FINAL

Paso Basin Cooperative Committee
and the Groundwater Sustainability Agencies

Paso Robles Subbasin
First Annual Report (2017—2019)

March 25, 2020
(updated ~~November~~ February 25~~20~~, 2021~~0~~)

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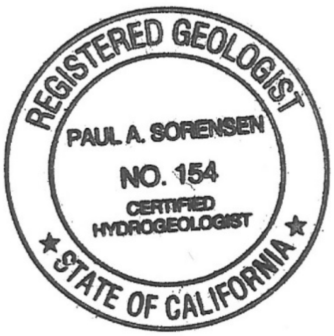
Paso Robles Subbasin
First Annual Report (2017–2019)

This report was prepared by the staff of GSI Water Solutions, Inc. under the supervision of professionals whose signatures appear below. The findings or professional opinion were prepared in accordance with generally accepted professional engineering and geologic practice.



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Abbreviations and Acronyms

AEM	aerial electromagnetic method
AF	acre-feet
AFY	acre-feet per year
AMSL	above mean sea level
BMP	Best Management Practice
CASGEM	California State Groundwater Elevation Monitoring Program
CCR	California Code of Regulations
CDEC	California Data Exchange Center
CDFFP	California Department of Forestry and Fire Protection
CIMIS	California Irrigation Management Information System
COC	constituent of concern
CSA	Community Service Area
CSD	Community Services District
CWWCP	Countywide Water Conservation Program
DWR	California State Department of Water Resources
EPCWD	Estrella-El Pomar-Creston Water District
ETo	reference evapotranspiration
GDE	groundwater dependent ecosystem
GMP	Groundwater Management Plan
gpd/ft	gallons per day per foot
gpm	gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GSSI	Geoscience Support Services, Inc.
IDC	IWFM Independent Demand Calculator
ILRP	Irrigated Lands Regulatory Program
InSAR	interferometric synthetic-aperture radar
IWFM	Integrated Water Flow Model
LID	low-impact development
M&A	Montgomery & Associates, Inc.
MOA	memorandum of agreement
NPDES	National Pollutant Discharge Elimination System
NWP	Nacimiento Water Project
PBCC	Paso Basin Cooperative Committee
PWS	public water system
RDI	regulated deficit irrigation
RMS	representative monitoring site
RU	rural domestic unit

S	storage coefficient
SEP	Supplemental Environmental Project
SGMA	Sustainable Groundwater Management Act
SLOFCWCD	County of San Luis Obispo Flood Control and Water Conservation District
SPI	Standardized Precipitation Index
SSJWD	Shandon-San Juan Water District
Subbasin	Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin
SWMP	Stormwater Management Plan
SWRCB	State Water Resources Control Board
SWRP	San Luis Obispo County Stormwater Resource Plan
SWP	State Water Project
TDS	total dissolved solids
USGS	U.S. Geological Survey
WNND	Water Neutral New Development
WY	water year

Annual Report Elements Guide and Checklist

California Code of Regulations – GSP Regulation Sections	Annual Report Elements	Location in Annual Report
Article 7	Annual Reports and Periodic Evaluations by the Agency	
§ 356.2	Annual Reports	
	Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:	
	(a) General information, including an executive summary and a location map depicting the basin covered by the report.	Executive Summary (§356.2[a])
	(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:	Section 2.4 Groundwater Elevation Monitoring (§356.2[b])
	(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:	Section 3 Groundwater Elevations (§356.2[b][1])
	(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.	Section 3.2 Seasonal High and Low (Spring and Fall) (§356.2[b][1][A])
	(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.	Section 3.3 Hydrographs (§356.2[b][1][B], and Appendix E)
	(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.	Section 4 Groundwater Extractions (§356.2[b][2])
	(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.	Section 5 Surface Water Use (§356.2[b][3])

California Code of Regulations – GSP Regulation Sections	Annual Report Elements	Location in Annual Report
Article 7	Annual Reports and Periodic Evaluations by the Agency	
§ 356.2	Annual Reports	
	(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.	Section 6 Total Water Use (§356.2[b][4])
	(5) Change in groundwater in storage shall include the following:	Section 7 Change in Groundwater in Storage (§356.2[b][5])
	(A) Change in groundwater in storage maps for each principal aquifer in the basin.	Section 7.1 Annual Changes in Groundwater Elevation (§356.2[b][5][A])
	(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.	Section 7.2 Annual and Cumulative Change in Groundwater in Storage Calculations (§356.2[b][5][B])
	(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.	Section 8 Progress towards Basin Sustainability (§356.2[c])

Executive Summary (§ 356.2[a])

Introduction

This First Annual Report for the Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin (Paso Robles Subbasin or Subbasin; see Figure 1) has been prepared in accordance with the Sustainable Groundwater Management Act (SGMA) and Groundwater Sustainability Plan (GSP) Regulations. Pursuant to the California Department of Water Resources (DWR) regulations, a GSP Annual Report must be submitted to DWR by April 1 of each year following the adoption of the GSP.

With the submittal of the adopted Paso Robles Subbasin GSP by the January 31, 2020 deadline, the Groundwater Sustainability Agencies (GSAs) are required to submit an annual report for the preceding Water Year (October 1 through September 30) to DWR by April 1, 2020. Because this is the first GSP Annual Report for the Paso Robles Subbasin, this report documents and updates data from October 1, 2016 (for groundwater production and water use data) or October 1, 2017 (for water level data) through October 31, 2019. The annual report will convey monitoring and water use data to the DWR and to Subbasin stakeholders on an annual basis to gauge performance of the Subbasin relative to the sustainability goals set forth in the GSP.

Sections of the Annual Report include the following:

Section 1. Introduction – Paso Robles Subbasin First Annual Report (2017–2019): a brief background of the formation and activities of the Paso Robles Subbasin GSAs and development and submittal of the GSP.

Section 2. Paso Robles Subbasin Setting and Monitoring Networks: a summary of the Subbasin setting, Subbasin monitoring networks, and ways in which data are used for groundwater management.

Section 3. Groundwater Elevations (§356.2[b][1]): a description of recent monitoring data with groundwater elevation contour maps for spring and fall monitoring events and representative hydrographs.

Section 4. Groundwater Extractions (§356.2[b][2]): compilation of metered and estimated groundwater extractions by land use sector and location of extractions.

Section 5. Surface Water Use (§356.2[b][3]): a summary of reported surface water use.

Section 6. Total Water Use (§356.2[b][4]): a presentation of total water use by source and sector.

Section 7. Change in Groundwater in Storage (§356.2[b][5]): a description of the methodology and presentation of changes in groundwater in storage based on fall to fall groundwater elevation differences.

Section 8. Progress towards Basin Sustainability (§356.2[c]): a summary of management actions taken throughout the Subbasin by GSAs and individual entities towards sustainability of the Subbasin.

Groundwater Elevations

In general, the groundwater elevations observed in the Subbasin during water years 2017 through 2019 reflect slight increases across much of the Subbasin compared with the declines witnessed in water years 2015 and 2016. The increased groundwater elevations are likely due predominantly to above-average rainfall conditions in water years 2017 and 2019. Both positive and negative changes in groundwater elevations from year to year are observed in different parts of the Subbasin, as has been the pattern in the Subbasin for many years. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels continued in each of the water years.

Groundwater Extractions

Total groundwater extractions in the Subbasin for water years 2017, 2018, and 2019 are ~~81,8~~70,800 acre-feet (AF), 82~~1~~,2~~1~~00 AF, and 6~~8~~2,6~~1~~00 AF, respectively. Table ES-1 summarizes the groundwater extractions by water use sector for each water year.

Table ES- 1. Groundwater Extractions by Water Use Sector

Water Year	Groundwater Extractions by Water Use Sector			Total (AF)
	Municipal (AF)	PWS and Rural Domestic (AF)	Agriculture (AF)	
2017	1,626~~4,235~~	5,060	64,100~~72,500~~	70,800~~81,800~~
2018	1,677~~5,029~~	5,060	75,500~~71,000~~	82,200~~81,100~~
2019	1,729~~4,804~~	5,060	55,800~~72,200~~	62,600~~82,100~~
Method of Measure:	Metered	2016 Groundwater Model	Soil-Water Balance Model	
Level of Accuracy:	high	low-medium	medium	

Notes:
AF = acre-feet
PWS = public water systems

Surface Water Use

The Subbasin currently benefits from surface water entitlements from the Nacimiento Water Project (NWP) and the State Water Project (SWP) to supplement municipal groundwater demands in the City of Paso Robles and the community of Shandon, respectively. Locations of communities dependent on groundwater and with access to surface water are shown on Figure 11. There is currently no surface water available for agricultural or recharge project use within the Subbasin. A summary of total actual surface water use by source is provided in Table ES-2.

Table ES- 2. Total Surface Water Use by Source

Water Year	Nacimiento Water Project[1] (AF)	State Water Project[2] (AF)	Total Surface Water Use (AF)
2017	1,650~~1,784~~	42	1,691~~1,826~~
2018	1,423~~2,284~~	55	1,477~~2,339~~
2019	1,142~~1,498~~	43	1,184~~1,541~~

Notes:
[1] Contract annual entitlement to the City of Paso Robles = 6,488 AFY
[2] Contract annual entitlement to CSA 16 = 100 AFY
AF = acre-feet
AFY = acre-feet per year

Total Water Use

For water years 2017, 2018, and 2019, quantification of total water use was completed through reporting of metered water production data from municipal wells, metered surface water use, and from models used to estimate agricultural crop water supply requirements. In addition, rural water use and small commercial public water system use was estimated. Table ES-3 summarizes the total annual water use in the Subbasin by source and water use sector.

Table ES- 3. Total Annual Water Use in the Subbasin by Source and Water Use Sector

Water Year	Municipal (AF)		PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
Source:	Groundwater	Surface Water	Groundwater	Groundwater	
2017	1,626~~4,235~~	1,691~~1,826~~	5,060	64,100~~72,500~~	72,500~~83,600~~
2018	1,677~~5,029~~	1,477~~2,339~~	5,060	75,500~~71,000~~	83,700~~83,400~~
2019	1,729~~4,804~~	1,184~~1,541~~	5,060	55,800~~72,200~~	63,800~~83,600~~
Method of Measure:	Metered	Metered	2016 Groundwater Model	Soil-Water Balance Model	
Level of Accuracy:	high	high	low-medium	medium	

Notes:
AF = acre-feet
PWS = public water systems

Change in Groundwater in Storage

The calculation of change in groundwater in storage in the Subbasin was derived from comparison of fall groundwater elevation contour maps from one year to the next as well as taking the difference between groundwater elevations throughout the Subbasin as the aquifer becomes saturated (storage gain) or dewatered (storage loss). For example, the fall 2016 groundwater elevations were subtracted from the fall 2017 groundwater elevations, resulting in a map depicting the changes in groundwater elevations in the Paso Robles Formation Aquifer that occurred during the 2017 water year. Similar calculations were made for water years 2018 and 2019, resulting in a series of groundwater elevation change maps in the Paso Robles Formation Aquifer.

The groundwater elevation change map for water year 2017 (Figure 12), which was an above-average rainfall year, shows that water levels declined over a large portion of the central and northern areas of the Subbasin, with a minor depression in the City of Paso Robles area and a more pronounced area of decline in the Shandon area. The 2017 map also shows that groundwater elevations increased significantly in the southern highland areas of the Subbasin, in response to the above-average precipitation received in 2017.

The groundwater elevation change map for water year 2018 (Figure 13), which was a below-average rainfall year, shows that water levels declined in the southern, eastern, and northwestern areas of the Subbasin and increased over the central portion of the Subbasin, notably in the Shandon area.

The groundwater elevation change map for water year 2019 (Figure 14), which was an above-average rainfall year, shows that groundwater elevations increased over a large portion of the eastern half of the Subbasin, including a pronounced increase in the Shandon area, and that water levels declined over a large portion of the western half of the Subbasin, notably in the area west of Creston.

The annual changes of groundwater in storage calculated for water years 2017, 2018, and 2019 are presented in Table ES-4.

Table ES- 4. Annual Changes of Groundwater in Storage for Water Years 2017, 2018, and 2019

Water Year	Annual Change in Groundwater in Storage (AF)
2017	60,100
2018	6,400
2019	59,700

Note:
AF = acre-feet

Progress towards Meeting Basin Sustainability

Several projects and management actions are in process or have been recently implemented in the Subbasin to attain sustainability. These projects and actions include capital projects as well as non-structural basin-wide policies intended to reduce or optimize local groundwater use. Some of these projects were described in concept in the GSP; some of the actions described herein are new initiatives designed to make new water supplies available to the Subbasin that may be implemented by project participants to reduce pumping and partially mitigate the degree to which the management actions would be needed. Some of the ongoing efforts include:

- Amendment #1 to the Memorandum of Agreement
- Extension of Water Neutral New Development Program
- Paso Basin Aerial Groundwater Mapping Pilot Study
- Expand the Alluvial Aquifer Monitoring Network and Install New Stream Gages
- City of Paso Robles Recycled Water Program
- San Miguel Community Services District Recycled Water Project
- Blended Water Project
- Stormwater Capture and Recharge Projects

Relative to the most current basin conditions as reported in the GSP, this First Annual Report (2017–2019) indicates an improvement in groundwater conditions throughout the Subbasin, increased groundwater elevations in several of the representative monitoring site (RMS) wells, and a marked increase in total groundwater in storage. It is clear that historical groundwater pumping in excess of the sustainable yield has created challenging conditions for sustainable management. However, actions are already underway to collect data, improve the monitoring and data-collection networks, and coordinate with affected agencies and entities throughout the Subbasin to develop solutions that address the shared mutual interest in the Subbasin's overall sustainability goal.

The above-average rainfall water years of 2017 and 2019 improved groundwater conditions in the Subbasin. Of the 22 RMS wells in the Subbasin groundwater monitoring network, none of the wells exhibit groundwater elevations at or below the minimum threshold established in the GSP. Although the groundwater elevations in some of the RMS wells are continuing to trend downward, several of the RMS wells exhibit recovering groundwater elevations in the past two years. Ten of the 22 RMS wells in the monitoring network have current groundwater elevations greater than the measurable objective for that RMS well.

Groundwater in storage in the Subbasin increased more than 126,000 AF in total over the past three water years. ~~The volume of groundwater extractions in the Subbasin has remained relatively consistent for the past~~

~~three years averaging approximately 81,700 AFY, which is slightly less than the average volume of 85,800 AFY of groundwater extractions estimated for 2012–2016.~~ Although groundwater in storage has increased somewhat over the past three water years, groundwater pumping continues to exceed the estimated future sustainable yield and the projects and management actions described in the GSP and in this First Annual Report will be necessary in order to bring the Subbasin into sustainability.

At this time, there are no more recent data available since publication of the GSP to assess any changes in Subbasin subsidence, the interconnectivity of surface water and groundwater, or potential surface water depletion. The potential for impacts to these sustainability indicators will be assessed in future annual reports as data are developed.

Additional time will be necessary to judge the effectiveness and quantitative impacts of the projects and management actions either now underway or in the planning and implementation stage. However, it is clear that the actions in place and as described in this First Annual Report are a good start towards reaching the sustainability goals laid out in the GSP. It is too soon to judge the observed changes in basin conditions against the interim goals outlined in the GSP, but the anticipated effects of the projects and management actions now underway are expected to significantly affect the ability of the Subbasin to reach the necessary sustainability goals.

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SECTION 1: Introduction – Paso Robles Subbasin First Annual Report (2017–2019)

The First Annual Report for the Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin (Paso Robles Subbasin or Subbasin) has been prepared for the Paso Basin Cooperative Committee (PBCC) and the Groundwater Sustainability Agencies (GSAs) in accordance with the Sustainable Groundwater Management Act (SGMA) and Groundwater Sustainability Plan (GSP) Regulations (§ 356.2. Annual Reports) (see Appendix A, GSP Regulations for Annual Reports). Pursuant to the California Department of Water Resources (DWR) regulations, a GSP Annual Report must be submitted to DWR by April 1 of each year following the adoption of the GSP. With adoption and submittal of the Paso Robles Subbasin GSP by January 31, 2020, the GSAs are required to submit an annual report for the preceding water year (October 1 through September 30) to DWR by April 1, 2020. Because this is the first GSP Annual Report for the Paso Robles Subbasin, this report documents and updates data from October 1, 2016 (for groundwater production and water use data) or October 1, 2017 (for water level data) through October 31, 2019.[1]

1.1 Setting and Background

The Paso Robles Subbasin Groundwater Sustainability Plan was prepared by Montgomery & Associates, Inc. (M&A, 2019), on behalf of and in cooperation with the Paso Basin Cooperative Committee and the Subbasin GSAs. The GSP, and this Annual Report, covers the entire Paso Robles Subbasin (Figure 1). The Subbasin lies in the northern portion of San Luis Obispo County. The majority of the Subbasin comprises gentle flatlands near the Salinas River Valley, ranging in elevation from approximately 450 to 2,400 feet (ft) above mean sea level (AMSL). The Subbasin is drained by the Salinas River and its tributaries, including the Estrella River, Huer Huero Creek, and San Juan Creek. Communities in the Subbasin are the City of Paso Robles and the communities of San Miguel, Creston, and Shandon. Highway 101 is the most significant north-south highway in the Subbasin, with Highways 41 and 46 running east-west across the Subbasin.

The GSP was jointly developed by four GSAs:

- City of Paso Robles GSA
- Paso Basin - County of San Luis Obispo GSA
- San Miguel Community Services District (CSD) GSA
- Shandon - San Juan GSA

The Paso Basin GSAs overlying the Subbasin entered into a Memorandum of Agreement (MOA) in September 2017. The purpose of the MOA was to establish a Paso Basin Cooperative Committee (PBCC) to develop a single GSP for the entire Subbasin to be considered for adoption by each GSA and subsequently submitted to DWR for approval. Under the framework of the original MOA, the GSAs engaged the public and coordinated to jointly develop the Paso Robles Subbasin GSP. At its November 20, 2019 meeting, in accordance with the MOA, the PBCC voted unanimously to recommend that the GSAs adopt the GSP and submit it to DWR by the SGMA deadline. Subsequent actions by each GSA resulted in unanimous approval of the GSP and a joint submittal of the GSP to DWR.

[1] The required timeframe of the annual reports, pursuant to the SGMA regulations, is by water year, which is October 1 through September 30 of any water year. However, because the County of San Luis Obispo Groundwater Level Monitoring Program measures water levels in October, the October 2019 measurements, for instance, are utilized to reflect conditions at the end of water year 2019.

The original MOA included provision for automatic termination upon approval of the GSP by DWR. Resolutions adopted by each GSA during the GSP approval process included an amendment to the MOA that removed automatic termination language because the GSAs will continue cooperating on the GSP and its implementation until such time as the long-term governance structure for implementation of the GSP is developed.

Each of the GSAs appointed a representative to the PBCC to coordinate activities among the GSAs during the development of the GSP and the development and submittal of this Annual Report. The GSAs also agreed to designate the County of San Luis Obispo Director of Public Works as the Plan Manager with the authority to submit the GSP and the Annual Report and serve as the point of contact with DWR.

1.2 Organization of This Report

The required contents of an Annual Report are provided in the GSP Regulations (§ 356.2), included as Appendix A. Organization of the report is meant to follow the regulations where possible to assist in the review of the document. The sections are briefly described as follows:

Section 1. Introduction – Paso Robles Subbasin First Annual Report (2017–2019): a brief background of the formation and activities of the Paso Robles Subbasin GSAs and development and submittal of the GSP.

Section 2. Paso Robles Subbasin Setting and Monitoring Networks: a summary of the Subbasin setting, Subbasin monitoring networks, and the ways in which data are used for groundwater management.

Section 3. Groundwater Elevations (§356.2[b][1]): a description of recent monitoring data with groundwater elevation contours for spring and fall monitoring events and representative hydrographs.

Section 4. Groundwater Extractions (§356.2[b][2]): compilation of metered and estimated groundwater extractions by land use sector and location of extractions.

Section 5. Surface Water Use (§356.2[b][3]): a summary of reported surface water use.

Section 6. Total Water Use (§356.2[b][4]): a presentation of total water use by source and sector.

Section 7. Change in Groundwater in Storage (§356.2[b][5]): a description of the methodology and presentation of changes in groundwater in storage based on fall to fall groundwater elevation differences.

Section 8. Progress towards Basin Sustainability (§356.2[c]): a summary of management actions taken throughout the Subbasin by GSAs and individual entities towards sustainability of the Subbasin.

SECTION 2: Paso Robles Subbasin Setting and Monitoring Networks

2.1 Introduction

This section provides a brief description of the basin setting and the groundwater management monitoring programs described in the GSP, as well as any notable events affecting monitoring activities or the quality of monitoring results in the reported 2017–2019 water years. Much of the information reported on in this Annual Report was taken from the GSP prepared by Montgomery & Associates, Inc. (M&A, 2019).

2.2 Subbasin Setting

The Subbasin is a structural trough trending to the northwest filled with terrestrially derived sediments sourced from the surrounding mountains. The Subbasin is surrounded by relatively impermeable geologic formations, sediments with poor water quality, and structural faults. Land surface elevation ranges from approximately 2,000 ft AMSL in the southeast extent of the Subbasin to about 600 ft AMSL in the northwest extent, where the Salinas River exits the Subbasin. Agriculture is the dominant land use. The Subbasin includes the incorporated City of Paso Robles and unincorporated communities of San Miguel, Creston, and Shandon.

The Subbasin is the southernmost portion of the Salinas Valley Groundwater Basin. As originally defined by DWR (2003), the Subbasin was in both San Luis Obispo and Monterey counties. The 2019 DWR basin boundary modification process resulted in a revision of the northern boundary of the Paso Robles Subbasin to be coincident with the San Luis Obispo/Monterey county line, thereby placing the Subbasin entirely within San Luis Obispo County.

The top of the Subbasin is defined by land surface. The bottom of the Subbasin is defined by the base of the Paso Robles Formation. Sediments below the base of the Paso Robles Formation are typically much less permeable than the overlying sediments. Although the bedrock sediments often produce usable quantities of groundwater, the water is generally of poor quality, so they are not considered part of the Subbasin. As described in the GSP, the lateral boundaries of the Subbasin include the following:

- The western boundary is defined by the contact between the sediments in the Subbasin and the sediments of the Santa Lucia Range. A portion of the western boundary is defined by the Rinconada fault system which separates the Paso Robles Subbasin from the Atascadero Area Subbasin.
- The eastern boundary of the Subbasin is defined by the contact between the sediments in the Subbasin and the sediments of the Temblor Range. The San Andreas Fault generally forms the eastern Subbasin boundary.
- The southern boundary of the Subbasin is defined by the contact between the sediments in the Subbasin and the sediments of the La Panza Range. To the southeast, a watershed and groundwater divide separates the Subbasin from the adjacent Carrizo Plain Basin; sedimentary layers are likely continuous across this divide.
- The northern boundary of the Subbasin is defined by the San Luis Obispo/Monterey county line.

Two principal aquifers exist in the Subbasin, including the Alluvial Aquifer and the Paso Robles Formation Aquifer. The Alluvial Aquifer is the youngest aquifer. It is unconfined and consists of predominantly coarse-grained sediments (sand and gravel) deposited along Huer Huero Creek, the Estrella River, and the Salinas River. The Alluvial Aquifer varies in thickness but may be up to 100 ft thick along the channels. Much of the Alluvial Aquifer is characterized by relatively high transmissivity that may exceed 100,000 gallons per day per foot (gpd/ft). Wells screened in the Alluvial Aquifer can be very productive and may yield over 1,000 gallons per minute (gpm).

The Paso Robles Formation Aquifer underlies the Alluvial Aquifer and outcrops in the Subbasin everywhere outside of the Holocene stream channels. The Paso Robles Formation represents the largest volume of sediments in the Subbasin, with a total thickness up to 3,000 ft in the northern Estrella area and up to 2,000 ft in the Shandon area. The Paso Robles Formation has a thickness of 700 to 1,200 ft throughout most of the Subbasin. It is generally characterized by interbedded, discontinuous lenses of sand and gravel that comprise the most productive strata within the aquifer, separated vertically by comparatively thick zones of fine-grained sediments (silts and clays). Well depths generally range from approximately 200 ft to 1,000 ft or more. As described in the GSP, reported aquifer transmissivity estimates in the Paso Robles Formation range from approximately 1,000 to 9,000 gpd/ft, and well yields range from approximately 150 gpm to 850 gpm.

The primary components of recharge to the Subbasin aquifers are percolation of precipitation and infiltration of surface water from rivers and streams. Natural discharge from the Subbasin aquifers occurs through springs and seeps, evapotranspiration, and discharge to surface water bodies. The most significant component of discharge is pumping of groundwater from wells. The regional direction of groundwater flow is from the southeast to the northwest. As there is no hydrogeologic barrier to flow along the northern boundary of the Subbasin, groundwater exits the Subbasin along that boundary to the adjacent Salinas Valley Basin to the north.

2.3 Precipitation and Climatic Periods

Annual precipitation recorded at the Paso Robles weather station (National Oceanic and Atmospheric Administration [NOAA] station 46730) is presented by water year in Figure 2. The long-term average annual precipitation for the period 1925 through 2019 is 14.6 inches per water year, as recorded at the Paso Robles weather station. Climatic periods in the Subbasin have been determined based on analysis of data from the Paso Robles weather station using the Standardized Precipitation Index (SPI), which quantifies deviations from normal precipitation patterns, using a 60-month period for analysis to maintain consistency with previous analyses in the GSP. These climatic periods are categorized according to the following designations: wet, dry, and average/alternating wet and dry (Figure 2). Historical precipitation records are provided in Appendix B.

2.4 Groundwater Elevation Monitoring (§ 356.2[b])

This section provides a brief description of the groundwater management monitoring programs currently in place and any notable events affecting monitoring activities or the quality of monitoring results.

2.4.1 Groundwater Elevation Monitoring Locations

The GSP provided a summary of existing groundwater monitoring efforts currently promulgated under various existing local, state, and federal programs. SGMA requires that monitoring networks be developed to provide sufficient data quality, frequency, and spatial distribution to characterize groundwater and surface water in the Subbasin, and to evaluate changing aquifer conditions in response to GSP implementation. The monitoring network developed in the GSP is intended to support efforts to do the following:

- Monitor changes in groundwater conditions and demonstrate progress toward achieving measurable objectives and minimum thresholds documented in the GSP
- Quantify annual changes in water use
- Monitor impacts to the beneficial uses and users of groundwater

Monitoring networks are developed for each of the five sustainability indicators relevant to the Paso Robles Subbasin:

- Chronic lowering of groundwater levels
- Reduction of groundwater in storage
- Degraded water quality
- Land subsidence
- Depletion of interconnected surface water

Monitoring for the first two sustainability indicators (chronic lowering of water levels and reduction of groundwater in storage) is implemented using the same representative monitoring sites (RMS). The GSP identifies an existing network of 23 RMS wells for water level monitoring. Of these 23 wells, 22 are wells that screen the Paso Robles Formation[2], and one is an Alluvial Aquifer well. These RMS have been monitored biannually, in April and October, for various periods of record. The RMS are displayed in Figure 3, and a summary of information for each of the wells is included in Appendix C.

2.4.2 Monitoring Data Gaps

The GSP noted numerous data gaps in the current RMS network. It should be noted that efforts are continuing during the implementation phase of the GSP to identify existing wells that can be added to the network, or to construct new wells for the network. As a start to this effort, the GSP identified nine additional wells that may be incorporated into the RMS network once the depth and screened aquifer are established. These wells are displayed in Figure 3, and a summary of available well information is included in Appendix D.

2.5 Additional Monitoring

Evaluation of the water quality sustainability indicator is achieved through monitoring of an existing network of supply wells in the Subbasin. Constituents of concern (COCs) identified in the GSP that have the potential to impact suitability of water for public supply or agricultural use include total dissolved solids (TDS), chloride, sulfate, nitrate, boron, and gross alpha radiation.

COCs for drinking water are monitored at public water supply wells (PWS). There are 41 PWSs in the Subbasin. PWSs constitute part of the monitoring network for water quality in the Subbasin. In addition, the GSP identified 28 agricultural supply wells that are monitored for COCs under the Irrigated Lands Regulatory Program (ILRP).

Land subsidence in the Subbasin is monitored using interferometric synthetic-aperture radar (InSAR) data collected using microwave satellite imagery provided by DWR. Available data to date indicate no significant subsidence in the Subbasin that impacts infrastructure. The GSAs will annually assess subsidence using the InSAR data provided by DWR.

A monitoring network to assess the sustainability indicator of groundwater/surface water interconnection is a current data gap that will be addressed during GSP implementation. There is at present only a single Alluvial Aquifer well in the water level monitoring network. This is identified in the GSP as a significant data gap. Additional Alluvial Aquifer wells will need to be established in the monitoring network before groundwater/surface water interaction can be more robustly analyzed.

[2] Since initial establishment of the monitoring well network, two of the 22 Paso Robles Formation Aquifer RMS wells (27S/13E-30N01 and 26S/12E-2607) have become either inactive or inaccessible.

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SECTION 3: Groundwater Elevations (§ 356.2[b][1])

3.1 Introduction

This section provides a detailed report on groundwater elevations in the Subbasin since spring of 2017, which marked the end of the analyses completed for the GSP. In the future, annual reports will present groundwater elevation updates for the previous water year. However, because of the gap between the end of the GSP analysis and this First Annual Report, five groundwater elevation maps are presented—for fall 2017, spring 2018, fall 2018, spring 2019, and fall 2019.

These maps present the most up-to-date seasonal conditions in the Basin. Most of the data presented characterizes conditions in the Paso Robles Formation Aquifer. Data for the Alluvial Aquifer is too sparse for regional analysis. Monitoring data is reviewed for quality and an appropriate time frame is chosen to provide the highest consistency in the wells used for each reporting period. Data quality is often difficult to ascertain when measurements are taken by other agencies or private well owners, and well construction information may be incomplete or unavailable. This means that a careful review of the data is required prior to uploading to DWR's new Monitoring Network Module (replacing the current CASGEM program) to verify whether measurements are trending consistent with trends of previous years and with the current year's hydrology and level of extractions.

3.1.1 Principal Aquifers

As discussed in Section 2, there are two principal aquifers in the Subbasin. The Paso Robles Formation Aquifer is several hundreds of feet thick, represents the greatest volume of saturated sediments in the Subbasin, and is the aquifer that is most utilized for supply. The Alluvial Aquifer is limited in extent to the active channels of the streams in the Subbasin and is generally less than 100 ft thick.

3.2 Seasonal High and Low (Spring and Fall) (§ 356.2[b][1][A])

The assessment of groundwater elevation conditions in the Subbasin as described in the GSP is largely based on data from the County of San Luis Obispo Flood Control and Water Conservation District (SLOFCWCD) groundwater monitoring program. Groundwater levels are measured by the SLOFCWCD through a network of public and private wells in the Subbasin. Data from many of the wells in the monitoring program are collected subject to confidentiality agreements between the SLOFCWCD and well owners. Consistent with the terms of such agreements, the well owner information and specific locations for these wells are not published in the GSP and that convention is continued in this Annual Report. To maintain consistency with the GSP and represent conditions that can be easily compared from year to year, this Annual Report used the same set of wells as was used in the GSP. Groundwater level data from approximately 50 to 55 wells are used to create the groundwater elevation contour maps, but the well locations and data points are not shown on the maps to preserve confidentiality. Of these 50 to 55 wells, owners of 23 of the wells have agreed to allow public use of the well data and are therefore used as RMS wells for the purpose of monitoring sustainability indicators. As implementation of the GSP progresses, it is anticipated that additional wells will be added to the data set and that many of the wells with current confidentiality agreements will be modified to allow for public use of the data.

In accordance with the SGMA regulations, the following information is presented based on available data:

- Groundwater elevation contour maps for the seasonal high and seasonal low groundwater conditions for the previous water year. Because the most recent presentation of groundwater conditions described in the GSP was spring 2017, groundwater elevation contour maps are presented for fall 2017, spring 2018, fall 2018, spring 2019, and fall 2019.

- A map depicting the change in groundwater elevation for the preceding water year. Because the most recent change in groundwater elevation in the GSP represented the period between 1997 and 2017, change in groundwater elevation maps are shown here for the periods fall 2016 to fall 2017, fall 2017 to fall 2018, and fall 2018 to fall 2019 (Section 7.1).
- Hydrographs for wells with publicly available data (Appendix E).

3.2.1 Alluvial Aquifer Groundwater Elevation Contours

Groundwater elevation data for the Alluvial Aquifer are too limited to prepare representative contour maps of the seasonal high and seasonal low groundwater elevations. Figure 4 shows the current (as of 2017) groundwater elevation contours for the Alluvial Aquifer, as shown in the GSP. This map, however, was developed using 2017 data (when available) as well as the most recent data prior to 2017. A reasonable data set of Alluvial Aquifer groundwater elevations specific to years 2018 or 2019 is not available, so the map as presented in the GSP is the most recent map available.

Groundwater elevations range from approximately 1,400 ft AMSL in the southeastern portion of the Subbasin to approximately 600 ft AMSL near San Miguel. Groundwater flow direction in the Alluvial Aquifer generally follows the alignment of the creeks and rivers. Overall, groundwater in the Alluvial Aquifer flows from southeast to northwest across the Subbasin. On a basin-wide scale, the average horizontal hydraulic gradient in the alluvium is about 0.004 feet per foot (ft/ft) from the southeastern portion of the Subbasin to San Miguel.

3.2.2 Paso Robles Formation Aquifer Groundwater Elevation Contours

Seasonal high and low groundwater elevation data for the Subbasin for fall 2017 through fall 2019 for the Paso Robles Formation Aquifer were contoured to assess spatial variations, yearly fluctuations, trends in groundwater conditions, groundwater flow directions, and horizontal groundwater gradients. Contour maps were prepared for the seasonal high groundwater levels, which typically occur in the spring, and the seasonal low groundwater levels, which typically occur in the fall. In general, the spring groundwater data are for April and the fall groundwater data are for October. For consistency with the GSP, the same well data sets were used for contouring; information identifying the owner or detailed location of private wells is not shown on the maps to preserve confidentiality.

