Basin Optimization Yield Study

Las Posas Valley Basin

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Prepared for:

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AF	Acre-Feet
AFY	Acre-Feet per Year
Basin	Las Posas Valley Groundwater Basin (DWR Basin No. 4-008)
BOY	Basin Optimization Yield
CMWD	Calleguas Municipal Water District
ELPMA	East Las Posas Management Area
ET	Evapotranspiration
FCGMA	Fox Canyon Groundwater Management Agency
First Periodic Evaluation	First Periodic Evaluation of the Groundwater Sustainability Plan for the Las Posas Valley Groundwater Basin
Judgment	Judgment in Las Posas Valley Water Rights Coalition, et al., v. Fox Canyon Groundwater Management Agency, Santa Barbara Sup. Ct. Case No. VENC100509700
LAS	Lower Aquifer System
MWC	Mutual Water Company
MT	Minimum Threshold Groundwater Elevation defined at Key Wells in the GSP for the Las Posas Valley Basin
PAC	Policy Advisory Committee
SGMA	Sustainable Groundwater Management Act
SVWQCP	Simi Valley Water Quality Control Plant
TAC	Technical Advisory Committee
VCWWD-1	Ventura County Waterworks District No. 1
VCWWD-19	Ventura County Waterworks District No. 19
WLPMA	West Las Posas Management Area
ZMWC	Zone Mutual Water Company

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Executive Summary

This Basin Optimization Yield (BOY) Study has been prepared to determine the Basin Optimization Yield, Rampdown, and Rampdown Rate for the Las Posas Valley Groundwater Basin (Basin), in conformance with the Judgment adjudicating groundwater rights in the Basin. The initial scope of this Study was reviewed by both the Technical Advisory Committee (TAC) and Policy Advisory Committee (PAC) for the Basin.

The Basin Optimization Yield was evaluated using numerical groundwater model simulations that incorporated differing groundwater production rates and two projects identified in the Basin Optimization Plan that provided quantifiable groundwater at a level of detail that could be included in the model. These projects are (1) the purchase of imported water from Calleguas Municipal Water District (CMWD) for Basin replenishment (Basin Optimization Plan Project 2) and (2) an Arroyo Simi-Las Posas water acquisition project (Basin Optimization Plan Project 5). The scenarios evaluated included a Baseline Scenario, in which groundwater production equaled the Initial Operating Yield of 40,000 Acre-Feet per Year (AFY) set by the Judgment, a Projects Scenario in which groundwater production was reduced at nine wells owned and operated by Zone Mutual Water Company, Ventura County Waterworks District 19, and Ventura County Waterworks District 1, and replaced by imported water consistent with Project 2 in the Basin Optimization Plan: Purchase of imported Water from CMWD for Basin Replenishment, and two Rampdown scenarios.

Groundwater Production at the Initial Operating Yield was determined to be unsustainable because modeled future groundwater elevations at several Key Wells, or representative monitoring points, fell below the minimum threshold groundwater elevation established in the Groundwater Sustainability Plan for the Las Posas Valley Basin. Groundwater production from the Projects Scenario was determined to be sustainable, if starting groundwater elevations are raised above the minimum threshold groundwater elevations prior to 2040. The projects rely on other water agencies for implementation thus inter agency coordination is critical. Initial discussions between the Watermaster and these agencies have begun, but coordination agreements between the agencies have not yet been drafted.

If the projects are not implemented, the BOY Study evaluated the Rampdown, and Rampdown rate for the Basin for two scenarios. In the first scenario, referred to as the Basin-wide Rampdown Scenario, groundwater production was reduced uniformly in all management areas relative to the Initial Operating Yield of 40,000 AFY until groundwater conditions avoided the undesirable results specified in the Groundwater Sustainability Plan. The Sustainable Yield was determined to be 32,000 AFY if pumping is reduced uniformly in all management areas and projects are not implemented. The Rampdown is the difference between the Initial Operating Yield and this Sustainable Yield. Therefore, under these conditions, the Rampdown is 8,000 acre-feet per year (AFY) of groundwater production. Under this scenario, groundwater production was reduced by 3,683 AFY in the WLPMA, 4,112 AFY in the ELPMA, and 205 AFY in the Epworth Gravels Management Area. The Rampdown Rate, which is the annual reduction in pumping required if the Rampdown is fully implemented by the fall of 2039, was determined by dividing the Rampdown by the 14-year period over which it will be implemented. The Rampdown rate is 571 AFY.

In the second scenario, referred to as the Differential Rampdown Scenario, the Rampdown differed by management area. Under this scenario the Sustainable Yield, in the absence of projects, was determined to be 33,942 AFY, and the overall Rampdown was 6,058 AFY. Under this scenario, groundwater production was reduced by 3,683 AFY in the WLPMA, 2,261 AFY in the ELPMA, and 113 AFY in the Epworth Gravels Management Area. This scenario avoided undesirable results while maintaining higher overall groundwater production rates than the Basin-wide Rampdown Scenario.

1 Introduction

This initial BOY Study is prepared in conformance with the Judgment adjudicating groundwater rights in the Basin and in consultation with the TAC and PAC (Basin; Figure 1-1). TAC and PAC provided feedback and recommendations on the initial scope of this Study and TAC provided feedback on initial model simulations. TAC feedback and recommendations shaped the subsequent model simulations and discussion.

The purpose of this BOY Study is to determine the Basin Optimization Yield, which is defined in the Judgment as "*the estimated yield that is projected to be available to achieve Sustainable Groundwater Management by 2040*" (Judgment § 1.21). The BOY Study evaluates groundwater conditions under three potential future production scenarios: (1) continued production at 40,000 acre-feet per year (AFY), the initial Operating Yield defined in the Judgment, (2) implementation of two groundwater in-lieu projects evaluated in the Basin Optimization Plan (BOP), and (3) a ramp-down scenario to determine the BOY in the event that the projects are not implemented. The Rampdown calculated in this first BOY Study is the reduction of the initial Operating Yield necessary to "*(i) achieve Sustainable Groundwater Management and the reasonable and beneficial use of the Basin's water resources and (ii) avoid Undesirable Results*" (Judgment § 1.88) in the event that projects are not implemented. The Rampdown Rate is the annual amount of Rampdown of Operating Yield during each Water Year necessary to achieve the Basin Optimization Yield by 2040.

The BOY Study must be performed every 5 years, following Committee Consultation, to reassess the Basin Optimization Yield (Judgment § 1.22). The next BOY Study must be completed, "*on or before February 1, 2030, to establish the Rampdown Rate for the period from Water Years 2030 through 2034*"[1] (Judgment § 4.10.2). The 2030 BOY Study will be prepared in conjunction with the second Periodic Evaluation of the Groundwater Sustainability Plan, which is due to the California Department of Water Resources no later than January 13, 2030. Additionally, the Basin Optimization Plan can be amended or additional projects included if they meet the required criteria, as determined in Watermaster's discretion, subject to Committee Consultation (Judgment § 5.3.2.2). Amendment or addition of projects to the Basin Optimization Plan may trigger an update of the BOY Study, which can be updated "*at Watermaster's discretion in response to material changing or changed Basin conditions*" (Judgment § 1.22).

1.1 LPV Judgment

On July 10, 2023, the Santa Barbara Superior Court issued a statement of decision adopting a judgment in Las Posas Valley Water Rights Coalition, et al., v. Fox Canyon Groundwater Management Agency, Santa Barbara Sup. Ct. Case No. VENC100509700 (Judgment). The Judgment adjudicates all groundwater rights in the Basin and provides for the Basin's sustainable management pursuant to the Sustainable Groundwater Management Act (SGMA). The Judgment appoints Fox Canyon Groundwater Management Agency (FCGMA) as the Watermaster to implement and administer the Judgment.

As outlined in the Judgment, Watermaster, following Committee Consultation, is responsible for determining the Basin Optimization Yield of the Basin. The BOY Study is designed to evaluate future groundwater conditions,

1 A water year begins October 1 and ends September 30 to reflect the precipitation patterns in California. Under DWR's definition of a water year, water year 2030 begins October 1, 2029, and ends September 30, 2030. Under the Judgment, water year 2030 begins on October 1, 2030, and ends on September 30, 2031. This document adopts DWR's naming convention for a water year.

including projects selected for the Basin Optimization Plan, to set the Basin Optimization Yield, Rampdown, and Operating Yield, for the following water year and subsequent water years (Judgment § 2.22).

1.2 Summary of Basin Optimization Plan

Watermaster, in accordance with the Judgment and in consultation with the LPV Policy Advisory Committee (PAC) and TAC, developed a Basin Optimization Plan (FCGMA 2025a) that identified, evaluated, and prioritized projects that are "*practical, reasonable, and cost-effective to implement prior to 2040 to maintain the Operating Yield at 40,000 AFY or as close thereto as achievable*" (Judgment § 5.3.2.2). Potential projects for evaluation in the Basin Optimization Plan were identified by FCGMA and stakeholders via the Judgment, the LPV Groundwater Sustainability Plan (GSP), and the First Periodic Evaluation of the LPV GSP (First Periodic Evaluation; Table 1-1).

Table 1-1. Summary of Projects Evaluated

Project No.	Project Title	Project Ranking	Selected for BOP	Selected for BOY Modeling	Source(s)
1	Arroyo-Simi Las Posas Arundo Removal	7	Yes	No	Judgment No. 1 (§ 5.4.1) GSP Project No. 2 GSP Evaluation Project No. 2
2	Purchase of Imported Water from CMWD for Basin Replenishment[a]	1	Yes	Yes	Judgment Nos. 1&2 (§§ 5.4.2 & 5.4.9) GSP Project No. 1 GSP Evaluation Project No. 1
3	Arroyo Las Posas Storm Water Capture and Recharge	8	Yes	No	Judgment No. 3 (§ 5.4.3) GSP Evaluation Project No. 6
4	Moorpark Desalter	9	Yes	No	Judgment No. 4 (§ 5.4.4) GSP Evaluation Project No. 5
5	Arroyo Simi-Las Posas Water Acquisition	2	Yes	Yes	Judgment No. 5 (§ 5.4.5) GSP Project No. 3 GSP Evaluation Project No. 3
6	Delivery of Recycled Water to Las Posas Valley Users via Pipeline	6	No	No	Judgment No. 6 (§ 5.4.6)
7	In Lieu Deliveries to Northern East Las Posas Management Area Feasibility Study	4	No	No	Judgment No. 7 (§ 5.4.7) GSP Evaluation Project No. 9
8	Allocation Buyback and Reduction Program	3	No	No	Judgment No. 8 (§ 5.4.8)
9	Regional Desalter Feasibility Study	5	No	NO	GSP Evaluation Project No. 7

Notes: FCGMA = Fox Canyon Groundwater Management Agency; VCWWD-1 = Ventura County Waterwork District No. 1; AFY = Acre-Feet per Year; ET = evapotranspiration; SVWQCP = Simi Valley Water Quality Control Plant.
[a] Projects identified in Judgment sections 5.4.2 and 5.4.9 were combined based on TAC recommendation (TAC, August 27, 2024).

Watermaster developed evaluation criteria in four primary categories: (1) water supply, (2) timing and feasibility, (3) cost and funding, and (4) additional project considerations, to conduct the initial assessment of the original nine projects. After scoring, ranking, and prioritizing the potential projects, three projects and two feasibility studies were determined to be practical, reasonable, and cost-effective to implement prior to 2040. Five-year implementation schedules and costs for the selected projects and feasibility studies were developed in the Basin Optimization Plan.

Additionally, the Basin Optimization Plan evaluated which projects could be included in the numerical groundwater modeling conducted for the BOY Study. Two projects provided quantifiable supplemental groundwater at a level of detail that could be included in the model: Project 2, Purchase of Imported Water from CMWD for Basin Replenishment, and Project 5, and Arroyo Simi-Las Posas Water Acquisition Project. These Basin Optimization Projects are discussed further in Section 3.1.3.

1.3 Approach to Estimating the LPVB Basin Optimization Yield, Rampdown, and Rampdown Rate

As defined in the Judgment, the Basin Optimization Yield is *"the estimated yield that is projected to be available to achieve Sustainable Groundwater Management by 2040"* (Judgment § 1.21). Restated, the Basin Optimization Yield is the estimated groundwater production rate that can be maintained without causing undesirable results if the Basin Optimization Projects are implemented. Undesirable results were defined in the GSP for the three management areas of the Basin: the East Las Posas Management Area (ELPMA), the Epworth Gravels Management Area, and the West Las Posas Management Area (WLPMA), (FCGMA 2019). Minimum threshold (MT) groundwater elevations were selected at representative monitoring points, or Key Wells, in each management area. The MTs represent the groundwater elevation below which undesirable results related to four sustainability indicators - chronic declines in groundwater elevation, loss of groundwater in storage, degradation of groundwater quality, and potential land subsidence related to groundwater production, may occur. Additionally, the MTs in the WLPMA were selected in concert with the MTs for the adjacent Oxnard Subbasin, to ensure that they do not interfere with the ability of the Oxnard Subbasin to meet its sustainability goal.

Because the MTs are the metric by which groundwater conditions in the Basin are determined to be sustainable, the BOY Study compares simulated future groundwater elevations in the Basin to the MTs at the Key Wells in the Basin. Future groundwater elevations were simulated using the two numerical groundwater models that cover the three management areas of the Basin. Simulated production rates that result in long-term stability of the groundwater elevations at levels above the MTs are considered sustainable. The Basin Optimization Yield is the production rate, with implementation of the Basin Optimization Projects that can be reasonably implemented by 2040 and maintains groundwater elevations above the MTs.

The need for a Rampdown was evaluated based on the difference between the initial Operating Yield and the sustainable groundwater production rate that could be maintained if projects are not implemented by 2040. The Rampdown was calculated over a 13-year period (DWR water year 2027 through water year 2039[1]) assuming that if Rampdown is warranted, the first pumping reductions would be in place by the fall of 2026, and the Basin would reach the final sustainable production rate by the fall of 2039.

The following sections discuss the numerical groundwater models, future model scenarios, calculation of the Basin Optimization Yield, and calculation of the Rampdown Rate in more detail.

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2 Summary of Numerical Models

The eastern and western portions of the Basin are hydrogeologically distinct, separated by the Somis Fault. Consequently, the Basin is covered by two distinct numerical groundwater models:

- ELP Model: a MODFLOW numerical model developed by CMWD, which covers the entirety of the ELPMA and Epworth Gravels Management Area (CMWD 2018).
- Coastal Plain Model: a version of the Ventura Regional Groundwater Flow Model (VRGFM) MODFLOW numerical model developed and maintained by UWCD, which covers the entirety of the WLPMA, Oxnard Subbasin, PVB, and Mound Subbasin (UWCD 2018).

Both models are basin-scale models that reasonably reproduce historical trends in groundwater elevations in response to groundwater production, climate, recharge, and other basin management operations. These models were used to assess potential future groundwater levels in the GSP and the First Periodic Evaluation (FCGMA 2019 and FCGMA 2024, respectively). As part of the First Periodic Evaluation, both the Coastal Plain Model and ELP Model were updated to re-evaluate projected future conditions. Additional information on the updates to the models is provided in Section 5.1 of the First Periodic Evaluation (FCGMA 2024). This BOY Study uses the same version of each model used for the First Periodic Evaluation.

2.1 East Las Posas Model

The East Las Posas (ELP) Model, which covers the entirety of the ELPMA and portions of the FCGMA expansion area to the north and east of the ELPMA, was used to conduct the numerical groundwater flow modeling for the ELPMA and Epworth Gravels Management Areas. The Epworth Gravels Management Area is fully within the ELPMA and included within the ELP Model. CMWD no longer maintains the ELP Model but has provided this model to FCGMA to support management of the Basin. This model was used by FCGMA to support management of the LPVB under both the GSP and the First Periodic Evaluation. As part of the First Periodic Evaluation, FCGMA reviewed data collected since the GSP was prepared and determined that revisions to the model structure were not required (FCGMA 2024). Therefore, the only change FCGMA made to the model for the First Periodic Evaluation was to extend the simulation time period through the end of water year 2022 (i.e., September 30, 2022) (FCGMA 2024). The BOY Study uses the version of the ELP Model that was used in the First Periodic Evaluation. The GSP established uncertainty bounds in the sustainable yield for the ELPMA (including the Epworth Gravels Management Area) estimated using the ELP Model of ±2,300 AFY (FCGMA 2019). This intrinsic model uncertainty should be kept in mind when evaluating the results of scenario simulations conducted for this BOY Study.

Consistent with the hydrogeologic conceptual model, the western boundary of the ELP Model in the Fox Canyon aquifer and Grimes Canyon aquifer is a no-flow boundary. Therefore, the ELP Model does not simulate flow between the ELPMA and the WLPMA.

2.2 Coastal Plain Model

UWCD actively maintains the VRGWFM to support regional groundwater management decisions. This model was first used to assess the sustainable yield for the WLPMA during development of the GSP for the Basin (FCGMA 2019). At the time the GSP was developed, the VRGWFM covered the entirety of Oxnard and Mound Subbasins and the majority of the WLPMA and PVB (UWCD 2018). Between 2018 and 2020, UWCD updated the VRGWFM to cover the entirety of WLPMA and PVB and included the Santa Paula, Piru, and Fillmore Subbasins (UWCD 2021). The updated model included an improved representation of local hydrogeologic conditions in the Santa Paula, Piru, and Fillmore subbasins and, in the Oxnard Subbasin, a better representation of the influence of coastal groundwater elevations on seawater intrusion. The GSP established uncertainty bounds in the sustainable yield for the WLPMA estimated using the GSP version of the VRGWFM of ±1,200 AFY (FCGMA 2019). This intrinsic model uncertainty should be kept in mind when evaluating the results of scenario simulations conducted for this BOY Study.

The updated VRGFM simulated the effects of Santa Clara River flows on groundwater conditions in the Santa Paula, Piru, and Fillmore subbasins, with a daily model timestep, which is necessary to capture the complexity of river flows, but increases the computational requirements for each model run. Because of the computational requirements of the larger VRGFM, UWCD also maintains a localized version of the VRGWFM that excludes the upper Santa Clara River subbasins (Santa Paula, Piru, and Fillmore) and uses a monthly timestep. This branch-off of the VRGWFM is informally referred to as the Coastal Plain Model. The Coastal Plain Model, which is distinct from the VRGWFM, has a design and structure that are consistent with the model used during development of the GSP, and is the model that was used for the First Periodic Evaluation. Therefore, the Coastal Plain Model was used to assess the influence of groundwater pumping and projects on groundwater conditions in the WLPMA for this BOY Study.

Although the Coastal Plain Model included improved hydrogeologic conceptual model data in several groundwater basins, the update also included a revision to the model boundary at the eastern edge of the WLPMA. In previous versions of the model, the boundary between the ELPMA and WLPMA was represented using a no-flow boundary condition, which is consistent with the Somis Fault acting as a barrier to groundwater flow between the two management areas (FCGMA 2019). In contrast, the model boundary in the version of the model used in the First Periodic Evaluation and in this BOY Study is a general head boundary, which allows flow into or out of the WLPMA depending on the simulated groundwater elevations in the eastern portion of the WLPMA. As a result, the model predicts periods of flow from the WLPMA to the ELPMA, despite measured groundwater elevations in the ELPMA being several hundred feet higher than those in the WLPMA. Because these flows are an artifact of the model construction and are inconsistent with the hydrogeologic conceptual model, they were not integrated into the modeling conducted for the ELPMA.

