DRAFT

First Periodic Evaluation

Groundwater Sustainability Plan for the Pleasant Valley Basin

AUGUST 2024

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AF	acre-feet
AFY	acre-feet per year
AMI	automated metering infrastructure
AWPF	Advanced Water Purification Facility
CMWD	Calleguas Municipal Water District
CWD	Camrosa Water District
CWRF	Camrosa Water Reclamation Facility
DWR	California Department of Water Resources
EBB	Extraction Barrier Brackish
EPVMA	East Pleasant Valley Management Area
FCA	Fox Canyon Aquifer
FCGMA	Fox Canyon Groundwater Management Agency
GCA	Grimes Canyon Aquifer
GDE	groundwater-dependent ecosystem
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
LAS	Lower Aquifer System
LPVB	Las Posas Valley Basin
MCP	Monitoring and Contingency Plan
mg/L	milligrams per liter
msl	mean sea level
NNP	No New Projects
NPV	North Pleasant Valley
NPV Desalter	North Pleasant Valley Desalter Treatment Facility
NPVMA	North Pleasant Valley Management Area
PNW	Potential New Well
PTP	Pumping Trough Pipeline
PVB	Pleasant Valley Basin
PVCWD	Pleasant Valley County Water District
PVP	Pleasant Valley Pipeline
PVPDMA	Pleasant Valley Pumping Depression Management Area
RO	reverse osmosis
SGMA	Sustainable Groundwater Management Act
SMC	sustainable management criteria
State Water	State Water Project water
TDS	total dissolved solids
UAS	Upper Aquifer System
UWCD	United Water Conservation District
VCWPD	Ventura County Watershed Protection District
VRGWFM	Ventura Regional Groundwater Flow Model

Acronym/Abbreviation	Definition
WRP	Water Reclamation Plant
ZMWC	Zone Mutual Water Company

Executive Summary

The Fox Canyon Groundwater Management Agency (FCGMA), the Groundwater Sustainability Agency (GSA) for the portions of the Pleasant Valley Basin (PVB) within its jurisdictional boundaries, in coordination with the Camrosa Water District-Pleasant Valley GSA and the Pleasant Valley Basin Outlying Areas GSA (County of Ventura), has prepared this first Periodic Evaluation of the Pleasant Valley Basin Groundwater Sustainability Plan (GSP) in compliance with the 2014 Sustainable Groundwater Management Act (SGMA) (California Water Code, Section 10720 et seq.)[1]. This first Periodic Evaluation of the GSP evaluates impacts of climate, water usage trends, and groundwater management decisions on groundwater conditions in the PVB between water year 2020[2] and water year 2024 and provides an assessment of whether GSP implementation is on track to achieve the sustainability goal of the PVB by 2040.

The GSP was submitted to the Department of Water Resources (DWR) on January 13, 2020, and was approved by DWR on November 18, 2021. The GSP reported on groundwater conditions through water year 2015. This evaluation includes an assessment of groundwater condition changes since the GSP was submitted. DWR's approval of the GSP included five recommended corrective actions, which FCGMA has worked to address over the past three years (Table ES-1, Recommended Corrective Actions and Corresponding FCGMA Activities).

Table ES-1. Recommended Corrective Actions and Corresponding FCGMA Activities

NO.	Summary of Recommended Corrective Action	Activities completed by FCGMA			Discussion of FCGMA Responses
		Technical Analysis or Study	New Project	Updated Monitoring Network	
1	Investigate the Grimes Canyon aquifer	✓	✓	✓	Section 4.1.2
2	Investigate the connectivity between surface water and groundwater	✓	✓	✓	Section 2.2.6
3	Evaluate how the sustainability goals established for dry climate conditions impact sustainability goals for the Oxnard Subbasin	✓			Section 2.2.3
4	Elaborate on the use of groundwater levels as a proxy for degraded water quality	✓	✓		Section 2.2.4
5	Incorporate periodic land subsidence monitoring into the GSP's monitoring plan			✓	Sections 2.2.5 and 7.4

Additionally, since adopting the GSP, the FCGMA has been working to fill data gaps identified in the GSP, implement projects and management actions, and address legal actions taken in the PVB. FCGMA has undertaken these efforts in conjunction with other local agencies, and in consultation with interested parties in the PVB and the adjacent Oxnard Subbasin and Las Posas Valley Basin. Targeted workshops were held during the development of this first Periodic Evaluation to solicit feedback and suggestions that have shaped the interpretations and

[1] The GSAs that overlie that PVB have not been modified since the GSP was submitted.
[2] A water year begins October 1 and ends September 30 to reflect the precipitation patterns in California. Under DWR's definition of a water year, water year 2024 began October 1, 2023 and ended September 30, 2024.

recommendations presented in this document. The FCGMA Board of Directors remains committed to engaging with interested parties over the next periodic evaluation cycle.

Current Groundwater Conditions

Three principal aquifers are defined in the PVB: the older alluvium, which is time equivalent to the Upper Aquifer System (UAS) in the Oxnard Subbasin, the Fox Canyon aquifer (FCA), and the Grimes Canyon aquifer (GCA) (FCGMA 2019). The FCA and GCA compose the Lower Aquifer System (LAS) in the PVB. Groundwater production for agricultural, municipal, and industrial use in the PVB, specifically near the boundary with the Oxnard Subbasin, has contributed to seawater intrusion in both the UAS and LAS of the Oxnard Subbasin (FCGMA 2019). This first Periodic Evaluation of the GSP evaluates impacts of climate, water usage trends, and groundwater management decisions on groundwater conditions in the UAS and LAS between water year 2015 and water year 2024.

Since 2015, groundwater elevation changes have varied in response to changing climate conditions. Between water year 2015 and 2022, the PVB experienced seven years of drier-than-average conditions[3]. Consequently, fall groundwater elevations in both the UAS and LAS declined between 2015 and 2022, even after FCGMA purchased 15,000 AF of supplemental State Water Project water in 2019. The wetter than average 2023 and 2024 water years resulted in increased availability of Santa Clara River surface water diversions. These diversions supported groundwater elevation recoveries across the Oxnard Subbasin and PVB over the past two water years. Groundwater elevations in the western part of the PVB, adjacent to the Oxnard Subbasin are currently higher than those measured in 2015. In contrast, spring 2024 groundwater elevations in the northern PVB were lower than they were in 2015. These groundwater level declines, which were anticipated in the GSP, are a response to decreasing flows from the Las Posas Valley Basin and operation of the North Pleasant Valley Groundwater Desalter project. The aforementioned project is designed to extract brackish groundwater from the PVB and improve groundwater quality conditions in northern PVB.

While groundwater elevations in most areas are higher than they were in 2015, available groundwater quality and numerical modeling data indicate that groundwater elevations in the PVB and adjacent Oxnard Subbasin contributed to seawater intrusion in the Oxnard Subbasin.

Relationship to the Sustainable Management Criteria

The GSP established minimum threshold and measurable objective groundwater elevations at 9 representative monitoring points, or “key wells”, in the PVB. These SMCs were established to avoid undesirable results associated with chronic lowering of groundwater levels, depletion of groundwater in storage, degradation of water quality, and land subsidence in the PVB (FCGMA 2019). Additionally, groundwater elevations below these SMCs have the potential to exacerbate seawater intrusion in the Oxnard Subbasin (FCGMA 2019). In 2015, groundwater elevations were below the minimum thresholds at 8 of the 9 key wells.

The GSP acknowledged that groundwater elevation recoveries from 2015 conditions to the measurable objectives would require progressive implementation of projects and management actions over a 20-year period. To account for this, the GSP established interim milestones that serve as groundwater elevation targets through 2040. Under average climate conditions, the interim milestones targeted groundwater elevation recoveries that averaged approximately 17 feet in the older alluvium and approximately 30 feet in the LAS over the first five years of GSP

[3] The Subbasin received higher than average precipitation in water years 2017 and 2019, but the precipitation and local surface water available for diversion was not sufficient for the Subbasin to recover from long-term drought conditions.

implementation. The groundwater elevations measured in spring 2024 were approximately 28 to 76 feet higher than the interim milestones.

Importantly, groundwater elevations in spring 2024 were higher than the minimum thresholds in 6 of the 8 key wells based upon available data. FCGMA anticipates that the general trend of rising groundwater elevations will continue through 2040 with continued implementation of the GSP.

Water Supplies in the Pleasant Valley Basin

Water Supplies in the PVB consist of surface water, imported water, recycled water, and groundwater (Table ES-2, Historical and Current Water Supplies in the Pleasant Valley Basin). Total water supplies since 2015 (2016-2022) were approximately 10% lower than the historical average, largely due to a reduction in the availability of Santa Clara River water during drought years and use of imported water from CMWD. At the same time, use of Conejo Creek water and recycled water in the PVB was higher than the historical period. Total groundwater usage was lower than the historical period. Total groundwater pumping was about 6% lower than in 2015 (Table ES-2). Groundwater production reductions were principally due to groundwater extraction allocation revisions implemented by FCGMA.

Table ES-2. Historical and Current Water Supplies in the Pleasant Valley Basin

Water Source		Historical Average (1985 - 2015) [Acre-Feet per Year][a]	Current Average (2016 - 2022) [Acre-Feet per Year][a]
Groundwater	Older Alluvium	7,650	7,050
	Lower Aquifer System	7,810	7,420
	Subtotal	15,460	15,000
Surface Water	Conejo Creek	3,560	4,830
	Santa Clara River	4,090	930
Imported Water	From CMWD	8,700	7,000
	Imported GW	1,390	1,990
Recycled Water		2,260	3,040
	Total	**35,670**	**32,260**

Notes: CMWD = Calleguas Municipal Water District; Imported GW = groundwater pumped from the Arroyo Santa Rosa Valley Basin and Tierra Rejada Basin and used in the PVB.
a Rounded to the nearest ten (10) acre-feet.

State of Overdraft

While groundwater elevations in the PVB have historically recovered over climatic cycles, overdraft in the PVB has contributed to seawater intrusion and the migration of saline water in the adjacent Oxnard Subbasin. To better characterize the degree of overdraft currently occurring in the PVB, the sustainable yield was re-evaluated through multiple new future condition numerical groundwater flow modeling scenarios. In the event that no new projects are implemented in the PVB and Oxnard Subbasin, the sustainable yield of the PVB is estimated to be 13,400 AFY[4].

[4] Due to uncertainty in the model-estimates of seawater flux into the Oxnard Subbasin, the sustainable yield of the PVB may range from 12,200 to 14,600 AFY (FCGMA, 2019).

Groundwater production from the PVB currently exceeds this estimate by approximately 1,600 AFY. Actual overdraft may exceed this estimate due to uncertainty in the estimated sustainable yield.

Future Groundwater Conditions

Under Future Baseline conditions, groundwater production is anticipated to exceed the sustainable yield by approximately 1,200 AFY. To address this, FCGMA and other agencies in the PVB and Oxnard Subbasin have made significant progress developing projects and management actions that mitigate overdraft by 2040. These include:

- The development and implementation of a fixed extraction allocation system that places an upper bound on the total allowable annual extractions available to each operator in the PVB.
- The development and implementation of projects and policies, which expand availability and usage of recycled water.
- The development and implementation of projects that increase surface water diversions from Santa Clara River for recharge in the Oxnard Subbasin and delivery for use in lieu of groundwater.
- The development and evaluation of seawater intrusion barrier projects that create new water supplies and increase the sustainable yield of the PVB and Oxnard Subbasin.

The benefits of future projects and management actions, and their ability to mitigate overdraft, were evaluated through numerical modeling (Table ES-3, Estimated Project-Related Future Sustainable Yield).

Table ES-3. Estimated Project-Related Future Sustainable Yield

Model Scenario Name	Projects Evaluated	Estimated Sustainable Yield (Acre-Feet per Year)[a]		Estimated Remaining Overdraft (Acre-Feet per Year)[b]	
		Older Alluvium	Lower Aquifer System	Older Alluvium	Lower Aquifer System
Projects	▪ Expansion of Santa Clara River water diversions. ▪ Voluntary temporary fallowing ▪ Infrastructure improvements	3,600	10,200	900	-
Basin Optimization	▪ Redistribution of pumping	3,600	10,200	900	-
Future Baseline with EBB	▪ Extraction Barrier and Brackish Water Treatment Project (Seawater Intrusion Extraction Barrier)	4,700	9,100	-	-

Notes: "-" indicates that Overdraft is addressed; WLPMA = West Las Posas Management Area of the Las Posas Valley Basin.
a Sustainable yield increases associated with each project may not be additive.
b Estimated based on the Future Baseline groundwater extraction rates, which are equal to the 2016 to 2022 average, adjusted for estimated Santa Clara River water and recycled water availability.

While the modeling suggests that future projects will play a critical role in mitigating overdraft and achieving the sustainability goal for the PVB, uncertainty remains surrounding the timing, feasibility, scale, and cost of each project. Additional numerical modeling would need to be conducted to characterize the individual, rather than collective, benefits of each project. FCGMA anticipates coordinating with agency-leads for each of these projects to integrate updated project understandings into the GSP as they evolve.

Importantly, over the next five years, United Water Conservation District will be developing and implementing Phase I of their Extraction Barrier and Brackish Water Treatment project. This project is intended to create a seawater intrusion barrier by extracting brackish water near Point Mugu and maintaining a pumping trough that helps prevent landward migration of saline water in the Oxnard Subbasin. This project is anticipated to both increase water supplies in the PVB and Oxnard Subbasin, through delivery of treated brackish water, and increase the sustainable yield. Results from Phase I of this project, which is anticipated to start in 2028, will inform the need to revise the sustainable management criteria for the Oxnard Subbasin and PVB to allow for project-related groundwater elevation declines along the coast and provide operators with additional flexibility.

Assessment of Progress Towards Sustainability

The primary sustainability goal for the PVB is to "maintain a sufficient volume of groundwater in storage in the older alluvium and the LAS so that there is no net decline in groundwater elevation or storage over wet and dry climatic cycles" (FCGMA 2019). Additionally, "groundwater levels in the PVB 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" in the Oxnard Subbasin after 2040 (FCGMA 2019). GSP implementation, thus far, is on track to meet the sustainability goal set forth in the GSP. This has been accomplished through:

- Development of policy that allocates groundwater extractions in a manner consistent with the GSP and SGMA.
- Diversification of water supplies and reduction in groundwater production from the PVB.
- Ongoing groundwater elevation and quality monitoring.
- Implementation of projects that address data gaps,
- Development, evaluation, and implementation of projects that increase water supplies and the sustainable yield of the PVB.

The information collected through these activities has improved groundwater condition monitoring, the hydrogeologic conceptual model of the PVB, and the understanding of projects and management actions that are implementable and support sustainable groundwater management in the PVB. This has resulted in improved estimates of the sustainable yield of the PVB and potential improvements to the sustainable management criteria that will guide management over the next five years. Significantly, adjudication proceedings have been undertaken in the PVB. At this time, it is unclear what legal effect the adjudication action will have on FCGMA's continued ability to implement the GSP and sustainably manage the PVB. Over the next five-years, FCGMA will continue to work towards sustainability and will re-evaluate the impacts of climate, water usage, project implementation, and legal actions on groundwater conditions and groundwater management in the PVB in accordance with the ongoing GSP evaluation process and adaptive management approach outlined in SGMA.

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1 Significant New Information

Fox Canyon Groundwater Management Agency (FCGMA) and other agencies in the Pleasant Valley Basin (PVB) (California Department of Water Resources [DWR] Bulletin 118 Groundwater Basin 4-006) have designed, funded, and implemented a range of projects and management actions that facilitate implementation of the Groundwater Sustainability Plan (GSP). These have included: the development of policy that supports management of groundwater extractions from the PVB in a manner consistent with the GSP; construction of additional monitoring wells that address data gaps identified in the GSP; and the design and implementation of larger capital projects that increase water supplies in the PVB. Additionally, there have been legal challenges filed against FCGMA's management of the Subbasin including a challenge to the GSP and request for a comprehensive adjudication. These activities are summarized in Table 1-1, Summary of New Information Since GSP, and are discussed in detail in Section 3, Status of Projects and Management Actions.

Table 1-1. Summary of New Information Since GSP

Significant New Information	Description	Aspects of Plan Affected	Warrant Changes to Any Aspects of the Plan
Legal Challenges			
OPV Coalition, et al. v. Fox Canyon Groundwater Management Agency, Santa Barbara Sup. Ct. Case No. VENCI00555357	In June 2021, the OPV Coalition filed a lawsuit against FCGMA, challenging the OPV (Oxnard and Pleasant Valley) GSPs, the ordinance that establishes extraction allocations (limits) for all users in the Basins, and requesting an adjudication of all groundwater rights in the Basins. At this time, it is unclear what legal effect the lawsuit, in particular the adjudication action, will have on FCGMA's continued ability to implement the OPV GSPs and sustainably manage the Basins.	Unknown	Unknown
City of Oxnard v. Fox Canyon Groundwater Management Agency, Los Angeles Sup. Ct. Case No. 20STCP00929	In December 2019, the City of Oxnard (City) filed a petition for writ of mandate challenging FCGMA's adoption of an ordinance intended to transition the Agency's current groundwater management programs to sustainable groundwater management under SGMA. FCGMA amended its ordinance in response to the court's August 2023 writ of mandate.	Unknown	Unknown

Table 1-1. Summary of New Information Since GSP

Significant New Information	Description	Aspects of Plan Affected	Warrant Changes to Any Aspects of the Plan
Monitoring Network Information			
New Monitoring Data	▪ Two nested monitoring well was installed by FCGMA in northern Pleasant Valley, adjacent to the Las Posas Valley Basin (LPVB) in 2019 (FCGMA 2022). ▪ Three nested monitoring wells were installed by the City of Camarillo near the North Pleasant Valley Groundwater Desalter project. ▪ FCGMA is constructing up to three additional nested monitoring wells in the PVB in calendar year 2024.	Monitoring Network	Yes
Interferometric Synthetic Aperture Radar (InSAR) Data	DWR InSAR data is now available to examine land subsidence in the PVB.	Monitoring Network	Yes
New Water Supplies			
Recycled water served in PVCWD	In 2019, the City of Camarillo and CWD began delivering recycled water for irrigation within the PVCWD service area. Prior to this, recycled water was a source of irrigation water supply within the PVB but not within PVCWD.	Water Budget	Yes
Projects and Management Actions			
Management Actions			
Fixed Extraction Allocation System	In 2019, FCGMA adopted a fixed extraction allocation system that placed an upper bound on the total allowable annual extractions available to each operator in the Subbasin. Since adoption of the GSP, FCGMA has adopted ordinance amendments and resolutions to facilitate transition to the new allocation system, provide policies and procedures for seeking variances, and made modifications required under a court order addressing a challenge to the ordinance.	Projects and Management Actions	Yes
In-lieu recycled water for agricultural irrigation program	In 2023, FCGMA adopted 23-02, which provides a "recycled water pumping allocation" to the City of Oxnard for delivery of recycled water from its Advanced Water Purification Facility to agricultural operators in the Oxnard	Projects and Management Actions	Yes

Table 1-1. Summary of New Information Since GSP

Significant New Information	Description	Aspects of Plan Affected	Warrant Changes to Any Aspects of the Plan
	Subbasin and to PVWCD, whose service area covers both the Oxnard Subbasin and PVB		
Project Prioritization Process and Criteria	In 2023, FCGMA adopted a formal process for evaluating and prioritizing projects in the Subbasin. This process, which was developed with stakeholder input, provides other agencies and stakeholders in the Subbasin to submit project information to FCGMA for consideration in future funding opportunities and GSP modeling.	Projects and Management Actions	No
Water Supply Projects			
Pleasant Valley County Water District (PVCWD) Private Reservoir Program	Incentivize the utilization of privately owned and operated reservoirs for the use of surface water capture during rain events, in order to expand storage capacity within the PVCWD service area (FCGMA 2022).	Projects and Management Actions	Yes
PVCWD Recycled Water Connection Pipeline	Connection of the east and west zones of PVCWD's distribution system to more effectively distribute up to 4,000 AFY of recycled water from the City of Oxnard's Advanced Water Purification Facility (AWPF) and an additional 1,000 to 2,000 AFY of surface water from Conejo Creek (FCGMA 2022).	Projects and Management Actions	Yes
Seawater Intrusion Extraction Barrier and Brackish Water Treatment Project	Extraction of brackish groundwater in the Oxnard, Mugu, and Fox Canyon aquifers near Point Mugu, in the Oxnard Subbasin, to help prevent landward migration of the saline water impact front and increase the sustainable yield of both the Oxnard Subbasin and the PVB (UWCD 2021a).	Projects and Management Actions	Yes
Freeman Diversion Expansion Project	Expansion of the existing intake, conveyance, and recharge facilities to divert surface water at higher flow rates and with higher sediment loads than is possible with UWCD's existing Freeman Diversion on the Santa Clara River (FCGMA 2022).	Projects and Management Actions	Yes
Laguna Road Recycled Water Pipeline Interconnection	Construction of a new pipeline interconnection to allow conveyance of recycled water from Pleasant Valley	Projects and Management Actions	Yes

Table 1-1. Summary of New Information Since GSP

Significant New Information	Description	Aspects of Plan Affected	Warrant Changes to Any Aspects of the Plan
	County Water District's (PVCWD's) system to UWCD's Pumping Trough Pipeline (PTP) system. This will allow for full utilization of available recycled water (FCGMA 2022).		
Purchase of Supplemental State Water Project (SWP) Water	In years when SWP water is available in excess of UWCD's Table A allocation, it would be purchased and used for recharge in the Oxnard Subbasin and delivered to users on the PTP and PVCWD systems (FCGMA 2022).	Projects and Management Actions	Yes
Projects to Address Data Gaps			
Installation of Additional Groundwater Monitoring Wells	This project proposes installation of multi-depth monitoring wells in the PVB to assess groundwater conditions in the principal aquifers in areas of the PVB that lack data (FCGMA 2022).	Projects and Management Actions	Yes
Installation of Additional Shallow Groundwater Monitoring Wells	This project proposes installation of shallow monitoring wells to assess groundwater conditions along the Arroyo Las Posas, Conejo Creek, and Calleguas Creek in the PVB to better characterize the interaction between shallow groundwater and the principal aquifers (FCGMA 2022).	Projects and Management Actions	Yes
Installation of Transducers in Monitoring Wells	This project proposes installation of transducers in representative monitoring points, or key wells, in the PVB to reduce the temporal data gaps that currently exist in the record of aquifer conditions (FCGMA 2022).	Projects and Management Actions	Yes
Feasibility Studies			
Stormwater Diversion to Camarillo Sanitary District Water Reclamation Plant for Treatment and Reuse	Investigate the feasibility of diverting stormwater flows from the City of Camarillo's stormwater collection system to the Camarillo Sanitary District's (CSD) Water Reclamation plant, to be treated and reused for irrigation purposes (FCGMA 2022).	Projects and Management Actions	Yes
Camarillo Hills Drain Stormwater Diversion to Camarillo Sanitary District Water Reclamation Plant	Investigate the feasibility of diverting a portion of stormwater flows from the Camarillo Hills Drain to the CSD Water Reclamation Plant (WRP) where it would be treated, and the reclaimed	Projects and Management Actions	Yes

Table 1-1. Summary of New Information Since GSP

Significant New Information	Description	Aspects of Plan Affected	Warrant Changes to Any Aspects of the Plan
	water would be used for irrigation in the Camarillo and Camrosa Service areas.		
Camarillo Airport Regional Stormwater Project	Investigate the feasibility of implementing a regional stormwater capture and infiltration project in the vicinity of the Camarillo Airport. This feasibility study seeks to investigate diverting stormwater flows from the Camarillo Hills Drain to an underground infiltration or detention basin for groundwater recharge	Projects and Management Actions	Yes
Infiltration Basin Near Camarillo Sanitary District Water Reclamation Plant	Understand the feasibility of adding stormwater infiltration or detention areas to the west of the existing CSD flood management project near the WRP.	Projects and Management Actions	Yes
City of Camarillo North Pleasant Valley Desalter Expansion	Regionally led effort to investigate the feasibility of increasing the volume of groundwater treated by the North Pleasant Valley Desalter Treatment Facility Desalter for the benefit of regional agencies and multiple basins	Projects and Management Actions	Yes

Notes: OPV = Oxnard and Pleasant Valley; N/A = Not Applicable; PVCWD = Pleasant Valley Count Water District; FCGMA = Fox Canyon Groundwater Management Agency; CWD = Camrosa Water District; CSD = Camarillo Sanitary District; UWCD = United Water Conservation District; WRP = Water Reclamation Plant.

2 Current Groundwater Conditions

2.1 Background

The PVB (DWR Bulletin 118 Groundwater Basin 4-006) is an alluvial groundwater basin, located in Ventura County, California (Figure 2-1, Vicinity Map for the Pleasant Valley Basin). The PVB is in hydrologic communication with the Oxnard Subbasin to the west and southwest with a boundary defined by a facies change between the more recent predominantly coarser-grained sand and gravel deposits that compose the Oxnard and Mugu aquifers in the Oxnard Subbasin and the older finer-grained clay and silt-rich deposits of the Older Alluvium in the PVB. The Springville Fault Zone bounds the Basin to the north and is believed to form a groundwater flow barrier at depth between the aquifers in the Las Posas Valley Basin (LPVB, DWR Bulletin 118 Groundwater Basin 4-008) and the PVB, based on historical hydraulic head differences of up to 60 feet across the fault zone (DWR 1975). However, shallow alluvial deposits in the vicinity of Arroyo Las Posas and the Somis Gap are in hydraulic communication with the LPVB (CMWD 2018). The eastern boundary of the PVB is formed by a hydrogeologic constriction in Arroyo Santa Rosa Valley (SWRCB 1956; DWR 2003). The southern boundary of the PVB is delineated by the contact between the alluvial deposits and surface exposures of bedrock in the Santa Monica Mountains (DWR 2003).

Three principal aquifers are defined in the PVB: the older alluvium, which is time equivalent to the Upper Aquifer System (UAS) in the Oxnard Subbasin, the Fox Canyon aquifer (FCA), and the Grimes Canyon aquifer (GCA) (FCGMA 2019). The FCA and GCA compose the Lower Aquifer System (LAS) in the PVB.

The sustainability goal for the PVB established in the GSP is: “to maintain a sufficient volume of groundwater in storage in the older alluvium and the LAS so that there is no net decline in groundwater elevation or storage over wet and dry climatic cycles” (FCGMA 2019). Additionally, “groundwater levels in the PVB 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” in the Oxnard Subbasin after 2040 (FCGMA 2019). Groundwater elevation minimum thresholds and measurable objectives were established at representative monitoring points, referred to as “key wells,” in the GSP (Figure 2-2; Representative Monitoring Points in the Pleasant Valley Basin). The measurable objective water levels are “the groundwater levels throughout the PVB at which there is neither seawater flow into, nor freshwater flow out of the UAS or LAS in the Oxnard Subbasin” (FCGMA 2019). The minimum threshold water levels are water levels that allow declines during periods of future drought to be offset by recovery during future periods of above-average rainfall (FCGMA 2019).

At the time the GSP was prepared, the groundwater elevations were below the minimum threshold groundwater elevations at 8 of the 9 key wells in the PVB. The GSP established interim milestone groundwater elevations at these 8 key wells as targets for groundwater elevation recoveries between 2020 and 2040 (FCGMA 2019). The GSP established two sets of interim milestones, one for groundwater levels to reach the minimum thresholds by 2040, and a second for groundwater levels to reach the measurable objectives by 2040. These two sets of interim milestones were established to account for the climatic influence on groundwater levels (FCGMA 2019). Under drought conditions, there is less surface water available for recharge in the Basin, and groundwater elevations would be anticipated to recover to the minimum thresholds by 2040. Under average climatic conditions, groundwater elevations should recover to the measurable objectives by 2040. Between October 1, 2019, and September 30, 2023, the Subbasin received 11.6 inches of precipitation, on average. This is approximately 13%

less than the long-term average precipitation of 13.3 inches. Therefore, for this 5-year evaluation, groundwater elevations are compared to the interim milestones for average precipitation conditions in the following sections.

The groundwater elevation minimum thresholds and measurable objectives selected to meet the sustainability goal for the Basin were used as a proxy for all other applicable sustainability indicators in the GSP (FCGMA 2019). These groundwater elevations are higher than the historical low groundwater elevations. Therefore, the minimum thresholds and measurable objective water levels will prevent chronic lowering of groundwater levels, significant and unreasonable reduction of groundwater storage, degraded water quality as a result of groundwater production, and land subsidence related to groundwater production (FCGMA 2019). Depletions of interconnected surface water that result in a significant and unreasonable loss of groundwater-dependent ecosystem (GDE) habitat, have not occurred within the PVB because there are only a few wells that produce water from the shallow alluvial aquifer, which is the source of the groundwater that supports GDEs in the Basin (FCGMA 2019). The shallow alluvial aquifer is not considered a principal aquifer in the Basin, and there are currently no plans to produce groundwater from this unit in the future (FCGMA 2019).

2.1.1 DWR Recommended Corrective Actions

DWR's assessment and approval of the GSP included four "recommended corrective actions" that should be considered for the first 5-year GSP evaluation. Following are the recommended corrective actions and the applicable sustainability indicators.

RECOMMENDED CORRECTIVE ACTION 1

Investigate the groundwater condition of the Grimes Canyon aquifer, identified as one of the principal aquifers in the GSP, by compiling and collecting data and information sufficient to describe the properties of this aquifer. Based on the results of the investigation, provide a discussion of the management of this aquifer.

Recommended corrective action 1 applies to the hydrogeologic conceptual model of the PVB and a data gap identified in the GSP. This recommended corrective action is discussed in Section 4.1.2, Improvements to the Hydrogeologic Conceptual Model.

RECOMMENDED CORRECTIVE ACTION 2

Investigate the hydraulic connectivity of the surface water bodies to the shallow aquifers and principal aquifers to improve the understanding of potential migration of impaired water, the reliance of the potential GDEs on the shallow aquifer(s), and depletion of interconnected surface water bodies. Identify specific locations of gaining and losing reaches of interconnected surface water and quantify the depletion of interconnected surface water. Provide a timeline and discuss the steps that will be taken to fill the data gap identified in the GSP related to shallow groundwater monitoring near surface water bodies and GDEs.

Recommended corrective action 2 applies to depletions of interconnected surface water. This recommended corrective action is discussed in Section 2.2.6, Depletions of Interconnected Surface Water.

RECOMMENDED CORRECTIVE ACTION 3

Evaluate how the sustainability goals of Pleasant Valley Basin established for the dry climatic condition may affect the sustainability goals of the adjacent Oxnard Subbasin. Also, provide an assessment of the potential impact of sustainable management criteria adopted for Pleasant Valley Basin on seawater intrusion in the adjacent Oxnard Subbasin.

Recommended corrective action 3 applies to seawater intrusion. This recommended corrective action is discussed in Section 2.2.3, Seawater Intrusion.

RECOMMENDED CORRECTIVE ACTION 4

Elaborate how the Agency is planning to verify that the groundwater level thresholds are adequate to assess the groundwater quality conditions in the Basin. Discuss how the groundwater quality data from the existing monitoring network will be used for sustainable management of the Basin. Evaluate and describe how the Agency's current groundwater management strategy, in coordination with other agencies associated with water quality programs, is affecting groundwater quality in the Basin, and describe those effects on all beneficial users of the Basin.

Recommended corrective action 4 applies to degraded water quality. This recommended corrective action is discussed in Section 2.2.4, Degraded Water Quality.

RECOMMENDED CORRECTIVE ACTION 5

Include a periodic subsidence monitoring plan that can be used to quantify whether land subsidence is occurring and whether the groundwater level proxy is avoiding undesirable results associated with land subsidence. As an option, the Department provides statewide InSAR data that can be used for monitoring land subsidence.

Recommended corrective action 5 applies to land subsidence. This recommended corrective action is discussed in Section 2.2.5, Land Subsidence.

2.2 Current Conditions Related to Sustainability Indicators

The following sections discuss the current groundwater conditions related to each of the sustainability indicators in the PVB. The groundwater levels relative to the sustainable management criteria (SMC) are discussed in Section 2.2.1, Chronic Lowering of Groundwater Levels, along with a discussion of undesirable results related to groundwater levels, DWR recommended corrective actions related to groundwater levels, and progress toward achieving sustainability. Sections 2.2.2, Groundwater in Storage, through 2.2.7, Depletions of Interconnected Surface Water, focus on the undesirable results, DWR recommended corrective actions, and the progress toward achieving sustainability for each sustainability indicator.

Changes to the SMC are included in each subsection. These revised SMC will serve as the basis for evaluating groundwater sustainability over, at a minimum, the next 5 years of GSP implementation.

2.2.1 Chronic Lowering of Groundwater Levels

This section summarizes current (i.e., water year 2024) groundwater elevations in the Basin and their relation to the SMCs established in the GSP, as well as groundwater elevations measured at the start of the evaluation period (i.e., water year 2020) and the end of the GSP reporting period (i.e., calendar year 2015). Water year groundwater elevations are characterized using seasonal low and seasonal high measurements. Seasonal low groundwater elevations are characterized using measurements collected between October 2 and October 29 and seasonal high groundwater elevations are characterized using measurements collected between March 2 and March 29.

In fall 2023 and spring 2024, measured groundwater elevations were available for 7 of the 9 key wells in the PVB (Table 2-1, Water Year 2024 Groundwater Elevations at Key Wells in the PVB; Figure 2-3, Fall 2023 Groundwater Levels Relative to the SMCs; Figure 2-4, Spring 2024 Groundwater Levels Relative to the SMCs).

2.2.1.1 DWR Recommended Corrective Actions

DWR did not issue a recommended corrective action specific to reduction of groundwater storage, although two of the recommended corrective actions issued by DWR are related to groundwater levels (DWR 2021). These two recommended corrective actions are discussed in more detail in Sections 2.2.3, Seawater Intrusion, and 2.2.4, Degraded Water Quality.

2.2.1.2 Groundwater Elevation Changes in the PVB

Since 2015, groundwater elevations changes have varied in response to changing climate conditions. During the drought that characterized the start of the evaluation period, groundwater elevations generally declined in the PVB and in fall 2018 were approximately 1 to 10 feet lower than 2015. In the wetter-than-average water year 2019, FCGMA funded the purchase of 15,000 acre-feet of supplemental State Water Project water, and groundwater elevations increased through fall 2020, before declining again in the 2021 and 2022 water years in response to below normal precipitation. The wet 2023 and 2024 water years supported groundwater elevations recoveries, and spring 2024 groundwater elevations in the PVB, near the boundary with the Oxnard Subbasin, were an average of approximately 40 feet higher than 2015. In the northern part of the PVB, spring groundwater elevations were approximately 46 feet lower in 2024 than 2015. These declines, which were anticipated in the GSP, are a response to decreasing flows from the LPVB and operation of the North Pleasant Valley Groundwater Desalter project, which is designed to extract brackish groundwater from the PVB and improve groundwater quality conditions in northern PVB.

The sections below summarize the net groundwater elevation change in each principal aquifer over this period.

2.2.1.2.1 Older Alluvium (Age Equivalent Oxnard and Mugu Aquifers)

Since 2015, fall groundwater elevations in the Older Alluvium have been consistently measured in one multi-completion well: 02N21W34G05S (screened in the age equivalent stratigraphic unit as the Oxnard aquifer in the adjacent Oxnard Subbasin) and 02N21W34G04S (screened in the age equivalent stratigraphic unit as the Mugu aquifer in the adjacent Oxnard Subbasin). These wells are in the Pleasant Valley Pumping Depression Management Area (PVPDMA).

Between fall 2015 and fall 2023, the groundwater elevation at 02N21W34G05S increased by approximately 31 feet (Figure 2-5, Oxnard Aquifer – Groundwater Elevation Changes from Fall 2015 to 2023). Over this same period, the groundwater elevation at 02N21W34G04S increased by 50 feet (Figure 2-6, Mugu Aquifer – Groundwater Elevation Changes from Fall 2015 to 2023). Between spring 2015 and 2024, groundwater elevations measured at 02N21W34G05S and 02N21W34G04S increased by approximately 20 and 46 feet, respectively (Figure 2-7, Oxnard Aquifer – Groundwater Elevation Changes from Spring 2015 to 2024, and Figure 2-8, Mugu Aquifer – Groundwater Elevation Changes from Spring 2015 to 2024).

Since 2019, the start of the evaluation period, the fall groundwater elevation measured at 02N21W34G05S and 02N21W34G04S have increased by approximately 34 feet and 38 feet, respectively (Table 2-1). Spring groundwater elevations showed similar recoveries over the evaluation period at these two wells (Table 2-1).

2.2.1.2.2 Lower Aquifer System

Upper San Pedro Formation

There is limited production from the Upper San Pedro formation which is not a principal aquifer in the PVB. There is one well, 02N20W20D04S, screened solely within the Upper San Pedro formation (age-equivalent stratigraphic unit as the Hueneme aquifer in the adjacent Oxnard Subbasin) in the PVB. This well is located within the North Pleasant Valley Management Area (NPVMA), near Arroyo Las Posas, and was constructed in 2021 (Section 7.1, Summary of Changes to the Monitoring Network). The record of measurement at this well is not sufficient to characterize groundwater elevation changes since 2015.

Fox Canyon Aquifer

Since 2015, fall groundwater elevations in the FCA of PVPDMA, in the western portion of the PVB, have increased by approximately 55 to 60 feet (Figure 2-9, Fox Canyon Aquifer – Groundwater Elevation Changes from Fall 2015 to 2023). Over the same period, groundwater elevations in the NPVMA, in the eastern portion of the PVB, declined by approximately 19 to 51 feet (Figure 2-9).

Spring groundwater elevations in the FCA increased by approximately 22 to 45 feet in the PVPDMA between 2015 and 2024 (Figure 2-10, Fox Canyon Aquifer – Groundwater Elevation Changes from Spring 2015 to 2024). Over this period in the NPVMA, groundwater elevations declined by approximately 46 feet.

Since 2019, the start of the evaluation period, fall groundwater elevations in the FCA within the PVPDMA have increased by 40 to 52 feet. The recoveries measured in the PVPDMA reflect the benefits of increased recharge in the Oxnard Forebay and deliveries of surface water and recycled water for use in lieu of groundwater production in the pumping trough that spans the boundary between the PVB and Oxnard Subbasin. Over this same period, fall groundwater elevations in the FCA within the NPVMA decreased by approximately 6 feet (Table 2-1). The ongoing declines measured in this part of the PVB reflect the ongoing reduction in flows from the Las Posas Valley Basin to the PVB and recent operation of the NPV Groundwater Desalter project.

Table 2-1. Water Year 2024 Groundwater Elevations at Key Wells in the PVB

State Well Number	Aquifer	Management Area	Fall Groundwater Elevations			Spring Groundwater Elevations			Minimum Threshold (ft msl)	Measurable Objective (ft msl)	2025 Interim Milestone (Average Climate; ft msl)
			2023 (ft msl)	Change from 2019[a] (ft)	Change from 2015[a] (ft)	2024 (ft msl)	Change from 2020[a] (ft)	Change from 2015[a] (ft)			
02N21W34G05S	Older Alluvium (Oxnard)	PVPDMA	20.58	33.75	30.77	30.41	25.73	20.29	32	40	2
01N21W03K01S	Older Alluvium (Mugu)	PVPDMA	NM	—	—	NM	—	—	-53	5	-59
02N21W34G04S	Older Alluvium (Mugu)	PVPDMA	-27.99	38.46	52.29	-12.88	35.56	46.37	-48	5	-59
01N21W03C01S	FCA	PVPDMA	-63.26	52.16	54.26	-54.39	19.83	29.24	-48	0	-88
02N20W19M05S	FCA	NPVMA	-4.23	**-5.80**	**-19.39**	-7.19	**-12.86**	**-45.81**	-135	65	—[b]
02N21W34G02S	FCA	PVPDMA	-61.23	40.93	56.30	-47.82	23.74	22.25	-53	0	-88
02N21W34G03S	FCA	PVPDMA	-61.14	41.30	59.48	-47.63	23.89	44.90	-53	0	-90
01N21W02P01S	Multiple	PVPDMA	NM	—	—	NM	—	—	-43	5	-68
01N21W04K01S	Multiple	PVPDMA	-49.20	70.40	84.28	-24.08	37.15	66.00	-48	0	-100

Notes: ft = feet; ft msl = feet mean sea level; PVPDMA = Pleasant Valley Pumping Depression Management Area; NM = Not Measured; NPVMA = North Pleasant Valley Management Area

a Positive (+) values indicate an increase in groundwater elevation over the referenced period. Negative (-) values indicate a decrease in groundwater elevation over the referenced period. Bolded where groundwater elevations have declined.

b Interim milestones were not established for well 02N20W19M05S because the 2015 groundwater elevation was higher than the established minimum threshold.

2.2.1.3 Sustainable Management Criteria

2.2.1.3.1 Measurable Objectives

In 2015, the end of the GSP reporting period, groundwater elevations in the PVB were lower than the measurable objective groundwater elevations at all nine key wells. Under average climate conditions, the GSP targeted groundwater elevation recoveries in the PVB to the measurable objectives by 2040.

Fall 2023 and Spring 2024 groundwater elevations were below the measurable objectives for all key wells in the PVB (Table 2-1; Figure 2-3, Figure 2-4, and Figures 2-11 through 2-13, Groundwater Elevation Hydrographs for Key Wells).

2.2.1.3.2 Minimum Thresholds

In 2015, groundwater elevations were lower than the minimum threshold groundwater elevations at all key wells, except for 02N20W19M05S, which is the only key well located in the NPVMA. Under average climate conditions, the GSP targeted groundwater elevation recoveries to the minimum thresholds by 2035.

Fall 2023 groundwater elevations were higher than the minimum thresholds at two key wells in the PVB (Table 2-1; Figure 2-3 and Figures 2-11 through 2-13). Of these, one well, 02N21W34G04S, is screened in the Older Alluvium within the PVPDMA, and the other well, 02N20W19M05S, is screened in the FCA within the NPVMA. Between fall 2023 and spring 2024, groundwater elevations at the key wells in the PVPDMA increased by an average of approximately 14 feet and decreased in the NPVMA by approximately 3 feet. Spring 2024 groundwater elevations were above the minimum thresholds at five of the representative monitoring points in the Basin (Table 2-1; Figure 2-4 and Figures 2-11 through 2-13).

2.2.1.3.3 Interim Milestones

Fall 2023 and Spring 2024 groundwater elevations were above the 2025 Interim Milestone for Average Climate conditions at all key wells[5] in the PVB with available data and an assigned Interim Milestone (Table 2-1).

Groundwater elevations the PVB are influenced by water year type and the availability of surface water for recharge and use in lieu of groundwater. Because of this, there may be periods of declining groundwater elevations during dry water years. Despite this, FCGMA anticipates that groundwater elevations will continue to rise between 2025 and 2040 with the implementation of projects and management actions. The one exception to this is in the NPVMA, where operation of the NPV Groundwater Desalter Project is anticipated to cause groundwater elevation declines over the next 25 years. Future scenario modeling indicates that groundwater elevations in this part of the PVB will recover to pre-project levels by 2070 (Section 5, Updated Numerical Modeling).

2.2.1.4 Undesirable Results

Chronic lowering of groundwater levels resulting in a significant and unreasonable depletion of supply is an undesirable result applicable to the PVB. Chronic lowering of groundwater levels is also associated with depletion of groundwater in storage, degradation of groundwater quality, and subsidence (FCGMA 2019). In addition, while direct seawater intrusion is not a concern in the PVB, groundwater elevations in the PVB impact groundwater

[5] Interim milestones were not established for key well 02N20W19M05S.

elevations in the Oxnard Subbasin to the west. Consequently, chronic lowering of groundwater levels in the PVB has the potential to exacerbate seawater intrusion in the Oxnard Subbasin and may inhibit the ability of the Oxnard Subbasin to prevent net landward migration of the saline water impact front after 2040. This potential is greatest in the PVPDMA, which is adjacent to the Oxnard Subbasin. Declines in groundwater elevation in the eastern part of the NPVMA are less likely to influence seawater intrusion in the Oxnard Subbasin.

The GSP defined conditions in the PVB that would be indicative of undesirable results associated with chronic lowering of groundwater levels (FCGMA 2019). Under these conditions, the PVB would be experiencing an undesirable result if:

- In any single monitoring event, water levels in four of the nine key wells are below their respective minimum thresholds.
- The groundwater elevation at any individual key well is below the historical low groundwater elevation at the individual monitoring site, or in a nearby well if the historical record at the monitoring location is not long enough to capture the historical low water levels in the PVB; or
- The water level in any individual key well were below the minimum threshold for either three consecutive monitoring events or three of five consecutive monitoring events.

Prior to fall 2023, groundwater elevations were below the minimum thresholds at all key wells except 02N20W19M05S. These data indicate that the PVB likely experienced undesirable results during the evaluation period.

Importantly, fall groundwater elevations at six[6] of the nine key wells in the PVB have increased since 2019 and are higher than the interim milestones. The one key well in which groundwater elevations have declined, 02N20W19M05S, is located in the NPVMA where groundwater elevations are projected to decrease in response to changing flows in the Arroyo Las Posas and operation of the North Pleasant Valley (NPV) Groundwater Desalter project (FCGMA 2019). These data indicate that management of the PVB under the adopted GSP, along with climate conditions that allowed for recharge in the adjacent Oxnard Subbasin, surface water delivery for use in lieu of groundwater in the PVB, and increased creek recharge in the PVB has resulted in groundwater levels that are progressing toward sustainable levels.

2.2.1.5 Progress Toward Achieving Sustainability

The fact that groundwater elevations have risen in the PVB and are currently higher than the interim milestones indicates that GSP implementation has been effective so far. These groundwater levels reflect management decisions by the FCGMA, projects that have been implemented, and the influence of two water years with above average precipitation.

2.2.1.6 Adaptive Management Approaches

FCGMA has taken several steps to adaptively manage the PVB since adoption of the GSP. These have included:

- Purchase of supplemental State Water Project water in 2019 to support recharge in the adjacent Oxnard Subbasin and conjunctive use within the PVB.

6 Key well 01N21W02P01S was last measured in December 2019 and destroyed in January 2022. Key well 01N21W03K01S was last measured in May 2023. There is no interim milestone associated with well 02N20W19M05S.

- Development and implementation of a new extraction allocation system with fixed allocations for all pumpers that facilitates groundwater extraction reporting and management in a manner consistent with SGMA.
- Development of a project evaluation criteria and process to prioritize water supply and infrastructure projects that support groundwater sustainability in the PVB.
- Initial investigation of basin optimization scenarios that consider differential pumping adjustments by management area within the Oxnard Subbasin, to increase the sustainable yield of the Oxnard Subbasin, PVB, and West Las Posas Management Area (WLPMA) of the LPVB.

2.2.1.7 Impacts to Beneficial Uses and Users of Groundwater

Beneficial uses and users of groundwater within the PVB include environmental, agricultural, domestic, and municipal and industrial users (FCGMA 2019). Groundwater elevations that remain above the minimum thresholds are anticipated to improve beneficial uses of the PVB by limiting chronic lowering of groundwater levels. The fact that groundwater elevations are currently higher than the interim milestones indicates that GSP implementation has positively impacted beneficial uses in the PVB.

2.2.1.8 Changes to the Sustainable Management Criteria

The GSP established minimum threshold and measurable objective groundwater elevations that protect against net seawater intrusion in the UAS and LAS of the Oxnard Subbasin, avoid chronic lowering of groundwater levels and storage in the PVB, and provide flexibility to operate projects in the NPVMA that improve groundwater quality (FCGMA 2019). These SMC were based on results from future scenario modeling using the Ventura Regional Groundwater Flow Model (VRGWFM; UWCD 2018).

Future scenario modeling was updated as part of this 5-Year GSP evaluation. Two simulations were found to be sustainable in the PVB, Oxnard Subbasin, and WLPMA: No New Projects (NNP) 3 and Future Baseline with the United Water Conservation District (UWCD) Extraction Barrier Brackish (EBB) Water Treatment project (Section 5.2, Future Scenario Water Budgets and Sustainable Yield). The simulated groundwater elevations from the NNP 3 scenario were used to develop recommended revisions to the SMC in the PVB.

Minimum Thresholds

Six minimum threshold groundwater elevations are recommended for revision (Table 2-2, Minimum Threshold and Measurable Objective Groundwater Elevations for the Pleasant Valley Basin). The recommendations are limited to the PVPDMA. In the age-equivalent stratigraphic unit as the Mugu aquifer of the Older Alluvium, the recommended minimum thresholds are an average of approximately 16 feet higher than the GSP. In the FCA, the recommended minimum thresholds are an average of approximately 8 feet higher than the GSP. In the remaining well screened across multiple aquifers, the recommended minimum thresholds are 13 feet higher than the GSP.

Measurable Objectives

Six measurable objective groundwater elevations are recommended for revision (Table 2-2). In the Mugu-equivalent of the Older Alluvium, the recommended measurable objective groundwater elevations are an average of approximately 12 feet lower than the GSP. In the FCA of the PVPDMA, the recommended measurable objectives are an average of approximately 10 feet lower than the GSP. In the NPVMA, the measurable objective would be approximately 80 feet lower than the GSP.

Consideration of UWCD's EBB Projects

UWCD's EBB Water Treatment project is intended to create a seawater intrusion barrier in the Oxnard Subbasin, near Point Mugu, by extracting brackish groundwater in the Oxnard and Mugu aquifer near the coast and maintaining a pumping trough that helps prevent landward migration of seawater. The project would cause groundwater elevations along the coast to decline below current elevations. To account for this as part of the successful implementation of this project, the SMC in the PVB may need to be lowered to provide sufficient operational flexibility for the project and operators within the PVB and Oxnard Subbasin. Potential revisions to the SMC if UWCD's EBB project is implemented are described in Section 6 (Revisions to the Sustainable Management Criteria).

Table 2-2. Minimum Threshold and Measurable Objective Groundwater Elevations for the Pleasant Valley Basin

SWN[a]	Management Area	Aquifer	Historical Low (ft msl) and Date Measured[b]		Minimum Thresholds and Measurable Objectives Defined in the GSP[c]		Recommended Minimum Thresholds and Measurable Objectives[c]	
					MT	MO	MT	MO
02N21W34G05S	Older Alluvium (Oxnard)	PVPDMA	-10.19	10/2/2015	32	40	32	40
01N21W03K01S	Older Alluvium (Mugu)	PVPDMA	-79.98	6/30/2015	-53	5	**-35**	**-5**
02N21W34G04S	Older Alluvium (Mugu)	PVPDMA	-80.28	10/15/2015	-48	5	**-35**	**-10**
01N21W03C01S	FCA	PVPDMA	-117.52	10/15/2015	-48	0	**-40**	**-10**
02N20W19M05S	FCA	NPVMA	15.17	10/13/2015	-135	65	-135	**-15**
02N21W34G02S	FCA	PVPDMA	-117.53	10/2/2015	-53	0	**-45**	**-10**
02N21W34G03S	FCA	PVPDMA	-120.62	10/15/2015	-53	0	**-45**	**-10**
~~01N21W02P01S~~	~~Multiple~~	~~PVPDMA~~	-91.77	10/13/2015	-43	5	—	—
01N21W04K01S	Multiple	PVPDMA	-133.47	10/29/2015	-48	0	**-35**	0

Notes: GSP = Groundwater Sustainability Plan; SWN = State Well Number; MT = minimum threshold; MO = measurable objective; PVPDMA = Pleasant Valley Pumping Depression Management Area; NPVMA = North Pleasant Valley Management Area; FCA= Fox Canyon Aquifer, GCA = Grimes Canyon Aquifer; ft msl = feet mean sea level.

a New key wells are bolded. Key wells removed from the monitoring network denoted with a strikethrough.

b Historical low groundwater elevation measured prior to 12/31/2015. "-" where groundwater elevations were not measured prior to 2015.

c Bolded where different from the GSP (FCGMA 2019).

2.2.2 Reduction of Groundwater in Storage

2.2.2.1 DWR Recommended Corrective Actions

DWR did not issue a recommended corrective action specific to reduction of groundwater in storage, although two of the recommended corrective actions issued by DWR are related to groundwater levels and storage (DWR 2021). These two recommended corrective actions are discussed in more detail in Sections 2.2.3, Seawater Intrusion, and 2.2.4, Degraded Water Quality.

2.2.2.2 Groundwater in Storage Changes

Since adoption of the GSP, FCGMA has estimated the change in groundwater in storage in the PVB annually using a series of linear regression models that relate measured groundwater elevations to simulated values of change in storage (FCGMA 2020, 2021, 2022, 2023, 2024a). The linear regressions utilized results from the VRGWFM for the historical period from 1985 through 2015 (UWCD 2018). As part of the 5-year GSP evaluation, UWCD updated the VRGWFM to improve the hydrogeologic conceptual model along the coastline and simulate groundwater conditions through September 30, 2022 (Section 4.1, Hydrogeologic Conceptual Model; Table 2-3a, UWCD Model Water Budget for the Older Alluvium; Table 2-3b. UWCD Model Water Budget for the Lower Aquifer System).

The change in storage values summarized below are based on the model results from the updated VRGWFM. Because the updated VRGWFM does not simulate water years 2023 and 2024, the change in storage for the last two years of the evaluation period were estimated using model results from water years with similar starting and ending measured groundwater elevations. In the Older Alluvium, groundwater elevations in fall 2021 and spring 2024 were similar to those measured in fall 1996 and spring 1999, respectively (Figure 2-11). In the FCA, groundwater elevations in fall 2021 and spring 2024 were similar to those measured in fall 1993 and spring 1998, respectively (Figure 2-12). Because of this, the change in groundwater in storage in the Older Alluvium and LAS for the 2023 and 2024 water years were estimated using the simulated change in storage for the 1997 through 1999 and 1994 through 1998 periods, respectively.

2.2.2.2.1 Older Alluvium (Age Equivalent to Oxnard and Mugu Aquifers)

The GSP reported on the change in groundwater in storage in the Basin through the end of calendar year 2015. Between January 1, 2016, and September 30, 2022, the VRGWFM estimates that groundwater in storage in the Older Alluvium decreased by approximately 9,300 acre-feet (AF). Between water years 1997 and 1999, the VRGWFM estimates that groundwater in storage in the Older Alluvium increased by approximately 11,300 AF. Adding these estimates to the simulation results for water years 2016 through 2022 suggests that since 2016, groundwater in storage in the Older Alluvium has increased by approximately 2,000 AF.

Table 2-3a. UWCD Model Water Budget for the Older Alluvium

WY	Groundwater Recharge (Acre-Feet)						Groundwater Discharge (Acre-Feet)						Change in Groundwater in Storage[a] (Acre-Feet)
	Mtn Front Recharge & Subsurface Flows from LPVB	Recharge	Subsurface Inflow from the Semi-Perched Aquifer	Creek Percolation	Subsurface Inflow from the Oxnard Subbasin	TOTAL INFLOW	Pumping	Subsurface Outflow to LAS	Evapotrans-Tranpiration (ET)	Subsurface Outflow to Las Posas Basin	Subsurface Outflow to Oxnard Subbasin	TOTAL OUTFLOW	
2016[b]	1,656	348	9,248	3,070	0	14,322	-6,307	-6,903	-1,336	-173	-3,063	-17,782	-3,460
2017	4,096	987	11,781	4,562	0	21,426	-7,341	-8,944	-1,673	-399	-3,964	-22,320	-895
2018	2,425	498	11,838	3,687	0	18,448	-7,146	-8,707	-1,662	-234	-4,138	-21,887	-3,439
2019	3,810	902	11,401	4,853	0	20,965	-5,804	-8,262	-1,678	-386	-4,131	-20,262	704
2020	3,375	683	10,456	4,020	0	18,535	-5,644	-7,886	-1,697	-299	-3,136	-18,661	-126
2021	1,982	239	10,578	5,243	0	18,042	-6,602	-8,096	-1,608	-384	-2,683	-19,374	-1,332
2022	3,238	563	10,560	4,882	0	19,243	-6,657	-8,303	-1,620	-446	-3,008	-20,033	-790
Average	**2,940**	**603**	**10,837**	**4,331**	**0**	**18,711**	**-6,500**	**-8,157**	**-1,611**	**-332**	**-3,446**	**-20,045**	**-1,334**

a Negative (-) values denote a reduction of groundwater in storage. Positive (+) values denote an increase in groundwater in storage.
b Represents the nine-month period from January 1, 2016 through September 30, 2022.

2.2.2.2.2 Lower Aquifer System

Between the period from January 1, 2016, and September 30, 2022, the VRGWFM estimates that groundwater in storage in the LAS decreased by approximately 700 AF (Table 2-3b). During the 1994 through 1998 period, the VRGWFM estimates that groundwater in storage in the LAS increased by approximately 4,500 AF. Adding these estimates to the simulation results for water years 2016 through 2022 suggests that groundwater in storage in the LAS has increased by approximately 3,800 AF since 2015.

Table 2-3b. UWCD Model Water Budget for the Lower Aquifer System

WY	Groundwater Recharge (Acre-Feet)					Groundwater Discharge (Acre-Feet)				Change in Groundwater in Storage[a] (Acre-Feet)
	Recharge	Subsurface Inflow from the UAS	Subsurface Inflow from Las Posas Valley Basin	Subsurface Inflow from the Oxnard Subbasin	Total Inflow	Pumping	Subsurface Outflow to Las Posas Valley Basin	Subsurface Outflow to Oxnard Subbasin	Total Outflow	
2016[b]	146	6,903	6	0	7,054	-6,184	0	-1,230	-7,414	-359
2017	386	8,944	0	0	9,330	-6,891	-498	-1,730	-9,118	212
2018	204	8,707	0	0	8,911	-7,647	-482	-1,038	-9,168	-257
2019	351	8,262	0	0	8,613	-5,938	-1,078	-1,290	-8,306	307
2020	246	7,886	0	0	8,131	-5,692	-1,237	-1,001	-7,930	202
2021	68	8,096	0	0	8,165	-7,720	-912	-391	-9,023	-858
2022	187	8,303	0	0	8,490	-7,245	-804	-362	-8,411	79
Average	**227**	**8,157**	**1**	**0**	**8,385**	**-6,759**	**-716**	**-1,006**	**-8,481**	**-96**

a Negative (-) values denote a reduction of groundwater in storage. Positive (+) values denote an increase in groundwater in storage.
b Represents the nine-month period from January 1, 2016 through September 30, 2022.

2.2.2.3 Undesirable Results

Groundwater levels are used as a proxy for undesirable results associated with groundwater in storage. Groundwater elevations in both the Older Alluvium and LAS were below the minimum threshold groundwater elevations between January 2016 and the end of water year 2022. During this period, the VRGWFM suggests that groundwater in storage declined by approximately 10,000 AF in the PVB. These data indicates that the PVB experienced undesirable results associated with reduction of groundwater in storage.

The wet 2023 and 2024 water years promoted groundwater elevation recoveries across the PVB and over the last two years of the evaluation period, results from the VRGWFM suggest that groundwater in storage in the PVB increased by approximately 15,800 AF. This has resulted in a net increase in storage in the PVB of approximately 5,800 AF.

2.2.2.4 Progress Toward Achieving Sustainability

As described in Section 2.2.1.5, GSP implementation has been effective thus far in achieving the sustainability goal for the PVB by 2040.

2.2.2.5 Adaptive Management Approaches

FCGMA's approach to adaptive management is described in Section 2.2.1.6.

2.2.2.6 Impacts to Beneficial Uses and Users of Groundwater

The benefits of GSP implementation on beneficial uses and users of groundwater in the PVB are described in Section 2.2.1.7.

2.2.2.7 Changes to Sustainable Management Criteria

Groundwater levels are used as a proxy for groundwater in storage. Proposed revisions for a subset of the minimum thresholds and measurable objectives are presented in Section 2.2.1.8.

2.2.3 Seawater Intrusion

2.2.3.1 DWR Recommended Corrective Actions

DWR issued a recommended corrective action related to seawater intrusion (DWR 2021). This recommended corrective action states:

> "Evaluate how the sustainability goals of Pleasant Valley Basin established for the dry climatic condition may affect the sustainability goals of the adjacent Oxnard Subbasin. Also, provide an assessment of the potential impact of sustainable management criteria adopted for Pleasant Valley Basin on seawater intrusion in the adjacent Oxnard Subbasin."

Effects of Dry Climate Conditions on the Sustainability Goal of the Oxnard Subbasin

The Oxnard Subbasin and PVB have historically experienced similar climatological conditions, and both benefit from the availability of Santa Clara River water during wet water years. Under dry climate conditions, groundwater elevations in the PVB and Oxnard Subbasin are anticipated to reach the minimum threshold groundwater elevations, rather than the measurable objectives, by 2040. These groundwater elevations will limit seawater intrusion into the Oxnard Subbasin (FCGMA 2019). For these climate conditions, groundwater elevations in the UAS of the Oxnard Subbasin and Older Alluvium of the PVB are expected to recover at a long-term average rate of approximately 2 feet per year and 1 foot per year, respectively (FCGMA 2019). In the LAS, groundwater elevations are expected to recover at a long-term average rate of approximately 3 feet per year in both the Oxnard Subbasin and PVB. The groundwater elevation recovery goals are similar for the Oxnard Subbasin and PVB.

FCGMA has historically managed the Oxnard Subbasin and PVB collectively. This collective management reflects the influence of groundwater conditions in one basin on another, and the influence of existing surface water and recycled water infrastructure on groundwater demands within the pumping depression that spans the two basins. Consistent with historical management of the Oxnard Subbasin and PVB, FCGMA anticipates managing the Oxnard Subbasin and PVB using the same climate trajectories. Because the groundwater elevation recovery goals in the Oxnard Subbasin and PVB are similar, the sustainability goals for dry climate in the PVB are not anticipated to affect the sustainability goals of the adjacent Oxnard Subbasin.

Impacts of Sustainable Management Criteria in the PVB on Seawater Intrusion in the Oxnard Subbasin

The SMC established for the PVB were developed using historical groundwater elevation measurements and future scenario numerical model results (FCGMA 2019). Because of the hydrogeologic connection between the two basins, the SMC for both basins were evaluated concurrently, using the same model and model simulations, to ensure that the minimum thresholds and measurable objectives do not impede on the adjacent basin's ability to achieve its sustainability goal. Further, the SMC in the Oxnard Subbasin and PVB are intended in increase groundwater elevations in the pumping depression that spans both basins, helping to mitigate seawater intrusion in the Oxnard Subbasin by 2040.

2.2.3.2 Seawater Intrusion Changes

The PVB is not impacted by direct seawater intrusion. However, groundwater elevations in the PVB impact seawater intrusion in the UAS and LAS of the Oxnard Subbasin. A description of seawater intrusion changes over the evaluation period in the Oxnard Subbasin is provided in FCGMA (2024b).

2.2.3.3 Undesirable Results

Because seawater intrusion has not occurred historically in the PVB and is not likely to occur in the PVB in the future, specific criteria for undesirable results related to seawater intrusion are not established in this GSP (FCGMA 2019).

2.2.3.4 Progress Toward Achieving Sustainability

As described in Section 2.2.1.5, GSP implementation has been effective thus far in achieving the sustainability goal for the PVB by 2040.

2.2.3.5 Adaptive Management Approaches

FCGMA's approach to adaptive management is described in Section 2.2.1.6.

2.2.3.6 Impacts to Beneficial Uses and Users of Groundwater

The benefits of GSP implementation on beneficial uses and users of groundwater in the PVB are described in Section 2.2.1.7.

2.2.3.7 Changes to Sustainable Management Criteria

Minimum thresholds and measurable objectives for seawater intrusion are not required in the PVB because the PVB is not adjacent to the Pacific Ocean (FCGMA 2019). However, the groundwater elevation minimum thresholds established for chronic lowering of groundwater levels, reduction of groundwater in storage, degraded water quality, and land subsidence were developed with consideration of the impacts that they have on seawater intrusion in the adjacent Oxnard Subbasin. Proposed revisions for a subset of the minimum thresholds and measurable objectives are presented in Section 2.2.1.8.

2.2.4 Degraded Water Quality

This section summarizes current groundwater quality conditions in the PVB and the relation to groundwater quality conditions at the end of the GSP reporting period. Due to the variation in groundwater quality monitoring schedules across the PVB, groundwater quality is characterized using the most recent groundwater samples collected over a 5-year window. For the GSP, groundwater quality conditions were characterized using the most recent groundwater sample collected during the period from 2011 through 2015. Groundwater quality conditions over the evaluation period were characterized using measurements collected during the period from 2019 through 2023.

The FCGMA adopted Basin Management Objectives (BMOs) for nitrate, chloride, and total dissolved solids (TDS) in the Basin as part of its 2007 Groundwater Management Plan (FCGMA 2007). Additionally, the Water Quality Control Plan: Los Angeles Region specifies water quality objectives for TDS, chloride, nitrate, sulfate, and boron (LARWQCB 2013). The GSP defines undesirable results for all five (5) of these constituents (FCGMA 2019).

2.2.4.1 DWR Recommended Corrective Actions

DWR issued a recommended corrective action related to water quality (DWR 2021). This recommended corrective action states:

> Elaborate how the Agency is planning to verify that the groundwater level thresholds are adequate to assess the groundwater quality conditions in the Basin. Discuss how the groundwater quality data from the existing monitoring network will be used for sustainable management of the Basin. Evaluate and describe how the Agency's current groundwater management strategy, in coordination with other agencies associated with water quality programs, is affecting groundwater quality in the Basin, and describe those effects on all beneficial users of the Basin.

Adequacy of Groundwater Level Thresholds as Proxies for Groundwater Quality

Degraded water quality resulting in a significant and unreasonable depletion of supply is an undesirable result applicable to the PVB. Groundwater quality conditions in the PVB are impacted by different mechanisms. In the NPVMA, ongoing inflows from the LPVB are the primary causes of water quality degradation. These inflows are a result of wastewater treatment plant and dewatering discharges to the Arroyo Simi-Las Posas outside of the PVB. Groundwater production in the NPVMA may result in significant and unreasonable results if the groundwater elevation gradient causes expansion of the currently impacted area into areas not previously impacted, thereby limiting agricultural and potable use (FCGMA 2019). In the PVPDMA, lowered groundwater elevations may influence the rate of brine migration into the FCA and GCA from underlying formations and along the Bailey Fault (FCGMA 2019).

North Pleasant Valley Management Area

The primary mechanism in place to address degraded water quality in the NPVMA is the NPV Groundwater Desalter project. This project, which is led by the City of Camarillo, aims to pump brackish water from the PVB and serve the treated water in areas impacted by historical inflows of poor-quality water from the LPVB (City of Camarillo 2015). The NPV Groundwater Desalter project operates under a Monitoring and Contingency Plan (MCP) that was developed in coordination with FCGMA. The MCP defines groundwater elevation, quality, seawater intrusion, and land subsidence contingency thresholds that, in effect, ensure that the project operates as designed and does not cause undesirable results within the PVB.

The groundwater elevation contingency threshold established in the NPV Groundwater Desalter project MCP requires project-related pumping to reduce once the groundwater elevation at well 02N20W19M06S or 02N20W19E01S drops below -126 ft. msl. The GSP established the minimum threshold groundwater elevation at the one existing key well in the NPVMA, 02N20W19M05S, at -135 ft. msl. This key well is located near the groundwater elevation contingency wells established in the NPV Groundwater Desalter MCP.

The City of Camarillo, in coordination with FCGMA, is in the process of developing a revised MCP. The current minimum threshold groundwater elevation at well 02N20W19M05S does not interfere with operation of the NPV Groundwater Desalter Project and, therefore, is appropriate to assess undesirable results associated with degraded water quality in this part of the PVB. The appropriateness of this minimum threshold will be re-evaluated when the MCP revisions are complete. FCGMA, in coordination with the City of Camarillo, will continue to monitor groundwater level and quality conditions in the NPVMA through implementation of the NPV Groundwater Desalter project. As part of this, FCGMA will evaluate the appropriateness of each contingency threshold, their relation to the SMC established in the GSP, and undesirable results associated with degraded water quality in the PVB.

Pleasant Valley Pumping Depression Management Area (PVPDMA)

The spatial and vertical distribution of wells screened solely within single aquifers of the PVPDMA remains a data gap in the PVB. For example, over the evaluation period, TDS, nitrate, and sulfate concentrations in the LAS generally increased. There are no wells in this part of the PVB that are screened solely within a single aquifer of the PVB, limiting the ability to characterize the relationship between groundwater quality and levels in the PVPDMA.

FCGMA, with partial funding from DWR's Sustainable Groundwater Management Act Implementation Grant Round 1, is constructing two multi-completion monitoring wells in the PVPDMA of the PVB. FCGMA will use these wells to collect depth-discrete groundwater elevations and quality samples, which will be used to improve understanding of the relationship between groundwater levels and quality in this part of the PVB. FCGMA anticipates completing construction of these wells in 2024 and collecting baseline samples and measurements in the first quarter of 2025. FCGMA will analyze the groundwater level and quality data collected over the subsequent 5 years to better characterize:

- The source of high TDS and chloride concentrations in the lower aquifers of the PVB; and
- The relationship between groundwater quality and levels within PVPDMA

FCGMA will use this data to verify that groundwater levels are adequate to assess groundwater quality conditions in the PVPDMA of the PVB.

Use of Existing Monitoring Network for Sustainable Groundwater Management

FCGMA and the City of Camarillo have constructed four new nested monitoring well clusters in the PVB since adoption of the GSP. These new wells are located exclusively within the NPVMA, where groundwater quality and elevations are, and will be in the future, impacted by operation of the NPV Groundwater Desalter project. Data collected through these wells and project will be used to evaluate changes in groundwater quality conditions in the NPVMA, and their relation to project operations and groundwater levels.

In the PVPDMA, FCGMA's new monitoring well clusters are anticipated to improve characterization of groundwater quality conditions in this part of the PVB. As noted above, FCGMA will analyze the groundwater level and quality data collected over the subsequent 5 years to better characterize:

- The source of high TDS and chloride concentrations in the lower aquifers of the PVB; and
- The relationship between groundwater quality and levels within PVPDMA

FCGMA anticipates regularly evaluating the relationship between groundwater quality and groundwater elevations as part of the periodic evaluation process to assess whether groundwater levels continue to be an appropriate proxy for groundwater quality.

Existing Management Strategies and Effects on Beneficial Users

FCGMA has supported, and developed policies that facilitate, projects that improve groundwater quality conditions within the PVB. The primary project in the PVB that improves groundwater quality is the NPV Groundwater Desalter project, which began extracting non-native brackish groundwater from the PVB in water year 2023. As part of this project, FCGMA authorized the City of Camarillo to extract up to 4,500 AFY of brackish groundwater from the LPVB in addition to their existing allocation in support of project operation (FCGMA 2016). In addition, FCGMA's pursuit of grant funds to construct new dedicated monitoring wells in the PVPDMA demonstrates the commitment to better characterize, and effectively manage, groundwater conditions in the southern part of the basin, where existing data gaps exist.

These FCGMA policies and actions are expected to improve groundwater quality conditions and positively impact beneficial uses and users in the PVB.

2.2.4.2 Groundwater Quality Changes in the Basin

2.2.4.2.1 Total Dissolved Solids

Older Alluvium

Over the 2019 to 2023 period, TDS concentrations in the Older Alluvium were highest in the southern portion of the PVPDMA, where they ranged from 1,240 milligrams per liter (mg/L) to 4,790 mg/L (Figure 2-14, Older Alluvium – Most Recent TDS (mg/L) Measured 2019-2023). In the NPVMA, TDS concentrations ranged from approximately 720 mg/L to 1,300 mg/L (Figure 2-14). In the 2019-2023 time period, TDS concentrations exceeded the water quality objective of 700 mg/L for all but one of the wells in the Older Alluvium (Figure 2-14).

TDS concentrations in the southeastern part of PVPDMA measured between 2019 and 2023 were generally higher than those measured between the 2011 and 2015 period (Figure 2-15, Change in TDS Concentration (mg/L) in the Older Alluvium, Between 2011-2015 and 2019-2023). At well 01N21W02J01S, the most recent 2019 to 2023 measured TDS concentration was approximately 690 mg/L higher than the 2011 to 2015 period. Farther south, near the Bailey Fault, the TDS concentration measured at well 01N21W15H01S was 400 mg/L higher than it was between 2011 and 2015. In the northern part of the PVPDMA, TDS concentrations were similar to those measured during the 2011 to 2015 period.

