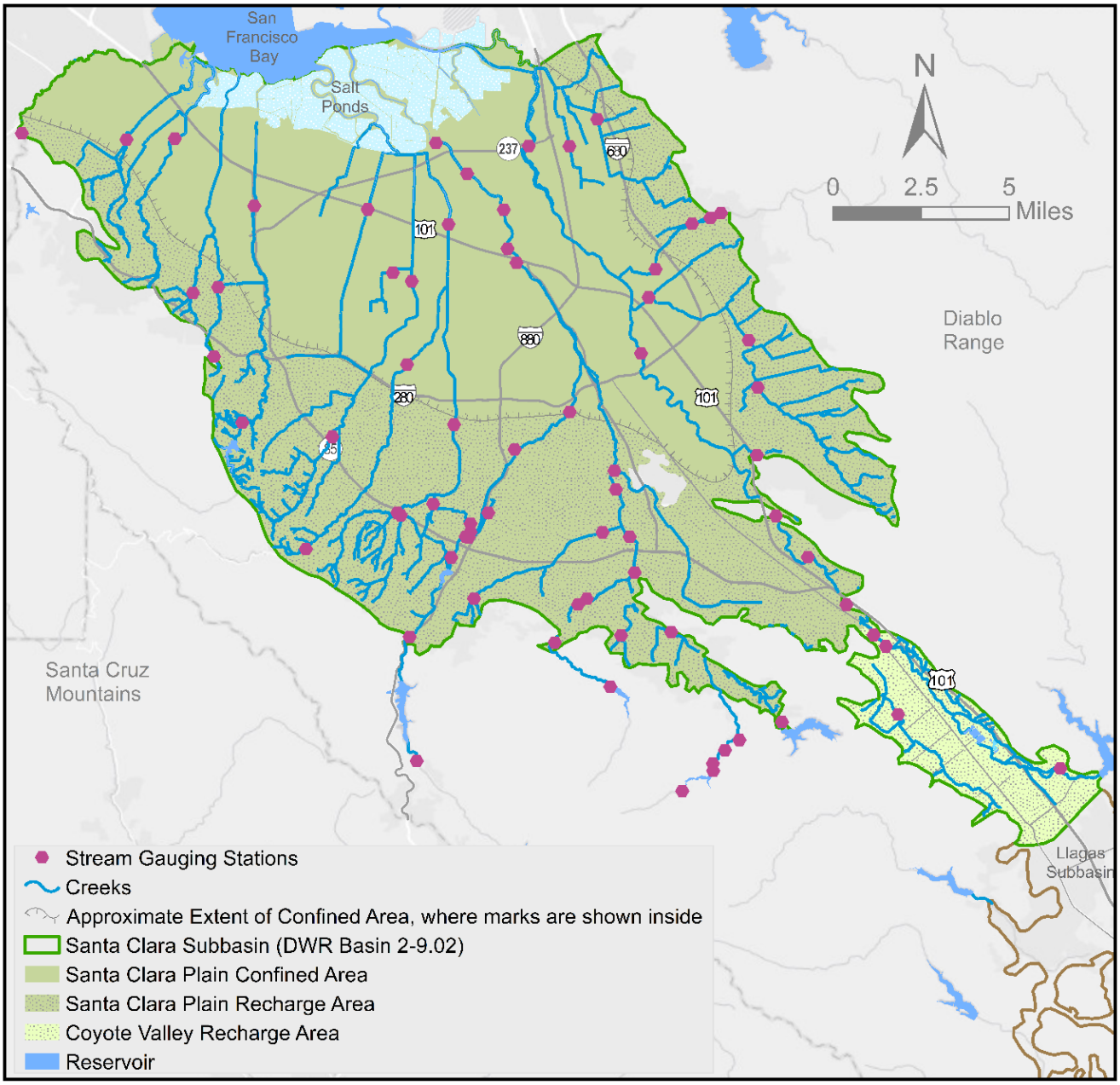

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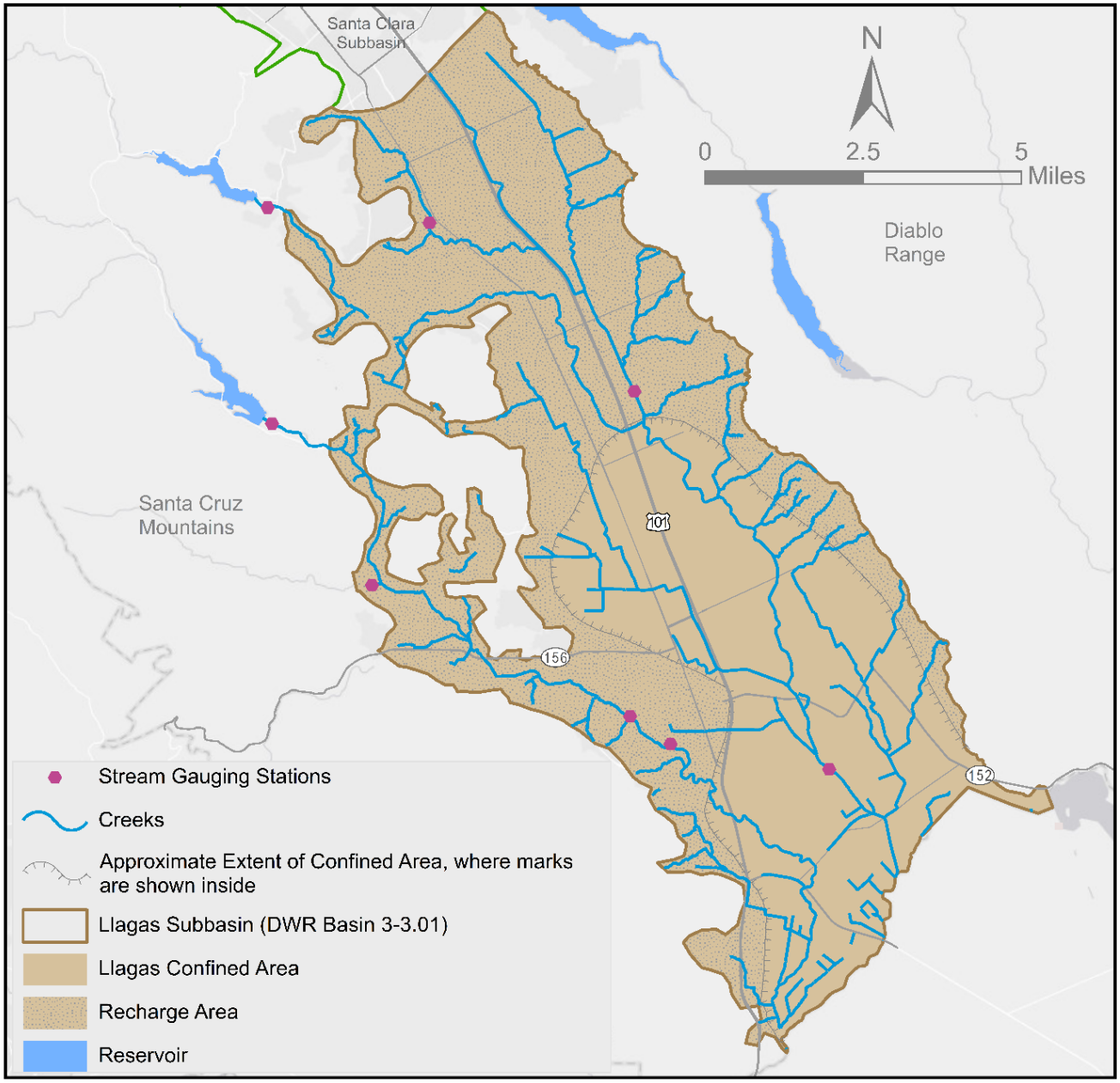
Figure 7-17. Llagas Subbasin Stream Gauging Locations



7.4.3 Surface Water Quality Monitoring by Other Agencies

Other agencies conducting surface water quality monitoring in Santa Clara County include the Central Coast Regional Water Quality Control Board and SCVURPPP as described below.

7.4.3.1 Central Coast Ambient Monitoring Program

The Central Coast Ambient Monitoring Program (CCAMP) is the Central Coast Regional Water Quality Control Board's regional water quality monitoring program. The CCAMP program aims to collect, assess, and disseminate water quality information to aid decision makers and the public in maintaining and promoting, restoring, and enhancing water quality within the Central Coast region. General programmatic goals of CCAMP are to 1) determine the status and trends of surface, estuarine and coastal water quality

and associated beneficial uses in the Central Coast Region; 2) coordinate with other data collection efforts; and 3) provide information in easily accessible forms to support decision-making.[150]

CCAMP maintains permanent monitoring sites that provide a framework for trend analysis and detection of emerging water quality problems. CCAMP monitors a suite of 33 sites on an ongoing basis and rotates through an additional 30 sites annually in five watershed areas. The program design includes monthly monitoring for standard water quality parameters and flow (where accessible). Other approaches may be used at some sites based on funding and hydrogeomorphological considerations or special interest (such as known discharges or existing Total Maximum Daily Loads (TMDLs)).[151]

7.4.3.2 Santa Clara Valley Urban Runoff Pollution Prevention Program

SCVURPPP is an association of fifteen agencies that work together under a MOU to more effectively comply with the San Francisco Bay NPDES Municipal Regional Stormwater Permit (MRP). Member agencies include Valley Water, County of Santa Clara, and the 13 individual cities in northern Santa Clara County.

SCVURPPP's mission is to assist in the protection of beneficial uses of receiving waters by preventing pollutants generated from activities in urban service areas from entering runoff to the maximum extent practicable. Compliance elements of the MRP include pollution prevention, source control (including construction site control), illicit discharge control, municipal operations, water quality monitoring, and outreach among others. Towards this end, SCVURPPP conducts local water quality monitoring and participates in the San Francisco Bay Regional Monitoring Program (RMP).

The current MRP was reissued on July 1, 2022 and will remain in effect through at least June 30, 2027. Provision C.8, water quality monitoring done on behalf of SCVURPPP consists of several components to evaluate the effectiveness of stormwater management actions, assess receiving water conditions, detect trends in water quality over time, identify appropriate management actions, and inform future monitoring program implementation, including 1) low impact development (LID) effectiveness; 2) trash load reduction; 3) pollutants of concern (e.g., legacy pollutants such as mercury and polychlorinated biphenyls); and 4) pesticides and toxicity control. The water quality monitoring components changed slightly from past iterations of the MRP to add new monitoring components and removal of creek status monitoring. Water quality data collected by SCVURPPP now includes a collection of analytes including dissolved and total metals, emerging contaminants, trash flow and categorization, bacteria, sediment chemistry, water and sediment toxicity, pesticides, and basic water quality parameters such as dissolved oxygen, temperature, etc. Water quality data collected by SCVURPPP are stored in the California Environmental Data Exchange Network (CEDEN) database. Results are presented each year in an annual report.[152]

The SCVURPPP Monitoring and Assessment Program is conducted to achieve specific objectives and requirements of the MRP and is not carried out continuously. For over two decades, the SCVURPPP Monitoring and Assessment Program collected and analyzed water quality monitoring data from hundreds of creek sites and most recently several low impact development sites located within the major Santa Clara Basin watersheds. Water samples were analyzed for conventional water quality parameters, chemical pollutants (metals, organic, and emerging contaminants), aquatic toxicity, and pathogen indicators. Updates on the monitoring efforts are available on the SCVURPPP website.[153]

150 https://www.ccamp.org/
151 Central Coast Ambient Monitoring Program: http://www.ccamp.org/ccamp/ccampa3.htm
152 Most recent SCVURPPP Annual Report: https://scvurppp.org/2025/09/26/fy-24-25-annual-report/.
153 Santa Clara Valley Urban Runoff Pollution Prevention Program: https://scvurppp.org/.

7.5 REPORTING AND DATA AVAILABILITY

Monitoring data provides the basis for numerous Valley Water programs, projects, and management decisions, including annual water supply operations and long-term water utility planning. Data collected by Valley Water is made publicly available on Valley Water's website[154] through several regular publications as shown in Table 7-12 below. Water level data are also available on Valley Water's Groundwater Elevation App[155].

Table 7-12. Groundwater Reports

Report	Frequency of Publication	Contents
Water Tracker	Monthly	Overview of current water supply conditions, including high-level summary of groundwater levels, estimated pumping and managed recharge.
Monthly Groundwater Condition Report	Monthly	More detailed information on current groundwater levels, estimated pumping, and managed recharge to supplement the monthly Water Tracker.
Protection and Augmentation of Water Supplies (PAWS) Report	Annual (February)	Information on water supply and use; groundwater recharge, pumping, levels, and storage; in-lieu recharge, projected water supply availability and demand, and activities to protect and augment water supplies as required by the District Act.
Annual Groundwater Summary Report	Annual (July)	Summarized information on groundwater quality conditions in Santa Clara and Llagas subbasins for the preceding water year, focusing on parameters with primary and secondary MCLs.
Water Year Report	Annual (April 1)	Annual report submitted to DWR by April 1 of each year following the adoption of the Alternative Plan, as required under California Code of Regulations Title 23, Division 2, Chapter 1.5, Subchapter 2, Article 7, §356.2. This report summarizes information on groundwater conditions and management, included groundwater level elevation data, water supply and use (groundwater extraction, surface water supply used, total water use, and change in groundwater storage), and plan implementation.

7.6 GROUNDWATER MODELS

Valley Water uses calibrated numerical groundwater models to support operational decisions, short-term water supply outlook, SGMA compliance groundwater management updates, and long-term water supply planning. These include operational and water supply system models as well as groundwater flow models, which are described in this section. Currently, Valley Water maintains three groundwater models: two for the Santa Clara Subbasin (one for the Santa Clara Plain and one for Coyote Valley) and a separate model for the Llagas Subbasin (Figure 7-18). These models are used to evaluate and forecast groundwater storage and water levels under various groundwater demand, operational scenarios, and hydrologic conditions. Maintaining calibrated models that can reasonably forecast groundwater conditions is an important part of Valley Water's comprehensive groundwater management strategy.

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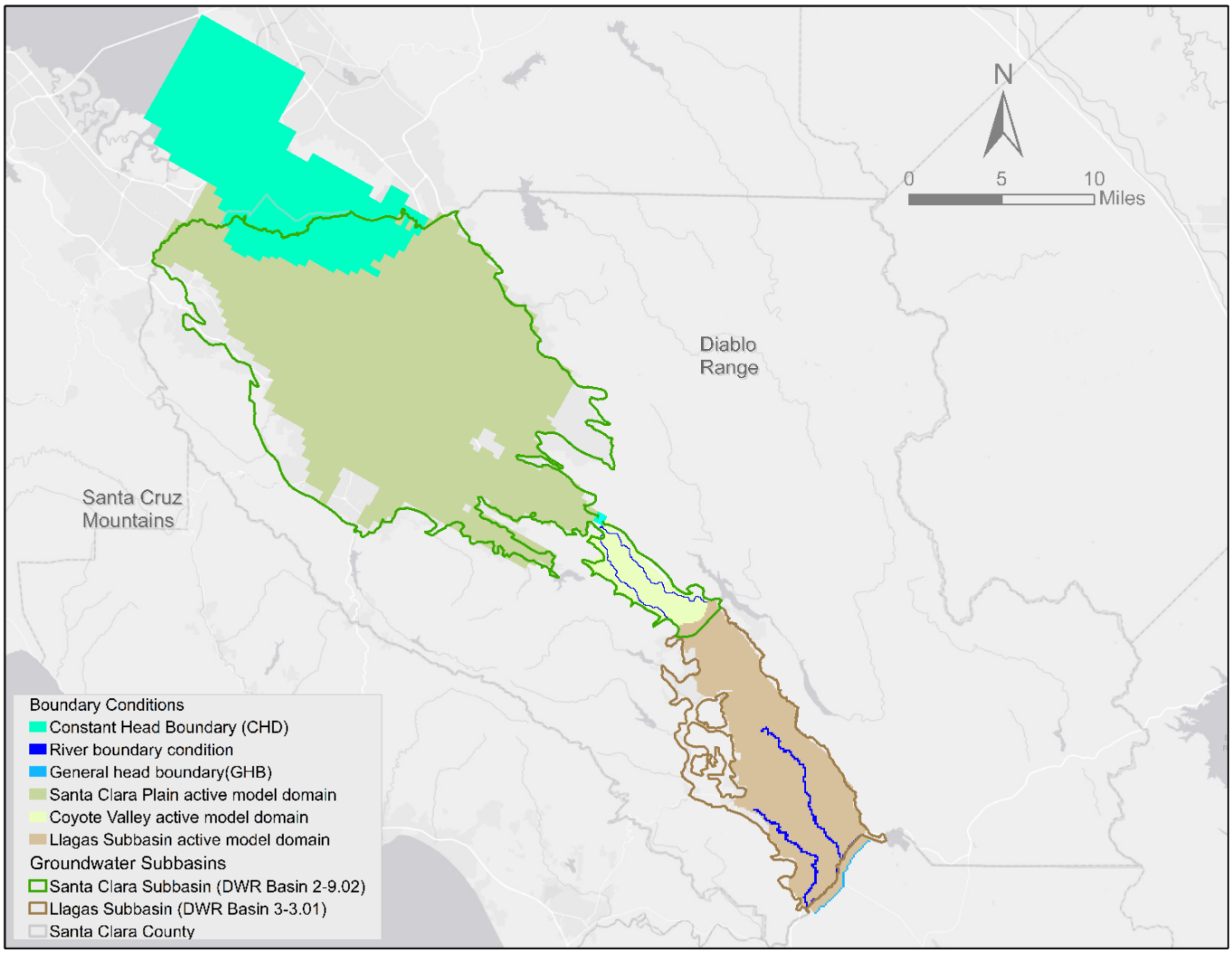
154 http://www.valleywater.org
155 https://gis.valleywater.org/Wells.html

Figure 7-18. Groundwater Flow Model Domain and Boundary Conditions



7.6.1 Santa Clara Subbasin Models

Valley Water uses and maintains two numerical groundwater models for the Santa Clara Subbasin: one for Santa Clara Plain and the other for Coyote Valley, as described below.

7.6.1.1 Santa Clara Plain Model

The Santa Clara Plain Model is a numerical groundwater flow model for the northern Santa Clara Valley.[156] The numerical model is based on the hydrogeologic conceptual model presented in the Hydrogeologic Interpretation Draft Technical Memorandum.[157] The model was developed and runs on MODFLOW 88/96, with different MODFLOW packages representing input data from beginning of 1970 to the present on a monthly time-step basis. The model has been used to evaluate groundwater supplies under current and projected future demands across a range of managed recharge operations and hydrologic conditions. It supports informed operational decision-making, short-term water supply forecasting, SGMA compliance and groundwater management updates, long-term water supply planning, and the sustainable management of groundwater resources within the Santa Clara Plain. The Santa

156 CH2M HILL, Santa Clara Valley Groundwater Model Project, Basinwide Groundwater Flow Model, 1992a.
157 CH2M HILL, Santa Clara Valley Groundwater Model Project, Hydrogeologic Interpretation, 1992b.

Clara Plain model uses the MODFLOW model[158] to simulate groundwater flow in the Santa Clara Plain, with the model domain (Figure 7-18) extending from the Coyote Narrows (Metcalf Road) in the south to the Santa Clara-Alameda and Santa Clara-San Mateo county lines in the north. The model area encompasses most of the alluvial fill in the northern Santa Clara Valley.

The Santa Clara Plain model has six layers. Layers 1 and 2 represent shallow aquifers above the regional confining layer and extend only to the confined area boundary. Layer 3 extends over the entire model domain, representing the principal aquifer under the confining layer in the center of the basin and the shallow aquifer in the unconfined area for the remainder of the domain. Layers 4, 5, and 6 represent the deeper zones of the principal aquifer, which vary in extent based on the shape of the basin and bedrock encountered at depth. The model grid contains 57 rows and 92 columns. Active grid cells encompass an area of approximately 315 square miles. The smallest cells have a grid spacing of 1,000 feet by 1,000 feet and the largest cells have a grid spacing of 6,000 feet by 6,000 feet.

Model boundaries include constant head and no-flow boundaries along the northern and southern edges of the Santa Clara Plain, respectively. Constant head cells at the San Francico Bay boundary were assigned to simulate groundwater interactions between the Bay and the Santa Clara Plain aquifers. A constant head boundary at the Coyote Narrows was assigned to represent subsurface flow from the Coyote Valley to the Santa Clara Plain resulting from the hydraulic connection between the aquifers at that boundary. All other model boundaries along the lateral edges and bottom the Santa Clara Plain are represented by no-flow boundary cells. A specified-flux boundary condition representing recharge from different recharge components was assigned to the top surface of the model. In addition, specified-flux boundary conditions representing groundwater pumping were assigned to different model layers based on well construction information. This approach allows pumping fluxes to be distributed accurately among the corresponding layers of the model.

The model has two major inflow components: managed recharge and natural recharge. The managed recharge occurs at the Valley Water in-stream recharge and off-stream percolation (recharge) ponds facilities. Natural recharge includes deep percolation of rainfall, minor un-gauged percolation from streams, mountain front recharge, water loss from transmission and distribution lines, sewer line exfiltration, and return water from agricultural and all other pumping. The major outflow component is groundwater pumping. Minor outflow components accounted for in the model include evapotranspiration, sewer infiltration, and subsurface flow to San Francisco Bay (shallow layers) and aquifers beneath San Francisco Bay (deeper layers) through a constant head boundary.

The initial conditions of the model are based on the regional groundwater elevation head distribution developed from water level data collected during late 1969 and early 1970. The model is continuously updated as new data becomes available. In addition to updating model input data, Valley Water routinely evaluates the calibration status of the groundwater flow model as part of its ongoing modeling improvement efforts to determine whether refinement, recalibration, or other improvements are needed.

7.6.1.2 Coyote Valley Model

In 2000, CH2M Hill developed a finite element Coyote valley groundwater model using MicroFEM for the Metcalf Energy Center.[159] CH2M Hill transformed the MicroFEM finite element model into a finite difference grid using data from mid-1987 through 1998 in six-month increments and provided the finite difference grid model to Valley Water in early 2000s. Valley Water staff made significant modifications to the CH2M Hill finite difference grid model and use the refined model to assess groundwater conditions in Coyote Valley. Since 2005, Valley Water has been using this model to support informed operational decisions, short-term water supply outlook, SGMA compliance and groundwater management updates,

158 McDonald and Harbaugh, A modular three-dimensional finite-difference ground-water flow model ,1988.
159 CH2M Hill, Coyote Valley Groundwater Report, 2000.

long-term water supply planning and the sustainable management of groundwater resources in Coyote Valley.

The Coyote Valley model boundary (Figure 7-18) extends from Metcalf Road at the Coyote Narrows in the north to the groundwater divide near Cochrane Road (Morgan Hill) in the south. The eastern and western boundaries are the contact between the valley fill alluvial sediments and the bedrock exposed along the edge of the valley. The finite difference model grid contains 140 rows and 150 columns, with a uniform grid spacing of 250 feet by 250 feet. The model runs on both MODFLOW 88/96 and MODFLOW 2000, using different MODFLOW packages to represent input data spanning from mid-1987 to present, with a monthly time step. The model has four layers: three top layers representing alluvial sediments and the bottom layer representing the Santa Clara formation. The three top layers that represent the alluvium are of equal thickness, which provides greater flexibility on assigning groundwater pumping to specific depth intervals or model layers.

The model boundary conditions consist of time-variant constant head boundaries, no-flow and river boundaries. The time-variant constant head boundary at the Coyote Narrows along the northern model boundary was assigned to simulate subsurface groundwater exchange between the Coyote Valley and the Santa Clara Plain, primarily representing subsurface groundwater outflow from the Coyote Valley to the Santa Clara Plain area. All other model boundaries along the eastern, western, and southern lateral edges, as well as the bottom the model, are represented as no-flow boundaries. River boundary conditions were assigned along Coyote and Fisher creeks to simulate managed recharge releases along Coyote creek, as well as, surface water and groundwater interactions along the lower reaches of Coyote and Fisher reeks where groundwater discharge to creek occurs. Specified-flux boundary condition representing areal recharge from various recharge components was assigned to the top surface of the model. In addition, specified-flux boundary condition representing groundwater pumping was assigned to different model layers based on well construction information. This approach allows pumping fluxes to be distributed accurately among the corresponding layers of the model.

The inflow components of the water budget include managed recharge releases along Coyote Creek, natural stream seepage from upper Fisher Creek, and natural recharge from the deep percolation of rainfall, agricultural irrigation, and septic system return flows. The outflow components of the water budget include groundwater pumping, subsurface outflow through the Coyote Narrows, evapotranspiration from shallow groundwater areas, and groundwater discharges along the lower reaches of Fisher and Coyote creeks.

The initial conditions of the model are based on the regional groundwater elevation head distribution developed from water-level data collected in June 1987. The model is continuously updated as new data become available. In addition to updating model input data, Valley Water routinely evaluates the calibration status of the groundwater flow model as part of its ongoing model improvement efforts to determine whether refinements, recalibration, or other updates are needed.

7.6.2 Llagas Subbasin Model

The Llagas Subbasin groundwater flow model was developed in 2005 to provide Valley Water with a tool to support management of the subbasin.[160] The model has been used to evaluate groundwater supplies under current and projected future demands across a range of managed recharge operations and hydrologic conditions. It supports informed operational decision-making, short-term water supply forecasting, SGMA compliance and groundwater management updates, long-term water supply planning, and the sustainable management of groundwater resources within the Llagas Subbasin.

160 CH2MHill, Llagas Basin Numerical Groundwater Model Report, 2005.

The Llagas model was developed with a finite difference gridding method using MODFLOW 2000 to assess the subbasin response to groundwater demand, managed recharge operations and hydrologic conditions using data from the water year 1988 to water year 2002 in six-month increments. The model runs on MODFLOW 2000, using different MODFLOW 2000 packages to represent input data spanning from October 1987 to present, with a monthly time step. The model grid (Figure 7-18) covers the main alluvial areas of the Llagas Subbasin, which extends from Cochrane Road in the north to the subbasin's southern boundary near the Pajaro River. The finite difference grid contains four active layers of 200 rows and 140 columns, with a uniform grid spacing of 500 feet by 500 feet. The model has four parallel layers that roughly coincide with the distribution of production well perforations. The bottom of Layer 1 is below the lowest water levels anticipated during simulations, and the bottom of Layer 4 is the top of the bedrock interpreted from cross-sections. The elevation and thickness of the layers are based on borehole lithology and drillers logs.

The model boundary conditions consist of general head boundaries, no-flow boundaries, drains, and river boundaries. The model has no-flow boundaries on the east and west sides of the model, at Cochrane Road in the north, and at the bottom of the model. A general head boundary was assigned at the southern boundary to simulate the head-dependent subbasin groundwater exchange between the Llagas and North San Benito Subbasins. Specified-flux boundary conditions representing recharge from various recharge components were assigned to the top surface of the model. In addition, specified-flux boundary conditions representing groundwater pumping were assigned to different model layers based on well construction information. This approach allows pumping fluxes to be distributed accurately among the corresponding model layers.

The Llagas model inflow water budget components include managed recharge to creeks and off-stream percolation (recharge) ponds, natural recharge (estimated from deep percolation of rainfall, septic return flow, and stream seepage), and subsurface inflow from bedrock uplands, alluvial tributary canyons, and the adjacent North San Benito Subbasin. The primary outflow component is groundwater pumping, with smaller fractions of evapotranspiration, gaining creeks, and subsurface outflows to the North San Benito Subbasin.

The initial conditions of the model are based on the regional groundwater elevation head distribution developed from water-level data collected in September 1987. The model is continuously updated as new data become available. In addition to updating model input data, Valley Water routinely evaluates the calibration status of the groundwater flow model as part of its ongoing model improvement efforts to determine whether refinements, recalibration, or other updates are needed.

7.6.3 Groundwater Storage Analysis

Groundwater provides nearly all water used in the Coyote Valley and Llagas Subbasin and is an important water supply in the Santa Clara Plain. Valley Water regularly analyzes groundwater storage to support operational decisions, contingency planning, and planning to meet future needs. To support near-term operations, Valley Water uses groundwater models to estimate storage for the current year and simulate conditions for the following calendar year under a range of projected water supply and hydrologic scenarios. As the water year progresses and more water supply and demand information become available, operations plans are updated accordingly. The goal of operational planning is to ensure adequate supplies are available and groundwater resources are protected. Projected end-of-year groundwater storage is used to evaluate the storage outcome measure (Chapter 5) and is the key trigger for Valley Water's Water Shortage Contingency Plan, which recommends increased short-term water use reduction measures as groundwater storage declines.

Groundwater models are also used to support SGMA compliance groundwater management updates and long-term water planning efforts such as the UWMP and WSMP and individual projects. Understanding groundwater conditions under various pumping and hydrologic scenarios supports the analysis of the potential impacts of various projects, or when and where additional investments (such as additional recharge) may be needed.

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CHAPTER 8 – NEXT STEPS

Previous chapters of this 2026 Groundwater Management Plan outline Valley Water's basin sustainability goals, strategies to meet those goals, related programs and activities, and outcome measures to gauge performance. This chapter describes outcome measure evaluation, potential tools to address outcome measure performance, and recommendations to ensure continued sustainability.

8.1 EVALUATION AND REPORTING OF OUTCOME MEASURES

The 2026 GWMP is based on an adaptive groundwater management philosophy that is consistent with SGMA and uses a "Plan, Do, Check, Act" framework or model of continuous improvement:

- Identify sustainability goals and strategies in accordance with the District Act, Board policy, and SGMA ("Plan")
- Implement basin management programs and activities in accordance with strategies to achieve sustainability goals ("Do")
- Conduct monitoring, analyze results, and compare to outcome measures and corresponding outcome measure – lower thresholds ("Check")
- Modify existing programs or evaluate and develop new strategies and tools if outcome measures and outcome measure – lower thresholds indicate improvement is needed ("Act")

The outcome measures and corresponding outcome measure – lower thresholds presented in the 2026 GWMP will be evaluated on an annual basis and presented in the Annual SGMA Water Year Reports, which will also include recommendations for action as needed. Valley Water will review and update the GWMP as needed, but at least every five years. This will ensure compliance with SGMA requirements for GSP Alternatives and provide current groundwater management information to support five-year updates of the Urban Water Management Plan as required by State law.

8.2 ADDRESSING OUTCOME MEASURE PERFORMANCE

Significant investments in conjunctive water management, close coordination with water retailers, and careful planning have allowed Valley Water to overcome historical undesirable results related to long-term overdraft, subsidence, and seawater intrusion to achieve sustainable groundwater conditions. Valley Water's approach to groundwater management has evolved over many decades in response to numerous challenges, and this adaptive approach will help meet future water supply challenges to ensure continued groundwater sustainability.

If evaluation of the outcome measures and outcome measure – lower thresholds indicates a need for improvement, Valley Water will first assess potential changes to existing programs and activities prior to considering significant groundwater management changes. Any significant policy or investment decisions would be developed and evaluated in coordination with other Valley Water planning efforts and in consultation with water retailers and local interested parties, as Valley Water does in current planning and budgeting processes.

8.2.1 Groundwater Supply Reliability

Maintaining reliable groundwater supplies helps meet community water needs and avoid undesirable results such as long-term overdraft, land subsidence, and seawater intrusion. The 2025 UWMP projects that countywide water supplies are projected to be sufficient to meet Valley Water's level of service goal through 2050 under a normal, a single dry, and a five consecutive dry year conditions.[161] The greatest challenge to Valley Water's water supply reliability is multiple year droughts, such as the 2012–2016 and

161 Valley Water, 2025 Urban Water Management Plan.

2020–2022 droughts. As part of the 2020–2022 drought response, Valley Water called for a mandatory 15% water-use reduction relative to 2019, conducted a comprehensive campaign to increase the community's awareness and participation in water conservation, worked with water retailers on water source shifts, imported water from the Semitropic Water Bank, and secured emergency imported water supplies, among other actions.

Adopted in 2025, Valley Water's WSMP 2050 emphasizes the importance of adaptive management strategies to provide a reliable supply of water to meet countywide needs through 2050. The WSMP 2050 recommends the lower cost strategy that will benefit groundwater supply reliability through investing in a diverse water supply portfolio, including direct potable reuse and south county groundwater recharge projects, as well as additional storage and imported water projects.

In addition to those projects and actions outlined in the 2025 UWMP and WSMP 2050, Valley Water's other existing groundwater management tools for ensuring groundwater reliability include:

- Implementation of managed recharge and groundwater pumping offsets through in-lieu recharge programs.
- Cooperation with water retailers on source shifts and shortage response.
- Creation of new or modified groundwater benefit zones beyond recent changes made in 2020[162].
- Coordination with water retailers and land use agencies on General Plans, Urban Water Management Plans, and water supply assessments.

Potential groundwater management activities and tools that Valley Water could also consider if needed to ensure sustainable groundwater supplies include:

- Changes to the groundwater charge rate structure.
- Changes in Valley Water's well permitting and well metering processes.
- Institutional agreements with water retailers related to groundwater management.
- Regulation of groundwater pumping under Board Resolution 18-04 (Appendix E), if needed. As noted in the resolution and Chapter 1, continued collaboration with water retailers and other pumpers is the preferred approach to addressing future challenges.

8.2.2 Groundwater Quality Protection

Challenges to protecting groundwater quality include intensified land use, emerging contaminants such as PFAS, and more stringent regulatory standards. Valley Water does not control land use or deliver groundwater directly to customers, so protecting groundwater quality requires coordination with water retailers, land use agencies, regulatory agencies, and the public.

Valley Water's existing groundwater management tools to protect groundwater quality include:

- Coordination with regulatory agencies to address threats such as PFAS and ensure adequate cleanup at high-threat remediation sites.
- Coordination with local land use agencies on water supply assessments, land use proposals, stormwater infiltration devices, septic systems, and small water systems served by wells.
- Outreach to domestic well owners on well maintenance and water quality issues, such as nitrate.

162 https://www.valleywater.org/your-water/where-your-water-comes/groundwater/groundwater-benefit-zone-study

Potential groundwater management activities and tools that Valley Water could also consider if necessary to improve groundwater protection include:

- Increased coordination with regulatory agencies to ensure high-threat contamination is promptly and adequately addressed.
- Expanded outreach efforts to raise awareness of groundwater protection, including outreach to agricultural users in coordination with local partners and the Central Coast Regional Water Quality Control Board.
- Coordination with local land use agencies and others to develop guidelines or best management practices related to specific threats.
- Expanded efforts with legislators and others to target significant threats and fund regulatory efforts.
- Enhanced managed recharge programs to further dilute contaminants.
- Re-initiation of Valley Water's abandoned well destruction assistance program to address vertical conduit threats.
- New groundwater-protection ordinance or regulatory solutions, if needed to protect groundwater quality.
- Coordination with interested parties and partners for special focused studies, as needed.

8.3 GROUNDWATER MANAGEMENT PLAN RECOMMENDATIONS

Valley Water's proactive groundwater management programs and activities have maintained sustainable groundwater levels and storage, minimized land subsidence, and improved groundwater protection. To maintain the long-term sustainability of groundwater resources, the following actions are recommended, with many of these carried forward from 2021 as they are still essential and relevant:

1. **Maintain existing conjunctive water management programs and evaluate opportunities for enhancement or increased efficiency.**

   Programs to recharge groundwater through direct replenishment and in-lieu recharge maintain groundwater levels and flow gradients and are essential to prevent groundwater overdraft, land subsidence, and seawater intrusion. Priorities include efforts to:

   a. Ensure the reliability of Valley Water's water utility infrastructure, including local dams and reservoirs, diversion structures, pipelines, pumping stations, treatment plants, and managed recharge facilities through appropriate maintenance or replacement.

   b. Implement high-priority capital projects that support conjunctive water management, including direct potable reuse, which provides a drought-resilient, locally controlled recharge source, and dam seismic retrofit projects, which will restore full reservoir capacity to better source managed and in-lieu recharge.

   c. Secure local and imported sources of supply, including a long-term solution for reliable Delta conveyance.

   d. Maintain and expand in-lieu recharge programs to offset pumping, including treated water sales, water recycling and water conservation, to reduce demands on the groundwater subbasins.

   e. Encourage water retailers to maintain other water supply sources, including San Francisco Public Utilities Commission contract deliveries to Santa Clara County.

f. Maintain and optimize operations activities that support conjunctive water management, including modeling, forecasting, systems control, and water accounting. For example, continue to periodically evaluate the recharge capacity of the managed recharge facilities.

2. **Continue to aggressively protect groundwater quality through Valley Water programs and collaboration with land use agencies, regulatory agencies, and basin interested parties.**
   A reliable water supply depends not only on quantity, but also on quality. Unlike surface water, most groundwater pumped in the county does not require treatment beyond disinfection, making protection of this local resource all the more important. Priorities include efforts to:

   a. Continue to implement comprehensive programs to evaluate groundwater quality conditions so potentially adverse trends can be quickly identified and appropriate action can be taken before conditions become severe.

   b. Continue to track the threat PFAS and other emerging contaminants pose to local groundwater resources and work with water retailers, regulatory agencies, and other interested parties to take actions needed to protect water supplies.

   c. Collaborate with local partners and regulatory agencies on efforts including salt and nutrient management, stormwater management, land use and policy review, recycled water expansion, and sea-level rise impact to protect groundwater quality.

   d. Evaluate opportunities for expanded partnerships to maximize groundwater protection.

3. **Continue to incorporate groundwater sustainability in Valley Water planning efforts.**
   Future sustainability depends on continued, thoughtful water supply planning and investments. Priorities include efforts to:

   a. Continue implementing the WSMP 2050 to address future challenges to maintain reliable groundwater supplies and implement related projects as appropriate. For example, continue evaluating projects to increase managed recharge capacity and improve water supply reliability in South County[163].

   b. Continue including groundwater sustainability as an important component under Valley Water's long range water supply plans, including the WSMP, UWMP, and related WSCP.

   c. Account for groundwater sustainability during the planning and implementation of multi-benefit projects under Valley Water's Watershed Master Planning.

4. **Maintain adequate monitoring programs and modeling tools.**
   The assessment of groundwater conditions and performance of outcome measures relies on timely, accurate, and representative data. Valley Water has comprehensive groundwater

163 See the South County Recharge Projects in the Water Supply Master Plan 2050.

monitoring programs (see sections 7.1 to 7.4) and calibrated groundwater flow models (see section 7.6), but they need to be maintained and improved. Priorities include efforts to:

a. Acquire and/or install new monitoring wells to address gaps in existing monitoring networks, as updated in Appendix G, and continue to regularly evaluate monitoring networks to address gaps, redundancies, and changing needs.

b. Continue to identify and implement modeling improvements to enhance simulation capabilities, including sea-level rise impacts on seawater intrusion.

c. Continue to improve understanding of interconnected surface water and groundwater.

d. Evaluate the subsidence thresholds at index wells under present-day groundwater conditions for continued protection against resuming inelastic (permanent) subsidence in the Santa Clara Subbasin.

e. As outlined in Appendix F, update the groundwater dependent ecosystem (GDE) maps as new information becomes available during each five-year GWMP periodic evaluation.

5. **Continue and enhance groundwater management partnerships with water retailers and land use agencies.**
   Continued collaboration and strong partnerships with water retailers and land use agencies are needed to ensure future sustainability, with priorities including efforts to:

   a. Continue regular interaction with water retailers through Water Retailer meetings, including the joint Water Supply and Groundwater Subcommittee meetings.

   b. Meet regularly with South County water retailers to discuss groundwater management issues in areas dependent on groundwater.

   c. Explore options for improved management of local water and San Francisco Public Utilities Commission supplies in Santa Clara County.

   d. Maintain contingency plans and further develop management options for water shortages, as well as for local or Delta-related interruptions in supply.

   e. Coordinate with water retailers and local land use agencies on General Plans, water supply assessments, and Urban Water Management Plans.

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A

Acre-Foot
The volume of water necessary to cover one acre to a depth of one foot; equal to 43,560 cubic feet or 325,851 gallons.

Alluvium
A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water, as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, as a cone or fan at the base of a mountain slope.

Aquifer
A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant or economic quantities of groundwater to wells and springs.

Aquitard
A confining bed and/or formation composed of rock or sediment that retards but does not prevent the flow of water to or from an adjacent aquifer. It does not readily yield water to wells or springs, but stores ground water.

Artesian Aquifer
A body of rock or sediment containing groundwater that is under greater than hydrostatic pressure; that is, a confined aquifer. When an artesian aquifer is penetrated by a well, the water level will rise above the top of the aquifer.

B

Basin
A groundwater basin or subbasin identified and defined in the California Department of Water Resources Bulletin 118.

Basin Plan
The Regional Water Quality Control Board's master water quality control planning document that designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater and includes implementation programs to achieve water quality objectives.

Beneficial Use
One of many ways that water can be used either directly by people or for their overall benefit. The State Water Resources Control Board recognizes 23 types of beneficial use with water quality criteria for those uses established by the Regional Water Quality Control Boards.

Bulletin 118
The Department of Water Resources report, entitled "California's Groundwater: Bulletin 118", updated in 2003, or as it may be subsequently updated or revised.

C

CASGEM
The California Statewide Groundwater Elevation Monitoring Program developed by the Department of Water Resources pursuant to Water Code Section 10920 et seq.

Cone of Depression
In an unconfined aquifer, this is an actual depression of the water levels. In confined aquifers (artesian), the cone of depression is a reduction in the pressure head surrounding the pumped well.

Confined Aquifer
An aquifer that is bounded above and below by formations of distinctly lower permeability than that of the aquifer itself. An aquifer containing confined groundwater. See artesian aquifer.

Conjunctive Management/Use
The coordinated and planned management of both surface and groundwater resources to maximize the efficient use of the resource; that is, the planned and managed operation of a groundwater basin and a surface water storage system combined through a coordinated conveyance infrastructure. Water is stored in the groundwater basin for later and planned use by intentionally recharging the basin with available surface water supplies.

G

General Circulation Model (or global climate model)
Numerical models representing physical processes in the atmosphere, ocean, cryosphere and land surface, are the most advanced tools currently available for simulating the response of the global climate system to increasing greenhouse gas concentrations.

Groundwater
Water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water but does not include water that flows in known and definite channels.

Groundwater Basin
An alluvial aquifer or a stacked series of alluvial aquifers with reasonably well-defined boundaries in a lateral direction and having a definable bottom.

Groundwater Budget
A numerical accounting of the recharge, discharge and changes in storage of an aquifer, part of an aquifer, or a system of aquifers. The groundwater equation for mass conservation or balance for an aquifer, part of an aquifer, or a system of aquifers.

Groundwater Charge Zone
A zone in which groundwater production charges are levied to fund District activities that protect and augment groundwater supplies.

Groundwater Demand
The quantity of groundwater within the subbasin needed for beneficial use.

Groundwater Dependent Ecosystem
An ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.

Groundwater Gradient
A measure of the change in groundwater head over a given distance. Groundwater flows from areas of high hydraulic head (high water level elevation) to areas of low head (low water level elevation).

Groundwater Recharge
The natural or intentional infiltration of surface water into the zone of saturation.

Groundwater Subbasin
A subdivision of a groundwater basin created by dividing the basin using geologic and hydrologic conditions or institutional boundaries.

Groundwater Sustainability Agency
One or more local agencies that implement the provisions of the Sustainable Groundwater Management

Act. The Santa Clara Valley Water District is the groundwater sustainability agency for Santa Clara Subbasin and Llagas Subbasin.

Groundwater Sustainability Plan (GSP)
A plan of a groundwater sustainability agency proposed or adopted pursuant to the Sustainable Groundwater Management Act.

I

Imported Water
Non-local source of water. Water is purchased from the State and Federal Water Projects and others outside the groundwater basin's geographical boundaries and transported into the basin for use as surface water or for recharge into the basin.

In-Lieu Recharge
The practice of providing surplus surface water or recycled water to historic groundwater users, thereby leaving groundwater in storage for later use. Water conservation programs also serve as in-lieu recharge by reducing demands, thereby increasing storage.

L

Land Subsidence
The lowering of the natural land surface due to groundwater extraction.

Long-Term Overdraft
The condition of a groundwater basin where the average annual amount of water extracted for a long-term period, generally 10 years or more, exceeds the long-term average annual supply of water to the basin, plus any temporary surplus. Overdraft during a period of drought is not sufficient to establish a condition of long-term overdraft if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

M

Managed Recharge
The addition of water to a groundwater reservoir by human activity, such as putting surface water into dug or constructed spreading basins or injecting water through wells.

Maximum Contaminant Level (MCL)
The highest drinking water contaminant concentration allowed under federal and State Safe Drinking Water Act regulations. Health based MCLs are referred to as Primary MCLS. Secondary MCLs are established for contaminants that may affect aesthetic properties of drinking water such as taste, color, and odor.

N

Natural Recharge
Natural replenishment of an aquifer, generally from runoff, through seepage from the surface.

O

Operational Storage
The usable storage within an aquifer system or groundwater basin that accounts for the avoidance of adverse impacts. It is a dynamic quantity that must be determined from a set of alternative groundwater management decisions subject to goals, objectives, and constraints of the groundwater management plan.

Outcome Measures
Specific, quantifiable goals for the maintenance or improvement of the specified groundwater conditions included in the Plan to achieve the sustainability goal for the basin.

P

Potable Reuse
The use of recycled water as part of the potable water supply. Indirect potable reuse is the use of highly treated recycled water for managed recharge, which provides natural filtration and blending with groundwater prior to its reuse as a potable supply. Direct potable reuse is the direct delivery of highly purified recycled water to the potable water supply.

Public Water System
As defined in Section 116275 of the Health and Safety Code, a public water system is a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. A public water system includes the following:

(1) Any collection, treatment, storage, and distribution facilities under control of the operator of the system that are used primarily in connection with the system.

(2) Any collection or pretreatment storage facilities not under the control of the operator that are used primarily in connection with the system.

(3) Any water system that treats water on behalf of one or more public water systems for rendering it safe for human consumption.

R

Recharge Area
The area that supplies water to an aquifer in a groundwater basin.

Representative Concentration Pathway
A greenhouse gas concentration trajectory adopted by the Intergovernmental Panel on Climate Change (IPCC). Four pathways were used for climate modeling for the IPCC fifth Assessment Report (AR5) (RCPs 2.6, 4.5, 6, and 8.5). The pathways describe different climate futures, all of which are considered possible depending on the volume of greenhouse gases emitted in the future. RCP 8.5 was used in this 2021 GWMP and refers to a radiative forcing value of 8.5 W/m^2. RCP 8.5 is generally taken as the basis for the worst-case climate change scenarios.

S

Salt Water Intrusion
The movement of salt water into a body of fresh water. It can occur in either surface water or groundwater bodies.

Semitropic Groundwater Bank
Long-term water storage project designed to optimize the distribution and use of water resources between the Semitropic Groundwater Bank and its banking partners, like the District. Semitropic receives SWP or CVP surface water from its banking partners in years of ample supplies and delivers it to landowners in Kern County for irrigation use in lieu of groundwater pumping. Groundwater which otherwise would have been pumped remains in storage, credited to the account of the banking partner. In times of surface water shortages, the water may be withdrawn and used by Semitropic or other downstream users in exchange for an equal amount of water conveyed to the District from the Sacramento-San Joaquin Delta.

Sustainable Groundwater Management Act (SGMA)
Legislation signed into state law in 2014 with the intent for groundwater to be managed sustainably in California's groundwater basins by local public agencies and newly-formed groundwater sustainability agencies.

Sustainable Yield
As defined in SGMA (Water Code Section 10721), the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.

U

Unconfined Aquifer
An aquifer which is not bounded on top by an aquitard. The upper surface of an unconfined aquifer is the water table.

Undesirable Result
As defined in SGMA (Water Code Section 10721), an undesirable result is one or more of the following effects caused by groundwater conditions occurring throughout the basin:

1. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
2. Significant and unreasonable reduction of groundwater storage.
3. Significant and unreasonable seawater intrusion.
4. Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
5. Significant and unreasonable land subsidence that substantially interferes with surface land uses.
6. Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Urban Water Management Plan (UWMP)
An UWMP is required for all urban water suppliers having more than 3,000 connections or supplying more than 3,000 acre-feet of water. The plans include discussions on water supply, supply reliability, water use, water conservation, and water shortage contingency and serve to assist urban water suppliers with their long-term water resources planning to ensure adequate water supplies for existing and future demands.

W

Water Budget
An accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored. See groundwater budget.

Water Year
The period from October 1 through the following September 30, inclusive.

Wellhead Protection Area
The surface and subsurface area surrounding a water well or well field that supplies a public water system through which contaminants are reasonably likely to migrate toward the water well or well field.

ACRONYMS AND ABBREVIATIONS

AF: acre-feet

AFY: acre-feet per year

BAO: Board Appointed Officer

Board: Santa Clara Valley Water District Board of Directors

CASGEM: California Statewide Groundwater Elevation Monitoring Program

CCAMP: Central Coast Ambient Monitoring Program

CEC: Constituents of Emerging Concern

CEO: Chief Executive Officer

County: Santa Clara County

CVP: Central Valley Project

CY: Calendar Year

DDW: State Water Resources Control Board Division of Drinking Water

DEH: Santa Clara County Department of Environmental Health

DFW: California Department of Fish and Wildlife

District: Santa Clara Valley Water District

District Act: Santa Clara Valley Water District Act

DSOD: California Division of Safety of Dams

DTSC: California Department of Toxic Substances Control

DWR: California Department of Water Resources

DWSAP: Drinking Water Source Assessment and Protection Program

EC: electrical conductivity

EDD: Electronic Data Deliverable

EIR: Environmental Impact Report

FAHCE: Fisheries and Aquatic Habitat Collaborative Effort

FWS: United States Fish and Wildlife Service

FY: Fiscal Year (July 1 to June 30)

GAMA: Groundwater Ambient Monitoring Assessment

GCM: General Circulation Model (or Global Climate Model)

GCRCD: Guadalupe Coyote Resource Conservation District

GDE: Groundwater Dependent Ecosystem

GIS: Geographic Information System

GMMP: Groundwater Mitigation and Monitoring Plan

GSA: Groundwater Sustainability Agency

GSP: Groundwater Sustainability Plan

GWMP: Groundwater Management Plan

IDT: Integrated Device Technology, Inc.

ILRP: Irrigated Lands Regulatory Program

InSAR: Interferometric Synthetic Aperture Radar

IQR: Interquartile range

LAMP: Local Agency Management Plan

LIDAR: Light Imaging, Detecting, and Ranging

LLNL: Lawrence Livermore National Laboratory

LUFT: Leaking Underground Fuel Tank

MCL: Maximum Contaminant Level

MGD: Million gallons per day

MLE: Maximum Likelihood Estimate

MRP: Municipal Regional Permit

MTBE: Methyl tert-butyl ether

NAVD 88: North American Vertical Datum of 1988

NDMA: N-Nitrosodimethylamine

NGVD 29: National Geodetic Vertical Datum of 1929

NMFS: National Marine Fisheries Service

NPDES: National Pollutant Discharge Elimination System

NTU: Nephelometric Turbidity Unit

OWTS: Onsite Wastewater Treatment Systems

PAWS: Protection and Augmentation of Water Supplies

PFAS: Per- and polyfluoroalkyl substances

PFC: Perfluorochemical

PPT: parts per trillion

PSI: pounds per square inch

QA: Quality Assurance

QC: Quality Control

RCP: Representative Concentration Pathway

RWIG: Recycled Water Irrigation and Groundwater

SBA: South Bay Aqueduct

SBWR: South Bay Water Recycling

SCRWA: South County Regional Wastewater Authority

SCVURPPP: Santa Clara Valley Urban Runoff Pollution Prevention Program

SCVWCD: Santa Clara Valley Water Conservation District

SFEI: San Francisco Estuary Institute

SFPUC: San Francisco Public Utilities Commission

SGMA: Sustainable Groundwater Management Act

SMCL: Secondary Maximum Contaminant Level

SNMP: Salt and Nutrient Management Plan

State Water Board: State Water Resources Control Board

SVAWPC: Silicon Valley Advanced Water Purification Center

SWI: seawater intrusion

SWID: Stormwater Infiltration Device

SWP: State Water Project

TDS: Total Dissolved Solids

TMDL: Total Maximum Daily Load

USEPA: United States Environmental Protection Agency

USGS: United States Geological Survey

UST: Underground Storage Tank

UWMP: Urban Water Management Plan

VOC: Volatile Organic Compound

Water Board: Regional Water Quality Control Board

Water Code: California Water Code

WPCP: Water Pollution Control Plant

WSCP: Water Shortage Contingency Plan

WSMP: Water Supply Master Plan

WTP: Water Treatment Plant

WWTP: Wastewater Treatment Plant

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Appendix A – Board Action and GWMP Outreach

A1. Board Resolution to Adopt the 2026 Groundwater Management Plan (GWMP) for the Santa Clara and Llagas Subbasins and Related Agenda Item (Includes Public Comment Letters Received)

A2. GWMP Outreach – Public Notices

A3. GWMP Outreach – Emails to Interested Parties

A4. GWMP Outreach – List of Meetings Where the GWMP was Discussed

A5. GWMP Outreach – Valley Water Website Information

A6. Environmental Documentation

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Appendix A – Board Action and GWMP Outreach

A1. Board Resolution to Adopt the 2026 Groundwater Management Plan (GWMP) for the Santa Clara and Llagas Subbasins and Related Agenda Item (Includes Public Comment Letters Received)

DRAFT

A2. GWMP Outreach – Public Notices

DRAFT

Newspaper: The Mercury News Advertiser: SANTA CLARA VALLEY WATER DISTR
Issue Date: Sun, 07/19/26 Ad Number: 6973439

TREATMENT 'MOONSHOT'

Behavorial health center plan approved

Sonoma County goes all in on proposed $135 million mental healthcare project

By Marisa Endicott and Austin Murphy
SANTA ROSA PRESS DEMOCRAT

Sonoma County supervisors took action recently to advance a bold new project — the term most frequently used was "moonshot" — to address glaring needs in the county's system of treating people with mental health and substance abuse disorders.

In a unanimous vote July 7, the board agreed to continue pursuing funds to build new 88-bed inpatient care campus that would in part replace a behavioral health wing once envisioned but never built at the county jail.

The $135 million initiative gets its unwieldy name, the Behavioral Health Continuum Infrastructure Program — or B-chip — from a state grant awarded to the county's Health Services department two years ago.

Those funds are meant to go toward the construction of two mental health rehabilitation centers, each with 16 beds, along with a 56-bed substance use disorder treatment facility.

While a potential game changer, the proposal is also an admitted long shot — a "Hail Mary" county staff wouldn't normally bring to the board given the challenges, Assistant County Administrator Jennifer Solito said, if not also a "once-in-a generation opportunity."

Due to rising construction costs and other factors, the BHCIP's cost had nearly tripled in the two years since the $66.7 million award was granted. Even after scaling the project down from 104 treatment beds (projected cost: $160.2 million) to 88 treatment beds ($135.5 million) and a reduced state funding offer of $54.6 million, the county is still looking a shortfall of $49.9 million.

To help cobble together funds to close the funding gap, supervisors also voted Tuesday to return a different state grant and kill a zombie project that never came to fruition at the jail, a much-touted 72-bed mental health wing to house detainees in need of more advanced supervision.

The jail project, also a moonshot of sorts when it was approved by the board in 2015 — "heralded as this program that was going to save us," Supervisor James Gore recalled July 7 — could serve as a cautionary tale as much as a last-ditch funding source.

Abandoning that wing would mean relinquishing a $40 million state grant, but $27 million set aside so far by the county to build and operate the specialized jail unit could be reallocated to shrink the new project's funding gap.

If the county continues to reserve an annual $6.6 million envisioned for future operating costs, officials could squirrel away an additional nearly $20 million by the time the new complex is envisioned to open.

Nolan Sullivan, the county's health services director, said the need for the BHCIP's 32 mental health rehab center beds — locked, "high-intensity, high-needs inpatient mental health facilities" — is especially urgent today.

At this time, he said, no such beds exist in the county, which as a result must often send those patients to "very expensive private facilities."

On average, he said at Tuesday's meeting, his department annually "serves about 200 conserved clients" — high-needs patients requiring such advanced care. Of those, around 60% are sent out of the county, "because we don't have local beds."

Sonoma County spent $6.8 million in the fiscal year that just ended to house those patients "in out-of-county facilities that are often for profit" because state-funded sites are "completely full," he said.

Sullivan said the county also pays "the additional labor cost of transport, travel, getting folks back and forth."

Building a pair of mental health recovery centers would "significantly reduce" the county's ongoing expenditures. Adding those beds would also create the opportunity for Sonoma to partner with surrounding counties "that maybe don't have access to the number of beds or facilities," Sullivan said.

In its original plans for the new project, the county envisioned building both the mental health facility and substance use treatment site at the Orenda Center, its existing Santa Rosa drug treatment center near Farmers Lane.

But further inspections revealed that the Neotomas Avenue site presents "substantial grading, slope stabilization, and infrastructure challenges," according to a county report, that increased the cost of the project by $20 to $25 million.

The county is now considering two options.

In the first scenario, all three facilities — the two mental health rehab centers, and the 56-bed substance use disorder treatment center — will be built at the county's 200-acre Los Guilicos campus just east of Santa Rosa on Highway 12 across from Oakmont.

In the second scenario, the current Orenda Center will be demolished, followed by the construction of a new, 56-bed substance use treatment facility.

In this split scenario, the two 16-bed mental health rehab centers would be built at Los Guilicos.

To further narrow the funding gap faced by the project, the county intends to take $3.8 million from its pool of state opioid settlement funds.

Several speakers criticized that plan during a public comment period. Funneling all all available opioid settlement funds into the BHCIP project, they fear, diminishes the possibility that a sober living house proposed for Forestville will ever get built.

The site of a potential behavioral center at Los Guilicos, along Highway 12 in Santa Rosa, is seen July 8.
CHRISTOPHER CHUNG — THE PRESS DEMOCRAT

That Forestville facility would be the fourth such sober living house to result from a public-private partnership between Sonoma County, Santa Rosa-based Poppy Bank, and Buckelew Programs, a nonprofit provider of mental health and substance use services.

But that project hinges on the county's willingness to contribute $1.4 million of opioid settlement funds — which would be matched by Buckelew, using a low interest loan from Poppy Bank, whose founder and chairman is Bill Gallaher.

With Sullivan laser focused on making the BHCIP project happen, that $1.4 million award seemed like a long shot Tuesday.

Sullivan confirmed last week, the new project takes precedence over additional sober living homes, crucial as they may be.

He went on to say that he would welcome collaboration "with Poppy Bank and other community partners to help make this once-in-a-generation investment" — BHCIP — "a reality."

If the project comes in under budget, any savings could be put back into other important initiatives, like recovery, Sullivan told The Press Democrat on Tuesday.

Cindy Gallaher, co-founder of the Windor-based Gallaher Cos., which is building three Santa Rosa sober living houses at cost, was present for part of Tuesday's Board of Supervisors meeting. Asked if the Gallahers' construction company might bid on some part of the BHCIP project, she didn't rule it out.

While the 32 high-security mental health recovery facilities are not in their wheelhouse, she said, the 56 treatment beds probably are.

A NEW PROPOSAL BUILT ON AN OLD ONE

In 2015, the Press Democrat reported on the state's approval of a $40 million grant to build a behavioral health wing at the Sonoma County jail, located just Highway 101 in north Santa Rosa. The $48 million project envisioned 72 beds and a slate of mental health and substance abuse services.

It was billed as a desperately needed response to a jail ill-equipped to serve a growing number of inmates with mental health conditions that had made the facility the county's largest de facto psychiatric facility in the county. The new wing was slated to open as early as 2020.

But more than a decade later, construction remained on hold.

At the Tuesday meeting, Solito cited ballooning construction and operating costs that had created an insurmountable funding gap. "Further, the design of the project is over a decade old and would have to be redone if we want to proceed with the project, which would further drive up additional costs and time constraints," she told the board.

According to a last update in October 2024, construction costs were estimated at $69.5 million, with a $15.5 million funding gap. Projections for operating expenses had risen sharply, too, to $11 million annually, up from the $6.62 million the county had been setting aside each year for that purpose.

Cost estimates would likely be substantially higher now, Solito told The Press Democrat.

In the intervening years, the county had to navigate a series of now-familiar setbacks, from devastating wildfires to the Covid-19 pandemic. Later, staffing shortages at the jail created concerns that even existing facilities could be maintained. Meanwhile, construction costs continued to rise.

In that same period since 2015, the county has spent at least $4.6 million on the project, including $2.8 million on design as well various legal, environmental and project management costs, according to county records.

"It is hard to get things built for what one would want to assume is a reasonable price. So many things work against you," said Supervisor David Rabbitt, who was chair of the board when the project was first dreamed up.

$40 million seems like a lot, and it is, Rabbitt said. At the time, the concern was more focused on the operational costs, and "every year you wait, construction costs go up."

The county was also navigating bureaucratic hurdles and requirements tied to the state funds, and Rabbitt noted that when applying for grants, wiggle room, related to extra costs and delays, isn't always accounted for. The legitimate intent of the project, "at the end of the day" over a decade later, Rabbitt said — "we haven't achieved that because of the inflexibility and maybe our own exuberance in thinking we could bring it in for that amount of money."

The similarities — in need, intent and pitfalls — between the old and new projects aren't lost on Sullivan.

"We'd applied for the $67 million based on a quote from a professional scoping company, and by the time this award came back, the costs almost doubled," Sullivan said, citing a variety of issues like tariffs and the limited pool of specialized contracting options.

Applying for the new grant, the county didn't learn from its past lesson and should have added 30% to its estimated costs for that latest proposal, he said.

The difference, this time, is "it's a much shorter do or die. It's not going to linger for years and years," Sullivan said. "We're really stretching here to see if we can make it work. A big piece of that will be if we get a bunch of quotes in that are astronomical, the project's dead."

Solicitations for competitive bids would need to out by the end of July, followed by "a very short turnaround time" for the county to share its plans with the state's health department, "September at the very latest," said Ricardo Goodridge, special project director in the county health department, told the board supervisors,

The project then needs to finished by June 2030, he said.

LONG-STANDING NEED

While one ambitious undertaking has given way to another, the need that existed a decade ago for mental health support in and outside the jail remains today.

The county tried various avenues to combine the two projects and their funding — meeting with state officials with the help of state Sen. Mike McGuire, trying to pass legislation — to no avail.

The new complex won't serve as many inmates, but there will be some overlap that can hopefully alleviate some pressure on the criminal justice system while also helping to divert some people away from jail in the first place, Sullivan said.

"Jails are the largest mental health care provider in almost every county in the state," Sullivan said. "Part of the problem, in my opinion, really is the tale of" the twin projects — representing the criminal justice and behavioral health departments working with the same population from two different sides. "We need to all sync up and work together," he said.

Sonoma County Sheriff Eddie Engram, who previously oversaw the jail and was shepherding the jail project since taking office in 2023, was unavailable for an interview, but a department spokesperson indicated the Sheriff's Office is supportive of the new project.

Public Meeting
2026 Groundwater Management Plan
Valley Water

You're Invited! Valley Water is committed to sustainably managing groundwater resources in Santa Clara County. This commitment involves protecting and replenishing local groundwater supplies to make sure we have a reliable water supply in years to come. Groundwater is an essential local water resource, providing nearly half of the water used in the county.

Valley Water welcomes public feedback on the potential updates to our Groundwater Management Plan and encourages you to join us at our July 30, 2026, public meeting. Valley Water updates its Groundwater Management Plan every five years per the state's Sustainable Groundwater Management Act (SGMA). These updates help ensure this important resource continues to be sustainably managed.

For more information on our groundwater management efforts, visit ***valleywater.org/SGMA*** or reach out to Scott Elkins by calling 408-630-2885 or emailing selkins@valleywater.org.

We look forward to getting your input and hope to see you at our upcoming public meeting!

When: Thursday, July 30, 2026, 5:30 p.m. – 6:30 p.m.

Where: Valley Water Headquarters Boardroom
5700 Almaden Expressway, San José, CA 95118

Zoom: ***valleywater.zoom.us/j/88974138162***

Valley Water manages an integrated water resources system that includes the supply of clean, safe water, flood protection and stream stewardship on behalf of Santa Clara County's two million residents. For over 95 years, Valley Water has managed groundwater in Santa Clara County. Nearly half of the water used in the county is pumped from groundwater, with some communities relying solely on groundwater. Valley Water's comprehensive groundwater management programs and investments have resulted in sustainable groundwater conditions for many decades. In May 2016, following a public hearing, the Valley Water Board of Directors adopted a resolution to become the Groundwater Sustainability Agency (GSA) for the Santa Clara and Llagas subbasins under SGMA. Valley Water is also the primary water wholesaler, flood manager, and stream steward for the county.

