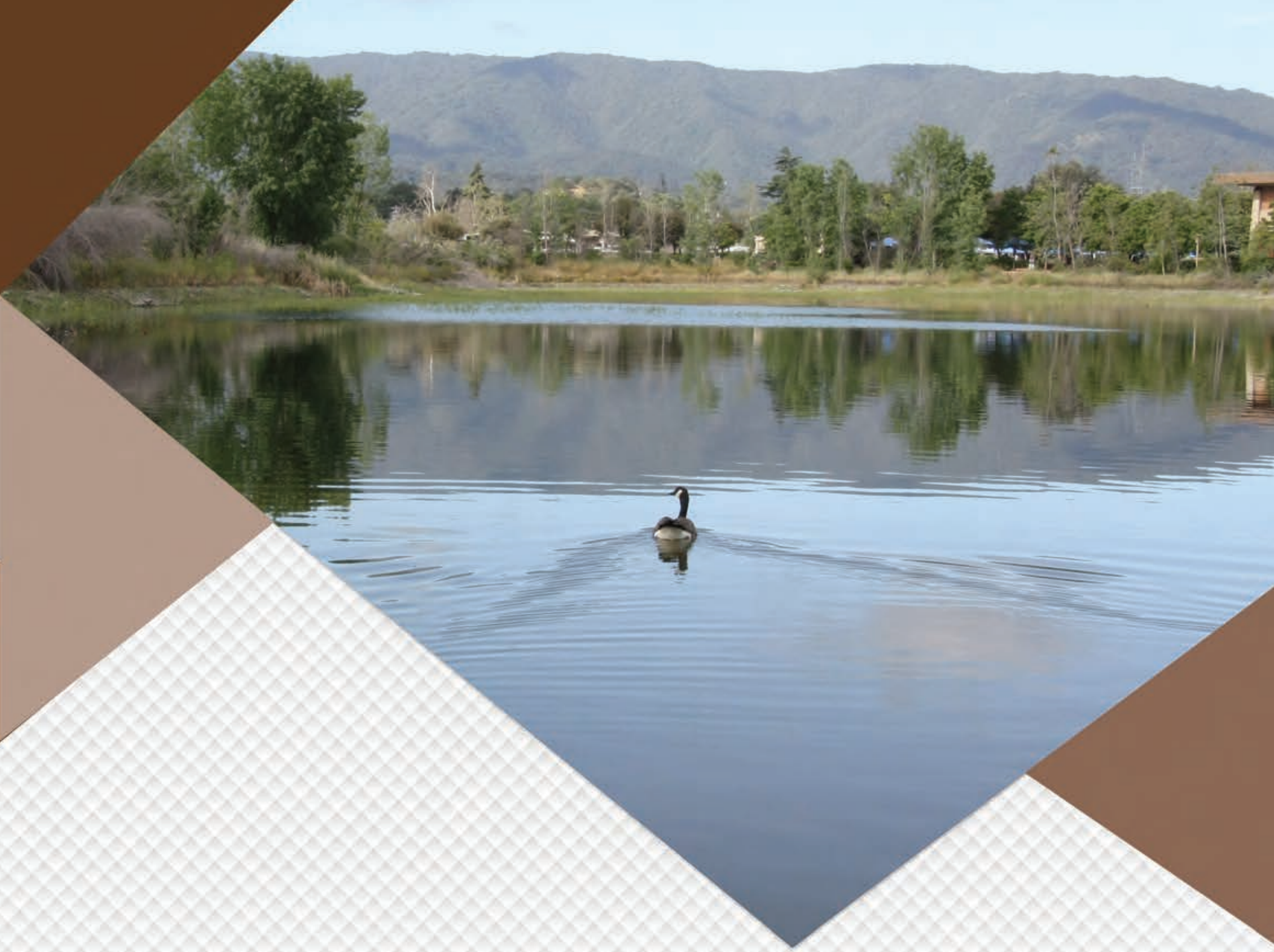

Annual Groundwater Report

For Calendar Year 2016

Santa Clara Valley Water District

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2016 Annual Groundwater Report

EXEECUTIVE SUMMARY

This annual Groundwater Report describes groundwater use, levels, quality, storage, and land subsidence in the Santa Clara and Llagas Subbasins[1] for Calendar Year (CY) 2016. Groundwater monitoring data are used to evaluate outcome measures identified in the District's Groundwater Management Plan (GWMP).[2] These measures help evaluate performance in meeting **Board Water Supply Objective 2.1.1: "Aggressively protect groundwater from the threat of contamination and maintain and develop groundwater to optimize reliability and to minimize land subsidence and salt water intrusion."**

Groundwater provided nearly 40 percent of the water used in the county in CY 2016, the fifth consecutive year of California's recent drought. To help sustain and protect groundwater supplies, the District:

- Recharged groundwater with 140,500 acre-feet (AF) of local and imported surface water,
- Reduced groundwater demands by approximately 187,000 AF through treated water deliveries, water conservation, and water recycling (which collectively provide in-lieu groundwater recharge),
- Requested a 20% reduction in water use compared to 2013, which was exceeded by the community, with an impressive 28% water use reduction,
- Conducted extensive monitoring of water levels, groundwater quality, and land subsidence,
- Implemented the well ordinance program and other programs to minimize threats to groundwater quality, and
- Worked with basin stakeholders, land use agencies, and regulatory agencies to protect local groundwater resources.

Compliance with the Sustainable Groundwater Management Act (SGMA) was a major District groundwater management focus in CY 2016. The District was recorded as the exclusive Groundwater Sustainability Agency (GSA) for the Santa Clara and Llagas Subbasins on June 22, 2016 by the California Department of Water Resources (DWR). The District's scientific basin boundary modification request for the Llagas Subbasin was also approved by DWR. The District prepared the 2016 Groundwater Management Plan for the Santa Clara and Llagas Subbasins (GWMP), which was adopted by the Board of Directors in November 2016 and submitted it to DWR as an Alternative to a Groundwater Sustainability Plan under SGMA in December 2016.

Table ES-1 shows data for key indicators in CY 2016 as compared to CY 2015 and the past five years. Groundwater levels and storage have recovered significantly, with about 75,000 AF[3] added storage to groundwater reserves in 2016. CY 2016 water levels increased as compared to CY 2015 due to reduced pumping and a large increase in recharge. Water levels were well above historical minimums in all groundwater level index wells. Estimated end of 2016 total groundwater storage was 307,000 AF, which falls in the "Normal" stage (Stage 1) of the District's Water Shortage Contingency Plan. Groundwater quality remained very good, with the majority of water supply wells meeting drinking water standards, except for nitrate in South County.

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[1] California Department of Water Resources Basins 2-9.02 and 3-3.01, respectively

[2] Santa Clara Valley Water District, Groundwater Management Plan, November 2016

[3] Groundwater storage estimates presented in this report are as of June 2017. Storage estimates are updated in other reports as additional data becomes available.

North County Groundwater Summary

Groundwater use in the Santa Clara Plain (the northern portion of the Santa Clara Subbasin) was 56,300 AF in CY 2016, a 15% decrease from CY 2015. Pumping locations and use remained relatively stable, with nearly all groundwater used for municipal and industrial (M&I) purposes. Groundwater levels recovered significantly compared to 2015, and were well above historical lows. Groundwater levels in the Santa Clara Plain were also higher than the minimum thresholds established to protect against the risk of land subsidence. Estimated groundwater storage at the end of 2016 was 278,800 AF, which was 62,500 AF higher than CY 2015.

North County groundwater is generally of very high quality; in CY 2016, 99% of water supply wells tested met all health-based drinking water standards. The only exception was one domestic well in which nitrate exceeded the drinking water standard. Public water systems must comply with drinking water standards, which may require treatment or blending prior to delivery.

South County Groundwater Summary

In CY 2016, groundwater pumping in the Coyote Valley (the southern portion of the Santa Clara Subbasin) and Llagas Subbasin was 10,900 AF and 41,800 AF, respectively. Pumping increased by 17% in the Coyote Valley and 5% in the Llagas Subbasin compared to CY 2015. The distribution of pumping for M&I, domestic, and agricultural uses showed an increase in agricultural use as compared to CY 2015. 2016 groundwater levels remained well above historical lows at index wells and were higher than 2015 levels. Estimated groundwater storage in South County at the end of 2016 was 28,600 AF, which is 12,600 AF higher than 2015.

Groundwater quality in South County is generally good, with most water supply wells meeting drinking water standards, except for nitrate. Nitrate remains the primary groundwater protection challenge due to historic and ongoing sources. Nitrate was detected above the drinking water standard in about 22% of South County water supply wells tested (primarily domestic wells). For this reason, the outcome measure related to drinking water standards was not met. The District continues to offer basic well testing (including nitrate) to eligible domestic well owners. As part of the Safe Clean Water Program, the District also approved five nitrate treatment system rebates for private well users exposed to elevated nitrate.

The occurrence of perchlorate in the Llagas Subbasin from a former highway safety flare plant has been substantially reduced due to ongoing managed recharge and removal of perchlorate from the source area. The perchlorate plume, which once extended from Morgan Hill to Gilroy (about 10 miles), now extends from Morgan Hill to the San Martin Airport, shrinking about 7 miles. The District continues to closely monitor related activities and advocate for expedited and thorough cleanup.

Table ES-1. CY 2016 Groundwater Conditions as Compared to Other Years

Index[1]	2016	Compared to 2015	Compared to Last 5 Years (2011 - 2015)
Managed Recharge (AF)	140,500	Up 156%	Up 90%
Groundwater Pumping (AF)	109,000	Down 5%	Down 21%
Groundwater as % of Total Water Use	39%	Down 3%	Down 9%
Groundwater Levels (feet)[2]			
Santa Clara Plain	77.8	Up 28 feet	Up 15.6 feet
Coyote Valley	270.7	Up 11.4 feet	Up 7.6 feet
Llagas Subbasin	213.9	Up 25 feet	Up 4.6 feet
End of Year Groundwater Storage (AF)	307,000	Up 32%	--
Land Subsidence (feet/year)[3]	0.002	Decrease	--
Groundwater Quality[4]			
Santa Clara Plain – Median TDS, mg/L	410	No Change	No Change
Coyote Valley – Median TDS, mg/L	376	No Change	No Change
Llagas Subbasin – Median TDS, mg/L	419	No Change	No Change
Santa Clara Plain –Median Nitrate, mg/L	3	No Change	No Change
Coyote Valley – Median Nitrate, mg/L	4.9	No Change	No Change
Llagas Subbasin – Median Nitrate, mg/L	4.5	No Change	No Change

Notes:

1. Groundwater levels and quality are shown for three groundwater management areas: the Santa Clara Plain and Coyote Valley (which comprise the Santa Clara Subbasin) and the Llagas Subbasin.
2. Groundwater elevations represent the average of all readings at groundwater level-index wells for the time period noted.
3. Measured compaction was less than the District's established tolerable rate of 0.01 feet per year. Throughout 2016, water levels at all ten subsidence index wells were above thresholds established to prevent inelastic subsidence.
4. Values shown represent median groundwater quality for all principal aquifer zone wells tested. Nitrate is measured as Nitrogen (N). Data from shallow monitoring wells is excluded, including wells with high TDS due to saline intrusion. Individual wells sampled for TDS and nitrate vary each year so a straight numeric comparison of median values is not performed. "No change" indicates no significant difference using an appropriate statistical test (Mann-Whitney Test) at 95% confidence level. An entry of either "Increase" or "Decrease" indicates a statistically significant change between the time period indicated.

Outcome measures related to groundwater storage and land subsidence were met, except for groundwater storage in the Coyote Valley. Groundwater quality outcome measures were met for agricultural objectives and stable/improving trends for TDS and nitrate. However, outcome measures were not met for water supply well quality (due to South County nitrate) and chloride trends. Table ES-2 summarizes outcome measure performance and recommended actions to address measures not being met.

Groundwater Outlook

Groundwater storage was critical in helping to meet the county's water supply needs during the recent drought, and reserves were reduced by about 123,000 AF between the end of 2012 and end of 2015. Groundwater levels and storage have shown significant rebound with improved rainfall and increased surface water available for managed recharge in CY 2016. The estimated end of year storage for 2016 was above the 300,000 AF target and water levels did not fall below subsidence thresholds in related index wells. The District Board set a 20% water use reduction target (compared to 2013) in June 2016.

The District continues to actively monitor groundwater levels, land subsidence, and water quality to support operational decisions and ensure groundwater resources are protected. To help ensure water supply reliability, the District is also evaluating potential Indirect Potable Reuse (IPR) projects to provide a drought-proof source of purified water for groundwater replenishment. The District will also continue to track proposed legislation, policies, and regulatory standards that may impact groundwater resources or the District's ability to manage them.

Table ES-2. Summary of 2016 Outcome Measure Performance and Action Plan

Groundwater Storage	**OM 2.1.1.a.** Greater than 278,000 AF of projected end of year groundwater storage in the Santa Clara Plain. Estimated end of 2016 storage: 278,800 AF **OM 2.1.1.b.** Greater than 5,000 AF of projected end of year groundwater storage in the Coyote Valley. Estimated end of 2016 storage: 3,800 AF **OM 2.1.1.c.** Greater than 17,000 AF of projected end of year groundwater storage in the Llagas Subbasin. Estimated end of 2016 storage: 24,800 AF
	Action Plan for OM 2.1.1.b: The District Board of Directors called for a 20% countywide water use reduction in June 2016.
Groundwater Levels and Subsidence	**OM 2.1.1.d.** 100% of subsidence index wells with groundwater levels above subsidence thresholds. All ten subsidence index wells had groundwater levels above thresholds in 2016.
Groundwater Quality	**OM 2.1.1.e.** At least 95% of countywide water supply wells meet primary drinking water standards. Only 87% of countywide water supply wells tested in 2016 met primary drinking water standards due to elevated nitrate in South County (mainly in domestic wells). If nitrate is not included, 100% of water supply wells met primary drinking water standards. **OM 2.1.1.f.** At least 90% of South County wells meet Basin Plan agricultural objectives. Nearly all wells (98%) met Basin Plan agricultural objectives.
	Action Plan for OM 2.1.1.e: Implement Salt and Nutrient Management Plans to address salt loading, continue free testing program for domestic wells, and work to increase participation in the nitrate treatment system rebate program.
Groundwater Quality Trends	**OM 2.1.1.g.** At least 90% of wells in both the shallow and principal aquifer zones have stable or decreasing concentrations of nitrate, chloride, and total dissolved solids. This measure is nearly met for chloride, with 86% of wells showing stable or decreasing concentrations. The measure is met for nitrate and total dissolved solids as stable or decreasing concentrations were observed in 90% and 95% of wells, respectively.
	Action Plan for OM 2.1.1.g: Implement Salt and Nutrient Management Plans to address salt loading.

Outcome measure met

Outcome measure not met

CHAPTER 1 – INTRODUCTION

The Santa Clara Valley Water District (District) has the responsibility and authority to manage the Santa Clara and Llagas subbasins in Santa Clara County per an act of the California legislature.[4] The District also formally became the Groundwater Sustainability Agency (GSA) for these subbasins in 2016. The District's comprehensive groundwater management programs and investments have resulted in sustainable groundwater conditions for many decades. The District's objectives and authority related to groundwater management under the District Act 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 the District'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 Board of Directors (Board) adopted Water Supply Objective 2.1.1, which reflects the mission to protect groundwater resources: ***"****Aggressively protect groundwater from the threat of contamination and maintain and develop groundwater to optimize reliability and to minimize land subsidence and salt water intrusion***."** Pursuant to the District Act and Board policy, the District has identified the following basin management objectives in the 2016 Groundwater Management Plan (GWMP):[5]

- Groundwater supplies are managed to optimize water supply reliability and minimize land subsidence.
- Groundwater is protected from existing and potential contamination, including salt water intrusion.

Purpose

This annual report describes groundwater conditions in the Santa Clara and Llagas subbasins for Calendar Year (CY) 2016 including groundwater use, water levels, storage, quality, and land subsidence. The following outcome measures (OM) derived from the GWMP are also assessed to evaluate performance in meeting Water Supply Objective 2.1.1:

- OM 2.1.1.a. Greater than 278,000 AF[6] of projected end of year groundwater storage in the Santa Clara Plain.
- OM 2.1.1.b. Greater than 5,000 AF of projected end of year groundwater storage in the Coyote Valley.
- OM 2.1.1.c. Greater than 17,000 AF of projected end of year groundwater storage in the Llagas Subbasin.
- OM 2.1.1.d. 100% of Santa Clara Plain subsidence index wells with groundwater levels above subsidence thresholds.
- OM 2.1.1.e. At least 95% of countywide water supply wells meet primary drinking water standards.
- OM 2.1.1.f. At least 90% of Coyote Valley and Llagas Subbasin wells meet Basin Plan agricultural objectives.
- OM 2.1.1.g. At least 90% of wells have stable or decreasing concentrations of nitrate, chloride, and total dissolved solids.

Study Area

This report presents information for the Santa Clara and Llagas subbasins, which are managed by the District and are identified by the California Department of Water Resources (DWR) as Basin 2-9.02 and Basin 3-3.01, respectively (Figure 1). The District divides the Santa Clara Subbasin into two groundwater management areas, the Santa Clara Plain and the Coyote Valley, due to different land use and management characteristics. The Santa Clara and Llagas subbasins are separated by a groundwater divide near Cochrane Road near Morgan Hill. Groundwater in the Santa Clara Subbasin generally flows northwest toward San Francisco Bay, while flow in the Llagas Subbasin is generally to the southeast toward the Pajaro River. Both the Santa Clara Plain and Llagas Subbasin have confined and recharge areas. Within the confined areas, low permeability clays and silts separate shallow and principal aquifers, with the latter defined as aquifer materials greater than about 150 feet below ground surface.

In 2016, DWR considered revisions to basin boundaries as allowed by the Sustainable Groundwater Management Act (SGMA). DWR revised the boundaries of both the Santa Clara and Llagas subbasins to correspond with the San Mateo, Alameda, and San Benito county lines. DWR also approved a District request to modify the eastern boundary of the Llagas Subbasin by removing areas underlain by bedrock and sediments that do not contain significant quantities of groundwater. Figure 1 illustrates the current DWR basin boundaries, including the revised Llagas Subbasin.

The information in this report is summarized by groundwater management area or by groundwater charge zone (Figure 2). Charge Zone W-2 (North County) generally coincides with the Santa Clara Plain, while Zone W-5 generally overlaps the combined area of the Coyote Valley and Llagas Subbasin.

Report Content

In addition to this Introduction, this Annual Groundwater Report for 2016 includes the following chapters:

- Chapter 2: Groundwater Pumping, Recharge, and Water Balance
- Chapter 3: Groundwater Levels and Storage
- Chapter 4: Land Subsidence
- Chapter 5: Groundwater Quality
- Chapter 6: Other Groundwater Management Activities
- Chapter 7: Conclusions

Figure 1. Santa Clara and Llagas Subbasins

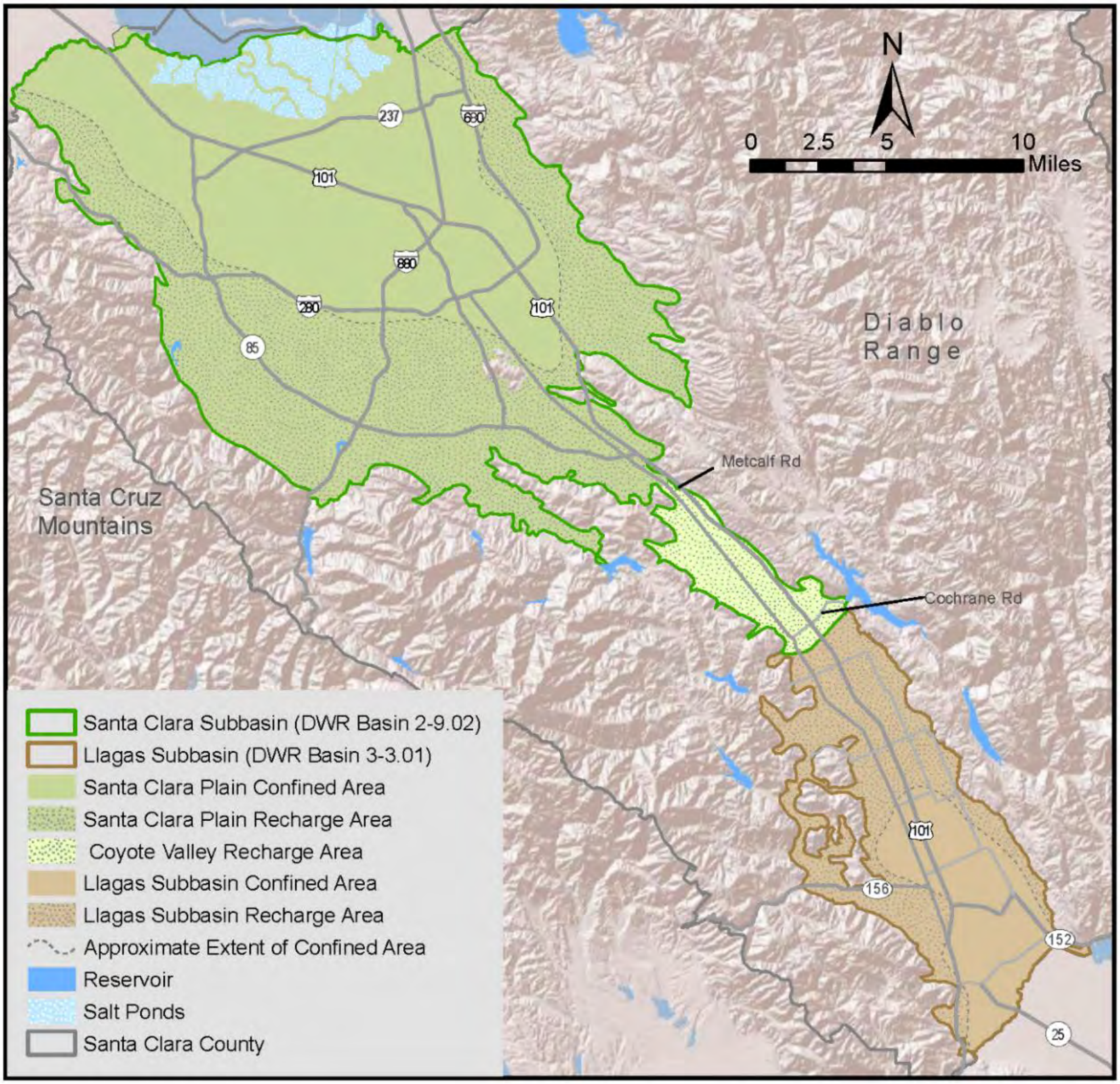
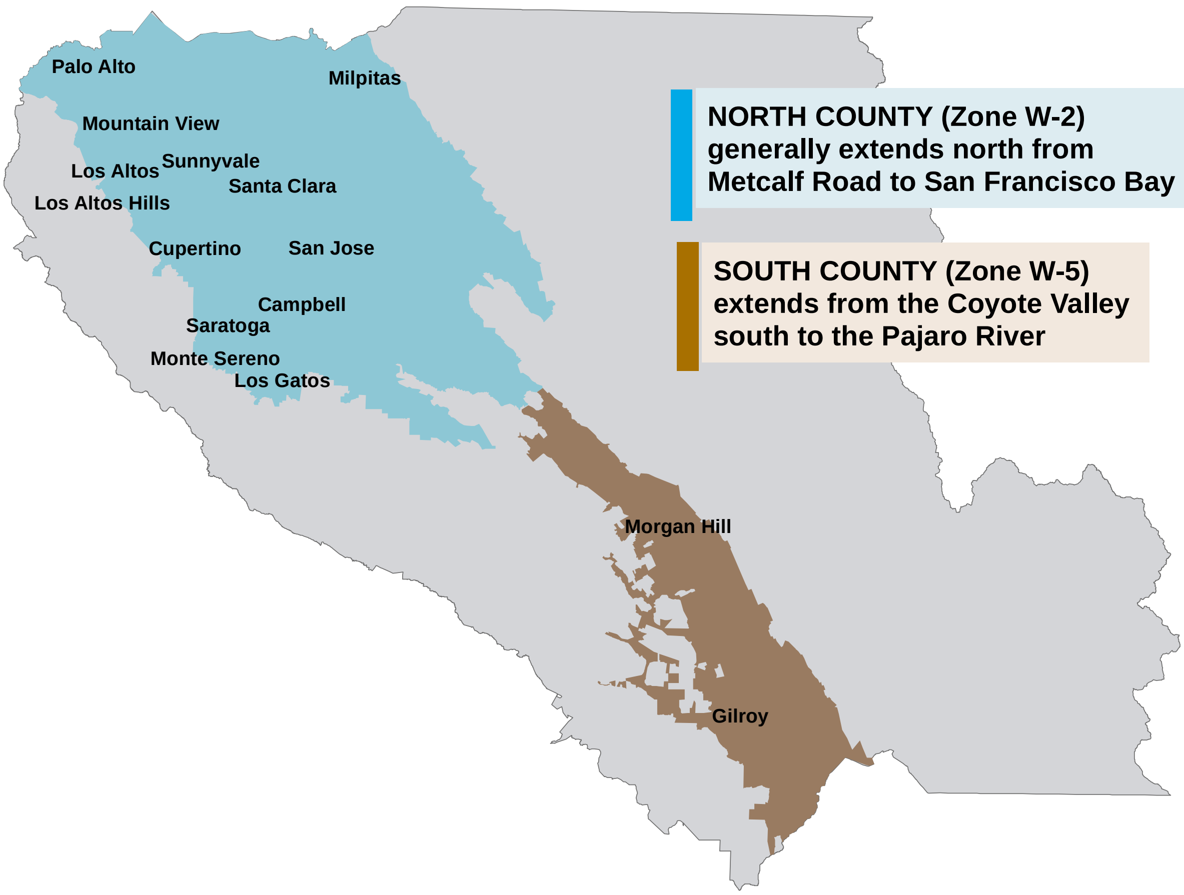


Figure 2. Groundwater Charge Zones



CHAPTER 2 – GROUNDWATER PUMPING, RECHARGE, AND WATER BALANCE

Countywide groundwater pumping in CY 2016 was 109,000 AF, providing 39 percent of the water used by county residents and businesses. Compared to CY 2015, groundwater pumping decreased 15 percent in the Santa Clara Plain. Pumping increased 10 percent in the Coyote Valley and 4 percent in the Llagas Subbasin. Due to improved rainfall conditions in CY 2016 and available surface water supplies, the District operated an above-normal managed recharge program, using about 141,000 AF of local and imported water to replenish the groundwater subbasins. The managed recharge volume exceeded that of normal years due to fine sediment removal in recharge ponds by the District during the drought and because the soil underlying the creeks and ponds was very dry after the prolonged drought. In-lieu recharge, including treated water deliveries, recycled water use, and water conservation programs reduced demands on groundwater by approximately 187,000 AF.

The primary inflow to the subbasins was managed recharge, providing over 72% of the total inflow. Groundwater pumping accounted for over 92% of the subbasin outflows. Due to improved water supply conditions, the inflows exceeded the outflows, resulting in a net increase in storage of 75,100 AF between 2015 and 2016.

2.1 Groundwater Pumping

Approximately 109,000 AF of groundwater was pumped in Santa Clara County in CY 2016, compared to 116,000 AF in CY 2015. Figures 3 and 4 show the location and volume of CY 2016 groundwater pumping, and Table 1 summarizes pumping by area and use category.

Groundwater in North County is used primarily for M&I purposes, with minimal agricultural or domestic use. In South County, agricultural use is more significant. This is especially evident in the Llagas Subbasin, where 56% of the use is for agriculture. While the quantity of groundwater used for domestic purposes is relatively small in South County, there are several thousand individual wells that reported groundwater use (Table 2).

Table 1. CY 2016 Groundwater Pumping by Use (AF)

Use	Zone W-2 North County	Zone W-5 South County		Total
	Santa Clara Plain	Coyote Valley	Llagas Subbasin	
Municipal & Industrial (M&I)	55,400	8,450	16,560	80,410
Domestic	130	220	2,010	2,360
Agricultural	720	2,210	23,250	26,180
Total	**56,250**	**10,880**	**41,820**	**108,950**

Note: Pumping for wells reporting semi-annually or annually (primarily domestic and agricultural) is estimated as validated data is not yet available.

Table 2. Number of Wells Reporting Groundwater Use in CY 2016

Use	Zone W-2 North County	Zone W-5 South County		Total
	Santa Clara Plain	Coyote Valley	Llagas Subbasin	
Municipal & Industrial (M&I)	674	62	257	993
Domestic	318	325	2,473	3,116
Agricultural	36	87	537	660
Total	**1,028**	**474**	**3,267**	**4,769**

Note: Some wells may report pumping for more than one use category (e.g., domestic and agricultural).

Figure 3. CY 2016 Zone W2 Groundwater Pumping

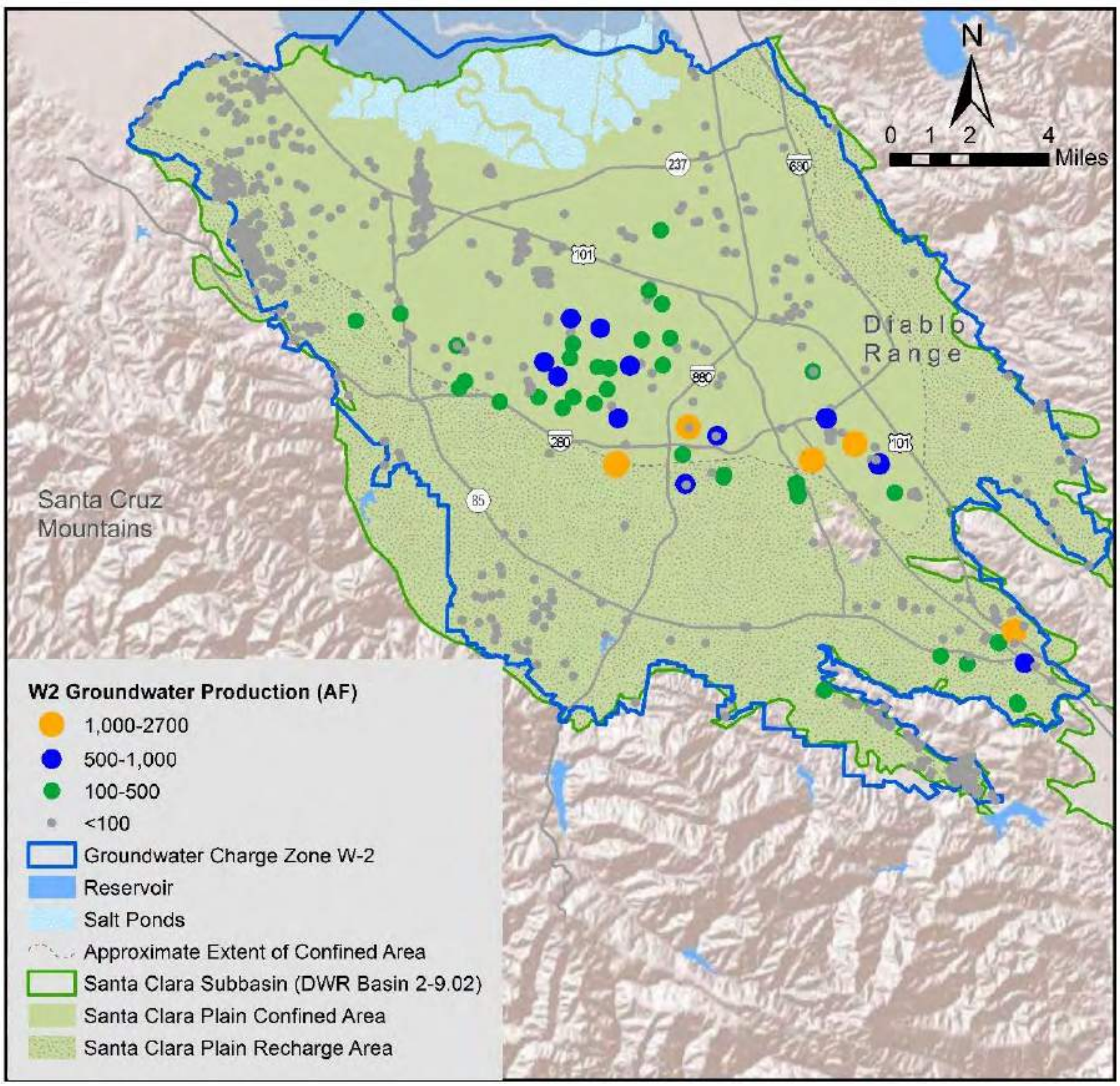
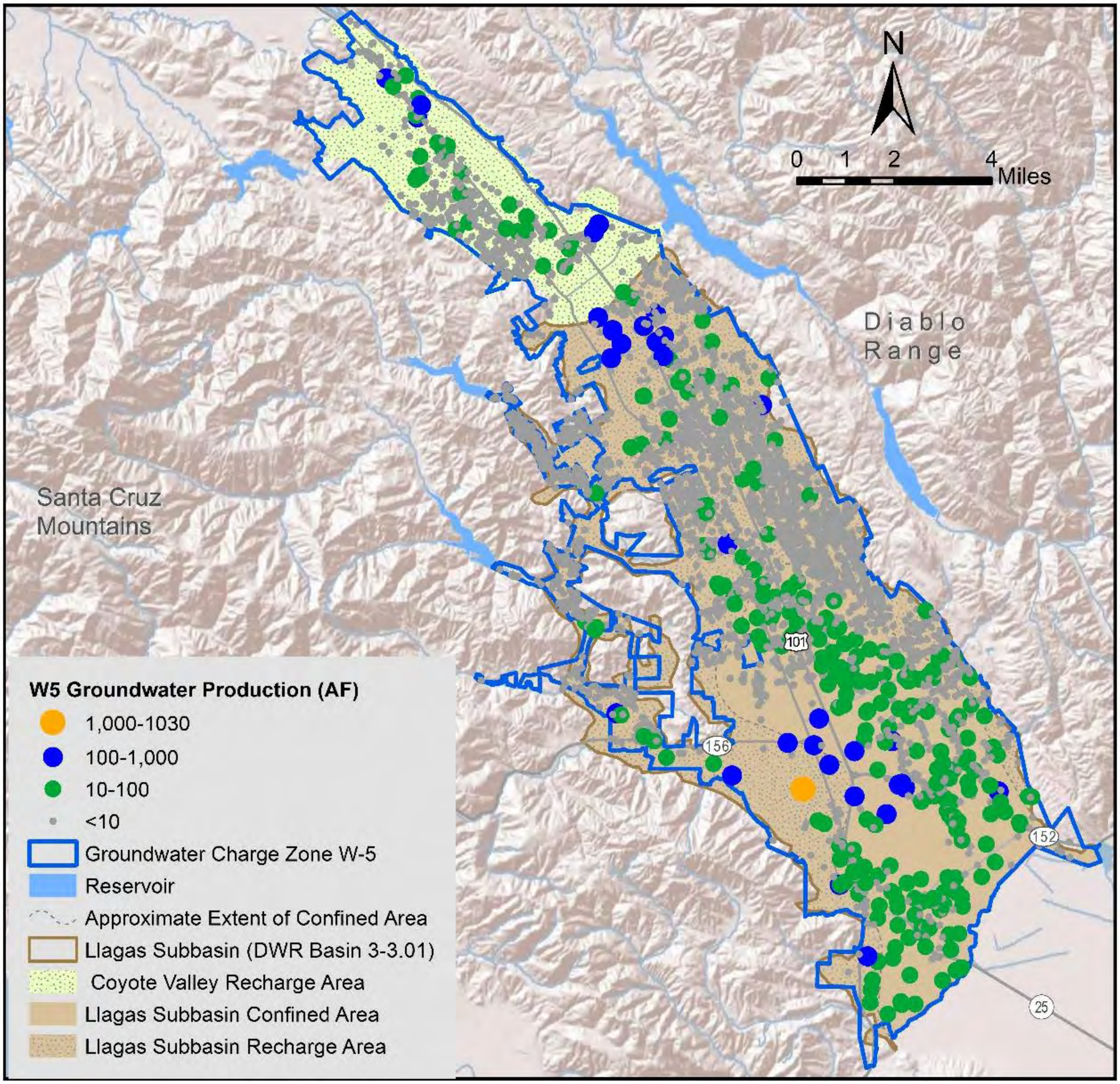


Figure 4. CY 2016 Zone W5 Groundwater Pumping



Groundwater Pumping Trends

Groundwater pumping is largely offset by the District's managed recharge of local and imported surface water in normal or wet years (Figure 5). Over the last 25 years, managed recharge has averaged 63% of the amount of groundwater pumped.

Countywide, total water use was 278,000 AF in CY 2016, approximately the same as in CY 2015. Countywide groundwater pumping was down about 6% from the previous year (Table 3). Groundwater use decreased 15% in the Santa Clara Plain but increased 10% and 4% in the Coyote Valley and Llagas Subbasin, respectively. Since groundwater is the only potable water supply for the Coyote Valley and Llagas Subbasin, the increase in total water use is reflected in pumping. Figure 6 shows the countywide water use by source, including groundwater, treated water, San Francisco Public Utility Commission (SFPUC) supplies, local surface water and recycled water. Groundwater provided 39% of the total water used countywide in CY 2016.

Groundwater pumping and use patterns over time are shown in Figure 7 for each of the groundwater management areas. In the Santa Clara Plain, a significant drop in groundwater pumping is noted in the late 1980s following completion of the District's Santa Teresa Water Treatment Plant (WTP). Since then, pumping has averaged about 100,000 AF per year. A notable increase in pumping in the Coyote Valley occurred in 2006 when a water retailer installed new wells and began extracting water to serve customers in the Santa Clara Plain. This increased the average annual pumping volume by about 5,000 AF. Pumping in the Llagas Subbasin has remained relatively stable over the period of record.

Table 3. CY 2016 Groundwater Pumping Compared to Other Years (AF)

Period	Zone W-2	Zone W-5		Total
	North County	South County		
	Santa Clara Plain	Coyote Valley	Llagas Subbasin	
2016	56,250	10,880	41,820	108,950
2015	65,880	9,870	40,058	115,808
5 Year Average (2012-2016)	81,670	11,073	43,373	136,116
Period of Record (Average)	**113,194**	**8,813**	**42,502**	

Note: The period of record is 1981-2016 for the Santa Clara Plain and 1988-2016 for Coyote Valley and Llagas Subbasin.

Major Groundwater Users

The largest groundwater users in each charge zone are shown on Figure 8. Water retailers are the primary users in North County, accounting for over 87% of all pumping in 2016. San Jose Water Company is the largest individual user, followed by other retailers and a few large industrial users. Unlike North County, about 53% of pumping in South County was from numerous individual pumpers including agricultural and domestic users. In South County, water retailers' pumping accounted for about 37% of groundwater use. Other large users include golf courses and industrial users.

Figure 5. Countywide Groundwater Pumping and Managed Recharge

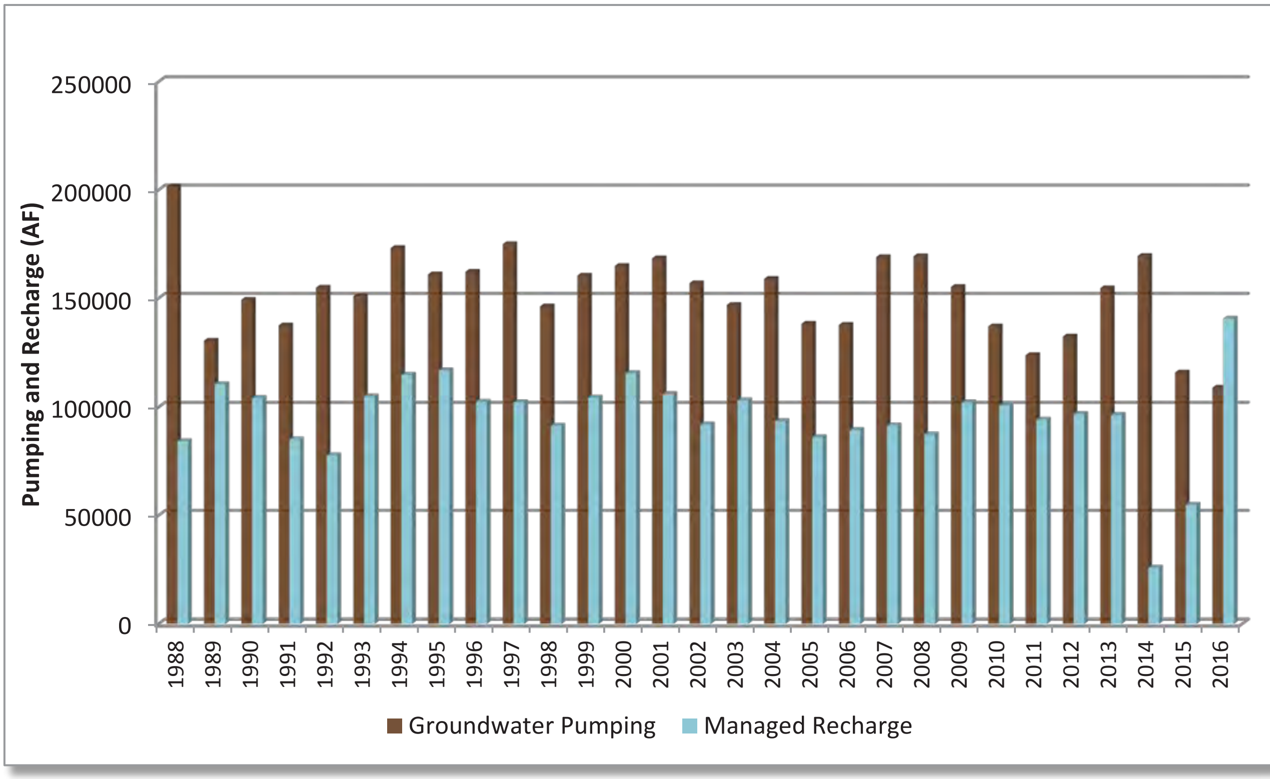


Figure 6. Countywide Water Use

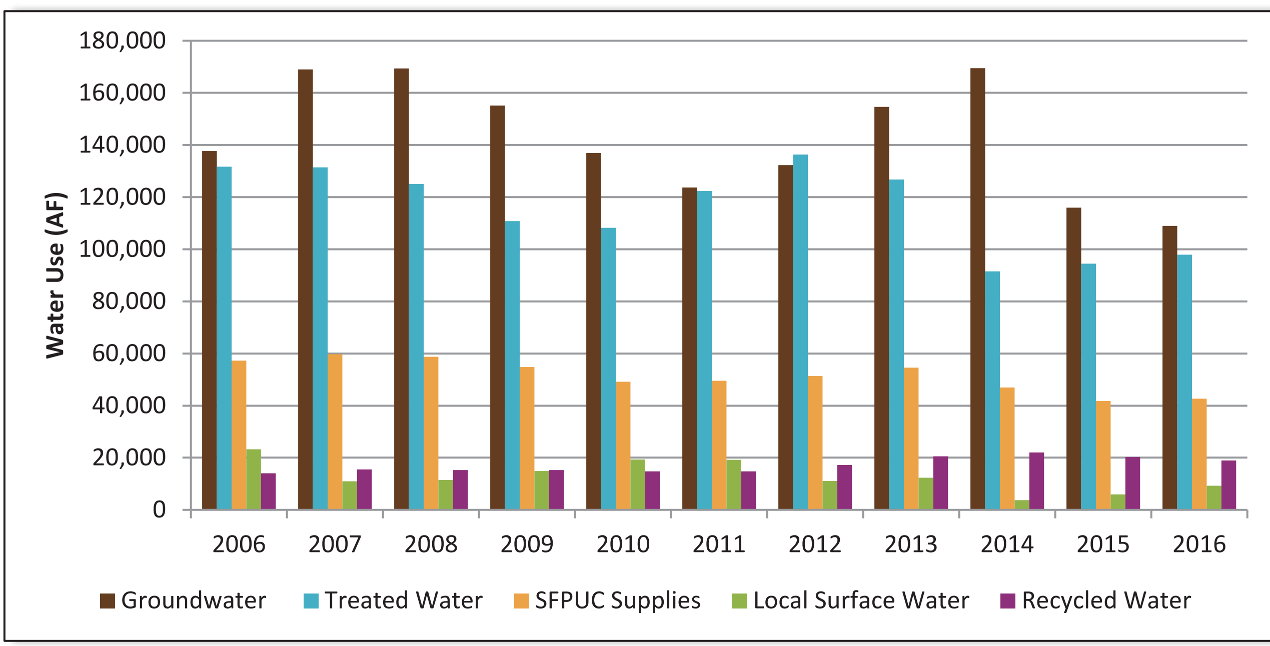


Figure 7. Groundwater Pumping by Use Category

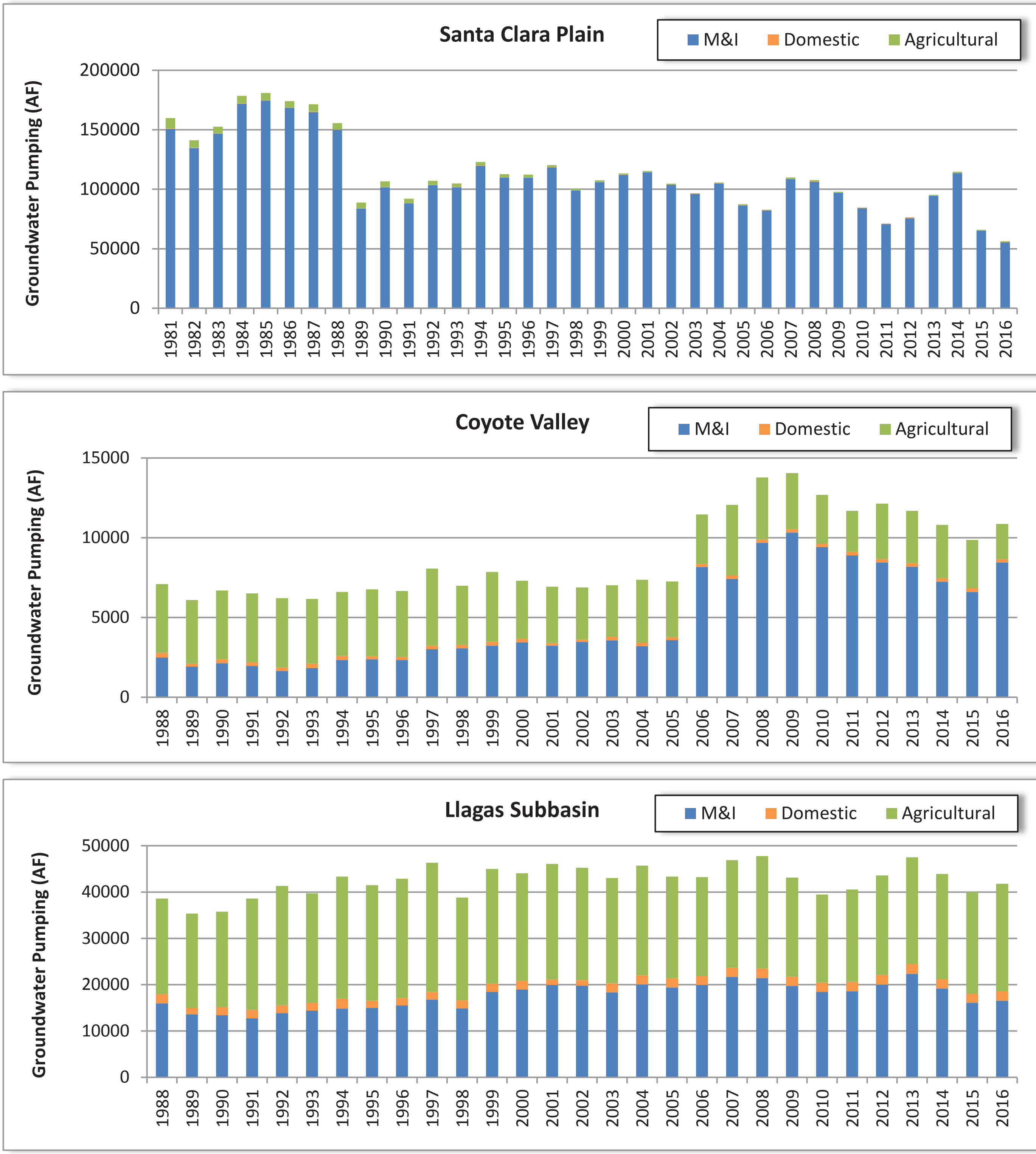
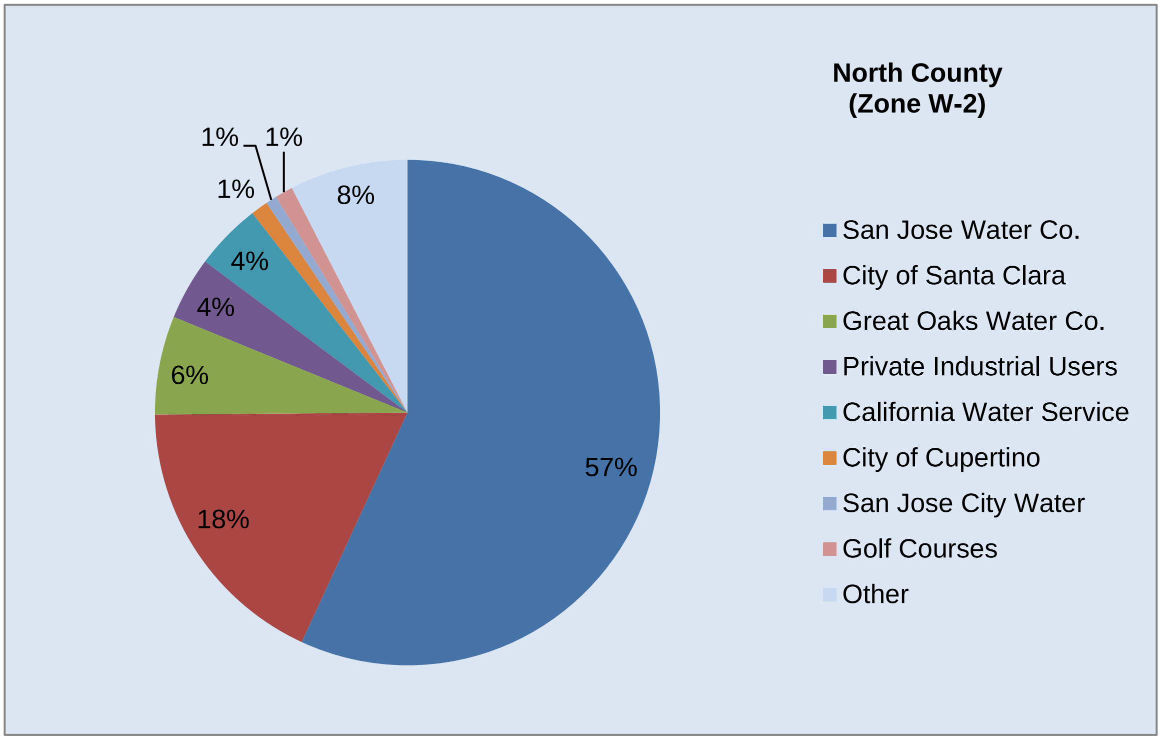
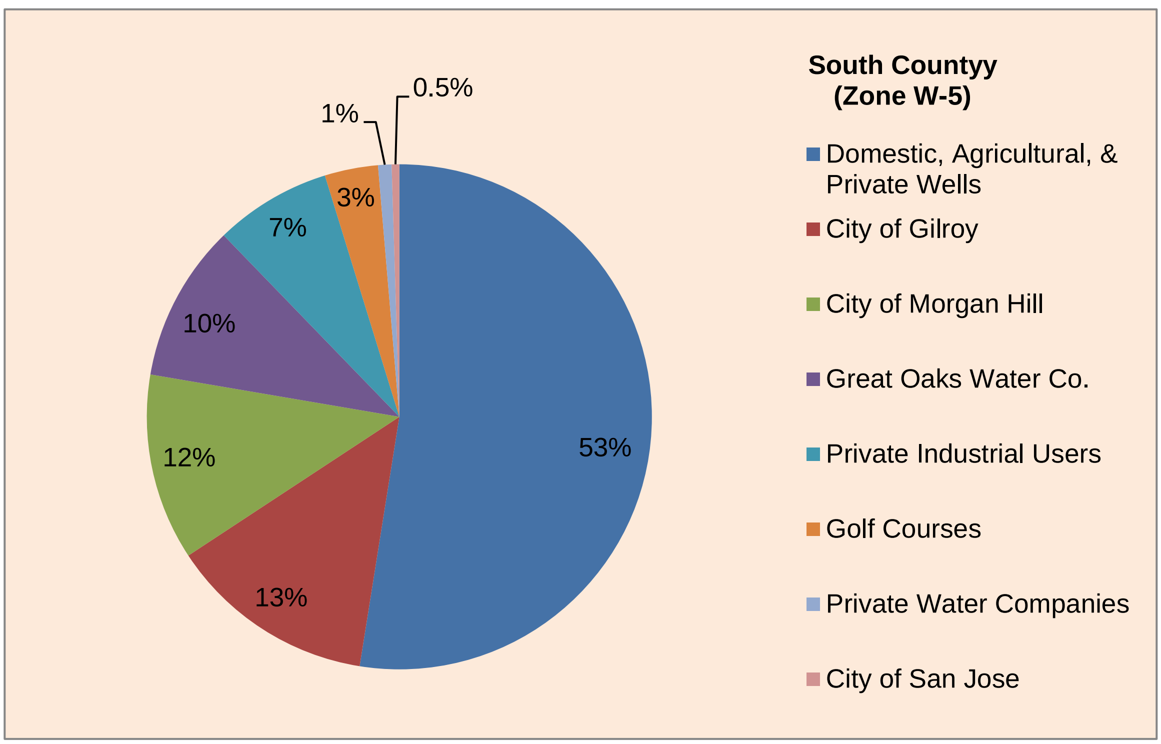


