



## **PBCC REVIEW DRAFT**

Paso Basin Cooperative Committee  
and the Groundwater Sustainability Agencies

# **Paso Robles Subbasin Water Year 2021 Annual Report**

February 24, 2022

Prepared by:

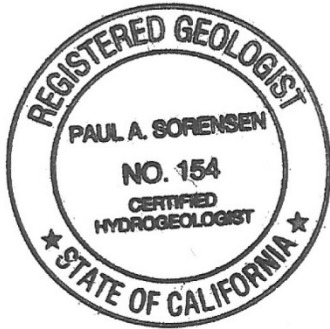
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## Paso Robles Subbasin Water Year 2021 Annual Report

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	airborne 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
DSOD	Division of Safety of Dams
DWR	California State Department of Water Resources
EPCWD	Estrella-EI Pomar-Creston Water District
ET <sub>o</sub>	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
PRWSP	Paso Robles Watershed Plan
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
SLO	San Luis Obispo
SLOFCWCD	San Luis Obispo County Flood Control and Water Conservation District
SPI	Standardized Precipitation Index
SSJGSA	Shandon-San Juan Groundwater Sustainability Agency
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
USACE	United States Army Corps of Engineers
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 Monitoring Networks (§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 Water Year 2021 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 on January 31, 2020, 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 of each subsequent year. These annual reports 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 Water Year 2021 Annual Report include the following:

**Section 1. Introduction – Paso Robles Subbasin Water Year 2021 Annual Report:** 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 year (WY) 2021 show a decline across portions of the Subbasin, likely due predominantly to below-average rainfall conditions in WY 2021. Positive and negative changes in groundwater elevations from year to year are observed in various parts of the Subbasin, as has been observed historically. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels are observed annually.

## Groundwater Extractions

Total groundwater extractions in the Subbasin for WY 2021 are estimated to be 82,100 acre-feet (AF). Table ES-1 summarizes the groundwater extractions by water use sector for each water year. The values for WYs 2017 – 2020 (grayed out) are included for reference purposes. This convention is carried throughout the report.

**Table ES- 1. Groundwater Extractions by Water Use Sector**

Water Year	Groundwater Extractions by Water Use Sector			Total (AF)
	Municipal <sup>1</sup> (AF)	PWS and Rural Domestic (AF)	Agriculture (AF)	
2017	1,626	5,060	64,100	70,800
2018	1,677	5,060	75,500	82,200
2019	1,729	5,060	55,800	62,600
2020	1,509	5,060	60,700	67,300
2021	1,553	5,060	75,500	82,100
Method of Measure:	Metered	2016 Groundwater Model	Soil-Water Balance Model	
Level of Accuracy:	high	low-medium	medium	

**Notes:**

- <sup>1</sup> These volumes include any water produced as Salinas River underflow within the Paso Robles Subbasin.
- 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. In WY 2021 the City of Paso Robles actually utilized 1,996 AF of their NWP entitlement, but 746 AF of their NWP deliveries were recharged and extracted in the Atascadero Subbasin, so those volumes do not show up in this accounting. Locations of communities dependent on groundwater and with access to surface water are shown on Figure 8. 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 (AF)	Imported Salinas River Underflow <sup>1</sup> (AF)	State Water Project (AF)	Total Surface Water Use (AF)
2017	1,650	2,609	42	4,301
2018	1,423	3,352	55	4,829
2019	1,142	3,075	43	4,259
2020	737	3,852	0	4,589
2021	1,250	3,612	0	4,861

**Notes:**

- <sup>1</sup> The City of Paso Robles produces Salinas River underflow, regulated as surface water by the State Water Resources Control Board, from its Thunderbird Wells located in the adjacent Atascadero Subbasin.
- AF = acre-feet
- AFY = acre-feet per year

## Total Water Use

For WY 2021, quantification of total water use was completed through reporting of metered water production data from municipal wells (including imported Salinas River underflow<sup>1</sup>, see Section 5), 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 Water Use in the Subbasin by Source and Water Use Sector**

Water Year	Municipal (AF)		PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
	Groundwater	Surface Water <sup>1</sup>	Groundwater	Groundwater	
2017	1,626	4,301	5,060	64,100	75,100
2018	1,677	4,829	5,060	75,500	87,100
2019	1,729	4,259	5,060	55,800	66,800
2020	1,509	4,589	5,060	60,700	71,900
2021	1,553	4,861	5,060	75,500	87,000
Method of Measure:	Metered	Metered	2016 Groundwater Model	Soil-Water Balance Model	
Level of Accuracy:	high	high	low-medium	medium	

**Notes:**

<sup>1</sup> Includes imported Salinas River underflow, which is regulated as surface water by the State Water Resources Control Board

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 this analysis, fall 2020 groundwater elevations were subtracted from the fall 2021 groundwater elevations resulting in a map depicting the changes in groundwater elevations in the Paso Robles Formation Aquifer that occurred during WY 2021.

The groundwater elevation change map for WY 2021 (Figure 10) shows that water levels declined primarily in areas east and southeast of Shandon and within and to the west of Creston. The 2021 map also shows that groundwater elevations generally increased within a north-south strip through the Shandon area, and also notably in the northeastern portion of the City of Paso Robles.

The annual change of groundwater in storage calculated for WY 2021 is presented in Table ES-4. Increases of groundwater in storage are presented as positive numbers and decreases of groundwater in storage are presented as negative numbers.

<sup>1</sup> Salinas River underflow is regulated as surface water by the State Water Resources Control Board.

**Table ES- 4. Annual Change of Groundwater in Storage**

Water Year	Annual Change (AF)
2017	60,100
2018	6,400
2019	59,700
2020	-80,800
2021	-62,300

Note: AF = acre-feet

## Summary of Response to DWR Review of GSP

On June 3, 2021, the Paso Robles Subbasin GSP manager received a consultation letter from DWR. The letter was intended to initiate consultation between DWR and the Paso Robles Subbasin GSAs in advance of issuance of a plan adequacy determination. The letter indicates that DWR had identified deficiencies which may result in an incomplete determination. The letter also presents two potential corrective actions that, if addressed sufficiently, may result in GSP approval. Since receipt of the consultation letter, the GSAs have retained the services of a consultant to address these potential corrective actions and rewrite related sections of the GSP. This work is ongoing as of the date of this report. On January 21, 2022, DWR released an official ‘incomplete’ determination for the Paso Robles Subbasin GSP. Basins with GSPs that are determined incomplete have 180 days to address deficiencies and resubmit their corrected GSPs to DWR for review. The corrected Paso Robles Subbasin GSP must be resubmitted to DWR by July 20, 2022.

## 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:

- Paso Basin Aerial Groundwater Mapping Pilot Study
- Paso Basin Land Use Management Area Planting Ordinance
- Airborne Electromagnetic (AEM) Geophysical Survey
- Three-Dimensional Geologic Model of Basin using SkyTEM Survey Data
- Installation of Monitoring Wells and Stream Gages (SEP)
- City of Paso Robles Recycled Water Program
- San Miguel Community Services District Recycled Water Project
- Blended Water Project
- Expansion of Monitoring Well Network
- Expansion of Salinas Dam and Ownership Transfer

Relative to the basin conditions at the end of the study period as reported in the GSP, the First Annual Report (WYs 2017–2019) (GSI, 2020) and the Water Year 2020 Annual Report indicated an improvement in



groundwater conditions throughout the Subbasin and a modest increase of total groundwater in storage. However, the groundwater conditions documented in this Water Year 2021 Annual Report indicate a return to worsening conditions following two consecutive years with below average rainfall. It is clear that historical groundwater pumping in excess of the sustainable yield has created challenging conditions for sustainable management. However, actions are underway to collect data, improve the monitoring and data collection networks, and coordinate with affected agencies and entities throughout the Subbasin to develop and implement 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. However, two consecutive below average rainfall years in 2020 and 2021 have resulted in a reversal of this trend. One of the 22 Paso Robles Formation Aquifer representative monitoring site (RMS) wells in the Subbasin groundwater monitoring network exhibit groundwater elevations below the minimum threshold established in the GSP for the second consecutive year (this is discussed in more detail in Section 3.3). Although groundwater elevations in three of the Paso Robles Formation Aquifer RMS wells are recovering in the past few years, groundwater elevations in several of the RMS wells are continuing to trend downward. Three of the 22 Paso Robles Formation Aquifer RMS wells have current groundwater elevations greater than the measurable objective for that RMS well.

As of the date of this report, updated Interferometric Synthetic Aperture Radar (InSAR) data has been provided by DWR through October 2020. As discussed in the GSP, there is a potential error of 0.1 feet (or 1.2 inches) associated with the InSAR measurement and reporting methods. A land surface change of less than 0.1 feet is therefore within the noise of the data and is equivalent to no evidence of subsidence. Considering this range of potential error, examination of the October 2019 through October 2020 InSAR data show that zero land subsidence has occurred since October 2019. These data indicate that there is no indication of an undesirable result. The GSAs will continue to monitor and report annual subsidence as more data become available.

At this time, there are insufficient data available to adequately assess the interconnectivity of surface water and groundwater and the potential depletion of interconnected surface water. There is at present only a single Alluvial Aquifer RMS well in the Subbasin. Additional Alluvial Aquifer wells will need to be established in the monitoring network before groundwater/surface water interaction can be more robustly analyzed. The GSAs have retained the services of a consultant to address potential corrective actions to the GSP, including improvements to the groundwater/surface water interactions analysis. This work is ongoing as of the date of this report.

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 Water Year 2021 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 positively affect the ability of the Subbasin to reach the necessary sustainability goals.

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## SECTION 1: Introduction – Paso Robles Subbasin Water Year 2021 Annual Report

The Water Year 2021 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. Submittal of the adopted Paso Robles Subbasin GSP occurred on 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 of each subsequent year. This Water Year 2021 Annual Report for the Paso Robles Subbasin documents groundwater production, water use data and water level data from October 1, 2020 through October 31, 2021 <sup>2</sup>.

### 1.1 Setting and Background

The Paso Robles Subbasin GSP was prepared by Montgomery & Associates, Inc. (M&A, 2020), on behalf of and in cooperation with the Paso Basin Cooperative Committee and the Subbasin GSAs. The GSP, and subsequent annual reports including this Water Year 2021 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 above mean sea level (AMSL). The Subbasin is drained by the Salinas River and its tributaries, including the Estrella River, Huer Huevo 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.

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<sup>2</sup> 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 year. However, because the County of San Luis Obispo Groundwater Level Monitoring Program measures water levels in October, the October 2021 measurements, for instance, are utilized to reflect conditions at the end of water year 2021.

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 Member and Alternate to the PBCC to coordinate activities among the GSAs during the development of the GSP and the development and submittal of this Water Year 2021 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 annual reports 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 Water Year 2021 Annual Report:** 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 the 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 WY 2021. Much of the background information reported on in this Water Year 2021 Annual Report was taken from the GSP prepared by Montgomery & Associates, Inc. (M&A, 2020).

### 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 feet AMSL in the southeast extent of the Subbasin to about 600 feet 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 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 the Salinas River, Estrella River, Huer Huero Creek, and San Juan Creek. The Alluvial Aquifer varies in thickness but may be up to 100 feet 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 feet in the northern Estrella area and up to 2,000 feet in the Shandon area. The Paso Robles Formation has a thickness of 700 to 1,200 feet 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 feet to 1,000 feet 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 total annual precipitation recorded at the Paso Robles weather station for WY 2021 is 8.2 inches. The long-term average annual precipitation for the period 1925 through 2021 is 14.5 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. The WY 2021 SPI analysis uses a 24-month period instead of the 60-month period used in previous analyses in the GSP and prior Annual Reports<sup>3</sup>. Climatic periods are categorized according to the following designations: wet, dry, and average/alternating wet and dry (Figure 2). It is generally recognized that the eastern portion of the Subbasin receives less annual rainfall than the rest of the Subbasin. Recently, the University of California Cooperative Extension (UCCE) installed a series of sophisticated weather stations across San Luis Obispo County and nine of these are now located in the Subbasin. Station locations and rainfall totals for WY 2021 are presented in Figure 3, along with the spatial distribution of long-term average annual precipitation in the Paso Robles Subbasin<sup>4</sup>. Historical precipitation records for the Paso Robles weather station and monthly UCCE station records for WY 2021 are provided in Appendix B.

<sup>3</sup> The 24-month period SPI analysis is considered an improvement over the 60-month period analysis due to its improved sensitivity to short-term climatic variations. The 24-month period SPI analysis provides insight into the relationship between water year type and groundwater elevation response (WMO, 2012).

<sup>4</sup> Average distribution of annual precipitation based on 30-year normal PRISM data calibrated to the Paso Robles Station (NOAA 46730).

## 2.4 Monitoring Networks

This section provides a brief description of the monitoring programs currently in place and any notable events affecting monitoring activities or the quality of monitoring results. 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 representative monitoring sites (RMS), discussed in Section 2.4.1. Monitoring for the remaining three sustainability indicators (degraded water quality, land subsidence, and depletion of interconnected surface water) is discussed in Section 2.4.2.

### 2.4.1 Groundwater Elevation Monitoring Network (§ 356.2[b])

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 in the Subbasin to provide sufficient data quality, frequency, and spatial distribution to evaluate changing aquifer conditions in response to GSP implementation.

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<sup>5</sup>, and one is an Alluvial Aquifer well. These RMS have been monitored biannually, in April and October, for various periods of record. The RMS groundwater 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

The RMS are displayed in Figure 4, and a summary of information for each of the wells is included in Appendix C.

#### 2.4.1.1 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 4, and a summary of available well information is included in Appendix D.

<sup>5</sup> 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.

## 2.4.2 Additional Monitoring Networks

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 salinity (as indicated by electrical conductivity), total dissolved solids (TDS), sodium, chloride, nitrate, sulfate, boron, and gross alpha.

COCs for drinking water are monitored at public water systems<sup>6</sup> (PWS), including municipal and small PWSs. There are 41 PWSs in the Subbasin which serve potable water to small communities, schools, and rural businesses such as restaurants and wineries. 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) (see GSP Figure 7-4 [M&A, 2020]).

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 RMS well in the Subbasin. However, the City of Paso Robles installed two new Alluvial Aquifer wells using Supplemental Environmental Project (SEP) funding during WY 2021<sup>7</sup>. The GSAs should incorporate these two new Alluvial Aquifer wells into the RMS network during WY 2022. Additional Alluvial Aquifer wells will need to be established in the monitoring network before groundwater/surface water interaction can be more robustly analyzed. The GSAs have retained the services of a consultant to address potential corrective actions to the GSP, including improvements to the groundwater/surface water interactions analysis. This work is ongoing as of the date of this report.

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<sup>6</sup> A public water system is defined as a system that provides water for human consumption to 15 or more connections or regularly serves 25 or more people daily for at least 60 days out of the year ([https://www.waterboards.ca.gov/drinking\\_water/certlic/drinkingwater/documents/waterpartnerships/what\\_is\\_a\\_public\\_water\\_sys.pdf](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/waterpartnerships/what_is_a_public_water_sys.pdf)).

<sup>7</sup> The City of Paso Robles GSA and the SWRCB agreed to the use of SEP funds that are available as a result of a settlement agreement between the SWRCB and the City of Paso Robles for violations of the City's National Pollutant Discharge Elimination System (NPDES) permit related to wastewater treatment releases.



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

### 3.1 Introduction

This section provides a detailed report on groundwater elevations in the Subbasin measured during spring and fall of 2021. 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 are 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 Monitoring Network Module<sup>8</sup> 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 feet thick.

### 3.2 Seasonal High and Low Groundwater Elevations (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 San Luis Obispo County 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 Water Year 2021 Annual Report. To maintain consistency with the GSP and represent conditions that can be easily compared from year to year, this Water Year 2021 Annual Report used the same set of wells as was used in the GSP. Groundwater level data from 42 wells were used to create the spring 2021 groundwater elevation contour map and data from 44 wells were used for the fall 2021 contour map. The well locations and data points are not shown on the maps to preserve confidentiality of the data between the well owner and the SLOFCWCD. Of these 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.

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<sup>8</sup> The Paso Robles Subbasin is no longer in the CASGEM program since implementation of the GSP. The GSAs are now responsible for monitoring and reporting of groundwater elevation 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. Groundwater elevation contour maps are presented for spring 2021 and fall 2021.
- A map depicting the change in groundwater elevation for the preceding water year. A change in groundwater elevation map is shown here for the period fall 2020 to fall 2021 (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 5 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 2021 is not available, so the map as presented in the GSP is the most recent map available. This same map was also presented in the First Annual Report (GSI, 2020) and Water Year 2020 Annual Report (GSI, 2021). Work is currently underway to identify existing alluvial wells that along with the two newly constructed SEP funded wells (see Section 2.4.2) can be added to the RMS network.

Groundwater elevations range from approximately 1,400 feet AMSL in the southeastern portion of the Subbasin to approximately 600 feet 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

Spring and fall 2021 (high and low) groundwater elevation data for the Paso Robles Formation Aquifer in the Subbasin 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. Information identifying the owner or detailed location of private wells is not shown on the maps to preserve confidentiality.

Figures 6 and 7 show contours of groundwater elevations in the Paso Robles Formation Aquifer for spring 2021 and fall 2021, respectively. Overall, groundwater conditions in the Subbasin in the spring and fall of 2021 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.

In general, the groundwater elevations observed in the Subbasin during WY 2021 show a decline across portions of the Subbasin, likely due predominantly to below-average rainfall conditions in WY 2021. Positive and negative changes in groundwater elevations from year to year are observed in various parts of the

Subbasin, as has been observed historically. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels are observed annually.

### 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 climatic 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 RMS wells that are constructed in and extract groundwater from the Paso Robles Formation Aquifer and the single Alluvial Aquifer RMS well are presented in Appendix E. 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 for the Paso Robles Formation Aquifer RMS wells<sup>9</sup>, 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.

Three of the 22 Paso Robles Formation Aquifer RMS wells have current groundwater elevations greater than the measurable objective for that RMS well. Although groundwater elevations in three of the Paso Robles Formation Aquifer RMS wells are recovering in the past few years, groundwater elevations in several of the RMS wells are continuing to trend downward. One of the 22 Paso Robles Formation Aquifer RMS wells exhibit groundwater elevations below the minimum threshold for the second consecutive year (27S/13E-28F01). This condition constitutes a chronic lowering of groundwater elevation undesirable result as defined in the GSP. Based on initial observation this appears to be an isolated local issue. However, according to Section 8.4.5.1 of the GSP<sup>10</sup>, the GSAs must initiate an investigation to determine if local or Subbasin-wide actions are required to address this undesirable result.

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<sup>9</sup> A measurable objective and minimum threshold were not set for the single Alluvial Aquifer monitoring network well due to lack of available historical groundwater elevation data at the time of GSP submittal (M&A, 2020).

<sup>10</sup> Section 8.4.5.1 of the GSP – Criteria for Defining Undesirable Results includes the text: “A single monitoring well in exceedance for two consecutive years also represents an undesirable result for the area of the Basin represented by the monitoring well. Geographically isolated exceedances will require investigation to determine if local or Basin wide actions are required in response.”

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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 WY 2021. The types of groundwater extraction described in this section include municipal (Table 1), agricultural (Table 2), rural domestic (Table 3), and small PWSs<sup>11</sup> (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 <sup>1</sup> (AF)	San Miguel CSD (AF)	CSA 16 (AF)	
2017	1,261	295	70	1,626
2018	1,302	325	50	1,677
2019	1,392	289	48	1,729
2020	1,121	297	91	1,509
2021	1,157	300	96	1,553

**Notes:**

<sup>1</sup> - The City of Paso Robles produces water 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. These volumes include any water produced as Salinas River underflow within the Paso Robles Subbasin.

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 92 percent of the total anthropogenic groundwater use in the Subbasin in WY 2021. 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<sup>12</sup> (Carollo, 2012). Climate data inputs include precipitation from the Paso Robles

<sup>11</sup> Small PWSs in the Subbasin generally serve water produced from their own private wells.

<sup>12</sup> Vineyard crop coefficients were modified based on discussions with Mark Battany, University of California Extension (GSSI, 2014).

Station (NOAA station 46730) and reference evapotranspiration (ET<sub>o</sub>) 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 WY 2016 during completion of the GSP (M&A, 2020) and for WYs 2017, 2018, and 2019 in the First Annual Report (GSI, 2020), and for WY 2020 in the Water Year 2020 Annual Report (GSI, 2021). Agricultural water demand for this Water Year 2021 Annual Report was estimated for WY 2021 also using the soil-water balance model. The resulting estimated groundwater extractions for agricultural demands are summarized in Table 2. The accuracy level rating of this estimated volume is medium.

**Table 2. Estimated Agricultural Irrigation Groundwater Extractions**

Water Year	Agricultural Demand (AF)
2017	64,100
2018	75,500
2019	55,800
2020	60,700
2021	75,500

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, 2020) used a linear regression projection based on the 2014 model update to estimate rural domestic demand through WY 2016. The projected future water budget presented in the GSP (M&A, 2020) assumes water neutral growth in rural domestic water demand from WY 2016 going forward. Therefore, the rural domestic demand has been held constant at the estimated WY 2016 volume for this Water Year 2021 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.

**Table 3. Estimated Rural Domestic Groundwater Extractions**

Water Year	Rural Domestic (AF)
2017	3,530
2018	3,530
2019	3,530
2020	3,530
2021	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, 2020) used a linear regression projection for the 2014 model update to estimate small PWS demand through WY 2016. The projected future water budget presented in the GSP (M&A, 2020) assumes water neutral growth in small PWS water demand from WY 2016 going forward. Therefore, the small PWS demand has been held constant at the estimated WY 2016 volume for this Water Year 2021 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
2020	1,530
2021	1,530

Note: AF = acre-feet

## 4.5 Total Groundwater Extraction Summary

Total groundwater extractions in the Subbasin for WY 2021 are estimated to be 82,100 AF. Table 5 summarizes the total groundwater 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 8).

**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	5,060	64,100	70,800
2018	1,677	5,060	75,500	82,200
2019	1,729	5,060	55,800	62,600
2020	1,509	5,060	60,700	67,300
2021	1,553	5,060	75,500	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 WY 2021. This section also reports quantities of Salinas River underflow, regulated as surface water by the State Water Resources Control Board (SWRCB), produced and imported into the Subbasin by the City of Paso Robles from the adjacent Atascadero Subbasin. 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 9.

### 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 <sup>1</sup> (AF)	State Water Project <sup>2</sup> (AF)	Total Available Surface Water (AF)
2017	6,488	100	6,588
2018	6,488	100	6,588
2019	6,488	100	6,588
2020	6,488	100	6,588
2021	6,488	100	6,588

**Notes:**

<sup>1</sup> Contract annual entitlement to the City of Paso Robles

AF = acre-feet

<sup>2</sup> Contract annual entitlement to CSA 16

### 5.3 Imported Salinas River Underflow

Salinas River underflow, which is regulated as surface water by the SWRCB, is produced by the City of Paso Robles from the adjacent Atascadero Subbasin and imported into the Subbasin. These imported underflow volumes are integrated into the City of Paso Robles water distribution system and served to municipal customers located predominantly within the Subbasin<sup>13</sup>. The annual volumes of imported Salinas River underflow production are presented in Table 7. The accuracy level rating of these metered data is high.

<sup>13</sup> A minor portion of the City of Paso Robles municipal water supply is used by customers located outside of the Subbasin.

**Table 7. Imported Salinas River Underflow**

Water Year	Imported Salinas River Underflow <sup>1</sup> (AF)
2017	2,609
2018	3,352
2019	3,075
2020	3,852
2021	3,612

**Notes:** AF = acre-feet

<sup>1</sup> - The City of Paso Robles produces Salinas River underflow, regulated as surface water by the State Water Resources Control Board, from wells located in both the Paso Robles Subbasin and the Atascadero Subbasin. Only the portion produced from within the Atascadero Subbasin is included here.

## 5.4 Total Surface Water Use

A summary of total actual surface water use by source is provided in Table 8. The accuracy level rating of these metered data is high.

Environmental uses of surface water are 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 8. Surface Water Use**

Water Year	Nacimiento Water Project (AF)	Imported Salinas River Underflow <sup>1</sup> (AF)	State Water Project (AF)	Total Surface Water Use (AF)
2017	1,650	2,609	42	4,301
2018	1,423	3,352	55	4,829
2019	1,142	3,075	43	4,259
2020	737	3,852	0	4,589
2021	1,250	3,612	0	4,861

**Notes:**

<sup>1</sup>The City of Paso Robles produces Salinas River underflow, regulated as surface water by the State Water Resources Control Board, from its Thunderbird Wells located in the adjacent Atascadero Subbasin

AF = acre-feet

AFY = acre-feet per year

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

This section summarizes the total annual groundwater and imported surface water used to meet municipal, agricultural, and rural demands within the Subbasin. For WY 2021, 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 9 summarizes the total water use in the Subbasin by source and water use sector for WY 2021. 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 9. Total Water Use by Source and Water Use Sector, Water Year 2021**

Water Year	Municipal (AF)		PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
	Groundwater	Surface Water <sup>1</sup>	Groundwater	Groundwater	
Source:	Groundwater	Surface Water <sup>1</sup>	Groundwater	Groundwater	
<b>2017</b>	1,626	4,301	5,060	64,100	<b>75,100</b>
<b>2018</b>	1,677	4,829	5,060	75,500	<b>87,100</b>
<b>2019</b>	1,729	4,259	5,060	55,800	<b>66,800</b>
<b>2020</b>	1,509	4,589	5,060	60,700	<b>71,900</b>
<b>2021</b>	1,553	4,861	5,060	75,500	<b>87,000</b>
Method of Measure:	Metered	Metered	2016 Groundwater Model	Soil-Water Balance Model	
Level of Accuracy:	high	high	low-medium	medium	

**Notes:**

<sup>1</sup> Includes imported Salinas River underflow, which is regulated as surface water by the State Water Resources Control Board

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 WY 2021 are derived from comparison of fall groundwater elevation contour maps from one year to the next. For this analysis, fall 2020 groundwater elevations were subtracted from the fall 2021 groundwater elevations resulting in a map depicting the changes in groundwater elevations in the Paso Robles Formation Aquifer that occurred during WY 2021 (see Figure 10). This groundwater elevation change map is 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 Water Year 2021 Annual Report.

The groundwater elevation change map for WY 2021 (Figure 10) shows that compared to the previous fall, water levels are lower primarily in areas east and southeast of Shandon and within and to the west of Creston. The 2021 map also shows that groundwater elevations generally higher within a north-south strip through the Shandon area, and also notably in the northeastern portion of the City of Paso Robles. The groundwater elevation change map represents the difference in groundwater elevations between two snapshots in time, made approximately one year apart. Considering that groundwater elevations may fluctuate dynamically throughout each year in response to changing climatic conditions and groundwater pumping patterns, the specific patterns of 'higher' versus 'lower' water level areas shown on Figure 10 may not necessarily be representative of conditions occurring throughout the entire water year.

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

The groundwater elevation change map presented above represents a volume change within the Paso Robles Formation Aquifer for WY 2021. The volume change inferred from the groundwater elevation change map (Figure 10) 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.<sup>14</sup> The annual change of groundwater in storage calculated for WY 2021 is presented in Table 10 and the annual and cumulative change in groundwater in storage since 1981 are presented on Figure 11.

<sup>14</sup> Appendix F includes derivation of the storage coefficient from the GSP groundwater model files and a sensitivity analysis.

**Table 10. Annual Change in Groundwater in Storage - Paso Robles Formation Aquifer**

Water Year	Annual Change (AF)
2017	60,100
2018	6,400
2019	59,700
2020	-80,800
2021	-62,300

Note: AF = acre-feet

The 62,300 AF decrease of groundwater in storage in WY 2021 shown in Table 10 is coincident with below average precipitation in 2021 (8.2 inches). Historical comparison of annually tabulated precipitation, total groundwater extractions, and annual change in groundwater in storage reveals a close correlation between annual total precipitation and change in groundwater in storage (see Figure 12). Specifically, years with well above average precipitation (i.e. 1983, 1993, 1995, 1998, 2005, and 2017) are all associated with years of large increases in groundwater in storage. Conversely, nearly all<sup>15</sup> below average precipitation years are associated with years of decline in groundwater in storage. The influence of total annual groundwater extractions on annual change in groundwater in storage is also apparent, although to a lesser degree. The influence of groundwater extractions on annual changes in groundwater in storage is most apparent during the drought of the mid-1980's through the early 1990's, when below average precipitation prevailed, but a trend of decreasing groundwater extractions resulted in a slight upward trend in annual changes of groundwater in storage.

Annual Change in Groundwater in Storage was calculated using the groundwater model for water years 1981 through 2016 and by groundwater elevation change maps for water years 2017 through present. The groundwater elevation method has been calibrated to groundwater model results (see Appendix F), however, some noteworthy differences between the methods remain; While the estimated value of S, used in the groundwater elevation change method, 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 estimated value of seven percent. This, coupled with the necessity to rely on interpolated water levels through data gap areas in the groundwater level monitoring network (see Section 2.4.1), contributes to a moderate amount of method uncertainty. In addition, the groundwater elevation change method is susceptible to potential over or under-estimation due to the method's inability to account for groundwater in transit<sup>16</sup>. Regardless, the groundwater elevation change method is considered the best available tool for estimating annual change in groundwater in storage until the GSP groundwater model can be updated.

<sup>15</sup> The exception to this is water year 2018, which was a below average precipitation year associated with a minor increase in groundwater in storage. It should be noted that this change in groundwater in storage was calculated independently from the groundwater model using the groundwater elevation change map method described above.

<sup>16</sup> Groundwater in transit refers to recharged groundwater that is in the process of percolating downward through the unsaturated zone and is not yet contributing to a measurable change in groundwater elevation. The amount of groundwater in transit is assumed to be highly spatially and temporally variable in the Subbasin.

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

### 8.1 Introduction

This section describes several projects and management actions that are in process, have been initiated, or have been recently implemented in the Subbasin as a means to improve groundwater conditions, avoid potential undesirable results, attain subbasin sustainability, and improve understanding of the Subbasin groundwater dynamics as well as implications of GSP implementation. 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 the GSAs 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 some parts of the Subbasin, indicating that the amount of groundwater pumping is more than the natural recharge.
- The calculated water budget of the Paso Robles Formation aquifer indicates that the amount of groundwater in storage is in decline and will continue to decline if there is no net decrease in groundwater extractions.

To mitigate declines in groundwater levels in some parts of the Subbasin, achieve the Subbasin sustainability goal by 2040, and avoid undesirable results as required by SMGA regulations, new water supplies must be imported into the Subbasin [i.e., project(s)] and/or groundwater pumping must be reduced through management action(s).

In addition to project and management actions that address chronic declines in groundwater levels and depletion of groundwater in storage, this section also provides a brief discussion of land subsidence, potential depletion of interconnected surface waters, and groundwater quality trends that occurred during WY 2021.

The projects and management actions described in this section are all intended to help achieve groundwater sustainability in the Subbasin and avoid undesirable results.

### 8.2 Implementation Approach

As described in the GSP, the volume of groundwater pumping in the Subbasin is more than the estimated sustainable yield and, as a result, groundwater levels are persistently declining in some parts of the Subbasin. In response, the GSAs have initiated several projects and management actions designed to address the impacts of the decline in groundwater levels and reductions of groundwater in storage. It is anticipated that additional new projects and management actions, some of which are described herein, will be implemented in the 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. 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 Paso Basin Aerial Groundwater Mapping 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 Airborne Electromagnetic method (AEM). The goal of the study was 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 SkyTEM aerial survey was flown from November 5<sup>th</sup> to November 7<sup>th</sup>, 2019, encompassing a large portion of the center of the Subbasin plus a few transects extending to the eastern edge of the Subbasin. Throughout 2020, the acquired data were compiled and analyzed. An initial data report was finalized and made public in October 2020 (SkyTEM, 2020) and a hydrogeologic conceptual model report summarizing the results and interpretations of the data was completed in December 2020 (Ramboll, 2020)<sup>17</sup>. The results of the study have enhanced understanding of groundwater flow within the Subbasin, the interconnectedness of different parts of the Subbasin, and the geologic framework that controls groundwater flow. The dataset generated by this study has been input into a 3D geologic model using Leapfrog Works®, which is described in greater detail below.

### 8.3.2 Paso Basin Land Use Management Area Planting Ordinance

On April 6, 2021 the County Board of Supervisors provided authorization to develop a new planting ordinance for the Paso Basin Land Use Management Area (PBLUMA) to be in effect through 2045. Funding was subsequently approved by the board in June 2021 for the new ordinance development and Environmental Impact Report (EIR). On August 24, 2021, the board adopted Ordinance No. 3456, amending Title 22 of the San Luis Obispo County code by amending section 22.30.204 agricultural offset requirements to extend the termination date to August 31, 2022, and to add a table grapes specific water duty factor. This action effectively extends the existing Water Neutral New Development amendments to Title 22<sup>18</sup>. The termination date was extended to allow time to develop the new PBLUMA Planting Ordinance. A copy of Ordinance No. 3456 is included in Appendix G.

After the conclusion of Water Year 2021 the draft PBLUMA Planting Ordinance was released for public comment on October 22 and the public review period concluded on November 24, 2021. The 45-day Draft EIR public review period is scheduled to begin in January of 2022 and the Final EIR is expected in April 2022. As of this writing, the tentative effective date for the new PBLUMA Planting Ordinance is August 31, 2022. Further details shall be provided in next year's annual report.

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<sup>17</sup> The Ramboll (2020) report can be downloaded here: <https://www.slocounty.ca.gov/Departments/Public-Works/Forms-Documents/Projects/Paso-Basin-Aerial-Groundwater-Mapping-Pilot-Study/Hydrogeologic-Conceptual-Model-in-Paso-Robles-Tra.pdf>.

<sup>18</sup> In October 2015, the County Board of Supervisors adopted the Water Neutral New Development (WNND) amendments to the County Land Use Ordinance (Title 22) and Building and Construction Ordinance (Title 19). The amendments require a 1:1 water offset for new non-agricultural development and new or expanded irrigated commercial crop production while providing a 5 AFY exemption for irrigated properties outside of an "area of severe decline" defined based on changes in groundwater elevation measurements from Spring 1997 to Spring 2013. The action to amend the ordinances was taken in response to declining groundwater levels to minimize further depletion of the groundwater resource. The 1:1 water offset requirement was originally intended to be a stopgap measure to avoid further depletion of the groundwater basin until SGMA implementation and included a termination clause to expire upon the effective date of a final and adopted GSP. On November 5, 2019, the County Board of Supervisors extended the termination date of the WNND ordinances to January 1, 2022 and removed "off-site" agricultural water offsets.



### 8.3.3 Airborne Electromagnetic (AEM) Geophysical Survey

The DWR is conducting airborne electromagnetic (AEM) surveys in California's high- and medium-priority groundwater basins, where data collection is feasible, to assist local water managers as they implement SGMA to manage groundwater for long term sustainability. The surveys are funded by voter-approved Proposition 68, Senate Bill 5, and from the State general fund.

In August 2021 DWR, together with Ramboll and SkyTEM, conducted additional airborne electromagnetic (AEM) geophysical surveying in San Luis Obispo County, including portions of the Paso Robles Subbasin that had not been previously surveyed during the Paso Basin Aerial Groundwater Mapping Study survey in November 2019 (see above). Results from this 2021 survey are expected to become available sometime in March 2022. It is anticipated that the results from this 2021 survey will infill data gaps in the existing SkyTEM dataset that resulted from the initial Paso Basin Aerial Groundwater Mapping Study. The results of the study will improve understanding of the geologic framework that controls groundwater flow in the Subbasin and specifically within the data gap areas of the existing SkyTEM dataset. Once available, the dataset generated from this 2021 survey will be input into the 3D geologic model, which is described in greater detail below.

### 8.3.4 Three-Dimensional Geologic Model of Basin using SkyTEM Survey Data

SSJWD retained the services of a consultant to conduct a basin-wide groundwater recharge desktop study utilizing all available science, including the results of the Paso Basin Aerial Groundwater Mapping Study (Ramboll, 2020). This ongoing study has resulted in the creation of a digital 3D geologic model of the Paso Robles Subbasin incorporating the SkyTEM geophysical survey results (Ramboll, 2020) developed in Leapfrog Works®<sup>19</sup>. The 3D model is being used to enhance data visualization and communication with stakeholders and to help identify favorable groundwater recharge areas in the Subbasin. The initial concept of the ongoing desktop study is to focus on the physical characteristics of the basin materials, including aquifers and aquitards, and to identify areas with favorable conditions to recharge the major aquifers of the basin (primarily the Paso Robles Formation Aquifer) regardless of location within the basin or proximity to potential recharge water sources. As further data are developed, such as the 2021 AEM geophysical survey (see above), these data can be incorporated into the 3D geologic model to produce an ever-improving understanding of the geologic framework and groundwater flow within the Subbasin. It is anticipated that this 3D geologic model will ultimately be used to select key target areas where high resolution, site specific subsurface investigations may be performed for the purpose of developing groundwater recharge project(s) that would benefit areas of the Subbasin that are experiencing the greatest groundwater elevation declines.

## 8.4 Area-Specific Projects

### 8.4.1 Installation of Monitoring Wells and Stream Gages (SEP)

The existing network of monitoring wells in the Alluvial Aquifer in areas where surface water and groundwater interaction may occur is insufficient for adequate assessment, and surface water flows in the Subbasin are ephemeral. Together, these two factors make it difficult to evaluate the interconnectivity of surface water and groundwater and to quantify whether any surface water depletion has occurred. The lack of publicly available groundwater level data for the Alluvial Aquifer is a significant data gap.

The inadequacy of publicly available data to assess the interconnectivity of the surface water with the underlying aquifers also affects the understanding of the potential impacts of pumping on groundwater

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<sup>19</sup> A video demonstrating the current status of the 3D geologic model can be found at this link: <https://youtu.be/C4F08rJc8ak>.

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.”* The GSAs recognize that installing the proposed network of monitoring wells and stream gages throughout the Subbasin 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.

As an initial step to address this significant data gap and assess the potential for interconnectivity of the surface water with the principal aquifers of the Subbasin, the City of Paso Robles GSA proposed to the SWRCB to use the Supplemental Environmental Project (SEP) funds that were available as a result of a settlement agreement between the SWRCB and the City of Paso Robles for violations of the City’s National Pollutant Discharge Elimination System (NPDES) 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 collected and analyzed. Prior to this work, two stream gages existed within the Subbasin. The initial phase of work utilizing the SEP funds has expanded that network by coupling stream gages with monitoring wells.

The SEP project resulted in installations of four new monitoring wells and three new stream gages that record stream stage. The monitoring wells were installed in pairs at two locations, each with existing stream gages: Site 1 – near the 13<sup>th</sup> Street Bridge over the Salinas River in Paso Robles, and Site 9 – near the intersection of Airport Road and Estrella Road next to the Estrella River (Cleath-Harris Geologists, 2021a; a copy of the report is provided in Appendix H). A shallow well, completed in the Alluvial Aquifer, and an intermediate well, completed in the upper Paso Robles Formation were installed at each site. A third deeper well was originally planned at each site, however, due to shallow bedrock and potential geothermal activity encountered at Site 1 a deep well is no longer recommended at Site 1. Installation of a deep well remains as a recommendation at Site 9, although its completion has been deferred to another project phase. Initial groundwater levels measured in each of these four new wells are being used to improve understanding of interconnection between the two principal aquifers and the potential surface water/groundwater interaction at these two sites. The GSAs have retained the services of a consultant to analyze these and other available data to evaluate the potential interconnectivity of surface water and groundwater. This work is ongoing as of the date of this report.

The SEP project funds were sufficient for performing the feasibility analysis of stream gage installation, identifying potential sites, developing a work plan, and installing three gages (Cleath-Harris Geologists, 2021b; a copy of the report is provided in Appendix H). Rating curve development is not part of the project. Stage data without a rating curve is useful for identifying flow/no flow conditions and the timing of stormwater runoff when analyzed with rain gages and other stream gages in the watershed. The stage data may also be used to evaluate the interconnectivity of surface water and groundwater. The three new stream gage sites, installed in April 2021 are:

- Salinas River at the River Road Bridge in San Miguel
- Estrella River at the River Grove Drive Bridge in Whitley Gardens

- Huer Huero Creek at the Geneseo Road Bridge near Eagle Oak Ranch Way

## 8.4.2 City of Paso Robles Recycled Water Program

In 2016, the City completed a major upgrade of its Wastewater Treatment Plant to remove all harmful pollutants efficiently and effectively from the wastewater. The City's master plan is to produce tertiary-quality recycled water and distribute it to various locations within the City as well as east Paso Robles, where it may be 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 began operating the recycled water system. Some sections of the distribution system are currently in construction in anticipation of eventually building the full system, pending development of funding mechanisms.

