Las Posas Valley Basin Groundwater Sustainability Plan 2023 Annual Report: Covering Water Year 2022

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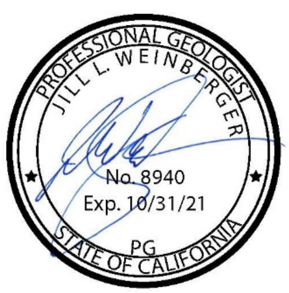

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Executive Summary

The Fox Canyon Groundwater Management Agency (FCGMA), the Groundwater Sustainability Agency (GSA) for the portions of the Las Posas Valley Basin (LPVB) within its jurisdictional boundaries, in coordination with the other two GSAs in the LPVB, has prepared this fourth annual report for the Las Posas Valley Basin (LPVB) Groundwater Sustainability Plan (GSP) in compliance with the 2014 Sustainable Groundwater Management Act (SGMA) (California Water Code, Section 10720 et seq.). This annual report covers the entire LPVB. The GSP for the LPVB was submitted to the Department of Water Resources (DWR) on January 13, 2020 and was approved by DWR on January 13, 2022. SGMA regulations require that an annual report be submitted to DWR by April 1 of each year following the adoption of the GSP. The data presented in the LPVB GSP ends in water year 2015. This annual report provides an update on the groundwater conditions in the LPVB for water year 2022 (October 1, 2021 through September 30, 2022).

Since 2015, the LPVB experienced two dry[1] water years (2016 and 2018), in which precipitation was below 75% of the long-term average precipitation for the LPVB, one below normal water year (2022), three above normal water years[2] (2017, 2019, and 2020) in which precipitation was greater than average, and one critically dry[3] water year (2021), in which precipitation was approximately 23% of the historical average within the LPVB. In the 2022 water year, the LPVB received 13.38 inches of precipitation, which is approximately 88% of the long-term average.

Groundwater elevations in the Fox Canyon aquifer declined throughout the majority of the LPVB between spring 2021 and 2022. In the West Las Posas Management Area (WLPMA), groundwater elevations declined by approximately 5 to 10 feet, with the largest declines occurring in the eastern part of the WLPMA. In the ELPMA, groundwater elevations were 1 to 23 feet lower in 2022 than 2021 in all wells except well 02N20W10D02, which is located in the southwestern part of the ELPMA. At this well, the spring 2022 groundwater elevation was approximately 0.5 feet higher than 2021. In both the WLPMA and ELPMA, spring 2022 groundwater elevations were lower than 2015, with the largest declines measured in northern ELPMA and the eastern part of the WLPMA. Spring 2022 groundwater elevations were lower than the minimum threshold groundwater elevations at two of the three wells measured in the WLPMA. Groundwater elevations at one of these wells, 02N21W11J03S, has remained below the minimum threshold groundwater elevation for four consecutive monitoring events (fall 2020, spring 2021, fall 2021, and spring 2022). Water year 2022 groundwater elevations in the ELPMA were 25 to 175 feet above the minimum threshold groundwater elevations.

In the WLPMA, the volume of groundwater in storage declined by approximately 2,300 AF in water year 2022, with the largest declines occurring in the eastern portion of management area, adjacent to the Somis Fault. In the ELPMA, the volume of groundwater in storage declined by approximately 2,700 AF in water year 2022. In water year 2022, Calleguas Municipal Water District (CMWD) injected approximately 1,060 acre-feet (AF) of imported water into the ELPMA for temporary storage via operation of its Aquifer Storage and Recovery (ASR) well field. The storage change estimates for the 2022 water year in the ELPMA include CMWD's ASR operations. The total reduction of groundwater in storage of approximately 5,300 AF is similar to the groundwater storage reductions

[1] "Dry" water year type is defined as ≥50% and <75% of mean.
[2] "Above Normal" water year type is defined as ≥100% and <150% of mean.
[3] "Critical" water year type is defined as <50% of mean.

estimated in 2017 and 2018. Since 2015, groundwater in storage has declined by approximately 20,400 AF in the LPVB.

FCGMA has undertaken several steps toward implementing the GSP and filling data gaps identified in the GSP. At the request of FCGMA, DWR installed a nested well cluster in 2019 near the boundary between the Pleasant Valley Basin (PVB) and ELPMA, an area identified in the GSP as a critical location where groundwater elevation measurements were lacking. Construction of this well cluster helps address critical gaps in the monitoring network that impact the aerial coverage of groundwater elevation measurements. In addition, in 2022, FCGMA solicited project descriptions from various agencies in the LPVB to include in a grant application submitted to DWR under their Sustainable Groundwater Management Grant Program's SGMA Implementation Round 2 funding opportunity. FCGMA submitted this grant application in December 2022 and is awaiting notice on award.

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1 Background and Plan Area

1.1 Background

FCGMA, the GSA for the portions of the Las Posas Valley Basin (LPVB; DWR Bulletin 118 Basin No. 4-008) within its jurisdictional boundaries, has prepared this fourth annual report for the LPVB GSP in compliance with SGMA (California Water Code, Section 10720 et seq.). SGMA requires that an annual report be submitted to DWR by April 1 of each year following the adoption of the GSP. FCGMA adopted a GSP for the LPVB in December 2019 and submitted the GSP to DWR on January 13, 2020. DWR approved the LPVB GSP on January 13, 2022.

FCGMA is one of three Groundwater Sustainability Agencies (GSAs) in the LPVB. The other two GSAs are the Camrosa Water District (CWD) Las Posas Basin GSA and the Las Posas Basin Outlying Areas GSA (County of Ventura). This annual report applies to the entirety of the LPVB. To coordinate management and reporting in the LPVB, FCGMA and CWD have executed a Memorandum of Understanding, and FCGMA and the County have formed a Joint Powers Authority.

1.1.1 Fox Canyon Groundwater Management Agency

FCGMA is an independent special district formed by the California Legislature in 1982 to manage and protect the aquifers within its jurisdiction for the common benefit of the public and all agricultural, and M&I users (FCGMA et al. 2007). FCGMA's boundaries include all land overlying the Fox Canyon Aquifer (FCA) and includes portions of the LPVB (4-008), the Oxnard Subbasin (4-004.02), the Pleasant Valley Basin (4-006), and the Arroyo Santa Rosa Valley Basin (ASRVB; 4-007).

FCGMA is governed by a Board of Directors (Board) with five members who represent: (1) the County of Ventura (County), (2) the United Water Conservation District (UWCD), (3) seven mutual water companies and water districts within the Agency[4], (4) five incorporated cities which are all or a portion of each is within the FCGMA jurisdictional area[5], and (5) a farmer representative. The Board members representing the County, UWCD, the mutual water companies and water districts, and the incorporated cities are appointed by their respective organizations or groups. The representative for the farmers is appointed by the other four seated Board members from a list of candidates jointly supplied by the Ventura County Farm Bureau and the Ventura County Agricultural Association. An alternate Board member is selected by each appointing agency or group in the same manner as the regular member and acts in place of the regular member in case of absence or inability to act. All members and alternates serve for a 2-year term of office, or until the member or alternate is no longer an eligible official of the member agency. Information regarding current FCGMA Board representatives can be found on the FCGMA website[6].

4 The seven mutual water companies and water districts are: Alta Mutual Water Company, Pleasant Valley County Water District (PVCWD), Berylwood Mutual Water Company, Calleguas Municipal Water District (CMWD), CWD, Zone Mutual Water Company, and Del Norte Mutual Water Company.

5 The five incorporated cities within the FCGMA jurisdictional area are: Ventura, Oxnard, Camarillo, Port Hueneme, and Moorpark

6 FCGMA Website: https://fcgma.org/

1.1.2 LPVB Groundwater Sustainability Plan

The GSP for the LPVB defined the conditions under which the groundwater resources of the entire LPVB will be managed sustainably in the future (FCGMA 2019). Although DWR has defined the LPVB as a single groundwater basin, there is limited hydraulic connection between the eastern and western parts of the LPVB (FCGMA 2019). Hydrogeologic differences in the controls on groundwater recharge and groundwater production necessitated the definition of three management areas in the LPVB. These management areas are the West Las Posas Management Area (WLPMA), the East Las Posas Management Area (ELPMA) and the Epworth Gravels Management Area. The Epworth Gravels Management Area is a shallow unconfined aquifer located within the geographic boundaries of the ELPMA, but separated from the underlying Fox Canyon and Grimes Canyon aquifers.

The GSP evaluated groundwater conditions in four hydrostratigraphic units in the WLPMA: the shallow alluvial system, the Upper San Pedro Formation, the Fox Canyon aquifer, and the Grimes Canyon aquifer (FCGMA 2019). The WLPMA is hydrogeologically connected to the Oxnard Subbasin to the west. The shallow alluvial system is in connection with the Upper Aquifer System (UAS) in the Oxnard Subbasin, and the Upper San Pedro Formation, Fox Canyon aquifer, and Grimes Canyon aquifer compose the Lower Aquifer System (LAS) in the LPVB and the Oxnard Subbasin (FCGMA 2019).

In the ELPMA the GSP evaluated groundwater conditions in the Epworth Gravels, Shallow Alluvial aquifer, the Upper San Pedro Formation, the Fox Canyon aquifer, and the Grimes Canyon aquifer (FCGMA 2019). The Upper San Pedro Formation is not a primary aquifer but is a source of water to the underlying Fox Canyon aquifer. Geologic folding and faulting of the region has resulted in variations in thickness, elevation, and exposure of the Fox Canyon aquifer in the ELPMA. This folding was found to result in differential impacts from groundwater elevation declines in the ELPMA (FCGMA 2019).

The primary sustainability goal for the LPVB adopted in the GSP is “to maintain a sufficient volume of groundwater in storage in each management area so that there is no significant and unreasonable decline in groundwater elevation or storage over wet and dry climatic cycles” (FCGMA 2019). Additionally, “groundwater levels in the WLPMA should be maintained at elevations that are high enough to not inhibit the ability of the Oxnard Subbasin to prevent net landward migration of the saline water impact front after 2040” (FCGMA 2019). These goals were established based on both historical and potential future undesirable results to the groundwater resources of the LPVB from six sustainability indicators: chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletions of interconnected surface water. The LPVB was found not to experience direct impacts from seawater intrusion or depletion of interconnected surface water.

The GSP established minimum threshold groundwater elevations, which varied geographically within the WLPMA and ELPMA (FCGMA 2019). These groundwater elevations were selected to avoid undesirable results in the LPVB. In addition to minimum threshold groundwater elevations, the GSP also established measurable objective groundwater elevations. Measurable objective groundwater elevations are higher than the minimum threshold groundwater elevations to allow for operational flexibility during drought periods (FCGMA 2019). Minimum threshold and measurable objective groundwater elevations were established at one representative monitoring point (or “key well”) in the Epworth Gravels Management Area, fifteen representative monitoring points in the ELPMA, and five representative monitoring points in the WLPMA (FCGMA 2019).

The GSP documented conditions throughout the LPVB through the fall of 2015. The first and second annual reports evaluated progress toward sustainability based on a review of groundwater elevation data, groundwater extraction data, surface water supply used, or surface water supply available for use, total water used, and change in groundwater storage between the fall of 2015 and the end of water year 2020[7]. This annual report documents the conditions in the LPVB and the progress toward sustainability for water year 2022.

1.2 Plan Area

The LPVB is bounded to the north by South Mountain and Oak Ridge; to the northeast and east by the foothills of Big Mountain; to the south by the Springville Fault (western segment of the Simi–Santa Rosa Fault) and the Las Posas Hills; and to the west by the Oxnard Subbasin of the Santa Clara River Valley Basin (Figure 1-1).

In the Camarillo Hills area, the Springville Fault Zone is believed to form a groundwater flow barrier at depth between the aquifers in the LPVB and the PVB, based on historical hydraulic head differences of up to 60 feet across the fault zone (Turner 1975). However, shallow alluvial deposits in the vicinity of Arroyo Las Posas and the Somis Gap are in hydraulic communication with the PVB (CMWD 2017). On the west, the WLPMA is in hydrogeologic communication with the Oxnard Subbasin. The boundary between the LPVB and Oxnard Subbasin is a jurisdictional boundary.

1.2.1 Climate

The climate of the LPVB is typical of coastal Southern California, with average daily temperatures ranging generally from 54°F to 84°F in summer and from 40°F to 74°F in the winter (FCGMA 2019). Typically, most of the precipitation in the Ventura County region falls between November and April. Precipitation is measured at several stations in the LPVB (Figure 1-2). Water year precipitation, measured at Stations 002 and 190, in the central LPVB is highly variable, ranging from 3.5 inches in 2021 to 39.0 inches in 2005 (Figure 1-3; Las Posas Valley Basin Historical Water Year Precipitation). On average, the LPVB received approximately 15.1 inches of precipitation per water year between 1956 and 2022. In water year 2022, the LPVB received 13.38 inches of precipitation, which is approximately 88% of the 1956-2022 average.

The GSP for the LPVB included precipitation through the 2015 water year (FCGMA 2019). Since 2015, the LPVB has experienced three above normal[8] water years (2017, 2019, and 2020), one below normal water year (2022), two dry water years (2016 and 2018), and one critically dry water year (2021). Water year 2021 was the driest water year on record in the LPVB, in which the total precipitation was approximately 77% lower than the long-term mean precipitation[9]. Overall, the LPVB has continued to experience drier than average conditions since 2015.

1.2.2 Surface Water and Drainage Features

The dominant surface water body in the LPVB is Arroyo Las Posas, located in the ELPMA. In the easternmost portion of the LPVB, Arroyo Las Posas is named Arroyo Simi, and Arroyo Las Posas becomes Calleguas Creek in the PVB. Arroyo Las Posas, which drains a watershed larger than the area of the LPVB, is a source of recharge to the ELPMA.

7 A water year begins on October 1 and ends on September 30 of the following year. The convention for naming the water year is to name the water year based on the year in which it ends. For example, the 2022 water year begins on October 1, 2021 and ends on September 30, 2022.

8 Water years have been classified into five types based on their relationship to the mean water year precipitation. The five types are: critical, dry, below normal, above normal, and wet. Critical water years are < 50% of the mean annual precipitation. Dry water years are ≥ 50% and <75% of the mean annual precipitation. Below normal water years are ≥ 75% and <100% of the mean annual precipitation. Above normal water years are ≥ 100% and <150% of the mean annual precipitation. Wet water years are ≥ 150% of the mean annual precipitation.

9 Long-term mean precipitation was calculated using precipitation measured at Station 190 over the period from water year 1956 through 2022

Dry weather flows in Arroyo Las Posas result from upstream wastewater treatment plant and dewatering well discharges to the Arroyo Simi (FCGMA 2019).

There is only one active streamflow gauging station in the LPVB. This station, gauge 841A, which is maintained by the Ventura County Watershed Protection District (VCWPD), is located on Arroyo Simi above Hitch Blvd. (Figures 1-2 and 1-4). Streamflow measured at gauge 841 since water year 2010 is presented in Table 1-1.

Table 1-1. Streamflow on Arroyo Las Posas for Water Years 2010 through 2022

Water Year	Average Daily Flow (cfs) at Gauge 841A
2010	38.5
2011	51.1
2012	25.3
2013	17.5
2014	NM
2015	17.7
2016	15.0
2017	31.0
2018	14.7
2019	22.5
2020	22.6
2021	9.49
2022*	22.31

Notes: cfs - cubic feet per second
NM – Not Measured
* VCWPD notes that this data is provisional, subject to revision.

Average daily flows in Arroyo Las Posas reflect the water year precipitation (Section 1.2.1) with the highest daily average flows measured at gauge 841A over the past 10 years occurring in 2010, 2011.and 2017. Water years 2010, 2011 and 2017 were above normal water years in which water year precipitation was approximately 140% of the long-term mean. Daily average flow measured at gauge 841A in the 2022 water year was approximately 93% of the 2010-2022 average (Table 1-1; Figure 1-4). The relatively high daily average flows measured in this water year largely reflect the significant precipitation events in December 2021, during which the LPVB received approximately 7.8 inches of precipitation, or 50% of the long-term average annual precipitation, over a nine-day storm event. Peak daily average flows during this period measured at 841A were 2,970 cubic feet per second.

1.3 Annual Report Organization

This is the fourth Annual Report prepared since the GSP for the LPVB was submitted to DWR. This annual report is organized according to the GSP Emergency Regulations. Chapter 1 provides the background information on the GSP, the LPVB, and the FCGMA. Chapter 2 provides information on the groundwater conditions in the LPVB since 2015, including groundwater elevations, groundwater extractions, surface water supply, total water available, and change in groundwater storage. Chapter 3 provides an update on the GSP implementation.

2 Groundwater Conditions

This chapter presents the change in groundwater conditions in the LPVB from water year 2022. Comparison of water year 2022 conditions to water year 2021 conditions characterizes the impact that water year type, groundwater production, surface water, imported water and recycled water availability in water year 2022 have had on groundwater conditions in the LPVB. Additionally, data from water year 2015 is provided for context.

2.1 Groundwater Elevations

Groundwater elevation contour maps are presented in Figures 2-1 through 2-10: the Shallow Alluvial aquifer in Figures 2-1 and 2-2, the Epworth Gravels aquifer in Figures 2-3 and 2-4, the Upper San Pedro Formation in Figures 2-5 and 2-6, the Fox Canyon aquifer in Figures 2-7 and 2-8, and the Grimes Canyon aquifer in Figures 2-9 through 2-10. These maps show the seasonal low groundwater elevations for the fall of 2021 and seasonal high groundwater elevations for the spring of 2022. Groundwater elevations are best defined in the Fox Canyon aquifer (Figures 2-7 and 2-8), and least well constrained in the Grimes Canyon aquifer (Figures 2-9 and 2-10).

Fall and spring groundwater elevations were defined as any groundwater elevation measured between October 2 and October 29, 2021, and March 2 and March 29, 2022, respectively. These four-week measurement windows are approximately the same measurement windows used to generate fall and spring groundwater elevation contours for the 2022 Annual Report covering water year 2021. The GSP recommended collecting groundwater elevations within a two-week window in the future (FCGMA 2019a). FCGMA has been prioritizing recommendations made in the GSP and evaluating the timeframe and feasibility of implementing these recommendations.

The groundwater elevation contour maps are based on the groundwater elevations measured at wells screened solely within an individual aquifer. The intent of using groundwater elevations from wells screened within a single aquifer is to accurately represent groundwater flow directions within an aquifer, as well as vertical gradients between aquifers. It is important to note that production wells in the LPVB may be screened in multiple aquifers.

2.1.1 Groundwater Elevation Contour Maps

2.1.1.1 Shallow Alluvial Aquifer

Fall 2021 groundwater elevations in the Shallow Alluvial aquifer in the ELPMA ranged from a low of 150 feet mean sea level (ft msl) at well 02N20W17J06S to a high of 481 ft msl at well 02N19W09E01S (Figure 2-1). The groundwater elevation low of 150 ft msl occurred along the western most reach of Arroyo Las Posas within the LPVB, near the boundary with the PVB (Figure 2-1). The groundwater elevation high of 481 ft msl occurred along the easternmost reach of Arroyo Las Posas within the LPVB, near the boundary with the Simi Valley Basin (Figure 2-1). Fall 2021 groundwater elevations were within 1 foot of the fall 2020 conditions at all wells screened in the Shallow Alluvial aquifer. The fall 2021 groundwater elevations were within 1 foot of the fall 2015 elevations in the southeast portion of the ELPMA along Arroyo Las Posas. The fall 2021 groundwater elevations were approximately five feet to ten feet lower than the fall 2015 groundwater elevations at wells 02N20W17J06S, 02N20W09Q08S and 02N20W10K02S located adjacent to Arroyo Las Posas in the southwestern portion of the ELPMA.