In addition to impacting the groundwater budget, the change in the model boundary with the ELPMA also impacts simulated groundwater elevations in the eastern portion of the WLPMA. Because groundwater is allowed to flow out of the WLPMA along this boundary, simulated groundwater elevations do not rise as rapidly in response to reduced groundwater production as they would if the model boundary were a no-flow boundary. The impact of this change on groundwater elevations was observed in the difference between the simulated response to groundwater projects in the GSP and the First Periodic Evaluation (Figure 2-1). In the GSP, simulated groundwater elevations at well 02N20W06R01 rose approximately 103 feet in response to implementation of an in-lieu groundwater delivery project. This rise is similar to that measured in the historical data between 1994 and 2006, when CMWD was delivering imported water in-lieu groundwater delivery to WLPMA. In contrast, when the same project was modeled in the First Periodic Evaluation with the general head boundary condition, the simulated groundwater elevation recovery was approximately 46 feet.

The comparison of the observed historical change in groundwater elevation to the modeled change in groundwater elevation indicates that the model boundary change has introduced additional uncertainty into the predictive capabilities of the model in this region. Future work should be conducted to reduce this uncertainty by recalibrating the revised model using a no-flow boundary to better represent the hydrogeologic conceptual model of this area.

The changes to the UWCD model and their potential impact on simulated groundwater elevations were discussed with the LPV TAC before the model was used for this BOY Study. Watermaster and TAC agreed that, while the change in the model boundary is not consistent with the hydrogeologic conceptual model, groundwater management decisions will be based on observed water levels, rather than model simulation. Because the UWCD model is capable of simulating groundwater elevations in the eastern portion of the WLPMA that rise above the minimum threshold prior to 2040 and remain above the minimum threshold from 2040 to 2070, use of the UWCD model files developed for the Periodic Evaluation remains the best available option to evaluate the BOY and complete this first BOY study prior to the beginning of the 2027 water year (October 1 2026 – September 30, 2027) (FCGMA 2025b).

3 BOY Scenario Modeling

3.1 BOY Scenario Assumptions

This section describes the common set of assumptions used to model groundwater conditions with both the Coastal Plain Model and the ELP Model, as well as the common set of assumptions used to determine which model scenarios are considered sustainable.

3.1.1 Simulation Time Period

The future scenarios developed for the BOY Study simulate groundwater conditions in the Basin over the 47-year period from October 1, 2022, through September 30, 2069 (i.e., DWR water years 2023 through 2069). This is the same period simulated for the First Periodic Evaluation.

3.1.2 Hydrology

To simulate future groundwater conditions, the numerical models must incorporate assumptions about the potential future hydrology of the Basin. Multiple methods can be used to generate a synthetic future hydrology. During development of the GSP, the preferred method for generating the synthetic future hydrology was to extract measured historical data from a representative period and adjust those data based on the future predicted climate. The period from 1933 to 1979 was determined to be representative of overall historical conditions and included periods of above average precipitation as well as periods of drought. To convert the historical record into a synthetic future hydrology, the data were multiplied by DWR's 2070 central tendency climate change factors, as described in the GSP and the First Periodic Evaluation (FCGMA 2018 and FCGMA 2024). These adjusted data were then used to represent the future hydrology in the model runs for the BOY Study. This is the same future hydrology that was used in the First Periodic Evaluation.

Of course, the exact future hydrology is unknown. Therefore, the synthetic future hydrology is a source of uncertainty in any future model simulations.

3.1.3 Future Projects and Water Supply

Two Basin Optimization Projects were incorporated into the future model scenarios based on the findings of the Basin Optimization Plan (FCGMA 2025a). These projects are the Purchase of Imported Water from CMWD for Basin Replenishment project, and the Arroyo Simi-Las Posas Water Acquisition project.

As discussed in the Basin Optimization Plan, the Purchase of Imported Water from CMWD for Basin Replenishment project would supply imported water in lieu of groundwater extraction in areas of the WLPMA and ELPMA exhibiting chronic groundwater level declines. Historical data suggest that rapid recoveries in groundwater elevation can be achieved with in-lieu deliveries to the WLPMA (FCGMA 2019). In the ELPMA, historical groundwater recoveries were not observed during implementation of the in-lieu program, but reduction in the rate of decline and stabilization of water levels were observed.

The total estimated imported water assumed to be available for the project was based on the historical deliveries of imported water under the previous in-lieu programs as well as estimates provided by CMWD, Zone Mutual Water Company (ZMWC), and Ventura County Waterworks District No. 19 (VCWWD-19) during development of the Basin Optimization Plan (FCGMA 2025a). In WLPMA, the in-lieu project would deliver 1,760 AFY of imported water to offset pumping in wells operated by Zone Mutual Water Company and VCWWD-19 (Table 3-1; Figure 3-1). In the ELPMA, the in-lieu project would deliver 1,380 AFY of imported water to offset pumping in wells operated by Ventura County Waterworks District No. 1 (VCWWD-1; Figure 3-1). This project relies on existing infrastructure. Therefore, it can be implemented after a program policy by the Watermaster Board is developed, including determination of the pumping costs and amount of incentive, allocation of funds, and incentivization agreements to purchase water from CMWD (FCGMA 2025a).

Table 3-1. Projected Future Water Supplies and Projects in the Las Posas Valley Basin

Project Name	Description	Source of Future Water Supply	Projected Future Water Supply/In Lieu Delivery (acre-feet)	Time Period for Implementation
Purchase of Imported Water from CMWD for Basin Replenishment	In lieu delivery of imported water to WLPMA and ELPMA to reduce groundwater production in key areas prone to declining groundwater levels and loss of groundwater storage	Imported water	1,760 AFY - WLPMA 1,380 AFY – ELPMA *3,140 AFY - Total*	Water year 2027 - if agencies choose to participate and the program policy is finalized by the Watermaster Board
Arroyo Simi-Las Posas Water Acquisition	Purchase of upstream discharges to Arroyo Simi-Las Posas to maintain future surface water flows into ELPMA	WWTP Discharges to Arroyo Simi-Las Posas	0 AFY increase relative to current state. This project maintains existing flows	Water year 2027 - Following final negotiations with the City of Simi Valley

The Arroyo Simi–Las Posas Water Acquisition project would involve the purchase or lease of recycled water from the City of Simi Valley to continue discharging the water from its shallow dewatering wells and/or the Simi Valley Water Quality Control Plant to the Arroyo Simi for downstream recharge to the Basin (FCGMA 2025a). The City of Simi Valley has indicated that 4,700 AFY of water would be available (FCGMA 2019). However, riparian use of the water along the Arroyo Simi–Las Posas reduces the likely water available to the Basin as surface flow and recharge to 2,200 to 3,700 AFY (FCGMA 2021). As noted in the Basin Optimization Plan, this project seeks to maintain existing water supplies in the Basin rather than provide new or additional water supply. The project could be implemented immediately following final negotiations between FCGMA and Simi Valley, however, the time required to develop this agreement is not well defined. Under the Basin Optimization Plan, the time required to generate the final agreements was estimated to be approximately 18 months (FCMGA 2025).

Because neither project requires construction of additional infrastructure and the implementation timing for each project primarily relies on the timing of coordination agreements, both projects were implemented at the start of the model scenarios rather than assuming a delayed start date, consistent with the Basin Optimization Project schedule in the Basin Optimization Plan (FCGMA 2025a). This approach is consistent with the current state of the surface water flows in Arroyo Simi-Las Posas, which, to date, have continued to flow into LPV without a formal agreement. However, the in-lieu project deliveries are not currently occurring. If implementation of the in-lieu project is delayed for multiple years, the modeled impacts of the project on groundwater levels in this BOY Study may overestimate the impact of this project. Thus, the simulated groundwater levels should be considered an indicator of the long-term potential project impact, rather than the specific anticipated groundwater level for any given year. The actual timing of the project start date is a source of uncertainty in the future model results.

3.1.4 Sustainability Evaluation Metrics

This section provides a description of the criteria used to evaluate whether the simulated future groundwater production rates in the model scenarios developed for this BOY Study are sustainable. Because of the unique hydrogeologic characteristics of each management area, the criteria for evaluating sustainability are discussed, by management area, in the subsections below.

ELPMA and Epworth Gravels Management Area

In the ELPMA and Epworth Gravels Management Area, groundwater production rates were determined to be sustainable if the simulated groundwater elevations at the Key Wells remained above the MTs established in the GSP. These MTs were selected to protect against chronic declines in groundwater elevation in both the ELPMA and Epworth Gravels Management Area. In the ELPMA, the MTs were also selected to prevent significant and unreasonable loss of groundwater storage and conversion from confined to unconfined conditions in the Fox Canyon aquifer.

WLPMA

In the WLPMA, groundwater production rates were considered to be sustainable if the simulated groundwater elevations at the Key Wells remained above the MTs established in the GSP. These MTs were selected to protect against chronic declines in groundwater elevation and loss of groundwater in storage (FCGMA 2019).

Additionally, in the WLPMA, the long-term groundwater production rate was determined to be potentially sustainable if groundwater elevations remained stable over the future model period, such that the ending groundwater level was equal to or higher than the starting groundwater elevation. This definition was adopted because in the eastern portion of the WLPMA, groundwater elevations have declined significantly in recent years, such that they are now below the MTs established in the GSP. Historically, in-lieu imported water deliveries have resulted in groundwater elevation recoveries that exceeded 100 feet in this area of the WLPMA (Section 2.2; Figure 2-1); thus, it is likely that groundwater elevations will respond similarly to implementation of a similar in-lieu project in the future. However, the updated Coastal Plain Model did not reproduce the same magnitude of groundwater elevation response as was observed historically (Figure 2-1). Therefore, project implementation and adjustment through groundwater elevation monitoring are expected to bring groundwater elevations back above the MT. Once the groundwater elevations are higher than the MT, a long-term production rate that results in stable groundwater elevations that remain above the MT is sufficient to avoid undesirable results.

Because the WLPMA is hydrogeologically connected to the adjacent Oxnard Subbasin, which is experiencing seawater intrusion, the volume of groundwater that flows across the boundary between the Oxnard Subbasin and WLPMA can impact the ability of the Oxnard Subbasin to prevent future seawater intrusion. The First Periodic Evaluation found that, under the pumping distribution in the No New Projects 3 or NNP3 scenario, up to 800 AFY of groundwater can flow from the Oxnard Subbasin to the WLPMA without causing undesirable effects in either basin (See Table 5-2 in FCGMA 2024). For all other scenarios that avoided undesirable results, the flux across the WLPMA boundary with the Oxnard Subbasin was less than 800 AFY or, in some cases, changed direction with flow from WLPMA contributing to the Oxnard Subbasin. Based on these results, a simulated groundwater flux of 800 AFY or less across the boundary between Oxnard Subbasin and the WLPMA was considered sustainable in this BOY Study.

3.2 BOY Baseline Scenario

The baseline groundwater production scenario for the BOY Study assesses whether groundwater production can be maintained sustainably at the initial Operating Yield of 40,000 AFY, based on the allocation assigned to each Water Master Identification Number (WMID) in the Judgment, without implementing projects.

3.2.1 Judgment Allocations to WMIDs

The Judgment grants four types of allocations - Agricultural, Commercial, Domestic, and Mutual Water Company (MWC) Allocations. Allocations were assigned to WMIDs for an individual Water Right Holder or a group of Water Right Holders. All agricultural landowners that participated in the Judgment received a groundwater allocation, although some of those allocations were less than 0.1 AFY. Additionally, some agricultural properties that historically reported extractions did not receive allocation.

The total allocation assigned in Exhibit C of the Judgment equaled 41,851.58 AFY. This total exceeded the initial Operating Yield of 40,000 AFY and the Watermaster adjusted Annual Allocations to equal 40,000 AFY in accordance with the Judgment (Judgment § 4.2). Because the BOY Study is intended to assess the ability of projects to maintain the BOY at as close to 40,000 AFY as possible, and to evaluate the need for a Rampdown relative to the Basin Optimization Yield, this BOY Study used the Water Year 2024 Annual Allocations published by the Watermaster as the basis for extractions in the numerical groundwater models.

3.2.2 Baseline Scenario Extraction Rates

3.2.2.1 Baseline Pumping Distribution Methodology

While the Judgment assigns allocations based on WMIDs, groundwater production in the Basin occurs at individual wells. Therefore, the allocation assigned to each WMID had to be distributed to the groundwater production well or wells associated with that WMID. For the purpose of distributing the allocations assigned to each WMID, Water Right Holders were divided into three general groups:

- Water Right Holders who pump all their assigned groundwater allocation from wells associated with their WMID and not by a MWC,
- MWC exclusive users – who receive their entire allocation from mutual water companies and do not pump any groundwater from wells associated with their WMID,
- MWC hybrid users – who receive some of their allocation from MWCs and pump the remaining allocation from well(s) associated with their WMID.

For Water Right Holders who pump their groundwater allocation from a single well associated with their WMID, the distribution is straightforward. All of the Annual Allocation for these Water Right Holders was assigned to the single well associated with their WMID. For MWC exclusive users, all of their Annual Allocation was assumed to be pumped by the MWC and delivered to the Water Right Holder. Therefore, these users did not have wells in the Basin associated with their WMID. For all other Water Right Holders, those with multiple wells and those that receive some portion of their allocation from a MWC, several methods for determining the volume of Annual Allocation that was distributed to each well were considered.

Of the methods considered, the selected approach, with which the TAC concurred, was to distribute the Annual Allocation based on the reported pumping and MWC deliveries for DWR water year 2024, the first full water year after the Judgment was adopted. Groundwater production patterns after the Judgment was adopted may better represent future groundwater pumping under Exhibit C than the historical groundwater production distribution used in the GSP and the First Periodic Evaluation. However, shifts in pumping distribution in the future are also likely, as groundwater allocation trading occurs and Water Right Holders better understand how to manage their use under the new allocation scheme. Therefore, while the pumping distribution in the BOY model scenarios represents the distribution based on the best available data, these data will change in the future and should be updated for the next BOY Study.

The method for distributing pumping for each user type is presented in Figure 3-2. For Water Right Holders that pump their allocation from multiple wells, the proportion of the allocation that was assigned to each well was based on the proportion of the total reported pumping for water year 2024 that well represented. For example, if in water year 2024, a Water Right Holder with two wells pumped 10% of their total water used from one well and 90% from their second well, 10% of the Annual Allocation for that Water Right Holder, whether it was larger or smaller than what was pumped in 2024, was distributed to the first well and 90% was distributed to the second well. Similarly, for water users that received a portion of their allocation from an MWC, the proportion of the allocation received equaled that reported as received in water year 2024. If a Water Right Holder received 50% of the water they used in water year 2024 from an MWC and pumped 50% from a well or wells associated with their WMID, then 50% of their Annual Allocation was assigned to the MWC and the remaining 50% was distributed to the well, or wells, associated with the WMID based on the percentage pumped in water year 2024. The Baseline Scenario allocation for each well is provided in Appendix A and shown in Figure 3-3.

3.2.2.2 Baseline Scenario Pumping Distribution by Management Area

After the allocations for each WMID were distributed to individual wells (Figure 3-3), the total groundwater production was calculated for each management area (Table 3-2). The Baseline Scenario production exceeds the

First Periodic Evaluation estimates of sustainable yield by approximately 7,000 AFY in the WLPMA and by approximately 2,700 AFY in the ELPMA (Table 3-2).

Table 3-2. Comparison of Baseline Groundwater Production by Management Area

Management Area	Groundwater Production Rate (AFY)	
	BOY Study Baseline Scenario	Estimated Sustainable Yield[1]
WLPMA	18,417	11,400
ELPMA	20,559	17,900
Epworth Gravels	1,024	1,330
Total	40,000	30,630

Note:
[1] Values are from Tables 5-2 and 5-3 of the First Periodic Evaluation (FCGMA 2024)

The differences between the Baseline Scenario production rate and the average groundwater production from water years 2016 to 2024 are shown in Figure 3-4. The wells with the largest increases in groundwater production under the Baseline Scenario are located in the eastern WLPMA, and the northern ELPMA. These areas have been prone to declining groundwater elevations in the past and, as a result, specific groundwater elevation thresholds were developed in the GSP to avoid undesirable results from chronic declines in groundwater elevation (FCMGA 2019). Additional groundwater production from these areas beyond the historical average groundwater production would be anticipated to exacerbate groundwater declines, and likely cause groundwater elevations to fall below the minimum thresholds established in the GSP.

It should be noted, however, that the future pattern of groundwater production is unlikely to match the exact distribution of groundwater production shown in Figure 3-3 for two primary reasons. First, the distribution is based on a single year of reported groundwater production since the Judgment became effective. This approach was adopted, with concurrence by TAC, because the groundwater allocation in the Judgment did not match the historical pattern of groundwater production in the Basin (Figure 3-4). However, historically, the relative distribution of groundwater use between wells has changed from year to year as Water Right Holders actively manage which wells they use and how much they pump from those wells. Because the allocation is assigned to the Water Right Holders, and not to the well, we anticipate that, with additional years of reported groundwater extractions under the Judgment, the distribution of groundwater pumping calculated for this initial BOY Study is likely to change. Second, allocation transfers are allowed under the Judgment. As Water Right Holders transfer allocation between WMIDs, the distribution of groundwater production will also change. Consequently, while relying on the single year of groundwater production under the Judgment is appropriate for this initial BOY Study, the distribution of groundwater production may look quite different in five years. Thus, the physical distribution of groundwater production in the Baseline Scenario represents a source of uncertainty in the future model results. This uncertainty should be reduced for each successive BOY Study, as Basin operation conditions become established under the Judgment.

3.2.3 Baseline Scenario Model Results

3.2.3.1 Baseline Scenario Groundwater Elevations

Epworth Gravels

In the Epworth Gravels Management Area, simulated groundwater elevations rose throughout the 47-year model time period (Figure 3-5). The model results are consistent with the finding in the GSP that the simulated groundwater elevations in the Epworth Gravels Management Area are sensitive to small changes in the groundwater production rate. However, the modeled groundwater elevations are not anticipated to reflect actual conditions in the Epworth Gravels Management Area over time for two primary reasons. First, not all groundwater producers with wells in the Epworth Gravels Management Area received an allocation in the Judgment (Figure 3-4). Second, Water Right Holders within the Epworth Gravels Management Area often have multiple wells, some of which are screened in the Fox Canyon aquifer. If, during water year 2024, these Water Right Holders pumped less than average from the Epworth Gravels Management Area wells, the baseline pumping distribution in the BOY Study Baseline Scenario would extrapolate this single year of reduced pumping over the entire 47-year model time period. The result is continuously rising simulated groundwater elevations that do not reflect the historical production patterns from the aquifer.

The baseline groundwater production rate in the Epworth Gravels Management Area for this BOY Study is 1,059 AFY, which is approximately 411 AFY lower than the average 2016 to 2022 baseline extractions modeled in the First Periodic Evaluation (FCGMA 2024). At the Periodic Evaluation baseline groundwater production rate of 1,470 AFY, simulated groundwater elevations in the Epworth Gravels Management Area decline over the entire model period (Figure 3-5). The sustainable groundwater production rate for the Epworth Gravels Management Area is estimated to be approximately 1,320 AFY (FCGMA 2019, FCGMA 2024).

