LOS MOLINOS SUBBASIN GROUNDWATER SUSTAINABILITY PLAN ANNUAL REPORT – 2022

PREPARED FOR

TEHAMA COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

TEHAMA COUNTY GSA

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
AEM	airborne electromagnetic
af	acre-feet
af/ac	acre-feet per acre
bgs	below ground surface
CASGEM	California Statewide Groundwater Elevation Monitoring Online System
CVP	Central Valley Project
District	Tehama County Flood Control and Water Conservation District
DMS	data management system
DWR	Department of Water Resources
ET	evapotranspiration
eWRIMS	Electronic Water Rights Information Management System
ft	feet
GAMA	groundwater ambient monitoring and assessment program
GIS	geospatial information system
GPCD	gallons per capita per day
GSP	Groundwater Sustainability Plan
GSA	Groundwater Sustainability Agency
InSAR	Interferometric Synthetic Aperture Radar
km	kilometer
m	meter
MO	measurable objective
MT	minimum threshold
NAVD 88	North American Vertical Datum of 1988
PMA	projects and management action
PRISIM	Parameter-elevation Regressions on Independent Slopes Model
RMS	representative monitoring site
SCADA	supervisory control and data acquisition
SGMA	Sustainable Groundwater Management Act
SMC	sustainable management criteria
Subbasin	Corning Subbasin
SWRCB	State Water Resource Control Board
TDS	total dissolved solids
Tehama IHM	Tehama Integrated Hydrogeological Model

Tehama County FCWCD	Tehama County Flood Control and Water Conservation District
TNC	The Nature Conservancy
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WY	water year

EXECUTIVE SUMMARY

ES 1 Introduction

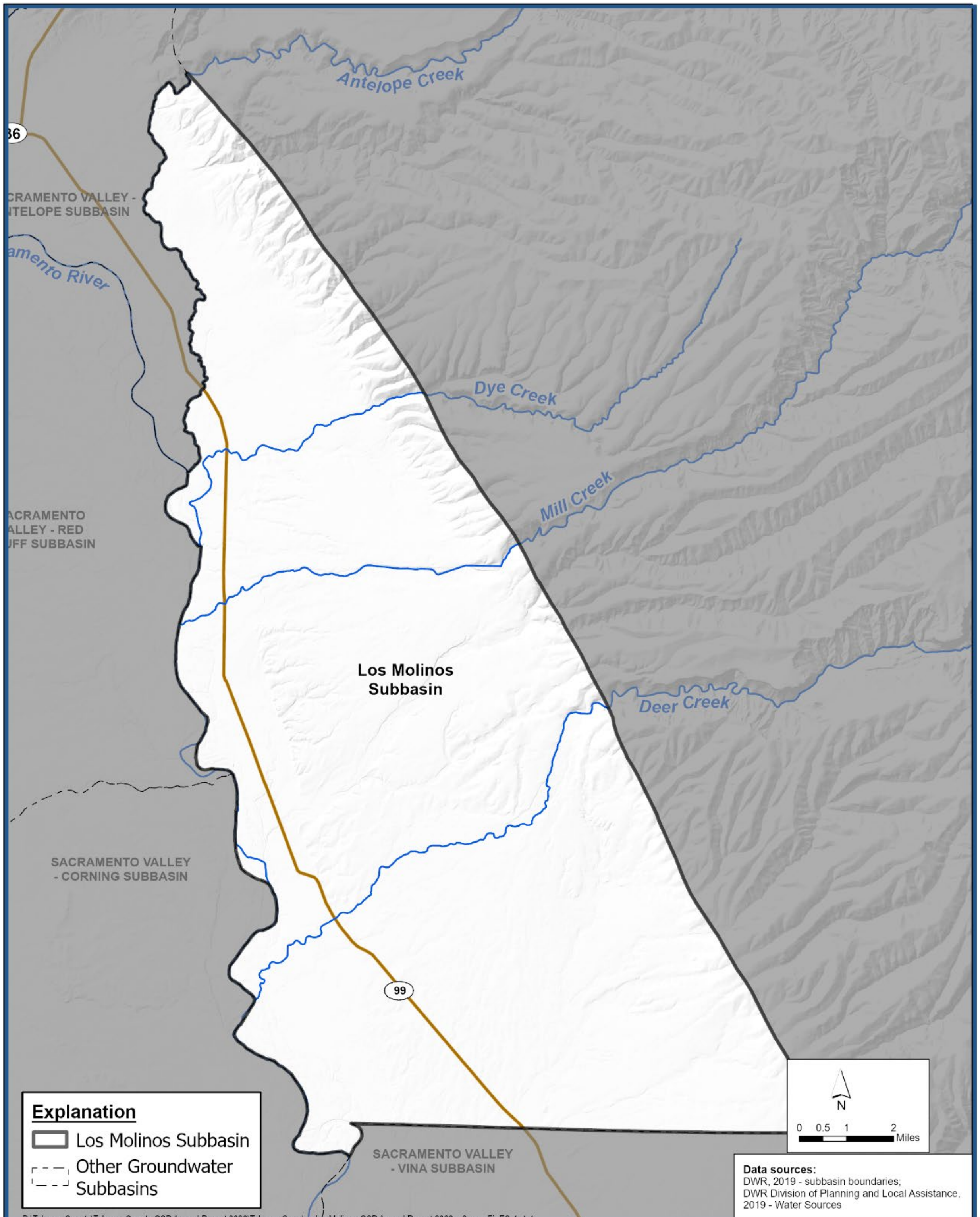
The annual report for the Los Molinos Subbasin (Subbasin) (5-021.56) was prepared on behalf of the Tehama County Groundwater Sustainability Agency (GSA or District) to fulfill the statutory requirements of the Sustainable Groundwater Management Act (SGMA) legislation (Section 10728) and regulatory requirements developed by the California Department of Water Resources (DWR) included in the Groundwater Sustainability Plan (GSP) Regulations (Section 354.40 and Section 356.2). The Regulations require the GSA to submit an Annual Report to DWR by April 1, 2023 following the reporting year (October through September).

The Los Molinos Subbasin covers 99,400 acres and is in the Northern Sacramento Valley Groundwater Basin (**Figure ES-1**). Los Molinos is one of seven (7) groundwater subbasins within Tehama County. The Tehama County FCWCD is the exclusive GSA for six (6) of those subbasins: Antelope, Bend, Bowman, Los Molinos, Red Bluff, and South Battle Creek. The seventh, the Corning Subbasin, extends into Glenn County, and the GSP for that subbasin is being developed in a coordinated effort between the Tehama County FCWCD and the Corning Sub-basin GSAs.

This report is the second Annual Report prepared to support the adopted Los Molinos Subbasin GSP submitted in January 2022. This Annual Report includes data elements for the current reporting Water Year (WY), 2022. Pursuant to GSP Regulations, the Annual Report includes:

1. Groundwater Elevation Data
2. Water Supply and Use
3. Change in Groundwater Storage
4. GSP Implementation Progress

This Annual Report coincides with one of the most severe and extensive droughts in the western United States' recorded history. In WY 2022, drought conditions in this subbasin were classified as ranging from "extreme" to "exceptional," the most extreme classification defined by the U.S. Drought Monitor. Historically, observed impacts during exceptional drought generally include: widespread water supply shortages, depleted surface water supplies, extremely low federal and state surface water deliveries, curtailment of water rights, extremely high surface water prices, increased groundwater pumping to satisfy water demands, dry groundwater wells, increased well drilling and deepening, increased pumping costs, wildfire, decreased recreational opportunities, and poor water quality, among other potential impacts reported by the U.S. Drought Monitor. All of these conditions were experienced to a degree across California in 2022 and, at least in part, within the Subbasin.



TEHAMA COUNTY
LSCE Team

Subbasin Area Map

Figure ES-1

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

ES 2 Groundwater Elevations

Groundwater elevation data in the Upper and Lower Aquifers for WY 2022 were analyzed. The Water Year is defined as October through September. Groundwater elevation contour maps for seasonal low and seasonal high-water levels were prepared for WY 2022. Six Representative Monitoring Site (RMS) wells exist that monitor groundwater levels in the Upper Aquifer while only three RMS wells are screened in the Lower Aquifer. Through the TSS program an additional monitoring well is planned to be installed. This nested monitoring well will provide an added well to both the Upper and Lower Aquifers. Seasonal high groundwater elevations were at or above their respective Measurable Objectives (MO) during WY 2022.

ES 3 Water Supply and Use

Table ES-1 includes groundwater use data by sector for WY 2022, numbers are rounded to two significant digits, except totals which are unrounded. The agricultural sector had the greatest increase in use from 40,000 af in WY 2021 to 48,000 af in WY 2022. Native vegetation experienced a decrease from 2500 in WY 2021 to 5,900 af in WY 2022, while urban groundwater use saw a decrease from 990 af in WY 2021 to 753 af WY 2022. In WY 2021 Urban use included an estimated Rural Residential use, in WY 2022 they are reported separately. WY 2022 has been preliminarily classified as Critical by DWR (DWR, 2022).

Table ES-1. Groundwater Use by Water Use Sector	
Sector	**2022 (af)**
Agricultural	48,000
Urban	750
Rural Residential	3
Native Vegetation (Plant groundwater uptake)	5,900
Total	**54,653**
Total (excluding Native Vegetation[1])	**48,753**

[1] *Excludes native vegetation which involves only natural plant uptake of shallow groundwater, not direct pumping, and extraction.*

Total surface water deliveries have been estimated from total surface water diversions by accounting for conveyance losses, reuse, and boundary outflows for WY 2022 and are presented in **Table ES-2**, numbers are rounded to two significant digits, except totals which are unrounded. Total surface water deliveries for the Los Molinos Subbasin were estimated to be about 33,000 af for WY 2022.

Table ES-2. Surface Water Deliveries by Water Use Sector and Source		
Sector	**2022 (af) Supply Source**	
	CVP	**Local**
Agricultural	0	33,000
Urban	0	0
Native Vegetation	0	0
Total	**33,000**	

ES 4 Groundwater Storage

Changes in groundwater storage from Spring 2021 to Spring 2022 were calculated using measured groundwater levels and a storage coefficient for the Upper and Lower Aquifers. Changes in groundwater levels from Spring 2021 to Spring 2022 at selected wells were interpolated to estimate the groundwater elevation change in areas where sufficient data was available. Estimated elevation change was multiplied by a storage coefficient (0.066) available from the Tehama Integrated Hydrogeological Model (Tehama County FCWCD, 2022) to estimate the groundwater storage change volume in the Upper and Lower aquifers. Changes in storage calculations are described further in **Sections 2.1**. **Table ES-3** presents the annual storage change values for each principal aquifer.

Table ES-3. Change in Groundwater Storage Based on Seasonal High Groundwater Levels

Aquifer	2022 (af)
Upper Aquifer	-12,000
Lower Aquifer	-2,000
Total	**-14,000**

ES 5 GSP Implementation Progress

ES 5.1 Progress Towards Achieving Sustainability

Groundwater conditions were above the established Minimum Thresholds (MTs) for the chronic lowering of groundwater levels sustainable management criteria (SMC) in Spring 2022. However, two wells (26N02W22E006M, and 26N02W22E004M) do not have established MTs. Overall, water levels in Spring 2022 were lower than Spring 2021 due to extended drought conditions.

The GSA is on track to stay above the Measurable Objective (MO) for the land subsidence SMC. The land subsidence MT is 0.5 feet (ft) per five years.

The depletion of interconnected surface water SMC uses spring groundwater elevations in wells within the monitoring network, and all interconnected surface water RMS wells' water levels were above MT levels.

ES 5.2 Progress Towards PMA Implementation

Updates and activities since the previous Annual Report include the Tehama County FCWCD GSA submitting a proposal for funding through DWR's SGM Grant Program in order to further develop and fund project and management actions (PMAs) for monitoring, recharge, and conjunctive use. A draft awards list for the grant application is anticipated to be released by DWR in June 2023.

There has been progress with the Deer Creek Instream Flow Planning and Design Project since the last annual report, with Trout Unlimited securing grant funding for four distinct planning and design projects in the Deer Creek watershed area.

The GSA coordinated with DWR to conduct an Airborne Electromagnetic (AEM) Survey in the summer of 2022 to address data gaps in the subbasin, provide a better understanding of aquifer characteristics and refine the current hydrogeologic conceptual model. Other actions include monitoring and recording of groundwater levels and quality data, maintaining, and updating the Data Management System (DMS), annual reporting of subbasin conditions, and ongoing intra- and inter-basin coordination.

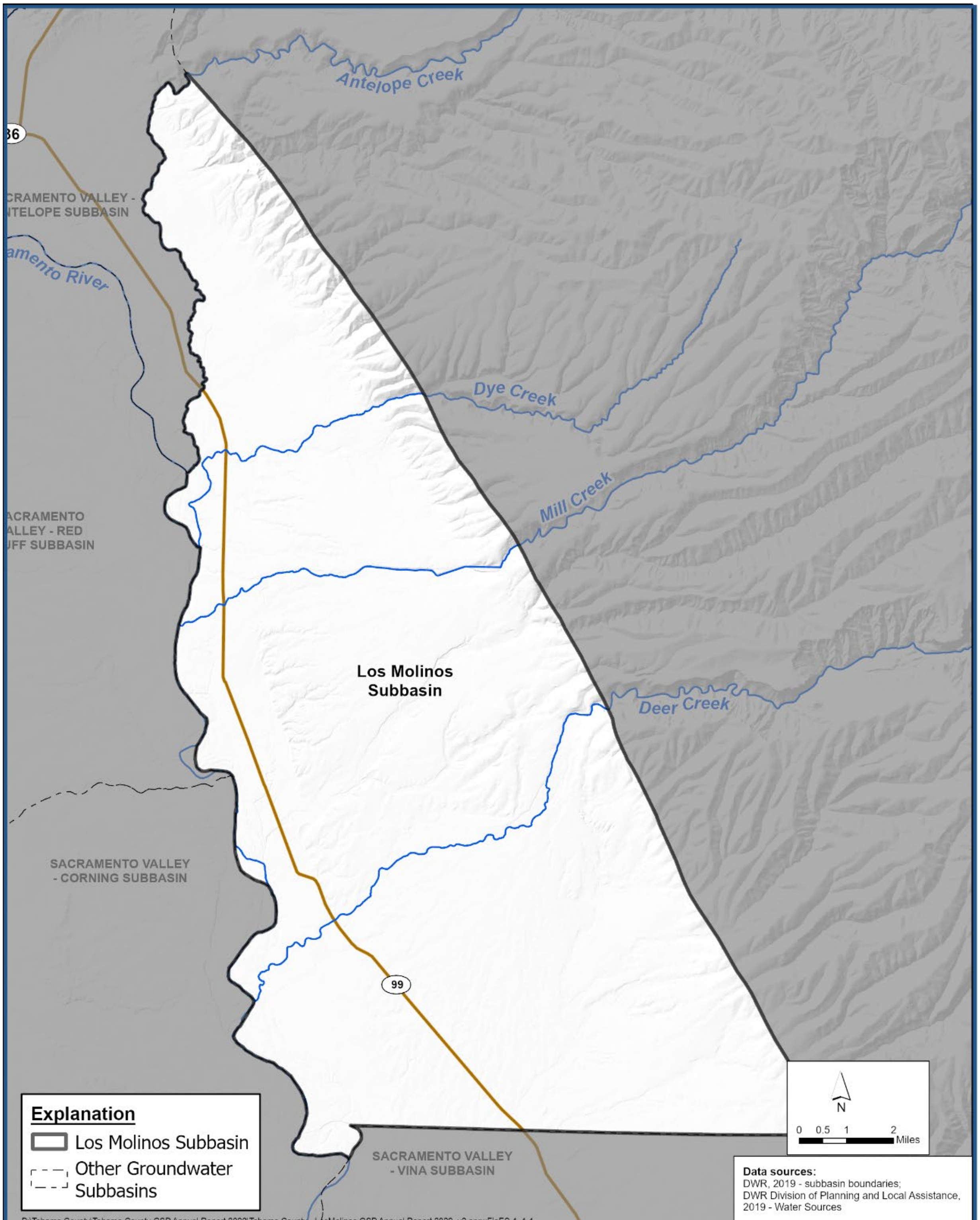
1 GENERAL INFORMATION

The annual report for the Los Molinos Subbasin (Subbasin) (5-021.56) was prepared on behalf of the Tehama County Groundwater Sustainability Agency (GSA) to fulfill the statutory requirements of the Sustainable Groundwater Management Act (SGMA) legislation (Section 10728) and regulatory requirements developed by the California Department of Water Resources (DWR) included in the Groundwater Sustainability Plan (GSP) Regulations (Section 354.40 and Section 356.2). The Regulations require the GSA to submit an Annual Report to DWR by April 1st following the reporting year (October through September).

1.1 Subbasin Setting

The Los Molinos Subbasin (DWR Subbasin No. 5-021.56) covers 99,400 acres and is located in the Northern Sacramento Valley Groundwater Basin. The lateral extent of the Subbasin is defined by the Subbasin boundaries provided in Bulletin 118 (DWR, 2018). It is bounded on the west by the Antelope Subbasin (DWR Subbasin No. 5-021.54), the Red Bluff Subbasin (5-021.50), and the Corning Subbasin (DWR Subbasin 5-021.51). It is bounded on the south by the Vina Subbasin (5--021.57), on the north by the Antelope Subbasin (DWR Subbasin No. 5-021.54), and on the east by the Cascade Mountain Range. The western boundary of the Subbasin generally follows the Sacramento River after its confluence with Antelope Creek to the Tehama/Butte County line. The entire eastern portion of the Subbasin does not border another groundwater subbasin. (**Figure 1-1**).

Current data sources (discussed in Section **3.2**) estimate 70% of the Subbasin is native vegetation, 22% is agricultural, and 3% is riparian vegetation. The Subbasin's agricultural water users rely on both surface water and groundwater to irrigate their crops. The Subbasin receives local surface water supplies that include runoff from upgradient small watersheds adjacent to the Subbasin and surface inflows along the Sacramento River, Antelope Creek, little Antelope Creek, Dye Creek, Mill Creek and Deer Creek. A portion of these local supplies are diverted by local water rights users for beneficial use within the Subbasin.



Subbasin Area Map

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 1-1

Fresh groundwater bearing geologic deposits in the Subbasin are subdivided from previous studies into two units: The Upper Aquifer and the Lower Aquifer (DWR, 2003; DWR, 2004). The two-aquifer designation is based on an examination of groundwater elevation time-series, electric resistivity data from geophysical logs, lithologic logs, well construction details, and review of previous studies in the Subbasin. Generally, semi-confined, and confined aquifer conditions are encountered at depth and unconfined conditions are seen in the shallower porous media. The complexity of the geologic materials and the formations makes it difficult to define a singular widespread aquitard or distinctive change in geologic materials separating an Upper and Lower Aquifer. To delineate between areas with a higher likelihood of confined conditions, well construction data throughout the Subbasin were examined. Water bearing geologic units in the Upper Aquifer include the Quaternary formations and the upper portions of the Tehama and Tuscan Formations. Wells screened in the Upper Aquifer are largely for domestic purposes. The depth to the bottom of the Upper Aquifer is approximately 350-450 feet (ft) below ground surface (bgs).