Figure 8. Percent of Total Pumping by Major Groundwater Users in 2016

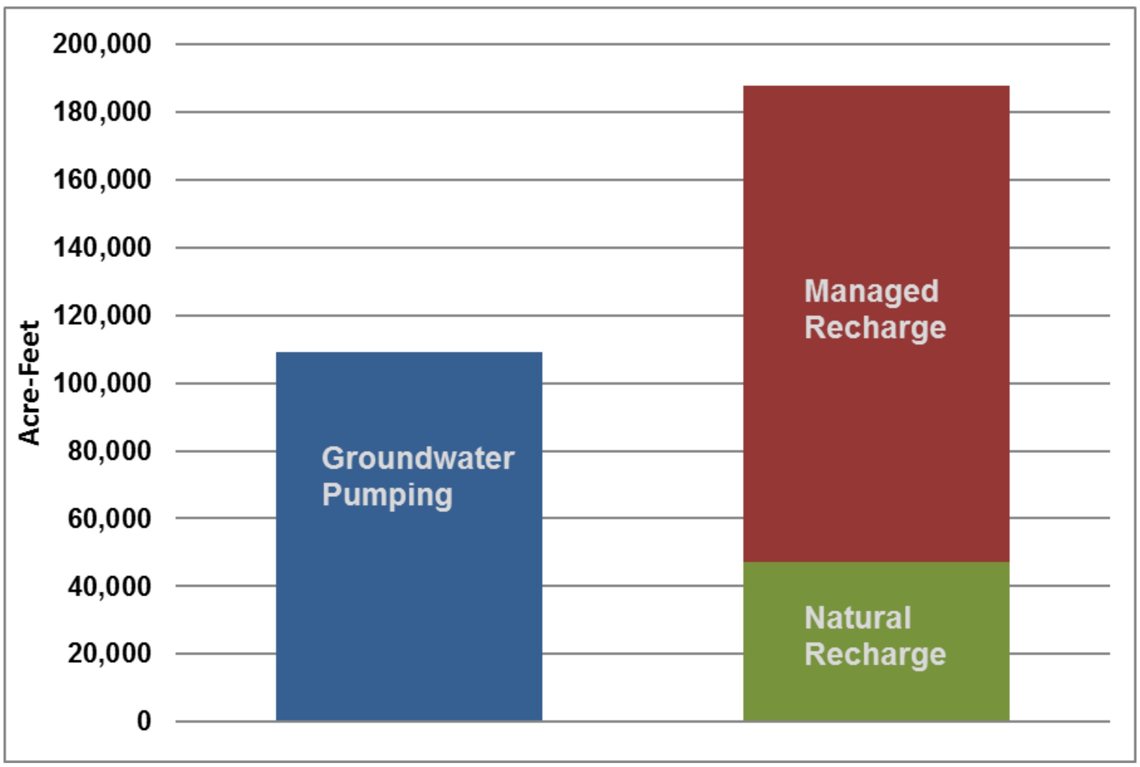




2.2 Groundwater Recharge

Since the 1930s, the District's water supply strategy has been to maximize the conjunctive management of surface water and groundwater. The annual amount of groundwater pumped far exceeds what is replenished naturally by rainfall, so the District's managed recharge and in-lieu recharge activities are critical to ensuring water supply reliability (Figure 9). Total recharge exceeded groundwater pumping in 2016 due to normal rainfall and the increased availability of surface water for managed recharge.

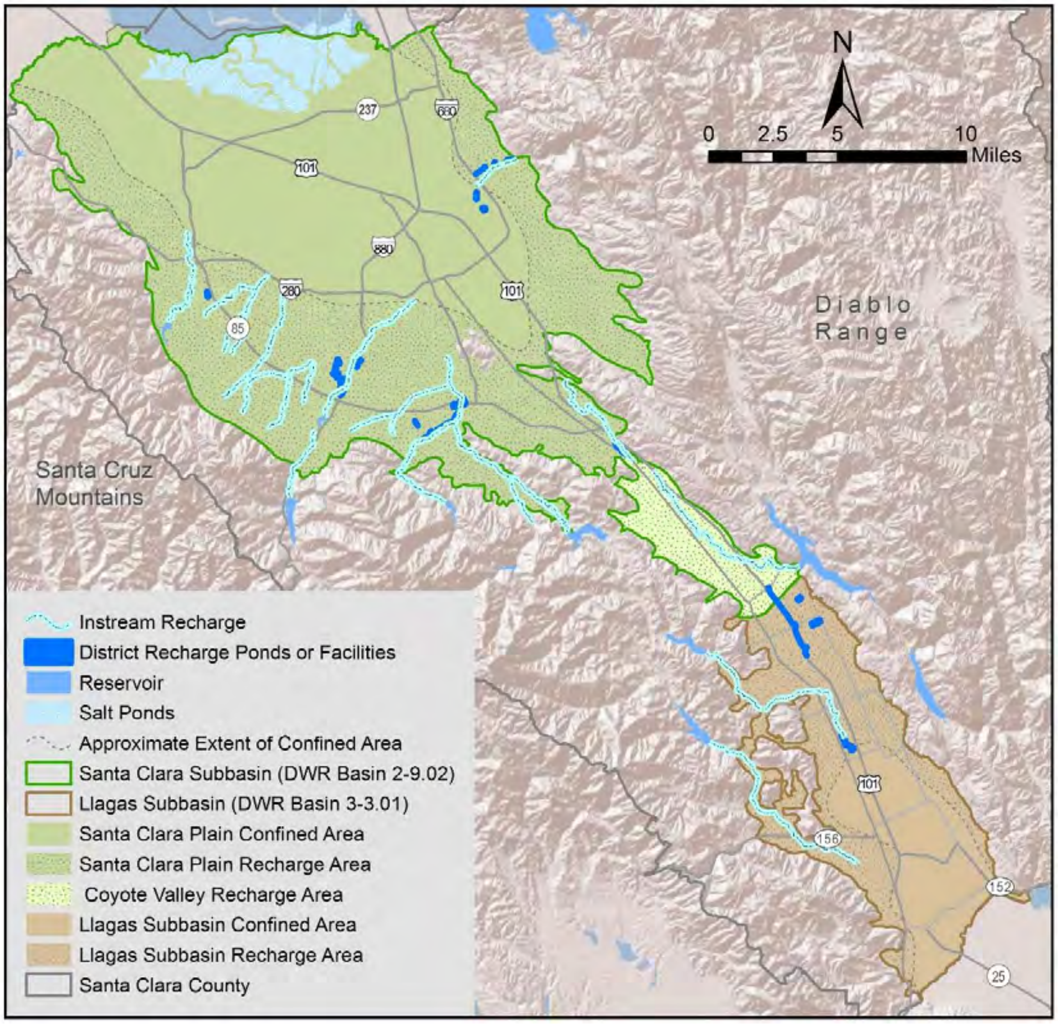
Figure 9. Countywide Groundwater Pumping and Recharge in CY 2016



Managed Recharge

The District replenishes the groundwater subbasins with imported water and runoff captured in 10 local reservoirs. District recharge facilities include more than 300 acres of recharge ponds and over 90 miles of creeks (Figure 10). Imported sources include the federal Central Valley Project (CVP) and the State Water Project (SWP). The use of imported or local water for managed recharge each year depends on many factors including hydrology, imported water allocations, treatment plant demands, and environmental needs. In general, a greater percentage of local water is used for recharge in wet years due to increased capture of local storm runoff in local reservoirs.

Figure 10. District Managed Recharge Facilities

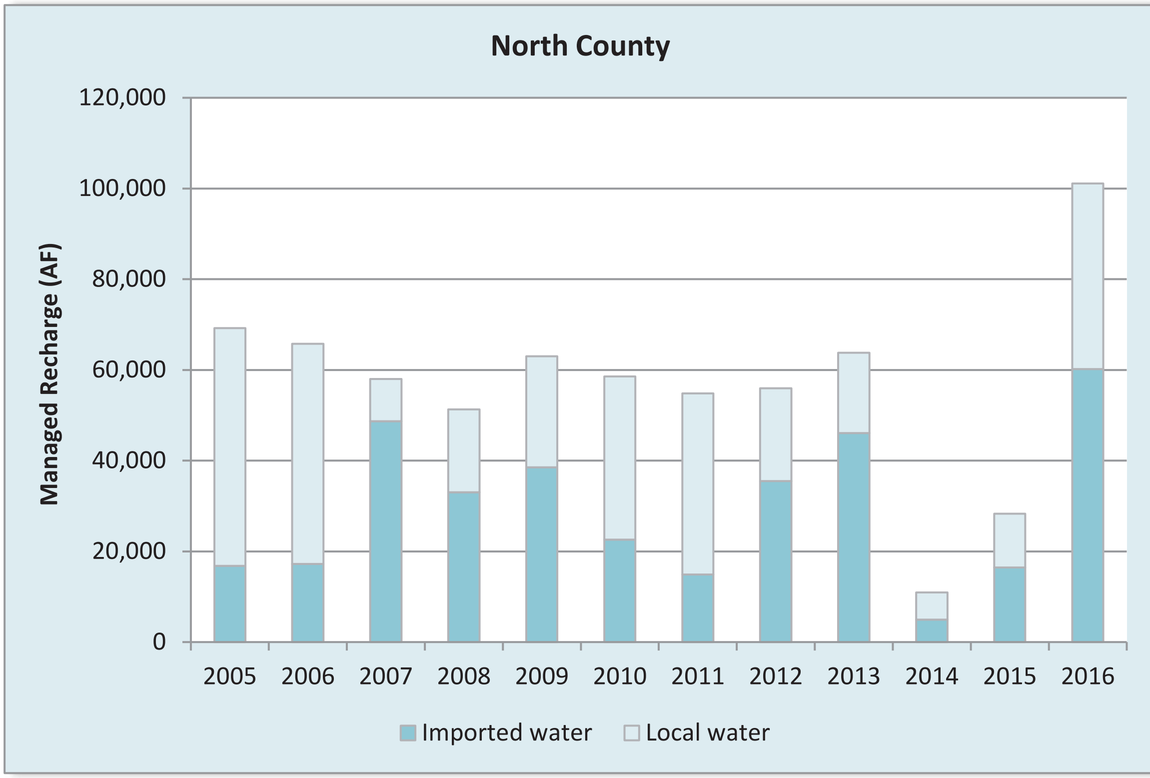


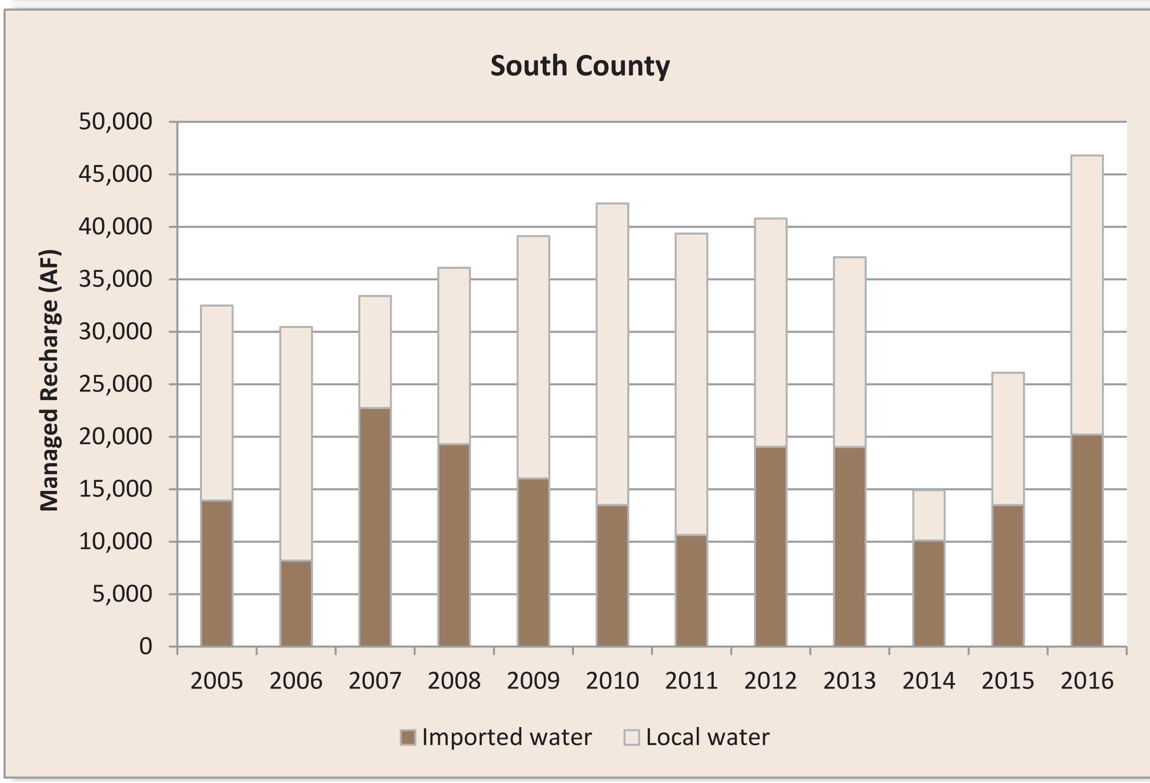
About 140,500 AF of local and imported surface water was recharged through District facilities in CY 2016 (Table 4). This far exceeds the long-term average managed recharge volume of about 98,000 AF. Approximately 61% of the District managed recharge occurred in-stream, with the remainder through percolation ponds. Most water used for North County managed recharge came from imported sources (60%), while South County managed recharge was predominantly from local water (57%), as shown in Figure 11.

Table 4. CY 2016 Managed Recharge (AF)

Zone	In-Stream Recharge (Creeks)	Off-Stream Recharge (Recharge Ponds)	Total
W-2 (North County)	54,800	48,100	102,900
W-5 (South County)	30,200	7,400	37,600
Total	85,000	55,500	140,500

Figure 11. Managed Recharge by Source





The District's 10 reservoirs were constructed in the 1930s and 1950s. Based on recent seismic studies, operating restrictions have been imposed on five District reservoirs while seismic stability concerns are mitigated. This limits the amount of water that can be stored for groundwater recharge by over 46,000 AF, but is needed to provide an adequate level of safety to the public. Major upcoming capital projects include seismic retrofit of Anderson, Calero, Guadalupe, and Almaden dams.

In-Lieu Recharge

The District's treated surface water deliveries, water conservation, and recycled water programs play a critical role in maintaining groundwater storage by reducing demand on groundwater. In 2016, treated water and recycled water provided about 97,900 and 19,000 AF of water, respectively. The District's long-term water conservation programs also saved approximately 70,000 AF.[7]

The District's Silicon Valley Advanced Water Purification Center began operating in 2014. This state-of-the-art facility in San Jose produces up to 8 million gallons per day of highly purified water by treating recycled water with microfiltration, reverse osmosis, and ultraviolet light. Purified water is blended with tertiary-treated recycled water to lower the salt content for landscape irrigation and industrial uses. This facility supports the District's goal of expanding the use of recycled water, which reduces the demand on groundwater.

2.3 Groundwater Balance

The groundwater balance provides an assessment of annual inflows and outflows for the Santa Clara Plain, Coyote Valley, and Llagas Subbasin, as shown in Figure 12. It should be noted that some terms presented in the groundwater balance cannot be directly measured and represent estimated values from the District's groundwater flow models.

Inflows

Major inflows to the subbasins are primarily controlled by hydrologic conditions and include:

- Managed recharge by the District, using local and imported surface water, and
- Natural recharge, which includes deep percolation of rainfall, natural seepage through creeks, subsurface inflow from adjacent aquifers, water loss from transmission and distribution lines, mountain front recharge, and return flows from septic systems and irrigation.

Managed recharge is quantified with water accounting models, the data for which comes from streamflow measurements and measured releases from reservoirs and raw water pipelines. Rainfall is measured at precipitation gage stations in San Jose (City of San Jose Station 131), Los Gatos (NOAA[8] Station USC00045123), Coyote Valley (District Station 37), and Morgan Hill (District Station 41). These stations provide rainfall data used in each of the three numerical

[7] Santa Clara Valley Water District, Protection and Augmentation of Water Supplies, 2017/2018 (PAWS), 46th Annual Report, February 2017.
[8] U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA).

groundwater models (MODFLOW) for the Santa Clara Plain, Coyote Valley, and the Llagas Subbasin. Subsurface inflows and outflows from/to adjacent aquifer systems and mountain front recharge are derived from the District's calibrated flow models. Total inflows to the subbasins were 193,800 AF in 2016, with managed District recharge providing 73% of total inflows.

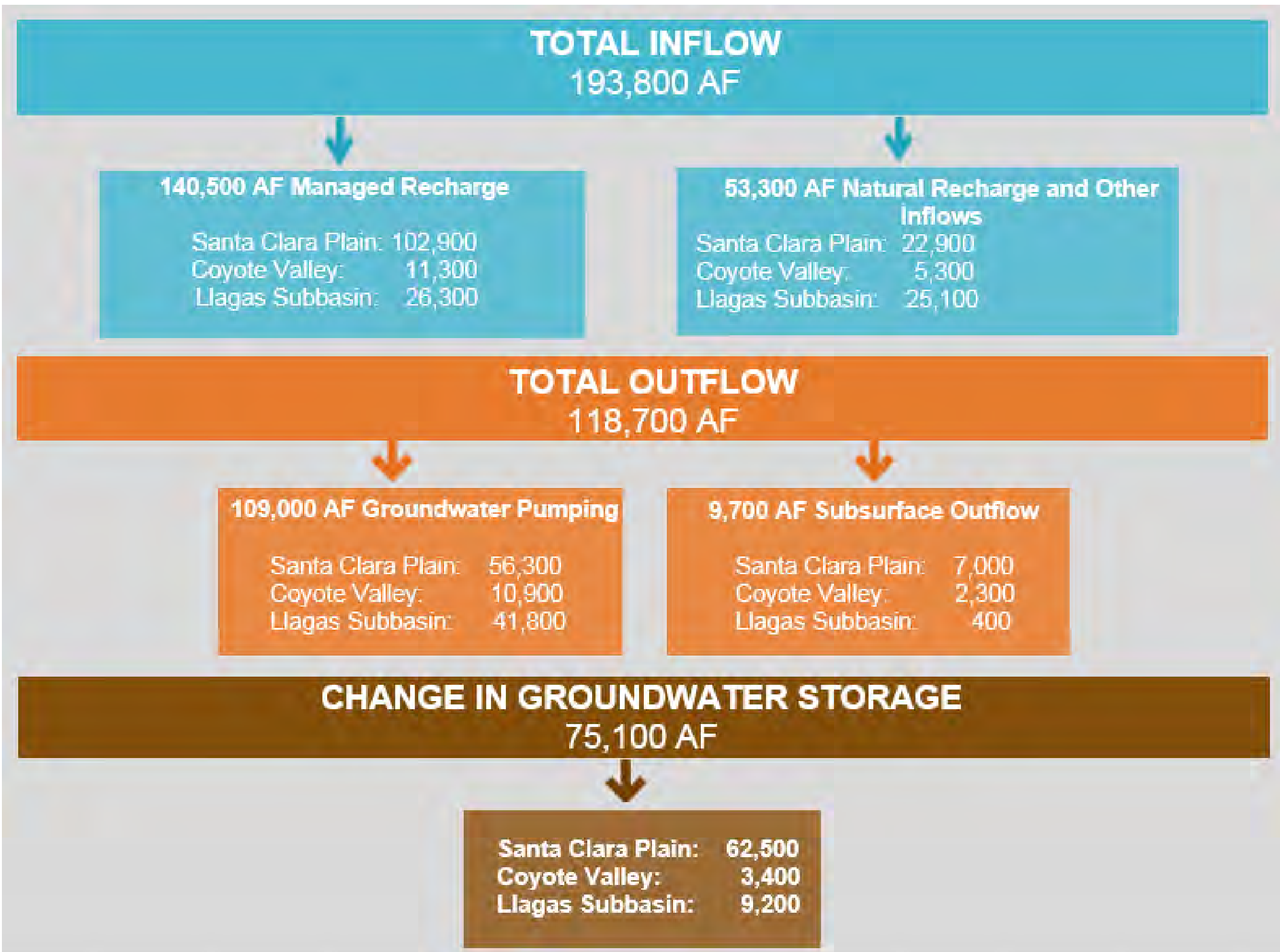
Outflows

The primary outflow of groundwater is pumping, which accounted for 92% of the total outflow of 118,700 AF in CY 2016. The vast majority of groundwater used is metered. In Zone W2, meters are required for wells pumping more than 1 AF of non-agricultural water or 4 AF of agricultural water annually. In Zone W5, meters are required for wells producing more than 2 AFY of non-agricultural water or 20 AFY of agricultural water. Where meters are not installed, domestic use is estimated through average values and crop factors estimate agricultural water use. Subsurface outflow to adjacent aquifer systems was about 9,700 AF, or about 8% of the total outflow.

Change in Storage

Based on the estimated inflows and outflows, there was an estimated increase in storage of 75,100 AF in CY 2016 due to an overall reduction in pumping and increase in managed recharge compared to 2015. Storage in the Santa Clara Plain, Coyote Valley, and Llagas Subbasin increased by about 62,500 AF, 3,400 AF, and 9,200 AF, respectively.

Figure 12. CY 2016 Groundwater Balance



Notes:

1) Groundwater balance terms presented are estimates as of June 2017. Storage estimates are refined in other District reports as additional data becomes available. Values shown are based on measured quantities or calibrated groundwater flow models, with all values rounded to the nearest 100 AF.
2) Managed recharge represents direct replenishment by the District using local and imported water. Estimates from the groundwater models may differ slightly from surface water accounting estimates.
3) Natural recharge and other inflows include the deep percolation of rainfall, septic system and/or irrigation return flows, natural seepage through creeks, and inflow from adjacent aquifer systems.
4) The groundwater pumping estimate is based on pumping metered by the District or reported by low-volume groundwater users.
5) Subsurface outflow represents outflow to adjacent aquifer systems. In the Santa Clara Plain, this includes outflows to San Francisco Bay. In Coyote Valley, this includes outflow to the Santa Clara Plain, and in the Llagas Subbasin, this includes outflows to the Bolsa Subbasin in San Benito County.

CHAPTER 3 – GROUNDWATER LEVELS AND STORAGE

The District collected monthly water level measurements from 220 wells in CY 2016, and evaluated water levels from 100 wells measured by water retailers. Groundwater levels at regional groundwater level index wells were significantly higher than 2015 in the Santa Clara Plain, Coyote Valley and the Llagas Subbasin. Due to improved water supply conditions, the District reduced the water use reduction target from 30% to 20% in June 2016. Countywide, customers served by water retailers achieved an impressive water use savings of 28% compared to CY 2013 use. Groundwater reserves increased by around 75,000 AF between 2015 and 2016 due to increased managed recharge and reduced pumping. The estimated end of 2016 groundwater storage was 307,000 AF, in the normal stage of the District's Water Shortage Contingency Plan and above the GWMP storage target of 300,000 AF. The projected end of year storage for CY 2017 is also above the 300,000 AF target.

3.1 Groundwater Levels

Comprehensive and accurate monitoring data allows the District to evaluate groundwater level and storage conditions to support operational decisions and water supply planning efforts. The District measured depth to water data from 220 wells on a daily or monthly basis as shown in Figure 13. The District also evaluated water levels from 100 water supply wells measured by water retailers. As the designated monitoring entity for Santa Clara County under the California Statewide Groundwater Elevation Monitoring (CASGEM) program, the District uploaded over 1,000 groundwater elevation measurements for 106 wells to the CASGEM website in CY 2016.

Three groundwater level index wells are used to represent regional groundwater elevations in the Santa Clara Plain, Coyote Valley, and the Llagas Subbasin (Figure 14). Table 5 shows March and October groundwater elevations for the index wells, which typically represent the seasonal high and low groundwater elevations, respectively. Due to improved rainfall, average groundwater elevations at these wells were 28 feet higher than the previous year in the Santa Clara Plain, 11 feet higher in Coyote Valley and 25 feet higher in the Llagas Subbasin. Groundwater elevations remained above the historical minimums and levels seen during the last major drought of 1987-1992 (Figure 14). Groundwater elevations were also above the thresholds established to minimize the risk of land subsidence in all 10 Santa Clara Plain subsidence index wells throughout 2016.

In the Santa Clara Subbasin, groundwater elevations are highest in the Coyote Valley and the recharge areas of the Santa Clara Plain. Groundwater elevations generally decrease within the interior, confined area of the subbasin, and the general groundwater flow direction is northwest toward San Francisco Bay (Figure 15). The District's managed recharge helps maintain adequate pressure in the principal aquifer zone such that groundwater flows toward the bay and maintains an upward vertical gradient near the bay. The upward gradient minimizes the potential for saltwater intrusion into the principal aquifers.

Groundwater elevation contours for the principal aquifer zone in late spring and fall of 2016 are shown in Figures 15 and 16, respectively. The typical seasonal pattern observed is groundwater levels that peak in the spring and decline through the summer and fall due to increased pumping and less natural recharge. However, this was not observed in CY 2016 because water savings increased as the year progressed and pumping was reduced in the summer months, which is atypical. Groundwater levels in the central portion of the Santa Clara Plain increased between spring and fall due to the drought response. Groundwater pumping was significantly reduced and there was increased managed recharge compared to the previous year. The 2016 fall contours indicate that groundwater elevations in the interior of the Santa Clara Plain have recovered significantly as compared to the fall of 2015.

Table 5 . Groundwater Elevations at Regional Index Wells (feet above mean sea level)

Groundwater Subbasin/Area	Index Well	March 2016	October 2016	2016 Average	2015 Average	5 Year Average (2011-2015)	Period of Record Average
Santa Clara Subbasin, Santa Clara Plain	07S01W25L001	74.1	85.6	77.8	49.8	62.2	9.6
Santa Clara Subbasin, Coyote Valley	09S02E02J002	268.4	272.2	270.7	259.3	263.1	264.3
Llagas Subbasin	10S03E13D003	213.4	218.0	213.9	188.9	209.3	217.6

Note: The period of record for the index wells is 1936-2016 for the Santa Clara Plain, 1948-2016 for the Coyote Valley, and 1969-2016 for the Llagas Subbasin.

The groundwater flow patterns observed in Coyote Valley were similar to those observed in the past, with the highest elevations at the subbasin divide near Cochrane Road and groundwater flow generally toward the northwest. The highest groundwater elevations in the Llagas Subbasin are in the recharge area in Morgan Hill, and groundwater generally flows southeast toward the Pajaro River and San Benito County. Managed and natural recharge within the recharge area maintains groundwater pressures within the confined area, where groundwater exists in partially to fully confined conditions.

Figure 13. CY 2016 Groundwater Level Monitoring

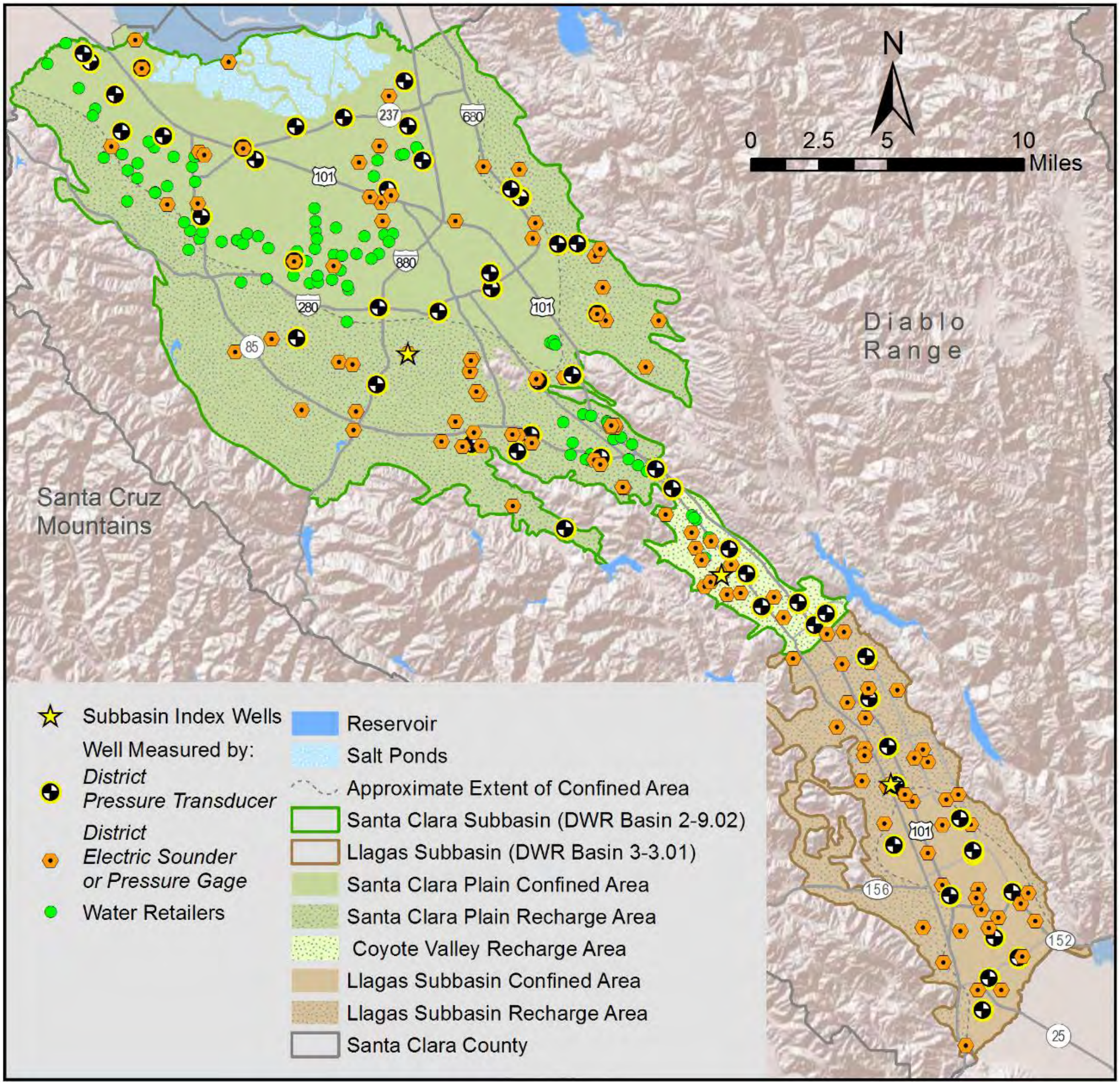
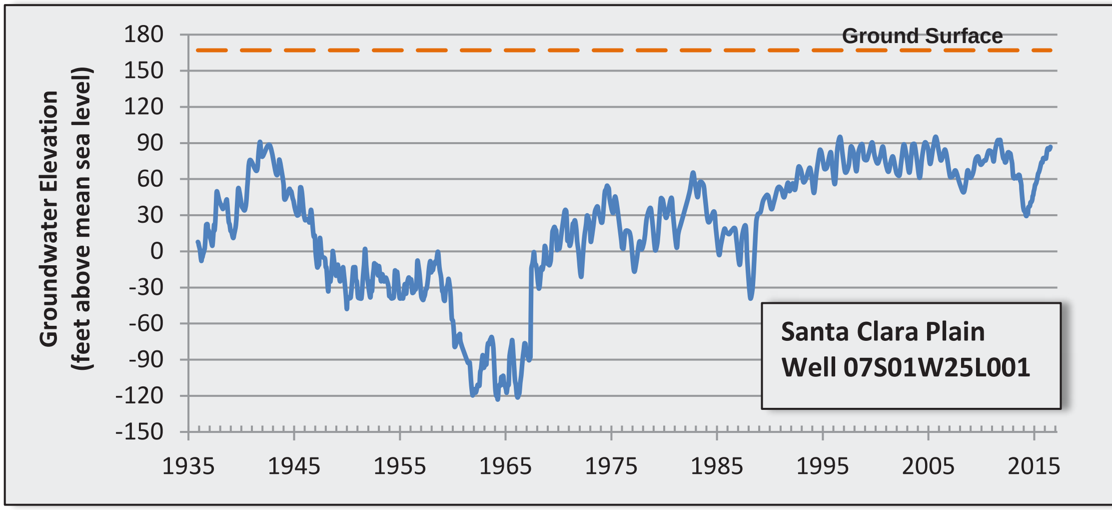
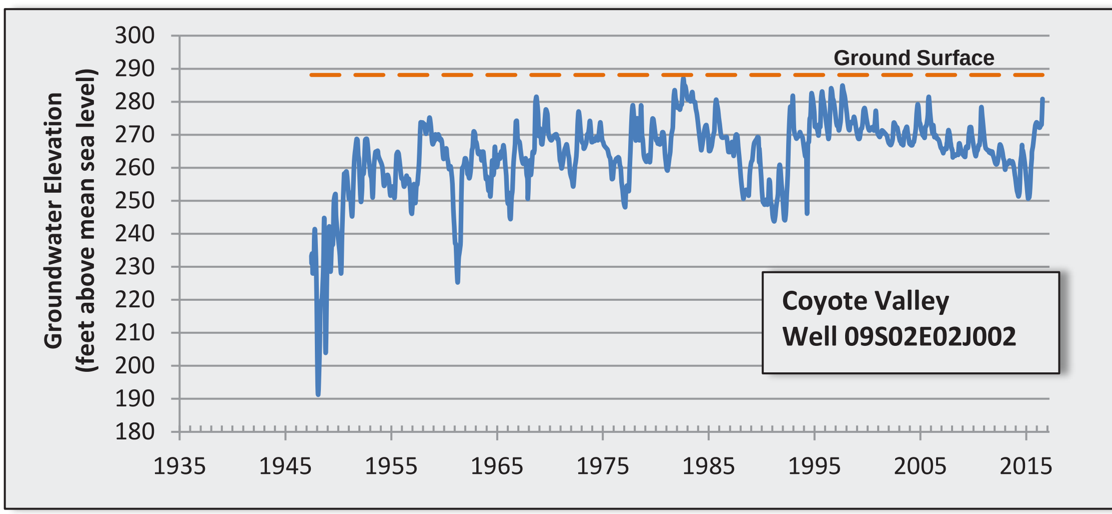


Figure 14. Groundwater Elevations at Regional Index Wells





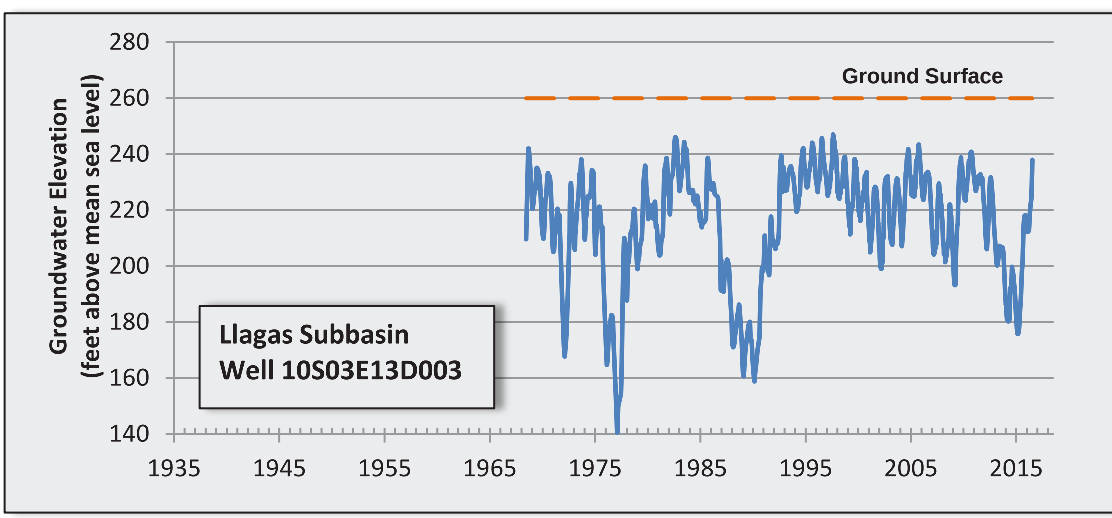


Figure 15. Spring 2016 Groundwater Elevation Contours

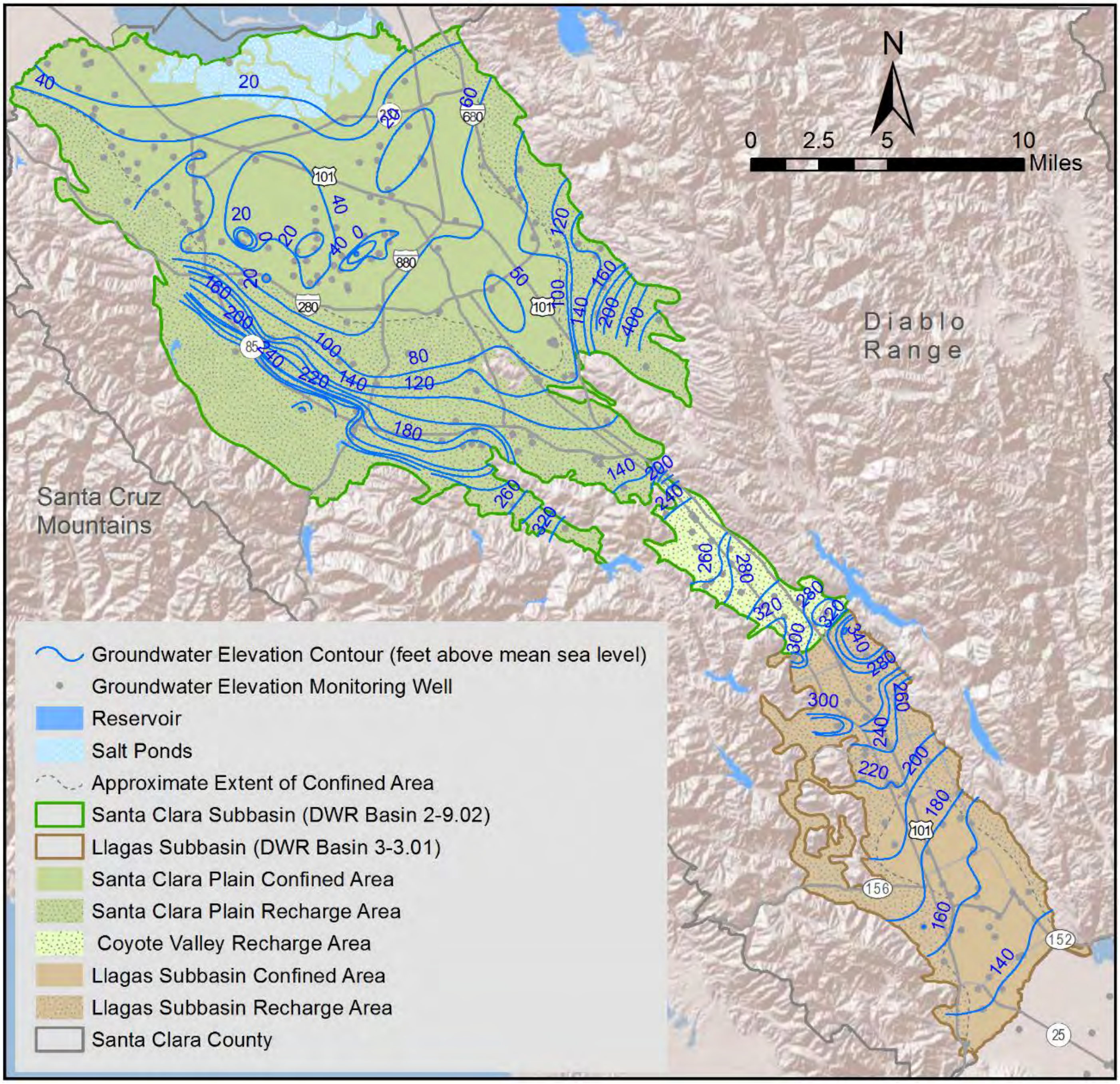
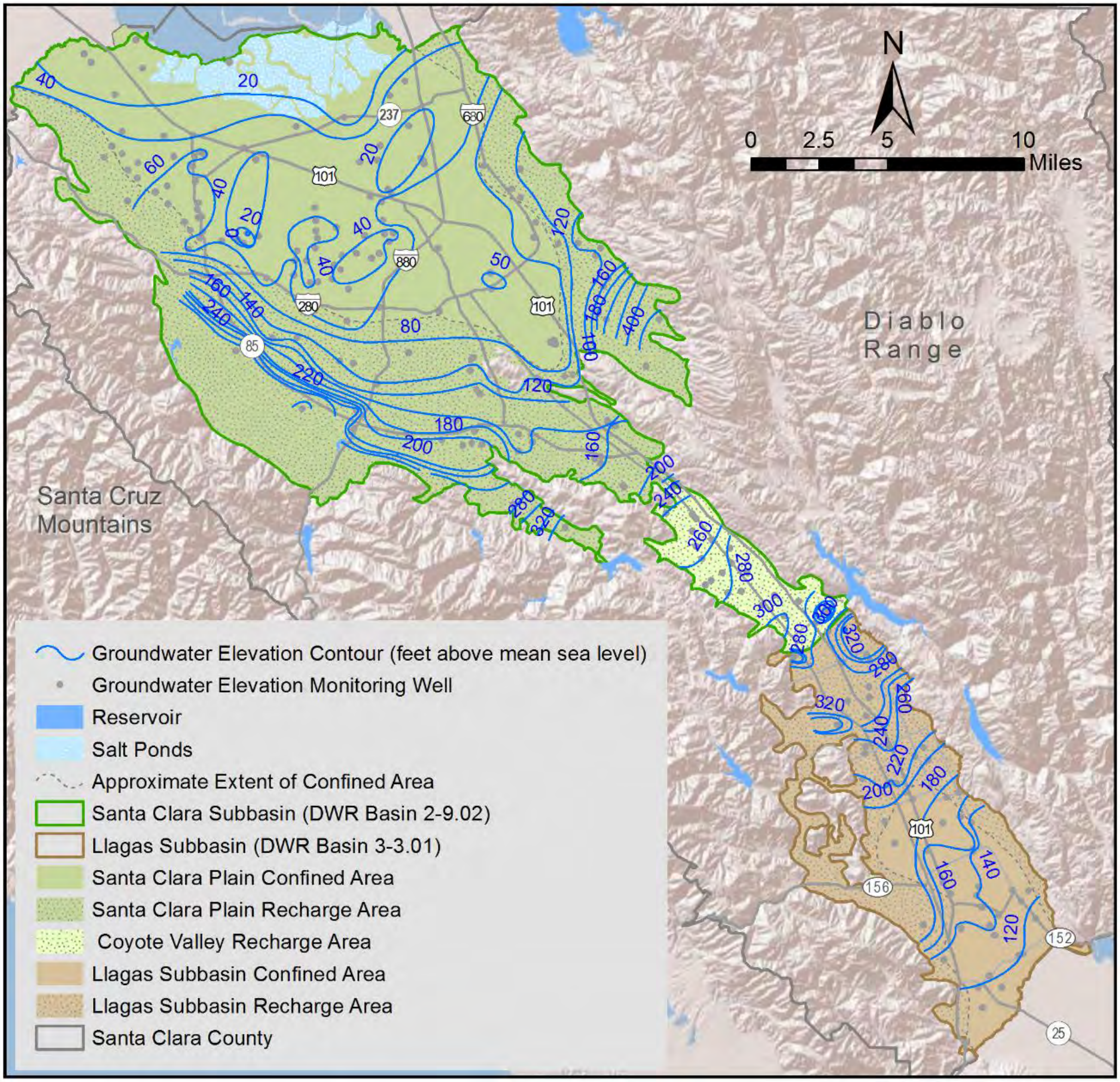


Figure 16. Fall 2016 Groundwater Elevation Contours



3.2 Groundwater Storage

Estimated groundwater storage at the end of 2016 was above the GWMP outcome measure of 300,000 AF, and 75,100 AF higher than at the end of 2015 (Table 6). End of year groundwater storage of more than 300,000 AF indicates a normal basin condition, per the District's Water Shortage Contingency Plan. Due to improved conditions, the projected end of year storage for 2017 is also above the 300,000 AF target.