Spring 2022 groundwater elevations were measured at seven wells in the Shallow Alluvial aquifer (Figure 2-2). During this measurement period, groundwater elevations ranged from a low of approximately 170 ft msl at well 02N20W17J06S to a high of 482 ft msl at well 02N19W09E01S (Figure 2-2). Spring 2022 groundwater elevations ranged from approximately 0 to 10 feet lower than spring 2021 conditions. Since 2015, spring groundwater elevations have declined in the Shallow Alluvial aquifer. These declines are largest near the boundary with the PVB, where the spring 2022 groundwater elevation was approximately 16 feet lower than spring 2015 conditions.

2.1.1.2 Epworth Gravels Aquifer

There are only two wells in the Epworth Gravels aquifer for which groundwater elevations were reported in fall 2021: 03N19W29F06S and 03N19W30M02S (Figures 2-3 and 2-4). The fall 2021 groundwater elevations were approximately 541.9 ft msl and 620 ft msl at wells 03N19W29F06S and 03N19W30M02S, respectively (Figure 2-3). These fall conditions are approximately 5 to 130 feet higher than fall 2020 conditions and approximately 2 to 60 feet lower than fall 2015 conditions.

In spring 2022, the groundwater elevation at well 03N19W29F06S was approximately 592.45 ft msl, and approximately 623 ft msl at well 03N19W30M02S. The spring 2022 groundwater elevation at well 03N19W30M02S is approximately 0.5 feet higher than spring 2021 and 3.5 feet higher than spring 2015 conditions. The spring 2022 groundwater elevation at well 03N19W29F06S is approximately 9 feet lower than spring 2015 and 40 feet higher than spring 2021.

2.1.1.3 Upper San Pedro Formation

Groundwater elevations in the Upper San Pedro Formation vary with depth (Figures 2-5 and 2-6) and generally reflect the presence of laterally discontinuous lenses of permeable sediments that characterize the Upper San Pedro Formation in the LPVB. The influence of these discontinuous lenses on local groundwater conditions is reflected in the groundwater elevation measurements collected at nested wells located in the WLPMA, wells 02N21W11J05S (screened 340-380 feet below ground surface (ft bgs)) and 02N21W11J06S (screened 190-230 fts bgs; Figure 2-5 and 2-6). In fall 2021, the groundwater elevation measured at well 02N21W11J06S, the shallowest completion of the nested well cluster, was approximately 38 feet higher than the groundwater elevation measured well at well 02N21W11J05S (Figure 2-5). The fall 2021 groundwater elevation measured at well 02N21W15M03S, which is located approximately 2 miles southwest of wells 02N21W11J05/6S, was -86.13 ft msl (Figure 2-5). In western WLPMA, fall 2021 groundwater elevations, as measured at well 02N21W15M03S, were approximately 23 feet lower than fall 2020 and approximately 32 feet lower than fall 2015. In central WLPMA, fall 2021 groundwater conditions were approximately 2.5 ft lower than fall 2020, and 10 to 130 feet lower than fall 2015.

Only one well in the Upper San Pedro formation of the ELPMA was measured in fall 2021. The groundwater elevation measured at this well, which is located within the trough of the Moorpark syncline, was approximately 262 ft msl (Figure 2-5). The fall 2021 groundwater elevation is approximately 1.5 feet lower than the fall 2020 elevation and approximately 10 feet lower than the fall 2015 elevation.

In the spring of 2022, groundwater elevations in the Upper San Pedro Formation in the WLPMA ranged from a low of -84 ft msl at well 02N21W15M03S to high of 244 ft msl at well 02N21W16J01S (Figure 2-6). Between spring 2021 and 2022, groundwater elevations in the Upper San Pedro decreased by approximately 16 feet in western WLPMA and 3 to 4 feet in central WLPMA. Spring 2021 groundwater elevations were approximately 60 feet below spring 2015 conditions in western WLPMA and approximately 11 to 41 feet below fall 2015 in central WLPMA.

In the ELPMA, spring 2022 groundwater elevations ranged from 437 ft msl near Arroyo Las Posas to approximately 262 ft msl north of the Moorpark anticline at well 03N20W35R04S (Figure 2-6). Spring 2022 groundwater elevations along Arroyo Las Posas were similar to the spring 2021 conditions. Within the trough of the Moorpark syncline, spring groundwater elevations declined by approximately 10 feet between 2015 and 2022.

2.1.1.4 Fox Canyon Aquifer

Fall 2021 groundwater elevations in the Fox Canyon aquifer in the WLPMA ranged from a low of approximately -172 ft msl in southern WLPMA at well 02N21W13A01S to a high of approximately -47 ft msl in central WLPMA at well 02N20W12H01S (Figure 2-7). Groundwater elevations in WLPMA generally declined from fall 2020 to fall 2021. Over this period, groundwater elevation declines ranged from approximately 0 feet at well 02N21W11J03S to approximately 9 feet at well 02N21W13A01S. Fall 2021 groundwater elevations in the WLPMA were between approximately 11 and 60 feet lower than they were in fall 2015 (measured at wells 02N21W11J03S and 02N21W13A01S, respectively).

In the ELPMA, fall 2021 groundwater elevations ranged from a high of approximately 273 ft msl at well 02N20W10J01S to a low of approximately 80 ft msl at well 02N20W027H03S (Figure 2-7). Between fall 2020 and fall 2021, groundwater elevations in southern ELPMA, near Arroyo Las Posas, declined by approximately 6 feet. Near the Moorpark anticline, groundwater elevation declines ranged from approximately 5 feet at well 02N20W02D02S to approximately 15 feet at well 03N20W35R03S. Within the trough of the Moorpark syncline, groundwater elevation were not measured in fall 2021.

In central ELPMA, fall groundwater elevations have declined by approximately 15 to 25 feet since 2015 (measured at wells 02N20W34G01S and 02N20W03H01S, respectively). Along the base of the Moorpark anticline, where groundwater elevations are influenced by CMWD's Aquifer Storage and Recovery (ASR) operations, fall 2021 groundwater elevations ranged from 5 feet lower than 2015 elevations (measured at well 03N20W35R03S) to 3 feet higher than to 2015 elevations (measured at well 03N20W35R02S). Along the base of Oak Ridge, the fall 2021 groundwater elevation measured at well 03N19W19J01S was approximately 16 feet lower than fall 2015.

Spring 2022 groundwater elevations in the WLPMA ranged from a low of approximately -172 ft msl at well 02N21W13A01S to a high of approximately -42 ft msl at well 02N20W12H01S (Figure 2-8). Spring groundwater elevations declined across the WLPMA between 2021 and 2022, with the largest declines occurring in southeastern WLPMA at well 02N21W13A01S. At this well, the spring 2022 groundwater elevation was approximately 12 feet lower than spring 2021 and 67 feet lower than spring 2015. In central WLPMA, the spring 2022 groundwater elevations ranged from approximately 9 feet lower than spring 2021 elevations at well 02N21W11J03S to approximately 5 feet lower than spring 2021 elevations at well 02N21W12H01S. In this part of the WLPMA, spring 2022 groundwater elevations were approximately 30 lower than they were in spring 2015.

Spring 2021 groundwater elevations in the ELPMA ranged from a high of approximately 279 ft msl at well 02N20W10J01S to a low of approximately 121 ft msl at well 02N20W03H01S (Figure 2-8). Groundwater elevations declined between spring 2021 and 2022. In the southern ELPMA, near Arroyo Las Posas, the spring 2022 groundwater elevation measured at well 02N20W10J01S was approximately 1 foot lower than spring 2021. Downgradient of this well, groundwater elevations were approximately 22 feet lower than spring 2021 groundwater elevations at well 02N20W03H01S. North of the Moorpark anticline, spring 2022 groundwater elevations ranged from approximately 6 to 17 feet lower than spring 2021 groundwater elevations (measured at wells 03N19W19J01S and 03N20W35R02S, respectively). The spring 2022 groundwater elevations ranged from approximately 6 feet lower than spring 2015 groundwater elevations (measured at well 02N20W10J01S, near the

Arroyo Las Posas) to approximately 19 feet lower than spring 2015 groundwater elevations (measured at well 03N19W28N03S, in the northern part of the ELPMA).

2.1.1.5 Grimes Canyon Aquifer

Of the eight wells screened solely within the Grimes Canyon aquifer in the WLPMA, groundwater elevations were only measured at well 02N21W18A02S. The fall 2021 groundwater elevation measured at this well was -104.81 ft msl (Figure 2-9); the groundwater elevation was not measured at this well in the spring of 2022 (Figure 2-10). The fall 2021 groundwater elevation measured at this well was approximately 4 feet lower than it was in fall 2020 and 15 feet lower than fall 2015.

Groundwater elevations were not measured in either of the two wells screened solely in the Grimes Canyon aquifer in the ELPMA (Figures 2-9 through 2-10).

Table 2-1. Water Year 2022 Groundwater Elevations, Minimum Thresholds, Measurable Objectives, and Interim Milestones for Representative Monitoring Wells in the LPVB

Well Number	Management Area	Aquifer	Fall Groundwater Conditions			Spring Groundwater Conditions			Minimum Threshold (ft MSL)	Measurable Objective (ft MSL)	2025 Interim Milestone (ft MSL)
			2021 Groundwater Elevation (ft MSL)	Change from 2020 to 2021 (feet)[a]	Change from 2015 to 2021 (feet)[b]	2022 Groundwater Elevation (ft MSL)	Change from 2021 to 2022 (feet)[a]	Change from 2015 to 2022 (feet)[b]			
03N19W29F06S	Epworth Gravels	Epworth Gravels	586.0	48.8	**-12.6**	595	43.4	**-6.7**	555	585	581
02N20W09Q08S	ELPMA	Shallow Alluvial	264.0	-	**-7.0**	272	**-1**	**-0.56**	170	270	—
02N20W12MMW1	ELPMA	Shallow Alluvial	369.0	0.5	-	372	-	-	300	370	—
02N20W01B02S	ELPMA	Fox	126.0	**-12.0**	-	130	**-19**	-	80	120	—
02N20W03H01S	ELPMA	Fox	128.0	19.0	**-23.7**	121	**-22.5**	**-44.45**	100	135	—
02N20W04F02S	ELPMA	Fox	Destroyed	-	-	Destroyed	-	-	100	145	—
02N20W10D02S	ELPMA	Fox	131.2	**-5.3**	**-19.3**	145.83	0.55	**-19.7**	80	130	—
02N20W10G01S	ELPMA	Fox	NM	-	-	NM	-	-	100	230	—
02N20W10J01S	ELPMA	Fox	273.4	**-6.3**	**-5.9**	279.22	**-0.9**	**-6.55**	110	250	—
03N19W19J01S	ELPMA	Fox	160.4	**-9.9**	**-15.8**	159.8	**-6.4**	**-19.9**	130	160	—
03N19W28N03S	ELPMA	Fox	164.0	-	**-17.0**	163	-	**-18.82**	130	170	—
03N19W31B01S	ELPMA	Fox	149	-	2.5	148	-	**-7.5**	105	145	—
03N20W34G01S	ELPMA	Fox	126.0	**-11.0**	**-15.9**	131.38	**-12**	**-13.7**	75	130	—
03N20W35R03S	ELPMA	Fox	131.4	**-15.3**	**-5.2**	130.37	**-14.5**	**-25.2**	105	145	139
03N20W26R03S	ELPMA	Fox	123.3	**-13.7**	-	126.41	**-14.6**	**-20.1**	100	120	—
03N20W35R02S	ELPMA	Grimes	131.5	**-14.7**	2.7	130.37	**-13.8**	**-26.2**	105	145	133
02N20W06R01S	WLPMA	LAS[c]	-201.9	**-10.6**	**-47.9**	NM	-	-	-170	-125	-147
02N20W08F01S	WLPMA	LAS	NM	-	-	-229.8	-	-	-195	-150	—
02N21W16J03S	WLPMA	LAS	NM	-	-	NM	-	-	-75	-45	-71
02N21W11J03S	WLPMA	LAS	-80.3	**-0.3**	**-11.3**	-80.81	**-8.6**	**-29.81**	-70	-50	-64
02N21W12H01S	WLPMA	LAS	-46.8	**-5.1**	-	-42.21	**-4.6**	-	-70	-45	—

ft MSL = feet mean sea level
NM = not measured

[a] Data in this column shows the difference between water year 2022 and water year 2021 groundwater elevations measured at each representative monitoring site. Positive (+) values indicate that seasonal high or low groundwater elevations have increased from water year 2021 conditions. Negative (-) values indicate that seasonal high or low groundwater elevations have decreased from water year 2020 conditions. Groundwater elevation declines from 2020 conditions are presented in bold font. Blank cells in this column indicate that data was not measured in the current, or previous, water year.

[b] Data in this column shows the difference between water year 2022 and water year 2015 groundwater elevations measured at each representative monitoring site. Positive (+) values indicate that seasonal high or low groundwater elevations have increased from water year 2015 conditions. Negative (-) values indicate that seasonal high or low groundwater elevations have decreased from water year 2015 conditions. Groundwater elevation declines from 2015 conditions are presented in bold font. Blank cells in this column indicate that data was not measured in the current, or previous, water year.

[c] In the WLPMA, the LAS consists of the Fox Canyon aquifer and Grimes Canyon aquifer (FCGMA 2019)

2.1.2 Groundwater Elevation Hydrographs

Groundwater elevation hydrographs for each of the key wells identified in the GSP are presented in Figures 2-11 through 2-13. These key wells are the designated representative monitoring sites for the LPVB (FCGMA 2019). Since the GSP was prepared, well 02N20W04F02S, one of the representative monitoring wells in the ELPMA, was destroyed (Table 2-1). FCGMA is currently working to identify a suitable replacement monitoring site for inclusion in subsequent annual reports. Additionally, groundwater elevations in wells 02N20W08F01S and 02N21W16J03S have not been measured since 2016 or 2017 (Table 2-1). Groundwater elevations at wells 02N20W08F01S and 02N21W16J03S have historically been monitored by VCPWD, Zone Mutual Water Company, and UWCD; FCGMA is continuing to assess whether these wells can be accessed and included in future monitoring, or whether suitable replacement wells need to be identified. The FCGMA has pursued funding opportunities to construct additional monitoring wells in the LPVB to address gaps in the monitoring network as part of DWR's Sustainable Groundwater Management Grant Program's Round 2 GSP Implementation funding opportunity.

In the WLPMA, spring 2022 groundwater elevations were measured in three of the five representative monitoring wells, two of which (wells 02N21W11J03S and 02N21W12H01S) were also measured in spring 2021 (Table 2-1). At these two wells, seasonal high groundwater elevations declined between approximately 5 and 9 feet over the 2022 water year and spring 2022 groundwater elevations were approximately 30 feet lower than spring 2015. The spring 2022 groundwater elevations measured in the WLPMA were below the minimum threshold groundwater elevations at two of the three measured wells: 02N20W08F01S and 02N21W11J03S (Table 2-1). The groundwater elevations measured at well 02N21W11J03S have been below the minimum threshold groundwater elevation for four consecutive monitoring events (fall 2020, spring 2021, fall 2021, and spring 2022). The spring 2022 groundwater elevation measured at well 02N20W08F01S was the first measurement collected at this well since spring 2017. The spring 2017 groundwater elevation measured at this well was -141 ft msl, which is approximately 54 feet higher than the minimum threshold (Table 1-1).

In the Fox Canyon aquifer of the ELPMA, spring groundwater elevations declined at all measured representative monitoring wells except well 02N20W10D02S. The spring groundwater elevation at this well was approximately 0.5 feet higher in 2022 than 2021. At all other key wells in the Fox Canyon aquifer of the ELPMA, the spring 2022 groundwater elevations were between approximately 1 and 23 feet lower than they were in 2021 (Table 2-1). Spring 2022 groundwater elevations in the Fox Canyon aquifer of the ELPMA ranged from approximately 14 to 20 feet lower than spring 2015 elevations. Although groundwater elevations declined throughout the majority of the ELPMA, they remained above the established minimum threshold groundwater elevations at all wells in the ELPMA.

2.2 Groundwater Extraction

On December 14, 2020, the FCGMA adopted an Ordinance to Establish an Extraction Allocation System for the Las Posas Valley Groundwater Basin. The ordinance was designed to facilitate sustainable groundwater management under SGMA. The new allocation system went into effect on October 1, 2021 and transitioned from calendar year to water year reporting for groundwater extractions.

Historically, groundwater extractions in the LPVB have been reported to the FCGMA in two periods (semi-annually) over the course of a single calendar year. Because groundwater extractions are not reported monthly, groundwater production prior to 2021 cannot be reported on a water year basis. Therefore, the groundwater extractions for 2016 through 2020 reported in Table 2-2 and Table 2-3, and shown on Figures 2-16 through 2-19, follow the historical precedent and represent calendar year extractions.

Due to the transition from calendar year to water year reporting, the 2021 groundwater extractions reported in Tables 2-2 and 2-3 represent: (i) a combination of reported and estimated extractions for the period from October 1, 2020 through December 31, 2020, and (ii) a combination of reported and estimated extractions for the period from January 1, 2021 through September 30, 2021. Agricultural extractions for the October to December 2020 period were estimated using monthly AMI data that were validated against the 2020 calendar year extraction reports, and the October to December 2020 extractions for municipal and domestic water supply wells were estimated by assuming that 50% of the June-December extraction reporting occurred during the October to December timeframe. Groundwater extractions for the second half of the 2022 water year were estimated using the same approach for users who have not yet submitted final extraction statements. These data will be updated in the 2024 GSP annual report based on final reporting.

Since 2015, groundwater extractions in the WLPMA have ranged from a minimum of approximately 14,100 AF in 2019 to a maximum of approximately 18,000 AF in 2021 (Table 2-2). The water year 2021 groundwater extraction volume is approximately 2,600 AF higher than the historical extraction rates reported for the period from calendar year 1985 through 2015 and is similar to the 2011 through 2014 drought-period average annual extraction from the WLPMA (FCGMA 2019). During the 2016 to 2022 period, approximately 85% of the groundwater extracted from the WLPMA was used for agricultural applications, 15% was used to support M&I, and less than 1% was used as a source of domestic water supply. In the ELPMA, groundwater extractions have ranged from a minimum of approximately 20,400 AF in 2019 to a maximum of approximately 26,700 AF in 2022 (Table 2-3). During the 2016 to 2022 period, approximately 94% of the groundwater extracted from the ELPMA was used for agricultural applications, 7% was used to support M&I, and less than 1% was used as a source of domestic water supply.

The sustainable yield of the ELPMA, WLPMA, and Epworth Gravels aquifer is estimated to be approximately 17,800 ± 2,300 AFY, 12,500 ± 1,200 AFY, and 1,300 AFY respectively (FCGMA 2019). Combining these values leads to an estimate of the total sustainable yield for the LPVB that ranges from 28,100 AFY to 35,100 AFY. Since 2015, groundwater extractions in the WLPMA have exceeded the upper bound of the estimated sustainable yield (13,600 AFY) by approximately 500 to 4,400 AFY. During this period, groundwater extractions were highest in 2020 and 2021, and exceeded the upper bound of the estimated sustainable yield by approximately 2,600 AFY and 4,400 AFY, respectively. In the ELPMA, groundwater extractions have ranged from a low of approximately 20,400 AF in 2019 to a high of approximately 26,700 AF in 2022 (Table 2-3). These recent groundwater extraction rates exceed the upper bound of the estimated sustainable yield by 300 to 6,600 AFY. Since 2015, groundwater extractions from the Epworth Gravels aquifer have not exceeded the estimated sustainable yield (Table 2-3).

Total groundwater extractions from the LPVB have ranged from a low of approximately 35,300 AF in calendar year 2019 to a high of approximately 44,600 AF in water year 2021. These extraction rates indicate that groundwater production from the LPVB has remained above the estimated sustainable yield since 2015 (Table 2-2 and Table 2-3).

2.3 Surface Water Supply

There are no locally derived sources of surface water in the LPVB (FCGMA 2019).

