CHAPTER 3
SUSTAINABLE MANAGEMENT CRITERIA

3.1 INTRODUCTION TO SUSTAINABLE MANAGEMENT CRITERIA

In the Las Posas Valley Basin (LPVB), chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply, along with a corresponding loss of storage and potential for subsidence due to groundwater withdrawal, are the primary undesirable results that can occur when groundwater production exceeds the sustainable yield. In order to sustainably manage the groundwater resources of the LPVB, the LPVB has been divided into three management areas (see Section 2.5, Management Areas, and Figure 1-2, Administrative Boundaries for the Las Posas Valley Basin, of this Groundwater Sustainability Plan [GSP]). These areas are defined by differences in their hydrogeologic properties or historical groundwater elevations.

Declines in groundwater elevation in the West Las Posas Management Area (WLPMA) affect the groundwater gradient across the boundary between the LPVB and the Oxnard Subbasin of the Santa Clara River Valley Groundwater Basin (Oxnard Subbasin). Changes to this gradient impact seawater intrusion in the Oxnard Subbasin, which is in hydraulic communication with the WLPMA (Chapter 2, Basin Setting). The boundary between the WLPMA and the Oxnard Subbasin is not a barrier to flow, but rather is based on a change of lithology in the Upper Aquifer System (UAS) (see Chapter 2). In the Lower Aquifer System (LAS), the Fox Canyon Aquifer (FCA) and the Grimes Canyon Aquifer are continuous across the boundary. Therefore, although the WLPMA has not experienced direct seawater intrusion historically, determination of the sustainable management criteria for the WLPMA is coupled to sustainable management of the Oxnard Subbasin.

Groundwater elevations in the East Las Posas Management Area (ELPMA) are not influenced by and do not influence groundwater elevations in the adjacent groundwater basins, or the other management areas of the LPVB. The same is true for groundwater elevations in the Epworth Gravels Management Area.

On October 28, 2015, the Fox Canyon Groundwater Management Agency (FCGMA) Board of Directors (Board) adopted the following planning goals regarding management of the basins within its jurisdiction (FCGMA 2015):

- Control saline water impact front at its current position.
- Do not allow groundwater quality to further degrade without mitigation.
- No net subsidence due to groundwater withdrawal.
- Promote water levels that mitigate or minimize undesirable results (including pumping trough depressions, surface water connectivity, and chronic lowering of water levels).

These goals, which apply to all basins within FCGMA jurisdiction, guide the definition of undesirable results, minimum thresholds, and measurable objectives in the subsequent sections.

Groundwater elevations are the primary metrics by which progress toward meeting the sustainability goal in the LPVB will be measured. Sustainable management of the LPVB does not necessarily mean, however, that springtime high groundwater levels in the basin remain the same year over year. Rather sustainability can be achieved over cycles of drought and recovery, so long as the impacts to the basin that may occur during periods of drought are not significant or unreasonable. Thus, year over year, groundwater levels may decline during a drought, but sustainable management will result in groundwater levels—and, by extension, land surface elevations and groundwater in storage—returning to pre-drought levels in the wet years following a drought.

3.2 SUSTAINABILITY GOAL

The sustainability goal in the LPVB is to maintain a sufficient volume of groundwater in storage in each management area so that there is no significant and unreasonable net decline in groundwater elevation or storage over wet and dry climatic cycles. Further, groundwater levels in the WLPMA will 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 (see Section 3.3.3, Seawater Intrusion) after 2040.

The sustainability goal for the LPVB recognizes the influence of climatic cycles on groundwater elevations over multi-year periods and requires that assessment of undesirable results in the LPVB be tied to a time period over which net impacts are measured. Critically for the LPVB, climate cycles exert little measurable influence on groundwater elevations (see Chapter 2).

This GSP assesses net impacts to the LPVB over both a 50-year period beginning in 2020 and a 30-year period beginning in 2040. Undesirable results may occur in the LPVB between 2020 and 2039, as progress is made toward achieving the sustainability goal. By 2040, however, management of the LPVB will achieve the sustainability goal. The 30-year period from 2040 through 2069 is referred to as the sustaining period in this GSP, as it is the period on which the evaluation of sustainability is based.

In order to achieve the sustainability goal, groundwater production from the three management areas of the LPVB will need to be reduced relative to historical groundwater production rates. During the first 5 years following GSP adoption, it is anticipated that the groundwater production will begin to be reduced toward the estimated sustainable yield, accounting for the uncertainty assessed in the model water budget and sustainable yield projections for the different management areas (see Section 2.4, Water Budget).

Proposed reductions in groundwater production should take into account both the potential economic disruption to the users of groundwater and the uncertainty in the estimated sustainable yield of the LPVB. Because the management areas of the LPVB are hydrologically separated from each other, the estimated sustainable yield of the LPVB is broken out by management area. The sustainable yield of the WLPMA is approximately 12,500 acre-feet per year (AFY), with an uncertainty estimate of ±1,200 AFY (see Section 2.4.5.1.9, West Las Posas Management Area: Estimates of Future Sustainable Yield). The average 2015–2017 groundwater production rate was approximately 14,000 AFY. The difference between the estimated sustainable yield and the average 2015 production rate is 1,500 AFY. If production is reduced linearly between 2020 and 2040, the estimated groundwater production reduction necessary throughout the geographic extent of the WLPMA over the first 5 years is approximately 375 AFY. To reflect the uncertainty in the estimated sustainable yield estimate, the difference between the upper estimate of the sustainable yield (13,700 AFY) and the 2015 production rate (1,400 AFY) is also examined. This difference is 300 AFY. If production is reduced linearly between 2020 and 2040, the estimated groundwater production reduction necessary throughout the geographic extent of the WLPMA over the first 5 years is approximately 70 AFY. The sustainability goal allows for operational flexibility, as groundwater production patterns are anticipated to change during the GSP implementation period. Progress toward sustainability will be evaluated throughout the 20-year implementation period from 2020 through 2039. The estimated sustainable yield may be revised based on progress toward sustainability in the WLPMA and the Oxnard Subbasin.

In the ELPMA and the Epworth Gravels Management Area combined, the sustainable yield is estimated to be between 17,800 AFY ±2,300 AFY (see Section 2.4.5.2.7, East Las Posas Management Area: Estimates of Future Sustainable Yield). This estimate includes production from the Epworth Gravels Management Area. In the Epworth Gravels Management Area, the sustainable yield is estimated to be approximately 1,300 AFY (see Section 2.4.5.2.7). If the estimated sustainable yield of the Epworth Gravels Management Area is subtracted, the estimated sustainable yield for the ELPMA is approximately 15,700 ±1,250 AFY to 18,700 ±1,500 AFY. The average 2015–2017 groundwater production rate was approximately 20,500 AFY, excluding production from the Epworth Gravels Management Area. To reflect the uncertainty in the estimated sustainable yield, the difference between the upper and lower estimates of the sustainable yield were examined. The difference between the upper estimate of the sustainable yield (20,200 AFY) and the 2015 production rate (20,500 AFY) is 300 AFY. If production is reduced linearly between 2020 and 2040, the estimated groundwater production reduction necessary for the aquifers of the ELPMA over the first 5 years is approximately 75 acre-feet (AF), or 15 AFY. The difference between the lower estimate of the sustainable yield and the average 2015 production rate is 6,000 AFY. If production is reduced linearly between 2020 and 2040 the reduction in groundwater production over the first 5 years is approximately 1,500 AF, or 300 AFY.

The average 2015 production rate in the Epworth Gravels Aquifer was approximately 1,500 AFY. The difference between the estimated sustainable yield and the 2015 production rate is 200 AFY. If production is reduced linearly between 2020 and 2040, the estimated groundwater production reduction necessary for the aquifers of the ELPMA over the first 5 years is approximately 50 AFY. As is true for the WLPMA, the sustainability goal in the ELPMA and the Epworth Gravels Aquifer allows for operational flexibility and progress toward sustainability will be evaluated throughout the 20-year implementation period. The estimated sustainable yield may be revised based on progress toward sustainability over the next 5 years.

The following sections describe the undesirable results that have occurred and may occur within the LPVB, the minimum thresholds developed to avoid future undesirable results, and the measurable objectives that account for the need to continue groundwater production during drought cycles and the associated interim milestones to help gauge progress toward sustainability over the next 20 years.

3.3 UNDESIRABLE RESULTS

Under the Sustainable Groundwater Management Act (SGMA), undesirable results occur when the effects caused by groundwater conditions occurring throughout the basin cause significant and unreasonable impacts to any of the six sustainability indicators. These sustainability indicators are:

- Chronic lowering of groundwater levels
- Reduction of groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletions of interconnected surface water

The definition of what constitutes a significant and unreasonable impact for each sustainability indicator is determined locally using the processes and criteria set forth in this GSP. Each of the sustainability indicators is discussed below, in the context of undesirable results.

3.3.1 Chronic Lowering of Groundwater Levels

Chronic lowering of groundwater levels resulting in a significant and unreasonable depletion of supply is an undesirable result applicable to the LPVB. Chronic lowering of groundwater levels in the LPVB is also associated with depletion of groundwater in storage, degradation of groundwater quality, and subsidence. Depletion of groundwater in storage will occur in the LPVB if groundwater production exceeds the natural and artificial recharge over a multi-year period that includes both wetter than average and drier than average conditions. Degradation of groundwater quality may occur in the ELPMA if groundwater production results in migration of poor-quality recharge water along Arroyo Simi–Las Posas. Subsidence can occur in the LPVB if groundwater elevations fall below historical low water levels for a sufficient time to allow collapse of the pore structure and settling of geologic formations.

Direct seawater intrusion is not a concern in the LPVB (see Section 3.3.3); however, groundwater elevations in the WLPMA impact groundwater elevations in the Oxnard Subbasin to the west. Consequently, chronic lowering of groundwater levels in the WLPMA 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 western part of the WLPMA, adjacent to the Oxnard Subbasin. Declines in groundwater elevation in the eastern part of the WLPMA are less likely to influence seawater intrusion in the Oxnard Subbasin.

The primary cause of groundwater conditions in the LPVB that would lead to chronic lowering of groundwater levels is groundwater production in excess of natural and artificial recharge. Groundwater production from the LPVB would result in significant and unreasonable lowering of groundwater levels if the groundwater levels were lowered to an elevation below which:

- Groundwater levels do not recover to pre-drought conditions during multi-year periods of above-average precipitation that follow a drought.
- The Oxnard Subbasin is unable to prevent net landward migration of the saline water impact front after 2040.
- Subsidence that substantially interferes with surface land uses is induced.

Of these criteria, chronic lowering of groundwater levels and impacting the landward migration of the saline water impact front are the most likely to occur in the LPVB. Historically, the LPVB has not experienced subsidence that substantially interfered with surface land uses.

West Las Posas Management Area

Based on need for the coordinated management of the LPVB and the Oxnard Subbasin, the criteria used to define undesirable results for chronic lowering of groundwater levels in the western part of the WLPMA are groundwater levels that indicate a long-term decline over periods of drought and recovery, and net landward migration of the 2015 saline water impact front after 2040. It is expected that there will be some landward migration of this front between 2020 and 2040 as FCGMA undertakes the necessary projects and management actions toward achieving sustainability in 2040. The minimum thresholds metric against which chronic lowering of groundwater levels will be measured is groundwater levels from which complete recovery can be achieved over anticipated periods of drought and above average precipitation. These groundwater levels, which are higher than previous historical low groundwater levels, are anticipated to prevent net landward migration of the 2015 saline water impact front in the Oxnard Subbasin. (Table 3-1, Minimum Threshold Groundwater Elevations by Well, Management Area, and Aquifer for Key Wells in the Las Posas Valley Basin; Figure 3-1, Key Wells Screened in the Fox Canyon Aquifer for the Las Posas Valley Basin, and Figure 3-2, Key Wells Screened in the Shallow Alluvial Aquifer and Epworth Gravels Aquifer for the Las Posas Valley Basin).

The criterion used to define undesirable results for chronic lowering of groundwater levels in the eastern part of the WLPMA is groundwater levels that indicate a long-term decline over periods of drought and recovery. The minimum thresholds metric against which chronic lowering of groundwater levels will be measured is groundwater levels from which complete recovery can be achieved over anticipated periods of drought and above-average precipitation.

East Las Posas Management Area

Groundwater elevation declines in the ELPMA result in differential impacts depending on location within the management area. In the vicinity of the Moorpark anticline and on the northern and southern boundaries of the ELPMA, declines in groundwater elevation will result in currently confined areas of the FCA becoming unconfined. In order to limit the area of the FCA that becomes unconfined and to preserve groundwater storage for users of groundwater in the ELPMA, a storage loss of greater than 20% of the 2015 groundwater storage in the areas prone to greater impacts from conversion of the FCA to unconfined conditions was defined as the undesirable result. Limiting the long-term loss of storage to no more than 20% in these areas of the ELPMA was determined to be a reasonable approach by the FCGMA Board to avoid significant and unreasonable loss of supply.

The criteria used to define undesirable results for chronic lowering of groundwater levels in the ELPMA are groundwater levels that indicate a long-term decline over periods of drought and recovery, and groundwater levels that result in localized loss of storage in excess of 20% of the estimated 2015 groundwater storage. The minimum thresholds metric against which chronic lowering of groundwater levels will be measured is groundwater levels that prevent greater than 20% loss of storage in the areas of the ELPMA that will be most impacted by ongoing declines in groundwater elevation.

Epworth Gravels Management Area

Historical groundwater elevation declines in the Epworth Gravels Aquifer have resulted in loss of groundwater supply in this aquifer. As deeper wells, screened in the FCA, replaced wells in the Epworth Gravels Aquifer, groundwater elevations in the Epworth Gravels Aquifer recovered (see

Chapter 2). In order to maintain a sufficient volume of groundwater in storage in the Epworth Gravels Aquifer, the criteria used to define undesirable results for chronic lowering of groundwater levels in the Epworth Gravels Management Area is the same as it is for the ELPMA: groundwater levels that indicate a long-term decline over periods of drought and recovery and groundwater levels that result in loss of storage in excess of 20% of the estimated 2015 groundwater storage. The minimum thresholds metric against which chronic lowering of groundwater levels will be measured is groundwater levels from which complete recovery can be achieved over anticipated periods of drought and above-average precipitation.

3.3.2 Reduction of Groundwater Storage

Significant and unreasonable reduction of groundwater storage is an undesirable result applicable to the LPVB. Reduction of groundwater storage in the LPVB is also associated with chronic lowering of groundwater levels and subsidence. Additionally, because reduction of groundwater storage in the WLPMA is correlated with declines in groundwater elevations, reduction in groundwater storage in the WLPMA 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 2015 saline water impact front after 2040.

The primary cause of groundwater conditions in the LPVB that would lead to reduction in groundwater storage is groundwater production in excess of recharge over cycles of drought and recovery. Groundwater production from the LPVB may result in a significant and unreasonable reduction of groundwater in storage if the volume of groundwater produced from the basin exceeds the volume of freshwater recharging the basin over a cycle of drought and recovery. Changes in groundwater in storage that would indicate significant and unreasonable depletions differ between management areas.

Reduction of groundwater storage has the potential to impact the beneficial uses and users of groundwater in the LPVB by limiting the volume of groundwater available for agricultural, municipal, industrial, and domestic use. These impacts can affect all users of groundwater in the LPVB.

Groundwater elevations within each management area of the LPVB will be used to determine whether significant and unreasonable reduction of groundwater in storage is occurring. All of the management areas have wells in which groundwater levels can be monitored.

West Las Posas Management Area

In the WLPMA, reduction in groundwater in storage would become significant and unreasonable if (1) groundwater levels were lowered to an elevation below which they could not recover during a multi-year period of above-average precipitation or (2) groundwater levels were lowered to elevations below which the Oxnard Subbasin would experience net seawater intrusion in the UAS and LAS over cycles of drought and recovery from 2040 through 2069.

Numerical model groundwater model simulations indicate that since 1985 the volume of groundwater in storage has decreased in both the shallow aquifer system and the LAS (Section 2.3.2, Estimated Change in Storage; Appendix E, UWCD Model Report). The cumulative decrease in groundwater storage in the shallow aquifer system was 6,800 AF between 1985 and 2015. In the LAS, the cumulative decrease in groundwater storage over the same period was approximately 63,400 AF. The decrease in storage in the LAS reflects falling groundwater levels between water years 1985 and 1991, as well as between 2010 and 2015 (Figure 2-27, West Las Posas Management Area Cumulative Change in Storage). These groundwater levels are independent of water year type because they were driven by two periods of groundwater production in excess of recharge that were offset by delivery of surface water in lieu of groundwater production.

Based on the sustainability goal for the WLPMA, the criteria used to define undesirable results for reduction in groundwater storage are groundwater levels that indicate a long-term decline over periods of drought and recovery, and landward migration of the 2015 saline water impact front in the Oxnard Subbasin after 2040. The minimum thresholds metric against which reduction in groundwater storage will be measured in the western WLPMA is groundwater levels that were selected to prevent net landward migration of the 2015 saline water impact front, and net seawater intrusion after 2040. These groundwater elevations are higher than previous historical low groundwater levels (Table 3-1). The minimum thresholds metric against which reduction in groundwater storage will be measured in the eastern part of the WLPMA is a groundwater level that allows for complete recovery during multi-year periods of above-average precipitation that follow a drought.

East Las Posas Management Area

In the ELPMA, reduction in groundwater in storage would become significant and unreasonable if groundwater levels were lowered to an elevation below which parts of the ELPMA experience greater than 20% loss of storage relative to the 2015 groundwater storage estimates from the CMWD model. Limiting the long-term loss of storage to no more than 20% in these areas of the ELPMA was determined to be a reasonable approach by the FCGMA Board to avoid significant and unreasonable loss of supply.

Numerical groundwater model simulations indicate that since 1985 the volume of groundwater in storage has increased in all of the aquifers of the ELPMA (Section 2.3.2; Appendix E). The cumulative change in storage from water year 1985 through water year 2015 for the Shallow Alluvial Aquifer, Epworth Gravels Aquifer, Upper San Pedro Formation, FCA, and Grimes Canyon Aquifer were increases of approximately 7,600 AF, 2,700 AF, 53,700 AF, 44,700 AF, and 3,800 AF, respectively, for a total cumulative storage increase in the basin of approximately 112,500 AF (Figure 2-29). The change in storage in the FCA and Grimes Canyon Aquifer is not uniform geographically. Groundwater elevations and groundwater storage in 2015 were higher than they were in 1985 in areas of the FCA that are adjacent to Arroyo Simi–Las Posas and south of the Moorpark anticline. In areas north of the Moorpark anticline, or more distant from Arroyo Simi–Las Posas, groundwater elevations were lower in 2015 than in 1985. The increase in groundwater in storage in the south offset declines in storage north of the Moorpark anticline. The different groundwater level response between these areas reflects the influence of additional recharge along Arroyo Simi–Las Posas since the 1970s as well as the influence of geologic structures in impacting subsurface groundwater flow. Simi Valley Water Quality Control Plant (SVWQCP) and shallow dewatering well discharges in Simi Valley reached the ELPMA via Arroyo Simi–Las Posas, and provided additional recharge to the management area. The Moorpark anticline acted as a partial barrier to subsurface flow in the ELPMA, limiting the impact of this recharge to the areas south of the anticline and adjacent to Arroyo Simi–Las Posas.