Figure 5 presents groundwater elevation contours for fall 2017. Groundwater elevations are higher than 1,250 ft AMSL in the southeast portion of the Subbasin and the regional direction of groundwater flow is from the southeast to northwest. The lowest groundwater elevations are observed in the northern portion of the City of Paso Robles and immediately north of the city, with elevations lower than 500 ft AMSL.

Figures 6 and 7 show contours of groundwater elevations in the Paso Robles Formation Aquifer for spring 2018 and fall 2018, respectively. Overall, groundwater conditions in the Subbasin in the spring and fall of 2018 were similar, with groundwater elevations in the fall generally lower than in the spring, a typical seasonal trend for the Subbasin. Groundwater flow direction is generally to the northwest and west over most of the Subbasin. In general, groundwater flow in the western portion of the Subbasin tends to converge toward areas of low groundwater elevations. These areas of low groundwater elevation are in the area between the City of Paso Robles and the communities of San Miguel and Whitley Gardens. Horizontal groundwater gradients range from approximately 0.002 ft/ft in the southeast portion of the Subbasin to approximately 0.02 ft/ft in the area southeast of Paso Robles.

Figures 8 and 9 show contours of groundwater elevations in the Paso Robles Formation Aquifer for spring 2019 and fall 2019, respectively. As is the overall trend every year in the Subbasin, groundwater conditions in the Subbasin in the spring and fall are similar, with groundwater elevations in the fall generally slightly lower than in the spring. Groundwater flow direction is generally to the northwest and west over most of the Subbasin. In general, groundwater flow in the western portion of the Subbasin tends to converge toward areas of low groundwater elevations.

In general, the groundwater elevations observed in the Subbasin during water years 2017 through 2019 reflect slight increases across portions of the Subbasin, likely due predominantly to above-average rainfall conditions in water years 2017 and 2019. Positive and negative changes in groundwater elevations from year to year are observed in different parts of the Subbasin, as has been observed historically. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels continued in each of the water years.

3.3 Hydrographs (§ 356.2[b][1][B])

Groundwater elevation hydrographs are used to evaluate aquifer behavior over time. Changes in groundwater elevation at a given point in the Subbasin can result from many influencing factors, with all or some occurring at any given time. Factors can include changing hydrologic trends, seasonal variations in precipitation, varying Subbasin extractions, changing inflows and outflows along boundaries, availability of recharge from surface water sources, and influence from localized pumping conditions. Climatic variation can be one of the most significant factors affecting groundwater elevations over time. For this reason, the hydrographs also display periods of climatic variation categorized as wet, dry, or average/alternating wet and dry (see Figure 2).

3.3.1 Hydrographs

Groundwater elevation hydrographs and associated location maps for the 22 wells in the Subbasin monitoring network that are constructed in and extract groundwater from the Paso Robles Formation Aquifer are presented in Appendix E. The groundwater elevation data for the single Alluvial Aquifer RMS is not shown. These hydrographs also include information on well screen interval (if available), reference point elevation, as well as measurable objectives and minimum thresholds for each well that were developed during the preparation of the GSP. Many of the hydrographs illustrate a condition of declining water levels since the late 1990s, although some indicate relative water level stability over the same period.

As described in the GSP, an average of the 2017 non-pumping groundwater levels was selected as the measurable objectives and minimum thresholds are set below those levels. Going forward from 2017, the average of the spring and fall measurements in any one water year will be the benchmark against which trends will be assessed.

Of the 22 RMS hydrographs presented in Appendix E, none of the RMS wells exhibit groundwater elevations at or below the minimum threshold. Although the groundwater elevations in some of the RMS wells are continuing to trend downward, several of the RMS wells exhibit recovering groundwater elevations recently, apparently as a result of the recent years of above-average rainfall. Ten of the 22 RMS wells have current groundwater elevations greater than the measurable objective for that RMS well.

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SECTION 4: **Groundwater Extractions (§ 356.2[b][2])**

4.1 Introduction

This section presents the metered and estimated groundwater extractions from the Subbasin for the 2017, 2018, and 2019 water years. The types of groundwater extraction described in this section include municipal (Table 1), agricultural (Table 2), rural domestic (Table 3), and small public water systems (Table 4). Each following subsection includes a description of the method of measurement and a qualitative level of accuracy for each estimate. The level of accuracy is rated on a qualitative scale of low, medium, and high. The annual groundwater extraction volumes for all water use sectors are shown in Table 5.

4.2 Municipal Metered Well Production Data

The municipal groundwater extractions documented in this report are metered data. Metered groundwater pumping extraction data are from the City of Paso Robles, San Miguel CSD, and the County of San Luis Obispo for Community Service Area 16 (CSA 16), providing service to the community of Shandon. The data shown in Table 1 reflect metered data reported by the respective agencies. The accuracy level rating of these metered data is high.

Table 1. Municipal Groundwater Extractions

Water Year	Metered Groundwater Extractions			Total (AF)
	City of Paso Robles[1] (AF)~~City of Paso Robles (AF)~~	San Miguel CSD (AF)	CSA 16 (AF)	
2017	1,261~~3,870~~	295	70	1,626~~4,235~~
2018	1,302~~4,654~~	325	50	1,677~~5,029~~
2019	1,392~~4,467~~	289	48	1,729~~4,804~~

Notes:
[1] – The City of Paso Robles produces groundwater from wells located in both the Paso Robles Subbasin and the Atascadero Subbasin. Only the portion produced from within the Paso Robles Subbasin is included here.
AF = acre-feet
CSA = community service area (County of San Luis Obispo)
CSD = community services district
~~AF = acre-feet~~
~~CSA = community service area (County of San Luis Obispo)~~
~~CSD = community services district~~

4.3 Estimate of Agricultural Extraction

Agricultural water use constituted ~~88~~ 91 percent of the total anthropogenic groundwater use in the Subbasin in water years 2017-2019. To estimate agricultural water demand, land use data along with climate and soil data were analyzed and processed using the soil-water balance model that was developed for the Paso Robles Groundwater Basin Model Update (GSSI, 2014). Annual land use spatial data sets from San Luis Obispo County were used to determine the appropriate crop categories, distribution, and acreages. Land use types were grouped within seven crop categories, including alfalfa, citrus, deciduous, nursery, pasture, vegetable, and vineyard, each with a respective set of crop water demand coefficients from the San Luis

Obispo County Master Water Report[3] (Carollo, 2012). Climate data inputs include precipitation from the Paso Robles Station (NOAA station 46730) and reference evapotranspiration (ETo) data from several private stations in the Subbasin operated by Western Weather Group. Soil water holding capacity data from National Resources Conservation Service soil surveys of San Luis Obispo County were used. The soil-water balance model includes consideration for regulated deficit irrigation (RDI), cover crop, and frost protection water demands for vineyards as well as irrigation system efficiencies (GSSI, 2014).

The soil-water balance model was utilized to estimate agricultural water demands through water year 2016 during completion of the GSP (M&A, 2019). Agricultural water demand for this First Annual Report was estimated for water years 2017, 2018, and 2019 using the soil-water balance model. The resulting estimated groundwater extractions for agricultural demands are summarized in Table 2. The accuracy level rating of these estimated volumes is medium.

Table 2. Estimated Agricultural Irrigation Groundwater Extractions

Water Year	Agricultural Demand (AF)
2017	64,100~~72,500~~
2018	75,500~~71,000~~
2019	55,800~~72,200~~

Note:
AF = acre-feet

4.4 Rural Domestic and Small Public Water System Extraction

Rural domestic and small PWS groundwater extractions in the Subbasin were estimated using the methods described here.

4.4.1 Rural Domestic Demand

As documented in the Paso Robles Groundwater Basin Model Update (GSSI, 2014), the rural domestic water demand was originally estimated as the product of County estimates of rural domestic units (DUs) and a water demand factor of 1.7 AFY per DU, which included small PWS water demand (Fugro, 2002). This factor was subsequently modified to 1.0 AFY/DU in the San Luis Obispo County Master Water Report, not including small PWS demand (Carollo, 2012). Based on further investigation completed for the 2014 groundwater model update, the rural domestic water use factor was refined to 0.75 AFY/DU (GSSI, 2014). To simulate rural water demand over time in the groundwater model, an annual growth rate of 2.25 percent for the rural population was assumed, based on recommendation from the San Luis Obispo County Planning Department (GSSI, 2014). The groundwater model update completed for the GSP (M&A, 2019) used a linear regression projection based on the 2014 model update to estimate rural domestic demand through water year 2016. The projected future water budget presented in the GSP (M&A, 2019) assumes water neutral growth in rural domestic water demand from water year 2016 going forward. Therefore, the rural domestic demand has been held constant at the estimated 2016 water year volume for this annual report. The resulting groundwater extractions for rural domestic demands are summarized in Table 3. The accuracy level rating of these estimated volumes is low-medium.

[3] Vineyard crop coefficients were modified based on discussions with Mark Battany, University of California Extension (GSSI, 2014).

Table 3. Estimated Rural Domestic Groundwater Extractions

Water Year	Rural Domestic (AF)
2017	3,530
2018	3,530
2019	3,530

Note: AF = acre-feet

4.4.2 Small Public Water System Extractions

The category of small PWSs includes a wide variety of establishments and facilities including small mutual water companies, golf courses, wineries, rural schools, and rural businesses. Various studies over the years used a mix of pumping data and estimates for type-specific water demand rates to estimate small PWS groundwater demand (Fugro, 2002; Todd Engineers, 2009). The 2012 San Luis Obispo County Master Water Report used the County of San Luis Obispo geographic information services mapping to define the distribution and number of commercial systems at the time and applied a single annual factor of 1.5 AFY per system (Carollo, 2012).

For the 2014 model update, actual pumping data were used as available to provide a monthly record over the study period (GSSI, 2014). Groundwater demand for four major golf courses (at the time) in the Subbasin (The Links, Hunter Ranch, Paso Robles, and River Oaks) was estimated using the following factors: ETo data measured in Paso Robles, the crop coefficient for turf grass, monthly rainfall data, and golf course acreage (GSSI, 2014). Water use for wineries was estimated by identifying each winery and its permitted capacity and applying a water use rate of 5 gallons of water per gallon of wine produced. Minor landscaping, wine tasting/restaurant functions, and return flows were also accounted for (GSSI, 2014). Water use for several small commercial/institutional water systems was estimated using water duty factors specific to the water system type (i.e., camp, school, restaurant, and other uses) (GSSI, 2014).

The groundwater model update completed for the GSP (M&A, 2019) used a linear regression projection for the 2014 model update to estimate small PWS demand through water year 2016. The projected future water budget presented in the GSP (M&A, 2019) assumes water neutral growth in small PWS water demand from water year 2016 going forward. Therefore, the small PWS demand has been held constant at the estimated 2016 water year volume for this annual report. The resulting groundwater extractions for small PWS demands are summarized in Table 4. The accuracy level rating of these estimated volumes is low-medium.

Table 4. Estimated Small Public Water System Groundwater Extractions

Water Year	Small PWS (AF)
2017	1,530
2018	1,530
2019	1,530

Note:
AF = acre-feet

4.5 Total Groundwater Extraction Summary

Total groundwater extractions in the Subbasin for water years 2017, 2018, and 2019 are ~~81~~70,800 AF, ~~81~~82,2~~1~~00 AF, and ~~82~~62,6~~1~~00 AF, respectively. Table 5 summarizes the total water use by sector and indicates the method of measure and associated level of accuracy. Approximate points of extraction were spatially distributed and colored according to a grid system to represent the relative pumping across the basin in terms of AF per acre (see Figure 10).

Table 5. Total Groundwater Extractions

Water Year	Groundwater Extractions by Water Use Sector			Total (AF)
	Municipal (AF)	PWS and Rural Domestic (AF)	Agriculture (AF)	
2017	1,626~~4,235~~	5,060	64,100~~72,500~~	70,800~~81,800~~
2018	1,677~~5,029~~	5,060	75,500~~71,000~~	82,200~~81,100~~
2019	1,729~~4,804~~	5,060	55,800~~72,200~~	62,600~~82,100~~
Method of Measure:	Metered	2016 Groundwater Model	Soil-Water Balance Model	
Level of Accuracy:	high	low-medium	medium	

Notes:
AF = acre-feet
PWS = public water systems

SECTION 5: **Surface Water Use (§ 356.2[b][3])**

5.1 Introduction

This section addresses the reporting requirement of providing surface water supplies used, or available for use, and describes the annual volume and sources for the 2017, 2018, and 2019 water years. The method of measurement and level of accuracy is rated on a qualitative scale. The Subbasin currently benefits from surface water entitlements from the Nacimiento Water Project (NWP) and the State Water Project (SWP) to supplement municipal groundwater demands in the City of Paso Robles and the community of Shandon, respectively. Locations of communities dependent on groundwater and with access to surface water are shown on Figure 11.

5.2 Surface Water Available for Use

Table 6 provides a breakdown of surface water available for municipal use in the Subbasin. There is currently no surface water available for agricultural or recharge project use within the Subbasin.

Table 6. Surface Water Available for Use

Water Year	Nacimiento Water Project[1] (AF)	State Water Project[2] (AF)	Total Available Surface Water (AF)
2017	6,488	100	6,588
2018	6,488	100	6,588
2019	6,488	100	6,588

Notes:
[1] Contract annual entitlement to the City of Paso Robles
[2] Contract annual entitlement to CSA 16
AF = acre-feet

5.3 Total Surface Water Use

A summary of total actual surface water use by source is provided in Table 7. The accuracy level rating of these metered data is high.

Environmental uses of surface water is also recognized but not estimated due to insufficient data to make an estimate of surface water use. It is expected that environmental uses will be quantified in future annual reports as more data become available.

Table 7. Annual Surface Water Use

Water Year	Nacimiento Water Project[1] (AF)~~Nacimiento Water Project (AF)~~	State Water Project[2] (AF)~~State Water Project (AF)~~	Total Surface Water Use (AF)
2017	1,650~~1,784~~	42	1,691~~1,826~~
2018	1,423~~2,284~~	55	1,477~~2,339~~
2019	1,142~~1,498~~	43	1,184~~1,541~~

Notes:
[1] Contract annual entitlement to the City of Paso Robles = 6,488 AFY
[2] Contract annual entitlement to CSA 16 = 100 AFY
AF = acre-feet

AFY = acre-feet per year
~~AF = acre-feet~~

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SECTION 6: **Total Water Use (§ 356.2[b][4])**

This section summarizes the total annual groundwater and surface water used to meet municipal, agricultural, and rural demands within the Subbasin. For the 2017, 2018, and 2019 water years, the quantification of total water use was completed from reported metered municipal water production and metered surface water delivery, and from models used to estimate agricultural and rural water demand. Table 8 summarizes the total annual water use in the Subbasin by source and water use sector for water years 2017, 2018, and 2019. The method of measurement and a qualitative level of accuracy for each estimate is rated on a qualitative scale of low, medium, and high.

Table 8. Total Annual Water Use by Source and Water Use Sector

Water Year	Municipal (AF)		PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
Source:	Groundwater	Surface Water	Groundwater	Groundwater	
2017	1,626~~4,235~~	1,691~~1,826~~	5,060	64,100~~72,500~~	72,500~~83,600~~
2018	1,677~~5,029~~	1,477~~2,339~~	5,060	75,500~~71,000~~	83,700~~83,400~~
2019	1,729~~4,804~~	1,184~~1,541~~	5,060	55,800~~72,200~~	63,800~~83,600~~
Method of Measure:	Metered	Metered	2016 Groundwater Model	Soil-Water Balance Model	
Level of Accuracy:	high	high	low-medium	medium	

Notes:
AF = acre-feet
PWS = public water systems

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SECTION 7: Change in Groundwater in Storage (§ 356.2[b][5])

7.1 Annual Changes in Groundwater Elevation (§ 356.2[b][5][A])

Annual changes in groundwater elevation in the Paso Robles Formation Aquifer for water years 2017, 2018, and 2019 are derived from comparison of fall groundwater elevation contour maps from one year to the next. For example, the fall 2016 groundwater elevations were subtracted from the fall 2017 groundwater elevations resulting in a map depicting the changes in groundwater elevations in the Paso Robles Formation Aquifer that occurred during the 2017 water year (see Figure 12). Similar calculations were made for water years 2018 and 2019 resulting in groundwater elevation change maps in the Paso Robles Formation Aquifer for water year 2018 (Figure 13) and water year 2019 (Figure 14). These groundwater elevation change maps are based on a reasonable and thorough analysis of the currently available data. As stated in Section 3, groundwater elevation data for the Alluvial Aquifer are too limited to prepare annual groundwater elevation contour maps. Therefore, the change in groundwater in storage analysis is limited to the Paso Robles Formation Aquifer for this annual report. As discussed in the GSP, the monitoring network needs to be expanded to more completely assess Subbasin conditions.

The groundwater elevation change map for water year 2017 (Figure 12) shows that water levels declined over a large portion of the central and northern areas of the Subbasin, with a minor depression in the City of Paso Robles area and a more pronounced area of decline in the Shandon area. The 2017 map also shows that groundwater elevations increased significantly in the southern highland areas of the Subbasin in response to the above-average precipitation received in 2017.

The groundwater elevations change map for water year 2018 (Figure 13) shows that water levels declined in the southern, eastern, and northwestern areas of the Subbasin and increased over the central portion of the Subbasin, notably in the Shandon area.

The groundwater elevations change map for water year 2019 (Figure 14) shows that groundwater elevations increased over a large portion of the eastern half of the Subbasin including a pronounced increase in the Shandon area and that water levels declined over a large portion of the western half of the Subbasin, notably in the area west of Creston.

7.2 Annual and Cumulative Change in Groundwater in Storage Calculations (§ 356.2[b][5][B])

The groundwater elevation change maps presented above represent a volume change within the Paso Robles Formation Aquifer for each water year. The volume change depicted on each map represents a total volume, including the volume displaced by the aquifer material and the volume of groundwater stored within the void space of the aquifer. The portion of void space in the aquifer that can be utilized for groundwater storage is represented by the aquifer storage coefficient (S), a unitless factor, which is multiplied by the total volume change to derive the change in groundwater in storage. Based on work completed for the GSP, S is estimated to be 7 percent.[4] The annual changes of groundwater in storage calculated for water years 2017, 2018, and 2019 are presented in Table 9 and the annual and cumulative change in groundwater in storage since 1981 are presented on Figure 15.

[4] Appendix F includes derivation of the storage coefficient from the GSP groundwater model files and a sensitivity analysis.

Table 9. Annual Changes in Groundwater in Storage - Paso Robles Formation Aquifer

Water Year	Annual Change (AF)
2017	60,100
2018	6,400
2019	59,700

Note:
AF = acre-feet

SECTION 8: **Progress toward Basin Sustainability (§ 356.2[c])**

8.1 Introduction

This section describes several projects and management actions that are in process or have been recently implemented in the Subbasin to avoid undesirable results and to attain sustainability. These projects and actions include capital projects and non-structural policies intended to reduce or optimize local groundwater use. Some of these projects were described in concept in the GSP; some of the actions described herein are new initiatives designed to make new water supplies available to the Subbasin that may be implemented by project participants to reduce pumping and partially mitigate the degree to which the management actions would be needed.

As described in the GSP, the need for projects and management actions is based on emerging Subbasin conditions, including the following:

- Groundwater levels are declining in many parts of the Subbasin, indicating that the amount of groundwater pumping is more than the natural recharge.
- Water budgets indicate that the amount of groundwater in storage has been in decline and will continue to decline in the future if there is no net decrease in pumping demand on the Subbasin.

To mitigate declines in groundwater levels in some parts of the Subbasin, achieve the sustainability goal before 2040, and avoid undesirable results as required by SMGA regulations, an overall reduction of groundwater pumping will be needed. A reduction in groundwater pumping can occur as a result of both management actions and projects that develop new water supplies used in lieu of pumping.

This section also provides a brief discussion of land subsidence, potential depletion of interconnected surface waters, and groundwater quality trends that have occurred during water years 2017, 2018, and 2019.

The projects and management actions described in this section will help achieve groundwater sustainability by avoiding undesirable results.

8.2 Implementation Approach

As described in the GSP, because the amount of groundwater pumping in the Subbasin is more than the estimated sustainable yield and groundwater levels are persistently declining in some parts of the Subbasin, the GSAs have already initiated several projects and management actions. It is anticipated that additional new projects and management actions will be implemented in the near future to continue progress towards avoiding or mitigating undesirable results.

Some of the projects and management actions described in this section are Subbasin-wide initiatives and some are area-specific. Generally, the basin-wide management actions apply to all areas of the Subbasin and reflect relatively basic GSP implementation requirements. Area-specific projects have been designed to aid in mitigating persistent water level declines in certain parts of the Subbasin.

8.3 Basin-Wide Management Actions and Projects

8.3.1 Amendment #1 to the MOA

The original five GSAs overlying the original Subbasin entered into a Memorandum of Agreement (MOA) in September 2017. Heritage Ranch Community Services District (CSD) was an original party to the MOA but with basin boundary modification approval by DWR in 2019, Heritage Ranch CSD is no longer part of the Subbasin and has withdrawn from the MOA, leaving four participants. The purpose of the MOA was to establish a committee to develop a single GSP for the entire Subbasin. Furthermore, the GSAs intended to use the MOA as the framework for basin-wide cooperation in management of the Subbasin during the time between adoption of the GSP and approval of the GSP by DWR. As originally written, the MOA would automatically terminate upon DWR's approval of the GSP.

Prior to submittal of the GSP for DWR review and approval, each of the GSAs adopted the GSP pursuant to the terms of the MOA. Each GSA separately adopted resolutions amending the original MOA to remove the automatic termination language because the GSAs agree to continue cooperating on the GSP and its implementation pursuant to the framework established by the MOA until such time as a long-term governance structure is developed. The amendment (Amendment #1) will allow for continued collaboration and cooperation among the GSAs to manage groundwater in the Subbasin and achieve sustainability.

8.3.2 Extension of Water Neutral New Development Program

In October 2015, the County Board of Supervisors established the Countywide Water Conservation Program (CWWCP), which includes the County's Water Neutral New Development (WNND) program, in response to declining groundwater levels. WNND programs that are being implemented in the Subbasin include:

- The Urban/Rural Water Offset and Rebate Programs
- The Agricultural Offset Program

These programs required new urban/rural development using groundwater from the Subbasin to offset new water use at a 1:1 ratio and limited new or expanded irrigated commercial crop production in areas within the Subbasin except by offset of existing irrigated crop production at a 1:1 ratio either on the same property or on a different property in the Subbasin. The Agricultural Offset Program also identified areas of severe decline in groundwater elevation and further restricted properties overlying these areas from planting new or expanded irrigated crops except for those converting irrigated crops on the same property to a different crop type. The Agricultural Offset Program was originally intended to be a stop-gap measure to avoid further depletion of the Subbasin until SGMA implementation. The ordinances that created the programs included a termination clause that stated the programs in the Subbasin shall expire upon the effective date of a final and adopted GSP.

In June 2019, the County Board of Supervisors directed the County of San Luis Obispo Department of Planning and Building to develop recommendations for extending the WNND programs such that there would be no gap between the expiration of the County's programs and any pumping restrictions or controls that may be implemented as part of the GSP. Modification of the Agricultural Offset Program was proposed to occur in several phases, with the first phase starting in November 2019 to avoid the gap. The first phase amendments, adopted by the County Board of Supervisors on November 5, 2019, did not require environmental review because the changes from the existing ordinance were relatively minor. These items include the following:

- Extend the WNND ordinance expiration dates by two years
- Include a process to add water duty factors to unlisted crops
- Include a water duty factor for supplementally irrigated Dry Cropland and a methodology for determining previous five-year onsite water use
- Include a water duty factor for hemp
- Eliminate off-site offsets

- Require a recorded disclosure form

The County Board of Supervisors anticipates addressing additional items in early 2020, including:

- Re-evaluate the extent of the "red zone," the zone of critical impact in the central portion of the Subbasin
- Update and set the Subbasin boundary map to match the DWR Bulletin 118 boundary
- Establish a registration process for voluntary fallowing of irrigated agricultural lands

Items that will likely be addressed in mid-to-late 2020 are those that could trigger additional environmental review because they have the potential to result in adverse environmental impacts, and as such, more time is needed to complete those amendments. These later-phase items as they pertain to the Subbasin include the following:

- Consider expanding the definition of de minimis use from 5 AFY to 25 AFY per site, considering parcel size
- Consider extending the lookback period beyond five years
- Revisit the Paso Robles Subbasin planning area standards that prohibit general plan amendments and land divisions (to allow for water-neutral housing projects)
- Revisit water offset fees and water usage assumptions
- Discuss allowing off-site offsets

The extension of the WNND has been included in the Annual Report because the WNND represents a current management action. However, it is a temporary management action enacted by the County pursuant to its police powers that is set to expire on January 1, 2022 rather than a long-term management action identified in the GSP. Thus, its inclusion in the Annual Report and reference to future potential items to be addressed shall not be construed as any sort of commitment on the part of the County to a further extension.

8.3.3 Paso Basin Aerial Groundwater Mapping Pilot Study

In November 2019, the County of San Luis Obispo joined in a pilot study through DWR and Stanford University to conduct aerial groundwater mapping of a large portion of the Subbasin utilizing Aerial Electromagnetic method (AEM). The goal of the pilot study is to acquire survey data to characterize and map subsurface geologic structures as well as the presence and extent of clay, silt, sand, and gravel layers to a depth of approximately 1,000 to 1,400 feet below the ground surface. The study has the potential to enhance our understanding of the groundwater flow within the Subbasin, the interconnectedness of different parts of the Subbasin, and the geologic framework that controls groundwater flow. The study is in line with proposal #3.7 of California's Water Resilience Portfolio (see Section 8.4.1 for additional discussion and detail of the Water Resilience Portfolio) which is specifically intended to support use of aerial electromagnetic surveys, groundwater quality conditions, and well completion reports to identify optimal areas for enhanced recharge and critical connections in aquifer systems.

8.4 Area-Specific Projects

8.4.1 Expand Alluvial Aquifer Monitoring Network and Install New Stream Gages

A significant data gap that was identified in the GSP was the need to expand the network of monitoring wells and stream gages within the Alluvial Aquifer, one of the two principal aquifers in the Subbasin. The existing network of monitoring wells in the Alluvial Aquifer in areas where surface water and groundwater interaction may occur is extremely sparse and surface water flows in the Subbasin are ephemeral. Together, these two factors make it difficult to assess the interconnectivity of surface water and groundwater and to quantify whether any surface water depletion has occurred. There are no available data that establish whether the groundwater and surface water are connected through a continuous saturated zone in any aquifer, although water elevation contour maps of the Paso Robles Formation wells suggest that a continuous saturated zone between the surface water and the Paso Robles Formation aquifer does not exist.

The inability to assess the interconnectivity of the surface water with the underlying aquifers also affects the understanding of the potential impacts of pumping on groundwater dependent ecosystems (GDEs), which are plant and animal communities that require groundwater to meet some or all of their water needs. GDEs can be associated with areas where there is a direct connection between shallow alluvial water-bearing formations and deeper aquifers. The existing groundwater monitoring program in the Subbasin does not include any nested monitoring wells that can be used to assess the interaction between the surface stream flows, associated Alluvial Aquifer, and the underlying Paso Robles Formation Aquifer.

Per the recommendations set forth in the GSP, *"Definitive data delineating any interconnections between surface water and groundwater or a lack of interconnected surface waters is a data gap that will be addressed during implementation of this GSP."* To address this significant data gap and assess the potential for interconnectivity of the surface water with the principal aquifers of the Subbasin, the four GSAs have submitted a proposal to the State Water Resources Control Board (Board) for the use of Supplemental Environmental Project (SEP) funds that are potentially available as a result of a settlement agreement between the Board and the City of Paso Robles for violations of the City's National Pollutant Discharge Elimination System permit related to wastewater treatment releases.

Through the assistance of the SEP funds, the potential for interconnected surface water within the Alluvial Aquifer will be assessed after data from this expanded network of monitoring wells and stream gages are developed and analyzed. Currently, only two stream gages exist within the Basin. The proposed SEP project intends to expand that network by coupling stream gages with monitoring wells in each of the major drainages across the Subbasin, including the Salinas River, Huer Huero Creek, Estrella River, San Marcos Creek, Shell Creek, San Juan Creek and other smaller surface water drainage features.

The GSAs have identified 10 sites in which additional hydrologic, geologic, and hydrogeologic data are necessary. The overall project goals include the installation of a stream gage and a nested monitoring well at each of the 10 sites. The sites were identified in locations where stream gages coupled with dedicated monitoring wells would provide key data. Monitoring wells would be nested or paired (depending on local conditions and whether existing wells are available and suitable) with a minimum of three wells, or discrete depth intervals, at each site. The discrete intervals are intended to monitor hydrologic conditions within the Alluvial Aquifer, a short distance below the base of the Alluvial Aquifer in the Paso Robles Formation Aquifer and deeper into the Paso Robles Formation Aquifer at depths similar to production wells in the general vicinity of each individual site.

Two of the selected sites, the 13th Street Bridge in Paso Robles and the Airport Road crossing of the Estrella River, have existing U.S. Geological Survey (USGS) stream gages. The other eight sites will require new stream gage installations. GSAs recognize that installing the proposed network of monitoring wells and stream gages at all of the 10 proposed sites will require a significant initial capital investment as well as a commitment of resources and funding for annual operation and maintenance of the sites. Thus, the GSAs intend to implement the proposed monitoring network over time. Under the terms of this proposed grant application, the GSAs intend to complete two or three sites at this time, and install monitoring systems at the remaining sites as funding becomes available.

This proposed work effort is in line with California Senate Bill 19 (approved September 27, 2019) which is an act to add Section 144 to the California Water Code, relating to water resources. The bill requires DWR to develop a plan to deploy a network of stream gages that includes a determination of funding needs and opportunities for modernizing and reactivating existing gages and deploying new gages. The bill also requires DWR to give priority in the plan to placing or modernizing and reactivating stream gages where lack of data contributes to conflicts in water management or where water can be more effectively managed for multiple benefits.

This proposed project also supports the mandate of Governor Gavin Newsom's Executive Order N-10-19 (April 2019) that directs the state's water agencies to develop a "water resilience portfolio," described as a set of actions to meet California's water needs. In response, the state agencies developed an inventory and assessment of key aspects of California water, leading to a series of priorities. Among the list of 133 specific priorities, proposal #22.6 is intended to modernize water data systems to inform real-time water management decisions and long-term planning by building on implementation of Senate Bill 19 which requires an assessment of the state's stream gage network.

The amount of money that may be available to fund the project is $240,000.

8.4.2 City of Paso Robles Recycled Water Program

In 2016, the City completed a major upgrade of its Wastewater Treatment Plant to efficiently and effectively remove all harmful pollutants from the wastewater. The City's master plan is to produce tertiary-quality recycled water and distribute it to east Paso Robles, where it may be safely used for irrigation of city parks, golf courses, and vineyards. This will reduce the need to pump groundwater from the Subbasin and will further improve the sustainability of the City's water supply. In 2019, the City completed construction and began operating the recycled water system and is presently designing a major distribution system to deliver recycled water to east Paso Robles. The recycled water distribution system project will be ready for construction in 2020.

The project will use up to 2,200 AFY of disinfected tertiary effluent for in-lieu recharge in the central portion of the Subbasin near and inside the City of Paso Robles. Water that is not used for recycled water purposes can be discharged to Huer Huero Creek with the potential for additional recharge benefits. Infrastructure includes upgraded wastewater treatment plant and pump station, 5.8 miles of pipeline, a storage tank, numerous turnouts, and a discharge to Huer Huero Creek.

The primary benefit from the City's Recycled Water Program is higher groundwater elevations in the central portion of the Subbasin due to in-lieu recharge from the direct use of the recycled water and recharge through Huer Huero Creek.

8.4.3 San Miguel CSD Recycled Water Project

The San Miguel CSD Recycled Water project is currently in the planning and preliminary design phases. This planned project will upgrade the CSD wastewater treatment plant to meet California Code of Regulations (CCR) Title 22 criteria for disinfected secondary recycled water for irrigation use by vineyards. Potential customers include a group of agricultural irrigators on the east side of the Salinas River, and a group of agricultural customers northwest of the wastewater treatment plant. The project could provide between 200 AFY and 450 AFY of additional water supplies. The primary benefit from the CSD's Recycled Water project is higher groundwater elevations in the vicinity of the community of San Miguel due to in-lieu recharge from the direct use of the recycled water.

8.4.4 Blended Water Project

Private entities and individuals are working actively with the City of Paso Robles and numerous agricultural irrigators to develop a project that can bring recycled water to the central portion of the Subbasin. As described above, the City estimates that as much as 2,200 AFY of recycled water will be available, and the volume will likely increase in the future as the City grows. The wastewater treatment plant is designed to process and deliver up to 4,000 AFY.

The goal of the Blended Water Project is to design and construct a pipeline system to connect to the City's Recycled Water Program and convey recycled water into the agricultural areas east of the City. Although there are many ways to utilize the Recycled Water Program water directly, certain challenges exist to make the water quality of the recycled water attractive to some agricultural users. Blending the recycled water with surplus Nacimiento Water Project water, when available, may mitigate these challenges.

Numerous challenges exist to develop the project, but considerable time and effort has been expended by several private entities as well as City staff to develop this conceptual project. The primary benefit from the Blended Water Project is higher groundwater elevations in the central portion of the Subbasin east of the City of Paso Robles due to reductions in groundwater pumping for irrigation and in-lieu recharge from the direct use of the blended water. Associated benefits may include improved groundwater quality from the use and recharge of high-quality irrigation water.

8.4.5 Stormwater Capture and Recharge Projects

As described in the GSP, stormwater runoff capture projects, including low-impact development (LID) standards for new or retrofitted construction, will be promoted throughout the Subbasin as priority projects to be implemented as described in the San Luis Obispo County Stormwater Resource Plan (SWRP). The SWRP outlines an implementation strategy to ensure valuable, high-priority projects with multiple benefits.