Table 2-2. Annual Groundwater Extractions in the WLPMA by Aquifer System and Water Use Sector

Year	Shallow Alluvial System (Acre-Feet)				Lower Aquifer System (Acre-Feet)				Wells in Unassigned Aquifer Systems (Acre-Feet)				Total (Acre-Feet)
	AG	*M&I*	*Dom*	*Sub-total*	*AG*	*M&I*	*Dom*	*Sub-total*	*AG*	*M&I*	*Dom*	*Sub-total*	
CY 2016	1,316	0	1	1,317	11,291	2,371	0	13,662	178	372	33	583	**15,562**
CY 2017	1,348	0	1	1,349	11,197	2,321	0	13,518	569	386	44	999	**15,866**
CY 2018	903	0	1	904	10,184	1,511	0	11,695	1,287	376	42	1,705	**14,304**
CY 2019	675	0	16	691	10,171	2,023	0	12,194	1,013	218	25	1,256	**14,141**
CY 2020	1,031	0	18	1,049	11,622	2,115	0	13,737	1,214	183	41	1,437	**16,223**
WY 2021[a]	1,006	0	1	1,006	13,380	1,910	0	15,290	1,185	470	30	1,686	**17,982**
WY 2022[b]	410	0	0	411	10,637	1,582	0	12,220	1,556	64	2	1,623	**14,253**

Notes: AG = Agriculture ; Dom = domestic; M&I = Municipal and Industrial; CY = Calendar Year (January 1 through December 31); WY = Water Year (October 1 through September 30)

[a] Groundwater extractions updated using additional extraction reporting.

[b] Groundwater extractions are preliminary and expected to change. Additional extraction reporting is anticipated.

Table 2-3. Annual Groundwater Extractions in the ELPMA by Aquifer System and Water Use Sector

Year	Epworth Gravels Aquifer (Acre-Feet)				Upper San Pedro Formation (Acre-Feet)				Fox Canyon Aquifer (Acre-Feet)				Grimes Canyon Aquifer (Acre-Feet)				Wells in Multiple or Unassigned Aquifers (Acre-Feet)				Total (Acre-Feet)
	AG	*M&I*	*Dom*	*Sub-total*	*AG*	*M&I*	*Dom*	*Sub-total*	*AG*	*M&I*	*Dom*	*Sub-total*	*AG*	*M&I*	*Dom*	*Sub-total*	*AG*	*M&I*	*Dom*	*Sub-total*	
CY 2016	1,052	0	0	1,052	583	0	0	583	11,270	1,128	0	12,398	384	87	1	472	8,424	98	18	8,540	**23,045**
CY 2017	924	0	0	924	580	0	0	580	11,900	1,093	0	12,993	453	91	1	545	9,008	131	29	9,168	**24,210**
CY 2018	766	0	0	766	562	0	0	562	10,944	1,393	0	12,337	500	92	1	593	8,579	418	29	9,026	**23,284**
CY 2019	744	0	0	744	217	0	0	217	11,059	1,295	0	12,354	272	99	0	371	6,573	128	20	6,721	**20,407**
CY 2020	865	0	0	865	133	0	0	133	11,791	1,626	0	13,417	569	121	1	692	8,287	289	19	8,595	**23,702**
WY 2021[a]	817	0	0	817	150	0	0	150	13,125	1,830	0	14,954	474	146	2	622	9,784	290	32	10,105	**26,647**
WY 2022[b]	410	0	0	410	74	0	0	74	14,948	1,061	0	16,010	423	107	0	530	9,608	63	18	9,689	**26,713**

Notes: AG = Agriculture; Dom = domestic; M&I = Municipal and Industrial; CY = Calendar Year (January 1 through December 31); WY = Water Year (October 1 through September 30)

a Groundwater extractions updated using additional extraction reporting.

b Groundwater extractions are preliminary and expected to change. Additional extraction reporting is anticipated.

2.4 Imported Water Supply

Imported water supplies consist of imported Metropolitan Water District of Southern California (State Water Project and/or Colorado River water) water provided by the CMWD to local water purveyors and imported groundwater and Conejo Creek water provided by CWD. CMWD is largest imported water supplier to the LPVB and has provided approximately 97% of the imported water to the LPVB since water year 2015 (Table 2-4). Table 2-4 summarizes imported water supplies to the LPVB from water year 2016 to water year 2022.

CWD provided imported water to the LPVB during calendar years 2016 through 2022. In order to convert the imported water supply data from calendar year to water year, 25% of CWD's imported water from a given calendar year was assigned to the following water year, and 75% of the calendar year imported water was assigned to the current water year. This division, while approximate, is based on the monthly split between water year and calendar year, with January through September (75% of the calendar year) belonging to the current water year, and October through December (25% of the calendar year) belonging to the following water year.

Table 2-4. Total Imported Water Supplies in the LPVB

Water Year	*CMWD (Acre-Feet)*						*CWD (Acre-feet)*								Total
	WLPMA		*ELPMA*			*Sub-total*	*GW Pumped in PVB and used in LPVB*		*GW Pumped in SRV and used in LPVB*		*Imported from CMWD to ELPMA*		*Sub-total*	Nonpotable water delivered for Ag	
	M&I	*Ag*	*M&I*	*Ag*	*ASR Injections*[a]		*M&I*	*Ag*	*M&I*	*Ag*	*M&I*	*Ag*			
2016	697	762	5,210	1,966	946	9,581	10	13	21	29	54	76	203	122	**9,906**
2017	541	372	5,526	1,896	4,066	12,401	9	13	33	43	51	69	218	99	**12,718**
2018	1,011	772	6,296	2,298	2,056	12,433	10	13	33	45	53	71	225	97	**12,754**
2019	666	384	5,195	1,802	6,814	14,861	9	13	26	35	54	73	210	139	**15,210**
2020	544	379	5,460	1,884	2,866	11,133	11	15	17	24	69	90	226	132	**11,493**
2021	968	352	6,041	2,023	683	10,067	15	21	15	21	69	91	233	144	**10,444**
2022	506	347	4,720	1,602	1,057	8,232	20	28	20	82	49	64	262	103	**8,597**

Notes: M&I = Municipal and Industrial; Ag = Agriculture; ASR = Aquifer Storage and Recovery; NR = Not Reported, SRV = Santa Rosa Valley Basin, PVB = Pleasant Valley Basin
CWMD = Calleguas Municipal Water District; CWD = Camrosa Water District
[a] ASR injections are stored water in the ELPMA.

2.5 Total Water Available

Total available water was tabulated from the groundwater extractions reported in Tables 2-2 and 2-3, the imported water supplies reported in Table 2-4, and treated wastewater sent to the Moorpark Wastewater Treatment Plant (MWTP) percolation ponds. Total available water is reported in Table 2-5 by water year. In order to convert the reported groundwater pumping from calendar year to water year for 2016 through 2020, 25% of groundwater production from a given calendar year was assigned to the following water year, and 75% of the calendar year production was assigned to the current water year. This division, while approximate, is based on the monthly split between water year and calendar year, with January through September (75% of the calendar year) belonging to the current water year, and October through December (25% of the calendar year) belonging to the following water year.

Similar to Table 2-2, the groundwater extractions for water year 2021 presented in Table 2-5 represent reported extractions for the period from October 1, 2020 through September 30, 2021 and groundwater extractions for water year 2022 represent a combination of reported extractions and extractions estimated using AMI data.

Table 2-5. Total Water Available in the LPVB

Water Year	Groundwater (acre-feet)			Recycled Water (acre-feet)	Imported Water[a] (acre-feet)		Total[b] (acre-Feet)
	Ag	*Dom*	*M&I*	*M&I*	*Ag*	*M&I*	
2016	34,872	53	4,160	598	2,969	5,991	48,643
2017	35,610	69	4,031	765	2,492	6,160	49,127
2018	34,296	72	3,848	897	3,296	7,402	49,811
2019	31,474	64	3,770	823	2,446	5,950	44,527
2020	34,315	74	4,191	861	2,525	6,102	48,068
2021[c]	39,920	4,645	64	1,244	2,652	7,108	55,633
2022[d]	38,067	2,878	20	949	2,226	5,315	49,455

Notes: Ag = Agriculture; Dom = Domestic; M&I = Municipal and Industrial.
a Imported water updated to include data provided by CWD.
b Total water available in the LPVB does not include CMWD ASR injections which are considered stored water in the ELPMA. ASR injection totals were 946 AF in 2016, 4,066 AF in 2017, 2,056 in 2018, 6,814 AF in 2019, 2,866 AF in 2020, 683 in 2021, and 1,057 AF in 2022.
c Groundwater extraction reporting for 2021 was updated based on additional extraction reporting.
d Groundwater extraction reporting for 2022 are preliminary and expected to change. Additional extraction reporting is anticipated.

2.6 Change in Groundwater Storage

Change in storage estimates were calculated in the LPVB by comparing annual seasonal high groundwater elevations from water years 2016 through 2022. The change in storage for the Fox Canyon aquifer between spring 2021 and spring 2022 is shown in Figure 2-15. Annual and cumulative change in storage for water years 2016 through 2022 are presented in Tables 2-6A and 2-6C and Figures 2-16 through 2-19.

Change in groundwater in storage was calculated using a series of linear regression models that correlate measured groundwater elevations to simulated storage change values extracted from the Ventura Regional Groundwater Flow Model (UWCD, 2018) for the WLPMA and the CMWD numerical groundwater flow model for the ELPMA (CMWD, 2018). This methodology differs from previous estimates of storage change presented in the 2020 and 2021 Annual Reports. This methodology builds on the approach used in the previous Annual Reports and addresses identified data gaps by: (1) removing the influence of contouring algorithms on the resulting estimates of storage change, and (2) providing an estimate of storage change across the majority of the ELPMA and WLPMA. The updated estimates are presented in Table 2-6A, Table 2-6C, and Figures 2-16 through 2-19. A comparison of the estimated change in storage using the two methodologies is provided in FCGMA (2022).

2.6.1 Fox Canyon Aquifer

Change in groundwater storage in the Fox Canyon aquifer was calculated for approximately 11,500 acres of the 17,400 acres of the WLPMA and 21,300 acres of the 27,200 acres of ELPMA. This corresponds to change in storage estimates that represent approximately 66% of the Fox Canyon aquifer in the WLPMA and 78% of the Fox Canyon aquifer in the ELPMA. Prior estimates of storage change presented in the 2019 and 2020 Annual Reports for the Las Posas Valley Basin represented changes in storage within the Fox Canyon aquifer over approximately 18% of the WLPMA and 19% of the ELPMA.

Groundwater in storage decreased between spring 2021 and spring 2022 across the majority of the LPVB. In the ELPMA, groundwater storage declines ranged from approximately 2 acre-feet per 100 acres (AF/100A) near Arroyo Las Posas, to approximately 31 AF/100A north of the Moorpark syncline (Figure 2-15). In the southern ELPMA, groundwater in storage increased by approximately 1.75 AF/100A, which reflects the 0.55-foot groundwater elevation increase measured at well 02N20W10D02S (Figure 2-15). The estimated increase in groundwater in storage in the eastern part of the ELPMA should be considered uncertain because spring groundwater elevations were not measured consistently between 2021 and 2022 at well 03N19W31B01S. Total change in storage between spring 2021 and spring 2022 in the ELPMA was approximately -2,700 AF (Table 2-6a).

Declines in groundwater in storage in the WLPMA were highest in the area near the Somis Fault. In this part of the WLPMA, groundwater elevations declined up to 47 feet, which corresponded to storage reductions ranging from approximately 8 AF/100A to 47 AF/100A. In western WLPMA, near the boundary between the LPVB and Oxnard Subbasin, change in groundwater storage varied between declines of approximately 44 AF/100A to recoveries of approximately 56 AF/100A (Figure 2-15). Total change in storage between spring 2021 and spring 2022 in the WLPMA was approximately -2,333 AF.

Table 2-6a. Annual Change in Storage (Acre-feet) in the Fox Canyon Aquifer in the LPVB

Water Year	Water Year Type	LPVB[a]		
		WLPMA[a]	*ELPMA[a]*	*Total*
2016	Dry	-224	-1,289	-1,513
2017	Above Normal	-4,411	-526	-4,936
2018	Dry	-1,592	-3,880	-5,472
2019	Above Normal	129	-446	-316
2020	Above Normal	2,474	5,698	8,173
2021	Critically Dry	-5,895	-5,372	-11,266
2022	Below Normal	-2,333	-2,743	-5,076

Notes: ELPMA change in storage includes ASR injections in 2016 through 2019.
[a]Change in groundwater storage for water years 2016 through 2020 was updated during preparation of the 2022 Annual Report (FCGMA 2022) using correlations between measured groundwater elevations and modeled storage change extracted from the Ventura Regional Flow Model (UCWD 2018) and CMWD numerical groundwater flow model (CMWD, 2018). A discussion of this approach is provided in FCGMA (2022).

Estimates of groundwater change in storage described above require consecutive water year measurements. Spring groundwater elevations were not measured during consecutive water years at wells 02N20W07R02S and 02N20W06R01S in the WLPMA and at well 03N19W31B01S in the ELPMA. The missing groundwater elevations were estimated by using nearby wells (Table 2-6b). Because there was not sufficient measurement overlap between well 02N20W07R02S and nearby wells, the local change in storage value for water year 2022 was estimated using a correlation between modeled change in storage and groundwater elevations measured at well 02N20W18A01S. This correlation equation is described in FCGMA (2022).

Table 2-6b. Estimated Groundwater Elevations

SWN	Missing Period	Correlation Well	Correlation Statistic (R^2)	Groundwater Elevation Measured at Correlation Well (ft msl)	Estimated Groundwater Elevation (ft msl)
02N20W06R01S	Spring 2022	02N21W12H01S	0.3380	-42.21	**-124.09**
03N19W31B01S	Spring 2021	03N19W31H01S	0.6132	140.30	**137.1**

Neither annual nor cumulative changes in groundwater storage correspond to water year types in the LPVB (Tables 2-6a and 2-6b; Figures 2-16 through 2-19). Based on the available data, groundwater storage declined at similar rates in 2017 (above normal water year), 2018 (dry water year), and 2022 (below normal water year). Groundwater storage declines in water year 2021 were the largest that the LPVB has experienced since water year 2015. The change in storage volumes reported include ASR operations between 2016 and 2022[10].

10 CMWD's ASR operations impact groundwater elevations in the vicinity of the Moorpark Anticline in the ELPMA. Groundwater elevation changes that result from CMWD's ASR operations are included in the linear regression models used to estimate storage change.

Table 2-6c. Cumulative Change in Storage (Acre-feet) in the Fox Canyon Aquifer in the LPVB

Water Year	Water Year Type	LPVB		
		WLPMA[a]	*ELPMA*[a]	*Total*
2016	Dry	-224	-1,289	-1,513
2017	Above Normal	-4,635	-1,814	-6,449
2018	Dry	-6,227	-5,694	-11,921
2019	Above Normal	-6,098	-6,140	-12,237
2020	Above Normal	-3,623	-441	-4,064
2021	Critically Dry	-9,518	-5,813	-15,331
2022	Below Normal	-11,851	-8,556	-20,406

Notes: ELPMA change in storage includes ASR injections in 2016 through 2021.

[a] Change in groundwater storage for water years 2016 through 2020 was updated during preparation of the 2022 Annual Report (FCGMA 2022) using correlations between measured groundwater elevations and modeled storage change extracted from the Ventura Regional Flow Model (UCWD 2018) and CMWD numerical groundwater flow model (CMWD, 2018). A discussion of this approach is provided in FCGMA (2022).

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3 GSP Implementation Progress

The GSP for the LPVB was submitted to DWR in January 2020 and approved by DWR in January 2022. This is the fourth annual report prepared since the GSP was submitted. The GSP implementation progress described in this report covers work begun during development of the GSP as well as work that has been conducted over the 2 years since the GSP was submitted. Concurrent with FCGMA's ongoing GSP implementation efforts in the LPVB, the basin is under adjudication in the California Superior Court. FCGMA continues to engage with stakeholders as part of the GSP implementation efforts.

Project Implementation Progress

During development of the GSP, FCGMA identified the northern Pleasant Valley, adjacent to the boundary between the PVB and the ELPMA, as a critical area in which aquifer specific groundwater elevations were lacking. This is an area where subsurface flows between the two basins are poorly constrained. At FCGMA's request, DWR installed two new nested monitoring wells in this area in 2019 per FCGMA's technical specifications. Combined, the new nested wells are screened in the Older Alluvium (one each in the Oxnard aquifer equivalent, and Mugu aquifer equivalent), Upper San Pedro Formation (Hueneme aquifer equivalent), and the Fox Canyon aquifer (one each in the upper and basal portions). Groundwater elevation data from these wells were incorporated into this annual report to better represent groundwater conditions at the boundary between the LPVB and PVB.

In anticipation of future funding potential through DWR's Sustainable Groundwater Management program, FCGMA solicited project descriptions and details for projects that were not included in the initial GSP during preparation of the 2022 GSP Annual Report (FCGMA 2022). FCGMA incorporated these project into an application submitted to DWR's Sustainable Groundwater Management Program's GSP Implementation Round 2 funding opportunity. FCGMA submitted the grant application to DWR in December 2022 and awaiting notice of reward to begin prioritizing project component timing, scope, and supplemental funding sources to implement projects that benefit the LPVB.

In addition to the projects added to the GSP list for consideration last year, FCGMA has been developing a process and criteria for evaluating and prioritizing water-supply and infrastructure projects for consideration of funding and inclusion in GSP future sustainable yield projections. The FCGMA Board Operations Committee conducted four meetings with active stakeholder participation to develop the process and criteria. The Board of Directors will consider adoption of the Operation Committee's recommendations at its March 22, 2023, meeting.

Management Action Implementation Progress

FCGMA has made progress on several management actions since adoption of the GSP. First, the FCGMA Board adopted a fixed-extraction allocation ordinance for the LPVB in December 2020 that went into effect on October 1, 2021. This allows for a better understanding of the impacts of climate and extraction on groundwater elevations and change in groundwater storage in the LPVB.

Second, in anticipation of the additional reporting associated with implementing the allocation ordinance, FCGMA is conducting an analysis of its data management system needs. The updated data management system will incorporate the new AMI data and will be structured to allow for land-based extraction assignments. Changes to the data management system will target the specific needs of the FCGMA moving toward sustainable management of the LPVB by 2040.

Lastly, FCGMA has begun planning, scoping, and budgeting for the first periodic evaluation of the GSP, which is due to DWR in January 2025. This evaluation will provide an assessment of the basin setting and groundwater conditions based on new data collected since submittal of the GSP; an evaluation of the established sustainable management criteria, monitoring network, and data gaps; and a comprehensive description of GSP implementation activities in the LPVB. FCGMA has initiated discussions with other agencies in the LPVB to coordinate planning and modeling efforts. FCGMA anticipates beginning preparation of the first periodic evaluation of the LPVB GSP in summer 2023.

The progress made over the past year on projects and management actions applicable to the LPVB demonstrates FCGMA's commitment to allocating the necessary time and resources to ensure the long-term sustainable management of the groundwater resources of the LPVB.

