

Salinas Valley: Langley Area Subbasin Groundwater Sustainability Plan – Amendment 1

VOLUME 2

Chapter 5. Groundwater Conditions

Chapter 6. Water Budgets

Chapter 7. Monitoring Networks

Chapter 8. Sustainable Management Criteria

Prepared for:

Salinas Valley Basin Groundwater Sustainability Agency

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5 GROUNDWATER CONDITIONS

Chapter 5 describes the Langley Subbasin groundwater conditions historically and at the beginning of GSP implementation, in accordance with the GSP Regulations § 354.16. This chapter focuses on information required by the GSP regulations and that is important for developing an effective plan to achieve sustainability. Chapter 5 provides a description of groundwater conditions historically and at the start of GSP implementation at a scale and level of detail appropriate for meeting the GSP sustainability requirements under SGMA.

In this GSP, historical conditions are conditions prior to the January 1, 2015, start of SGMA, and current conditions are conditions at the start of GSP implementation – referred to as GSP baseline in this chapter. The GSP baseline includes conditions generally occurring between 2015 and 2019. Where data does not exist for 2015 – 2019, more recent data has been incorporated. Otherwise, more recent data is reported in GSP annual reports and 5-year GSP periodic evaluations.

This chapter is organized to align the groundwater conditions descriptions with the 6 sustainability indicators relevant to this Subbasin, including:

1. Chronic lowering of groundwater levels
2. Changes in groundwater storage
3. Seawater intrusion
4. Groundwater quality
5. Land subsidence
6. Depletion of ISW due to pumping

In addition, in line with GSP Regulations § 356.4 assessment requirements, this chapter includes a section on water use.

5.1 Groundwater Elevations

5.1.1 Data Sources

The assessment of groundwater elevation conditions is largely based on data collected by MCWRA from 1960 through the present. MCWRA's monitoring programs are described in Chapter 3.

Groundwater elevation data are analyzed and presented with 2 sets of graphics:

- Maps of groundwater elevation contours show the geographic distribution of groundwater elevations at a specific time. These contours represent the elevation of

the groundwater in feet, using the North American Vertical Datum of 1988 (NAVD88). The contours are of differing intervals and dashed where uncertain (Figure 5-1 to Figure 5-3). These figures are summarized in Table 5-1.

- Hydrographs of individual wells show the variations in groundwater elevations at individual wells over an extended period of time (Figure 5-4).

5.1.2 Groundwater Elevation Contours and Horizontal Groundwater Gradients

MCWRA biannually produces groundwater elevation contour maps for the Salinas Valley using data from their annual August trough and fall measurement programs. These contours do not extend into the Langley Subbasin; therefore, contours specific to the Langley Subbasin were developed using the groundwater elevation measurements collected by MCWRA for this GSP. This section presents groundwater elevation contours for both GSP baseline (2019) and historical (1994/1995) conditions.

Historically, MCWRA has only collected fall groundwater elevation measurements within the Langley Subbasin. These measurements are collected from mid-November to December after the end of the irrigation season and before seasonal recharge from winter precipitation increases groundwater levels. Fall groundwater elevations represent neutral groundwater conditions and provide a consistent basis for evaluating groundwater elevations over time.

In the main Salinas Valley, the true seasonal high occurs between January and March (MCWRA, 2015). Groundwater elevations in the Langley Subbasin are not monitored frequently enough to assess whether the seasonal high occurs during the January to March period. Therefore, although fall measurements do not represent the true seasonal high, they are used as a surrogate for seasonal high conditions.

Starting in WY 2023, SVBGSA increased groundwater elevation monitoring frequency through collaboration with MCWRA, adding August groundwater elevation data points throughout the Subbasin. August groundwater elevations are used to assess the driving force of seawater intrusion because this is usually when the aquifer is the most stressed. Accordingly, August measurements represent seasonal low conditions in this GSP. Because August groundwater elevations have not historically been collected in the Langley Subbasin, the August/September 1994 groundwater elevation contours adapted from the contours presented in *The North Monterey County Hydrogeologic Study, Volume I, Water Resources* report are used to represent the historical seasonal low, as this is the best available data (Fugro West Inc., 1995). Similarly, there are insufficient August data during the GSP baseline period to develop contours.

The following maps listed on Table 5-1 present the GSP baseline (2019) and historical (1994/1995) groundwater elevation contours for the Subbasin. The groundwater elevation

contours only cover the portions of the Subbasin monitored by MCWRA. Contours do not always extend to subbasin margins, nor do they cover the entire Langley Subbasin.

Table 5-1. Figures Showing GSP Baseline and Historical Groundwater Elevation Contours

Figure #	Year	Season
Figure 5-1	GSP Baseline (2019)	Fall
Figure 5-2	Historical (1994/1995)	August/September
Figure 5-3	Historical (1994/1995)	Fall

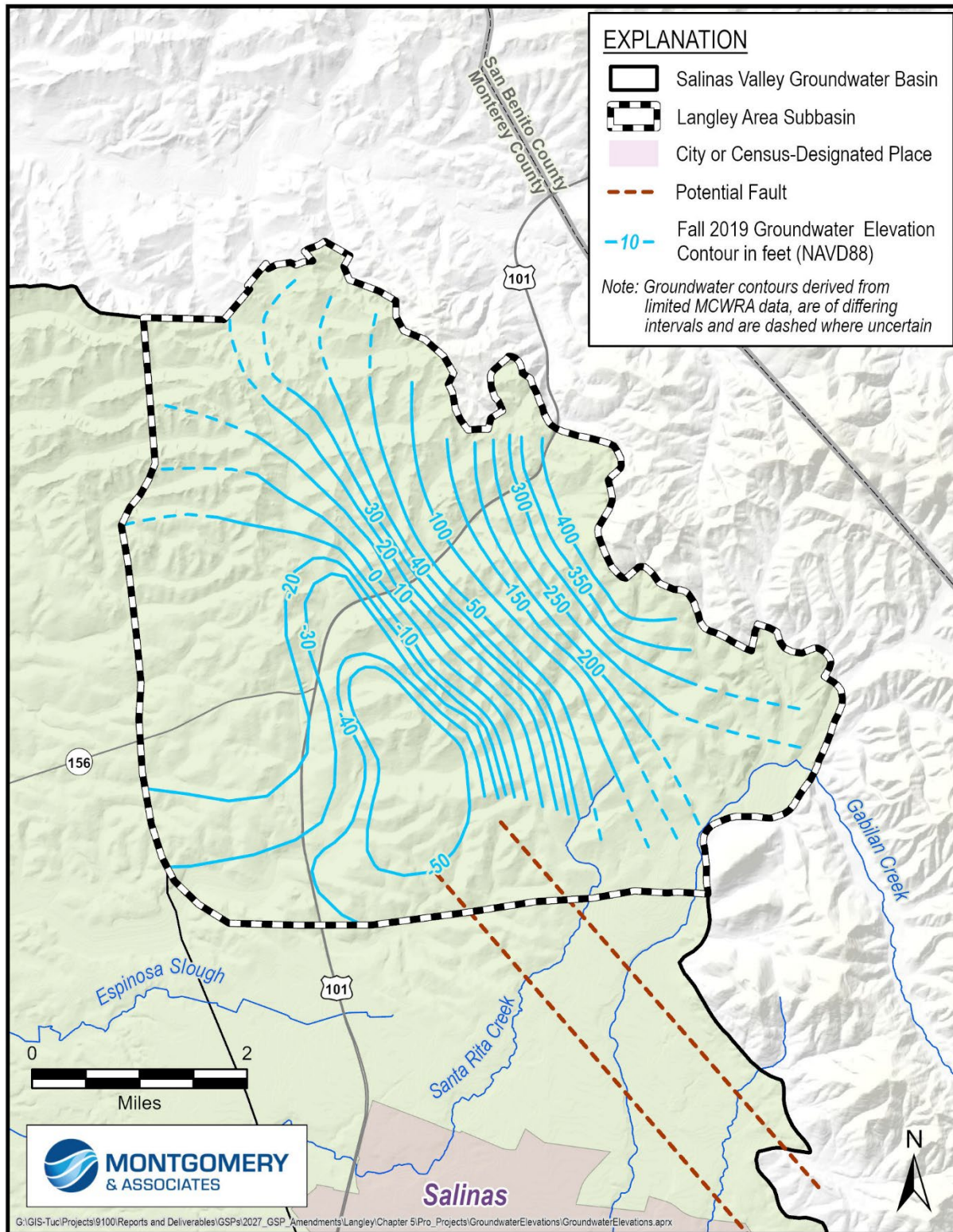
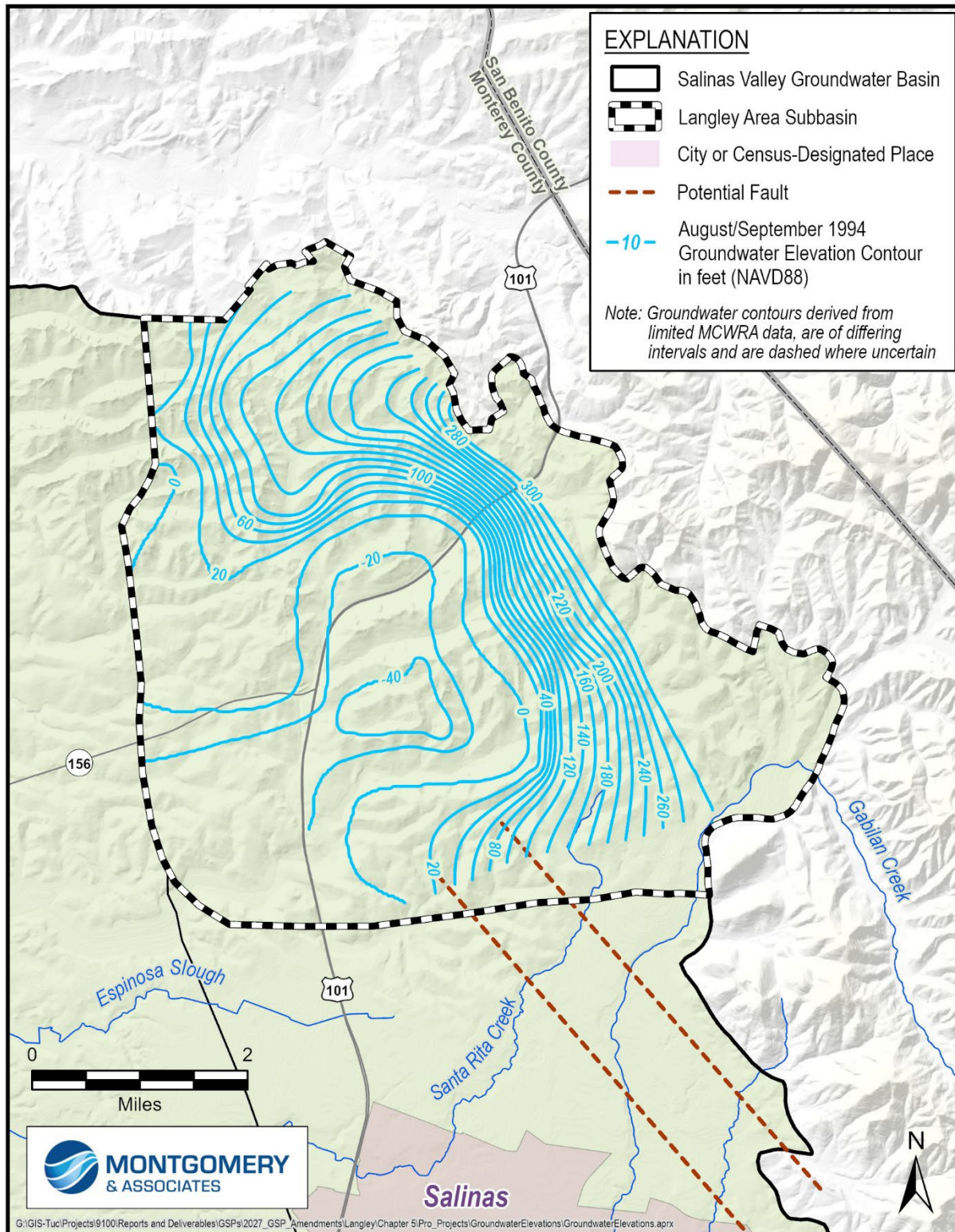


Figure 5-1. Fall 2019 Groundwater Elevation Contours



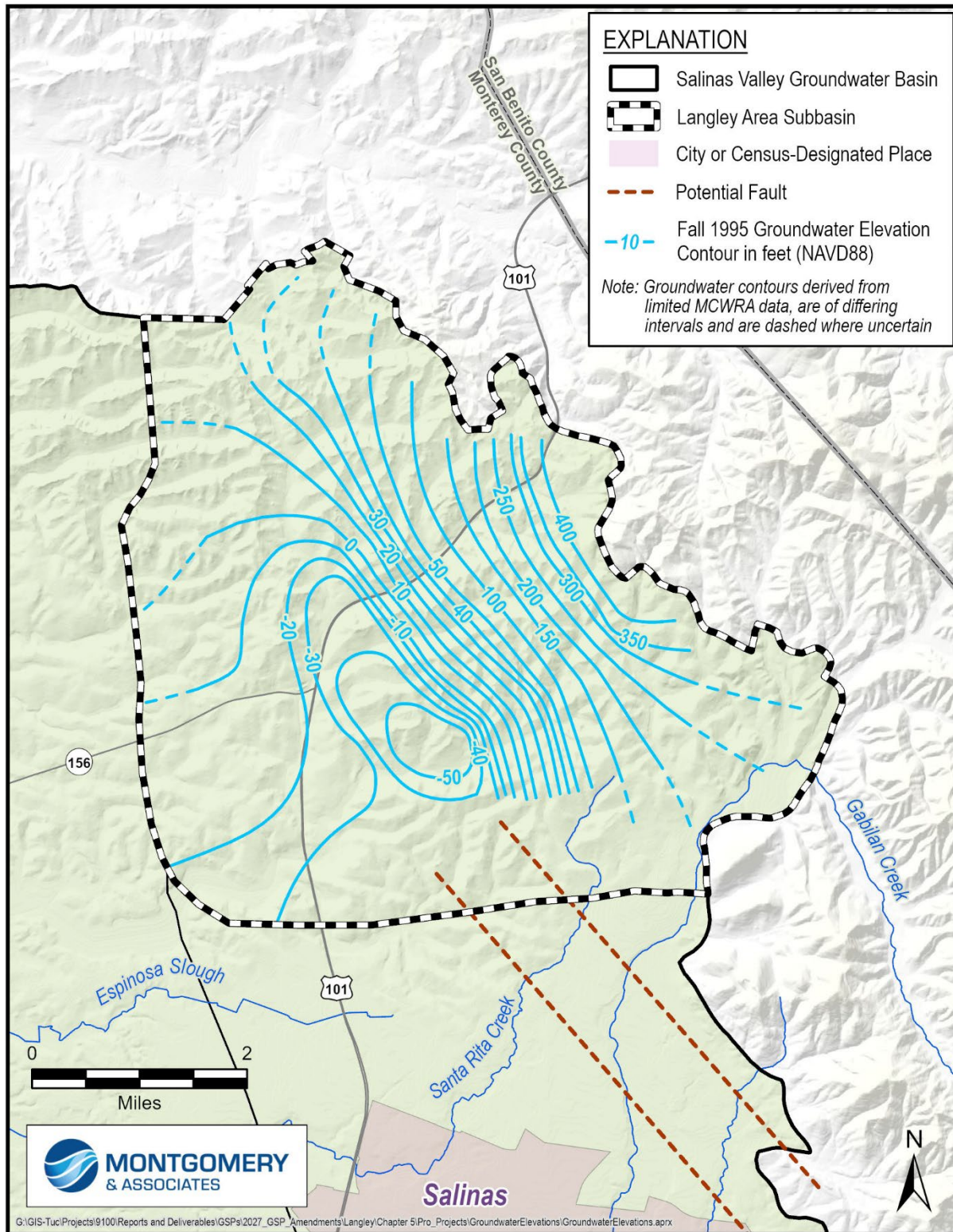


Figure 5-3. Fall 1995 Groundwater Elevation Contours

Groundwater generally flows from the north-northeast toward the south of the Subbasin. Under GSP baseline conditions (Figure 5-1 and Figure 5-2), groundwater elevations in the southern half of the Subbasin are generally below sea level, estimated as zero feet NAVD88, as indicated by the negative values on the contour lines. The lowest groundwater elevations in the Subbasin occur near the center of the Subbasin with minimum groundwater elevations of approximately -50 feet NAVD88. These low groundwater elevations are related to a pumping trough centered east of the junction of Highways 101 and 156. The hydraulic gradient differs across the Langley Subbasin due to variable groundwater elevations and thus is difficult to approximate.

Under the historical conditions of 1994, a flow pattern similar to that of GSP baseline conditions was present in the Langley Subbasin. Examples of historical groundwater elevation changes at specific wells are presented in Section 5.1.3.

5.1.3 Hydrographs

Representative temporal trends in groundwater elevations can be assessed with hydrographs, which plot changes in groundwater elevations over time. Groundwater elevation data from wells in the Subbasin are available from monitoring conducted and reported by MCWRA.

Figure 5-5 depicts the locations and hydrographs of example monitoring wells in the Subbasin. Larger versions of the hydrographs for these wells, as well as all Representative Monitoring Sites, are included in Appendix 5A. Chapter 7 provides more information specific to the wells and the monitoring system.

Groundwater elevation trends in the Langley Subbasin vary from well to well. Some wells historically demonstrate stable conditions, while other wells have experienced declining groundwater elevations.

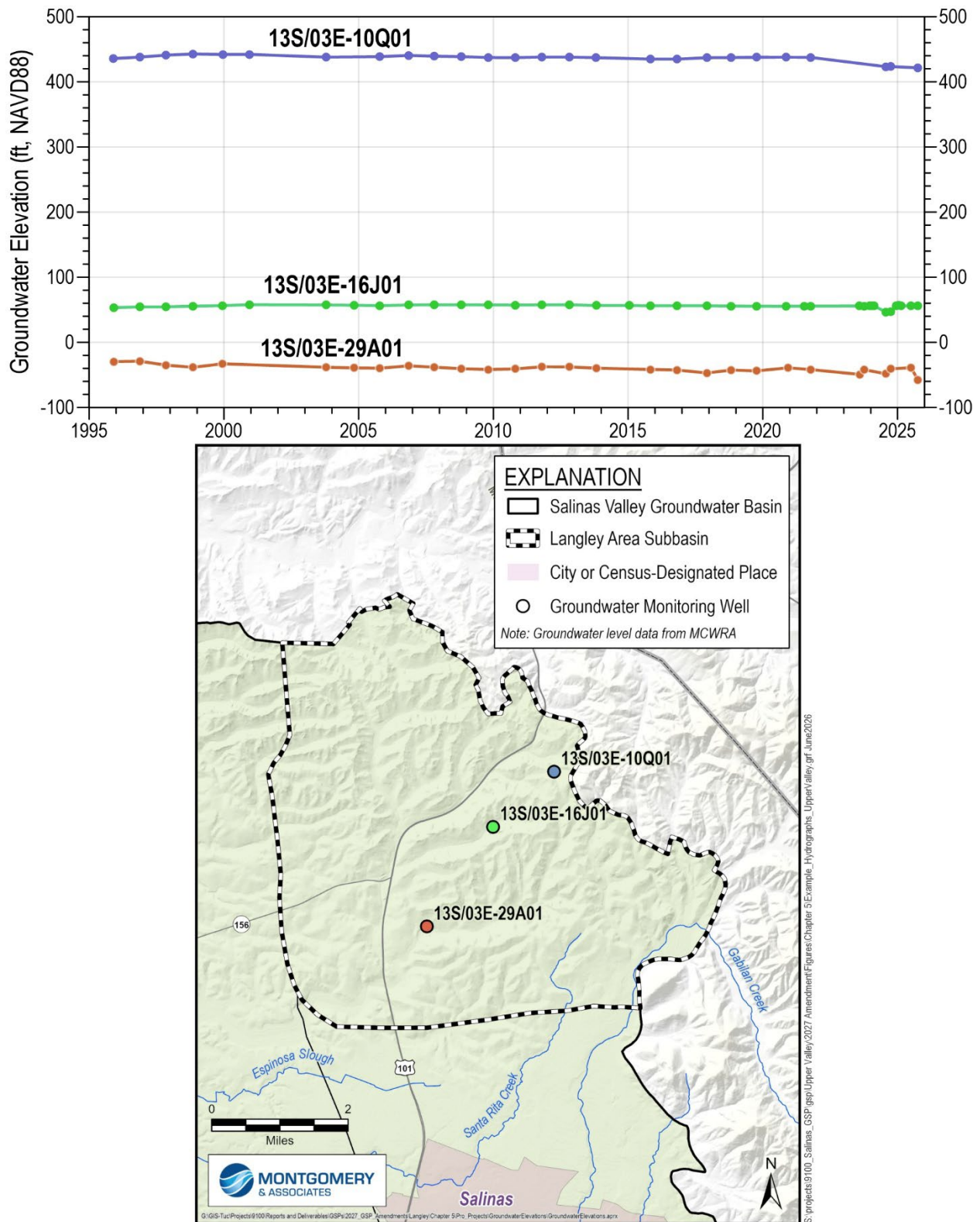


Figure 5-4. Map of Example Hydrographs

Figure 5-5 presents a graph of cumulative groundwater elevation change for the Langley Subbasin. The graph was initially derived from a graph developed by MCWRA for the Eastside Subarea. Although a majority of the Langley Subbasin is covered by the Eastside Subarea, most of the sampled wells in the Eastside Subarea fall outside the Langley Subbasin (Figure 3-3). To make a graph more representative of the Subbasin, the cumulative analysis was completed using fall groundwater elevation data for wells in the Langley Subbasin only.

Fall measurements occur at the end of the irrigation season and before groundwater levels increase due to seasonal recharge by winter rains and/or seasonal decreases in groundwater pumping. These measurements record annual changes in storage reflective of groundwater recharge and withdrawals in the Subbasin. The cumulative groundwater elevation change plot is therefore an estimated average hydrograph for wells in the Subarea. Although this plot does not reflect the groundwater elevation change at any specific location, it provides a general illustration of how the average groundwater elevation in the Subarea changes in response to climatic cycles, groundwater extraction, and water resources management at the subbasin scale.

The plot shows several data gaps between years. These data gaps exist because groundwater levels were not collected within the Langley Subbasin in those given years. The frequency of groundwater elevation collection is being improved during GSP implementation through collaboration with MCWRA.

5.1.4 Vertical Groundwater Gradients

The Langley Subbasin is underlain by a single, unconfined aquifer with no extensive aquitards that might result in vertical groundwater gradients. However, vertical gradients could be developed by the cumulative confining effect of many discontinuous clay lenses. As described in Chapter 4, the updated HCM conceptualizes localized areas of hardpan throughout the Subbasin that can create pockets of perched groundwater.

Figure 5-6 shows the fall 2025 groundwater elevations for wells in the Langley Subbasin. This figure includes several new monitoring wells that the SVBGSA has added to the monitoring network since the 2022 GSP. The red circle highlights a cluster of nearby wells, one of which has a groundwater elevation more than 200 feet higher than the others. Review of the lithology log indicates that this well is likely screened in a perched groundwater zone created by localized hardpan. At least 2 other wells that are monitored for groundwater elevations are possibly completed in perched zones based on groundwater elevation differences with neighboring wells.

While similar perched conditions may occur elsewhere in the Subbasin, these zones are not known to yield significant groundwater and are therefore considered part of the Subbasin's single principal aquifer system. As more data is collected, the understanding of the complex subsurface in the Langley Subbasin will be refined.

In addition, the 400/Deep Aquitard that separates the 400-Foot Aquifer and its stratigraphic equivalent from the Deep Aquifers extends into the southwestern corner of the Subbasin. There are insufficient data about the Deep Aquifers' extent in the Langley Subbasin to compare to the overlying aquifer. However, in the adjacent 180/400 and Eastside Subbasins, there is a downward gradient in groundwater elevations from the 400-Foot Aquifer or equivalent to the Deep Aquifers.

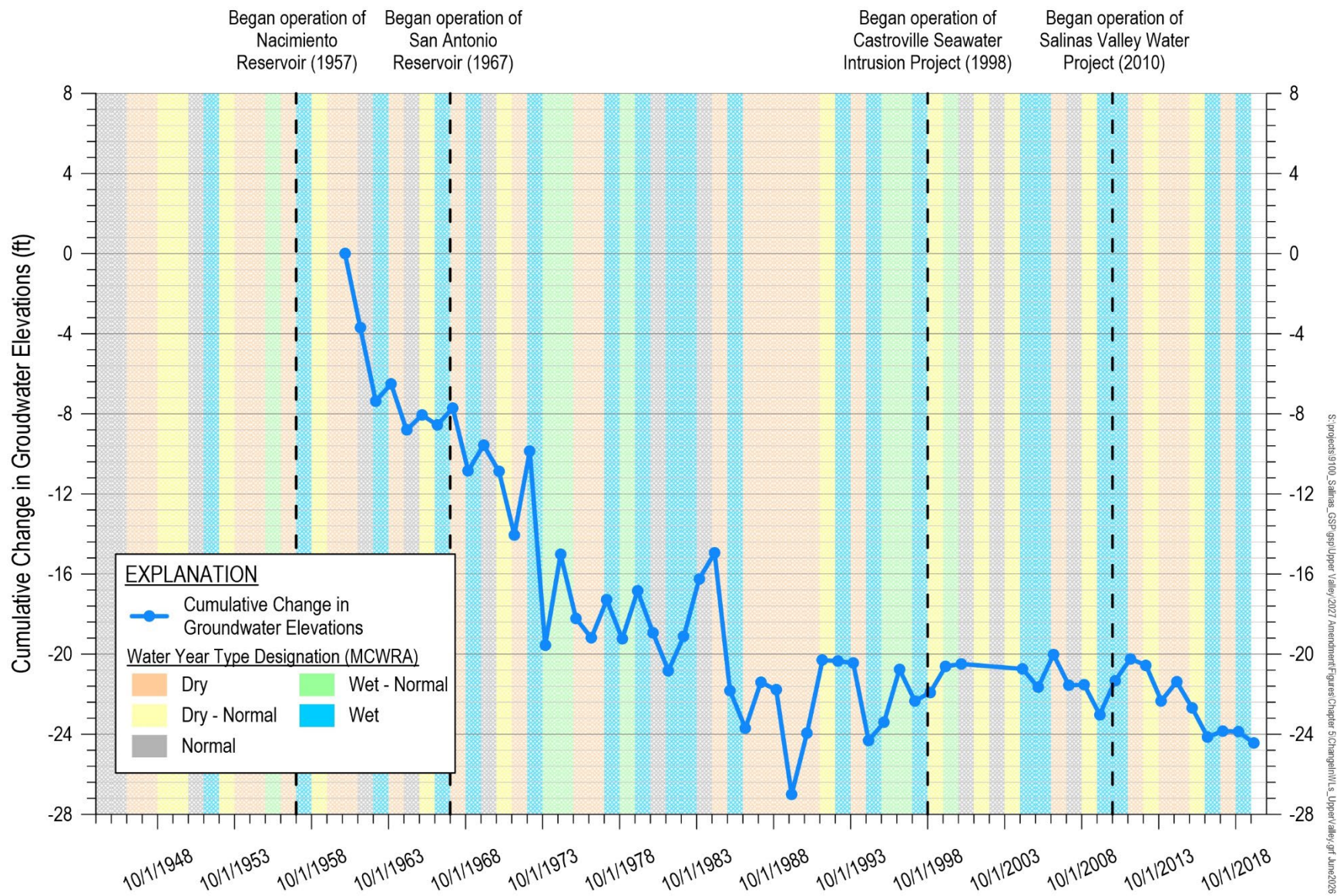


Figure 5-5. Cumulative Groundwater Elevation Change Graph for the Langley Subbasin, Based on Data Collected by MCWRA

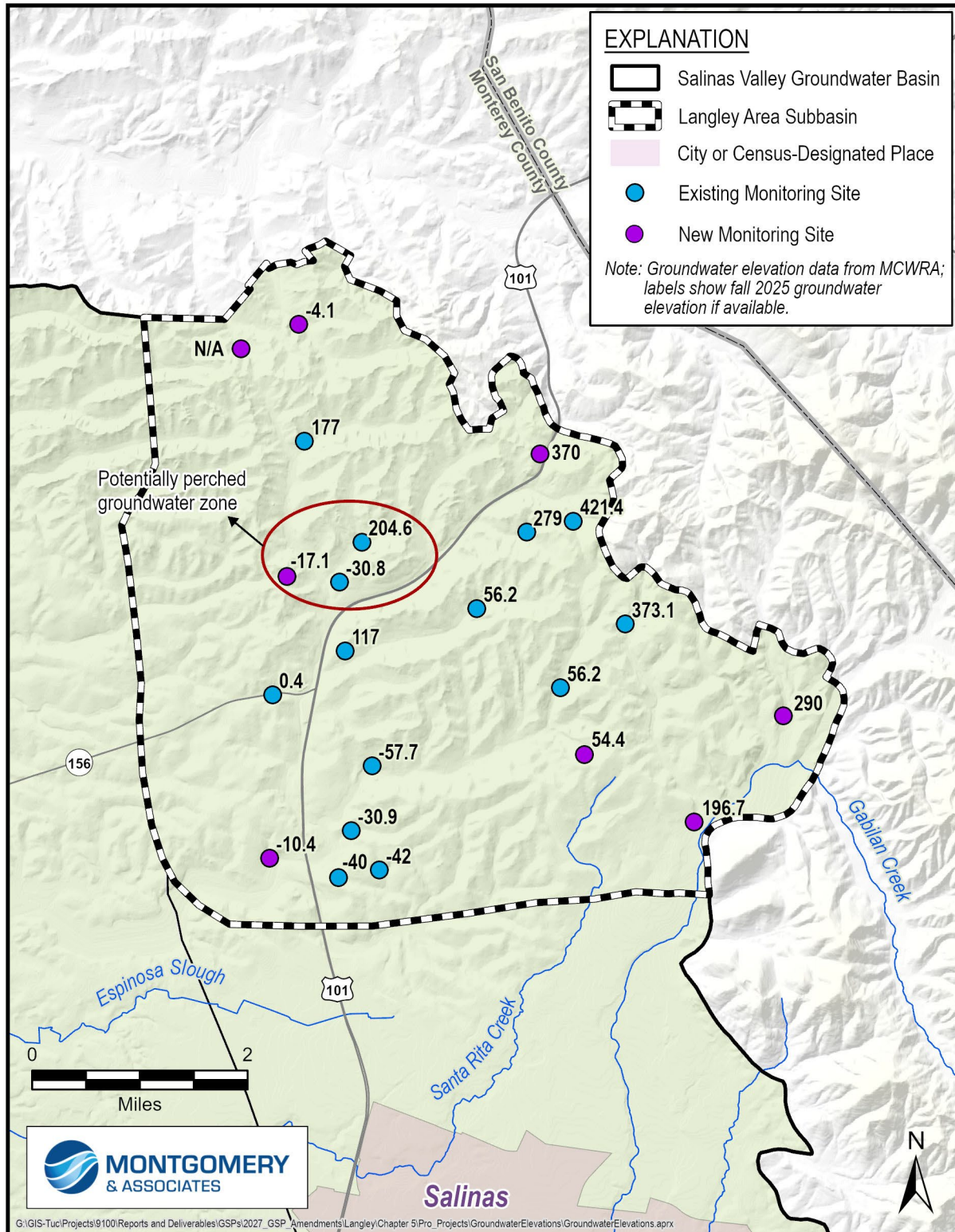


Figure 5-6. Perched Groundwater Elevation Comparison

5.2 Change in Groundwater Storage

5.2.1 Data Sources

Change in storage is developed based on MCWRA's fall groundwater elevation measurements. Fall groundwater elevations are used because these measurements are taken after groundwater elevations generally recover from the peak irrigation season and before winter precipitation increases groundwater levels. As a result, fall groundwater elevations provide a representative measure of the annual change in groundwater storage. Groundwater elevation measurements are also used to create fall groundwater elevation raster layers that are used to determine the spatial distribution of storage change.

5.2.2 Change in Groundwater Storage

Change in groundwater storage is derived from change in observed groundwater elevations at RMS wells, which are described in more detail in Chapter 7. These groundwater elevation changes are used to estimate the gain and loss of groundwater in storage each year according to the following relationship:

$$\Delta S = \Delta WL \times A \times SC$$

Where: ΔS = Annual change in storage volume in the Subbasin (AF/yr.)

ΔWL = Annual change in average groundwater elevation in the Subbasin (ft/yr)

A = Land area of Subbasin (acres)

SC = Storage coefficient (ft³/ft³)

The change in storage is presented below in 2 ways: (1) a timeseries of cumulative and annual change in storage from 1960 through 2019 averaged across the Subbasin (Figure 5-9) and (2) a map showing spatial change in storage across the Subbasin from 1995 to 2019 (Figure 5-10).

The estimated cumulative change in groundwater storage in the Langley Subbasin shown on Figure 5-7 is derived from the cumulative subbasin-wide average change in groundwater elevations (Figure 5-5). The magnitude of the groundwater storage change is calculated by multiplying the annual groundwater elevation change by a storage coefficient and an area. The storage coefficient used to create this plot is the average storativity of layer 1 of the updated SVIHM (0.08 ft³/ft³), which is the best available data source for this aquifer property. Although more than 1 model layer comprises the Langley Subbasin in the SVIHM, only the storage properties of layer 1 are used because most of the storage change occurs in the upper aquifer zone. The area used in this calculation is 17,500 acres, which is the sum of the cells comprising layer 1 within the Langley Subbasin.

Method 1: For the first method of estimating change in storage, Figure 5-7 shows that groundwater elevations have fluctuated over this historical period, as indicated by annual change in storage, however the Subbasin has experienced decline in groundwater storage due to lowering groundwater elevations. The average annual storage loss due to lowering groundwater elevations in the Subbasin between 1960 and 2019 is approximately 570 AF/yr. From 1995 to 2019, storage decreased at a smaller rate of approximately 60 AF/yr. The storage change calculation is a reflection of groundwater elevations in the start and end years, which does not capture groundwater level fluctuations within that period. Figure 5-7 also shows the estimated annual groundwater extractions starting in 1995, which is when groundwater extraction reporting began.

Method 2: For the second method of estimating of change in storage, Figure 5-8 shows the spatial distribution of estimated change in groundwater storage from fall 1995 to fall 2019. To create this map, separate raster layers were generated from interpolated groundwater elevations measured at the RMS wells for fall 1995 and fall 2019. After the rasters were created, groundwater elevations were spatially averaged within each SVIHM grid cell that overlaps with the Langley Subbasin (grid cell size is larger than the raster resolution) and then subtracted from each other. The difference in groundwater elevations was multiplied by the storativity of the top layer (layer 1) of the model, as previously described, and then summed together to estimate total change in storage. This yielded an estimated loss in storage of approximately 1,370 AF/yr. The discrepancy with the estimate from the previous paragraph is mainly due to the interpolation of groundwater elevation between the measurement points.