Lower Aquifer System

TDS concentrations exceeded the water quality objective of 700 mg/L for all but one of the wells in the LAS in the 2019-2023 period (Figure 2-16, Lower Aquifer System – Most Recent TDS (mg/L) Measured 2019-2023). In the LAS, TDS concentrations during the 2019 to 2023 period were generally highest in the north and central portion of the NPVMA, where they ranged from approximately 800 mg/L to 2,300 mg/L. Farther south in the NPVMA TDS concentrations ranged from approximately 970 mg/L to 990 mg/L (Figure 2-16). Seven of the 11 wells with TDS measurements during the 2019 to 2023 in the NPVMA were constructed after adoption of the GSP. The change in TDS concentrations in the NPVMA, ranged from approximately 210 mg/L higher than the 2011 to 2015 period to 430 mg/L lower than the 2011 to 2015 period (Figure 2-17, Change in TDS Concentration (mg/L) in the LAS between the Period from 2011-2015 and 2019-2023).

In the PVPDMA, TDS concentrations during the 2019 to 2023 period ranged from a low of approximately 700 mg/L to a high of approximately 1,690 mg/L (Figure 2-16). In the southern third of this management area, TDS concentrations were approximately 460 to 510 mg/L higher than they were between 2011 and 2015 (Figure 2-17). In the northern part of the PVPDMA, TDS concentrations in the LAS between 2019 and 2023 ranged from 160 mg/L lower than they were between 2011 and2015, to 160 mg/L higher than they were between 2011 and 2015.

2.2.4.2.2 Chloride

Older Alluvium

Between 2019 and 2023, chloride concentrations in the older alluvium were highest in the southern third of the PVPDMA, where they ranged from 230 to 650 mg/L (Figure 2-18, Older Alluvium – Most Recent Chloride (mg/L) Measured 2019-2023). In the northern two-thirds of this management area, chloride concentrations ranged from 60 to 130 mg/L (Figure 2-20). In the NPVMA, Chloride concentrations were approximately equal to 100 mg/L (Figure

2-22). Chloride exceeded the water quality objective of 150 mg/L for one third of the wells in the Older Alluvium between 2019 and 2023, similar to the period from 2011 to 2015.

Chloride concentrations were lower in the period between 2019 and 2023 than they were between 2011 and 2015 in the majority of the wells in the Older Alluvium (Figure 2-19, Change in Chloride Concentration (mg/L) in the Older Alluvium Between 2011-2015 and 2019-2023). However, at well 01N21W02J01S in the PVPDMA, the most recent chloride concentration was 190 mg/L higher than it was between 2011 and 2015 period (Figure 2-19).

Lower Aquifer System

Between 2019 and 2023, chloride concentrations in the LAS were generally highest in the NPVMA. In this part of the PVB, chloride concentrations in the LAS groundwater ranged from 125 to 1,200 mg/L (Figure 2-20, Lower Aquifer System – Most Recent Chloride (mg/L) Measured 2019 - 2023). In the PVPDMA, LAS chloride concentrations ranged from 67 to 230 mg/L (Figure 2-20). Chloride exceeded the water quality objective in over half of the wells in the LAS during the 2019 to 2023 period.

Chloride concentrations were similar to those measured during the 2011 to 2015 period (Figure 2-21, Change in Chloride Concentration (mg/L) in the LAS, Between 2011-2015 and 2019-2023). The largest increases in chloride concentration were in the PVPDMA, with a 49 mg/L increase at well 02N21W34G02S and a 40 mg/L increase at well 01N21W10G01S.

2.2.4.2.3 Nitrate

Older Alluvium

Between 2019 and 2023, nitrate concentrations in the Older Alluvium within the PVPDMA ranged from 0.4 to 228 mg/L (Figure 2-22, Older Alluvium – Most Recent Nitrate (mg/L) Measured 2019-2023). No quality data are available for the 2019 to 2023 period in the NPVMA. Nitrate exceeded the water quality objective of 45 mg/L in four of the six Older Alluvium wells measured in 2019 to 2023 and in three of the seven Older Alluvium wells measured in 2011 to 2015 periods.

Nitrate concentrations increased in four of the six wells with complete measurements since the 2011 to 2015 period (Figure 2-23, Change in Nitrate Concentration (mg/L) in the Older Alluvium Between 2011-2015 and 2019-2023). At well 01N21W02J01S in the PVPDMA, the most recent chloride concentration measured between 2019 and 2023 was 57 mg/L higher than the 2011 to 2015 period. Wells 01N21W03K01S and 01N21W10A02S increased approximately 20 mg/L and the remaining wells remained similar in concentration to the 2011 to 2015 period (Figure 2-23).

Lower Aquifer System

Over the 2019 to 2023 period, nitrate concentrations in the LAS were highest in the southern third of the PVPDMA and ranged from 7.3 to 42 mg/L (Figure 2-24, Lower Aquifer System – Most Recent Nitrate (mg/L) Measured 2019-2023). In the remainder of the PVB, nitrate concentrations ranged from 0.5 to 2.4 mg/L (Figure 2-24).

Nitrate concentrations increased for the wells measured in the southern third of the PVPDMA, with concentration increases ranging from 6 to 17 mg/L. For the remainder of the PVB, concentrations either decreased or remained the same as compared to the 2011-2015 concentrations (Figure 2-25, Change in Nitrate Concentration (mg/L) in the LAS, Between 2011-2015 and 2019-2023).

2.2.4.2.4 Sulfate

Older Alluvium

Over the 2019 to 2023 period, sulfate concentrations in the Older Alluvium were highest in the southeastern third of the PVPDMA, where they ranged from 906 to 2,180 mg/L (Figure 2-26, Older Alluvium – Most Recent Sulfate (mg/L) Measured 2019-2023). Sulfate concentrations ranged from 202 to 630 mg/L in the remainder of the Older Alluvium (Figure 2-26). Older Alluvium sulfate concentrations exceeded the water quality objective of 300 mg/L in in all but one of the wells measured in PVPDMA and one of the four wells measured in the NPVMA.

Older Alluvium sulfate concentrations generally increased from the 2011 to 2015 period compared to 2019 to 2023 period in the southern half of the PVPDMA (Figure 2-27, Change in Sulfate Concentration (mg/L) in the Older Alluvium, between 2011-2015 and 2019-2023) while concentrations decreased in the northern half of the PVPDMA. No concentration data were available for the NPVMA for the period from 2011-2015, at the time that the GSP was prepared.

Lower Aquifer System

Sulfate concentrations measured in the LAS between 2019 and 2023 were the highest in the central northern NPVMA, where they ranged from 96 to 880 mg/L (Figure 2-28, Lower Aquifer System – Most Recent Sulfate (mg/L) Measured 2019-2023). LAS sulfate concentrations ranged from 206 to 668 mg/L in the PVPDMA (Figure 2-28). Sulfate concentrations exceeded the water quality objective for over half the wells across the LAS, similar to the 2011 to 2015 period.

LAS sulfate concentration changes from the 2011 to 2015 period varied geographically (Figure 2-29, Change in Sulfate Concentration (mg/L) in the LAS Between the Period from 2011-2015 and 2019-2023). The largest increase in sulfate was in the southwestern part of the PVB, adjacent to the Oxnard Subbasin.

2.2.4.2.5 Boron

Older Alluvium

Over the 2019 to 2023 period, boron concentrations in the Older Alluvium within the PVPDMA ranged from 0.2 to 2 mg/L (Figure 2-30, Older Alluvium – Most Recent Boron (mg/L) Measured 2019-2023). Concentrations in two of the wells sampled were above the RWQCB's water quality objective of 1 mg/L, similar to the 2011 to 2015 period. No concentration data were available for the Older Alluvium in the NPVMA for the periods from 2019-2023 and 2011-2015.

Boron concentrations in the Older Alluvium in the 2019 to 2023 period were similar to those in the 2011 to 2015 period (Figure 2-31, Change in Boron Concentration (mg/L) in the Older Alluvium, Between 20112015 and 2019-2023). The changes in concentration ranged from a 0.3 mg/L decrease to a 0.1 mg/L increase (Figure 2-31).

Lower Aquifer System

Boron concentrations in the LAS over the 2019 to 2023 period remained below the water quality objective across the Basin (Figure 2-32, Lower Aquifer System – Most Recent Boron (mg/L) Measured 2019-2023). Concentrations ranged from 0.2 to 0.8 mg/L in the PVPDMA and from no detection to 0.7 mg/L in the NPVMA. Boron measurements across the Basin in the LAS were the same or lower than the concentrations measured in the 2011 to 2015 period (Figure 2-33, Change in Boron Concentration (mg/L) in the LAS Between 2011-2015 and 2019-2023).

2.2.4.3 Undesirable Results

Groundwater levels measured at the key wells in the Basin are used as a proxy for undesirable results associated with degraded water quality. Undesirable results were not defined for specific constituents. As discussed in Section 2.2.1, groundwater levels met the criteria for undesirable results. As described in Section 2.2.4.1, DWR Recommended Corrective Actions, FCGMA will analyze groundwater quality and level data collected from new monitoring wells and as part of the NPV Groundwater Desalter project to evaluate the adequacy of using groundwater levels to assess groundwater quality in the PVB.

2.2.4.4 Progress Toward Achieving Sustainability

As described in Section 2.2.1.5, GSP implementation has been effective thus far in achieving the sustainability goal for the PVB by 2040. In addition, the NPV Groundwater Desalter Project began extracting brackish groundwater from the PVB in 2023 (City of Camarillo 2024). Operation of this project helps to improve degraded water quality in the PVB.

However, as noted in the GSP, the relationship between groundwater quality impacts from flows along Arroyo Simi–Las Posas that originate outside of the PVB and groundwater production within the PVB is not well established. This constitutes a data gap that will continue to be evaluated over the next 5 years. Water quality will continue to be monitored at monitoring well locations identified by FCGMA and its partner agencies. As additional data are collected, the effectiveness of applying a water level threshold to groundwater quality degradation will continue to be assessed.

2.2.4.5 Adaptive Management Approaches

FCGMA's approach to adaptive management is described in Section 2.2.1.6.

2.2.4.6 Impacts to Beneficial Uses and Users of Groundwater

The benefits of GSP implementation on beneficial uses and users of groundwater in the PVB are described in Section 2.2.1.7.

2.2.4.7 Changes to Sustainable Management Criteria

Groundwater levels are used as a proxy for degraded water quality. Proposed revisions for a subset of the minimum thresholds and measurable objectives are presented in Section 2.2.1.8.

2.2.5 Land Subsidence

2.2.5.1 DWR Recommended Corrective Actions

DWR issued a recommended corrective action related to land subsidence (DWR 2021). This recommended corrective action states:

> "Include a periodic subsidence monitoring plan that can be used to quantify whether land subsidence is occurring and whether the groundwater level proxy is avoiding undesirable results associated with land subsidence. As an option, the Department provides statewide InSAR data that can be used for monitoring land subsidence."

The minimum threshold and measurable objective groundwater levels in the Basin are higher than historical low groundwater elevations, except at well 02N20W19M05S. Because of this, groundwater management under the GSP is not anticipated to cause land subsidence, related to groundwater production, that would significantly impact land uses and critical infrastructure. To monitor these conditions in the future, FCGMA has incorporated periodic subsidence monitoring into the GSP monitoring network. Subsidence monitoring will be performed using DWR's statewide InSAR datasets (Section 7.4, Functionality of Additional Monitoring Network).

2.2.5.2 Land Subsidence Changes

Since June 2015, DWR's InSAR data indicates that land surface elevation changes have varied across the PVB. In the NPVMA, land surface elevations have locally declined by approximately 2.5 inches (Figure 2-34, Land Subsidence June 2015 to January 2024). In the PVPDMA, land surface elevations have increased by approximately 1 inch. There are no known reports that these land-surface deformations have impacted land uses or critical infrastructure within the PVB.

2.2.5.3 Undesirable Results

The GSP defines undesirable results associated with land subsidence as land subsidence that "substantially interferes with surface and land uses" (FCGMA 2019). The land subsidence measured during the evaluation did not substantially interfere with surface and land uses. Therefore, undesirable results associated with land subsidence did not occur during the evaluation period.

2.2.5.4 Progress Toward Achieving Sustainability

As described in Section 2.2.1.5, GSP implementation has been effective thus far in achieving the sustainability goal for the PVB by 2040.

2.2.5.5 Adaptive Management Approaches

FCGMA's approach to adaptive management is described in Section 2.2.1.6.

2.2.5.6 Impacts to Beneficial Uses and Users of Groundwater

The benefits of GSP implementation on beneficial uses and users of groundwater in the PVB are described in Section 2.2.1.7.

2.2.5.7 Changes to Sustainable Management Criteria

Groundwater levels are used as a proxy for land subsidence. Proposed revisions for a subset of the minimum thresholds and measurable objectives are presented in Section 2.2.1.8.

2.2.6 Depletions of Interconnected Surface Water

2.2.6.1 DWR Recommended Corrective Actions

DWR issued a recommended corrective action related to groundwater-surface water connections (DWR 2021). This recommended corrective action states:

> "Investigate the hydraulic connectivity of the surface water bodies to the shallow aquifers and principal aquifers to improve the understanding of potential migration of impaired water, the reliance of the potential GDEs on the shallow aquifer(s), and depletion of interconnected surface water bodies. Identify specific locations of gaining and losing reaches of interconnected surface water and quantify the depletion of interconnected surface water. Provide a timeline and discuss the steps that will be taken to fill the data gap identified in the GSP related to shallow groundwater monitoring near surface water bodies and GDEs."

In 2022, FCGMA was awarded grant funds through DWR's Sustainable Groundwater Management Grant Program to support implementation of projects developed during the GSP and subsequent stakeholder discussions. One component of this grant project is the construction of shallow and multi-depth monitoring wells in the Basin to address groundwater elevation data gaps identified in the GSP. The shallow monitoring wells funded through this program are planned along Arroyo Las Posas and Calleguas Creek located in the NPVMA, and along Conejo Creek within the EPVMA. FCGMA anticipates completing construction of these shallow wells in the 2024 calendar year and integrating these data into the GSP starting in water year 2025. Data collected through these new wells will be used to improve understanding of the connectivity between surface water bodies, the semi-perched aquifers, and the principal aquifer and shallow alluvium within the Basin.

2.2.6.2 Undesirable Results

The undesirable results associated with depletion of interconnected surface water in the Basin is loss of GDE habitat. The primary cause of groundwater conditions in the Basin that would lead to loss of GDE habitat would be reduced streamflow in the lower Arroyo Simi-Las Posas, Calleguas Creek, and Conejo Creek, both upstream and within the boundaries of the Basin. Groundwater production within the shallow alluvium, which is not a principal aquifer of the Basin, can also lower the groundwater elevation near the potential GDEs. However, there was limited pumping from the shallow alluvium over the evaluation period (Table 2-3c, UWCD Water Budget for the Semi-Perched aquifer). In addition, satellite-based estimates of habitat health at the four GDEs identified in the GSP indicate that habitat conditions are similar to those at the start of 2016 (TNC 2024). These data suggest that undesirable results associated with depletion of interconnected surface water and GDEs have not occurred during the evaluation period.

Table 2-3c. UWCD Model Water Budget for the shallow alluvium

WY	Groundwater Recharge (Acre-Feet)			Groundwater Discharge (Acre-Feet)						Change in Groundwater in Storage (Acre-Feet)
	Recharge	Creek Percolation	TOTAL INFLOW	Pumping	Tile Drains	Subsurface Outflow to UAS	Evapotrans-Tranpiration (ET)	Subsurface Outflow to Oxnard Subbasin	TOTAL OUTFLOW	
2016*	2,806	6,319	9,126	-241	-211	-9,248	0	-1,645	-11,345	-2,219
2017	6,103	8,610	14,713	-301	-335	-11,781	0	-2,202	-14,619	94
2018	3,798	8,646	12,443	-302	-323	-11,838	0	-2,122	-14,586	-2,142
2019	5,266	9,725	14,990	-282	-338	-11,401	0	-2,144	-14,165	825
2020	4,627	7,660	12,287	-263	-358	-10,456	0	-2,065	-13,143	-856
2021	3,019	7,186	10,205	-263	-271	-10,578	0	-1,701	-12,814	-2,609
2022	4,407	8,239	12,646	-273	-256	-10,560	0	-1,626	-12,715	-69
Average	**4,289**	**8,055**	**12,344**	**-275**	**-299**	**-10,837**	**0**	**-1,930**	**-13,341**	**-997**

a GHB = General Head Boundary Condition, which represents recharge to the semi-perched aquifer through Channel Island Harbor, Port Hueneme, and Duck Ponds north of Naval Base Ventura County at Point Mugu.
b Negative (-) values denote a reduction of groundwater in storage. Positive (+) values denote an increase in groundwater in storage.
c Represents the nine-month period from January 1, 2016 through September 30, 2022.

2.2.6.3 Progress Toward Achieving Sustainability

As described in Section 2.2.1.5, GSP implementation has been effective thus far in achieving the sustainability goal for the PVB by 2040. In addition, the NPV Groundwater Desalter Project began extracting brackish groundwater from the PVB in 2023 (City of Camarillo 2024) – operation of this project helps to improve degraded water quality in the PVB.

2.2.6.4 Adaptive Management Approaches

FCGMA's approach to adaptive management is described in Section 2.2.1.6.

2.2.6.5 Impacts to Beneficial Uses and Users of Groundwater

The benefits of GSP implementation on beneficial uses and users of groundwater in the PVB are described in Section 2.2.1.7. In addition to the previously described benefits, satellite-based estimates of habitat health show that environmental users of groundwater in the PVB have not been impacted during the evaluation period (TNC 2024).

2.2.6.6 Changes to Sustainable Management Criteria

The GSP did not establish SMC for the depletion of interconnected surface water. Data collected through FCGMA's planned shallow monitoring wells along Arroyo Las Posas and Calleguas Creek will inform the need to establish sustainable management criteria for depletion of interconnected surface water.

3 Status of Projects and Management Actions

The GSP identified one project and one management action that support implementation of the GSP and groundwater sustainability in the PVB (FCGMA 2019). The project identified in the GSP was a Voluntary Temporary Agricultural Land Fallowing Project. The management action identified in the GSP was reduction in groundwater production from the PVB. Since adoption of the GSP, FCGMA and other agencies in the Basin have identified, designed, funded, and implemented a broader range of projects that increase water supplies and reduce groundwater demands within the PVB.

To facilitate funding, implementation, and integration into the GSP modeling, FCGMA developed a formal process for evaluating, ranking, and prioritizing projects within the PVB. This project evaluation process was developed under the guidance of the FCGMA Board of Directors' Operations Committee, with participation by of other agencies and stakeholders in the PVB. The project evaluation process includes a set of evaluation criteria, guidelines, and policies for vetting, adding, and prioritizing projects. FCGMA adopted the project prioritization process and solicited the first found of project information from agencies in the PVB in September 2023. The adoption of this process provides stakeholders and other agencies in the PVB with the opportunity to submit new or updated project information for consideration in the GSP to FCGMA on an annual basis.

This section of the GSP evaluation provides an assessment of the projects and management actions identified in the GSP, summarizes all new projects that have been identified in the PVB that support GSP implementation, and describes the process for public notice and engagement throughout the implementation of projects and management actions in the Subbasin.

3.1 Evaluation of Projects and Management Actions Identified in the GSP

3.1.1 Management Actions

In 2019, FCGMA adopted an ordinance to establish a new fixed extraction allocation system that supports managing groundwater demand in the PVB in a manner consistent with the SGMA and the GSP. Since adoption of the GSP, FCGMA has adopted ordinance amendments and resolutions to facilitate transition to the new ordinance, provide policies and procedures for seeking variances, and made modifications required under a court order addressing a challenge to the ordinance. Additionally, FCGMA adopted resolutions increasing tiered groundwater surcharge rates for extractions that exceed allocation. The surcharge provides an economic disincentive to extract groundwater exceeding allocation.

The new extraction allocation system supports FCGMA's implementation of the management action identified in the GSP. Activities accomplished associated with each management action to date are summarized in Table 3-1.

3.1.2 Projects

3.1.2.1 Project No. 1: Voluntary Temporary Agricultural Land Fallowing Project

3.1.2.1.1 Description of Project No. 1

The Voluntary Temporary Agricultural Land Fallowing Project would use replenishment fees to temporarily fallow agricultural land (FCGMA 2018). This would result in decreased groundwater production on the parcels or ranches that are fallowed, and an overall reduction in groundwater demand in the PVB. (FCGMA 2018).

Project No. 1 would use the existing monitoring network to evaluate improved groundwater conditions.

3.1.2.1.2 Benefits and Impacts of Project No. 1

Realized Benefits

This project is conceptual; thus, benefits have not yet been realized.

Expected Benefits

Temporary fallowing is a quick way to reduce demand with no capital costs or infrastructure needed. Because it is inexpensive, it is envisioned that temporary fallowing could be implemented early, while other long-term solutions are investigated and implemented. The Temporary Agricultural Land Fallowing Project will benefit the Basin by helping meet the measurable objective water levels. This project would be utilized in conjunction with other projects and management actions to reduce the groundwater demand in the subbasin.

Impacts to beneficial uses and users

Temporary Agricultural Land Fallowing will increase groundwater elevations in the Basin, and thus have a positive impact on beneficial uses and users.

Table 3-1. Status of Projects and Management Actions Identified in the GSP

Number	Name	Description	Status	Expected Schedule	Benefits Observed to Date	Estimated Accrued Benefits at Completion
Management Actions						
1	Reduction in Groundwater Production	Reduce Groundwater production by monitoring and imposing quantitative limits on pumpers; with governing authority from the FCGMA Board.	Not Implemented	Not defined	Establishment of a fixed groundwater extraction allocation system.	Recovery of groundwater levels that have contributed to seawater intrusion in the Oxnard Subbasin.
Projects						
1	Temporary Agricultural Land Fallowing Project	Utilize replenishment fees to lease and temporarily fallow agricultural land	Not Implemented	Not defined	N/A	Up to 2,400 AFY groundwater demand reduction

3.2 Newly Identified Projects and Management Actions

FCGMA and other agencies in the Subbasin have undertaken significant efforts to identify, evaluate, fund, and implement additional projects in the PVB and Oxnard Subbasin that increase water supplies in the PVB and support GSP implementation. These projects were not included in the GSP. A portion of these projects were incorporated into the GSP through the 2021 GSP Annual Report for the PVB (FCGMA 2022) and a portion of these projects were identified through FCGMA's new project evaluation process. These projects are summarized below and in Table 3-2.

3.2.1 Project No. 2: Laguna Road Recycled Water Pipeline Interconnection

3.2.1.1 Description of Project No. 2

This project, which is a complementary project to the PVCWD Recycled Water Connection Pipeline project, is a new pipeline interconnection to allow conveyance of recycled water from Pleasant Valley County Water District's system to UWCD's Pumping Trough Pipeline (PTP) system to allow full utilization of available recycled water. This interconnection will also allow delivery of water from the PTP system to the PVCWD distribution system when such movement would optimize conjunctive use opportunities to improve sustainable yield in the Pleasant Valley Basin. Benefits of using more recycled water in the PTP system include higher groundwater levels, more groundwater in storage, and improved groundwater quality in the Pleasant Valley Basin. The PVCWD service area will receive additional recycled water for agricultural use, reducing pumping and increasing groundwater elevations. This project is largely funded by a subgrant to UWCD from the DWR SGMA Implementation Grant awarded to FCGMA.

Project No. 7 uses the existing monitoring network to evaluate improved groundwater conditions.

3.2.1.2 Benefits and Impacts of Project No. 2

Realized Benefits

This project is currently under construction; thus, benefits have not yet been realized.

Expected Benefits

Benefits of using more recycled water in the PTP system will include higher groundwater levels, more groundwater in storage, improved groundwater quality, and reduced potential for seawater intrusion in the Oxnard Subbasin. This project will reduce pumping from the UAS and the potential for migration of high-TDS water into the aquifers. The PTP area will receive additional recycled water for agricultural use, reducing pumping in those areas, which will increase groundwater elevations and improve groundwater quality, while reducing potential for subsidence. The PTP area will receive the most direct and immediate benefit, but reduction of pumping in the Oxnard Pumping Depression Management Area should benefit groundwater levels in the adjacent Pleasant Valley Pumping Depression Management Area.

Impacts to beneficial uses and users

The Laguna Road Recycled Water Pipeline Interconnection will reduce groundwater demands within the PVB, increasing groundwater levels, and thus will have a positive impact on beneficial uses and users.

3.2.2 Project No. 3: PVCWD Recycled Water Connection Pipeline

3.2.2.1 Description of Project No. 3

This project proposes to connect the east and west zones of PVCWD's distribution system. This will allow PVCWD to more effectively distribute up to 4,000 AFY of recycled water from the City of Oxnard's AWPF and an additional 1,000 to 2,000 AFY of surface water from Conejo Creek. This water will be available to PVCWD and the UWCD PTP system. This project is a complimentary project to the UWCD Laguna Road Recycled Water Pipeline Project. Blending the high-quality recycled water with existing water sources will result in reduced water use within the Basin because the higher quality water will improve uptake by crops and increase crop yields. Better access to and distribution of Conejo Creek water will result in less water stranded due to bottlenecks in the distribution system. This, in turn, will decrease in groundwater demands.

3.2.2.2 Benefits and Impacts of Project No. 3

Realized Benefits

This project is still in the planning stage; therefore, no benefits have been realized.

Expected Benefits

This project anticipates decreasing demand for groundwater in the Pleasant Valley basin with the use of additional surface water following rainfall events. This would allow groundwater elevations to rise and improve groundwater elevations relative to the measurable objectives.

Impacts to beneficial uses and users

Increases in groundwater elevations associated with implementation of this project is expected to benefit all groundwater uses and users in the Basin.

3.2.3 Project No. 4: PVCWD Private Reservoir Program

3.2.3.1 Description of Project No. 4

PVCWD has access to various water sources, including Conejo Creek diversions, that are available during rain events. During these rain events and for a brief period directly following them, demand within the PVCWD system is depressed. PVCWD maintains approximately 250 AF of storage. Additionally, a portion of PVCWD pumpers maintain onsite private storage. While a formal accounting of this storage has not been completed, it is estimated to be on the order of 100 AF. To utilize water that is available following rain events, it is necessary to store and retain the water until demands return.

This project seeks to incentivize the utilization of existing, and the construction of new, privately owned, and operated reservoirs for the use of surface water capture during rain events for the purpose of expanding storage capacity within the PVCWD service area. This will increase capture and use of surface waters and reduce groundwater demand, benefitting the entire groundwater basin. In addition to meeting the needs of capturing and utilizing winter flows, the project will also serve a dual purpose of achieving land fallowing. Utilizing a depth of 5 feet, 20 AF of storage corresponds to approximately 4 acres of land. A program target of 200 AF would correspond to approximately 40 acres of land fallowing.

3.2.3.2 Benefits and Impacts of Project No. 4

Realized Benefits

This project is still in the planning stage; therefore, no benefits have been realized.

Expected Benefits

This project anticipates decreasing demand for groundwater in the Pleasant Valley basin with the use of additional surface water following rainfall events. This would allow groundwater elevations to rise and improve groundwater elevations relative to the measurable objectives.

Impacts to beneficial uses and users

Increases in groundwater elevations associated with implementation of this project is expected to benefit all groundwater uses and users in the Basin.

3.2.4 Project No. 5: Purchase of Supplemental State Water Project Water

3.2.4.1 Description of Project No. 5

This project proposes purchasing supplemental State Water Project water (State Water) for recharge in the Oxnard Subbasin and delivery to users on PTP and PVCWD systems in years when State Water is available and willing participants can be found to execute a water transfer. "Supplemental" refers to State Water purchased, exchanged, or transferred for use in the Oxnard and Pleasant Valley basins, in excess of UWCD's Table A allocation, which is 3,150 AFY (in an average year, only about 60% of allocated State Water is actually delivered by DWR). The annual volume of State Water transfers that can be purchased will depend on the volume available and the price that UWCD and other Ventura County agencies are willing to pay. UWCD anticipates that over the long-term approximately 6,000 AFY of supplemental State Water imports will be available at the Freeman Diversion for use within the Oxnard Subbasin and PVB.

This project uses the existing monitoring network to evaluate improved groundwater conditions.

3.2.4.2 Benefits and Impacts of Project No. 5

Realized Benefits

Importation of supplemental State Water has already begun. In 2019, FCGMA funded UWCD's purchase of 25,000 AF of supplemental State Water for recharge in the Oxnard Subbasin and PVB. Between 2019 and 2021, UWCD purchased an additional 10,000 AF of supplemental State Water for recharge and delivery in the Oxnard Subbasin and PVB. Realized benefits are an increase in groundwater elevations as a result of recharge in the Forebay and a reduction in groundwater pumping as a result of surface water deliveries for use in-lieu of groundwater.

Expected Benefits

This project anticipates increasing the combined sustainable yield of the Oxnard Subbasin and the Pleasant Valley basin by approximately 6,000 AFY.

Impacts to beneficial uses and users

The Purchase of Supplemental State Water Project Water will increase sustainable yield in the Basin, and thus have a positive impact on beneficial uses and users. Project impacts are intended to increase sustainable yield for all users.

3.2.5 Project No. 6: Extraction Barrier and Brackish Water Treatment Project

3.2.5.1 Description of Project No. 6

This project is intended to create a seawater intrusion barrier in the Oxnard Subbasin, near Point Mugu, by extracting brackish groundwater in the Oxnard and Mugu aquifers near the coast and maintaining a pumping trough that helps prevent landward migration of seawater. Creation of a barrier to seawater intrusion will increase the sustainable yield of the Oxnard Subbasin and may impact water levels in the adjacent PVB and the WLPMA of the LPVB. In addition, this project will (1) produce desalinated potable water for municipal and industrial use, agricultural use, and/or artificial recharge from currently saline portions of the aquifers and (2) reduce the area and volume of the aquifers that are currently contaminated with seawater, thereby increasing storage capacity for fresh water.

Project components include construction of: (1) extraction barrier wells near Mugu Lagoon, (2) a reverse-osmosis treatment plant, and (3) a conveyance system for distribution of treated water. The brackish groundwater extracted in the Point Mugu area will be treated for beneficial use, including artificial recharge and/or direct delivery to water users (e.g., PTP, Pleasant Valley Pipeline [PVP]). Benefits will include limiting further seawater intrusion, reversing the impacts of seawater intrusion in localized areas, and improving groundwater quality.

The project is envisioned to be advanced in multiple phases. The first phase of the project includes construction of monitoring well clusters and data collection in the vicinity of the proposed project site to aid in optimizing the project design. The monitoring well clusters will be used to collect groundwater quality and level data from the aquifers that will be pumped as part of the extraction barrier, as well as the Semi-perched aquifer. The data collected from these wells will be used to: 1) refine understanding of horizontal and vertical conductivity of the aquifers and confining layers, to aid in design of the extraction wellfield; 2) provide additional data regarding geochemistry of the aquifers that will be pumped as part of the extraction; and 3) assess whether contaminants in some shallow portions of the Semi-perched aquifer are likely to migrate toward the extraction wells, now or in the future. Additionally, Phase 1 will include construction and operation of approximately 10 groundwater extraction wells that operate at an average annual production rate of approximately 3,500 AFY.

The second phase of the project includes design and construction of ten (10) additional extraction wells, design and construction of the treatment plant, and the conveyance system for treated water distribution and a connection to Calleguas Salinity Management Pipeline for reverse osmosis (RO) brine discharge. Full build-out of the EBB project is designed to pump and treat 10,000 AFY of brackish water from the Oxnard Subbasin.

Other supporting activities include additional groundwater modeling, geophysical studies, and operation of a pilot-scale extraction/treatment system that will help refine the extent of extraction and treatment needs.

3.2.5.2 Benefits and Impacts of Project No. 6

Realized Benefits

This project is currently in design and permitting; thus, benefits have not yet been realized.

Expected Benefits

This project should aid with achievement of measurable objectives and minimum thresholds for four out of six sustainability criteria by limiting seawater intrusion near Point Mugu, raising groundwater elevations in the Forebay, improving groundwater quality, and increasing fresh groundwater in storage in the aquifers (replacing the existing intruded seawater). The project anticipates increasing the combined annual sustainable yield of the Oxnard Subbasin and PVB, considering both the quantity of treated brackish water supplied by the project and the effects on sustainable yield resulting from mitigating existing and future seawater intrusion.

Impacts to beneficial uses and users

The Extraction Barrier and Brackish Water Treatment Project will increase sustainable yield in the Oxnard Subbasin and PVB, and thus have a positive impact on beneficial uses and users. Project impacts are intended to increase sustainable yield for all users.

3.2.6 Project No. 7: Freeman Diversion Expansion Project

3.2.6.1 Description of Project No. 7

UWCD currently operates the Freeman Diversion on the Santa Clara River, which diverts surface water flows from the river into groundwater recharge facilities in the Oxnard Forebay and directs surface-water deliveries to growers via UWCD's and PVCWD pipelines. In recent years, more restrictive environmental regulations have lessened the amount of Santa Clara River surface water available that can be diverted at the Freeman Diversion. The Freeman Diversion Expansion Project proposes to construct facilities capable of diverting surface water at higher flow rates and with higher sediment loads than currently possible. Use of flows with higher sediment loads, which are less conducive to fish migration, has been encouraged by both regulatory agencies and non-governmental organizations (FCGMA 2019). The expansion project has advanced since the GSP was submitted to DWR. This project description reflects the updated understanding of the project based on work that was completed since 2018.

This project requires expansion of the existing intake, conveyance, and recharge facilities associated with Freeman Diversion and, in a subsequent phase, an associated increase in UWCD's right to divert surface water from the Santa Clara River from 375 cubic feet per second to 750 cubic feet per second instantaneous flow during periods of peak flow in the river. When constructed, this project will result in additional recharge and conjunctive use of flood/storm flows in both Oxnard and Pleasant Valley Basins. UWCD will improve fish passage and implement a new Multi-Species Habitat Conservation Plan, concurrent with this project.

Increased volume of diverted water will be used for artificial recharge and conjunctive use via the PTP in Oxnard Subbasin and PVB. Benefits will include higher groundwater levels, more groundwater in storage, reduced potential for seawater intrusion and land subsidence, and improved groundwater quality. The project will improve groundwater quality in the Forebay because the diverted surface water is of higher chemical quality (i.e., lower TDS) than groundwater. Historical data show a direct relationship between diversion and recharge rates with groundwater quality at several water-supply wells in the Forebay. The areas served by the PTP and the PVP will receive additional surface-water deliveries for conjunctive use, reducing pumping and increasing groundwater elevations. Higher groundwater elevations will reduce the potential for subsidence related to groundwater production in the Oxnard Subbasin and PVB.

Some components of this project have been designed or are constructed already. Next-step project components include expansion of existing conveyance structures (inverted siphon, 3-barrel culvert, and extension of the conveyance system to connect to UWCD's new Ferro-Rose spreading basin via a new undercrossing at Vineyard Ave.

3.2.6.2 Benefits and Impacts of Project No. 7

Realized Benefits

UWCD is currently expanding and extending existing conveyance structures and connections to the Ferro-Rose recharge basin in the Oxnard Subbasin to allow for more recharge and increase diversions, within their existing water rights, from the Santa Clara River.

Expected Benefits

Increased volume of diverted water will be used for artificial recharge and conjunctive use via the PTP in PVB. Benefits will include higher groundwater levels, more groundwater in storage, reduced potential for seawater intrusion and land subsidence, and improved groundwater quality. The areas served by the PTP and PVP will receive additional surface-water deliveries for conjunctive use, reducing pumping and increasing groundwater elevations. Higher groundwater elevations will reduce the potential for subsidence related to groundwater production in the Basin.

Impacts to beneficial uses and users

The Freeman Diversion Expansion Project will increase sustainable yield in the Subbasin, and thus have a positive impact on beneficial uses and users

3.2.7 Project No. 8: Houweling Nursery's Indoor Grow Facility RO Brine Recovery Project

3.2.7.1 Description of Project No. 8

Houweling Nursery's indoor grow facility in Camarillo has grown hydroponic tomatoes and cucumbers on approximately 125 acres of land over the last 14 years. This grow operation requires approximately 800 AFY which is supplied by a mix of groundwater and purified / reused hydroponic wastewater returning from the plants. This grow operation desalinates the groundwater and hydroponic waste feed onsite using a dedicated RO system which is capable of recovering approximately 60 to 70% of the influent. Thus, approximately 300 AFY of water is not recoverable through the current system.

This project seeks to recover 99% of the RO effluent processed using zero liquid discharge treatment of RO brine. This project will be sized to process 200 gallons per minute of brine, which will give it the ability to generate up to 320 AFY of treated water for re-use. Previously, zero liquid discharge technology has been prohibitively expensive for use in the agricultural industry. New innovations may reduce costs by approximately 80% over previous estimates, thereby making this cost-effective to implement. If this project is successful, it would reduce groundwater demand in the PVB by approximately 320 AFY.

Since this project was proposed, the Houweling Nursery property has been sold and the project is on indefinite hold.

3.2.7.2 Benefits and Impacts of Project No. 8

Realized Benefits

This project has not been implemented. Thus, project have not been realized.

Expected Benefits

This project anticipates decreasing demand for groundwater in the Pleasant Valley basin with the use of zero liquid discharge of brine. This would allow groundwater elevations to rise and improve groundwater elevations relative to the measurable objectives.

Impacts to beneficial uses and users

Increases in groundwater elevations associated with implementation of this project is expected to benefit all groundwater uses and users in the Basin.

3.2.8 Project No. 9: Installation of Multi-Depth Monitoring Wells

3.2.8.1 Description of Project No. 9

This project proposes installation of multi-depth monitoring wells in the PVB at up to three locations to assess groundwater conditions in the principal aquifers in areas that lack data. The GSP determined that there were spatial data gaps in the understanding of aquifer conditions and identified six potential new well locations that would help fill the gaps identified. Since the GSP was submitted to DWR, two multi-depth monitoring wells were installed near location Potential New Well (PNW)-22 in the northern PVB. In reviewing the GSP, DWR identified investigation of the groundwater conditions in the GCA as a recommended corrective action for the first 5-year GSP evaluation. The addition of multi-depth monitoring wells, completed in each of the principal aquifers, including the GCA, will help refine the understanding of aquifer properties, groundwater flow directions and vertical gradients. These wells will also provide information that can be used to determine SMC for the GCA.

Up to three locations were identified: vicinity of PNW 17, in the EPVMA, PNW 21 in the Pleasant Valley Pumping Depression Management Area, and PNW 20 in the NPVMA would provide a more complete understanding of groundwater conditions in the various management areas within the PVB.

3.2.8.2 Benefits and Impacts of Project No. 9

Realized Benefits

In 2022, FCGMA was awarded grant funds through DWR's SGMA Implementation Grant Program to support implementation of projects developed during the GSP and subsequent stakeholder discussions. Up to three multi-depth monitoring wells were partially funded through this program. FCGMA anticipates completing construction of two of the multi-depth wells in the 2024 calendar year.

Expected Benefits

The expected benefits of this project lie in the additional data gathered from the well installation process and the ongoing monitoring of the groundwater conditions at the well sites. This data can be used to refine the conceptual and numerical models of the PVB. Such refinement may result in reevaluation and adjustment of the minimum thresholds or measurable objectives.

Impacts to beneficial uses and users

The installation of multi-depth monitoring wells will improve data collection and management of groundwater resources for beneficial uses and users. Projects impacts are intended to benefit all users.

3.2.9 Project No. 10: Installation of Shallow Monitoring Wells

3.2.9.1 Description of Project No. 10

This project proposes installation of shallow monitoring wells to assess groundwater conditions along Arroyo Las Posas, Conejo Creek, and Calleguas Creek in the PVB. The GSP determined that there was a data gap in the understanding of how surface water and shallow groundwater interact with the deeper primary aquifers in the PVB. DWR also identified "investigation of the hydraulic connectivity of the surface water bodies to the shallow aquifer and principal aquifers" as a recommended corrective action that should be addressed for the 5-year evaluation of the PVB GSP. Shallow groundwater wells will be used to help understand the relationship between surface water and groundwater along the stream courses. Data from the construction of the wells will help define aquifer properties in the younger and older alluvium, and data on groundwater conditions in these wells will be used to help assess whether riparian vegetation is accessing groundwater in the Shallow Alluvial Aquifer.

Two locations, PNW 15 along Arroyo Las Posas in NPVMA and PNW 16 along Conejo Creek in EPVMA, were identified. This project will expand the existing monitoring network to evaluate improved groundwater conditions and improve the understanding of interconnected surface waters.

3.2.9.2 Benefits and Impacts of Project No. 10

Realized Benefits

In 2022, FCGMA was awarded grant funds through DWR's SGMA Implementation Grant Program to support implementation of projects developed during the GSP and subsequent stakeholder discussions. The shallow monitoring wells partially funded through this program are planned near PNW 15 and PNW 16. FCGMA anticipates completing construction of these shallow wells in the 2024 calendar year.

Expected Benefits

The expected benefits of this project lie in the additional data gathered from the well installation process and the ongoing monitoring of the groundwater conditions at the well sites. These data can be used to refine the conceptual and numerical models of the PVB. Such refinement may result in reevaluation and adjustment of the minimum thresholds or measurable objectives associated with GDEs.

3.2.10 Project No. 11: Installation of Transducers in Groundwater Monitoring Wells

3.2.10.1 Description of Project No. 11

This project proposes installation of transducers in key wells. The GSP determined that there were often temporal data gaps in the understanding of aquifer conditions. These data gaps limit the number of wells that can be used to contour spring high and fall low groundwater conditions. The temporal data gaps have persisted in reporting groundwater levels in storage for the annual reports prepared after the GSP was submitted to DWR. Additionally, as most key wells are agricultural irrigation wells, transducers will help assure that measured water levels are actual static water levels unaffected by recovery or potential well interference. The addition of transducers will help ensure that spring high and fall low water levels are collected from the key wells within a 2-week window, as recommended by DWR, and will provide a clearer understanding of groundwater conditions during the spring and fall measurement events. This will allow a better comparison for annual change in storage estimates and will facilitate better management of the Basin.

Installation of transducers in irrigation wells may include the need to modify wellheads, install sounding tubes below turbine pump bows, and modify agreements with well owners to make these modifications.

Project No. 11 is an improvement to the existing monitoring network.

3.2.10.2 Benefits and Impacts of Project No. 11

Realized Benefits

This project has not been implemented.

Expected Benefits

The expected benefits of this project lie in the collection of data from a 2-week window each spring and fall and the ongoing monitoring of the groundwater conditions at the well sites including a better understanding of potential well interference and non-static conditions on water-level measurements. This data can be used make better management decisions depending on the observed groundwater conditions.

Impacts to beneficial uses and users

This project does not have a direct impact on beneficial uses and users. It will, however, provide data that can be used to help evaluate groundwater conditions.

3.2.11 Project No. 12: Camarillo Stormwater Diversion to WRP Feasibility Study

3.2.11.1 Description of Project No. 12

This project seeks to understand the feasibility of diverting stormwater flows from the stormwater collection system to the Water Reclamation Plant (WRP) to be treated and turned into recycled water for agriculture irrigation purposes. This project would increase the amount of recycled water provided to farmers. Any excess recycled water produced by the WRP will be distributed to the Camrosa Water District via an existing connection where the recycled water is then used for agricultural uses as well. This is a multi-benefit project that 1) helps the recharge and sustain the basin, 2) helps the region comply with the regional MS4 Permit, and 3) helps supply the farming community with recycled water thereby reducing water demand from the Basin.

3.2.11.2 Benefits and Impacts of Project No. 12

Realized Benefits

This project is a feasibility study and has not been implemented.

Expected Benefits

This is a feasibility study so expected benefits are to provide a better understanding of 1) the feasibility of treating stormwater at the WRP, 2) the feasibility of using the recycled water for irrigation, and 3) the potential volume of recycled water that would be available.

If the project is found to be feasible and constructed, the additional irrigation water would reduce the groundwater demand within the Basin.

Impacts to beneficial uses and users

This is a paper study, so the impacts to beneficial uses and users will be neutral. If the project is found to be feasible and is constructed, it will reduce demand in the Basin and thus have a positive impact on beneficial uses and users. The project may also help the region comply with the MS4 Permit requirements for total maximum daily loads for the Revolon Slough, Beardsley Wash and other creeks with total maximum daily load limits within the City of Camarillo.

3.2.12 Project No. 13: Camarillo Airport Feasibility Study

3.2.12.1 Description of Project No. 13

This project seeks to understand the feasibility of implementing a regional stormwater capture and infiltration project in the vicinity of the Camarillo Airport. This feasibility study seeks to investigate diverting stormwater flows from the Camarillo Hills Drain to an underground infiltration or detention basin for groundwater recharge. Through a regionally led effort, the study would investigate and propose a suitable location, provide required testing, and other reports as required to fully evaluate project feasibility. The project will also help with compliance of total maximum daily loads for Revlon Slough and Beardsley Wash.

3.2.12.2 Benefits and Impacts of Project No. 13

Realized Benefits

This project is a feasibility study and has not been implemented.

Expected Benefits

This is a feasibility study so expected benefits are to provide 1) a suitable location to use for underground infiltration or as a detention basin, 2) the feasibility of the site for groundwater recharge, and 3) the volume of water that could be accommodated at the site.

Impacts to beneficial uses and users

This is a paper study, so the impacts to beneficial uses and users will be neutral. If the project is found to be feasible and is constructed, the project would help increase groundwater levels in the vicinity of the project and help meet the measurable objectives for groundwater levels. Also, the project would help the region comply with the total maximum daily load limits for Revlon Slough and Beardsley Wash.

3.2.13 Project No. 14: Camarillo Desalter Expansion Feasibility Study

3.2.13.1 Description of Project No. 14

The North Pleasant Valley Desalter Treatment Facility (NPV Desalter) was constructed to treat brackish groundwater that infiltrated from Arroyo Simi-Las Posas and entered the PVB as underflows from the LPVB over the past several decades. The NPV Desalter became operational in January 2023. The NPV Desalter treats up to 4,500 AFY of brackish water via RO filters and produces approximately 3,800 AF of potable water for the City of Camarillo. This regionally led effort will investigate the feasibility of increasing the volume of groundwater treated by the NPV Desalter for the benefit of regional agencies and multiple basins. The groundwater elevation data collected after the NPV Desalter began operations and the actual volume of potable water produced by the NPV Desalter will be used to help assess whether there is the potential for additional groundwater production in this area and treatment by the NPV Desalter.

3.2.13.2 Benefits and Impacts of Project No. 14

Realized Benefits

This project is a feasibility study and has not been implemented.

Expected Benefits

This is a feasibility study so expected benefits are to provide 1) the feasibility of expanding the capacity of the NPV Desalter, and 2) the volume of water that could be accommodated at the site.

Impacts to beneficial uses and users

This is a feasibility study, so the impacts to beneficial uses and users will be neutral. If the project is found to be feasible and is constructed, the impacts on the minimum thresholds and measurable objectives in the vicinity of the NPV Desalter would need to be evaluated. Expansion of the NPV Desalter would help the region meet water quality objectives within the Basin.

3.2.14 Project No. 15: Camarillo Hills Drain Diversion to WRP Feasibility Study

3.2.14.1 Description of Project No. 15

This project seeks to understand the feasibility of diverting a portion of stormwater flows from the Camarillo Hills Drain, near the Camarillo Airport, to the Camarillo Sanitation District sanitary sewer Pump Station No. 3, near the intersection of Las Posas Road and Pleasant Valley Road. Stormwater would be pumped from Pump Station No. 3 to the Camarillo Sanitary District WRP. Stormwater would be treated at the WRP, and the reclaimed water would be used for irrigation in the Camarillo and Camrosa Service areas. The additional irrigation water will reduce groundwater demand in the Basin, and treatment of this stormwater will help with MS4 Permit compliance.

3.2.14.2 Benefits and Impacts of Project No. 15

Realized Benefits

This project is a feasibility study and has not been implemented.

Expected Benefits

This is a feasibility study so expected benefits are to provide a better understanding of 1) the feasibility of treating stormwater at the WRP, 2) the feasibility of using the recycled water for irrigation, and 3) the potential volume of recycled water that would be available.

If the project is found to be feasible and constructed, the additional irrigation water would reduce the groundwater demand within the Basin.

Impacts to beneficial uses and users

This is a paper study, so the impacts to beneficial uses and users will be neutral. If the project is found to be feasible and is constructed, it will reduce demand in the Basin and thus have a positive impact on beneficial uses and users.

3.2.15 Project No. 16: Camarillo Infiltration Basin Feasibility Study

3.2.15.1 Description of Project No. 16

This project seeks to understand the feasibility of adding stormwater infiltration or detention areas to the west of the existing Camarillo Sanitary District flood management project near the WRP. This study would investigate and propose a suitable location, provide required testing and other reports as required to fully evaluate project feasibility.

3.2.15.2 Benefits and Impacts of Project No. 16

Realized Benefits

This project is a feasibility study and has not been implemented.

Expected Benefits

This is a feasibility study so expected benefits are to provide a better understanding of 1) the feasibility of the location for infiltration and 2) the potential volume of recycled water that would be available.

If the project is found to be feasible and constructed, the additional recharge would increase the groundwater elevations within the vicinity.

Impacts to beneficial uses and users

This is a paper study, so the impacts to beneficial uses and users will be neutral. If the project is found to be feasible and is constructed, the increased groundwater elevations from recharge would help meet measurable objectives in the vicinity.

Table 3-2. Summary of New Projects and Management Actions

Number	Name	Description	Status	Expected Schedule	Benefits Observed to Date	Estimated Accrued Benefits at Completion
New Projects						
2	Laguna Road Recycled Water Pipeline Interconnection	New pipeline interconnection to allow conveyance of recycled water from Pleasant Valley County Water District's system to UWCD'S Pumping Trough Pipeline.	Under Construction	Phase 1 completion 2025 Phase 2 completion 2027	N/A	Increased sustainable yield of Oxnard Subbasin and PVB by 1,500 AFY (average). Reduced energy consumption for pumpers.
3	PVCWD Recycled Water Connection Pipeline	Connect the east and west zones of PVCWD's distribution system to distribute recycled water from the City of Oxnard's AWPF and surface water from Conejo Creek	Planning in process	Not defined	N/A	Up to 6,000 AFY of additional recycled water and Conejo Creek water for delivery
4	PVCWD Private Reservoir Program	Incentivize the utilization of existing and the construction of new privately owned and operated reservoirs for surface water capture during rain events to expand storage capacity in PVB	Planning in process	Not defined	N/A	Increase groundwater storage by up to 400 AF
5	Purchase of Supplemental State Water Project Water	Purchase supplemental SWP water for recharge in	Ongoing	Immediate	25,000 AF water imported to Oxnard Basin and PVB from	Increased combined sustainable yield

Table 3-2. Summary of New Projects and Management Actions

Number	Name	Description	Status	Expected Schedule	Benefits Observed to Date	Estimated Accrued Benefits at Completion
New Projects						
		the Oxnard Subbasin and delivered to users.			SWP between 2019 and 2021.	(Oxnard and PVB) by 6000 AFY. Reduced energy consumption for pumpers.
6	Extraction Barrier& Brackish Water Treatment	Seawater intrusion barrier formed by extracting brackish water and maintaining a pumping trough	Preliminary Design in process	Phase 1 completion 2028 Phase 2 completion 2031	N/A	Increase sustainable yield of Oxnard Subbasin and PVB by more than 10,000 AFY.
7	Freeman Diversion Expansion Project	Construct new facilities at Freeman Diversion to capture surface water at higher flow rates and sediment loads than currently possible; recharge groundwater	Initial phases under construction	3 to 15 years	Infrastructure improvements to increase recharge at the Ferro-Rose basin	Up to 10,000 AFY of additional diversions for recharge and delivery via PTP and PVP
8	Houweling Nursery's Indoor Grow Facility RO Brine Recovery Project	Recovery of 99% of RO effluent for up to 320 AFY of treated water for re-use.	Planning in Process.	On hold	N/A	Increase in groundwater elevations.
9	FCGMA Installation of multi-depth monitoring wells at up to 3 locations in the Pleasant Valley Basin	Installation of monitoring wells in the Basin to assess groundwater conditions in areas that lack data.	Ongoing	Completion by the end of 2025	One well cluster installed at PNW-22; two additional well clusters anticipated for construction in 2024.	Improved data collection and understanding of groundwater conditions. Improved

Table 3-2. Summary of New Projects and Management Actions

Number	Name	Description	Status	Expected Schedule	Benefits Observed to Date	Estimated Accrued Benefits at Completion
New Projects						
						management of subbasin.
10	FCGMA Installation of shallow monitoring wells in the Pleasant Valley Basin	Installation of monitoring wells along the Arroyo Las Posas and Conejo Creek. Wells will be used to help understand relationship between surface water and groundwater along stream courses.	Ongoing	Completion by the end of 2024	PNW 15 and 16 planned for construction in 2024	Improved data collection and understanding of groundwater conditions. Improved management of groundwater-dependent ecosystems.
11	Installation of Transducers in Groundwater Monitoring Wells	Installation of transducers in key wells to improve data collection and provide clearer understanding of groundwater conditions.	Preliminary Design in process	Not defined	N/A	Improved data collection and understanding of groundwater conditions. Improved management of subbasin.
12	Camarillo Stormwater Diversion to WRP Feasibility Study	Feasibility study of diversion of stormwater flows to Water Reclamation Plant to be treated and used as recycled water for agricultural irrigation	Conceptual	Not defined	N/A	N/A
13	Camarillo Airport Feasibility Study	Feasibility study of diversion of	Conceptual	Not defined	N/A	N/A

Table 3-2. Summary of New Projects and Management Actions

Number	Name	Description	Status	Expected Schedule	Benefits Observed to Date	Estimated Accrued Benefits at Completion
New Projects						
		stormwater flows from Camarillo Hills Drain to be used as groundwater recharge in vicinity of Camarillo Airport.				
14	Camarillo Desalter Expansion Feasibility Study	Feasibility of expanding the North Pleasant Valley Desalter Project to treat more groundwater	Conceptual	Not defined	N/A	N/A
15	Camarillo Hills Drain Diversion to WRP Feasibility Study	Feasibility of diversion of stormwater flows to Pump Station No. 3 to be treated and recycled at CSD Water Reclamation Plant (WRP)	Conceptual	Not defined	N/A	N/A
16	Camarillo Infiltration Basin Feasibility Study	Feasibility of adding stormwater infiltration or detention areas to the west of the existing CSD flood management project near the WRP.	Conceptual	Not defined	N/A	N/A

Notes: PVB = Pleasant Valley Basin; AFY = acre-feet per year; PVCWD = Pleasant Valley County Water District; AWPF = Advanced Water Purification Facility; SWP = State Water Project; FCGMA = Fox Canyon Groundwater Management Agency; PNW = Potential New Well; WRP = Water Reclamation Plant; CSD = Camarillo Sanitary District.

3.3 Process for Public Notice and Engagement

To facilitate funding, implementation, and integration into the GSP modeling, FCGMA developed a formal process for evaluating, ranking, and prioritizing projects within the Subbasin. This project evaluation process was developed under the guidance of the FCGMA Board of Directors' Operations Committee, with participation by other agencies and stakeholders in the Subbasin. The project evaluation process includes set of evaluation criteria, guidelines, and policies for vetting, adding, and prioritizing projects. FCGMA adopted the project prioritization process and solicited the first found of project information from agencies in the Subbasin in September 2023. The adoption of this process provides stakeholders and other agencies in the Subbasin with the opportunity to submit new or updated project information for consideration in the GSP to FCGMA on an annual basis.

4 Basin Setting Review

This section of the report evaluates the Basin Setting described in the GSP, including the Hydrogeologic Conceptual Model (Section 4.1); and water supplies, land uses, and water budgets over the evaluation period (Section 4.2).

4.1 Hydrogeologic Conceptual Model

Groundwater in the PVB occurs in six aquifers: the semi-perched aquifer, the Shallow Alluvial aquifer, the Older Alluvium, the Upper San Pedro formation, the FCA, and the GCA (FCGMA 2019). The Older Alluvium, the FCA, and the GCA are defined as principal aquifers in the PVB. The Upper San Pedro formation is not considered an aquifer in the PVB but may be a leaky aquitard. The FCA and GCA are grouped into the LAS in the PVB.

Since adoption of the GSP, FCGMA and other agencies have designed, scoped, and implemented new projects and technical studies that improve understanding of the hydrogeologic conceptual model of the PVB and the adjacent Oxnard Subbasin. This section summarizes: (i) new information and data gathered from these projects and studies, and (ii) the improved understanding of local hydrogeologic conditions within the PVB.

4.1.1 New Information and Data

4.1.1.1 Hydrostratigraphic Information

UWCD maintains the three-dimensional (3D) hydrostratigraphic model of the PVB. This 3D hydrostratigraphic model maps the lateral extents, thicknesses, and properties of the six water-bearing aquifers in the PVB. The 3D model was designed during development of the VRGWFM and integrates geophysical logs (e-logs) and lithologic data from approximately 575 wells in the Oxnard Subbasin, PVB, and LPVB with structural geologic information into a 3D model developed using the Rockworks software (UWCD 2018). Since adoption of the GSP, UWCD has continued development of the 3D hydrostratigraphic model of the region. UWCD has focused their hydrostratigraphic model updates to areas in the Oxnard Subbasin underlying Naval Base Ventura County (NBVC) at Point Mugu and Port Hueneme where groundwater is impacted by seawater intrusion. These revisions impact the interpretation of aquifer thicknesses and extents along the coastline of the Oxnard Subbasin.

While these hydrostratigraphic model updates are not specific to the PVB, they help to improve understanding of the impacts of groundwater conditions in the PVB on seawater intrusion in the Oxnard Subbasin. These revisions are described in FCGMA (2024b).

4.1.1.2 Depth-Discrete Groundwater Elevation and Quality Data

In 2019, DWR installed a nested monitoring well cluster in the NPVMA, adjacent to Arroyo Las Posas, for FCGMA under DWR's Technical Support Services program. The new well consists of shallow and deep well clusters that improve characterization of vertical gradients between the principal aquifers and addresses a data gap in the spatial distribution of depth-discrete groundwater elevation measurements identified in the GSP. Separate well casings are screened in the Older Alluvium (Oxnard equivalent), Older Alluvium (Mugu equivalent), the Upper San Pedro Formation (Hueneme equivalent), upper FCA, and basal FCA. These new depth-discrete monitoring wells are measured quarterly using an electronic sounder and are sampled to characterize local groundwater quality conditions. Data collected at these wells have been used to improve groundwater elevation contouring and interpretation of aquifer-specific conditions since March 2020 and have been included in the GSP annual reports covering water years 2020 through 2023.

In addition, as described in Section 4.1.2, Improvements to the Hydrogeologic Conceptual Model, the City of Camarillo constructed three new nested monitoring wells in the NPVMA during the evaluation period. These nested wells include completions in the Older Alluvium and upper and basal zones of the FCA. Data collected at these wells have been used to improve groundwater elevation contouring and interpretation of aquifer-specific conditions since January 2021 and have been included in the GSP annual reports covering water years 2021 through 2023. A summary of the wells constructed in the PVB during the evaluation period is included in Table 4-1, New Dedicated Monitoring Wells Constructed in the PVB.

Table 4-1. New Dedicated Monitoring Wells Constructed in the PVB

SWN	Well Depth (ft. bgs)	Perforated Interval (ft. bgs)	Aquifer Designation	Owner
02N20W30C04S	210	100-200	Older Alluvium (Oxnard Equivalent)	City of Camarillo
02N20W30C03S	740	590-730	FCA – Upper	
02N20W30C02S	970	900-960	FCA - Basal	
02N21W26P06S	340	270-330	Older Alluvium (Mugu equivalent)	
02N21W26P05S	850	780 - 840	FCA - Upper	
02N21W26P04S	1,090	1,010 – 1,080	FCA - Basal	
02N20W30L03S	260	100 – 250	Older Alluvium (predominantly Mugu Equivalent)	
02N20W30L02S	760	550 – 750	FCA – Upper	
02N20W30L01S	1,070	1,000 – 1,060	GCA	
02N20W20D03S	120	60-120	Older Alluvium (Oxnard Equivalent)	FCGMA
02N20W20D05S	190	150-190	Older Alluvium (Mugu equivalent)	
02N20W20D04S	390	330 – 390	Upper San Pedro	
02N20W20D02S	640	540 – 640	FCA - Upper	
02N20W20D01S	750	710 - 750	FCA - Basal	

Notes: FCGMA = Fox Canyon Groundwater Management Agency; FCA = Fox Canyon Aquifer; GCA = Grimes Canyon Aquifer; ft. bgs = feet below ground surface

4.1.2 Improvements to the Hydrogeologic Conceptual Model

DWR issued a recommended corrective action related to the hydrogeologic conceptual model of the PVB (DWR, 2021). This recommended corrective action states:

> "Investigate the groundwater condition of the Grimes Canyon aquifer, identified as one of the principal aquifers in the GSP, by compiling and collecting data and information sufficient to

describe the properties of this aquifer. Based on the results of the investigation, provide a discussion of the management of this aquifer"

In early 2020, the City of Camarillo, as part of the NPV Groundwater Desalter project, constructed three new nested monitoring wells within the NPVMA of the PVB. One well, 02N20W30L01S, is completed in the GCA. This is the only well in the PVB completed solely within the GCA.

Well 02N20W30L01S is equipped with transducers that measure pressure and conductivity on a 3-hour interval (City of Camarillo 2024). Groundwater elevations measured at this well between January 2021 and January 2024 ranged from a high of approximately -57 ft. msl to a low of approximately -85 ft. msl (City of Camarillo 2024). Over this period, measurements collected from multiple completions of this well cluster indicate that groundwater elevations in the FCA were higher than the GCA at this location in the PVB. The downward vertical gradients between the FCA and GCA measured at this location ranged from a low of approximately 0.02 feet/foot to a high of approximately 0.05 feet/foot.

Between January 2021 and 2024, chloride concentrations measured in 02N20W30L01S were approximately 150 to 270 mg/L higher than those measured in the FCA at the same location. Conversely, sulfate concentrations were 190 to 430 mg/L lower than those measured in the FCA at the same location. TDS concentrations in the GCA and FCA at this nested well were similar between the FCA and GCA.

While the data collected from well 02N20W30L01S over the evaluation period improves understanding of groundwater level and quality conditions in the GCA, there are still insufficient data to provide an updated approach toward managing the GCA. To support additional characterization of the GCA, FCGMA plans to construct up to three new multi-completion monitoring wells in the PVB. At least one completion in each well is anticipated for the GCA. Data collected through these wells will help characterize local groundwater elevations, quality, and aquifer properties of the GCA. FCGMA anticipates completing construction of these new wells in calendar year 2024. FCGMA will re-evaluate management of this aquifer over the next 5 years as additional groundwater level and quality data are collected from the GCA. It should be noted that there are no production wells screened solely in the GCA in the PVB; all production wells screened in the GCA are screened across both the FCA and the GCA.

4.1.2.1 Depth-Discrete Groundwater Elevation Data

Older Alluvium

Oxnard Aquifer Equivalent

Two of the nested monitoring wells constructed during the evaluation period include completions within Oxnard aquifer-equivalent zone of the Older Alluvium in the PVB (Table 4-1). During the dry 2021 and 2022 water years, groundwater elevations at this well declined by approximately 5 feet. Over the wet 2023 water year, groundwater elevations increased in these wells by approximately 10 feet (City of Camarillo 2024).

Mugu Aquifer Equivalent

Three of the four nested wells constructed during the evaluation period include completions in the Mugu aquifer-equivalent zone of the Older Alluvium in the PVB (Table 4-1). Since 2021, groundwater elevations at all three wells have remained within 5 feet of each other (City of Camarillo 2024). Like the groundwater elevation trends observed in the Oxnard aquifer-equivalent zone, groundwater elevations in the Mugu aquifer-equivalent declined by approximately 10 to 12 feet in the dry 2021 and 202 water years. In the 2023 water year, groundwater elevations measured at these wells increased by approximately 10 to 15 feet (City of Camarillo 2024).

Vertical Gradients within the Older Alluvium

Since 2021, groundwater elevations in the Oxnard aquifer-equivalent have, on average, occurred approximately 50 feet higher than the groundwater elevations measured in the Mugu aquifer-equivalent. This translates to a downward vertical gradient within the Older Alluvium of the NPVMA of approximately 0.4 feet/foot.

Lower Aquifer System

Upper San Pedro Formation

Well 02N20W20D04S is the only well in the PVB that is screened solely within the Upper San Pedro formation (age-equivalent to the Hueneme aquifer in the Oxnard Subbasin). Since 2021, the groundwater elevation in this well has declined by approximately 10 feet (City of Camarillo 2024). As noted above, the Upper San Pedro formation is not a principal aquifer in the PVB.

Fox Canyon Aquifer

All four of the nested wells contain completions in the upper FCA (Table 4-1). Groundwater elevations measured at these wells varied geographically across the NPVMA. In the far northern region of the NPVMA, the groundwater elevations measured at 02N20W20D04S ranged from a high of approximately 44 ft. msl to a low of approximately 32 ft. msl. Groundwater elevations measured at this well have declined since January 2021. Farther south, near the boundary with the PVDMA, the groundwater elevations measured at well 02N21W26P05S ranged from a high of approximately -75 ft. msl to a low of approximately -114 ft. msl. The groundwater elevations at this well declined by approximately 30 feet over the 2021 and 2022 water years and recovered by approximately 40 feet in the 2023 water year.

Since 2021, groundwater elevations measured in the basal FCA in these wells have average approximately 20 feet higher than those measured in the upper FCA. This translates to an upward vertical gradient within the FCA of approximately 0.09 to 0.17 feet/foot.

Grimes Canyon Aquifer

Well 02N20W30L01S is the only well in the PVB that is screened solely within the GCA. In water years 2021 and 2022, the groundwater elevation at this well declined from approximately -58 ft. msl to approximately -83 ft. msl. In water year 2023, the groundwater elevation at this well increased by approximately 13 feet.

Vertical Gradients within the LAS

Measurements at 02N20W20D04S and 02N20W20D02S indicate that during the 2021 to 2023 period, groundwater elevations in the FCA were slightly higher than the Upper San Pedro formation near the boundary with the LPVB. Over the 2021 to 2023 period, the upward vertical gradients between the FCA and Upper San Pedro formation ranged from a low of approximately 0.003 feet/foot to a high of approximately 0.007 feet/foot.

Vertical Gradients between the Older Alluvium and LAS

Groundwater elevations measured at all four new nested well clusters indicate that there is a downward vertical gradient between the Older Alluvium and LAS within the NPVMA. This gradient was steepest near the PVPDMA, where the downward vertical gradient measured at nested well cluster 02N21W26P04S, P05S, and P06S averaged approximately 0.23 feet/foot. Farther north, near the boundary with the LPVB, the vertical gradient between the Older Alluvium and LAS measured at nested well cluster 02N20W20D01S, D02S, D03S, D04S, and D05S averaged approximately 0.03 feet/foot.

4.1.2.2 Depth-Discrete Groundwater Quality Data

The City of Camarillo and FCGMA regularly collect groundwater quality samples from the nested wells constructed in the NPVMA. The most recent (2019 – 2023) groundwater quality data from these wells are summarized in Section 2.2.4, Degraded Water Quality.

4.1.2.3 Potential Recharge Areas

To evaluate potential future recharge areas within, and surrounding, the PVB, soil types were obtained from the Web Soil Survey, available online at https://websoilsurvey.nrcs.usda.gov/ (USDA 2019). Soil Ksat rates (saturated hydraulic conductivity rates) for soils of 92 micrometers per second or greater were plotted (Figure 4-1, Potential Recharge Areas). In addition to this, areas where the FCA outcrops at land surface act as potential recharge areas for the PVB.

4.1.3 Data Gaps

The GSP identified data gaps in the hydrogeologic conceptual model of the PVB that create uncertainty in the understanding of the impacts of water level changes on change in storage. These data gaps are summarized in Table 4-2. Since adoption of the GSP, FCGMA and the City of Camarillo have implemented projects that have begun to address these data gaps through the construction and monitoring of new nested monitoring wells in the NPVMA (Table 4-2). Additionally, FCGMA, with partial funding from DWR's Sustainable Groundwater Management Act Implementation Grant Round 1, is constructing up to two multi-completion monitoring wells in the PVPDMA which are projected to be completed in 2024. FCGMA will evaluate data collected with these monitoring wells to further prioritize that provide the greatest benefit to management of the PVB.

To help prioritize projects that address data gaps in the PVB, FCGMA developed a project evaluation process that weights project benefits and costs to quantitatively rank and prioritize projects in the PVB. FCGMA anticipates the ongoing use of this process to identify, rank, fund, and implement projects in the Subbasin, some of which will address the data gaps identified in the GSP.

Table 4-2. Summary of Actions Taken to Address Data Gaps Identified in the GSP

Data Gap Identified in the GSP		
No.	Description	Actions Taken
1	Distributed measurements of aquifer properties	▪ FCGMA and other agencies in the PVB have not identified opportunities to collect additional measurements of aquifer properties since adoption of the GSP. However, new geophysical and lithologic data collected during construction of the nested monitoring wells in the NVPMA improve characterization of local geologic conditions. ▪ FCGMA will evaluate and prioritize opportunities to implement new projects that better characterize local aquifer properties as part of the broader project evaluation and prioritization process.
2	Distributed measurements of groundwater quality	▪ FCGMA and the City of Camarillo constructed new depth-discrete nested monitoring wells in the NPVMA. These new monitoring wells improve characterization of groundwater quality within each principal aquifer. ▪ FCGMA is constructing up to three additional nested monitoring wells in the PVB. These wells will be sampled to characterize aquifer-specific groundwater quality conditions.
3	Measurements of groundwater quality that distinguish the sources of high TDS in the FCA and GCA	▪ FCGMA is evaluating groundwater quality data from the new nested wells in the NPVMA to characterize aquifer-specific groundwater quality conditions and trends in the FCA and at one well in the GCA. ▪ FCGMA is constructing up to three additional nested monitoring wells in the PVB. Groundwater quality data from the FCA and GCA from these wells will be evaluated to better characterize the sources of high total dissolved solids.
4	Sufficient water level measurements from wells screened in a single aquifer to delineate the effects of faulting on groundwater flow in northern Pleasant Valley	▪ FCGMA and the City of Camarillo constructed new depth-discrete nested monitoring wells in the NPVMA. These new monitoring wells improve characterization of groundwater flow in northern Pleasant Valley. ▪ FCGMA is constructing up to three additional nested monitoring wells in the PVB. Groundwater elevation data from these wells will improve characterization of groundwater elevation gradients across branches of the Springville Fault zone. ▪ FCGMA will evaluate and prioritize opportunities to implement new projects that better characterize local aquifer properties as part of the broader project evaluation and prioritization process.

Notes: GSP = Groundwater Sustainability Plan; FCGMA = Fox Canyon Groundwater Management Agency; NVPMA = North Pleasant Valley Management Area; FCA = Fox Canyon aquifer; GCA = Grimes Canyon aquifer;

4.2 Water Uses During the Evaluation Period

The GSP characterized historical land uses and water supplies in the PVB through December 31, 2015. Since 2015, FCGMA and other agencies in the PVB have implemented projects that have diversified water supplies in the Basin and supported ongoing conjunctive use of surface water, recycled water, and groundwater. This section summarizes the water supplies in the PVB since 2015. Land use changes in the PVB since 2015 are provided for context.

4.2.1 Land Use Change

Land use change in the PVB was evaluated using DWR's statewide land use data for 2014 and 2022. Land uses were grouped into three categories: agriculture, urban, and idle/unclassified. Between 2014 and 2022, the area of agricultural land decreased by approximately 145 acres, area of urban land increased by approximately 607 acres, and area of idle/unclassified land increased by approximately 127 acres (Table 4-3). The total mapped land use in the PVB in DWR's published data sets varies by 589 acres between 2014 and 2022 pointing to uncertainty in the data which should be considered when evaluating the land-use changes.

Table 4-3. Land Use Change 2014–2022

Land Use	2014 (acres)	2022 (acres)	Difference (acres)	Percent Change
Agriculture	7,189	7,044	-145	-2%
Urban	8,418	9,025	607	7%
Idle/Unclassified	113	240	127	112%

Source: DWR 2024.
Notes: In 2014, mapped land use totaled 15,720 acres. In 2022, mapped land use totaled 16,309 acres. The difference in total mapped acreage reflects uncertainty in the land use mapping and does not represent a change in the areal extent of the PVB.