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4 References

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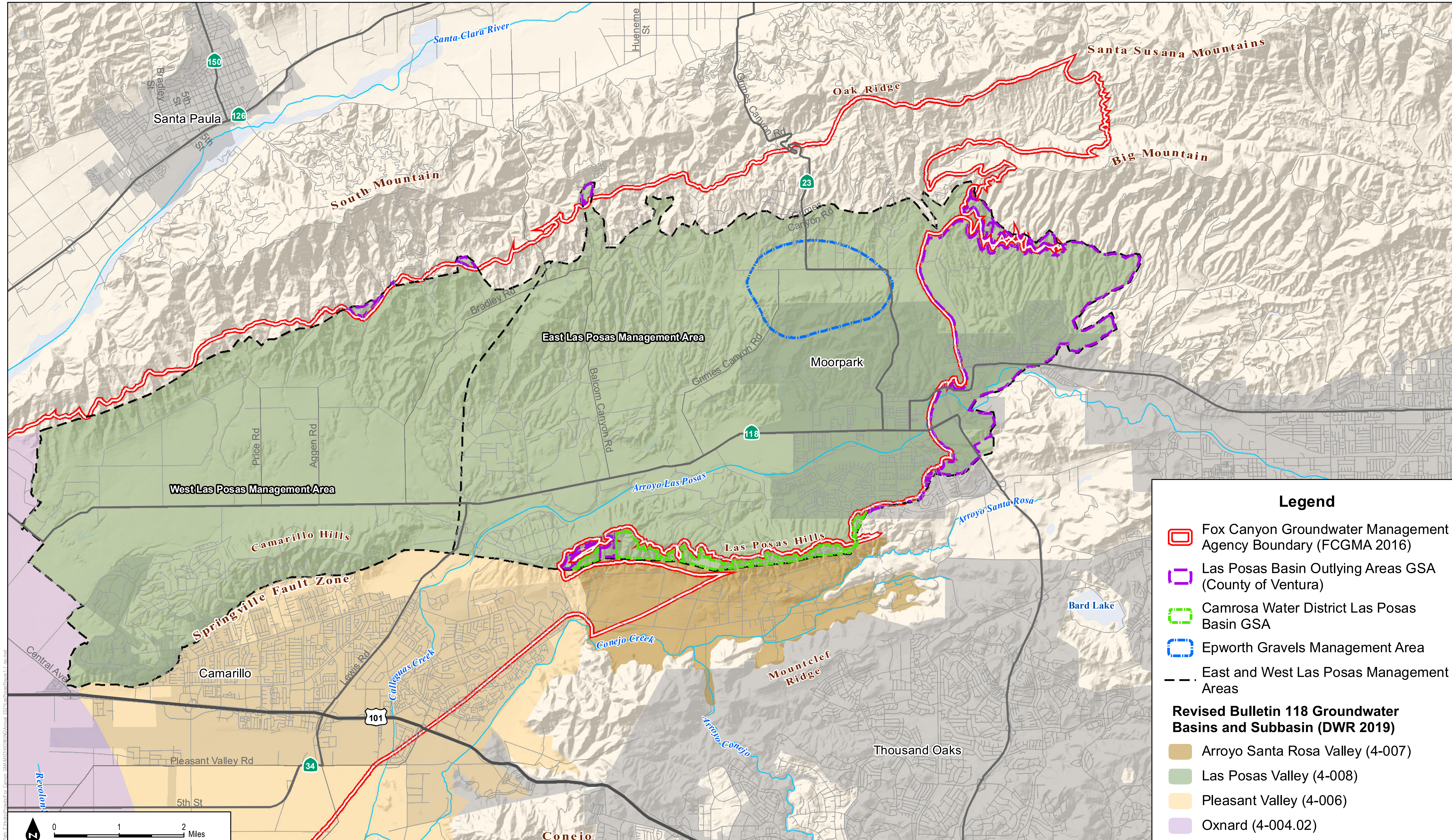
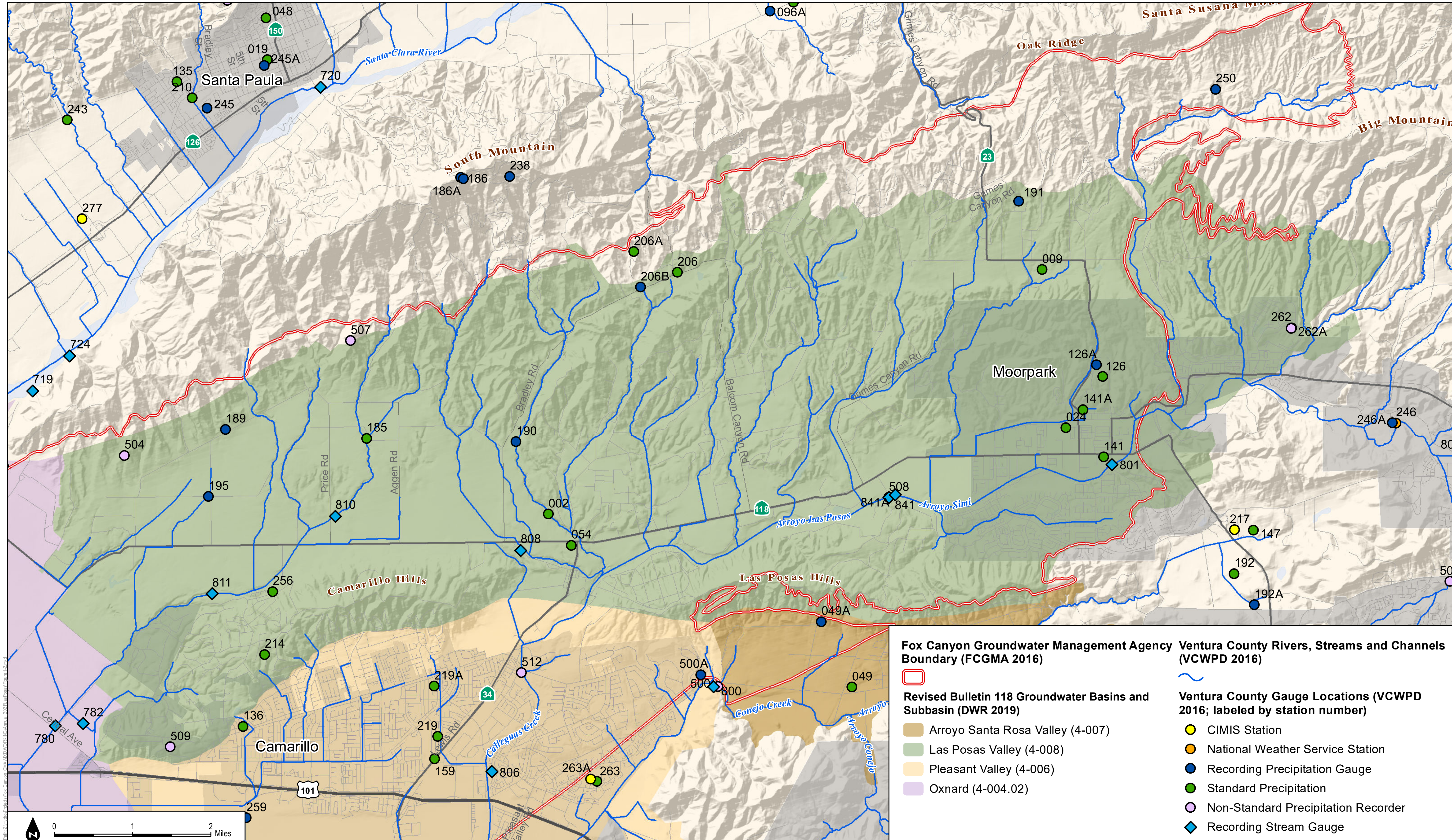
5 Figures



DUDEK

SOURCE: DWR; Ventura County

FIGURE 1-1
Vicinity Map for the Las Posas Valley Basin

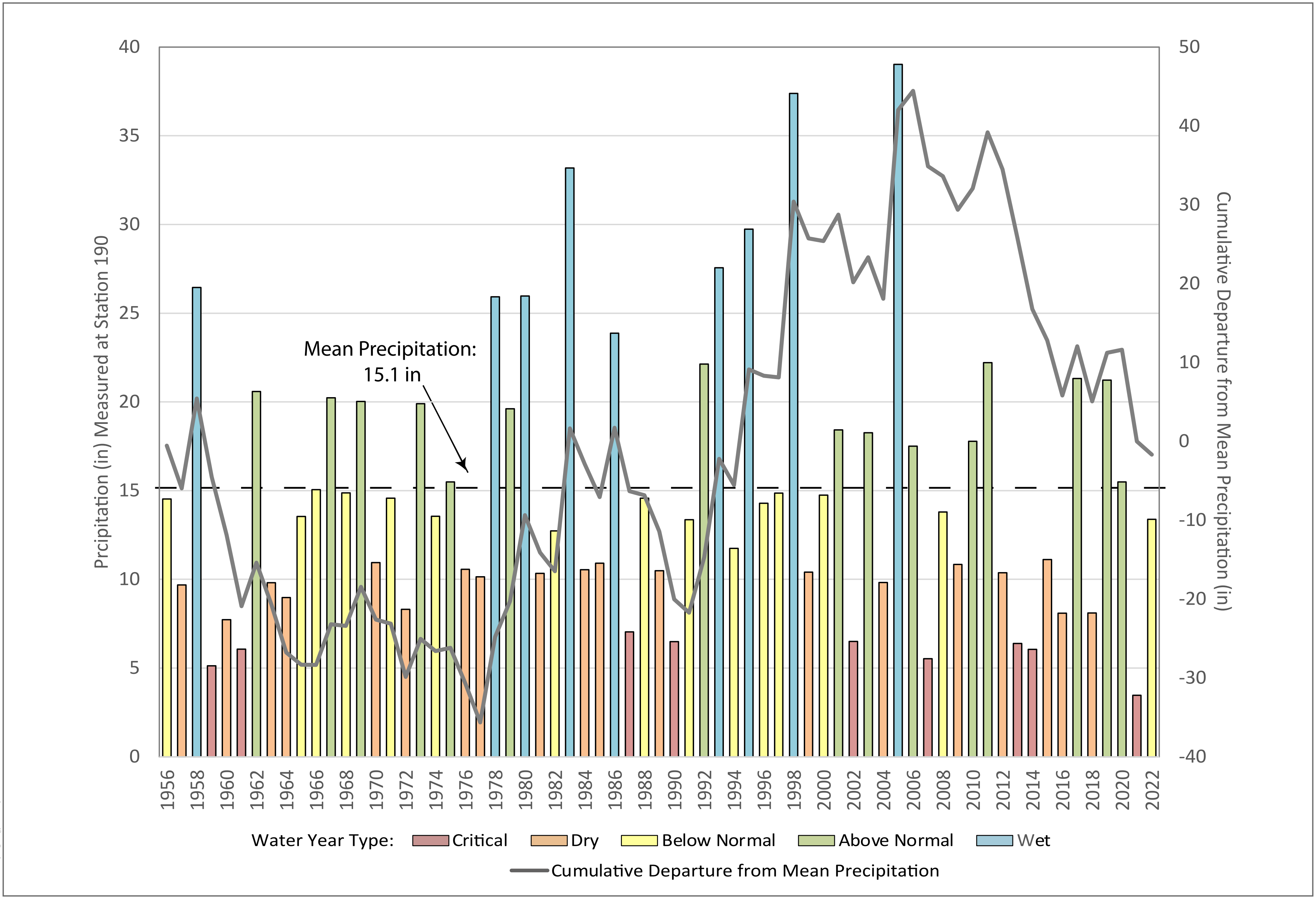


SOURCE: DWR; Ventura County; VCWPD

DUDEK

FIGURE 1-2

Precipitation and Stream Gauges in the Las Posas Valley Basin



Note: Water year is from October 1 through September 30. Water year type is based on the percentage of the water year precipitation compared to the mean precipitation. Types are defined as: Wet (≥150% of mean), Above Normal (≥100% to <150% of mean), Below Normal (≥75% to <100% of mean), Dry (≥50% to <75% of average), and Critical (<50% of mean)

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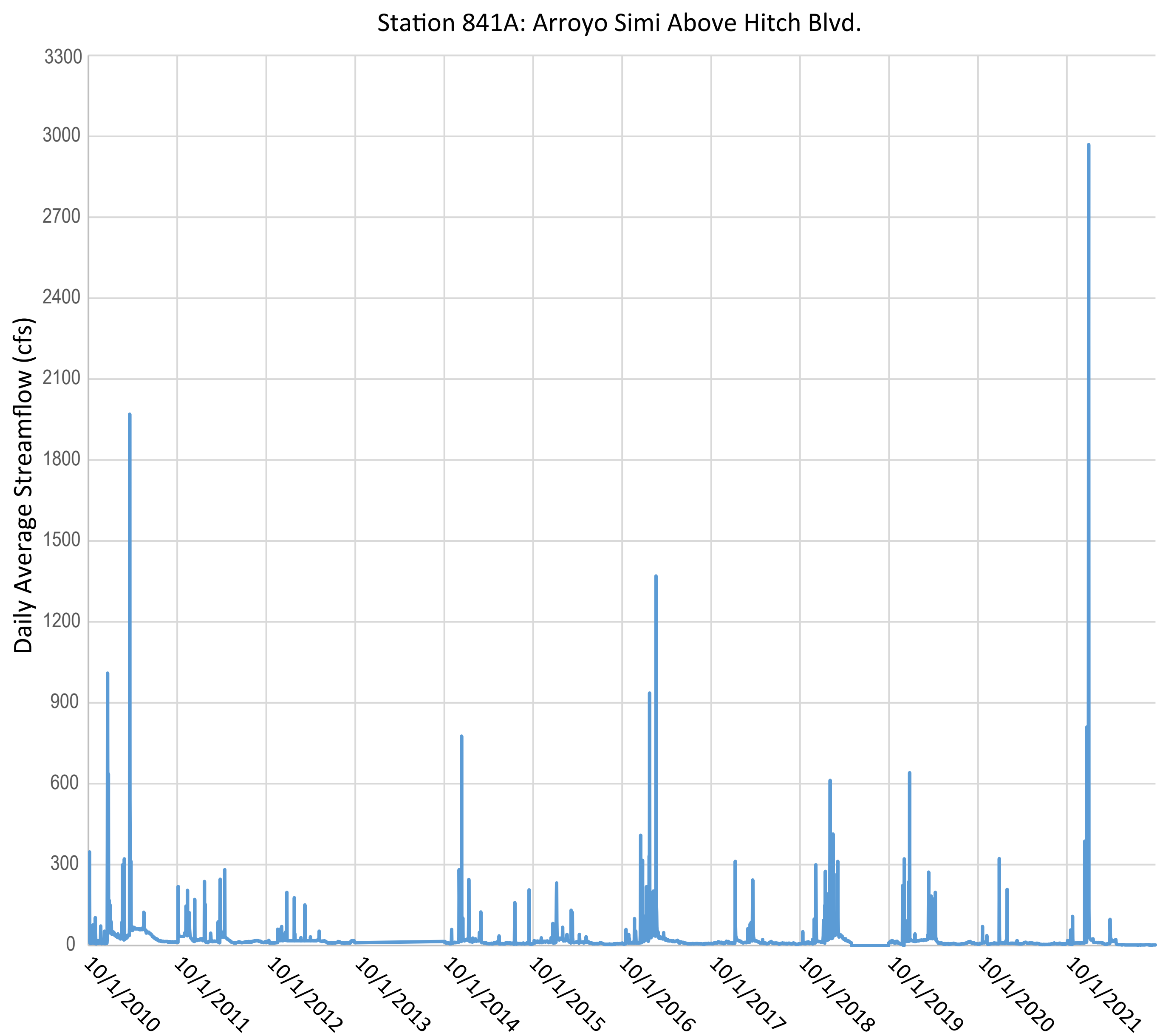
FIGURE 1-3

Las Posas Valley Basin Historical Water Year Precipitation

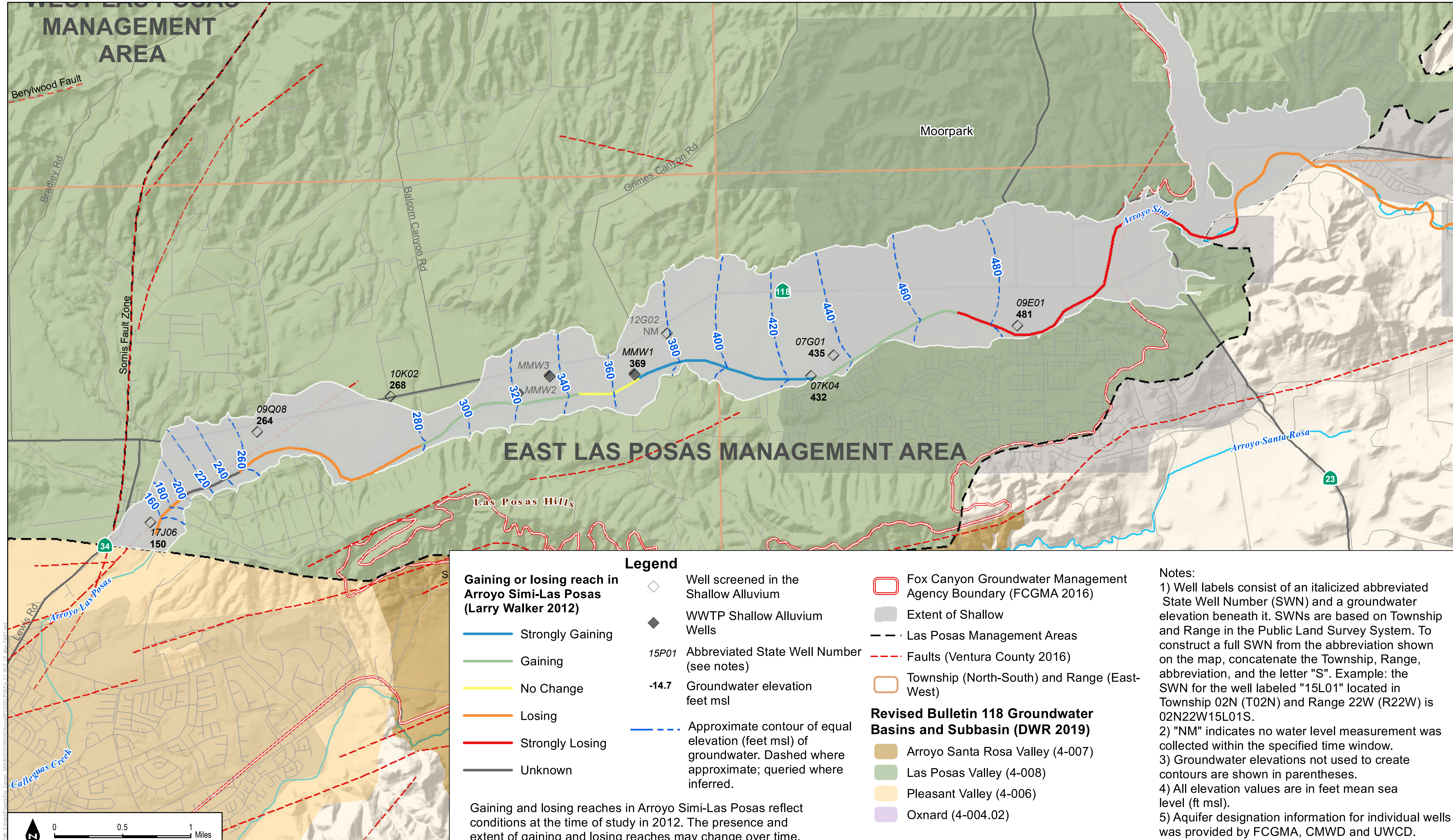
Las Posas Valley Basin Groundwater Sustainability Plan 2023 Annual Report



SOURCE: Ventura County Watershed Protection District (VCWPD) Hydrologic Data Server (https://www.vcwatershed.net/hydrodata/)