The Lower Aquifer is defined as the freshwater bearing geologic units throughout the Subbasin from the bottom of model layer 5 at approximately 350-450 ft bgs, to the bottom of the Subbasin. The aquifer is confined to semi-confined conditions. Water bearing geologic units include the lower portions of the Tehama and Tuscan Formations. Wells screened in the Lower Aquifer are largely for non-domestic purposes.

1.2 Report Contents

This report is the second Annual Report prepared to support the adopted Los Molinos Subbasin GSP submitted in January 2022. The Annual Report includes data elements for the current reporting Water Year (WY), 2022. Data elements presented in this report refer to the Water Year (12-month period from October through September) unless otherwise noted. Pursuant to of the GSP Regulations, the Annual Report includes:

1. Groundwater Elevation Data
2. Water Supply and Use
3. Change in Groundwater Storage
4. GSP Implementation Progress

2 GROUNDWATER ELEVATIONS SECTION 356.2(B)(1)

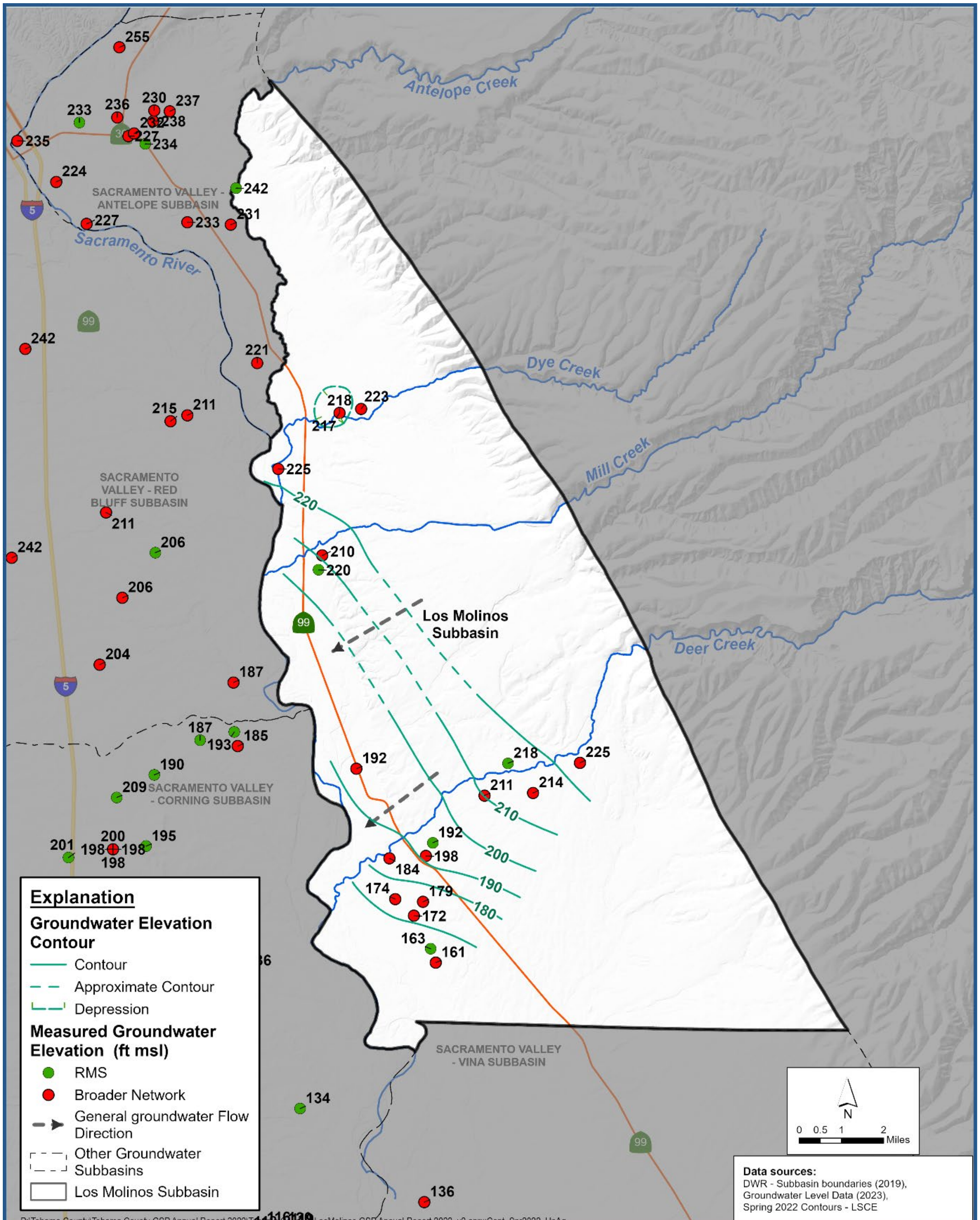
Currently, 54 wells are monitored as part of a broad network for groundwater levels and nine are Representative Monitoring Sites (RMS) wells assigned Sustainability Management Criteria (SMC). The wells are measured at least in the spring and fall each year. Groundwater elevation data in each of the principal aquifers for WY 2022 were analyzed. Hydrographs for these wells are included in **Appendix A**. **Appendix B** includes a copy of the monitoring data used to generate this Annual Report pursuant to GSP regulations (Section 354.40). Groundwater elevation contour maps for seasonal low and seasonal high water levels were prepared for WY 2022. Groundwater level data collected at RMS and other wells used to develop groundwater contours and RMS well hydrographs are collected by DWR, United States Geological Survey (USGS), The Nature Conservancy (TNC) and the District and records are maintained by the State Water Resources Control Board (GAMA) and DWR (CASGEM). Records of groundwater elevations are also maintained in the GSA's data management system (DMS).

2.1 Groundwater Elevation Contours – Section 356.2(b)(1)(A)

Seasonal high and seasonal low groundwater elevation contour maps for WY 2022 are presented for the Upper Aquifer on **Figures 2-1** and **2-2** and in the Lower Aquifer on **Figures 2-3** and **2-4**. The seasonal high contours were prepared based on observed maximum springtime (February-May) water levels, while the seasonal low contours were prepared based on minimum water levels measured in July-October. Due to the limited number of wells in the subbasin and to resolve data gaps near the edge of the subbasin wells neighboring the Los Molinos subbasin were included in the contouring process. Wells were not displayed in contour maps if data did not exist at that well during the mapping period. Contours are shown solid if there is good confidence in the contour placement whereas contours are shown dashed if their position is inferred from data yet generally representative of the contour's true location. Contours are not drawn if confidence in contours is poor. Most notably this occurs on the far northern side of the subbasin where coverage of monitoring wells is poor. Groundwater elevations on the contour maps are shown as feet above mean sea level (ft amsl) based on the North American Vertical Datum of 1988 (NAVD 88).

The contour maps illustrate general features of the groundwater flow system in the Los Molinos Subbasin, including:

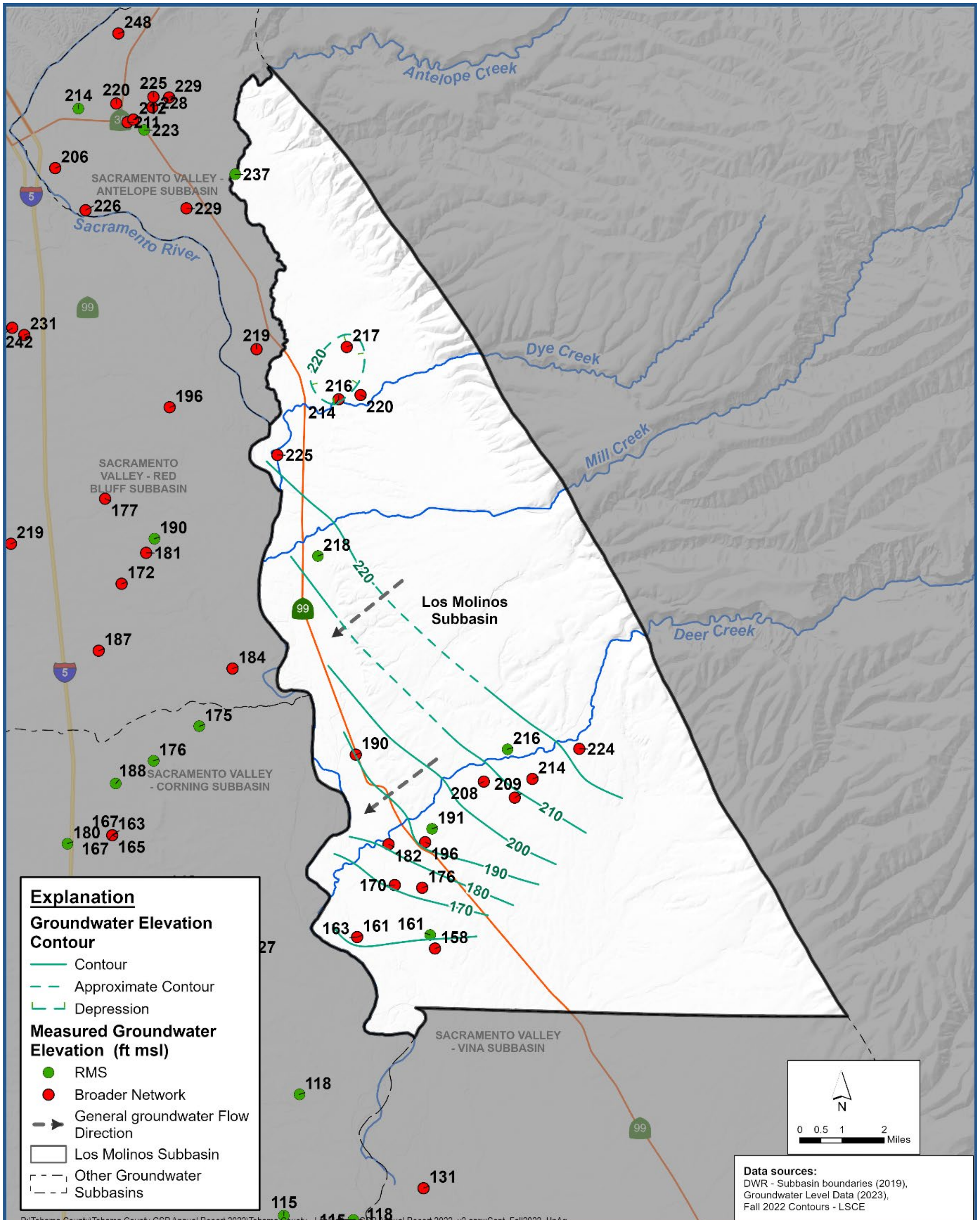
- General groundwater flow moving from the northeast to southwest in both aquifers.
- Generally similar groundwater gradients in the lower aquifer during spring and fall.



Contours of Equal Groundwater Elevation
Upper Aquifer – Spring 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 2-1



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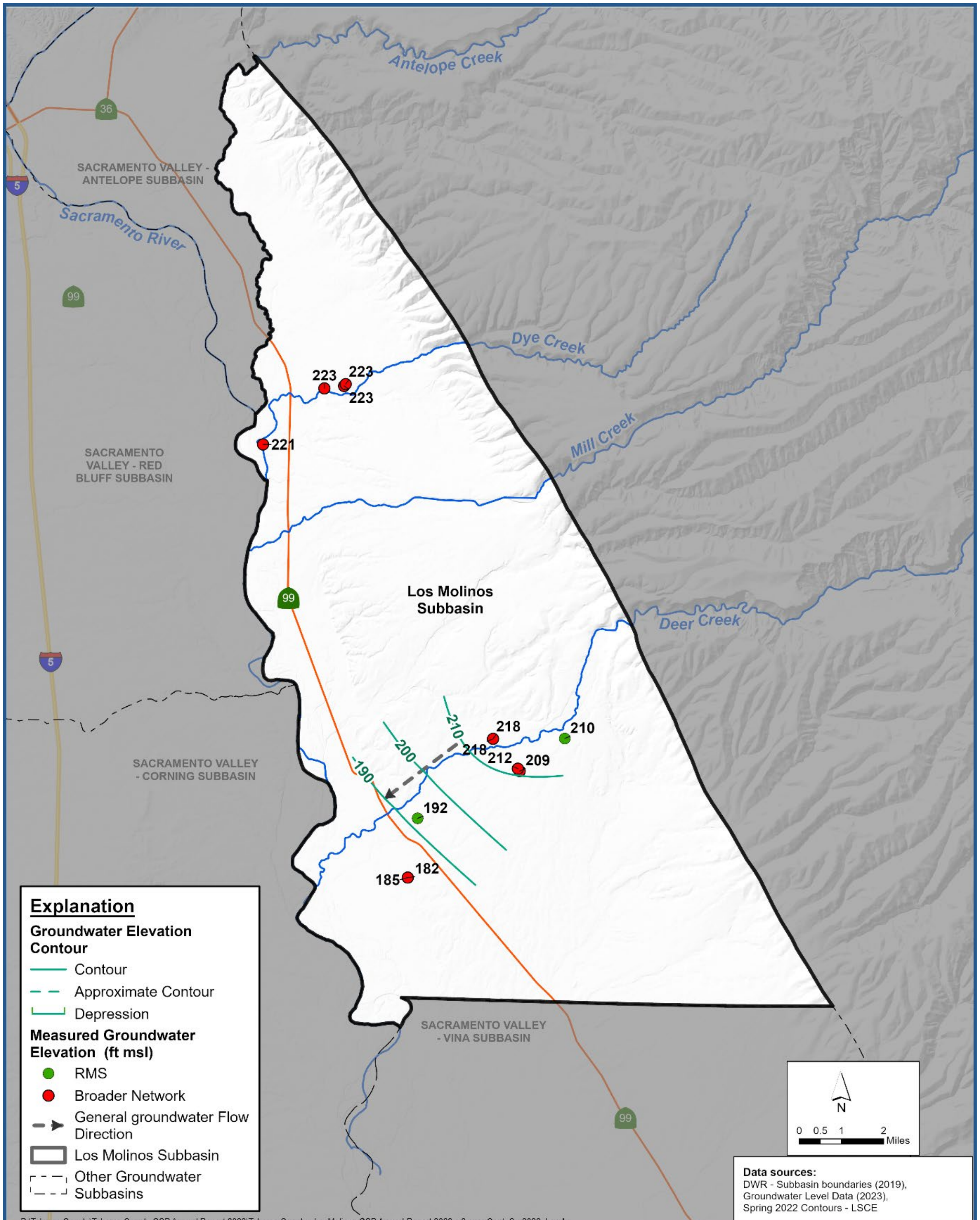
Contours of Equal Groundwater Elevation
Upper Aquifer – Fall 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 2-2



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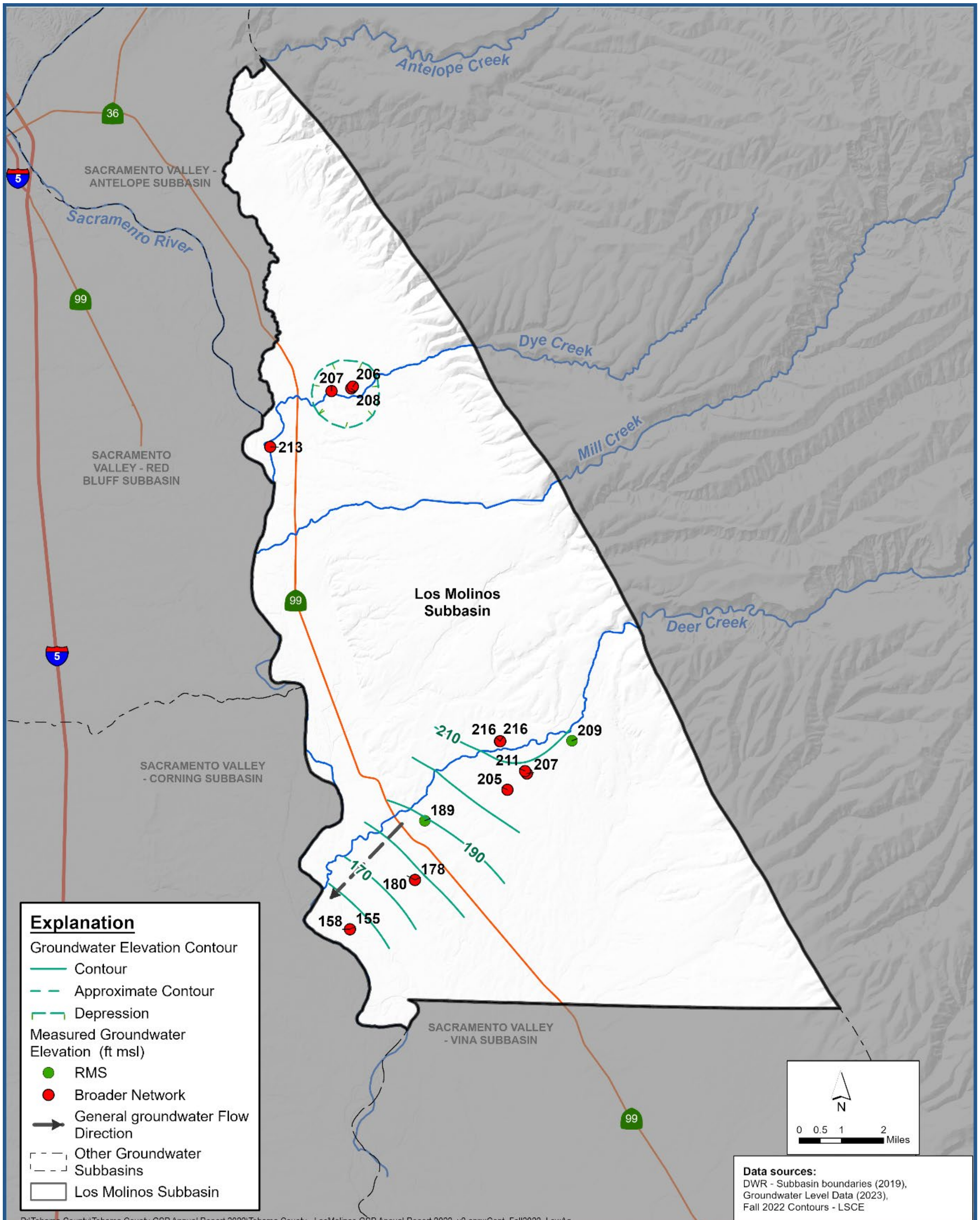
Contours of Equal Groundwater Elevation
Lower Aquifer – Spring 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 2-3



Contours of Equal Groundwater Elevation
Lower Aquifer – Fall 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 2-4

TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
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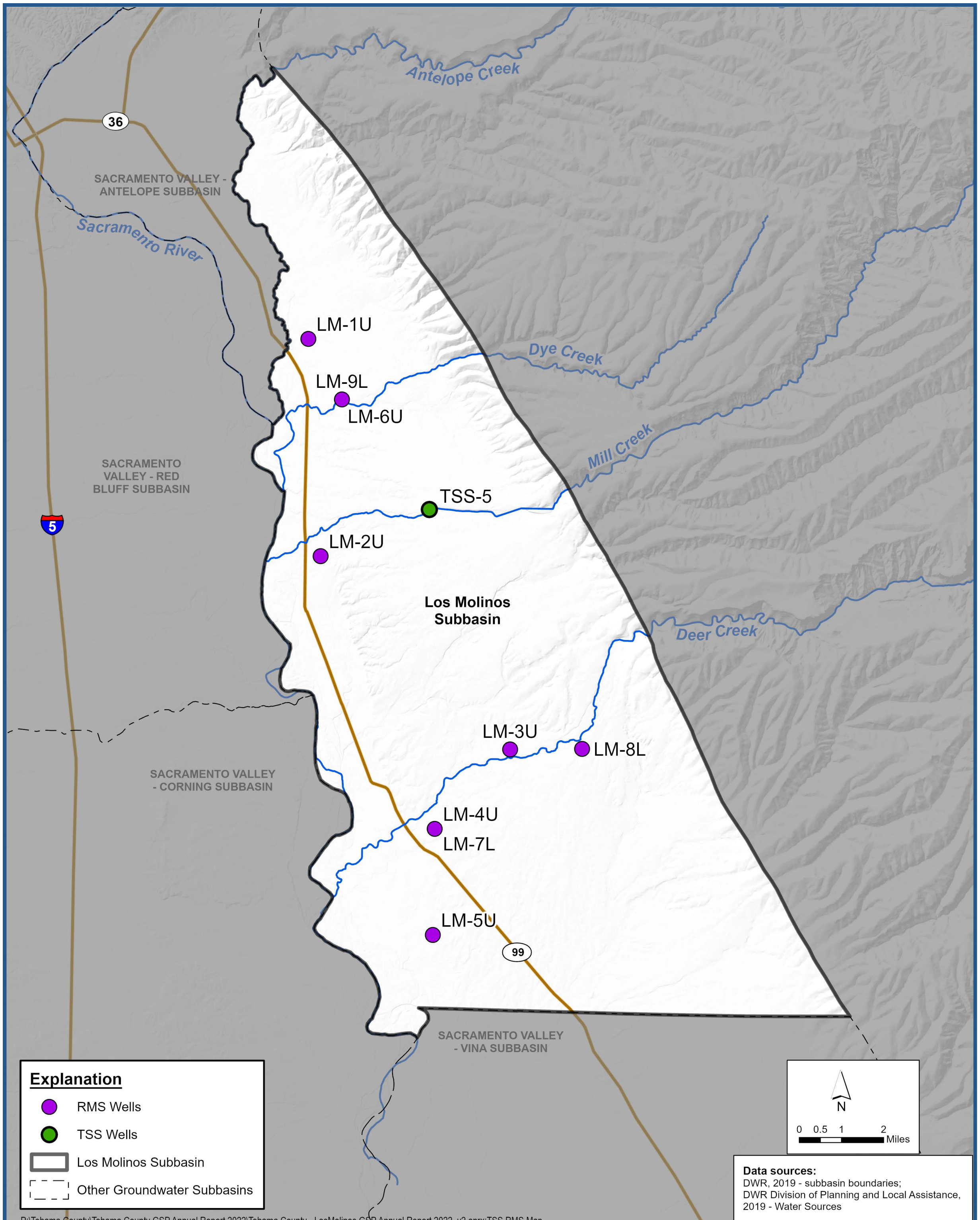
2.2 Groundwater Elevation Hydrographs – Section 356.2(b)(1)(B)

Hydrographs of groundwater elevations were prepared for seven of nine RMS wells in the Upper and Lower Aquifers. Hydrographs for LM-6U and LM-9L were not prepared because these wells are newly constructed and water level elevations have not been collected. SMC definitions for the new wells can be set after additional monitoring is conducted. RMS wells are distributed throughout the Subbasin to provide broad spatial coverage of the Subbasin. **Figure 2-5** shows the distribution of the current RMS wells and the location of the approved TSS well. The process for selecting these sites is documented in the Los Molinos Subbasin GSP. Long-term fluctuations in groundwater levels (and groundwater in storage) occur when there is an imbalance between the volume of water recharged into the aquifer and the volume of water removed from the aquifer, either by extraction or natural discharge to surface water bodies. If, over a period of years, the amount of water recharged to the aquifer exceeds the amount of water removed from the aquifer, then groundwater levels will increase and groundwater storage increases (i.e., positive change in storage). Conversely, if, over time, the amount of water removed from the aquifer exceeds the amount of water recharged then groundwater levels decline. These long-term changes can be linked to various factors including increased or decreased groundwater extraction or variations in recharge associated with wet or dry hydrologic cycles.

All seasonal high groundwater elevations were above the Minimum Thresholds (MT) during WY 2022. Additionally, the seven RMS wells, with a water level history, had seasonal high groundwater elevations at or above the measurable objectives (MO). Fall measurements at one well, LM-2U, had a seasonal low (fall) groundwater elevation below the MO, but well above the minimum threshold (MT). Copies of hydrographs for all RMS wells are included in **Appendix A**.



TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

LSCE Team

RMS TSS Network

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 2-5

3 WATER SUPPLY AND USE

Water supply and use information are presented below. Water use data by sector (required per Section 356.2) is summarized in **Section 3** and categorized by groundwater extraction, surface water supply and total supply using the best data available. Water use sectors are broadly identified as agricultural, urban, and native vegetation land uses.

Groundwater use was taken from records where available and otherwise were estimated from 2022 land use data, climate conditions, and crop coefficients consistent with those used in the Tehama IHM. Surface water use was estimated from historic deliveries when records were not available. Numbers are rounded to two significant digits, except totals which are unrounded.

3.1 Water Budget Approach

Water supply and use in the Subbasin were quantified using the best available data sources and information. Where available, groundwater extraction and surface water supplies were quantified directly from measured and reported groundwater pumping, surface water diversions, and deliveries data. However, groundwater extraction data has historically been limited, particularly for privately-owned wells. Thus, a water budget approach has been used to estimate the remaining, unmeasured volume of groundwater extraction that has occurred to meet demand in the Subbasin.

The Tehama IHM model was used to prepare water budgets for the Subbasin during GSP development. The model was adapted from the Sacramento Valley Groundwater-Surface Water Simulation Model (SVSim, version BETA 3-19-2020; DWR, 2020). Direct measurements of groundwater extraction data could not be used in the model calibration to determine accuracy due to the limited number of observations. Instead, water levels and stream flows were used to calibrate the model resulting in a normalized root mean of squared residual error of five percent. The first Annual Report for WY 2021 leveraged information from the Tehama IHM model to quantify subregion-scale water budgets in the Subbasin through WY 2021. More information about the model's development process can be found in the GSP Appendix 2-J. In the WY 2022, a modified approach to the water budget calculation is utilized to enhance the resolution of the water budget. The method follows the framework laid out in Hessels et al. (2022).

Building on past work, the water budget approach used in this Annual Report utilizes available geospatial data and information to quantify crop water demand, precipitation, and other parameters with pixel-scale resolution (30-meter (m) x 30 m), corresponding to the spatial resolution of satellite imagery used in developing these inputs. In addition to geospatial data, available surface water supply and groundwater extraction data is incorporated into the water budget by distributing that water out to specific regions where that water is used (e.g., surface water supplier service areas). The remaining groundwater extraction needed to meet demand is then calculated based on the balance of water demand and available water supplies, with consideration for rainfall, irrigation, and soils characteristics. The result is a spatially distributed water budget calculated with a finer spatial resolution than was possible in the previous water budgets. The pixel-scale water budget results provide greater insight into where water use occurs in the Subbasin and are configurable to create water budget summaries for any region of the Subbasin.

This approach was used to calculate monthly water budgets by water use sector in the Subbasin during the current reporting year (WY 2022), as required in Title 23 of the California Code of Regulations Section 356.2. Key water budget inflows and outflows calculated in this water budget approach were compared with equivalent values from the Tehama IHM model and the first Annual Report, allowing verification of the consistency between this water budget approach and previous approaches.

Data and information that is used in the water budget approach generally includes:

- Actual evapotranspiration (ET) estimates, extracted from OpenET remote sensing analyses. OpenET is a multi-agency web-based geospatial information system (GIS) utility that quantifies spatial ET using satellite imagery. While OpenET is a new utility, the underlying methodologies to quantify ET apply a variety of well-established modeling approaches that are widely used in government and research. The OpenET modeling approaches utilize the same surface energy balance approach used in the Tehama IHM model used in GSP development. OpenET results are available in the Subbasin with a spatial resolution of 30 m x 30 m (approximately 0.22 acres), allowing easily scalable ET quantification.
  - Additional information about the OpenET team, data sources, and methodologies are available at: https://openetdata.org/.
- Precipitation estimates, extracted from the Parameter-elevation Regressions on Independent Slopes Model (PRISM), developed by the PRISM Climate Group at Oregon State University. PRISM quantifies spatial precipitation estimates, among other climate parameters, based on available weather station data and modeled spatial relationships with topography and other factors influencing weather and climate. PRISM data is available in the Subbasin with a spatial resolution of 4-kilometer (km) x 4 km.
  - Additional information about the PRISM data and methodologies are available at: https://prism.oregonstate.edu.
- 2022 land use data, evaluated through two approaches. Both datasets were compared and evaluated to identify changes in land use as well as the spatial extent of water use sectors in the Subbasin.
  - Pixel-scale (30 m x 30 m) land use coverages of the Subbasin were prepared through analysis of the following datasets:
    - DWR 2019 statewide crop mapping dataset (https://data.cnra.ca.gov/dataset/statewide-crop-mapping)
    - United States Department of Agriculture (USDA) CropScape 2022 Cropland Data Layer coverage (https://nassgeodata.gmu.edu/CropScape/).
      - Measured surface water diversions data, reported from water supplier records, or collected from publicly available sources (water rights diversion records, etc.). Surface water diversions data are generally available at the supplier scale. In this water budget approach, diversions were distributed evenly across the irrigated pixels associated with that supplier's service area.
      - Measured groundwater extraction data, reported from municipal and agricultural water supplier pumping records and private pumping records, where available. Groundwater extraction data is generally available at the supplier scale and was

distributed evenly across the urban or irrigated pixels associated with that supplier's service area.

- Measured boundary water outflow data, reported from water supplier records where available.

Additional details for groundwater extraction and surface water supply data sources are given in the sections below.

3.2 Groundwater Extraction – Section 356.2(b)(2)

Groundwater extraction in the Subbasin is summarized in Table 3-1. Groundwater extraction is reported from pumping records where available, while the remaining groundwater extraction in the Subbasin is estimated through the water budget approach described in the previous section.

A portion of the Subbasin is dependent on groundwater as the only available water source for agricultural irrigation. During dry and critically dry years, agricultural groundwater extraction increases relative to long-term average demand due to less rainfall, reduced soil moisture, and increased evapotranspiration associated with hotter, drier conditions, and less surface water available for diversion. There are a total of 22,200 cropped acres in the Los Molinos Subbasin, and the agricultural groundwater extraction for these lands (estimated through the water budget approach described above) for WY 2022 was 48,000 acre-feet (af).

All municipal suppliers in the Subbasin are reliant on groundwater for their municipal water supplies, although there are a limited number of public supply wells in the Subbasin. The largest community in the Subbasin is Los Molinos, which is located near the center of the western boundary. The total volume during WY 2022 was 750 af.

Additionally, private domestic wells provide rural residential water needs throughout the Subbasin. The highest density of domestic wells is in and around the community of Los Molinos. Rural residential groundwater extraction through domestic wells was estimated based on the California Water Service Company's 2020 Urban Water Management Plan's (UWMP) 2020 water use (CWSC, 2020). Water use in 2020 was 184 gallons per capita per day (GPCD). The UWMP Act (1983) requires urban water suppliers to prepare a UWMP every five years. The 2020 GPCD was combined with 2020 census data for parcels that are not serviced by municipal supplies. Parcel data was obtained from county geographic information system (GIS) portals. The census designated value of 2.63 persons per household for the county was multiplied by the selected residential parcels to determine the number of people in those households. This value was then used to estimate water usage using the GPCD. The total volume during WY 2022 was three af.

Environmental groundwater use in the Subbasin includes uptake of shallow groundwater from deeply rooted plants. Although no groundwater is directly pumped or extracted for use in these areas, the consumptive use of shallow groundwater has been estimated through the water budget approach described above for areas classified as native vegetation, riparian vegetation, or barren lands. The estimated volumes are based on the evaporative demand unable to be met through precipitation that must instead be met through plant access to shallow groundwater. There are roughly 2,600 acres of riparian vegetation that had a total estimated groundwater use of 5,900 af, roughly 2.3 af per acre (af/ac). This method of estimating environmental groundwater use is dependent on both precipitation and ET estimates. Since environmental groundwater use is modeled over a large area, small changes or uncertainties in precipitation, ET, or ET from precipitation have a large impact on the overall estimated volume. Additionally, the method does not differentiate between evapotranspiration coming from changes in root zone soil moisture storage and the shallow groundwater system. As a result, a portion of the quantified environmental groundwater demand may be met through a depletion of root zone soil moisture rather than uptake of shallow groundwater from the aquifer. All else being equal, larger depletions of root zone soil moisture are more likely to occur (1) during below normal, dry, and critical water years and (2) in landscapes with deeply rooted vegetation.

Also, there are a total of 69,500 additional acres of native vegetation, which are primarily grasslands and oak woodlands in the eastern portion of the Subbasin. Potential shallow groundwater use from deeply-rooted plants in these areas has not been quantified for the Annual Report, but could be considered and further evaluated in future years.

The Los Molinos Subbasin did not have any managed recharge volumes or groundwater extractions for managed wetlands in WY 2022. The municipal supplies do not distinguish between urban and industrial water uses.

The total estimated groundwater extraction in WY 2022 was approximately 48,000 af. This is about 4,500 af greater than WY 2021 groundwater extraction of 43,500 af for the Subbasin reported in the last Annual Report (WY 2021); the difference is largely influenced by increased agricultural pumping in WY 2022 due to the increased water demand for water by crops during drier conditions and the need to compensate for reduced surface water supplies during droughts. Figure 3-1 shows the location and volumes of groundwater extractions in WY 2022 for the Subbasin. Table 3-1 shows the breakdown of groundwater usage by sector; WY 2022 has been preliminarily classified as Critical by DWR (DWR, 2022).

The agricultural sector had the greatest increase in use from 40,000 af in WY 2021 to 48,000 af in WY 2022. Native vegetation experienced a decrease from 2500 in WY 2021 to 5,900 af in WY 2022, while urban groundwater use saw a decrease from 990 af in WY 2021 to 753 af WY 2022. In WY 2021 Urban use included an estimated Rural Residential use, in WY 2022 they are reported separately. In WY 2022 the agricultural sector accounted for approximately 87% of the total groundwater extraction, while the remaining 13% was utilized for municipal and rural residential water needs.

Table 3-1. Groundwater Use by Water Use Sector	
Sector	**2022 (af)**
Agricultural	48,000
Urban	750
Rural Residential	3
Native Vegetation (Plant groundwater uptake)	5,900
Total	**54,653**
Total (excluding Native Vegetation[1])	**48,753**

[1] Excludes native vegetation which involves only natural plant uptake of shallow groundwater, not direct pumping, and extraction.

3.3 Surface Water Supply – Section 356.2(b)(3)

Surface water supplies used or available for use in the Subbasin are summarized in Table 3-2. Surface water supplies are reported directly from water supplier records or collected from publicly available sources (water rights diversion records, etc.) where available.

Surface water provided about 41% of the agricultural water demand in the Subbasin for WY 2022. Diversions from creeks (such as Deer Creek, and Mill Creek) flowing out of the Cascade Mountain Range to the east of the Subbasin are used by Los Molinos Mutual Water Company, Deer Creek Irrigation District, Stanford Vina Ranch Irrigation Company, and private diverters. Diversion records were accessed from the State Water Resource Control Board's (SWRCB) Electronic Water Rights Information Management System (eWRIMS; SWRCB, 2023) data for total diversions.

There are currently no surface water supplies for use by the urban or riparian/native vegetation sectors in the Los Molinos Subbasin; all surface water use is for agricultural purposes. Two surface water supply volumes are included and reported in this section: diversions and deliveries. Table 3-2 depicts total diverted surface water, which are the volumes obtained from the sources described above. Total surface water diversions for the Los Molinos Subbasin were estimated to be about 46,000 af for WY 2022.

Table 3-2. Surface Water Diversions by Water Use Sector and Source		
Sector	**2022 (af)** Supply Source	
	CVP	Local
Agricultural	0	46,000
Urban	0	0
Native Vegetation	0	0
Total	**46,000**	

Table 3-3 depicts total surface water deliveries, estimated from total surface water diversions by accounting for conveyance losses, reuse, and boundary outflows. Total surface water deliveries for the Los Molinos Subbasin was estimated to be about 33,000 af for WY 2022, as shown in **Table 3-3**.

Table 3-3. Surface Water Deliveries by Water Use Sector and Source		
Sector	2022 (af) Supply Source	
	CVP	Local
Agricultural	0	33,000
Urban	0	0
Native Vegetation	0	0
Total	**33,000**	

3.4 Total Water Use by Sector – Section 356.2(b)(4)

Total water use in the Subbasin was tabulated from groundwater extraction volumes reported in **Table 3--1** and the surface water supply deliveries reported in **Table 3-3**. Total water available is summarized in **Table 3-4** for WY 2022. The results are either based on measured data or estimates as described in the previous two sections.

In total, groundwater supplied approximately 59% of the agricultural water demand in the Subbasin and also constituted approximately 63% of the total water supplies for all water demand sectors in WY 2022.