This management action covers two types of stormwater capture activities. The first stormwater management activity is the effort to reduce runoff of rainwater in the urban environment into streets, storm drains, and other sites that discharge water as well as pollutants directly into waterways and the underlying aquifer through infiltration of streamflow recharge. In this way, groundwater quality is protected and improved. Examples of this effort include LID and on-farm recharge of local runoff. The second stormwater capture effort involves direct recharge of storm flows through the capture and diversion of water to recharge locations to help maintain base flows in streams and to replenish aquifer storage.

Two stormwater capture programs are underway in the Paso Robles Subbasin, including the City of Paso Robles's Municipal Stormwater Program and a joint investigation by the Shandon-San Juan Water District (SSJWD) and the Estrella-El Pomar-Creston Water District (EPCWD) to assess the feasibility of developing stormwater capture and recharge in their respective districts.

8.4.5.1 City of Paso Robles Municipal Stormwater Program

The City of Paso Robles currently has a City Watershed Plan in development. This Plan will identify opportunities to capture stormwater, send it through the City's wastewater treatment plant, and add it to the Recycled Water supply. The City of Paso Robles has also developed a Municipal Stormwater Program that includes the development and implementation of a Stormwater Management Plan (SWMP) to reduce or eliminate pollutants in stormwater runoff and non-storm water discharges. The SWMP describes the Best Management Practices (BMPs), measurable goals, and timetables for implementation of the following five minimum control measures:

- Construction Site Stormwater Runoff Control
- Illicit Discharge Detection and Elimination
- Pollution Prevention/Good Housekeeping for Municipal Operations
- Post-Construction Stormwater Runoff Management

- Public Education and Public Participation

Under the program, the City educates and involves the community in stormwater pollution prevention, regulates stormwater run-off from construction sites, investigates non-stormwater discharges, and reduces non-stormwater runoff from municipal operations.

8.4.5.2 SSJWD/EPCWD Stormwater Capture and Recharge Feasibility Study

The SSJWD and EPCWD are jointly funding a study to assess the feasibility and costs associated with capturing stormwater runoff and recharging aquifers within selected areas of their respective districts, including Shell Creek, Navajo Creek, San Juan Creek, and Huer Huero Creek. If feasible and cost effective, the capture and recharge of stormwater will aid in reducing the deficit between pumping and natural recharge in the Subbasin, which will improve the sustainability of the groundwater system. This ongoing investigation focuses on the following key questions:

- Where are the best areas to divert and recharge stormwater that would benefit the Subbasin?
- How much water can potentially be captured?
- What scale is necessary to make the projects meaningful?
- What is the most efficient way to capture and recharge stormwater and what would a typical project concept look like?
- What are the permitting and regulatory requirements for building and operating a stormwater capture and recharge project?
- What would a project or projects cost to design, permit and construct?
- What is the availability of grant funds?

Building on previous County of San Luis Obispo studies of the Huer Huero Creek near the City of Paso Robles (Todd Groundwater, RMC Woodard & Curran, 2017), the joint SSJWD/EPCWD study will be expanded to include the southern reaches of Huer Huero Creek in the Creston area, as well as the Shell, San Juan, and Navajo creeks. Areas within the watershed of these creeks will be assessed to identify the most promising locations for stormwater capture and recharge by considering the following:

- Existing drainage locations overlying or feeding into the Subbasin
- Land surface elevation and slope
- Soils conducive to recharge
- Locations directly overlying the Paso Robles Formation Aquifer
- Proximity to low permeability layers that would impede infiltration
- Proximity to structures
- Potential for impacts caused by ponding stormwater

The results of the study are expected in spring 2020.

8.5 Summary of Progress toward Meeting Subbasin Sustainability

Relative to the basin conditions at the end of the study period as reported in the GSP, this First Annual Report (2017–2019) indicates an improvement in groundwater conditions throughout the Subbasin and a marked increase of total groundwater in storage. It is clear that historical groundwater pumping in excess of the sustainable yield has created challenging conditions for sustainable management. However, actions are already underway to collect data, improve the monitoring and data collection networks, and coordinate with affected agencies and entities throughout the Subbasin to develop solutions that address the shared mutual interest in the Subbasin's overall sustainability goal.

8.5.1 Subsidence

Land subsidence is the lowering of the land surface. As described in the GSP, several human-induced and natural causes of subsidence exist, but the only process applicable to SGMA are those due to lowered ground surface elevations caused by groundwater pumping (M&A, 2019). Historical subsidence can be estimated using Interferometric Synthetic Aperture Radar (InSAR) data provided by DWR. InSAR measures ground elevation using microwave satellite imagery data. The GSP documents minor subsidence in the Subbasin using data provided by DWR depicting the difference in InSAR measured ground surface elevations between June 2015 and June 2018. These data show that subsidence of up to 0.125 feet may have occurred over this three-year period in a few small, isolated areas of the Subbasin (M&A, 2019). This is a minor rate of subsidence and is relatively insignificant and not a major concern for the Subbasin. As of the date of this report, there are no more recent land subsidence datasets available since publication of the GSP. The GSA's will continue to monitor and report annual subsidence as more data become available.

8.5.2 Interconnected Surface Water

Ephemeral surface water flows in the Subbasin make it difficult to assess the interconnectivity of surface water and groundwater and to quantify the degree to which surface water depletion has occurred. Currently, there are no available data that establish connectivity between groundwater and surface water through a continuous saturated zone in any aquifer. As stated in the GSP, water elevation contour maps of the Paso Robles Formation wells may suggest that a continuous saturated zone between the surface water and the Paso Robles Formation aquifer does not exist (M&A, 2019). As of the date of this report, there are no more recent data available since publication of the GSP to assess the interconnectivity of surface water and groundwater or to quantify potential surface water depletion. The potential for interconnected surface water with the alluvial aquifer will be assessed as data are developed and analyzed as discussed in Section 8.4.1.

8.5.3 Groundwater Quality

Although groundwater quality is not a primary focus of SGMA, actions or projects undertaken by GSAs to achieve sustainability cannot degrade water quality to the extent that they would cause undesirable results. As stated in the GSP, groundwater quality in the Subbasin is generally suitable for both drinking water and agricultural purposes (M&A, 2019). Eight constituents of concern (COC's) were identified and discussed in the GSP that have the potential to be impacted by groundwater management activities. These COC's identified in the GSP are salinity (as indicated by electrical conductivity), total dissolved solids (TDS), sodium, chloride, nitrate, sulfate, boron, and gross alpha. For this annual report, concentrations of these eight COC's were analyzed for the water years 2017 through 2019 period using data from the GeoTracker GAMA database (GAMA, 2019) to document any potential changes in Subbasin-wide concentration trends since 2016. All but one of the COC's reviewed show a steady concentration trend since 2016. Gross alpha, the exception, exhibits a slight downward trend since 2016, driven mostly by sampling results from the City of Paso Robles area.

Overall, there are no significant changes to groundwater quality since 2016, as documented in the GSP. Implementation of sustainability projects and/or management actions, as presented in the GSP, in this annual report, or in future reports or GSP updates, are not anticipated to result in degraded groundwater quality in the Subbasin. Any potential changes in groundwater quality will be documented in future annual reports and GSP updates.

8.5.4 Summary of Changes in Basin Conditions

The above-average rainfall water years of 2017 and 2019 improved groundwater conditions in the Subbasin. Groundwater in storage in the Subbasin increased more than 125,000 AF in total over the past three water years (Section 7.2). The volume of groundwater extractions in the Subbasin has remained relatively consistent for the past several years (averaging approximately 81,700 AFY; Section 4.5) because the known irrigated acreage in the Subbasin has not changed dramatically. Although groundwater in storage has increased somewhat over the past three water years, groundwater pumping continues to exceed the estimated future sustainable yield and the projects and management actions described in the GSP and in this First Annual Report will be necessary in order to bring the Subbasin into sustainability.

8.5.5 Summary of Impacts of Projects and Management Actions

Additional time will be necessary to judge the effectiveness and quantitative impacts of the projects and management actions either now underway or in the planning and implementation stage. However, it is clear that the actions in place and as described in this First Annual Report are a good start towards reaching the sustainability goals laid out in the GSP. It is too soon to judge the observed changes in basin conditions against the interim goals outlined in the GSP, but the anticipated effects of the projects and management actions now underway are expected to significantly affect the ability of the Subbasin stakeholders to reach the necessary sustainability goals.

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FIGURES

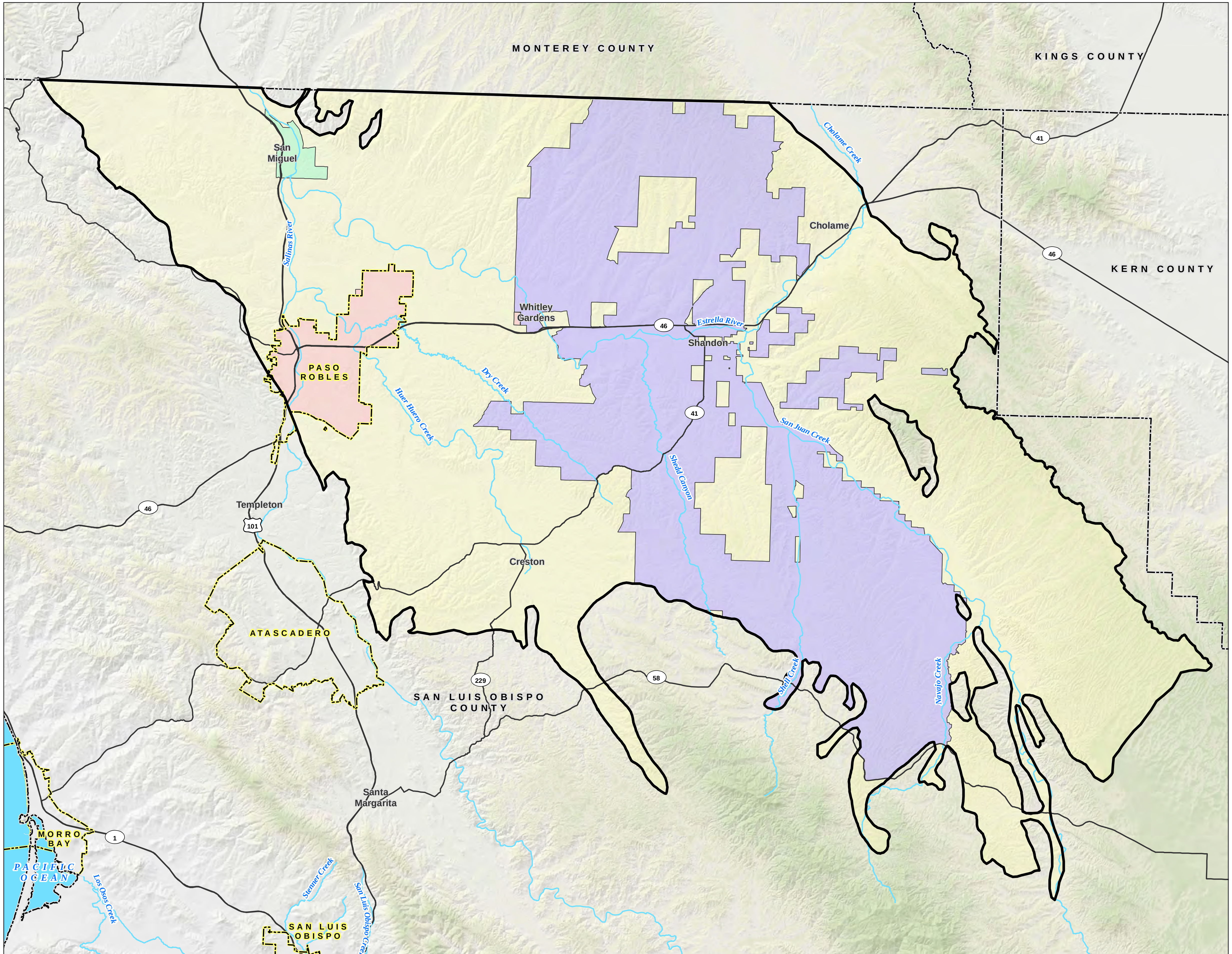


FIGURE 1

Extent of the Paso Robles Subbasin and Exclusive Groundwater Sustainability Agencies

Paso Robles Subbasin
First Annual Report

LEGEND

- Paso Robles Subbasin

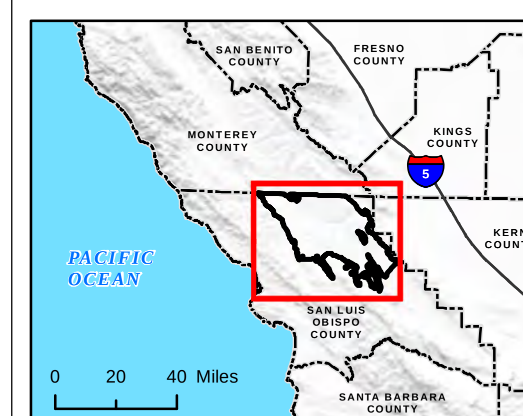
Exclusive Groundwater Sustainability Agencies

- San Miguel Community Services District
- City of Paso Robles
- Shandon- San Juan Water District
- Paso Basin - County of San Luis Obispo

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

LOCATOR MAP:



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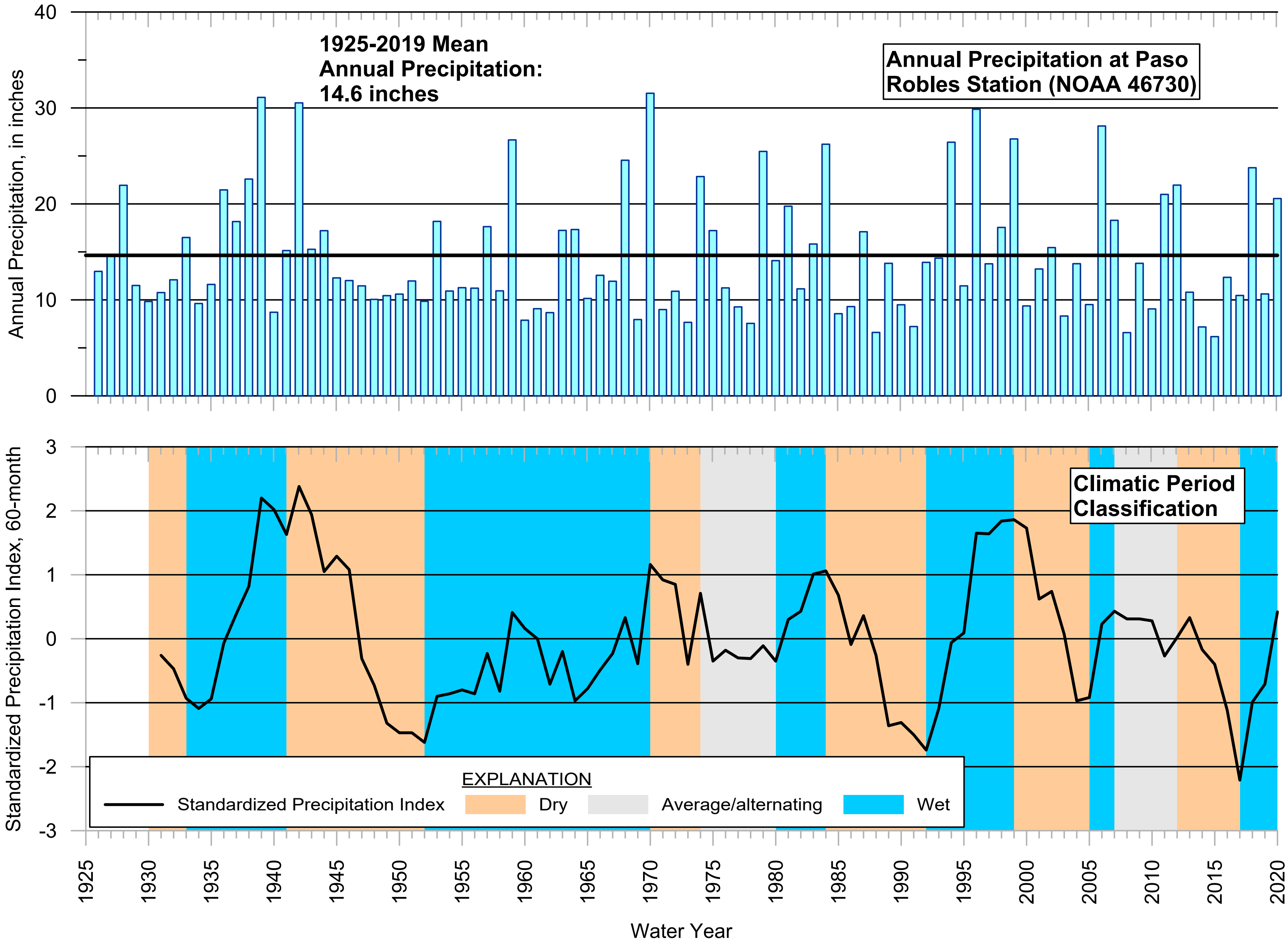

FIGURE 2

Annual Precipitation and Climatic Periods in the Paso Robles Subbasin

Paso Robles Subbasin First Annual Report

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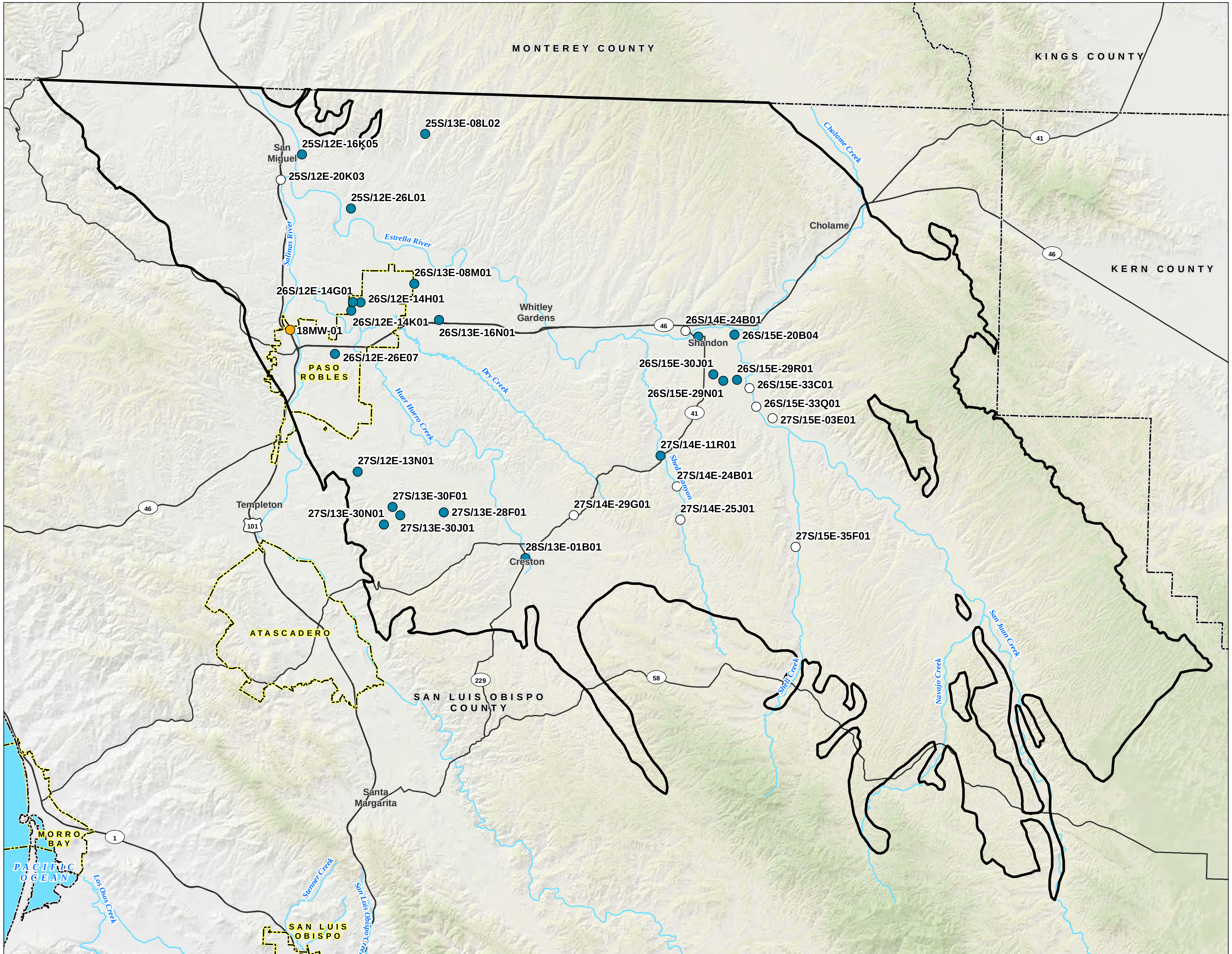

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FIGURE 3

Groundwater Elevation Monitoring Well Network in the Paso Robles Subbasin

Paso Robles Subbasin
First Annual Report

LEGEND

Wells

- Paso Robles Formation
- Alluvial Aquifer
- Potential Future Monitoring Well

All Other Features

- Paso Robles Subbasin
- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

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Date: January 16, 2020
Data Sources: CA DWR, SLO Co., City of Paso Robles, USGS

GSI Water Solutions, Inc.

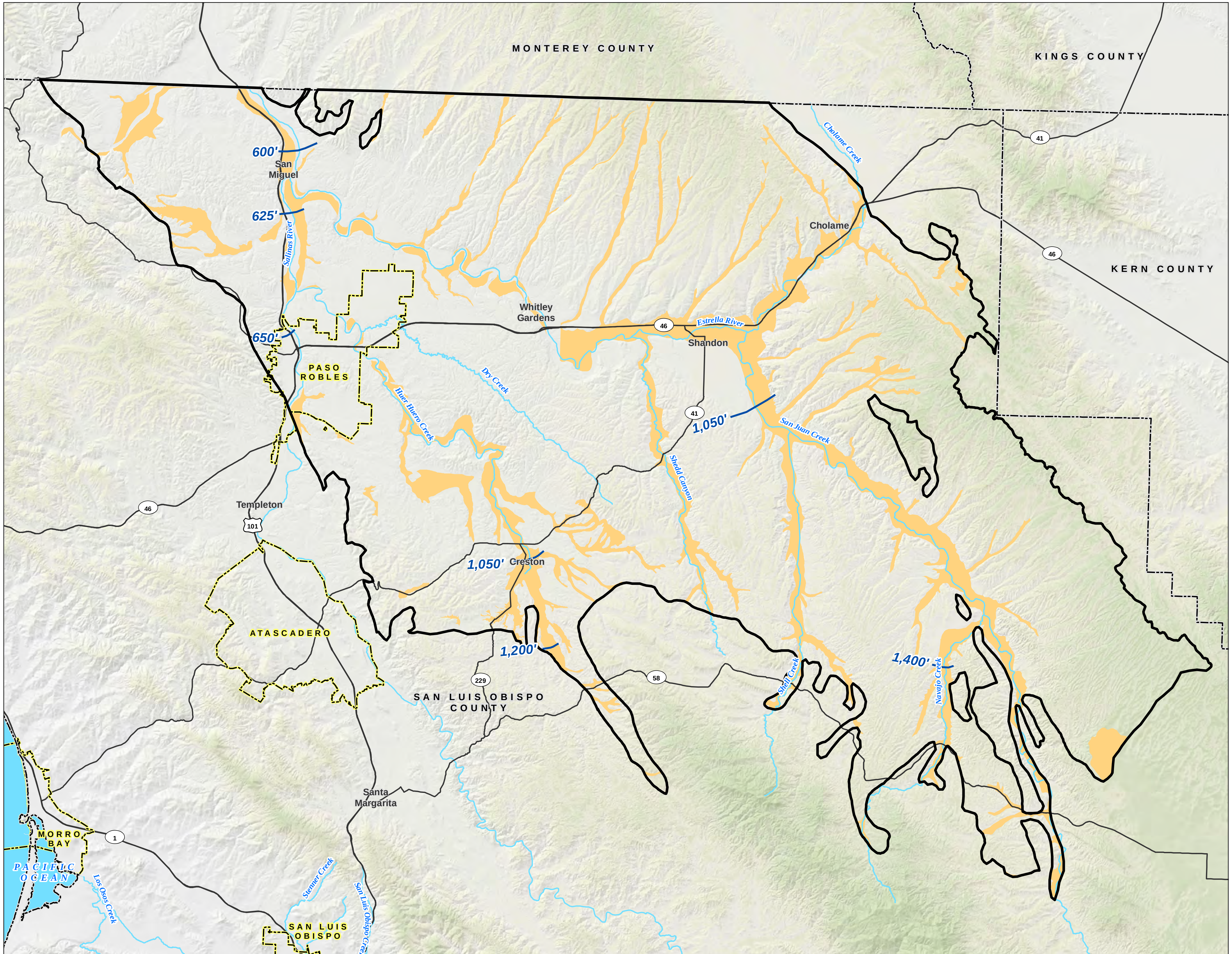

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FIGURE 4

Alluvial Aquifer Groundwater Elevation Contours

Paso Robles Subbasin
First Annual Report

LEGEND

Alluvial Groundwater Elevation Contour, in feet above mean sea level

Paso Robles Subbasin

Geologic Alluvial Units

Qal: Alluvial Deposits

All Other Features

County Boundary

City Boundary

Major Road

Watercourse

Waterbody

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Feet

Date: January 16, 2020
Data Sources: CA DWR, SLO Co., Montgomery, USGS

GSI Water Solutions, Inc.

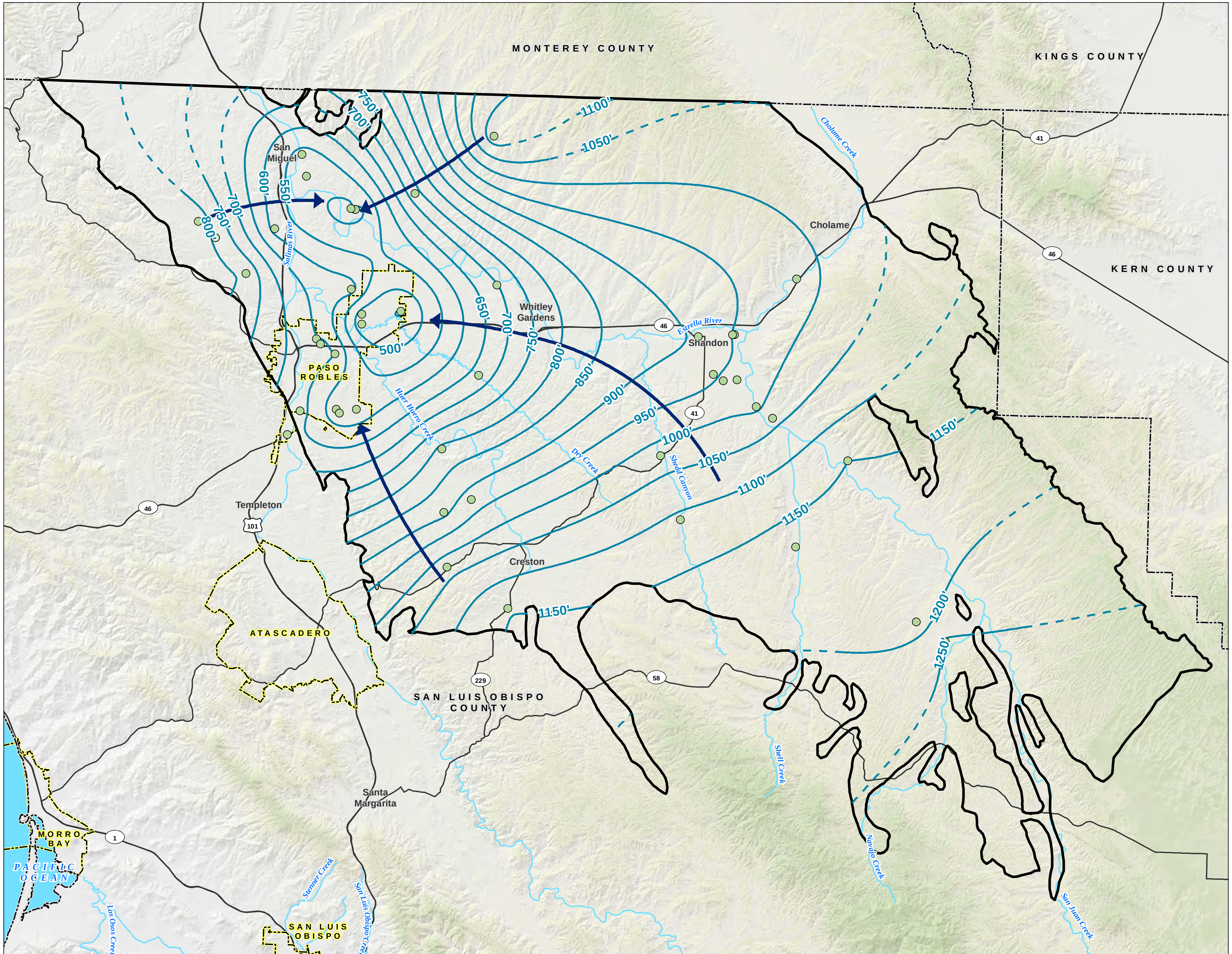

FIGURE 5

Paso Robles Formation Aquifer Fall 2017 Groundwater Elevation Contours

Paso Robles Subbasin
First Annual Report

LEGEND

- Well providing data for Paso Robles Formation Aquifer
- Fall 2017 Groundwater Elevation Contour in feet above mean sea level; dashed where inferred
- Inferred Groundwater Flow Direction
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

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Feet

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Date: January 16, 2020
Data Sources: CA DWR, SLO Co., USGS

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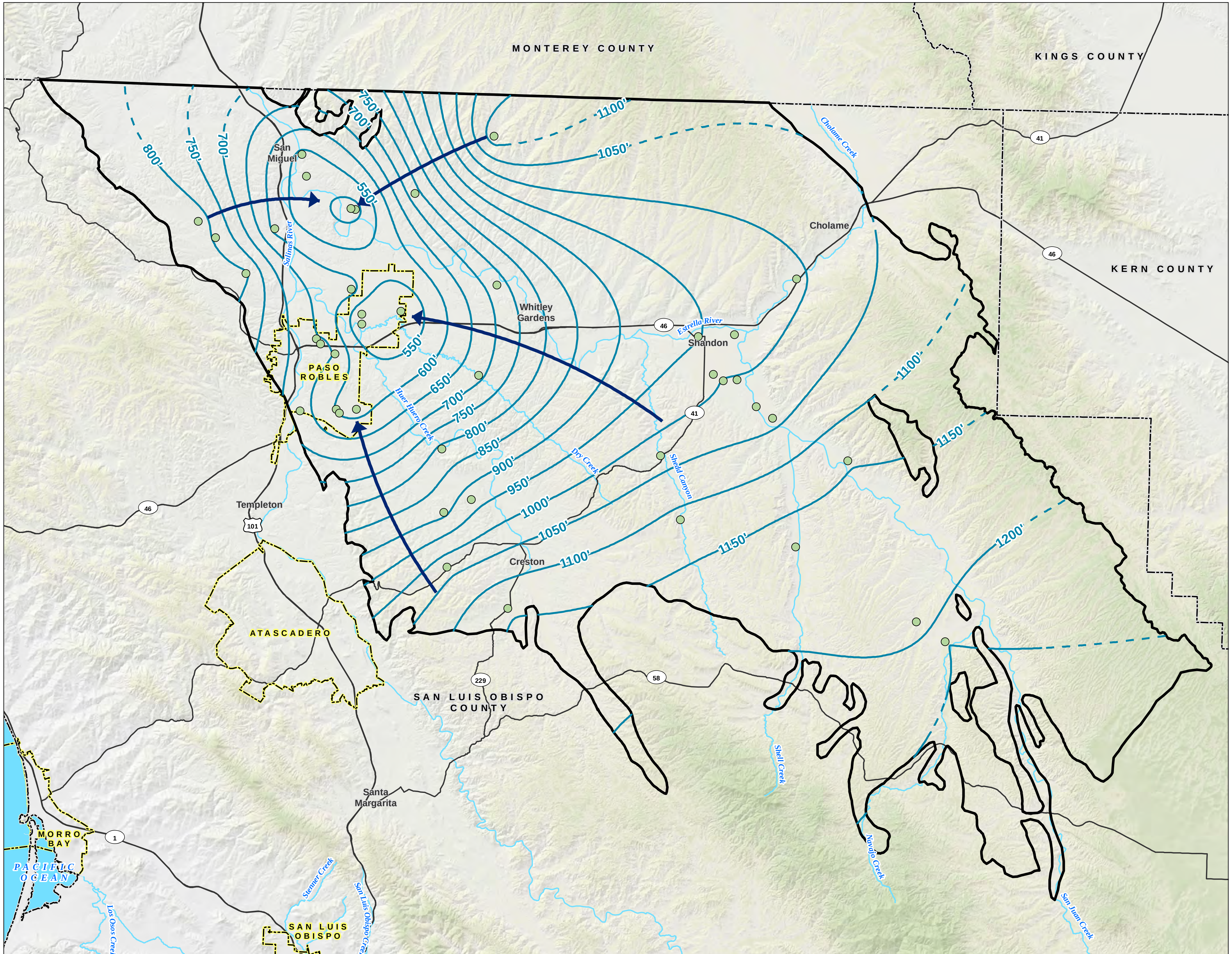

FIGURE 6

Paso Robles Formation Aquifer Spring 2018 Groundwater Elevation Contours

Paso Robles Subbasin
First Annual Report

LEGEND

- Well providing data for Paso Robles Formation Aquifer
- Spring 2018 Groundwater Elevation Contour in feet above mean sea level; dashed where inferred
- Inferred Groundwater Flow Direction
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

