CHAPTER 4
MONITORING NETWORKS

4.1 MONITORING NETWORK OBJECTIVES

The overall objective of the monitoring network in the Oxnard Subbasin (Subbasin) is to track and monitor parameters that demonstrate progress toward meeting the sustainability goals. In order to accomplish this objective, the monitoring network in the Subbasin must be capable of the following:

- Monitoring changes in groundwater conditions (in six sustainability indicator categories)
- Monitoring progress toward minimum thresholds and measurable objectives
- Quantifying annual changes in water budget components

The existing network of groundwater wells includes both monitoring wells and production wells. This network is capable of delineating the groundwater conditions in the Subbasin and has been used for this purpose in the past. The current groundwater well network will be used to monitor groundwater conditions moving forward, in order to continue to assess long-term trends in groundwater elevation and groundwater quality in the Subbasin.

In the future, to the extent possible, additional dedicated monitoring wells will be incorporated into the existing monitoring network. These wells will provide information on groundwater conditions in geographic locations where data gaps have been identified, or where a dedicated monitoring well would better represent conditions in the aquifers than a production well currently used for monitoring.

4.2 DESCRIPTION OF EXISTING MONITORING NETWORK

The existing monitoring network for groundwater and related surface conditions in the Subbasin includes groundwater production wells, dedicated groundwater monitoring wells, stream gauges, and weather stations. The components of the monitoring network are discussed in Section 4.2.1, Groundwater Monitoring, and Section 4.2.2, Surface Conditions Monitoring, in the context of their ability to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions and of the ability of the network to provide representative conditions in the Subbasin. A discussion of how the monitoring network relates to each of the sustainability criteria follows this discussion in Section 4.3, Monitoring Network Relationship to Sustainability Indicators.

4.2.1 Groundwater Monitoring

Groundwater Elevation

Data collected from more than 150 wells in the Subbasin have been used to demonstrate historical groundwater elevation conditions in the Upper Aquifer System and Lower Aquifer System (Figures 4-1 through 4-6, Monitoring Wells Screened in the Oxnard Subbasin (by aquifer)). The groundwater well monitoring network contains wells that are located in every management area of the Subbasin except the East Oxnard Plain Management Area (EOPMA) and that are screened in every primary aquifer in the Subbasin. Although the network of groundwater wells includes agricultural, municipal and industrial, and domestic production wells, the majority of the wells used to determine groundwater elevations are designated as monitoring wells in the Ventura County Watershed Protection District (VCWPD) database of groundwater elevation and groundwater quality data collected in the Subbasin.

The United Water Conservation District (UWCD) collects groundwater elevation data from more than 100 monitoring and agricultural wells in the Subbasin. These wells are monitored either monthly or bimonthly (once every two months). Water levels are measured both manually and with pressure transducers, which record the pressure of water (or height of the water column) above the transducer in the well. Pressure transducers have been installed in 65 of these wells. These transducers record the height of the water column in the well every 4 hours, thereby providing high temporal resolution data on groundwater conditions in the aquifers. Data are downloaded from the transducers quarterly, in a rotating pattern. Transducer records are subject to quality control review before being added to UWCD databases and reported to VCWPD.

Manual groundwater elevation measurements are collected monthly or bimonthly from the UWCD network of groundwater wells. These data are used to assess seasonal and long-term trends in groundwater elevation in the Subbasin, where groundwater elevations were first measured in the 1930s. Seasonal and long-term groundwater elevation trends have been assessed based on the data collected from the existing network of groundwater monitoring wells, and are discussed in Section 2.3, Groundwater Conditions, of this Groundwater Sustainability Plan (GSP).

The spatial and temporal coverage of the existing groundwater monitoring network is sufficient to provide an understanding of representative conditions in the Upper Aquifer System and Lower Aquifer System throughout the Subbasin, and this network will be used to demonstrate progress toward the sustainability goals for the Subbasin. Although evaluation of the current network suggests that the network is sufficient to document groundwater conditions in the Subbasin, areas for future improvement of the network are identified in Section 4.6, Potential Monitoring Network Improvements.

Groundwater Quality

The majority of the wells in the groundwater elevation monitoring network in the Subbasin are also monitored for groundwater quality. UWCD conducts the majority of the water quality monitoring in the Subbasin. UWCD water quality monitoring is conducted in a rotating pattern such that each well is monitored at least once per year. Annual monitoring of groundwater quality is sufficient to demonstrate long-term trends in groundwater quality, because the physical processes that drive changes in groundwater quality operate on a longer timescale. Currently, groundwater elevations are the primary metric by which progress toward sustainability will be measured. However, groundwater quality data will continue to be collected and analyzed to assess whether groundwater elevation thresholds are sufficiently protective of groundwater conditions in the Subbasin. Recommendations for improvement of the groundwater quality monitoring network are identified in Section 4.6.

Groundwater Extraction

The Fox Canyon Groundwater Management Agency (FCGMA) has required reporting of groundwater extraction from the Subbasin since 1983. Historically, groundwater extraction data from wells within the FCGMA jurisdictional boundary have been self-reported by well owners semi-annually (Figure 2-5, Upper Aquifer System 2015 Extraction [acre-feet] in Oxnard and Pleasant Valley, and Figure 2-6, Lower Aquifer System 2015 Extraction [acre-feet] in Oxnard and Pleasant Valley). In 2018, FCGMA adopted an ordinance that required installation of advanced metering infrastructure (AMI) telemetry on wells that were equipped with flowmeters (FCGMA 2018). All agricultural wells were required to install AMI by December 31, 2018; municipal and industrial wells are required to install AMI by October 1, 2019; and all other metered wells are required to install AMI by October 1, 2020. Requiring AMI on all metered wells within FCGMA jurisdiction will provide for broader simultaneous reporting of groundwater extractions, improve FCGMA's ability to monitor and manage groundwater use, and facilitate implementation of this GSP.

4.2.2 Surface Conditions Monitoring

The primary surface conditions that impact groundwater conditions in the Oxnard Subbasin are surface water flows and precipitation. The monitoring networks for both surface conditions are discussed in this section.

Surface Water

Surface flows in the Subbasin are monitored by a network of gauges that are maintained by the VCWPD (Table 4-1). The network includes three types of gauges:

1. Recording Stream Gauges (also known as Daily and Peak Stations). These stream gauges record daily average flowrates as well as "peak" flowrates during rain events.

2. Peak Only (Event) Gauges. This type of stream gauge records only "peak" flowrates during rain events (the threshold over which a flowrate is considered to be part of a rain event is site-specific).
3. ALERT Peak Gauges. These stream gauges serve only as a flood warning system. These stations register high flows but are not used to measure numerical flow rates.

The recording stations at the Freeman Diversion Channel near Saticoy, Santa Clara River at Victoria Avenue, Beardsley Wash at Central Avenue, and the Revolon Slough at Pleasant Valley Road are recording gauges that provide the primary data on surface flows. These gauges collect daily data, while the other gauges in the basin only record flows during precipitation events.

In addition to the surface flow monitoring network in the Subbasin, UWCD monitors and reports diversions from the Santa Clara River. These diversions are used to deliver surface water to agricultural users in lieu of groundwater production and are used for recharge, via UWCD's spreading grounds, to the groundwater aquifers in the Subbasin.

Surface water flows have been recorded in the Subbasin since the 1930s (Figure 1-4, Average Daily Flows (ADF) and Monthly Minimum ADF in Oxnard Surface Waters). Daily flows on Calleguas Creek and in the Revolon Slough have been recorded since the 1970s. There are currently gauges on the major surface water bodies in the Subbasin (Figure 4-7, Active Surface Water Monitoring Network for the Oxnard Subbasin). The historical and existing spatial and temporal coverage from the surface water flow gauge network provides adequate coverage for the short-term, seasonal, and long-term surface flow conditions in the Subbasin. Although the current network is sufficient to document surface flow conditions in the Subbasin, areas for improvement are identified in Section 4.6.

Precipitation

Thirteen precipitation gauges currently monitor precipitation in the Subbasin (Table 4-2; Figure 4-8, Active Precipitation Monitoring Network for the Oxnard Subbasin). The precipitation gauges are maintained, and data are collected, by VCWPD and the National Weather Service.

Precipitation in the Subbasin has been recorded for more than a century (Figure 1-5, Oxnard Plain Annual Precipitation). Although the locations of individual precipitation gauges have changed through time, with some gauges being removed from service and others added, there is overlap between the records collected from the various gauges. Therefore, a continuous precipitation record can be constructed for the Subbasin to demonstrate long-term trends. More recent data, collected with greater frequency, can be used to demonstrate short-term and seasonal trends in precipitation.

In addition to providing adequate temporal coverage of the Subbasin, the current network of precipitation gauges includes sites in every management area of the Subbasin except the EOPMA. This is sufficient spatial coverage to document precipitation in the Subbasin and to connect the precipitation measurements to both streamflow and groundwater conditions. Additional precipitation monitoring locations are not currently recommended for characterizing surface conditions in the Oxnard Subbasin.

4.3 MONITORING NETWORK RELATIONSHIP TO SUSTAINABILITY INDICATORS

To document changes in groundwater conditions related to each of the six sustainability indicators, monitoring will be conducted using the existing network of groundwater wells (Figures 4-1 through 4-6). This network includes a greater number of wells than the list of key wells provided in Chapter 3, Sustainable Management Criteria, of this GSP (see Tables 4-3 and 4-4). Minimum thresholds and measurable objectives have been selected for the set of key wells but have not been selected for every well used to monitor groundwater conditions in the Subbasin. Conditions measured in the key wells will be used to document progress toward the sustainability goals. Groundwater conditions measured in the broader network of wells, which includes the key wells, will be used to document conditions in the Subbasin at a greater spatial coverage than is provided by the key wells. Recommendations and findings based on the key well data will be supported by the data collected by the broader well network.

4.3.1 Chronic Lowering of Groundwater Levels

To monitor conditions related to chronic lowering of groundwater levels, the groundwater monitoring network must be structured to accomplish the following:

- Track short-term, seasonal, and long-term trends in water elevation.
- Demonstrate groundwater elevations in mid-March and mid-October for each primary aquifer or aquifer system.
- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Subbasin.

Spatial Coverage by Aquifer

The Subbasin monitoring well density for groundwater elevations varies by aquifer (Tables 4-3 and 4-4). Of the primary aquifers in the Subbasin identified in Chapter 2, Basin Setting, the Grimes Canyon Aquifer has the lowest density of active wells in which groundwater elevations can be measured. The density of wells in the Grimes Canyon Aquifer is approximately 1 well per 13 square

miles (the Oxnard Subbasin area is approximately 90 square miles). There is no definitive rule for the density of groundwater monitoring points needed in a basin; however, for comparison, the monitoring well density recommended by CASGEM Groundwater Elevation Monitoring Guidelines ranges from 1 to 10 wells per 100 square miles (DWR 2010). Additional California Department of Water Resources (DWR) guidelines recommend a well network with a density of 1 observation per 16 square miles (DWR 2010, 2016b). Therefore, the density of wells in the Grimes Canyon Aquifer meets the criteria for adequate coverage to accomplish the objectives of the monitoring well network for determining chronic lowering of groundwater levels.

In addition to the Grimes Canyon Aquifer, the density of wells in the other primary aquifers in the Subbasin is also greater than the recommended well density provided in the DWR and CASGEM guidelines. The density of active monitoring wells in the Fox Canyon Aquifer (FCA) and the Hueneme Aquifer is approximately 1 well per 4 square miles. The density of active monitoring wells in the Mugu Aquifer is approximately 1 well per 3 square miles, and the density of active monitoring wells in the Oxnard Aquifer is approximately 1 well per square mile.

Groundwater elevations are also monitored in the semi-perched aquifer, although the semi-perched aquifer is not a primary aquifer in the Subbasin. These elevations are measured to document interactions between the semi-perched aquifer and the surface water bodies in the Subbasin, as well as to document potential gradients between the semi-perched aquifer and the underlying Oxnard Aquifer. The density of monitoring wells in the semi-perched aquifer is approximately 1 well per 13 square miles. This density meets the DWR and CASGEM criteria for documenting groundwater elevations in the semi-perched aquifer.

Although the active network of wells used to document chronic lowering of groundwater levels in the Subbasin has sufficient spatial density on the Subbasin scale, in some aquifers, there are local areas in which coverage can be improved. Potential improvements in local coverage are discussed in Section 4.6.

Temporal Coverage by Aquifer

Groundwater elevation data will be collected from the network of groundwater wells to provide groundwater elevation conditions in the spring and fall of each year. Further discussion of the monitoring schedule is provided in Section 4.4, Monitoring Network Implementation.

4.3.2 Reduction of Groundwater Storage

To monitor conditions related to reduction of groundwater storage, the groundwater monitoring network must be structured to accomplish the following:

- Demonstrate groundwater elevations in mid-March and mid-October for each primary aquifer or aquifer system.
- Calculate year-over-year (mid-March to mid-March) change in storage by aquifer.
- Provide data from which lateral and vertical hydraulic gradients within and between aquifers can be calculated.
- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Subbasin.

The requirements for documenting reduction in groundwater storage are similar to those for chronic lowering of groundwater levels (see Section 4.3.1), because these two sustainability indicators are interrelated. The primary difference between the two sets of requirements is the need to document potential gradients between aquifers. These gradients influence the movement of water between aquifers, which in turn influences storage in the aquifer.

Historically, the change in groundwater stored in freshwater aquifers in the Subbasin has been modeled by UWCD. After GSP adoption, modeled volumes of annual change in storage will be reported by aquifer and by year in annual reports. A standardized method to calculate the change in storage that relies solely on water elevations within each aquifer, rather than on a numerical model, may also be developed as a check on the model predictions.

The spatial and temporal density of groundwater elevation data necessary to document groundwater storage changes in the aquifers of the Subbasin is the same as that necessary to document groundwater elevation changes. The current network of wells is capable of documenting changes to both sustainability indicators. Specific recommendations for potential improvements to local coverage are discussed in Section 4.6.