Table 3-4. Total Water Use by Water Use Sector			
Sector	**2022 (af)**		
	Groundwater	**Surface Water**	**Total**
Agricultural	48,000	33,000	81,000
Urban	750	0	750
Rural Residential	3	0	3
Native Vegetation (Plant groundwater uptake)	5,900	0	5,900
Total	**54,653**	**33,000**	**87,653**
Total (excluding Native Vegetation[1])	**48,753**	**33,000**	**81,753**

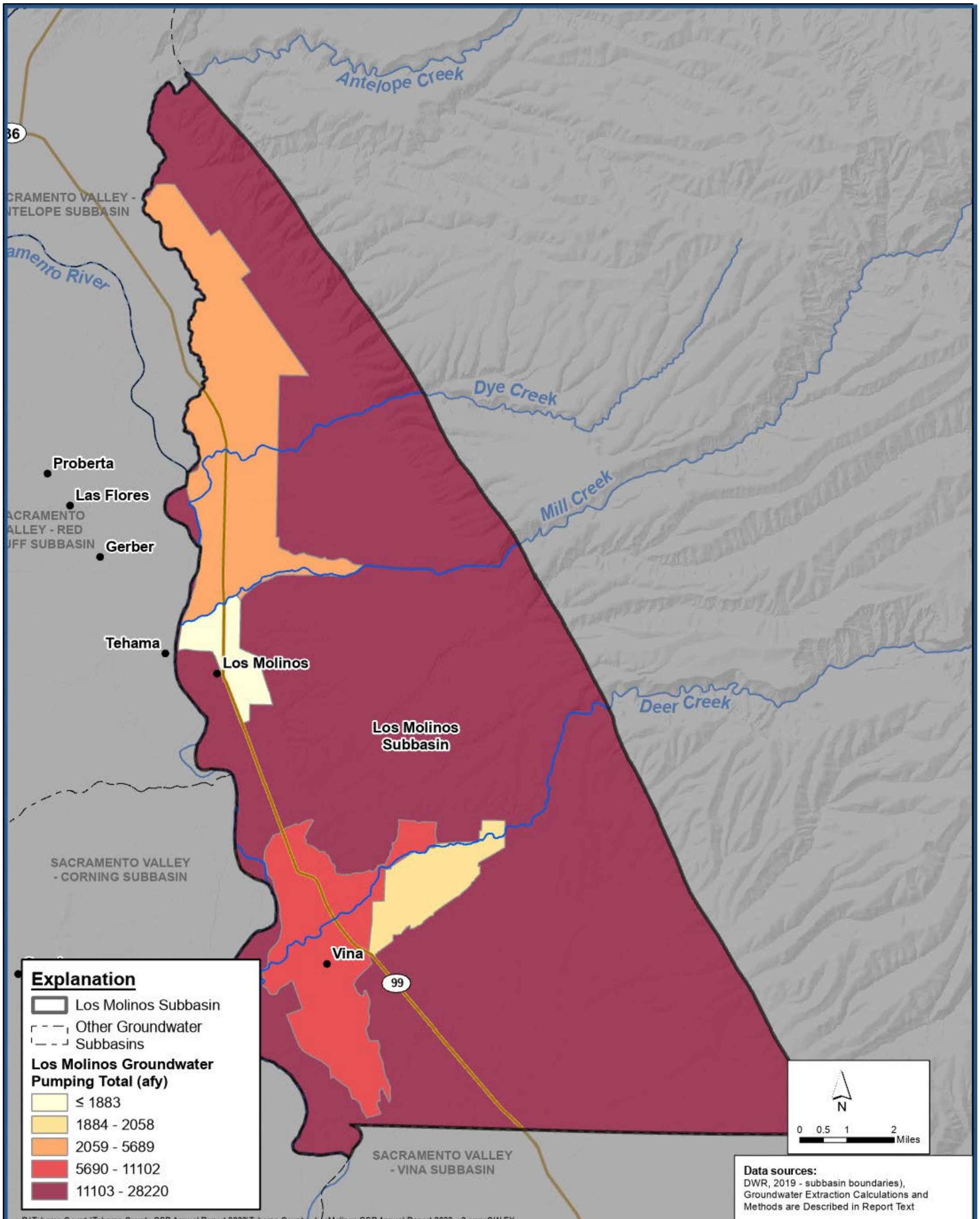
[1] Excludes native vegetation which involves only natural plant uptake of shallow groundwater, not direct pumping, and extraction.

3.5 Uncertainties in Water Use Estimates

Estimated uncertainties in the water budget components are presented in **Table 3-5**. The uncertainty of these water budget components is based on typical accuracies given in technical literature and the cumulative estimated accuracy of all inputs used to calculate the components.

Table 3-5 Estimated Uncertainty in Water Use Estimates			
Water Budget Component	**Data Source**	**Estimated Uncertainty (%)**	**Source**
Groundwater Water			
Agricultural	Measurement	20%	Typical uncertainty from water balance calculation.
Urban	Measurement/Estimate	5%	Typical accuracy of urban water system reporting.
Rural Residential	Calculation	15%	Estimated from per capita water use and Census information.
Native Vegetation (Plant groundwater uptake)	Calculation	25%	Estimated based on land use classification, precipitation, and ET.
Surface Water			
Agricultural	Calculation	10%[1]	Estimated from SB 88 measurement accuracy standards.

[1] Higher uncertainty of 10%-20% is typical for estimated surface water inflows, including un-gaged inflows from small watersheds into creeks that enter the Basin.



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Groundwater Extraction in the Subbasin Water Year 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 3-1

4 GROUNDWATER STORAGE

Changes in groundwater storage from Spring 2021 to Spring 2022 were calculated for the Upper and Lower Aquifers. Spring (seasonal high) groundwater levels are less influenced by groundwater pumping compared to Fall (seasonal low) groundwater levels; therefore, they are more reliable to calculate groundwater storage change.

Change of groundwater levels from Spring 2021 to Spring 2022 at wells screened in the Upper Aquifer were interpolated to estimate the groundwater elevation change in areas where sufficient data were available. Estimated elevation change was multiplied by a spatially variable aquifer storage coefficient available from the Tehama Integrated Hydrogeological Model (Tehama County FCWCD, 2022) to estimate the groundwater storage change volume in the Upper Aquifer. Spatial extent of this estimate was limited to areas where measured groundwater levels were available. (**Figure 4-1**). Therefore, an area-weighted adjustment was applied to the estimated storage to estimate the subbasin-wide change in storage.

Sufficient groundwater level data were not available to interpolate water level changes in the Lower Aquifer. Therefore, Lower Aquifer storage change was estimated using the Upper Aquifer storage change and historical ratio of storage changes in the two aquifers for critical years. The summation of the changes in the Upper and Lower Aquifers provides the total groundwater storage change in the Subbasin. **Table 4--1** presents the annual storage change values for both the Upper and Lower Aquifers.

It should be noted that the groundwater model was not used to estimate storage changes for 2020 through 2022. Therefore, future updates to the model may result in different estimates for 2020 through 2022 groundwater storage changes. The approach of using measured groundwater elevation changes to estimate storage changes is considered reasonable and cost effective for the purposes of the annual report. **Table 4-2** includes estimates of annual groundwater pumping, groundwater uptake, storage change and cumulative storage change for WYs 1990-2022. Change in storage and cumulative change in storage for WYs 2020-2022 was estimated based on the above method. The Tehama IHM Model was used to estimate groundwater pumping, groundwater uptake, change in storage, and cumulative change in storage for WYs 1990-2019.

Table 4-1. Change in Groundwater Storage Based on Seasonal High Groundwater Levels

Aquifer	2022 (af)
Upper Aquifer	-12,000
Lower Aquifer	-2,000
Total	**-14,000**

Table 4-2. Change in Groundwater Storage				
Water Year (Type[a])	Groundwater Pumping (af)	Groundwater Uptake (af)	Annual Groundwater Storage Change[b] (af)	Cumulative Groundwater Storage Change (af)
1990 (C)	-19,000	-20,000	-40,000	-40,000
1991 (C)	-22,000	-13,000	-31,000	-71,000
1992 (C)	-24,000	-10,000	-15,000	-86,000
1993 (AN)	-16,000	-13,000	54,000	-32,000
1994 (C)	-21,000	-14,000	-33,000	-65,000
1995 (W)	-13,000	-17,000	80,000	15,000
1996 (W)	-14,000	-23,000	19,000	34,000
1997 (W)	-14,000	-24,000	-2,000	32,000
1998 (W)	-8,000	-24,000	67,000	99,000
1999 (W)	-9,400	-27,000	-15,000	84,000
2000 (AN)	-9,100	-25,000	-21,000	63,000
2001 (D)	-14,000	-23,000	-46,000	17,000
2002 (D)	-16,000	-21,000	-17,000	0
2003 (AN)	-9,900	-21,000	33,000	33,000
2004 (BN)	-13,000	-23,000	-4,700	28,000
2005 (AN)	-8,600	-21,000	8,100	36,000
2006 (W)	-9,000	-25,000	44,000	80,000
2007 (D)	-13,000	-23,000	-62,000	18,000
2008 (C)	-17,000	-18,000	-38,000	-20,000
2009 (D)	-16,000	-13,000	-24,000	-44,000
2010 (BN)	-13,000	-13,000	22,000	-22,000
2011 (W)	-9,500	-17,000	41,000	19,000
2012 (BN)	-15,000	-17,000	-41,000	-22,000
2013 (D)	-21,000	-12,000	-28,000	-50,000
2014 (C)	-28,000	-6,400	-51,000	-100,000
2015 (C)	-35,000	-4,200	-30,000	-130,000
2016 (BN)	-23,000	-4,100	23,000	-110,000
2017 (W)	-17,000	-8,700	73,000	-35,000
2018 (BN)	-24,000	-7,800	-38,000	-73,000
2019 (W)	-16,000	-9,300	47,000 [b]	-26,000
2020 (D)	-16,000	-17,000	-2,500 [b]	-28,000
2021 (C)	-41,000	-2,500	-66,000[b]	-94,000

Table 4-2. Change in Groundwater Storage				
Water Year (Type[a])	Groundwater Pumping (af)	Groundwater Uptake (af)	Annual Groundwater Storage Change[b] (af)	Cumulative Groundwater Storage Change (af)
2022 (C)	-49,000	-5,900	-14,000[b]	-108,000
Average	**-18,000**	**-16,000**	**-3,300**	

Note: All volumes are rounded to two significant digits.

a. Sacramento Valley Water Year Type is provided by DWR for WYs 1990-2021. Water Year 2022 has been preliminarily classified as Critical by DWR (DWR, 2022). Wet (W), Above Normal (AN), Below Normal (BN), Dry (D), Critical (C)

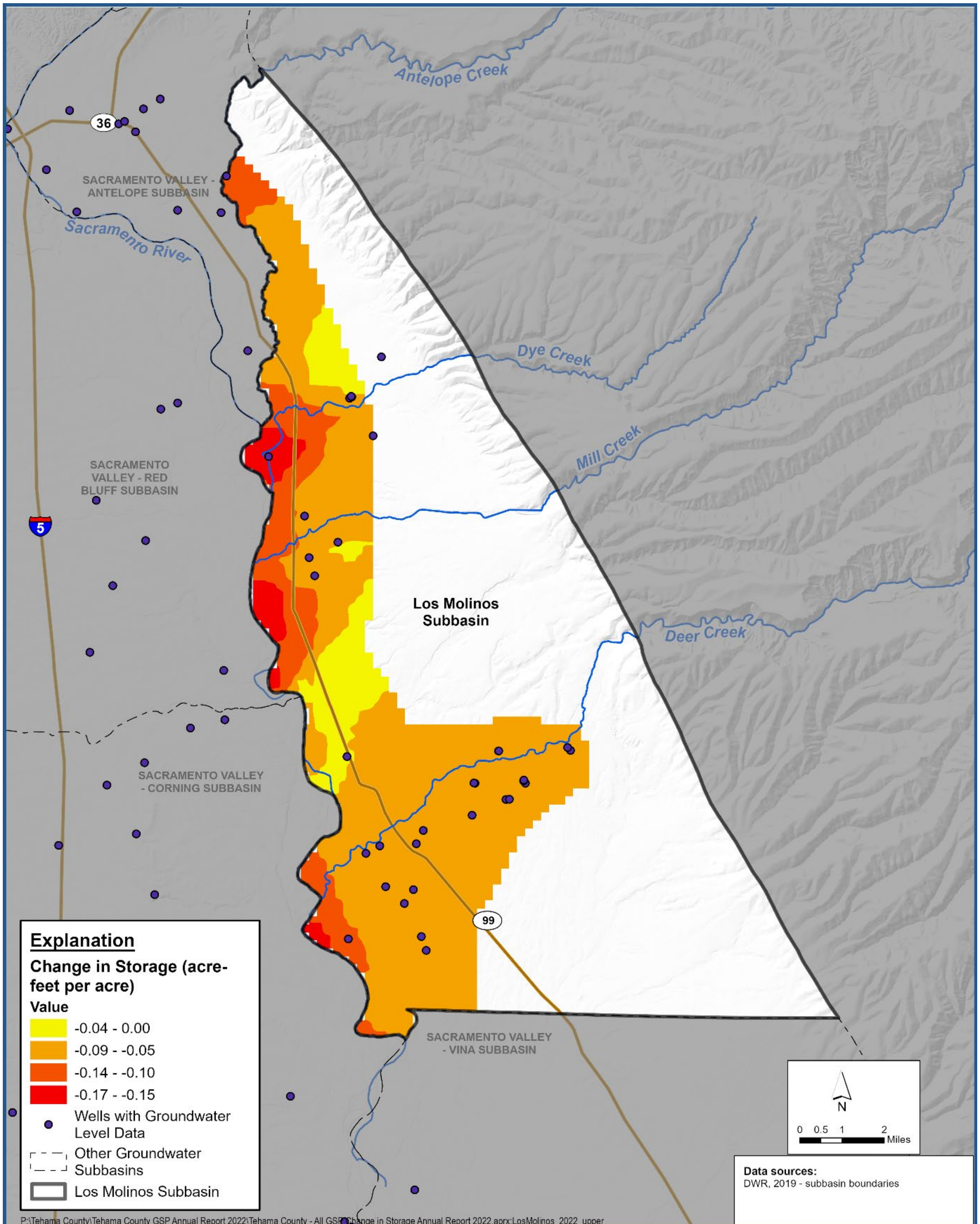
b. Storage changes in WYs 2019-2022 were estimated using the change in seasonal high spring to spring water levels. All other years were calculated using the Tehama IHM.

4.1 Groundwater Storage Maps – Section 356.2(b)(5)(A)

Figures 4-1 presents the distribution of storage change in the Upper Aquifer for WY 2022; and **Figure 4-2** for the Lower Aquifer. Maps include the groundwater wells used to calculate changes in storage. Groundwater storage change is not shown on **Figures 4-1** and **4-2** outside the established monitoring area to avoid extrapolating beyond the control points (i.e., reliable monitoring well data).

4.2 Subbasin Water Budget – Section 356.2(b)(5)(B)

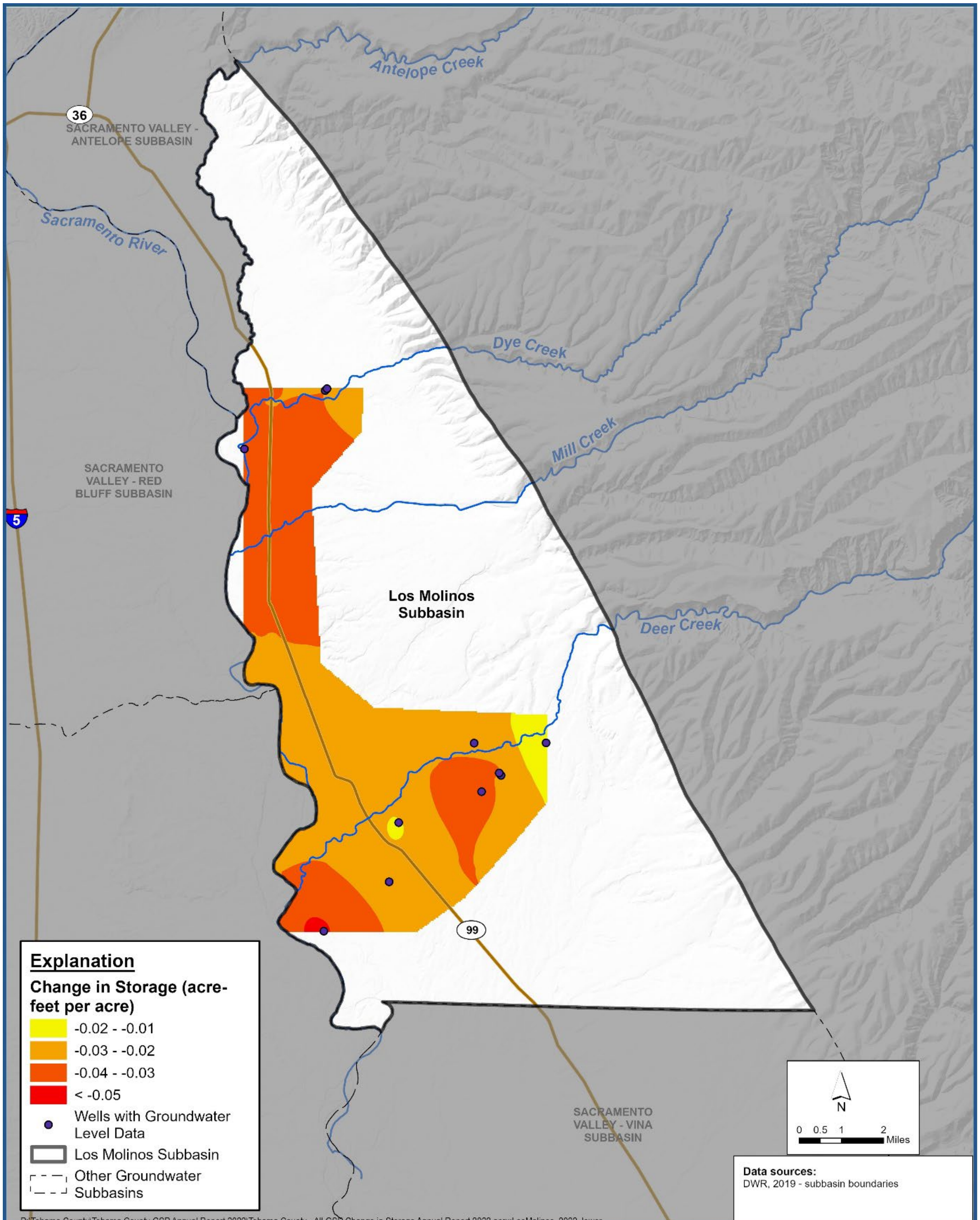
A graph depicting the Water Year type, groundwater pumping, groundwater uptake, the annual change in groundwater storage, and the cumulative change in groundwater storage is presented on **Figure 4-3**.