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Feet

Date: January 16, 2020
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

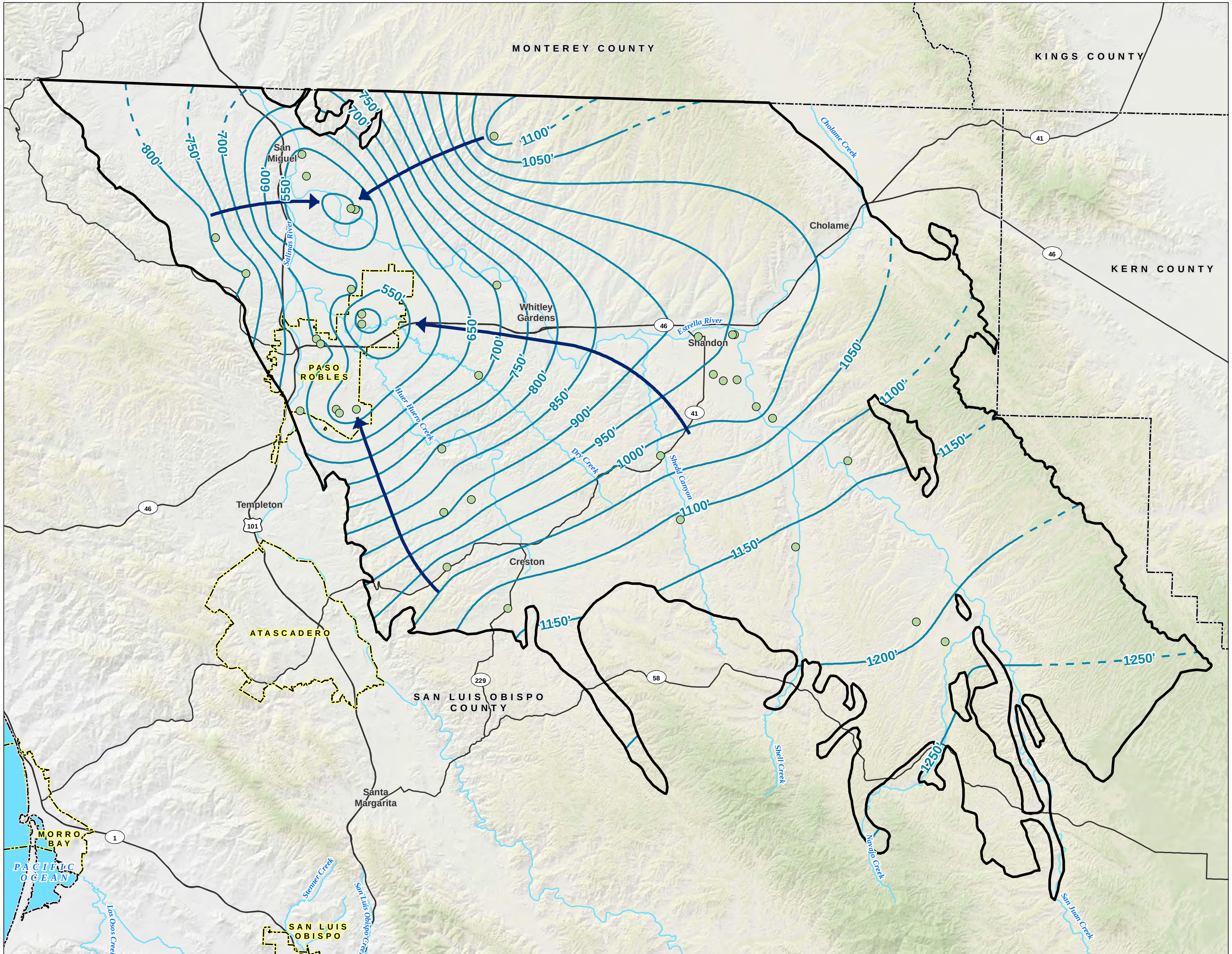

FIGURE 7

Paso Robles Formation Aquifer Fall 2018 Groundwater Elevation Contours

Paso Robles Subbasin
First Annual Report

LEGEND

- Well providing data for Paso Robles Formation Aquifer
- Fall 2018 Groundwater Elevation Contour in feet above mean sea level; dashed where inferred
- Inferred Groundwater Flow Direction
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

Date: January 16, 2020
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

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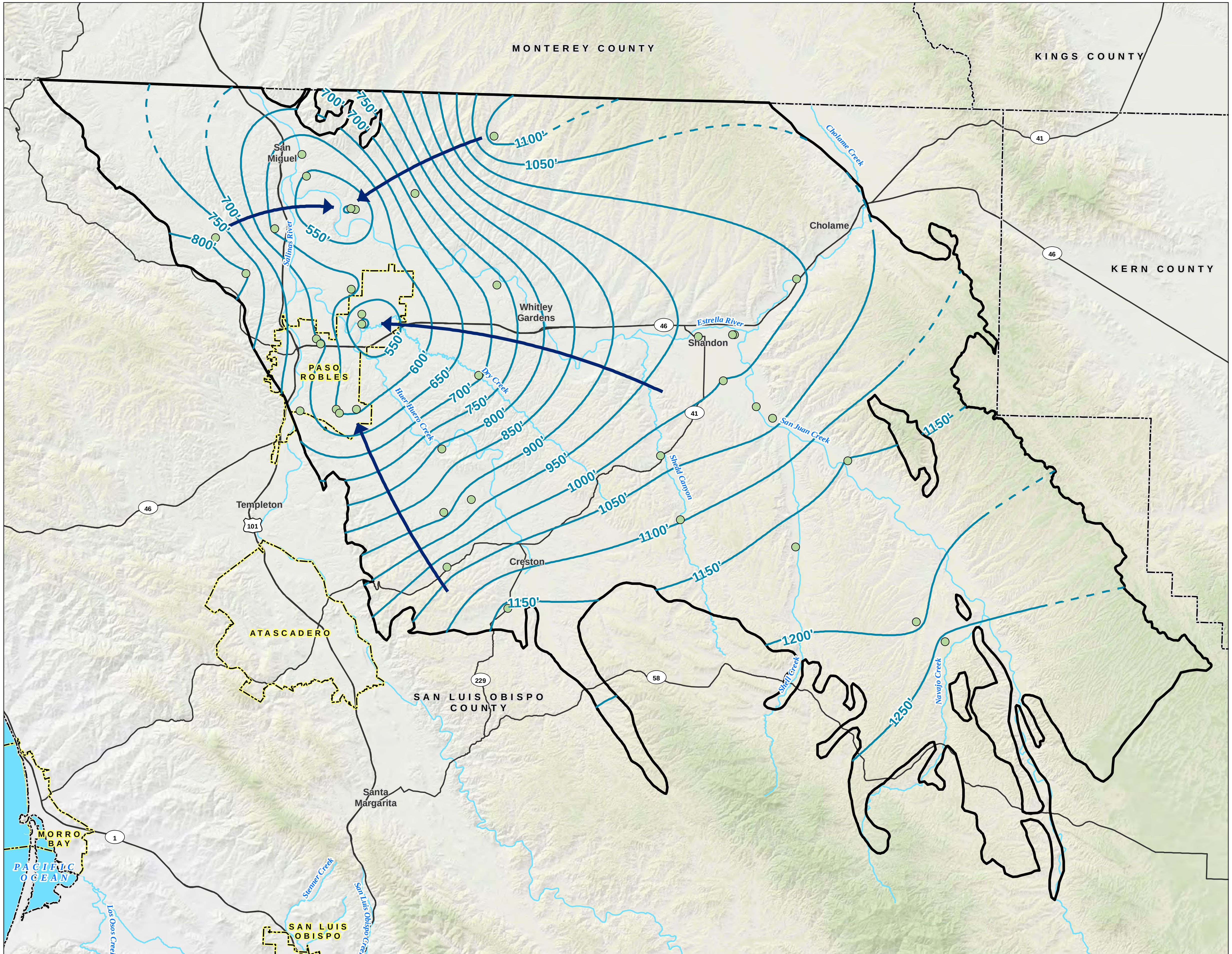

FIGURE 8

Paso Robles Formation Aquifer Spring 2019 Groundwater Elevation Contours

Paso Robles Subbasin
First Annual Report

LEGEND

- Well providing data for Paso Robles Formation Aquifer
- Spring 2019 Groundwater Elevation Contour in feet above mean sea level; dashed where inferred
- Inferred Groundwater Flow Direction
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

Date: January 16, 2020
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

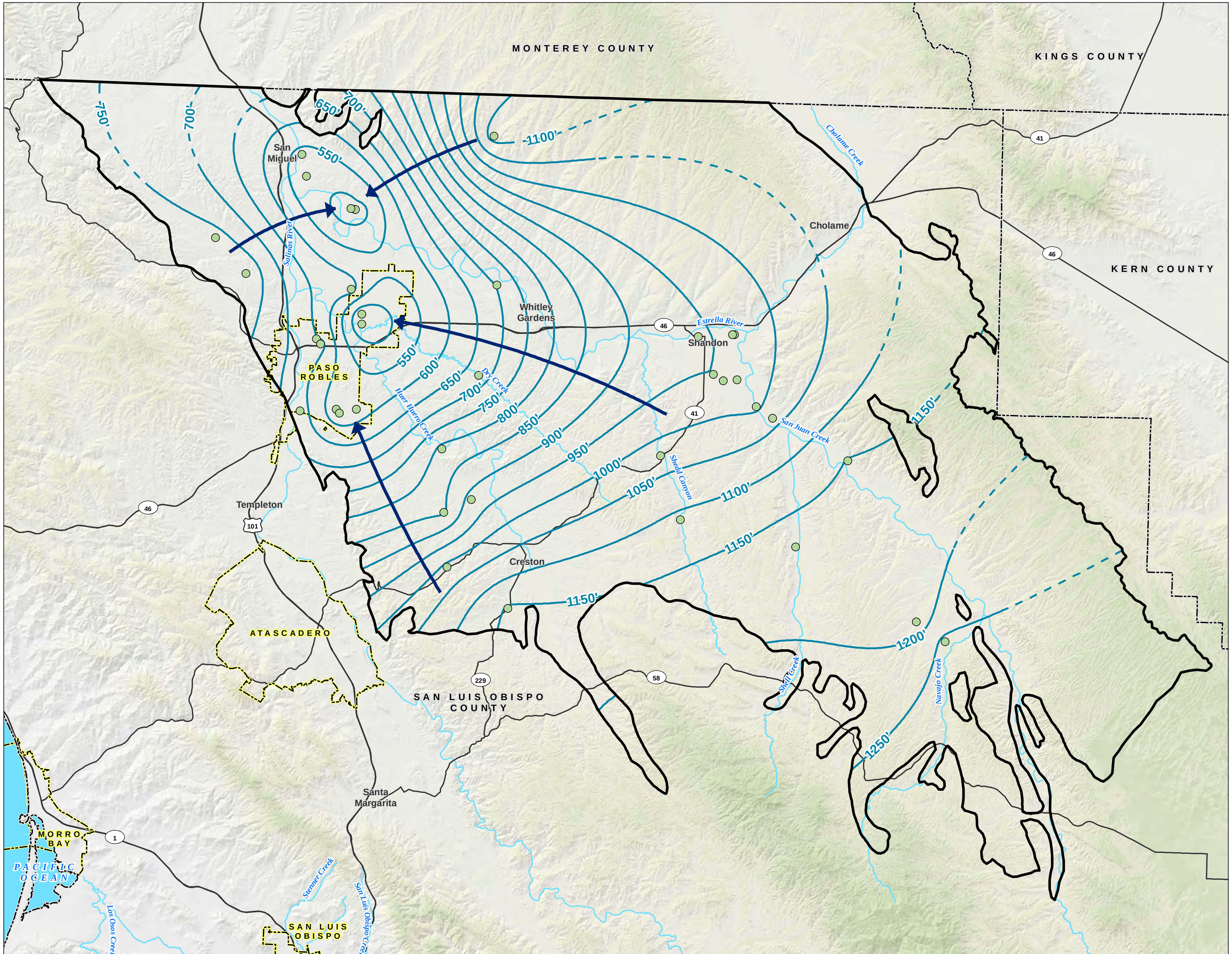

FIGURE 9

Paso Robles Formation Aquifer Fall 2019 Groundwater Elevation Contours

Paso Robles Subbasin
First Annual Report

LEGEND

- Well providing data for Paso Robles Formation Aquifer
- Fall 2019 Groundwater Elevation Contour in feet above mean sea level; dashed where inferred
- Inferred Groundwater Flow Direction
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

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Feet

Date: January 16, 2020
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

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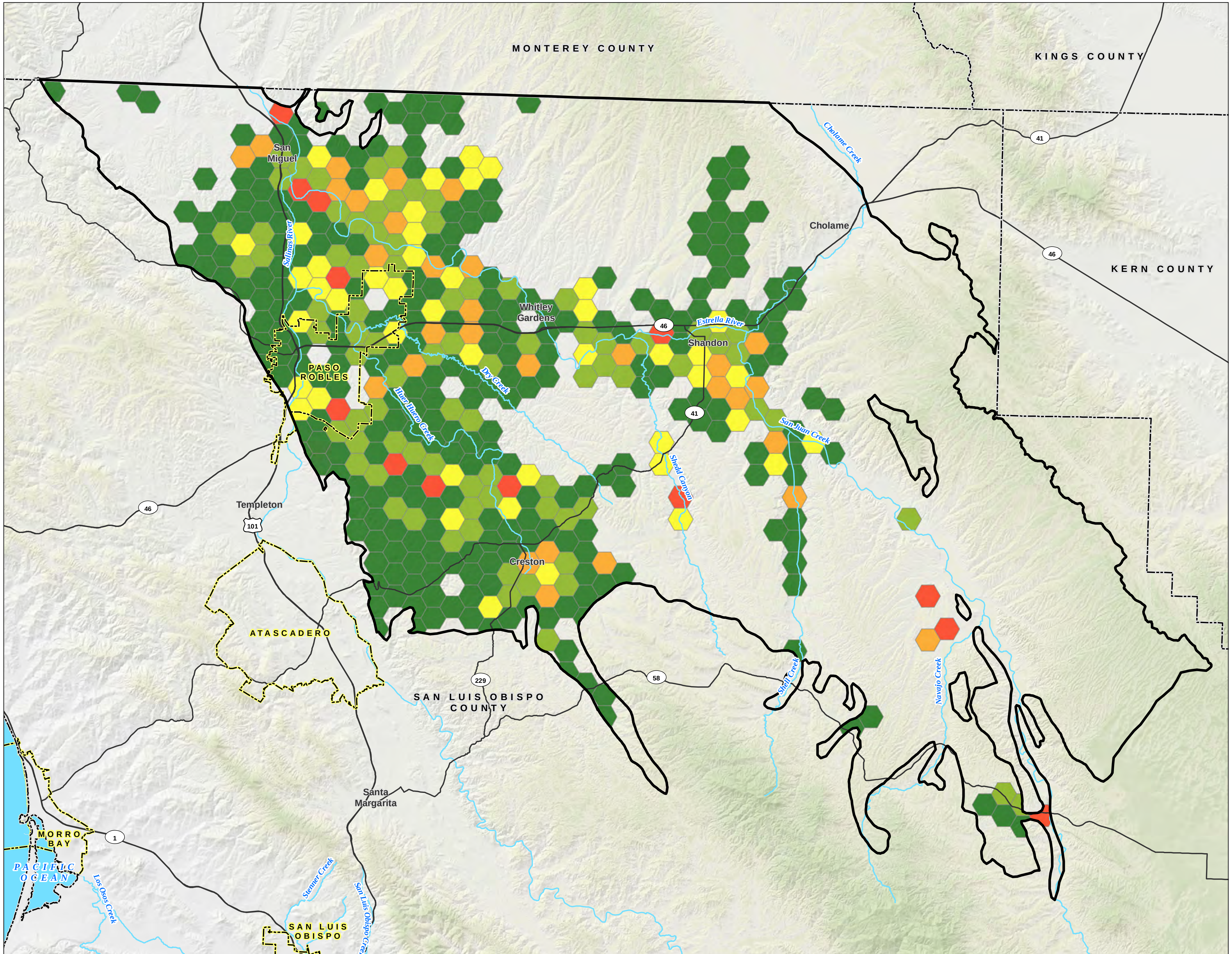


Document Path: Y:\0824_PasoRobles\Source_Figures\Paso_Robles_Annual_Report\Figure10_General_Locations_and_Volumes_of_Groundwater_Extractions.mxd

FIGURE 10

General Locations and Volumes of Groundwater Extraction

Paso Robles Subbasin
First Annual Report

LEGEND

Paso Robles Subbasin

Total Groundwater Extraction (Average AFY)

- 0.036 - 5.00
- 5.00 - 15.00
- 15.00 - 30.00
- 30.00 - 50.00
- 50.00 - 99.101

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

NOTE

AFY: Acre-Feet per Year

N

0 10,000 20,000 30,000
Feet

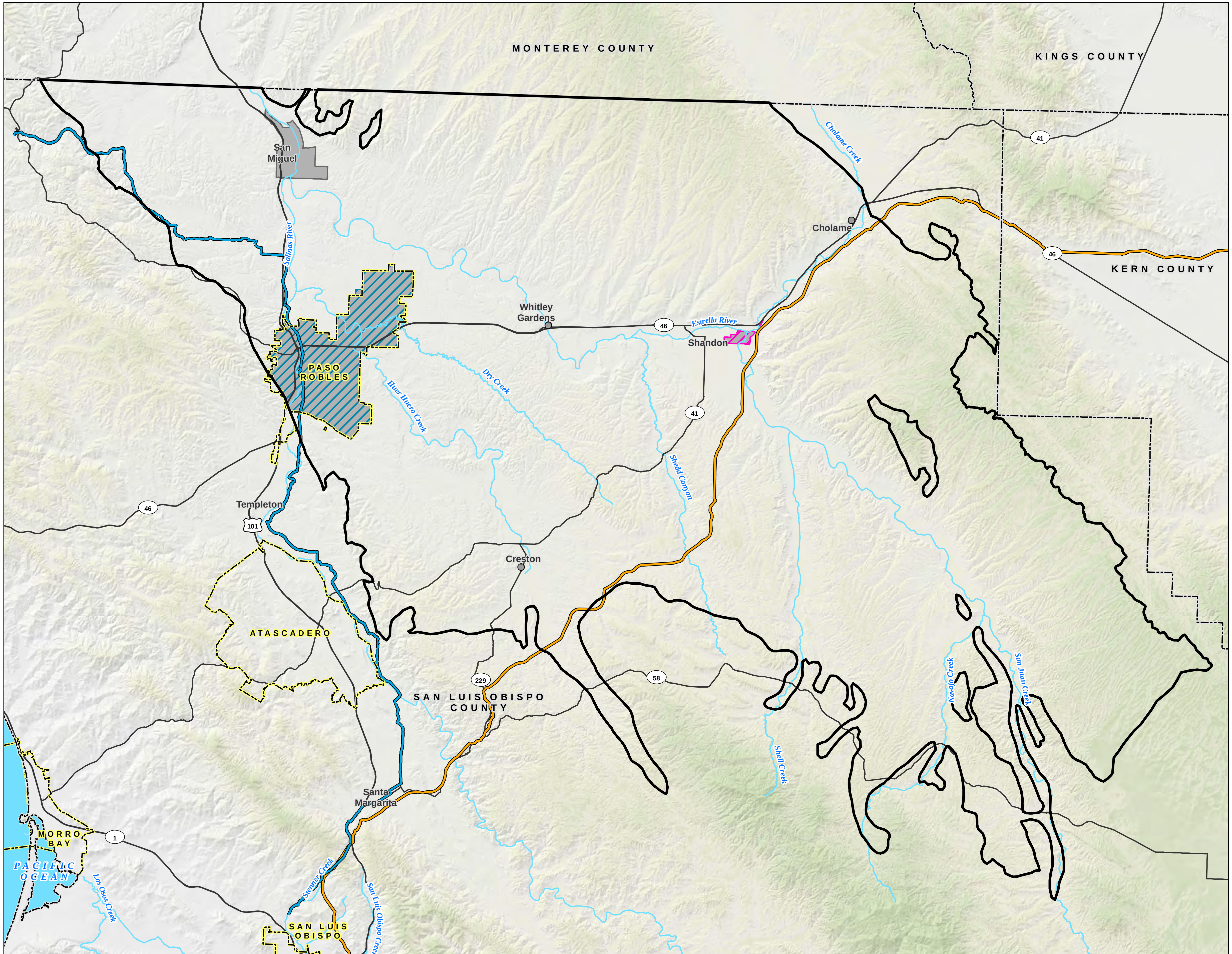
Date: January 16, 2020
Data Sources: CA DWR, SLO Co., Soil Water Balance Model, USGS

GSI Water Solutions, Inc.

FIGURE 11

Communities Dependent on Groundwater and with Access to Surface Water

Paso Robles Subbasin
First Annual Report



LEGEND

- Nacimiento Water Project Pipeline
- State Water Project Pipeline
- Community Dependent Solely on Groundwater
- Community Served by Groundwater and Nacimiento Water Project
- Community Served by Groundwater and State Water Project
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

N

0 10,000 20,000 30,000
Feet

Date: January 27, 2020
Data Sources: CA DWR, SLO Co., USGS

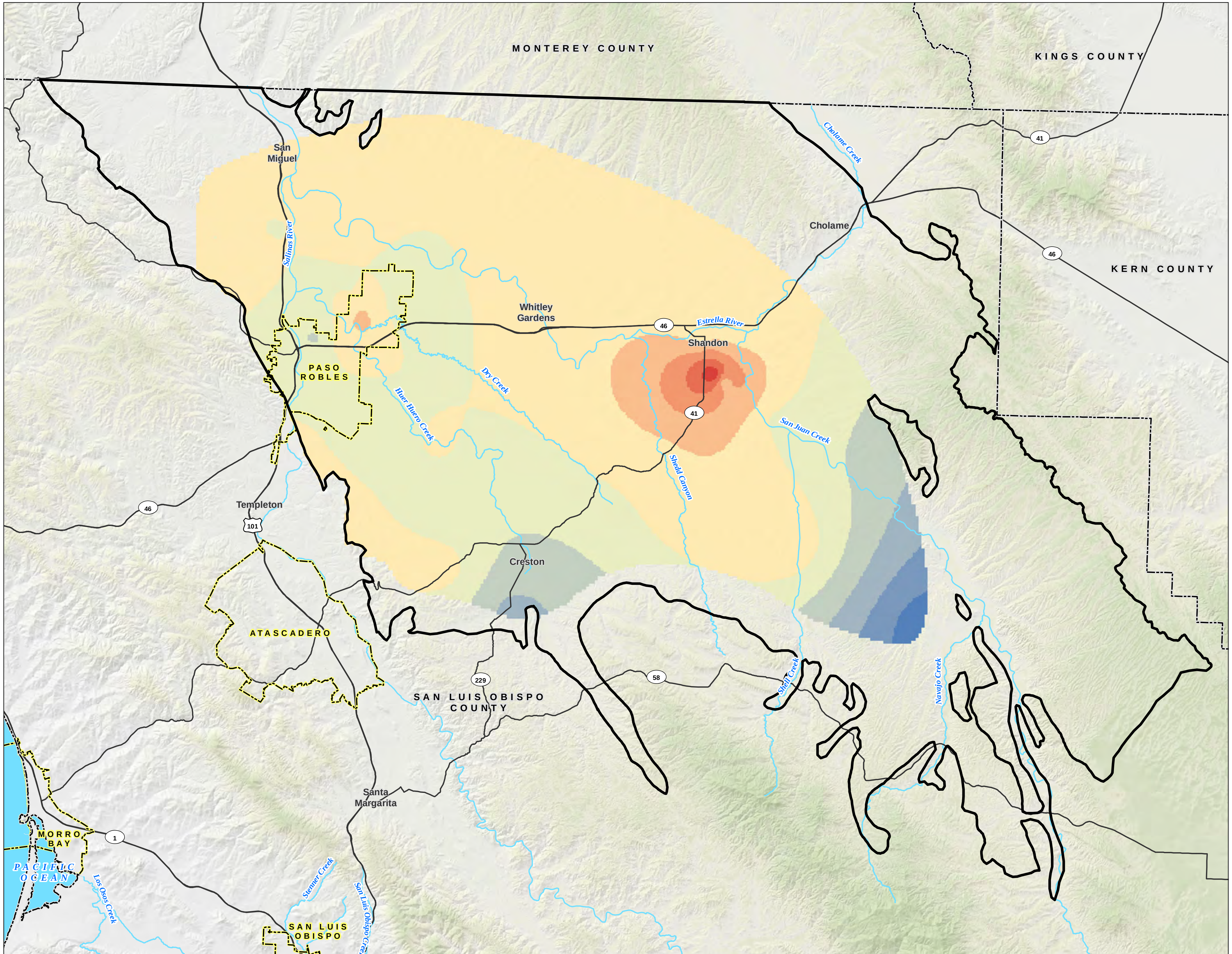
GSI Water Solutions, Inc.

Document Path: Y:\0824_PasoRobles\Source_Figures\Paso_Robles_Annual_Report\Figure11_Communities_Dependent_on_Groundwater_and_with_Access_to_Surface_Water.mxd

FIGURE 12

Paso Robles Formation Aquifer Change in Groundwater Elevation Fall 2016 to Fall 2017

Paso Robles Subbasin
First Annual Report



LEGEND

Paso Robles Subbasin

Water Level Change, in feet

Fall 2016 to Fall 2017

- < -40 feet
- -40 to -30 feet
- -30 to -20 feet
- -20 to -10 feet
- -10 to 0 feet
- 0 to 10 feet
- 10 to 20 feet
- 20 to 30 feet
- 30 to 40 feet
- > 40 feet

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

N

0 10,000 20,000 30,000
Feet

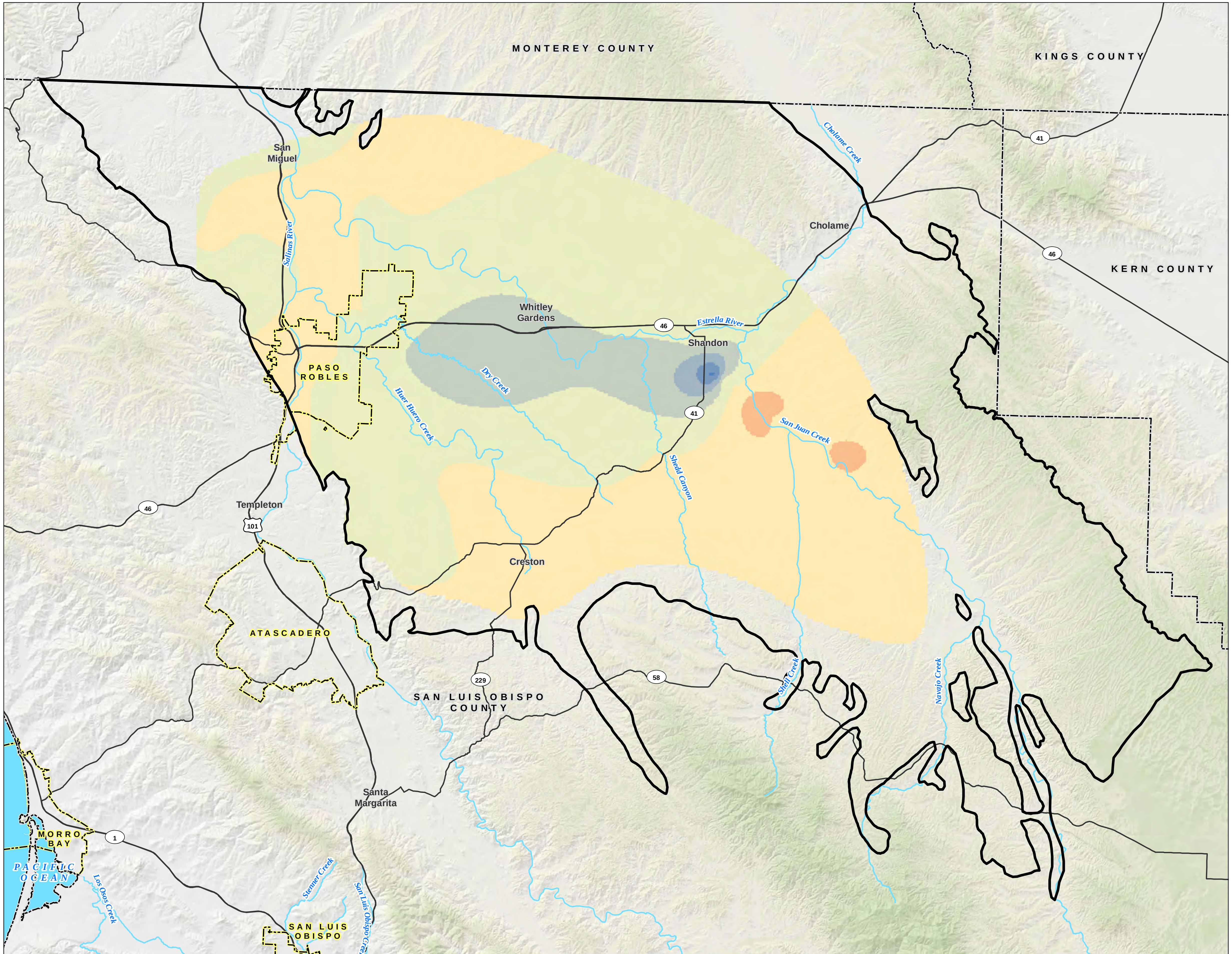
Date: January 16, 2020
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

FIGURE 13

Paso Robles Formation Aquifer Change in Groundwater Elevation Fall 2017 to Fall 2018

Paso Robles Subbasin
First Annual Report



LEGEND

Paso Robles Subbasin

Water Level Change, in feet

Fall 2017 to Fall 2018

- < -40 feet
- -40 to -30 feet
- -30 to -20 feet
- -20 to -10 feet
- -10 to 0 feet
- 0 to 10 feet
- 10 to 20 feet
- 20 to 30 feet
- 30 to 40 feet
- > 40 feet

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

N

0 10,000 20,000 30,000
Feet

Date: January 16, 2020
Data Sources: CA DWR, SLO Co., USGS

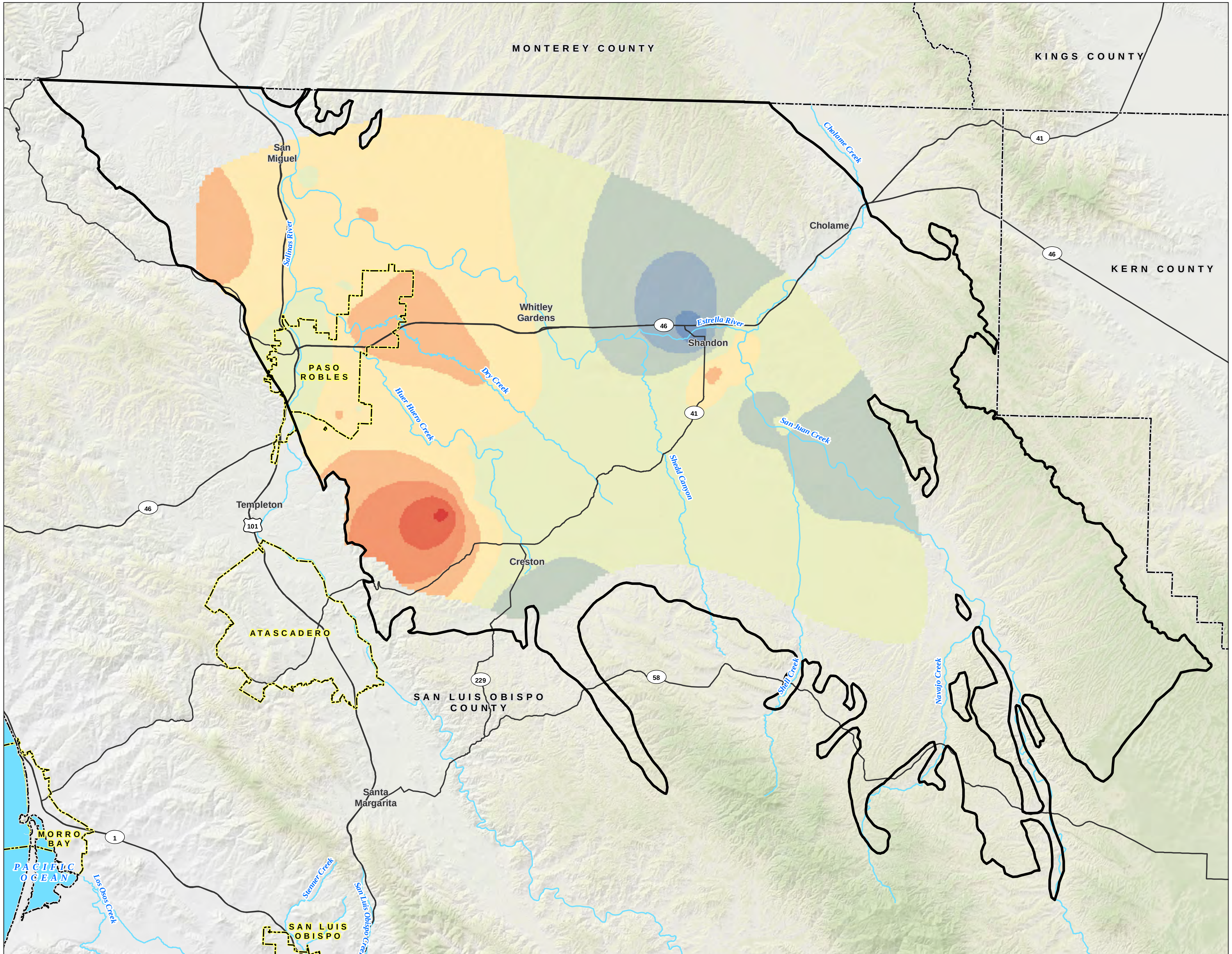
GSI Water Solutions, Inc.