The project will have the capacity to use up to 2,200 AFY of disinfected tertiary effluent for in-lieu recharge inside the City of Paso Robles and in the central portion of the Subbasin (see Section 8.4.4) Water that is not used for recycled water purposes can potentially be discharged to surface infiltration facilities, such as Huer Huero Creek, with the possibility for additional recharge benefits.

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 potential surface recharge opportunities.

## 8.4.3 San Miguel CSD Recycled Water Project

The San Miguel CSD Recycled Water project is currently in the final design phase. 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. Additional challenges with the use of NWP water include acreage limitations on the place of use for irrigated agricultural lands within SLO County – a constraint in the existing water right held by the Monterey County Water Resources Agency.

Numerous challenges exist to develop the project, but considerable time and effort has been expended by several private entities as well as City and County staff to develop this conceptual project. Key developments in 2021 include ongoing negotiations with Monterey County regarding modification to the point of use requirements for Nacimiento Water Project water. 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 Expansion of Monitoring Well Network**

As described in the GSP, SGMA regulations require a sufficient density of monitoring wells to characterize the groundwater elevation in each principal aquifer. The GSP concluded that a significant data gap existed in the number of monitoring wells in both the Alluvial Aquifer and Paso Robles Formation Aquifer within the Subbasin. The City of Paso Robles GSA project (using SEP funds) has partially addressed this data gap by drilling new monitoring wells, as described in Section 8.4.1.

The 22 wells in the Paso Robles Formation Aquifer monitoring network are insufficient to develop representative and sufficiently detailed groundwater contour maps. The lack of publicly available data for the aquifer is identified as a data gap that must be addressed in GSP implementation. This section describes new projects and initiatives undertaken by SLOFCWCD, Shandon-San Juan GSA (SSJGSA), and EPCWD to expand the collection of water level data in the Paso Robles Formation Aquifer and develop potential new monitoring wells in their respective districts.

#### **8.4.5.1 SLOFCWCD Initiative to Expand the Monitoring Well Network on Public Properties**

On July 7, 2020, the County Board of Supervisors directed staff to evaluate groundwater wells that are located on public properties and include them into the SLOFCWCD's existing monitoring network. County staff is evaluating approximately 6 groundwater wells in the Paso Robles Subbasin and has identified 2-3 wells on public properties that are suitable to be added to the semiannual groundwater level measuring program.

#### **8.4.5.2 SSJGSA Program to Expand the Monitoring Well Network**

The SSJGSA initiated a program in WY 2020 to enlist many well owners that are members of the SSJWD to join a pilot study to measure water levels in wells throughout the District. Beginning in March 2021 and continuing through the end of WY 2021 water levels were measured during 7 monitoring events in 66 wells. This initial effort is being undertaken to gain a better understanding of the time of year of the seasonal high and low water levels and to identify key representative wells in each area throughout the District. Data collection is continuing into WY 2022.

After about a year of this extensive monitoring and recording program, the data will be analyzed with the intent to reduce the number of measuring points as well as frequency of measurements. The eventual goal of the program is to develop a network of 20 to 30 new wells to incorporate into the GSP RMS monitoring network. It is expected that water level data from this expanded monitoring network will be incorporated into the groundwater elevation and change in groundwater in storage analyses for WY 2022.

#### **8.4.5.3 EPCWD Program to Expand the Monitoring Well Network**

The EPCWD initiated a program in WY 2020 similar to the SSJGSA program. Beginning in April 2021 and continuing through the end of WY 2021 water levels were measured during 2 monitoring events in approximately 30 wells throughout the EPCWD membership area. Data collection is continuing into WY

2022. Like the SSJGSA program, the eventual goal of the EPCWD initiative is to develop a network of 20 to 30 new wells to incorporate into the GSP RMS monitoring network. It is expected that water level data from this expanded monitoring network will be incorporated into the groundwater elevation and change in groundwater in storage analyses for WY 2022.

#### 8.4.6 Expansion of Salinas Dam and Ownership Transfer

One of the conceptual projects discussed in the GSP (Section 9.5.2.7 of the GSP) is expansion of the Salinas Dam. The dam is owned by the United States Army Corps of Engineers (USACE), which jointly holds Santa Margarita Reservoir water rights permits with the City of San Luis Obispo (City of SLO). The USACE leases the dam to the SLOFCWCD, who oversees its operation and maintenance, including water delivery to the City of SLO.

The original dam design included the installation of spillway gates that would raise the reservoir elevation, however they were not installed due to seismic safety concerns. The storage capacity of Santa Margarita Reservoir could be expanded by installing the spillway gates, potentially increasing the maximum volume in the reservoir from 23,843 AF to 41,792 AF.

As described in the GSP, expanded reservoir storage might benefit the Subbasin by scheduling summer releases from reservoir storage to the Salinas River, which would benefit the Subbasin by increasing streamflow recharge through augmented flows in the Salinas River. Another way the project might indirectly benefit the Subbasin is if the City of SLO could increase their Santa Margarita Reservoir deliveries, thereby freeing up a portion of their NWP water allocation for purchase by the GSAs.

In 2018, the USACE initiated a Disposition Study to evaluate options to dispose of the Salinas Dam, including transferring ownership to a local agency. An option under investigation is to transfer the dam to a local agency such as the SLOFCWCD, thus the USACE has requested that the County Board of Supervisors, acting in their role as the SLOFCWCD, submit a letter expressing interest in potentially moving forward with the ownership transfer process. Such an ownership transfer would help facilitate the dam expansion, should it prove to be a cost-effective and worthwhile project.

Some of the known issues with transferring ownership of the dam include:

- The USACE has indicated that the Salinas Dam has some deficiencies but is considered low risk. As such, the USACE has indicated that the dam would need to be transferred “as-is”, with the USACE only willing to consider providing minimal funding to support retrofit.
- The State, as the California DWR Division of Safety of Dams (DSOD), has indicated that seismic rehabilitation of Salinas Dam would be required. Any retrofit or structural improvements, including expanding the dam’s capacity, will require coordination with and approval by the DSOD following acquisition of the dam by the SLOFCWCD.
- Since the USACE has indicated they are unlikely to install the gates, ownership of the dam would need to be transferred from the federal government to a local agency to pursue the opportunity. This transfer would result in the Salinas Dam oversight responsibilities transferring from federal to state jurisdiction and require the dam retrofit and expansion to meet any additional requirements from the State.

On September 22, 2020, the County Board of Supervisors approved sending a letter to the USACE expressing interest in moving forward with the ownership transfer process. Key developments in WY 2021 include continued coordination between the agencies and advocacy for the ownership transfer by United States Congressman Salud Carbajal. It will require considerable time and expense to eventually bring this potential project to fruition and increase the local water supply resiliency, including potential benefits to the Subbasin and other public or private entities downstream of the dam along or near the Salinas River.

## 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, the First Annual Report (WYs 2017–2019) (GSI, 2020) and the Water Year 2020 Annual Report (GSI, 2021) indicated an improvement in groundwater conditions throughout the Subbasin and a modest increase of total groundwater in storage. However, the groundwater conditions documented in this Water Year 2021 Annual Report indicate a return to worsening conditions following two consecutive years with below average rainfall. Historical groundwater pumping in excess of the sustainable yield has created challenging conditions for sustainable management. However, actions are 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 Summary of Response to DWR Review of GSP

On June 3, 2021, the Paso Robles Subbasin GSP manager received a consultation letter from DWR. The letter was intended to initiate consultation between DWR and the Paso Robles Subbasin GSAs in advance of issuance of a plan adequacy determination. The letter indicates that DWR had identified deficiencies which may result in an incomplete determination. The letter also presents two potential corrective actions that, if addressed sufficiently, may result in GSP approval. The two potential corrective actions are:

- Potential Corrective Action 1. Provide justification for, and effects associated with, the sustainable management criteria for groundwater levels
- Potential Corrective Action 2. Develop Sustainable Management Criteria for the Depletions of Interconnected Surface Water Based on Best Available Information and Science

Since receipt of the consultation letter, the GSAs have retained the services of a consultant to address these potential corrective actions and rewrite related sections of the GSP. This work is ongoing as of the date of this report. On January 21, 2022, DWR released an official ‘incomplete’ determination for the Paso Robles Subbasin GSP. Basins with GSPs that are determined incomplete have 180 days to address deficiencies and resubmit their corrected GSPs to DWR for review. The corrected Paso Robles Subbasin GSP must be resubmitted to DWR by July 20, 2022.

### 8.5.2 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 permanently lowered ground surface elevations caused by groundwater pumping (M&A, 2020). 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 0.025 feet may have occurred over this three-year period in a few small, isolated areas of the Subbasin (M&A, 2020). As of the date of this report, updated InSAR data has been provided by DWR through October 2020. As discussed in the GSP, there is a potential error of 0.1 feet (or 1.2 inches) associated with the InSAR measurement and reporting methods. A land surface change of less than 0.1 feet is therefore within the noise of the data and is equivalent to no subsidence. Considering this range of potential error, examination of the October 2019 through October 2020 InSAR data show that zero land subsidence has occurred since October 2019 (Figure 13). Therefore, subsidence of up to 0.025 feet may have occurred in a few small, isolated areas over the five-year period between June 2015 and October 2020. The GSA’s will continue to monitor and report annual subsidence as more data become available.

### 8.5.3 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. 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, 2020). As of the date of this report, there are insufficient publicly available data to adequately assess the interconnectivity of surface water and groundwater or to quantify potential surface water depletion. However, the GSAs have retained the services of a consultant to address potential corrective actions to the GSP, including improvements to the groundwater/surface water interactions analysis. This work is ongoing as of the date of this report.

### 8.5.4 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, 2020). 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 Water Year 2021 Annual Report, trends of concentrations of these eight COC's were analyzed through WY 2021 using data from the GeoTracker GAMA database (GAMA, 2021). All COC's reviewed show a steady concentration trend since 2016.

Overall, there are no significant changes to groundwater quality since 2016, as documented in the GSP, the First Annual Report, WY 2020 Annual Report, and this WY 2021 Annual Report. Implementation of sustainability projects and/or management actions, as presented in the GSP, in this WY 2021 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.

### 8.5.5 Summary of Changes in Basin Conditions

The above-average rainfall water years of 2017 and 2019 improved groundwater conditions in the Subbasin. However, two consecutive below average rainfall years in 2020 and 2021 have resulted in a reversal of this trend. Although groundwater elevations in three of the Paso Robles Formation Aquifer RMS wells are recovering in the past few years, groundwater elevations in several of the RMS wells are continuing to trend downward. Groundwater pumping continues to exceed the estimated future sustainable yield and the projects and management actions described in the GSP and in this Water Year 2021 Annual Report will be necessary in order to bring the Subbasin into sustainability.

### 8.5.6 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 Water Year 2021 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.





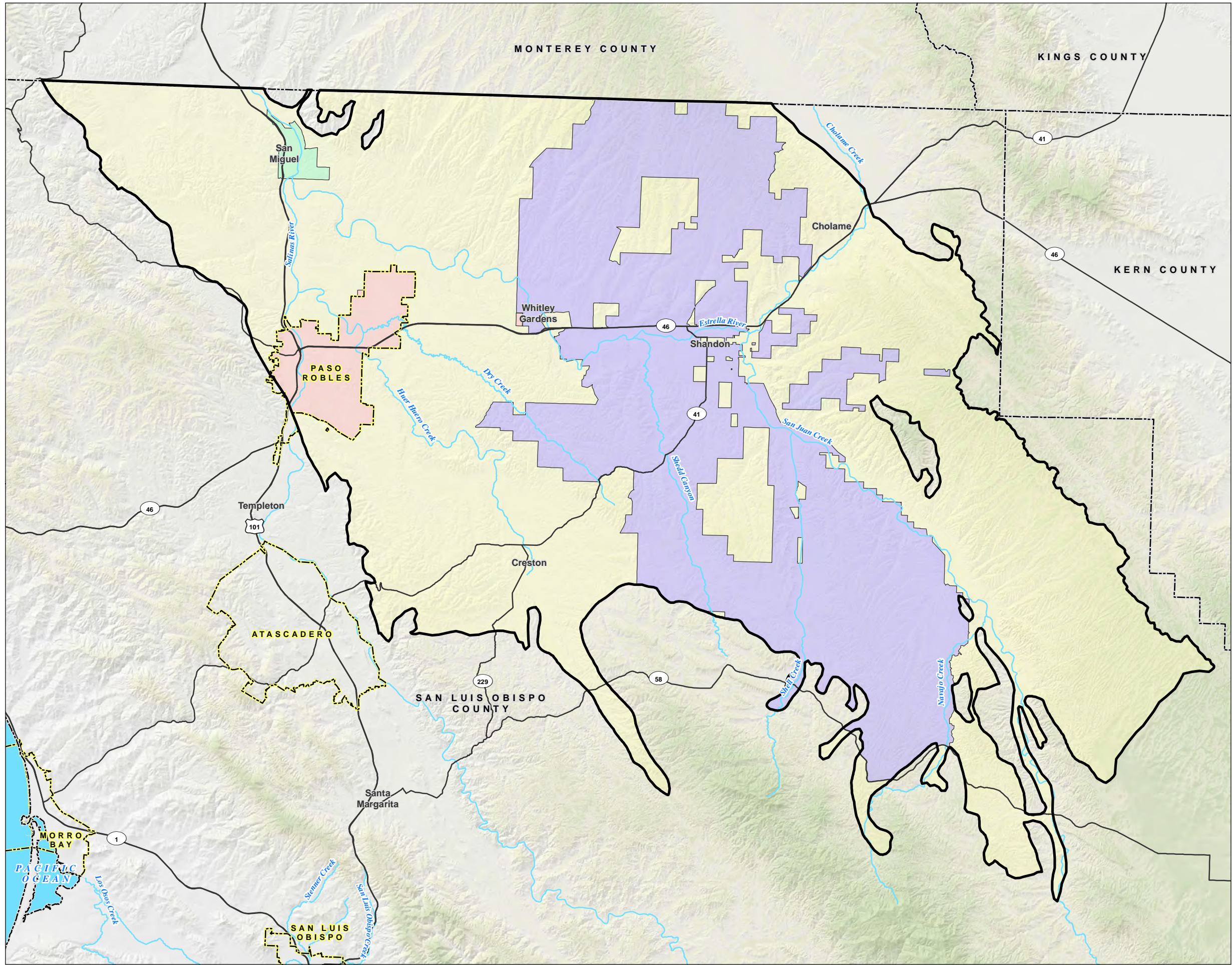
## References

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<http://geotracker.waterboards.ca.gov/gama/gamamap/public/>
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## FIGURES

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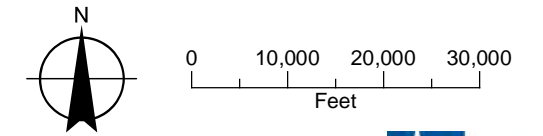
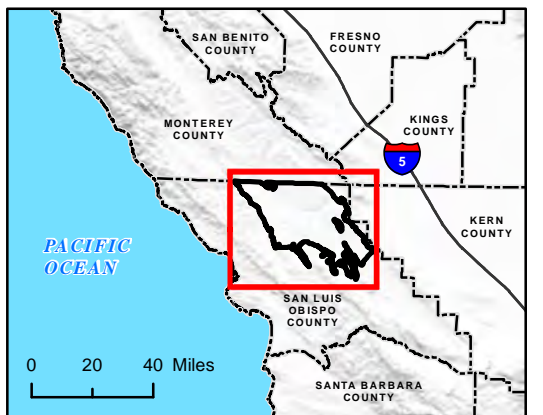
**FIGURE 1**  
**Extent of the Paso Robles Subbasin and Exclusive Groundwater Sustainability Agencies**

Paso Robles Subbasin  
 Water Year 2021 Annual Report

**LEGEND**

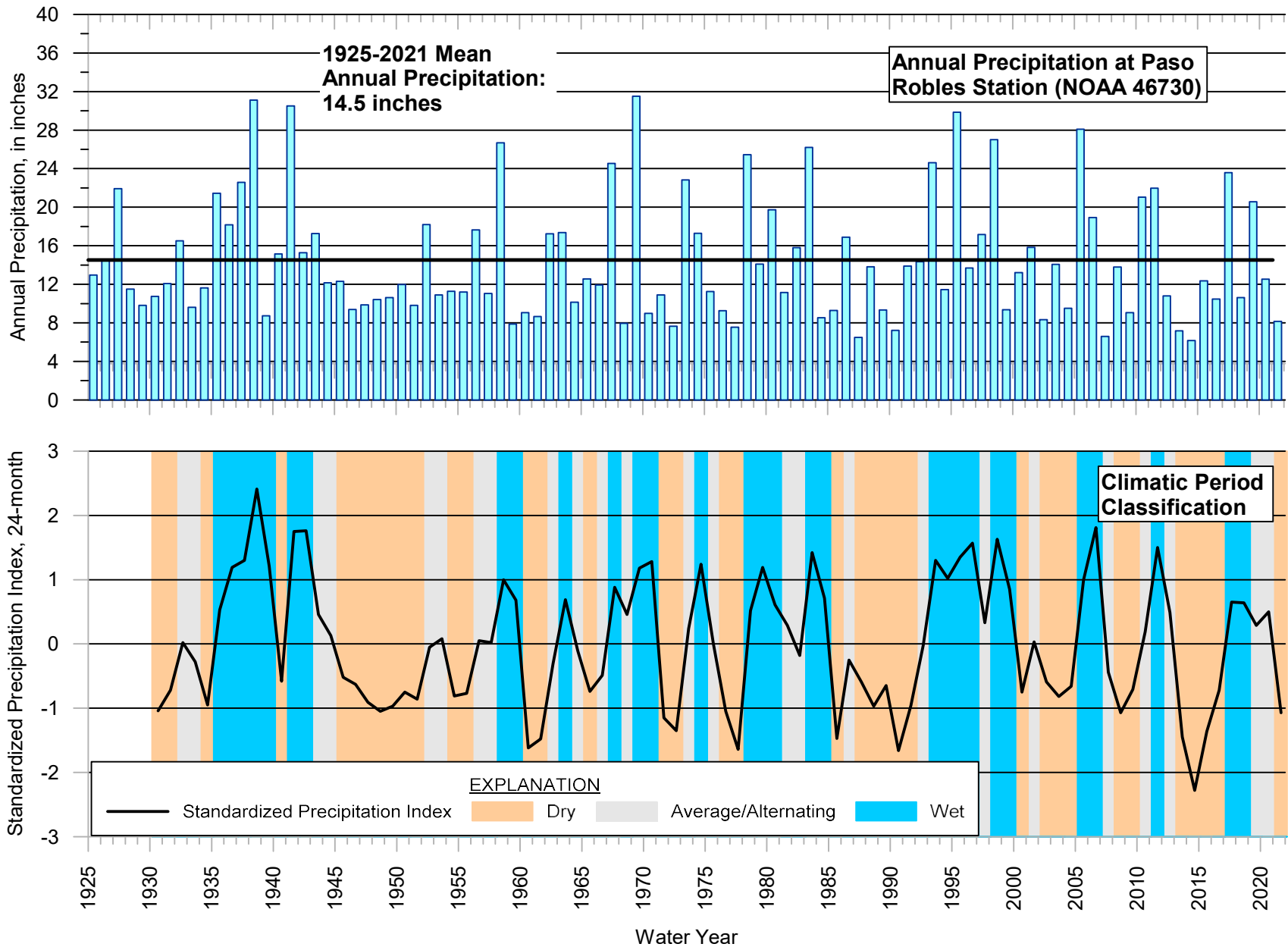
- Paso Robles Subbasin
- Exclusive Groundwater Sustainability Agencies**
- San Miguel Community Services District
- City of Paso Robles
- Shandon- San Juan Water District
- Paso Basin - County of San Luis Obispo
- All Other Features**
- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

**LOCATOR MAP:**



Date: December 9, 2021  
 Data Sources: CA DWR, SLO Co., USGS

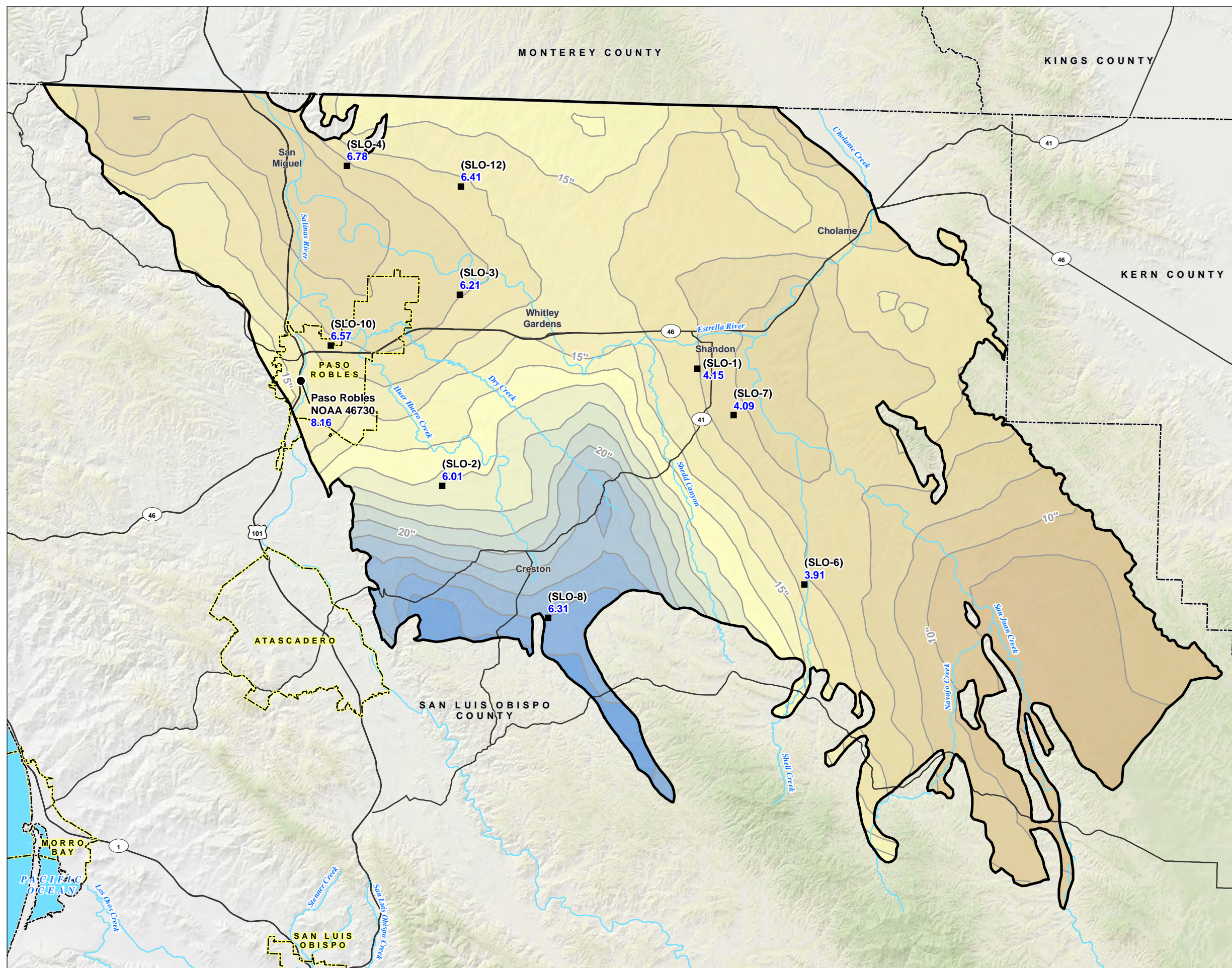




**FIGURE 2**  
**Annual Precipitation and Climatic Periods**  
**in the Paso Robles Subbasin**  
 Paso Robles Subbasin Water Year 2021 Annual Report

**FIGURE 3**  
**Water Year 2021 Precipitation Totals and Average Distribution of Annual Precipitation in the Paso Robles Subbasin**

Paso Robles Subbasin  
 Water Year 2021 Annual Report



**LEGEND**

- Paso Robles NOAA Precipitation Station  
WY 2021 Precipitation Total (inches)
- UCCE Precipitation Station  
WY 2021 Precipitation Total (inches)
- ⬭ Paso Robles Subbasin
- ~ 1 in. Precipitation Contour

**Annual Precipitation (in.)**

- 8 - 9
- 9 - 10
- 10 - 11
- 11 - 12
- 12 - 13
- 13 - 14
- 14 - 15
- 15 - 16
- 16 - 17
- 17 - 18
- 18 - 19
- 19 - 20
- 20 - 21
- 21 - 22
- 22 - 23
- 23 - 24
- 24 - 25

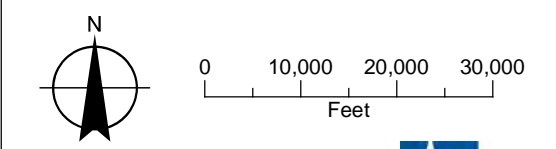
**All Other Features**

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

**NOTES**

Average distribution of annual precipitation based on 30-year normal PRISM data calibrated to the Paso Robles Station (NOAA 46730).

UCCE: University of California Cooperative Extension

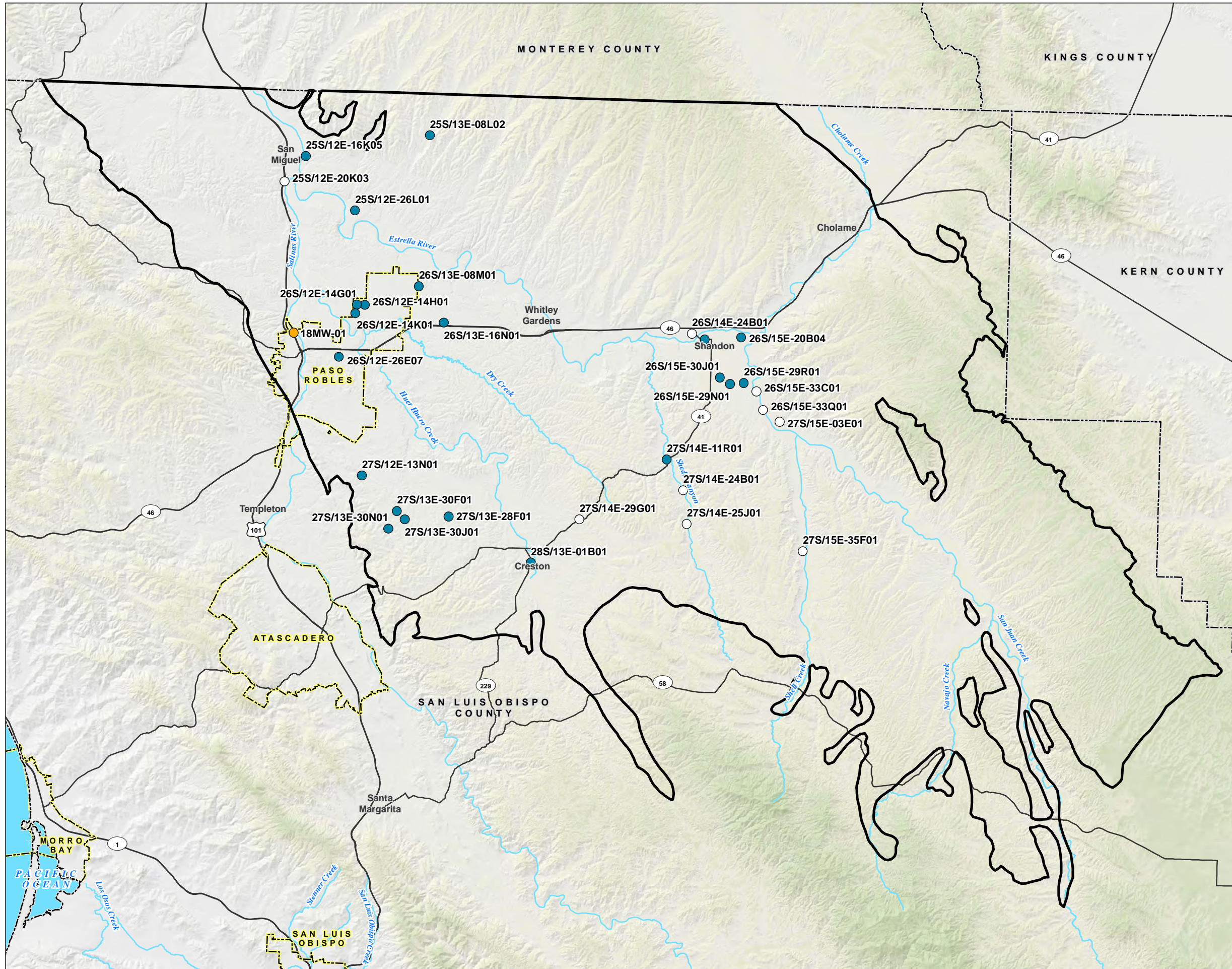


Date: February 4, 2022  
 Data Sources: CA DWR, SLO Co., USGS, PRISM (OregonState), NOAA, UCCE



**FIGURE 4**  
**Groundwater Elevation Monitoring**  
**Well Network in the**  
**Paso Robles Subbasin**

Paso Robles Subbasin  
 Water Year 2021 Annual Report



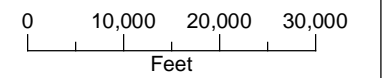
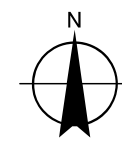
**LEGEND**

**Wells**

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

**All Other Features**

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



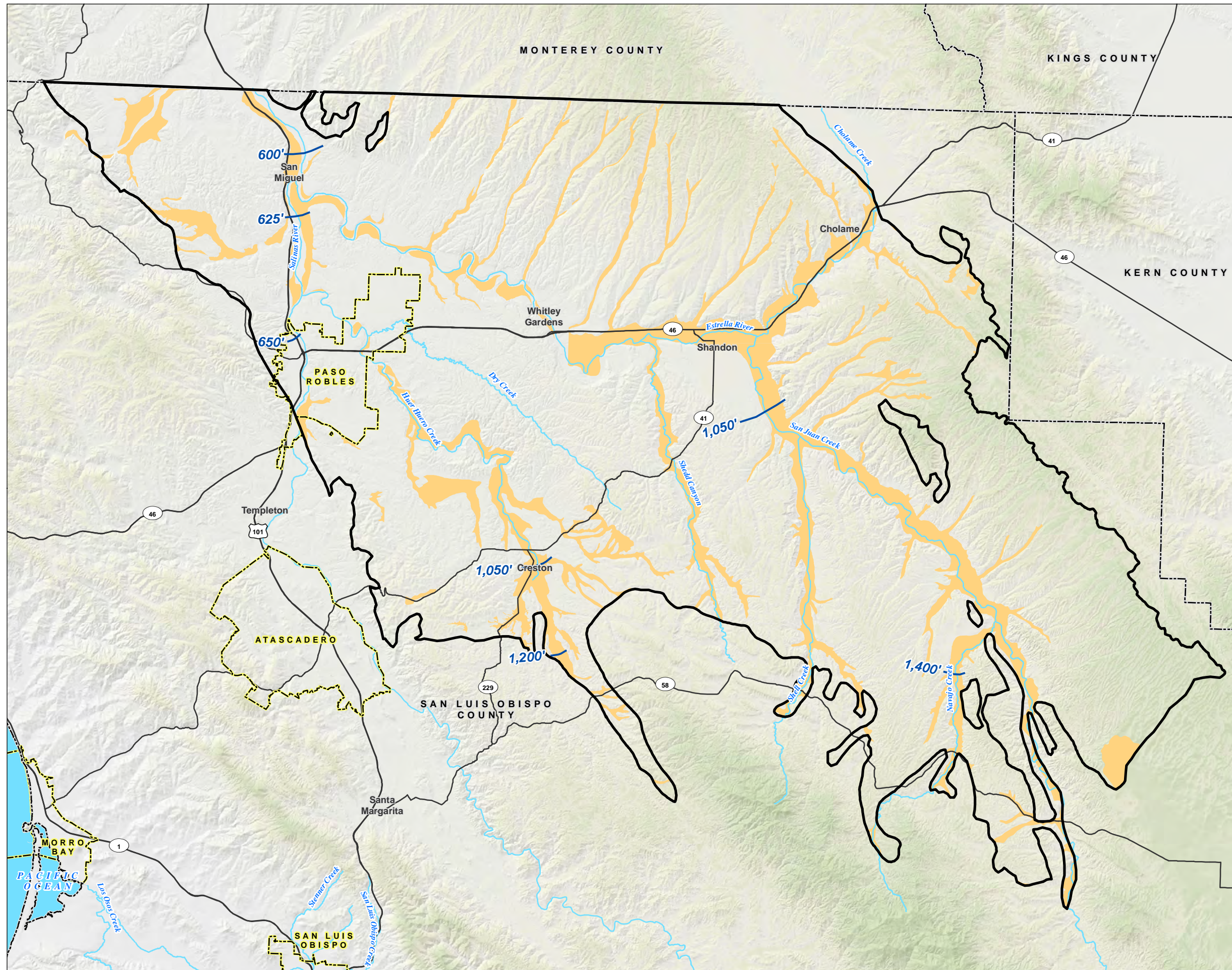
Date: December 9, 2021  
 Data Sources: CA DWR, SLO Co.,  
 City of Paso Robles, USGS



**FIGURE 5**

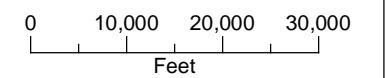
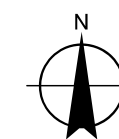
**Alluvial Aquifer Groundwater  
Elevation Contours**

Paso Robles Subbasin  
Water Year 2021 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



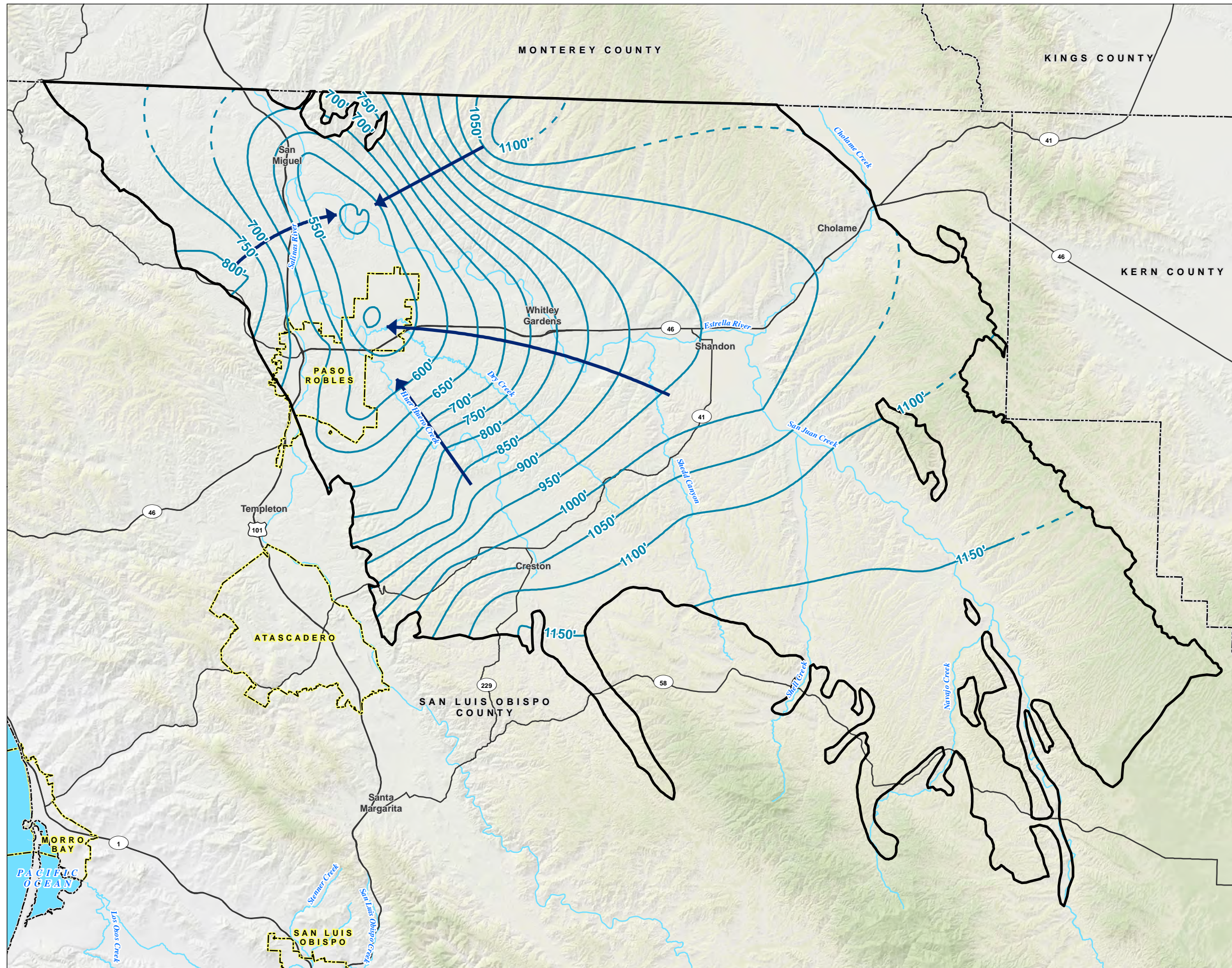
Date: December 9, 2021  
Data Sources: CA DWR, SLO Co.,  
Montgomery, USGS













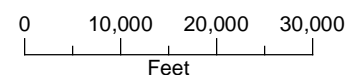
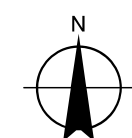
**FIGURE 6**  
**Paso Robles Formation Aquifer**  
**Spring 2021 Groundwater**  
**Elevation Contours**

Paso Robles Subbasin  
 Water Year 2021 Annual Report



**LEGEND**

-  Spring 2021 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



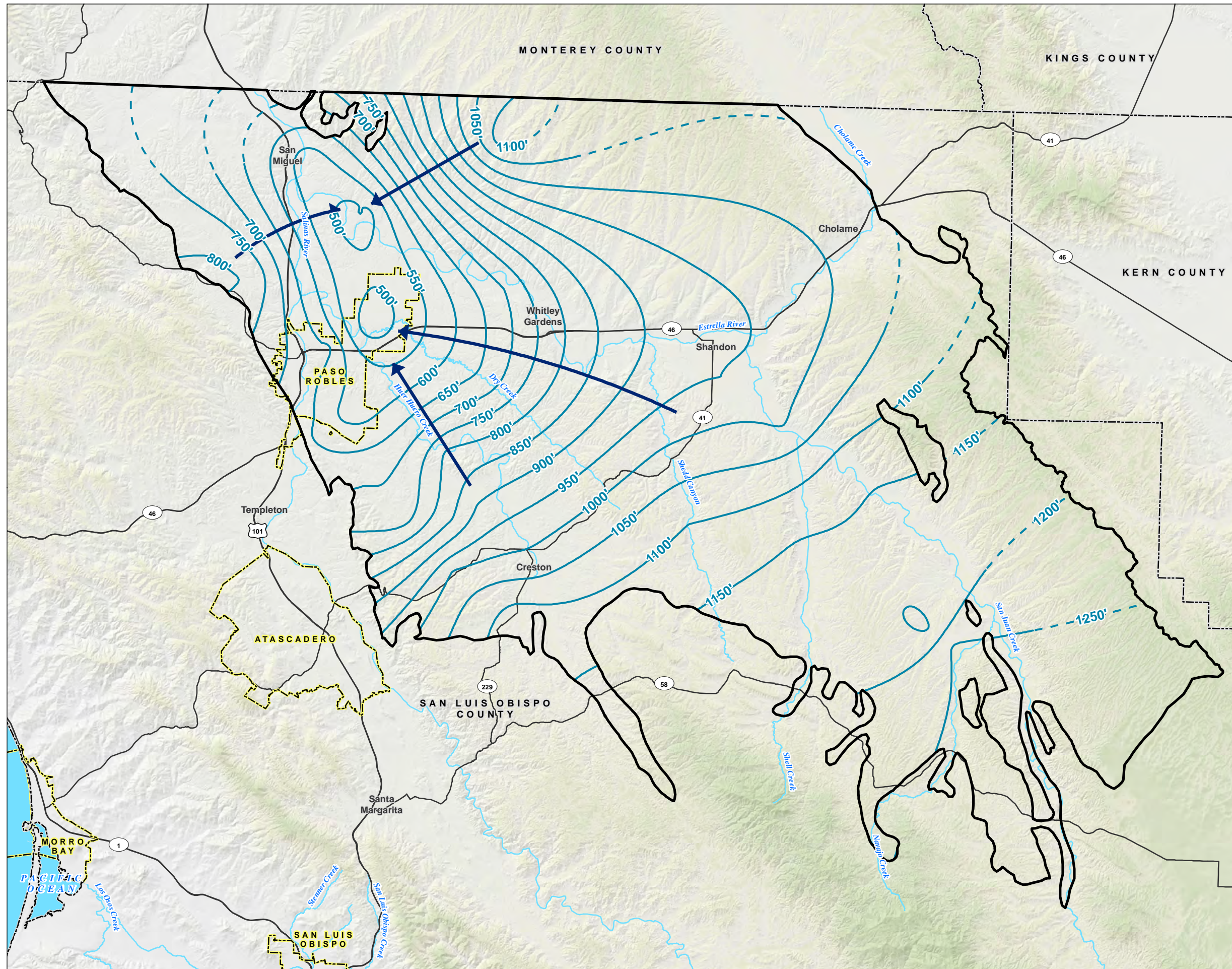
Date: December 15, 2021  
 Data Sources: CA DWR, SLO Co., USGS