For more information, please contact Neighborhood Liaison Jiana Escobar at 408-630-2266 or by email at jescobar@valleywater.org.

valleywater.org Clean Water • Healthy Environment • Flood Protection

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A3. GWMP Outreach – Emails to Interested Parties

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Wednesday, July 29, 2026 12:22 PM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: Public Meeting Thursday July 30, 5:30 to 6:30 pm: 2026 Groundwater Management Plan for SGMA

Dear Interested Parties,
Valley Water welcomes public feedback on the potential updates to our 2026 Groundwater Management Plan and encourages you to join us at our July 30, 2026 public meeting. See attached invitation.
Valley Water updates its Groundwater Management Plan every five years per the state's Sustainable Groundwater Management Act (SGMA). These updates help ensure this important resource continues to be sustainably managed.
We look forward to getting your input and hope to see you at our meeting tomorrow!
When: Thursday, July 30, 2026, 5:30 p.m. to 6:30 p.m.
Where (in person or Zoom): Valley Water Headquarters Boardroom, 5700 Almaden Expressway, San Jose, CA 95118.
Zoom link: https://valleywater.zoom.us/j/88974138162
For more information on our groundwater management, visit www.valleywater.org/SGMA or reach out to Scott Elkins by calling 408-630-2885 or emailing selkins@valleywater.org.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Friday, July 24, 2026 4:10 PM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: Public Meeting Thursday July 30, 5:30 to 6:30 pm: 2026 Groundwater Management Plan for SGMA

Dear Interested Parties,
Valley Water welcomes public feedback on the potential updates to our 2026 Groundwater Management Plan and encourages you to join us at our July 30, 2026 public meeting.
Valley Water updates its Groundwater Management Plan every five years per the state's Sustainable Groundwater Management Act (SGMA). These updates help ensure this important resource continues to be sustainably managed.
We look forward to getting your input and hope to see you at our upcoming meeting!
When: Thursday, July 30, 2026, 5:30 p.m. to 6:30 p.m.
Where (in person or Zoom): Valley Water Headquarters Boardroom, 5700 Almaden Expressway, San Jose, CA 95118.
Zoom link: https://valleywater.zoom.us/j/88974138162
For more information on our groundwater management, visit www.valleywater.org/SGMA or reach out to Scott Elkins by calling 408-630-2885 or emailing selkins@valleywater.org.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Wednesday, July 1, 2026 9:34 AM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA Alternative plan update for the Santa Clara and Llagas subbasins

Dear Interested Parties,
Valley Water staff will provide a Sustainable Groundwater Management Act (SGMA) update to the Board's Agricultural Water Advisory Committee (Committee) during the July 6, 2026 meeting. This update will include progress on the periodic evaluation of the Alternative plan for the Santa Clara and Llagas subbasins. Staff plan to have a draft Alternative update for public review by late summer 2026 and Board consideration in fall 2026. Staff will submit the updated Alternative plan to the Department of Water Resources before the December 2026 regulatory deadline.
The Committee meeting agenda is available here: https://www.valleywater.org/how-we-operate/committees/board-advisory-committees
Additional information about Valley Water's activities as the Groundwater Sustainability Agency is available here: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable
If you have any questions, please contact Jason Gurdak, Groundwater Management Unit Manager at jgurdak@valleywater.org or 408-630-2971.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Monday, June 1, 2026 4:48 PM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA Alternative plan update for the Santa Clara and Llagas subbasins

Dear Interested Parties,
Valley Water staff will provide a Sustainable Groundwater Management Act (SGMA) update to the Board's Water Supply and Demand Management Committee (Committee) during the June 8, 2026 meeting. This update will include progress on the periodic evaluation of the Alternative plan for the Santa Clara and Llagas subbasins. Staff plan to have a draft Alternative update for public review by late summer 2026 and Board consideration in fall 2026. Staff will submit the updated Alternative plan to the Department of Water Resources before the December 2026 regulatory deadline.
The Committee meeting agenda is available here: https://www.valleywater.org/how-we-operate/committees/board-committees
Additional information about Valley Water's activities as the Groundwater Sustainability Agency is available here: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable
If you have any questions, please contact Jason Gurdak, Groundwater Management Unit Manager at jgurdak@valleywater.org or 408-630-2971.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Wednesday, April 1, 2026 3:34 PM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA Alternative plan update for the Santa Clara and Llagas subbasins

Dear Interested Parties,
Valley Water staff will provide a Sustainable Groundwater Management Act (SGMA) update to the Board's Agricultural Water Advisory Committee (Committee) during the April 6, 2026 meeting. This update will include the outreach plan for the periodic evaluation of the Alternative plan for the Santa Clara and Llagas subbasins. Staff plan to have a draft Alternative update for public review by late summer 2026 and Board consideration in fall 2026. Staff will submit the updated Alternative plan to the Department of Water Resources before the December 2026 regulatory deadline.
The Committee meeting agenda is available here: https://www.valleywater.org/how-we-operate/committees/board-advisory-committees
On March 26, 2026, Valley Water uploaded its Water Year 2025 report for the Santa Clara and Llagas subbasins to the Department of Water Resources SGMA portal website:
https://sgma.water.ca.gov/portal/alternative/annualreport/submitted
The Water Year 2025 report and other information about Valley Water's activities as the Groundwater Sustainability Agency is also available here: https://www.valleywater.org/SGMA
If you have any questions, please contact Jason Gurdak, Groundwater Management Unit Manager at jgurdak@valleywater.org or 408-630-2971.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Wednesday, February 18, 2026 3:09 PM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA Alternative plan update for the Santa Clara and Llagas subbasins

Dear Interested Parties,
Valley Water staff will provide a Sustainable Groundwater Management Act (SGMA) update to the Board's Water Supply and Demand Management Committee (Committee) during the February 23, 2026 meeting. This update will include progress on the annual water year report and outreach for the periodic evaluation of the Alternative plan for the Santa Clara and Llagas subbasins. Staff plan to have a draft Alternative update for public review by late summer 2026 and Board consideration in fall 2026. Staff will submit the updated Alternative plan to the Department of Water Resources before the December 2026 regulatory deadline.
The Committee meeting agenda is available here: https://www.valleywater.org/how-we-operate/committees/board-committees
Additional information about Valley Water's activities as the Groundwater Sustainability Agency is available here: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable
If you have any questions, please contact Jason Gurdak, Groundwater Management Unit Manager at jgurdak@valleywater.org or 408-630-2971.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Tuesday, December 2, 2025 7:53 AM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA Alternative plan update for the Santa Clara and Llagas subbasins

Dear Interested Parties,
Valley Water staff will provide a Sustainable Groundwater Management Act (SGMA) update to the Board's Water Supply and Demand Management Committee (Committee) during the December 8, 2025 meeting. This update will include progress and schedule for the periodic evaluation of the Alternative plan for the Santa Clara and Llagas subbasins. Staff plan to have a draft Alternative update for public review by late summer 2026 and Board consideration in fall 2026. Staff will submit the updated Alternative plan to the Department of Water Resources before the December 2026 regulatory deadline.
The Committee meeting agenda is available here: https://www.valleywater.org/how-we-operate/committees/board-committees
Additional information about Valley Water's activities as the Groundwater Sustainability Agency is available here: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable
If you have any questions, please contact Jason Gurdak, Groundwater Management Unit Manager at jgurdak@valleywater.org or 408-630-2971.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Friday, October 17, 2025 2:50 PM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA Alternative plan update for the Santa Clara and Llagas subbasins

Dear Interested Stakeholders,
Valley Water staff provided a Sustainable Groundwater Management Act (SGMA) update to the Board's Agricultural Water Advisory Committee during the October 6, 2025 meeting. This update included progress and schedule for the periodic evaluation of the Alternative plan for the Santa Clara and Llagas subbasins. Staff plan to have a draft Alternative update for public review by late summer 2026, with Board consideration in fall 2026. Staff will submit the updated Alternative plan to Department of Water Resources before the December 2026 regulatory deadline.
The Committee meeting agenda and minutes are available here: https://www.valleywater.org/how-we-operate/committees/board-advisory-committees
Additional information about Valley Water's activities as the Groundwater Sustainability Agency is available here: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable
If you have any questions, please contact Jason Gurdak, Groundwater Management Unit Manager at jgurdak@valleywater.org or 408-630-2971.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Wednesday, June 4, 2025 11:16 AM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: Valley Water new study report and fact sheet on groundwater rise and emergence

Dear Interested Stakeholders,
Valley Water conducted a multi-year study on groundwater in the Santa Clara Subbasin adjacent to the southern San Francisco Bay to advance understanding of the impacts from tides, seawater intrusion, and sea-level rise on groundwater rise and emergence at land surface.
The report provides an overview for the public and policymakers, as well as relevant technical details for practitioners in groundwater science, engineering, and management. The report includes major advances in the hydrogeologic conceptual model of the Santa Clara Subbasin shallow aquifer system near the Bay.
The fact sheet and report are available on our Groundwater Studies page: https://www.valleywater.org/your-water/groundwater/groundwater-studies
Or use these direct links:
Report: Groundwater Response to Tides, Seawater Intrusion, and Sea-Level Rise in Santa Clara County, California
Fact Sheet: Groundwater Response to Tides, Seawater Intrusion, and Sea-Level Rise in Santa Clara County, California
If you have questions, please contact Jason Gurdak, Groundwater Management Unit Manager at jgurdak@valleywater.org or 408-630-2971.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Tuesday, April 15, 2025 7:16 AM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA water year 2024 reports for Santa Clara, Llagas, and North San Benito Subbasins

Dear Interested Stakeholders,
On March 19, 2025, Valley Water uploaded its Water Year 2024 report for the Santa Clara and Llagas subbasins to the Department of Water Resources (DWR) SGMA Alternatives portal:
https://sgma.water.ca.gov/portal/alternative/annualreport/submitted
As required under SGMA, the annual report must be submitted to DWR by April 1 of each year for the previous water year (October 1 to September 30). The 2024 report documents continued sustainable groundwater conditions and provides information on the implementation of the approved Alternative over the prior water year. The report is also available on Valley Water's Sustainable Groundwater Management page: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable
The San Benito County Water District uploaded the Water Year 2024 report for the North San Benito Subbasin to DWR's SGMA GSP portal: https://sgma.water.ca.gov/portal/gspar/submitted
If you have questions, please contact Jason Gurdak, Senior Water Resources Specialist at jgurdak@valleywater.org or 408-630-2971.

From: groundwater@valleywater.org <groundwater@valleywater.org>
Sent: Tuesday, April 15, 2025 7:16 AM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA water year 2024 reports for Santa Clara, Llagas, and North San Benito Subbasins

Dear Interested Stakeholders,
On March 19, 2025, Valley Water uploaded its Water Year 2024 report for the Santa Clara and Llagas subbasins to the Department of Water Resources (DWR) SGMA Alternatives portal:
https://sgma.water.ca.gov/portal/alternative/annualreport/submitted
As required under SGMA, the annual report must be submitted to DWR by April 1 of each year for the previous water year (October 1 to September 30). The 2024 report documents continued sustainable groundwater conditions and provides information on the implementation of the approved Alternative over the prior water year. The report is also available on Valley Water's Sustainable Groundwater Management page: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable
The San Benito County Water District uploaded the Water Year 2024 report for the North San Benito Subbasin to DWR's SGMA GSP portal: https://sgma.water.ca.gov/portal/gspar/submitted
If you have questions, please contact Jason Gurdak, Senior Water Resources Specialist at jgurdak@valleywater.org or 408-630-2971.

From: Valley Water Groundwater Management <groundwater@valleywater.org>
Sent: Tuesday, August 6, 2024 11:34 AM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: State approves 2021 Groundwater Management Plan for continued SGMA compliance

Dear Interested Stakeholders,
The California Department of Water Resources (DWR) recently (June 27, 2024) approved Valley Water's 2021 Groundwater Management Plan as the first periodic evaluation of the groundwater sustainability plan alternative (Alternative) for the Santa Clara and Llagas subbasins. DWR's approval confirms that the Alternative continues to satisfy the objectives of the Sustainable Groundwater Management Act (SGMA) and substantially complies with related regulations. SGMA requires periodic evaluations of alternatives at least every five years.
DWR's evaluation and approval included two minor recommendations to enhance the Alternative and facilitate future evaluations. The first recommendation is to better document inter-basin coordination with adjacent basins on items such as monitoring networks and conceptual hydrogeologic models. The second recommendation is to ensure monitoring network details are consistent with DWR's online SGMA data portal. Valley Water will incorporate these recommendations before the second periodic evaluation, which is due to DWR by December 17, 2026.
If you have any questions, please contact Jason Gurdak, Senior Water Resources Specialist at jgurdak@valleywater.org or 408-630-2971.

From: Valley Water Groundwater Management <groundwater@valleywater.org>
Sent: Tuesday, April 30, 2024 2:26 PM
To: Valley Water Groundwater Management <groundwater@valleywater.org>
Subject: SGMA water year 2023 reports for Santa Clara, Llagas, and North San Benito Subbasins

Dear Interested Stakeholders,
Valley Water submitted the Water Year 2023 report for the Santa Clara and Llagas Subbasins. As required under SGMA, the annual report must be submitted to DWR by April 1 of each year for the previous water year (October 1 to September 30). The 2023 report documents continued sustainable groundwater conditions and provides information on the implementation of the approved Alternative over the prior water year.
The Water Year 2023 report for the Santa Clara and Llagas Subbasins is publicly available at:

- DWR's SGMA portal for Alternatives: https://sgma.water.ca.gov/portal/alternative/annualreport/submitted
- Valley Water's Sustainable Groundwater Management page: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable

The San Benito County Water District submitted the Water Year 2023 report for the North San Benito Subbasin, which is publicly available at:

- DWR's SGMA portal for GSPs: https://sgma.water.ca.gov/portal/gspar/submitted

If you have any questions, please contact Jason Gurdak, Senior Water Resources Specialist at jgurdak@valleywater.org or 408-630-2971.

From: Valley Water Groundwater Management <Valley_Water_Groundwater_Management@valleywater.org>
Sent: Tuesday, April 4, 2023 9:28 AM
To: Valley Water Groundwater Management <Valley_Water_Groundwater_Management@valleywater.org>
Subject: SGMA water year 2022 reports for Santa Clara, Llagas, and North San Benito Subbasins

Dear Interested Stakeholders,
Valley Water submitted the Water Year 2022 report for the Santa Clara and Llagas Subbasins. As required under SGMA, the annual report must be submitted to DWR by April 1 of each year for the previous water year (October 1 to September 30). The 2022 report documents continued sustainable groundwater conditions and provides information on the implementation of the approved Alternative over the prior water year.
The Water Year 2022 report for the Santa Clara and Llagas Subbasins is publicly available at:

- DWR's SGMA portal for Alternatives: https://sgma.water.ca.gov/portal/alternative/annualreport/submitted
- Valley Water's Sustainable Groundwater Management page: https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable

The San Benito County Water District submitted the Water Year 2022 report for the North San Benito Subbasin, which is publicly available at:

- DWR's SGMA portal for GSPs: https://sgma.water.ca.gov/portal/gspar/submitted

If you have any questions, please contact Jason Gurdak, Senior Water Resources Specialist at jgurdak@valleywater.org or 408-630-2971.

A4. GWMP Outreach – List of Meetings Where the GWMP was Discussed

A4. GWMP Outreach – List of Meetings Where the GWMP was Discussed

Board of Directors Meetings

- November 10, 2026

Board of Directors Water Supply and Demand Management Committee Meetings

- October 26, 2026
- September 28, 2026
- June 8, 2026
- February 23, 2026
- December 8, 2025
- November 4, 2024

Board of Directors Agricultural Advisory Committee Meetings

- October 5, 2026
- July 6, 2026
- April 6, 2026
- October 6, 2025

Interested Parties Meetings

- Meetings with Water Retailers – Water Supply and Groundwater Subcommittee

  - October 21, 2026
  - June 8, 2026
  - February 25, 2026
  - December 9, 2025

- Informational Public Meetings
  - July 30, 2026

A5. GWMP Outreach – Valley Water Website Information

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Sustainable Groundwater Management

Valley Water has managed groundwater resources in Santa Clara County since 1929, and conditions have been sustainable for many decades due to our activities that protect and augment groundwater supplies. In 2014, Governor Brown signed the Sustainable Groundwater Management Act (SGMA) to promote local, sustainable groundwater management.

For basins designated as medium and high priority by the state, SGMA requires local Groundwater Sustainability Agencies (GSAs) to develop and implement Groundwater Sustainability Plans (GSPs) or Alternatives to achieve sustainability. Valley Water is the GSA for the Santa Clara and Llagas Subbasins (the primary basins in the county) and the small portions of the North San Benito Subbasin in Santa Clara County. SGMA compliance for these basins is described below.

July 30, 2026 Groundwater Management Plan Public Meeting

Valley Water welcomes public feedback on the potential updates to our Groundwater Management Plan and encourages you to join us at our July 30, 2026, public meeting. Valley Water updates its Groundwater Management Plan every five years per the state's Sustainable Groundwater Management Act. These updates help ensure this important resource continues to be sustainably managed.

To view the presentation, click here

To view the meeting recording, click here

Santa Clara and Llagas Subbasins

In 2019, DWR approved Valley Water's 2016 Groundwater Management Plan (GWMP) for the Santa Clara and Llagas Subbasins as an Alternative, determining it satisfies the objectives of SGMA. Periodic evaluations of approved plans are required at least every five years, so Valley Water submitted the Board-adopted 2021 GWMP to the Department of Water Resources (DWR) in December 2021. In June 2024, DWR approved the 2021 GWMP confirming the Alternative satisfies the objectives of SGMA and complies with related regulations.

Valley Water is currently in the process of developing the 2026 GWMP, which is the second periodic evaluation to the approved Alternative and due to DWR in December 2026. As part of the 2026 GWMP, Valley Water will build on the 2021 GWMP and address DWR's recommendations. Valley Water will provide outreach to interested parties by email, social

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media posts, and public meetings, including the Board's Water Supply and Demand Management Committee and Agricultural Water Advisory Committee.

Anticipated public review period is September to October, 2026.

Annual reports must be submitted to DWR by April 1 of each year for the previous water year (October 1 to September 30). Links to Valley Water's SGMA periodic evaluation, recent water year report, and DWR's SGMA portal are below.

- 2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasins (PDF 37 MB)
- Water Year 2025 Groundwater Report for the Santa Clara and Llagas Subbasin (PDF 28.5 MB)
- DWR SGMA Portal
- North San Benito GSP (86 MB)
- Water Year 2024 Report for the North San Benito Subbasin (21 MB)

If you would like to receive information about SGMA compliance in the North San Benito Subbasin, please contact Barbara Mauro, SBCWD Board Clerk, at bmauro@sbcwd.com.

This webpage was last updated on February 18, 2026. For questions, please contact us at groundwater@valleywater.org.

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A6. Environmental Documentation

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Appendix B – Demonstration of Functional Equivalency

Valley Water has prepared the 2026 Groundwater Management Plan (GWMP) under authority granted by the District Act. The 2026 GWMP demonstrates how Valley Water will continue to sustainably manage the Santa Clara and Llagas subbasins. The comprehensive framework documented in this plan includes authorities, sustainability goals and strategies, conjunctive management and monitoring programs, long-term planning, numeric outcome measures, and corresponding outcome measure-lower thresholds that effectively prompt action when needed.

In 2024, DWR approved the 2021 GWMP submitted in 2021 as the first five-year periodic evaluation to the DWR-approved 2016 GWMP, which was approved as an Alternative Plan because it satisfies the objectives of SGMA. This 2026 GWMP is the second five-year periodic evaluation to the approved Alternative Plan. The 2026 GWMP continues to meet the requirements of an Alternative to a GSP in accordance with Water Code Section 10733.6 (b)(1) and Article 9 of the Emergency GSP Regulations.[1] Alternatives must be functionally equivalent to requirements in Articles 5 and 7 of the Emergency GSP Regulations. This plan meets the intent of SGMA and is functionally equivalent to Articles 5 and 7 of the Emergency GSP Regulations, as described in this Appendix.

General Requirements of Article 5

The functional equivalence of this GWMP to the five subarticles of Article 5 is summarized below.

1) Administrative Information

   The GWMP provides detailed information on the plan area as well as Valley Water's legal authorities, governance, management structure, and funding sources. As a special act district created in 1929 to manage groundwater, Valley Water has a well-established framework to fund and implement successful conjunctive management programs through the Water Utility Enterprise, which has a $907 million operations and capital budget for fiscal year 2026-2027.

   The GWMP also describes how Valley Water accounts for future land use and water demand changes through the Urban Water Management Plan and Water Supply Master Plan, which have a 25-year planning horizon and are updated every five years. Beneficial uses, users, and outreach are also described in various sections of the GWMP.

2) Basin Setting

   The GWMP contains detailed information on the Santa Clara and Llagas subbasins with regard to basin structure, boundaries, stratigraphy, and recharge areas. Basin conditions related to water levels, water quality, land subsidence, seawater intrusion, interconnected surface waters, and groundwater dependent ecosystems (GDEs) are also described in detail. The GWMP also presents balanced water budgets and future groundwater demands and budgets considering climate change and expected population growth.

3) Sustainable Management Criteria

   Valley Water's 2016 GWMP documented numeric outcome measures to assess performance in meeting basin sustainability goals. Based on recommended actions received from DWR in 2019, Valley Water's 2021 GWMP (Appendix C) included (i) separate outcome measures for water quality in the Santa Clara and Llagas subbasins, (ii) a new seawater intrusion outcome measure separate from other water quality outcome measures, and (iii) new outcome measure-lower thresholds for all outcome measures (groundwater storage, land subsidence, water quality, and seawater intrusion) that correspond to undesirable results.

   The updates to the outcome measures and outcome measure-lower thresholds in the 2021 GWMP remain

[1] California Code of Regulations, Title 23, Division 2, Chapter 1.5, Subchapter 2.

largely unchanged in the 2026 GWMP because they have been effective in avoiding undesirable results and prompting action when needed. Chapter 5 of this 2026 GWMP describes small changes to refine the water quality outcome measures that better reflect the current conditions and trends in the Santa Clara and Llagas subbasins. All outcome measures and outcome measure-lower thresholds will continue to be evaluated and reported annually in the Water Year Reports due each April 1 to DWR.

4) Monitoring Networks

Valley Water has established extensive networks to monitor groundwater levels, groundwater quality, land subsidence, and surface water. Valley Water evaluates data from hundreds of wells measured directly and also leverages groundwater level and quality data collected by water retailers. Detailed information on monitoring results is available through Valley Water's annual Water Year Reports. Valley Water also prepares a monthly Water Tracker, which summarizes water supply conditions, and the companion monthly Groundwater Condition Report. These reports are available on Valley Water's website, as is groundwater level data and real-time stream, reservoir, and precipitation data.

5) Projects and Management Actions

For more than 80 years, Valley Water has implemented conjunctive water management programs to maximize water supply reliability. These programs include the direct managed recharge of about 100,000 AF or more of local and imported surface water each year. Valley Water's in-lieu recharge programs, including treated surface water deliveries, water conservation, and water recycling, account for over 200,000 AF in most years. These programs require extensive infrastructure and rely on substantial local water rights and imported water agreements. Valley Water also implements programs to ensure groundwater quality is protected, such as the well ordinance program. The GWMP contains information on programs implemented by Valley Water and other agencies to protect local groundwater.

General Requirements of Article 7

The functional equivalence of this GWMP to the Article 7 requirements is described below.

1) Annual Water Year Reports

Agencies are required to submit an annual water year report to DWR with information on groundwater elevations, pumping, recharge, total water use, and change in storage for the preceding water year. Each year, Valley Water prepares a comprehensive annual Water Year Report with detailed information on groundwater conditions for the preceding water year, including all the information listed above. This report is submitted to DWR and posted to Valley Water's website. Valley Water has submitted these annual reports to DWR from 2017 through 2025 (9 reports) and will continue submitting them during the next five-year periodic evaluation cycle.

2) Periodic Evaluations by the Agency

Article 7 also requires agencies to review their plans at least every five years and provide a written assessment to DWR. Article 9 (Alternatives) requires Alternatives to be submitted by January 1, 2017 and every five years thereafter. Both these requirements are aligned with Valley Water's goal of updating the GWMP every five years. This approach supports updates to Valley Water's Urban Water Management Plan and Water Supply Master Plan, which are also on five-year update cycles. The 2021 GWMP was the first five-year periodic evaluation to the approved Alternative Plan. This 2026 GWMP is the second five-year periodic evaluation to the approved Alternative Plan.

Appendix B – Demonstration of Functional Equivalency

DWR's Alternative Element Guide[2] (Table 1) is provided to further demonstrate functional equivalency and facilitate review of this GWMP as an approved Alternative.

Table 1. Alternative Element Guide

California Code of Regulations - GSP Regulation Sections	Alternative Elements	Document which attachment(s) contains the applicable alternative element.	Document which section(s), page number(s), or briefly describe why that Alternative element does not apply to the entity.
Article 5 - Plan Contents			
SubArticle 1	**Administrative Information**		
§ 354.4.	**General Information**		**2026 Groundwater Management Plan (GWMP) Section**
	(a) An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.	2026 GWMP	Executive Summary
	(b) A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.		References
§ 354.6.	**Agency Information**		
	When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:	2026 GWMP	
	(a) The name and mailing address of the Agency.		§ 1.1.2

[2] DWR's Alternative Element Guide is available on the SGMA portal https://sgma.water.ca.gov/portal/resources

	(b) The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.		§§ 1.1–1.4
	(c) The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.		§ 1.1.2
	(d) The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.		§§ 1.3, 1.4.2
	(e) An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.		§§ 1.3, 1.4.2.2, 6.1.4.3, 6.1.4.4
§ 354.8.	**Description of Plan Area**		
	Each Plan shall include a description of the geographic areas covered, including the following information:	2026 GWMP	§§ 2.1, 3.1, 4.2, 4.4.1.1, 4.4.2.1
	(a) One or more maps of the basin that depict the following, as applicable:		
	(1) The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.		Figures ES-2, 1-1, 2-1, 3-1
	(2) Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.		Not applicable
	(3) Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.		Figures ES-2, 1-1
	(4) Existing land use designations and the identification of water use sector and water source type.		Figures 4-1; Appendix F

	(5) The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.		Figures 4-9, 4-13
	(b) A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.		§§ 2.1, 3.1
	(c) Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.		Chapters 6, 7
	(d) A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.		Chapter 6
	(e) A description of conjunctive use programs in the basin.		§§ 4.3, 6.1, 6.3, 6.4
	(f) A plain language description of the land use elements or topic categories of applicable general plans that includes the following:		§§ 1.3, 1.4, 1.5, 4.5, 4.6, 5.3, 6.1, 6.2
	(1) A summary of general plans and other land use plans governing the basin.		§§ 1.3, 1.4.5, 1.5
	(2) A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects.		§§ 1.4.5, 4.5, 4.6, 5.3, 6.1, 6.2

	(3) A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.		§§ 1.4.5, 4.5, 4.6
	(4) A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.		§ 6.2
	(5) To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.		§ 1.4.5
	(g) A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.		Not applicable
§ 354.10.	**Notice and Communication**		
	Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:	2026 GWMP	Appendix A
	(a) A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.		Executive Summary, Chapter 1, Appendix A
	(b) A list of public meetings at which the Plan was discussed or considered by the Agency.		Appendix A
	(c) Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.		Appendix A
	(d) A communication section of the Plan that includes the following:		
	(1) An explanation of the Agency's decision-making process.		§§ 1.4, 1.5, Appendix A, Appendix F
	(2) Identification of opportunities for public engagement and a discussion of how public input and response will be used.		§§ 1.6, Appendix A

	(3) A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.		§§ 1.5, 1.6, Appendix A
	(4) The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.		§§ 1.5, 1.6
SubArticle 2	**Basin Setting**		
§ 354.14.	**Hydrogeologic Conceptual Model**		
	(a) Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.	2026 GWMP	Chapters 2, 3
	(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:		Chapters 2, 3
	(1) The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.		Chapters 2, 3
	(2) Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.		Chapters 2, 3
	(3) The definable bottom of the basin.		Chapters 2, 3
	(4) Principal aquifers and aquitards, including the following information:		Chapters 2, 3
	(A) Formation names, if defined.		Chapters 2, 3
	(B) Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.		Chapters 2, 3
	(C) Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.		Chapters 2, 3
	(D) General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.		Chapters 2, 3

	(E) Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.		Chapters 2, 3
	(5) Identification of data gaps and uncertainty within the hydrogeologic conceptual model		Chapters 2, 3
	(c) The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.		Figures 2-4, 2-5, 2-24, 2-26, 3-4, 3-5, 3-6
	(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:		Figures 1-2, 1-4, 2-1, 2-2, 2-4, 2-5, 2-6, 2-14, 3-1, 3-2, 3-4, 3-5, 3-6
	(1) Topographic information derived from the U.S. Geological Survey or another reliable source.		Figure 1-2
	(2) Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.		Figures 2-2, 3-2
	(3) Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.		Figures 2-2, 3-2
	(4) Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.		Figures 2-1, 2-14, 3-1,
	(5) Surface water bodies that are significant to the management of the basin.		Figure 1-4
§ 354.16.	**Groundwater Conditions**		
	Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:	2026 GWMP	§§ 2.2, 3.2
	(a) Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:		§§ 2.2, 3.2

	(1) Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.		Figures 2-8, 2-9, 3-9, 3-10
	(2) Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.		Figures 2-10, 2-11, 3-8
	(b) A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.		§§ 4.4; Figures 4-6, 4-10, 4-11, 4-14
	(c) Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.		§ 2.2, 2.2.6; Appendix H; Figures 2-22, 2-23, 2-24, 2-25, 2-26
	(d) Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.		§§ 2.2, 3.2, 6.2; Figures 6-3, 6-4
	(e) The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.		§ 2.2 Figures 2-12, 2-13, 2-14, 2-15, 2-16
	(f) Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.		§§ 2.2, 3.2
	(g) Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.		§§ 2.2, 3.2; Appendix F; Figures 2-17, 3-13; Tables 2-1, 3-1
§ 354.18.	**Water Budget**		

	(a) Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.	2026 GWMP	§§ 4.4, 4.5; Figure 4-5, 4-6; Tables 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, 4-10, 4-11
	(b) The water budget shall quantify the following, either through direct measurements or estimates based on data:		§ 4.4
	(1) Total surface water entering and leaving a basin by water source type.		§ 4.4
	(2) Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.		§ 4.4
	(3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.		§ 4.4
	(4) The change in the annual volume of groundwater in storage between seasonal high conditions.		§ 4.4
	(5) If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.		Not applicable
	(6) The water year type associated with the annual supply, demand, and change in groundwater stored.		§ 4.4
	(7) An estimate of sustainable yield for the basin.		Not applicable (§ 4.4)
	(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:		§§ 4.4, 4.5
	(1) Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.		§ 4.4

	(2) Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:		§ 4.4
	(A) A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.		§ 4.4
	(B) A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.		§ 4.4
	(C) A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.		§ 4.4
	(3) Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:		§ 4.5, 4.6

	(A) Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.		§ 4.5, 4.6
	(B) Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.		§ 4.5, 4.6
	(C) Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.		§ 4.5, 4.6
	(d) The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:		§§ 4.4, 4.5, 4.6, 6.1
	(1) Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.		§§ 4.4, 4.5
	(2) Current water budget information for temperature, water year type, evapotranspiration, and land use.		§§ 4.4, 4.5
	(3) Projected water budget information for population, population growth, climate change, and sea level rise.		§ 4.5, 4.6

	(e) Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.		§§ 4.4, 4.5, 4.6, 7.6
	(f) The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.		§ 7.6
§ 354.20.	**Management Areas**		
	(a) Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin.	2026 GWMP	Executive Summary, § 2.1
	(b) A basin that includes one or more management areas shall describe the following in the Plan:		
	(1) The reason for the creation of each management area.		Executive Summary, § 2.1
	(2) The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.		§ 5.4

	(3) The level of monitoring and analysis appropriate for each management area.		Chapters 2, 7
	(4) An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.		§ 5.4
	(c) If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.		Chapter 2
SubArticle 3	**Administrative Information**		
§ 354.24.	**Sustainability Goal**		
	Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.	2026 GWMP	Chapters 5, 6, 8
§ 354.26.	**Undesirable Results**		
	(a) Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.	2026 GWMP	Chapters 2, 3, 5; § 5.4
	(b) The description of undesirable results shall include the following:		
	(1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.		Chapters 2, 3, 5; § 5.4

	(2) The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.		§ 5.4
	(3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.		Chapters 2, 3, 5; § 5.4
	(c) The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.		§ 5.4
	(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.		Chapters 2, 3, 5; § 5.4
§ 354.28.	**Minimum Threshold**		
	(a) Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.	2026 GWMP	§§ 2.2, 3.2, 5.4, Chapter 5
	(b) The description of minimum thresholds shall include the following:		

	(1) The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.		§§ 2.2, 3.2, 5.4
	(2) The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.		§§ 2.2, 3.2, 5.4
	(3) How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.		§§ 2.2, 3.2, 5.4
	(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.		§§ 2.2, 3.2, 5.4
	(5) How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.		§ 5.4
	(6) How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.		§ 5.4, Chapter 7
	(c) Minimum thresholds for each sustainability indicator shall be defined as follows:		
	(1) Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:		§§ 2.2, 3.2, 5.4

	(A) The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.		§§ 2.2, 3.2, 5.4
	(B) Potential effects on other sustainability indicators.		§§ 2.2, 3.2, 5.4
	(2) Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.		§§ 2.2, 3.2, 5.4
	(3) Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following:		§§ 2.2.6, 5.4.4
	(A) Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.		§§ 2.2.6, 5.4.4; Figures 2-23, 2-24, 2-25, 2-26
	(B) A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.		§§ 2.2.6, 5.4.4,; Figures 2-23, 2-24, 2-25, 2-26
	(4) Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.		§§ 2.2, 3.2, 5.4

	(5) Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:		§§ 2.2, 5.4
	(A) Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.		§§ 2.2, 5.4; Figures 2-12, 2-13
	(B) Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.		Figures 2-12, 2-13
	(6) Depletions of Interconnected Surface Water. The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following:		Not Applicable (§§ 2.2.3, 5.4)
	(A) The location, quantity, and timing of depletions of interconnected surface water.		Not Applicable (§§ 2.2.3, 5.4)
	(B) A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.		Not Applicable (§§ 2.2.3, 5.4)
	(d) An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.		Not Applicable (§ 5.4)

	(e) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.		Chapter 2, 3, §5.4
§ 354.30.	**Measurable Objectives**		
	(a) Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.	2026 GWMP	Executive Summary, Chapter 5, 8
	(b) Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.		§5.4
	(c) Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.		§5.4
	(d) An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.		Not Applicable (§5.4)
	(e) Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.		Executive Summary, Chapter 5, 8

	(f) Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.		Not Applicable
	(g) An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.		Not Applicable
SubArticle 4	**Monitoring Networks**		
§ 354.34.	**Monitoring Network**		
	(a) Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.	2026 GWMP	Chapter 7
	(b) Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:		§§ 7.1, 7.2, 7.3, 7.4, 7.5
	(1) Demonstrate progress toward achieving measurable objectives described in the Plan.		§§ 7.1, 7.2, 7.3, 7.4, 7.5
	(2) Monitor impacts to the beneficial uses or users of groundwater.		§§ 7.1, 7.2, 7.3, 7.4, 7.5
	(3) Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.		§§ 7.1, 7.2, 7.3, 7.4, 7.5
	(4) Quantify annual changes in water budget components.		§§ 7.1, 7.2, 7.3, 7.4, 7.5

	(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:		
	(1) Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:		§ 7.1
	(A) A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.		§ 7.1
	(B) Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.		§ 7.1
	(2) Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.		§ 7.1
	(3) Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.		§ 7.3
	(4) Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.		§ 7.3
	(5) Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.		§ 7.2

	(6) Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:		§ 7.4
	(A) Flow conditions including surface water discharge, surface water head, and baseflow contribution.		§ 7.4
	(B) Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.		§ 7.4
	(C) Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.		§ 7.4
	(D) Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.		§ 7.4
	(d) The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.		Chapter 7; Appendix I
	(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.		Chapter 7; Appendix I
	(f) The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:		Chapter 7; Appendix I
	(1) Amount of current and projected groundwater use.		Chapter 7
	(2) Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.		Chapter 7

	(3) Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.		Chapter 7
	(4) Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.		Chapter 7
	(g) Each Plan shall describe the following information about the monitoring network:		
	(1) Scientific rationale for the monitoring site selection process.		Chapter 7
	(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.		Chapter 7
	(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.		Chapter 7
	(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.		Chapter 7; Appendix I
	(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.		Chapter 7

	(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.		Chapters 2, 3, 5, 7
§ 354.36.	**Representative Monitoring**		
	Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:	2026 GWMP	Chapters 5, 7
	(a) Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.		Chapters 5, 7
	(b) Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:		Chapters 5, 7
	(1) Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.		Chapters 5, 7
	(2) Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.		Chapters 5, 7
	(c) The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.		Chapters 5, 7
§ 354.38.	**Assessment and Improvement of Monitoring Network**		
	(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.	2026 GWMP	Chapter 7; Appendix G

J	(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.		Chapter 7; Appendix G
	(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:		Chapter 7; Appendix G
	(1) The location and reason for data gaps in the monitoring network.		Chapter 7; Appendix G
	(2) Local issues and circumstances that limit or prevent monitoring.		Chapter 7; Appendix G
	(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.		Chapters 7, 8; Appendix G
	(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:		Chapters 7, 8; Appendix G
	(1) Minimum threshold exceedances.		Chapters 7, 8; Appendix G
	(2) Highly variable spatial or temporal conditions.		Chapters 7, 8; Appendix G
	(3) Adverse impacts to beneficial uses and users of groundwater.		Chapters 7, 8; Appendix G
	(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.		Chapters 7, 8; Appendix G
§ 354.40.	**Reporting Monitoring Data to the Department**		
	Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.	2026 GWMP	Chapter 7
SubArticle 5	**Projects and Management Actions**		

§ 354.44	Projects and Management Actions		
	a) Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.	2026 GWMP	Chapters 6, 8
	(b) Each Plan shall include a description of the projects and management actions that include the following:		
	(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent. The Plan shall include the following:		Chapters 6, 8
	(A) A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.		Chapters 6, 8
	(B) The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.		Chapters 6, 8
	(2) If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.		Chapters 6, 8
	(3) A summary of the permitting and regulatory process required for each project and management action.		Chapter 6
	(4) The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.		Chapter 6

	(5) An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.		Chapter 6
	(6) An explanation of how the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.		Chapter 6
	(7) A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.		Chapter 6
	(8) A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.		Chapter 6
	(9) A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.		Chapters 1, 4, 6
	(c) Projects and management actions shall be supported by best available information and best available science.		Chapters 1, 4, 6
	(d) An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.		Chapters 1, 4, 6
Article 7	**Annual Reports and Periodic Evaluations by the Agency**		**Water Year Reports 2017 to 2025 (last 5 years 2021 to 2025)**
§ 356.2	**Annual Reports**		
	Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:	Water Year Reports	
	(a) General information, including an executive summary and a location map depicting the basin covered by the report.		Executive Summary, Chapter 1
	(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:		

	(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:		Chapter 3
	(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.		Chapter 3
	(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.		Chapter 3
	(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.		Chapter 2
	(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.		Chapter 2
	(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.		Chapter 2
	(5) Change in groundwater in storage shall include the following:		Chapter 2
	(A) Change in groundwater in storage maps for each principal aquifer in the basin.		Chapter 2

	(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.		Chapter 2
	(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.		Chapter 5
§ 356.4	**Periodic Evaluation by Agency**		**2026 GWMP**
	Each Agency shall evaluate its Plan at least every five years and whenever the Plan is amended, and provide a written assessment to the Department. The assessment shall describe whether the Plan implementation, including implementation of projects and management actions, are meeting the sustainability goal in the basin, and shall include the following:		
	(a) A description of current groundwater conditions for each applicable sustainability indicator relative to measurable objectives, interim milestones and minimum thresholds.		Chapters 2, 3, 4, 5
	(b) A description of the implementation of any projects or management actions, and the effect on groundwater conditions resulting from those projects or management actions.		Chapters 6, 8
	(c) Elements of the Plan, including the basin setting, management areas, or the identification of undesirable results and the setting of minimum thresholds and measurable objectives, shall be reconsidered and revisions proposed, if necessary.		Chapters 2, 3, 4, and 5
	(d) An evaluation of the basin setting in light of significant new information or changes in water use, and an explanation of any significant changes. If the Agency's evaluation shows that the basin is experiencing overdraft conditions, the Agency shall include an assessment of measures to mitigate that overdraft.	2026 GWMP	Chapters 2, 3, 4

	(e) A description of the monitoring network within the basin, including whether data gaps exist, or any areas within the basin are represented by data that does not satisfy the requirements of Sections 352.4 and 354.34(c). The description shall include the following:	Chapter 7; Appendices G and I
	(1) An assessment of monitoring network function with an analysis of data collected to date, identification of data gaps, and the actions necessary to improve the monitoring network, consistent with the requirements of Section 354.38.	Chapter 7; Appendices G and I
	(2) If the Agency identifies data gaps, the Plan shall describe a program for the acquisition of additional data sources, including an estimate of the timing of that acquisition, and for incorporation of newly obtained information into the Plan.	Chapters 7, 8; Appendix G
	(3) The Plan shall prioritize the installation of new data collection facilities and analysis of new data based on the needs of the basin.	Chapters 7, 8; Appendices G and I
	(f) A description of significant new information that has been made available since Plan adoption or amendment, or the last five-year assessment. The description shall also include whether new information warrants changes to any aspect of the Plan, including the evaluation of the basin setting, measurable objectives, minimum thresholds, or the criteria defining undesirable results.	Appendices B, C, F, and Chapter 5 (§ 5.4)
	(g) A description of relevant actions taken by the Agency, including a summary of regulations or ordinances related to the Plan.	Chapter 6
	(h) Information describing any enforcement or legal actions taken by the Agency in furtherance of the sustainability goal for the basin.	Not Applicable
	(i) A description of completed or proposed Plan amendments.	Not Applicable
	(j) Where appropriate, a summary of coordination that occurred between multiple Agencies in a single basin, Agencies in hydrologically connected basins, and land use agencies.	§ 6.4.1

	(k) Other information the Agency deems appropriate, along with any information required by the Department to conduct a periodic review as required by Water Code Section 10733.		Not Applicable

Appendix C – Response to DWR Recommended Actions

On December 17, 2021, Valley Water submitted the 2021 Groundwater Management Plan (GWMP) as an Alternative to the Groundwater Sustainability Plan (GSP) prior to the statutory deadline of January 1, 2022. Water Code Section 10733.6(b) allows for several different types of Alternatives, including an existing groundwater management plan. On June 27, 2024, DWR approved the Alternative for both the Santa Clara and Llagas Subbasins[1,2] because it satisfies the objectives of SGMA.

Department of Water Resources (DWR) Recommended Actions

In the Alternative Assessment Staff Reports (Appendix C-1 and C-2), DWR made two recommended actions for the Santa Clara Subbasin[1] and two recommended actions for the Llagas Subbasin[2], which are the same for the each subbasin (see 1 – 2 below). The DWR Recommended Actions are as follows:

1. Provide an explanation in future Alternative updates how inter-basin items, such as: thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water along basin boundaries have been coordinated.
2. Ensure the monitoring network details included in the Alternative are consistent with the information contained in the Department's SGMA Portal Monitoring Network Module.

2026 GWMP Addresses DWR Recommended Actions

The 2026 GWMP is the second Periodic Evaluation to the 2016 GWMP. Valley Water staff have responded to the two DWR recommended actions. The following sections explain how the 2026 GWMP addresses each recommended action.

Recommended Action 1

Sections 6.4.1 Coordination with Adjacent Groundwater Sustainability Agencies (GSAs) includes information regarding how inter-basin items are coordinated. As part of Valley Water's longstanding sustainable groundwater management, dating back nearly 100 years, close communication with partner agencies has always been an important consideration. Partners like the Alameda County Water District (ACWD) and San Benito County Water District (SBCWD), both now Groundwater Sustainability Agencies, continue to be a valued component of Valley Water's sustainable groundwater management. Sections 6.4.1.1 and 6.4.1.2 highlight coordination efforts between Valley Water and ACWD and SBCWD, respectively.

Recommended Action 2

Section 7.1.4 Reporting and Communication of the 2026 GWMP includes information regarding maintenance of DWR's SGMA Portal Monitoring Network Module. Valley Water works to ensure consistency and accuracy of the MNM database.

Appendix C-1 and C-2

Appendix C-1 is the DWR cover letter and Periodic Review for the Santa Clara Subbasin.
Appendix C-2 is the DWR cover letter and Periodic Review for the Llagas Subbasin.

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[1] Department of Water Resources, Sustainable Groundwater Management Office, Periodic Review of Alternative Groundwater Sustainability Plan for the Santa Clara Subbasin, dated June 27, 2024.
[2] Department of Water Resources, Sustainable Groundwater Management Office, Periodic Review of Alternative Groundwater Sustainability Plan for the Llagas Subbasin, dated June 27, 2024.

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CALIFORNIA DEPARTMENT OF WATER RESOURCES
SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE
715 P Street, 8th Floor | Sacramento, CA 95814 | P.O. Box 942836 | Sacramento, CA 94236-0001

June 27, 2024

Vanessa De La Piedra
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA, 95118
vdelapiedra@valleywater.org

RE: Santa Clara Valley - Santa Clara Subbasin - Periodic Review of Alternative Groundwater Sustainability Plan

Dear Vanessa De La Piedra,

The Department of Water Resources (Department) has evaluated the alternative to a groundwater sustainability plan (Alternative) submitted for the Santa Clara Valley - Santa Clara Subbasin and has determined the Alternative is approved. The approval is based on recommendations from the Staff Assessment, included as an exhibit to the attached Statement of Findings, which describes that the Santa Clara Valley - Santa Clara Subbasin Alternative satisfies the objectives of the Sustainable Groundwater Management Act (SGMA) and substantially complies with the Groundwater Sustainability Plan (GSP) Regulations. The Staff Assessment also proposes recommended corrective actions that will enhance the Alternative and facilitate future evaluation by the Department. The Department strongly encourages the recommended corrective actions be given due consideration and suggests incorporating all resulting changes to the Alternative in future updates.

Recognizing SGMA sets a long-term horizon for groundwater sustainability agencies (GSAs) to achieve their basin sustainability goals, monitoring progress is fundamental for successful implementation. GSAs are required to evaluate their Alternative at least every five years and whenever the Alternative is amended, and to provide a written assessment to the Department. Accordingly, the Department will evaluate approved Alternatives and issue an assessment at least every five years. The agencies are required to submit their second periodic review of the Santa Clara Valley - Santa Clara Subbasin Alternative no later than December 17, 2026.

Please contact Department Sustainable Groundwater Management staff by emailing sgmps@water.ca.gov if you have any questions related to the Department's assessment or implementation of your Alternative.

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Thank You,

Paul Gosselin

Paul Gosselin
Deputy Director
Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Periodic Review and Approval of the Santa Clara Valley - Santa Clara Subbasin Alternative Groundwater Sustainability Plan

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STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE PERIODIC REVIEW AND APPROVAL OF THE SANTA CLARA VALLEY – SANTA CLARA SUBBASIN ALTERNATIVE GROUNDWATER SUSTAINABILITY PLAN
JUNE 27, 2024

Under the Sustainable Groundwater Management Act (SGMA), an alternative to a groundwater sustainability plan (Alternative) must be resubmitted every five years,[1] and the Department of Water Resources (Department) is required to review the Alternative to assess progress in achieving the sustainability goal within the basin and recommend corrective action to address any deficiencies.[2] The Department evaluates updates to Alternatives in accordance with the criteria used to evaluate Groundwater Sustainability Plans, as applicable.[3] This Statement of Findings explains the Department's determination regarding the Alternative submitted on December 17, 2021, by the Santa Clara Valley Water District – Santa Clara Groundwater Sustainability Agency (Agency) for the Santa Clara Valley – Santa Clara Subbasin (Basin No. 2-009.02), herein referred to as the Department's "Periodic Review" of the Alternative.

Department management have discussed the Alternative with staff and have reviewed the written assessment titled *Periodic Review of Alternative Groundwater Sustainability Plan, Staff Assessment*, Santa Clara Subbasin, attached as Exhibit A, and have incorporated the findings, which recommends approval of the Alternative. Department management is satisfied that staff have conducted a thorough evaluation and assessment of the Alternative and concurs with staff's recommendation. The Department therefore **APPROVES** the Alternative and makes the following findings:

A. The Alternative satisfies the conditions listed in 23 CCR Section 358.4 on the grounds that:

    1. The Alternative was submitted within five years of its initial submission date as required by Water Code Section 10733.6(c).

    2. The Department has confirmed that the Alternative is within a basin that is in compliance with Part 2.11 (commencing with Water Code Section 10920) as required by Water Code Section 10733.6(d).

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[1] Water Code § 10733.6(c))
[2] Water Code § 10733.8
[3] 23 CCR § 358.4(b))

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3. The Alternative is complete and includes the applicable information required by SGMA for the type of alternative submitted.

4. The Alternative covers the entire basin. The Department determined that the Alternative, as originally submitted, covered the entire basin, and those boundaries remain unchanged.

B. In addition to the grounds listed above, the Department also finds that the Alternative remains consistent with SGMA and is being implemented in a manner that will likely achieve the sustainability goal for the basin because:

1. At this time, there do not appear to be exceedances of any minimum thresholds or any failures of the Agency to meet any interim milestones which are likely to affect the ability of the Agency to achieve the sustainability goal for the basin within 20 years of implementation of the Alternative (23 CCR Section 355.6(c)(1)).

2. The Agency is implementing projects and management actions consistent with the Alternative (23 CCR Section 355.6(c)(2)). The suite of projects and management actions being implemented and considered in the Subbasin appears to be sufficient to address the water budget deficit, provides a buffer against climate change, and considers imported and local water supply reliability.

3. The Agency is addressing data gaps and reducing the levels of uncertainty identified in the Alternative (23 CCR Section 355.6(c)(3)). The Agency presents several technical memoranda addressing data gaps on a variety of important topics and has incorporated this information into the 2021 Alternative. The Agency appears to be actively working to address known data gaps and continually improve its understanding of the Subbasin for improved management using best-available science and practices.

4. As explained in the attached Staff Assessment, the Alternative continues to satisfy the criteria described in 23 CCR Section 355.6(c)(4), as applicable.

C. Furthermore, the Department also finds that the Alternative sufficiently demonstrates its ability to achieve the objectives of SGMA at this time because:

1. The Agency has demonstrated that the Alternative is functionally equivalent to the elements of a GSP; and

2. The Agency has taken steps to improve the Alternative by considering the recommended actions previously provided by staff. To ensure that the Alternative continues to satisfy SGMA's objectives, staff have provided additional recommended corrective actions for the Agency to consider before the Alternative's next Periodic Evaluation.

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D. The Department also finds:

1. The Department developed its GSP Regulations consistent with and intending to further the State's human right to water policy through implementation of SGMA and the GSP Regulations, primarily by achieving sustainable groundwater management in a basin. By ensuring substantial compliance with the GSP Regulations, the Department has considered the state policy regarding the human right to water in its evaluation of the Alternative (Water Code Section 106.3; 23 CCR Section 350.4(g)).

2. The California Environmental Quality Act (CEQA) (Public Resources Code Sections 21000 *et seq*.) does not apply to the Department's evaluation and assessment of Alternatives, and the Department's evaluation and assessment of Alternatives is statutorily or categorically exempt from CEQA.

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Accordingly, the Alternative submitted by the Agency for the Santa Clara Valley – Santa Clara Subbasin is hereby **APPROVED.** The recommended corrective actions identified in the attached Staff Assessment will assist the Department's future review of the Alternative's implementation for consistency with SGMA, and the Department, therefore, recommends the Agency address them in the next Periodic Evaluation, which is set to be submitted on June 17, 2026, as required by Water Code Section 10733.6(c). Department staff will continue to monitor and evaluate the progress toward achieving the basin's sustainability goal through continued Annual Reporting and future revisions to the Alternative. Failure to address the Department's recommended corrective actions before future, subsequent Alternative evaluations, may lead to the Alternative being determined incomplete or inadequate.

Signed:

Karla Nemeth

Karla Nemeth, Director
Date: June 27, 2024

Exhibit A: Periodic Review of Alternative Groundwater Sustainability Plan, Staff Assessment, Santa Clara Valley – Santa Clara Subbasin

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State of California
Department of Water Resources
Sustainable Groundwater Management Program
Periodic Review of
Alternative Groundwater Sustainability Plan
Staff Assessment

Groundwater Basin Name:	Santa Clara Valley – Santa Clara Subbasin (2-009.02)
Number of GSAs or Local Agencies:	One (1)
Basin Plan Manager:	Vanessa De La Piedra
Type of Alternative:	Existing Groundwater Management Plan
Date Alternative First Submitted:	December 21, 2016
Date Alternative First Approved:	July 17, 2019
Date Periodic Evaluation Submitted:	December 17, 2021
Date Periodic Review Completed:	June 27, 2024
Staff Recommendation:	Approved

This assessment addresses the Department of Water Resources' (Department) statutory and regulatory responsibility to periodically review and evaluate approved groundwater sustainability plans (GSPs) and approved alternatives to a GSP (Alternative) pursuant to the Sustainable Groundwater Management Act (SGMA)[1] and the GSP Regulations.[2] As stated in the GSP Regulations: "The Department shall periodically review an approved Plan to ensure the Plan, as implemented, remains consistent with the Act and in substantial compliance with this Subchapter, and is being implemented in a manner that will likely achieve the sustainability goal for the basin. The Department shall evaluate approved Plans and issue an assessment at least every five years. The Department review shall be based on information provided in the annual reports and the periodic evaluation of the Plan prepared and submitted by the Agency."[3]

SGMA allows for basins to be managed under alternative groundwater management structures rather than a GSP.[4] An alternative can be based on an existing groundwater management plan or other law authorizing groundwater management, management pursuant to an adjudication action, or an analysis of basin conditions that demonstrates

[1] Water Code § 10720 *et seq*.
[2] 23 CCR § 350 *et seq*.
[3] 23 CCR §§ 355.6(a) and 355.6(b). For the purposes of this Periodic Review, "Plan" refers to a groundwater sustainability plan as defined in SGMA and the GSP Regulations, while "Alternative" refers to an alternative to a groundwater sustainability plan described in Water Code § 10733.6.
[4] Water Code §10733.6; 23 CCR §§ 358.2 and 358.4.

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the basin has operated within its sustainable yield over a period of at least ten years. Basins with approved alternatives are not explicitly subject to the Periodic Evaluation requirements like those basins with approved GSPs;[5] however, basins with approved alternatives must submit Annual Reports and the alternative must be submitted to the Department at least every five years for review and assessment.[6] Like GSPs, alternatives are subject to Periodic Reviews, in which the Department issues an assessment evaluating the progress toward achieving or maintaining the basin's sustainability goal.

If an alternative is not amended or is not in some other way materially changed, a Periodic Evaluation may be submitted in lieu of resubmission of the entire, identical alternative that was previously approved by the Department. A Periodic Evaluation, as it applies to alternatives, is a written assessment prepared by the local agency or groundwater sustainability agency (GSA) describing whether the implementation of the alternative, including implementation of projects and management actions, is meeting or maintaining the basin's sustainability goal. As indicated throughout this assessment, the Department's Periodic Review is based on information provided in Annual Reports and any available alternative or Periodic Evaluation submitted by local agencies or GSAs managing the basin for SGMA compliance.[7]

- ***Based on the current evaluation of the Alternative, Department staff recommend that it be approved with the recommended corrective actions described herein.***

This Periodic Review includes the following sections:

- **Section 1 – Alternative Summary**: A description of the basin's alternative submittal, an overview of the Department's responsibility to periodically review and evaluate approved alternatives, and a summary of the alternative's recommended actions.
- **Section 2 – Periodic Review Criteria**: Describes the applicable statutory and regulatory requirements and the Department's evaluation criteria for approved alternatives.
- **Section 3 – Periodic Review of Approved Alternative**: Summarizes the Department's evaluation of the basin's approved alternative and may recommend corrective actions to facilitate the Department's ongoing evaluation of the basin's existing groundwater management program.
- **Section 4 – Progress Towards Addressing 2019 Recommended Actions**: A discussion of whether the agencies in the basin have made progress towards

[5] 23 CCR § 356.4.
[6] 23 CCR § 358.2(b).
[7] Water Code § 10733.8.

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addressing the recommended actions identified by the Department in its previous assessment.

- **Section 5 – Staff Recommendation**: Includes the alternative's recommended status for approval, and provides new recommended corrective actions, if necessary.

1 ALTERNATIVE SUMMARY

In the Santa Clara Valley – Santa Clara Subbasin (Subbasin) a single alternative groundwater sustainability plan (GSP),[8] an alternative based on an existing groundwater management plan and other law authorizing groundwater management, was prepared and submitted by the Santa Clara Valley Water District (Valley Water), the sole GSA in the Subbasin. The *2016 Groundwater Management Plan for the Santa Clara and Llagas Subbasins* (2016 GWMP) was adopted by the GSA's Board of Directors on November 22, 2016. At the same public meeting, the GSA's Board authorized the 2016 GWMP to be adopted as an alternative GSP. The 2016 GWMP updated and expanded upon technical information from the groundwater management plan adopted by Valley Water in 2012, and Valley Water indicated that "the 2016 GWMP…meets the objectives of SGMA and contains information and elements that are functionally equivalent to the elements of a GSP…"[9] While the 2016 GWMP was the primary document relied upon to comply with SGMA's planning deadlines, Valley Water also relied upon additional plans, reports, and technical documents, which for the purposes of this assessment, are collectively referred to as the 2016 Alternative.[10]

The GSA's 2016 Alternative was first approved by the Department on July 17, 2019, with five recommended actions.[11] The 2016 Alternative's recommended actions, which were intended to improve the Alternative and facilitate the Department's ongoing evaluation of the basin's existing groundwater management program, are presented in detail in Section 4 of this assessment and generally relate to the following topics:

- Identification of groundwater dependent ecosystems (Recommended Action 1).
- Incorporation of climate change and population growth projections into the water budget over the 50-year planning and implementation horizon (Recommended Action 2).
- Establish separate water quality outcome measures for the Santa Clara and Llagas Subbasins (Recommended Action 3).

[8] Water Code § 10733.6(b)(1); 23 CCR § 358.2.
[9] 2021 GWMP, Chapter 1.1.1, p. 24.
[10] https://sgma.water.ca.gov/portal/alternative/print/18.
[11] https://sgma.water.ca.gov/portal/alternative/assessments/18.

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- Development of outcome measures specific to seawater intrusion, separate from water quality (Recommended Action 4).
- Clarify definition and relation of outcome measures to the avoidance of undesirable results by sustainability indicator (Recommended Action 5).

Since the Alternative was first adopted in 2016, the Subbasin's Plan Manager has been submitting Annual Reports to the Department and has been documenting progress of the Subbasin's existing groundwater management program. At the time this Periodic Review was conducted by Department staff, the most recent Annual Report, which was submitted to the SGMA Portal on March 29, 2023, covered water year 2022.[12]

The *2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasins* (2021 GWMP or 2021 Alternative)[13] was prepared pursuant to the authority granted by the Santa Clara Valley Water District Act and was adopted on November 23, 2021; the 2021 GWMP is intended to supersede all previous groundwater management plans.[14] As stated in the 2021 GWMP, "Basin management goals, strategies, programs, and outcome measures in the 2021 GWMP are very similar to the 2016 plan, as they have been effective in ensuring sustainable conditions. Valley Water's 2016 GWMP documented numeric outcome measures to assess performance in meeting basin sustainability goals. These outcome measures relate to groundwater storage, land subsidence, and water quality and are largely unchanged in this 2021 GWMP because they have been effective in avoiding undesirable results and prompting action when needed…"[15] The 2021 Alternative was submitted to the Department for evaluation on December 17, 2021. Functional equivalence to a GSP is documented in detail by the GSA throughout Appendix B of the 2021 GWMP.[16]

1.1 Recommendation Summary

Department staff conclude that the 2021 Alternative includes the components of a functionally equivalent GSP, demonstrates a thorough understanding of the Subbasin based on what appears to be the best available science and information, sets well explained, supported, and reasonable sustainable management criteria to prevent undesirable results as defined in the 2021 Alternative, and proposes a set of projects and management actions that will likely achieve the sustainability goals defined for the Subbasin. Department staff will continue to monitor and evaluate the progress toward achieving the Subbasin's sustainability goals through continued Annual Reporting and future revisions to the Alternative.

[12] https://sgma.water.ca.gov/portal/alternative/annualreport/60.
[13] https://sgma.water.ca.gov/portal/alternative/periodiceval/preview/6.
[14] 2021 GWMP, Executive Summary, p. 15.
[15] 2021 GWMP, Chapter 1.1.1, pp. 24-25.
[16] 2021 GWMP, Appendix B, pp. 339-369.

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For reference, the sustainability goals of the Subbasin are "*related to groundwater supply reliability and protection [and] are based on Board Policy:*

- *Manage groundwater to ensure sustainable supplies and avoid land subsidence.*
- *Aggressively protect groundwater from the threat of contamination*."[17]

As stated in the 2021 Alternative, "These goals describe the overall objectives of Valley Water's groundwater management programs. The basin management strategies below are used to meet the sustainability goals. Many of these strategies…have overlapping benefits, acting to improve water supply reliability, minimize subsidence, and protect or improve groundwater quality.

1. Manage groundwater in conjunction with surface water.
2. Implement programs to protect and promote groundwater quality.
3. Maintain and develop adequate groundwater models and monitoring networks.
4. Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination."[18]

Based on the current evaluation of the 2016 Alternative, and after considering information provided by the Subbasin's GSA, Department staff recommend that the 2021 Alternative be approved with recommended corrective actions, which are related to consideration of adjacent basins and alignment of monitoring networks. Additional evaluation details, implementation observations, and recommendations are provided herein.

2 PERIODIC REVIEW CRITERIA

At least every five years after the initial submission of a plan prepared pursuant to Water Code Section 10733.4, the Department is required to review any available GSP, as well as any alternative[19] submitted in accordance with Water Code Section 10733.6.[20] The Department is required to periodically review an approved alternative to ensure it remains consistent with the objectives of SGMA and continues to substantially comply with the GSP Regulations.[21] The Department is also required to ensure that an approved alternative is being implemented in a manner that will likely achieve the basin's sustainability goal.[22]

The Department's Periodic Review is based on information provided in the Annual Reports as well as the alternative's functionally equivalent Periodic Evaluation, which may

[17] 2021 GWMP, Executive Summary, p. 20.
[18] 2021 GWMP, Executive Summary, p. 20.
[19] 23 CCR § 358.2.
[20] 23 CCR § 358.4.
[21] 23 CCR §§ 355.6 and 358.4.
[22] 23 CCR § 355.4(b).

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be either a Periodic Evaluation prepared in accordance with Section 356.4 of the GSP Regulations or an amended version of its approved alternative.[23] In both cases, the entity submitting an alternative is required to explain how the elements of the alternative are functionally equivalent to the elements of a GSP.[24]

The Department considers the following in determining whether an alternative and its implementation remains consistent with SGMA and the GSP Regulations:[25]

- Whether the exceedances of any minimum thresholds or failure to meet any interim milestones are likely to affect the ability of the local agencies and/or GSAs in the basin to achieve the basin's sustainability goal.
- Whether the local agencies and/or GSAs in the basin are implementing projects and management actions consistent with the alternative, or that the local agencies and/or GSAs have demonstrated that actions described in the alternative have been rendered unnecessary based on changing basin conditions or an improved understanding of basin conditions.
- Whether the local agencies and/or GSAs are addressing data gaps in the basin and reducing the levels of uncertainty identified in the alternative.
- Whether the alternative continues to satisfy the evaluation criteria described in Section 355.4 of the GSP Regulations.

Following its Periodic Review of the approved alternative, the Department is required to issue a written assessment of its findings and potentially make a new determination of the alternative's status, as follows: approved,[26] incomplete,[27] or inadequate.[28] The assessment may recommend corrective actions to address any new or remaining regulatory deficiencies identified by the Department.

As defined in the GSP Regulations, the Department may request any information it deems necessary to evaluate the progress toward achieving the basin's sustainability goal and the potential for adverse effects on adjacent basins.[29] Additionally, the Department may evaluate the implementation of an alternative at any time to determine whether it is consistent with the objectives of SGMA and in substantial compliance with the GSP Regulations.[30]

[23] 23 CCR §§ 358.2(d) and (e).
[24] 23 CCR § 358.2(d).
[25] 23 CCR § 355.6(c).
[26] 23 CCR § 355.6(d)(1).
[27] 23 CCR § 355.6(d)(2).
[28] 23 CCR § 355.6(d)(3).
[29] 23 CCR § 355.6(e).
[30] 23 CCR § 355.6(f).

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3 PERIODIC REVIEW OF APPROVED ALTERNATIVE

Pursuant to the GSP Regulations, the Department is required to consider basin conditions and associated minimum thresholds, the status of projects and management actions, and efforts taken to address data gaps and uncertainty when determining whether an alternative remains consistent with SGMA and continues to substantially comply with the GSP Regulations.[31] The perspective of Department staff of whether the approved alternative continues to satisfy Section 355.4 of the GSP Regulations in a functionally equivalent manner is provided below in Section 5.

As part of its Periodic Review responsibilities, the Department must also assess whether implementation of an alternative will adversely affect the ability of an adjacent basin to implement its alternative or its GSP, and Department staff must ensure that the monitoring network described in the alternative aligns with the data uploaded to the SGMA Portal Monitoring Network Module. Staff perspective regarding adjacent basins and monitoring networks is provided within this section.

As described in the 2016 GWMP, and as incorporated into the updated 2021 GWMP, the GSA has documented functional equivalence to a GSP by submitting an updated groundwater management plan and associated justification.[32] Although the terminology and approaches differ slightly from basins with GSPs, the 2021 GWMP is based on existing groundwater management practices in the Subbasin. The GSA describes an adaptive management approach to groundwater management, which is informed by the continually evolving monitoring network.[33] The 2021 GWMP describes that "all outcome measures and outcome measure-lower thresholds will be evaluated annually and related reporting occurs through Valley Water's Annual Groundwater Report and annually in the Water Year [Annual] Reports due each April 1 to [the Department]."[34] Additionally, as reported in the 2021 GWMP and on Valley Water's website, the monitoring network and near-real time reporting of conditions allows the GSA to prioritize, develop, and implement projects and management actions to ensure sustainable Subbasin conditions are not threatened. The GSA has continued to demonstrate that it is able to operate the Subbasin at or near the measurable objective (outcome measure), is meeting its sustainability goals, and will continue to adaptively manage the Subbasin by incorporating best available science and information.

The GSA has internally identified several areas for improvement of its 2021 GWMP and Department staff concur that those items are important and should be addressed as soon as practicable.[35] Department staff have identified additional recommendations that should be considered by the GSA as the 2021 GWMP is being implemented and improved upon.

[31] 23 CCR § 355.6.
[32] 2021 GWMP, Appendix B, pp. 339-369.
[33] 2021 GWMP, Appendix J, p. 771.
[34] 2021 GWMP, Appendix B, p. 340.
[35] 2021 GWMP, Chapter 8, pp. 219-221.

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Addressing these recommendations will be important to demonstrate that the GSA is likely to maintain its sustainability goals. Details regarding these recommendations can be found in the following sections grouped by sustainability indicator.

3.1 Minimum Thresholds

The GSP Regulations require that the description of minimum thresholds include the information and criteria relied upon to establish and justify the thresholds established for each sustainability indicator.[36] The numeric value used to define those thresholds should represent a point in the basin that, if exceeded, may cause undesirable results.[37] As part of its Periodic Review responsibility, the Department is required to consider whether the exceedances of any minimum thresholds, or failure to meet any interim milestones, are likely to affect the ability of the local agencies and/or GSAs to achieve the basin's sustainability goal.[38]

The Alternative applies functionally equivalent minimum thresholds in the Subbasin. As stated in the 2021 GWMP, "The outcome measures are quantifiable goals to track performance of sustainable management and are functionally equivalent to measurable objectives under SGMA. This 2021 GMWP has new outcome measure-lower thresholds that are quantifiable values used to define undesirable results and are functionally equivalent to minimum thresholds under SGMA. The outcome measure-lower thresholds account for a reasonable margin of operational flexibility below the outcome measures that accommodate drought, climate change, conjunctive use operations, and other groundwater management activities. Valley Water has a long-established history of sustainable groundwater management and will continue to proactively manage groundwater to minimize the risk of reaching the outcome measure-lower thresholds and related undesirable results."[39] Department staff agree that the use of outcome measures by the GSA is functionally equivalent to sustainable management criteria as defined by the GSP Regulations. Below is information for each of the applicable sustainability indicators discussed in the 2021 Alternative.

3.1.1 Chronic Lowering of Groundwater Levels

According to the 2021 Alternative, the Subbasin's groundwater level monitoring network includes 171 wells monitored by Valley Water, as well as 107 wells monitored by water retailers. The GSA states that all data collected is maintained in Valley Water's database and is used in regional condition and trend analysis.[40] Department staff note that, although monitoring groundwater levels is an integral part of Valley Water's basin management activities and is intimately connected to managing land subsidence, groundwater storage, seawater intrusion, and water quality, there are no sustainable

[36] 23 CCR § 354.28(b)(1).
[37] 23 CCR § 354.28(a).
[38] 23 CCR § 355.6(c)(1).
[39] 2021 GWMP, Chapter 5.4, p. 145.
[40] 2021 GWMP, Chapter 7.1.1, pp. 179-181; Appendix K, Table K-1, pp. 815-822.

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management criteria explicitly set for the chronic lowering of groundwater levels sustainability indicator. However, because the Subbasin has been, and continues to be, managed pursuant to an updated groundwater management plan, as well as the policies of Valley Water's District Act, sustainable management criteria for chronic lowering of groundwater levels are not directly warranted. Instead, the GSA uses "outcome measures" to monitor groundwater conditions and meet its sustainability goals.[41]

Outcome Measures (functionally equivalent measurable objectives) and Outcome Measures-Lower Thresholds (functionally equivalent minimum thresholds) have been established for groundwater levels for the purpose of preventing land subsidence in the Subbasin. As stated in the 2021 GWMP, "Significant inelastic (permanent) land subsidence occurred in the Santa Clara Plain through the 1960s due to long-term overdraft. Permanent subsidence was essentially halted by about 1970 through Valley Water's expanded conjunctive use programs, which allowed a substantial recovery in groundwater levels. The avoidance of inelastic land subsidence has been and continues to be a major driver for Valley Water given the extremely high costs associated with damaged infrastructure, reduced carrying capacity of flood control structures, and seawater encroachment into freshwater aquifers."[42] In 1991, Valley Water evaluated the remaining land subsidence potential to avoid additional inelastic subsidence due to groundwater overdraft. Based on the findings of the 1991 study, Valley Water established an acceptable subsidence rate of no more than 0.01 feet per year on average, measured over a multi-year period.

Ten index wells throughout the Subbasin, shown in Table 5-1 in the 2021 GWMP, were selected as control points for subsidence model calibration and prediction, and the rate of 0.01 feet per year of inelastic subsidence was applied to determine threshold groundwater levels for these wells. The subsidence thresholds are the groundwater levels that must be maintained to ensure a low risk of unacceptable land subsidence.[43] The "outcome measure relies on continued observation of groundwater levels at the subsidence index wells and comparison to subsidence thresholds to ensure groundwater levels are maintained above these thresholds."[44]

- Outcome Measure [measurable objectives]: Groundwater levels are above subsidence thresholds at the Santa Clara Subbasin subsidence index wells.
- Outcome Measure – Lower Threshold [minimum thresholds]: Groundwater levels are above the historical low water levels at the majority of the Santa Clara Subbasin subsidence index wells.