Historically, groundwater production in the Epworth Gravels Management Area has depleted groundwater in storage, causing groundwater users to drill deeper wells that produce water from the underlying Fox Canyon aquifer (FCGMA 2019). When wells were rested in the Epworth Gravels Management Area, the groundwater elevations recovered. Both the GSP and the First Periodic Evaluation anticipated that adaptive management would occur, through pumping reductions in Epworth Gravels Management Area wells, as necessary, to maintain groundwater elevations between the minimum threshold and measurable objective.

ELPMA

Groundwater production at the Baseline Scenario rates was determined not to be sustainable in the ELPMA because simulated groundwater elevations at five Key Wells fell below the minimum threshold groundwater during the 47-year model run (Figure 3-6). These wells, which are screened in the Fox Canyon aquifer, are located in the northern ELPMA, where the influence of recharge from Arroyo Simi-Las Posas is less pronounced. Baseline Scenario production rates in the northern ELPMA were, on average, higher than the 2016 to 2024 average production rates (Figure 3-4). The simulated groundwater elevation declines in the northern ELPMA are consistent with previous model scenarios evaluated in for the GSP and the First Periodic Evaluation (FCGMA 2019, FCGMA 2024).

WLPMA

Groundwater production at the Baseline Scenario rates was determined not to be sustainable in the WLPMA because simulated groundwater elevations at three Key Wells were below the minimum threshold groundwater during a portion of, or the entirety of, the 47-year model time period (Figure 3-6). Two of the three wells, which are screened in the lower aquifer system, are located in the eastern WLPMA, adjacent to the Somis Fault. Groundwater recharge in this area of the WLPMA is limited. Baseline Scenario production rates in the WLPMA were, on average, higher than the 2016 to 2024 average production rates, and these rates were determined not to be sustainable in the First Periodic Evaluation of the GSP (Figure 3-4; FCGMA 2024). Therefore, the determination that the Baseline Scenario production rates in this study are not sustainable is consistent with the findings of the GSP and the First Periodic Evaluation (FCGMA 2019, FCGMA 2024).

3.2.3.2 Baseline Scenario Water Budget

The two models covering the Basin were used to calculate the water budgets for the WPLMA, ELPMA, and Epworth Gravels Management Area. Because the ELP Model includes both the ELPMA and Epworth Gravels Management Area, a single water budget for both management areas is discussed below. The water budget for the WLPMA is discussed separately.

ELPMA and Epworth Gravels

The primary inflows in the ELPMA are stream leakage, recharge from precipitation, M&I and agricultural return flows, and mountain front recharge (Figure 3-7). The Epworth Gravels Management Area does not receive stream leakage or mountain front recharge. Recharge to this aquifer is limited to precipitation and return flows. The primary outflow in both the ELPMA and Epworth Gravel Management Area is groundwater production. In addition, in the ELPMA, there is outflow from evapotranspiration along Arroyo Simi-Las Posas, underflows to the Pleasant Valley Basin, and underflows to the WLPMA (Figure 3-7).

In the Baseline Scenario, groundwater outflows exceed groundwater inflows by approximately 1,500 AFY.

WLPMA

The WLPMA is divided vertically into a shallow aquifer system and the Lower Aquifer System (LAS). Approximately 90% of the total groundwater extraction from the WLPMA occurs in the LAS, while approximately 65% of the recharge to the LAS comes from the shallow aquifer system. The primary inflows to the shallow aquifer system are recharge from precipitation, M&I and agricultural return flows, subsurface flows from the Oxnard Subbasin, and, to a much smaller extent, subsurface inflow from the Pleasant Valley Basin (Figure 3-8). Vertical flows to the LAS and groundwater pumping are the primary outflows in the shallow aquifer system (Figure 3-8).

The primary inflows to the Lower Aquifer System of the WLPMA are vertical flows from the shallow aquifer system, recharge from precipitation, M&I and agricultural return flows, recharge from the outcrop area, and minor flows in from the Pleasant Valley Basin and Oxnard Subbasin (Figure 3-9). Groundwater production is the primary outflow from the LAS (Figure 3-9). Additionally, there is a component of the water budget that represents flows across the model boundary between the WLPMA and ELPMA. In the Baseline Scenario, the model simulated approximately 500 AFY of inflow to the WLPMA across this boundary (Figure 3-9). This component of flow is shown in the water budget for completeness but, as discussed in section 2.1, it is considered an artifact of the model construction and not representative of physical hydrogeological conditions in the management area.

In the Baseline Scenario, groundwater outflows to the WLPMA exceeded groundwater inflows by approximately 400 AFY (Figures 3-8 and 3-9).

3.3 Projects Scenario

Because the Baseline Scenario is unsustainable, a Projects Scenario was developed to simulate the Purchase of Imported Water from CMWD for Basin Replenishment project selected in the Basin Optimization Plan (FCGMA 2025a). This project consists of deliveries of CMWD to VCWWD-1 in the northern ELPMA and VCWWD-19 and ZMWC in the eastern WLPMA in lieu of pumping. These areas were targeted because they were the areas in which Baseline Scenario groundwater elevations were below the minimum thresholds. Historical in-lieu imported-water delivery projects were successful in reversing, or slowing, groundwater elevation declines in these areas (FCGMA 2019).

3.3.1 Projects Scenario Extraction Rates

As discussed in Section 3.1.3, the Projects Scenario incorporated 1,760 AFY of surface water deliveries to offset groundwater production from six wells in the eastern WLPMA, and 1,380 AFY of surface water deliveries to offset production from three wells in the ELPMA. The resulting groundwater production rates were 16,656 AFY in the WLPMA and 16,420 AFY in the ELPMA (Table 3-3). The groundwater production rate in the Epworth Gravels Management Area remained the same as in the Baseline Scenario. The total production in the Projects Scenario from all three management areas was 36,860 AFY, which represents an approximately 8% reduction in the groundwater production relative to the Baseline Scenario.

Table 3-3. BOY Future Groundwater Production Scenario Extraction Rates

Management Area	Groundwater Production Rate (AFY)			
			Basin-wide Rampdown Scenario	Differential Rampdown Scenario
	Baseline Scenario	Projects Scenario	20% Reduction WLPMA, ELPMA, and Epworth Gravels	20% Reduction WLPMA/ 11% Reduction ELPMA and Epworth Gravels
WLPMA	18,417	16,657	14,734	14,734
ELPMA	20,559	19,179	16,447	18,298
Epworth Gravels	1,024	1,024	819	911
Total	40,000	36,860	32,000	33,943

3.3.2 Projects Scenario Results

3.3.2.1 Project Scenario Groundwater Elevations

Epworth Gravels

The simulated groundwater production rate in the Projects Scenario was the same as that simulated in the Baseline Scenario because no pumpers within the Epworth Gravels Management Area received in-lieu surface water deliveries as part of the projects in the Basin Optimization Plan and therefore in this BOY Study. Therefore, the groundwater elevations simulated in the Epworth Gravels Management Area for the Projects Scenario were the same as those discussed in Section 3.2.3.1 and shown in Figure 3-5.

ELPMA

The groundwater production rate in the Projects Scenario is likely to be sustainable in the ELPMA because simulated groundwater elevations remained above the minimum threshold groundwater elevations at all the Key Wells in the management area (Appendix B). This includes the five Key Wells that had groundwater elevations fall below the minimum threshold in the Baseline scenario (Figure 3-10). These wells are located in the area of the ELPMA that was targeted by the in-lieu surface water delivery program. Although the decline in simulated groundwater elevations in these wells did not fully stabilize in this scenario, the results suggest that implementation of the project as envisioned in the Basin Optimization Plan may be sufficient to avoid undesirable results in the ELPMA.

WLPMA

In the WLPMA, groundwater production at the Projects Scenario rates is likely to be sustainable because simulated groundwater elevations remained above the minimum threshold groundwater elevation at two of three Key Wells in which groundwater elevations were previously below the minimum threshold (Figure 3-10). Although the groundwater elevation at the third well, Well 02N20W06R01, remained below the minimum threshold during the Projects Scenario, the groundwater elevation at the end of the scenario was similar to the elevation at the start of the scenario. This suggests that if the initial groundwater elevation can be raised at this well, ongoing production at the rates simulated in the Projects Scenario will maintain the groundwater elevation in the future.

After reviewing the initial results of the Projects Scenario, TAC suggested that additional Projects Scenarios be investigated for the WLPMA, to see if redistributing groundwater production among the project wells could help raise the simulated groundwater elevations at Well 02N20W06R01. The overall groundwater production rate in the WLPMA remained the same in these redistributed Projects Scenarios, but the volume of groundwater produced from Well 02N20W06R01 was reduced and assigned to the other project wells. The resulting groundwater elevations at Well 02N20W06R01 were not significantly affected by redistributing the project pumping to the other project wells (Figure 3-11).

As discussed in Section 2.1, simulated groundwater elevations in Well 02N20W06R01 are influenced by the change in the model boundary condition that dampens the groundwater level response to projects relative to the observed historical groundwater elevation response (Figure 2-1). Because the project was successfully implemented in the WLPMA in the past, does not require construction of new infrastructure, and can be actively managed based on measured groundwater elevations, additional attempts to simulate redistributed groundwater production were not pursued. Measured groundwater elevations will provide a better assessment of the effectiveness of the project, and in-lieu imported water deliveries can be increased or decreased annually in order to ensure that sufficient deliveries are provided to maintain groundwater elevations above the minimum thresholds.

3.3.2.2 Projects Scenario Water Budget

ELPMA and Epworth Gravels

The total inflow to the ELPMA and Epworth Gravels Management Areas in the Projects Scenario was similar to that in the Baseline Scenario (Figure 3-7). Groundwater production decreased in the Projects Scenario by 1,380 AFY. In the Projects Scenario, groundwater outflows exceed groundwater inflows by approximately 600 AFY.

WLPMA

The total inflow and outflow to the shallow aquifer system of the WLPMA in the Projects Scenario was similar to that in the Baseline Scenario (Figure 3-8). The primary change between the two scenarios was an approximately 700 AFY decrease in the flow leaving the shallow aquifer system and replenishing the LAS because lower groundwater production in the LAS maintained higher groundwater elevations and induced less recharge from the shallow aquifer system. Additionally, in the LAS groundwater production was reduced by 1,760 AFY to simulate implementation of the in-lieu surface water delivery project to Zone MWC and VCWWD 19. As a result of higher groundwater elevations in the eastern WLPMA during the Projects Scenario, the model simulated flow leaving the model domain and flowing toward the ELPMA (Figure 3-9). This flow is an artifact of the model construction. In the Projects Scenario, groundwater outflows equaled groundwater inflows in the WLPMA.

The water budgets for the Redistributed Projects 1 and 2 scenarios are also shown in Figures 3-8 and 3-9. These water budgets are the same as the water budget for the Project Scenario, as the only change between the scenarios was the distribution of groundwater pumping at the project wells. The total groundwater production and the distribution of groundwater production at the non-project wells remained the same.

3.4 Rampdown Scenarios

In order to provide both the Watermaster Board and Water Right Holders with an understanding of the reduction in groundwater production necessary to reach sustainable conditions if the projects are not implemented, two

Rampdown Scenarios were developed. Consistent with the Judgment, the first Rampdown Scenario applies a Basin-wide reduction factor to groundwater production in all three management areas. This scenario is discussed in Section 3.4.1. The second Rampdown Scenario applies two different reduction factors, one for the WLPMA and the other for the ELPMA and Epworth Gravels Management Area. This Rampdown Scenario is called the Differential Rampdown Scenario and is discussed further in Section 3.4.2.

3.4.1 Basin-wide Rampdown Scenario

3.4.1.1 Basin-wide Rampdown Scenario Extraction Rates

The goal of the Basin-wide Rampdown scenario was to determine the groundwater production rate at which undesirable results are avoided in all management areas if projects are not implemented. Previous model analyses conducted for the First Periodic Evaluation were used to develop an initial estimate of the reduction factor, relative to the Initial Operating Yield of 40,000 AFY, that would maintain groundwater elevations above the minimum threshold water level at all Key Wells in the Basin. The initial estimate was then tested using the WLPMA and ELP Models. Simulated groundwater elevations from this initial estimate were used to refine the reduction rate and that rate was tested using the two models. The results of this scenario, which are discussed below, indicated that a 20% reduction to the Baseline Scenario extraction rates, or the Initial Operating Yield, avoided undesirable results in all three management areas of the Basin.

The total extraction rate for the Basin-wide Rampdown Scenario was 32,000 AFY (Table 3-3). Of the total, 14,734 AFY of groundwater was pumped in the WLPMA, 16,447 AFY was pumped in the ELPMA, and 819 AFY was pumped in the Epworth Gravels Management Area. The estimated sustainable yield of the WLPMA in the First Periodic Evaluation was approximately 3,300 AFY lower than the simulated groundwater production in the Basin-wide Rampdown scenario. The estimated sustainable yields of the Epworth Gravels Management Area and the ELPMA were approximately 500 and 1,450 AFY higher, respectively, than the simulated groundwater production in the Basin-wide Rampdown scenario.

3.4.1.2 Basin-wide Rampdown Scenario Groundwater Elevations

Epworth Gravels

Simulated groundwater elevations in the Epworth Gravels Management Area rose at a higher rate in the Basin-wide Rampdown Scenario than those in the Baseline Scenario (Appendix B). This is consistent with the additional 20% reduction in groundwater pumping imposed under this Basin-wide Rampdown Scenario.

ELPMA

Simulated groundwater elevations remained above the minimum threshold at all Key Wells in the ELPMA and remained above the measurable objective in several Key Wells in the Basin-wide Rampdown Scenario (Appendix B). The simulated groundwater elevations were consistent with groundwater production rates that were lower than the estimated sustainable yield for the ELPMA.

WLPMA

In the WLPMA, simulated groundwater elevations remained above the minimum threshold groundwater elevation at two of three Key Wells in which groundwater elevations were below the minimum threshold in the Baseline Scenario (Figure 3-12). Additionally, the groundwater elevation in Well 02N20W06R01 at the end of the Basin-wide Rampdown scenario was similar to that at the start of the scenario. However, it should be noted that the groundwater elevation did not rise above the minimum threshold during this scenario. This result is similar to the Projects Scenario simulation.

As discussed in Sections 2.1 and 3.3.2.1, the simulated response to reduced groundwater production from this well is dampened relative to historical observations. Therefore, it is likely that a 20% reduction in groundwater production relative to the Initial Operating Yield will be sufficient to allow groundwater elevations at this well to recover and rise above the minimum threshold. For this reason, the 20% reduction is considered sufficient for this initial BOY Study. If groundwater elevations continue to decline at this well in the future, subsequent BOY Studies will need to investigate ways in which the groundwater elevation at this well can be increased so that the Basin will avoid undesirable results.

3.4.1.3 Basin-wide Rampdown Scenario Water Budget

ELPMA and Epworth Gravels

The total inflow to the ELPMA and Epworth Gravels Management Areas in the Basin-wide Rampdown Scenario was approximately 1,900 AFY lower than the inflow in the Baseline Scenario (Figure 3-6). The reduction occurs because there is less inflow to the ELPMA from stream leakage. Groundwater elevations are higher in the Basin-wide Rampdown scenario than in the Baseline Scenario because groundwater production in the ELPMA is approximately 4,300 AFY lower in the Basin-wide Rampdown Scenario. Consequently, groundwater inflows exceed groundwater outflows in this scenario by approximately 600 AFY. This is the only scenario modeled for this study in which groundwater inflows exceed groundwater outflows in the ELPMA and Epworth Gravels Management Area.

WLPMA

The total inflow to and outflow from the shallow aquifer system of the WLPMA in the Basin-wide Rampdown Scenario was reduced by approximately 900 AFY relative to the Baseline Scenario resulting in no net change in storage between the two scenarios (Figure 3-8). The total inflow to the LAS was reduced by approximately 1,400 AFY relative to the Baseline Scenario, and the groundwater production rate in the LAS was reduced by 3,384 AFY relative to the Baseline scenario (Figure 3-9). The reduced inflows to the WLPMA are the result of the decrease in groundwater production, as higher groundwater elevations reduce the gradient between the shallow aquifer system and the LAS. The reduction in groundwater pumping exceeded the reduction in inflows to the WLPMA. Consequently, inflows exceeded outflows by approximately 500 AFY in the Basin-wide Rampdown Scenario.

3.4.2 Differential Rampdown Scenario

Both the water budget and the simulated groundwater levels in the Basin-wide Rampdown Scenario suggested that a 20% reduction to the groundwater production was necessary to avoid undesirable results in the WLPMA, but that a 20% reduction in the ELPMA and Epworth Gravels Management Area production rates would result in groundwater production at rates that were lower than the estimated sustainable yield for these management areas. Therefore, although not specified in the Judgment, this BOY Study considers a Differential Rampdown Scenario in which the groundwater production rate is reduced by 20% relative to the Initial Operating Yield in the WLPMA, but is reduced by a lower percentage in the ELPMA and Epworth Gravels Management Area.

3.4.2.1 Differential Rampdown Scenario Extraction Rates

The extraction rate for the WLPMA in the Differential Rampdown Scenario is the same as the WLPMA extraction rate in the Basin-wide Rampdown Scenario, as this reduction is needed to avoid undesirable results in the WLPMA if projects are not implemented (Table 3-3). In the ELPMA and Epworth Gravels Management Area, previous model analyses from the First Periodic Evaluation were used to develop an initial estimate of a reduction factor, relative to the Baseline Scenario groundwater production rate, that would maintain groundwater elevations above the minimum threshold water level. The initial estimate was then tested using the ELP Model. Simulated groundwater elevations from this initial estimate were used to refine the reduction rate and that rate was tested again using the ELP Model. The results of this scenario, which are discussed below, indicated that an 11% reduction, relative to the Baseline Scenario extraction rates, or the Initial Operating Yield, resulted in groundwater levels that would avoid undesirable results in the ELPMA and Epworth Gravels Management Area.

The total Basin extraction rate for the final Differential Rampdown Scenario was 33,943 AFY (Table 3-3). This rate is approximately equivalent to a 15% reduction of the Initial Operating Yield for the Basin. Of the total, 14,734 AFY of groundwater was pumped in the WLPMA, which is the same as the production rate in the Basin-wide Rampdown Scenario. In ELPMA, the groundwater production rate in the Differential Rampdown Scenario was 18,298 AFY, which is approximately 400 AFY higher than the sustainable yield estimate in the First Periodic Evaluation. In the Epworth Gravels Management Area, the groundwater production rate was 911 AFY, which is approximately 400 AFY lower than the estimated sustainable yield in the First Periodic Evaluation. Less rampdown was required to achieve the sustainability goals with the differential Rampdown versus the basin wide Rampdown alternative.

As discussed in Section 2.1,the GSP established uncertainty bounds in the sustainable yield for the ELPMA estimated using the ELP Model. While the ELPMA production rate under the Differential Rampdown scenario is approximately 400 AFY higher than the estimated sustainable yield, it falls within the uncertainty bounds of the potential range of sustainable yields identified in the GSP (FCGMA 2019).

3.4.2.2 Differential Rampdown Scenario Groundwater Elevations

Epworth Gravels

Simulated groundwater elevations in the Epworth Gravels Management Area increased at a higher rate in the Differential Rampdown Scenario than those in the Baseline Scenario, but did not increase as rapidly as those in the Basin-wide Rampdown Scenario (Appendix B). This is consistent with the 11% reduction in groundwater pumping imposed within the Epworth Gravels Management Area under this scenario.