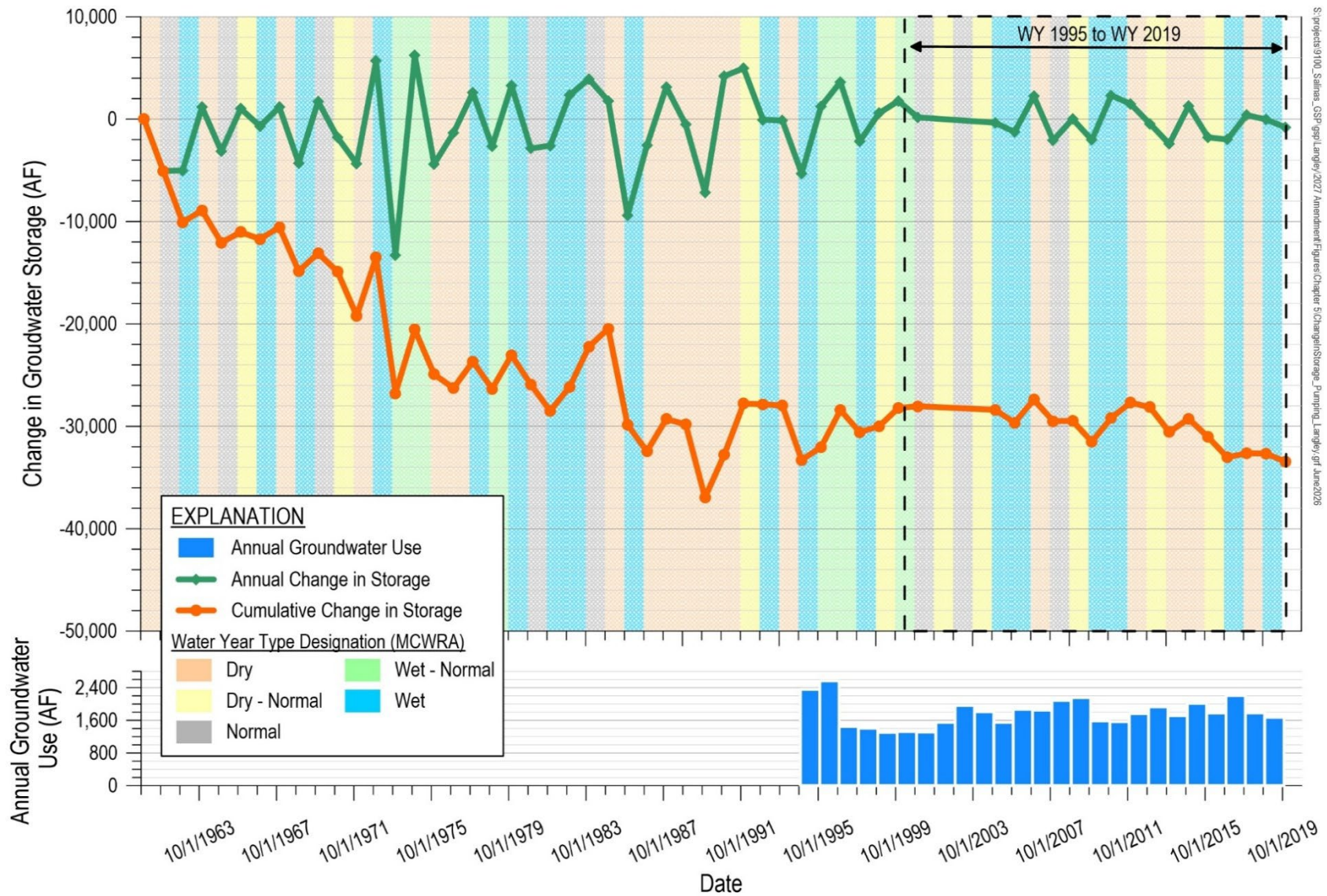


Figure 5-7. Annual and Cumulative Change in Groundwater Storage and Total Groundwater Extraction in the Langley Subbasin, Based on Groundwater Elevations Collected by MCWRA

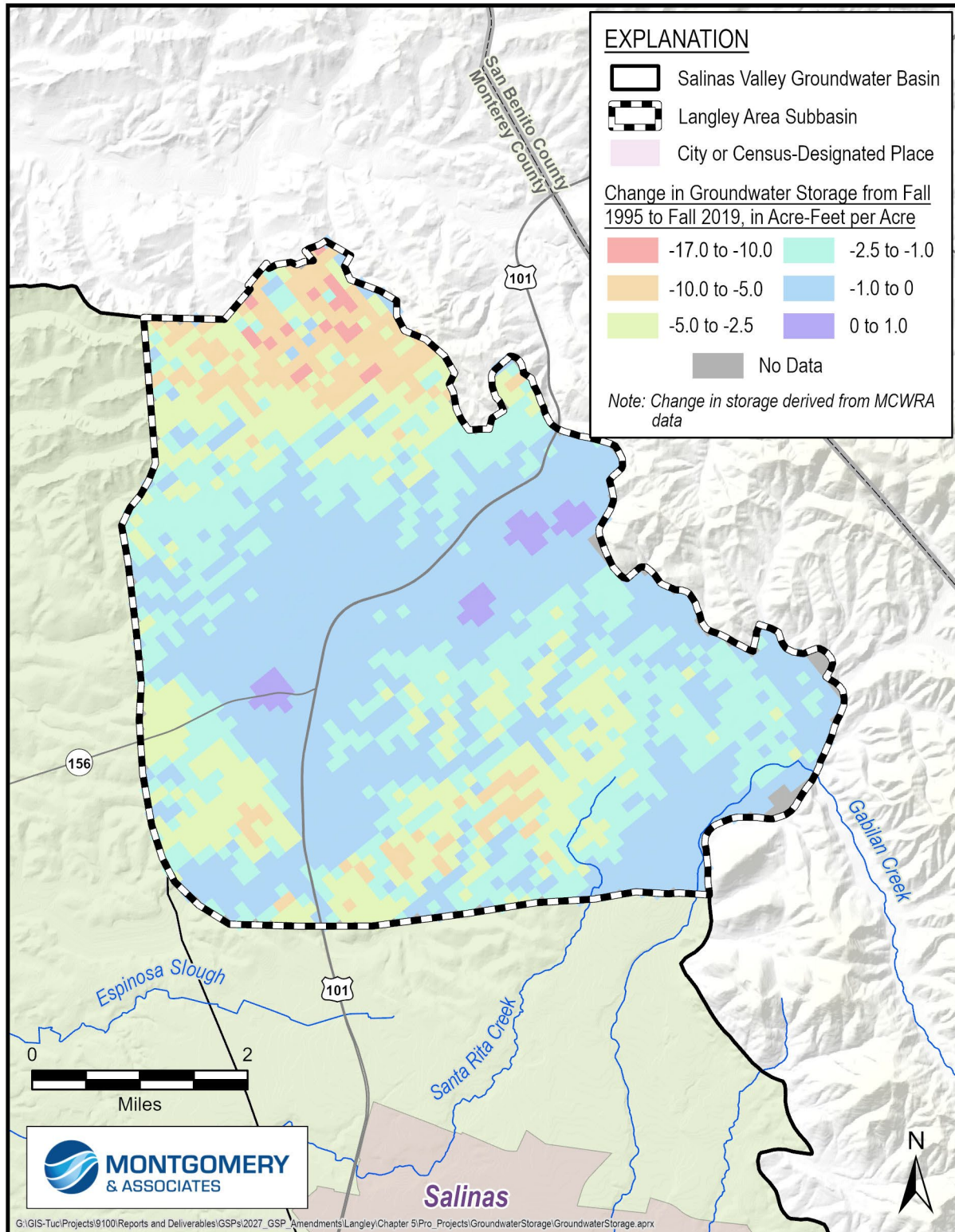


Figure 5-8. Change in Groundwater Storage from Fall 1995 to Fall 2019

5.3 Seawater Intrusion

There is no seawater intrusion in the Langley Subbasin as of GSP Amendment 1. However, the adjacent 180/400 Subbasin has been subject to seawater intrusion for more than 70 years.

5.3.1 Data Sources

The extent and advance of seawater intrusion are monitored and reported by MCWRA. Monitoring seawater intrusion has been ongoing since the Agency formed in 1947, and a network of dedicated monitoring and production wells that are sampled twice annually in June and August. The water samples are analyzed for general minerals, and the analytical results are used by MCWRA to analyze and report the following:

- Maps and graphs of historical chloride and specific conductivity trends
- Stiff diagrams and Piper diagrams
- Plots of chloride concentration vs. Na/Cl molar ratio trends

MCWRA publishes estimates of the extent of seawater intrusion every year, and has historically done so every other year. MCWRA maps define the extent of seawater intrusion as the location of the 500 mg/L chloride concentration isocontour. This chloride concentration is significantly lower than the 19,000 mg/L chloride concentration typical of seawater; however, it represents a concentration that may begin to impact beneficial uses. The 500 mg/L threshold is the Upper Limit SMCL for chloride as defined by the Environmental Protection Agency (EPA) and is approximately 10 times the concentration of naturally occurring groundwater in the Subbasin.

5.3.2 Seawater Intrusion Maps and Cross Section

Figure 5-9 shows the MCWRA mapped extents of GSP baseline and historical seawater intrusion near the Langley Subbasin. The maximum extent of the shaded contours on the figure represents the extent of groundwater with chloride exceeding 500 mg/L during the 2019 monitoring period. The historical progression of the 500 mg/L extent is also illustrated on these figures through the colored overlays that represent the extent of seawater intrusion observed during selected years. The map shows that seawater is close but not yet observed in the Subbasin. Further updates will be reported in annual reports and 5-year GSP periodic evaluations.

Figure 5-9 also shows the mapped August 2019 groundwater elevations for the adjacent 180/400 and Eastside Subbasins. This map shows the groundwater elevations that are persistently below sea levels that, when paired with a pathway, enable seawater intrusion. The groundwater elevation contours show that groundwater is drawn toward the depression at the northern end of the Eastside Subbasin. If the magnitude of this depression increases, it could potentially draw

seawater intrusion into the Langley Subbasin. However, the contours themselves are not fully representative of flow between the subbasins.

As described in Chapter 4, the Aromas Sands—which comprise the principal aquifer—are very permeable. Despite the high permeability and lowered groundwater elevations, the seawater intrusion front is not advancing in the direction of the Subbasin. Because there is no seawater intrusion in the Subbasin, no cross sections are presented showing the extent of seawater intrusion.

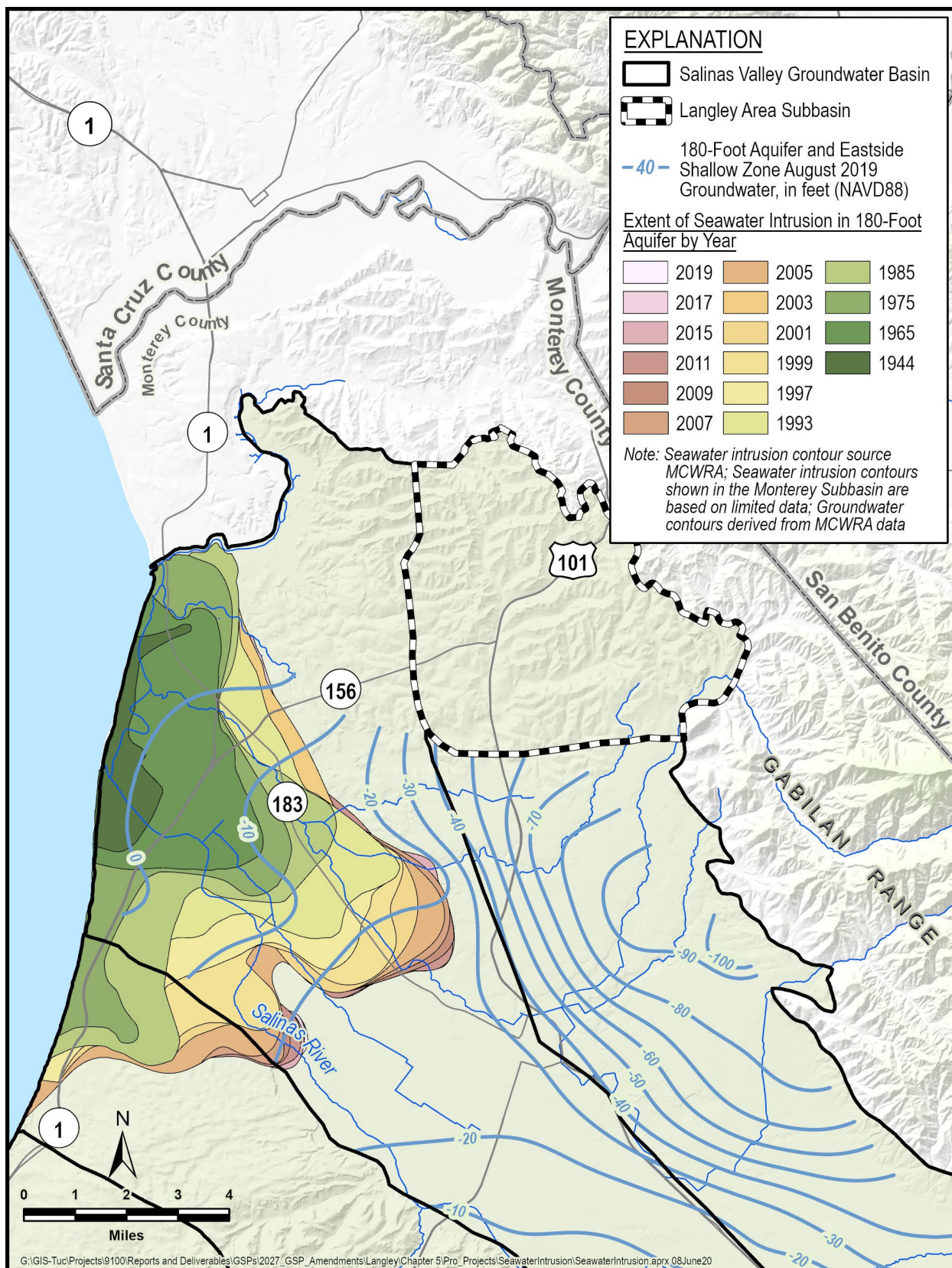


Figure 5-9. Seawater Intrusion in the 180-Foot Aquifer

5.4 Groundwater Quality

The SVBGSA does not have sole regulatory authority over groundwater quality and is not charged with improving groundwater quality in the Salinas Valley. Projects and actions implemented by the SVBGSA are not required to improve groundwater quality; however, they must not further degrade it.

5.4.1 Data Sources

Groundwater quality samples have been collected and analyzed in the Langley Subbasin for various studies and programs. Groundwater quality samples have also been collected on a regular basis for compliance with regulatory programs. Groundwater quality data for this GSP were collected from:

- The Northern Counties Groundwater Characterization report (CCGC, 2015)
- The USGS Groundwater Ambient Monitoring and Assessment Program (GAMA) reports (Kulongoski and Belitz, 2005; Burton and Wright, 2018)
- SWRCB GeoTracker Data Management System (DMS) (SWRCB, 2026)
- SWRCB GAMA Groundwater Information System (SWRCB, 2020)
- The California Department of Toxic Substances Control (DTSC) EnviroStor DMS (DTSC, 2026)
- CCRWQCB ILP data (CCRWQCB, 2024)

5.4.2 Point Sources of Groundwater Contaminants

Clean up and monitoring of point source pollutants may be under the responsibility of either the CCRWQCB or the DTSC. GeoTracker is the SWRCB's data management system for sites that may affect water quality, particularly groundwater. It tracks locations that require environmental cleanup, such as leaking underground storage tank (LUST) sites, Department of Defense sites, and other cleanup program sites. GeoTracker also includes information on regulated and unregulated facilities and projects, including irrigated lands, oil and gas production sites, permitted underground storage tanks, and land disposal sites.

EnviroStor is used by the DTSC to track hazardous waste facilities and contaminated sites, including the agency's cleanup, permitting, enforcement, and investigation activities. EnviroStor contains information on sites with known contamination as well as locations that may require further environmental investigation.

There are no active contamination sites in the Langley Subbasin as of GSP Amendment 1. The status of contamination sites will continue to be monitored by the DTSC or the CCRWQCB.

5.4.3 Distribution and Concentrations of Diffuse or Natural Groundwater Constituents

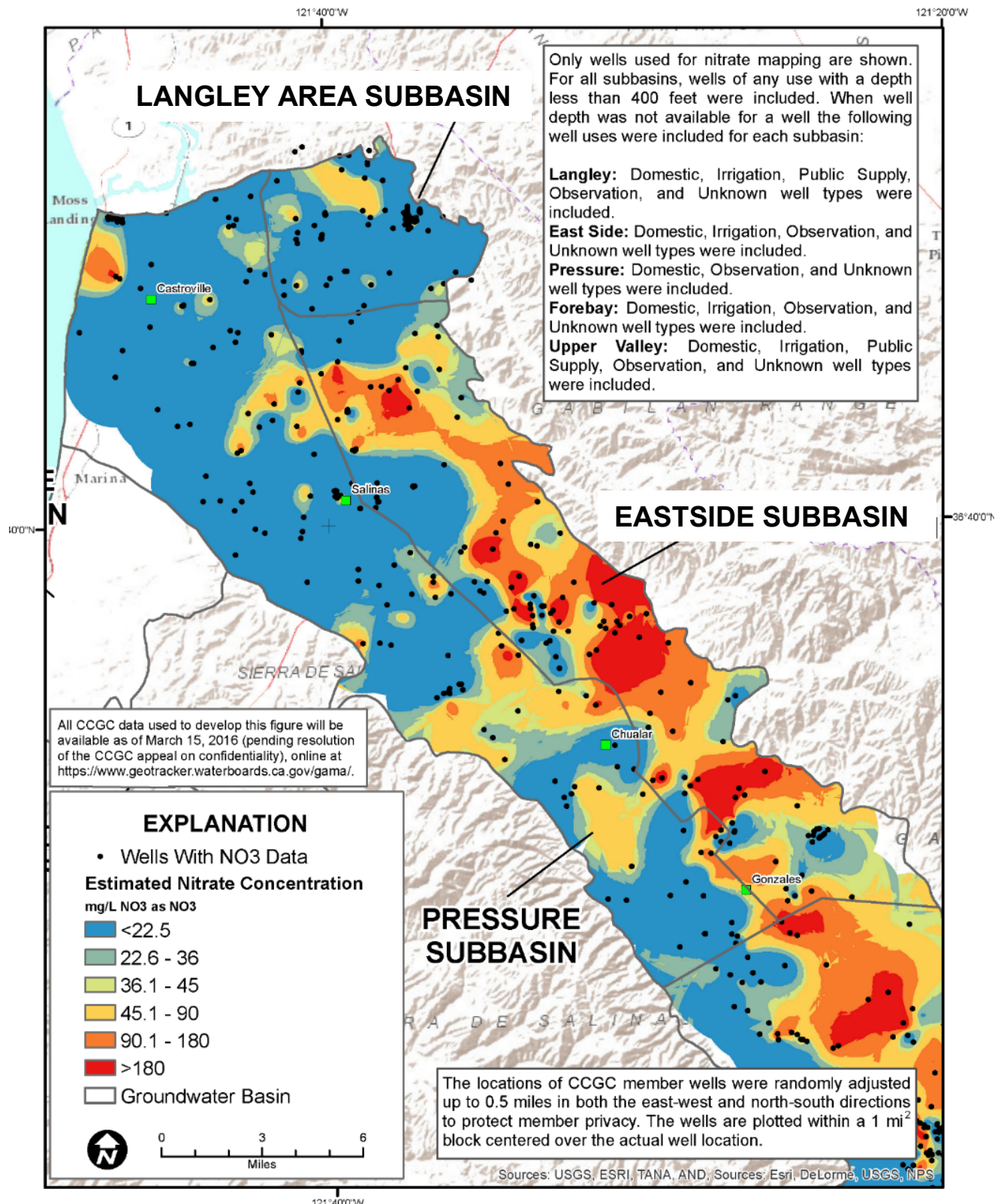
In addition to the single point source of groundwater contamination described above, the CCRWQCB monitors and regulates activities and discharges that can contribute to non-point pollutants that are released to groundwater over large areas. In the Subbasin, the most prevalent non-point water quality concern is nitrate. The recent distribution of nitrate was extensively monitored and evaluated by the CCGC and documented in a report submitted to the CCRWQCB (CCGC, 2015).

5.4.3.1 Previous Studies

Figure 5-13 shows a map of nitrate distribution in the Subbasin prepared by CCGC. The orange and red areas in the north of the Subbasin illustrate the portions of the Subbasin where groundwater has nitrate concentrations above the drinking water MCL of 45 mg/L NO₃.

A May 2018 staff report to the CCRWQCB included a summary of nitrate concentrations throughout the Central Coast Region, including the Salinas Valley. The staff report includes data from 2008 to 2018 collected at 2,235 wells in the Salinas Valley, during Agricultural Orders 2.0 and 3.0 sampling events. The report states that none of the on-farm domestic wells in the Langley Subbasin exceeded the drinking water MCL with a mean concentration of 4.9 mg/L NO₃. In addition, 9% of irrigation supply wells in the Subbasin exceeded this MCL with a mean concentration of 26.6 mg/L NO₃ (CCRWQCB, 2018).

In response to a Recommended Corrective Action from DWR on the original GSP, SVBGSA analyzed whether groundwater extraction and declining groundwater levels are linked to groundwater quality degradation in the Langley Subbasin (Montgomery & Associates, 2026a). The analysis analyzed 30 years (1995–2024) of nitrate, arsenic, groundwater elevation, and extraction data using Mann-Kendall trend tests and Pearson’s correlation. Results show that nitrate trends are mixed across wells (45% increasing, 14% decreasing, 41% stable), and statistical testing found no significant correlation between nitrate trends and groundwater elevation trends ($r_p = 0.1$, $p\text{-value} = 0.5$) or between nitrate trends and annual average extraction rates ($r_p = -0.2$, $p\text{-value} = 0.2$). For arsenic, results show that trends are mixed across wells (12% increasing, 41% decreasing, 47% stable), and statistical testing found no significant correlation between arsenic trends and groundwater elevation trends ($r_p = -0.1$, $p\text{-value} = 0.8$) or between arsenic trends and annual average extraction rates ($r_p = -0.1$, $p\text{-value} = 0.7$). These findings indicate that, at the subbasin scale, groundwater pumping and groundwater level declines are not driving changes in nitrate or arsenic concentrations.



(from CCGC, 2015)

Figure 5-10. Estimated Nitrate Concentrations

Additional groundwater quality conditions in the Basin are summarized in 2 USGS water quality studies in the Salinas Valley. The USGS 2005 GAMA study characterized deeper groundwater resources used for public water supply (Kulongoski and Belitz, 2005). The USGS 2018 GAMA study focused on domestic well water quality (Burton and Wright, 2018). The source data used in these 2 studies and additional publicly available water quality data was accessed through the SWRCB GAMA groundwater information system at

https://www.waterboards.ca.gov/water_issues/programs/gama/online_tools.html

5.4.3.2 Water Quality Constituent Assessment

The GAMA groundwater information system includes groundwater quality data for public water system supply wells from the SWRCB DDW, and on-farm domestic wells and irrigation supply wells from CCRWQCB's ILP. This GSP relies on established constituents: Maximum Contaminant Levels (MCLs) and SMCLs established by the State's Title 22 drinking water standards for public water system supply wells and on-farm domestic wells, and levels that may lead to reduced crop production for irrigation supply wells, as outlined in the CCRWQCB's Basin Plan (CCRWQCB, 2019). If a constituent is monitored for Title 22 and the Basin Plan, then the stricter of the 2 limits is used. The Basin Plan only had stricter limits for the chloride, sodium, and boron. These drinking water and agricultural water quality criteria are jointly defined herein as concentration level of concern.

Table 5-3 reports the constituents that have historically occurred in the active wells in the Langley Subbasin. The number of wells that exceed the concentration level of concern for any given constituent is based on the last sample for each well in the monitoring network. Not all wells have been sampled for all constituents. Therefore, the percentage of wells with exceedances is the number of wells that exceed the level of concern divided by the total number of wells that have ever been sampled for that constituent. Additionally, Table 5-3 does not report all of the constituents that are monitored, it only includes the constituents that have historically exceeded a Title 22 regulatory standard or Basin Plan water quality objective. The locations of wells that exceeded the level of concern for any of the constituents listed in Table 5-3 are provided in Appendix 5B.

Table 5-3 indicates that several constituents exceeded regulatory standards in both drinking water and irrigation supply wells. Among the DDW wells sampled, manganese (25%) and iron (23%) had the highest rates of exceedance, followed by chloride (18%), chromium hexavalent (13%), arsenic (12%), and nitrate (10%). Exceedances of MTBE, total dissolved solids, and specific conductivity were relatively uncommon, occurring in only 2% to 3% of sampled wells. For the 3 ILP irrigation supply wells, chloride exceeded the regulatory standard in 2 wells (67%), while sodium exceeded its standard in 1 well (33%). Overall, naturally occurring metals, salinity-related constituents, and nitrate represent the primary groundwater quality concerns in the

Subbasin. In on-farm domestic well, no constituent exceeded the level of concern in the last sample.

This GSP relies on data from existing monitoring programs to measure changes in groundwater quality. Therefore, the GSA is dependent on the monitoring density and frequency of the DDW and ILP. The monitoring system is further defined in Chapter 7.

Table 5-2. Water Quality Constituents and Exceedances

Constituent	Regulatory Exceedance Standard	Standard Units	Data up to WY 2019		
			Number of Wells Sampled for COC	Number of Wells Exceeding Regulatory Standard from latest sample	Percentage of Wells with Exceedances
DDW Wells (Data from July 1986 to September 2019)					
Arsenic	10	UG/L	82	10	12%
Chloride	106	mg/L	78	14	18%
Chromium, Hexavalent (Cr6)	10	µg/L	80	10	13%
Iron	300	µg/L	78	18	23%
Manganese	50	µg/L	77	19	25%
Methyl-tert-butyl ether (MTBE)	13	µg/L	80	2	3%
Nitrate (as nitrogen)	10	mg/L	160	16	10%
Specific Conductivity	1600	µmhos/cm	86	2	2%
Total Dissolved Solids	1,000	mg/L	78	2	3%
ILP Irrigation Supply Wells (Data from November 2012 to May 2019)					
Chloride	106	mg/L	3	2	67%
Sodium	69	mg/L	3	1	33%

5.5 Subsidence

Land subsidence is the lowering of the ground surface elevation. This is often caused by pumping below thick clay layers. Land subsidence can be elastic or inelastic. Elastic subsidence consists of small lowering and rising of the ground surface that is reversible, while inelastic subsidence is generally irreversible and is the focus of this GSP.

5.5.1 Data Sources

To estimate subsidence, DWR has made Interferometric Synthetic Aperture Radar (InSAR) satellite data available on their SGMA Data Viewer web map: <https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub>. These are the only data used for estimating subsidence in this GSP.

5.5.2 Subsidence Mapping

Figure 5-12 presents a map showing the average annual InSAR subsidence data in the Langley Subbasin between June 2015 and June 2019 (DWR, 2020c). The yellow area on the map is the area with measured changes in ground elevation of between -0.1 and 0.1 foot per year. As discussed in Section 8.9.2.1, because of measurement error in this methodology, any measured ground level changes between -0.1 and 0.1 foot are not considered subsidence. The clear areas on the map are areas with no data available. The map shows that no measurable subsidence has been recorded anywhere in the Subbasin.

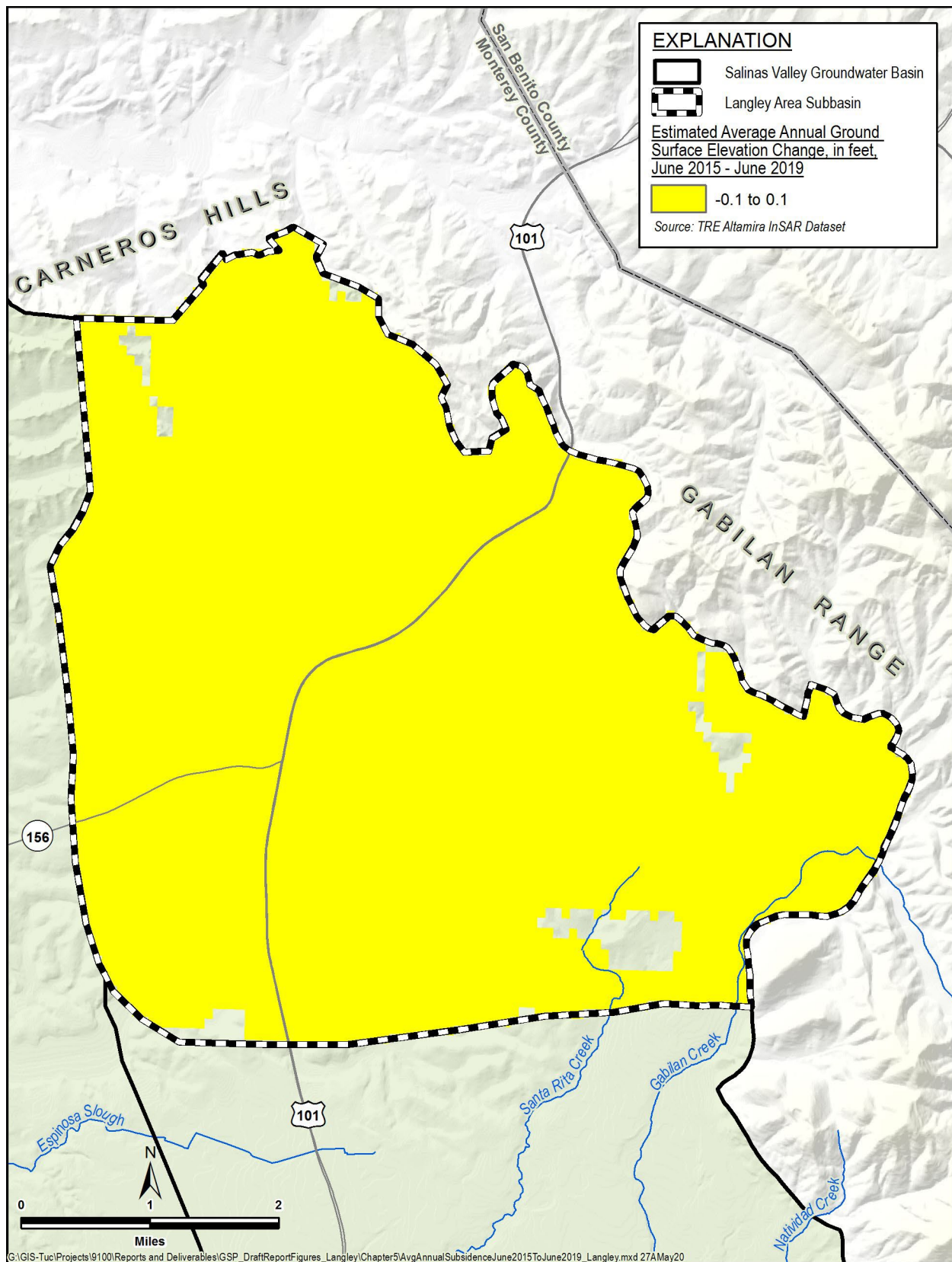
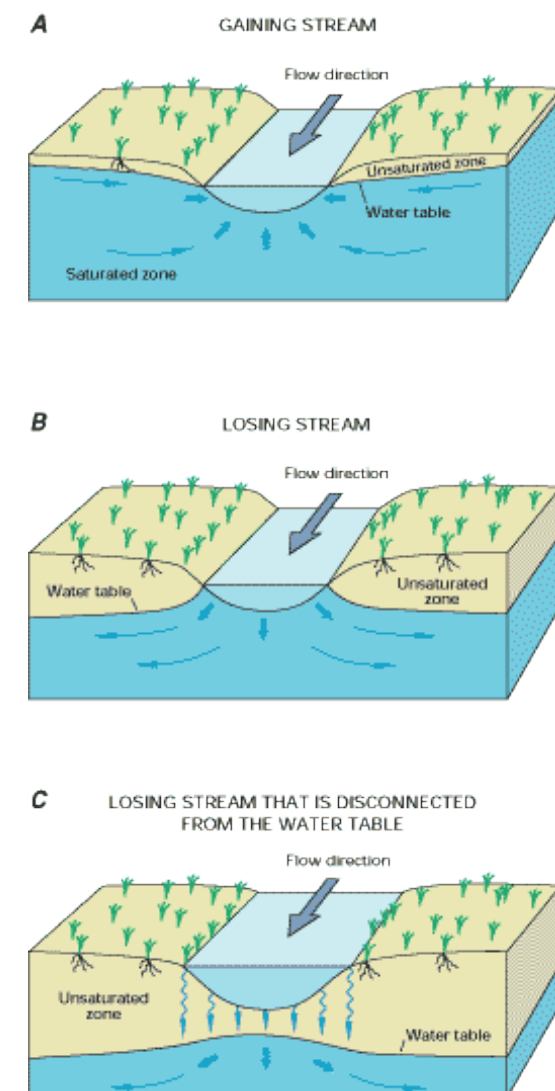


Figure 5-11. Estimated Average Annual InSAR Subsidence in Subbasin

5.6 Interconnected Surface Water

ISW is surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water. If groundwater elevations are higher than the water level in the stream, the stream is said to be a gaining stream because it gains water from the surrounding groundwater. If the groundwater elevation is lower than the water level in the stream, it is termed a losing stream because it loses water to the surrounding groundwater. If the groundwater elevation is below the streambed elevation, the stream and groundwater are considered to be disconnected. SGMA does not require that disconnected stream reaches be analyzed or managed. These concepts are illustrated on Figure 5-13.



(Winter, *et al.*, 1999)

Figure 5-12. Conceptual Representation of ISW

Historically, the streams in the Subbasin have been referred to as losing streams, as indicated by net stream exchange going from surface water to groundwater in water budgets presented in Chapter 6. For a losing stream, interconnection is substantially dependent on surface water availability. Groundwater levels, stream stage, and streambed conductance are also factors in interconnection; but surface water availability plays a dominant role in a losing stream system.

5.6.1 Data Sources

The updated SVIHM (version 1; Montgomery & Associates, 2025b) is used to map the potential locations of ISW, as described in Chapter 4 and shown on Figure 4-9. There is no observed data that verifies the location and extent of surface water connection to groundwater in most parts of the valley, nor the extent to which groundwater extraction depletes surface water. Therefore, this section describes the hydraulic principles that establish the relationship between surface water and groundwater, upon which the GSP baseline conditions and monitoring network are based, and summarizes the use of the updated SVIHM to estimate and evaluate historical ISW depletions due to pumping.

5.6.2 Evaluation of Surface Water and Groundwater Interconnection

Groundwater extraction can alter flows between surface water and groundwater. Flow changes related to interconnected surface and groundwater could be due to reductions in groundwater discharge to surface water or increases in surface water recharge to groundwater. These 2 changes together constitute the change in the amount of surface water depletion due to pumping.

For this GSP, ISW depletions are reductions in ISW flows due to groundwater pumping. Depletion of ISW is estimated by evaluating the change in the modeled stream leakage (loss or gain in river flow) with and without pumping. Stream leakage is water flowing from the stream into the groundwater system. A model simulation without any groundwater pumping in the model (i.e., SVIHM with no pumping) was compared to the model simulation with groundwater pumping (i.e., SVIHM with pumping). The difference in stream leakage between the two simulations is the depletion attributed to groundwater pumping. ISW depletions are only estimated for the interconnected segment identified in the Subbasin, as shown on Figure 4-9.

Only one, relatively short reach of potential ISW is located within the Subbasin. This analysis evaluates ISW depletions along this identified reach as an annual average, as well as monthly average. The estimated water year annual average depletion of ISW along the stream segment for the historical modeling period from WY 1980 to WY 2022 is about 100 AF/yr. This estimated depletion rate is uncertain due to challenges with calibration of the SVIHM in this Subbasin. Depletions are caused by groundwater pumping within the Langley Subbasin and likely groundwater pumping in adjacent subbasins as well. This is the average historical rate, which, as discussed in Chapter 8, is monitored over time based on shallow groundwater levels.

Figure 5-14 shows annual ISW depletions for the historical model period from WY 1980 through WY 2022. The analysis indicates that annual depletions vary from year to year but remains relatively stable over time, likely due to a relatively small extent of ISW in the Subbasin, a relatively small amount of pumping, and no surface water influence from reservoir releases. Unlike other subbasins in the Valley, where ISW depletions sharply declined during drought periods (1990, 2015, 2022) even though groundwater pumping increased slightly during the same time, historical ISW depletions in the Langley Subbasin do not appear to be substantially affected by drought years. This could be due to not being connected to the Salinas River system, which receives water released from upstream reservoirs.

In addition to annual variability, seasonal conditions influencing ISW depletions in the Subbasin were also evaluated. Results of this assessment indicate that ISW depletions are relatively constant throughout the year, with a slight decrease in the summer months, likely due to generally drier conditions in the Subbasin and limited surface water availability.

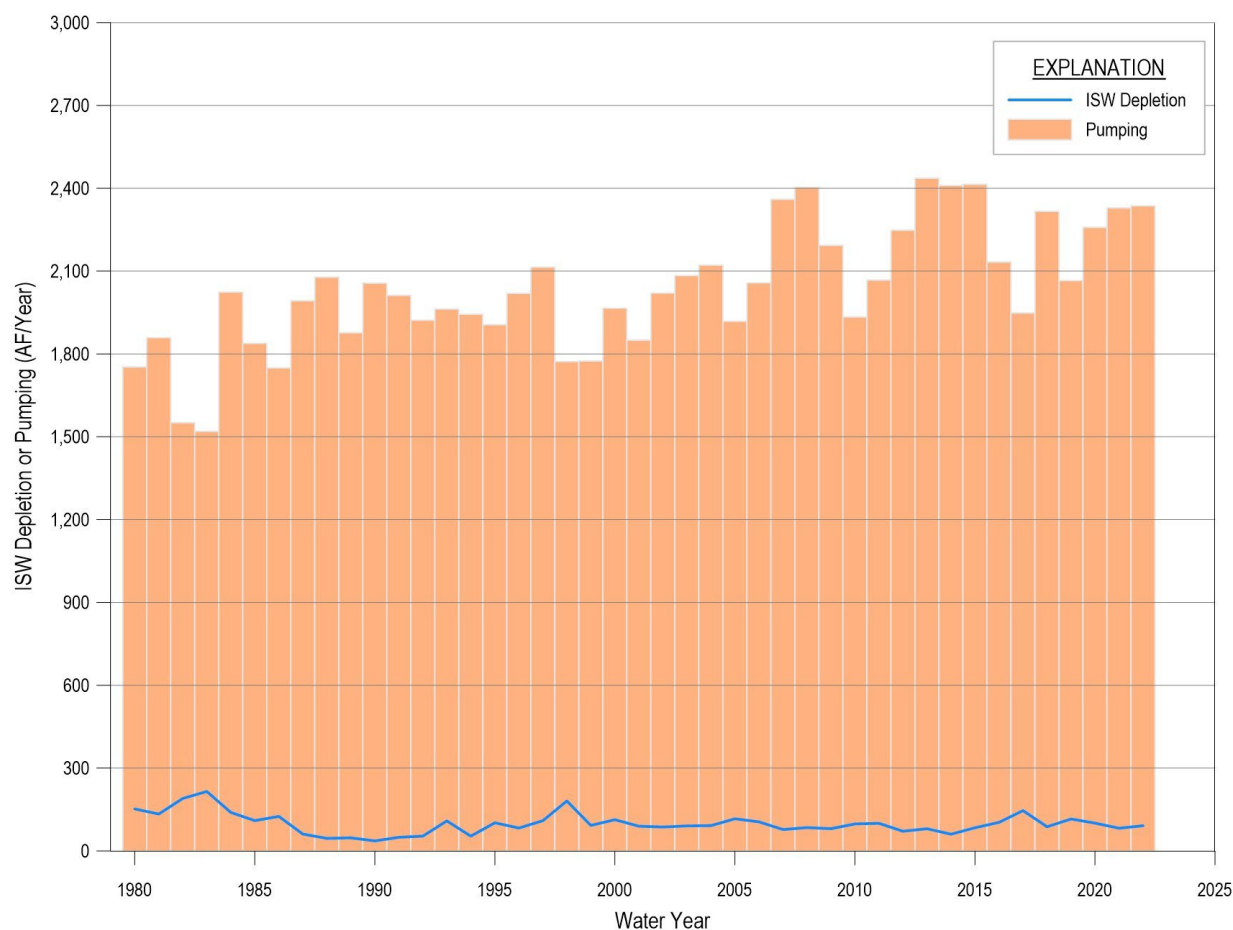


Figure 5-5-13. Average annual ISW Depletions and Annual Extraction in the Langley Subbasin

5.7 Water Use and Supply

Rural residential use accounts for the majority of water demand within the Subbasin, followed by urban and industrial uses, and then rural domestic use. Water use by wetlands and native vegetation represents a relatively small portion of total demand.

Water supplies in the Langley Subbasin are solely derived from groundwater. No surface water is diverted within the Subbasin, and no recycled water is used.