Document Path: Y:\0824_PasoRobles\Source_Figures\Paso_Robles_Annual_Report\Figure13_Paso_Robles_Formation_Aquifer_Change_in_Groundwater_Elevation_Fall_2017_to_Fall_2018.mxd

FIGURE 14

Paso Robles Formation Aquifer Change in Groundwater Elevation Fall 2018 to Fall 2019

Paso Robles Subbasin
First Annual Report



LEGEND

Paso Robles Subbasin

Water Level Change, in feet

Fall 2018 to Fall 2019

- < -40 feet
- -40 to -30 feet
- -30 to -20 feet
- -20 to -10 feet
- -10 to 0 feet
- 0 to 10 feet
- 10 to 20 feet
- 20 to 30 feet
- 30 to 40 feet
- > 40 feet

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

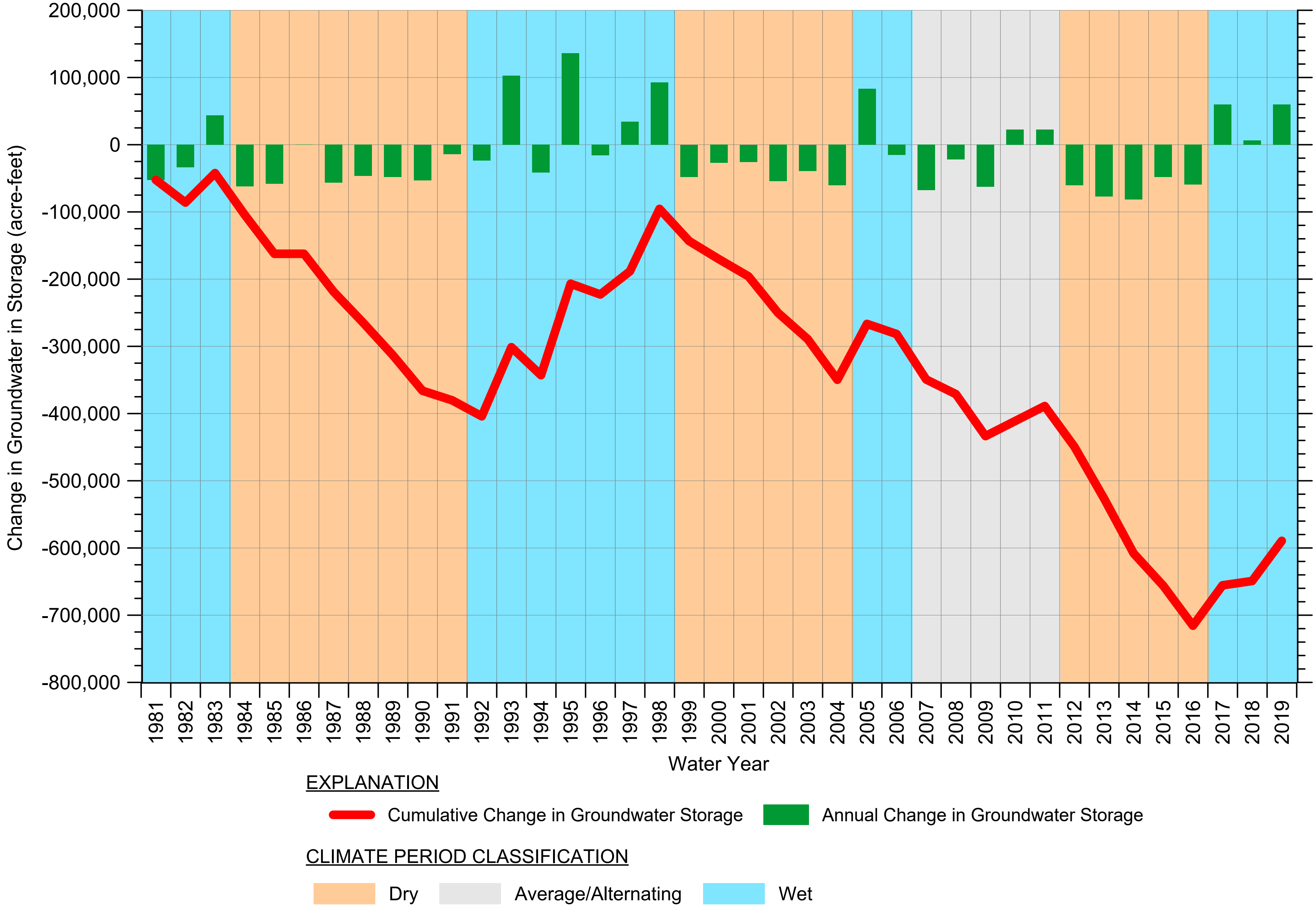
N

0 10,000 20,000 30,000
Feet

Date: January 16, 2020
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

Document Path: Y:\0824_PasoRobles\Source_Figures\Paso_Robles_Annual_Report\Figure14_Paso_Robles_Formation_Aquifer_Change_in_Groundwater_Elevation_Fall_2018_to_Fall_2019.mxd



GSI Water Solutions, Inc.

FIGURE 15

Estimated Annual and Cumulative Change in Groundwater in Storage in the Paso Robles Subbasin

Paso Robles Subbasin First Annual Report

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\ChangeInStorage\GW_CumulativeChangeGWStoragePRannual_1981-2019_wTitle.grf

APPENDICES

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APPENDIX A

GSP Regulations for Annual Reports

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§ 356.2. Annual Reports

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(a) General information, including an executive summary and a location map depicting the basin covered by the report.

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:

(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.

(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.

(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.

(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.

(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.

(5) Change in groundwater in storage shall include the following:

(A) Change in groundwater in storage maps for each principal aquifer in the basin.

(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.

(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.

Note: Authority cited: Section 10733.2, Water Code.

Reference: Sections 10727.2, 10728, and 10733.2, Water Code.

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APPENDIX B
Precipitation Data

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Monthly Precipitation at the Paso Robles Station (NOAA 46730)

(inches)

Source: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6730

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	WY Total
1925	0.34	2.44	2.57	2.01	2.41	0.08	0.09	0.12	0.02	0.17	0.21	1.98	**12.95**
1926	2.13	6.26	0.27	3.52	0.00	0.02	0.00	0.00	0.00	0.25	7.14	0.90	**14.56**
1927	1.84	9.04	1.45	1.27	0.00	0.02	0.00	0.00	0.00	1.33	2.02	1.63	**21.91**
1928	0.23	2.87	2.76	0.37	0.29	0.00	0.00	0.00	0.00	0.01	1.82	2.87	**11.50**
1929	1.27	1.65	1.22	0.49	0.00	0.49	0.00	0.00	-----	0.00	0.00	0.24	**9.82**
1930	4.32	1.80	3.00	0.54	1.01	0.04	0.00	0.00	0.04	0.00	1.64	0.16	**10.99**
1931	4.58	1.87	0.39	0.56	2.01	0.93	0.00	0.09	0.00	0.01	1.89	7.04	**12.23**
1932	2.74	3.89	0.50	0.30	0.13	0.00	0.00	0.00	0.00	0.04	0.11	1.28	**16.50**
1933	6.05	0.08	0.84	0.22	0.32	0.68	0.00	0.00	0.00	0.64	0.00	4.26	**9.62**
1934	2.06	3.75	0.04	0.00	0.12	0.75	0.00	0.00	0.00	1.56	2.61	2.66	**11.62**
1935	6.23	0.65	4.08	3.41	0.02	0.00	0.00	0.16	0.07	0.18	1.58	1.66	**21.45**
1936	0.61	11.07	1.24	1.52	0.01	0.04	0.25	0.00	0.00	1.93	0.00	6.10	**18.16**
1937	4.59	4.54	5.25	0.16	0.00	0.00	0.00	0.00	0.00	0.16	0.66	7.40	**22.57**
1938	1.73	12.74	6.77	0.93	0.30	0.00	0.00	0.00	0.41	0.23	0.33	1.45	**31.10**
1939	3.11	1.45	1.58	0.05	0.09	0.00	0.00	0.00	0.43	0.55	0.78	1.29	**8.72**
1940	5.28	5.57	1.13	0.54	0.00	0.00	0.00	0.00	0.00	0.19	0.13	8.18	**15.14**
1941	4.73	8.16	6.14	2.76	0.19	0.00	0.00	0.02	0.00	1.34	0.70	5.15	**30.50**
1942	2.40	0.76	1.77	3.01	0.15	0.00	0.00	0.00	0.00	0.53	1.01	1.64	**15.28**
1943	8.00	1.68	3.63	0.72	0.00	0.00	0.00	0.00	0.00	0.39	0.12	3.38	**17.21**
1944	1.03	5.96	0.64	0.65	0.13	0.00	0.00	0.00	0.00	0.26	2.64	1.09	**12.30**
1945	0.80	4.17	2.76	0.26	0.02	0.00	0.00	0.00	0.00	1.09	0.49	3.89	**12.00**
1946	0.31	1.64	3.01	0.05	0.72	0.00	0.26	0.00	0.00	0.19	4.57	2.17	**11.46**
1947	0.56	0.97	1.14	0.13	0.28	0.00	0.00	0.00	0.04	0.32	0.18	0.62	**10.05**
1948	0.00	1.85	3.51	3.50	0.45	0.00	0.00	0.00	0.00	0.06	0.00	3.04	**10.43**
1949	1.09	1.95	3.73	0.36	0.38	0.00	0.00	0.00	0.00	0.00	0.78	2.33	**10.61**
1950	3.05	2.43	1.65	1.00	0.05	0.00	0.68	0.00	0.00	1.24	1.18	2.50	**11.97**
1951	2.50	0.68	0.58	1.11	0.00	0.00	0.00	0.00	0.03	0.33	1.91	4.64	**9.82**
1952	5.54	0.20	3.92	1.49	0.03	0.00	0.07	0.00	0.02	0.02	1.76	4.78	**18.15**
1953	1.71	0.00	0.66	1.90	0.06	0.01	0.00	0.00	0.00	0.00	2.46	0.00	**10.90**
1954	3.06	1.89	3.12	0.64	0.10	0.00	0.00	0.00	0.00	0.00	1.29	1.51	**11.27**
1955	3.57	1.85	0.37	1.16	1.31	0.00	0.00	0.13	0.00	0.00	1.36	8.14	**11.19**
1956	3.82	0.99	0.01	1.87	1.45	0.00	0.00	0.00	0.00	1.07	0.00	0.17	**17.64**
1957	4.77	1.90	0.31	1.63	0.70	0.37	0.00	0.00	0.02	0.60	0.30	3.30	**10.94**
1958	2.93	6.02	6.35	5.22	0.37	0.00	0.00	0.38	1.20	0.00	0.13	0.48	**26.67**
1959	1.69	4.53	0.03	0.44	0.05	0.00	0.00	0.00	0.52	0.00	0.00	0.31	**7.87**
1960	2.42	4.20	0.70	1.40	0.04	0.00	0.00	0.00	0.00	0.10	3.63	1.17	**9.07**
1961	1.72	0.20	0.88	0.22	0.74	0.00	0.00	0.00	0.00	0.01	1.99	2.59	**8.66**
1962	2.05	8.49	1.98	0.00	0.12	0.00	0.00	0.00	0.00	0.79	0.01	2.49	**17.23**
1963	4.41	3.79	2.10	3.32	0.17	0.01	0.00	0.00	0.24	1.00	4.25	0.01	**17.33**
1964	1.87	0.15	1.46	0.68	0.55	0.06	0.00	0.08	0.03	1.05	2.27	2.37	**10.14**
1965	2.50	0.51	1.16	2.48	0.00	0.00	0.04	0.03	0.15	0.00	6.43	3.24	**12.56**
1966	1.17	0.68	0.08	0.00	0.01	0.14	0.08	0.00	0.11	0.00	2.43	8.60	**11.94**
1967	3.93	0.35	3.99	4.41	0.03	0.02	0.00	0.00	0.79	0.14	1.74	1.70	**24.55**
1968	1.19	0.68	1.76	0.70	0.04	0.00	0.00	0.00	0.00	1.83	1.14	3.13	**7.95**
1969	13.93	9.12	0.35	1.68	0.06	0.01	0.25	0.00	0.00	0.24	0.44	0.68	**31.50**
1970	3.71	1.66	1.83	0.37	0.00	0.04	0.00	0.00	0.00	0.08	3.14	4.56	**8.97**
1971	1.08	0.24	0.85	0.69	0.21	0.00	0.00	0.00	0.05	0.29	0.88	4.27	**10.90**
1972	1.35	0.30	0.00	0.53	0.00	0.00	0.00	0.00	0.03	1.68	4.14	0.85	**7.65**
1973	6.54	6.95	2.60	0.01	0.06	0.00	0.00	0.00	0.00	0.61	3.09	1.61	**22.83**
1974	6.39	0.05	4.56	0.91	0.00	0.00	0.00	0.00	0.00	0.64	0.43	2.33	**17.22**

Monthly Precipitation at the Paso Robles Station (NOAA 46730)

(inches)

Source: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6730

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	WY Total
1975	0.01	4.12	2.81	0.89	0.00	0.00	0.00	0.01	0.00	0.77	0.03	0.10	**11.24**
1976	0.00	2.61	1.09	0.66	0.00	0.08	0.00	1.02	2.90	0.58	0.55	1.80	**9.26**
1977	1.47	0.03	1.41	0.00	1.71	0.00	0.00	0.00	0.00	0.08	0.25	5.25	**7.55**
1978	5.77	7.31	3.10	2.77	0.00	0.00	0.00	0.00	0.92	0.00	2.47	1.04	**25.45**
1979	4.70	3.52	2.30	0.00	0.00	0.00	0.00	0.00	0.06	0.93	0.85	2.31	**14.09**
1980	4.47	8.05	1.88	0.65	0.24	0.00	0.35	0.00	0.00	0.00	0.02	0.44	**19.73**
1981	4.00	1.60	4.52	0.56	0.00	0.00	0.00	0.00	0.00	1.01	1.44	0.62	**11.14**
1982	2.65	0.88	5.10	3.05	0.00	0.02	0.00	0.00	1.04	0.90	3.98	1.98	**15.81**
1983	5.84	4.53	4.69	3.35	0.05	0.00	0.00	0.52	0.37	1.34	2.07	3.68	**26.21**
1984	0.20	0.24	0.66	0.35	0.00	0.00	0.00	0.00	0.00	0.38	2.10	3.01	**8.54**
1985	0.52	0.92	2.11	0.19	0.00	0.00	0.02	0.00	0.04	0.40	1.07	0.97	**9.29**
1986	2.11	6.93	4.64	0.32	0.00	0.00	0.03	0.00	0.63	0.02	0.15	0.75	**17.10**
1987	0.88	2.01	3.40	0.14	0.06	0.07	0.00	0.00	0.00	1.50	2.63	2.73	**7.48**
1988	1.94	2.54	0.10	2.02	0.21	0.14	0.00	0.00	0.00	0.00	1.29	2.87	**13.81**
1989	0.98	1.59	0.71	0.37	0.07	0.00	0.00	0.00	1.59	0.97	0.22	0.00	**9.47**
1990	3.02	1.48	0.24	0.12	0.66	0.00	0.00	0.00	0.51	0.00	0.14	0.20	**7.22**
1991	0.63	2.17	10.25	0.08	0.03	0.20	0.00	0.10	0.10	0.50	0.16	3.00	**13.90**
1992	1.44	6.09	2.99	0.10	0.00	0.03	0.03	0.00	0.01	0.79	0.00	3.59	**14.35**
1993	9.63	8.31	3.89	0.07	0.01	0.14	0.00	0.00	0.00	0.17	0.86	1.28	**26.43**
1994	1.90	3.37	1.16	0.49	1.05	0.00	0.00	0.00	1.17	0.70	2.32	0.93	**11.45**
1995	11.51	1.42	12.31	0.09	0.44	0.14	0.00	0.00	0.00	0.00	0.12	1.92	**29.86**
1996	1.84	6.52	2.03	0.78	0.55	0.00	0.00	0.00	0.00	1.78	1.85	5.83	**13.76**
1997	7.93	0.00	0.00	0.00	0.00	0.00	0.01	0.05	0.10	0.07	4.05	3.93	**17.55**
1998	2.99	9.06	2.71	1.90	1.87	0.11	0.00	0.00	0.08	0.21	0.99	0.73	**26.77**
1999	1.84	1.26	2.68	1.19	0.00	0.00	0.00	0.00	0.47	0.00	0.71	0.22	**9.37**
2000	3.16	5.89	1.55	1.56	0.05	0.04	0.00	0.00	0.03	1.34	0.05	0.16	**13.21**
2001	4.43	5.14	3.59	0.68	0.00	0.00	0.04	0.00	0.00	0.24	2.81	2.19	**15.43**
2002	0.87	0.33	1.40	0.23	0.25	0.00	0.00	0.00	0.00	0.00	2.54	4.36	**8.32**
2003	0.00	2.10	1.85	1.70	1.18	0.00	-----	0.03	0.00	0.00	1.36	2.31	**13.76**
2004	0.91	4.31	0.30	0.32	0.00	0.00	0.00	0.00	0.00	5.11	1.39	6.75	**9.51**
2005	4.81	5.02	3.07	0.76	1.10	0.01	0.00	0.08	0.00	0.02	0.44	2.54	**28.10**
2006	5.78	1.23	4.50	2.74	1.48	0.00	0.00	0.00	0.00	0.61	0.28	1.13	**18.73**
2007	0.74	2.98	0.13	0.37	0.00	0.00	0.00	0.31	0.04	0.96	0.00	2.23	**6.59**
2008	8.44	1.83	0.00	0.33	0.01	0.00	0.00	0.00	0.00	0.14	1.26	1.13	**13.80**
2009	0.91	3.89	1.37	0.17	0.12	0.02	0.00	0.00	0.05	4.04	0.02	3.96	**9.06**
2010	6.09	3.38	0.64	2.71	0.12	0.00	0.03	0.00	0.00	1.06	1.57	7.14	**20.99**
2011	2.07	3.05	5.29	0.28	0.95	0.53	0.00	0.00	0.03	0.90	1.93	0.12	**21.97**
2012	2.38	0.25	2.44	2.60	0.18	0.00	0.00	0.00	0.00	0.28	0.75	3.94	**10.80**
2013	1.02	0.28	0.69	0.07	0.15	0.00	0.00	0.00	0.00	0.01	0.26	0.30	**7.18**
2014	0.00	2.75	1.96	0.85	0.00	0.00	0.03	0.00	0.00	0.00	1.00	5.48	**6.16**
2015	0.32	2.16	0.10	0.37	0.05	0.00	2.82	0.00	0.05	0.07	1.45	0.89	**12.35**
2016	4.13	0.85	2.92	0.15	0.00	0.00	0.00	0.00	0.00	1.61	1.46	1.98	**10.46**
2017	9.50	6.44	0.92	1.46	0.24	0.00	0.00	0.00	0.16	0.08	0.22	0.04	**23.77**
2018	2.08	0.25	7.74	0.21	0.00	0.00	0.00	0.00	0.00	0.28	3.23	1.12	**10.62**
2019	5.30	6.72	3.01	0.08	0.82	0.00	0.00	0.00	0.00	0.00	1.40	5.22	**20.56**
												Water Year Average (1925 - 2019):	**14.65**

APPENDIX C

Groundwater Level and Groundwater Storage Monitoring Well Network

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Table C-1 – Groundwater Level and Groundwater Storage Monitoring Well Network

Well ID (alt ID)	Well Depth (feet)	Screen Interval(s) (feet bls)	Reference Point Elevation (feet AMSL)	First Year of Data	Last Year of Data	Years Measured	Number of Measurement	Aquifer
18MW-0191[1]	50	10-50	672 (LSE)	2018	2018	<1	1	Qa
25S/12E-16K05 (PASO-0345)	350	300-310, 330-340	669.8	1992	2019	27	56	PR
25S/12E-26L01 (PASO-0205)	400	200-400	719.72	1970	2019	49	107	PR
25S/13E-08L02 (PASO-0195)	270	110-270	1,033.81	2012	2019	7	15	PR
26S/12E-14G01 (PASO-0048)	740	---	789.3	1969	2019	50	121	PR
26S/12E-14G02 (PASO-0017)	840	640-840	787	1993	2019	26	28	PR
26S/12E-14H01 (PASO-0184)	1230	180-?	790	1969	2019	50	48	PR
26S/12E-14K01 (PASO-0238)	1100	---	786	1979	2019	40	84	PR
26S/12E-26E07 (PASO-0124)	400	---	835	1958	2018	60	131	PR
26S/13E-08M01 (PASO-0164)	400	260-400	827.92	2013	2019	6	16	PR
26S/13E-16N01 (PASO-0282)	400	200-400	890.17	2012	2019	7	16	PR
26S/15E-19E01 (PASO-0073)	512	223-512	1,020	1987	2019	32	56	PR
26S/15E-20B04 (PASO-0401)	461	297-461	1,036.36	1984	2019	35	71	PR
26S/15E-29N01 (PASO-0226)	350	---	1,135	1958	2019	61	127	PR
26S/15E-29R01 (PASO-0406)	600	180-600	1,109.5	2012	2019	7	12	PR
26S/15E-30J01 (PASO-0393)	605	195-605	1,123.3	1970	2019	49	83	PR
27S/12E-13N01 (PASO-0223)	295	195-295	972.42	2012	2019	7	15	PR
27S/13E-28F01 (PASO-0243)	212	118-212	1,072	1969	2019	50	108	PR
27S/13E-30F01 (PASO-0355)	310	200-310	1,043.2	2012	2019	7	14	PR
27S/13E-30J01 (PASO-0423)	685	225-685	1,095	2012	2019	7	10	PR
27S/13E-30N01 (PASO-0086)	355	215-235, 275-355	1,086.73	2012	2016	4	6	PR
27S/14E-11R01 (PASO-0392)	630	180-630	1,160.5	1974	2019	45	75	PR
28S/13E-01B01 (PASO-0066)	254	154-254	1,099.93	2012	2019	7	17	PR

NOTES: New alluvial monitoring well information provided by City of Paso Robles; well not included in County database.

"—" = unknown; AMSL – above mean sea level; PR Paso Robles Formation Aquifer; Qa Alluvial Aquifer

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APPENDIX D

Potential Future Groundwater Monitoring Wells

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Table D-1 – Potential Future Groundwater Monitoring Wells

Well ID (alt ID)	Well Depth (feet)	Screen Interval(s) (feet bls)	Reference Point Elevation (feet AMSL)	First Year of Data	Last Year of Data	Years Measured (years)	Number of Measurements	Aquifer
25S/12E-20K03 (PASO-0304)	---	---	625	1974	2019	45	86	---
26S/14E-24B01 (PASO-0302)	---	---	1001	1962	2019	57	99	---
26S/15E-33C01 (PASO-0314)	---	---	1095	1973	2019	46	80	---
26S/15E-33Q01 (PASO-0381)	---	---	1102	1973	2019	46	82	---
27S/15E-03E01 (PASO-0277)	---	---	1120.8	1968	2019	51	109	---
27S/14E-24B01 (PASO-0391)	---	---	1180.5	1973	2019	46	74	---
27S/14E-25J01 (PASO-0074)	---	---	1,225.5	1972	2019	47	72	--
27S/14E-29G01 (PASO-0041)	---	---	1201.5	1974	2019	45	78	---
27S/15E-35F01 (PASO-0053)	---	---	1230	1965	2019	54	82	---

NOTES: “—“ = unknown

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Appendix E
Hydrographs

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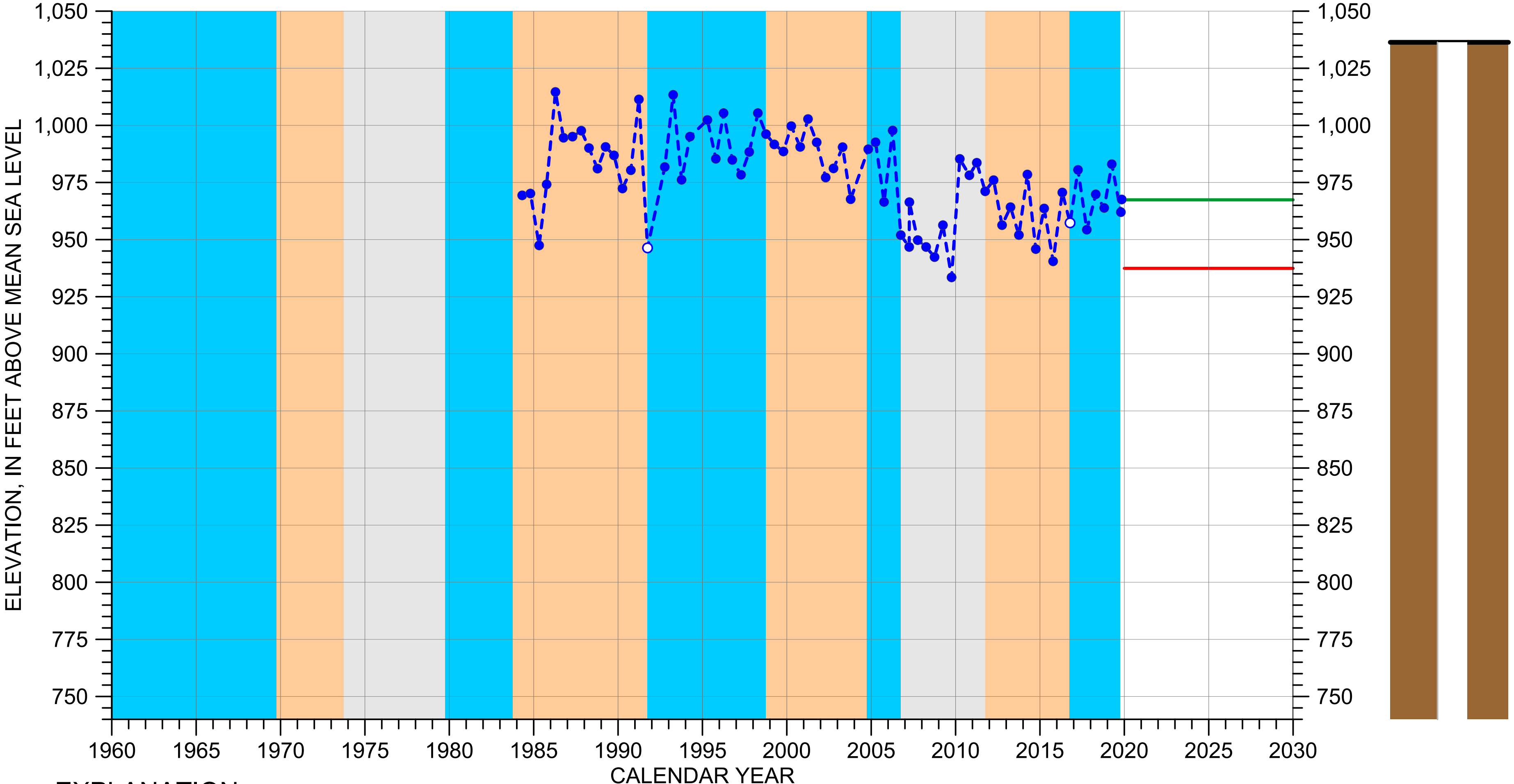


EXPLANATION

GROUNDWATER ELEVATION

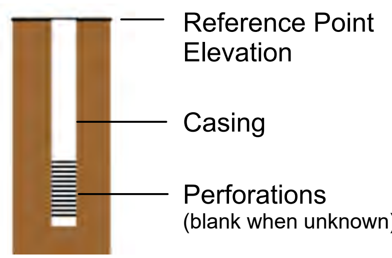
MEASUREMENT NOT VERIFIED*

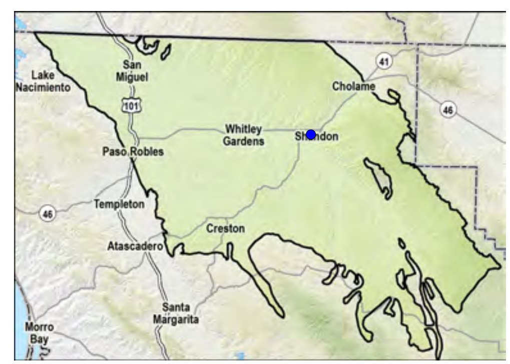
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET





Well Depth: 461 feet
Screened Interval: 297-461 feet below ground surface
Reference Point Elevation: 1036.36 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-20B04

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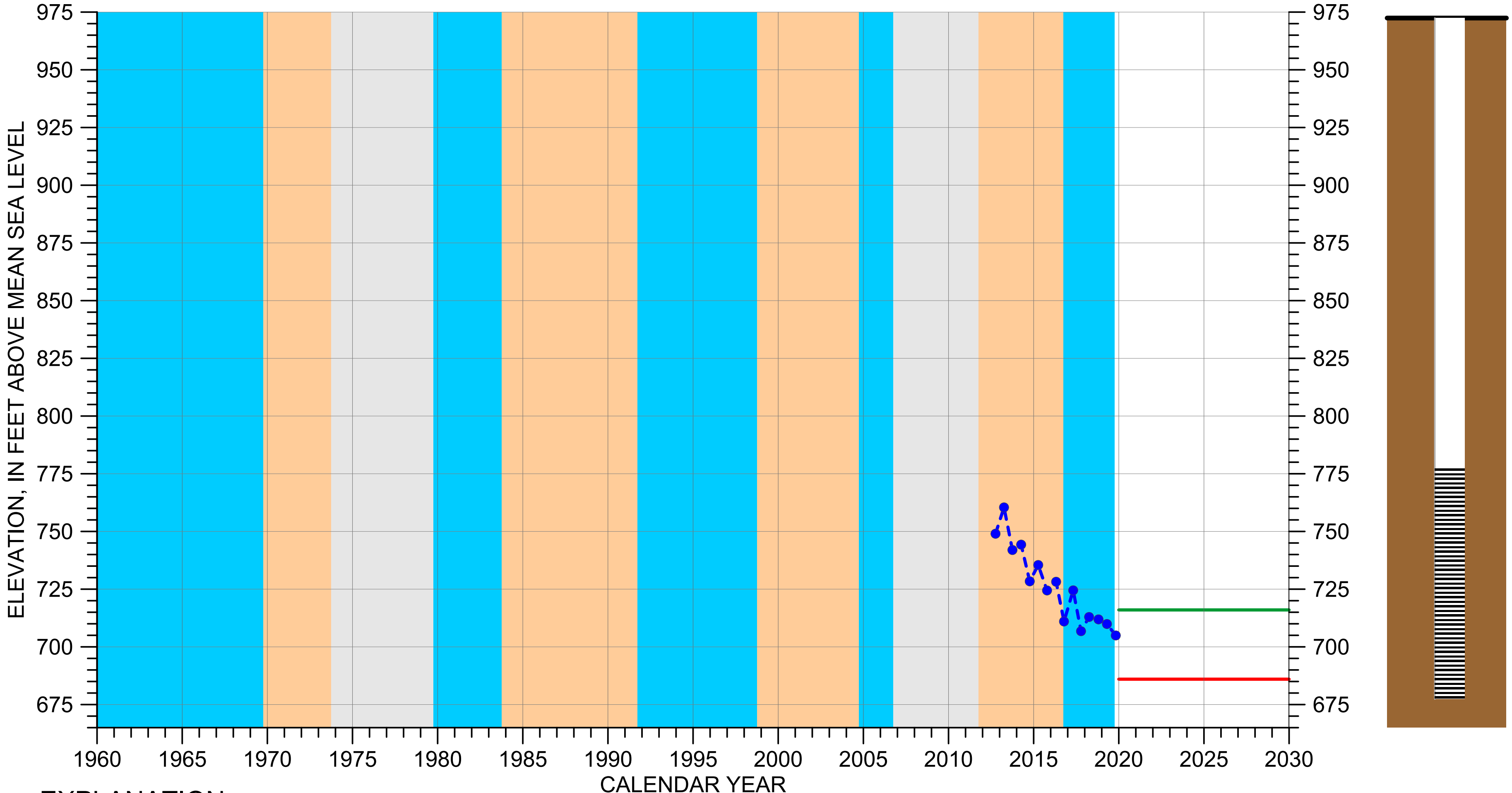


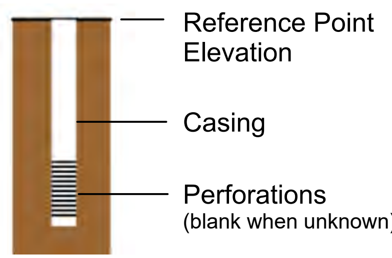
EXPLANATION

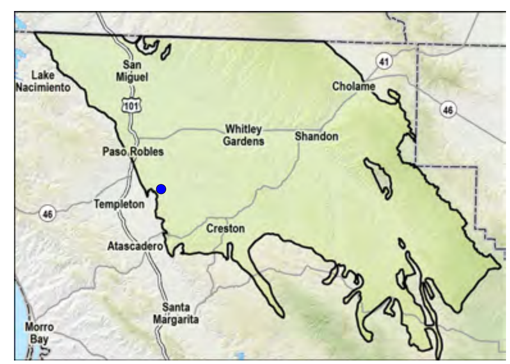
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

MEASURABLE OBJECTIVE

MINIMUM THRESHOLD





CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 295 feet
Screened Interval: 195-295 feet below ground surface
Reference Point Elevation: 972.4 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/12E-13N01