In 2015, the District Board called for 30% water use reduction compared to 2013. However, due to improved water supply conditions, in June 2016, the District Board reduced the target to 20%. Consequently, water demands decreased by roughly 28% in 2016 compared to 2013, helping to increase groundwater storage.

Table 6. Estimated End of Year Groundwater Storage (AF)

Groundwater Subbasin/Area	GWMP Outcome Measure	End of Year 2015	End of Year 2016	Change in Storage
Santa Clara Subbasin Santa Clara Plain	278,000	216,300	278,800	+62,500
Santa Clara Subbasin Coyote Valley	5,000	400	3,800	+3,400
Llagas Subbasin	17,000	15,600	24,800	+9,200
Total	**300,000**	**232,300**	**307,400**	**+75,100**

Note: Groundwater storage estimates presented are as of June 2017. These estimates are based on accumulated groundwater storage since 1970, 1991, and 1990 for the Santa Clara Plain, Coyote Valley, and Llagas Subbasin, respectively. These estimates are refined as additional pumping and managed recharge data become available.

Groundwater Storage Outcome Measures

OM 2.1.1.a.
Greater than 278,000 AF of projected end of year groundwater storage in the Santa Clara Plain.

OM 2.1.1.b
Greater than 5,000 AF of projected end of year groundwater storage in the Coyote Valley.

OM 2.1.1.c.
Greater than 17,000 AF of projected end of year groundwater storage in the Llagas Subbasin.

The outcome measures for the Santa Clara Plain and Llagas Subbasin were met in 2016 but were not met for the Coyote Valley. The estimated end of year storage was 278,800 AF for the Santa Clara Plain, 3,800 AF for Coyote Valley, and 24,800 AF for the Llagas Subbasin.

CHAPTER 4 – LAND SUBSIDENCE

In CY 2016, the District measured subsidence at 144 benchmarks along three cross valley level circuits and two extensometers. Water levels at ten subsidence index wells were also monitored and compared to thresholds established to minimize the risk of permanent land subsidence. The subsidence outcome measure was met in 2016.

The Santa Clara Plain is vulnerable to land subsidence with about 13 feet of inelastic (permanent) land subsidence observed in San Jose between 1915 and 1969 due to groundwater overdraft. Significant inelastic subsidence was essentially halted by about 1970 through the District's expanded conjunctive management programs, which allowed artesian heads to recover. A minor amount of elastic subsidence and recovery occurs annually in response to seasonal pumping and recharge as indicated by extensometer measurements, benchmark surveys, and Interferometric Synthetic Aperture Radar (InSAR) data.[9] To avoid resumption of permanent inelastic subsidence, the District has established subsidence thresholds at ten index wells in the Santa Clara Plain.[10] A tolerable rate of 0.01 feet per year of subsidence[11] was used to determine thresholds at these wells. These subsidence thresholds are the groundwater levels that must be maintained to ensure a low risk of land subsidence.

The District conducts ongoing monitoring of benchmarks on the land surface, extensometers, and groundwater levels at subsidence index wells to determine if land subsidence is occurring or threatening to exceed established thresholds. Subsidence monitoring points are shown in Figure 17. Monitoring data in 2016 from extensometers, benchmark surveys, and subsidence index wells indicates a low risk of subsidence, as described further below and in the 2016 Subsidence Data Analysis Report (Appendix A).

4.1 Extensometer Monitoring

The District monitors two 1,000-foot deep extensometers that measure vertical ground motion (or aquifer compaction) relative to a central, isolated pipe set beneath the water-bearing units. The extensometers, located in Sunnyvale near Moffett Field ("Sunny") and near downtown San Jose ("Martha"), are equipped with data loggers to provide hourly readings of aquifer compaction and water level. The District evaluates the average land subsidence measured during the last 11 years to determine if it meets the tolerable rate of land subsidence of 0.01 feet/year.

Figure 18 shows cumulative compaction measured at the extensometers for the period of record supplemented with nearby benchmark data. These figures indicate that land subsidence conditions over the last few decades have been relatively stable. The figures also show close correlation between the District's land subsidence model, which is used to forecast land subsidence, and actual measured data. Measured data show a negative compaction (i.e., aquifer expansion) at both sites in 2016. The average subsidence rate over the last 11 years (2006 to 2016) is 0.002 feet/year, which is below the tolerable subsidence rate of 0.01 feet/year. The average for the previous period (2005 to 2015) was

[9] Schmidt, D.A. and Burgmann, R., 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, Volume 108, No. B9, 2003.

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

[11] The tolerable subsidence rate of no more than 0.01 feet per year on average was endorsed by the District's Water Retailer Groundwater Subcommittee.

0.005 feet/year. The decreased average subsidence rate results from groundwater level recovery in 2016. Measured compaction is within the elastic range observed historically, but the District will continue to closely monitor land subsidence conditions.

4.2 Benchmark Elevation Surveys

Periodic benchmark surveys of land surface elevation have been conducted in Santa Clara County since 1912.[12] The District's current benchmark leveling program consists of annual surveys along three cross valley level circuits in the Santa Clara Plain. In 2016, the District analyzed land surface elevation data from 144 benchmarks to evaluate the spatial variability of land subsidence. Survey data at most benchmarks show the land surface rising in 2016 due to significantly decreased pumping and increased recharge. Regional benchmark data is consistent with extensometer data, indicating the average annual change of land surface over the last 11 years does not exceed the tolerable rate of subsidence of 0.01 feet per year.

4.3 Subsidence Index Wells

Groundwater level measurements are an integral part of land subsidence monitoring because declining water levels due to long-term overdraft were the driving force of historical subsidence in the Santa Clara Plain. The District measures water levels at ten subsidence index wells on a daily to monthly basis to ensure they remain above established thresholds. If water levels drop below subsidence thresholds for extended periods, permanent land subsidence may resume, resulting in an increased risk of flooding, salt water intrusion, and damage to infrastructure and utilities.

Figure 19 shows groundwater levels and subsidence thresholds at ten subsidence index wells. The lowest historical water levels were generally observed in the 1960s and 1970s. Since then, groundwater levels have recovered, primarily due to the District's managed recharge and in-lieu recharge programs. In general, groundwater levels in 2016 were in recovery from water level declines in the previous year. End of 2016 water levels improved in 9 of 10 subsidence index wells and they slightly declined in one well. Three subsidence index wells located near the Baylands continue to have upward vertical gradients. In addition to keeping water levels above subsidence thresholds, maintaining an upward hydraulic gradient in principal aquifer zone wells is critical for preventing shallow groundwater with elevated salts from entering the principal aquifer through abandoned wells and other vertical conduits. The District will continue to frequently track data from the subsidence index wells to support water supply operations and planning.

[12] USGS, Land Subsidence in the Santa Clara Valley, California as of 1982, Professional Paper 497-F, 1988.

Figure 17. CY 2016 Land Subsidence Monitoring

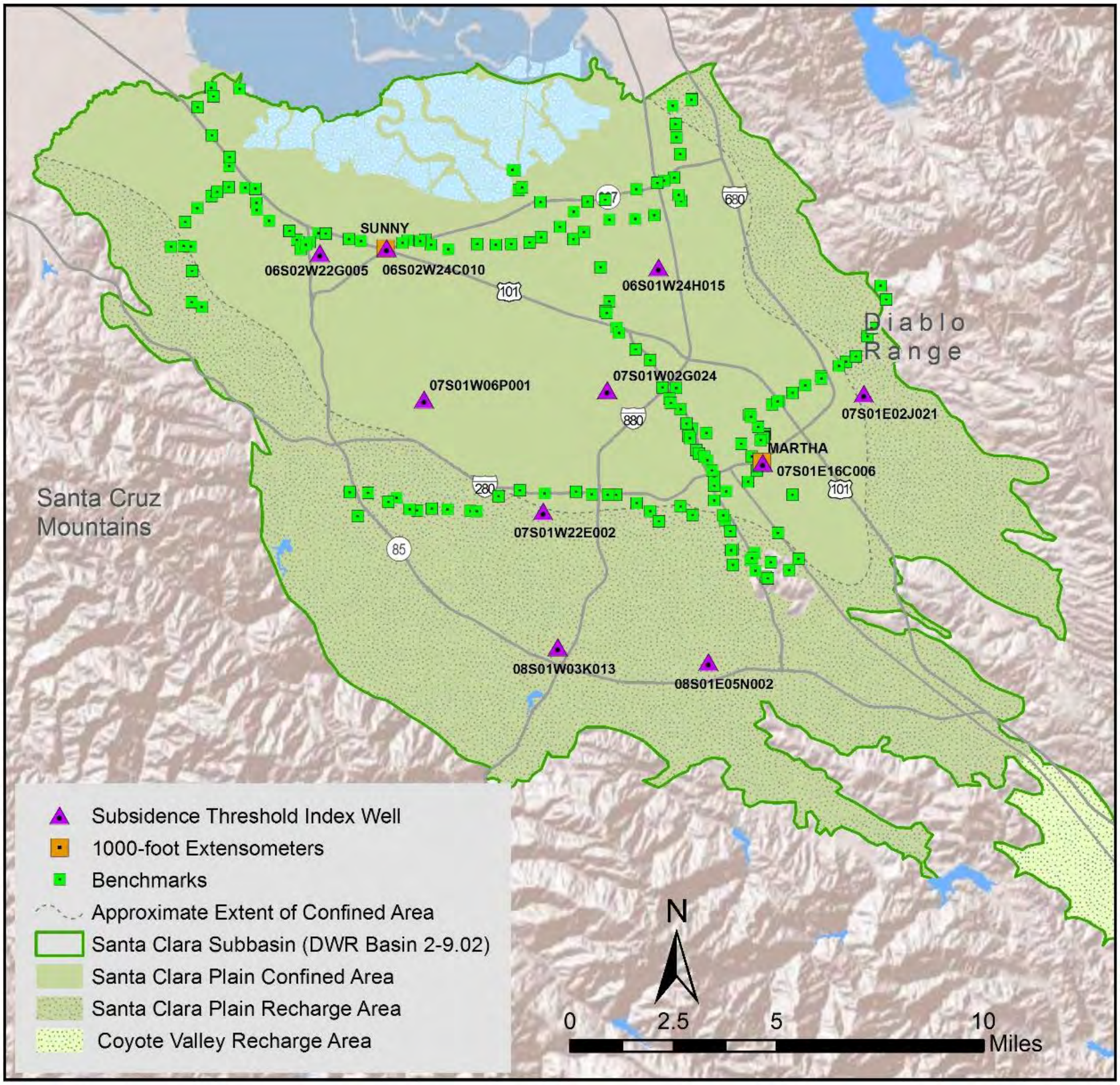
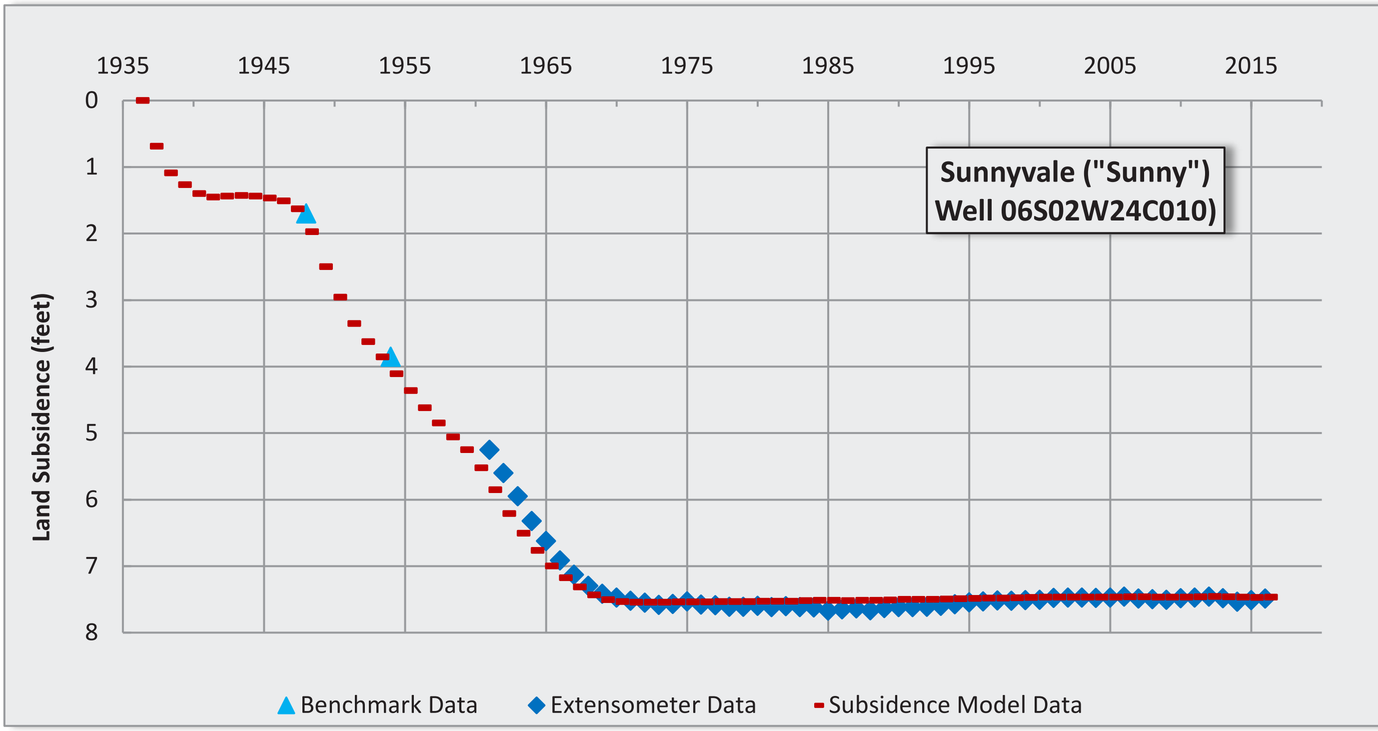


Figure 18. Cumulative Land Subsidence



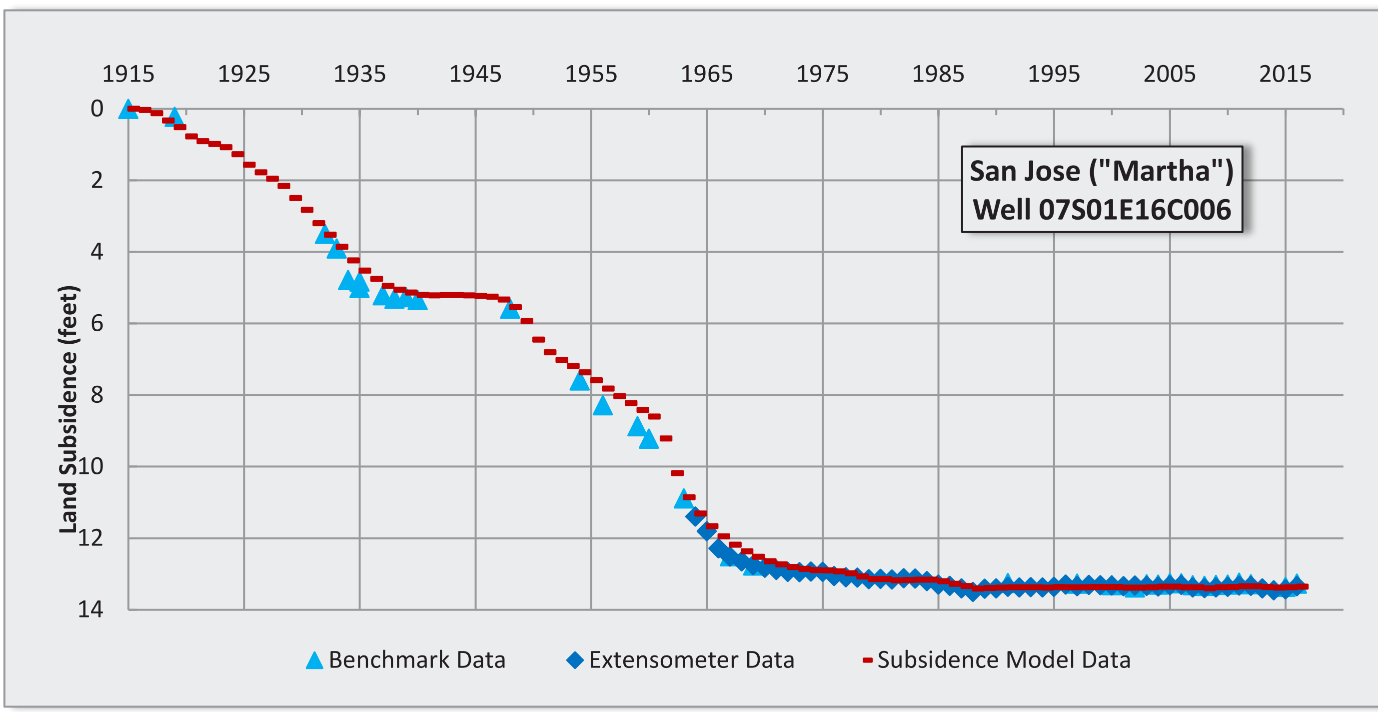


Figure 19. Groundwater Levels at Santa Clara Plain Subsidence Index Wells (feet above mean sea level)

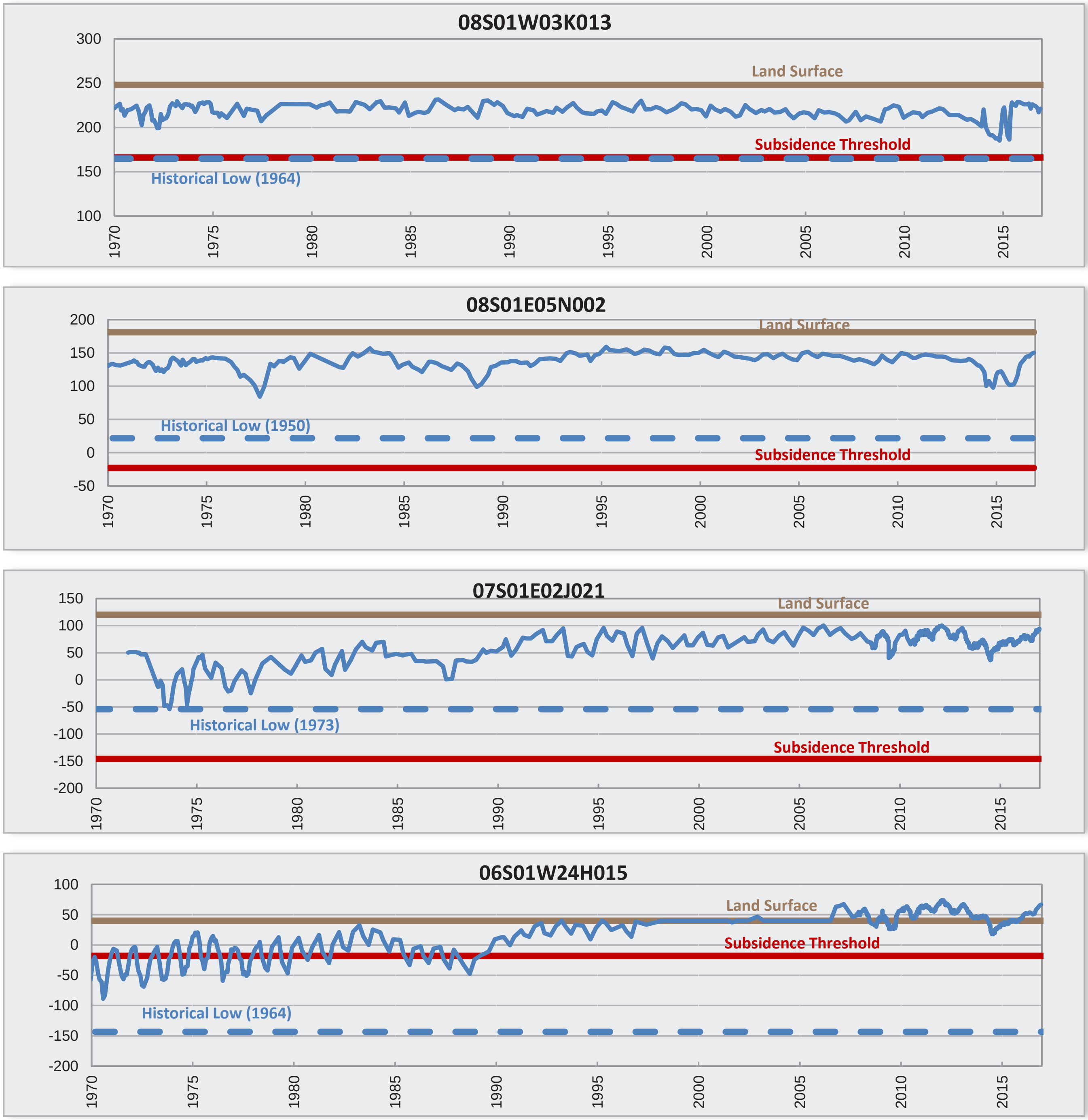
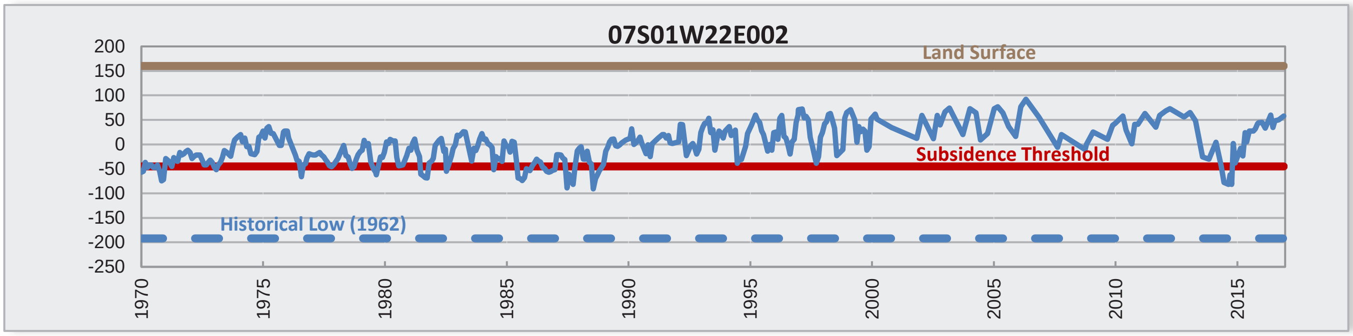
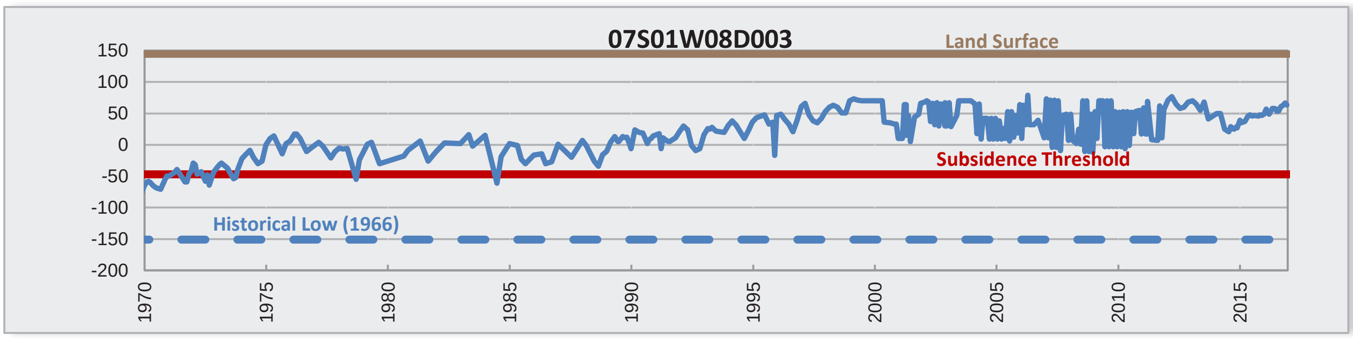
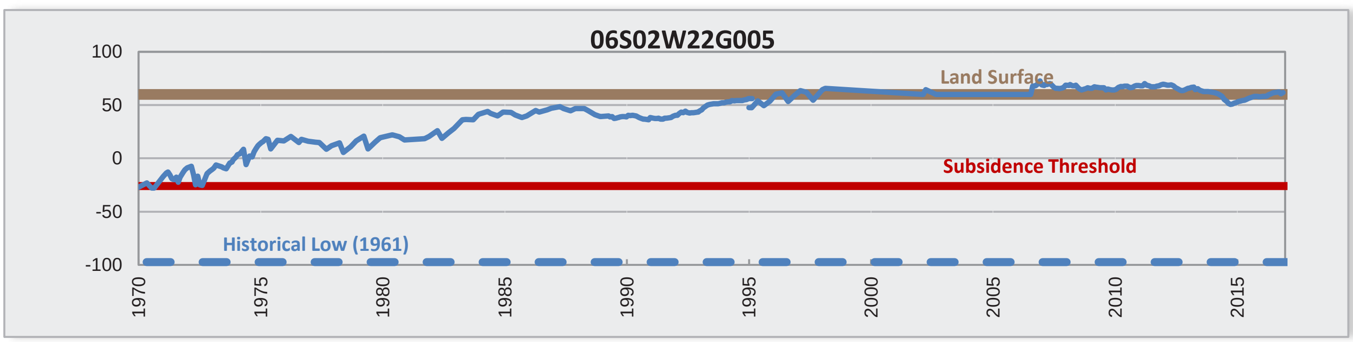


Figure 19. Groundwater Levels at Santa Clara Plain Subsidence Index Wells (feet above mean sea level, continued)







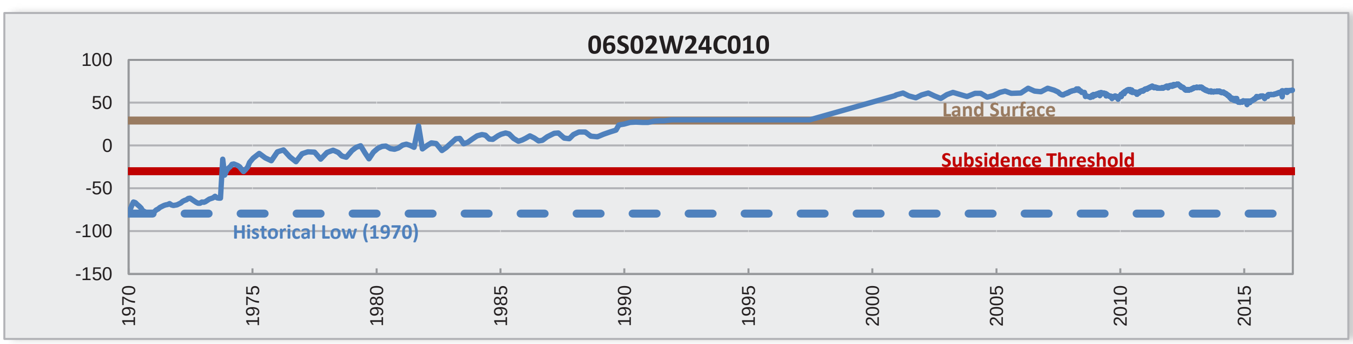
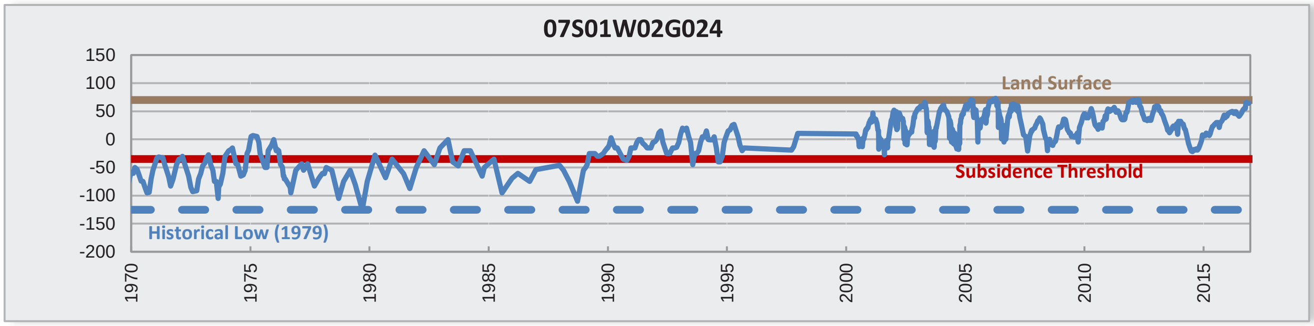
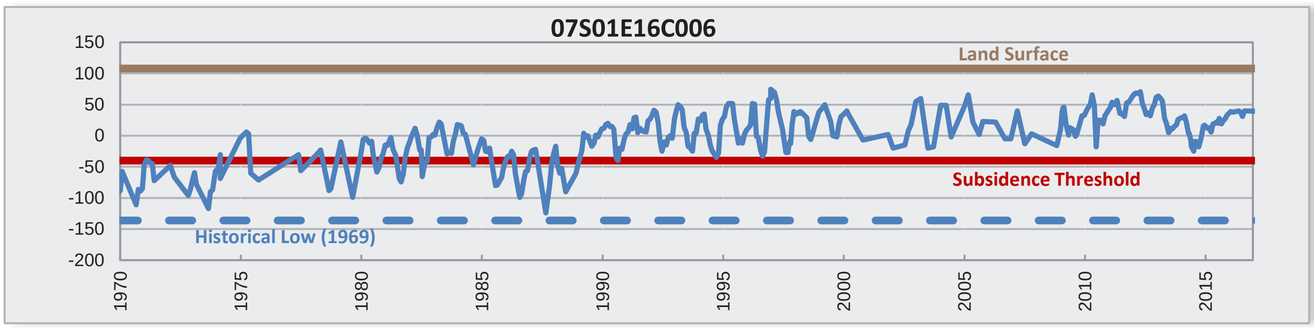


Figure 19. Groundwater Levels at Santa Clara Plain Subsidence Index Wells (feet above mean sea level, continued)





4.4 InSAR Data

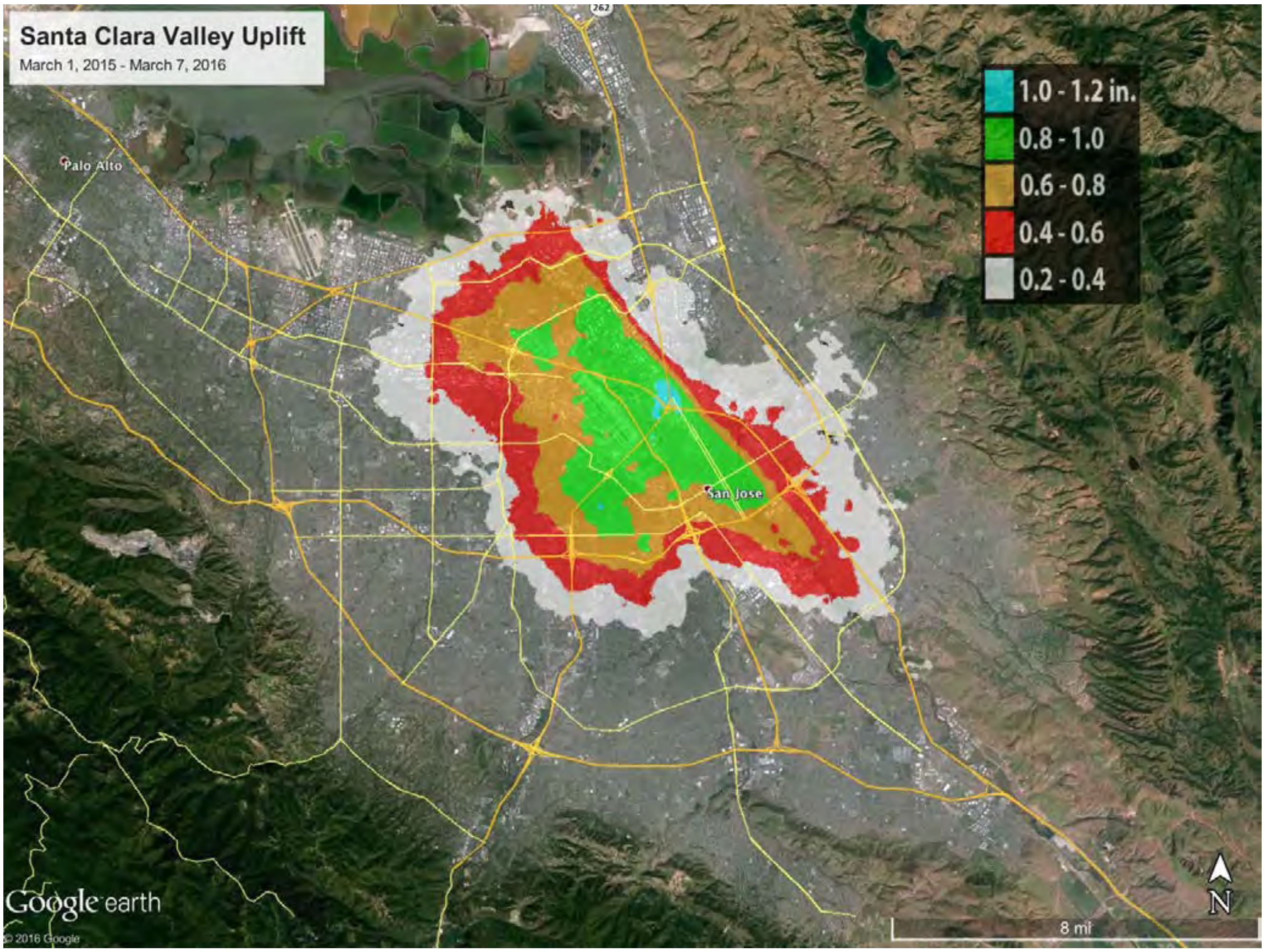
In addition to extensometer and benchmark monitoring for subsidence performed by the District, there are other tools that have been used over the past few years to monitor land subsidence. InSAR data from satellites and aircraft has been used to produce maps of subsidence with sensitivity of fractions of an inch. European Space Agency's satellite-borne Sentinel-1A data covering the period March 2015 to March 2016 was processed by researchers at the Jet Propulsion Laboratory (JPL), Arizona State University, and the University of California, Berkeley[13] to produce a deformation map for Santa Clara Valley (Figure 20). The overall deformation is uplift with a maximum of about 1 inch from March 1, 2015 to March 7, 2016. The deformation history of the maximum location (Figure 21) shows small variations throughout the year, but a general upward trend.[14] This is in stark contrast to other areas of California evaluated in the JPL Report, particularly the Central Valley, where subsidence of 16 to 22 inches was observed between March 2015 and September 2016.

The InSAR data corroborates the findings by the District's land subsidence monitoring network, where benchmark survey data shows mostly uplift between fall 2015 and fall 2016, with a maximum uplift of 0.12 feet (1.4 inches). Also the

[13] Shirzaei, M., R. Burgmann and E. Fielding, 2016, Sentinel-1 TOPS multitemporal interferometry for monitoring slow ground motions in the San Francisco Bay Area, Geophysical Research Letters, submitted.
[14] Farr, T. G., C. E. Jones and Z. Liu, Subsidence in California, March 2015 – September 2016, Jet Propulsion Laboratory, California Institute of Technology, Progress Report, February 2017.

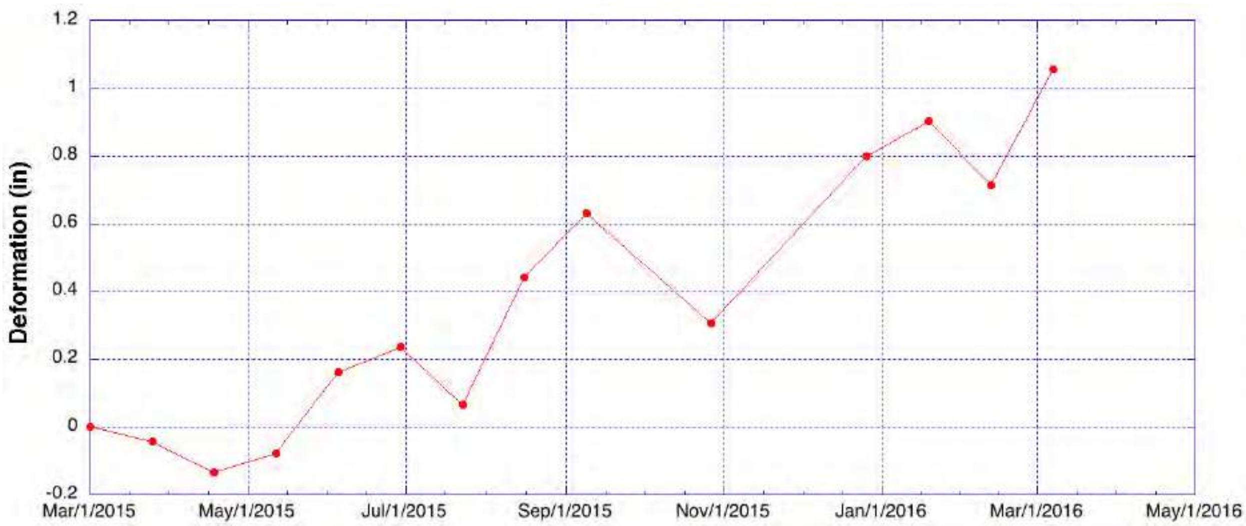
District's two extensometers show an uplift of 0.087 feet (1 inch) and 0.025 feet (0.3 inches) from January 1 to December 31, 2016 in Sunnyvale (Sunny) and San Jose (Martha), respectively.

Figure 20. Total Uplift in the Santa Clara Valley for the Period March 1, 2015 to March 7, 2016



Source: Subsidence in California, March 2015 – September 2016, Jet Propulsion Laboratory, California Institute of Technology, Progress Report, February 2017

Figure 21. Deformation History of the Location of Maximum Deformation in the Santa Clara Valley (March 1, 2015 to March 7, 2016)



Source: Subsidence in California, March 2015 – September 2016, Jet Propulsion Laboratory, California Institute of Technology, Progress Report, February 2017

Land Subsidence Outcome Measure

OM 2.1.1.d.
100% of subsidence index wells with groundwater levels above subsidence thresholds.

The outcome measure was met for calendar year 2016 as groundwater levels were above subsidence thresholds at all ten Santa Clara Plain subsidence index wells.

CHAPTER 5 – GROUNDWATER QUALITY

In CY 2016, the District tested groundwater quality at 265 wells, including 87 long-term monitoring locations, 161 domestic wells, and 17 wells near recycled water irrigation sites. The District also analyzed groundwater quality data from 237 public water supply wells and recharge water quality from 8 groundwater replenishment sites. A summary of groundwater quality for domestic and public water supply wells is presented in Appendix B.

Results indicate that groundwater in the Santa Clara and Llagas Subbasins is generally of good quality that meets drinking water standards in most wells for all constituents tested. The exception is nitrate, which is elevated in 22% of the South County water supply wells sampled (primarily domestic wells). Nitrate is present due to current and historic sources, with the highest concentrations found in private domestic wells. To assess nitrate loading, the District completed Salt and Nutrient Management Plans in 2014 in coordination with basin stakeholders. The District continues to offer eligible domestic wells owners free water testing for nitrate and rebates for qualifying nitrate treatment systems.

Surface water samples were collected in May and December 2016 from the West Side and Coyote recharge systems. Results indicate recharge water quality continues to be of similar or better quality than groundwater for the parameters tested. Surface water quality indicators measured in CY 2016 were all within the normal range.

In 2016, recycled water irrigation monitoring wells at the Santa Clara Plain study site could not be sampled because they were dry due to the drought. In the Gilroy recycled water irrigation groundwater monitoring wells, salt concentrations are variable with no discernible trend. Perfluorinated compounds and NDMA[15] continue to be detected in the recycled water sources. Perfluorinated compounds were detected in several Gilroy recycled water irrigation monitoring wells in 2016, but NDMA was not been detected in monitoring wells in 2016.

The District continues to coordinate with the state and federal agencies managing cleanup of groundwater contamination sites to track progress and issue recommendations for effective remediation measures. The District will continue to track water quality changes and work with stakeholders to identify ways to protect groundwater quality.

5.1 Regional Groundwater Quality

The District sampled groundwater quality at 87 wells, including 62 monitoring wells and 25 domestic wells, as part of the annual groundwater quality monitoring program (Figure 22).[16] Eighty-two samples were analyzed for approximately 100 water quality parameters including major and minor ions, nutrients, and trace metals, and volatile organic compounds (VOCs). Analyses for VOCs were not performed from five shallow monitoring wells near the San

[15] N-nitrosodimethylamine

[16] The District also collected limited water quality data at 161 domestic wells in 2016 as part of the Domestic Well Testing Program. In addition to data from the long-term regional monitoring network, data from the 13 domestic wells with available well construction information are summarized in this section, where results are grouped by subbasin and aquifer zone. The results for wells sampled under the Domestic Well Testing Program wells are summarized in Section 5.3.

Francisco Bay that are used only for salt water intrusion monitoring. This evaluation also incorporates limited data from 13 wells with known construction attributes sampled through the District's domestic well sampling program. The District also evaluated data from 237 water supply wells sampled by public water systems and reported to the State Water Resources Control Board Division of Drinking Water (DDW) .

To evaluate regional water quality conditions, water quality test results are compared to state and federal water quality standards. A summary table of sampled parameters showing median and range for each subbasin and aquifer zone[17] and trend analyses is provided in Appendix C. Results indicate that groundwater in the Santa Clara and Llagas subbasins is generally of high quality. Water quality indicators, ions, and trace elements were within the normal range expected in groundwater, except nitrate. Elevated nitrate is primarily an issue in South County due to historic and ongoing sources including synthetic fertilizer, septic systems, and animal enclosures.

Recent sample median concentrations for nitrate and Total Dissolved Solids (TDS) are presented in Table 7. There is no statistically significant change for nitrate or TDS between CY 2015 and CY 2016 for all areas and aquifer zones per the Mann-Whitney Test, using a 95% confidence level. Fluctuations in sample medians are expected due to variation in which wells are tested each year, and amounts of recharge, pumping, and rainfall.

About twenty individual volatile organic compounds (VOCs) and disinfection byproducts were detected in groundwater in 2016, as summarized and listed by subbasin in Table C-4. However, none of the compounds detected was present above its respective Maximum Contaminant Level (MCL), and maximum concentrations were typically well below the MCL. VOCs occur primarily from industrial use of solvents and from leaking underground fuel tanks. Pesticide compounds were not detected in the Santa Clara Plain, Coyote Valley or the Llagas Subbasin.

[17] Public water supply wells were assumed to represent the principal aquifer if no construction information was available, as these are typically deep wells.