Based on the sustainability goal for the ELPMA, the criteria used to define undesirable results for reduction in groundwater storage are groundwater levels that indicate a long-term decline over periods of drought and recovery, and result in greater than 20% loss of storage in areas of the ELPMA that are most impacted by declines in groundwater level. The minimum thresholds metric against which reduction in groundwater storage will be measured in the ELPMA is groundwater levels that were selected to prevent both long-term declines over periods of drought and recovery, and storage loss of greater than 20% in areas of the ELPMA that are most impacted by declines in groundwater level. In areas of the ELPMA that receive recharge from Arroyo Las Posas, these groundwater elevations are equal to the historical low groundwater elevations (Table 3-1). In areas of the ELPMA that do not receive recharge from Arroyo Las Posas, these groundwater elevations are lower than the historical low groundwater elevation because groundwater elevations have been continuously declining and are currently at the historical low (Table 3-1). In these areas of the ELPMA, the minimum threshold prevents further long-term loss of storage, but allows for some decline between 2020 and 2040.

Epworth Gravels Management Area

In the Epworth Gravels Management Area, reduction in groundwater in storage would become significant and unreasonable if groundwater levels were lowered to an elevation below which parts of the ELPMA experience greater than 20% loss of storage relative to the 2015 groundwater storage estimates from the CMWD model. Limiting the long-term loss of storage to no more than 20% in these areas of the ELPMA was determined to be a reasonable approach by the FCGMA Board to avoid significant and unreasonable loss of supply.

Historically, groundwater elevations in the Epworth Gravels Management Area have fallen to levels that caused significant and unreasonable results in the Epworth Gravels Aquifer. When groundwater elevations declined in the past, well owners drilled deeper wells into the FCA. When this occurred, production from the Epworth Gravels Aquifer was reduced and groundwater elevations recovered. In order to prevent groundwater elevations from declining to a level at which well owners would drill deeper in the future, the criteria used to define undesirable results for reduction in groundwater storage are groundwater levels that indicate a long-term decline over periods of drought and recovery, and result in greater than 20% loss of storage compared to 2015 groundwater storage estimates.

3.3.3 Seawater Intrusion

Seawater intrusion is not an undesirable result that applies to the LPVB. Direct seawater intrusion has not occurred historically in the LPVB. Seawater intrusion has impacted the Oxnard Subbasin, which is adjacent to and in hydraulic communication with the WLPMA. Currently, the area of the Oxnard Subbasin impacted by concentrations of chloride greater than 500 milligrams per liter (mg/L) is generally west of Highway 1 and south of Hueneme Road. Sources of water high in chloride in the Oxnard Subbasin include modern seawater as well as brines and connate water in fine-grained marine-deposited sediments. Therefore, this area is referred to as the "saline water impact area," rather than the "seawater intrusion impact area," to reflect all the potential sources of chloride to the aquifers in this area.

Because the WLPMA and the Oxnard Subbasin are in hydraulic communication, it is theoretically possible for seawater intrusion to impact the WLPMA. However, particle tracks from groundwater model simulations that continue the present groundwater production rates in the WLPMA and the Oxnard Subbasin over the next 50 years suggest that the current extent of the saline water impact front will remain over 5 miles away from the WLPMA boundary (FCGMA 2019). Additionally, FCGMA is one of the GSAs for both the Oxnard Subbasin and the LPVB and has the authority to manage groundwater flows between the Oxnard Subbasin and the WLPMA to prevent the net landward migration of the 2015 saline water impact front. Therefore, seawater intrusion is unlikely to occur in the LPVB in the future. Because seawater intrusion has not occurred historically in the LPVB and is not likely to occur in the LPVB in the future, specific criteria for undesirable results related to seawater intrusion are not established in this GSP.

3.3.4 Degraded Water Quality

Degraded water quality is an undesirable result applicable to the LPVB. This undesirable result primarily applies to the WLPMA and the ELPMA. The Epworth Gravels Management Area has limited historical water quality data. The available data indicate that the water quality in the Epworth Gravels Management Area has not exceeded the water quality objectives. This management area receives recharge primarily from precipitation infiltration and the water quality in the management area reflects the water quality of the recharge. The sections below discuss water undesirable results related degraded water quality in the WLPMA and the ELPMA.

West Las Posas Management Area

Concentrations of total dissolved solids (TDS), nitrate, sulfate, and boron exceed the water quality objectives (WQOs) in the WLPMA. TDS and nitrate concentrations exceeding the WQOs are localized to the area adjacent to the Oxnard Forebay. These concentrations are not caused by groundwater conditions occurring throughout the WLPMA. Rather, concentrations of TDS and nitrate above WQOs and Basin Management Objectives are likely a legacy of historical septic discharges and historical agricultural fertilizer application practices.[1] Concentrations of sulfate and boron that exceed the WQOs occur over a larger area of the WLPMA. These concentrations may reflect native groundwater concentrations in the aquifers. There is no indication that groundwater production has contributed to an increase in these concentrations over time (Appendix F, Water Quality Hydrographs).

Degradation of groundwater quality from increased concentrations of TDS, nitrate, sulfate, and boron has the potential to impact the beneficial uses and users of groundwater in the WLPMA by (1) limiting the volume of groundwater available for agricultural, municipal, industrial, and domestic use or (2) requiring construction of treatment facilities to remove the constituents of concern.

The primary cause of groundwater conditions in the WLPMA that would lead to degradation of water quality from increased concentrations of TDS, nitrate, sulfate, and boron is resumption of previous land use practices. Groundwater production from the WLPMA may result in a significant and unreasonable degradation of water quality if areas that have not previously been impacted become impacted by TDS, nitrate, sulfate, and boron concentrations that limit agricultural and potable use. This could occur if groundwater production creates groundwater gradients that cause migration of water with concentrations of TDS, nitrate, sulfate, and boron that limit agricultural use into areas that were not previously degraded.

Based on the sustainability goals for the LPVB, the criteria used to define undesirable results for degraded water quality in the WLPMA are groundwater elevations that indicate a long-term decline over periods of drought and recovery. The minimum thresholds metric against which degradation of water quality will be measured is groundwater levels that were selected to prevent long-term declines over periods of drought and recovery. These groundwater elevations are equal to, or higher than, previous historical low water levels (Table 3-1).

Sustainable groundwater management of the LPVB will mitigate or minimize the undesirable result of degraded water quality related to groundwater production. Water quality will continue to

1 Ventura County extended sewer lines into this area in the years between 2000 and 2011 to address additional discharges of nitrate.

be monitored over the next 5 years (see Chapter 4, Monitoring Networks). As additional data are collected, the effectiveness of applying a water level threshold to groundwater quality degradation will continue to be assessed.

East Las Posas Management Area

Increasing TDS concentrations in the groundwater have been observed in the ELPMA, where perennial flows of SVWQCP and shallow dewatering well discharge along Arroyo Simi–Las Posas have recharged the groundwater aquifers. Degradation of groundwater quality from increased concentrations of TDS has the potential to impact the beneficial uses and users of groundwater in the ELPMA by (1) limiting the volume of groundwater available for agricultural, municipal, industrial, and domestic use or (2) requiring construction of treatment facilities to remove the constituents of concern.

Groundwater production from the ELPMA may result in a significant and unreasonable degradation of water quality if the groundwater gradient causes expansion of the currently impacted area into areas that were not previously impacted, thereby limiting agricultural and potable use. Particle track simulations from the CMWD groundwater model indicate that groundwater production has little influence on the overall migration of percolated surface water that recharged the management area through Arroyo Simi–Las Posas (Figures 3-3 through 3-7, Predicted Particle Tracks for 2020–2070 from CMWD Model and Most Recent TDS [mg/L] Measured 2011–2015 under various scenarios). Changing groundwater production rates uniformly in the future model simulations did not substantially alter the area of the ELPMA impacted by water that is recharging along Arroyo Simi–Las Posas, because reducing the groundwater production rates did not result in rising water levels throughout the ELPMA. The larger influence on the spread of recharge water was flow in the Arroyo, because Arroyo Simi–Las Posas is the primary source of recharge to the ELPMA. When flow was maintained in Arroyo Simi–Las Posas, groundwater elevations in the vicinity of the Arroyo remained high, and the groundwater gradient between the Arroyo and the central part of the ELPMA caused the particles to travel farther than they did when flow was reduced in the Arroyo (Figures 3-3 through 3-7).

Based on the sustainability goals for the LPVB, the criteria used to define undesirable results for degraded water quality in the ELPMA are groundwater elevations as they relate to the groundwater gradient that indicate a long-term decline over periods of drought and recovery. The minimum thresholds metric against which degradation of water quality will be measured is groundwater levels that were selected to accomplish this goal. These groundwater elevations are equal to, or higher than, previous historical low water levels in the southern part of the ELPMA where groundwater quality has been impacted by SVWQCP and shallow dewatering well recharge along Arroyo Simi–Las Posas (Table 3-1). In the northern part of the ELPMA, the minimum threshold groundwater elevations are lower than historical low water levels, but historical water levels, the hydrogeologic conceptual model, and particle track simulations all indicate that this area is not likely to be influenced by recharge from Arroyo Simi–Las Posas.

Water quality will continue to be monitored over the next 5 years (see Chapter 4). As additional data are collected, the effectiveness of applying a groundwater level threshold to groundwater quality degradation will continue to be assessed.

3.3.5 Land Subsidence

The undesirable result associated with land subsidence in the LPVB is subsidence that substantially interferes with surface land uses. One of the FCGMA Board-adopted planning goals discussed in Section 3.1, Introduction to Sustainable Management Criteria, calls for groundwater management that will not result in net subsidence due to groundwater withdrawal. Subsidence related to groundwater withdrawal can occur as groundwater elevations decline below previous historical low groundwater levels, because the groundwater acts to reduce the effective stress, or pressure, on the sediments in the aquifers. As groundwater levels decline, the pressure on the sediment matrix increases, and the pore structure of the sediment can collapse, resulting in subsidence.

It is important to note that groundwater production is only one cause of subsidence in the LPVB. In addition to groundwater production, tectonic forces can also result in subsidence in the LPVB (Section 2.3.5, Subsidence). Currently, there are no monitoring stations that separate the effects of groundwater withdrawal from those of the other causes of subsidence.

Groundwater production from the LPVB as it relates to groundwater levels may result in significant and unreasonable land subsidence if the subsidence “substantially interferes with surface land uses” (California Water Code, Section 10721[x][5]). Using this definition, historical records of land subsidence in the LPVB do not indicate that land subsidence as a result of past groundwater production with resultant groundwater levels has caused, or is likely to cause, undesirable results.

The minimum thresholds metric against which subsidence will be measured in the western WLPMA is groundwater levels that were selected to prevent to prevent net landward migration of the 2015 saline water impact front, and net seawater intrusion after 2040. These groundwater elevations are higher than previous historical low groundwater levels (Table 3-1). The minimum thresholds metric against which reduction in groundwater storage will be measured in the eastern part of the WLPMA is a groundwater level that allows for complete recovery during multi-year periods of above-average precipitation that follow a drought. In the ELPMA and the Epworth Gravels Management Area the minimum thresholds metric against which land subsidence will be measured is groundwater levels that were selected to prevent both long-term declines over periods of drought and recovery, and storage loss of greater than 20% in areas of the ELPMA that are most impacted by declines in groundwater level. Limiting the long-term loss of storage to no more than 20% in these areas of the ELPMA was determined to be a reasonable approach by the FCGMA Board to avoid significant and unreasonable loss of supply.

In the WLPMA and the southern part of the ELPMA these groundwater elevations are equal to, or higher than, previous historical low groundwater levels, which will limit the potential for future land subsidence resulting from groundwater withdrawal (Table 3-1). In the northern part of the ELPMA, groundwater elevations have declined historically without inducing undesirable results related to land subsidence (see Section 2.3, Groundwater Conditions). Future management of the ELPMA will result in stable groundwater elevations, thereby limiting the potential for future land subsidence related to groundwater withdrawal.

Land subsidence related to groundwater production and resultant groundwater levels has the potential to impact the beneficial uses and users of groundwater in the LPVB by interfering with surface land uses in a way that causes additional costs for releveling fields, replacing surface infrastructure, and otherwise interfering with surface land uses. Even though substantial interference with land surface uses is not anticipated, actions to reduce groundwater production to a rate that prevents future long-term declines in groundwater elevation and maintains groundwater levels at or above historic lows will mitigate future seawater intrusion as well as reducing the potential for additional subsidence in the LPVB related to groundwater production.

3.3.6 Depletions of Interconnected Surface Water

The undesirable result associated with depletion of interconnected surface water in the LPVB is loss of Groundwater-Dependent Ecosystem (GDE) habitat. No GDEs or potential GDEs were identified in the WLPMA. In ELPMA, Arroyo Simi–Las Posas was identified as a potential GDE.

Current groundwater conditions in the LPVB do not impact the volume of flow in Arroyo Simi–Las Posas and groundwater production from the ELPMA has not resulted in depletion of interconnected surface water with significant and unreasonable adverse effects on beneficial uses of surface water.

Ongoing surface water discharges to Arroyo Simi–Las Posas are not guaranteed in the future. If discharge from the Simi Valley and Moorpark wastewater treatment plants and Simi Valley dewatering wells decreases in the future, this may lead to depletions of interconnected surface water and impacts to the Arroyo Simi–Las Posas potential GDE. Decreased discharge will lead to decreased surface water flows, decreased recharge, and lowered groundwater elevations throughout much of the ELPMA. Changes in groundwater elevation in the Shallow Alluvial Aquifer related to decreased surface water flows cannot be mitigated by management actions related to groundwater pumping. The measurable objectives selected to maintain groundwater elevations adjacent to Arroyo Las Posas at levels that promote the health of the vegetation in the Arroyo Simi–Las Posas potential GDE are established "for the purpose of improving overall conditions" in the ELPMA, "but failure to achieve those objectives shall not be grounds for finding of inadequacy of the Plan" (23 CCR 354.30[g]). FCGMA proposes this aspirational goal with recognition of the dependence on the continuation of these external water sources.

3.3.7 Defining Undesirable Results

In order to better manage groundwater production and projects within the LPVB, the basin has been divided into three management areas (Section 2.5, Management Areas). These management areas are hydrologically separated from each other, and impacts from groundwater production in one management area do not translate to impacts in the other management areas. Therefore, rather than defining basin-wide groundwater conditions that would constitute an undesirable result, these conditions are defined for each management area.

Wells that can be used to monitor representative groundwater conditions were selected in each management area (Table 3-1). One well was selected in the Epworth Gravels Management Area, 14 wells were selected in the ELPMA, and 8 wells were selected in the WLPMA. Of the 14 wells selected in the ELPMA, 2 are screened in the Shallow Alluvial Aquifer, 11 are screened in the FCA, and 1 is screened in the Grimes Canyon Aquifer. The only well selected to monitor conditions in the Epworth Gravels Management Area is screened in the Epworth Gravels Aquifer. All of the wells selected in the WLPMA are screened in the LAS.

West Las Posas Management Area

Five wells were selected as key wells used to monitor representative groundwater conditions in the LAS (Table 3-1). Of these, one is in the western part of the WLPMA, and four are in the eastern part of the WLPMA. Undesirable results are defined in two ways for the LAS in the WLPMA. The first is based on the total number of wells. Under this definition, the WLPMA will be determined to be experiencing undesirable results if, in any single monitoring event, groundwater levels in three of the five key wells are below their respective minimum thresholds.

The second definition of undesirable results for the WLPMA is based on the time over which a well may exceed the minimum threshold. Under this definition, the WLPMA would be determined to be experiencing an undesirable result if the groundwater level in any individual key well were below the minimum threshold for either three consecutive monitoring events or in three of five consecutive monitoring events. Monitoring events are scheduled to occur in the spring and fall of each year.

If conditions in the WLPMA meet either of the definitions of undesirable results listed above, the WLPMA would be considered to be experiencing undesirable results.

East Las Posas Management Area

Fifteen wells were selected as key wells in the ELPMA (Table 3-1). Of these, 2 are screened in the Shallow Alluvial Aquifer, 1 is screened in the Grimes Canyon Aquifer, and 12 are screened in the FCA. Undesirable results are defined in two ways for the ELPMA. The first is based on the total number of wells, independent of aquifer, that have groundwater levels below the minimum threshold. Under this definition, the ELPMA will be determined to be experiencing undesirable results if, in any single monitoring event, groundwater levels in 5 of the 15 key wells are below their respective minimum thresholds.

The second definition of undesirable results for the ELPMA is based on the time over which a well may exceed the minimum threshold. Under this definition, the ELPMA would be determined to be experiencing an undesirable result if the groundwater level in any individual key well were below the minimum threshold for either three consecutive monitoring events or in three of five consecutive monitoring events. Monitoring events are scheduled to occur in the spring and fall of each year.

If conditions in the ELPMA meet any of the definitions of undesirable results listed above, the LAS would be considered to be experiencing undesirable results.

Epworth Gravels Management Area

One well was selected as a key well in the Epworth Gravels Management Area. The definition of undesirable results for the Epworth Gravels Management Area is based on the time over which this well may exceed the minimum threshold. Under this definition, the Epworth Gravels Management Area would be determined to be experiencing an undesirable result if the groundwater level in the key well were below the minimum threshold for either three consecutive monitoring events or in three of five consecutive monitoring events. Monitoring events are scheduled to occur in the spring and fall of each year.

3.4 MINIMUM THRESHOLDS

The following sections and discussion set forth the minimum thresholds for chronic lowering of groundwater levels, reduction of groundwater storage, degraded water quality, land subsidence, and depletions of interconnected surface water. A minimum threshold is not established for seawater intrusion because direct seawater intrusion has not occurred and is unlikely to occur in the future in the LPVB (Section 3.3.3). Additionally, a minimum threshold was not established for depletion of interconnected surface water in the WLPMA or Epworth Gravels Management Area because no GDEs or potential GDEs were established in these areas.

The thresholds discussed below are the minimum groundwater elevations at individual wells that avoid undesirable results, which have been defined as follows:

- Groundwater levels in the LPVB that do not recover to pre-drought levels during multi-year periods of above-average precipitation that follow a drought
- Groundwater levels in the ELPMA and the Epworth Gravels Management Area that allow for more than 20% loss of storage, relative to 2015 storage volumes, in areas that are impacted by declines in groundwater level
- Induced subsidence that substantially interferes with surface land uses
- Groundwater levels in the WLPMA that prevent the Oxnard Subbasin from stopping net landward migration of the saline water impact front after 2040

Of the undesirable results listed above, only the first (declines in groundwater elevation that do not recover to pre-drought levels during multi-year periods of above-average precipitation) has occurred in every management area in the LPVB. Induced subsidence that substantially interferes with surface land uses has not occurred historically in any of the management areas of the LPVB. Groundwater levels that contribute to seawater intrusion in the Oxnard Subbasin have only occurred within the WLPMA.

3.4.1 West Las Posas Management Area

The minimum threshold groundwater levels in the WLPMA are based on a review of the historical groundwater elevation data, incorporation of potential projects, and an analysis of the potential for seawater intrusion in the Oxnard Subbasin under multiple future groundwater production scenarios. Predicted groundwater levels were simulated over a 50-year period from 2020 to 2069 (Section 2.4.5.1, West Las Posas Management Area). The future climate simulated in the model recreated the observed climate from 1930 to 1979 with adjustments to precipitation and streamflow based on climate change factors provided by DWR. The historical period from 1930 to 1979 includes periods of drought and periods of above-average precipitation, but has the average precipitation of the entire climate record for the WLPMA. The 50-year future simulations were used to assess the rate of groundwater production in the WLPMA, Oxnard Subbasin, and Pleasant Valley Basin that results in stable groundwater levels in the WLPMA and avoids net seawater intrusion in either the UAS or the LAS in the Oxnard Subbasin after 2040.