5.7.1 Data Sources

The extraction data presented in this section was collected by MCWRA through GEMS, which is part of the GMP, under which groundwater extraction data from non-*de minimis* wells within the SVBGSA subbasins are reported to MCWRA.

Prior to WY 2025, agricultural and urban groundwater extraction data were collected only for wells with discharge pipes greater than 3 inches in internal diameter located within Zones 2, 2A, and 2B. Because the GEMS reporting area covered only a small portion of the Subbasin, the GMP expanded reporting requirements to the entire Subbasin.

Urban groundwater extraction data reported through the GMP include municipal wells, small public water systems, and industrial wells. Although urban groundwater users throughout the Subbasin are now required to report, some reporting lag is expected in areas outside the historical GEMS reporting area as users become familiar with the new requirements. Therefore, urban pumping estimates were supplemented with groundwater extraction data reported to the SWRCB for public drinking water systems (generally includes systems with >15 connections); specifically, those located outside the historical GEMS reporting area (SWRCB, 2025). Because SWRCB pumping data for 2025 are not yet available, 2024 data were used as a proxy.

Agricultural land use is concentrated primarily within the portion of the Subbasin that overlaps the historical GEMS reporting area. Therefore, the GMP is considered to provide sufficient coverage of agricultural groundwater pumping.

Rural domestic pumping is estimated using the number of drinking water connections based on data compiled for water systems and 2024 County of Monterey parcel data. To estimate water use, the approximate number of connections is multiplied by a constant pumping rate of 0.35 acre-feet per year (AF/yr) per connection.

Any surface water diversions reported within the Subbasin are obtained from eWRIMS. In 2025, eWRIMS was replaced by the CalWATRS. No surface water diversions have been reported with the Langley Subbasin.

5.7.2 Groundwater Use

Table 5-4 provides groundwater extraction by water use sector for the Langley Subbasin from 2021 to 2025. Agricultural pumping was historically reported by MCWRA for the period November 1 through October 31, whereas urban pumping was reported on a calendar-year basis. As of WY 2025, groundwater extraction reported under the GMP aligns with the WY (October 1 through September 30). Rural domestic pumping is estimated on a calendar year basis.

Urban use data from MCWRA aggregates municipal wells, small public water systems, and industrial wells. On average, agricultural use accounted for 95% of groundwater extraction; urban and industrial use accounted for 5%. The GMP allows 3 different reporting methods: water flowmeter, electrical meter, or hour meter. On average, 83% of extractions from 2017 to 2020 were calculated using a flowmeter, 16% electrical meter, and <1%-hour meter. MCWRA ordinance number 5426 requires flowmeters be calibrated every 5 years and be accurate to within +/- 10%. The same ordinance requires annual pump efficiency tests for wells using the electrical meter method. SVBGSA assumes an electrical meter accuracy of +/- 5%.

Pumping is reported to SWRCB on a calendar year basis. The SWRCB pumping data do not include specific measurement method or accuracy.

No groundwater was extracted for managed wetlands or managed recharge. Groundwater use by natural vegetation is assumed to be small and was not estimated for this report.

Table 5-3. 2021 to 2025 Groundwater Use (AF/yr)

	2021	2022	2023	2024	2025
Rural Domestic	840	840	840	840	840
Urban (includes industrial)	770	850	730	870	790
Agricultural	90	10	630	100	100
Managed Wetlands	0	0	0	0	0
Managed Recharge	0	0	0	0	0
Natural Vegetation	0	0	0	0	0
Total	1,700	1,700	2,200	1,810	1,730

5.7.3 Total Water Use

Although this does not occur in the Langley Subbasin, many growers and residents have noted that some irrigation water use is reported both to the SWRCB as Salinas River diversions and to the MCWRA as groundwater pumping. For WY 2024 and earlier, because no direct information on reporting overlap was available, all surface water reported as a Statement of Diversion and Use was assumed to be duplicative and was excluded from the Subbasin total water use

calculation. It is possible that not all of the surface water diversions excluded are being reported to both SWRCB and MCWRA, in which case total water use may be up to that amount greater than calculated here. This accounting is done to calculate the total water use and is not meant to imply that SVBGSA classifies any or all the reported diversions as groundwater.

Beginning in WY 2025, MCWRA revised its GMP reporting process to allow reporters to indicate whether they also report surface water use to SWRCB. Based on this self-reported data, approximately 30 AF/yr out of the total agricultural groundwater extraction reported to MCWRA was also reported to the SWRCB. Because there were no surface water diversions reported within the Langley Subbasin to the SWRCB, it is assumed that there is no double-reporting. This accounting is done to calculate the total water use and is not meant to imply that SVBGSA classifies any or all the reported diversions as groundwater.

In the Langley Subbasin, total water use consists entirely of groundwater extractions and is summarized in Figure 5-16. SVBGSA will continue to work with stakeholders to refine the method used to resolve double counting.

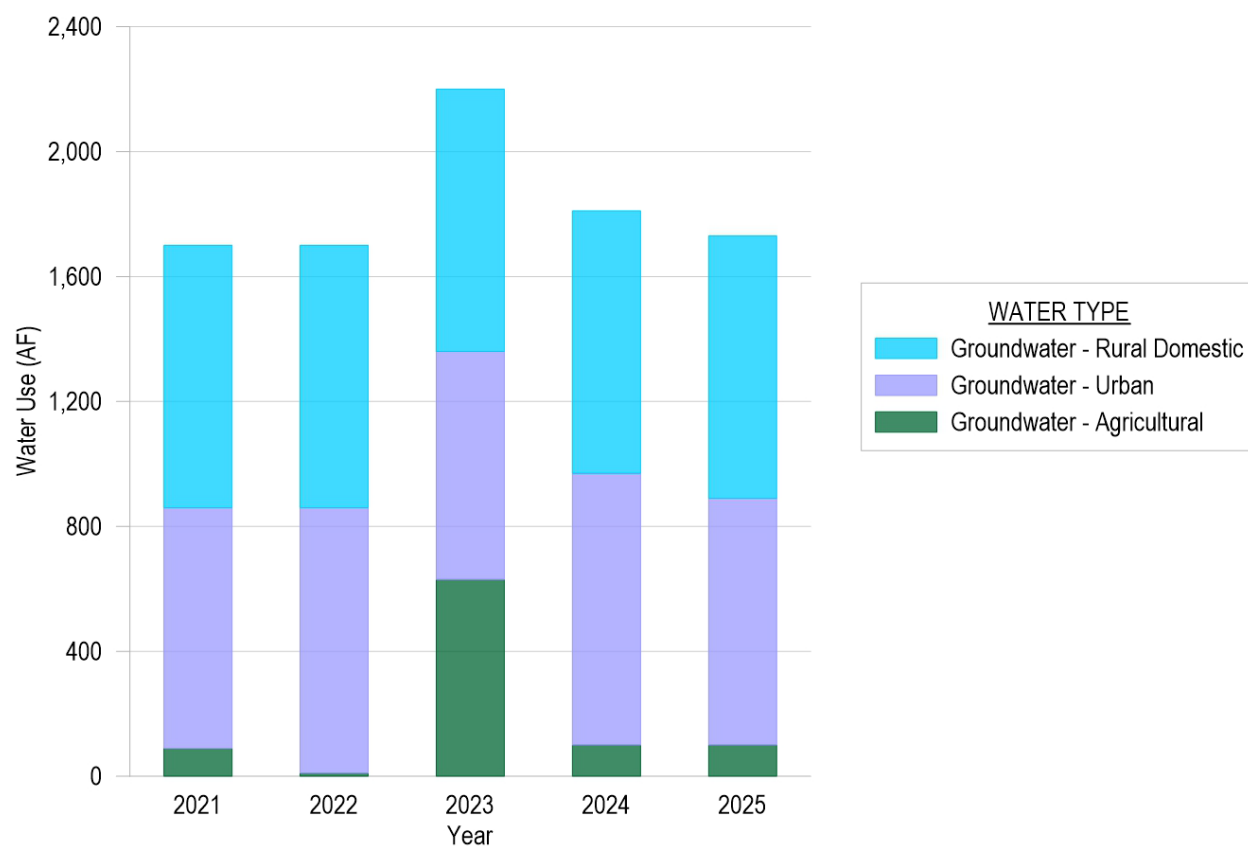


Figure 5-14. 2021 to 2025 Total Water Use by Water Source Type and Water Use Sector

6 WATER BUDGETS

This chapter summarizes the estimated water budgets for Langley Subbasin, including information required by the GSP Regulations and additional content needed to support effective groundwater sustainability planning. In accordance with the GSP Regulations § 354.18, this water budget provides an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the basin, including historical, current, and projected water budget conditions, and the change in the volume of groundwater in storage. For the purposes of this chapter, historical is WY 2003-2020 and current is the last 2 years in the SVIHM, WY 2021-2022. Water budgets are reported in graphical and tabular formats, where applicable.

The previous water budgets described in the approved GSP were developed using best tools and methods available at the time. Since the release and approval of the original GSP, groundwater models were updated. Updating the water budgets for this Subbasin using these new, best available tools is important for maintaining consistency with adjacent Subbasins managed by the SVBGSA. This section describes the water budgets for this Subbasin in a manner consistent with GSPs for other subbasins in the Valley.

6.1 Overview of Water Budget Development

The water budgets are presented in 2 subsections: (1) historical and current water budgets, and (2) future (projected) water budgets. Historical, current and future water budgets are developed using similar methods, but with different groundwater models. For each period, surface water and groundwater budgets are developed together but evaluated and presented separately.

Historical and current water budgets are being developed using SVIHM initially developed by the USGS and subsequently updated by the SVBGSA. The water budgets presented herein are based on results from the SVIHM version 1 (Montgomery & Associates, 2025b). The SVIHM is a numerical groundwater-surface water model that was constructed using the code MODFLOW-OWHM (Boyce *et al.*, 2020). This code is a version of the USGS groundwater flow code MODFLOW that estimates the agricultural supply and demand through the Farm Process (USGS, 2026).

The model area covers the Salinas Valley from the Monterey-San Luis Obispo County Line in the south to the Pajaro Basin in the north, including the offshore extent of the major aquifers. The model includes operations of the San Antonio and Nacimiento reservoirs. The SVIHM is supported by 2 sub models: a geologic model known as the Salinas Valley Geologic Model (SVGM) and a watershed model known as the Salinas Valley Watershed Model (SVWM), which uses the Hydrologic Simulation Program – Fortran (HSPF) code. Additional details on the original model development and calibration are provided by USGS (2026), and a summary of model updates and recalibration is described in Montgomery & Associates (2025b).

Future water budgets created using the SVOM, which was initially developed by the USGS and MCWRA and subsequently updated by the SVBGSA. The SVOM uses a similar framework and processes as the SVIHM, but is specifically designed to simulate future scenarios or alternative reservoir operations. It incorporates complex surface water operations through the Surface Water Operations (SWO) module. Information on model inputs, design, and results is summarized in USGS (2026), and initial updates are documented by Montgomery & Associates (2025b).

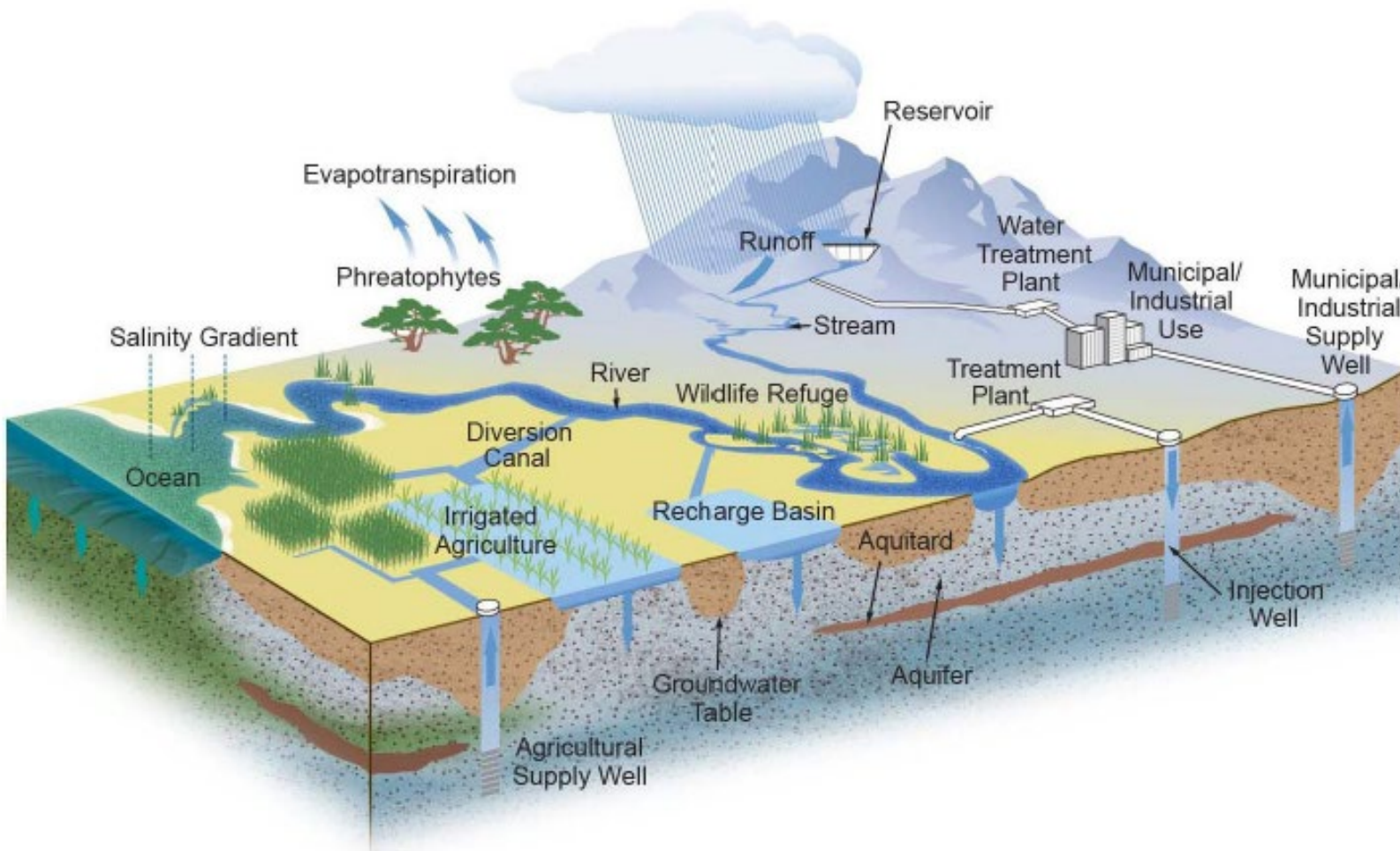
Consistent with GSP Regulations § 354.18, an integrated groundwater budget is being developed for the combined inflows and outflows of the principal aquifer for each water budget period. In the Langley Subbasin, groundwater is pumped from the 1 principal aquifer.

6.1.1 Water Budget Components

The water budget is an inventory of surface water and groundwater inflows and outflows from the Subbasin. Some components of the water budget can be measured, such as groundwater pumping from a metered well, precipitation, and surface water diversions. Other components are not easily measured and can be estimated using groundwater models, such as the SVIHM; these include unmetered agricultural pumping, recharge from precipitation and irrigation return flows, and change of groundwater in storage. Figure 6-1 presents a general schematic diagram of the HCM that is included in the water budget (DWR, 2020d).

The water budgets for the Subbasin are calculated within the following boundaries:

- **Lateral boundaries.** The perimeter of the Langley Subbasin within the SVIHM is shown on Figure 6-2.
- **Bottom.** The base of the groundwater subbasin as described in the HCM, which has been updated with new data, is now defined as the contact between the Aromas Red Sands and the surface of the unweathered crystalline rocks of the Gabilan Range. Farther from the Gabilan Range, this surface is deeper than current data are able to verify, and the base is defined as the base of the usable and productive unconsolidated sediments (Durbin *et al.* 1978). This ranges from 200 feet below ground surface along Gabilan Creek in the southeast of the Subbasin to more than 1,000 feet deep in the southwest. The water budget is not sensitive to the exact definition of this base elevation because it is defined as a depth below where there is no significant inflow, outflow, or change in storage.
- **Top.** Surface water is included in the water budget because the top of the water budget area is above the ground surface.



(From DWR, 2020d)

Figure 6-1. Schematic Hydrogeologic Conceptual Model

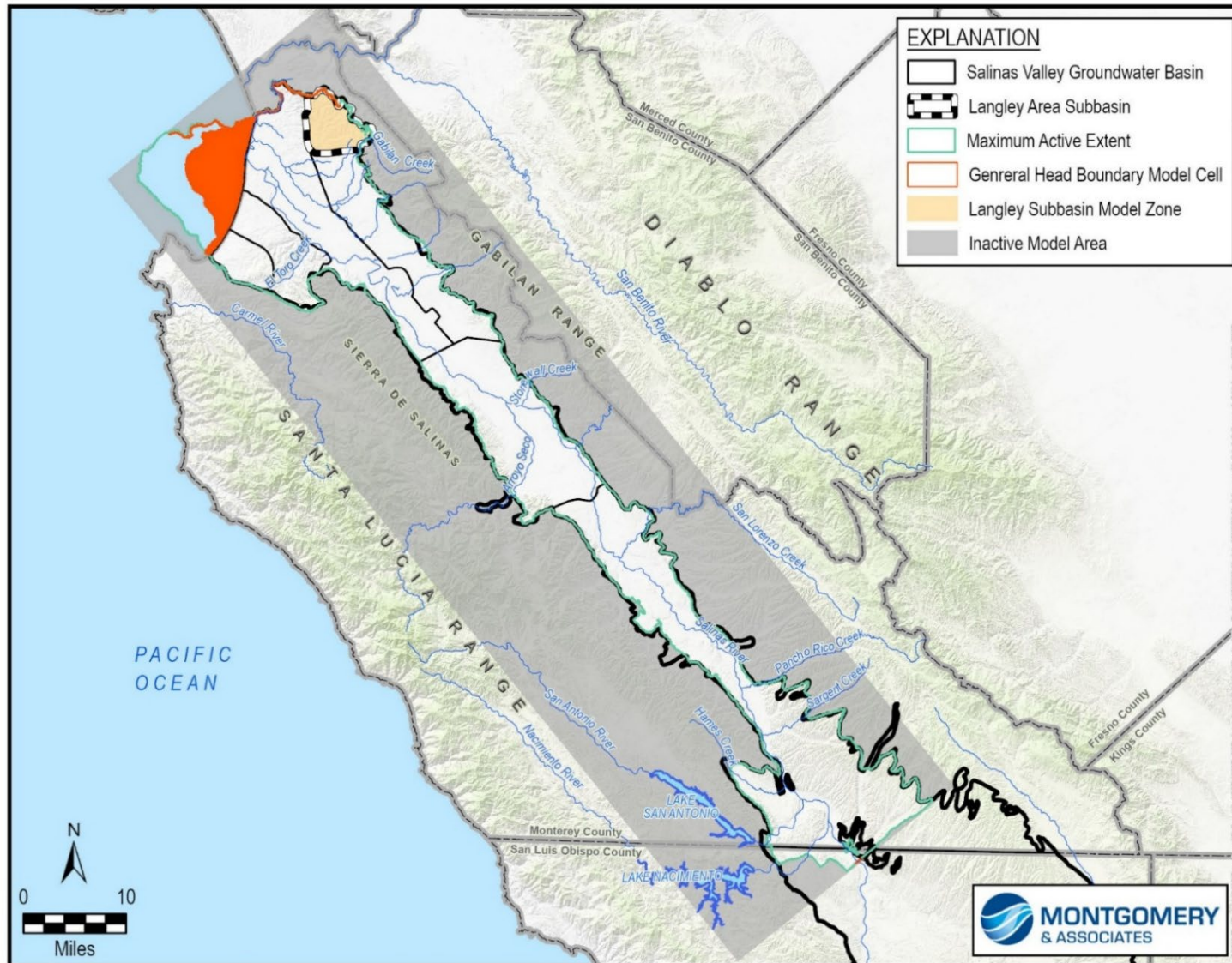


Figure 6-2. Zones and Boundary Conditions for the SVIHM

The Langley Subbasin water budget includes the following components:

Surface Water Budget:

- Inflows
- Precipitation runoff
 - Surface water inflows along Gabilan Creek and other smaller streams that enter the Subbasin
 - Groundwater discharge to streams
- Outflows
 - Stream recharge to groundwater
 - Outflow to neighboring subbasins along Gabilan Creek, Santa Rita Creek, and other smaller streams

Groundwater Budget:

- Inflows
 - Deep percolation from precipitation and applied irrigation water (recharge)
 - Streambed recharge to groundwater
 - Subsurface inflows:
 - Inflow from 180/400 Subbasin
 - Inflow from Eastside Subbasin
 - Inflow from Pajaro Valley (Elkhorn Slough)
 - Subsurface inflow from the surrounding watershed that are not in other DWR subbasins
- Outflows
 - Groundwater pumping (including urban, industrial, domestic, and agricultural)
 - Evapotranspiration (ET) from groundwater (crop and native vegetation)
 - Groundwater discharge to streams
 - Subsurface outflows:
 - Outflow to Eastside Subbasin
 - Outflow to 180/400 Subbasin
 - Outflow to Pajaro Valley (Elkhorn Slough)

The difference between groundwater inflows and outflows is equal to the change of groundwater in storage.

6.1.2 Water Budget Timeframes

The GSP Regulations require development of water budgets for 3 periods: historical, current, and future (projected). These timeframes are defined as follows:

- The historical water budget evaluates how past water use and supply availability has affected aquifer conditions and the ability of groundwater users to operate within the sustainable yield. GSP Regulations require that the historical water budget start with the most recently available information and extend back a minimum of 10 years of water budget information. DWR's Water Budget Best Management Practices (BMP) document further states that the historical water budget should help develop an understanding of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability to operate the basin within the sustainable yield. Accordingly, historical conditions should go back to the most reliable historical data that are available for GSP development and water budgets calculations.
- The current water budget is intended to allow the GSA and DWR to understand the existing supply, demand, and change in storage under the most recent population, land use, and hydrologic conditions. Current conditions are generally the most recent conditions for which adequate data are available. Current conditions are not well defined by DWR but can include an average over a few recent years with various climatic and hydrologic conditions. The last 2 years in the SVIHM, WY 2021 and WY 2022, were drier than normal and do not represent average hydrologic conditions. Current, as used here in this GSP Amendment 2, is defined by the last 2 years in the SVIHM, WY 2021 and WY 2022. These years were drier than normal and do not represent average hydrologic conditions. More recent periods during GSP implementation will be included in 5-year GSP periodic evaluations.
- The projected water budget is intended to quantify the estimated future baseline conditions without additional PMAs. The projected water budget estimates the future baseline conditions concerning hydrology, water demand, and surface water supply over a 50-year planning and implementation horizon. It is based on historical trends in hydrologic conditions that are used to project forward 50 years, without climate change. Uncertainty associated with climate change is addressed at the end of the chapter.

Although there is a significant variation between wet and dry seasons, the GSP does not consider separate seasonal water budgets for the groundwater budget. All water budgets are developed for

complete WYs. Selected periods for the historical and current water budgets are summarized in Table 6-1 and on Figure 6-3 and described in Sections 6.1.2.1 and 6.1.2.2.

Table 6-1. Summary of Historical and Current Water Budget Periods

Period	Proposed Date Range	Water Year Types Represented in Period	Rationale
Historical	WYs 2003 through 2020	Dry: 5 Dry-Normal: 5 Normal: 2 Wet-Normal: 0 Wet: 6	Provides insights on water budget response to a wide range of variations in climate and groundwater use over an extensive period of record. Throughout this period, changes in water use efficiency and cropping patterns remain relatively stable.
Current	WY 2021 and 2022	Dry: 1 Dry-Normal: 1	Last years in SVIHM. Best reflection of current land use and recent water use conditions based on best available data.

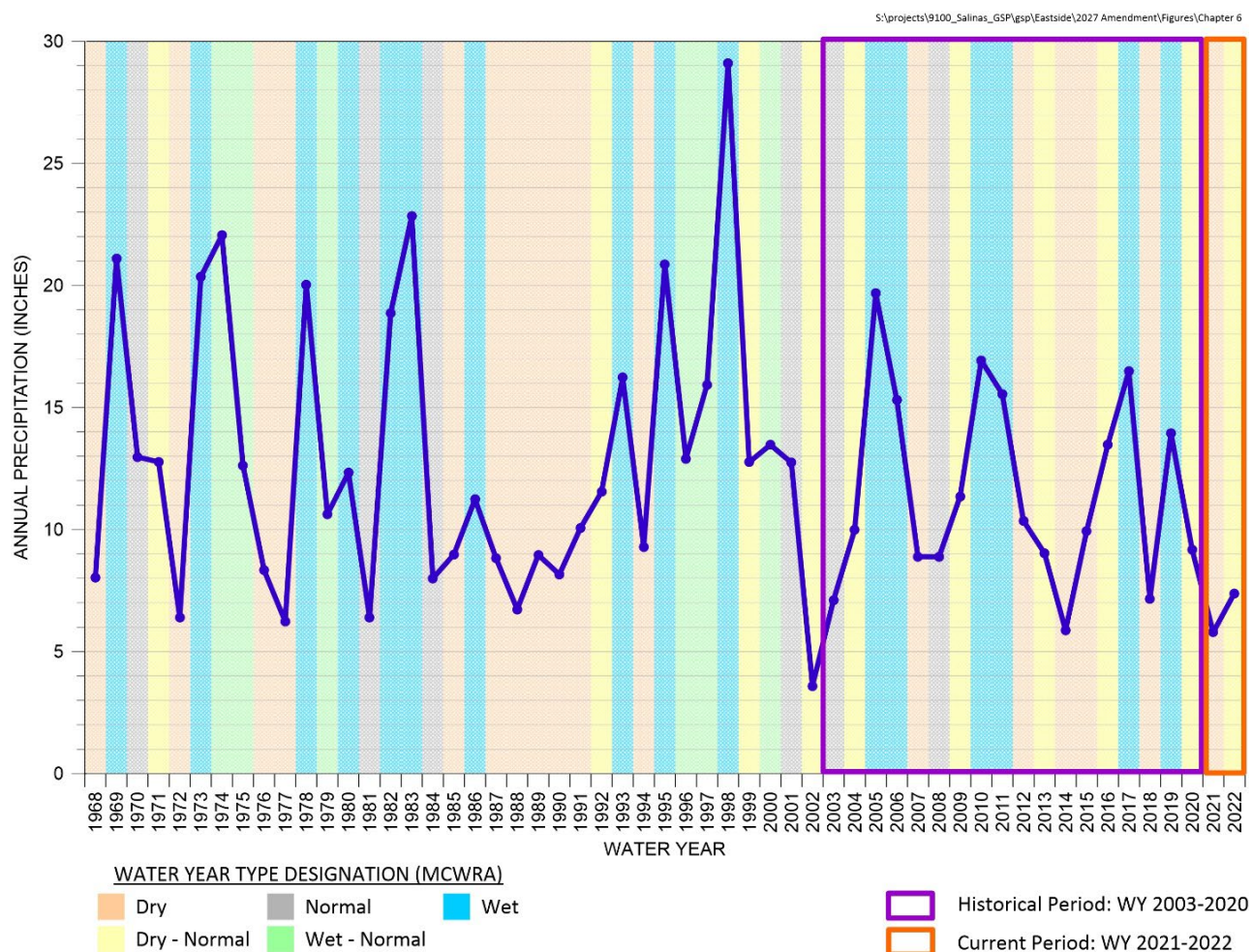


Figure 6-3. Climate and Precipitation for Historical and Current Water Budget Periods

6.1.2.1 Historical Water Budgets Period

The historical water budget is developed for the period WY 2003 – WY 2020 (October 2002 through September 2020). Although the SVIHM simulation covers WYs 1968 through 2022, the water budget focuses on WY 2003 through 2020 because this period includes relatively stable water use efficiency and cropping patterns across the Salinas Valley. Therefore, this historical period more closely represents current water use practices. WYs 2003 through 2020 comprise a representative time period with both wet and dry periods in the Subbasin (Table 6-1, Figure 6-3).

6.1.2.2 Current Water Budget Time Period

The current water budget covers WYs 2021 and 2022, the last 2 years included in the SVIHM. While these years appropriately meet the regulatory requirement for using the most recent hydrology, water supply, water demand, and land use information for which there is data available, the years are classified as dry and dry-normal, respectively, and thus do not represent average hydrology.

6.1.2.3 Future Projected Water Budgets Time Period

Future projected conditions are based on model simulations using the updated SVOM groundwater flow model, which incorporates current reservoir operation rules and a baseline climate sequence derived from historical conditions. A repeating 25-year projected climate sequence is used to represent long-term variability. Using this approach, Montgomery & Associates developed a 50-year projected baseline scenario that represents status quo conditions. This scenario includes estimated sea level rise but does not incorporate broader climate change effects, which are incorporated later in the chapter. The projected baseline serves as the reference for assessing potential PMAs.

6.2 Overview of Model Assumptions for Water Budget Development

Table 6-2 provides detailed water budget components and known model assumptions and limitations for each. A few water budget components are directly measured, but most water budget components are either estimated as input to the model or simulated by the model. Both estimated and simulated values in the water budgets are underpinned by certain assumptions. These assumptions can lead to uncertainty in the water budget. However, inputs to the SVIHM were carefully selected using best available data, reducing the level of uncertainty.

No model is a perfect representation of natural condition and level of calibration. However, the updated SVIHM's calibration error is within reasonable bounds, and it is the best available scientific tool for estimating water budgets for the GSP.

Table 6-2. Summary of Water Budget Component Data Source from the SVIHM

Water Budget Component	Source of Component Data	Limitations
Precipitation	Incorporated in calibrated model as part of land use process	
Surface Water Inflows		
Inflow from Streams Entering Basin	Simulated from watershed model for all creeks	Not all creeks are gaged
Groundwater Discharge to Streams	Simulated from calibrated model	Based on calibration of streamflow to available data from gaged creeks
Overland Runoff	Simulated from calibrated model	Based on land use, precipitation, and soils specified in model
Surface Water Outflows		
Streambed Recharge to Groundwater	Simulated from calibrated model	Based on calibration of streamflow to available data from gaged creeks and groundwater level data from nearby wells
Diversions	Reported and simulated from original model	Some input data are uncertain
Outflow to Streams Leaving Basin	Simulated from calibrated model for all creeks	Not all creeks are gaged
Groundwater Inflows		
Streambed Recharge to Groundwater	Estimated by calibrated model	Based on calibration of streamflow to available data from gaged creeks and groundwater level data from nearby wells
Deep percolation of irrigation water	Estimated by calibrated model based on demands based on crop, acreage, temperature, and soil zone processes	No measurements available; based on assumed parameters for crops and soils
Subsurface Inflow from neighboring basins	Estimated by calibrated model	Limited groundwater calibration data in adjacent basins
Subsurface Inflow from surrounding watershed other than neighboring basins	Estimated by calibrated model	Limited groundwater calibration data in adjacent basins
Groundwater Outflows		
Groundwater Pumping	Reported GEMS data for historical urban, and some small water systems. Estimated data for urban pumping pre-1995 and rural domestic pumping. Simulated agricultural pumping calibrated to reported data. Rural domestic pumping for the Langley Subbasin is estimated based on population and per capita assumptions	Rural residential pumping within MCWRA Zone 2A not simulated in model
Groundwater Discharge to Streams	Simulated from calibrated model	Based on calibration of streamflow to available data from gaged creeks and groundwater level data from nearby wells
Subsurface Outflow to Adjacent Basins	Simulated from calibrated model	Limited calibration data in adjacent boundaries
ET from Groundwater	Simulated from calibrated model	Based on representative plant group and uniform extinction depth

6.3 Historical and Current Water Budgets

Water budgets for the historical and current periods are presented below. The surface water budgets are presented first, followed by the groundwater budgets. Water budgets will be updated in future GSP periodic evaluations.

6.3.1 Historical and Current Surface Water Budget

The surface water budget accounts for the inflows and outflows for the stream network within the Subbasin. This includes flows from tributaries that enter and exit the Subbasin as well as flows into and out of streams within the Subbasin. Flows within the Subbasin include overland runoff to streams and stream-aquifer interactions. Stream-aquifer interactions within the Subbasin including recharge to groundwater and discharge from groundwater are also part of the groundwater budget. ET by riparian vegetation along stream channels is estimated by the SVIHM as part of the groundwater system and is accounted for in the groundwater budget.

Figure 6-4 shows the model grid cells for the surface water network simulated in the SVIHM. The network includes the Gabilan Creek and other streams in the subbasin. The model accounts for surface water flowing in and out across the subbasin boundary. For this water budget, boundary inflows and outflows are the sum of all locations that cross the Subbasin boundary. In some instances, a simulated stream might enter and exit the Subbasin boundary at multiple locations, such as along the southern boundary of the Langley Subbasin.

Figure 6-5 shows the surface water budget for the historical period and current period in acre-feet per year (AF/yr). Table 6-3 shows the average values for components of the surface water budget for the historical and current periods. Positive values are inflows to the stream system, and negative values are outflows from the stream system. Surface water inflows come mainly from stream inflows into the Subbasin and overland runoff to streams. The flow between surface water and groundwater (streamflow exchange) in the Subbasin is net negative, which indicates more deep percolation of streamflow to groundwater than groundwater discharge to streams. However, it is a small portion of the water budget. Most surface water outflow is through stream outflows out of the Subbasin.

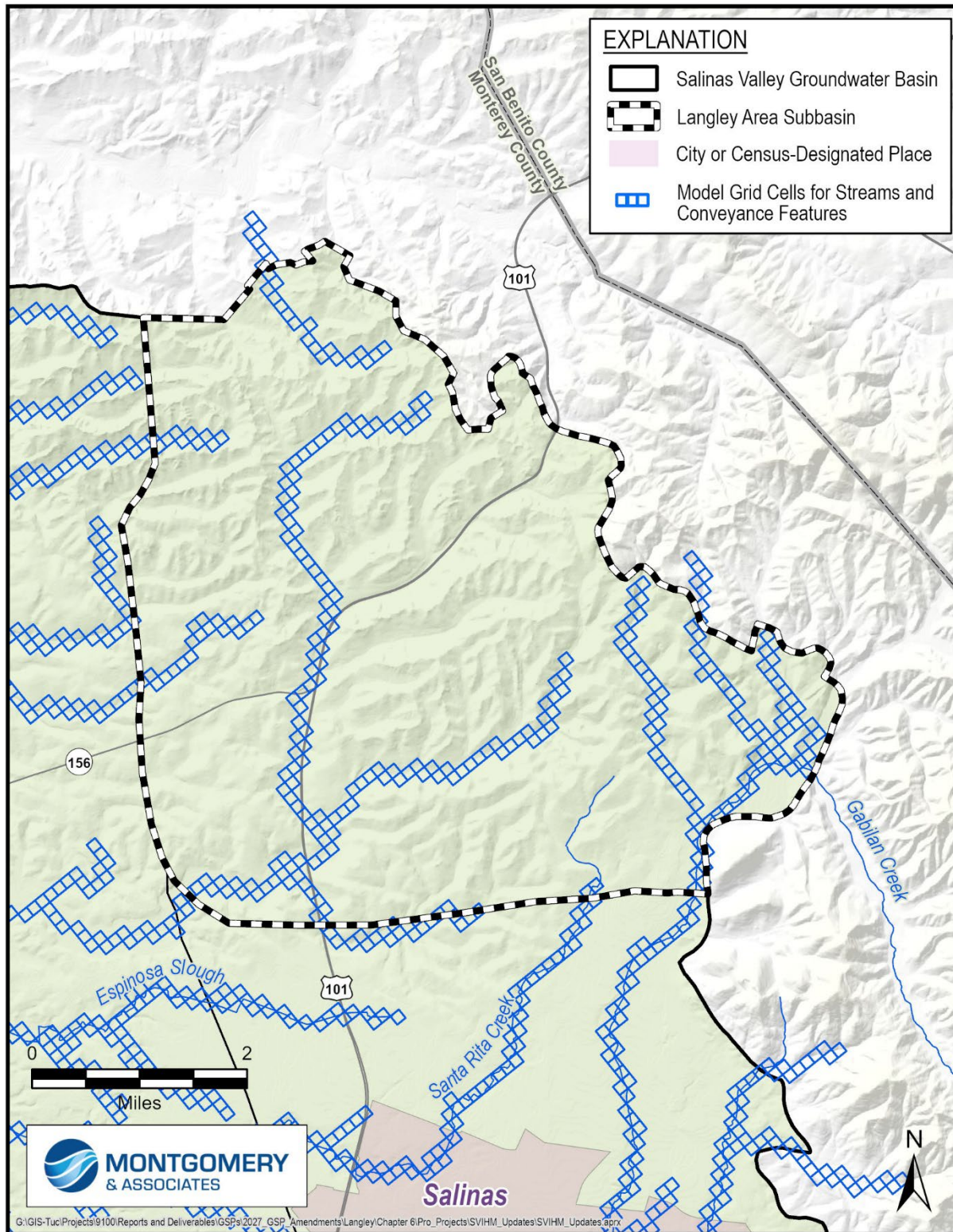


Figure 6-4. Surface Water Network in Langley Subbasin from the SVIHM

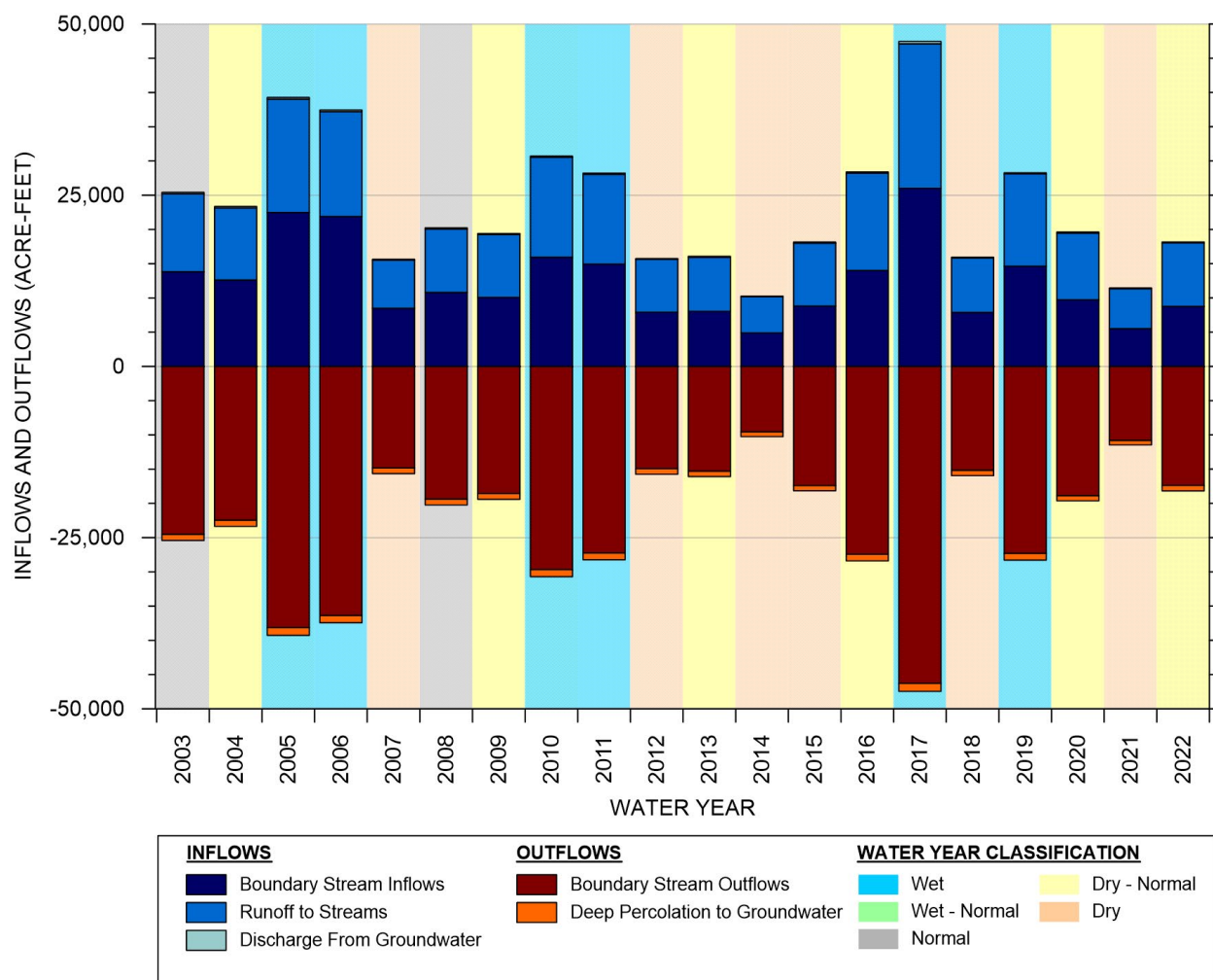


Figure 6-5. Historical and Current Surface Water Budget

Table 6-3. SVIHM-Simulated Surface Water Budget Summary

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Boundary Stream Inflows	12,900	7,100
Net Flow between Surface Water and Groundwater	-700	-600
Overland Runoff to Streams	11,300	7,600
Boundary Stream Outflows	-23,500	-14,100

6.3.2 Historical and Current Groundwater Budget

The groundwater budget accounts for the inflows and outflows to and from the Subbasin's aquifer, based on results from the SVIHM. This includes subsurface inflows and outflows of groundwater at the Subbasin boundaries, recharge, pumping, ET, and net streambed exchange. The net effect of these inflows and outflows is reflected in the change in groundwater in storage.