Figure 22. CY 2016 Groundwater Quality Monitoring Wells

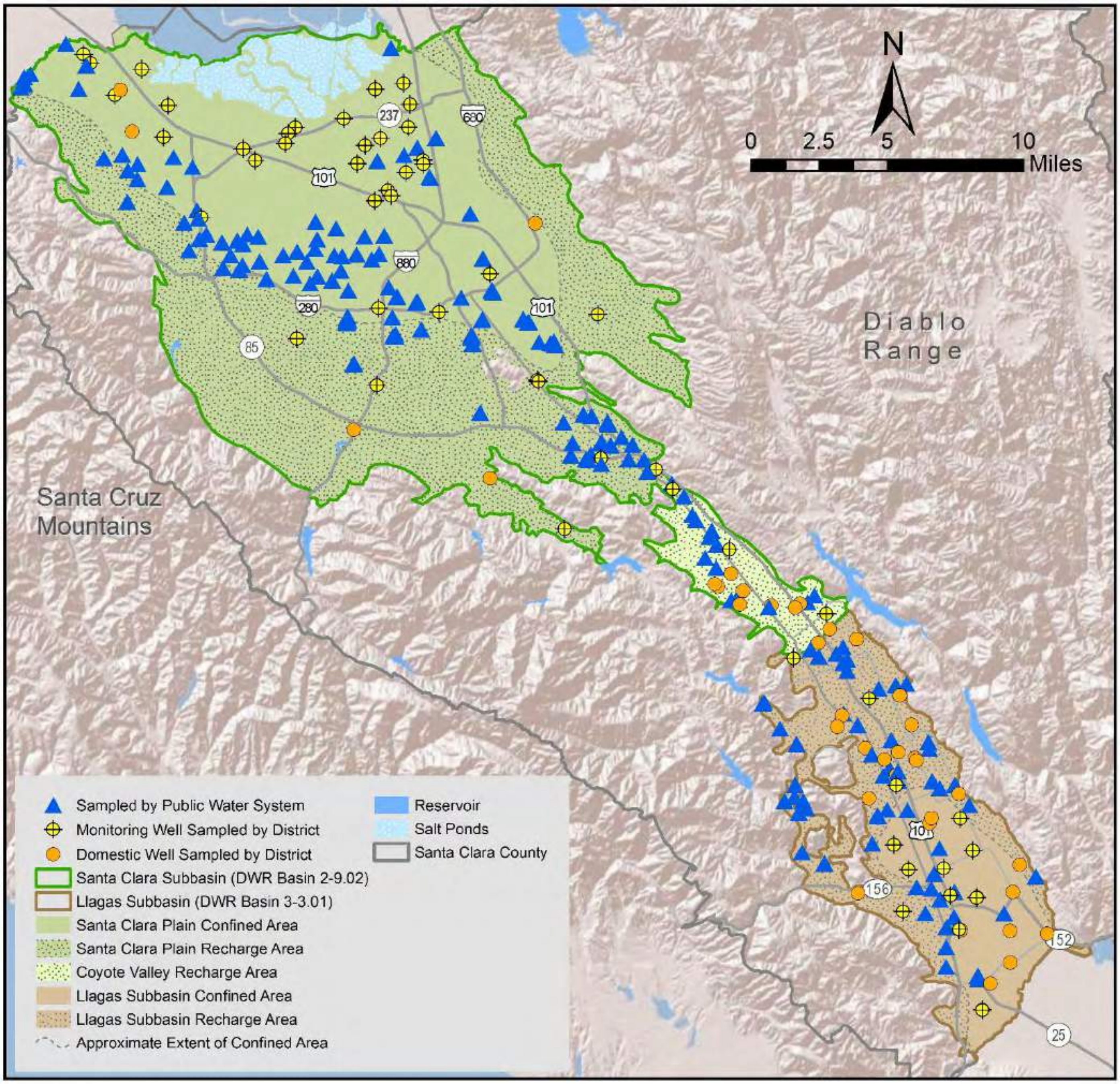


Table 7. Median Nitrate and TDS by Subbasin and Aquifer Zone (mg/L)

Parameter	Santa Clara Subbasin						Llagas Subbasin			
	Santa Clara Plain Shallow Aquifer		Santa Clara Plain Principal Aquifer		Coyote Valley		Shallow Aquifer		Principal Aquifer	
	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015
Nitrate (as N)	1.1	2.1	3	2.9	4.9	5.3	7.2	7.6	4.5	6.4
TDS	498	498	410	400	376	380	400	412	419	371

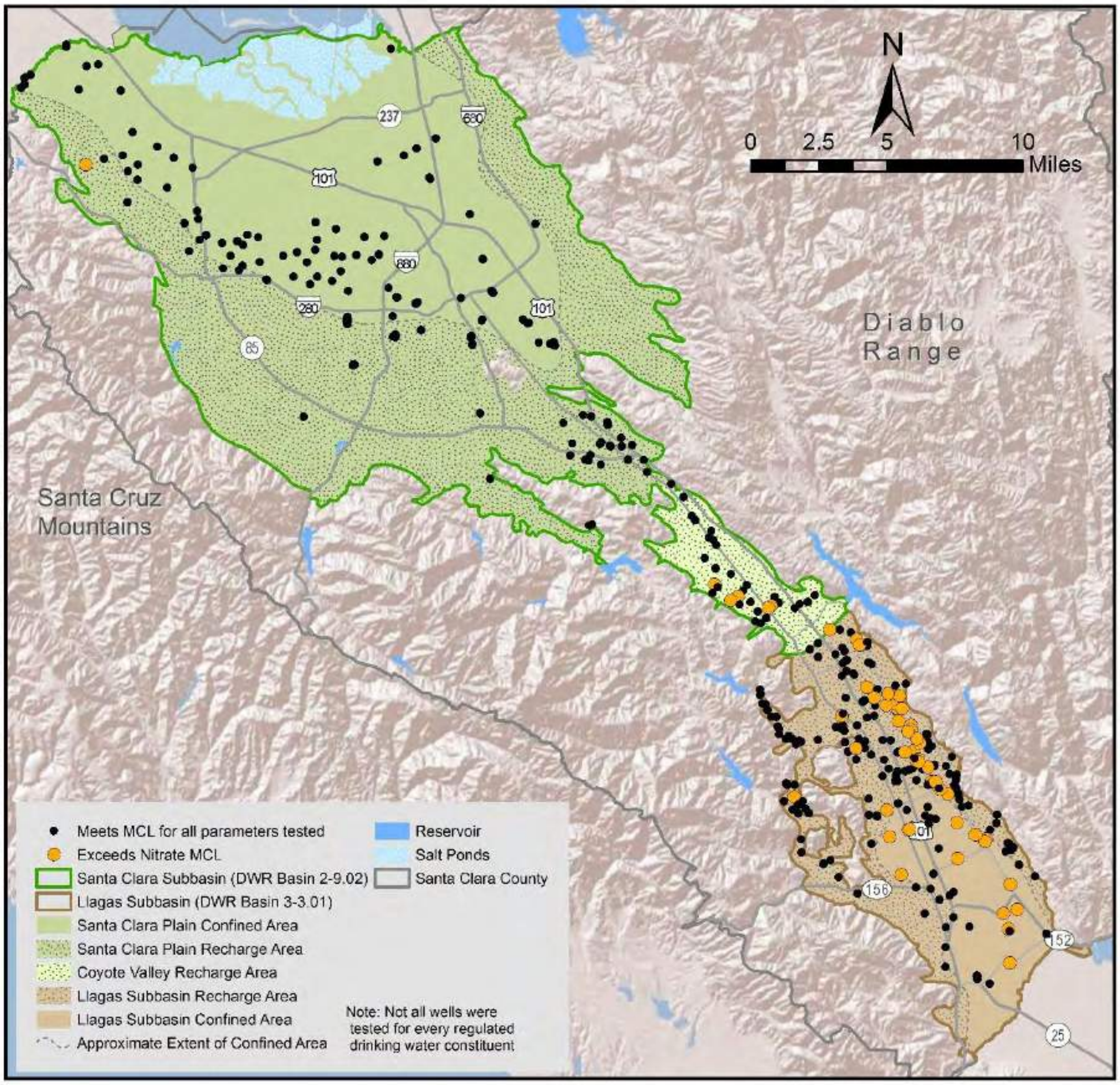
1) The shallow and principal aquifer zones are represented by wells primarily drawing water from depths less than and greater than 150 feet below ground surface, respectively.
2) Nitrate as N has a health-based MCL of 10 mg/L. TDS has an aesthetic-based MCL, which ranges from 500 to 1,000 mg/L (recommended and upper limit, respectively).
3) Table 7 includes information for monitoring wells, public water supply wells, and domestic wells for which construction information is available. The set of wells sampled each year varies.
4) Median TDS in the Santa Clara Plain Shallow aquifer excludes certain wells within the region influenced by saltwater interaction.

Comparison to Drinking Water Standards

With the exception of nitrate, all water supply wells tested (including public water supply wells and domestic wells) met all MCLs. The nitrate MCL is met for 87% of public water supply wells and domestic wells. 22% of South County water supply wells tested exceeded the nitrate MCL of 10 milligrams per liter (mg/L). Figure 23 presents the locations of wells with an MCL exceedance. Most of these detections were from private domestic wells that are not regulated by the state, while 10% (7 wells) were public water systems. Public water systems must comply with drinking water standards, which may require treatment or blending prior to customer delivery. Based on communication with well owners participating in District sampling programs, many domestic well owners use bottled water for drinking and cooking, or reverse osmosis treatment to remove nitrate.

While not used as a source of drinking water, some monitoring wells sampled are screened in the principal aquifer zone. None of the deep monitoring wells sampled in 2016 had detections of any constituent above its MCL. Ten shallow aquifer zone monitoring wells were affected by nitrate. Shallow groundwater quality is important, even though it is generally not used as a source of drinking water, because it is a potential water supply source and because shallow groundwater recharges the principal aquifer in recharge areas.

Figure 23. CY 2016 Water Supply Well Results: MCL Exceedances



Unregulated Contaminant Monitoring

The U.S. Environmental Protection Agency (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 5 years, the EPA develops a list of compounds to be analyzed in large public drinking water systems through the Unregulated Contaminant Monitoring Rule (UCMR). The EPA has completed two rounds of UCMR: UCMR 1, with monitoring between 2001 and 2003, and UCMR 2, with monitoring between 2008 and 2010. UCMR 3 required testing for 28 unregulated contaminants between 2013 and 2015 for large public water systems. UCMR 3 sampling was conducted at

91 wells in Santa Clara County. Related data is available on the EPA website, and the UCMR 3 results for Santa Clara County are summarized in Appendix D.

The occurrence of UCMR 3 constituents in Santa Clara County groundwater is generally similar to national occurrence rates in groundwater, with the following exceptions:

- The metals chromium, hexavalent chromium, and vanadium are detected more often, likely due to presence of serpentinite rock and sediments in Santa Clara County groundwater subbasins.
- Chlorate, an agricultural defoliant/dessicant and disinfection byproduct, is detected more often in Santa Clara County (78% detection rate) compared to 51% detection nationwide.
- Five of the seven UCMR 3 VOC compounds were absent in Santa Clara County groundwater, but present nationwide. For the two VOC compounds detected locally:
  - The detection rate for 1,1-dichloroethane was less than 1% (6 times lower than the national average).
  - Freon 22, a gas used as a refrigerant and solvent, was detected in 36% of wells tested locally, over 10 times the national occurrence rate. 95% of detections (38 of 41 wells) are in the Santa Clara Plain.
- Perfluorinated compounds and hormones were not detected in groundwater in Santa Clara County in contrast to nationwide occurrence findings.
- The detection rate of 1,4-Dioxane was 7 times lower locally (detected in only 2 Santa Clara County wells).

The District will continue to follow EPA progress in assessing the occurrence of unregulated contaminants and any related regulatory efforts.

Comparison to Agricultural Objectives

South County groundwater quality was evaluated against agricultural water quality objectives from the applicable Regional Water Quality Control Board Basin Plans[18] to assess its suitability for agricultural uses. Because the District has limited access to agricultural wells, water supply well data was used in this evaluation. Ninety-eight percent of all South County water supply wells met Basin Plan agricultural objectives. In Coyote Valley, all wells met agricultural objectives except one well for nitrate and one well for electrical conductivity. In the Llagas Subbasin, six wells did not meet agricultural limits for sodium (2 wells), nitrate (2 wells), manganese (1 well), or fluoride (1 well).

5.2 Groundwater Quality Trends

To assess changes in water quality over time, the District evaluated statistical trends for chloride, nitrate, and TDS concentrations by groundwater management area and aquifer zone. Concentration trends were evaluated for all wells sampled in 2016 with at least five results over the last 15 years (2002 through 2016). The results show that most wells

[18] Groundwater in the Coyote Valley is compared to the limits in Table 3-6 of the San Francisco Bay Basin Water Quality Control Plan (March 2015). Groundwater in the Llagas Subbasin is compared to the upper range of the "increasing problems" range in Table 3-3 and Table 3-4 (irrigation supply) of the Water Quality Control Plan for the Central Coast Basin (March 2016).

have stable or decreasing concentration trends for chloride, nitrate, and TDS, as shown in Figures 24 through 26 and summarized in Table 8. In general, chloride trends are stable or decreasing in the Llagas Subbasin, stable in Coyote Valley, and mixed in the Santa Clara Plain. Nitrate is generally stable or decreasing throughout the county, and a group of wells with decreasing trends is observed in the southern portion of the Santa Clara Plain near the Coyote Valley (Figure 25). This may be the result of dilution from the managed recharge of water with low nitrate content through Coyote Creek. Though less well-defined, another group of wells with an upward nitrate trend is observed in the downtown area of San Jose. Only a small percentage of countywide wells analyzed had an increasing trend for TDS (5%), whereas, in the Coyote Valley and shallow aquifer of the Llagas Subbasin, 11% and 27% of wells had increasing TDS trends, respectively.

Table 8. Chloride, Nitrate, and TDS Trends (2001 - 2016)

Groundwater Management Area	Parameter	Number of Wells Evaluated	Percent of Wells with Stable or Decreasing Trend	Number of Wells with Increasing Trend
Santa Clara Plain Shallow Aquifer	Chloride	45	84%	7
	Nitrate (as NO_3)	20	95%	1
	TDS	22	95%	1
Santa Clara Plain Principal Aquifer	Chloride	288	95%	14
	Nitrate (as NO_3)	254	89%	27
	TDS	148	98%	3
Coyote Valley	Chloride	34	97%	1
	Nitrate (as NO_3)	32	91%	3
	TDS	19	89%	2
Llagas Subbasin Shallow Aquifer	Chloride	30	73%	8
	Nitrate (as NO_3)	26	88%	3
	TDS	22	73%	6
Llagas Subbasin Principal Aquifer	Chloride	100	94%	6
	Nitrate (as NO_3)	110	93%	8
	TDS	52	96%	2
All Groundwater Management Areas	Chloride	497	93%	36
	Nitrate (as NO_3)	442	90%	42
	TDS	263	95%	14

Figure 24. Chloride Trends (2002 - 2016)

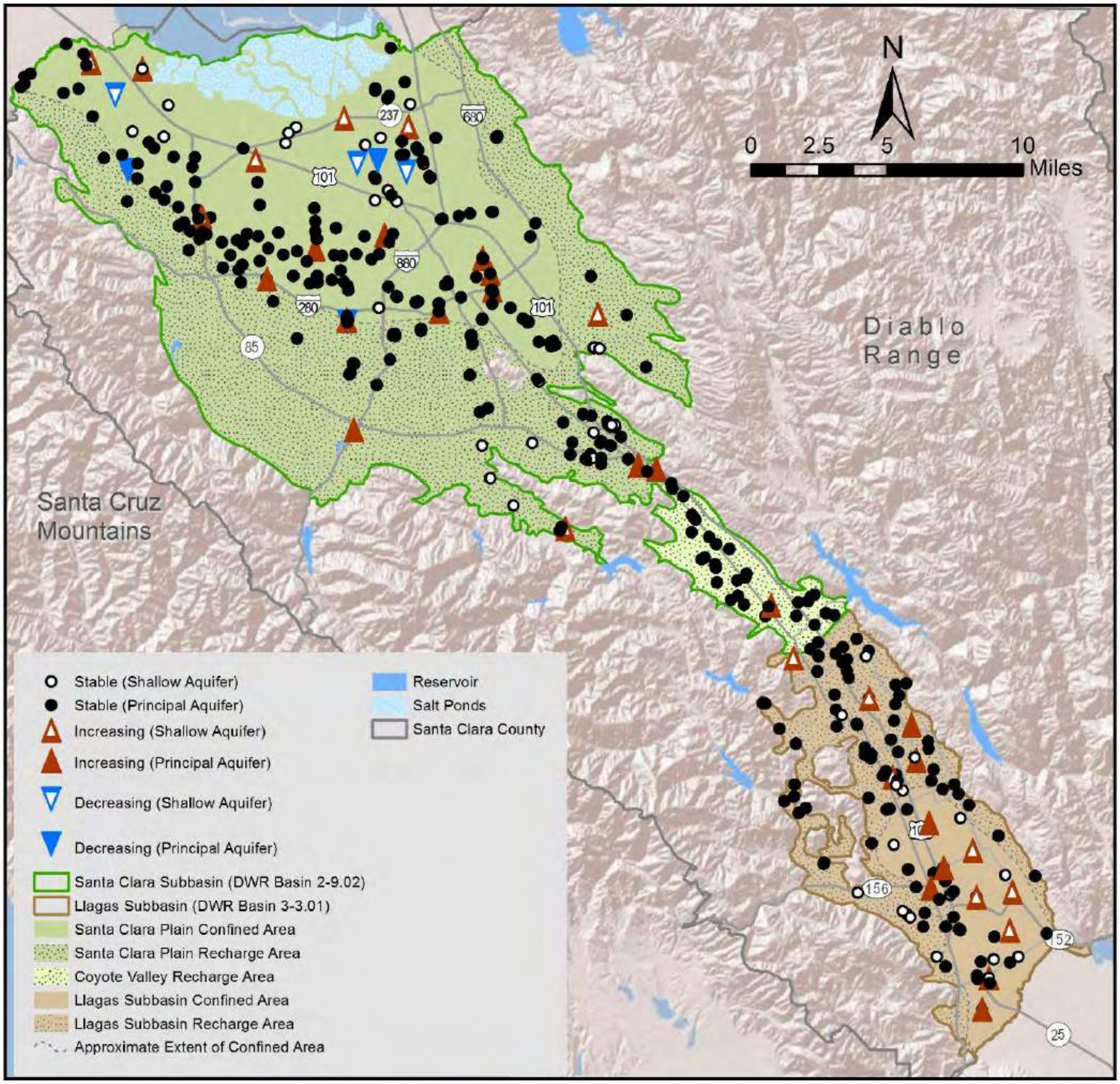


Figure 25. Nitrate Trends (2002 - 2016)

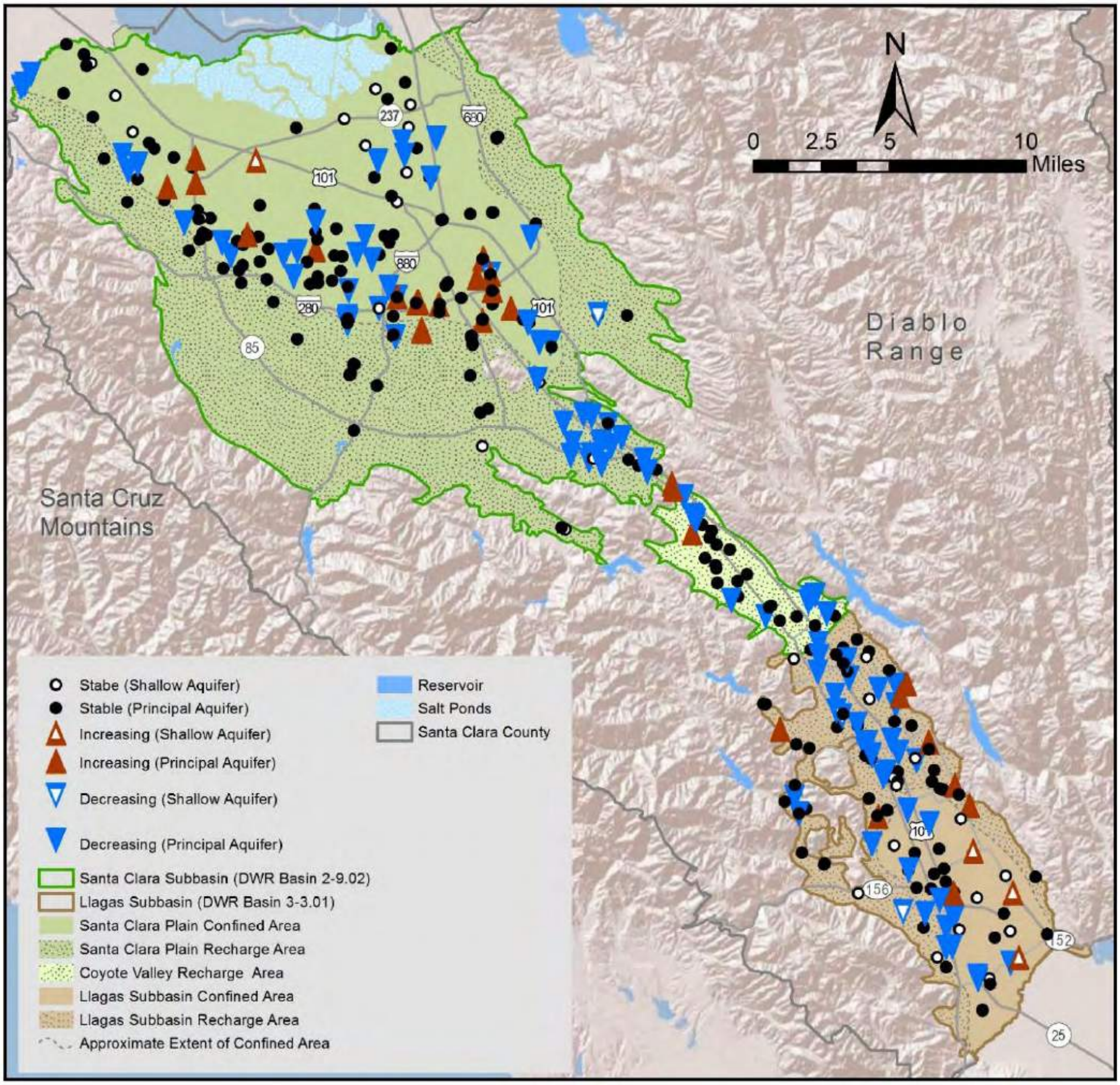
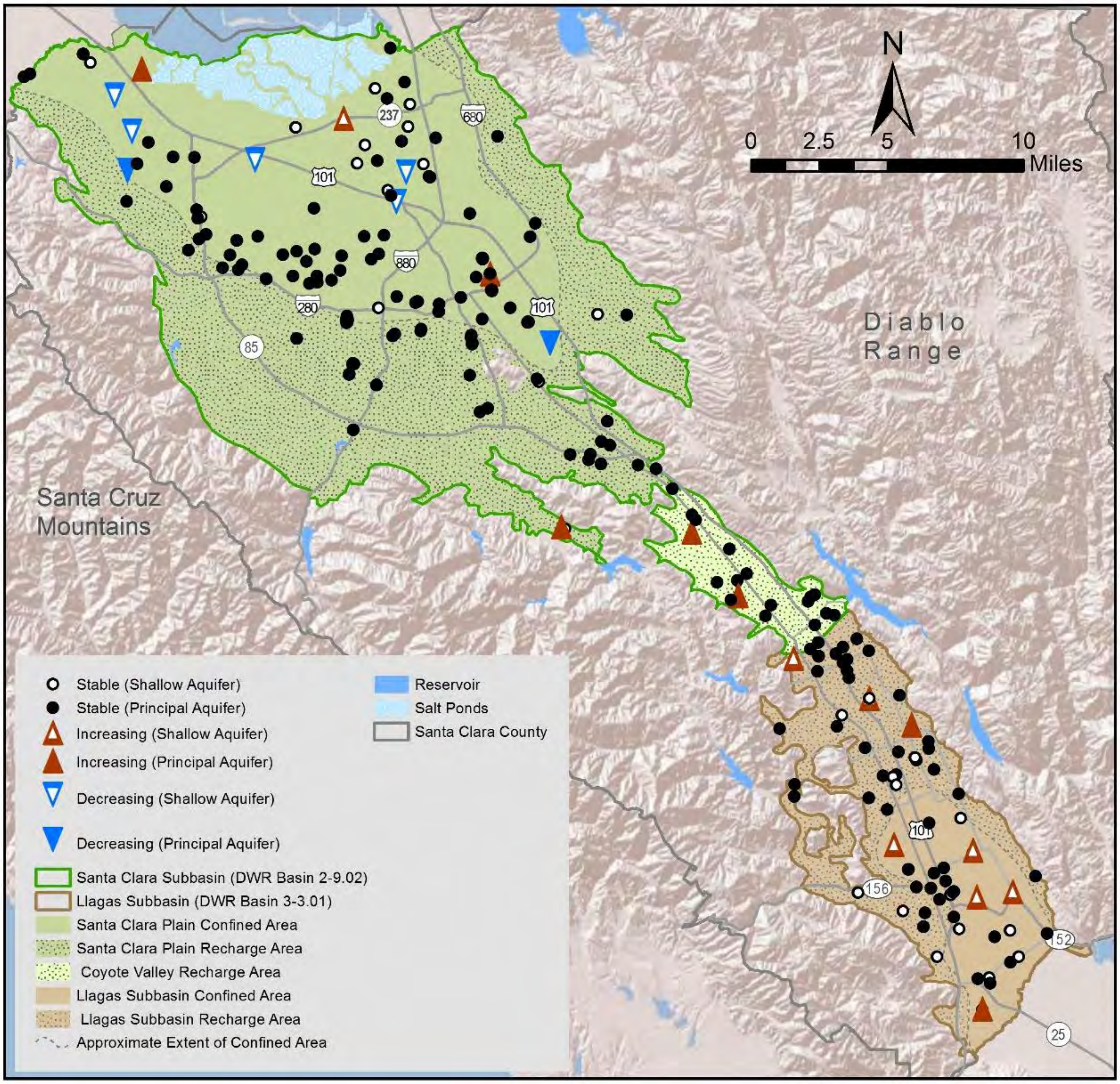


Figure 26. Total Dissolved Solids (TDS) Trends (2002 - 2016)



Groundwater and Salt Water Interaction

Salt water intrusion of shallow aquifers was observed historically near South San Francisco Bay and adjacent to the tidal reaches of the Guadalupe River, Coyote Creek, and other creeks in the northern portion of the Santa Clara Plain. As previously discussed, the District has implemented managed recharge and in-lieu recharge programs to minimize the risk of groundwater overdraft, land subsidence, and salt water intrusion.

Chloride concentrations from shallow monitoring wells were used to assess groundwater and salt water interaction adjacent to southern San Francisco Bay and near tidal reaches of creeks. The District uses a chloride concentration of 100 mg/L to indicate influence from salt water. This is a conservative indicator since the aesthetic-based secondary MCL for chloride is 250 mg/L.

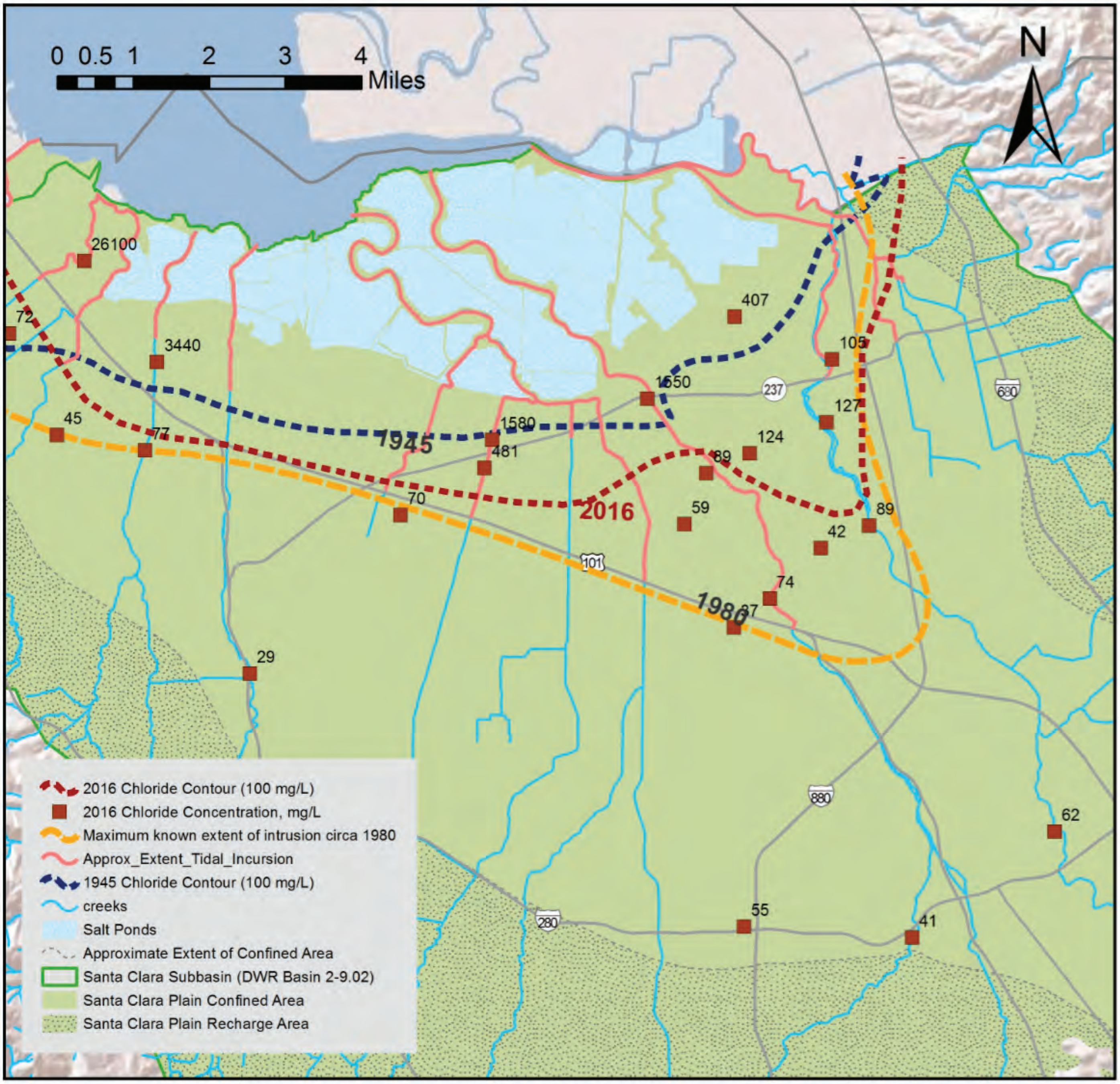
As shown on Figure 27, wells with chloride over 100 mg/L are located in a narrow band near the former salt evaporation ponds, except in the areas adjacent to the tidal reaches of creeks (e.g., lower extent of the Guadalupe River and Coyote Creek). In these areas, a larger portion of the shallow aquifer is affected due to tidal incursion in these channels that occurs due to historic land subsidence. A significant increase in chloride content is observed near the levee system that defines former salt evaporation ponds. Most shallow wells in this area have downward trends for chloride, demonstrating that the salt water intrusion front appears to be stable or retreating.

Historically, few wells in the principal aquifer zone were found to have elevated TDS, and the chloride concentrations noted were relatively low. Salt water intrusion of the principal aquifer may occur from shallow saline groundwater via vertical conduits such as abandoned wells when the vertical hydraulic gradient is downward.[19] At isolated locations in Palo Alto and southeast San Jose, the source of elevated TDS in deeper wells has been characterized as connate water (trapped salt water from the geologic past), rather than recent salt water intrusion. The District currently conducts only limited monitoring of the principal aquifer in the Baylands area because few deeper wells are available. Migration of saline shallow groundwater into the principal aquifer has been prevented due to the District's managed and in-lieu recharge programs, which maintains artesian conditions (upward vertical gradient) in the Baylands area.[20] Tidal incursion in the bayward reaches of streams still occurs, and continues to introduce saline water to the shallow aquifer, as observed in elevated chloride concentrations in shallow aquifer wells in the Baylands area.

[19] Vertical gradients in the Baylands area where salt water interaction occurs have been upward for the last 20 years (approximately).

[20] Artesian conditions are facilitated by the presence of a laterally-extensive clay layer (aquitard), which confines the pressure within the principal aquifer, and isolates the principal aquifer from saline intrusion and other contamination.

Figure 27. Groundwater and Salt Water Interaction in Shallow Aquifer



5.3 Domestic Well Water Quality

The District offers free, basic water quality testing to domestic well owners within the District's groundwater charge zones. In 2016, the District tested 11 domestic wells in North County and 150 wells in South County. Basic water quality parameters tested include nitrate, bacteria, electrical conductivity, and hardness. This section summarizes 2016 data from domestic wells sampled as part of the District's Domestic Well Testing Program. The wells sampled under this program vary by year based on voluntary participation by well owners. North County testing included 4 new wells and 7 repeat wells, while South County included 49 new wells and 101 repeat samples.

Domestic well testing helps improve the District's understanding of the occurrence of common contaminants and provides important information that helps well owners understand their water quality. Although water quality in private domestic wells is not regulated by the state, the comparison to state drinking water standards provides context for results. Table 9 summarizes the results for each charge zone, including median concentrations and percent of wells with concentrations above drinking water standards.

Nitrate was detected above the MCL at 9% of North County wells tested and 26% of South County domestic wells tested. The nitrate results are shown in Figure 28 relative to the MCL of 10 mg/L nitrate as nitrogen. The median concentration of nitrate (as nitrogen) in domestic wells in North and South County was 2.1 mg/L and 5.9 mg/L, respectively. The 2016 regional median nitrate concentrations for the Santa Clara Plain, Coyote Valley, and Llagas Subbasin are outlined in Table 7. The nitrate median in domestic wells is higher than the regional median, possibly due to differences in well depth/construction and maintenance or the fact that public water systems have more flexibility in blending or switching sources when concentrations approach the MCL.

Countywide, total coliform bacteria were detected in about 32% of the domestic wells tested, a slightly lower percentage than in 2015 (37%). Coliform bacteria are naturally present in humans, animals, and the environment and do not normally cause illness, but they should not be present in drinking water. Escherichia coli (E. coli), a type of bacteria indicative of fecal contamination, were detected in about 2% of the domestic wells tested countywide. Total coliform and E. coli detections appear randomly distributed, but more frequent in the Llagas subbasin.

The continued presence of nitrate above the MCL in many domestic wells highlights the need for ongoing efforts by regulatory and land use agencies, agricultural operators, and groundwater management agencies to address elevated nitrate in groundwater. To reduce well owners' exposure to nitrate, the District began implementation of a multi-year rebate program for nitrate treatment systems in the fall of 2013, funded by the District's Safe, Clean Water and Natural Flood Protection Program (Measure B, a countywide special parcel tax). In 2016, the District issued eight nitrate treatment system rebates. This effort complements outreach and other efforts to reduce nitrate loading in coordination with the Central Coast Water Board and other basin stakeholders.

Figure 28. Nitrate Results for 2016 Domestic Well Testing Program Wells

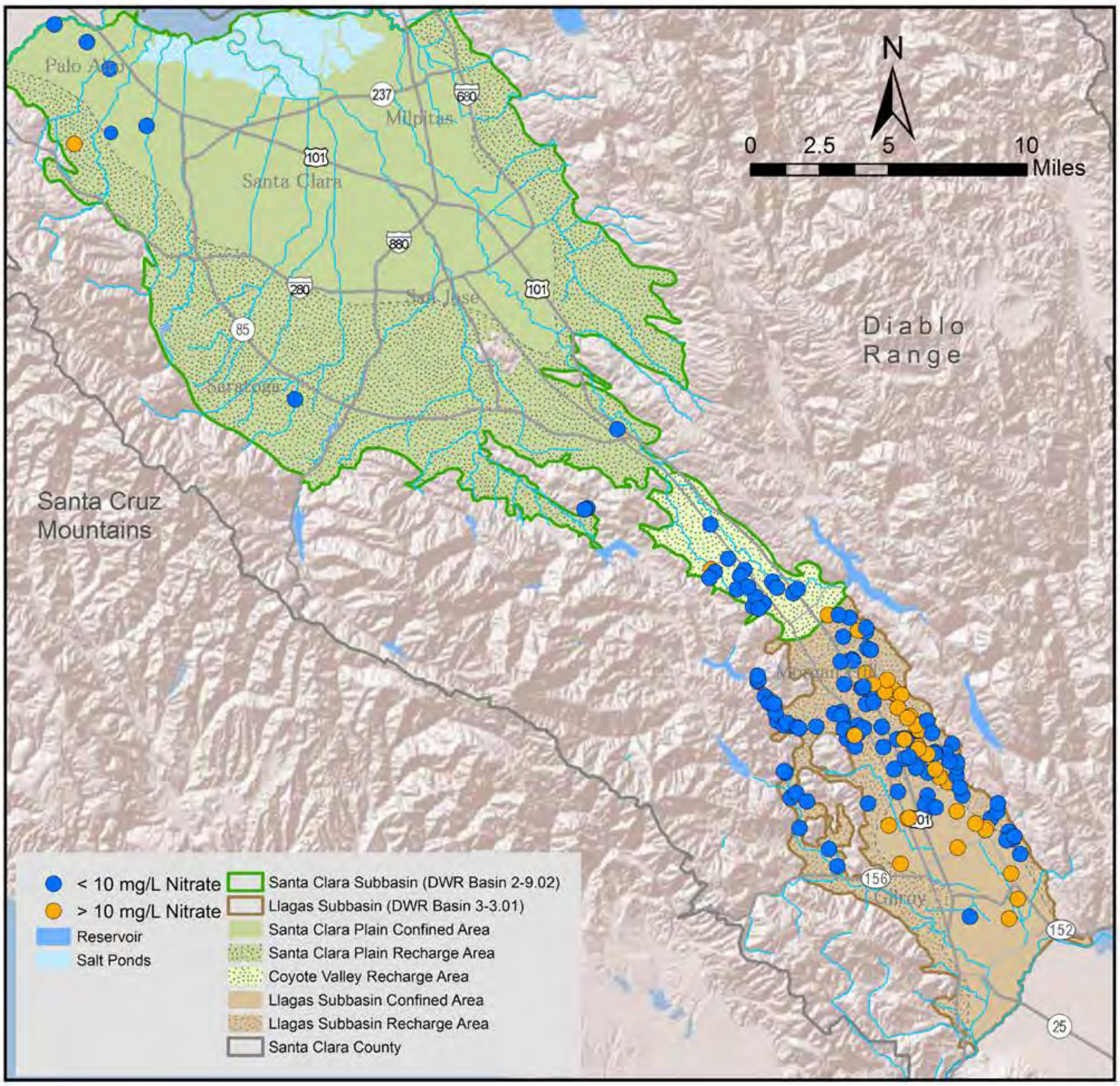


Table 9. CY 2016 Domestic Well Testing Results

Parameter and Units	MCL[1]	Zone W-2 North County		Zone W-5 South County	
		Median	Wells above MCL[1] (%)	Median	Wells above MCL[1] (%)
Nitrate as N (mg/L)	10 (P)	2.1	9%	5.9	26%
Fluoride (mg/L)	2 (P)	0.1	0%	0.1	0%
Electrical Conductivity (uS/cm)	900 (S)	865	45%	667	15%
Sulfate (mg/L)	250 (S)	47.5	0%	34.7	1%
Hardness (mg/L as CaCO3)	--	403	--	265	--
		Wells with Bacteria Present (No.)	**Wells with Bacteria Present (%)**	**Wells with Bacteria Present (No.)**	**Wells with Bacteria Present (%)**
Total Coliform Bacteria	--[2]	0	0%	52	35%
E. Coli Bacteria	--[2]	0	0%	3	2%

Notes:

1) Maximum contaminant levels are established by the DDW for public water systems. (P) indicates the parameter has a health-based primary MCL and (S) indicates a secondary, aesthetic-based MCL. Hardness does not have a primary or secondary MCL but water with hardness above 180 mg/L is classified as very hard. Water quality in domestic wells is not regulated by the state.
2) Bacteria are measured as present or absent. Public water systems are required to ensure that fewer than 5% of samples have total coliform present and that no samples have E. Coli present.

5.4 Recharge Water Quality

The District monitors surface water quality at selected in-stream and off-stream recharge facilities to characterize recharge water quality and assess how groundwater quality may be influenced by managed recharge. Monitoring is conducted in accordance with the District's 2016 GWMP, which prescribes sampling each recharge system every three years.

In 2016, the District monitored a total of 11 facilities in the West Side and Coyote recharge systems in May and December (Figure 29, Table 10). The samples were analyzed for major and minor ions, and trace elements. The source of managed recharge water at each facility varies and may consist of imported water, local water, or a blend of the two.

Table 10. CY 2016 Recharge Water Quality Sampling Locations

Recharge System	Facilities Sampled in May and December 2016
West Side	• Saratoga Creek: near Lawrence Expressway and Castle Glen Avenue in San Jose • Stevens Creek: near Foothill Rd and I-280 in Cupertino • Stevens Creek: near Stevens Creek Blvd and Scenic Blvd in Cupertino • Stevens Creek: near McClellan Rd and Club House Ln in Cupertino
Coyote	• Coyote Creek: near Singleton Rd and Tuers Rd in San Jose • Coyote Creek: near Blossom Hill Rd and Hwy 101 in San Jose • Coyote Pond North: near Metcalf Rd and Old Monterey Rd in San Jose • Coyote Pond South: near Metcalf Rd and Old Monterey Rd in San Jose • Coyote Creek: near Coyote Ranch Rd and Old Monterey Rd in San Jose • Coyote Creek: near Bailey Ave and Hwy 101 in San Jose • Coyote Creek: near Barnhart Ave and Old Monterey Rd in Morgan Hill

Although managed recharge water is not suitable for direct consumption before treatment or infiltration, comparing it to drinking water standards provides context for results. No parameters were detected above health-based drinking water standards in any of the recharge water samples. Table 11 provides water quality indicators for salinity, non-point source pollution, and trace metals. Results are compared against median groundwater concentrations for the corresponding groundwater subbasin area.

Table 11. Summary of Key Water Quality Indicators for All Recharge Systems Sampled in May and December 2016

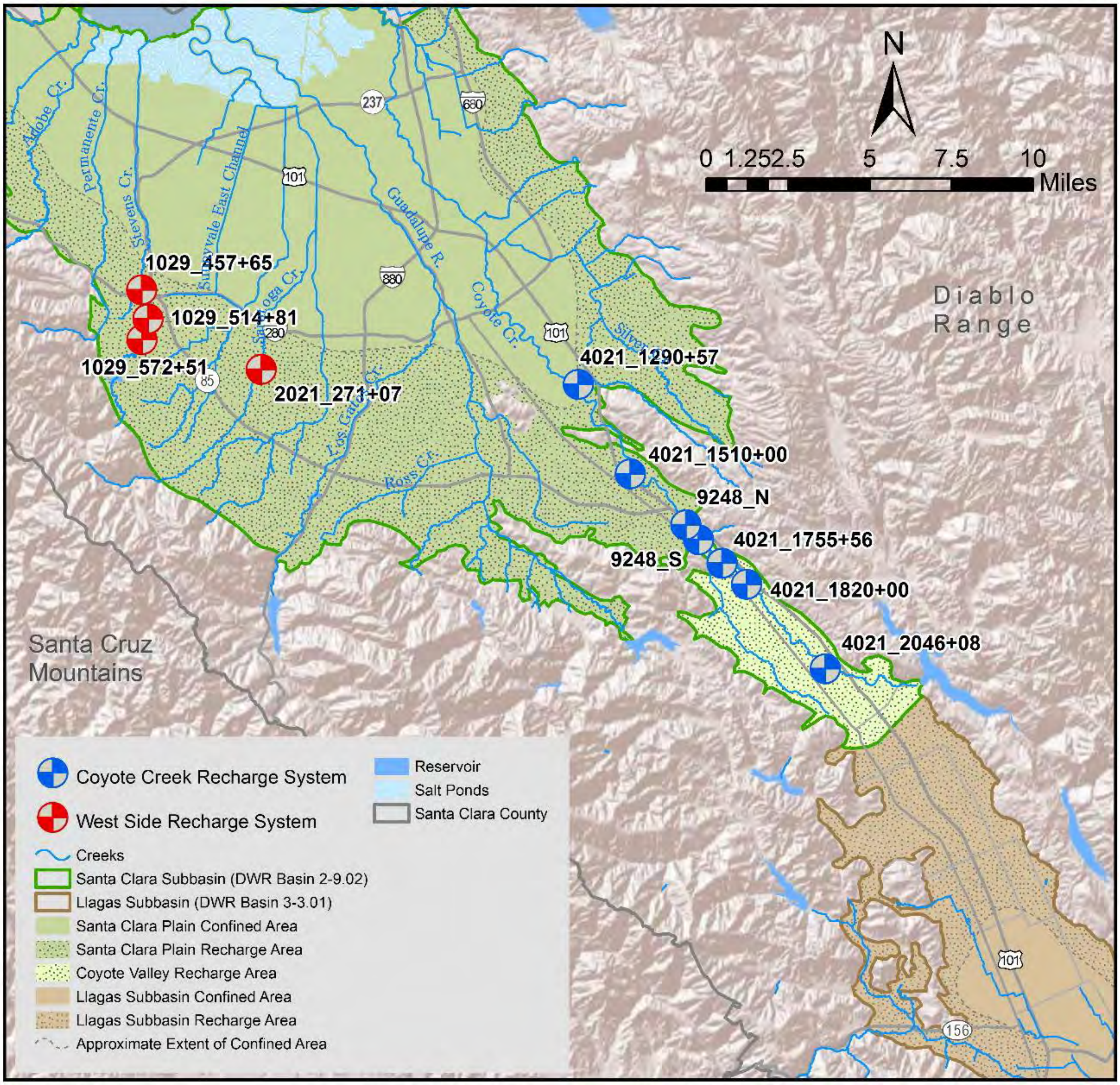
Parameter	Units	West Side System Median [1]		Coyote System Median [1]		MCL	SMCL	Regional Groundwater [2]	
								Santa Clara Plain	Coyote Valley
		May	Dec	May	Dec				
TDS	mg/L	296	330	342	282	-	500	425	376
Total Alkalinity (as $CaCO_3$)	mg/L	169	202	167	145	-	-	240	180
Chloride	mg/L	21	28	39	47	-	250	48	39
Sulfate	mg/L	35	47	48	37	-	250	45	47
pH	pH units	7.42	N/A	7.44	7.89	-	6.6-8.5	7.6	7.8
Nitrate (as N)	mg/L	0.15	0.14	0.08 [3]	0.03 [4]	10	-	3.0	4.9
Aluminum	ug/L	<20 [5]	<20 [5]	<20 [6]	<20 [5]	1,000	200	14	13
Iron	ug/L	<20 [5]	<20 [5]	55 [6]	<20 [5]	-	300	33	<100

Notes:

N/A = not available; measurements not taken due to equipment issues

1) Table 11 contains the median value for all stations sampled within the recharge system.
2) 2016 median for the principal zone of the Santa Clara Plain and Coyote Valley.
3) Two of seven stations had non-detect values (0.05 mg/L or less) for nitrate for the Coyote System.
4) Four of seven stations were non-detect (less than 0.05 mg/L) for nitrate for the Coyote System.
5) All values for all stations were non-detect.
6) One of seven stations was non-detect (20 ug/L or less) for iron for the Coyote System.

Figure 29. Location of 2016 Sampling Sites in the West Side and Coyote Recharge Systems



5.5 Monitoring Near Recycled Water Irrigation Sites

The District partners with the four recycled water producers in the county[21] to provide recycled water for non-potable purposes like landscape and agricultural irrigation, and industrial processes. Tertiary treated recycled water generally has higher concentrations of salts, nutrients, disinfection byproducts, and emerging contaminants than local groundwater or potable treated water.[22] Previous studies near recycled water irrigation sites, including the District study discussed below, have shown that contaminants migrate to shallow groundwater when turf and other landscaping is irrigated with tertiary treated recycled water.[23] Accordingly, the District conducts groundwater monitoring at more than twenty wells near recycled water irrigation sites.

In 2011, the District completed the Recycled Water Irrigation and Groundwater (RWIG) Study,[24] which included a field study at a recycled water irrigation site, the Integrated Device Technology (IDT) campus in southeast San Jose. The RWIG study and subsequent monitoring at IDT found that groundwater concentrations of most constituents of concern did not increase after recycled water irrigation; however, chloride and TDS increased in one monitoring well. Several constituents indicative of recycled water were detected in shallow groundwater at IDT including perfluorinated compounds (PFCS) N-Nitrosodimethylamine (NDMA, a disinfection byproduct), and three other nitrosamine compounds. The RWIG study suggested that best management practices and/or changes in recycled water treatment may be warranted for irrigation with recycled water in sensitive areas.

The District and South Bay Water Recycling (SBWR) have worked to improve recycled water quality for irrigation and other uses. Since March 2014, recycled water provided by SBWR has been blended with advanced treated water from the District's Silicon Valley Advanced Water Purification Center (SVAWPC), which produces up to eight million gallons of water a day using microfiltration, reverse osmosis, and ultraviolet light. The final blended recycled water has better water quality, with TDS lowered from about 750 mg/L to about 500 mg/L.

To determine the impacts to groundwater of recycled water irrigation, the District monitors groundwater quality changes near selected recycled water irrigation sites as shown in Figures 30 and 31. In addition, SBWR collects annual samples at several wells in the Santa Clara Subbasin as part of their Groundwater Monitoring and Mitigation Program. Table 12 provides a summary of related monitoring in 2016.

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[21] Recycled water is produced at the Palo Alto Regional Water Quality Control Plant, San Jose/Santa Clara Water Pollution Control Plant (WPCP), the Sunnyvale WPCP and the South County Regional Wastewater Authority.

[22] Advanced Recycled Water Treatment Feasibility Project, Black & Veatch, Kennedy/Jenks for the Santa Clara Valley Water District, August 2003. In the Llagas subbasin, nutrient content of recycled water is lower than ambient groundwater concentrations (Llagas Subbasin Salt and Nutrient Management Plan).

[23] California GAMA Program: Fate and Transport of Wastewater Indicators: Results from Ambient Groundwater and from Groundwater Directly Influenced by Wastewater, Lawrence Livermore National Laboratory and California State Water Resources Control Board, June 2006.

[24] 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.