Change in Groundwater Storage, Upper Aquifer – Spring 2021 to Spring 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 4-1



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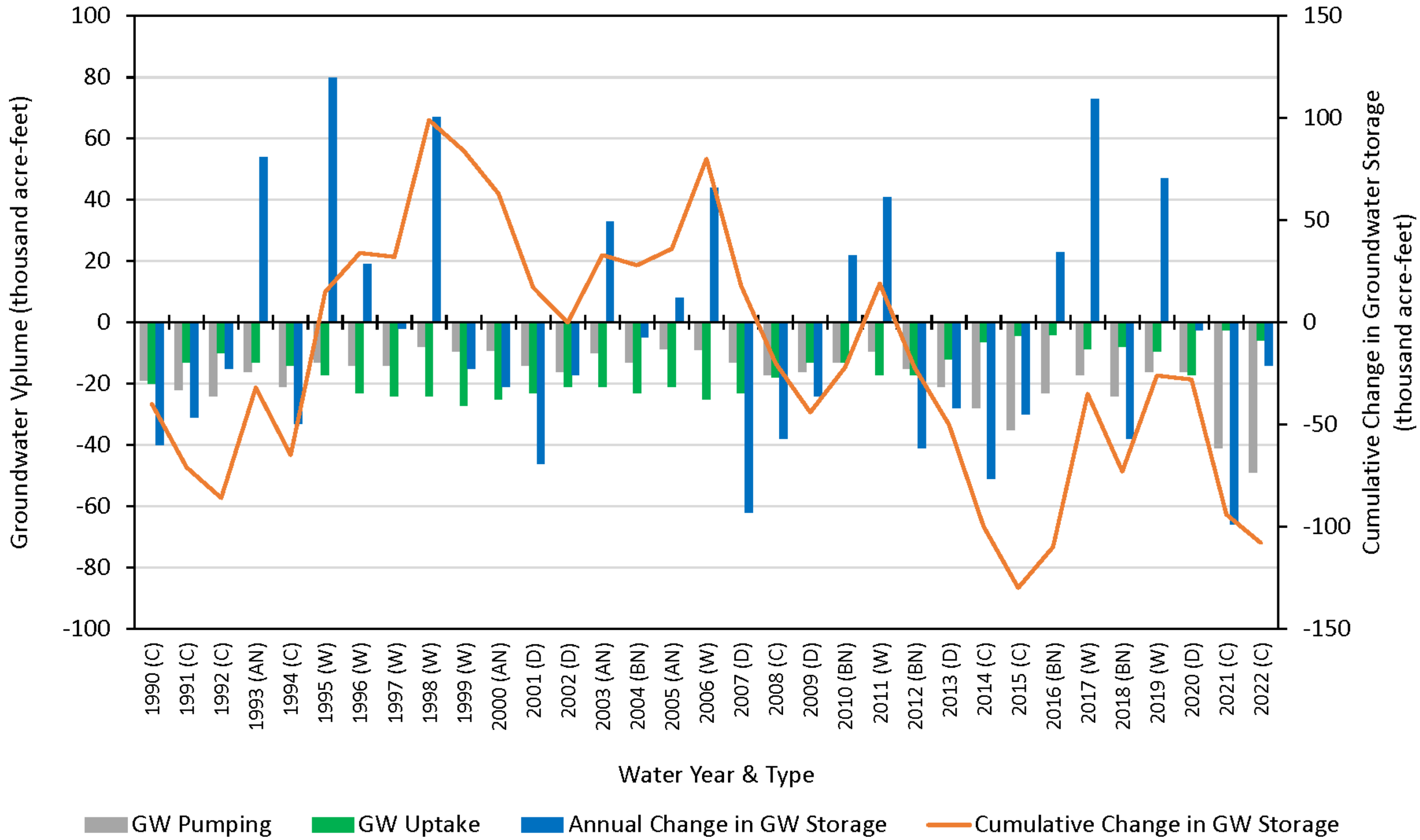
Change in Groundwater Storage,
Lower Aquifer – Spring 2021 to Spring 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 4-2



Groundwater Extraction and Change in Groundwater Storage

Groundwater Sustainability Plan - Annual Report WY 2022
Los Molinos Subbasin

Figure 4-3

5 GSP IMPLEMENTATION PROGRESS – SECTION 356.2(B)

The GSP for the Los Molinos Subbasin was adopted by the GSA in December 2021 and submitted to DWR in January 2022. This is the second annual report to be prepared since the GSP was submitted. The GSP implementation progress reported in this report covers ongoing work during GSP development since late 2021.

5.1 Progress Toward Achieving Sustainability

5.1.1 Chronic Lowering of Groundwater Levels and Reduction in Groundwater Storage SMC

The reduction in groundwater storage SMC utilizes the chronic lowering of groundwater levels SMC as a proxy. Thus, groundwater conditions related to storage and chronic lowering of groundwater levels are discussed together. Groundwater conditions in the Subbasin are on track to meet the first 5- year 2027 IM for groundwater levels at each of the RMS wells. In Spring 2022, all groundwater elevations were above the established MTs. However, two wells (26N02W22E006M, and 26N02W22E004M) do not have established MTs (as indicated in **Table 5-1**). These two wells are part of a nested monitoring well that was installed in June of 2021. The GSA plans to establish SMC for these wells when there are sufficient water level measurements to do so. The lower water levels in Spring 2022 compared to Spring 2021 were expected due to extended drought conditions, which have caused reductions in surface water supplies and increased demands for groundwater in the Subbasin.

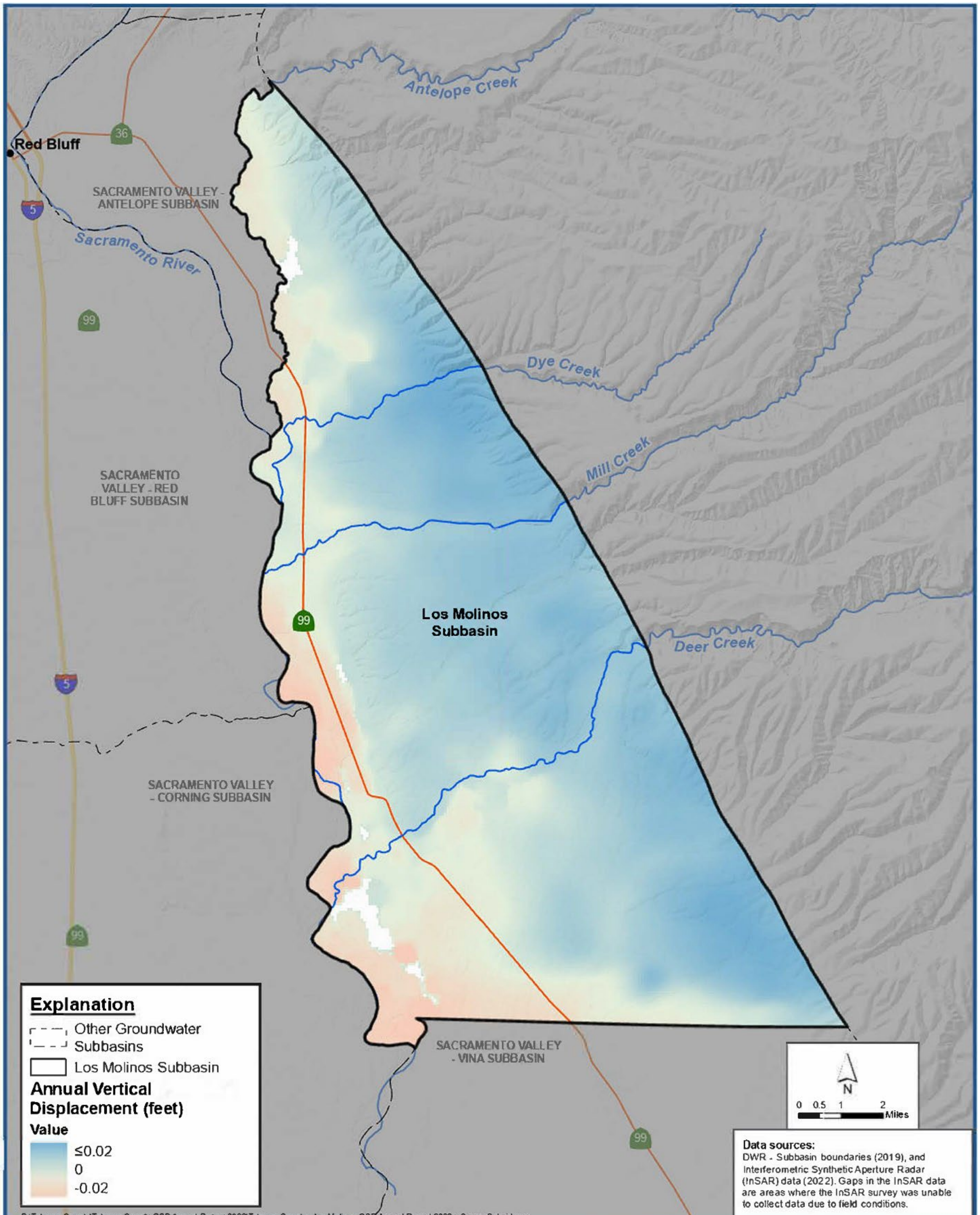
Table 5-1. Groundwater Level Measurements and MT Exceedances

Well ID	State Well Number	MT	MO	2027 IM	Recent Spring Groundwater Level Measurements		Spring 2022 MT Exceedance	Two Consecutive WY MT Exceedances
					2021	2022		
Upper Aquifer								
LM-1U	26N02W16C001M	172.4	218.9	217.9	NA	NA	NA	NA
LM-2U	25N02W09G001M	174.4	219.9	220.6	220.8	220.4	No	No
LM-3U	25N01W32P001M	163.4	205.8	216.6	220.2	218.1	No	No
LM-4U	24N02W12P001M	118.4	182.7	191.1	193.9	192.1	No	No
LM-5U	24N02W25G001M	114.4	157.1	164.1	166.4	163.4	No	No
LM-6U	26N02W22E006M	TBD	TBD	TBD	NA	218.4	NA	NA
Lower Aquifer								
LM-7L	24N02W12P002M	68.4	183.1	190.9	193.6	191.9	No	No
LM-8L	25N01W34N003M	96.4	196.3	208	211.8	210.3	No	No
LM-9L	26N02W22E004M	TBD	TBD	TBD	NA	222.6	NA	NA

NA = Measurement is not reliable (i.e., well was pumping, recently pumped, or had access issues)

5.1.2 Land Subsidence SMC

The land subsidence MT is 0.5 feet per five years (i.e., averaged 0.1 foot per year) and the MO for land subsidence is zero throughout the subbasin. Only inelastic subsidence, defined as subsidence solely due to lowered groundwater elevations, will be considered in this SMC. Due to the measurement error of 0.1 feet associated with the Interferometric Synthetic Aperture Radar (InSAR) method, any measurements must be beyond the error to be considered inelastic subsidence. Subsidence measured by InSAR in WY 2022 (**Figure 5-1**) ranged from 0.02 feet of subsidence to 0.01 feet of uplift. No subsidence measured during WY 2022 is considered inelastic since measurements are less than the measurement error of 0.1 feet. The total subsidence measured from 2015 through WY 2022 (**Figure 5-2**) ranged from 0.07 feet of subsidence to 0.03 feet of uplift. The GSA is on track to stay above the MT for land subsidence.



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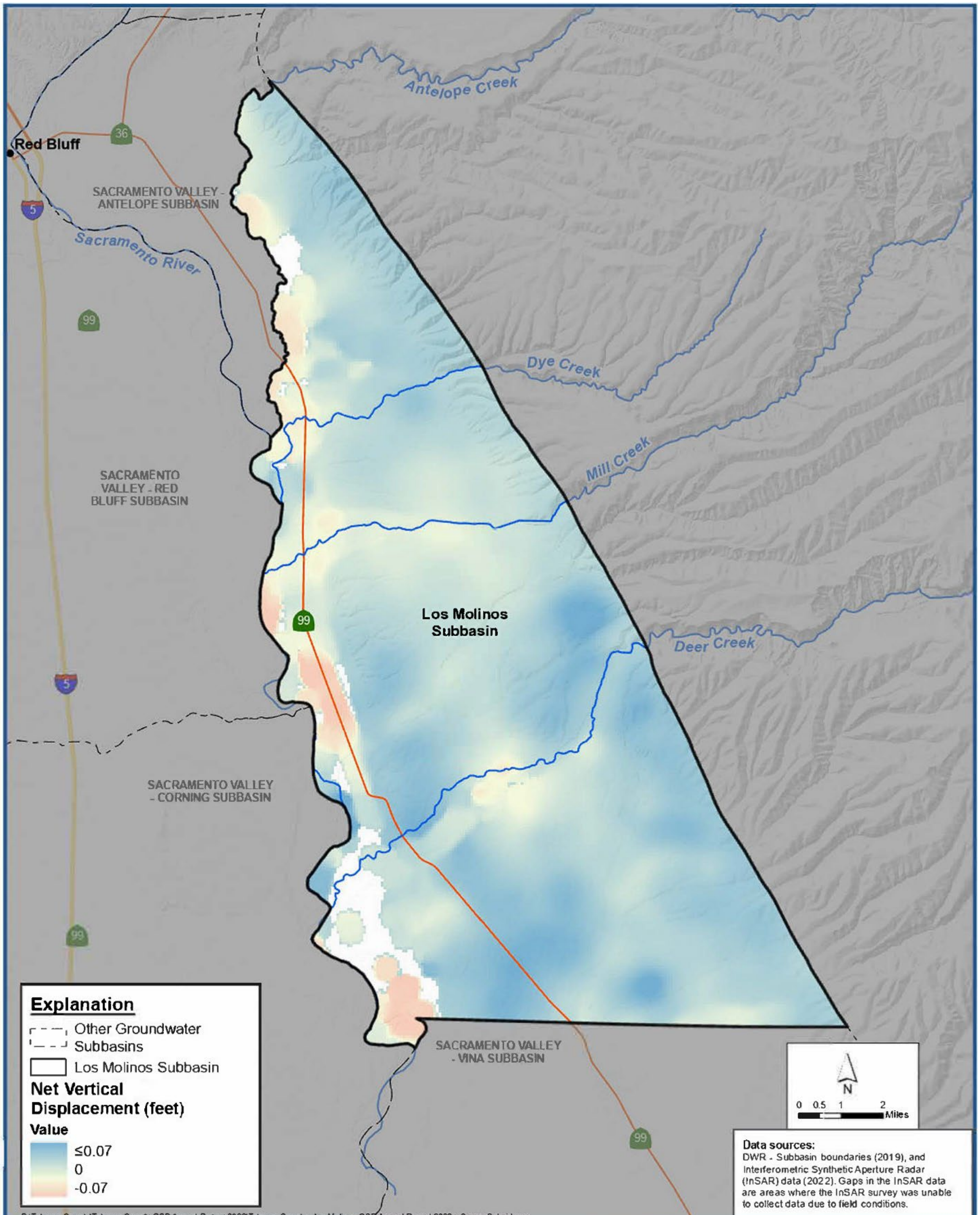
Annual Vertical Displacement in 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 5-1



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Net Vertical Displacement 2015 to 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Los Molinos Subbasin

Figure 5-2

5.1.3 Depletion of Interconnected Surface Water SMC

Depletion of Interconnected Surface Water SMC utilize fall groundwater elevations in the shallow wells within the groundwater level monitoring network nearest the interconnected streams. All interconnected surface water RMS that have established MTs were at or above MT levels and on track to meeting the 2027 interim milestone if trends hold (**Table 5-2**).

Table 5-2. Depletion of Interconnected Surface Water Data and SMC

Well ID	State Well Number	MT	MO	2027 IM	Recent Spring Groundwater Level Measurements		Spring 2022 MT Exceedance	Two Consecutive WY MT Exceedances
					2021	2022		
Upper Aquifer								
LM-1U	26N02W16C001M	172.4	218.9	217.9	NA	NA	NA	NA
LM-2U	25N02W09G001M	174.4	219.9	220.6	220.8	220.4	No	No
LM-3U	25N01W32P001M	163.4	205.8	216.6	220.2	218.1	No	No
LM-4U	24N02W12P001M	118.4	182.7	191.1	193.9	192.1	No	No
LM-5U	24N02W25G001M	114.4	157.1	164.1	166.4	163.4	No	No
LM-6U	26N02W22E006M	TBD	TBD	TBD	NA	218.4	NA	NA

NA = Measurement is not reliable (i.e., well was pumping, recently pumped, or had access issues)

5.2 Progress Toward PMA Implementation

The Tehama County GSA is pursuing grant funds through DWR's SGM Grant Program for funding to assist in the implementation of PMAs. The grant application was submitted in December 2022, and a draft awards list is anticipated to be released by DWR in June 2023. Three broader components, each fulfilling a different need of the GSA for implementation of the GSP were applied for including:

- GSP Implementation Outreach and Compliance Activities
- Ongoing Monitoring, Data Gaps, and Enhancements

  Project and Management Action Implementation – Recharge Focused

Together, if funded, these projects will assist the GSAs in meeting the sustainability goals set forth in the GSP.

As part of the GSA's efforts to address data gaps in the subbasin, an Airborne Electromagnetic (AEM) Survey by DWR took place in the summer of 2022. The data collected provides a better understanding of aquifer characteristics and will help to refine the current hydrogeologic conceptual model. Data is available at: https://data.cnra.ca.gov/dataset/aem/resource/29c4478d-fc34-44ab-a373-7d484afa38e8

Since the last annual report (Water Year 2021) progress has been made on another project, the Deer Creek Instream Flow Planning and Design Project. Trout Unlimited has secured grant funding to implement four distinct planning and design projects in the Deer Creek watershed area within the Los Molinos Subbasin and is moving forward with implementation with completion expected by the end of 2025. The shared objective of these projects is to support water diverters' ability to implement voluntary on-farm and stream flow enhancements for the purpose of benefiting instream habitat and fish passage. The projects are focused on producing opportunities for physical water savings and utilizing those savings to meet both ecological flow targets and agricultural needs through integrated management of surface water and groundwater, in combination with future projects and management actions, and in a manner that supports long-term sustainability objectives.

Two of the planning projects also include tasks to evaluate groundwater recharge opportunities and alternatives, including both in-lieu recharge (e.g., utilizing surface water on lands currently dependent on groundwater for irrigation) and Flood-Managed Aquifer Recharge (Flood-MAR).

6 CONCLUSIONS

In WY 2022, groundwater conditions are sustainable. No water levels fell below the MTs, for wells that have established MTs. WY 2022 and subsidence data indicate sustainable conditions and no MTs were exceeded. Recent progress made on all of the, above mentioned, activities applicable to the GSA since late 2021 demonstrates the commitment of the GSA to implement the GSP by allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources in the Subbasin.