As reported in the 2021 GWMP, "From 2010 to 2019, groundwater levels at all 10 subsidence index wells remained above their respective subsidence threshold elevations

[41] 2021 GWMP, Chapter 5.4, pp. 145-152.
[42] 2021 GWMP, Chapter 5.4.2, pp. 146-148.
[43] 2021 GWMP, Table 5-1, p. 147.
[44] 2021 GWMP, Chapter 5.4.2, p. 146.

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except during the 2012–2016 drought when water levels temporarily dropped below the subsidence threshold at one well (07S01W22E002) during the summer and fall of 2014. Because the water levels at two other index wells (07S01W02G024 and 07S01E16C006) were also approaching their respective thresholds, Valley Water worked with several water retailers to reduce groundwater pumping in these areas. Due to this coordinated effort, Valley Water's recharge programs, and community water use reduction, the groundwater levels at 07S01W22E002 quickly recovered to levels above the subsidence threshold in early 2015 despite continued dry conditions. Water levels at the other nine subsidence index wells had a similar response and water levels rose to healthy levels above the subsidence thresholds."[45]

The Water Year 2022 Annual Report describes recovery of water levels since the 2012 to 2016 drought, attributing this to "robust managed recharge and continued water use reduction…"[46] The Water Year 2022 Annual Report continues, describing "healthy groundwater conditions in WY 2017 through 2020 (Figure 5), with the groundwater basins essentially full heading into the recent drought (2020 to present)."[47] The Water Year 2022 Annual Report describes impacts on water levels due to recent challenging hydrologic conditions, describing that "WY 2022 groundwater elevations in many regional wells were lower than WY 2021 due to statewide drought conditions and increased groundwater pumping. However, the groundwater elevations remain far above the historical [minimums] and levels observed during the last major droughts of 1987-1992 and 2012-2016. Despite drought conditions, artesian pressures were observed in the northern Santa Clara Subbasin. Groundwater elevations in WY 2022 were also well above Valley Water thresholds established to minimize the risk of land subsidence in the Santa Clara Subbasin."[48]

Although there are no sustainable management criteria directly set for the chronic lowering of groundwater levels, it is apparent that the GSA has been monitoring and managing groundwater levels in the Subbasin for many years to address the undesirable results associated with land subsidence. Department staff note that the Subbasin appears to be meeting its sustainability goals with respect to chronic lowering of groundwater levels, as well as land subsidence (see Section 3.1.5 below).

3.1.2 Reduction of Groundwater Storage

The 2021 GWMP contains the following functionally equivalent sustainable management criteria for the reduction of groundwater storage sustainability indicator.[49] As discussed below, no exceedances of groundwater storage minimum thresholds have occurred in the Subbasin.

[45] 2021 GWMP, Chapter 4.5.2, pp. 147-148.
[46] 2022 WY Annual Report, Chapter 2, p. 9.
[47] 2022 WY Annual Report, Chapter 2, p. 9.
[48] 2022 WY Annual Report, Chapter 2, p. 9.
[49] 2021 GWMP, Chapter 5.4.1, p. 145.

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- Outcome Measure [measurable objective]: Projected end of year groundwater storage is greater than 278,000 acre-feet (AF) in the Santa Clara Plain, 5,000 AF in the Coyote Valley, and 17,000 AF in the Llagas Subbasin.
- Outcome Measure – Lower Threshold [minimum threshold]: Projected end of year countywide groundwater storage is greater than Stage 5 (150,000 AF) of the Water Shortage Contingency Plan.

The 2021 GWMP describes the importance of the sustainable management of groundwater storage, indicating that it "is a critical consideration in water supply reliability and is the county's best protection against drought or facility outage. The end of year groundwater storage is projected to support operational decisions, including the timing and location of reservoir releases and managed recharge, and decisions related to imported water such as short-term water exchanges or out of county banking."[50] The 2021 GWMP continues that, "Valley Water regularly analyzes groundwater storage to support operational decisions, contingency planning, and planning to meet future needs. To support near-term operations, Valley Water uses groundwater models to estimate storage for the current year and simulate conditions for the following calendar year under a range of projected water supply and hydrologic scenarios. As the water year progresses and more water supply and demand information become available, operations plans are updated accordingly."[51]

While the GSA's 2020 Urban Water Management Plan provides an overall storage target of 300,000 acre-feet in both the Santa Clara and Llagas subbasins, based on groundwater storage observed historically, the end of year storage targets established in the 2021 GWMP are 283,000 acre-feet in the Santa Clara Subbasin (278,000 acre-feet in the Santa Clara Plain and 5,000 acre-feet in the Coyote Valley) and 17,000 acre-feet in the Llagas Subbasin. The rationale for adopting these outcome measures was "to account for a reasonable operational flexibility, including more severe future droughts or infrastructure outages, the outcome measure-lower threshold for groundwater storage in the Santa Clara and Llagas subbasins is greater than stage 5 (150,000 acre-feet) of the water shortage contingency plan. If storage falls below this target, there would be a greatly increased risk of resumed permanent subsidence and more widespread reports of dry wells. The outcome measure-lower threshold accounts for the integrated groundwater management and operational decisions that are necessary for Valley Water to make across both Santa Clara and Llagas subbasins, particularly during a drought response."[52]

In addition to monthly reports on Valley Water's website, the 2021 GWMP describes recent groundwater storage conditions, stating that "From 2010 to 2019, countywide groundwater storage in the Santa Clara and Llagas subbasins remained in the normal stage (>300,000 AF) each year except during the 2012–2016 drought when storage

[50] 2021 GWMP, Chapter 5.4.1, pp.145-146.
[51] 2021 GWMP, Chapter 7.6.3, p. 216.
[52] 2021 GWMP, Chapter 5.4.1, p. 146.

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dipped into stage 3 during 2014 and 2015."[53] The 2021 GWMP continues, "Despite this drop in storage, there were very limited impacts to well users, with fewer than 15 reports of wells going dry for domestic wells along the basin margins where well yield is more uncertain. No permanent subsidence was observed. Due to Valley Water's recharge programs, coordination with water retailers, and community water use reductions in response to Board action, groundwater storage quickly recovered to the normal stage (stage 1) in 2016."[54]

The Water Year 2022 Annual Report summarizes general groundwater storage conditions, although not expressly compared to the functionally equivalent sustainable management criteria, "Due to increased recharge and decreased groundwater use starting in WY 2021 and continuing through WY 2022, Valley Water estimates a net increase in countywide groundwater storage of 2,200 AF in WY 2022 compared to WY 2021. Storage increased by 2,500 AF in the Santa Clara Subbasin and decreased by 300 AF in the Llagas Subbasin. Groundwater storage is the primary trigger for action under Valley Water's Water Shortage Contingency Plan, and storage remained within the low "Normal" stage in WY 2022."[55]

Additional information supporting the Subbasin's groundwater management program, organized by calendar year rather than water year as required by SGMA and the GSP Regulations, is found on the GSA's website. Because the GSA does not appear to be exceeding its "Outcome Measure – Lower Threshold"[56] with respect to the reduction of groundwater storage sustainability indicator, the Subbasin appears to be on track to meeting its sustainability goals.

3.1.3 Seawater Intrusion

The 2021 GWMP contains the following functionally equivalent sustainable management criteria for the seawater intrusion sustainability indicator.[57] As discussed below, the GSA has demonstrated that no exceedances of the seawater intrusion minimum threshold have occurred in the Subbasin.

- Outcome Measure [measurable objective]: In the Santa Clara Subbasin shallow aquifer, the 100 milligram per liter chloride isocontour area is less than the historical maximum extent area (57 square miles).
- Outcome Measure – Lower Threshold [minimum threshold]: In the Santa Clara Subbasin shallow aquifer, the 100 milligram per liter chloride isocontour area is less than 81 square miles, which represents a one-mile radial buffer of the historical maximum extent area.

[53] 2021 GWMP, Chapter 5.4.1, p. 145.
[54] 2021 GWMP, Chapter 5.4.1, pp.145-146.
[55] 2022 WY Annual Report, Chapter 3.4, p. 24.
[56] 2021 GWMP, Chapter 5.4.1, p. 145.
[57] 2021 GWMP, Chapter 5.4.4, pp. 150-152.

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As stated, "This 2021 GWMP includes a new seawater intrusion outcome measure for the Santa Clara Subbasin. A detailed technical memorandum that documents the current understanding of seawater intrusion mechanisms, approach, and analysis used to develop the seawater intrusion outcome measure is included in Appendix H. Appendix H also documents current understanding of climate change driven sea-level rise and implications for monitoring and managing seawater intrusion in the Santa Clara Subbasin."[58]

The rationale for development of the functionally equivalent sustainable management criteria for seawater intrusion is provided in the 2021 GWMP, indicating that "The number and location of supply wells were evaluated in relation to the 100 [milligram per liter (mg/L)] isocontours to identify an appropriate outcome measure and outcome measure-lower threshold. Most supply wells are screened in the deeper, principal aquifer zone, where no widespread [seawater intrusion (SWI)] has been observed. The 100 mg/L chloride isocontours are based on monitoring wells screened in the shallow aquifer zone and thus represent potential vulnerability of contamination of the deeper, principal aquifer, via improperly constructed or destroyed wells that may serve as vertical conduits for poorer quality water from the shallow zone."[59] Potential impacts to supply wells were factored into the analysis, and the GSA indicates that the "maximum known extent and the 5,280-foot radial buffer have a combined total of 49 active wells that pump 1,558 AF, which is equivalent to only about 1.7% of the total groundwater pumping in the Santa Clara Subbasin in 2013 (Appendix H). Using the 5,280-foot [one mile] buffer as a lower threshold to the outcome measure will help minimize the risk of SWI vulnerability to supply wells in the Santa Clara Subbasin."[60]

The 2021 GWMP describes the importance of the seawater intrusion sustainability indicator given its long history studying and grappling with the impacts of it in the Subbasin. The 2021 GWMP states that "Due to historic high groundwater pumping and land subsidence, particularly in the years following World War II, seawater intrusion has been observed in the shallow aquifer of the Santa Clara Plain."[61] The 2021 GWMP describes the early understanding of the relationship between the seawater intrusion and subsidence sustainability indicators, describing that "seawater intrusion was exacerbated by land subsidence, which decreased the elevation of the land surface adjacent to San Francisco Bay, causing further inland movement along tidal creeks."[62] The GSA describes monitoring water quality with respect to seawater intrusion, stating that "Valley Water has been monitoring groundwater quality in the Santa Clara Subbasin for decades. Chloride data from wells screened in the shallow aquifer zone was presented as the mg/L chloride isocontour in the 2016 GWMP and Valley Water's Annual Groundwater Report.

[58] 2021 GWMP, Chapter 5.4.4, pp. 150; Appendix H, pp. 705-763.
[59] 2021 GWMP, Chapter 5.4.4, p. 150.
[60] 2021 GWMP, Chapter 5.4.4, pp.150-152.
[61] 2021 GWMP, Chapter 2.2.6, p. 85.
[62] 2021 GWMP, Chapter 2.2.6, p. 85.

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This concentration is used as an early warning of potential seawater intrusion since the [Secondary Maximum Contaminant Level (SMCL)] for chloride is 250 mg/L."[63]

The 2021 GWMP continues that "Figure 5-3 is a compilation of available 100 mg/L isocontours that have been presented in recent Valley Water reports, spanning the years from 1945 to 2019. Figure 5-3 indicates that the maximum known extent of SWI (denoted by the 100 mg/L chloride isocontour) occurred around 1960, which coincided with groundwater overdraft conditions and historic low groundwater levels throughout much of the Santa Clara Subbasin…The maximum known extent of the 100 mg/L chloride isocontour in 1960 covered an area of about 57 square miles as compared to only 40 square miles in 2019. Additional details of the historical progress of the 100 mg/L chloride isocontours are presented in Appendix H."[64] With respect to the seawater intrusion sustainability indicator, because the area impacted by chloride is 40 square miles and well below the 57 square mile Outcome Measure, the Subbasin appears to be maintaining its sustainability goal with respect to seawater intrusion.

While the Department acknowledges that water quality data specific to seawater intrusion is provided in Valley Water's Calendar Year Annual Reports, documentation of progress on the seawater intrusion sustainability indicator should be provided in the SGMA Annual Reports to better determine if the Subbasin is meeting its sustainability goals. Most of the pertinent information provided in the GSA's Calendar Year Annual Reports is not reported to the Department in the required Water Year Annual Reports. For example, the 2022 Calendar Year Annual Report incorporates the recent development of a separate outcome measure (measurable objective) and outcome measure-lower threshold (minimum threshold) for the seawater intrusion sustainability indicator and presents the 2022 chloride contour against these new sustainable management criteria.[65] As described in the 2022 Calendar Year Annual Report, the chloride isocontour extent of 46 square miles is less than the historical maximum extent area (57 square miles) outcome measure (measurable objective), indicating that the outcome measure was met.[66] Although there does not appear to be exceedances of the seawater intrusion minimum threshold at this time, the Department staff encourage the GSA to incorporate information about all applicable sustainability indicators in future versions of the SGMA Annual Report and organize that information by water year not calendar year.

3.1.4 Degraded Water Quality

The 2021 GWMP contains the following functionally equivalent sustainable management criteria for the degraded water quality sustainability indicator.[67] As discussed below, no exceedances of water quality minimum thresholds have occurred in the Subbasin.

[63] 2021 GWMP, Chapter 5.4.4, p. 150.
[64] 2021 GWMP, Chapter 5.4.4, p. 150; Appendix H, Table 1, p. 730.
[65] 2022 Calendar Year Annual Report, Figure 27, p.54.
[66] 2022 Calendar Year Annual Report, Executive Summary, p. 14.
[67] 2021 GWMP, Chapter 5.4.3, pp. 148-150.

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- Outcome Measure [measurable objective]: For Santa Clara Subbasin water supply wells, at least 95% meet primary drinking water standards, and at least 90% have stable or decreasing trends for total dissolved solids (TDS).
- Outcome Measure – Lower Threshold [minimum threshold]: At least 70% of water supply wells have stable or decreasing trends for nitrate and TDS.

As stated in the 2021 GWMP, "Based on DWR Recommended Actions…the water quality outcome measures in the 2021 GMWP include new and separate outcome measures and corresponding outcome measures-lower thresholds related to groundwater quality in the Santa Clara and Llagas subbasins. These separate subbasin-specific criteria will allow for a determination of whether each subbasin, separately, is meeting or making progress toward the outcome measures. Additionally, the new water quality outcome measure for the Santa Clara Subbasin is distinctly different than the new outcome measure for seawater intrusion in the subbasin…"[68]

The 2021 GWMP explains that the water quality outcome measures evaluate the percentage of water supply wells that meet all primary Maximum Contaminant Level (MCLs) and that the outcome measures will be evaluated annually using data collected at water supply wells sampled by Valley Water and water retailers. Additionally, the 2021 GWMP states, "The target percentage for water supply wells meeting primary MCLs is set high (95%) since these are health-based regulatory standards that must be met by public water systems. This measure is not set at 100% for several reasons. Some of the wells monitored by Valley Water are private domestic wells, which are assumed to have less stringent wellhead protection, maintenance, and testing. The water quality at these wells may be more influenced by local land use and conditions near the well as they are typically shallower than public water supply wells."[69] Additionally, "to account for reasonable operational flexibility, including annual factors that can affect groundwater quality, the outcome measure-lower threshold for groundwater quality is that at least 70% of supply wells have stable or decreasing concentrations of nitrate and TDS."[70]

The primary water quality constituents of concern in the Subbasin are TDS and nitrate. Concentrations of TDS in groundwater are an indicator of salt loading and overall groundwater conditions, while nitrate is reported to be "the one parameter that is frequently detected above the MCL and affects the largest number of wells..."[71] As stated, "The trend-based component of the outcome measures will help Valley Water to better

[68] 2021 GWMP, Chapter 5.4.3, p. 148.
[69] 2021 GWMP, Chapter 5.4.3, p. 149.
[70] 2021 GWMP, Chapter 5.4.3, p. 150.
[71] 2021 GWMP, Chapter 5.4.3, p. 149.

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understand how groundwater quality is changing over time and highlight areas that may warrant further study or action to protect the beneficial use of groundwater."[72]

In the Santa Clara Plain Management Area of the Subbasin, groundwater quality is reported to be of very good quality with infrequent detections of water quality parameters above health-based MCLs.[73] In the 2021 GWMP, Figures 2-20 and 2-21 show the relative concentrations of inorganic parameters, including those with health-based MCLs and aesthetic-based secondary MCLs (SMCLs) for the period 2010 to 2019 in the principal aquifer. The median concentration in the principal aquifer zone between 2010-2019 was 406 mg/L for TDS (SMCL is 500 mg/L) and 2.7 mg/L for nitrate as nitrogen (MCL is 10 mg/L).[74] The nitrate exceedances are reported to be a legacy issue from agricultural land use, which was widespread throughout the Santa Clara Plain Management Area.[75] A full water quality summary of multiple water quality constituents is provided in Table 2-2 (shallow aquifer zone) and Table 2-3 (principal aquifer zone) for the Santa Clara Plain Management Area in the 2021 GWMP. With respect to the degraded water quality sustainability indicator, the Subbasin appears to be meeting its sustainability goals.

In the Coyote Valley Management Area of the Subbasin, groundwater quality is reported to be "…typically of good quality."[76] The 2021 GWMP describes nitrate as the primary exception, which is detected above the MCL in some wells due to historic and ongoing sources. In the 2021 GWMP, Figures 2-20 and 2-21 show the relative concentrations of inorganic parameters, including those with health-based MCLs and aesthetic-based SMCLs for the period 2010 to 2019. The median concentration between 2010-2019 was 388 mg/L for TDS (SMCL is 500 mg/L) and 5.1 mg/L for nitrate as nitrogen (MCL is 10 mg/L).[77] The nitrate exceedances in the Coyote Valley Management Area are reported to be from historical and ongoing agricultural practices and use of septic systems.[78] A full water quality summary of multiple water quality constituents is provided in Table 2-6 and Table 2-7 for the Coyote Valley Management Area in the 2021 GWMP. With respect to the degraded water quality sustainability indicator, the Subbasin appears to be meeting its sustainability goals.

Water quality conditions are not discussed in the GSA's Annual Reports as they pertain to SGMA's annual reporting requirements, but they are discussed in Valley Water's Calendar Year Annual Reports.[79] The 2022 Calendar Year Annual Report explains that "elevated nitrate continues to be the primary groundwater protection challenge in the Coyote Valley [within Santa Clara Subbasin] and Llagas groundwater management areas, where a significant number of domestic wells contain water with nitrate above the

[72] 2021 GWMP, Chapter 5.4.3, p. 149.
[73] 2021 GWMP, Chapter 2.2.5.1, pp. 71-80.
[74] 2021 GWMP, Chapter 2.2.5.1, Table 2-3, p. 78.
[75] 2021 GWMP, Chapter 2.2.5.1, p. 73.
[76] 2021 GWMP, Chapter 2.2.5.2, p. 81.
[77] 2021 GWMP, Chapter 2.2.5.2, Table 2-6, pp. 83-84.
[78] 2021 GWMP, Chapter 2.2.5.2, p. 82.
[79] https://www.valleywater.org/your-water/groundwater.

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drinking water standard (Table ES-4)."[80] The 2022 Calendar Year Annual Report describes how the GSA coordinates "with land use and regulatory agencies to influence related policies, regulations, and decisions. More directly, Valley Water's managed recharge programs help dilute nitrate, and water quality testing helps to reduce well owner exposure. While most wells have stable or decreasing long-term chloride concentrations, increasing concentrations in some shallow aquifer wells warrant continued tracking and evaluation."[81]

While the Department acknowledges that water quality data is provided in Valley Water's Calendar Year Annual Reports, documentation of progress on the degraded water quality sustainability indicator should be provided in the SGMA Annual Reports to determine if the Subbasin is meeting its sustainability goals. Most of the pertinent information is provided in the Calendar Year Annual Reports, which is not reported to the Department in Water Year Annual Reports. For example, and importantly, the 2022 Calendar Year Annual Report describes recent performance against the functionally equivalent sustainable management criteria, indicating that the outcome measure (measurable objective) for degraded water quality was met, stating that "96% of Santa Clara Subbasin water supply wells tested met all primary drinking water standards; and 92% had stable or decreasing trends for TDS."[82] Though the GSA appears to be on track to meeting its water quality sustainability goals, Department staff encourage the GSA to incorporate information about all applicable sustainability indicators in future versions of the SGMA Annual Report and organize that information by water year, not calendar year.

3.1.5 Land Subsidence

The 2021 GWMP contains the following functionally equivalent sustainable management criteria for the land subsidence sustainability indicator.[83] As indicated in the 2021 GWMP, these outcome measures are the same as those established for groundwater levels. As discussed below, no exceedances of land subsidence minimum thresholds have occurred in the Subbasin.

- Outcome Measure [measurable objective]: Groundwater levels are above subsidence thresholds at the Santa Clara Subbasin subsidence index wells.
- Outcome Measure – Lower Threshold [minimum threshold]: Groundwater levels are above the historical low water levels at the majority of the Santa Clara Subbasin subsidence index wells.

The 2021 GWMP describes the importance of the land subsidence sustainability indicator, stating that "Significant inelastic (permanent) land subsidence occurred in the Santa Clara Plain through the 1960s due to long-term overdraft. Permanent subsidence was essentially halted by about 1970 through Valley Water's expanded conjunctive use

[80] 2022 Calendar Year Annual Report, Executive Summary, p. 12.
[81] 2022 Calendar Year Annual Report, Executive Summary, p.12
[82] 2022 Calendar Year Annual Report, Executive Summary, p.14.
[83] 2021 GWMP, Chapter 5.4.2, pp. 146-148.

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programs, which allowed a substantial recovery in groundwater levels. The avoidance of inelastic land subsidence has been and continues to be a major driver for Valley Water given the extremely high costs associated with damaged infrastructure, reduced carrying capacity of flood control structures, and seawater encroachment into freshwater aquifers. It is critical to prevent inelastic subsidence because it is irreversible."[84]

The 2021 GWMP describes the development of land subsidence criteria, stating that "In 1991, Valley Water evaluated the remaining land subsidence potential to avoid additional inelastic subsidence due to groundwater overdraft. Based on the findings of this study, Valley Water has established an acceptable subsidence rate of no more than 0.01 feet per year on average, measured over a multi-year period."[85] The 2021 GWMP describes the development of the subsidence monitoring network and indicates that "Ten index wells throughout the Santa Clara Subbasin were selected as control points for subsidence model calibration and prediction and the tolerable rate of 0.01 feet per year of inelastic subsidence was applied to determine threshold groundwater levels for these wells. These subsidence thresholds (Table 5-1) are the groundwater levels that must be maintained to ensure a low risk of unacceptable land subsidence."[86]

The 2021 GWMP describes the use of groundwater levels as a proxy stating "This outcome measure relies on continued observation of groundwater levels at the subsidence index wells and comparison to subsidence thresholds to ensure groundwater levels are maintained above these thresholds (Table 5-1). It should be noted that a few wells shown in Table 5-1 differ from those in the 1991 study due to well destruction or loss of access. Replacement wells are chosen such that they are in close proximity to and display similar water level patterns as the original well."[87] Further detail on the Agency's land subsidence monitoring program is provided in its 2022 Calendar Year Annual Report, which describes that "Valley Water conducts ongoing monitoring of land surface benchmarks, extensometers, and groundwater levels at subsidence index wells to determine if land subsidence is occurring and threatening to exceed established thresholds. The subsidence monitoring network is shown in Figure 17. Recent monitoring data from land benchmark surveys, extensometers, and subsidence index wells indicate that there is a low risk of subsidence, as described further below and in the 2022 Subsidence Data Analysis Technical Memorandum (Appendix A)."[88]

The 2021 GWMP also describes the rationale for the adoption of the new outcome measure-lower threshold (minimum threshold), in response to the Department's Recommended Action 4 from its 2019 Staff Report, "To account for a reasonable operational flexibility, including more severe future droughts or infrastructure outages, the outcome measure-lower threshold for subsidence is that groundwater levels remain above the historical low water levels at the majority of the Santa Clara Subbasin

[84] 2021 GWMP, Chapter 5.4.2, p. 146.
[85] 2021 GWMP, Chapter 5.4.2, p. 146.
[86] 2021 GWMP, Chapter 5.4.2, p. 146.
[87] 2021 GWMP, Chapter 5.4.2, p. 146.
[88] 2022 Calendar Year Annual Report, Chapter 4, p. 46.

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subsidence index wells. If groundwater levels fall below historical low levels, widespread, permanent subsidence will resume. The outcome measure-lower threshold accounts for short-term and localized water levels dropping below the subsidence thresholds, which may not result in inelastic subsidence across the Santa Clara Subbasin."[89]

The 2021 GWMP also describes groundwater levels with respect to land subsidence monitoring, stating that "From 2010 to 2019, groundwater levels at all 10 subsidence index wells remained above their respective subsidence threshold elevations except during the 2012–2016 drought when water levels temporarily dropped below the subsidence threshold at one well (07S01W22E002) during the summer and fall of 2014."[90] The GSA describes a robust feedback mechanism, where management actions are triggered to avoid undesirable results from land subsidence, "…Valley Water worked with several water retailers to reduce groundwater pumping in these areas. Due to this coordinated effort, Valley Water's recharge programs, and community water use reduction, the groundwater levels at 07S01W22E002 quickly recovered to levels above the subsidence threshold in early 2015 despite continued dry conditions. Water levels at the other nine subsidence index wells had a similar response and water levels rose to healthy levels above the subsidence thresholds."[91]

More recently, the Water Year 2022 Annual Report states that "Groundwater elevations in WY 2022 were also well above Valley Water thresholds established to minimize the risk of land subsidence in the Santa Clara Subbasin."[92] Detailed information regarding the subsidence monitoring program can be found in the Calendar Year Annual Reports on the GSA's website. The 2022 Calendar Year Annual Report states that the subsidence outcome measure (measurable objective) was met, stating, "Groundwater levels were above subsidence thresholds at all ten Santa Clara Plain subsidence index wells."[93] Department staff note that the 2022 Calendar Year Annual Report depicts, in Figures 20b (subsidence index well 2) and 20c (subsidence index well 3), subsidence thresholds (presumably meant to be the outcome measure [measurable objective] per definition above) which are below the historical low (presumably meant to be the outcome measure-lower limit [minimum threshold] per definition above). Further, Table 5-1 of the 2021 GWMP presents subsidence thresholds that are less than the historical low in those same two wells, describing that "Subsidence index wells 2 and 3 have subsidence threshold elevations lower than the historical low groundwater elevations due to the local geology and the minimal historical subsidence at those locations."[94] Department staff understand that subsidence index well 2 has been replaced, as Figure 20b from the 2022 Calendar Year Annual Report notes "Valley Water no longer has access to the former PRESS well

[89] 2021 GWMP, Chapter 5.4.2, p. 148.
[90] 2021 GWMP, Chapter 5.4.2, p. 147.
[91] 2021 GWMP, Chapter 5.4.2, p. 147-148.
[92] 2022 Water Year Annual Report, Chapter 2, p. 9.
[93] 2022 Calendar Year Annual Report, Executive Summary, p. 13.
[94] 2021 GWMP, Chapter 5.4.2, Table 5-1, p. 147.

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2 (well 08S01E05N002) as of June 2021. A replacement well 08S01E10J004 was implemented as the new PRESS well 2 on June 9, 2021."[95]

Department staff note that the outcome measure (measurable objective) groundwater levels for subsidence monitoring at subsidence index wells 2 and 3 are set below their respective outcome measure-lower limit (minimum threshold) levels. This appears to be a mistake because outcome measures (measurable objectives) refer to specific, quantifiable goals for the maintenance or improvement of the sustainability indicator to achieve the sustainability goal for the Subbasin, while minimum thresholds are used to define undesirable results. By definition, the outcome measure (measurable objective) groundwater level should be above the outcome measure-lower limit (minimum threshold).

The 2021 GWMP describes that "During the next five-year GWMP update cycle, Valley Water will evaluate the maximum magnitude and duration that water levels can drop below subsidence thresholds without resulting in inelastic subsidence."[96] Department staff agree that it is important to revisit and reevaluate sustainable management criteria as new data and information warrants, given the enormous potential community costs from inelastic land subsidence in the Santa Clara Plain. However, the GSA should either clarify or revise the outcome measure-lower threshold (minimum threshold) definitions, or the outcome measure (measurable objective), to account for the discrepancy at subsidence index wells 2 and 3 and consider the planned evaluation described above.

Additional information supporting the Subbasin's groundwater management program, organized by calendar year rather than water year as required by SGMA and the GSP Regulations, is found on the GSA's website. Given that there do not appear to be exceedances of minimum thresholds with respect to the land subsidence sustainability indicator, the Subbasin appears to be meeting its sustainability goals. However, Department staff encourage the GSA to incorporate information about all applicable sustainability indicators in future versions of the SGMA Annual Report and organize that information by water year, not calendar year.

3.1.6 Depletions of Interconnected Surface Water

Although there are no sustainable management criteria set for the depletions of interconnected surface water sustainability indicator in the 2021 GWMP, nor were they recommended by the Department in its 2019 Staff Report that approved the 2016 Alternative, the 2021 GWMP presents information pertinent to the depletions of interconnected surface water sustainability indicator, including sections on surface water and groundwater interaction and groundwater dependent ecosystems, while incorporating a discussion of current monitoring and associated data gaps in the Subbasin.

[95] 2022 Calendar Year Annual Report, Chapter 4.3, p. 52.
[96] 2021 GWMP, Chapter 5.4.2, p. 148.

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The 2021 GWMP includes a section, *Surface Water and Groundwater Interaction*, generally describing the GSA's current understanding of surface water and groundwater interaction.[97] The GSA makes the distinction between managed recharge program influenced areas and those under direct influence of groundwater, describing "Valley Water's managed recharge program includes significant recharge through many miles of stream channels over the recharge area, indicating groundwater and surface water generally are disconnected in these reaches. As described…the managed recharge program helps to maintain flows in these creeks, most of which would flow only intermittently otherwise."[98] To monitor surface water the GSA describes "Valley Water has a comprehensive surface water monitoring network to measure creek flows, comply with water rights reporting and reservoir restrictions, and meet environmental requirements…Surface water flow data can be used to evaluate which reaches of streams are gaining or losing streams with regard to groundwater..."[99] The GSA states that "Figure 2-15 shows areas of known and suspected surface water/groundwater interaction. Identification of these areas is based on long-term observations by Valley Water field staff and supported by a 2018 differential gauging study conducted by Valley Water staff…"[100] The GSA describes generally that, with a few exceptions, "Gaining reaches in the Santa Clara Subbasin are primarily located in sections of the creeks overlying the confined area of the subbasin closer to San Francisco Bay (Figure 2-15)."[101] The GSA also presents a historical ecology map and depth to groundwater map that "can help evaluate surface water/groundwater interaction."[102] Finally, the GSA states that historically, "…the Guadalupe River was the only perennial stream in the Santa Clara Subbasin. The other creeks were intermittent, running during the wet season, but dry in the summers."[103]

As previously stated, functionally equivalent sustainable management criteria for the depletions of interconnected surface water sustainability indicator were not recommended by Department staff in its 2019 Staff Report; however, the 2021 GWMP did identify groundwater dependent ecosystems in the Subbasin in response to Recommended Action 1 from the Department's 2019 Staff Report. Information regarding groundwater dependent ecosystems and what the GSA did in response to Recommended Action 1 is provided in this assessment in Section 4.1.

3.2 Projects and Management Actions

The GSP Regulations require a description of the projects and management actions the local agencies and/or GSAs in the basin have determined will achieve the established sustainability goal, including projects and management actions to respond to changing

[97] 2021 GWMP, Chapter 2.2.3, pp. 64-68.
[98] 2021 GWMP, Chapter 2.2.3, p. 64.
[99] 2021 GWMP, Chapter 2.2.3, p. 64.
[100] 2021 GWMP, Chapter 2.2.3, p. 64.
[101] 2021 GWMP, Chapter 2.2.3, p. 65.
[102] 2021 GWMP, Chapter 2.2.3, pp. 66-68.
[103] 2021 GWMP, Chapter 2.2.3, p. 66.

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conditions.[104] As part of its Periodic Review responsibility, the Department is required to determine whether the local agencies and/or GSAs in the basin are implementing projects and management actions consistent with the alternative, or that the local agencies and/or GSAs have demonstrated that actions described in the alternative have been rendered unnecessary based on changing basin conditions or an improved understanding of basin conditions.[105]

The 2021 GWMP describes the implementation of projects and management actions, as well as their effect on groundwater conditions, in *Chapter 6 – Basin Management Programs and Activities*.[106] Chapter 6 details programs to maintain a reliable groundwater supply, programs to protect groundwater quality, programs related to surface water-groundwater interaction, and other projects and activities to support continued sustainability. The 2021 GWMP provides a portfolio of projects and management actions that are currently being implemented by Valley Water or other agencies to address County-wide sustainability goals. The GSA explains that it has the authority to implement "capital projects as needed to protect and augment groundwater resources. These projects are described in Valley Water's Capital Improvement Program."[107]

Projects and management actions described in the 2021 GWMP are as follows:

- Programs to maintain reliable groundwater supply include managed aquifer recharge, in-lieu recharge, protection of natural recharge, groundwater production management, water accounting, groundwater level and storage assessments, and asset management.[108]
- Programs to protect groundwater quality include a well ordinance program, domestic well testing program, recycled water irrigation evaluation, vulnerability assessment, coordination with land use and regulatory agencies, and public outreach.[109]
- Programs related to surface water-groundwater interaction are described as in-stream releases of surface water, stormwater management, seawater intrusion prevention, and watershed management.[110]
- Other projects and activities to support continued sustainability include monitoring network improvements, assessments of managed recharge system capacity, stormwater projects, and various capital improvement projects.[111]

[104] 23 CCR § 354.44(a).
[105] 23 CCR § 355.6(c)(2).
[106] 2021 GWMP, Chapter 6, pp. 153-178.
[107] 2021 GWMP, Chapter 6, p. 153.
[108] 2021 GWMP, Chapter 6.1, pp. 153-165.
[109] 2021 GWMP, Chapter 6.2, pp. 166-173.
[110] 2021 GWMP, Chapter 6.3, pp. 173-176.
[111] 2021 GWMP, Chapter 6.4, pp. 176-178.

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Additionally, as stated in the 2021 GWMP, "Valley Water's proactive groundwater management programs and activities have maintained sustainable groundwater levels and storage, minimized land subsidence, and improved groundwater protection. To maintain the long-term sustainability of groundwater resources, the following actions are recommended…"[112]

- Maintain existing conjunctive water management programs and evaluate opportunities for enhancement or increased efficiency.
- Continue to aggressively protect groundwater quality through Valley Water programs and collaboration with land use agencies, regulatory agencies, and basin stakeholders.
- Continue to incorporate groundwater sustainability in Valley Water planning efforts.
- Maintain adequate monitoring programs and modeling tools.
- Continue and enhance groundwater management partnerships with water retailers and land use agencies.

In support of management action planning, the 2021 GWMP describes various GSA Board resolutions adopted in support of sustainable groundwater management since the 2016 GWMP (approved 2016 Alternative) was adopted and submitted to the Department. Notably, Valley Water Board Resolution No. 18-04 (provided in Appendix F of the 2021 GWMP) memorializes "the process to regulate groundwater extraction under SGMA, if needed. The resolution lays out an implementation framework for Valley Water, in coordination with stakeholders, to address worsening basin conditions."[113]

The GSA has established groundwater zones and has implemented groundwater pumping/use charges for quite some time, and in 2020 conducted "an extensive groundwater benefit zone study that re-evaluated the zone boundaries and resulted in new and modified zones that became effective in July 2020."[114] With respect to metering to enable groundwater use charges, the 2021 GWMP describes that in "the Santa Clara Plain [Management Area], meters are required for facilities producing more than 4 [acre-feet] of agricultural water or more than 1 [acre-foot] of non-agricultural water annually. Within the Coyote Valley [Management Area] or Llagas Subbasin, meters are required for facilities producing more than 20 [acre-feet] of agricultural water or more than 2 [acre-feet] of non-agricultural water. The Valley Water Board has the ability to modify the volumetric thresholds for metering as well as related responsibilities for installation, maintenance, and reading."[115]

[112] 2021 GWMP, Chapter 8, pp. 219-221.
[113] 2021 GWMP, Chapter 1.4.2.2, p. 38.
[114] 2021 GWMP, Chapter 6.1.4.3, pp. 160-162.
[115] 2021 GWMP, Chapter 6.1.4.1, p. 159.

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With respect to project implementation, notably, the GSA has been engaging in managed recharge operations since 1934 and 1955 (depending on recharge system)[116] to "offset groundwater withdrawals and ensure the long-term sustainability of groundwater resources…with local and imported surface waters in Valley Water recharge facilities."[117] Absent careful management and recharge operations, the Santa Clara Subbasin would be in chronic decline, as groundwater withdrawals are in excess of natural recharge and other inflows. Having acknowledged the importance of conjunctive use for many years, one of six major internal recommendations in the 2022 Water Year Annual Report is to "maintain existing conjunctive water management programs and evaluate opportunities for enhancement or increased efficiency."[118] The 2022 Water Year Annual Report describes the importance of direct recharge and conjunctive use, explaining that "Valley Water continues to focus on extensive groundwater recharge through direct replenishment and in-lieu recharge"[119] and reports that it was able to recharge about 70,000 acre-feet of local and imported water in the Santa Clara Subbasin during water year 2022.[120]

The suite of projects and management actions being implemented and considered in the Subbasin appears to be sufficient to address the water budget deficit, provides a buffer against climate change, and considers imported and local water supply reliability. With respect to implementation of projects and management actions, the Subbasin appears to be meeting its sustainability goal.

3.3 Data Gaps

Data gaps can relate to information about the physical setting and characteristics of a basin, a basin's current conditions, its hydrogeologic conceptual model, or its monitoring network.[121] As part of its Periodic Review responsibility, the Department is required to determine whether the local agencies and/or GSAs are addressing the basin's data gaps and are reducing the levels of uncertainty identified in the alternative.[122]

The GSA appears to be actively working to address known data gaps and continually improve its understanding of the Subbasin for improved management. The 2021 GWMP describes the importance of working "to ensure that the monitored locations and the data collected provide adequate information to understand groundwater conditions to support informed decision-making. This includes assessments of data gaps and redundancies, monitoring protocols, and data management, evaluation, and reporting."[123] The GSA

[116] 2021 GWMP, Chapter 4.4.2.2, Table 4-4, p. 132.
[117] 2021 GWMP, Chapter 6.1.1, p. 153.
[118] 2022 WY Annual Report, Chapter 4, p. 28.
[119] 2022 WY Annual Report, Chapter 4, p. 28.
[120] 2022 WY Annual Report, Chapter 3.2, p. 22.
[121] 23 CCR §§ 354.12; 354.15(b)(5); 354.38.
[122] 23 CCR § 355.6(c)(3).
[123] 2021 GWMP, Chapter 7, p. 179.

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states that "regular evaluations of monitoring gaps and redundancies will be reported and summarized in each five-year update of the GWMP."[124]

The GSA presents several technical memoranda addressing data gaps on a variety of topics in the 2021 GWMP. The technical memorandum *Groundwater Monitoring Network Gap Analysis for the 2021 Groundwater Management Plan*[125] fulfills an internal recommendation from its 2016 GWMP. The gap analysis was prepared to "compile, inventory, and map the locations of the existing groundwater monitoring networks, and identify any gaps and redundancies in those networks, as well as outline recommendations to fills gaps or eliminate redundancies."[126] The memorandum additionally states "Results and recommendations summarized in this memo indicate the need to fill several gaps in the groundwater level and quality monitoring networks, with a priority of co-located gaps overlying the shallow and principal aquifer zones, especially in the confined area of the Santa Clara Plain near southern San Francisco Bay."[127]

With respect to groundwater dependent ecosystems, the 2021 GWMP includes another technical memorandum, *Identification of Groundwater Dependent Ecosystems (GDEs) for the 2021 Groundwater Management Plan*,[128] which fulfills Recommended Action 1 from the Department's 2019 Staff Report.[129] The memorandum describes there are approximately 3,303 acres of "likely and transition"[130] GDE categories in the Santa Clara Plain Management Area and 851 acres in the Coyote Valley Management Area (Figure 28 and Table 7).[131] As stated in *Chapter 8 – Next Steps* of the 2021 GWMP, the GSA describes that it will "[c]ontinue to improve understanding of surface water/groundwater interaction…" and "[e]xpand on Valley Water's 2018 differential gauging study to include additional time periods, hydrologic conditions, and methods, as appropriate."[132]

The 2021 GWMP includes another relevant technical memorandum, *Evaluation of Dry Supply Wells During Drought in the Santa Clara and Llagas Subbasins*,[133] which "presents information on water supply wells that went dry during the 2012 to 2016 drought and evaluates the vulnerability of wells going dry in the Santa Clara and Llagas subbasins."[134] The memorandum describes that the "findings from this memo are being incorporated into the gap analysis of Valley Water's groundwater level monitoring program that is being conducted as part of the 2021 GWMP update."[135] The memorandum further describes that, "filling such gaps in the water level monitoring

[124] 2021 GWMP, Appendix J, p. 812.
[125] 2021 GWMP, Appendix J, pp. 769-813.
[126] 2021 GWMP, Appendix J, p. 770.
[127] 2021 GWMP, Appendix J, p. 770.
[128] 2021 GWMP, Appendix G, pp. 651-704.
[129] 2021 GWMP, Appendix C, p. 425.
[130] 2021 GWMP, Appendix G, p. 701.
[131] 2021 GWMP, Appendix G, pp. 700-702.
[132] 2021 GWMP, Chapter 8, p. 221.
[133] 2021 GWMP, Appendix D, pp. 427-441.
[134] 2021 GWMP, Appendix D, p. 428.
[135] 2021 GWMP, Appendix D, p. 441.

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program are likely to provide data that will result in a better understanding of groundwater conditions and vulnerability of water supply wells to drought."[136]

With respect to land subsidence data gaps, the 2021 GWMP describes that "during the next five-year GWMP update cycle, Valley Water will evaluate the maximum magnitude and duration that water levels can drop below subsidence thresholds without resulting in inelastic subsidence."[137]

Department staff agree that it is important to revisit and reevaluate sustainable management criteria as new data and information warrants. The findings and conclusions from these technical memoranda have been incorporated into the 2021 GWMP. It is apparent that the GSA continues to adaptively manage its Subbasin and seeks to incorporate best-available science and practices into its management and will continue to identify and address data gaps while doing so.

3.4 Consideration of Adjacent Basins

SGMA requires the Department to "…evaluate whether a groundwater sustainability plan adversely affects the ability of an adjacent basin to implement their groundwater sustainability plan or impedes achievement of sustainability goals in an adjacent basin."[138] Furthermore, the GSP Regulations state that minimum thresholds defined in each GSP be selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.[139]

The Santa Clara Subbasin (No. 2-009.02) is part of the larger Santa Clara Valley Groundwater Basin and is adjacent to the Santa Clara Valley – Niles Cone Subbasin (No. 2-009.01) to the northeast and the Santa Clara Valley – San Mateo Plain Subbasin (No. 2-009.03) to the northwest. The hydrologically separate Gilroy Hollister Valley – Llagas Area Subbasin (No. 3-003.01) lies to the south. The 2021 GWMP describes that the Santa Clara Subbasin "borders the San Mateo Plain and Niles Cone subbasins, respectively, at institutional boundaries formed by county boundaries."[140] The Santa Clara Subbasin borders the Llagas Area Subbasin at its southern extent at a topographic and hydrologic divide.

The GSA should be aware of the adjacent basins' sustainability goals and actively coordinate with the respective Plan Managers to ensure the Santa Clara Subbasin's groundwater management program is not affecting the adjacent basins. Furthermore, the GSA should be aware of the recommended corrective actions that adjacent basins are actively working to address. Department staff recommend the GSA provide an explanation in future updates or Periodic Evaluations of its Alternative how inter-basin items, such as: thresholds across basin boundaries; monitoring networks; hydrogeologic

[136] 2021 GWMP, Appendix D, p. 441.
[137] 2021 GWMP, Chapter 5.4.2, p. 148.
[138] Water Code § 10733(c).
[139] 23 CCR § 354.28(b)(3).
[140] 2021 GWMP, Chapter 2.1.1, p. 48.

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conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water have been coordinated (see Recommended Corrective Action 1).

The 2021 Alternative, at this time, does not anticipate any negative impacts to the adjacent basins resulting from the minimum thresholds defined for the Santa Clara Subbasin, and the Department is not aware of any information, at this time, suggesting or claiming that adjacent basins' implementation of plans have been, or will be, negatively impacted by implementation of the Subbasin's Alternative. While Department staff are not aware of any information that would refute this position, additional information related to coordination with adjacent basins may be warranted. Department staff will continue to review the GSA's Periodic Evaluations to assess whether implementation of the Santa Clara Subbasin Alternative is potentially impacting plans in the adjacent basins.

3.5 Alignment of Monitoring Network

The GSP Regulations describe the monitoring network that must be developed for each sustainability indicator including monitoring objectives, monitoring protocols, and data reporting requirements. Collecting monitoring data of sufficient quality and quantity is necessary for the successful implementation of an alternative or a GSP. The GSP Regulations require a monitoring network of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the alternative or GSP.[141] Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,[142] monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,[143] capture seasonal low and high conditions,[144] include required information such as location and well construction and include maps and tables clearly showing the monitoring site type, location, and frequency.[145]

Department staff encourage local agencies and GSAs to collect monitoring data as specified in their respective plans, follow SGMA data and reporting standards,[146] fill data gaps,[147] update monitoring network information as needed, follow monitoring best management practices, and submit all monitoring data to the Department's Monitoring Network Module immediately after collection, including any additional groundwater monitoring data that is collected within the respective plan area that is used for making groundwater management decisions. Department staff note that if agencies do not fill their identified data gaps, the agencies' understanding of the basin may not represent the best available science for use in monitoring basin conditions.

[141] 23 CCR § 354.32.
[142] 23 CCR § 354.34(b)(2).
[143] 23 CCR § 354.34(b)(3).
[144] 23 CCR § 354.34(c)(1)(B).
[145] 23 CCR §§ 354.34(g-h).
[146] 23 CCR § 352.4 *et seq*.
[147] 23 CCR § 354.38(d).

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Department staff recommend the GSA ensure the monitoring network details included in its Alternative are consistent with the information contained in the SGMA Portal Monitoring Network Module (see Recommended Corrective Action 2).

3.6 Consideration of Climate Change and Future Conditions

Since the 2021 Alternative was adopted and submitted, climate change conditions have advanced faster and more dramatically. It is anticipated that the hotter, drier conditions will result in a loss of ten percent of California's water supply. As California adapts to a hotter, drier climate, local agencies and GSAs should be preparing for these changing conditions as they work to sustainably manage groundwater within their jurisdictional areas. Specifically, the Department encourages local agencies and GSAs to:

- Explore how their proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the basin based on current and future drought conditions.
- Explore how groundwater level data from the existing monitoring network will be used to make progress towards sustainable management of the basin given increasing aridification and effects of climate change, such as prolonged drought.
- Take into consideration changes to surface water reliability and the potential impact on groundwater conditions.
- Evaluate updated watershed studies that may modify assumed frequency and magnitude of recharge projects, if applicable.
- Continually coordinate with the appropriate groundwater users, including but not limited to domestic well owners and state small water systems, as well as the appropriate overlying county jurisdictions developing drought plans and establishing local drought task forces, to evaluate how their respective groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

4 Progress Towards Addressing 2019 Recommended Actions

The July 17, 2019, *Statement of Findings Regarding the Approval of the Santa Clara Subbasin Alternative* explains the Department's decision to review and approve the GSA's Alternative. As stated in the Statement of Findings, "Based on its review of the Staff Report, Department management is satisfied that [Department] staff have conducted a thorough evaluation and assessment of the Alternative and concurs with staff's recommendation and all the recommended actions and thus hereby approves the

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Alternative on the following grounds..."[148] The Statement of Findings further states, "The recommended actions in the Staff Report will assist the Department's review of the Alternative's implementation for consistency with SGMA and are thus recommended to be included in the resubmitted Alternative, due on January 1, 2022, as required by Water Code Section 10733.6(c)."[149]

The 2021 GWMP summarizes the GSA's response to the Department's five Recommended Actions from the 2019 Staff Report in Appendix C – *Response to DWR Recommended Actions*.[150] As part of that effort, new information regarding the Subbasin has been made available and has been incorporated into the 2021 GWMP. The Department appreciates the effort put forth in addressing the Recommended Actions from the 2016 Alternative and notes the progress made to date on implementation of the recommendations.

The GSA's efforts to address the Department's recommended actions are summarized below. New recommended corrective actions and considerations for improvement of the Alternative are provided in Section 5.

4.1 Recommended Action 1

Recommended Action 1. Staff recommend that the District provide an identification of groundwater dependent ecosystems in the Subbasin.

In response to Recommended Action 1, the GSA states that "within the Basin Setting of the 2021 GWMP, section *2.2.4 Groundwater Dependent Ecosystems* includes a new map identifying groundwater dependent ecosystems (GDEs) for the Santa Clara Subbasin, and section *3.2.4 Groundwater Dependent Ecosystems* includes a new map identifying GDEs for the Llagas Subbasin. A detailed technical memorandum that documents the current understanding, approach, and methods used to identify and map GDEs in the Santa Clara and Llagas subbasins is included in Appendix G of the 2021 GWMP."[151]

The GSA describes that it mapped GDEs in the Subbasin in general accordance with the 2018 guidance published by The Nature Conservancy, *Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans* and presents findings from the 34 field assessments performed by Valley Water biologists.[152] The GSA describes that "…most GDEs in the recharge (unconfined) areas of the Santa Clara Plain and Coyote Valley are along losing stream reaches that are disconnected from the regional water table and thus are not interconnected surface water. Because these losing stream reaches are not interconnected surface water and streamflow is supported by natural runoff and in-stream

[148] https://sgma.water.ca.gov/portal/alternative/assessments/18.
[149] https://sgma.water.ca.gov/portal/alternative/assessments/18.
[150] 2021 GWMP, Appendix C, pp. 370-372.
[151] 2021 GWMP, Appendix C, pp. 371; Section 2.2.4, p 69-71; Section 3.2.4, pp. 104-106; Appendix G, pp. 651-704.
[152] 2021 GWMP, Chapter 2.2.4, p. 69.

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recharge operations, GDEs are not affected by groundwater pumping in these recharge areas of the Santa Clara Plain and Coyote Valley."[153] The 2021 GWMP continues, describing "The Laguna Seca is an area of known wetlands in northern Coyote Valley that has several GDEs, as detailed in Appendix G. Valley Water's groundwater management activities, including managed recharge operations in Coyote Valley, have maintained sustainable groundwater supply conditions in the northern Coyote Valley that support GDEs in Laguna Seca. Long-term groundwater levels are stable in Laguna Seca and demonstrate sustainable groundwater conditions in northern Coyote Valley. Droughts of limited duration may suppress the shallow water table, but effects to GDEs are expected to be minimal with continued management activities."[154] The GDE memo describes there are approximately 3,303 acres of "likely and transition"[155] GDE categories in the Santa Clara Plain management area and 851 acres in the Coyote Valley management area.[156]

4.1.1 Staff Assessment of Agency's Response to Recommended Action 1

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 1 has been sufficiently addressed. The GSA prepared the GDE memo to specifically address the Department's recommendations. The GDE memo is a detailed technical memorandum documenting the current understanding, approach, and methods used to identify and map GDEs. The GSA not only identifies GDEs but incorporates and builds upon findings from the memo by applying them throughout the 2021 GWMP and into future actions. The GSA's Gap Analysis memo incorporates recommendations from the GDE memo, stating "the gaps identified as 1 in the Coyote Valley and Llagas Subbasin would help to quantify the groundwater/surface-water interaction in the Laguna Seca area, downstream of Uvas Reservoir and at the Pajaro River, which are identified as recommendations in the groundwater dependent ecosystem (GDE) analysis (Appendix G) of the 2021 GWMP."[157] Staff agree that filling these data gaps are important and that these data would aid in refining its interconnected surface water conceptual model and assist in monitoring potential impacts to GDEs and other beneficial uses and users. The GSA appears intent on incorporating best available science and information into its management of the Subbasin.

4.2 Recommended Action 2

Recommended Action 2. Staff recommend that the District provide a projected water budget incorporating climate change and expected population growth over the planning and implementation horizon of 50 years.

[153] 2021 GWMP, Chapter 2.2.4, p. 70.
[154] 2021 GWMP, Chapter 2.2.4, p. 71.
[155] 2021 GWMP, Appendix J, p. 787.
[156] 2021 GWMP, Appendix G, Figure 28 and Table 7, pp. 700-702.
[157] 2021 GWMP, Appendix J, p. 787.

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In response to Recommended Action 2, the GSA states that "Section [4.6] *Climate Change Impacts on Groundwater Budget* of the 2021 GWMP includes an analysis of projected groundwater budget considering climate change for the year 2045. This analysis focuses on 2045 to stay consistent with other Valley Water planning documents, including the 2020 Urban Water Management Plan. During the next five-year update cycle of the GWMP, Valley Water plans to conduct a more integrated analysis of climate change impacts that also considers projected climate change impacts on imported water supply."[158]

4.2.1 Staff Assessment of Agency's Response to Recommended Action 2

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 2 has been sufficiently addressed. Although the analysis presented in the 2021 GWMP does not cover the entire planning and implementation horizon, Department staff concur that it is reasonable for the GSA to align and leverage activities from other related efforts to be compliant with SGMA and create a local financial and planning nexus. Furthermore, evaluating climate change impacts to the water budget as it pertains to imported water supplies is of great importance to the GSA, given that conjunctive use and active recharge operations in the Subbasin are critical components of groundwater management and water supply reliability. The Department looks forward to reviewing the updated analysis and determining how it will be incorporated into basin management activities over the 50-year SGMA planning and implementation horizon, as planned for the next update to the Subbasin's Alternative. Note that Section 3.6 in this assessment (Consideration of Climate Change and Future Conditions) provides additional considerations and recommendations to anticipate how future water use may change in response to changing climate conditions.

4.3 Recommended Action 3

Recommended Action 3. Staff recommend that the District create separate outcome measures related to water quality in the Santa Clara and Llagas subbasins. Separate subbasin-specific criteria will allow for a determination of whether each subbasin, separately, is meeting or making progress toward the outcome measures.

In response to Recommended Action 3, the GSA states that "Section 5.4 Outcome Measures of the 2021 GWMP includes new and separate outcome measures related to water quality in the Santa Clara and Llagas subbasins. These separate subbasin-specific criteria will allow for a determination of whether each subbasin, separately, is meeting or making progress toward the outcome measures. The new water quality outcome measure for the Santa Clara Subbasin is distinctly different than the new outcome measure for seawater intrusion in the subbasin…"[159] More detailed information as it pertains to Recommended Action 3 is provided in this assessment in Section 3.1.4.

[158] 2021 GWMP, Appendix C. p. 371.
[159] 2021 GWMP, Appendix C. pp. 371.

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4.3.1 Staff Assessment of Agency's Response to Recommended Action 3

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 3 has been sufficiently addressed. The 2021 GWMP explains that the water quality outcome measures evaluate the percentage of water supply wells that meet all primary Maximum Contaminant Levels (MCLs) and that the outcome measures will be evaluated annually using data collected at water supply wells sampled by Valley Water and water retailers.

4.4 Recommended Action 4

Recommended Action 4. Staff recommend the District develop specific seawater intrusion outcome measures separate from other water quality outcome measures.

In response to Recommended Action 4, the GSA describes that "Section 5.4 Outcome Measures of the 2021 GWMP includes a new seawater intrusion outcome measure for the Santa Clara Subbasins. A detailed technical memorandum that documents the current understanding of seawater intrusion mechanisms, approach, and analysis used to develop the seawater intrusion outcome measure is included in Appendix H of the 2021 GWMP. This memo also documents current understanding of climate change driven sea-level rise and implications for monitoring and managing seawater intrusion in the Santa Clara Subbasin."[160] More detailed information as it pertains to Recommended Action 4 is provided in this assessment in Section 3.1.3.

4.4.1 Staff Assessment of Agency's Response to Recommended Action 4

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 4 has been sufficiently addressed. The rationale for development of the functionally equivalent sustainable management criteria for seawater intrusion is provided in the 2021 GWMP, indicating that "the number and location of supply wells were evaluated in relation to the 100 mg/L isocontours to identify an appropriate outcome measure and outcome measure-lower threshold."[161]

4.5 Recommended Action 5

Recommended Action 5. Staff recommend that the District clarify how meeting its outcome measures relates to the avoidance of undesirable results in the Santa Clara Subbasin. Specifically, it should clarify whether not meeting the outcome measures represents an undesirable result for the applicable sustainability indicator. If that is not the intent of the District, then it should provide additional clarification and additional metrics that can be used by the District, and by the Department as it reviews the Alternative on an ongoing basis, to determine what effects represent undesirable results and to objectively assess the presence or absence of those undesirable results.

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[160] 2021 GWMP, Appendix C. pp. 371. Note that the 2021 GWMP mistakenly labeled the Department's Recommended Action 4 as Recommended Action 5.
[161] 2021 GWMP, Section 5.4.4, p. 150.

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In response to Recommended Action 5, the GSA describes that "Section 5.4 Outcome Measures of the 2021 GWMP includes new outcome measure-lower thresholds for each of the five corresponding outcome measures in the Santa Clara and Llagas subbasins. These outcome measure-lower thresholds are designed to be functionally equivalent to a minimum threshold and thus help define undesirable results for each corresponding sustainability indicator. Additional details are provided in section 5.4 of the 2021 GWMP."[162] In summary, the functionally equivalent sustainable management criteria for each of the applicable sustainability indicators defined in the 2021 GWMP include the following.

- Groundwater Levels and Land Subsidence.
    - Outcome Measure [measurable objectives]: Groundwater levels are above subsidence thresholds at the Santa Clara Subbasin subsidence index wells.
    - Outcome Measure – Lower Threshold [minimum thresholds]: Groundwater levels are above the historical low water levels at the majority of the Santa Clara Subbasin subsidence index wells.
- Groundwater Storage.
    - Outcome Measure [measurable objective]: Projected end of year groundwater storage is greater than 278,000 acre-feet (AF) in the Santa Clara Plain, 5,000 AF in the Coyote Valley, and 17,000 AF in the Llagas Subbasin.
    - Outcome Measure – Lower Threshold [minimum threshold]: Projected end of year countywide groundwater storage is greater than Stage 5 (150,000 AF) of the Water Shortage Contingency Plan.
- Seawater Intrusion.
    - Outcome Measure [measurable objective]: In the Santa Clara Subbasin shallow aquifer, the 100 milligram per liter chloride isocontour area is less than the historical maximum extent area (57 square miles).
    - Outcome Measure – Lower Threshold [minimum threshold]: In the Santa Clara Subbasin shallow aquifer, the 100 milligram per liter chloride isocontour area is less than 81 square miles, which represents a one-mile radial buffer of the historical maximum extent area.

[162] 2021 GWMP, Appendix C. pp. 371. Note that the 2021 GWMP mistakenly labeled the Department's Recommended Action 5 as Recommended Action 4.

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- Water Quality.
    - Outcome Measure [measurable objective]: For Santa Clara Subbasin water supply wells, at least 95% meet primary drinking water standards, and at least 90% have stable or decreasing trends for total dissolved solids (TDS).
    - Outcome Measure – Lower Threshold [minimum threshold]: At least 70% of water supply wells have stable or decreasing trends for nitrate and TDS.

4.5.1 Staff Assessment of Agency's Response to Recommended Action 5

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 5 has been sufficiently addressed. As stated in the 2021 GWMP, "The outcome measures are quantifiable goals to track performance of sustainable management and are functionally equivalent to measurable objectives under SGMA. This 2021 GMWP has new outcome measure-lower thresholds that are quantifiable values used to define undesirable results and are functionally equivalent to minimum thresholds under SGMA. The outcome measure-lower thresholds account for a reasonable margin of operational flexibility below the outcome measures that accommodate drought, climate change, conjunctive use operations, and other groundwater management activities. Valley Water has a long-established history of sustainable groundwater management and will continue to proactively manage groundwater to minimize the risk of reaching the outcome measure-lower thresholds and related undesirable results."[163]

5 STAFF RECOMMENDATION

The Department previously approved the Alternative submitted for the Subbasin based on the grounds presented in the July 17, 2019, *Statement of Findings Regarding the Approval of the Santa Clara Subbasin Alternative*. As part of its ongoing Periodic Review responsibility, the Department is required to assess whether the approved 2016 Alternative continues to satisfy the evaluation criteria described in Section 355.4 of the GSP Regulations and determine whether the updated 2021 Alternative should be considered approved, incomplete, or inadequate.[164]

Based on the current evaluation of the 2016 Alternative, and after considering information provided by the Subbasin's GSA, Department staff recommend that the 2021 Alternative for the Santa Clara Subbasin be approved with recommended corrective actions. Department staff conclude that the 2021 Alternative includes the components of a functionally equivalent GSP, demonstrates a thorough understanding of the Subbasin based on what appears to be the best available science and information, sets well explained, supported, and reasonable sustainable management criteria to prevent

[163] 2021 GWMP, Chapter 5.4, p. 145.
[164] 23 CCR §§ 355.6(c)(4) and 355.6(d).

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undesirable results, and proposes a set of projects and management actions that will likely achieve the sustainability goal defined for the Subbasin.

5.1 Recommended Corrective Actions

Although Department staff believe that the 2021 Alternative continues to comply with the objectives of SGMA and substantially complies with the GSP Regulations, new corrective actions have been recommended.[165] Although the issues addressed by the recommended corrective actions do not, at this time, preclude approval of the 2021 Alternative, they are intended to facilitate progress in achieving the Subbasin's sustainability goals and guide the Department's ongoing evaluation process. Additionally, the new recommended corrective actions will allow the Department to better evaluate whether implementation of the 2021 Alternative could adversely affect an adjacent basin from reaching its sustainability goal. As with GSPs, a GSA's failure to address the Department's recommended corrective actions could potentially lead to an alternative being determined incomplete or inadequate.

The GSA has identified several areas for improvement of its GWMP and Department staff concur that those items are important and should be addressed as soon as practicable.[166] Department staff have described additional recommendations throughout the preceding sections of this assessment that should be considered by the GSA as the 2021 GWMP is being implemented.

Recommended Corrective Action 1

Provide an explanation in future Alternative updates how inter-basin items, such as: thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water along basin boundaries have been coordinated.

Recommended Corrective Action 2

Ensure the monitoring network details included in the Alternative are consistent with the information contained in the Department's SGMA Portal Monitoring Network Module.

[165] Water Code § 10733.8.
[166] 2021 GWMP, Chapter 8, pp. 219-221.

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CALIFORNIA DEPARTMENT OF WATER RESOURCES
SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE
715 P Street, 8th Floor | Sacramento, CA 95814 | P.O. Box 942836 | Sacramento, CA 94236-0001

June 27, 2024

Vanessa De La Piedra
Santa Calara Valley Water District
5750 Almaden Expressway
San Jose, CA, 95118
vdelapiedra@valleywater.org

RE: Gilroy-Hollister Valley - Llagas Area Subbasin - Periodic Review of Alternative Groundwater Sustainability Plan

Dear Vanessa De La Piedra,

The Department of Water Resources (Department) has evaluated the alternative to a groundwater sustainability plan (Alternative) submitted for the Gilroy-Hollister Valley - Llagas Area Subbasin and has determined the Alternative is approved. The approval is based on recommendations from the Staff Assessment, included as an exhibit to the attached Statement of Findings, which describes that the Gilroy-Hollister Valley - Llagas Area Subbasin Alternative satisfies the objectives of the Sustainable Groundwater Management Act (SGMA) and substantially complies with the Groundwater Sustainability Plan (GSP) Regulations. The Staff Assessment also proposes recommended corrective actions that will enhance the Alternative and facilitate future evaluation by the Department. The Department strongly encourages the recommended corrective actions be given due consideration and suggests incorporating all resulting changes to the Alternative in future updates.

Recognizing SGMA sets a long-term horizon for groundwater sustainability agencies (GSAs) to achieve their basin sustainability goals, monitoring progress is fundamental for successful implementation. GSAs are required to evaluate their Alternative at least every five years and whenever the Alternative is amended, and to provide a written assessment to the Department. Accordingly, the Department will evaluate approved Alternatives and issue an assessment at least every five years. The agencies are required to submit their second periodic review of the Gilroy-Hollister Valley - Llagas Area Subbasin Alternative no later than December 17, 2026.

Please contact Department Sustainable Groundwater Management staff by emailing sgmps@water.ca.gov if you have any questions related to the Department's assessment or implementation of your Alternative.

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Thank You,

Paul Gosselin

Paul Gosselin
Deputy Director
Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Periodic Review and Approval of the Gilroy-Hollister Valley - Llagas Area Subbasin Alternative Groundwater Sustainability Plan

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STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE PERIODIC REVIEW AND APPROVAL OF THE GILROY-HOLLISTER VALLEY – LLAGAS AREA SUBBASIN ALTERNATIVE GROUNDWATER SUSTAINABILITY PLAN
JUNE 27, 2024

Under the Sustainable Groundwater Management Act (SGMA), an alternative to a groundwater sustainability plan (Alternative) must be resubmitted every five years,[1] and the Department of Water Resources (Department) is required to review the Alternative to assess progress in achieving the sustainability goal within the basin and recommend corrective action to address any deficiencies.[2] The Department evaluates updates to Alternatives in accordance with the criteria used to evaluate Groundwater Sustainability Plans, as applicable.[3] This Statement of Findings explains the Department's determination regarding the Alternative submitted on December 17, 2021, by the Santa Clara Valley Water District (referred to as Agency) for the Gilroy-Hollister Valley – Llagas Area Subbasin (Basin No. 3-003.01), herein referred to as the Department's "Periodic Review" of the Alternative.

Department management have discussed the Alternative with staff and have reviewed the written assessment titled *Staff Assessment of Agency's Periodic Evaluation*, Llagas Area Subbasin, attached as Exhibit A, and have incorporated the findings, which recommends approval of the Alternative. Department management is satisfied that staff have conducted a thorough evaluation and assessment of the Alternative and concurs with staff's recommendation. The Department therefore **APPROVES** the Alternative and makes the following findings:

A. The Alternative satisfies the conditions listed in 23 CCR Section 358.4 on the grounds that:

    1. The Alternative was submitted within five years of its initial submission date as required by Water Code Section 10733.6(c).

    2. The Department has confirmed that the Alternative is within a basin that is in compliance with Part 2.11 (commencing with Water Code Section 10920) as required by Water Code Section 10733.6(d).

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[1] Water Code § 10733.6(c))
[2] Water Code § 10733.8
[3] 23 CCR § 358.4(b))

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3. The Alternative is complete and includes the applicable information required by SGMA for the type of alternative submitted.

4. The Alternative covers the entire basin. The Department determined that the Alternative, as originally submitted, covered the entire basin, and those boundaries remain unchanged.

B. In addition to the grounds listed above, the Department also finds that the Alternative remains consistent with SGMA and is being implemented in a manner that will likely achieve the sustainability goal for the basin because:

1. At this time, there do not appear to be exceedances of any minimum thresholds or any failures of the Agency to meet any interim milestones which are likely to affect the ability of the Agency to achieve the sustainability goal for the basin within 20 years of implementation of the Alternative (23 CCR Section 355.6(c)(1)).

2. The Agency is implementing projects and management actions consistent with the Alternative (23 CCR Section 355.6(c)(2)). The suite of projects and management actions being implemented and considered in the Subbasin appears to be sufficient to address the water budget deficit, provides a buffer against climate change, and considers imported and local water supply reliability.

3. The Agency is addressing data gaps and reducing the levels of uncertainty identified in the Alternative (23 CCR Section 355.6(c)(3)). The Agency presents several technical memoranda addressing data gaps on a variety of important topics and has incorporated this information into the 2021 Alternative. The Agency appears to be actively working to address known data gaps and continually improve its understanding of the Subbasin for improved management using best-available science and practices.