Table 12. Summary of 2016 Groundwater Monitoring near Recycled Water Irrigation Sites

Subbasin	Location	Sampling Agency	Sampling Summary
Santa Clara Subbasin (Santa Clara Plain)	Integrated Device Technology (IDT) Campus, Edenvale area of San Jose	IDT and District	• Although recycled water continues to be used for irrigation at this site, the 4 shallow wells were dry in 2016 • Recycled water delivered to this site was sampled in May 2016
	Various Locations in San Jose	South Bay Water Recycling	• 5 shallow and 5 deep wells were monitored in March 2016 by the City of San Jose per their Groundwater Mitigation and Monitoring Plan (GMMP)
Llagas Subbasin	Christmas Hill Park, Gilroy	District	• 3 shallow wells and 1 deep well were sampled quarterly in 2016 • Water from the recycled water distribution pipeline was also sampled quarterly
	Irrigated Land Near SCRWA Plant, Gilroy	District	• 4 shallow wells were sampled quarterly • The effluent water from the SCRWA recycled water treatment process was also sampled quarterly
	Irrigated Land Along Phase 1B Pipeline Alignment (West Gilroy)	District	• 10 shallow monitoring wells were sampled quarterly, the 2 other shallow wells were dry in 2016

The District evaluates the Santa Clara Plain groundwater data from SBWR and the District sites in both the Santa Clara Plain and the Llagas Subbasin. Statistical analysis of concentration trends and other geochemical analytical methods are used to evaluate water quality changes as summarized below for each subbasin.

Santa Clara Subbasin

As shown in Figure 30, both the SBWR and the District monitor for the effects of recycled water irrigation on groundwater in the Santa Clara Plain. The parameters analyzed by SBWR include basic salts and minerals, alkalinity and TDS. The District analyzes the IDT well samples for basic water quality parameters, ions, DBPs, PFCs, NDMA, bacterial parameters, and other constituents commonly encountered in recycled water.

Due to continued drought conditions, IDT monitoring wells were dry throughout most of 2016. District staff gages water levels monthly. Groundwater levels rose back in to the wells in September 2016; however, there was not enough water to allow sampling. To provide continued information on the quality of recycled water used onsite, the District analyzed recycled source water samples from the onsite irrigation system. NDMA levels in the irrigation water fall within the range of past concentrations, but increased from 280 ng/L in March 2014 to 340 ng/L in June 2016 despite water quality improvements in the SBWR system due to blending with SVAWPC purified water. NDMA can form during recycled water treatment and within pipelines[25] and the recent, exceptional drought may have also affected wastewater composition. The maximum concentration of NDMA ever detected in shallow groundwater at the IDT site was 18 ng/L, in September 2013. Groundwater monitoring by SBWR indicates increasing chloride in most wells, with varied trends in other constituents. Table 13 presents a summary of groundwater quality trends at Santa Clara Subbasin sites where recycled water is used.

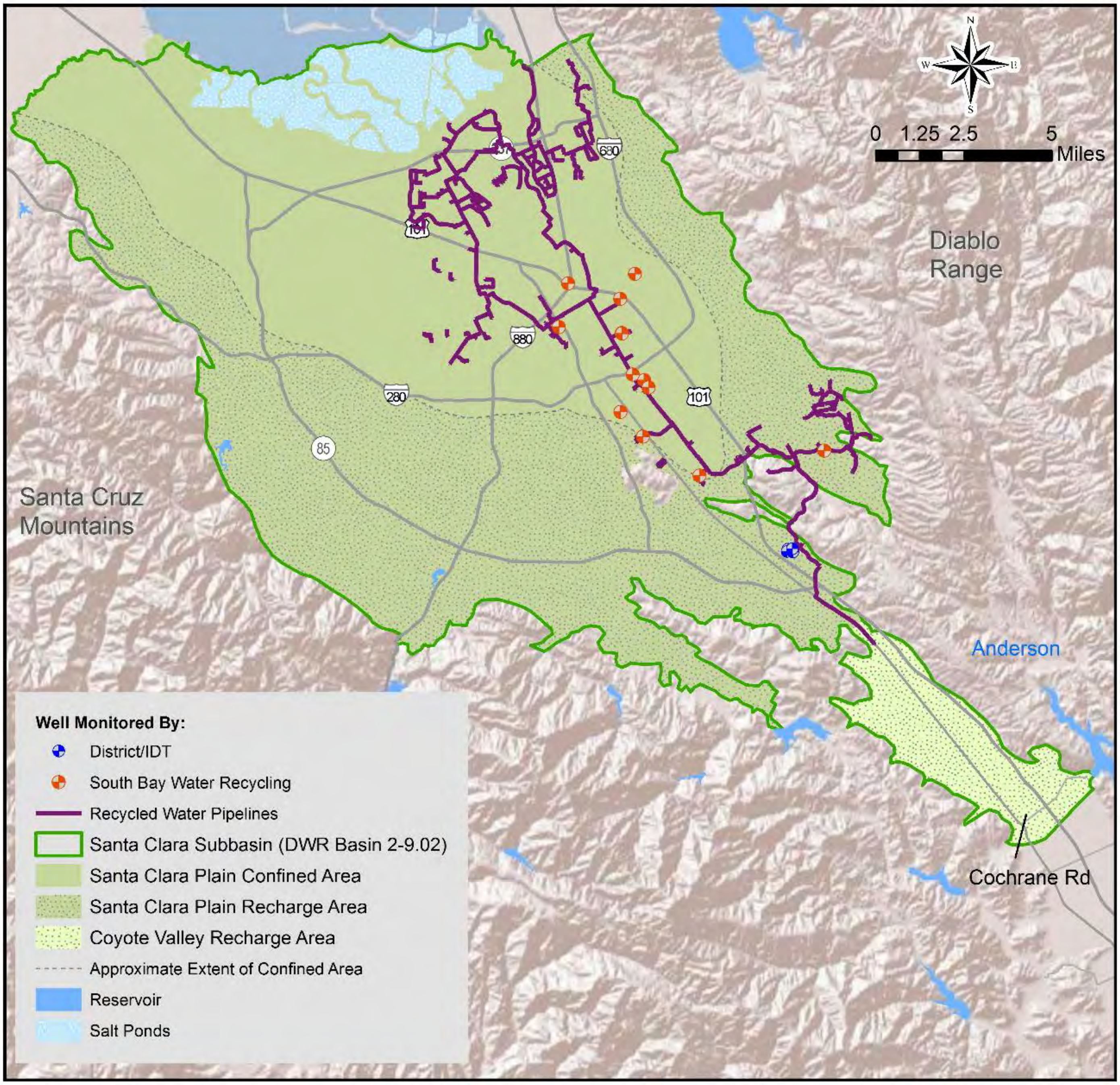
Table 13. Groundwater Quality Trends at Santa Clara Subbasin Recycled Water Irrigation Sites

	South Bay Water Recycling (10 wells)	
Constituent	**Number of Wells with Stable or Decreasing Trends**	**Number of Wells with Increasing Trends**
Total Dissolved Solids (TDS)	5	5
Chloride	2	8
Nitrate	9	1
Potassium	7	3
Sodium	10	0
Sulfate	9	1
Calcium	4	6
Magnesium	3	7
Bicarbonate	9	1

Note: Table 13 summarizes the trend analysis for wells with data in 2016 and more than five data points over a varying period of record, with the earliest data point in 1997. All four wells at the Integrated Device Technology (IDT) site were dry between 2014 and the end of 2016 and are not included in this table.

[25] Monochloramine, a disinfection byproduct, can react with certain forms of organic nitrogen that contains precursors to produce NDMA.

Figure 30. Groundwater Monitoring Near Santa Clara Subbasin Recycled Water Irrigation Sites



Llagas Subbasin

Recycled water used in the Llagas Subbasin is tertiary treated water produced by the South County Regional Wastewater Authority (SCRWA). This recycled water is distributed to several sites in Gilroy and the District monitors groundwater in 20 wells at recycled water irrigation sites (Figure 31). The District analyzes well samples for basic water quality parameters, ions, DBPs, PFCs, NDMA, bacterial parameters, and other constituents commonly encountered in recycled water.

At Christmas Hill Park, groundwater quality at two wells (11S03E12A002 and 11S03E12A003) have similar sodium and chloride ratios as recycled water and show a slight ionic shift towards recycled water. Groundwater quality at a third well (11S03E01Q002) continues to resemble water from the adjacent Uvas Creek, although chloride concentrations appear to be slightly increasing. Continued detections of PFOA were observed in wells 11S03E12A002 and 11S03E12A003, but remain stable and below advisory levels.

Shallow monitoring wells adjacent to the recycled water irrigated land near SCRWA show concentration ratios of ions similar to that of recycled water and different from other local groundwater. The secondary MCL for TDS (500 mg/L) was exceeded in all recycled water irrigation monitoring wells. In 2016, NDMA was detected in all four quarters in the SCRWA source water, but not in any wells. Groundwater monitoring continues to show that recycled water irrigation influences shallow groundwater quality, as indicated by presence of perfluorinated compounds and elevated TDS.

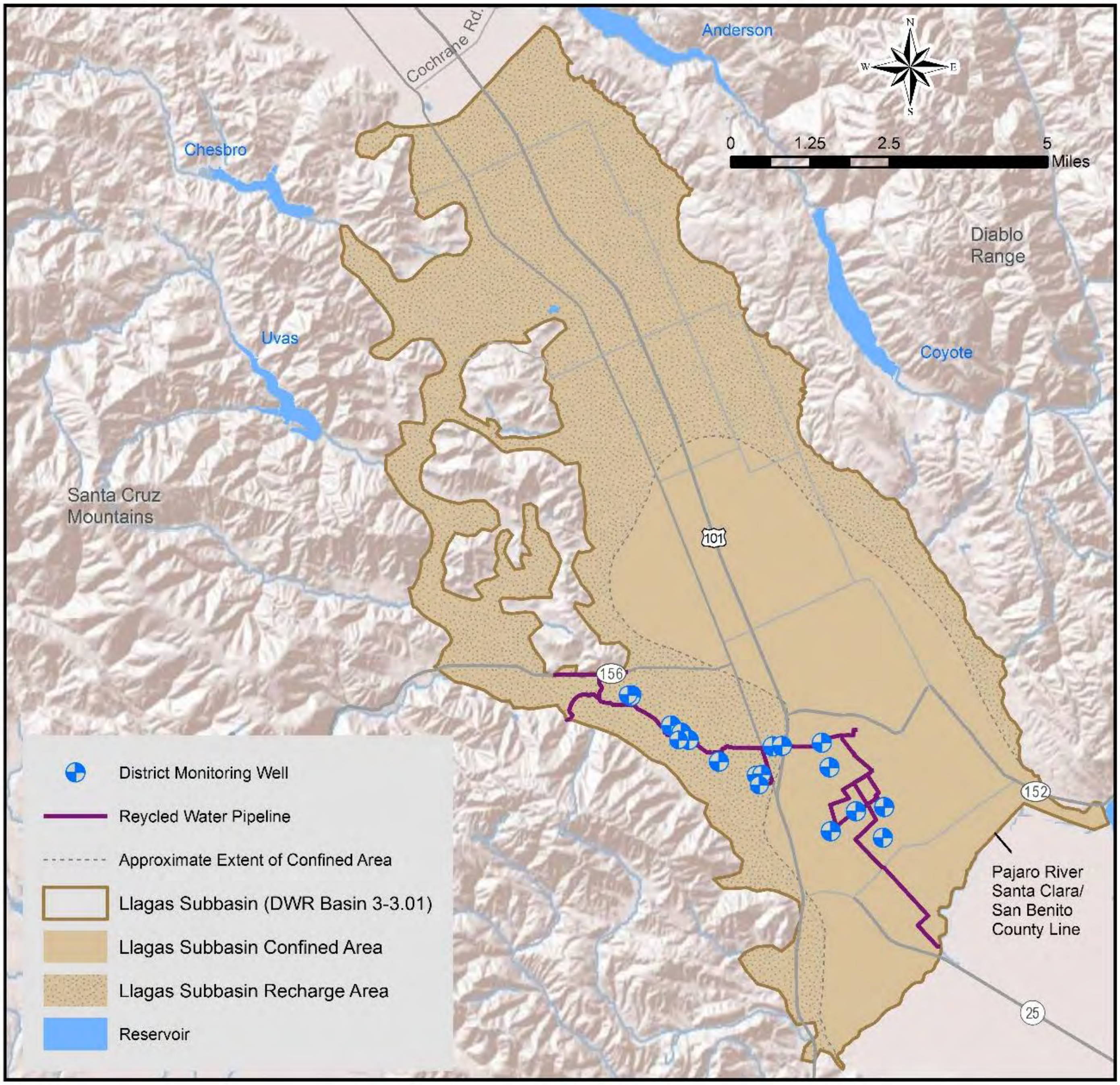
Table 14 presents a summary of groundwater quality trends at Llagas Subbasin sites where recycled water is used. The other recycled water irrigation monitoring wells in the Llagas Subbasin either do not have a sufficient number of samples to support trend analysis, or are near a site that has not yet received recycled water.

Table 14. Groundwater Quality Trends at Llagas Subbasin Recycled Water Irrigation Sites

Constituent	Irrigated Land near SCRWA (3 wells)		Christmas Hill Park (4 wells)	
	Number of Wells with Stable or Decreasing Trends	Number of Wells with Increasing Trends	Number of Wells with Stable or Decreasing Trends	Number of Wells with Increasing Trends
Total Dissolved Solids (TDS)	1	2	2	2
Chloride	2	1	0	4
Bromide	2	1	4	0
Potassium	1	2	3	1
Sodium	1	2	4	0
Sulfate	2	1	4	0
n-Nitrosodi-n-Butylamine (NDBA)	3	0	4	0
Perfluoro Octanoic Acid (PFOA)	3	0	4	0
Perfluoro Butanoic Acid (PFBA)	2	1	4	0

Note: Table 14 includes wells with 2016 detections and more than five data points over a varying period of record (earliest data point in 2002).

Figure 31. Groundwater Monitoring Near Llagas Subbasin Recycled Water Irrigation Sites



5.6 Salt and Nutrient Management Plans

The State Water Resources Control Board's 2009 Recycled Water Policy requires the development of regional Salt and Nutrient Management Plans (SNMPs) to address current and future regional salt and nutrient loading to groundwater from all sources, including recycled water and agricultural activity. The District completed two SNMPs for the Santa Clara and Llagas Subbasins in 2014 by working with local stakeholders and regulators, and completing detailed salt balance analyses. The plans are posted to the District's website[26] and include: salt and nutrient source identification, loading and assimilative capacity estimates, water recycling and storm water recharge goals and objectives, implementation measures, groundwater monitoring provisions, and an anti-degradation analysis. The San Francisco Bay Regional Water Quality Control Board adopted resolution R2-2016-0046 concurring with the Santa Clara Subbasin SNMP in November 2016. The Central Coast Regional Water Quality Control Board does not plan to endorse specific SNMPs. Both agencies will use these plans evaluate future recycled water projects.

The SNMPs estimate and project long-term trends in salts (using total dissolved solids) and nutrients (using nitrate) through the year 2035. Table 15 compares the SNMP projections for 2016 with the median values based on wells sampled in 2016.

Table 15. Comparison of 2016 Median Concentrations with Projected 2016 SNMP Median Concentrations

Subbasin/Sub-area	SNMP Projected Median 2016 TDS (mg/L)	2016 Median TDS From Sample Analysis (mg/L)	SNMP Projected Median 2016 Nitrate as N (mg/L)	2016 Median Nitrate as N from Sample Analysis (mg/L)
Santa Clara Plain	431	410	2.3	3
Coyote Valley	325	376	3.4	4.9
Llagas Subbasin, Shallow Zone	390	406	7.2	7.2
Llagas Subbasin, Principal Zone	375	419	6.5	5

Note: The Llagas Subbasin SNMP projects the median for both the northern and southern portions of the subbasin. The projected SNMP median shown in this table for each aquifer zone is the average of the north and south subbasin medians.

The SNMPs apply a number of simplifying assumptions to project future concentrations, such as instantaneous mixing, and therefore are likely to project higher concentrations than actually occur. Measured median concentrations of TDS and nitrate are similar to SNMP projections for the Santa Clara Plain. In the Coyote Valley, measured TDS and nitrate are both higher than was projected in the Santa Clara Subbasin SNMP. SNMP projections used data through 2012, so the effects of the severe drought that occurred between 2011 and 2015 are not reflected. In the Llagas Subbasin, measured TDS is higher than projected in the SNMP, whereas nitrate is the same or lower. As shown in Table 8 and

[26] http://www.valleywater.org/GroundwaterStudies/

Figures 25 and 26, regional trends for both TDS and nitrate are stable or decreasing in the Santa Clara Plain, Coyote Valley, and the Llagas Subbasin.

5.7 Contaminant Release Sites

There are over 400 open cases where non-fuel contaminants have been released to soil and/or groundwater in the county. These cases are overseen by the California Department of Toxic Substances Control, and the Central Coast and San Francisco Regional Water Quality Control Boards. There are also nearly 200 open fuel leak sites overseen by the Santa Clara County Department of Environmental Health (DEH), of which 10 are eligible for closure, 36 are undergoing site assessment, 26 are undergoing remediation, 22 are in verification monitoring, and 100 are inactive. In addition, there are 23 active Superfund sites in Santa Clara County overseen by the United States Environmental Protection Agency (USEPA). Although there have been very limited impacts to principal drinking water aquifers from these sites, contaminant release sites pose an ongoing threat to groundwater quality.

In 2016, 17 drinking water supply wells at 12 locations had low-level detections of 9 different VOCs,[27] including 6 different solvent compounds, 2 fuel hydrocarbons, and one plasticizer. All concentrations of detected contaminants remained below regulatory thresholds, as summarized in Appendix C, Table C-4. The interconnection between contaminated release sites and drinking water supply wells underscores the importance of the ongoing work by the California Regional Water Quality Control Board, California Department of Toxic Substances Control, and the US Environmental Protection Agency to ensure that contaminant release sites are properly remediated to protect water supply reliability.

The District prioritizes which cases are closely tracked based on groundwater vulnerability, proximity to water supply wells or surface water, and contaminant concentration. District staff reviews monitoring and progress reports submitted to regulatory agencies by responsible parties, as well as any regulatory orders or correspondence. Staff attends community meetings for high-threat cases and advocates for expedited cleanup through collaboration with regulatory agencies. The District also provides technical review of other contaminant release sites when requested by regulatory agencies, and shares groundwater data with the regulatory agencies to support their work.

In 2016, the following high-priority contaminant release cases had noteworthy developments:

Olin Corporation, 425 Tennant Avenue, Morgan Hill

Perchlorate cleanup activities by the responsible party, including the off-site extraction system, continued. In 2016, over 4,940 AF of groundwater were treated and 23 pounds of perchlorate were removed. Since 2004, 996 million gallons (3,057 AF) of groundwater have been treated, removing a total of 215 pounds.

The Gradient Driven Remediation (GDR) pilot study began in January 2016, and three GDR monitoring events have

[27] None of the wells with VOC detections has all 9 compounds detected; typically just one or a few related compounds are detected in a single well.

been completed. GDR is designed to leverage existing downward vertical gradients to exert hydraulic control and reduce perchlorate concentrations in the lower deep aquifer. Water level monitoring demonstrates that while downward flow increased, the desired hydraulic effect has not yet been achieved, and perchlorate concentrations within the lower deep aquifer have not yet changed appreciably. GDR performance will be analyzed following the first quarter of 2017 monitoring event, and a determination will be made whether the GDR pilot study should continue or be terminated.

Analysis of regional perchlorate monitoring results in 2016 found that perchlorate concentration trends were stable or declining in all aquifers throughout the Llagas Subbasin.[28] While the number of domestic wells impacted by perchlorate has been dramatically reduced (99%), there remain six domestic wells with perchlorate above the 6 µg/L MCL. Olin's consultants conclude that the plume core is stable or shrinking, and recommends that monitored attenuation remain the primary means for addressing remediation outside the plume core. District staff continues to participate in the Perchlorate Community Advisory Group meetings and to advocate for expedited cleanup.

Hillview Cleaners, 1440 Big Basin Way, Saratoga

The Hillview Cleaners site is a dry cleaner site that has released perchloroethylene (PCE) to soil and groundwater, resulting in PCE discharges to Saratoga Creek. In January 2016, District staff provided comments on the December 18, 2015 Remedial Action Plan to the San Francisco Bay Regional Water Quality Control Board. The site has been undergoing remediation, including injection of electron donor compounds to enhance anaerobic biodegradation of PCE. Groundwater elevation measurements and creek gaging confirmed that Saratoga Creek was a gaining stream near the site throughout 2016, and creek sampling confirmed that PCE continues to be detected more than 300 feet downstream of the storm drain outlet associated with groundwater discharge from the site[29]. The District will continue to engage in the review of related site documents and advocate for timely and thorough cleanup.

Moffett Field, Middlefield-Ellis-Whisman (MEW) Sites, Mountain View

This area includes four Superfund sites and more than 15 individual contaminant release sites with soil and shallow groundwater contamination by trichloroethylene (TCE) and other VOCs. MEW has reduced site-wide groundwater level monitoring and groundwater quality sampling to annual and biennial frequencies, respectively. The groundwater treatment system pumped 9.1 million gallons of groundwater (28 AF) to remove 3.7 pounds of VOCs. Sampling conducted in 2016 indicates that VOC concentrations and distribution within Moffett Field remain relatively constant. District staff continues to participate in related MEW, Moffett Field Regional Advisory Board and EPA community meetings.

United Technologies Corporation, 600 Metcalf Road, Santa Clara County

United Technologies Corporation owns and occupies a large (5,113 acre) property upstream of Anderson Reservoir, where it has operated a solid rocket motor research and development facility since 1959. Various VOCs and

[28] Olin Corporation, 2017. 2016 Annual Monitoring and Sampling Report, 425 Tennant Ave, Morgan Hill, CA, Section 7.1. Available on www.GeoTracker.gov

[29] PES Environmental, 2016. Semi-Annual Progress Report, 2nd Half 2016, Hillview Cleaners Site, 14440 Big Basin Way, Saratoga, California. Available on www.geotracker.gov

perchlorate have been released from the site and detected in soil, groundwater, and seasonal creeks. In 2016, there were perchlorate detections up to 23 ug/L in the creek sampling station downstream of the site. However, perchlorate has not been detected in Anderson Reservoir above laboratory reporting limits. Between May 2015 and April 2016, 26 million gallons (80 AF) of groundwater were treated, removing 15 pounds of VOCs, 140 pounds of perchlorate, and 0.4 pounds of 1,4-dioxane. Concentrations of perchlorate, VOCs, and 1,4-dioxane in monitoring wells remained relatively constant in 2016. Monitoring data demonstrate that multiple extraction wells maintain hydraulic control to prevent further migration of contaminated groundwater from the site. Performance of the three in situ bioremediation trenches was monitored in 2016. Results show that with a few exceptions, the trenches are performing as intended, biologically reducing perchlorate as groundwater passes through the trenches filled with pea gravel, compost, and walnut shells coated with soybean oil. UTC now reports monitoring results annually in July.

Fuel Leak Cases

District staff continues to coordinate with the DEH to provide technical support and review as necessary. The District received 18 public notices of fuel leak site closures; all proposed closures appeared to be warranted and no comments were submitted.

The evaluation of 2016 groundwater quality data against the Groundwater Management Plan outcome measures is summarized below. Additional discussion of outcome measures, including planned action to address measures not being met, is presented in Section 7.

Groundwater Quality Outcome Measures

OM 2.1.1.e.
At least 95% of countywide water supply wells meet primary drinking water standards.

OM 2.1.1.f.
At least 90% of South County wells meet Basin Plan agricultural objectives.

OM 2.1.1.g.
At least 90% of wells in both the shallow and principal aquifer zones have stable or decreasing concentrations of nitrate, chloride, and total dissolved solids.

OM 2.1.1.e. is not met as 87% of countywide water supply wells tested in 2016 met primary drinking water standards. The exceedances were due to elevated nitrate in South County, primarily in domestic wells. If nitrate is not included, 100% of water supply wells met primary drinking water standards.

OM 2.1.1.f. is met as 98% of all South County wells met Basin Plan agricultural objectives in 2016.

OM 2.1.1.g. This measure is nearly met for chloride, with 86% of wells showing stable or decreasing concentrations. The measure is met for total dissolved solids as stable or decreasing concentrations were observed in 90% and 95% of wells, respectively.

CHAPTER 6 – OTHER GROUNDWATER MANAGEMENT ACTIVITIES

Other District groundwater management activities in 2016 included permitting and inspecting over 1,600 wells, reviewing relevant policy and land use proposals, and conducting public outreach on groundwater.

6.1 Well Ordinance Program

The District's well ordinance program helps ensure that wells and other deep excavations are properly constructed, maintained, and destroyed so they prevent vertical transport of contaminants into deep drinking water aquifers. The District issued nearly 1,700 well permits in 2016, primarily for well destruction and monitoring well construction. The District also inspected over 1,700 wells to ensure they were properly constructed or destroyed (Table 16).

Table 16. CY 2016 District Well Permit and Inspection Summary

Permit Type	Number Processed
Well Construction - Water Producing Wells	70
Well Construction - Monitoring Wells	316
Well Destruction	1,070
Exploratory Boring	230
Total	**1,686**
Inspection Type	**Number Inspected**
Well Construction - Water Producing Wells	84
Well Construction - Monitoring Wells	317
Well Destruction	1,146
Exploratory Boring	191
Total	**1,738**

6.2 Policy and Legislation Review

The District reviews proposed legislation and policies (both statewide and local) to ensure the county's water resources and the District's ability to manage them are protected. In 2016, this included District tracking of various assembly and senate bills related to groundwater such as proposed legislation for conditional use well permits, groundwater sustainability agency fees, graywater, and water supply planning.

Compliance with the Sustainable Groundwater Management Act (SGMA) was a major District focus in 2016. The District is subject to SGMA requirements as the primary subbasins within the County, the Santa Clara and Llagas Subbasins, are designated as medium priority and high priority, respectively. SGMA requires the formation of Groundwater Sustainability Agencies (GSAs) for all groundwater subbasins classified as medium or high priority by June 30, 2017. A Groundwater Sustainability Plan (GSP) must be submitted for these basins by January 2020 for basins in critical overdraft, or by January 2022 for other basins. Alternatives to GSPs were required to be submitted by January 2017. SGMA provides broad authorities to GSAs, including the ability to meter wells, restrict pumping, implement conjunctive management projects and fund them through various fees. These authorities are in addition to any authority provided through existing statute, such as what is provided by the District Act.

Following a public hearing, the District Board adopted a resolution to become the GSA for the Santa Clara and Llagas Subbasins in May 2016. The state adopted regulations for GSPs and alternative plans in June 2016, and the District prepared the 2016 Groundwater Management Plan as an alternative plan. The Board of Directors adopted the GWMP in November 2016, and the plan was submitted to the Department of Water Resources as an alternative to a GSP prior to the January 2017 statutory deadline.

6.3 Land Use Review

Threats to groundwater quality include urban runoff, industrial chemical releases, inefficient agricultural practices, and leaking underground storage tanks. Of particular concern are potentially contaminating activities over groundwater recharge areas, which are more vulnerable to contamination due to more permeable soils and higher groundwater flow rates. Proposed development and redevelopment may also result in additional groundwater demands or impacts to water supply reliability. Land use decisions fall under the authority of the local cities and the County of Santa Clara. The District reviews land use and development plans related to District facilities and watercourses under District jurisdiction, and provides technical review for other land use proposals as requested by the local agency. Water supply assessments for new developments are also reviewed and evaluated in the context of the District's long-term water supply planning assumptions. For all reviews, the District's groundwater-related comments focus on additional analysis or action needed to ensure groundwater resources are adequately protected.

In 2016, the District submitted groundwater-related comments to on the following land use proposals:

- City of Morgan Hill 2035 General Plan
- City Place Santa Clara Final Environmental Impact Report
- California High Speed Rail Project, San Francisco to San Jose Project Section

The District also consulted with land use agencies on a variety of sites regarding proposed stormwater infiltration devices.

6.4 Public Outreach

Public outreach is an important component of the District's groundwater protection efforts. To help keep the public informed about current groundwater and water supply conditions, the District prepares monthly Water Tracker reports that are posted on the District website.[30] The District also posts monthly groundwater condition reports that contain more detailed information on groundwater pumping, recharge, and water levels.

[30] www.valleywater.org/WaterTracker.aspx

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. In 2016, the District celebrated Groundwater Awareness Week (March 5-11) by highlighting groundwater on the District website and posting social media messages.

The District also maintained its status as a Groundwater Guardian Affiliate through the Groundwater Guardian Program sponsored by the Groundwater Foundation, a non-profit organization. Groundwater Guardian is an annually earned designation for communities and affiliates that take voluntary, proactive steps toward groundwater protection. District activities include the school program (which reaches thousands of students each year), implementation of groundwater protection programs, and participation in workshops such as the Small Acreage Stewardship series. At this series, District staff presents targeted information on wells and water quality protection to well owners.

The District mails the Annual Groundwater Quality Summary to all well owners in June to provide information on sampling by the District and local water suppliers. The 2016 Groundwater Quality Summary was mailed in June 2017 (Appendix B). This summary is similar to water retailer consumer confidence reports, and provides basic groundwater quality information to domestic well owners who do not typically receive water from a water retailer.

Other public outreach conducted by the District related to groundwater in 2016 included:

- Direct communication with well owners on groundwater quality and well maintenance when conducting sampling for the Domestic Well Testing Program (Section 5.3).
- A presentation on wells and groundwater protection for the Small Acreage Stewardship Workshop hosted by the Loma Prieta Resource Conservation District.
- Staff tables presenting information on groundwater issues at various public meetings and open houses held by the District.

CHAPTER 7 – CONCLUSIONS

Groundwater levels and storage improved in 2016 due to increased water supplies and the impressive 28% water use reduction achieved by customers served by water retailers as compared to 2013. Table 17 shows data for key indicators as compared to 2015 and the last five years. The managed recharge program was significantly increased compared to the previous year and well exceeded the 5-year average due to the increased availability of imported and local surface water supplies. Because of high recharge and decreased groundwater pumping, groundwater storage increased by 74,700 AF. The increased recharge and reduced groundwater pumping resulted in increased groundwater levels in many areas of the Santa Clara Plain, Coyote Valley and the Llagas Subbasin. Groundwater levels at all index wells were well above historic lows. Groundwater quality conditions were generally like the previous year and as compared to 5 years ago. Nitrate continues to be the primary groundwater protection challenge, particularly in South County.

Table 17. CY 2016 Groundwater Conditions as Compared to Other Years

Index[1]	2016	Compared to 2015	Compared to Last 5 Years (2011 - 2015)
Managed Recharge (AF)	140,500	Up 156%	Up 90%
Groundwater Pumping (AF)	109,000	Down 5%	Down 21%
Groundwater as % of Total Water Use	39%	Down 3%	Down 9%
Groundwater Levels (feet)[2]			
Santa Clara Plain	77.8	Up 28 feet	Up 15.6 feet
Coyote Valley	270.7	Up 11.4 feet	Up 7.6 feet
Llagas Subbasin	213.9	Up 25 feet	Up 4.6 feet
End of Year Groundwater Storage (AF)	307,000	Up 32%	--
Land Subsidence (feet/year)[3]	0.002	Decrease	--
Groundwater Quality[4]			
Santa Clara Plain – Median TDS, mg/L	410	No Change	No Change
Coyote Valley – Median TDS, mg/L	376	No Change	No Change
Llagas Subbasin – Median TDS, mg/L	419	No Change	No Change
Santa Clara Plain – Median Nitrate, mg/L	3	No Change	No Change
Coyote Valley – Median Nitrate, mg/L	4.9	No Change	No Change
Llagas Subbasin – Median Nitrate, mg/L	4.5	No Change	No Change

Notes:

1. Groundwater levels and quality are shown for three groundwater management areas: the Santa Clara Plain Principal Aquifer and Coyote Valley (which comprise the Santa Clara Subbasin) and the Llagas Subbasin Principal Aquifer.
2. Groundwater elevations represent the average of all readings at groundwater level index wells for the time period noted.

3. Measured compaction was less than the District's established tolerable rate of 0.01 feet per year. Throughout 2016, water levels at all ten subsidence index wells were above thresholds established to prevent inelastic subsidence.
4. Values shown represent median groundwater quality for all principal aquifer zone wells tested. Nitrate is measured as Nitrogen (N). Data from shallow monitoring wells is excluded, including wells with high TDS due to saline intrusion. Individual wells sampled for TDS and nitrate vary each year so a straight numeric comparison of median values is not performed. "No change" indicates no significant difference using an appropriate statistical test (Mann-Whitney Test) at 95% confidence level. An entry of either "Increase" or "Decrease" indicates a statistically significant change between the time period indicated.

Outcome Measure Performance and Action Plan

The District's GWMP identifies several outcome measures to assess whether basin management objectives are being accomplished. The measurement of CY 2016 data against these measures is summarized in Table 18 below, along with recommended actions to address measures not being met.

Table 18. Summary of Outcome Measure Performance and Action Plan

Groundwater Storage	**OM 2.1.1.a.** Greater than 278,000 AF of projected end of year groundwater storage in the Santa Clara Plain. Estimated end of 2016 storage: 279,800 AF **OM 2.1.1.b.** Greater than 5,000 AF of projected end of year groundwater storage in the Coyote Valley. Estimated end of 2016 storage: 3,800 AF **OM 2.1.1.c.** Greater than 17,000 AF of projected end of year groundwater storage in the Llagas Subbasin. Estimated end of 2016 storage: 24,800 AF **Action Plan for OM 2.1.1.b:** The District Board of Directors called for a 20% countywide water use reduction in June 2016.
Groundwater Levels and Subsidence	**OM 2.1.1.d.** 100% of subsidence index wells with groundwater levels above subsidence thresholds. All ten subsidence index wells had groundwater levels above thresholds in 2016.
Groundwater Quality	**OM 2.1.1.e.** At least 95% of countywide water supply wells meet primary drinking water standards. Only 87% of countywide water supply wells tested in 2016 met primary drinking water standards due to elevated nitrate in South County (mainly in domestic wells). If nitrate is not included, 100% of water supply wells met primary drinking water standards. **OM 2.1.1.f.** At least 90% of South County wells meet Basin Plan agricultural objectives. Nearly all wells (98%) met Basin Plan agricultural objectives. **Action Plan for OM 2.1.1.e:** Implement Salt and Nutrient Management Plans to address salt loading, continue free testing program for domestic wells, and work to increase participation in the nitrate treatment system rebate program.
Groundwater Quality Trends	**OM 2.1.1.g.** At least 90% of wells in both the shallow and principal aquifer zones have stable or decreasing concentrations of nitrate, chloride, and total dissolved solids. This measure is nearly met for chloride, with 86% of wells showing stable or decreasing concentrations. The measure is met for nitrate and total dissolved solids as stable or decreasing concentrations were observed in 90% and 95% of wells, respectively. **Action Plan for OM 2.1.1.g:** Implement Salt and Nutrient Management Plans to address salt loading.

Outcome measure met

Outcome measure not met

Groundwater Outlook

Groundwater levels and storage have generally recovered to pre-drought levels with continued water use reduction by the community, improved rainfall, and increased surface water available for managed recharge in 2016. The estimated end of year storage for 2016 was above the 300,000 AF target and water levels did not fall below subsidence thresholds in related index wells.

The District continues to actively monitor groundwater levels, land subsidence, and water quality to support operational decisions and ensure groundwater resources are protected. To help ensure water supply reliability, the District is also working to expedite several potential IPR projects to provide a drought-resilient source of purified water for groundwater replenishment. The District will also continue to track proposed legislation, policies, and regulatory standards that may impact groundwater resources or the District's ability to manage them.

Compliance with SGMA will continue to be a focus for the District in CY 2017. The District is evaluating new authorities available under SGMA through the Board's Water Conservation and Demand Management Committee, which provides an open and transparent forum to engage interested stakeholders in discussions of potential authorities to implement different fee types or regulate pumping, if needed. In June 2017, the District Board adopted a resolution to become the GSA for the small portions of the Hollister and San Juan Bautista Subbasins located Santa Clara County. The District will work with the San Benito County Water District to prepare a related Groundwater Sustainability Plan by the 2022 statutory deadline. The District is also coordinating with the County of San Mateo in their assessment of the San Mateo Plain, which is not currently subject to SGMA requirements but extends in Santa Clara County.

Appendix A

2016 Subsidence Data Analysis Report

Santa Clara Valley Water District TECHNICAL MEMORANDUM

2016 SUBSIDENCE DATA ANALYSIS

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EXECUTIVE SUMMARY

This technical memo presents land subsidence data analysis for calendar year 2016. Historically, land subsidence has been an issue in the Santa Clara Plain in northern Santa Clara County due to groundwater overdraft and declining groundwater elevations. Permanent (inelastic) subsidence was essentially halted in the early 1970s through the Santa Clara Valley Water District's (District's) conjunctive management programs and investments (SCVWD, 2016). However, ongoing monitoring is critical to fulfill the District goals of minimizing land subsidence and salt water intrusion (Board Ends Policy 2.1.1). Monitoring provides data to evaluate current conditions and early detection of the potential resumption of permanent subsidence. Annually, the District analyzes land subsidence monitoring data, evaluates subsidence conditions, and recommends improvements to the subsidence monitoring network. Data collected from 2006 to 2016 is used in this analysis.

2016 annual precipitation was normal, about 14.6 inches, in Santa Clara Valley. The annual groundwater pumping of 2016 from the Santa Clara Plain was 55,900 AF (acre feet) and reduced by about 10,000 AF from 2015, due to water use reduction efforts during the drought and coordination with water retailers to increase treated water use. Annual pumping in 2016 was below the ten-year average of 91,500 AF from 2004 to 2013 before the drought. Santa Clara Plain 2016 managed recharge was about 103,300 AF, well above the ten-year average of 62,900 AF from 2004 to 2013. The combination of reduced pumping and increased recharge resulted in a full recovery of groundwater elevations at subsidence index wells in 2016; the annual average water elevations in most subsidence index wells were higher than 2013, the pre-drought level. Because of the groundwater elevation recovery, the land surface elevation rebounded to pre-drought elevations as observed through benchmark survey and extensometer monitoring data.

The data measured in 2016 through the District's subsidence monitoring network show the following:

- Aquifer expansion was measured at the District's two extensometer sites in 2016. The average annual subsidence rate over the last 11 years at the San Jose (Martha) and Sunnyvale (Sunny) sites is 0.002 feet/year, which is less than the District's established tolerable rate of 0.01 feet/year.
- 2016 annual average of groundwater elevations was higher than 2015 at all ten subsidence index wells. Groundwater elevations were above subsidence thresholds at all ten index wells in 2016. Water elevations at the end of 2016 were on the rise at all index wells and approaching historical high elevations at some wells.
- Benchmark survey data showed that the land surface elevations in 2016 were generally higher than 2015, indicating a land subsidence recovery. The average annual change of land surface elevations of all benchmarks over last 11 years was 0.00 feet (zero net change).

The analysis of the data collected through the District's subsidence monitoring network indicates that the risk of land subsidence in 2016 was very low, and less than 2015. The impact of the drought in the last four years was alleviated due to higher groundwater elevations and related recovery in land surface elevation. Continued monitoring of the subsidence network is needed to detect early signs of inelastic land subsidence in the future and to ensure sustainable groundwater management.

BACKGROUND

The Santa Clara Plain is a groundwater management area occupying the northwestern and largest part of the Santa Clara Subbasin. The Santa Clara Plain extends from Santa Clara County's northern boundary to approximately Metcalf Road in the Coyote Valley and is bounded on the west and east by the Santa Cruz Mountains and the Diablo Range, respectively (Figure 1). Land subsidence has caused serious problems in the past in the Santa Clara Plain, including nearly 13 feet of permanent subsidence in downtown San Jose and more than a foot of inelastic subsidence over a hundred square miles.

Ongoing monitoring provides data for current land subsidence evaluation and early detection of potential inelastic (permanent) subsidence. The District maintains a land subsidence monitoring network (Figure 1), including:

- Two extensometers: one in Sunnyvale (Sunny) and one in San Jose (Martha), both monitored daily;
- 144 benchmarks along three Cross Valley Level Circuits (CVLCs) surveyed in the fall of 2016; and
- Ten subsidence index wells with groundwater elevations monitored monthly or more frequently.

EVALUATION

Figure 1 shows a map of the District subsidence monitoring network in the Santa Clara Plain. Two extensometers are in the confined area of the Santa Clara Plain. Benchmarks are grouped into three CVLCs: Guadalupe (northwest-trending circuit along the axis of the valley), Los Altos (west-east trending circuit to the north), and Alum Rock circuit (west-east trending circuit to the south). Ten subsidence index wells are located throughout the Santa Clara Plain.

Groundwater elevation analysis

Groundwater elevation monitoring is an integral part of the land subsidence monitoring program since the decrease in water elevation is the driving force of land subsidence in the Santa Clara Plain. The current frequency of groundwater elevation monitoring at subsidence index wells varies from daily to monthly. Water elevation hydrographs at ten index wells are presented in Figure 2, along with the subsidence groundwater elevation thresholds determined for each well (GEOSCIENCE, 1991).

A subsidence threshold is a recommended elevation; maintaining groundwater at elevations near or below the threshold for extended periods of time may increase the risk of subsidence resumption and potential damage to facilities and structures. Historically, land subsidence was observed mainly in the confined area of Santa Clara Plain. Accordingly, most index wells (eight out of ten) are in or near the confined area. The District's groundwater management goal is to maintain groundwater elevations in the Santa Clara Plain above subsidence thresholds to minimize the risk of resuming permanent land subsidence.

Figure 2 shows that historical low water elevations at most subsidence index wells were observed in 1960s and 1970s. Since then, the groundwater elevations have been generally in recovery due to the importation of surface water from the Delta and related increased managed recharge and reduced groundwater pumping. Groundwater elevations in the Santa Clara Plain had been generally declining starting in 2012 and reached recent low water elevations in 2014 due to extended drought conditions. Water elevations at three subsidence index wells (well numbers ending in E002, C006, and G024) were close to or temporarily below subsidence thresholds and caused concern about an increased risk of land subsidence.

2015 was a relatively dry year and the fourth consecutive year of drought in California. Despite continued dry conditions, groundwater elevations started rising in 2015, especially in the confined area of the basin. The annual precipitation of 2016 was about normal and groundwater elevations rose throughout the year in 9 of the 10 subsidence index wells. The main driver of the water elevation recovery in 2015 and 2016 was the reduced pumping and increased managed recharge, especially in 2016. In comparison to 2014, the groundwater pumping was reduced by about 43% and 50% and the managed recharge increased by 157% and 842% in 2015 and 2016, respectively. These resulted in a water elevation recovery of 11 to 140 feet from the low water elevations in 2014 to water elevations at the end of 2016 in subsidence index wells.

Groundwater elevations in all ten index wells were well above subsidence thresholds and close to historical highs at the end of 2016 in most wells.

It is critical to manage the groundwater basin in a manner that maintains a groundwater gradient towards the San Francisco Bay to keep salt water from entering groundwater. There are three index wells along the bay front: G005, C010, and H015. Since 2012, groundwater elevations in those three wells declined consistently, reaching their recent low elevations in 2014. As described above, a significant water elevation recovery was observed in 2015 and 2016. By the end of 2016, all three bay front index wells were flowing artesian, which reduces the risk of salt water intrusion.

In summary, groundwater elevations measured at subsidence index wells were maintained above subsidence thresholds throughout 2016. Measured groundwater elevations indicate that the risk of both land subsidence resumption and salt water intrusion was reduced significantly in 2016 in comparison to 2014.

Extensometer data analysis

Daily compaction/expansion data measured at two extensometers and depth to water (DTW) measured at or near the extensometers were used for this analysis. An extensometer is a device used to continuously monitor aquifer compaction (land subsidence) and expansion (land uplift). The extensometers were installed in the early 1960s in Sunnyvale (Sunny) and San Jose (Martha) to measure compaction/expansion of the top 1,000-foot of the aquifer. The extensometer sites were selected in areas with high land subsidence between the 1930s and 1960s. These areas were also pumping centers during that period. The District goal is to keep the average value of subsidence measured at the two sites over the last 11 years below the District's tolerable subsidence rate of 0.01 feet/year (GEOSCIENCE, 1991).

Long-term data: Cumulative aquifer compaction/expansion and DTW from 1980 to 2016 are presented in Figures 3 and 4 for the Sunny and Martha extensometers, respectively. There are some differences of compaction/expansion and groundwater elevation conditions between the two sites: (1) net aquifer expansion was observed at Sunny while net compaction was observed at Martha from 1980 to 2016; (2) the groundwater elevation at Sunny has been above the land surface (negative DTW) since 1993, while the groundwater elevation at Martha has consistently been below the land surface (positive DTW); and (3) the seasonal water elevation change at Sunny is relatively small when compared to that at Martha. Those differences indicate that pumping activities have been reduced significantly near Sunny, while pumping is ongoing near the Martha extensometer, which is in the middle of a wellfield.

Current conditions: Measured extensometer data are used to evaluate current land subsidence conditions. An 11-year average annual subsidence rate is calculated using data measured at Sunny and Martha from 2006 to 2016 and compared to the District's tolerable rate of 0.01 feet/year. Table 1 shows measured annual subsidence from 2006 to 2016 and the calculated 11-year average at Sunny and Martha. Following the convention of subsidence data measured by extensometers, a positive value indicates land subsidence and a negative value indicates land uplift.

2016 annual observed subsidence was -0.087 feet and -0.025 feet at Martha and Sunny, respectively, indicating land uplift (or aquifer expansion) at both extensometer sites. The average annual subsidence is 0.002 feet/year during the past 11-year period (2006-2016) over the two extensometer sites, which meets the District tolerable rate of 0.01 feet/year. The previous 11-year average (2005 to 2015) reported in the 2015 Subsidence Data Analysis Technical Memo was 0.005 feet/year. The improvement from the previous year is due to groundwater elevation recovery and aquifer expansion in 2016.

Table 1 Measured annual land subsidence at the Sunnyvale (Sunny) and San Jose (Martha) extensometers from 2006 to 2016

Year	Sunny (feet/year)	Martha (feet/year)	Average at Two Sites (feet/year)
2006	0.001	-0.014	-0.006
2007	0.012	0.076	0.044
2008	0.010	0.019	0.015
2009	0.008	-0.020	-0.006
2010	-0.025	-0.024	-0.025
2011	-0.009	-0.032	-0.020
2012	-0.014	0.013	0.000
2013	0.026	0.064	0.045
2014	0.049	0.053	0.051
2015	-0.022	-0.021	-0.021
2016	-0.025	-0.087	-0.056
Average from 2006 – 2016	0.001	0.002	0.002

*Negative values indicate land uplift and positive values indicate land subsidence.

Stress-strain analysis: A stress - strain diagram plots DTW against subsidence to analyze seasonal, annual, or multi-year land subsidence. Strain increases with stress. Since a typical groundwater hydrograph in Santa Clara Plain shows annual high groundwater elevations (or low DTW) in the spring, the corresponding subsidence is low in spring. A stress-strain diagram from one spring to the next shows an annual cycle in which the strain usually increases from the spring to the fall and then decreases from the fall to the next spring. Figures 5 and 6 present the stress-strain diagrams using measured data from spring 2015 to spring 2016 at the Sunny and Martha extensometers, respectively. These diagrams demonstrate that the stress and strain in spring 2016 are lower than in spring 2015 at both locations, which means the increased strain from spring to fall 2015 was fully recovered and more by spring 2016, or there was net aquifer expansion from spring 2015 to spring 2016. The net aquifer expansion was also observed from end of year (EOY) 2015 to EOY 2016 at both the Sunny and Martha extensometers sites.

Continuous monitoring at extensometer sites provides data for ongoing analysis of subsidence conditions, which supports groundwater operation decisions throughout the year. The analysis of extensometer data shows that the 11-year average annual land subsidence from 2006 to 2016 meets the District's tolerable rate of 0.01 feet/year.

Benchmark survey data analysis

The benchmark survey data along the Los Altos, Alum Rock, and Guadalupe CVLCs are used to study spatial land subsidence conditions and annual changes throughout the Santa Clara Plain. The benchmark survey is conducted in the fall of each year. Figure 1 shows benchmark locations along three CVLCs surveyed in 2016. Related analysis is summarized below.