4.2.2 Water Supplies during the Evaluation Period

Water supplies in the PVB consist of surface water, imported water, recycled water, and groundwater. This section of the GSP evaluation summarizes the total water supplies in the PVB and provides a comparison to historical usage. Because the GSP provides data on water supplies through 2015, water supply data are summarized here for water years 2016 through 2023. However, water-use trends over the evaluation period are characterized using data for the period of water years 2020 through 2023[7]. Data for water year 2024 were not available at the time of reporting.

4.2.2.1 Groundwater

On October 23, 2019, the FCGMA Board of Directors adopted an Ordinance to Establish an Allocation System for the Oxnard and Pleasant Valley Groundwater Basins, effective October 1, 2020. The prior system provided an efficiency allocation to agricultural pumpers based on the crop type, number of acres planted, and water-year type. This enabled increased groundwater extractions if more water-intensive crops were planted, or additional acres were brought into production. The new system established fixed extraction allocations assigned to each production

[7] Groundwater extraction trends for the evaluation period are summarized using data from 2 years: water year 2021 and 2022. Water year 2020 was not included because this was a transitional reporting year. Water year 2023 was not included because, at the time of reporting, FCGMA had only received and/or processed extraction reports for approximately 80% of the operators in the Subbasin.

well, a change that was needed to sustainably manage the basin. The ordinance additionally transitioned extraction reporting from calendar year to water year.

Groundwater extractions from the PVB over the 2016 to 2023 period are summarized in Table 4-4. Historically, groundwater extractions in the FCGMA have been reported in two periods over the course of a single calendar year. Because groundwater extractions were not reported monthly, groundwater production prior to 2020 cannot be reported on a water year basis. Therefore, the groundwater extractions for 2016 through 2019 reported in Table 4-4, Groundwater Extractions in the Pleasant Valley Basin by Aquifer System and Water Use Sector, follow the historical precedent and represent calendar year extractions. Due to the transition from calendar year to water year reporting in 2020, groundwater extractions reported for 2020 represent extractions for the 9-month period from January 1, 2020, through September 30, 2020 (Table 4-4). Additionally, as part of this Periodic Evaluation, aquifer designations for each well were reviewed; through this process, it was identified that a subset of wells were incorrectly characterized as wells that pump from both the Older Alluvium and LAS in the GSP annual reports. Table 4-4 reflects the corrected aquifer designations for each well.

The water year 2023 extractions presented in Table 4-4 represent the extractions reported to FCGMA as of January 26, 2024, and do not include estimates of extractions for wells that had not yet been reported. As of January 26, 2024, FCGMA had received reporting from approximately 70% of the operators in the basin. Water year 2022 extractions from these operators accounted for approximately 20% of the total extractions from the PVB.

Comparison to Historical Groundwater Supplies

During the 1985 to 2015 period, approximately 15,700 AFY of groundwater was extracted from the PVB (FCGMA 2019). Approximately 87% was used for agriculture, 10% was used for municipal supply, and 2% was reportedly used for domestic purposes. Available data characterizing groundwater extractions in water years 2021 and 2022 indicate that groundwater extractions from the PVB averaged approximately 15,000 AFY (Table 4-4), or 5% lower than the 1985 to 2015 average. In water years 2021 and 2022, approximately 67% of the pumped groundwater was used for agriculture, 33% was used for municipal supply, and less than 1% was used for domestic purposes.

Comparison to Projected Groundwater Supplies

Future projections of groundwater extractions were updated as part of this 5-year GSP evaluation (Section 5.2, Future Scenario Water Budgets and Sustainable Yield). Under baseline conditions, groundwater extractions from the PVB are projected to average approximately 14,600 AFY. This is approximately equal to the average annual groundwater extractions over the 2021 and 2022 water years.

Table 4-4. Groundwater Extractions in the Pleasant Valley Basin by Aquifer System and Water Use Sector

Year	Extraction Reporting Complete / Estimated Percentage Complete (%)	Older Alluvium (acre-feet)			Lower Aquifer System (acre-feet)				Wells Screened in both the Older Alluvium and LAS (acre-feet)				Wells in Unassigned Aquifer Systems (acre-feet)			Total (acre-Feet)
		AG	Dom	Sub-Total	AG	Dom	M&I	Sub-Total	AG	Dom	M&I	Sub-Total	AG	Dom	Sub-Total	
CY 2016	Yes	1,578	5	1,583	3,874	2	4,098	7,973	5,877	1	380	6,257	151	41	193	16,006
CY 2017	Yes	1,165	5	1,170	3,397	2	3,928	7,327	6,668	1	628	7,297	163	9	172	15,966
CY 2018	Yes	1,226	5	1,231	3,383	2	4,154	7,538	4,552	1	180	4,733	66	33	99	13,602
CY 2019	Yes	821	6	826	2,787	2	3,421	6,209	3,247	1	825	4,073	14	25	39	11,148
2020[b]	Yes	508	6	514	1,699	2	3,313	5,013	2,471	1	362	2,834	12	27	39	8,400
WY 2021	Yes	1,803	7	1,810	3,560	3	3,797	7,360	5,277	1	469	5,747	27	23	49	14,966
WY 2022[c]	Yes	1,852	3	1,855	3,239	3	4,858	8,099	4,579	1	514	5,095	18	53	71	15,120
WY 2023[d]	No/70%	249	1	250	1,045	1	6,387	7,433	2,043	1	357	2,402	470	1	470	10,555
2016-2022 Average[e]		**1,407**	**5**	**1,413**	**3,373**	**2**	**4,043**	**7,418**	**5,033**	**1**	**499**	**5,534**	**73**	**31**	**104**	**14,468**
2021 - 2022 Average[e,f]		**1,827**	**5**	**1,833**	**3,399**	**3**	**4,327**	**7,729**	**4,928**	**1**	**492**	**5,421**	**22**	**38**	**60**	**15,043**

Notes: CY = Calendar Year; WY = Water Year; AG = Agriculture; Dom = domestic; M&I = Municipal and Industrial. Groundwater extractions updated based on additional review of Automated Metering Infrastructure data.

a Qualifier indicates whether extraction reporting is complete for the given year. "Yes" indicates no additional reporting is anticipated. "No" indicates that additional reporting is anticipated. The percentage included after the "No" qualifier represents the estimated total percentage of operators who have reported extractions as of January 26, 2024.

b Groundwater extraction reporting is from January 1, 2020, through September 30, 2020, due to transition to water year reporting.

c Groundwater extractions updated upon receipt of additional reporting.

d Groundwater extractions are preliminary and will be updated during preparation of the 2025 GSP Annual report based on receipt of additional reporting.

e Excludes 2020 because this was a transitional reporting year in which only 9 months of extractions were reported to FCGMA.

f Excludes 2023 from the average because, as of January 26, 2024, approximately 20% of the extraction reports are outstanding.

4.2.2.2 Surface Water

The primary surface water supplies to the PVB are Conejo Creek, via a diversion operated by CWD, and the Santa Clara River, via the UWCD Freeman Diversion and the PVP. Within the PVB, CWD supplies surface water to the Pleasant Valley County Water District (PVCWD) and distributes a portion of its diversions to water users within CWD's service area[8] (FCGMA 2019). UWCD delivers Santa Clara River water to PVCWD through the PVP. Surface water deliveries to the PVB for water years 2016 through 2023 are reported in Table 4-5.

Table 4-5. Summary of Surface Water Deliveries to the Pleasant Valley Basin

Water Year	CWD		PVCWD[a]	United Water Conservation District		Total (acre-feet)
				PVP[b] (acre-feet)		
	Conejo Creek for M&I (acre-feet)	Conejo Creek for Agriculture (acre-feet)	Conejo Creek Flows Delivered to PVCWD for Agriculture (acre-feet)	Diversions of Santa Clara River Water Used for Agriculture (PVP)	Recharged Water Pumped and Used for Agriculture (Saticoy Wells)	
2016	740	2,804	816	0	0	4,361
2017	802	3,207	1,394	0	0	5,404
2018	777	3,107	1,456	0	0	5,341
2019	598	2,389	2,196	243	0	5,426
2020	541	2,099	1,815	759	0	5,214
2021	624	2,401	1,551	824	0	5,400
2022	557	2,199	1,880	334	0	4,970
2023	1,181	1,727	1,748	1,795	0	6,452
2016 – 2023 Average	**728**	**2,492**	**1,607**	**494**	**0**	**5,321**
2020 – 2023 Average	**726**	**2,107**	**1,749**	**928**	**0**	**5,509**

Notes:

Acronyms: PVCWD = Pleasant Valley County Water District; UWCD = United Water Conservation District; CWD = Camrosa Water District; PTP = Pumping Trough Pipeline; PVP = Pleasant Valley Pipeline.

[a] Estimated by using 44% of the total Conejo Creek water delivered by CWD to PVCWD. This division is based on the fraction of PVCWD's service area that overlies the PVB.

[a] Estimated by using 44% of the total Santa Clara River water delivered via the PVP. This division is based on the fraction of PVCWD's service area that overlies the PVB.

During the 2020 to 2023 period, CWD delivered an average of approximately 4,600 AFY of Conejo Creek water within the PVB, 1,700 AFY of which was delivered to agricultural operators through PVCWD. UWCD delivered an average of approximately 900 AFY of Santa Clara River.

[8] 44% of the total CWD deliveries to PVCWD, and 44% of the total PVP surface water deliveries from UWCD, were assigned to the PVB based on an analysis of the size of PVCWD's service area (FCGMA 2019).

Comparison to Historical Surface Water Supplies

CWD began delivering Conejo Creek Project water to PVCWD in 2002 (FCGMA 2019). Between 2002 and 2015, CWD delivered an average of approximately 2,000 AFY of Conejo Creek Project water to PVCWD for agricultural uses[9] (FCGMA 2019). CWD's average annual delivery of Conejo Creek water to PVCWD during the 2020 to 2023 period is approximately 13% lower than the historical delivery volumes (Table 4-5).

UWCD constructed the PVP[10] in 1959 to deliver surface water diverted from the Santa Clara River to PVCWD, which delivers this water to agricultural customers in both the Oxnard Subbasin and the PVB. Between 1985 and 2015, UWCD delivered an average of approximately 4,100 AFY of Santa Clara River water to users on the PVP and (FCGMA 2019). Between water years 2020 and 2023, UWCD's deliveries on the PVP were approximately 77% lower than the 1985 to 2015 average (Table 4-4). The reduction in PVP and PTP deliveries over this time reflects the drought conditions experienced in the PVB and adjacent Oxnard Subbasin during the first three years of the evaluation period.

Comparison to Projected Surface Water Supplies

Future projections of surface water availability in the PVB were updated as part of this 5-year GSP evaluation (Section 5.2, Future Scenario Water Budgets and Sustainable Yield). Under baseline conditions, UWCD anticipates delivering approximately 5,100 AFY of Santa Clara River Water via the PVP; approximately 2,200 AFY[11] of this would be delivered in the PVB. UWCD's average annual Santa Clara River water diversions during the evaluation period were approximately 60% lower than projected, which reflects the drought conditions experienced between water years 2019 through 2022. Additionally, UWCD is constructing projects to provide additional flexibility in in diverting Santa Clara River water.

CWD anticipates future deliveries of approximately 4,000 AFY of Conejo Creek Project water to PVCWD, approximately 1,760 AFY[12] of which would be served in the PVB, and 2,900 AFY of Conejo Creek water users within CWD's service area. CWD's deliveries of Conejo Creek water during the evaluation period are approximately equal to their future projections.

4.2.2.3 Imported Water

4.2.2.3.1 Calleguas Municipal Water District

Calleguas Municipal Water District (CMWD) provides imported potable water to CWD, the City of Camarillo, and Pleasant Valley Mutual Water Company. Sales and use of imported water supplied by CMWD are summarized in Table 4-6. Additionally, State Water Project water imported by UWCD is delivered through Lake Piru and diverted at the Freeman diversion. UWCD's importations are included in the sum of PVP volumes shown in Table 4-5.

9 Calculated by multiplying CWD's deliveries for Conejo Creek deliveries to PVCWD by the percentage of PVCWD's service area that overlies the PVB (44%).
10 Deliveries via the PVP consist exclusively of Santa Clara River water.
11 Calculated by multiplying the total PVP deliveries to PVCWD by the percentage of PVCWD's service area that overlies the PVB (44%).
12 Calculated by multiplying CWD's projections for Conejo Creek deliveries to PVCWD by the percentage of PVCWD's service area that overlies the PVB (44%).

Table 4-6. Sales and Use of Imported Water Supplied by CMWD

Water Year	Delivered to and Used by CWD (acre-feet		Delivered to and Used by the City of Camarillo (acre-feet)	Delivered to and Used by PVMWC (acre-feet)	Total Imported Water Supplied by CMWD (acre-feet)
	AG	M&I			
2016	57	2,155	3,170	184	5,566
2017	61	2,049	4,513	335	6,958
2018	63	2,107	4,371	443	6,984
2019	65	2,159	4,693	382	7,299
2020	76	2,700	4,380	341	7,497
2021	54	1,976	4,350	427	6,807
2022	51	1,894	5,698	391	8,034
2023	42	1,491	5,158	127	6,818
2016 – 2023 Average	**59**	**2,066**	**4,542**	**329**	**6,995**
2020 – 2023 Average	**56**	**2,015**	**4,897**	**322**	**7,174**

Notes: M&I = Municipal and Industrial; CWD = Camrosa Water District; PVMWC = Pleasant Valley Mutual Water Company; CMWD = Calleguas Municipal Water District

Over the 2020 to 2023 period, CMWD delivered an average of approximately 7,200 AFY of imported water for municipal and industrial uses within the PVB. Approximately 67% of this was supplied for municipal use by the City of Camarillo and 28% was supplied for municipal use by CWD (Table 4-6).

Comparison to Historical Imported Water Supplies

Over the 1985 to 2015 period, CMWD delivered an average of approximately 8,700 AFY of imported water. The average annual volume of imported water supplied by CMWD in the PVB during the evaluation period is approximately 18% lower than the 1985 to 2015 average.

Comparison to Projected Imported Water Supplies

In their 2015 and 2020 Urban Water Management Plans, CMWD included projections for CWD, the City of Camarillo, and Pleasant Valley Mutual Water Company's combined imported water demands. Over the 2020 to 2025 period, these projections average approximately 9,800 AFY (CMWD 2016; CMWD 2021). Under normal, single year dry, and multi-year dry scenarios, CMWD does not anticipate experiencing water supply shortages that would impact their ability to meet these demands (CMWD 2016; CMWD 2021).

Over the 2020 to 2023 period, the combined imported water demand was approximately 27% lower than the projections included in CMWD's 2015 and 2020 Urban Water Management Plans.

4.2.2.3.2 Other Imported Water Supplies

CWD pumps groundwater from the Arroyo Santa Rosa Valley Basin (DWR Basin No. 4-007) and Tierra Rejada Basin DWR Basin No. 4-015) for use within the PVB (Table 4-7). Over the 2020 to 2023 period, CWD imported an average of approximately 2,000 AFY of groundwater from these two basins (Table 4-7). This is an increase in imported groundwater supplies of approximately 70% compared to the historical average (FCGMA 2019).

CWD anticipates importing approximately 1,800 AFY of groundwater from the Arroyo Santa Rose and Tierra Rejada basins for future water supplies (Section 5.2.1.4, Future Projects and Water Supply).

Table 4-7. Other Imported Water Supplies

Water Year	Groundwater pumping from Arroyo Santa Rosa Valley used for M&I (AF)	Groundwater pumping from Arroyo Santa Rosa Valley used for Agriculture (AF)	Groundwater pumped from Tierra Rejada used for M&I (AF)	Groundwater pumped from Tierra Rejada used for Agriculture (AF)	Total
2016	1,399	67	—	—	1,467
2017	1,650	79	162	5	1,896
2018	2,085	100	136	4	2,325
2019	2,085	100	129	4	2,318
2020	2,085	100	117	3	2,305
2021	2,085	100	58	2	2,245
2022	2,085	100	47	1	2,234
2023	900	18	195	28	1,141
2016 – 2023 Average	**1,797**	**83**	**105**	**6**	**1,991**
2020 – 2023 Average	**1,789**	**80**	**104**	**8**	**1,981**

Notes: M&I = municipal and industrial; AF = acre-feet.

4.2.2.4 Recycled Water

Recycled water provides a source of agricultural water supply within the PVB. Recycled water used in the PVB originates from three sources: the City of Oxnard's Advanced Water Purification Facility (AWPF), the City of Camarillo's WRP, and CWD's Water Reclamation Facility (CWRF).

In 2016, the City of Oxnard began delivering AWPF water to PVCWD and other agricultural operators within the Oxnard Subbasin. The City of Oxnard delivers recycled water to PVCWD and other agricultural users for use in lieu of groundwater and accrues one acre-foot of Recycled Water Pumping Allocation (RWPA) for each acre-foot of recycled water delivered (FCGMA 2023a).

CWD has historically provided recycled water from the CWRF for agricultural irrigation and municipal and industrial uses within their service area (FCGMA 2019). In 2019, CWD began delivering CWRF water for agricultural irrigation within the PVCWD service area.

The City of Camarillo produces recycled water at the Camarillo Sanitation District's WRP. The City of Camarillo has historically served recycled water to users within the city boundaries and discharged excess recycled water to Conejo Creek. In 2019, the City of Camarillo began delivering recycled water to PVCWD, through CWD.

Over the 2020 to 2023 period, agricultural operators used an average of approximately 2,600 AFY of recycled water supplies. In addition, municipal and industrial users used an average of approximately 300 AFY of recycled water. The City of Camarillo provided approximately 77% of the recycled water used within the PVB.

Table 4-8. Recycled Water Supplies in the Pleasant Valley Basin

Water Year	Recycled Water Delivered in PVCWD for Agriculture[a] (acre-feet)			Recycled Water Delivered in the City of Camarillo (acre-feet)		Recycled Water Delivered in CWD (acre-feet)		Total (acre-feet)
	CamSan	CWRF	AWPF	AG	M&I	AG	M&I	
2016	0	0	103	1,426	366	929	211	3,035
2017	0	0	341	1,264	414	1,032	236	3,288
2018	0	0	504	1,237	414	832	190	3,177
2019	0	0	374	1,351	215	858	196	2,993
2020	486	295	0	1,819	314	154	180	3,250
2021	649	229	0	1,506	245	-	166	2,796
2022	521	150	3	1,795	181	498	188	3,336
2023	551	381	50	954	121	231	148	2,436
2016 – 2023 Average	**276**	**132**	**172**	**1,419**	**284**	**648**	**189**	**3,039**
2020 – 2023 Average	**552**	**264**	**13**	**1,519**	**215**	**295**	**170**	**2,954**

Notes:
Acronyms: PVCWD = Pleasant Valley County Water District; CamSan = Camarillo Sanitation District's Water Reclamation Plant; CWRF = Camrosa Water Reclamation Facility; AWPF = Advanced Water Purification Facility; AG = Agriculture; M&I = Municipal and Industrial;
[a] Estimated by using 44% of the total volume of recycled water delivered to PVCWD. This division is based on the fraction of PVCWD's service area that overlies the Subbasin.

Comparison to Historical Recycled Water Supplies

Recycled water has historically supported agricultural irrigation and municipal and industrial uses within the City of Camarillo and CWD's service area. Over the 1985-2015 period, recycled water uses in these two service areas averaged approximately 2,400 AFY. Over the 2020 to 2023 period, recycled water uses within CWD and the City of Camarillo averaged approximately 2,200 AFY, or 10% less than the 1985-2015 average.

Prior to 2016, recycled water was not a source of water supply within the PVCWD service area. Over the 2020 to 2023 period, the City of Camarillo, CWD, and the City of Oxnard provided an average of approximately 800 AFY of recycled water supplies for the PVB portion of the PVCWD service area (Table 4-7).

Comparison to Projected Recycled Water Supplies

Future projections of recycled water availability in the PVB were updated as part of this 5-year GSP evaluation (Section 5.2, Future Scenario Water Budgets and Sustainable Yield). Under baseline conditions, the City of Oxnard anticipates delivering an average of approximately 1,500 AFY of recycled water to PVCWD and agricultural operators in the Oxnard Subbasin; of this, approximately 500 AFY is estimated to be used in the PVB[13]. The City of Camarillo anticipates delivering an average of approximately 1,500 AFY of CamSan WRP water to PVCWD, 700 AFY of which is estimated to be used within the PVB, and an additional 2,700 AFY of recycled water to users within the City of Camarillo. CWD anticipates delivering an average of approximately 2,600 AFY of CWRF water, a portion of which is anticipated to be provided to PVCWD. In total, recycled water supplies in the PVB are estimated to average approximately 5,300 AFY. Over the evaluation period, recycled water supplies were approximately 44% lower than future projections.

13 Calculated using the 2016 – 2022 average percentage of total AWPF deliveries provided to PVCWD. Multiplied by 44% to estimate the portion of AWPF deliveries to PVCWD used within the PVB.

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5 Updated Numerical Modeling

5.1 Model Updates

UWCD actively maintains the VRGWFM to support regional groundwater management. The version of the VRGWFM used during development of the GSP covered the entirety of the Oxnard and Mound subbasins and the majority of the WLPMA and PVB (UWCD 2018). Following adoption of the GSP, UWCD expanded the VRGWFM to cover the entirety of WLPMA and PVB and to include the Santa Paula, Piru, and Fillmore Subbasins (UWCD 2021b). As part of this, UWCD updated their hydrogeologic conceptual model of each basin to improve representation of local hydrogeologic conditions and, in the Oxnard Subbasin, better represent groundwater elevations along the coast and their influence on seawater intrusion.

Due to the complexity of simulating the effects of Santa Clara River flows on groundwater conditions in the Santa Paula, Piru, and Fillmore subbasins, UWCD maintains a localized version of the VRGWFM that excludes these upper basins. This branch-off of the VRGWFM is informally referred to as the Coastal Plain Model and covers the entirety of the Oxnard Subbasin, PVB, WLPMA, and Mound Subbasin. Consistent with the GSP modeling, the Coastal Plain Model represents interactions between the Oxnard Subbasin and the upgradient Santa Paula Subbasin using general head boundary condition (FCGMA 2018). While the Coastal Plain Model is distinct from the VRGWFM, the model design and structure are consistent with the model used during development of the GSP. Therefore, the Coastal Plain Model is considered an update to the GSP model and was used for the 5-year GSP evaluation modeling.

Improvements to the Coastal Plain Model compared to the GSP model include revised estimates of subsurface exchanges with the Santa Paula Subbasin (Basin No. 4-004.04), and updated hydrostratigraphy in the vicinity of Port Hueneme and Point Mugu. Additionally, as part of this GSP evaluation, UWCD extended the Coastal Plain Model to simulate groundwater conditions in the Subbasin through water year 2022. Updates are summarized below and described will be detailed in a technical memorandum prepared by UWCD[14].

5.1.1 Underflows from the Santa Paula Subbasin

The Coastal Plain Model includes improved estimates of underflows between the Santa Paula and Oxnard subbasins. These estimates were informed by UWCD's regional modeling efforts with the VRGWFM, which was calibrated to groundwater elevations measured in the Santa Paula, Fillmore, and Piru subbasins, and provides direct simulation of the underflows between each basin. Results from the VRGWFM simulations were used to update the north-eastern general head boundary condition in the Coastal Plain Model, which controls underflows between the Oxnard and Santa Paula subbasins.

5.1.2 Port Hueneme and Point Mugu

As described above, in 2020, UWCD updated the hydrogeologic conceptual model of the Oxnard Subbasin in the vicinity of Port Hueneme and Point Mugu based on newly available geophysical and borehole data. UWCD incorporated the revised hydrostratigraphic mapping into the VRGWFM to better represent hydrogeologic conditions

14 UWCD anticipates publishing the Coastal Plain Model update technical memorandum in fall 2024.

along the coastline. Revisions to the interpreted aquifer thicknesses are summarized in FCGMA (2024b). Importantly, these revisions provide an improved representation of hydrogeologic connectivity between the UAS and FCA near Point Mugu.

5.1.3 Model Extension and Re-Calibration

As part of this 5-year evaluation, UWCD extended the Coastal Plain Model to simulate groundwater conditions in the Subbasin through the end of water year 2022 (i.e., September 30, 2022). As part of the model update and extension process, UWCD re-calibrated the Coastal Plain Model. This re-calibration effort involved incremental adjustments to local hydraulic conductivity, storativity, and boundary conductance values which resulted in better simulation of groundwater conditions along the coastline (details to be included in UWCD's Coastal Plain Model update technical memorandum).

5.2 Future Scenario Water Budgets and Sustainable Yield

Future scenario modeling was updated as part of this 5-year GSP evaluation to better reflect current groundwater usage trends within the PVB; update the future hydrology; and expand the suite of projects included in the simulation of future groundwater conditions. In addition, the future modeling time period was updated to account for the extension in the historical modeling period. Results from the updated future model scenarios were used to estimate the sustainable yield of the PVB under different project and management scenarios.

Revisions to the simulation time period, baseline extractions, future hydrology, and suite of projects considered in the future scenarios are described in Section 5.2.1, Updated Future Scenario Assumptions. The suite of future scenarios, and associated model results, are summarized in Section 5.2.2, Projected Water Budgets. Resulting revisions to the estimates of the future sustainable yield of the Subbasin are summarized in Section 5.2.3, Estimates of the Future Sustainable Yield.

5.2.1 Updated Future Scenario Assumptions

This section describes the set of assumptions used for the updated modeling and provides a comparison to the assumptions used for the GSP.

5.2.1.1 Updated Simulation Time Period

The future scenarios developed for this 5-year evaluation simulate groundwater conditions in the PVB over the 47-year period from October 1, 2022, through September 30, 2069 (i.e., water year 2023 through 2069). This simulation period, combined with the 2020, 2021, and 2022 water-year simulation results, provides a 50-year GSP projection horizon as required under 23 CCR §354.18.

Comparison to the GSP Modeling

The future scenarios developed for the GSP simulated groundwater conditions in the PVB over the 50-year period from January 1, 2020, through December 31, 2069 (FCGMA 2019). Because water years 2020, 2021, and 2022 were incorporated into the historical modeling, the future scenarios were updated to begin in water year 2023.

5.2.1.2 Updated Baseline Extraction Rates

The future baseline groundwater extraction rates used for 5-year evaluation modeling are equal to the 2016 to 2022 average[15]. Groundwater extractions over this period consist of both reported and estimated extractions. Estimated extractions were based on available automated metering infrastructure (AMI) data for wells with missing extraction reports (for example, see FCGMA 2023b).

Comparison to the GSP Modeling

For the GSP, the future baseline extraction rates were equal to the average 2015 to 2017 extraction rates. The 2015 to 2017 extraction rates, adjusted by the projected availability of surface water and recycled water, was equal to approximately 14,000 AFY. The updated baseline extraction rates are approximately 600 AFY higher than those simulated for the GSP (Table 5-2).

5.2.1.3 Updated Hydrology

The future hydrology used for this 5-year evaluation modeling is the 1933 through 1979 hydrology, adjusted by DWR's 2070 central tendency climate change factors, with the noted exception that water year 1933 hydrology was replaced with water year 1978 hydrology. Average annual precipitation over this 47-year period is approximately equal to the long-term average and includes periods of drought as well as wetter-than-average conditions.

Water year 1933 hydrology was approximately 15% drier than the long-term historical average. Conversely, precipitation measured in water year 2023 in the PVB was approximately 75% higher than the long-term historical average, and the volume of Santa Clara River water diverted for recharge in the Forebay Management Area of the Oxnard Subbasin was approximately 230% of the long-term historical average (FCGMA 2024b). To represent the wet 2023 water year in the future projections, the hydrologic record for water year 1933 was replaced with the hydrologic record for water year 1978. Water year 1978 was selected because flows available for diversion from the Santa Clara River were similar to those in water year 2023.

Comparison to the GSP Modeling

The future scenarios developed for the GSP used hydrology measured during the 1930 to 1979 period, adjusted by DWR's 2070 central tendency climate change factors. This hydrology represented the future hydrology for the period from January 1, 2020, through December 31, 2069 (FCGMA 2019). The hydrology used for this 5-year evaluation modeling is consistent with the hydrology used for the GSP, with the noted exception that water year 1933 hydrology was replaced with water year 1978 hydrology.

5.2.1.4 Future Projects and Water Supply

In 2023, FCGMA adopted a process for evaluating water supply and infrastructure projects in the PVB, Oxnard Subbasin, and WLPMA. As part of this process, FCGMA solicited project information from project proponents to evaluate, rank, and prioritize projects for funding and incorporation into the GSP modeling. A full summary of project information solicited through this process is included in Section 3, Status of Projects and Management Actions.

15 Water year 2020 was not included in the calculation. FCGMA transitioned extraction reporting from calendar year to water year in 2020; therefore, 2020 extraction reporting only spanned 9 months (January 1 through September 30).

The suite of projects incorporated into the future scenario modeling is summarized in Table 5-1 and in Section 5.2.2, Projected Water Budgets. Because the Coastal Plain Model spans the entirety of the Oxnard Subbasin, PVB, and WLPMA, Table 5-1 includes existing and planned projects applicable to each basin. Similarly, the water supply estimates shown in Table 5-1 include each project's anticipated total water supply, a portion of which may be used in the PVB.

Table 5-1. Projected Future Water Supplies and Projects in the Oxnard Subbasin, Pleasant Valley Basin, and West Las Posas Management Area of the Las Posas Valley Basin

Source of Future Water Supply	Existing Projects and Programs				Planned Water Supply Projects			
	Description	Project Proponent	Applicable Basin(s)	Projected Future Water Supply / In Lieu Delivery (AFY)	Project Name or Description	Project Proponent	Applicable Basin(s)	Projected Future Water Supply / In Lieu Delivery (AFY)
Santa Clara River	MAR	UWCD	Ox	50,000				
	PTP	UWCD	Ox	5,000				
	PVP	UWCD	Ox, PV	5,100				
					Freeman Expansion	UWCD	Ox, PV	6,800
Imported Water	CMWD Deliveries	CMWD	PV	8,700				
		CMWD	Ox	13,900				
	Groundwater Pumped from ASRV and Used in PVB	CWD	PV	1,600				
	Groundwater Pumped from Tierra Rejada and Used in PVB	CWD	PV	200				
					Purchase of Imported water from CMWD for Basin Replenishment	—	WLPMA	2,262
State Water Project	Supplemental State Water Project Purchase	UWCD	Ox, PV	6,000				
City of Oxnard AWPF	Deliveries to AG Operators[a]	City of Oxnard	Ox, PV	1,500				
	Laguna Road Recycled Water Interconnect	UWCD	Ox, PV	Unknown[b]				
					AWPF Expansion[c]	City of Oxnard	Ox, PV	7,500 - 10,000
					Aquifer Storage and Recovery Program	City of Oxnard	Ox	Unknown[b]
					Injection Barrier	City of Oxnard	Ox	Unknown[b]
Conejo Creek	Conejo Creek Project	CWD	Ox, PV	4,000				
	CWD Deliveries	CWD	PV	2,900				
Camrosa Water Reclamation Facility	CWD Deliveries to AG & M&I Operators	CWD	Ox, PV	2,600				
Camarillo Sanitary District Water Reclamation Plant	Recycled Water Deliveries to PVCWD	City of Camarillo	Ox, PV	1,500				
	Recycled Water Deliveries to AG and M&I within the City of Camarillo	City of Camarillo	PV	2,300				
Treated Brackish Water					Extraction Barrier Brackish Water Treatment Project (EBB)	UWCD	Ox, PV	5,000
	North Pleasant Valley Desalter Project	City of Camarillo	PV	-4,500[d]				
Santa Rosa Subbasin	CWD Importation and delivery to AG & M&I Operators	CWD	PV	1,600				
Tierra Rejada Subbasin	CWD Importation and delivery to AG & M&I Operators	CWD	PV	200				
Demand Reduction	Water Delivery Infrastructure Improvements	ZMWC	WLPMA	500				
					Temporary Voluntary Fallowing	FCGMA	Ox	504[e]
						FCGMA	PV	2,407[e]
Total Anticipated Water Supply from Existing Projects (AFY)				**103,100**	**Total Anticipated Water Supply from Future Projects (AFY)**			**24,473 – 26,973**

Notes: UWCD = United Water Conservation District; CMWD = Calleguas Municipal Water District; CWD = Camrosa Water District; FCGMA = Fox Canyon Groundwater Management Agency; ZMWC = Zone Mutual Water Company; PTP = Pumping Trough Pipeline; PVP = Pleasant Valley Pipeline; AWPF = Advanced Water Purification Facility; ASR = Aquifer Storage and Recovery; MAR = Managed Aquifer Recharge; AG = Agricultural; M&I = Municipal and Industrial; Ox = Oxnard Subbasin; PV = Pleasant Valley Basin; WLPMA = West Las Posas Management Area of the Las Posas Valley Basin; ASRVB = Arroyo Santa Rosa Valley Basin.

a Under existing FCGMA program (Resolution 23-02).

b Project related water supplies dependent on City of Oxnard AWPF water availability.

c The City of Oxnard is currently evaluating the feasibility and benefits of projects in the Oxnard Subbasin and PVB that utilize this water.

[d] Project is designed to extract 4,500 AFY of brackish groundwater from the northern portion of PVB. The City of Camarillo intends to treat and serve this water in lieu of imported water.
[e] Represents temporary demand reduction, not a temporary increase in water supply.

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5.2.2 Projected Water Budgets

Five model scenarios were developed for this 5-year evaluation in accordance with the SGMA guidelines, and consistent with the GSP, to evaluate the future sustainable yield of the Subbasin. These scenarios are:

- Future Baseline Scenario
- NNP Scenario
- Projects Scenario
- Basin Optimization Scenario
- EBB Water Treatment Project Scenario

As noted in Section 5.2.1, Updated Future Scenario Water Budgets and Sustainable Yield, these scenarios cover a 47-year period from October 1, 2022, through September 30, 2069 (i.e., water year 2023 through water year 2069). Consistent with the GSP, the period from 2023 through 2039 is referred to as the "implementation period" and the period from 2040 to 2069 is referred to as the "sustaining period." Due to the connection between the PVB and Oxnard Subbasin, the sustainable yield was evaluated using the model runs that resulted in: (1) no net flux of seawater into either the UAS or LAS of the Oxnard Subbasin, and (2) no landward migration of the saline water impact front in the Oxnard Subbasin. Both metrics were evaluated over the 30-year sustaining period, with consideration of the uncertainty in Coastal Plain Model's predictions (FCGMA 2019).

Because the PVB is hydrogeologically connected to the Oxnard Subbasin, which is hydrogeologically connected to the WLPMA, the sustainable yield of the PVB is influenced by groundwater production and projects in these adjacent basins. The Coastal Plain Model includes both the Oxnard Subbasin and the WLPMA in the model domain, and the modeling assumptions associated with each scenario discussed below include the assumptions made for these adjacent basins.

5.2.2.1 Evaluation Metrics

A total of eight (8) model runs were completed under the five scenarios referenced above. Results from each model run were analyzed to characterize the effects of different pumping distributions, projects, and management actions on groundwater conditions in the PVB, groundwater conditions in the WLPMA, seawater flux into the Oxnard Subbasin, and the landward migration of the saline water impact front. The methods for calculating seawater flux, landward migration of the saline water impact front, and conditions in the PVB and WLPMA are summarized below.

5.2.2.1.1 Seawater Flux and Landward Migration of the Saline Water Impact Front

The Coastal Plain Model provides an estimate of the volume of water entering and leaving the Oxnard Subbasin along the coastline on a monthly timescale. This estimate is divided into four coastal segments: (1) from the northern boundary of the Subbasin, south to Channel Islands Harbor, (2) Channel Islands Harbor to Perkins Road, which is south of Port Hueneme, (3) Perkins Road to Arnold Road, and (4) Arnold Road to Point Mugu (Figure 5-1, Modeled Seawater Flux Coastal Segments). The coastal segment from Channel Islands Harbor to Point Mugu (segments 2 through 4) represents the approximate coastal boundary of the Saline Intrusion Management Area and the portion of the Subbasin that has historically been impacted by seawater intrusion (FCGMA 2019).

Net seawater flux for each model run was calculated by averaging the annual flow of seawater into the Subbasin south of Channel Islands Harbor during the sustaining period. Net seawater flux was calculated separately for both the UAS and LAS to develop an estimate of sustainable yield by aquifer system.

The landward migration of the saline water impact front was characterized using particle tracking for a subset of the model runs. Initial particle positions were set along the current interpretation of the 2020 saline water impact front in each aquifer. The particles were released at the start of the model simulation to provide a 50-year trajectory of the saline water migration within the Oxnard Subbasin.

Particle tracks were analyzed concurrently with the estimates of seawater flux to characterize the likelihood of ongoing landward migration of saline water and seawater intrusion over the 30-year sustaining period.

Scenarios with UWCD's EBB Project

The approach for evaluating seawater intrusion in the Oxnard Subbasin differs between the scenarios that do and do not include UWCD's EBB project. This approach is described in detail in Section 5.2.2.6, Extraction Barrier Brackish Water Treatment Scenario.

5.2.2.1.2 Impacts of PVB and WLPMA on Seawater Intrusion in the Oxnard Subbasin

The Coastal Plain Model internally calculates underflows between the Oxnard Subbasin, PVB, and WLPMA of the LPVB. Results from the Coastal Plain Model were used to calculate the average underflows across each boundary, and by aquifer system, during the 30-year sustaining period to characterize the impacts of pumping, projects, and management actions implemented in one basin on groundwater conditions in an adjacent basin.

5.2.2.2 Future Baseline Model Scenario

SGMA requires that the GSP include an assessment of "future baseline" conditions. The Future Baseline scenario developed for this 5-year evaluation built on the GSP modeling and was designed to assess whether current groundwater extractions from the Oxnard Subbasin, PVB, and WLPMA of the LPVB are sustainable. To do this, the average annual 2016 to 2022 extraction rates, adjusted by surface water and recycled deliveries, were simulated. Future surface water deliveries were estimated by UWCD using their Surface Water Distribution Model (UWCD 2021c) with the GSP evaluation hydrology (Section 5.2.1.3, Updated Hydrology). Estimates of recycled water available for use in lieu of groundwater were provided by the City of Camarillo, CWD, and the City of Oxnard. In addition, the Future Baseline Scenario included all existing projects that are either funded or currently under construction in the Subbasin (Table 5-1).

Adjusting the 2016 to 2022 average groundwater extractions by projected surface water and recycled water supplies leads to an average annual groundwater extraction rate over the sustaining period of approximately 68,300 AFY in the Oxnard Subbasin, 13,900 AFY in the PVB, and 13,500 AFY in the WLPMA.

5.2.2.2.1 Future Baseline Model Assumptions

The Future Baseline model simulation assumptions included the following:

- Average annual extractions from the Subbasin equal to the 2016 to 2022 average, adjusted by surface and recycled water availability.

- Starting groundwater levels equal to the September 30, 2022, groundwater levels from the Coastal Plain Model.
- Precipitation and streamflow for the 1933 to 1979 period, adjusted by DWR's 2070 central tendency climate change factors, with 1933 hydrology replaced by 1978 hydrology (Section 5.2.1.3, Updated Hydrology).
- Estimates of surface water availability for diversion prepared by UWCD using the 5-year GSP evaluation hydrology and calculated using their Surface Water Distribution Model.
- Estimates of recycled water availability provided by the City of Oxnard, City of Camarillo, and CWD.
- Inflows to PVB along Arroyo Las Posas extracted from the East Las Posas Management Area model.

In addition to these assumptions, all existing projects in the Subbasin were included in the Future Baseline model scenario (Table 5-1).

5.2.2.2.2 Future Baseline Model Results

Results from the Future Baseline Scenario indicate that groundwater pumping at the average 2016 to 2022 rate in the Oxnard Subbasin, PVB, and WLPMA, would cause ongoing seawater intrusion into the Oxnard Subbasin and landward migration of the current saline water impact front (Table 5-2; Figures 5-2 through 5-9). The average annual seawater flux into the UAS and LAS was approximately 2,100 AFY and 3,200 AFY, respectively (Table 5-2). In the UAS and LAS, particle tracks indicate that current saline water impact front would migrate landward (Figures 5-4 through 5-9). Based on these factors, the current areal and aquifer-system distribution of groundwater production at the 2016 to 2022 extraction rates in the Oxnard Subbasin and PVB was determined not to be sustainable.

Under the Future Baseline conditions, approximately 900 AFY of underflows from PVB recharged the Oxnard Subbasin through the UAS and approximately 300 AFY of underflows from the PVB recharged the Oxnard Subbasin through the LAS. While net underflows from PVB provided a source of recharge to the Oxnard Subbasin under these conditions, groundwater extractions near the boundary between the two basins contributed to the regional pumping depression that influences seawater intrusion and saline water migration in the Oxnard Subbasin. Approximately 4,400 AFY of underflows from the Oxnard Subbasin recharged the WLPMA (Table 5-2).

Table 5-2. Summary of Future Scenarios

Future Scenario		Average Annual Rate Over the Sustaining Period (2040 – 2069; AFY)							
		Future Baseline	No New Projects			Basin Optimization	Projects	EBB	
			NNP1	NNP2	NNP3			Baseline	Projects
Groundwater Extractions in the PVB[a]	UAS	-4,500	-3,100	-3,200	-3,300	-3,600	-4,100	-4,700	-4,200
	LAS	-10,100	-10,100	-10,800	-10,100	-10,200	-8,900	-9,100	-8,800
	Total	**-14,600**	**-13,200**	**-14,000**	**-13,400**	**-13,800**	**-13,000**	**-13,800**	**-13,000**
Seawater Flux into the Oxnard Subbasin[b]	UAS	2,100	-1,000	-1,100	-600	-400	1,300	6,900	6,200
	LAS	3,400	500	200	1,000	1,100	2,900	4,000	3,400
	Total	**5,500**	**-500**	**-900**	**400**	**700**	**4,200**	**10,900**	**9,600**
Flux across the Current Saline Water Impact Front in the Oxnard Subbasin[c]	UAS	—	—	—	—	—	—	3,200	3,800
	LAS	—	—	—	—	—	—	500	600
	Total	**—**	**—**	**—**	**—**	**—**	**—**	**3,700**	**4,200**
Underflows from PVB to the Oxnard Subbasin[d]	UAS	900	700	600	700	900	1,600	1,100	1,800
	LAS	300	-1,200	-2,000	-1,000	-1,000	600	500	900
	Total	**1,200**	**-500**	**-1,400**	**-300**	**-100**	**2,200**	**1,600**	**2,700**
Underflows from WLPMA to the Oxnard Subbasin[e]	UAS	-4,900	-4,400	-4,500	-4600	-4500	-4,400	-5,000	-4,500
	LAS	500	-1,000	-1,800	-700	300	700	500	800
	Total	**-4,400**	**-5,400**	**-6,300**	**-5,300**	**-4,200**	**-3,700**	**-4,500**	**-3,700**

Notes: AFY = acre-feet per Year; NNP = No New Projects; EBB = Extraction Barrier Brackish; PVB = Pleasant Valley Basin; WLPMA = West Las Posas Management Area of the Las Posas Valley Basin; UAS = Upper Aquifer System; LAS = Lower Aquifer System.

a

a Represents groundwater production from the PVB. Negative (-) values denote that this is a discharge from the PVB.

b Represents the average annual simulated seawater flux across the coastline south of Channel Islands Harbor. Negative (-) values denote a groundwater outflow to the Pacific Ocean. Positive (+) values denote coastal flux into the Oxnard Subbasin.

c Represents sum of fluxes across the interpreted 500 mg/L chloride concentration contour in each principal aquifer. Positive (+) values indicate that fresh groundwater is migrating toward the coast and UWCD's EBB extraction wells. Results are shown only for the EBB scenarios because seawater flux across the coastline in all other scenarios is an indication of ongoing seawater intrusion.

d Negative (-) values denote a net underflow from the PVB to the Oxnard Subbasin. Positive (+) values denote a net underflow from the Oxnard Subbasin to the PVB.

e Negative (-) values denote a net underflow from the WLPMA to the Oxnard Subbasin. Positive (+) values denote a net underflow from the Oxnard Subbasin to the WLPMA.

5.2.2.3 No New Projects Model Scenario

The NNP scenario was designed to provide a direct simulation of the groundwater pumping distributions that limit seawater flux into the Oxnard Subbasin and the landward migration of the 2020 saline water impact front. Three separate model runs were conducted under the NNP scenario: NNP 1, NNP2, and NNP3. Each model run incorporated all the assumptions included in the Future Baseline scenario (Section 5.2.2.2, Future Baseline Model Scenario) but used different sets of assumptions for groundwater production.

The NNP Scenario model runs evaluated different pumping distributions and reductions to provide the FCGMA Board of Directors information to evaluate potential future management actions. While the simulated pumping reductions provide an estimate of the sustainable yield of the PVB, operation within the estimated sustainable yield likely would require development of additional projects and policies that equitably distribute impacts across operators in the PVB. Additionally, and importantly, FCGMA and other agencies in the Oxnard Subbasin, PVB, and WLPMA are actively pursuing the development of water supply projects aimed at increasing the sustainable yield of each basin.

5.2.2.3.1 No New Projects Scenario Assumptions

As described above, the NNP Scenario included all the assumptions from the Future Baseline Scenario, except for the distribution of groundwater production. Groundwater production distributions were adjusted by basin and aquifer system in each of the three model runs. The specific distributions used in each model run are described below.

No New Projects 1

The NNP1 model run incorporated a 20% reduction in pumping in the UAS of the Oxnard Subbasin, an 80% reduction in pumping in the LAS of the Oxnard Subbasin, and a 20% reduction in pumping from both aquifer systems in the PVB and WLPMA of the LPVB (Table 5-2). This reduction in groundwater production, adjusted by surface and recycled water availability, resulted in an average annual groundwater production rate of approximately 39,100 AFY in the Oxnard Subbasin, 13,200 AFY in the PVB, and 10,800 AFY in the WLPMA. The NNP1 pumping distribution is equal to the estimates of future sustainable yield presented in the GSP, adjusted by surface and recycled water availability (FCGMA 2019).

No New Projects 2

The NNP2 model run was designed to evaluate the impacts of pumping in the PVB and WLPMA on seawater flux in the LAS of the Oxnard Subbasin. To do this, a 10% reduction in pumping was implemented in the UAS of the Oxnard Subbasin, a 100% reduction in pumping was implemented in the LAS of the Oxnard Subbasin, and no pumping reductions were implemented in the PVB and WLPMA. Implementing this reduction in groundwater production resulted in an average annual groundwater production rate of approximately 37,800 AFY in the Oxnard Subbasin, 14,000 AFY in the PVB, and 13,500 AFY in the WLPMA. The NNP2 run was specifically to evaluate flows between the basins and not as a potential management scenario.

No New Projects 3

The NNP3 model run was designed to evaluate future groundwater conditions using a revised estimate of the sustainable yield of the Oxnard Subbasin, PVB, and WLPMA. The revised estimate was developed using a multi-parameter system of linear regressions developed using results from the Future Baseline, NNP1, and NNP2 model runs. The NNP3 scenario incorporated a 15% reduction in pumping in the UAS of the Oxnard Subbasin, a 65% reduction in pumping in the LAS of the Oxnard Subbasin, and a 15% reduction in pumping in both aquifer systems of the PVB and WLPMA (Table 5-2). Implementing this reduction in groundwater production results in an average annual groundwater production rate of approximately 44,700 AFY in the Oxnard Subbasin, 13,400 AFY in the PVB, and 11,400 AFY in the WLPMA.

5.2.2.3.2 No New Projects Scenario Model Results

No New Projects 1

In the NNP1 scenario, approximately 1,000 AFY of groundwater discharged to the Pacific Ocean through the UAS south of Channel Islands Harbor, and approximately 500 AFY of seawater entered the Oxnard Subbasin through the LAS south of Channel Islands Harbor (Table 5-2; Figures 5-2, Seawater Flux in the UAS: Future Model Scenarios without UWCD's EBB Project, and 5-3, Seawater Flux in the LAS: Future Model Scenarios without UWCD's EBB Project). Particle tracks were not conducted for this model run.

The NNP1 pumping distribution resulted in approximately 2,200 AFY of underflows from the LAS of the Oxnard Subbasin to the LPVB and PVB (Table 5-2). This is a change in both the direction and magnitude of LAS underflows, compared to the Future Baseline Scenario. This represents a loss of approximately 3,000 AFY in underflow recharge to the Oxnard Subbasin. In the UAS, the NNP1 pumping distribution resulted in a reduction in underflows of approximately 200 AFY from the PVB and a reduction in underflows to the LPVB of approximately 500 AFY, resulting in a net gain in underflows to the UAS of Oxnard Subbasin approximately 300 AFY. The change in underflows in the UAS were less than those simulated in the LAS.

No New Projects 2

The NNP1 model simulation indicates that pumping in the PVB and LPVB influences seawater flux into the Oxnard Subbasin by capturing underflows that would otherwise be recharging the Oxnard Subbasin. The effects of this are more pronounced in the LAS, where differential reductions in pumping between the Oxnard Subbasin, PVB, and WLPMA result in a change in the direction and magnitude of underflows between basins. To better characterize this process, the NNP2 simulation included a complete reduction in pumping in the LAS of the Oxnard Subbasin while maintaining groundwater production in the PVB and WLPMA at the Future Baseline rates.

The NNP2 pumping distribution resulted in approximately 2,000 AFY and 1,800 AFY of underflows from the LAS of the Oxnard Subbasin to the PVB and WLPMA, respectively (Table 5-2). This represents a loss of approximately 4,600 AFY in underflow recharge to LAS of the Oxnard Subbasin compared to the Future Baseline scenario. Additionally, the NNP2 pumping distribution resulted in a 70% increase in the volume of underflows from the LAS of the Oxnard Subbasin to the WLPMA and PVB, compared to the NNP1 scenario. In the UAS, the NNP2 pumping distribution results in a 300 AFY decrease in underflows from the PVB to the Oxnard Subbasin and a 400 AFY decrease in underflows from the WLPMA to the Oxnard Subbasin (Table 5-2).

In the NNP2 simulation, approximately 1,100 AFY of groundwater discharged to the Pacific Ocean through the UAS south of Channel Islands Harbor and approximately 200 AFY of seawater entered the Oxnard Subbasin through the LAS south of Channel Islands Harbor (Table 5-2; Figures 5-2 and 5-3). Particle tracks were not conducted for this model run.

No New Projects 3

In the NNP3 model run, approximately 600 AFY of groundwater discharged to the Pacific Ocean through the UAS south of Channel Islands Harbor and approximately 1,000 AFY of seawater entered the Subbasin through the LAS south of Channel Islands Harbor (Table 5-2; Figures 5-2 and 5-3). Compared to the NNP1 simulation, this represents a 40% reduction in the volume of groundwater lost to the Pacific Ocean through the UAS and provides a similar estimate of seawater flux into the LAS of the Oxnard Subbasin, given the uncertainty in the Coastal Plain Model predictions (FCGMA 2019).

Particle tracks indicate that the NNP3 pumping distribution results in a recession of the saline water impact front in the Oxnard aquifer (Figure 5-10, UWCD Model Particle Tracks, Oxnard Canyon Aquifer, Future Baseline). Similarly, south of Casper Road, particle tracks show no landward migration of the saline water impact front in the Mugu aquifer (Figure 5-11, UWCD Model Particle Tracks, Mugu Aquifer, NNP3). In the northern portion of the saline water impact front in the Mugu aquifer, the NNP3 pumping distribution reduced saline water migration by approximately 50% (Figure 5-11).

In the LAS, the NNP3 pumping distribution does not fully mitigate the landward migration of the saline water impact front, except in the GCA. In the Hueneme aquifer, particle tracks show ongoing landward migration over the entire 47-year simulation period; however, the particle trajectories in the NNP3 scenario are approximately 40% shorter than the Future Baseline Scenario (Figures 5-12 and 5-6, UWCD Model Particle Tracks, Hueneme Aquifer, NNP3). In the upper and basal FCA, the 2020 saline water impact front migrated landward by approximately 0.1 miles. This is an approximately 80% reduction in the saline water impact front migration within the FCA, and within the model uncertainty (Figures 5-13, UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, NNP3; 5-14, UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, NNP3; 5-7, UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Future Baseline; and 5-8, UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Future Baseline).

These particle track and seawater flux results indicate that NNP3 pumping rate and distribution is sustainable, within the uncertainty of the Coastal Plain Model.

The NNP3 pumping distribution resulted in approximately 1,700 AFY of underflows from the LAS of the Oxnard Subbasin to the WLPMA and PVB (Table 5-2). This represents a loss of approximately 2,500 AFY in underflow recharge to the Oxnard Subbasin compared to the Future Baseline scenario. However, the reduction in underflows to the Oxnard Subbasin was approximately 15% and 45% lower than the NNP1 and NNP2 model runs, respectively (Table 5-2). In the UAS, the NNP3 pumping distribution results in a net increase in underflow recharge to the Oxnard Subbasin of approximately 100 AFY (Table 5-2).

5.2.2.4 Basin Optimization Model Scenario

To support effective management, the GSP established five separate management areas in the Oxnard Subbasin: the Forebay Management Area, the West Oxnard Plain Management Area, the Oxnard Pumping Depression Management Area, the Saline Intrusion Management Area, and the East Oxnard Plain Management Area (Figure 5-1). Results from an initial investigation of the pumping impacts within each management area on seawater flux indicate that the sustainable yield of the Oxnard Subbasin and PVB could be increased by shifting pumping out of the Saline Intrusion and Oxnard Pumping Depression management areas into the West Oxnard Plain and Forebay management areas (FCGMA 2024b). The Basin Optimization Scenario was developed to integrate these results into the future scenario modeling for the GSP, with the goal of increasing total groundwater production from the Oxnard

Subbasin, PVB, and WLPMA, while maintaining similar estimates of seawater flux and landward migration of the saline water impact front as the NNP3 model run.

The pumping distribution evaluated as part of this Basin Optimization scenario neither represents a commitment by FCGMA to implement a reduction and/or shift in groundwater production. While the simulated pumping scenario provides the foundation on which additional basin optimization strategies can be developed and evaluated, implementing management actions consistent with this scenario would require the development of additional projects that equitably distribute impacts across operators in the Subbasin. Additionally, and importantly, FCGMA and other agencies in the Subbasin are actively pursuing the development of water supply and treatment projects aimed at increasing the sustainable yield of the Subbasin. These projects should be considered in future evaluations of basin optimization strategies.

5.2.2.4.1 Basin Optimization Scenario Assumptions

As described above, the Basin Optimization Scenario included all the assumptions from the Future Baseline Scenario, except for the distribution of groundwater production. Using the results from the Future Baseline Scenario and NNP Scenario, along with the results from FCGMA's initial investigation of management area impacts (FCGMA 2024b), the Basin Optimization Scenario implemented:

- A 10% reduction in groundwater production from the UAS of the Oxnard Subbasin
- A 40% reduction in groundwater production from the LAS of the Oxnard Subbasin
- A 10% reduction in groundwater production from both aquifer systems of the PVB
- A 10% reduction in groundwater production from both aquifer systems of the LPVB

Importantly, during the sustaining period, all pumping that would have occurred in the Saline Intrusion Management Area of the Oxnard Subbasin and 40% of the pumping that would have occurred in the Oxnard Pumping Depression Management Area of the Oxnard Subbasin, was moved to the West Oxnard Plain Management Area. Implementing this reduction and shift in groundwater production resulted in an average annual groundwater production rate of approximately 52,300 AFY in the Oxnard Subbasin, 13,800 AFY in the PVB, and 12,200 AFY in the WLPMA.

This scenario did not include any changes to existing land uses in the Oxnard Subbasin. Therefore, this modeling scenario assumes that implementing pumping shifts across the Subbasin would occur concurrently with the development of infrastructure projects that would deliver water to operators directly impacted by pumping reductions.

5.2.2.4.2 Basin Optimization Scenario Results

In the Basin Optimization Scenario, approximately 400 AFY of groundwater discharged to the Pacific Ocean through the UAS and approximately 1,100 AFY of seawater entered the Oxnard Subbasin through the LAS (Table 5-2, Figures 5-1 and 5-2). These estimates are similar to the seawater flux values estimated in the NNP3 simulation and are within the quantitative uncertainty of the Coastal Plain Model.

Particle tracks show a similar recession of the saline water impact front in the Oxnard aquifer (5-16, UWCD Model Particle Tracks, Oxnard Aquifer, Basin Optimization). In the Mugu aquifer, the Basin Optimization Scenario pumping distribution reduced the landward migration of the saline water impact front compared to the NNP3 simulation (Figure 5-17, UWCD Model Particle Tracks, Mugu Aquifer, Basin Optimization). In the Hueneme aquifer, FCA, and GCA, particle tracks show similar trajectories of the saline water impact fronts within each aquifer (Figure 5-18 through 5-22). Therefore, the particle tracks and simulated seawater flux values indicate that an average annual production rate of approximately 52,300 AFY in the Oxnard Subbasin, 13,800 AFY in the PVB, and 12,200 AFY in the WLPMA could be sustainable if pumping is redistributed across the Oxnard Subbasin.

The Basin Optimization Scenario pumping distribution resulted in approximately 1,000 AFY of underflows from the LAS of the Oxnard Subbasin to the PVB. Underflows from the LAS of the WLPMA to the Subbasin were approximately 200 AFY less than the Future Baseline Scenario. The combined underflows in the LAS represent a loss of approximately 900 AFY in underflow recharge to the Oxnard Subbasin compared to the Future Baseline scenario. This is approximately 45% lower than the NNP3 simulation (Table 5-2). Recharge from underflows in the UAS increased by approximately 400 AFY (Table 5-2).

5.2.2.5 Projects Scenario

Modeling of future conditions in the Projects Scenario included all the assumptions incorporated in the Future Baseline Scenario, and also included UWCD's Freeman Expansion project, FCGMA's Voluntary Temporary Fallowing Project, and the Zone Mutual Water Company (ZMWC) in-lieu delivery and infrastructure improvement project (Table 5-2). The City of Oxnard's AWPF Expansion project was not incorporated into the Projects Scenario because use(s) of AWPF water have not yet been defined. Additionally, UWCD's EBB Water Treatment project was not included in the Projects Scenario, but rather, was evaluated in a separate scenario to account for the impacts of this project on groundwater elevations and seawater flux along the coast (Section 5.2.2.6, Extraction Barrier Brackish Water Treatment Scenario).

Incorporation of the potential future projects in the Projects Scenario does not represent a commitment by FCGMA to move forward with each project included in the future model scenario.

5.2.2.5.1 Projects Scenario Assumptions

In the Oxnard Subbasin simulated future projects included UWCD's Freeman Diversion Expansion project, which, under the projected future hydrology, would increase Santa Clara River water diversions by approximately 6,800 AFY compared to Future Baseline conditions. UWCD anticipates delivering a portion of this water to users on their pipelines including in the PVB and recharging a portion of this water in the Forebay (Table 5-2). The timing and volume of pipeline deliveries and recharge was determined by UWCD using their Surface Water Distribution Model.

Two voluntary temporary fallowing projects were modeled in the Projects Scenario. In the Oxnard Subbasin, a 504 AFY reduction of pumping was simulated. In the PVCWD service area, a voluntary temporary fallowing program was simulated using a 2,407 AFY reduction in agricultural water demands, which consists of both surface water, recycled water, and groundwater. To do this, agricultural water demands were reduced uniformly and proportionally in the PVCWD service area, and UWCD's Surface Water Distribution Model was used to estimate the resulting reduction in groundwater pumping. These projects are discussed in detail in Section 3.1, Evaluation of Projects and Management Actions Identified in the GSP.

In the WLPMA, future projects included the purchase of 1,762 AFY of water to be delivered to the eastern portion of the WLPMA in lieu of groundwater extraction and infrastructure improvements to ZMWC's distribution network, which are anticipated to reduce groundwater demands by approximately 500 AFY. The combination of these projects results in a reduction in pumping of 2,263 AFY. Simulated pumping was reduced uniformly and proportionally at ZMWC and VCWWD-19 wells located in the WLPMA.

After incorporating the potential future projects, the average groundwater production rate for the UAS in the Oxnard Subbasin was 39,500 AFY and the average groundwater production rate for the LAS in the Oxnard Subbasin was 26,600 AFY for the Projects Scenario. In the PVB, the average groundwater production rate was 4,100 AFY in the UAS and 8,900 AFY in the LAS. In the WLPMA, the average production rate in the LAS was 11,400 AFY.

5.2.2.5.2 Projects Scenario Results

In the Projects Scenario, groundwater production from the Oxnard Subbasin at a rate of approximately 66,100 AFY resulted in seawater flux into both the UAS and LAS of the Subbasin (Table 5-2). In the UAS, the seawater flux averaged approximately 1,300 AFY over the sustaining period, and in the LAS, the seawater flux averaged approximately 2,100 AFY over the sustaining period. These results indicate that implementation of UWCD's Freeman Expansion Project, FCGMA's temporary voluntary fallowing project, and ZMWC's infrastructure improvement and in-lieu delivery project would result in a 20% decrease in total seawater flux, compared to the Future Baseline Scenario. The majority of these benefits would occur in the UAS (Table 5-2).

Implementation of these three projects in the Oxnard Subbasin, PVB, and WLPMA, without any additional demand reduction actions, results in an increase in underflows from the PVB and WLPMA. In the LAS, underflows from the PVB and WLPMA increased by approximately 500 AFY (Table 5-2). In the UAS, underflows from the WLPMA and PVB increased by approximately 1,200 AFY (Table 5-2). The increase in underflow recharge to the Oxnard Subbasin in this scenario helps to raise groundwater elevations in the depression that spans the basin boundary and reduce seawater intrusion into the Oxnard Subbasin.

5.2.2.6 Extraction Barrier Brackish Water Treatment Scenario

UWCD is designing and implementing an EBB Water Treatment Project to create a seawater intrusion barrier at Naval Base Ventura County Point Mugu. UWCD intends to operate the project by extracting brackish groundwater from the Oxnard and Mugu aquifers near the coast, creating a pumping trough that helps prevent landward migration of saline water throughout the Oxnard Subbasin. Because successful implementation and operation of this project will intentionally lower groundwater elevations along the coastline, thereby inducing seawater flux along the coast, a separate set of model simulations were conducted to evaluate this project.

Two model runs were conducted under this scenario:

- Future Baseline with EBB
- Projects with EBB

The assumptions used for each model run are described below. The pumping distributions evaluated in the EBB Water Treatment Scenario does not represent a commitment by FCGMA to move forward with pumping scenarios or projects.

5.2.2.6.1 EBB Water Treatment Scenario Assumptions

Simulation of UWCD's EBB Water Treatment project included the following:

- A total of ten (10) EBB extraction wells screened in the Oxnard aquifer, pumping at a combined rate of approximately 5,000 AFY over the 30-yr sustaining period.
- A total of ten (10) EBB extraction wells screened in the Mugu aquifer, pumping at a combined rate of approximately 5,000 AFY over the 30-year sustaining period.

Consistent with the current project understanding (Section 3.2.5, Project No. 6: Extraction Barrier and Brackish Water Treatment Project), implementation of the EBB Water Treatment Project occurred in two phases:

- **Phase I (Water Year 2028 through Water Year 2030):** 2,500 AFY of production from 5 wells screened in the Oxnard aquifer, and 1,000 AFY of production from 2 wells screened in the Mugu aquifer.
- **Phase I (Water Year 2031 through Water Year 2069):** 5,000 AFY of production from 10 wells screened in the Oxnard aquifer, and 5,000 AFY of production from 10 wells screened in the Mugu aquifer.

Based on the current project understanding, it was assumed that 50% of the brackish water treated as part of the EBB project would be made available for delivery and use in the Subbasin. Of this, UWCD anticipates delivering approximately 1,500 AFY to Naval Base Ventura County and delivering the remaining 3,500 AFY either to operators in the Subbasin or to the Forebay for additional recharge. For simplicity in both the Future Baseline with EBB and Projects with EBB scenario, it was assumed that the 3,500 AFY of treated EBB water was recharged in the Forebay Management Area. The addition of a consistent source of recharge to the Forebay through this project resulted in an increase in the availability of Santa Clara River water for delivery to users on the PTP and PVP.

Future Baseline with EBB Model Simulation

The Future Baseline with EBB simulation included all the assumptions from the Future Baseline Scenario, and also included the full implementation of UWCD's EBB Water Treatment Project. Including UWCD's EBB Water Treatment Project resulted in a total groundwater production rate of 78,200 AFY in the Oxnard Subbasin (10,000 AFY of which are from UWCD's EBB extraction wells), 13,800 AFY from the PVB, and 13,500 AFY from the WLPMA.

Projects with EBB Model Simulation

The Projects with EBB simulation included all the assumptions from the Projects Scenario, and also included the full implementation of UWCD's EBB Water Treatment Project. The net effects of UWCD's EBB Water Treatment Project, Freeman Diversion Expansion Project, Voluntary Temporary Fallowing Project, and In-Lieu and infrastructure improvement projects in WLPMA resulted in a total groundwater production rate of 75,800 AFY from the Oxnard Subbasin (10,000 AFY of which are from UWCD's EBB extraction wells), 13,000 AFY from the PVB, and 11,400 AFY from the WLPMA.

5.2.2.6.2 EBB Water Treatment Scenario Model Results

Because UWCD's EBB project will increase seawater flux into the Subbasin, while mitigating the landward migration of saline water in the Oxnard Subbasin, groundwater sustainability was evaluated by calculating the simulated flows across the current inland extent of saline water impact in the UAS and LAS of the Oxnard Subbasin. The average annual flows across these boundaries for the 30-year sustaining period were used to characterize the pumping rates, projects, and management actions that would result in no net landward movement of the current saline water extents.

Like the some of the scenarios that do not include UWCD's EBB projects, the net flow estimates were analyzed concurrently with particle tracks to characterize the trajectory of the saline water impact front over the sustaining period.

Future Baseline with EBB

In the Future Baseline with EBB scenario, approximately 3,200 AFY of groundwater flowed across the current inland extent of saline water impact in the UAS of the Oxnard Subbasin, toward the coast. This flow direction indicates that, under Future Baseline conditions, operation of UWCD's EBB project did not result in a net landward migration of saline water over the 30-year sustaining period. Particle tracks show a recession in the saline water impact front in the UAS, and corresponding capture of groundwater that migrates toward the coast by UWCD's EBB extraction wells (Figures 5-21, UWCD Model Particle Tracks, Grimes Canyon Aquifer, Basin Optimization; and 5-22, UWCD Model Particle Tracks, Oxnard Aquifer, Future Baseline with EBB).

Over the sustaining period, approximately 500 AFY of groundwater flowed across the current inland extent of saline water impact in the LAS, toward the coast (Table 5-2). This suggests that, under the Future Baseline conditions, while UWCD's EBB project does not include any dedicated extraction wells in the LAS, operation of the UAS extraction wells limit the landward migration of saline water throughout the LAS. This interpretation is consistent with particle tracks that shows a recession of the saline water impact front, particularly near Point Mugu (Figures 5-23 and 5-26). However, particle tracks suggest some inland migration in the Hueneme aquifer near Port Hueneme (Figure 5-24, UWCD Model Particle Tracks, Hueneme Aquifer, Future Baseline with EBB). Presently, there are no wells in this vicinity to monitor the actual saline front. Although modeled particle tracks indicate inland migration of approximately 0.75 miles over the 30-year sustaining period, the closest wells screened across the Hueneme aquifer are still more than 1.5 miles from the modeled inland saline intrusion extent.

These results indicate that groundwater production at the average 2016 to 2022 rates in the Oxnard Subbasin, PVB, and WLPMA may be sustainable if UWCD's EBB project is implemented at a 10,000 AFY production scale.

Projects with EBB

In the Projects with EBB scenario, approximately 3,800 AFY of groundwater flowed across the current inland extent of saline water impact in the UAS, toward the coast. This is an increase in the coastward flow of approximately 20% compared to the Future Baseline with EBB simulation. Like the Future Baseline with EBB simulation, this indicates that operation of UWCD's EBB project will limit the landward migration of saline water throughout the UAS over the 30-year sustaining period. This is consistent with particle tracks that show a recession in the saline water impact front in the UAS (Figures 5-27, Baseline with EBB Scenario, Grimes Canyon Aquifer; and 5-28, UWCD Model Particle Tracks, Oxnard Aquifer, Projects with EBB).

Over the sustaining period, approximately 600 AFY of groundwater will flow across the current inland extent of saline water impact in the LAS, toward the coast. Like the Future Baseline with EBB scenario, this suggests that, while UWCD's EBB project does not include any dedicated extraction wells in the LAS, operation of the UAS extraction wells will result in the vertical migration of flow from the LAS to UAS, limiting the landward migration of saline water throughout the LAS. This interpretation is consistent with particle tracks that shows a recession of the saline water impact front, particularly near Point Mugu (Figures 5-29 through 5-32). The one exception to this is in the Hueneme aquifer near Port Hueneme, where the particle trajectories under the Projects with EBB scenario were similar to those in the Future Baseline with EBB scenario.

5.2.3 Estimates of the Future Sustainable Yield

The sustainability goal for the PVB is: “to maintain a sufficient volume of groundwater in storage in the older alluvium and the LAS so that there is no net decline in groundwater elevation or storage over wet and dry climatic cycles” (FCGMA 2019). Additionally, “groundwater levels in the PVB 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” in the Oxnard Subbasin after 2040 (FCGMA 2019).

Future projected groundwater elevations at all key wells in the PVB indicate that the PVB is not expected to experience long-term decline in groundwater elevation or storage over wet and dry climatic cycles (Section 6, Revisions to the Sustainable Management Criteria). Because of this, the sustainable yield of the PVB was estimated by evaluating the seawater into the Oxnard Subbasin, south of Channel Islands Harbor, over the 30-year sustaining period. The sustaining period was assessed because SGMA recognizes that undesirable results may occur during the 20-year implementation period, as basins move toward sustainable groundwater management. In addition to the flux of seawater, particle tracks from model runs were analyzed to evaluate the potential migration of the current extent of saline water impact in the UAS and the LAS of the Oxnard Subbasin. As described in Section 5.2.2.1, Seawater Flux and Landward Migration of the Saline Water Impact Front, the particles were placed along the approximate inland extent of the zone of saline water impact in 2020. Scenarios that minimize the net flux of seawater into the Oxnard Subbasin and the landward migration of the saline water impact front over the 30-year sustaining period are sustainable for the Subbasin, while those that allow for net seawater intrusion and landward migration of the saline water impact front are not.

Sustainable Yield without Future Projects

All three simulations performed under the NNP Scenario reduced seawater intrusion in the LAS during the 30-year sustaining period and resulted in net freshwater loss from the UAS to the Pacific Ocean. Therefore, the simulation with the highest overall production rate, that also minimized impacts from adjacent basins, was identified as the best estimate of the sustainable yield of the Oxnard Subbasin, PVB, and WLPMA, in the event that no new future projects are implemented in the Oxnard Subbasin and PVB. The simulation with the highest total groundwater production rate from this scenario was NNP3 – under this simulation, an average of approximately 3,300 AFY of groundwater was pumped from the older alluvium (Section 5.2.2.3, No New Projects Model Scenario). This estimate of the sustainable yield is approximately 1,100 AFY lower than the estimate presented in the GSP for the older alluvium (FCGMA 2019). In the NNP3 simulation, a total of 10,100 AFY of groundwater was pumped from the LAS, which is approximately 2,900 AFY higher than the estimate of sustainable yield for the LAS presented in the GSP.

Adding these two estimates together leads to a total estimate of the sustainable yield of the PVB of approximately 13,400 AFY. Applying the estimate of sustainable yield uncertainty calculated during the development of the GSP for the sustaining period suggests that the sustainable yield of the PVB may be as high as 14,600 AFY or as low as 12,200 AFY (FCGMA 2019).

The 2021 to 2022 average annual extractions from the PVB of 15,000 AFY is approximately 400 AFY higher than the estimated upper end of the sustainable yield of the PVB (Table 4-4).

Sustainable Yield with Future Projects

FCGMA and other agencies in the Subbasin have identified, and anticipate implementing, as feasible, additional projects in the Oxnard Subbasin, PVB, and WLPMA that increase the sustainable yield, provide supplemental water, and/or reduce demand in each basin. In the Projects Scenario, implementation of the suite of projects described above reduced seawater flux into the Oxnard Subbasin by approximately 800 AFY, or 40%, in the UAS and 300 AFY, or 10%, in the LAS. Based on the relationship between pumping and seawater intrusion in the Future Baseline and NNP scenarios, this may translate into a 300 AFY increase in the sustainable yield of the older alluvium and a 100 AFY increase in the sustainable yield of the LAS in the PVB.