The minimum threshold groundwater elevations in the WLPMA depend on the proximity to the Oxnard Subbasin. For Well 02N21W16J03, in the western part of the WLPMA, the minimum thresholds are based on the lowest simulated groundwater elevation after 2040 for the model scenario in which the 2015 to 2017 average production rate was continued throughout the 50-year model simulation, and projects were implemented. For the remaining wells, the minimum threshold is based on the average low historical groundwater elevations in the early 1990s, before in-lieu surface water deliveries to the WLPMA began (Section 2.3.1, Groundwater Elevation Data). These elevations were selected because the groundwater levels in the eastern part of the WLPMA were able to recover, with the aid of in-lieu surface water deliveries, from the historical low levels in the early 1990s. Additionally, groundwater levels in this area do not exert a measurable influence on groundwater levels in the Oxnard Subbasin.

The minimum thresholds selected for the WLPMA do not impact groundwater elevations in the ELPMA or the Epworth Gravels Management Area because these areas are not in direct hydraulic communication with the ELPMA. Therefore, the exceedance of minimum thresholds selected in the WLPMA will not cause undesirable results in the ELPMA or Epworth Gravels Management Area. The minimum thresholds for each well are presented in Table 3-1 and on Figures 3-8a and 3-8b, Key Well Hydrographs in the West Las Posas Valley Management Area.

3.4.1.1 Chronic Lowering of Groundwater Levels

The selected minimum thresholds for chronic lowering of groundwater levels are presented in Table 3-1. These minimum thresholds are groundwater levels that were selected based on historical groundwater elevations and future groundwater model simulations that show groundwater elevations recover during multi-year cycles of drought and recovery. Numerical groundwater model simulations indicate that, under the conditions modeled, declines in groundwater elevations during periods of future drought will be offset by recoveries during future periods of above-average rainfall throughout the WLPMA (Figures 3-8a and 3-8b).

The minimum threshold selection was guided by historical groundwater elevations and numerical groundwater model simulations that incorporate production throughout the WLPMA, the Oxnard Subbasin, and the Pleasant Valley Basin. These minimum thresholds are anticipated to improve the beneficial uses of the WLPMA by preventing chronic lowering of groundwater levels. This allows for long-term use of groundwater supplies in the WLPMA without ongoing loss of storage that would impair the beneficial uses of groundwater in the WLPMA. These minimum thresholds may impact groundwater users in the WLPMA by requiring an overall reduction in groundwater production relative to historical levels.

The minimum thresholds for chronic lowering of groundwater levels are groundwater levels that will be measured at the monitoring wells listed in Table 3-1. Groundwater levels in these wells, which are referred to as *key wells*, will be reported to DWR in the annual reports that will follow the submittal of this GSP. As funding becomes available, it is recommended that each of these wells be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether groundwater levels in individual wells are above the minimum thresholds.

3.4.1.2 Reduction of Groundwater Storage

The minimum thresholds for reduction in groundwater storage in the WLPMA are groundwater levels that were selected based on historical groundwater elevations and future groundwater model simulations that show groundwater elevations recover during multi-year cycles of drought and recovery (Table 3-1). The minimum thresholds impacts to groundwater users for reduction of groundwater storage are the same as those for chronic lowering of groundwater levels (see Section 3.4.1.1). These minimum thresholds are anticipated to improve the beneficial uses of the WLPMA by allowing for long-term use of groundwater supplies.

The minimum thresholds for reduction of groundwater storage are groundwater levels that will be measured at the key wells. As funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether groundwater levels in individual wells are above the minimum thresholds.

3.4.1.3 Seawater Intrusion

No minimum thresholds are required for seawater intrusion in the WLPMA because the WLPMA is not adjacent to the Pacific Ocean (see Section 3.3.3).

3.4.1.4 Degraded Water Quality

Water quality impacts to the aquifers of the WLPMA are limited to locally high concentrations of TDS, nitrate, sulfate, and boron (Section 2.3 and Section 3.3.4, Degraded Water Quality, under “West Las Posas Management Area”). The sources and mechanisms controlling the concentration of these constituents differs throughout the WLPMA (Section 2.3). Because groundwater quality in the WLPMA is not directly correlated with groundwater production from the WLPMA, specific concentration minimum thresholds have not been selected for the WLPMA. Instead, until a causal relationship between groundwater quality degradation and groundwater production is established, the minimum thresholds for groundwater quality are the same as the groundwater level minimum thresholds for chronic lowering of groundwater levels (Section 3.4.1.1). Groundwater quality will continue to be monitored to evaluate the potential connection between groundwater quality and groundwater production. As the understanding of this connection improves, the minimum thresholds may be revised and direct concentration minimum thresholds may be proposed in the future.

The minimum thresholds impacts to groundwater users for degraded water quality are anticipated to be the same as those for chronic lowering of groundwater levels and reduction of groundwater in storage, which are described in Section 3.4.1.1.

The minimum thresholds for degraded water quality are groundwater levels that will be measured at the key wells. Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether groundwater levels in individual wells are above the minimum thresholds.

3.4.1.5 Land Subsidence

The minimum thresholds for land subsidence in the WLPMA are groundwater levels that were selected based on the historical record of groundwater elevations. Numerical groundwater modeling indicates that the minimum threshold groundwater levels will allow declines in groundwater elevations during periods of future drought to be offset by recoveries during future periods of above-average rainfall (Table 3-1). The minimum thresholds are equal to or higher than historical low groundwater levels. In order to avoid undesirable results, groundwater levels in the WLPMA will remain above historical low groundwater levels after 2040. Therefore, groundwater levels in the WLPMA will reduce the potential for inelastic subsidence.

These minimum thresholds will also limit future subsidence, because currently the thresholds are greater than the historical low groundwater elevation. The minimum thresholds impacts to groundwater users for land subsidence are anticipated to be the same as those for chronic lowering of groundwater levels and depletion of groundwater storage, which are described in Section 3.4.1 (West Las Posas Management Area) and Section 3.4.2 (East Las Posas Management Area).

The minimum thresholds for subsidence are groundwater levels that will be measured at the key wells (Table 3-1). Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether groundwater levels in individual wells are above the minimum thresholds.

3.4.1.6 Depletions of Interconnected Surface Water

No minimum thresholds specific to the depletion of interconnected surface water are proposed at this time because no interconnected surface waters or potential GDEs were identified in the WLPMA. Therefore, depletion of interconnected surface water in the WLPMA is not currently occurring and is unlikely to occur in the future.

3.4.2 East Las Posas Management Area

The minimum threshold groundwater levels in the ELPMA are based on a review of the historical groundwater elevation data, incorporation of potential projects, and an analysis of the projected future declines in groundwater elevation and storage under multiple future groundwater production scenarios. Predicted groundwater levels were simulated over a 50-year period from 2020 to 2069 (Section 2.4.5.2, Projected Water Budget and Sustainable Yield: East Las Posas Management Area). The future climate simulated in the model recreated the observed climate from 1930 to 1979 with adjustments to precipitation and streamflow based on climate change factors provided by DWR. The historical period from 1930 to 1979 includes periods of drought and periods of above-average precipitation, but has the average precipitation of the entire climate record for the ELPMA. The 50-year future simulations were used to assess the rate of groundwater production in the ELPMA that avoids chronic lowering of groundwater elevation and loss of storage after 2040.

The minimum threshold groundwater elevations in the ELPMA vary geographically within the management area and depend on the historical record of groundwater levels, proximity to both Arroyo Simi–Las Posas and the Moorpark anticline. For wells that are adjacent to Arroyo Simi–Las Posas and are, generally, south and west of the Moorpark anticline, the minimum thresholds are based on the historical low groundwater elevation. For the remaining wells, the minimum threshold is based on the groundwater level that limits reduction in storage to less than 20% relative to the estimated 2015 groundwater storage volume in areas of the ELPMA where the FCA may convert from being confined to unconfined (Section 2.3.1). Limiting the long-term loss of storage to no more than 20% in these areas of the ELPMA was determined to be a reasonable approach by the FCGMA Board to avoid significant and unreasonable loss of supply.

Conversion of the FCA from confined to unconfined conditions is most likely to occur on the flanks of the Moorpark and Long Canyon anticlines, and on the northern and southern margins of the ELPMA where the FCA crops out (Figure 3-9, Fox Canyon Aquifer Zone Map). Continued production at the 2015 to 2017 rates has the potential to cause these areas of the ELPMA to lose greater than 30% of the available groundwater storage. Limiting the long-term loss of storage to 20% will avoid significant and unreasonable loss of supply in these areas of the ELPMA.

The minimum thresholds selected for the ELPMA do not impact groundwater elevations in the PVB, the WLPMA, or the Epworth Gravels Management Area because these areas are not in direct hydraulic communication with the ELPMA. Therefore, the minimum thresholds selected in the ELPMA will not cause undesirable results in the PVB, WLPMA, or Epworth Gravels Management Area. The minimum thresholds for each well are presented in Table 3-1 and on Figures 3-10a through 3-10e, Key Well Hydrographs in the East Las Posas Valley Management Area.

3.4.2.1 Chronic Lowering of Groundwater Levels

The selected minimum thresholds for chronic lowering of groundwater levels are presented in Table 3-1. These minimum thresholds are groundwater levels that were selected based on historical groundwater elevations and groundwater model simulations of future conditions that limit loss of groundwater storage in the ELPMA. Numerical groundwater model simulations indicate that, under the conditions modeled, declines in groundwater elevations are not offset by recoveries during future periods of above-average rainfall throughout the ELPMA (Figures 3-8a and 3-8b). Therefore, groundwater elevations in the ELPMA must stabilize, and should not reach the minimum thresholds, because it may be difficult for groundwater elevations to recover from long-term declines without finding additional sources of recharge for the management area.

The minimum threshold selection was guided by historical groundwater elevations and numerical groundwater model simulations. The model simulations were used to investigate the groundwater elevation that would limit loss of groundwater storage to less than 20% in areas of the ELPMA where the FCA is prone to conversion from confined to unconfined conditions. These minimum thresholds are anticipated to maintain the beneficial uses of the ELPMA by preventing chronic lowering of groundwater levels. This allows for long-term use of groundwater supplies in the ELPMA without ongoing loss of storage that would impair the beneficial uses of groundwater. These minimum thresholds may impact groundwater users in the ELPMA by requiring an overall reduction in groundwater production relative to historical levels.

The minimum thresholds for chronic lowering of groundwater levels are groundwater levels that will be measured at the monitoring wells listed in Table 3-1. Groundwater levels in these key wells will be reported to DWR in the annual reports that will follow the submittal of this GSP. As funding becomes available, it is recommended that each of these wells be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether groundwater levels in individual wells are above the minimum thresholds.

3.4.2.2 Reduction of Groundwater Storage

The minimum thresholds for reduction in groundwater storage in the ELPMA are groundwater levels that were selected based on historical groundwater elevations and future groundwater model simulations that limit loss of groundwater storage in the ELPMA to less than 20% relative to the estimated 2015 groundwater storage volume in areas of the ELPMA where the FCA may convert from being confined to unconfined (Table 3-1; Figure 3-9).

The minimum thresholds impacts to groundwater users for reduction of groundwater storage are the same as those for chronic lowering of groundwater levels (see Section 3.4.2.1). These minimum thresholds are anticipated to maintain the beneficial uses of the ELPMA by allowing for long-term use of groundwater supplies and preserving groundwater storage.

The minimum thresholds for reduction of groundwater storage are groundwater levels that will be measured at the key wells. As funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether groundwater levels in individual wells are above the minimum thresholds.

3.4.2.3 Seawater Intrusion

No minimum thresholds are required for seawater intrusion in the ELPMA because the ELPMA is not adjacent to the Pacific Ocean (see Section 3.3.3).

3.4.2.4 Degraded Water Quality

Water quality impacts to the aquifers of the ELPMA have been observed in areas that receive recharge from Arroyo Simi–Las Posas. In these areas concentrations of TDS in the groundwater have increased, related to the perennial flows of SVWQCP and shallow dewatering well discharge along Arroyo Simi–Las Posas (Sections 2.3 and 3.3.4). Groundwater modeling suggests that groundwater production rates exert little influence over the area of the ELPMA that will eventually be impacted by higher concentrations of TDS (Figures 3-3 through 3-7). Because groundwater quality in the ELPMA is not directly correlated with groundwater production from the ELPMA, specific concentration minimum thresholds have not been selected for the ELPMA. Instead, until a causal relationship between groundwater quality degradation and groundwater production is established, the minimum thresholds for groundwater quality are the same as the groundwater level minimum thresholds for chronic lowering of groundwater levels (Section 3.4.1). Groundwater quality will continue to be monitored to evaluate the potential connection between groundwater quality and groundwater production. As the understanding of this connection improves, the minimum thresholds may be revised and direct concentration minimum thresholds may be proposed in the future.

The minimum thresholds impacts to groundwater users for degraded water quality are anticipated to be the same as those for chronic lowering of groundwater levels and reduction of groundwater in storage, which are described in Section 3.4.2.1.

The minimum thresholds for degraded water quality are groundwater levels that will be measured at the key wells. Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether groundwater levels in individual wells are above the minimum thresholds.

3.4.2.5 Land Subsidence

The minimum thresholds for land subsidence in the ELPMA are groundwater levels that were selected based on the historical record of groundwater elevations. These thresholds vary geographically in the ELPMA (Table 3-1). In the key wells where the minimum thresholds are equal to or higher than historical low groundwater levels, subsidence is not a concern (Figure 3-9). In areas where the minimum threshold is lower than the historical low groundwater level there is potential for land subsidence, however, DWR designated the LPVB as an area with a medium to low potential for future subsidence. Because the ELPMA has a medium to low potential for subsidence, and future declines in groundwater levels are limited by the minimum thresholds for chronic lowering of groundwater levels and declines in groundwater storage, these minimum thresholds are adopted for land subsidence as well. The minimum thresholds for chronic lowering of groundwater levels and declines in groundwater storage are anticipated to reduce the potential for subsidence that substantially interferes with surface land uses (Section 3.3.5, Land Subsidence). The need for specific subsidence monitoring will be explored over the next 5 years.

As discussed previously, the minimum thresholds are anticipated to maintain the beneficial uses of the ELPMA by limiting declines in freshwater storage in the ELPMA. These minimum thresholds will also limit future subsidence. The minimum thresholds impacts to groundwater users for land subsidence are anticipated to be the same as those for chronic lowering of groundwater levels and depletion of groundwater storage, which are described in Sections 3.4.1 and 3.4.2.

The minimum thresholds for land subsidence are groundwater levels that will be measured at the key wells (Table 3-1). Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether groundwater levels in individual wells are above the minimum thresholds.

3.4.2.6 Depletions of Interconnected Surface Water

Arroyo Simi–Las Posas is a losing stream in the ELPMA, and groundwater elevations are below the bottom of the Arroyo (see Section 3.3.6). Therefore, groundwater production from the FCA and underlying aquifers will not impact flow in Arroyo Simi–Las Posas. A potential GDE has been identified in the ELPMA adjacent to Arroyo Simi–Las Posas, however. This potential GDE is described in more detail in Section 2.3.6, Groundwater–Surface Water Connections, and Section 2.3.7, Groundwater-Dependent Ecosystems. Riparian vegetation associated with the potential GDE may have roots that reach groundwater in the Shallow Alluvial Aquifer, or the roots may rely on soil water as surface flows in Arroyo Simi–Las Posas infiltrate into the underlying aquifers. Until the relationship between groundwater elevation and impacts to the potential GDE is better understood, the minimum thresholds for chronic lowering of groundwater levels and depletion of groundwater storage are assumed to be protective of the potential GDE. These minimum thresholds were selected based on groundwater levels that limit future declines in groundwater storage to less than 20% of the 2015 groundwater storage volume in areas of the ELPMA where the FCA is susceptible to conversion from confined to unconfined conditions (Table 3-1).

As discussed previously, the minimum thresholds are anticipated to maintain or improve the beneficial uses of the ELPMA by limiting decreases in the overall amount of groundwater storage in the management area. The minimum thresholds impacts to groundwater users for interconnected groundwater and surface water are anticipated to be the same as those for chronic lowering of groundwater levels and reduction in groundwater storage, which are described in Sections 3.4.2.1 and 3.4.2.2.

Currently there is very little groundwater production from the Shallow Alluvial Aquifer. If future projects investigate producing water from the Shallow Alluvial Aquifer they will have to evaluate the potential impact to the potential GDE as part of the feasibility and permitting process. Additionally, if projects that produce groundwater from the Shallow Alluvial Aquifer are implemented, the need for specific groundwater level minimum thresholds to protect against depletion of interconnected surface water should be reevaluated.

3.4.3 Epworth Gravels Management Area

The minimum threshold groundwater level in the Epworth Gravels Management Area is based on a review of the historical groundwater elevation data, incorporation of potential projects, and an analysis of the potential future declines in groundwater elevation and storage under multiple future groundwater production scenarios. Predicted groundwater levels were simulated over a 50-year period from 2020 to 2069 (Section 2.4.5.2). The future climate simulated in the model recreated the observed climate from 1930 to 1979 with adjustments to precipitation and streamflow based on climate change factors provided by DWR. The historical period from 1930 to 1979 includes periods of drought and periods of above-average precipitation, but has the average precipitation of the entire climate record for the ELPMA. The 50-year future simulations were used to assess the rate of groundwater production in the ELPMA that avoids chronic lowering of groundwater elevation and loss of storage after 2040.

There is only one key well located in the Epworth Gravels Management Area. The minimum threshold groundwater level was selected as the groundwater level that limits reduction in storage to less than 20% relative to the estimated 2015 groundwater storage volume (Section 2.3.1). Limiting the long-term loss of storage to 20% will avoid significant and unreasonable loss of supply in the Epworth Gravels Management Area.

The minimum threshold selected for Epworth Gravels Management Area does not impact groundwater elevations in the ELPMA because the ELPMA is not in direct hydraulic communication with the Epworth Gravels Aquifer. Therefore the minimum threshold selected in the Epworth Gravels Aquifer will not cause undesirable results in the ELPMA. The minimum threshold is presented in Table 3-1 and in Figure 3-11, Key Well Hydrographs in the Epworth Gravels Management Area – Epworth Gravels Aquifer.

3.4.3.1 Chronic Lowering of Groundwater Levels

The selected minimum threshold for chronic lowering of groundwater levels was selected based on historical groundwater elevations and future groundwater model simulations that limit loss of groundwater storage in the Epworth Gravels Management Area. Numerical groundwater model simulations indicate that, under the conditions modeled, declines in groundwater elevations are not offset by recoveries during future periods of above-average rainfall throughout the ELPMA (Figure 3-11). However, groundwater elevations are sensitive to groundwater production rates (Section 2.4). As groundwater production in the Epworth Gravels Aquifer was reduced, groundwater elevations recovered, while higher rates of groundwater production resulted in chronic lowering of groundwater levels. Therefore, impacts from groundwater production on groundwater levels in the Epworth Gravels Aquifer can be minimized or mitigated through controls on groundwater production.

Consequently the minimum threshold groundwater elevation for chronic lowering of groundwater levels in the Epworth Gravels Management Area is the same as the minimum threshold for groundwater in storage discussed in Section 3.4.3.2, Reduction of Groundwater Storage. This minimum threshold is anticipated to maintain the beneficial uses of the Epworth Gravels Management Area by preventing chronic lowering of groundwater levels. This allows for long-term use of groundwater supplies without ongoing loss of storage that would impair the beneficial uses of groundwater. These minimum thresholds may impact groundwater users in the Epworth Gravels Management Area by requiring an overall reduction in groundwater production relative to historical levels.

The minimum threshold for chronic lowering of groundwater level is a groundwater levels that will be measured at the monitoring well listed in Table 3-1. Groundwater levels in this key well will be reported to DWR in the annual reports that will follow the submittal of this GSP. As funding becomes available, it is recommended that this well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in this well will be compared to the minimum threshold assigned in Table 3-1 to determine whether the groundwater level is above the minimum threshold.