4.3.3 Seawater Intrusion

To monitor conditions related to seawater intrusion, groundwater elevations will be measured, and water quality samples will be collected, in such a way as to accomplish the following:

- Track short-term, seasonal, and long-term trends in water elevation.
- Demonstrate groundwater elevations in mid-March and mid-October for each primary aquifer or aquifer system.

- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Subbasin.

These goals are the same as those for chronic lowering of groundwater levels (see Section 4.3.1). Groundwater elevations are the metric by which seawater intrusion will be assessed (see Section 3.3.3).

Spatial Coverage by Aquifer

A network of nested monitoring wells was installed in the early 1990s by the U.S. Geological Survey for the Regional Aquifer System Analysis, which includes 16 wells in the Oxnard Subbasin (USGS 1996). Fourteen of these well sites are located within an approximately 28-square-mile area adjacent to the Pacific Ocean. Thus, the density of dedicated monitoring wells adjacent to the coast is approximately 1 well per 2 square miles. The current network of wells is capable of documenting groundwater elevations that could induce seawater intrusion. No additional coastal monitoring wells are proposed.

Water Quality Constituents

Groundwater samples will continue to be collected and analyzed for total dissolved solids (TDS) and chloride in order to assess trends in groundwater quality related to seawater intrusion. The network of existing wells is capable of providing an adequate assessment of groundwater quality trends for these constituents.

Temporal Resolution

Historically, groundwater quality samples have been collected with sufficient temporal resolution to identify seawater intrusion in the aquifers of the Subbasin (see Section 2.3.3, Seawater Intrusion, of this GSP). The temporal resolution of the data has varied through time and depends on the entity monitoring a given well. UWCD has collected annual groundwater samples from the network of monitoring wells along the Subbasin coastline since the late 1980s (UWCD 2016). These samples have documented long-term trends in chloride concentration for the coastal wells. Because the degradation of water quality associated with seawater intrusion is a process that occurs over a longer time than changes in groundwater elevation associated with groundwater production, annual groundwater quality sampling is adequate for documenting changes in chloride and TDS concentration associated with seawater intrusion.

4.3.4 Degraded Water Quality

To monitor conditions related to degraded water quality, water quality samples will be collected in such a way as to track long-term trends in water quality that may impact beneficial uses and users of groundwater in the Subbasin. Specifically, these water quality samples should be targeted to constituents of concern and areas of the Subbasin that have documented degradation, or the potential for degradation, in water quality related to groundwater production from the Subbasin.

Spatial Coverage by Aquifer

The network of wells currently used to monitor groundwater elevation conditions in each aquifer is sufficient to determine trends in groundwater quality as well. The primary areas of concern for groundwater quality degradation relating to groundwater elevations in the Subbasin are the Forebay Management Area, the Saline Intrusion Management Area, and the Oxnard Pumping Depression Management Area. Monitoring groundwater quality changes associated with seawater intrusion is discussed in Section 4.3.3. The spatial density of groundwater elevation monitoring wells is discussed in Section 4.3.1. The spatial coverage provided by the existing monitoring network is sufficient to document changes in groundwater quality.

Water Quality Constituents

Monitoring and annual reporting has occurred for constituents that are associated with a water quality threshold adopted by the FCGMA Board of Directors or by the Los Angeles Regional Water Quality Control Board. These constituents are TDS, chloride, nitrate, sulfate, and boron. The network of existing wells is capable of providing an adequate assessment of groundwater quality trends for these constituents.

Temporal Resolution

Degradation of groundwater quality occurs on a longer timescale than changes in groundwater elevation. Historically, UWCD has collected water quality samples on a quarterly basis and VCWPD has collected samples annually, although more frequent sampling can occur in some wells. These samples have provided information on trends in groundwater quality throughout the Subbasin. Samples from coastal wells have been used to document seawater intrusion, and samples from wells in the Oxnard Forebay have been used to document degradation of water quality related to increasing nitrate concentrations (see Section 2.3). The temporal resolution of the data collection is adequate to document trends in groundwater concentration for the constituents identified by the FCGMA Board of Directors and the Los Angeles Regional Water Quality Control Board.

4.3.5 Land Subsidence

To monitor conditions related to land subsidence, groundwater elevations will be measured to determine if water levels fall below historical lows. Groundwater elevations are being used as a proxy for land subsidence in the Subbasin. The minimum thresholds identified at the key wells are above the historical low groundwater elevation. Therefore, it is not anticipated that specific land subsidence monitoring will be required for the Subbasin. Instead, the network of groundwater monitoring wells discussed in Sections 4.2.1 and 4.3.1 will be used to determine if land subsidence related to groundwater production may occur.

4.3.6 Depletions of Interconnected Surface Water

To monitor conditions related to depletions of interconnected surface water, surface water flows and shallow groundwater will be measured in such a way as to accomplish the following:

- Track short-term, seasonal, and long-term trends in groundwater elevation in the semi-perched aquifer.
- Demonstrate groundwater elevations in mid-March and mid-October for the semi-perched aquifer.
- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Subbasin.

Surface water flows in the Revolon Slough, Calleguas Creek, and the Santa Clara River downstream of, but not including, the Freeman Diversion are connected to water levels in the semi-perched aquifer, rather than the underlying confined aquifers of the Upper Aquifer System and Lower Aquifer System. In turn, the groundwater elevation in the semi-perched aquifer is effectively regulated by the height of the agricultural tile drains installed throughout the Oxnard Plain (UWCD 2016).

Although the active network of wells used to document groundwater conditions in the semi-perched aquifer has sufficient spatial density at the Subbasin scale, there are local areas in which coverage can be improved. Potential improvements in local coverage are discussed in Section 4.6.

4.4 MONITORING NETWORK IMPLEMENTATION

4.4.1 Groundwater Elevation Monitoring Schedule

To reduce uncertainty associated with hydraulic gradients, and to follow guidance documents produced by DWR (DWR 2016b), water level measurements used in the evaluation of seasonal high

and seasonal low groundwater conditions should be collected in a 2-week window in mid-March and mid-October (specifically, March 9–22 and October 9–22 of any given calendar year).

Short-term trends in groundwater elevation are currently, and will continue to be, monitored using transducers that are operated and maintained by UWCD. Data from these transducers are downloaded quarterly and stored in a central database.

Seasonal and long-term trends in groundwater elevation are monitored using the transducer data and manual measurements made by UWCD on a monthly or bimonthly basis, and manual measurements made by VCWPD on a quarterly basis. Additional manual water level measurements made by other partner agencies (e.g., the City of Oxnard or mutual water districts) are typically sent to VCWPD annually.

4.4.2 Groundwater Storage Monitoring Schedule

Groundwater storage is directly related to, and calculated from, groundwater elevations. Consequently, the schedule for monitoring groundwater storage is the same as that for monitoring groundwater elevations.

4.4.3 Seawater Intrusion Monitoring Schedule

Groundwater Elevation

Twice-yearly comprehensive evaluations (in mid-March and mid-October) of groundwater elevations in each aquifer will be used to assess progress toward minimum thresholds designed to avoid seawater intrusion.

Groundwater Quality

Annual groundwater quality samples for each coastal well will be used to monitor water quality trends related to seawater intrusion.

4.4.4 Water Quality Monitoring Schedule

UWCD conducts monthly or quarterly monitoring of groundwater quality in many wells throughout the Oxnard Subbasin. Wells with stable water quality are sampled annually or twice annually by UWCD. Groundwater quality monitoring should continue on the same schedule in order to document groundwater quality trends in the Subbasin. Annual reviews of the groundwater quality trends will be used to assess whether sampling frequency or the spatial density of samples needs to be adjusted.

4.4.5 Groundwater Extraction Monitoring Schedule

Monitoring of groundwater extraction rates will take place continuously, using flowmeters and telemetry equipment installed on individual wellheads, and monthly totals of pumped water will be transmitted to a central database maintained by FCGMA.

4.5 PROTOCOLS FOR DATA COLLECTION AND MONITORING

Protocols for collecting groundwater level measurements and water quality samples, as well as downloading transducers and logging the boreholes of newly drilled wells, are included in the Monitoring Protocols Best Management Practices (BMPs) produced by DWR (DWR 2016a). FCGMA plans to work with agency partners to ensure that future data collection is conducted according to relevant protocols in the BMP. Current practices used by VCWPD and UWCD are described in this section.

VCWPD Protocols

VCWPD technicians collect water levels using steel tapes. For a well that is too deep for the tape, an acoustical sounder or an air pressure gauge is used, and the measurement is stored in the database with a Questionable Measurement Code, indicating that alternate equipment was used.

VCWPD technicians collect water quality samples from production wells using the installed pump equipment. A three-volume purge, or a testing of groundwater parameters including pH, temperature, and electrical conductivity, is conducted to determine whether the water at the wellhead is representative of groundwater in the aquifer. Water quality samples are then sent to an analytical laboratory, where they are filtered and preserved.

UWCD Protocols

UWCD technicians collect water levels using a variety of equipment, including dual-wire and single-wire sounders and metal tapes. In the event that the well contains a pump, the technician manually tests the approximate temperature of the pump housing. If the pump housing is warm, the water level that is entered into the database is qualified with a Questionable Measurement Code, indicating recent pumping. UWCD also considers other indicators, such as wet conditions at wells and in nearby fields, to evaluate if water levels may not be static.

UWCD technicians collect water quality samples using the three-volume purge method, and follow U.S. Geological Survey guidelines for groundwater quality sampling. For shallow wells, a Grundfos Redi-Flo pump is used to purge and sample the groundwater. For deeper wells, a compressor is used to airlift the groundwater for purging and sampling. On rare occasions, a bailer is used to purge and sample.

4.6 POTENTIAL MONITORING NETWORK IMPROVEMENTS

The existing monitoring network in the Subbasin is sufficient to document groundwater conditions in the Subbasin, and can be used to document progress toward the sustainability goals for the Subbasin. Analysis of the monitoring network, however, also indicates that there are local areas in which data coverage and monitoring efforts can be improved in the future. Areas for improvement of the existing monitoring network and data infrastructure system, are described in the following sections.

4.6.1 Water Level Measurements: Spatial Data Gaps

Additional monitoring wells could be used to improve spatial coverage for groundwater elevation measurements in the West Oxnard Plain Management Area, the Oxnard Pumping Depression Management Area, and the EOPMA. Wells that are added to the network should be dedicated monitoring well clusters, with individual wells in the cluster screened in a single aquifer. The potential improvements to the monitoring network in each aquifer are shown on Figures 4-9 through 4-14 (Existing and Potential New Wells for Monitoring Groundwater Conditions, by aquifer).

The groundwater monitoring network in the Subbasin could be improved by adding monitoring wells in the Oxnard Pumping Depression Management Area (Figures 4-9 through 4-14). An additional well, or wells, in this area would provide aquifer-specific groundwater elevations in an area that does not have local wells screened solely in the Mugu Aquifer or the Hueneme Aquifer, and does not have a dedicated monitoring well screened in any of the primary aquifers. Groundwater elevation measurements in this well would help constrain groundwater gradients across the boundary between the Subbasin and the Pleasant Valley Basin. Additionally, a well in this management area could be used to assess groundwater conditions in the semi-perched aquifer adjacent to the Revolon Slough. FCGMA has applied for funding through a DWR Technical Support Services monitoring well funding grant to add a monitoring well in the Oxnard Pumping Depression Management Area.

In the West Oxnard Plain Management Area, the groundwater monitoring network could be improved by adding a monitoring well to the area north of Highway 101 and south of the Oxnard Forebay. Currently, there are no dedicated monitoring wells in this area (Figures 4-9 through 4-14). Adding a monitoring well in this area would provide for aquifer-specific water levels adjacent to the West Las Posas Management Area boundary. These groundwater levels could be used to constrain the gradient between the West Las Posas Management Area and the Subbasin.

The monitoring network in the West Oxnard Plain Management Area could also be improved by adding a monitoring well to the area north of 6th Street and west of Ventura Road. This area has dedicated monitoring wells in the Oxnard Aquifer, but does not have a dedicated monitoring well in the Mugu or Hueneme Aquifer or the FCA. A monitoring well in this area would help constrain groundwater gradients in the northwest part of the Oxnard Subbasin.

There are currently no monitoring wells in the EOPMA, which has minimal known groundwater production. Addition of a monitoring well in the vicinity of Calleguas Creek in the EOPMA would improve understanding of groundwater conditions in this management area. It would also provide data to help constrain the relationship between groundwater elevations in the EOPMA and groundwater conditions in the adjacent Oxnard Pumping Depression and Saline Intrusion Management Areas.

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

Proposed locations are approximate and subject to feasibility review (accounting for infrastructure, site acquisition, and site access, among other factors) after GSP submittal. The schedule for new well installation will be developed in conjunction with feasibility review.

4.6.2 Water Level Measurements: Temporal Data Gap

The DWR Monitoring Protocol BMP (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 BMP (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. To minimize the effects of this type of temporal data gap in the future, it will 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 to 22 in the fall and March 9 to 22 in the spring (see Section 4.4).

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.

4.6.3 Groundwater Quality Monitoring

To improve the existing groundwater quality monitoring in the Subbasin, the current analyte list could be expanded to include a full general minerals suite. Stiff or Piper diagrams could then be created to fully characterize the geochemical characteristics of the groundwater and track changes over time. UWCD currently gets a general mineral analysis at least annually for most monitoring wells in the Oxnard Subbasin.

4.6.4 Subsidence Monitoring

Currently, neither FCGMA nor its partner agencies in the region monitor land subsidence. The U.S. Geological Survey maintained one benchmark in the southern part of the Oxnard Plain between 1939 and 1978 (see Section 2.3.5, Subsidence, of this GSP), but it is not currently operational. Subsidence related to groundwater production is not anticipated to occur in the Subbasin in the future because the minimum threshold groundwater elevations are higher than the historical low groundwater elevations in the Subbasin. Preexisting GPS-based benchmarks could be used for monitoring land subsidence in the event that groundwater elevations drop below historical low levels for an extended period, and the potential for land subsidence to substantially interfere with surface land uses is determined (see Section 3.3.5, Land Subsidence). Additionally, historical InSAR and LIDAR records exist for the Oxnard Plain and could be used for comparison to future conditions if groundwater production causes water levels that are below the historical lows.