6.3.2.1 Groundwater Inflow and Outflow Components

The main groundwater inflow into the Subbasin is the percolation of precipitation and applied agricultural irrigation water. Other smaller inflows include streambed recharge and subsurface inflow from adjacent groundwater subbasins. Groundwater pumping is the predominant groundwater outflow, followed by subsurface outflows to adjacent subbasins. The smaller outflow terms are ET and discharge to streams.

SVIHM-estimated annual inflows to the groundwater system for the historical and current periods are shown on Figure 6-6. Inflows vary substantially from year to year. Table 6-4 provides average groundwater inflows for the historical and current period. Total average inflow for the historical period is about 8,200 AF/yr. The biggest inflow component is deep percolation of precipitation and excess irrigation water, which comprised 70% of inflows during the historical and current periods. Deep percolation of precipitation and applied water was especially high during WY 2017. Deep percolation of streamflow and subsurface inflows contribute a relatively minor amount of groundwater to the Subbasin. Average total recharge for the historical period is greater than total recharge over the current period, likely due to WY 2021 being dry and WY 2022 being dry-normal.

Figure 6-7 shows the SVIHM-estimated outflows from the groundwater system for the historical and current periods. Total average outflow for the historical period is about -8,900 AF/yr. Table 6-5 provides SVIHM-estimated annual averages for groundwater outflows of the historical and current periods. Approximately 70% of outflows consist of subsurface flows to adjacent subbasins, making it the largest groundwater outflow component in the Subbasin. The second largest outflow is groundwater pumping comprising 25% of outflows. Discharge to stream and ET are minimal. Outflows for the current period are similar to historical average outflows.

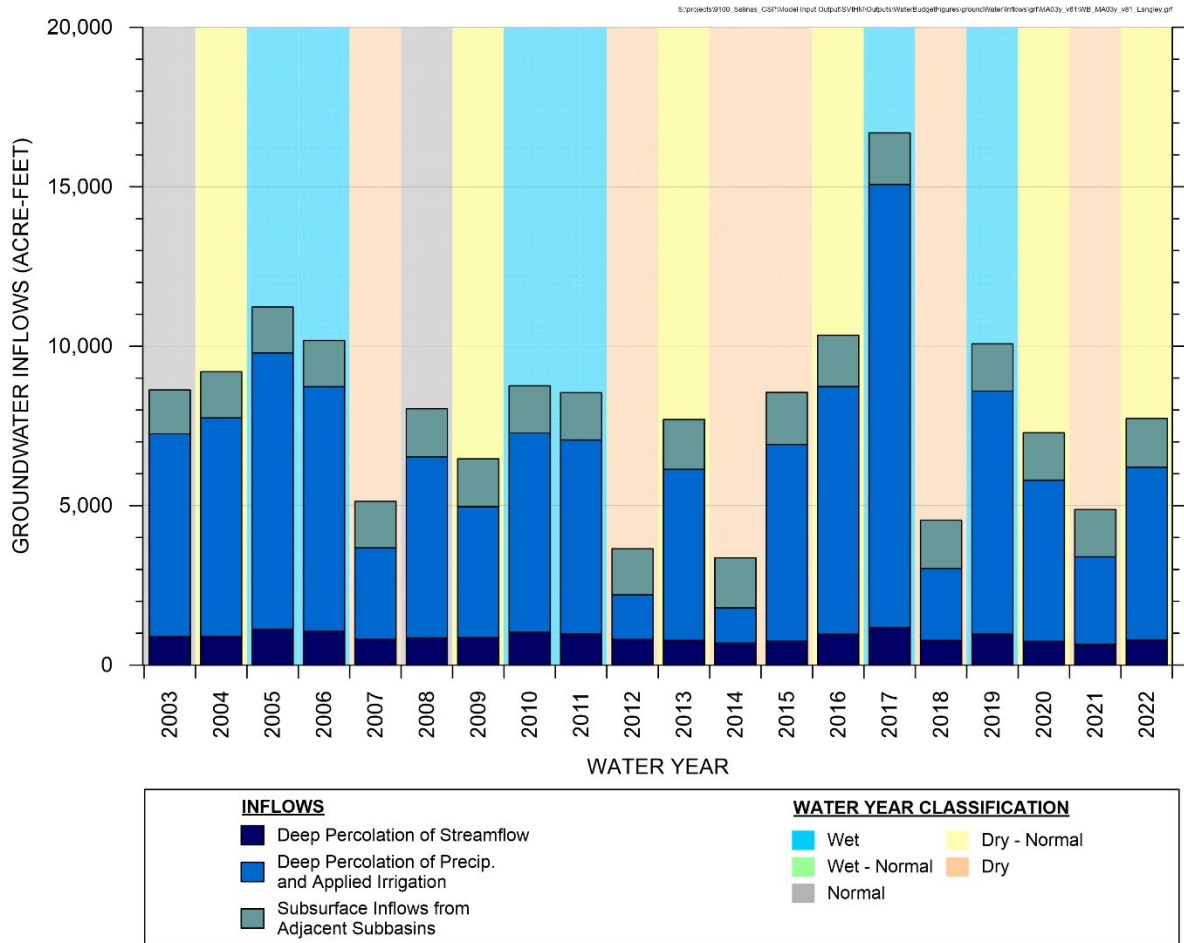


Figure 6-6. SVIHM-Simulated Inflows to the Groundwater System

Table 6-4. SVIHM-Simulated Groundwater Inflows Summary

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Deep Percolation of Streamflow	900	700
Deep Percolation of Precipitation and Applied Water	5,800	4,100
Subsurface Inflow from Adjacent Subbasins/Basin	1,500	1,500

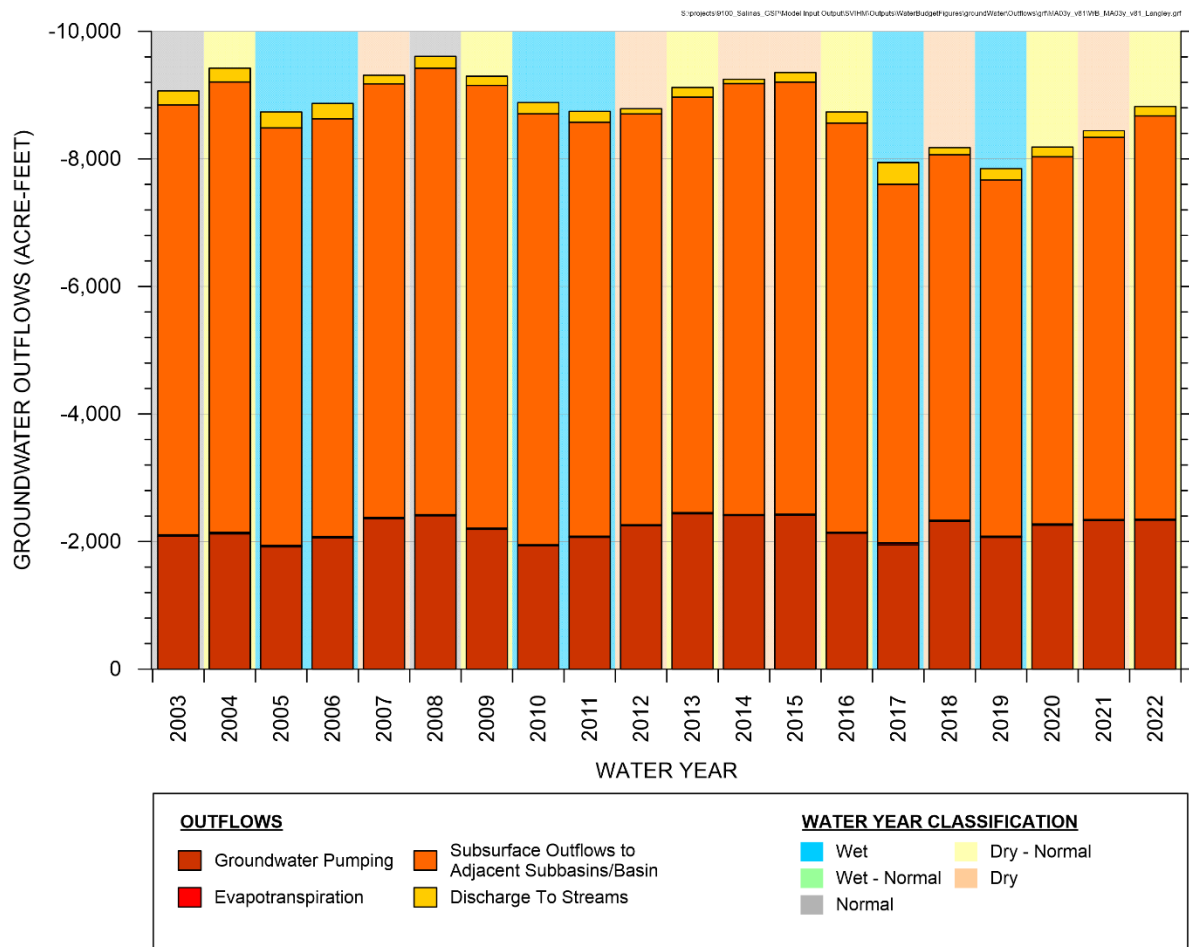


Figure 6-7. SVIHM-Simulated Outflows from the Groundwater System

Table 6-5. SVIHM-Simulated and Adjusted Groundwater Outflows Summary

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Groundwater Pumping	-2,200	-2,300
ET from Groundwater	0	0
Subsurface Outflow to Adjacent Subbasins/Basin	-6,500	-6,200
Discharge to Streams	-200	-100

Figure 6-8 and Table 6-6 show SVIHM-simulated groundwater pumping by water use sector. Groundwater pumping remained relatively stable over the historical period. Current period groundwater pumping is similar to the historical average. About 70% of pumped groundwater is used for agricultural purposes. For the Langley Subbasin, municipal, agricultural, and rural domestic pumping are simulated in the SVIHM.

The original SVIHM from the USGS did not include rural domestic pumping; however the model was updated to include it. Total annual municipal and rural domestic pumping is estimated to be 840 AF/yr in the Langley Subbasin. They are included together in the non-agricultural category on Figure 6-8 and in Table 6-6. The total non-agricultural pumping does not reflect the total estimate because some of the model cells where domestic wells are located are dry.

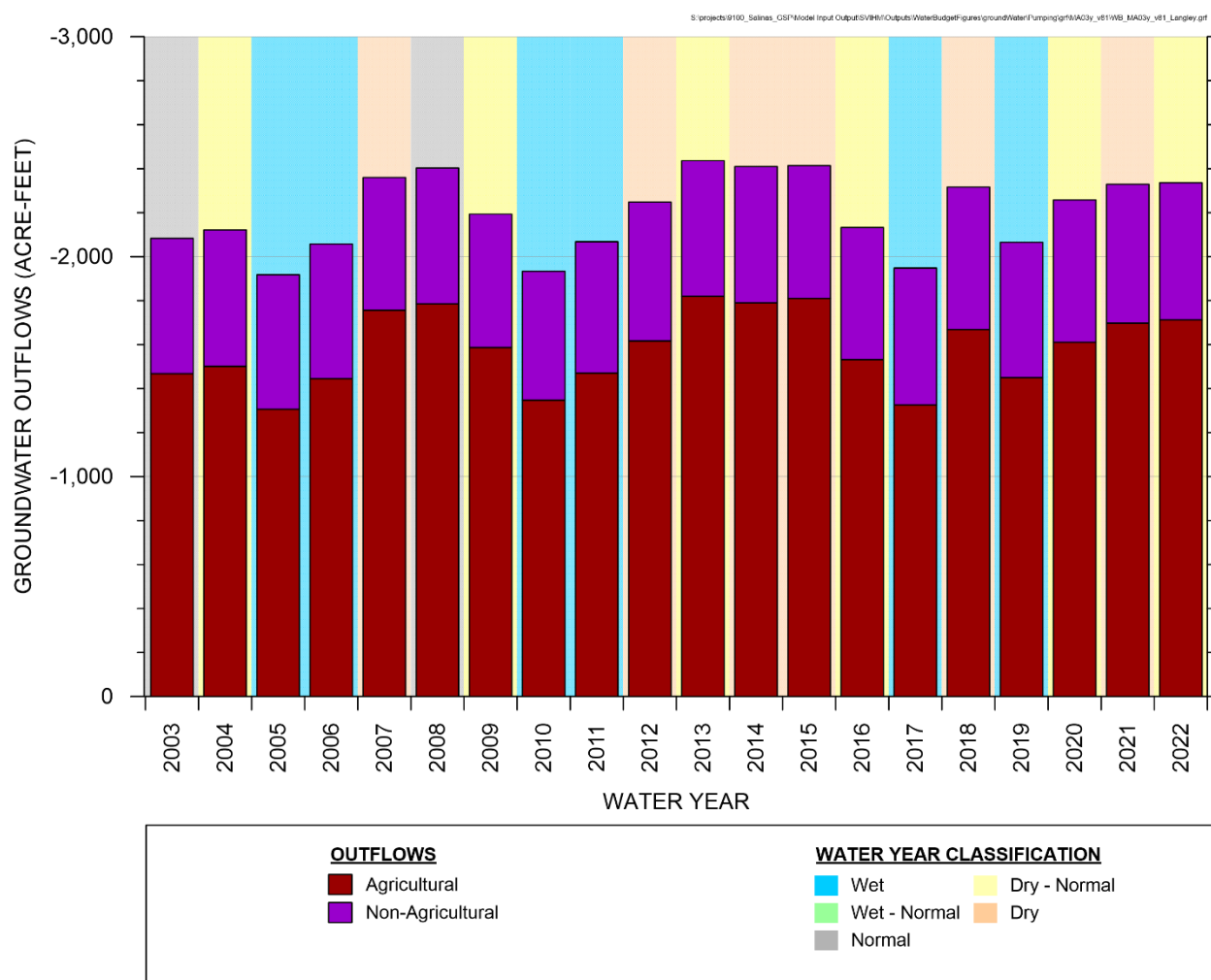


Figure 6-8. SVIHM-Simulated Groundwater Pumping by Water Use Sector

Table 6-6. SVIHM-Simulated Groundwater Pumping by Water Use Sector

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Non-Agricultural (Municipal and Rural Domestic)	-600	-600
Agricultural	-1,600	-1,700
Total Pumping	-2,200	-2,300

Figure 6-9 shows SVIHM-estimated net subsurface flows entering and exiting the Subbasin by watershed and neighboring subbasin. For the majority of the historical period, the Subbasin's subsurface outflows are roughly 4 times greater than the inflows. This is a result of the Langley Subbasin being bordered by no substantial upgradient subbasins, and influence from groundwater pumping in downgradient subbasins. Table 6-7 shows SVIHM-estimated historical and current periods net subsurface flows at the subbasin boundaries. The net subsurface flow is outflow to the adjacent subbasins.

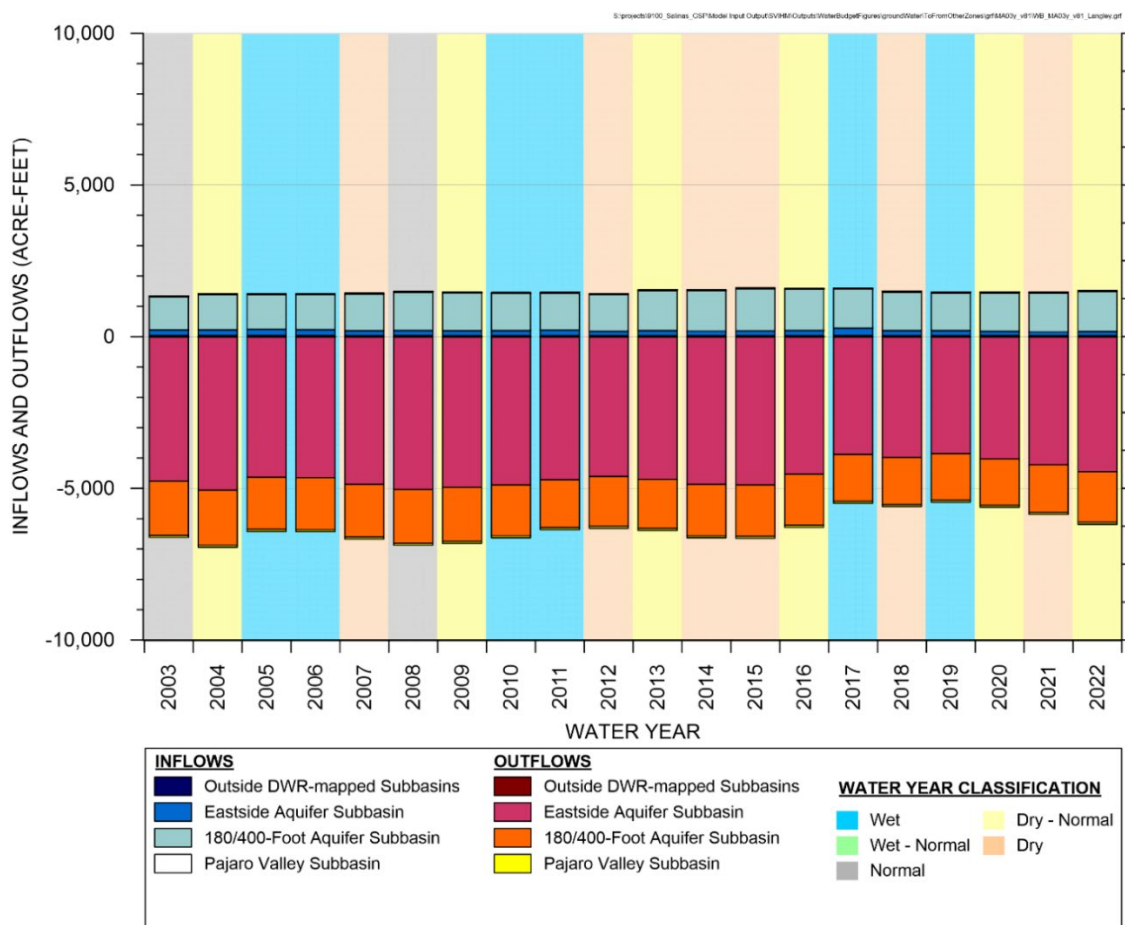


Figure 6-9. SVIHM-Simulated Subsurface Inflows and Outflows from Watershed Areas and Neighboring Basins/Subbasins

Table 6-7. SVIHM-Simulated Net Subbasin Boundary Flows

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Eastside Subbasin	-4,400	-4,200
180/400 Subbasin	-500	-300
Pajaro Subbasin	-100	-100

Positive values indicate net inflow, and negative values indicate net outflow.

6.3.2.2 Change in Groundwater in Storage

Figure 6-10 shows the cumulative and annual simulated change in groundwater storage along with the entire groundwater budget from the SVIHM.

A comparison of the historical and current net summary of groundwater budgets is shown in Table 6-8. The values in the table are based on the inflows and outflows presented in previous tables. Negative values indicate outflows or depletions. Particularly, a negative change in groundwater storage value indicates groundwater storage depletion associated with lower groundwater levels, while a positive value indicates groundwater storage accretion associated with higher groundwater levels. Averaged over the historical period, the SVIHM estimates that the Langlely Subbasin is in overdraft by about 600 AF/yr.

Changes in groundwater storage in the Langlely Subbasin are strongly correlated with changes in deep percolation of precipitation and applied agricultural irrigation water. This relationship explains the main difference between the historical and current periods shown in Table 6-8. Because the current period consists of 2 dry years, reduced deep percolation of precipitation and applied water resulted in a greater loss in storage compared to the historical period.

Water budget results for Langlely Subbasin are based on the updated SVIHM. Model calibration to groundwater levels in the basin was relatively poor due to the complexities of the fractured bedrock aquifer system, which creates local flow paths that are challenging to replicate with the SVIHM. However, the overall trend showing gradual loss in groundwater storage is consistent with long-term trends in groundwater level measurements.

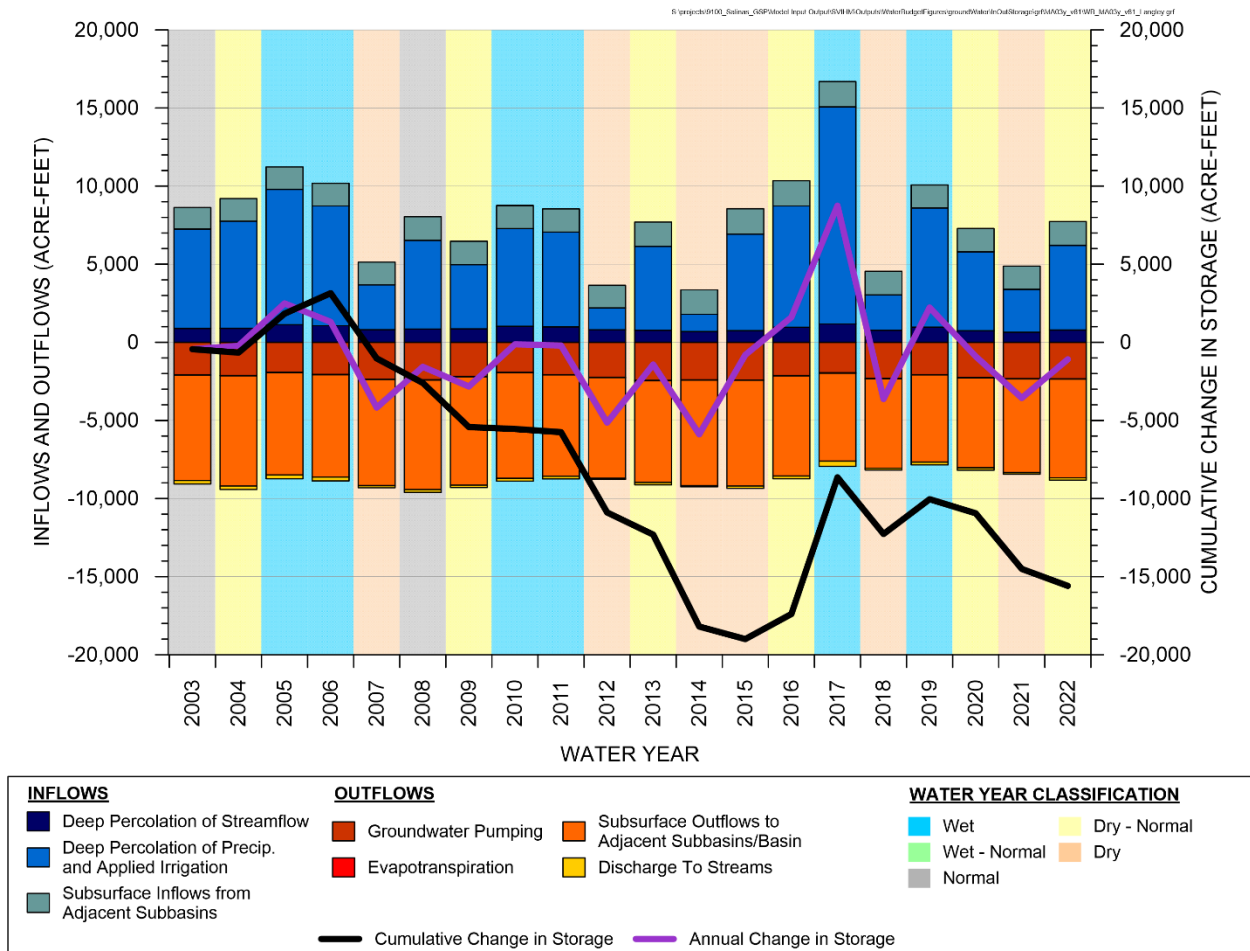


Figure 6-10. SVIHM-Simulated Historical and Current Groundwater Budget

Table 6-8. Summary of Groundwater Budget

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Groundwater Pumping	-2,200	-2,300
Net Stream Exchange	700	600
Deep Percolation	5,800	4,100
Net flow from Eastside Subbasin	-4,400	-4,200
Net flow from Pajaro Valley Subbasin	-100	-100
Net flow from 180/400 Subbasin	-500	-300
Groundwater ET	0	0
Net Storage Gain (+) or Loss (-)	-600	-2,300

Note: Due to rounding, net storage values may differ by 100 AF/yr from sum of inflows and outflows.

6.3.3 Historical and Current Sustainable Yield

The sustainable yield is the amount of groundwater that can be withdrawn without causing long-term harm to the aquifer. Thus, when undesirable results are avoided, it is the pumping that can be sustained without causing a net decrease in storage. There is no true estimate of the historical and current sustainable yield because elimination of pumping would have caused other flows to change. However, an approximation of the subbasin-wide historical and current sustainable yields can be calculated based on water budget components. The historical and current sustainable yields reflect the amount of Subbasin-wide pumping reduction needed to balance the water budget, resulting in no net decrease in storage. The sustainable yield can be estimated as:

$$\text{Sustainable yield} = \text{pumping} + \text{change in storage}$$

As a subbasin-wide calculation, this obscures geographic differences within the Subbasin. To avoid undesirable results, greater pumping reductions may need to occur in some parts of the subbasin and less in other parts. More refined analysis of the future sustainable yield will be done in conjunction with demand management feasibility studies.

For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables.

Table 6-9 shows the estimated historical and current sustainable yields for the Subbasin. As expected, the current sustainable yield is lower than the historical because it is based on 2 years with below average precipitation while there were continued subsurface outflows to adjacent subbasins. These estimates reflect total simulated storage change in the Subbasin, and do not relay geographic variability in groundwater levels, nor the ability to meet SMC.

Table 6-9. Historical and Current Sustainable Yield for the Langley Subbasin

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Total Subbasin Pumping	2,200	2,300
Change in Storage	-600	-2,300
Estimated Sustainable Yield	1,600	0

Pumping is shown as positive value for this computation.

6.4 Projected Water Budgets

- Projected water budgets are extracted from the updated SVOM, which simulates future hydrologic conditions for a representative sequence of potential climate years. Using a repeating 25-year projected climate period, a projected 50-year baseline scenario representing status quo conditions. The SVOM simulation period extends from the end of the historical model and runs from WY 2023 through WY 2072.
- The baseline averaging period is defined as WY 2040 through 2064, a 25-year window during which PMAs are anticipated to be operational. This baseline water budget serves as the reference condition against which potential PMAs are evaluated. The baseline scenario reflects a single plausible climate sequence. Although evaluating multiple climate sequences would provide a broader understanding of potential future variability, this approach establishes a consistent baseline that allows project simulations to be directly compared and differenced to isolate project-specific effects.

Model information and assumptions are summarized in a model summary report by Montgomery & Associates (2025b). Since the SVOM does not simulate seawater intrusion, the SWIM is used for the projection of advancement of seawater intrusion and loss of usable storage due to seawater intrusion (Montgomery & Associates, 2026b).

6.4.1 Assumptions Used in Projected Water Budget Development

The assumptions incorporated into the SVOM for the projected water budget simulations include:

- Land Use: Agricultural land use is assumed to be static, aside from a semi-annual change to represent crop seasonality. The annual pattern repeats 2022 land use every year in the model.
- Urban growth according to Association of Monterey Bay Area Governments (AMBAG) projections is included in this simulation. It assumes urban growth is infill, keeping the same urban footprint. If urban growth replaces agriculture, the effect on extraction will also depend on the location of agricultural water use replaced.
- Reservoir Operations: The reservoir operations reflect MCWRA's current approach to reservoir management, as described in MCWRA's Nacimiento Dam Operation Policy (MCWRA, 2018). The implementation of MCWRA operational rules in the previous SVOM is described in Wood Environment & Infrastructure Solutions (2023); only minor modifications were made in the current update. Those refinements were intended to better represent natural variability in stream inflow, align

operational rules with MCWRA's operational approach, and remain consistent with MCWRA's preparation of the Salinas River Operations HCP.

- **Stream Diversions:** The SVOM explicitly simulates only 2 stream diversions in the Salinas Valley Basin: Clark Colony and the Salinas River Diversion Facility (SRDF). The Clark Colony diversion is located along Arroyo Seco and diverts stream water to an agricultural area nearby. The SRDF came online in 2010 and diverts water from the Salinas River to the CSIP area. Clark Colony diversions are repeated from the historical record to match the water year. SRDF diversions are made throughout the duration of the SVOM whenever reservoir storage and streamflow conditions allow during the period from April through October. For purposes of the projected water budgets, SRDF diversions occur at up to a rate 36 cubic feet per second.
- **Recycled Water Deliveries:** Recycled water has been delivered to the CSIP area since 1998 as irrigation supply. The SVOM includes these recycled water deliveries throughout the duration of the model, but may not include all sources of recycled water.

6.4.2 Projected Surface Water Budget

As with the historical and current periods, the projected surface water budget accounts for the inflows and outflows for the streams within the Subbasin. This includes flow from streams entering and exiting the Subbasin, precipitation that falls directly onto streams, overland runoff to streams, and stream-aquifer interactions. ET by riparian vegetation along stream channels is estimated by the updated SVOM as part of the groundwater system and is accounted for in the groundwater budget.

Figure 6-11 shows the surface water budget for the projected period. Table 6-10 shows the average values for components of the surface water budget for the projected period. Positive values are inflows to the stream system, and negative values are outflows from the stream system. Compared to the historical surface water budget, in which boundary inflows and runoff to streams were about equal, boundary inflows in the projected surface water budget are greater than before while runoff to streams is less than before. Boundary outflows remain the dominant outflow component. The flow between surface water and groundwater in the Subbasin is net negative, which indicates more seepage from the streams to groundwater rather than discharge of groundwater to streams. However, the projected seepage from streams to groundwater may be overestimated due to potential perched zones in the aquifer, as described in Chapter 4.

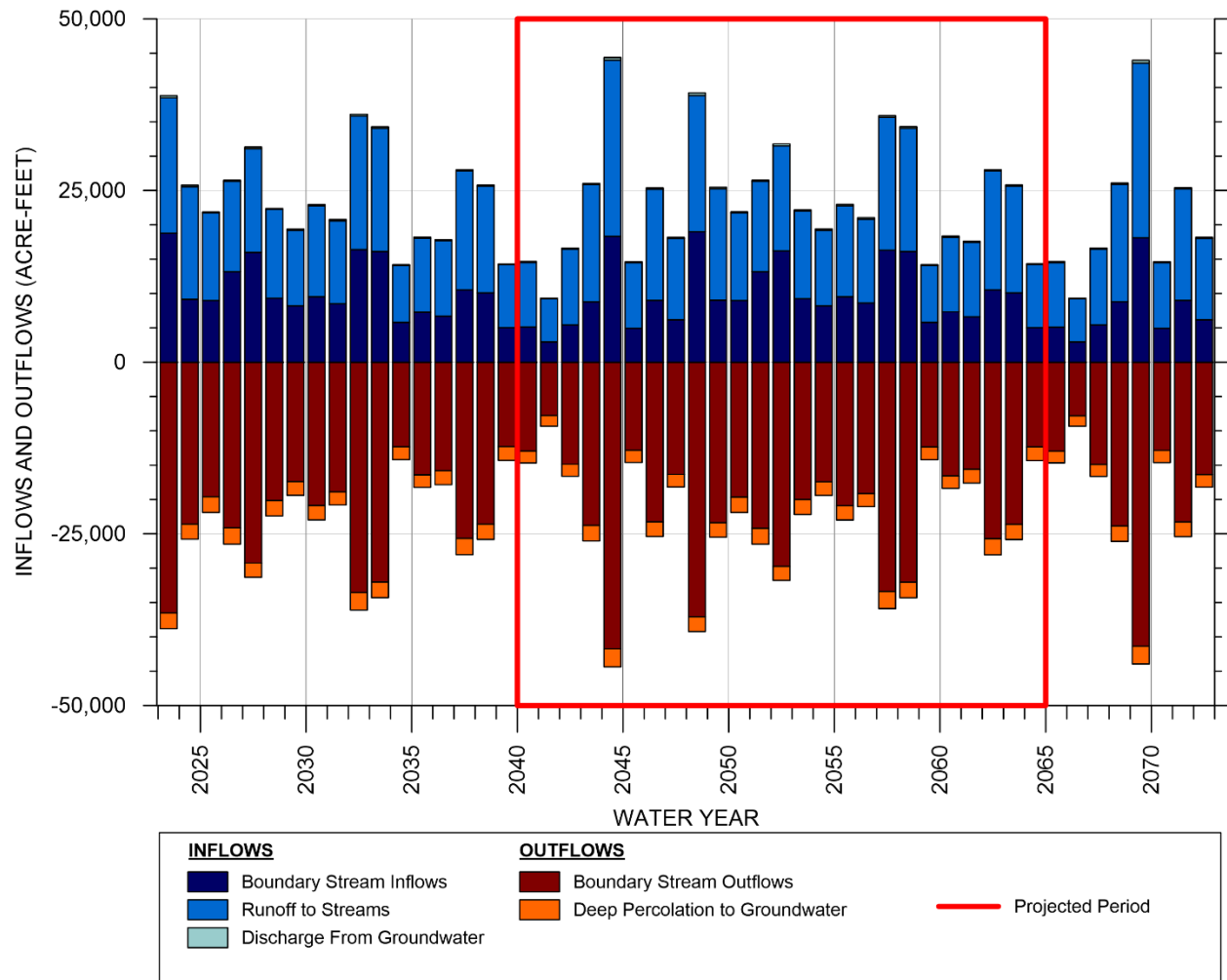


Figure 6-11. SVOM-Simulated Projected Surface Water Budget

Table 6-10. SVOM-Simulated Projected Surface Water Budget Summary

Surface Water Budget Components	Average Flow WY 2040-2064 (AF/yr)
Boundary Inflows	9,600
Boundary Outflows	-21,500
Net Flow Between Surface Water and Groundwater	-1,900
Overland Runoff to Streams	13,700
Diversions from Streams	0

6.4.3 Projected Groundwater Budget

Figure 6-12 shows the SVOM-simulated projected groundwater budget. Average groundwater budget components for the projected period are quantified in Table 6-11. Overall, the largest SVOM inflow is deep percolation of precipitation and irrigation, though that component varies widely throughout the projected period. The other inflow and outflow components are more consistent. The largest outflow is subsurface flows to adjacent subbasins. Cumulative change in storage begins with the change in storage from the historical water budget. Average projected change in groundwater storage is 600 AF/yr. However, the main difference between the historical and projected water budget is deep percolation of streamflow. Given that hardpan may inhibit percolated water from reaching the main part of the principal aquifer where it exists, though it is not modeled under streams due to lack of data, this may be an overestimate of storage gain. The projected water budget period is representative of a longer period than the historical water budget and the historical water budget period has less precipitation than the projected period; however, the exact future climate is unknown.