Change in land surface elevation from 2015 to 2016: As discussed above, groundwater elevations in the Santa Clara Plain were declining since 2012, but 2016 groundwater elevations were rising throughout the groundwater subbasin. Figure 7 shows the 2016 annual change of land surface elevation at benchmarks along the Los Altos, Alum Rock, and Guadalupe circuits. For benchmark survey data, a positive value indicates an increase in land surface elevation (uplift) and a negative value indicates a decrease (subsidence).

2016 survey data showed a trend of positive land surface elevation changes from 2015 at most the benchmarks. Table 2 summarizes the average and range of annual change of land surface elevation from 2015 to 2016. The average annual change of land surface elevation in 2016 is positive, indicating uplift for all three CVLCs. The risk of land subsidence of 2016 was lower than 2015.

Table 2 Fall 2016 change in land surface elevation compared to fall 2015

Survey Circuit	Average	Range	Number of Benchmarks
	(ft)	(ft)	
Los Altos	0.02	-0.01 to 0.06	40
Alum Rock	0.06	0.02 to 0.12	54
Guadalupe	0.06	-0.01 to 0.10	50

Change in land surface elevation during the drought: Figure 8 presents the cumulative change of land surface elevation from 2012 to 2016. The cumulative change in Figure 8 shows some positive, especially along the mid portion of Guadalupe circuit and along Alum Rock circuit. The positive values indicate the land subsidence observed during the recent drought (2012 to 2015) has fully recovered. The benchmarks with positive values represent areas in the center of Santa Clara Plain groundwater basin and the south in general.

Longer-term change in land surface elevation: The average annual change of land surface elevation in the last 11 years from 2006 to 2016 at individual benchmarks is presented in Figure 9. Although land surface elevations moved up or down at higher values in some years at some benchmarks, the average annual change at majority benchmarks was within the range of -0.01 to 0.01 feet/year. Figure 10 shows the average annual change of land surface elevation at all benchmarks in the last 11 years from 2006 to 2016. During the last 11-year period, there were 6 years with uplift (positive values) and 5 years with compaction (negative values). The average annual ground surface elevation change over the last eleven years is 0.00 feet, indicating no net change.

In summary, the benchmark survey data show land surface elevation uplift for all three CVLCs corresponding with rebounding groundwater elevations in 2016. At some benchmark locations, the land surface elevation was reaching or exceeding the elevation prior to the drought (Figure 8). The risk of land subsidence of 2016 was lower than 2015. The average annual change of land surface elevation in the last 11 years at all benchmarks is 0.00 feet, which corroborates the extensometer data, and shows that inelastic land subsidence has not continued in the Santa Clara Plain, despite the severe drought that ended in early 2017

Discussion

As shown in Figure 1, the current land subsidence monitoring network consists of two extensometers, benchmarks along three CVLCs, and ten subsidence monitoring wells, covering most of the Santa Clara Plain. The extensometers monitor subsidence conditions at two sites with high quality subsidence and water elevation data. The annual survey provides data representing the subsidence condition at benchmarks along three CVLCs. The monitoring of water elevations at subsidence index wells does not provide data to quantify the subsidence condition directly, but the monitoring is straightforward and related data can be used as an indicator for subsidence condition. Since the index wells are located throughout the Santa Clara Plain, the monitoring data reflects regional conditions.

The current practice of evaluating the land subsidence condition in Santa Clara Plain is to calculate the average over an 11-year period using subsidence data collected at two extensometers (Sunny and Martha) and compare it with the established, tolerable rate of land subsidence. The tolerable subsidence rate of 0.01 feet/year is based on the arithmetic average of historic subsidence and rebound measured in the Sunny and Martha extensometers for the 11-year period 1980-1990 (GEOSCIENCE, 1991). Re-evaluation of the tolerable subsidence rate may be warranted to ensure the rate remains aligned with local groundwater management goals.

The location of the two extensometers was selected in the early 1960's, based on groundwater conditions at that time. As shown in Figures 3 and 4, the data shows land uplift at Sunny and land subsidence at Martha from 1980 to 2016. The current groundwater elevation at Sunny is above the land surface (flowing artesian), in comparison to the groundwater elevation below the land surface at Martha. Both subsidence and water elevation data indicate pumping activity at Sunny has been reduced significantly in the past thirty plus years. Because the average subsidence is calculated using both extensometers, the subsidence condition may be underestimated at Martha where higher subsidence has been observed. Although the continued subsidence and water elevation monitoring at current extensometer sites will provide consistently high-quality land subsidence data, additional extensometers could enhance the monitoring program if resources are available.

The subsidence thresholds established at ten index wells are used as the minimum water elevations that should be maintained to avoid further inelastic land subsidence. Although the thresholds were established more than twenty years ago, they were based on a thorough study of historical data, subsidence modeling, and previous studies. It is recommended to continue to use these thresholds for groundwater operations and early indication of potential concerns. Because these thresholds are based on the 0.01 feet/year tolerable subsidence rate, they should be re-evaluated if the tolerable subsidence rate changes or if other information indicates a change is warranted.

The annual survey at benchmarks provides direct measurement of land surface changes along three CVLCs in the Santa Clara Plain. However, there are no established criteria to evaluate the survey data. It is recommended to initiate a study to establish a tolerable or allowable subsidence rate for the survey data analysis. This study could be combined with the tolerable/allowable rate for extensometer data.

CONCLUSIONS

In summary, the data measured by each component of the subsidence monitoring network shows:

- Uplift (or aquifer expansion) was measured at both extensometer sites in 2016. The average annual subsidence rate over the last 11 years at the Martha and Sunny sites is 0.002 feet/year, which is less than the District's tolerable rate of 0.01 feet/year.
- The EOY 2016 water elevations were higher than the EOY 2015 elevations at nine out of ten subsidence index wells. The water elevation recovery was observed throughout the basin. Groundwater elevations were higher than the subsidence thresholds at all ten index wells in 2016.
- The benchmark survey data showed the land surface elevation in 2016 was generally higher than 2015, indicating the land surface uplift, and that the average annual change of land surface elevation over last 11 years was 0.00 feet (no net change).

The analysis of the data collected through the District subsidence monitoring network indicates that the risk of land subsidence in 2016 was lower than 2015. The impacts of the 2012 to 2015 drought on land subsidence have been alleviated, as data shows that the groundwater elevations in 2016 were on the rise and close to historical highs and the land surface elevations in 2016 were higher than 2012 at some benchmarks, especially in the center and south of Santa Clara Plain. Continued monitoring of the subsidence network is recommended to detect early signs of inelastic land subsidence and to support sustainable groundwater management.

REFERENCES

1. GEOSCIENCE Support Services Incorporated, Subsidence Threshold in the North County Area of Santa Clara Valley, 1991.
2. SCVWD, Groundwater Management Plan, 2016.
3. SCVWD, 2015 Subsidence Data Analysis, Technical Memo, 2016.

Figure 1 Map of the District subsidence monitoring network

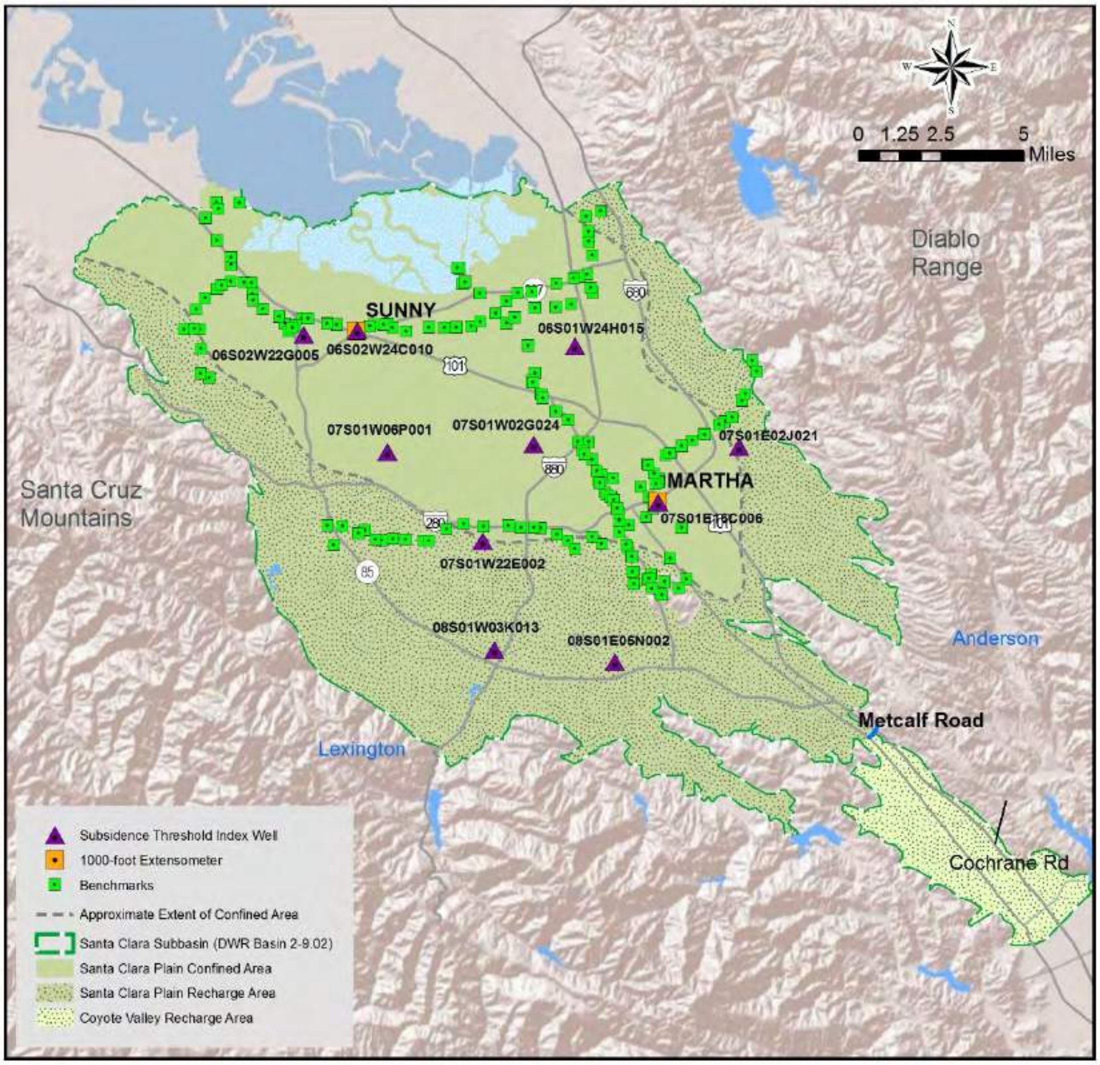
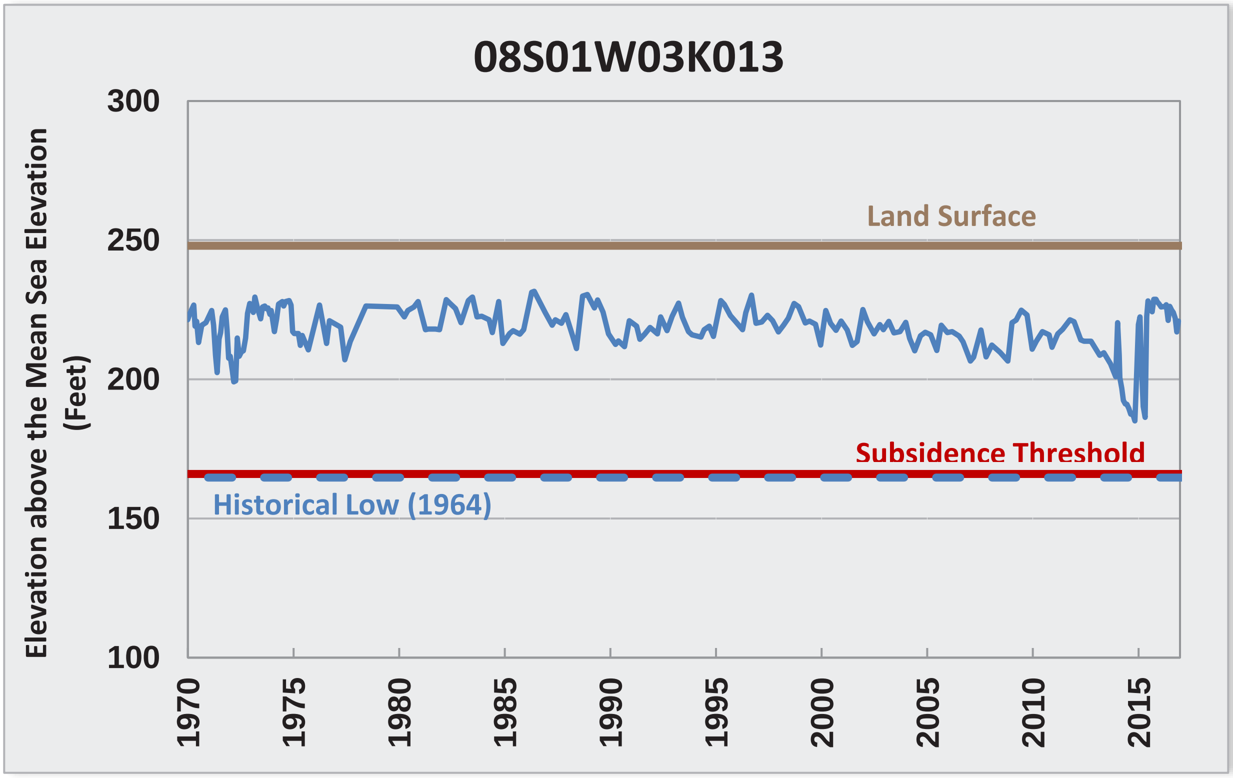


Figure 2 Measured groundwater elevation at subsidence index wells



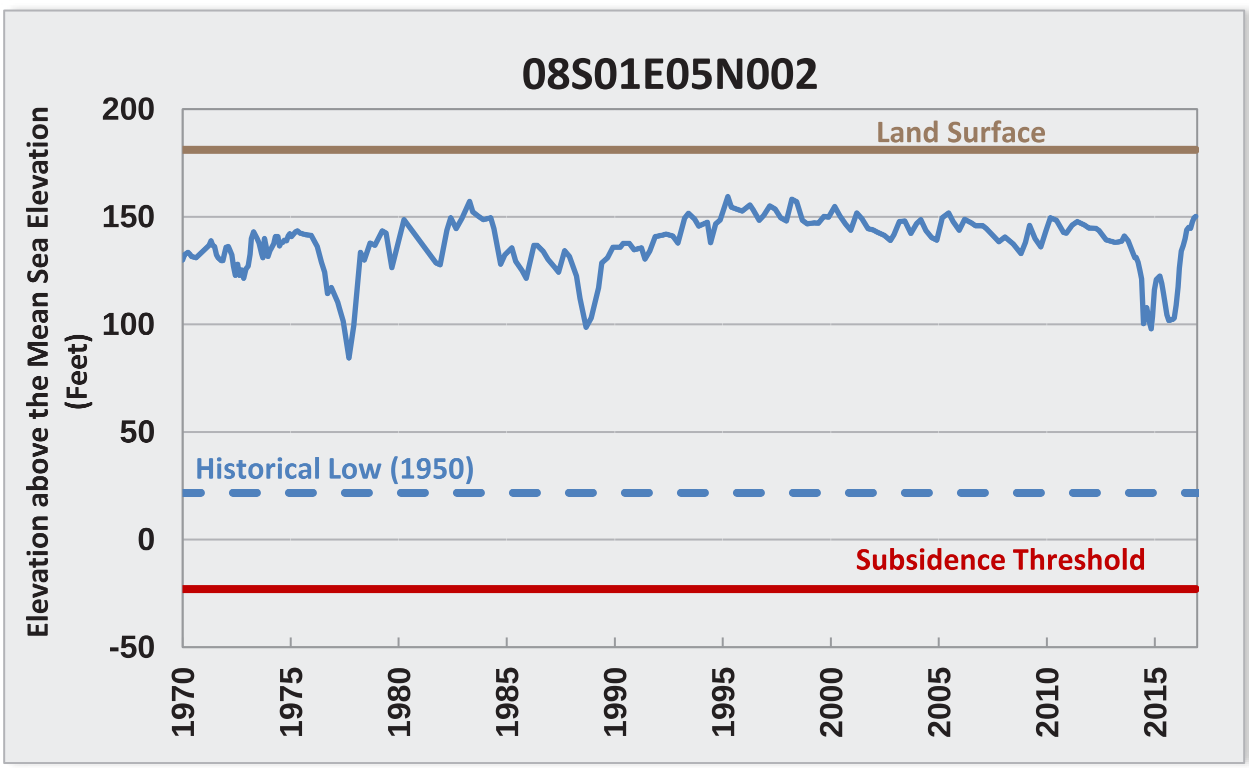
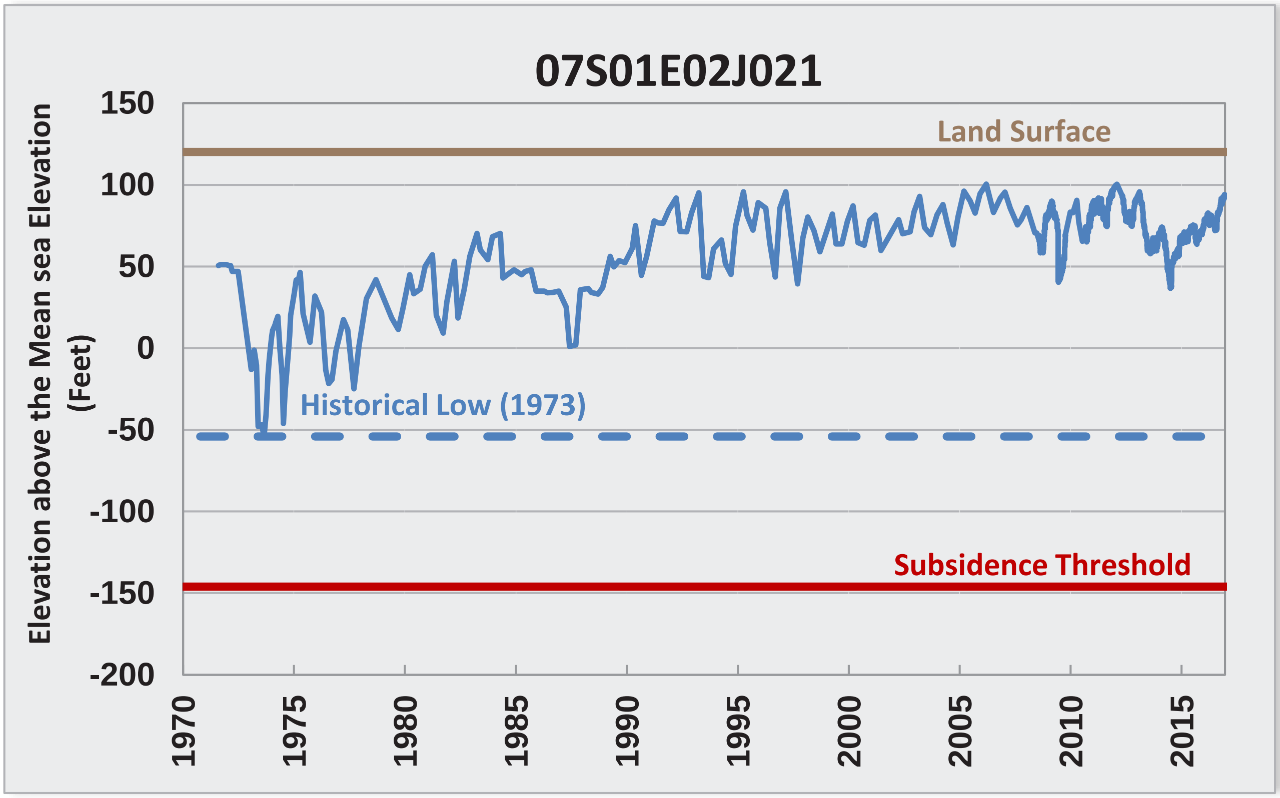


Figure 2 Measured groundwater elevation at subsidence index wells (continued)



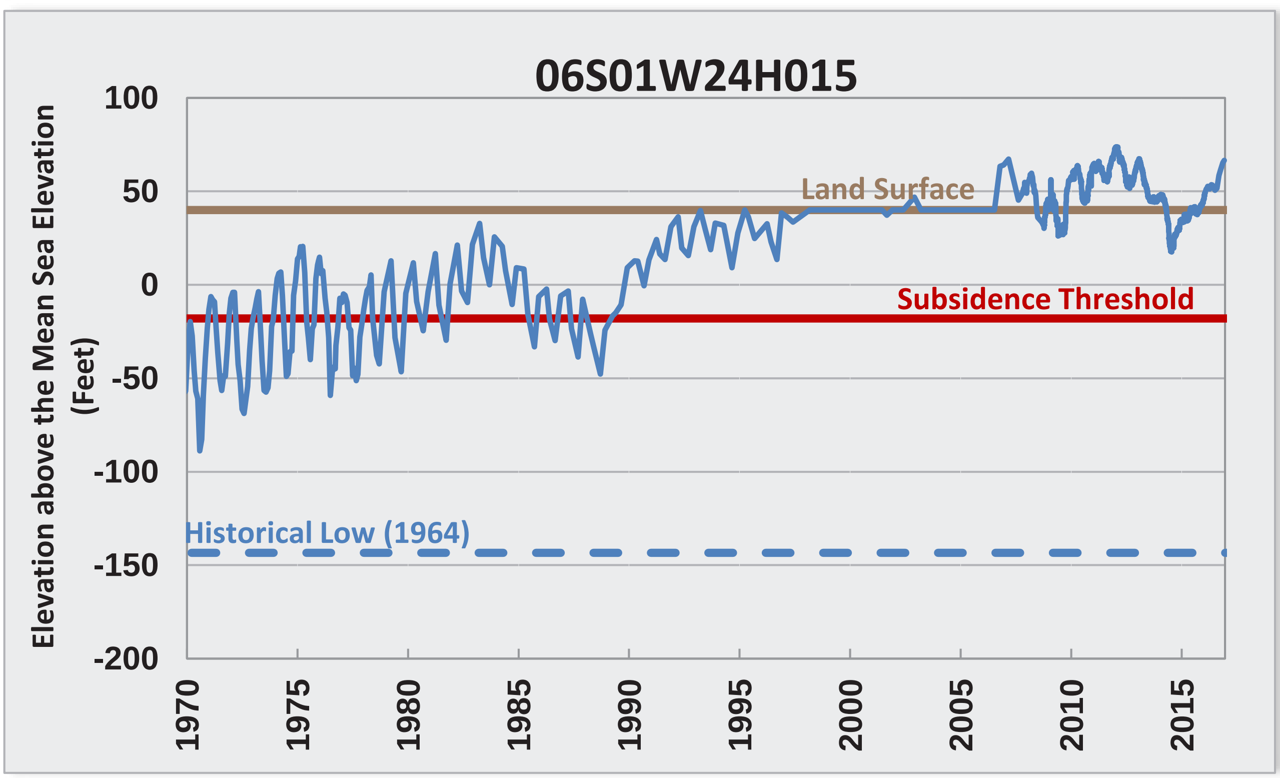
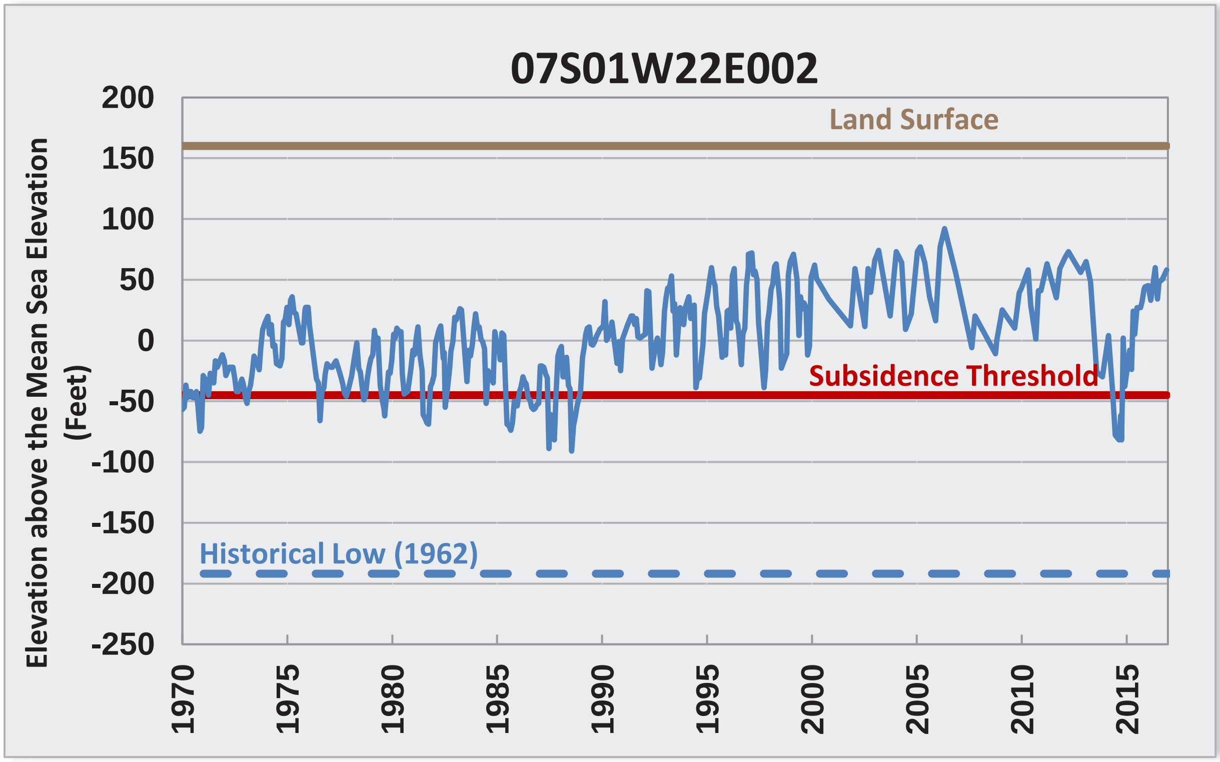


Figure 2 Measured groundwater elevation at subsidence index wells (continued)



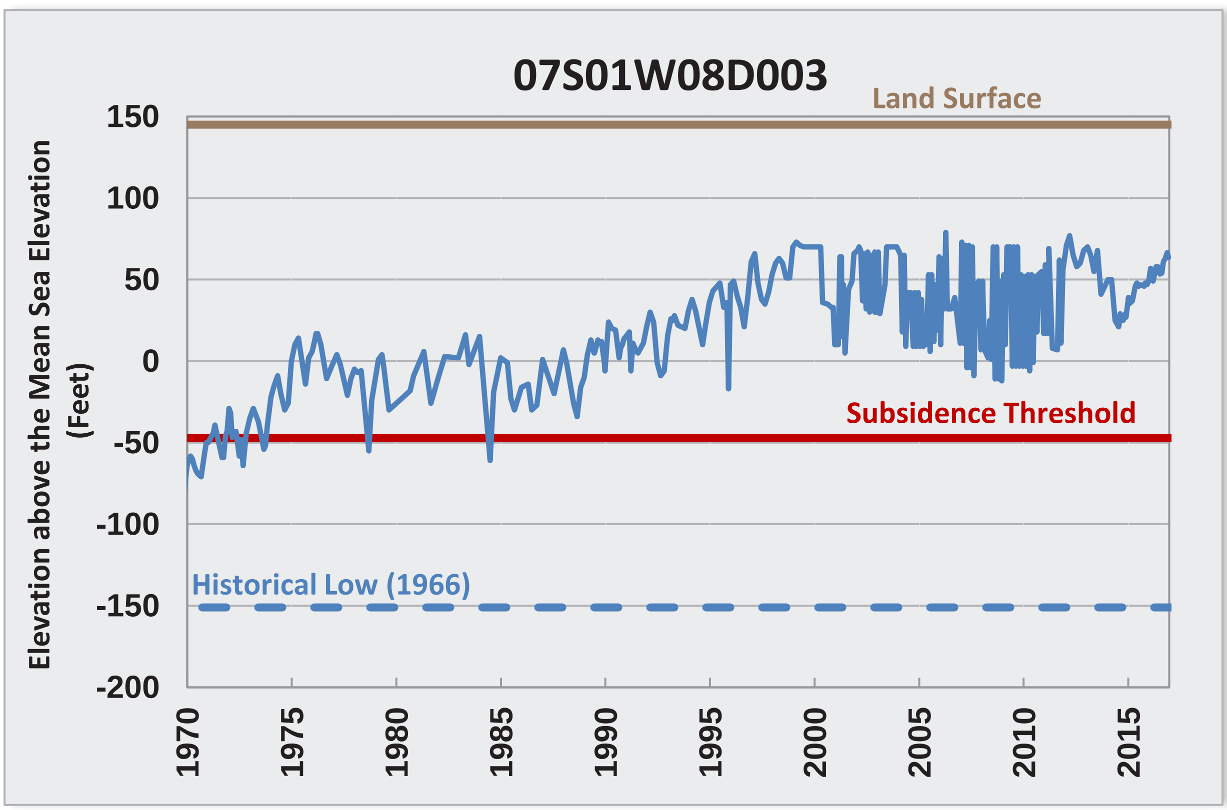
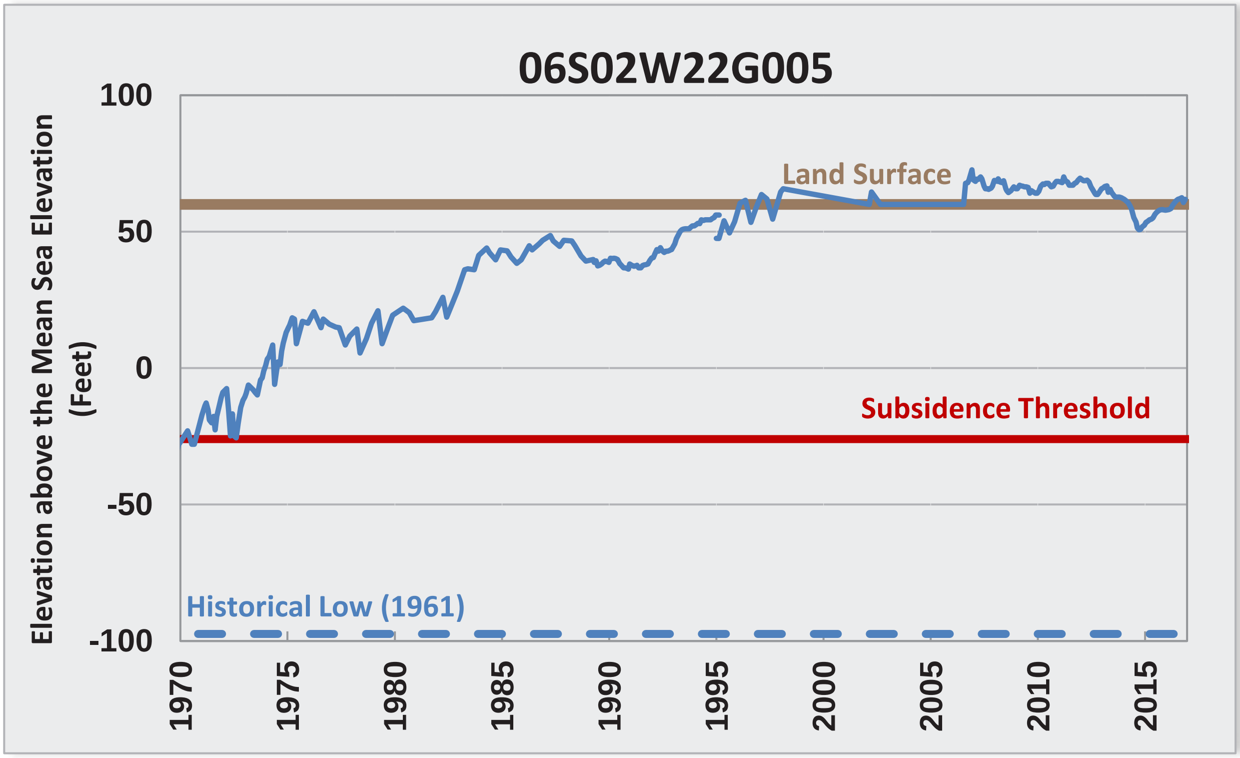


Figure 2 Measured groundwater elevation at subsidence index wells (continued)



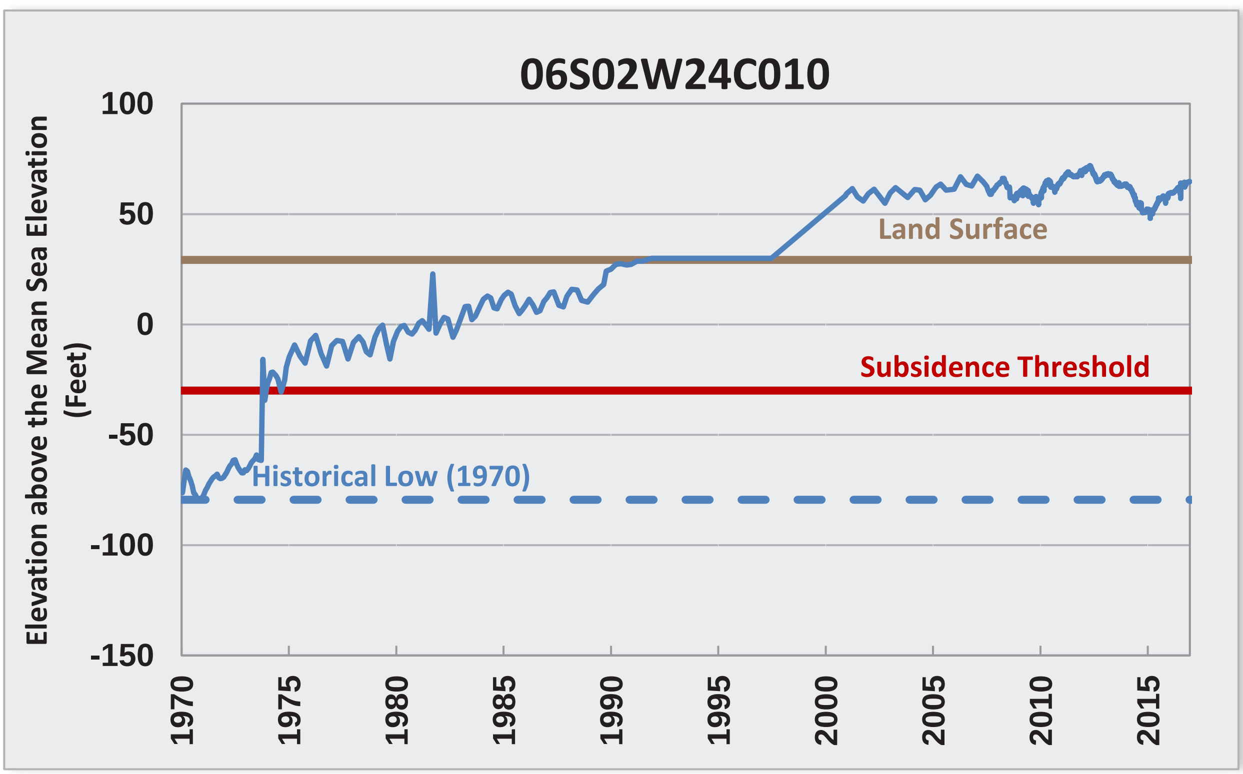
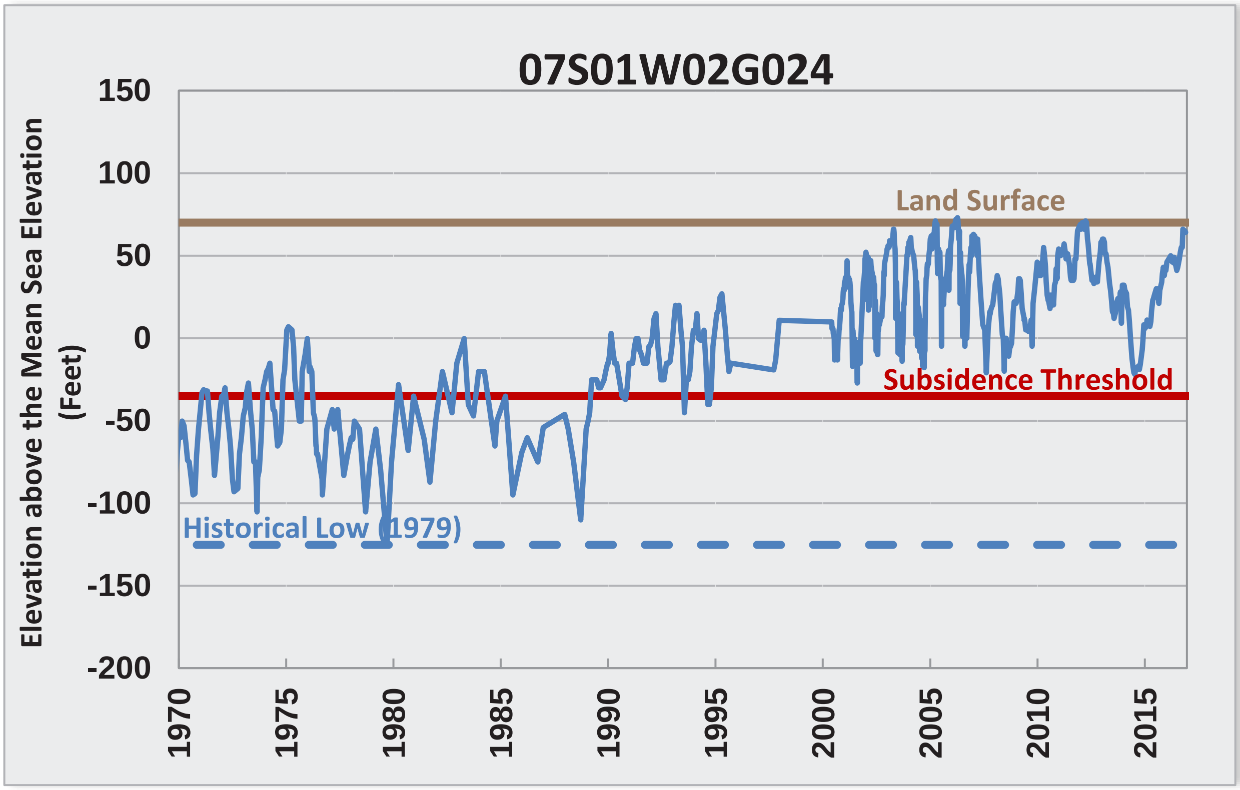


Figure 2 Measured groundwater elevation at subsidence index wells (continued)



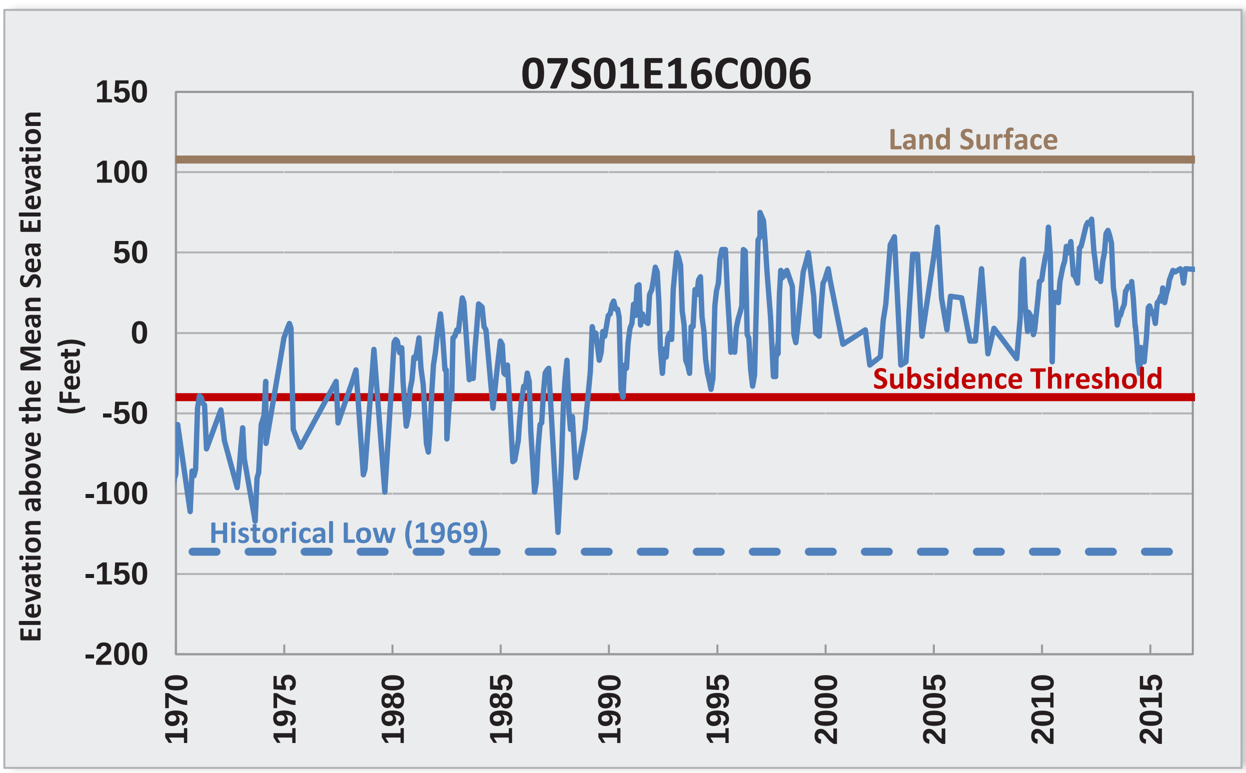


Figure 3 Measured depth to water and compaction at the Sunnyvale (Sunny) extensometer

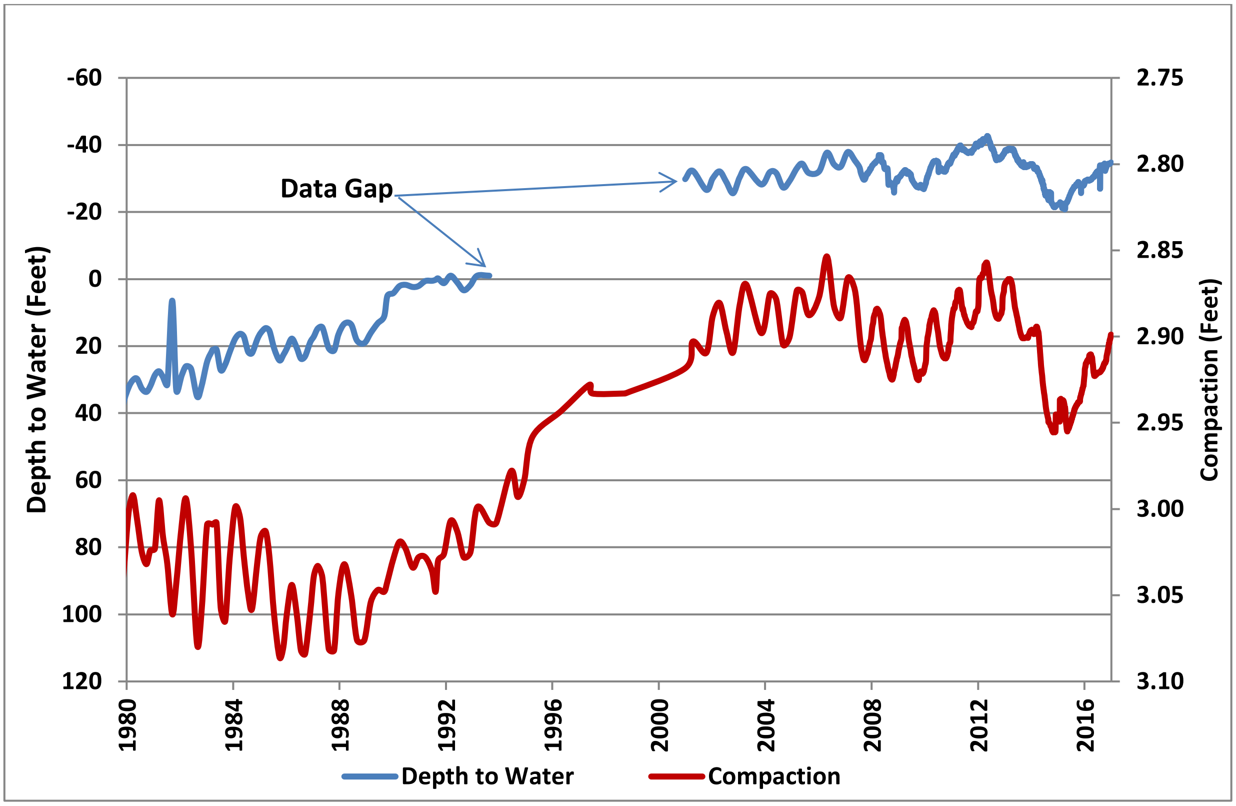


Figure 4 Measured depth to water and compaction at the San Jose (Martha) extensometer

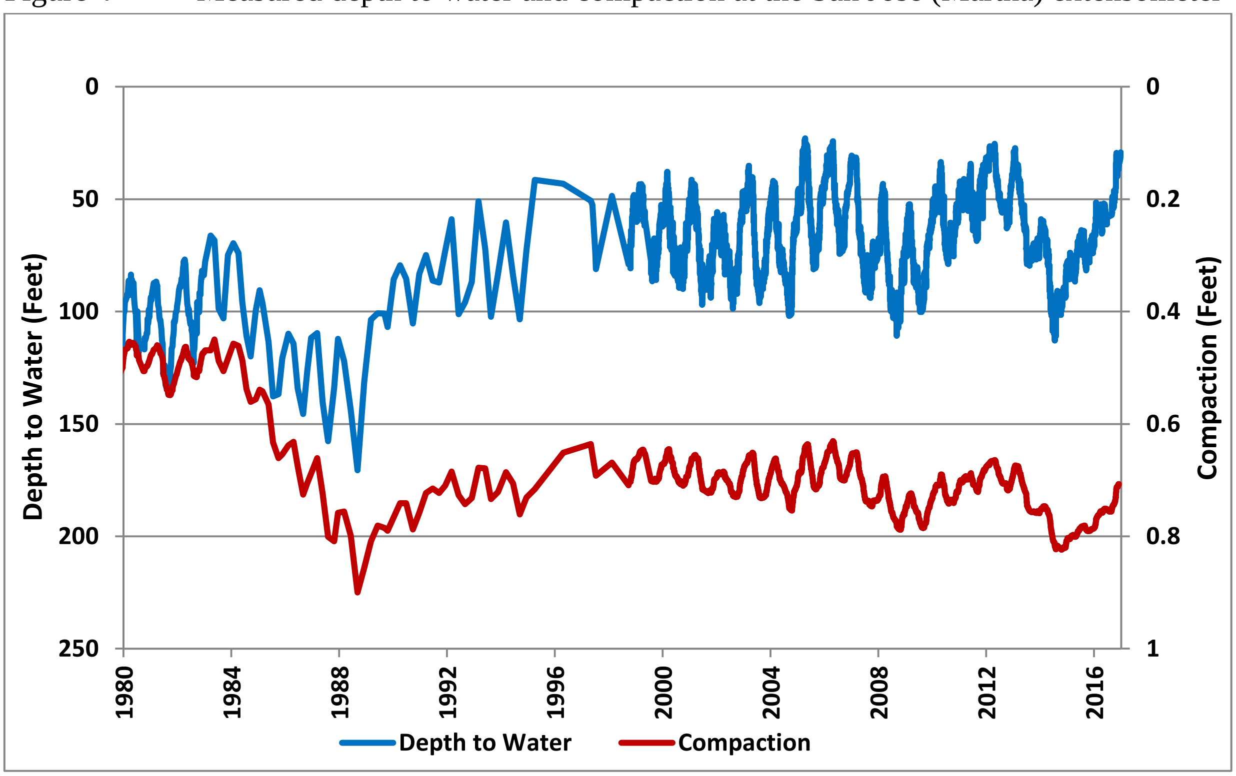


Figure 5 Stress-strain (depth to water vs. compaction) from spring 2015 to spring 2016 at the Sunnyvale (Sunny) extensometer