4. As explained in the attached Staff Assessment, the Alternative continues to satisfy the criteria described in 23 CCR Section 355.6(c)(4), as applicable.

C. Furthermore, the Department also finds that the Alternative sufficiently demonstrates its ability to achieve the objectives of SGMA at this time because:

1. The Agency has demonstrated that the Alternative is functionally equivalent to the elements of a GSP; and

2. The Agency has taken steps to improve the Alternative by considering the recommended actions previously provided by staff. To ensure that the Alternative continues to satisfy SGMA's objectives, staff have provided additional recommended corrective actions for the Agency to consider before the Alternative's next Periodic Evaluation.

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D. The Department also finds:

1. The Department developed its GSP Regulations consistent with and intending to further the State's human right to water policy through implementation of SGMA and the GSP Regulations, primarily by achieving sustainable groundwater management in a basin. By ensuring substantial compliance with the GSP Regulations, the Department has considered the state policy regarding the human right to water in its evaluation of the Alternative (Water Code Section 106.3; 23 CCR Section 350.4(g)).

2. The California Environmental Quality Act (CEQA) (Public Resources Code Sections 21000 *et seq*.) does not apply to the Department's evaluation and assessment of Alternatives, and the Department's evaluation and assessment of Alternatives is statutorily or categorically exempt from CEQA.

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Accordingly, the Alternative submitted by the Agency for the Gilroy-Hollister Valley - Llagas Area Subbasin is hereby **APPROVED.** The recommended corrective actions identified in the attached Staff Assessment will assist the Department's future review of the Alternative's implementation for consistency with SGMA, and the Department, therefore, recommends the Agency address them in the next Periodic Evaluation, which is set to be submitted on December 17, 2026, as required by Water Code Section 10733.6(c). Department staff will continue to monitor and evaluate the progress toward achieving the basin's sustainability goal through continued Annual Reporting and future revisions to the Alternative. Failure to address the Department's recommended corrective actions before future, subsequent Alternative evaluations, may lead to the Alternative being determined incomplete or inadequate.

Signed:

Karla Nemeth

Karla Nemeth, Director
Date: June 27, 2024

Exhibit A: Periodic Review of Alternative Groundwater Sustainability Plan, Staff Assessment, Gilroy-Hollister Valley – Llagas Area Subbasin

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State of California
Department of Water Resources
Sustainable Groundwater Management Program
Periodic Review of
Alternative Groundwater Sustainability Plan
Staff Assessment

Groundwater Basin Name:	Gilroy-Hollister Valley – Llagas Area Subbasin (3-003.01)
Number of GSAs or Local Agencies:	One (1)
Basin Plan Manager:	Vanessa De La Piedra
Type of Alternative:	Existing Groundwater Management Plan
Date Alternative First Submitted:	December 21, 2016
Date Alternative First Approved:	July 17, 2019
Date Periodic Evaluation Submitted:	December 17, 2021
Date Periodic Review Completed:	June 27, 2024
Staff Recommendation:	Approved

This assessment addresses the Department of Water Resources' (Department) statutory and regulatory responsibility to periodically review and evaluate approved groundwater sustainability plans (GSPs) and approved alternatives to a GSP (Alternative) pursuant to the Sustainable Groundwater Management Act (SGMA)[1] and the GSP Regulations.[2] As stated in the GSP Regulations: "The Department shall periodically review an approved Plan to ensure the Plan, as implemented, remains consistent with the Act and in substantial compliance with this Subchapter, and is being implemented in a manner that will likely achieve the sustainability goal for the basin. The Department shall evaluate approved Plans and issue an assessment at least every five years. The Department review shall be based on information provided in the annual reports and the periodic evaluation of the Plan prepared and submitted by the Agency."[3]

SGMA allows for basins to be managed under alternative groundwater management structures rather than a GSP.[4] An alternative can be based on an existing groundwater management plan or other law authorizing groundwater management, management pursuant to an adjudication action, or an analysis of basin conditions that demonstrates

[1] Water Code § 10720 *et seq*.
[2] 23 CCR § 350 *et seq*.
[3] 23 CCR §§ 355.6(a) and 355.6(b). For the purposes of this Periodic Review, "Plan" refers to a groundwater sustainability plan as defined in SGMA and the GSP Regulations, while "Alternative" refers to an alternative to a groundwater sustainability plan described in Water Code § 10733.6.
[4] Water Code §10733.6; 23 CCR §§ 358.2 and 358.4.

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the basin has operated within its sustainable yield over a period of at least ten years. Basins with approved alternatives are not explicitly subject to the Periodic Evaluation requirements like those basins with approved GSPs;[5] however, basins with approved alternatives must submit Annual Reports and the alternative must be submitted to the Department at least every five years for review and assessment.[6] Like GSPs, alternatives are subject to Periodic Reviews, in which the Department issues an assessment evaluating the progress toward achieving or maintaining the basin's sustainability goal.

If an alternative is not amended or is not in some other way materially changed, a Periodic Evaluation may be submitted in lieu of resubmission of the entire, identical alternative that was previously approved by the Department. A Periodic Evaluation, as it applies to alternatives, is a written assessment prepared by the local agency or groundwater sustainability agency (GSA) describing whether the implementation of the alternative, including implementation of projects and management actions, is meeting or maintaining the basin's sustainability goal. As indicated throughout this assessment, the Department's Periodic Review is based on information provided in Annual Reports and any available alternative or Periodic Evaluation submitted by local agencies or GSAs managing the basin for SGMA compliance.[7]

- ***Based on the current evaluation of the Alternative, Department staff recommend it be approved with the recommended corrective actions described herein.***

This Periodic Review includes the following sections:

- **Section 1 – Alternative Summary**: A description of the basin's alternative submittal, an overview of the Department's responsibility to periodically review and evaluate approved alternatives, and a summary of the alternative's recommended actions.
- **Section 2 – Periodic Review Criteria**: Describes the applicable statutory and regulatory requirements and the Department's evaluation criteria for approved alternatives.
- **Section 3 – Periodic Review of Approved Alternative**: Summarizes the Department's evaluation of the basin's approved alternative and may recommend corrective actions to facilitate the Department's ongoing evaluation of the basin's existing groundwater management program.
- **Section 4 – Progress Towards Addressing 2019 Recommended Actions**: A discussion of whether the agencies in the basin have made progress towards

[5] 23 CCR § 356.4.
[6] 23 CCR § 358.2(b).
[7] Water Code § 10733.8.

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addressing the recommended actions identified by the Department in its previous assessment.

- **Section 5 – Staff Recommendation**: Includes the alternative's recommended status for approval, and provides new recommended corrective actions, if necessary.

1 ALTERNATIVE SUMMARY

In the Gilroy-Hollister Valley – Llagas Area Subbasin (Subbasin) a single alternative groundwater sustainability plan (GSP),[8] an alternative based on an existing groundwater management plan and other law authorizing groundwater management, was prepared and submitted by the Santa Clara Valley Water District (referred to as Valley Water, Agency or GSA). The *2016 Groundwater Management Plan for the Santa Clara and Llagas Subbasins* (2016 GWMP) was adopted by the GSA's Board of Directors on November 22, 2016. At the same public meeting, the GSA's Board authorized the 2016 GWMP to be adopted as an alternative GSP. The 2016 GWMP updated and expanded upon technical information from the groundwater management plan adopted by Valley Water in 2012, and Valley Water indicated that "the 2016 GWMP…meets the objectives of SGMA and contains information and elements that are functionally equivalent to the elements of a GSP…"[9] While the 2016 GWMP was the primary document relied upon to comply with SGMA's planning deadlines, Valley Water also relied upon additional plans, reports, and technical documents, which for the purposes of this assessment, are collectively referred to as the 2016 Alternative.[10]

The GSA's 2016 Alternative was first approved by the Department on July 17, 2019, with four recommended actions.[11] The 2016 Alternative's recommended actions, which were intended to improve the Alternative and facilitate the Department's ongoing evaluation of the basin's existing groundwater management program, are presented in detail in Section 4 of this assessment and generally relate to the following topics:

- Identification of groundwater dependent ecosystems (Recommended Action 1).
- Incorporation of climate change and population growth projections into the water budget over the 50-year planning and implementation horizon (Recommended Action 2).
- Establish separate water quality outcome measures for the Santa Clara and Llagas Subbasins (Recommended Action 3).

[8] Water Code § 10733.6(b)(1); 23 CCR § 358.2.
[9] 2021 GWMP, Chapter 1.1.1, p. 24.
[10] https://sgma.water.ca.gov/portal/alternative/print/20.
[11] https://sgma.water.ca.gov/portal/alternative/assessments/20.

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- Clarify definition and relation of outcome measures to the avoidance of undesirable results by sustainability indicator (Recommended Action 4).

Since the Alternative was first adopted in 2016, the Subbasin's Plan Manager has been submitting Annual Reports to the Department and has been documenting the progress of the Subbasin's existing groundwater sustainability program. At the time this Periodic Review was conducted by Department staff, the most recent Annual Report, which was submitted to the SGMA Portal on March 29, 2023, covered water year 2022.[12]

The *2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasins* (2021 GWMP or 2021 Alternative)[13] was prepared pursuant to the authority granted by the Santa Clara Valley Water District Act and was adopted on November 23, 2021; the 2021 GWMP is intended to supersede all previous groundwater management plans.[14] As stated in the 2021 GWMP, "Basin management goals, strategies, programs, and outcome measures in the 2021 GWMP are very similar to the 2016 plan, as they have been effective in ensuring sustainable conditions. Valley Water's 2016 GWMP documented numeric outcome measures to assess performance in meeting basin sustainability goals. These outcome measures relate to groundwater storage, land subsidence, and water quality and are largely unchanged in this 2021 GWMP because they have been effective in avoiding undesirable results and prompting action when needed…"[15] The 2021 Alternative was submitted to the Department for evaluation on December 17, 2021. Functional equivalence to a GSP is documented in detail by the GSA throughout Appendix B of the 2021 GWMP.[16]

1.1 Recommendation Summary

Department staff conclude that the 2021 Alternative includes the components of functionally equivalent GSP, demonstrates a thorough understanding of the Subbasin based on what appears to be the best available science and information, sets well explained, supported, and reasonable sustainable management criteria to prevent undesirable results as defined in the 2021 Alternative, and proposes a set of projects and management actions that will likely achieve the sustainability goals defined for the Subbasin. Department staff will continue to monitor and evaluate the progress toward achieving the Subbasin's sustainability goals through continued annual reporting and future revisions to the Alternative.

For reference, the sustainability goals of the Subbasin are "related to groundwater supply reliability and protection [and] are based on Board Policy:

[12] https://sgma.water.ca.gov/portal/alternative/annualreport/61.
[13] https://sgma.water.ca.gov/portal/alternative/periodiceval/preview/7.
[14] 2021 GWMP, Executive Summary, p. 15.
[15] 2021 GWMP, Chapter 1.1.1, pp. 24-25.
[16] 2021 GWMP, Appendix B, pp. 339-369.

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- *Manage groundwater to ensure sustainable supplies and avoid land subsidence.*
- *Aggressively protect groundwater from the threat of contamination."*[17]

As stated in the 2021 Alternative, "*These goals describe the overall objectives of Valley Water's groundwater management programs. The basin management strategies below are used to meet the sustainability goals. Many of these strategies…have overlapping benefits, acting to improve water supply reliability, minimize subsidence, and protect or improve groundwater quality.*

1. *Manage groundwater in conjunction with surface water.*
2. *Implement programs to protect and promote groundwater quality.*
3. *Maintain and develop adequate groundwater models and monitoring networks.*
4. *Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination*."[18]

Based on the current evaluation of the 2016 Alternative, and after considering information provided by the Subbasin's GSA, Department staff recommend that the 2021 Alternative be approved with recommended corrective actions, which are related to consideration of adjacent basins and alignment of monitoring networks. Additional evaluation details, implementation observations, and recommendations are provided herein.

2 PERIODIC REVIEW CRITERIA

At least every five years after the initial submission of a plan prepared pursuant to Water Code Section 10733.4, the Department is required to review any available GSP, as well as any alternative[19] submitted in accordance with Water Code Section 10733.6.[20] The Department is required to periodically review an approved alternative to ensure it remains consistent with the objectives of SGMA and continues to substantially comply with the GSP Regulations.[21] The Department is also required to ensure that an approved alternative is being implemented in a manner that will likely achieve the basin's sustainability goal.[22]

The Department's Periodic Review is based on information provided in the Annual Reports as well as the alternative's functionally equivalent Periodic Evaluation, which may be either a Periodic Evaluation prepared in accordance with Section 356.4 of the GSP

[17] 2021 GWMP, Executive Summary, p. 20.
[18] 2021 GWMP, Executive Summary, p. 20.
[19] 23 CCR § 358.2.
[20] 23 CCR § 358.4.
[21] 23 CCR §§ 355.6 and 358.4.
[22] 23 CCR § 355.4(b).

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Regulations or an amended version of its approved alternative.[23] In both cases, the entity submitting an alternative is required to explain how the elements of the alternative are functionally equivalent to the elements of a GSP.[24]

The Department considers the following in determining whether an alternative and its implementation remains consistent with SGMA and the GSP Regulations:[25]

- Whether the exceedances of any minimum thresholds or failure to meet any interim milestones are likely to affect the ability of the local agencies and/or GSAs in the basin to achieve the basin's sustainability goal.
- Whether the local agencies and/or GSAs in the basin are implementing projects and management actions consistent with the alternative, or that the local agencies and/or GSAs have demonstrated that actions described in the alternative have been rendered unnecessary based on changing basin conditions or an improved understanding of basin conditions.
- Whether the local agencies and/or GSAs are addressing data gaps in the basin and reducing the levels of uncertainty identified in the alternative.
- Whether the alternative continues to satisfy the evaluation criteria described in Section 355.4 of the GSP Regulations.

Following its Periodic Review of the approved alternative, the Department is required to issue a written assessment of its findings and potentially make a new determination of the alternative's status, as follows: approved,[26] incomplete,[27] or inadequate.[28] The assessment may recommend corrective actions to address any new or remaining regulatory deficiencies identified by the Department.

As defined in the GSP Regulations, the Department may request any information it deems necessary to evaluate the progress toward achieving the basin's sustainability goal and the potential for adverse effects on adjacent basins.[29] Additionally, the Department may evaluate the implementation of an alternative at any time to determine whether it is consistent with the objectives of SGMA and in substantial compliance with the GSP Regulations.[30]

[23] 23 CCR §§ 358.2(d) and (e).
[24] 23 CCR § 358.2(d).
[25] 23 CCR § 355.6(c).
[26] 23 CCR § 355.6(d)(1).
[27] 23 CCR § 355.6(d)(2).
[28] 23 CCR § 355.6(d)(3).
[29] 23 CCR § 355.6(e).
[30] 23 CCR § 355.6(f).

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3 PERIODIC REVIEW OF APPROVED ALTERNATIVE

Pursuant to the GSP Regulations, the Department is required to consider basin conditions and associated minimum thresholds, the status of projects and management actions, and efforts taken to address data gaps and uncertainty when determining whether an Alternative remains consistent with SGMA and continues to substantially comply with the GSP Regulations.[31] The perspective of Department staff of whether the Alternative continues to satisfy Section 355.4 of the GSP Regulations in a functionally equivalent manner is provided below in Section 5.

As part of its Periodic Review responsibilities the Department must also assess whether implementation of an alternative will adversely affect the ability of an adjacent basin to implement its alternative or its GSP, and Department staff must ensure that the monitoring network described in the alternative aligns with the data uploaded to the SGMA Portal Monitoring Network Module. Staff perspective regarding adjacent basins and monitoring networks is provided within this section.

As described in the 2016 GWMP, and as incorporated into the updated 2021 GWMP, the GSA has documented functional equivalence to a GSP by submitting an updated groundwater management plan and associated justification.[32] Although the terminology and approaches differ slightly from basins with GSPs, the 2021 GWMP is based on existing groundwater management practices in the Subbasin. The GSA describes an adaptive management approach to groundwater management, which is informed by the continually evolving monitoring network.[33] The 2021 GWMP describes that "all outcome measures and outcome measure-lower thresholds will be evaluated annually and related reporting occurs through Valley Water's Annual Groundwater Report and annually in the Water Year [Annual] Reports due each April 1 to [the Department]."[34] Additionally, as reported in the 2021 GWMP and on Valley Water's website, the monitoring network and near-real time reporting of conditions allows the GSA to prioritize, develop, and implement projects and management actions to ensure sustainable Subbasin conditions are not threatened. The GSA has continued to demonstrate that it is able to operate the Subbasin at or near the measurable objective (outcome measure), is meeting its sustainability goals, and will continue to adaptively manage the Subbasin by incorporating best available science and information.

The GSA has internally identified several areas for improvement of its 2021 GWMP and Department staff concur that those items are important and should be addressed as soon as practicable.[35] Department staff have identified additional recommendations that should be considered by the GSA as the 2021 GWMP is being implemented and improved upon.

[31] 23 CCR § 355.6.
[32] 2021 GWMP, Appendix B, pp. 339-369.
[33] 2021 GWMP, Appendix J, p. 771.
[34] 2021 GWMP, Appendix B, p. 340.
[35] 2021 GWMP, Chapter 8, pp. 219-221.

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Addressing these recommendations will be important to demonstrate that the GSA is likely to maintain its sustainability goals. Details regarding these recommendations can be found in the following sections grouped by sustainability indicator.

3.1 Minimum Thresholds

The GSP Regulations require that the description of minimum thresholds include the information and criteria relied upon to establish and justify the thresholds established for each sustainability indicator.[36] The numeric value used to define those thresholds should represent a point in the basin that, if exceeded, may cause undesirable results.[37] As part of its Periodic Review responsibility, the Department is required to consider whether the exceedances of any minimum thresholds, or failure to meet any interim milestones, are likely to affect the ability of the local agencies and/or GSAs to achieve the basin's sustainability goal.[38]

As stated in the 2021 GWMP, "The outcome measures are quantifiable goals to track performance of sustainable management and are functionally equivalent to measurable objectives under SGMA. This 2021 GMWP has new outcome measure-lower thresholds that are quantifiable values used to define undesirable results and are functionally equivalent to minimum thresholds under SGMA. The outcome measure-lower thresholds account for a reasonable margin of operational flexibility below the outcome measures that accommodate drought, climate change, conjunctive use operations, and other groundwater management activities. Valley Water has a long-established history of sustainable groundwater management and will continue to proactively manage groundwater to minimize the risk of reaching the outcome measure-lower thresholds and related undesirable results."[39] Department staff agree that the use of outcome measures by the GSA is functionally equivalent to sustainable management criteria as defined by the GSP Regulations. Below is information for each of the applicable sustainability indicators discussed in the 2021 Alternative.

3.1.1 Chronic Lowering of Groundwater Levels

According to the 2021 Alternative, the Subbasin's groundwater level monitoring network includes 58 wells monitored by Valley Water, as well as 12 wells monitored by water retailers. The GSA states that all data collected is maintained in Valley Water's database and is used in regional condition and trend analysis.[40] Department staff note that, although monitoring groundwater levels are an integral part of Valley Water's basin management activities and are intimately connected to managing groundwater storage and water quality, there are no sustainable management criteria explicitly set for the chronic lowering of groundwater levels sustainability indicator.

[36] 23 CCR § 354.28(b)(1).
[37] 23 CCR § 354.28(a).
[38] 23 CCR § 355.6(c)(1).
[39] 2021 GWMP, Chapter 5.4, p. 145.
[40] 2021 GWMP, Chapter 7.1.1, pp. 179-181; Appendix K, Table K-2, pp. 823-825.

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As stated in the Department's 2019 Staff Report, "The District does not manage the Subbasin to specific groundwater-level thresholds. Instead, the District uses a threshold for end-of-year groundwater storage. However, water levels are monitored throughout the year to support groundwater supply assessment and forecasting, recharge operations, efforts to monitor concentrated pumping and land subsidence, and other purposes."[41] Because the Subbasin has been and continues to be, managed pursuant to an updated groundwater management plan, as well as the policies of Valley Water's District Act, sustainable management criteria for chronic lowering of groundwater levels are not directly warranted. In the adjacent Santa Clara Subbasin, outcome measures and outcome measure-lower thresholds have been set for groundwater levels, but in the context of preventing subsidence.

The Water Year 2022 Annual Report describes the recovery of water levels since the 2012 to 2016 drought, attributing this to "robust managed recharge and continued water use reduction…"[42] The Water Year 2022 Annual Report continues, describing "healthy groundwater conditions in WY 2017 through 2020 (Figure 5), with the groundwater basins essentially full heading into the recent drought (2020 to present)."[43] The Water Year 2022 Annual report describes impacts on water levels due to recent challenging hydrologic conditions, describing that "WY 2022 groundwater elevations in many regional wells were lower than WY 2021 due to statewide drought conditions and increased groundwater pumping. However, the groundwater elevations remain far above the historical [minimums] and levels observed during the last major droughts of 1987-1992 and 2012-2016."[44]

Although there are no sustainable management criteria explicitly set for the chronic lowering of groundwater levels, it is apparent that the GSA has been monitoring and managing groundwater levels in the Subbasin for many years, and those levels are used to quantify end-of-year storage estimates, which are used to define sustainable groundwater conditions. Department staff note that the Subbasin appears to be meeting its sustainability goals with respect to chronic lowering of groundwater levels, as well as groundwater storage.

3.1.2 Reduction of Groundwater Storage

The 2021 GWMP contains the following functionally equivalent sustainable management criteria for the reduction of groundwater storage sustainability indicator.[45] As discussed below, no exceedances of groundwater storage minimum thresholds have occurred in the Subbasin.

[41] https://sgma.water.ca.gov/portal/alternative/assessments/20.
[42] Water Year 2022 Annual Report, Chapter 2, p. 9.
[43] Water Year 2022 Annual Report, Chapter 2, p. 9.
[44] Water Year 2022 Annual Report, Chapter 2, p. 9.
[45] 2021 GWMP, Chapter 5.4.1, p. 145.

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- Outcome Measure [measurable objective]: Projected end of year groundwater storage is greater than 278,000 acre-feet (AF) in the Santa Clara Plain, 5,000 AF in the Coyote Valley, and 17,000 AF in the Llagas Subbasin.
- Outcome Measure – Lower Threshold [minimum threshold]: Projected end of year countywide groundwater storage is greater than Stage 5 (150,000 AF) of the Water Shortage Contingency Plan.

The 2021 GWMP describes the importance of the sustainable management of groundwater storage, indicating that it "is a critical consideration in water supply reliability and is the county's best protection against drought or facility outage. The end of year groundwater storage is projected to support operational decisions, including the timing and location of reservoir releases and managed recharge, and decisions related to imported water such as short-term water exchanges or out of county banking."[46] The 2021 GWMP continues that, "Valley Water regularly analyzes groundwater storage to support operational decisions, contingency planning, and planning to meet future needs. To support near-term operations, Valley Water uses groundwater models to estimate storage for the current year and simulate conditions for the following calendar year under a range of projected water supply and hydrologic scenarios. As the water year progresses and more water supply and demand information become available, operations plans are updated accordingly."[47]

While the GSA's 2020 Urban Water Management Plan provides an overall storage target of 300,000 acre-feet in both the Santa Clara and Llagas subbasins, based on groundwater storage observed historically, the end of year storage targets established in the 2021 GWMP are 283,000 acre-feet in the Santa Clara Subbasin (278,000 acre-feet in the Santa Clara Plain and 5,000 acre-feet in the Coyote Valley) and 17,000 acre-feet in the Llagas Subbasin. The rationale for adopting these outcome measures was "to account for a reasonable operational flexibility, including more severe future droughts or infrastructure outages, the outcome measure-lower threshold for groundwater storage in the Santa Clara and Llagas subbasins is greater than stage 5 (150,000 acre-feet) of the water shortage contingency plan. If storage falls below this target, there would be a greatly increased risk of resumed permanent subsidence and more widespread reports of dry wells. The outcome measure-lower threshold accounts for the integrated groundwater management and operational decisions that are necessary for Valley Water to make across both Santa Clara and Llagas subbasins, particularly during a drought response."[48]

In addition to monthly reports on Valley Water's website, the 2021 GWMP describes recent groundwater storage conditions, stating that "From 2010 to 2019, countywide groundwater storage in the Santa Clara and Llagas subbasins remained in the normal stage (>300,000 AF) each year except during the 2012–2016 drought when storage

[46] 2021 GWMP, Chapter 5.4.1, pp.145-146.
[47] 2021 GWMP, Chapter 7.6.3, p. 216.
[48] 2021 GWMP, Chapter 5.4.1, p. 146.

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dipped into stage 3 during 2014 and 2015."[49] The 2021 GWMP continues, "Despite this drop in storage, there were very limited impacts to well users, with fewer than 15 reports of wells going dry for domestic wells along the basin margins where well yield is more uncertain. No permanent subsidence was observed. Due to Valley Water's recharge programs, coordination with water retailers, and community water use reductions in response to Board action, groundwater storage quickly recovered to the normal stage (stage 1) in 2016."[50]

The Water Year 2022 Annual Report summarizes general groundwater storage conditions, although not expressly compared to the functionally equivalent sustainable management criteria, "Due to increased recharge and decreased groundwater use starting in WY 2021 and continuing through WY 2022, Valley Water estimates a net increase in countywide groundwater storage of 2,200 AF in WY 2022 compared to WY 2021. Storage increased by 2,500 AF in the Santa Clara Subbasin and decreased by 300 AF in the Llagas Subbasin. Groundwater storage is the primary trigger for action under Valley Water's Water Shortage Contingency Plan, and storage remained within the low 'Normal' stage in WY 2022."[51] Additional groundwater storage information supporting the Subbasin's groundwater management program, organized by calendar year rather than water year as required by SGMA and the GSP Regulations, is found on the GSA's website.[52] Because the GSA does not appear to be exceeding its "Outcome Measure – Lower Threshold" with respect to the reduction of groundwater storage sustainability indicator, the Subbasin appears to be on track to meeting its sustainability goals.

3.1.3 Seawater Intrusion

The 2021 GWMP does not establish sustainable management criteria for the seawater intrusion sustainability indicator. The Subbasin is not vulnerable to seawater intrusion due to its landlocked, interior location, which the Department acknowledged in its 2019 Staff Report.

[49] 2021 GWMP, Chapter 5.4.1, p. 145.
[50] 2021 GWMP, Chapter 5.4.1, pp.145-146.
[51] Water Year 2022 Annual Report, Chapter 3.4, p. 24.
[52] https://www.valleywater.org/your-water/groundwater.

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3.1.4 Degraded Water Quality

The 2021 GWMP contains the following functionally equivalent sustainable management criteria for the degraded water quality sustainability indicator.[53] As discussed below, no exceedances of water quality minimum thresholds have occurred in the Subbasin.

- Outcome Measure [measurable objective]: For Llagas Subbasin water supply wells, at least 95% meet primary drinking water standards, and at least 90% have stable or decreasing trends for total dissolved solids (TDS).
- Outcome Measure – Lower Threshold [minimum threshold]: At least 70% of water supply wells have stable or decreasing trends for nitrate and TDS.

The 2021 GWMP describes the importance of the degraded water quality sustainability indicator in the Subbasin, explaining that "Water supply reliability depends on maintaining both an adequate supply of water and protecting water quality. While surface water goes through significant treatment before being served as drinking water, groundwater from public water supply wells is of high quality and does not typically require wellhead treatment beyond disinfection before being delivered to consumers. Protecting groundwater quality is critical for ensuring clean safe water for well users and avoiding the need for treatment. The Santa Clara and Llagas subbasins have good water quality overall, but maintaining that quality is not without its challenges."[54]

The 2021 GWMP explains that the water quality outcome measures evaluate the percentage of water supply wells that meet all primary Maximum Contaminant Levels (MCLs) and that the outcome measures will be evaluated annually using data collected at water supply wells sampled by Valley Water and water retailers. Additionally, the 2021 GWMP states, "The target percentage for water supply wells meeting primary MCLs is set high (95%) since these are health-based regulatory standards that must be met by public water systems. This measure is not set at 100% for several reasons. Some of the wells monitored by Valley Water are private domestic wells, which are assumed to have less stringent wellhead protection, maintenance, and testing. The water quality at these wells may be more influenced by local land use and conditions near the well as they are typically shallower than public water supply wells."[55] Additionally, "to account for reasonable operational flexibility, including annual factors that can affect groundwater quality, the outcome measure-lower threshold for groundwater quality is that at least 70% of supply wells have stable or decreasing concentrations of nitrate and TDS."[56]

The primary water quality constituents of concern in the Subbasin are TDS and nitrate. Concentrations of TDS in groundwater are an indicator of salt loading and overall groundwater conditions, while nitrate is reported to be "the one parameter that is

[53] 2021 GWMP, Chapter 5.4.3, p. 148.
[54] 2021 GWMP, Chapter 5.4.3, p. 148.
[55] 2021 GWMP, Chapter 5.4.3, p. 149.
[56] 2021 GWMP, Chapter 5.4.3, p. 150.

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frequently detected above the MCL and affects the largest number of wells..."[57] As stated, "The trend-based component of the outcome measures will help Valley Water to better understand how groundwater quality is changing over time and highlight areas that may warrant further study or action to protect the beneficial use of groundwater."[58]

The 2021 GWMP describes that in the Subbasin, groundwater is generally "…of good quality that does not need treatment beyond disinfection at public water supply wells."[59] The 2021 GWMP continues, describing elevated nitrate as an "ongoing groundwater protection challenge, as presented in Figure 3-14."[60] Figures 3-15 and 3-16 in the 2021 GWMP show the relative concentrations of inorganic parameters, including those with health-based MCLs and aesthetic-based secondary MCLs (SMCLs) for the period 2010 to 2019 in the principal aquifer.[61] The median concentration in the principal aquifer zone between 2010-2019 was 383 mg/L for TDS (SMCL is 500 mg/L) and 5.6 mg/L for nitrate as nitrogen (MCL is 10 mg/L).[62] The nitrate exceedances are reported to be an issue from historical and ongoing agricultural practices and the use of septic systems.[63] A full water quality summary of multiple water quality constituents is provided on Table 3-2 (shallow aquifer zone) and Table 3-3 (principal aquifer zone) in the 2021 GWMP.[64] With respect to the degraded water quality sustainability indicator, the Subbasin appears to be meeting its sustainability goals.

Water quality conditions are not discussed in the GSA's Annual Reports as they pertain to SGMA's annual reporting requirements, but they are discussed in Valley Water's Calendar Year Annual Reports.[65] The Calendar Year 2022 Annual Report explains that "Elevated nitrate continues to be the primary groundwater protection challenge in the Coyote Valley [within Santa Clara Subbasin] and Llagas groundwater management areas, where a significant number of domestic wells contain water with nitrate above the drinking water standard (Table ES-4)."[66] The Calendar Year 2022 Annual Report continues, describing how the GSA coordinates "with land use and regulatory agencies to influence related policies, regulations, and decisions. More directly, Valley Water's managed recharge programs help dilute nitrate, and water quality testing helps to reduce well owner exposure. While most wells have stable or decreasing long-term chloride

[57] 2021 GWMP, Chapter 5.4.3, p. 149.
[58] 2021 GWMP, Chapter 5.4.3, p. 149.
[59] 2021 GWMP, Chapter 3.2.5, p. 106.
[60] 2021 GWMP, Chapter 3.2.5, p. 106; Figure 3-14, p. 108.
[61] 2021 GWMP, Figures 3-15 and 3-16, pp. 109-110.
[62] 2021 GWMP, Chapter 3.2.5, Table 3-3, pp. 113-114.
[63] 2021 GWMP, Chapter 3.2.5, p. 108.
[64] 2021 GWMP, Tables 3-2 and 3-3, pp. 111-114.
[65] https://www.valleywater.org/your-water/groundwater.
[66] Calendar Year 2022 Annual Report, Executive Summary, p. 12.

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concentrations, increasing concentrations in some shallow aquifer wells warrant continued tracking and evaluation."[67]

While the Department acknowledges that water quality data is provided in Valley Water's Calendar Year Annual Reports, documentation of progress on the degraded water quality sustainability indicator should be provided in the SGMA Annual Reports to determine if the Subbasin is meeting its sustainability goals. Most of the pertinent information is provided in the Calendar Year Annual Reports, but not reported to the Department in Water Year Annual Reports. For example, the Calendar Year 2022 Annual Report describes recent performance against the functionally equivalent sustainable management criteria, indicating that the outcome measure (measurable objective) for degraded water quality was not met, stating that "78% of Llagas Subbasin water supply wells met all primary drinking water standards; and 86% had stable or decreasing trends for TDS."[68] Although the outcome measure (measurable objective) was not met, the groundwater quality in the Llagas was above the outcome measure-lower threshold (minimum threshold), with the GSA stating that "86% of Llagas Subbasin water supply wells had stable or decreasing trends for TDS and 93% had stable or decreasing trends for nitrate."[69] The GSA presents an action plan to address the unmet measurable objective, stating that it will "Assess potential causes, continue to implement the Salt and Nutrient Management Plans, and engage with regulatory and/or land use agencies as needed."[70] Though the GSA appears to be on track to meeting its sustainability goals in regard to water quality, Department staff encourage the GSA to incorporate information about all applicable sustainability indictors in future versions of the SGMA Annual Report and organize that information by water year not calendar year.

3.1.5 Land Subsidence

The 2021 GWMP does not establish sustainable management criteria for the land subsidence sustainability indicator because the GSA believes it is not applicable in the Llagas Subbasin. As stated in the 2021 GWMP, "Inelastic land subsidence has not been observed in the Llagas Subbasin. Valley Water partnered with U.C. Berkeley researchers to use satellite imagery (InSAR) to evaluate the potential for subsidence in the Llagas Subbasin. Using satellite imagery from 1992 to 2000, they concluded that there was no evidence of long-term subsidence. Seasonal ground surface movement was observed; rising and lowering by the same amount between the wet and dry seasons."[71] Department staff note that, although historically there is limited evidence of susceptibility to land subsidence in the Subbasin, subsidence should continue to be monitored as new data and information becomes available.

[67] Calendar Year 2022 Annual Report, Executive Summary, p.12
[68] Calendar Year 2022 Annual Report, Executive Summary, p.14.
[69] Calendar Year 2022 Annual Report, Executive Summary, p.14.
[70] Calendar Year 2022 Annual Report, Executive Summary, p.14.
[71] 2021 GWMP, Section 3.2.2, p. 101.

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3.1.6 Depletions of Interconnected Surface Water

Although there are no sustainable management criteria set for the depletions of interconnected surface water sustainability indicator in the 2021 GWMP, nor were they recommended by the Department in its 2019 Staff Report that approved the 2016 Alternative, the 2021 GWMP includes information pertinent to the depletions of interconnected surface water sustainability indicator, including sections on surface water and groundwater interaction and groundwater dependent ecosystems, while incorporating a discussion of current monitoring and associated data gaps in the Subbasin.

The 2021 GWMP includes a section, *Surface Water and Groundwater Interaction*, generally describing the GSA's current understanding of surface water and groundwater interaction.[72] The section makes the distinction between managed recharge program influenced areas and those under direct influence of groundwater, describing "Valley Water's managed recharge program includes significant recharge through many miles of stream channels over the recharge area, indicating groundwater and surface water generally are disconnected in these reaches. As described further below, the managed recharge program helps to maintain flows in these creeks, most of which would flow only intermittently otherwise."[73] To monitor surface water the GSA describes "Valley Water has a comprehensive surface water monitoring network to measure creek flows, comply with water rights reporting and reservoir restrictions, and meet environmental requirements…Surface water flow data can be used to evaluate which reaches of streams are gaining or losing streams with regard to groundwater."[74]

The GSA describes two wetland areas with likely or potential for groundwater-surface water interaction, the Uvas-Carnadero wetland in the southwestern corner of the Subbasin, and the Soap Lake area in the southeast. The GSA describes that the Uvas-Carnadero wetland "…is the exit for all groundwater flowing towards San Benito County. Groundwater upwells in this area and maintains the wetlands."[75] The GSA continues, describing that the wetlands [in the Soap Lake area] are believed to be primarily due to flooding and poorly draining soils.[76] Department staff concur, as was done in the 2019 Staff Report, that sustainable management criteria for depletions of interconnected surface water are not warranted in the Subbasin, but appreciate the information and analyses provided in the 2021 GWMP.

As previously stated, functionally equivalent sustainable management criteria for the depletions of interconnected surface water sustainability indicator are not required in the Subbasin; however, in the 2021 GWMP, the GSA identified groundwater dependent ecosystems in the Subbasin in response to Recommended Action 1 from the

[72] 2021 GWMP, Chapter 3.2.3, pp. 101-103.
[73] 2021 GWMP, Chapter 3.2.3, p. 101.
[75] 2021 GWMP, Chapter 3.2.3, p. 101.
[75] 2021 GWMP, Chapter 3.2.3, p. 101.
[76] 2021 GWMP, Chapter 3.2.3, p. 101.

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Department's 2019 Staff Report. Information regarding groundwater dependent ecosystems and what the GSA did in response to Recommended Action 1 is provided in this assessment in Section 4.1.

3.2 Projects and Management Actions

The GSP Regulations require a description of the projects and management actions the local agencies and/or GSAs in the basin have determined will achieve the established sustainability goal, including projects and management actions to respond to changing conditions.[77] As part of its Periodic Review responsibility, the Department is required to determine whether the local agencies and/or GSAs in the basin are implementing projects and management actions consistent with the alternative, or that the local agencies and/or GSAs have demonstrated that actions described in the alternative have been rendered unnecessary based on changing basin conditions or an improved understanding of basin conditions.[78]

The 2021 GWMP describes the implementation of projects and management actions, as well as their effect on groundwater conditions in Chapter 6 – *Basin Management Programs and Activities*.[79] Chapter 6 details programs to maintain a reliable groundwater supply, programs to protect groundwater quality, programs related to surface water - groundwater interaction, and other projects and activities to support continued sustainability. The 2021 GWMP provides a portfolio of projects and management actions that are currently being implemented by the District or other agencies to address County-wide sustainability goals. The GSA explains that it has the authority to implement "capital projects as needed to protect and augment groundwater resources. These projects are described in Valley Water's Capital Improvement Program."[80]

Projects and management actions described in the 2021 GWMP include:

- Programs to maintain reliable groundwater supply include managed aquifer recharge, in-lieu recharge, protection of natural recharge, groundwater production management, water accounting, groundwater level and storage assessments, and asset management.[81]
- Programs to protect groundwater quality include a well ordinance program, domestic well testing program, recycled water irrigation evaluation, vulnerability assessment, coordination with land use and regulatory agencies, and public outreach.[82]

[77] 23 CCR § 354.44(a).
[78] 23 CCR § 355.6(c)(2).
[79] 2021 GWMP, Chapter 6, pp. 153-178.
[80] 2021 GWMP, Chapter 6, p. 153.
[81] 2021 GWMP, Chapter 6, pp. 153-165.
[82] 2021 GWMP, Chapter 6, pp. 166-173.

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- Programs related to surface water - groundwater interaction are described as in-stream releases of surface water, stormwater management, seawater intrusion prevention, and watershed management.[83]
- Other projects and activities to support continued sustainability include monitoring network improvements, assessments of managed recharge system capacity, stormwater projects, and various capital improvement projects.[84]

Additionally, as stated in the 2021 GWMP, "Valley Water's proactive groundwater management programs and activities have maintained sustainable groundwater levels and storage, minimized land subsidence, and improved groundwater protection. To maintain the long-term sustainability of groundwater resources, the following actions are recommended…"[85]

- Maintain existing conjunctive water management programs and evaluate opportunities for enhancement or increased efficiency.
- Continue to aggressively protect groundwater quality through Valley Water programs and collaboration with land use agencies, regulatory agencies, and basin stakeholders.
- Continue to incorporate groundwater sustainability in Valley Water planning efforts.
- Maintain adequate monitoring programs and modeling tools.
- Continue and enhance groundwater management partnerships with water retailers and land use agencies.

In support of management action planning, the 2021 GWMP describes various GSA Board Resolutions adopted in support of sustainable groundwater management since the 2016 GWMP (approved 2016 Alternative) was adopted and submitted to the Department. Notably, Valley Water Board Resolution No. 18-04 (provided in Appendix F of the 2021 GWMP) memorializes "the process to regulate groundwater extraction under SGMA, if needed. The resolution lays out an implementation framework for Valley Water, in coordination with stakeholders, to address worsening basin conditions."

The GSA has established groundwater zones and implemented groundwater pumping/use charges for quite some time, and in 2020 conducted "an extensive groundwater benefit zone study that re-evaluated the zone boundaries and resulted in new and modified zones that became effective in July 2020."[86] With respect to metering to enable groundwater use charges, the 2021 GWMP describes that "Within the Coyote Valley [a Santa Clara Subbasin management area] or Llagas Subbasin, meters are

[83] 2021 GWMP, Chapter 6, pp. 173-176.
[84] 2021 GWMP, Chapter 6.4, pp. 176-178.
[85] 2021 GWMP, Chapter 8, pp. 219-221.
[86] 2021 GWMP, Chapter 6.1.4.3, pp. 160-162

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required for facilities producing more than 20 [acre-feet] of agricultural water or more than 2 [acre-feet] of non-agricultural water. The Valley Water Board has the ability to modify the volumetric thresholds for metering as well as related responsibilities for installation, maintenance, and reading."[87]

With respect to project implementation, notably, the GSA has been engaging in managed recharge operations since 1934 and 1955 (depending on recharge system)[88] to "offset groundwater withdrawals and ensure the long-term sustainability of groundwater resources…with local and imported surface waters in Valley Water recharge facilities."[89] Absent careful management and recharge operations, the Llagas Subbasin would be in chronic decline, as groundwater withdrawals are in excess of natural recharge and other inflows. Having acknowledged the importance of conjunctive use for many years, one of six major internal recommendations in the Water Year 2022 Annual Report is to "maintain existing conjunctive water management programs and evaluate opportunities for enhancement or increased efficiency."[90] The Water Year 2022 Annual Report describes the importance of direct recharge and conjunctive use, explaining that "Valley Water continues to focus on extensive groundwater recharge through direct replenishment and in-lieu recharge",[91] and reports that it was able to recharge about 18,900 acre-feet of local and imported water in the Llagas Subbasin during water year 2022.[92]

The suite of projects and management actions being implemented and considered in the Subbasin appears to be sufficient to address the water budget deficit, provides a buffer against climate change, and takes into account imported and local water supply reliability. With respect to the implementation of projects and management actions, the Subbasin appears to be meeting its sustainability goal.

3.3 Data Gaps

Data gaps can relate to information about the physical setting and characteristics of a basin, a basin's current conditions, its hydrogeologic conceptual model, or its monitoring network.[93] As part of its Periodic Review responsibility, the Department is required to determine whether the local agencies and/or GSAs are addressing the basin's data gaps and are reducing the levels of uncertainty identified in the alternative.[94]

The GSA appears to be actively working to address known data gaps and continually improve its understanding of the Subbasin for improved management. The 2021 GWMP describes the importance of working "to ensure that the monitored locations and the data collected provide adequate information to understand groundwater conditions to support

[87] 2021 GWMP, Chapter 6.1.4.1, p. 159.
[88] 2021 GWMP, Chapter 4.4.2.2, Table 4-4, p. 132.
[89] 2021 GWMP, Chapter 6.1.1, p. 153.
[90] Water Year 2022 Annual Report, Chapter 4, p. 28.
[91] Water Year 2022 Annual Report, Chapter 4, p. 28.
[92] Water Year 2022 Annual Report, Chapter 3.2, p. 22.
[93] 23 CCR §§ 354.12; 354.15(b)(5); 354.38.
[94] 23 CCR § 355.6(c)(3).

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informed decision-making. This includes assessments of data gaps and redundancies, monitoring protocols, and data management, evaluation, and reporting."[95] The GSA states that "regular evaluations of monitoring gaps and redundancies will be reported and summarized in each five-year update of the GWMP."[96]

The GSA presents several technical memoranda addressing data gaps on a wide variety of topics in the 2021 GWMP. The technical memorandum *Groundwater Monitoring Network Gap Analysis for the 2021 Groundwater Management Plan*[97] fulfills an internal recommendation from its 2016 GWMP. The gap analysis was prepared to "compile, inventory, and map the locations of the existing groundwater monitoring networks, and identify any gaps and redundancies in those networks, as well as outline recommendations to fill gaps or eliminate redundancies."[98] The memorandum additionally states "Results and recommendations summarized in this memo indicate the need to fill several gaps in the groundwater level and quality monitoring networks, with a priority of co-located gaps overlying the shallow and principal aquifer zones…"[99]

With respect to groundwater dependent ecosystems, the 2021 GWMP includes another technical memorandum, *Identification of Groundwater Dependent Ecosystems (GDEs) for the 2021 Groundwater Management Plan*,[100] which fulfills Recommended Action 1 from the Department's 2019 Staff Report.[101] The memorandum describes there are approximately 1,707 acres of "likely and transition" GDE categories in the Llagas Subbasin (Figure 29 and Table 7).[102] As stated in Chapter 8 – *Next Steps*, of the 2021 GWMP, the GSA describes that it will "continue to improve understanding of surface water/groundwater interaction" and "expand on Valley Water's 2018 differential gauging study to include additional time periods, hydrologic conditions, and methods, as appropriate."[103]

The 2021 GWMP includes another relevant technical memorandum, *Evaluation of Dry Supply Wells During Drought in the Santa Clara and Llagas Subbasins*,[104] which "presents information on water supply wells that went dry during the 2012 to 2016 drought and evaluates the vulnerability of wells going dry in the Santa Clara and Llagas subbasins."[105] The memorandum describes that the "findings from this memo are being incorporated into the gap analysis of Valley Water's groundwater level monitoring program that is being conducted as part of the 2021 GWMP update."[106] The

[95] 2021 GWMP, Chapter 7, p. 179.
[96] 2021 GWMP, Appendix J, p. 812.
[97] 2021 GWMP, Appendix J, pp. 769-813.
[98] 2021 GWMP, Appendix J, p. 770.
[99] 2021 GWMP, Appendix J, p. 770.
[100] 2021 GWMP, Appendix J, pp. 769-813.
[101] 2021 GWMP, Appendix C, p. 426.
[102] 2021 GWMP, Appendix G, p. 700-702.
[103] 2021 GWMP, Chapter 8, p. 221.
[104] 2021 GWMP, Appendix D, pp. 427-441.
[105] 2021 GWMP, Appendix D, p. 428.
[106] 2021 GWMP, Appendix D, p. 441.

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memorandum further describes that, "filling such gaps in the water level monitoring program are likely to provide data that will result in a better understanding of groundwater conditions and vulnerability of water supply wells to drought."[107]

Department staff agree that it is important to revisit and reevaluate sustainable management criteria as new data and information warrants. The findings and conclusions from these technical memoranda have been incorporated into the 2021 GWMP. It is apparent that the GSA continues to adaptively manage its Subbasin and seeks to incorporate best-available science and practices into its management and will continue to identify and address data gaps while doing so.

3.4 Consideration of Adjacent Basins

SGMA requires the Department to "…evaluate whether a groundwater sustainability plan adversely affects the ability of an adjacent basin to implement their groundwater sustainability plan or impedes achievement of sustainability goals in an adjacent basin."[108] Furthermore, the GSP Regulations state that minimum thresholds defined in each GSP be selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.[109]

The Llagas Area Subbasin is part of the larger Gilroy-Hollister Valley Groundwater Basin, with the Gilroy-Hollister Valley – North San Benito Subbasin located to the south. The hydrologically separate Santa Clara Valley – Santa Clara Subbasin lies to the north. The 2021 GWMP describes that the Llagas Subbasin is "part of the larger Gilroy-Hollister Valley Groundwater Basin, which extends into San Benito County to the south."[110] The 2021 GWMP continues by describing the Subbasin's lateral boundaries, stating "the subbasin's southern boundary is institutional, coincident with the boundary between Santa Clara and San Benito counties and adjacent to the North San Benito Subbasin."[111]

The GSA should be aware of the adjacent basins' sustainability goals and actively coordinate with the respective Plan Managers to ensure the Llagas Area Subbasin's groundwater management program is not affecting the adjacent basins. Furthermore, the GSA should be aware of the corrective actions that adjacent basins are actively working to address. Department staff recommend the GSA provide an explanation in future updates or Periodic Evaluations of its Alternative how inter-basin items, such as: thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water have been coordinated (see Recommended Corrective Action 1).

[107] 2021 GWMP, Appendix D, p. 441.
[108] Water Code § 10733(c).
[109] 23 CCR § 354.28(b)(3).
[110] 2021 GWMP, Chapter 3.1, p. 90.
[111] 2021 GWMP, Chapter 3.1.1, p. 91.

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The 2021 Alternative, at this time, does not anticipate any negative impacts to the adjacent basins resulting from the minimum thresholds defined for the Llagas Area Subbasin, and the Department is not aware of any information, at this time, suggesting or claiming that adjacent basins' implementation of plans have been, or will be, negatively impacted by implementation of the Subbasin's Alternative. While Department staff are not aware of any information that would refute this position, additional information related to coordination with adjacent basins may be warranted. Department staff will continue to review the GSA's Periodic Evaluations to assess whether implementation of the Llagas Area Subbasin Alternative is potentially impacting plans in the adjacent basins.

3.5 Alignment of Monitoring Network

The GSP Regulations describe the monitoring network that must be developed for each sustainability indicator including monitoring objectives, monitoring protocols, and data reporting requirements. Collecting monitoring data of sufficient quality and quantity is necessary for the successful implementation of an alternative or a GSP. The GSP Regulations require a monitoring network of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the alternative or GSP.[112] Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,[113] monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,[114] capture seasonal low and high conditions,[115] include required information such as location and well construction and include maps and tables clearly showing the monitoring site type, location, and frequency.[116]

Department staff encourage local agencies and GSAs to collect monitoring data as specified in their respective plans, follow SGMA data and reporting standards,[117] fill data gaps,[118] update monitoring network information as needed, follow monitoring best management practices, and submit all monitoring data to the Department's Monitoring Network Module immediately after collection, including any additional groundwater monitoring data that is collected within the respective plan area that is used for making groundwater management decisions. Department staff note that if agencies do not fill their identified data gaps, the agencies' understanding of the basin may not represent the best available science for use in monitoring basin conditions.

Department staff recommend the GSA ensure the monitoring network details included in its Alternative are consistent with the information contained in the SGMA Portal Monitoring Network Module (see Recommended Corrective Action 2).

[112] 23 CCR § 354.32.
[113] 23 CCR § 354.34(b)(2).
[114] 23 CCR § 354.34(b)(3).
[115] 23 CCR § 354.34(c)(1)(B).
[116] 23 CCR §§ 354.34(g-h).
[117] 23 CCR § 352.4 *et seq*.
[118] 23 CCR § 354.38(d).

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3.6 Consideration of Climate Change and Future Conditions

Since the 2021 Alternative was adopted and submitted, climate change conditions have advanced faster and more dramatically. It is anticipated that the hotter, drier conditions will result in a loss of ten percent of California's water supply. As California adapts to a hotter, drier climate, local agencies and GSAs should be preparing for these changing conditions as they work to sustainably manage groundwater within their jurisdictional areas. Specifically, the Department encourages local agencies and GSAs to:

- Explore how their proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the basin based on current and future drought conditions.
- Explore how groundwater level data from the existing monitoring network will be used to make progress towards sustainable management of the basin given increasing aridification and effects of climate change, such as prolonged drought.
- Take into consideration changes to surface water reliability and the potential impact on groundwater conditions.
- Evaluate updated watershed studies that may modify assumed frequency and magnitude of recharge projects, if applicable.
- Continually coordinate with the appropriate groundwater users, including but not limited to domestic well owners and state small water systems, as well as the appropriate overlying county jurisdictions developing drought plans and establishing local drought task forces, to evaluate how their respective groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

4 Progress Towards Addressing 2019 Recommended Actions

The July 17, 2019, *Statement of Findings Regarding the Approval of the Llagas Subbasin Alternative* explains the Department's decision to review and approve the GSA's Alternative. As stated in the Statement of Findings, "Based on its review of the Staff Report, Department management is satisfied that [Department] staff have conducted a thorough evaluation and assessment of the Alternative and concurs with staff's recommendation and all the recommended actions, and thus hereby approves the Alternative on the following grounds…"[119] The Statement of Findings further states, "The recommended actions in the Staff Report will assist the Department's review of the Alternative's implementation for consistency with SGMA and are thus recommended to

[119] https://sgma.water.ca.gov/portal/alternative/assessments/20.

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be included in the resubmitted Alternative, due on January 1, 2022, as required by Water Code Section 10733.6(c)."

The 2021 GWMP summarizes the GSA's response to the Department's four Recommended Actions from the 2019 Staff Report in Appendix C – *Response to DWR Recommended Actions*.[120] As part of that effort, new information regarding the Subbasin has been made available and has been incorporated into the 2021 GWMP. The Department appreciates the effort put forth in addressing the Recommended Actions from the 2016 Alternative and notes the progress made to date on implementation of the recommendations.

The GSA's efforts to address the Department's recommended actions are summarized below. New recommended corrective actions and considerations for improvement of the Alternative are provided in Section 5.

4.1 Recommended Action 1

Recommended Action 1. Staff recommend that the District provide an identification of groundwater dependent ecosystems in the Subbasin.

In response to Recommended Action 1, the GSA describes that "within the Basin Setting of the 2021 GWMP, section 2.2.4 *Groundwater Dependent Ecosystems* includes a new map identifying groundwater dependent ecosystems (GDEs) for the Santa Clara Subbasin, and section 3.2.4 *Groundwater Dependent Ecosystems* includes a new map identifying GDEs for the Llagas Subbasin. A detailed technical memorandum that documents the current understanding, approach, and methods used to identify and map GDEs in the Santa Clara and Llagas subbasins is included in Appendix G of the 2021 GWMP."[121]

The GSA describes that it mapped GDEs in the Subbasin in general accordance with the 2018 guidance published by The Nature Conservancy, *Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans* and presents findings from the 34 field assessments performed by Valley Water biologists.[122] The GSA describes that "…most GDEs in the recharge (unconfined) areas of the Llagas Subbasin are along losing stream reaches that are disconnected from the regional water table and thus are not considered interconnected surface water. Because these losing stream reaches are not interconnected and streamflow is supported by natural runoff and in-stream recharge operations via reservoir releases, GDEs are generally not affected by groundwater pumping in the recharge areas or the central portion of the Llagas Subbasin. Long-term groundwater levels are stable and demonstrate sustainable groundwater conditions (Chapter 4). Droughts of limited duration may suppress the shallow water table, but

[120] 2021 GWMP, Appendix C. pp. 370-372.
[121] 2021 GWMP, Appendix C. p. 371.
[122] 2021 GWMP, Chapter 3.2.4, p. 104.

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effects to GDEs are expected to be minimal with continued management activities."[123]. The GDE memo summarizes that there are approximately 3,047 acres of "likely, transition, and possible" GDE categories in the Llagas Subbasin.[124]

4.1.1 Staff Assessment of Agency's Response to Recommended Action 1

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 1 has been sufficiently addressed. The GSA prepared the GDE memo to specifically address the Department's recommendations. The GDE memo is a detailed technical memorandum documenting the current understanding, approach, and methods used to identify and map GDEs. The GSA not only identifies GDEs but incorporates and builds upon findings from the memo by applying them throughout the 2021 GWMP and into future actions. The GSA's Gap Analysis memo incorporates recommendations from the GDE memo, stating "The gaps identified as 1 in the Coyote Valley and Llagas Subbasin would help to quantify the groundwater/surface-water interaction in the Laguna Seca area, downstream of Uvas Reservoir and at the Pajaro River, which are identified as recommendations in the groundwater dependent ecosystem (GDE) analysis (Appendix G) of the 2021 GWMP."[125] Staff agree that filling these data gaps are important and that these data would aid in refining its interconnected surface water conceptual model and assist in monitoring potential impacts to GDEs and other beneficial uses and users. The GSA appears intent on incorporating best available science and information into its management of the Subbasin.

4.2 Recommended Action 2

Recommended Action 2. Staff recommend that the District provide a projected water budget incorporating climate change over the planning and implementation horizon of 50 years.

In response to Recommended Action 2, the GSA states that "Section [4.6] Climate Change Impacts on Groundwater Budget of the 2021 GWMP includes an analysis of projected groundwater budget considering climate change for the year 2045. This analysis focuses on 2045 to stay consistent with other Valley Water planning documents, including the 2020 Urban Water Management Plan. During the next five-year update cycle of the GWMP, Valley Water plans to conduct a more integrated analysis of climate change impacts that also considers projected climate change impacts on imported water supply."[126]

4.2.1 Staff Assessment of Agency's Response to Recommended Action 2

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 2 has been sufficiently addressed. Although the analysis

[123] 2021 GWMP, Chapter 3.2.4, p. 104.
[124] 2021 GWMP, Chapter 3.2.4, p. 104.
[125] 2021 GWMP, Appendix J, p.787.
[126] 2021 GWMP, Appendix C. pp. 371.

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presented in the 2021 GWMP does not cover the entire planning and implementation horizon, Department staff concur that it is reasonable for the GSA to align and leverage activities from other related efforts to be compliant with SGMA and create a local financial and planning nexus. Furthermore, evaluating climate change impacts on the water budget as it pertains to imported water supplies is of great importance to the GSA, given that conjunctive use and active recharge operations in the Subbasin are critical components of groundwater management and water supply reliability. The Department looks forward to reviewing the updated analysis and determining how it will be incorporated into basin management activities over the 50-year SGMA planning and implementation horizon, as planned for the next update to the Subbasin's Alternative. Note that Section 3.6 in this assessment (Consideration of Climate Change and Future Conditions) provides additional considerations and recommendations to anticipate how future water use may change in response to changing climate conditions.

4.3 Recommended Action 3

Recommended Action 3. Staff recommend that the District create separate outcome measures related to water quality in the Santa Clara and Llagas subbasins. Separate subbasin-specific criteria will allow for a determination of whether each subbasin, separately, is meeting or making progress toward the outcome measures.

In response to Recommended Action 3, the GSA states that "Section 5.4 Outcome Measures of the 2021 GWMP includes new and separate outcome measures related to water quality in the Santa Clara and Llagas subbasins. These separate subbasin-specific criteria will allow for a determination of whether each subbasin, separately, is meeting or making progress toward the outcome measures."[127] More detailed information as it pertains to Recommended Action 3 is provided in this assessment in Section 3.1.4.

4.3.1 Staff Assessment of Agency's Response to Recommended Action 3

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 3 has been sufficiently addressed. The 2021 GWMP explains that the water quality outcome measures evaluate the percentage of water supply wells that meet all primary Maximum Contaminant Levels (MCLs) and that the outcome measures will be evaluated annually using data collected at water supply wells sampled by Valley Water and water retailers.

4.4 Recommended Action 4

Recommended Action 4. The District should clarify how meeting its outcome measures relates to the avoidance of undesirable results in the Llagas Subbasin. Specifically, it should clarify whether not meeting the outcome measures represents an undesirable result for the applicable sustainability indicator. If the intent of the outcome measures is not to represent undesirable results, the District should provide additional clarification

[127] 2021 GWMP, Appendix C. pp. 371.

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about their purpose. In addition, the District should provide metrics that it can use and can be used by the Department to objectively assess the presence or absence of undesirable results.

In response to Recommended Action 4, the GSA describes that "Section 5.4 Outcome Measures of the 2021 GWMP includes new outcome measure-lower thresholds for each of the five corresponding outcome measures in the Santa Clara and Llagas subbasins. These outcome measure-lower thresholds are designed to be functionally equivalent to a minimum threshold and thus help define undesirable results for each corresponding sustainability indicator. Additional details are provided in section 5.4 of the 2021 GWMP."[128] In summary, the functionally equivalent sustainable management criteria for each of the applicable sustainability indicators defined in the 2021 GWMP include the following.

- Groundwater Storage.
    - Outcome Measure [measurable objective]: Projected end of year groundwater storage is greater than 278,000 acre-feet (AF) in the Santa Clara Plain, 5,000 AF in the Coyote Valley, and 17,000 AF in the Llagas Subbasin.
    - Outcome Measure – Lower Threshold [minimum threshold]: Projected end of year countywide groundwater storage is greater than Stage 5 (150,000 AF) of the Water Shortage Contingency Plan.
- Water Quality.
    - Outcome Measure [measurable objective]: For Llagas Subbasin water supply wells, at least 95% meet primary drinking water standards, and at least 90% have stable or decreasing trends for total dissolved solids (TDS).
    - Outcome Measure – Lower Threshold [minimum threshold]: At least 70% of water supply wells have stable or decreasing trends for nitrate and TDS.

4.4.1 Staff Assessment of Agency's Response to Recommended Action 4

Based on the information provided in the 2021 GWMP, Department staff believe that Recommended Action 4 has been sufficiently addressed. As stated in the 2021 GWMP, "The outcome measures are quantifiable goals to track performance of sustainable management and are functionally equivalent to measurable objectives under SGMA. This 2021 GMWP has new outcome measure-lower thresholds that are quantifiable values used to define undesirable results and are functionally equivalent to minimum thresholds under SGMA. The outcome measure-lower thresholds account for a reasonable margin of operational flexibility below the outcome measures that accommodate drought, climate change, conjunctive use operations, and other groundwater management activities.

[128] 2021 GWMP, Appendix C. p. 371.

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Valley Water has a long-established history of sustainable groundwater management and will continue to proactively manage groundwater to minimize the risk of reaching the outcome measure-lower thresholds and related undesirable results."[129]

5 STAFF RECOMMENDATION

The Department previously approved the Alternative submitted for the Subbasin based on the grounds presented in the July 17, 2019, *Statement of Findings Regarding the Approval of the Llagas Subbasin Alternative*. As part of its ongoing Periodic Review responsibility, the Department is required to assess whether the approved 2016 Alternative continues to satisfy the evaluation criteria described in Section 355.4 of the GSP Regulations and determine whether the 2021 Alternative should be considered approved, incomplete, or inadequate.[130]

Based on the current evaluation of the 2016 Alternative, and after considering information provided by the Subbasin's GSA, Department staff recommend that the 2021 Alternative Update for the Llagas Subbasin be approved with recommended corrective actions. Department staff conclude that the 2021 Alternative includes the components of a functionally equivalent GSP, demonstrates a thorough understanding of the Subbasin based on what appears to be the best available science and information, sets well explained, supported, and reasonable sustainable management criteria to prevent undesirable results, and proposes a set of projects and management actions that will likely achieve the sustainability goal defined for the Subbasin.

5.1 Recommended Corrective Actions

Although Department staff believe that the 2021 Alternative continues to comply with the objectives of SGMA and substantially complies with the GSP Regulations, new corrective actions have been recommended.[131] Although the issues addressed by the recommended corrective actions do not, at this time, preclude approval of the 2021 Alternative, they are intended to facilitate progress in achieving the Subbasin's sustainability goal and guide the Department's ongoing evaluation process. Additionally, the new recommended corrective actions will allow the Department to better evaluate whether implementation of the 2022 Alternative could adversely affect an adjacent basin from reaching its sustainability goal. As with GSPs, the failure to address the Department's recommended corrective actions could potentially lead to an alternative being determined incomplete or inadequate.

The GSA has identified several areas for improvement of its GWMP and Department staff concur that those items are important and should be addressed as soon as practicable.[132]

[129] 2021 GWMP, Chapter 5.4, p. 145.
[130] 23 CCR §§ 355.6(c)(4) and 355.6(d).
[131] Water Code § 10733.8.
[132] 2021 GWMP, Chapter 8, pp. 219-221.

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Department staff have described additional recommendations throughout the preceding sections of this assessment that should be considered by the GSA as the 2021 GWMP is being implemented.

Recommended Corrective Action 1

Provide an explanation in future Alternative updates how inter-basin items, such as: thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water along basin boundaries have been coordinated.

Recommended Corrective Action 2

Ensure the monitoring network details included in the Alternative are consistent with the information contained in the Department's SGMA Portal Monitoring Network Module.

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APPENDIX D

TECHNICAL MEMORANDUM

EVALUATION OF DRY SUPPLY WELLS DURING DROUGHT IN THE SANTA CLARA AND LLAGAS SUBBASINS

Prepared by:

Chanie Abuye
Senior Water Resources Specialist

Cheyne Hirota, P.G.
Associate Water Resources Specialist

Under the Direction of:

Jason Gurdak, Ph.D.
Unit Manager

Santa Clara Valley Water District

Groundwater Management Unit

May 2026

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Executive Summary

This technical memo presents information on water supply wells that were reported dry during the 2020–2022 drought and evaluates the vulnerability of wells to going dry in the Santa Clara and Llagas subbasins. This evaluation is based on analysis of well completion depths, observed and estimated depths to groundwater, and reports of dry wells during the 2020–2022 drought.

During the 2020–2022 drought, nine wells within Santa Clara County were reported dry, including only 0.07% (4 of 6,130) of the total active and standby water supply wells in the Santa Clara and Llagas subbasins. All nine were domestic wells, including one well in the Santa Clara Subbasin, three in the Llagas Subbasin, four outside the subbasins, and one with no latitude/longitude information. No agricultural or municipal and industrial (M&I) supply wells were reported dry. One of the three dry domestic wells in the Llagas Subbasin is within the confined area of the groundwater basin and likely caused by site-specific well construction (relatively shallow pump or well-screen depth) and did not reflect general groundwater conditions because upgradient and downgradient adjacent wells were not reported as dry. With the exception of the one shallow domestic well screened above the Llagas Subbasin confined area, all of the reported dry domestic wells with available coordinate information were located along the subbasin margins or outside the subbasins where natural geologic conditions result in relatively low groundwater storage and groundwater levels that are more responsive to pumping stresses under drought conditions.

Based on analysis of interpolated regional groundwater depths and available well depth information, an estimated 93 water supply wells may have been vulnerable to going dry during the 2020–2022 drought. The Santa Clara Plain (northern Santa Clara Subbasin) has 187 very shallow wells (total depth less than 100 feet) and relatively larger percentage (47.3%) of the 93 wells that may have been at risk of going dry compared to the Coyote Valley (8.6%) or Llagas Subbasin (44.1%). Like the reported dry domestic wells, the estimated supply wells vulnerable to going dry are also primarily located along the subbasin margins. Of the 93 vulnerable wells, 77 (82.8%) were shallow wells with total depths less than 100 feet.

In comparison to the 2012–2016 drought, groundwater levels during 2020–2022 remained higher across much of the Santa Clara and Llagas subbasins. This difference can be attributed to many factors, including a shorter and less severe drought, as well as Valley Water's ongoing groundwater management practices and increased managed recharge operations. However, the percentage and distribution of reported dry and vulnerable water supply wells were generally consistent between the 2020–2022 and 2012–2016 drought periods. This finding indicates that some areas, especially outside the subbasins and along the subbasin margins are inherently more vulnerable to drought despite improved groundwater conditions and management, due to the natural geologic conditions and relatively low natural groundwater storage and rapid decline of water levels during drought.

The analysis described in this memo includes inherent uncertainty due to regional interpolation and limited data points and likely overestimates vulnerable supply wells. Interestingly, the wells reported as dry during the 2020–2022 drought were not identified as being vulnerable in this analysis, highlighting the challenge of using simplified approaches and interpolation over large regions. Valley Water will explore alternative analytical approaches to better understand potential supply well impacts from drought. However, the relatively small percentage of wells reported dry in relation to the estimated number vulnerable supply wells and their locations indicate that Valley Water's management practices are maintaining sustainable groundwater conditions, even during drought. The findings from this study will be incorporated into the 2026 Groundwater Management Plan (GWMP) update.

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1. Introduction

Groundwater resources are often stressed because of climate variability and drought when surface-water resources become limited (Gurdak, 2017). For example, groundwater is California's largest source of storage (PPIC, 2018a) and statewide reliance on groundwater resources greatly increased relative to surface-water resources during the statewide 2012–2016 and 2020–2022 droughts (DWR, 2025; PPIC, 2018b). Pumping stress on groundwater during drought results in the lowering of water levels in wells. If the pumping stress is severe or prolonged, water levels can fall below the well pump intake or well screen, effectively creating either temporary or permanent "dry well" conditions. Thousands of water supply wells, largely in the California's Central Valley, were reported dry during the 2012–2016 and the 2020–2022 droughts (DWR, 2025; Jesechko and Perrone, 2020). Depending on local groundwater management practices, groundwater levels can recover after the drought ends, resulting in only temporary, rather than permanent, dry well conditions (DWR, 2019). As described in this memo, only a very small number of domestic wells were reported as dry in the Santa Clara and Llagas subbasins during the 2020–2022 drought, largely due to Valley Water's proactive drought response and actions to quickly recover groundwater to pre-drought conditions.