FIGURE 1-4

Las Posas Valley Basin Stream Gauge Data



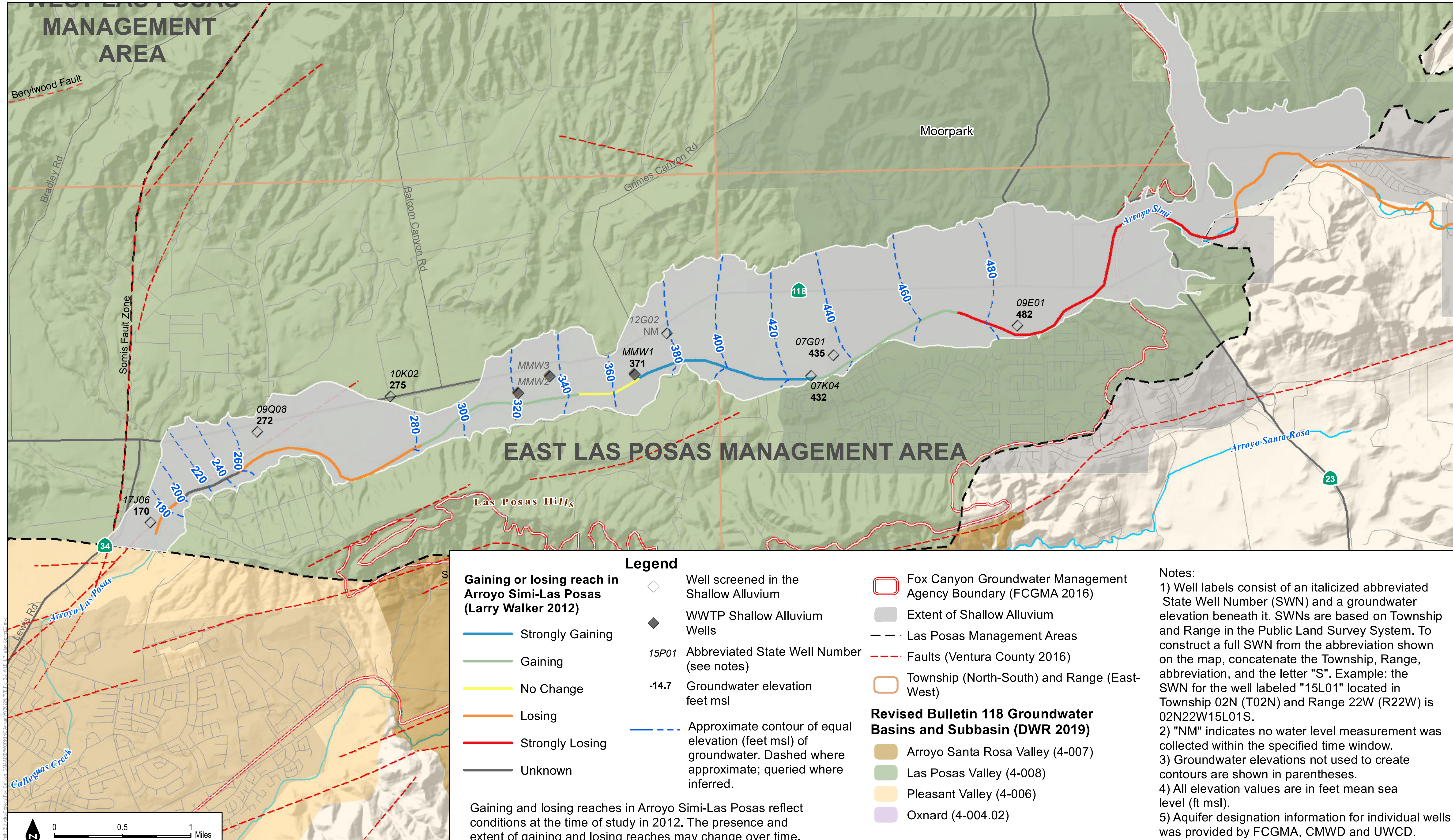
Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet mean sea level (ft msl).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-1

Groundwater Elevation Contours in the Shallow Alluvium, October 2 to 29, 2021

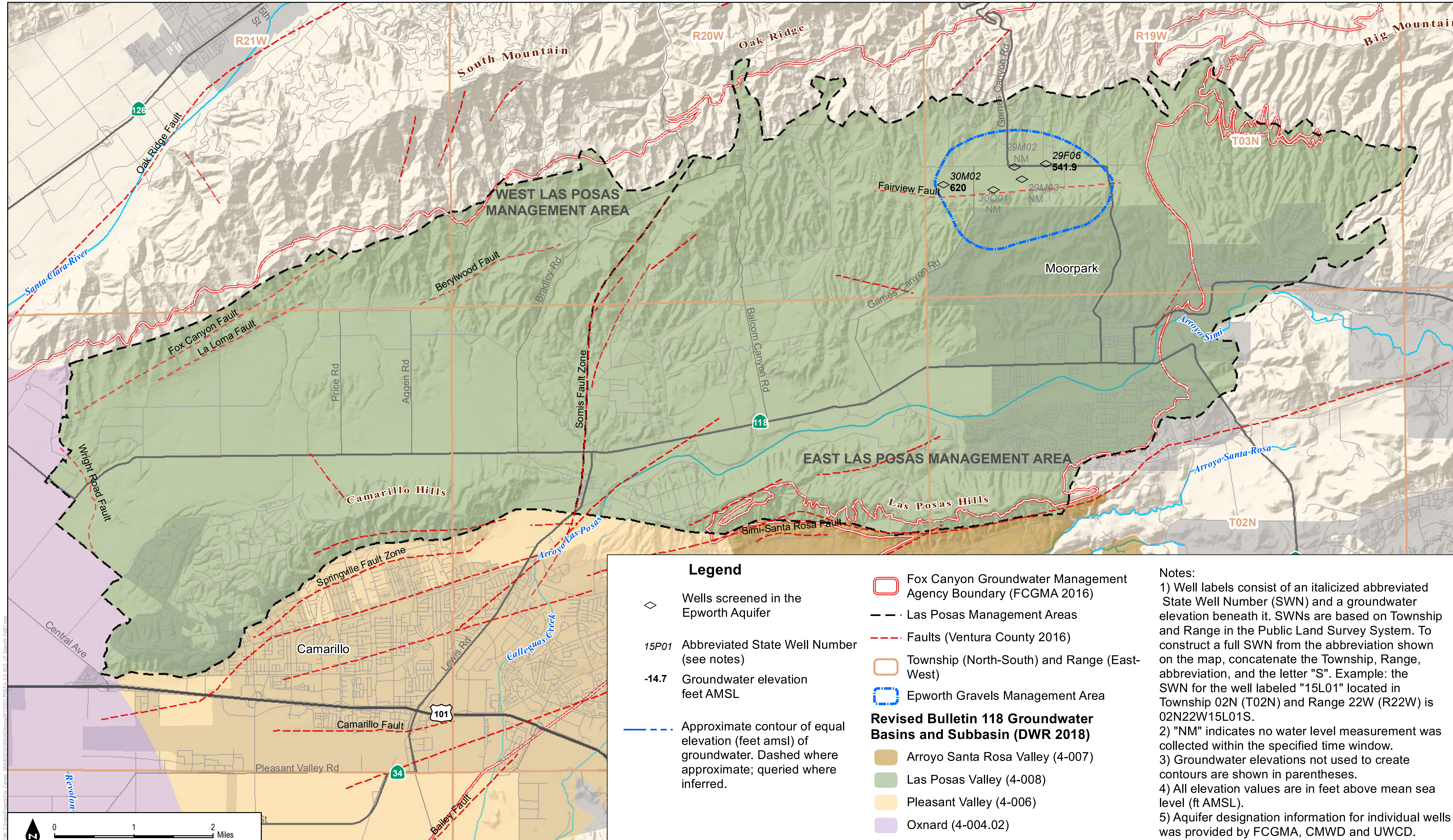


DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-2

Groundwater Elevation Contours in the Shallow Alluvium, March 2 to 29, 2022



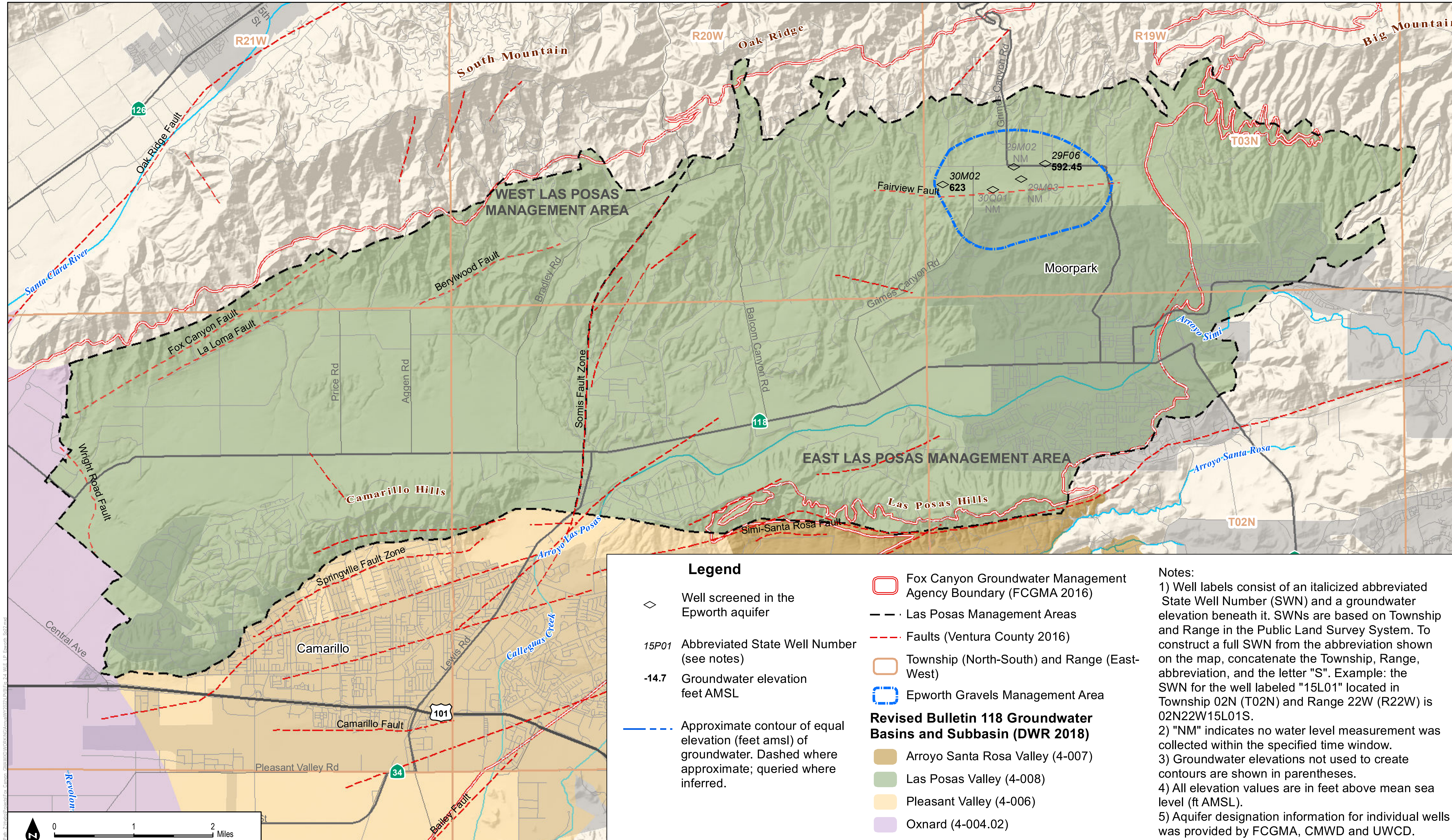
DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-3

Groundwater Elevation Contours in the Epworth Gravels Aquifer, October 2 to October 29, 2021

Las Posas Valley Basin Groundwater Sustainability Plan 2023 Annual Report

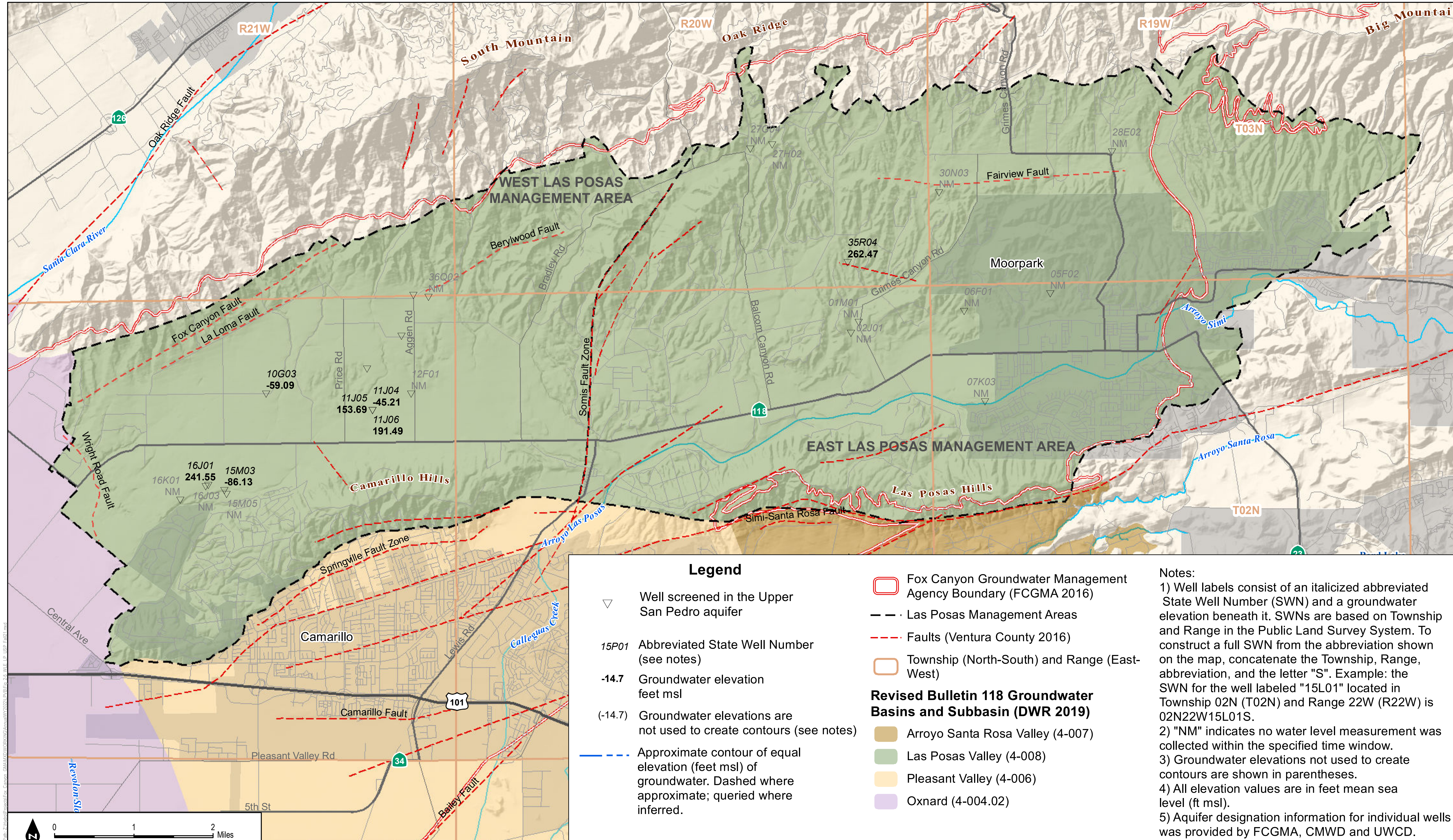


DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-4

Groundwater Elevation Contours in the Epworth Gravels Aquifer, March 2 to March 29, 2022



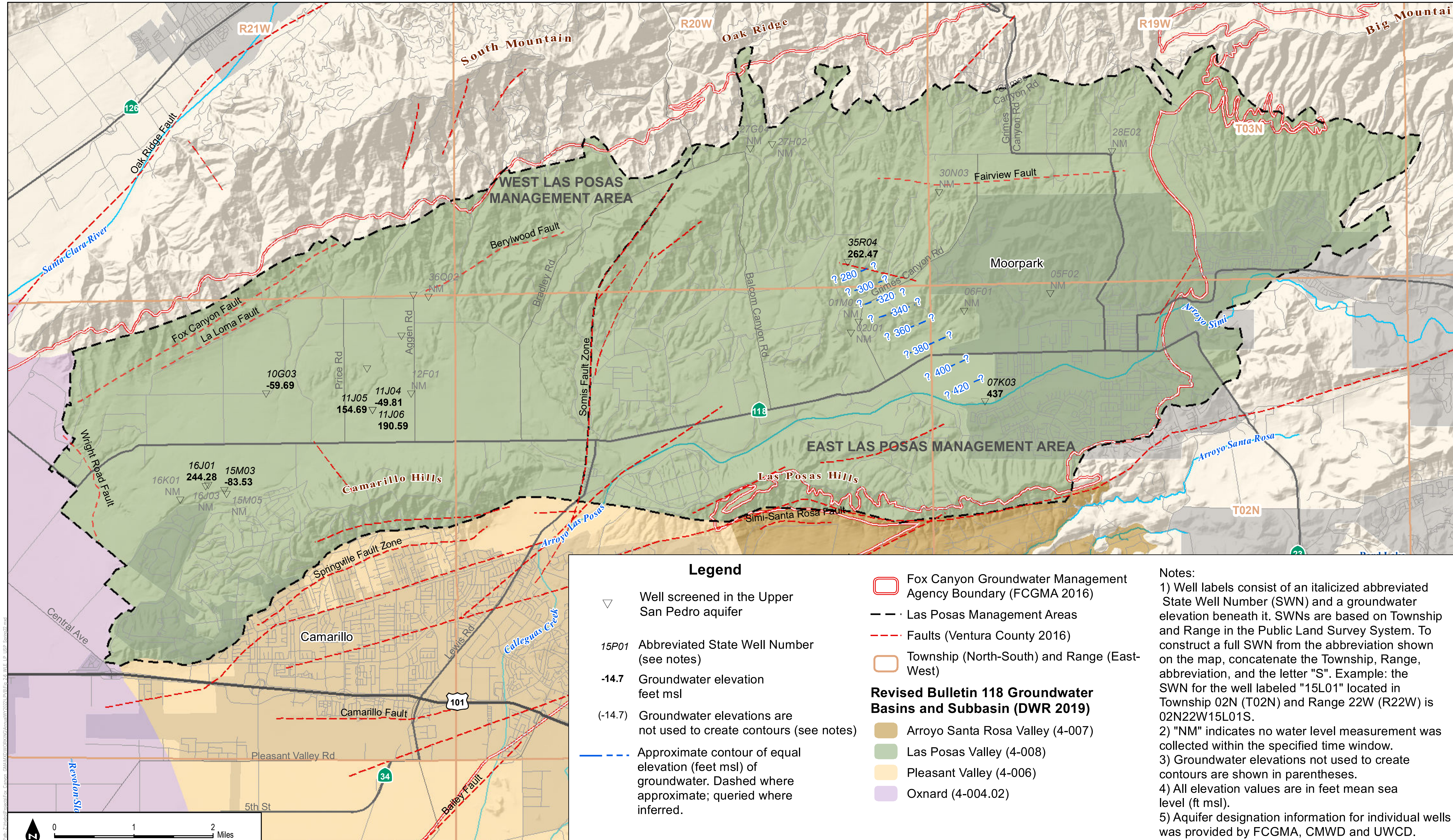
DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-5

Groundwater Elevation Contours in the Upper San Pedro Formation, October 2 to October 29, 2021