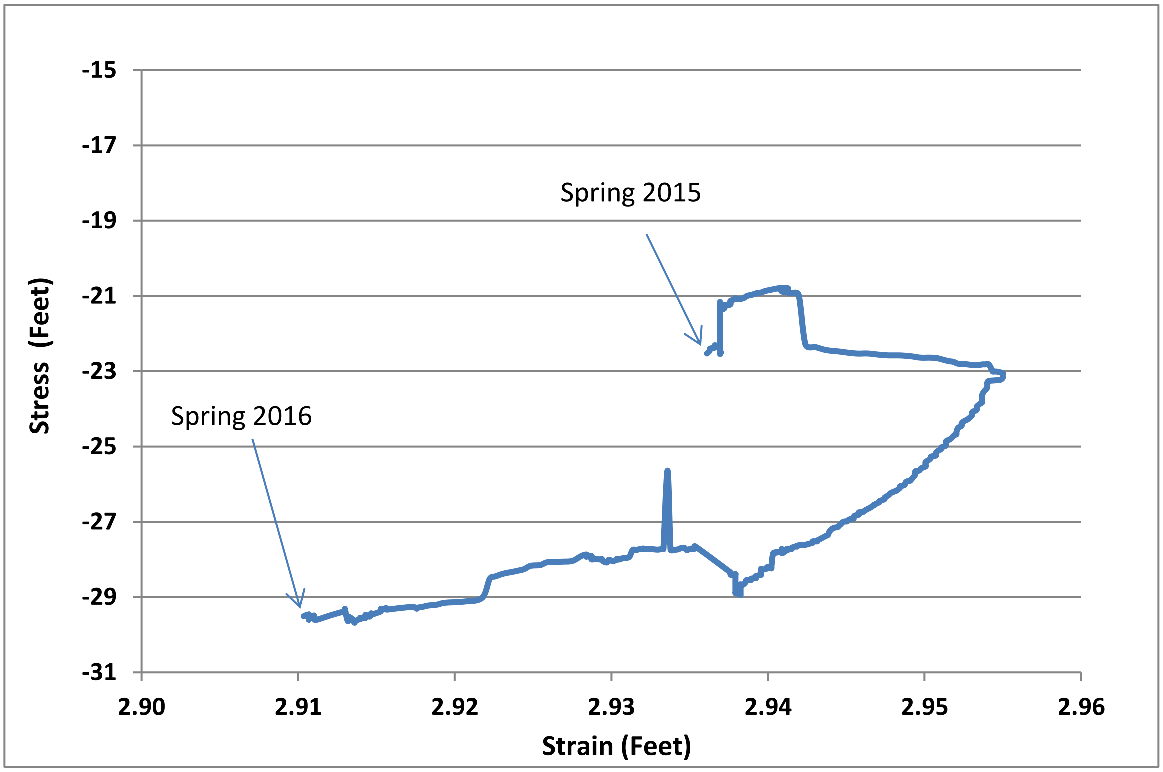


Figure 6 Stress-strain (depth vs. compaction) from spring 2015 to spring 2016 at the San Jose (Martha) extensometer

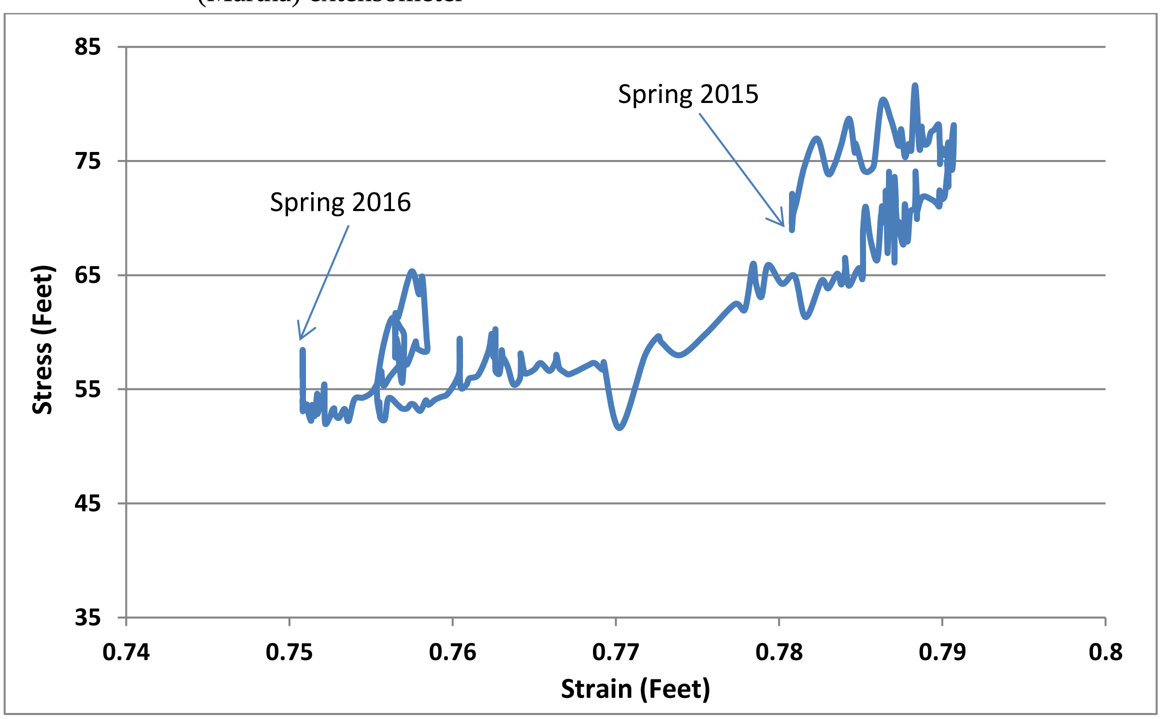
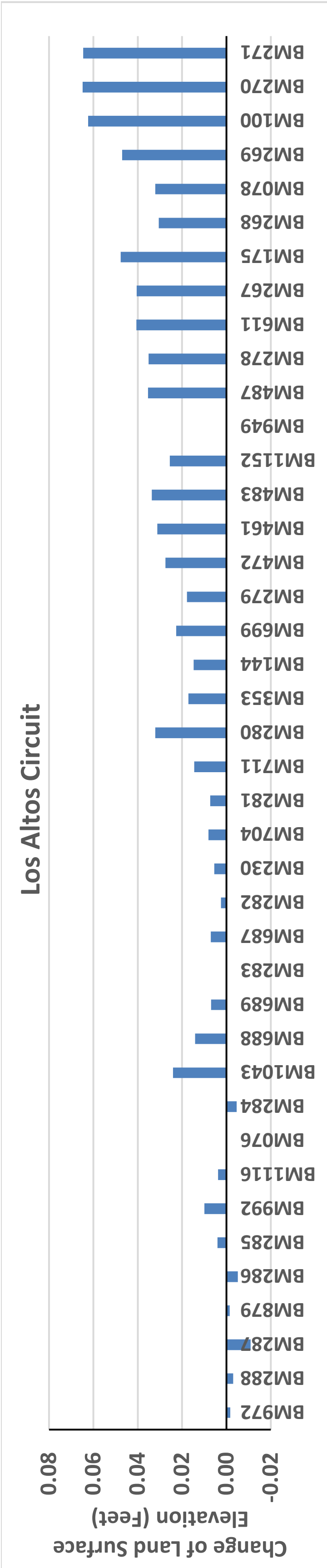
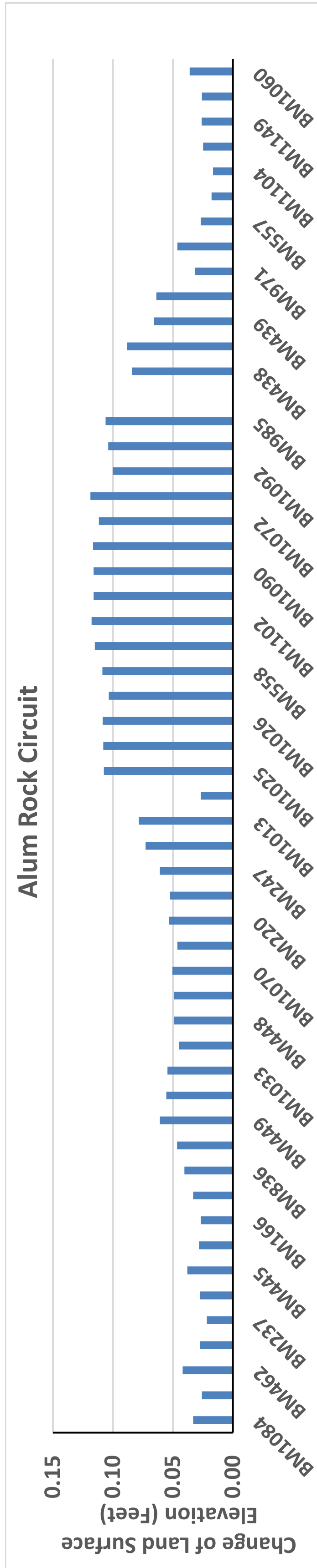


Figure 7 Change of land surface elevation between 2015 and 2016 along three circuits (shown from west to east for Los Altos and Alum Rock, and north to south for Guadalupe)





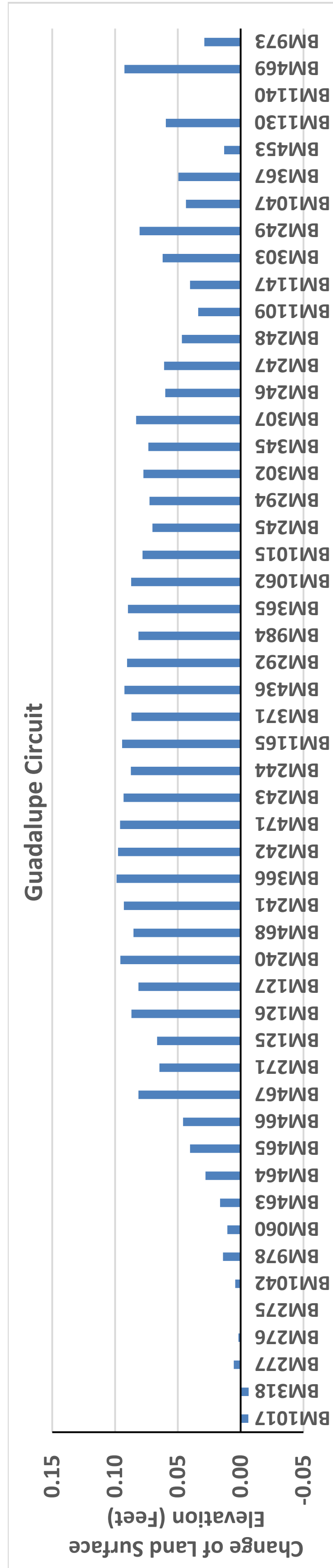
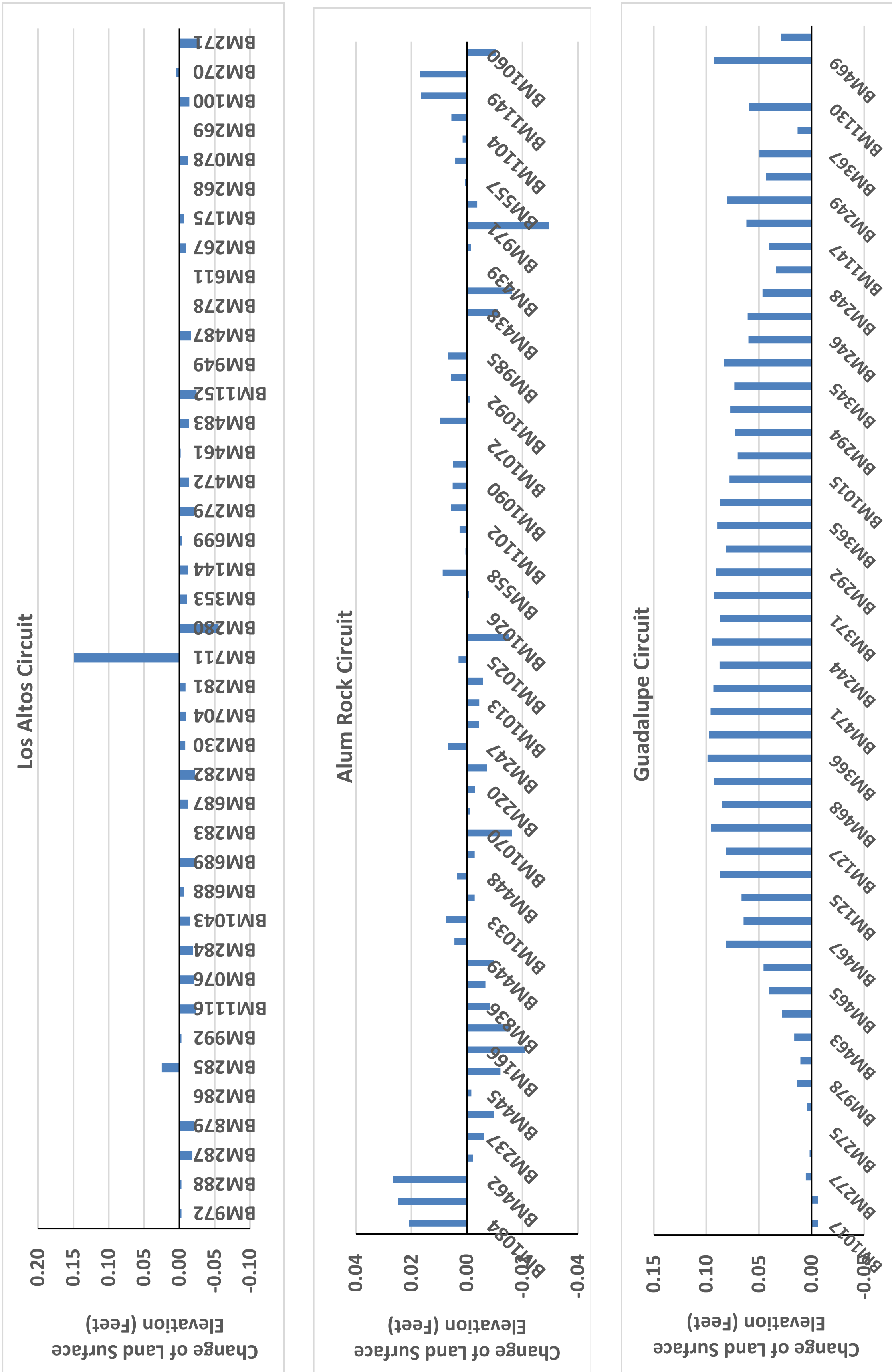


Figure 8 Cumulative change of land surface elevation from 2012 to 2016 along three circuits (shown from west to east for Los Altos and Alum Rock, and north to south for Guadalupe).



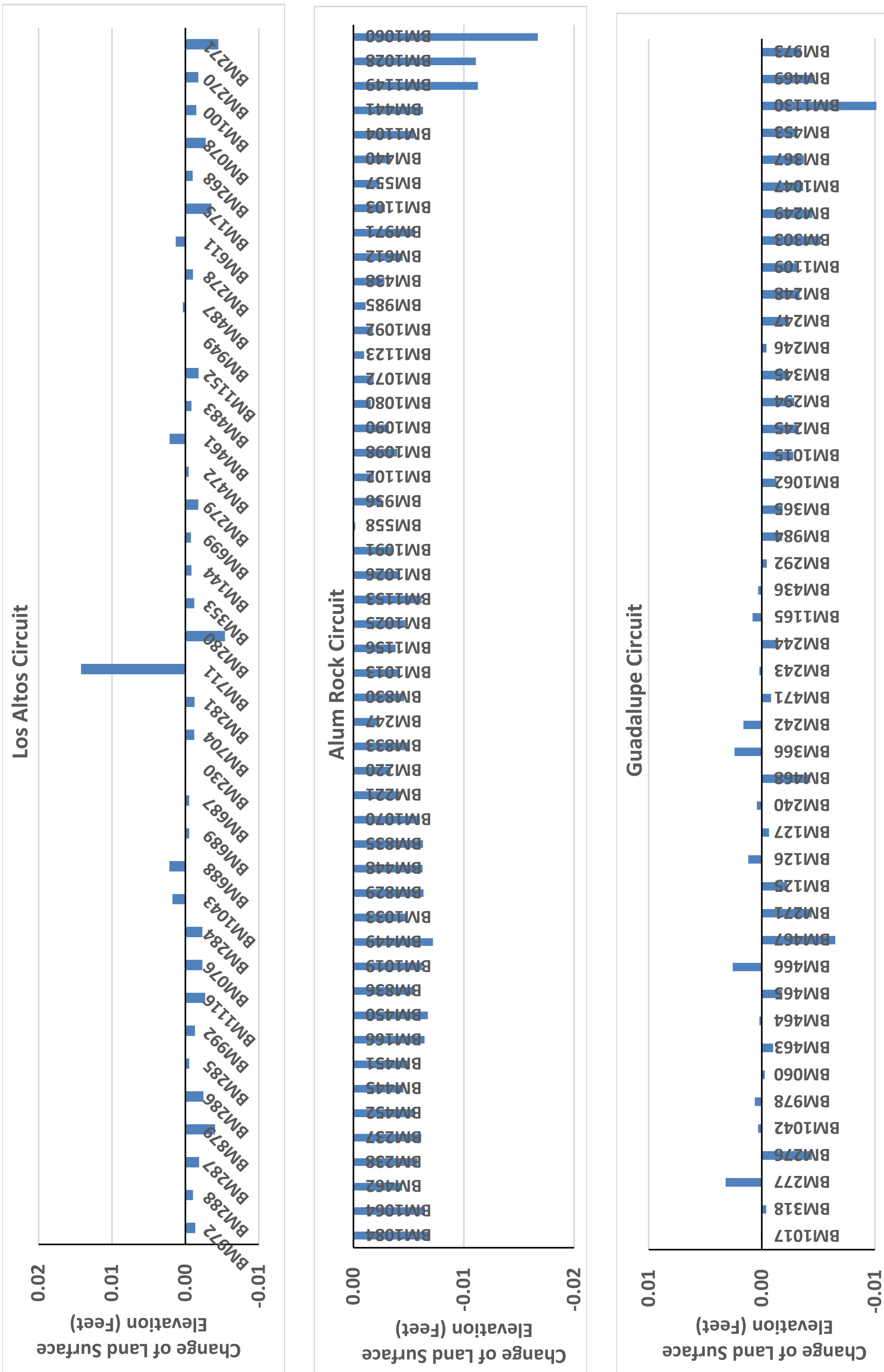
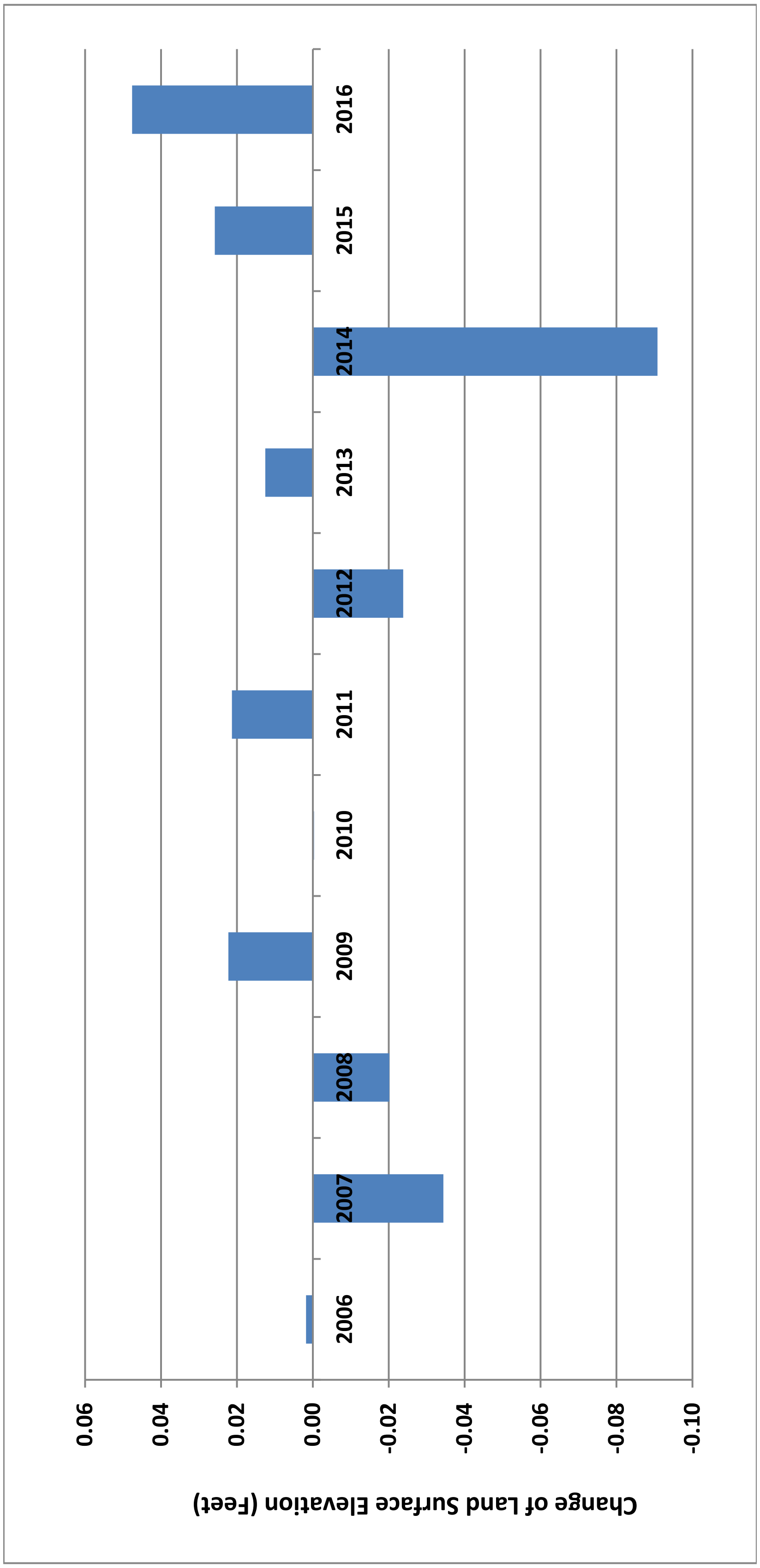


Figure 9 Average annual change of land surface elevation from 2006 to 2016 along three circuits (shown from west to east for Los Altos and Alum Rock, and north to south for Guadalupe)

Figure 10 Average annual change of land surface elevation along the three circuits from 2006 to 2016



Appendix B

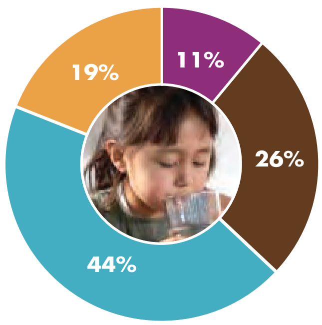
2016 Groundwater Quality Summary Provided to Well Owners

Groundwater Quality Summary Report

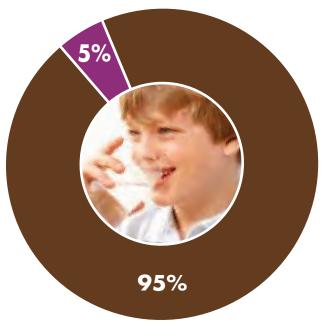
For Testing Performed in Calendar Year 2016

Santa Clara Valley Water District

NORTH COUNTY
WATER USE



SOUTH COUNTY
WATER USE



- Groundwater
- Treated Water
- Hetch-Hetchy
- Other Local and Recycled Water

Protecting our Groundwater

Groundwater is an essential local resource, providing about half of the water used in Santa Clara County each year. In some areas, groundwater is the only source of drinking water. Protecting our groundwater helps ensure adequate supplies are available now and in the future.

The Santa Clara Valley Water District works to safeguard groundwater by:

- Replenishing groundwater with local and imported surface water.
- Reducing demands on groundwater through treated water deliveries, water conservation and water recycling.
- Monitoring groundwater and implementing programs to protect against contamination.

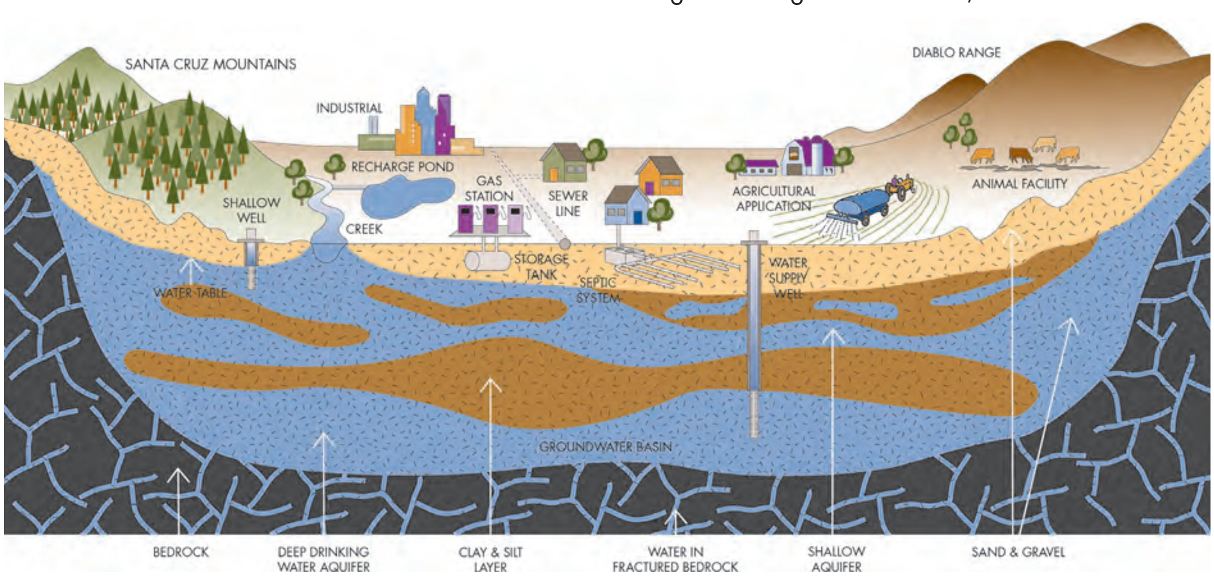
Regular well testing throughout the county indicates that groundwater quality is generally very good. Drinking water, including bottled water, may contain at least small amounts of some contaminants. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive materials, and can pick up substances from animal and human activities.

Contaminants that may be present include:

- Microbial contaminants such as viruses and bacteria that may come from sewage treatment plants, sewer lines, septic systems, agricultural operations and wildlife.
- Inorganic contaminants such as salts and metals that can be naturally occurring or result from stormwater runoff, industrial or domestic wastewater discharges, animal facilities, farming, and mining.
- Pesticides, fertilizers and herbicides that may come from agriculture, stormwater runoff and residential uses.
- Organic chemicals including synthetic and volatile organic chemicals from industrial processes, gas stations, dry cleaners, stormwater runoff, agricultural application and septic systems.
- Radioactive contaminants that are typically naturally occurring in our area.

The presence of natural or man-made contaminants does not necessarily indicate that water poses a health risk. State and federal drinking water standards identify maximum contaminant levels that relate to health risk.

Everyone has a role in protecting groundwater. Well owners should maintain their wells and septic systems, and create a zone of protection around the well where no contaminants are used or stored. See the water district's Guide for the Private Well Owner at **www.valleywater.org** for helpful tips. Residents can help by conserving water and by raising awareness that activities on the land surface can affect our largest drinking water reservoir, which is beneath our feet.



2016 Groundwater Quality Summary

Monitoring confirms generally high groundwater quality, but South County nitrate is a concern

In 2016, the water district sampled nearly 250 domestic water supply wells and evaluated data from over 230 local water supplier wells. The table below summarizes groundwater quality results for North and South County (see map on back page). 2016 results show that nearly all wells tested meet drinking water standards with the notable exception of nitrate in South County domestic wells. The water district works with regulatory and land use agencies on this ongoing groundwater protection challenge.

Water from public water systems must meet Maximum Contaminant Levels (MCLs), but domestic wells are not subject to these standards. It should be noted that not every well was tested for all parameters shown, and only parameters that were detected in water supply wells are listed. Water quality standards, including MCLs, are shown to provide context for quality in your well since every property and well is unique.

Primary Drinking Water Standards — Public Health Related Standards				North County		South County		
Inorganic Contaminants	UNITS	PRIMARY MCL	PHG	MEDIAN	RANGE	MEDIAN	RANGE	Typical Sources
Aluminum	ppb	1,000	600	ND	ND - 260	23.5	ND - 430	Erosion of natural deposits
Arsenic	ppb	10	0.004	ND	ND - 5.70	ND	ND - 4.00	Erosion of natural deposits; glass and electronics production waste
Asbestos	MFL	7	7	ND	ND	ND	ND - 2.30	Erosion of natural deposits
Barium	ppb	1,000	2,000	115	ND - 280	85.2	ND - 310	Erosion of natural deposits
Chromium (total)	ppb	50	—	ND	ND - 10.3	1.30	ND - 4.50	Erosion of natural deposits; metal plating
Chromium-6 (hexavalent)	ppb	10	0.02	2.00	ND - 5.80	1.20	ND - 5.20	Erosion of natural deposits; metal plating and industrial discharges
Fluoride (natural source)	ppm	2	1	0.13	ND - 0.23	0.1	ND - 1.53	Erosion of natural deposits
Nickel	ppb	100	12	2.30	ND - 16.0	ND	ND - 6.30	Erosion of natural deposits; discharge from metal industries
Nitrate + Nitrite (as N)	ppm	10,000	10,000	2.95	0.64 - 7.10	2.60	ND - 5.80	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
Nitrite (as N)	ppm	10	10	3.20	ND - 12.5	5.00	ND - 46.4	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
Perchlorate	ppb	6	6	ND	ND	ND	ND - 4.60	Solid rocket propellant, fireworks, explosives, flares, matches, and a variety of industries
Selenium	ppb	50	30	ND	ND - 6.30	ND	ND	Erosion of natural deposits
Radioactive Contaminants								
Gross Alpha	pCi/L	15	—	1.10	ND - 4.60	ND	ND - 6.01	Erosion of natural deposits
Gross Beta	mrem/yr	50	—	ND	ND	0.12	0.12	Erosion of natural deposits
Tritium	pCi/L	20,000	400	NA	NA	305	305	Erosion of natural deposits
Uranium	pCi/L	20	0.43	ND	ND - 0.80	NA	NA	Erosion of natural deposits
Volatile Organic Chemicals								
1,1,1-Trichloroethane (1,1,1-TCA)	ppb	200	1,000	ND	ND - 1.70	ND	ND	Discharge from metal degreasing sites and other industrial processes
1,2,2-Trichloro-1,2,2-Trifluoroethame (Freon 113)	ppb	1,200	4,000	ND	ND - 12.0	ND	ND	Discharge from industrial processes and automotive repair
1,1 - Dichloroethylene (1,1- DCE)	ppb	6	10	ND	ND - 0.86	ND	ND	Discharge from industrial processes, dry cleaners, and automotive repair
Haloacetic acids (HAA5)	ppb	60	0	7.25	ND - 13.5	NA	NA	Drinking water chlorination
Styrene	ppb	100	0	ND	ND - 0.69	ND	ND	Discharge from industrial processes
Tetrachloroethene (PCE)	ppb	5	0.06	ND	ND	ND	ND - 2.30	Discharge from industrial processes, dry cleaners, and automotive repair
Total Trihalomethanes (THMs)	ppb	80	—	ND	ND - 57.3	ND	ND - 9.00	Drinking water chlorination
Microbiological Contaminants[1]				**Present**	**Absent**	**Present**	**Absent**	**Typical Sources**
E. Coli Bacteria				2	9	4	164	Human and animal fecal waste
Total Coliform Bacteria				7	4	59	109	Naturally present in the environment

Notes: 1) The table shows the number of domestic wells tested that had bacteria present or absent. Public water systems are required to ensure that fewer than 5% of samples have total coliform present and that no samples have e.coli present. Domestic wells are not subject to these standards.

Terms and Definitions

Color units: A measure of color in water

Maximum Contaminant Level (MCL): The highest level of a contaminant allowed in public water systems. Primary MCLs are set as close to PHGs as is economically and technologically feasible. Secondary MCLs protect the odor, taste and appearance of drinking water.

Median: The "middle" value of the results, with half of the values above the median and half of the values below the median.
mrem/yr = millirems per year
MFL: = Million Fibers per Liter
NA: Not analyzed
ND: Not detected (at laboratory testing limit)
NTU: Nephelometric Turbidity Units
pCi/L: picoCuries per liter (a measure of radiation)

ppm: parts per million (milligrams per liter)
ppb: parts per billion (micrograms per liter)
Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to human health. PHGs are set by the California EPA.
TON: Threshold Odor Number
uS/cm: microSiemens per centimeter
(a measure of the dissolved inorganic salt content)

2016 Groundwater Quality Summary

Secondary Drinking Water Standards — Aesthetic Standards	UNITS	SECONDARY MCL	PHG	North County MEDIAN	North County RANGE	South County MEDIAN	South County RANGE	Typical Sources
Chloride	ppm	250	—	48.0	27 - 100	45.0	15.0 - 140	Runoff/leaching from natural deposits; seawater influence
Color	color units	15	—	ND	ND - 5.00	ND	ND - 10.0	Naturally-occurring organic materials
Copper	ppb	1,000	300	3.80	ND - 21.5	2.95	ND - 45.4	Internal corrosion of household plumbing systems; erosion of natural deposits
Iron	ppb	300	—	32.8	ND - 2,600	14.4	ND - 620	Leaching from natural deposits; industrial wastes
Manganese	ppb	50	—	0.54	ND - 310	1.30	ND - 455	Leaching from natural deposits; industrial wastes
Odor Threshold	TON	3	—	ND	ND - 2.00	ND	ND	Naturally-occurring organic materials
pH	pH units	6.5 - 8.5	—	7.60	6.31 - 8.20	7.60	7.00 - 8.10	Erosion of natural deposits; carbon dioxide emissions; rainfall
Specific Conductance	uS/cm	900	—	705	440 - 1,360	649	279 - 2,770	Substances that form ions when in water; seawater influence
Sulfate	ppm	250	—	45.0	2.70 - 110	37.1	11.4 - 358	Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (TDS)	ppm	500	—	425	300 - 650	378	262 - 678	Runoff/leaching from natural deposits
Turbidity	NTU	5	—	0.20	ND - 3.00	0.61	ND - 5.10	Soil runoff
Zinc	ppb	5,000	—	ND	ND - 15.7	3.50	ND - 89.0	Runoff/leaching from natural deposits; industrial wastes
Other Water Quality Parameters								
Alkalinity (total, as CaCO3)	ppm	—	—	240	120 - 360	178	90.0 - 343	Atmospheric and vadose zone carbon dioxide
Boron	ppb	—	—	78.5	ND - 441	98.1	66.4 - 1,900	Erosion of natural deposits
Bromide	ppm	—	—	0.15	ND - 0.48	0.17	0.05 - 0.74	Erosion of natural deposits; seawater intrusion; sea spray
Bromodichloromethane (THM)	ppb	—	—	ND	ND - 15.1	ND	ND - 2.10	Drinking water chlorination
Bromoform (THM)	ppb	—	—	ND	ND - 15.7	ND	ND	Drinking water chlorination
Calcium	ppm	—	—	68.0	23.8 - 110	51.0	33.5 - 116	Erosion of natural deposits
Carbon Dioxide	ppb	—	—	15.5	ND - 42,000	NA	NA	Atmospheric sources; dissolution of carbonate rocks
Chlorate	ppb	—	—	220	220	NA	NA	Pyrotechics; leaching from natural deposits
Chloroform (THM)	ppb	—	—	ND	ND - 17.7	ND	ND - 9.30	Drinking water chlorination
Cobalt	ppb	—	—	ND	ND - 0.17	ND	ND	Leaching from natural deposits; industrial wastes
Dibromoacetic Acid	ppb	—	—	1.95	ND - 3.40	NA	NA	Drinking water chlorination
Dibromochloromethane (THM)	ppb	—	—	ND	ND - 25.6	ND	ND - 1.70	Drinking water chlorination
Dichloroacetic Acid	ppb	—	—	3.15	ND - 7.00	NA	NA	Drinking water chlorination
Dichlorodifluoromethane (Freon 12)	ppb	—	—	ND	ND - 6.20	ND	ND	Discharge from industrial processes, dry cleaners, and automotive repair
Hardness (total, as CaCO3)	ppm	—	—	296	170 - 594	261	55.0 - 946	Erosion of natural deposits
Lead	ppb		0.2	ND	ND - 2.04	ND	ND - 2.24	Erosion of natural deposits; internal corrosion of household water plumbing systems; discharges from industrial manufacturers
Lithium	ppb	—	—	7.90	ND - 25.0	10.0	5.80 - 27.0	Erosion of natural deposits; discharge from industrial uses
Magnesium	ppm			28.5	8.20 - 61.0	31.0	20.0 - 57.1	Erosion of natural deposits
Molybdenum	ppb	—	—	1.86	ND - 5.10	ND	ND - 4.40	Erosion of natural deposits
Orthophosphate	ppm	—	—	0.15	ND - 0.47	0.05	ND - 0.85	Leaching from natural deposits; agricultural runoff
Potassium	ppm	—	—	1.26	ND - 2.40	1.30	0.50 - 1.90	Erosion of natural deposits
Radium 228	pCi/L	—	0.019	ND	ND	0.044	ND - 0.047	Erosion of natural deposits
Radium 222	pCi/L	—	—	410	410	NA	NA	Leaching from natural deposits
Silica	ppm	—	—	26.6	24.6 - 35.0	26.3	20.3 - 43.0	Erosion of natural deposits
Sodium	ppm	—	—	31.5	15.1 - 92.0	27.8	13.1 - 110	Erosion of natural deposits
Trichloroacetic Acid	ppb	—	—	1.80	ND - 3.10	NA	NA	Drinking water chlorination
Vanadium	ppb	—	—	1.85	1.50 - 3.00	1.85	1.10 - 13.0	Erosion of natural deposits; discharge from industrial uses

Do I need to test my water?

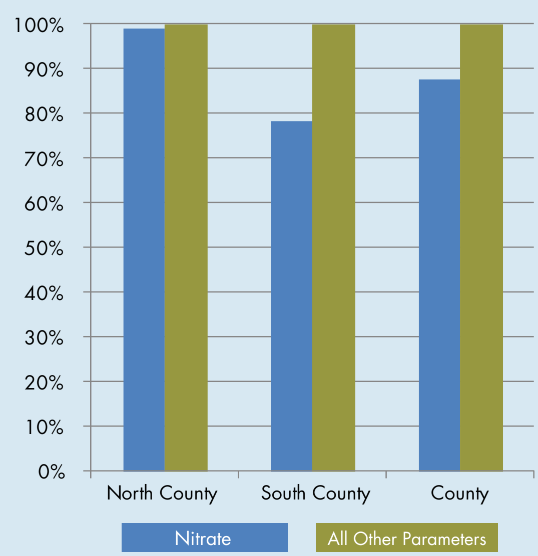
If your water comes from a public water supply, such as a city or water company, it is tested regularly to make sure that it meets state and federal drinking water standards.

If your water comes from a private well, you are responsible for making sure it is safe to drink. Although the water district monitors regional groundwater quality, every property and well has unique conditions. Some contaminants are colorless and odorless, so the first step in protecting your health is having your water tested.

The water district encourages private well owners to have their well water tested by a state-certified laboratory annually or more often if there is a change in taste, odor or appearance. If your water contains any contaminant above drinking water standards, you may want to install a treatment system or use an alternative source of water.

The water district currently offers free basic water quality testing for domestic wells and rebates of up to $500 for nitrate treatment systems — call the Groundwater Hotline at (408) 630-2300 to find out if you're eligible.

PERCENTAGE OF WATER SUPPLY WELLS TESTED IN 2016 MEETING PRIMARY DRINKING WATER STANDARDS



Hot Topics in Water Quality

Nitrate

As shown in the chart to the left, nitrate is an ongoing groundwater protection challenge, particularly in South County. Common sources of nitrate are fertilizers, septic systems and livestock waste, so nitrate is often higher in rural and agricultural areas. Nitrate can interfere with the blood's ability to transport oxygen and is of greatest concern for infants and pregnant women. The effects of consuming high levels of nitrate are often referred to as "blue baby syndrome" and symptoms include shortness of breath and blueness of the skin.

The water district monitors nitrate to assess current conditions and trends, recharges groundwater which helps dilute nitrate, and works with other agencies to address elevated nitrate in groundwater. To help reduce private well owners' exposure to elevated nitrate in drinking water, the water district is offering rebates of up to $500 for eligible treatment systems. Call the Groundwater Hotline at (408) 630-2300 for more information.

Perchlorate

Perchlorate is a salt used for rocket fuel, highway flares, fireworks and other uses. Perchlorate can have adverse health effects at high levels as it can interfere with the thyroid gland, which can affect hormones that regulate metabolism and growth. Contamination from a former highway flare manufacturer in Morgan Hill was first discovered in 2000. At the urging of the water district and the community, the Central Coast Regional Water Quality Board has taken timely action to restore groundwater quality.

Due to cleanup activities and groundwater recharge, perchlorate levels have decreased dramatically. The area affected is also getting smaller, now extending from Tennant Avenue south to approximately San Martin Avenue. A few water supply wells still contain perchlorate above the drinking water standard and remediation by the responsible party is ongoing.

Chromium-6

Chromium-6, a suspected carcinogen, is a naturally—occurring metal that is also used in several industrial processes. Geologic deposits containing chromium-6 are present in areas of Santa Clara County. California's drinking water standard of 10 parts per billion (ppb) for Chromium-6 became effective on July 1, 2014.

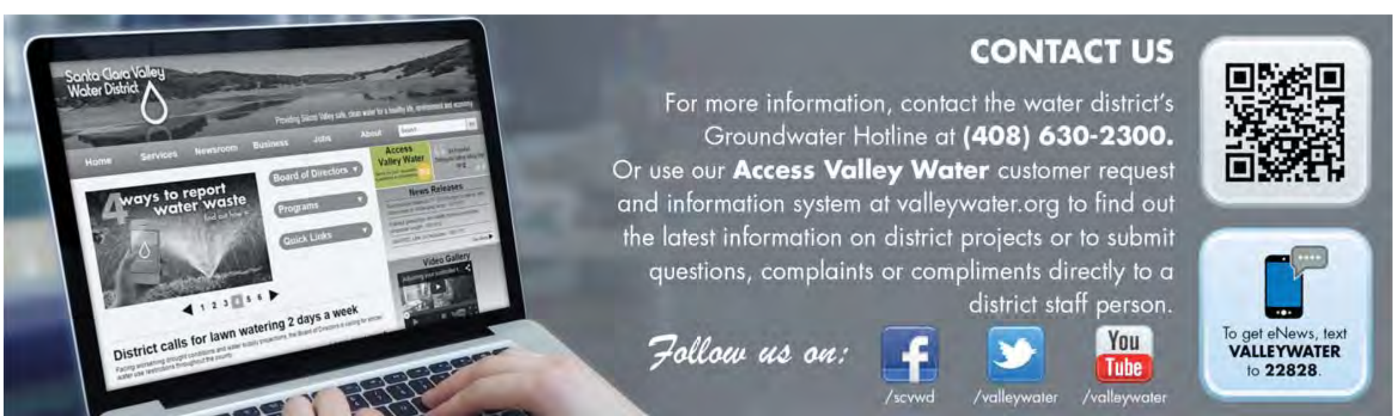
Lead

Lead and other metals are naturally present at low levels in groundwater due to the erosion of natural deposits. Groundwater is generally not corrosive by nature. Lead may be introduced to drinking water from faucets, plumbing fixtures and lead solder within the home and from lead service lines, if they are present. For more information, please visit **www.valleywater.org**

You live on a groundwater basin

Health and education information

Drinking water, including bottled water, may reasonably be expected to contain small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained from the U.S. Environmental Protection Agency's Safe Drinking Water Hotline **(800-426-4791)**, the CA Division of Drinking Water **(www.waterboards.ca.gov/drinking_water/programs)**, the CA Office of Environmental Health Hazard Assessment **(www.oehha.ca.gov/water)**, or from your healthcare provider.



Appendix C

2016 Groundwater Quality Results by Subbasin and Zone

Table C-1 Summary of 2016 Water Quality Indicator Data

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain								Santa Clara Subbasin, Coyote Valley				Maximum Contaminant Levels	
		Shallow Zone[2]				Principal Zone[3]									
		n[4]	Min[5]	Median[6]	Max	n	Min	Median	Max	n	Min	Median	Max	MCL[7]	SMCL[8]
Aggressive Index (Corrosivity)	INDEX	--	--	--	--	57	10.91	12	13	5	11.61	12	12	--	--
Alkalinity - Hydroxide (as $CaCO_3$)	mg/L	19	<5	<5	<5	20	<5	<5	<5	4	<5	<5	<5	--	--
Alkalinity - Bicarbonate (as $CaCO_3$)	mg/L	19	136	273	555	20	89	224	333	4	177	225	278	--	--
Alkalinity (Total, as $CaCO_3$)	mg/L	19	136	273	555	78	89	227	360	9	170	180	278	--	--
Alkalinty - Carbonate (as $CaCO_3$)	mg/L	28	<5	<5	<5	20	<5	<5	<5	4	<5	<5	<5	--	--
Caffeine	ug/L	--	--	--	--	33	<0.05	<0.05	<0.05	2	<0.05	<0.05	<0.05	--	--
Carbonate (as CO3)	mg/L	19	<5	<5	<5	44	<5	1.6	6	5	<5	<5	<2	--	--
Color	Color units	--	--	--	--	27	<3	<3	5	2	<3	4.3	10	--	15
E. Coli	P/A 100 mL	2	2 Absent	0 Present		--	--	--	--	9	9 Absent	0 Present		--	--
Foaming Agents (MBAS)	ug/L	--	--	--	--	23	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1	--	500
Hardness (Total, as $CaCO_3$)	mg/L	20	190	369	629	79	76	285	450	17	210	264	427	--	--
Hydroxide Alkalinity	mg/L	19	<5	<5	<5	43	<5	<2	<2	5	<5	<5	<2	--	--
Langelier Index @ 60 °C	INDEX	--	--	--	--	27	-0.19	1.1	1.6	3	0.23	0.28	1	--	--
Langelier Index at Source Temp.	INDEX	--	--	--	--	27	-1.16	-0.44	0.24	--	--	--	--	--	--
Odor Threshold @ 60 °C	TON	--	--	--	--	59	<1	<1	2	5	<1	<1	<1	--	3
pH, Field	pH units	--	--	--	--	6	7.2	7.5	7.6	--	--	--	--	--	--
pH, Laboratory	pH units	19	6.9	7.6	9	78	6.31	7.6	8.3	9	7.35	7.8	8.1	--	--
Source Temperature °C	°C	--	--	--	--	6	18	19	26	--	--	--	--	--	--
Specific Conductance	uS/cm	20	466	809	1,430	86	391	680	995	17	520	644	995	--	900
Total Coliform MPN Per 100 mL[9]	P/A 100 mL	2	1 Absent	1 Present		--	--	--	--	9	7 Absent	2 Present	0	--	--
Total Organic Carbon (TOC)	mg/L	--	--	--	--	1	<0.3	<0.3	<0.3	--	--	--	--	--	--
Turbidity, Laboratory	NTU	--	--	--	--	53	<0.1	0.2	3	5	<0.1	0.5	5.1	--	5

Table C-1 Summary of 2016 Water Quality Indicator Data

Parameter	Units[1]	Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone				Principal Zone					
		n	Min	Median	Max	n	Min	Median	Max	MCL[7]	SMCL[8]
Aggressive Index (Corrosivity)	INDEX	--	--	--	--	6	11.66	11.8	12	--	--
Alkalinity - Hydroxide (as $CaCO_3$)	mg/L	20	<5	<5	<5	19	<5	<5	<5	--	--
Alkalinity - Bicarbonate (as $CaCO_3$)	mg/L	20	101	182	323	19	90	200	343	--	--
Alkalinity (Total, as $CaCO_3$)	mg/L	20	101	182	323	25	90	200	343	--	--
Alkalinty - Carbonate (as $CaCO_3$)	mg/L	20	<5	<5	<5	19	<5	<5	<5	--	--
Caffeine	ug/L	--	--	--	--	--	--	--	--	--	--
Carbonate (as CO_3)	mg/L	20	<5	<5	<5	19	<5	<5	<5	--	--
Color	Color units	--	--	--	--	1	10	10	10	--	15
E. Coli	P/A 100 mL	7	6 Absent	1 Present		17	16 Absent	1 Present		--	--
Foaming Agents (MBAS)	ug/L	--	--	--	--	--	--	--	--	--	500
Hardness (Total, as $CaCO_3$)	mg/L	18	179	269	564	28	188	257	543	--	--
Hydroxide Alkalinity	mg/L	20	<5	<5	<5	19	<5	<5	<5	--	--
Langelier Index @ 60 °C	INDEX	--	--	--	--	1	0.54	0.54	0.54	--	--
Langelier Index at Source Temp.	INDEX	--	--	--	--	--	--	--	--	--	--
Odor Threshold @ 60 °C	TON	--	--	--	--	3	<1	<1	<1	--	3
pH, Field	pH units	--	--	--	--	--	--	--	--	--	--
pH, Laboratory	pH units	16	7	7.3	7.8	27	7.1	7.6	8	--	--
Source Temperature °C	°C	--	--	--	--	--	--	--	--	--	--
Specific Conductance	uS/cm	22	400	631	1,220	84	390	577	1,160	--	900
Total Coliform MPN Per 100 mL[9]	P/A 100 mL	7	4 Absent	3 Present		17	7 Absent	10 Present		--	--
Total Organic Carbon (TOC)	mg/L	--	--	--	--	--	--	--	--	--	--
Turbidity, Laboratory	NTU	--	--	--	--	6	0.1	0.6	1.3	--	5

Table C-1 Summary of 2016 Water Quality Indicator Data (Notes)

Table includes data for wells monitored by the District (monitoring 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. DDW wells are assumed to represent the principal zone if no construction information is available, as these are typically deep wells.