Adding these two estimates together leads to a potential increase in the sustainable yield of the PVB of approximately 400 AFY. Therefore, if projects are implemented to increase diversions from the Santa Clara River, incentivize Voluntary Temporary Fallowing, and implement in-lieu delivery and infrastructure improvement projects in the WLPMA, the sustainable yield of the PVB may be as high as approximately 15,000 AFY or as low as 12,600 AFY.

In addition to this, results from the Basin Optimization Scenario indicate that a project designed to shift pumping in the Oxnard Subbasin may increase the sustainable yield of the PVB by approximately 400 AFY. This leads to the same estimated range in sustainable yield as the Projects scenario. Additional modeling would be required to evaluate whether or not these benefits are additive to the sustainable yield increases associated with the Projects Scenario.

Sustainable Yield with UWCD's EBB Water Treatment Project

Both simulations conducted under the EBB Water Treatment Scenario limited the landward migration of saline water in the Oxnard aquifer, Mugu aquifer, FCA, and GCA. Because of this, the simulation with the highest overall production rate was used as the estimate of sustainable yield of the Oxnard Subbasin if UWCD's EBB Water Treatment project is successfully implemented as described in Section 5.2.2.6, Extraction Barrier Brackish Water Treatment Scenario. The simulation with the highest total groundwater production rate from this scenario was the Future Baseline with EBB simulation – under this simulation, an average of approximately 4,700 AFY of groundwater was pumped from the UAS and 9,100 AFY of groundwater was pumped from the LAS in the PVB (Section 5.2.2.6, Extraction Barrier Brackish Water Treatment Scenario). This would represent an increase in the sustainable yield of PVB of approximately 400 AFY compared to the scenario in which no new projects are implemented in the Oxnard Subbasin and PVB. In addition to this increase in sustainable yield, UWCD's EBB project is intended to increase water supplies in the PVB by approximately 800 AFY (Table 5-2).

Therefore, if UWCD's EBB project is implemented at a 10,000 AFY production scale, the sustainable yield of the PVB may be as high as approximately 15,400 AFY or as low as 13,000 AFY.

Additional Considerations

Particle tracks from the 5-year GSP evaluation modeling show a consistent landward migration of the saline water impact front in the Hueneme aquifer near Port Hueneme. While none of the scenarios fully mitigate seawater intrusion in the Hueneme aquifer near Port Hueneme, the NNP3, Basin Optimization, and Future Baseline with EBB scenarios were considered sustainable because the particle tracks in the Hueneme aquifer suggest that the saline water migration would not impact beneficial uses and users of groundwater. Over the 47-year period, these three scenarios suggest that the saline water impact front may migrate approximately 0.5 miles inland; the nearest groundwater wells are approximately 1 to 2 miles away from the estimated saline water impact front in 2070 (Figures 5-4 through 5-33).

FCGMA and other agencies will continue to monitor saline water impact in this part of the Oxnard Subbasin. As necessary and appropriate, FCGMA will evaluate the need to implement new projects and technical studies if beneficial uses and users of groundwater are likely to be impacted by future seawater intrusion in the Hueneme aquifer.

6 Revisions to the Sustainable Management Criteria

6.1 Revisions to the Key Well Network

The only revision to the key well network is the removal of well 01N21W02P01S, which was destroyed during the evaluation period (Section 7.3, Functionality of the Water Level Monitoring Network).

6.2 Sustainable Management Criteria

The GSP established minimum threshold and measurable objective groundwater elevations that protect against net chronic lowering of groundwater levels and storage in the PVB, provide flexibility to operate projects in the NPVMA that improve groundwater quality, and mitigate net seawater intrusion in the UAS and LAS of the Oxnard Subbasin (FCGMA 2019). These SMC were established based on simulation results from the VRGWFM (FCGMA 2019). As noted in Section 5.2, Future Scenario Water Budgets and Sustainable Yield, future scenario modeling was updated as part of this periodic evaluation. Two model runs were found to be sustainable: the NNP 3 and Future Baseline with EBB.

Phase I of UWCD's EBB project is anticipated to start in water year 2028 and operate for approximately 3 years (Section 3, Status of Projects and Management Actions). Data collected during Phase I operation will inform project efficacy and impacts. Full scale implementation of the EBB project will require demonstration that the local increase in extractions from the UAS does not induce vertical migration of contaminants from the semi-perched aquifer, down into the drinking water aquifers of the Oxnard Subbasin. Because full-scale implementation of the EBB project will depend on results from Phase I of the project, the minimum thresholds and measurable objectives recommended for the next 5 years of GSP implementation are the SMC that do not account for implementation of UWCD's EBB project.

Recommendations for SMC that account for EBB are discussed in Section 6.2.3, Potential Sustainable Management Criteria with Implementation of EBB. These SMC are included to provide a framework for future management objectives in the event that EBB is successfully implemented in the Oxnard Subbasin. FCGMA and other agencies in the PVB will appropriateness of managing toward these criteria as Phase I of the EBB project is implemented in the Oxnard Subbasin.

6.2.1 Minimum Thresholds

Consistent with the GSP, the minimum threshold groundwater elevations were evaluated by comparing the GSP-defined minimum threshold groundwater elevations to the lowest simulated groundwater elevation after 2040 from the NNP 3 simulation. Groundwater elevation minimum thresholds were updated if the simulated lows in the updated scenarios were more than 5 feet different than the minimum threshold established in the GSP. This 5-foot criterion was selected based on the uncertainty in the modeled relationship between seawater flux and average groundwater elevation within the Saline Intrusion Management Area of the Oxnard Subbasin. Lastly, consistent with the GSP, the minimum threshold groundwater elevation was rounded down to the nearest 5-foot interval (Figures 6-1 through 6-3).

Six minimum threshold groundwater elevations are recommended for revision (Table 6-1, Minimum Threshold and Measurable Objective Groundwater Elevations for the Pleasant Valley Basin). The recommendations are limited to the PVPDMA. In the age-equivalent stratigraphic unit as the Mugu aquifer of the Older Alluvium, the recommended minimum thresholds are an average of approximately 16 feet higher than the GSP. In the FCA, the recommended minimum thresholds are an average of approximately 8 feet higher than the GSP. In the remaining well screened across multiple aquifers, the recommended minimum thresholds are 13 feet higher than the GSP.

6.2.2 Measurable Objectives

Consistent with the GSP, the measurable objective groundwater elevations were evaluated by comparing the GSP-defined measurable objective groundwater elevations to the median simulated groundwater elevation after 2040 from the NNP 3 simulation. Measurable objectives were updated if the median groundwater elevations in the updated scenarios were more than 5-feet different than the measurable objectives established in the GSP. This 5-foot criterion was selected based on the uncertainty in the modeled relationship between seawater flux and average groundwater elevation within the Saline Intrusion Management Area of the Oxnard Subbasin. Lastly, consistent with the GSP, the measurable objective groundwater elevation was rounded down to the nearest 5-foot interval (Figures 6-1 through 6-3).

Six measurable objective groundwater elevations are recommended for revision (Table 6-1). In the Mugu-equivalent of the Older Alluvium, the recommended measurable objective groundwater elevations are an average of approximately 12 feet lower than the GSP. In the FCA of the PVPDMA, the recommended measurable objectives are an average of approximately 10 feet lower than the GSP. In the NPVMA, the measurable objective would be approximately 80 feet lower than the GSP.

Table 6-1. Minimum Threshold and Measurable Objective Groundwater Elevations for the Pleasant Valley Basin

SWN[a]	Management Area	Aquifer	Historical Low (ft msl) and Date Measured[b]		Minimum Thresholds and Measurable Objectives Defined in the GSP[c]		Recommended Minimum Thresholds and Measurable Objectives[c]	
					MT	MO	MT	MO
02N21W34G05S	Older Alluvium (Oxnard)	PVPDMA	-10.19	10/2/2015	32	40	32	40
01N21W03K01S	Older Alluvium (Mugu)	PVPDMA	-79.98	6/30/2015	-53	5	**-35**	**-5**
02N21W34G04S	Older Alluvium (Mugu)	PVPDMA	-80.28	10/15/2015	-48	5	**-35**	**-10**
01N21W03C01S	FCA	PVPDMA	-117.52	10/15/2015	-48	0	**-40**	**-10**
02N20W19M05S	FCA	NPVMA	15.17	10/13/2015	-135	65	-135	**-15**
02N21W34G02S	FCA	PVPDMA	-117.53	10/2/2015	-53	0	**-45**	**-10**
02N21W34G03S	FCA	PVPDMA	-120.62	10/15/2015	-53	0	**-45**	**-10**
~~01N21W02P01S~~	~~Multiple~~	~~PVPDMA~~	-91.77	10/13/2015	-43	5	—	—
01N21W04K01S	Multiple	PVPDMA	-133.47	10/29/2015	-48	0	**-35**	0

Notes: FCA= Fox Canyon Aquifer, GCA = Grimes Canyon Aquifer; MT = minimum threshold; MO = measurable objective; ft. msl = feet mean sea level.

a New key wells are bolded. Key wells removed from the monitoring network denoted with a strikethrough.

b Historical low groundwater elevation measured prior to 12/31/2015. "-" where groundwater elevations were not measured prior to 2015.

c Bolded where different from the GSP (FCGMA 2019).

6.2.3 Potential Sustainable Management Criteria with Implementation of EBB

Implementation of UWCD's EBB project will require the minimum threshold and measurable objective groundwater elevations along the coast in the Oxnard Subbasin to be lower than the GSP SMC to provide sufficient flexibility for project operation. In addition, successful implementation of UWCD's EBB project is expected to support the lowering of the SMC in the PVB, without inducing additional seawater intrusion in the Oxnard Subbasin and causing chronic lowering of groundwater levels and storage in the PVB (Figures 6-4 through 6-6).

6.2.3.1 Minimum Thresholds

Based on the Baseline with EBB simulation results, minimum thresholds in the PVPDMA could be lowered by an average of approximately 33 feet in the Older Alluvium and 44 feet in the FCA and key wells screened across multiple aquifers in the LAS of the PVB. In the NPVMA, the minimum threshold at 02N20W19M05S could be lowered by approximately 10 feet.

The minimum threshold elevations at three key wells under the EBB scenario may be below historical low groundwater elevations (Table 6-2, Potential Minimum Threshold and Measurable Objective Groundwater Elevations for the Pleasant Valley Basin with EBB). One of these wells, 02N20W19M05S, is screened within the LAS of the PVB. Groundwater elevations at this well are strongly influenced by groundwater production from the North Pleasant Valley Desalter project, which has its own set of restrictions on groundwater elevation declines and groundwater quality conditions. The restrictions in the current MCP are being re-evaluated and may be revised in the future.

In the PVPDMA, the minimum threshold groundwater elevations may below historical low elevations at wells 01N21W03K01S and 02N21W34G04S, which are screened within the Older Alluvium. Because groundwater elevations in the LAS in this part of the PVB would be maintained above historical lows, these revised minimum thresholds are not anticipated to cause upward migration of brines from formations that underlie the PVB. However, minimum thresholds below historical low in the Older Alluvium have the potential to cause land subsidence. In the event that these minimum thresholds are integrated into the sustainable groundwater management program, the FCGMA will implement regular subsidence monitoring to evaluate the impacts of groundwater elevations on land subsidence, land uses, and critical infrastructure.

6.2.3.2 Measurable Objectives

Based on the Baseline with EBB simulation results, measurable objectives in the PVPDMA could be lowered by an average of approximately 38 feet in the Older Alluvium and an average of approximately 47 feet in the FCA and key wells screened across multiple aquifers in the LAS. In the NPVMA, the measurable objective at 02N20W19M05S could be lowered by approximately 20 feet.

Table 6-2. Potential Minimum Threshold and Measurable Objective Groundwater Elevations for the Pleasant Valley Basin with EBB

SWN[a]	Management Area	Aquifer	Historical Low (ft msl) and Date Measured[b]		Minimum Thresholds and Measurable Objectives Defined in the GSP[c]		Recommended Minimum Thresholds and Measurable Objectives with EBB[c]	
					MT	MO	MT	MO
02N21W34G05S	Older Alluvium (Oxnard)	PVPDMA	-10.19	10/2/2015	32	40	**10**	**20**
01N21W03K01S	Older Alluvium (Mugu)	PVPDMA	-79.98	6/30/2015	-53	5	**-90**	**-40**
02N21W34G04S	Older Alluvium (Mugu)	PVPDMA	-80.28	10/15/2015	-48	5	**-90**	**-45**
01N21W03C01S	FCA	PVPDMA	-117.52	10/15/2015	-48	0	**-95**	**-50**
02N20W19M05S	FCA	NPVMA	15.17	10/13/2015	-135	65	**-145**	**-35**
02N21W34G02S	FCA	PVPDMA	-117.53	10/2/2015	-53	0	**-95**	**-50**
02N21W34G03S	FCA	PVPDMA	-120.62	10/15/2015	-53	0	**-95**	**-50**
~~01N21W02P01S~~	~~Multiple~~	~~PVPDMA~~	-91.77	10/13/2015	-43	5	—	—
01N21W04K01S	Multiple	PVPDMA	-133.47	10/29/2015	-48	0	**-95**	**-45**

Notes: FCA= Fox Canyon Aquifer, GCA = Grimes Canyon Aquifer; MT = minimum threshold; MO = measurable objective; ft. msl = feet mean sea level.

a New key wells are bolded. Key wells removed from the monitoring network denoted with a strikethrough.

b Historical low groundwater elevation measured prior to 12/31/2015. "-" where groundwater elevations were not measured prior to 2015.

c Bolded where different from the GSP (FCGMA 2019)

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7 Monitoring Network

7.1 Summary of Changes to the Monitoring Network

Groundwater elevation and quality data for the PVB are collected from a network of more than 40 wells. The wells in the monitoring network are monitored by UWCD, Ventura County Watershed Protection District (VCWPD), and the City of Camarillo, in addition to a few smaller agencies that report readings to VCWPD.

Changes to UWCD's Monitoring Activities

The UWCD monitors eight wells in the PVB which have remained the same since the adoption of the GSP. UWCD has revised the monitoring schedule for three of these wells:

- 02N21W34G06S, screened in across multiple aquifers, is no longer sampled for water quality. In addition, UWCD no longer maintains a pressure transducer in this well. Water levels are manually measured.
- UWCD no longer maintains a transducer in well 02N21W34G02S. Water levels are manually measured.
- UWCD no longer maintains a transducer in well 02N21W34G05S. Water levels are manually measured.

Changes to VCWPD's Monitoring Activities

At the time of GSP adoption, VCWPD monitored 23 wells in the PVB. Three of these wells have been removed from the monitoring network because they were either destroyed or VCWPD had recurring access issues. In addition to removing these wells, VCWPD now monitors the new nested well cluster constructed by FCGMA in the NPVMA (Table 7-1, VCWPD Wells Added to the Monitoring Network).

Table 7-1. VCWPD Wells Added to the Monitoring Network

State Well Number (SWN)	Status	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD	Water Quality Samples Collected by VCWPD
01N21W02P01S	Removed	Domestic	Multiple	Unassigned	—	—
02N21W33P02S	Removed	Agricultural	Multiple	LAS	—	—
02N20W28G02S	Removed	Agricultural	Multiple	Unassigned	—	—
02N20W20D01S	Added	Monitoring	Fox	LAS	Yes	—
02N20W20D02S	Added	Monitoring	Fox	LAS	Yes	—
02N20W20D03S	Added	Monitoring	Oxnard Equivalent	Older Alluvium	Yes	—
02N20W20D04S	Added	Monitoring	Hueneme	LAS	Yes	—
02N20W20D05S	Added	Monitoring	Mugu Equivalent	Older Alluvium	Yes	—

Notes: VCWPD = Ventura County Watershed Protection District; LAS = Lower Aquifer System.

In addition to the revisions to their monitoring network, VCWPD updated the monitoring schedule for nine of the 23 wells in the GSP monitoring network (Table 7-2, Change in VCWPD Monitoring Schedule). The primary changes are associated with the lead agency responsible for collecting groundwater level measurements (Table 7-2).

Table 7-2. Change in VCWPD Monitoring Schedule

State Well Number	Main Use	Screened Aquifer	Screened Aquifer System	Change in Water Levels Monitoring Schedule	Water Quality Samples Collected by VCWPD[a]
01N21W01B05S	Agricultural	Unassigned	Unassigned	No longer monitored	Yes
01N21W03D01S	Agricultural	Multiple	Both	No longer monitored	Yes
01N21W03K01S	Agricultural	Mugu	LAS	Now monitored PVCWD	Yes
01N21W03R01S	Agricultural	Multiple	LAS	Now monitored PVCWD	Yes
01N21W10A02S	Domestic	Unassigned	Older Alluvium	No longer monitored-	Yes
01N21W15D02S	Agricultural	Multiple	LAS	Now monitored PVCWD	Yes
02N20W29B02S	Municipal	Unassigned	Unassigned	Now monitored CWD	Yes
02N21W34C01S	Municipal	FCA	LAS	Now monitored City of Camarillo	Yes
02N21W34G01S	Agricultural	Multiple	LAS	Now monitored PVCWD	Yes

Notes: PVCWD = Pleasant Valley County Water District; VCWPD = Ventura County Watershed Protection District; CWD = Camrosa Water District; FCA = Fox Canyon aquifer; LAS = Lower Aquifer System.

Changes to the City of Camarillo's Monitoring Activities

The City of Camarillo monitors three well clusters with three wells screened in different aquifers for each for a total of nine groundwater monitoring wells in the Basin (Table 7-3, City of Camarillo Wells Added to the Network). The wells are sampled for water quality and continuously measured for water levels by transducer. In addition, manual measurements of depth to groundwater are collected at these wells quarterly.

As described in Section 6.1, Revisions to the Key Well Network, these wells have been integrated into the key well network.

Table 7-3. City of Camarillo Wells Added to the Network

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual and Transducer Water Levels Monitored	Water Quality Samples Collected
02N20W30C04S	Monitoring	Oxnard Equivalent	Older Alluvium	Yes	Yes

Table 7-3. City of Camarillo Wells Added to the Network

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual and Transducer Water Levels Monitored	Water Quality Samples Collected
02N20W30C03S	Monitoring	FCA - Upper	LAS	Yes	Yes
02N20W30C02S	Monitoring	FCA – Basal	LAS	Yes	Yes
02N21W26P06S	Monitoring	Mugu Equivalent	Older Alluvium	Yes	Yes
02N21W26P05S	Monitoring	FCA – Upper	LAS	Yes	Yes
02N21W26P04S	Monitoring	FCA – Basal	LAS	Yes	Yes
02N20W30L03S	Monitoring	Mugu Equivalent	Older Alluvium	Yes	Yes
02N20W30L02S	Monitoring	FCA – Upper	LAS	Yes	Yes
02N20W30L01S	Monitoring	GCA	LAS	Yes	Yes

Notes: UAS = Upper Aquifer System; FCA = Fox Canyon Aquifer; GCA = Grimes Canyon Aquifer.

7.2 Data Gaps

7.2.1 Data Gaps That Have Been Addressed

Spatial Data Gaps

The GSP identified six locations for new wells in the PVB that would improve groundwater level and quality characterization (FCGMA 2019). Three of these locations were in the NPVMA and two were in the PVPDMA, and one is in the EPVMA. The new nested monitoring wells constructed by FCGMA and the City of Camarillo are located near two of the locations in the NPVMA (PNW 22 and PNW 20). Data collected at these wells help address data gaps associated with the spatial and temporal distribution of groundwater level and quality monitoring in the PVB.

In addition to these new wells, FCGMA is constructing two additional nested monitoring wells in the PVB, with partial funding through DWR's Sustainable Groundwater Management Implementation Grant. These wells are planned for construction in the same vicinity as PNW-19 and PNW-17. FCGMA anticipates completing construction of these wells in 2024.

Shallow Groundwater Monitoring near Surface Water Bodies and GDEs

Currently, there are no dedicated monitoring wells that can be used to monitor shallow groundwater that may be interconnected with surface water bodies or sustain potential GDEs in the PVB. To fill this data gap, FCGMA is constructing two shallow groundwater monitoring wells in the PVB. The first well is located near Arroyo Las Posas, near the boundary with the LPVB, in the vicinity of PNW-15 (FCGMA 2019). The second well is located near Conejo Creek, in the northern portion of the EPVMA, in the vicinity of PNW-16 (FCGMA 2019). FCGMA anticipates completing construction of these wells in 2024. These new wells are partially funded through DWR's Sustainable Groundwater Management Implementation Grant.

7.2.2 Data Gaps that Remain

As described in the GSP, the existing monitoring network in the PVB is sufficient to document groundwater and can be used to document progress toward the sustainability goals for the PVB. Potential monitoring network improvements that address data gaps that remain from the GSP are summarized below.

7.2.2.1 Water Level Measurements: Temporal Data Gap

The DWR Monitoring Protocols Best Management Practices (DWR 2016a) states the following:

> Groundwater elevation data … should approximate conditions at a discrete period in time. Therefore, all groundwater levels in a basin should be collected within as short a time as possible, preferably within a 1-to-2-week period.

The DWR Monitoring Networks Best Management Practices (DWR 2016b) states the following:

> Groundwater levels will be collected during the middle of October and March for comparative reporting purposes.

Currently, groundwater elevation measurements are not scheduled according to these criteria because FCGMA relies on monitoring by several other agencies. To minimize the effects of this type of temporal data gap in the future, it would be necessary to coordinate the collection of groundwater elevation data, so it occurs within a 2-week window during the key reporting periods of mid-March and mid-October. The recommended collection windows are October 9–22 in the fall and March 9–22 in the spring (FCGMA 2019).

Additionally, as funding becomes available, pressure transducers should be added to wells in the groundwater monitoring network. Pressure transducer records provide the high-temporal-resolution data that allows for a better understanding of water level dynamics in the wells related to groundwater production, groundwater management activities, and climatic influence. Installing pressure transducers in agricultural irrigation wells requires installation of sounding tubes to below the turbine pump bowls and modification of the wellhead.

7.2.2.2 Groundwater Quality Monitoring

Improvements to the groundwater quality monitoring network include increasing the spatial density of samples by collecting water quality samples from all wells in the monitoring network and ensuring that water quality samples are collected at least annually from each well. Annual groundwater quality samples should also be collected from wells that are added to the groundwater elevation monitoring network in the future. This spatial data gap is most prevalent in the PVPDMA.

Additionally, the current analyte list at the wells planned for construction should include a full general minerals suite so that Stiff or Piper diagrams can be created to fully characterize the geochemical characteristics of the groundwater and track changes over time.

7.3 Functionality of the Water Level Monitoring Network

The spatial and temporal coverage of the existing groundwater monitoring network is sufficient to provide an understanding of representative water level conditions in the Older Alluvium and LAS in the PVB (Figures 7-1 to 7-5). Wells in the key well network are screened sufficiently deep to measure groundwater elevations at, or below, the minimum thresholds in the PVB.

Revisions to the Key Well Network

Well 01N21W02P01S was destroyed during the evaluation period and has been removed from the key well network. This well was screened across multiple aquifers within the PVPDMA. Because this well was screened across multiple aquifers, FCGMA has not identified a replacement for this well to include in the key well network. Instead, FCGMA will incorporate the new nested monitoring well planned for the PVPDMA that is currently under construction. These new wells will provide aquifer-specific groundwater elevation and quality data that improve on the measurements provided by 01N21W02P01S.

New wells will be constructed to applicable well installation standards set in California DWR Bulletin 74-81 and 74-90, or as updated (DWR 2016b). It is recommended that, where feasible, new wells be subjected to pumping tests in order to collect additional information about aquifer properties in the vicinity of new monitoring locations.

7.4 Functionality of Additional Monitoring Network

FCGMA will monitor subsidence in the PVB using DWR's TRE ALTAMIRA InSAR data. Updates are provided annually with point data and raster interpolations of total vertical displacement since June 13, 2015, and annual vertical displacement rates. This data will be used in conjunction with groundwater elevation data to monitor land subsidence with relation to groundwater extraction.

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8 FCGMA Authorities and Enforcement Actions

8.1 Actions Taken by the Agency

This section describes relevant actions taken by FCGMA and includes a summary of regulations or ordinances related to the GSP, per GSP Emergency Regulations Section 356.4(g). As a groundwater management agency established by the California Legislature in 1982 with the Fox Canyon Groundwater Management Agency Act, the FCGMA adopted many ordinances and regulations related to managing the Basin prior to adoption of the GSP in December 2019 and submittal in January 2020.

This section describes the ordinances and resolutions adopted since adoption of the GSP, which are summarized in Table 8-1, Summary of Actions Taken by the Agency. These ordinances and resolutions can be grouped into the following general actions to advance groundwater sustainability and implement the GSP.

Table 8-1. Summary of Actions Taken by the Agency

Date Adopted	Regulatory Action	Description
4/22/2020	Resolution No. 2020-03 Establishing Policies and Procedures for Granting Variances from the Initial Extraction Allocation Under the Ordinance to Establish an Allocation System for the Oxnard and Pleasant Valley Groundwater Basins	Facilitated implementation of new extraction allocation system by establishing policies and procedures for granting variances to initial allocations.
5/27/2020	An Ordinance to Adjust Extraction Allocations to Facilitate the Transition from Calendar Year to Water Year Reporting of Groundwater Extractions	Established the process to transition from Agency's traditional calendar year extraction reporting to reporting by water year.
10/28/2020	An Ordinance to Amend the Ordinance to Establish an Allocation System for the OPV Groundwater Basins to Reduce the Potential for Imposition of Surcharges	Eased transition to new allocation ordinance for pumpers with reduced extraction allocations under new ordinance.
10/28/2020	Resolution No. 2020-05 Imposing a Fee on Groundwater Extractions to Establish a Reserve Fund to be Used to Pay the Cost and Expenses of Actions and Proceedings Related to FCGMA's Groundwater Sustainability Program	Imposed a new $20 per AF fee on all but de minimis pumpers for legal expenses related to actions and proceedings related to the FCGMA's GSP implementation.
10/2/2020	Resolution No. 2020-07 Increasing Tiered Groundwater Extraction Surcharge Rates.	Increased the surcharge rate to $1,549 for extractions that exceed a pumper's extraction allocation.
3/24/2021	Ordinance to Amend the Ordinance to Establish an Allocation System for the Oxnard and Pleasant Valley Groundwater Basins	Modified reporting requirements for mutual water companies, special districts, and municipalities for groundwater or in lieu deliveries for agricultural use outside of the Basin or Agency boundary.

Table 8-1. Summary of Actions Taken by the Agency

Date Adopted	Regulatory Action	Description
3/24/2021	An Ordinance to Exempt Domestic Operators from the Requirement that Flowmeters be Equipped with Advanced Metering Infrastructure (AMI) Telemetry	Exempts domestic pumpers that extract 2 AF or less per year with specified maximum pump discharge and horsepower from Agency's AMI requirements.
2/23/2022	Amended Resolution No. 2020-03 establishing policies and procedures for granting variances from the initial extraction allocation under the ordinance to establish an allocation for the Oxnard and Pleasant Valley Groundwater Basins	Facilitated implementation of extraction allocation system by delegating consideration of certain civil penalties to the Executive Officer and clarified text to avoid potential confusion.
5/25/2022	Ordinance 8.10 to Amend the Fox Canyon Groundwater Management Agency Ordinance Code Relating to Reporting Extractions	Requires monthly extraction reporting by M&I and domestic pumpers, in addition to agricultural pumpers, for wells required to be equipped with AMI.
9/28/2022	Resolution No. 2022-05 Increasing Fee on Groundwater Extractions to Fund the Costs of a Groundwater Sustainability Program.	Increased the groundwater sustainability fee to $29 per AF (except de minimis pumpers) to fund the costs of the groundwater sustainability program.
10/26/2022	Resolution No. 2022-06 Increasing the Tiered Groundwater Extraction Surcharge Rates.	Increased the surcharge rate to $1,841 for extractions that exceed a pumper's allocation.
3/27/2024	An Ordinance Amending Articles 4 and 6 and Rescinding Section 10.2 of an Ordinance to Establish an Allocation System for the Oxnard and Pleasant Valley Groundwater Basins	Amends the allocation ordinance to comply with a court decision and order; establishes a new Calleguas Flex Program to encourage coordinated use of groundwater and imported water supplies.
4/24/2024	Resolution No. 2024-03 Increasing Tiered Groundwater Extraction Surcharge Rates	Increased the surcharge rate to $1,929 for extractions that exceed a pumper's allocation.

Notes: OPV = Oxnard Subbasin and Pleasant Valley Basin; AF = acre-feet; FCGMA = Fox Canyon Groundwater Management Agency; GSP = Groundwater Sustainability Plan; M&I = Municipal and Industrial.

8.1.1 Extraction Reporting

FCGMA implemented several ordinances to improve extraction reporting. These include transition from FCGMA's traditional calendar year reporting to reporting by water year; modified reporting requirements for mutual water companies, special districts, and municipalities for groundwater or in lieu deliveries for agricultural use outside of the Basin; exempting de minimis domestic pumpers from FCGMA's advanced metering infrastructure (AMI) requirements; and requiring monthly extraction reporting by all pumpers required to equip wells with AMI.

8.1.2 Extraction Allocations

Regulating extraction allocations is the primary management action available to FCGMA for managing groundwater demand in the Basin. FCGMA's previous allocation system needed to be replaced to sustainably manage the Basin and a new allocation system was developed over several years concurrent with development of the GSP. The new allocation ordinance was adopted in October 2019 and became effective on October 1, 2020. Since adoption of the GSP, FCGMA has adopted ordinance amendments and resolutions to facilitate transition to the new ordinance, provide policies and procedures for seeking variances, and made modifications required under a court order addressing a challenge to the ordinance. Additionally, FCGMA adopted resolutions increasing tiered groundwater surcharge rates for extractions that exceed allocation. The surcharge provides an economic disincentive to extract groundwater exceeding allocation.

8.1.3 Funding

FCGMA adopted a “groundwater sustainability” regulatory fee on extractions to fund development of the GSP. Subsequent to adoption of the GSP, the fee was increased from $14 per acre-foot to $29 per acre-foot to fund the cost of FCGMA’s groundwater sustainability program. FCGMA also adopted a $20 per acre-foot “reserve fee” to fund the cost and expense of legal actions and proceedings brought against FCGMA related to implementation of FCGMA’s groundwater sustainability program. Surcharges collected for extractions exceeding allocation are accounted separate from the operating account and are to be used for acquisition of supplemental water or actions to increase the yield of the Basin. FCGMA has also been investigating establishment of a “groundwater replenishment” fee to fund groundwater supply and replenishment projects and programs.

8.2 Enforcement and Legal Actions by the Agency

FCGMA has a robust ordinance code and set of resolutions that establish programs for basin management and reporting. These include ordinances and resolutions adopted under both the authority of the FCGMA Act and SGMA. The FCGMA Board has adopted policies and procedures for ordinance code violations, including sending notices of violation and assessing civil penalties, for failure to:

- Register an extraction facility.
- Report a change in owner or operator of an extraction facility within 30 days.
- Submit a semi-annual groundwater extraction statement.
- Install and maintain advanced metering infrastructure (AMI) on an extraction facility, unless exempt.
- Submit monthly reports of extractions from AMI, unless exempt.
- Install a flowmeter prior to pumping groundwater from an extraction facility.
- Report flowmeter failure and repair or replace the flowmeter within the required timeframe.
- Test and calibrate a flowmeter at the required frequency.
- Remit payment of groundwater extraction fees or civil penalties

The FCGMA Board additionally established a tiered surcharge for extractions in excess of extraction allocation.

8.3 Plan Amendments

The work completed as part of this periodic GSP evaluation will be integrated into an amendment of the PVB GSP. This amendment will include updates to the:

- List of projects and management actions that support GSP implementation.
- Hydrogeologic conceptual model of the PVB.

- Future scenario modeling.
- Estimates of the sustainable yield for the older alluvium and LAS.
- Minimum thresholds, measurable objectives, and interim milestones.
- Representative Monitoring Well (Key Well) Network.
- General GSP monitoring network.

FCGMA anticipates adopting the PVB GSP amendment and submitting to DWR in the first quarter of 2025.

9 Outreach, Engagement, and Coordination

9.1 Outreach and Engagement

A public outreach and engagement plan was developed for the PVB GSP (FCGMA 2019). The outreach and engagement plan:

- Discusses FCGMA's decision-making process and how public input and responses will be used.
- Identifies opportunities for public engagement.
- Describes how FCGMA encourages the active involvement of diverse social, cultural, and economic elements of the population in the PVB; and
- Describes the method FCGMA shall follow to inform the public about progress implementing the plan, including the status of projects and management actions.

Since adopting the GSP for the PVB in 2019, the FCGMA Board of Directors has continued to prioritize outreach and engagement with interested parties and has followed the elements of the outreach and engagement plan developed for the GSP. Review of the outreach and engagement plan for this First Periodic Evaluation indicates that the methods described for outreach and engagement activities are relevant to GSP implementation and are being used to successfully support interested party involvement in the GSP implementation process.

During the GSP development and adoption process, interested parties expressed an interest in developing additional projects to increase the sustainable yield of the PVB. FCGMA engaged with interested parties to solicit project descriptions, which were included in the 2022 GSP annual report (FCGMA 2022). In order to assist the FCGMA Board with evaluating the projects, FCGMA collaborated with interested parties to develop a project evaluation criteria checklist and held multiple operations committee meetings at which the project evaluation process was discussed, and project descriptions were refined. This process will allow FCGMA and project proponents to pursue project funding opportunities and has helped the implementation of project and management actions.

FCGMA has provided updates on GSP implementation activities and public participation opportunities to interested parties through direct electronic communications and posts to the FCGMA website. Additional, updates and opportunities for public comment were provided at FCGMA Regular Board meetings, FCGMA Special Board meetings, and FCGMA Board committee meetings. Meeting agendas and minutes, as well as video recordings of all FCGMA Board meetings and workshops, were made available on the FCGMA website. The Draft Periodic Evaluation of the GSP, was made available for review on the GSP website for 45 days. FCGMA encouraged active participation from interested parties through public workshops (August 30, 2023; April 25, 2024; and September 9, 2024). Additionally, in response to requests from interested parties, the FCGMA Board held a technical workshop focused on baseline and future model scenarios for the Oxnard Subbasin and the PVB on May 30, 2024. This workshop provided interested parties with an opportunity to review the numerical model updates and future model scenarios during the development of this periodic evaluation. Comments made during the technical workshop were used to refine the model scenarios proposed and to develop an additional modeling scenario to evaluate impacts of a geographic redistribution groundwater production on seawater intrusion in the Oxnard Subbasin.

9.2 GSA Board

The FCGMA Board of Directors holds monthly meetings during which the Board is apprised of ongoing projects and upcoming initiatives that impact groundwater conditions in the basins under its jurisdiction, including the LPVB. Interested parties are informed in advance of each Board meeting via email and the Board meeting schedule is posted on the FCGMA website. Technical updates, consideration of impacts to beneficial uses and users of groundwater, and feedback from interested parties serve as the underpinnings for policy decisions made by the Board.

Since adopting the GSP in 2019, the Board has held 52 regular meetings and 25 special meetings. The topics discussed at these meetings included:

- GSP Implementation
- Grant Opportunities for Projects and Management Actions
- GSP Annual Reports
- GSP Periodic Updates
- Groundwater Allocation Ordinances
- Groundwater Adjudication Proceedings

The Board is composed of members representing the County of Ventura, the United Water Conservation District, the seven small water districts within the FCGMA jurisdiction, the five incorporated cities within the FCGMA jurisdiction, and the farmers. Members of the current Board have served for multiple years and are fully informed of the requirements for sustainable management of the PVB under SGMA.

9.3 Summary of Coordination Between Agencies

FCGMA has a long-standing history of coordination with other agencies in the PVB, including the Camrosa Water District – Pleasant Valley GSA, the Pleasant Valley Outlying Areas GSA (County of Ventura), United Water Conservation District, and Pleasant Valley County Water District. There are no federally recognized tribal communities, federal lands, or state lands within the PVB. Coordination between relevant agencies in the PVB has continued throughout the implementation of the GSP, with FCGMA holding regular meetings with to coordinate on projects, grant funding opportunities, land use planning, well permitting, and water management strategies within the PVB. Because of the history of coordination between agencies that began before SGMA was enacted, no new inter-agency agreements have been required to manage the PVB since the GSP was adopted. Similarly, no changes were made to the GSP in response to new local requirements by these agencies.

The PVB shares a basin boundary with both the Oxnard Subbasin to the west, and the LPVB to the northeast. FCGMA is the primary GSA, along with Camrosa Water District and the County of Ventura, for these adjacent basins. The GSPs for the PVB, Oxnard Subbasin, and LPVB were all prepared by FCGMA using consistent data, methods, and tools, and the sustainable management criteria for each basin were developed with the consideration of impacts on the adjacent basins. The internal coordination that has been in place since the formation of the FCGMA in 1982 has continued through the first 5 years of GSP implementation. The FCGMA Board considers the impacts of implementation activities and policy decisions on the interested parties in all of the basins within the FCGMA jurisdiction.

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10 Other Information

10.1 Consideration of Adjacent Basins

The PVB is hydrogeologically connected with the Oxnard Subbasin and LPVB. FCGMA, as the lead GSA for the Oxnard Subbasin, PVB, and LPVB, used a regional approach to determine the combined sustainable yield of all three basins during development of the GSP. The individual sustainable yields and sustainable management criteria for each basin were then established to ensure that each basin is managed with mutually beneficial sustainability goals. DWR found that FCGMA's approach demonstrated an adequate consideration of adjacent basins and subbasins (DWR 2021). FCGMA has not altered this approach as a result of the first periodic evaluation process because implementation of the GSP has not affected the ability of the Oxnard Subbasin or LPVB to achieve their respective sustainability goals. FCGMA will continue to manage the PVB with consideration of impacts to the adjacent basins and, as part of GSP implementation, will continue to evaluate the relationship between groundwater production in the PVB and groundwater conditions in adjacent basins.

10.2 Challenges Not Previously Discussed

The most significant challenge for successful implementation of the GSP is acquiring funding to fill data gaps, address DWR recommended corrective actions, and construct projects. FCGMA has investigated funding mechanisms to support these efforts and has implemented a reserve fee to respond to legal challenges. However, development and implementation of replenishment fees sufficient to fund full GSP implementation remains a challenge for the agency.

10.3 Legal Challenges

Fox Canyon Groundwater Management Agency (FCGMA) did not take legal action or enforcement in the Pleasant Valley Basin or the Oxnard Subbasin (Basins) in furtherance of the Basins' sustainability goal (23 C.C.R. § 356.4(h).) The following discussion describes the lawsuits pending against FCGMA and their effect on FCGMA's implementation of the OPV GSPs and sustainable management of the Basins.

City of Oxnard v. Fox Canyon Groundwater Management Agency, Los Angeles Sup. Ct. Case No. 20STCP00929

In December 2019, the City of Oxnard filed a petition for writ of mandate challenging FCGMA's adoption of an ordinance intended to transition the Agency's current groundwater management programs to sustainable groundwater management under SGMA. The ordinance establishes extraction allocations (limits) for all users in the Basins and recognizes the need to reduce allocations in the event the sustainable yield of the Basins is less than the total extraction allocations established under the ordinance. In August 2023, the Los Angeles Superior Court issued a writ of mandate requiring FCGMA to amend the ordinance; FCGMA amended the ordinance in March 2024; the City of Oxnard challenged FCGMA's adoption of the amended ordinance in April 2024; and a hearing on FCGMA's amended ordinance is scheduled for August 2024. If the amended ordinance is invalidated, FCGMA will be required to rescind or revise the ordinance including provisions governing extraction allocations. If required to further amend the ordinance, it is unclear at this time whether FCGMA will rescind or further amend the ordinance and what amendments will be adopted. Consequently, the legal effect of the City of Oxnard's lawsuit on FCGMA's implementation of the Oxnard and Pleasant Valley GSPs and the sustainable management of the Basins is uncertain at this time.

OPV Coalition, et al. v. Fox Canyon Groundwater Management Agency, Santa Barbara Sup. Ct. Case No. VENCI00555357

In June 2021, the OPV Coalition filed a lawsuit against FCGMA, challenging the Oxnard and Pleasant Valley GSPs, the ordinance that establishes extraction allocations (limits) for all users in the basins, and requesting an adjudication of all groundwater rights in the basins. In May 2024, the Court stayed the claims challenging the Oxnard and Pleasant Valley GSPs and the ordinance establishing allocations in favor of the groundwater adjudication. In June 2024, the Court issued an order dividing the adjudication into three phases with Phase 1 deciding the basins' safe yield and total safe yield; Phase 2 adjudicating all groundwater rights; and Phase 3 dedicated to deciding the challenges to the Oxnard and Pleasant Valley GSPs and the allocation ordinance, basin governance and management, and whether a physical solution is necessary. At this time, it is unclear what legal effect the lawsuit, in particular the adjudication action, will have on FCGMA's continued ability to implement the Oxnard and Pleasant Valley GSPs and sustainably manage the basins. If the Court had given priority to the writ claims challenging the Oxnard and Pleasant Valley GSPs and the allocation ordinance (rather than the adjudication), review of the Oxnard and Pleasant Valley GSPs (including their sustainable yield estimates) and the allocation ordinance would be limited to the administrative records and discovery on the GSPs and ordinance would likely be avoided. Because the Court decided to prioritize the adjudication, plaintiffs intend to take discovery on the Oxnard and Pleasant Valley GSPs and ordinance during the adjudication, which will necessarily divert FCGMA resources from implementation of the Oxnard and Pleasant Valley GSPs and sustainably managing the basins.

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11 Summary of Proposed or Completed Revisions to Plan Elements

The work completed as part of this periodic GSP evaluation has resulted in:

- An expanded suite of projects considered as part of GSP implementation.
- Improvements to the hydrogeologic conceptual model of the Subbasin based on newly available data.
- Improvements to the estimate of the sustainable yield of Subbasin that accounts for a range of projects and management actions implemented in the Subbasin.
- Revisions to the monitoring network, including the key well network, used to evaluate groundwater conditions and groundwater sustainability in the Subbasin.

These revisions warrant an amendment to the GSP. A summary of planned revisions to the GSP elements are summarized in Table 11-1, Summary of Proposed Plan Element Revisions.

Table 11-1. Summary of Proposed Plan Element Revisions

Section	Proposed Change	Reference to information in this report that warrants Plan Element Revisions
Administrative Information		
There are no proposed changes to the Administrative Information presented in the GSP based on the information reviewed and evaluated as part of this periodic GSP evaluation.		
Basin Setting		
Hydrogeologic Conceptual Model	Description of vertical gradients between the Older Alluvium and LAS in the NPVMA	Section 4.1
	Description of data gaps and uncertainty in the hydrogeologic conceptual model	
Groundwater Conditions	There are no proposed changes to the Groundwater Conditions presented in the GSP based on the information reviewed and evaluated as part of this periodic GSP evaluation.	
Water Budget	Description of Projected Future Water Budget	Section 5.2
	Description of Future Sustainable Yield	Section 5.2.3
Management Areas	There are no proposed changes to the Management Areas presented in the GSP based on the information reviewed and evaluated as part of this periodic GSP evaluation.	
Sustainable Management Criteria		
Sustainability Goal	There are no proposed changes to the Sustainability Goal presented in the GSP based on the information reviewed and evaluated as part of this periodic GSP evaluation.	
Undesirable Results	There are no proposed changes to the definition of Undesirable Results presented in the GSP.	
Minimum Thresholds	Update groundwater elevation minimum thresholds based on revised future scenarios	Section 6.2
Measurable Objectives	Update groundwater elevation measurable objectives based on revised future scenarios	Section 6.2
Monitoring Network		
Monitoring Network Objectives	There are no proposed changes to the monitoring network objectives presented in the GSP based on the information reviewed and evaluated as part of this periodic GSP evaluation.	
Description of Monitoring Network	Incorporate updates to UWCD's, VCWPD's, and the City of Camarillo's current monitoring program and include newly constructed monitoring wells into the key well network	Sections 7.1, 7.2, and 7.3

Table 11-1. Summary of Proposed Plan Element Revisions

Section	Proposed Change	Reference to information in this report that warrants Plan Element Revisions
Monitoring Network Implementation	There are no proposed changes to the monitoring network implementation presented in the GSP based on the information reviewed and evaluated as part of this periodic GSP evaluation	
Protocols for Data Collection and Monitoring	There are no proposed changes to the protocols for data collection and monitoring presented in the GSP based on the information reviewed and evaluated as part of this periodic GSP evaluation	
Potential Monitoring Network Improvements	Update the potential new well (PNW) locations based on revisions to the existing monitoring network	Section 7.1 and 7.3
Projects and Management Action		
Projects	Provide updated descriptions of projects included in the GSP	Section 3.1
	Include an expanded suite of projects based on information submitted to FCGMA by other agencies in the Subbasin.	Section 3.2
Management Actions	There are no proposed changes to the management actions presented in the GSP based on the information reviewed and evaluated as part of this periodic GSP evaluation	

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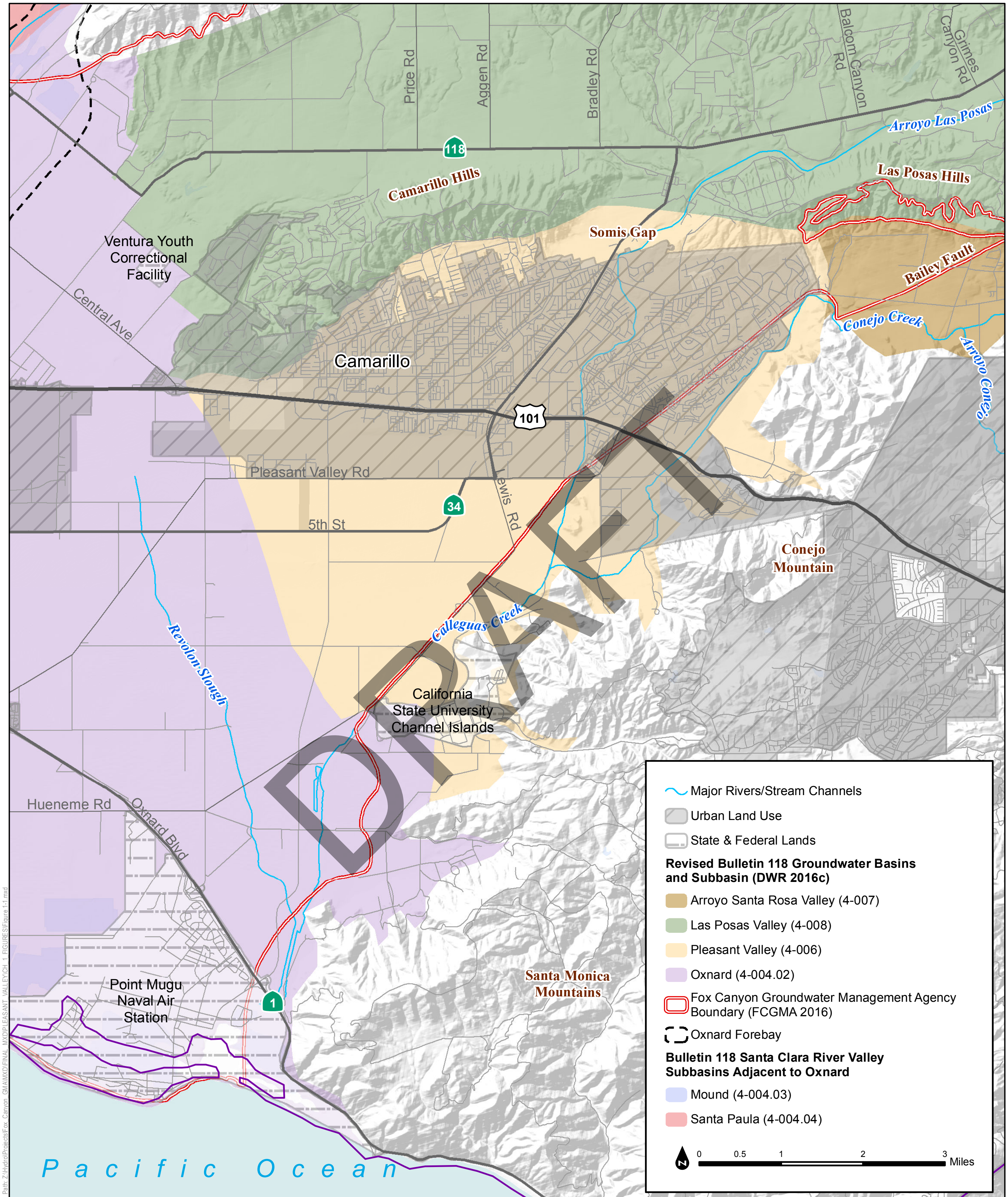

DUDEK

SOURCE: DWR; Ventura County; FCGMA

FIGURE 2-1

Vicinity Map for the Pleasant Valley Basin

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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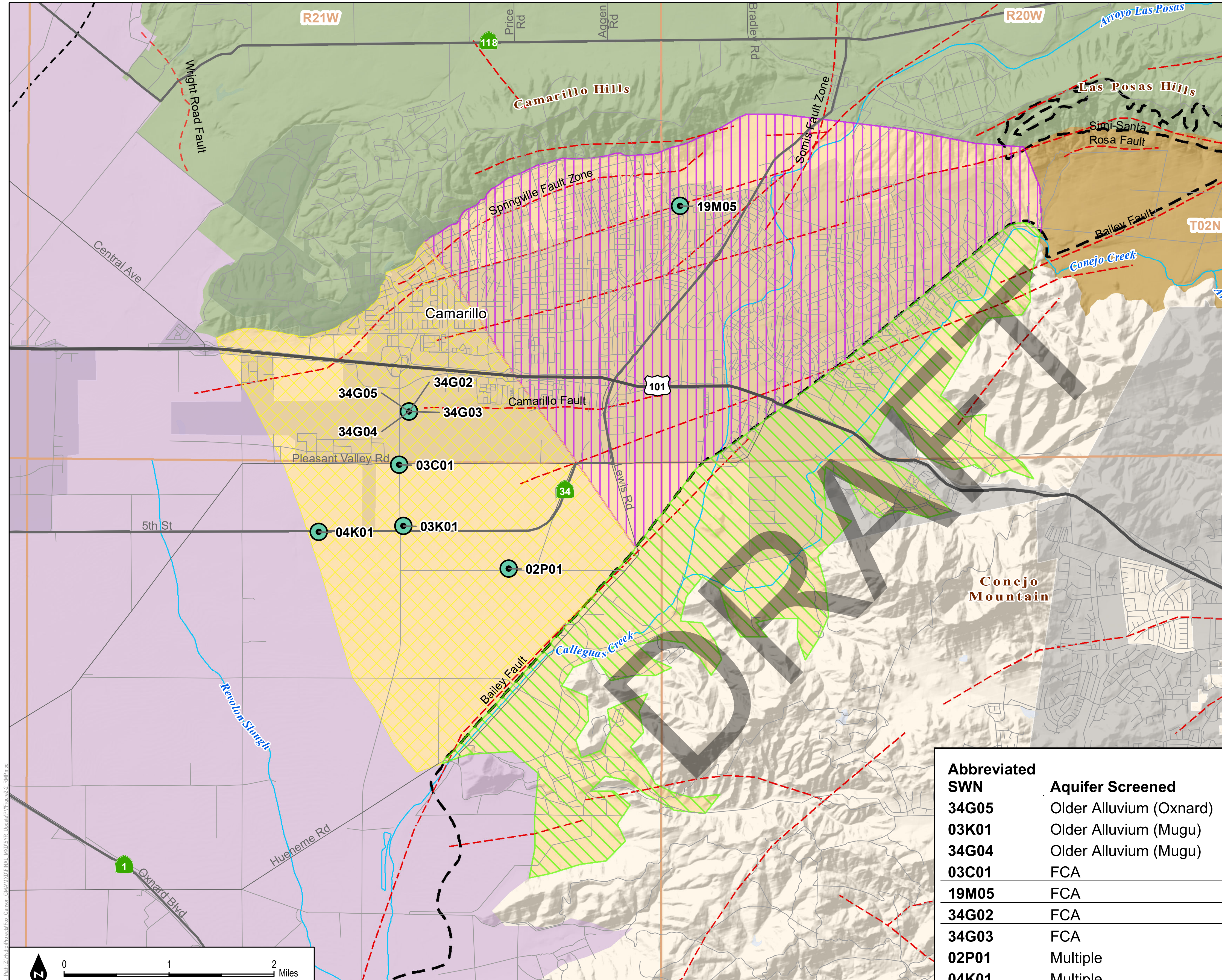

Legend

- Repesentative Monitoring Points
- *15P01* Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults
- Township (North-South) and Range (East-
- Oxnard Forebay

Pleasant Valley Basin Management Areas

- East Pleasant Valley Management Area
- North Pleasant Valley Management
- Pleasant Valley Pumping Depression Management Area

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Abbreviated SWN	Aquifer Screened
34G05	Older Alluvium (Oxnard)
03K01	Older Alluvium (Mugu)
34G04	Older Alluvium (Mugu)
03C01	FCA
19M05	FCA
34G02	FCA
34G03	FCA
02P01	Multiple
04K01	Multiple

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). 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 "29B02" located in Township 02N (T02N) and Range 20W (R20W) is 02N20W29B02S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-2

Representative Monitoring Points in the Pleasant Valley Basin

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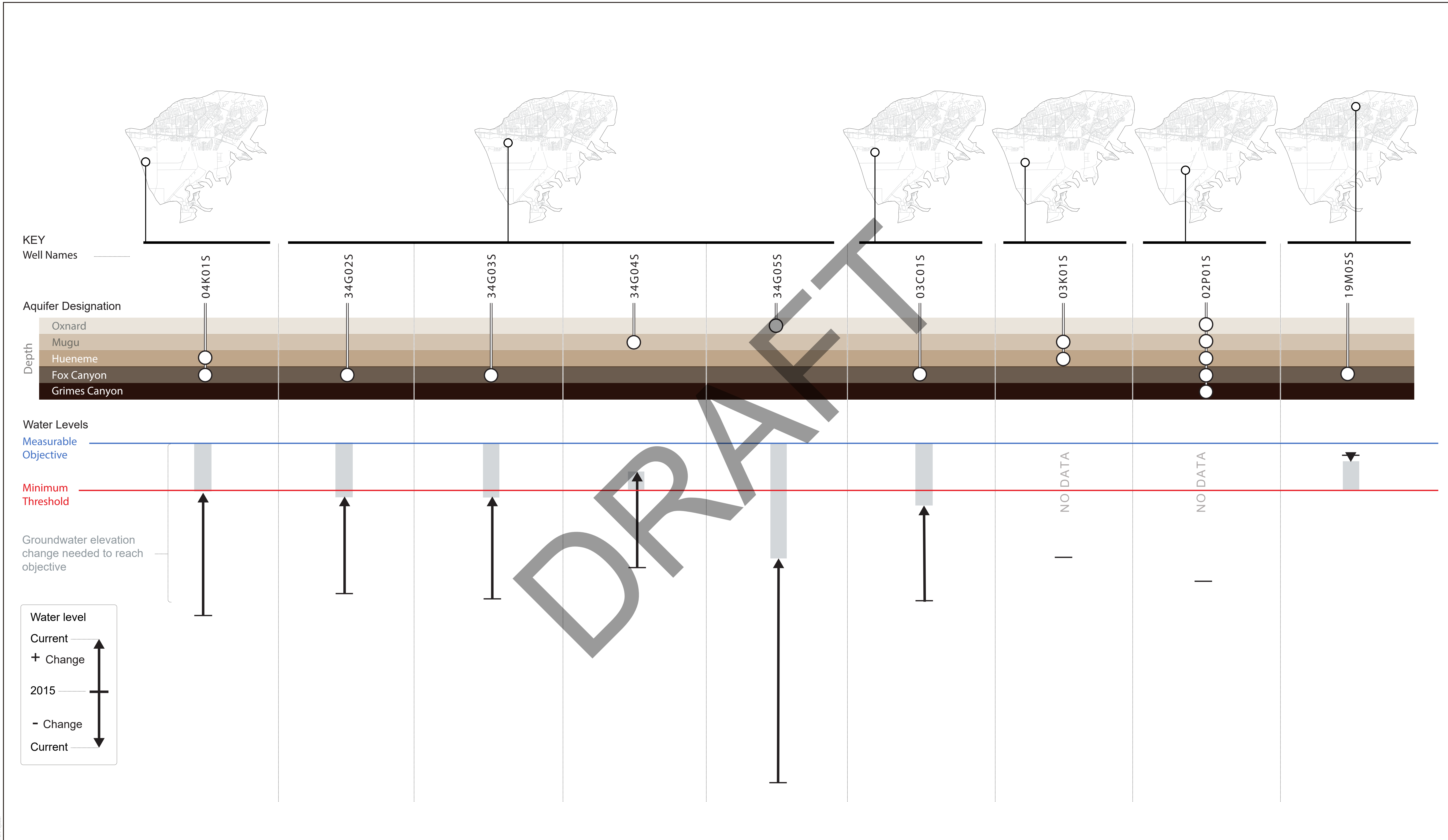

SOURCE:

DUDEK

FIGURE 2-3

Fall 2023 Groundwater Levels Relative to the SMCs

First Periodic Evaluation: Groundwater Sustainability Plan for the Pleasant Valley Basin

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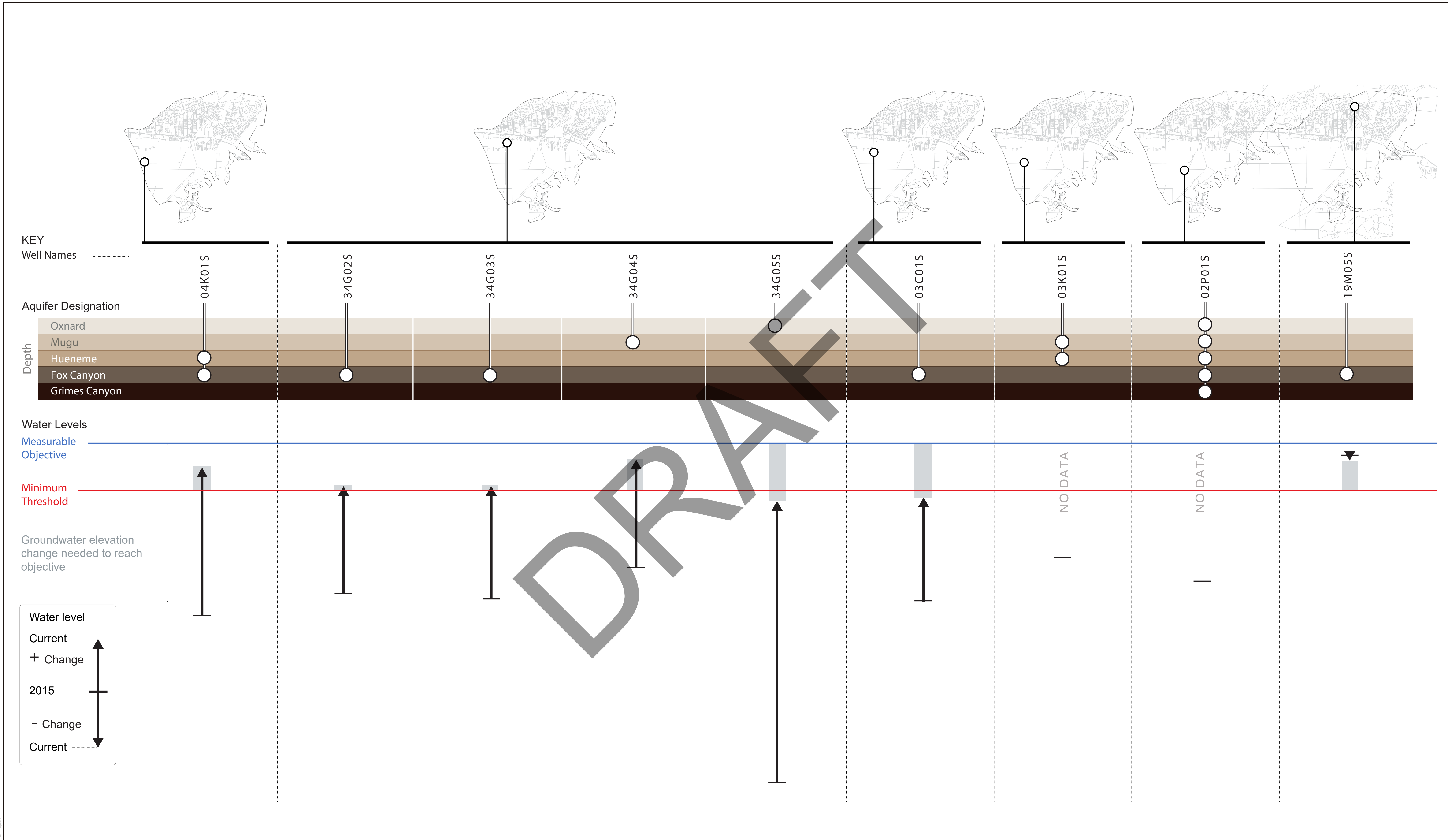

SOURCE:

FIGURE 2-4

Spring 2024 Groundwater Levels Relative to the SMCs

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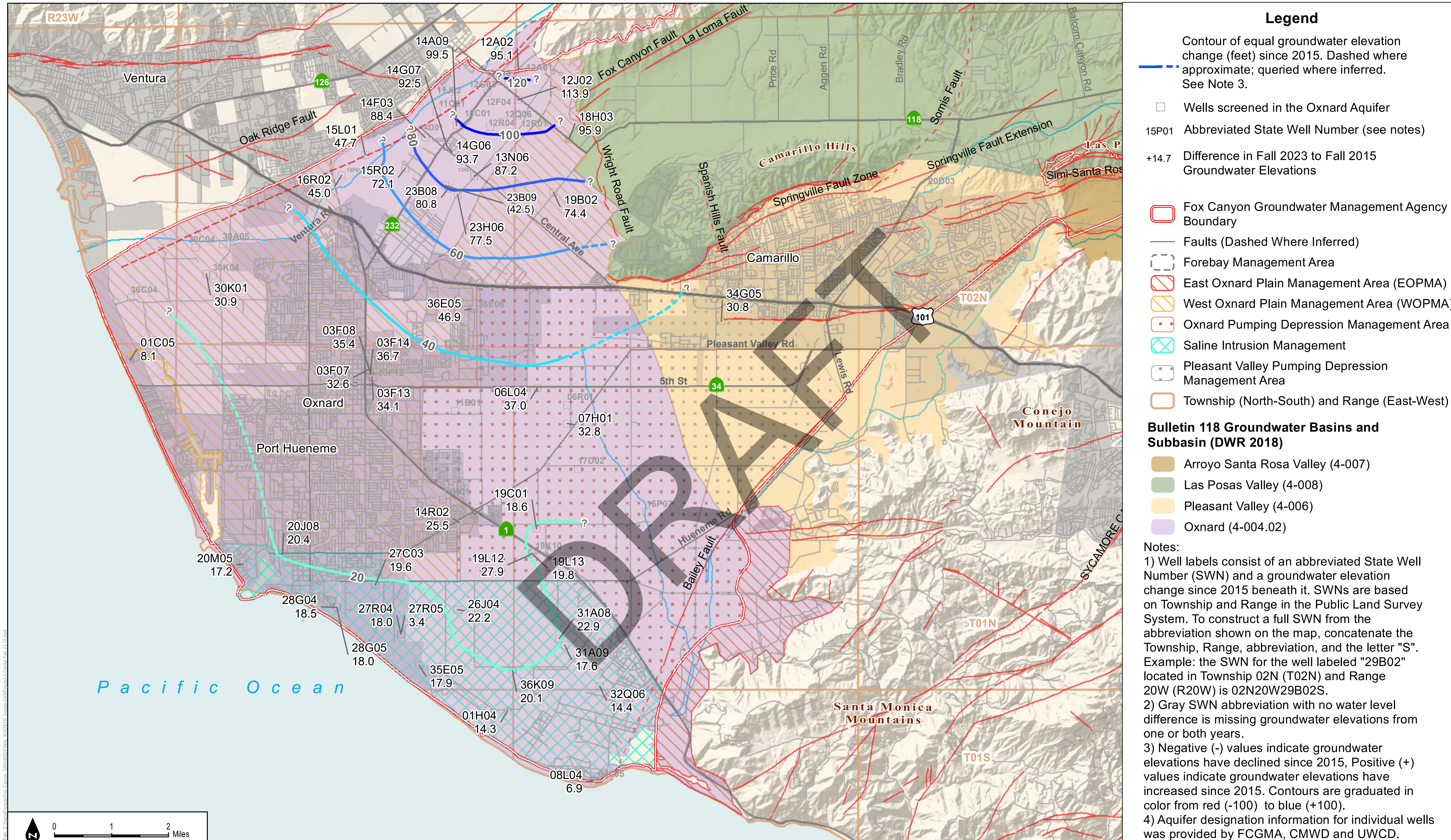

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-5

Oxnard Aquifer (Older Alluvium) - Groundwater Elevation Changes from Fall 2015 to 2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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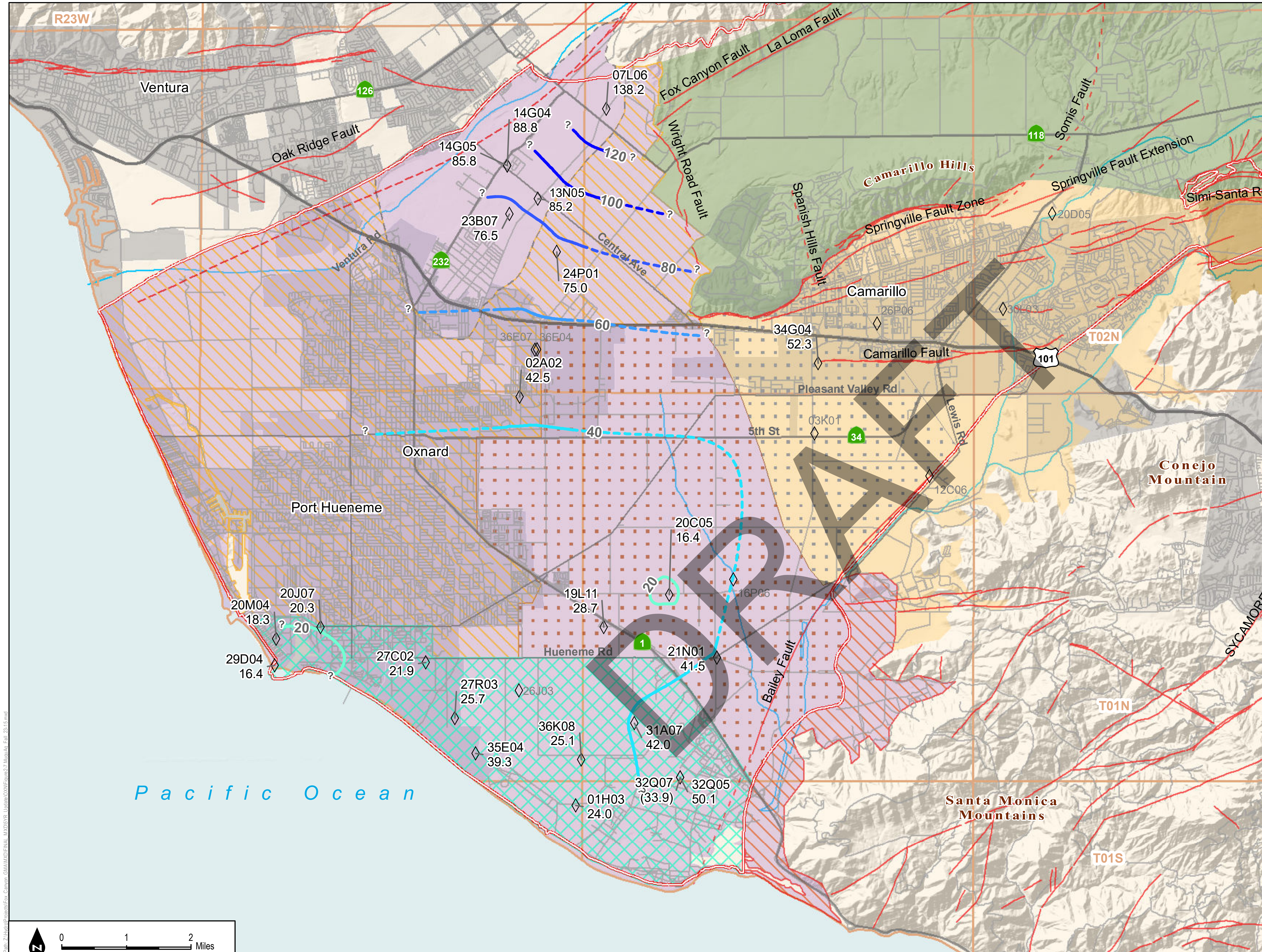

Legend

- Contour of equal groundwater elevation change (feet) since 2015. Dashed where approximate; queried where inferred. See Note 3.
- ◊ Wells screened in the Mugu Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- +14.7 Change in groundwater elevation (in Feet) from Fall 2023 to Fall 2015
- Faults (Dashed Where Inferred)
- Fox Canyon Groundwater Management Agency Boundary
- Forebay Management Area
- East Oxnard Plain Management Area (EOPMA)
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management
- Pleasant Valley Pumping Depression Management Area
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- 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 abbreviated State Well Number (SWN) and a groundwater elevation change since 2015 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 "29B02" located in Township 02N (T02N) and Range 20W (R20W) is 02N20W29B02S.
2) Gray SWN abbreviation with no water level difference is missing groundwater elevations from one or both years.
3) Negative (-) values indicate groundwater elevations have declined since 2015, Positive (+) values indicate groundwater elevations have increased since 2015. Contours are graduated in color from red (-100) to blue (+100).
4) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-6

Mugu Aquifer (Older Alluvium) - Groundwater Elevation Changes from Fall 2015 to 2023

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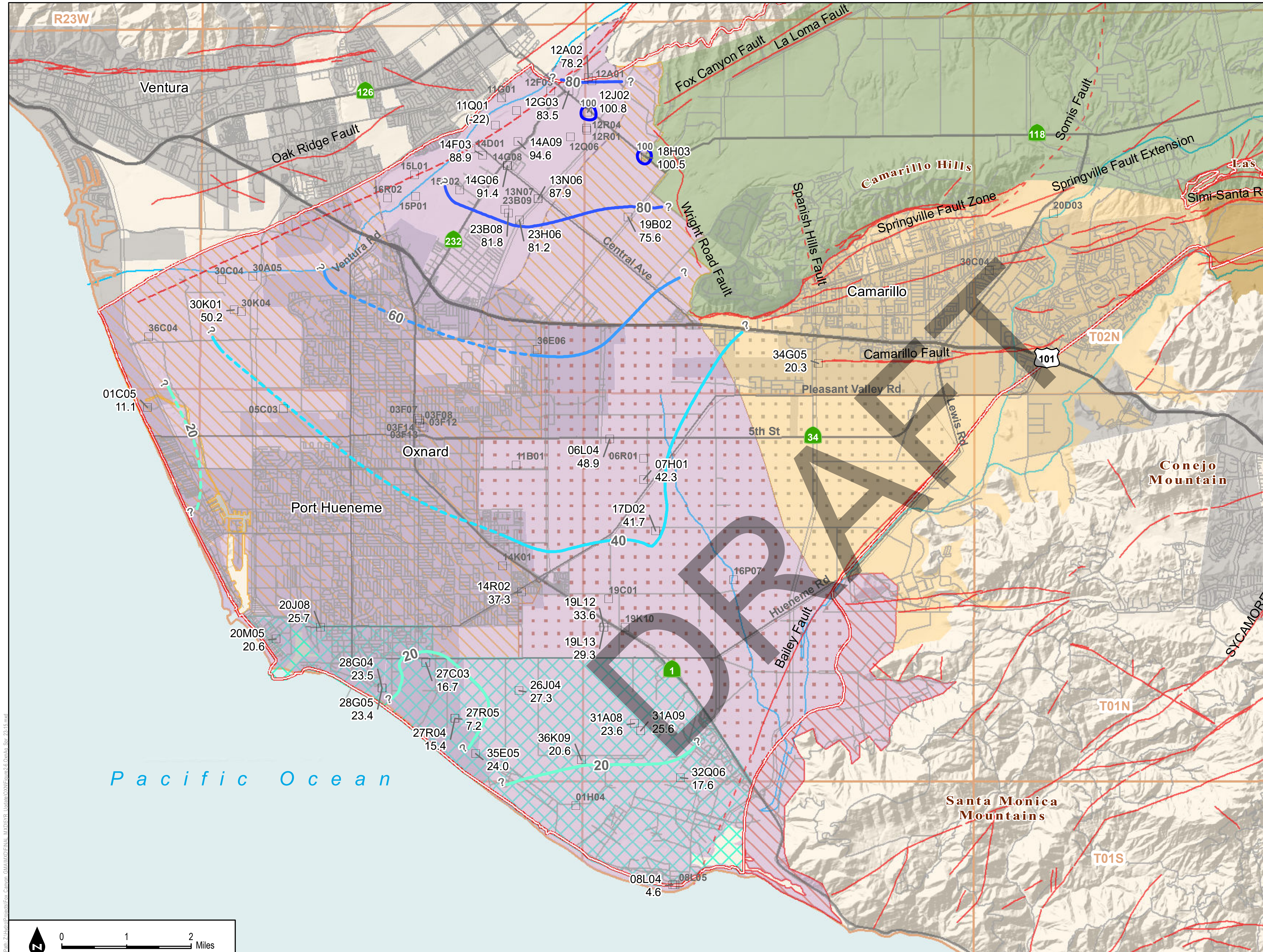

Legend

Contour of equal groundwater elevation change (feet) since 2015. Dashed where approximate; queried where inferred. See Note 3.