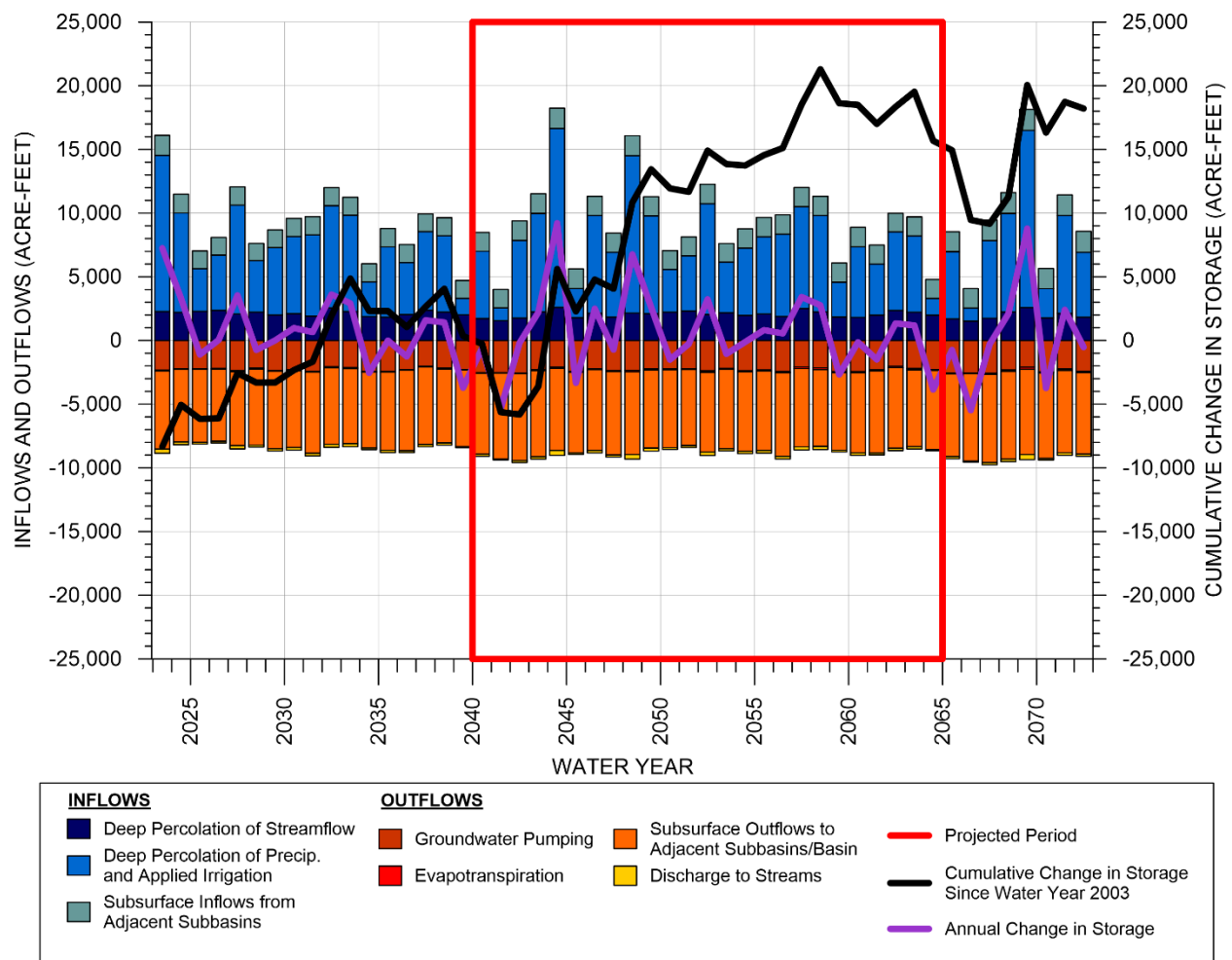


Figure 6-12. SVOM-Simulated Projected Groundwater Budget

Table 6-11. SVOM-Simulated Projected Groundwater Budget Summary

Groundwater Budget Components	Average Flow WY 2040-2064 (AF/yr)
Deep Percolation of Precipitation and Irrigation	6,000
Groundwater Pumping	-2,300
Net Stream Exchange	1,900
ET from Groundwater	-100
Net Flow to Eastside Subbasin	-4,200
Net Flow to 180/400 Subbasin	-500
Net Flow to Pajaro Valley Basin	-200
Net Flow from Outside Areas	0
Net Storage Gain (+) or Loss (-) ¹	600

¹ As noted in text, simulated gain in storage is likely overestimated

SVOM projected groundwater pumping by water use sector is summarized in Table 6-12. Agricultural pumping is projected to be about 74% of total pumping in the Subbasin.

Table 6-12. SVOM-Simulated Projected Groundwater Pumping

Water Use Sector	Average Pumping WY 2040-2064 (AF/yr)
Agricultural	-1,700
Non-Agricultural (Municipal and Rural Domestic)	-600
Total Pumping	-2,300

6.4.4 Projected Sustainable Yield

The projected sustainable yield is the amount of groundwater that can be withdrawn without causing long-term harm to the aquifer. Thus, when undesirable results are avoided, it is the pumping that can be sustained without causing change in storage to decrease. Langley Subbasin groundwater conditions will also depend on climate, pumping, and the success of management actions and projects.

Projected sustainable yield would be estimated by summing all the average groundwater extractions and subtracting the average loss in storage (or adding the average gain in storage, if applicable), if applying the same methodology as was used for the historical sustainable yield. This would represent the change in pumping that results in no change in storage, assuming no other projects or management actions are implemented. However, that methodology does not convey information about groundwater levels or variation within the Subbasin, or if extraction in one part of the Subbasin is outpacing recharge to the principal aquifer and therefore causing localized groundwater level declines. As noted above, the projected change (gain) in storage may

be an overestimate due in part to overestimated recharge from stream channel infiltration (net stream exchange in Table 6-11). This is accounted for by adjusting projected change in storage by an assumed overestimated amount of stream recharge. If average stream recharge (deep percolation of streamflow) in the future is approximately the same as the historical average (700 AF/yr Instead of 1,900 AF/yr), it would result in an adjusted projected change in storage to be a loss of 600 AF/yr (initial projected 600 AF/yr storage gain minus 1,200 AF/yr overestimated stream recharge). Given this adjustment to change in storage, the projected sustainable yield is on the order of 1,700 AF/yr. While there is uncertainty in this sustainable yield projection, it provides a reasonable approximation of potential future conditions.

Projected SVOM simulated pumping, adjusted change in storage, and sustainable yield are noted in Table 6-13. For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables. Table 6-13 provides estimates of the future sustainable yield using estimated future pumping presented in Table 6-12 and the adjusted change in storage estimate described in the previous paragraph. Although the sustainable yield values provide guidance for achieving sustainability, simply reducing pumping to within the sustainable yield is not proof of sustainability. Sustainability must be demonstrated through the SMC.

Table 6-13. Projected Sustainable Yield

	Average Flow WY 2040-2064 (AF/yr)
Groundwater Pumping	2,300
Change in Storage	-600
Projected Sustainable Yield	1,700

Pumping is shown as positive value for this computation.

6.5 Climate Change Scenarios

The projected water budget was developed based on future hydrologic conditions representative of historical conditions. To help understand the potential effect of climate change on future conditions, 3 sets of climate change factors were applied to the projected baseline:

1. Central Tendency
2. Wet-Moderate Warming
3. Dry-Extreme Warming

These future climate change scenarios used DWR-provided datasets consisting of monthly scaling factors for precipitation, reference evapotranspiration (ET_o), and streamflow. Scaling factors were also applied to tributary inflows and reservoir inflows to maintain alignment across

all hydrologic inputs. These factors were applied multiplicatively to the future baseline model climate (precipitation and ETo) or hydrologic (tributary and reservoir inflows) inputs. These scaling factors vary both spatially and temporally (year to year). This approach preserves the temporal sequencing of wet and dry periods from the baseline model while adjusting the magnitude of precipitation, ETo, and surface water inputs to reflect projected future conditions. Since the DWR scaling factors are provided for climate change at 2070, the scaling factor applied in a given WY was calculated as a linear interpolation between baseline and 2070 conditions. The linearized monthly precipitation and ETo change factors from DWR were provided spatially as a grid with a lower resolution than the future baseline model grid whereas surface water inputs were scaled based on HUC-8 watersheds, which are much larger than the baseline model grid resolution.

Table 6-14 shows the average annual water budget for the Langley Subbasin for WY 2040-2064 for the projected baseline and 3 climate scenarios run with the SVOM. Positive values represent inflows and negative values represent outflows from the subbasin. All 3 climate scenarios have greater deep percolation, subsurface outflows and slightly increased groundwater extraction than the baseline scenario. Of the 4 climate scenarios tested, the Dry-Extreme Warming scenario represents the worst-case scenario for sustainability, however annual change in storage is similar to the baseline in this scenario. Deep percolation is greater in the Dry-Extreme Warming scenario due to higher overall precipitation, as well as increased return flow from increased irrigation pumping. The Wet-Moderate Warming shows a significantly greater annual change in storage compared to the baseline. However, regardless of the scenario, there is substantial uncertainty in the groundwater modeling results due to the varied stratigraphy and hydrogeologic complexities in the Subbasin. In addition, net stream exchange is likely overestimated, as previously described for projected baseline water budgets. Because of this potential overestimate of recharge, projected change in storage could be on the order of 1,200 AF/year less than shown in Table 6-14. Regardless of uncertainty, the results of these scenarios can still be compared, and these scenarios represent potential futures to help understand the uncertainty associated with climate change.

Table 6-14. Average Water Budget Comparison for Climate Change Scenarios
for WY 2040-2064: Langley Subbasin

Water Budget Component	WY 2040-2064 Average (AF/yr)			
	Baseline	Central Tendency	Dry-Extreme Warming	Wet-Moderate Warming
Deep Percolation	6,000	6,600	6,400	7,800
Net Stream Exchange	1,900	1,800	1,800	1,700
Net Seawater Exchange	0	0	0	0
Net Subsurface Inflows	-4,800	-4,900	-5,100	-4,900
ET from Groundwater	-100	-100	-100	-100
Groundwater Extraction	-2,300	-2,400	-2,400	-2,300
Net Storage Change	600	1,000	600	2,200

6.6 Overdraft Assessment

Groundwater level trends in the Langley Subbasin were evaluated using several annual metrics — annual maximum, minimum, and fall water levels — over the most recent 15 and 20 years. This window is long enough to give a dependable view of long-term trends rather than short-term variability, yet short enough to reflect current conditions, including variable pumping demand and conditions in adjacent, hydrologically connected subbasins. A 10-year window was judged too short, as it begins in the trough of a drought and largely tracks recovery from it rather than longer-term conditions. Similarly, periods of 25 years or more were excluded, as unusually high 1990s levels paired with drought-driven lows of the 2010s can also produce misleading long-term trends.

Groundwater level observations indicate that the Langley Subbasin is experiencing overdraft in certain areas. Of the 18 wells with sufficient data (including RMS wells and non-RMS wells), the majority (56%) show declining water level trends, compared to 17% with increasing trends and 28% with no trend (percentages do not sum to 100% due to rounding). The declining trends appear somewhat more concentrated in the center-southeastern portion of the subbasin. Hydrograph shapes among the declining wells vary and do not fall into clear groupings. A few wells, however, show nearly monotonic decline. Most wells showing declining trends are limited primarily to the central-southeastern portion of the Subbasin. This localized condition might be the result of hydrogeologic complexities in the Subbasin, including a potential fault zone. Overdraft is not occurring in other parts of the Subbasin, as indicated by stable or rising groundwater level trends. Therefore, the Subbasin as a whole is not in chronic overdraft.

6.7 Subbasin Water Supply Availability and Reliability

Water is not imported into the Langley Subbasin from other basins, and the Salinas River does not run through the Langley Subbasin.

6.8 Uncertainties in Water Budget Calculations

Models are mathematical representations of physical systems. They have limitations in their ability to represent physical systems exactly because of limitations in the data inputs used. There is also inherent uncertainty in groundwater flow modeling itself, since mathematical (or numerical) models can only approximate physical systems and have limitations in how they compute data. However, DWR (2018) recognizes that although models are mathematical depictions and not exact representations of physical systems, they are powerful tools that can provide useful insights.

The level of accuracy and certainty is highly variable between water budget components. A few water budget components are directly measured, but most water budget components are either estimated inputs to the model or simulated by the model. Additional model uncertainty stems

from an imperfect representation of natural conditions and this is reflected by the model calibration error. However, inputs to the models are carefully selected using best available data, the model's calculations represent established science for groundwater flow. The model calibration error is within acceptable bounds.

There is additional inherent uncertainty involved in projected water budgets given that actual future climate conditions and the sequence of wet and dry years are unknown. Montgomery & Associates created a 25-year sequence, based on historical data, that repeats twice for the SVOM projections. Because the SVOM is not intended to forecast specific future weather events, model projections should not be interpreted as year-by-year predictions; instead, multi-year averages should be used to evaluate how groundwater levels and basin water budgets may respond to average future climate conditions. The model only represents a single climate realization. Running a broader suite of climate realizations would provide a better understanding of the uncertainty of the individual climate run selected and the resulting water budget projections. This baseline serves as a best-available reference against which potential PMAs can be evaluated.

7 MONITORING NETWORKS

This chapter describes the networks that will monitor the SMC explained further in Chapter 8. This description of the monitoring networks has been prepared in accordance with the GSP Regulations § 354.32 *et seq.* to include monitoring objectives, monitoring protocols, and data reporting requirements.

7.1 Introduction

7.1.1 Monitoring Network Objectives

SGMA requires monitoring networks to collect data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin, and to evaluate changing conditions that occur as the Plan is implemented. The monitoring networks are intended to:

- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds
- Demonstrate progress toward achieving measurable objectives
- Monitor impacts to the beneficial uses or users of groundwater
- Quantify annual changes in water budget components

7.1.2 Approach to Monitoring Networks

Monitoring networks are developed for each of the 6 sustainability indicators that are relevant to the Langley Subbasin:

1. Chronic lowering of groundwater levels
2. Reduction in groundwater storage
3. Seawater intrusion
4. Degraded groundwater quality
5. Land subsidence
6. Depletion of ISW

Also included in this chapter are other monitoring networks, such as groundwater extraction, that are necessary to comply with GSP Regulations. Representative Monitoring Sites (RMS) are a subset of the monitoring network to provide the most representative information about groundwater conditions in the Subbasin.

The SVBGSA estimated the density of monitoring sites and the frequency of measurements required to demonstrate short-term, seasonal, and long-term trends. If the required monitoring site density does not currently exist, the SVBGSA will expand monitoring networks during GSP implementation. Filling data gaps and developing more extensive and complete monitoring networks will improve the SVBGSA's ability to demonstrate sustainability and refine the existing conceptual and numerical hydrogeologic models. The SVBGSA will review the monitoring network in each 5-year assessment, including a determination of uncertainty and whether there are remaining data gaps that could affect the ability of the Plan to achieve the sustainability goal for the Subbasin.

7.1.3 Management Areas

No management areas are defined within the Langley Subbasin.

7.2 Groundwater Level Monitoring Network

The sustainability indicator for chronic lowering of groundwater levels is evaluated by assessing groundwater elevations in a designated well network. The GSP Regulations require a network of monitoring wells sufficient to demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features.

Figure 7-1 shows 24 wells in the Subbasin monitored by MCWRA for groundwater elevations that are used to develop groundwater elevation contours and that have publicly available data on the SVBGSA Web Map. Of these wells, 19 are selected as groundwater level RMS wells. As agreed to by DWR, RMS wells are monitored biannually in the fall and August. SVBGSA will report spring groundwater level measurements, but will not monitor all RMS wells in the spring. Generally, the criteria for selecting RMS wells include:

- RMS wells must have known depths and well completion data.
- RMS wells should have a relatively long period of historical data. If no other nearby wells exist, wells that do not meet this requirement may be used.
- Hydrographs of RMS wells should be visually representative of the hydrographs from surrounding wells.
- RMS locations must cover the basin and provide data near basin boundaries.
- RMS should be selected for each aquifer. There is only 1 principal aquifer in the Langley Subbasin.
- Data from RMS wells is public data and will be used for groundwater elevation maps and analysis. SVBGSA notified well owners of intent to include their well in the monitoring network.

The RMS wells in the water level monitoring network as of GSP Amendment 1 are shown in Table 7-1 and on Figure 7-1. Only RMS wells are labeled on Figure 7-1. Both the table and map include the 8 new monitoring wells SVBGSA has added to the network since the original 2022 GSP, 4 of which were installed by the SVBGSA. They are marked with an asterisk in Table 7-1. For simplicity, the new wells will also be referred to as RMS wells although they do not have SMC yet. Appendix 5A provides well construction information and historical hydrographs for each RMS well.

As established in the Salinas Valley Deep Aquifers Study, the Deep Aquifers extend slightly into the Langley Subbasin (Montgomery & Associates, 2024a). Since the 400/Deep Aquitard that delineates the Deep Aquifers does not exist in most of the Subbasin, the Deep Aquifers are not considered a separate principal aquifer in the Langley Subbasin for SGMA purposes.

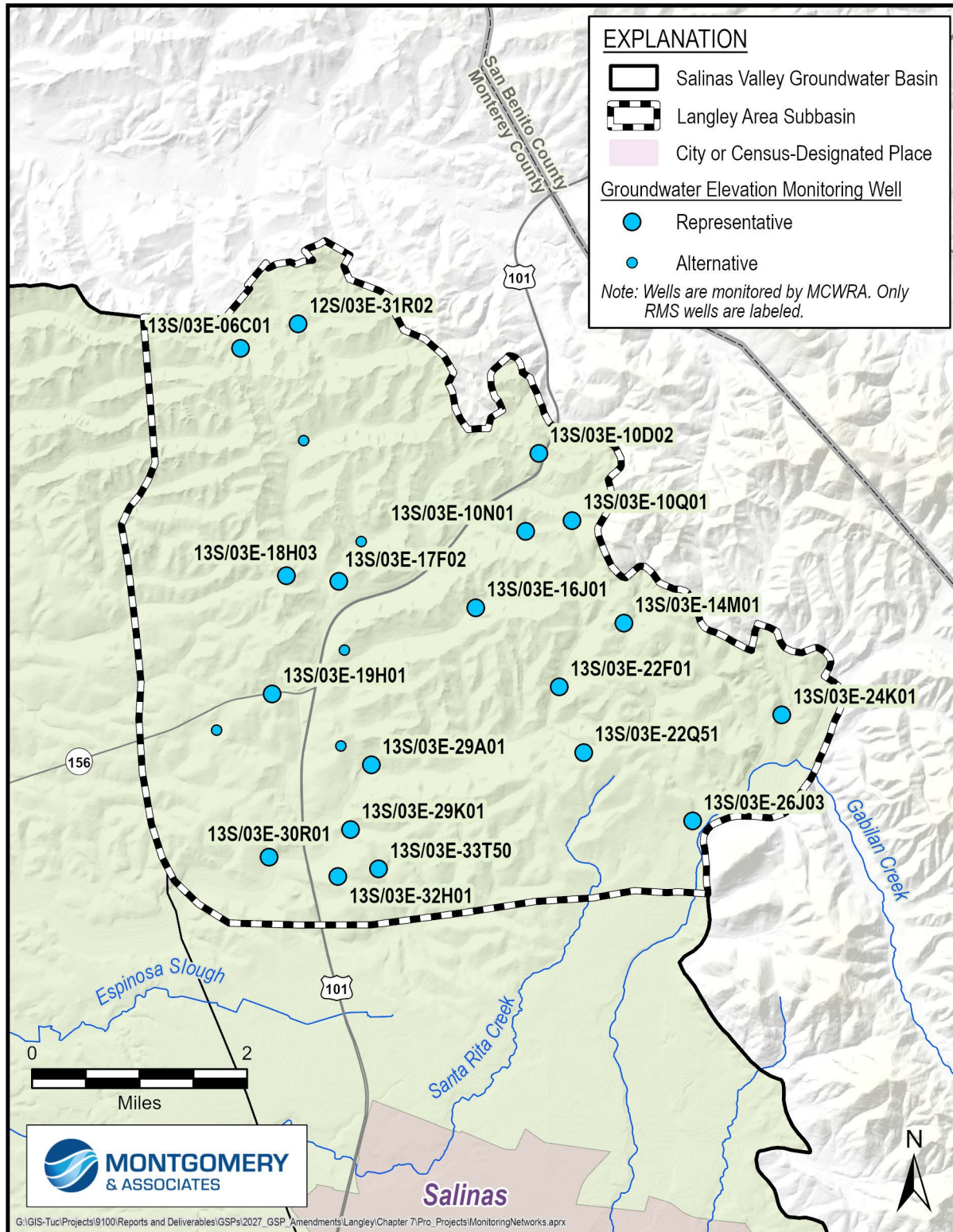


Figure 7-1. Groundwater Levels Monitoring Network

Table 7-1. Langley Area Groundwater Level Representative Monitoring Site Network

State Well Number	SGMA Site Code	Local Well Designation	Well Use	Total Well Depth (ft)	Reference Point (ft, NAVD88)	Latitude (NAD 83)	Longitude (NAD 83)
13S/03E-10N01	368114N1216330W001	13507	Domestic	145	383.3	36.81140	-121.63303
13S/03E-10Q01	368130N1216252W001	13513	Domestic	76	493.9	36.81306	-121.62529
13S/03E-14M01	367993N1216161W001	13543	Domestic	402	461.5	36.79939	-121.61617
13S/03E-16J01	368011N1216412W001	13625	Domestic	252	279.1	36.80105	-121.64117
13S/03E-17F02	368039N1216641W001	13680	Domestic	392	226.5	36.80399	-121.66418
13S/03E-19H01	367886N1216748W001	13783	Domestic	192	137.2	36.78860	-121.67483
13S/03E-22F01	367906N1216267W001	13950	Domestic	334	218.0	36.79057	-121.62669
13S/03E-22Q51*	N/A	13967	Domestic	500		36.78186	-121.62233
13S/03E-29A01	367793N1216578W001	14072	Domestic	200	87.8	36.77939	-121.65786
13S/03E-29K01	367706N1216610W001	14115	Domestic	335	73.3	36.77062	-121.66103
13S/03E-30R01*	N/A	26083	Irrigation	560	29.0	36.76644	-121.67452
13S/03E-32H01	367654N1216561W001	14189	Municipal	400	116.0	36.76542	-121.65613
13S/03E-33T50	367642N1216629W001	14211	Municipal	500	150.0	36.76422	-121.66290
12S/03E-31R02	N/A	Royal Oaks Park Well 2	Municipal	350	208.0	36.83852	-121.67213
13S/03E-18H03	N/A	Manzanita Park Well 01	Municipal	N/A	378.1	36.80453	-121.67294
13S/03E-06C01*	N/A	L-GWL-6	Observation	215	262.6	36.83497	-121.68172
13S/03E-26J03*	N/A	L-GWL-2	Observation	215	243.6	36.77304	-121.60374
13S/03E-24K01*	N/A	L-GWL-1	Observation	165	312.5	36.78764	-121.58924
13S/03E-10D02*	N/A	L-GWL-4	Observation	335	471.6	36.82195	-121.63121

Note: Asterisk symbolizes new monitoring wells, either recently installed or existing wells, that do not have SGMA Site Codes because RMS wells must have established SMC to be entered into SGMA Portal.

N/A = Not available

7.2.1 Groundwater Level Monitoring Protocols

Chapter 4 of the MCWRA CASGEM monitoring plan includes a description of existing groundwater elevation monitoring procedures (MCWRA, 2015). The CASGEM groundwater elevation monitoring protocols established by MCWRA are adopted by this GSP and are included in Appendix 7A. Groundwater elevation measurements are collected at least 2 times per year to characterize seasonal low and seasonal high groundwater conditions. The monitoring protocols described in Appendix 7A cover multiple monitoring methods for collecting data by hand and by automated pressure transducers. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.2.2 Groundwater Level Monitoring Network Data Gaps

Based on the GSP Regulations and the BMPs published by DWR on monitoring networks (DWR, 2016b), a visual analysis of the existing monitoring network was performed using professional judgment to evaluate whether there are data gaps in the groundwater level monitoring network.

While there is no definitive requirement on monitoring well density, the BMP cites several studies (Heath, 1976; Sophocleous, 1983; Hopkins and Anderson, 2016) that recommend 0.2 to 10 wells per 100 square miles. The BMP notes that professional judgment should be used to design the monitoring network to account for high-pumping areas, proposed projects, and other subbasin-specific factors.

The Langley Subbasin encompasses 27.5 square miles. Applying the BMP guidance recommendations to the Subbasin, the well network should include between 1 and 3 wells. The RMS network includes 19 wells—surpassing the BMP-recommended range. Furthermore, visual inspection of Figure 7-1 indicates that the geographic distribution of the RMS network is sufficient and there is no significant spatial data gap in the network.

Some of the wells in the monitoring network have unknown well construction information. SVBGSA will work with MCWRA to fill this data gap during GSP implementation through MCWRA's well registration effort.

7.3 Groundwater Storage Monitoring Network

As further discussed in Chapter 8, the sustainability indicator for reduction of groundwater storage is measured using groundwater elevations as proxies. Therefore, the groundwater storage monitoring network is the same as the groundwater level monitoring network.

7.4 Seawater Intrusion Monitoring Network

Seawater intrusion is not considered an imminent threat to the Subbasin, as demonstrated on Figure 5-11. However, seawater intrusion does exist in the adjacent 180/400 Subbasin and is closely monitored by MCWRA. The Langley Subbasin relies on the monitoring network in the 180/400 Subbasin to track the position of the seawater intrusion front. Should seawater intrusion, as measured by the 500 mg/L chloride isocontour, come within one-half mile of the Langley Subbasin boundary, the SVBGSA's Joint Technical Advisory Committee (JTAC, formerly the Groundwater Technical Advisory Committee or Seawater Intrusion Working Group) will consider expanding the existing seawater intrusion monitoring network into the Subbasin. The monitoring protocols and chloride data contouring protocols established by MCWRA are provided in Appendix 7B and 7C, respectively.

MCWRA monitors water quality in 2 dedicated monitoring wells. These wells may be used to track changes in water quality indicative of seawater intrusion.

7.5 Groundwater Quality Monitoring Network

The sustainability indicator for degraded water quality is evaluated at wells monitored for established water quality regulatory programs. The SVBGSA adopts the active public water system supply wells monitored under SWRCB DDW and on-farm domestic wells monitored under CCRWQCB ILP. The Subbasin's groundwater quality network is shown on Figure 7-2 and the wells in the network are listed in Appendix 7D.

The public water system supply wells included in the monitoring network were identified by reviewing data from the SWRCB DDW. The SWRCB collects data for municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days a year. Only active DDW wells are included in the SVBGSA's groundwater quality network.

Water quality for agricultural supply wells is monitored through the CCRWQCB ILP, which regulates discharge from irrigated agricultural lands through the Ag Orders. Ag Order 4.0 established 2 main monitoring requirements: 1) the creation of a monitoring plan to assess groundwater quality trends and 2) monitoring of all on-farm domestic wells for the presence of 1,2,3-trichloropropane (1,2,3-TCP) and nitrate. The Central Coast Water Quality Preservation Inc., the third-party that conducts most CCRWQCB ILP compliance sampling in the Salinas Valley, is developing the Groundwater Quality Trend Monitoring (GQTM) Workplan to address the trend monitoring requirement of the Ag Order 4.0 requirements. The GQTM Workplan will evaluate nitrate and major cations and anions trends in select wells. All ILP wells sampled by Preservation Inc. as of GSP Amendment 1 are provisionally included in the Subbasin's

monitoring network until the GQTM Workplan is approved by the CCRWQCB. Once it's approved, the SVBGSA's monitoring network will comprise the wells in the GQTM Workplan and additional on-farm domestic wells sampled for 1,2,3-TCP and nitrate. The GQTM Workplan has different jurisdictional zones and the agriculture present in the southern part of the Langley Subbasin is monitored together with the adjacent subbasins and does not include any wells in the Langley Subbasin. Therefore, once the GQTM is approved, the SVBGSA's monitoring network will comprise only the ILP on-farm domestic wells sampled for 1,2,3-TCP and nitrate.

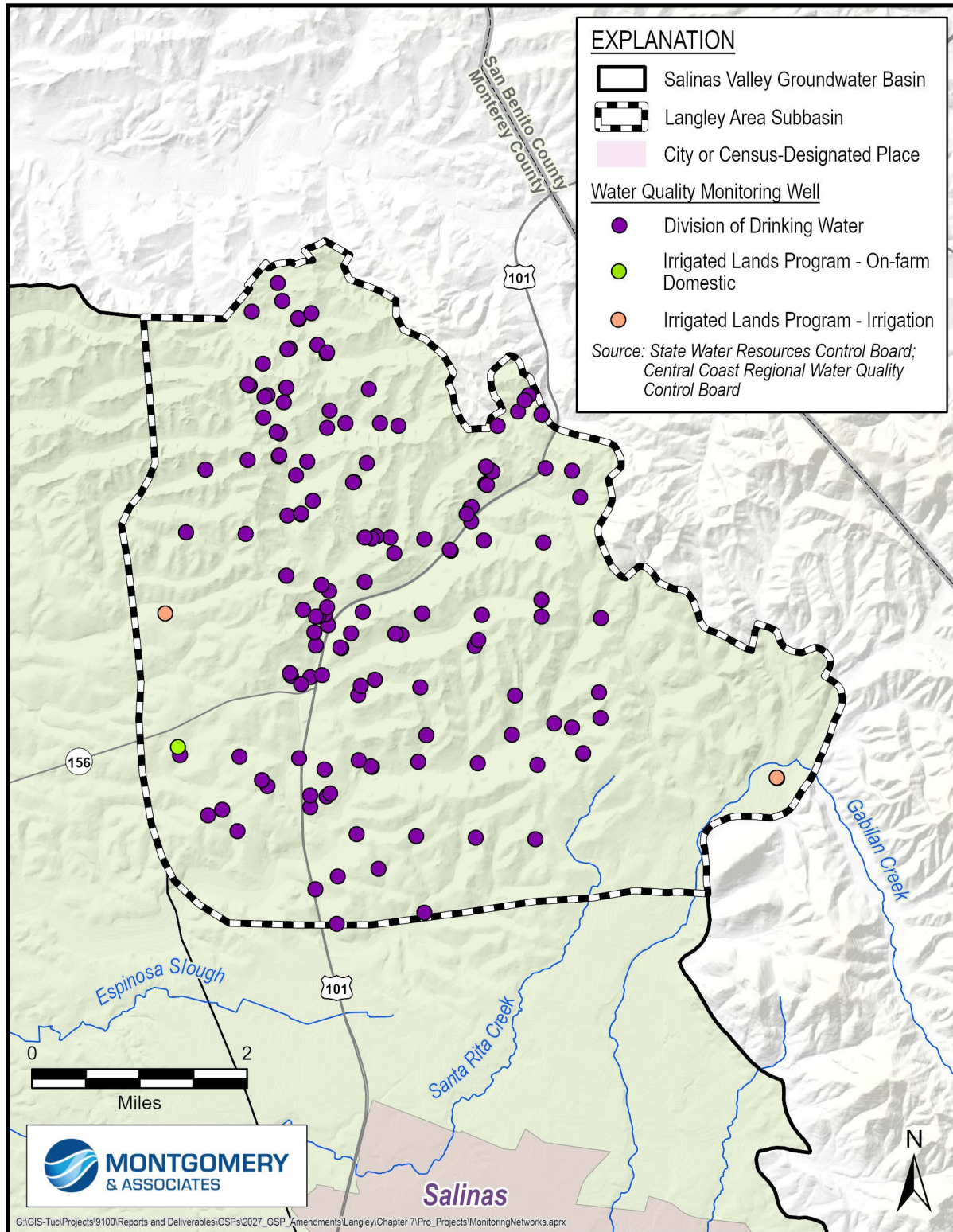


Figure 7-2. Groundwater Quality Monitoring Network

7.5.1 Groundwater Quality Monitoring Protocols

The SVBGSA does not independently sample wells. Instead, the GSA analyzes water quality data that are collected through the DDW and ILP. Therefore, the GSA is dependent on the monitoring density and frequency of DDW and ILP.

Water quality data from public water systems are collected, analyzed, and reported in accordance with protocols that are reviewed and approved by the SWRCB DDW, in accordance with the state and federal Safe Drinking Water Acts. Monitoring protocols may vary by agency.

The ILP data are collected annually under CCRWQCB Ag Order 4.0. Ag Order 4.0 will take effect in the Subbasin beginning in 2027. A copy of Ag Orders 4.0 monitoring and reporting programs are included in Appendix 7E and are incorporated into this GSP. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.5.2 Groundwater Quality Monitoring Data Gaps

The DDW and ILP monitoring network provide sufficient spatial and temporal data to determine groundwater quality trends for water quality indicators to address known water quality issues. Additionally, there is adequate spatial coverage in the water quality monitoring network to assess impacts to beneficial uses and users.

7.6 Land Subsidence Monitoring Network

As described in Section 5.5, DWR collects land subsidence data using InSAR satellite data and makes these data available to GSAs. This subsidence dataset represents the best available science for the Langley Subbasin and is therefore used as the subsidence monitoring network.

7.6.1 Land Subsidence Monitoring Protocols

Land Subsidence monitoring protocols are the ones used by DWR for InSAR measurements and interpretation. DWR adapted their methods to measure subsidence on hard surfaces only and interpolate between them to minimize the change in land surface elevation captures in soft surfaces that are likely not true subsidence. The cell size of this interpolated surface is 302 feet by 302 feet. If the annual monitoring indicates subsidence is occurring at a rate greater than the minimum thresholds, then additional investigation and monitoring may be warranted. In particular, the GSAs will implement a study to assess if the observed subsidence can be correlated to groundwater elevations, and whether a reasonable causality can be established. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.6.2 Land Subsidence Data Gaps

There are no data gaps associated with the subsidence monitoring network.

7.7 Interconnected Surface Water Monitoring Network

Depletion of ISW due to groundwater pumping is evaluated by monitoring shallow groundwater levels near locations of potential ISW in monitoring wells adjacent to streams. The ISW monitoring network in the Salinas Valley is based on the approach recommended by the Environmental Defense Fund (EDF, 2018), which uses groundwater elevations as surrogates for streamflow depletion rates. EDF notes that the change in hydraulic gradient between stream stage and surrounding groundwater elevations is representative of variance in interconnection between surface water and groundwater. Thus, monitoring the gradient also monitors interconnection. The gradient will be monitored by measured shallow groundwater elevations.

Table 7-2 and Figure 7-3 show the ISW monitoring network. These shallow monitoring wells were chosen based on proximity to the short reach of potential ISW identified in the Subbasin, as shown on Figure 4-9. This ISW monitoring well and the groundwater level sustainability indicator are both classified as RMS.

Table 7-2. Shallow Well in the ISW Monitoring Network

State Well Number	SGMA Site Code	Local Well Designation	Well Use	Total Well Depth (feet)	Latitude (NAD 83)	Longitude (NAD 83)
13S/03E-30R01	N/A	26083	Irrigation	560	36.76644	-121.67452

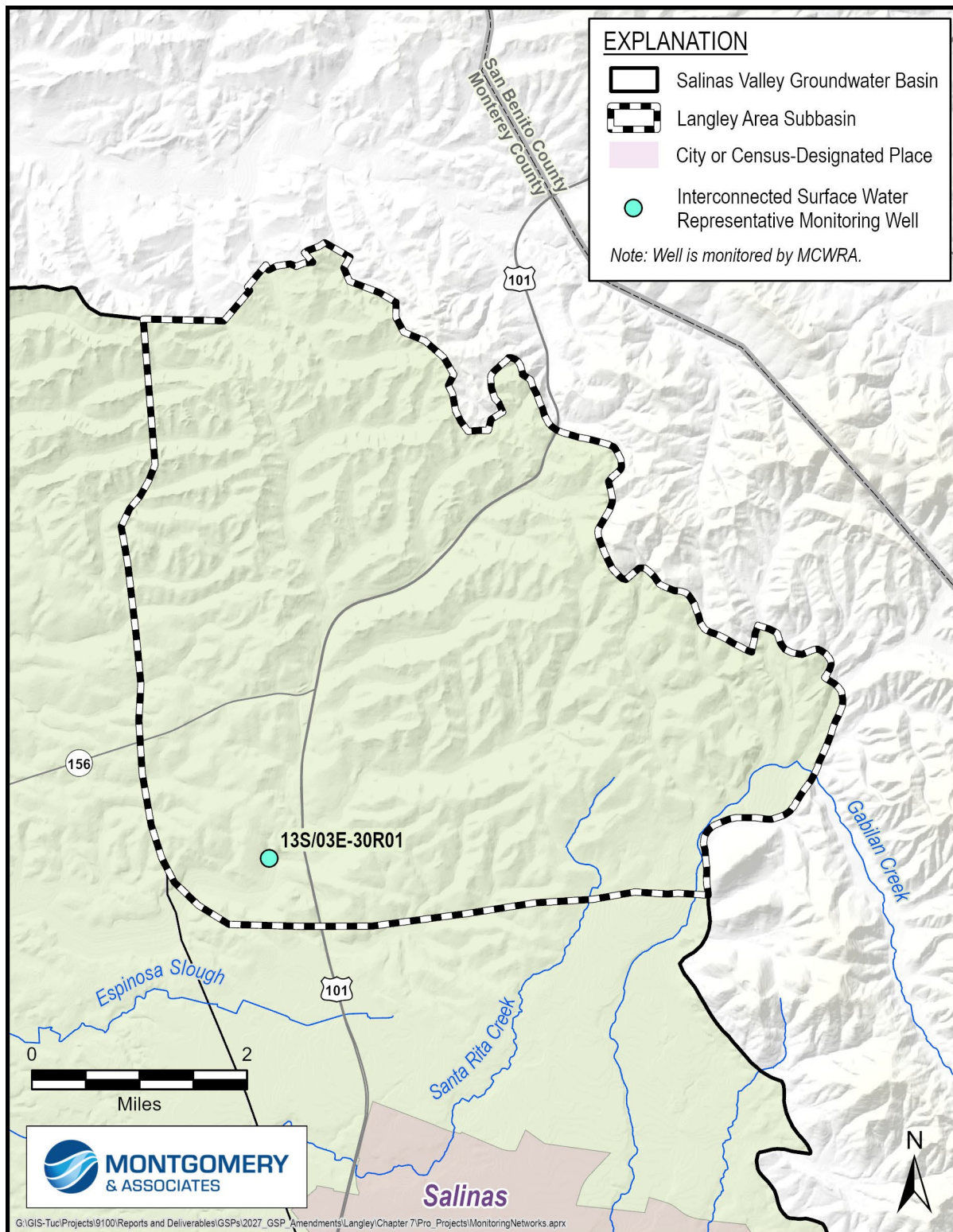


Figure 7-3. ISW Monitoring Network

7.7.1 Interconnected Surface Water Monitoring Protocols

Monitoring protocols for shallow wells monitoring ISW will be identical to MCWRA's groundwater elevation monitoring protocols, included in Appendix 7A. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4. Additionally, the ISW monitoring well will be monitored at least monthly to allow SVBGSA to access if seasonal pumping is resulting in streamflow depletions.