1. ug/L = microgram per liter; mg/L = milligrams per liter; P/A = present/absent per 100 ml; uS/cm = microSiemens per centimeter;

NTU = Nephelometric Turbidity Units; TON = Threshold Odor Number

2. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.

3. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.

4. n = number of results for each parameter. Some parameters may have been analyzed more than once at a particular well.

5. 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.

6. For parameters with results reported at multiple reporting limits, the median was computed using the Maximum Likelihood Estimate (MLE) method.

7. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.

8. 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 first with the upper threshold in parentheses.

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 C-2 Summary of 2016 Inorganic Constituent Data

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain								Santa Clara Subbasin, Coyote Valley				Maximum Contaminant Levels	
		Shallow Zone[2]				Principal Zone[3]									
		n[4]	Min[5]	Median[6]	Max	n	Min	Median	Max	n	Min	Median	Max	MCL[7]	SMCL[8]
Major and Minor Ions															
Bicarbonate (as HCO_3)	mg/L	19	166	333	677	78	109	280	440	9	200	220	339	--	--
Bromide	mg/L	20	0.07	0.16	0.42	20	<0.5	0.125	0.26	12	0.07	0.12	0.74	--	--
Calcium	mg/L	19	36.2	71.1	140	82	16.3	64	110	9	6.9	41	68	--	--
Calcium (as $CaCO_3$)	mg/L	19	90.5	178	350	20	40.8	130	270	4	17.4	114.9	146	--	--
Carbon Dioxide	ug/L	--	--	--	--	51	1.6	25	42,000	1	<2,000	<2,000	<2,000	--	--
Chlorate	ug/L	--	--	--	--	1	220	220	220	--	--	--	--	--	--
Chloride	mg/L	19	29	59	105	78	11	47	100	11	15	39	75	--	250
Cyanide	ug/L	--	--	--	--	64	<5	<100	<100	5	<100	<100	<100	150	--
Fluoride (Natural Source)	mg/L	20	<0.05	0.11	0.46	86	<0.1	0.14	0.25	17	<0.05	0.13	0.31	2	--
Magnesium	mg/L	19	12.5	36.2	75.1	84	6.7	28	61	9	27.5	30	58.8	--	--
Perchlorate	ug/L	19	<4	<4	<4	77	<4	<4	<4	9	<4	<4	<4	6	--
Potassium	mg/L	19	0.6	1.2	2.4	75	<1	1.3	4.3	7	<1	1.1	1.8	--	--
Silica	mg/L	19	19.3	23.4	35.3	21	15.2	27	41.3	4	20.3	21.1	37.9	--	--
Sodium	mg/L	19	21.2	37	169	82	14.8	31.6	115	9	18	26.5	103	--	--
Sodium Adsorption Ratio	ratio	19	0.61	0.98	4.7	75	0.52	0.92	6.2	9	0.55	0.75	3.5	--	--
Sulfate	mg/L	20	19.6	60	307	78	1.5	45	110	19	1.4	47	80	--	250
Sulfide	mg/L	--	--	--	--	1	<0.05	<0.05	<0.05	--	--	--	--	--	--
Total Dissolved Solids	mg/L	19	312	498	968	78	244	410	650	15	280	376	520	--	500
Nutrients															
Ammonia	mg/L	--	--	--	--	1	<0.05	<0.05	<0.05	--	--	--	--	--	--
Nitrate + Nitrite (as N)	mg/L	--	--	--	--	59	0.64	3	7	9	<0.4	0.92	5.8	10	--
Nitrate (as N)	mg/L	20	<0.05	1	6	255	<0.4	3	9	46	<0.4	4.9	24	10	--
Nitrite (as N)	mg/L	--	--	--	--	66	<0.05	<0.4	<0.4	16	<0.4	<0.4	<0.4	1	--
Phosphate	ug/L	--	--	--	--	1	<0.03	<0.03	<0.03	--	--	--	--	--	--
Phosphate, Ortho	mg/L	20	<0.05	0.21	1.25	20	<0.05	0.15	1.8	12	<0.05	0.08	0.4	--	--
Trace Elements															
Aluminum	ug/L	19	<20	36.6	120	88	<50	17.9	1,700	9	<20	13.3	430	1,000	200
Antimony	ug/L	19	<1	<1	<1	85	<1	<6	<6	9	<1	<6	<6	6	--
Arsenic	ug/L	19	<2	<2	10	85	<2	<2	5.7	9	<2	<2	<2	10	--
Asbestos	MFL	--	--	--	--	13	<0.2	<0.2	<0.2	2	<0.2	<0.2	<0.2	7	--
Barium	ug/L	19	41	110	330	85	56	117	280	9	<100	88	260	1,000	--
Beryllium	ug/L	19	<1	<1	<1	85	<1	<1	<1	9	<1	<1	<1	4	--
Boron	ug/L	19	85.7	180	850	27	40	129	440	4	68.4	116	130	--	--
Cadmium	ug/L	19	<1	<1	<1	85	<1	<1	<1	9	<1	<1	<1	5	--
Chromium (Total)	ug/L	19	<1	<1	4.4	86	<1	0.92	10.3	9	<1	1.3	3.9	50	--
Chromium, Hexavalent	ug/L	19	<1	<1	3.7	72	<1	1.9	8.8	9	<1	2.6	5.2	10	--
Cobalt	ug/L	19	<1	<1	<1	21	<1	<1	1.7	4	<1	<1	<1	--	--
Copper	ug/L	19	<1	<1	17.7	93	<1	0.7	21.5	9	<1	0.9	1.5	--	1,000
Iron	ug/L	19	<20	<20	1,500	109	<20	17	11,000	9	<100	<100	620	--	300
Lead	ug/L	19	<1	<1	1.54	86	<1	0.49	5	9	<1	<5	<5	--	--
Lithium	ug/L	19	<5	6.9	18	20	<5	8.1	27	4	8.9	10.5	25	--	--
Manganese	ug/L	19	<1	39.4	870	88	<1	1.2	310	9	<1	0.4	136	--	50
Mercury	ug/L	19	<1	<1	<1	85	<0.2	<1	<1	9	<1	<1	<1	2	--
Molybdenum	ug/L	19	<1	2.1	27	21	<1	1.6	10	4	<1	<1	15	--	--
Nickel	ug/L	19	<1	1.4	2.7	86	<1	1	16	9	<1	<10	<10	100	--
Selenium	ug/L	19	<5	<5	<5	85	<2	<5	6.3	9	<5	<5	<5	50	--
Silver	ug/L	19	<1	<1	<1	78	<10	<10	<1	9	<1	<10	<10	--	100
Thallium	ug/L	19	<1	<1	<1	84	<1	<10	<10	9	<1	<1	<1	2	--
Vanadium	ug/L	19	<1	1.9	4.3	21	<1	2.4	7.3	4	1.2	1.6	11	--	--
Zinc	ug/L	19	<10	<10	99	84	<10	<10	2,300	9	<10	<50	<50	--	5,000

Table C-2 Summary of 2016 Inorganic Constituent Data

Parameter	Units[1]	Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone				Principal Zone					
		n	Min	Median	Max	n	Min	Median	Max	MCL[7]	SMCL[8]
Major and Minor Ions											
Bicarbonate (as HCO_3)	mg/L	20	123	222	394	25	109	244	418	--	--
Bromide	mg/L	22	<0.05	0.13	0.81	22	0.05	0.17	1.02	--	--
Calcium	mg/L	20	34.7	63.3	94.4	25	33.2	52.7	116	--	--
Calcium (as $CaCO_3$)	mg/L	20	86.8	158	236	19	82.9	140	290	--	--
Carbon Dioxide	ug/L	--	--	--	--	--	--	--	--	--	--
Chlorate	ug/L	--	--	--	--	--	--	--	--	--	--
Chloride	mg/L	20	12	41	80	26	20	51.5	140	--	250
Cyanide	ug/L	--	--	--	--	9	<100	<100	<100	150	--
Fluoride (Natural Source)	mg/L	22	<0.05	0.12	0.36	31	<0.05	0.12	0.22	2	--
Magnesium	mg/L	20	20.1	30.3	73.8	25	20	32	66.1	--	--
Perchlorate	ug/L	20	<4	<4	<4	93	<4	<4	4.6	6	--
Potassium	mg/L	20	<0.5	1.1	1.9	23	<0.5	1.3	1.9	--	--
Silica	mg/L	20	18.6	27.6	38.9	19	21.5	26.3	43	--	--
Sodium	mg/L	20	12.3	24.9	60.6	26	13.1	28.55	110	--	--
Sodium Adsorption Ratio	ratio	17	0.38	0.7	1.94	25	0.41	0.82	4.23	--	--
Sulfate	mg/L	22	17.6	39.15	79.6	29	17.1	39.4	73.4	--	250
Sulfide	mg/L	--	--	--	--	--	--	--	--	--	--
Total Dissolved Solids	mg/L	20	222	406	684	26	286	419	714	--	500
Nutrients											
Ammonia	mg/L	--	--	--	--	--	--	--	--	--	--
Nitrate + Nitrite (as N)	mg/L	--	--	--	--	6	2	4	5	10	--
Nitrate (as N)	mg/L	22	0.213	7.2	56.9	200	<0.4	5	34	10	--
Nitrite (as N)	mg/L	--	--	--	--	19	<0.4	<0.4	<0.4	1	--
Phosphate	ug/L	--	--	--	--	--	--	--	--	--	--
Phosphate, Ortho	mg/L	22	<0.05	<0.05	0.18	22	<0.05	0.07	0.85	--	--
Trace Elements											
Aluminum	ug/L	20	<20	29.3	120	28	<50	24	64	1,000	200
Antimony	ug/L	20	<1	<1	<1	28	<1	<1	<6	6	--
Arsenic	ug/L	20	<2	<2	<2	28	<2	<2	4	10	--
Asbestos	MFL	--	--	--	--	4	<0.2	1.635	6	7	--
Barium	ug/L	20	13	130	470	28	18	99	310	1,000	--
Beryllium	ug/L	20	<1	<1	<1	28	<1	<1	<1	4	--
Boron	ug/L	20	<50	98	186	22	<50	99	1900	--	--
Cadmium	ug/L	20	<1	<1	<1	28	<1	<1	<1	5	--
Chromium (Total)	ug/L	20	<1	1.2	5.2	28	<1	1.3	4.5	50	--
Chromium, Hexavalent	ug/L	16	<1	<1	4.7	20	<1	1.08	3.1	10	--
Cobalt	ug/L	20	<1	<1	<1	19	<1	<1	<1	--	--
Copper	ug/L	20	<1	1.8	12.7	25	<1	2.6	45	--	1,000
Iron	ug/L	20	<20	<20	81	29	<20	23.3	570	--	300
Lead	ug/L	20	<1	<1	1.1	28	<1	<1	2.2	--	--
Lithium	ug/L	20	<5	9.1	34	19	<5	10	27	--	--
Manganese	ug/L	20	<1	1.4	710	25	<1	2.5	455	--	50
Mercury	ug/L	18	<1	<1	<1	28	<1	<1	<1	2	--
Molybdenum	ug/L	20	<1	<1	1.5	19	<1	<1	4	--	--
Nickel	ug/L	20	<1	1.7	5.6	28	<1	<1	6.3	100	--
Selenium	ug/L	20	<5	<5	<5	28	<5	<5	<5	50	--
Silver	ug/L	20	<1	<1	<1	25	<1	<1	<10	--	100
Thallium	ug/L	20	<1	<1	<1	28	<1	<1	<1	2	--
Vanadium	ug/L	20	2.4	2.42	16	19	<1	2.4	13	--	--
Zinc	ug/L	20	<10	<10	92	25	<50	4.3	89	--	5,000

Table C-2 Summary of 2016 Inorganic Constituent Data (Notes)

Table includes data for wells monitored by the District (monitoring 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. DDW wells are assumed to represent the principal zone if no construction information is available, as these are typically deep wells.

1. mg/L = milligrams per liter; ug/L = micrograms per liter; MFL = million fibers per liter.
2. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
3. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.
4. n = number of results for each parameter. Some parameters may have been analyzed more than once at a particular well.
5. 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.
6. For parameters with results with multiple reporting limits, the median was computed using the Maximum Likelihood Estimate (MLE) method.
7. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
8. 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 first with the upper threshold in parentheses.

Table C-3 Summary of 2016 Volatile Organic Compound (VOC) Findings (Detect/Non-Detect)

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain						Santa Clara Subbasin, Coyote Valley			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone[2]			Principal Zone[3]						Shallow Zone			Principal Zone				
		n[4]	Result[5]	RL[6]	n	Result	RL	n	Result	RL	n	Result	RL	n	Result	RL	MCL[7]	SMCL[8]
1,1,1,2-Tetrachlorethane	ug/L	18	ND	0.5	51	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
1,1,1-Trichloroethane	ug/L	18	**D**	0.5	117	**D**	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	200	--
1,1,2,2-Tetrachloroethane	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	1	--
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	ug/L	18	**D**	2	117	**D**	10	7	ND	10	20	ND	2	58	ND	10	1200	--
1,1,2-Trichloroethane	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	5	--
1,1-Dichloroethane	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	5	--
1,1-Dichloroethylene	ug/L	18	ND	0.5	117	**D**	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	6	--
1,1-Dichloropropene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
1,2,3-Trichlorobenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
1,2,3-Trichloropropane	ug/L	18	ND	0.5	23	ND	0.5	6	ND	0.5	20	ND	0.5	27	ND	0.5	--	--
1,2,4-Trichlorobenzene	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	5	--
1,2,4-Trimethylbenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
1,2-Dichlorobenzene	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	600	--
1,2-Dichloroethane	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	1	--
1,2-Dichloropropane	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	5	--
1,3,5-Trimethylbenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
1,3-Dichlorobenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
1,3-Dichloropropane	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
1,3-Dichloropropene (Total)	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	0.5	--
1,4-Dichlorobenzene	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	5	--
1,4-Dioxane	ug/L	--	--	--	1	ND	1	--	--	--	--	--	--	--	--	--	--	--
1-Phenylpropane (N-Propylbenzene)	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
2,2-Dichloropropane	ug/L	18	ND	0.5	47	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
2,4-Dinitrotoluene	ug/L	--	--	--	32	ND	0.1	2	ND	0.1	--	--	--	--	--	--	--	--
2-Chlorotoluene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
4-Chlorotoluene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--

Table C-3 Summary of 2016 Volatile Organic Compound (VOC) Findings (Detect/Non-Detect)

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain						Santa Clara Subbasin, Coyote Valley			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone[2]			Principal Zone[3]						Shallow Zone			Principal Zone				
		n[4]	Result[5]	RL[6]	n	Result	RL	n	Result	RL	n	Result	RL	n	Result	RL	MCL[7]	SMCL[8]
Benzene	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	1	--
Benzo (a) Pyrene	ug/L	--	--	--	45	ND	0.1	2	ND	0.1	--	--	--	10	ND	0.1	0	--
Bromobenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Bromochloroacetic Acid (BCAA)	ug/L	--	--	--	1	ND	1	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Bromodichloromethane (THM)	ug/L	18	ND	0.5	54	**D**	1	7	ND	1	20	ND	0.5	54	**D**	1	--	--
Bromoform (THM)	ug/L	18	ND	0.5	54	**D**	1	7	ND	1	20	ND	0.5	54	ND	1	--	--
Bromomethane	ug/L	18	ND	0.5	47	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Carbon Disulfide	ug/L	--	--	--	25	ND	0.5	1	ND	0.5	--	--	--	--	--	--	--	--
Carbon Tetrachloride	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	1	--
Chloroethane	ug/L	18	ND	0.5	47	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Chloroform (THM)	ug/L	18	ND	0.5	54	**D**	1	7	ND	1	20	**D**	0.5	54	**D**	1	--	--
Chloromethane	ug/L	18	ND	0.5	47	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
cis-1,2-Dichloroethylene	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	6	--
Di(2-Ethylhexyl)Adipate	ug/L	--	--	--	45	ND	5	2	ND	5	--	--	--	10	ND	5	400	--
Di(2-Ethylhexyl)Phthalate	ug/L	--	--	--	45	ND	3	2	ND	3	--	--	--	10	ND	3	4	--
Dibromoacetic Acid	ug/L	--	--	--	2	**D**	1	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane (THM)	ug/L	18	ND	0.5	54	**D**	1	7	ND	1	20	ND	0.5	54	**D**	1	--	--
Dibromochloropropane (DBCP)	ug/L	--	--	--	43	ND	0.01	2	ND	0.01	--	--	--	10	ND	0.01	0.2	--
Dibromomethane	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Dichloroacetic Acid	ug/L	--	--	--	2	**D**	1	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane (Freon 12)	ug/L	18	ND	0.5	53	**D**	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Dichloromethane	ug/L	18	ND	0.5	116	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	5	--
Diisopropyl Ether	ug/L	18	ND	2	51	ND	3	7	ND	3	20	ND	2	54	ND	3	--	--
Ethylbenzene	ug/L	18	ND	0.5	117	ND	0.5	7	**D**	0.5	20	ND	0.5	58	ND	0.5	300	--
Ethylene Dibromide (EDB)	ug/L	--	--	--	43	ND	0.02	2	ND	0.02	--	--	--	10	ND	0.02	0	--

Table C-3 Summary of 2016 Volatile Organic Compound (VOC) Findings (Detect/Non-Detect)

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain						Santa Clara Subbasin, Coyote Valley			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone[2]			Principal Zone[3]						Shallow Zone			Principal Zone				
		n[4]	Result[5]	RL[6]	n	Result	RL	n	Result	RL	n	Result	RL	n	Result	RL	MCL[7]	SMCL[8]
Ethyl-Tert-Butyl Ether	ug/L	18	ND	2	51	ND	3	7	ND	3	20	ND	2	54	ND	3	--	--
Haloacetic Acids (5) (HAA5)	ug/L	--	--	--	2	**D**	2	--	--	--	--	--	--	--	--	--	60	--
Hexachlorobutadiene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Isopropylbenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
m,p-Xylene	ug/L	18	ND	0.5	59	**D**	0.5	7	**D**	0.5	20	ND	0.5	54	ND	0.5	--	--
Methyl Ethyl Ketone (MEK, Butanone)	ug/L	--	--	--	30	ND	5	3	ND	5	--	--	--	35	ND	5	--	--
Methyl Isobutyl Ketone	ug/L	--	--	--	31	ND	5	3	ND	5	--	--	--	35	ND	5	--	--
Methyl-Tert-Butyl-Ether (MTBE)	ug/L	18	ND	2	122	ND	3	7	ND	3	20	ND	2	58	ND	3	13	5
Monobromoacetic Acid (MBAA)	ug/L	--	--	--	2	ND	1	--	--	--	--	--	--	--	--	--	--	--
Monochloroacetic Acid (MCAA)	ug/L	--	--	--	2	ND	2	--	--	--	--	--	--	--	--	--	--	--
Monochlorobenzene	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	70	--
Naphthalene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
N-Butylbenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
N-Nitrosodiethylamine (NDEA)	ug/L	--	--	--	1	ND	0.002	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodimethylamine (NDMA)	ug/L	--	--	--	2	ND	0.002	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Butylamine (NDPA)	ug/L	--	--	--	1	ND	0.002	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-N-Propylamine (NDPA)	ug/L	--	--	--	1	ND	0.002	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosomethylethylamine (NMEA)	ug/L	--	--	--	1	ND	0.002	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosopiperidine (NMU)	ug/L	--	--	--	1	ND	0.002	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosopyrrolidine (NPYR)	ug/L	--	--	--	1	ND	0.002	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	ug/L	18	ND	0.5	59	ND	0.5	7	**D**	0.5	20	ND	0.5	54	ND	0.5	--	--
PCB-1016	ug/L	--	--	--	41	ND	0.5	2	ND	0.5	--	--	--	8	ND	0.5	1	--
PCB-1221	ug/L	--	--	--	41	ND	0.5	2	ND	0.5	--	--	--	8	ND	0.5	0.5	--
PCB-1232	ug/L	--	--	--	41	ND	0.5	2	ND	0.5	--	--	--	8	ND	0.5	1	--
PCB-1242	ug/L	--	--	--	41	ND	0.5	2	ND	0.5	--	--	--	8	ND	0.5	0.5	--
PCB-1248	ug/L	--	--	--	41	ND	0.5	2	ND	0.5	--	--	--	8	ND	0.5	1	--

Table C-3 Summary of 2016 Volatile Organic Compound (VOC) Findings (Detect/Non-Detect)

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain						Santa Clara Subbasin, Coyote Valley			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone[2]			Principal Zone[3]						Shallow Zone			Principal Zone				
		n[4]	Result[5]	RL[6]	n	Result	RL	n	Result	RL	n	Result	RL	n	Result	RL	MCL[7]	SMCL[8]
PCB-1254	ug/L	--	--	--	41	ND	0.5	2	ND	0.5	--	--	--	8	ND	0.5	0.5	--
PCB-1260	ug/L	--	--	--	41	ND	0.5	2	ND	0.5	--	--	--	8	ND	0.5	--	--
p-Isopropyltoluene	ug/L	18	ND	0.5	45	ND	0.5	5	ND	0.5	20	ND	0.5	19	ND	0.5	--	--
Polychlorinated Biphenyls (Total PCBs)	ug/L	--	--	--	38	ND	0.5	2	ND	0.5	--	--	--	8	ND	0.5	1	--
sec-Butylbenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Styrene	ug/L	18	ND	0.5	117	**D**	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	100	--
Tert-Amyl-Methyl Ether	ug/L	18	ND	2	51	ND	3	7	ND	3	20	ND	2	54	ND	3	--	--
Tert-Butyl Alcohol	ug/L	18	ND	2	23	ND	2	6	ND	2	20	ND	2	53	ND	2	--	--
Tert-Butylbenzene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--
Tetrachloroethylene	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	**D**	0.5	5	--
Toluene	ug/L	18	ND	0.5	117	**D**	0.5	7	**D**	0.5	20	ND	0.5	58	ND	0.5	150	--
Total Trihalomethanes	ug/L	--	--	--	25	**D**	0.5	1	ND	0.5	--	--	--	1	**D**	9	80	--
Trans-1,2-Dichloroethylene	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	10	--
Trichloroacetic Acid	ug/L	--	--	--	2	**D**	1	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene	ug/L	18	ND	0.5	117	**D**	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	5	--
Trichlorofluoromethane (Freon 11)	ug/L	18	ND	2.5	117	ND	5	7	ND	5	20	ND	2.5	58	ND	5	150	--
Vinyl Chloride	ug/L	18	ND	0.5	117	ND	0.5	7	ND	0.5	20	ND	0.5	58	ND	0.5	0.5	--
Xylenes (Total)	ug/L	18	ND	0.5	48	ND	1	5	**D**	0.5	20	ND	0.5	19	ND	0.5	1750	--

Table includes data for wells monitored by the District (monitoring 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. Unless construction is known, DDW wells are assumed to represent the principal zone, as these are typically deep wells.

1. ug/L = micrograms per liter.
2. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
3. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.
4. n = number of results for each parameter. Some parameters may have been analyzed more than once at a particular well.
5. ND= not detected above laboratory reporting limit in any samples. D = detection above reporting limit in one or more samples (see Table C-4 for more information).
6. RL = Laboratory reporting limit. In the case of multiple reporting limits, the highest limit is shown. NA is shown if the reporting limit is not available.
7. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
8. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per DDW or US EPA.

Table C-4 Summary of 2016 Volatile Organic Compounds (VOCs) Detections

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain								Santa Clara Subbasin, Coyote Valley				Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone[2]				Principal Zone[3]								Shallow Zone				Principal Zone					
		n[4]	Min[5]	Median[6]	Max	n	Min	Median	Max	n	Min	Median	Max	n	Min	Median	Max	n	Min	Median	Max	MCL[7]	SMCL[8]
1,1,1-Trichloroethane	ug/L	18	<0.5	<0.5	0.8	101	<0.5	<0.5	2.5	7	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5	58	<0.5	<0.5	<0.5	200	--
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	ug/L	18	<2	<2	2.1	101	<10	<10	12	7	<2	<2	<10	20	<2	<2	<2	58	<2	<2	<10	1,200	--
1,1-Dichloroethylene	ug/L	18	<0.5	<0.5	<0.5	101	<0.5	<0.5	4.3	7	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5	58	<0.5	<0.5	<0.5	6	--
Bromodichloromethane	ug/L	18	<0.5	<0.5	<0.5	51	<1	<1	15.1	7	<0.5	<0.5	<1	20	<0.5	<0.5	<0.5	54	<1	<1	2.1	--	--
Bromoform	ug/L	18	<0.5	<0.5	<0.5	51	<1	<1	25	7	<0.5	<0.5	<1	20	<0.5	<0.5	<0.5	54	<0.5	<0.5	<1	--	--
Chloroform	ug/L	18	<0.5	<0.5	<0.5	51	<1	<1	17.7	7	<0.5	<0.5	<1	20	<0.5	<0.5	<0.5	54	<1	<1	5.2	--	--
Dibromoacetic Acid	ug/L	--	--	--	--	2	<1	2	3.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	ug/L	18	<0.5	<0.5	<0.5	51	<1	<1	26	7	<0.5	<0.5	<1	20	<0.5	<0.5	<0.5	54	<1	<1	1.7	--	--
Dichloroacetic Acid	ug/L	--	--	--	--	2	<1	3.8	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane (Freon 12)	ug/L	18	<0.5	<0.5	<0.5	50	<0.5	<0.5	6.2	7	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5	54	<0.5	<0.5	<0.5	--	--
Ethylbenzene	ug/L	18	<0.5	<0.5	<0.5	101	<0.5	<0.5	<0.5	7	<0.5	<0.5	0.7	20	<0.5	<0.5	<0.5	58	<0.5	<0.5	<0.5	300	--
Haloacetic Acids (5) (HAA5)	ug/L	--	--	--	--	2	<2	7.3	13.5	--	--	--	--	--	--	--	--	--	--	--	--	60	--
m,p-Xylene	ug/L	18	<0.5	<0.5	<0.5	56	<0.5	<0.5	0.7	7	<0.5	<0.5	4	20	<0.5	<0.5	<0.5	54	<0.5	<0.5	<0.5	--	--
o-Xylene	ug/L	18	<0.5	<0.5	<0.5	56	<0.5	<0.5	<0.5	7	<0.5	<0.5	1.2	20	<0.5	<0.5	<0.5	54	<0.5	<0.5	<0.5	--	--
Styrene	ug/L	18	<0.5	<0.5	<0.5	101	<0.5	<0.5	0.7	7	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5	58	<0.5	<0.5	<0.5	100	--
Tetrachloroethylene	ug/L	18	<0.5	<0.5	<0.5	101	<0.5	<0.5	<0.5	7	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5	58	<0.5	<0.5	2.3	5	--
Toluene	ug/L	18	<0.5	<0.5	<0.5	101	<0.5	<0.5	1.9	7	<0.5	<0.5	9.6	20	<0.5	<0.5	<0.5	58	<0.5	<0.5	<0.5	150	--
Total Trihalomethanes	ug/L	--	--	--	--	25	<0.5	<0.5	57.3	1	<0.5	<0.5	<0.5	--	--	--	--	1	9	9	9	80	--
Trichloroacetic Acid	ug/L	--	--	--	--	2	<1	1.8	3.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene	ug/L	18	<0.5	<0.5	<0.5	101	<0.5	<0.5	1.6	7	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5	58	<0.5	<0.5	<0.5	5	--
Xylenes (Total)	ug/L	18	<0.5	<0.5	<0.5	48	<0.5	<0.5	<1	5	<0.5	<0.5	5.2	20	<0.5	<0.5	<0.5	19	<0.5	<0.5	<0.5	1,750	--

Notes:

Table includes data for wells monitored by the District (monitoring 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. DDW wells are assumed to represent the principal zone if no construction information is available, as these are typically deep wells.

1. ug/L = micrograms per liter.
2. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
3. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.
4. n = number of results for each parameter. Some parameters may have been analyzed more than once at a particular well.
5. 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.
6. For parameters with results with multiple reporting limits, the median was computed using the Maximum Likelihood Estimate method.
7. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
8. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per DDW or US EPA.

Table C-5 Summary of 2016 Pesticide Findings (All Non-Detect)

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain						Santa Clara Subbasin, Coyote Valley			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone[2]			Principal Zone[3]						Shallow Zone			Principal Zone				
		n[4]	Result[5]	RL[6]	n	Result	RL	n	Result	RL	n	Result	RL	n	Result	RL	MCL[7]	SMCL[8]
2,3,7,8-TCDD (Dioxin)	ug/L	--	--	--	40	ND	0.000005	2	ND	0.000005	--	--	--	10	ND	0.000005	0.00003	--
2,4,5-TP (Silvex)	ug/L	--	--	--	46	ND	1	2	ND	1	--	--	--	11	ND	1	50	--
2,4-D	ug/L	--	--	--	47	ND	10	3	ND	10	--	--	--	12	ND	10	70	--
3-Hydroxycarbofuran	ug/L	--	--	--	40	ND	3	2	ND	3	--	--	--	11	ND	3	--	--
Alachlor	ug/L	--	--	--	48	ND	1	3	ND	1	--	--	--	16	ND	1	2	--
Aldicarb	ug/L	--	--	--	40	ND	3	2	ND	3	--	--	--	11	ND	3	--	--
Aldicarb Sulfone	ug/L	--	--	--	40	ND	4	2	ND	4	--	--	--	11	ND	4	--	--
Aldicarb Sulfoxide	ug/L	--	--	--	40	ND	3	2	ND	3	--	--	--	11	ND	3	--	--
Aldrin	ug/L	--	--	--	36	ND	0.075	2	ND	0.075	--	--	--	8	ND	0.075	--	--
Atrazine	ug/L	--	--	--	46	ND	0.5	3	ND	0.5	--	--	--	13	ND	0.5	1	--
Bentazon	ug/L	--	--	--	46	ND	2	2	ND	2	--	--	--	11	ND	2	18	--
Bromacil	ug/L	--	--	--	34	ND	10	2	ND	10	--	--	--	2	ND	10	--	--
Butachlor	ug/L	--	--	--	34	ND	0.38	2	ND	0.38	--	--	--	2	ND	0.38	--	--
Captan	ug/L	--	--	--	1	ND	0.1	--	--	--	--	--	--	--	--	--	--	--
Carbaryl	ug/L	--	--	--	40	ND	5	2	ND	5	--	--	--	11	ND	5	--	--
Carbofuran	ug/L	--	--	--	43	ND	5	2	ND	5	--	--	--	11	ND	5	18	--
Chlordane	ug/L	--	--	--	41	ND	0.1	2	ND	0.1	--	--	--	12	ND	0.1	0.1	--
cis-1,3-Dichloropropene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	0.5	--
Cyanazine	ug/L	--	--	--	1	ND	150	--	--	--	--	--	--	--	--	--	--	--
Dalapon	ug/L	--	--	--	46	ND	10	2	ND	10	--	--	--	11	ND	10	200	--
DCPA	ug/L	--	--	--	35	ND	2	2	ND	0.1	--	--	--	--	--	--	--	--
Diazinon	ug/L	--	--	--	33	ND	0.1	2	ND	0.1	--	--	--	2	ND	0.25	--	--
Dicamba	ug/L	--	--	--	35	ND	1.5	2	ND	1.5	--	--	--	3	ND	1.5	--	--

Table C-5 Summary of 2016 Pesticide Findings (All Non-Detect)

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain						Santa Clara Subbasin, Coyote Valley			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone[2]			Principal Zone[3]						Shallow Zone			Principal Zone				
		n[4]	Result[5]	RL[6]	n	Result	RL	n	Result	RL	n	Result	RL	n	Result	RL	MCL[7]	SMCL[8]
Dieldrin	ug/L	--	--	--	36	ND	0.02	2	ND	0.02	--	--	--	8	ND	0.02	--	--
Dimethoate	ug/L	--	--	--	33	ND	0.1	2	ND	0.1	--	--	--	2	ND	1	--	--
Dinoseb	ug/L	--	--	--	46	ND	2	2	ND	2	--	--	--	11	ND	2	7	--
Diphenamide	ug/L	--	--	--	1	ND	100	--	--	--	--	--	--	--	--	--	--	--
Diquat	ug/L	--	--	--	43	ND	4	2	ND	4	--	--	--	11	ND	4	20	--
Disulfoton	ug/L	--	--	--	1	ND	100	--	--	--	--	--	--	--	--	--	--	--
Endothall	ug/L	--	--	--	42	ND	45	2	ND	45	--	--	--	11	ND	45	100	--
Endrin	ug/L	--	--	--	41	ND	0.1	2	ND	0.1	--	--	--	12	ND	0.1	2	--
Gamma-BHC (Lindane), Total	ug/L	--	--	--	41	ND	0.2	2	ND	0.2	--	--	--	12	ND	0.2	0.2	--
Glyphosate	ug/L	--	--	--	43	ND	25	2	ND	25	--	--	--	11	ND	25	700	--
Heptachlor	ug/L	--	--	--	41	ND	0.01	2	ND	0.01	--	--	--	12	ND	0.01	0.01	--
Heptachlor Epoxide	ug/L	--	--	--	41	ND	0.01	2	ND	0.01	--	--	--	12	ND	0.01	0.01	--
Hexachlorobenzene	ug/L	--	--	--	43	ND	0.5	2	ND	0.5	--	--	--	12	ND	0.5	1	--
Hexachlorocyclopentadiene	ug/L	--	--	--	43	ND	1	2	ND	1	--	--	--	12	ND	1	50	--
Methiocarb	ug/L	--	--	--	33	ND	0.5	2	ND	0.5	--	--	--	--	--	--	--	--
Methomyl	ug/L	--	--	--	40	ND	2	2	ND	2	--	--	--	11	ND	2	--	--
Methoxychlor	ug/L	--	--	--	41	ND	10	2	ND	10	--	--	--	12	ND	10	30	--
Metolachlor	ug/L	--	--	--	33	ND	0.05	2	ND	0.05	--	--	--	2	ND	1	--	--
Metribuzin	ug/L	--	--	--	33	ND	0.05	2	ND	0.05	--	--	--	2	ND	1	--	--
Molinate	ug/L	--	--	--	45	ND	2	2	ND	2	--	--	--	10	ND	2	20	--
Oxamyl	ug/L	--	--	--	43	ND	20	2	ND	20	--	--	--	11	ND	20	50	--
Pentachlorophenol	ug/L	--	--	--	46	ND	0.2	2	ND	0.2	--	--	--	11	ND	0.2	1	--
Picloram	ug/L	--	--	--	46	ND	1	2	ND	1	--	--	--	11	ND	1	500	--
Prometryn	ug/L	--	--	--	1	ND	2	--	--	--	--	--	--	--	--	--	--	--
Propachlor	ug/L	--	--	--	33	ND	0.5	2	ND	0.5	--	--	--	--	--	--	--	--
Propoxur	ug/L	--	--	--	33	ND	0.5	2	ND	0.5	--	--	--	--	--	--	--	--
Simazine		--	--	--	46	ND	1	3	ND	1	--	--	--	13	ND	1	4	--
Terbacil		--	--	--	1	ND	0.1	--	--	--	--	--	--	--	--	--	--	--
Thiobencarb	ug/L	--	--	--	46	ND	1	2	ND	1	--	--	--	10	ND	1	70	1

Table C-5 Summary of 2016 Pesticide Findings (All Non-Detect)

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain						Santa Clara Subbasin, Coyote Valley			Llagas Subbasin						Maximum Contaminant Levels	
		Shallow Zone[2]			Principal Zone[3]						Shallow Zone			Principal Zone				
		n[4]	Result[5]	RL[6]	n	Result	RL	n	Result	RL	n	Result	RL	n	Result	RL	MCL[7]	SMCL[8]
Toxaphene	ug/L	--	--	--	41	ND	1	2	ND	1	--	--	--	12	ND	1	3	--
trans-1,3-Dichloropropene	ug/L	18	ND	0.5	53	ND	0.5	7	ND	0.5	20	ND	0.5	54	ND	0.5	--	--

Notes:

Table includes data for wells monitored by the District (monitoring 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. DDW wells are assumed to represent the principal zone if no construction information is available, as these are typically

1. ug/L = micrograms per liter.
2. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
3. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.
4. n = number of results for each parameter. Some parameters may have been analyzed more than once at a particular well.
5. ND= not detected above laboratory reporting limit in any samples.
6. RL = Laboratory reporting limit. In the case of multiple reporting limits, the highest limit is shown. NA is shown if the reporting limit is not available.
7. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
8. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per DDW or US EPA

Table C-6 Summary of 2016 Radioactive Constituent Data

Parameter	Units[1]	Santa Clara Subbasin, Santa Clara Plain								Santa Clara Subbasin, Coyote Valley				Llagas Subbasin								Maximum Contaminant Levels	
		Shallow Zone[2]				Principal Zone[3]								Shallow Zone				Principal Zone					
		n[4]	Min[5]	Median[6]	Max	n	Min	Median	Max	n	Min	Median	Max	n	Min	Median	Max	n	Min	Median	Max	MCL[7]	SMCL[8]
Gross Alpha	pCi/L	--	--	--	--	41	-3	1.1	4.6	5	-3	3.02	6.01	--	--	--	--	12	<3	<3	<3	15	--
Gross Alpha Counting Error	pCi/L	--	--	--	--	39	0.16	0.23	2.7	5	0.22	1.12	3.3	--	--	--	--	10	0.11	0.191	1.28	--	--
Gross Alpha MDA95	pCi/L	--	--	--	--	39	1.06	1.5	3	5	1.53	2.6	3	--	--	--	--	12	0.63	1.1	2.1	--	--
Gross Beta	mrem/yr	--	--	--	--	1	<4	<4	<4	1	0.12	0.12	0.12	--	--	--	--	--	--	--	--	50	--
Gross Beta Counting Error	pCi/L	--	--	--	--	1	1.3	1.3	1.3	1	1.09	1.1	1.1	--	--	--	--	--	--	--	--	--	--
Gross Beta MDA95	pCi/L	--	--	--	--	1	1.3	1.3	1.3	1	1.59	1.6	1.6	--	--	--	--	--	--	--	--	50	--
Radium 226	pCi/L	--	--	--	--	7	<1	<1	<1	1	<1	<1	<1	--	--	--	--	--	--	--	--	--	--
Radium 226 Counting Error	pCi/L	--	--	--	--	7	0.19	0.38	0.56	1	0.21	0.21	0.21	--	--	--	--	--	--	--	--	50	--
Radium 226 MDA95	pCi/L	--	--	--	--	1	0.4	1.4	0.4	1	0.47	0.47	0.47	--	--	--	--	--	--	--	--	--	--
Radium 228	pCi/L	--	--	--	--	7	<1	<1	<1	1	0.05	0.05	0.05	--	--	--	--	2	<1	<1	<1	50	--
Radium 228 Counting Error	pCi/L	--	--	--	--	6	0.31	0.33	0.39	1	0.53	0.53	0.53	--	--	--	--	2	0.28	0.39	0.5	--	--
Radium 228 MDA95	pCi/L	--	--	--	--	1	0.86	0.86	0.86	1	0.2	0.2	0.2	--	--	--	--	1	0.2	0.2	0.2	5	--
Radon 222	pCi/L	--	--	--	--	1	410	410	410	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Radon 222 Counting Error	pCi/L	--	--	--	--	1	17	17	17	--	--	--	--	--	--	--	--	--	--	--	--	5	--
Strontium-90	pCi/L	--	--	--	--	--	--	--	--	1	<2	<2	<2	--	--	--	--	--	--	--	--	--	--
Strontium-90 Counting Error	pCi/L	--	--	--	--	--	--	--	--	1	0.62	0.62	0.62	--	--	--	--	--	--	--	--	5	--
Strontium-90 MDA95	pCi/L	--	--	--	--	--	--	--	--	1	0.68	0.68	0.68	--	--	--	--	--	--	--	--	--	--
Tritium	pCi/L	--	--	--	--	--	--	--	--	1	305	305	305	--	--	--	--	--	--	--	--	5	--
Tritium Counting Error	pCi/L	--	--	--	--	--	--	--	--	1	272	272	272	--	--	--	--	--	--	--	--	--	--
Tritium MDA95	pCi/L	--	--	--	--	--	--	--	--	1	434	434	434	--	--	--	--	--	--	--	--	--	--
Uranium	pCi/L	--	--	--	--	10	<0.67	<0.67	0.8	--	--	--	--	--	--	--	--	--	--	--	--	20	--

Notes:

Table includes data for wells monitored by the District (monitoring 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. DDW wells are assumed to represent the principal zone if no construction information is available, as these are typically deep wells.

1. pCi/l = picocuries per liter; mrem/yr = millirem per year.
2. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
3. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.
4. n = number of results for each parameter. Some parameters may have been analyzed more than once at a particular well.
5. 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.
6. For parameters with results with multiple reporting limits, the median was computed using the Maximum Likelihood Estimate (MLE) method.
7. MCL = Maximum Contaminant Level specified in Title 22 of the California Code of Regulations. The MCL is a health-based drinking water standard.
8. SMCL = Secondary Maximum Contaminant Level, or aesthetic-based standard, per DDW or US EPA.

Appendix D

EPA Unregulated Contaminant Monitoring Rule 3

Summary of Groundwater Results in Santa Clara County

Table D-1 Unregulated Contaminant Monitoring Requirements Round 3 Results

Contaminant	Detection Rate in Groundwater (%)		Method Reporting Limit (ug/L)	Santa Clara County Maximum Detection (ug/L)	Advisory Level (ug/L)	Advisory Level Source	Chemical Description and Use
	Santa Clara County	Nation-wide					
Hormones							
17-alpha-ethynylestradiol	0%	0.01%	0.0009	ND	0.035	EPA 2017	Prepared from estrone; synthetic steroid
17-beta-estradiol	0%	0.04%	0.0004	ND	0.0009	EPA 2017	Human hormone; pharmaceuticals
4-androstene-3,17-dione	0%	0.14%	0.0003	ND	NA		Human hormone; anabolic steroid, dietary supplement
Equilin	0%	0%	0.004	ND	0.35	EPA 2017	Equine hormone; pharmaceuticals
Estriol	0%	0.01%	0.0009	ND	0.35	EPA 2017	Human hormone; pharmaceuticals
Estrone	0%	0%	0.002	ND	0.35	EPA 2017	
Testosterone	0%	0.22%	0.0001	ND	NA		Human steroid; pharmaceuticals
Metals							
Chromium	97%	55%	0.2	6.8	100	EPA 2017	Naturally-occurring element; chrome plating, dyes and pigments, wood preservation
Chromium-6	99%	70%	0.03	6.8	0.00002	CA PHG	
Cobalt	0.9%	2.2%	1	1.1	70	EPA 2017	Naturally-occurring elements
Molybdenum	43%	43%	1	5.5	40	EPA 2017	
Strontium	100%	100%	0.3	1,100	1,500	EPA 2017	
Vanadium	100%	58%	0.2	19	21	EPA 2017	

Table D-1 Unregulated Contaminant Monitoring Requirements Round 3 Results

Contaminant	Detection Rate in Groundwater (%)		Method Reporting Limit (ug/L)	Santa Clara County Maximum Detection (ug/L)	Advisory Level (ug/L)	Advisory Level Source	Chemical Description and Use
Oxyanions							
Chlorate	78%	51%	20	450	210	EPA 2017	Agricultural defoliant, disinfection byproduct
Perfluorinated Compounds							
PFBS	0%	0.03%	0.09	ND	NA		Manmade chemicals; used to make products resistant to stains, grease, heat and water
PFHpA	0%	0.6%	0.01	ND			
PFHxS	0%	0.8%	0.03	ND			
PFNA	0%	0.08%	0.02	ND			
PFOA	0%	1.2%	0.02	ND	0.07	EPA 2017	Used in fire-fighting foams, lubricants, adhesives
PFOS	0%	1.0%	0.04	ND	0.07		Used in fire-fighting foam, circuit board etching
Synthetic Organic Compounds							
1,4-dioxane	1.6%	12%	0.07	0.22	0.35	EPA 2017	Cyclic ether; solvent stabilizer
Volatile Organic Compounds							
1,1-dichloroethane	0.54%	3.4%	0.03	0.03	6.14	EPA 2017	Halogenated alkane; solvent
1,2,3-trichloropropane	0%	1.1%	0.03	ND	0.0004	EPA 2017	Halogenated alkane; solvent, soil fumigant
1,3-butadiene	0%	0.004%	0.1	ND	0.0103	EPA 2017	Alkene; rubber manufacturing

Table D-1 Unregulated Contaminant Monitoring Requirements Round 3 Results

Contaminant	Detection Rate in Groundwater (%)		Method Reporting Limit (ug/L)	Santa Clara County Maximum Detection (ug/L)	Advisory Level (ug/L)	Advisory Level Source	Chemical Description and Use
Bromomethane	0%	0.5%	0.2	ND	140	EPA 2017	Halogenated alkane; soil fumigant
Chloromethane	0%	1.1%	0.2	ND	2.69	EPA 2017	Halogenated alkane; foaming agent; DIB
Bromochloromethane (Halon 1011)	0%	0.9%	0.06	ND	90	EPA 2017	Used as a fire-extinguishing fluid, solvent in pesticides production
Chlorodifluoromethane (HCFC-22)	36%	3.3%	0.08	(250) [a] 2.9	NA		Chlorofluorocarbon; refrigerant, solvent

Notes: ug/L = micrograms per liter, or parts per billion
CA PHG = California Public Health Goal
EPA 2017 = EPA 2017 UCMR3 Data Summary
NA = none available
ND = not detected above the Method Reporting Limit
[a] 250 ug/L result for HCFC-22 is an outlier; next highest detection was 2.9 ug/L

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