Wells screened in the Oxnard Aquifer

15P01 Abbreviated State Well Number (see notes)

+14.7 Difference in Spring 2024 to Spring 2015 Groundwater Elevations

Fox Canyon Groundwater Management Agency Boundary

Faults (Dashed Where Inferred)

Forebay Management Area

East Oxnard Plain Management Area (EOPMA)

West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

Pleasant Valley Pumping Depression Management Area

Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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 abbreviated State Well Number (SWN) and a groundwater elevation change since 2015 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 "29B02" located in Township 02N (T02N) and Range 20W (R20W) is 02N20W29B02S.

2) Gray SWN abbreviation with no water level difference is missing groundwater elevations from one or both years.

3) Negative (-) values indicate groundwater elevations have declined since 2015, Positive (+) values indicate groundwater elevations have increased since 2015. Contours are graduated in color from red (-100) to blue (+100).

4) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-7

Oxnard Aquifer (Older Alluvium) - Groundwater Elevation Changes from Spring 2015 to 2024

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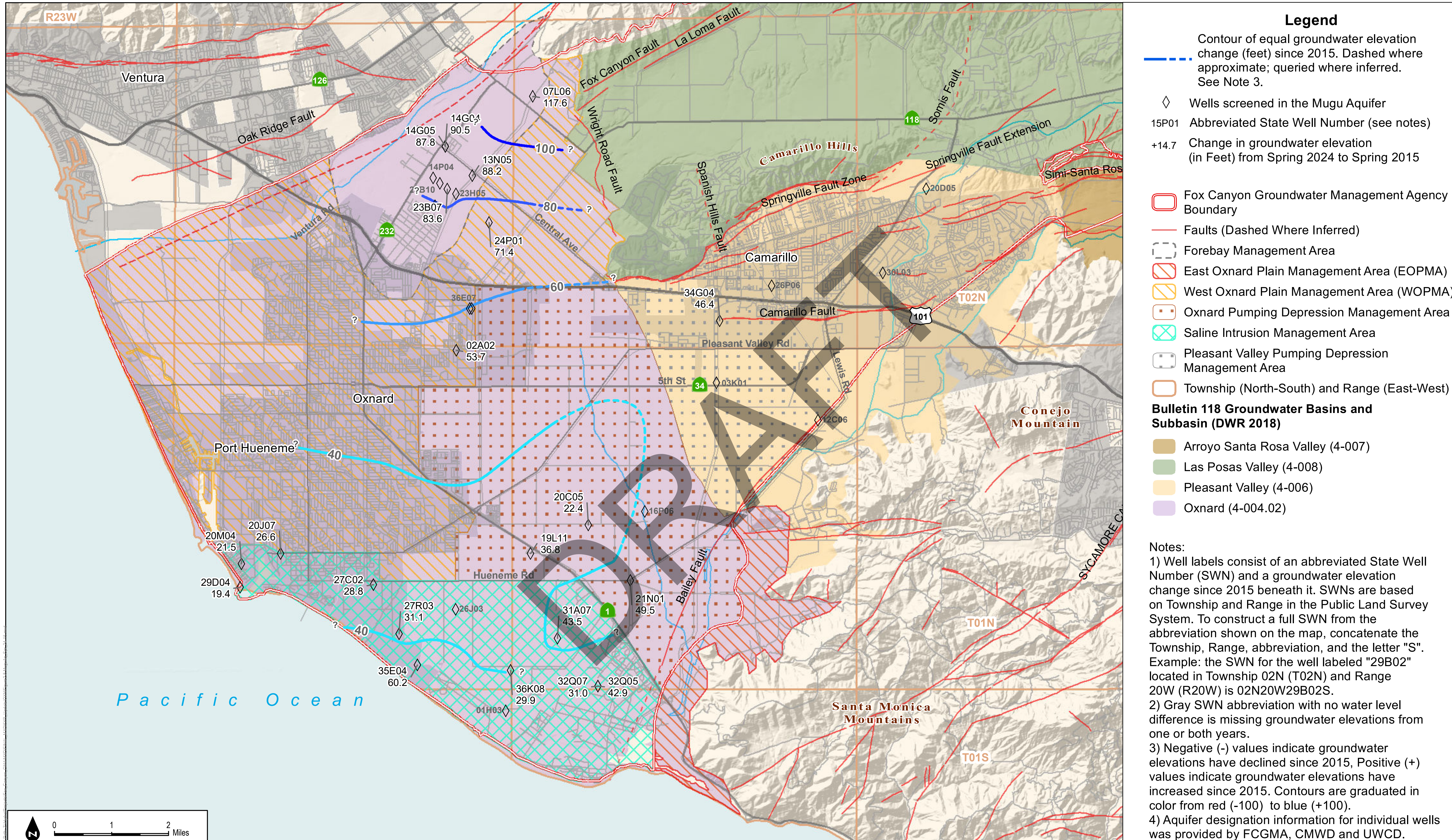

SOURCE: DWR; Ventura County; UWCD; CMWD

DUDEK

FIGURE 2-8

Mugu Aquifer (Older Alluvium) - Groundwater Elevation Changes from Spring 2015 to 2024

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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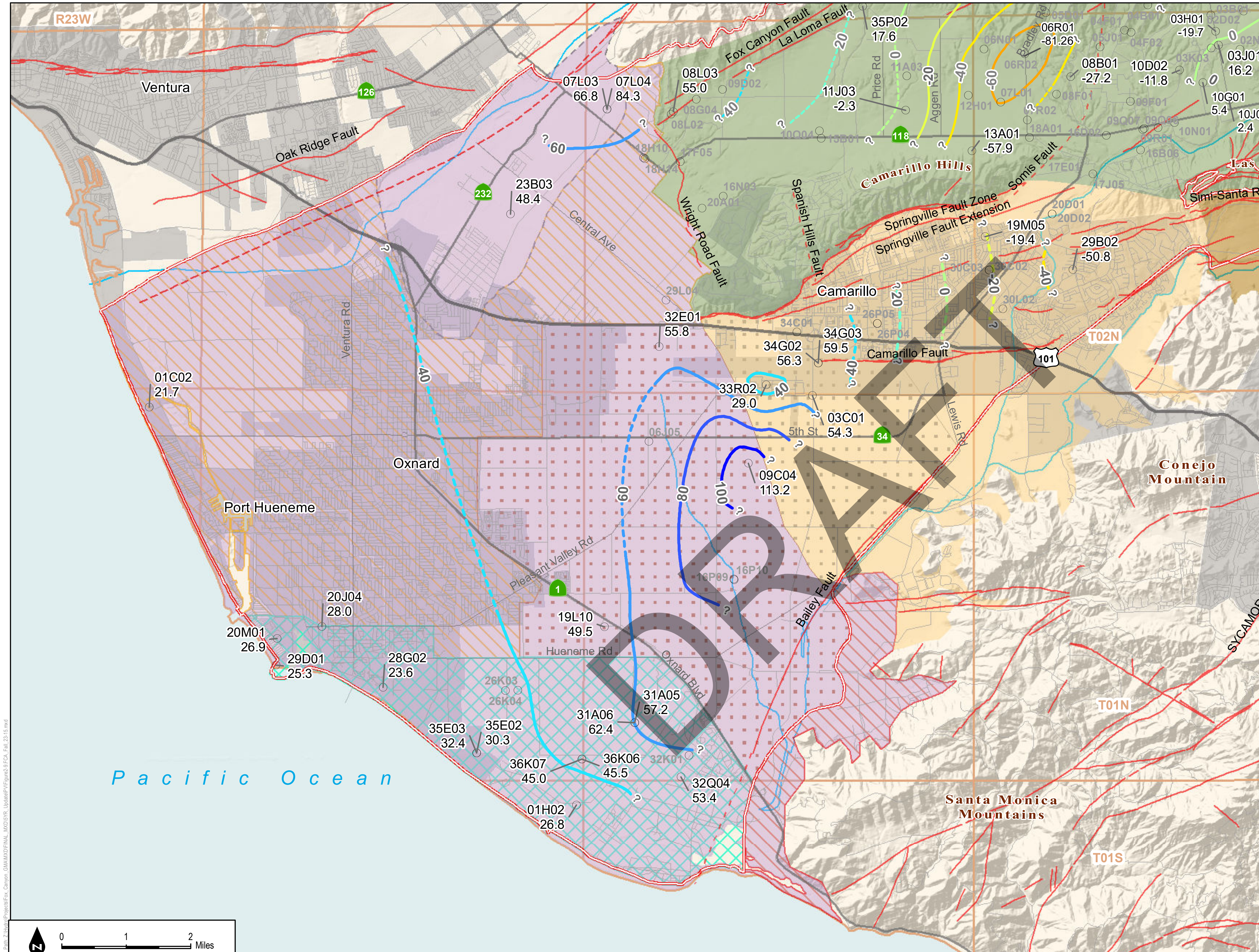

Legend

- Contour of equal groundwater elevation change (feet) since 2015. Dashed where approximate; queried where inferred. See Note 3.
- Wells Screened in the Fox Canyon Aquifer
- 19M05 Abbreviated State Well Number (see notes)
- +19 Change in groundwater elevation (in feet) from Fall 2015 to Fall 2023
- Fox Canyon Groundwater Management Agency Boundary
- Faults (Dashed Where Inferred)
- Forebay Management Area
- East Oxnard Plain Management Area (EOPMA)
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management
- Pleasant Valley Pumping Depression Management Area
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- 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 abbreviated State Well Number (SWN) and a groundwater elevation change since 2015 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 "29B02" located in Township 02N (T02N) and Range 20W (R20W) is 02N20W29B02S.
2) Gray SWN abbreviation with no water level difference is missing groundwater elevations from one or both years.
3) Negative (-) values indicate groundwater elevations have declined since 2015, Positive (+) values indicate groundwater elevations have increased since 2015. Contours are graduated in color from red (-100) to blue (+100).
4) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-9

Fox Canyon Aquifer - Groundwater Elevation Changes from Fall 2015 to 2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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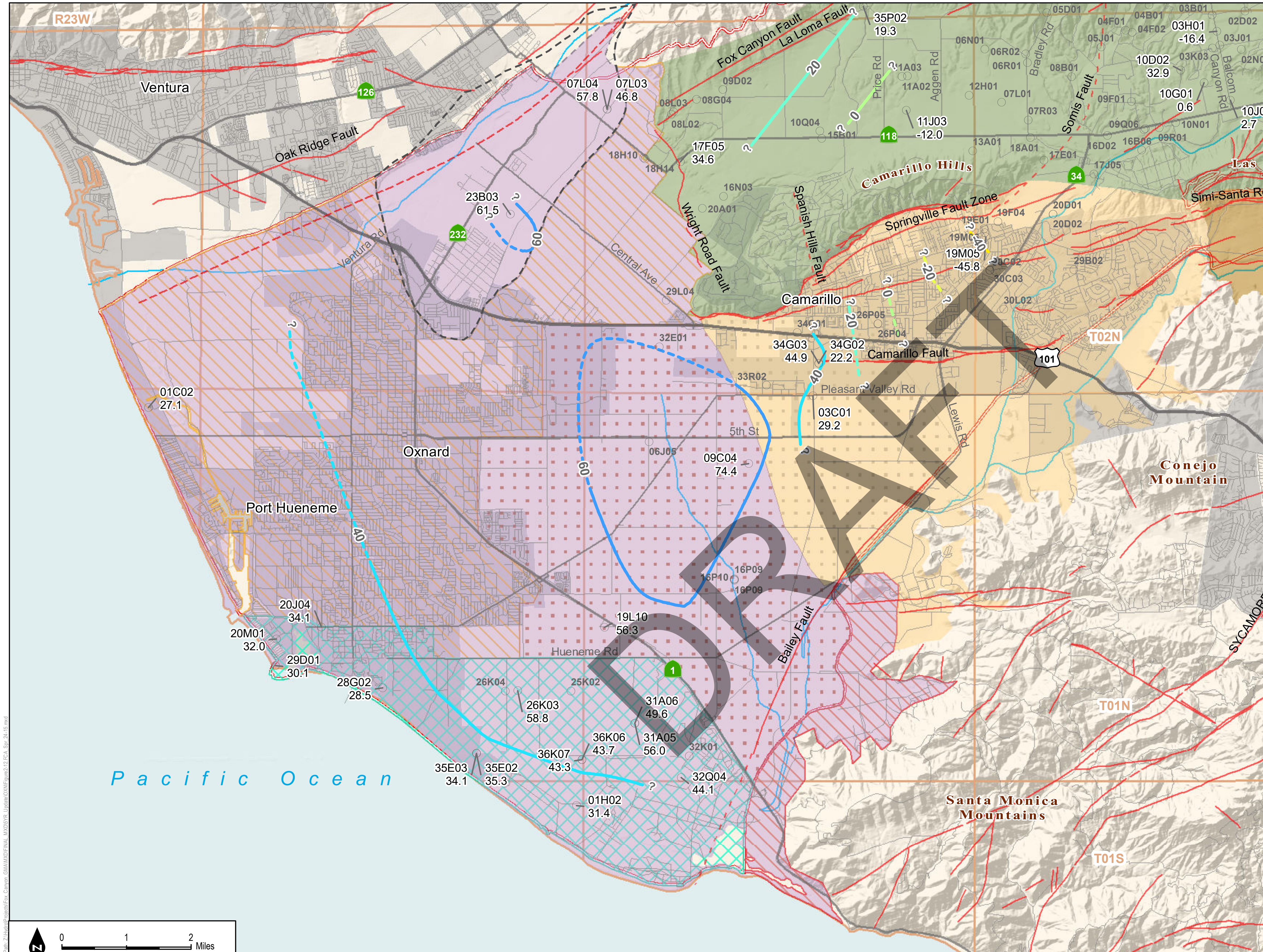

Legend

- Contour of equal groundwater elevation change (feet) since 2015. Dashed where approximate; queried where inferred. See Note 3.
- Wells Screened in the Fox Canyon Aquifer
- 19M05 Abbreviated State Well Number (see notes)
- +19 Change in groundwater elevation (in feet) from Spring 2015 to Spring 2024
- Faults (Dashed Where Inferred)
- Pleasant Valley Pumping Depression Management Area
- Forebay Management Area
- East Oxnard Plain Management Area (EOPMA)
- West Oxnard Plain Management Area
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area
- Fox Canyon Groundwater Management Agency Boundary
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- 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 abbreviated State Well Number (SWN) and a groundwater elevation change since 2015 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 "29B02" located in Township 02N (T02N) and Range 20W (R20W) is 02N20W29B02S.
2) Gray SWN abbreviation with no water level difference is missing groundwater elevations from one or both years.
3) Negative (-) values indicate groundwater elevations have declined since 2015, Positive (+) values indicate groundwater elevations have increased since 2015. Contours are graduated in color from red (-100) to blue (+100).
4) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-10

Fox Canyon Aquifer - Groundwater Elevation Changes from Spring 2015 to 2024

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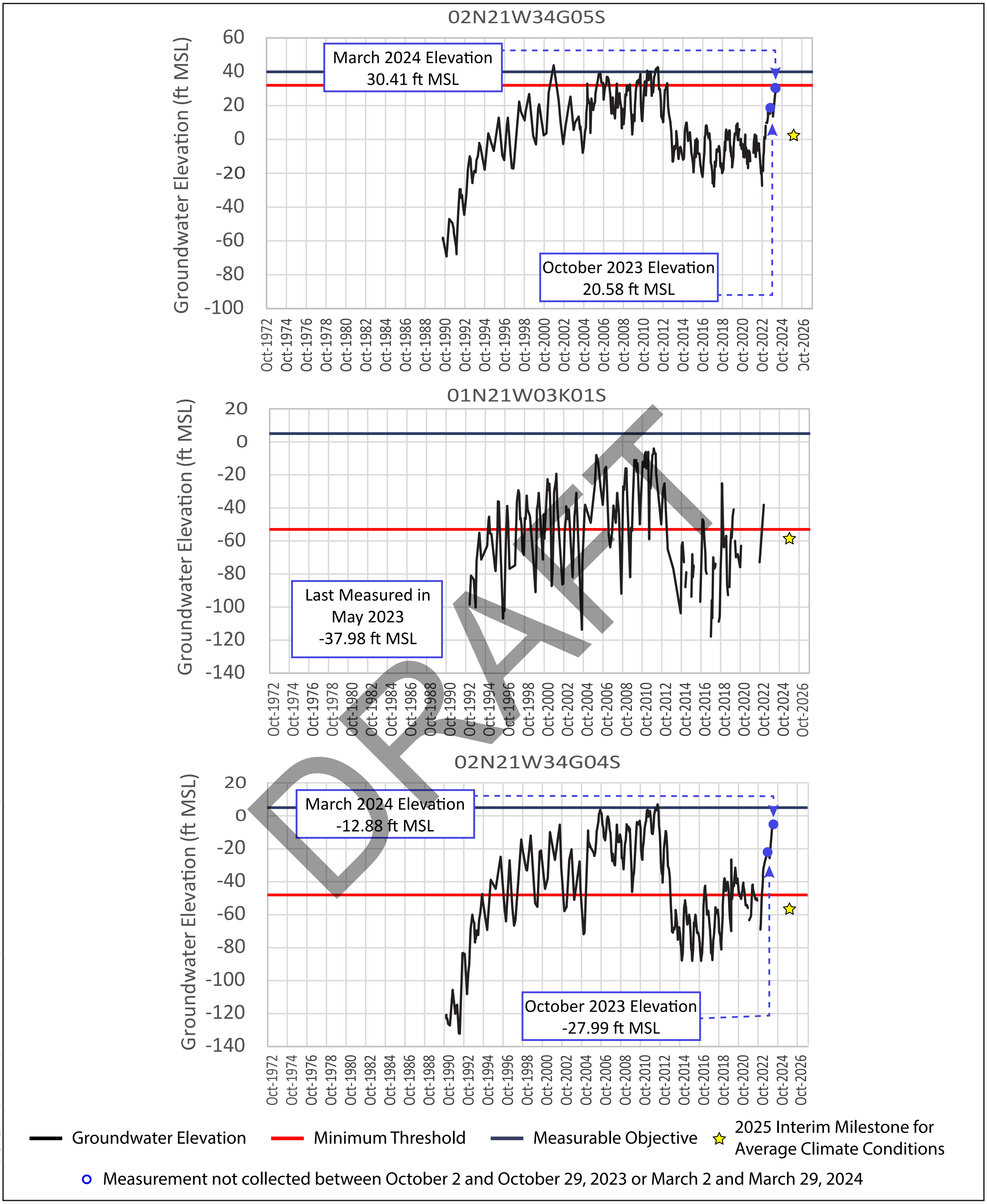

SOURCE: UWCD, VCWPD

FIGURE 2-11

Groundwater Elevation Hydrographs for Representative Monitoring Points in the Older Alluvium

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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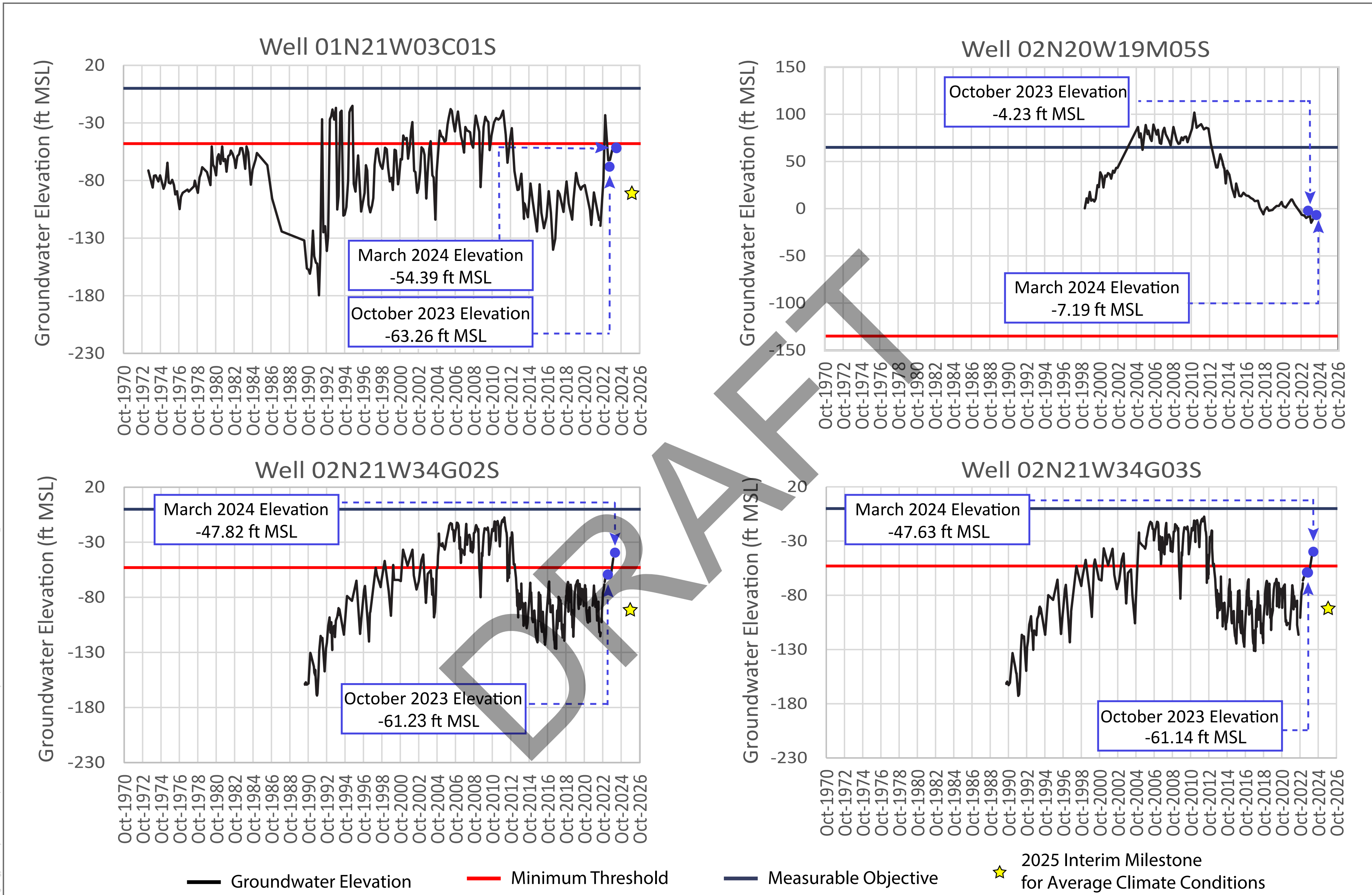

Note: 2025 interim milestone groundwater elevation has not been established for 02N20W19M05S because groundwater elevations are more than 100 feet higher than the established minimim threshold groundwater elevation.

SOURCE: UWCD, VCWPD

FIGURE 2-12

Groundwater Elevation Hydrographs for Representative Monitoring Points in the Fox Canyon Aquifer

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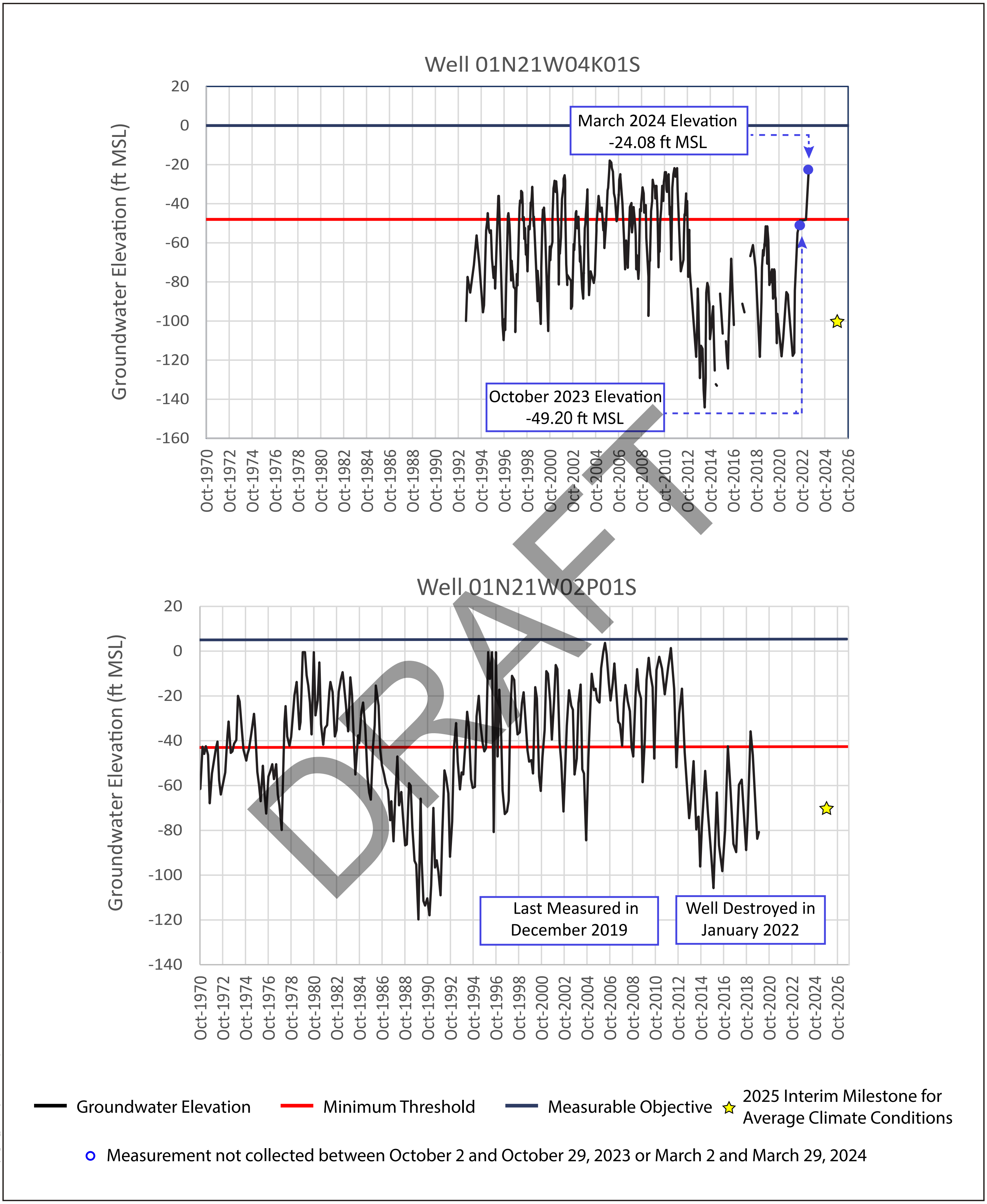

SOURCE: UWCD, VCWPD

FIGURE 2-13

Groundwater Elevation Hydrographs for Representative Monitoring Points in Multiple Aquifers

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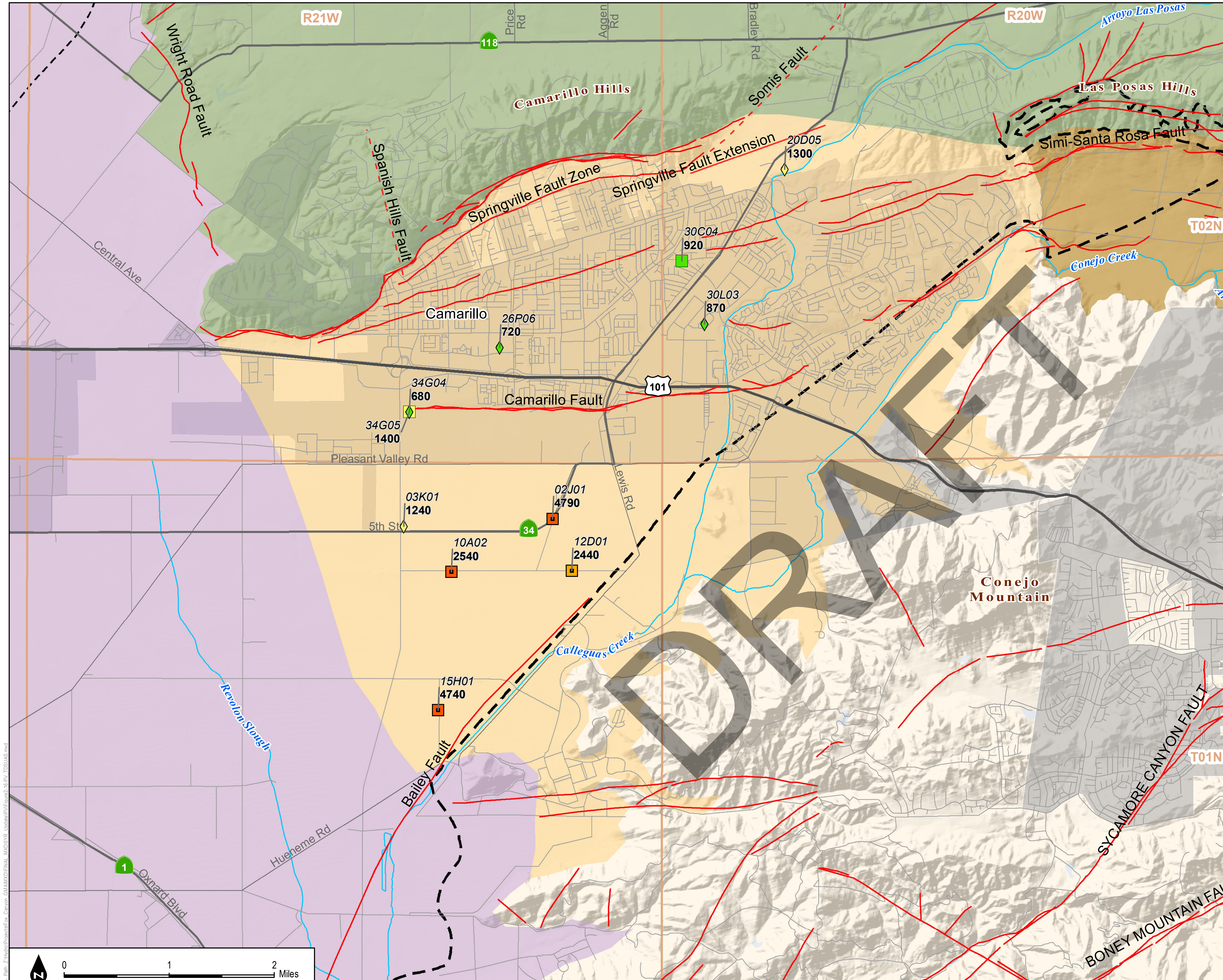

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

TDS concentration (mg/L), 2019-2023

- 680 - 1000
- >1000 - 1500
- >1500 - 2500
- >2500 - 49800

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-14

Older Alluvium - Most Recent TDS (mg/L) Measured 2019-2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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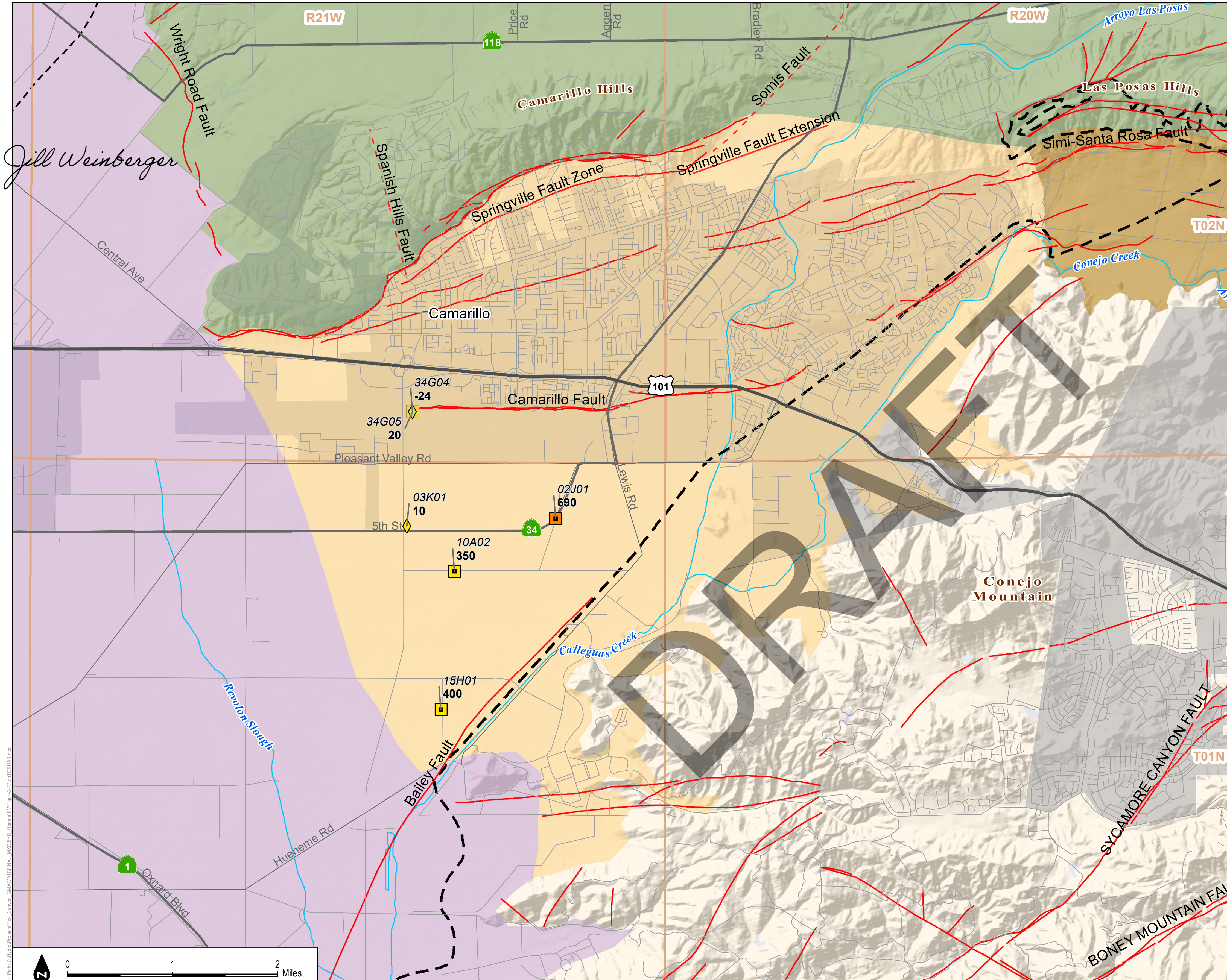

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

TDS change in concentration (mg/L)

- =< -4000
- -3999 - -500
- -499 - 0
- 1 - 500
- 501 - 4000
- >4000

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS
- *15P01* Abbreviated State Well Number (see notes)
- **10.5** Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-15

Change in TDS Concentration (mg/L) in the Older Alluvium, Between 2011-2015 and 2019-2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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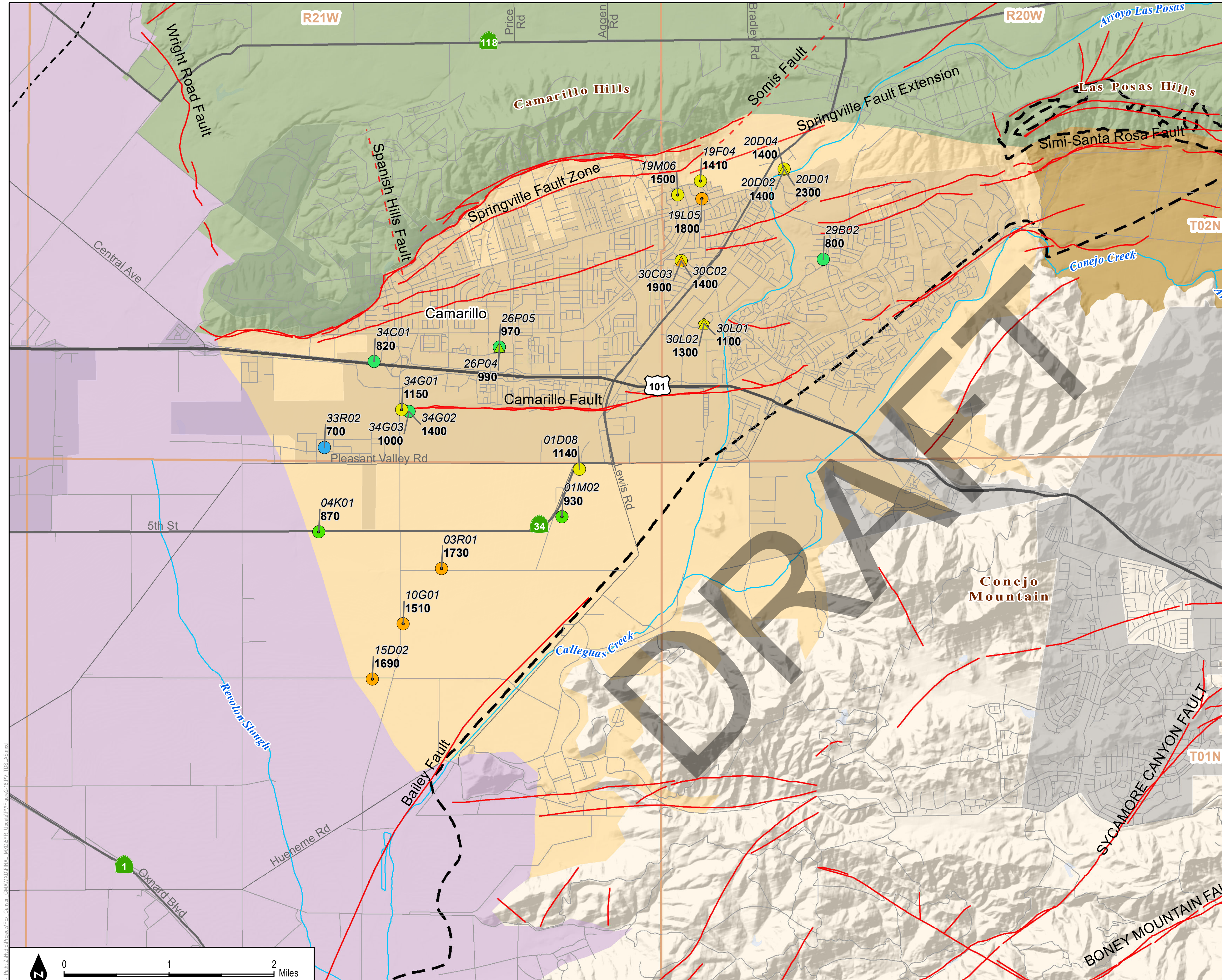

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

TDS concentration (mg/L), 2019-2023

- 410 - 500
- >500 - 750
- >750 - 1000
- >1000 - 1500
- >1500 - 2500
- >2500

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-16
Lower Aquifer System - Most Recent TDS (mg/L) Measured 2019-2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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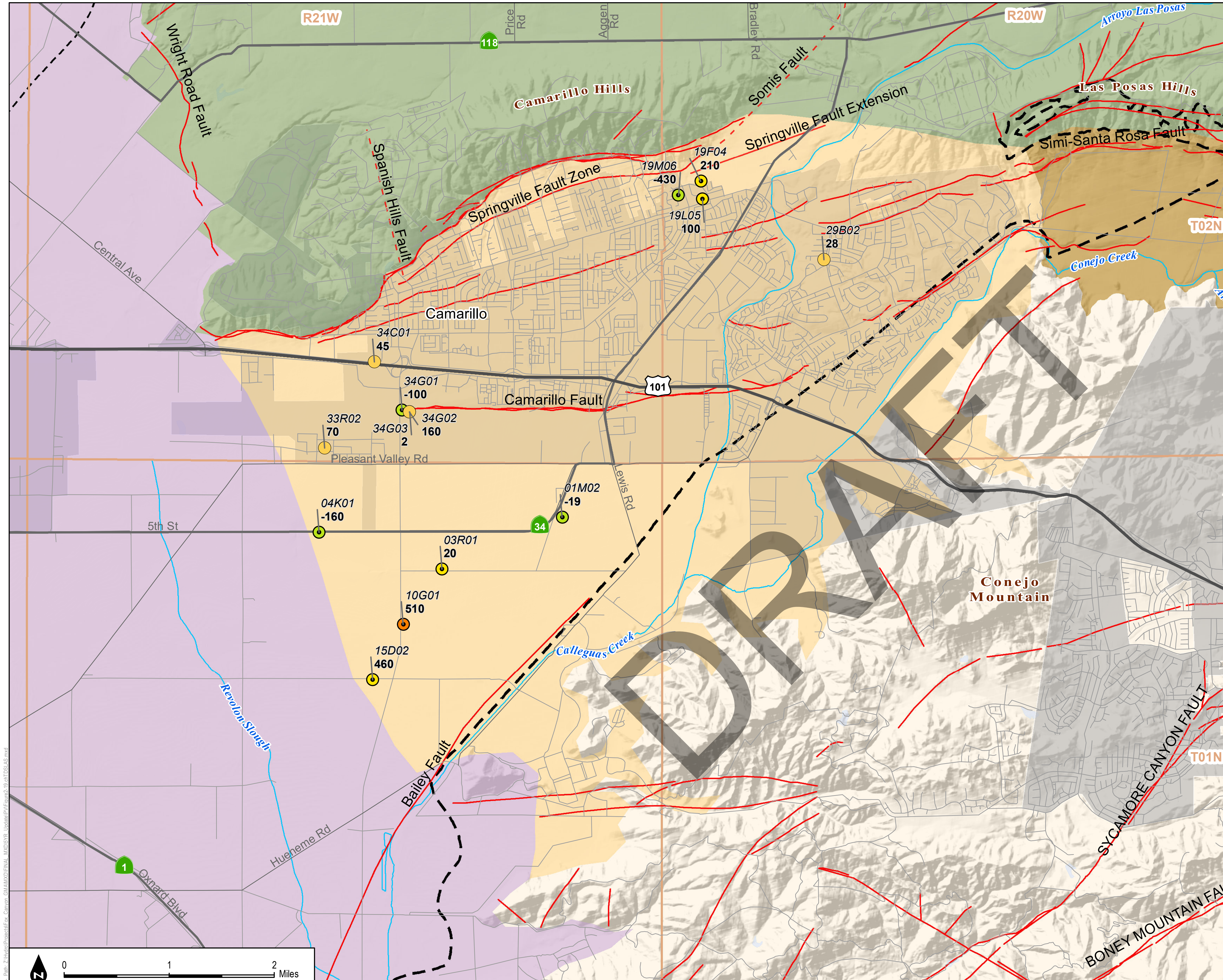

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

TDS change in concentration (mg/L)

- =< -4000
- -3999 - -500
- -499 - 0
- 1 - 500
- 501 - 4000
- >4000

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)

10.5 Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-17

Change in TDS Concentration (mg/L) in the LAS, between the period from 2011-2015 and 2019-2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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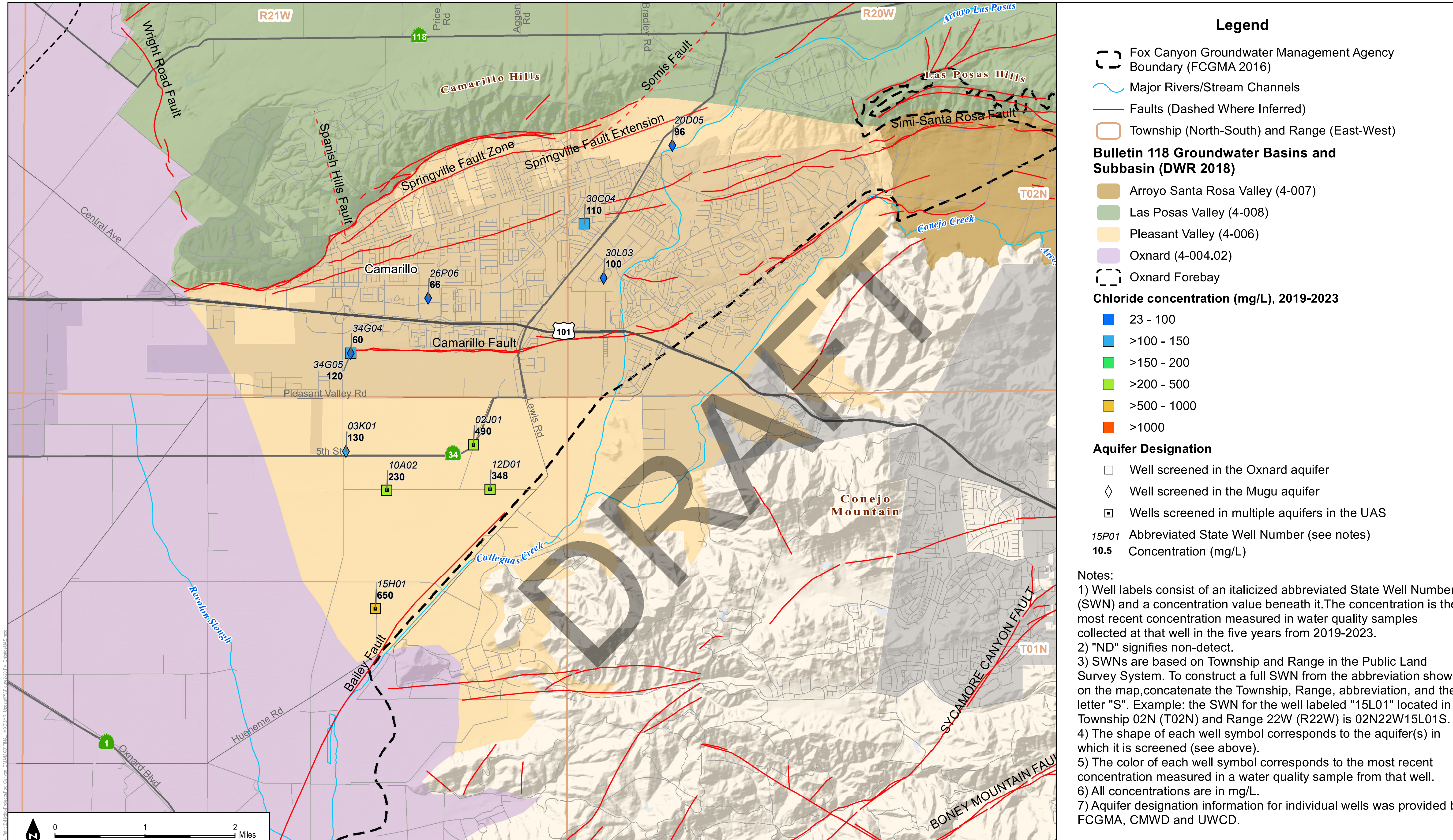

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-18

Older Alluvium - Most Recent Chloride (mg/L) Measured 2019-2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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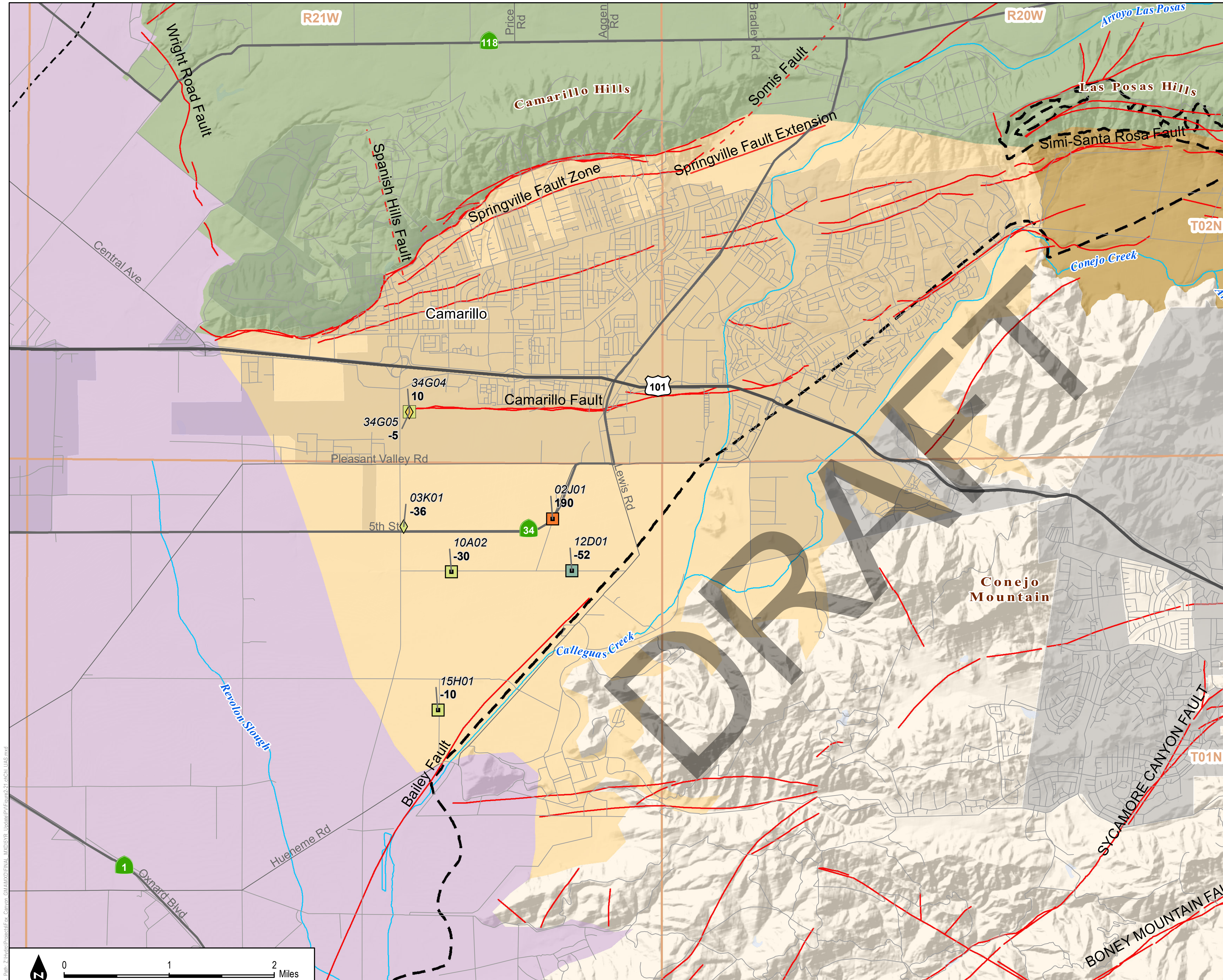

Legend

Fox Canyon Groundwater Management Agency Boundary

Major Rivers/Stream Channels

Faults (Dashed Where Inferred)

Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Chloride change in concentration (mg/L)

- =< -100
- > -100 - -50
- > -50 - 0
- >0 - 50
- >50 - 500
- >500

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)

10.5 Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-19

Change in Chloride Concentration (mg/L) in the Older Alluvium, Between 2011-2015 and 2019-2023

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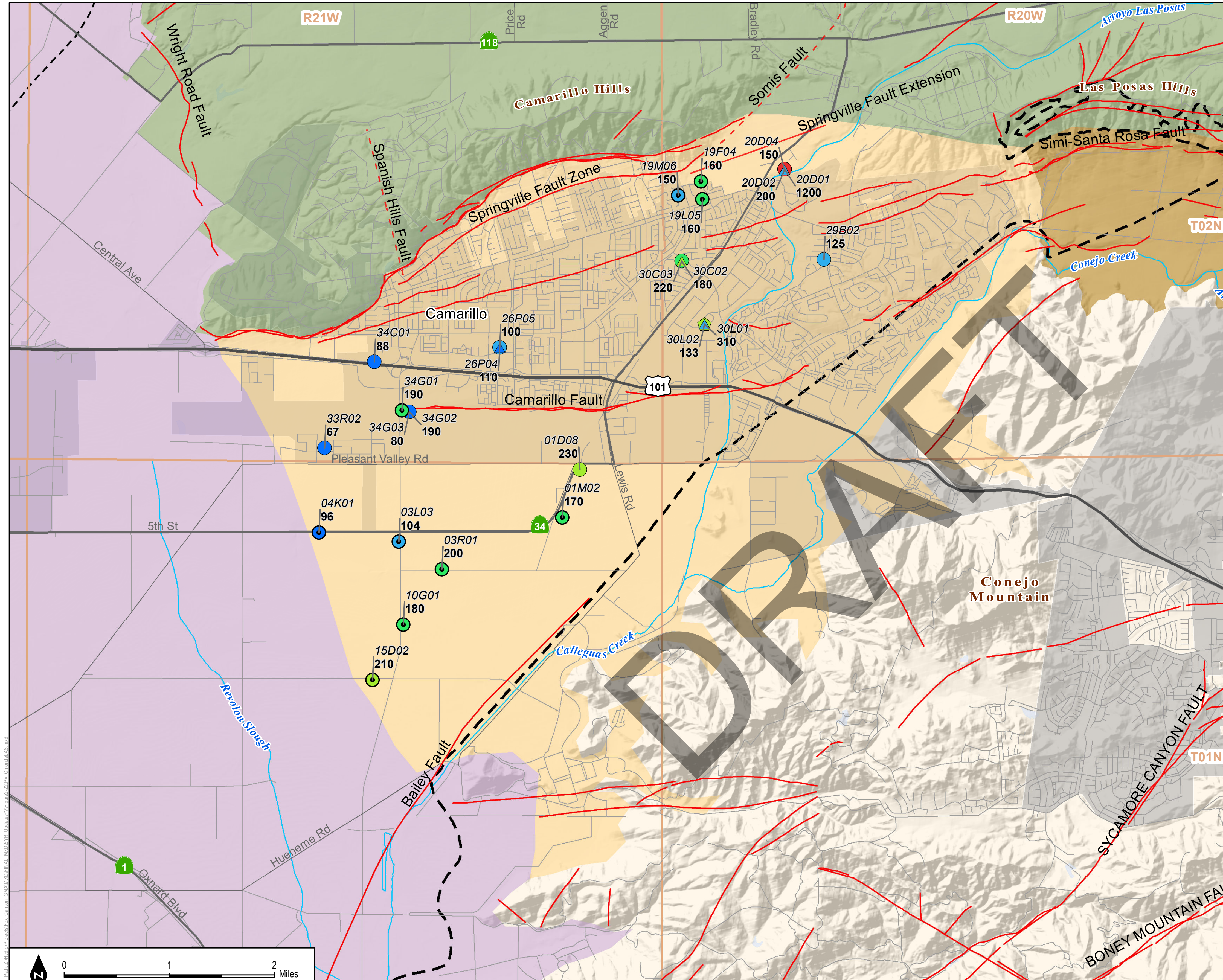

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Chloride concentration (mg/L), 2019-2023

- 23 - 100
- 101 - 150
- 151 - 200
- 201 - 500
- 501 - 1000
- 1001 - 22500

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)

10.5 Concentration (mg/L)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-20

Lower Aquifer System - Most Recent Chloride (mg/L) Measured 2019-2023

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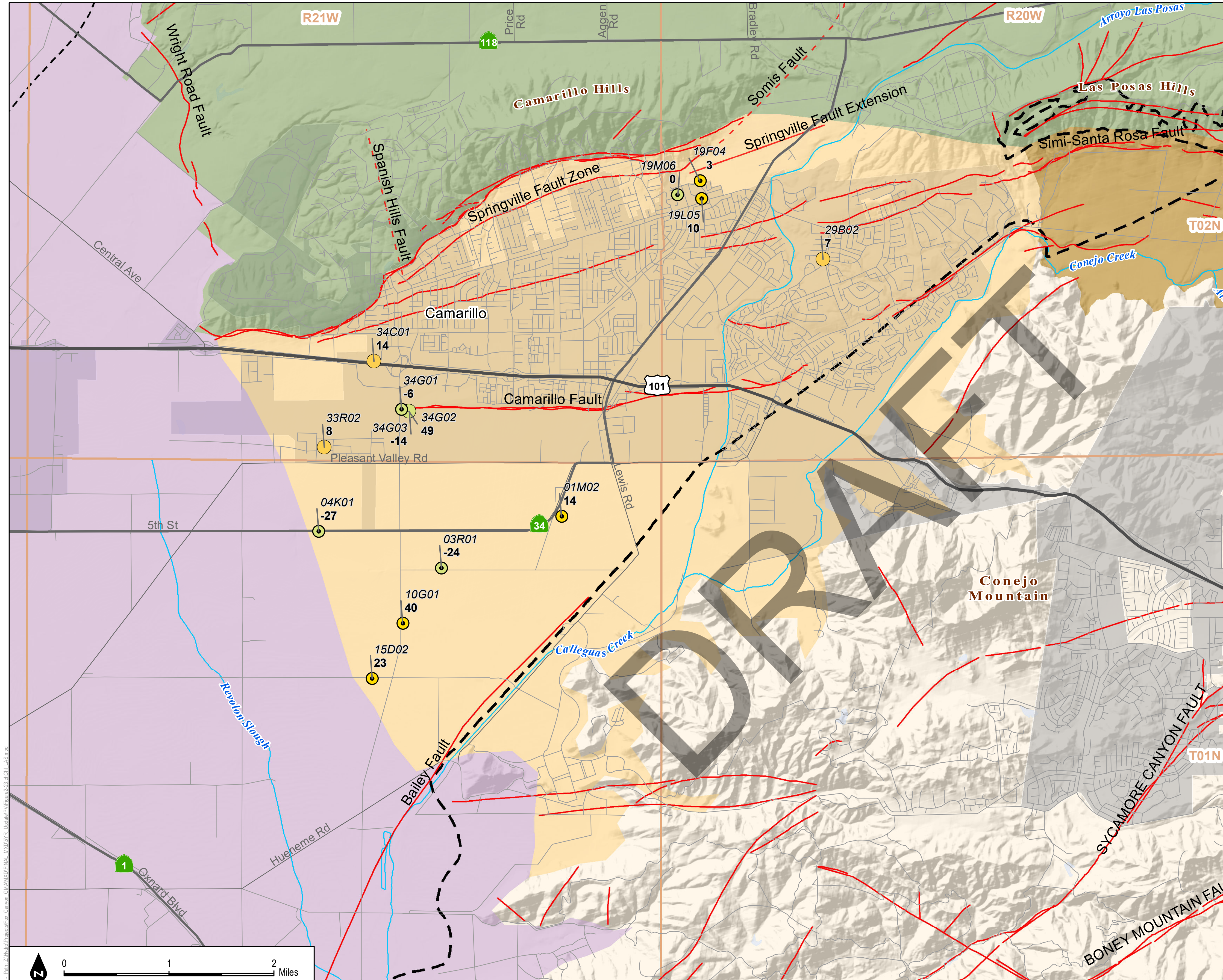

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

Chloride change in concentration (mg/L)

- =< -100
- -99 - -50
- -49 - 0
- 1 - 50
- 51 - 100
- >100

15P01 Abbreviated State Well Number (see notes)

10.5 Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-21

Change in Chloride Concentration (mg/L) in the LAS, Between 2011-2015 and 2019-2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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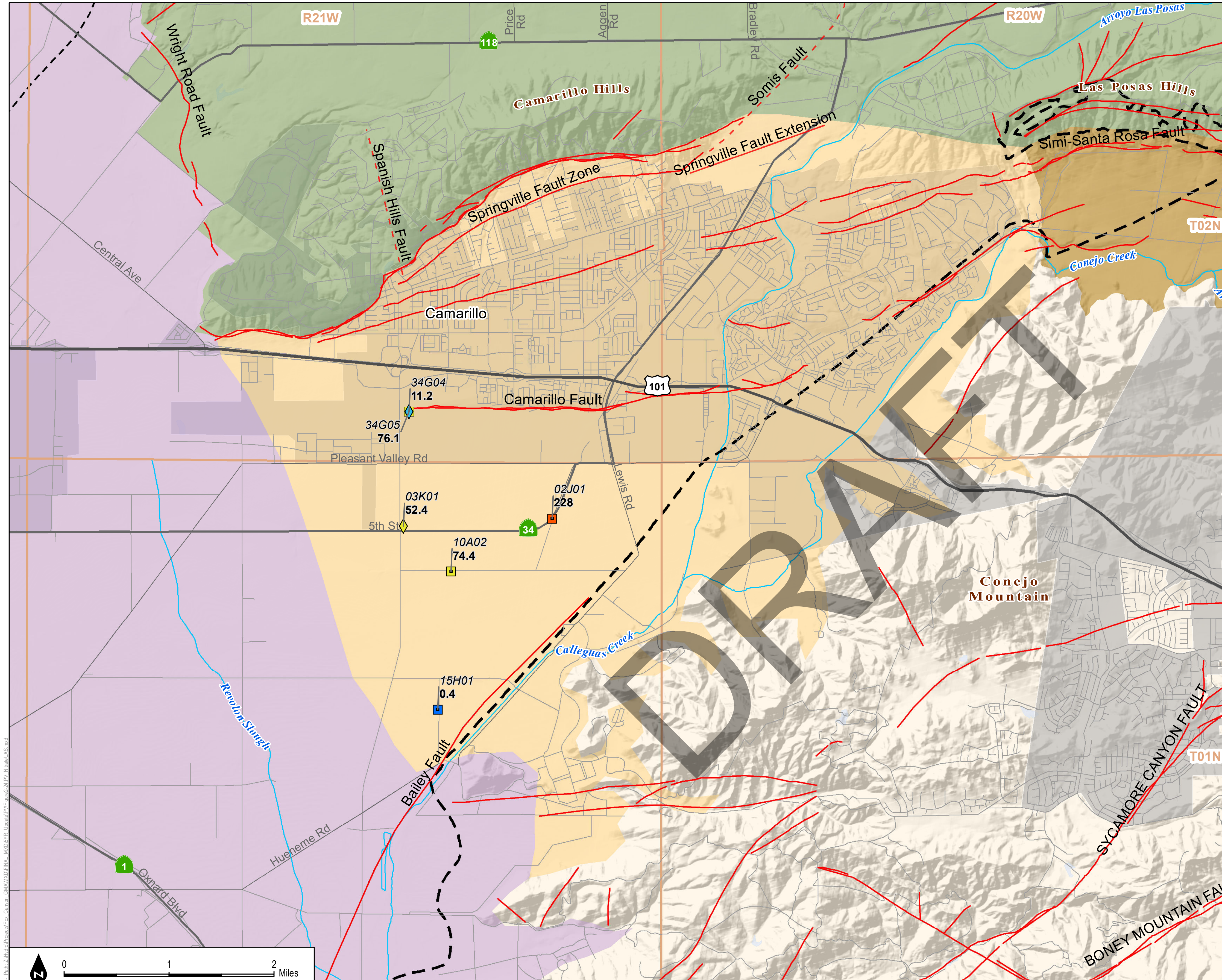

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Nitrate concentration (mg/L as Nitrate), 2019-2023

- 0 - 10
- >10 - 22.5
- >20 - 45
- >45 - 90
- >90

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)

10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-22

Older Alluvium - Most Recent Nitrate (mg/L) Measured 2019-2023

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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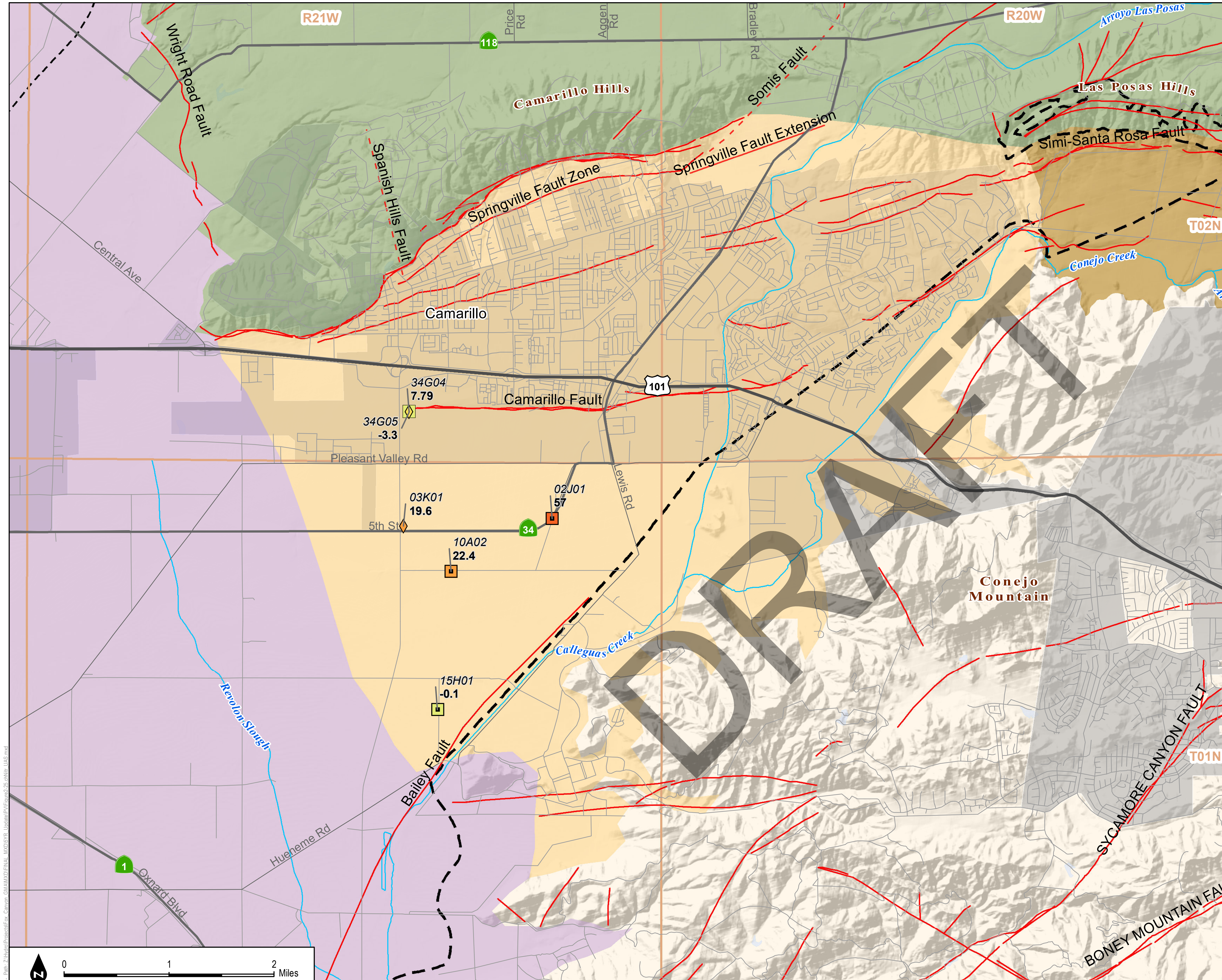

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Nitrate change in concentration (mg/L)

- =< -100
- -99 - -50
- -49 - -15
- -14 - 0
- 1 - 15
- 16 - 50
- 51 - 100
- > 100

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)

10.5 Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-23

Change in Nitrate Concentration (mg/L) in the Older Alluvium, Between 2011-2015 and 2019-2023

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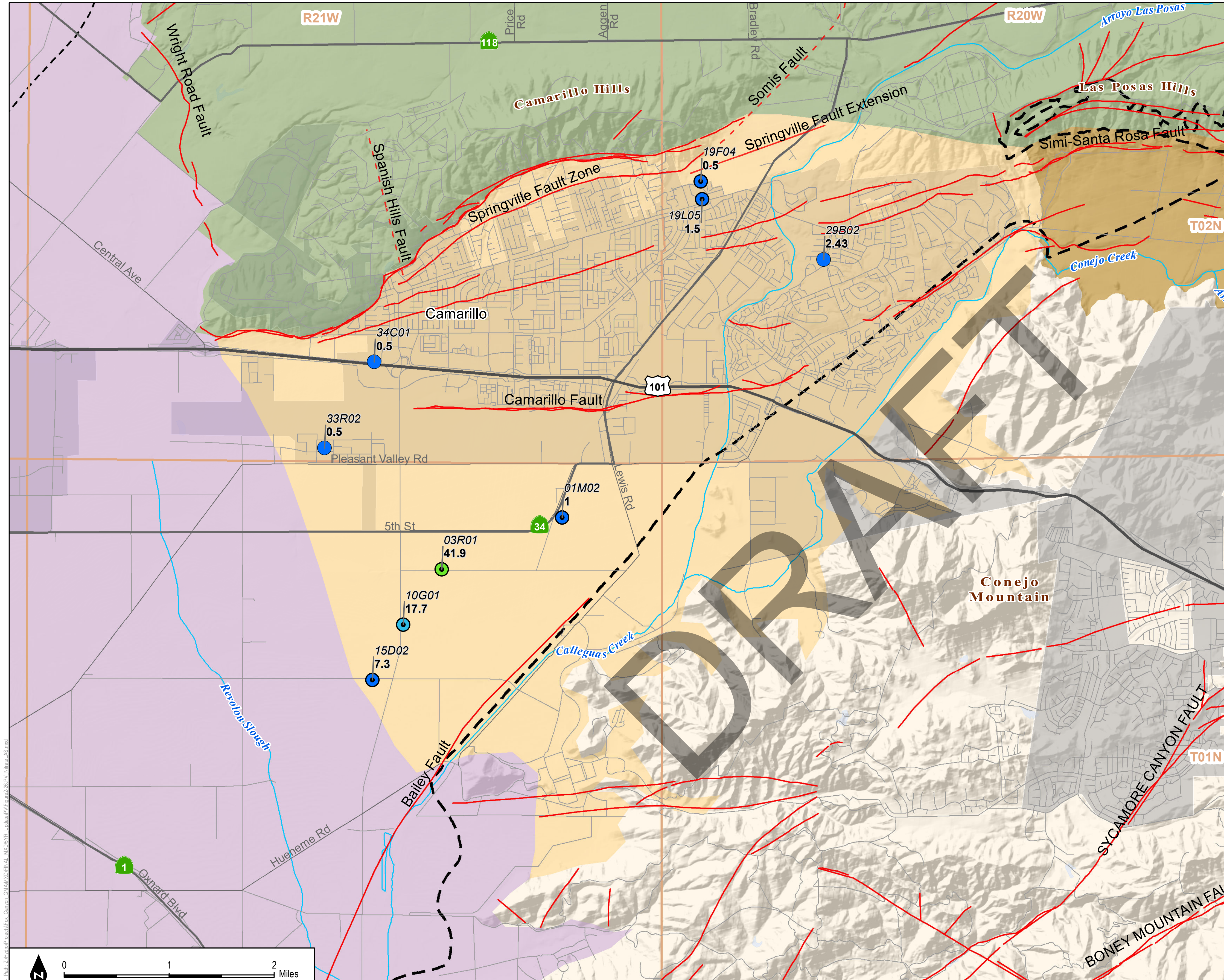

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Nitrate concentration (mg/L as Nitrate), 2019-2023