ELPMA

Simulated groundwater elevations remained above the minimum threshold at all Key Wells in the ELPMA and were similar to the simulated groundwater elevations in the Projects Scenario (Appendix B; Figure 3-13). The simulated groundwater elevations suggest that groundwater production at a rate of 18,300 AFY may be sustainable for the ELPMA, however, it should be noted that simulated groundwater elevations exhibited a declining trend over the 37-year modeled period.

WLPMA

The simulated future groundwater elevations in the WLPMA under the Differential Rampdown Scenario were the same as the simulated future groundwater elevations under the Basin-wide Rampdown Scenario because the WLPMA groundwater extraction rates in these scenarios were the same (Figures 3-11 and 3-12).

3.4.2.3 Differential Rampdown Scenario Water Budget

ELPMA and Epworth Gravels

The total inflow to the ELPMA and Epworth Gravels Management Areas in the Basin-wide Rampdown Scenario was approximately 1,200 AFY lower than the inflow in the Baseline Scenario (Figure 3-7). The reduction occurs because there is less inflow to the ELPMA from stream leakage. Groundwater elevations are higher in the Differential Rampdown scenario than in the Baseline Scenario because groundwater production in the ELPMA is approximately 2,300 AFY lower in the Differential Rampdown Scenario. Groundwater outflows exceed groundwater inflows in this scenario by approximately 400 AFY.

WLPMA

The water budget for the Differential Rampdown Scenario is the same as the water budget for the Basin-wide Rampdown Scenario in the WLPMA. The Basin-wide Rampdown Scenario water budget for the WLPMA is discussed in Section 3.4.1.3.

4 Estimate of Basin Optimization Yield

As defined in the Judgment and discussed in Section 1.3, the Basin Optimization Yield is the production rate, with implementation of the Basin Optimization Projects that can be reasonably implemented by 2040, that maintains groundwater elevations above the MTs and the flux between the WLPMA and the Oxnard Subbasin, as discussed in Section 3.1.4. Based on the model scenarios simulated for this BOY Study the Basin Optimization Yield is estimated to be 36,860 AFY if the in-lieu surface water delivery projects are implemented as shown in Table 3-3 and described as Project 2: Purchase of Imported Water from CMWD for Basin Replenishment. This pumping maintains the Baseline Scenario production rates at all but six wells in the WLPMA and three wells in the ELPMA. The wells in which groundwater production is reduced are owned and operated by VCWWD-1, VCWWD-19, and Zone MWC. This estimate of the Basin Optimization Yield is called the "Basin Optimization Yield – Projects."

The estimate of Basin Optimization Yield - Projects was derived through the use of numerical groundwater flow models, as described in this BOY Study, and subject to the uncertainty inherent in the models described in Section 2 and the scenario assumptions described in Section 3.1. The forecasted groundwater elevations simulated by the numerical modeling should be compared to measured groundwater elevations at Key Wells on an ongoing basis to confirm the validity of the model projections and adjust project operations, as necessary. Additionally, if Project 2: Purchase of Imported Water from CMWD for Basin Replenishment is not fully implemented for any reason, then a Ramp-down should be considered.

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5 Rampdown Rate

5.1 Basin-wide Rampdown Rate

Consistent with the Judgment, this initial BOY Study calculates a Rampdown Rate for a Basin-wide reduction in groundwater pumping if the projects are not implemented. The Rampdown Rate is the annual reduction in groundwater necessary to have the Operating Yield equal the Sustainable Yield by the fall of 2039 (Judgment §§1.89 and 4.10.1.4). The resulting Basin Optimization Yield if projects are not implemented is referred to as the Basin Optimization Yield – Basin-wide Rampdown.

1. The Rampdown was determined by subtracting the overall production modeled in the Basin-wide Rampdown Scenario (32,000 AFY) from the Initial Operating Yield (40,000 AFY).
2. The Rampdown (8,000 AFY) was divided by 14 water years to calculate the Rampdown Rate (assuming that Rampdown would begin in the fall of 2026 and that the groundwater production rate would equal 32,000 AFY by the fall of 2039).

The resulting Rampdown Rate, or the annual reduction in groundwater production that would result in an overall production rate of 32,000 AFY by the fall of 2039 is 571.4 AFY.

Future BOY Studies, which are to be prepared every five years, will each reevaluate the Rampdown and the Rampdown Rate. Therefore, while the Rampdown Rate was calculated to reduce the Operating Yield to Basin Optimization Yield – Basin-wide Rampdown volume of 32,000 AFY (Section 3.4.1) by the fall of 2039, the resulting Basin-wide groundwater production is only provided through September of 2030 in this initial BOY Study (Table 5-1). It should be noted that this Boy Study and the values provided in Table 5-1 have not yet been approved by the Watermaster Board of Directors.

Table 5-1. Water Year 2027 through 2030 Rampdown Production

Water Year (October – September)	Groundwater Production Rate (AFY)				
	Basin-wide Rampdown	Differential Rampdown			
		WLPMA	ELPMA	Epworth Gravels Management Area	Differential Rampdown TOTAL
Oct 2026 – Sept 2027	39,429	18,154	20,398	1,016	39,567
Oct 2027 – Sept 2028	38,857	17,891	20,236	1,008	39,135
Oct 2028 – Sept 2029	38,286	17,628	20,075	1,000	38,702
Oct 2029 – Sept 2030	37,714	17,365	19,913	992	38,269

5.2 Differential Rampdown Rate

In addition to the Basin-wide Rampdown rate, which is required to be calculated by the Judgment, this initial BOY Study also calculates a potential Differential Rampdown rate based on the Differential Rampdown Scenario. In that scenario groundwater production was reduced by 20% relative to the Baseline Scenario pumping in the WLPMA and by 11% in the ELPMA and Epworth Gravels Management Area. The overall groundwater production from the Basin is higher under this scenario than it is in the Basin-wide Rampdown (Table 3-3).

In order to calculate the annual Rampdown Rate for each management area under this scenario, the management area specific groundwater production modeled in the Differential Rampdown Scenario was subtracted from the Baseline Scenario groundwater production for each management area. The Rampdown for the WLPMA is 3,683 AFY; the Rampdown for the ELPMA is 2,261 AFY; and the Rampdown for the Epworth Gravels Management Area is 113 AFY. The Rampdown for each management area was then divided by 14 water years to calculate the resulting management area specific Rampdown Rates that would result in an overall production rate of 33,943 AFY by the fall of 2039. These rates are 236.1 AFY for the WLPMA, 161.5 AFY for the ELPMA, and 8.1 AFY for the Epworth Gravels Management Area (Table 5-1).

6 Conclusion

The Judgment states that "*following the first Basin Optimization Yield Study, Rampdown of the Operating Yield will commence in annual steps, if necessary*" (Judgment §4.9.1.3). Based on numerical modeling, with the inherent limitations, this BOY Study finds that the Basin Optimization Yield under the Projects Scenario would achieve sustainable groundwater management, if the projects are implemented as described in the Basin Optimization Plan as Project 2: Purchase of Imported Water from CMWD for Basin Replenishment. If, however, these projects are not implemented, a Rampdown will be required in order to have the Operating Yield of the Basin equal the Sustainable Yield of the Basin by the fall of 2039.

This BOY Study outlines two potential Rampdown scenarios for the Watermaster to consider. The first is a Basin-wide Rampdown that reduces groundwater production by 20%, relative to the Baseline Scenario groundwater production, in all management areas of the Basin (Sections 3.4.1 and 5.1). The second is a Differential Rampdown that reduces groundwater production in the ELPMA and Epworth Gravels Management Areas by 11%, relative to the Baseline Scenario, and reduces groundwater production in the WLPMA by 20% relative to the Baseline Scenario (Sections 3.4.2 and 5.2). The annual Rampdown Rate for each scenario calculated in Sections 5.1 and 5.2 assumes a 14-year implementation, beginning in DWR water year 2027. If the Watermaster delays implementing a Rampdown until later water years, the annual Rampdown Rate would increase, relative to that calculated in Sections 5.1 and 5.2, because the Rampdown would occur over a shorter period. The difference in the annual Rampdown Rate, by implementation year between DWR water years 2027 and water year 2029, and the two Rampdown scenarios, is presented in Table 6-1.

Table 6-1. Rampdown Rate for Different Rampdown Implementation Time Periods

Implementation Year	Rampdown Duration (yrs)	Rampdown Rate (AFY)			
		Basin-wide Rampdown	Differential Rampdown		
			WLPMA	ELPMA	Epworth Gravels Management Area
Oct 2026 – Sept 2027	14	571.4	263.1	161.5	8.1
Oct 2027 – Sept 2028	13	615.4	283.3	173.9	8.7
Oct 2028 – Sept 2029	12	666.7	306.9	188.4	9.4
Oct 2029 – Sept 2030	11	727.3	334.8	205.5	10.3

The process to implement a Basin-wide Rampdown differs from the process to implement a Differential Rampdown. Under the Judgment, a Basin-wide Rampdown can be implemented by the Watermaster if the BOY Study finds that it is necessary (Judgment §4.9.1.3). Additional steps are required if the Watermaster intends to implement a Differential Rampdown that would result in "*localized restrictions on extractions*" (Judgment §4.10.3). This process includes, but is not limited to, committee consultation and a list of specific findings relative to the implementation of projects and the avoidance of undesirable results (Judgment §4.10.3.1). Although the process to implement a

Differential Rampdown is more complex, this BOY Study finds that the Differential Rampdown approach avoids undesirable results while preserving higher overall groundwater production rates in the Basin.

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UWCD (United Water Conservation District). 2021. *Ventura Regional Groundwater Flow Model Expansion and Updated Hydrogeologic Conceptual Model for the Piru, Fillmore, and Santa Paula Groundwater Basins*. June 2021. Available online: https://www.unitedwater.org/wp-content/uploads/2022/09/UWCD_OFR_2021_01_Ventura_Regional_Groundwater_Flow_Model_Expansion.pdf

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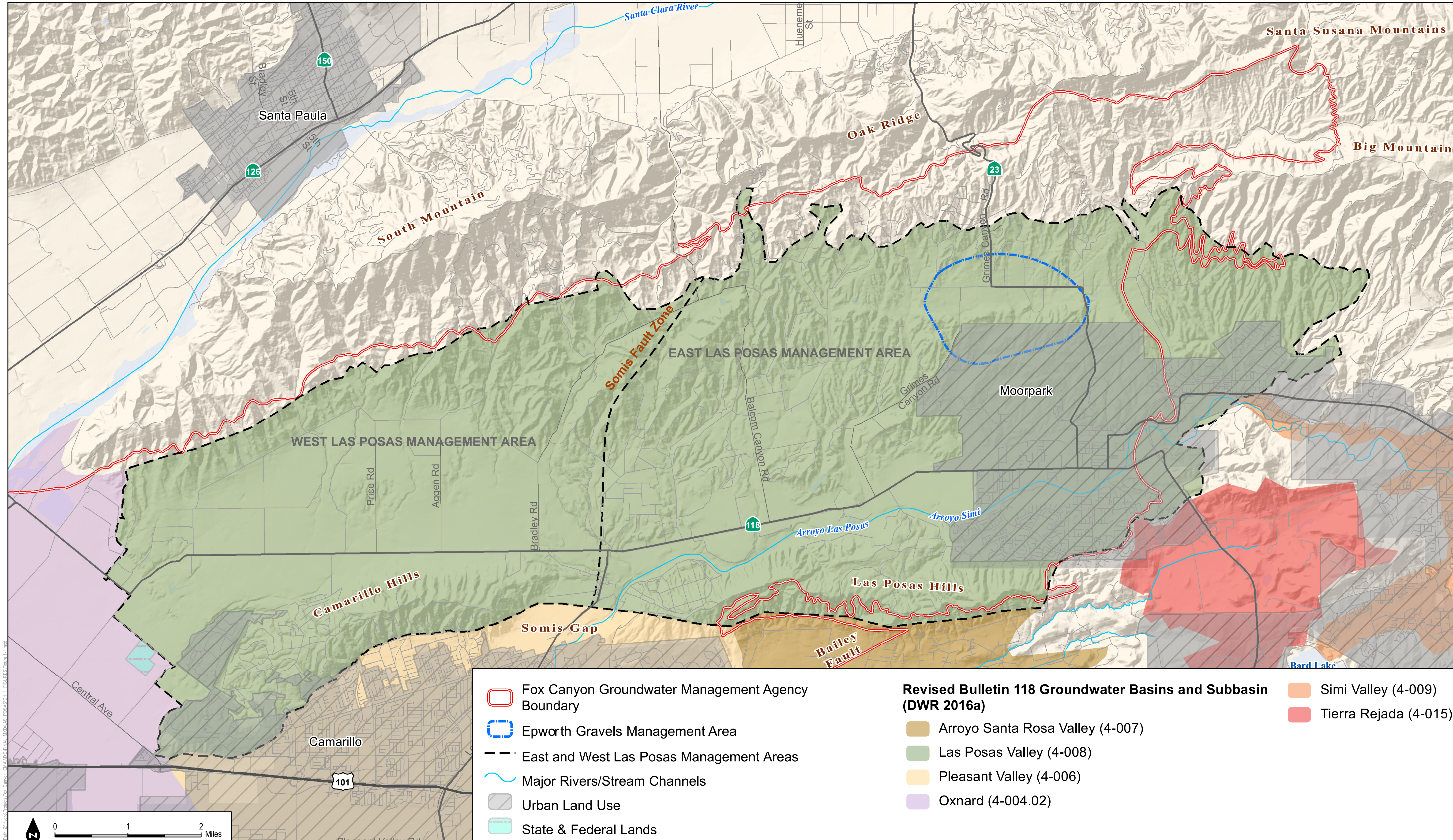

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SOURCE: DWR; County of Ventura

FIGURE 1-1

Vicinity Map for the Las Posas Valley Basin

Basin Optimization Yield Study for the Las Posas Valley Basin

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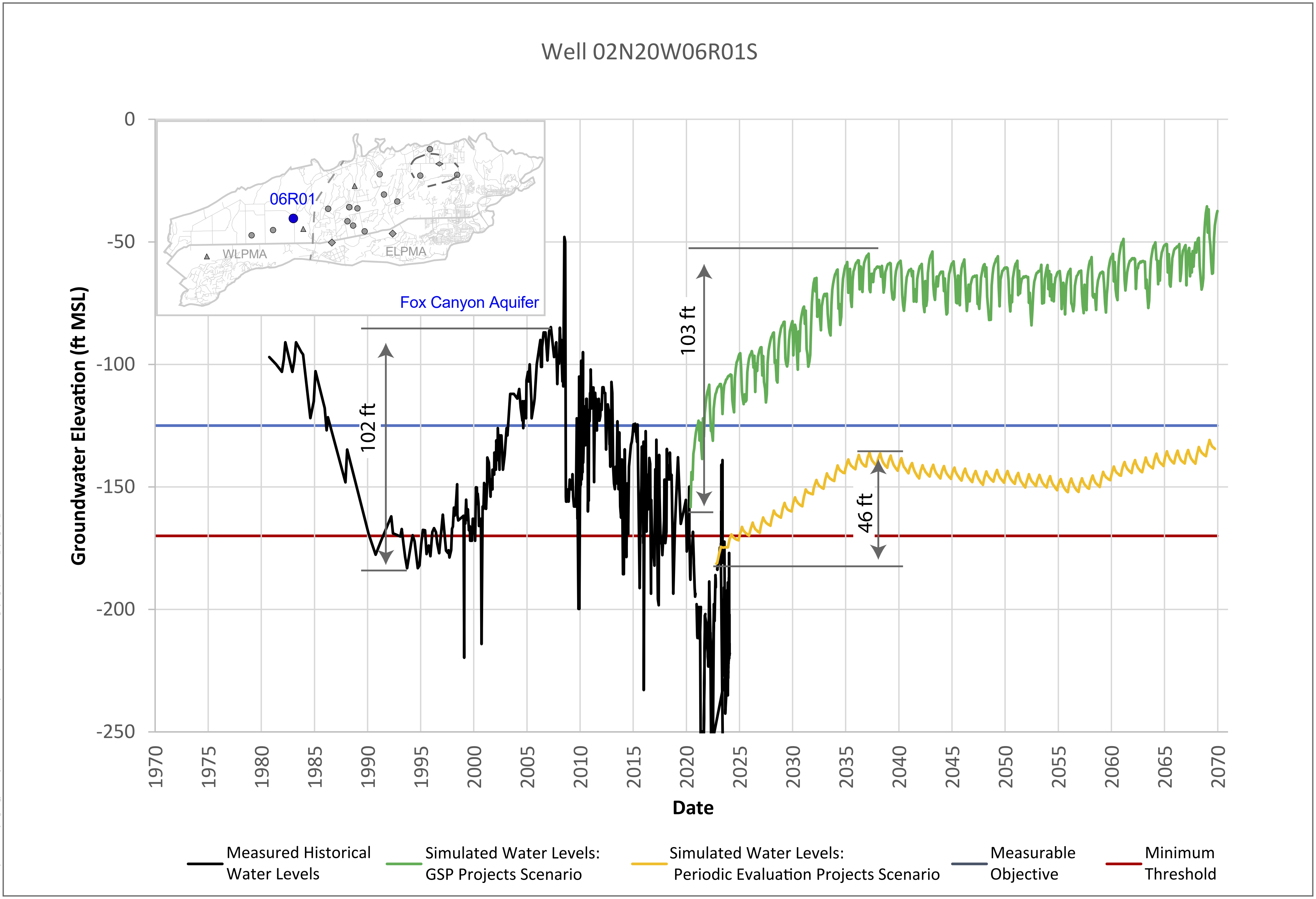