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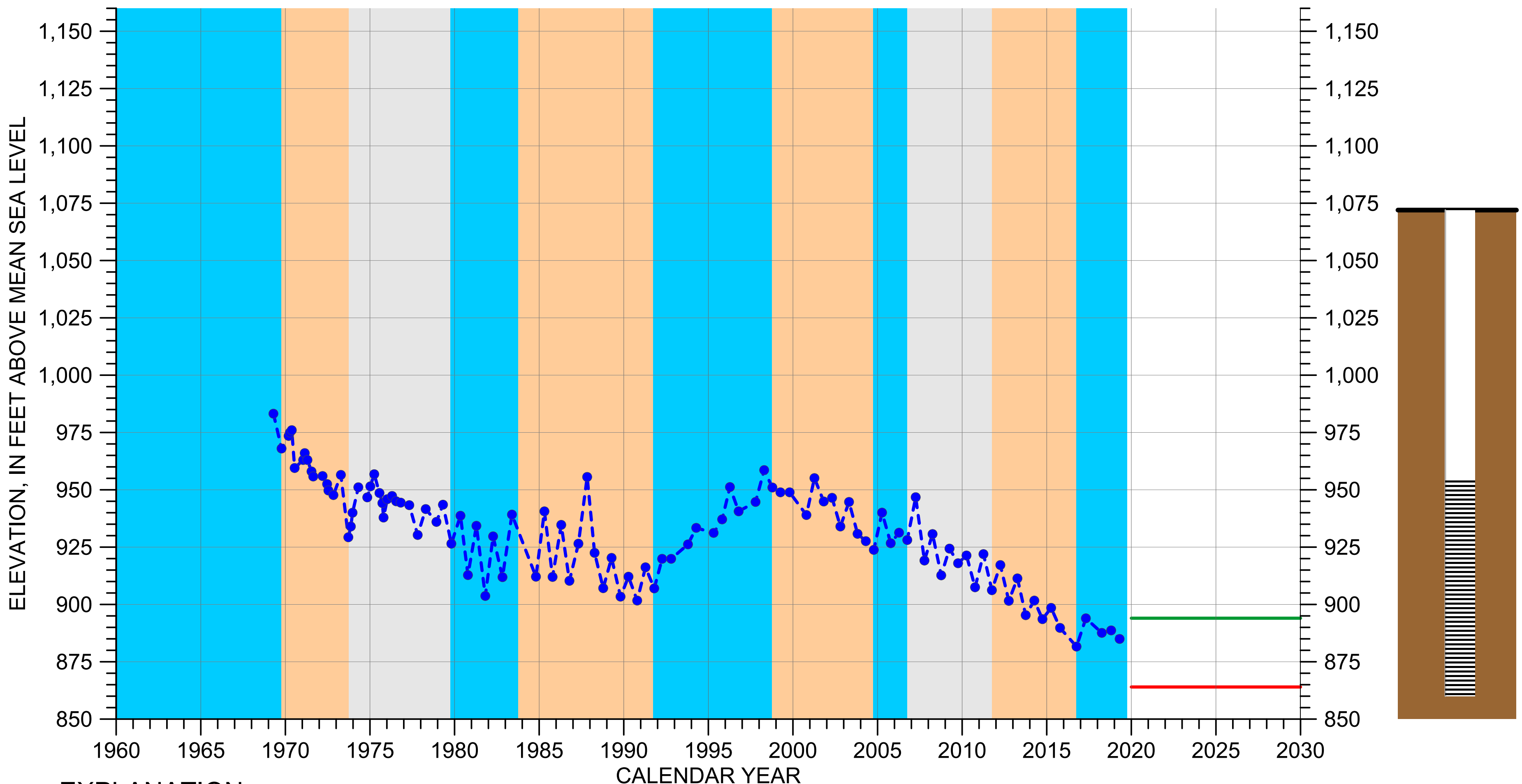


EXPLANATION

GROUNDWATER ELEVATION

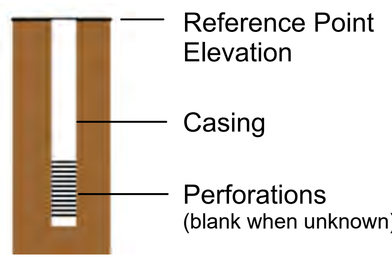
MEASUREMENT NOT VERIFIED*

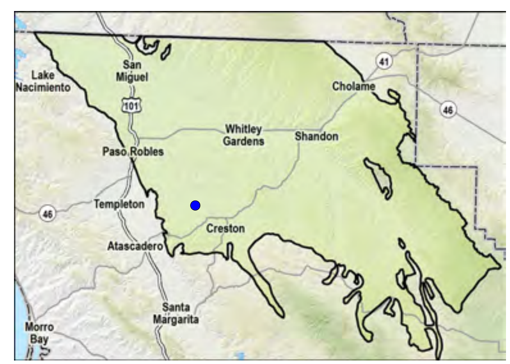
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET





Well Depth: 212 feet
Screened Interval: 118-212 feet below ground surface
Reference Point Elevation: 1072 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/13E-28F01

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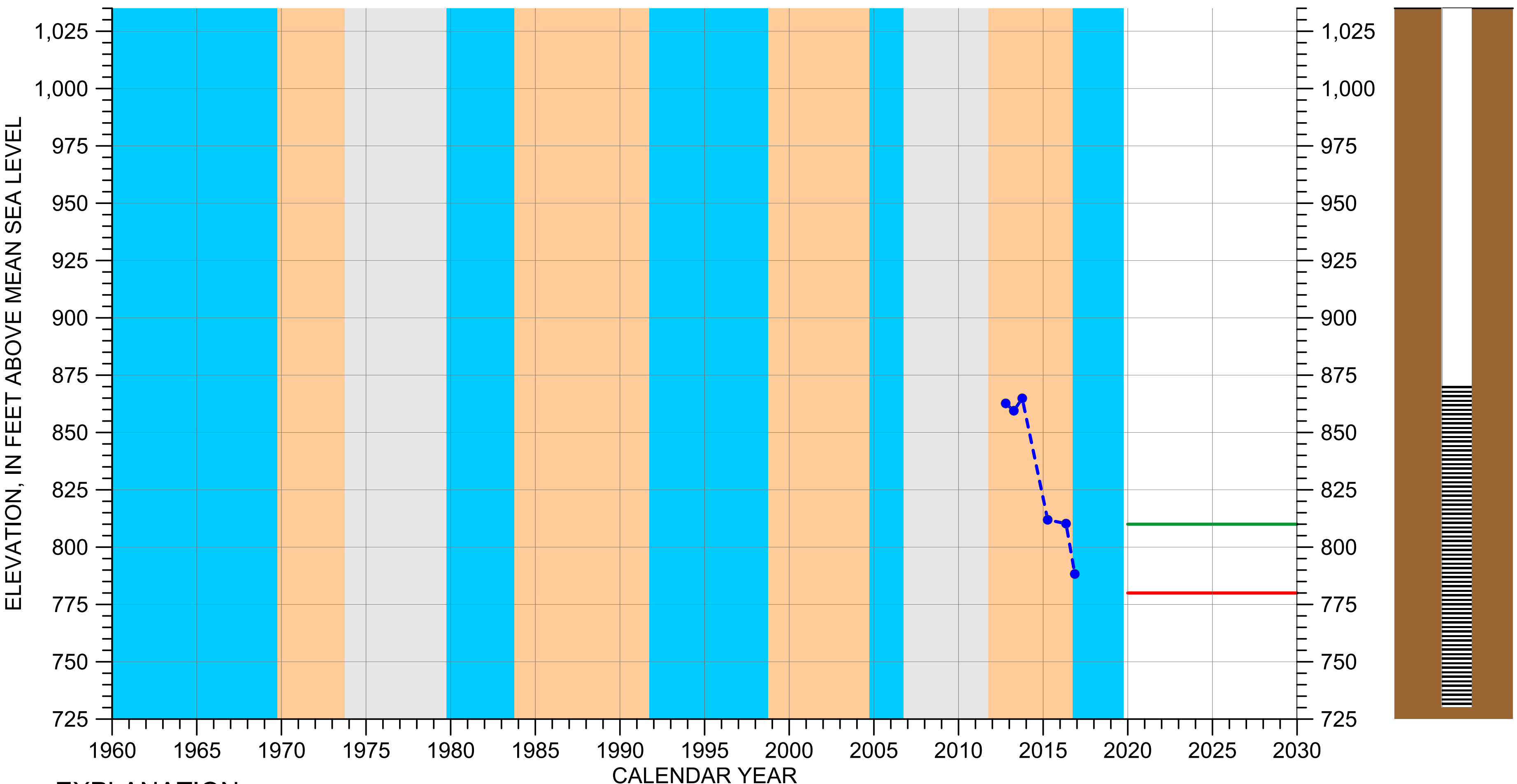


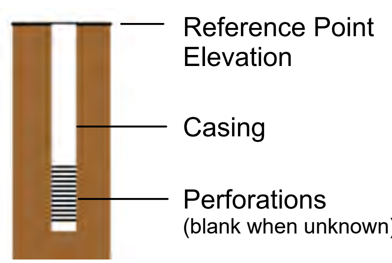
EXPLANATION

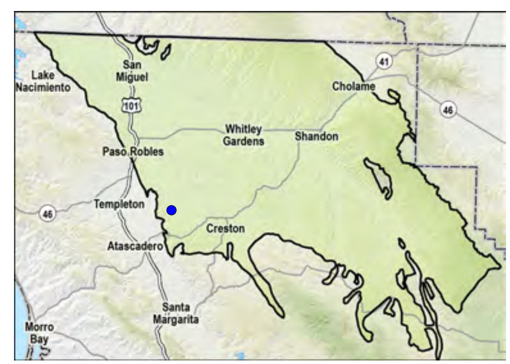
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

MEASURABLE OBJECTIVE

MINIMUM THRESHOLD





CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 355 feet
Screened Interval: 215-235, 275-355 feet below ground surface
Reference Point Elevation: 1086.7 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/13E-30N01

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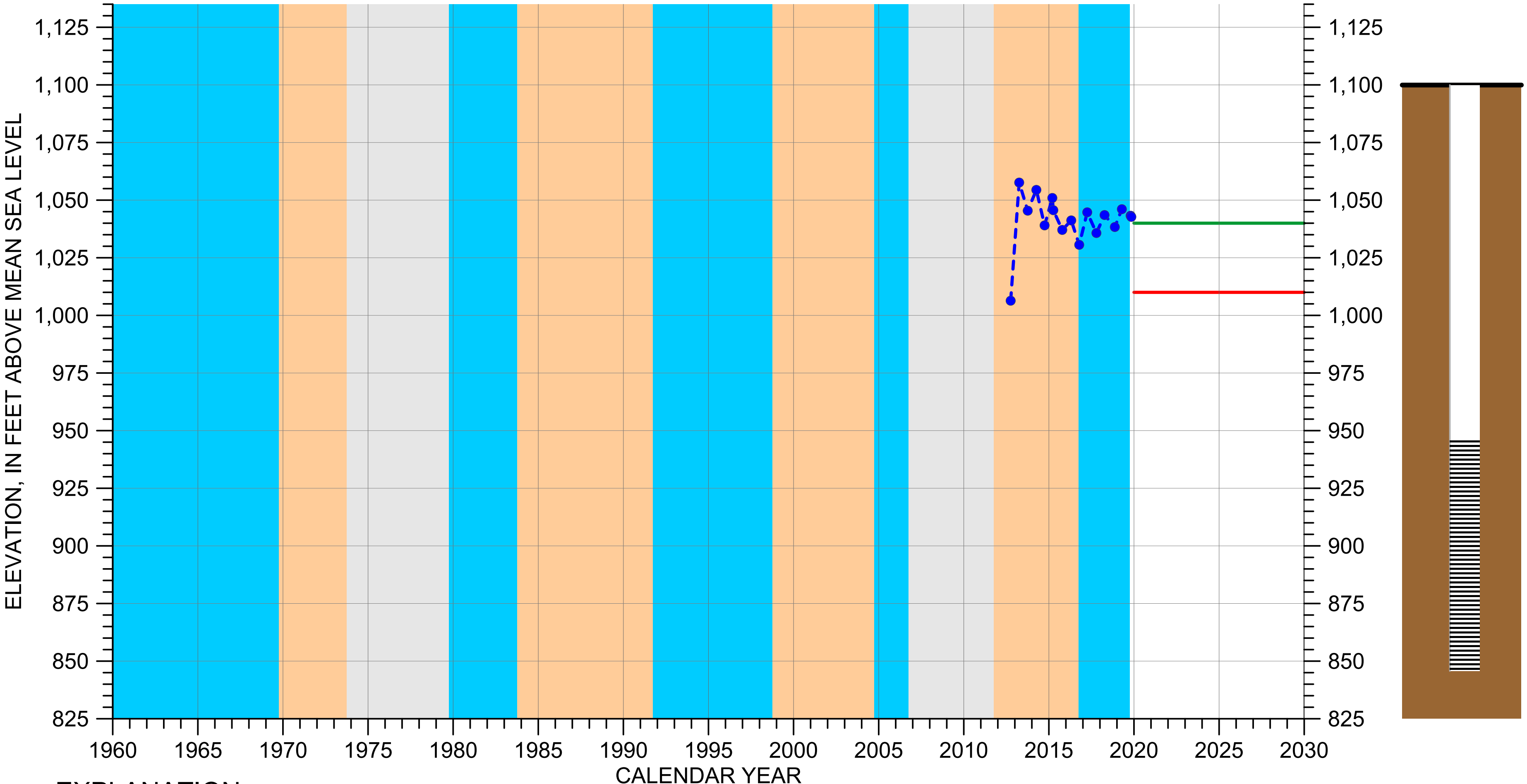


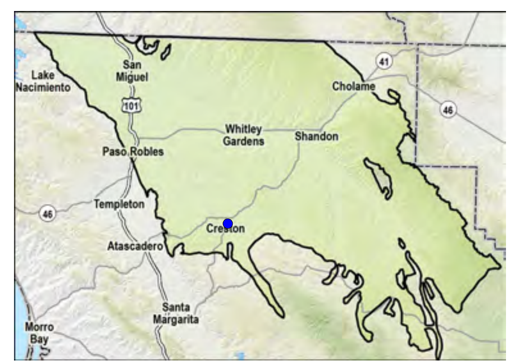
EXPLANATION

GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

MEASURABLE OBJECTIVE

MINIMUM THRESHOLD



CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 254 feet
Screened Interval: 154-254 feet below ground surface
Reference Point Elevation: 1099.9 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 28S/13E-01B01

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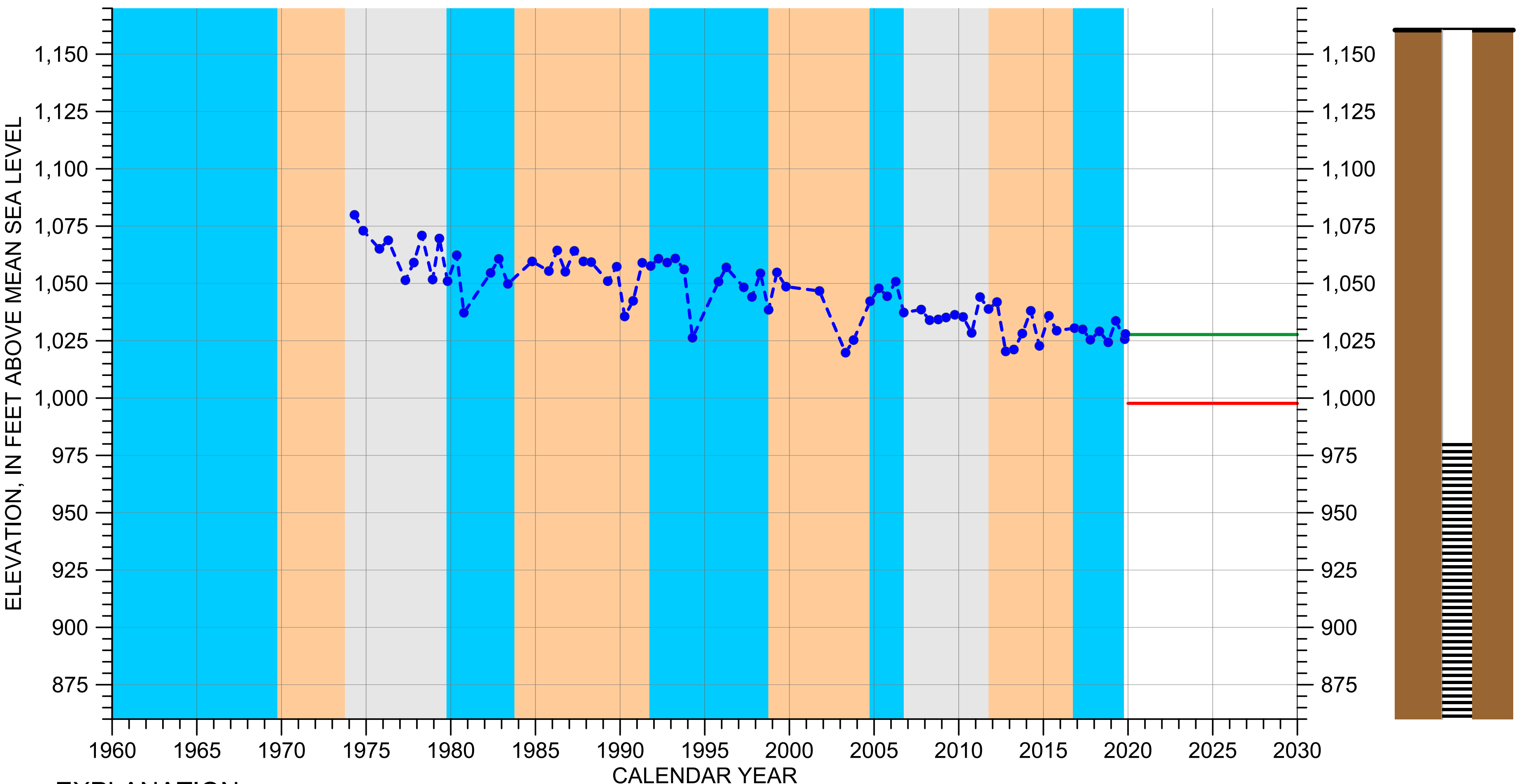


EXPLANATION

GROUNDWATER ELEVATION

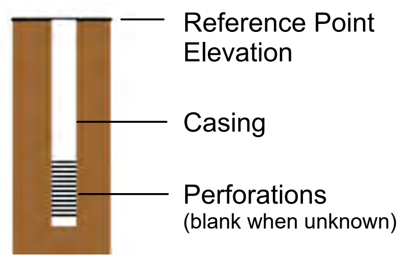
MEASUREMENT NOT VERIFIED*

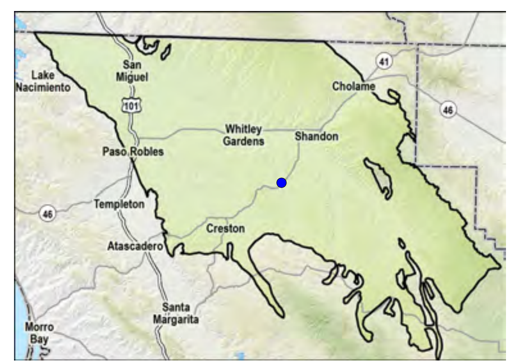
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY | AVERAGE/ALTERNATING | WET





Well Depth: 630 feet
Screened Interval: 180-630 feet below ground surface
Reference Point Elevation: 1160.5 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/14E-11R01

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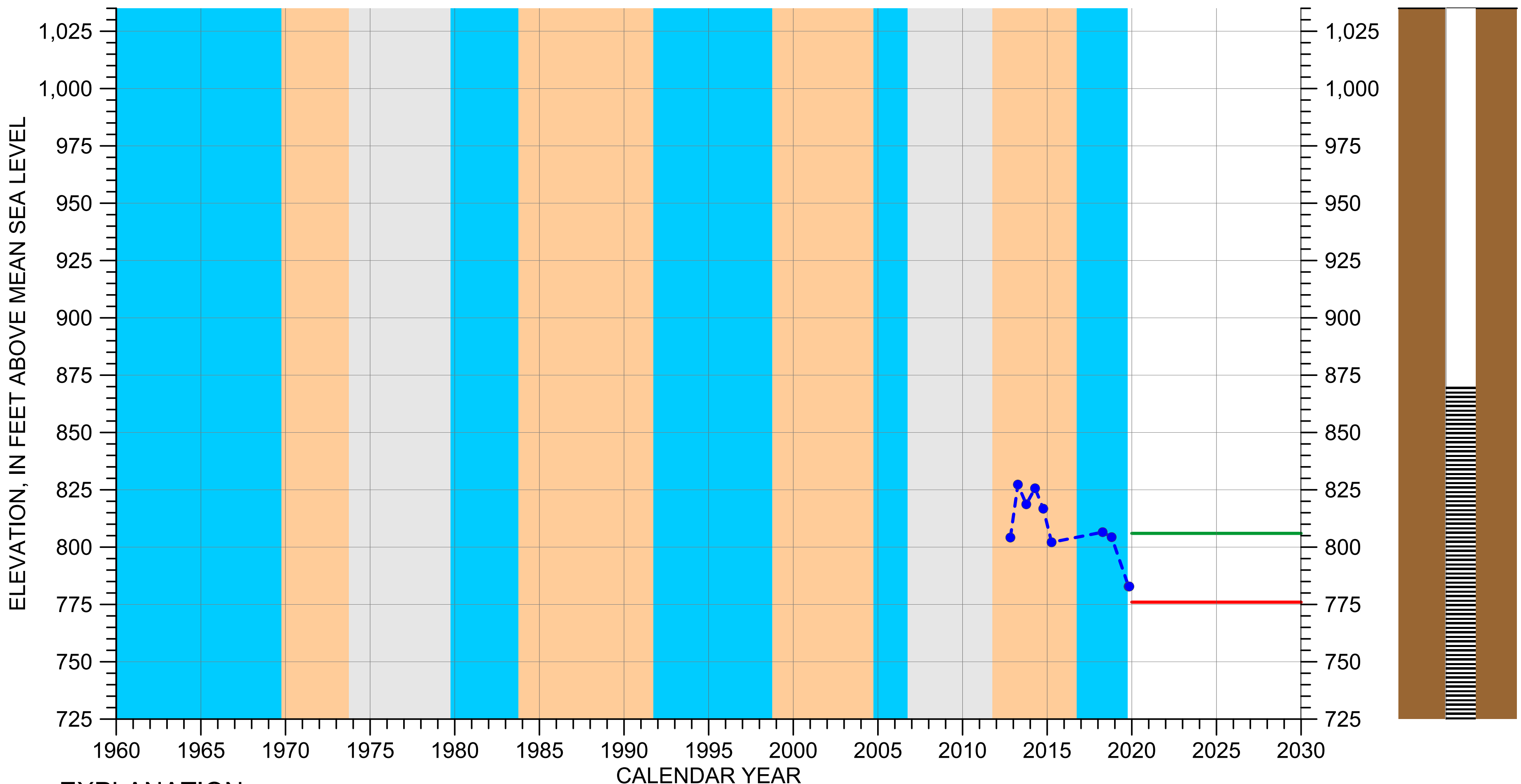
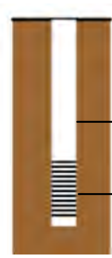


EXPLANATION

- GROUNDWATER ELEVATION
- MEASUREMENT NOT VERIFIED*
- MEASURABLE OBJECTIVE
- MINIMUM THRESHOLD



Reference Point Elevation

Casing

Perforations
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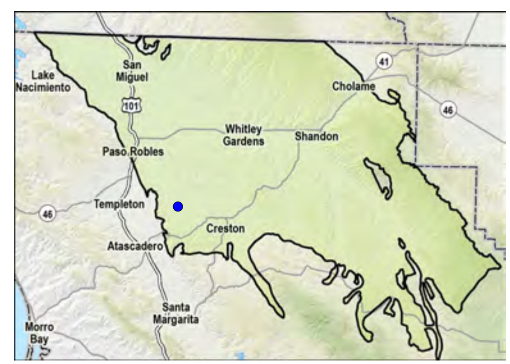
CLIMATE PERIOD CLASSIFICATION

DRY | AVERAGE/ALTERNATING | WET



Well Depth: 685 feet
Screened Interval: 225-685 feet below ground surface
Reference Point Elevation: 1095 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/13E-30J01

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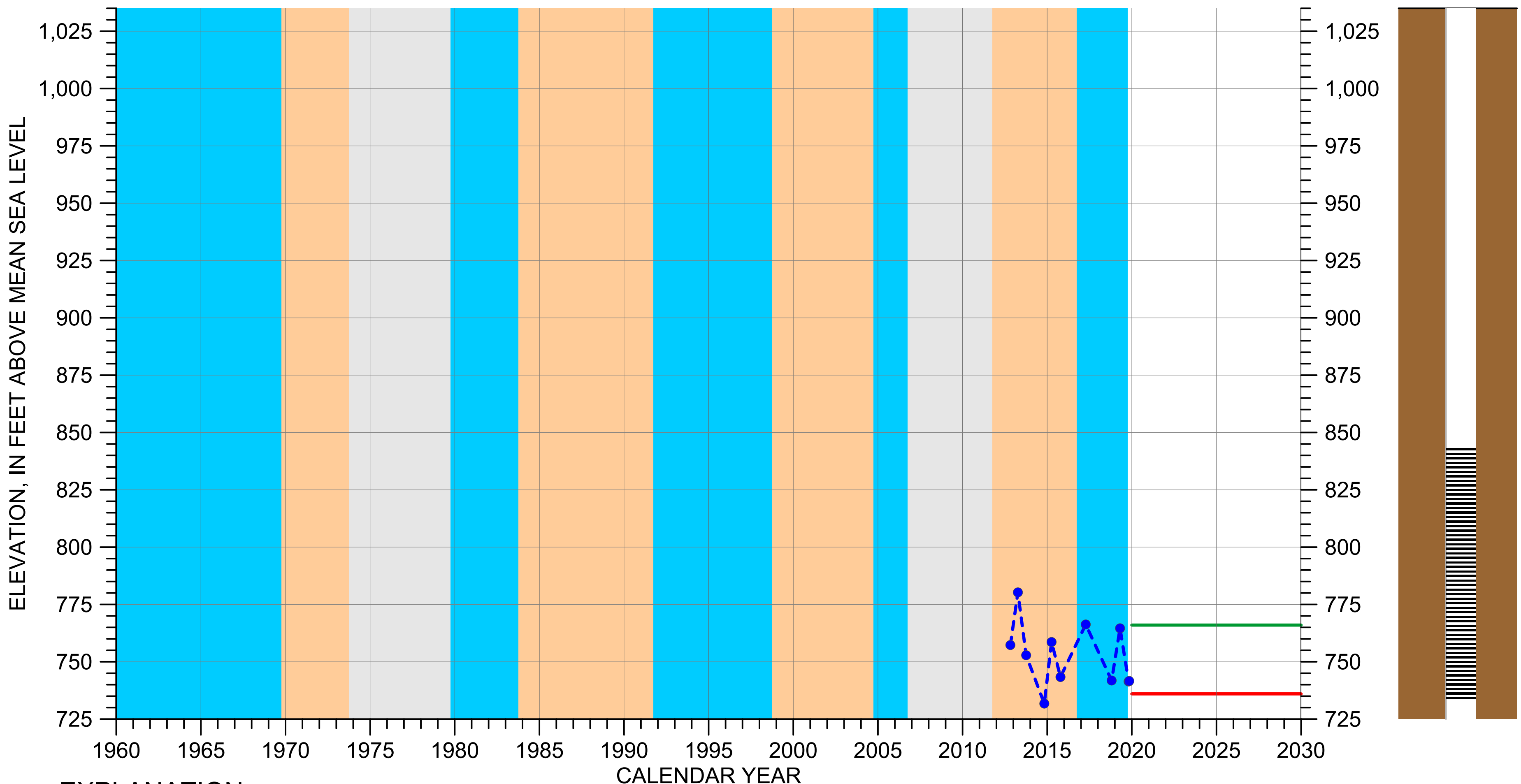


EXPLANATION

GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

MEASURABLE OBJECTIVE

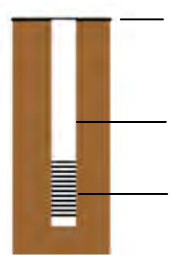
MINIMUM THRESHOLD

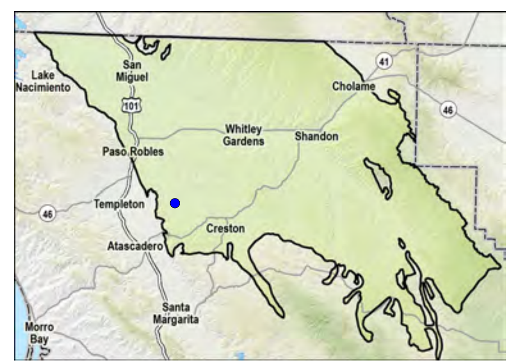
CLIMATE PERIOD CLASSIFICATION

DRY

AVERAGE/ALTERNATING

WET



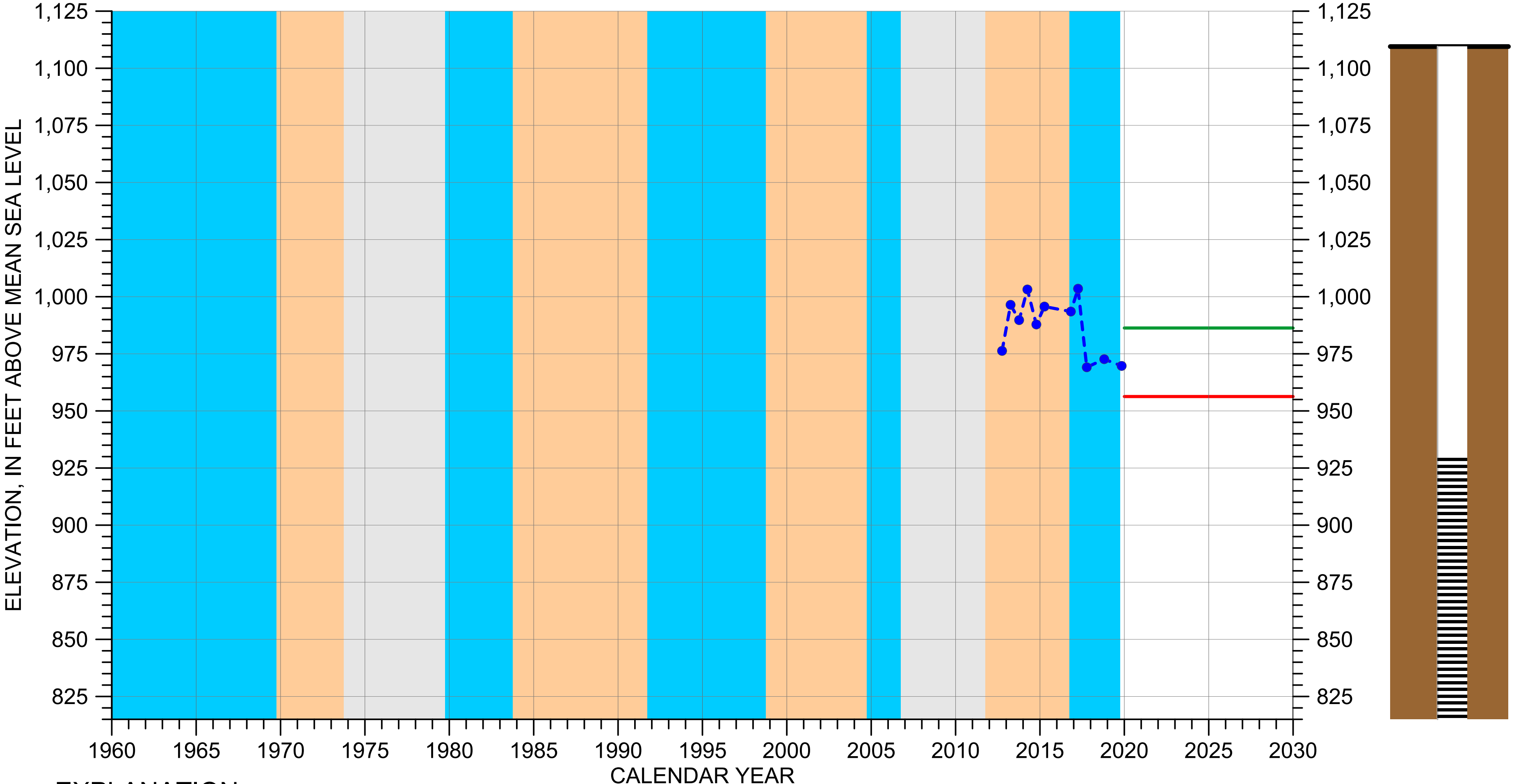


Well Depth: 310 feet
Screened Interval: 200-310 feet below ground surface
Reference Point Elevation: 1043.2 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/13E-30F01

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_27S_13E-30F01.grf



EXPLANATION

GROUNDWATER ELEVATION

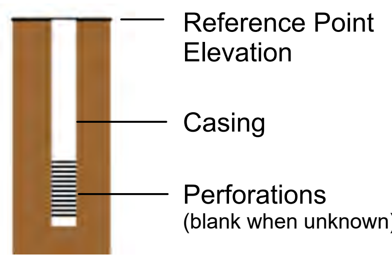
MEASUREMENT NOT VERIFIED*

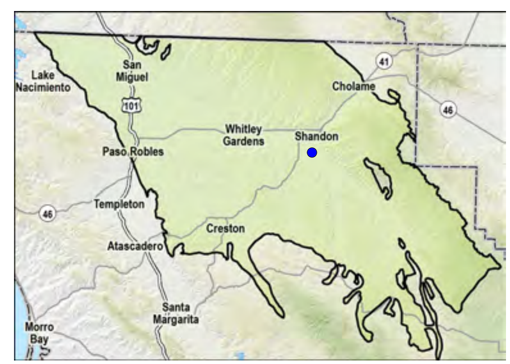
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET





Well Depth: 600 feet
Screened Interval: 180-600 feet below ground surface
Reference Point Elevation: 1109.5 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-29R01