- 0 - 10
- >10 - 22.5
- >22.5 - 45
- >45 - 90
- >90 - 528

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-24

Lower Aquifer System - Most Recent Nitrate (mg/L) Measured 2019-2023

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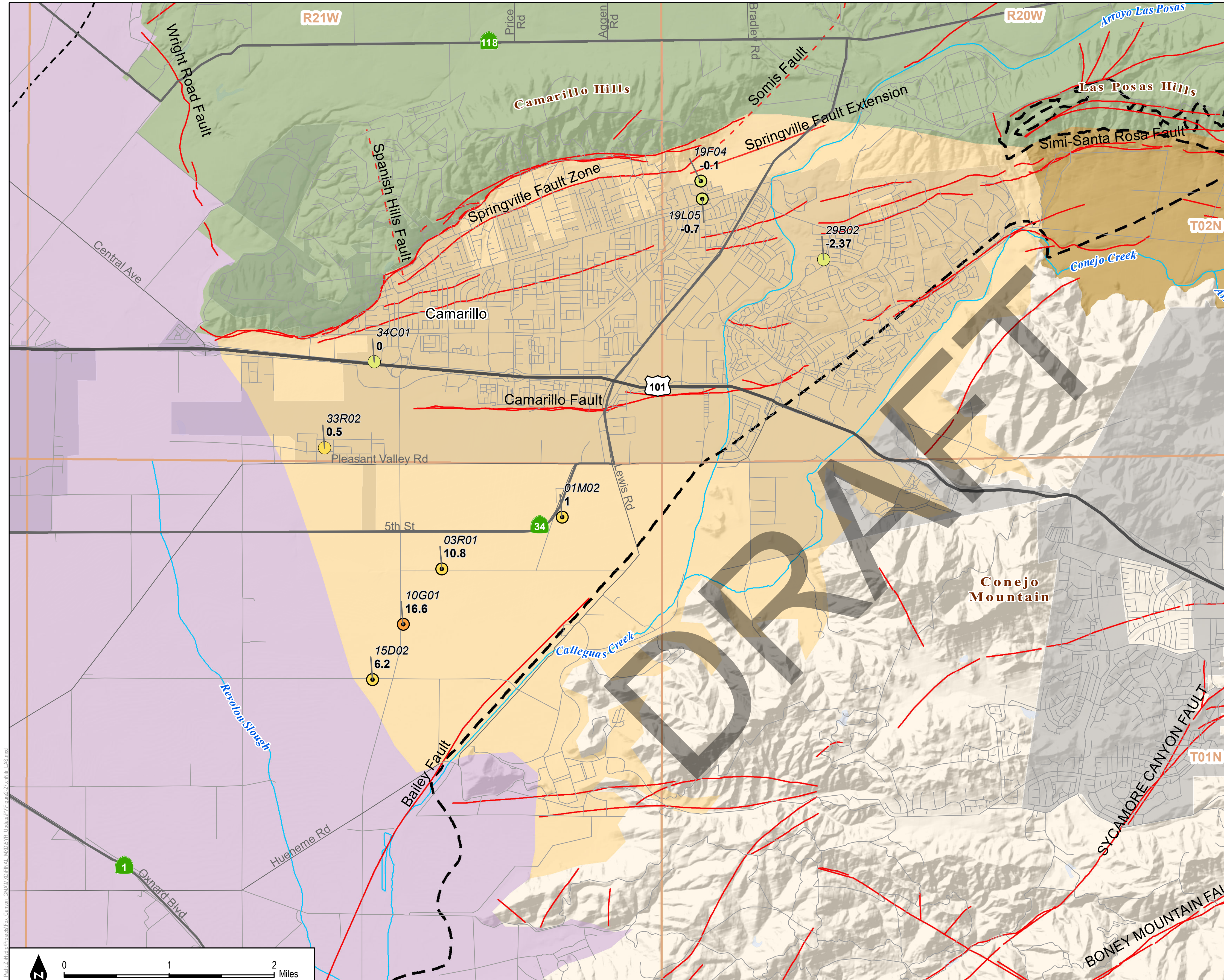

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Nitrate change in concentration (mg/L)

- =< -100
- -99 - -50
- -49 - -15
- -14 - 0
- 1 - 15
- 16 - 50
- 51 - 100
- > 100

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)

10.5 Change in Concentration (mg/L)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-25

Change in Nitrate Concentration (mg/L) in the LAS, between the period from 2011-2015 and 2019-2023

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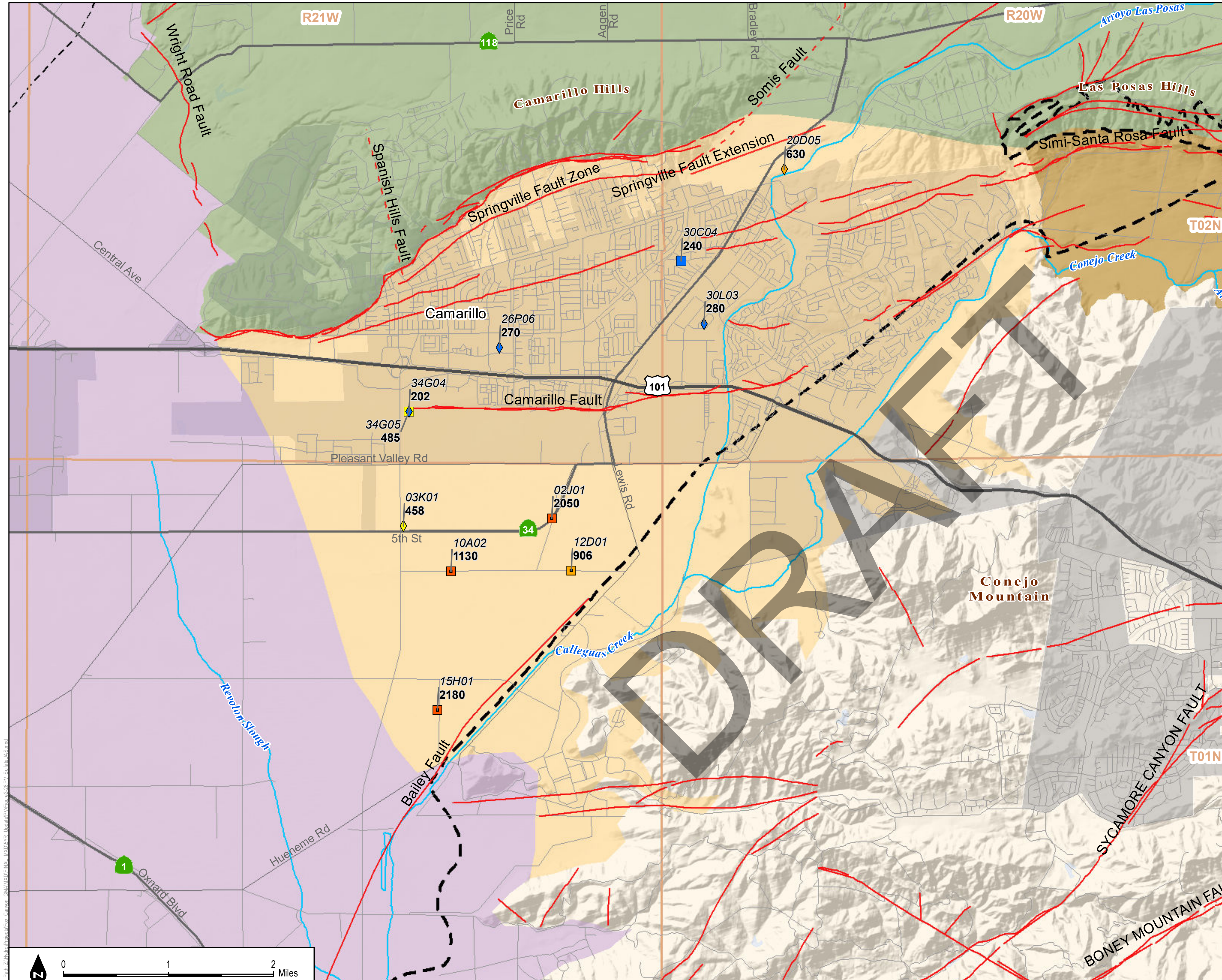

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Sulfate concentration (mg/L), 2019-2023

- 202 - 300
- >300 - 600
- >600 - 1000
- >1000

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)

10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-26

Older Alluvium - Most Recent Sulfate (mg/L) Measured 2019-2023

Groundwater Sustainability Plan for Pleasant Valley Basin: First Periodic Evaluation

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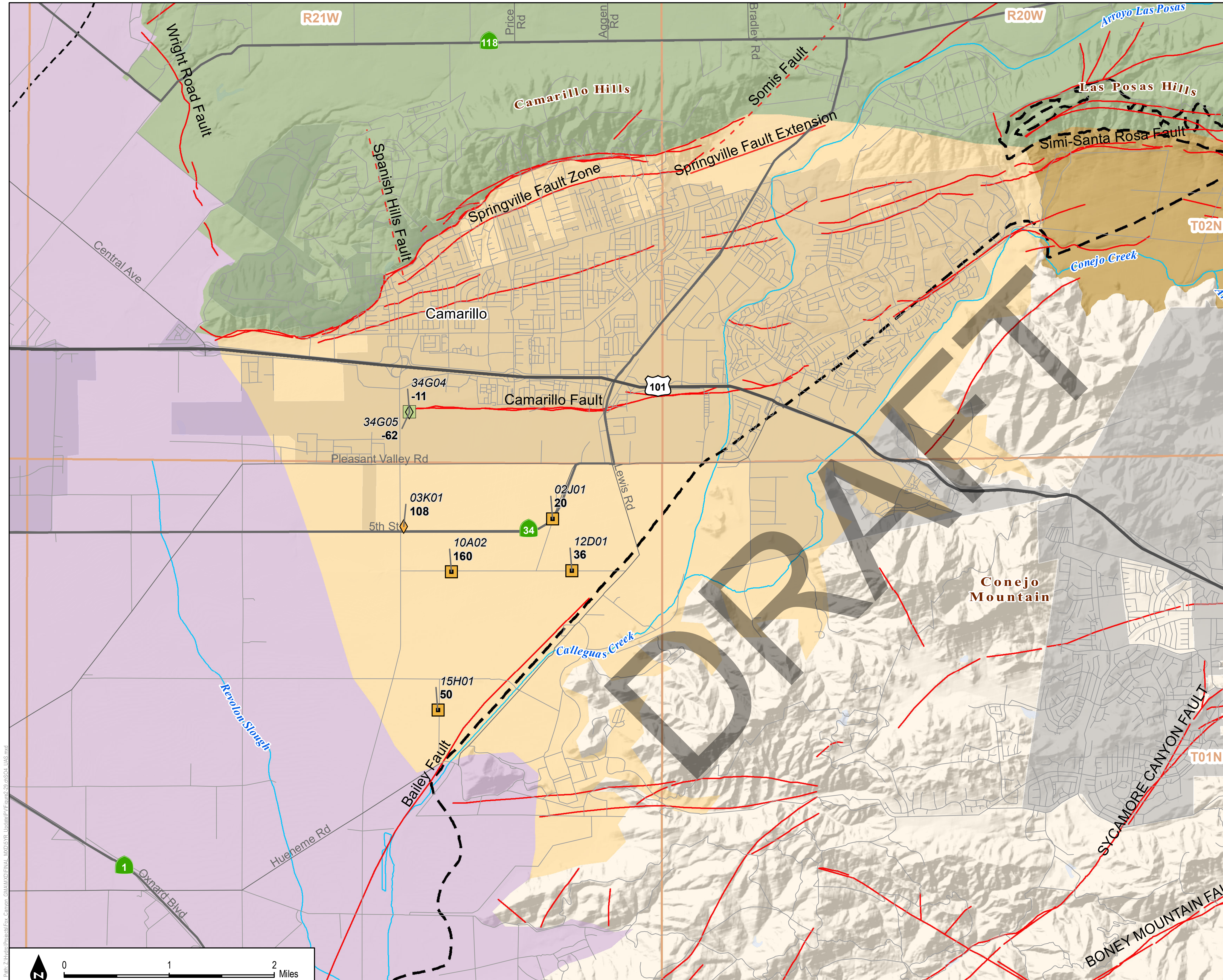

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

Sulfate change in concentration (mg/L)

- =< -200
- -199 - 0
- 0 - 200
- > 200

15P01 Abbreviated State Well Number (see notes)

10.5 Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-27

Change in Sulfate Concentration (mg/L) in the UAS, between the period from 2011-2015 and 2019-2023

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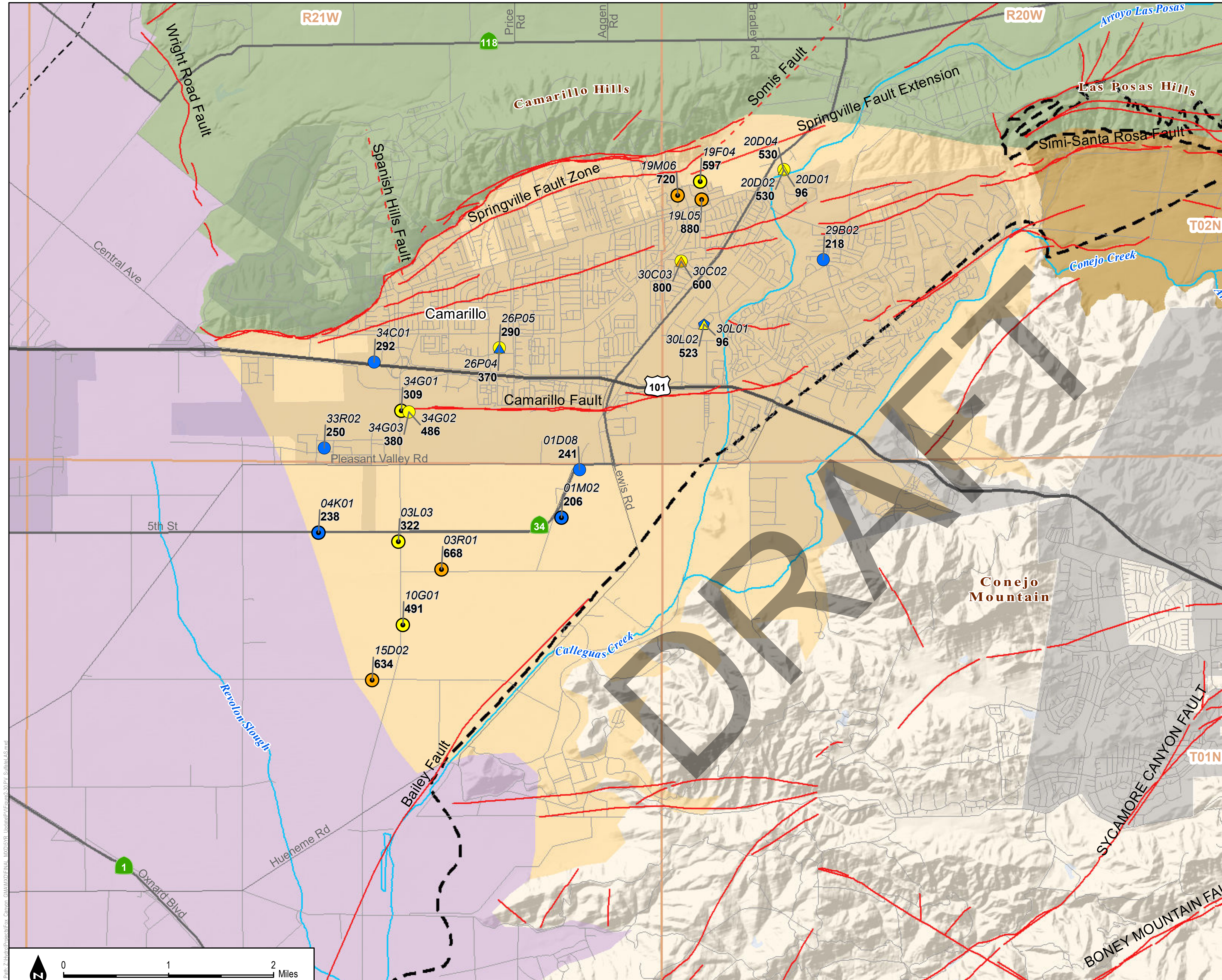

Legend

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Major Rivers/Stream Channels

Faults (Dashed Where Inferred)

Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

Arroyo Santa Rosa Valley (4-007)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Forebay

Sulfate concentration (mg/L), 2019-2023

29 - 300

301 - 600

601 - 1000

1001 - 5740

Aquifer Designation

Well screened in the Hueneme aquifer

Well screened in the Fox Canyon aquifer

Well screened in the Grimes Canyon aquifer

Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)

10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-28

Lower Aquifer System - Most Recent Sulfate (mg/L) Measured 2019-2023

Groundwater Sustainability Plan for Pleasant Valley Basin: First Periodic Evaluation

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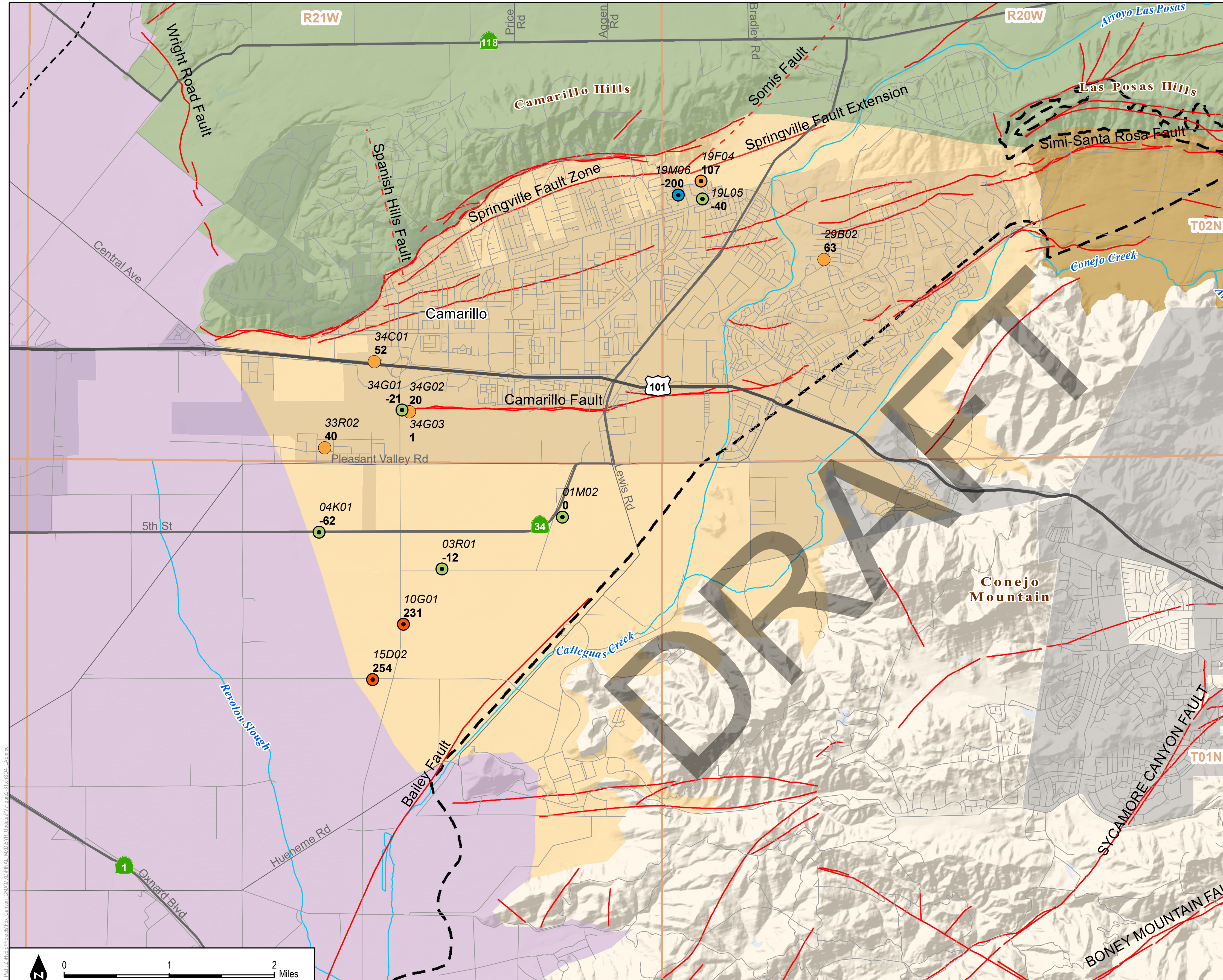

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Sulfate change in concentration (mg/L)

- -400 - -200
- >-200 - 0
- >0 - 200
- >200

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)

10.5 Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-29

Change in Sulfate Concentration (mg/L) in the LAS, between the period from 2011-2015 and 2019-2023

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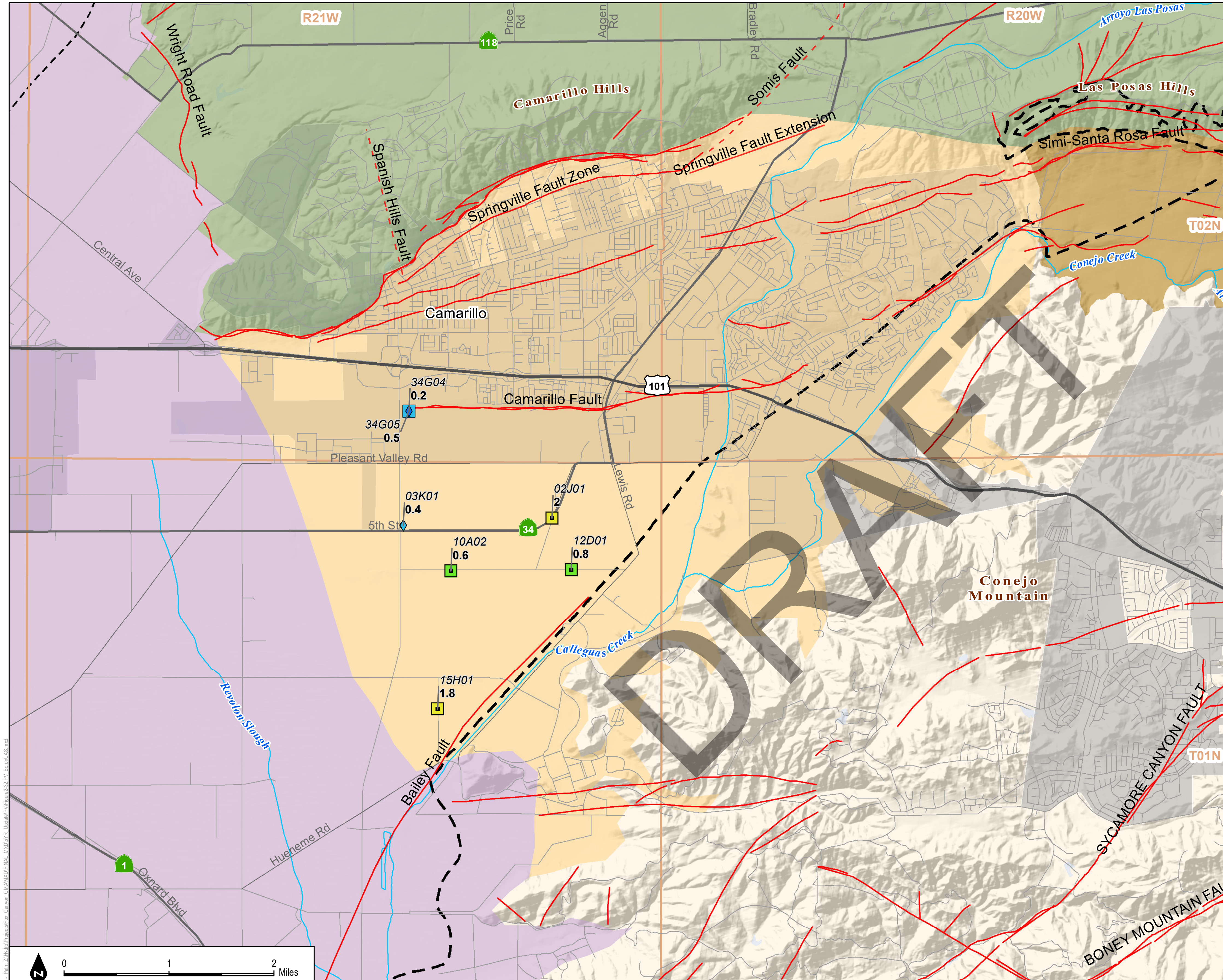

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Boron concentration (mg/L), 2019-2023

- 0 - 0.2
- >0.2 - 0.5
- >0.5 - 1.0
- >1.0 - 2.0
- >2.0 - 6.0

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)

10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-30

Older Alluvium - Most Recent Boron (mg/L) Measured 2019-2023

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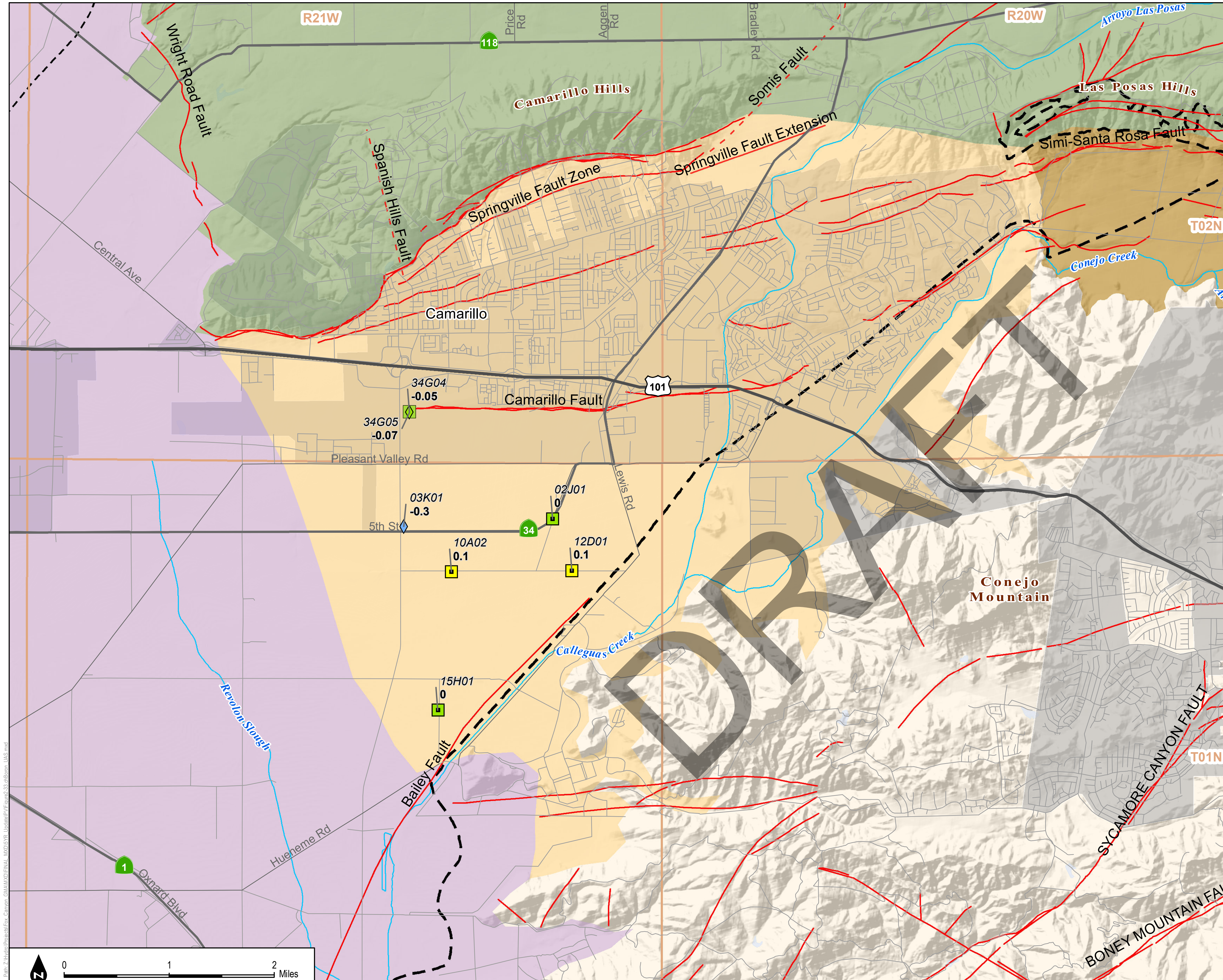

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Aquifer Designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

Boron change in concentration (mg/L)

- <= -0.2
- > -0.2 - 0
- >0 - 0.2

15P01 Abbreviated State Well Number (see notes)

10.5 Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-31

Change in Boron Concentration (mg/L) in the UAS, between the period from 2011-2015 and 2019-2023

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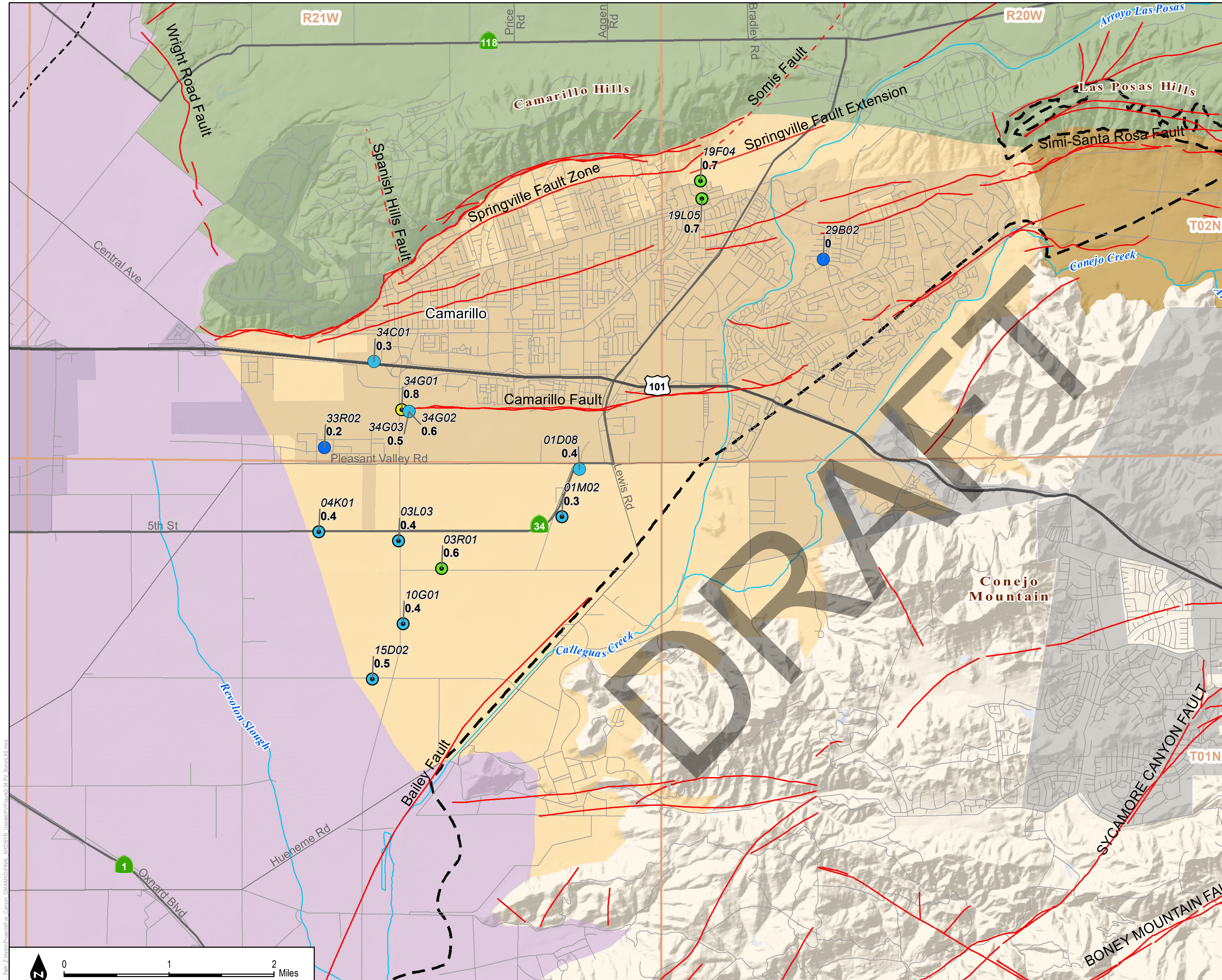

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Boron concentration (mg/L), 2019-2023

- 0 - 0.2
- >0.2 - 0.5
- >0.5 - 1.0
- >1.0 - 2.0
- >2.0

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2019-2023.
2) "ND" signifies non-detect.
3) 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.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-32
Lower Aquifer System - Most Recent Boron (mg/L) Measured 2019-2023

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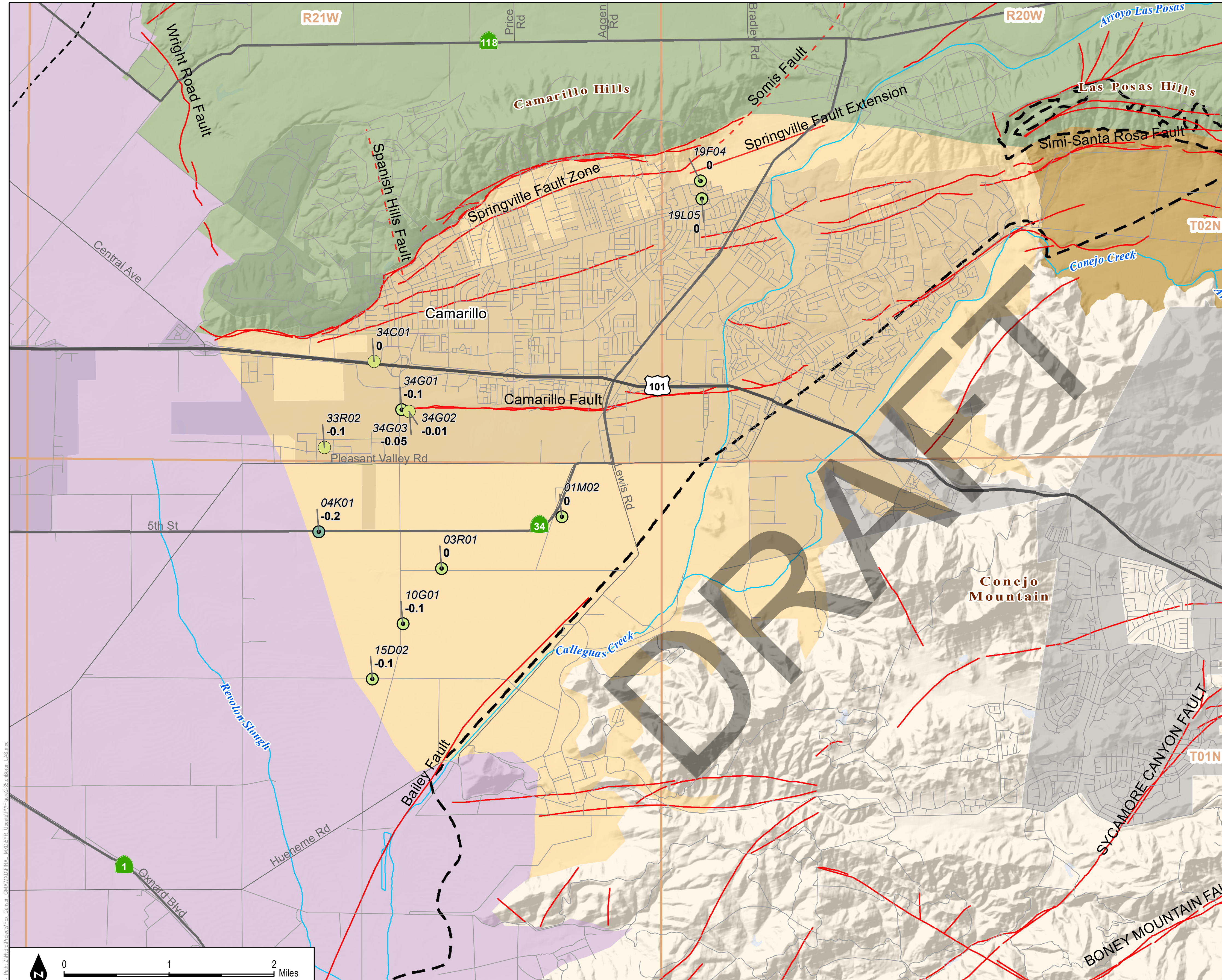

Legend

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults (Dashed Where Inferred)
- Township (North-South) and Range (East-West)

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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

Aquifer Designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

Boron change in concentration (mg/L)

- =< -0.60
- -0.59- -0.20
- -0.19 - 0.00
- 0.01 - 0.20
- 0.21 - 0.60
- > 0.60

15P01 Abbreviated State Well Number (see notes)
10.5 Change in Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a change in concentration value beneath it.The change in concentration represents the difference between the 2011-2015 and 2019-2023 most recent concentrations. Maps of the 2011-2015 most recent concentration are included in the GSP.
2) 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.
3) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
4) The color of each well symbol represents the change in groundwater quality measured since the 2011 to 2015 period.
5) All concentrations are in mg/L.
6) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.
7) Negative (-) values represent a decrease in concentration. Positive (+) values represent an increase in concentration.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-33
Change in Boron Concentration (mg/L) in the LAS, Between 2011-2015 and 2019-2023

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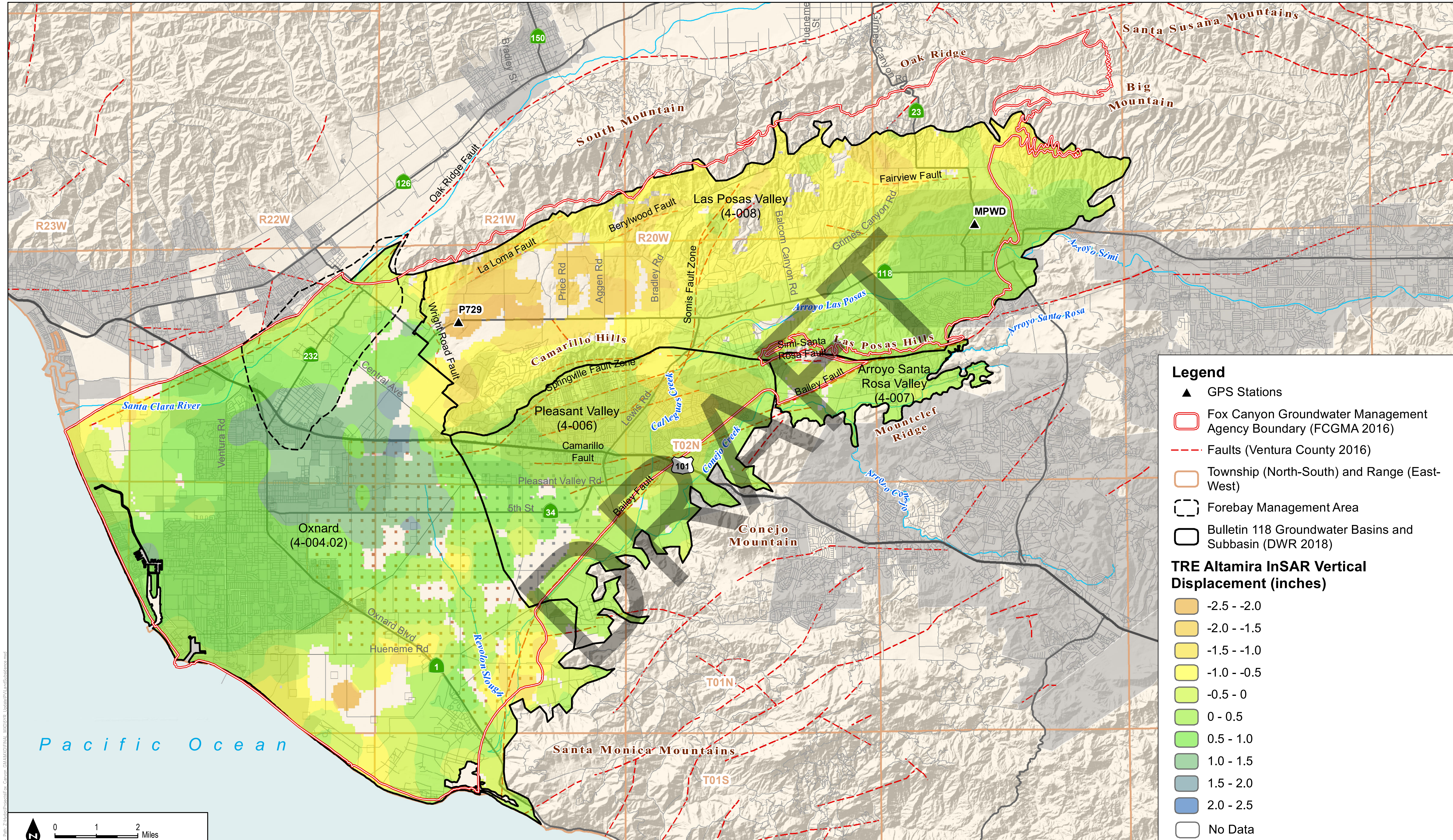

SOURCE: DWR; Ventura County; UWCD; CMWD

DUDEK

FIGURE 2-34

Land Subsidence June 2015 to January 2024

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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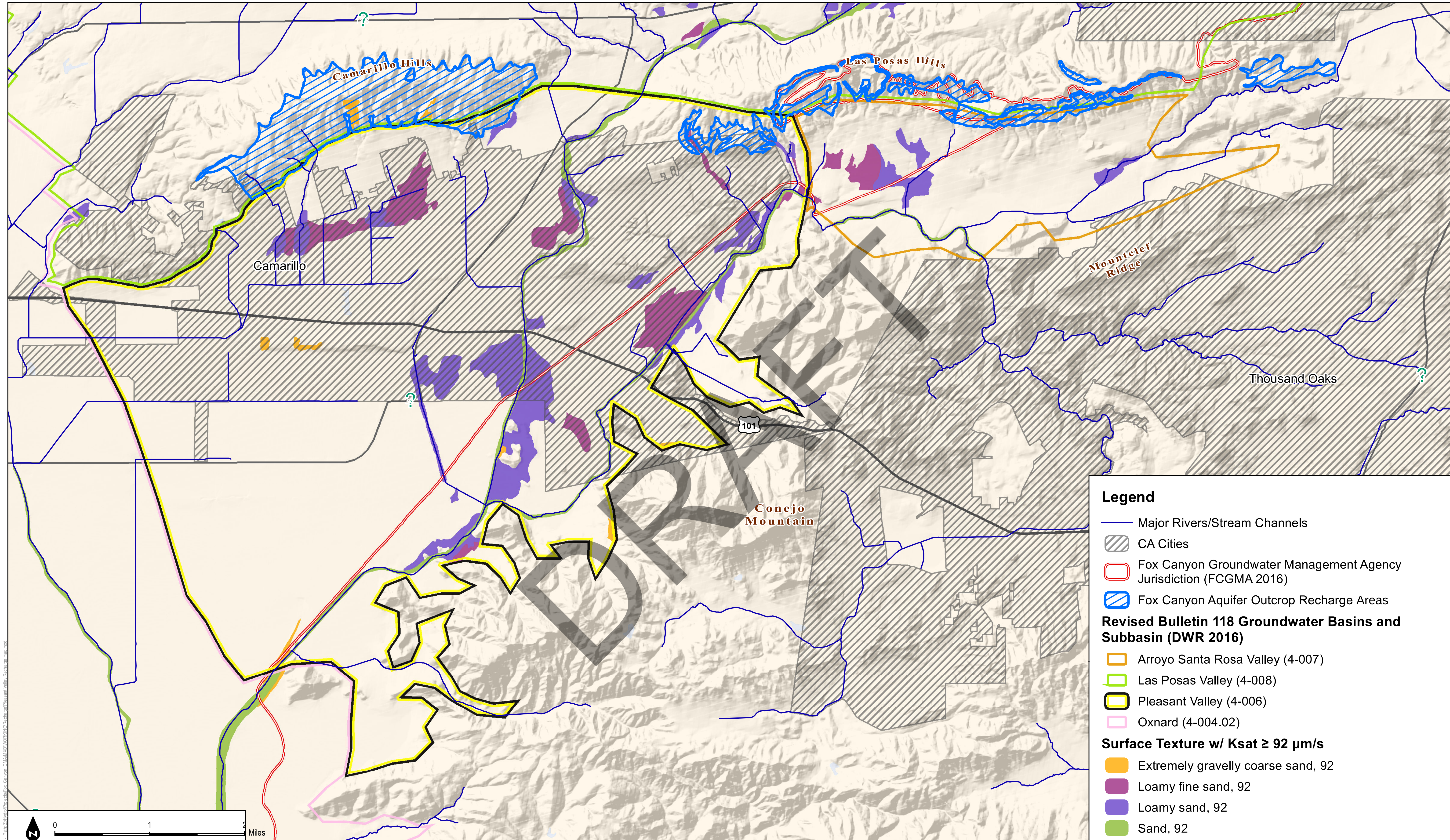

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SOURCE: DWR, USGS, NRCS

Figure 4-1

Pleasant Valley Basin Potential Recharge Areas

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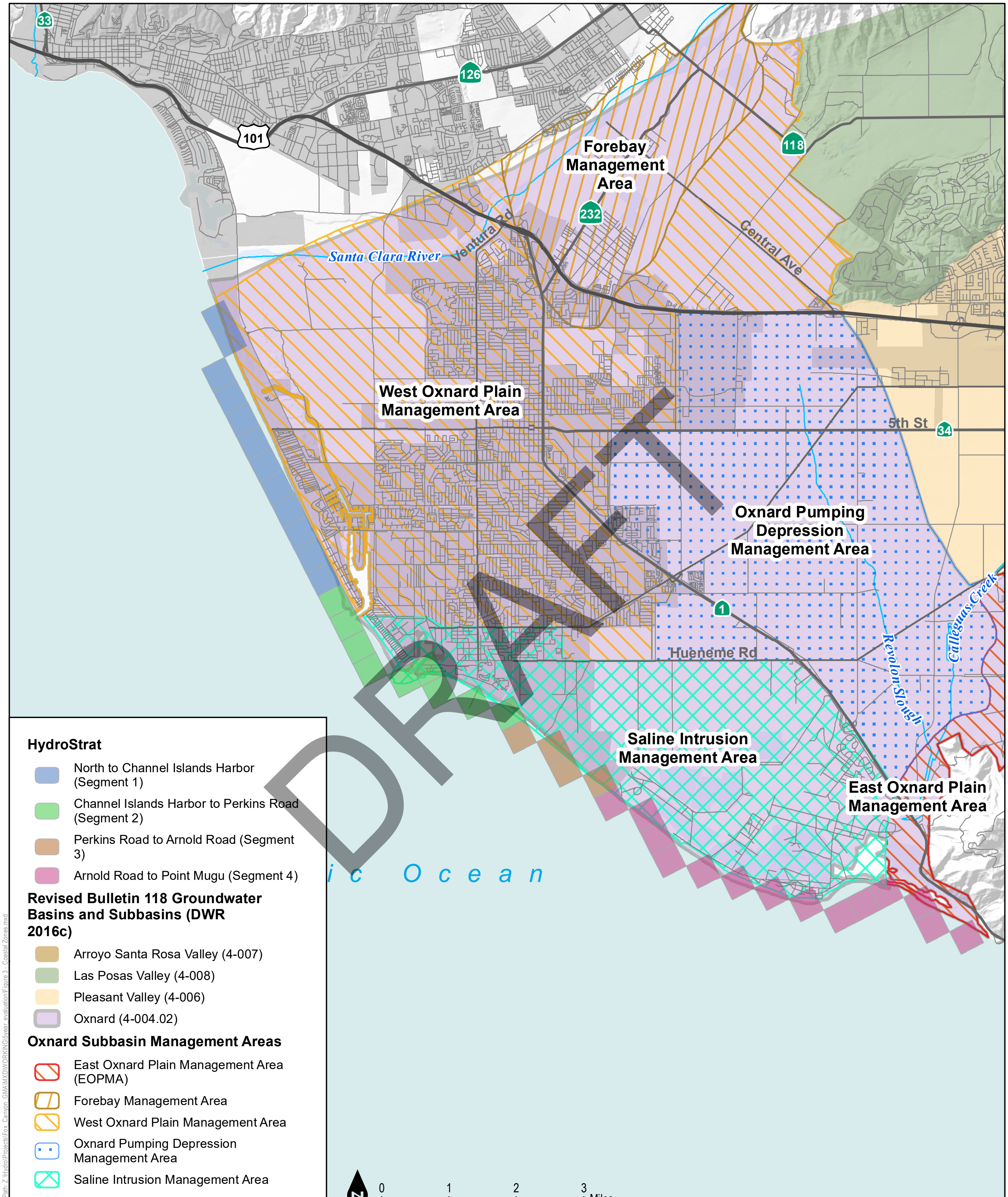

DUDEK

SOURCE: DWR; County of Ventura; FCGMA

FIGURE 5-1

Modeled Seawater Flux Coastal Segments

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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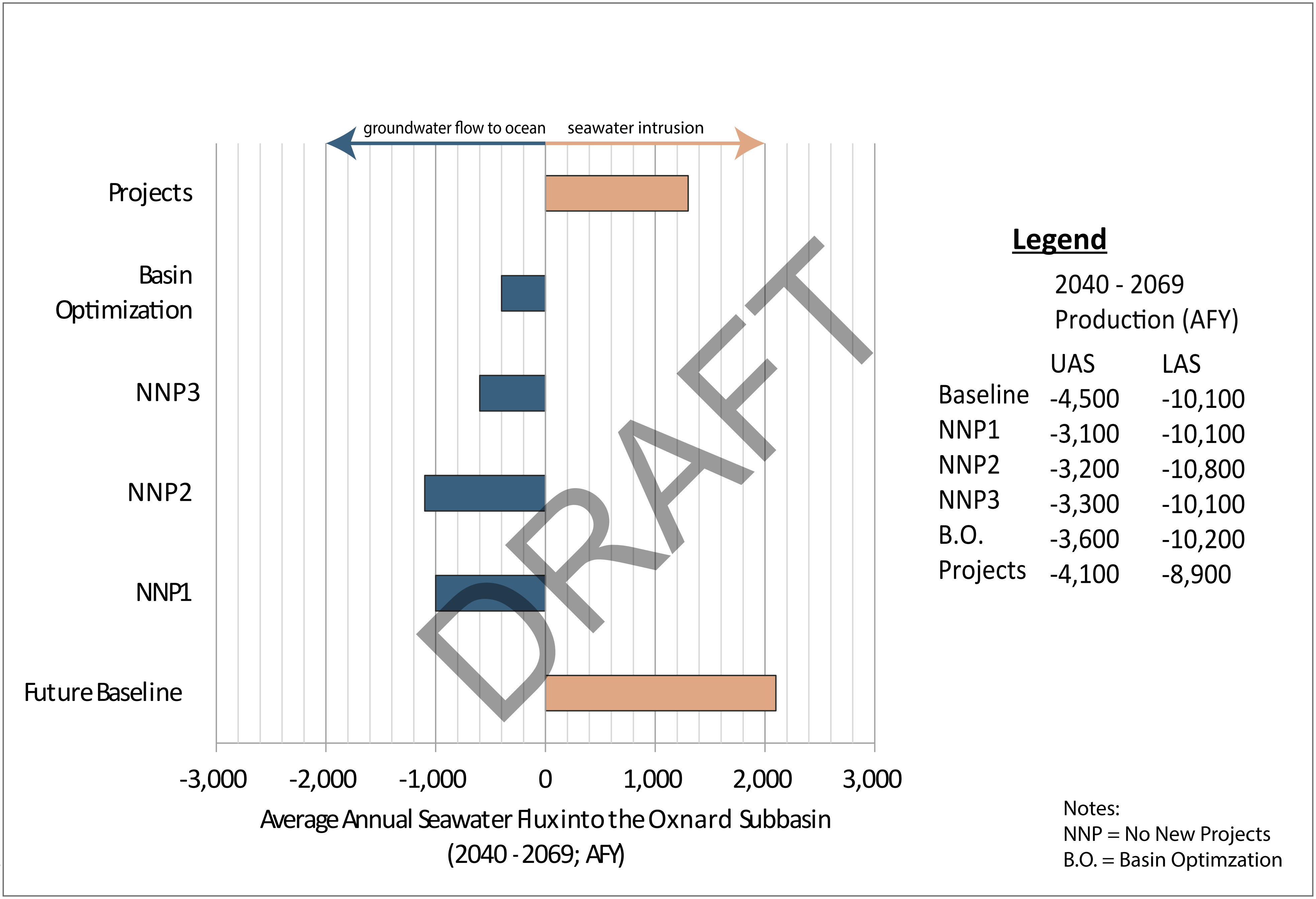

SOURCE: UWCD

DUDEK

FIGURE 5-2

Seawater Flux in the UAS: Future Model Scenarios without UWCD's EBB Project

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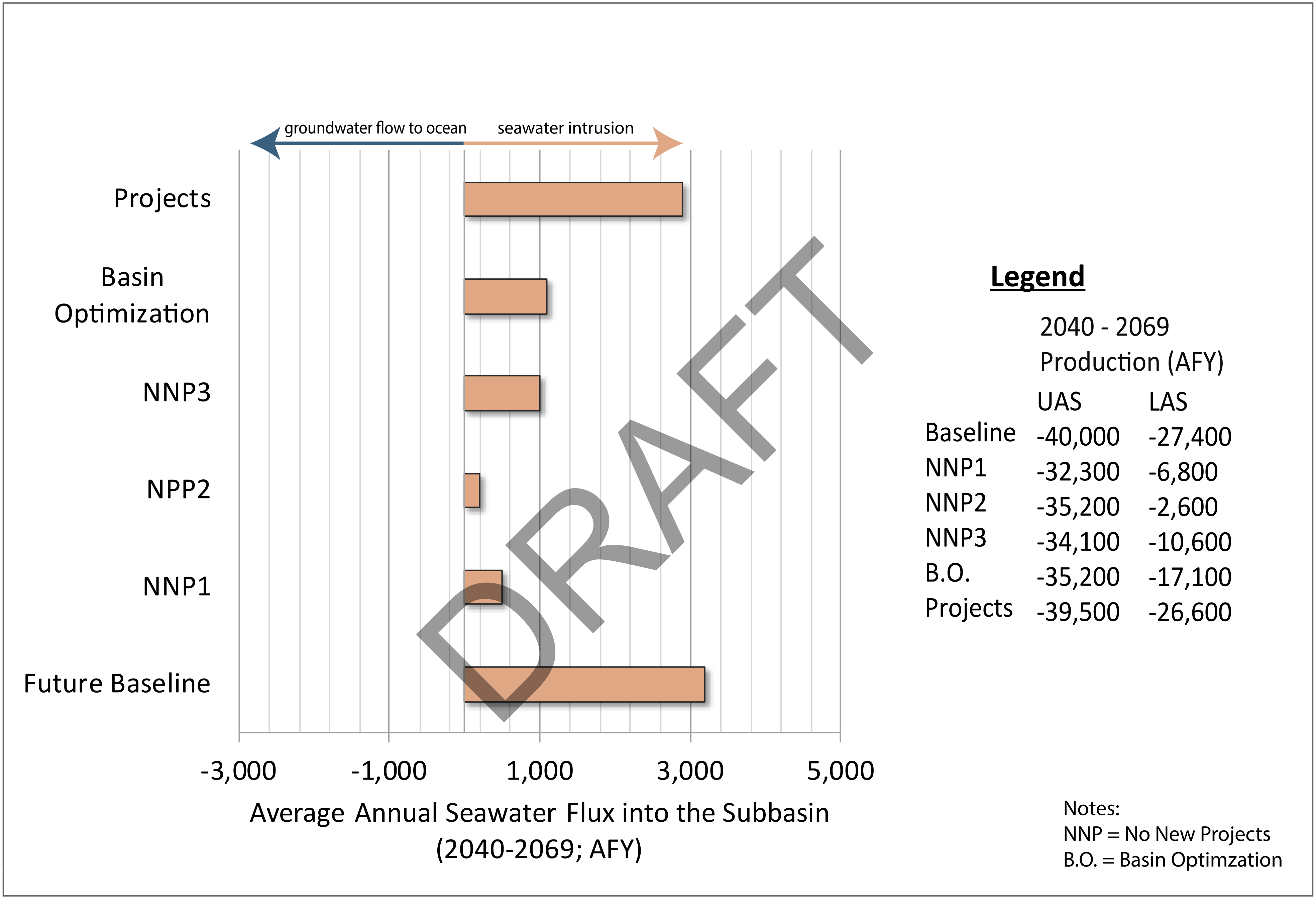

SOURCE: UWCD

DUDEK

FIGURE 5-3

Seawater Flux in the LAS: Future Model Scenarios without UWCD's EBB Project

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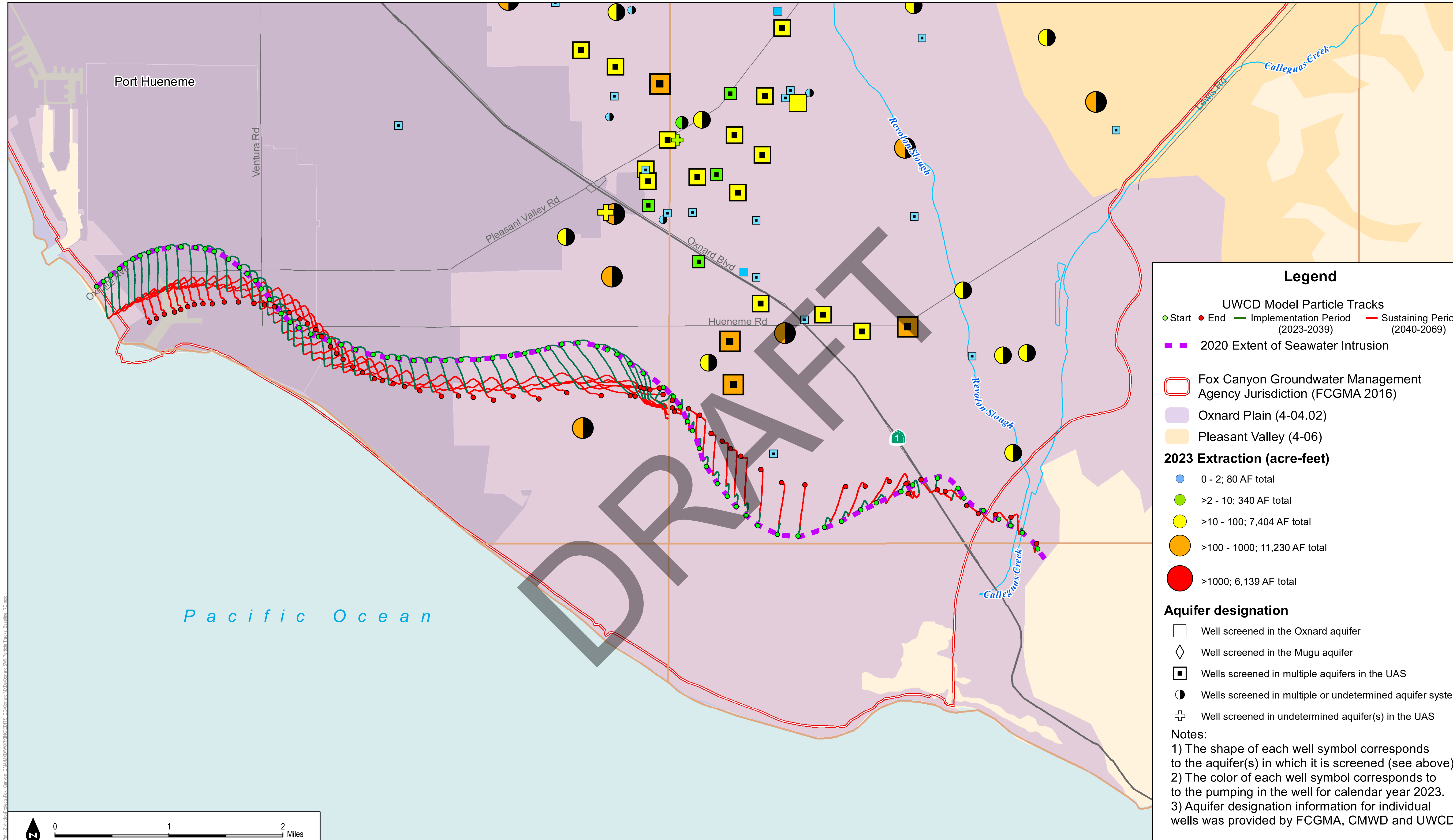

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 5-4
UWCD Model Particle Tracks, Oxnard Aquifer, Future Baseline

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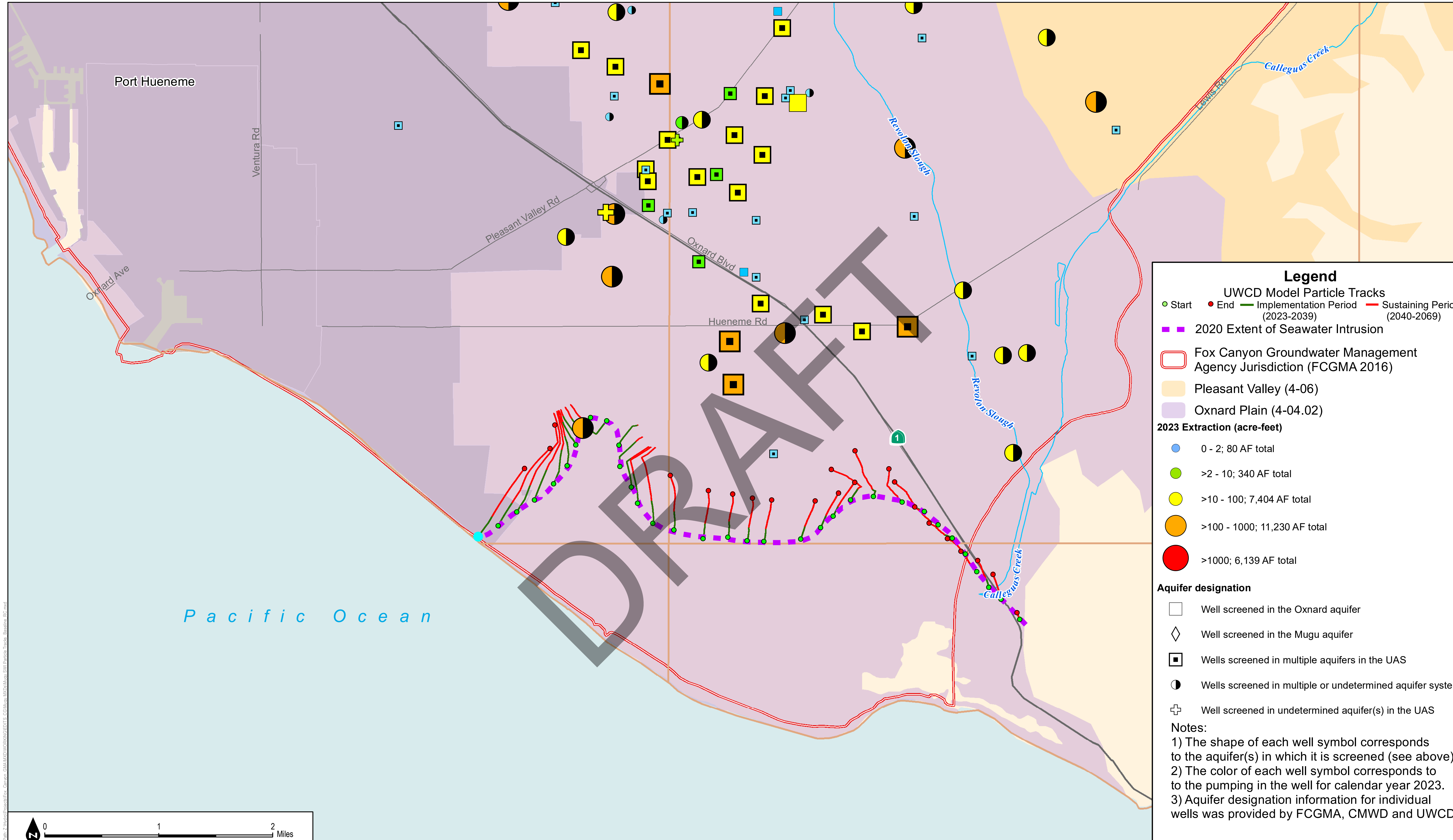

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 5-5
UWCD Model Particle Tracks, Mugu Aquifer, Future Baseline

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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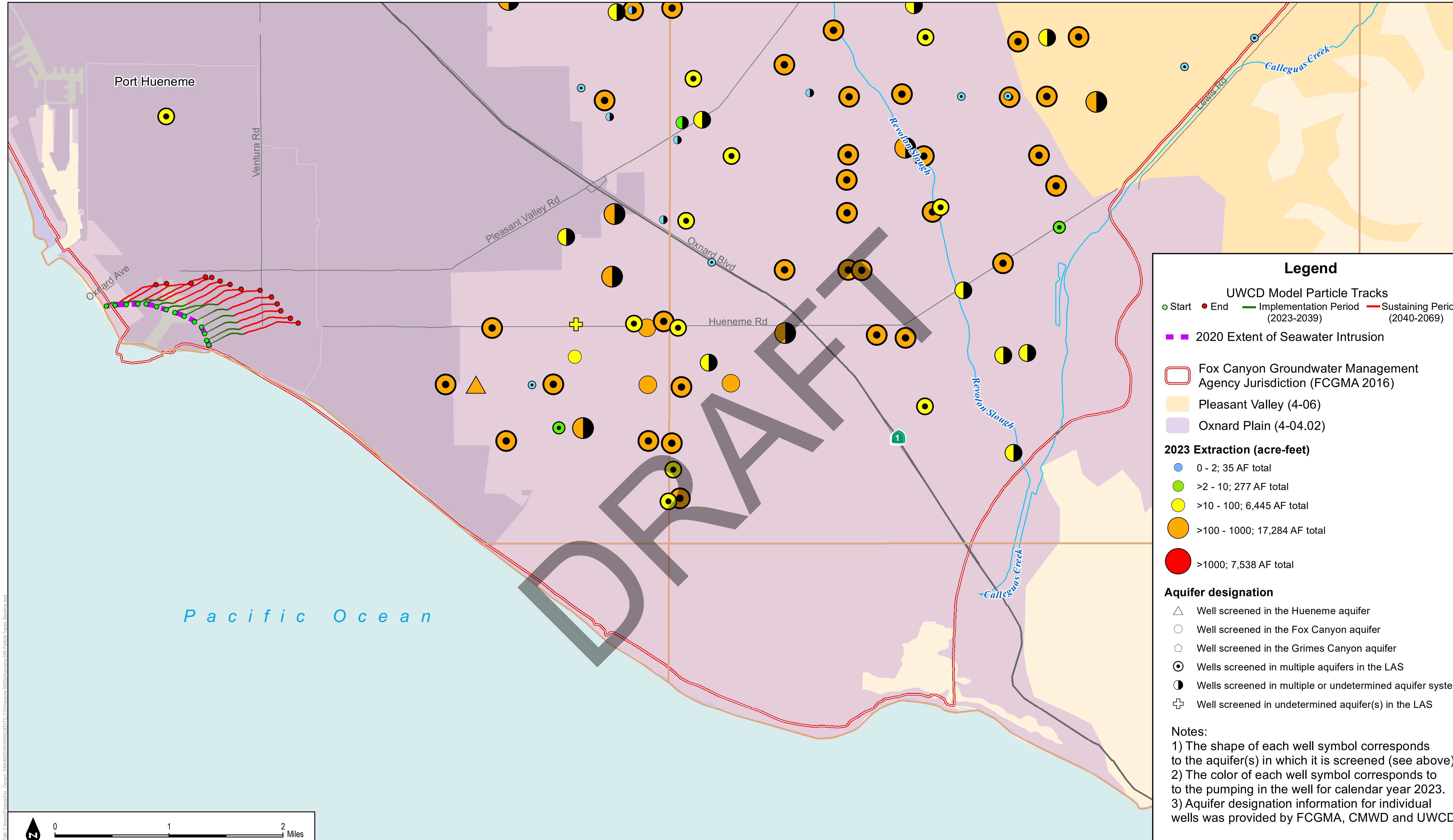

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 5-6
UWCD Model Particle Tracks, Hueneme Aquifer, Future Baseline

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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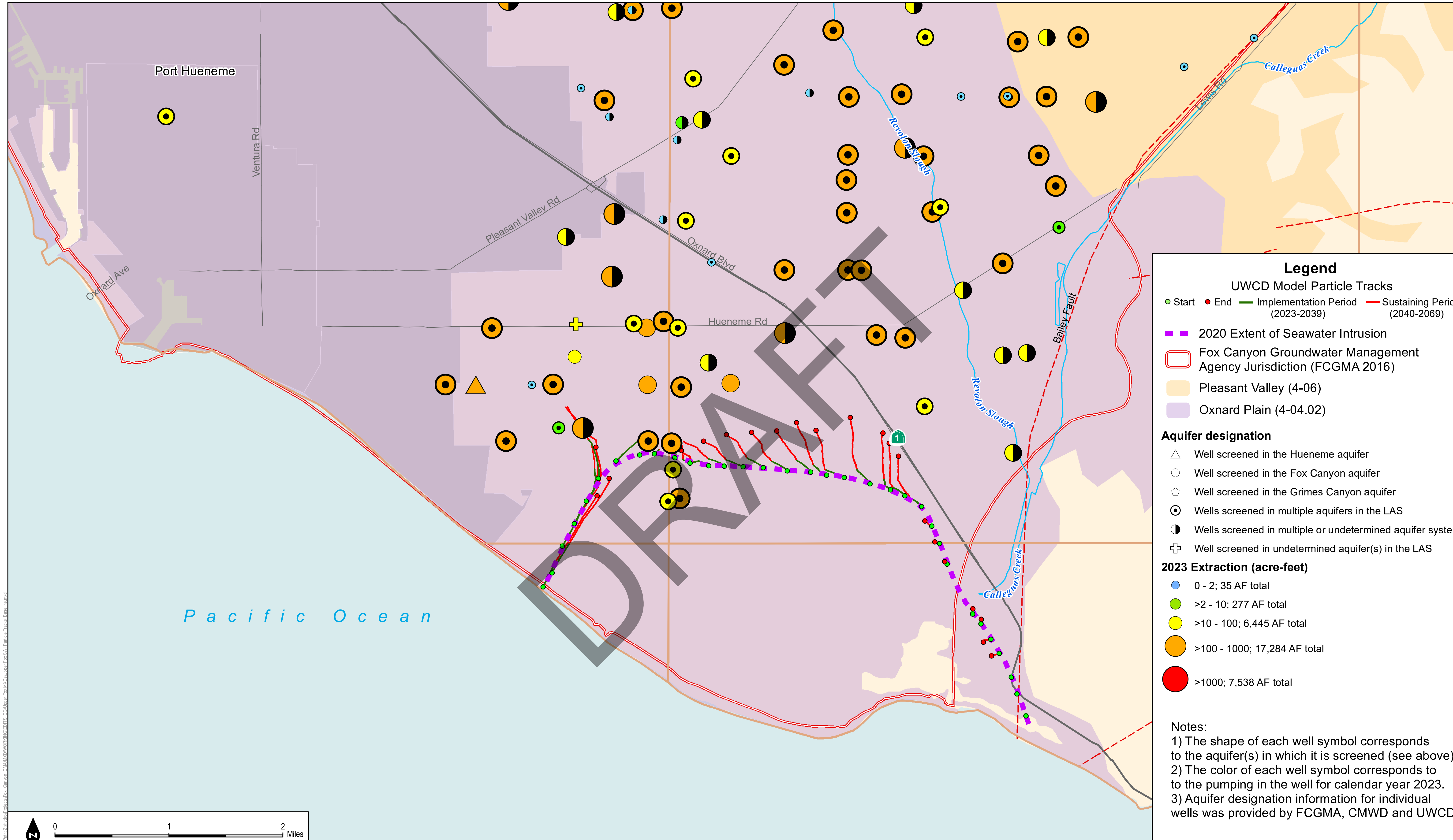

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 5-7
UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Future Baseline