3.4.3.2 Reduction of Groundwater Storage

The minimum threshold for reduction in groundwater storage in the Epworth Gravels Management Area is a groundwater level that was selected to limit loss of groundwater storage in the Epworth Gravels Management Area to less than 20% relative to the estimated 2015 groundwater storage volume (Table 3-1; Figure 3-9).

This minimum threshold is anticipated to maintain the beneficial uses of the Epworth Gravels Management Area by allowing for long-term use of groundwater supplies and preserving groundwater storage. This minimum threshold may impact groundwater users in the Epworth Gravels Management Area by requiring an overall reduction in groundwater production relative to historical levels.

The minimum threshold for reduction of groundwater storage is a groundwater level that will be measured at the key well. As funding becomes available, it is recommended that this well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation in the well will be compared to the minimum threshold assigned in Table 3-1 to determine whether the groundwater level is above the minimum threshold.

3.4.3.3 Seawater Intrusion

No minimum thresholds are required for seawater intrusion in the Epworth Gravels Management Area because it is not adjacent to the Pacific Ocean (see Section 3.3.3).

3.4.3.4 Degraded Water Quality

No minimum thresholds specific to the degraded water quality are proposed at this time because degraded water quality has not been detected in the Epworth Gravels Management Area, despite long-term use of the Epworth Gravels Aquifer for agricultural production and historical groundwater levels that were lower than the minimum threshold groundwater levels for chronic lowering of groundwater elevation. Therefore, degraded water quality in the Epworth Gravels Management Area is not currently occurring and is unlikely to occur in the future.

3.4.3.5 Land Subsidence

The minimum threshold for land subsidence in the Epworth Gravels Management Area is a groundwater level that was selected based on the historical record of groundwater elevations (Table 3-1). The minimum threshold water level for chronic lowering of groundwater levels is higher than the historical low groundwater levels in the management area. Therefore, this minimum threshold will also reduce the potential for subsidence that substantially interferes with surface land uses in the Epworth Gravel Management Area.

As discussed previously, the minimum threshold is anticipated to maintain the beneficial uses of the Epworth Gravels Management Area by limiting declines in groundwater storage and avoiding chronic lowering of groundwater levels. This minimum threshold will also limit future subsidence. The minimum threshold impacts to groundwater users for land subsidence are anticipated to be the same as those for chronic lowering of groundwater levels which are described in Section 3.4.3.1.

The minimum threshold for land subsidence is a groundwater level that will be measured at the key well in the Epworth Gravels Management Area (Table 3-1). Additionally, as funding becomes available, it is recommended that this well be instrumented with a pressure transducer capable of recording hourly groundwater levels. The groundwater elevation will be compared to the minimum threshold assigned in Table 3-1 to determine whether the groundwater level is above the minimum threshold.

3.4.3.6 Depletions of Interconnected Surface Water

No minimum thresholds specific to the depletion of interconnected surface water are proposed at this time because no interconnected surface waters or potential GDEs were identified in the Epworth Gravels Management Area. Therefore, depletion of interconnected surface water in the Epworth Gravels Management Area is not currently occurring and is unlikely to occur in the future.

3.5 MEASURABLE OBJECTIVES

The measurable objectives are quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted GSP to achieve the sustainability goal. The criteria for selecting the measurable objectives vary by management area in the LPVB, therefore, the discussion of the measurable objectives has been broken out by management area in the following subsections.

3.5.1 West Las Posas Management Area

The criteria for selecting the measurable objectives differ geographically within the WLPMA. In the eastern WLPMA, the measurable objective groundwater levels were selected based on the groundwater level recovery observed in wells in the eastern WLPMA between 1995 and 2008. This groundwater level recovery resulted from in-lieu deliveries of surface water that reduced groundwater production from the area (Section 2.2, Hydrogeologic Conceptual Model). The measurable objective groundwater elevation is the elevation that represents half of the total recovery in the historical record. Therefore, historical groundwater elevations were below the measurable objective groundwater elevations between 1995 and 2003, and were above the measurable objective groundwater elevation between 2003 and 2012 (Figures 3-8a and 3-8b). In the western WLPMA the measurable objective at Well 02N21W16J03 is selected based on both the historical groundwater levels and the groundwater modeling results used to assess the potential for seawater intrusion in the Oxnard Subbasin. In this well, the measurable objective is the groundwater level to which the well has recovered historically, and is achievable under the UWCD model simulation that includes projects. The measurable objective groundwater levels in the WLPMA are at least 20 feet higher than the minimum threshold groundwater levels, thereby allowing for operational flexibility in the management area.

3.5.1.1 Chronic Lowering of Groundwater Levels

The measurable objective for chronic lowering of groundwater elevations in the western WLPMA is the groundwater level to which Well 02N21W16J03 has recovered historically, and allows the Oxnard Subbasin to avoid seawater intrusion. In the eastern WLPMA, the measurable objective groundwater elevation is the groundwater elevation that is halfway between the historical low groundwater elevation and the high groundwater elevations measured since 2000 (Table 3-2, Measurable Objectives and Interim Milestones). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the WLPMA.

Interim Milestones for Chronic Lowering of Groundwater Levels

Interim milestones, which are target groundwater levels in 2025, 2030, and 2035 at key wells, will be used to assess progress toward sustainable groundwater management in the WLPMA between 2020 and 2040. These milestones have only been selected for key wells in which the fall 2015 groundwater level was below the measurable objective groundwater level (Table 3-2). The interim milestones for chronic lowering of groundwater levels are the same as the interim milestones for the other sustainability indicators, because the interim milestones measure progress toward the groundwater elevations in the WLPMA that will prevent undesirable results. In these wells, the interim milestones were calculated using linear interpolation between the fall 2015 low groundwater elevation and the measurable objective.

3.5.1.2 Reduction of Groundwater in Storage

The measurable objective for reduction of groundwater in storage in the western WLPMA is the groundwater level to which Well 02N21W16J03 has recovered historically, and allows the Oxnard Subbasin to avoid seawater intrusion. In the eastern WLPMA, the measurable objective groundwater elevation is the groundwater elevation that is half way between the historical low groundwater elevation and the high groundwater elevations measured since 2000 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the WLPMA.

Interim Milestones for Reduction of Groundwater in Storage

Interim milestones for reduction of groundwater in storage are presented in Table 3-2 for wells in which the measurable objective is above the fall 2015 groundwater level. The interim milestones were calculated from a linear interpolation between the fall 2015 low groundwater elevation and the measurable objective at the well. These interim milestones will be used to assess progress toward sustainable groundwater management in the WLPMA between 2020 and 2040. The interim milestones for reduction of groundwater in storage are the same as the interim milestones for chronic lowering of groundwater levels.

3.5.1.3 Seawater Intrusion

No measurable objectives are required for seawater intrusion in the WLPMA because the WLPMA is not adjacent to the Pacific Ocean (Section 3.3.3).

3.5.1.4 Degraded Water Quality

The measurable objective for degraded water quality in the western WLPMA is the groundwater level to which Well 02N21W16J03 has recovered historically, and allows the Oxnard Subbasin to avoid seawater intrusion. In the eastern WLPMA, the measurable objective groundwater elevation is the groundwater elevation that is half way between the historical low groundwater elevation and the high groundwater elevations measured since 2000 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the WLPMA.

Interim Milestones for Degraded Water Quality

Interim milestones for degraded water quality are the same as those for chronic lowering of groundwater levels and reduction of groundwater in storage. These interim milestones are presented in Table 3-2 for wells in which the measurable objective is above the fall 2015 groundwater level. The interim milestones were calculated from a linear interpolation between the fall 2015 low groundwater elevation and the measurable objective at the well. These interim milestones will be used to assess progress toward sustainable groundwater management in the WLPMA between 2020 and 2040.

3.5.1.5 Land Subsidence

The measurable objective for land subsidence in the western WLPMA is the groundwater level to which Well 02N21W16J03 has recovered historically, and allows the Oxnard Subbasin to avoid seawater intrusion. In the eastern WLPMA, the measurable objective groundwater elevation is the groundwater elevation that is half way between the historical low groundwater elevation and the high groundwater elevations measured since 2000 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the WLPMA.

Interim Milestones for Land Subsidence

Interim milestones for land subsidence are the same as those for chronic lowering of groundwater levels and reduction of groundwater in storage. These interim milestones are presented in Table 3-2 for wells in which the measurable objective is above the fall 2015 groundwater level. The interim milestones were calculated from a linear interpolation between the fall 2015 low groundwater elevation and the measurable objective at the well. These interim milestones will be used to assess progress toward sustainable groundwater management in the WLPMA between 2020 and 2040.

3.5.1.6 Depletions of Interconnected Surface and Groundwater

No measurable objectives specific to the depletion of interconnected surface water are proposed in the WLPMA because no interconnected surface waters or potential GDEs were identified in the WLPMA. Therefore, depletion of interconnected surface water in the WLPMA is not currently occurring and is unlikely to occur in the future.

3.5.2 East Las Posas Management Area

In the ELPMA, the measurable objective groundwater elevations were selected based on the historical groundwater level record and the groundwater model simulations that result in stable groundwater elevations after 2040. The measurable objective groundwater elevation is lower than the 2015 groundwater elevation in each of the key wells in the ELPMA (Figures 3-10a through 3-10e). South of the Moorpark anticline, in the areas of the ELPMA that received recharge from Arroyo Simi–Las Posas, groundwater elevations have been above the measurable objective since the late 1980s or early 1990s (Figures 3-10a through 3-10e). As SVWQCP discharge to Arroyo Simi–Las Posas decreased upstream of the ELPMA, groundwater levels have been declining in these areas, and were within 20 feet of the measurable objective groundwater level in 2015. North of the Moorpark anticline the historical groundwater level has always been above the measurable objective groundwater level. However, groundwater production from this area has caused long-term declines in groundwater elevations. Because groundwater elevations do not respond to climate cycles in this management area, numerical groundwater simulations indicate that reductions in groundwater production will be necessary to avoid further chronic lowering of groundwater levels. As groundwater production in the simulations is reduced between 2020 and 2040, groundwater elevations continue to decline. Consequently, measurable objective groundwater levels, which are the stable groundwater levels in the model simulations, are below the current groundwater level. The measurable objective groundwater levels in the ELPMA are at least 20 feet higher than the minimum threshold groundwater levels, thereby allowing for operational flexibility in the management area.

3.5.2.1 Chronic Lowering of Groundwater Levels

The measurable objective for chronic lowering of groundwater elevations in the ELPMA is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the ELPMA.

Interim Milestones for Chronic Lowering of Groundwater Levels

Interim milestones, which are target groundwater levels in 2025, 2030, and 2035 at key wells, can be used to assess progress toward sustainable groundwater management between 2020 and 2040. However, groundwater elevations in the ELPMA are currently higher than the measurable objective groundwater elevation. Therefore, interim milestone targets have not been selected for wells in the ELPMA.

3.5.2.2 Reduction of Groundwater in Storage

The measurable objective for reduction of groundwater storage in the ELPMA is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). This measurable objective is the same as the measurable objective for chronic lowering of groundwater levels. At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the ELPMA.

Interim Milestones for Reduction of Groundwater in Storage

Interim milestones target groundwater levels have not been selected for wells in the ELPMA because the groundwater elevations in the ELPMA are currently higher than the measurable objective groundwater levels.

3.5.2.3 Seawater Intrusion

No measurable objectives are required for seawater intrusion in the ELPMA because the ELPMA is not adjacent to the Pacific Ocean (Section 3.3.3).

3.5.2.4 Degraded Water Quality

The measurable objective for degraded water quality is the same as the measurable objective for chronic lowering of groundwater levels and reduction in groundwater storage. In the ELPMA, the measurable objective is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the ELPMA.

Interim Milestones for Degraded Water Quality

Interim milestones target groundwater levels have not been selected for wells in the ELPMA because the groundwater elevations in the ELPMA are currently higher than the measurable objective groundwater levels.

3.5.2.5 Land Subsidence

The measurable objective for land subsidence is the same as the measurable objective for chronic lowering of groundwater levels and reduction in groundwater storage. In the ELPMA, the measurable objective is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the ELPMA.

Interim Milestones for Land Subsidence

Interim milestones target groundwater levels have not been selected for wells in the ELPMA because the groundwater elevations in the ELPMA are currently higher than the measurable objective groundwater levels.

3.5.2.6 Depletions of Interconnected Surface and Groundwater

The measurable objective for interconnected surface and groundwater is the same as the measurable objective for chronic lowering of groundwater levels and reduction in groundwater storage in all wells except those in the Shallow Alluvial Aquifer. For wells not screened in the Shallow Alluvial Aquifer, the measurable objective is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the ELPMA.

In addition to the primary sustainability goal, the measurable objectives selected for the Shallow Alluvial Aquifer in the ELPMA (see Section 3.5.2, East Las Posas Management Area) recognize an aspirational sustainability goal of maintaining groundwater elevations in the Shallow Alluvial Aquifer at 2015 levels by continued surface flows in Arroyo Simi–Las Posas. This goal stems from the FCGMA Board planning goal that seeks to promote water levels that mitigate or minimize undesirable results including surface water connectivity (see Section 3.1, Introduction to Sustainable Management Criteria), and acknowledges the environmental benefit of the vegetation that composes the Arroyo Simi–Las Posas potential GDE.

For wells screened in the Shallow Alluvial Aquifer, the measurable objectives were selected to maintain groundwater elevations at or near 2015 levels. These objectives exceed the reasonable margin of operational flexibility in the ELPMA, but were selected for the purpose of improving the environmental beneficial use of water along Arroyo Simi–Las Posas (in accordance with 23 CCR 354.30[g]).

Interim Milestones for Depletions of Interconnected Surface and Groundwater

Interim milestones target groundwater levels have not been selected for wells in the ELPMA because the groundwater elevations in the ELPMA are currently higher than or equal to the measurable objective groundwater levels.

3.5.3 Epworth Gravels Management Area

In the Epworth Gravels Management Area, the measurable objective groundwater elevation was selected based on the historical groundwater level record and the groundwater model simulations that result in stable groundwater elevations after 2040. Groundwater elevations have been below the measurable objective groundwater elevation historically (Figure 3-11). However, as groundwater production from the Epworth Gravels Aquifer was reduced, groundwater elevations recovered. Between 2005 and 2015, groundwater elevations in the Epworth Gravels Aquifer remained above the measurable objective. The measurable objective groundwater level in the Epworth Gravels Management Area is 30 feet higher than the minimum threshold groundwater levels, thereby allowing for operational flexibility.

3.5.3.1 Chronic Lowering of Groundwater Levels

The measurable objective for chronic lowering of groundwater elevations in the Epworth Gravels Management Area is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). The difference between the measurable objective and the minimum threshold is 30 feet, which provides a margin of safety for operational flexibility in the Epworth Gravels Management Area.

Interim Milestones for Chronic Lowering of Groundwater Levels

Interim milestones, which are target groundwater levels in 2025, 2030, and 2035 at key wells, can be used to assess progress toward sustainable groundwater management between 2020 and 2040. However, groundwater elevations in the Epworth Gravels Management Area are currently higher than the measurable objective groundwater elevation. Therefore, interim milestone targets have not been selected for wells in the Epworth Gravels Management Area.

3.5.3.2 Reduction of Groundwater in Storage

The measurable objective for reduction of groundwater storage in the Epworth Gravels Management Area is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). The difference between the measurable objective and the minimum threshold is 30 feet, which provides a margin of safety for operational flexibility in the Epworth Gravels Management Area.

Interim Milestones for Reduction of Groundwater in Storage

Interim milestones target groundwater levels have not been selected for wells in the ELPMA because the groundwater elevations in the ELPMA are currently higher than the measurable objective groundwater levels. 3.5.3.3 Seawater Intrusion

No measurable objectives are required for seawater intrusion in the Epworth Gravels Management Area because the Epworth Gravels Management Area is not adjacent to the Pacific Ocean (Section 3.3.3).

3.5.3.4 Degraded Water Quality

The measurable objective for degraded water quality is the same as the measurable objective for chronic lowering of groundwater levels and reduction in groundwater storage. In the Epworth Gravels Management Area, the measurable objective is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the Epworth Gravels Management Area.

Interim Milestones for Degraded Water Quality

Interim milestones target groundwater levels have not been selected for wells in the Epworth Gravels Management Area because the groundwater elevations in the Epworth Gravels Management Area are currently higher than the measurable objective groundwater levels.

3.5.3.5 Land Subsidence

The measurable objective for land subsidence is the same as the measurable objective for chronic lowering of groundwater levels and reduction in groundwater storage. In the Epworth Gravels Management Area, the measurable objective is the groundwater level at which observed declines in groundwater elevation would cease if gradual reductions in groundwater production are implemented between 2020 and 2040 (Table 3-2). At each of the wells, the difference between the measurable objective and the minimum threshold is greater than or equal to 20 feet, which provides a margin of safety for operational flexibility in the Epworth Gravels Management Area.

Interim Milestones for Land Subsidence

Interim milestones target groundwater levels have not been selected for wells in the Epworth Gravels Management Area because the groundwater elevations in the Epworth Gravels Management Area are currently higher than the measurable objective groundwater levels.

3.5.3.6 Depletions of Interconnected Surface and Groundwater

No measurable objectives specific to the depletion of interconnected surface water are proposed in the Epworth Gravels Management Area because no interconnected surface waters or potential GDEs were identified in the Epworth Gravels Management Area. Therefore, depletion of interconnected surface water in the Epworth Gravels Management Area is not currently occurring and is unlikely to occur in the future.