4.6.5 Shallow Groundwater Monitoring near Surface Water Bodies and GDEs

Currently, there are relatively few wells that can be used to monitor the shallow groundwater in the semi-perched aquifer that may be interconnected with surface water bodies and sustain GDEs or potential GDEs in the Subbasin. To improve the existing monitoring network and to assist with understanding the potential connectivity between shallow groundwater and potential GDEs, a dedicated shallow monitoring well within the boundaries of the potential GDE along the Revolon Slough and an additional dedicated shallow monitoring well in the vicinity of Lower Calleguas Creek could be added to the monitoring network, independent of an additional nested well cluster (Figure 2-52, Groundwater Dependent Ecosystems for the Oxnard Subbasin).

Additional shallow monitoring wells are not proposed for the coastal GDEs (Lower Santa Clara River, McGrath Lake, Ormond Beach, and Mugu Lagoon) described in Section 2.3.7, Groundwater-Dependent Ecosystems, of this GSP (see Figures 2-52 through 2-56). The coastal GDEs are sustained by groundwater in the semi-perched aquifer, which is rarely used for water supply in the Subbasin (FCGMA 2007). However, if future projects propose to produce water from the semi-perched aquifer, depletion of interconnected surface water is possible, and significant and unreasonable impacts may occur. Therefore, additional monitoring wells may be necessary and should be installed in conjunction with the planning for those projects.

4.6.6 Surface Water: Flows in Agricultural Drains in the Oxnard Plain

Discharge flows are currently unmeasured in the drainage system, frequently referred to as the "tile drains," that was installed throughout the Oxnard Plain in the 1950s (Isherwood and Pillsbury 1958). The tile drains were installed to support the development of land in the Oxnard Plain, which was formerly affected by high soil salinity levels, for agriculture (Isherwood and Pillsbury 1958). The drains are typically located 6 to 7 feet below ground surface, though the depth varies and is not well documented in most areas. Shallow groundwater entering the drains discharges to central drainage ditches, and from there flows into local surface waters, such as the Revolon Slough, or directly to the ocean, such as at Port Hueneme.

Metering flow in the tile drains would provide an important check on numerical groundwater results and would also provide valuable information about the water resource potential of the semi-perched aquifer. The tile drain system is extensive, and in much of the Oxnard Plain its current state of repair is currently unknown. A feasibility study is recommended to identify the best locations in the drainage system for installing flowmeters.

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Table 4-1
Network of Stations Monitoring Surface Flows in the Vicinity of the Oxnard Subbasin

Station Number	Station Name	Latitude	Longitude	Elevation (ft msl)	Station Type	USGS ID
A639	Freeman Diversion Weir ALERT	34.299111	−119.108417	187	ALERT Stream Gauge	—
724A	Santa Clara River at Freeman Diversion (ALERT)	34.299222	−119.108	—	ALERT Stream Gauge	—
793	J Street Drain at Lagoon (ALERT)	34.140944	−119.188028	15	ALERT Stream Gauge	—
778	Nyeland Acres Drain	34.225099	−119.126788	46	Peak Only (Event) Gauge	—
779	Rice Rd Drain at Wooley Rd	34.189448	−119.151126	24	Peak Only (Event) Gauge	—
781	Santa Clara Drain	34.242678	−119.113763	79	Peak Only (Event) Gauge	—
719	Freeman Diversion Channel near Saticoy	34.292778	−119.116389	—	Recording Stream Gauge	11113900
723	Santa Clara River at Victoria Ave	34.234917	−119.216611	62	Recording Stream Gauge	—
780	Beardsley Wash at Central Ave	34.2305	−119.112028	60	Recording Stream Gauge	—
776A	Revolon Slough at Pleasant Valley Rd	34.192592	−119.107875	20	Recording Stream Gauge	—

Notes: ft msl = feet above mean sea level; USGS = U.S. Geological Survey.
This table shows results from active gauges only (as of August 2016).

Table 4-2
Network of Stations Monitoring Precipitation in the Vicinity of the Oxnard Subbasin

Station Number	Station Name	Latitude	Longitude	Elevation (ft msl)	Station Type	USGS ID
273A	Oxnard NWS	34.207207	−119.137384	63	National Weather Service Site	—
403	Silverstrand Alert (Type B)	34.15271	−119.218965	18	Non-Standard Recorder	—
017C	Port Hueneme–Oxnard Sewer Plant	34.141684	−119.18665	10	Recording Precipitation Gauge	—
032A	Oxnard Civic Center	34.200087	−119.180278	53	Recording Precipitation Gauge	46569
168	Oxnard Airport	34.201647	−119.207685	34	Recording Precipitation Gauge	—

Table 4-2
Network of Stations Monitoring Precipitation in the Vicinity of the Oxnard Subbasin

Station Number	Station Name	Latitude	Longitude	Elevation (ft msl)	Station Type	USGS ID
175A	Saticoy–County Yard	34.281214	−119.141018	150	Recording Precipitation Gauge	—
177A	Camarillo–Pacific Sod	34.155471	−119.073003	20	Recording Precipitation Gauge	—
215A	Channel Is Harbor–Kiddie Beach	34.158944	−119.222338	15	Recording Precipitation Gauge	—
239	El Rio–UWCD Spreading Grounds	34.239405	−119.153009	105	Recording Precipitation Gauge	—
412	El Rio–Mesa School APCD	34.252361	−119.143056	131	Recording Precipitation Gauge	—
223A	Point Mugu–USN	34.112778	−119.119444	12	Standard Precipitation Midnight	—
215	Channel Islands Harbor	34.162042	−119.222717	5	Standard Precipitation	—
261	Saticoy–Recharge Facility	34.278889	−119.123056	145	Standard Precipitation	—

Notes: APCD = Air Pollution Control District; ft msl = feet above mean sea level; NWS = National Weather Service; USGS = U.S. Geological Survey; USN = U.S. Navy; UWCD = United Water Conservation District.
This table shows results from active gauges only.

Table 4-3
VCWPD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD[a]	Water Quality Samples Collected by VCWPD[a]	Water Level Sampling Schedule after GSP Adoption	Water Quality Sampling Schedule after GSP Adoption
01N21W04D04S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W04N02S	Monitoring	Multiple	Unassigned	Yes	—		—
01N21W06L04S	Agricultural	Oxnard	UAS	Yes	—		—
01N21W07H01S	Agricultural	Oxnard	UAS	Yes			—
01N21W08R01S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W09C04S	Agricultural	FCA	LAS	Yes	—		—
01N21W16A04S	Agricultural	Multiple	LAS	Yes	—		—
01N21W16M01S	Agricultural	Multiple	Both	Yes	—		—

Table 4-3
VCWPD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD[a]	Water Quality Samples Collected by VCWPD[a]	Water Level Sampling Schedule after GSP Adoption	Water Quality Sampling Schedule after GSP Adoption
01N21W16M03S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W16P03S	Agricultural	Multiple	LAS	Yes	—		—
01N21W17D02S	Agricultural	Oxnard	UAS	Yes	—		—
01N21W19J05S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W20K03S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W20N07S	Domestic	Multiple	UAS	Yes	—		—
01N21W21H02S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W21H03S	Agricultural	Unassigned	LAS	—	Yes		Annual
01N21W21K03S	Agricultural	Unassigned	Both	—	Yes		Annual
01N21W21N01S	Agricultural	Mugu	UAS	Yes	—		—
01N21W22C01S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W28D01S	Agricultural	Multiple	LAS	Yes	Yes		Annual
01N21W28G01S	Agricultural	Unassigned	UAS	—	Yes		Annual
01N21W28H03S	Agricultural	Unassigned	Both	—	Yes		Annual
01N21W29B03S	Agricultural	Multiple	UAS	Yes	Yes		Annual
01N21W32K01S	Municipal	FCA	LAS	Yes	—		—
01N22W03F05S	Municipal	Hueneme	LAS	—	Yes		Annual
01N22W03F07S	Municipal	Oxnard	UAS	—	Yes		Annual
01N22W06B01S	Domestic	Unassigned	UAS	—	Yes		Annual
01N22W12M01S	Agricultural	Unassigned	UAS	—	Yes		Annual
01N22W12N03S	Agricultural	Multiple	LAS	Yes	—		—
01N22W12R01S	Agricultural	Multiple	LAS	Yes	—		—
01N22W14K01S	Agricultural	Oxnard	UAS	Yes	—		—
01N22W16D04S	Municipal	Hueneme	LAS	—	Yes		Annual
01N22W19A01S	Municipal	Hueneme	LAS	—	Yes		Annual
01N22W21B03S	Municipal	Multiple	LAS	Yes	—		—
01N22W21B06S	Municipal	Multiple	LAS	—	Yes		Annual
01N22W23R02S	Agricultural	Unassigned	LAS	—	Yes		Annual
01N22W24B04S	Agricultural	Multiple	LAS	—	Yes		Annual
01N22W24C02S	Agricultural	Multiple	UAS	Yes	—		—
01N22W24C03S	Agricultural	Unassigned	Both	—	Yes		Annual
01N22W25K01S	Agricultural	Unassigned	UAS	—	Yes		Annual
01N22W25K02S	Agricultural	FCA	LAS	—	Yes		Annual

Table 4-3
VCWPD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD[a]	Water Quality Samples Collected by VCWPD[a]	Water Level Sampling Schedule after GSP Adoption	Water Quality Sampling Schedule after GSP Adoption
01N22W26K03S	Agricultural	Multiple	LAS	Yes	—	Twice yearly	—
01N22W26M03S	Agricultural	Hueneme	LAS	Yes	Yes		Annual
01N22W26P02S	Agricultural	Unassigned	LAS	—	Yes		Annual
01N22W26Q01S	Agricultural	Unassigned	Both	—	Yes		Annual
01N22W36B02S	Agricultural	Multiple	LAS	Yes	—		—
02N21W07P04S	Agricultural	Multiple	LAS	Yes	Yes		Annual
02N21W19A01S	Domestic	Multiple	UAS	—	Yes		Annual
02N21W19A03S	Agricultural	Multiple	LAS	Yes	—		—
02N21W19B02S	Agricultural	Oxnard	UAS	Yes	—		—
02N21W20F02S	Domestic	Multiple	Unassigned	Yes	—		—
02N21W20M03S	Agricultural	Multiple	UAS	—	Yes		Annual
02N21W20M06S	Agricultural	Multiple	LAS	Yes	—		—
02N21W31P02S	Monitoring	Multiple	Unassigned	Yes	—		—
02N21W31P03S	Monitoring	Hueneme	LAS	Yes	—		—
02N22W23H03S	Agricultural	Unassigned	UAS	—	Yes		Annual
02N22W24P01S	Agricultural	Mugu	UAS	Yes	Yes		Annual
02N22W24P02S	Agricultural	Multiple	LAS	—	Yes		Annual
02N22W24R02S	Domestic	Unassigned	UAS	—	Yes		Annual
02N22W25A02S	Agricultural	Unassigned	UAS	—	Yes		Annual
02N22W25F01S	Industrial	Unassigned	UAS	—	Yes		Annual
02N22W26E01S	Municipal	Multiple	UAS	Yes	—		—
02N22W27M02S	Municipal	Unassigned	UAS	—	Yes		Annual
02N22W30F03S	Agricultural	Unassigned	LAS	—	Yes		Annual
02N22W30K01S	Agricultural	Oxnard	UAS	Yes	—		—
02N22W31A01S	Agricultural	Multiple	Unassigned	Yes	—		—
02N22W31D02S	Agricultural	Unassigned	UAS	—	Yes		Annual
02N22W32C04S	Agricultural	Multiple	UAS	—	Yes		Annual
02N22W32Q03S	Agricultural	Multiple	UAS	Yes	—	Twice yearly	—
02N22W36E02S	Municipal	Hueneme	LAS	—	Yes		Annual
02N22W36E03S	Municipal	Hueneme	UAS	—	Yes		Annual
02N22W36F01S	Domestic	Unassigned	Unassigned	—	Yes	Twice yearly	Annual
02N22W36F02S	Agricultural	Unassigned	UAS	—	Yes		Annual

Table 4-3
VCWPD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD[a]	Water Quality Samples Collected by VCWPD[a]	Water Level Sampling Schedule after GSP Adoption	Water Quality Sampling Schedule after GSP Adoption
02N23W25G02S	Industrial	Multiple	Unassigned	Yes	Yes		Annual
02N23W25M01S	Agricultural	Unassigned	UAS	—	Yes		Annual
02N23W36C04S	Domestic	Oxnard	UAS	Yes	—		—

Notes: FCA = Fox Canyon Aquifer; GSP = Groundwater Sustainability Plan; LAS = Lower Aquifer System; UAS = Upper Aquifer System; VCWPD = Ventura County Watershed Protection District.

[a] As of October 2017.