7.7.2 Interconnected Surface Water Data Gaps

There are no data gaps in the ISW monitoring network in the Langley Subbasin.

7.8 Other Monitoring Networks

The following monitoring networks are needed in addition to the monitoring networks outlined above for sustainability indicators. These include monitoring of GDEs at identified locations throughout the Subbasin, as well as monitoring and reporting of annual groundwater extractions and surface water diversions, which are required under SGMA to document total water use within the Subbasin.

7.8.1 Groundwater Dependent Ecosystems Monitoring Network

Central Coast Wetlands Group will monitor and assess GDEs to detect if their conditions are declining. When such declines in condition are detected, the GDE must be flagged for further investigation into the root cause of the decline to determine if it is related to groundwater management activities. For the purposes of GDE monitoring in the Salinas Valley, ecosystem condition is primarily defined through vegetation health and vigor since this metric can be most readily tied to groundwater conditions. If groundwater levels are lowered below a depth that vegetation roots can access, a decline in vegetation vigor due to the loss of the water source would be an expected result and defined as an adverse impact.

7.8.1.1 Groundwater Dependent Ecosystems Monitoring Protocols

The GDE monitoring methodology uses a 2-pronged approach including an annual desktop-based component and a 5-year interval field-based component. A change in GDE vegetation vigor could be related to many factors, so a subsequent hydrogeological analysis is required to investigate groundwater level trends around potential GDEs to understand if GDE health is related to groundwater management.

7.8.1.2 Groundwater Dependent Ecosystems Monitoring Data Gaps

There are no GDE monitoring data gaps in the Langley Subbasin. Groundwater Extraction Monitoring Network

MCWRA's GEMS is the part of the GMP used to monitor extraction in the Salinas Valley. Monthly extractions for agricultural and urban water use are reported annually to MCWRA pursuant to MCWRA Ordinance 5426. Urban water use includes larger public water systems and industrial water use. Historically, most pumping in the Salinas Valley was only reported for Zones 2, 2A, and 2B, which only overlapped with the southern portion of the Subbasin as shown on Figure 3-3. Extraction is self-reported by well owners or operators on a water year basis (October 1 to September 30).

SVBGSA will work with MCWRA to obtain the GMP data through a coordinated reporting program such that well owners can provide a single annual reporting to fulfill the requirements of both the GSP and the existing MCWRA Ordinance 5426.

SVBGSA prepared an estimate of rural domestic pumping across the Valley. Rural domestic pumping is estimated using the number of drinking water connections based on data compiled for water systems and 2024 Monterey County parcel data. After estimating the number of connections, the connections were multiplied by a constant value 0.35 AF/yr per connection across all subbasins to estimate water use. This constant was verified using reported urban pumping to assess the accuracy of the connections and water use estimates. This estimate will be revised during GSP implementation based on the results of MCWRA well registration and GMP reporting. Once all non-*de minimis* extractors are reporting through GEMS, those estimates will be replaced with reported data.

7.8.1.3 Groundwater Extraction Monitoring Protocols

Groundwater extraction monitoring is accomplished using the GMP data provided by MCWRA.

7.8.1.4 Groundwater Extraction Monitoring Data Gaps

Accurate assessment of the amount of pumping requires a complete count of the number of municipal, agricultural, and domestic wells in the GSP area. As discussed in Chapter 9, MCWRA has an ongoing well registration program catalogue existing and active groundwater wells, including their locations, depths, whether the well is active, abandoned, or destroyed.

The accuracy and reliability of groundwater pumping reported through the GMP is constantly being updated. SVBGSA will continue to work with MCWRA to assure data quality control.

7.8.2 Salinas River Watershed Diversions

Salinas River watershed monthly diversion data are collected annually by the SWRCB. Prior to WY 2025, the SWRCB used eWRIMS, which has been replaced with CalWATRS. CalWATRS is used to track information of water rights in the state on a water year basis and is publicly accessible at <https://calwatrs.waterboards.ca.gov/portal/s/search-information>. These data include diversions from the Salinas River and its tributaries.

These data are used in the Annual Reports to account for surface water use in the Salinas Valley. However, many stakeholders have noted that a portion of the agricultural water use in the Valley has been reported to MCWRA as groundwater extraction and to the SWRCB as surface water diversions. To help reduce any potential double-counting in the Annual Reports, the GMP requires every well owner or well operator reporting groundwater extraction to the SWRCB to report that same information to MCWRA and indicate if data are reported to both sources.

7.8.2.1 Salinas River Watershed Diversions Monitoring Protocols

Salinas River watershed diversion monitoring protocols are established by the SWRCB for the collection of water right information. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.8.2.2 Salinas River Watershed Diversions Monitoring Data Gaps

There are no data gaps in the Salinas River watershed diversion monitoring network in the Langley Subbasin.

7.9 Data Management System and Data Reporting

The SVBGSA has developed a Data Management System (DMS) in adherence to GSP Regulations § 352.6 and § 354.40 that is used to store, review, and upload data collected as part of the GSP development and implementation.

The SVBGSA DMS consists of 2 SQL databases. The HydroSQL database stores information about each well and timeseries data for water level and extraction. Fields in the HydroSQL database include:

- Subbasin
- Cadastral coordinates
- Planar coordinates
- Well owner
- Well name

- Well status
- Well depth
- Screened interval top and bottom
- Well type
- Water level elevation
- Annual pumping volume

Well owner and annual pumping information will be stored in HydroSQL; however, neither will be publicly accessible due to confidentiality requirements. Real-time streamflow data for USGS gages are automatically uploaded to the HydroSQL database via a live link to the USGS website.

Water quality data are stored in the EnviroSQL database, which is linked to the HydroSQL database for data management purposes. Fields in the EnviroSQL database include:

- Station
- Parameter
- Sample Date
- Detection (detect or non-detect)
- Value
- Unit

The data used to populate the SVBGSA DMS are listed in Table 7-3. Categories marked with an X indicate datasets that are used in populating the DMS, including data that are publicly accessible or that are available to SVBGSA from MCWRA. Some data, such as groundwater extraction, is confidential and cannot be made publicly accessible by SVBGSA unless aggregated.

Table 7-3. Datasets Available for Use in Populating the DMS

Data Sets	Data Category					
	Well and Site Information	Well Construction	Water Level	Groundwater Extraction ¹	Streamflow	Water Quality
MCWRA	X	X	X	X		
GAMA Groundwater Information System (DDW)	X					X
CCRWQCB (GQTM)						X
USGS Gage Stations					X	

¹Pumping data not publicly accessible

Data are compiled and reviewed to comply with data quality objectives. The review included the following checks:

- Removing or flagging questionable data being uploaded in the DMS, which includes identifying outliers that may have been introduced during the original data entry process and plotting each well hydrograph to identify and remove anomalous data points
- Loading into the database and checking for errors and missing data

Well log information is entered for selected wells, and other information will be added as it is acquired to satisfy the requirements of the GSP Regulations.

The DMS includes a publicly accessible web map hosted on the SVBGSA website; accessible at <https://svbgsa.org/gsp-web-map-and-data/>. This web map allows users to visualize and interact with the data stored in the DMS. The web-map interested parties to access non-confidential technical information used in the development of the GSP and annual reports, and includes public well data and analysis such as water level contour maps and seawater intrusion maps, as well as various local administrative boundaries. In addition, the web map has functionalities to be able to graph timeseries of water levels and search for specific wells in the database. This web-map is regularly updated as new information is made available to the SVBGSA.

8 SUSTAINABLE MANAGEMENT CRITERIA

This chapter defines the conditions that constitute sustainable groundwater management; and establishes minimum thresholds, measurable objectives, and undesirable results for each sustainability indicator. The minimum thresholds, measurable objectives, and undesirable results detailed in this chapter define how the Subbasin's sustainability is measured, informing the PMAs that may be needed to achieve these criteria. This chapter includes adequate data to explain how SMC were developed and how they influence all beneficial uses and users.

The chapter is structured to address all the GSP Regulations § 354.22 *et. seq.* regarding SMC. To retain an organized approach, the SMC are grouped by each sustainability indicator. The discussion follows a consistent format that contains all the information required by the GSP Regulations, and as further clarified in the SMC BMP (23 California Code of Regulations § 354.22 *et. seq.*; DWR, 2017).

8.1 Definitions

Key terms relevant to the SMC are repeated from the SGMA legislation and GSP Regulations below. Where there is no definition in the Regulations, additional explanatory text is added.

- **Sustainability indicator** refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in California Water Code § 10721(x).

The 6 sustainability indicators relevant to this subbasin include chronic lowering of groundwater levels; reduction of groundwater storage; degraded water quality; land subsidence; seawater intrusion; and depletion of ISW.

- **Significant and unreasonable** is not defined in the Regulations. However, the definition of undesirable results states, “Undesirable results occur when significant and unreasonable effects...are caused by groundwater conditions....” This GSP adopts the phrase significant and unreasonable to be the qualitative description of undesirable conditions due to inadequate groundwater management. Minimum thresholds are the quantitative measurement of the significant and unreasonable conditions.
- **Minimum threshold** refers to numeric value(s) for each sustainability indicator used to define undesirable results.
Minimum thresholds are indicators of an unreasonable condition.
- **Measurable objective** refers to specific, quantifiable goal(s) for the maintenance or improvement of specified groundwater conditions that has been included in an adopted Plan to achieve the sustainability goal for the basin.

Measurable objectives are goals that the GSP is designed to achieve for each sustainability indicator.

- **Interim milestone** refers to a target value representing measurable groundwater conditions, in increments of 5 years, set by an Agency as part of a Plan.

Interim milestones are targets such as groundwater elevations that will be achieved every 5 years to demonstrate progress towards sustainability.

- **Undesirable Result** is not defined in the Regulations. However, the description of undesirable result states that it should be a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the subbasin. An example undesirable result is more than 10% of the measured groundwater elevations being lower than the minimum thresholds. Undesirable results should not be confused with significant and unreasonable conditions. Significant and unreasonable conditions are qualitative descriptions of conditions to be avoided; an undesirable result is a quantitative assessment based on minimum thresholds.

8.2 Sustainability Goal

The sustainability goal of the Langley Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits to the Subbasin's residents and businesses. The goal of this GSP is to ensure long-term viable water supplies while maintaining the unique cultural, community, and business aspects of the Subbasin. It is the express goal of this GSP to balance the needs of all water users in the Subbasin.

Several PMAs that will allow the SVBGSA to attain sustainability are included in this GSP and detailed in Chapter 9. It is not necessary to implement all projects and actions listed in this GSP to attain sustainability. However, some combination of these will be implemented to ensure the Subbasin is operated within its sustainable yield and meets the sustainability goal throughout the planning and implementation horizon. Chapter 10 describes the prioritized PMAs as of GSP Amendment 2. This portfolio of PMAs provide sufficient options to attain sustainability in the Langley Subbasin throughout GSP implementation.

The management actions and projects are designed to attain sustainability within the next 20 years by one or more of the following means:

- Educating stakeholders and prompting changes in behavior to improve chances of achieving sustainability
- Increasing awareness of groundwater pumping impacts to promote voluntary reductions in groundwater use through improved water use practices or fallowing crop land

- Increasing basin recharge, including through injections into the confined aquifers.
- Creating barriers to the expansion of seawater intrusion.
- Developing new alternative water supplies for use in the Subbasin to offset groundwater pumping

8.3 Achieving Long-Term Sustainability

The GSP addresses long-term groundwater sustainability. Correspondingly, the SVBGSA has developed SMC to avoid undesirable results under future hydrologic conditions. The understanding of future conditions is based on historical precipitation, ET, streamflow, and reasonable anticipated climate change, which have been estimated based on the best available climate science (DWR, 2018). These parameters underpin the estimated future water budget over the planning horizon (see Section 6.4). The average hydrologic conditions include reasonably anticipated wet and dry periods. Groundwater conditions that are the result of extreme climatic conditions and are worse than those anticipated do not constitute an undesirable result. However, SMC may be modified in the future to reflect observed future climate conditions.

The GSA tracks hydrologic conditions as an ongoing GSP implementation activity. These observed hydrologic conditions are used to develop values for average hydrologic conditions, which are compared to predicted future hydrologic conditions. This information will be used to interpret the Subbasin's performance against SMC. This GSP is developed to avoid undesirable results with long-term, deliberate groundwater management, not with continual micro-management. For example, groundwater extractions may experience variations caused by reasonably anticipated hydrologic fluctuations. However, under average hydrologic conditions, GSP PMAs consider these factors. Because the GSP addresses long-term groundwater sustainability, exceedance of some SMC during an individual year does not constitute an undesirable result by itself. Pursuant to SGMA Regulations (California Water Code § 10721(w)(1)), "Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods." Therefore, groundwater levels may temporarily fall below minimum thresholds during prolonged droughts, which could be more extreme than those that have been anticipated based on historical data and anticipated climate change conditions. Such temporary exceedances do not constitute an undesirable result.

The SMC presented in this chapter are developed based on historically observed hydrologic conditions and, in most cases, reasonably anticipated climate change. These SMC may be updated in future amendments to reflect changes in anticipated climate conditions and climate change based upon groundwater modeling results or changes in anticipated monitoring trends.

8.4 General Process for Establishing Sustainable Management Criteria

The SMC presented in this chapter were developed using publicly available information during development of the original GSP and subsequent amendments. The process has included feedback gathered during public meetings hydrogeologic analysis, and coordination with other agencies. The general process included:

- Presenting to subbasin committees on the general SMC requirements and implications. These presentations outlined the approach to developing SMC and discussed initial SMC ideas.
- Providing supplemental data to the subbasin committees to guide the approach to setting SMC.
- Polling and receiving feedback from the subbasin committees to establish preferences for establishing SMC.
 - Obtaining additional input on SMC from GSA staff and GSA Board Members.
 - Modifying minimum thresholds and measurable objectives based on input from the public, GSA staff, and GSA Board Members, if needed.
- During GSP Amendment 1, the process included:
 - Presenting to the Subbasin Committee on the general SMC requirements and implications. These presentations outlined the original approach to developing SMC.
 - Presenting to the Subbasin Committee on lessons learned on SMC since 2022, including DWR's review and assessment of the Salinas Valley GSPs. Amendment 1 incorporates DWR's suggested corrective actions into the SMC where appropriate.
- Discussions on updates to the approach to SMC in the GSP Amendments and receiving feedback from the Subbasin Committees and public.
- Modifying SMC approach for the storage and ISW SMC based on input from the Subbasin Committee and Board approval of the amendments.
- Receiving public comments on the GSP Amendment SMC updates, and discussing public comments with the Subbasin Committee and Board.
- Considering the preferred portfolio of PMAs to be able to achieve SMC within SGMA timeframes.¹

8.5 Sustainable Management Criteria Summary

Table 8-1 provides a summary of the 4 SMC for each of the 6 sustainability indicators. One of these SMC, measurable objectives, are the goals that reflect SVBGSA's desired groundwater conditions in the Subbasin for each sustainability indicator. These measurable objectives provide operational flexibility above the minimum thresholds. Another SMC, minimum thresholds, are quantitative indicators of the Subbasin's locally defined significant and unreasonable conditions. An undesirable result is a combination of minimum threshold exceedances that show a significant and unreasonable condition across the Subbasin as a whole. This GSP is designed to not only avoid undesirable results, but to achieve the sustainability goals within 20 years, along with interim milestones every 5 years to demonstrate progress. The preferred portfolio of management actions and projects is selected to maintain conditions above minimum thresholds or reach the measurable objectives within 20 years and maintain those conditions for 30 years for all 6 sustainability indicators. Chapter 9 also includes contingency projects to provide options for reaching and maintaining sustainability as defined by the SMC. The rationale and background for developing these criteria are described in detail in the following sections.

Minimum thresholds are selected to avoid undesirable results for other sustainability indicators, with the exception of groundwater level minimum thresholds avoiding seawater intrusion. Seawater intrusion requires projects and/or management actions to address within the SGMA timeframe, and depending on those selected and their design, seawater intrusion may not be addressed by protective groundwater elevations. The SMC presented in Table 8-1 are part of the GSA's 50-year management plan: SGMA allows for 20 years to reach sustainability and requires the Subbasin have no undesirable results for the subsequent 30 years.

Table 8-1. Sustainable Management Criteria Summary

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result
Chronic lowering of groundwater levels	Measured through groundwater level representative monitoring well network.	Minimum thresholds are set to 2019 groundwater elevations, adjusted based on well-specific elevation assessments. See Table 8-2.	Measurable objectives are set to 2010 groundwater elevations adjusted based on well-specific elevation assessments.	More than 15% of groundwater elevation minimum thresholds are exceeded.
Reduction in groundwater storage	Measured by proxy through groundwater level representative monitoring well network.	Minimum thresholds are established by proxy using groundwater elevations. The reduction in groundwater storage minimum thresholds are identical to the chronic lowering of groundwater levels minimum thresholds.	Measurable objectives are established by proxy using groundwater elevations. The reduction in groundwater storage measurable objectives are identical to the chronic lowering of groundwater levels measurable objectives.	More than 15% of groundwater elevation minimum thresholds are exceeded. The undesirable result for reduction in groundwater storage is established by proxy using groundwater elevations.
Seawater intrusion	Seawater intrusion maps developed by MCWRA.	Minimum threshold is the 500 mg/L chloride isocontour at the Subbasin boundary.	Measurable objective is identical to the minimum threshold, resulting in no seawater intrusion in the Langley Subbasin.	Any exceedance of the minimum threshold, resulting in mapped seawater intrusion within the Subbasin boundary.
Degraded groundwater quality	Groundwater quality data downloaded annually from GAMA groundwater information system for DDW wells and requested annually from CCRWQCB for ILP wells.	Minimum thresholds are zero additional exceedances of the regulatory drinking water standards or the Basin Plan objectives beyond those observed in 2019 for groundwater quality COC. Exceedances are only measured in public water system supply wells and ILRP on-farm domestic and irrigation supply wells. See Table 8-4.	Measurable objectives are identical to the minimum thresholds.	Future or new minimum thresholds exceedances are caused by a direct result of extraction or GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction, unless minimum threshold exceedances are managed to provide a water supply (i.e., treated, blended, or replaced) or beneficial users are not potentially harmed.
Land Subsidence	Measured using DWR provided InSAR data.	Minimum threshold is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement to account for InSAR errors.	Measurable objective is identical to the minimum threshold, resulting in zero net long-term subsidence.	There is an exceedance of the minimum threshold for subsidence due to lowered groundwater elevations.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result
Depletion of Interconnected Surface Water	Groundwater elevations in shallow wells adjacent to locations of ISW identified using the SVIHM.	Minimum thresholds are established by proxy using shallow groundwater elevations. Minimum thresholds are shallow groundwater elevations observed in 2019 near locations of ISW.	Measurable objectives are established by proxy using shallow groundwater elevations. Measurable objectives are groundwater elevations observed in 2010 near locations of ISW.	There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor ISW.

8.6 Chronic Lowering of Groundwater Levels SMC

8.6.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable groundwater elevations in the Subbasin are those that:

- Are at or below the observed groundwater elevations in 2019. Public and stakeholder input identified these historical groundwater elevations as significant and unreasonable
- Cause low groundwater elevations in a significant number of domestic and small water system wells that lead to inadequate water production
- Interfere with other sustainability indicators, with the exception of seawater intrusion, which will be addressed through PMAs rather than protective groundwater elevations

These significant and unreasonable conditions were determined during development of the original GSP

8.6.2 Minimum Thresholds

The minimum thresholds for chronic lowering of groundwater levels are set to 2019 groundwater elevations, adjusted based on well-specific elevation assessments.

The minimum threshold values for each well within the groundwater level representative monitoring network are provided in Table 8-2. The minimum threshold contour maps, along with the RMS well locations for the single principal aquifer in the Langley Subbasin, are shown on Figure 8-1.

The tables and maps shown below do not include the 8 new monitoring wells SVBGSA added to the monitoring network after the original GSP. Once these wells have approximately 5 years of groundwater elevation measurements, SMC will be established for each and will be documented through annual reports.

Table 8-2. Chronic Lowering of Groundwater Levels Minimum Thresholds and Measurable Objectives

Monitoring Site	Minimum Threshold (feet)	Measurable Objective (feet)
13S/03E-10N01	273.2	278.8
13S/03E-10Q01	435.9	440.9
13S/03E-14M01	364.8	375.7
13S/03E-16J01	50.4	57.2
13S/03E-17F02	-35.4	-25.4
13S/03E-19H01	-3.6	1.4
13S/03E-22F01	66.2	82.4
13S/03E-29A01	-43.9	-33.9
13S/03E-29K01	-38.6	-28.6
13S/03E-32H01	-47.0	-38.0
13S/03E-33T50	-50.0	-45.0

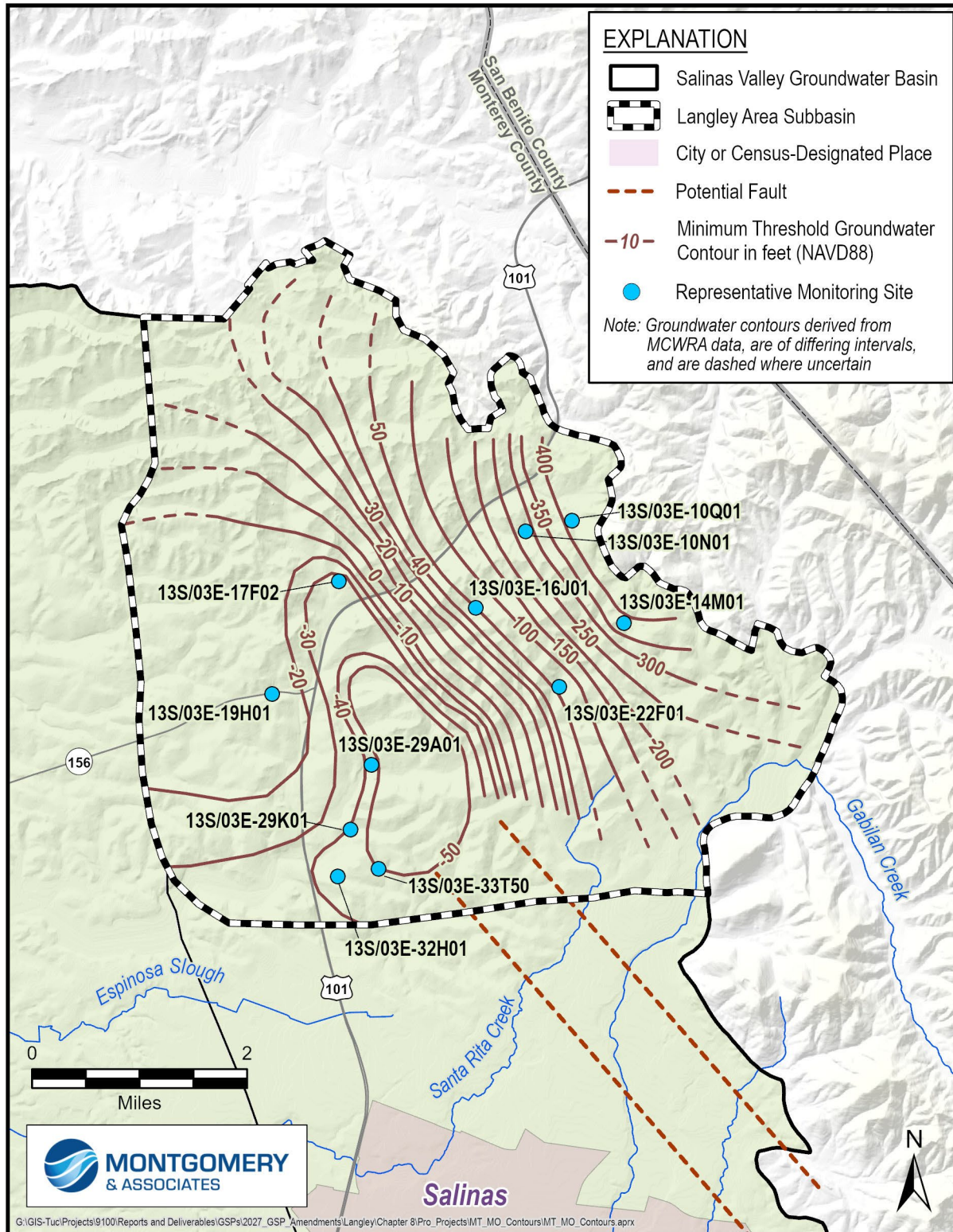


Figure 8-1. Groundwater Level Minimum Threshold Contour Map

8.6.2.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

The development of minimum thresholds and measurable objectives followed similar processes and are described concurrently in this section. The information used includes:

- Feedback from discussions with the Subbasin Committee on challenges and goals
- Historical groundwater elevation data and hydrographs from wells monitored by the MCWRA
- Maps of GSP baseline and historical groundwater elevation data
- Analysis of the impact of groundwater elevations on domestic wells

The following were general steps for developing minimum thresholds and measurable objectives during development of the original GSP included the following:

SVBGSA presented options to the Subbasin Committee and recommended an approach and criteria to set the groundwater level minimum thresholds and measurable objectives, which was approved by the Board through GSP adoption.

SVBGSA used MCWRA's average groundwater elevation change hydrographs to select representative years that could define minimum thresholds and measurable objectives for the Subbasin. Groundwater elevations like those experienced during the representative climatic cycle between 1967 and 1998 were used to identify minimum thresholds and measurable objectives to ensure that they were achievable under reasonably expected climatic conditions. This representative period corresponds to important water management milestones for the Salinas Valley; WY 1967 marks the beginning of operations at San Antonio Reservoir. The CSIP began operating in 1998.

The average groundwater elevation change hydrograph with minimum threshold and measurable objective lines for the Langley Subbasin are shown on Figure 8-2. The average 2019 groundwater elevations in the Langley Subbasin are considered significant and unreasonable. When looking at the groundwater elevation changes within the representative climatic cycle, the historical lowest elevations occurred in 1981, at approximately 2 feet lower than 2019 elevations. The minimum thresholds were therefore set to the 2019 groundwater elevations. The measurable objectives were set to 2010 groundwater elevations, which is an achievable goal for the Subbasin under reasonably expected climatic conditions.

SVBGSA identified the appropriate minimum thresholds and measurable objectives on the respective monitoring well hydrographs. Each hydrograph was visually inspected to check if the minimum threshold and measurable objective was reasonable. If the minimum threshold seemed unreasonable, it was adjusted to be more reflective of recently low groundwater elevations and

changes in groundwater elevations experienced due to climatic cycles. Additionally, measurable objectives were revised in order to set a more realistically achievable goal based on historic water levels. Moreover, the SMC were adjusted to have a difference of at least 5 feet between the 2 levels. The adjusted minimum thresholds and measurable objectives are indicated by an asterisk in Table 8-2.

Hydrographs with well completion information showing minimum thresholds for each RMS are included in Appendix 5A.

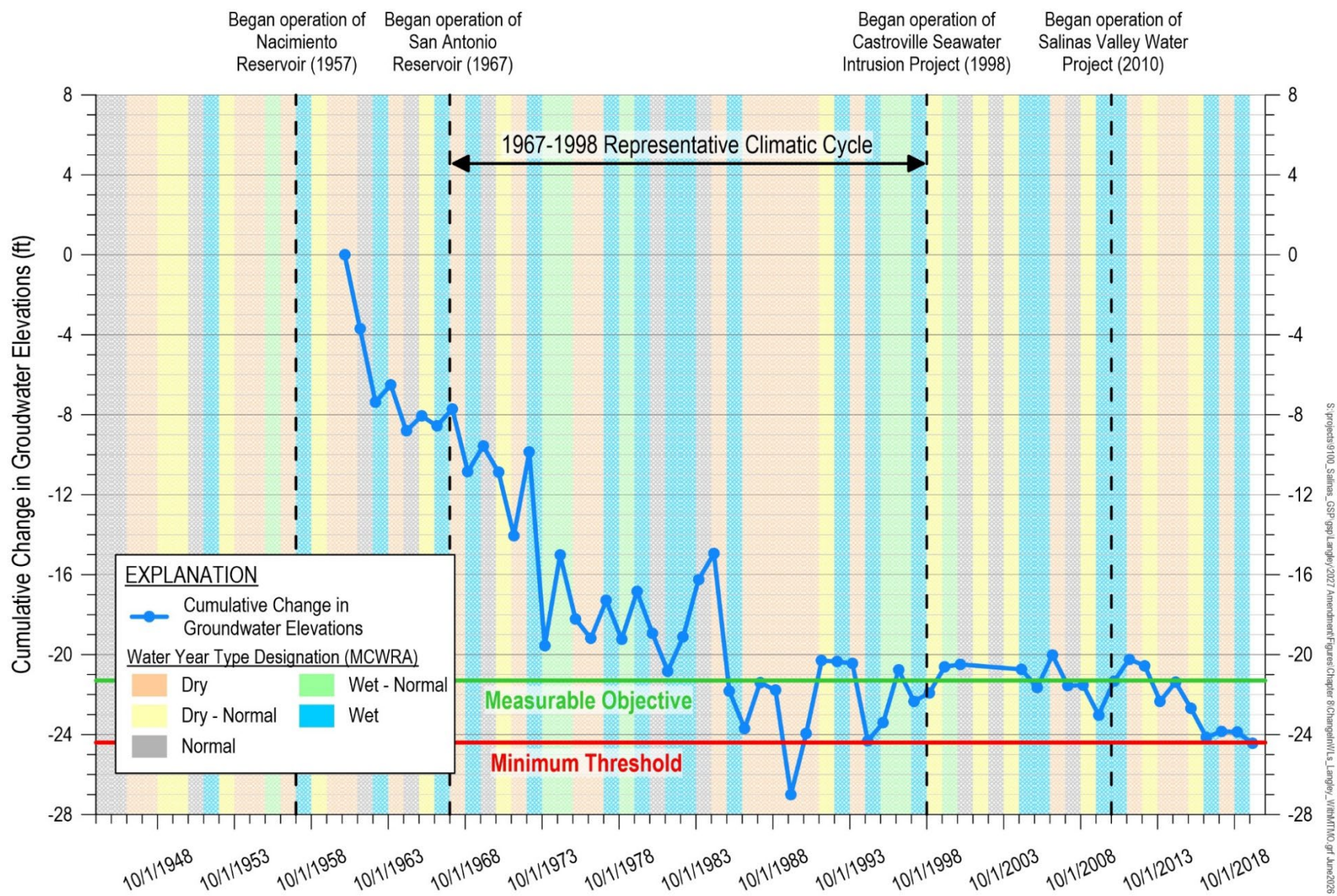


Figure 8-2. Cumulative Groundwater Elevation Change Hydrograph with Selected Minimum Threshold and Measurable Objective for the Langley Subbasin

8.6.2.2 Minimum Thresholds Impact on Domestic Wells

To address the human right to water, minimum thresholds for groundwater levels are compared to the range of domestic well depths in the Subbasin using DWR's OSWCR database. This check was done to assure that the minimum thresholds maintain operability in a reasonable percentage of domestic wells. The proposed minimum thresholds for groundwater levels do not necessarily protect all domestic wells because it is impractical to manage a groundwater basin in a manner that fully protects the shallowest wells. However, domestic wells are an important beneficial user. Well completion reports that were reported as domestic were included; however, some may support multiple households.

The OSWCR database is used to check that most domestic wells are covered by the groundwater level monitoring network. The average computed depth of domestic wells in the Subbasin is 307 feet using the Public Land Survey System sections data in the OSWCR database.

While this approach is reasonable, there are some adjustments that had to be made to improve the accuracy of the analysis. Considerations included:

- The OSWCR database does not eliminate wells that have been abandoned or destroyed, such as if the user switched to a water system and abandoned or destroyed wells would have no detrimental impacts from lowered groundwater levels.
- Well registration under the GMP further informs the analysis.
- Only wells likely to be in the principal aquifer were considered, based on geologic logs, since some domestic wells are drilled in the granite underlying the principal aquifer or the shallow, perched groundwater that is not managed under this GSP.
- Only wells that had accurate locations were included, since the estimated depth to water may not be accurate in those listed as the centroid, particularly in this hilly region. In addition, the groundwater elevation contours may not be accurate in steep terrain.

Given the limitations listed above, the analysis of minimum threshold impacts on domestic wells included 41 wells out of the total 823 domestic wells in the OSWCR database. In the Langley Subbasin, 85% of the domestic wells have at least 25 feet of water in them as long as groundwater elevations remain above minimum thresholds and measurable objectives. These percentages were considered reasonable despite the limitations of this analysis. Since data for the analysis is limited, further assessment may be done when more data becomes available.

An additional analysis was completed using MCWRA well database, which includes 42 active domestic wells. Of these only, 22 wells had construction information and were used to compare to the minimum thresholds. Most domestic wells (86%) will have at least 25 feet of water in them as long as groundwater elevations remain above minimum thresholds and when measurable

objectives are achieved. If more wells with construction information are registered, the assessment may be redone.

For both sets of domestic wells used for the analysis, the depth to water is derived from a smoothly interpolated groundwater elevation contour map and a digital elevation model of land surface elevation. Such regional interpolation maps are the best estimate of the groundwater elevations between measured points in the subbasin; however, site-specific groundwater elevations may not match it precisely. Uncertainty in the regional map may result in discrepancies in groundwater elevations at the selected domestic wells.

8.6.2.3 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

SVBGSA compared minimum thresholds between RMSs to understand the relationship between RMS wells (i.e., describe why or how a groundwater level minimum threshold set at a particular RMS is similar to or different from groundwater level thresholds in RMS). The minimum thresholds are unique at every well, but when combined represent a reasonable and potentially realistic groundwater elevation map. Because the underlying groundwater elevation map is a reasonably achievable condition, the individual minimum thresholds at RMS wells do not conflict with each other.

Groundwater level minimum thresholds are set to avoid undesirable results for other sustainability indicators, with the exception of seawater intrusion. Seawater intrusion requires projects and/or management actions to address within the SGMA timeframe, and depending on those selected and their design, seawater intrusion may not be addressed by protective groundwater elevations. Relationships between groundwater level minimum thresholds and the other sustainability indicators are:

- **Reduction in groundwater storage.** The chronic lowering of groundwater levels minimum thresholds are identical to the groundwater storage minimum thresholds. Thus, the groundwater level minimum thresholds will not result in an undesirable loss of groundwater storage.
- **Seawater intrusion.** The chronic lowering of groundwater level minimum thresholds are set above historical lows. Therefore, the groundwater elevation minimum thresholds are not set to prevent seawater intrusion. Seawater intrusion may be mitigated by either lowering groundwater elevations near the coast to capture seawater intrusion or raising groundwater elevations inland of the intrusion to drive seawater intrusion towards the coast. PMAs may result in lower or higher groundwater elevations to manage seawater intrusion depending on the type of project. The groundwater elevation minimum threshold was not set to solve seawater intrusion in this GSP, but rather to not exacerbate

seawater intrusion, without intervention. This relationship may need to be re-evaluated during the next phase of PMA development.

- **Degraded water quality.** The chronic lowering of groundwater levels minimum threshold could affect groundwater quality through 2 processes:
 1. Changes in groundwater elevation could change groundwater gradients, which could cause poor quality groundwater to flow toward production and domestic wells that would not have otherwise been impacted. These groundwater gradients, however, are only dependent on differences between groundwater elevations, not on the groundwater elevations themselves. Therefore, the minimum threshold groundwater levels do not directly lead to a significant and unreasonable degradation of groundwater quality in production and domestic wells.
 2. Decreasing groundwater elevations may mobilize COC that are concentrated at depth, such as arsenic. The groundwater level minimum thresholds are near or above historical lows at the start of SGMA. Therefore, any depth dependent constituents have previously been mobilized by historical groundwater levels. Maintaining groundwater elevations above the minimum thresholds is intended to assure that no new depth dependent COC are mobilized and are therefore protective of beneficial uses and users.
- **Land subsidence.** The chronic lowering of groundwater levels' minimum thresholds are set at or above recent low groundwater elevations. Thus, avoiding the dewatering and compaction of clay-rich sediments that causes subsidence in response to lowering groundwater elevations. Where groundwater levels are consistently below minimum thresholds, such as in the Deep Aquifers, land subsidence is a risk.
- **Depletion of ISW.** The chronic lowering of groundwater levels' minimum thresholds are identical to the ISW minimum thresholds. Therefore, the groundwater level minimum thresholds will not result in a significant or unreasonable depletion of ISW.

8.6.2.4 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley:

- The Eastside Aquifer Subbasin to the south
- The 180/400 Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because SVBGSA's jurisdiction includes all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. GSPs for the other Salinas Valley subbasins were

submitted in 2022 and approved in 2023. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum thresholds in the Langley Subbasin are above historical low groundwater elevations and the basins are separated by thick clay layers, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency to ensure that the basins do not prevent each other from achieving sustainability.

8.6.2.5 Effects on Beneficial Users and Land Uses

The groundwater level minimum thresholds may have several effects on beneficial users and land uses in the Subbasin.

Agricultural land uses and users. The groundwater level minimum thresholds prevent continued lowering of groundwater elevations in the Subbasin. Unless sufficient recharge projects are undertaken, this may have the effect of limiting the amount of groundwater pumping in the Subbasin and the amount and type of crops that can be grown in the Subbasin. The groundwater level minimum thresholds could therefore limit expansion of the Subbasin's agricultural economy. This could have various effects on beneficial users and land uses:

- Agricultural land under irrigation may become more valuable as bringing new lands into irrigation becomes more difficult and expensive.
- Agricultural land not under irrigation may become less valuable or converted to another land use because it may be too difficult and expensive to irrigate.
- Keeping groundwater elevations above historical lows will help prevent greater electricity demand associated with pumping at lower elevations.