3.6 REFERENCES CITED

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Table 3-1
Minimum Threshold Groundwater Elevations by Well, Management Area, and Aquifer for Key Wells in the Las Posas Valley Basin

State Well Number	Management Area	Aquifer	Perforations	Top Perforations	Bottom Perforations	Historical Groundwater Level Low		2015 Spring Groundwater Level		GSP Undesirable Result	Proposed Minimum Threshold
			(ft bgs)	*(ft msl)*	*(ft msl)*	*(ft msl)*	*Date Measured*	*(ft msl)*	*Date Measured*		*(ft msl)*
03N19W29F06	Epworth Gravels	Epworth Gravels	222–505	633	350	529.91	8/17/1984	601.5	3/9/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	555
02N20W09Q08	ELPMA	Shallow Alluvial	35–85	267	217	271	6/16/2016	273	3/15/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	170
02N20W12MMW1	ELPMA	Shallow Alluvial		—	—	358.17	11/8/1999	372.18	2/23/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	300
02N20W01B02	ELPMA	FCA	532–765	13	−220	53.79	6/17/2010	N/A	—	Chronic lowering of groundwater levels, reduction in groundwater storage	80
02N20W03H01	ELPMA	FCA	900–1,260	−374	−734	143	7/1/2012	N/A	—	Chronic lowering of groundwater levels, reduction in groundwater storage	100
02N20W04F02	ELPMA	FCA	680–1,000	−221	−541	157	9/18/2013	N/A	—	Chronic lowering of groundwater levels, reduction in groundwater storage	100
02N20W10D02	ELPMA	FCA	872–1,032	−404	−564	77.23	10/7/1977	165.52	3/10/15	Chronic lowering of groundwater levels, reduction in groundwater storage	80
02N20W10G01	ELPMA	FCA	635–890	−197	−452	66.5	10/4/1972	259.57	3/10/15	Chronic lowering of groundwater levels, reduction in groundwater storage	100
02N20W10J01	ELPMA	FCA	500–540	−94	−134	86.87	10/5/1971	285.76	3/10/15	Chronic lowering of groundwater levels, reduction in groundwater storage	110
03N19W19J01	ELPMA	FCA	858–1,050	180	−12	171.1	9/14/2016	179.69	3/9/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	130
03N19W28N03	ELPMA	FCA	598–900	204	98	175	6/15/2015	182	3/15/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	130
03N19W31B01	ELPMA	FCA	880–1,420	−102	−642	93.5	7/14/2014	155.5	3/15/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	105
03N20W34G01	ELPMA	FCA	580–1,011	104	−327	70.68	10/22/1974	145.07	3/9/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	75
03N20W35R03	ELPMA	FCA	800–900	−213	−313	83.16	6/3/2010	155.56	3/9/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	105
03N20W26R03	ELPMA	FCA	803–1,180	−92	−469	98.51	9/22/2009	146.51	3/10/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	100
03N20W35R02	ELPMA	FCA/GCA	1050–1,110	−463	−523	85.27	6/3/2010	156.56	3/9/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	105
02N20W06R01S	WLPMA	LAS	1,090–1,512	−631	−1053	−232.91	1/1/2016	−124.21	3/9/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	−170
02N20W08F01S	WLPMA	LAS	752–1,405	−315	−969	−230.83	10/14/1993	NA	—	Chronic lowering of groundwater levels, reduction in groundwater storage	−195
02N21W16J03S	WLPMA	LAS	560–1,120	−297	−857	−115.49	6/17/2004	−74	3/17/2015	Seawater intrusion (in Oxnard Subbasin), chronic lowering of groundwater levels, reduction in groundwater storage	−73
02N21W11J03S	WLPMA	LAS	1,020–1,080	−640	−700	−83.64	10/24/1994	−51.01	3/16/2015	Chronic lowering of groundwater levels, reduction in groundwater storage	−70
02N21W12H01S	WLPMA	LAS	928–1,765	−510	−1,347	−83.91	12/5/1991	N/A	—	Chronic lowering of groundwater levels, reduction in groundwater storage	−70

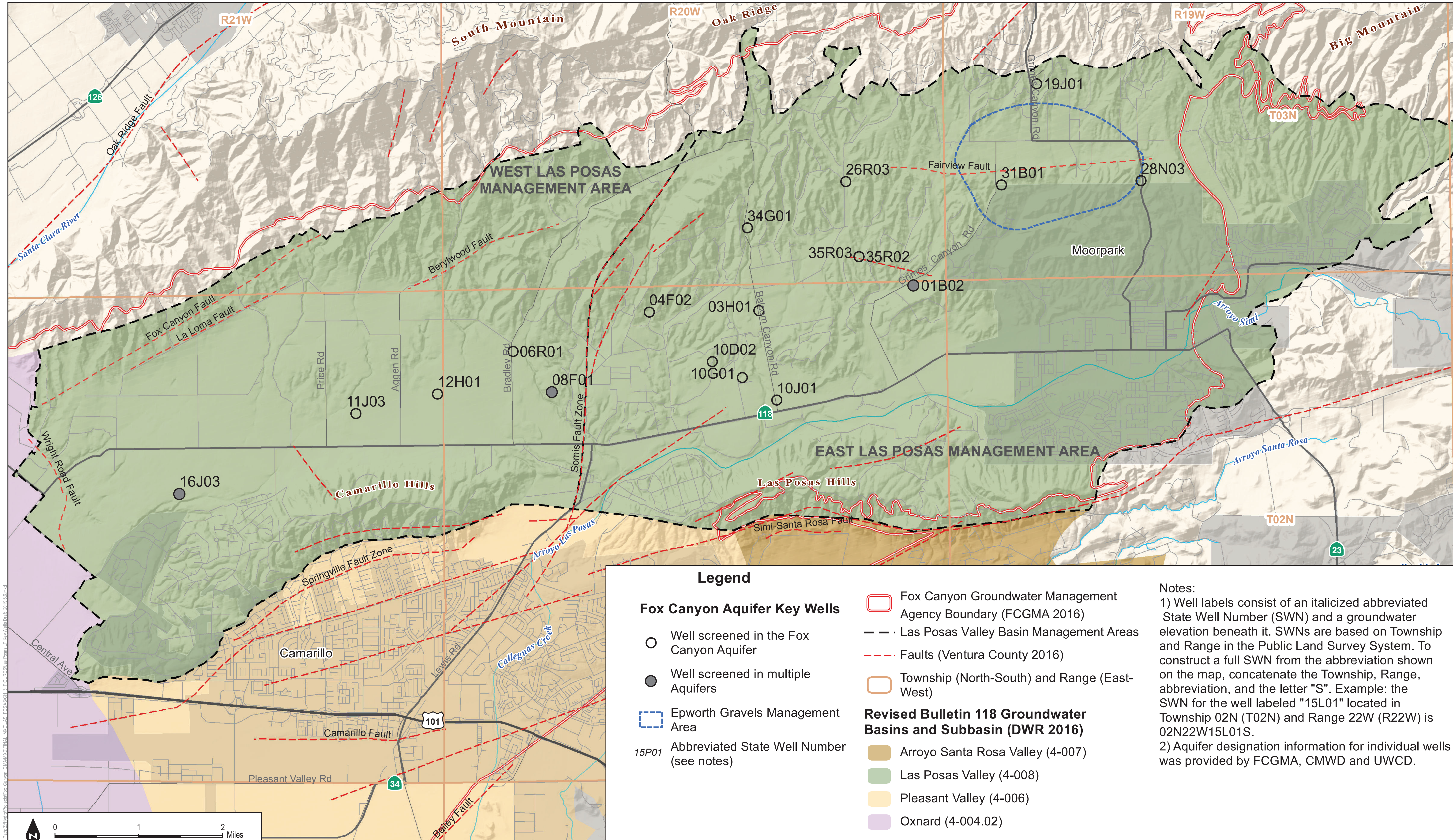
Notes: ELPMA = East Las Posas Management Area; FCA = Fox Canyon Aquifer; ft bgs = feet below ground surface; ft msl = feet above mean sea level; GCA = Grimes Canyon Aquifer; GSP = Groundwater Sustainability Plan; LAS = Lower Aquifer System; N/A = not applicable; UAS = Upper Aquifer System; WLPMA = West Las Posas Management Area.

Table 3-2
Measurable Objectives and Interim Milestones

Well Number	Management Area	Aquifer	Minimum Threshold	Measurable Objective	Fall 2015 Water Level Low		Interim Milestone (ft msl)			
			(ft msl)	*(ft msl)*	*(ft msl)*	*Date Measured*	*2025*	*2030*[a]	*2035*[a]	*2040*[a]
03N19W29F06	Epworth Gravels	Epworth Gravels	555	585	580	10/21/2015	581	583	584	585
02N20W09Q08	ELPMA	Shallow Alluvial	170	255	271	10/15/−2015	—	—	—	—
02N20W12MMW1	ELPMA	Shallow Alluvial	300	345	369	9/15/2015	—	—	—	—
02N20W01B02	ELPMA	FCA	80	120	129.8	9/23/2012	—	—	—	—
02N20W03H01	ELPMA	FCA	100	135	157	10/19/2015	—	—	—	—
02N20W04F02	ELPMA	FCA	100	145	157	9/18/2013	—	—	—	—
02N20W10D02	ELPMA	FCA	80	130	150.5	10/27/2015	—	—	—	—
02N20W10G01	ELPMA	FCA	100	230	244.8	10/27/2015	—	—	—	—
02N20W10J01	ELPMA	FCA	110	250	279.3	10/27/2015	—	—	—	—
03N19W19J01	ELPMA	FCA	130	160	176.2	10/21/2015	—	—	—	—
03N19W28N03	ELPMA	FCA	130	170	180.9	10/15/2015	—	—	—	—
03N19W31B01	ELPMA	FCA	105	145	146.5	10/15/2015	—	—	—	—
03N20W34G01	ELPMA	FCA	75	130	141.9	10/29/2015	—	—	—	—
03N20W35R03	ELPMA	FCA	105	145	136.6	10/29/2015	139	141	143	145
03N20W26R03	ELPMA	FCA	100	120	131.9	11/2/2015	—	—	—	—
03N20W35R02	ELPMA	GCA	105	145	128.7	10/15/2015	133	137	141	145
02N20W06R01S	WLPMA	LAS	−170	−125	−154	10/15/2015	−147	−140	−132	−125
02N20W08F01S	WLPMA	LAS	−195	−150	−121	7/1/2014	—	—	—	—
02N21W16J03S	WLPMA	LAS	−75	−45	−79.8	12/14/2015	−71	−62	−54	−45
02N21W11J03S	WLPMA	LAS	−70	−50	−69	10/22/2015	−64	−60	−55	−50
02N21W12H01S	WLPMA	LAS	−70	−45	−41.9	3/10/2014	—	—	—	—

Notes: ELPMA = East Las Posas Management Area; FCA = Fox Canyon Aquifer; ft msl = feet above mean sea level; GCA = Grimes Canyon Aquifer; LAS = Lower Aquifer System; WLPMA = West Las Posas Management Area.

[a] Interim milestones for 2030, 2035, and 2040 will depend on basin water level recoveries between 2020 and 2025. These thresholds are proposed for the current GSP but will be reviewed and revised with each 5-year evaluation.



DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 3-1

Key Wells Screened in the Fox Canyon Aquifer for the Las Posas Valley Basin

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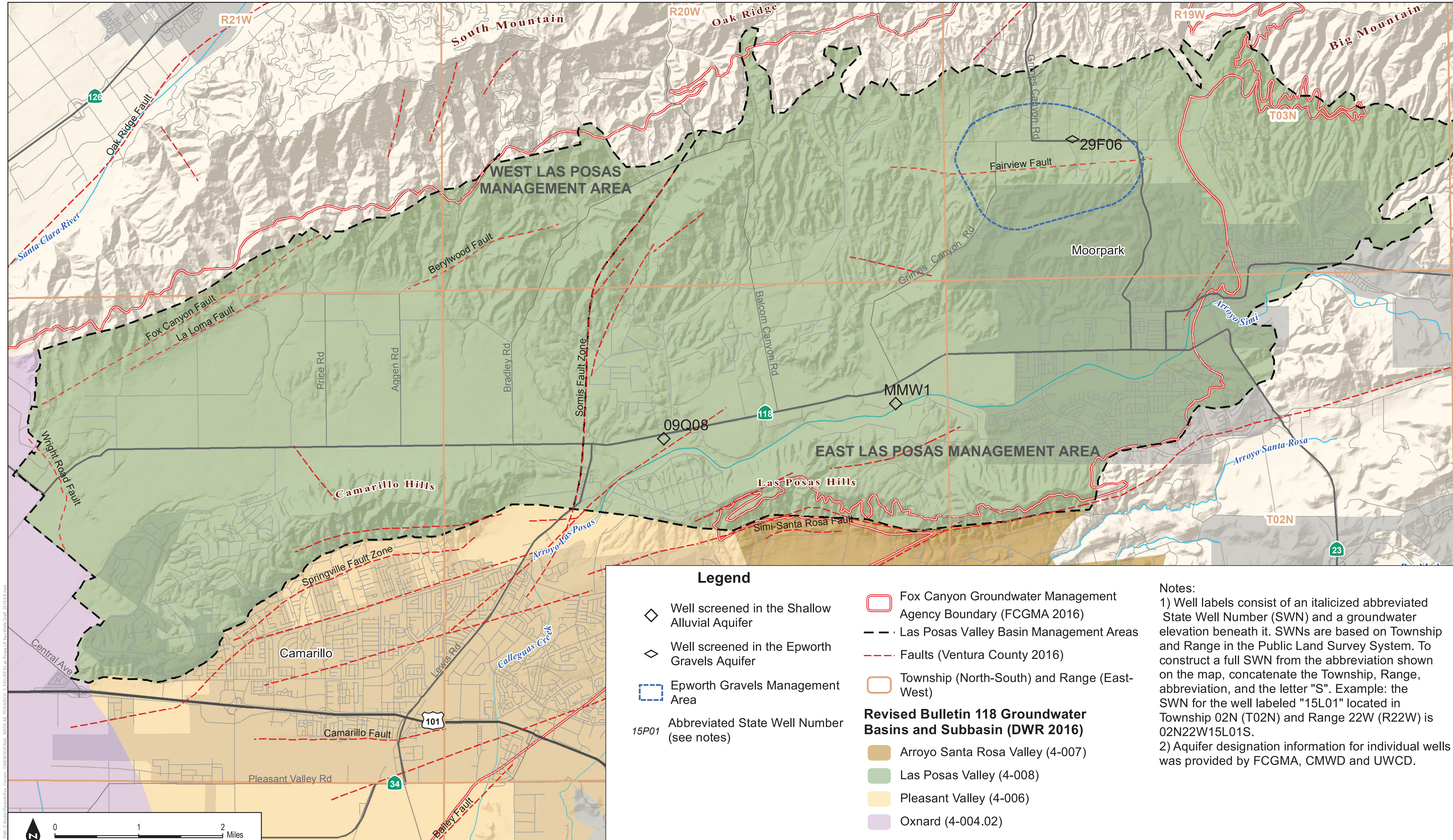

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SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 3-2

Key Wells Screened in the Shallow Alluvial Aquifer and Epworth Gravels Aquifer for the Las Posas Valley Basin

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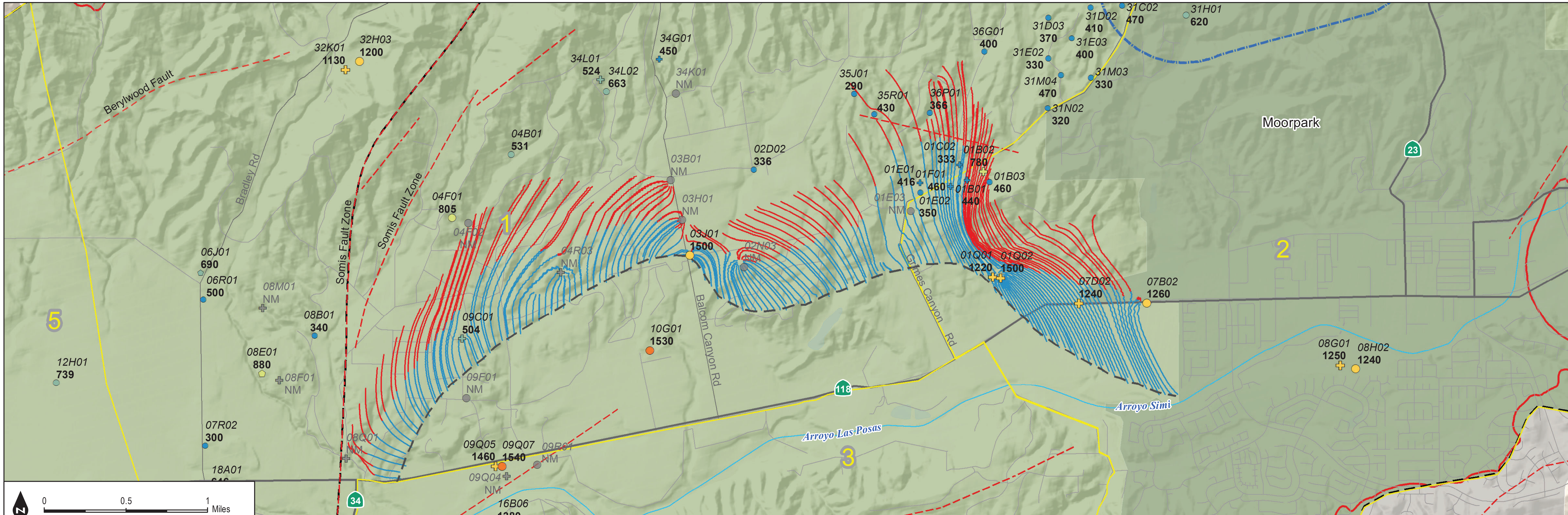


Legend

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Las Posas Basin Plan WQO Areas (see report text)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

Arroyo Santa Rosa Valley (4-007)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

TDS concentration (mg/L), 2011-2015

- 250 - 500
- 500 - 750
- 750 - 1000
- 1000 - 1500
- 1500 - 2500
- Not Measured (NM)

Las Posas Valley Basin Areas

Major Rivers/Stream Channels

Faults (Ventura County 2016)

Epworth Gravels Management

Particle Track Start (Current 1500 mg/L TDS contour)

Particle Tracks by Predicted Years

2020 - 2040

2041 - 2070

Aquifer designation

Well screened in the Epworth Gravels aquifer

Well screened in the Upper San Pedro Formation

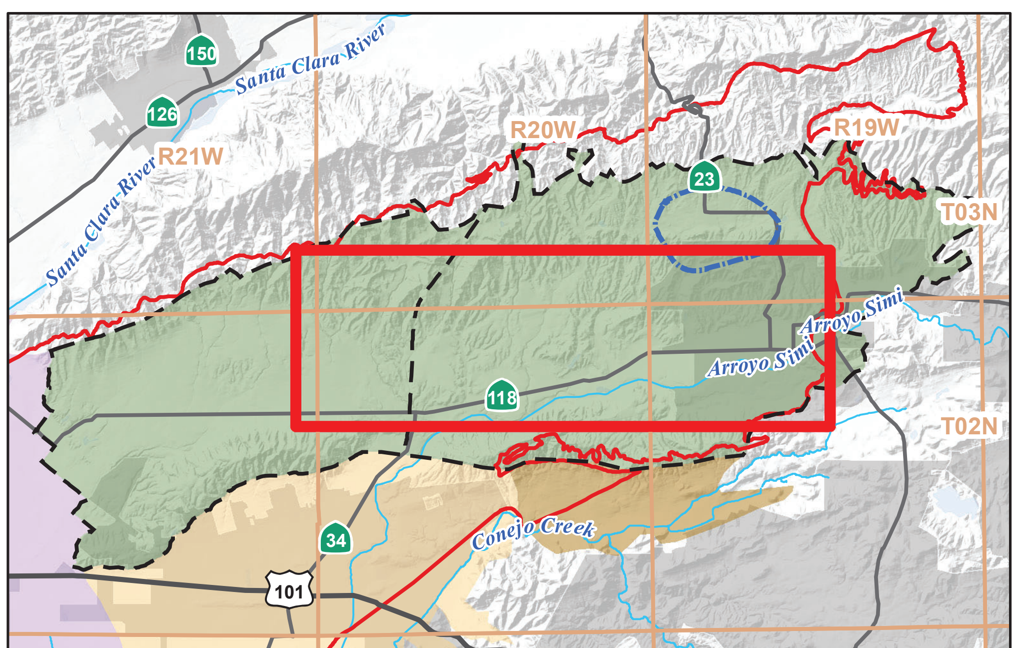
Well screened in the Fox Canyon aquifer

Well screened in the Grimes Canyon aquifer

Well screened in unknown aquifer(s)

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 2011-2015. For a complete water quality record for each well, see Appendix G.
2) "ND" signifies non-detect. "NM" signifies not measured.
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 legend).
5) The color of each well symbol corresponds to the concentration of the most recent sample (see legend). A well symbol with gray fill has no data between 2011-2015.
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 3-3

Scenario 3 Predicted Particle Tracks for 2020-2070 from CMWD model and Most Recent Total Dissolved Solids (mg/L) measured 2011-2015