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N21W04D04S	Agricultural	Multiple	LAS			Yes			Quarterly	
01N21W06J05S	Agricultural	FCA	LAS				Yes			
01N21W06R01S	Monitoring	Oxnard	UAS			Yes			Quarterly	
01N21W07J02S	Agricultural	Multiple	LAS				Yes		Twice yearly	
01N21W10G01S	Agricultural	Multiple	LAS			Yes			Quarterly	
01N21W12D01S	Agricultural	Multiple	UAS	Yes					Bimonthly	
01N21W15J04S	Agricultural	Multiple	LAS	Yes	Yes				Monthly	
01N21W17C02S	Agricultural	Unassigned	UAS			Yes			Quarterly	
01N21W17G03S	Agricultural	Multiple	LAS	Yes					Bimonthly	
01N21W18A04S	Agricultural	Unassigned	UAS	Yes	Yes				Bimonthly	
01N21W18L05S	Agricultural	Unassigned	LAS			Yes			Quarterly	
01N21W19C01S	Agricultural	Oxnard	UAS	Yes					Bimonthly	
01N21W19J05S	Agricultural	Multiple	LAS	Yes					Bimonthly	
01N21W19L10S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W19L11S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W19L12S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W19L13S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W19L14S	Monitoring	Semi-Perched	Semi-Perched	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W20C05S	Agricultural	Mugu	UAS	Yes					Bimonthly	
01N21W20K03S	Agricultural	Multiple	LAS	Yes					Bimonthly	
01N21W21H02S	Agricultural	Multiple	LAS			Yes			Quarterly	
01N21W28D01S	Agricultural	Multiple	LAS			Yes			Quarterly	
01N21W28G04S	Agricultural	Multiple	LAS	Yes					Bimonthly	

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N21W31A05S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N21W31A06S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N21W31A07S	Monitoring	Mugu	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N21W31A08S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N21W31A09S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N21W32Q02S	Monitoring	GCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q03S	Monitoring	GCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q04S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q05S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q07S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W01M03S	Agricultural	Multiple	LAS				Yes		Quarterly	
01N22W02A02S	Monitoring	Mugu	UAS	Yes	Yes	Yes			Monthly	
01N22W03F05S	Municipal	Hueneme	LAS			Yes			Quarterly	
01N22W03F09S	Monitoring	Unassigned	Unassigned	Yes	Yes			Yes	Monthly	Twice yearly
01N22W03F11S	Monitoring	Unassigned	Unassigned	Yes	Yes			Yes	Monthly	Twice yearly
01N22W03F13S	Municipal	Oxnard	UAS			Yes			Quarterly	
01N22W11C03S	Agricultural	Unassigned	Unassigned	Yes	Yes				Monthly	
01N22W13D03S	Agricultural	Multiple	LAS				Yes		Quarterly	
01N22W14R02S		Oxnard	UAS	Yes					Bimonthly	
01N22W16D04S	Municipal	Hueneme	LAS	Yes	Yes				Monthly	
01N22W17C03S	Municipal	Multiple	LAS			Yes			Quarterly	
01N22W18L02S	Municipal	Unassigned	LAS	Yes					Bimonthly	

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N22W19A01S	Municipal	Hueneme	LAS	Yes					Bimonthly	
01N22W20J04S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20J05S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20J06S	Monitoring	Mugu–Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20J07S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20J08S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20M01S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M02S	Monitoring	Hueneme	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M03S	Monitoring	Hueneme	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M04S	Monitoring	Mugu	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M05S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M06S	Monitoring	Semi-Perched	Semi-Perched	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W21B03S	Municipal	Multiple	LAS	Yes					Bimonthly	
01N22W21B06S	Municipal	Multiple	LAS	Yes					Bimonthly	
01N22W24B04S	Agricultural	Multiple	LAS	Yes					Bimonthly	
01N22W24C02S	Agricultural	Multiple	UAS	Yes					Bimonthly	
01N22W24M03S	Agricultural	Unassigned	Both	Yes					Bimonthly	
01N22W26J03S	Monitoring	Mugu	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W26J04S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W26J05S	Monitoring	Semi-Perched	Semi-Perched	Yes				Yes	Bimonthly	Quarterly
01N22W27C02S	Monitoring	Mugu	UAS	Yes				Yes	Bimonthly	Quarterly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N22W27C03S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W27C04S	Monitoring	Semi-Perched	Semi-Perched	Yes				Yes	Bimonthly	Quarterly
01N22W27R03S	Monitoring	Mugu	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W27R04S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W27R05S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W28G01S	Monitoring	GCA	LAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W28G02S	Monitoring	FCA	LAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W28G03S	Monitoring	Hueneme	LAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W28G04S	Monitoring	Oxnard	UAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W28G05S	Monitoring	Oxnard	UAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W29D01S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W29D02S	Monitoring	Hueneme	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W29D03S	Monitoring	Hueneme	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W29D04S	Monitoring	Mugu	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E01S	Monitoring	GCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E02S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E03S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E04S	Monitoring	Mugu	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E05S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W36K05S	Monitoring	GCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W36K06S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W36K07S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W36K08S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N22W36K09S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N23W01C02S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N23W01C03S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N23W01C04S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N23W01C05S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01S21W08L03S	Monitoring	GCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01S21W08L04S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01S22W01H01S	Monitoring	Multiple	LAS					Yes		Quarterly
01S22W01H02S	Monitoring	FCA	LAS					Yes		Quarterly
01S22W01H03S	Monitoring	Mugu	UAS					Yes		Quarterly
01S22W01H04S	Monitoring	Oxnard	UAS					Yes		Quarterly
02N21W06P01S	Agricultural	Multiple	Unassigned	Yes					Bimonthly	
02N21W07F01S	Agricultural	Multiple	UAS	Yes					Bimonthly	
02N21W07L03S	Monitoring	Multiple	Unassigned	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W07L04S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W07L05S	Monitoring	Multiple	Unassigned	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W07L06S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W07L07S	Municipal	Multiple	UAS				Yes		Bimonthly	
02N21W07M04S	Municipal	Multiple	UAS				Yes		Bimonthly	Twice yearly
02N21W07N02S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N21W07P03S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N21W07P04S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N21W07Q01S	Agricultural	Multiple	LAS			Yes				

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N21W07R01S	Monitoring	Multiple	LAS	Yes					Bimonthly	
02N21W08D01S	Monitoring	Multiple	Unassigned	Yes					Bimonthly	
02N21W16J03S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N21W17F05S	Agricultural	FCA	LAS	Yes					Bimonthly	
02N21W18B01S	Agricultural	Multiple	UAS	Yes				Yes	Bimonthly	Twice yearly
02N21W19P01S	Agricultural	Multiple	LAS	Yes	Yes				Bimonthly	
02N21W20A02S	Agricultural	Unassigned	Unassigned	Yes					Bimonthly	
02N21W22G01S	Municipal	GCA	LAS	Yes					Bimonthly	
02N21W28A02S	Municipal	GCA	LAS	Yes					Bimonthly	
02N21W29L04S	Agricultural	Multiple	LAS	Yes	Yes				Monthly	
02N21W29M02S	Agricultural	Unassigned	Unassigned	Yes	Yes				Monthly	
02N21W30A01S	Agricultural	Unassigned	LAS	Yes	Yes				Monthly	
02N21W31P06S	Agricultural	Hueneme	LAS	Yes					Bimonthly	
02N21W32E01S	Agricultural	Multiple	LAS				Yes		Quarterly	
02N21W34G02S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W34G03S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W34G04S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W34G05S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W34G06S	Monitoring	Unassigned	Unassigned	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W01P02S		Oxnard	UAS			Yes		Yes	Quarterly	
02N22W01R02S	Monitoring	Multiple	Unassigned			Yes		Yes	Quarterly	Twice yearly
02N22W02R05S	Agriculture	Multiple	Both	Yes					Bimonthly	
02N22W11G01S		Oxnard	UAS			Yes		Yes	Quarterly	

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N22W11J01S	Monitoring	Multiple	Unassigned	Yes		Yes		Yes	Bimonthly	Twice yearly
02N22W11J02S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W11Q01S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Twice yearly
02N22W12A01S	Monitoring	Oxnard	UAS	Yes		Yes			Bimonthly	
02N22W12A02S	Agricultural	Oxnard	UAS	Yes					Bimonthly	
02N22W12B08S	Agricultural	Multiple	UAS	Yes		Yes			Bimonthly	
02N22W12E04S	Industrial	Multiple	Both			Yes			Quarterly	
02N22W12F03S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W12F04S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W12G03S	Industrial	Oxnard	UAS	Yes					Bimonthly	
02N22W12H01S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W12J02S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W12J04S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W12K05S	Industrial	Unassigned	UAS			Yes			Quarterly	
02N22W12N03S	Agricultural	Hueneme	LAS	Yes					Bimonthly	
02N22W12Q06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W12R03S	Agricultural	Multiple	Both	Yes					Bimonthly	
02N22W12R04S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W12R05S	Agricultural	Unassigned	Both	Yes					Bimonthly	
02N22W13C01S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W13N02S	Municipal	Multiple	LAS				Yes		Quarterly	
02N22W13N05S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W13N06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N22W13N07S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14A09S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Twice yearly
02N22W14B01S	Agricultural	Multiple	LAS	Yes	Yes				Monthly	
02N22W14D01S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W14F03S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Twice yearly
02N22W14G04S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14G05S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14G06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14G07S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14G08S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14P02S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W14P03S	Municipal	Multiple	UAS	Yes				Yes	Bimonthly	
02N22W15L01S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W15P01S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W15R02S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W16R02S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W22Q05S	Municipal	Multiple	LAS	Yes	Yes				Monthly	
02N22W22R02S	Municipal	Multiple	Unassigned	Yes	Yes				Monthly	
02N22W23B02S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W23B03S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B04S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B05S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B06S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N22W23B07S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B08S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B09S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23C02S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W23C05S	Agricultural	Multiple	UAS			Yes	Yes		Quarterly	
02N22W23C06S	Municipal	Unassigned	UAS				Yes		Quarterly	
02N22W23D06S	Agricultural	Multiple	UAS	Yes					Bimonthly	
02N22W23G03S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W23G04S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W23H04S	Municipal	Multiple	LAS				Yes		Quarterly	
02N22W23H06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23K05S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W24A01S	Agricultural	Multiple	UAS	Yes				Yes	Bimonthly	Twice yearly
02N22W24P02S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N22W25J01S	Municipal	Multiple	LAS	Yes					Bimonthly	
02N22W25L03S	Municipal	Multiple	UAS			Yes			Quarterly	
02N22W26B03S	Municipal	Hueneme	LAS				Yes		Quarterly	
02N22W26E01S	Municipal	Multiple	UAS					Yes		Twice yearly
02N22W26H02S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N22W27A02S	Municipal	Unassigned	Unassigned					Yes		Twice yearly
02N22W27A03S	Municipal	Unassigned	Unassigned					Yes		Twice yearly
02N22W27K01S	Municipal	Unassigned	UAS					Yes		Twice yearly
02N22W27L01S	Municipal	Unassigned	UAS					Yes		Twice yearly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N22W27M02S	Municipal	Unassigned	UAS					Yes		Twice yearly
02N22W28H02S	Domestic	Unassigned	UAS					Yes		Twice yearly
02N22W30K01S	Agricultural	Oxnard	UAS	Yes					Bimonthly	
02N22W31A01S	Agricultural	Multiple	Unassigned			Yes			Quarterly	
02N22W32C04S	Agricultural	Multiple	UAS	Yes					Bimonthly	
02N22W36E04S	Monitoring	Hueneme	LAS						Twice yearly	
02N22W36E05S	Monitoring	Mugu	UAS						Twice yearly	
02N22W36E06S	Monitoring	Oxnard	UAS			Yes			Twice yearly	
02N22W36E07S	Monitoring	Mugu	UAS			Yes			Twice yearly	
02N22W36E08S	Monitoring	Hueneme	LAS			Yes			Twice yearly	
02N22W36M02S	Monitoring	Unassigned	Unassigned	Yes						

Notes: FCA = Fox Canyon Aquifer; GCA = Grimes Canyon Aquifer; GSP = Groundwater Sustainability Plan; LAS = Lower Aquifer System; O&M = operations and maintenance; UAS = Upper Aquifer System; UWCD = United Water Conservation District.

[a] As of October 2017.

[b] Although sometimes used to mean twice a month (i.e., semimonthly), *bimonthly* as used here means once every 2 months.

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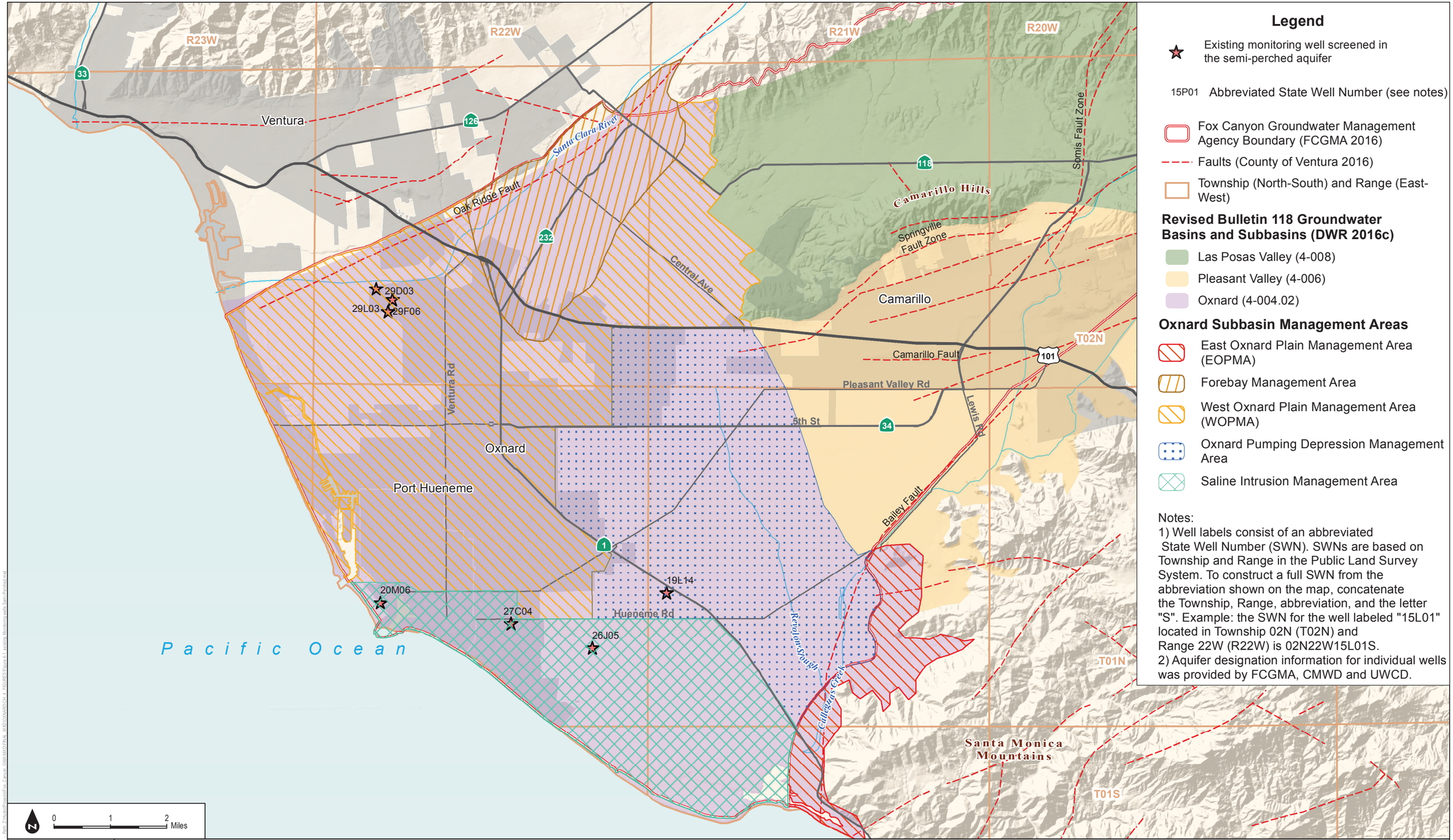