Urban land uses and users. The groundwater level minimum thresholds may reduce the amount of groundwater pumping in the Subbasin. This may limit urban growth or result in urban areas obtaining alternative sources of water. This may result in higher water costs for public drinking water system users. Keeping groundwater elevations above historical lows will help prevent greater electricity demand associated with pumping at lower elevations.

Domestic land uses and users. The groundwater level minimum thresholds are intended to protect most domestic wells, including small local system wells. Therefore, the minimum thresholds will likely have an overall beneficial effect on existing domestic land uses by

protecting the ability to pump from domestic wells. However, domestic wells may become dry if they are shallow, groundwater elevations in their vicinity are very low, or pump capacity is low, which may require deeper wells, higher capacity pumps, or joining a water system, if capacity is available. Maintaining groundwater levels above historical lows also helps prevent problems associated with elevations below well screens, such as mechanical damage to wells such as cavitation, reduced pump efficiency, and microbial growth. Additionally, the groundwater elevation minimum thresholds may limit the number of new domestic wells or small state and small local system wells that can be drilled to limit future declines in groundwater elevations.

Ecological land uses and users. The groundwater level minimum thresholds may limit the amount of groundwater pumping in the Subbasin and may limit both urban and agricultural growth. This outcome may benefit ecological land uses and users by curtailing the conversion of native vegetation to agricultural or domestic uses, and by reducing pressure on existing ecological land caused by declining groundwater elevations. Maintaining groundwater levels above historical lows helps protect GDEs whose rooting depths may be exceeded at deeper levels.

8.6.2.6 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for chronic lowering of groundwater levels.

8.6.2.7 Method for Quantitative Measurement of Minimum Thresholds

Groundwater level minimum thresholds will be directly measured from the representative monitoring well network. The groundwater elevation monitoring will be conducted according to the monitoring plan outlined in Chapter 7. Furthermore, the groundwater elevation monitoring will meet the requirements of the technical and reporting standards included in the GSP Regulations.

As noted in Chapter 7, the groundwater level monitoring network in the Subbasin across aquifers as of GSP Amendment 1 includes 19 wells. This includes 8 new monitoring wells that are not discussed in Chapter 8 because they do not have established SMC yet.

8.6.3 Measurable Objectives

The measurable objectives for chronic lowering of groundwater levels represent target groundwater elevations that are higher than the minimum thresholds. These measurable objectives provide operational flexibility to ensure that the Subbasin can be managed sustainably over a reasonable range of hydrologic variability.

The measurable objectives for the chronic lowering of groundwater levels are set to 2010 groundwater elevations, adjusted based on well-specific elevation assessments.

The measurable objectives are summarized in Table 8-2 and are also shown on the hydrographs for each RMS in Appendix 5A.

8.6.3.1 Methodology for Setting Measurable Objectives

The methodology for establishing measurable objectives is described in detail in Section 8.6.2.1. A year from the relatively recent past was selected for setting measurable objectives to ensure that objectives are achievable. Groundwater elevations from 2010 were selected as representative of the measurable objectives for the Langley Subbasin. The measurable objective contour maps along with the representative monitoring network wells are shown on Figure 8-3 for the Langley Subbasin.

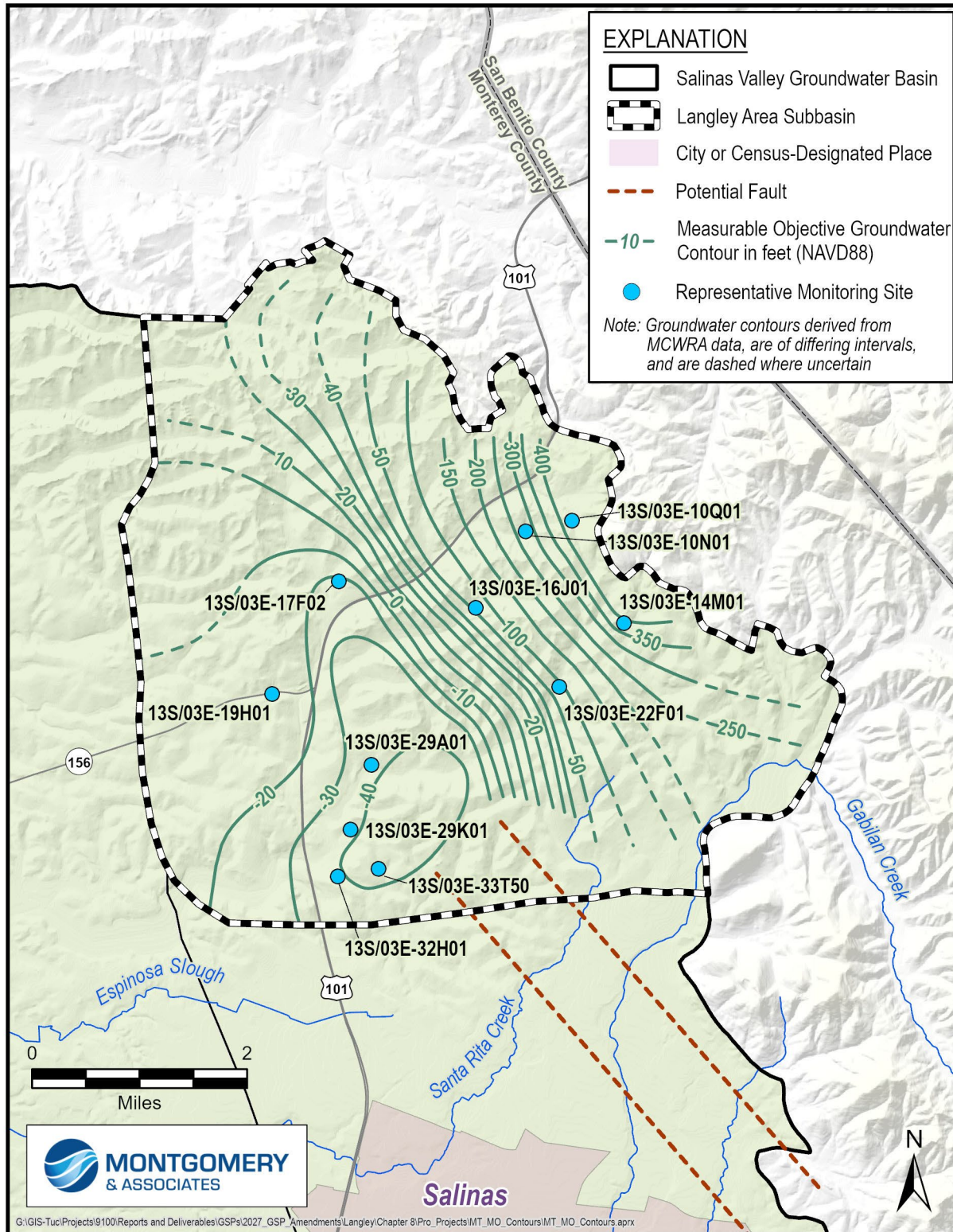


Figure 8-3. Groundwater Level Measurable Objective Contour Map

8.6.3.2 Interim Milestones

Interim milestones for groundwater levels are shown in Table 8-3. These are only initial estimates of interim milestones. Interim milestones for groundwater levels will be modified as better data, analyses, and project designs become available.

Table 8-3. Chronic Lowering of Groundwater Levels Interim Milestones

Monitoring Site	GSP Baseline Groundwater Elevation (feet)	Interim Milestone at Year 2027 (feet)	Interim Milestone at Year 2032 (feet)	Interim Milestone at Year 2037 (feet)	Measurable Objective (feet) (goal to reach at 2042)
13S/03E-10N01	278.5	274.6	276.0	277.4	278.8
13S/03E-10Q01	437.9	437.2	438.4	439.7	440.9
13S/03E-14M01	364.8	367.5	370.3	373.0	375.7
13S/03E-16J01	55.4	52.1	53.8	55.5	57.2
13S/03E-17F02	-35.4	-32.9	-30.4	-27.9	-25.4
13S/03E-19H01	-0.9	-2.4	-1.1	0.2	1.4
13S/03E-22F01	66.2	70.3	74.3	78.4	82.4
13S/03E-29A01	-43.9	-41.4	-38.9	-36.4	-33.9
13S/03E-29K01	-38.6	-36.1	-33.6	-31.1	-28.6
13S/03E-32H01	-47.0	-44.8	-42.5	-40.3	-38.0
13S/03E-33T50	-50.0	-48.8	-47.5	-46.3	-45.0

8.6.4 Undesirable Results

8.6.4.1 Criteria for Defining Chronic Lowering of Groundwater Levels Undesirable Results

The chronic lowering of groundwater levels undesirable result is a quantitative combination of groundwater level minimum threshold exceedances. The undesirable result is:

More than 15% of the groundwater elevation minimum thresholds are exceeded.

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater levels minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code §10721(w)(1)), “Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.” Therefore, groundwater levels may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result as long as groundwater levels rebound.

Undesirable results provide flexibility in defining sustainability. Increasing the percentage of allowed minimum threshold exceedances provides more flexibility but may lead to significant and unreasonable conditions for some beneficial users. Reducing the percentage of allowed minimum threshold exceedances ensures strict adherence to minimum thresholds but reduces flexibility due to unanticipated hydrologic conditions. The undesirable result was set at 15% to balance the interests of beneficial users with the practical aspects of groundwater management under uncertainty.

Based on the RMS wells that have SMC as of GSP Amendment 1, the 15% limit on minimum threshold exceedances in the undesirable result allows for 2 exceedances in the 11 existing monitoring wells. This was considered a reasonable number of exceedances given the hydrogeologic uncertainty of aquifer characteristics of the Subbasin. As the monitoring system grows, additional exceedances will be allowed.

8.6.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- **Localized pumping clusters.** Even if regional pumping occurs within the sustainable yield, clusters of high-capacity or heavily utilized wells may cause excessive localized drawdowns that lead to undesirable results.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought.** Minimum thresholds were established based on historical groundwater elevations and reasonable estimates of future climatic conditions and groundwater elevations. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations and undesirable results.
- **Reservoir operations.** Operation of Nacimiento and San Antonio Reservoirs affect the timing and quantity of surface water flows. This affects groundwater levels in the subbasin both directly from recharge of surface water in the Subbasin and indirectly from subsurface flows after recharge in adjacent subbasins. In addition, surface water redirection at the SRDF, along with recycled water availability, affect CSIP groundwater demand.
- **Subsurface flows with adjacent subbasins.** The Langley Subbasin is hydraulically connected with the 180/400 and Eastside Subbasins. Groundwater levels in those subbasins may affect the potential for undesirable results in the Langley Subbasin.

8.6.4.3 Effects on Beneficial Users and Land Uses

Undesirable results for groundwater levels could have negative effects on beneficial users and land uses. Domestic wells are the most vulnerable due to their shallower depths. Low

groundwater levels may result in higher pumping costs, the need to lower well pumps, mechanical problems, microbial contamination, or the need to drill deeper replacement wells. While municipal and agricultural production wells tend to be deeper, their electricity demand and the cost of pumping still increases at lower groundwater levels. Lowering the pump or drilling a deeper well in the same location is not a solution as the levels will only continue to drop unless the well is replaced in a deeper portion of the aquifer. Rural residential domestic users are the most vulnerable, as they tend to have the shallowest wells that are the first to be affected.

GDEs have the potential to be impacted if the depth to groundwater falls below their rooting depths.

The lower the groundwater levels are, the more it increases the risk that seawater intrusion advances inland, as well as vertically migrates to aquifers with lower groundwater levels. The Groundwater Level SMC was not set to prevent seawater intrusion; however, lower groundwater levels could cause greater advancement of seawater intrusion, either laterally or vertically.

8.7 Reduction in Groundwater Storage SMC

8.7.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions in groundwater storage in the Subbasin are those that:

- Lead to chronic, long-term reduction in groundwater storage, or
- Interfere with other sustainability indicators

These significant and unreasonable conditions were determined based on input collected during Subbasin Committee meetings and discussions with GSA staff.

8.7.2 Minimum Thresholds

The minimum thresholds for reduction in groundwater storage are established by proxy using groundwater elevations. The reduction in groundwater storage minimum thresholds are identical to the chronic lowering of groundwater levels minimum thresholds.

Although not the metric for establishing change in groundwater storage, the GSAs are committed to pumping at or less than the Subbasin's long-term sustainable yield. The projected long-term sustainable yield within Chapter 6 is based on the anticipated climate; however, if the climate or other conditions that occurs differ, the long-term amount that can be pumped while maintaining stable groundwater level trends may also differ. This will be further analyzed during GSP

implementation as PMAs are refined and modeling is updated to assess groundwater storage effects and benefits. SGMA allows 20 years to reach sustainability.

8.7.2.1 Information and Methodology Used to Establish Minimum Thresholds

Since groundwater storage and groundwater elevation minimum thresholds are identical, the methodology used to establish minimum thresholds for reduction in groundwater storage are detailed in Section 8.6.2.1.

The general relationship between groundwater storage and groundwater elevations is described in greater detail in Chapter 4, Section 4.4.2. The Subbasin-specific data analysis to establish the proxy relationship between groundwater storage and groundwater elevations is discussed below.

The GSP Regulations § 354.28(d) states that “an Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.”

Figure 8-4 compares the Subbasin’s cumulative change in storage, plotted on the black line, with the average annual change in groundwater elevation, plotted on the blue line. Groundwater elevation change data are derived from the groundwater elevation network; the cumulative change in groundwater storage is derived from the SVIHM. Although the data come from 2 sources, the data show similar patterns between 1998 and 2022. The decrease in storage modeled by the SVIHM from 1983 to 1998 is not reflected in the change in groundwater elevations blue line, because the modeled storage is dependent on the simulated groundwater elevations in the SVIHM.

Figure 8-5 shows a scatter plot of cumulative change in storage and average change in groundwater elevation. The blue data points show data for the entire model period from 1980 to 2022, and the brown data points show data from 1998 to 2022. Although, the data for the entire model period demonstrate a weak correlation ($R^2=0.035$), a more significant positive correlation exists between groundwater elevations and the amount of groundwater in storage between 1998 and 2022 ($R^2=0.517$). The correlation for the 1998 to 2022 period is sufficient to show that groundwater elevations are an adequate proxy for groundwater storage.

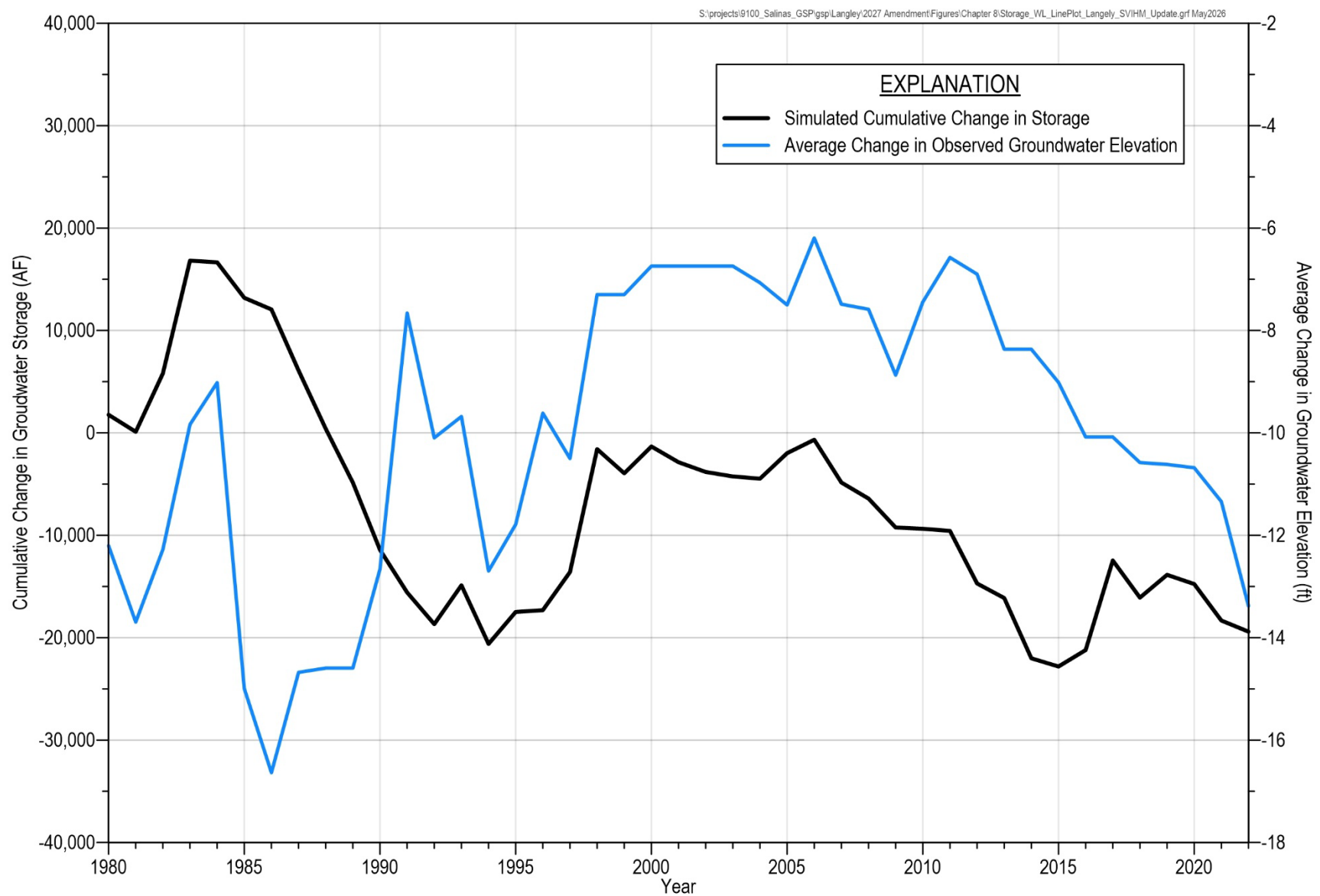
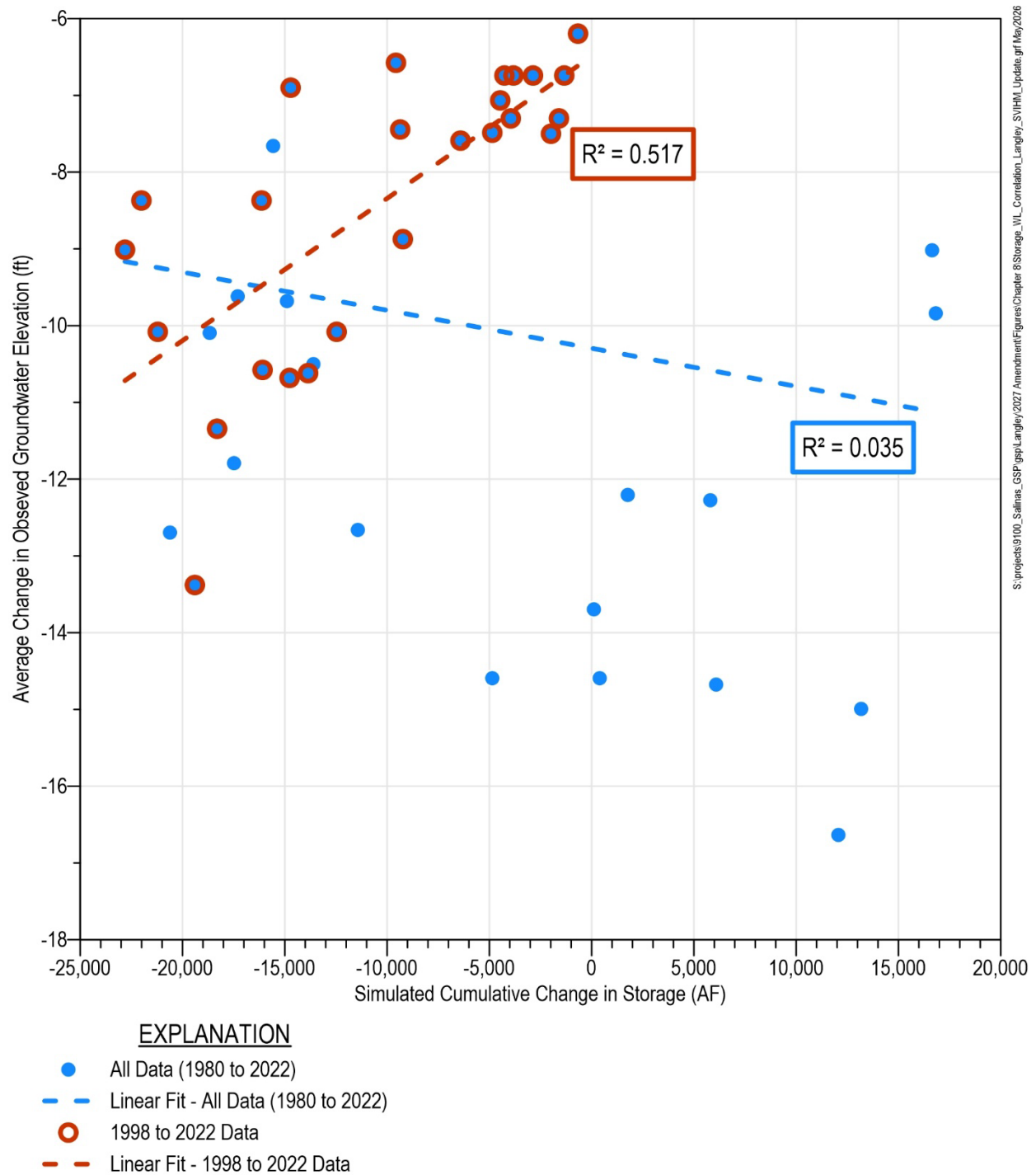


Figure 8-4. Cumulative Change in Storage and Average Change in Groundwater Elevation in the Langley Subbasin



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Figure 8-5. Correlation Between Cumulative Change in Storage and Average Change in Groundwater Elevation

8.7.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The groundwater storage minimum thresholds are identical to groundwater level minimum thresholds, which are consistent with other sustainability indicators, as described in Section 8.6.2.3.

8.7.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley:

- The Eastside Aquifer Subbasin to the south
- The 180/400 Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA's jurisdiction includes all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. GSPs for the other Salinas Valley subbasins were submitted in 2022 and approved in 2023. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Pajaro Valley Basin occurs directly to the north. Because the minimum thresholds in the Langley Subbasin are set to avoid dropping below recent storage levels, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

8.7.2.4 Effect on Beneficial Uses and Users

Because the groundwater storage minimum thresholds are defined based on groundwater level minimum thresholds, the effects of groundwater storage minimum threshold on beneficial uses and users are identical to those described in Section 8.6.2.5.

8.7.2.5 Relation to State, Federal, or Local Standards

No federal, state, or local standards exist for reductions in groundwater storage.

8.7.2.6 Method for Quantitative Measurement of Minimum Threshold

The groundwater level minimum thresholds will be used as proxies for reduction of groundwater storage, therefore, the measurement of change in groundwater storage will be measured as outlined in Section 8.6.2.7 using the groundwater level monitoring network described in Chapter 7.

8.7.3 Measurable Objectives

The measurable objectives for reduction in groundwater storage are established by proxy using groundwater elevations. The reduction in groundwater storage measurable objectives is identical to the chronic lowering of groundwater levels measurable objectives.

8.7.3.1 Methodology for Setting Measurable Objectives

As stated in Section 8.6.3, the groundwater level measurable objectives for chronic lowering of groundwater levels provide an adequate margin of operational flexibility for managing the Subbasin. Therefore, the change in storage measurable objectives were set to be identical to the groundwater level measurable objectives: providing the same margin of operation flexibility.

8.7.3.2 Interim Milestones

The groundwater level interim milestones described in Table 8-3 and Section 8.6.3.2 will serve as proxies for the reduction of groundwater storage interim milestones.

8.7.4 Undesirable Results

8.7.4.1 Criteria for Defining Reduction in Groundwater Storage Undesirable Results

The criteria used to define undesirable results for reduction of groundwater storage are based on minimum thresholds established for chronic lowering of groundwater levels. The reduction of storage undesirable result is:

More than 15% of groundwater elevation minimum thresholds are exceeded. The undesirable result for reduction in groundwater storage is established by proxy using groundwater elevations.

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater storage minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code §10721(w)(1)), “Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels

or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.” Therefore, groundwater storage may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

8.7.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the reduction in groundwater storage sustainability indicator include the following:

- **Expansion of agricultural or municipal pumping.** Additional agricultural or municipal pumping may result in lowered groundwater elevations, lower recharge of the principal aquifers from precipitation or streamflow that reduce groundwater in storage to an undesirable result.
- **Departure from the GSP’s climatic assumptions, including extensive, unanticipated drought.** Minimum thresholds are established based on reasonable anticipated future climatic conditions and groundwater elevations. Departure from the GSP’s climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater recharge and unanticipated high pumping rates that could cause an exceedance of the long-term sustainable yield.
- **Reservoir operations.** Operation of Nacimiento and San Antonio Reservoirs affect the timing and quantity of surface water flows. This affects groundwater levels and storage in the subbasin both directly from recharge of surface water in the Subbasin and indirectly from subsurface flows after recharge in adjacent subbasins. In addition, surface water redirection at the SRDF, along with recycled water availability, affect CSIP groundwater demand.
- **Subsurface flows with adjacent subbasins.** The Langley Subbasin is hydraulically connected with the 180/400 and Eastside Subbasins. Groundwater levels in those subbasins may affect the potential for undesirable results in the Langley Subbasin.

8.7.4.3 Effects on Beneficial Users and Land Use

The practical effect of the reduction in groundwater storage undesirable result is a chronic, long-term net loss of groundwater in storage. Therefore, beneficial uses and users would not have access to a similar amount of water in storage, and the undesirable result would have an additional negative effect on the beneficial users and uses of groundwater.

8.8 Seawater Intrusion SMC

8.8.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable seawater intrusion in the Subbasin is defined as follows:

- Any seawater intrusion in the Subbasin is significant and unreasonable.

This significant and unreasonable condition was determined based on input collected during Subbasin Committee meetings and discussions with GSA staff during the development of the original GSP.

8.8.2 Minimum Thresholds

The minimum threshold for seawater intrusion is defined as the 500 mg/L chloride concentration isocontour at the Subbasin boundary.

Figure 8-6 presents the minimum threshold, shown in red, for seawater intrusion in the Langley Subbasin as represented by the 500 mg/L chloride concentration isocontour. The purple line shows the GSP baseline 2019 extent of seawater intrusion in the 180-Foot Aquifer. This minimum threshold isocontour is the likely extent of seawater intrusion if it were to continue toward the Subbasin based on analysis of the stratigraphy, groundwater elevations, and hydraulic gradients. The minimum threshold in this GSP applies to any seawater intrusion into the Subbasin and does not apply to seawater intrusion outside of the Subbasin.

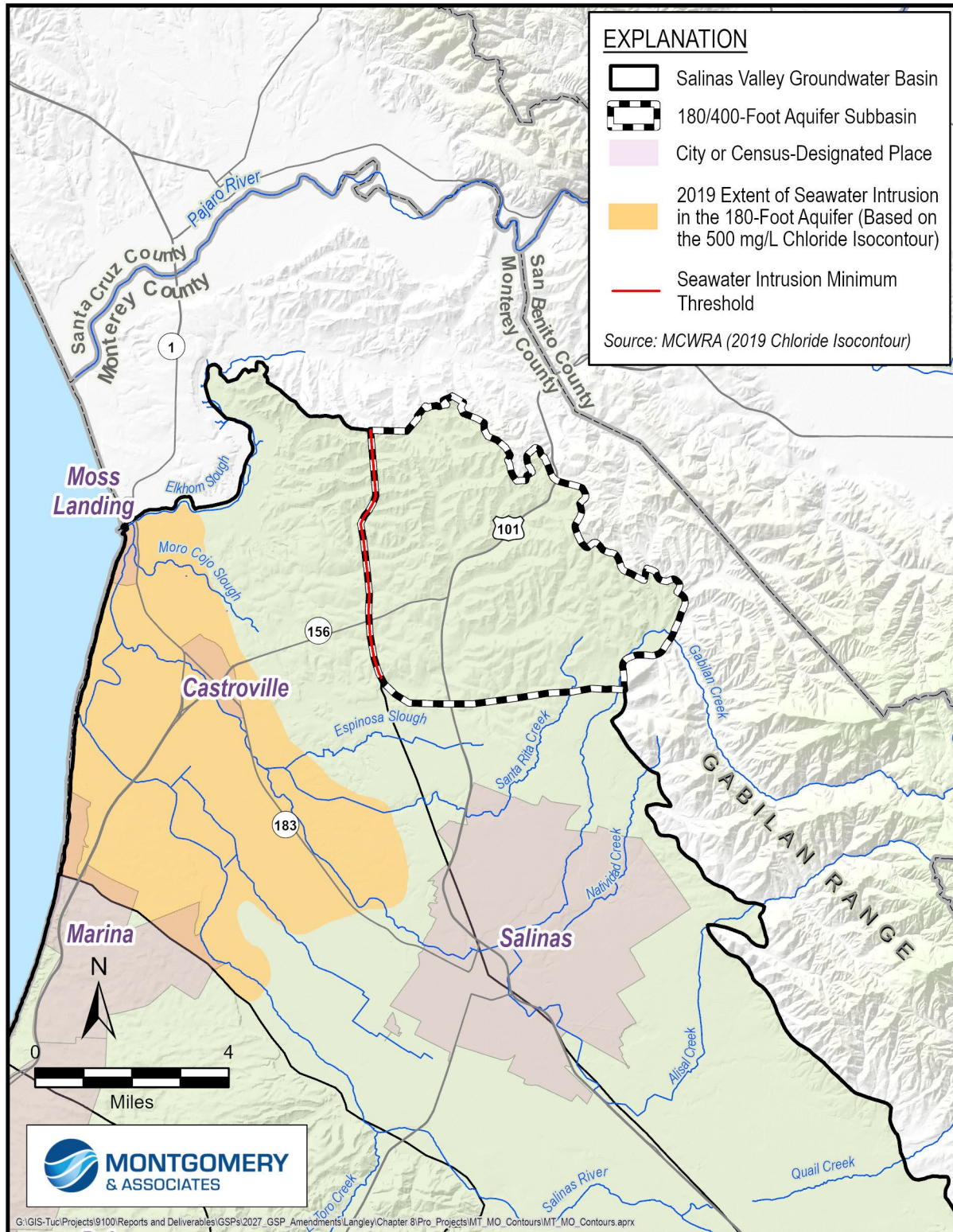


Figure 8-6. Minimum Threshold for Seawater Intrusion in the Langley Subbasin

8.8.2.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

The seawater intrusion minimum threshold is based on seawater intrusion maps developed by MCWRA. MCWRA publishes estimates of the extent of seawater intrusion every year. The MCWRA maps define the extent of seawater intrusion as the inferred location of the 500 mg/L chloride isocontour. These maps are developed through analysis and contouring of the values measured at privately-owned wells and dedicated monitoring wells within and adjacent to areas affected by seawater intrusion. The map of seawater intrusion used to develop the minimum threshold is included in Chapter 5.

The groundwater models used to assess the effectiveness of PMAs on seawater intrusion specifically incorporates assumptions for future sea level rise. Therefore, actions to avoid undesirable results will include sea level rise assumptions in their design and development. Future development of PMAs in the next phase of GSP implementation may warrant further review and modification of the seawater intrusion minimum threshold based on their ultimate timing, scale, configuration and anticipated benefits and effects.

8.8.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The relationship between the seawater intrusion minimum threshold and other sustainability indicators are as follows:

- **Chronic lowering of groundwater levels.** The seawater intrusion minimum threshold does not promote additional pumping that could cause groundwater elevations to decrease in the Subbasin. Therefore, the seawater intrusion minimum threshold will not result in significant or undesirable groundwater elevations.
- **Reduction in groundwater storage.** The seawater intrusion minimum threshold does not promote additional pumping in excess of the sustainable yield. Therefore, the seawater intrusion minimum threshold will not result in an exceedance of the groundwater storage minimum threshold. Groundwater storage, as measured by pumping, will not be affected by the seawater intrusion minimum thresholds.
- **Degraded water quality.** The seawater intrusion minimum threshold does not promote decreasing groundwater elevations that could lead to exceedances of groundwater quality minimum thresholds. In fact, the seawater intrusion minimum threshold may have a beneficial impact on groundwater quality by preventing increases in chloride concentrations in supply wells.
- **Land subsidence.** The seawater intrusion minimum threshold does not promote additional pumping that could cause subsidence. Therefore, the seawater intrusion

minimum threshold will not result in an exceedance of the subsidence minimum threshold.

- **Depletion of ISW.** The seawater intrusion minimum threshold does not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the seawater intrusion minimum threshold will not result in a significant or unreasonable depletion of ISW.

8.8.2.3 Effect of Minimum Threshold on Neighboring Basins and Subbasin

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley:

- The Eastside Aquifer Subbasin to the south
- The 180/400 Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA's jurisdiction covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. GSPs for the other Salinas Valley subbasins were submitted in 2022 and approved in 2023. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasins' GSPs and to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Pajaro Valley Basin has submitted an alternative submittal. Because the minimum threshold in the Langley Subbasin is to prevent seawater intrusion from advancing into the Subbasin and there are thick clay layers between the basins, it is likely that the minimum threshold will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

8.8.2.4 Effects on Beneficial Users and Land Uses

Agricultural land uses and users. The seawater intrusion minimum threshold generally provides positive benefits to the Subbasin's agricultural water users. Preventing seawater intrusion into the Subbasin ensures that a supply of usable groundwater will exist for agricultural use.

Urban land uses and users. The seawater intrusion minimum threshold generally provides positive benefits to the Subbasin's urban water users. Preventing seawater intrusion into the Subbasin will help ensure an adequate supply of groundwater for drinking water supplies.

Domestic land uses and users. The seawater intrusion minimum threshold generally provides positive benefits to the Subbasin’s domestic water users. Preventing seawater intrusion into the Subbasin will help ensure an adequate supply of groundwater for domestic supplies.

Ecological land uses and users. Although the seawater intrusion minimum threshold does not directly benefit ecological uses, it can be inferred that the seawater intrusion minimum thresholds provide generally positive benefits to the Subbasin’s ecological water uses. Preventing seawater intrusion into the Subbasin will help prevent unwanted high salinity levels from impacting ecological groundwater uses.

8.8.2.5 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for seawater intrusion.

8.8.2.6 Method for Quantitative Measurement of Minimum Threshold

Chloride concentrations are measured in groundwater samples collected from the MCWRA’s seawater intrusion monitoring network. These samples are used to develop the inferred location of the 500 mg/L chloride isocontour. The methodology and protocols for collecting samples and developing the 500 mg/L chloride isocontour are detailed in Appendix 7B and Appendix 7C.

8.8.3 Measurable Objectives

The measurable objective for seawater intrusion is identical to the minimum threshold that is shown on Figure 8-6.

The measurable objective for seawater intrusion is defined as the 500 mg/L chloride concentration isocontour at the Subbasin boundary.

8.8.3.1 Methodology for Setting Measurable Objectives

In the Langley Subbasin, the measurable objective for the seawater intrusion SMC is the same as the minimum threshold: preventing the 500 mg/L chloride isocontour from entering the Subbasin. The methodology used to set measurable objectives is discussed in Section 8.8.2.1.

8.8.3.2 Interim Milestones

The interim milestones for seawater intrusion are the same as the measurable objective, which is setting the 500 mg/L chloride isocontour at the subbasin boundary.

8.8.4 Undesirable Results

8.8.4.1 Criteria for Defining Seawater Intrusion Undesirable Results

The seawater intrusion undesirable result is a quantitative combination of chloride concentrations minimum threshold exceedances. Because even localized seawater intrusion is not acceptable, the subbasin-wide undesirable result is zero exceedances of the minimum threshold. The seawater intrusion undesirable result is:

Any exceedance of the minimum threshold, resulting in mapped seawater intrusion within the Subbasin boundary.

8.8.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- Groundwater levels below sea level and an inland flow gradient
- Increased pumping, such as during droughts, that lowers groundwater levels inland of the seawater intrusion front and causes additional intrusion
- Unanticipated high sea level rise

8.8.4.3 Effects on Beneficial Users and Land Use

The primary detrimental effect on beneficial users and land uses from allowing seawater intrusion to occur in the Subbasin is that the pumped groundwater may become saltier, which can impact crop production and may cause potential exceedances of secondary MCLs. This may necessitate treatment or blending of water, or drilling wells deeper, or limit the amount or type of crops that can be grown. Agricultural land may become less valuable because it may be too difficult and expensive to irrigate. Reduced yields may have a ripple effect on the local economy and may negatively affect land values. Thus, preventing seawater intrusion into the Subbasin prevents impacts to domestic and municipal wells and associated land uses. Preventing seawater intrusion in the Subbasin may also protect agriculture.

8.9 Degraded Water Quality SMC

8.9.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable changes in groundwater quality resulting from a direct result of extraction or GSA groundwater management action that either:

- Increase the number of potable water supply wells in which above an established MCL or SMCL, or

- Increase in the number of agricultural supply wells in which COC concentrations may lead to significantly reduced crop production based on the water quality objectives from the Water Quality Basin Plan for the Central Coastal Basin (CCRWQCB, 2019).

These are not considered significant and unreasonable if they are not managed to provide drinking water supply (i.e., treated, blended, or replaced) or if beneficial users are not potentially impacted. These significant and unreasonable conditions were determined with input from the Subbasin Committee, other coordinating GSAs, and discussions with GSA staff, and for GSP Amendment 1, the CCRWQCB. These conditions were determined to be significant and unreasonable because groundwater quality in exceedance of these could cause a financial burden on groundwater users or otherwise harm them. Public water systems with COC concentrations above the MCL or SMCL are required to add treatment to the drinking water supplies or drill new wells. Agricultural wells with COCs that significantly reduce crop production will reduce grower's yields and profits.

8.9.2 Minimum Thresholds

The minimum thresholds for degraded water quality are zero additional exceedances of the regulatory drinking water standards or Basin Plan objectives beyond those observed in 2019 for groundwater quality constituents of concern.