1.1. Purpose and Scope

This memo documents Valley Water's evaluation of the water supply wells that were reported dry during the 2020–2022 drought, as well as the estimated vulnerability of supply wells to drought in Santa Clara County. The analyses focus on supply wells within the Santa Clara and Llagas subbasins, which is consistent with Valley Water's role as Groundwater Sustainability Agency for these subbasins. Major findings and recommendations will be incorporated into the 2026 Groundwater Management Plan (GWMP), which will be submitted to the California Department of Water Resources (DWR) as the second periodic evaluation to Valley Water's approved Alternative to a Groundwater Sustainability Plan.

2. Methods

The evaluation presented in this memo is based on statistical and geographic information system (GIS) analysis of water supply wells with available completion depths, observed and estimated depths to groundwater, and reported dry supply wells within the Santa Clara and Llagas subbasins during the 2020–2022 drought. The observed depth to groundwater readings (groundwater levels) and supply well completion depths were compiled from Valley Water databases. Valley Water does not have completion depths for many wells that were installed prior to well permitting regulations, which took effect in the 1970s. Information on dry wells during the 2020–2022 drought were derived from voluntary reports submitted to Valley Water or DWR by well owners. These wells are also recorded in DWR dry well reporting portals or tracking systems[1], either with assistance from Valley Water staff or directly by the well owners. The following sections describe the data and approach used for this analysis.

2.1. Status, Depth, and Use of Water Supply Wells

Over 53,000 wells have been drilled in Santa Clara County and most of these are monitoring wells. Of the non-monitoring wells, a total of 6,744 are (or were) water supply wells located within the Santa Clara Subbasin (including the Santa Clara Plain and Coyote Valley groundwater management areas) and the Llagas Subbasin (Figure 1, Table 1). These supply wells are described in the next sections based on well status (active, standby, abandoned, and destroyed) and well-use type (agricultural, domestic, monitoring, and municipal and industrial (M&I)). As described below, subsequent analyses focus on active or standby supply wells within the Santa Clara and Llagas subbasins with available well depth completion information.

[1] https://mydrywatersupply.water.ca.gov/report/

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2.1.1. Well Status

Water supply well status is categorized as either active, standby, abandoned, or destroyed. Of the 6,744 supply wells, about 88.9% (5,995) are active wells, whereas the remainder have a well status of either standby (2.0%, 135), abandoned (1.4%, 93), or destroyed (7.7%, 521) (Figure 1, Table 1). There are approximately 2,600 abandoned and 24,000 destroyed wells in the Santa Clara and Llagas subbasins. However, only 93 abandoned and 521 destroyed wells have completed well depth information (Figure 1, Table 1). Due to the differences in land use and water supply sources between the two subbasins, the majority (4,127) of the supply wells are in the relatively less urbanized Llagas Subbasin and the remainder (2,617) are in the more urbanized Santa Clara Subbasin (Table 1). Due to different land use and management characteristics, Valley Water further delineates the Santa Clara Subbasin into two groundwater management areas: the Santa Clara Plain and Coyote Valley. Details about land use and associated well-use types in the three groundwater management areas are in the following sections.

Figure 1. Status of Water Supply Wells in the Groundwater Management Areas.

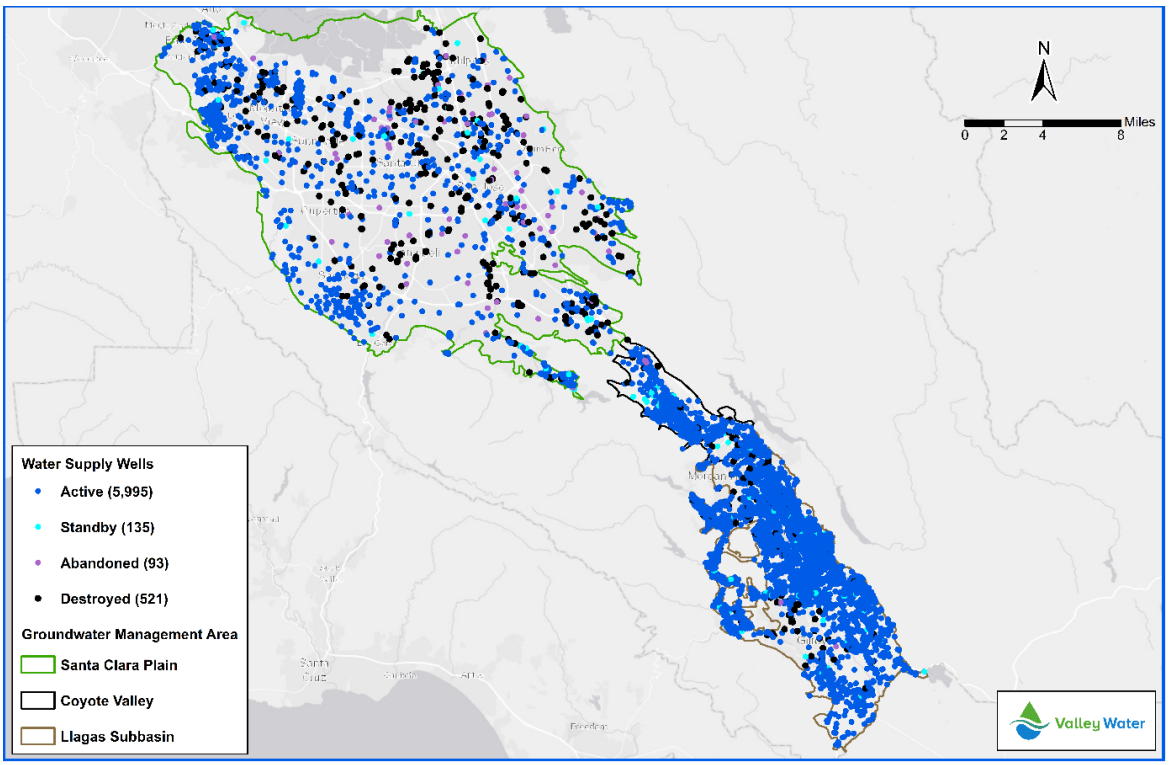

Table 1. Number and Status of Water Supply Wells in the Groundwater Management Areas.

Well Status	Santa Clara Subbasin		Llagas Subbasin	Total
	Santa Clara Plain	Coyote Valley		
Active	1,477	573	3,945	5,995
Standby Permits	44	16	75	135
Abandoned	81	3	9	93
Destroyed	399	24	98	521
Total	2,001	616	4,127	6,744

Note: Abandoned and destroyed wells shown include only those with well construction information.

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2.1.2. Well Depth

Similar to other groundwater basins in California, many supply wells in the Santa Clara and Llagas subbasins do not have completed well depth information. Many of these wells were installed prior to State and Valley Water well regulations that require the reporting of well construction information upon installation. Of the 6,744 supply wells in the Santa Clara and Llagas subbasins, only 2,763, or 41%, have available well depth information (Figure 2, Table 2). Of these wells, the majority (56%, 1,549) are in the Llagas Subbasin and 44% (1,214) are in the Santa Clara Subbasin.

Figure 2. Water Supply Wells with Available Completed Well Depth Information in the Groundwater Management Areas.

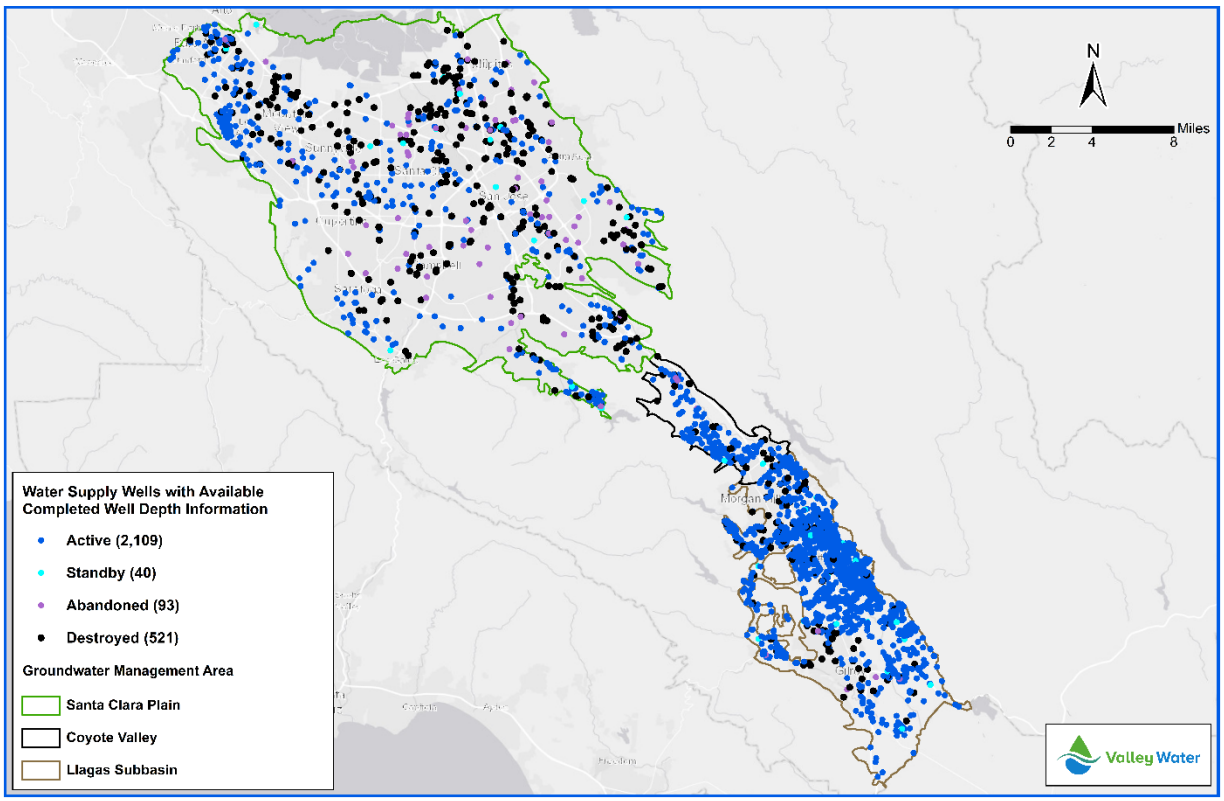

Table 2. Water Supply Wells with Completed Well Depth Information in the Groundwater Management Areas.

Well Status	Santa Clara Subbasin		Llagas Subbasin	Total
	Santa Clara Plain	Coyote Valley		
Active	503	184	1,422	2,109
Standby Permits	18	2	20	40
Abandoned	81	3	9	93
Destroyed	399	24	98	521
Total	1,001	213	1,549	2,763

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2.1.3. Well-Use Type

Well-use type is categorized in this memo as either agricultural, domestic, or M&I. These three categories describe the dominant use of all supply wells and represent a simplification of the 36 unique well use type categories in Valley Water's Water Supply Planning Database. The 36 unique well-use type categories indicate that many supply wells may be used for more than a single use. For example, some supply wells may be used for both domestic and agricultural uses. Similarly, many supply wells used for agricultural, M&I, and domestic purposes are part of Valley Water's water level monitoring network. Wells designated solely for monitoring purposes are not explicitly included in this analysis, as the scope of this memo focuses on water supply wells. Therefore, the three simplified well use type categories were selected based on the first well-use type listed in each of the 36 unique well use type categories and assumes that is the dominant use of the supply well.

Table 3 compares well-use type to well status for all 6,744 supply wells in the Santa Clara and Llagas subbasins regardless of whether the well has completed well depth information. Most active wells are domestic (4,112), followed by M&I (1,093) and agricultural (790). Most standby wells are also domestic (79), followed by agricultural (41) and M&I (15) (Table 3).

Table 3. Primary Use Type and Status for all Water Supply Wells in the Santa Clara and Llagas Subbasins.

Well Status	Well Type			
	Agricultural	Domestic	Municipal and Industrial (M&I)	Total
Active	790	4,112	1,093	5,995
Standby	41	79	15	135
Abandoned	39	29	25	93
Destroyed	106	160	255	521
Total	976	4,380	1,388	6,744

The Santa Clara Subbasin, especially in the Santa Clara Plain, has relatively more urban and developed land use than the Llagas Subbasin, which is characterized by more agricultural and rural land uses and includes large unincorporated areas not served by water retailers. These land use differences are reflected in the distribution of water supply well-use types (Table 4, Figure 3). The Santa Clara Plain has the majority (74%, 513) of the M&I supply wells while the Llagas Subbasin has the majority of the domestic (72%, 1,223) supply wells and about half of the agricultural (49%, 180) supply wells with completed depth information (Table 4).

Table 4. Water Supply Well-Use Type for Wells with Completed Depth Information in the Groundwater Management Areas.

Well-Use Type	Santa Clara Subbasin		Llagas Subbasin	Total
	Santa Clara Plain	Coyote Valley		
Agricultural	149	38	180	367
Domestic	339	138	1,223	1,700
M&I	513	37	146	696
Total	1,001	213	1,549	2,763

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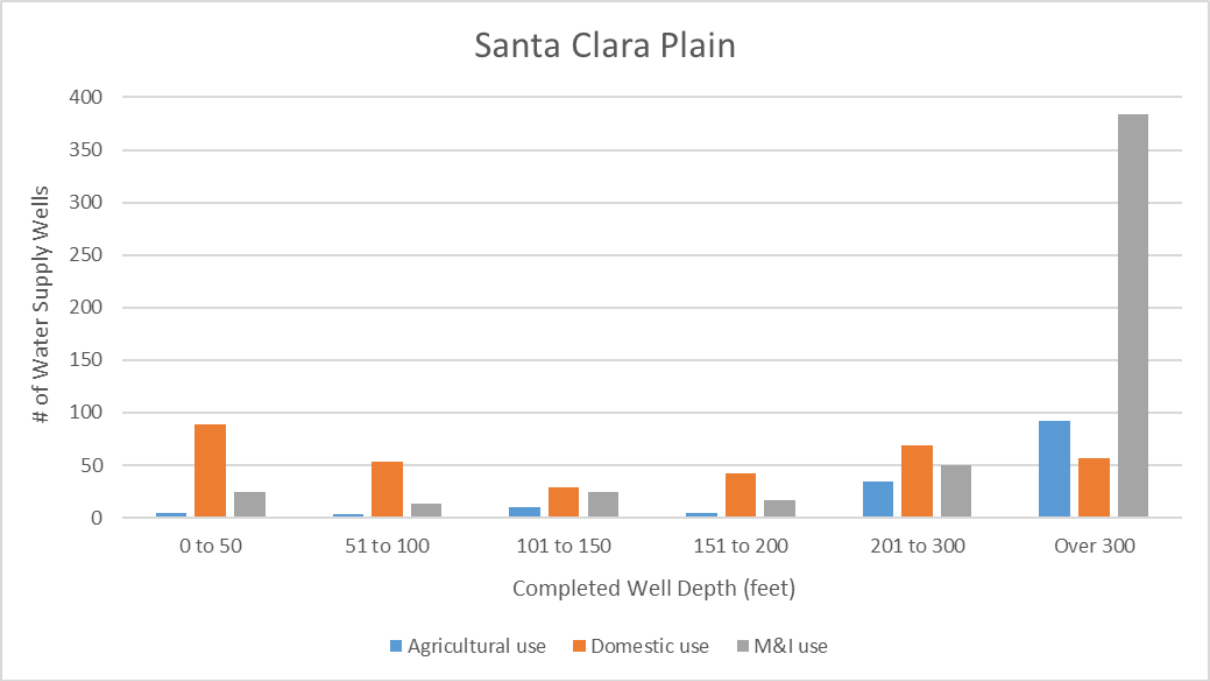
As shown in Figure 3, most water supply wells have total depth greater than 150 feet. However, available data indicates a surprising number of shallow water supply wells with total depth less than or equal to 100 feet: 187 in the Santa Clara Plain, 19 in the Coyote Valley, 143 in the Llagas Subbasin. In the Santa Clara Plain, 118 of these wells have total depth less than 50 feet making them more vulnerable not only to going dry but also to contaminants from the land surface.[2] It should be noted that some of these shallow wells may be related to groundwater remediation sites (i.e., extraction wells), rather than truly serving as water supply wells. Figure 4 shows the spatial distribution of active and standby supply wells with total depths less than or equal to 100 feet, which may be vulnerable to drought-induced reductions in groundwater levels.

Figure 3. Water Supply Well Depth by Well-Use Type.



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[2] Current Valley Water well standards require a minimum 50-foot annular seal, so wells this shallow would not be permitted.

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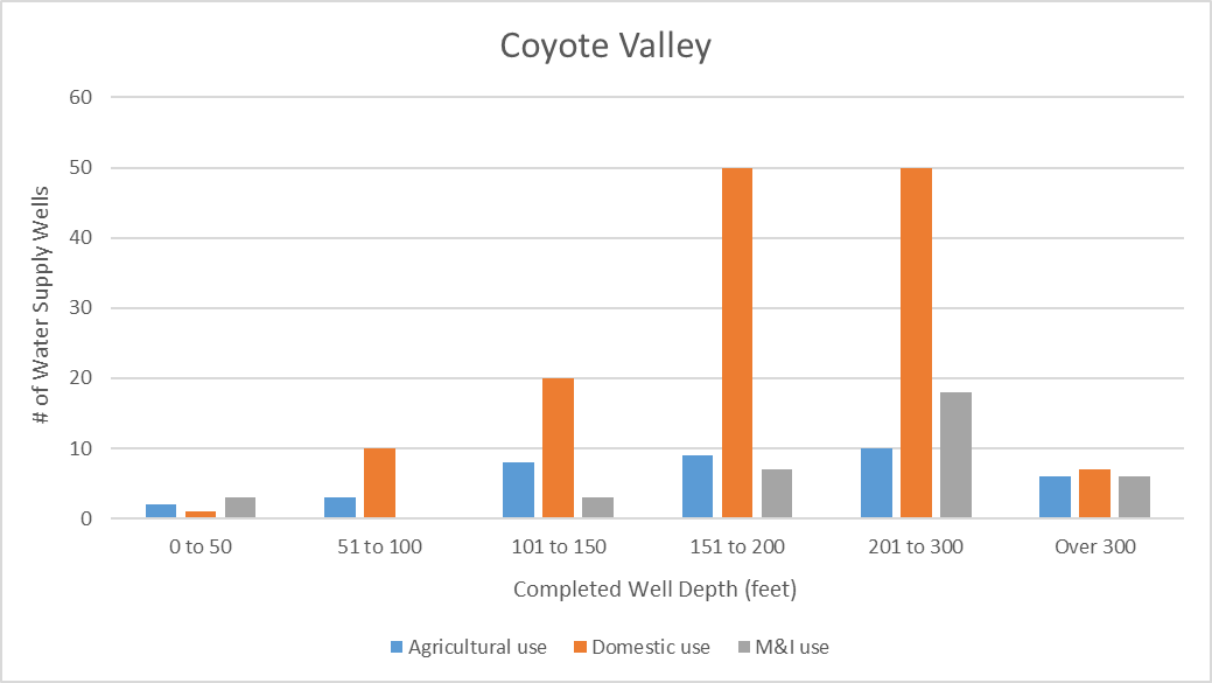
Figure 3 continued. Water Supply Well Depth by Well-Use Type.



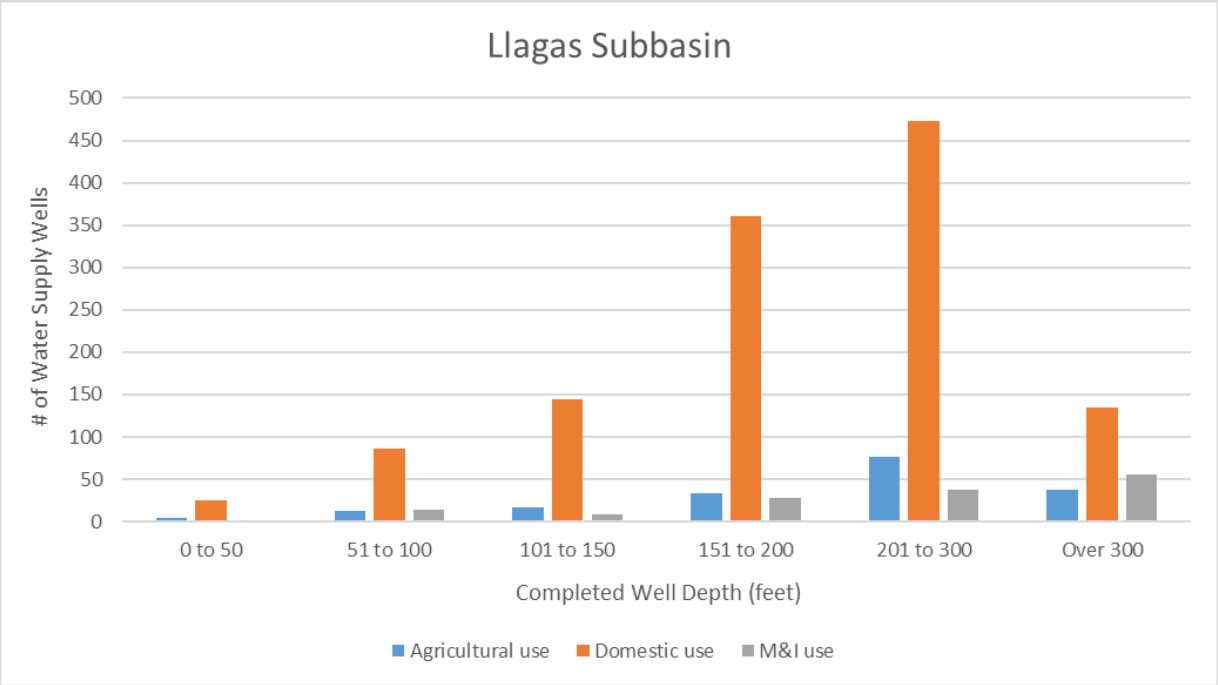


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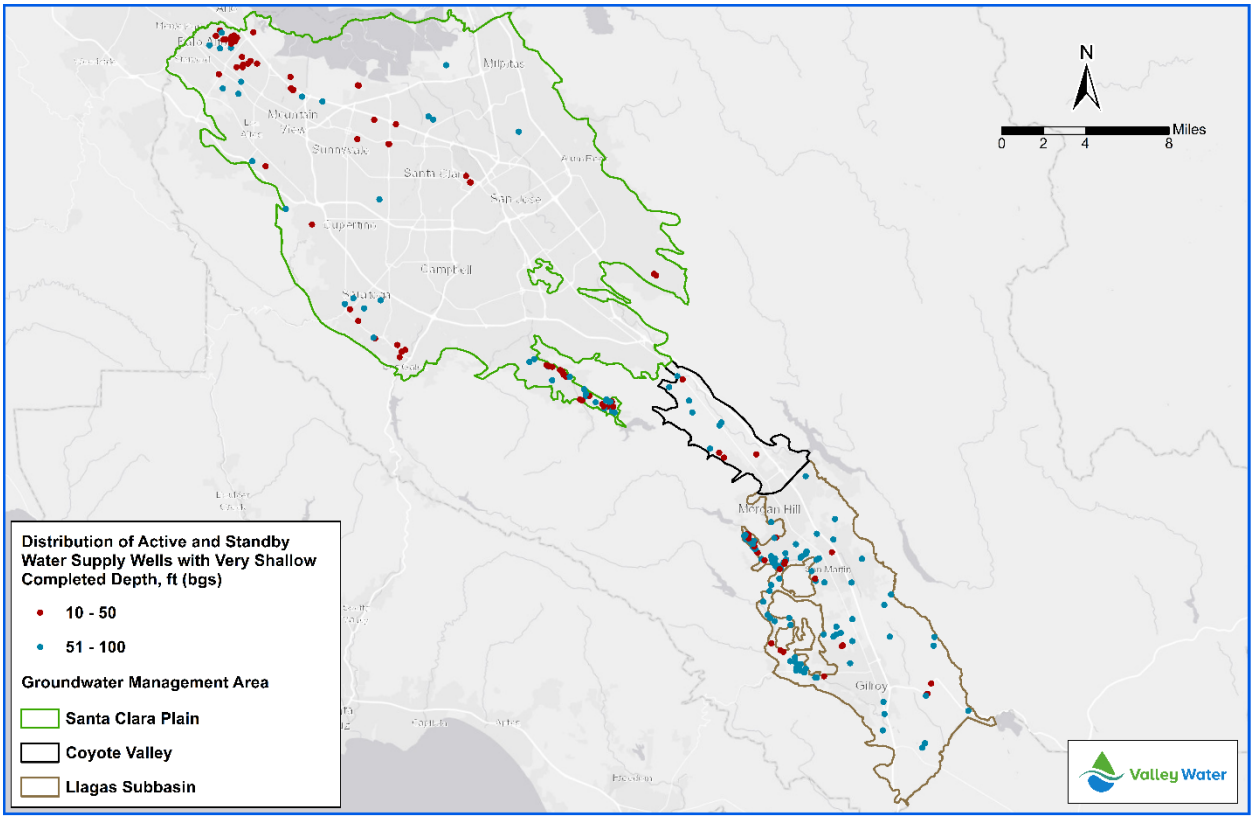
Figure 4. Spatial Distribution of Shallow Wells with Total Depth Less than 100 Feet.



2.2. Depth to Water During the 2020-2022 Drought

During the 2020–2022 drought, the maximum depth to water throughout the Santa Clara and Llagas subbasins occurred during 2021 and 2022 and began to recover in late 2022. This finding is based on analysis of hydrographs from regional index wells and many other wells in the subbasins, as well as review of the U.S Drought Monitor index for Santa Clara County[3]. Generally, groundwater levels across much of the Santa Clara and Llagas subbasins during the 2020–2022 drought remained higher than those observed during the 2012–2016 drought. This difference can be attributed to many factors, including the availability of recharge water during drought conditions, the severity and duration the drought, as well as Valley Water's ongoing groundwater management and increased managed recharge operations. During the 2012–2016 drought, calendar years 2014 and 2015 were among the most severe, and managed recharge volumes were approximately half of those observed during the 2020–2022 drought period. Specifically, recharge averaged about 40,000 acre-feet (AF) per year in 2014–2015, compared to approximately 80,000 AF per year in 2021–2022.

To assess drought vulnerability of individual wells, estimated groundwater depths during peak drought periods were mapped across all groundwater management areas using GIS. For the 2020–2022 drought, maximum depth to water readings (lowest observed water levels) from 267 wells in 2021 and 2022 were

[3] National Drought Mitigation Center, U.S. Department of Agriculture, and National Oceanic and Atmospheric Administration, National Integrated Drought Information System, March 2026, available online: https://www.drought.gov/states/california/county/Santa%20Clara#historical-conditions

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used to represent the most severe drought conditions in supply wells throughout the Santa Clara and Llagas subbasins. These data were interpolated to create a maximum depth to water surface representing estimated groundwater conditions during the 2021–2022 drought peak, as shown in Figure 5. The spline interpolation method was used to create a basin-wide coverage because water level measurements are only available at certain locations through Valley Water's water level monitoring program and data obtained from water retailers. Because Figure 5 represents an interpolated surface, it contains inherent uncertainty, including potential errors between the interpolated depth to water values and actual water level measurements if they had been available in 2021 and 2022. These uncertainties are likely greater near the basin boundaries where there are relatively fewer measured water level readings to serve as interpolation control points.

Figure 5. Maximum Depth to Water in the Groundwater Management Areas during the Drought Peak (2021–2022).

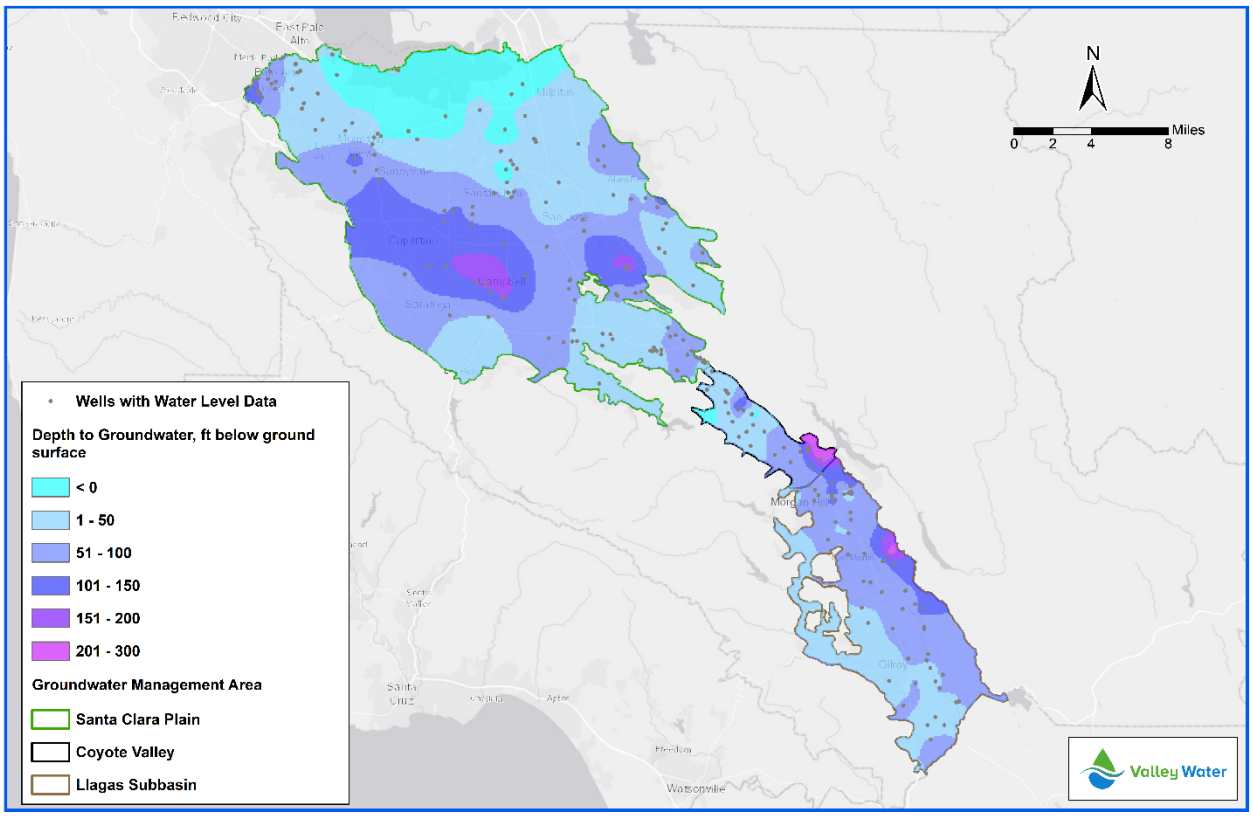

Figure 5 indicates that the maximum depth to water was greatest in parts of the western-central areas of the Santa Clara Plain, southeastern corner of Coyote Valley, and along the eastern boundary of the Llagas Subbasin. Areas represented by negative ("<0") values in Figure 5 indicate artesian conditions of the principal aquifer, which are primarily located in the northern and central areas of the Santa Clara Plain. For comparison, maximum groundwater depths observed during the 2012–2016 drought exhibit a similar spatial distribution but with greater depth magnitude, as shown on Figure 6.

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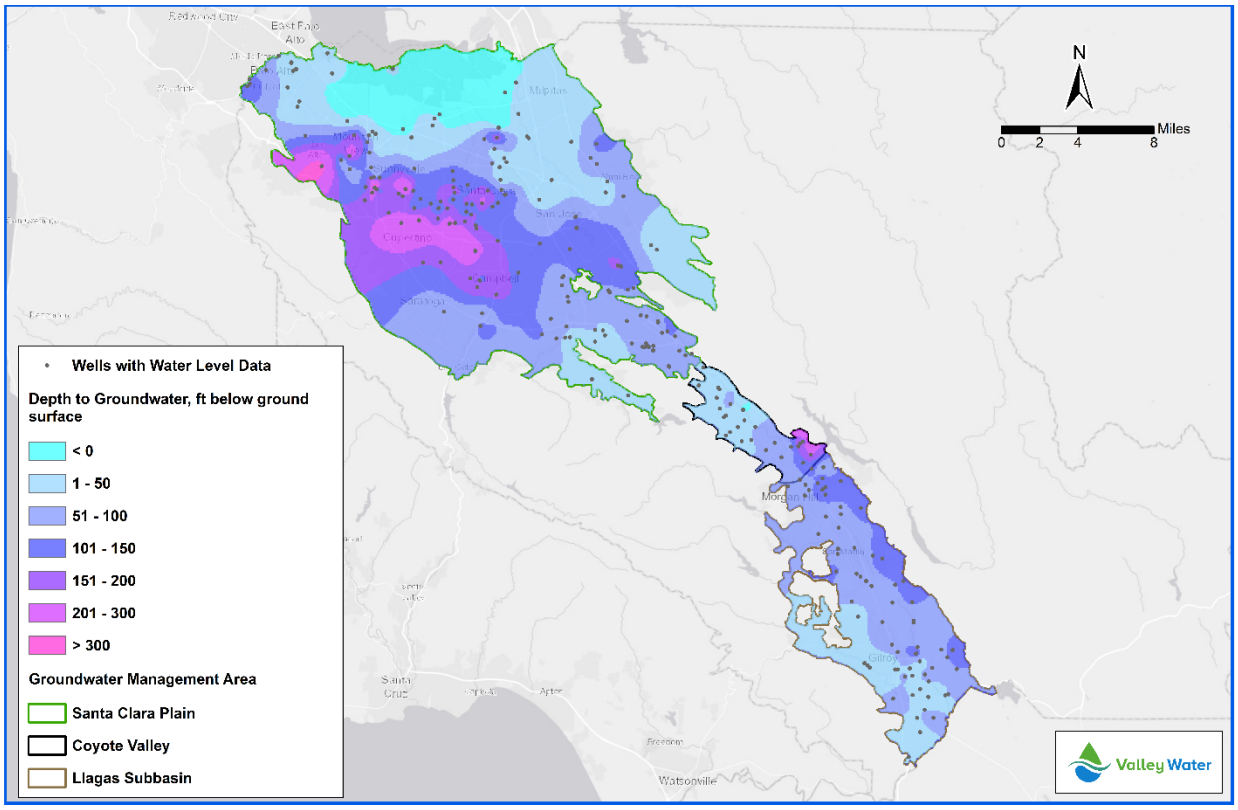
Figure 6. Maximum Depth to Water in the Groundwater Management Areas during the Drought Peak (2014–2015).



2.3. Reported Dry Domestic Wells During the 2020–2022 Drought

During the 2020–2022 drought, only nine wells within Santa Clara County and 0.07% (4 of the 6,130) of the total active and standby water supply wells in the Santa Clara and Llagas subbasins were reported by well owners to Valley Water or DWR dry well reporting portals as having gone dry (Figure 7). All were domestic wells, including one well in Coyote Valley, three wells in the Llagas Subbasin, and four wells outside of the subbasin boundaries. One well is unmapped due to missing latitude/longitude data in the DWR portal; therefore, its location relative to the groundwater subbasins is unknown. The reported dry wells were generally located near the subbasin boundaries, with at least four inside the subbasin boundaries and four nearby, but outside the subbasins.

The four dry wells (Figure 7) within the subbasin boundaries represent only 0.24% of active or standby domestic and agricultural wells with well depth information in the Santa Clara Subbasin (1 of 411) and 0.23% in the Llagas Subbasin (3 of 1,322) (Table 5). Three of the four wells are located along the margin of the subbasins where groundwater storage is relatively lower and water levels are more responsive to pumping stress. These conditions are due to boundary effects with lower permeability geologic units, which have the cumulative effect of relatively greater declines in water levels in those wells. One of the four dry wells is within the confined area of the Llagas Subbasin (Figure 7). This dry well may not reflect groundwater conditions in the area because upgradient and downgradient adjacent wells were not reported as dry. Therefore, the reported dry condition at this well may be related to well construction-specific factors, such as the pump installation or well screen at a relatively shallow depths.

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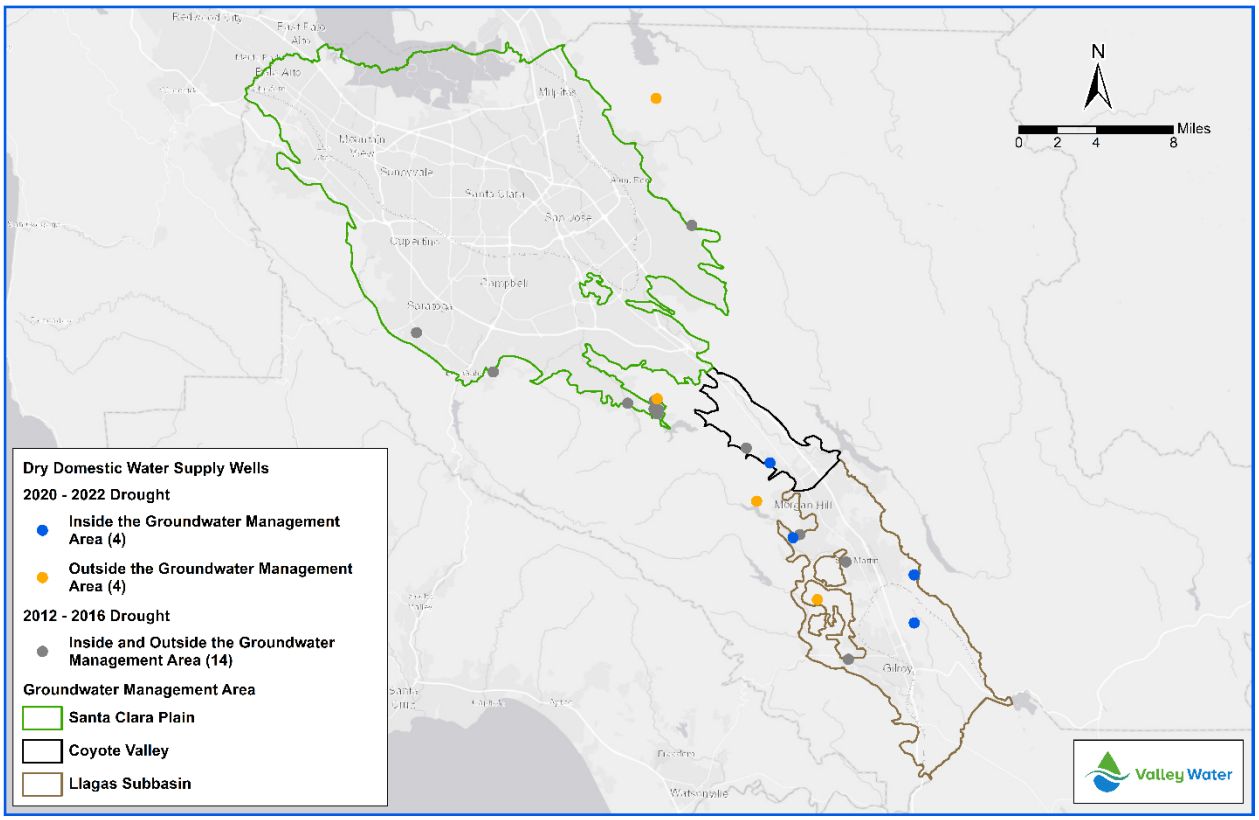
Table 5. Active or Standby Domestic or Agricultural Wells with Completed Depth Information in the Groundwater Management Areas.

Well-Use Type	Santa Clara Subbasin		Llagas Subbasin	Total
	Santa Clara Plain	Coyote Valley		
Agricultural	32	31	159	222
Domestic	222	126	1,163	1,511
Total	254	157	1,322	1,733

Figure 7. Domestic Supply Wells Reported Dry during the Recent Drought (2020–2022) Compared to Groundwater Management Areas.



Note: A total of nine (9) dry domestic wells were reported in Santa Clara County during the 2020–2022 drought. Only eight (8) are mapped due to lack of coordinate information for one well.

Only five of the nine reported dry domestic wells have available well construction information. For those five wells, the completed well depths range from 90 to 375 feet below land surface (bls). Within the subbasins, the deepest of the dry wells is located in the foothills along the eastern edge of the Llagas Subbasin, an area with some of the largest depth to water in the groundwater management areas (Figure 7). Figure 7 shows the relative locations of dry water supply wells during the 2012–2016 and the more recent 2020–2022 droughts in relation to groundwater management areas. As illustrated, wells that went dry during both drought periods are generally located near the edges of groundwater

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management areas. As noted above, groundwater conditions near these boundaries respond more rapidly to pumping stresses and limited recharge. As a result, shallow water supply wells in these areas are particularly vulnerable during drought conditions. As noted previously, the one reported dry well near the center of the confined area of the Llagas Subbasin is likely due to shallow pump or well screen installation or other well operation issues. This dry well is likely less a response to general groundwater conditions and more likely a result of site-specific well construction because no other nearby wells were reported dry during the 2020–2022 droughts.

3. Potential Vulnerability of Water Supply Wells to Drought

This section describes the analysis performed using the interpolated groundwater surface, available well depth information, and statistical analysis to assess the vulnerability of water supply wells to drought.

3.1. Relative Vulnerability of Water Supply Wells Based on Well Depth

To evaluate the potential vulnerability of water supply wells to drought, Valley Water compared the interpolated depth to groundwater map based on 2021–2022 conditions (Figure 5) with available well depth information. Wells with total depths above the interpolated groundwater surface were assumed to be more vulnerable to going dry (classified as *more likely* in Figure 8). This analysis indicates the majority of wells (96.0%, 2,653 of 2,763) evaluated were categorized as unlikely to go dry, even during the peak drought conditions of 2021–2022 (Figure 8). However, 93 wells (only 3.4% of supply wells with completed well depth information) were categorized as more likely to going dry during drought (Figure 8). This estimate includes about 4.4% (44 of 1,001) of supply wells in the Santa Clara Plain, 3.8% (8 of 213) in the Coyote Valley, and 2.6% (41 of 1,549) in the Llagas Subbasin. Three of the nine wells that were reported as going dry (Figure 7) had well-depth information and were included in this analysis; none of the three were identified as vulnerable using this method. This can be attributed to the previously described uncertainties associated with the maximum depth to water interpolation and well construction information. Additionally, the vulnerability of 0.6% (17) of wells evaluated could not be determined, likely due to similar uncertainties in the interpolated groundwater surface near the subbasin boundaries. As shown on Figure 8, wells with an unknown vulnerability are primarily located along the outer edges of the Llagas Subbasin. Overall, these results are nearly identical to those reported in Valley Water's dry well analysis for the 2012-2016 drought period[4].

Comparing the number of dry wells (9) reported during 2020–2022 to the estimated number of vulnerable wells (93) indicates the latter is overestimated by an order of magnitude. However, the spatial distribution of these vulnerable wells is generally consistent with the locations of the reported dry wells during the 2020–2022 drought (Figures 7 and 8). These areas include the southern boundary of the Santa Clara Plain north of Calero Reservoir, the southwestern boundary of Coyote Valley, the eastern boundary of the Llagas Subbasin, and the central-southern interior of the Llagas Subbasin. Unlike water retailer wells, which are generally located in the subbasin interior and serve large populations, supply wells along the subbasin margins are generally privately owned domestic wells with small volumes of pumping (generally less than 1 AF per year). Figure 9 shows that wells within the center of the basins shown as vulnerable are likely shallower, and/or are located in areas with large depth to water in 2021–2022. Of the 93 wells identified as vulnerable, a majority (82.8%, 77) were shallow with completed depths less than 100 feet.

[4] Santa Clara Valley Water District, Evaluation of Dry Supply Wells During Drought in the Santa Clara and Llagas Subbasins, October 2021, Appendix D, 2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasins

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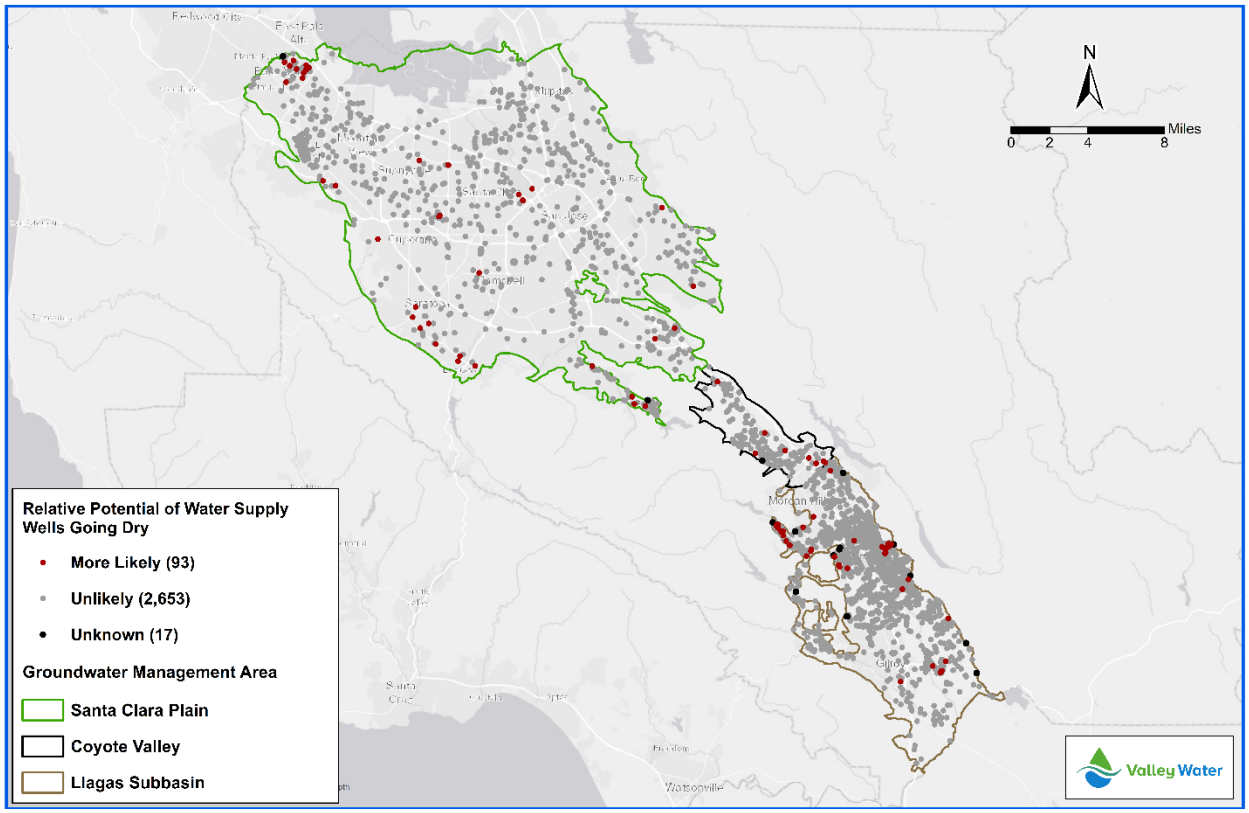
Figure 8. Relative Vulnerability of Wells to Drought Based on Well Depth.



Note: Analysis based on wells with total depth less than interpolated depth to groundwater surface for 2021-2022. Uncertainty with interpolated surface and well construction information indicates more vulnerable wells (93) compared to actual reports of dry wells (9).

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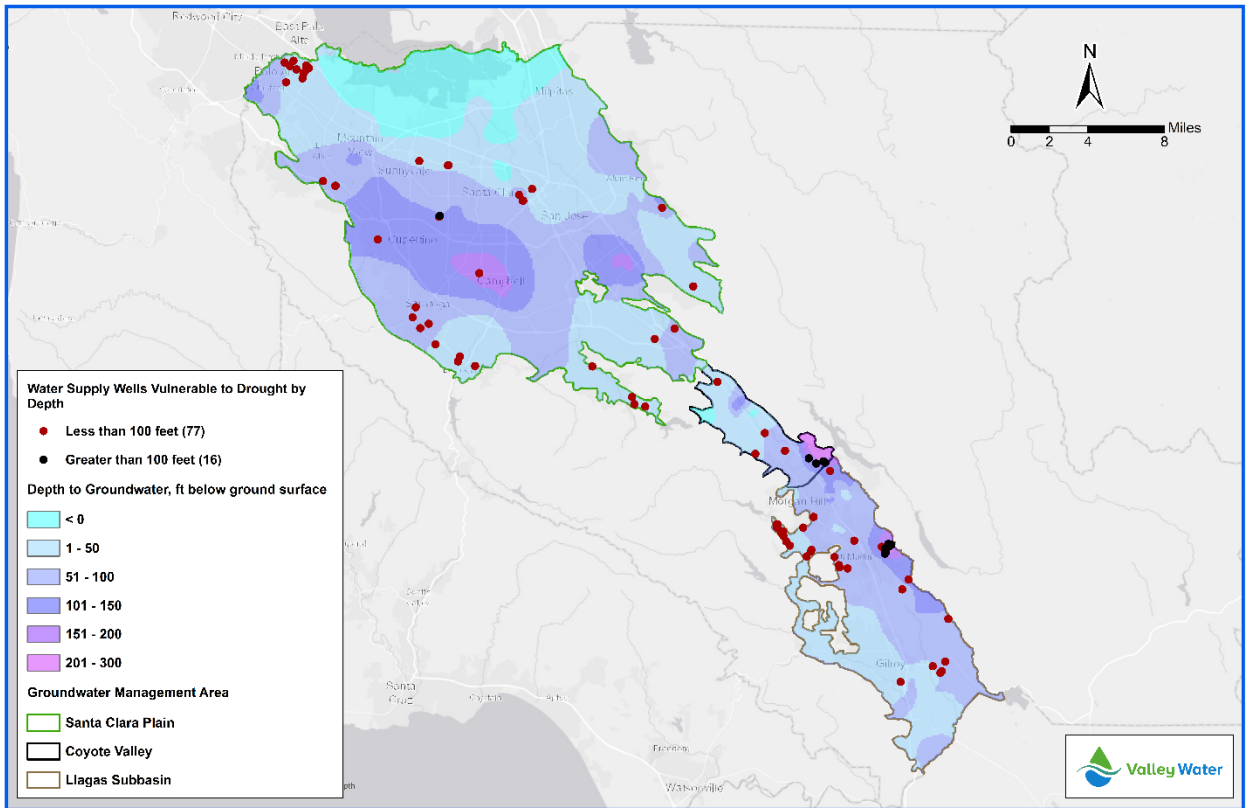
Figure 9. Depth Distribution of Relatively Vulnerable Water Supply Wells to Drought and Interpolated Depth to Water During 2021-2022 Drought Peak.



3.2. Distribution of Water Supply Well Depth Relative to Maximum Depth to Water

This section further evaluates the number of water supply wells in each groundwater management area that were determined to be at risk of going dry during the 2020–2022 drought. Rather than relying on relative ranking, this evaluation is based on the statistical distribution of the calculated "height of groundwater" for each well, defined as the vertical difference between the interpolated water level surface and the bottom of each well during the 2021–2022 drought peak. A negative value indicates that the bottom of the well is above the interpolated groundwater surface and is therefore vulnerable to going dry, whereas a positive value indicates the well bottom is deeper the interpolated surface and is less likely to go dry. This analysis was applied to all the supply wells in the groundwater management areas with well-depth information (Table 4). The results are shown in Figure 10 as both a statistical distribution and boxplot for each of the three groundwater management areas.

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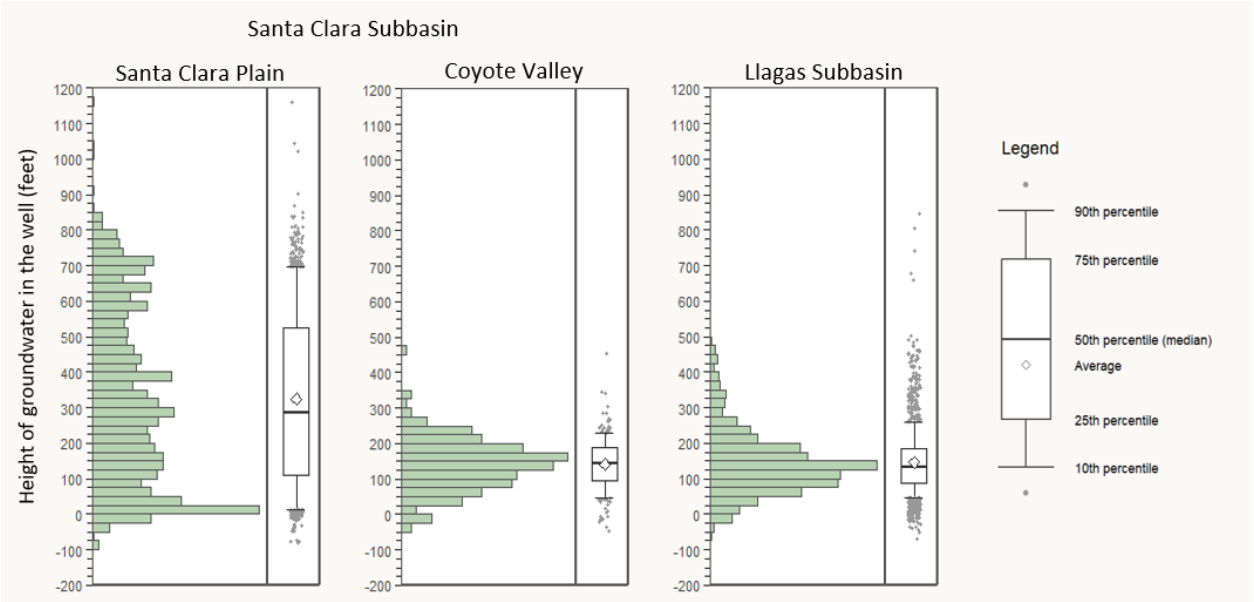
Figure 10. Statistical Distribution of Remaining Height of Groundwater in Supply Wells during the 2021–2022 Drought Peak by Groundwater Management Area.



Note – Height of groundwater is calculated for supply wells with total well depth information available as the difference between the completed well depth and the interpolated groundwater surface from 2021–2022.

Figure 10 supports the prior conclusion that most water supply wells likely had a substantial height of groundwater above the completed well depth and were not vulnerable to going dry during the 2020–2022 drought. The positive height of groundwater in the Santa Clara Plain wells ranged from less than 1 to 1,161 feet, which is consistent with the deeper principal aquifer system and confined conditions in that groundwater management area. The height of groundwater in supply wells in the Coyote Valley and Llagas Subbasin were comparatively smaller, ranging from 7 to 453 feet and from less than 1 to 845 feet, respectively. As illustrated in Figure 10, the 10th percentile values for the Santa Clara Plain (14 feet), Coyote Valley (45.1 feet), and the Llagas Subbasin (47.9 feet) were above zero. Therefore, at least 90% of wells in each groundwater management area had a positive height of groundwater and were not likely vulnerable to drought.

The estimated height of groundwater remaining in domestic and agricultural wells during the 2021–2022 drought peak is shown in Figure 11. Nearly all domestic and agricultural wells had a substantial height of groundwater above the completed well depth during the 2020–2022 drought (Figure 11).

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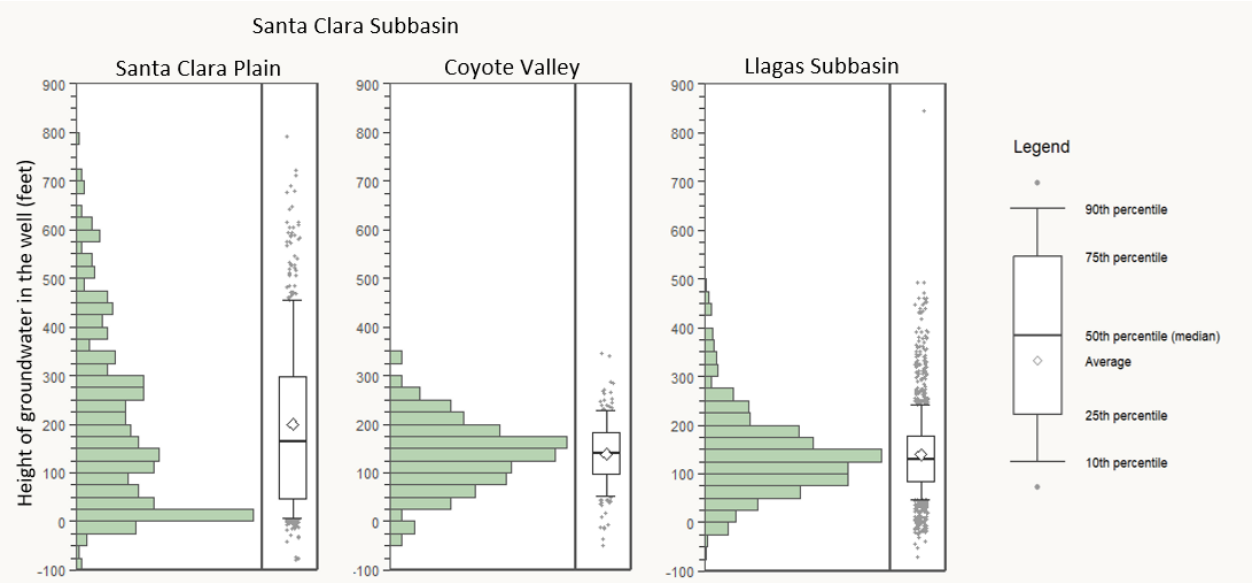
Figure 11. Statistical Distribution of Remaining Height of Groundwater in Domestic and Agricultural Wells during the 2021–2022 Drought Peak by Groundwater Management Area.



Note – Height of groundwater is calculated for supply wells with total well depth information available as the difference between the completed well depth and the interpolated groundwater surface from 2021–2022.

The distributions in Figures 10 and 11 indicate that the Santa Clara Plain may have had a relatively greater number of supply wells with interpolated water levels closer to 0 feet (i.e., potential dry well conditions) as compared to the Coyote Valley and Llagas Subbasin. This difference is likely attributed to the fact that many domestic wells in the Santa Clara Plain are located in the foothills on the western edge of the management area where there is a relatively large depth to water (Figure 5). In comparison, many of the domestic and agricultural wells in the Coyote Valley and Llagas Subbasins are in the valley floor where water levels are closer to land surface and groundwater storage is relatively greater. The results presented in Figure 11 support the finding that the majority of domestic and agricultural wells were not likely vulnerable to going dry during the 2021–2022 drought peak.

4. Summary and Conclusions

This memo documents the number of dry domestic wells that were reported by well owners during recent drought. During the 2020–2022 drought, nine wells within Santa Clara County were reported dry, including only 0.07% (4 of 6,130) of the total active and standby water supply wells in the Santa Clara and Llagas subbasins. Of the nine wells, all were domestic wells. Nearly all dry wells were located either outside of the subbasin boundaries or near the margin of the subbasins, where groundwater storage is relatively low compared to the interior of the subbasin. One of the eight dry wells is within the Llagas Subbasin confined area and likely attributed to site-specific well construction factors because all upgradient and downgradient adjacent wells were not reported as dry. The dry condition observed at this well may be related to relatively shallow pump or well screen installation. Additionally, one well did not have coordinate information, so it is unclear whether it is inside or outside the groundwater subbasins. The relatively small percentage of reported dry supply wells and their locations indicates that Valley Water's management practices are maintaining sustainable groundwater conditions, even during drought.

Although not reported dry by well owners, other domestic and agricultural wells may have been vulnerable to going dry during the 2020–2022 drought. To evaluate basin wide vulnerability, Valley

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Water compared an interpolated surface of the maximum depth to water during the peak of the drought in 2021–2022 with available well depth and location information. This analysis identified an additional 93 (out of 2,763 evaluated) supply wells that may have been vulnerable, including 44 (47.3%) supply wells in the Santa Clara Plain, 8 (8.6%) wells in the Coyote Valley, and 41 (44.1%) wells in the Llagas Subbasin. Similar to the actual reported dry domestic wells, these potentially vulnerable wells are also primarily located along the margin of the subbasins (Figure 8). Of the 93 vulnerable wells, a majority (82.8%, 77) were shallow wells with completed depths less than 100 feet (Figure 9). The statistical distributions and number of shallow wells indicates that the Santa Clara Plain may have had a relatively larger percentage of supply wells at risk of going dry compared to the Coyote Valley or the Llagas Subbasin. Despite this trend, the results of the analysis indicate that more than 90% of the wells evaluated in each management area were still unlikely to go dry under the 2021–2022 peak drought conditions.

In comparison to the 2012–2016 drought period, groundwater levels during the 2020–2022 drought remained higher across much of the Santa Clara and Llagas subbasins (Figures 5 and 6). This difference can be attributed to many factors, including the availability of recharge water during drought conditions, the severity of the drought, as well as Valley Water's ongoing groundwater management practices and expanded managed recharge operations. During the 2012–2016 drought, calendar years 2014 and 2015 were among the most severe, and managed recharge volumes were approximately half of those observed during the 2020–2022 drought period. However, the percentage and general distribution of reported dry and vulnerable water supply wells were found to be consistent between the 2020–2022 and 2012–2016 drought periods. This finding indicates that some areas, especially along the subbasin margins in shallow water supply wells, may remain vulnerable to drought despite improved groundwater conditions and management.

While informative in terms of potential risks to water supply wells during drought, the analyses described in this memo includes significant inherent uncertainty due to limitations of regional interpolation methods and limited data points. In particular, Valley Water has limited water level data near the basin margins, where wells are most likely at risk of going dry. Information on completed well depths is also only available for fewer than 41% of supply wells, so simplifying assumptions were also made in this analysis. Interestingly, the wells reported as dry during the 2020–2022 drought were not identified as being vulnerable in this analysis, highlighting the challenge of using simplified approaches and interpolation over large regions. This analysis helps Valley Water to evaluate potential areas and wells at risk but likely overestimates the number of vulnerable supply wells due to inherent uncertainty associated with the methods. Valley Water will explore alternative analytical approaches to better understand potential supply well impacts from drought.

The findings from this memo will be incorporated into the 2026 GWMP update as part of Valley Water's groundwater level monitoring program gap analysis. Several of the areas with either reported or estimated dry domestic and agricultural wells, especially along the western areas of the Santa Clara Plain, coincide with identified gaps in the groundwater level monitoring program. Filling these gaps will improve Valley Water's understanding of groundwater conditions and vulnerability of water supply wells to drought. Additionally, the data and findings from this memo will be included in Valley Water's adaptive groundwater management strategy, which includes learning and adapting to new data sets with the goal of maintaining continued sustainable groundwater conditions in the Santa Clara and Llagas subbasins.

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Appendix E – Board Resolution No. 18-04

Board Resolution 18-04 Memorializing the Process to Regulate Groundwater Extraction Under the Sustainable Groundwater Management Act, if Needed

File No.: 18-0023

Agenda Date: 2/27/2018
Item No.: 5.1.

BOARD AGENDA MEMORANDUM

SUBJECT:
Resolution Memorializing the Process to Regulate Groundwater Extraction under the Sustainable Groundwater Management Act, if Needed.

RECOMMENDATION:
Adopt the Resolution MEMORIALIZING THE PROCESS TO REGULATE GROUNDWATER EXTRACTION UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT, IF NEEDED.

SUMMARY:
The Santa Clara Valley Water District (District) has sustainably managed the Santa Clara and Llagas subbasins for many decades under the authority of the District Act. The Sustainable Groundwater Management Act (SGMA), enacted by the state in 2014, requires local agencies to develop and implement plans to sustainably manage groundwater and provides them with various, related authorities.

The proposed resolution (Attachment 1) and the accompanying presentation (Attachment 2) lay out a proposed process for the District, in coordination with stakeholders, to address worsening basin conditions through a process that may rely on SGMA authorities to regulate groundwater extraction.

BACKGROUND:
To comply with SGMA planning requirements, the District developed the 2016 Groundwater Management Plan for the Santa Clara and Llagas Subbasins (GWMP) as a prescribed alternative to a Groundwater Sustainability Plan. The GWMP describes the subbasins, as well as groundwater management goals, strategies, programs, and numeric outcome measures. It also recognizes new SGMA authorities, like the ability to regulate groundwater extraction and collect different fees, as potential tools to support continued sustainability. On November 22, 2016, the District Board of Directors (Board) adopted the GWMP following a public hearing. Several related comment letters expressed concerns with water rights and the potential regulation of pumping. The Board referred stakeholder engagement in evaluating new SGMA authorities to the Water Conservation and Demand Management Committee (Committee).

The Committee met nine times between December 2016 and December 2017 to evaluate new SGMA authorities in coordination with water retailers and other interested stakeholders. Through this open forum and with retailer and stakeholder participation, the Committee developed a process (an

implementation framework) for groundwater extraction regulation, which is included in the attached resolution (Attachment 1).

As noted in Attachment 1, the existing groundwater management framework is expected to support continued, sustainable groundwater conditions. Pumping regulation may never be needed. The attached process describes the fundamental approach to respond to worsening basin conditions, including the steps that would be taken prior to implementing SGMA authorities to regulate extraction. The focus is on providing certainty as to the process, while avoiding prescriptive requirements that may not be appropriate or effective.

The District's GWMP is currently being evaluated by the California Department of Water Resources to determine whether it meets SGMA planning requirements. If it is determined to be an acceptable alternative to a Groundwater Sustainability Plan, the District will need to update the GWMP every five years, with the next update scheduled for 2021. To ensure the process developed by the Committee is adequately documented prior to this update, staff recommends that the Board adopt the resolution Memorializing the Process to Regulate Groundwater Extraction under the Sustainable Groundwater Management Act, if Needed (Attachment 1).

FINANCIAL IMPACT:
There is no financial impact associated with this item.

CEQA:
The recommended action does not constitute a project under CEQA because it does not have a potential for resulting in direct or reasonably foreseeable indirect physical change in the environment.

ATTACHMENTS:
Attachment 1: Resolution
Attachment 2: PowerPoint

UNCLASSIFIED MANAGER:
Garth Hall, 408-630-2750

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BOARD OF DIRECTORS
SANTA CLARA VALLEY WATER DISTRICT

RESOLUTION NO. 18- 04

RESOLUTION MEMORIALIZING THE PROCESS TO REGULATE GROUNDWATER EXTRACTION UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT, IF NEEDED

WHEREAS, the Santa Clara Valley Water District Act (California Water Code Appendix, Chapter 60) provides the District with broad groundwater management authority, including the authority to protect, spread, store, retain, and cause water to percolate in the soil within Santa Clara County; and

WHEREAS, on September 16, 2014, the Sustainable Groundwater Management Act (SGMA) was signed into law and adopted into the California Water Code, commencing with Section 10720; and

WHEREAS, Water Code Section 10720.1 states that, in enacting SGMA, the intent of the legislature is to provide for the sustainable management of groundwater basins, to enhance local management of groundwater consistent with rights to use or store groundwater, to establish minimum standards for sustainable groundwater management, to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater, and to achieve other listed intents; and

WHEREAS, on May 24, 2016, the District Board of Directors adopted Resolution 16-51 on the Decision to Become the Groundwater Sustainability Agency (GSA) for the Santa Clara and Llagas Subbasins; and

WHEREAS, on June 13, 2017, the District Board of Directors adopted Resolution 17-38 on the Decision to Become the GSA for the Portions of the Hollister and San Juan Bautista Subbasins Located Within Santa Clara County; and

WHEREAS, Water Code Section 10733.6(b)(1) identifies a plan developed pursuant to Part 2.75 (commencing with Section 10750) or other law authorizing groundwater management as an acceptable alternative to a Groundwater Sustainability Plan; and

WHEREAS, the 2016 Groundwater Management Plan (GWMP) describes the District's comprehensive framework to ensure continued, sustainable groundwater conditions in the Santa Clara and Llagas Subbasins; and

WHEREAS, on November 22, 2016, the District Board of Directors adopted the GWMP through Resolution 16-78; and

WHEREAS, the District submitted the GWMP to the California Department of Water Resources as an alternative pursuant to SGMA; and

WHEREAS, the GWMP acknowledges new authorities granted by SGMA, including the potential to regulate groundwater extraction, control well spacing or operation, and collect different types of fees, within the constraints identified in SGMA; and

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WHEREAS, the existing groundwater management framework, which includes coordination with water retailers and other stakeholders, is expected to support continued, sustainable groundwater conditions; and

WHEREAS, the District Board of Directors directed the Water Conservation and Demand Management Committee (Committee) to engage stakeholders in evaluating the new SGMA authorities as potential tools that may be needed to ensure continued sustainability; and

WHEREAS, the Committee engaged water retailers and other interested stakeholders during nine publicly-noticed meetings between December 2016 and December 2017; and

WHEREAS, the Committee considered stakeholder input in developing the Process to Regulate Groundwater Extraction under the Sustainable Groundwater Management Act, if Needed, attached hereto as Exhibit A; and

WHEREAS, the Process to Regulate Groundwater Extraction under the Sustainable Groundwater Management Act, if Needed, describes the approach to respond to worsening basin conditions, including the steps that would be taken prior to implementing SGMA authorities to regulate extraction.