Legend

- Existing monitoring well screened in the semi-perched aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

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FIGURE 4-1

Monitoring Wells Screened in the Semi-Perched Aquifer in the Oxnard Subbasin

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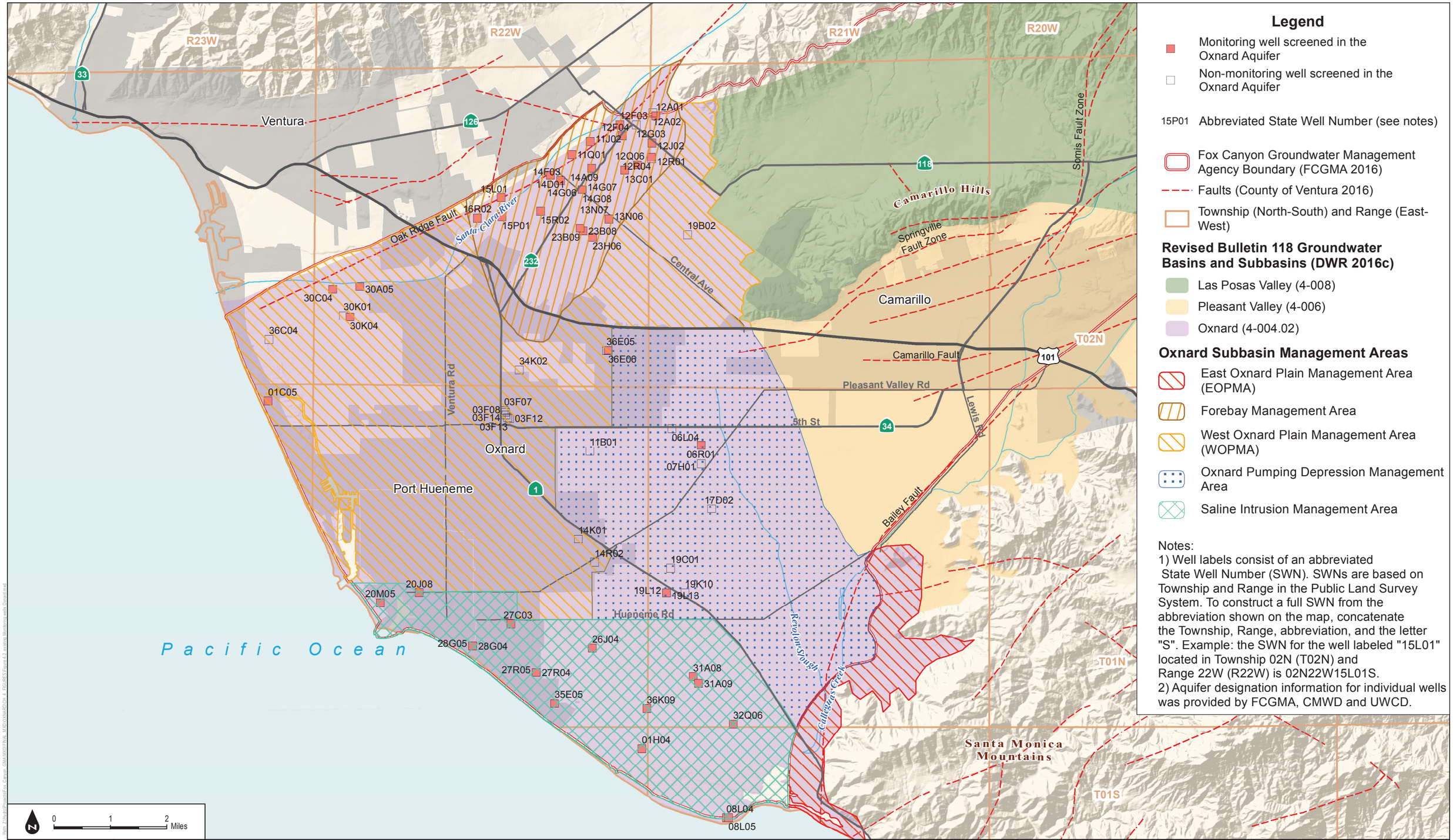

Legend

- Monitoring well screened in the Oxnard Aquifer
- Non-monitoring well screened in the Oxnard Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

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SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-2

Monitoring Wells Screened in the Oxnard Aquifer in the Oxnard Subbasin

Groundwater Sustainability Plan for the Oxnard Subbasin

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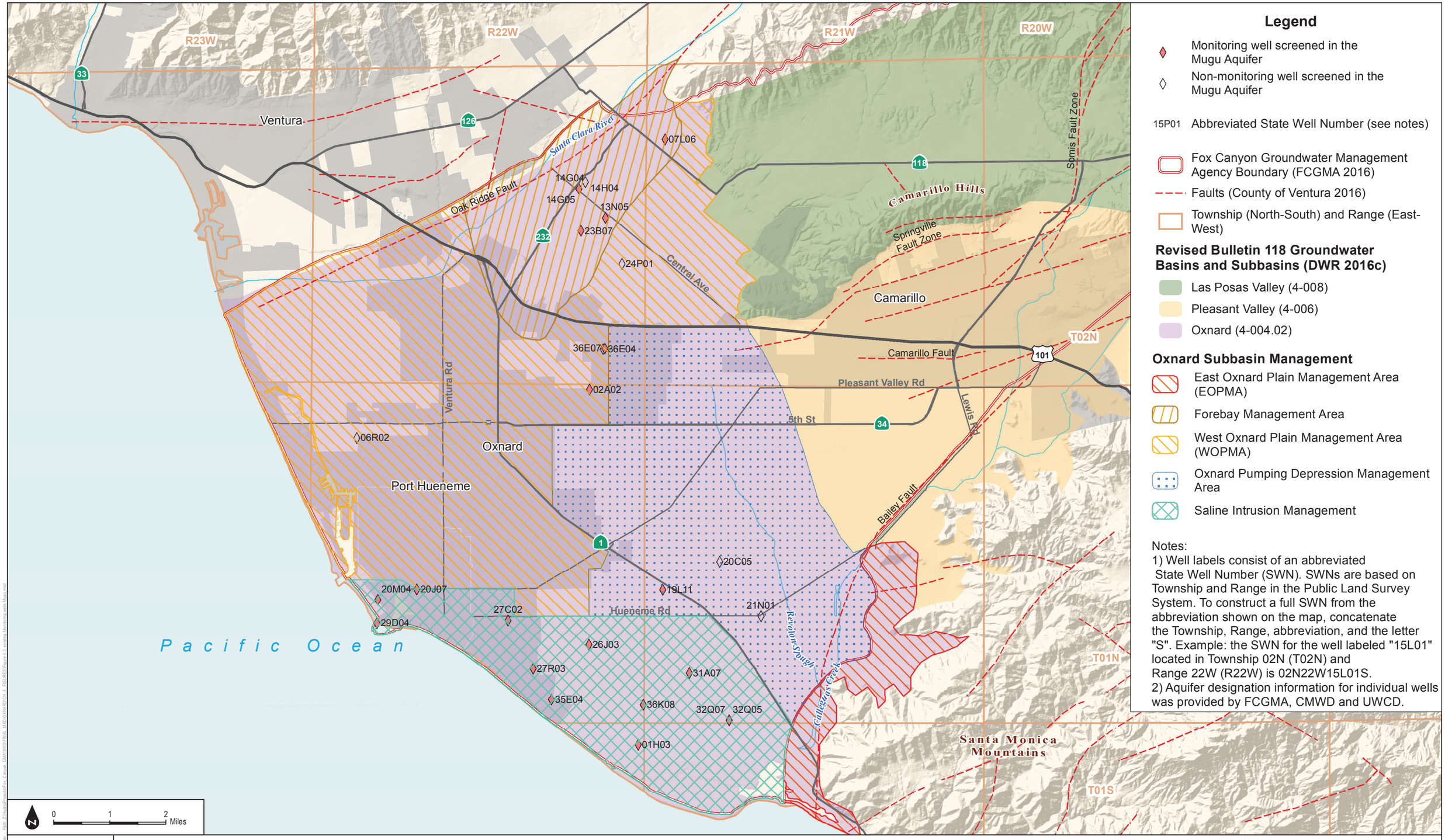

Legend

- Monitoring well screened in the Mugu Aquifer
- Non-monitoring well screened in the Mugu Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-3

Monitoring Wells Screened in the Mugu Aquifer in the Oxnard Subbasin

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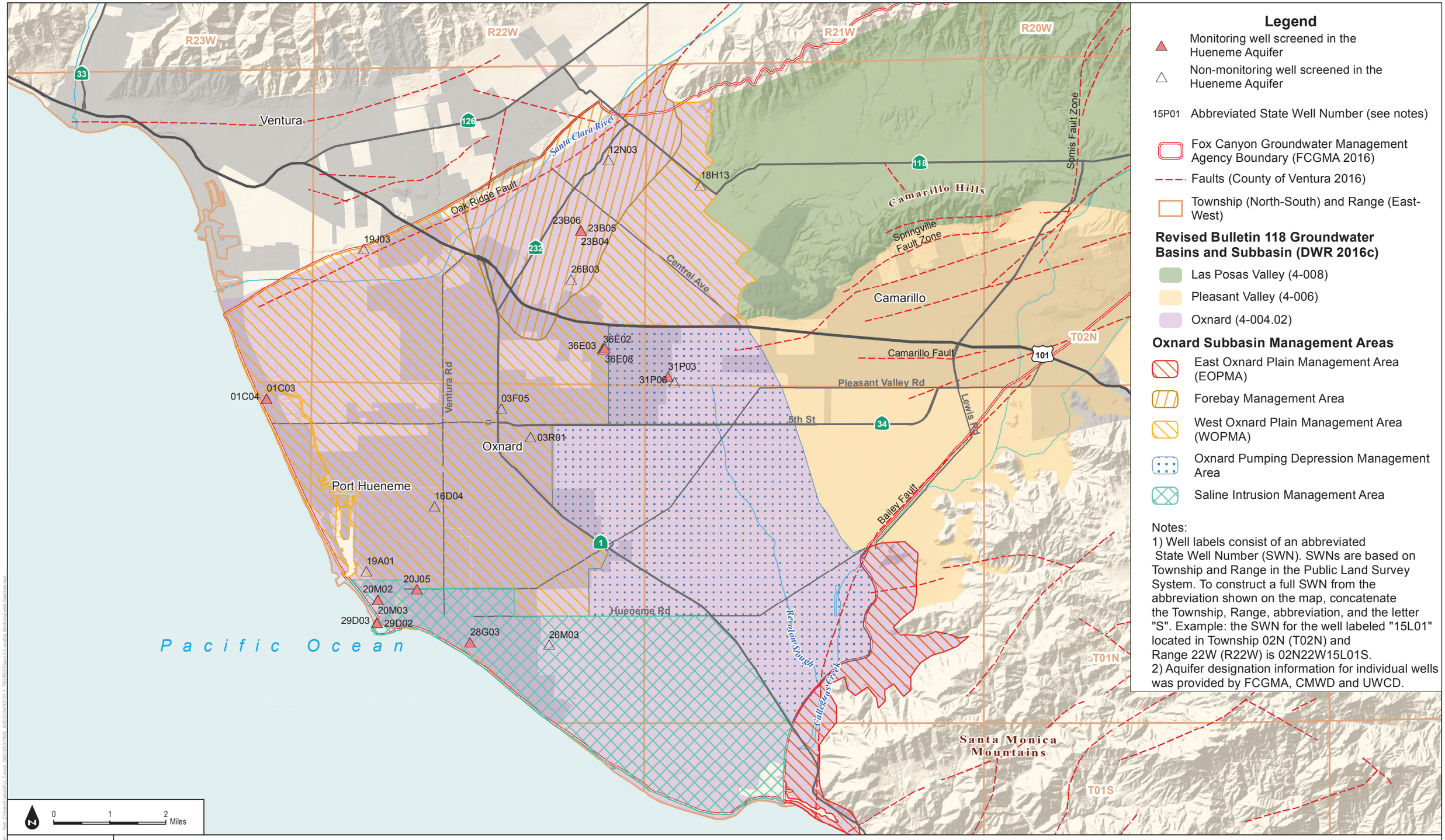

Legend

- Monitoring well screened in the Hueneme Aquifer
- Non-monitoring well screened in the Hueneme Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