**FIGURE 7**

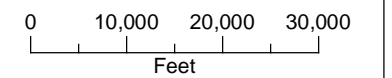
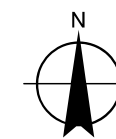
**Paso Robles Formation Aquifer  
Fall 2021 Groundwater  
Elevation Contours**

Paso Robles Subbasin  
Water Year 2021 Annual Report



**LEGEND**

- Fall 2021 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

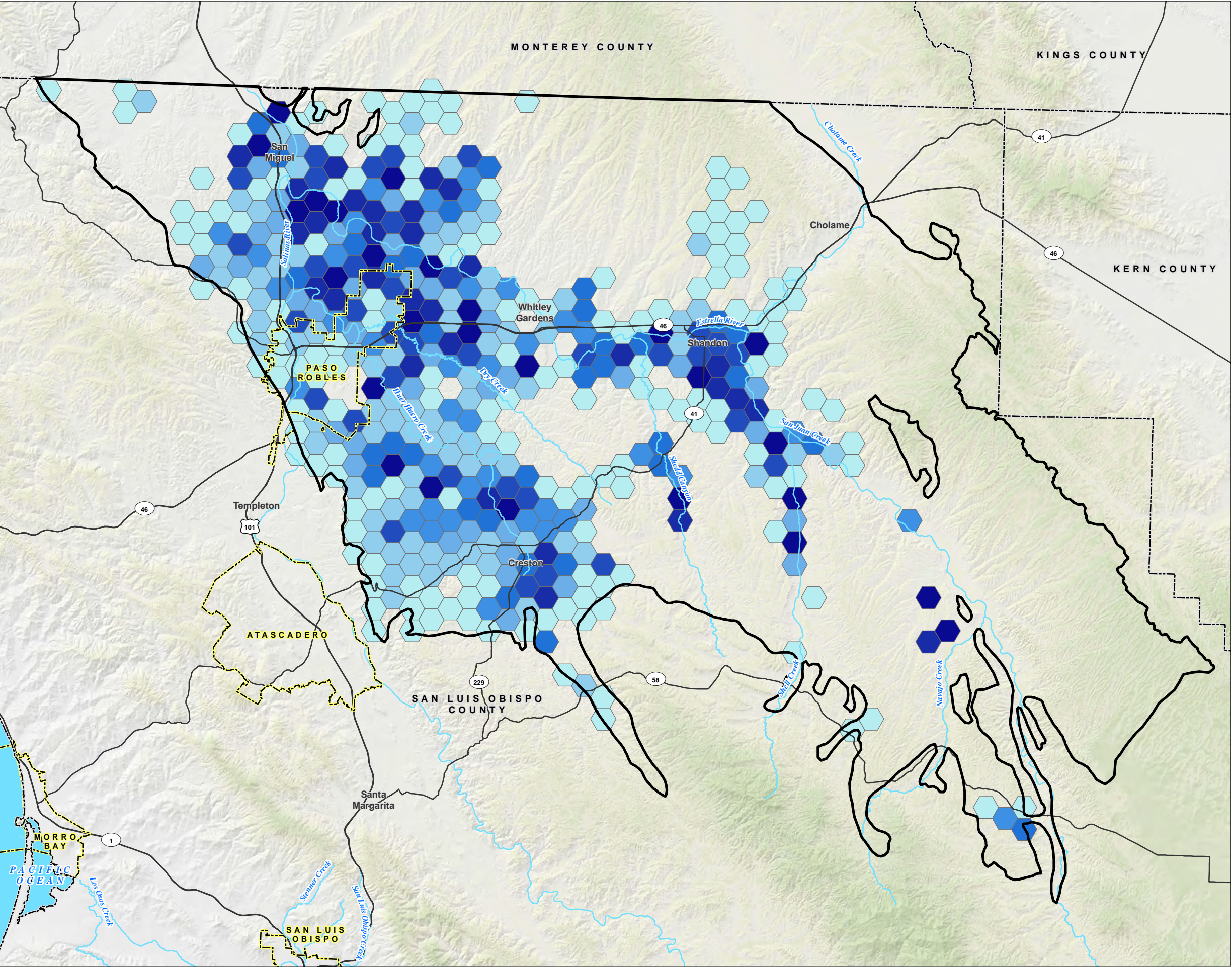


Date: December 15, 2021  
Data Sources: CA DWR, SLO Co., USGS



**FIGURE 8**  
**General Locations and**  
**Volumes of Groundwater Extraction**

Paso Robles Subbasin  
 Water Year 2021 Annual Report

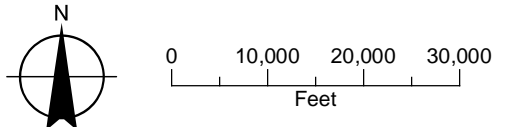


**LEGEND**

- Paso Robles Subbasin
- Water Year 2021 Groundwater Extraction (AFY)**
- 1 - 28
- 29 - 84
- 85 - 149
- 150 - 219
- 220 - 311
- 312 - 464
- 465 - 770
- 771 - 1696
- All Other Features**
- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

**NOTE**

AFY: Acre-Feet per Year



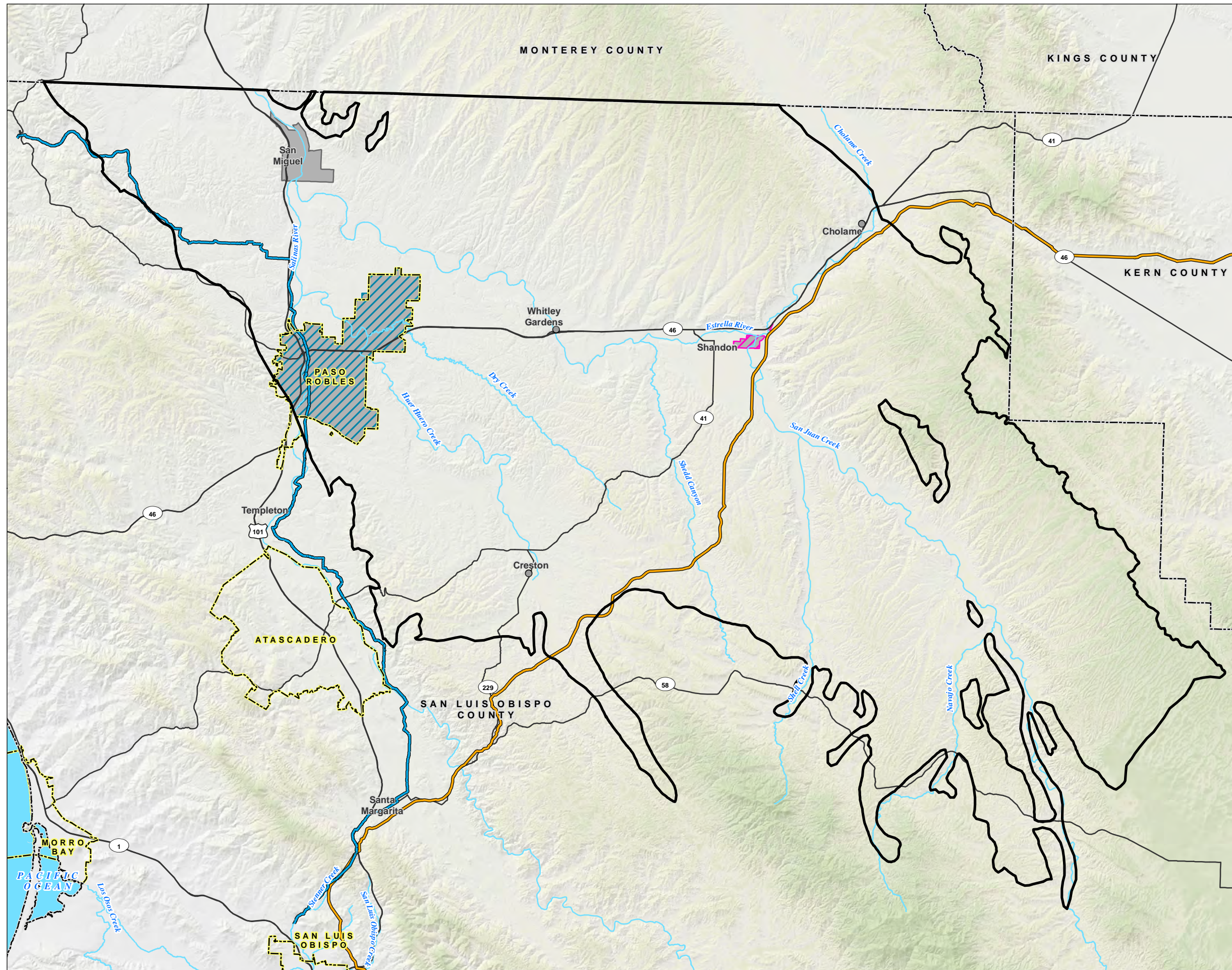
Date: December 13, 2021  
 Data Sources: CA DWR, SLO Co.,  
 Soil Water Balance Model, USGS



**FIGURE 9**

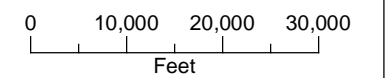
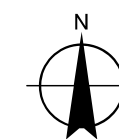
**Communities Dependent on Groundwater and with Access to Surface Water**

Paso Robles Subbasin  
Water Year 2021 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

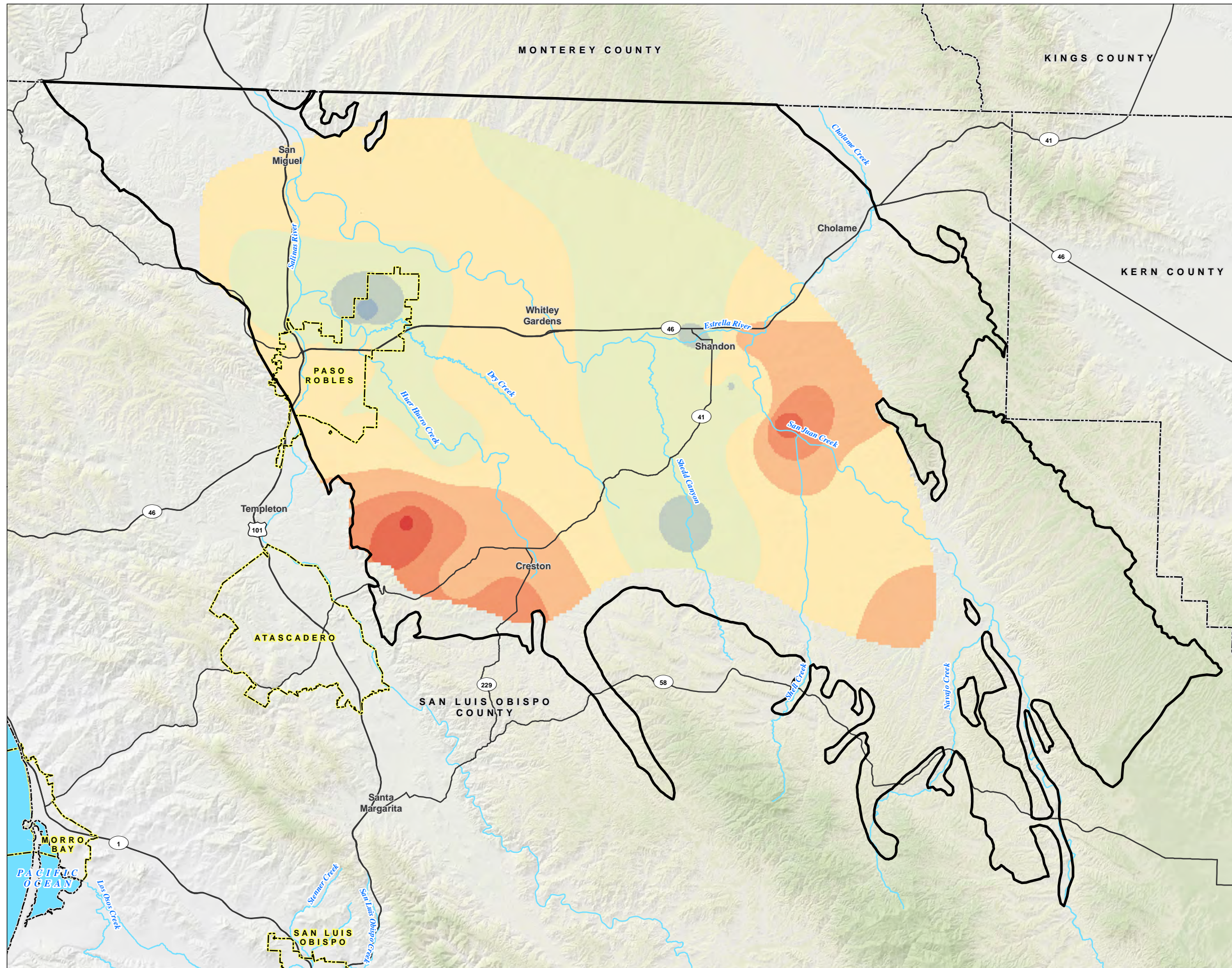


Date: December 9, 2021  
Data Sources: CA DWR, SLO Co., USGS



**FIGURE 10**  
**Paso Robles Formation Aquifer**  
**Change in Groundwater Elevation**  
**Fall 2020 to Fall 2021**

Paso Robles Subbasin  
 Water Year 2021 Annual Report



**LEGEND**

Paso Robles Subbasin

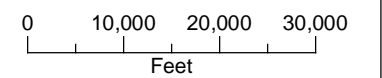
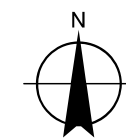
**Water Level Change, in feet**

**Fall 2020 to Fall 2021**

- < -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

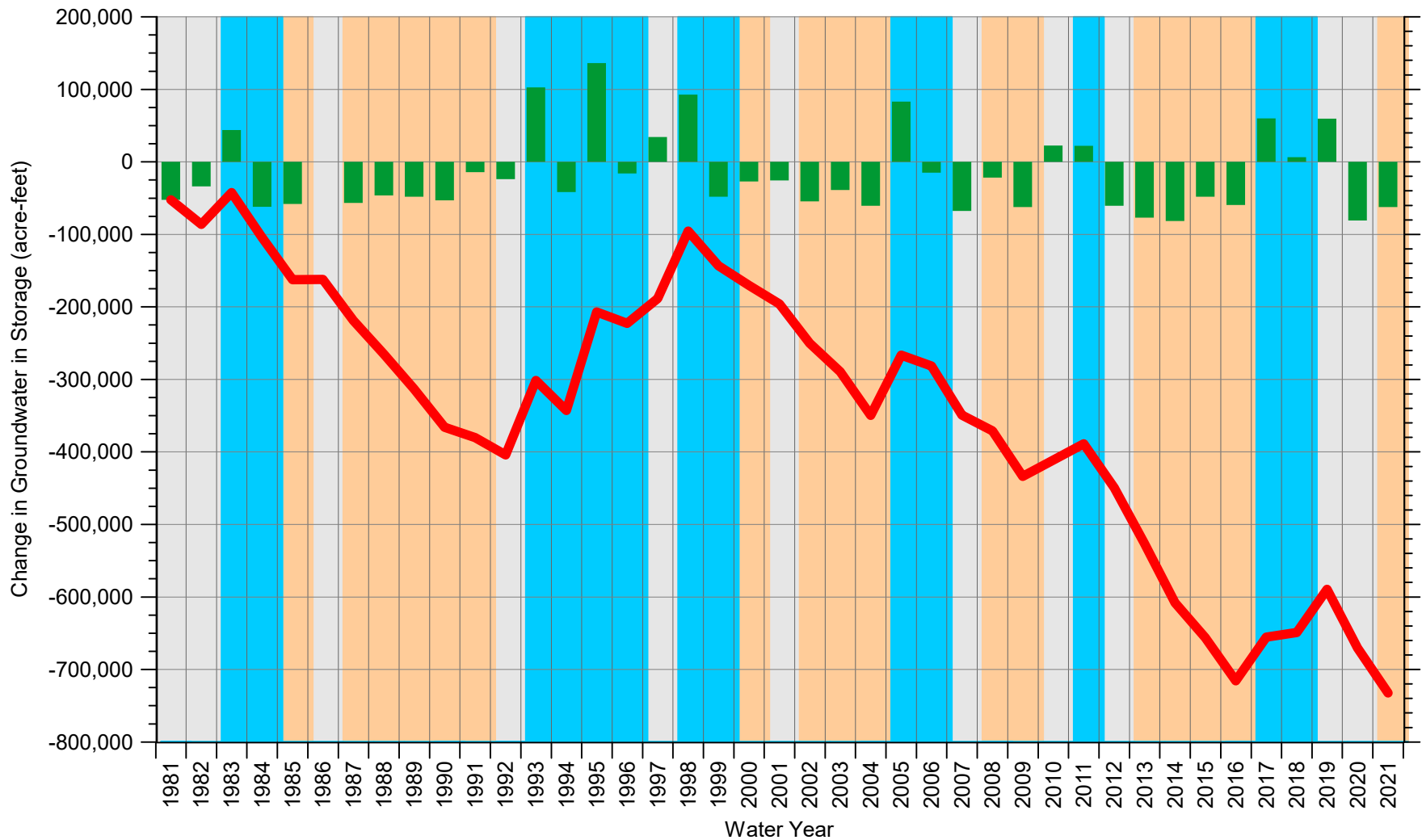
**All Other Features**

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



Date: December 15, 2021  
 Data Sources: CA DWR, SLO Co., USGS





**EXPLANATION**

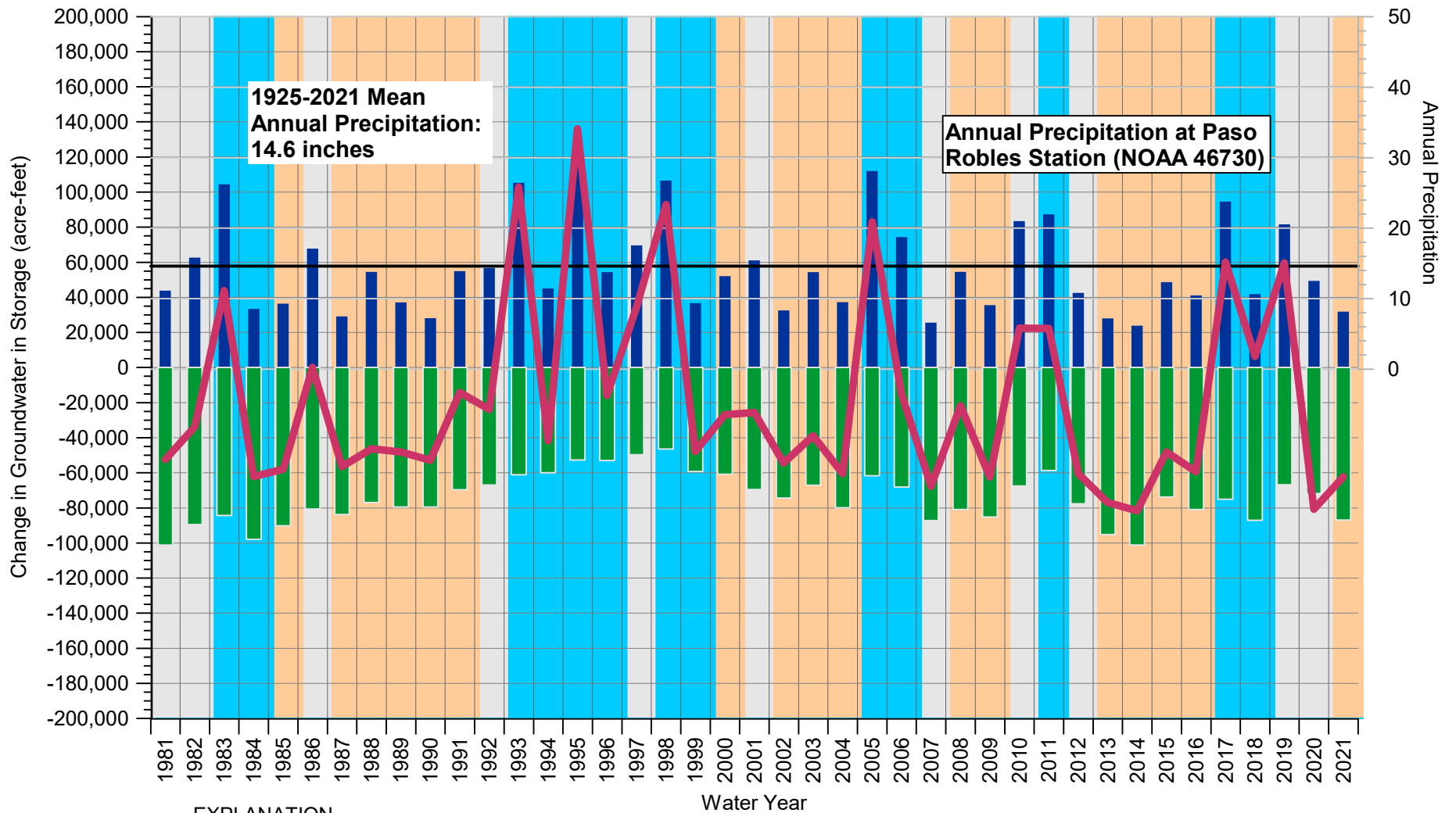
— Cumulative Change in Groundwater Storage    ■ Annual Change in Groundwater Storage

**CLIMATIC PERIOD CLASSIFICATION**

Dry     Avg/Alternating     Wet



**FIGURE 11**  
**Estimated Annual and Cumulative Change in Groundwater in Storage**  
**in the Paso Robles Subbasin**  
 Paso Robles Subbasin Water Year 2021 Annual Report



**EXPLANATION**

- Annual Precipitation
- Total Groundwater Extraction
- Annual Change in Groundwater in Storage\*

**CLIMATE PERIOD CLASSIFICATION**

- Dry
- Avg/Alternating
- Wet

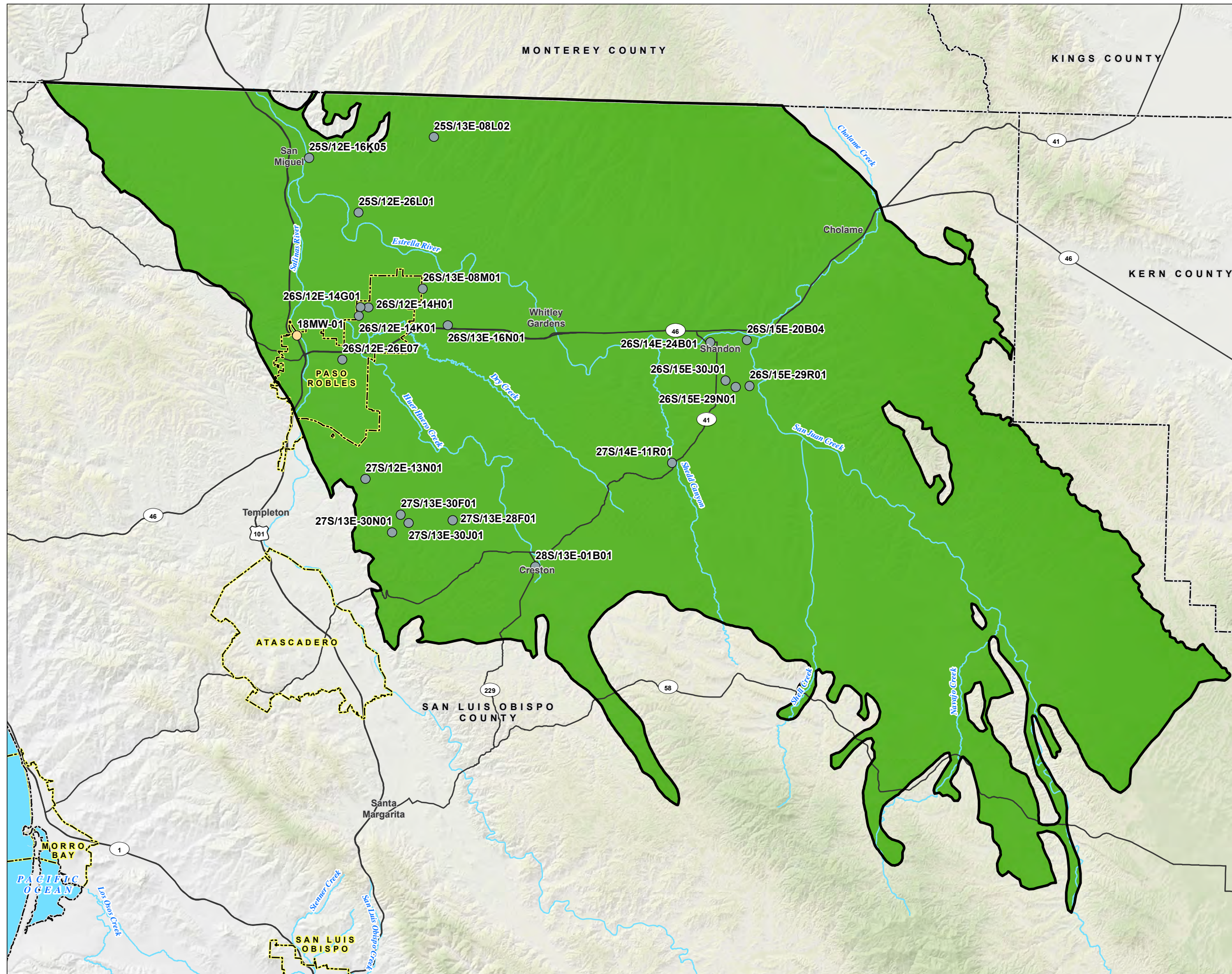


\*Annual Change in Groundwater in Storage is calculated using the groundwater model (1981-2016) and by water level change maps (2017-2021)

**FIGURE 12**  
**Annual Precipitation and Groundwater Extraction vs Annual Change in Groundwater in Storage**  
 Paso Robles Subbasin Water Year 2021 Annual Report

**FIGURE 13**  
**Land Subsidence**  
**Measured by InSAR**  
**(October 2019 – October 2020)**

Paso Robles Subbasin  
 Water Year 2021 Annual Report



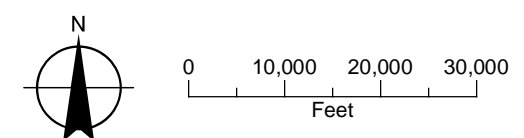
**LEGEND**

- Wells**
- Paso Robles Formation
  - Alluvial Aquifer

- Estimated Subsidence (decimal ft)**  
**October 2019 - October 2020**
- -0.1 - 0.1

- All Other Features**
- ⬭ Paso Robles Subbasin
  - ⬭ County Boundary
  - ⬭ City Boundary
  - ⬭ Major Road
  - ⬭ Watercourse
  - ⬭ Waterbody

**NOTE**  
 InSAR: Interferometric Synthetic Aperture Radar



Date: December 15, 2021  
 Data Sources: CA DWR, SLO Co.,  
 City of Paso Robles, USGS,  
 TRE Altamira InSAR dataset





## 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.

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>

Source: <https://www.prcity.com/462/Rainfall-Totals>

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	0.58	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	0.34	0.12	3.38	17.26
1944	0.94	5.96	0.64	0.65	0.13	0.00	0.00	0.00	0.00	0.26	2.64	1.38	12.16
1945	0.80	4.17	2.76	0.26	0.04	0.00	0.00	0.00	0.00	1.09	0.49	1.72	12.31
1946	0.31	1.64	3.01	0.05	0.72	0.00	0.26	0.00	0.10	0.00	4.57	2.17	9.39
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	9.86
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	0.78	0.78	2.33	10.61
1950	2.39	2.43	1.65	0.89	0.05	0.00	0.68	0.00	0.00	1.24	1.18	2.50	11.98
1951	2.50	0.68	0.58	1.11	0.00	0.00	0.00	0.00	0.03	0.33	1.94	4.64	9.82
1952	5.54	0.20	3.92	1.50	0.03	0.00	0.07	0.00	0.02	0.02	1.76	4.78	18.19
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	1.00	0.01	1.87	1.45	0.00	0.00	0.00	0.00	1.07	0.00	0.17	17.65
1957	4.77	1.90	0.31	1.63	0.71	0.47	0.00	0.00	0.02	0.62	0.30	3.30	11.05
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	26.69
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	2.52	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	17.36
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	0.68	3.09	1.61	22.83



## Monthly Precipitation at the Paso Robles Station (NOAA 46730)

(inches)

Source: <https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6730>  
 Source: <https://www.prcity.com/462/Rainfall-Totals>

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	WY Total
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	17.29
1975	0.01	4.12	2.81	0.89	0.00	0.00	0.00	0.01	0.00	0.76	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	9.25
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	1.96	15.81
1983	5.86	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	6.73	4.64	0.32	0.00	0.00	0.03	0.00	0.62	0.02	0.15	0.64	16.89
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	7.37
1988	1.94	2.54	0.10	2.02	0.21	0.14	0.00	0.00	0.00	0.00	1.16	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	9.34
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	6.96	3.43	0.06	0.01	0.14	0.00	0.00	0.00	0.17	0.86	1.28	24.61
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	0.72	0.55	0.00	0.00	0.00	0.00	1.78	1.52	5.78	13.70
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	17.17
1998	2.99	9.06	2.71	1.96	2.05	0.11	0.00	0.00	0.08	0.21	0.99	0.73	27.01
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	1.08	0.00	0.00	0.04	0.00	0.00	0.24	2.81	2.19	15.83
2002	0.87	0.33	1.40	0.23	0.25	0.00	0.00	0.00	0.00	0.00	2.54	4.52	8.32
2003	0.13	2.10	1.86	1.70	1.18	0.00	0.16	0.03	0.00	0.00	1.36	2.31	14.22
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	0.46	2.54	28.10
2006	5.78	1.23	4.50	2.92	1.48	0.00	0.00	0.00	0.00	0.61	0.28	1.13	18.93
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	2.75	0.12	0.00	0.03	0.00	0.00	1.06	1.57	7.14	21.03
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	1.80	10.46
2017	9.50	6.44	0.92	1.45	0.24	0.00	0.00	0.00	0.16	0.08	0.22	0.04	23.58
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
2020	0.65	0.00	3.53	1.59	0.03	0.00	0.00	0.11	0.00	0.00	0.29	0.89	12.53
2021	6.07	0.01	0.90	0.00	0.00	0.00	0.00	0.00	0.00	2.02	0.05	7.70	8.16
<b>Water Year Average (1925 - 2021):</b>													<b>14.53</b>

**University of California Cooperative Extension Weather Stations in Paso Robles Subbasin  
Total Monthly Precipitation for Water Year 2021**

(inches)

[Source: https://ucce-slo.westernweathergroup.com/](https://ucce-slo.westernweathergroup.com/)

<b>WY 2021</b>	<b>Shandon (SLO-1)</b>	<b>Creston Rd (SLO-2)</b>	<b>NE Paso Robles (SLO-3)</b>	<b>Cross Canyon Rd (SLO-4)</b>	<b>Shell Creek Rd (SLO-6)</b>	<b>South Shandon (SLO-7)</b>	<b>South Creston (SLO-8)</b>	<b>Experimental Station (SLO-10)</b>	<b>Von Dollen Road (SLO-12)</b>
<b>OCT</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>NOV</b>	0.29	0.32	0.20	0.12	0.25	0.23	0.48	0.25	0.13
<b>DEC</b>	0.52	0.86	0.52	0.47	0.50	0.49	0.91	0.70	0.50
<b>JAN</b>	2.67	4.13	4.57	5.56	2.34	2.55	4.04	4.91	4.83
<b>FEB</b>	0.07	0.02	0.05	0.07	0.09	0.06	0.01	0.00	0.09
<b>MAR</b>	0.60	0.68	0.86	0.52	0.68	0.76	0.86	0.62	0.68
<b>APR</b>	0.00	0.00	0.00	0.04	0.00	0.00	0.01	0.06	0.18
<b>MAY</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>JUN</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>JUL</b>	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00
<b>AUG</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
<b>SEP</b>	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
<b>WY Total</b>	<b>4.15</b>	<b>6.01</b>	<b>6.21</b>	<b>6.78</b>	<b>3.91</b>	<b>4.09</b>	<b>6.31</b>	<b>6.57</b>	<b>6.41</b>

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 <sup>1</sup>	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)	230	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: <sup>1</sup> 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

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

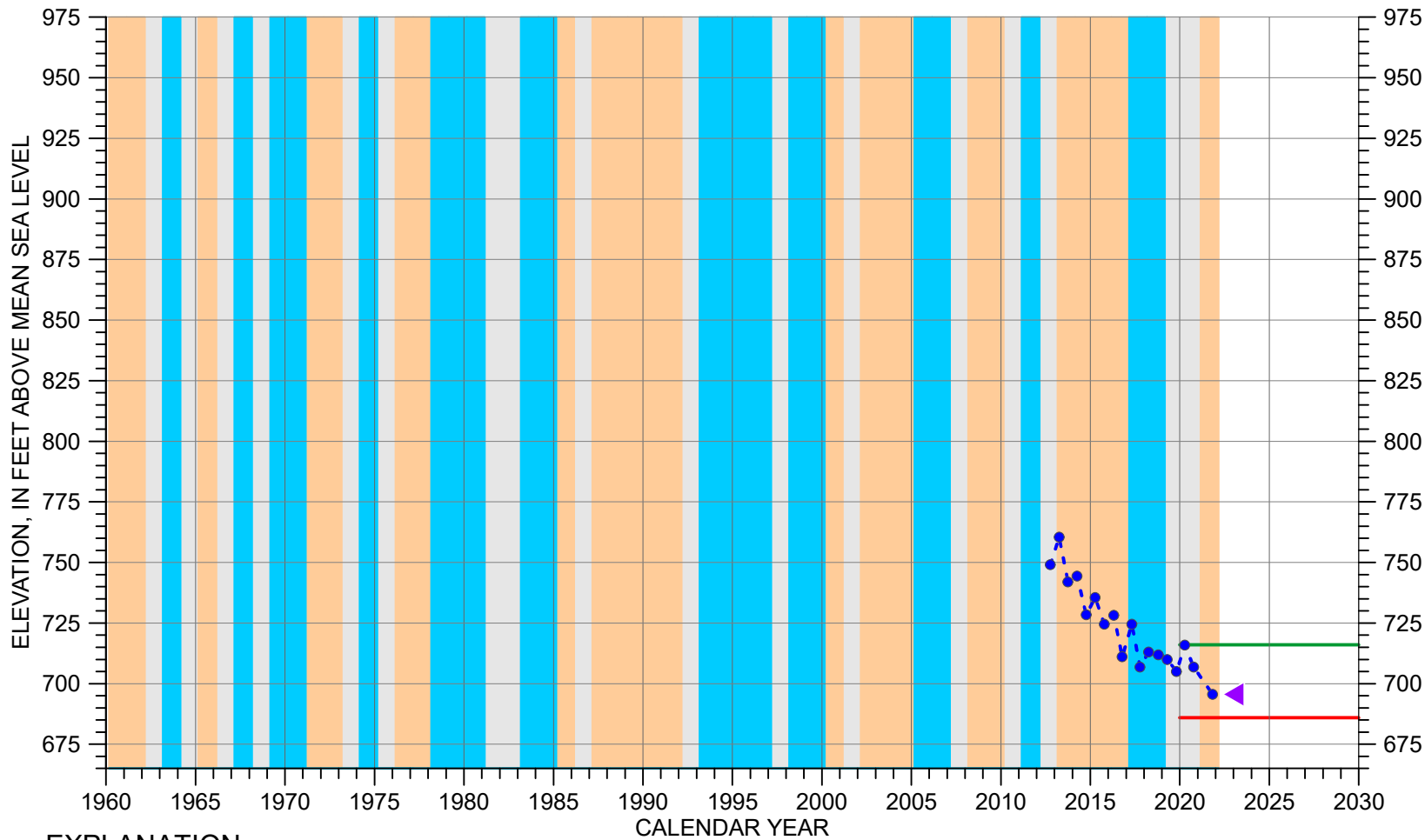


APPENDIX E

# Hydrographs

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## Paso Robles Formation Aquifer Hydrographs



**EXPLANATION**

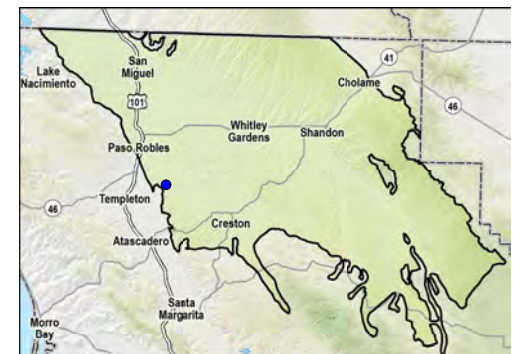
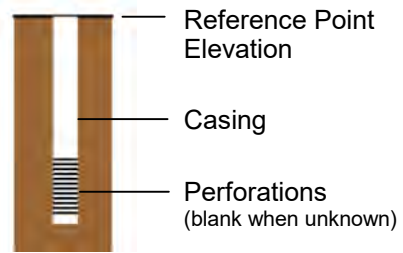
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

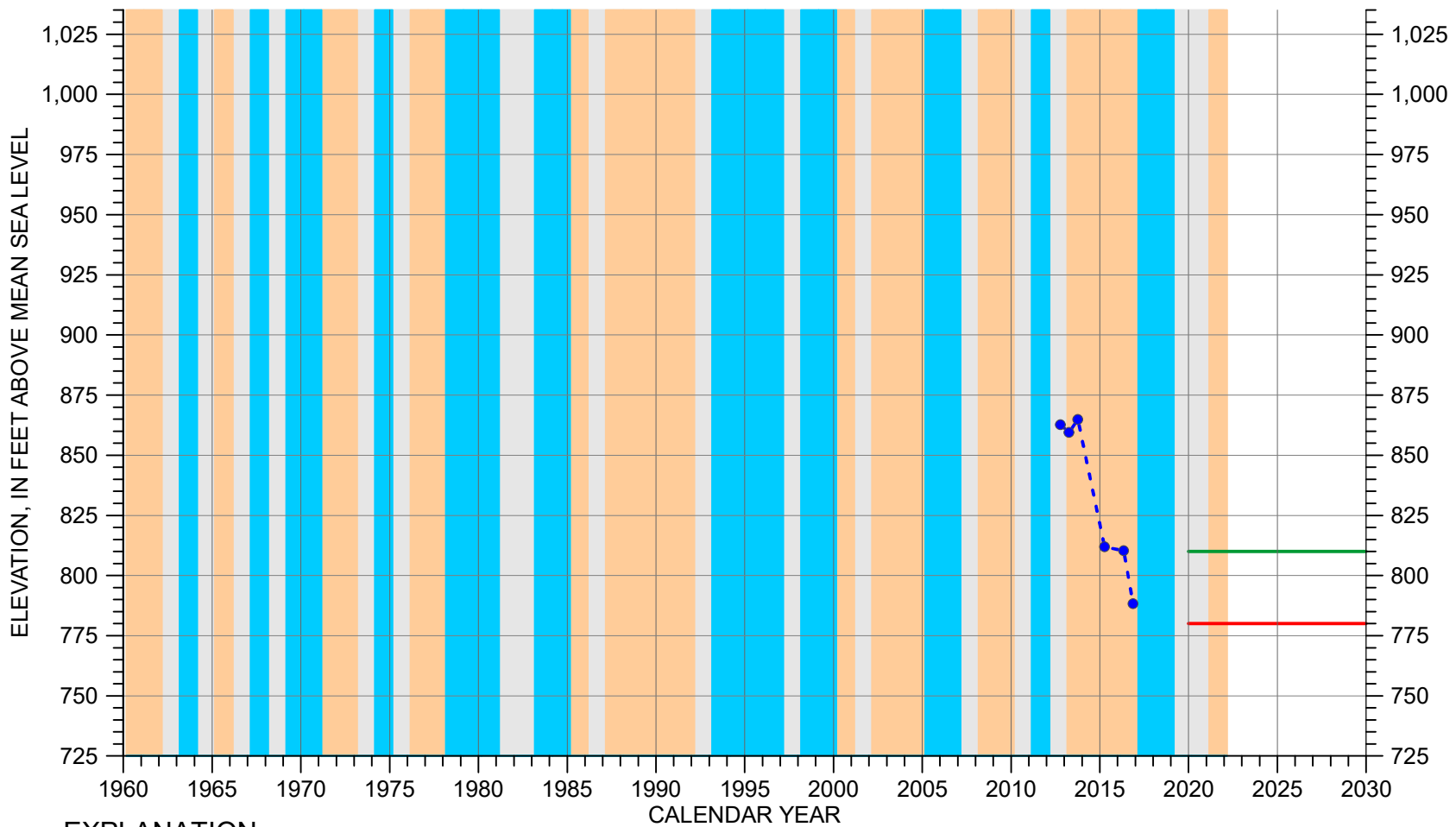
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