The minimum thresholds for all wells in the monitoring network reflect California's Title 22 drinking water standards and the water quality objectives listed in the Basin Plan (CCRWQCB, 2019). The minimum threshold values are based on data up to September 30, 2019. While SGMA states that undesirable results that occur after January 1, 2015, should be addressed for groundwater quality, 2019 was selected because it was the last year of data available when the original GSP was drafted and there was no substantial difference from 2015 water quality data. Full discussion of these GSP baseline conditions is included in Chapter 5 and comparison between 2015 and 2019 quality is included in the 2027 GSP Periodic Evaluation. Because the minimum thresholds reflect no additional exceedances, the minimum thresholds are set to the percentage of exceedances in 2019. Surpassing the percentage of existing exceedances for any of the listed constituents will lead to an undesirable result. Not all wells in the monitoring network are sampled for every COC.

The constituents listed in Table 8-4 comprise the constituent watchlist for the Langley Subbasin. This table expands upon the water quality assessment presented in Table 5-3. A subset of these constituents defines the constituents of concern (COC) for which SMC are established. Several constituents were not sampled prior to WY 2019; however, these constituents exceed the Title 22 regulatory standard or Basin Plan water quality objective during the WY 2021 to WY 2025 period, and therefore need to be included in the constituent watchlist.

The fourth through sixth columns of Table 8-4 show the criteria used to select COC that are described in Section 8.9.2.1. To be a COC, a constituent had to be found above the level of concern in 3 out of 5 years from WY 2021 to WY 2025, exist in at least 10% of wells, and occur in at least 5 wells averaged over this period. The constituents selected to be COC are highlighted in orange in Table 8-4. Nitrate does not meet the last criterion to be a COC, however, due to the widespread use of septic tanks, nitrate has historically been a concern in the Subbasin. Similarly hexavalent chromium does not meet the last criterion to be a COC, however, sampling for this COC is expected to ramp up now that the MCL has been established.

Only constituents that meet the criteria in Section 8.9.2.1 are designated as COC; however, all monitored constituents included in the watchlist are reviewed as part of annual reports. As part of 5-year periodic evaluations, the list of COCs are reassessed and SMC are added for additional constituents if they meet the COC criteria. This enables identification of persistent constituents, rather than year-to-year fluctuations. If any new COC are identified during the periodic evaluation, the minimum threshold is either: 1) set to 0% if it was sampled for and there were no exceedances of the level of concern for the COC in WY 2019, or 2) set after initial years of monitoring if it was not historically sampled.

Table 8-4. Water Quality Constituent Watchlist and Minimum Thresholds

Constituent	Concentration	Standard Units	Data from WY 2021 to WY 2025 for COC Criteria			Data up to WY 2019		
			Number of Years with Level of Concern Exceedances (COC >3)	Average Percentage of Wells with Exceedances (COC >10%)	Average Number of Wells with Exceedances (COC >5)	Number of Wells Sampled for COC	Number of Wells Exceeding Regulatory Standard from latest sample	Minimum Threshold/ Measurable Objective – Percent of Wells Exceeding Level of Concern
DDW Wells (Data from July 1986 to September 2019)								
Arsenic	10	UG/L	5	26%	8	82	10	12%
Chloride	106	mg/L	4	17%	2	78	14	18%
Chromium	50	µg/L	1	3%	1	0	0	-
Chromium, Hexavalent (Cr6)	10	µg/L	1	10%	3	80	10	13%
Iron	300	µg/L	5	35%	8	78	18	23%
Manganese	50	µg/L	5	45%	9	77	19	25%
Mercury	2	µg/L	1	1%	1	0	0	-
Methyl-tert-butyl ether (MTBE)	13	µg/L	0	0%	0	80	2	3%
Nitrate (as nitrogen)	10	mg/L	5	9%	7	160	16	10%
Sodium	69	mg/L	3	54%	4	0	0	-
Specific Conductivity	1,600	µmhos/cm	3	4%	0	86	2	2%
Total Dissolved Solids	1,000	mg/L	3	5%	0	78	2	3%
ILP On-Farm Domestic Wells (Data from March 2014 to August 2019)								
1,2,3-Trichloropropane (1,2,3-TCP)	0.005	µg/l	1	13%	1	0	0	-
Nitrate+nitrite (sum as nitrogen)	10	mg/L	3	50%	1	0	0	-
ILP Irrigation Supply Wells (Data from November 2012 to May 2019)								
Chloride	106	mg/L	2	100%	1	3	2	67%
Nitrate + Nitrite (sum as nitrogen)	10	mg/L	1	2%	1	0	0	-
Sodium	69	mg/L	2	100%	1	3	1	33%

8.9.2.1 Information and Methodology Used to Establish Water Quality Minimum Thresholds and Measurable Objectives

As noted in the GSP Regulations, minimum thresholds are based on a degradation of groundwater quality, not an improvement of groundwater quality (23 CCR § 354.28 (c)(4)). Therefore, this GSP is designed to avoid taking any action that may inadvertently move groundwater constituents already in the Subbasin in such a way that the constituents have a significant and unreasonable impact that would not otherwise occur. The constituents that have historically occurred in the Subbasin up to 2025 were reviewed and were included as COCs if they met the following criteria:

1. They must have an established level of concern such as an MCL or SMCL for drinking water, or a level known to affect crop production.
2. They must have been found in the Subbasin at levels above the level of concern in at least 3 years from WY 2021 to WY 2025.
3. They must have been found in the Subbasin at levels above the level of concern in 10% or more of the wells sampled on average between WY 2021 and WY 2025.
4. They must occur at levels above the level of concern in at least 5 wells in the monitoring network averaged from WY 2021 to WY 2025.

8.9.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

Based on the review of groundwater quality in Chapter 5, the COC that may affect drinking water supply wells or are known to cause reductions in crop production are listed in Table 8-4. The other constituents discussed in Chapter 5 that do not meet the COC criteria will be monitored under the constituent watchlist but are not used to define the SMC. Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

Preventing degradation of groundwater quality may affect other sustainability or may limit activities needed to achieve minimum thresholds for other sustainability indicators, as described below:

- **Chronic lowering of groundwater levels.** The degradation of groundwater quality minimum thresholds could influence groundwater level minimum thresholds by limiting the types of water that can be used for recharge to maintain or raise groundwater elevations.
- **Reduction in groundwater storage.** The degradation of groundwater quality minimum thresholds could influence groundwater storage minimum thresholds by limiting the types of water that can be used for recharge to maintain or raise groundwater elevations.

- **Seawater intrusion.** The degradation of groundwater quality minimum thresholds does not promote additional pumping that could exacerbate seawater intrusion. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the seawater intrusion minimum threshold.
- **Land subsidence.** The degradation of groundwater quality minimum thresholds does not promote additional pumping that could cause subsidence. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the subsidence minimum threshold.
- **Depletion of ISW.** The degradation of groundwater quality minimum thresholds does not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable depletion of ISW.

8.9.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The anticipated effect of the degraded groundwater quality minimum thresholds on each of the neighboring subbasins is addressed below.

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley:

- The Eastside Aquifer Subbasin to the south
- The 180/400 Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because SVBGSA's jurisdiction includes all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. GSPs for the other Salinas Valley subbasins were submitted in 2022 and approved in 2023. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum thresholds in the Langley Subbasin are to prevent degradation of water quality, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

8.9.2.4 Effect on Beneficial Uses and Users

Agricultural land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's agricultural water users. The minimum thresholds help ensure extraction or GSA actions do not degrade groundwater quality such that it would reduce crop production. This helps protect groundwater supplies for agricultural production.

Urban land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's urban water users. The minimum thresholds help ensure extraction or GSA actions do not degrade groundwater quality such that it would cause more drinking water wells to violate drinking water standards. This helps provide adequate groundwater quality for public water system supplies.

Domestic land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's domestic water users. Preventing any GSA actions that would result in COC in additional drinking water supply wells exceeding MCLs or SMCLs ensures adequate groundwater quality for domestic supplies.

Ecological land uses and users. Although the groundwater quality minimum thresholds do not directly benefit ecological uses, it can be inferred that the degradation of groundwater quality minimum thresholds provide generally positive benefits to the Subbasin's ecological water uses. GDEs could potentially become impacted if contaminated groundwater is taken up by GDEs. Some effects may be indirect, such as elevated nitrates stimulating additional aquatic growth, resulting in depressed dissolved oxygen levels. Species-specific tolerance levels for each COC is unknown, so minimum thresholds help protect ecological uses by preventing further degradation due to extraction or GSA action.

8.9.2.5 Relation to State, Federal, or Local Standards

The groundwater quality minimum thresholds specifically incorporate state and federal water quality standards for drinking water and basin plan objectives.

8.9.2.6 Method for Quantitative Measurement of Minimum Thresholds

Degradation of groundwater quality minimum thresholds will be directly measured from active wells in the Subbasin. Groundwater quality will be evaluated based on SWRCB GAMA groundwater information system data submitted through DDW and data received from CCRWQCB ILP and GQTM Workplan once approved, as discussed in Chapter 7.

Exceedances of MCLs and SMCLs and water quality objectives for crop production will be reviewed annually. This review will be centered around the COC identified above. Every 5 years, in line with Periodic Evaluations, water quality data will be reassessed to determine

whether any additional constituents meet the COC criteria listed above; if so, they will be added to the list of constituents of concern for the Subbasin.

8.9.3 Measurable Objectives

The measurable objectives for degradation of groundwater quality represent target groundwater quality distributions in the Subbasin. SGMA does not mandate the improvement of groundwater quality. Therefore, the measurable objectives are based on no groundwater quality degradation and are identical to the minimum thresholds, as defined in Table 8-4.

The measurable objectives for degraded water quality are zero additional exceedances of the regulatory drinking water standards or Basin Plan objectives beyond those observed in 2019 for groundwater quality constituents of concern.

8.9.3.1 Methodology for Setting Measurable Objectives

As described above, measurable objectives are set to be identical to the minimum thresholds and therefore follow the same method as detailed in Section 8.9.2.1.

8.9.3.2 Interim Milestones

There is no anticipated degradation of groundwater quality during GSP implementation that results from the implementation of projects and actions as described in Chapter 9. Therefore, the expected interim milestones are identical to GSP baseline conditions.

8.9.4 Undesirable Result

8.9.4.1 Criteria for Defining Undesirable Result

Water quality degradation that results in a minimum threshold exceedance becomes an undesirable result when it is a direct result of extraction or GS groundwater management. Some groundwater quality changes are expected to occur independent of SGMA activities; because these changes are not related to SGMA activities or GSA management, they do not constitute an undesirable result. Additionally, SGMA states that GSAs are not responsible for addressing water quality degradation that was present before January 1, 2015 (California Water Code § 10727.2(b)(4)). Therefore, the degradation of groundwater quality reaches an undesirable result when:

Future or new minimum thresholds exceedances are caused by a direct result of extraction or GSA groundwater management, including projects or management actions and regulation of groundwater extraction, unless minimum threshold exceedances are managed to provide a water supply (i.e., treated, blended, or replaced) or beneficial users are not potentially harmed.

The groundwater level SMC is designed and intended to help protect groundwater quality. Setting the groundwater level minimum thresholds at or above historical lows assures that no new depth dependent constituents of water quality concern are mobilized. The GSA may pursue projects or management actions to ensure that groundwater levels do not fall below groundwater level minimum thresholds.

This undesirable result recognizes there is an existing regulatory framework in the form of the California Porter Cologne Act and the federal Clean Water Act that addresses water quality management; and considers existing federal, state, and local groundwater quality standards, which were used in the development of minimum thresholds in the GSP. SVBGSA is not responsible for enforcing drinking water requirements or for remediating violations of those requirements that were caused by others (Moran and Belin, 2019). The existing regulatory regime does not require nor obligate SVBGSA to take any affirmative actions to manage or control existing groundwater quality. However, the GSAs are committed to monitoring and disclosing changes in groundwater quality and ensuring its groundwater management actions do not cause drinking water or irrigation water to be unusable.

SVBGSA will work closely with the Central Coast Regional Water Quality Control Board and other entities that have regulatory authority over water quality. SVBGSA will lead the Water Quality Coordination Group, as described in Chapter 9, which includes meeting annually with these partner agencies to review the status of water quality data and discuss any action needed to address water quality degradation.

If minimum thresholds are exceeded SVBGSA will review the potential causes, groundwater quality, and groundwater gradients to assess if the exceedance resulted from extraction or GSA action or was independent of GSA activities. Both the implementation of actions and assessment of exceedances will occur throughout the GSP timeframe of 50 years as required by SGMA. The evaluation of whether a minimum threshold exceedance constitutes an undesirable result includes:

Step 1: Desktop Assessment

Conduct initial screening of whether the exceedance is likely caused by extraction or GSA groundwater management action, is not managed, and is not associated with seawater intrusion.

Step 2: Coordination and Verification

Consult with the Water Quality Coordination Group.

Step 3: Evaluate Potential Impacts on Beneficial Uses and Users

If the exceedance is likely attributable to extraction or GSA actions, assess whether there are beneficial users that could potentially be harmed.

Step 4: Assess Data Needs

Evaluate whether additional sampling is needed to confirm conditions or better understand causes, considering existing monitoring programs (e.g., Preservation, Inc., MCWRA, SWRCB reporting).

Step 5: Identify Potential Actions to Address Water Quality Degradation

If degradation is linked to extraction or GSA actions, consider appropriate responses, such as:

- Additional data collection and/or analysis
- Modifications to projects or management actions
- Extraction management
- Well mitigation measures

Figure 8-7 outlines these steps and some of the specific considerations within them. Steps 1-3 will be conducted as part of the GSP annual report process. Steps 4 and 5 require more time and will be conducted afterwards. GSP 5-year periodic evaluations will summarize results of all steps, as well as if any management was added after annual reports to address undesirable results.

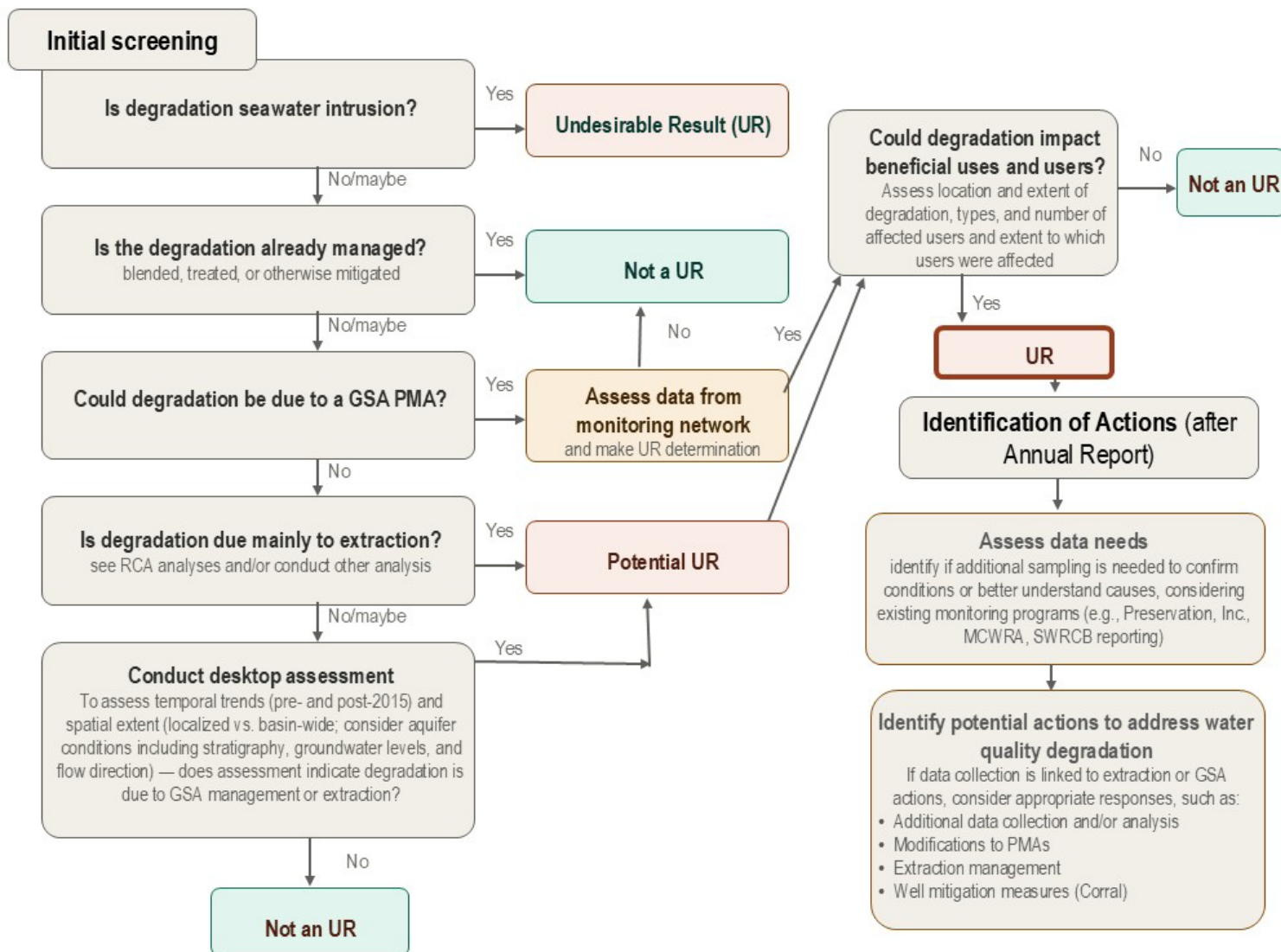


Figure 8-7. Process to Determine if Minimum Threshold Exceedances Constitute an Undesirable Result

For SGMA compliance, undesirable results for groundwater quality are not caused by (1) lack of action, unless due to pumping; (2) GSA required reductions in pumping; (3) exceedances in groundwater quality minimum thresholds that occur if there are fewer exceedances than if there had been a lack of management; (4) exceedances in groundwater quality minimum thresholds that would have occurred independent of pumping or GSA action; or (5) past harm.

8.9.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- **Required Changes to Subbasin Pumping.** If the location and rates of groundwater pumping change as a result of projects implemented under the GSP, these changes could alter hydraulic gradients and associated flow directions, and cause movement of one of the COC toward a supply well at concentrations that exceed relevant standards.
- **Groundwater Recharge.** Active recharge of imported water or captured runoff could modify groundwater gradients and move one of the COC toward a supply well in concentrations that exceed relevant limits.
- **Recharge of Poor-Quality Water.** Recharging the Subbasin with water that exceeds an MCL, SMCL, or level that reduces crop production will lead to an undesirable result.

8.9.4.3 Effects on Beneficial Users and Land Use

Groundwater quality degradation caused by pumping or GSA action could negatively affect beneficial users. Degradation could necessitate treatment for drinking water, reduce crop yields, or limit the types or amount of crops that can be grown. These could increase the cost of water or production. This undesirable result does not apply to groundwater quality changes that occur due to other causes.

8.10 Land Subsidence SMC

8.10.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable subsidence in the Subbasin is defined as follows:

- Any inelastic land subsidence that is caused by lowering of groundwater elevations occurring in the Subbasin or
- Any inelastic subsidence that causes an increase of flood risk.

These significant and unreasonable conditions were determined based on input collected during Subbasin Committee meetings and discussions with GSA staff.

Subsidence can be elastic or inelastic. Elastic subsidence is the small, reversible lowering and rising of the ground surface. Inelastic subsidence is generally irreversible. This SMC only concerns inelastic subsidence.

8.10.2 Minimum Threshold

The minimum threshold for land subsidence is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement measured subsidence to account for InSAR measurement errors.

The 2019 subsidence data from the original GSP, described in Chapter 5, did not exceed the minimum threshold.

8.10.2.1 Information Used and Methodology for Establishing Subsidence Minimum Thresholds

The minimum threshold was established using InSAR data available from DWR. The general minimum threshold is for no long-term irreversible subsidence in the Subbasin. The InSAR data provided by DWR, however, is subject to measurement error. DWR stated that, on a statewide level, for the total vertical displacement measurements between June 2015 and June 2019, the errors are as follows (DWR, 2019, personal communication):

1. The error between InSAR data and continuous GPS data is 16 mm (0.052 feet) with a 95% confidence level.
2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with 95% confidence level.

By adding errors 1 and 2, the combined error is 0.1 foot. While this is not a robust statistical analysis, it does provide an estimate of the potential error in the InSAR maps provided by DWR.

Additionally, the InSAR data provided by DWR reflects both elastic and inelastic subsidence. While it is difficult to compensate for elastic subsidence, visual inspection of monthly changes in ground elevations suggest that elastic subsidence is largely seasonal. To minimize the influence of elastic subsidence on the assessment of long-term, permanent subsidence, changes in ground level will only be measured annually from June of one year to June of the following year.

8.10.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The subsidence minimum threshold has little or no impact on other minimum thresholds, as described below:

- **Chronic lowering of groundwater levels.** The land subsidence minimum threshold will not decrease groundwater elevations and therefore will not result in significant or unreasonable groundwater elevations.
- **Reduction in groundwater storage.** The land subsidence minimum threshold will not change the amount of pumping and therefore will not result in a significant or unreasonable change in groundwater storage.
- **Seawater intrusion.** The land subsidence minimum threshold does not promote additional pumping that could exacerbate seawater intrusion. Therefore, the subsidence minimum threshold will not induce additional advancement of seawater intrusion along the coast.
- **Degraded water quality.** The land subsidence minimum threshold does not promote decreasing groundwater elevations that lead to exceedance of groundwater quality minimum thresholds and therefore will not result in significant or unreasonable degradation of water quality.
- **Depletion of ISW.** The land subsidence minimum threshold does not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the subsidence minimum threshold will not result in a significant or unreasonable depletion of ISW.

8.10.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley:

- The Eastside Aquifer Subbasin to the south
- The 180/400 Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because SVBGSA's jurisdiction includes all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. GSPs for the other Salinas Valley subbasins were submitted in 2022 and approved in 2023. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum threshold in the Langley Subbasin is zero subsidence, it is likely that the minimum threshold will

not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency as it sets minimum threshold to ensure that the basins do not prevent each other from achieving sustainability.

8.10.2.4 Effects on Beneficial Uses and Users

The subsidence minimum threshold is set to prevent any inelastic land subsidence. Available data indicate that as of GSP Amendment 1, there has been no inelastic subsidence occurring in the Subbasin, and therefore the minimum threshold has no impact on GSP baseline pumping rates. The subsidence minimum threshold does not require any additional reductions in pumping, and there is no negative impact on any beneficial user. Increased pumping, however, could initiate subsidence and require pumping restrictions. Therefore, the minimum threshold helps prevent damage to critical infrastructure, such as roads, drinking water systems, and supply wells.

8.10.2.5 Relation to State, Federal, or Local Standards

There are no federal, state, or local regulations related to subsidence.

8.10.2.6 Method for Quantitative Measurement of Minimum Threshold

The minimum threshold will be assessed using DWR-supplied InSAR data.

8.10.3 Measurable Objective

The measurable objective for ground surface subsidence represents a target annual subsidence rate in the Subbasin. Because the minimum threshold of zero net long-term subsidence is the best achievable outcome, the measurable objective is identical to the minimum threshold.

The measurable objective for land subsidence is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement measured subsidence to account for InSAR measurement errors.

8.10.3.1 Methodology for Setting Measurable Objectives

The measurable objective will be assessed using DWR-supplied InSAR data.

8.10.3.2 Interim Milestones

The subsidence measurable objective is set at GSP baseline conditions of no long-term subsidence. There is no change between GSP baseline conditions and sustainable conditions. Therefore, the interim milestones are identical to GSP baseline conditions of zero long-term

subsidence with annual measurements of no more than 0.1 foot of subsidence per year to account for measurement error.

8.10.4 Undesirable Results

8.10.4.1 Criteria for Defining Undesirable Results

By regulation, the ground surface subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. For the Subbasin, no long-term subsidence is acceptable. Therefore, the land subsidence undesirable result is:

There is an exceedance of the minimum threshold for land subsidence due to lowered groundwater elevations.

Should potential subsidence be observed, the SVBGSA will first assess whether the subsidence may be due to elastic subsidence. If the subsidence is not elastic, the SVBGSA will undertake a program to assess whether the subsidence is caused by lowered groundwater elevations. The first step in the assessment will be to check if groundwater elevations have dropped below historical lows. If groundwater elevations remain above historical lows, the GSA shall assume that any observed subsidence was not caused by lowered groundwater levels. If groundwater levels have dropped below historical lows, the GSA will attempt to correlate the observed subsidence with measured groundwater elevations. Additionally, if the Subbasin experiences subsidence in multiple consecutive years that are due to InSAR measurement error, the GSAs will confirm if the error is not actually net long-term subsidence.

8.10.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include a shift in pumping locations. Increasing pumping in an area that is susceptible to subsidence could trigger subsidence that has not been observed before.

8.10.4.3 Effects on Beneficial Users and Land Use

An undesirable result for subsidence would occur if any subsidence were to occur in the Subbasin. Land subsidence can harm critical infrastructure that affects land use and water use, such as roads, drinking water supply systems, and wells.

8.11 Depletion of Interconnected Surface Water SMC

Areas with ISW occur where shallow groundwater may be connected to the surface water system. This SMC applies only to locations of ISW, as shown on Figure 4-9.

The SVIHM is used to identify the locations of ISW and to develop an estimate of the quantity and timing of stream depletions due to pumping during GSP baseline and historical groundwater conditions. Shallow groundwater and surface water levels simulated by the SVIHM are used to identify the location of interconnection and evaluate the frequency with which different stream reaches are connected with groundwater in the underlying aquifer. The magnitude of stream depletions in relation to shallow groundwater elevations in interconnected reaches are evaluated in Chapter 5.

As described in Chapter 7, depletion of ISW due to pumping is monitored and assessed based on shallow groundwater levels near locations of ISW.

8.11.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable depletion of ISW in the Subbasin is defined as:

- Depletions from groundwater extraction that would result in a significant and unreasonable impact on other beneficial uses and users such as riparian water rights holders, appropriative surface water rights holders, ecological surface water users, and recreational surface water uses.
- Shallow groundwater levels near locations of ISW below those observed in 2019. While a documented determination of whether past depletions was significant is not available, staying above 2019 groundwater elevations was determined to be a reasonable balance for all the beneficial uses and users.

These significant and unreasonable conditions were determined based on input collected Subbasin Committee meetings and discussions with GSA staff. There is currently no data that determines what level of depletion from groundwater extraction or what groundwater levels have a significant adverse effect on a beneficial use or user of ISW. Should there be a determination regarding what level of depletion from groundwater extraction is significant, SVBGSA will take that into consideration as it reviews how it locally defines significant and unreasonable conditions for the SMC in the 5-year periodic evaluation.

8.11.2 Minimum Thresholds

The minimum thresholds are established to maintain consistency with the chronic lowering of groundwater elevation and reduction in groundwater storage minimum thresholds, which are also established based on groundwater elevations.

The minimum thresholds for depletion of ISW are shallow groundwater elevations observed in 2019 near locations of ISW.

As discussed in Chapter 7, the monitoring network for ISW is composed of shallow groundwater monitoring well(s). The monitoring network is dependent on the location of ISW established in Chapter 4. SMC will be determined using the well(s)'s groundwater elevations during the minimum threshold and measurable objective years. If the wells have been recently installed or do not have shallow groundwater elevation measurements for those years, SMC will be established when at least 5 years of data have been collected.

8.11.2.1 Information Used and Methodology for Establishing Depletion of Interconnected Surface Water Minimum Thresholds and Measurable Objectives

8.11.2.1.1 Establishing Groundwater Elevations as Proxies

The GSP Regulations § 354.28(d) states that: “an Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.”

The evaluation of ISW in the Salinas Valley is based on an approach recommended by the Environmental Defense Fund (EDF, 2018) that uses groundwater elevations as surrogates for streamflow depletion rates caused by groundwater use. Basic hydraulic principles state that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream, or conversely seepage from a stream to the underlying aquifer, is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. Assuming the elevation in the stream is relatively stable, changes in interconnectivity between the stream and the underlying aquifer is determined by changes in groundwater levels in the aquifer. Thus, the change in hydraulic gradient between stream elevation and surrounding groundwater elevations is representative of change in interconnection between surface water and groundwater. Monitoring the hydraulic gradient in the aquifer adjacent to the stream monitors the interconnectivity between stream and aquifer. Therefore, the gradient can be monitored by measuring and evaluating groundwater elevations at selected shallow monitoring wells near streams. No existing estimations of the quantity and timing of depletions of ISW exist, nor data available to make estimations, so the hydraulic principles provide the best available information.

8.11.2.1.2 Review of Beneficial Uses and Users of Surface Water

The various beneficial uses and users of surface waters were addressed when setting the ISW depletion minimum thresholds. The classes of beneficial uses and users that were reviewed include riparian rights holders, appropriative rights holders, ecological surface water users, and recreational surface water users. This is not a formal analysis of public trust doctrine, but it is a reasonable review of all uses and users in an attempt to balance all interests. This was not an assessment about what constitutes a reasonable beneficial use under Article X, Section 2 of the

California Constitution. The minimum thresholds for depletion of ISWs are developed using the definition of significant and unreasonable conditions described above, public information about critical habitat, locations of ISW derived from the SVIHM, and public information about water rights described below.

Riparian water rights holders. Table 8-5 provides a summary of water diversions reported to the SWRCB by water rights holders on tributaries within the Langley Subbasin. The diversion data were obtained from queries of the SWRCB eWRIMS water rights management system and represent all surface water diversions as self-reported by water-rights holders with points of diversion located within the Subbasin boundaries. Table 8-5 shows that there are no riparian rights holders in the Langley Subbasin.

Table 8-5. Reported Annual Surface Water Diversions in the Langley Subbasin

Diversions (Acre-Feet)	2011	2012	2013	2014	2015	2016	2017	2018	2019
Appropriative	16	16	16	16	16	16	16	16	11
Stock pond	0	0	0	0	0	0	9	3	0
Total	16	16	16	16	16	16	25	19	11

Appropriative water rights holders. One appropriative water right holder is shown in Table 8-6. In addition, there are stock ponds that divert water for storage, rather than direct use. The SVBGSA is not aware of any current water rights litigation or water rights enforcement complaints by any appropriative rights holders in the Subbasin. Therefore, SVBGSA assumes that the minimum threshold level of depletion has not injured any appropriative water rights holders in the Subbasin.

Ecological surface water users. There are no known flow prescriptions on any surface water bodies in the Subbasin. Therefore, the minimum threshold level of depletion has not violated any ecological flow requirements. This is not meant to imply that depletions do not impact potential species living in or near surface water bodies in the Subbasin. However, any impacts that may be occurring have not risen to the level that triggers regulatory intervention. Therefore, the impacts from minimum threshold rates of depletion on ecological surface water users is not unreasonable.

Recreational surface water users. No recreational activities such as boating regularly occur on surface water bodies in the Subbasin.

As shown by the analysis above, the minimum threshold rate of surface water depletion is not having an unreasonable impact on the various surface water uses and users in the Subbasin. Therefore, the minimum thresholds are set based on 2019 groundwater elevations.

8.11.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum thresholds for depletion of ISW are set to 2019 groundwater elevations in the shallow monitoring wells within the Subbasin. The minimum thresholds all reference the same historical year and have existed simultaneously in the past. Therefore, no conflict exists between minimum thresholds measured at various locations within the Subbasin.

The depletion of ISW minimum thresholds could influence other sustainability indicators as follows:

- **Chronic lowering of groundwater levels.** The depletion of ISW minimum thresholds is identical to the groundwater level minimum thresholds. Therefore, the ISW minimum thresholds will not result in chronic lowering of groundwater elevations.
- **Reduction in groundwater storage.** The depletion of ISW minimum threshold is identical to the change in storage minimum thresholds, which are the same as the groundwater level minimum thresholds. Therefore, the depletion of ISW interconnected minimum thresholds will not result in an undesirable loss of groundwater storage.
- **Seawater intrusion.** The depletion of ISW minimum thresholds does not promote additional pumping that could exacerbate seawater intrusion. Therefore, seawater intrusion will not be affected by the ISW minimum thresholds.
- **Degraded water quality.** The depletion of ISW minimum thresholds does not promote decreasing groundwater elevations that lead to exceedance of groundwater quality minimum thresholds. Therefore, groundwater quality will not be affected by the ISW minimum thresholds.
- **Land subsidence.** The depletion of ISW minimum thresholds does not promote additional pumping that could cause subsidence. Therefore, subsidence will not be affected by the ISW minimum thresholds.

8.11.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley:

- The Eastside Aquifer Subbasin to the south
- The 180/400 Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because SVBGSA's jurisdiction includes all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP

Amendment 1 was submitted in 2025. GSPs for the other Salinas Valley subbasins were submitted in 2022 and approved in 2023. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Pajaro Valley Basin occurs directly to the north of the Langley Subbasin. Although a small portion of the Langley Subbasin does drain to the north there are no significant surface water features or streams in this area. Therefore, the minimum thresholds for depletion of ISW does not influence the ability of Pajaro Valley to achieve sustainability.

8.11.2.4 Effect on Beneficial Uses and Users

The depletion of ISW minimum thresholds may have varied effects on beneficial users and land uses in the Subbasin. Creeks in the Langley Subbasin are ephemeral, so uses and users of any ISW are seasonal.

Agricultural land uses and users. The depletion of ISW minimum thresholds prevent lowering of groundwater elevations adjacent to certain parts of streams beyond historical lows. The measurable objectives are higher than the minimum thresholds, providing flexibility for groundwater extraction needed during droughts. The minimum thresholds are considered less restrictive for agricultural land users than higher thresholds and help protect downstream users. However, pumping limitations may be needed to maintain levels above minimum thresholds if there are insufficient PMAs available.

Urban land uses and users. The depletion of ISW minimum thresholds prevent lowering of groundwater elevations adjacent to certain parts of streams below historical lows. The measurable objective is higher than the minimum threshold, providing flexibility for groundwater extraction needed during droughts. Minimum thresholds higher than historical levels help protect downstream users, but they may limit the amount of urban pumping near streams. However, pumping limitations may be needed to maintain groundwater levels above minimum thresholds if there are insufficient PMAs implemented. If pumping is limited beyond historical levels, municipalities may have to obtain alternative sources of water to achieve urban growth goals. If this occurs, this may result in higher water costs for municipal water users.

Domestic land uses and users. The depletion of ISW minimum thresholds help protect existing domestic land users and uses near locations of ISW from groundwater elevation declines below historical lows by maintaining shallow groundwater elevations near streams and protecting the operability of relatively shallow domestic wells.

Ecological land uses and users. The depletion of ISW minimum thresholds help addresses ecological uses and users by preventing low groundwater levels near locations of ISW beyond what was historically experienced. Additionally, by setting future groundwater levels at or above recent lows, there should be less impact to ecological users than has Experienced at the start of SGMA.

8.11.2.5 Relation to State, Federal, or Local Standards

There are no federal, state, or local regulations related to depletion of ISW. However, both state and federal provisions call for the protection and restoration of conditions necessary for endangered and threatened species.

8.11.2.6 Method for Quantitative Measurement of Minimum Threshold

The SVIHM is used to identify areas of ISW. Groundwater elevations measured in shallow wells adjacent to these areas of ISW will serve as the primary approach for monitoring depletion of ISW.

New shallow monitoring wells installed pursuant to the GSP do not have data from 2019. Minimum thresholds for those wells will be estimated based on the first few years of groundwater elevation measurements.

8.11.3 Measurable Objectives

The measurable objectives for depletion of ISW target groundwater elevations that are higher than the minimum thresholds. The measurable objectives are established to maintain consistency with the chronic lowering of groundwater elevation and reduction in groundwater storage minimum thresholds, which are also established based on groundwater elevations.

The measurable objectives for depletion of ISW are established by proxy using shallow groundwater elevations observed in 2010 near locations of ISW, adjusted based on well-specific elevation assessments.

8.11.3.1 Methodology for Setting Measurable Objectives

The depletion of ISW measurable objectives is set to be identical to the groundwater level measurable objectives. The methodology for establishing measurable objectives is outlined in Section 8.6.2.1. Groundwater elevations from 2010 were selected as representative of the measurable objectives for the Langley Subbasin.

8.11.3.2 Interim Milestones

The interim milestones leading to the depletion of ISW measurable objectives will be added when the measurable objective is set if the monitoring well indicates that groundwater and surface water are connected.

8.11.4 Undesirable Results

8.11.4.1 Criteria for Defining Undesirable Results

By regulation, the depletion of ISW undesirable result is a quantitative combination of minimum threshold exceedances. The undesirable result for depletion of ISW is:

There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor ISW depletion.

Streamflow depletion in the Subbasin is complicated by many factors, such as recharge of the aquifer from streamflow, losses to vegetation, and ET. The ISW SMC applies to depletion of ISW from groundwater use and is monitored by proxy through groundwater elevations. For SGMA compliance purposes, the default assumption is that groundwater elevations below 2019 levels near locations of ISW represent depletions that are significant and unreasonable. Any additional groundwater level declines would likely be an undesirable result that must be addressed under SGMA.

8.11.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the depletion of ISW include the following:

- **Localized pumping increases.** Even if the Subbasin is adequately managed at the Subbasin scale, increases in localized pumping near ISW bodies could reduce shallow groundwater elevations.
- **Expansion of riparian water right water use.** Riparian water rights holders often pump from wells adjacent to streams. Pumping by riparian water rights holder users is not regulated under this GSP. Additional riparian pumping near interconnected reaches of rivers and streams may result in excessive localized surface water depletion.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought.** Minimum thresholds were established based on anticipated future climatic conditions. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations that increase surface water depletion rates.

8.11.4.3 Effects on Beneficial Users and Land Use

Undesirable results for depletion of ISW due to pumping could have negative effects on beneficial users and land uses. Groundwater levels below historical lows near locations of ISW could reduce surface water available for riparian water rights holders, appropriative water rights holders, ecological water uses, and recreational water uses.

SVBGSA will work with MCWRA and state and federal agencies, including National Marine Fisheries Service (NMFS), to further evaluate the effects of shallow groundwater levels near locations of ISW on surface water users and land uses.