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FIGURE 2-1

Groundwater Level Response Comparison in Well 02N20W06R01

Basin Optimization Yield Study for the Las Posas Valley Basin

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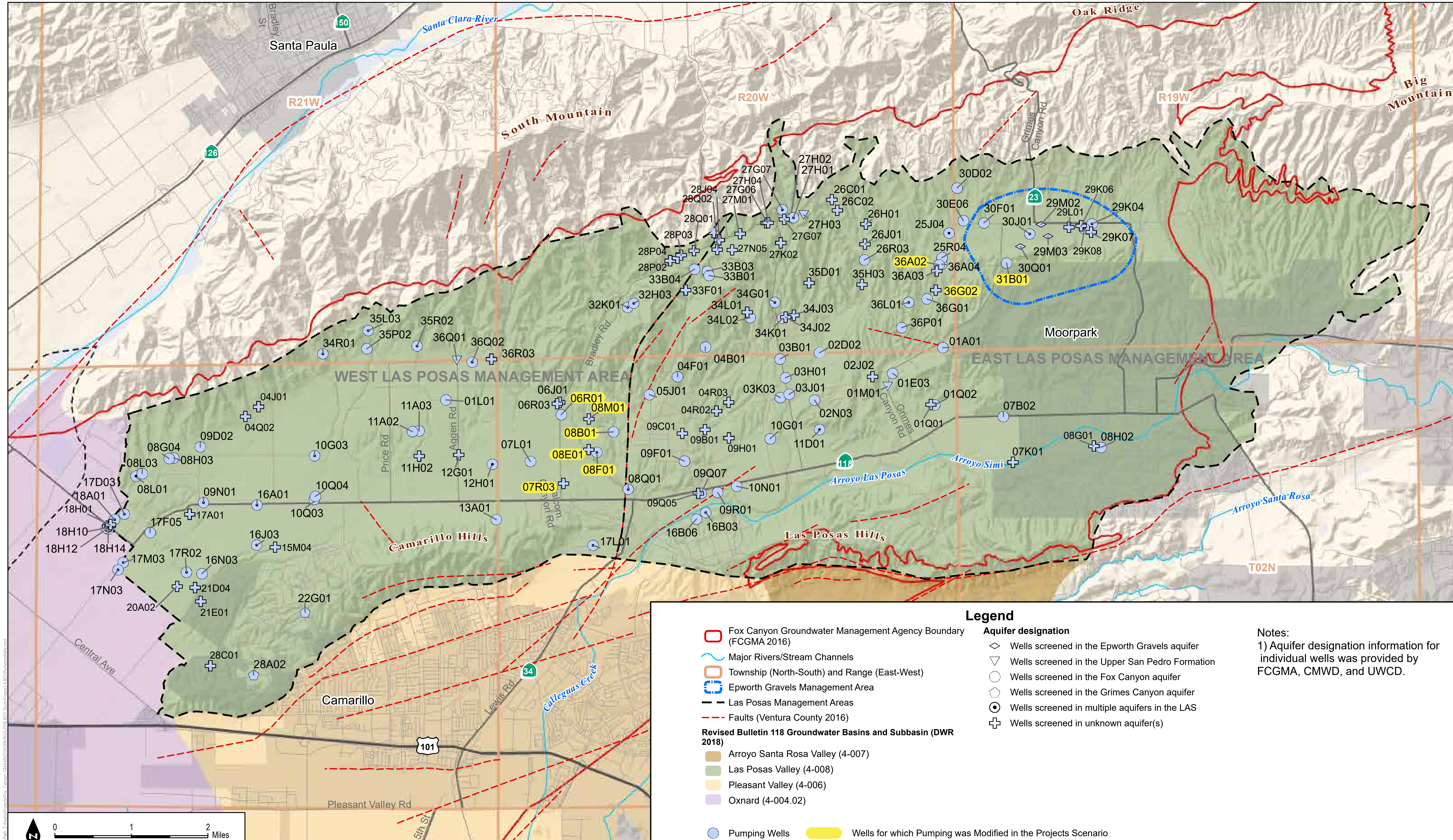

SOURCE: DWR, FCGMA, VCWPD, UWCD, CMWD

FIGURE 3-1

Groundwater Production Wells Associated with WMIDs in the Las Posas Valley Basin

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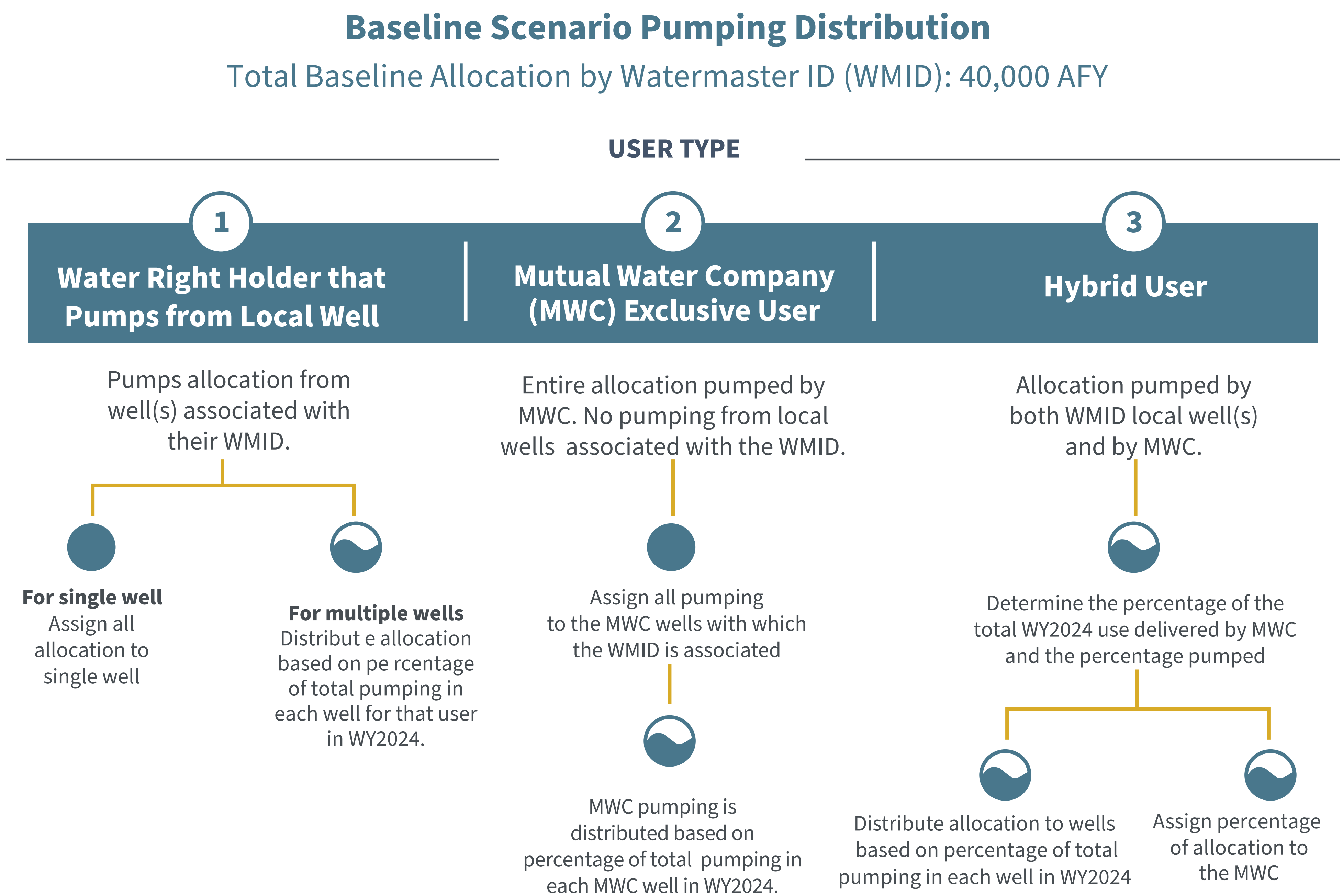

FIGURE 3-2

Distribution of Pumping for Modeling

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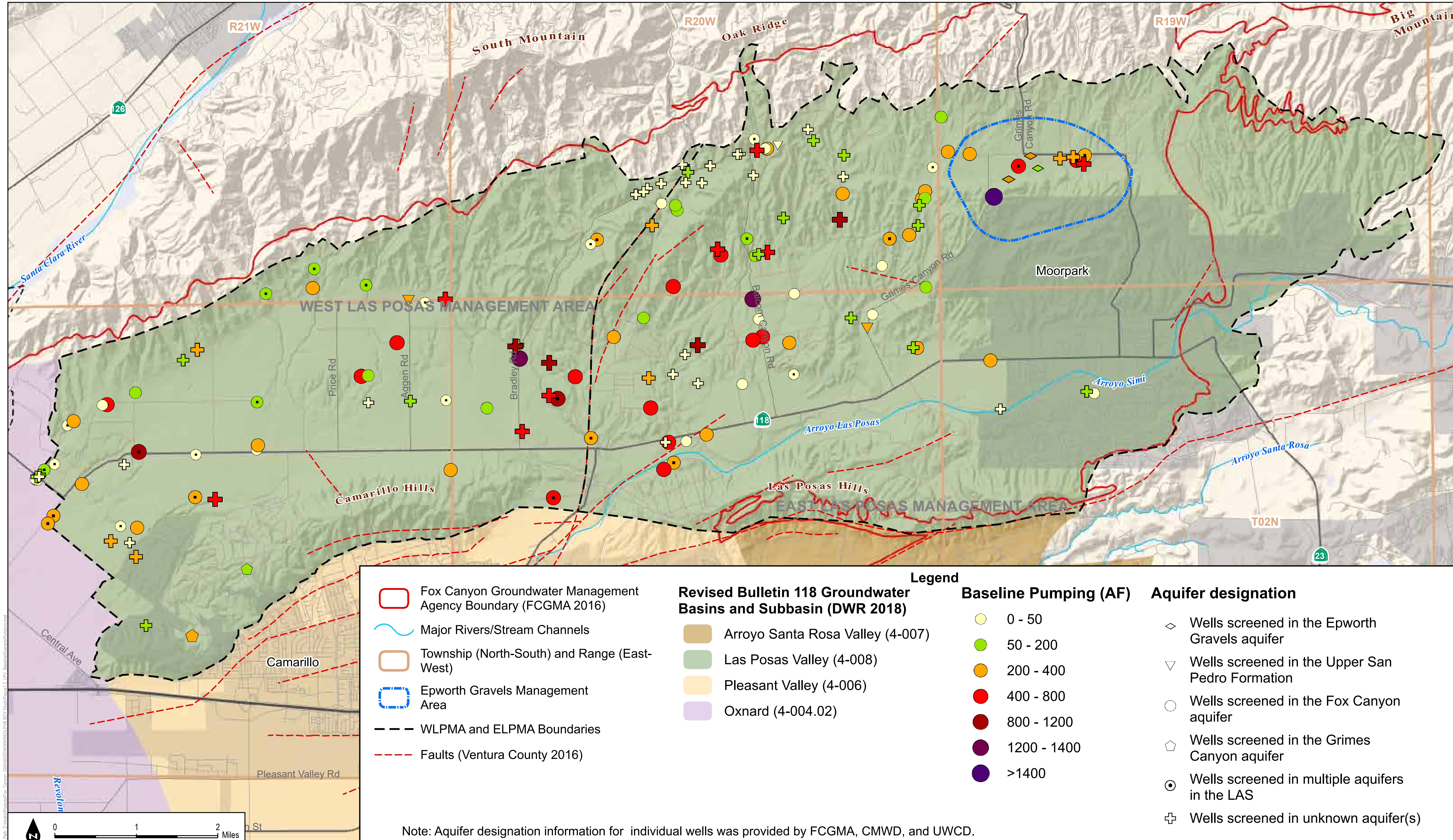

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SOURCE: DWR, FCGMA, VCWPD, UWCD, CMWD

FIGURE 3-3

Baseline Scenario Allocation Pumping

Basin Optimization Yield Study for the Las Posas Valley Basin

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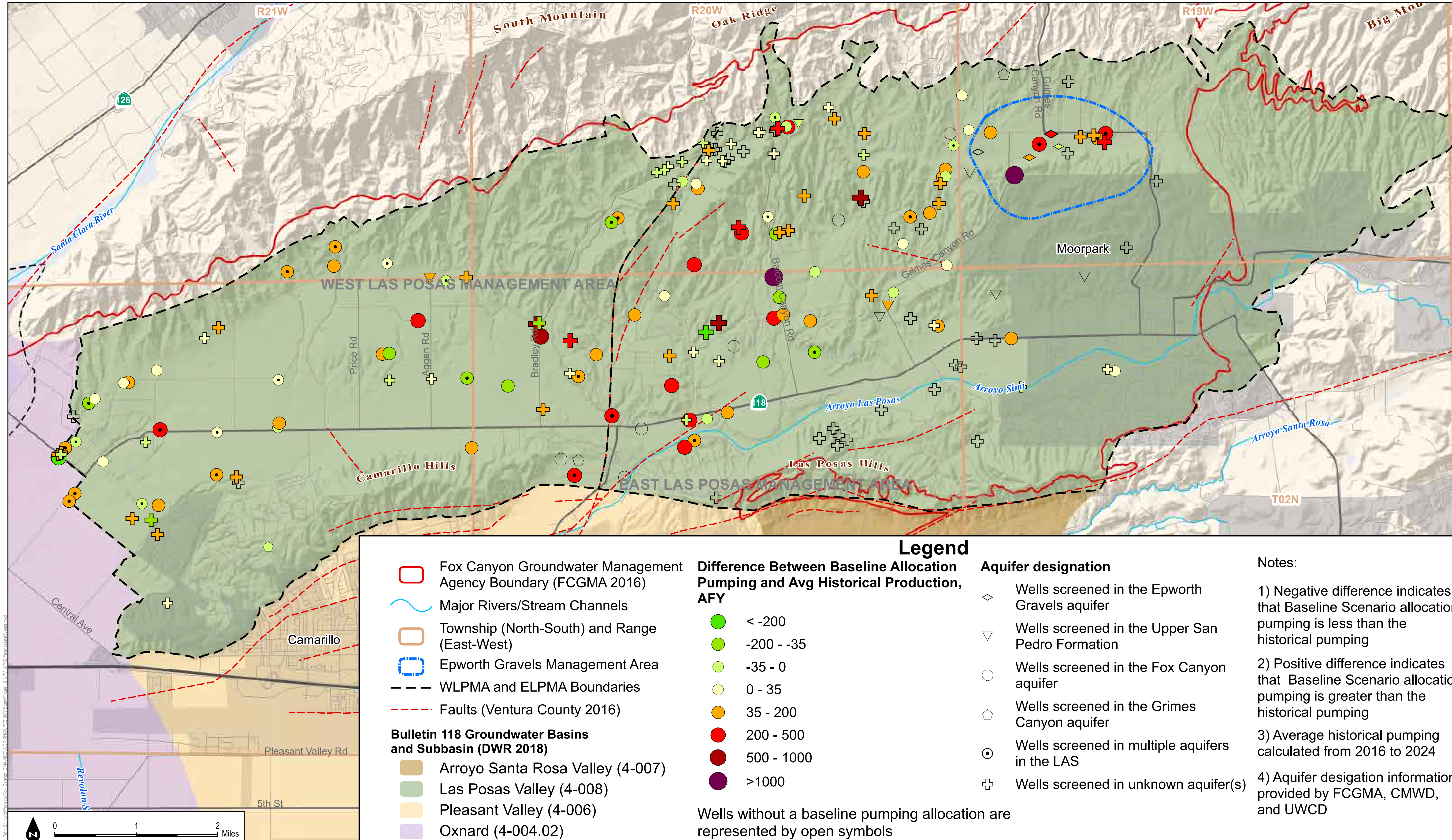

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SOURCE: DWR, FCGMA, VCWPD, UWCD, CMWD

FIGURE 3-4

Baseline Scenario Allocation Pumping Compared to the 2016-2024 Historical Average Pumping

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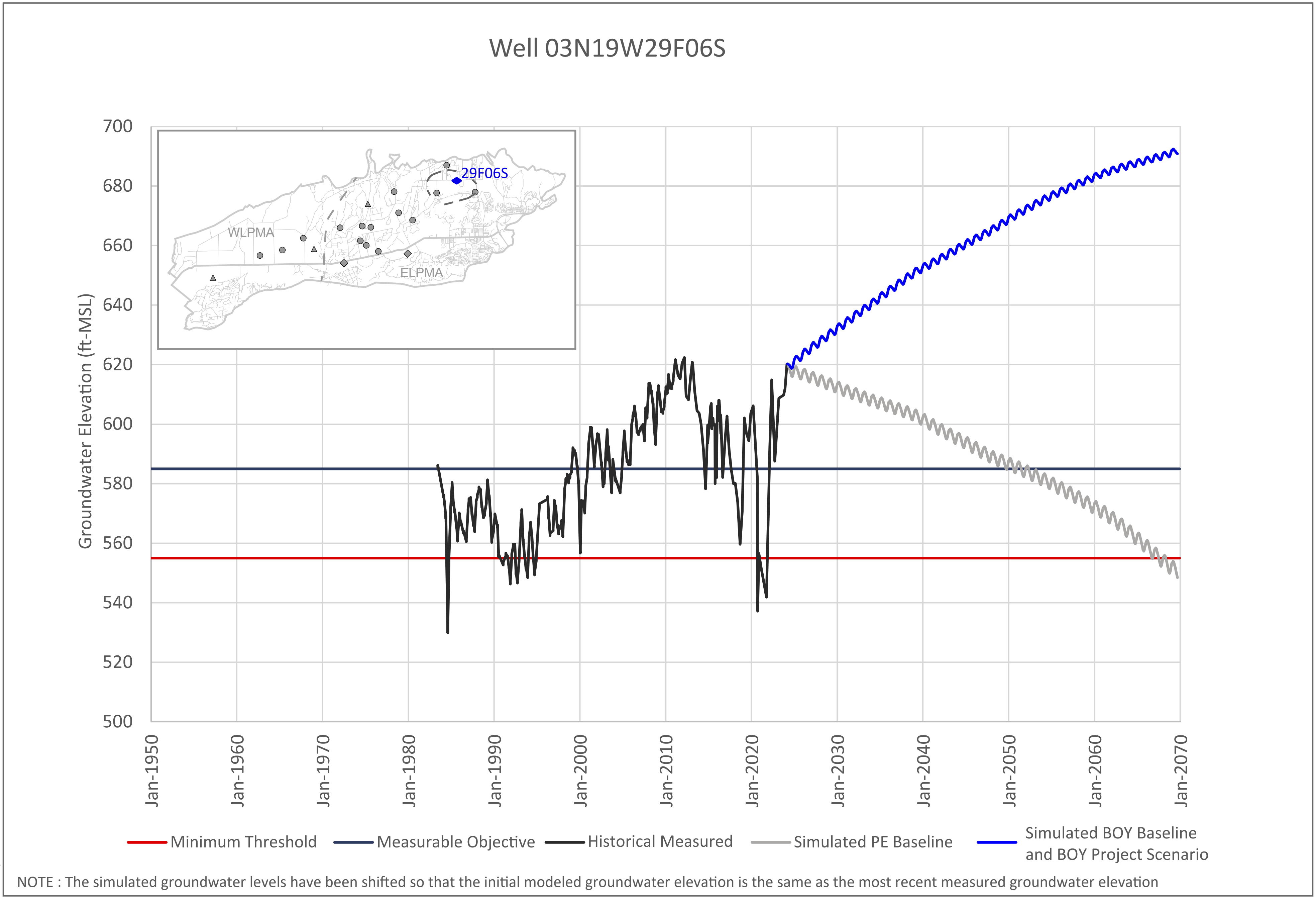