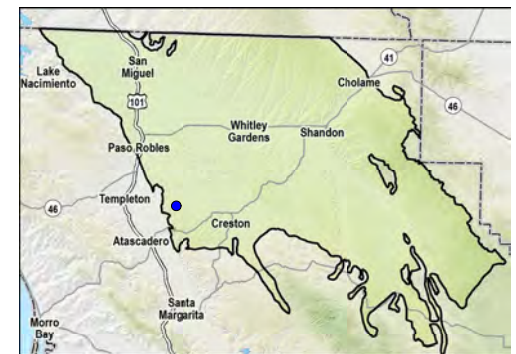
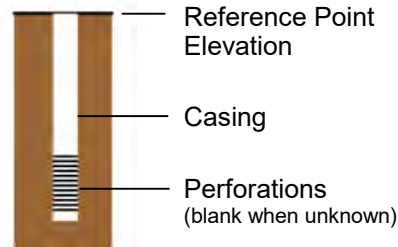
- Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold

**CLIMATE PERIOD CLASSIFICATION**

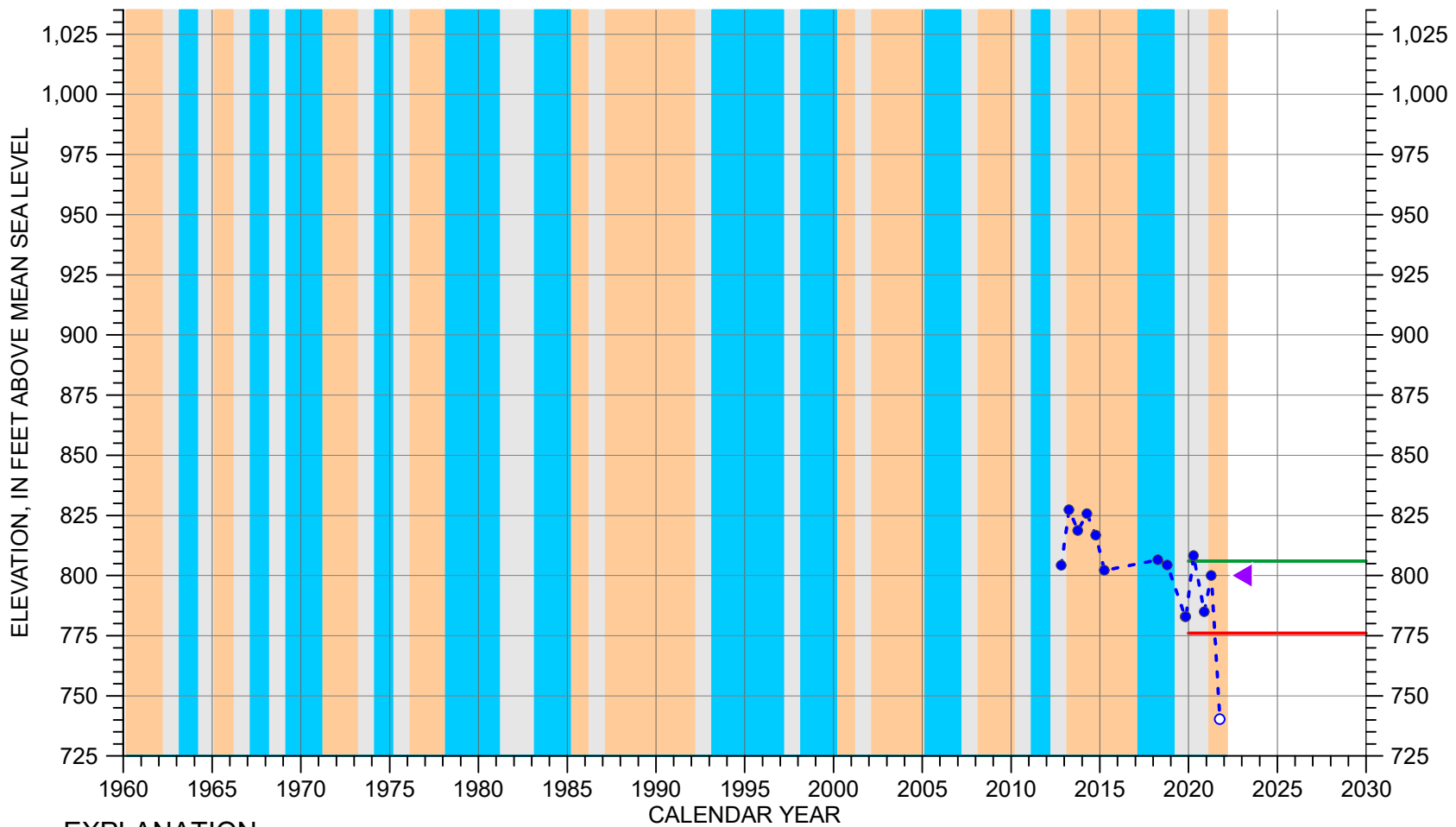
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

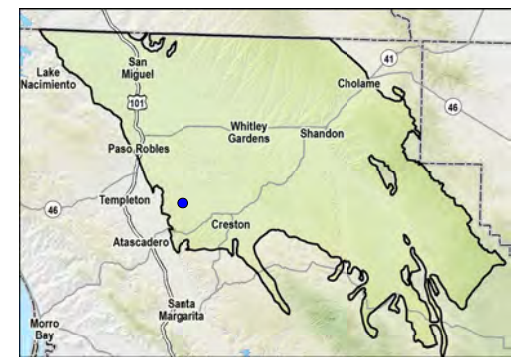
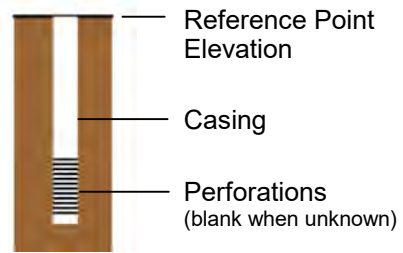
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

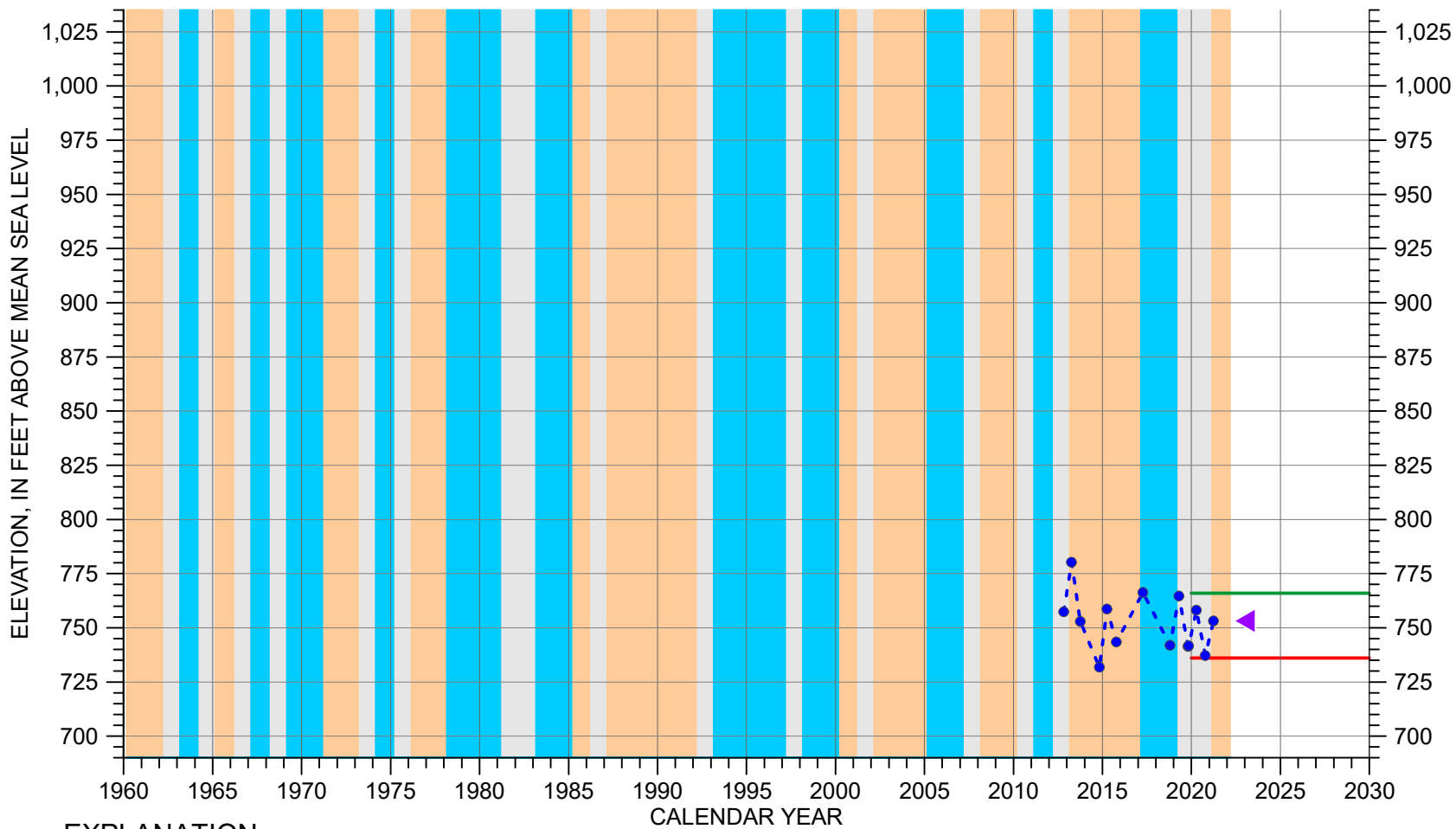
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

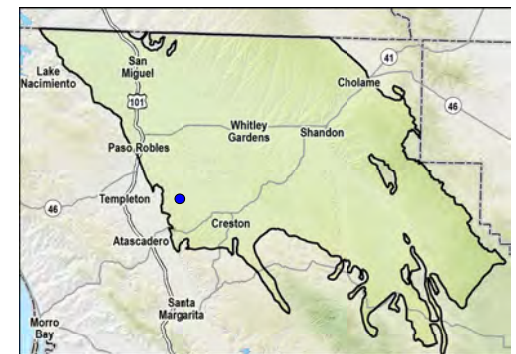
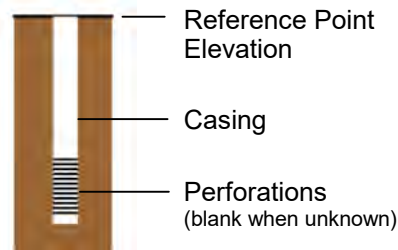
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

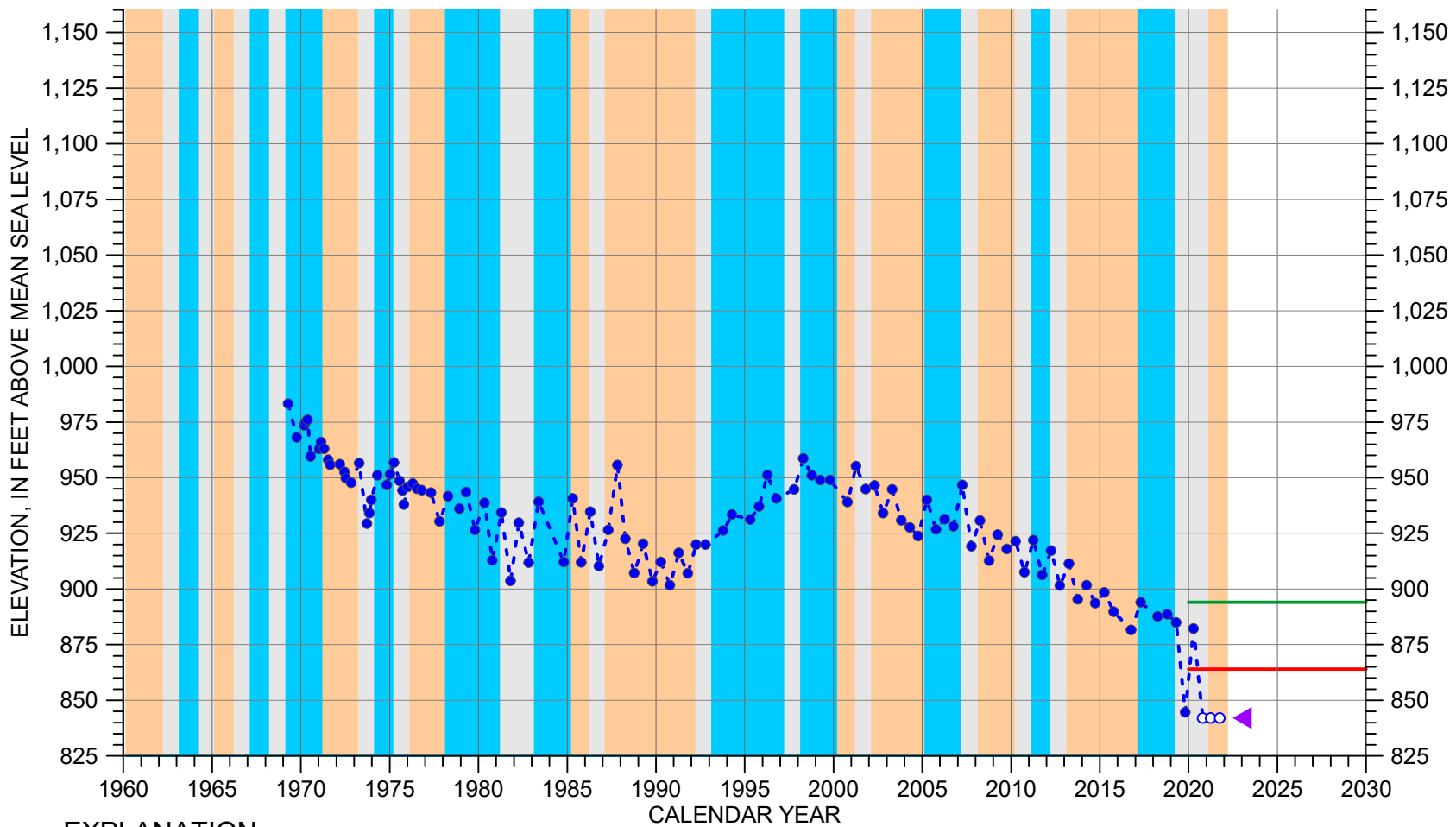
- Dry
- Avg/Alternating
- Wet

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

\* Measurement recorded at elevation below reported bottom of well.



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



**EXPLANATION**

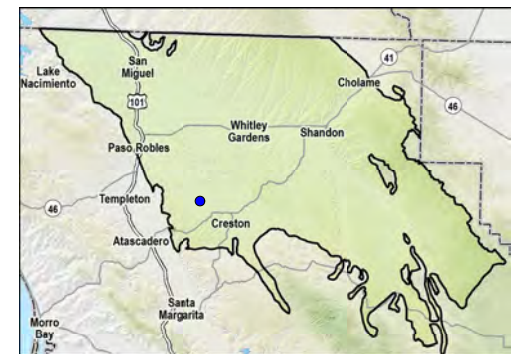
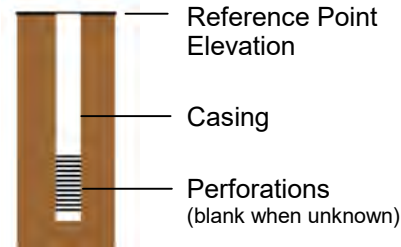
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

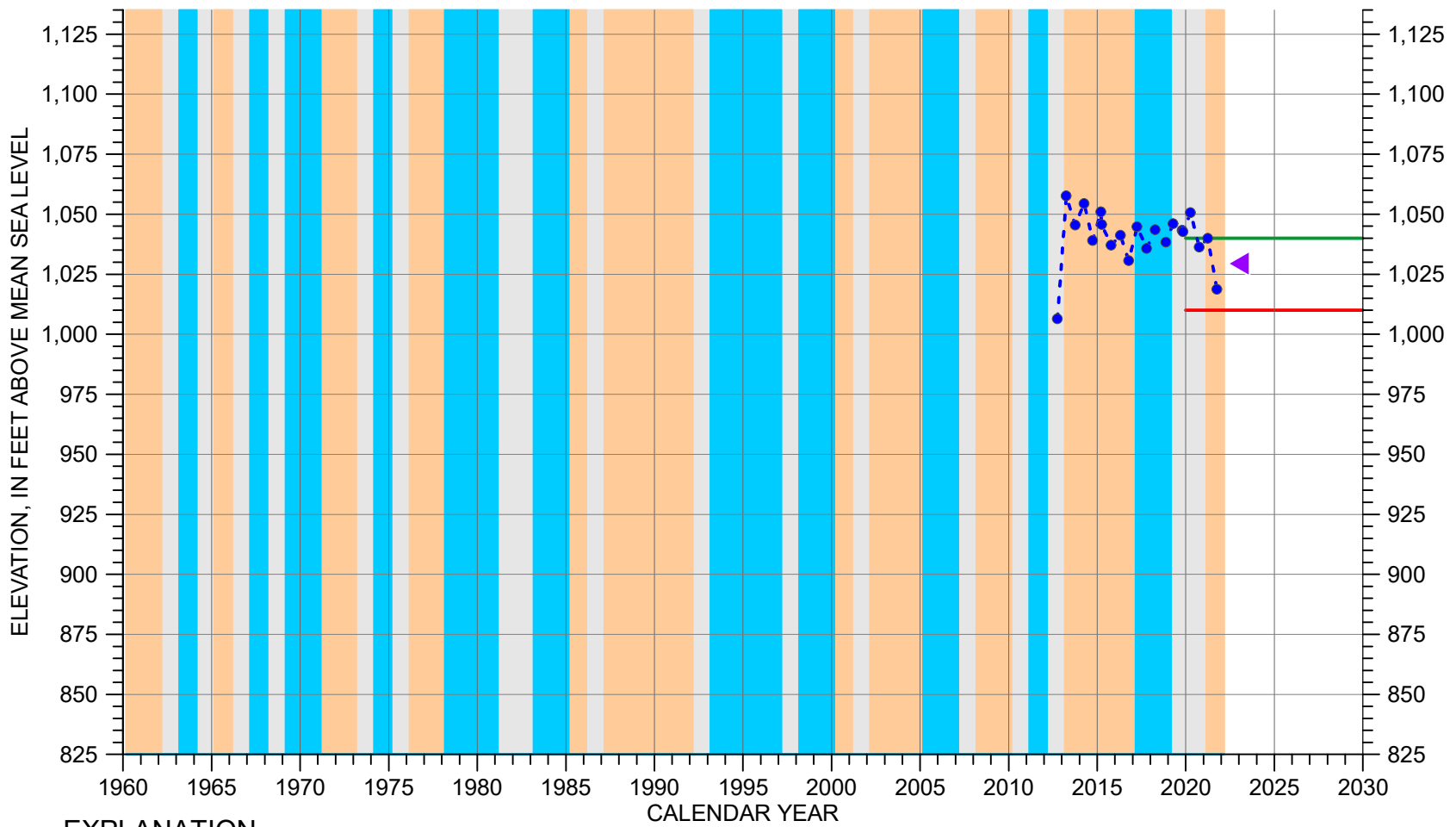
- Dry
- Avg/Alternating
- Wet

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

\* Measurement recorded at bottom of well (dry well). Actual elevation may be lower.



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



**EXPLANATION**

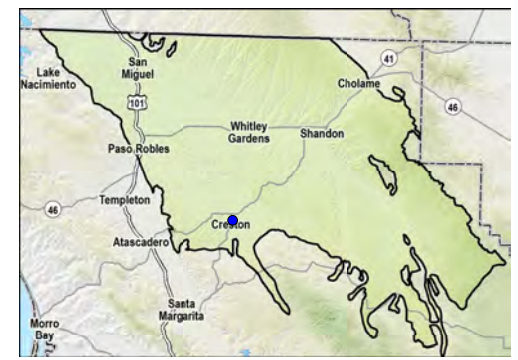
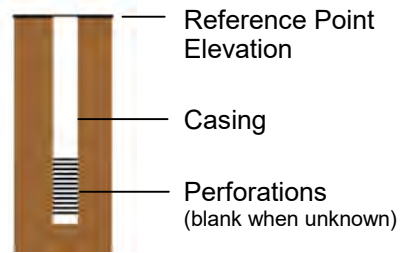
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

- Dry
- Avg/Alternating
- Wet

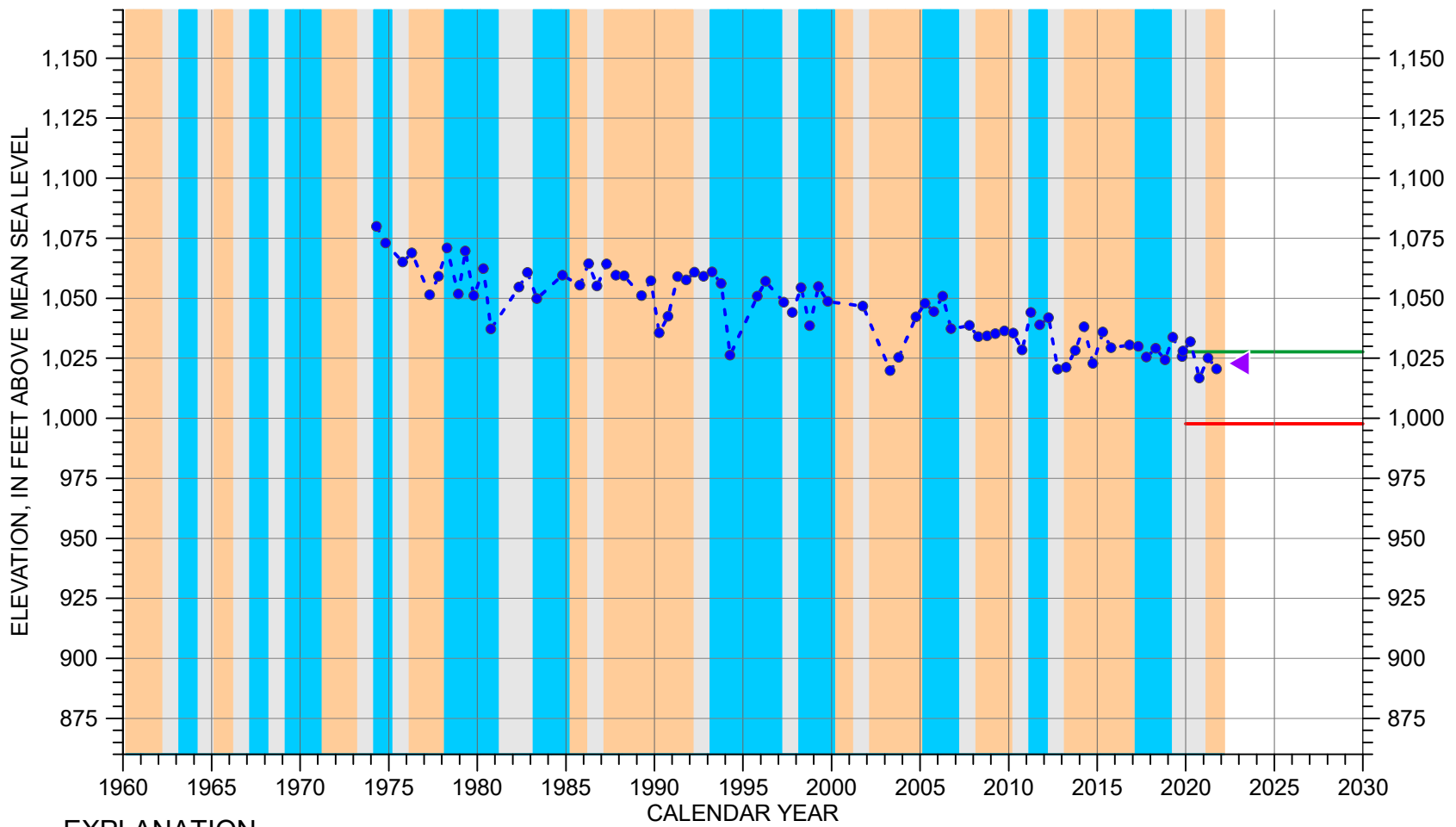
Well Depth: 254 feet  
 Screened Interval: 154-254 feet below ground surface  
 Reference Point Elevation: 1099.9 feet above mean sea level

\* Measurement reported as not static



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





**EXPLANATION**

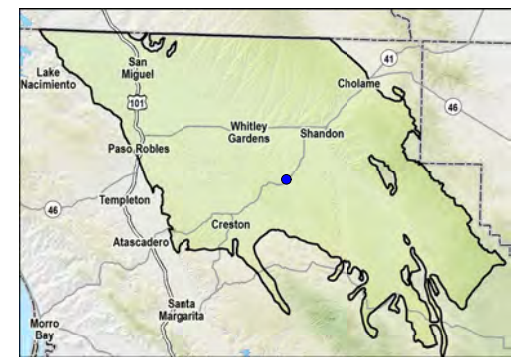
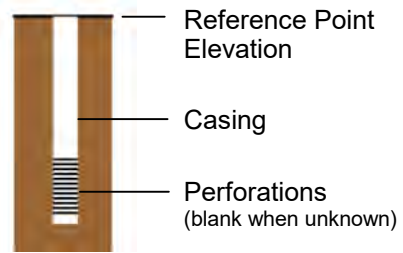
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

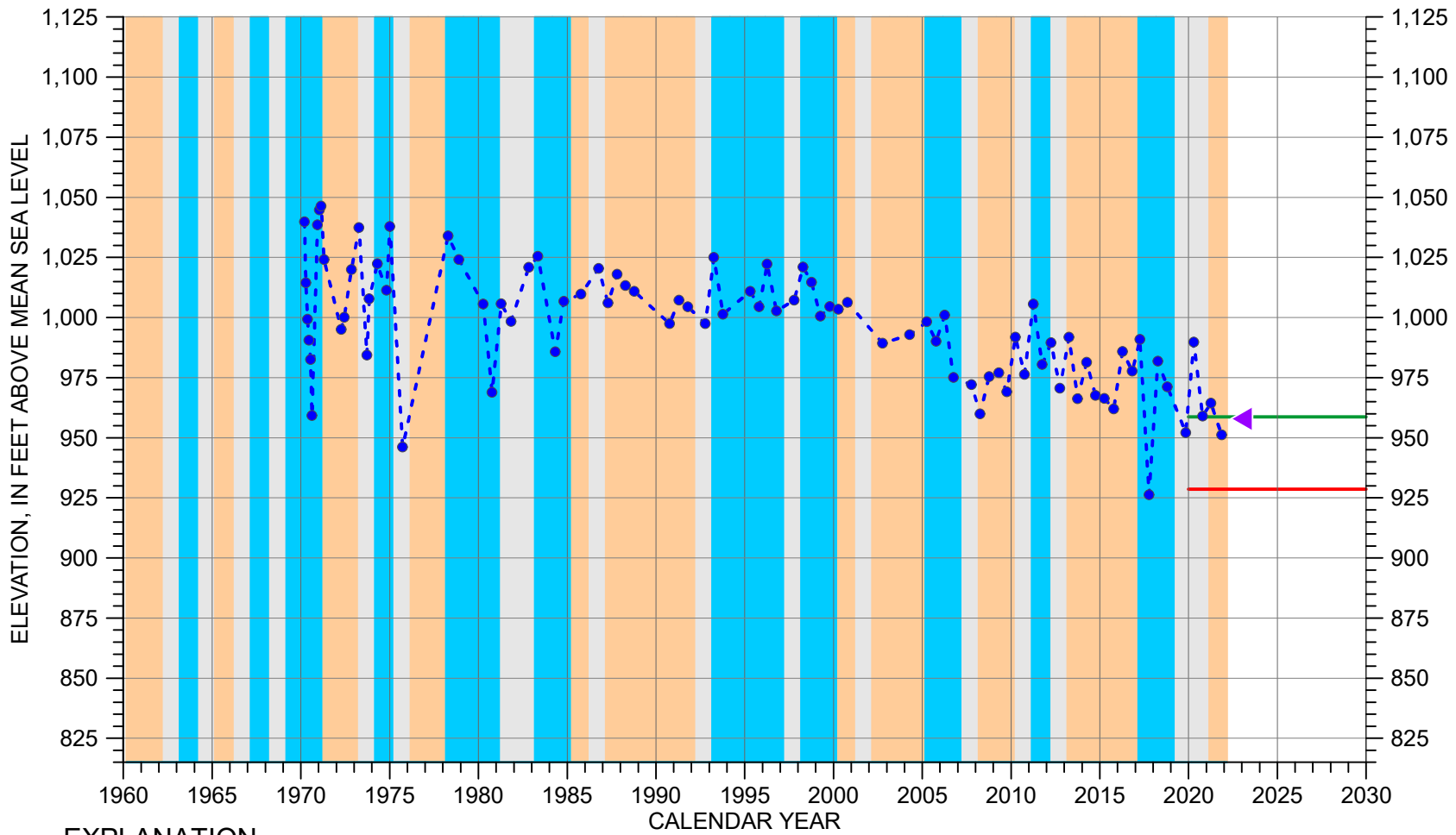
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

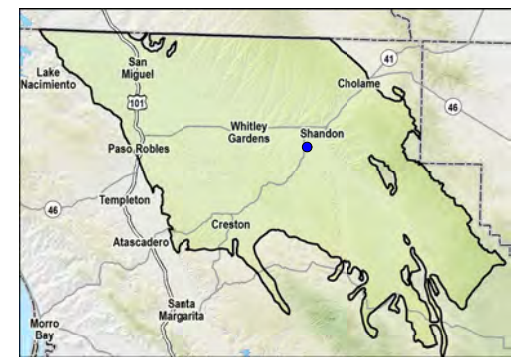
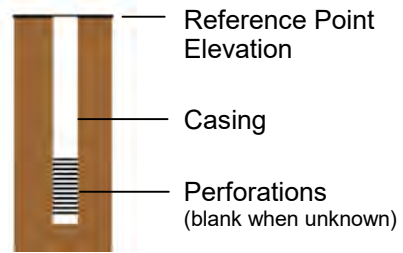
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

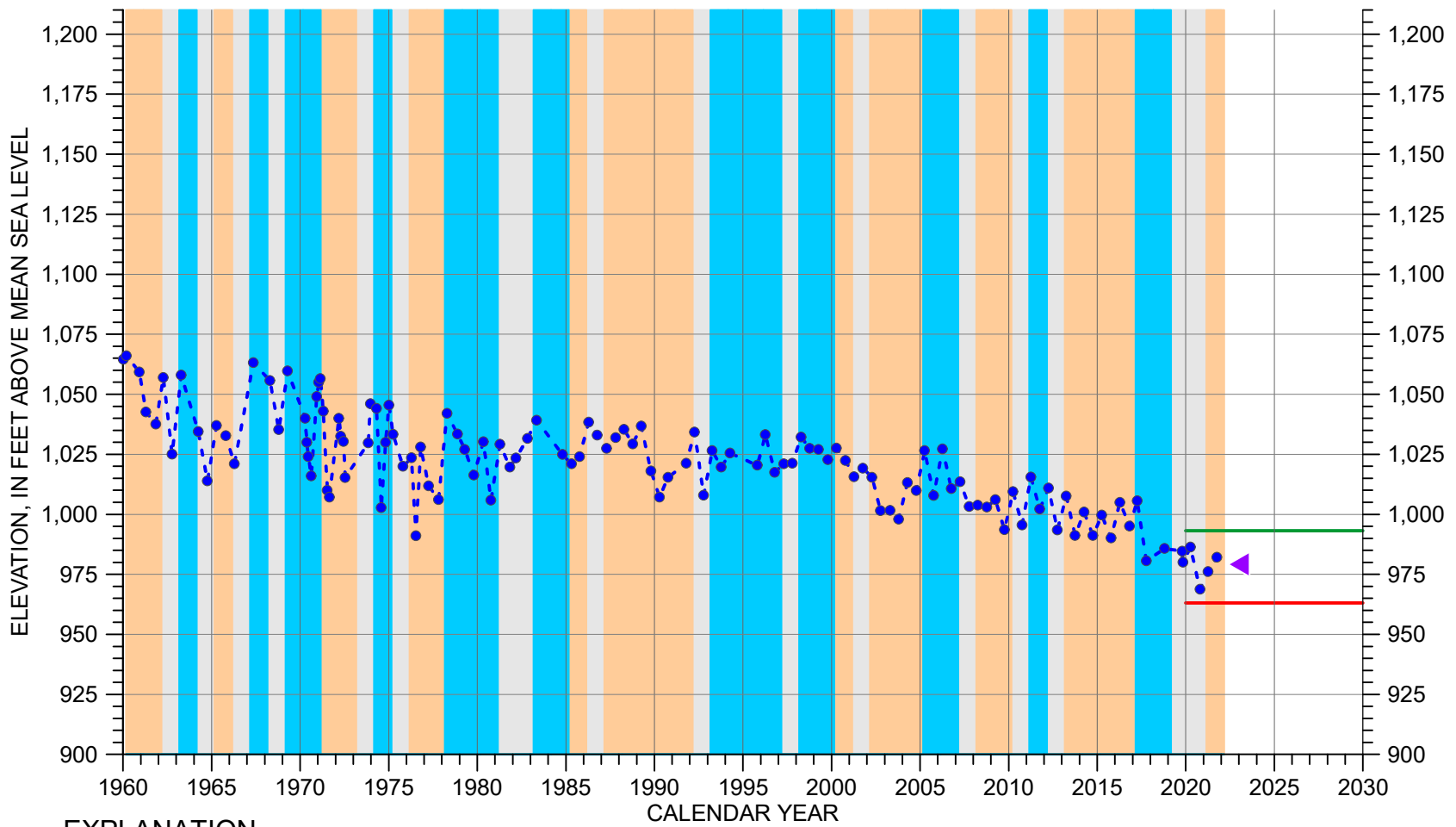
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

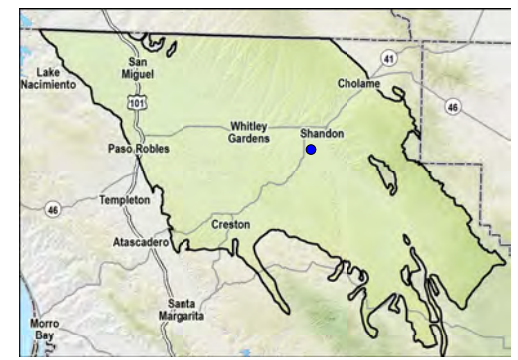
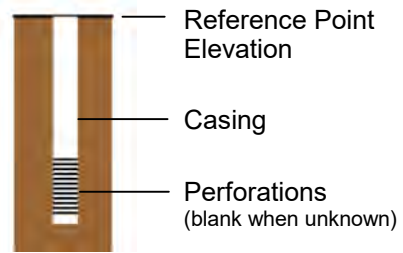
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

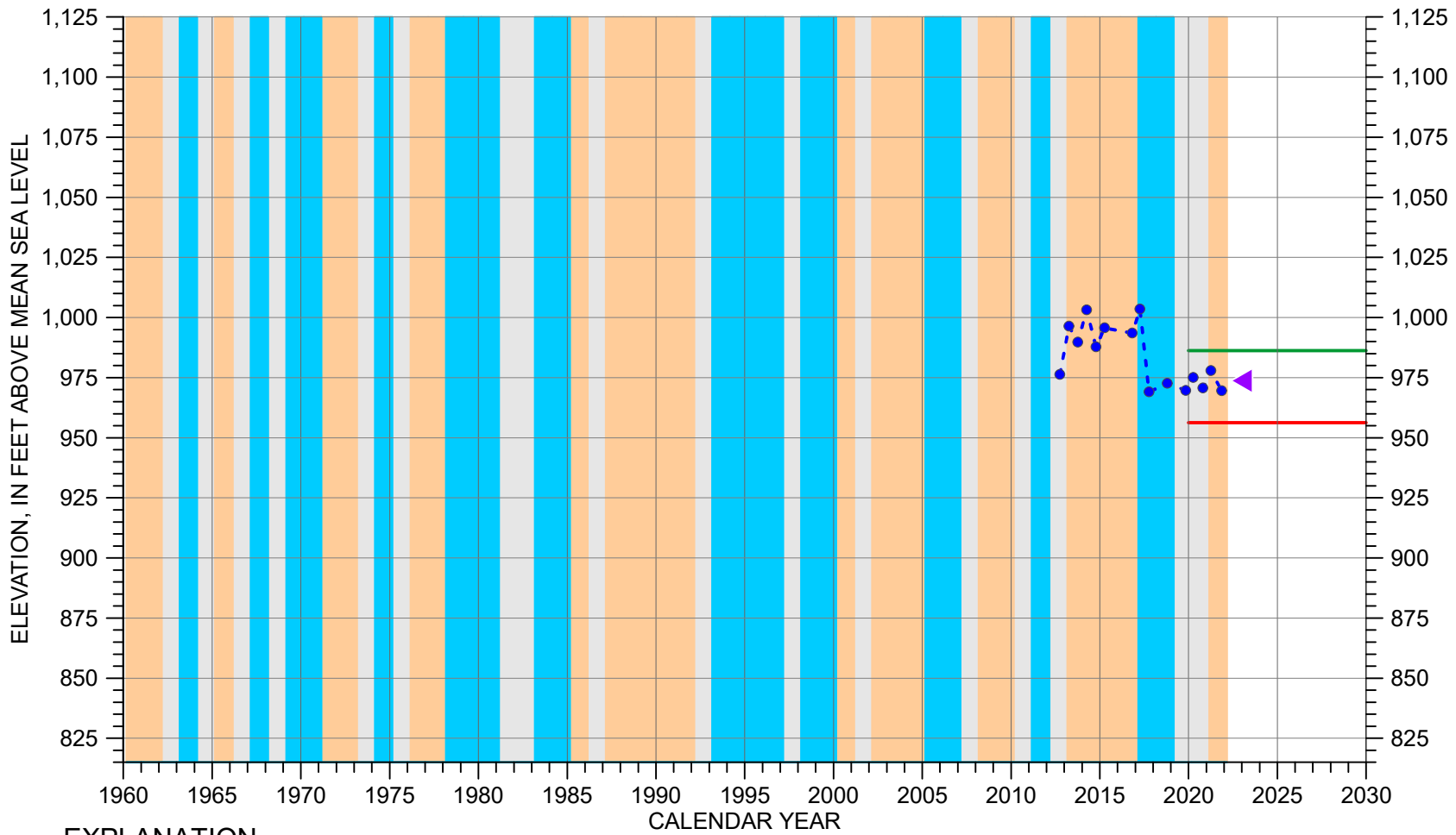
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

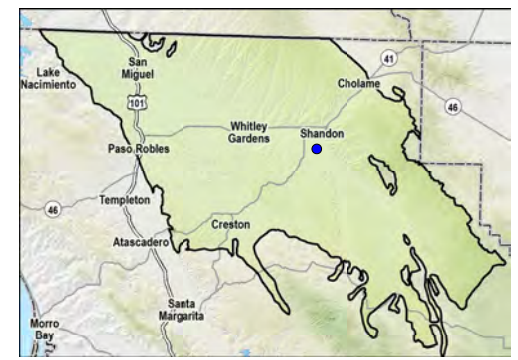
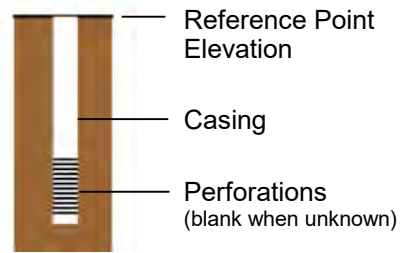
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