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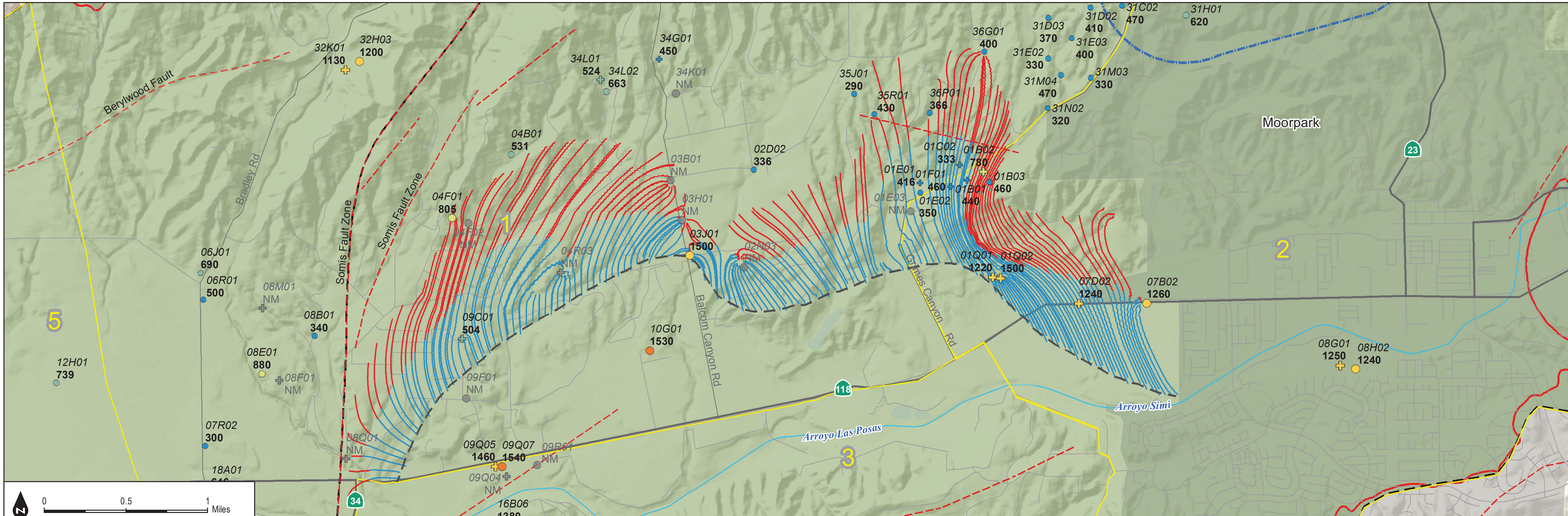


Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Las Posas Basin Plan WQO Areas (see report text)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

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

TDS concentration (mg/L), 2011-2015

- 250 - 500
- 500 - 750
- 750 - 1000
- 1000 - 1500
- 1500 - 2500
- Not Measured (NM)

- Las Posas Valley Basin Areas
- Major Rivers/Stream Channels
- Faults (Ventura County 2016)
- Epworth Gravels Management
- Particle Track Start (Current 1500 mg/L TDS contour)

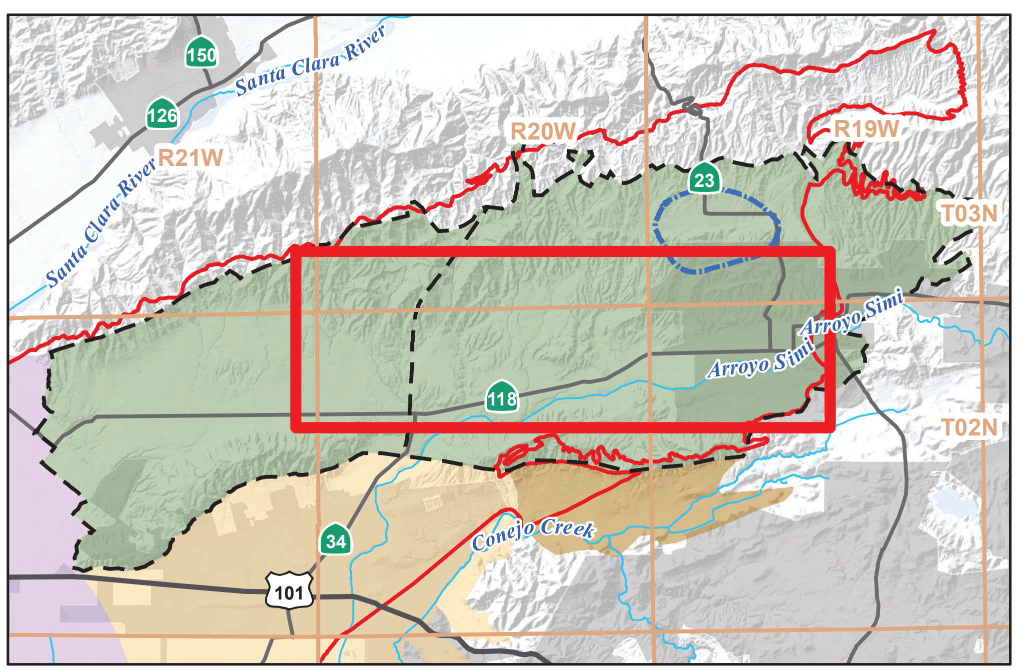
Particle Tracks by Predicted Years

- 2020 - 2040
- 2041 - 2070

Aquifer designation

- Well screened in the Epworth Gravels aquifer
- Well screened in the Upper San Pedro Formation
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Well screened in unknown aquifer(s)

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 2011-2015. For a complete water quality record for each well, see Appendix G.
2) "ND" signifies non-detect. "NM" signifies not measured.
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 legend).
5) The color of each well symbol corresponds to the concentration of the most recent sample (see legend). A well symbol with gray fill has no data between 2011-2015.
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 3-4

Scenario 5 Predicted Particle Tracks for 2020-2070 from CMWD model and Most Recent Total Dissolved Solids (mg/L) measured 2011-2015

Groundwater Sustainability Plan for the Las Posas Valley Basin

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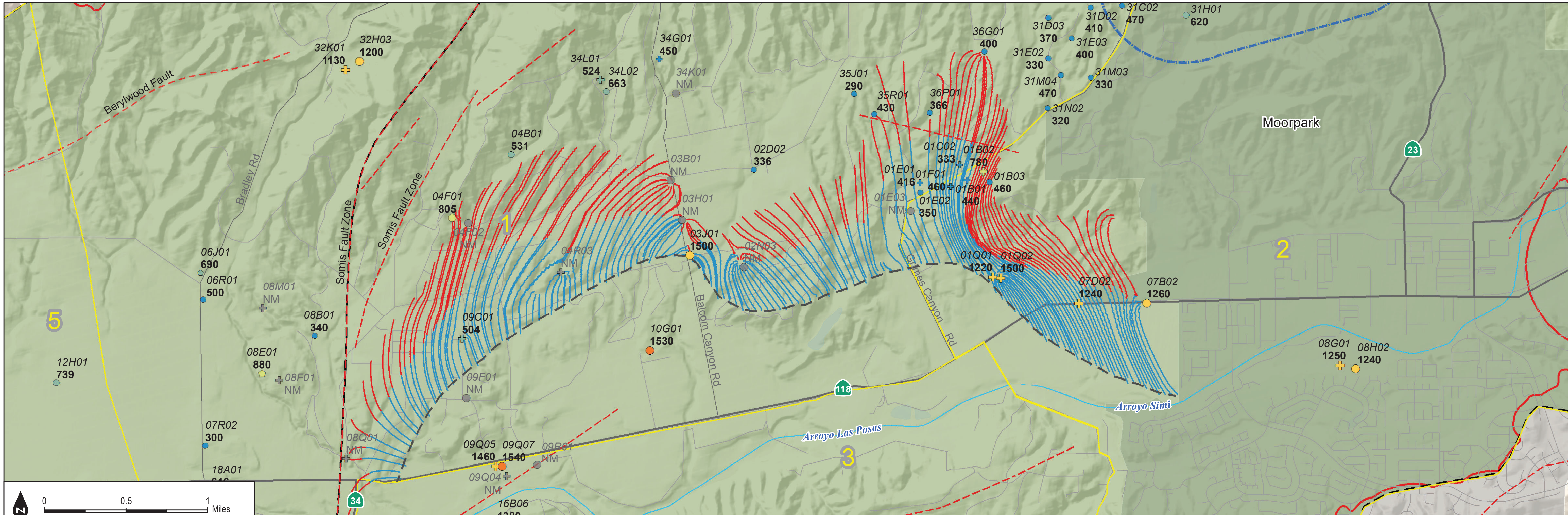

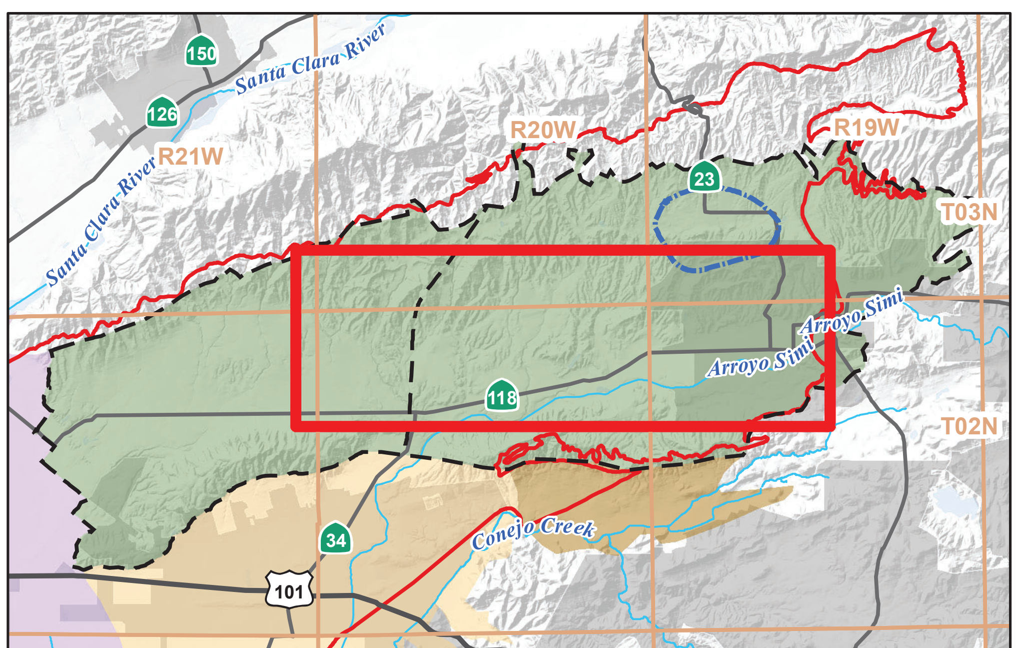

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Las Posas Basin Plan WQO Areas (see report text)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

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

TDS concentration (mg/L), 2011-2015

- 250 - 500
- 500 - 750
- 750 - 1000
- 1000 - 1500
- 1500 - 2500
- Not Measured (NM)

- Las Posas Valley Basin Areas
- Major Rivers/Stream Channels
- Faults (Ventura County 2016)
- Epworth Gravels Management
- Particle Track Start (Current 1500 mg/L TDS contour)

Particle Tracks by Predicted Years

- 2020 - 2040
- 2041 - 2070

Aquifer designation

- Well screened in the Epworth Gravels aquifer
- Well screened in the Upper San Pedro Formation
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Well screened in unknown aquifer(s)

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 2011-2015. For a complete water quality record for each well, see Appendix G.
2) "ND" signifies non-detect. "NM" signifies not measured.
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 legend).
5) The color of each well symbol corresponds to the concentration of the most recent sample (see legend). A well symbol with gray fill has no data between 2011-2015.
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 3-5

Scenario 6 Predicted Particle Tracks for 2020-2070 from CMWD model and Most Recent Total Dissolved Solids (mg/L) measured 2011-2015

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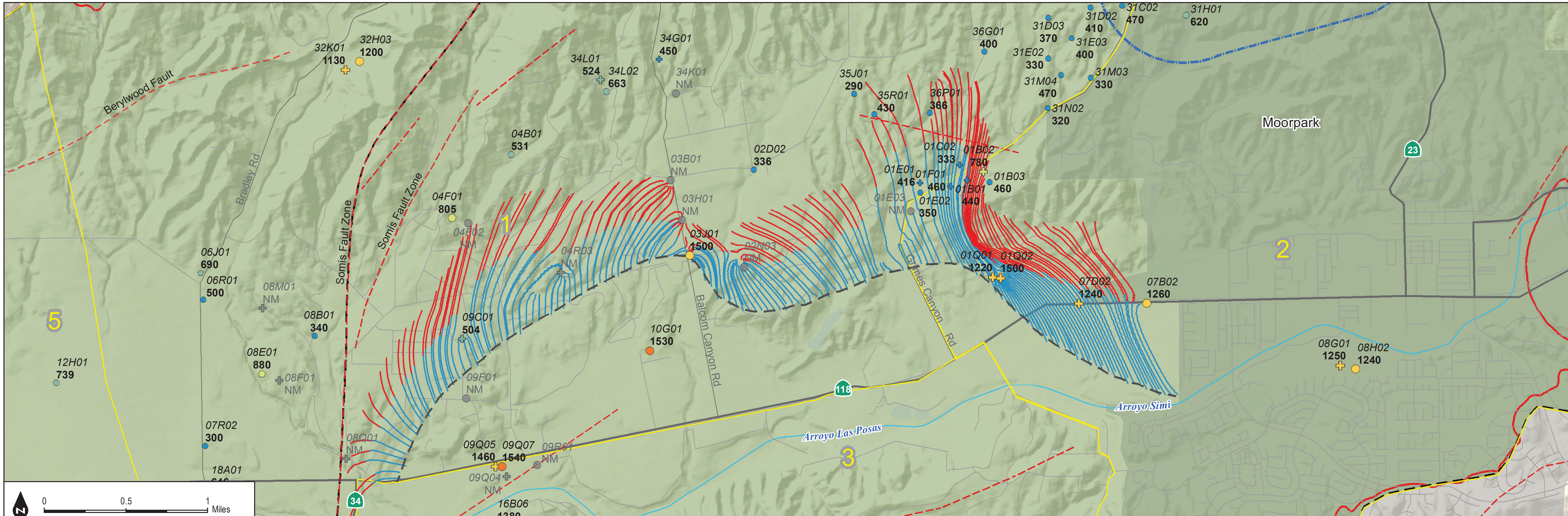

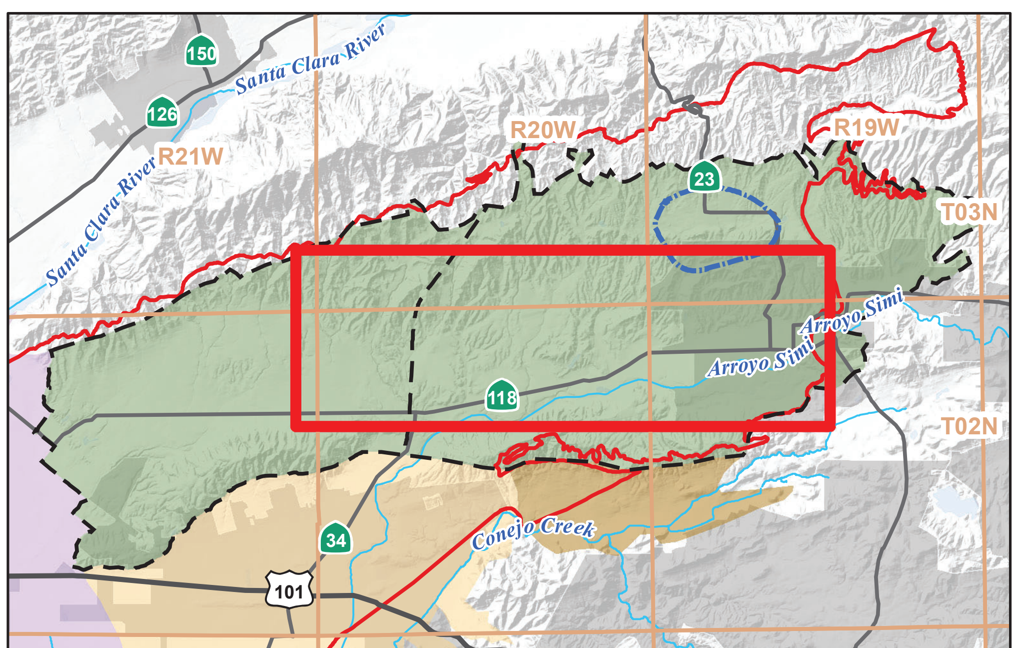

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Las Posas Basin Plan WQO Areas (see report text)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

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

TDS concentration (mg/L), 2011-2015

- 250 - 500
- 500 - 750
- 750 - 1000
- 1000 - 1500
- 1500 - 2500
- Not Measured (NM)

- Las Posas Valley Basin Areas
- Major Rivers/Stream Channels
- Faults (Ventura County 2016)
- Epworth Gravels Management
- Particle Track Start (Current 1500 mg/L TDS contour)

Particle Tracks by Predicted Years

- 2020 - 2040
- 2041 - 2070

Aquifer designation

- Well screened in the Epworth Gravels aquifer
- Well screened in the Upper San Pedro Formation
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Well screened in unknown aquifer(s)
- *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 2011-2015. For a complete water quality record for each well, see Appendix G.
2) "ND" signifies non-detect. "NM" signifies not measured.
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 legend).
5) The color of each well symbol corresponds to the concentration of the most recent sample (see legend). A well symbol with gray fill has no data between 2011-2015.
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 3-6

Scenario 7 Predicted Particle Tracks for 2020-2070 from CMWD model and Most Recent Total Dissolved Solids (mg/L) measured 2011-2015

Groundwater Sustainability Plan for the Las Posas Valley Basin

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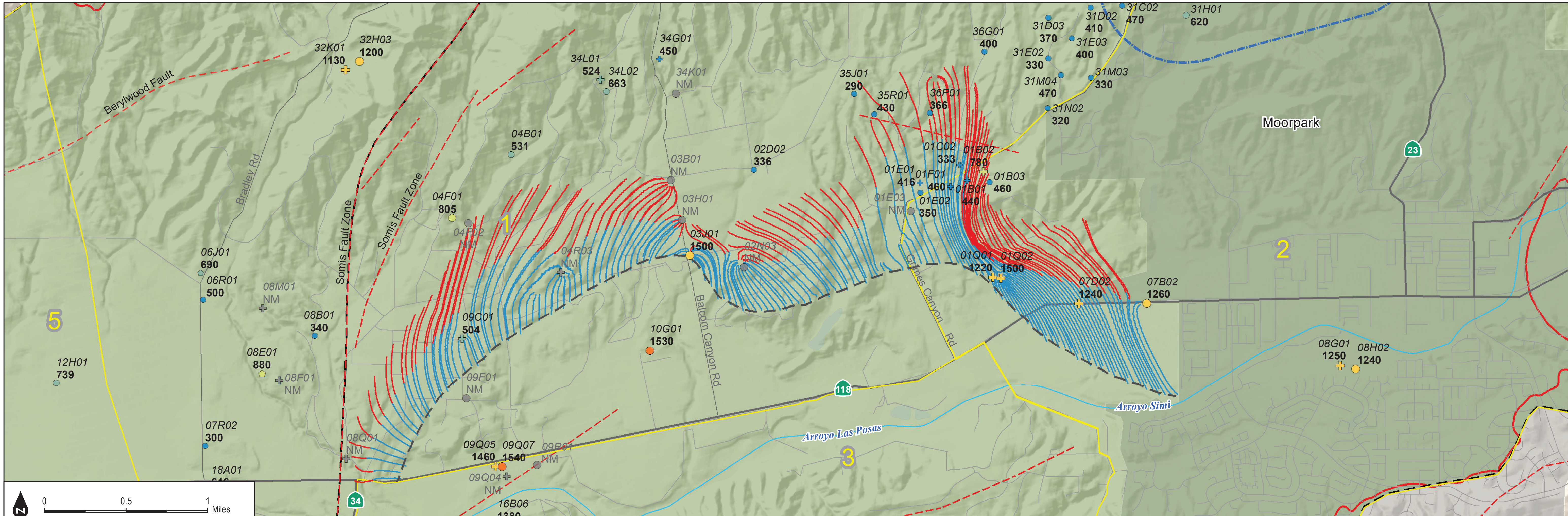