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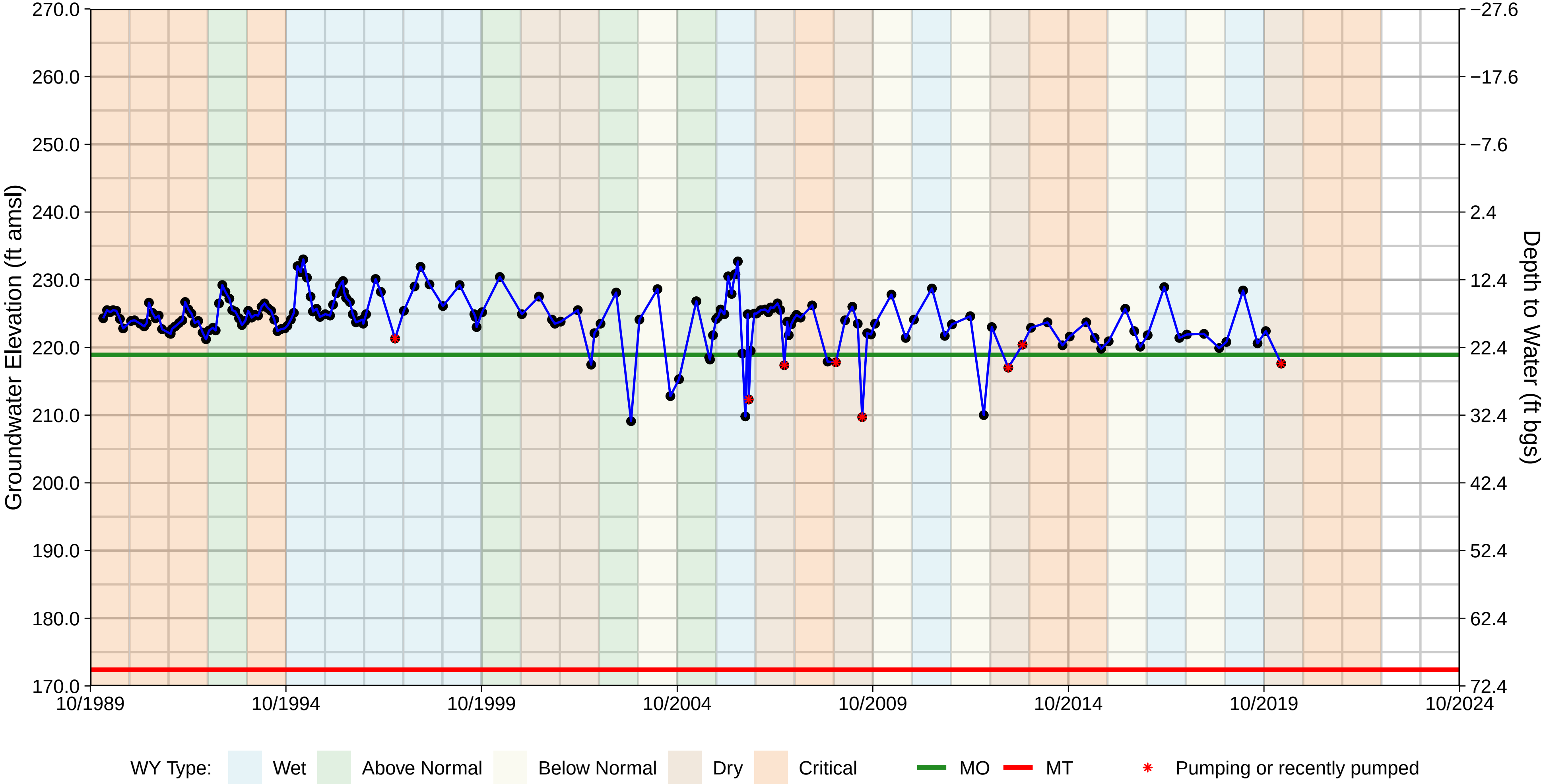
Appendix A

Water Level Hydrographs of Representative Monitoring Wells for Groundwater Level

LM−1U Los Molinos Subbasin − Upper Aquifer



SWN: 26N02W16C001M

Site Code: 401126N1221010W001

Total Depth (ft):50

Perf. Top (ft bgs): NA

Perf. Bottom (ft bgs): NA

Well Type: Residential

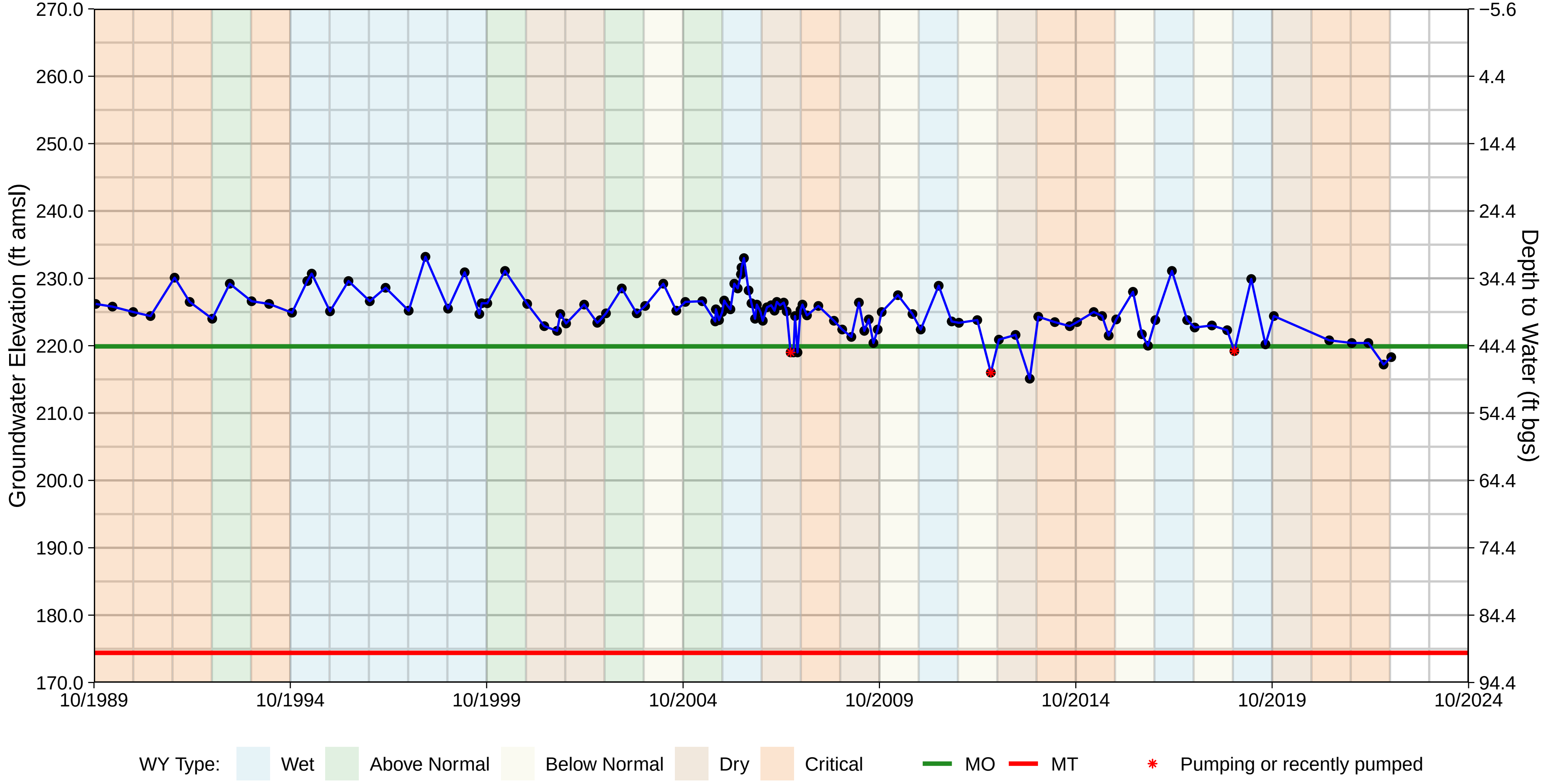
GSE (ft amsl): 242.4

Sustainable Management Criteria

MO: 218.9 ft amsl (23.5 ft bgs)

MT: 172.4 ft amsl (70 ft bgs)

LM−2U Los Molinos Subbasin − Upper Aquifer



SWN: 25N02W09G001M

Site Code: 400382N1220934W001

Total Depth (ft):60

Perf. Top (ft bgs): NA

Perf. Bottom (ft bgs): NA

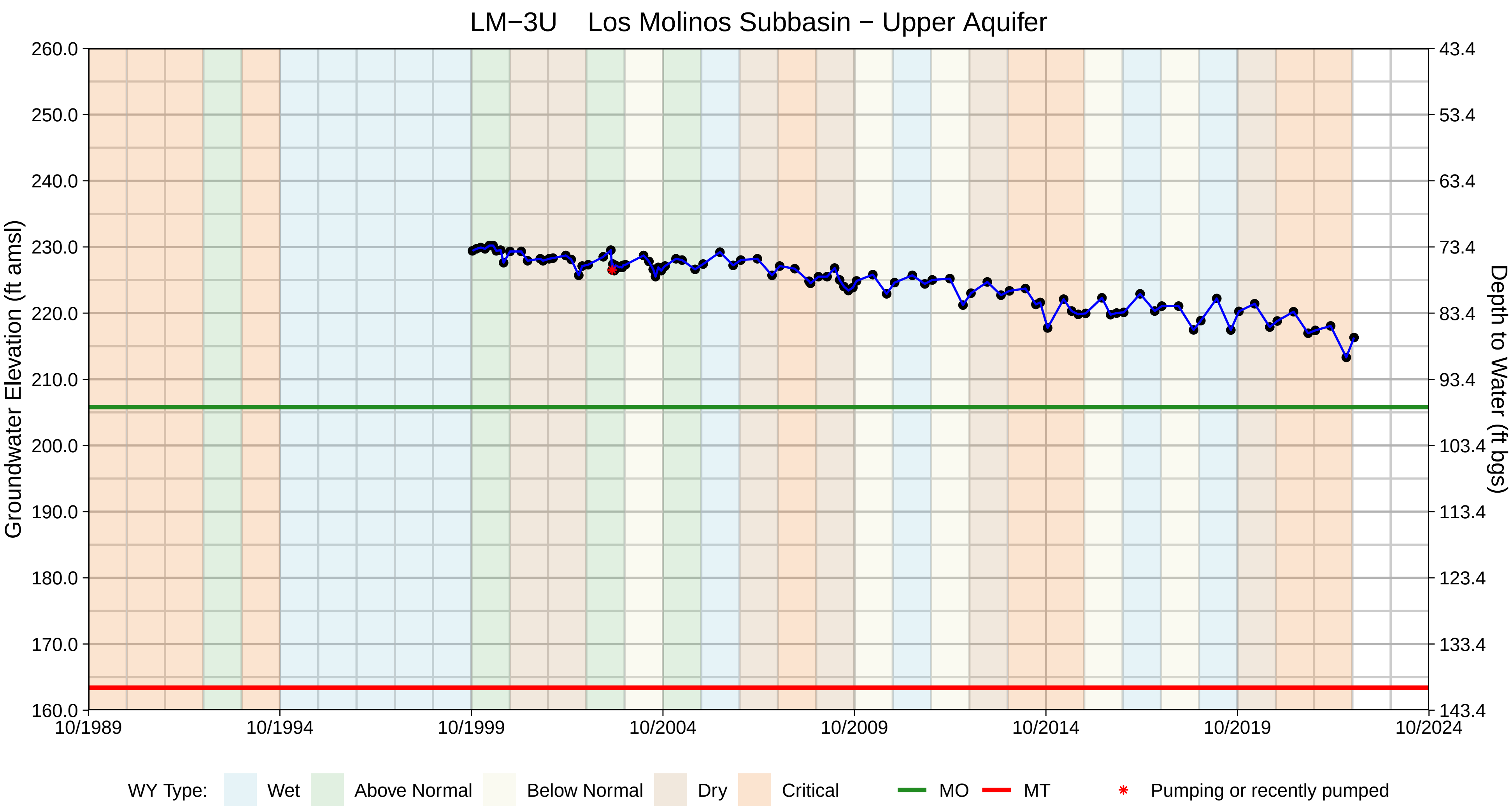
Well Type: Residential

GSE (ft amsl): 264.4

Sustainable Management Criteria

MO: 219.9 ft amsl (44.5 ft bgs)

MT: 174.4 ft amsl (90 ft bgs)



SWN: 25N01W32P001M

Site Code: 399733N1220069W001

Total Depth (ft):330

Perf. Top (ft bgs): 209

Perf. Bottom (ft bgs): 256

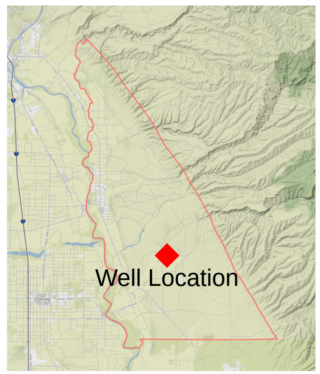
Well Type: Observation

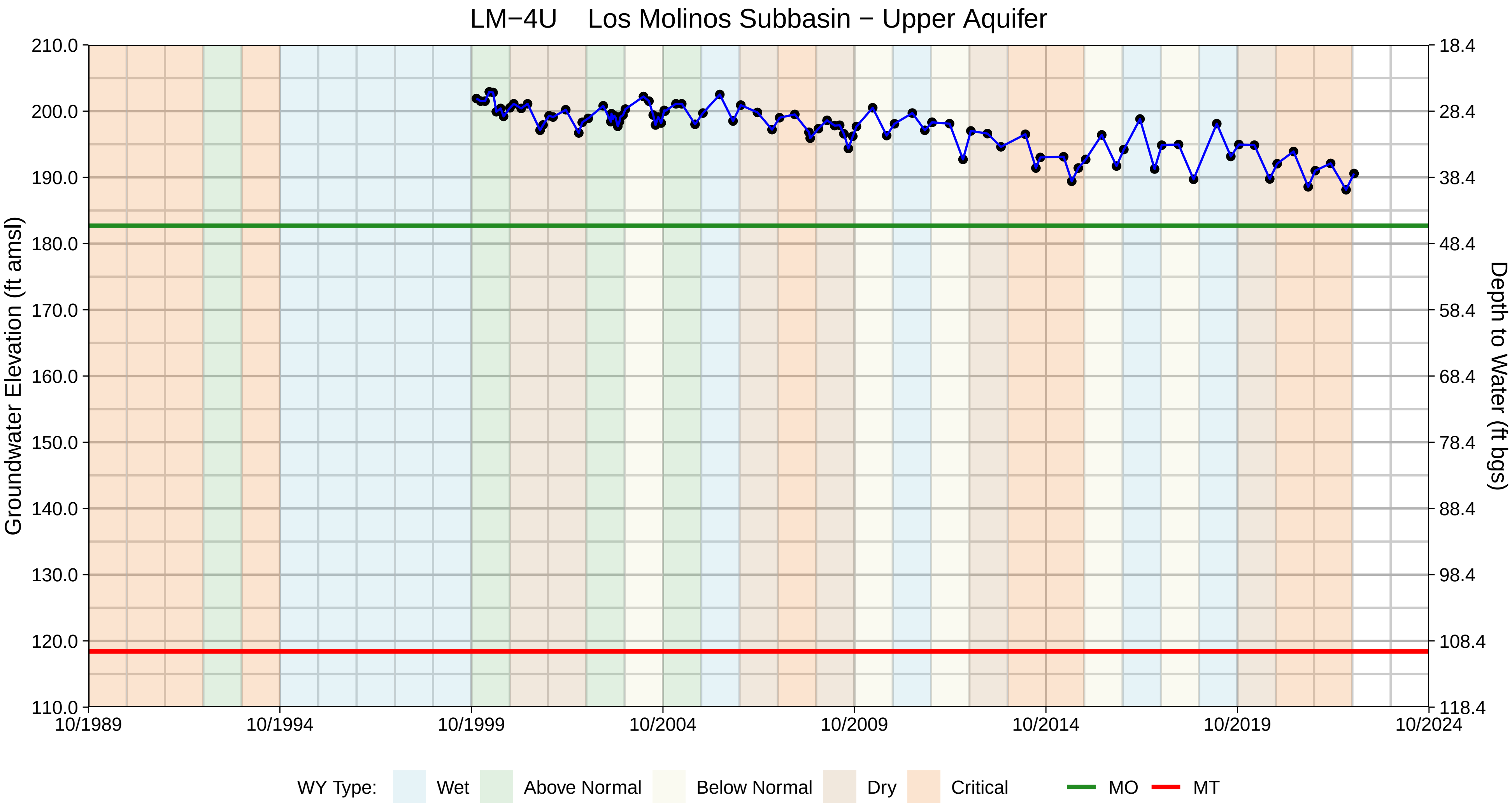
GSE (ft amsl): 303.4

Sustainable Management Criteria

MO: 205.8 ft amsl (97.6 ft bgs)

MT: 163.4 ft amsl (140 ft bgs)





SWN: 24N02W12P001M

Site Code: 399456N1220399W001

Total Depth (ft):370

Perf. Top (ft bgs): 165

Perf. Bottom (ft bgs): 360

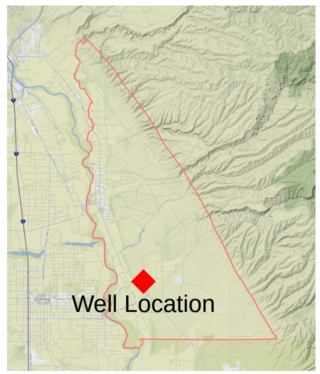
Well Type: Observation

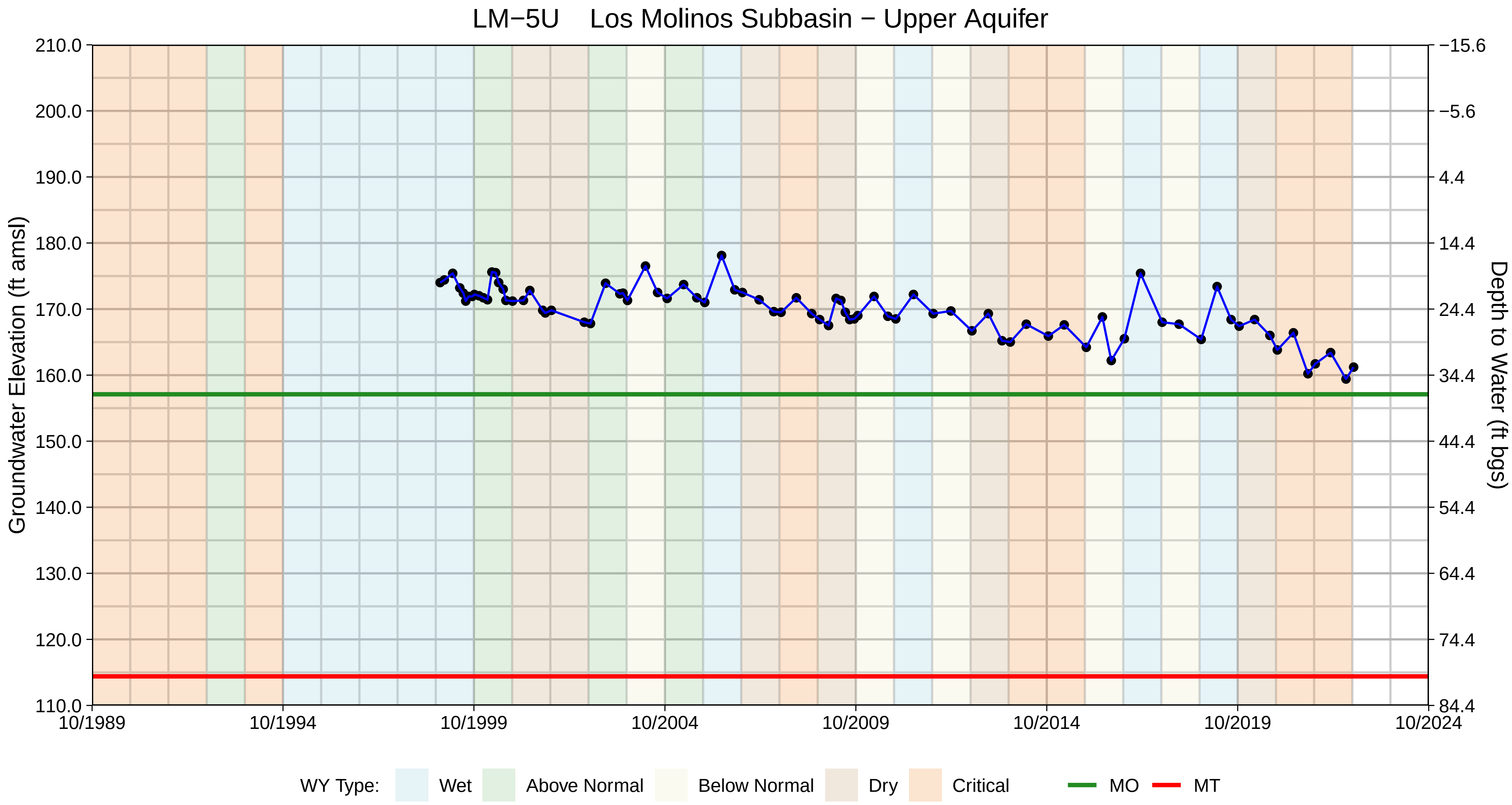
GSE (ft amsl): 228.4

Sustainable Management Criteria

MO: 182.7 ft amsl (45.7 ft bgs)