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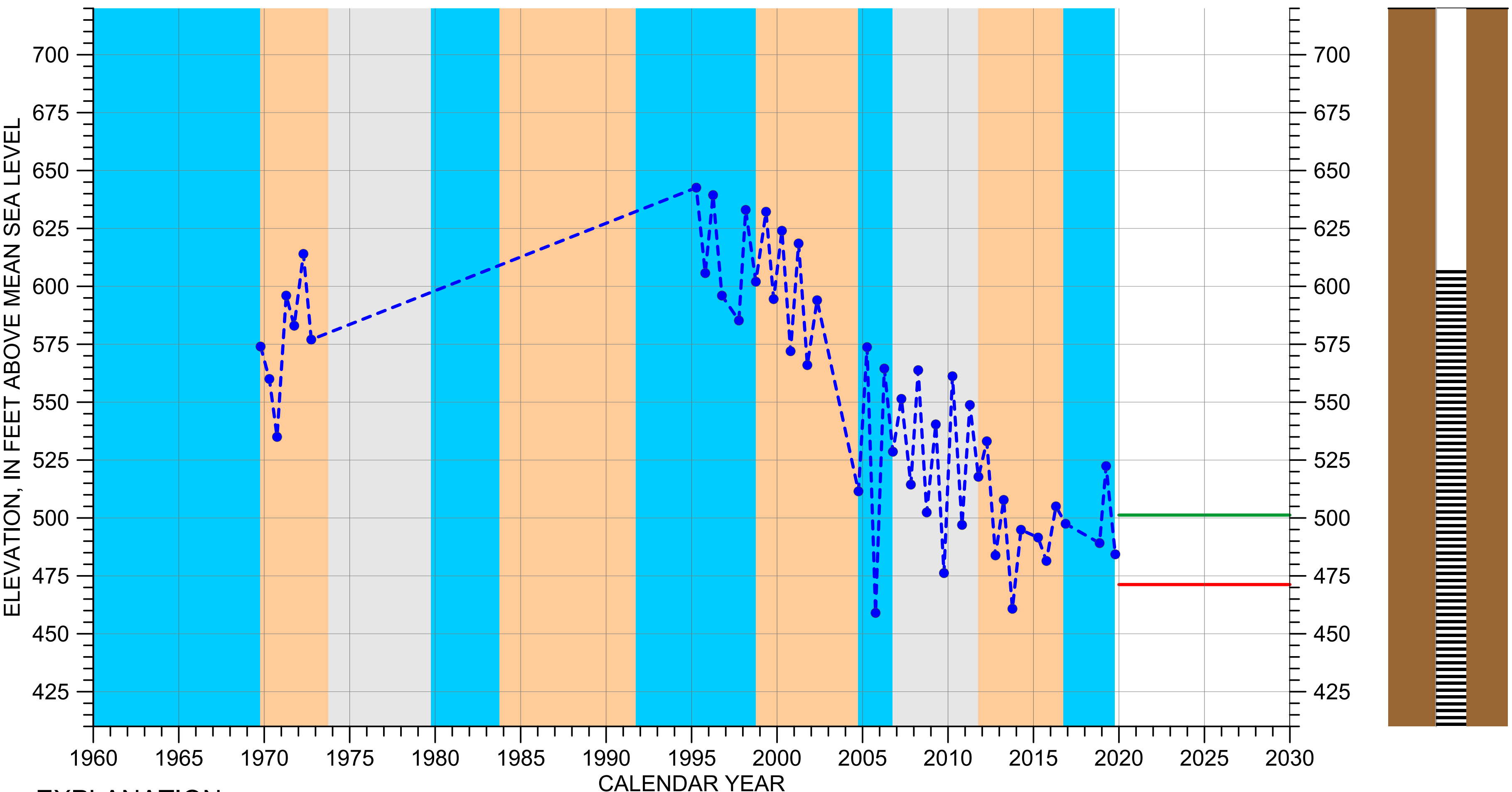


EXPLANATION

GROUNDWATER ELEVATION

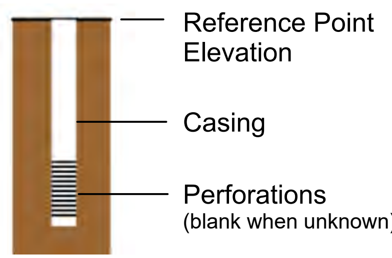
MEASUREMENT NOT VERIFIED*

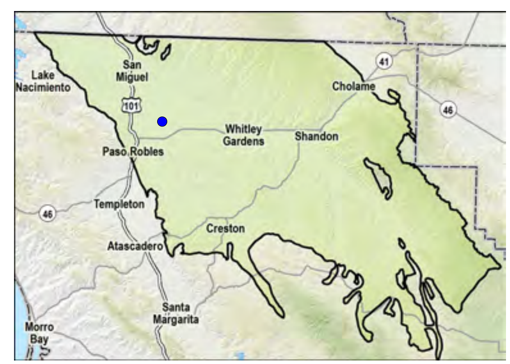
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY   AVERAGE/ALTERNATING   WET





Well Depth: 1230 feet
Screened Interval: 180-1230 feet below ground surface
Reference Point Elevation: 790 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-14H01

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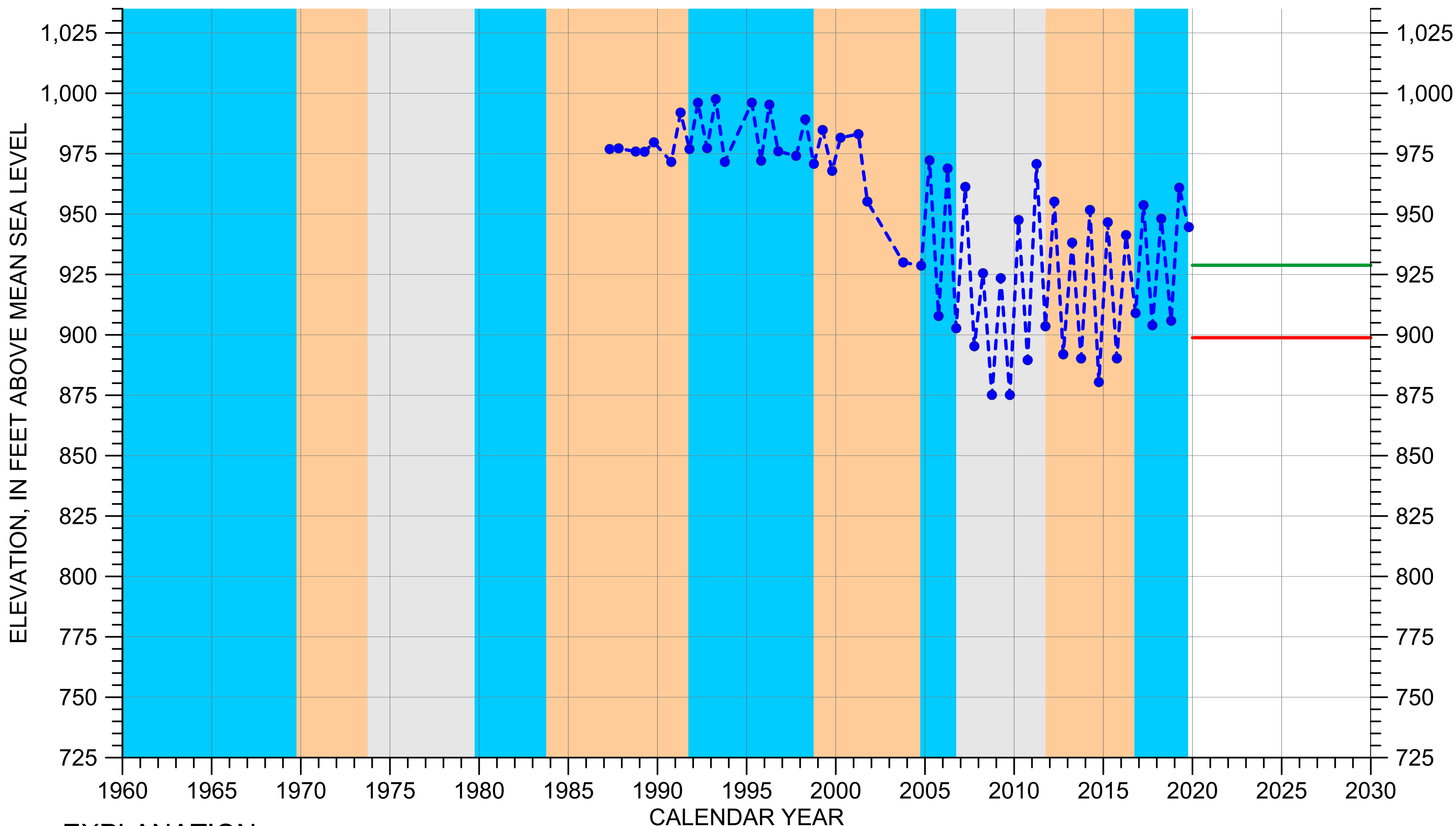
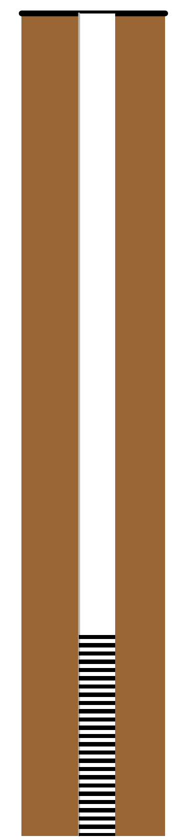




EXPLANATION

GROUNDWATER ELEVATION

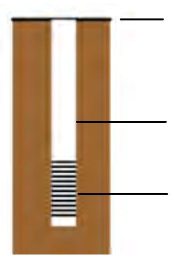
MEASUREMENT NOT VERIFIED*

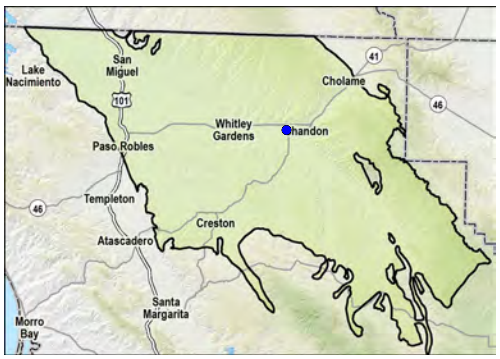
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET





Well Depth: 512 feet
Screened Interval: 223-512 feet below ground surface
Reference Point Elevation: 1020 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-19E01

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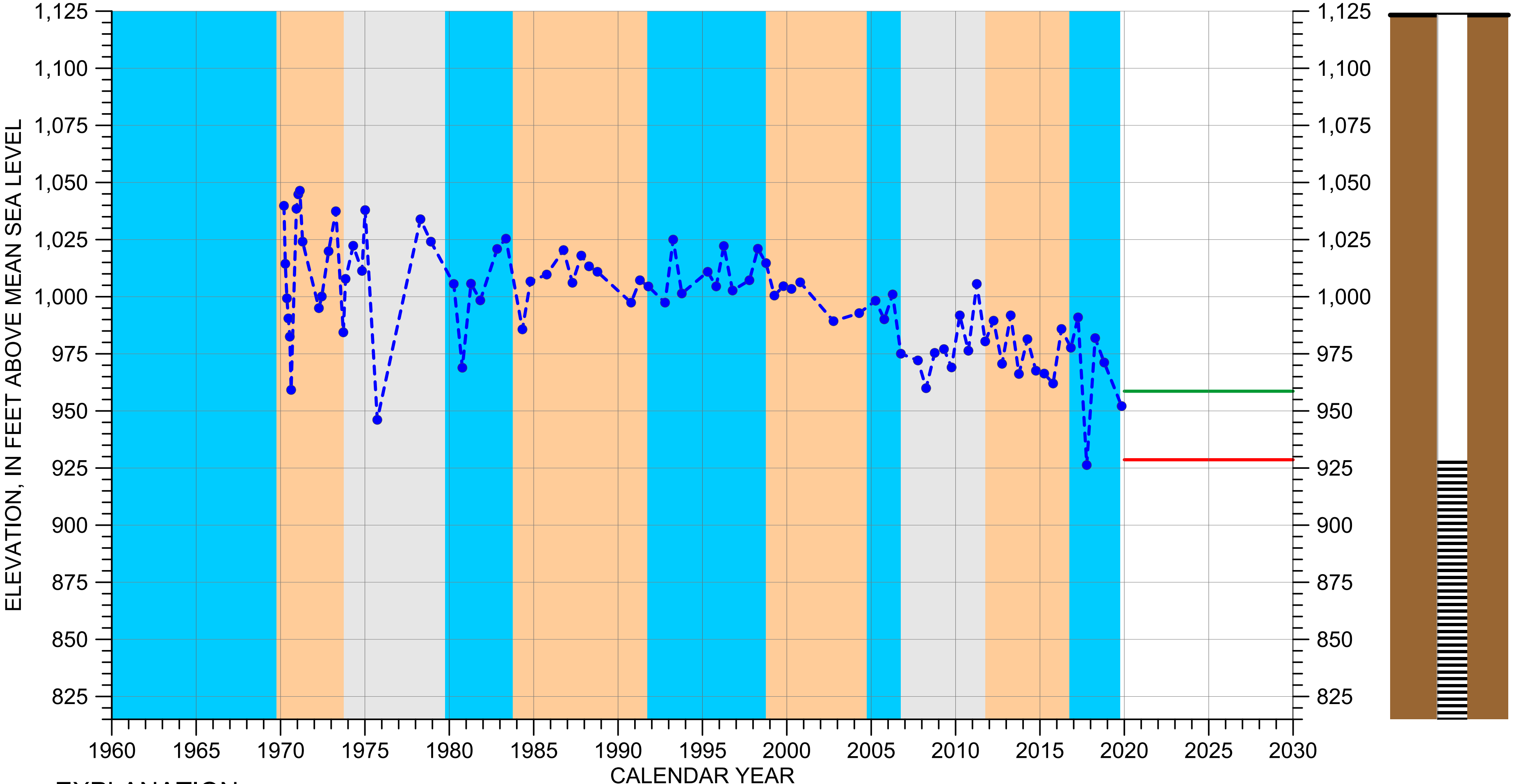


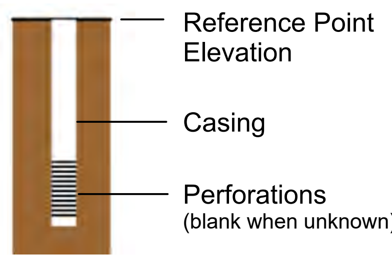
EXPLANATION

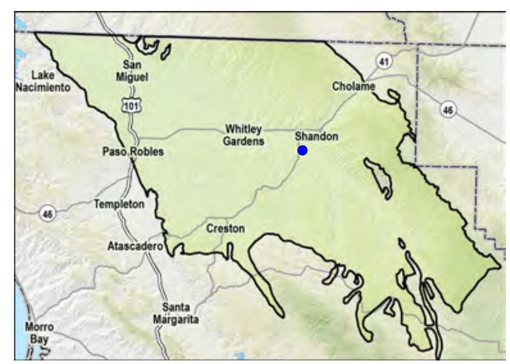
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

MEASURABLE OBJECTIVE

MINIMUM THRESHOLD





CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 605 feet
Screened Interval: 195-605 feet below ground surface
Reference Point Elevation: 1123.3 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-30J01

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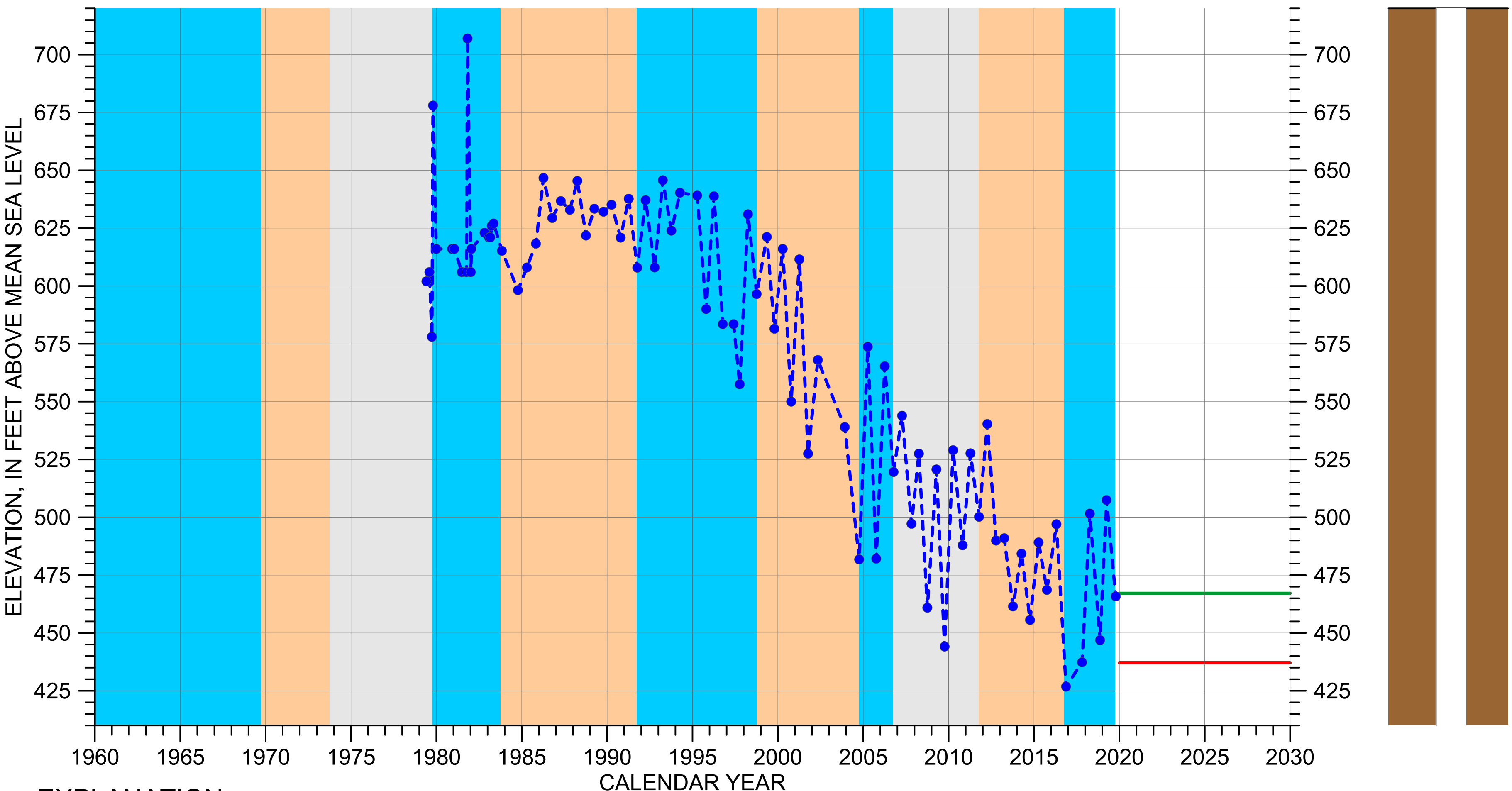


EXPLANATION

GROUNDWATER ELEVATION

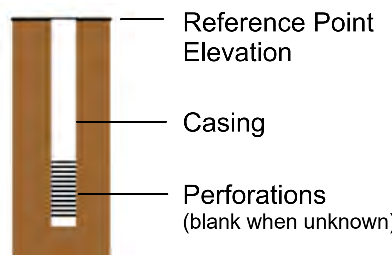
MEASUREMENT NOT VERIFIED*

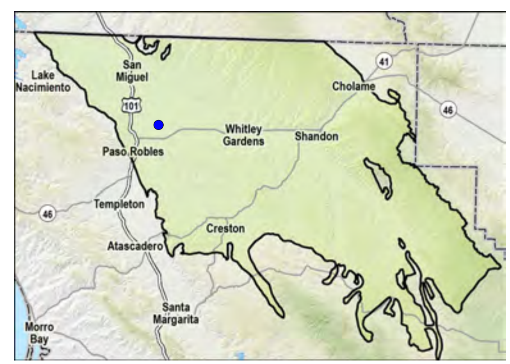
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



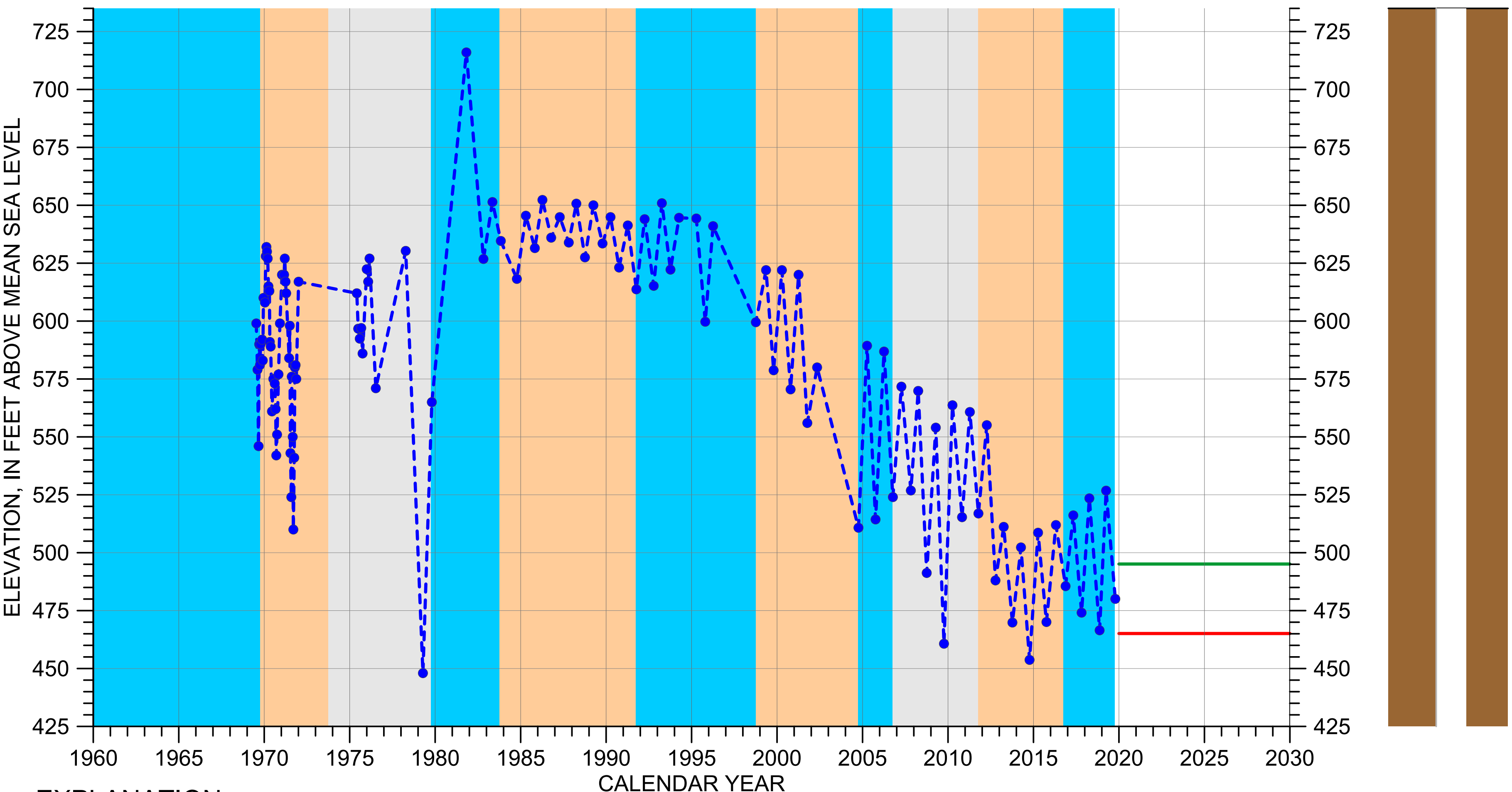


Well Depth: 1100 feet
Screened Interval: unknown
Reference Point Elevation: 786 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-14K01

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_26S_12E-14K01.grf



EXPLANATION

GROUNDWATER ELEVATION

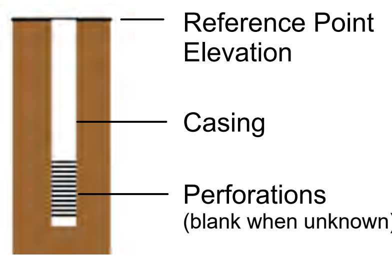
MEASUREMENT NOT VERIFIED*

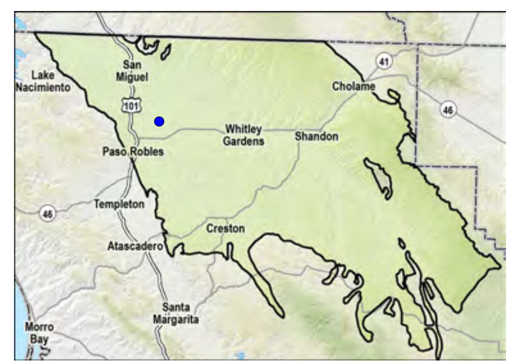
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



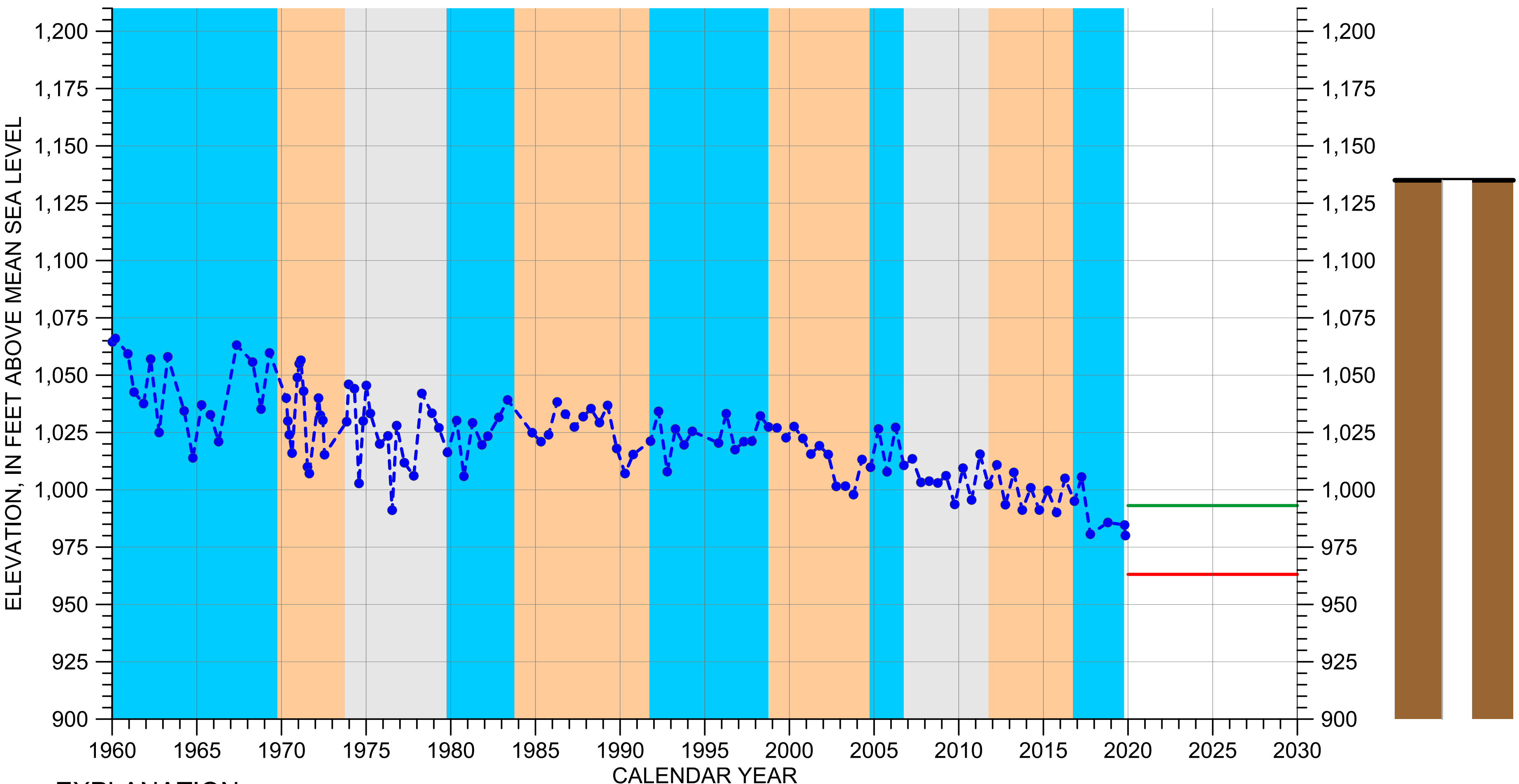


Well Depth: 740 feet
Screened Interval: unknown
Reference Point Elevation: 789.3 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-14G01

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_26S_12E-14G01.grf



EXPLANATION

GROUNDWATER ELEVATION

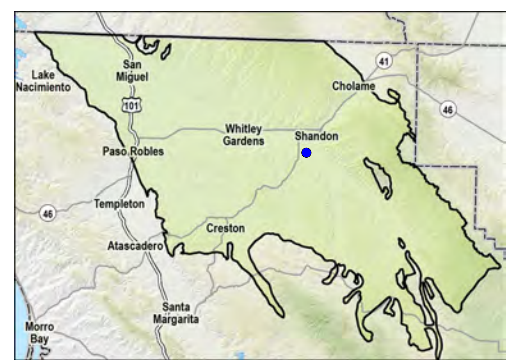
MEASUREMENT NOT VERIFIED*

MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY | AVERAGE/ALTERNATING | WET

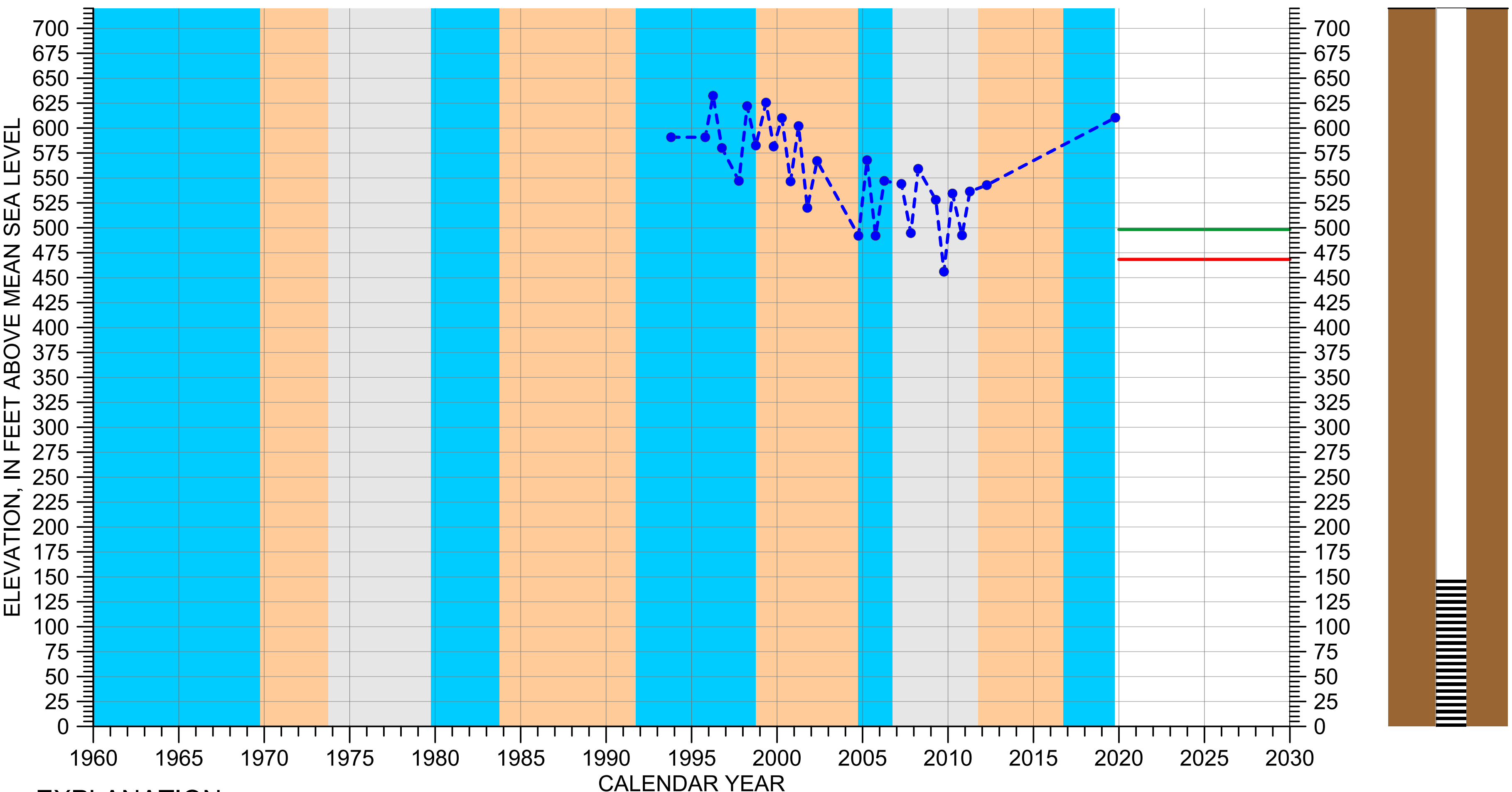


Well Depth: 350 feet
Screened Interval: unknown
Reference Point Elevation: 1135 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-29N01

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_26S_15E-29N01.grf



EXPLANATION

GROUNDWATER ELEVATION

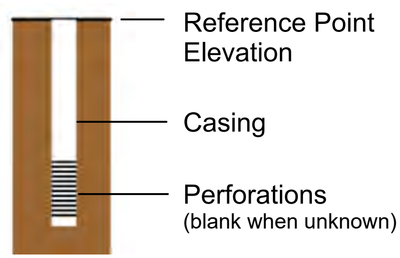
MEASUREMENT NOT VERIFIED*

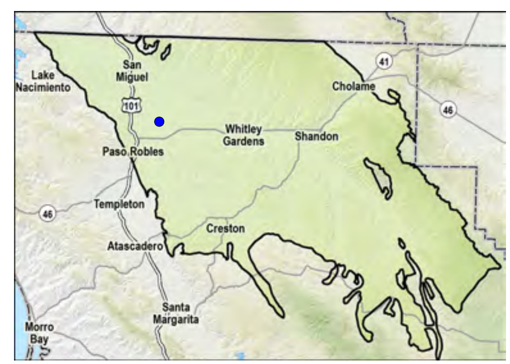
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