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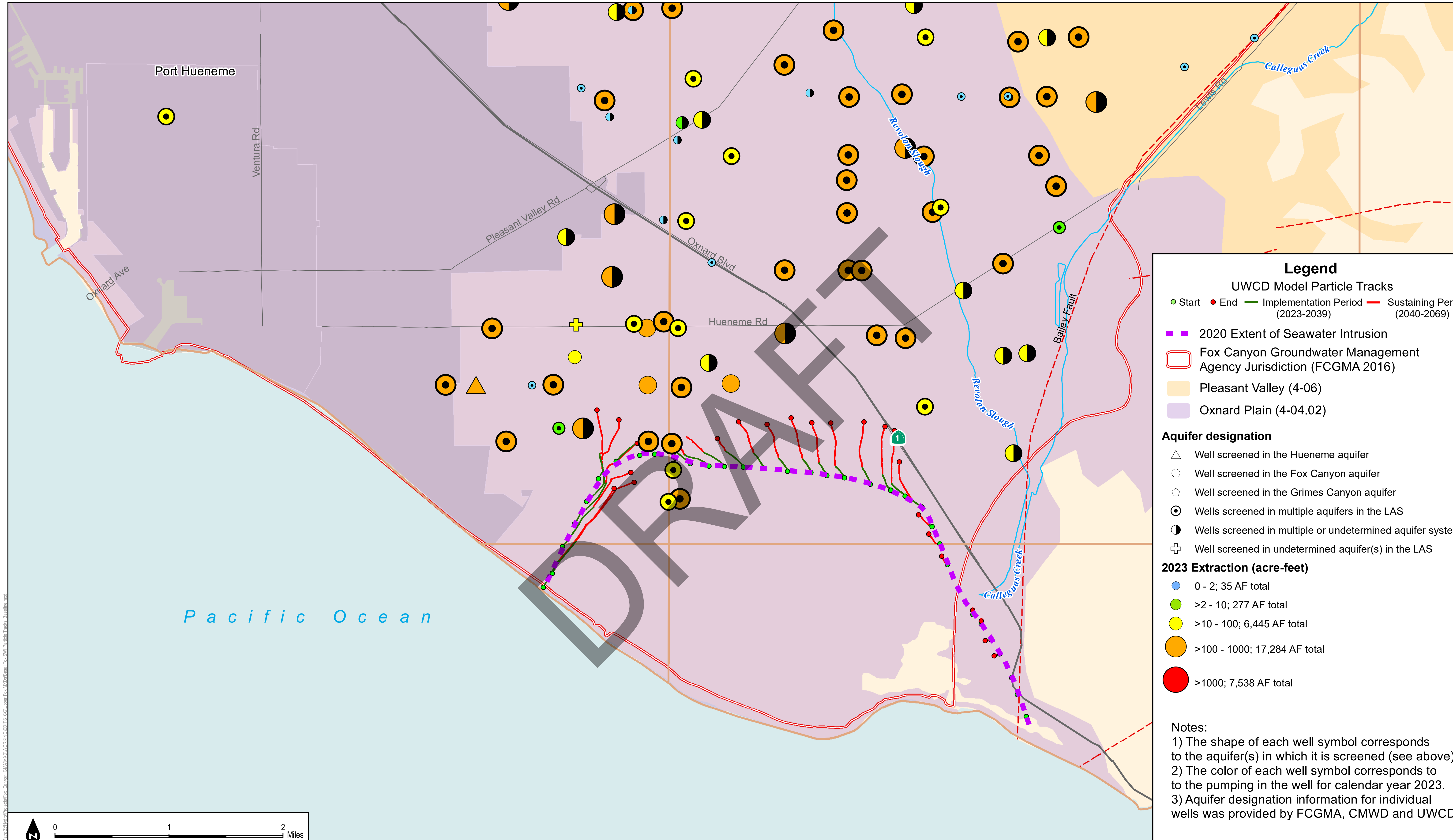

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SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-8
UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Future Baseline

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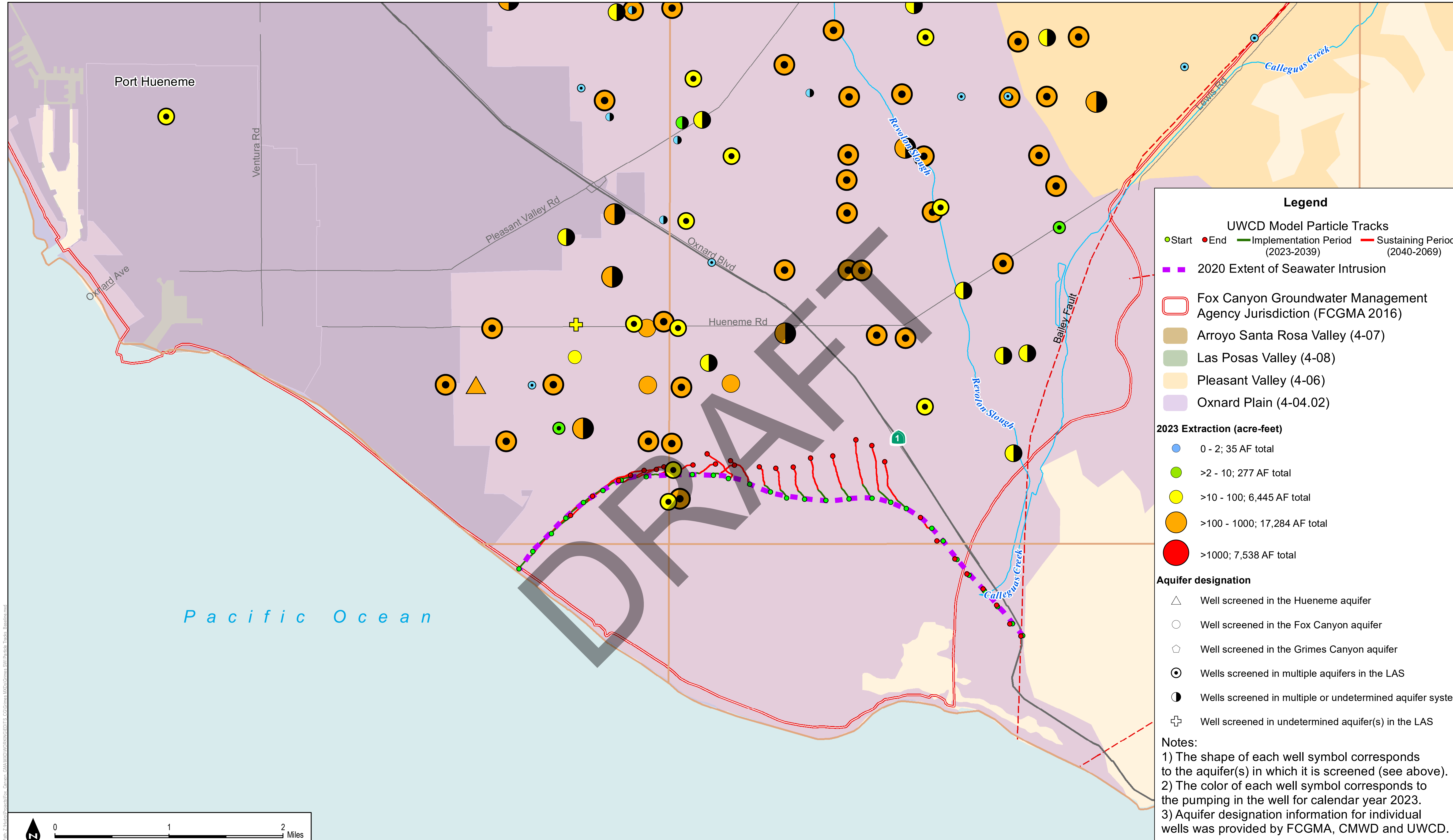

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-9
UWCD Model Particle Tracks, Grimes Canyon Aquifer, Future Baseline

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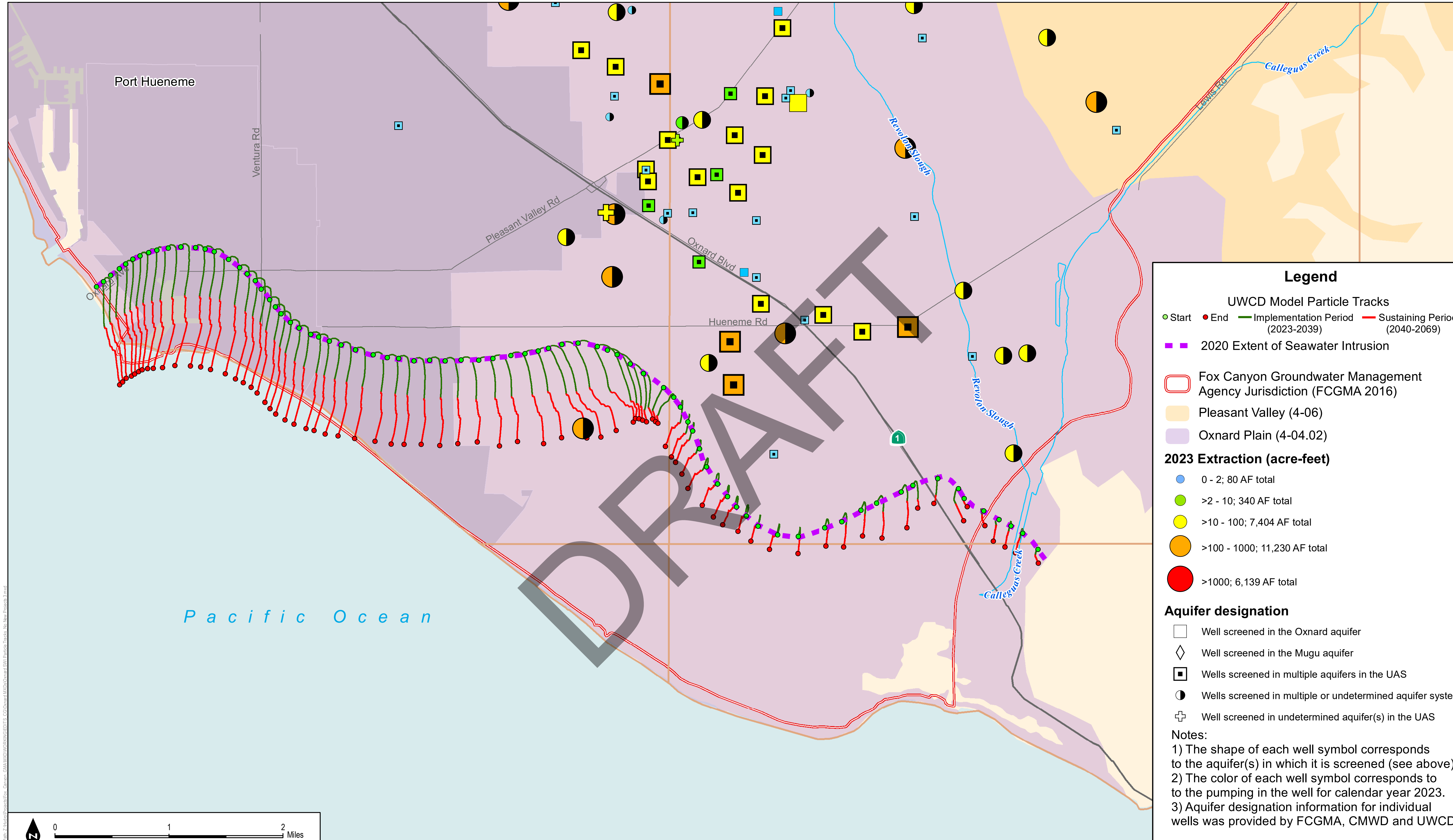

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-10
UWCD Model Particle Tracks, Oxnard Aquifer, NNP3

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Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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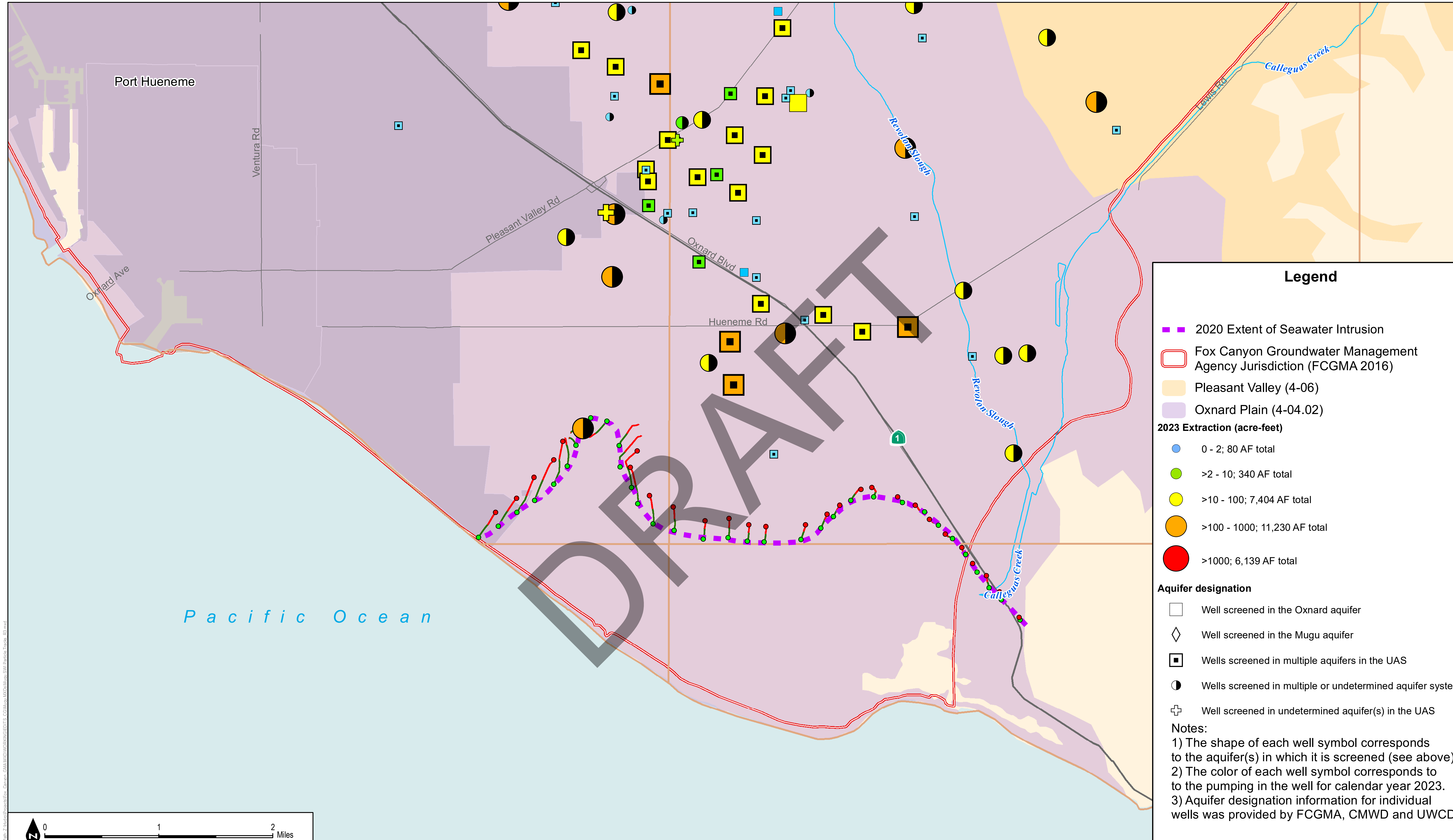

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

Figure 5-11
UWCD Model Particle Tracks, Mugu Aquifer, NNP3

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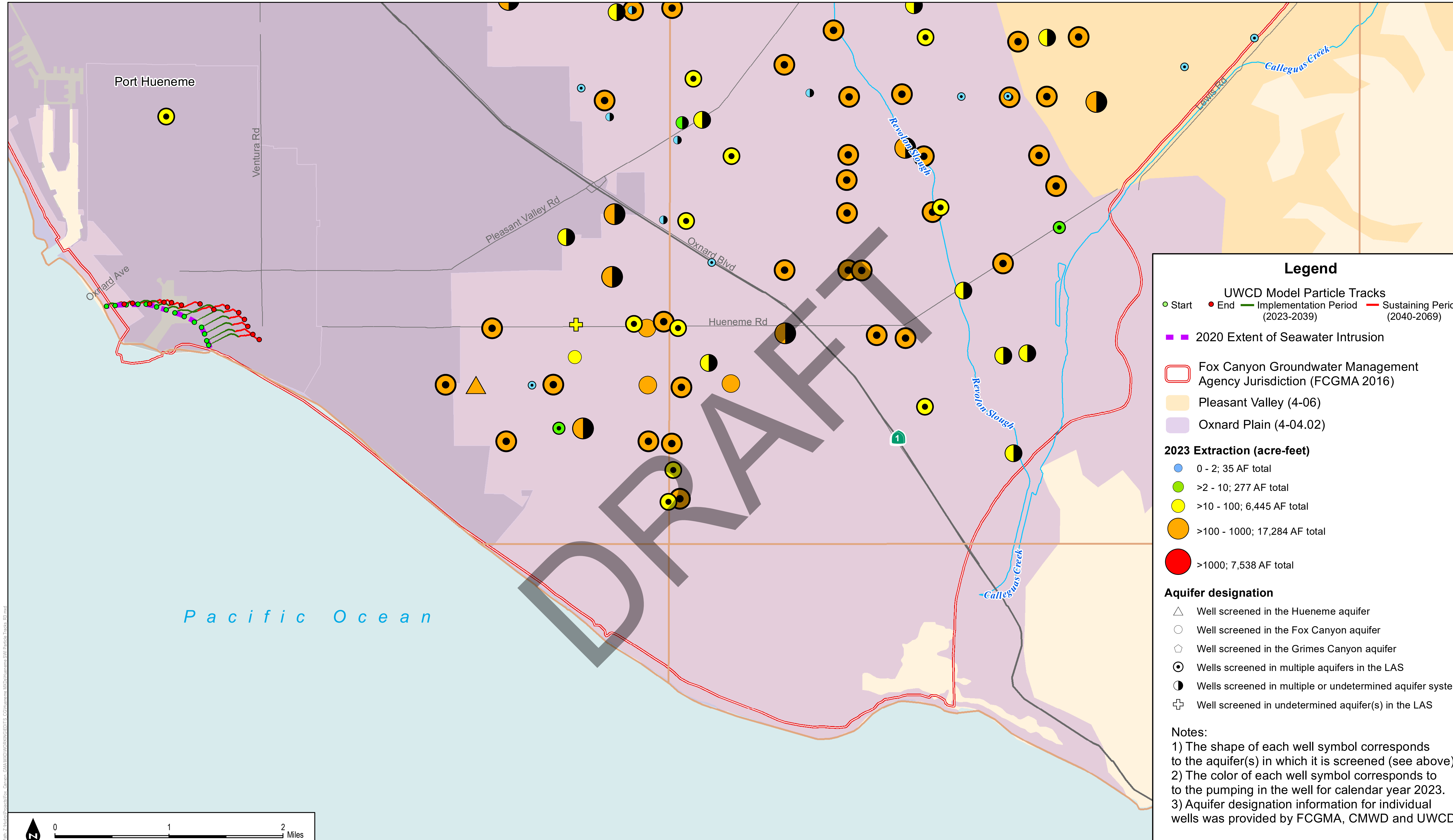

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

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Figure 5-12
UWCD Model Particle Tracks, Hueneme Aquifer, NNP3

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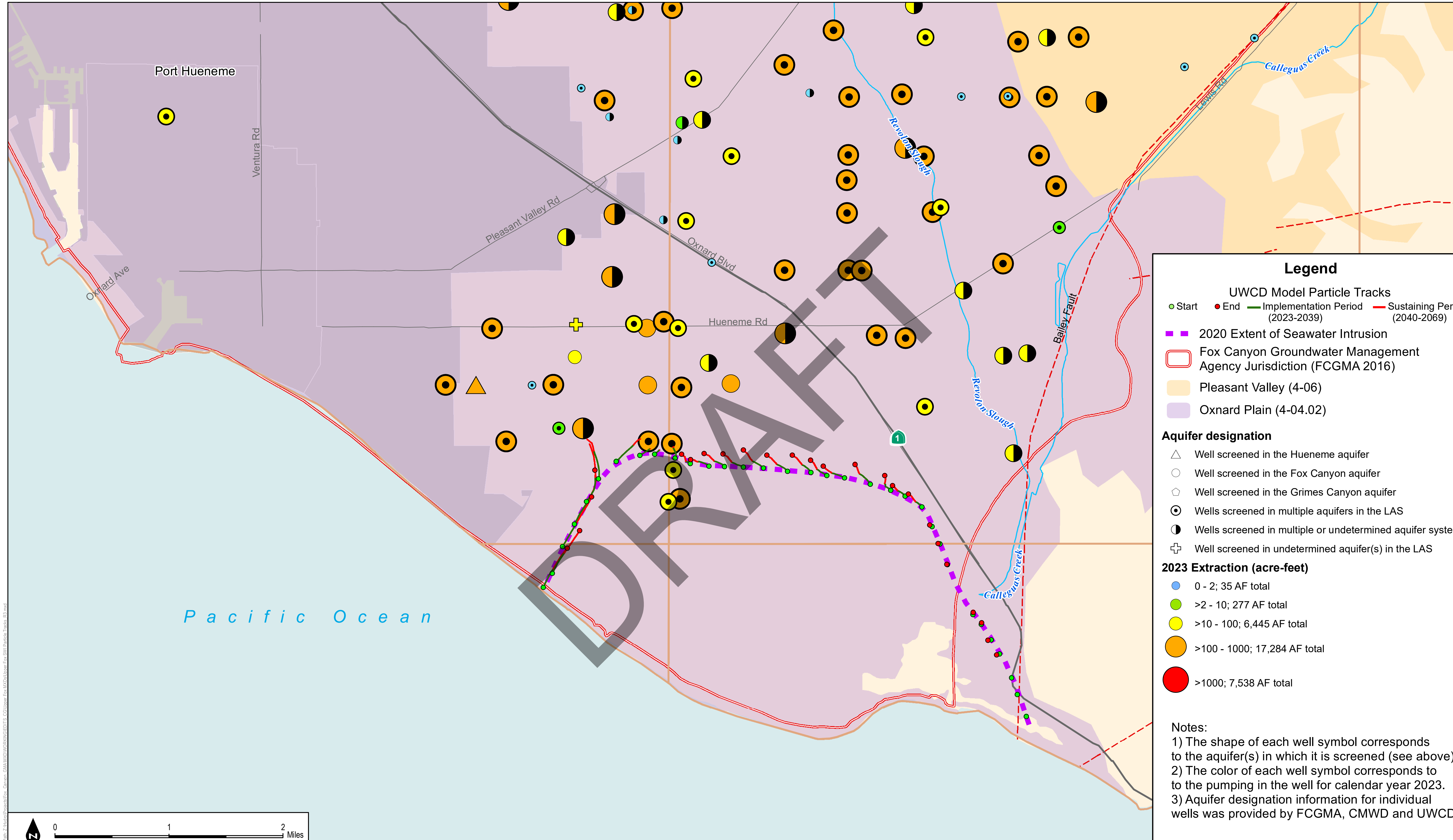

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-13
UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, NNP3

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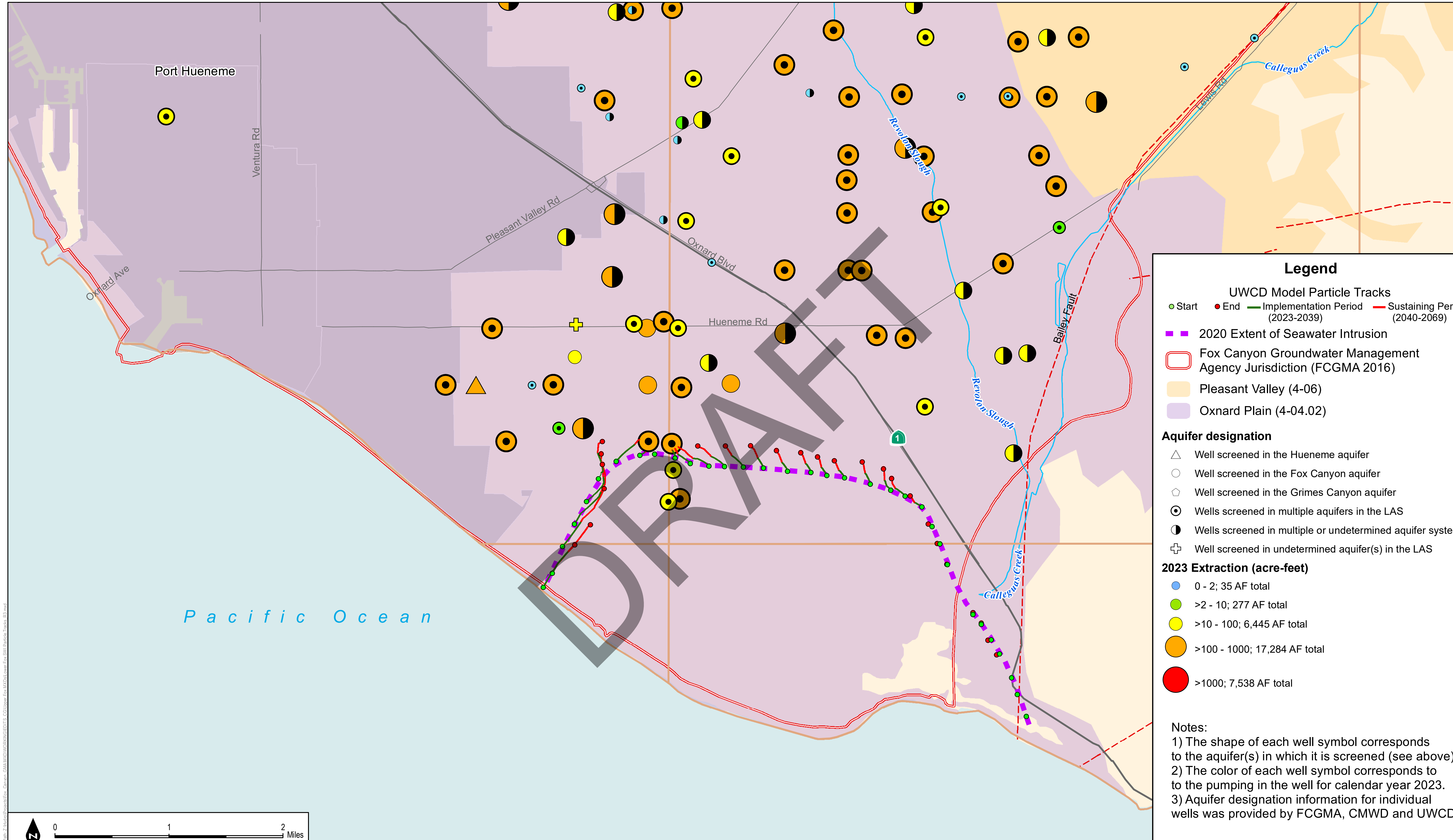

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-14
UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, NNP3

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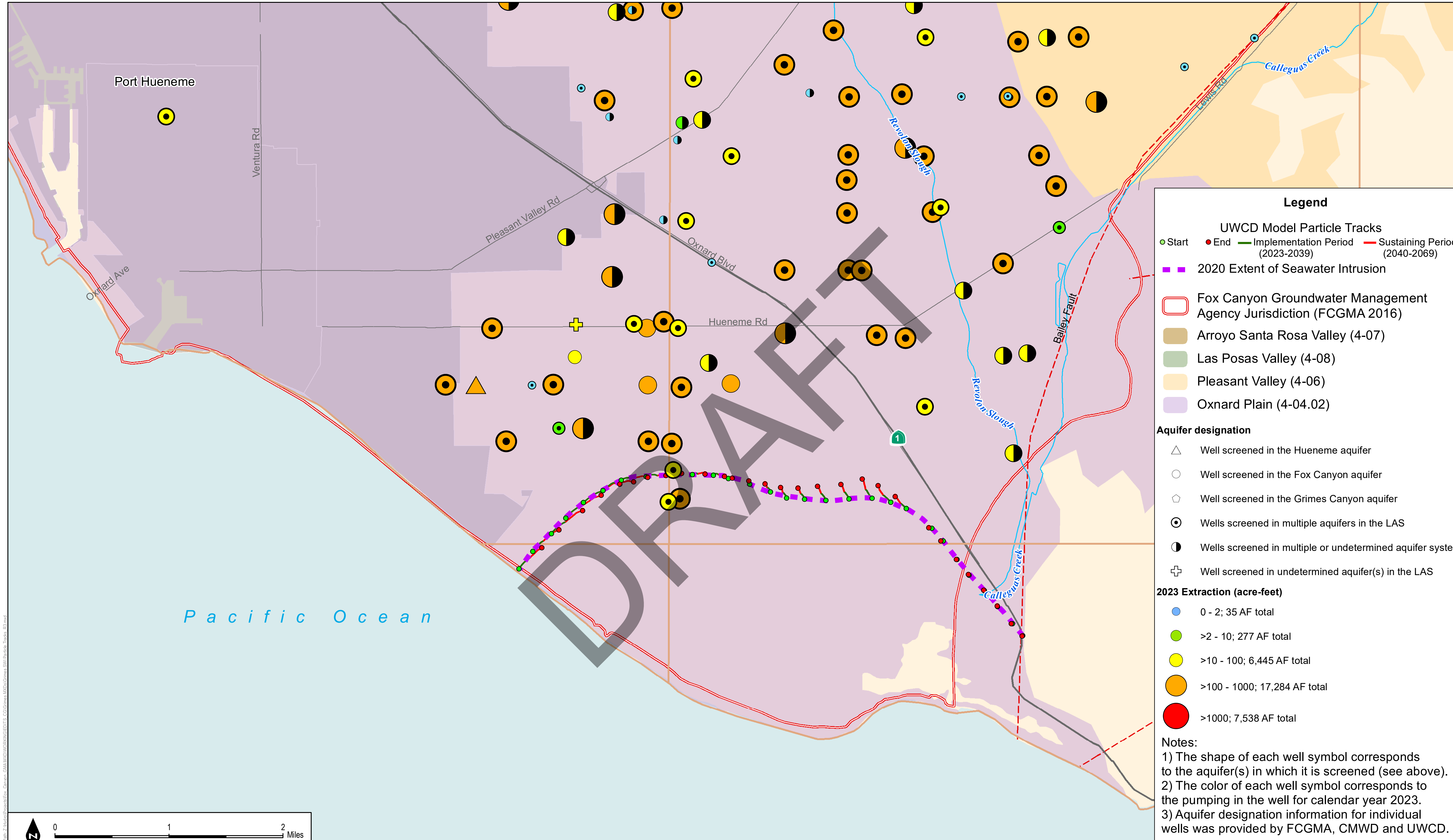

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

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Figure 5-15
UWCD Model Particle Tracks, Grimes Canyon Aquifer, NNP3

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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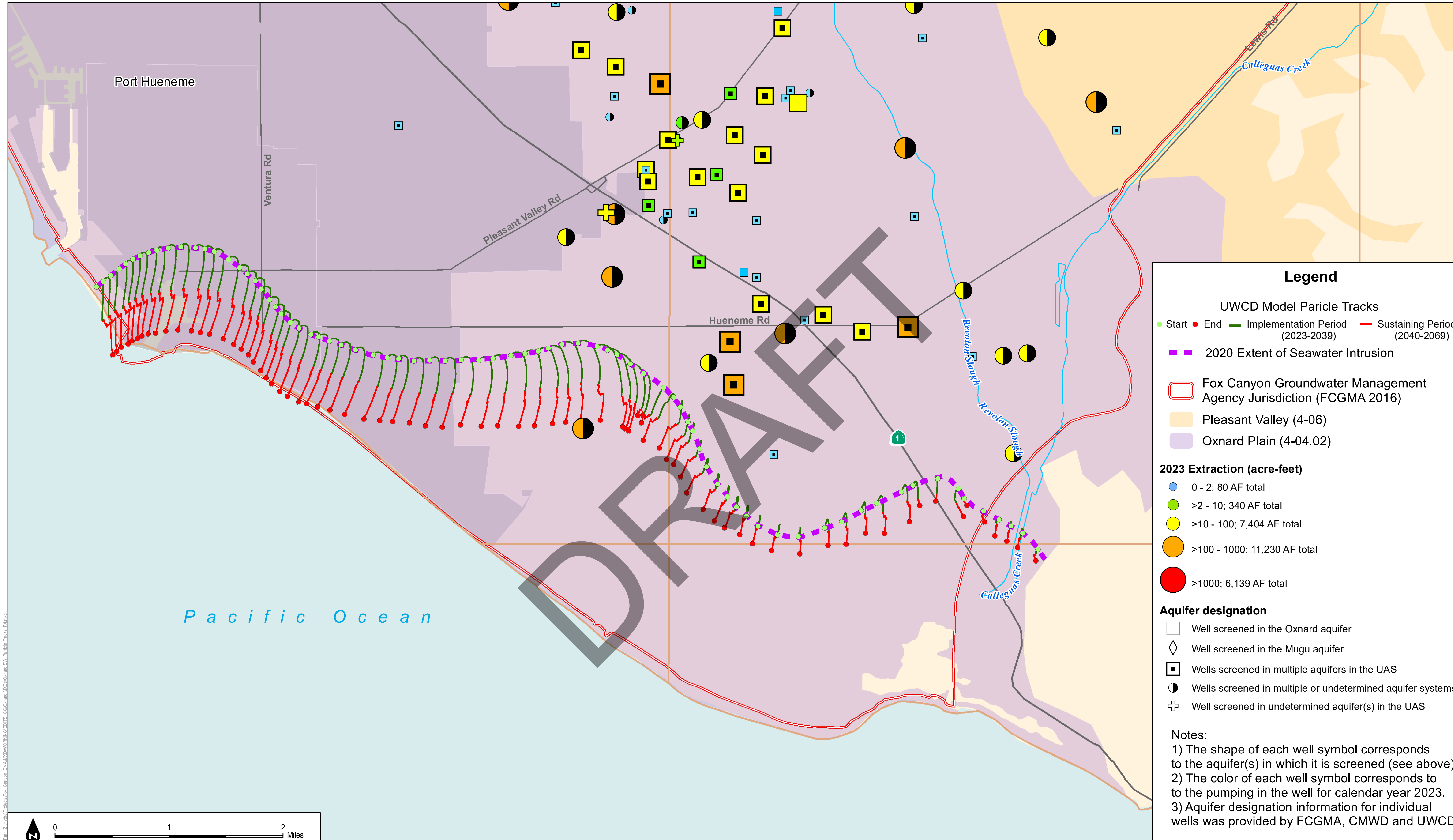

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 5-16
UWCD Model Particle Tracks, Oxnard Aquifer, Basin Optimization

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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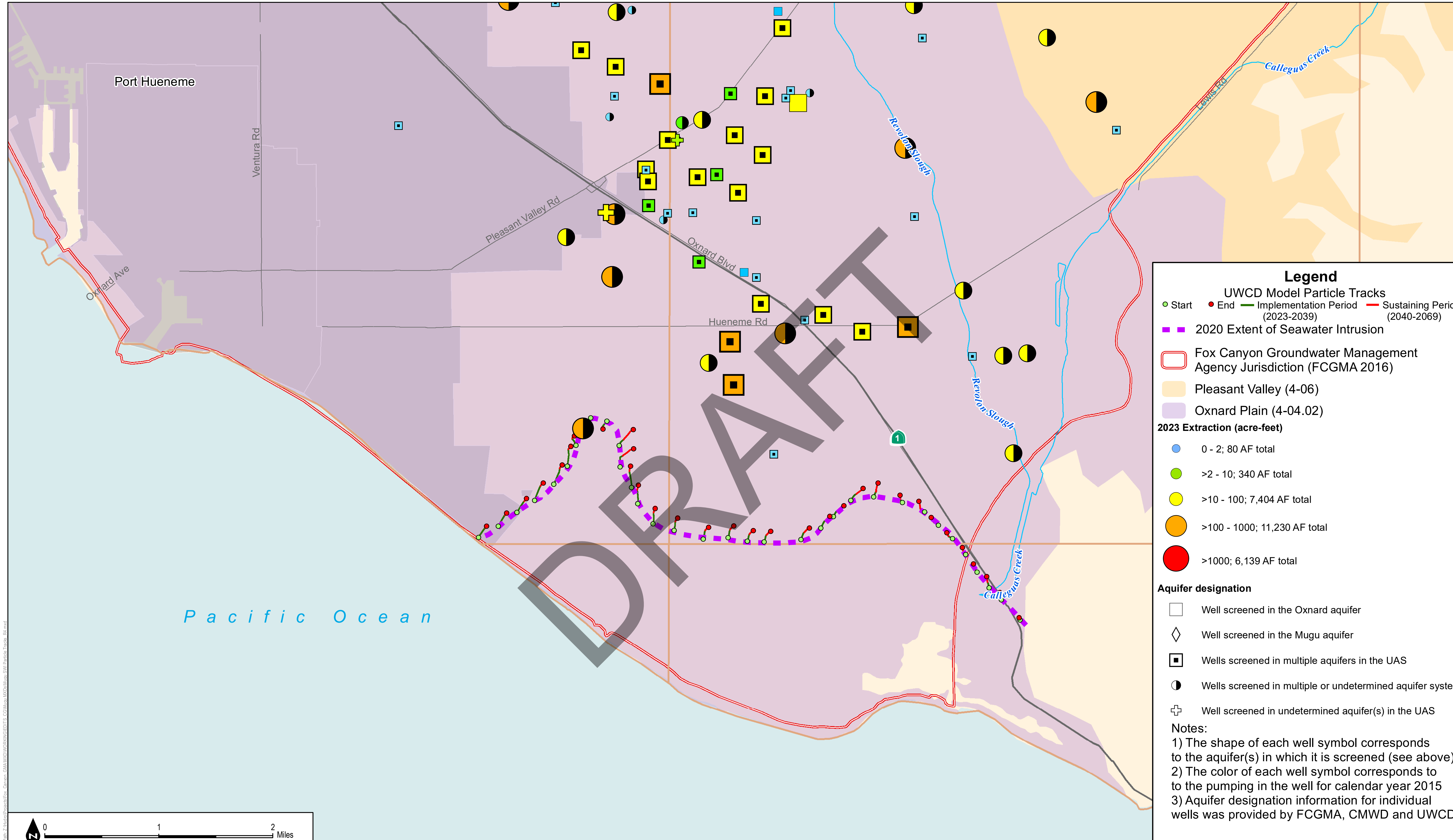

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

Figure 5-17
UWCD Model Particle Tracks, Mugu Aquifer, Basin Optimization

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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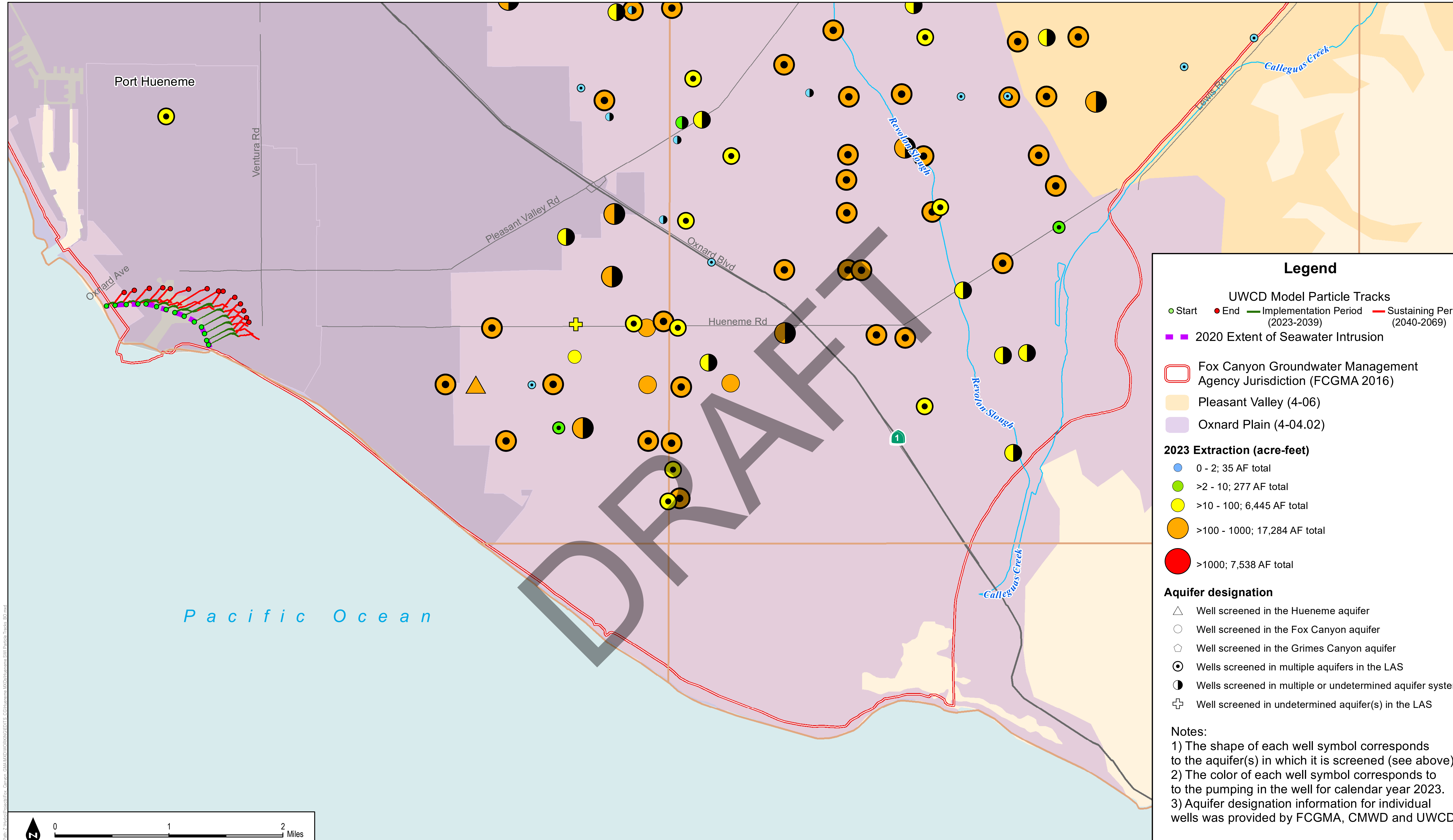

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 5-18
UWCD Particle Tracks, Hueneme Aquifer, Basin Optimization

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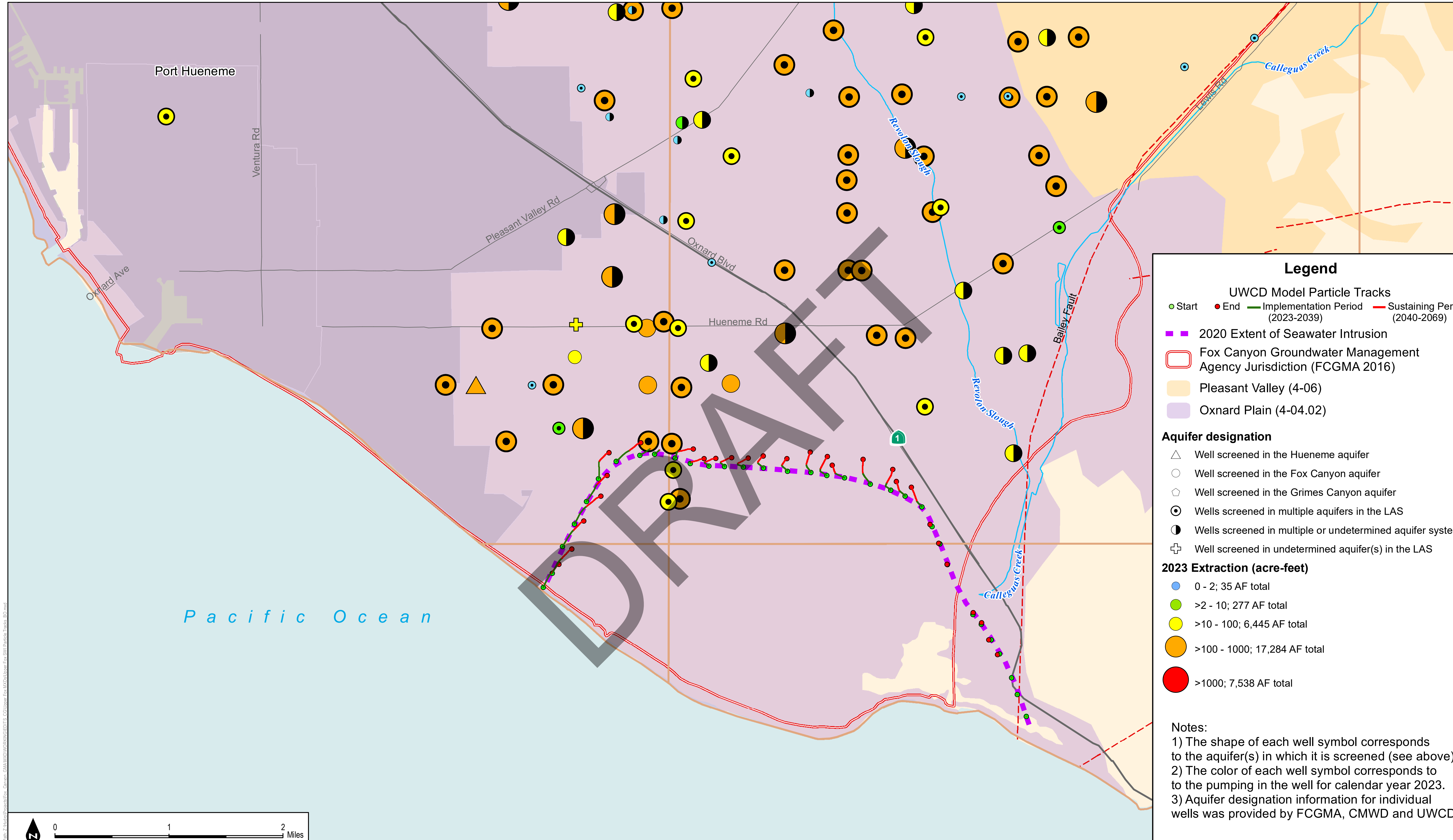

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-19
UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Basin Optimization

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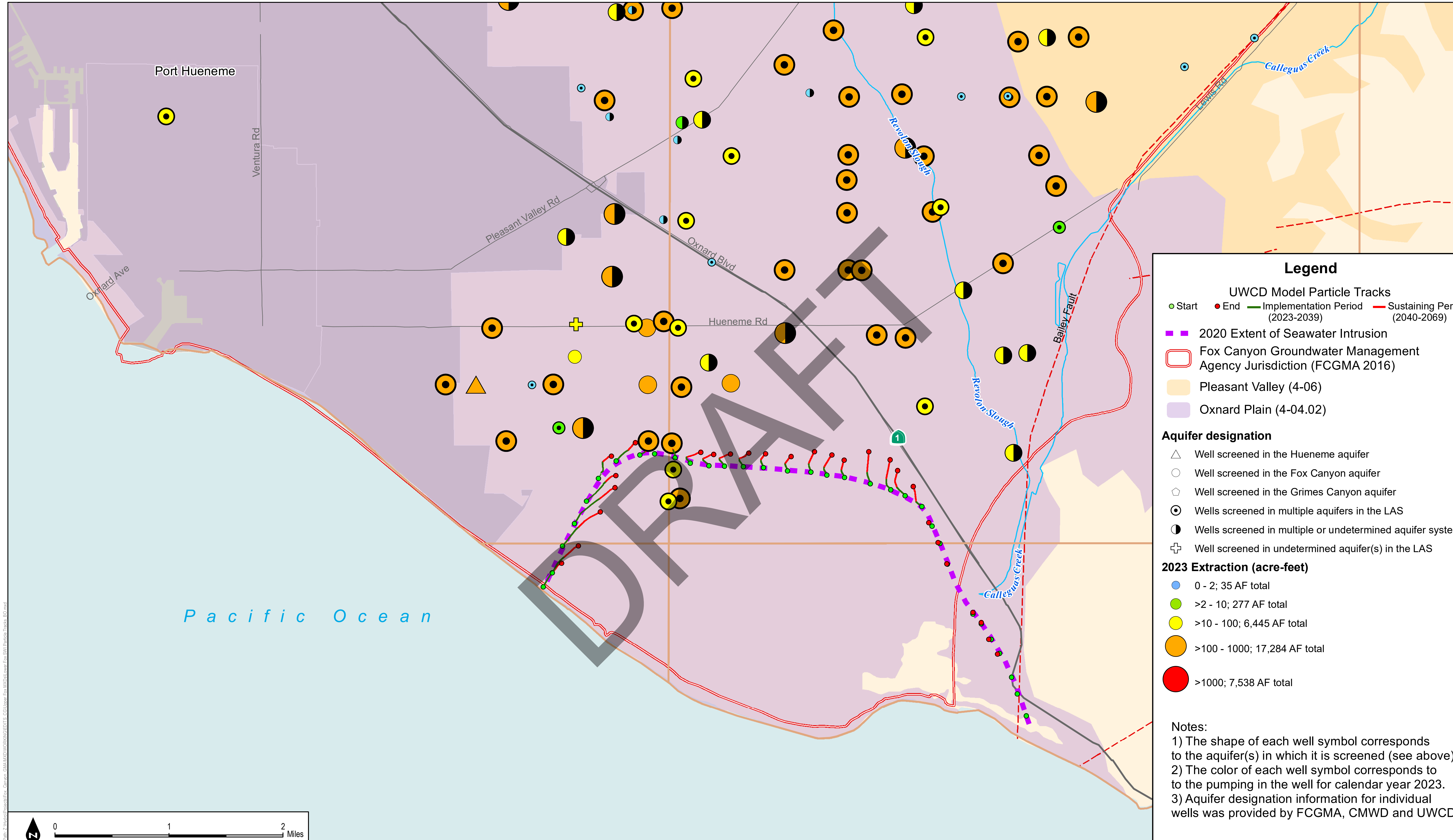

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-20
UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Basin Optimization

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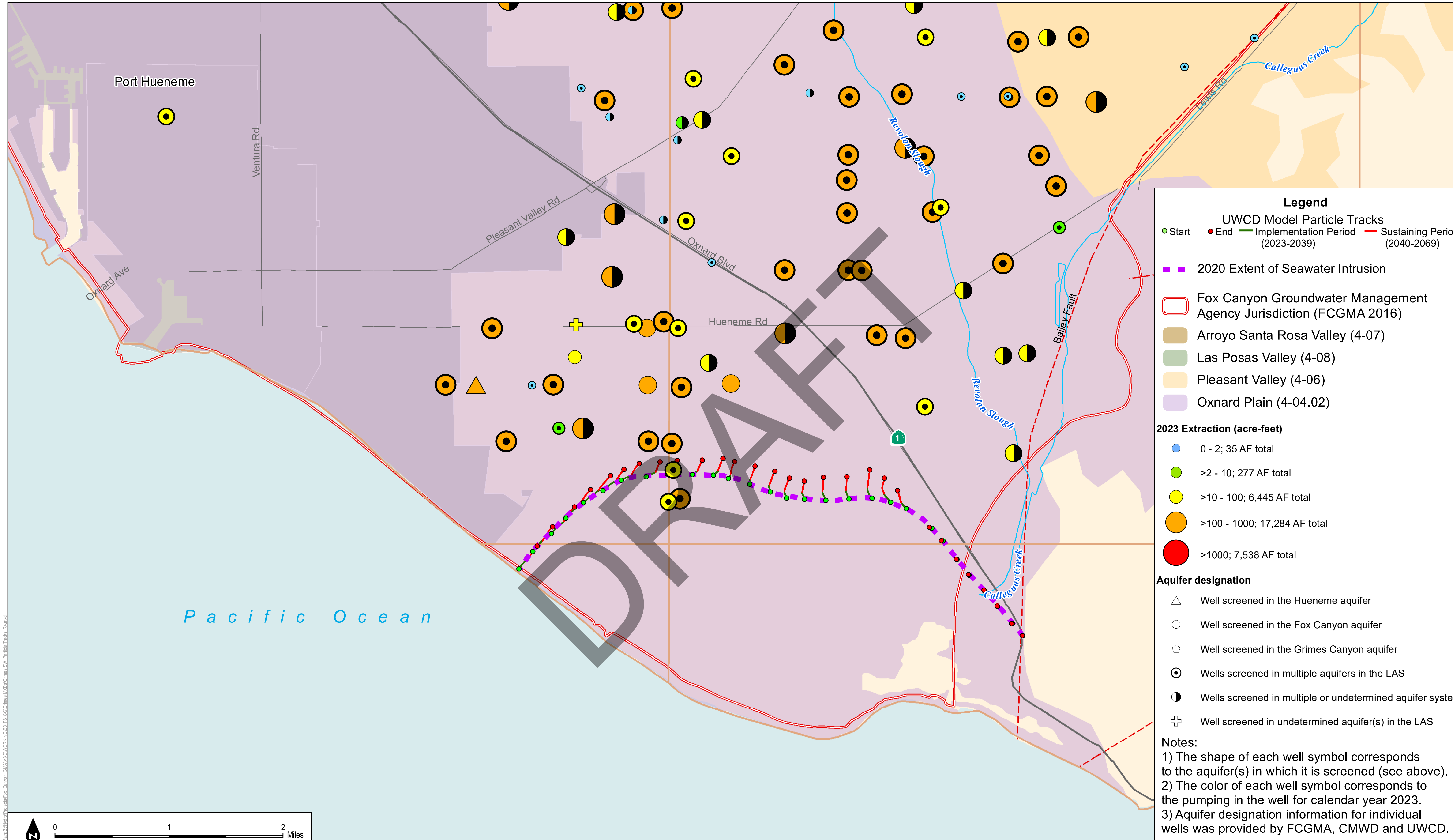

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-21
UWCD Model Particle Tracks, Grimes Canyon Aquifer, Basin Optimization

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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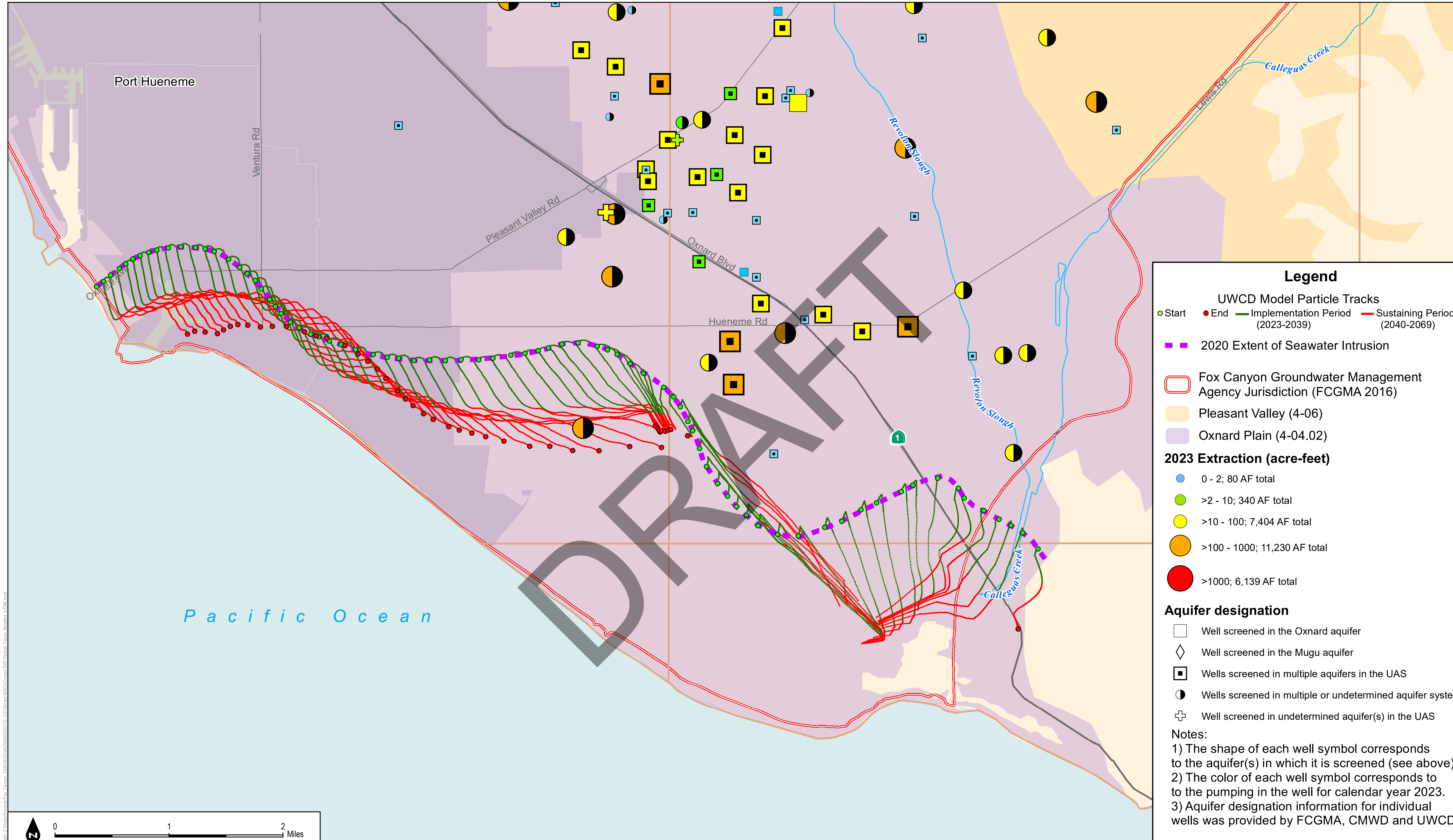

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 5-22
UWCD Model Particle Tracks, Oxnard Aquifer, Future Baseline with EBB

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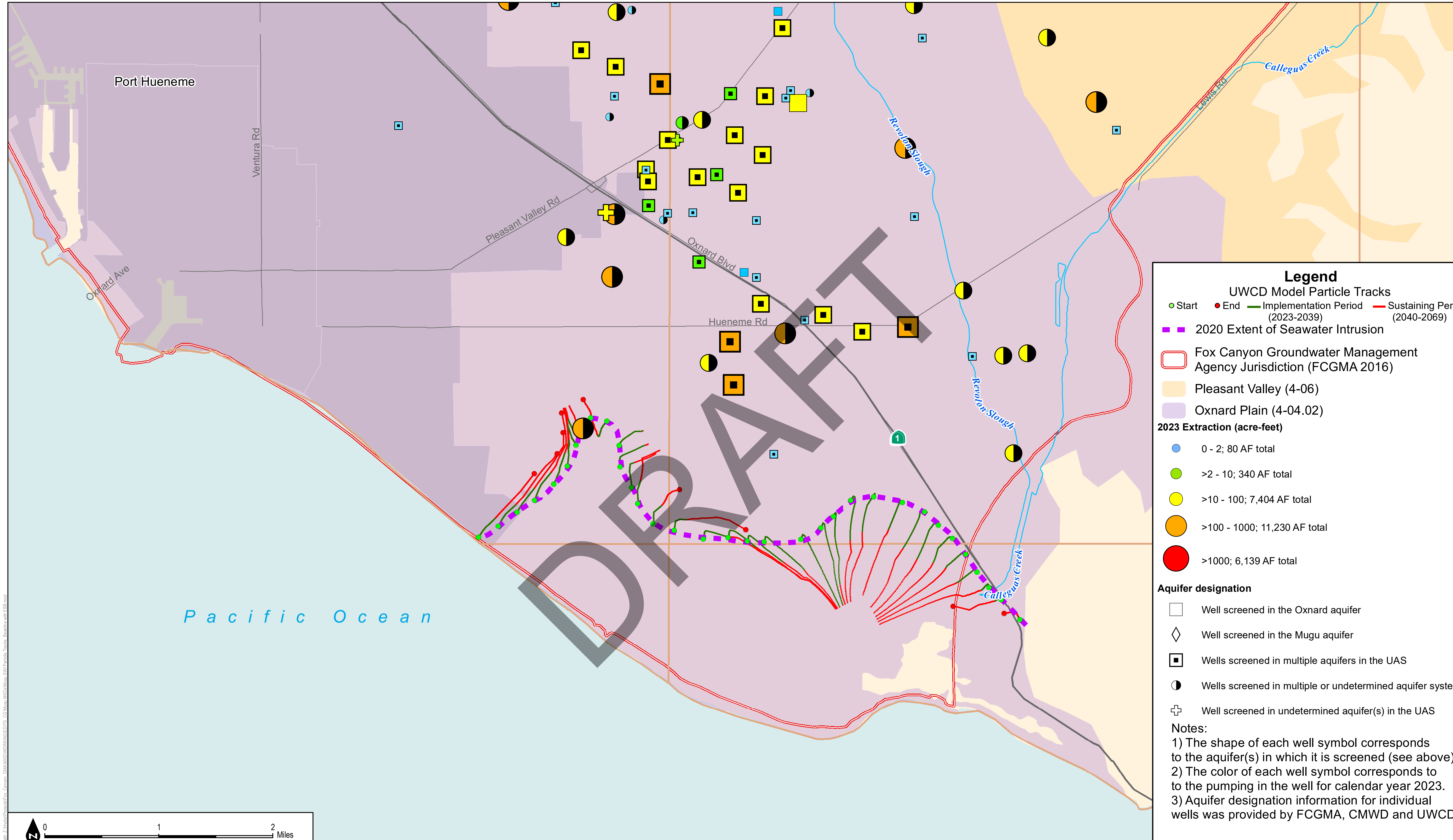

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 2-23
UWCD Model Particle Tracks, Mugu Aquifer, Future Baseline with EBB

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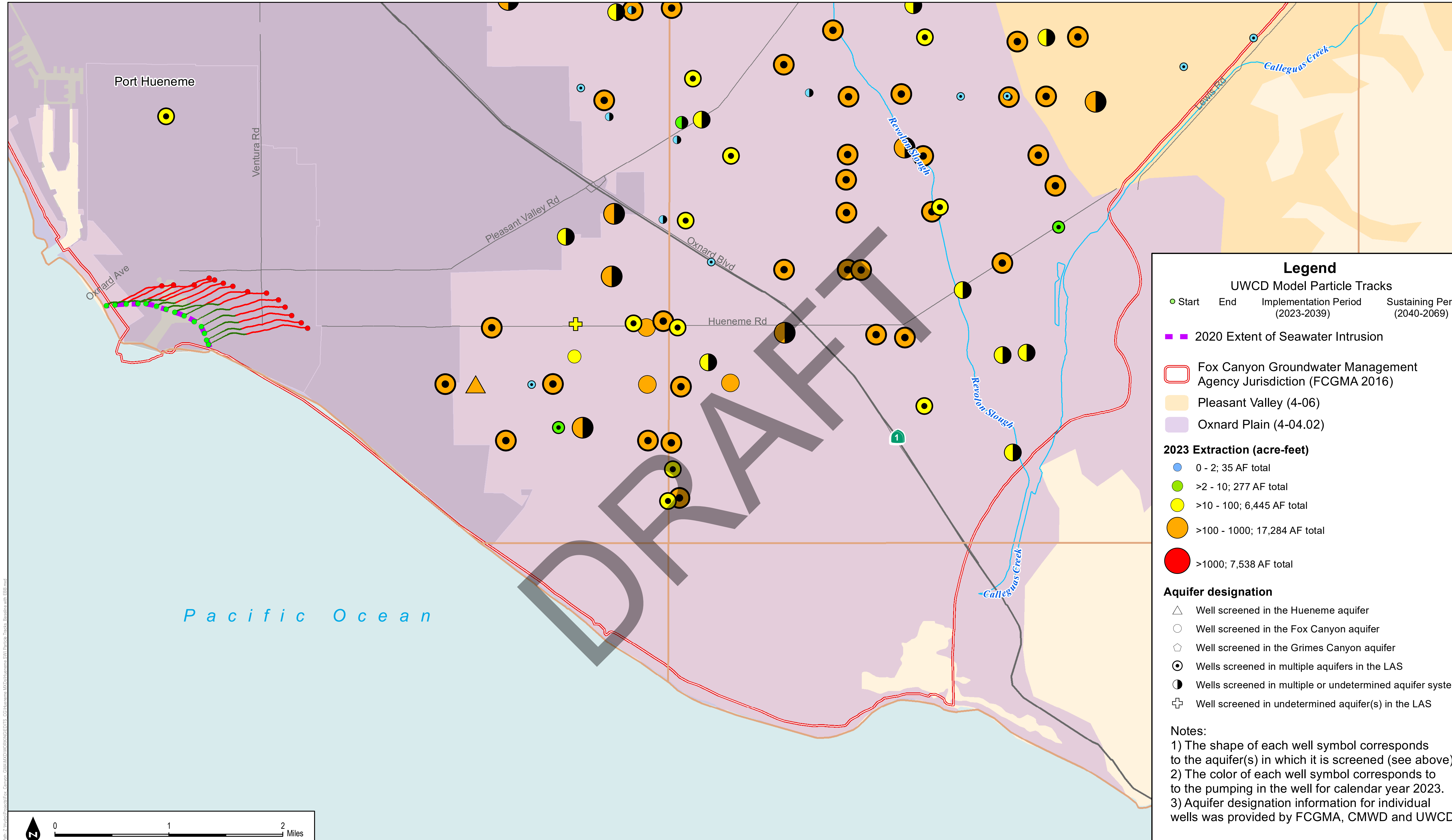

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

Figure 5-24
UWCD Model Particle Tracks, Hueneme Aquifer, Future Baseline with EBB

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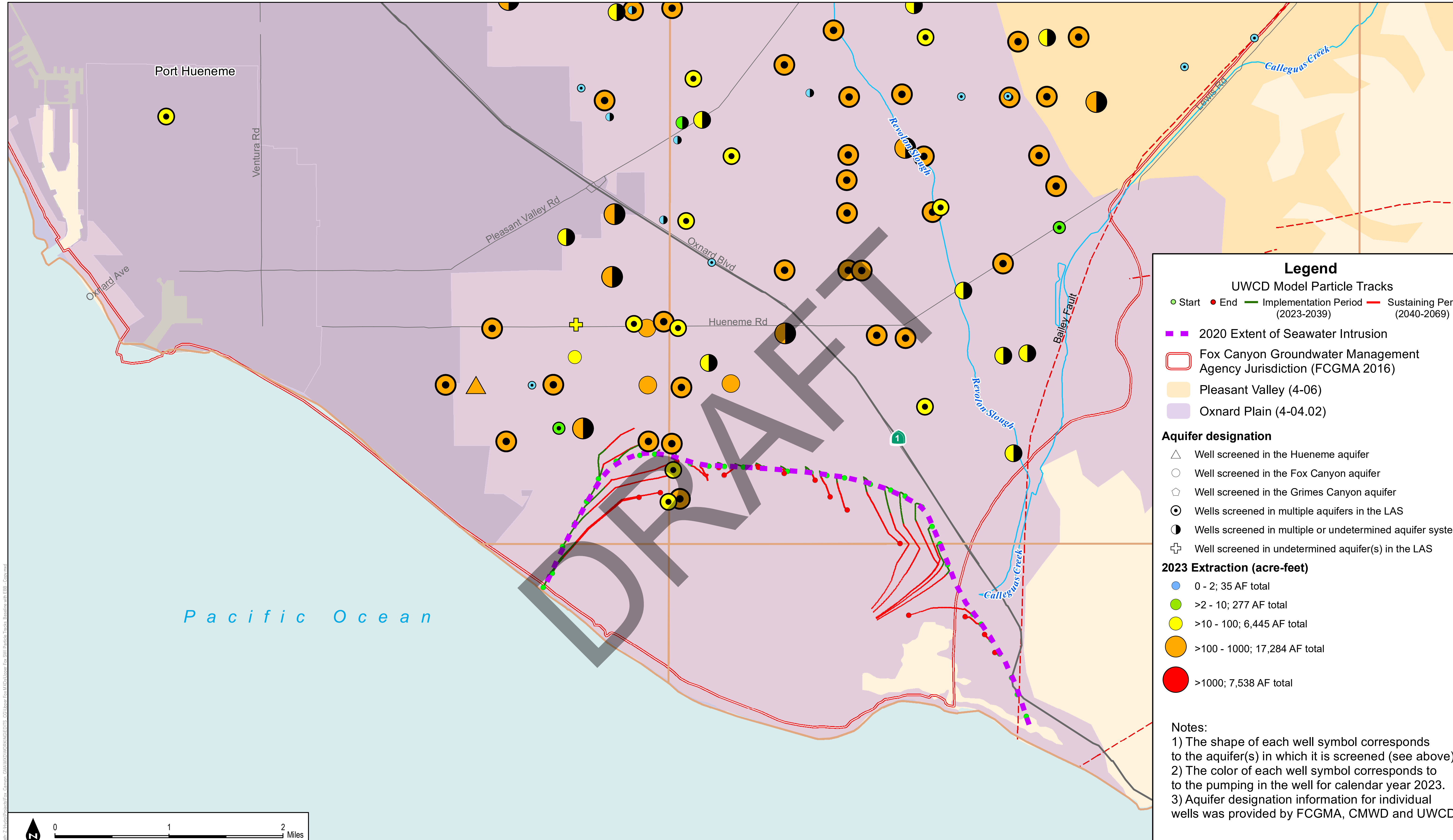

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-25
UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Future Baseline

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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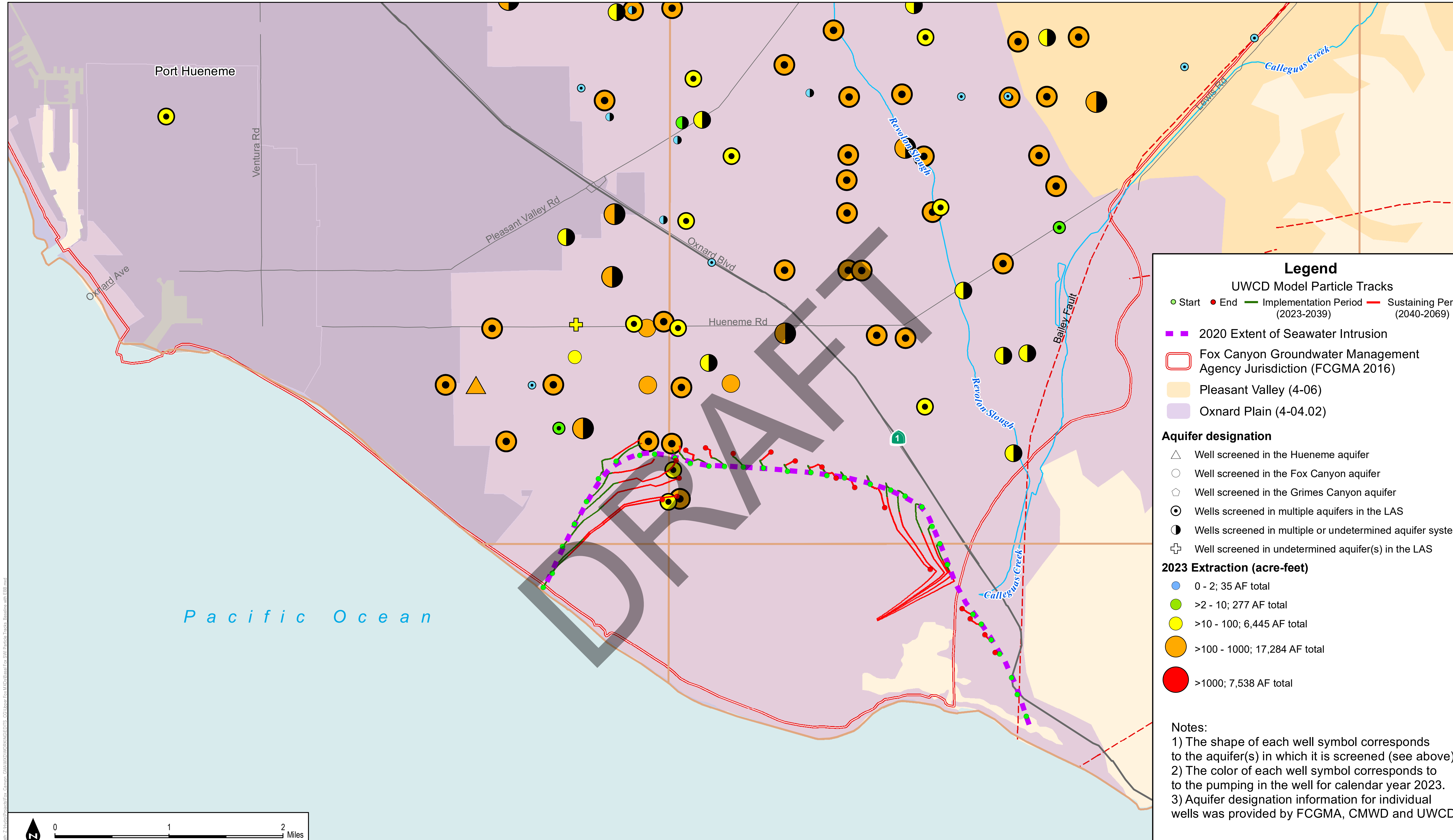