Las Posas Valley Basin Groundwater Sustainability Plan 2023 Annual Report

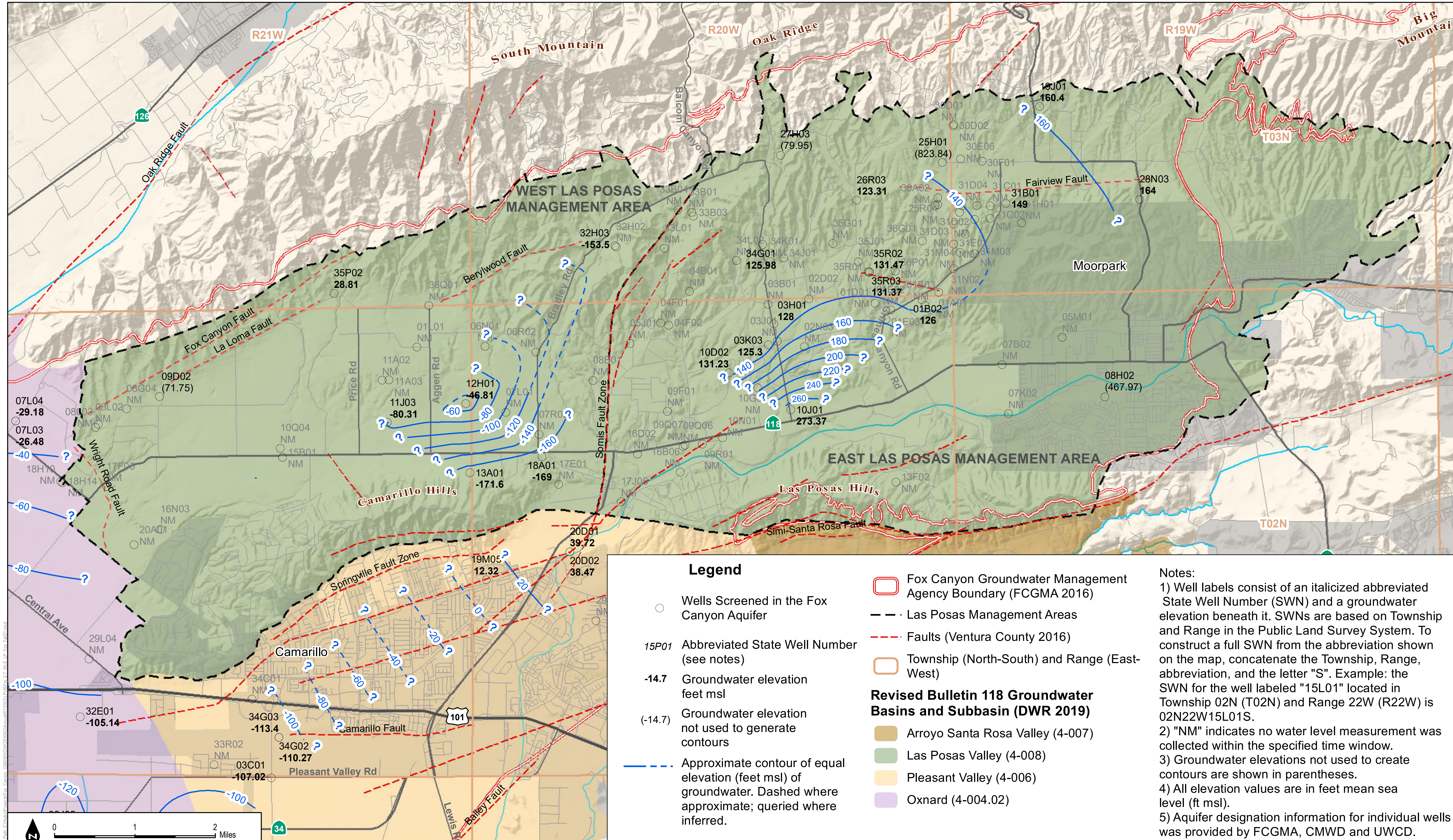


DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-6

Groundwater Elevation Contours in the Upper San Pedro Formation, March 2 to March 29, 2022

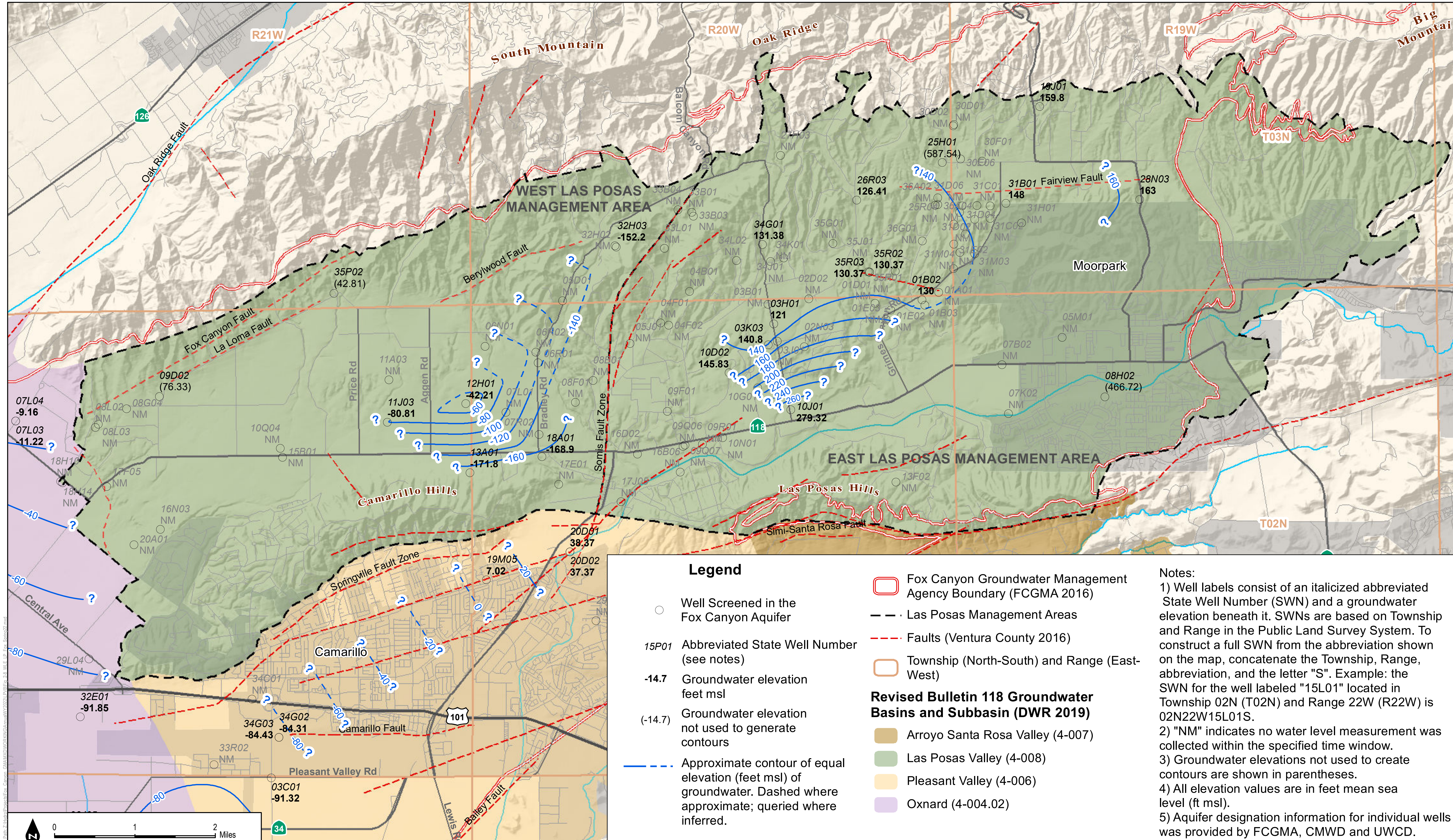


DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-7

Groundwater Elevation Contours in the Fox Canyon Aquifer, October 2 to October 29, 2021



Legend

- Well Screened in the Fox Canyon Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet msl
- (-14.7) Groundwater elevation not used to generate contours
- Approximate contour of equal elevation (feet msl) of groundwater. Dashed where approximate; queried where inferred.
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Las Posas Management Areas
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2019)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

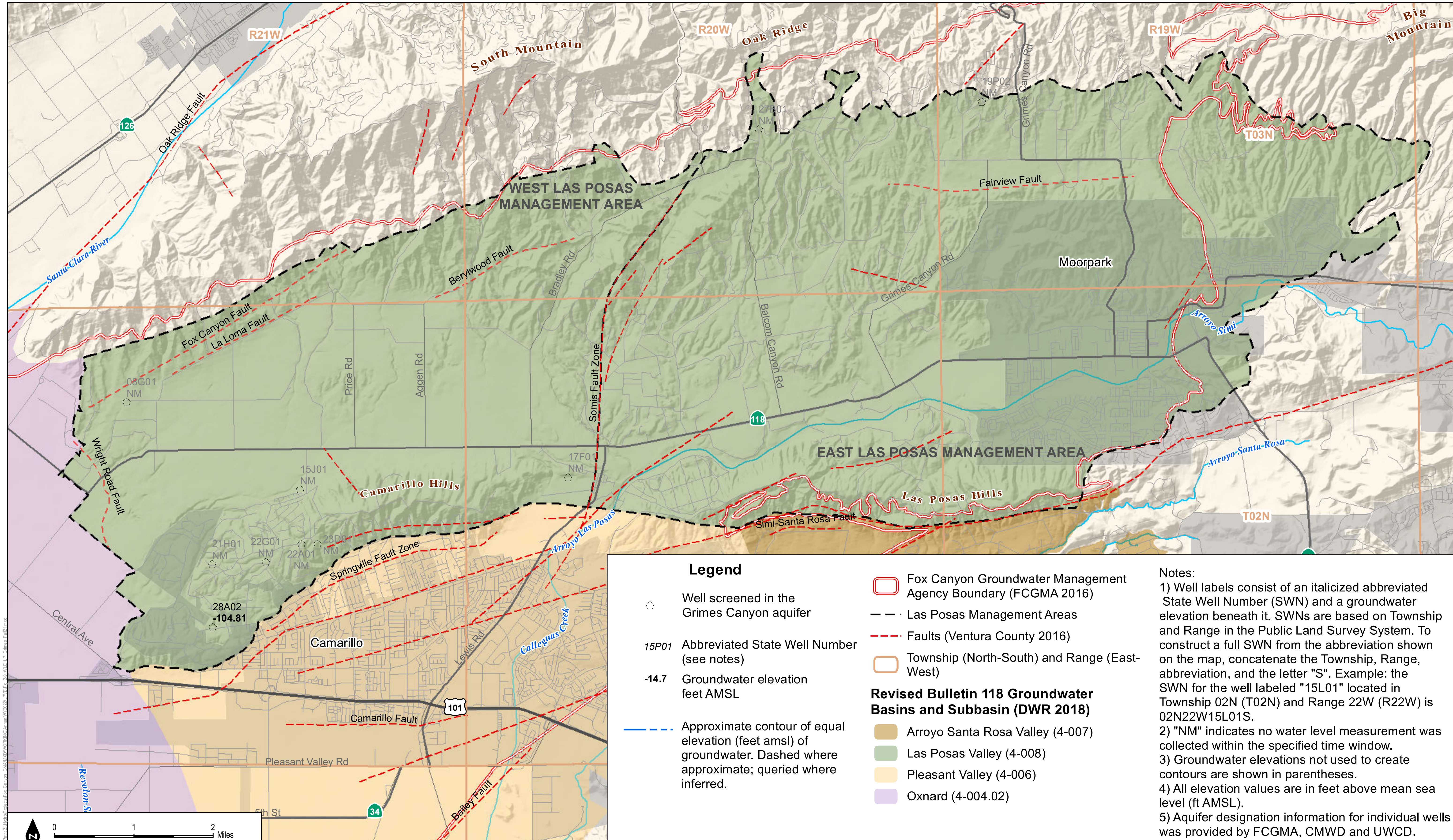
Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet mean sea level (ft msl).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-8

Groundwater Elevation Contours in the Fox Canyon Aquifer, March 2 to March 29, 2022

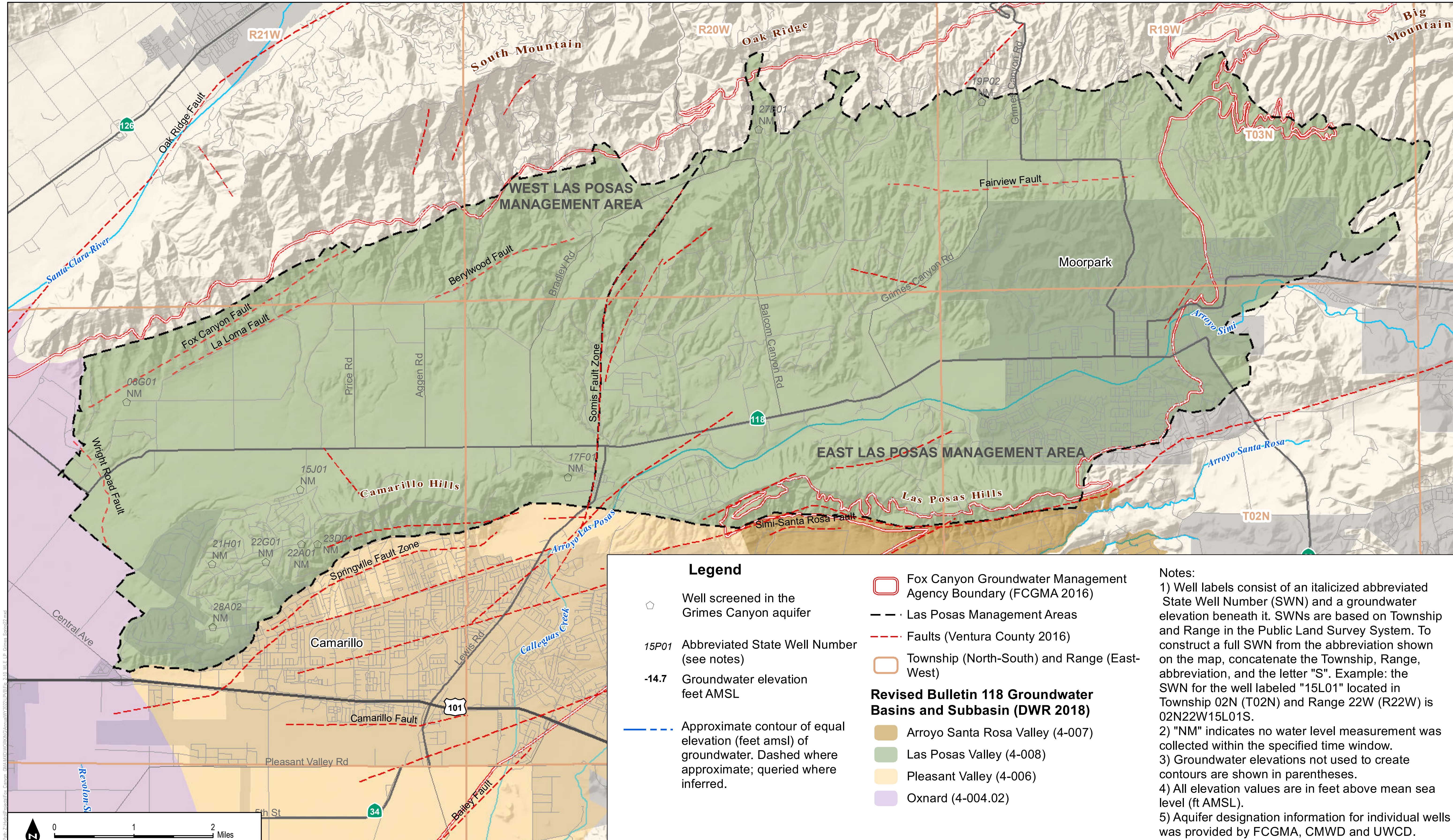


DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-9

Groundwater Elevation Contours in the Grimes Canyon Aquifer, October 2-29, 2021



Notes:

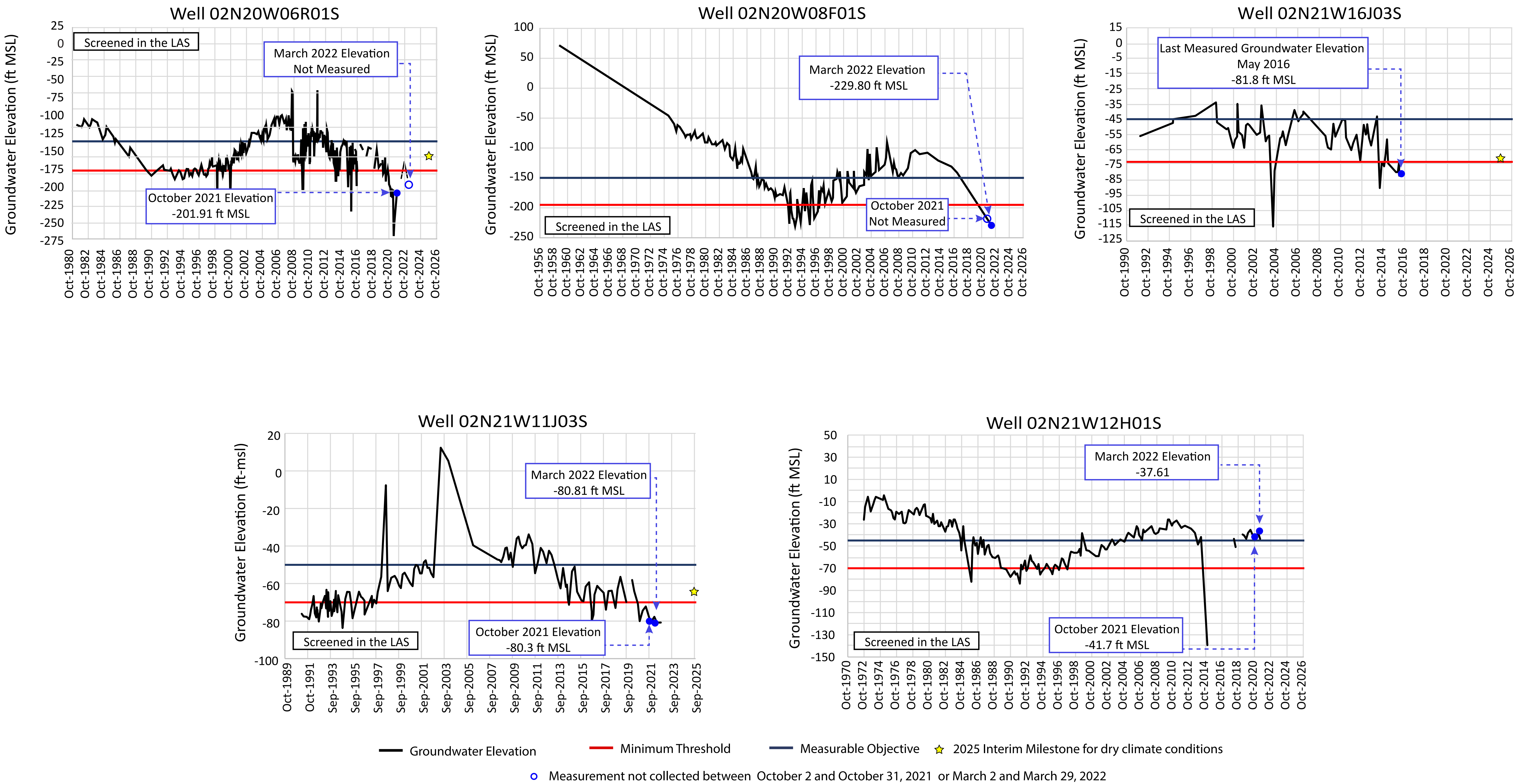
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-10