FIGURE 3-5

Epworth Gravels Key Well Hydrograph: Well 03N19W29F06S

Basin Optimization Yield Study for the Las Posas Valley Basin

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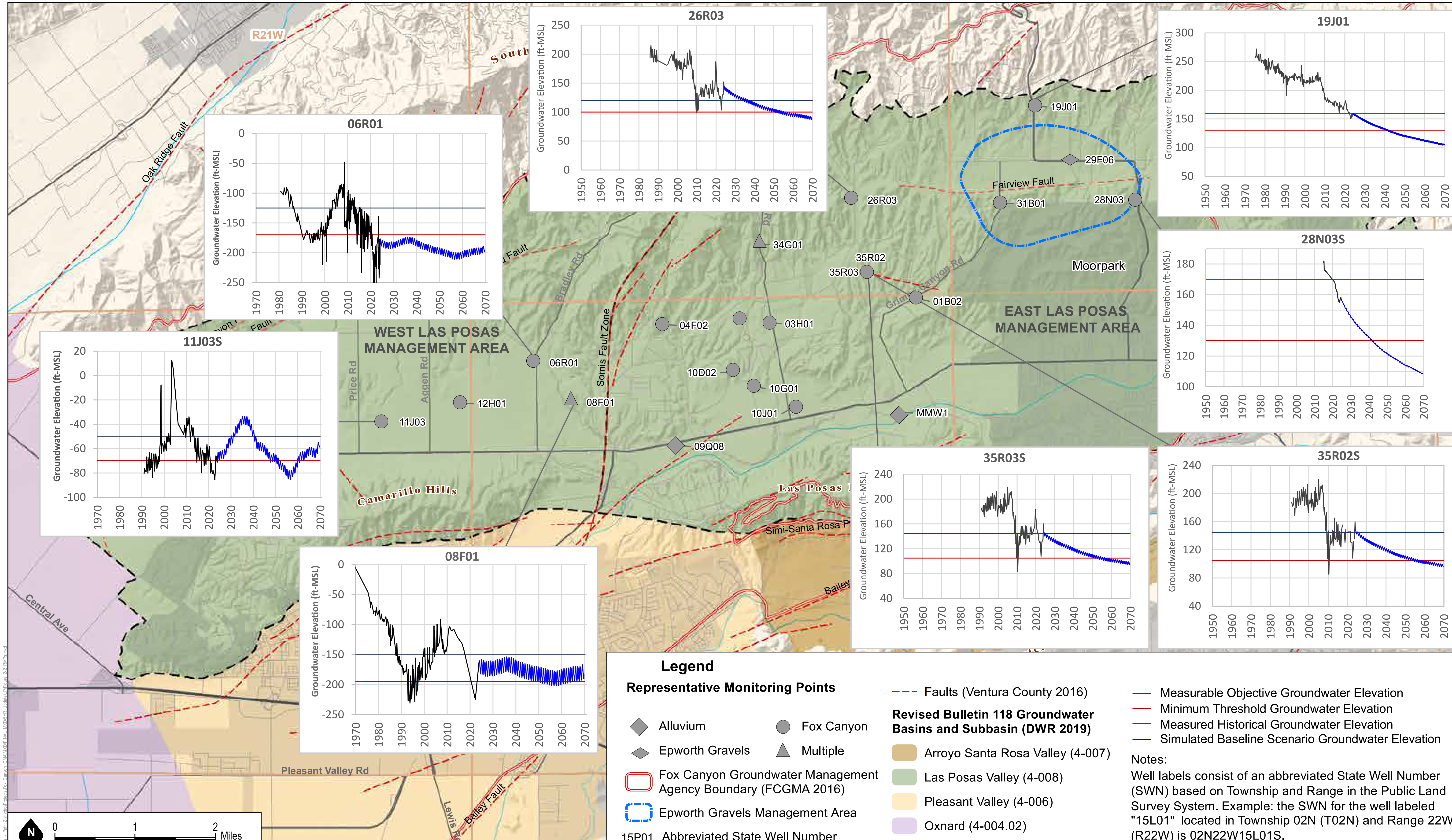

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SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 3-6

Baseline Scenario Groundwater Elevation Hydrograph Map

Basin Optimization Yield Study for the Las Posas Valley Basin

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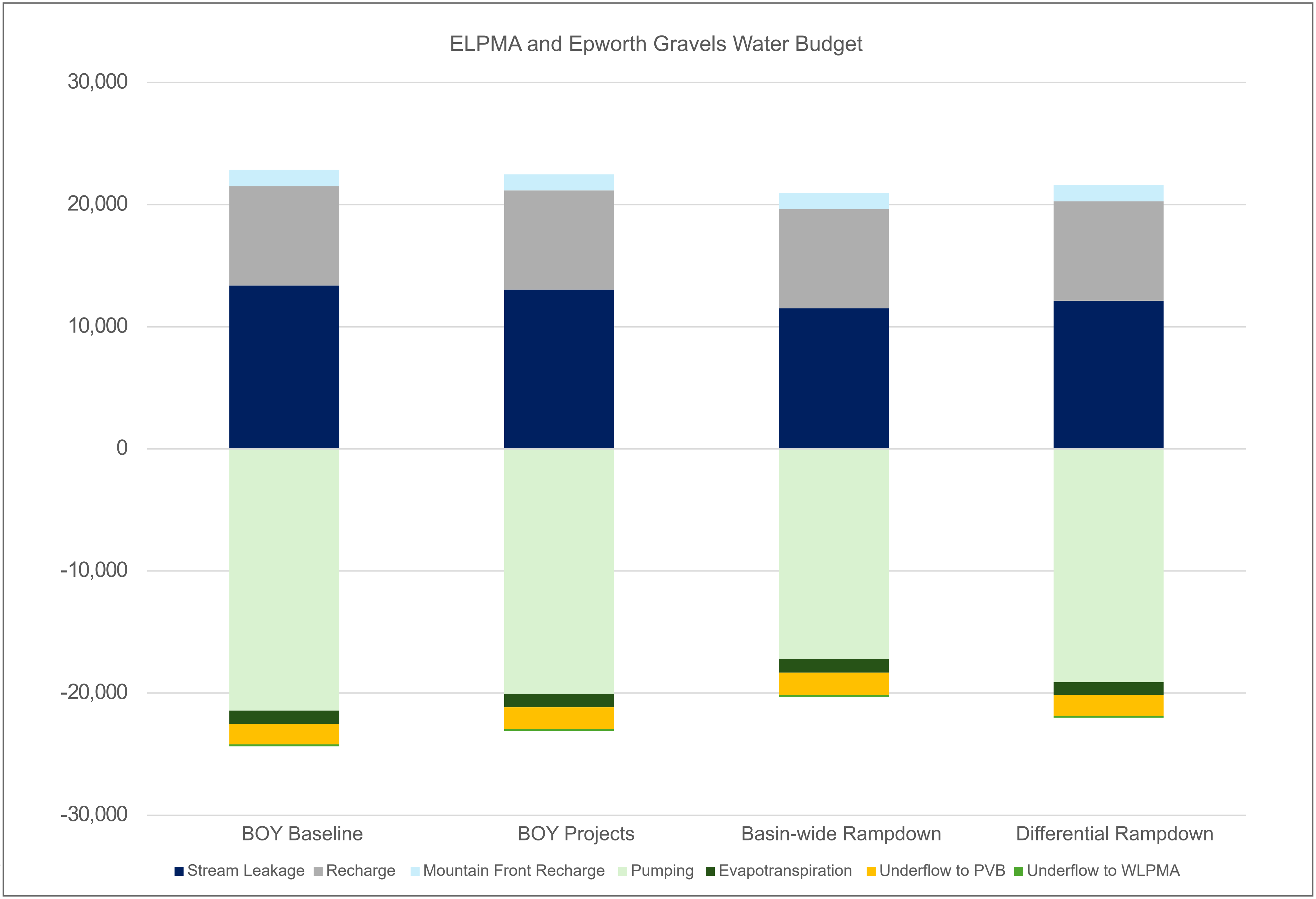

NOTE: The recharge term includes both precipitation recharge and return flows

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FIGURE 3-7

Model Scenario Water Budgets for the ELPMA and Epworth Gravels Management Area

Basin Optimization Yield Stidy for the Las Posas Valley Basin

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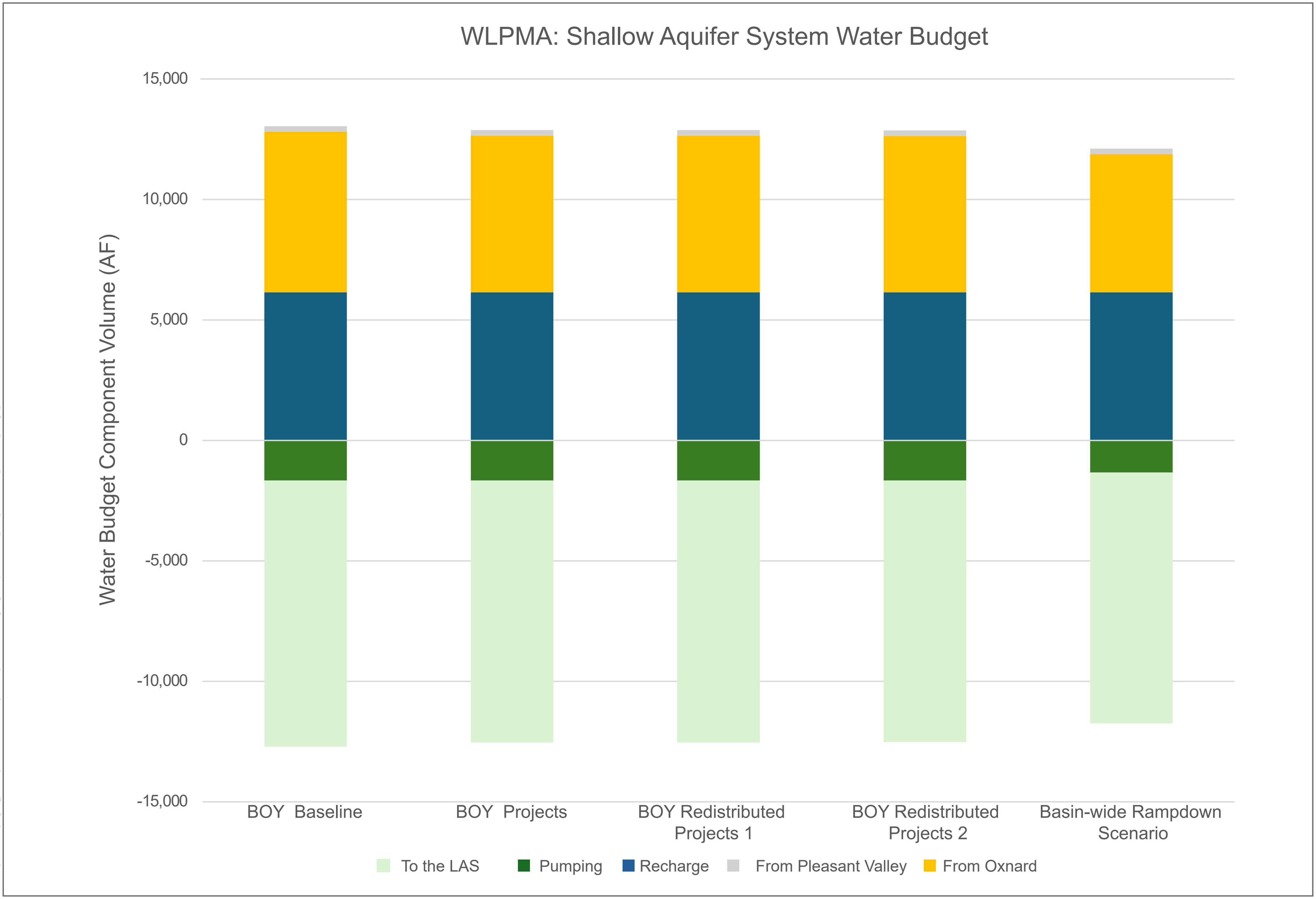

NOTE: The recharge term includes both precipitation recharge and return flows

FIGURE 3-8

Model Scenario Water Budgets for the WLPMA Shallow Aquifer System

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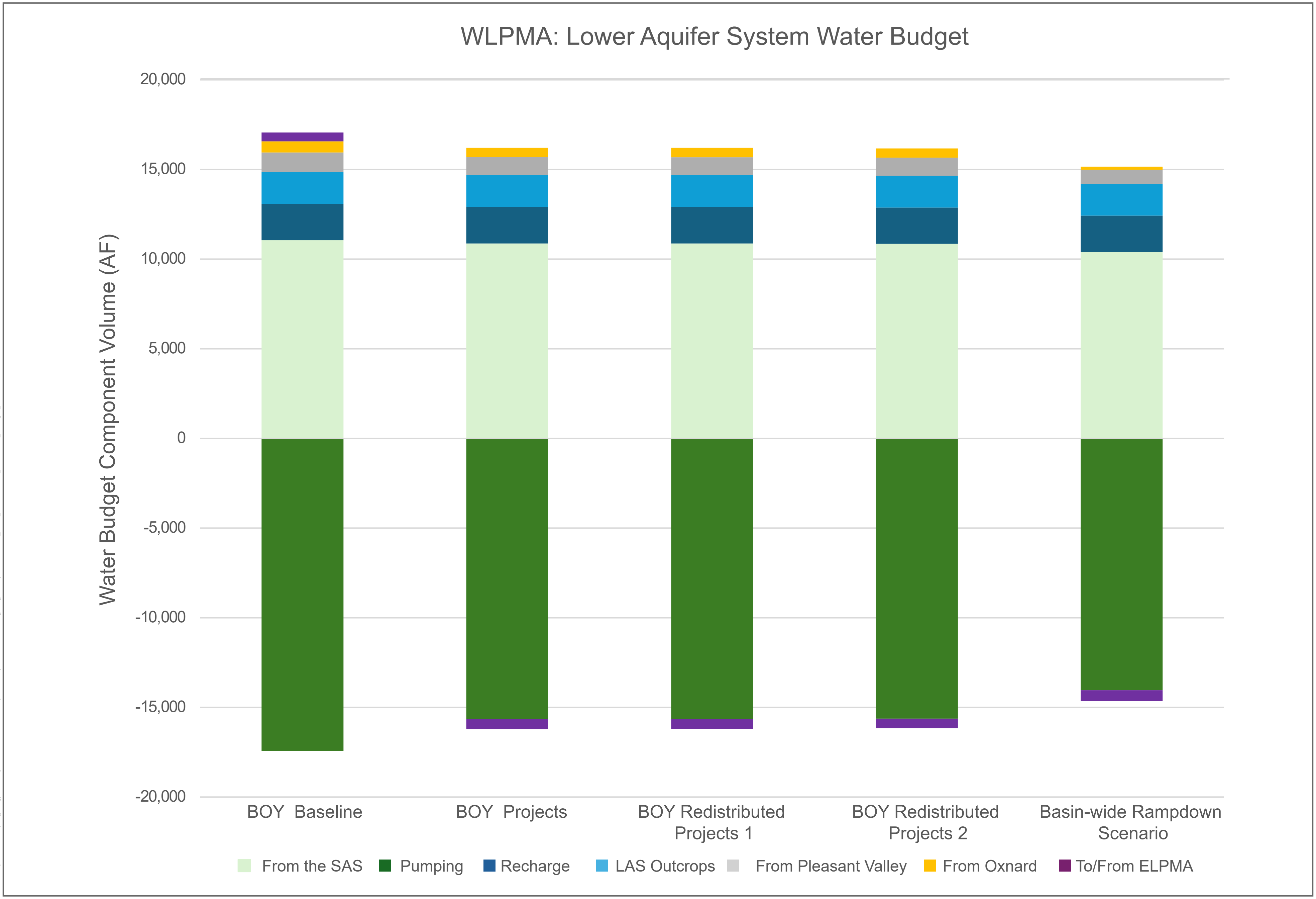

NOTE: The recharge term includes both precipitation recharge and return flows

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FIGURE 3-9

Model Scenario Water Budgets for the WLPMA Lower Aquifer System

Basin Optimization Yield Study for the Las Posas Valley Basin

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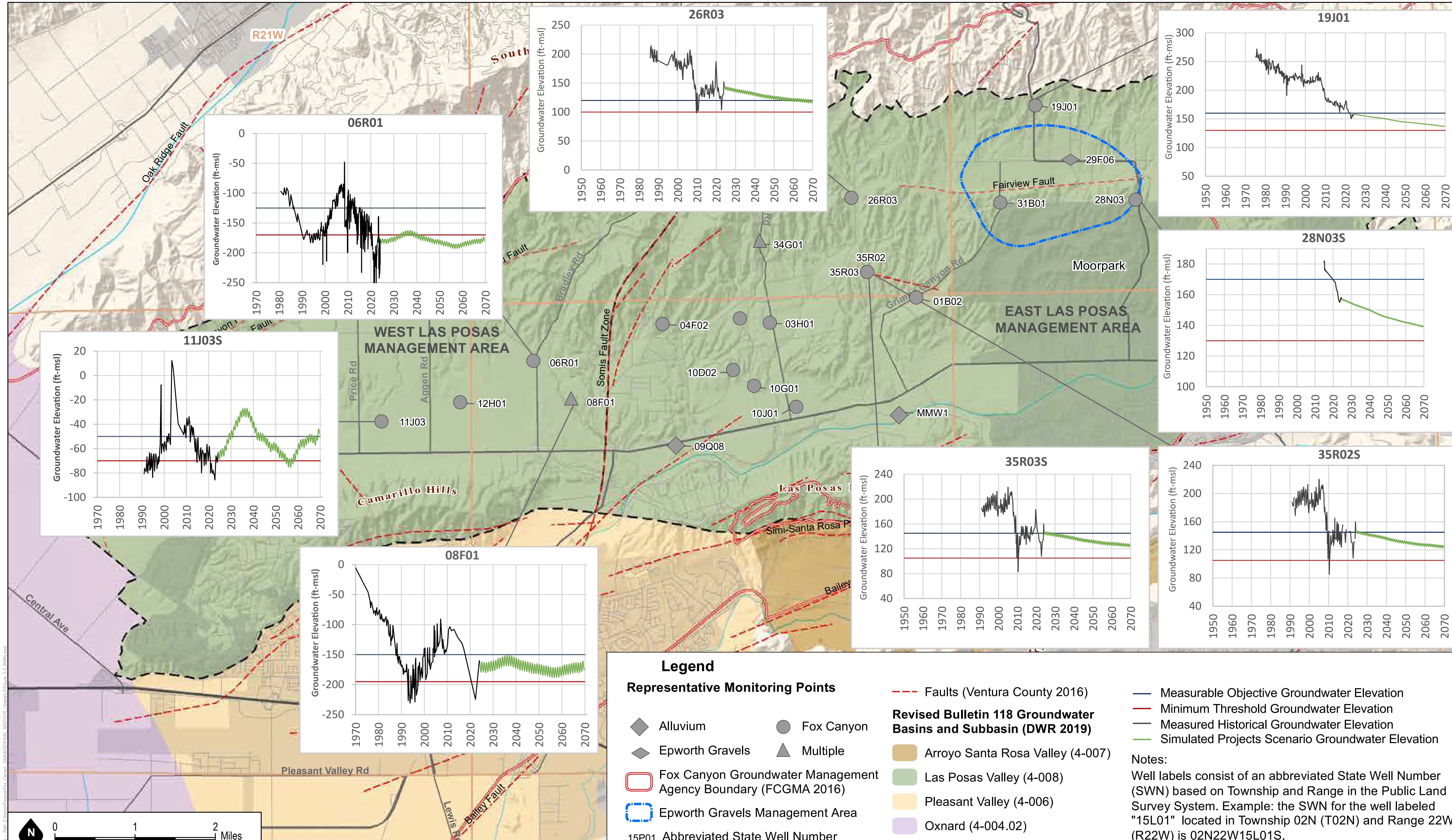

Legend

Representative Monitoring Points

- Alluvium
- Epworth Gravels
- Fox Canyon
- Multiple
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Epworth Gravels Management Area
- 15P01 Abbreviated State Well Number

- Faults (Ventura County 2016)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2019)

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

- Measurable Objective Groundwater Elevation
- Minimum Threshold Groundwater Elevation
- Measured Historical Groundwater Elevation
- Simulated Projects Scenario Groundwater Elevation

Notes:
Well labels consist of an abbreviated State Well Number (SWN) based on Township and Range in the Public Land Survey System. Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 3-10
Projects Scenario Groundwater Elevation Hydrograph Map