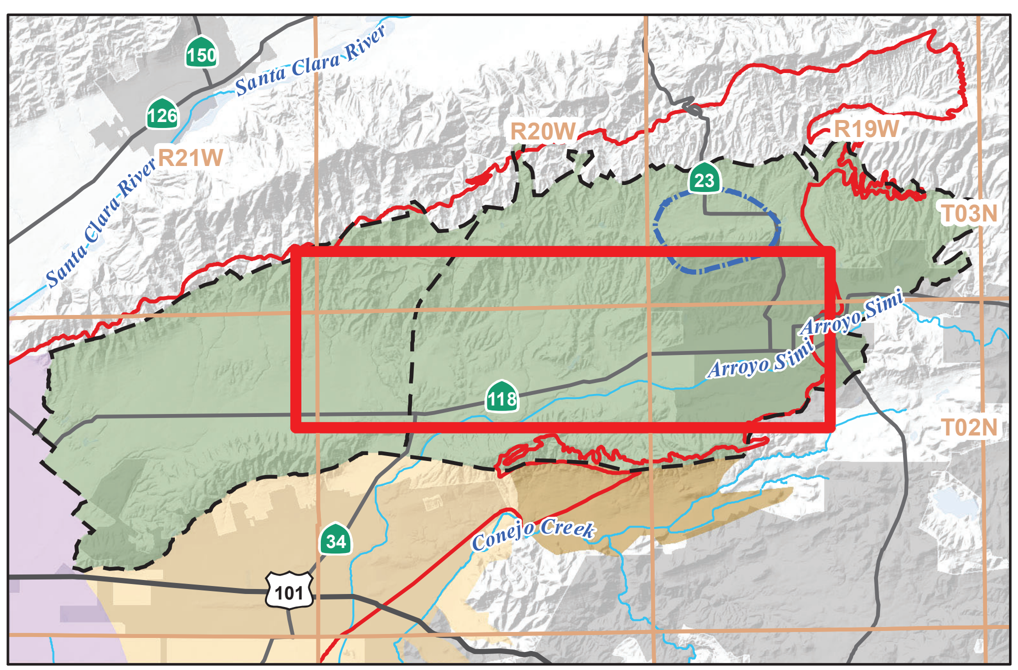

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Las Posas Basin Plan WQO Areas (see report text)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

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

TDS concentration (mg/L), 2011-2015

- 250 - 500
- 500 - 750
- 750 - 1000
- 1000 - 1500
- 1500 - 2500
- Not Measured (NM)

- Las Posas Valley Basin Areas
- Major Rivers/Stream Channels
- Faults (Ventura County 2016)
- Epworth Gravels Management
- Particle Track Start (Current 1500 mg/L TDS contour)

Particle Tracks by Predicted Years

- 2020 - 2040
- 2041 - 2070

Aquifer designation

- Well screened in the Epworth Gravels aquifer
- Well screened in the Upper San Pedro Formation
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Well screened in unknown aquifer(s)

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 2011-2015. For a complete water quality record for each well, see Appendix G.
2) "ND" signifies non-detect. "NM" signifies not measured.
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.
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5) The color of each well symbol corresponds to the concentration of the most recent sample (see legend). A well symbol with gray fill has no data between 2011-2015.
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 3-7

Scenario 8 Predicted Particle Tracks for 2020-2070 from CMWD model and Most Recent Total Dissolved Solids (mg/L) measured 2011-2015

Groundwater Sustainability Plan for the Las Posas Valley Basin

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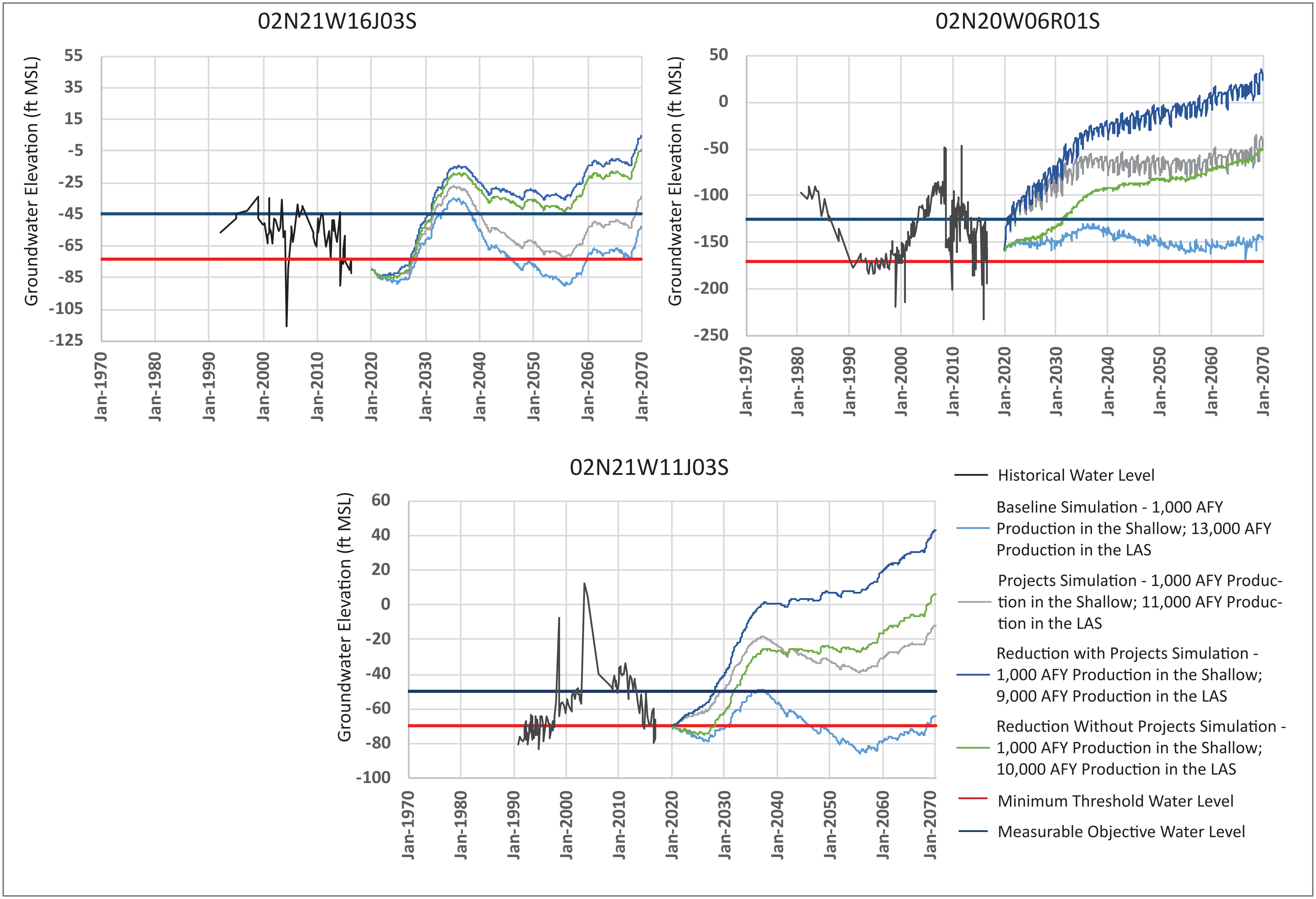

FIGURE 3-8a

Key Well Hydrographs in the West Las Posas Valley Management Area

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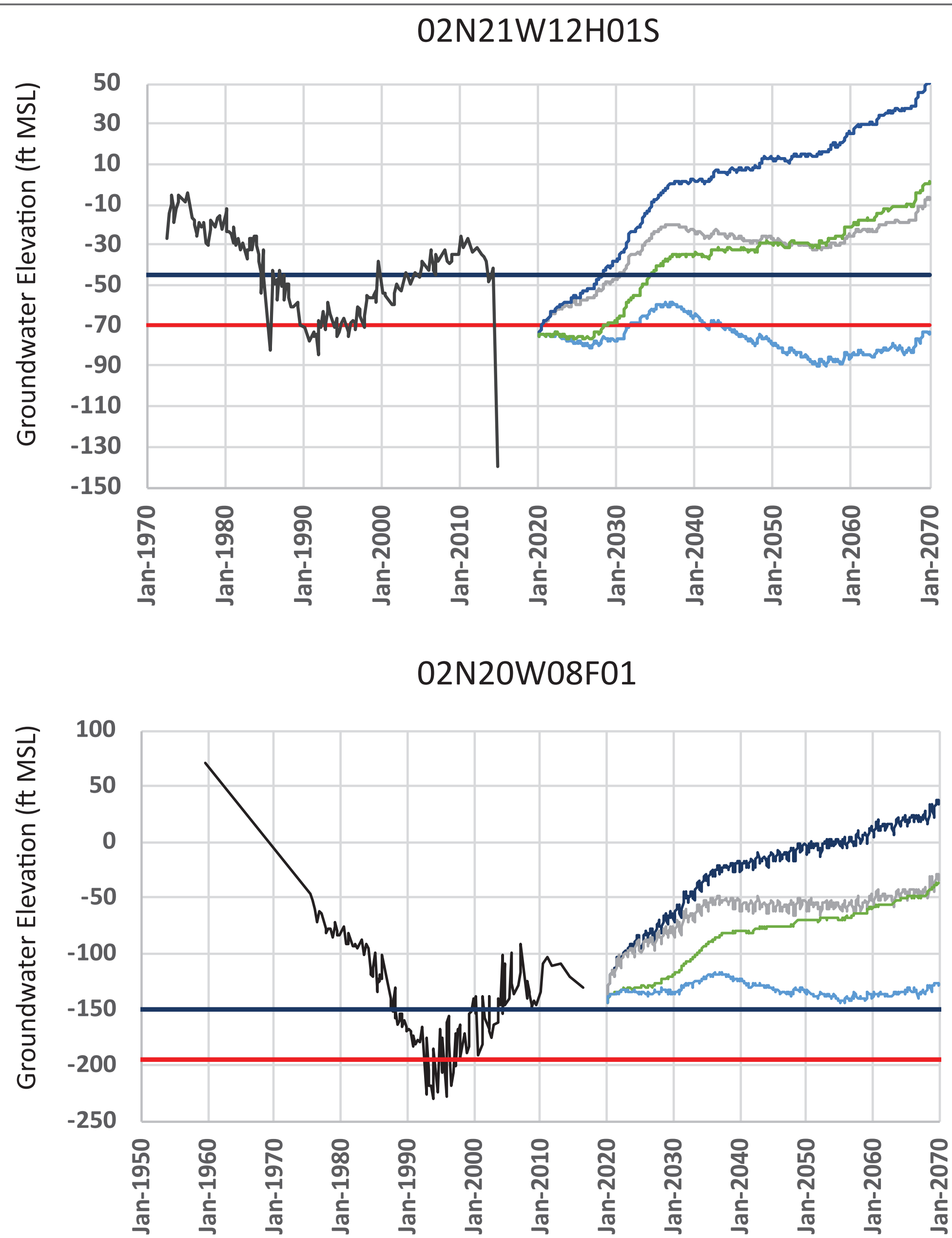

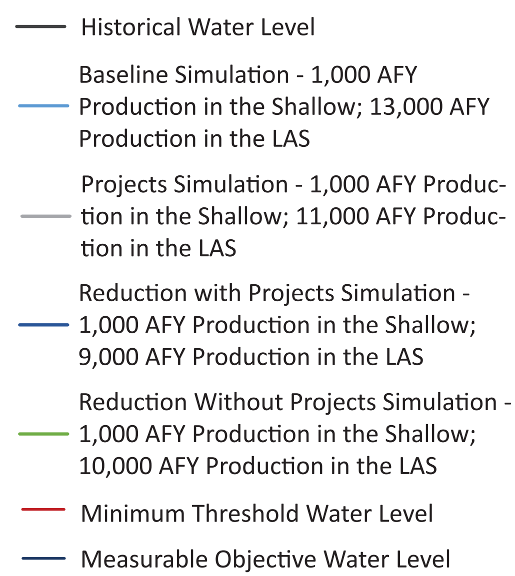

Note: Projected water levels shown for well 02N20W08F01 are from model simulations for well 02N20W07R02S, which was destroyed. Well 02N20W08F01 was selected to replace well 02N20W07R02 as a key well after the model simulations had been completed.

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FIGURE 3-8b

Key Well Hydrographs in the West Las Posas Valley Management Area

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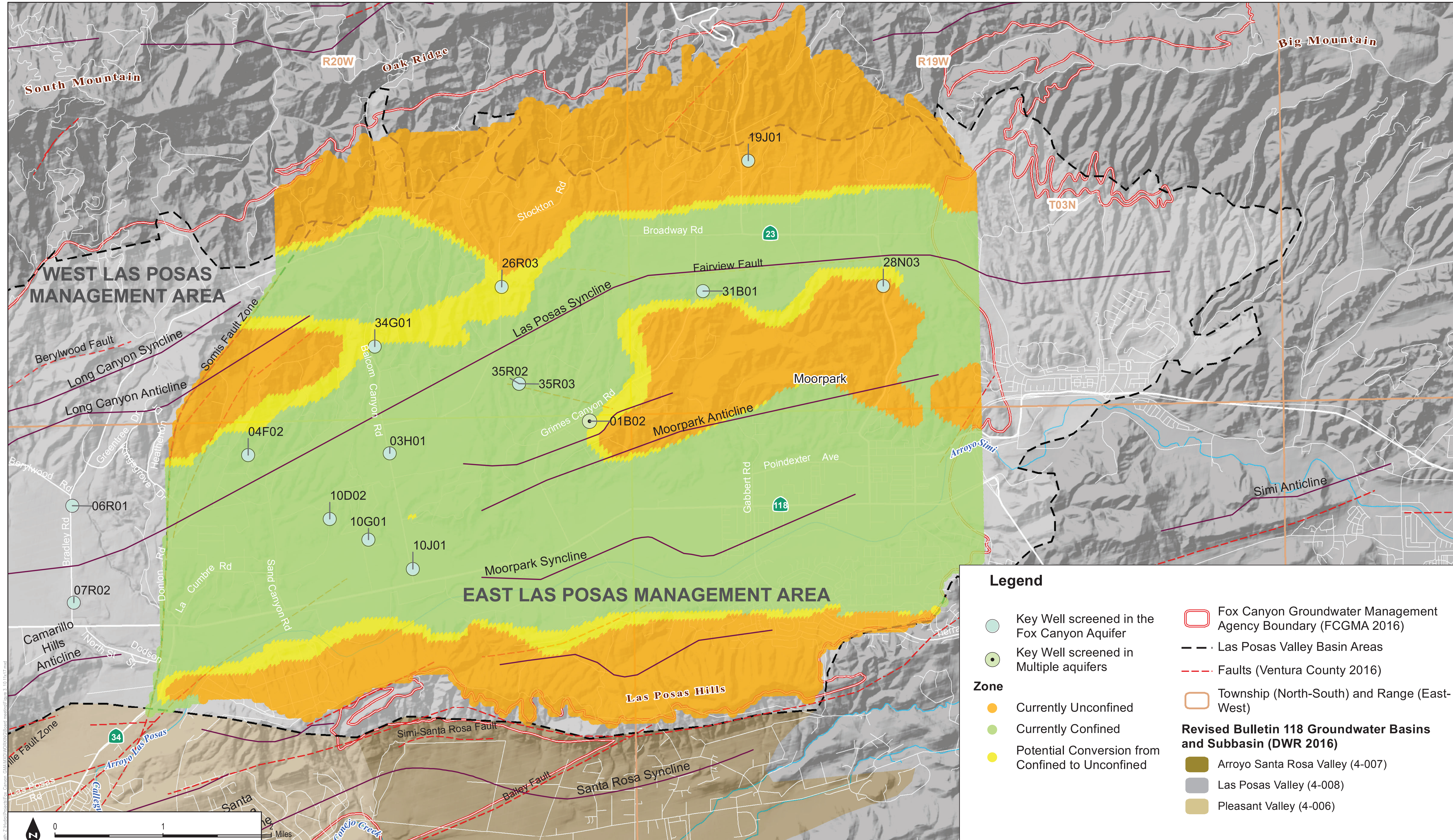

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 3-9

Fox Canyon Aquifer Zone Map

Groundwater Sustainability Plan for the Las Posas Valley Basin

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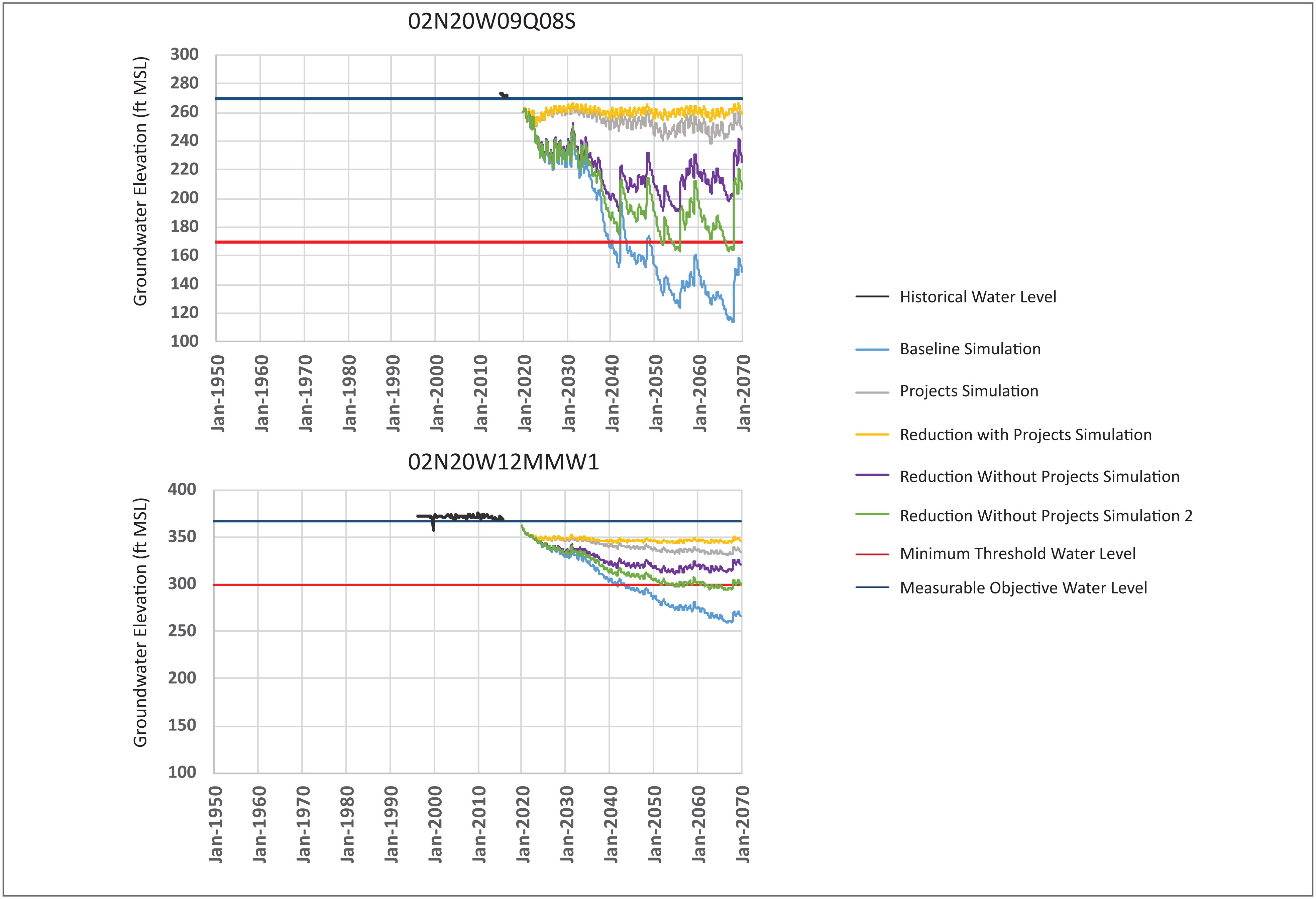