NOW, THEREFORE BE IT RESOLVED that the Board of Directors of the Santa Clara Valley Water District:

1. Hereby adopts the Process to Regulate Groundwater Extraction under the Sustainable Groundwater Management Act, if Needed; and

2. All the recitals in this Resolution are true and correct and the District so finds, determines, and represents.

PASSED AND ADOPTED by the Board of Directors of the Santa Clara Valley Water District by the following vote on February 27, 2018:

AYES: Directors N. Hsueh, T. Estremera, B. Keegan, G, Kremen, L. LeZotte, J. Varela, R. Santos

NOES: Directors None

ABSENT: Directors None

ABSTAIN: Directors None

SANTA CLARA VALLEY WATER DISTRICT

By: Richard P. Santos
RICHARD P. SANTOS
Chair/Board of Directors

ATTEST: MICHELE L. KING, CMC

Michele L. King
Clerk/Board of Directors

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EXHIBIT A
COVERSHEET

PROCESS TO REGULATE GROUNDWATER EXTRACTION UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT, IF NEEDED

No. of Pages:	6
Exhibit Attachment:	Attachment 1: Process to Regulate Groundwater Extraction under the Sustainable Groundwater Management Act, if Needed

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PROCESS TO REGULATE GROUNDWATER EXTRACTION UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT, IF NEEDED

INTRODUCTION

The Santa Clara Valley Water District (District) has sustainably managed the Santa Clara and Llagas Subbasins for many decades under the authority of the District Act. In 2014, the Sustainable Groundwater Management Act (SGMA) was enacted as California's first comprehensive, statewide regulatory program for groundwater. SGMA provides Groundwater Sustainability Agencies (GSAs), like the District, with various authorities to manage groundwater.

SGMA authorities include the ability to regulate pumping and assess different types of groundwater charges. These authorities have been discussed in various meetings of the District Board of Directors (Board) Water Conservation and Demand Management Committee (Committee) in an open forum and with input from interested stakeholders.

The existing, proven groundwater management approach, which includes strong partnerships with large groundwater pumpers, is expected to result in continued, sustainable groundwater management in the future and is the preferred approach to addressing future challenges. This document describes the approach to implementing SGMA authorities to regulate groundwater extraction, should such regulation become needed in the future.

BACKGROUND

SGMA established new requirements for GSAs, including the development of Groundwater Sustainability Plans (GSPs) or prescribed Alternatives. In 2016, the District prepared the 2016 Groundwater Management Plan (GWMP), which was approved by the Board following a public hearing on November 22, 2016. The District submitted the GWMP as an alternative to a GSP to the California Department of Water Resources (DWR) in December 2016. The GWMP acknowledged the new SGMA authorities and committed the District to work collaboratively with groundwater pumpers and other stakeholders to further evaluate the authorities. The Board referred related stakeholder engagement to the Committee.

The Committee, stakeholders, and the Board have indicated interest in the use of a fixed charge as a component of the groundwater production charge, and the District will further explore this concept. Committee items on the potential regulation of pumping and related discussion with stakeholders have led to the development of this process, or implementation framework.

SGMA provides GSAs with various authorities to ensure groundwater management and use do not cause undesirable results, which are defined as one of more of the following per Water Code §10721:

1. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon.
2. Significant and unreasonable reduction of groundwater storage.
3. Significant and unreasonable seawater intrusion.
4. Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

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5. Significant and unreasonable land subsidence that substantially interferes with surface land uses.
6. Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Per Water Code §10726.4(a), in regulating groundwater extraction, SGMA allows a GSA to:

1. impose spacing requirements on new wells and impose reasonable operating regulations on existing wells to minimize well interference by restricting or suspending well production;
2. control groundwater extractions by regulating, limiting, or suspending extractions, new well construction, well enlargement, or abandoned well reactivation, or by establishing allocations;
3. authorize temporary and permanent transfers of extraction allocations; and
4. establish rules to allow unused extraction allocations to be carried over from one year to another and voluntarily transferred.

However, SGMA acknowledges limitations on the regulation of pumping. Local agencies are not authorized to make a binding determination of the water rights of any person or entity (Water Code §§ 10720.5(b) and 10726.8(b)). Also, any actions to control extractions generally must be consistent with the city or county general plans (Water Code §§ 10726.4, 10726.8(f), and 10726.9).

Research into the use of similar authorities in other jurisdictions indicates that few agencies regulate pumping, and highlights related challenges. Where used, pumping regulation has been in response to significant basin problems like long-term overdraft or salt water intrusion, most commonly through the well permitting process. These agencies have struggled with well owner concerns, enforcement, and legal challenges. Others have decided against regulation due to concerns with water rights and the potential to trigger adjudication, focusing instead on financial incentives or groundwater replenishment.

GUIDING PRINCIPLES

The District's existing groundwater management framework has maintained sustainable groundwater conditions over many decades. This proven framework, including strong collaboration with stakeholders, is the preferred approach to address future challenges. However, SGMA authorities are available as potential tools if the need arises. The process to regulate groundwater extraction, if needed, is based on these guiding District principles:

1. The District will sustainably manage local groundwater as part of our mission to provide Silicon Valley safe, clean water for a healthy life, environment, and economy.
2. The District will continue to conduct comprehensive water supply planning and invest in diverse water supplies to ensure reliability and avoid chronic shortages.
3. Through ongoing water supply operations, the District will continue to optimize the use of available water supplies while protecting groundwater storage.
4. Transparency in fulfilling the District mission remains an important driver and the District will continue to encourage input and participation from all interested stakeholders.

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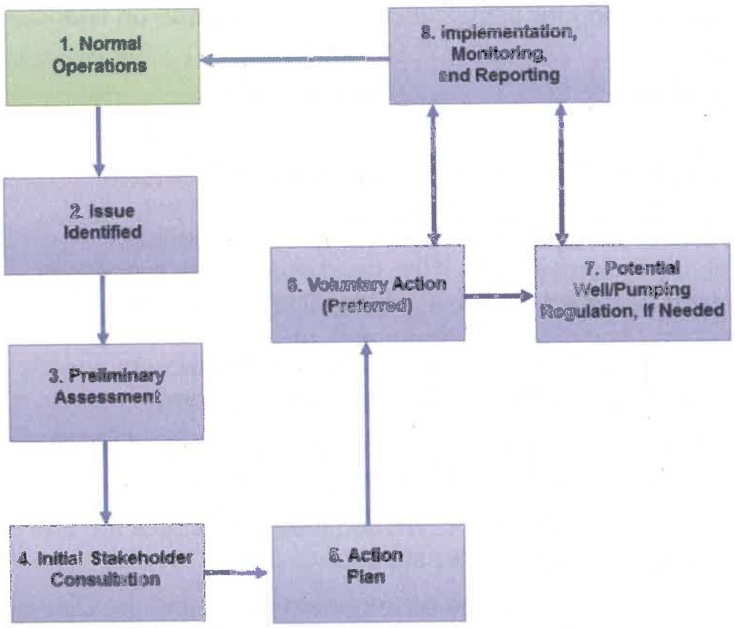
5. The District will continue to seek solutions that effectively and efficiently address identified water supply issues as they arise.
6. The District will work with water retailers and other stakeholders to continue to improve our understanding and management of groundwater basins and conditions, including sustainable use.
7. Strong partnerships with water retailers and other large groundwater users have been effective in avoiding undesirable results and are critical to future sustainability.
8. Collaboration with groundwater users and interested stakeholders will continue to be the preferred approach to address observed or projected undesirable results, and District regulation of pumping will only be considered if there is no viable alternative.
9. Given the uncertainty in the timing, location, and severity of potential future undesirable results, the process to regulate groundwater extraction avoids prescriptive triggers and requirements; instead, it clarifies how to respond to worsening conditions. This will maintain maximum flexibility to respond to changing conditions and avoid unnecessary or ineffective actions.

PROCESS TO REGULATE GROUNDWATER EXTRACTION, IF NEEDED

The existing groundwater management framework is expected to support continued, sustainable conditions, and pumping regulation may never be needed. The process described below and summarized in Figure 1 describes the fundamental approach to respond to worsening basin conditions, including the steps that would be taken prior to implementing SGMA authorities to regulate extraction. As mentioned above, the focus is on providing certainty as to the process, while avoiding prescriptive requirements that may not be appropriate. This process allows for moving between the various steps linearly or using feedback loops.

Figure 1. Process to Regulate Groundwater Extraction, if Needed



1. Evaluate groundwater conditions, coordinate with water retailers, and receive stakeholder input
2. Identify new regulatory requirement or observed/projected undesirable result
3. Prepare memo describing issue and potential mitigation (e.g., additional supplies and/or demand reduction)
4. Meet with affected pumpers and/or other stakeholders to discuss issue and preliminary assessment
5. Develop draft action plan with stakeholder input, including desired outcome, roles, actions, schedule, monitoring, and reporting
6. Agree to implement voluntary actions to address issue (preferred)
7. Develop Board ordinance to implement SGMA authorities through Committee and public process
8. Implement voluntary and/or mandatory actions described in action plan and/or ordinance, monitor and report out to Board and stakeholders

Note: Depending on the severity and challenges of the issue identified, the implementation of any step could be elevated to the Committee and/or Board.

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Step 1: Normal Operations

Comprehensive planning through the District's Urban Water Management Plan and Water Supply Master Plan ensures long-term water supply reliability (including groundwater) in accordance with level of service targets. Development of these plans includes coordination with water retailers and land use agencies, and the District encourages input from interested stakeholders. This regular, proactive planning avoids chronic shortages.

Operations planning helps meet near-term demands, protect groundwater reserves, and ensure adequate carryover supplies. Through this ongoing process, District staff develops operations scenarios based on the availability of imported and local supplies, including their optimal use and distribution. Water supply conditions are discussed with water retailers at least quarterly through Water Retailers Committee and Groundwater Subcommittee meetings, but operational or water supply issues often require more frequent communication and coordination. Current water supply information is also communicated to interested stakeholders through monthly Water Tracker updates and Groundwater Condition Reports, and the availability of groundwater level and other water supply data at www.valleywater.org.

Receiving input on groundwater management issues from interested stakeholders is an important part of normal operations. Accordingly, the District maintains a list of interested parties that includes water retailers, land use agencies, regulatory agencies, adjacent GSAs, non-governmental organizations, community groups, agricultural users, and private individuals, among others. The District notifies these interested parties of upcoming groundwater-related Board and Committee items and relevant information such as completion of the Annual Groundwater Report. The District also provides updates to all well owners on general topics of interest through regular mailings.

The District will continue to explore ways to ensure interested stakeholders are aware of groundwater management activities and opportunities for engagement, including participation in public meetings, Board correspondence, Access Valley Water inquiries, or direct communication with staff. The District evaluates all input and inquiries to determine if additional action is needed to protect groundwater resources.

Step 2: Issue Identified

Through the ongoing assessment of groundwater conditions described above, an issue requiring further action may be identified. This could be a new regulatory requirement, such as the need to limit water supply well construction near an indirect potable reuse project, or an observed or projected undesirable result as defined in Water Code §10721 and listed above. The GWMP identifies numeric outcome measures related to groundwater conditions that indicate the need for action; observed or projected failure to meet one of the outcome measures could lead to an undesirable result. There may also be unanticipated situations that do not trigger failure of an outcome measure, but require action to protect groundwater resources. If an issue requiring further action is identified, the District will inform potentially affected stakeholders and immediately move to the next step in the process.

Step 3: Preliminary Assessment

Once an issue requiring further action has been identified, District staff will use available information to evaluate the issue and summarize the findings in a technical memorandum. The memorandum will describe the nature and extent of impacts, suspected cause(s), potential

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effects of taking no action, and potential mitigation options. These options may include District action, such as more focused monitoring, recommended shortage response per the Water Shortage Contingency Plan, efforts to acquire supplemental supplies, or incentives for the use of treated water. Mitigation options could also include the reduction of pumping within the impacted area.

Step 4: Initial Stakeholder Consultation

After completing the prior step, District staff will meet with selected stakeholders within the affected area to discuss groundwater conditions and the preliminary assessment. This initial consultation targets those likely needing to take action to help address the issue. In most cases this is expected to include higher-volume pumpers like water retailers that more strongly influence basin conditions. Depending on the nature of the issue, other affected stakeholders may also be consulted during this stage.

The District will work with stakeholders to evaluate additional data and update the preliminary assessment as necessary. The District and affected stakeholders will identify the schedule to develop an action plan as well as related roles and responsibilities.

It should be noted that this consultation may result in quick consensus on the need to act and what needs to be done. This occurred in 2014 when the District met with staff from the San Jose Water Company and the City of Santa Clara to discuss concerns with groundwater levels approaching subsidence thresholds within their service areas. In that case, a single meeting led to quick agreement on the need to voluntarily adjust pumping. This process is intended to support similar decisive action at the staff level when possible.

Step 5: Action Plan

Based on the timeline and roles identified during the initial stakeholder consultation, District staff and/or affected stakeholders will develop a draft action plan to address the issue. This action plan will identify the desired outcome and clearly define actions needed, roles and responsibilities, implementation schedule, and how the issue will be monitored. The action plan will also explain the mechanism and timing of status reports to the Board and interested stakeholders. If the proposed mitigation involves pumping curtailment, staff recommends that affected pumpers have the first opportunity to propose an action plan to meet the desired outcome.

In the 2014 example mentioned above, District and retailer staff collaborated quickly and effectively to reduce localized pumping and minimize the risk of subsidence. Similarly, it is expected that some issues can be effectively resolved at the staff level, with ongoing reporting to the Board Committee and stakeholders as appropriate. However, effective action plans for more severe, challenging, or widespread issues may need to be elevated to allow for more extensive input. In these cases, it may be appropriate to develop the action plan in consultation with all potentially interested stakeholders through the open forum of the Board Committee.

Step 6: Voluntary Action (Preferred Option)

Staff, affected pumpers, and other interested stakeholders will work to finalize an action plan that is likely to be effective in addressing the identified issue. This is the preferred option, which avoids resorting to the need to potentially regulate pumping under SGMA authorities. If

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agreement for voluntary action is reached, all entities responsible for implementing the action plan will need to concur with the action plan prior to implementation.

Step 7: Potential Well/Pumping Regulation, if Needed

The District and affected pumpers may not reach consensus on a voluntary action plan or implementation of a voluntary action plan may not prove effective in addressing the identified issue. In those cases, the District may need to consider implementing any of the authorities provided by SGMA under the following process:

1. Discuss groundwater conditions and the potential need for pumping regulation at the Water Conservation and Demand Management Committee and receive input from the Committee and stakeholders;
2. Implement action recommended by the Committee, which may include, but not be limited to, discussion with the full Board, further District action, or additional attempts to reach consensus on voluntary action;
3. Prepare a draft ordinance to regulate groundwater extraction in accordance with Water Code §10726.4 or otherwise exercise authorities provided by SGMA; and
4. Conduct a public hearing for Board consideration of the proposed ordinance.

Step 8: Implementation, Monitoring, and Reporting

The District, affected pumpers, and other identified stakeholders will implement the voluntary and/or mandatory actions described in the action plan and/or ordinance. District staff will monitor the status of action commitments, groundwater conditions, and performance in meeting the desired outcome. Related reporting to the Committee and/or Board as well as interested stakeholders will be in accordance with the action plan or ordinance. Based on the monitoring results and progress toward meeting the desired outcome, operations may return to normal or the voluntary/mandatory action may need to be modified. Successful execution of this step will require close tracking/monitoring and good communication.

TIME FRAME FOR IMPLEMENTATION OF THE PROCESS

There are no fixed time frames assigned to each step above due to the wide range of possibilities in terms of potential issues and related action needed, including whether it is voluntary or mandated. Staff anticipates that, for more manageable issues, effective voluntary action could be implemented within six months. More severe or widespread issues may take longer to address, even through voluntary action, as they may require consideration by a city council, board, or regulatory agency, or due to implementation lead time.

It is expected that if pumping regulation became necessary, implementation of the process listed under Step 7 would take several months to provide adequate noticing and opportunity for input. This time frame should be considered to correspond to the most extreme and severe conditions, with more time likely needed to fully engage potentially affected pumpers and interested stakeholders on this complex and controversial issue.

The severity of the issue will correspond to the response, with more resources and urgency allocated to more extreme issues. In any case, the District will work to expedite an effective response to minimize the risks to beneficial users or groundwater resources, and will remain committed to prioritizing voluntary collaboration over regulation whenever possible.

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Process to Regulate Groundwater Extraction under the Sustainable Groundwater Management Act, if Needed

February 27, 2018

Santa Clara Valley Water District

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Groundwater management authority

- Broad District Act authority has supported sustainable groundwater management for many decades
- Sustainable Groundwater Management Act (SGMA) provides additional tools that may be needed in the future
  - Groundwater well/ extraction regulation
  - Different fee types

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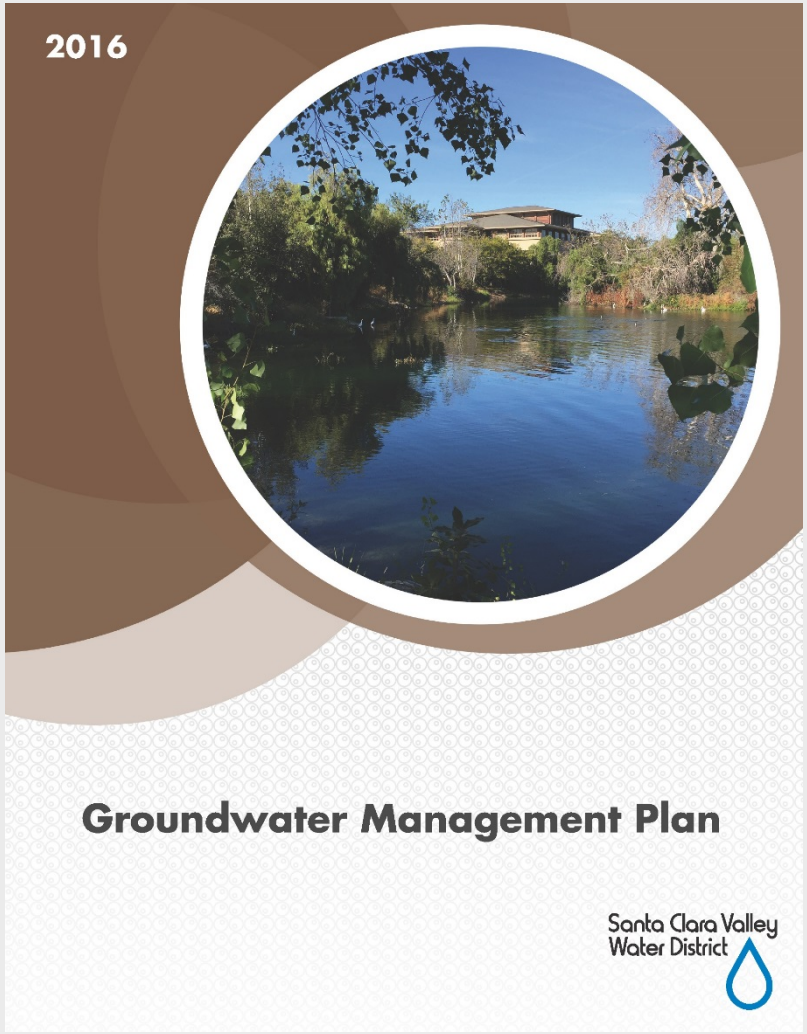
Groundwater Management Plan

- 2016 Groundwater Management Plan developed for SGMA compliance
- Retailer concerns over potential pumping regulation
- Stakeholder engagement referred to Board's Water Conservation and Demand Management Committee (Committee)



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Evaluation of new SGMA authorities

- Nine publicly-noticed Committee meetings to discuss new SGMA authorities
- Committee received input from water retailers and other stakeholders, resulting in
  - Exploration of fixed charges as groundwater production charge component
  - Process to regulate groundwater extraction, if needed

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Goals of process

- Affirm guiding principles supporting continued sustainable conditions
- Clarify process to respond to worsening basin conditions
- Identify steps that would be taken prior to regulating pumping
- Avoid prescriptive requirements that might lead to ineffective or unnecessary action

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Process to Regulate Pumping, if Needed

1. Normal Operations

Evaluate GW conditions, coordinate with retailers, and receive stakeholder input

2. Issue Identified

Identify projected/observed undesirable result or regulatory requirement

3. Preliminary Assessment

Prepare memo describing issue and potential mitigation

4. Initial Stakeholder Consultation

Meet with affected pumpers and/or other stakeholders to discuss preliminary assessment

5. Action Plan

With stakeholder input, identify desired outcome, roles, actions, schedule, monitoring, and reporting

6. Voluntary Action (Preferred)

Agree to implement voluntary actions to address issue

7. Potential Well/Pumping Regulation

Develop Board ordinance to implement SGMA authorities through Committee and public process

8. Implementation, Monitoring, and Reporting

Implement voluntary and/or mandatory actions and report out to Board and stakeholders

Note: Depending on the severity and challenges of the issue identified, the implementation of any step could be elevated to the Committee and/or Board.

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Recommendation

- Adopt the resolution Memorializing the Process to Regulate Groundwater Extraction under the Sustainable Groundwater Management Act, if Needed

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Handout 5.1-A
02/27/18

Michele King

From: Jack Lucas <jlucas1099@aol.com>
Sent: Tuesday, February 27, 2018 12:44 PM
To: Board of Directors
Subject: Groundwater Management Resolution SCVWD Board - February 27, 2018

Director Richard Santos, Chair
Santa Clara Valley Water District Board of Directors

February 27, 2018

Dear Director Richard Santos,

In regards today's Board Agenda resolution regarding process to regulate groundwater extraction in accordance with the Sustainable Groundwater Management Act (SGMA), do believe this is a critical and commendable action for the Board to take at this time.

Would urge Board to extend its conservation resolutions even further to encompass watershed protection for all tributary streams which supply your Santa Clara Valley groundwater basin.

Specially along western foothills of Santa Clara Valley fourteen streams supply high quality water to deep drinking water aquifers across a fold in topography known as the groundwater cascade. This geological percolation arc is rather unique to our valley and requires respect and protection. Equivalent percolation is difficult to duplicate with engineered filtration galleries or injection wells.

Conservation criteria could necessarily reflect California Water Law as to riparian, appropriative and prescriptive rights, stream diversions and well permit applications, but it could detail priorities in beneficial and domestic uses, and differentiate between agricultural and horticultural irrigation.

My personal concern has been use of Adobe, Los Trancos and San Francisquito Creeks for college campus irrigation to detriment of downstream riparian corridors when drought tolerant vegetation would provide natural, attractive and economical options.

District's public education efforts have been good but believe they must go farther and faster, if global warming trends continue to send us such erratic swings in temperature and precipitation.
Please inspire public to appreciate prime resources that valley enjoys and do engage scientists.

Thank you,

Libby Lucas

PS Might suggest it is imperative to educate engineers, upgrading South Bay infrastructure, as to ecology and environmental constraints of percolation streams relative to critical basin aquifer. I worry about High Speed Rail impacts to groundwater cascade if routed through Metcalf Narrows. Cal Trans cementing in of percolation reach of Regnart Creek under #85 is case in point.

REFER TO STAFF
FEB 27 2018

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APPENDIX F

TECHNICAL MEMORANDUM

IDENTIFICATION OF GROUNDWATER DEPENDENT ECOSYSTEMS FOR THE 2026 GROUNDWATER MANAGEMENT PLAN

Prepared by:

Dana Kilsby

Scott Elkins

Chanie Abuye

Under the Direction of:

Jason Gurdak, Ph.D.

Unit Manager

Santa Clara Valley Water District

Groundwater Management Unit

August 2026

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Executive Summary

This technical memorandum updates Valley Water's 2021 Groundwater Management Plan (GWMP) analysis of groundwater dependent ecosystems (GDEs) in the Santa Clara and Llagas subbasins and will be included in the 2026 GWMP. Consistent with the 2021 GWMP analysis that generally followed The Nature Conservancy's GDE guidance, the 2026 analysis used a geographic information system (GIS)-based approach to estimate GDEs by comparing interpolated groundwater conditions with the best available vegetation datasets for California phreatophytes. While the approach is similar to the 2021 analysis, the 2026 analysis updated methods for well selection, groundwater interpolation, and GIS processing. These updated 2026 methods corrected inconsistencies, eliminated double counting of GDE areas, and produced a more consistent estimate of GDE location and total area. The 2026 analysis relied on field observations from the 2021 analysis to verify the GIS-based approach and no new biological field assessments were conducted.

Using the 2026 updated methods, staff reanalyzed the 2010–2019 groundwater level dataset used in the 2021 GWMP to establish a corrected GDE baseline. Staff then applied the same 2026 updated methods to the 2015–2024 groundwater level dataset developed for the 2026 GWMP. The results show that interpolated depth-to-water (DTW) spatial patterns and corresponding GDE categories (Likely, Transition, and Unlikely) were generally similar between the two periods (2010–2019 and 2015–2024). However, the 2015–2024 period had slightly more area classified as Likely GDE, particularly where groundwater remained shallow or DTW decreased. Temporal changes in GDE categories were primarily along stream corridors and managed recharge-influenced areas with relatively greater fluctuations in groundwater levels. Some GDEs categories are along stream corridors that may not naturally be expected to support GDEs. These areas are downstream of Valley Water reservoirs, where releases for managed recharge and decrease the depth to shallow groundwater during much of the growing season.

Overall, the 2026 analysis is a more reliable and hydrologically representative estimate of DTW and GDEs in the Santa Clara and Llagas subbasins. Given these improvements to the 2021 GWMP methods, the 2026 analysis produced GDE maps that are expected to have a relatively high ability to accurately identify GDEs in the Santa Clara and Llagas subbasin. The improved 2021 GDE baseline and its comparison with the 2026 data will support ongoing groundwater level monitoring, adaptive groundwater management under the Sustainable Groundwater Management Act (SGMA), and future GWMP updates.

1. Introduction

As the Groundwater Sustainability Agency (GSA) for the Santa Clara and Llagas subbasins, Valley Water submitted the 2016 Groundwater Management Plan (GWMP) as a SGMA-required Alternative to the Groundwater Sustainability Plan (Alternative Plan) prior to the statutory deadline of January 1, 2017 (Valley Water, 2016). Water Code § 10733.6(b) allows for several types of Alternative Plans, including plans developed pursuant to other laws authorizing groundwater management, such as the Santa Clara Valley Water District Act. On July 17, 2019,

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the Department of Water Resources (DWR) approved Valley Water's Alternative Plan for both the Santa Clara and Llagas subbasins.

In its 2019 approval letter, DWR included a recommended action to provide identification of GDEs. In response, Valley Water conducted a comprehensive analysis for the 2021 GWMP, including a GIS-based approach to identify GDEs with biological field assessments for verification. The findings were documented in a detailed technical memorandum included as Appendix G of the 2021 GWMP. Under SGMA, periodic evaluations of approved plans are required at least every five years. Valley Water submitted the Board-adopted 2021 GWMP to DWR in December 2021 as the first periodic evaluation of the approved Alternative Plan. In June 2024, DWR approved the 2021 GWMP, confirming the Alternative Plan satisfies the objectives of SGMA and complies with related regulations. Although DWR's 2024 approval letter included two minor recommended actions, neither were about GDEs.

As part of the second periodic evaluation of the approved Alternative Plan, this technical memorandum documents Valley Water's efforts to refine the GIS methods, improve the 2021 GDE identification analysis for the 2010–2019 data, and compare it with the 2015–2024 data used in the 2026 GWMP. This memorandum and the 2026 GWMP describe Valley Water's continued efforts to sustainably manage groundwater, which support GDEs as integral components of the broader ecosystem within Santa Clara County.

1.1 SGMA and GDEs

SGMA requires GSAs to identify and consider impacts to GDEs as part of groundwater sustainability. SGMA defines GDEs as "ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (23 CCR § 351(m)). GDEs in California include a wide range of natural communities, including wetlands, rivers, streams, estuaries, seeps and springs, and terrestrial vegetation. GDEs also include deep-rooted plants or plant communities that obtain water from the water table, which are called phreatophytes. Chronic lowering of groundwater levels or depletion of interconnected surface water due to groundwater development or climate change can negatively affect GDEs (Klove et al., 2014). Negative impacts on GDEs are problematic for society because GDEs provide a variety of ecosystem services, including water sources for vegetation, habitat for sensitive animal and plant species, and water quality and quantity benefits to surface water resources (Rohde et al, 2018).

SGMA requires that all GSAs shall broadly consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing Groundwater Sustainability Plans (GSPs) (Water Code § 10723.2). These interests include, but are not limited to, holders of overlying groundwater rights (agricultural users and domestic well owners), municipal well operators, public water systems, local land use planning agencies, environmental uses of groundwater, surface water users, federal government, California Native American tribes, and disadvantaged communities. GDEs are included in these interests because of their environmental use of groundwater and use of surface water if connected with groundwater. More specifically under SGMA, the GSP regulations (23 CCR § 354.16) require a description of

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historical and current groundwater conditions in the basin that includes information related to groundwater elevations, groundwater storage, seawater intrusion, groundwater quality, subsidence, and interconnected surface water, as applicable. The GSP regulations also require an identification of GDEs under these groundwater conditions. In addition, DWR's Best Management Practices, including guidance on Sustainable Management Criteria (DWR, 2017), provide broader context for how GSAs evaluate groundwater conditions within the SGMA framework. GSP regulations (23 CCR § 354.16(g)) require the "identification of GDEs within the basin, utilizing data available from the Department, as specified in § 353.2, or the best available information." § 353.2 describes information provided by the Department, including § 353.2(b) that states "The Department shall provide information, to the extent available, to assist Agencies [GSAs] in the preparation and implementation of Plans, which shall be posted on the Department's website."

DWR has not published guidance documents specifically about GDEs or their identification. However, The Nature Conservancy's (TNC) Groundwater Resources Hub (https://groundwaterresourcehub.org/) has resources to assist GSAs, including guidance documents about GDEs. Specifically, the Groundwater Resources Hub has a guidance document titled "Groundwater dependent ecosystems under the Sustainable Groundwater Management Act – Guidance for preparing Groundwater Sustainability Plans" (Rohde et al., 2018). Although Rohde et al. (2018) is not a DWR-authored guidance document, both DWR and the State Water Resources Control Board were acknowledged for their contribution and review. As described below, this TNC guidance document was generally followed as an approach to identify GDEs in the Santa Clara and Llagas subbasins.

1.2 Conceptual Model of GDEs in the Santa Clara and Llagas Subbasins

The following conceptual model guided the approach to identify GDEs in the Santa Clara and Llagas subbasins and is consistent with Rhode et al. (2018). Prior to human development of the Santa Clara Valley, numerous areas were known to have shallow groundwater near land surface, marsh-like conditions, and well-developed wetland vegetation indicative of GDEs (Grossinger et al., 2006; Beller et al., 2010). Even today, despite significant drainage pattern alterations and agriculture and urban development, shallow groundwater conditions persist in some areas that likely support GDEs. Flows in gaining stream reaches are supported by shallow groundwater discharge (Figure 1A), including the riparian vegetation and associated GDEs. Low-lying areas near sea level along the San Francisco Bay (Bay) are also locations of natural groundwater discharge that may support GDEs. However, most stream reaches in the recharge (unconfined) areas of the Santa Clara and Llagas subbasins are either losing streams that are connected to the water table (Figure 1B) or losing streams that are disconnected from the water table (Figure 1C), and both are important components of Valley Water's managed recharge program. The riparian vegetation along losing or disconnected streams may be indicative of GDEs if the roots are deep enough to reach the water table, as described in more detail below. Since the 1930s, Valley Water's managed recharge activities along losing and disconnected streams, including imported water and reservoir releases, have created

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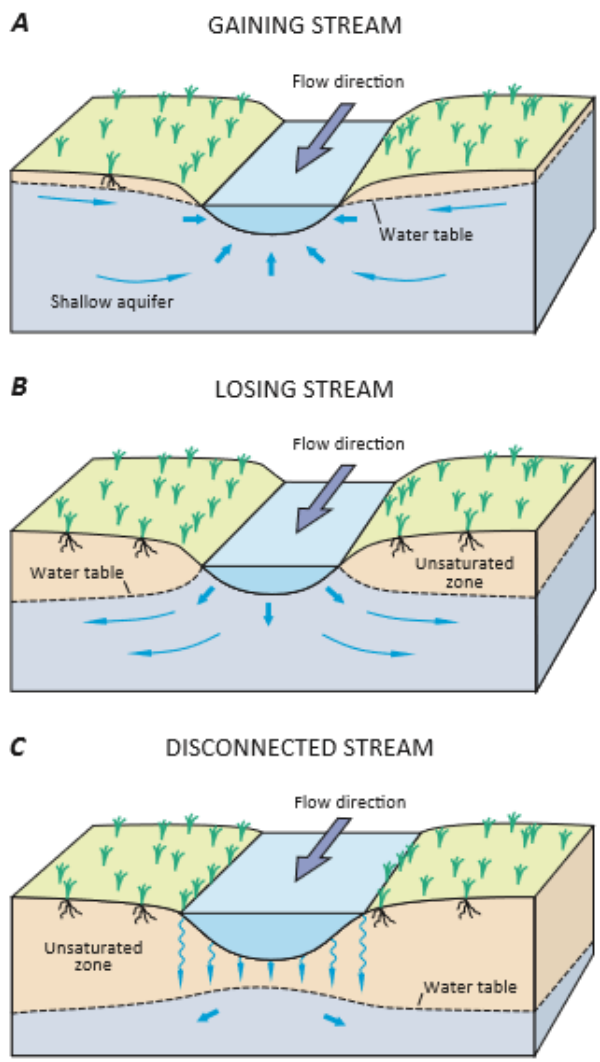
streamflow conditions that now support riparian vegetation where it may not have otherwise occurred without these water management activities.

Figure 1. Groundwater and Surface-Water Interactions – (A) Gaining, (B) Losing, and (C) Disconnected Streams (Modified from Winter et al., 1999).



DWR has published a series of guidance documents addressing interconnected surface water under SGMA, which Valley Water has reviewed in the context of groundwater management in the Santa Clara and Llagas subbasins (DWR, 2024a, 2024b, 2024c). Although these guidance documents focus primarily on estimating depletion of surface waters caused by groundwater pumping, groundwater–surface water interactions in the Santa Clara and Llagas subbasins are largely influenced by long-standing managed recharge operations that supply the predominantly losing or intermittently connected stream conditions in the subbasins (Figure 2). As a result, Valley Water's GDE identification relies heavily on depth-to-water (DTW) conditions

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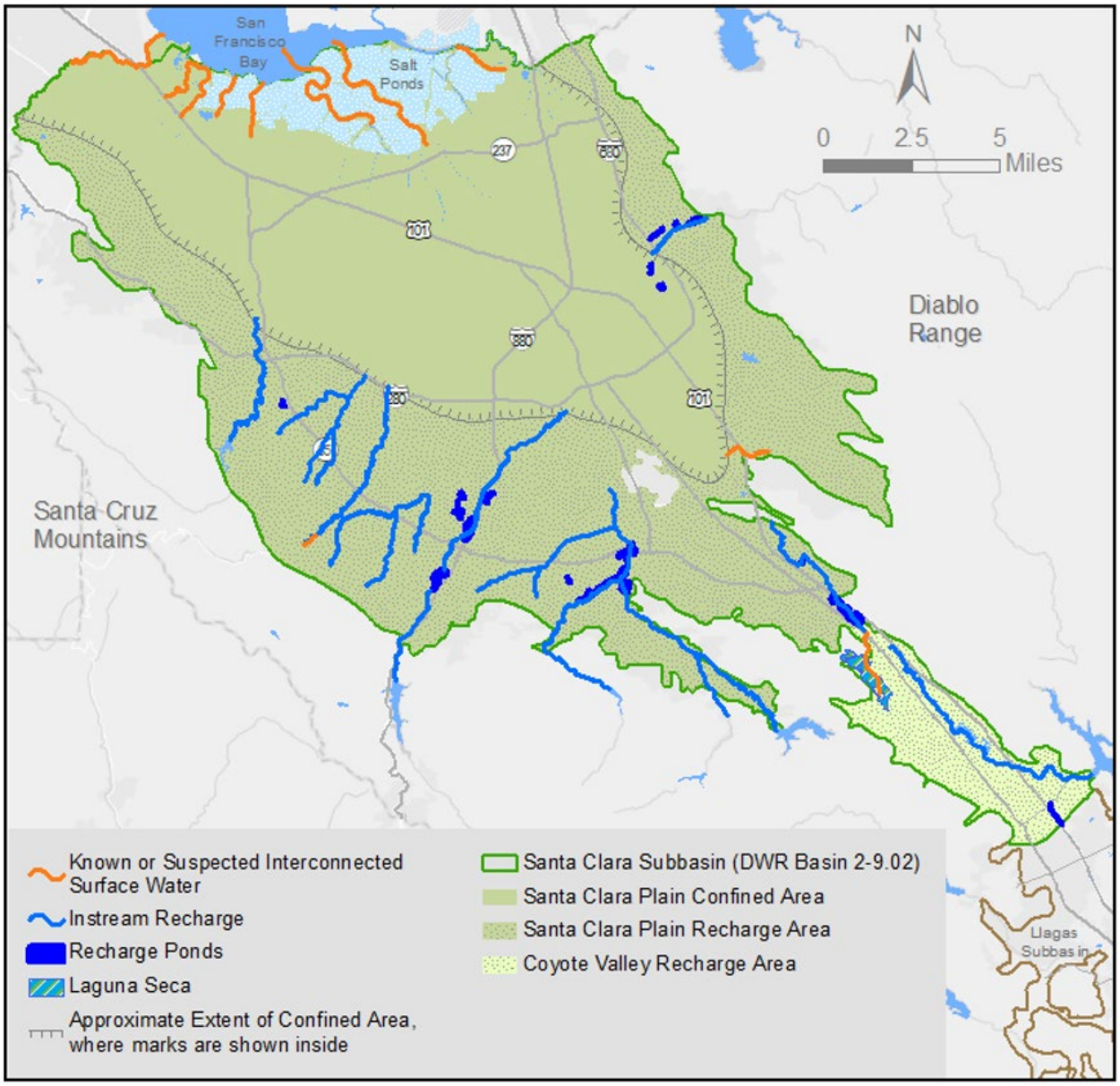
that reflect the cumulative effects of managed and natural recharge, streamflow management, and groundwater pumping, rather than on standalone streamflow depletion metrics.

Figure 2. Known and Suspected Surface-Water/Groundwater Interactions in the Santa Clara Subbasin (modified from Appendix G, Figure 2 in the 2021 GWMP).



2. Summary of Previous Analyses

The following section summarizes prior efforts to identify GDEs within the Santa Clara and Llagas subbasins, providing context for the updated 2026 methods and analyses presented in this technical memorandum.

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2.1 2016 GWMP

The 2016 GWMP did not specifically identify GDEs but summarized several other datasets that could be used to help identify them, including groundwater-surface water interactions, historical ecology maps, and depth to shallow groundwater. The 2016 GWMP summarized the subbasin areas with known and suspected groundwater-surface water interactions (Figure 2), in addition to instream groundwater recharge locations.

Figure 2 was based on previous studies by Valley Water and the U.S. Geological Survey, which identified the area as favorable for groundwater recharge due to its hydrogeologic setting, geology, and permeability of the alluvial sediments. This finding was further supported by a 2018 differential gauging study conducted by Valley Water. The differential gauging study compared stream discharge at upstream and downstream gauges during the low-flow period from April to July 2018. Downstream gauges with an increase in stream discharge compared to the upstream gauge indicate the reach is in a groundwater discharge area and a gaining stream. Conversely, a decrease in stream discharge at a downstream gauge relative to the upstream gauge indicates that the reach is in a groundwater recharge area and a losing stream.

Figure 2 was used to help identify sections of gaining streams and suspected locations of groundwater discharge. Most of the gaining sections overlie the confined part of the aquifer, with a few notable exceptions (Figure 2). The 2016 GWMP notes that Valley Water's managed recharge program relies on losing stream reaches, where the groundwater and surface water are disconnected. However, the 2016 GWMP further states that some areas are not necessarily net losing reaches and some reaches may be intermittently gaining during the wet season.

In addition to the known and suspected locations of gaining streams (Figure 2), the 2016 GWMP presented a map of historical ecology that was developed by the San Francisco Estuary Institute (SFEI) (Figures 3 and 4). Figures 3 and 4 show the locations of historical (circa early 1800s) wetlands and other ecological communities that may be associated with shallow groundwater and characterized as historical locations of GDEs. The 2016 GWMP acknowledges that these maps do not represent current or recent conditions throughout much of the Santa Clara Valley.

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Figure 3. Santa Clara Subbasin Historical Ecology from the early 1800s (from Figure 2-15 in the 2016 GWMP).

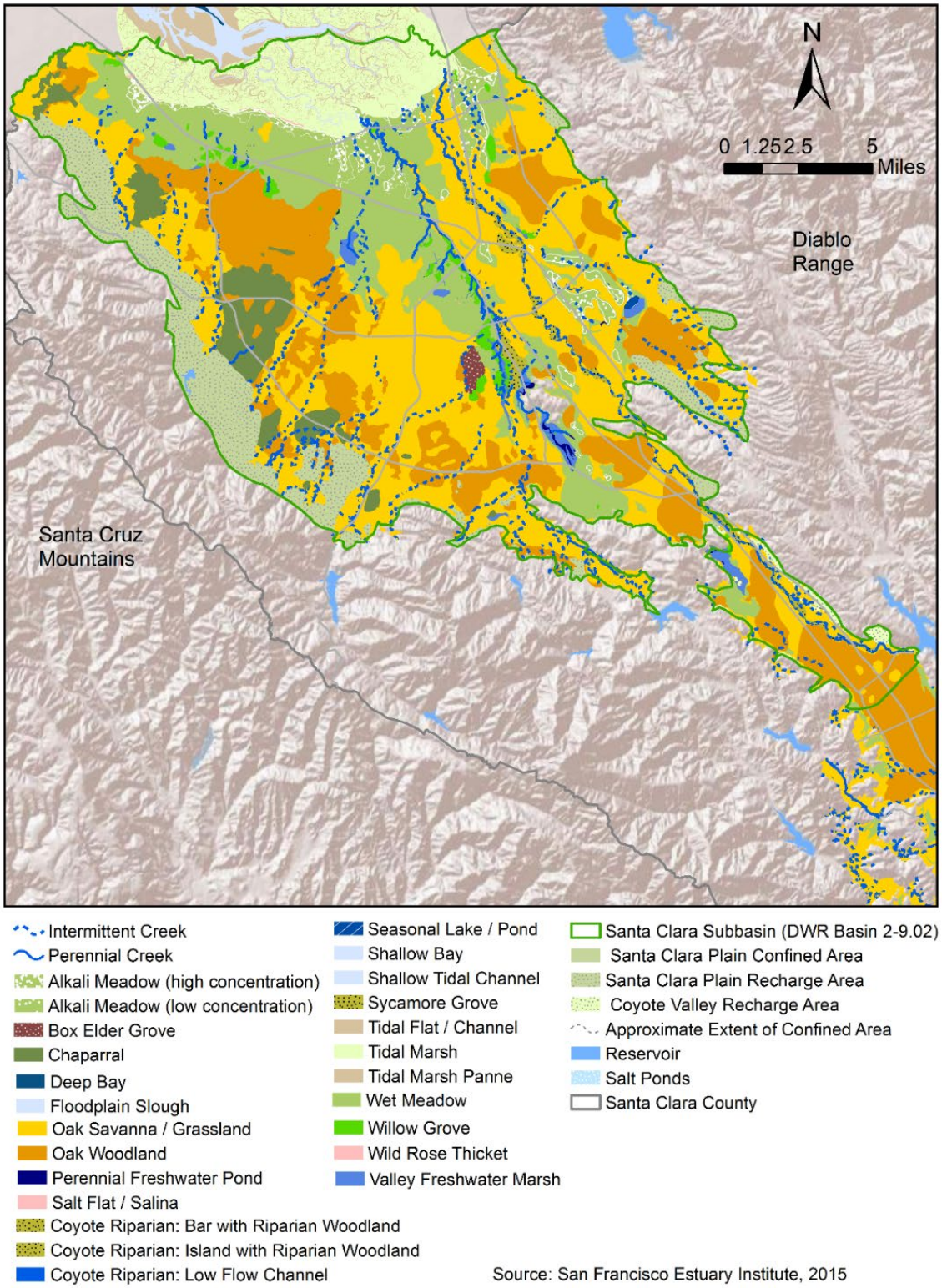

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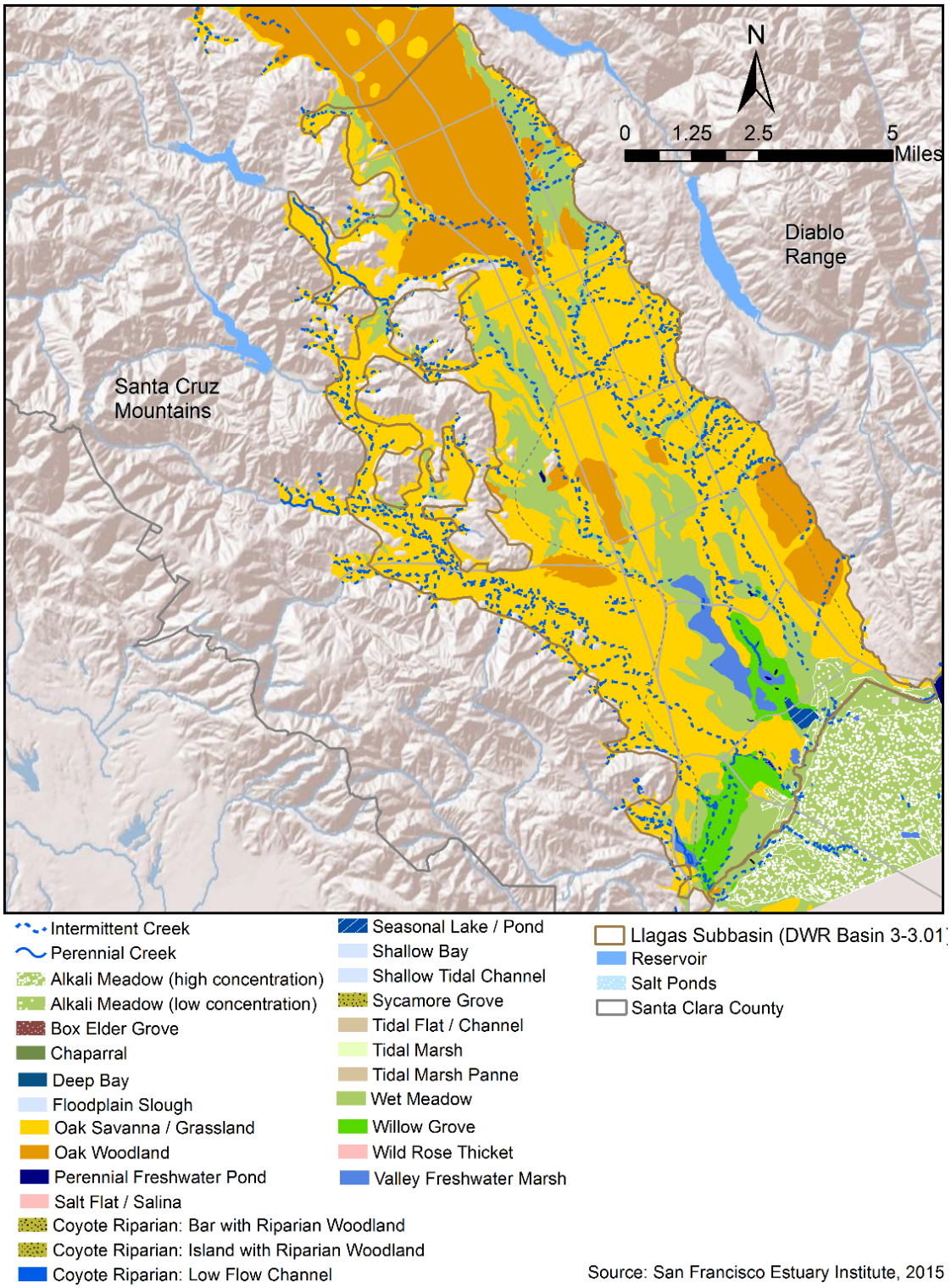
Figure 4. Llagas Subbasin Historical Ecology from the early 1800s (from Figure 3-11 in the 2016 GWMP).



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The 2016 GWMP also presented maps of depth to first groundwater in the Santa Clara and Llagas subbasins. While these maps show general patterns of depth to first water, the resolution is too coarse to help identify smaller scale GDEs, such as along stream reaches.

2.2 2021 GWMP

The 2021 GWMP included the first comprehensive GIS-based identification and evaluation of GDEs within the Santa Clara and Llagas subbasins. By generally following the TNC guidance described in Rohde et al. (2018), Valley Water developed a local-scale GIS mapping approach integrating vegetation, land-cover, and hydrogeologic datasets to delineate and field verify GDE areas where ecological communities are likely supported by shallow groundwater.

Two GIS vegetation data sources were used for the 2021 GDE analysis: (i) the Santa Clara Valley Habitat Agency [Habitat Agency] 'Land Cover' map, and (ii) the 'AIS Stream Vegetation' layer that is a Valley Water GIS dataset. The Habitat Agency (2020) 'Land Cover' dataset[1] is particularly useful for GDE mapping because it describes the various vegetation types and other land cover categories in most of Santa Clara County, although it does not provide complete coverage of the Santa Clara Subbasin. The 'AIS Stream Vegetation' GIS dataset was created by AIS Consulting (2010) and is a map of vegetation types along streams in Santa Clara County up to 1,000 feet in elevation, which provides good coverage for the Santa Clara and Llagas subbasins. Since both the land cover and AIS stream vegetation datasets had desirable attributes for mapping GDEs, Valley Water merged the maps together into a single map that retains all the features from each individual map (Figure 5). The vegetation types in the merged map (Figure 5) were assigned as *California phreatophytes*, based on their dominant species, guidance from TNC (Rohde et al.,2018), and regional patterns, as listed in full in Table 1 and Table 2.

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[1] Available at Santa Clara County Planning Office GIS Data page (Accessed August 23, 2021): https://gisdata-sccplanning.hub.arcgis.com/

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Figure 5. Example of the Merged Map of the AIS Stream Vegetation and Habitat Agency Land Cover (from Appendix G, Figure 7 in the 2021 GWMP).

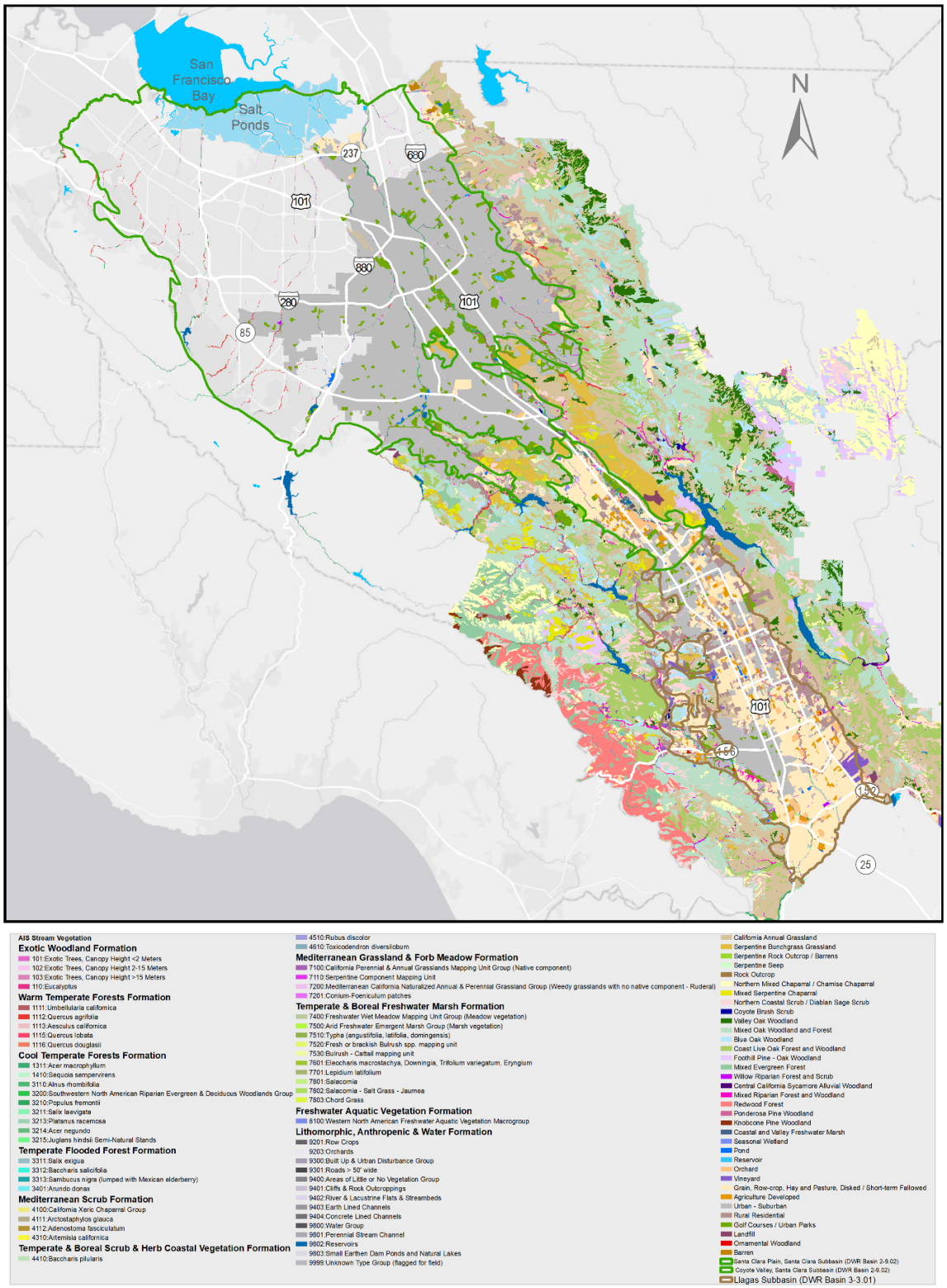

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Table 1. California Phreatophyte Status of Valley Habitat Agency Land Cover Types (from Appendix G, Table 1 in the 2021 GWMP).

Valley Habitat Plan Land Cover Type	California Phreatophyte (Yes or No)	Phreatophyte Status Notes[1]
Agriculture Developed	No	
Barren	No	
California Annual Grassland	No	
Coast Live Oak Forest and Woodland	Depends on location	Coast live oak is listed as a phreatophyte in California by TNC, and Steinberg (2002) says "Several deep main roots may tap groundwater if present within approximately 36 feet (11 m) of the soil surface. Coast live oak develops extensive horizontal root branches and surface-feeding roots." This species often grows near creeks, where it is likely groundwater dependent, but farther away it is not. It is not listed as a wetland indicator species by USACE (2018). As such, stands of this species alone should not be used to define GDEs unless in known shallow aquifer, near a waterway, and/or growing with other phreatophytes.
Coyote Brush Scrub	No	Listed by TNC[2]; not on wetland indicator list for CA; While Kidder PhD says "Dry season xylem waters for adult B. pilularis plotted near groundwater, indicating these plants likely relied on deeper water sources" many of our regional occurrences of this species do not indicate shallow groundwater and would likely be tolerant of groundwater table declines.
Golf Courses / Urban Parks	No	
Knobcone Pine Woodland	No	Not listed by TNC; no wetland indicator status; regionally this species is indicative of dry, well drained, upland areas.
Mixed Evergreen Forest	No	Depends on location. Mostly found on foothills or mountainous areas but in close proximity to creeks and streams. Also associated with Bay Laurel (FAC)[1], Big leaf maples (FAC), coast live oak.
Mixed Riparian Forest and Woodland	Yes	
Northern Coastal Scrub / Diablan Sage Scrub	No	Member species not listed by TNC; no wetland indicator status; regionally this vegetation type is indicative of very dry, well drained, upland conditions.
Orchard	No	
Pond	Depends on location	Characteristic species of pond margins and shallow ponds depend on surface water and shallow groundwater.
Redwood Forest	Depends on location	Sequoia is listed by TNC as CA phreatophyte and, where native, redwoods often grow near stream. Regionally, however, coast redwood is not considered native and is typically a planted/ornamental species that likely depends on irrigation.
Rock Outcrop	No	
Seasonal Wetland	Yes	Characteristic species use surface water and shallow groundwater.
Serpentine Rock Outcrop / Barrens	No	
Urban – Suburban	No	
Vineyard	No	
Northern Mixed Chaparral / Chamise Chaparral	No	Member species not listed by TNC; no wetland indicator status; regionally this vegetation type is indicative of very dry, well drained, upland conditions.
Mixed Serpentine Chaparral	No	Member species not listed by TNC; no wetland indicator status; regionally this vegetation type is indicative of very dry, well drained, upland conditions.
Mixed Oak Woodland and Forest	Depends on location	Coast live oak is listed as a CA phreatophyte by TNC, and US Forest Service says "Several deep main roots may tap groundwater if present within approximately 36 feet (11 m) of the soil surface. Coast live oak develops extensive horizontal root branches and surface-feeding roots." This species often grows near creeks, where it is likely groundwater dependent, but farther away it is not. It is not listed as a wetland indicator species by USACE. As such, stands of this species alone should not be used to define GDEs unless in known shallow aquifer, near a waterway, and/or growing with other phreatophytes.

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Valley Habitat Plan Land Cover Type	California Phreatophyte (Yes or No)	Phreatophyte Status Notes[1]
Blue Oak Woodland	No	
Foothill Pine - Oak Woodland	No	
Valley Oak Woodland	Yes	Listed by TNC; wetland indicator status = FACU[1]; uses deep groundwater.
Ponderosa Pine Woodland	No	
Willow Riparian Forest and Scrub	Yes	
Coastal and Valley Freshwater Marsh	Yes	
Reservoir	No	
Grain, Row-crop, Hay and Pasture, Disked / Short-term Fallowed	No	
Ornamental Woodland	No	
Serpentine Seep	Yes	
Serpentine Bunchgrass Grassland	No	
Rural Residential	No	
Landfill	No	
Central California Sycamore Alluvial Woodland	Yes	

Notes:

1) United States Army Corps of Engineers (USACE) wetland plant indicator status categories used in some descriptions are as follows:
OBL = Obligate Wetland Plants: Plants that occur almost always (estimated probability >99%) in wetlands in natural conditions but may also occur rarely in (estimated probability <1%) in non-wetlands.
FACW = Facultative Wetlands Plants: Plants that occur usually (estimated probability >67% to 99%) in wetlands, but also occur (estimated probability 1% to 33%) in non-wetlands
FAC = Facultative Plants: Plants with similar likelihood (estimated probability of 33% to 67%) of occurring in wetlands and non-wetlands
FACU = Facultative Upland Plants: Plants that occur sometimes in wetlands (estimated probability 33% to 67%) but occur more often (estimated probability >67% to 99%) in non-wetlands
UPL = Obligate Upland Plants: Plants that occur rarely in wetlands (estimated probability <1%), but occur almost always (estimated probability >99) in non-wetlands under natural conditions

2) TNC = The Nature Conservancy

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Table 2. AIS Vegetation Types (from Appendix G, Table 2 in the 2021 GWMP).

AIS Vegetation Type	California Phreatophyte (Yes or No)	Phreatophyte Status Notes
Bigleaf maple	Depends on location	Not listed by TNC[2]; wetland indicator status = FAC[1]; often associated with creeks/creek canyons, but often on extremely steep, well-drained slopes.
Box elder	Yes	
Chamise	No	Listed by TNC; no wetland indicator status; regionally this species is indicative of very dry, well drained, upland conditions.
California buckeye	No	Not listed by TNC; not on wetland indicator list; anecdotal evidence that they tap into groundwater when available.
Agriculture/Farmland	No	
White alder	Yes	Uses surface water and shallow groundwater.
Bigberry manzanita	No	
Bare/Barren	No	
Freshwater wetland	Yes	Uses surface water and shallow groundwater.
Giant reed	Yes	
Coyote brush	No	Listed by TNC; not on wetland indicator list for CA; While Kidder PhD says "Dry season xylem waters for adult B. pilularis plotted near groundwater, indicating these plants likely relied on deeper water sources" many of our regional occurrences of this species do not indicate shallow groundwater and would likely be tolerant of groundwater table declines.
Mule fat	Yes	Uses surface water and shallow groundwater.
Developed	No	
Native grassland	No	
Chaparral	No	
Cord grass	Yes	Uses surface water and shallow groundwater.
Bare/Barren	No	
Developed	No	
Poison hemlock-Fennel	Yes	Conium indicator status = FACW[1]
Earth Lined Channels	Depends on location	
Freshwater wetland	Yes	Uses surface water and shallow groundwater.
Eucalyptus	Yes	Listed by TNC; only E. camaldulensis listed as FAC; regional distribution suggests groundwater dependent.
Exotic Trees, Canopy Height <2 Meters	Depends on location	
Exotic Trees, Canopy Height >15 Meters	Depends on location	
Exotic Trees, Canopy Height 2-15 Meters	Depends on location	
Bulrush	Yes	Uses surface water and shallow groundwater.
Seasonal wetland	Yes	Uses surface water and shallow groundwater.
Northern Californian walnut	Yes	Not listed by TNC; wetland indicator status = FAC; typically associated with creeks
Perennial pepperweed	Yes	
Grassland	No	
Agriculture/Farmland	No	
Open water	Depends on location	

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California sycamore	Yes	
Fremont cottonwood	Yes	
Coast live oak	Depends on location	Listed by TNC; not on wetland indicator list for CA; US Forest Service says "Several deep main roots may tap groundwater if present within approximately 36 feet (11 m) of the soil surface. Coast live oak develops extensive horizontal root branches and surface-feeding roots." This species often grows near creeks, where it is likely groundwater dependent, but farther away it is not. Stands of this species alone should not be used to define GDEs unless in known shallow aquifer, near a waterway, and/or growing with other phreatophytes.
Blue oak	No	Not listed by TNC; no wetland indicator status; CNPS says "*Quercus douglasii* is a deciduous, drought and flood-tolerant tree that grows to 20 m in height. Its extensive roots can grow to 25 m and tap groundwater reserves." Regionally, however, this species is indicative of very dry, well drained, upland areas.
Valley oak	Yes	Listed by TNC; wetland indicator status = FACU[1]; uses deep groundwater.
Open water	No	
Developed	No	
Agriculture/Farmland	No	
Himalayan blackberry	Yes	Not listed by TNC; wetland indicator status = FAC; typically associated with wet areas.
Salt marsh	Yes	Uses surface water and shallow groundwater.
Salt marsh	Yes	Uses surface water and shallow groundwater.
Narrowleaf willow	Yes	Uses surface water and shallow groundwater.
Red willow	Yes	
Blue elderberry	Yes	Listed by TNC; wetland indicator status = FACU
Bulrush	Yes	Uses surface water and shallow groundwater.
Serpentine Component Mapping Unit	Depends on location	
Small Earthen Dam Ponds and Natural Lakes	Depends on location	
Mixed riparian forest	Yes	
Poison oak	No	Not listed by TNC; wetland indicator status = FACU; this species is found in many vegetation communities; position rather than presence may be more important for status
Cattail	Yes	Uses surface water and shallow groundwater.
California bay	Depends on location	Not listed by TNC; wetland indicator status = FAC; often associated with creeks/creek canyons, but often on extremely steep, well-drained slopes.
Water Group	No	
Freshwater wetland	Yes	Uses surface water and shallow groundwater.

Notes:

1) United States Army Corps of Engineers (USACE) wetland plant indicator status categories used in some descriptions are as follows:

OBL = Obligate Wetland Plants: Plants that occur almost always (estimated probability >99%) in wetlands in natural conditions but may also occur rarely in (estimated probability <1%) in non-wetlands.
FACW = Facultative Wetlands Plants: Plants that occur usually (estimated probability >67% to 99%) in wetlands, but also occur (estimated probability 1% to 33%) in non-wetlands
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UPL = Obligate Upland Plants: Plants that occur rarely in wetlands (estimated probability <1%), but occur almost always (estimated probability >99) in non-wetlands under natural conditions

2) TNC = The Nature Conservancy

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To better understand groundwater conditions and help identify GDE locations, Valley Water developed a detailed DTW map using groundwater elevation data from 571 wells and high-resolution LIDAR[2] land-surface data. Median groundwater levels from 2010–2019 were interpolated to create a continuous groundwater elevation model, which was subtracted from land-surface elevation to calculate DTW across both subbasins. The GDE maps were produced by overlaying the California phreatophytes (Figure 5, Tables 1 and 2) with the DTW map, and GDEs were classified in GIS following TNC's GDE indicators (Likely, Transition, and Unlikely GDEs) (Table 3).

The TNC GDE indicators are based primarily on the rooting depths of California phreatophytes (Rohde et al., 2018; Figure 6). Areas with DTW less than 30 feet are considered likely groundwater dependent, so vegetation polygons within this range are designated as Likely GDEs. Although this range includes a variety of species, the intent is to broadly capture communities that may rely on groundwater. TNC also defines a transition zone between 30- and 50-feet DTW, reflecting a conservative approach since some phreatophytes—such as California live oak—can root to depths up to 48 feet below land surface (Figure 6). Because most California phreatophyte species have shallower rooting depths, vegetation in areas where DTW exceeds 50 feet is considered unlikely to be groundwater dependent. To be consistent with the TNC GDE guidance, in areas where DTW is unknown, Valley Water used a fourth GDE indicator called 'Possible GDE' to reflect California phreatophytes located in areas of unknown DTW (Figures 7 and 8).

Table 3. Preliminary Indicators of Groundwater Dependent Ecosystems (GDEs) Based on Depth-to-Water (DTW) (from Appendix G, Table 3 in the 2021 GWMP; modified from Rohde et al., 2018).

Depth to water range	GDE Indicator
Less than 30 feet	*Likely a GDE*
30 – 50 feet	*Transition*
Greater than 50 feet	*Unlikely a GDE*
Unknown	*Possible GDE*

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[2] LIDAR (Light Detection and Ranging) is a remote sensing technology that uses laser light to measure distances, creating precise and high-resolution models of land surface.