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FIGURE 4-4

Monitoring Wells Screened in the Hueneme Aquifer in the Oxnard Subbasin

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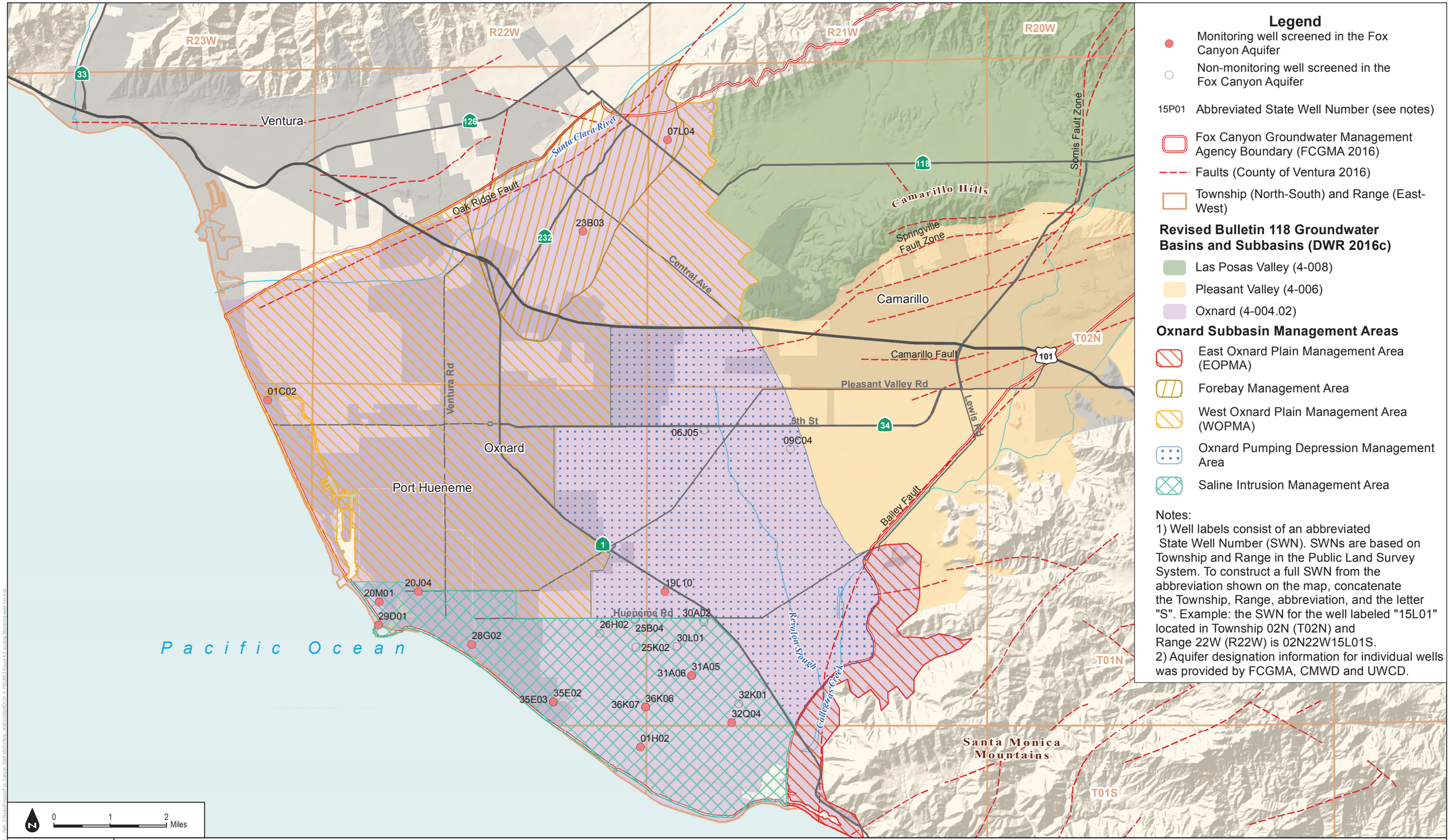

Legend

- Monitoring well screened in the Fox Canyon Aquifer
- Non-monitoring well screened in the Fox Canyon Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-5

Monitoring Wells Screened in the Fox Canyon Aquifer in the Oxnard Subbasin

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Groundwater Sustainability Plan for the Oxnard Subbasin

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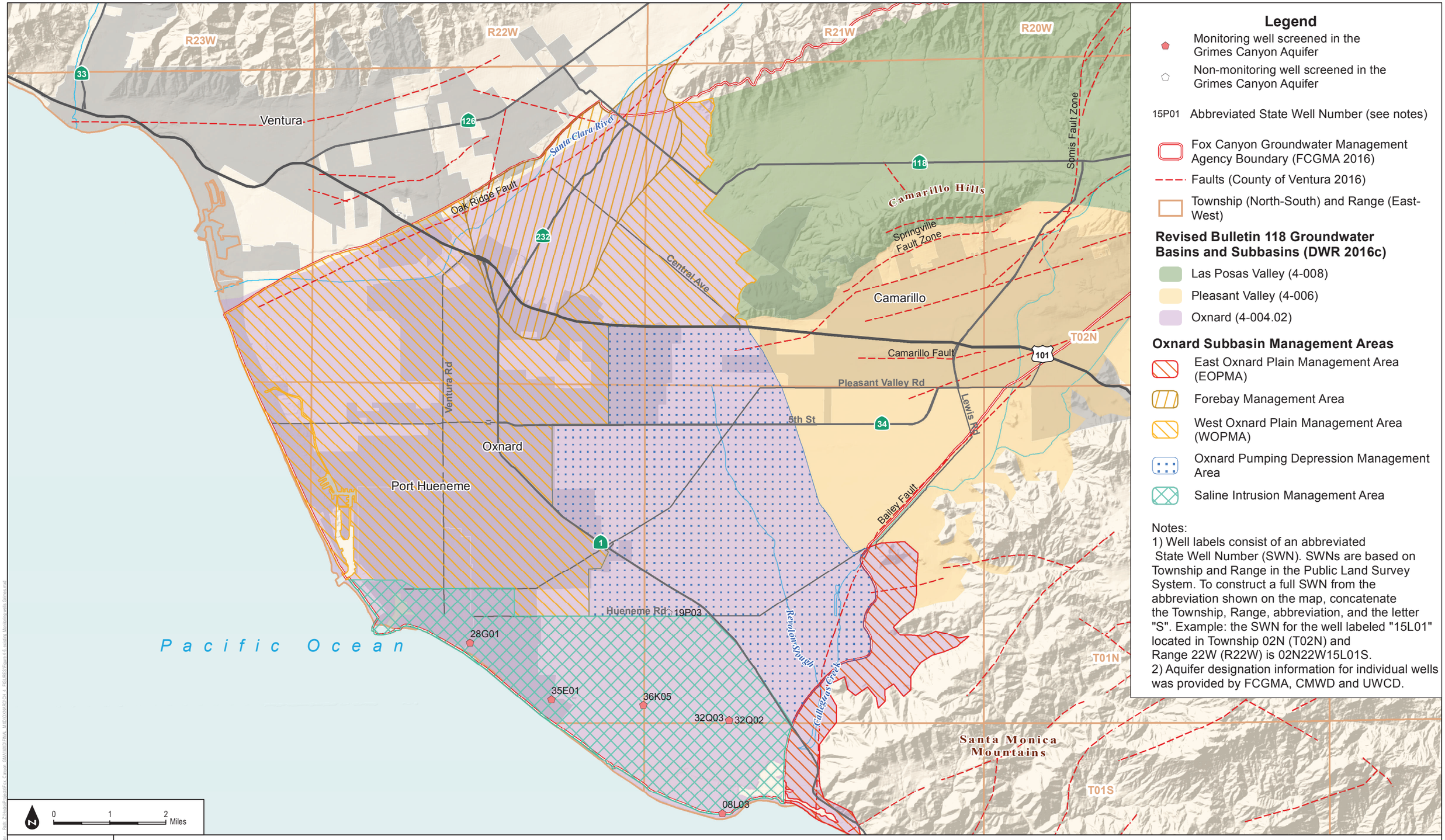

Legend

- Monitoring well screened in the Grimes Canyon Aquifer
- Non-monitoring well screened in the Grimes Canyon Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

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FIGURE 4-6

Monitoring Wells Screened in the Grimes Canyon Aquifer in the Oxnard Subbasin

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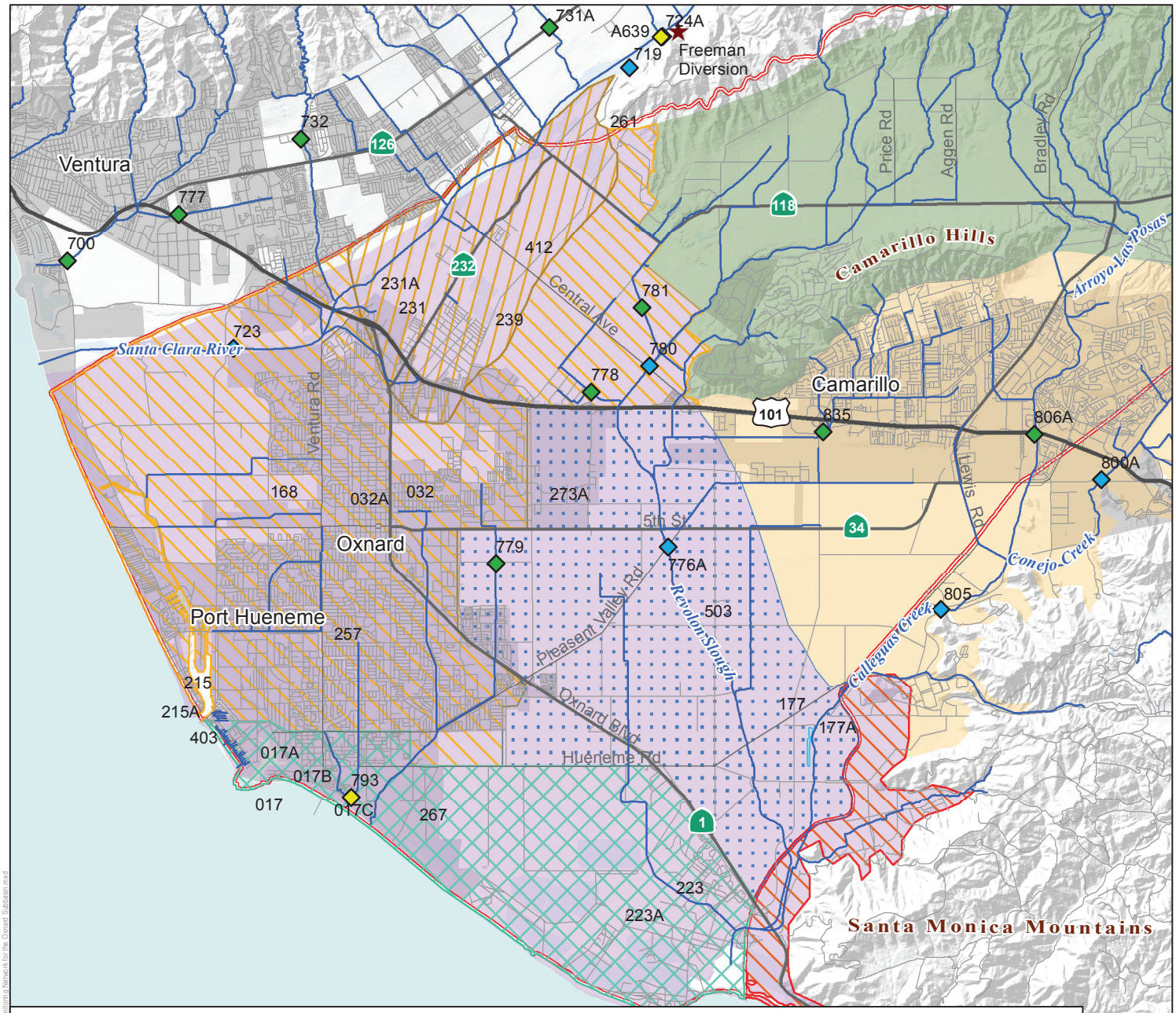

Ventura County Gauge Locations (VCWPD 2016; labeled by station number)

- Recording Stream Gauge
- Peak Only (Event) Site
- ALERT Stream Gauge
- Ventura County Rivers, Streams and Channels (VCWPD 2016)
- Freeman Diversion