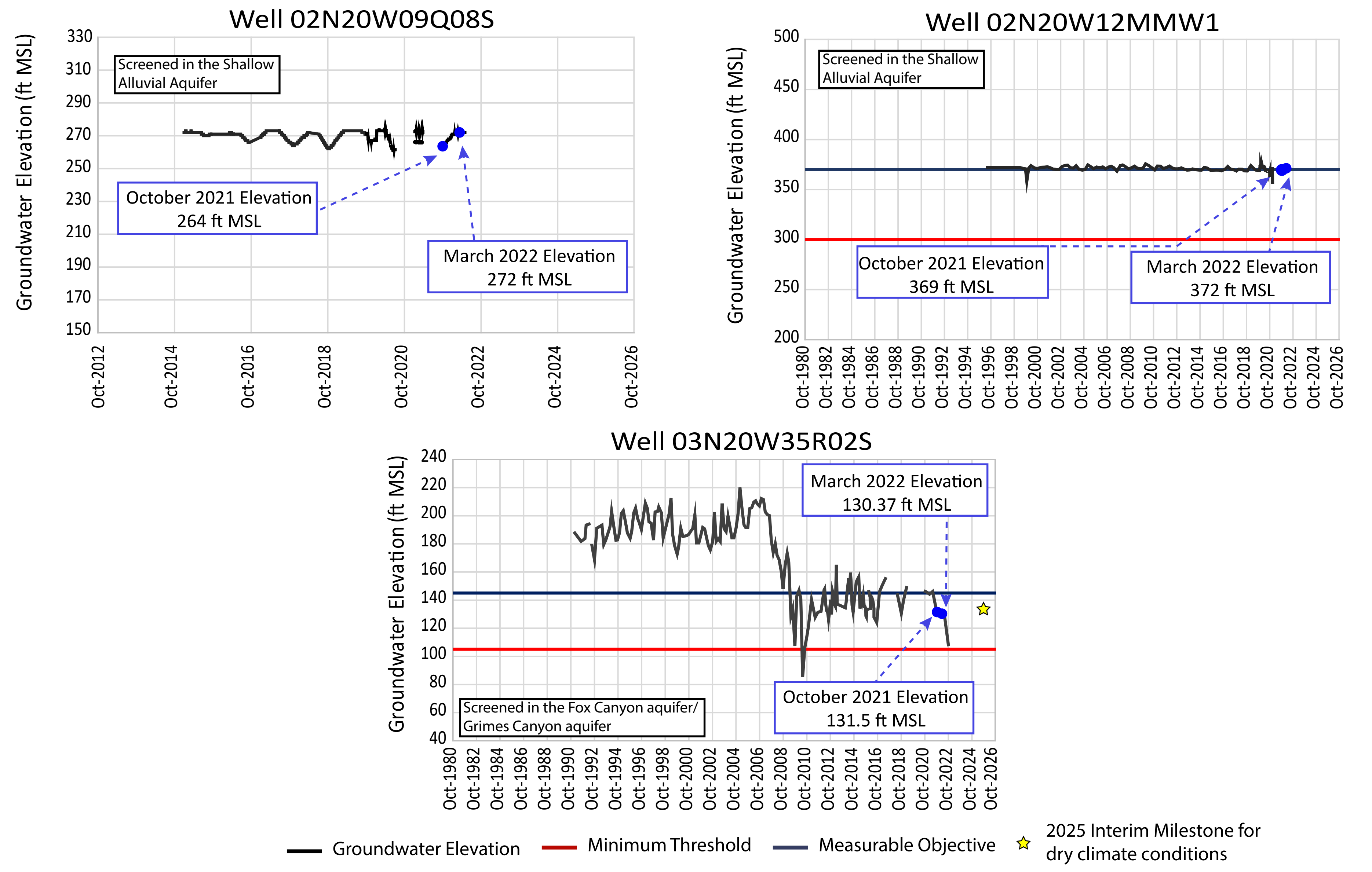
Groundwater Elevation Contours in the Grimes Canyon Aquifer, March 2-29, 2022



Note: 2025 Interim milestone groundwater elevations are not established for wells where 2015 groundwater elevations were higher than the established minimum thresholds

FIGURE 2-11

Groundwater Elevation Hydrographs for Representative Wells in the WLPMA

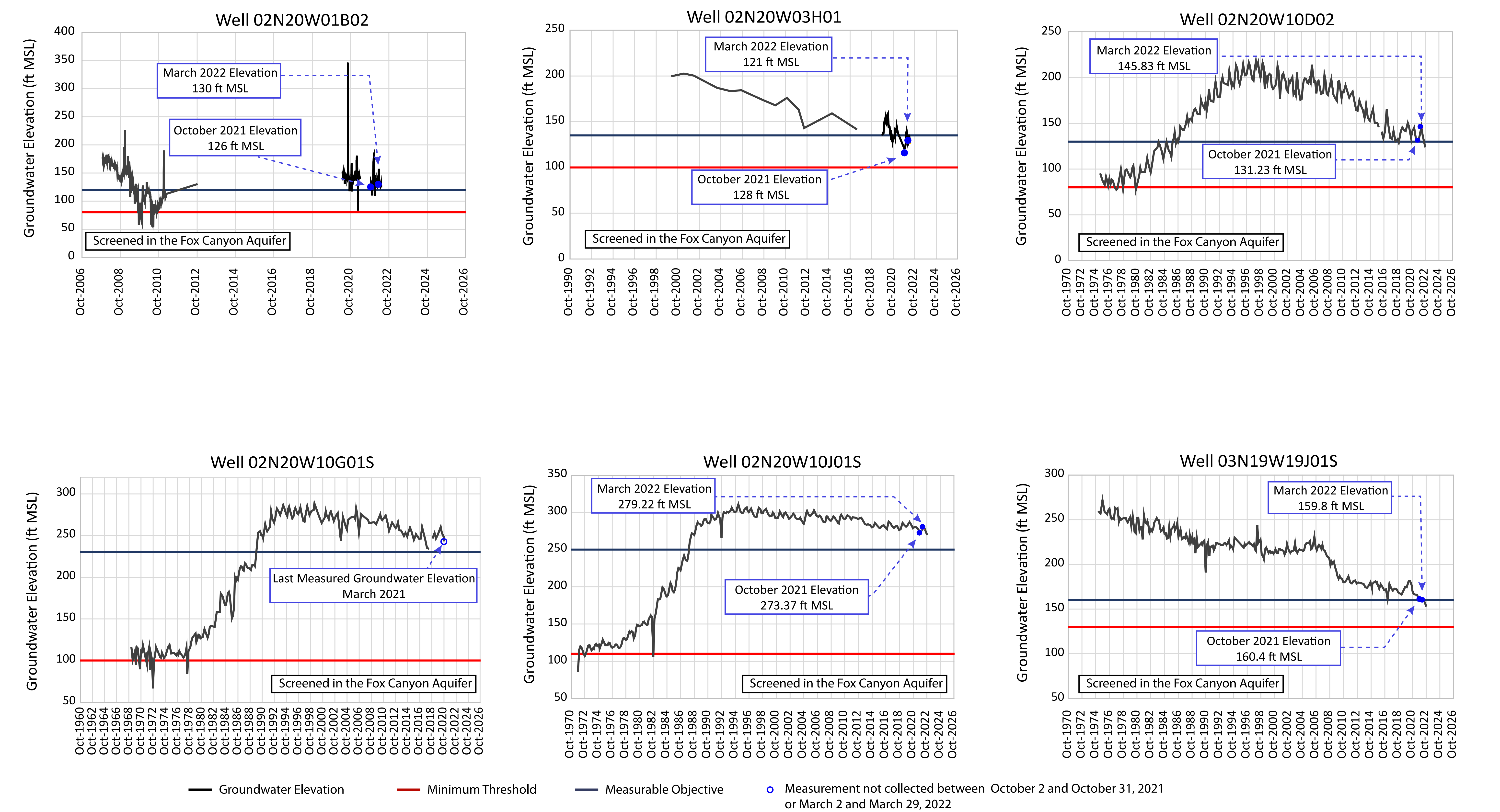


Note: 2025 Interim milestone groundwater elevations are not established for wells where 2015 groundwater elevations were higher than the established minimum thresholds

DUDEK

FIGURE 2-12a

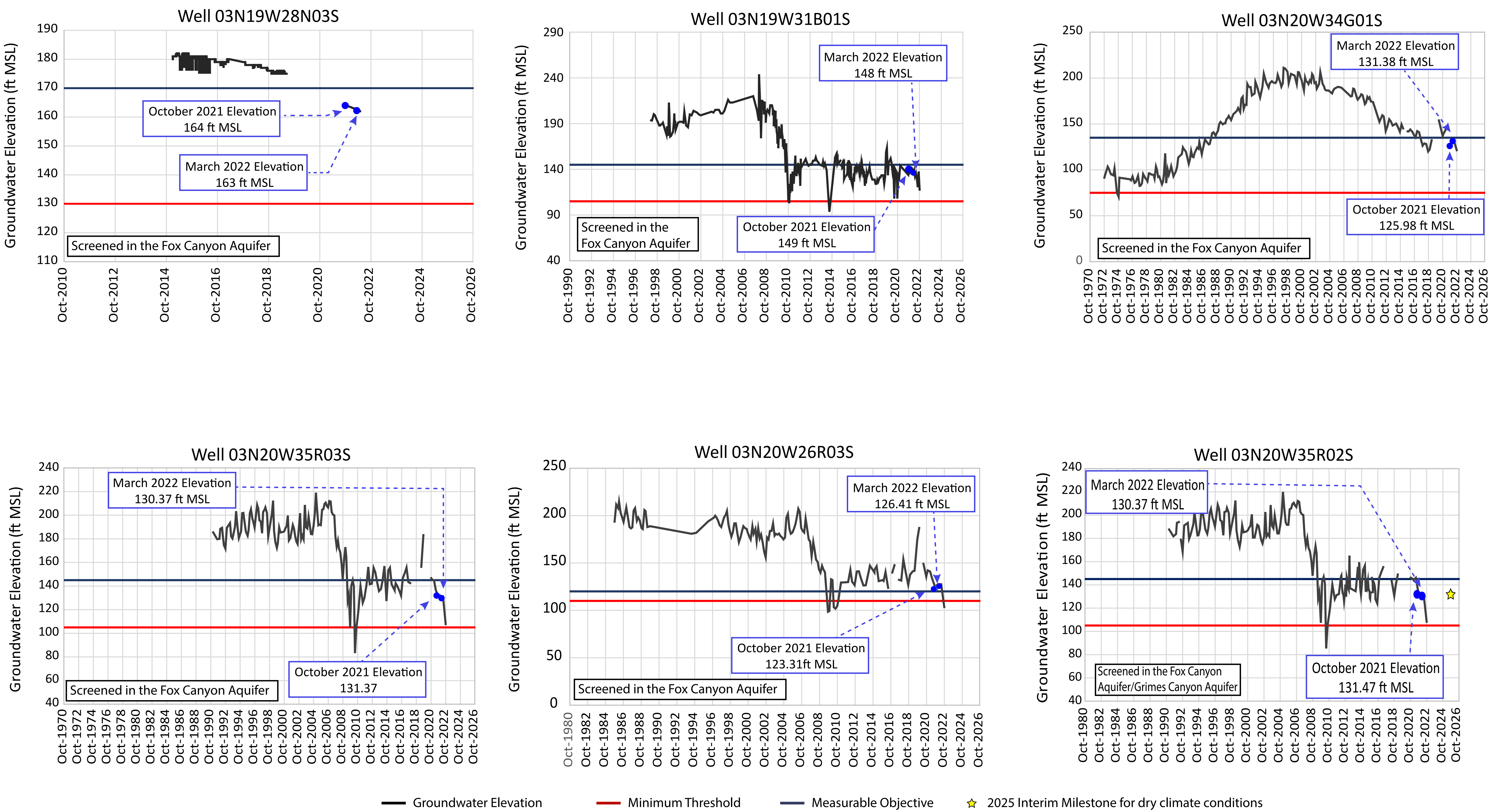
Groundwater Elevation Hydrographs for Representative Wells Screened in the East Las Posas Management Area



Note: 2025 Interim milestone groundwater elevations are not established for wells where 2015 groundwater elevations were higher than the established minimum thresholds

FIGURE 2-12b

Groundwater Elevation Hydrographs for Representative Wells in the East Las Posas Management Area



Note: 2025 Interim milestone groundwater elevations are not established for wells where 2015 groundwater elevations were higher than the established minimum thresholds

DUDEK

FIGURE 2-12c

Groundwater Elevation Hydrographs for Representative Wells in the East Las Posas Management Area

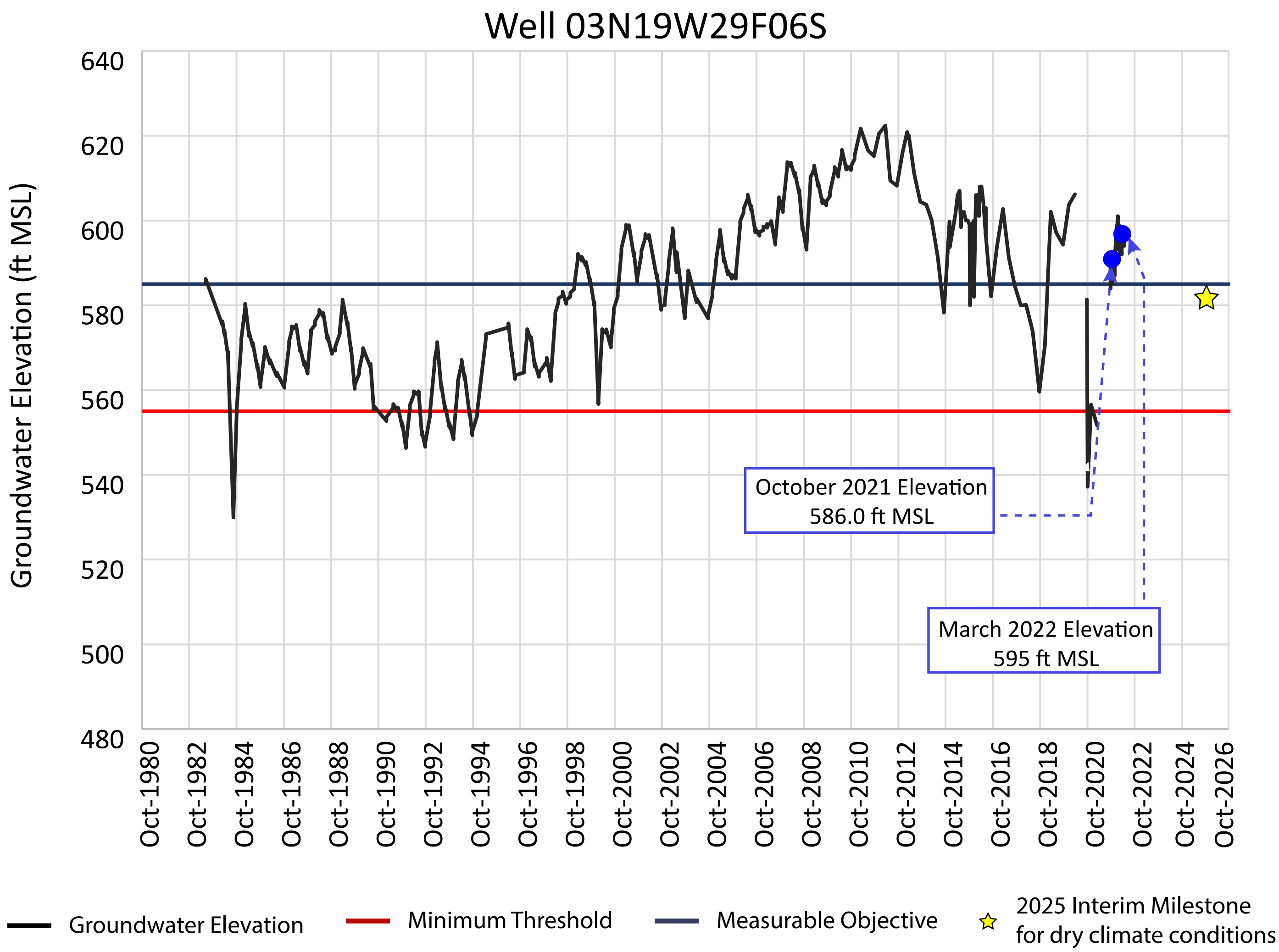
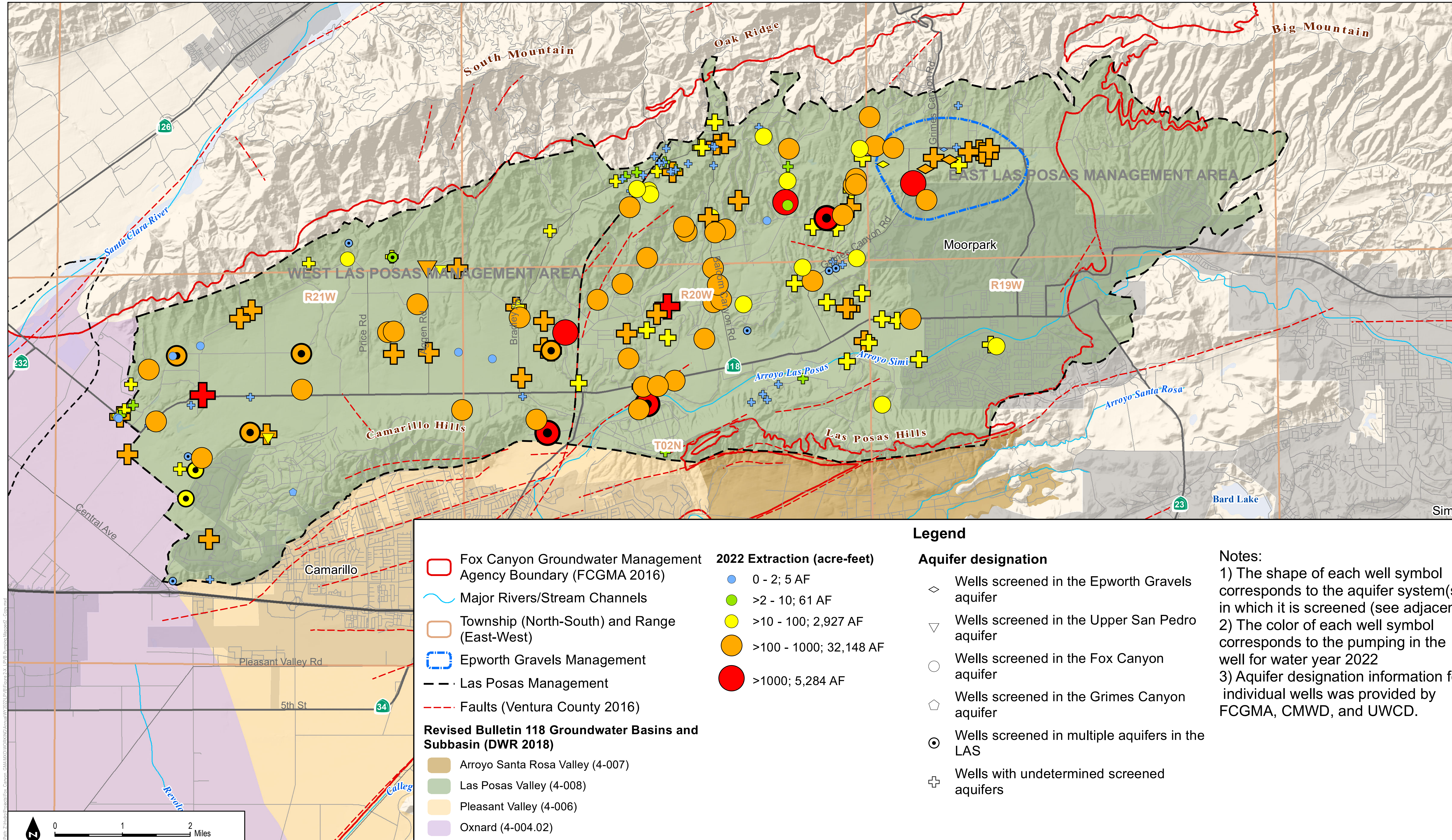


FIGURE 2-13

Groundwater Elevation Hydrographs for Representative Wells Screened in the Epworth Gravels Aquifer