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-26
UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Future Baseline

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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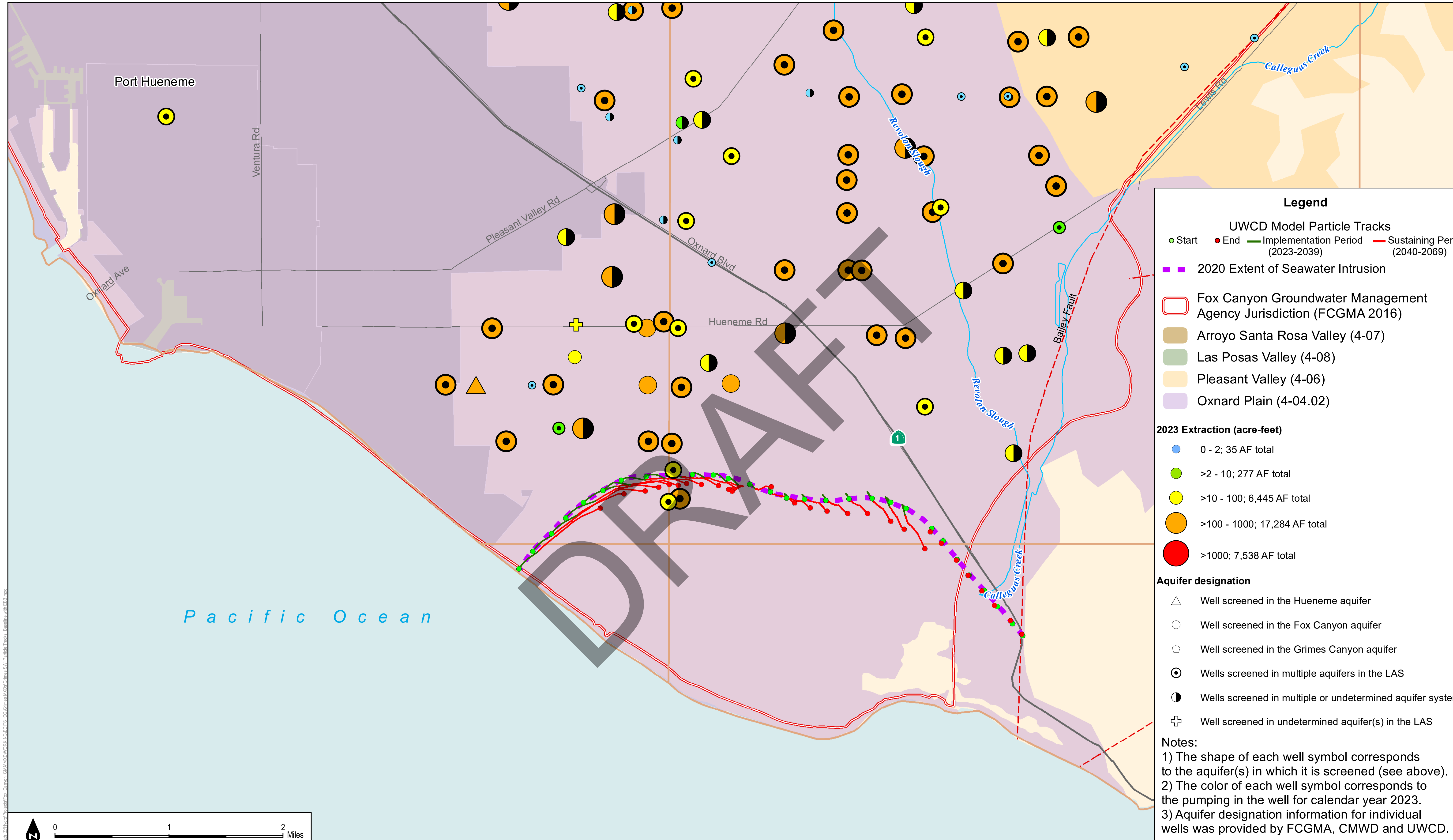

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-27
Baseline with EBB Scenario, Grimes Canyon Aquifer

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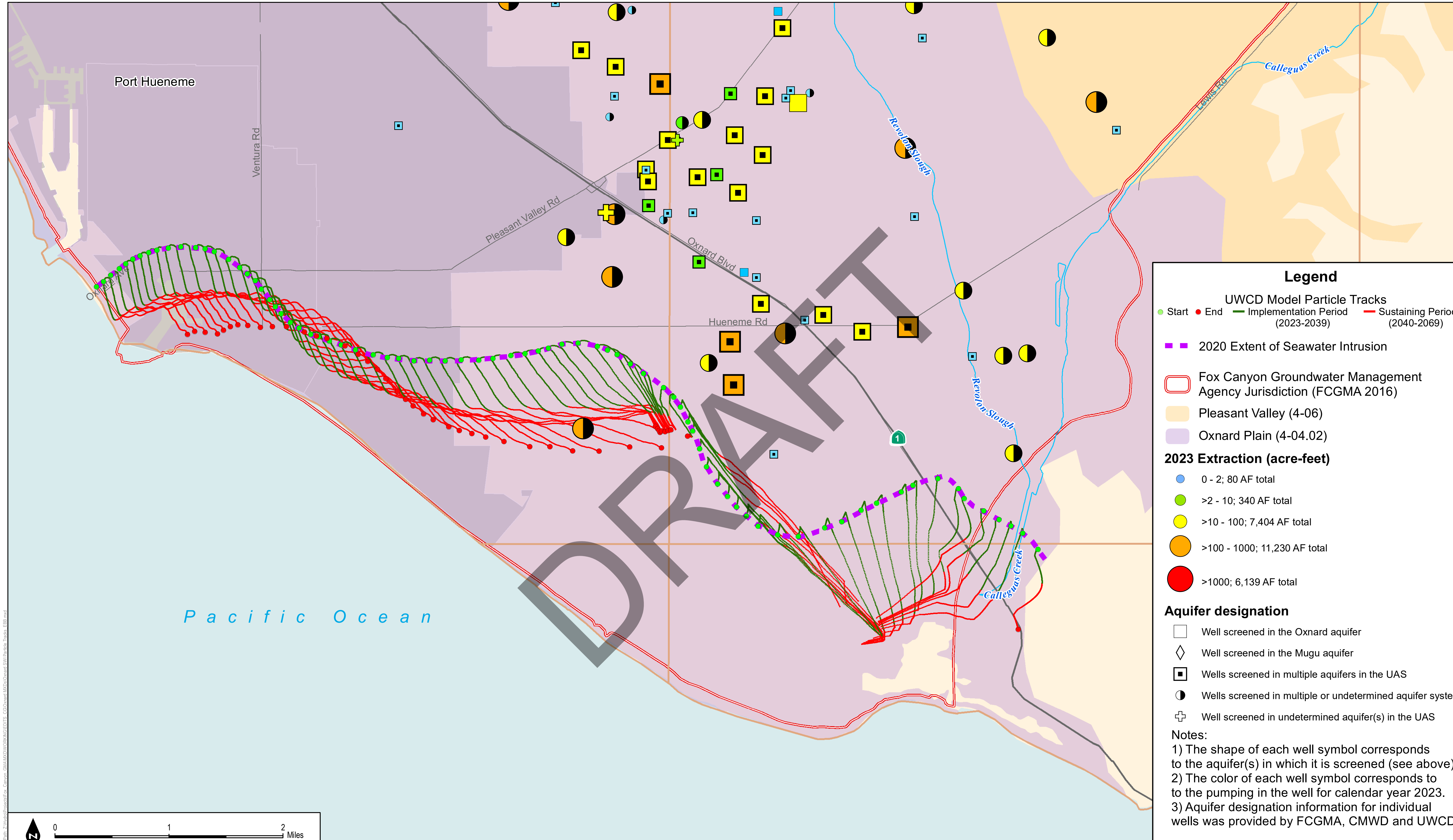

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-28
UWCD Model Particle Tracks, Oxnard Aquifer, Projects with EBB

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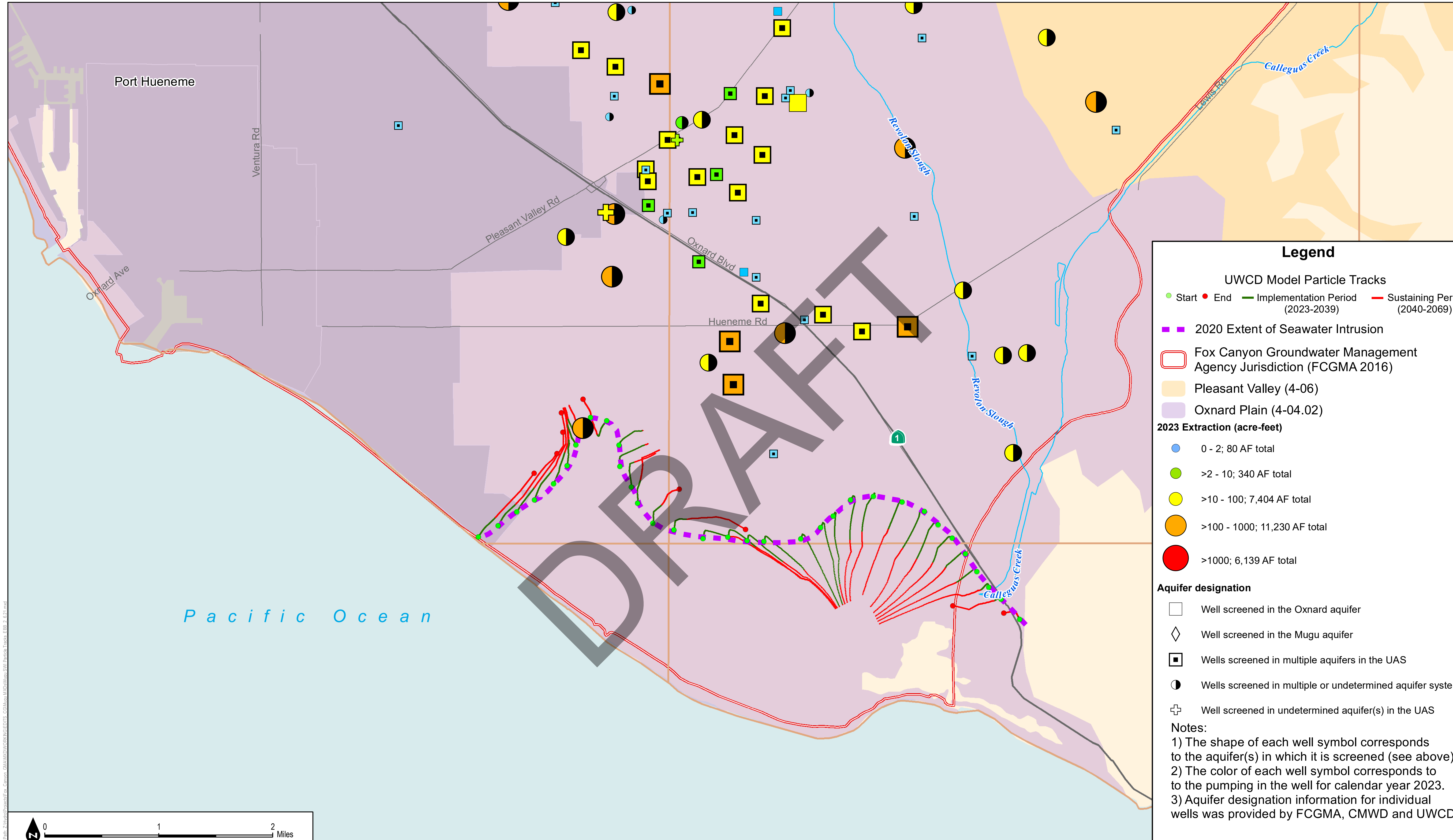

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

Figure 5-29
UWCD Model Particle Tracks, Mugu Aquifer, Projects with EBB

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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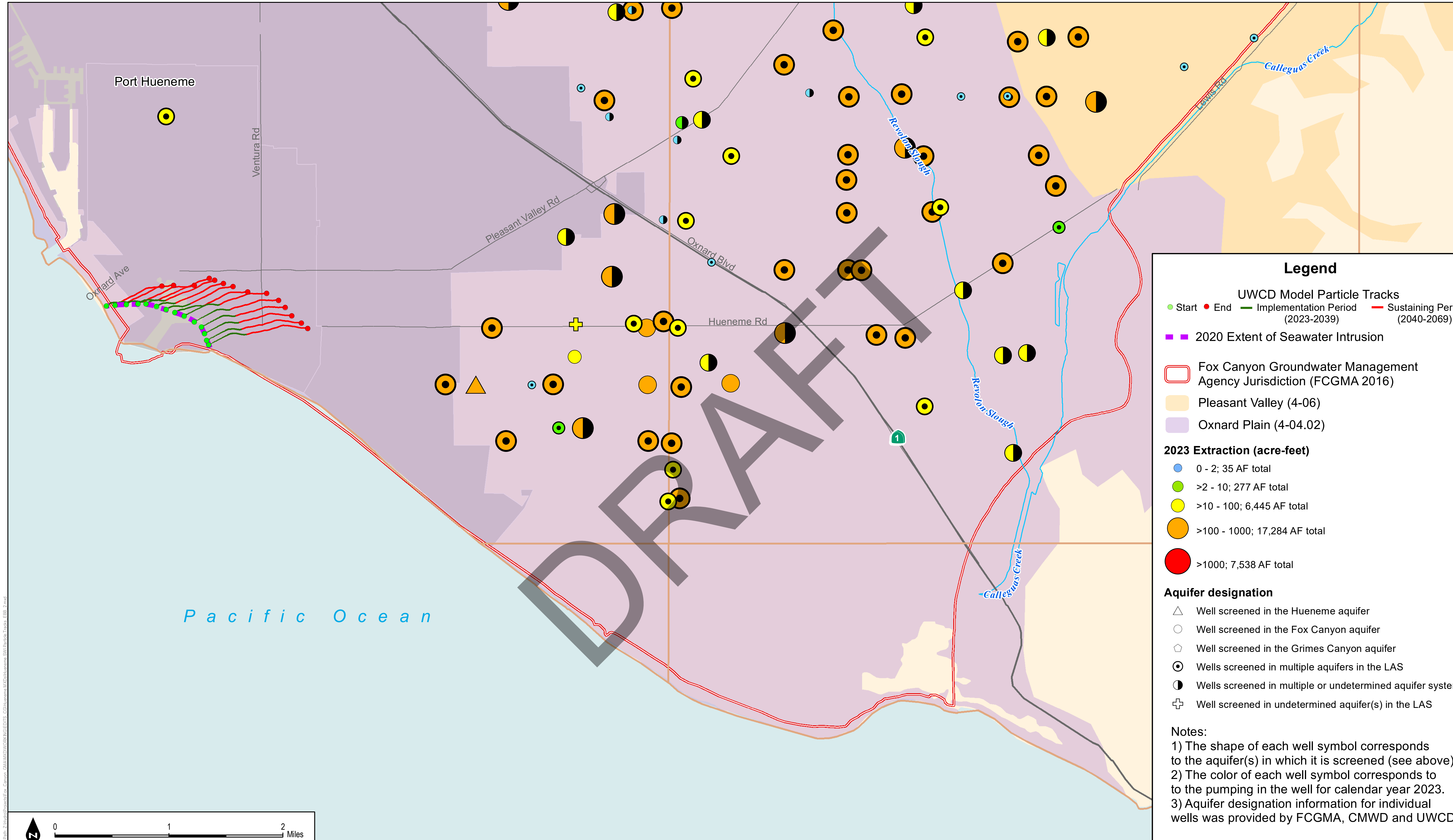

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

Figure 5-30
UWCD Model Particle Tracks, Hueneme Aquifer, Projects with EBB

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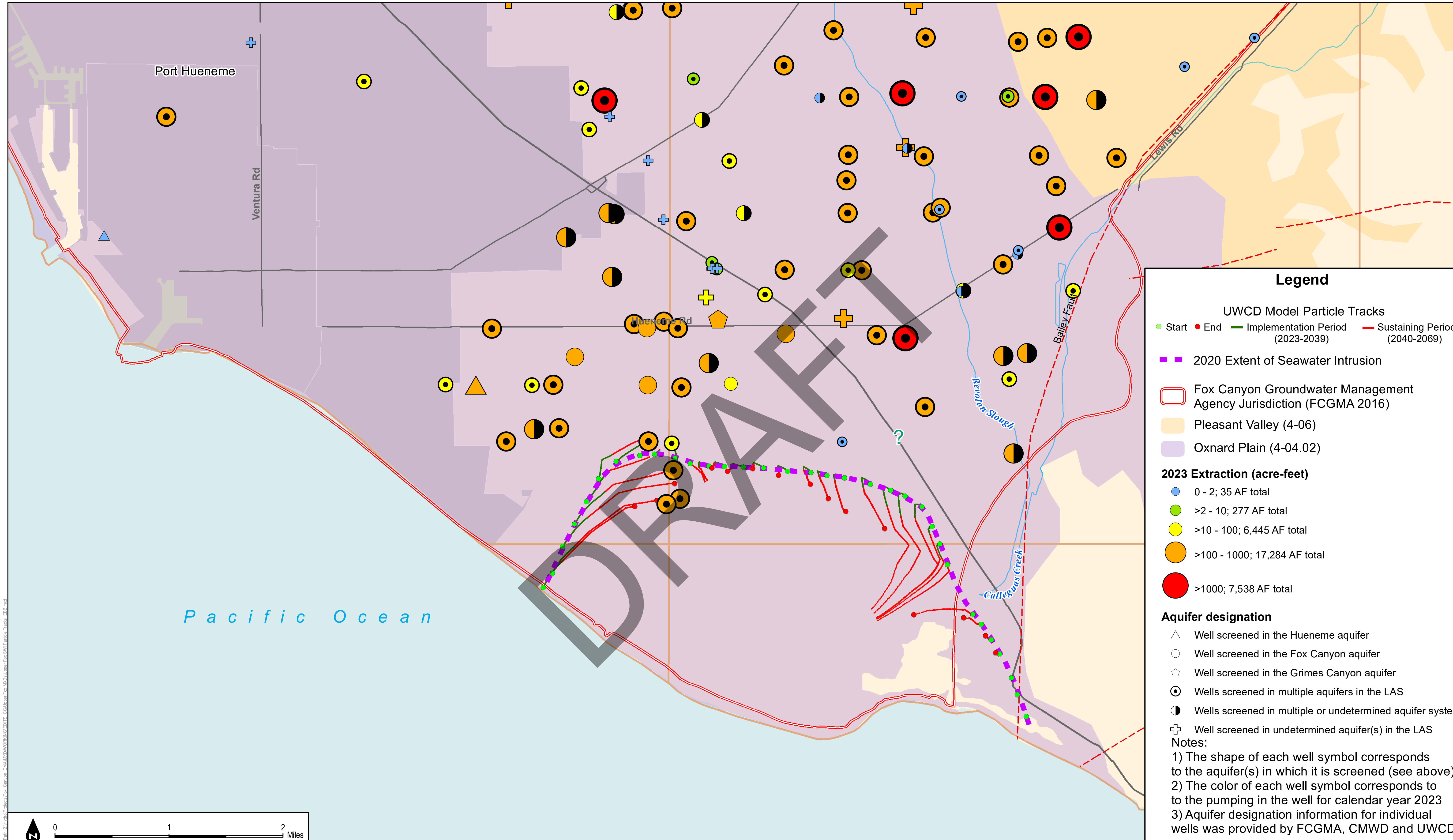

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-31
UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Projects with EBB

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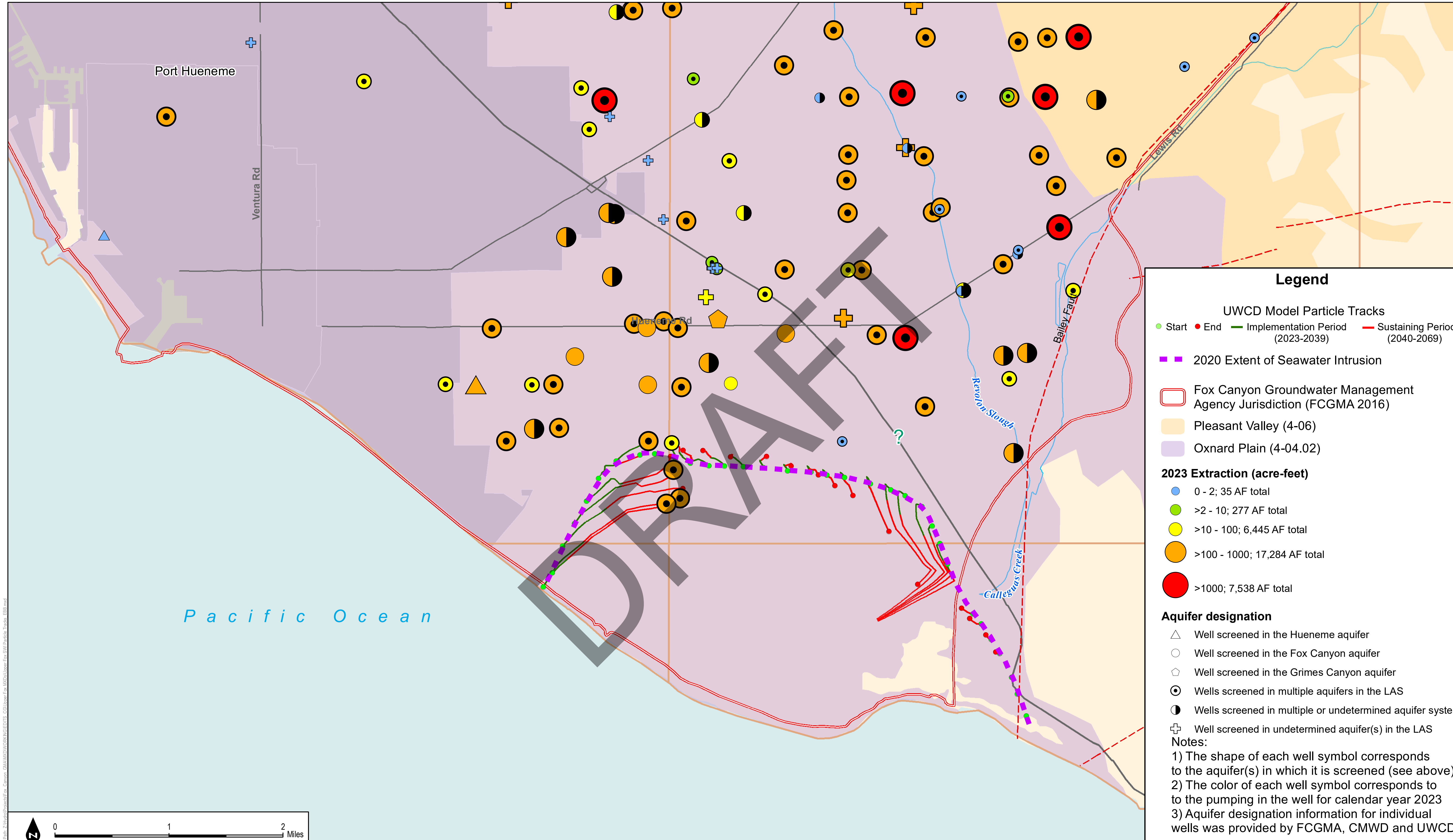

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-32
UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Projects with EBB

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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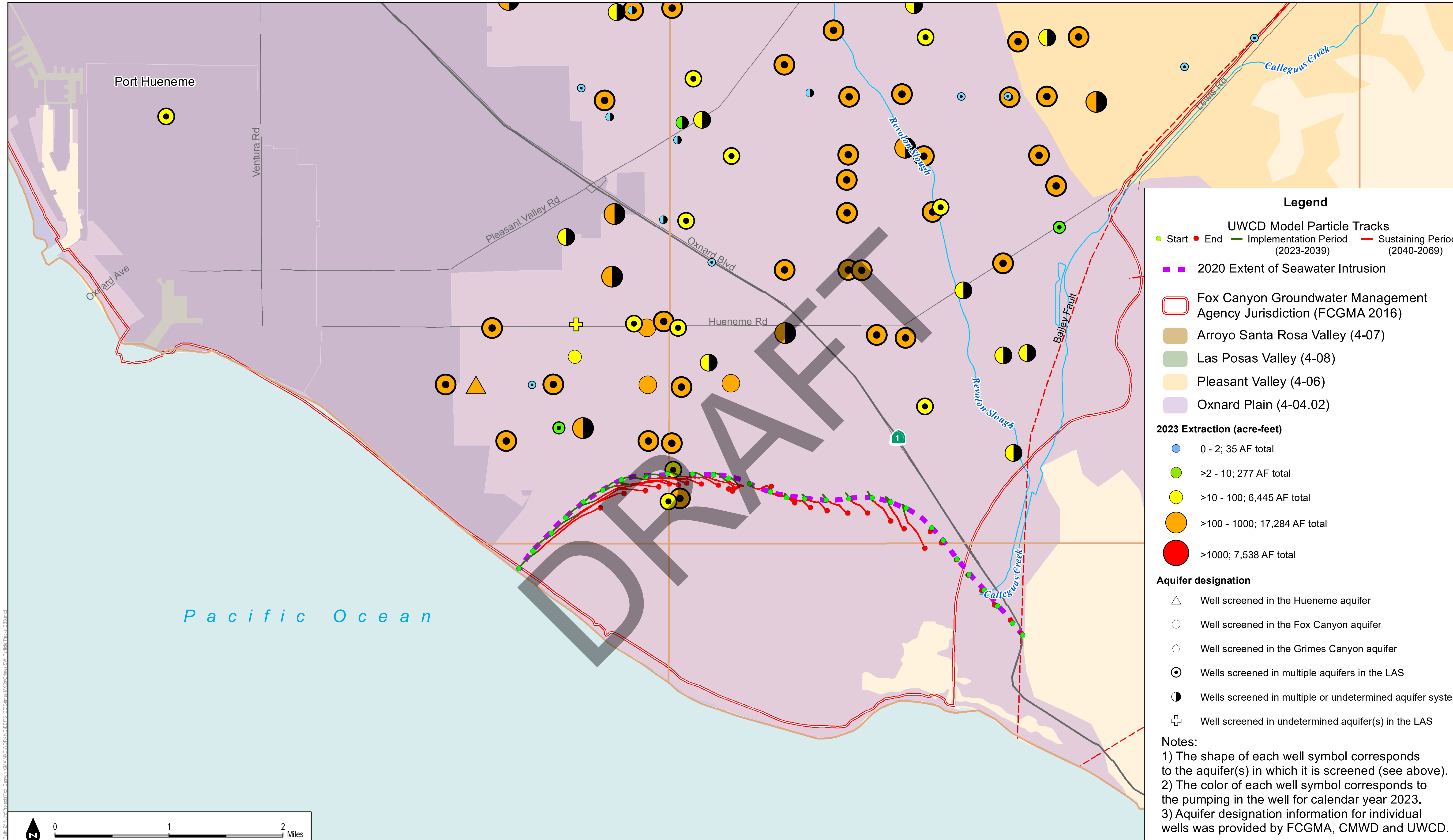

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

Figure 5-33
UWCD Model Particle Tracks, Grimes Canyon Aquifer, Projects with EBB

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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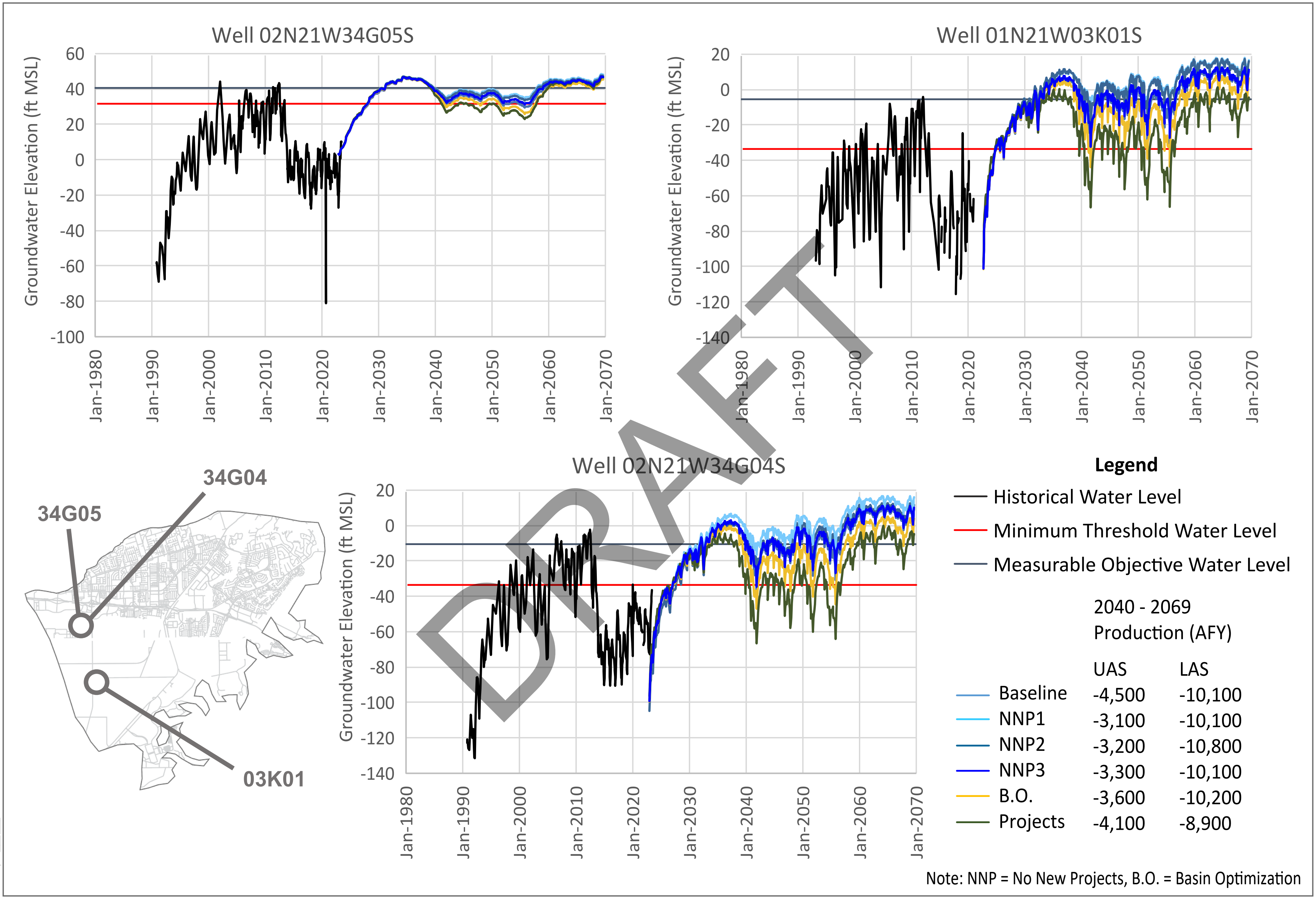

SOURCE: UWCD, VCWPD

FIGURE 6-1

Groundwater Elevation Hydrographs for Representative Monitoring Points in Older Alluvium

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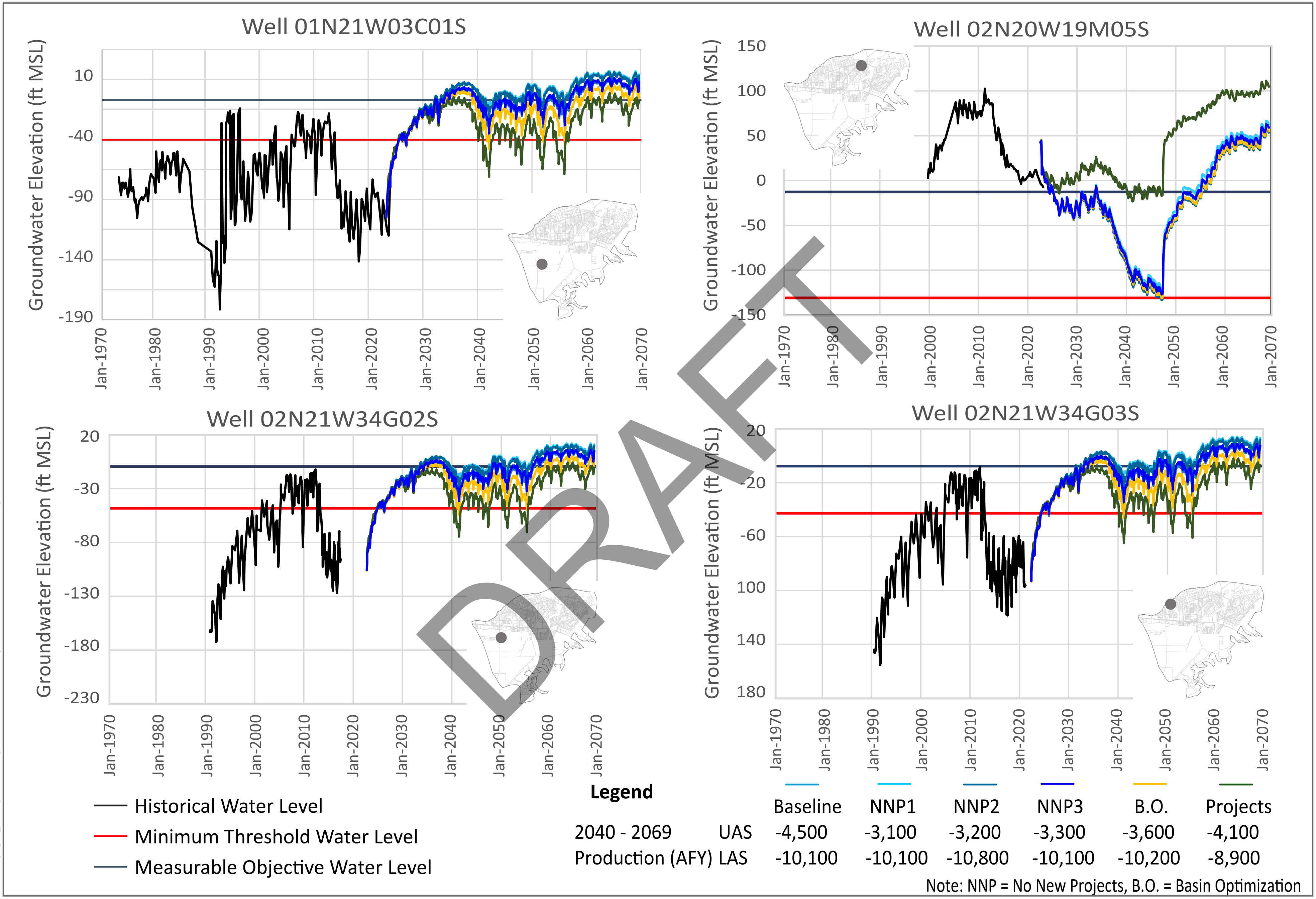

SOURCE: UWCD, VCWPD

FIGURE 6-2

Groundwater Elevation Hydrographs for Representative Monitoring Points in the Fox Canyon Aquifer

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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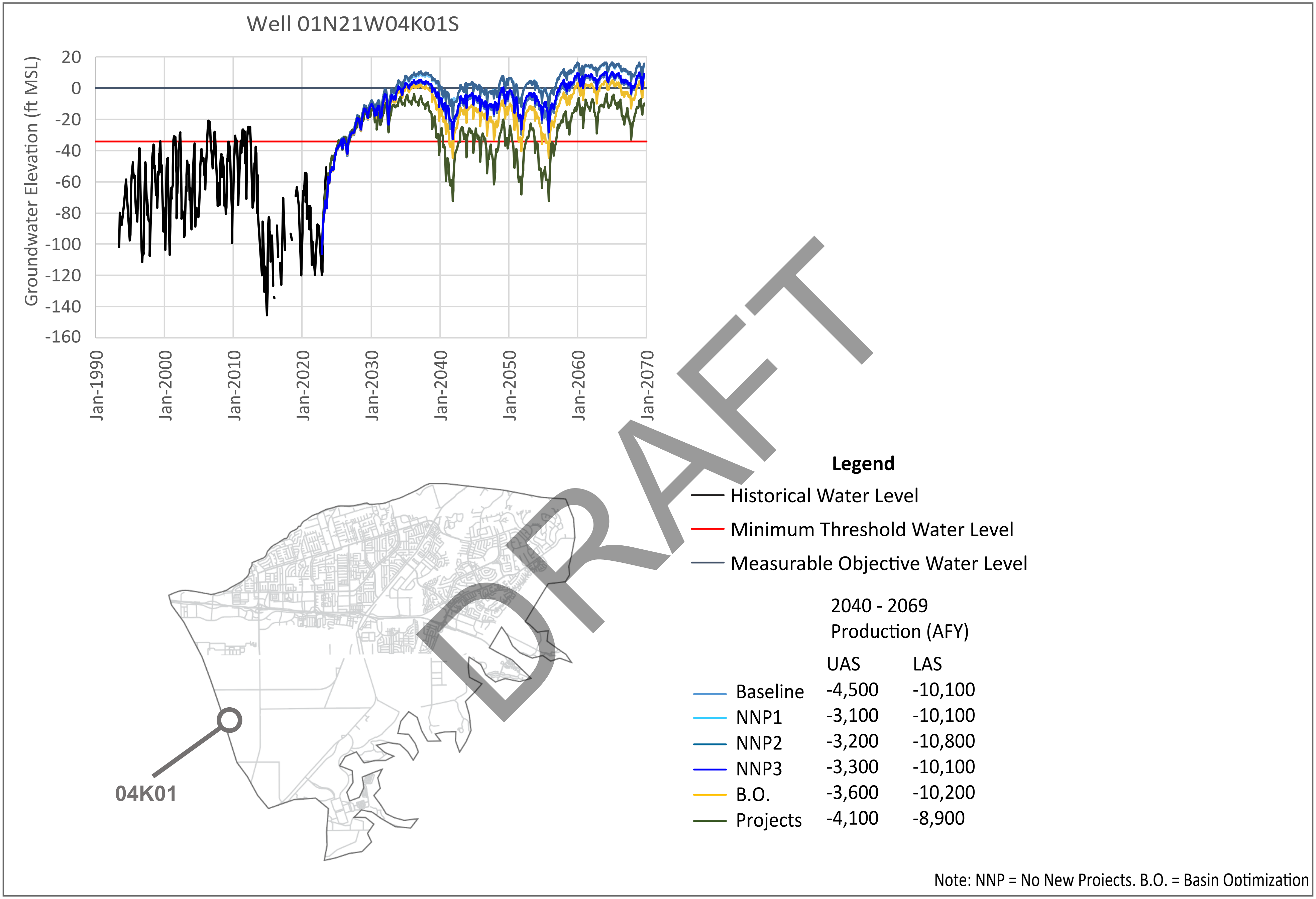

SOURCE: UWCD, VCWPD

FIGURE 6-3

Groundwater Elevation Hydrographs for Representative Monitoring Points in Multiple Aquifers

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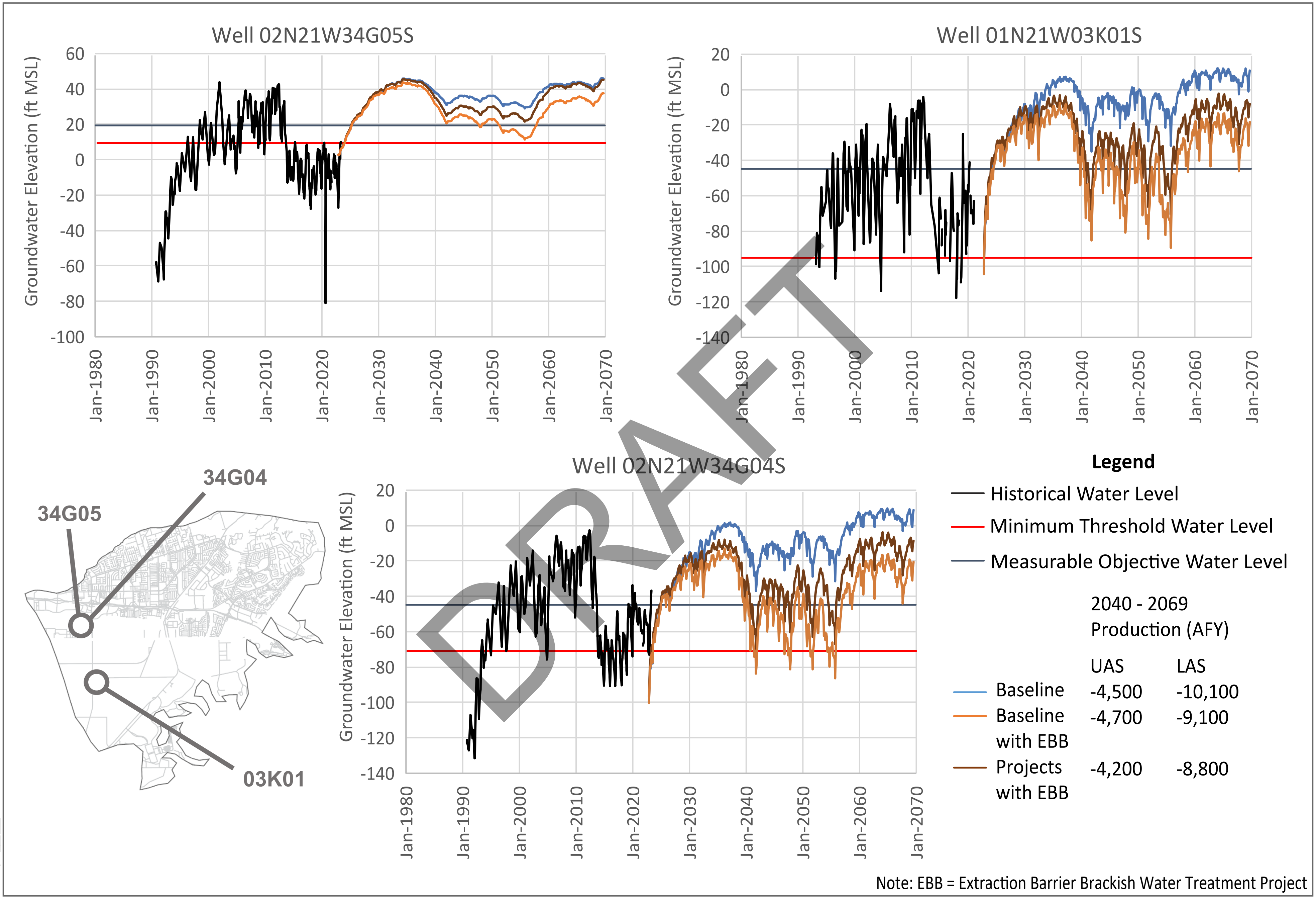

SOURCE: UWCD, VCWPD

FIGURE 6-4

Groundwater Elevation Hydrographs for Representative Monitoring Points in Older Alluvium: EBB Scenarios

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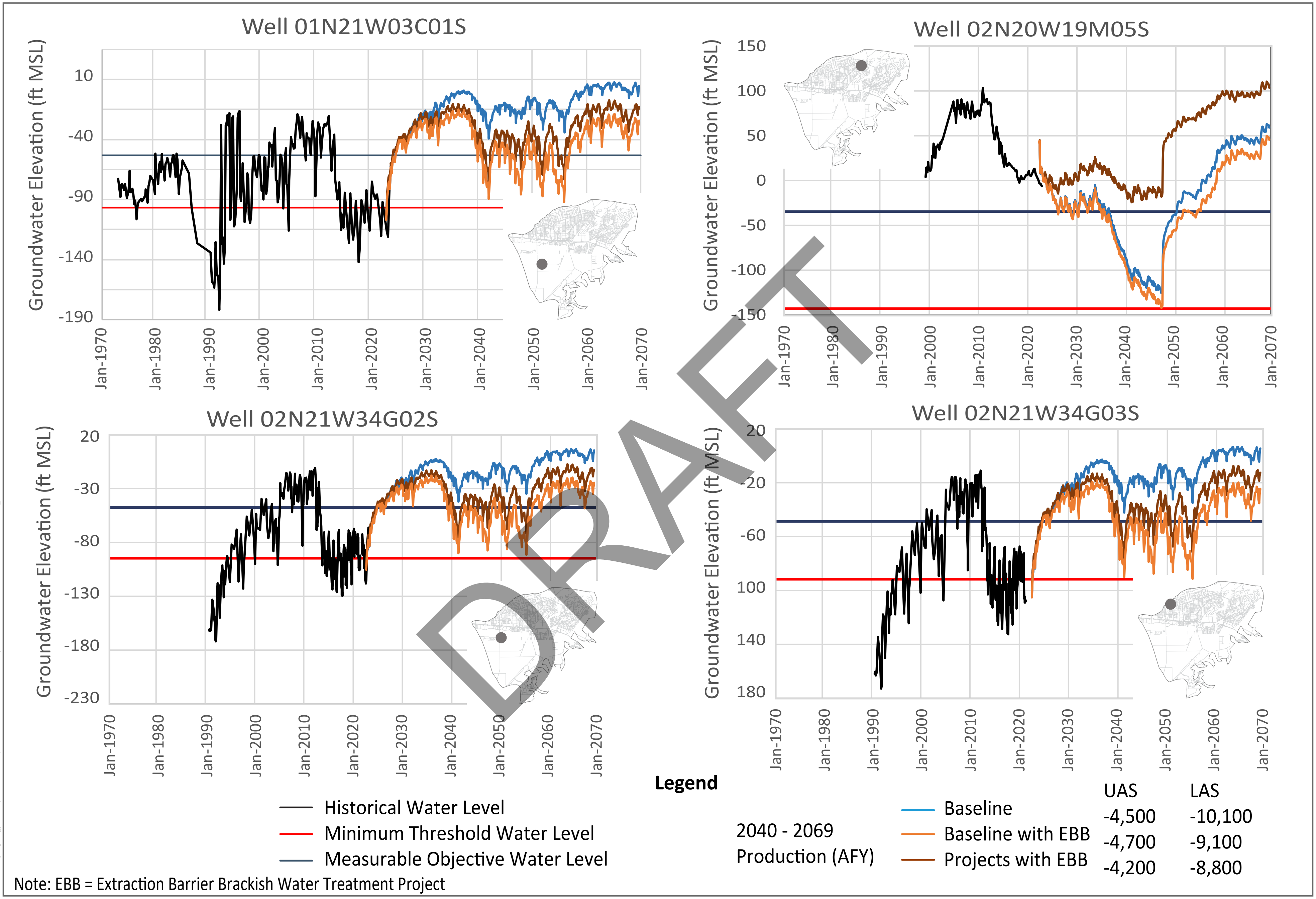

SOURCE: UWCD, VCWPD

FIGURE 6-5

Groundwater Elevation Hydrographs for Representative Monitoring Points in the Fox Canyon Aquifer: EBB Scenarios

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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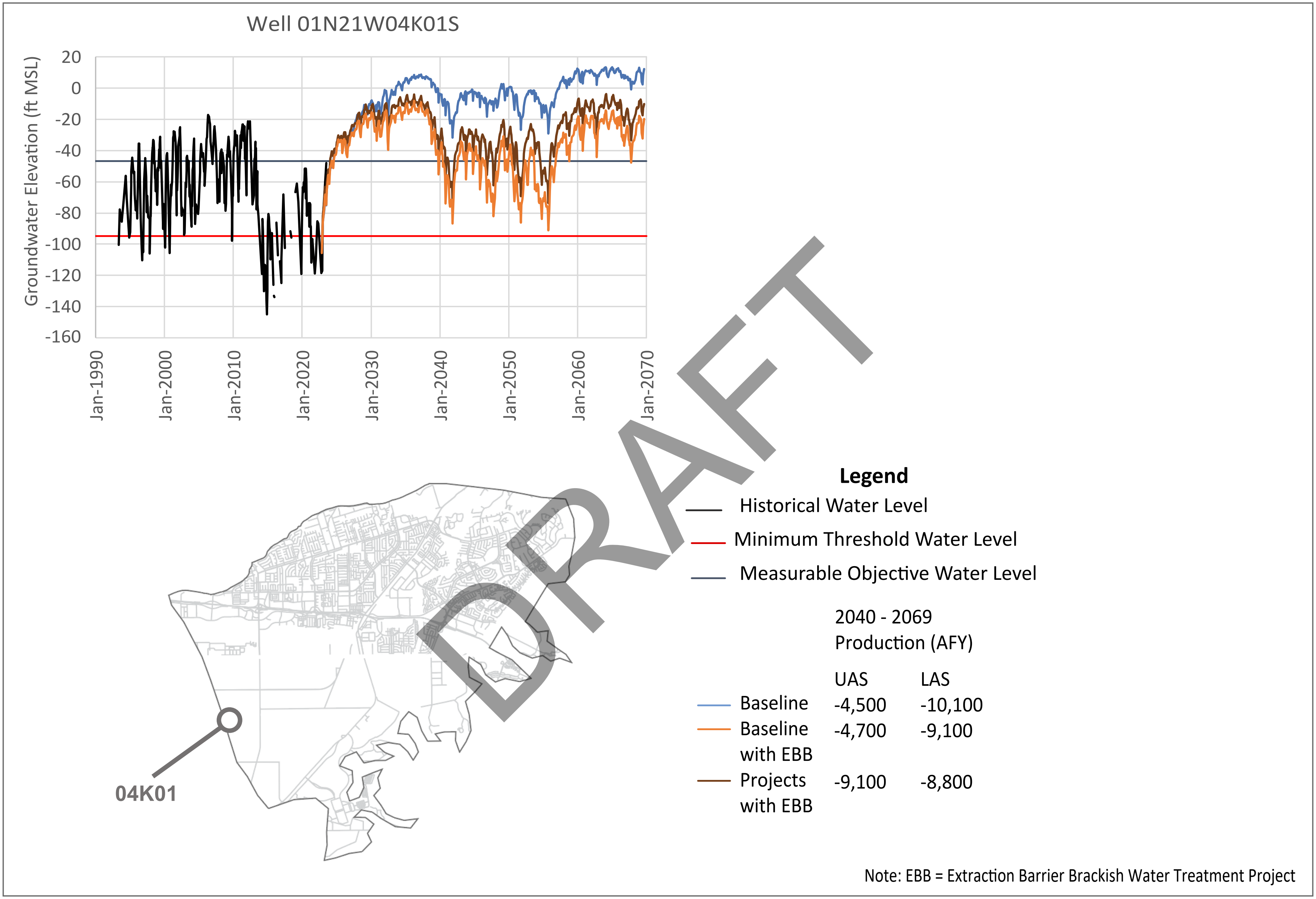

SOURCE: UWCD, VCWPD

FIGURE 6-6

Groundwater Elevation Hydrographs for Representative Monitoring Points in Multiple Aquifers: EBB Scenarios

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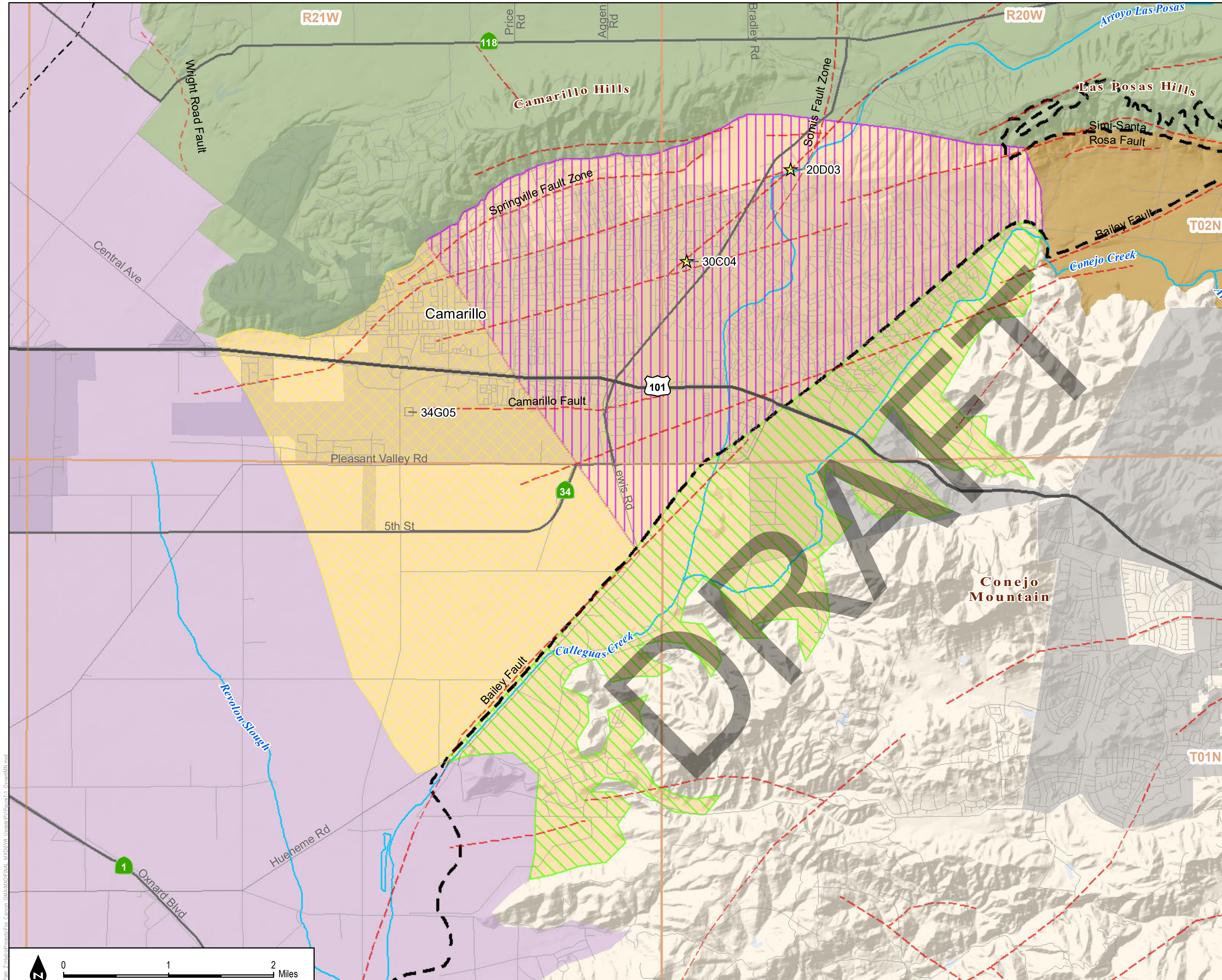

Legend

Wells Screened in the Oxnard Aquifer

- Monitored by UWCD/VCWPD/Camarillo
- Not Monitored by UWCD/VCWPD
- New Wells to Monitoring Network
- *15P01* Abbreviated State Well Number (see notes)

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults
- Township (North-South) and Range (East-West)
- Oxnard Forebay

Pleasant Valley Basin Management Areas

- East Pleasant Valley Management Area
- North Pleasant Valley Management
- Pleasant Valley Pumping Depression Management Area

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- 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 abbreviated State Well Number (SWN). 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 "29B02" located in Township 02N (T02N) and Range 20W (R20W) is 02N20W29B02S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

DUDEK

FIGURE 7-1
Monitoring Network Wells Screened in the Oxnard Aquifer

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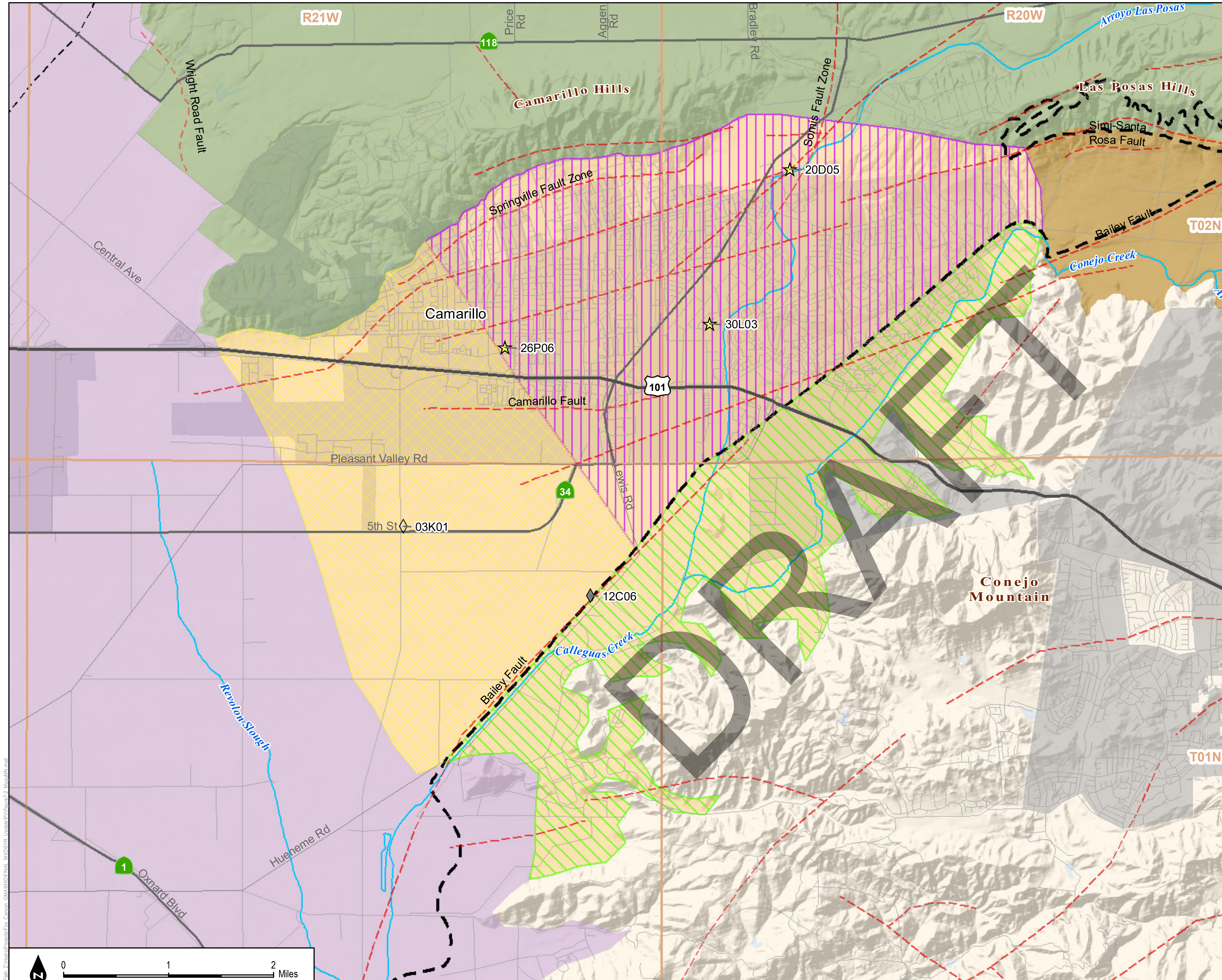

Legend

Wells Screened in the Mugu Aquifer

- ◊ Monitored by UWCD/VCWPD/Camarillo
- ♦ Not Monitored by UWCD/VCWPD
- ☆ New Wells to Monitoring Network
- *15P01* Abbreviated State Well Number (see notes)

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults
- Township (North-South) and Range (East-West)
- Oxnard Forebay

Pleasant Valley Basin Management Areas

- East Pleasant Valley Management Area (EPVMA)
- North Pleasant Valley Management Area
- Pleasant Valley Pumping Depression Management Area

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- 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 abbreviated State Well Number (SWN). 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 "29B02" located in Township 02N (T02N) and Range 20W (R20W) is 02N20W29B02S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 7-2

Monitoring Network Wells Screened in the Mugu Aquifer

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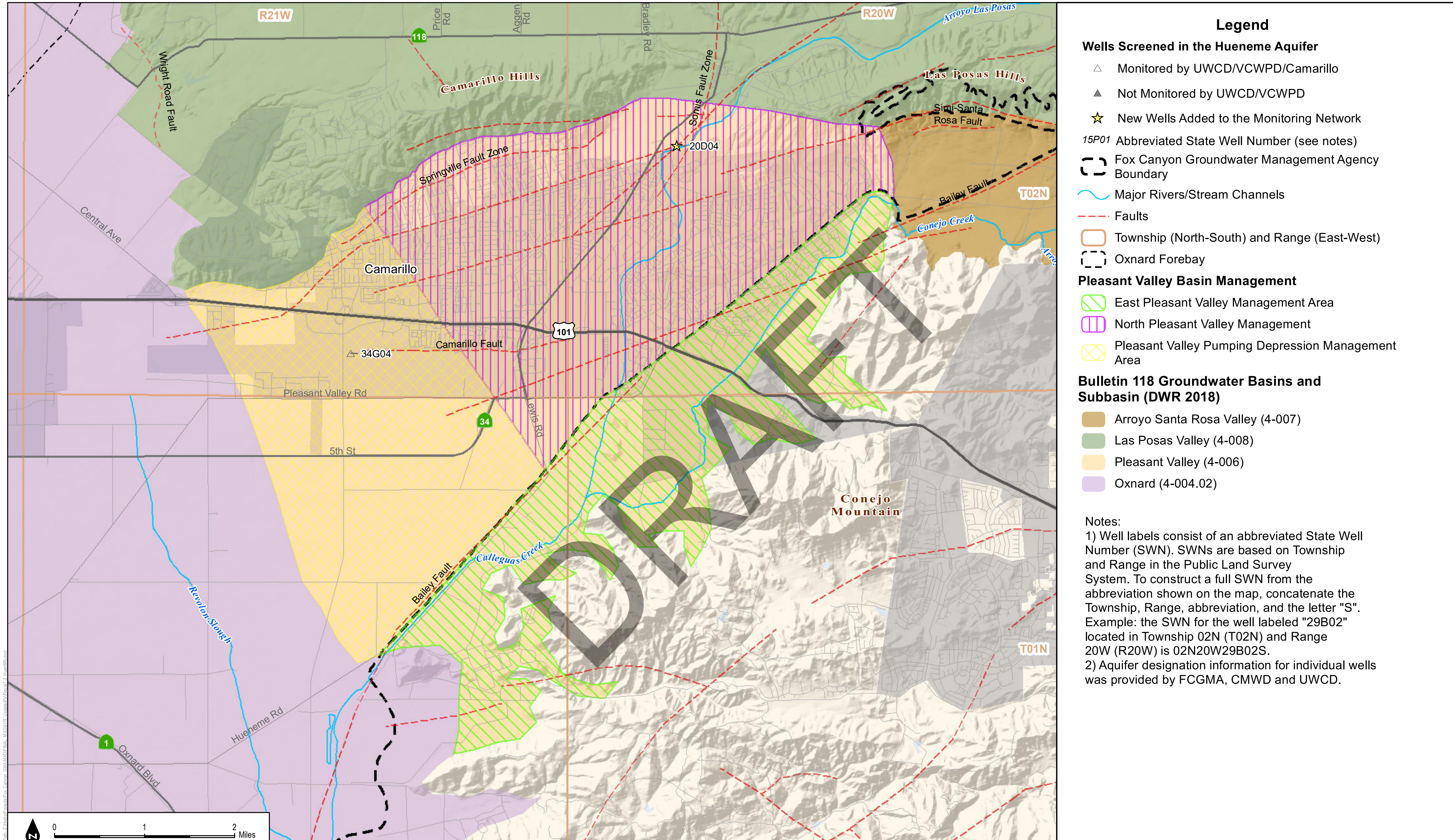

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 7-3

Monitoring Network Wells Screened in the Hueneme Aquifer

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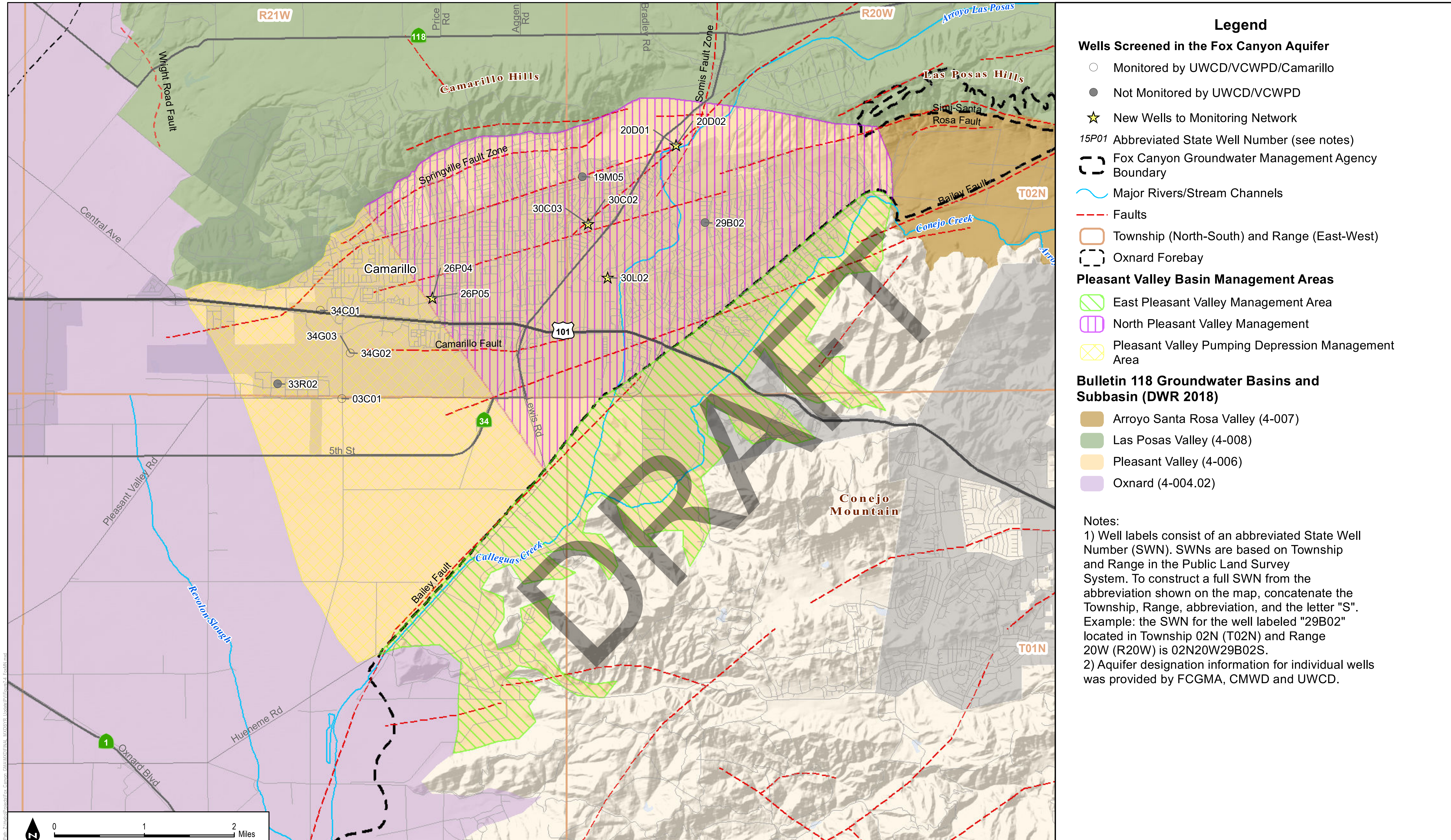

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

DUDEK

FIGURE 7-4

Monitoring Network Wells Screened in the Fox Canyon Aquifer

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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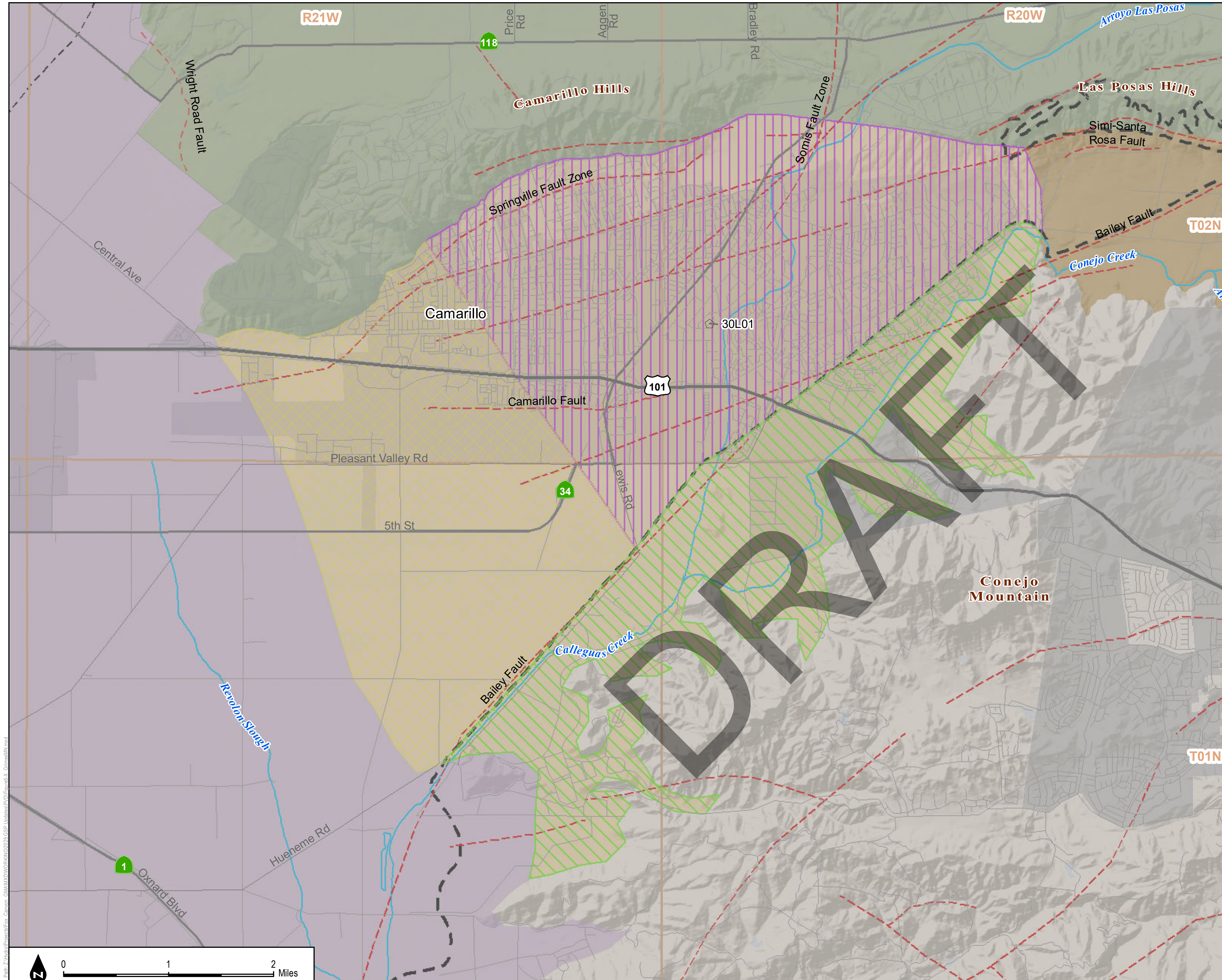

Legend

Wells Screened in the Grimes Canyon Aquifer

- Monitored by UWCD/VCWPD/Camarillo
- Not Monitored by UWCD/VCWPD

15P01 Abbreviated State Well Number (see notes)

- Fox Canyon Groundwater Management Agency Boundary
- Major Rivers/Stream Channels
- Faults
- Township (North-South) and Range (East-
- Oxnard Forebay

Pleasant Valley Basin Management

- East Pleasant Valley Management Area
- North Pleasant Valley Management
- Pleasant Valley Pumping Depression Management Area

Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- 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 abbreviated State Well Number (SWN). 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 "29B02" located in Township 02N (T02N) and Range 20W (R20W) is 02N20W29B02S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 7-5

Monitoring Network Wells Screened in the Grimes Canyon Aquifer

Groundwater Sustainability Plan for the Pleasant Valley Basin: First Periodic Evaluation

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