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

N

0 0.5 1 2 3 Miles

SOURCE: DWR; County of Ventura; VCWPD

FIGURE 4-7

Active Surface Water Monitoring Network for the Oxnard Subbasin

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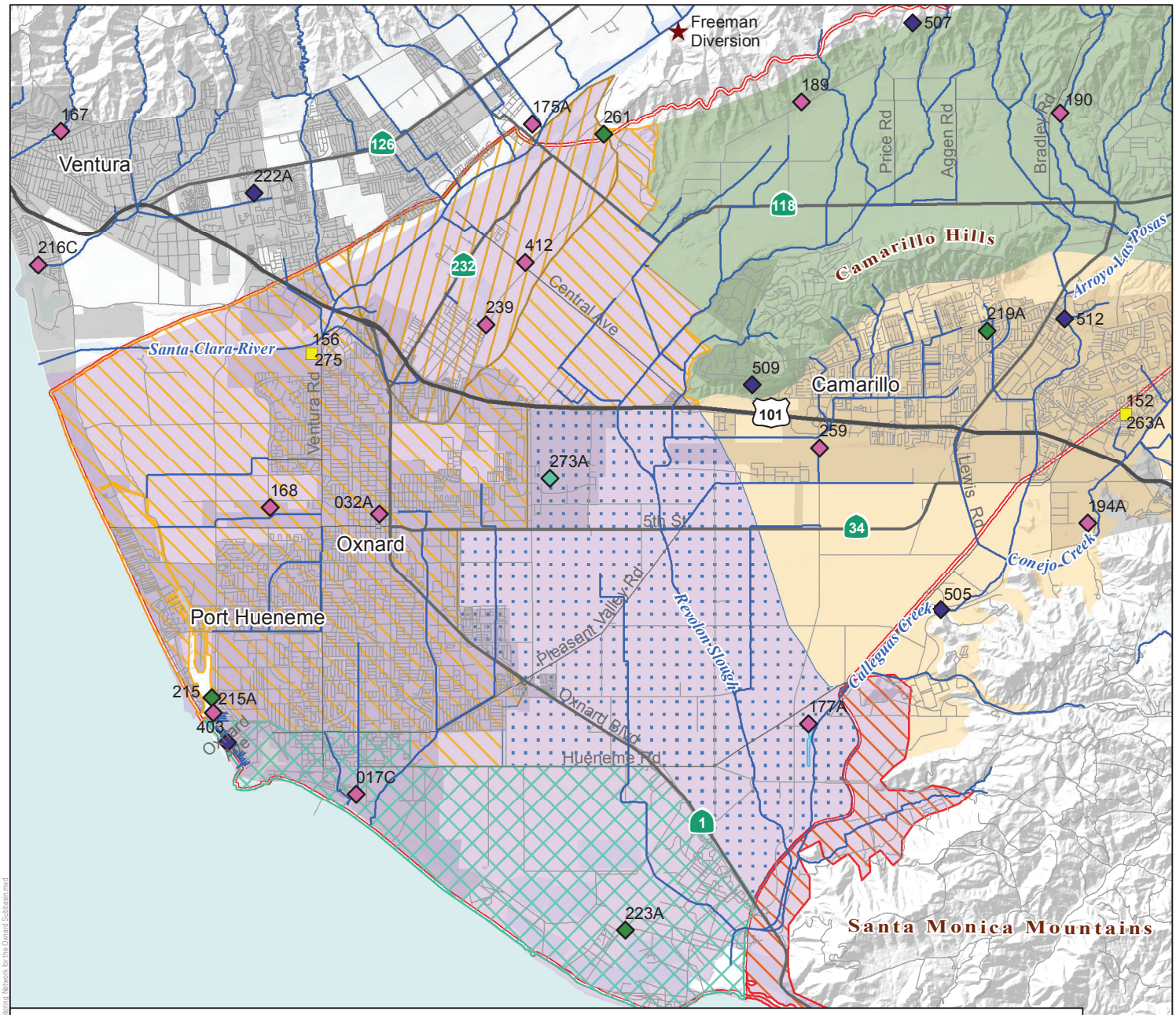

Ventura County Gauge Locations (VCWPD 2016; labeled by station number)

- Recording Precipitation Gauge
- Standard Precipitation
- Storage Precipitation
- Non-Standard Recorder
- ALERT Precipitation Gauge
- Storage Precip & ALERT
- National Weather Service Site
- Ventura County Rivers, Streams and Channels (VCWPD 2016)
- Freeman Diversion
- CIMIS Stations

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

N

0 0.5 1 2 3 Miles

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SOURCE: DWR; County of Ventura; VCWPD

FIGURE 4-8

Active Precipitation Monitoring Network for the Oxnard Subbasin

Groundwater Sustainability Plan for the Oxnard Subbasin

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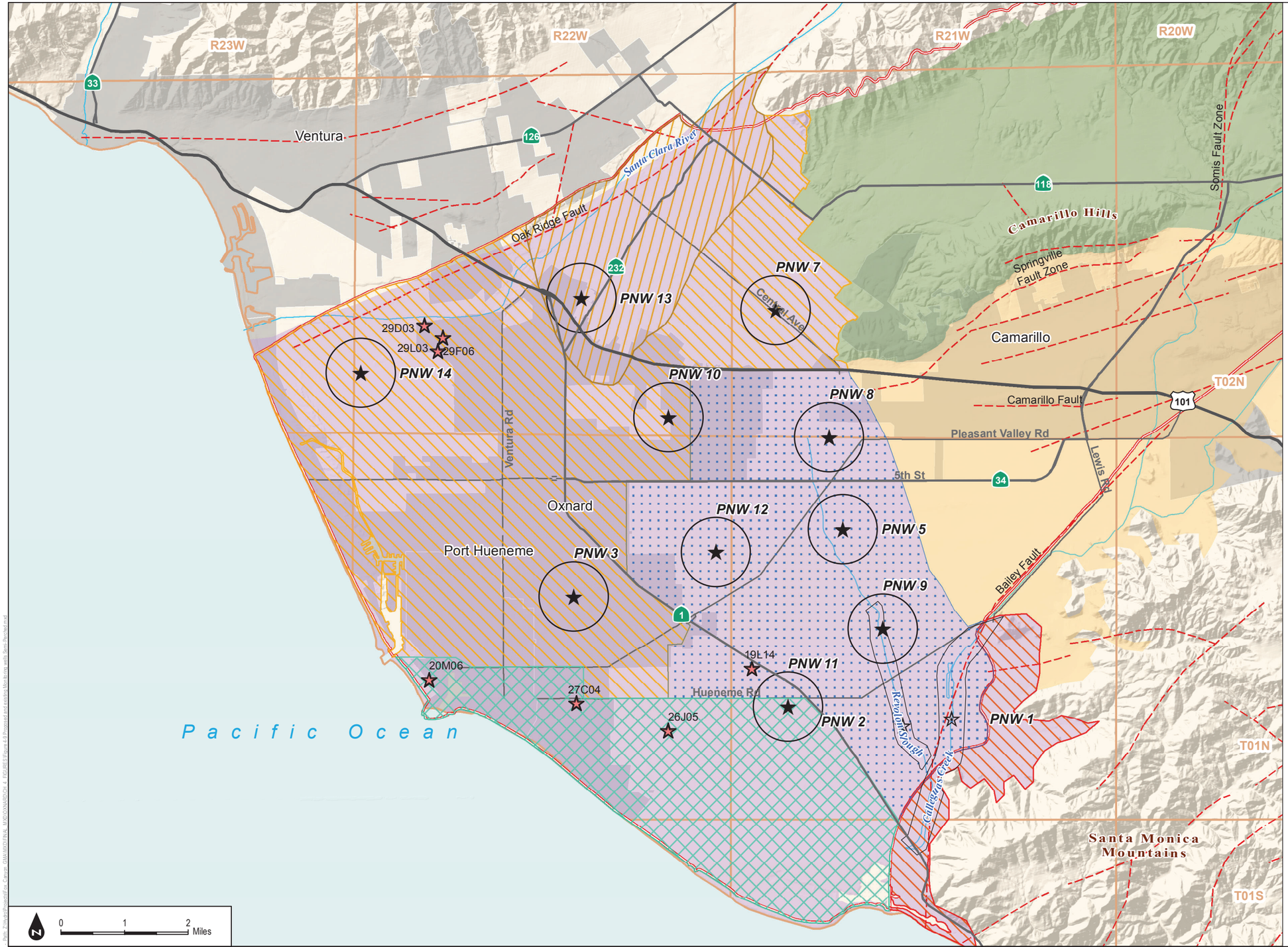

Legend

- Potential well screened in the semi-perched aquifer (nested cluster)
- Potential well screened in the semi-perched aquifer (GDE Monitoring)
- Existing monitoring well screened in the semi-perched aquifer
- 15P01 Abbreviated State Well Number (see notes)
- ***PNW 1*** Potential New Well and location number
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-9

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Semi-Perched Aquifer

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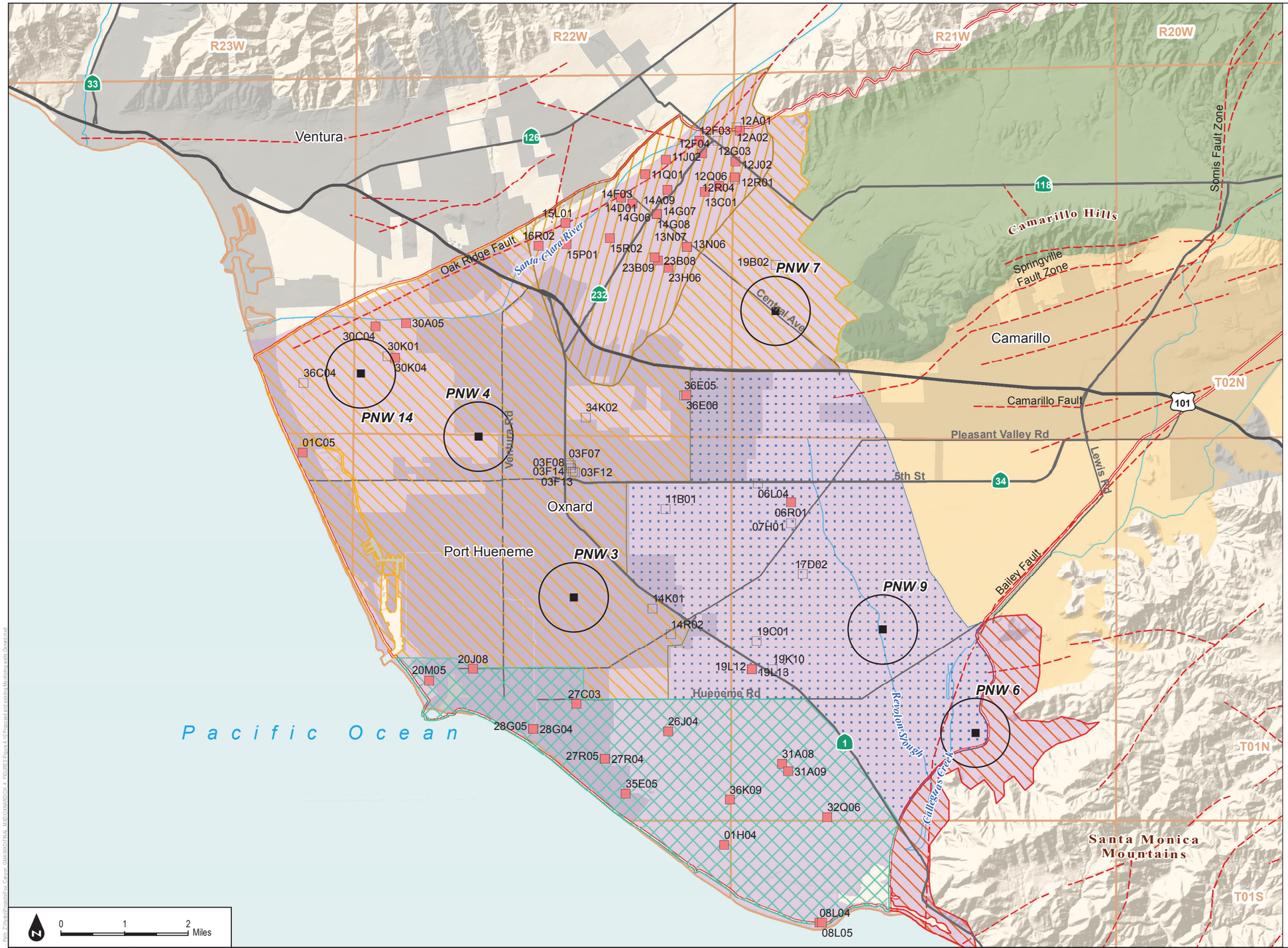

Legend

Installation target for potential new well screened in the Oxnard Aquifer

Monitoring well screened in the Oxnard Aquifer

Non-monitoring well screened in the Oxnard Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

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

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Subbasin Management Areas

East Oxnard Plain Management Area (EOPMA)

Forebay Management Area

West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-10

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Oxnard Aquifer

Groundwater Sustainability Plan for the Oxnard Subbasin

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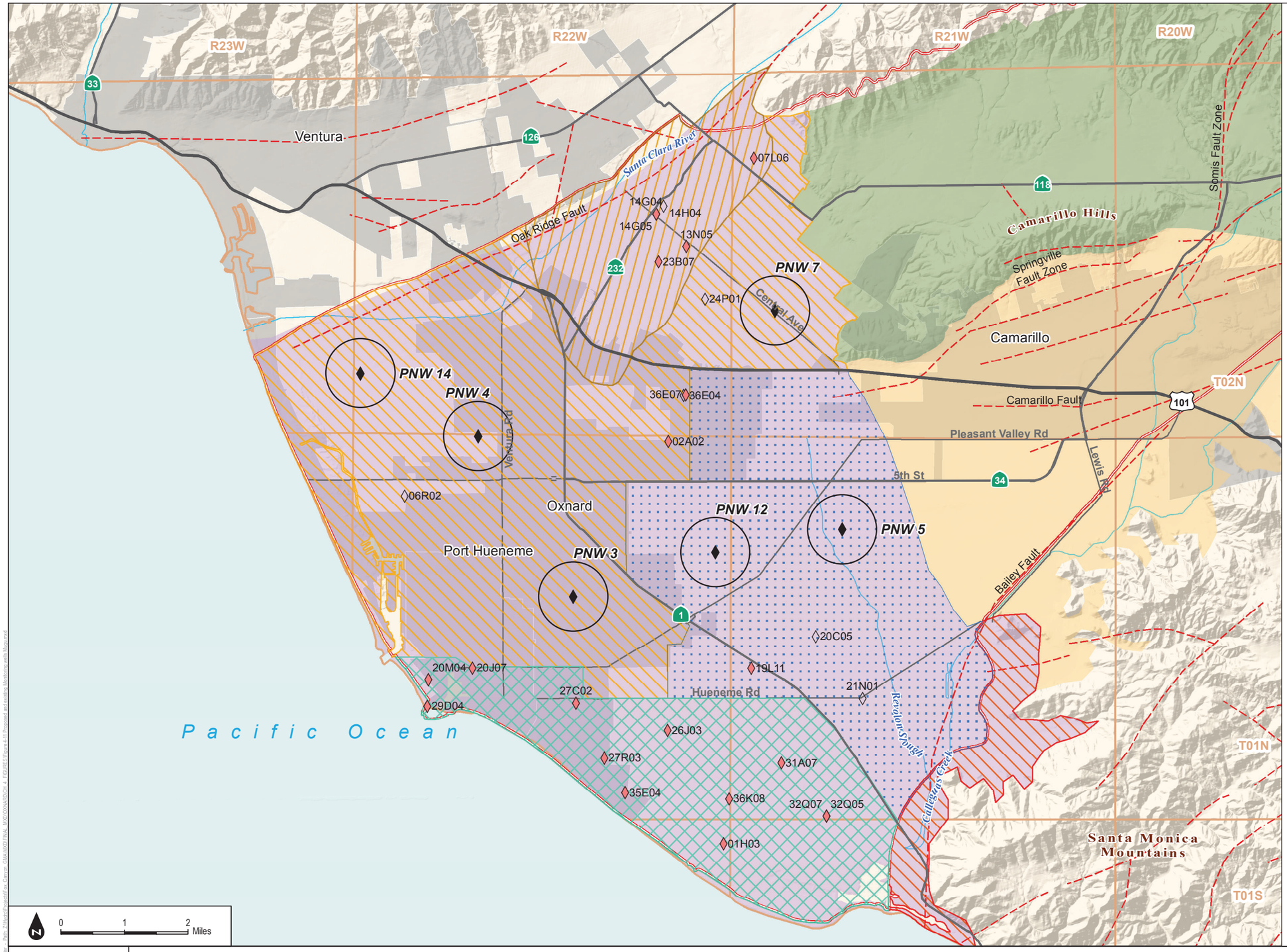