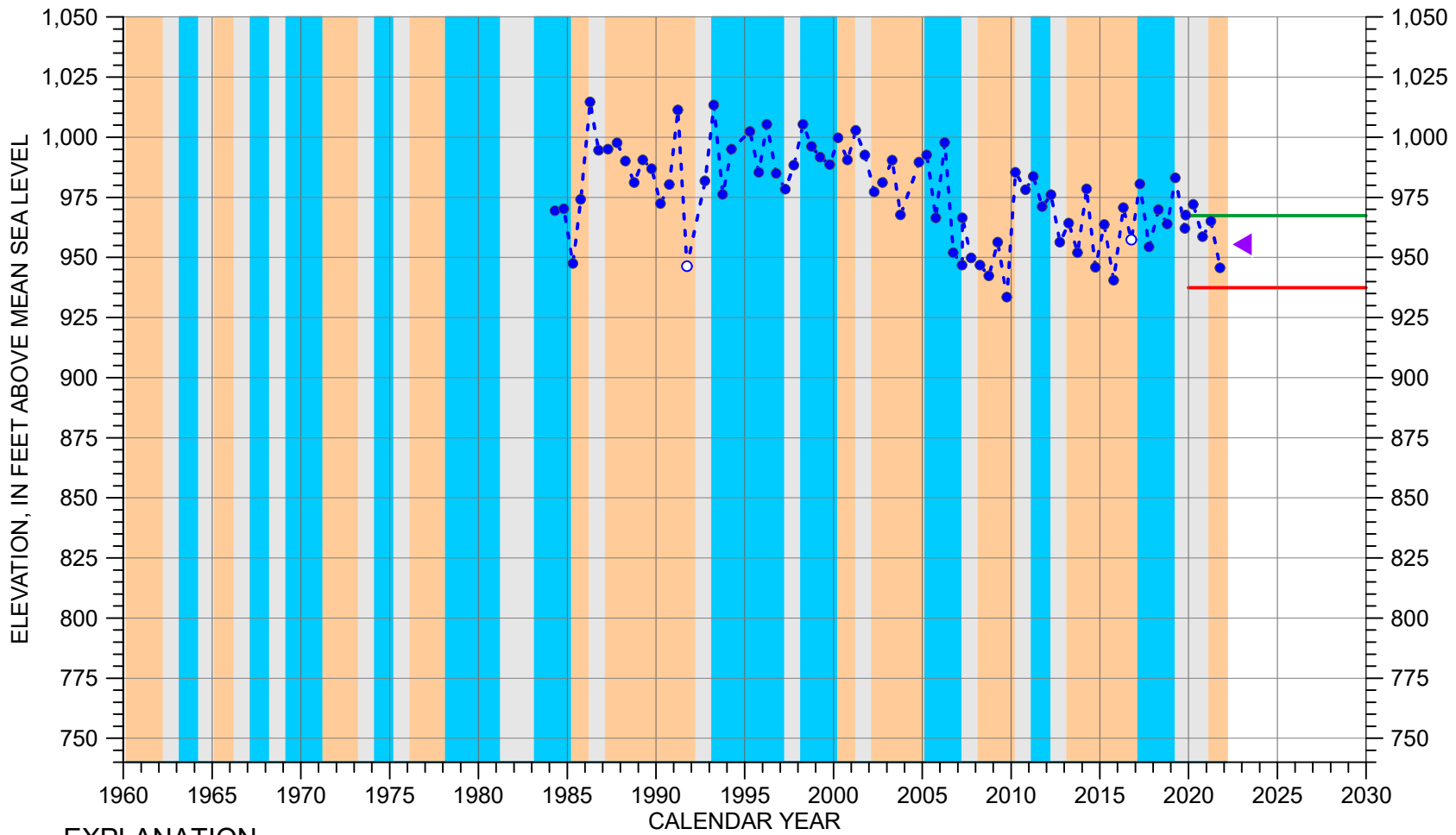
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

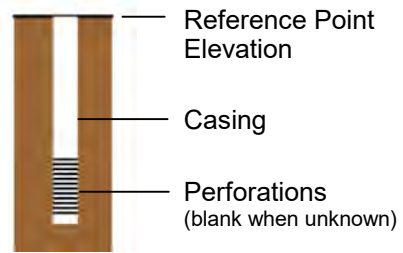
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

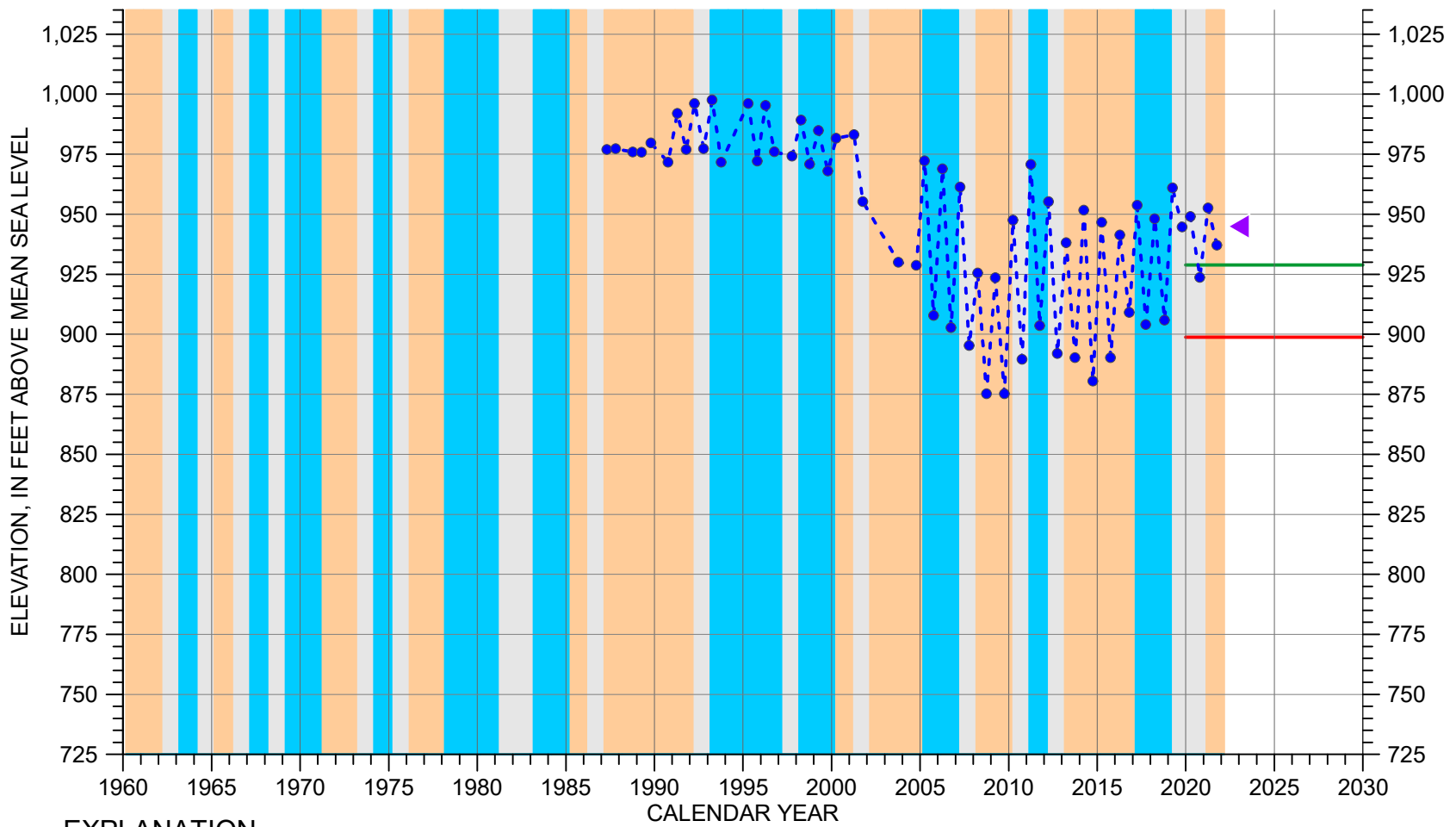
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

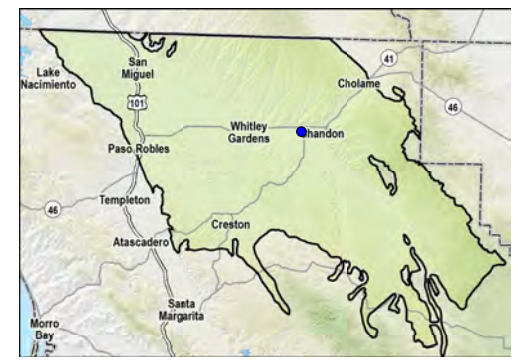
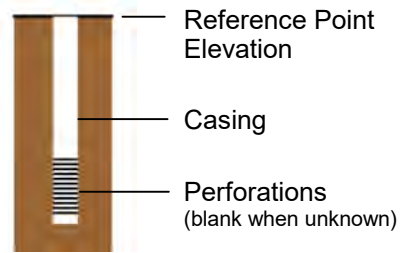
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

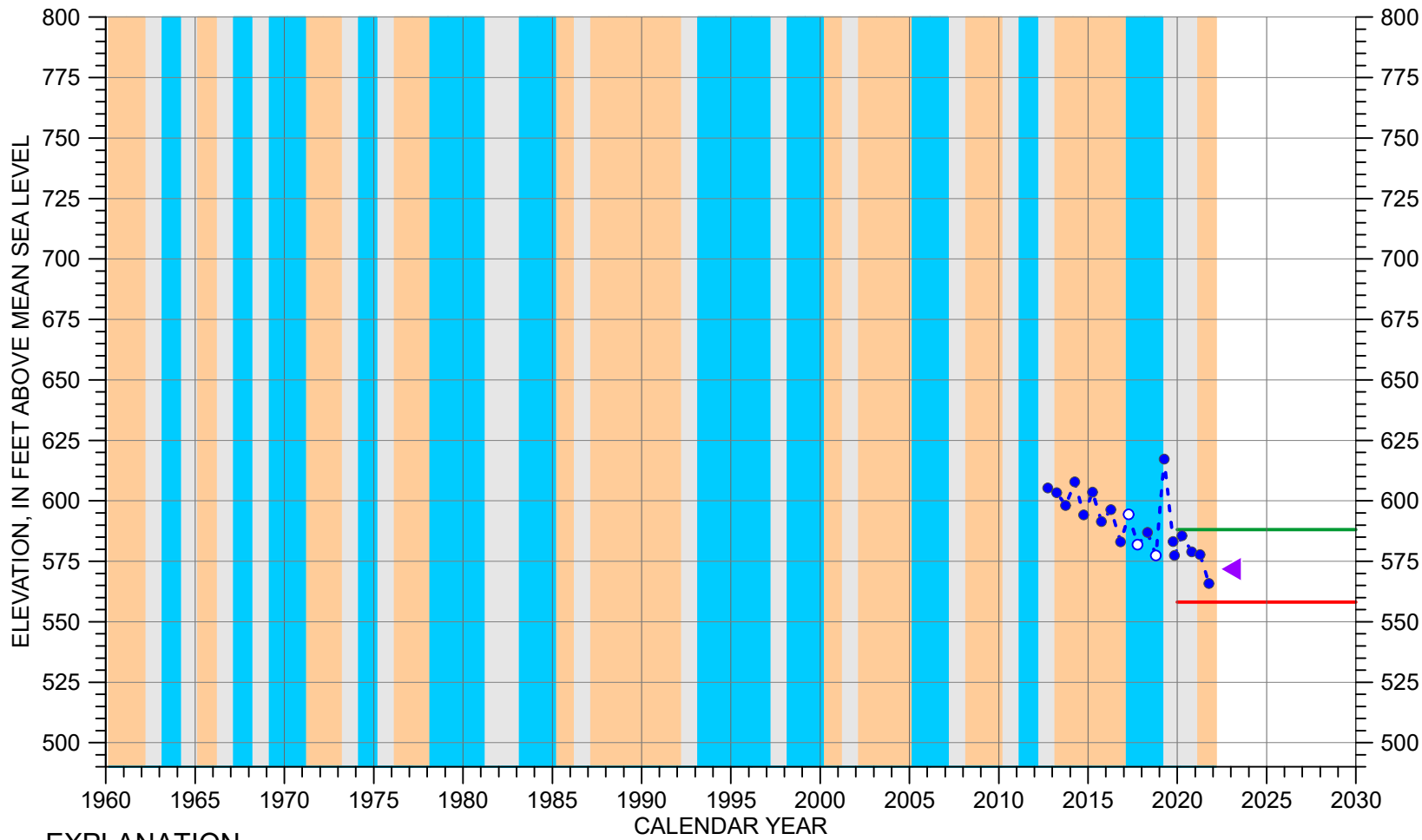
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

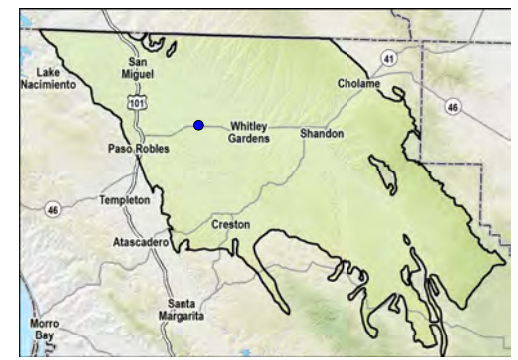
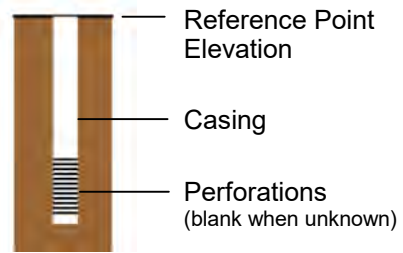
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

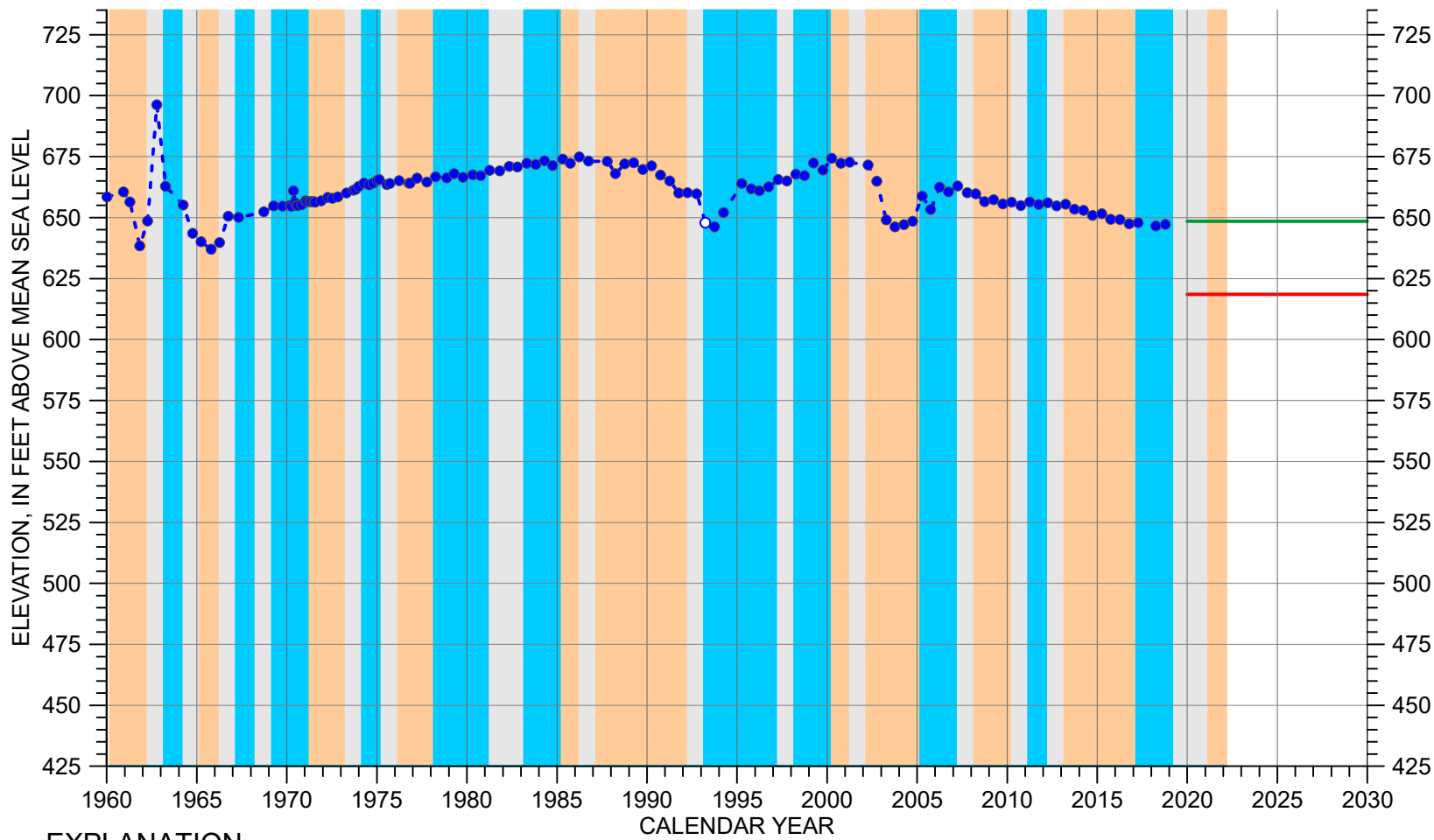
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

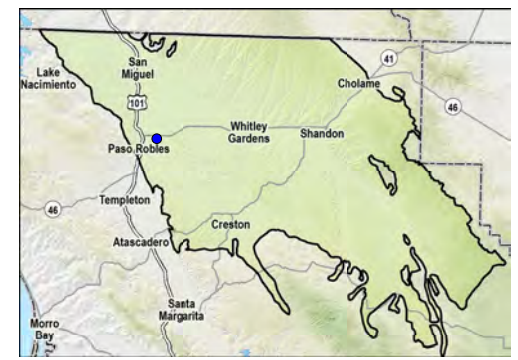
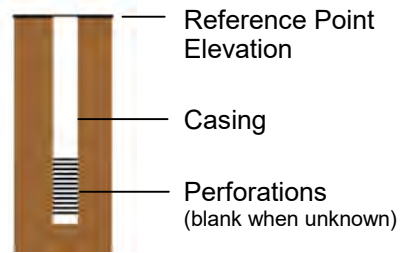
- Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold

**CLIMATE PERIOD CLASSIFICATION**

- Dry
- Avg/Alternating
- Wet

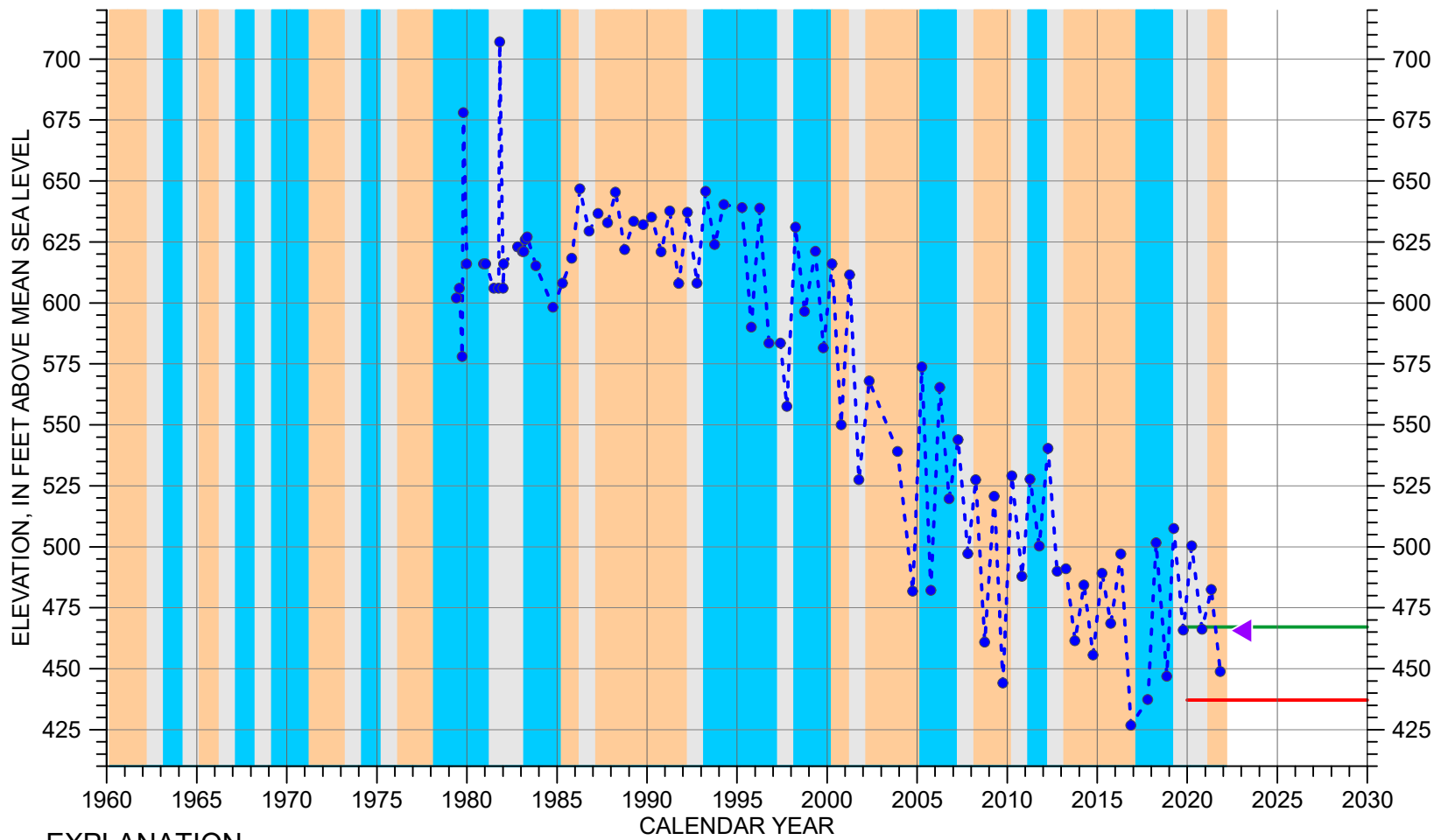
Well Depth: 400 feet  
 Screened Interval: unknown  
 Reference Point Elevation: 835 feet above mean sea level

\* Measurement reported as not static



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





**EXPLANATION**

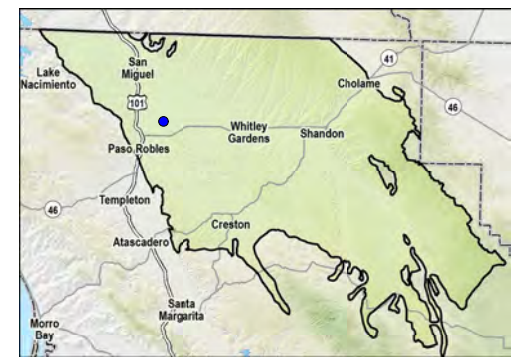
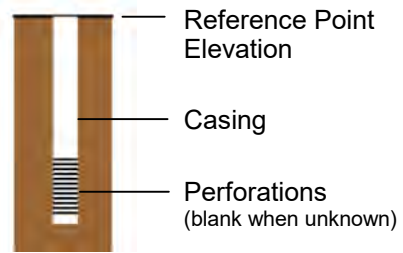
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

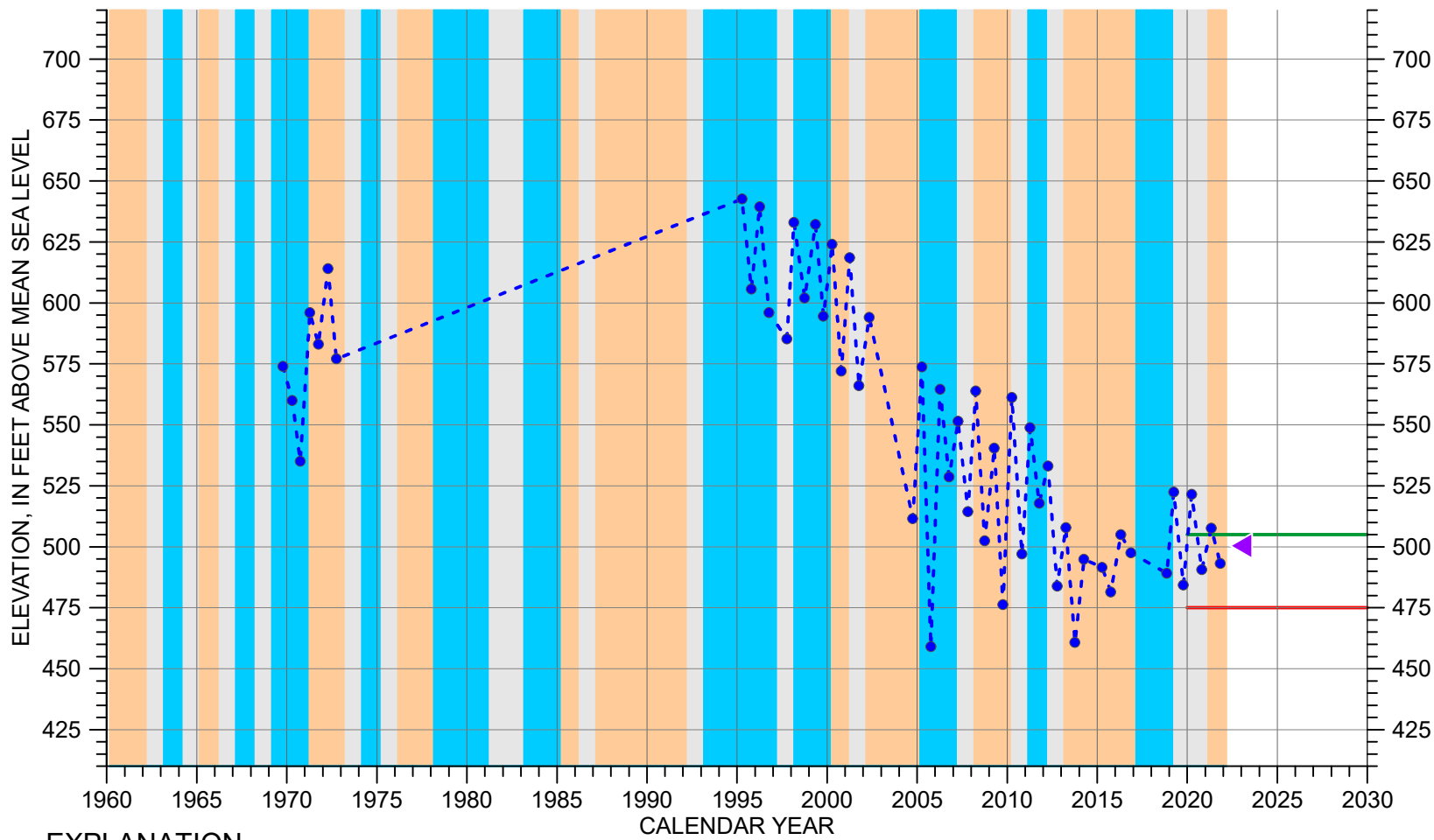
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

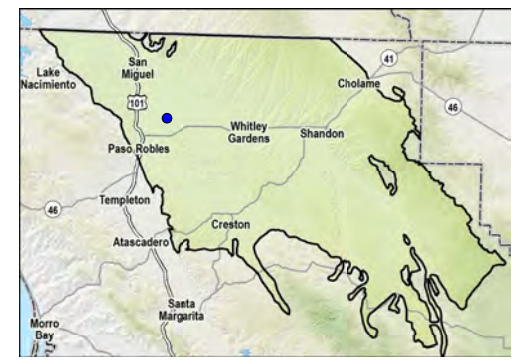
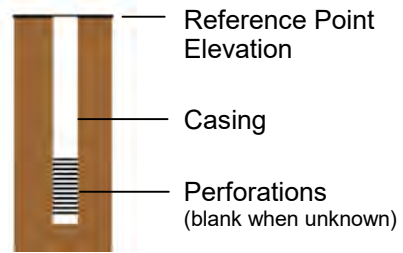
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

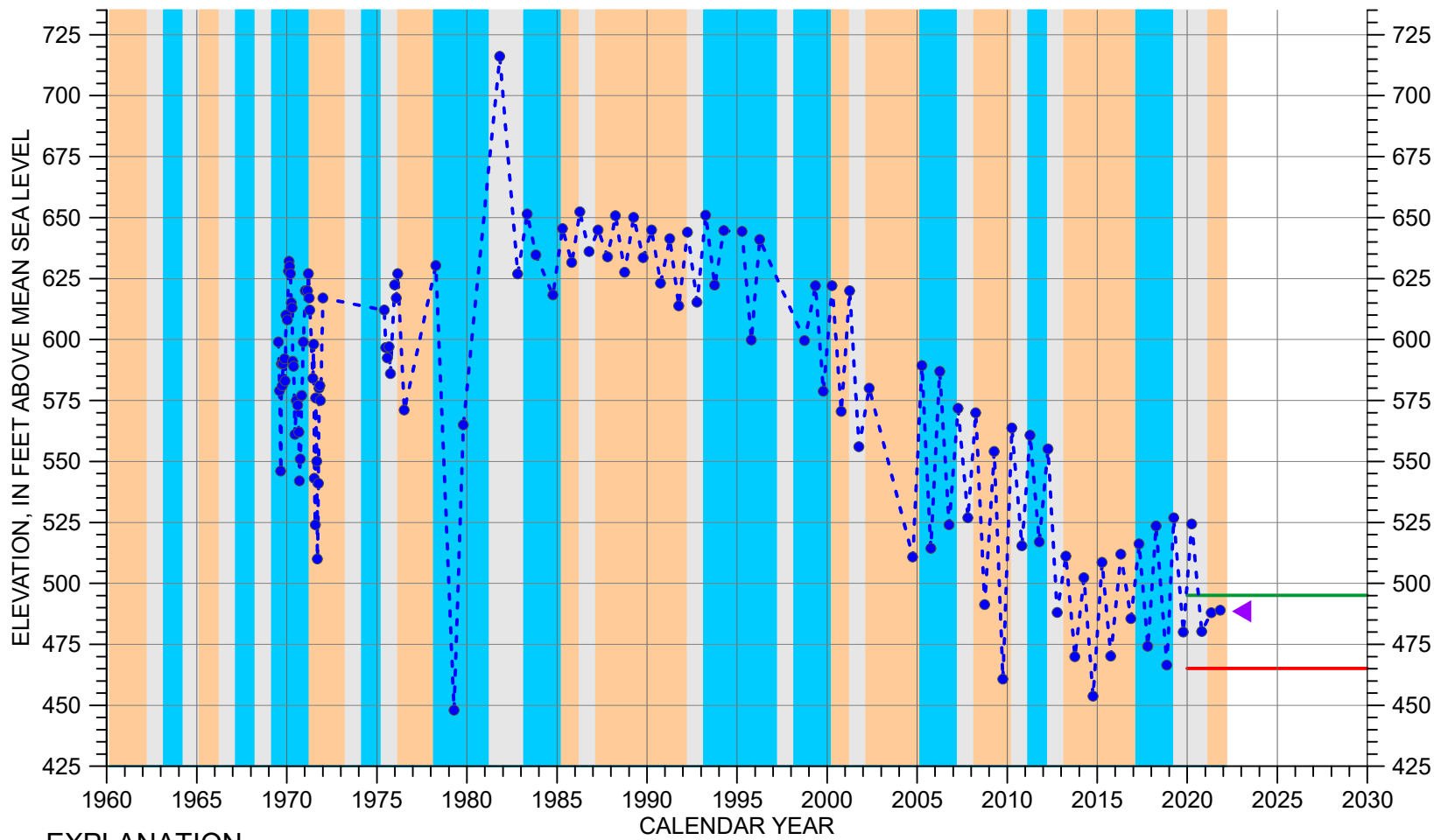
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

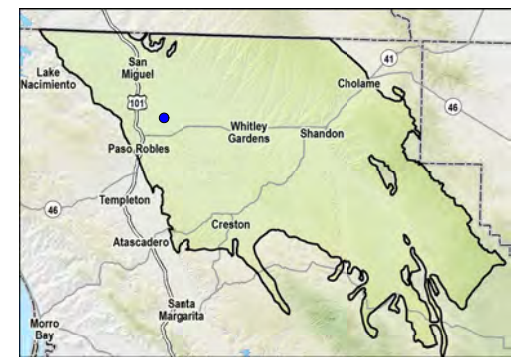
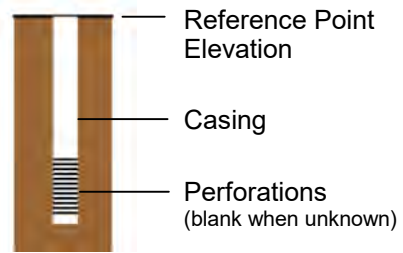
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

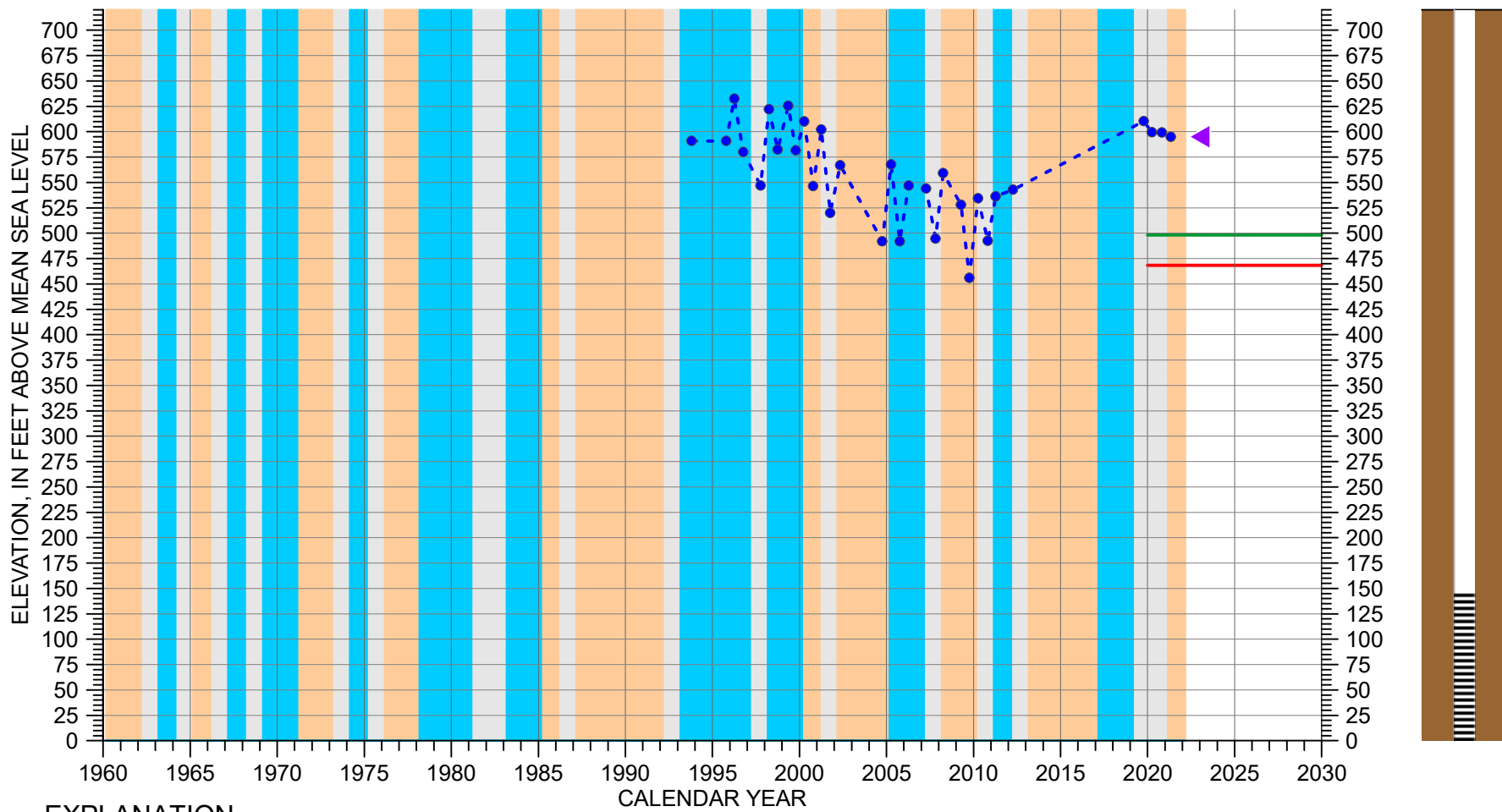
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

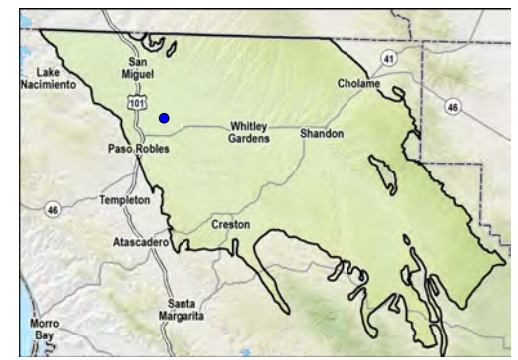
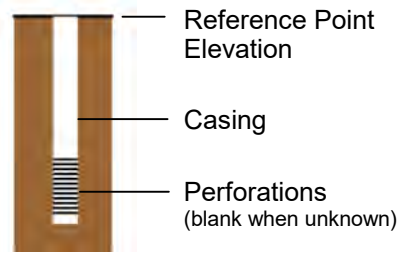
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

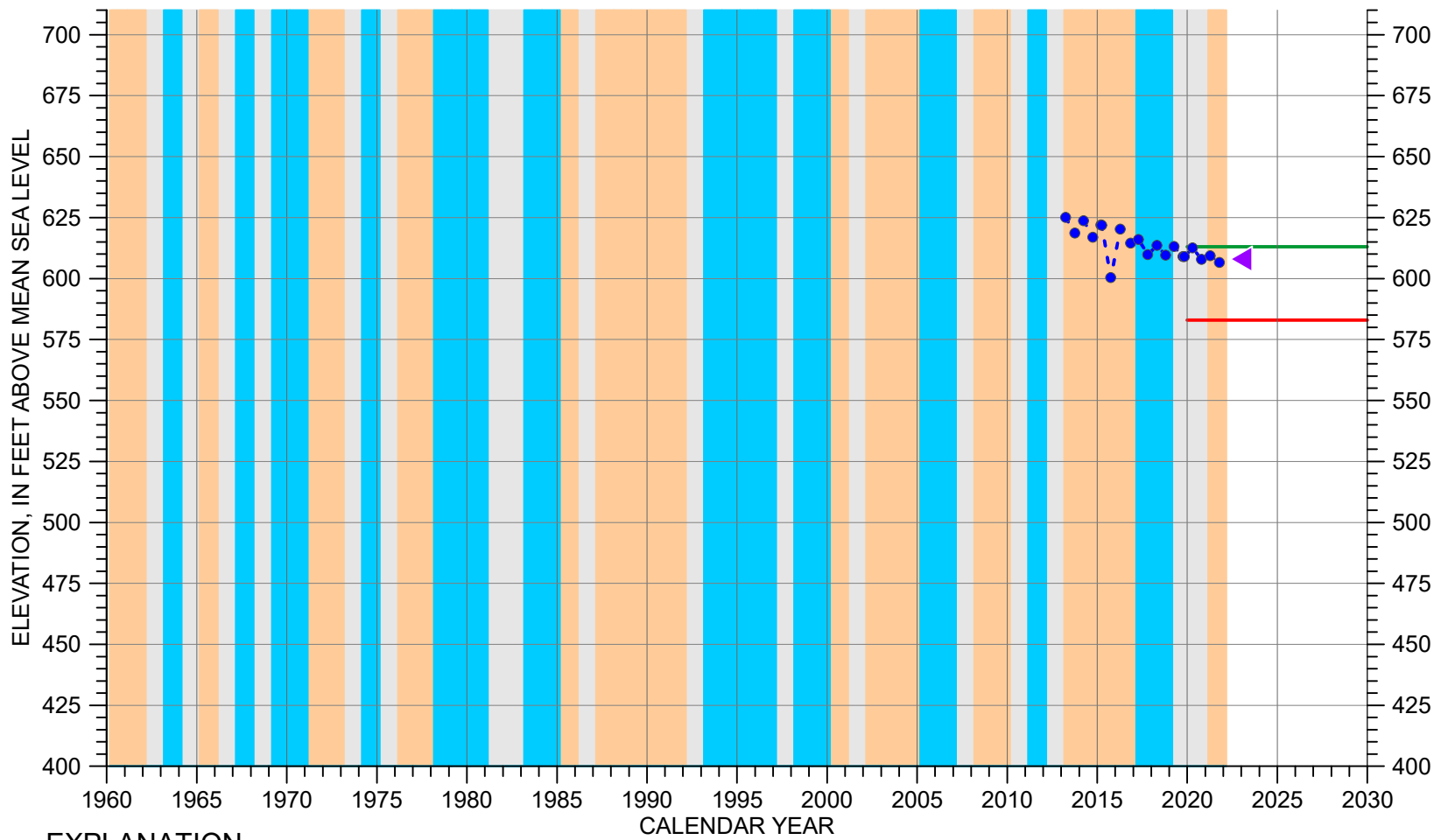
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