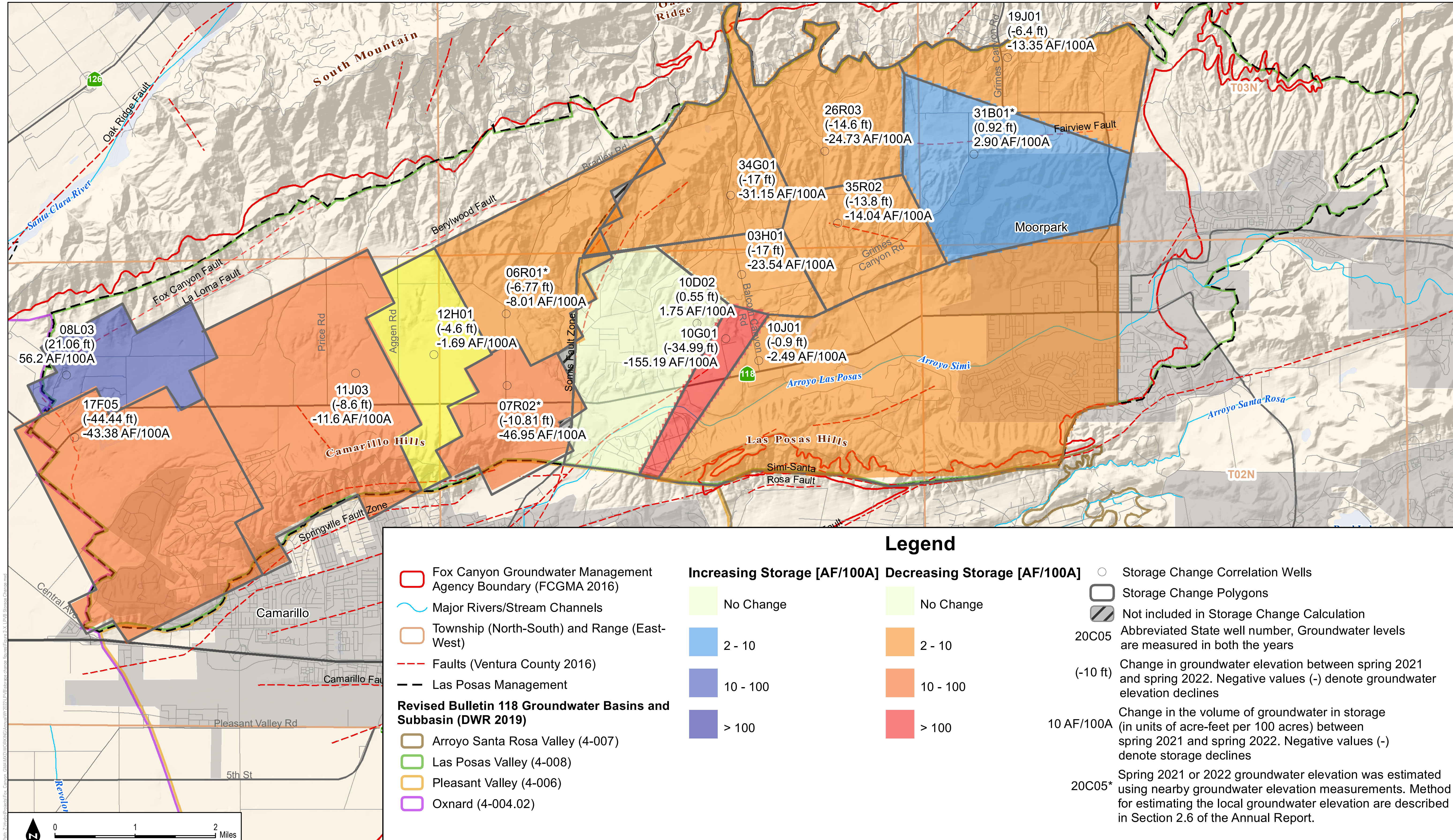
DUDEK

SOURCE: DWR, FCGMA, VCWPD, UWCD, CMWD

FIGURE 2-14

Groundwater Production (Acre-feet) in the Las Posas Valley Basin between October 1, 2021 and September 30, 2022

Las Posas Valley Basin Groundwater Sustainability Plan 2023 Annual Report

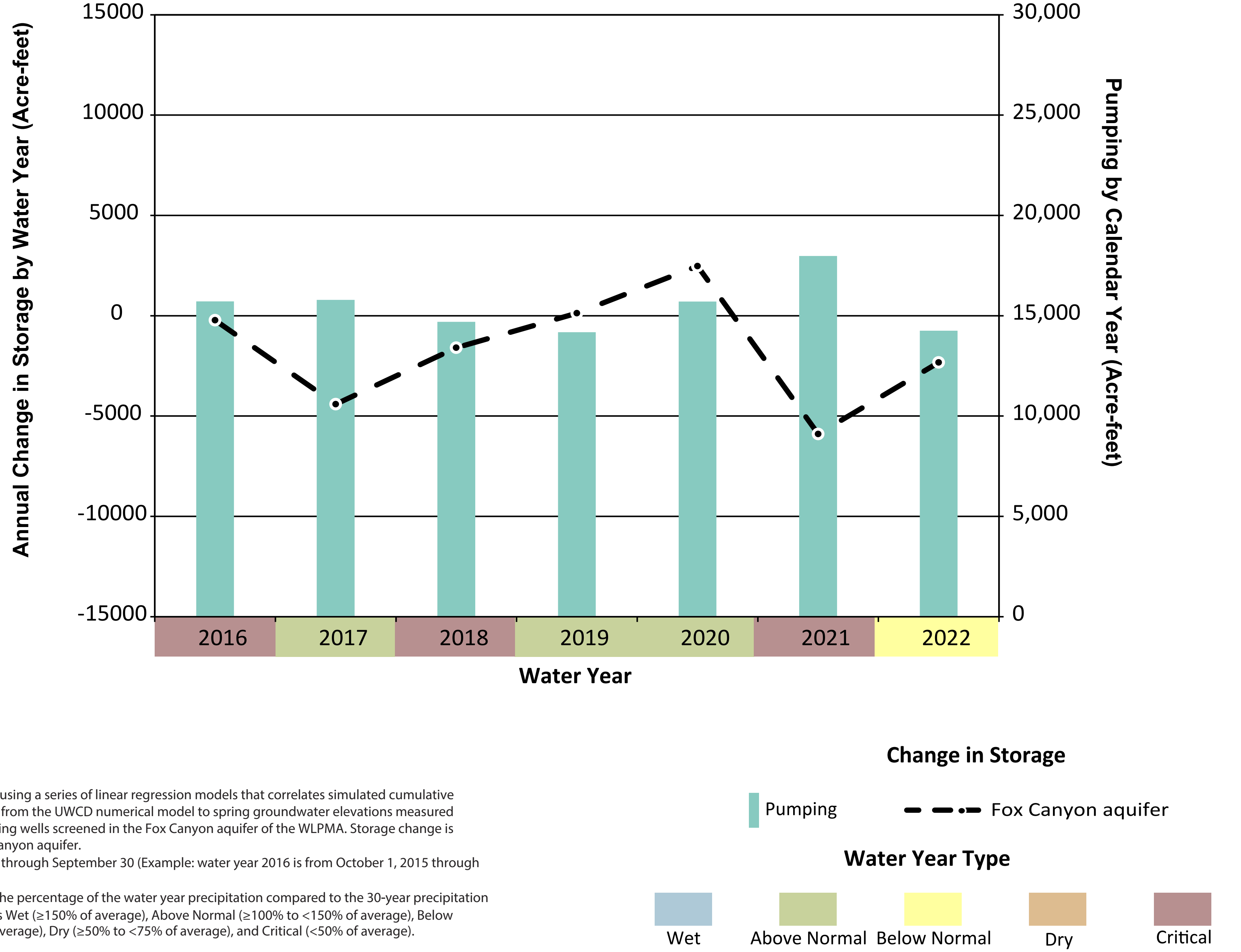


DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-15

Change in Storage in the Fox Canyon Aquifer: Spring 2021 to Spring 2022

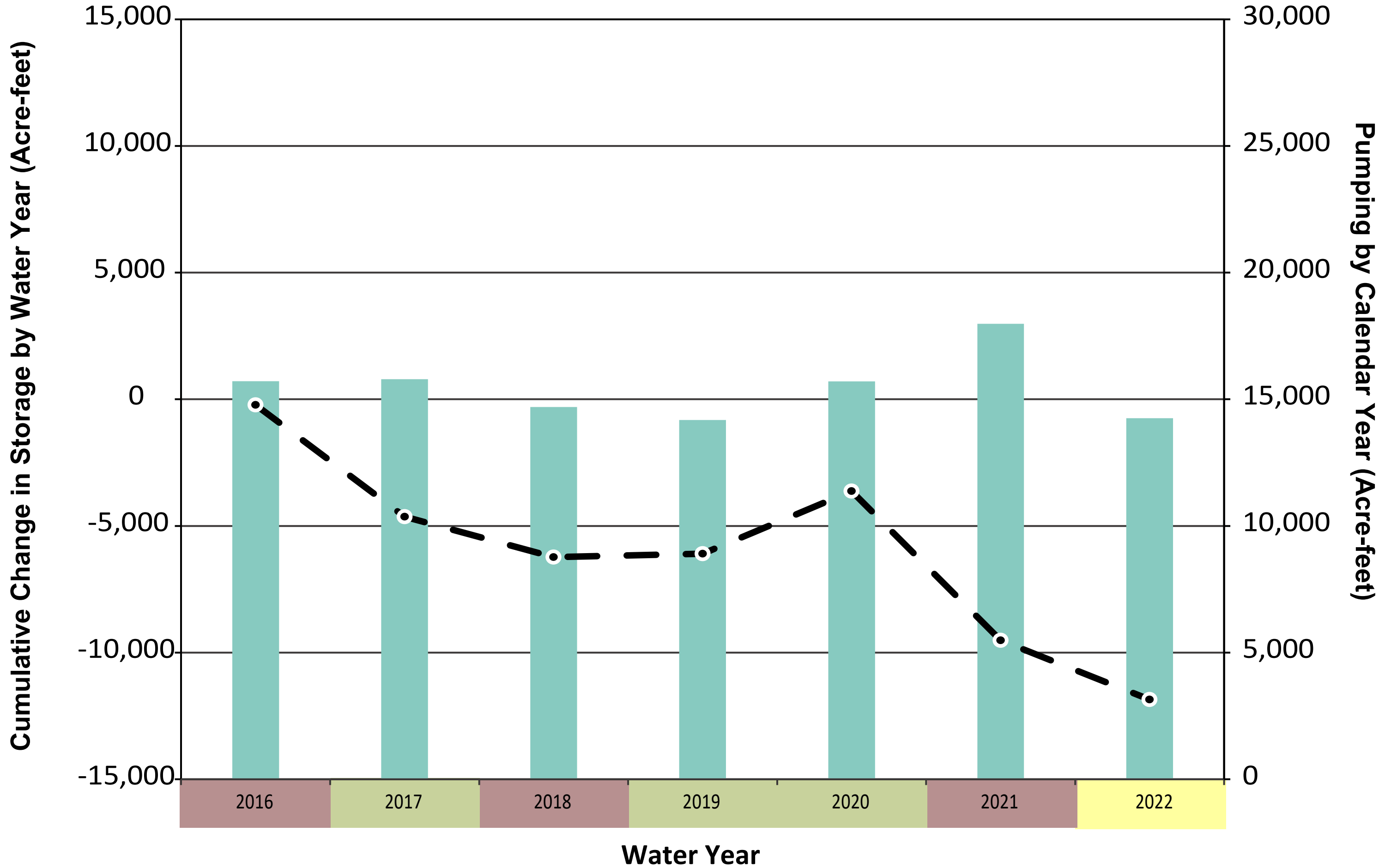


Notes:

1) Storage change is estimated using a series of linear regression models that correlates simulated cumulative change in storage extracted from the UWCD numerical model to spring groundwater elevations measured at a network seven monitoring wells screened in the Fox Canyon aquifer of the WLPMA. Storage change is only calculated for the Fox Canyon aquifer.
2) Water year is from October 1 through September 30 (Example: water year 2016 is from October 1, 2015 through September 30, 2016).
3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of average).

FIGURE 2-16

Water Year Type, Groundwater Use, and Annual Change in Storage in the West Las Posas Management Area



Notes:

1) Storage change is estimated using a series of linear regression models that correlates simulated cumulative change in storage extracted from the UWCD numerical model to spring groundwater elevations measured at a network seven monitoring wells screened in the Fox Canyon aquifer of the WLPMA. Storage change is only calculated for the Fox Canyon aquifer.
2) Water year is from October 1 through September 30 (Example: water year 2016 is from October 1, 2015 through September 30, 2016).
3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of average).

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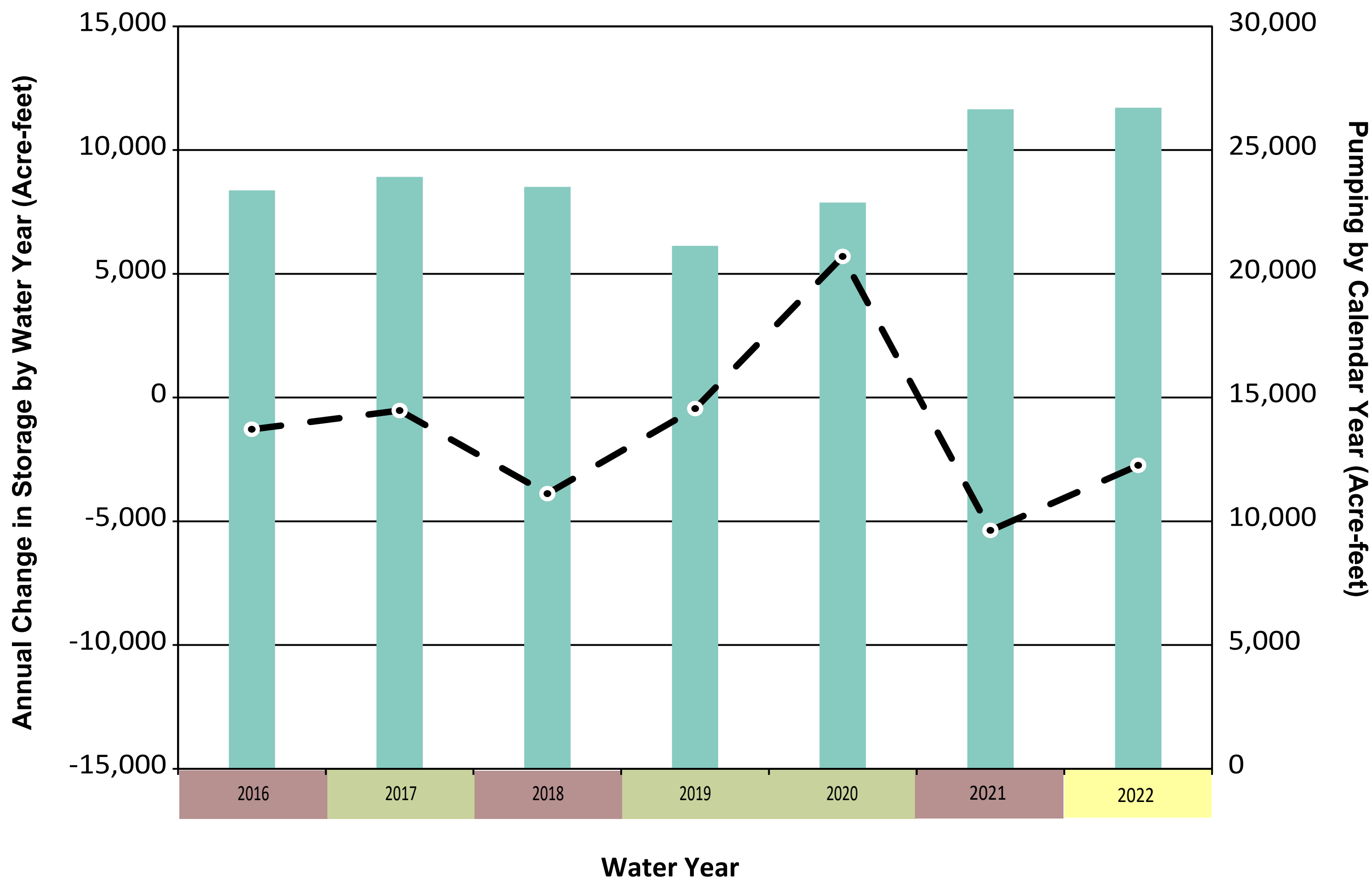
FIGURE 2-17

Water Year Type, Groundwater Use, and Cumulative Change in Storage in the West Las Posas Management Area

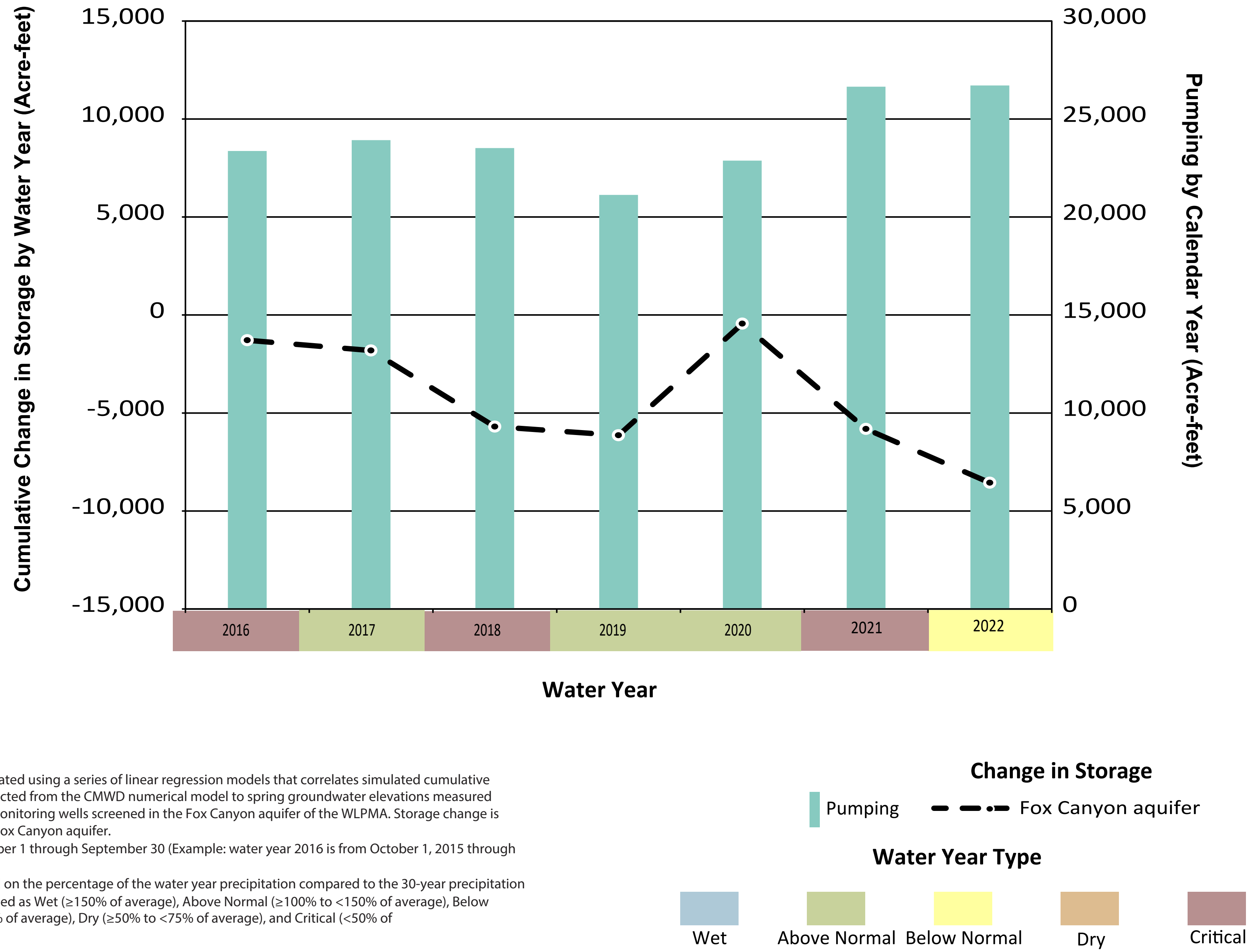


Notes:

1) Storage change is estimated using a series of linear regression models that correlates simulated cumulative change in storage extracted from the CMWD numerical model to spring groundwater elevations measured at a network of nine monitoring wells screened in the Fox Canyon aquifer of the WLPMA. Storage change is only calculated for the Fox Canyon aquifer.
2) Water year is from October 1 through September 30 (Example: water year 2016 is from October 1, 2015 through September 30, 2016).
3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of

FIGURE 2-18

Water Year Type, Groundwater Use, and Annual Change in Storage in the East Las Posas Management Area



Notes:

1) Storage change is estimated using a series of linear regression models that correlates simulated cumulative change in storage extracted from the CMWD numerical model to spring groundwater elevations measured at a network of nine monitoring wells screened in the Fox Canyon aquifer of the WLPMA. Storage change is only calculated for the Fox Canyon aquifer.
2) Water year is from October 1 through September 30 (Example: water year 2016 is from October 1, 2015 through September 30, 2016).
3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of

FIGURE 2-19

Water Year Type, Groundwater Use, and Cumulative Change in Storage in the East Las Posas Management Area