Legend

Installation target for potential well screened in the Mugu Aquifer

Monitoring well screened in the Mugu Aquifer

Non-monitoring well screened in the Mugu Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

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

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-11

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Mugu Aquifer

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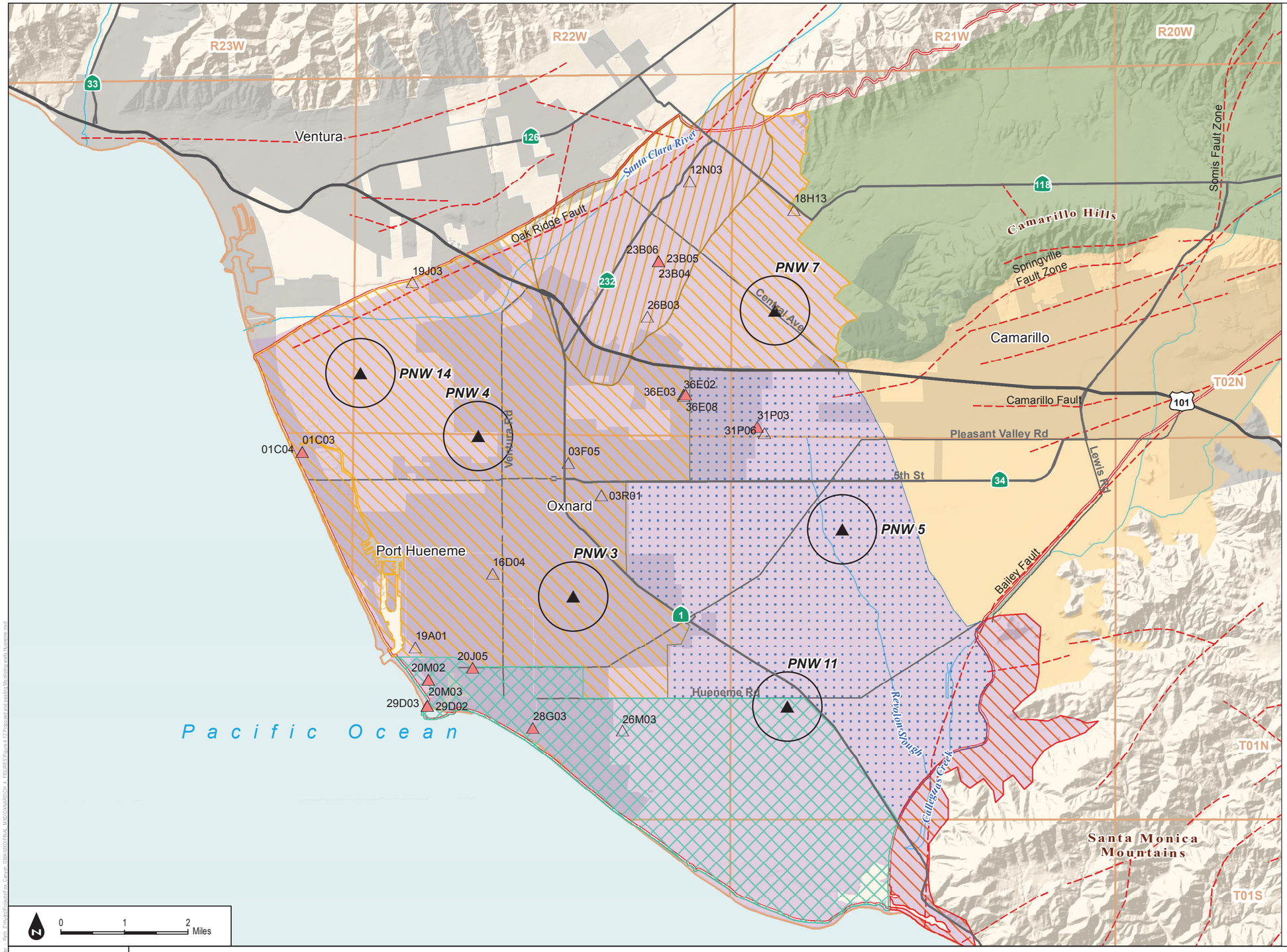

Legend

Installation target for potential well screened in the Hueneme Aquifer

Monitoring well screened in the Hueneme Aquifer

Non-monitoring well screened in the Hueneme Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

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

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Subbasin Management Areas

East Oxnard Plain Management Area (EOPMA)

Forebay Management Area

West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-12

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Hueneme Aquifer

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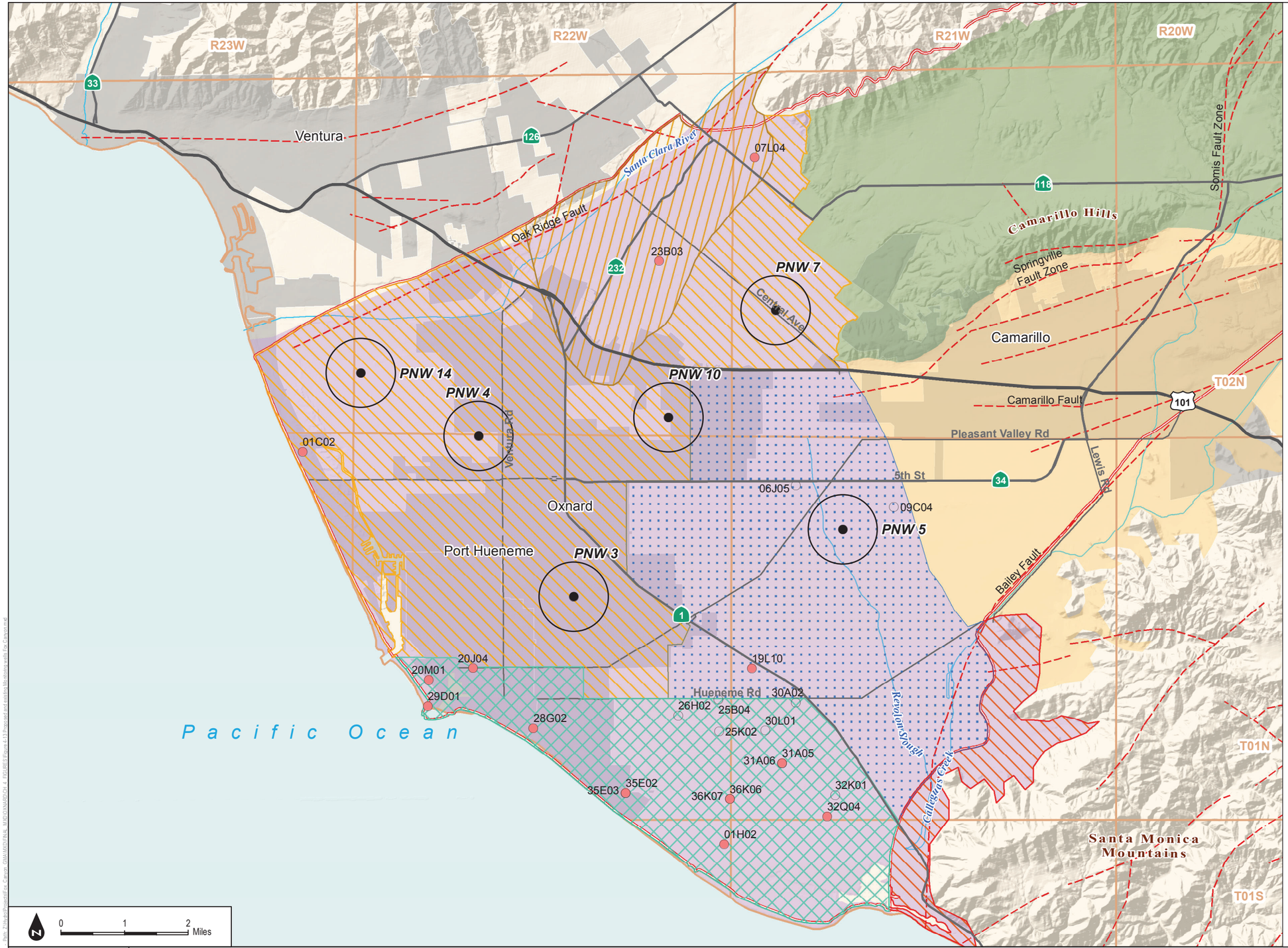

Legend

Installation target for potential well screened in the Fox Canyon Aquifer

Monitoring well screened in the Fox Canyon Aquifer

Non-monitoring well screened in the Fox Canyon Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

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

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Subbasin Management Areas

East Oxnard Plain Management Area (EOPMA)

Forebay Management Area

West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-13

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Fox Canyon Aquifer

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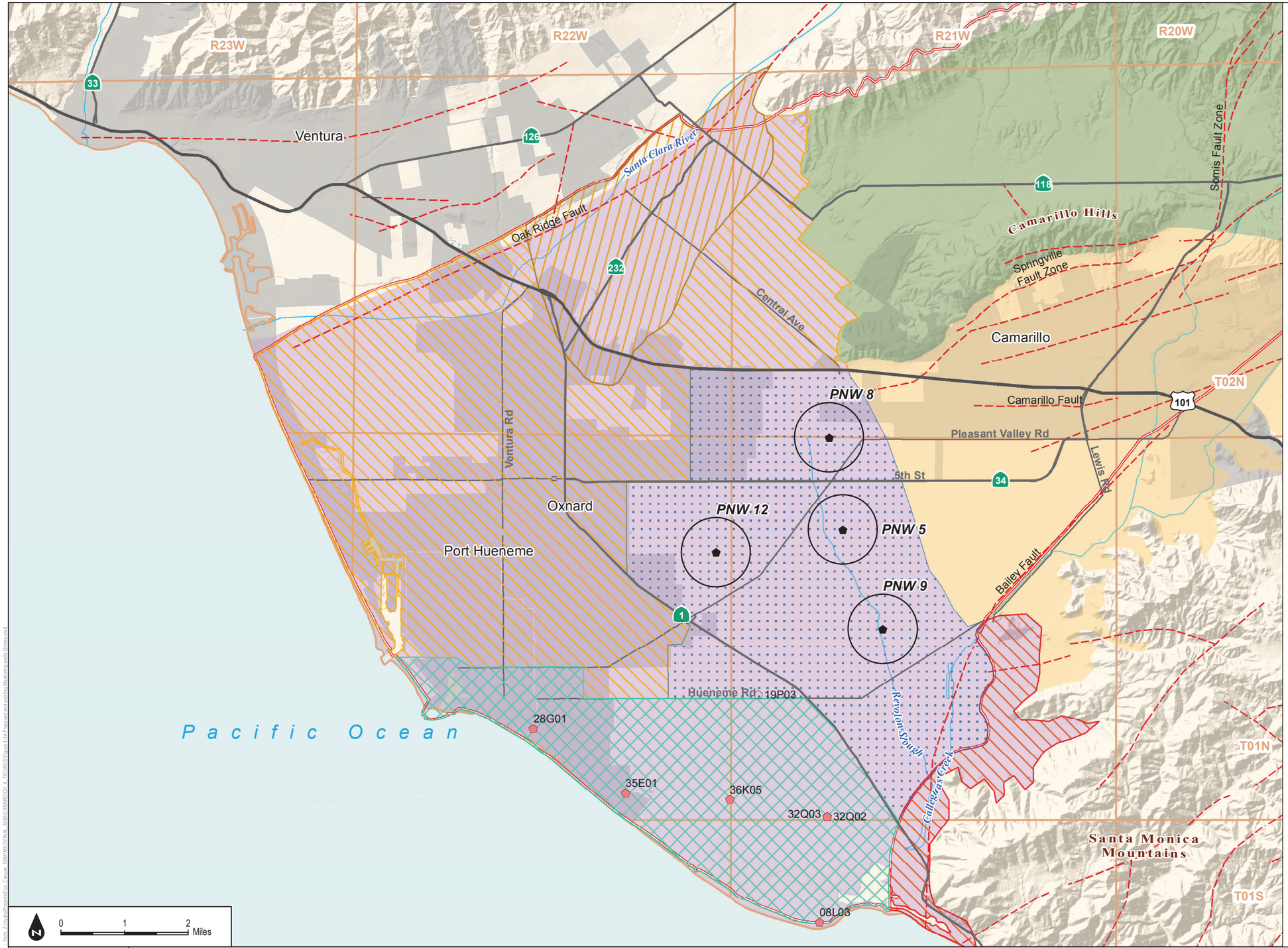

Legend

Potential installation target for proposed well screened in the Grimes Canyon Aquifer

Monitoring well screened in the Grimes Canyon Aquifer

Non-monitoring well screened in the Grimes Canyon Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

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

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Subbasin Management Areas

East Oxnard Plain Management Area (EOPMA)

Forebay Management Area

West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

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 "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-14

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Grimes Canyon Aquifer

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Groundwater Sustainability Plan for the Oxnard Subbasin

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