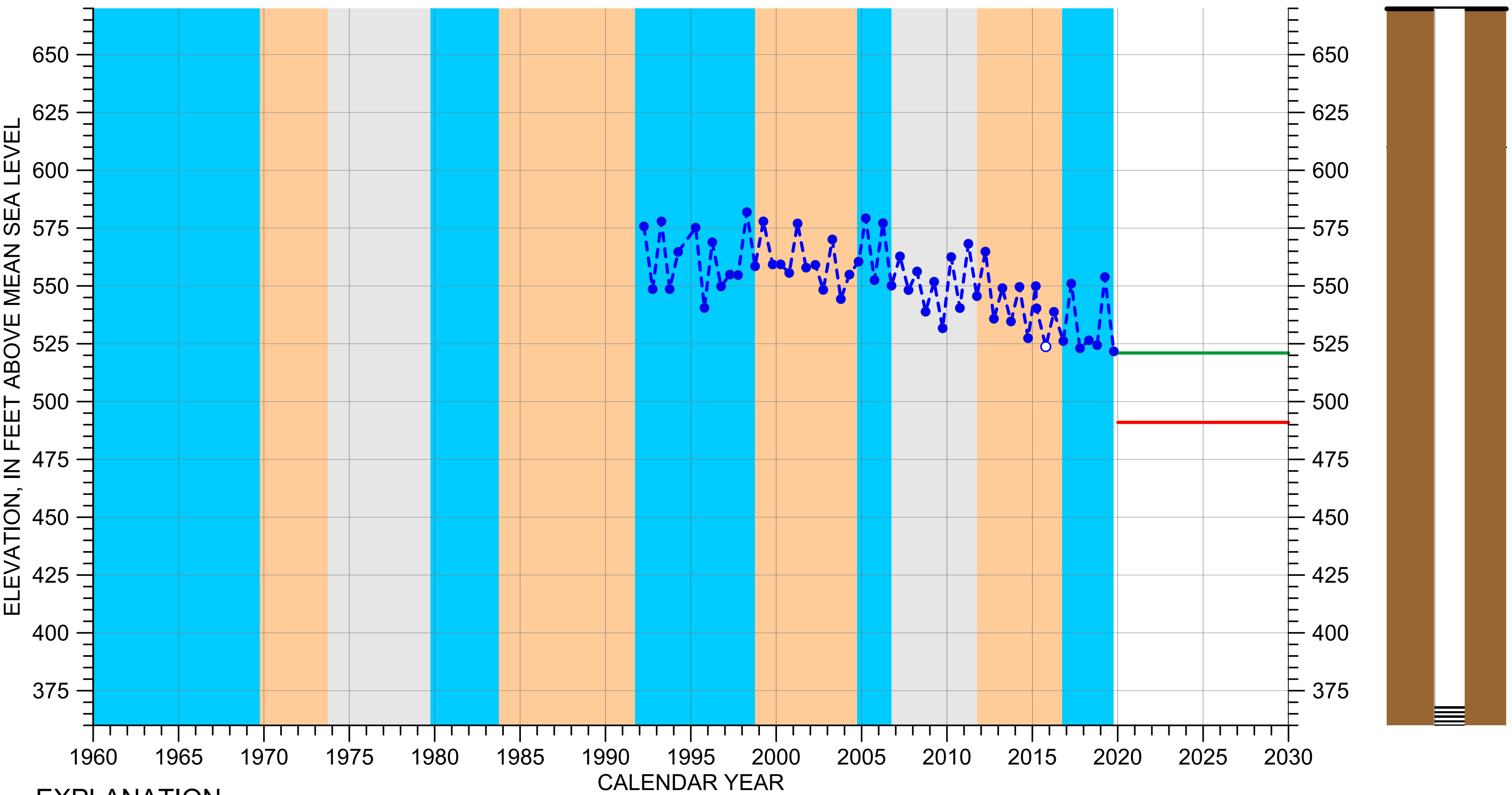


Well Depth: 840 feet
Screened Interval: 640-840 feet below ground surface
Reference Point Elevation: 787 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-14G02

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_26S_12E-14G02.grf



EXPLANATION

GROUNDWATER ELEVATION

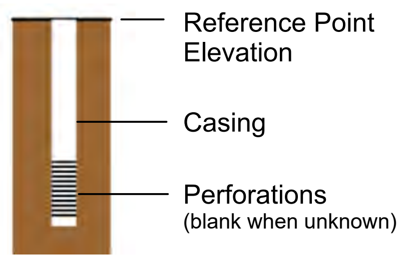
MEASUREMENT NOT VERIFIED*

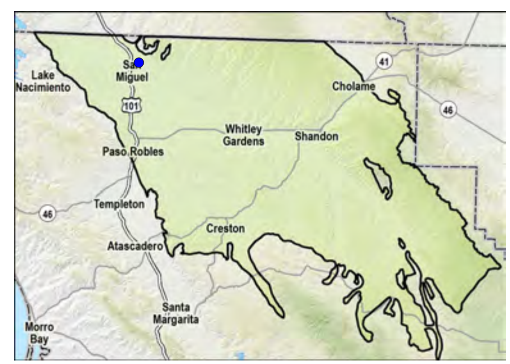
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



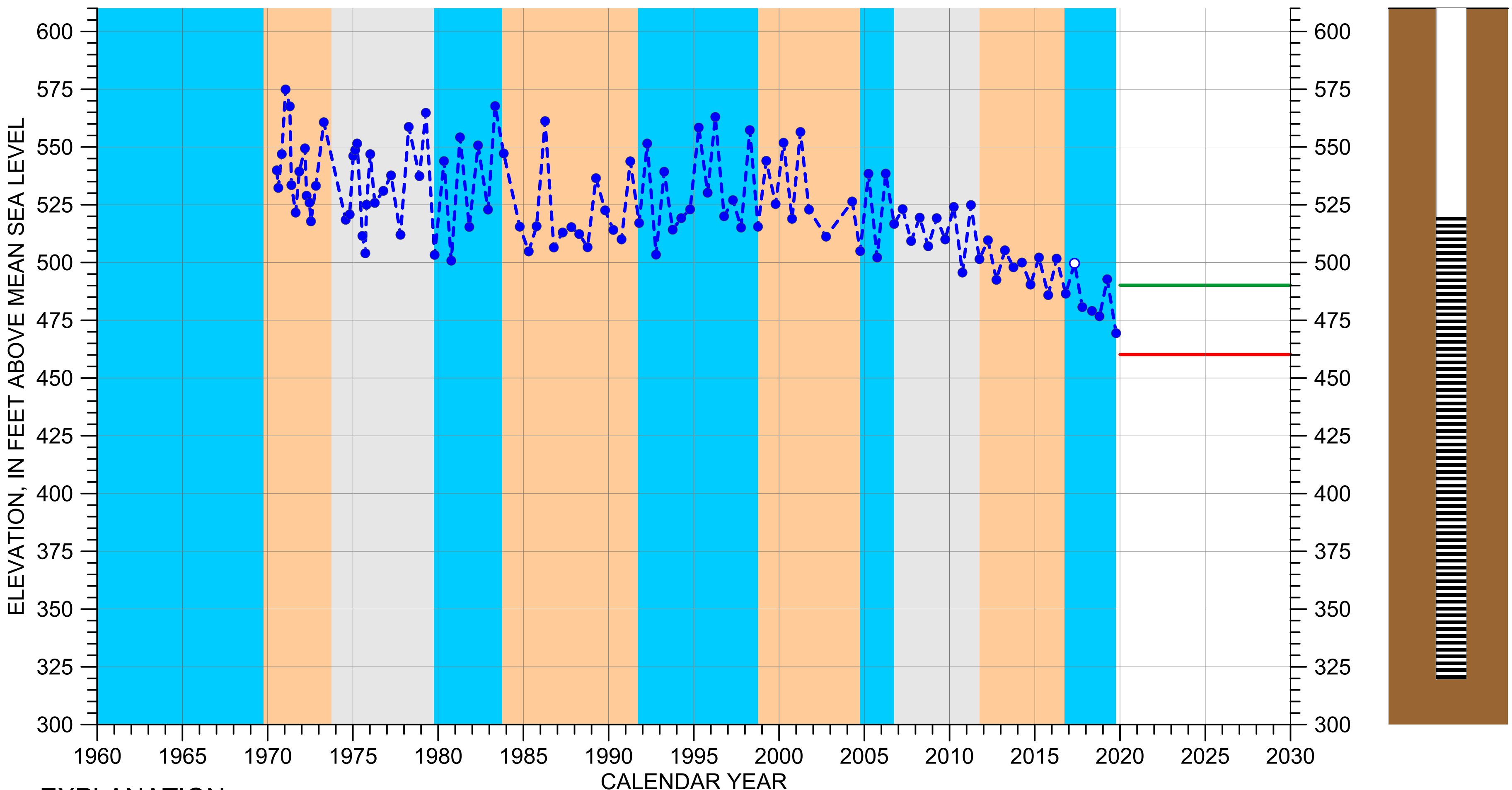


Well Depth: 350 feet
Screened Interval: 300-310, 330-340 feet below ground surface
Reference Point Elevation: 669.8 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 25S/12E-16K05

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_25S_12E-16K05.grf



EXPLANATION

GROUNDWATER ELEVATION

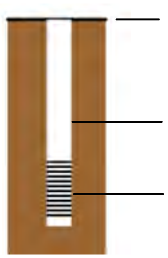
MEASUREMENT NOT VERIFIED*

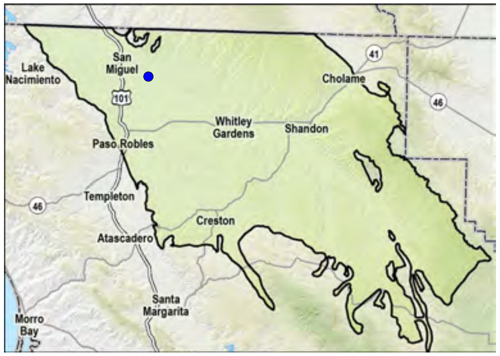
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



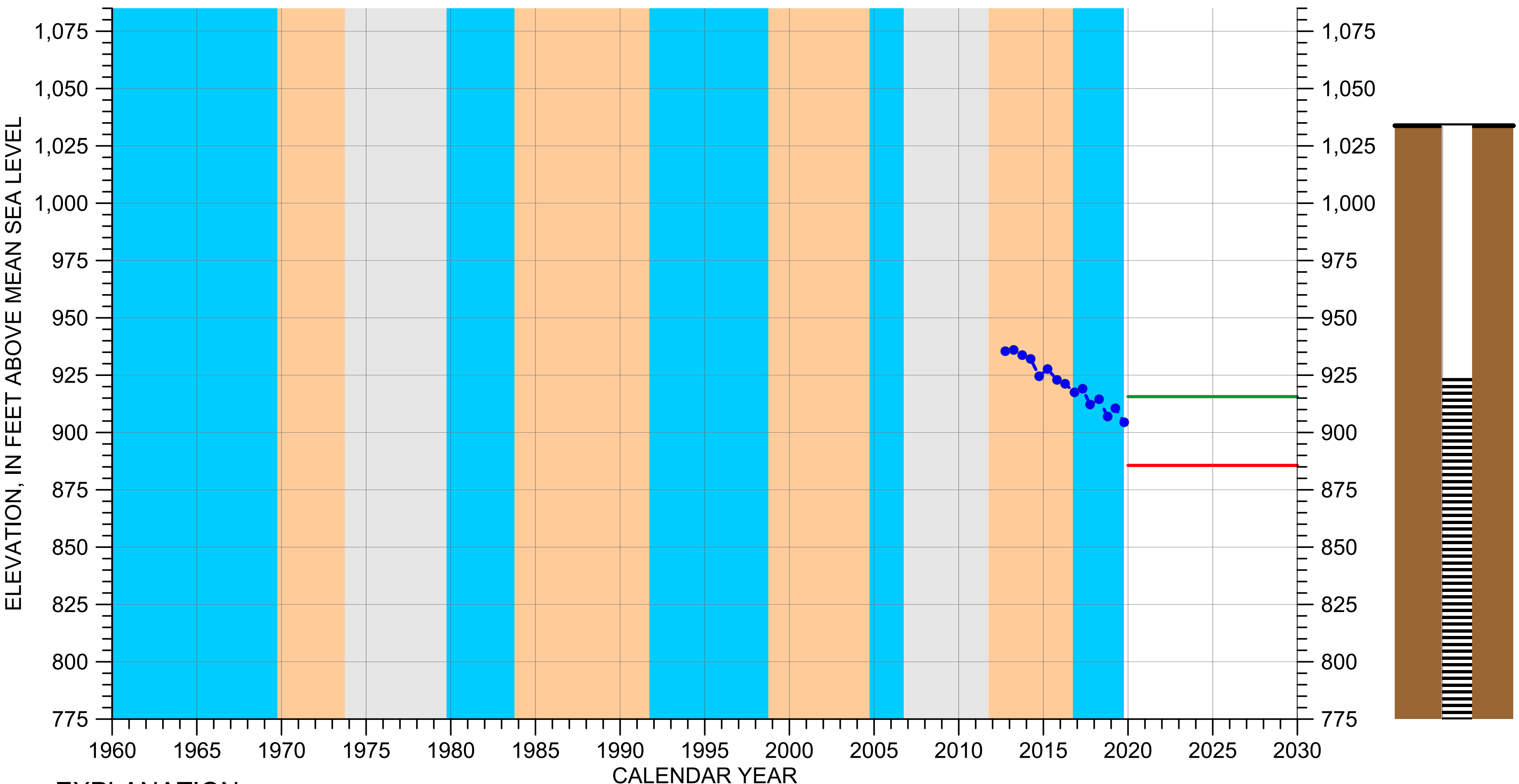


Well Depth: 400 feet
Screened Interval: 200-400 feet below ground surface
Reference Point Elevation: 719.7 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 25S/12E-26L01

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_25S_12E-26L01.grf



EXPLANATION

GROUNDWATER ELEVATION

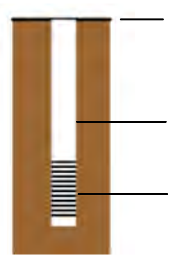
MEASUREMENT NOT VERIFIED*

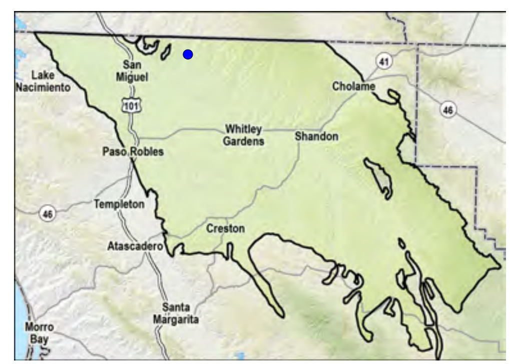
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY   AVERAGE/ALTERNATING   WET



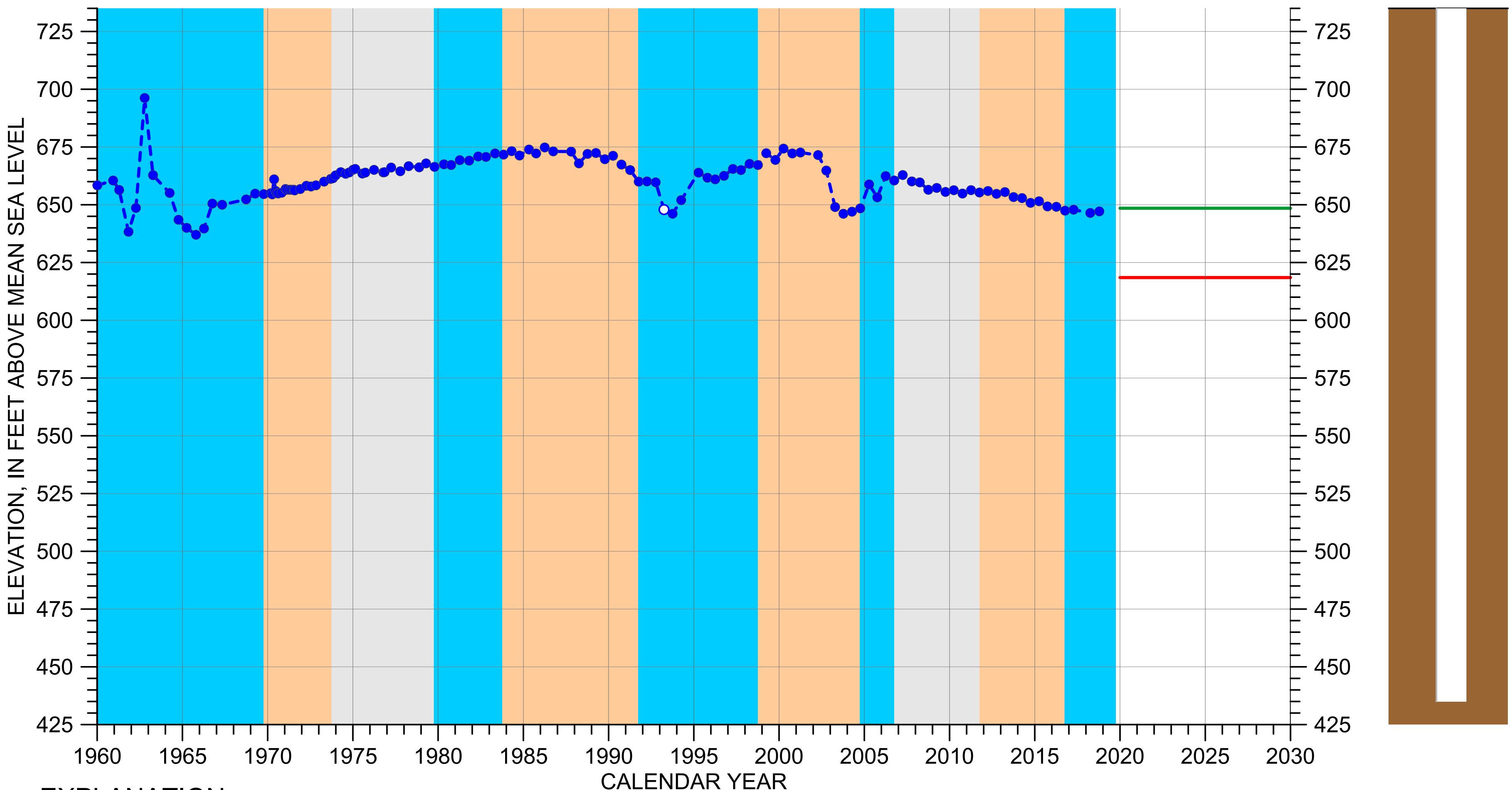


Well Depth: 270 feet
Screened Interval: 110-270 feet below ground surface
Reference Point Elevation: 1033.8 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 25S/13E-08L02

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_25S_13E-08L02.grf



EXPLANATION

GROUNDWATER ELEVATION

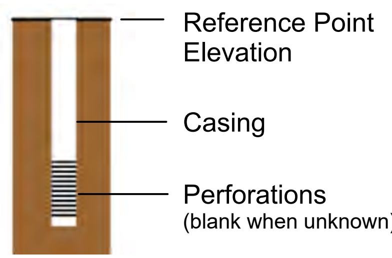
MEASUREMENT NOT VERIFIED*

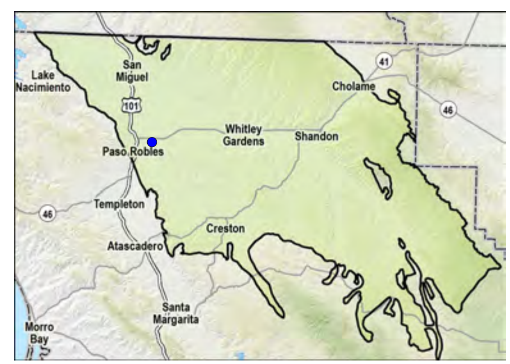
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



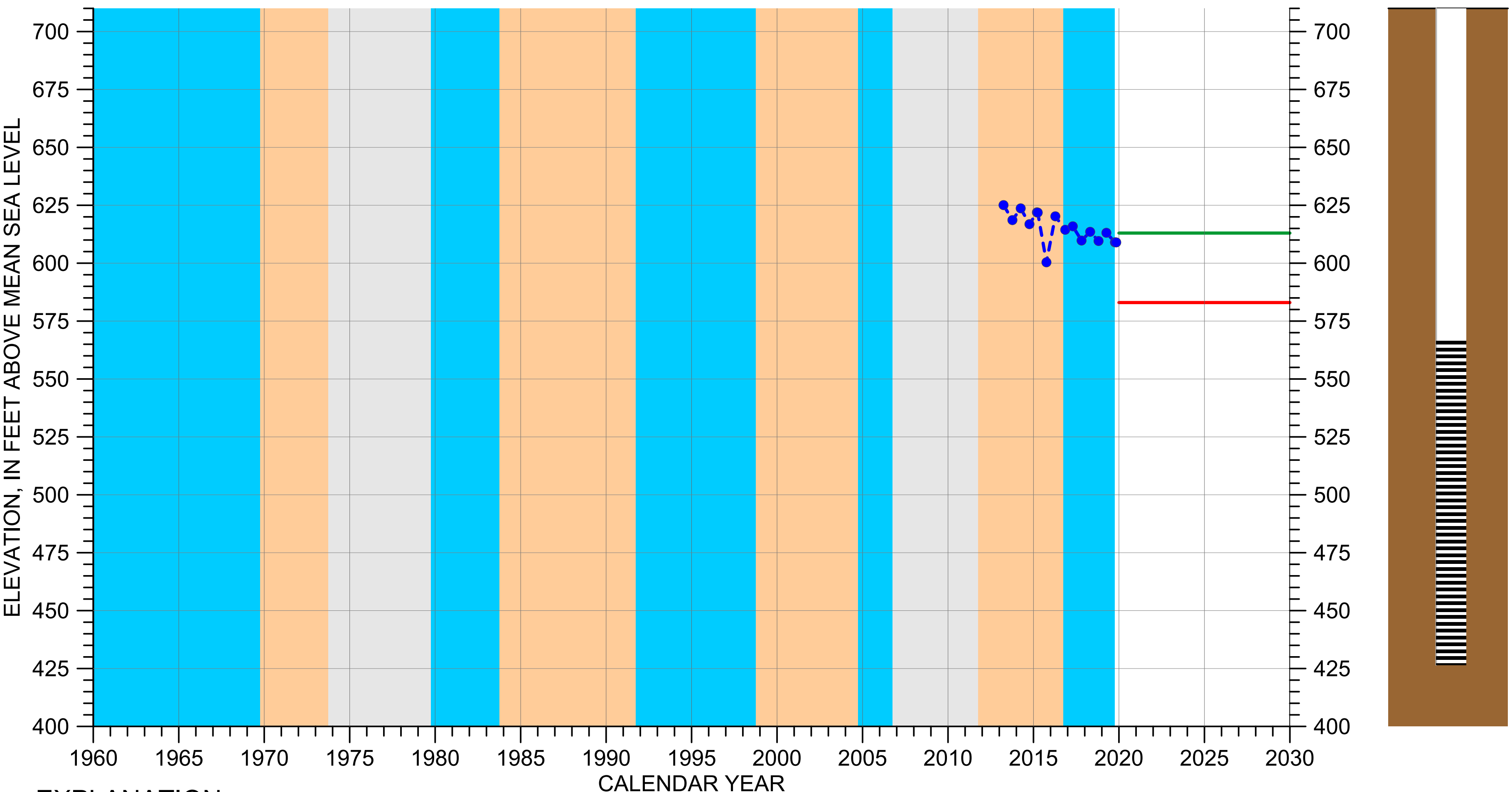


Well Depth: 400 feet
Screened Interval: unknown
Reference Point Elevation: 835 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-26E07

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_26S_12E-26E07.grf



EXPLANATION

GROUNDWATER ELEVATION

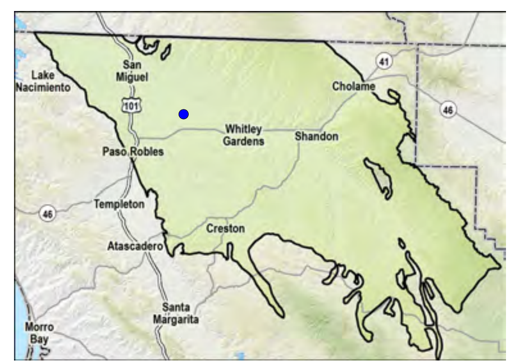
MEASUREMENT NOT VERIFIED*

MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

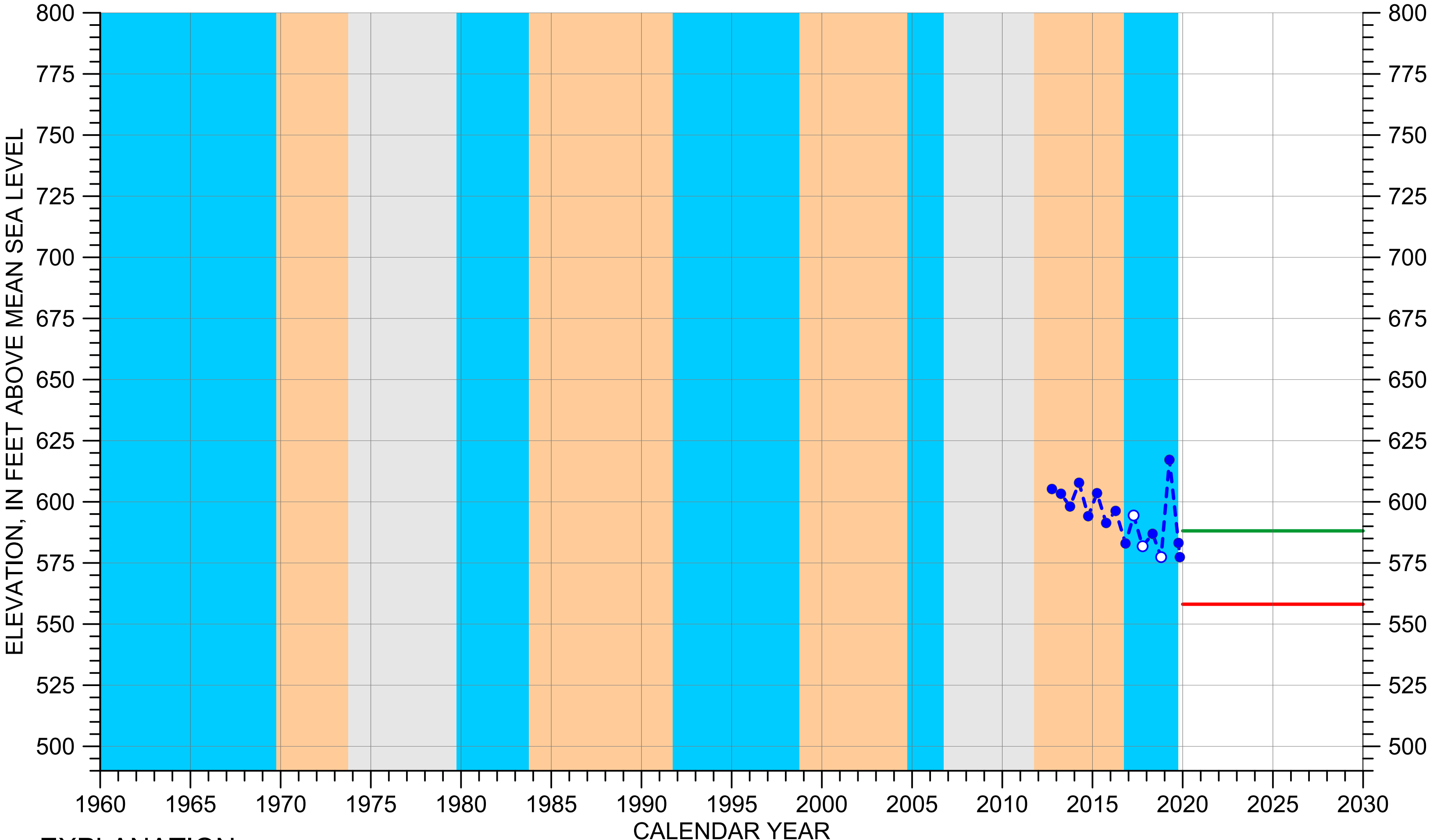


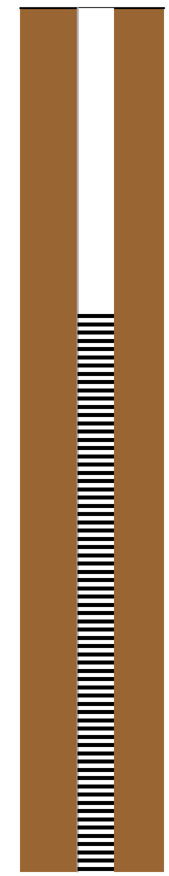
Well Depth: 400 feet
Screened Interval: 260-400 feet below ground surface
Reference Point Elevation: 827.9 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/13E-08M01

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_26S_13E-08M01.grf





EXPLANATION

GROUNDWATER ELEVATION

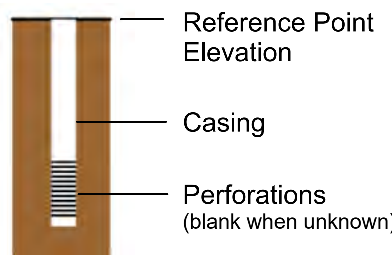
MEASUREMENT NOT VERIFIED*

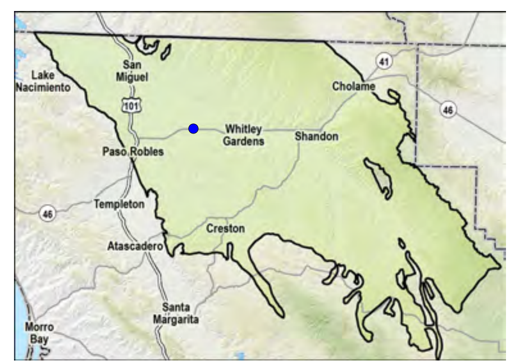
MEASURABLE OBJECTIVE

MINIMUM THRESHOLD

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET





Well Depth: 400 feet
Screened Interval: 200-400 feet below ground surface
Reference Point Elevation: 890.2 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/13E-16N01

P:\Portland\824-Paso Robles\001-GSP Annual Report\Analysis\Hydrographs\Grapher\Annual Rpt\Hydr_26S_13E-16N01.grf

APPENDIX F

Paso Robles Formation Aquifer Storage Coefficient Derivation and Sensitivity Analysis

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Paso Robles Formation Aquifer Storage Coefficient Derivation and Sensitivity Analysis

The annual changes in groundwater in storage calculated for water years 2017, 2018, and 2019 in the Paso Robles Formation Aquifer presented in this first annual report are based on a fixed storage coefficient (S) value derived from groundwater modeling and groundwater elevation data presented in the Groundwater Sustainability Plan (GSP) for water year 2016. The derivation of S for the Paso Robles Formation Aquifer and a sensitivity analysis are presented below. It should be noted that while the GSP groundwater model utilizes a spatially variable S (both laterally and vertically) the S value derived here and used in this first annual report is a single average value representing the Paso Robles Formation Aquifer within the Subbasin.

1.1 Derivation of the Storage Coefficient Term

Derivation of S was accomplished through a back calculation using the change in groundwater in storage in the Paso Robles Formation Aquifer determined from the GSP groundwater model for water year 2016 and the total volume change represented by a Paso Robles Formation Aquifer groundwater elevation change map prepared for water year 2016. The change in groundwater in storage for water year 2016 in the Paso Robles Formation Aquifer is -59,459 acre-feet (AF) based on the GSP groundwater model.

The Paso Robles Formation Aquifer groundwater elevation change map for water year 2016 was prepared for this annual report by comparing the fall 2015 groundwater elevation contour map to the fall 2016 groundwater elevation contour map. The fall 2015 groundwater elevations were subtracted from the fall 2016 groundwater elevations resulting in a map depicting the changes in groundwater elevations in the Paso Robles Formation Aquifer that occurred during the 2016 water year (not pictured, but similar to Figures 12, 13, and 14 in this first annual report).

The groundwater elevation change map for water year 2016 represents a total volume change within the Paso Robles Formation Aquifer of -807,490 AF. As described in Section 7.2 of this annual report, this total volume change includes the volume displaced by the aquifer material and the volume of groundwater stored within the void space of the aquifer. The portion of void space in the aquifer that can be utilized for groundwater storage is represented by S. The change in groundwater in storage is equivalent to the product of S and the total volume change, as shown here:

$$Change\ of\ Groundwater\ in\ Storage = S \times Total\ Volume\ Change$$

This equation can be re-arranged and solved for S:

$$S = \frac{Change\ of\ Groundwater\ in\ Storage}{Total\ Volume\ Change} = \frac{-59{,}459\ AF}{-807{,}490\ AF} = 0.07$$

Therefore, based on analysis of data for water year 2016, an average S value for the Paso Robles Formation Aquifer in the Paso Robles Subbasin is 0.07.

1.2 Sensitivity Analysis

The annual changes in groundwater in storage in the Paso Robles Formation Aquifer calculated for water years 2017, 2018, and 2019 presented in this first annual report are 60,106, 6,398, and 59,682 AF, respectively. These values, calculated using an S value of 0.07, appear reasonable when compared to historical changes in groundwater in storage (see Figure 15 in this first annual report). While the calculated value of S, presented above, is based on sound science and using the best readily available information, it is necessary to acknowledge that the true value of S in the Paso Robles Formation Aquifer is spatially variable (as indicated in the GSP groundwater model) and ranges in value both above and below the calculated value of 0.07. A sensitivity analysis was performed to demonstrate the range of annual changes in groundwater in storage that result from using a range of S values. Table F1 shows that the annual change in groundwater in storage volumes can range from 27 percent less to 27 percent more than presented in this first annual report based on S values ranging from 0.05 to 0.09. This shows the sensitivity of the S value to determination of annual change in groundwater in storage. However, neither the 27 percent lower nor the 27 percent higher annual change in groundwater in storage volumes seem reasonable when compared to historical changes in groundwater in storage (as shown in Figure 15 in this first annual report). Based on this sensitivity analysis, GSI believes that the calculated value of S (0.07) is reasonable and defensible for the purposes of this first annual report.

Table F 1. Change in Groundwater in Storage Sensitivity Analysis

Water Year	Total Volume of Change (AF)	Change in Groundwater in Storage (AF), based on:								
		S = 0.05		S = 0.06		Calculated S [0.07]	S = 0.08		S = 0.09	
		(AF)	% Diff	(AF)	% Diff	(AF)	(AF)	% Diff	(AF)	% Diff
2017	816,274	43,781	-27%	51,943	-14%	60,106	68,269	14%	76,432	27%
2018	86,885	4,660		5,529		6,398	7,267		8,135	
2019	810,508	43,471		51,577		59,682	67,787		75,892	

notes:

AF = acre-feet, S = storage coefficient, % Diff = percent difference from calculated S