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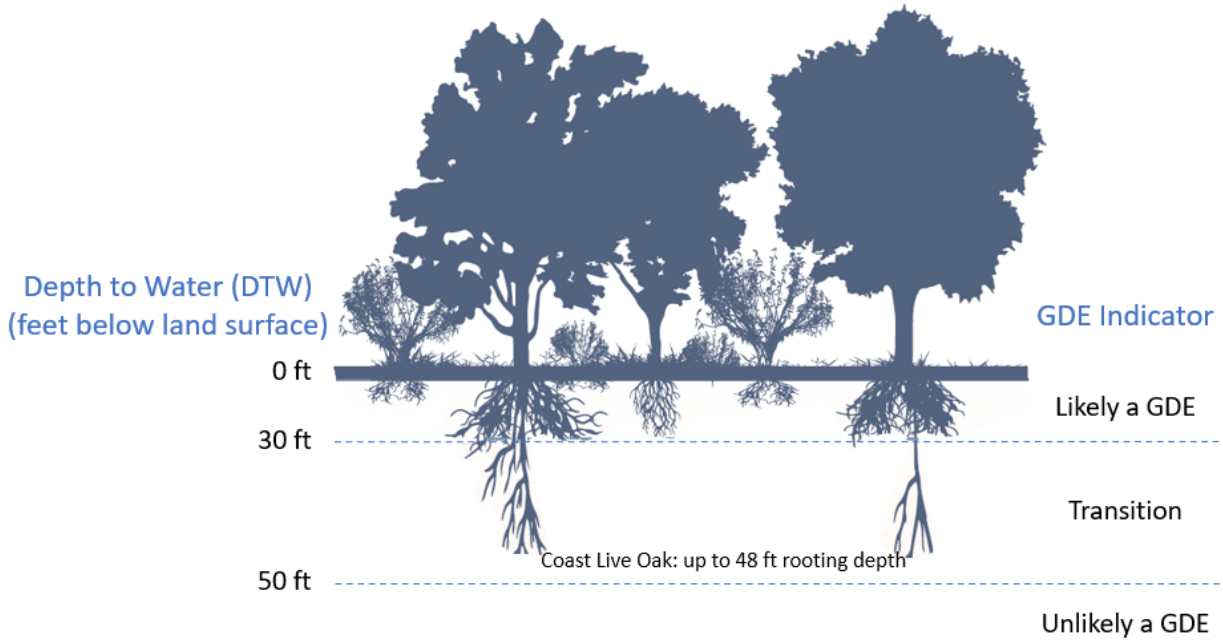
Figure 6. Indicator of GDEs Based on DTW and Rooting Depth of California Phreatophytes (from Appendix G, Figure 12 in the 2021 GWMP; modified from Rohde et al., 2018).



To verify the accuracy of the 2021 GDE maps (Figures 7 and 8), biological field assessments of GDEs were conducted at 34 targeted sites across both subbasins. At each site, Valley Water biologists applied the Vegetation Rapid Assessment Protocol, which is a method supported by the California Department of Fish and Wildlife and California Native Plant Society. Based on the results of the Vegetation Rapid Assessment, the biologists further categorized each site following the TNC recommendations as likely or not likely a GDE. Over 90% of the field results agreed with the GDE maps, which indicate a very high agreement between the GDE maps and independent site data. Based on these results, the 2021 GDE maps have a relatively high ability to accurately identify GDEs in the Santa Clara and Llagas subbasins.

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Figure 7. Field Verified GDEs and DTW in the Santa Clara Subbasin (from Appendix G, Figure 28 in the 2021 GWMP).

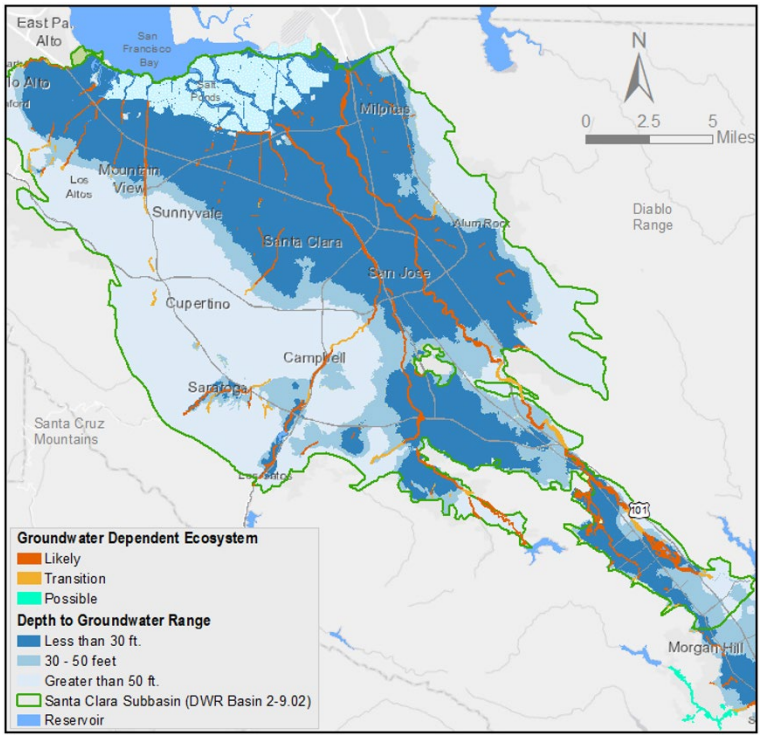

Figure 8. Field Verified GDEs and DTW in the Llagas Subbasin (from Appendix G, Figure 29 in the 2021 GWMP).

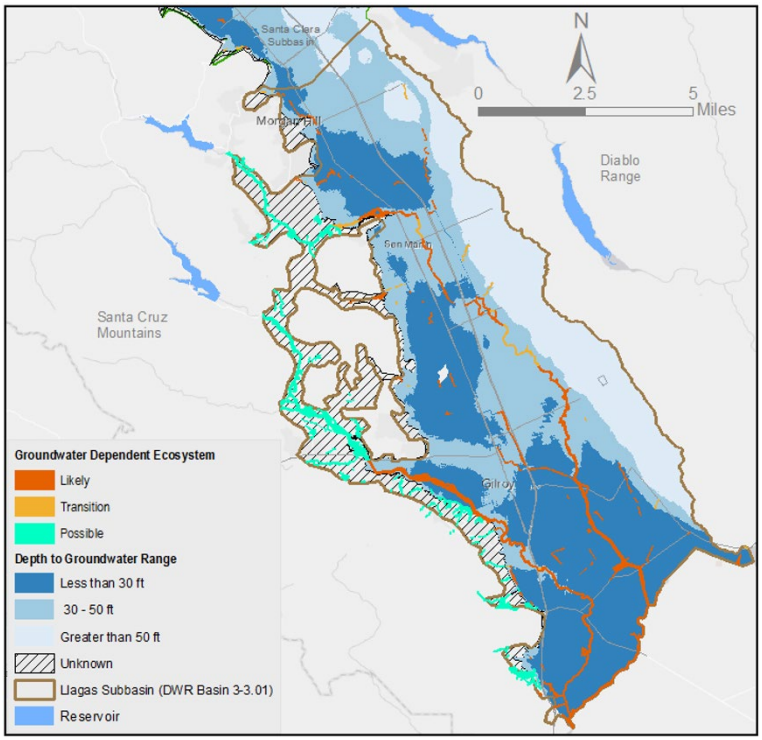

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Table 4 summarizes the GDE category and acres based on the field-verified GDE maps (Figures 7 and 8), totaling 7,264 acres of GDEs across the subbasins. Areas classified as Possible GDEs—primarily along the western edge of the Llagas Subbasin—were identified in the 2021 GWMP as gaps in the groundwater monitoring network.

Table 4. GDE Acres in each Groundwater Management Area (from Table 7 in the 2021 GWMP).

GDE category	Santa Clara Subbasin		Llagas Subbasin (acres)	Total (acres)
	Santa Clara Plain (acres)	Coyote Valley (acres)		
Likely GDE	2,682	744	1,600	5,026
Transition	621	170	107	898
Possible GDE	0	0	1,340	1,340
Total GDE (acres)	3,303	914	3,047	7,264

2.3 Limitations of the 2021 Analysis

During preparation of the 2026 GWMP, Valley Water identified several issues related to GIS data and methods, including well selection procedures, in the 2021 GDE analysis, which in some cases limited the accuracy and consistency of the GDE analysis. These issues with the 2021 analysis included:

- Overlapping California phreatophyte GIS polygons in some areas resulted in inadvertent double counting of GDE acres.
- Use of inverse distance weighting (IDW) interpolation, which produced less hydrologically realistic groundwater elevations compared to spline interpolation.
- Use of wells deeper than 150 feet that represent confined aquifer conditions rather than shallow groundwater levels.
- Use of wells with artesian conditions that also represent confined aquifer conditions rather than shallow groundwater.
- Use of single water-level measurements from borehole logs that do not reflect long-term groundwater conditions.

Based on this list, staff updated methods for the 2026 GDE analysis. As detailed below in section 3, the updated 2026 methods correct these issues by providing improved criteria for well selection, refined interpolation methods, and GIS procedures for identifying and eliminating polygon overlap.

Using the updated 2026 methods, Valley Water reprocessed the 2010–2019 dataset from the 2021 GWMP to establish a corrected, internally consistent GDE baseline to evaluate future analyses. Section 4 of this memo compares the original 2021 and corrected baseline GDE maps. The updated 2026 methods were then applied to the 2015–2024 groundwater dataset from the 2026 GWMP, enabling a reliable comparison of GDE conditions over time and ensuring that differences in identified GDEs reflect changes in groundwater conditions rather than data processing and GIS mapping methods.

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3. 2026 Approach and Methods

Like the 2021 GWMP analysis that generally followed TNC GDE guidance (Rohde et al., 2018), the 2026 analysis used a GIS-based approach to estimate GDEs by comparing 2015–2024 interpolated DTW and California phreatophytes (Figure 5, Tables 1 and 2). Since the general approach is similar and the 2021 analysis had over 90% agreement between the GIS-based GDE maps and independent biological field assessments of GDEs, no new field assessments were conducted for the 2026 analysis. Section 2.2 of this memo outlines the GIS data for the 2021 and 2026 analysis.

To address the limitations identified in the 2021 GWMP analysis and to ensure a consistent GIS-based approach moving forward, Valley Water updated the methods to identify and classify potential GDEs that meet DTW criteria (Table 3, Figure 6). The 2026 approach now uses a standardized framework for data selection, preprocessing, and spatial analysis, with improvements in (1) data refinement, well selection, and control points, (2) interpolation methods to generate groundwater elevations, and (3) overlapping California phreatophyte polygons. The following subsections describe each of these three updates.

3.1 Data Refinement, Well Selection, and Control Points

Many of the water levels used to interpolate DTW in the 2021 GWMP were single point measurements recorded during well construction, often from wells installed in the late 1990s. These decades-old, single-point water level measurements do not accurately represent current DTW conditions and are therefore not used with the update 2026 methods. Similarly, wells deeper than 150 feet or wells with artesian conditions are not used with the updated 2026 methods because their measured water levels represent the potentiometric surface of the confined aquifer, rather than the water table of the shallow aquifer. This issue is of particular concern in the confined and semiconfined areas of the northern Santa Clara Subbasin and southern Llagas Subbasin. Finally, for sites containing multiple monitoring wells, the updated 2026 methods incorporate data from each individual well rather than aggregating the well points into a single median value.

By following these updated 2026 methods, some wells were removed from the analysis in the western Baylands and the southwestern area of the Santa Clara Subbasin. To fill in these data gaps in the Baylands area, control points were used along the southern Bay and salt pond boundaries (Figure 9), which were identical to control points used for the 2021 depth to first water map study (Abuye, 2021). The control points have an assumed DTW of 0 ft, representing emergent groundwater at the southern Bay and salt pond boundaries. The control points added resolution and helped to produce a more accurate interpolation of shallow DTW across the Baylands area.

The updated 2026 methods produced a revised well list and a corresponding water level dataset used to generate the DTW map. Figure 9 illustrates the differences between the 2021 GWMP and updated well distributions for DTW modeling. In the Santa Clara Subbasin, the total number of wells increased from 522 to 1,815, which now includes 202 control points, 1,525

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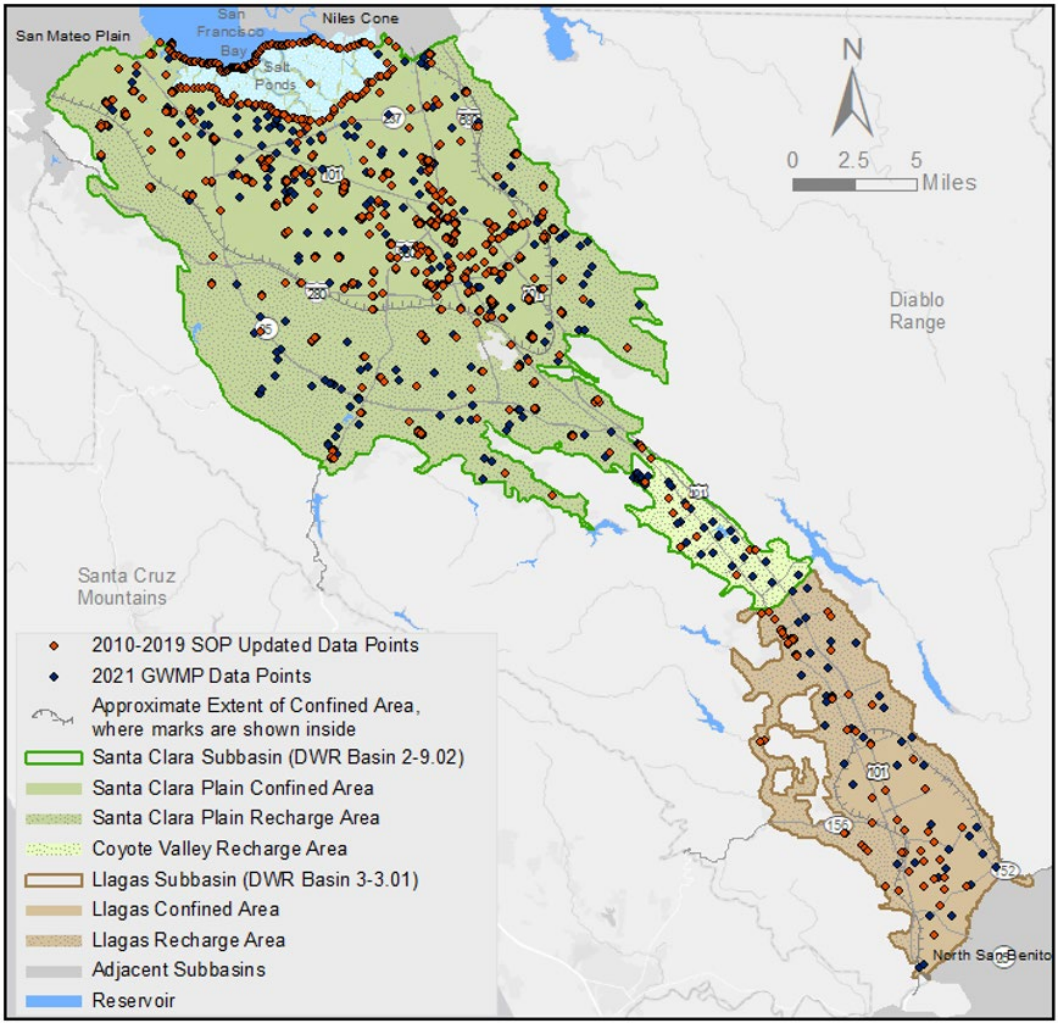
GeoTracker wells counted individually rather than aggregated by site, and 88 wells from Valley Water's groundwater database.

Figure 9: Well point coverage in the Santa Clara and Llagas subbasins.



3.2 Interpolation Improvements

The discrete DTW measurements are interpolated using GIS-based methods to generate a continuous groundwater elevation surface for the subbasins, which was used to evaluate groundwater conditions and identify areas that may support GDEs. While the 2021 GWMP used inverse distance weighting (IDW) interpolation, the updated 2026 method uses spline interpolation. Spline creates a smooth, hydrogeologically realistic groundwater elevation surface that better represents groundwater movement, whereas IDW can introduce artificial discontinuities that misrepresent natural groundwater behavior.

Spline interpolation is preferred because it better honors the observed water levels, resulting in a more continuous, gradual surface, preserving regional groundwater flow patterns and ensuring more accurate groundwater elevations. Spline is also better suited for sparse well

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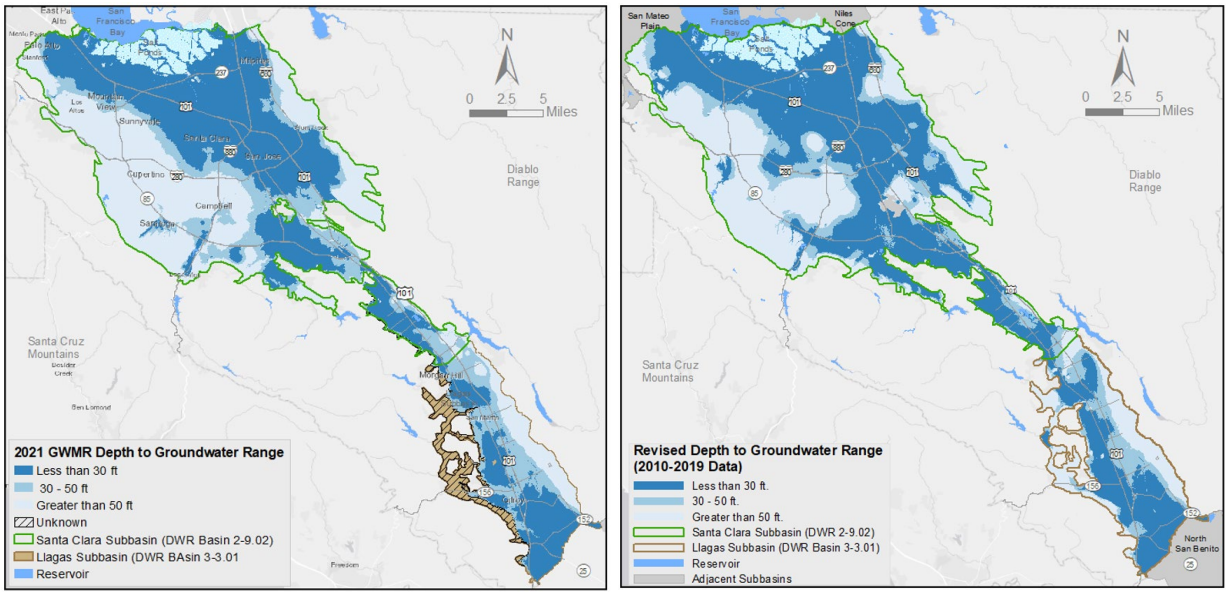
data, preventing artificial boundaries and creating realistic groundwater contours that align with natural hydraulic gradients. Additionally, using spline interpolation aligns with Valley Water's other groundwater GIS modeling projects, including the groundwater elevation maps in the 2026 GWMP.

Unlike the 2021 GWMP analysis that interpolated the Santa Clara and Llagas subbasins separately, the updated 2026 method interpolates across these two hydrogeologically connected subbasins. This updated interpolation results in a more realistic groundwater elevation pattern compared to interpolating the subbasins separately with an artificial boundary between the two subbasins.

The interpolated DTW is used to categorize GDEs. Figure 10 compares the three interpolated DTW indicators from the same 2010-2019 water level data using the 2021 GWMP methods and the updated 2026 methods. The updated 2026 methods produce a DTW map generally similar to the 2021 GWMP (Figure 10). For example, the updated 2026 interpolation shows a broad extent of shallow groundwater (DTW less than 30 ft) across the subbasins, generally similar to the 2021 GWMP map. However, the updated 2026 interpolation shows a more continuous and connected DTW less than 30 ft, particularly from the central Santa Clara Plain, through the entire Coyote Valley, and into the Llagas Subbasin. Figure 10 also shows that a reasonable DTW interpolation can be generated without relying on single-point water level measurements from historical well logs. The updated 2026 methods also eliminates areas previously mapped as "unknown" in the Llagas Subbasin, resulting in a more complete spatial coverage of DTW (Figure 10). The effects of the updated 2026 methods on estimated GDEs are described below in the results section 4.

Figure 10: Interpolated DTW comparison between 2021 GWMP (left) and updated 2026 methods (right) in the Santa Clara and Llagas subbasins (2010–2019).



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3.3 Overlapping GIS Polygons and GDE Area Estimates

The updated 2026 methods eliminate a 2021 GIS processing step that inadvertently double-counted some California phreatophyte polygons and thus artificially inflated estimates of GDE area (acres) in some locations. As discussed in the methods section, the 2021 analysis combined California phreatophyte polygons from two independent sources (the Santa Clara Valley Habitat Agency 'Land Cover' map and AIS 'Stream Vegetation' layer, detailed in section 2.2, Figure 5, and Tables 1 and 2), resulting in substantial spatial overlap between data sources and, in some cases, within a single source (e.g., multiple overlapping California phreatophyte types mapped within the same area in the Santa Clara Valley Habitat Agency 'Land Cover' dataset; Figure 11). The 2021 GWMP analysis did not correct the overlapping California phreatophyte polygons, which led to some double counting of California phreatophyte area and consequently overestimated GDE acres. The updated 2026 methods resolve this issue by merging overlapping California phreatophyte polygons before comparing to the interpolated DTW map (Figure 10) to estimate the areas of Likely, Transition, or Unlikely GDEs. This merging process eliminates double counting of GDEs and produces a more accurate estimate of GDE location and acres.

Figure 11: Example of overlapping California phreatophyte polygons in the Santa Clara Valley Habitat Agency 'Land Cover' GIS dataset.

Note: Panels A–C illustrate an example of overlapping California phreatophyte GIS polygons. The (A) single layer of Coast Live Oak (pink) is overlapped by (B) several different phreatophyte types (light pink and yellow) and a (C) mixed riparian layer (light green). Although the overlapping polygons represent different groundwater-dependent vegetation, the updated 2026 method counts the overlapped area once as GDE acres, rather than as multiple and distinct GDE acres, like in the 2021 GWMP analysis.

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4. Reanalysis of 2010–2019 GDE Dataset

Using the updated 2026 methods described in Section 3, Valley Water reanalyzed the 2010–2019 GDE dataset presented in the 2021 GWMP. The reanalysis, which includes updated well coverage, refined interpolation, and improved data filtering, produced a new and more accurate 2021 baseline estimate of GDE location, category, and area.

4.1 Updated 2021 GDE Baseline

As with DTW (Figure 10), the updated 2026 methods produce a spatial distribution of Likely, Transition, and Possible GDEs generally similar to the 2021 GWMP analysis for the Santa Clara Subbasin (Figures 12) and Llagas Subbasin (Figure 13). Eliminating the overlapping California phreatophyte polygons resulted in a more accurate estimate of GDE acres, while not changing the general spatial distribution of GDE location.

Although generally similar, the updated GDE map shows a more continuous and expanded distribution of Likely GDEs compared to the 2021 GWMP, particularly across the central Santa Clara subbasin and along basin margins (Figure 12) and the northern Llagas Subbasin (Figure 13). Areas previously classified as Transition or Possible GDEs are more frequently identified as Likely GDEs under the updated 2026 method, resulting from the broader extent of shallow DTW (Figure 10) and Valley Water's managed aquifer recharge operations. Another notable exception is the updated 2026 methods categorize in greater resolution some Transition GDEs that were categorized as Likely GDEs in the 2021 GWMP, especially in the Llagas Subbasin (Figure 13), as explained below. Additionally, areas previously mapped as unknown are now classified as GDEs under the updated 2026 method. This change reflects the improved DTW interpolation, which reduces data gaps and indicates a greater extent of shallow groundwater (less than 30 ft DTW) across the subbasin.

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Figure 12: Comparison of GDEs from the 2021 GWMP (left) and updated 2026 methods (right) in the Santa Clara Subbasin (2010–2019).

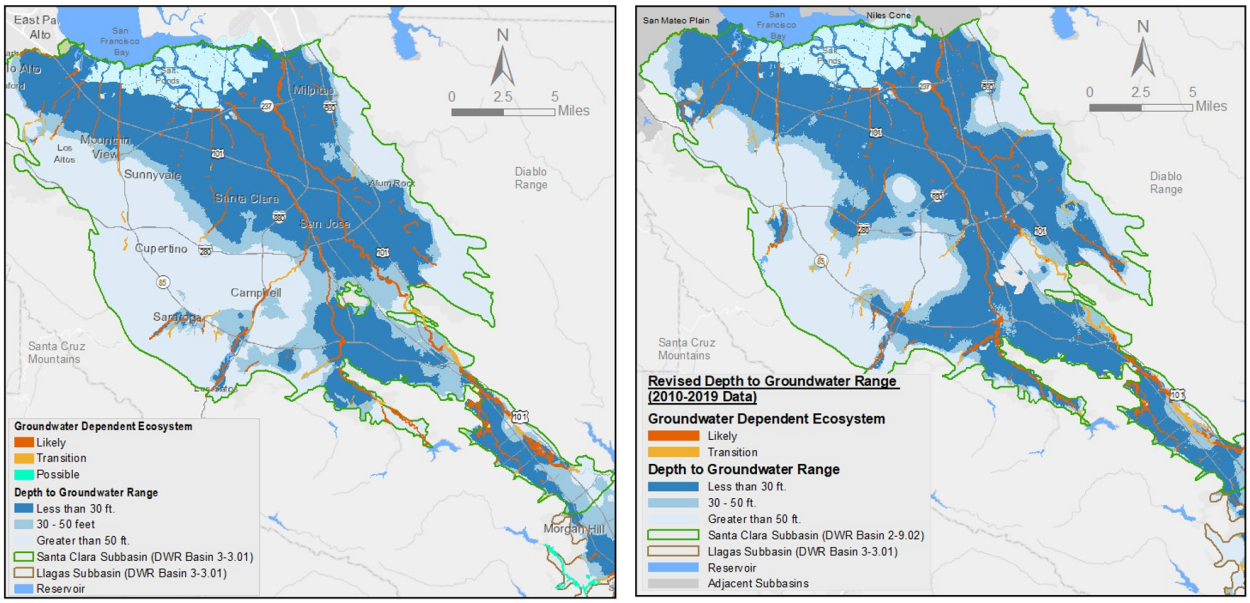
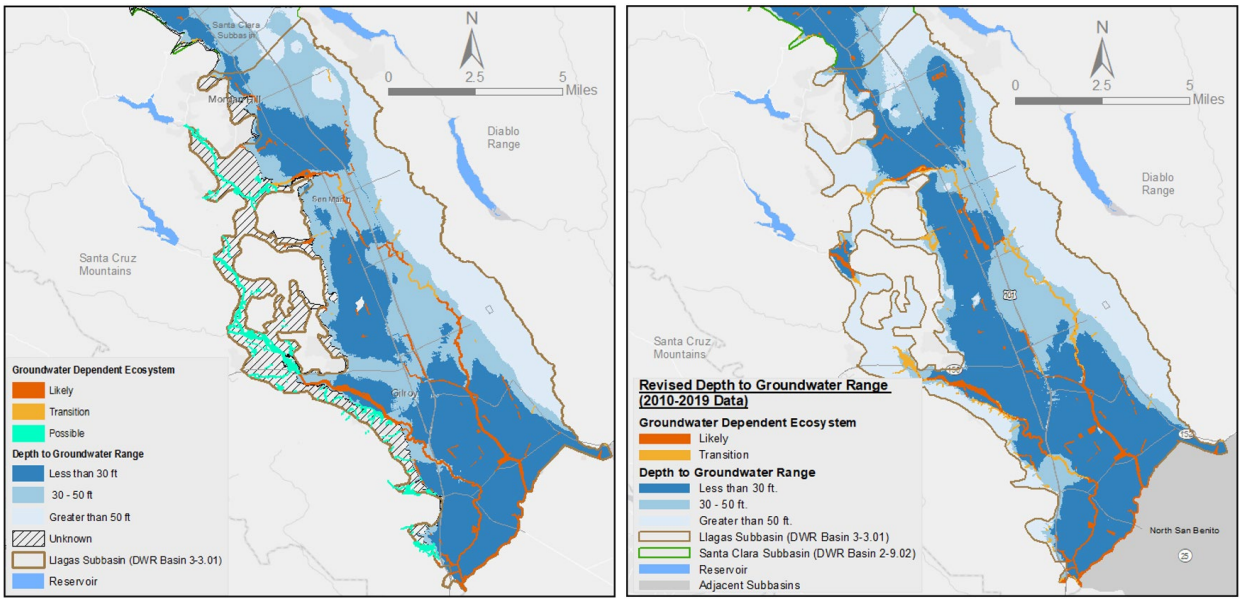


Figure 13: Comparison of GDEs from the 2021 GWMP (left) and updated 2026 methods (right) in the Llagas Subbasin (2010–2019).



Across the Santa Clara and Llagas subbasins, the updated 2026 method reduced the estimated acres of Likely and Transition GDEs by 33% and 2%, respectively, compared to the 2021 GWMP analysis (Table 5). Unlikely GDE acres decreased by 17% and the Possible (Unknown) category was eliminated. The removal of the Possible GDE category is due to the improved groundwater surface interpolation methods, which now provide full basin coverage.

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Table 5: Comparison of estimated GDE area between 2021 GWMP and updated 2026 methods for the Santa Clara and Llagas subbasins (2010–2019).

GDE Category	2010–2019 Median DTW Santa Clara and Llagas Subbasins (acres)	
	2021 GWMP	Updated 2026 Method (% change)
Likely	5,026	3,346 (-33%)
Transition	898	878 (-2%)
Unlikely	2,109	1,743 (-17%)
Possible (Unknown)	1,340	0

The 2026 updated methods created a higher resolution of GDE categories, as shown by some of the results in Table 5. For example, within some 30-50 ft DTW areas, surface water bodies (i.e., creeks and streams) are at lower elevations than the surrounding ground surface, which results in small or narrow areas of <30 ft DTW surrounded by 30-50 ft DTW areas (Figure 14). Using the 2021 GWMP methods, if any part of the California phreatophyte polygon intersected a <30 ft DTW area, the entire polygon would be classified as Likely GDE (Figure 15). However, the updated 2026 method splits California phreatophyte polygons based on their intersection with DTW and thus results in a higher resolution mapping of Likely and Transition GDEs, as illustrated in Figure 15. The 2026 updated methods that eliminated double counting from overlapping polygons led to a slight overall reduction (2% less) in Transition GDE acres (Table 5).

Figure 14: Example area of the Llagas Subbasin where a thin <30 ft DTW area (dark blue) lies within a larger 30-50 ft DTW area (light blue).

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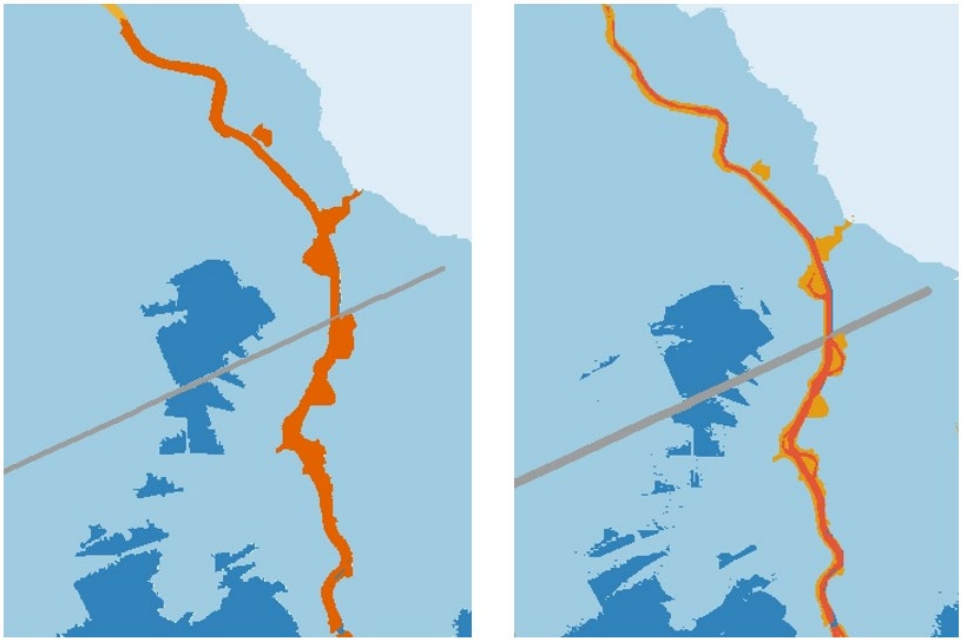
Figure 15: Results from the 2021 GWMP methods (left) and updated 2026 methods (right) for overlapping California phreatophyte polygons with DTW (dark orange is Likely GDEs and light orange is Transition GDEs) in the same area of the Llagas Subbasin as shown in Figure 14.



Overall, the updated 2026 method results in a reduction of GDE acres as compared to the 2021 GWMP and produces a higher resolution of each GDE category. Such improvements to the GIS-based mapping methods are important for continued monitoring of groundwater conditions that support GDEs.

4.2 Reduction in DTW Data Gaps

In the 2021 GWMP analysis, DTW data gaps existed, predominantly in the western areas of the Llagas Subbasin, resulting in insufficient data for GDE categorization. For example, in the 2021 GWMP analysis, 1,340 acres of California phreatophytes were categorized as Possible GDEs (Table 5) because DTW data was not available to further classify that area as Likely or Transition GDEs (Figure 13). These DTW gaps were identified in the 2021 GWMP as actionable future improvements for GDE delineation.

These DTW data gaps for the 2010–2019 timeframe were eliminated using the updated 2026 methods (Figure 13), largely because of the spline interpolation and using DTW data from individual wells rather than aggregating by site. However, depending on the timeframe and data availability, data gaps may occur and a designation of Possible GDEs may be needed in future assessments.

5. Comparative Analysis

The previously discussed reanalysis of the 2021 GWMP GDEs established a corrected 2010–2019 GDE dataset (Table 5, Figures 12 and 13) that serves as a baseline for future comparisons. Applying the updated 2026 methods, Valley Water analyzed the 2015–2024 DTW data to

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estimate GDEs for the 2026 GWMP. Comparing these results from 2010–2019 to 2015–2024 provides a consistent basis to evaluate groundwater level changes over time that may influence GDE category and distribution across the Santa Clara and Llagas subbasins.

5.1 Estimated GDEs: 2010–2019 Baseline vs. 2015–2024 Update

The comparative analysis between 2010–2019 and 2015–2024 revealed minor changes in estimated GDE area and category across the Santa Clara and Llagas subbasins (Table 6). The total area of estimated Likely and Transition GDEs increased less than 2% from 4,224 acres in 2010–2019 to 4,295 acres in 2015–2024, which is a negligible change. The Likely GDE area increased 5% from 3,346 to 3,514 acres, resulting from a shallower median DTW in 2015–2024. Conversely, Transition GDE and Unlikely GDE areas decreased 11%, resulting from median DTW of 30-50 ft and DTW >50 ft changing to more shallow groundwater (DTW <30 ft), and thus increasing the estimated Likely GDE area.

Table 6: Comparison of GDEs between 2010–2019 and 2015–2024.

GDE Category	Median DTW Santa Clara and Llagas Subbasins (acres)	
	2010–2019	2015–2024
Likely GDE	3,346	3,514
Transition GDE	878	781
Unlikely GDE	1,743	1,673

The spatial patterns of estimated GDEs are generally similar between 2010–2019 and 2015–2024, particularly in areas underlain by persistently shallow groundwater, such as along gaining stream reaches in the Santa Clara Subbasin and wetlands in the Laguna Seca area (Figures 16 and 17). The most notable changes in estimated GDE category between the two time periods are where groundwater levels trended either slightly upward or downward over the analysis periods (Figures 16 and 17). These changes were predominantly along stream corridors with variable hydrologic conditions or in recharge-influenced zones where groundwater levels fluctuate in response to climate variability or recharge operations. For example, the southwestern Santa Clara Plain and areas near Coyote Creek in the Coyote Valley have relatively larger areas of DTW less than 30 ft in 2015–2024 as compared to 2010–2019, which resulted in more estimated Likely GDEs along those stream corridors in 2015–2024 (Figure 16). Conversely, other areas had slightly smaller areas of DTW less than 30 ft in 2015–2024 as compared to 2010–2019, such as downstream of Uvas and Chesbro reservoirs in the western Llagas Subbasin, which resulted in fewer estimated Likely GDEs along those stream corridors in 2015–2024 (Figure 17).

Downstream of many Valley Water reservoirs, surface water releases for instream recharge contribute to sustained shallow groundwater levels. Therefore, some GDE categories in these downstream reaches reflect and are supported by groundwater conditions that are maintained

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through managed recharge operations. These patterns provide insight into the dynamics of shallow groundwater conditions and the ecosystems they support.

Figure 16: Comparison of GDEs based on median depth to water (DTW) in 2010–2019 (left) and 2015–2024 (right) in the Santa Clara Subbasin.

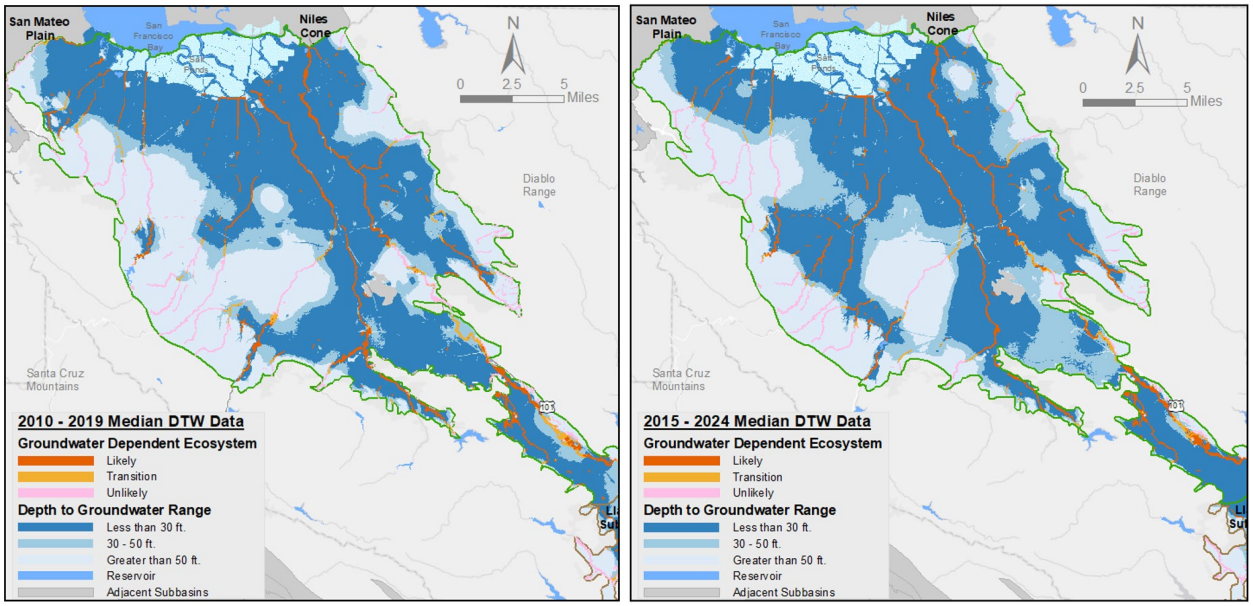
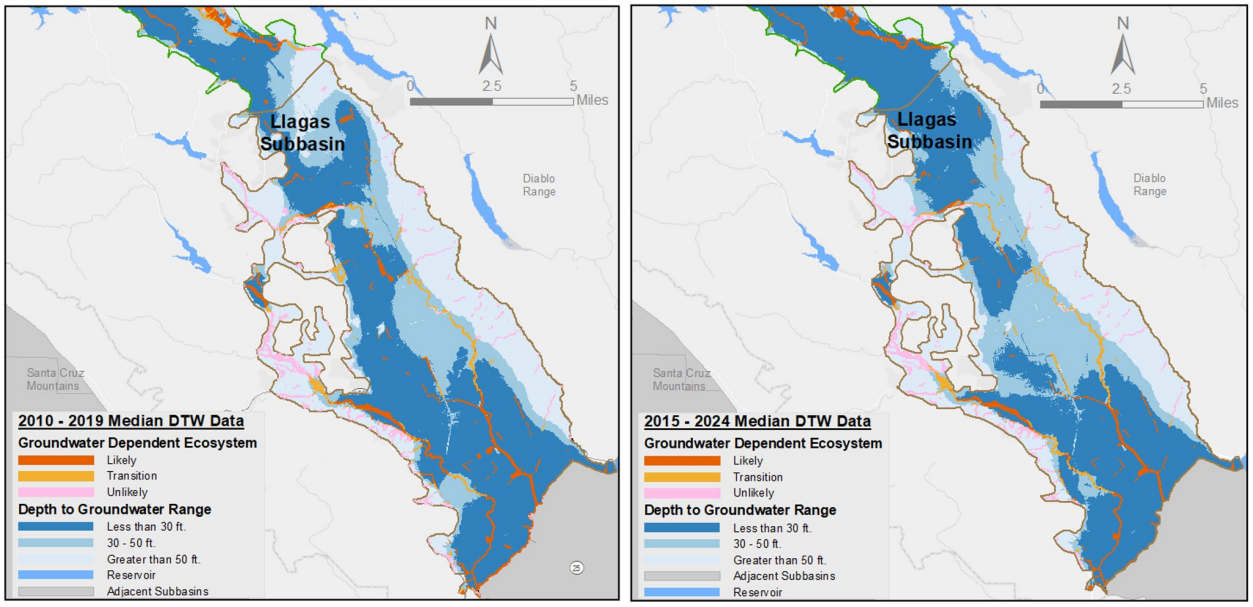


Figure 17: Comparison of GDEs based on median depth to water (DTW) in 2010–2019 (left) and 2015–2024 (right) in the Llagas Subbasin.



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6. Discussion

As explained in the methods and results sections, differences in estimated GDE category and area between 2010–2019 and 2015–2024 reflect changes in interpolated DTW conditions rather than changes in the GIS vegetation dataset or field observations of California phreatophytes. For example, the greater area of Likely GDEs in 2015–2024 resulted from average groundwater levels being shallower, or closer to land surface, than during 2010–2019.

Differences in groundwater conditions were due in part to greater managed recharge in the Santa Clara and Llagas subbasins, which averaged 89,000 acre-feet per year (AF/yr) in 2010–2019 and 95,000 AF/yr in 2015–2024. Average rainfall was about 12 to 13 inches per year during both periods. However, 2012–2016 and 2020–2022 were drought periods, with average annual rainfall in downtown San José, California, of approximately 11 inches and 9 inches, respectively. Rainfall affects natural recharge, which was slightly higher during 2015–2024 than during 2010–2019. Additionally, groundwater pumping was also lower during 2015–2024, averaging about 120,000 AF/yr, compared with about 129 ,000 AF/yr during 2010–2019. As a result of differences in natural recharge, managed recharge, and pumping, groundwater levels during 2015–2024 were slightly higher than during 2010–2019. These conditions contributed to a slightly greater area with DTW less than 30 ft and corresponding greater area of Likely GDE during 2015–2024.

As discussed, no new field assessments were conducted for the 2026 analysis because the overall analysis approach was similar to the 2021 analysis that had over 90 percent agreement between the GIS-based GDE maps and independent biological field assessments of GDEs. No new vegetation monitoring or remapping was conducted for the 2026 analysis because the comparative analysis indicated an increase in Likely GDE area in 2015–2024 was driven primarily by a greater area with DTW of less than 30 ft, rather than by changes in mapped vegetation. Groundwater conditions remained healthy during 2015–2024 because of Valley Water's continued sustainable groundwater management.

Overall, the comparison provides the first temporally consistent assessment of changes in DTW and estimated GDE distribution in the subbasins and will improve the detection of future trends. Assessing these GIS-based changes has important implications for groundwater management because sustainable groundwater conditions help support the continued sustainability of GDEs.

7. Conclusions

The updated 2026 methods and reanalysis of the 2010–2019 dataset improved the GDE identification by refining well selection, improving DTW interpolation, resolving GIS polygon overlap, and reducing data gaps. Applying the updated 2026 methods to the 2010-2019 dataset established a corrected and internally consistent GDE baseline that Valley Water can use in future analyses.

Applying the same methods to the 2015–2024 dataset produced the first temporally consistent comparison of DTW and associated GDE distribution across the Santa Clara and Llagas

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subbasins. This comparison found that DTW was generally shallower during 2015–2024 than during 2010–2019 and that shallow groundwater conditions supported broad areas of persistent GDE categories. Areas where GDE categories changed generally corresponded to hydrologic variability in DTW caused by droughts, wet periods, managed recharge operations, and other factors. This variability was especially pronounced in portions of the Llagas Subbasin, where groundwater levels respond strongly to annual hydrologic conditions. The findings underscore the need for continued groundwater monitoring in these dynamic areas.

It is important to recognize that some GIS-mapped GDEs, particularly along stream corridors downstream of Valley Water reservoirs, occur in areas where shallow groundwater conditions have been influenced by nearly 100 years of instream recharge operations. Surface water releases for recharge help maintain groundwater levels adjacent to these corridors, thereby supporting GDEs in areas where they may not have occurred under natural conditions. Consequently, some mapped GDEs may represent ecosystems sustained under current groundwater management practices rather than under pre-development conditions. This distinction provides important context for interpreting GDE sustainability and evaluating groundwater management activities. Although data gaps have been reduced, some areas with limited well density or complex shallow groundwater conditions would benefit from additional monitoring wells, targeted ecological assessments, or field verification.

Overall, the updated analysis provides a more robust technical foundation for understanding GDE distribution and sustainability in the Santa Clara and Llagas subbasins. The improved baseline and temporally consistent dataset will support more reliable tracking of future trends and better inform adaptive groundwater management under SGMA.

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APPENDIX G

TECHNICAL MEMORANDUM

GROUNDWATER MONITORING NETWORK GAP IMPLEMENTATION UPDATE FOR THE 2026 GROUNDWATER MANAGEMENT PLAN

Prepared by:

Scott Elkins, P.G.
Associate Water Resources Specialist

Victoria Garcia
Associate Water Resources Specialist

Geoffrey Tick, Ph.D.

Senior Water Resources Specialist

Under the Direction of:

Jason Gurdak, Ph.D.

Unit Manager

Santa Clara Valley Water District

Groundwater Management Unit

August 2026

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1. Introduction

This technical memorandum (memo) documents the implementation of the *Groundwater Monitoring Network Gap Analysis for the 2021 Groundwater Management Plan.*[1] In Appendix J of the 2021 Groundwater Management Plan (GWMP), Valley Water identified spatial gaps and redundancies in the groundwater level and groundwater quality monitoring networks. The overarching purpose of the 2021 gap analysis was to help ensure that the monitoring network provides groundwater data that supports Valley Water's adaptive management strategy and requirements as the GSA for the Santa Clara and Llagas subbasins. This memo summarizes steps taken since 2021 to address these gaps.

2. Considerations when Filling Gaps

As noted in Appendix J of the 2021 GWMP, the groundwater monitoring network includes wells installed by Valley Water, existing wells that Valley Water obtained, and privately owned wells that Valley Water monitors. Due to this complexity with well ownership and the expanding built environment of Santa Clara County, Valley Water first prioritizes filling gaps by installing new Valley Water-owned monitoring wells on Valley Water land. If Valley Water-owned land for a well installation is not available to fill a gap, Valley Water's secondary option is land owned by partners, such as city or county land. However, maintaining access to private land and privately owned wells can be unpredictable and requires additional consideration and coordination. As such, Valley Water is transitioning away from private land and private wells for groundwater monitoring network wells in favor of Valley Water-owned wells on Valley Water property or other publicly owned land, such as city or county land.

In addition to ensuring long-term access, Valley Water considers whether a new monitoring well(s) will benefit multiple programs (e.g., groundwater level and quality programs) and the cost of well installation. Valley Water prioritizes new wells that benefit more than one program and/or are lower in cost. For these reasons, most new monitoring wells have been installed in the shallow aquifer zone.

3. Data Gaps Filled - Groundwater Level Monitoring Network

A total of 31 wells added to the water level network, including 21 in the Santa Clara Subbasin and 10 in the Llagas Subbasin (Table 1). As discussed in the next sections, more wells were added to the shallow aquifer zone network compared to the principal aquifer zone network because there were existing shallow zone wells that could be easily incorporated from the groundwater quality program and because of the relative greater installation costs for deeper wells, especially for multi-level nested wells.

[1] Valley Water, Groundwater monitoring gap analysis for the 2021 Groundwater Management Plan, Appendix J, 2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasin.

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Table 1. Wells added to the water level monitoring network

Count	Well Number	Aquifer Zone	MNM ID	Subbasin
1	05S01E31R011	Shallow	374505N1218995W001	Santa Clara
2	05S01W36K013	Shallow	374538N1219204W001	Santa Clara
3	06S01W02N008	Shallow	374343N1219478W001	Santa Clara
4	06S01W10N006	Shallow	374182N1219684W001	Santa Clara
5	06S01W12G005	Shallow	374250N1219244W001	Santa Clara
6	06S01W14L005	Shallow	374081N1219438W001	Santa Clara
7	06S01W15R006	Shallow	374042N1219541W001	Santa Clara
8	06S01W17M009	Shallow	374099N1220055W001	Santa Clara
9	06S01W18E013	Shallow	374120N1220208W001	Santa Clara
10	06S01W18R007	Shallow	374045N1220072W001	Santa Clara
11	06S01W22K010	Shallow	373944N1219591W001	Santa Clara
12	06S01W29J009	Shallow	373781N1219869W001	Santa Clara
13	06S01W36D004	Shallow	373744N1219325W001	Santa Clara
14	06S02W06J003	Shallow	374387N1221155W001	Santa Clara
15	06S02W08C004	Shallow	374317N1221058W001	Santa Clara
16	06S02W09K022	Shallow	374231N1220866W001	Santa Clara
17	06S02W10Q020	Shallow	374182N1220682W001	Santa Clara
18	06S02W10Q021	Shallow	374182N1220682W002	Santa Clara
19	08S01E22M001	Shallow	372179N1218578W001	Santa Clara
20	08S01W06C003	Principal	372686N1220166W001	Santa Clara
21	09S03E15D005	Principal	NA	Santa Clara
22	09S03E22P007	Principal	371303N1216314W001	Llagas
23	09S03E23L002	Principal	371344N1216130W001	Llagas
24	09S03E23L006	Shallow	371343N1216132W001	Llagas
25	09S03E23L007	Shallow	371334N1216158W001	Llagas
26	09S03E23N011	Shallow	371326N1216198W001	Llagas
27	10S03E04K015	Shallow	370927N1216430W001	Llagas
28	11S03E01E003	Shallow	370075N1216014W001	Llagas
29	11S03E01E005	Shallow	370075N1216014W002	Llagas
30	11S03E03H002	Shallow	370084N1216235W001	Llagas
31	11S04E33N007	Shallow	369332N1215509W001	Llagas

3.1 Shallow Aquifer Monitoring Network

Since publication of the 2021 GWMP, Valley Water has added 27 shallow aquifer zone monitoring wells to the groundwater level monitoring network (Table 1, Figure 1). Of those new wells, nine were incorporated into the groundwater level monitoring program from groundwater quality networks that monitor seawater intrusion in the shallow aquifer near the

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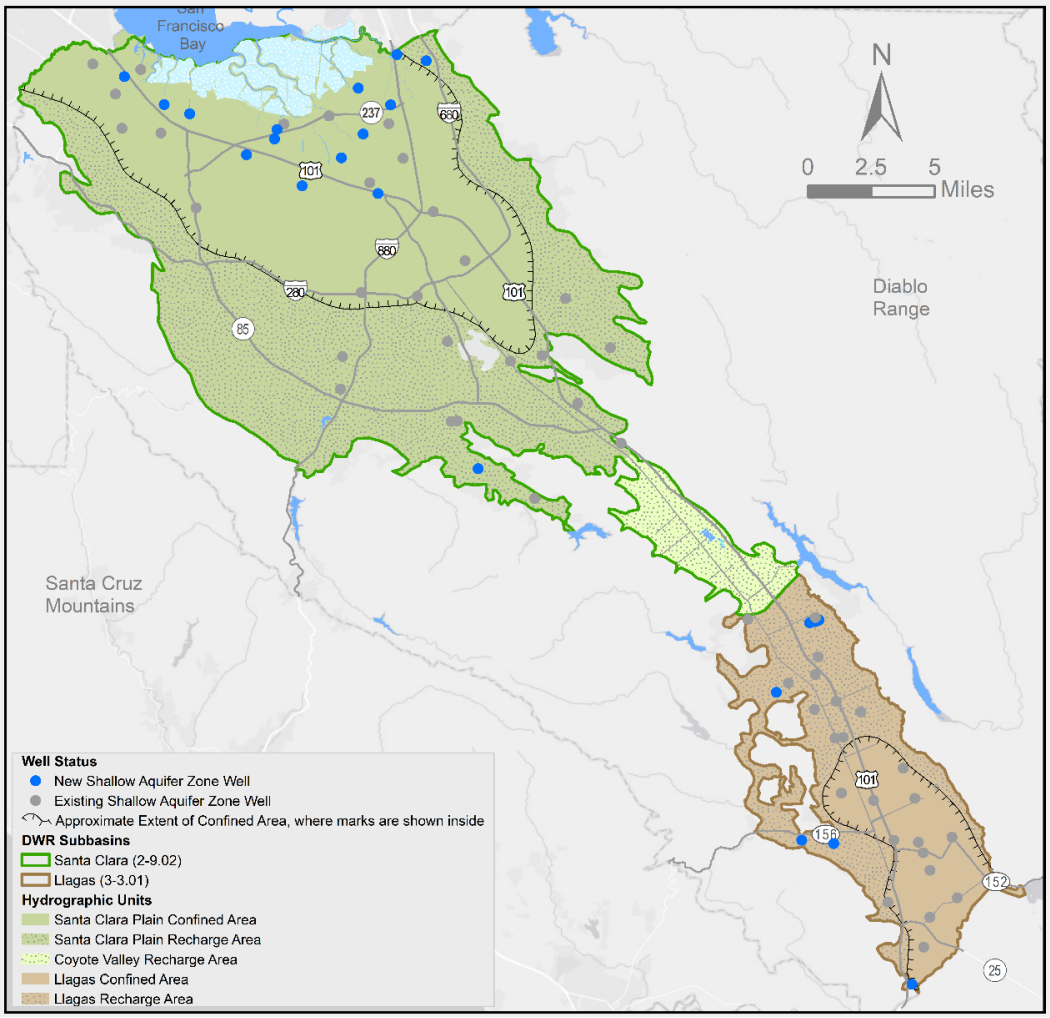
San Francisco Bay in the Santa Clara Subbasin or that monitor shallow groundwater quality beneath irrigated lands with recycled water in the Llagas Subbasin (Figure 1). Additionally, Valley Water incorporated eight existing Valley Water-owned monitoring wells into the groundwater level monitoring program that were not currently being monitored for groundwater levels or water quality. Where no existing monitoring wells were available, Valley Water installed nine new monitoring wells to address data gaps and partnered with a local city to gain access to one monitoring well.

Figure 1. New and existing shallow aquifer zone water level monitoring wells



3.2 Principal Aquifer Monitoring Network

Since publication of the 2021 GWMP, Valley Water has added four (4) principal aquifer zone monitoring wells to the groundwater level monitoring network (Table 1, Figure 2). Compared to the shallow aquifer zone, there were fewer existing principal aquifer zone wells available to incorporate from the groundwater quality program. Valley Water installed one new principal

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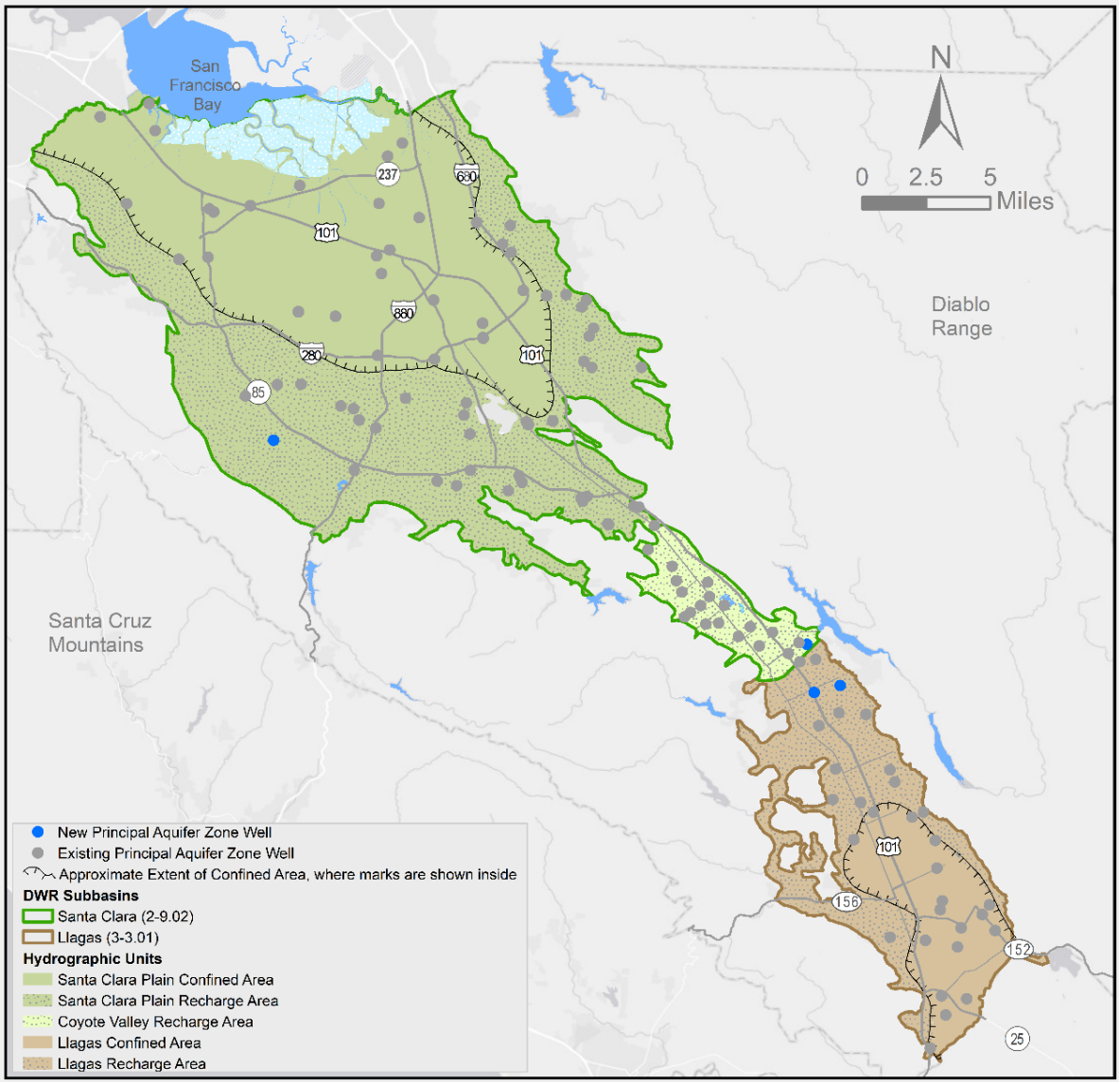
aquifer zone monitoring well in the northern Llagas Subbasin. Two newly added principal aquifer zone monitoring wells, one in the Santa Clara Subbasin and one in the Llagas Subbasin, are owned by Valley Water but had not been previously monitored. The last remaining well is in the Santa Clara Subbasin and owned by a local city who has granted access to the well for water level monitoring purposes.

Figure 2. New and existing principal aquifer zone water level monitoring wells



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4. Data Gaps Filled - Groundwater Quality Monitoring Network

In accordance with the recommendations from Appendix J, Monitoring Network Gap Analysis, of the 2021 GWMP, Valley Water evaluated opportunities to address groundwater quality monitoring gaps by incorporating existing groundwater level monitoring wells into the groundwater quality monitoring network where feasible. Since publication of the 2021 GWMP, Valley Water has assessed existing monitoring wells for suitability based on well construction, accessibility, sampling feasibility, and long-term reliability.

In several cases, existing groundwater level monitoring wells were determined to be suitable for incorporation into the groundwater quality monitoring network and will be used to address identified groundwater quality monitoring gaps. In other cases, wells initially identified through the gap analysis were determined to be unsuitable due to construction limitations, deteriorated well conditions, access agreement challenges, or infeasible sampling requirements. Where existing wells could not adequately address monitoring objectives, Valley Water identified the need for new monitoring well installations.

In addition to the regional groundwater quality monitoring program, several newly incorporated wells also support the Seawater Intrusion Monitoring Program and other groundwater management objectives. Consistent with the considerations described in Section 2, Valley Water continues to prioritize publicly owned wells and Valley Water-owned properties when addressing groundwater quality monitoring gaps to improve long-term monitoring reliability and reduce dependence on privately owned wells.

Since publication of the 2021 GWMP, Valley Water has added seven (7) monitoring wells to the groundwater quality monitoring network to address identified shallow and principal aquifer monitoring gaps and support additional groundwater management objectives, including seawater intrusion and PFAS monitoring (Table 2, Figures 3 and 4).

Table 2. Wells added to the groundwater quality monitoring network

Count	Well Number	Aquifer Zone	Well Name	Subbasin
1	05S01E31R011	Shallow	Milpitas High, G-2	Santa Clara
2	05S01W36K013	Shallow	Lower Penitencia	Santa Clara
3	06S01W10N006	Shallow	Guadalupe Shallow	Santa Clara
4	06S02W08C004	Shallow	Adobe Creek	Santa Clara
5	07S01W34G003	Shallow	Morgan Park 2, LGRS-02	Santa Clara
6	07S01W34G004	Principal	Morgan Park 3, LGRS-03	Santa Clara
7	11S04E07F004	Principal	Uvas Creek, Gilroy 2	Llagas

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4.1 Shallow Aquifer Monitoring Network

Since publication of the 2021 GWMP, Valley Water has evaluated several shallow aquifer zone wells for incorporation into the groundwater quality monitoring network to address monitoring gaps identified in the 2021 GWMP. Existing shallow aquifer wells continue to provide opportunities to efficiently address data gaps while supporting multiple groundwater management objectives.

To address the shallow aquifer groundwater quality monitoring gap in the southwestern portion of the Santa Clara Plain, Valley Water evaluated wells 07S01W34G003 (Morgan Park 2, LGRS-02) and 08S01W03K013 (Dell Avenue). After further review, well 08S01W03K013 was determined to be unsuitable for groundwater quality monitoring because the well is constructed with 1-inch PVC casing and is not compatible with standard sampling methods. Instead, well 07S01W34G003 was incorporated into the groundwater quality monitoring network (Table 2). This well is currently used to evaluate shallow groundwater quality impacts associated with recycled water irrigation and provides useful comparative data for groundwater quality evaluations in the shallow aquifer zone. To address the southeastern gap of the Santa Clara Plain, Valley Water determined that the existing monitoring well, Evergreen Shallow, has already been filling this gap.

As part of the annual recycled water sampling program, Valley Water will continue monitoring for per- and polyfluoroalkyl substances (PFAS) in the vicinity of recycled water application areas by collecting groundwater quality samples from both shallow and principal aquifer monitoring wells. Monitoring wells 07S01W34G003, screened in the shallow aquifer zone, and 07S01W34G004 (Morgan Park 3, LGRS-03), screened in the principal aquifer zone (Table 2) were selected to be incorporated into the regional water quality monitoring network. Monitoring both aquifer zones provides information regarding the vertical distribution of PFAS and supports evaluation of potential migration between aquifer zones. PFAS are emerging constituents of concern due to their persistence in the environment, widespread industrial and commercial use, and increasing regulatory focus at the state and federal levels. Continued PFAS monitoring will support Valley Water's ongoing evaluation of groundwater quality conditions and potential impacts associated with recycled water use and other land use activities.

Additional shallow aquifer monitoring gaps identified within the Santa Clara Subbasin and Llagas Subbasin remain under evaluation. Valley Water has identified opportunities to address these gaps through a combination of publicly owned wells, privately owned wells where access agreements can be maintained, and installation of new monitoring wells where necessary. In some areas, including portions of the northeastern Santa Clara Plain and groundwater benefit zone W-8 area of the Llagas Subbasin, new monitoring wells may be required to adequately address remaining shallow aquifer monitoring gaps.

Several shallow aquifer wells associated with the Seawater Intrusion Monitoring Program have also been incorporated into the groundwater quality monitoring network since publication of

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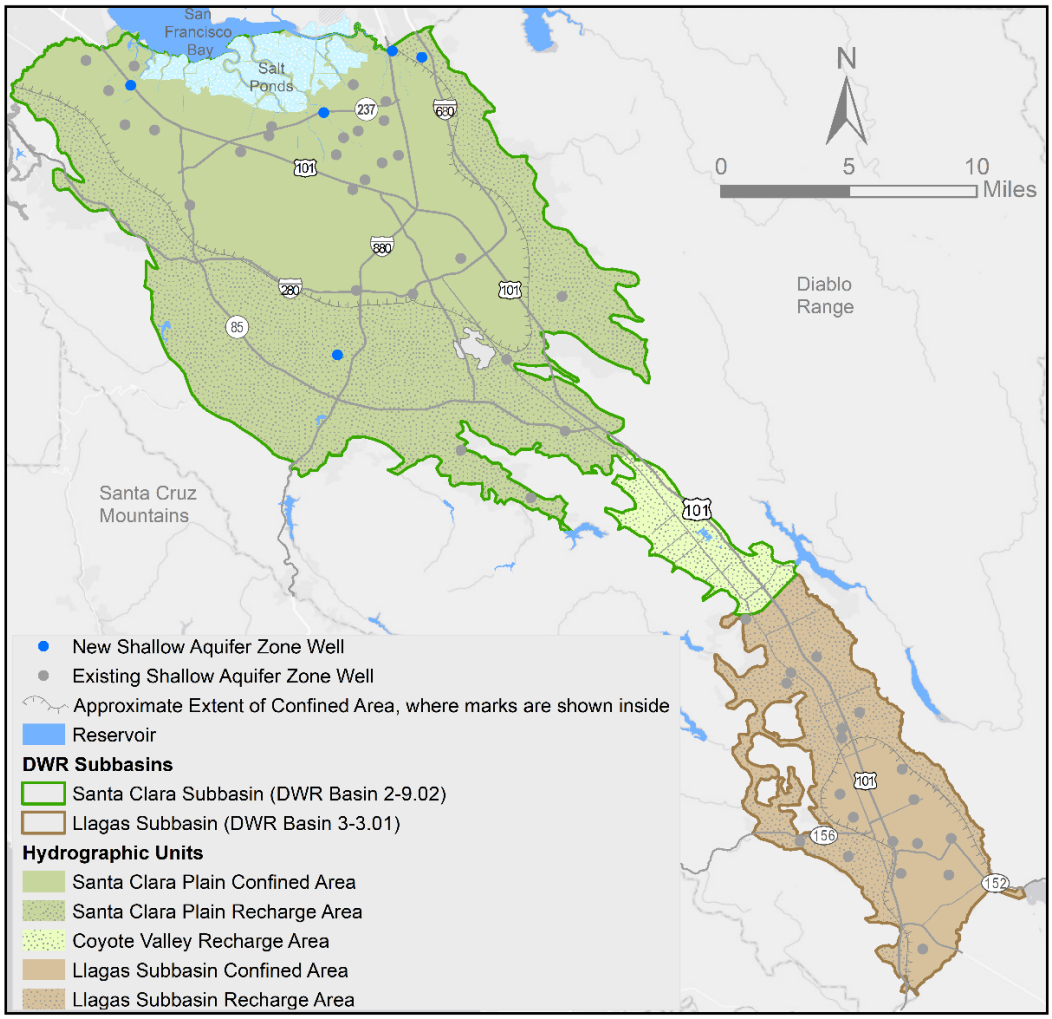
the 2021 GWMP. These wells are near the San Francisco Bay and include 05S01E31R011 (Milpitas High, G-2), 05S01W36K013 (Lower Penitencia), 06S01W10N006 (Guadalupe Shallow), and 06S02W08C004 (Adobe Creek) (Table 2). These wells provide improved spatial coverage for monitoring shallow groundwater quality conditions and potential seawater intrusion in the northern Santa Clara Subbasin.

Valley Water recently (June 2026) installed four (4) new shallow groundwater wells in the northern portion of the Santa Clara Plain to enhance monitoring of groundwater elevations, chloride concentrations, and groundwater quality conditions. Monitoring data from these wells will be assessed to determine their suitability for future inclusion in the groundwater quality monitoring network and to evaluate their effectiveness in addressing identified spatial and data coverage gaps within the shallow aquifer.