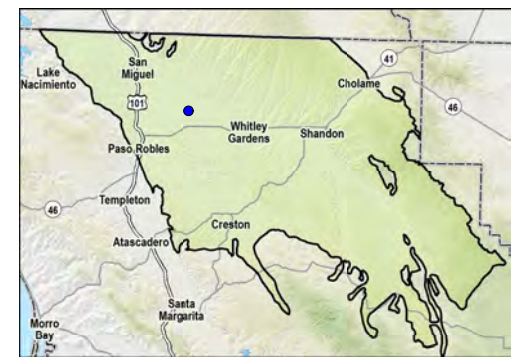
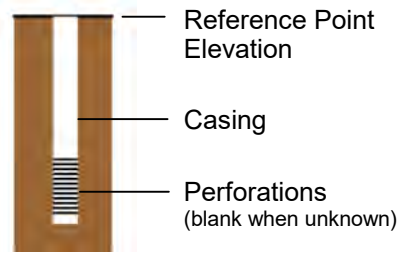
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

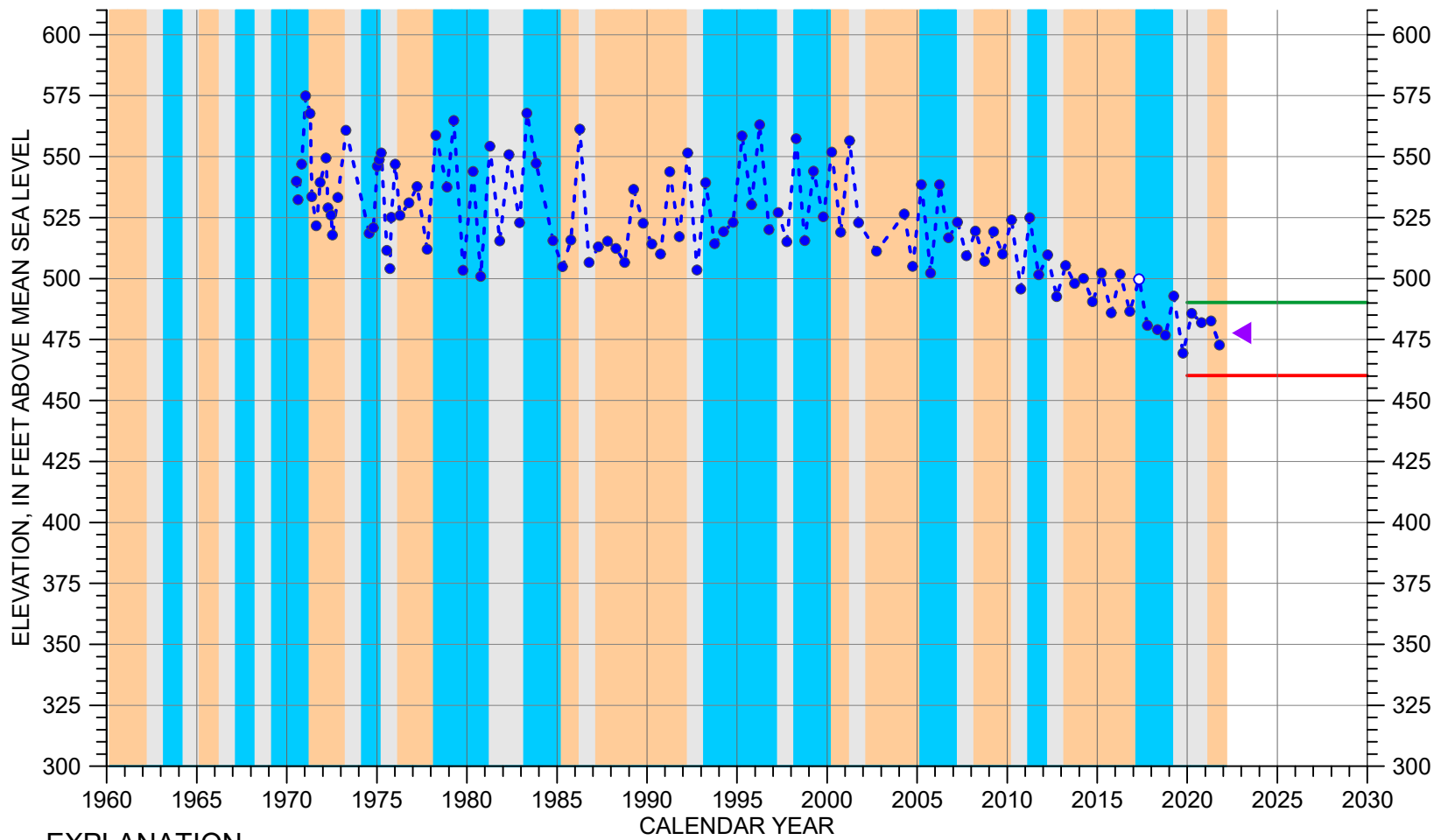
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

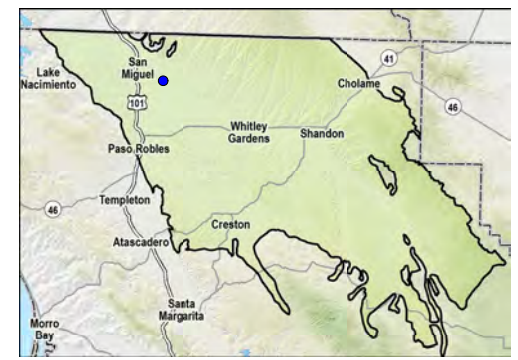
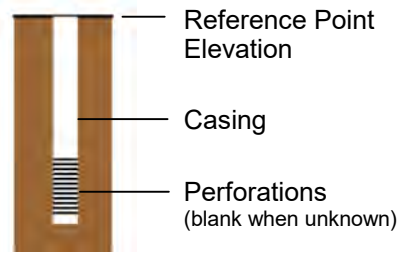
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

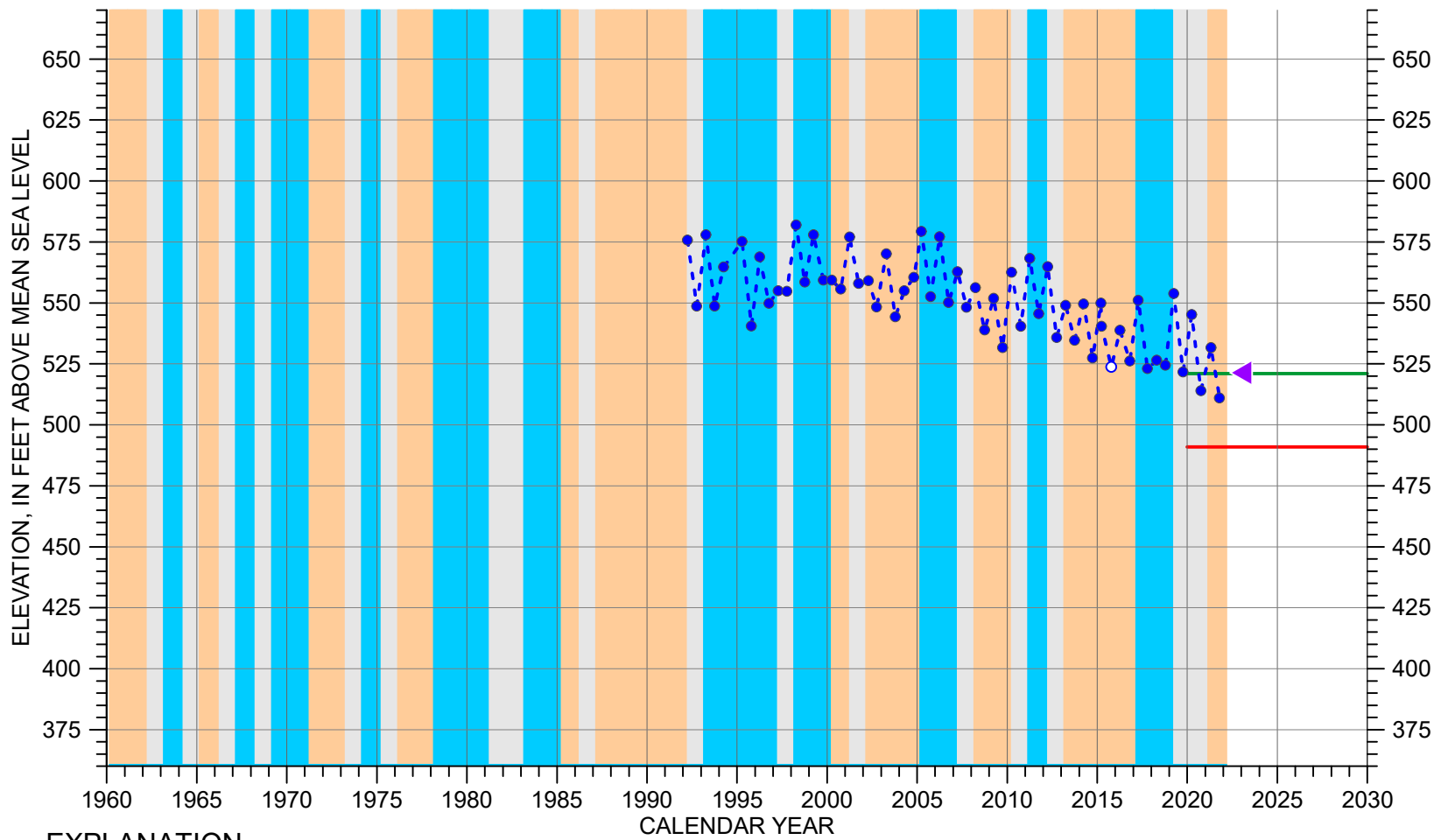
- Dry
- Avg/Alternating
- Wet

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**



**EXPLANATION**

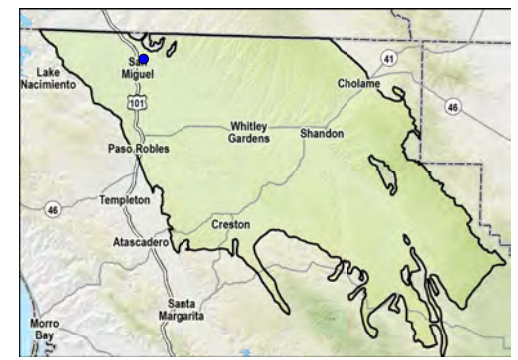
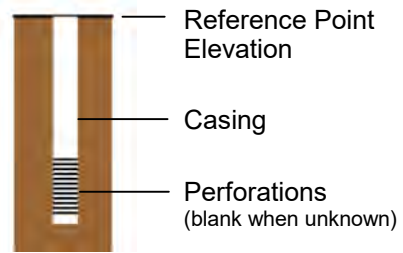
- - - ● - Groundwater Elevation
- - Measurement Not Verified\*
- (green) - Measurable Objective
- (red) - Minimum Threshold
- ▲ (purple) - Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

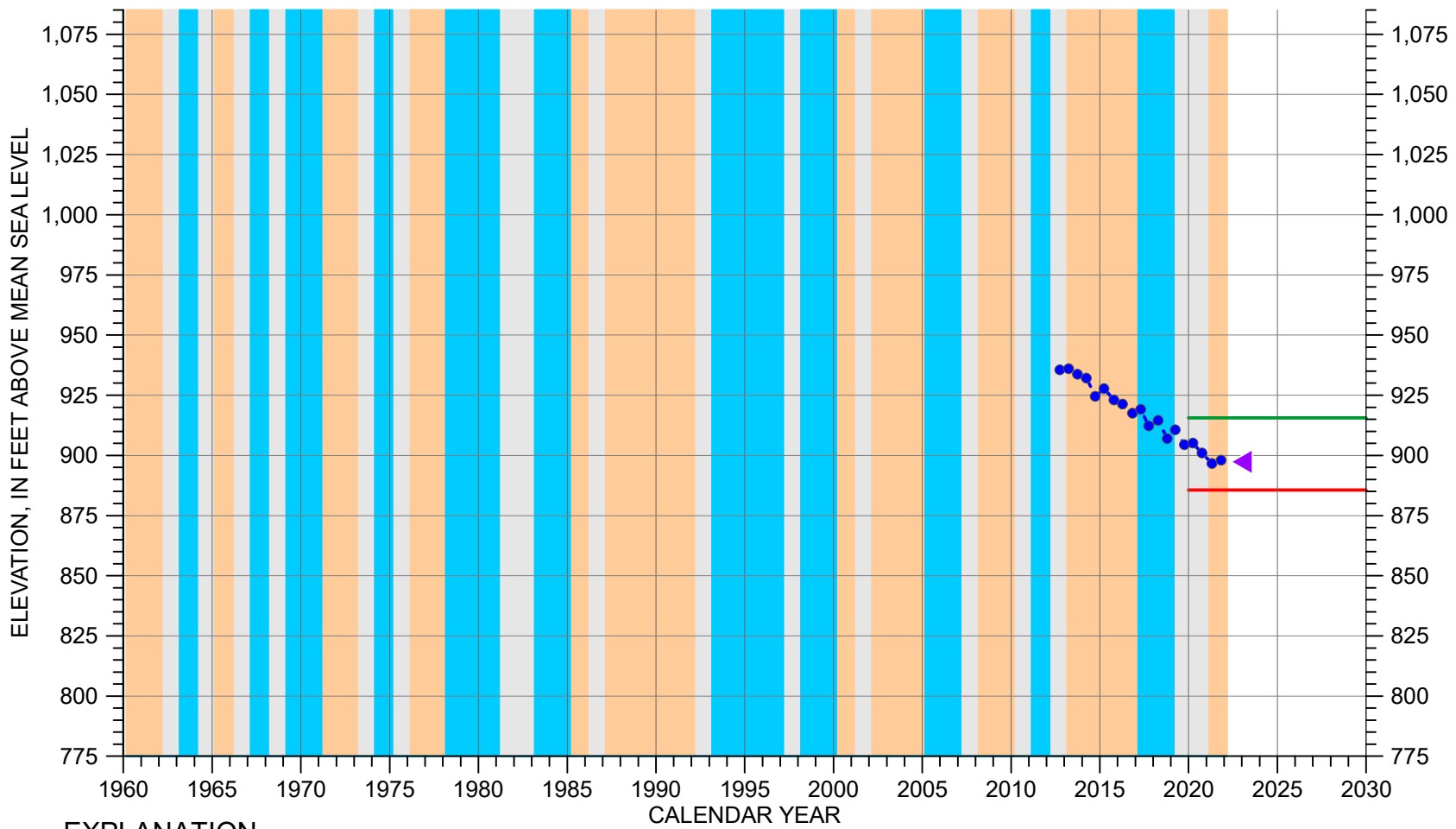
- (orange) - Dry
- (grey) - Avg/Alternating
- (blue) - Wet

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**



**EXPLANATION**

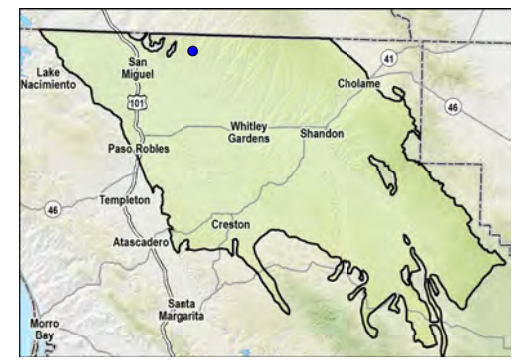
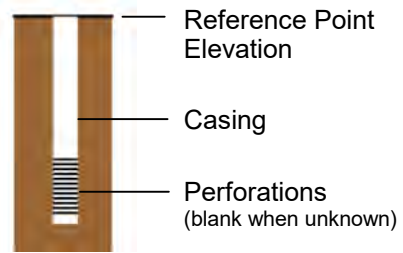
- Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

- Dry
- Avg/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

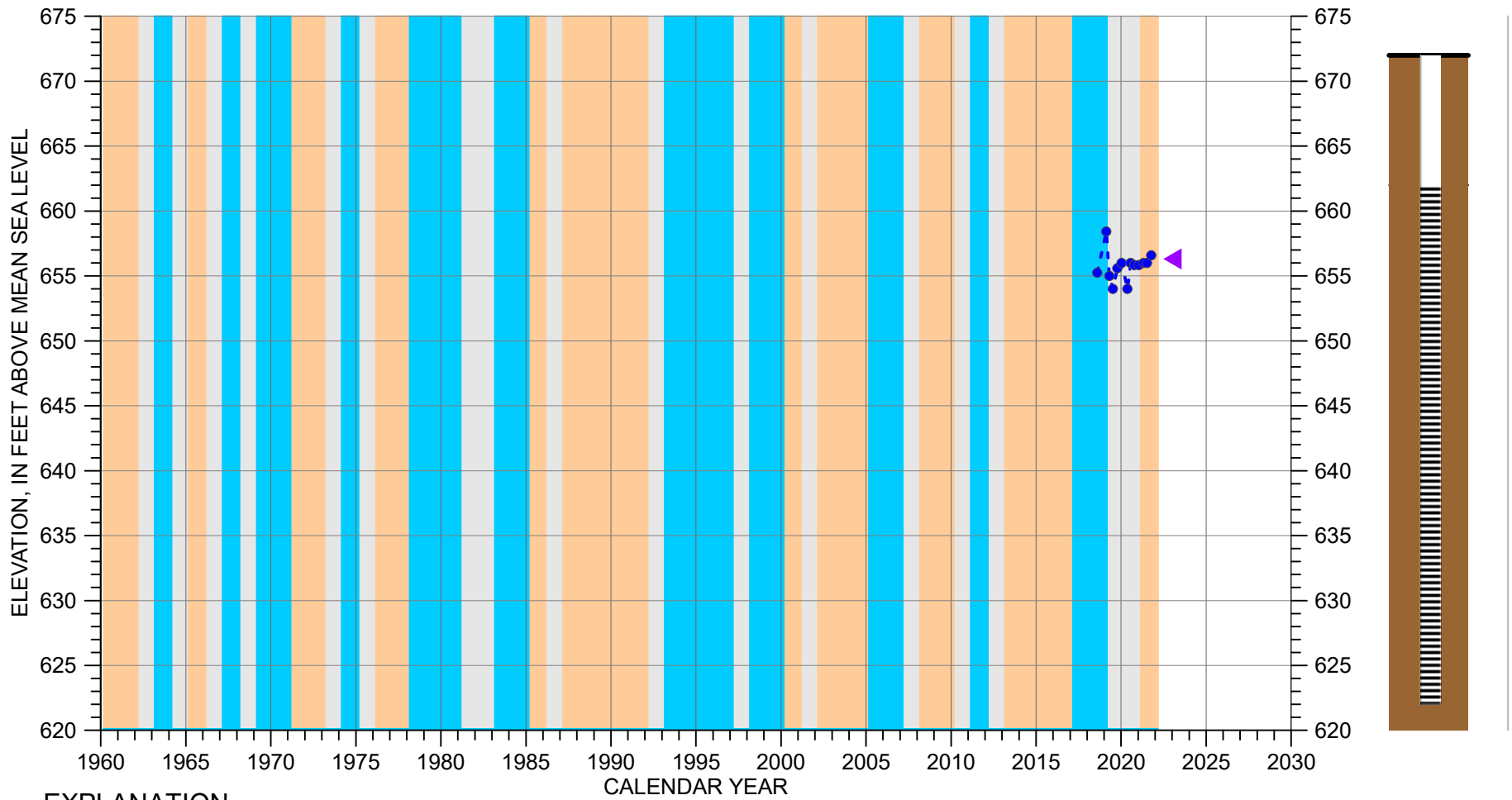


**HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 25S/13E-08L02**



## Alluvial Aquifer Hydrographs

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**EXPLANATION**

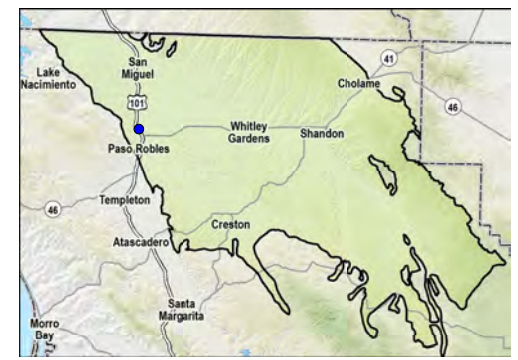
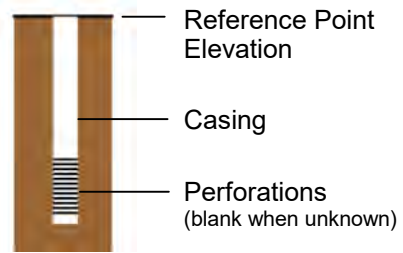
- - - ● Groundwater Elevation
- Measurement Not Verified\*
- Measurable Objective
- Minimum Threshold
- ▲ Average of spring and fall 2021 water elevations

**CLIMATE PERIOD CLASSIFICATION**

- Dry
- Avg/Alternating
- Wet

Well Depth: 50 feet  
 Screened Interval: 10-50 feet below ground surface  
 Reference Point Elevation: 672 feet above mean sea level

\* Measurement reported as not static



**HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 18MW-0191**

APPENDIX F

**Paso Robles Formation Aquifer Storage Coefficient  
Derivation and Sensitivity Analysis (GSI, 2020)**

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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:

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

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

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

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		51,943		60,106	68,269		76,432		
2018	86,885	4,660	-27%	5,529	-14%	6,398	7,267	14%	8,135	27%	
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

APPENDIX G  
**San Luis Obispo County**  
**Ordinance 3456**

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ORDINANCE NO. 3456

AN ORDINANCE AMENDING TITLE 22 OF THE SAN LUIS OBISPO COUNTY CODE,  
THE LAND USE ORDINANCE, BY AMENDING SECTION 22.30.204  
AGRICULTURAL OFFSET REQUIREMENTS TO EXTEND THE TERMINATION DATE  
AND CHANGE TABLE GRAPES WATER DUTY FACTOR

The Board of Supervisors of the County of San Luis Obispo, State of California, does ordain as follows:

SECTION I: That Section 22.30.204 of Title 22 of the San Luis Obispo County Code be amended as follows:

**Chapter 22.30.204 – New or Expanded Irrigated Crop Production Using Water from the Paso Robles Groundwater Basin, Excluding the Atascadero Sub-basin.**

**Table 2 – Crop Group and Commodities Used for the Agricultural Demand Analysis**

Crop Group	Primary Commodities
Alfalfa	Alfalfa
Nursery	Christmas trees, miscellaneous nursery plants, flowers
Pasture	Miscellaneous grasses, mixed pastures
Citrus	Avocados, grapefruits, lemons, oranges, olives, kiwis, pomegranates (non-deciduous)
Deciduous	Apples, apricots, berries, peaches, nectarines, plums, figs, pistachios, persimmons, pears, quinces
Strawberries	Strawberries
Vegetables	Artichokes, beans, miscellaneous vegetables, mushrooms, onions, peas, peppers, tomatoes
CBD Hemp	Field Grown CBD Hemp
<del>Vineyard</del>	<del>Wine grapes, table grapes</del>
<u>Wine grapes</u>	<u>Wine grapes</u>
<u>Table grapes</u>	<u>Table grapes</u>

Supplementally Irrigated Dry Cropland*	Barley, wheat, oat, grain/forage hay, safflower
--	---

Source: Table 3 of the Agricultural Water Offset Program, Paso Robles Groundwater Basin, October 2014.

\*San Luis Obispo County General Plan Agriculture Element

**Table 3 – Existing Crop-Specific Applied Water by Crop Type**

<b>Crop Group</b>	<b>Applied Water (AF/Ac/Yr)</b>
Alfalfa	4.5
Citrus	2.3
Deciduous	3.5
Strawberries	2.3 <sup>(1)</sup>
Nursery	2.5
Pasture	4.8
Vegetables	1.9
CBD Hemp	1.5 <sup>(2)</sup>
<del>Vineyard</del> <u>Wine Grapes</u>	1.25 <sup>(1)</sup>
<u>Table Grapes</u>	<u>3.0</u> <sup>(4)</sup>
Supplementally Irrigated Dry Cropland	0.1 <sup>(3)</sup>

1. Information obtained from RCD Program, UCCE, UC Davis (Strawberries 2011 data)
2. Information obtained from UCCE, San Luis Obispo County Cooperative Extension, April 2019
3. Supplementally irrigated Dry Cropland application requirements outlined per Section G.3.C above.
4. Information obtained from UCCE, San Luis Obispo County Cooperative Extension, April 2021

Source: Table 9 of the Agricultural Water Offset Program, Paso Robles Groundwater Basin, October 2014.

**H. Termination.** The provisions of this section for the Paso Robles Groundwater Basin (excluding the Atascadero Sub-basin) shall expire on ~~January 1, 2022~~ August 31, 2022.

SECTION II: If any section, subsection, clause, phrase or portion of this ordinance is for any reason held to be invalid or unconstitutional by the decision of a court of competent jurisdiction, such decision shall not affect the validity or constitutionality of the remaining portion of this ordinance. The Board of Supervisors hereby declares that it would have passed this ordinance and each section, subsection, clause, phrase or portion thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses, phrases or portions be declared invalid or unconstitutional.

SECTION III: This ordinance shall take effect and be in full force and effect thirty (30) days after its passage and before the expiration of fifteen (15) days after passage of this ordinance, it shall be published once with the names of the members of the Board of Supervisors voting for and against the ordinance in a newspaper of general circulation published in the County of San Luis Obispo, State of California.

SECTION IV: An addendum to the Supplemental Environmental Impact Report (SEIR) (SCH 2014081056) certified for the Countywide Water Conservation Program in 2015 was prepared in accordance with the applicable provisions of the California Environmental Quality Act, Public Resources Code Section 21000 et. seq. for the proposed changes to the County Code Section 22.30.204.

SECTION V: In accordance with Government Code Section 25131, after reading the title of this Ordinance, further reading of the Ordinance in full is waived.

Partially recommended at a regular meeting of the San Luis Obispo County Planning Commission held on the 19th day of September, 2019, introduced at a regular meeting of the Board of Supervisors held on the 10<sup>th</sup> day of August, 2021, and passed and adopted by the Board of Supervisors of the County of San Luis Obispo, State of California, on the 24<sup>th</sup> day of August, 2021, by the following roll call to vote, to wit:

AYES: Supervisors John Peschong, Dawn Ortiz-Legg, Bruce S. Gibson, and  
Chairperson Lynn Compton

NOES: Supervisor Debbie Arnold

ABSENT: None

ABSTAINING: None

*Lynn Compton*

\_\_\_\_\_  
Lynn Compton  
Chairperson of the Board of Supervisors,  
County of San Luis Obispo, State of California

ATTEST:

WADE HORTON  
Ex-Officio Clerk of the Board of Supervisors,  
County of San Luis Obispo State of California

By: \_\_\_\_\_  
Deputy Clerk

\_\_\_\_\_

APPENDIX H  
**Installation Reports for Monitoring Wells  
and Stream Gages**

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MONITORING WELL CONSTRUCTION  
COMPLETION REPORT

PASO ROBLES SUPPLEMENTAL  
ENVIRONMENTAL PROJECT

PASO ROBLES AREA GROUNDWATER SUBBASIN  
SAN LUIS OBISPO COUNTY  
CALIFORNIA

June 2021

CLEATH-HARRIS GEOLOGISTS  
75 Zaca Lane, Suite 110  
San Luis Obispo, California 93401

(805) 543-1413



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3.0 DRILLING METHODS AND DESIGN CONSIDERATIONS .....	2
4.0 MONITORING WELL SITES .....	2
4.1 Site 1 – City of Paso Robles 13 <sup>th</sup> Street Bridge.....	2
4.2 Site 9 – Airport Road at Estrella Road .....	3
5.0 CONSTRUCTION SUMMARIES .....	4
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Site 1 – 13 <sup>th</sup> Street Shallow	
Site 1 – 13 <sup>th</sup> Street Intermediate	
Site 9 – Airport Road Shallow	
Site 9 – Airport Road Intermediate	





## 1.0 INTRODUCTION

In accordance with the approved scope of work for the City’s Supplemental Environmental Project to Install Monitoring Wells and Stream Gages on the Salinas River and Major Tributaries within the Paso Robles Groundwater Basin, and consistent with the Groundwater Sustainability Plan (GSP) adopted by the Groundwater Sustainability Agencies (GSAs) for the Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin<sup>1</sup>, four monitoring wells (two wells at each of two sites) have been constructed to help fill a data gap with respect to the interaction between surface water and groundwater in the basin. This report summarizes the drilling and construction activities of these four wells performed under the Paso Robles Supplemental Environmental Project (SEP).

## 2.0 BACKGROUND

The Paso Robles Area Groundwater Subbasin GSP identified a need to expand the network of stream gages and monitoring wells within alluvial deposits associated with the major drainages in the Subbasin. Per the recommendations set forth in the GSP, “*Definitive data delineating any interactions 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*”.

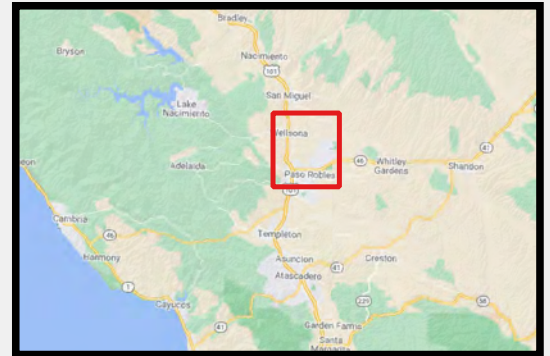
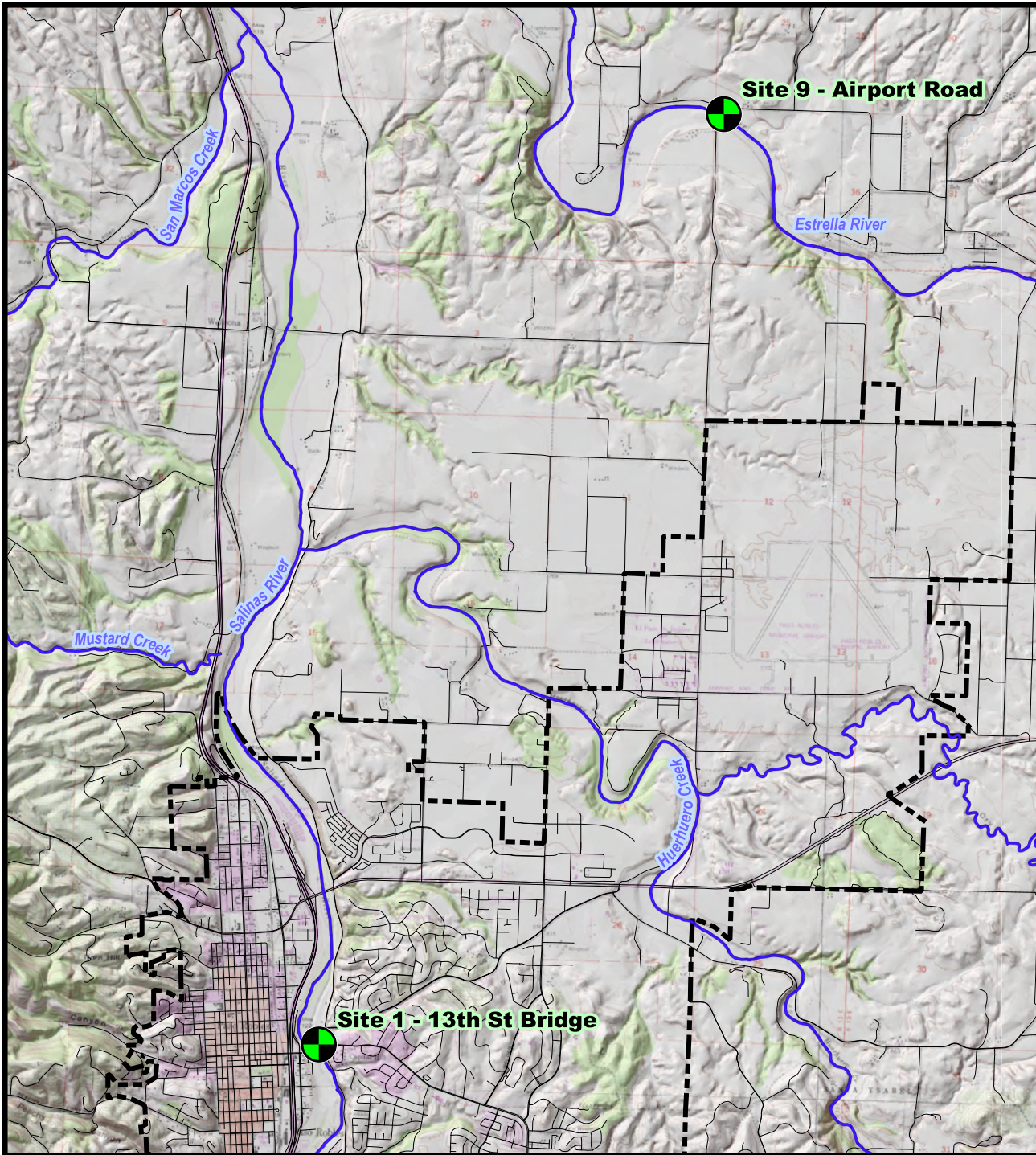
The SEP has expanded the network of both stream gages and adjacent monitoring wells in order to better assess the potential for interconnected surface water and groundwater across the Subbasin. Long-term plans included a minimum of three monitoring wells (paired or nested) at each existing and future stream gage site in the Subbasin<sup>2</sup>. A total of 10 potential sites were identified. One well would be completed within the alluvial aquifer, one completed a short distance below the base of the alluvial aquifer into the Paso Robles Formation, and, where applicable, at least one to be completed deeper into the Paso Robles Formation at elevations similar to production wells in the general vicinity of each individual site.

Prior to implementation of the SEP, there were two existing stream gages, one on the Salinas River at the 13<sup>th</sup> Street Bridge in the City of Paso Robles (City), and the other on the Estrella River at Airport Road in the unincorporated County area (Figure 1). The monitoring wells installed as part of the SEP were placed in the vicinity of these two stream gage sites to provide the interconnected surface water evaluation capability that would help fill the data gaps.

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<sup>1</sup> Montgomery & Associates, 2020, Paso Robles Subbasin Groundwater Sustainability Plan dated January 31, 2020.

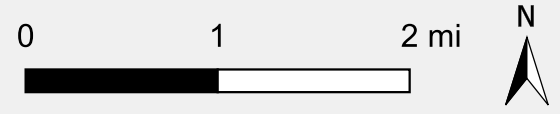
<sup>2</sup> SEP Grant Proposal *in* City of Paso Robles Request for Proposal dated April 7, 2020.



**Explanation**

 Paso Robles City Limits

 Monitoring Well Site



**Figure 1**  
**Site Overview**

**Monitoring Well Construction Report**

**Paso Robles Groundwater Basin**  
**Supplemental Environmental Project**

**City of Paso Robles**

**Cleath-Harris Geologists**



### 3.0 DRILLING METHODS AND DESIGN CONSIDERATIONS

Well siting and preliminary designs were described in a prior Work Plan<sup>3</sup>. For siting and design purposes, SEP monitoring wells were classified as Shallow, Intermediate, or Deep. Shallow wells would be used to monitor water levels and water quality in the alluvial deposits, Intermediate wells are those completed in the Paso Robles Formation aquifers immediately below the alluvial deposits, and Deep wells are those completed at greater depth in the Paso Robles Formation aquifers used locally for water supply. A Shallow and Intermediate well have been constructed at each of the two existing stream gage sites. A Deep well was not recommended at Site 1 (13<sup>th</sup> Street Bridge) due to the geothermal potential at depths below the Intermediate well. A deeper well at this location would not benefit investigating potentially interconnected surface waters. Construction of a Deep well at the Airport Road site, or identification of an existing Deep well that could be formally monitored by the GSAs, is recommended for a subsequent SEP phase. A Deep well could not be constructed at the Airport Road site due to SEP funding limitations.

The Shallow (alluvial) wells were constructed using hollow stem auger (HSA) drilling, while the Intermediate wells were constructed using sonic drilling. HSA requires less space than other methods, which was important at the 13<sup>th</sup> Street Bridge Shallow well site. Sonic has greater depth capability than HSA, and was better suited for the Intermediate wells. Both methods avoid the use of drilling mud and provide useful depth to water information during drilling. Deep wells would have been beyond the depth capacity of either method. Wellhead completions consisted of a 12-inch diameter, traffic-rated and water-tight monitoring well box with cement apron.

### 4.0 MONITORING WELL SITES

Monitoring wells are near the existing stream gages on the Salinas River (Site 1) and the Estrella River (Site 9), as shown Figure 1. The site numbers originate from a list of 10 sites that were previously identified as locations where stream gage and monitoring well pairs would help fill the data gap related to surface water and groundwater interaction in the subbasin<sup>4</sup>. Brief descriptions of the hydrogeologic setting are presented below.

#### 4.1 Site 1 – City of Paso Robles 13<sup>th</sup> Street Bridge

The 13th Street Bridge in the City of Paso Robles is near the eastern edge of the Subbasin and within an area of geothermal (hot water) resource potential. Geologic cross-sections from DWR<sup>5</sup>,

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<sup>3</sup>CHG, 2020, Monitoring Well Siting Work Plan dated November 10, 2020

<sup>4</sup>Monsoon Consultants, 2019. Figure 1 - Paso Robles Groundwater Basin - Proposed Monitoring Sites, Paso Robles GSP Data Gap Assessment dated September 6, 2019.

<sup>5</sup>DWR, 1981, Water Quality on the Paso Robles Are, Southern District Memorandum Report, June 1981.



along with Subbasin GSP Figure 4-2 (Base of Subbasin as Defined by the Base of the Paso Robles Formation) indicate the Subbasin is several hundred feet thick beneath the 13<sup>th</sup> Street Bridge, although reference logs of test borings at the bridge site appear to document hard shale immediately beneath the alluvial deposits. A drillers log from a well (26S/12E-33B1) at the old City yard on the east side of the bridge reported mostly shale beginning at 60 feet depth through 400 feet depth, with 1 gallon per minute (gpm) of artesian flow (“sulphurous water”). Several hot water wells are reported within a few thousand feet southwest of the bridge, the closest of which (26S/12E-33F) reported an artesian flow of 347 gpm with a surface temperature of 105 degrees Fahrenheit (well depth was 230 feet)<sup>6</sup>. A geothermal survey also showed higher than normal soil-air temperatures on the west side of the 13<sup>th</sup> Street Bridge<sup>7</sup>. Historical well records indicate shallow (alluvial) wells along North River Road near the 13<sup>th</sup> Street Bridge, with Paso Robles Formation logged in wells along Union Road (formerly Paso Robles Boulevard) to the east and Niblick Road to the southeast.

Considering the above indications of shallow bedrock at Site 1 and geothermal activity west and southwest of the bridge, only two monitoring wells were proposed, a Shallow and Intermediate well. Deep well construction is not recommended at this site given the geothermal resource potential.

Two SEP monitoring wells were completed at Site 1, a Shallow well and an Intermediate well. The Shallow well is located on City property alongside the San Juan Bautista bike trail, on the East bank of the Salinas River near the 13<sup>th</sup> Street Bridge (Figure 2). Ground elevation is approximately 695 feet above sea level. The target aquifer for this well was the alluvium of the Salinas River. Due to the limited access for drilling along the bike path (only HSA drilling was feasible), the Intermediate well was completed on City property northeast of the intersection of Creston and River Roads (Figure 2). Ground elevation is approximately 723 feet above sea level, and the target aquifer was the upper Paso Robles Formation.

## 4.2 Site 9 – Airport Road at Estrella Road

The Airport Road sites are immediately east of a paved crossing of the Estrella River approximately 5 miles north of the intersection of Airport Road and Highway 46, and 3 miles north of the Paso Robles Municipal Airport. Geologic cross-sections from Fugro<sup>8</sup>, along with Subbasin GSP Figure 4-2 (Base of Subbasin as Defined by the Base of the Paso Robles Formation) and an oil well log in the vicinity (3,000 feet south of crossing) indicate the Subbasin is 1,800-2,700 feet

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<sup>6</sup>California Division of Mines and Geology, 1983, Resource investigation of Low- and Moderate-Temperature Geothermal Areas in Paso Robles, California, Open File Report 83-11.

<sup>7</sup>GSI/Water, 1983, Geothermal Resource Assessment of the Paso Robles Area, September 1983.

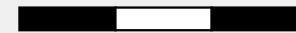
<sup>8</sup>Fugro West and Cleath & Associates, 2002, Paso Robles Groundwater Basin Study, August 2002.