Basin Optimization Yield Study for the Las Posas Valley Basin

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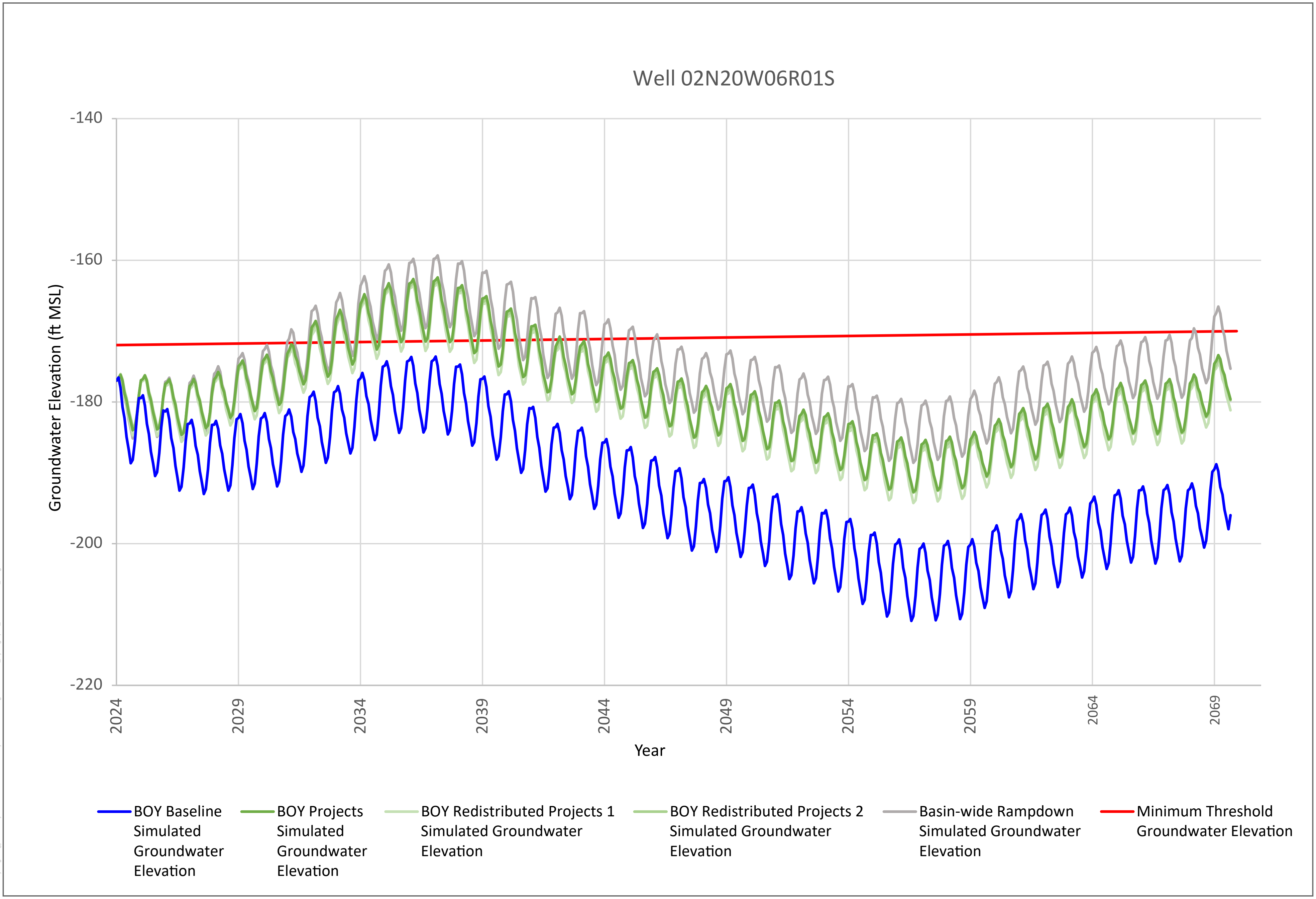

FIGURE 3-11

Simulated Groundwater Elevations in Well 02N20W06R01

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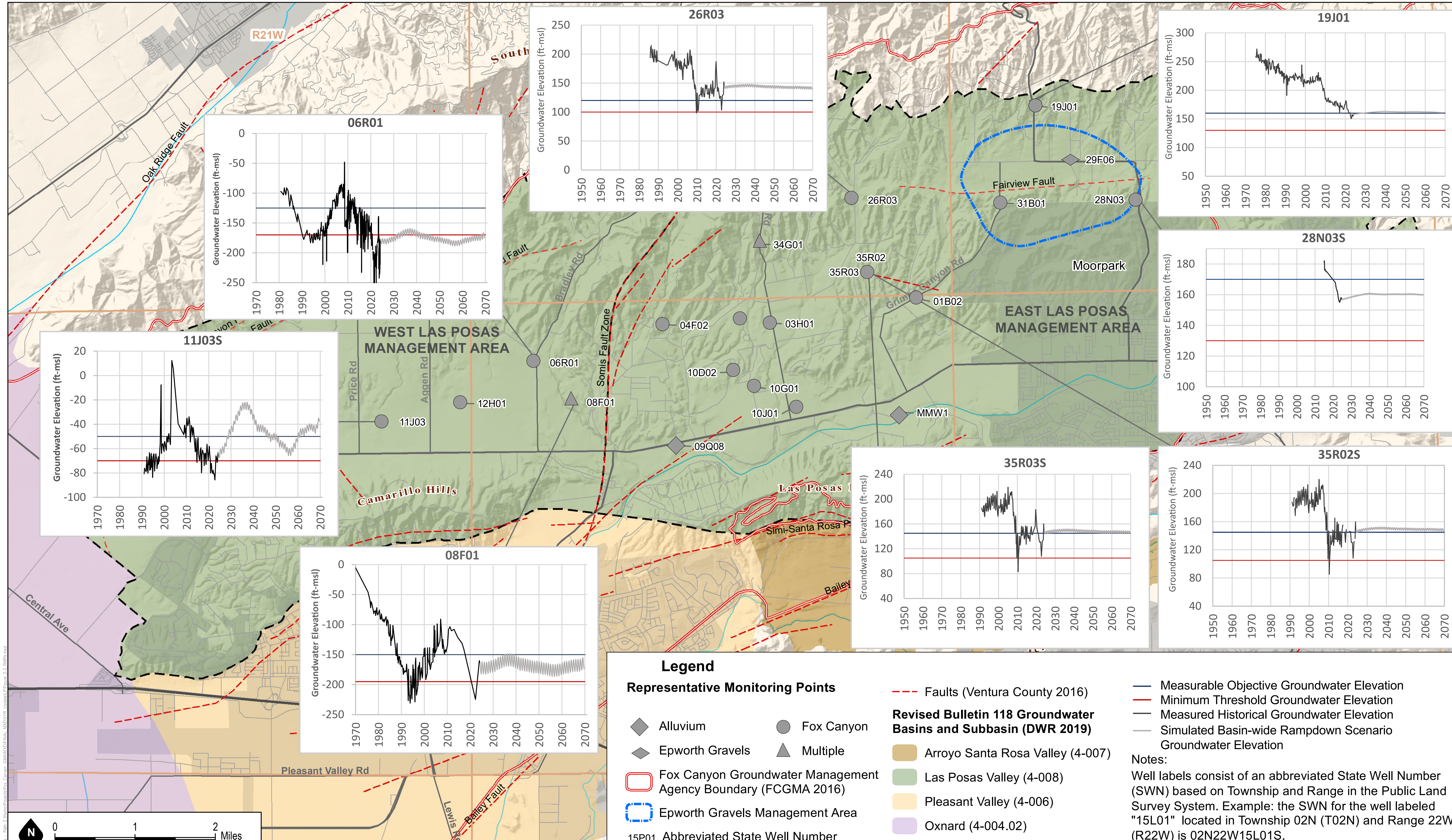

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 3-12

Basin-wide Rampdown Scenario Groundwater Elevation Hydrograph Map

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Basin Optimization Yield Study for the Las Posas Valley Basin

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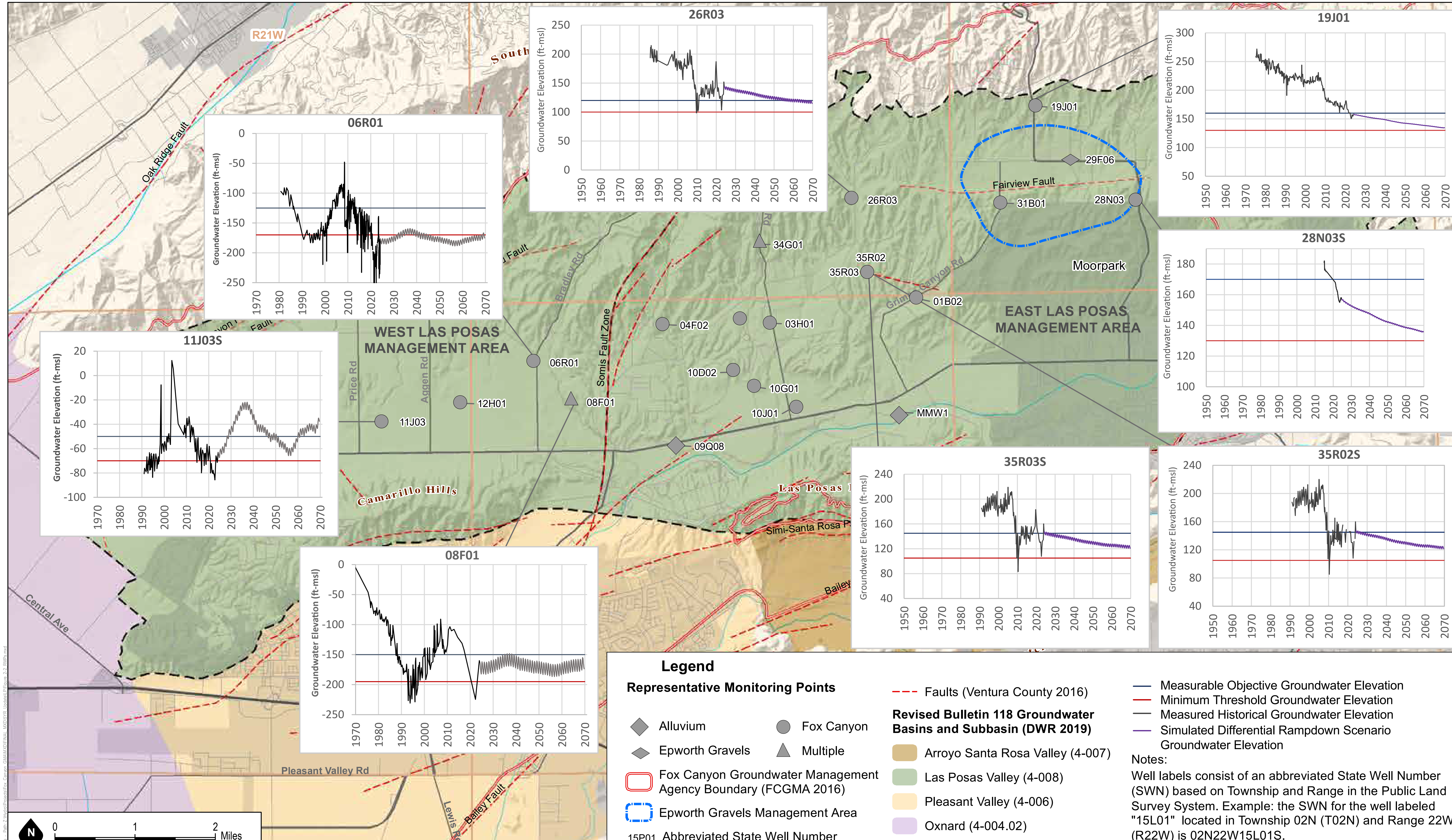

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SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 3-13

Differential Rampdown Scenario Groundwater Elevation Hydrograph Map

Basin Optimization Yield Study for the Las Posas Valley Basin

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Appendix A
BOY Baseline Allocation Groundwater Production Rates

State Well Number	Management Area	BOY Baseline Scenario Groundwater Pumping (AFY)	Average Historical Groundwater Pumping (AFY)	Difference (AFY)
02N19W07B02	ELPMA	300.8	196.9	103.9
02N19W07K01	ELPMA	21.5	35.2	-13.7
02N19W08G01	ELPMA	61.3	35.2	26.2
02N19W08H02	ELPMA	31.3	18.5	12.8
02N20W01A01	ELPMA	85.1	51.3	33.7
02N20W01E03	ELPMA	43.8	58.5	-14.7
02N20W01J01	ELPMA	24.9	12.5	12.4
02N20W01M01	ELPMA	216.1	113.4	102.7
02N20W01Q01	ELPMA	82.4	63.9	18.5
02N20W01Q02	ELPMA	275.7	129.3	146.4
02N20W02D02	ELPMA	0.0	30.6	-30.6
02N20W02J02S	ELPMA	76.3	36.9	39.4
02N20W02N03	ELPMA	383.6	192.1	191.5
02N20W03B01	ELPMA	1383.6	336.1	1047.4
02N20W03H01	ELPMA	0.9	89.7	-88.7
02N20W03J01	ELPMA	478.4	309.9	168.5
02N20W04B01	ELPMA	614.8	248.0	366.7
02N20W04F01	ELPMA	144.3	119.7	24.6
02N20W04R02	ELPMA	22.6	126.8	-104.2
02N20W04R03	ELPMA	1248.1	649.2	598.9
02N20W05J01	ELPMA	326.4	268.3	58.1
02N20W08Q01	ELPMA	372.6	102.8	269.8
02N20W09B01	ELPMA	27.4	18.2	9.2
02N20W09C01	ELPMA	245.6	147.2	98.4
02N20W09F01	ELPMA	504.9	179.4	325.5
02N20W09H01	ELPMA	28.4	17.2	11.2
02N20W09Q05	ELPMA	30.2	41.2	-11.1
02N20W09Q07	ELPMA	747.0	436.5	310.6
02N20W09R01	ELPMA	24.4	34.1	-9.7
02N20W10G01	ELPMA	47.5	87.3	-39.7
02N20W10N01	ELPMA	248.3	158.8	89.5
02N20W11D01	ELPMA	0.0	81.7	-81.7
02N20W16B03	ELPMA	288.5	145.1	143.3
02N20W16B06	ELPMA	405.9	165.5	240.4
03N19W17Q01	ELPMA	29.2	11.4	17.8
03N19W18Q01	ELPMA	172.3	2.2	170.1
03N19W20G01	ELPMA	5.9	47.3	-41.3
03N19W29F07	ELPMA	38.9	19.7	19.2
03N19W29K04	ELPMA	378.3	176.2	202.1
03N19W29K07	ELPMA	428.9	287.8	141.1
03N19W29K08	ELPMA	695.4	391.5	303.9

State Well Number	Management Area	BOY Baseline Scenario Groundwater Pumping (AFY)	Average Historical Groundwater Pumping (AFY)	Difference (AFY)
03N19W30D02	ELPMA	171.8	166.6	5.1
03N19W30E06	ELPMA	273.5	268.5	5.1
03N19W30F01	ELPMA	218.7	67.8	150.9
03N19W30J01	ELPMA	448.0	200.7	247.3
03N19W31B01	ELPMA	1959.9	446.1	1513.8
03N19W31H01	ELPMA	0.0	200.4	-200.4
03N20W24P03	ELPMA	66.6	41.6	25.0
03N20W25J04	ELPMA	0.0	31.2	-31.2
03N20W25R04	ELPMA	277.9	129.0	148.8
03N20W26C01	ELPMA	1.0	0.1	0.9
03N20W26C02	ELPMA	77.7	18.9	58.8
03N20W26D01	ELPMA	0.0	0.0	0.0
03N20W26H01	ELPMA	115.3	71.4	43.9
03N20W26J01	ELPMA	1.2	2.5	-1.4
03N20W26R03	ELPMA	213.2	84.2	129.1
03N20W27B03	ELPMA	38.0	35.6	2.4
03N20W27G05	ELPMA	0.0	0.0	0.0
03N20W27G06	ELPMA	30.7	15.4	15.4
03N20W27G07	ELPMA	20.4	5.6	14.8
03N20W27H01	ELPMA	316.0	86.4	229.6
03N20W27H02	ELPMA	1.4	10.2	-8.8
03N20W27H03	ELPMA	0.0	0.3	-0.3
03N20W27H04	ELPMA	485.8	129.3	356.5
03N20W27J01	ELPMA	6.3	0.0	6.3
03N20W27K02	ELPMA	1.0	0.4	0.6
03N20W27M01	ELPMA	0.0	0.4	-0.4
03N20W27M01	ELPMA	2.0	0.6	1.4
03N20W27N01	ELPMA	0.0	5.6	-5.6
03N20W27N05	ELPMA	1.0	0.5	0.5
03N20W28J04	ELPMA	63.5	27.6	35.8
03N20W28Q02	ELPMA	29.9	19.1	10.9
03N20W33B01	ELPMA	59.7	58.7	0.9
03N20W33B03	ELPMA	61.8	24.4	37.4
03N20W33F01	ELPMA	231.8	58.9	172.9
03N20W34G01	ELPMA	87.3	65.2	22.0
03N20W34J02	ELPMA	101.4	42.3	59.1
03N20W34J03	ELPMA	65.0	7.2	57.8
03N20W34J03	ELPMA	335.4	243.4	91.9
03N20W34K01	ELPMA	165.0	212.7	-47.7
03N20W34L01	ELPMA	402.8	154.1	248.7
03N20W34L02	ELPMA	754.6	375.5	379.1