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FIGURE 3-10a

Key Well Hydrographs in the East Las Posas Valley Management Area - Shallow Alluvial Aquifer

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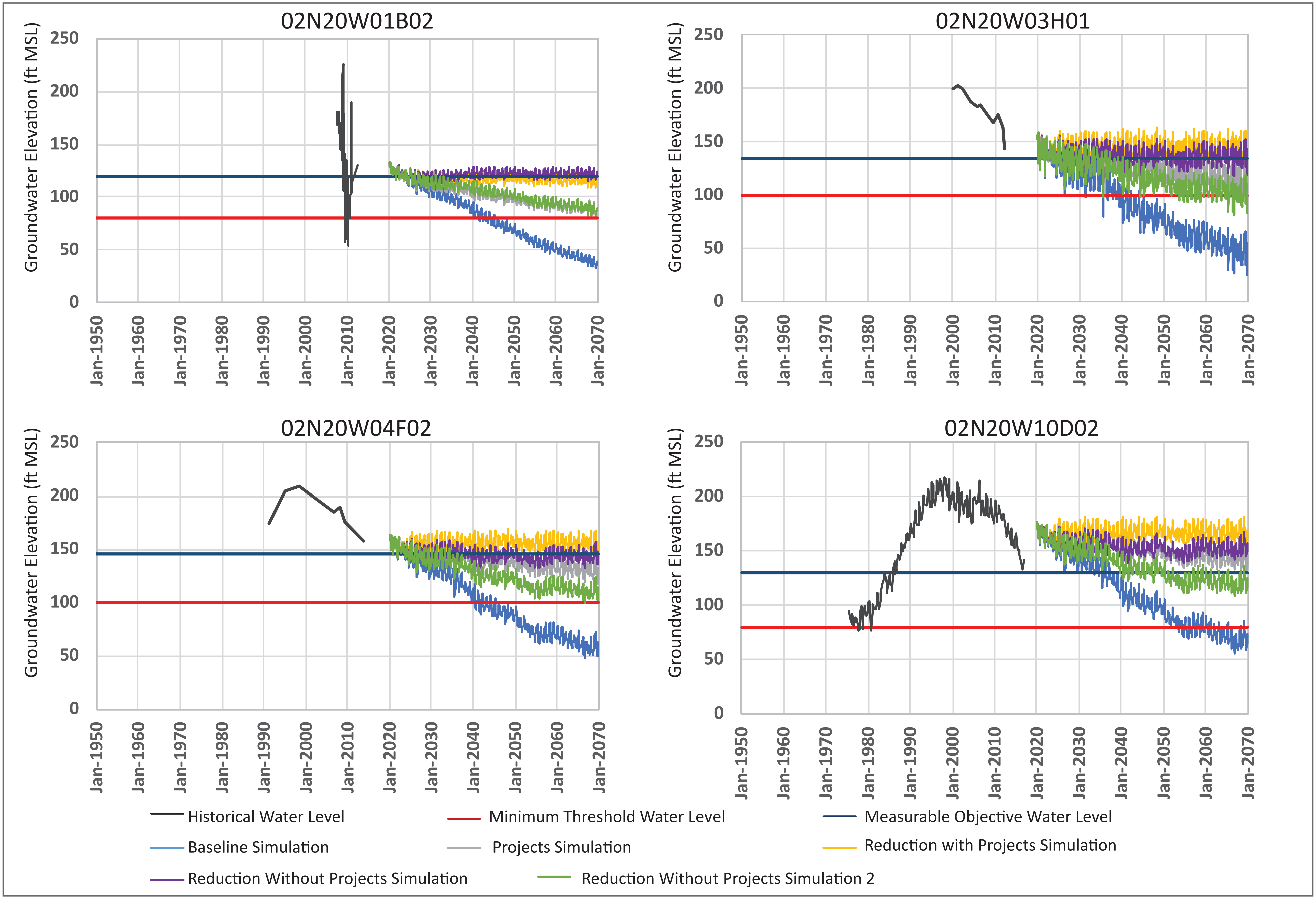

FIGURE 3-10b

Key Well Hydrographs in the East Las Posas Valley Management Area - Fox Canyon Aquifer

Groundwater Sustainability Plan for the Las Posas Valley Basin

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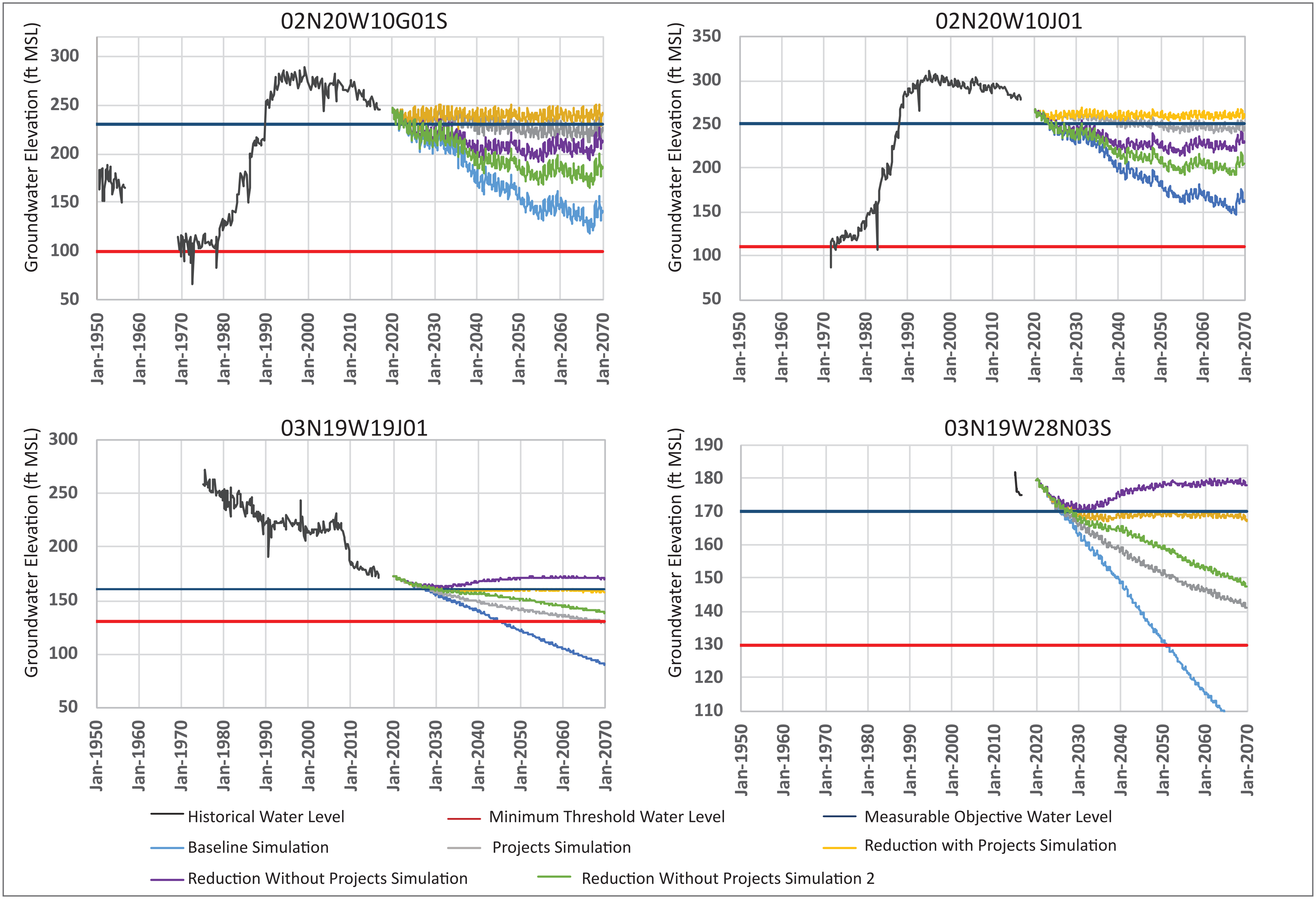

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FIGURE 3-10c

Key Well Hydrographs in the East Las Posas Valley Management Area - Fox Canyon Aquifer

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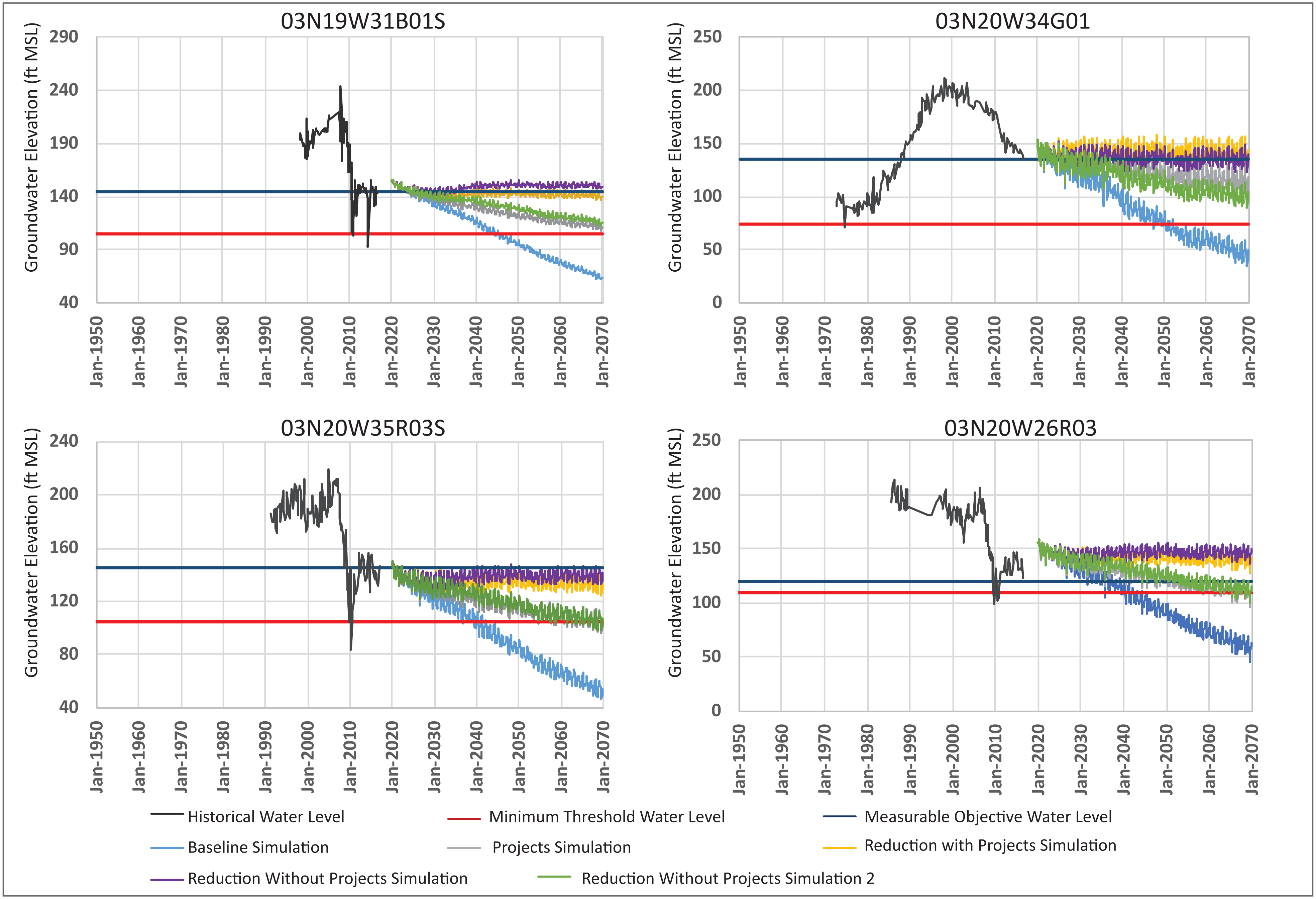

FIGURE 3-10d

Key Well Hydrographs in the East Las Posas Valley Management Area - Fox Canyon Aquifer

Groundwater Sustainability Plan for the Las Posas Valley Basin

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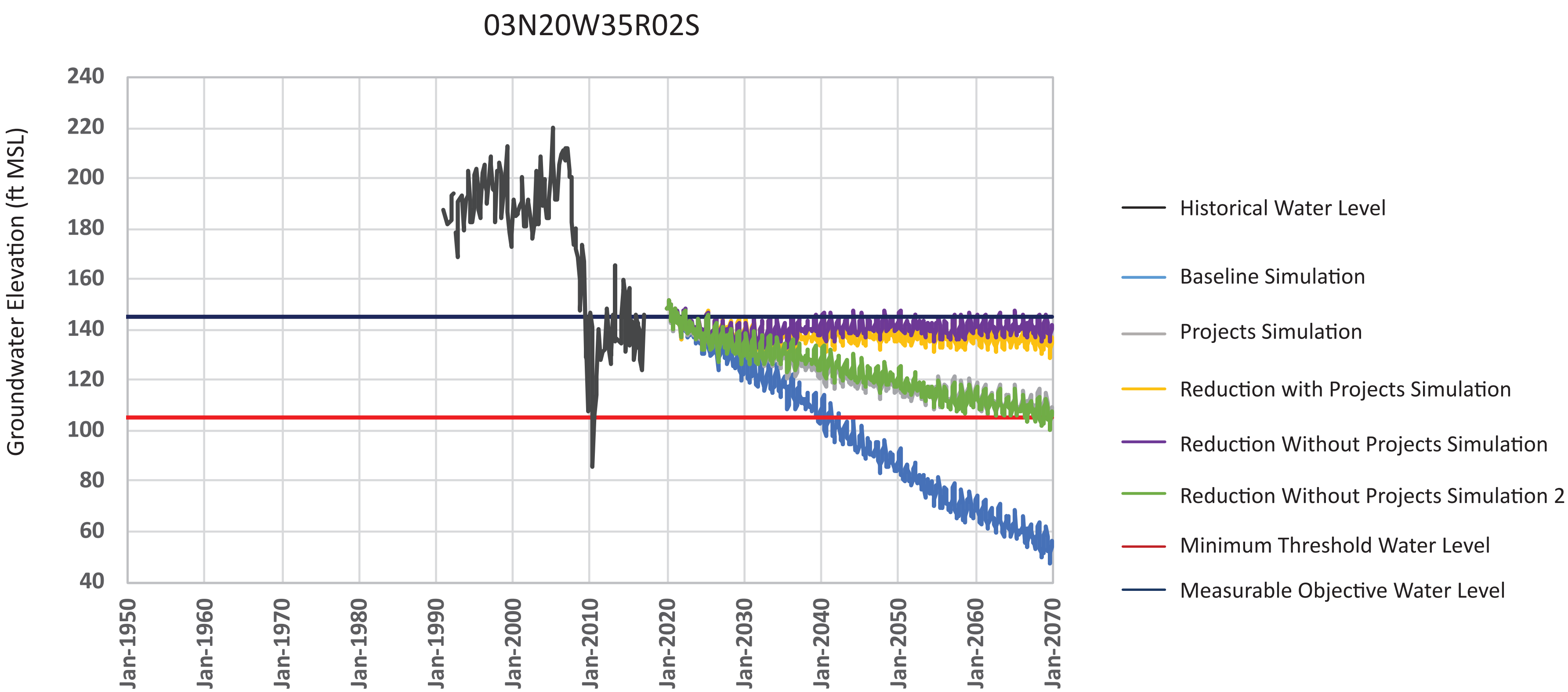

FIGURE 3-10e

Key Well Hydrographs in the East Las Posas Valley Management Area - Fox Canyon Aquifer

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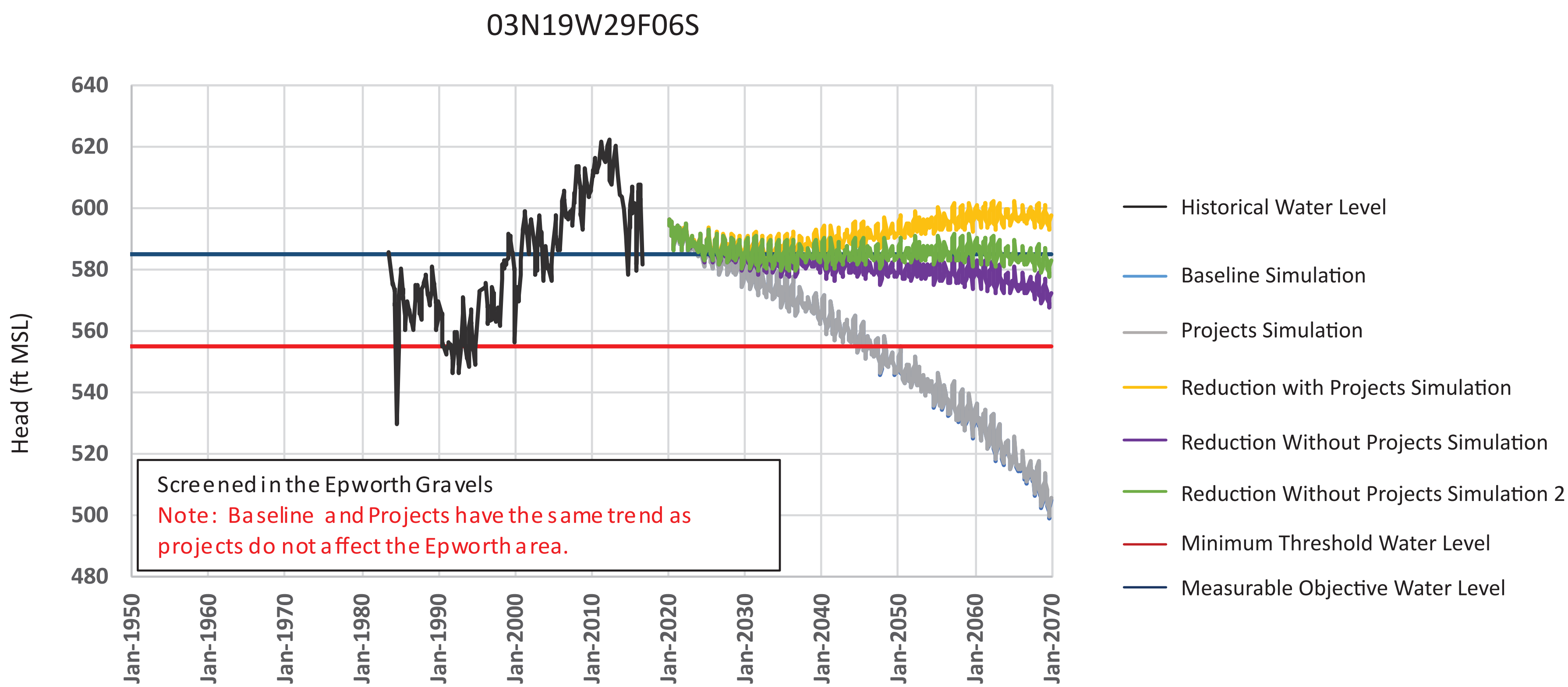

FIGURE 3-11

Key Well Hydrographs in the Epworth Gravels Management Area - Epworth Gravels Aquifer

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