**Explanation**

 Well Locations

0 60 120 180 ft



**Figure 2**  
**Well Site Locations**  
**Site 1 - 13th Street Bridge**

**Monitoring Well Construction Report**

**Paso Robles Groundwater Basin**  
**Supplemental Environmental Project**

**City of Paso Robles**

**Cleath-Harris Geologists**



thick beneath the site vicinity. Wells in the site vicinity are up to 890 feet deep and tap aquifers in both the Intermediate and Deep zones targeted for monitoring.

Two monitoring wells have been completed at Site 9, a Shallow well and an Intermediate well. The two wells are located within an easement for City use on Hammond Vineyards property on the north side of the Estrella River (Figure 3). As previously mentioned, the Deep well has been deferred for completion under another project phase.

The Shallow and Intermediate wells are located adjacent to the Estrella River (Figure 3). Ground elevation is approximately 681 feet above sea level. The target aquifer for the Shallow well was the alluvium of the Estrella River. The Intermediate well is approximately 80 feet to the northeast of the Shallow well (Figure 3), with the target aquifer being the upper Paso Robles Formation.

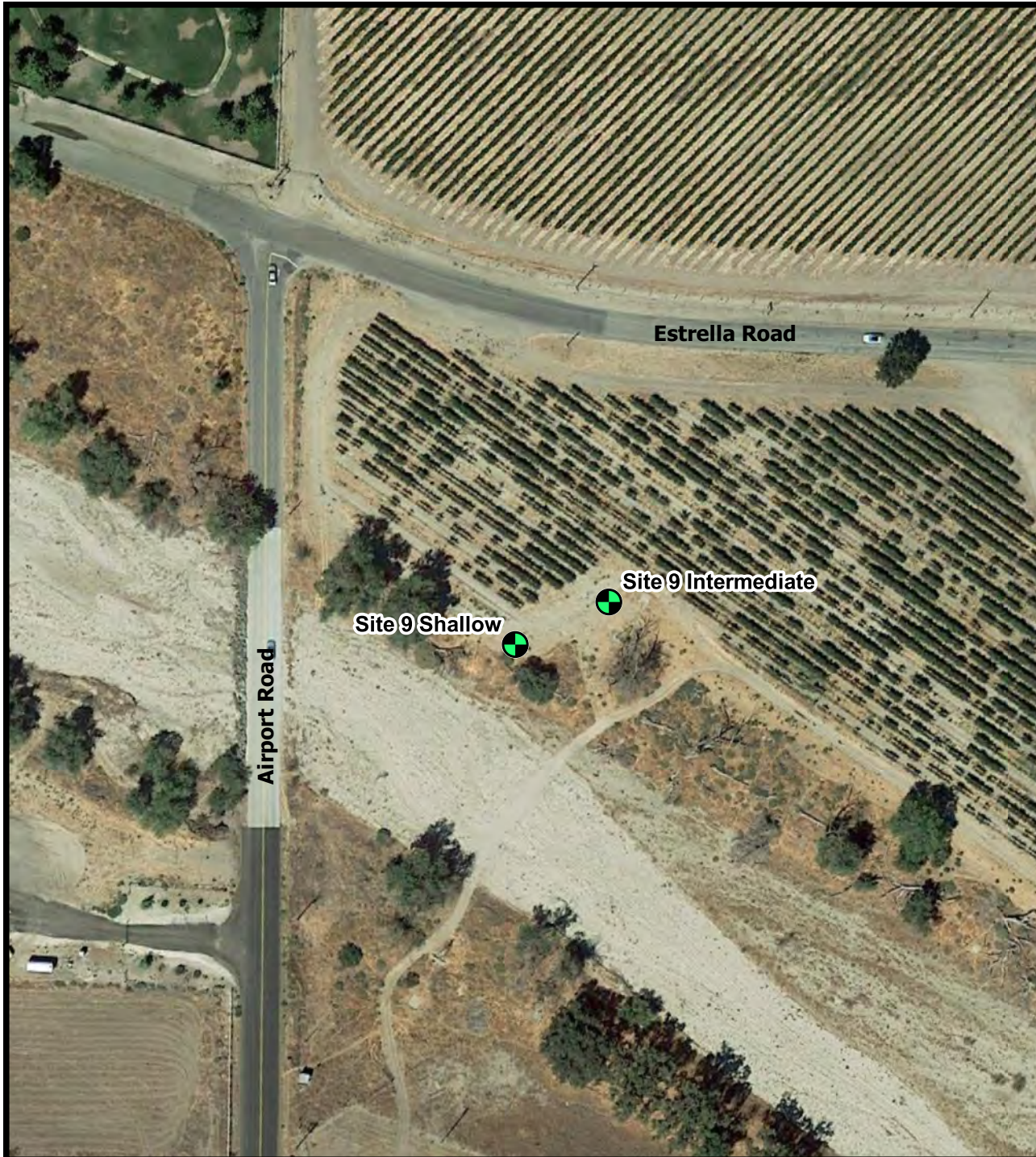
## 5.0 CONSTRUCTION SUMMARIES

The Shallow wells were completed by S/G Drilling on December 7 and 14, 2020, at Site 1 (13<sup>th</sup> Street Bridge) and on March 23-24 at Site 9 (Airport Road). The Intermediate wells were completed by ABC Liovin Drilling on March 15-18 at Site 1 and March 18-20 at Site 9. All four wells were cased with 4-inch Schedule 40 PVC and set within 12-inch monitoring well vaults at ground surface.


Construction summaries of the wells are provided in Table 1. Well Completion Reports, lithologic logs, and construction diagrams are presented in the Appendix.

Based on the results of SEP drilling, the Salinas River alluvium is interpreted to extend to a depth of 53 feet at the 13<sup>th</sup> Street Bridge Shallow well site, and is underlain by Paso Robles Formation clay (not hard shale). The Shallow well was completed to a depth of 55 feet. Drilling at the 13<sup>th</sup> Street Bridge Intermediate well site penetrated Paso Robles Formation sediments, and was completed to a depth of 140 feet. When adjusted for surface elevation, the Intermediate well taps the upper Paso Robles Formation beginning at an elevation of approximately 30 feet below the base of the Salinas River alluvium. The groundwater elevations are similar between the Shallow and Intermediate wells (Table 1).

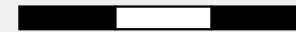
Based on the results of SEP drilling, the Estrella River alluvium is interpreted to extend to a depth of 30-34 feet at the Airport Road Shallow and Intermediate well sites, and is underlain by Paso Robles Formation sands, clays, and gravels. The Shallow well was completed to a depth of 40 feet, while the Intermediate well was completed to a depth of 240 feet. Groundwater elevations are substantially different between the alluvium and upper Paso Robles Formation aquifers, with the water level in the Paso Robles Formation 158 feet deeper than the alluvial water level (Table 1).



**Explanation**

 Well Locations

0 60 120 180 ft



**Figure 3**  
**Well Site Locations**  
**Site 9 - Airport and Estrella**

**Monitoring Well Construction Report**

**Paso Robles Groundwater Basin**  
**Supplemental Environmental Project**

**City of Paso Robles**

**Cleath-Harris Geologists**



**Table 1  
Monitoring Well Construction Summaries**

Description	Site 1 – 13 <sup>th</sup> Street Bridge		Site 9 – Airport Road	
	Shallow	Intermediate	Shallow	Intermediate
Approx. Site elevation (ft msl)	695	723	681	681
Test hole depth (ft)	65	146	42.5	240
Test hole diameter (in)	8	8.5	8	8.5
Well depth (ft)	55	140	40	240
Final borehole diameter (in)	10	8.5	10	8.5
Casing diameter (in)	4	4	4	4
Casing material	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Filter pack	8x20 sand	8x20 sand	8x20 sand	8x20 sand
Seal depths (ft)	0-20	0-100	0-23, 41-42.5	0-190
Perforations (ft)	25-55	110-140	25-40	200-240
Slot size (in)	0.020	0.020	0.020	0.020
Wellhead completion	12-inch vault	12-inch vault	12-inch vault	12-inch vault
Water level measurement date	3/23/21	3/24/21	3/24/21	3/23/21
Depth to water (ft)	17.8	43.7	29.5	187.6
Groundwater elevation (ft msl)	677	679	652	493

Notes: ft msl = feet above mean sea level; ft = feet; in = inches. **All elevations approximate.**



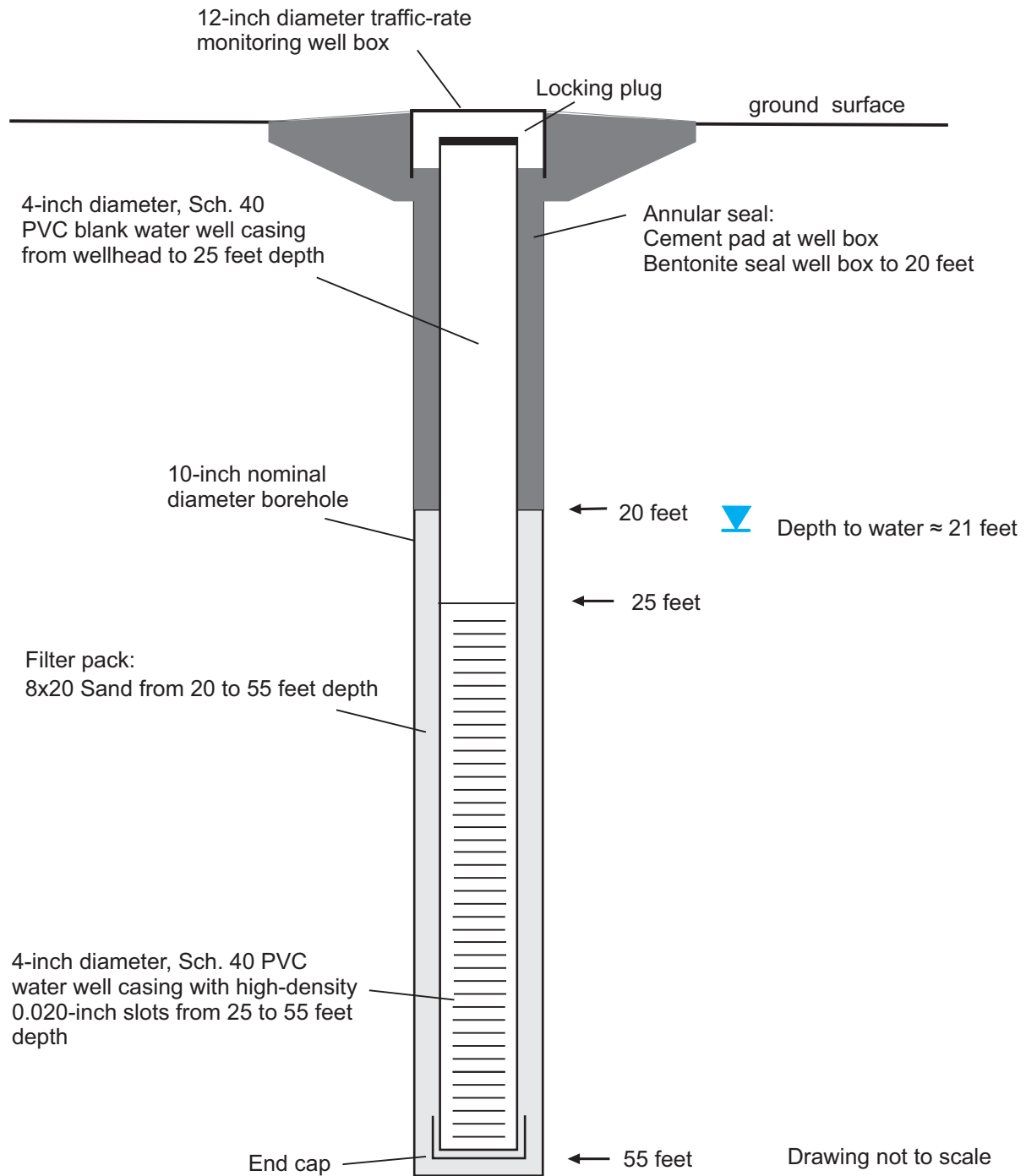


## **APPENDIX**

**Final Design Diagrams  
Well Completion Reports  
Lithologic Logs**



*Site 1 – 13<sup>th</sup> Street Bridge Shallow*



Shallow Well Final Design  
 Site 1 - 13th Street Bridge  
 Supplemental Environmental Project  
 City of Paso Robles

Cleath-Harris Geologists

State of California  
**Well Completion Report**  
 Form DWR 188 Submitted 2/11/2021  
 WCR2021-001910

Owner's Well Number MW-1 Date Work Began 12/07/2020 Date Work Ended 12/14/2020  
 Local Permit Agency San Luis Obispo County Environmental Health Services  
 Secondary Permit Agency \_\_\_\_\_ Permit Number 2020-087 Permit Date 11/25/2020

Well Owner (must remain confidential pursuant to Water Code 13752)	Planned Use and Activity
Name <u>CITY OF PASO ROBLES,</u>	Activity <u>New Well</u>
Mailing Address <u>1000 Spring Street</u>	Planned Use <u>Monitoring</u>
City <u>Paso Robles</u> State <u>Ca</u> Zip <u>93446</u>	

Well Location		
Address <u>0 13th ST</u>	APN <u>009511001</u>	
City <u>Paso Robles</u> Zip <u>93446</u> County <u>San Luis Obispo</u>	Township <u>26 S</u>	
Latitude <u>35 37 41.9879</u> N Longitude <u>-120 41 1.5575</u> W	Range <u>12 E</u>	
Dec. Lat. <u>35.62833</u> Dec. Long. <u>-120.683766</u>	Section <u>33</u>	
Vertical Datum _____ Horizontal Datum <u>WGS84</u>	Baseline Meridian <u>Mount Diablo</u>	
Location Accuracy _____ Location Determination Method _____	Ground Surface Elevation _____	
	Elevation Accuracy _____	
	Elevation Determination Method _____	

Borehole Information	Water Level and Yield of Completed Well
Orientation <u>Vertical</u> Specify _____	Depth to first water _____ (Feet below surface)
Drilling Method <u>Auger</u> Drilling Fluid <u>None</u>	Depth to Static _____
Total Depth of Boring <u>65</u> Feet	Water Level _____ (Feet) Date Measured _____
Total Depth of Completed Well <u>55</u> Feet	Estimated Yield* _____ (GPM) Test Type _____
	Test Length _____ (Hours) Total Drawdown _____ (feet)
	*May not be representative of a well's long term yield.

Geologic Log - Free Form		
Depth from Surface	Feet to Feet	Description
0	15	Sand
15	35	Sand With Gravel
35	53	Sand and Gravel
53	65	Clay

### Casings

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specifications	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	25	Blank	PVC	OD: 4.500 in.   Thickness: 0.337 in.	0.337	4.5			
1	25	55	Screen	PVC	OD: 4.500 in.   Thickness: 0.337 in.	0.337	4.5	Milled Slots	0.02	

### Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	20	Bentonite	Other Bentonite		
20	55	Filter Pack	8 x 20		

### Other Observations:

--

### Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	65	8

### Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name S/G TESTING LABORATORIES INC

Person, Firm or Corporation

308 NORTH 1ST STREET          LOMPOC          CA          93436

Address                                  City                          State                          Zip

Signed electronic signature received          02/11/2021          611394

C-57 Licensed Water Well Contractor          Date Signed          C-57 License Number

### Attachments

Well Contruction.pdf - Well Construction Diagram
2020-087.pdf - Permit
Well log.pdf - Geologic Log

### DWR Use Only

CSG #	State Well Number	Site Code	Local Well Number

											N
Latitude Deg/Min/Sec											W
Longitude Deg/Min/Sec											
TRS:											
APN:											

**13<sup>th</sup> STREET BRIDGE MONITORING WELL  
SUPPLEMENTAL ENVIRONMENTAL PROJECT  
CITY OF PASO ROBLES**

Date: December 7, 2020

Location: Southeast side of 13th Street Bridge over the Salinas River in Paso Robles, California

Elevation: Approximately 695 feet above mean sea level (based on topographic map)

Latitude: 35.628344°; Longitude: 120.683822°

Geologist: Andrea Berge

Drilling company: S/G Drilling, Inc.

Drilling method: Hollow stem auger

Pilot Hole diameter: 8.25 inches

Total depth: 65 feet

**Lithologic Log**

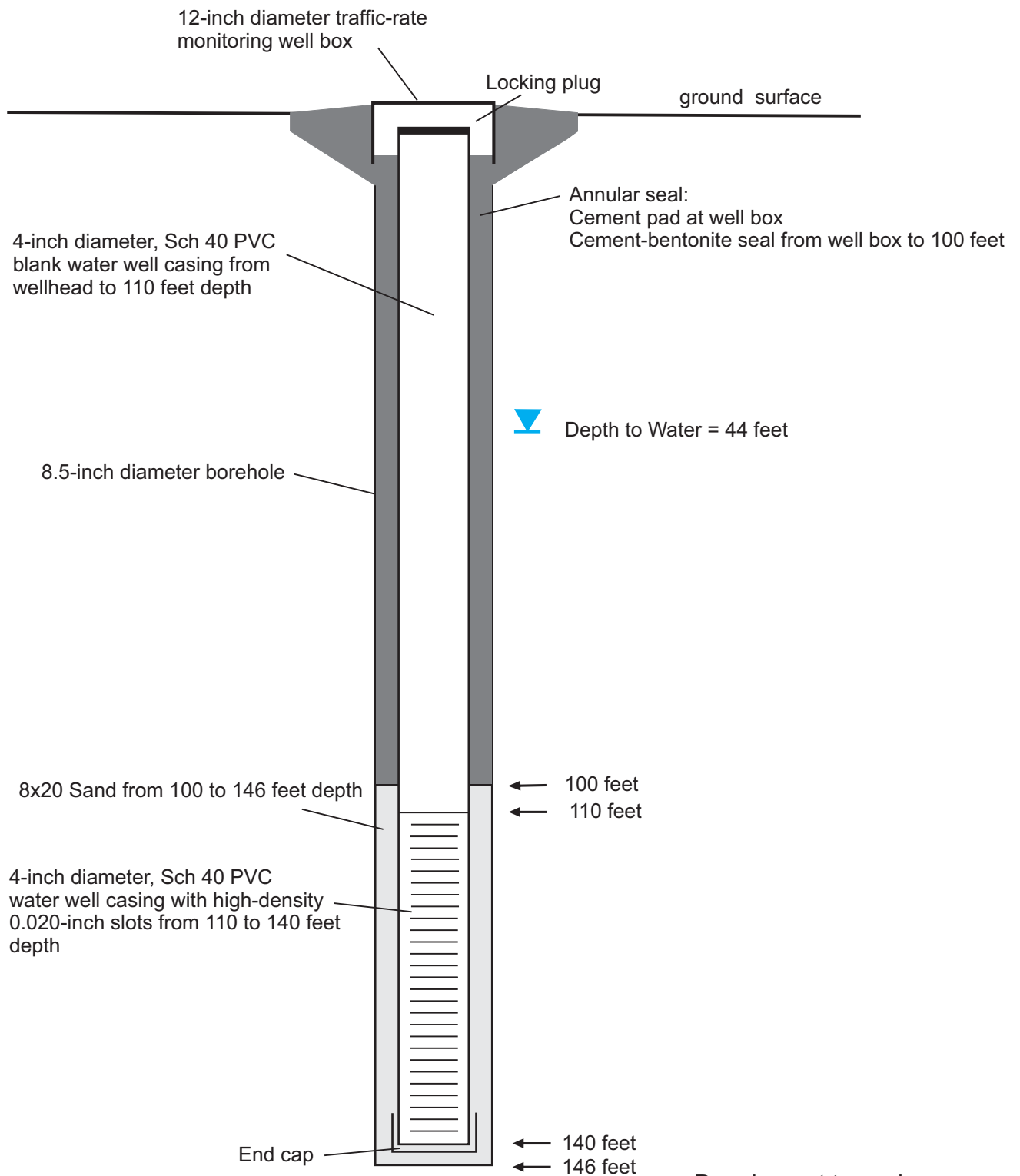
Depth to top and bottom in feet

<u>Top</u>	<u>Bottom</u>	<u>Thickness</u>	<u>Description</u>
0	15	15	<b>Sand</b> , trace clay; light brown to reddish brown; mostly fine.
15	35	20	<b>Sand with Gravel</b> , trace clay; medium brown; fine to coarse subrounded quartz sand; gravel clasts mostly of granitics, trace soft light brown plastic clay.
35	53	18	<b>Sand and Gravel</b> , trace cobbles, trace clay; medium brown transitioning to blue-gray at 40 feet; subrounded and subangular quartzite, granitics, volcanics and siliceous shale gravel clasts, trace cobbles; medium to coarse, subrounded, moderately well sorted quartz sand; trace firm blue clay.
53	65	12	<b>Clay</b> , trace gravel; blue-gray; stiff to hard, non-plastic clay, trace shale gravel as 6 inch stringer at 62-62.5 feet.

Total Depth: 65 feet



*Site 1- 13<sup>th</sup> Street Bridge Intermediate*



Drawing not to scale

Intermediate Well Final Design  
Site 1 - 13th Street Bridge  
Supplemental Environmental Project  
City of Paso Robles

Cleath-Harris Geologists



State of California  
**Well Completion Report**  
 Form DWR 188 Submitted 4/30/2021  
 WCR2021-005179

Owner's Well Number 01 Date Work Began 03/15/2021 Date Work Ended 03/18/2021  
 Local Permit Agency San Luis Obispo County Environmental Health Services  
 Secondary Permit Agency \_\_\_\_\_ Permit Number WP 1026984 Permit Date 02/08/2021

Well Owner (must remain confidential pursuant to Water Code 13752)	Planned Use and Activity
Name <u>CITY OF PASO ROBLES, Vikki Kuntz</u>	Activity <u>New Well</u>
Mailing Address <u>1000 Spring Street</u>	Planned Use <u>Monitoring</u>
City <u>Paso Robles</u> State <u>CA</u> Zip <u>93446</u>	

Well Location	
Address <u>101 Creston RD</u>	APN <u>009-401-018</u>
City <u>Paso Robles</u> Zip <u>93446</u> County <u>San Luis Obispo</u>	Township <u>26 S</u>
Latitude <u>35 37 46.5708 N</u> Longitude <u>-120 40 56.316 W</u>	Range <u>12 E</u>
Deg. Min. Sec. Deg. Min. Sec.	Section <u>33</u>
Dec. Lat. <u>35.629603</u> Dec. Long. <u>-120.68231</u>	Baseline Meridian <u>Mount Diablo</u>
Vertical Datum _____ Horizontal Datum <u>WGS84</u>	Ground Surface Elevation _____
Location Accuracy _____ Location Determination Method <u>GPS</u>	Elevation Accuracy _____
	Elevation Determination Method _____

Borehole Information	
Orientation <u>Vertical</u> Specify _____	
Drilling Method <u>Sonic</u> Drilling Fluid <u>None</u>	
Total Depth of Boring <u>146</u> Feet	
Total Depth of Completed Well <u>140</u> Feet	

Water Level and Yield of Completed Well	
Depth to first water <u>44</u> (Feet below surface)	
Depth to Static _____	
Water Level _____ (Feet) Date Measured <u>03/18/2021</u>	
Estimated Yield* _____ (GPM) Test Type <u>Bailing</u>	
Test Length <u>1</u> (Hours) Total Drawdown _____ (feet)	
*May not be representative of a well's long term yield.	

Geologic Log - Free Form		
Depth from Surface Feet to Feet		Description
0	146	See attached Lithologic Log

Casings										
Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	110	Blank	PVC	OD: 4.500 in.   Thickness: 0.337 in.	0.337	4.5			
1	110	140	Screen	PVC	OD: 4.500 in.   Thickness: 0.337 in.	0.337	4.5	Milled Slots	0.02	

Annular Material					
Depth from Surface Feet to Feet	Fill	Fill Type Details		Filter Pack Size	Description
0	1.5	Other Fill	See description.		Concrete Ready Mix
1.5	100	Cement	Portland Cement/Neat Cement		
100	146	Filter Pack	8 x 20		

**Other Observations:**

Borehole Specifications		
<b>Depth from Surface</b> Feet to Feet	<b>Borehole Diameter (inches)</b>	
0	146	8.5

Certification Statement			
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief			
Name	A B C LIOVIN DRILLING INC		
	Person, Firm or Corporation		
1180 E BURNETT STREET	SIGNAL HILL	CA	90755
Address	City	State	Zip
Signed	<i>electronic signature received</i>	04/30/2021	422904
	C-57 Licensed Water Well Contractor	Date Signed	C-57 License Number

Attachments
101 Creston Rd Location Map WP1026984.pdf - Location Map
101 Creston Rd Paso Robles permit WP1026984.pdf - Permit
101 Creston Rd Lithologic Log WP1026984.pdf - Geologic Log
101 Creston Rd Well Construction WP1026984.pdf - Well Construction Diagram
WP1026984 completion Creston Rd.pdf - Other

DWR Use Only			
<b>CSG #</b>	<b>State Well Number</b>	<b>Site Code</b>	<b>Local Well Number</b>
	<b>N</b>		<b>W</b>
<b>Latitude Deg/Min/Sec</b>		<b>Longitude Deg/Min/Sec</b>	
TRS:			
APN:			

**13<sup>TH</sup> STREET INTERMEDIATE MONITORING WELL  
SUPPLEMENTAL ENVIRONMENTAL PROJECT  
CITY OF PASO ROBLES**

Date: March 15 - March 18, 2021

Location: 101 Creston Road, Paso Robles, California

Elevation: Approximately 723 feet above Mean Sea Level (based on topographic map)

Latitude: 35.629603°, Longitude: 120.682310°

Geologist: Andrea Berge, Cleath-Harris Geologists

Drilling Company: ABC Liovin Drilling, Inc

Drilling Method: Sonic

Borehole Diameter: 8.5 inches; 0 to 146 feet depth

Total Depth: 146 feet

**Lithologic Log (page 1 of 2)**

Depth to top and bottom in feet

<u>Top</u>	<u>Bottom</u>	<u>Thickness</u>	<u>Description</u>
0	5	5	<b>Clay</b> ; dark gray brown; stiff, inclusions of organic matter.
5	22.5	17.5	<b>Sand, Gravel</b> , trace cobbles; light grayish brown; fine to very coarse, poorly sorted, subangular gray, brown, cream chert sand; subrounded, up to 3/4-inch chert and volcanic gravel; 3 to 5 inch diameter volcanic cobbles from 21- 21 feet depth.
22.5	36	13.5	<b>Clay</b> ; light grayish brown; stiff to hard, trace fine to medium chert sand between 29-33 feet depth.
36	40	4	<b>Gravelly Sand</b> ; light gray; fine to very coarse, poorly sorted, chert, shale and quartz sand; up to 1-inch diameter, subrounded shale and chert gravel.
40	46	6	<b>Clay</b> , trace gravelly sand; light gray; stiff clay, inclusions of shale gravelly sand between 43 and 45 feet depth.
46	47	1	<b>Sand and Gravel</b> , trace clay; light brownish gray; medium to very coarse, subrounded shale and quartz sand; up to 1/2-inch diameter subrounded shale gravel; firm clay.
47	50	3	<b>Sandy Clay</b> ; light brownish gray; firm to stiff, friable dry clay intermixed with coarse, subrounded to subangular shale, chert, quartz sand.
50	54	4	<b>Clay</b> ; pale brown; stiff to hard clay.
54	55	1	<b>Sand, Gravel and Clay</b> ; medium to very coarse, rounded olive gray shale and pale brown chert sand; up to 3/4-inch shale gravel; soft to firm clay.
55	56	1	<b>Clay</b> ; pale brown; stiff clay.
56	59	3	<b>Sandy Clay</b> , trace gravel; very coarse, subangular and subrounded shale and chert sand; firm to stiff clay; trace 1/2-inch shale gravel.
59	60	1	<b>Clay</b> ; light yellowish brown; stiff clay.
60	63	3	<b>Clayey Sand</b> , trace gravel; light yellowish brown; very coarse, subangular shale and chert sand; friable, firm clay; trace 1/2-inch shale gravel.

## Lithologic Log (page 2 of 2)

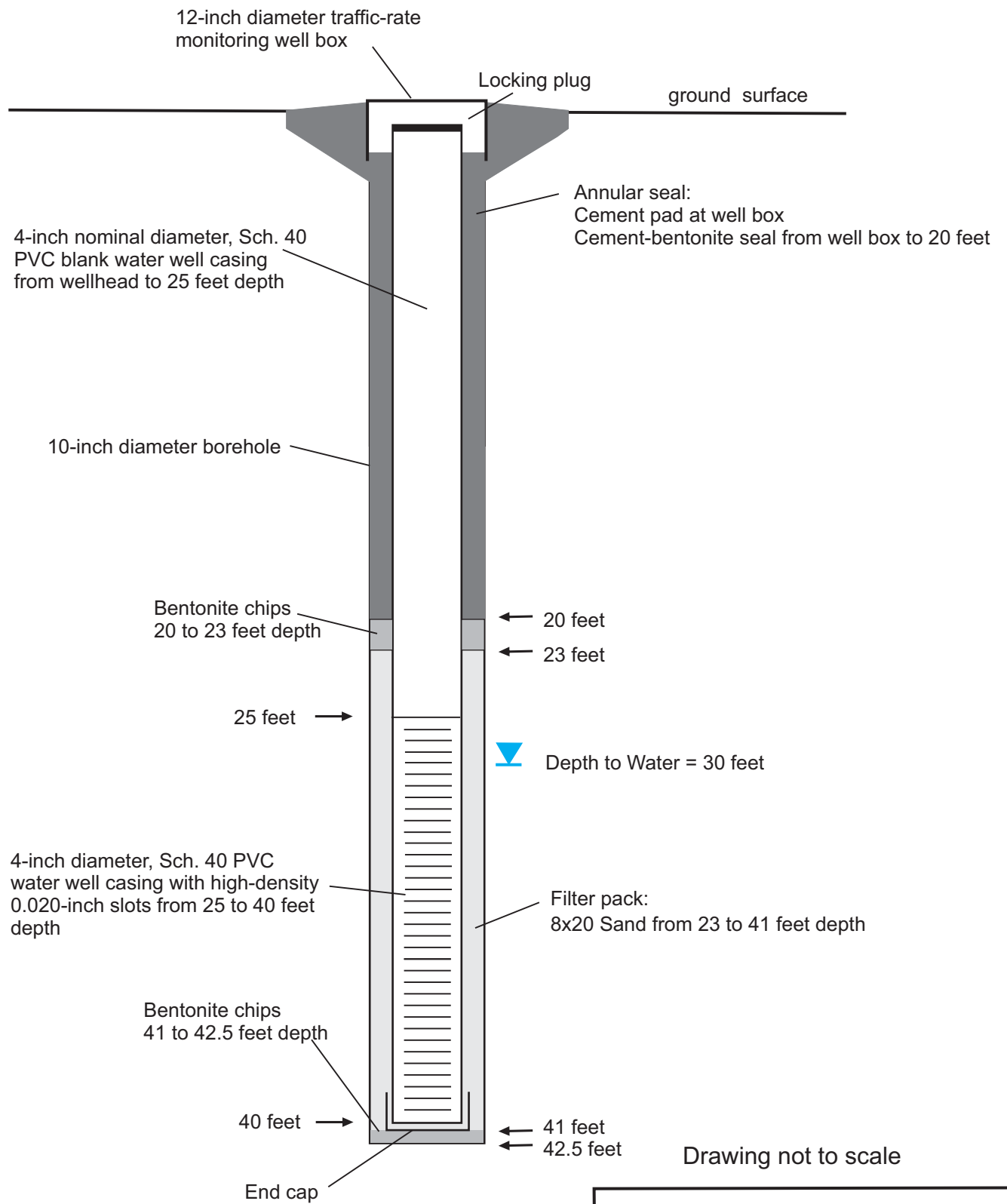
Depth to top and bottom in feet

<u>Top</u>	<u>Bottom</u>	<u>Thickness</u>	<u>Description</u>
63	64	1	<b>Clay</b> ; light yellowish brown; stiff clay.
64	67	3	<b>Sand, trace clay</b> ; light yellowish brown; very coarse, subangular shale and chert sand; friable, firm clay.
67	81	14	<b>Gravelly and Sandy Clay</b> ; light yellowish brown; stiff to hard clay; medium to coarse, subangular and subrounded shale and chert sand; subrounded, up to 1/2-inch shale gravel.
81	85	4	<b>Clayey Sand, trace gravel</b> ; dark gray; medium to very coarse, subrounded and subangular quartz and chert sand; stiff clay; trace 1/2-inch shale gravel.
85	92	7	<b>Clay</b> ; dark gray, stiff to hard clay.
92	96	4	<b>Sandy Clay, trace gravel</b> ; dark gray; stiff clay; subrounded to rounded shale sand; up to 3/4-inch rounded shale gravel.
96	105	9	<b>Clay</b> ; very stiff to hard clay.
105	106	1	<b>Sandy Clay trace gravel</b> ; gray; firm clay; subrounded and subangular shale and quartz sand; rounded 1/2-inch shale gravel.
106	112	6	<b>Clay</b> ; gray; very stiff to hard.
112	114	2	<b>Gravelly Clay</b> ; gray; very stiff to hard clay; inclusions of up to 3/4-inch rounded gravel.
114	117	3	<b>Clay</b> ; grayish brown; hard clay.
117	122	5	<b>Sand and Gravel with Clay</b> ; gray; medium to very coarse, subangular chert and shale sand; up to 3/4-inch shale gravel; soft clay, with some hard layers.
122	126	4	<b>Clay</b> ; bluish gray; firm grading to hard within interval.
126	133	7	<b>Sand and Gravel trace cobbles</b> ; gray; subangular, medium to coarse shale, chert and sandstone sand, presence of pyrite; 3/4-inch diameter rounded shale gravel; trace 3-inch diameter volcanic cobbles.
133	134	1	<b>Sandy Clay</b> ; gray; stiff bluish gray clay; coarse subangular chert and shale sand.
134	134.5	0.5	<b>Sand and Gravel trace cobbles</b> ; gray; subangular, medium to coarse shale, chert and sandstone sand, presence of pyrite; up to 3/4-inch rounded shale gravel; trace 3-inch volcanic cobbles.
134.5	146	11.5	<b>Clay, trace sand</b> ; gray; stiff to hard bluish gray clay; inclusions of coarse subangular shale sand; rare 1/2-inch gravel.

Total Depth: 146 feet



*Site 9 – Airport Road Shallow*



Shallow Well Final Design  
 Site 9 - Airport Road  
 Supplemental Environmental Project  
 City of Paso Robles

Cleath-Harris Geologists

State of California  
**Well Completion Report**  
 Form DWR 188 Submitted 4/28/2021  
 WCR2021-005076

Owner's Well Number MW1 Date Work Began 03/23/2021 Date Work Ended 03/24/2021  
 Local Permit Agency San Luis Obispo County Environmental Health Services  
 Secondary Permit Agency \_\_\_\_\_ Permit Number 2021-007 Permit Date 03/11/2021

**Well Owner (must remain confidential pursuant to Water Code 13752)**

Name HAMMOND VINEYARDS, LP,  
 Mailing Address 7200 Airpost Road  
 City Paso Robles State Ca Zip 93446

**Planned Use and Activity**

Activity New Well  
 Planned Use Monitoring

**Well Location**

Address 7200 Airport RD APN 027191050  
 City Paso robes Zip 93446 County San Luis Obispo Township 25 S  
 Latitude 35 42 19.5127 N Longitude -120 38 7.5353 W Range 12 E  
 Deg. Min. Sec. Deg. Min. Sec. Section 36  
 Dec. Lat. 35.7054202 Dec. Long. -120.6354265 Baseline Meridian Mount Diablo  
 Vertical Datum \_\_\_\_\_ Horizontal Datum WGS84 Ground Surface Elevation \_\_\_\_\_  
 Location Accuracy \_\_\_\_\_ Location Determination Method \_\_\_\_\_ Elevation Accuracy \_\_\_\_\_  
 Elevation Determination Method \_\_\_\_\_

**Borehole Information**

Orientation Vertical Specify \_\_\_\_\_  
 Drilling Method Auger Drilling Fluid None  
 Total Depth of Boring 42.5 Feet  
 Total Depth of Completed Well 40 Feet

**Water Level and Yield of Completed Well**

Depth to first water 30 (Feet below surface)  
 Depth to Static \_\_\_\_\_  
 Water Level \_\_\_\_\_ (Feet) Date Measured \_\_\_\_\_  
 Estimated Yield\* \_\_\_\_\_ (GPM) Test Type \_\_\_\_\_  
 Test Length \_\_\_\_\_ (Hours) Total Drawdown \_\_\_\_\_ (feet)  
 \*May not be representative of a well's long term yield.

**Geologic Log - Free Form**

Depth from Surface Feet to Feet	Description
0	13.5 Sand
13.5	15 Clay
15	17.5 Sand
17.5	20 clayey Sand
20	25 Gravelly Sand
25	30.5 Sand with Gravel
30.5	32 Sand with clay
32	35 Clayey Sand
35	38 Clay
38	40 Sand with Clay
40	42.5 Clay

Casings										
Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	25	Blank	PVC	OD: 4.500 in.   Thickness: 0.337 in.	0.337	4.5			
1	25	40	Screen	PVC	OD: 4.500 in.   Thickness: 0.337 in.	0.337	4.5	Milled Slots	0.02	

Annular Material					
Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	20	Cement	Portland Cement/Neat Cement		
20	23	Bentonite	Non Hydrated Bentonite		Bentonite chips
23	41	Filter Pack	8 x 20		
41	42.5	Bentonite	Other Bentonite		Bentonite chips

**Other Observations:**

Borehole Specifications		
Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	42.5	10

Certification Statement			
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief			
Name	S/G TESTING LABORATORIES INC		
	Person, Firm or Corporation		
308 NORTH 1ST STREET	LOMPOC	CA	93436
Address	City	State	Zip
Signed	<i>electronic signature received</i>	04/28/2021	611394
	C-57 Licensed Water Well Contractor	Date Signed	C-57 License Number

Attachments
location map.pdf - Location Map
Well log.pdf - Geologic Log
2021-007.pdf - Permit

DWR Use Only			
CSG #	State Well Number	Site Code	Local Well Number
		N	W
Latitude Deg/Min/Sec		Longitude Deg/Min/Sec	
TRS:			
APN:			



**AIRPORT ROAD SHALLOW MONITORING WELL  
SUPPLEMENTAL ENVIRONMENTAL PROJECT  
CITY OF PASO ROBLES**

Date: March 23-24, 2021

Location: 7200 Airport Road, Paso Robles, California

Elevation: Approximately 681 feet above Mean Sea Level (based on topographic map)

Latitude: 35.71717°, Longitude: -120.63992°

Geologist: James Carlson, Cleath-Harris Geologists

Drilling Company: S/G Drilling Company

Drilling Method: Hollow Stem Auger 0-42.5 feet depth

Borehole Diameter: 8.25 inches (pilot hole); 10 inches (ream)

Total Depth: 42.5 feet

**Lithologic Log (page 1 of 2)**

Depth to top and bottom in feet

<u>Top</u>	<u>Bottom</u>	<u>Thickness</u>	<u>Description</u>
0	13.5	13.5	<b>Sand;</b> yellowish brown; fine to medium, subrounded, quartz and chert sand; slightly calcaerous.
13.5	15	1.5	<b>Clay,</b> trace sand; brown; medium clay; strongly calcareous.
15	17.5	2.5	<b>Sand;</b> yellowish brown; fine to medium, subrounded, quartz and chert sand.
17.5	20	2.5	<b>Clayey Sand,</b> trace gravel; yellowish brown; fine to coarse, subrounded, quartz, and chert sand; soft clay and 0.5 feet of dark yellowish brown, medium, strongly calcareous clay.
20	25	5	<b>Gravelly Sand;</b> yellowish brown; fine to coarse, quartz and chert sand; up to 2-inch diameter, subrounded, shale, chert, and metamorphic gravel.
25	30.5	5.5	<b>Sand with Gravel;</b> brownish yellow; fine to coarse, subrounded, quartz and chert sand; up to 1-inch diameter, subrounded, shale, chert, and metamorphic gravel.
30.5	32	1.5	<b>Sand with Clay;</b> dark gray; fine, subrounded, quartz, chert, mica, and mafic sand; soft clay and 0.5 feet of very stiff clay
32	35	3	<b>Clayey Sand;</b> dark gray; fine, quartz, chert, mica, and mafic sand; soft clay.