Figure 3. Shallow aquifer zone water quality monitoring network updates



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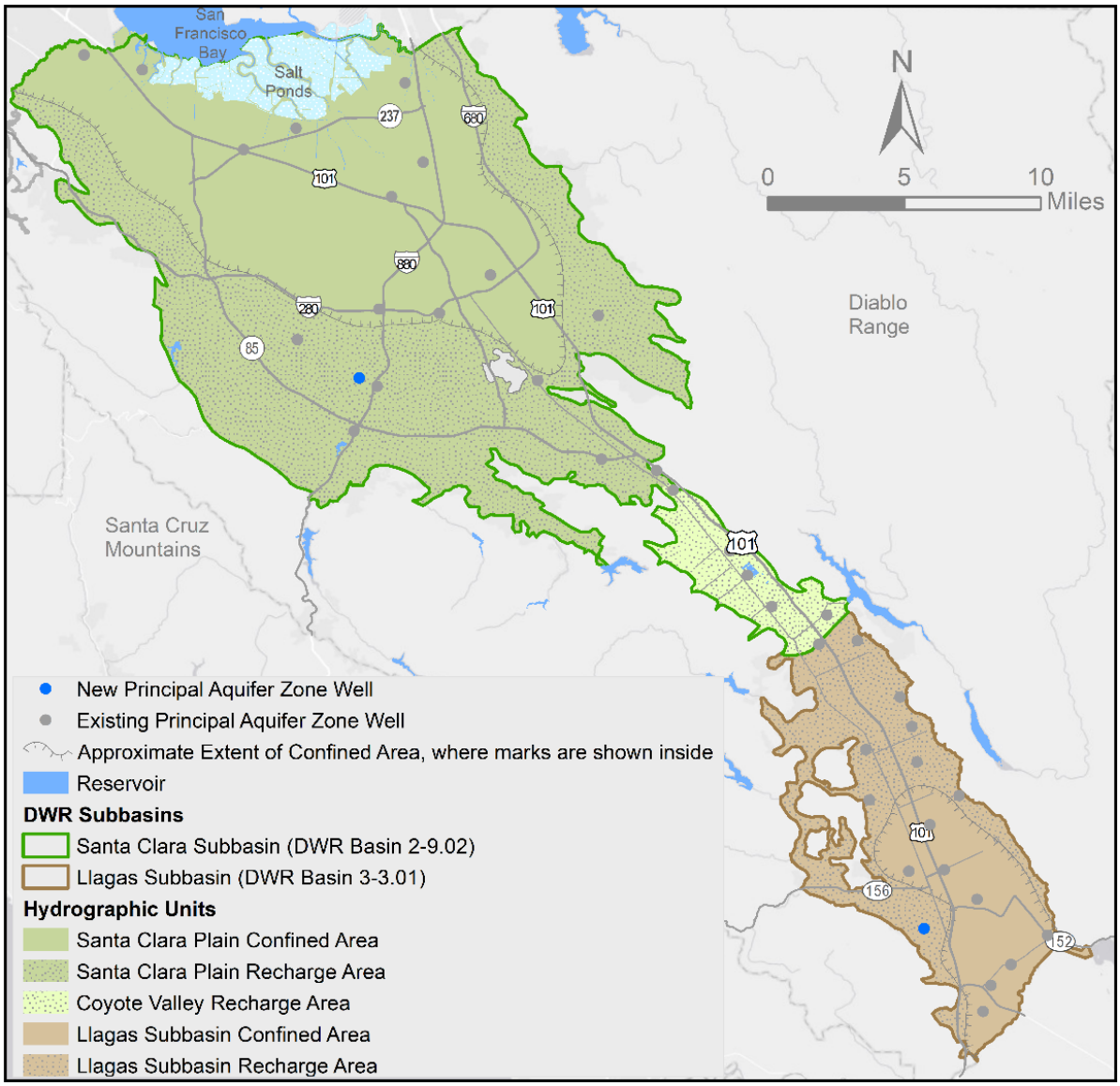
4.2 Principal Aquifer Monitoring Network

Since publication of the 2021 GWMP, Valley Water has evaluated several principal aquifer zone monitoring wells for incorporation into the groundwater quality monitoring network to address regional monitoring gaps identified in the 2021 GWMP. However, only two wells have been added to the groundwater quality monitoring network (Table 2, Figure 2), as described below.

Figure 4. Principal aquifer zone water quality monitoring network updates



To address the northwestern Santa Clara Plain principal aquifer monitoring gap, Valley Water plans to add water level monitoring well 07S01W08D003 (BK-2) to the groundwater quality monitoring network during the next regional water quality sampling event. An adjacent well,

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07S01W08D001 (BK-3), was also evaluated; however, BK-2 was determined to be more suitable because its smaller casing diameter allows for more efficient purging and sampling. Since both wells are located adjacent to one another, incorporation of both wells was determined to be unnecessary.

Well 06S01E27M006 (Penitencia) was evaluated for incorporation into the groundwater quality monitoring network to address the northeastern Santa Clara Plain principal aquifer monitoring gap. However, the well was determined to be unsuitable for groundwater quality monitoring because the 12-inch diameter casing and total depth would require infeasibly long purge times. In addition, the well casing is angled at the surface, preventing sampling equipment from being lowered into the well. Repair of the well casing configuration was determined to be infeasible. As a result, an alternate monitoring location will be required to address this monitoring gap.

Similarly, well 08S01E08R001 (Pioneer High School) was evaluated to address the southern Santa Clara Plain principal aquifer monitoring gap. Following further evaluation, the well was determined to be unsuitable due to deteriorated casing conditions that may affect groundwater quality sample integrity. In addition, efforts to establish a long-term access agreement with the property owner were unsuccessful. Valley Water subsequently identified additional candidate wells to address this monitoring gap and will continue to pursue suitable opportunities. Separately, well 07S01W34G004 was selected for incorporation into the regional water quality monitoring network to support PFAS monitoring in the Santa Clara Plain principal aquifer in response to increasing concerns regarding PFAS.

Within the Llagas Subbasin, water level monitoring well 11S04E07F004 (Uvas Creek, Gilroy 2) (Table 2) was added to the principal aquifer groundwater quality monitoring network to address a regional groundwater quality monitoring gap. This was the only new well added in the Llagas Subbasin groundwater quality monitoring network.

Valley Water also evaluated replacement monitoring needs associated with existing groundwater quality monitoring wells. In several cases, replacement wells initially proposed through the gap analysis process were determined to be unnecessary due to successful well repairs, redevelopment activities, restored access agreements, or redundancy within the monitoring network. In other cases, wells were removed from consideration because of unsafe site conditions, destroyed infrastructure, or loss of access agreements with private property owners.

Consistent with Valley Water's long-term groundwater monitoring strategy, the installation of new monitoring wells is generally preferred over reliance on private well access agreements where feasible. As a result, several remaining groundwater quality monitoring gaps will likely be addressed during future drilling and installation of dedicated monitoring wells rather than incorporation of existing privately owned wells.

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5. Next Steps

Valley Water will continue to implement recommendations summarized in Appendix J of the 2021 GWMP and address new data gaps that arise. As noted in Appendix J of the 2021 GWMP, as part of the adaptive management strategy, Valley Water will continue to regularly evaluate data gaps and redundancies, monitoring procedures, and associated data management, evaluation, and reporting. In general, Valley Water has a comprehensive and complementary set of monitoring networks as part of the water level and water quality programs. Data gap implementation updates will be provided in each five-year period evaluation of the GWMP.

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Appendix H – Valley Water Managed Recharge Facilities

Valley Water's managed recharge program uses both surface water runoff captured in local reservoirs and imported water delivered by the raw water conveyance system to recharge the groundwater subbasins in Santa Clara County through about 279 acres of managed recharge ponds and 98 miles of local creeks. There are 98 managed recharge ponds; nearly all are off-stream but one is an instream pond (Coyote Percolation Pond).

The recharge facilities have been organized into seven systems based on watersheds, as described below (Table H-1). The facilities have been sorted in this way to simplify describing management of a complex and interconnected network. These systems are not independent but rather share sources of supply and many systems recharge the same groundwater subbasins. Water recharged in one system may be extracted many miles away. The following seven recharge systems are organized here by the groundwater benefit zones (Tables H-1) that were Board adopted on April 28, 2020 and went into effect on July 1, 2020. The facilities within each Valley Water recharge system and the associated recharge capacity are shown in Table H-1. Table H-2 provides a summary of in-stream and off-stream recharge capacity for groundwater benefit zones W2, W5, W7, and W8.

Penitencia Recharge System

The Penitencia recharge system has a recharge capacity of approximately 5,300 AF per year, which includes 2,200 AF (42%) as in-stream recharge and 3,100 AF (58%) as off-stream recharge ponds (Table H-1). This small system is predominately served by imported water from the SWP, although local water from the Penitencia Creek Watershed also contributes to in-stream recharge in Penitencia Creek. The other facilities in the system, which exclusively recharge SWP water, include the Dr. Robert W. Gross, Piedmont, Helmsley, Capitol, City Park, and County Park ponds. This system recharges the Santa Clara Plain in Zone W2 (Table H-1). Recharge operations have been conducted in this system since 1934.

Los Gatos Recharge System

The Los Gatos recharge system has a recharge capacity of approximately 29,700 AF per year, which includes 5,800 AF (20%) as in-stream recharge and 23,900 AF (80%) as off-stream recharge ponds (Table H-1). The major features of this system include Lexington and Vasona reservoirs, Los Gatos Creek in-stream recharge, and several off-stream systems including Page, Budd Ave, Sunnyoaks, Camden, McGlincy, and Oka ponds. Most of the source water for this system is from the Los Gatos Creek Watershed in the Santa Cruz Mountains, although imported water from SWP and CVP is also delivered to the system through Valley Water's Central Pipeline. This system recharges the Santa Clara Plain in Zone W2 (Table H-1). Recharge operations have been conducted in this system since 1934.

West Side Recharge System

The West Side recharge system has a recharge capacity of approximately 22,900 AF per year, which includes 18,000 AF (79%) as in-stream recharge and 4,900 AF (21%) as off-stream recharge ponds (Table H-1). Major facilities in the system include Stevens Creek Reservoir, the McClellan off-stream ponds, and the various streams receiving water from the Stevens Creek Pipeline including Regnart, Calabazas, Rodeo, Saratoga, Wildcat, San Tomas, Smith, and Stevens creeks. In addition to local water from the West Side watersheds, imported water from SWP and CVP is delivered to the system using the Stevens Creek Pipeline. This system recharges the Santa Clara Plain in Zone W2 (Table H-1). Recharge operations have been conducted in this system since 1935.

Guadalupe Recharge System

This system has a recharge capacity of approximately 25,100 AF per year, which includes 12,400 AF (49%) as in-stream recharge and 12,700 AF (51%) as off-stream recharge ponds (Table H-1). The major features of this system include Almaden, Guadalupe, and Calero reservoirs; Guadalupe Creek, Guadalupe River, Alamitos Creek, Calero

Creek, and Ross Creek in-stream recharge; and Los Capitancillos, Alamitos, Kooser, and Guadalupe off-stream ponds. Water can be diverted from Almaden Reservoir to Calero Reservoir via the Almaden-Calero Canal. Local water supplies are developed from the Almaden, Guadalupe, and Calero Watersheds, and imported water from the State Water Project (SWP) and Central Valley Project (CVP) can be diverted into the system via the Cross Valley Pipeline, the Almaden Valley Pipeline, and the Central Pipeline. This system recharges the Santa Clara Plain in Zone W-2 (Table H-1), and water can also be diverted from Calero Reservoir to the Valley Water's surface water treatment plants via the Cross Valley Pipeline. Recharge operations have been conducted in this system since 1932.

Coyote Recharge System

This system has a recharge capacity of approximately 27,000 AF per year, which is 100% in-stream recharge (Table H-1). The major features of this system include Anderson and Coyote reservoirs, Coyote Creek in-stream recharge, and the Coyote percolation pond, which is an in-stream recharge pond. Water sources for this system include imported water and the large Coyote Creek watershed, draining much of the west-facing slope of the Diablo Range. After leaving the hills below Anderson Reservoir, Coyote Creek flows northwest to San Francisco Bay, recharging both the Coyote Valley and Santa Clara Plain groundwater management areas (Table H-1, Zone W2). Imported water from San Luis Reservoir via the Santa Clara Conduit is a major water source for the Coyote Recharge System where CVP water provided over half of all water between 2009 and 2018. Imported water can be stored in Anderson Reservoir using the Anderson Force Main and later released to Coyote Creek or diverted to the Cross Valley Pipeline for recharge elsewhere or as a water supply source for Valley Water's surface water treatment plants. Recharge operations have been conducted in this system since 1934. Through the Main Avenue Pipeline, water from Anderson Reservoir can also be diverted south into the Upper Llagas Recharge System recharging the Llagas Subbasin (Table H-1, Zone W5).

Upper Llagas Recharge System

The Upper Llagas recharge system has a recharge capacity of approximately 18,500 AF per year, which includes 11,100 AF (60%) as in-stream recharge and 7,400 AF (40%) as off-stream recharge ponds (Table H-1). Major facilities include Llagas in-stream recharge, the Madrone Channel, and the San Pedro and Main Avenue ponds. This system recharges the Llagas Subbasin in Zones W5 and W8 (Table H-1), predominately with imported CVP water. Recharge operations have been conducted in this system since 1955.

Lower Llagas Recharge System

The Lower Llagas recharge system has a recharge capacity of approximately 21,200 AF per year, which includes 13,900 AF (66%) as in-stream recharge and 7,300 AF (34%) as off-stream recharge ponds (Table H-1). Major facilities in the system include Uvas and Chesbro reservoirs, in-stream recharge in Llagas and Uvas Creeks, the Church off-stream ponds, and the Uvas-Llagas pipeline that can divert water from Uvas Reservoir to Llagas Creek. This system is entirely dependent on local water from the Uvas and Llagas watersheds and recharges the Llagas Subbasin in Zones W5 and W8 (Table H-1). Recharge operations have been conducted in this system since 1955.

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Table H-1. Valley Water Managed Recharge Facilities

Groundwater Benefit Zone	Recharge System	In-Stream Recharge (Creeks)	Annual Creek Recharge Capacity (AF)[1]	Off-Stream Recharge (Ponds)	Annual Pond Recharge Capacity (AF)[1]
Zone W2	Penitencia	Upper Penitencia Creek	2,200		
				Dr. Robert W. Gross Ponds	3,100
				Piedmont	
				City Park Pond	
				Helmsley	
				County Park Pond	
				Capitol	
		Creek Total	**2,200**	**Pond Total**	**3,100**
		Recharge System Total: 5,300			
	Los Gatos	Los Gatos Creek	5,800		
				Page Ponds	5,300
				Budd Ave Ponds	5,000
				Sunnyoaks Ponds	2,200
				Camden Ponds	2,200
				McGlincy Ponds	7,700
				Oka Ponds	1,500
		Creek Total	**5,800**	**Pond Total**	**23,900**
		Recharge System Total: 29,700			
	West Side	Regnart Creek	1,000		
		Calabazas Creek	2,600		
		Rodeo Creek	1,000		
		Saratoga Creek	7,600		
		Wildcat Creek	400		
		San Tomas Creek	700		
		Smith Creek	700		
		Stevens Creek	4,000		
				McClellan Ponds	4,900
		Creek Total	**18,000**	**Pond Total**	**4,900**
		Recharge System Total: 22,900			
	Guadalupe	Alamitos Creek	2,200		
		Calero Creek	900		

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Groundwater Benefit Zone	Recharge System	In-Stream Recharge (Creeks)	Annual Creek Recharge Capacity (AF)[1]	Off-Stream Recharge (Ponds)	Annual Pond Recharge Capacity (AF)[1]
		Guadalupe River	4,200		
		Guadalupe Creek	2,900		
		Ross Creek	2,200		
				Alamitos Ponds	1,500
				Guadalupe Ponds	6,600
				Los Capitancillos Ponds	2,900
				Kooser Ponds	1,700
		Creek Total	**12,400**	**Pond Total**	**12,700**
		Recharge System Total: 25,100			
	Coyote	Lower Coyote Creek	1,500		
		Coyote Percolation Pond[2]	10,900		
Zone W7		Upper Coyote Creek	14,600		
		Creek Total	**27,000**	**Pond Total**	**0**
		Recharge System Total: 27,000			
	Upper Llagas	Madrone Channel[3]	1,945		
Zone W5		Madrone Channel[4]	8,055		
		Tennant Creek	-		
		East Little Llagas	1,100		
				Main Avenue Ponds	2,700
				San Pedro Ponds	4,700
		Creek Total	**11,100**	**Pond Total**	**7,400**
		Recharge System Total: 18,500			
	Lower Llagas	Uvas Creek	7,999		
		Llagas Creek	5,764		
				Church Ponds	7,300
				Pond Total	**7,300**
Zone W8		Uvas Creek	101		
		Llagas Creek	36		
		Creek Total	**13,900**		
		Recharge System Total: 21,200			

1. The annual recharge capacity shown assumes water is available all year and that ponds are in normal operational condition.
2. Includes an operable (inflatable) dam.
3. Includes earthen dams.

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4. Includes earthen dams and flashboard steel dams.

Table H-2. Valley Water Annual Managed Recharge Capacity Summary

Groundwater Benefit Zone	In-Stream Recharge (AF)	Off-Stream Recharge (AF)	Total Recharge (AF)
Zone W2	50,800	44,600	95,400
Zone W5	22,918	14,700	37,618
Zone W7	16,545	-	16,545
Zone W8	137	-	137
Total	90,400	59,300	149,700

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Appendix I – Monitoring Well Details

Table I-1. Santa Clara Subbasin Groundwater Level Monitoring Network

Table I-2. Llagas Subbasin Groundwater Level Monitoring Network

Table I-3. Santa Clara Subbasin Groundwater Quality Monitoring Network

Table I-4. Llagas Subbasin Groundwater Quality Monitoring Network

Table I-5. Llagas Subbasin Recycled Water Monitoring Network

Table I-1. Santa Clara Subbasin Groundwater Level Monitoring Network

Well Number	MNM Well ID	Latitude	Longitude	Well Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Method	Frequency	Well Owner
05S01E31R011	374505N1218995W001	37.45052	-121.89952	30	10	30	44	43.75	S	MON	ES	M	Other
05S01W36K013	374538N1219204W001	37.45387	-121.92047	50	35	50	18	17.6	S	MON	ES	H	Valley Water
05S02W32E002	374581N1221085W001	37.45806	-122.10861	218	185	198	7.94	9.54	P	MON (was AG)	ES	M	Other
05S03W36P002	374502N1221430W001	37.45025	-122.14311	930	830	850	24.42	24.02	P	MON	PT	D	Valley Water
05S03W36P003	374502N1221430W002	37.45025	-122.14311	740	720	740	24.42	23.62	P	MON	PT	D	Valley Water
05S03W36P004	374502N1221430W003	37.45025	-122.14311	560	540	560	24.42	23.52	P	MON	PT	D	Valley Water
05S03W36P005	374502N1221430W004	37.45025	-122.14311	200	180	200	24.42	23.59	P	MON	PT	D	Valley Water
06S01E21M011	373938N1218748W001	37.39383	-121.87482	325	UK	UK	100.77	100.43	P	MON (was AG)	ES	M	Valley Water
06S01E22P002	373924N1218508W001	37.39244	-121.85080	519	UK	UK	182.11	181.64	P	MON (was AG)	ES	M	Valley Water
06S01E27M006	373817N1218562W001	37.38175	-121.85615	262	UK	UK	154.44	153.99	P	MON (was AG)	PT	D	Valley Water
06S01E27P002	373772N1218499W001	37.37743	-121.84960	400	UK	UK	152.58	152.29	P	MON (was AG)	PT	M	Other
06S01E32M005	376013N1224841W001	37.36455	-121.89291	110	UK	UK	63.69	63.69	S	DO	ST	M	Other
06S01W01M001	374376N1219291W001	37.43822	-121.92839	265	255	265	22.86	24.97	P	MON	PT	D	Valley Water
06S01W02N008	374343N1219478W001	37.43440	-121.94791	35	10	15	7.99	7.25	S	MON	ES	H	Valley Water
06S01W10N006	374182N1219684W001	37.41827	-121.96848	37	27	32	12.6	12.81	S	MON	ES	H	Valley Water
06S01W10N007	374183N1219686W001	37.41824	-121.96843	82.5	73	78	12.6	12.73	S	MON	PT	H	Valley Water
06S01W11B003	374305N1219386W001	37.43055	-121.93868	420	UK	UK	9.28	11.65	P	MI	PG	M	Other
06S01W12G005	374250N1219244W001	37.42556	-121.92480	37	30	35	15.31	15.35	S	MON	ES	H	Valley Water
06S01W13C009	374143N1219256W001	37.41434	-121.92556	65	56	61	36.29	36.12	S	MON	PT	H	Valley Water
06S01W14L005	374081N1219438W001	37.40819	-121.94386	47	37	47	12	10.9	S	MON	ES	H	Valley Water
06S01W14P008	NA	37.40375	-121.94425	392	UK	UK	13.02	12.02	P	MON (was AG)	PG	M	Other
06S01W15R006	374042N1219541W001	37.40423	-121.95418	57	45	51	15.75	15.75	S	MON	ES	H	Valley Water

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Well Number	MNM Well ID	Latitude	Longitude	Well Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Method	Frequency	Well Owner
06S01W17F001	374132N1220007W001	37.41317	-122.00065	110	90	100	2.4	1.75	S	MON	PT	D	Other
06S01W17F002	374132N1220007W002	37.41319	-122.00073	210	190	200	2.47	2.24	P	MON	PT	M	Other
06S01W17M009	374099N1220055W001	37.40997	-122.00554	45	20	45	12.75	12.5	S	MON	ES	H	Valley Water
06S01W18E013	374120N1220208W001	37.41202	-122.02084	30	15	30	9	8.71	S	MON	ES	H	Valley Water
06S01W18R007	374045N1220072W001	37.40458	-122.00727	45	20	45	12.75	12.5	S	MON	ES	H	Valley Water
06S01W22K010	373944N1219591W001	37.39450	-121.95913	100	60	65	20.81	19.96	S	MON	ES	H	Valley Water
06S01W24H015	373962N1219156W001	37.39615	-121.91556	227	UK	UK	44.5	44.05	P	MON (was AG)	PT	M	Valley Water
06S01W24J037	373947N1219147W001	37.39470	-121.91497	51	40	46	46.13	45.8	S	MON	PT	H	Valley Water
06S01W26K001	373804N1219385W001	37.38051	-121.93845	65	55	60	35.81	34.9	S	MON	PT	H	Valley Water
06S01W26P002	373738N1219428W001	37.37375	-121.94276	450	190	430	36.52	42.52	P	MON (was AG)	ES	M	Valley Water
06S01W26R001	373776N1219362W001	37.37761	-121.93623	1360	810	830	31.36	32.65	P	MON	PT	M	Valley Water
06S01W26R002	373776N1219362W002	37.37761	-121.93623	600	580	600	31.36	32.77	P	MON	PT	M	Valley Water
06S01W26R003	373776N1219362W003	37.37761	-121.93623	460	440	460	31.36	32.27	P	MON	PT	M	Valley Water
06S01W26R004	373776N1219362W004	37.37761	-121.93623	330	310	330	31.36	33.09	P	MON	PT	M	Valley Water
06S01W29J009	373781N1219869W001	37.37815	-121.98695	30	20	30	40.4	40.4	S	MON	ES	M	Valley Water
06S01W35L001	373640N1219417W001	37.36409	-121.94167	458	UK	UK	43.59	43.39	P	MON (was AG)	ES	M	Valley Water
06S01W36D004	373744N1219325W001	37.37441	-121.93253	70	60	65	28.75	28.55	S	MON	ES	M	Valley Water
06S02W05F001	374429N1221039W001	37.44291	-122.10384	31	21	31	6.76	8.46	S	MON	ES	H	Valley Water
06S02W05F002	374429N1221039W002	37.44288	-122.10388	50	40	50	6.76	8.36	S	MON	ES	H	Valley Water
06S02W05F003	374429N1221039W003	37.44288	-122.10388	200	190	200	6.76	8.76	P	MON	PT	H	Valley Water
06S02W06J003	374387N1221155W001	37.43879	-122.11547	70	60	65	8.98	8.77	S	MON	ES	H	Valley Water
06S02W07B023	373949N1219150W001	37.42870	-122.12168	45	28	45	14.49	13.34	S	MON	PT	H	Valley Water
06S02W08C004	374317N1221058W001	37.43171	-122.10588	45	20	40	11.8	11.49	S	MON	ES	H	Valley Water

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06S02W09K022	374231N1220866W001	37.42317	-122.08667	27	17	27	14.5	14.5	S	MON	ES	H	Valley Water
06S02W10Q020	374182N1220682W001	37.41820	-122.06824	75	55	75	24.7	24.7	S	MON	ES	H	Valley Water
06S02W10Q021	374182N1220682W002	37.41820	-122.06825	40	30	40	24.7	24.7	S	MON	ES	H	Valley Water
06S02W16L021	374069N1220886W001	37.40691	-122.08862	40	20	40	38.08	37.65	S	MON	PT	D	Valley Water
06S02W18J001	374090N1221168W001	37.40904	-122.11675	46	UK	UK	47.45	47.16	S	MON (was AG)	PT	D	Valley Water
06S02W19B002	374011N1221231W001	37.40111	-122.12306	295	110	292	84.02	84.94	P	MON (was MI)	ES	M	Other
06S02W22G004	373992N1220645W001	37.39920	-122.06453	285.5	265	285	62.59	62.36	P	MON	ES	M	Valley Water
06S02W22G005	373992N1220645W002	37.39919	-122.06453	449	414	449	62.65	62.42	P	MON	ES	M	Valley Water
06S02W22G006	373992N1220645W003	37.39917	-122.06454	333	303	333	62.53	62.42	P	MON	ES	M	Valley Water
06S02W22H012	373975N1220614W001	37.39752	-122.06137	360	314.5	359.5	64.91	64.63	P	MON	ES	M	Valley Water
06S02W22H014	373975N1220613W001	37.39751	-122.06134	420	374.5	419.5	64.59	64.19	P	MON	ES	M	Valley Water
06S02W24C008	374014N1220355W001	37.40137	-122.03546	250	UK	UK	32.33	34.83	P	MON	PT	D	Valley Water
06S02W24C009	NA	37.40140	-122.03539	550	UK	UK	32.08	32.88	P	MON	ES	M	Valley Water
06S02W24C010	NA	37.40143	-122.03531	1005	UK	UK	31.76	32.03	P	MON	ES	M	Valley Water
06S02W24J009	376515N1220353W001	37.39531	-122.02719	55	30	50.5	34.1	33.7	S	MON	PT	H	Valley Water
06S02W33B001	373703N1220855W001	37.37032	-122.08550	400	UK	UK	151.62	153.25	P	MI	ES	M	Other
06S02W34B006	373719N1220650W001	37.37186	-122.06498	190	UK	UK	152.03	151.55	P	MON	ES	M	Valley Water
06S02W34J001	373646N1220626W001	37.36459	-122.06258	140	120	130	169.2	169	S	MON	PT	M	Valley Water
06S03W01B010	374456N1221383W001	37.44563	-122.13831	101	93.5	98.5	20.25	19.75	S	MON	PT	D	Valley Water
07S01E01G001	373531N1218116W001	37.35377	-121.81070	400	UK	UK	180.47	181.37	P	MON (was AG)	PT	D	Valley Water
07S01E02J021	373529N1218244W001	37.35289	-121.82438	236	UK	UK	120.49	121.49	P	MON	PT	D	Valley Water
07S01E03H001	373556N1218411W001	37.35563	-121.84111	365	UK	UK	103.18	102.58	P	MON	ES	M	Valley Water
07S01E06L001	375693N1211513W001	37.34950	-121.90453	398	UK	UK	65.14	66.19	P	MON (was MI)	ES	M	Other

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07S01E09L004	373368N1218695W001	37.33677	-121.86953	1000	820	840	86.94	88.46	P	MON	PT	D	Valley Water
07S01E09L005	373368N1218695W002	37.33677	-121.86954	640	620	640	86.94	88.07	P	MON	PT	D	Valley Water
07S01E09L006	373368N1218695W003	37.33677	-121.86953	540	520	540	86.94	88.07	P	MON	PT	D	Valley Water
07S01E09L007	373368N1218695W004	37.33678	-121.86953	425	405	425	86.94	88.09	P	MON	PT	D	Valley Water
07S01E09L008	373368N1218695W005	37.33677	-121.86953	72	62	72	87.07	87.97	S	MON	PT	H	Valley Water
07S01E16C011	373284N1218687W001	37.32841	-121.86872	1000	551	660	102.53	104.02	P	MON	PT	D	Valley Water
07S01E16C014	373287N1218681W001	37.32815	-121.86891	725	526	682	110.65	112.15	P	MON	ES	D	Valley Water
07S01E19B002	373162N1219032W001	37.31619	-121.90324	85	75	85	114.85	114.69	S	MON	PT	M	Valley Water
07S01E19B003	373161N1219033W001	37.31617	-121.90326	850	770	790	114.85	115.3	P	MON	PT	M	Valley Water
07S01E19B004	373161N1219033W002	37.31611	-121.90325	455	435	455	114.85	114.92	P	MON	PT	M	Valley Water
07S01E19B005	373161N1219033W003	37.31611	-121.90325	365	345	365	114.85	114.95	P	MON	PT	M	Valley Water
07S01E19B006	373161N1219033W004	37.31611	-121.90325	240	220	240	114.85	115.05	P	MON	PT	M	Valley Water
07S01E19B007	373161N1219033W005	37.31611	-121.90325	590	570	590	114.85	114.95	P	MON	PT	M	Valley Water
07S01E24P001	372810N1218372W001	37.28097	-121.83721	277	164	272	164.03	162.48	P	MON	ES	M	Valley Water
07S01E29J007	372916N1218802W001	37.29166	-121.88024	190	UK	UK	145.27	145.02	P	MON	ES	M	Valley Water
07S01E29Q001	372906N1218812W001	37.29077	-121.88122	154	UK	UK	145.71	145.48	S	MON	ES	M	Valley Water
07S01E32B001	372846N1218818W001	37.28463	-121.88178	250	UK	UK	149.17	148.69	P	MON (was AG)	ES	M	Valley Water
07S01E32R003	372761N1218761W001	37.27610	-121.87612	350	UK	UK	159.67	158.92	P	MON	ES	M	Other
07S01E35E001	372813N1218374W001	37.28128	-121.83743	300	UK	UK	165.86	165.55	P	MON	ES	M	Other
07S01E35E003	372798N1218360W001	37.27979	-121.83598	148	46	146	167.84	166.92	S	MON	PT	M	Valley Water
07S01E35L004	372797N1218361W001	37.27974	-121.83606	229	181	226	167.71	167.28	P	MON	PT	D	Valley Water
07S01E36G003	372833N1218135W001	37.28331	-121.81350	134	UK	UK	164.39	164.14	S	MON (was AG)	PT	D	Valley Water
07S01E36L003	372797N1218144W001	37.27972	-121.81444	223	UK	UK	175.44	175.2	P	MON	ES	M	Valley Water

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07S01W08C003	373418N1220002W001	37.34181	-122.00021	398	388	398	126.93	126.43	P	MON	ES	M	Valley Water
07S01W08D001	373417N1220002W001	37.34175	-122.00020	480	460	475	127.17	127.72	P	MON	ES	M	Valley Water
07S01W08D002	373416N1220002W001	37.34163	-122.00021	340	320	335	127.51	126.78	P	MON	ES	M	Valley Water
07S01W08D003	373417N1220002W002	37.34168	-122.00021	440	420	435	127.35	127.69	P	MON	PT	D	Valley Water
07S01W09G011	373395N1219737W001	37.33954	-121.97379	300	UK	UK	103.75	103.6	P	MON (was AG)	ES	M	Valley Water
07S01W14P001	373177N1219435W001	37.31773	-121.94344	980	680	700	141.46	141.05	P	MON	PT	D	Valley Water
07S01W14P002	373177N1219435W002	37.31773	-121.94344	440	420	440	141.46	141.03	P	MON	PT	D	Valley Water
07S01W14P003	373177N1219435W003	37.31773	-121.94344	560	540	560	141.46	141.05	P	MON	PT	D	Valley Water
07S01W14P004	373177N1219435W004	37.31773	-121.94344	360	340	360	141.46	141.05	P	MON	PT	D	Valley Water
07S01W14P005	373177N1219435W005	37.31773	-121.94344	150	130	150	141.46	141.06	S	MON	PT	D	Valley Water
07S01W25L001	372938N1219233W001	37.29329	-121.92345	404	UK	UK	169.75	169.25	P	MON	ES	M	Valley Water
07S01W27P009	NA	37.28732	-121.96003	534	300	524	197.74	199.5	P	MON (was MI)	PT	M	Valley Water
07S01W28R001	372887N1219690W001	37.28877	-121.96904	450	UK	UK	202.14	202.63	P	MI	ES	M	Other
07S01W29C003	373008N1219975W001	37.30066	-121.99744	1000	630	650	231.17	232.34	P	MON	PT	M	Valley Water
07S01W29C004	373008N1219975W002	37.30066	-121.99743	550	530	550	231.12	231.96	P	MON	PT	M	Valley Water
07S01W29C005	373008N1219975W003	37.30066	-121.99743	380	360	380	231.12	231.92	P	MON	PT	M	Valley Water
07S01W29C006	373008N1219975W004	37.30066	-121.99743	270	250	270	231.12	231.95	P	MON	PT	M	Valley Water
07S01W30C002	373003N1220143W001	37.30028	-122.01425	554	UK	UK	249.97	250.1	P	MON (was AG)	ES	M	Other
07S01W34G002	372810N1219562W001	37.28095	-121.95614	110	90	105	205.46	204.4	S	MON	ES	D	Valley Water
07S01W34G003	372810N1219562W002	37.28096	-121.95610	150	132	147	205.46	204.41	S	MON	ES	D	Valley Water
07S01W34G004	372810N1219562W003	37.28095	-121.95609	300	275	295	205.41	204.37	P	MON	ES	D	Valley Water
07S01W34G005	372810N1219562W004	37.28095	-121.95614	235	210	230	205.41	204.36	P	MON	ES	D	Valley Water
07S01W34G006	372810N1219562W005	37.28096	-121.95610	395	370	390	205.41	204.35	P	MON	ES	D	Valley Water

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07S01W35L013	372767N1219439W001	37.27673	-121.94397	530	510	530	218.85	218	P	MON	PT	D	Valley Water
07S01W35L014	372767N1219439W002	37.27673	-121.94397	410	390	410	218.85	217.92	P	MON	PT	D	Valley Water
07S01W35L015	372767N1219439W003	37.27673	-121.94397	300	280	300	218.85	217.97	P	MON	PT	D	Valley Water
07S01W35L016	372767N1219439W004	37.27673	-121.94397	180	160	180	218.85	217.96	P	MON	PT	D	Valley Water
07S01W35L017	372767N1219439W005	37.27673	-121.94397	850	630	650	218.85	217.9	P	MON	PT	D	Valley Water
07S02E06N004	373469N1217994W001	37.34695	-121.79950	516	225	455	205.42	205.99	P	MON (was MI)	ES	M	Other
07S02E06Q001	378233N1224406W001	37.34916	-121.79439	402	UK	UK	265.5	265	P	MON	ES	M	Valley Water
07S02E07Q003	373346N1217908W001	37.33500	-121.79098	UK	UK	UK	181.94	180.87	UK	MON (was AG)	ES	M	Valley Water
07S02E18B007	373304N1217939W001	37.33038	-121.79395	366	UK	UK	155.73	155.45	P	MON	ES	M	Valley Water
07S02E19B009	373127N1217917W001	37.31274	-121.79175	410	140	400	212.4	212.87	P	MON (was AG)	ES	M	Valley Water
07S02E19C005	373161N1217973W001	37.31600	-121.79727	1030	740	760	188.81	188.29	P	MON	ES	M	Valley Water
07S02E19C006	373161N1217973W002	37.31601	-121.79729	630	610	630	189.15	188.39	P	MON	ES	M	Valley Water
07S02E19C007	373161N1217973W003	37.31601	-121.79729	390	370	390	189.15	188.4	P	MON	ES	M	Valley Water
07S02E19C008	373161N1217973W004	37.31601	-121.79729	290	270	290	189.15	188.36	P	MON	ES	M	Valley Water
07S02E19C009	373161N1217973W005	37.31601	-121.79729	150	130	150	189.15	188.36	S	MON	PT	D	Valley Water
07S02E21G010	373130N1217564W001	37.31308	-121.75627	358	88	353	494.66	495.26	P	MON	ES	M	Valley Water
07S02E28N003	372883N1217647W001	37.28828	-121.76465	38	UK	UK	435.99	435.99	S	DO	ES	M	Other
07S02W25M005	375839N1222353W001	37.29362	-122.03667	465	UK	UK	326.53	326.38	P	MON	ES	M	Valley Water
08S01E07Q003	372471N1219000W001	37.24706	-121.90003	200	UK	UK	228.48	228.12	P	MON	ES	M	Valley Water
08S01E08H004	372522N1218787W001	37.25342	-121.87667	220	UK	UK	187.84	187.44	P	MON	ES	M	Valley Water
08S01E08P003	372447N1218862W001	37.24416	-121.88611	180	UK	UK	213.16	212.31	P	MON	ES	M	Valley Water
08S01E08R001	372457N1218802W001	37.24485	-121.87781	255	40	202	203.35	202.46	S	MON (was AG)	PT	D	Valley Water
08S01E09N010	372452N1218733W001	37.24521	-121.87333	23	8	23	197.02	196.65	S	MON	ES	M	Valley Water

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08S01E10J004	372508N1218420W001	37.25077	-121.84202	191	UK	UK	162.32	162.32	P	MON	ES	D	Valley Water
08S01E11N001	372470N1218400W001	37.24703	-121.83993	177	UK	UK	162.1	161.6	P	MON	ES	M	Valley Water
08S01E15C007	372421N1218495W001	37.24216	-121.84944	435	UK	UK	167.26	167.26	P	MON	PT	D	Valley Water
08S01E22M001	372179N1218578W001	37.21790	-121.85785	70	45	65	256	255.64	S	MON	ES	M	Valley Water
08S01E25N003	372016N1218171W001	37.20162	-121.81713	90	21	60	346.2	347.95	S	MON	PT	M	Valley Water
08S01W03K013	372624N1219572W001	37.26241	-121.95729	94	UK	UK	249.86	249.69	S	MON	ES	M	Valley Water
08S01W06C003	372686N1220166W001	37.26866	-122.01661	540	200	520	382	384	P	AG	ES	M	Other
08S01W10F002	372528N1219587W001	37.25279	-121.95868	458	98	245	288.06	289.57	P	AG	ES	M	Other
08S02E07A015	372563N1217877W001	37.25625	-121.78767	45	25	45	204.89	204.36	S	MON	ES	M	Other
08S02E16K001	372341N1217571W001	37.23409	-121.75716	223	192	212	235.57	236.9	P	MON	PT	D	Valley Water
08S02E16L005	372343N1217607W001	37.23463	-121.76093	285	245	285	230	229.5	P	MON	ES	M	Valley Water
08S02E16Q014	372338N1217562W001	37.23384	-121.75610	35	25	35	239.75	242.6	S	MON	ES	M	Valley Water
08S02E18F016	372385N1217981W001	37.23861	-121.79813	179	147	177	193.93	193.58	P	MON	ES	M	Valley Water
08S02E18G010	372396N1217939W001	37.23959	-121.79388	179	138	178	197.56	199.18	P	MON	PT	D	Valley Water
08S02E18L001	372361N1217940W001	37.23608	-121.79400	295	UK	UK	193.53	193.18	P	MON (was AG)	ES	M	Valley Water
08S02E20F001	372242N1217786W001	37.22417	-121.77861	250	UK	UK	212.96	214.71	P	MI	ES	M	Other
08S02E20F002	372236N1217781W001	37.22361	-121.77806	170	UK	UK	212.77	214.5	P	MI	ES	M	Other
08S02E22E002	372237N1217459W001	37.22368	-121.74588	110	75	95	240.14	241.78	P	MON	PT	D	Valley Water
08S02E28H002	372100N1217502W001	37.20995	-121.75020	75	UK	UK	245.85	247	P	MON (was AG)	ES	M	Other
08S02E34A001	372006N1217325W001	37.20056	-121.73250	60	UK	UK	260.95	261.48	P	AG	ES	M	Other
08S02E35M001	371926N1217298W001	37.19255	-121.72981	90	UK	UK	264.2	264.82	P	AG	ST	M	Other
08S02E36M007	371919N1217076W001	37.19187	-121.70770	120	95	110	294.07	296.89	P	MON	PT	M	Valley Water
09S02E01C001	371789N1216956W001	37.17889	-121.69556	165	UK	UK	301.42	301.62	P	DO	ES	M	Other

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09S02E01J006	371790N1216958W001	37.17891	-121.69576	165	135	155	315.95	318.69	P	MON	PT	D	Valley Water
09S02E02C001	374725N1223622W001	37.18621	-121.72584	275	UK	UK	269.9	271.03	P	AG	ES	M	Other
09S02E02J002	375228N1222492W001	37.17862	-121.71237	114	UK	UK	290.49	291.92	P	AG	ES	M	Other
09S02E02Q008	371747N1217197W001	37.17474	-121.71974	180	UK	UK	281.58	282.16	P	DO	ES	M	Other
09S02E11C001	371722N1217237W001	37.17216	-121.72373	120	UK	UK	286.27	286.6	P	DO	ES	M	Other
09S02E12B001	371689N1216995W001	37.16893	-121.69947	180	UK	UK	314.56	314.96	P	AG	ES	M	Other
09S02E12E001	371669N1216769W001	37.16694	-121.67694	175	UK	UK	299.62	299.72	P	AG	ES	M	Other
09S03E07H003	371671N1216772W001	37.16713	-121.67718	300	UK	UK	347.92	349.19	P	AG	ES	M	Other
09S03E07L002	371639N1216614W001	37.16389	-121.66139	191	UK	UK	332.65	333.05	P	MON	PT	M	Other
09S03E08J016	371583N1216425W001	37.15833	-121.64250	285	UK	UK	370.89	371.19	P	MON (was AG)	PT	D	Other
09S03E09R004	371583N1216426W001	37.15839	-121.64264	380	350	370	405.57	406.18	P	MON	ES PT	D	Other
09S03E09R005	371583N1216426W002	37.15839	-121.64264	570	445	530	405.57	406.14	P	MON	ES	M	Other
09S03E15D005	NA	37.15738	-121.63718	46	10	46	413.75	413.75	P	MON	ES	M	Other
09S03E16F002	371521N1216501W001	37.15210	-121.65000	520	480	500	381.43	381.19	P	MON	PT	M	Valley Water
09S03E17D004	371562N1216707W001	37.15619	-121.67067	232	UK	UK	352.74	353.2	P	MON (was MI)	ES	M	Other

Notes:
Table shows monitoring wells actively monitored by Valley Water as of September 2026. Continued access to wells is not guaranteed, particularly for wells owned by others.
All elevations listed above are reported relative to the North American Vertical Datum of 1988 (NAVD 88).
All horizontal locations listed above are based on the North American Datum of 1983 (NAD 83).
AG = Agricultural well
D = Daily
DO = Domestic well
ES = Electric sounder
ft amsl = feet above mean sea level
ft bgs = feet below groundwater surface
H = Hourly
M = Monthly
MI = Municipal well

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Notes Continued:
MON = Monitoring well
NA = Value not available
P = Principal aquifer (Note: all wells in Coyote Valley are in the principal aquifer because there is no shallow aquifer designation in Coyote Valley)
PG = Pressure gauge
PT = Pressure transducer
S = Shallow aquifer
ST = Steel tape
UK = Unknown

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Table I-2. Llagas Subbasin Groundwater Level Monitoring Network

Well Number	MNM Well ID	Latitude	Longitude	Well Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Method	Frequency	Well Owner
09S03E15L013	371489N1216307W001	37.14892	-121.63068	200	UK	UK	394.08	394.29	P	DO	ES	M	Other
09S03E16J001	371477N1216418W001	37.14767	-121.64177	400	UK	UK	388.96	389.4	P	AG	ES	M	Other
09S03E20K003	371343N1216641W001	37.13428	-121.66407	100	70	90	354.98	354.78	S	MON	ES	M	Valley Water
09S03E22P007	371303N1216314W001	37.13037	-121.63149	222	157	217	357.3	356.37	P	MON	ES	M	Valley Water
09S03E23L002	371344N1216130W001	37.13443	-121.61307	498	108	420	359.45	359.95	P	MON (was AG)	ES	M	Valley Water
09S03E23L005	371357N1216158W001	37.13577	-121.61578	25	10	25	362.81	366	S	MON	PT	M	Valley Water
09S03E23L006	371343N1216132W001	37.13434	-121.61327	44.5	9.5	44.5	359.8	362.94	S	MON	ES	D	Valley Water
09S03E23L007	371334N1216158W001	37.13343	-121.61587	27.5	7.5	27.5	357.15	360.35	S	MON	ES	M	Valley Water
09S03E23N011	371326N1216198W001	37.13262	-121.61982	44	9	44	357.9	360.7	S	MON	ES	D	Valley Water
09S03E25P001	371183N1215946W001	37.11828	-121.59463	249	UK	UK	356.72	357.72	P	AG	ES	M	Other
09S03E26P001	374294N1221242W001	37.11886	-121.61387	250	UK	UK	331.64	331.99	P	AG	ES	M	Other
09S03E34G002	371113N1216275W001	37.11139	-121.62750	UK	UK	UK	322.2	323.55	UK	AG	ES	M	Other
09S03E35C011	371134N1216134W001	37.11341	-121.61344	91	81	86	324.18	323.51	S	MON	PT	M	Valley Water
09S03E35P013	371028N1216153W001	37.10306	-121.61528	160	80	155	307.18	308.59	S	DO	ES	M	Other
10S03E01N005	370881N1216003W001	37.08806	-121.60032	132	UK	UK	284.12	285.12	S	MON (was AG)	PT	D	Valley Water
10S03E02N002	370871N1216157W001	37.08711	-121.61570	215	155	215	288.6	289.01	P	DO	ES	M	Other
10S03E03D007	370981N1216346W001	37.09814	-121.63459	220	UK	UK	326.12	326.05	P	DO	ES	M	Other
10S03E04K015	370927N1216430W001	37.09279	-121.64301	58	38	58	341	340.31	S	MON	ES	M	Valley Water
10S03E11D010	370832N1216160W001	37.08323	-121.61597	181	80	181	281.58	281.97	S	AG	ES	M	Other
10S03E13E006	370670N1216007W001	37.06695	-121.60076	51.5	31.5	51.5	260.76	263.84	S	MON	ES	M	Valley Water
10S03E13E007	370683N1215981W001	37.06821	-121.59814	300	140	300	262.22	263.34	P	AG	ES	M	Other
10S03E13F005	370675N1215949W001	37.06625	-121.59415	54.5	32	52	262.03	265.13	S	MON	PT	M	Valley Water

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Well Number	MNM Well ID	Latitude	Longitude	Well Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Method	Frequency	Well Owner
10S03E13K004	370629N1215887W001	37.06290	-121.58860	199	111	199	254.75	254.75	P	MI	ES	M	Other
10S03E14D001	373711N1222136W001	37.06976	-121.61709	217	UK	UK	277.15	277.5	P	DO	ES	M	Other
10S03E24M001	370472N1216022W001	37.04717	-121.60210	190	UK	UK	237.65	238.05	P	AG	ST	M	Other
10S03E25F001	370357N1215958W001	37.03569	-121.59591	165	125	145	221.98	221.88	S	MON	PT	M	Valley Water
10S04E06P009	370867N1215772W001	37.08694	-121.57722	200	UK	UK	309.3	310.28	P	DO	ES	M	Other
10S04E07E031	370822N1215827W001	37.08217	-121.58271	130	UK	UK	286.84	287.39	S	DO	ES	M	Other
10S04E07F009	370800N1215736W001	37.08000	-121.57361	UK	UK	UK	306.8	307.52	UK	AG	ES	M	Other
10S04E17K002	371922N1220089W001	37.06320	-121.55324	250	UK	UK	299.54	299.54	P	DO	ES	M	Other
10S04E17N002	370604N1215612W001	37.06037	-121.56120	300	UK	UK	258.65	258.75	P	DO	ES	M	Other
10S04E20G008	370503N1215519W001	37.05025	-121.55193	90	80	85	242.18	243.18	S	MON	PT	D	Valley Water
10S04E21M002	372680N1220311W001	37.04725	-121.54472	UK	UK	UK	242.65	242.95	P	AG	ES	M	Other
10S04E28M005	370331N1215434W001	37.03310	-121.54332	60	50	60	210.26	209.93	S	MON	PT	M	Valley Water
10S04E28N006	370316N1215433W001	37.03165	-121.54326	572	532	552	209.75	212.25	P	MON	PT	M	Valley Water
10S04E30Q001	370997N1220292W001	37.03179	-121.57285	120	UK	UK	212.36	212.86	S	DO	ES	M	Other
11S03E01E003	370075N1216014W001	37.00757	-121.60144	100	77	97	224.45	223.99	S	MON	ES	M	Valley Water
11S03E01E005	370075N1216014W002	37.00757	-121.60144	43	20	40	224.68	227.23	S	MON	ES	M	Valley Water
11S03E03H002	370084N1216235W001	37.00845	-121.62356	48	38	48	241.5	240.92	S	MON	ES	M	Valley Water
11S04E02D008	370458N1219994W001	37.01105	-121.50598	250	UK	UK	232.94	233.04	P	AG	ES	M	Other
11S04E02N001	369966N1215017W001	36.99663	-121.50172	430	UK	UK	174.91	175.59	P	AG	ES	M	Other
11S04E03G005	370113N1215167W001	37.01133	-121.51669	85	70	80	190.44	192.4	S	MON	PT	M	Valley Water
11S04E03J002	370056N1215109W001	37.00599	-121.51098	415	UK	UK	198.75	199.15	P	DO	ES	M	Other
11S04E04C008	370129N1215392W001	37.01294	-121.53924	250	UK	UK	193.24	194.18	P	DO	ES	M	Other
11S04E04F007	370082N1215405W001	37.00798	-121.54064	55	40	50	194.71	196.78	S	MON	ES	D	Valley Water

Well Number	MNM Well ID	Latitude	Longitude	Well Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Method	Frequency	Well Owner
11S04E04Q012	370022N1215370W001	37.00224	-121.53707	39	UK	UK	185.22	185.14	S	MON	ES	M	Valley Water
11S04E05F001	370092N1215580W001	37.00916	-121.55800	107	UK	UK	189.56	189.76	S	MON (was AG)	PT	D	Valley Water
11S04E05H002	370081N1215406W001	37.00812	-121.54064	260	120	260	194.32	195.6	P	MON (was AG)	ES	M	Valley Water
11S04E07F004	369922N1215757W001	36.99220	-121.57565	200	160	180	211.38	211.29	P	MON	ES	M	Valley Water
11S04E08K002	369906N1215508W001	36.99056	-121.55083	278	53	274	181.84	184.14	P	AG	ES	M	Other
11S04E09J003	369922N1215320W001	36.99221	-121.53204	40	20	40	174.59	174.58	S	MON	ES	M	Valley Water
11S04E10D004	378711N1220275W001	36.99796	-121.52579	370	UK	UK	171.82	172.54	P	AG	ES	M	Other
11S04E10N001	369871N1215282W001	36.98711	-121.52816	550	510	530	167.48	167.17	P	MON	PT	M	Valley Water
11S04E15J003	369767N1215123W001	36.97667	-121.51233	53	48	53	153.56	153.26	S	MON	PT	D	Valley Water
11S04E17N004	369736N1215617W001	36.97361	-121.56167	80	UK	UK	183.55	184.82	S	AG	ES	M	Other
11S04E21G003	369654N1215318W001	36.96540	-121.53175	85	70	80	168.31	169.66	S	MON	PT	M	Valley Water
11S04E21P003	369591N1215388W001	36.95917	-121.53889	UK	UK	UK	156.71	157.79	UK	AG	ES	M	Other
11S04E22N001	369592N1215231W001	36.95917	-121.52327	220	UK	UK	154.05	154.41	P	AG	ES	M	Other
11S04E28K001	369486N1215359W001	36.94841	-121.53595	335	295	315	138.4	141.6	P	MON	PT	D	Valley Water
11S04E28K002	369483N1215360W001	36.94851	-121.53594	100	85	95	139	141.5	S	MON	ES	M	Valley Water
11S04E32R002	369296N1215465W001	36.92941	-121.54649	170	UK	UK	144.61	145.11	P	MON (was AG)	ES	M	Valley Water
11S04E33N007	369332N1215509W001	36.93325	-121.55097	20	10	20	131.85	133.9	S	MON	ES	M	Valley Water

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Notes:
Table shows monitoring wells actively monitored by Valley Water as of September 2026. Continued access to wells is not guaranteed, particularly for wells owned by others.
All elevations listed above are reported relative to the North American Vertical Datum of 1988 (NAVD 88).
All horizontal locations listed above are based on the North American Datum of 1983 (NAD 83).
AG = Agricultural well
D = Daily
DO = Domestic well
ES = Electric sounder
ft amsl = feet above mean sea level
ft bgs = feet below groundwater surface
M = Monthly
MI = Municipal well
MON = Monitoring well
P = Principal aquifer
PG = Pressure gauge
PT = Pressure transducer
S = Shallow aquifer
ST = Steel tape
UK = Unknown

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Table I-3. Santa Clara Subbasin Groundwater Quality Monitoring Network

Well Number	Latitude	Longitude	Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Frequency	Owner
05S01E31R011	37.4505	-121.89952	30	10	30	44	43.75	S	MON	Annual	Other
05S01W36K013	37.45387	-121.92047	50	35	50	18	17.6	S	MON	Annual	Valley Water
05S03W36P005	37.45025	-122.14311	200	180	200	24.42	23.59	P	MON	Annual	Valley Water
06S01W01M001	37.43822	-121.92839	265	255	265	22.86	24.97	P	MON (was AG)	Annual	Valley Water
06S01W02N008	37.4344	-121.94791	35	10	15	7.99	7.25	S	MON	Annual	Valley Water
06S01W10N006	37.41827	-121.96848	37	27	32	12.6	12.81	S	MON	Annual	Valley Water
06S01W10N007	37.41824	-121.96843	83	73	78	12.6	12.73	S	MON	Annual	Valley Water
06S01W12G005	37.42556	-121.92480	37	30	35	15.31	15.35	S	MON	Annual	Valley Water
06S01W13C009	37.4143	-121.92556	65	56	61	36.29	36.12	S	MON	Annual	Valley Water
06S01W14L005	37.40819	-121.94386	47	37	47	12	10.9	S	MON	Annual	Valley Water
06S01W15R006	37.40423	-121.95418	57	45	51	15.75	15.75	S	MON	Annual	Valley Water
06S01W17F002	37.41319	-122.00073	210	190	200	2.47	2.24	P	MON	Annual	Other
06S01W17M009	37.41	-122.00554	45	20	45	12.75	12.5	S	MON	Annual	Valley Water
06S01W18R007	37.40458	-122.00727	45	20	45	12.75	12.5	S	MON	Annual	Valley Water
06S01W22K010	37.39450	-121.95913	100	60	65	20.81	19.96	S	MON	Annual	Valley Water
06S01W24H015	37.39615	-121.91556	227	UK	UK	44.5	44.05	P	MON (was AG)	Annual	Valley Water
06S01W24J037	37.3947	-121.91497	51	40	46	46.13	45.8	S	MON	Annual	Valley Water
06S01W24P007	37.39027	-121.92647	96	81	86	29.75	29.75	S	MON	Annual	Valley Water
06S01W26K001	37.38051	-121.93845	65	55	60	35.81	34.9	S	MON	Annual	Valley Water
06S01W26N006	37.37486	-121.94703	100	77	82	42.75	42.75	S	MON	Annual	Valley Water
06S01W26R004	37.3776	-121.93623	330	310	330	31.36	33.09	P	MON	Annual	Valley Water
06S02W05F002	37.44288	-122.10388	50	40	50	6.76	8.36	S	MON	Annual	Valley Water
06S02W05F003	37.44288	-122.10388	200	190	200	6.76	8.76	P	MON	Annual	Valley Water
06S02W07B023	37.42870	-122.12168	45	28	45	14.49	13.34	S	MON	Annual	Valley Water
06S02W08C004	37.4317	-122.10588	45	20	40	11.8	11.49	S	MON	Annual	Valley Water
06S02W16L021	37.40691	-122.08862	40	20	40	38.08	37.65	S	MON	Annual	Valley Water
06S02W17L003	37.40953	-122.10972	122	UK	UK	40	40	S	DO	Annual	Other
06S02W24C008	37.40137	-122.03546	250	UK	UK	32.33	34.83	P	MON	Annual	Valley Water
06S02W24J009	37.3953	-122.02719	55	30	50.5	34.1	33.7	S	MON	Annual	Other

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Well Number	Latitude	Longitude	Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Frequency	Owner
06S02W34J001	37.36459	-122.06258	140	120	130	169.2	169	S	MON	Annual	Valley Water
06S03W01B010	37.44563	-122.13831	101	93.5	98.5	20.25	19.75	S	MON	Annual	Valley Water
07S01E09L007	37.33678	-121.86953	425	405	425	86.94	88.09	P	MON	Annual	Valley Water
07S01E09L008	37.3368	-121.86953	72	62	72	87.07	87.97	S	MON	Annual	Valley Water
07S01E19B002	37.31619	-121.90324	85	75	85	114.85	114.69	S	MON	Annual	Valley Water
07S01E19B006	37.31611	-121.90325	240	220	240	114.85	115.05	P	MON	Annual	Valley Water
07S01E24P001	37.28097	-121.83721	277	164	272	164.03	162.48	P	MON	Annual	Valley Water
07S01E35E003	37.2798	-121.83598	148	46	146	167.84	166.92	S	MON	Annual	Valley Water
07S01W14P002	37.31773	-121.94344	440	420	440	141.46	141.03	P	MON	Annual	Valley Water
07S01W14P005	37.31773	-121.94344	150	130	150	141.46	141.06	S	MON	Annual	Valley Water
07S01W29C005	37.30066	-121.99743	380	360	380	231.12	231.92	P	MON	Annual	Valley Water
07S01W34G003	37.281	-121.9561	150	132	147	205.46	204.41	S	MON	Annual	Valley Water
07S01W34G004	37.28095	-121.95609	300	275	295	205.41	204.37	P	MON	Annual	Valley Water
07S01W35L015	37.27673	-121.94397	300	280	300	218.85	217.97	P	MON	Annual	Valley Water
07S01W35L016	37.27673	-121.94397	180	160	180	218.85	217.96	P	MON	Annual	Valley Water
07S02E19C007	37.316	-121.79729	390	370	390	189.15	188.4	P	MON	Annual	Valley Water
07S02E19C009	37.31601	-121.79729	150	130	150	189.15	188.36	S	MON	Annual	Valley Water
08S01E21B001	37.22797	-121.86740	80	40	80	220	220	S	MI	Annual	Other
08S01E25N003	37.20162	-121.81713	90	21	60	346.2	347.95	S	MI	Annual	Valley Water
08S01W10F002	37.2528	-121.95868	458	98	245	288.06	289.57	P	AG	Annual	Other
08S02E16K001	37.23409	-121.75716	223	192	212	235.57	236.9	P	MON	Annual	Valley Water
08S02E18G009	37.23957	-121.79387	111	80	110	200	200	S	MON	Annual	Other
08S02E18G010	37.23959	-121.79388	179	138	178	197.56	199.18	P	MON	Annual	Valley Water
08S02E22E002	37.2237	-121.74588	110	75	95	240.14	241.78	P	MON	Annual	Valley Water
08S02E36M007	37.19187	-121.70770	120	95	110	294.07	296.89	P	MON	Annual	Valley Water
09S02E01J006	37.17891	-121.69576	165	135	155	315.95	318.69	P	MON	Annual	Valley Water
09S03E07J003	37.16244	-121.67933	230	130	230	346.75	346.75	P	DO	Annual	Other
09S03E09R004	37.1584	-121.64264	380	350	370	405.57	406.18	P	MON	Annual	Other

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Notes:
Table shows monitoring wells actively monitored by Valley Water as of September 2026. Continued access to wells is not guaranteed, particularly for wells owned by others.
All elevations listed above are reported relative to the North American Vertical Datum of 1988 (NAVD 88).
All horizontal locations listed above are based on the North American Datum of 1983 (NAD 83).
AG = Agricultural well
DO = Domestic well
ft amsl = feet above mean sea level
ft bgs = feet below groundwater surface
MI = Municipal well
MON = Monitoring well
P = Principal aquifer
S = Shallow aquifer
UK = Unknown

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Table I-4. Llagas Subbasin Groundwater Quality Monitoring Network

Well Number	Latitude	Longitude	Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Frequency	Owner
09S03E15K009	37.14494	-121.62218	250	150	250	384	384	P	MON	Annual	Other
09S03E20K003	37.13428	-121.66407	100	70	90	354.98	354.78	S	MON	Annual	Valley Water
09S03E21C003	37.14271	-121.64779	200	100	200	374.75	374.75	P	DO	Annual	Other
09S03E34P001	37.10426	-121.63142	163	103	163	320.75	320.75	S	DO/MI	Annual	Other
09S03E35C012	37.11340	-121.61344	61	45	55	325.75	325.75	S	MON	Annual	Valley Water
09S03E36B007	37.11520	-121.59327	225	165	225	350	350	P	DO	Annual	Other
10S03E01A009	37.09957	-121.58521	300	UK	UK	316.75	316.75	P	DO	Annual	Other
10S03E02N002	37.08711	-121.61570	215	155	215	288.6	289.01	P	DO	Annual	Other
10S03E03D007	37.09814	-121.63459	220	UK	UK	326.12	326.05	S	DO	Annual	Other
10S03E12P003	37.07284	-121.59489	182	100	182	265.95	264.95	S	DO	Annual	Other
10S03E13F005	37.06625	-121.59415	55	32	52	262.03	265.13	S	MON	Annual	Valley Water
10S03E14P005	37.06026	-121.61284	198	140	198	264.95	264.95	P	DO	Annual	Other
10S03E25F001	37.03569	-121.59591	165	125	145	221.98	221.88	S	MON	Annual	Valley Water
10S03E36H001	37.02262	-121.58609	440	220	260	209	209	P	MON	Annual	Other
10S03E36H004	37.02262	-121.58611	95	60	90	209	209	S	MON	Annual	Other
10S04E07E031	37.08217	-121.58271	130	UK	UK	286.84	287.39	S	DO	Annual	Other
10S04E07E033	37.08081	-121.58166	228	180	228	285	285	P	DO	Annual	Other
10S04E17K002	37.06320	-121.55324	250	UK	UK	299.54	299.54	P	DO	Annual	Other
10S04E19K006	37.04747	-121.57256	295	175	295	232.75	232.75	P	DO	Annual	Other
10S04E20G008	37.05025	-121.55193	90	80	85	242.18	243.18	S	MON	Annual	Valley Water
10S04E28M005	37.03310	-121.54332	60	50	60	210.26	209.93	S	MON	Annual	Valley Water
10S04E32E006	37.02361	-121.56269	285	225	280	206	206	P	MON	Annual	Other
11S03E01Q002	37.00036	-121.58945	44	29	44	216.59	216.38	S	MON	Annual	Valley Water
11S03E03H002	37.00845	-121.62356	48	38	48	241.5	240.92	S	MON	Annual	Valley Water
11S04E03G005	37.01133	-121.51669	85	70	80	190.44	192.4	S	MON	Annual	Valley Water
11S04E04F007	37.00798	-121.54064	55	40	50	194.71	196.78	S	MON	Annual	Valley Water
11S04E05F001	37.00916	-121.55800	107	UK	UK	189.56	189.76	S	MON (was AG)	Annual	Valley Water
11S04E05H002	37.00812	-121.54064	260	120	260	194.32	195.6	P	MON (was AG)	Annual	Valley Water
11S04E07F004	36.99220	-121.57565	200	160	180	211.38	211.29	P	MON	Annual	Valley Water

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Well Number	Latitude	Longitude	Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Frequency	Owner
11S04E08K008	36.99108	-121.55194	103	48	98	185	185	S	MON	Annual	Other
11S04E10L017	36.99058	-121.51823	150	50	150	160	160	S	DO	Annual	Other
11S04E11J007	36.98934	-121.49358	230	120	220	160	160	P	DO	Annual	Other
11S04E15P003	36.97366	-121.51771	248	161	242	150	150	P	DO	Annual	Other
11S04E21J003	36.96247	-121.53084	200	160	200	160	160	P	DO	Annual	Other
11S04E28K001	36.94841	-121.53595	335	295	315	138.4	141.6	P	MON	Annual	Valley Water
11S04E28K002	36.94851	-121.53594	100	85	95	139	141.5	S	MON	Annual	Valley Water

Notes:
Table shows monitoring wells actively monitored by Valley Water as of September 2026. Continued access to wells is not guaranteed, particularly for wells owned by others.
All elevations listed above are reported relative to the North American Vertical Datum of 1988 (NAVD 88).
All horizontal locations listed above are based on the North American Datum of 1983 (NAD 83).
AG = Agricultural well
DO = Domestic well
ft amsl = feet above mean sea level
ft bgs = feet below groundwater surface
MI = Municipal & industrial well
MON = Monitoring well
P = Principal aquifer
S = Shallow aquifer
UK = Unknown

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Table I-5. Llagas Subbasin Recycled Water Monitoring Network

Well Number	Latitude	Longitude	Depth (ft bgs)	Top of First Screen (ft bgs)	Bottom of Last Screen (ft bgs)	Ground Surface Elevation (ft amsl)	Measuring Point Elevation (ft amsl)	Aquifer	Well Type	Frequency	Owner
11S03E01E003	37.00680	-121.60083	100	77	97	224.45	223.99	S	MON	Annual	Valley Water
11S03E01E004	37.00731	-121.60063	43	25	40	225.61	225.31	S	MON	Annual	Valley Water
11S03E01E005	37.00683	-121.60086	43	20	40	224.68	227.23	S	MON	Annual	Valley Water
11S03E01Q002	37.00036	-121.58945	44	29	44	216.59	216.38	S	MON	Annual	Valley Water
11S03E02H004	37.00717	-121.60174	43	20	40	226.19	225.99	S	MON	Annual	Valley Water
11S03E12A002	36.99870	-121.58642	45	30	45	210.63	210.22	S	MON	Annual	Valley Water
11S03E12A003	36.99707	-121.58434	45	30	45	211.84	211.4	S	MON	Annual	Valley Water
11S04E07F004	36.99220	-121.57565	200	160	180	211.38	211.29	S	MON	Annual	Valley Water
11S04E07J005	36.98928	-121.56498	55.5	33	53	197.51	196.92	S	MON	Annual	Valley Water
11S04E08C003	36.99593	-121.55772	38	UK	UK	188.97	189.04	S	MON	Annual	Valley Water
11S04E08D006	36.99584	-121.56032	34	UK	UK	190.39	190.03	S	MON	Annual	Valley Water
11S04E08M013	36.98942	-121.56354	54	36	51	194.38	193.97	S	MON	Annual	Valley Water
11S04E08M015	36.98938	-121.56336	80	57	77	194.3	194.2	S	MON	Annual	Valley Water
11S04E08N009	36.98691	-121.56419	60	37	57	193.36	192.76	S	MON	Annual	Valley Water
11S04E09D002	36.99678	-121.54634	40	22	40	178.01	177.82	S	MON	Annual	Valley Water
11S04E09M001	36.99118	-121.54401	40	UK	UK	175.17	175.36	S	MON	Annual	Valley Water
11S04E15M002	36.97519	-121.52860	40	10	30	155.75	158.9	S	MON	Annual	Other
11S04E16F001	36.98109	-121.53639	40	26	44	172.12	174.27	S	MON	Annual	Other
11S04E16G003	36.98070	-121.53189	120	100	110	159.4	161.65	S	MON	Annual	Other
11S04E16M011	36.97658	-121.54348	47	27	40	175.85	178.43	S	MON	Annual	Other

Notes:
Table shows monitoring wells actively monitored by Valley Water as of September 2026. Continued access to wells is not guaranteed, particularly for wells owned by others.
All elevations listed above are reported relative to the North American Vertical Datum of 1988 (NAVD 88).
All horizontal locations listed above are based on the North American Datum of 1983 (NAD 83).
ft amsl = feet above mean sea level
ft bgs = feet below groundwater surface
MON = Monitoring well
S = Shallow aquifer
UK = Unknown

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Valley Water

Santa Clara Valley Water District
5750 Almaden Expressway, San Jose, CA 95118-3686
Phone: (408) 265-2600 Fax: (408) 266-0271
www.valleywater.org

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