MT: 118.4 ft amsl (110 ft bgs)





SWN: 24N02W25G001M

Site Code: 399091N1220396W001

Total Depth (ft):256

Perf. Top (ft bgs): 108

Perf. Bottom (ft bgs): 256

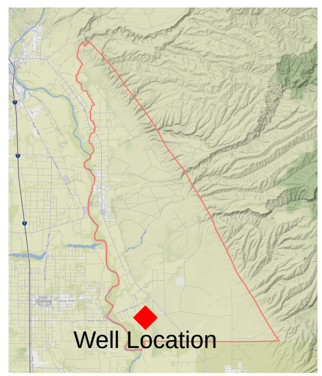
Well Type: Irrigation

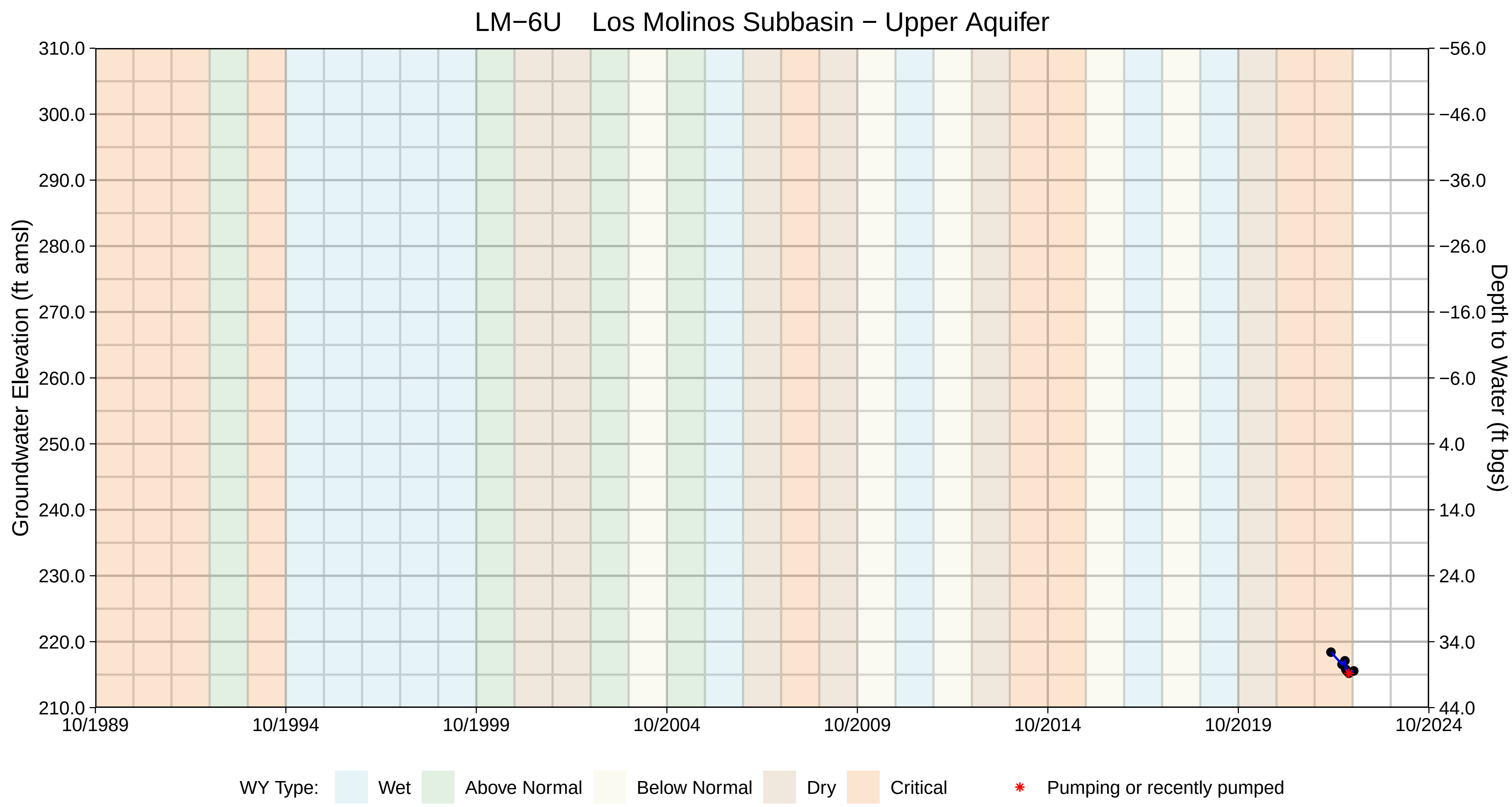
GSE (ft amsl): 194.4

Sustainable Management Criteria

MO: 157.1 ft amsl (37.3 ft bgs)

MT: 114.4 ft amsl (80 ft bgs)





SWN: 26N02W22E006M

Site Code: 400921N1220855W001

Total Depth (ft):60

Perf. Top (ft bgs): 40

Perf. Bottom (ft bgs): 50

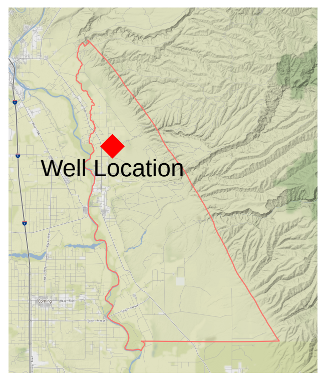
Well Type: Observation

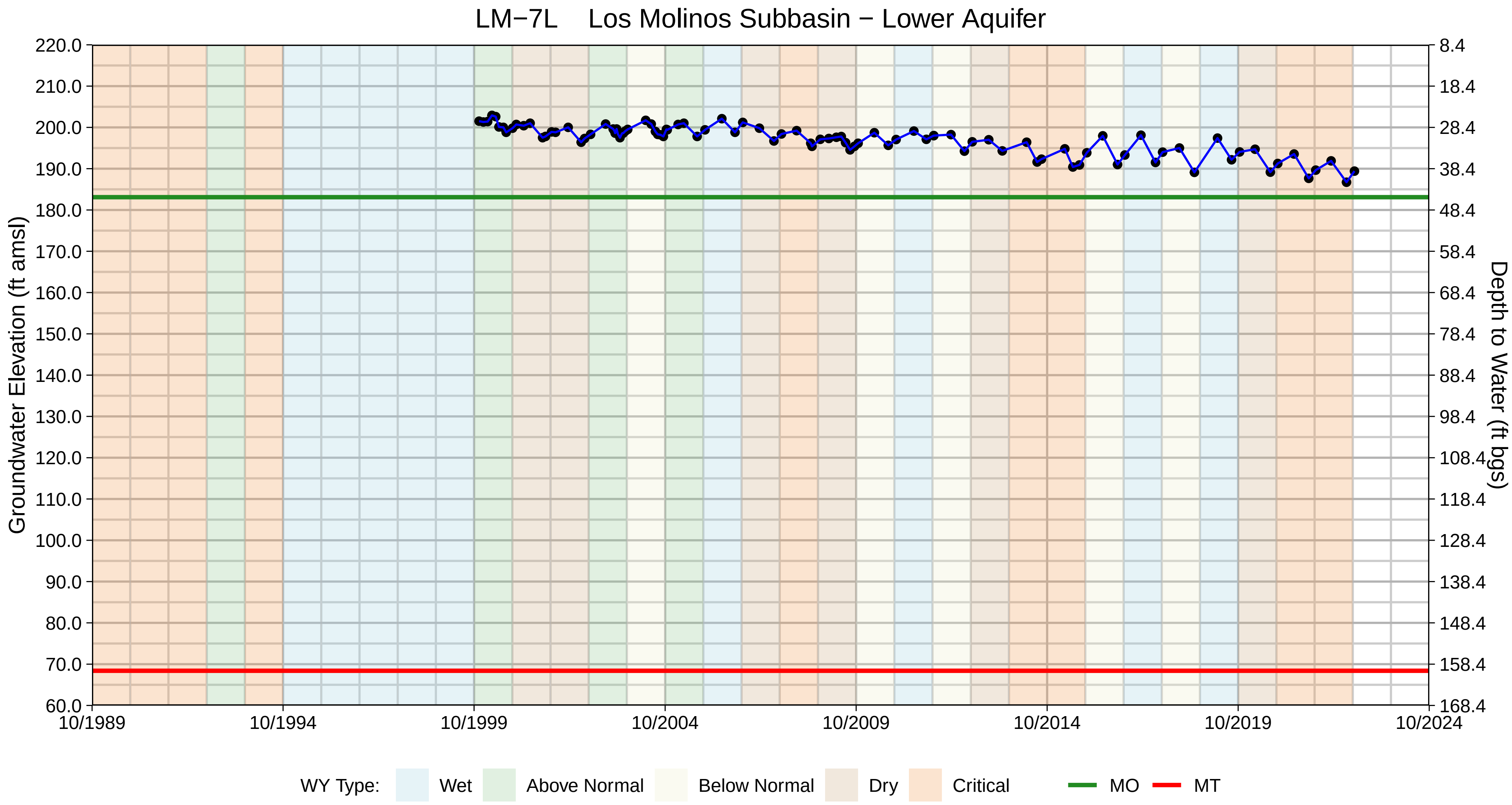
GSE (ft amsl): 254

Sustainable Management Criteria

MO: To be determined

MT: To be determined





SWN: 24N02W12P002M

Site Code: 399456N1220399W002

Total Depth (ft):870

Perf. Top (ft bgs): 760

Perf. Bottom (ft bgs): 850

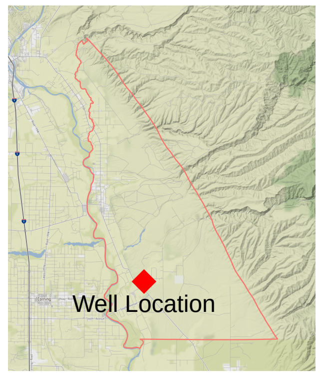
Well Type: Observation

GSE (ft amsl): 228.4

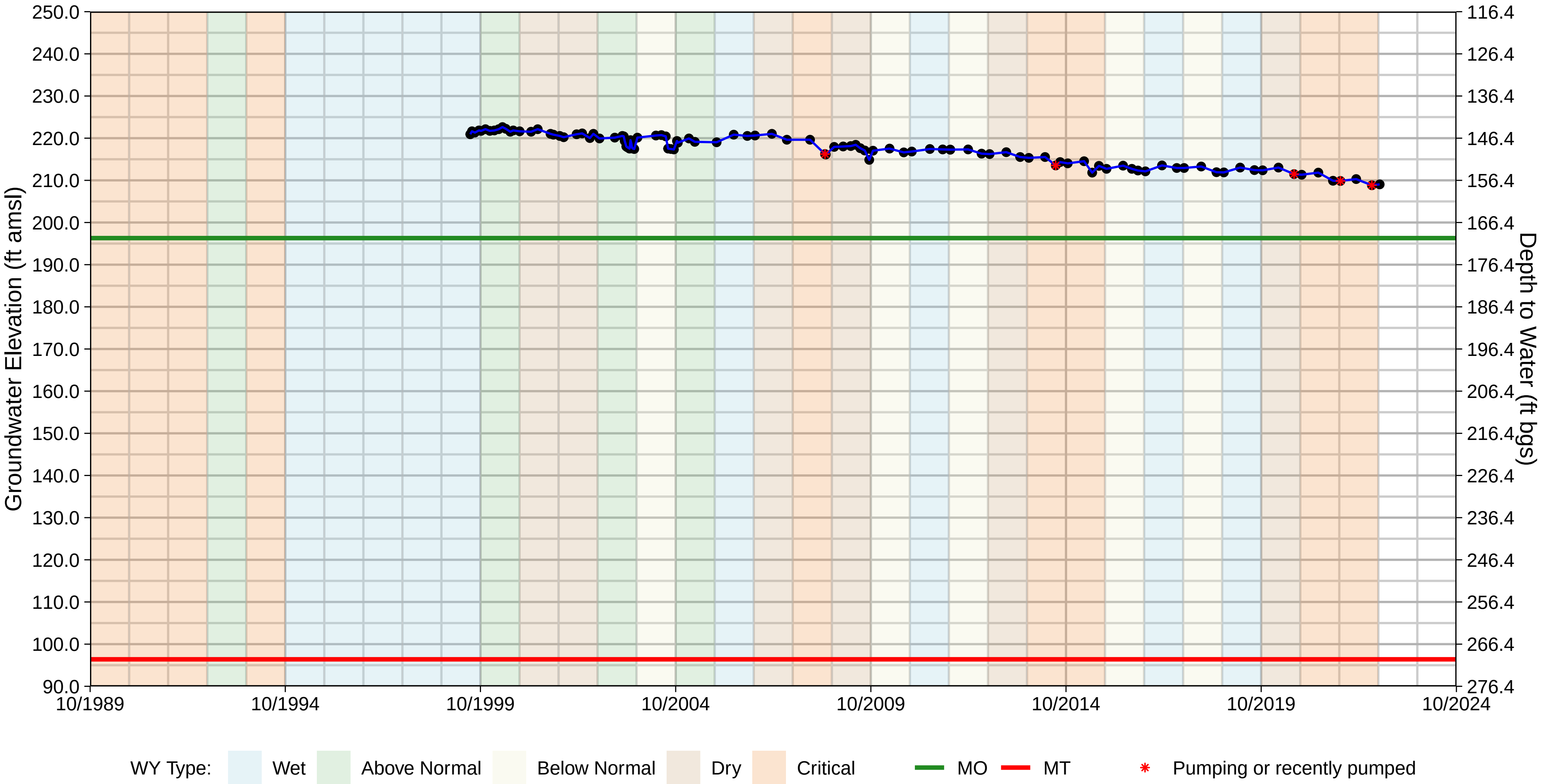
Sustainable Management Criteria

MO: 183.1 ft amsl (45.3 ft bgs)

MT: 68.4 ft amsl (160 ft bgs)



LM−8L Los Molinos Subbasin − Lower Aquifer



SWN: 25N01W34N003M

Site Code: 399740N1219748W002

Total Depth (ft):743

Perf. Top (ft bgs): 625

Perf. Bottom (ft bgs): 680

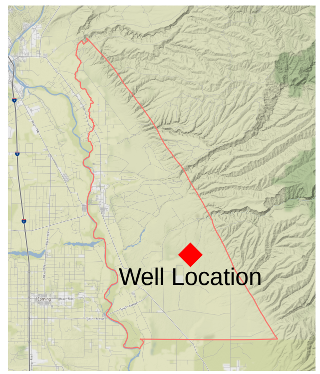
Well Type: Observation

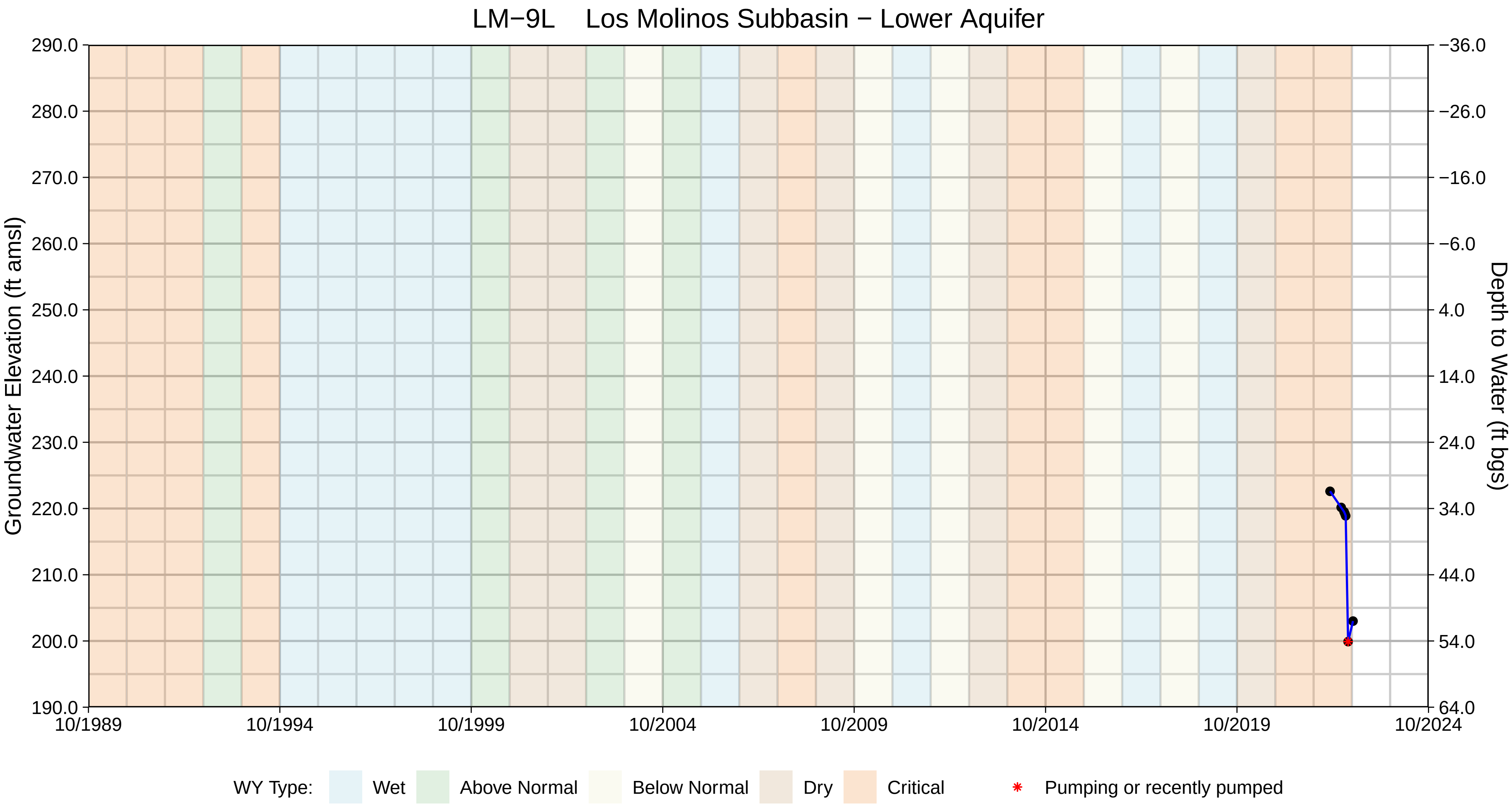
GSE (ft amsl): 366.4

Sustainable Management Criteria

MO: 196.3 ft amsl (170.1 ft bgs)

MT: 96.4 ft amsl (270 ft bgs)





SWN: 26N02W22E004M

Site Code: 410921N1210855W001

Total Depth (ft):680

Perf. Top (ft bgs): 560

Perf. Bottom (ft bgs): 670

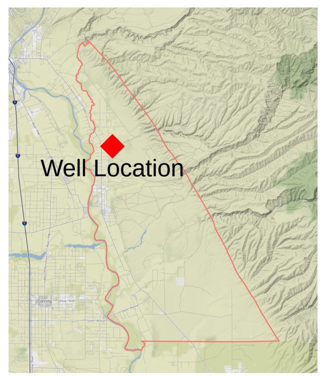
Well Type: Observation

GSE (ft amsl): 254

Sustainable Management Criteria

MO: To be determined

MT: To be determined



APPENDIX B

Annual Report Water Level Data

Data sources:

CA Department of Water Resources

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
24N02W25K001M	3/8/2022	191.91	190.41	29.1	30.6	161.31		
24N02W25K001M	8/2/2022	191.91	190.41	32.5	34	157.91	2	
24N02W25K001M	10/14/2022	191.91	190.41	32.3	33.8	158.11		
24N02W27G001M	3/9/2022	182.67	182.42	15.65	15.9	166.77	2	
24N02W27G001M	8/2/2022	182.67	182.42	31.27	31.52	151.15		
24N02W27G001M	10/14/2022	182.67	182.42	27.5	27.75	154.92		
24N02W27G002M	3/9/2022	182.92	182.42	24.02	24.52	158.4	2	
24N02W27G002M	8/2/2022	182.92	182.42	30.65	31.15	151.77		
24N02W27G002M	10/14/2022	182.92	182.42	24.9	25.4	157.52		
24N02W27G003M	3/9/2022	183.17	182.42	40.58	41.33	141.84	2	
24N02W27G003M	8/2/2022	183.17	182.42	22.1	22.85	160.32		
24N02W27G003M	10/14/2022	183.17	182.42	21.42	22.17	161		
24N02W27G004M	3/9/2022	183.42	182.42	20.34	21.34	162.08	2	
24N02W27G004M	8/2/2022	183.42	182.42	20.05	21.05	162.37		
24N02W27G004M	10/14/2022	183.42	182.42	19.83	20.83	162.59		
24N02W25G001M	3/8/2022	196.41	194.41	31	33	163.41		
24N02W25G001M	8/2/2022	196.41	194.41	35	37	159.41		
24N02W25G001M	10/14/2022	196.41	194.41	33.2	35.2	161.21		
24N02W24E001M	3/9/2022	202.11	201.41	29.8	30.5	171.61		
24N02W24E001M	8/2/2022	202.11	201.41	34.9	35.6	166.51		
24N02W24D003M	3/8/2022	213.16	212.41	30.65	31.4	181.76		
24N02W24D003M	8/2/2022	213.16	212.41	38.53	39.28	173.88	2	
24N02W24D003M	10/14/2022	213.16	212.41	34.72	35.47	177.69		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
24N02W24D002M	3/8/2022	212.91	212.41	27.75	28.25	184.66		
24N02W24D002M	8/2/2022	212.91	212.41	34.78	35.28	177.63	2	
24N02W24D002M	10/14/2022	212.91	212.41	32.17	32.67	180.24		
24N02W24D004M	3/8/2022	213.41	212.41	32.97	33.97	179.44		
24N02W24D004M	8/2/2022	213.41	212.41	42.15	43.15	170.26	2	
24N02W24D004M	10/14/2022	213.41	212.41	36.67	37.67	175.74		
24N02W23B002M	3/8/2022	201.02	200.42	26.9	27.5	173.52		
24N02W23B002M	8/2/2022	201.02	200.42	31.8	32.4	168.62		
24N02W23B002M	10/14/2022	201.02	200.42	30.6	31.2	169.82		
24N02W14E002M	3/8/2022	205.62	204.42	21.7	22.9	182.72		
24N02W14E002M	10/14/2022	205.62	204.42	24.6	25.8	179.82	4	
24N02W14C001M	3/8/2022	207.22	206.42	22.3	23.1	184.12		
24N02W14C001M	8/2/2022	207.22	206.42	26.3	27.1	180.12		
24N02W14C001M	10/14/2022	207.22	206.42	24.1	24.9	182.32		
24N02W13C001M	3/8/2022	226.21	225.41	27.2	28	198.21		
24N02W13C001M	8/2/2022	226.21	225.41	31.4	32.2	194.01		
24N02W13C001M	10/17/2022	226.21	225.41	29.2	30	196.21		
24N02W12P001M	3/8/2022	230.81	228.41	36.3	38.7	192.11		
24N02W12P001M	8/2/2022	230.81	228.41	40.28	42.68	188.13		
24N02W12P001M	10/17/2022	230.81	228.41	37.83	40.23	190.58		
24N02W12P002M	3/8/2022	230.81	228.41	36.52	38.92	191.89		
24N02W12P002M	8/2/2022	230.81	228.41	41.69	44.09	186.72		
24N02W12P002M	10/17/2022	230.81	228.41	39	41.4	189.41		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
24N01W07G001M	3/8/2022	259.51	258.41	53.9	55	204.51		
24N01W07G001M	8/4/2022	259.51	258.41	60.9	62	197.51		
24N01W07G001M	10/17/2022	259.51	258.41	57.8	58.9	200.61		
24N01W05Q003M	3/8/2022	291.41	289.41	82.4	84.4	207.01	2	
24N01W05Q003M	8/2/2022	291.41	289.41	84.78	86.78	204.63		
24N01W05Q003M	10/17/2022	291.41	289.41	80.72	82.72	208.69		
24N01W05Q004M	3/8/2022	291.01	289.41	82.09	83.69	207.32	2	
24N01W05Q004M	8/2/2022	291.01	289.41	86.05	87.65	203.36		
24N01W05Q004M	10/17/2022	291.01	289.41	84.32	85.92	205.09		
24N01W05Q002M	3/8/2022	290.11	289.41	54.7	55.4	234.71		
24N01W05Q002M	8/2/2022	290.11	289.41	53.1	53.8	236.31		
24N01W05Q002M	10/17/2022	290.11	289.41	53.4	54.1	236.01		
24N01W06J002M	3/8/2022	274.81	272.41	61.75	64.15	210.66		
24N01W06J002M	8/4/2022	274.81	272.41	73.21	75.61	199.2	2	
24N01W06J002M	10/17/2022	274.81	272.41	64.47	66.87	207.94		
24N01W06J001M	3/8/2022	273.81	272.41	37.12	38.52	235.29		
24N01W06J001M	8/4/2022	273.81	272.41	41.1	42.5	231.31	2	
24N01W06J001M	10/17/2022	273.81	272.41	37.8	39.2	234.61		
24N01W04M001M	3/8/2022	312.91	312.41	103.9	104.4	208.51		
24N01W04M001M	8/2/2022	312.91	312.41	106.06	106.56	206.35		
24N01W04M001M	10/17/2022	312.91	312.41	105.33	105.83	207.08		
24N01W05J003M	3/8/2022	314.51	312.41	98.91	101.01	213.5		
24N01W05J003M	8/2/2022	314.51	312.41	100.72	102.82	211.69		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
24N01W05J003M	10/17/2022	314.51	312.41	98.6	100.7	213.81		
24N01W05J004M	3/8/2022	314.21	312.41	100.23	102.03	212.18		
24N01W05J004M	8/2/2022	314.21	312.41	102.22	104.02	210.19		
24N01W05J004M	10/17/2022	314.21	312.41	101.26	103.06	211.15		
24N01W05J001M	3/8/2022	313.41	312.41	41.2	42.2	271.21		
24N01W05J001M	8/2/2022	313.41	312.41	39.1	40.1	273.31		
24N01W05J001M	10/17/2022	313.41	312.41	38.25	39.25	274.16		
24N01W05G001M	3/8/2022	305.11	304.41	91.8	92.5	212.61	8	Nearby pump operating
24N01W05G001M	8/2/2022	305.11	304.41	98.3	99	206.11	8	
24N01W05G001M	10/17/2022	305.11	304.41	106.8	107.5	197.61	8	Leaky/wet casing and oil
24N02W03B001M	3/9/2022	208.22	204.42	12.67	16.47	191.75		
24N02W03B001M	8/2/2022	208.22	204.42	17.05	20.85	187.37		
24N02W03B001M	10/17/2022	208.22	204.42	14.72	18.52	189.7		
25N01W32P001M	3/8/2022	305.71	303.41	85.35	87.65	218.06		
25N01W32P001M	8/4/2022	305.71	303.41	90.1	92.4	213.31		
25N01W32P001M	10/17/2022	305.71	303.41	87.1	89.4	216.31		
25N01W32P002M	3/8/2022	305.71	303.41	85.64	87.94	217.77		
25N01W32P002M	8/4/2022	305.71	303.41	90.68	92.98	212.73		
25N01W32P002M	10/17/2022	305.71	303.41	87.28	89.58	216.13		
25N01W32P003M	3/8/2022	305.71	303.41	85.8	88.1	217.61		
25N01W32P003M	8/4/2022	305.71	303.41	89.93	92.23	213.48		
25N01W32P003M	10/17/2022	305.71	303.41	87.45	89.75	215.96		
25N01W34N002M	3/8/2022	368.53	366.43	141.34	143.44	225.09		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
25N01W34N002M	8/2/2022	368.53	366.43	142.5	144.6	223.93	2	
25N01W34N002M	10/14/2022	368.53	366.43	142.29	144.39	224.14		
25N01W34N003M	3/8/2022	368.53	366.43	156.13	158.23	210.3		
25N01W34N003M	8/2/2022	368.53	366.43	157.6	159.7	208.83	2	
25N01W34N003M	10/14/2022	368.53	366.43	157.39	159.49	209.04		
25N01W33J001M	3/8/2022	364.43	363.43	120.8	121.8	242.63		
25N01W33J001M	8/2/2022	364.43	363.43	122.5	123.5	240.93	2	
25N01W33J001M	10/14/2022	364.43	363.43	122.2	123.2	241.23		
25N02W09G001M	3/14/2022	265.4	264.4	44	45	220.4		
25N02W09G001M	8/3/2022	265.4	264.4	47.2	48.2	217.2		
25N02W09G001M	10/13/2022	265.4	264.4	46.1	47.1	218.3		
25N02W04Q001M	3/14/2022	262.09	260.39	50.1	51.8	210.29		
26N02W29R001M	3/14/2022	234	230.4	5.52	9.12	224.88		
26N02W29R001M	8/3/2022	234	230.4	5.6	9.2	224.8		
26N02W29R001M	10/17/2022	234	230.4	5.7	9.3	224.7		
26N02W29R002M	3/14/2022	234.2	230.4	9.62	13.42	220.78		
26N02W29R002M	8/3/2022	234.2	230.4	18.4	22.2	212		
26N02W29R002M	10/17/2022	234.2	230.4	16.92	20.72	213.48		
26N02W26F001M	3/7/2022	318	316	92.75	94.75	223.25		
26N02W26F001M	8/3/2022	318	316	93.73	95.73	222.27		
26N02W26F001M	10/12/2022	318	316	95.85	97.85	220.15		
26N02W22E006M	3/7/2022	256.7	254	35.59	38.29	218.41		
26N02W22E006M	6/21/2022	256.7	254	37.44	40.14	216.56		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
26N02W22E006M	7/19/2022	256.7	254	36.9	39.6	217.1		
26N02W22E006M	7/27/2022	256.7	254	38.2	40.9	215.8		
26N02W22E006M	8/3/2022	256.7	254	38.39	41.09	215.61		
26N02W22E006M	8/26/2022	256.7	254	38.79	41.49	215.21	2	
26N02W22E006M	10/12/2022	256.7	254	38.43	41.13	215.57		
26N02W22E003M	3/7/2022	256	254	30.55	32.55	223.45		
26N02W22E003M	6/21/2022	256	254	32.79	34.79	221.21		
26N02W22E003M	7/27/2022	256	254	33.7	35.7	220.3		
26N02W22E003M	8/3/2022	256	254	34	36	220		
26N02W22E003M	8/26/2022	256	254	48.05	50.05	205.95	2	
26N02W22E003M	10/12/2022	256	254	47.43	49.43	206.57		
26N02W22E005M	3/7/2022	256.3	254	36.88	39.18	217.12		
26N02W22E005M	6/21/2022	256.3	254	38.75	41.05	215.25		
26N02W22E005M	7/19/2022	256.3	254	39.1	41.4	214.9		
26N02W22E005M	7/27/2022	256.3	254	39.4	41.7	214.6		
26N02W22E005M	8/3/2022	256.3	254	39.5	41.8	214.5		
26N02W22E005M	8/26/2022	256.3	254	39.99	42.29	214.01	2	
26N02W22E005M	10/12/2022	256.3	254	40.07	42.37	213.93		
26N02W22G001M	3/7/2022	271.62	269.42	46.5	48.7	222.92		
26N02W22G001M	8/3/2022	271.62	269.42	48.1	50.3	221.32		
26N02W22G001M	10/12/2022	271.62	269.42	61.5	63.7	207.92	4	
26N02W22G002M	3/14/2022	270.22	269.42	46.02	46.82	223.4		
26N02W22G002M	8/3/2022	270.22	269.42	47.7	48.5	221.72		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
26N02W22G002M	9/14/2022	270.22	269.42	49.5	50.3	219.92	2	WTM
26N02W22G002M	10/12/2022	270.22	269.42	49.67	50.47	219.75		
26N02W22G003M	3/14/2022	270.12	269.42	46.67	47.37	222.75		
26N02W22G003M	8/3/2022	270.12	269.42	48.84	49.54	220.58		
26N02W22G003M	9/14/2022	270.12	269.42	126.3	127	143.12	2	WTM
26N02W22G003M	10/12/2022	270.12	269.42	63.73	64.43	205.69		
26N02W13L001M	3/7/2022	367.5	367	153.3	153.8	213.7		
26N02W13L001M	8/3/2022	367.5	367	151.6	152.1	215.4	3	
26N02W13L001M	10/12/2022	367.5	367	156.3	156.8	210.7		
26N02W14G001M	3/7/2022	314.43	314.13	85	85.3	229.13		
26N02W14G001M	8/3/2022	314.43	314.13	85.2	85.5	228.93		
26N02W14G001M	10/17/2022	314.43	314.13	87.72	88.02	226.41		
26N02W15C001M	8/3/2022	262.42	260.42	43.1	45.1	217.32		
26N02W15C001M	10/12/2022	262.42	260.42	43.6	45.6	216.82		
26N02W14G001M	3/7/2022	314.43	314.13	85	85.3	229.13		
26N02W14G001M	8/3/2022	314.43	314.13	85.2	85.5	228.93		
26N02W14G001M	10/17/2022	314.43	314.13	87.72	88.02	226.41		
26N02W15C001M	8/3/2022	262.42	260.42	43.1	45.1	217.32		
26N02W15C001M	10/12/2022	262.42	260.42	43.6	45.6	216.82		
27N02W30C003M	3/7/2022	287	283	41.2	45.2	241.8		
27N02W30C003M	8/4/2022	287	283	53.2	57.2	229.8		
27N02W30C003M	10/13/2022	287	283	45.7	49.7	237.3		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 8-Oil or foreign substance in casing

APPENDIX C

DWR Upload Tables

LSCE

A. Groundwater Extractions

Total Groundwater Extractions (AF)	Water Use Sector Urban (AF)	Water Use Sector Industrial (AF)	Water Use Sector Agricultural (AF)	Water Use Sector Managed Wetlands (AF)	Water Use Sector Managed Recharge (AF)	Water Use Sector Native Vegetation (AF)	Water Use Sector Other (AF)	Water Use Sector Other Description
54,653	750	0	48,000	0	0	5,900	3	Rural Residential

B. Groundwater Extraction Methods

Meters Volume (AF)	Meters Description	Meters Type	Meters Accuracy (%)	Meters Accuracy Description	Electrical Records Volume (AF)	Electrical Records Description	Electrical Records Type	Electrical Records Accuracy (%)	Electrical Records Accuracy Description	Land Use Volume (AF)	Land Use Description	Land Use Type	Land Use Accuracy (%)	Land Use Accuracy Description	Groundwater Model Volume (AF)	Groundwater Model Description	Groundwater Model Type	Groundwater Model Accuracy (%)	Groundwater Model Accuracy Description	Other Method(s) Volume (AF)	Other Method(s) Description	Other Method(s) Type	Other Method(s) Accuracy (%)	Other Method(s) Accuracy Description
732	Metered municipal wells	Direct	5-10	Metered connection maintained by Los Molinos Mutal Water Company and Los Molinos Community Services District	0					0					0					53,921	Where available, groundwater extraction and surface water supplies were quantified directly from measured and reported groundwater pumping, surface water diversions, and deliveries data. However, groundwater extraction data has historically been limited, particularly for privately-owned wells. Thus, a water budget approach has been used to estimate the remaining, unmeasured volume of groundwater extraction that has occurred to meet demand in the Subbasin. Water budget approach used in this Annual Report utilizes available geospatial data and information to quantify crop water demand, precipitation, and other parameters with pixel-scale resolution (30-meter (m) x 30 m), corresponding to the spatial resolution of satellite imagery used in developing these inputs. In addition to geospatial data, available surface water supply and groundwater extraction data is incorporated into the water budget by distributing that water out to specific regions where that water is used (e.g., surface water supplier service areas).	Estimate	20-30 %	The uncertainty of these water budget components is based on typical accuracies given in technical literature and the cumulative estimated accuracy of all inputs used to calculate the components.

C. Surface Water Supply

Total Surface Water Supply (AF)	Methods Used To Determine	Water Source Type Central Valley Project (AF)	Water Source Type State Water Project (AF)	Water Source Type Colorado River Project (AF)	Water Source Type Local Supplies (AF)	Water Source Type Local Imported Supplies (AF)	Water Source Type Recycled Water (AF)	Water Source Type Desalination (AF)	Water Source Type Other (AF)	Water Source Type Other Description
33,000	Surface water supplies are reported directly from water supplier records or collected from publicly available sources (water rights diversion records, etc.) where available.	0	0	0	33,000	0	0	0	0	

D. Total Water Use

Total Water Use (AF)	Methods Used To Determine	Water Source Type Groundwater (AF)	Water Source Type Surface Water (AF)	Water Source Type Recycled Water (AF)	Water Source Type Reused Water (AF)	Water Source Type Other (AF)	Water Source Type Other Description	Water Use Sector Urban (AF)	Water Use Sector Industrial (AF)	Water Use Sector Agricultural (AF)	Water Use Sector Managed Wetlands (AF)	Water Use Sector Managed Recharge (AF)	Water Use Sector Native Vegetation (AF)	Water Use Sector Other (AF)	Water Use Sector Other Description
87,653	Where available, groundwater extraction and surface water supplies were quantified directly from measured and reported groundwater pumping, surface water diversions, and deliveries data. However, groundwater extraction data has historically been limited, particularly for privately-owned wells. Thus, a water budget approach has been used to estimate the remaining, unmeasured volume of groundwater extraction that has occurred to meet demand in the Subbasin. water budget approach used in this Annual Report utilizes available geospatial data and information to quantify crop water demand, precipitation, and other parameters with pixel-scale resolution (30-meter (m) x 30 m), corresponding to the spatial resolution of satellite imagery used in developing these inputs. In addition to geospatial data, available surface water supply and groundwater extraction data is incorporated into the water budget by distributing that water out to specific regions where that water is used (e.g., surface water supplier service areas). Surface water supplies are reported directly from water supplier records or collected from publicly available sources (water rights diversion records, etc.) where available.	54,653	33,000	0	0	0		750	0	81,000	0	0	5,900	3	Rural Residential