**Lithologic Log (page 2 of 2)**

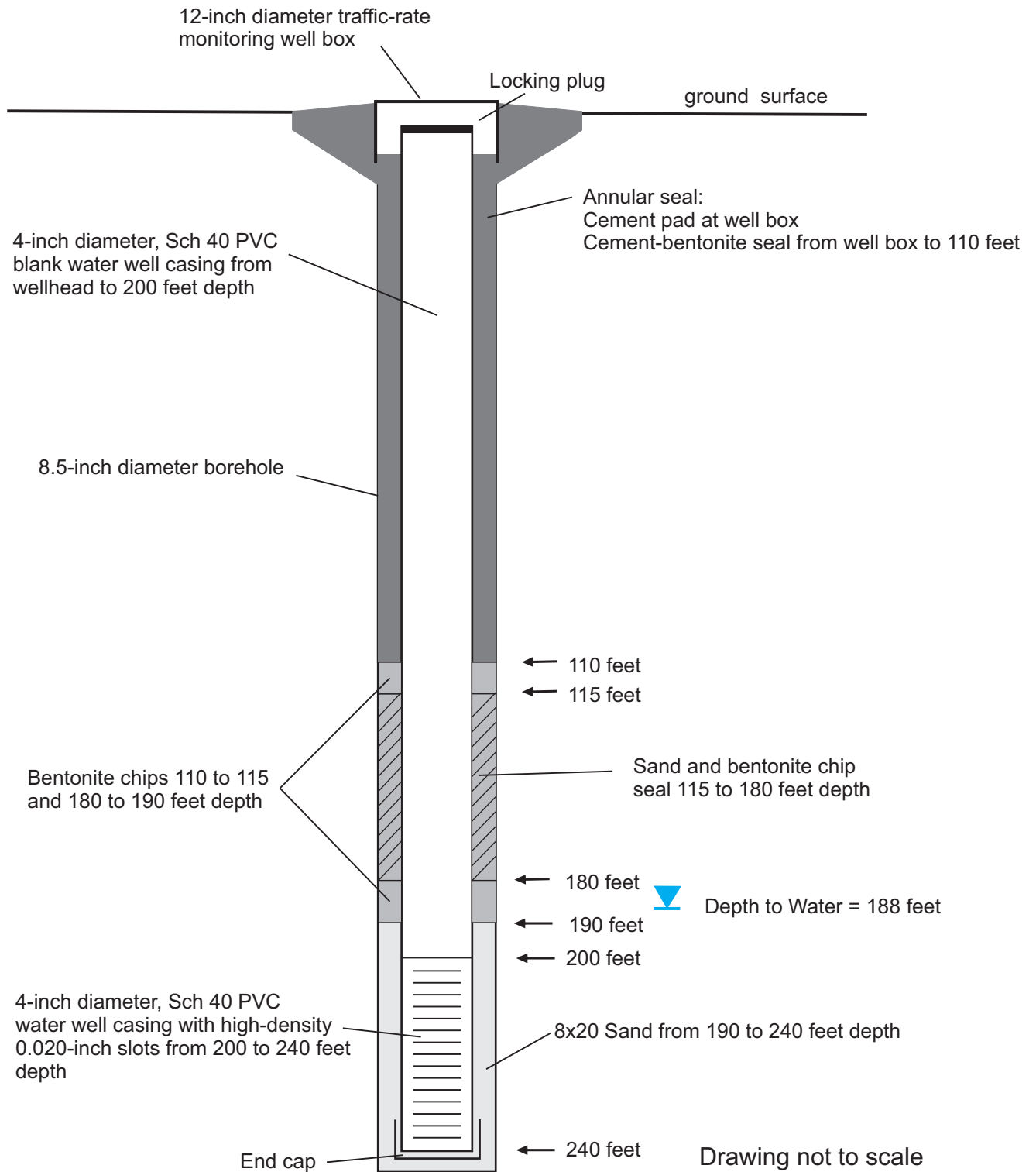
Depth to top and bottom in feet

<u>Top</u>	<u>Bottom</u>	<u>Thickness</u>	<u>Description</u>
35	38	3	<b>Clay</b> , trace sand; dark gray; stiff clay; very fine to fine sand; slightly calcareous.
38	40	2	<b>Sand with Clay</b> ; dark gray; very fine to fine, quartz, mica, and mafic sand; soft clay.
40	42.5	2.5	<b>Clay</b> ; dark gray; stiff clay; 0.5 feet of very fine sand; strongly calcareous.

Total Depth: 42.5 feet



*Site 9 – Airport Road Intermediate*



Intermediate Well Final Design  
 Site 9 - Airport Road  
 Supplemental Environmental Project  
 City of Paso Robles

Cleath-Harris Geologists

State of California  
**Well Completion Report**  
 Form DWR 188 Submitted 4/30/2021  
 WCR2021-005191

Owner's Well Number 02 Date Work Began 03/18/2021 Date Work Ended 03/20/2021  
 Local Permit Agency San Luis Obispo County Environmental Health Services  
 Secondary Permit Agency \_\_\_\_\_ Permit Number WP 1027016 Permit Date 03/10/2021

<b>Well Owner (must remain confidential pursuant to Water Code 13752)</b>			
Name	<u>HAMMOND VINEYARDS, LP,</u>		
Mailing Address	<u>7200 Airport Road</u>		
City	<u>Paso Robles</u>	State	<u>CA</u> Zip <u>93446</u>

<b>Planned Use and Activity</b>	
Activity	<u>New Well</u>
Planned Use	<u>Monitoring</u>

<b>Well Location</b>					
Address <u>7200 Airport RD</u>			APN <u>27-191-050</u>		
City	<u>Paso Robles</u>	Zip	<u>93446</u>	County	<u>San Luis Obispo</u>
Latitude	<u>35</u> <u>43</u> <u>2.172</u> <u>N</u>	Longitude	<u>-120</u> <u>38</u> <u>22.8479</u> <u>W</u>	Township	<u>25 S</u>
	Deg. Min. Sec.		Deg. Min. Sec.	Range	<u>12 E</u>
Dec. Lat.	<u>35.71727</u>	Dec. Long.	<u>-120.63968</u>	Section	<u>36</u>
Vertical Datum	_____	Horizontal Datum	<u>WGS84</u>	Baseline Meridian	<u>Mount Diablo</u>
Location Accuracy	_____	Location Determination Method	_____	Ground Surface Elevation	_____
				Elevation Accuracy	_____
				Elevation Determination Method	_____

<b>Borehole Information</b>	
Orientation	<u>Vertical</u> Specify _____
Drilling Method	<u>Sonic</u> Drilling Fluid <u>None</u>
Total Depth of Boring	<u>240</u> Feet
Total Depth of Completed Well	<u>240</u> Feet

<b>Water Level and Yield of Completed Well</b>	
Depth to first water	<u>185</u> (Feet below surface)
Depth to Static	_____
Water Level	_____ (Feet) Date Measured <u>03/20/2021</u>
Estimated Yield*	_____ (GPM) Test Type <u>Bailing</u>
Test Length	_____ (Hours) Total Drawdown _____ (feet)
*May not be representative of a well's long term yield.	

<b>Geologic Log - Free Form</b>		
Depth from Surface Feet to Feet		Description
0	240	see attached log

Casings										
Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	200	Blank	PVC	OD: 4.500 in.   Thickness: 0.337 in.	0.337	4.5			
1	200	240	Screen	PVC	OD: 4.500 in.   Thickness: 0.337 in.	0.337	4.5	Milled Slots	0.02	

Annular Material					
Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	1.5	Other Fill	See description.		Concrete
1.5	110	Cement	Portland Cement/Neat Cement		
110	115	Bentonite	Other Bentonite		Chips
115	180	Other Fill	See description.		Sand/Chips mix
180	190	Bentonite	Other Bentonite		Chips
190	240	Filter Pack	8 x 20		

**Other Observations:**

Borehole Specifications		
Depth from Surface Feet to Feet	Borehole Diameter (inches)	
0	240	8.5

Certification Statement			
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief			
Name	A B C LIOVIN DRILLING INC		
	Person, Firm or Corporation		
1180 E BURNETT STREET	SIGNAL HILL	CA	90755
Address	City	State	Zip
Signed	<i>electronic signature received</i>	04/30/2021	422904
	C-57 Licensed Water Well Contractor	Date Signed	C-57 License Number

Attachments
7200 Airport Rd Paso Robles permit WP1027016.pdf - Permit
WP1027016 completion Airport Rd.pdf - Other
7200 Airport Rd Lithologic Log WP1027016.pdf - Geologic Log
7200 Airport Rd Location Map WP1027016.pdf - Location Map
7200 Airport Rd Well Const WP1027016.pdf - Well Construction Diagram

DWR Use Only			
CSG #	State Well Number	Site Code	Local Well Number
		N	W
Latitude Deg/Min/Sec		Longitude Deg/Min/Sec	
TRS:			
APN:			

**AIRPORT ROAD INTERMEDIATE MONITORING WELL  
SUPPLEMENTAL ENVIRONMENTAL PROJECT  
CITY OF PASO ROBLES**

Date: March 18 - March 20, 2021

Location: 7200 Airport Road, Paso Robles, California

Elevation: Approximately 681 feet above Mean Sea Level (based on topographic map)

Latitude: 35.71727°, Longitude: -120.63968°

Geologist: James Carlson, Cleath-Harris Geologists

Drilling Company: ABC Liovin Drilling, Inc

Drilling Method: Sonic: 0-240 feet depth

Borehole Diameter: 8.5 inches; 0 to 240 feet depth

Total Depth: 240 feet

**Lithologic Log (page 1 of 2)**

Depth to top and bottom in feet

<u>Top</u>	<u>Bottom</u>	<u>Thickness</u>	<u>Description</u>
0	8	8	<b>Sand;</b> brownish yellow; fine sand; slightly calcareous,
8	14	6	<b>Clay;</b> trace sand; brown; very stiff clay; strongly calcareous.
14	16	2	<b>Sand;</b> trace gravel; very pale brown; fine to coarse, subrounded, quartz sand.
16	17	1	<b>Clayey Sand;</b> yellowish brown; fine to coarse, subrounded, quartz sand; stiff clay; slightly calcareous.
17	18	1	<b>Clay;</b> trace sand; dark yellowish brown; medium clay; slightly calcaerous.
18	19	1	<b>Sand;</b> trace gravel; yellowish brown; fine to coarse, subrounded, quartz and chert sand.
19	21	2	<b>Gravelly Sand;</b> yellowish brown; fine to coarse, subrounded, quartz and chert sand; up to 3-inch diameter, subrounded to rounded, chert, shale, and sandstone gravel.
21	25	4	<b>Sand;</b> yellowish brown; coarse, subrounded, quartz and chert sand.
25	28	3	<b>Sand with Gravel;</b> trace clay; yellowish brown; fine to coarse, subrounded, quartz and chert sand; up to 0.5-inch diameter, subrounded to round, chert, shale, and sandstone gravel; slightly calcareous.
28	34	6	<b>Sand;</b> trace clay; brown, fine to coarse, subrounded, quartz, chert, and mafic sand.
34	66	32	<b>Clay with Sand;</b> dark gray; very stiff clay, moderately calcaerous; fine sand; mostly clay with 0.5-1 foot sand lenses at 55 and 59 feet depth.
66	73	7	<b>Sand;</b> trace gravel; brown; fine to coarse, quartz, chert, mica, and mafic sand.

## Lithologic Log (page 2 of 2)

Depth to top and bottom in feet

<u>Top</u>	<u>Bottom</u>	<u>Thickness</u>	<u>Description</u>
73	76	3	<b>Clay</b> ; dark gray; very stiff clay; slightly calcareous.
76	78	2	<b>Sand</b> ; dark grayish brown; fine to medium, subrounded, quartz, chert, and mafic sand.
78	84	6	<b>Clay</b> ; gray; very stiff clay; fine quartz, chert, mica, and mafic sand; slightly calcareous.
84	86	2	<b>Clayey Sand</b> ; brown; fine, quartz, chert, mica, mafic sand; medium clay.
86	98	12	<b>Clay</b> ; dark grayish brown; very stiff clay; bottom 2 feet strongly calcareous.
98	106	8	<b>Sand</b> ; yellowish brown; fine to coarse, subrounded, quartz, chert, mica, and mafic sand.
106	110	4	<b>Clay with Sand</b> ; brown; stiff clay; very fine to fine, quartz, mica, and mafic sand.
110	206	96	<b>Clay</b> ; trace sand; very dark grayish brown; very stiff clay; moderately calcareous, micaceous; 2 to 3-foot clayey sand lenses at 143, 155, 166, and 196 feet depth.
206	220	14	<b>Sand and Gravel</b> , trace cobbles; yellowish brown; fine to coarse, subrounded, quartz, chert, and mafic sand; up to 4-inch diameter, subrounded to well rounded, chert, shale, and sandstone gravel/cobbles.
220	226	6	<b>Clayey Sand And Gravel</b> ; yellowish brown; soft clay; fine to medium, subrounded, quartz, chert, and mafic sand; up to 1-inch diameter, subrounded, chert, shale, and sandstone gravel.
226	234	8	<b>Clay</b> ; trace sand; dark yellowish brown; very stiff clay.
234	240	6	<b>Sand with Gravel</b> ; yellowish brown; fine to medium,

Total Depth 240 feet





STREAM GAGE INSTALLATION  
COMPLETION REPORT

PASO ROBLES SUPPLEMENTAL  
ENVIRONMENTAL PROJECT

PASO ROBLES AREA GROUNDWATER SUBBASIN  
SAN LUIS OBISPO COUNTY  
CALIFORNIA

June 2021

CLEATH-HARRIS GEOLOGISTS  
75 Zaca Lane, Suite 110  
San Luis Obispo, California 93401

(805) 543-1413



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## 1.0 INTRODUCTION

In accordance with the approved scope of work for the City’s Supplemental Environmental Project to Install Monitoring Wells and Stream Gages on the Salinas River and Major Tributaries within the Paso Robles Groundwater Basin, and consistent with the Groundwater Sustainability Plan (GSP) adopted by the Groundwater Sustainability Agencies (GSAs) for the Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin<sup>1</sup>, three stream gages have been installed to help fill a data gap with respect to the interaction between surface water and groundwater in the basin. This report summarizes the stream gage installation activities.

## 2.0 BACKGROUND

The Paso Robles Area Groundwater Subbasin GSP identified a need to expand the network of stream gages and monitoring wells within alluvial deposits associated with the major drainages in the Subbasin. Per the recommendations set forth in the GSP, *“Definitive data delineating any interactions 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”*.

A critical component of the current groundwater model is streamflow, and available streamflow data is very limited as there are only two existing stream gages operating in the Subbasin. This Supplemental Environmental Project (SEP) begins expanding the network of both stream gages and adjacent monitoring wells in order to better assess the potential for interconnected surface water and groundwater across the Subbasin. Monitoring well construction for the SEP is addressed in a separate Monitoring Well Construction Report.

The stream gages installed for the SEP record stream stage. Stage data is useful for identifying flow/no flow conditions and the timing of stormwater runoff (when analyzed with rainfall and other stream gages in a watershed). The stage data may also be used to evaluate the interconnectivity of surface water and groundwater. Additionally, recorded stream stage data, when combined with a site-specific rating curve, can be converted to streamflow for water budget and groundwater model analyses. Although development of rating curves for each stream gage site was not part of the current project, an analysis can be performed for each site in the future to convert logged stream gage data into streamflow. A brief summary of streamflow measurement in natural channels is include in Appendix A.

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<sup>1</sup> Montgomery & Associates, 2020, Paso Robles Subbasin Groundwater Sustainability Plan dated January 31, 2020.



## 2.0 SITE SELECTION PROCESS

Stream gage site selection was completed as part of the SEP and a detailed review is provided in a technical memorandum<sup>2</sup>. Ten locations were identified by the Subbasin GSAs that would help provide hydrologic, geologic and hydrogeologic data with appropriate monitoring equipment installations<sup>3</sup>. These locations represent sites where a stream gage, coupled with a set of nested or paired monitoring wells, would help to fill in data gaps related to surface water/groundwater interactions throughout the Subbasin. The original locations, along with replacements and alternative sites considered for gage installation, are shown in Figure 1. Table 1 presents the results of the site selection process and criteria evaluation for sites that were determined to be viable for the SEP project. Descriptions of these criteria and scoring, along with a discussion of all sites considered, are in the November 2020 memorandum.

**Table 1**  
**Stream Gage Site Criteria Evaluation**

Criteria	SEP SITE					
	2a	4a	4b	5	5a	10a
Proximity to iGDEs	3	2	2	2	2	3
Depth to Groundwater	3	2	2	3	1	3
Access for monitoring wells	3	3	2	3	1	2
Hydrologic Value*	3	3	3	2	2	3
Channel morphology/Rating curve dev.	1	2	3	2	2	3
Score (higher = more benefit)	13	12	12	12	8	14

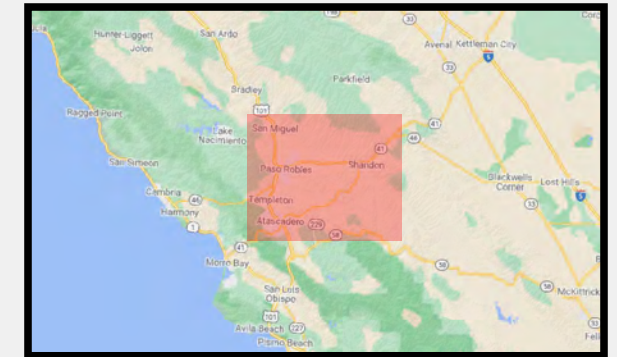
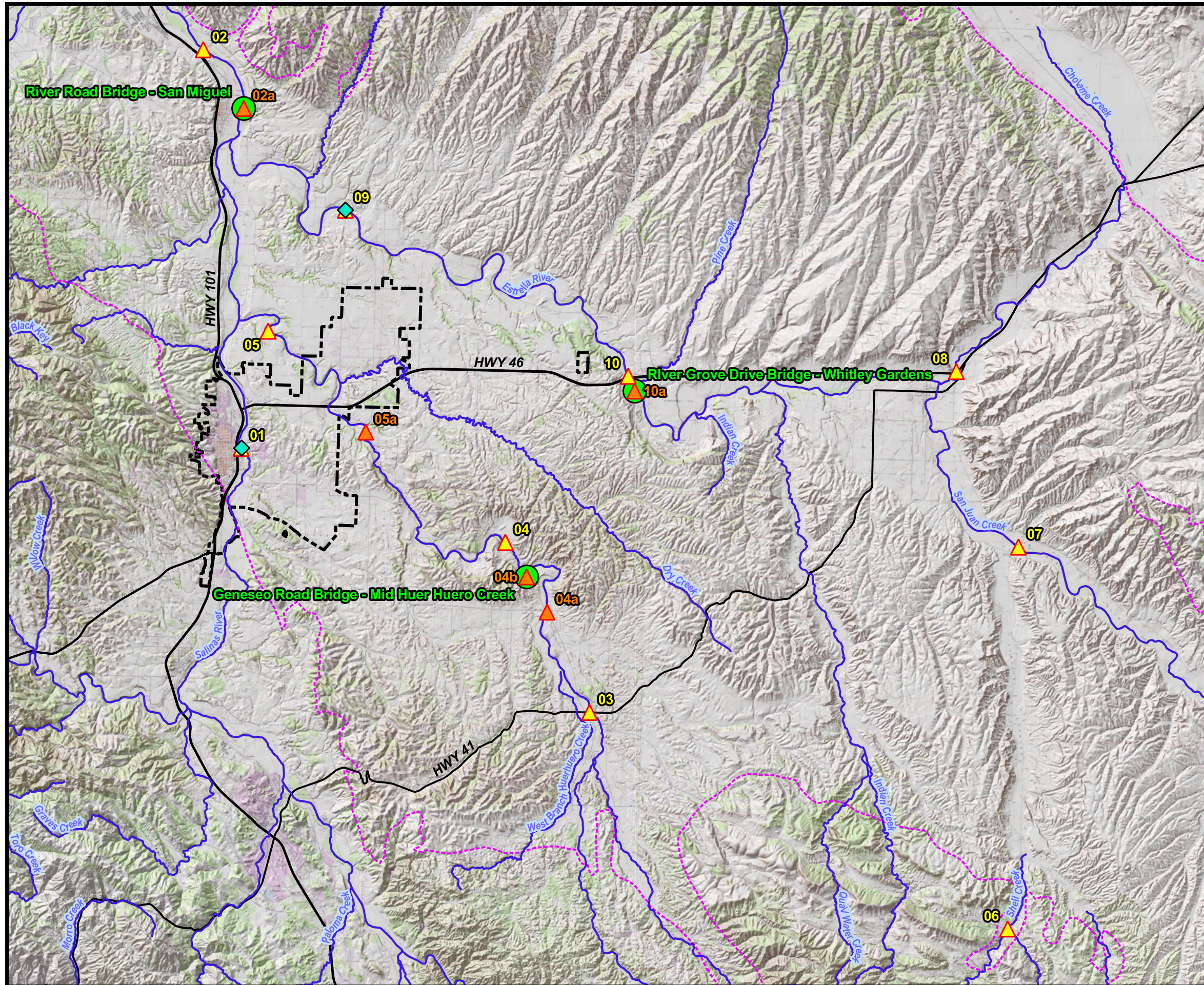
\*requires rating curve to achieve full benefit

Site 10a (Estrella River at Whitley Gardens) received the highest ranked score for a gage location under the criteria used, with a greater than average relative benefit of all criteria except access for monitoring wells (average rank). Site 2a (Salinas at San Miguel) was second in the rankings, with a greater than average relative benefit of all criteria except channel morphology/rating curve development (below average rank).

The remaining locations were all on Huer Huero Creek, with a tie between Sites 4a, 4b, and 5. Assuming future GSP project phases will construct Site 3 to represent Upper Huer Huero Creek, Site 4b was considered the best alternative for a Mid Huer Huero gage site. This resulted in the following three top-ranked sites:

<sup>2</sup> CHG, 2020, Stream Gage Siting Memorandum dated November 10, 2020.

<sup>3</sup> Monsoon Consultants, 2019. Figure 1 - Paso Robles Groundwater Basin - Proposed Monitoring Sites, Paso Robles GSP Data Gap Assessment dated September 6, 2019.



**Explanation**

- Paso Robles City Limits
- Paso Robles Groundwater Subbasin Boundary
- Major Stream

- Existing Stream Gage
- SEP Gage Site

**Evaluated Stream Gage Site**

- Originally Proposed (Conceptual Phase)
- Replacement/Alternate



**Figure 1**  
**Site Locations**

**Stream Gage Installation Report**

**Paso Robles Groundwater Basin  
Supplemental Environmental Project**

**City of Paso Robles**

**Cleath-Harris Geologists**



- Site 10a (Estrella River at River Grove Bridge, Whitley Gardens)
- Site 2a (Salinas River at San Miguel Bridge)
- Site 4b (Mid Huer Huero Creek at Geneseo Road Bridge near Eagle Oak Ranch Way)

Agency review concurred with the site selections, and the three top-ranked sites were brought forward into the design and installation phase.

### **3.0 STREAM GAGE INSTALLATIONS**

Equipment used for the stream gages, including enclosures, were sourced in consultation with San Luis Obispo County Public Works (Water Resources Division). All three stream gages are radar sensors with Alert 2 protocol and can be linked with existing base stations operated by San Luis Obispo County Flood Control and Water Conservation District.

The following is a list of equipment included with the stream gages:

- Alert 2 transmitter with integrated communications and web-based user interface.
- 12V, 12 amp-hour battery
- Weather-proof canister for transmitter and battery
- GPS antenna with surge suppressor
- Omni-directional VHF antenna with surge suppressor
- Radar water level sensor
- 10-watt solar panel

All equipment has been installed, with the radar and data loggers tested and operational. The transmitter and integrated communications for the “Alert 2” communication functionality can be activated pending further coordination between the GSAs.

The stream gage enclosures (boxes) are aluminum, with aluminum masts and corrosion resistance hardware (stainless steel and galvanized steel). These aluminum enclosures are locked and secured to the bridges with locking cables.

Stream profiles for the three sites are included in Appendix B. The gages are positioned over the lowest stream bed elevation along the profile, where low flow would be most likely to occur. No surface flow was present during the installations, however, evidence of flow from prior seasonal runoff was noted at the sites and confirmed that the radar sensors are optimally positioned to detect low flow. Individual stream gage installations are summarized below.

### 3.1 Site 10a: Estrella River, Whitley Gardens / River Grove Drive Bridge

The stream gage at Site 10a was installed on April 14, 2021. Following installation, the radar sensor and data logger were tested and are operational, recording the Estrella River channel bottom at 21.20 feet below the enclosure (confirmed with tag line). The installation is shown in Figure 3.



*Figure 2. Whitley Gardens (Estrella River) radar sensor stream gage installation*

### 3.2 Site 2a – Salinas River, River Road Bridge at San Miguel

The stream gage at Site 2a was installed on April 9, 2021. Following installation, the radar sensor and data logger were tested and are operational, recording the Salinas River channel bottom at 47.46 feet below the enclosure (confirmed with tag line). The installation is shown in Figure 4.



*Figure 3. San Miguel (Salinas River) radar sensor stream gage installation*



### 3.3 Site 4b – Mid Huer Huero Creek, Geneseo Road Bridge

The stream gage at Site 4b was installed on April 9, 2021. Following installation, the radar sensor and data logger were tested and are operational, recording the Huer Huero Creek channel bottom at 17.23 feet below the enclosure (confirmed with tag line). An image of the installation is presented in Figure 5.



*Figure 4. Creston (Huer Huero Creek) radar sensor stream gage installation*



#### **4.0 DATA COLLECTION AND SYSTEM MAINTENANCE**

The stream gages are operational and set to record stream stage at 15-minute intervals, consistent with San Luis Obispo County Flood Control and Water Conservation District practice. Until the transmitters at each site are linked with a base station, the stage data will need to be manually downloaded. There is ample storage capacity (equivalent to multiple years). Given the seasonal nature of stream flow in the basin, the City or GSA monitoring and maintaining the gages may also consider removing the radar sensors and electronics canisters from the enclosures for safe keeping during the dry season.



## APPENDIX A

### Streamflow Measurement in Natural Channels

## Streamflow Measurement in Natural Channels

The most practical method for measuring streamflow in natural channels is the velocity-area method, which has the following computation<sup>4</sup>:

$$Q = \sum_{i=1}^n (a_i v_i)$$

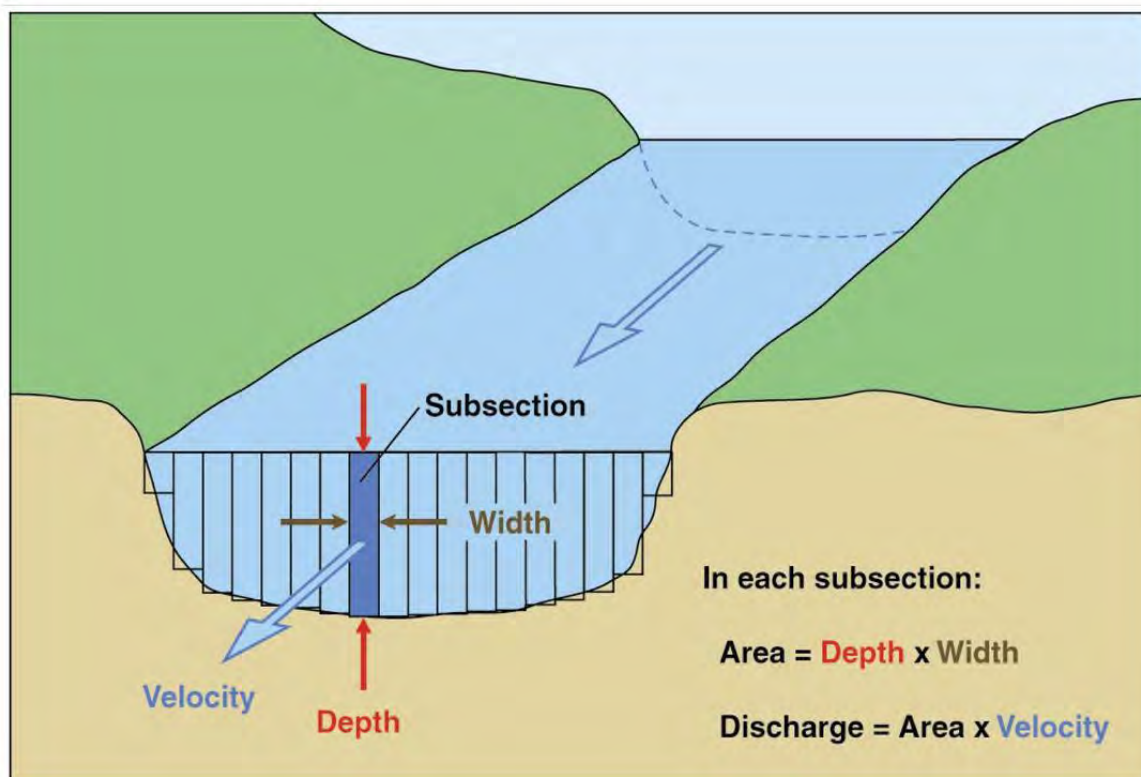
where:

$Q$  = total discharge (reported in cubic feet per second).

$a_i$  = cross-sectional area of flow for the  $i$ th segment of the  $n$  segments into which the cross section is divided (square feet), and

$v_i$  = the corresponding mean velocity of flow normal to the  $i$ th segment (feet per second).

The conceptual model for the velocity area-method is shown below. A stream is divided into segments, each with an individual area and velocity, which are then multiplied and summed using the above equation.



*Diagram of Channel cross-section with segments for discharge computation (USGS)*

<sup>4</sup> Turnipseed, D.P. and Sauer, V.B., 2010. Discharge Measurements at Gaging Stations, USGS Techniques and Methods 3-A8.



In natural channels, stream gages are used to record stage (feet), which is the height of water in the stream above an arbitrary point, usually at or below the stream bed. The stage is then converted to streamflow through the use of a rating curve, or stage-discharge relation. A rating curve incorporates information collected that is specific to each site, including the cross-sectional area of the channel and the average velocity for a given flow stage. These rating curves are developed using depth profiles and average flow velocity measurements during storm-runoff events. Rating curves may need to be revised periodically as they can shift due to changes in channel geometry. Measuring average flow velocity across a channel at different stream stages is the most challenging part of developing a rating curve.

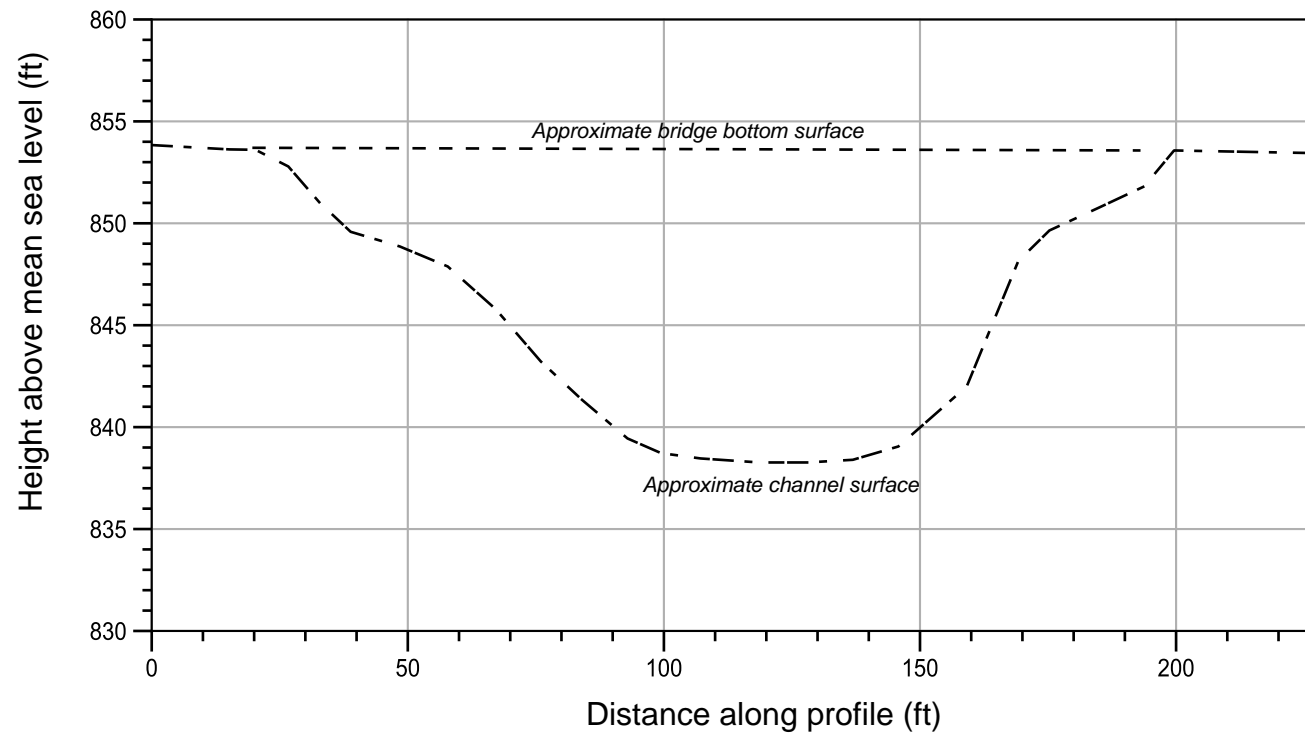


## APPENDIX B

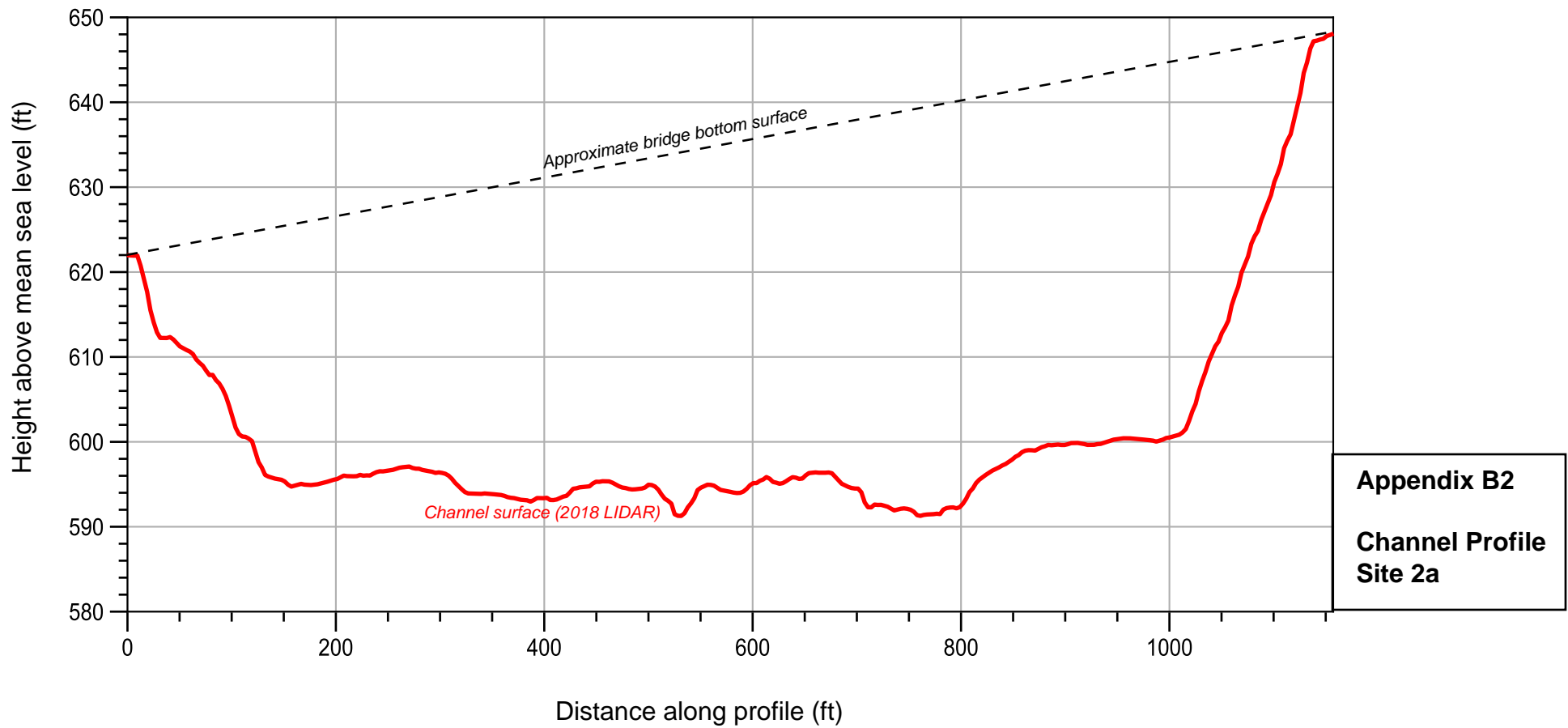
### Stream Profiles at SEP Stream Gage Sites



Note: Aerial imagery reflects conditions prior to the renovation of bridge 49C0307



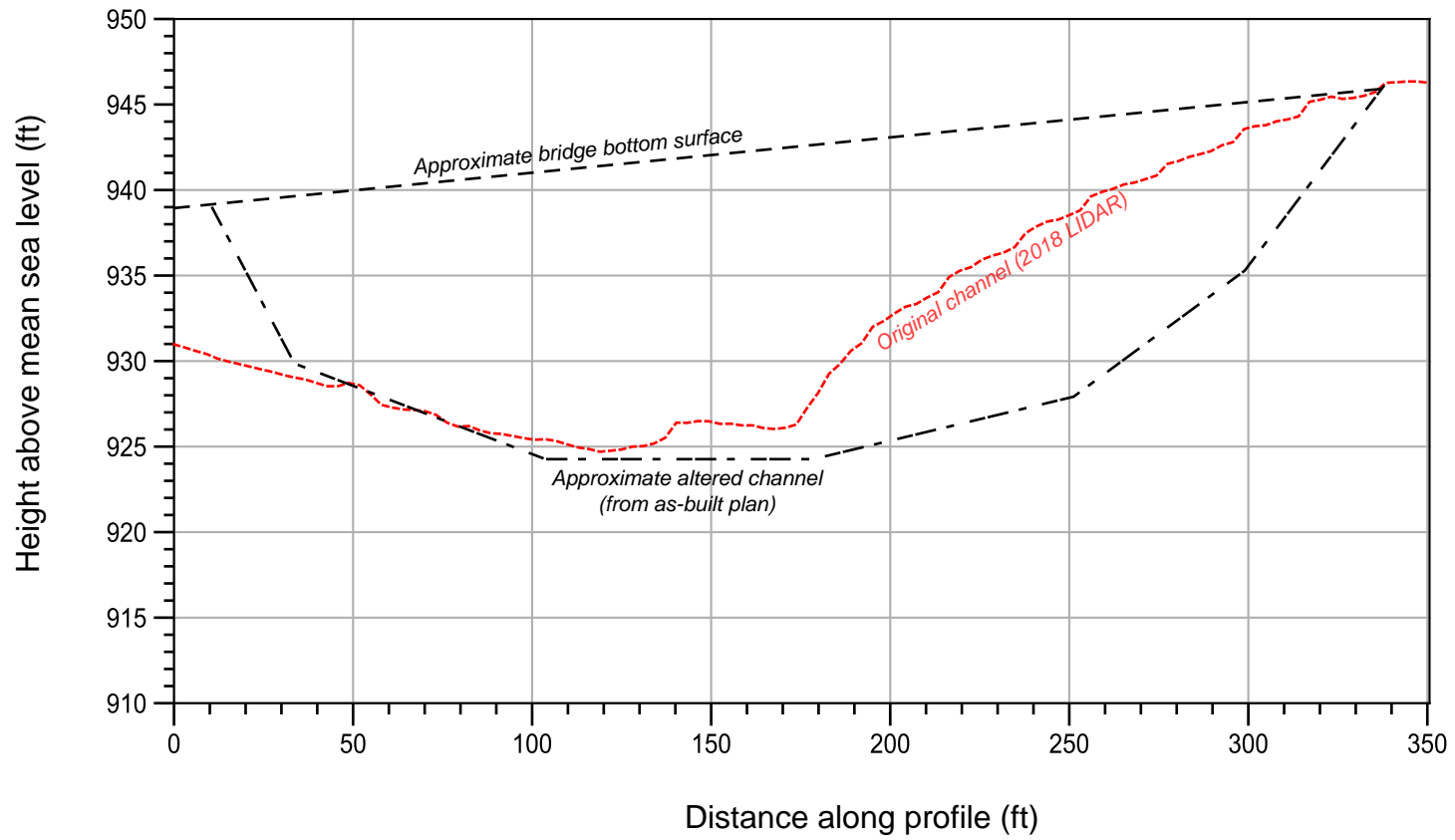
**Appendix B1**  
**Channel Profile**  
**Site 10a**







Note: Aerial imagery reflects conditions prior to the construction of bridge 49C0431



**Appendix B3**  
**Channel Profile**  
**Site 4b**