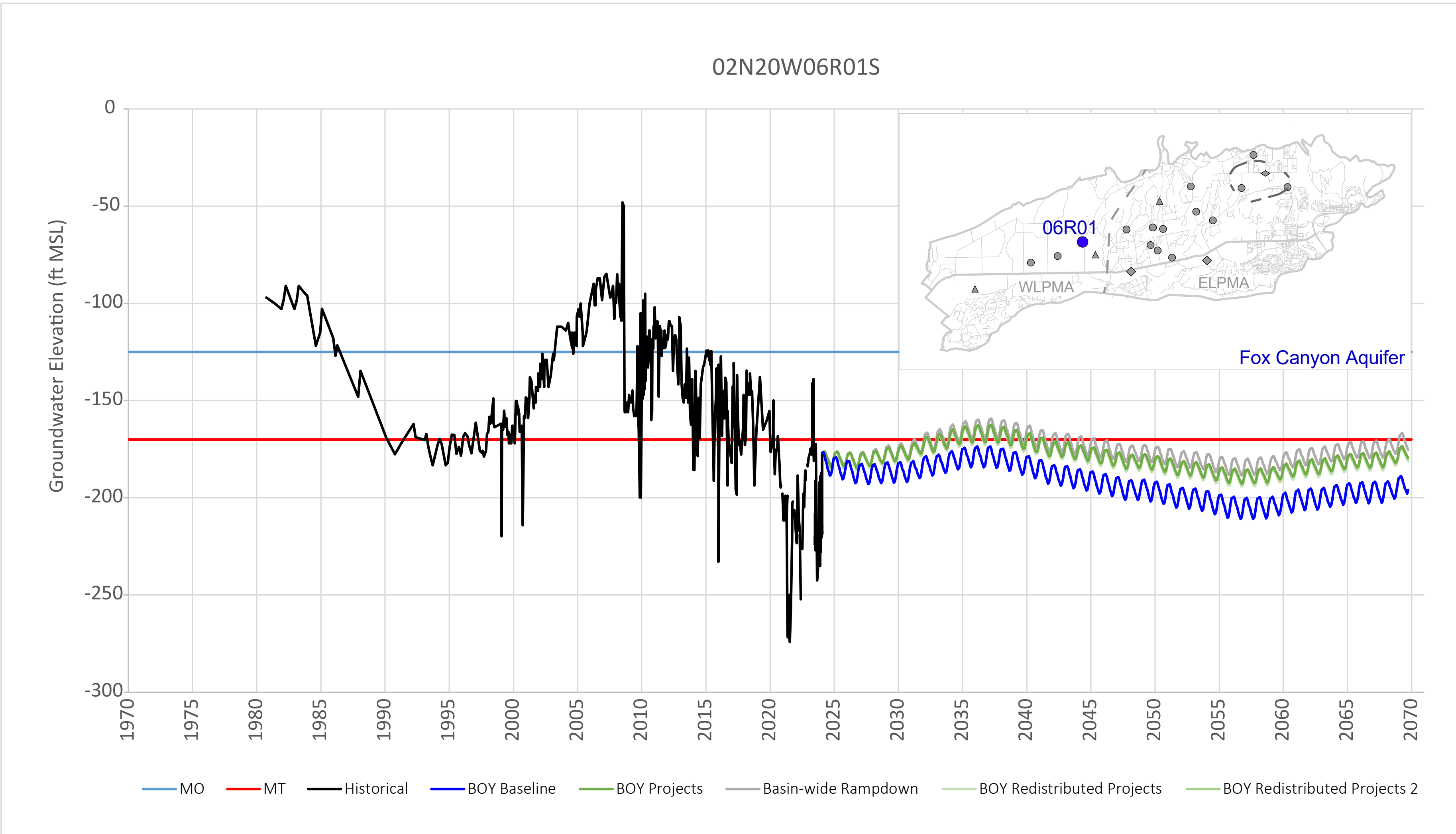
State Well Number	Management Area	BOY Baseline Scenario Groundwater Pumping (AFY)	Average Historical Groundwater Pumping (AFY)	Difference (AFY)
03N20W35D01	ELPMA	129.0	80.8	48.2
03N20W35H03	ELPMA	1197.8	573.4	624.4
03N20W36A02	ELPMA	331.5	156.7	174.8
03N20W36A03	ELPMA	71.4	31.2	40.1
03N20W36A04	ELPMA	82.3	99.1	-16.8
03N20W36G01	ELPMA	257.1	175.4	81.7
03N20W36G02	ELPMA	156.9	89.8	67.0
03N20W36L01	ELPMA	241.5	94.0	147.5
03N20W36P01	ELPMA	36.2	19.9	16.3
03N19W29K06	Epworth Gravels	253.2	170.3	82.9
03N19W29L01	Epworth Gravels	204.9	83.6	121.3
03N19W29M02	Epworth Gravels	239.1	21.6	217.6
03N19W29M03	Epworth Gravels	119.7	162.2	-42.5
03N19W30Q01	Epworth Gravels	207.3	158.3	48.9
02N20W06J01	WLPMA	75.6	120.7	-45.1
02N20W06R01	WLPMA	1258.7	725.6	533.1
02N20W06R03	WLPMA	1087.7	361.2	726.5
02N20W07L01	WLPMA	95.6	251.9	-156.3
02N20W07R03	WLPMA	508.4	335.8	172.6
02N20W08B01	WLPMA	647.1	518.1	128.9
02N20W08E01	WLPMA	410.8	386.5	24.3
02N20W08F01	WLPMA	1053.0	911.8	141.2
02N20W08M01	WLPMA	1050.6	747.0	303.5
02N20W17L01	WLPMA	545.5	318.5	227.0
02N21W01L01	WLPMA	655.8	406.2	249.6
02N21W04J01	WLPMA	239.6	153.2	86.3
02N21W04Q02	WLPMA	172.9	152.1	20.8
02N21W08G04	WLPMA	11.8	2.8	8.9
02N21W08H03	WLPMA	655.4	539.8	115.6
02N21W08L01	WLPMA	0.0	97.6	-97.6
02N21W08L02	WLPMA	0.0	84.3	-84.3
02N21W08L03	WLPMA	347.1	326.4	20.6
02N21W09D02	WLPMA	86.5	52.0	34.5
02N21W09N01	WLPMA	1176.7	866.9	309.7
02N21W10G03	WLPMA	84.3	62.3	22.0
02N21W10Q03	WLPMA	0.0	7.4	-7.4
02N21W10Q04	WLPMA	354.6	296.3	58.4
02N21W11A02	WLPMA	609.5	445.7	163.8
02N21W11A03	WLPMA	178.4	296.2	-117.7
02N21W11H02	WLPMA	23.5	35.1	-11.6
02N21W12G01	WLPMA	164.0	142.1	22.0

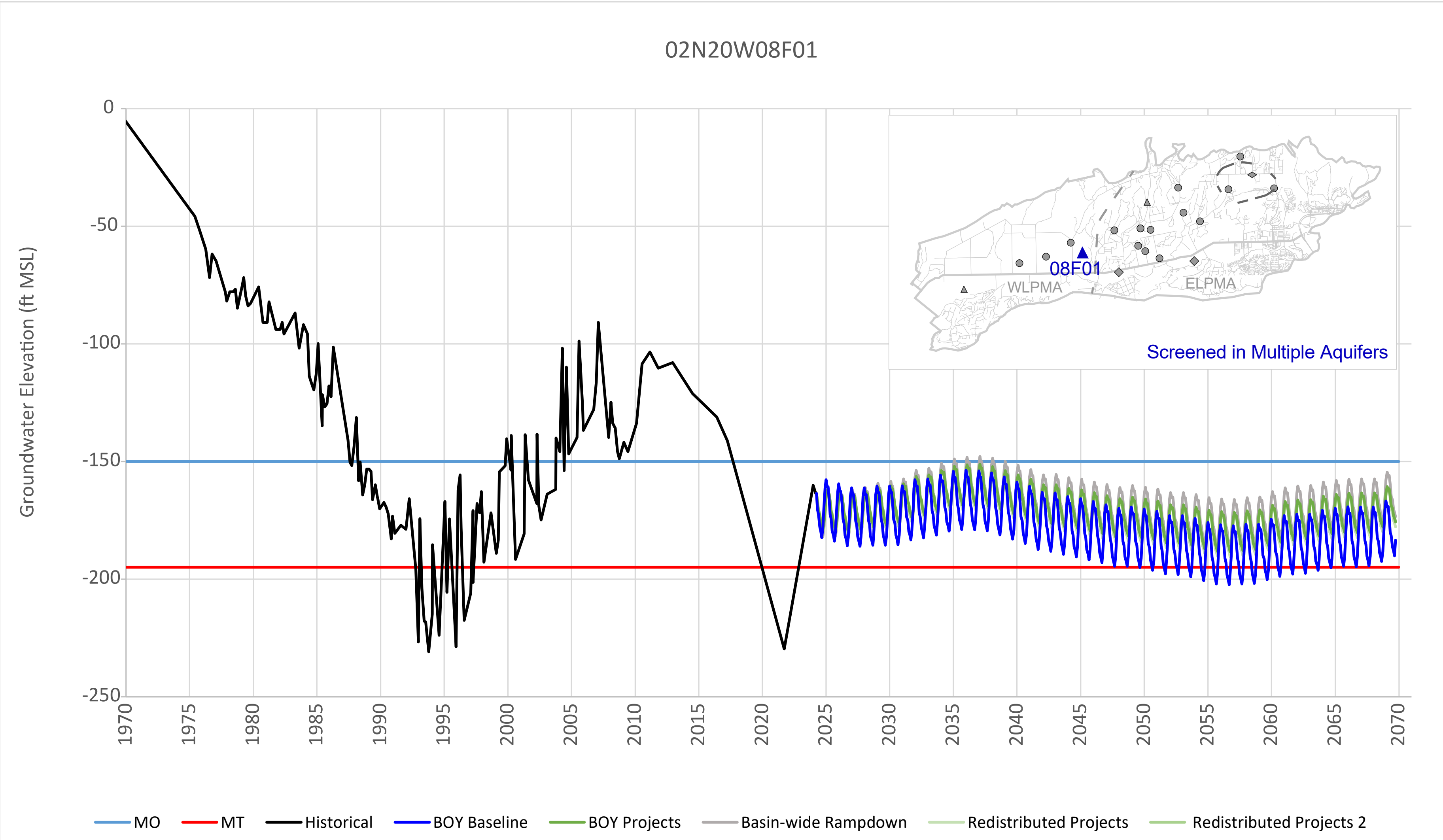
State Well Number	Management Area	BOY Baseline Scenario Groundwater Pumping (AFY)	Average Historical Groundwater Pumping (AFY)	Difference (AFY)
02N21W12H01	WLPMA	0.0	86.8	-86.8
02N21W12H02	WLPMA	211.1	195.0	16.1
02N21W13A01	WLPMA	332.4	234.9	97.5
02N21W15M04	WLPMA	479.4	420.3	59.2
02N21W16A01	WLPMA	1.0	0.5	0.4
02N21W16J03	WLPMA	344.0	280.0	64.0
02N21W16N03	WLPMA	307.9	197.1	110.7
02N21W17A01	WLPMA	13.2	21.1	-8.0
02N21W17D03	WLPMA	4.0	9.1	-5.2
02N21W17F05	WLPMA	222.9	194.0	28.9
02N21W17M03	WLPMA	285.2	218.1	67.1
02N21W17N03	WLPMA	205.6	150.9	54.7
02N21W17R02	WLPMA	1.7	23.8	-22.1
02N21W18A01	WLPMA	184.7	149.1	35.6
02N21W18H01	WLPMA	175.0	74.9	100.0
02N21W18H03	WLPMA	768.5	256.8	511.7
02N21W18H08	WLPMA	15.6	50.2	-34.6
02N21W18H10	WLPMA	17.2	7.6	9.6
02N21W18H11	WLPMA	79.9	15.9	64.0
02N21W18H12	WLPMA	177.9	368.6	-190.7
02N21W18H14	WLPMA	47.2	398.7	-351.5
02N21W20A02	WLPMA	202.5	152.2	50.3
02N21W21D04	WLPMA	16.6	102.4	-85.8
02N21W21E01	WLPMA	312.6	164.9	147.7
02N21W22G01	WLPMA	193.8	218.9	-25.1
02N21W28A02	WLPMA	492.6	438.5	54.1
02N21W28C01	WLPMA	192.7	192.0	0.7
03N20W28J05	WLPMA	1.0	1.2	-0.2
03N20W28P01	WLPMA	0.0	1.1	-1.1
03N20W28P02	WLPMA	1.0	1.0	0.0
03N20W28P03	WLPMA	26.2	5.5	20.6
03N20W28P04	WLPMA	24.5	26.3	-1.8
03N20W28Q01	WLPMA	10.6	17.0	-6.3
03N20W32H03	WLPMA	201.3	98.3	103.0
03N20W32K01	WLPMA	3.6	76.5	-72.9
03N20W33B04	WLPMA	16.3	40.6	-24.3
03N21W34R01	WLPMA	188.5	66.3	122.2
03N21W35L03	WLPMA	109.5	56.6	52.9
03N21W35P02	WLPMA	229.2	109.4	119.8
03N21W35R02	WLPMA	185.2	153.1	32.1
03N21W36Q01	WLPMA	239.2	148.6	90.6

State Well Number	Management Area	BOY Baseline Scenario Groundwater Pumping (AFY)	Average Historical Groundwater Pumping (AFY)	Difference (AFY)
03N21W36Q02	WLPMA	0.2	27.0	-26.8
03N21W36R03	WLPMA	402.7	306.6	96.1

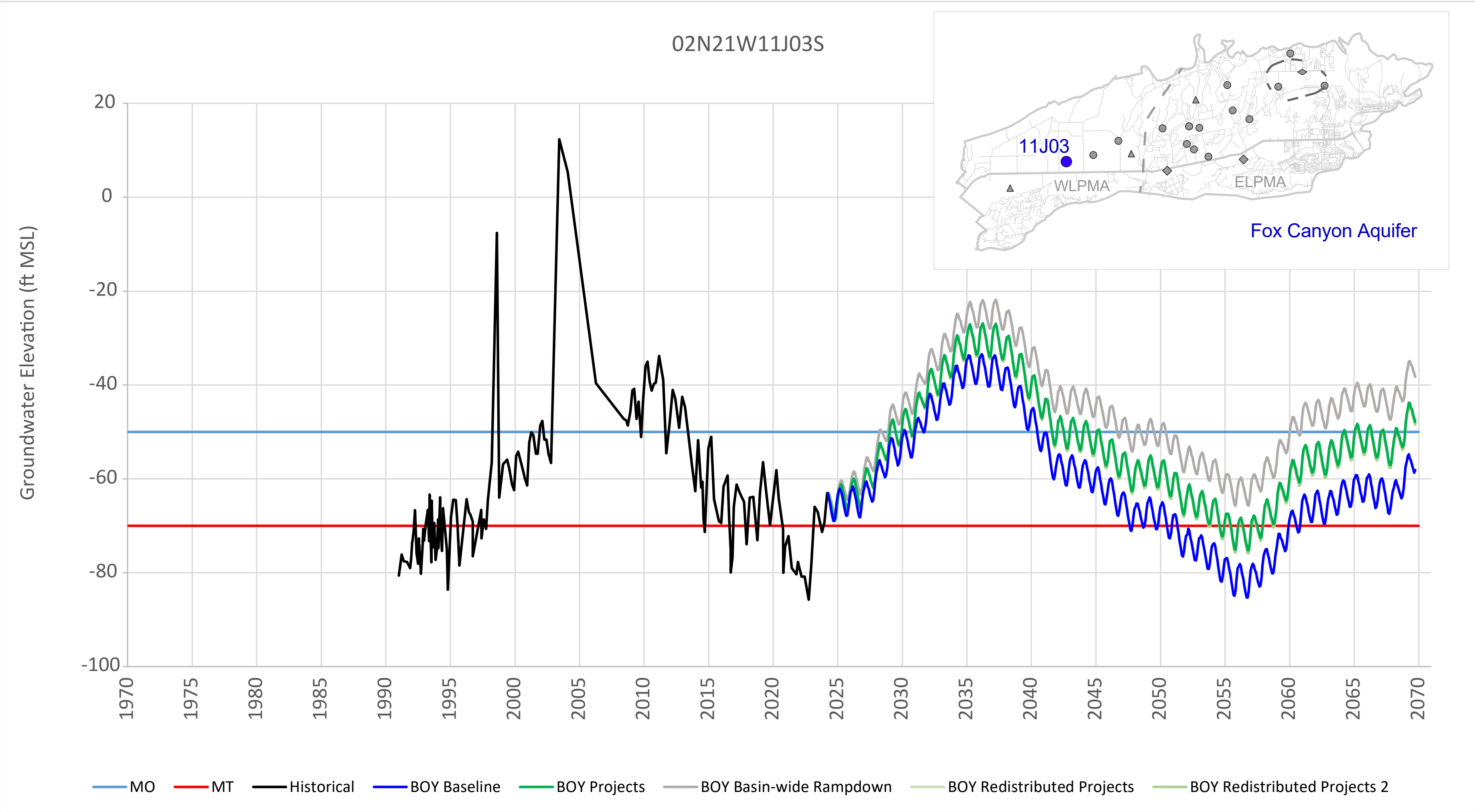
Appendix B

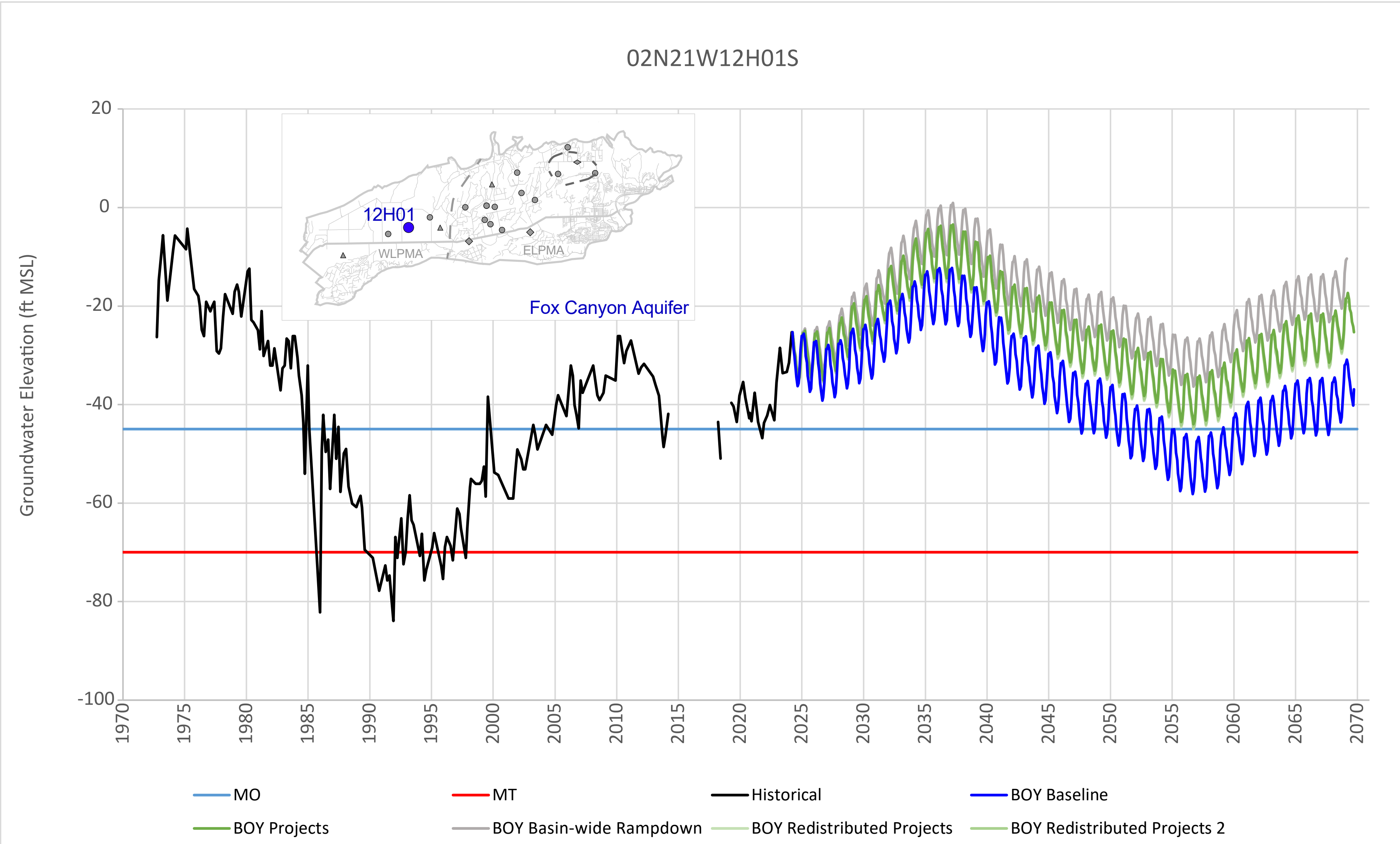
Groundwater Elevation Hydrographs


02N20W06R01S
Groundwater Elevation (ft MSL)
0
-50
-100
-150
-200
-250
-300
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
06R01
WLPMA
ELPMA
Fox Canyon Aquifer
MO
MT
Historical
BOY Baseline
BOY Projects
Basin-wide Rampdown
BOY Redistributed Projects
BOY Redistributed Projects 2

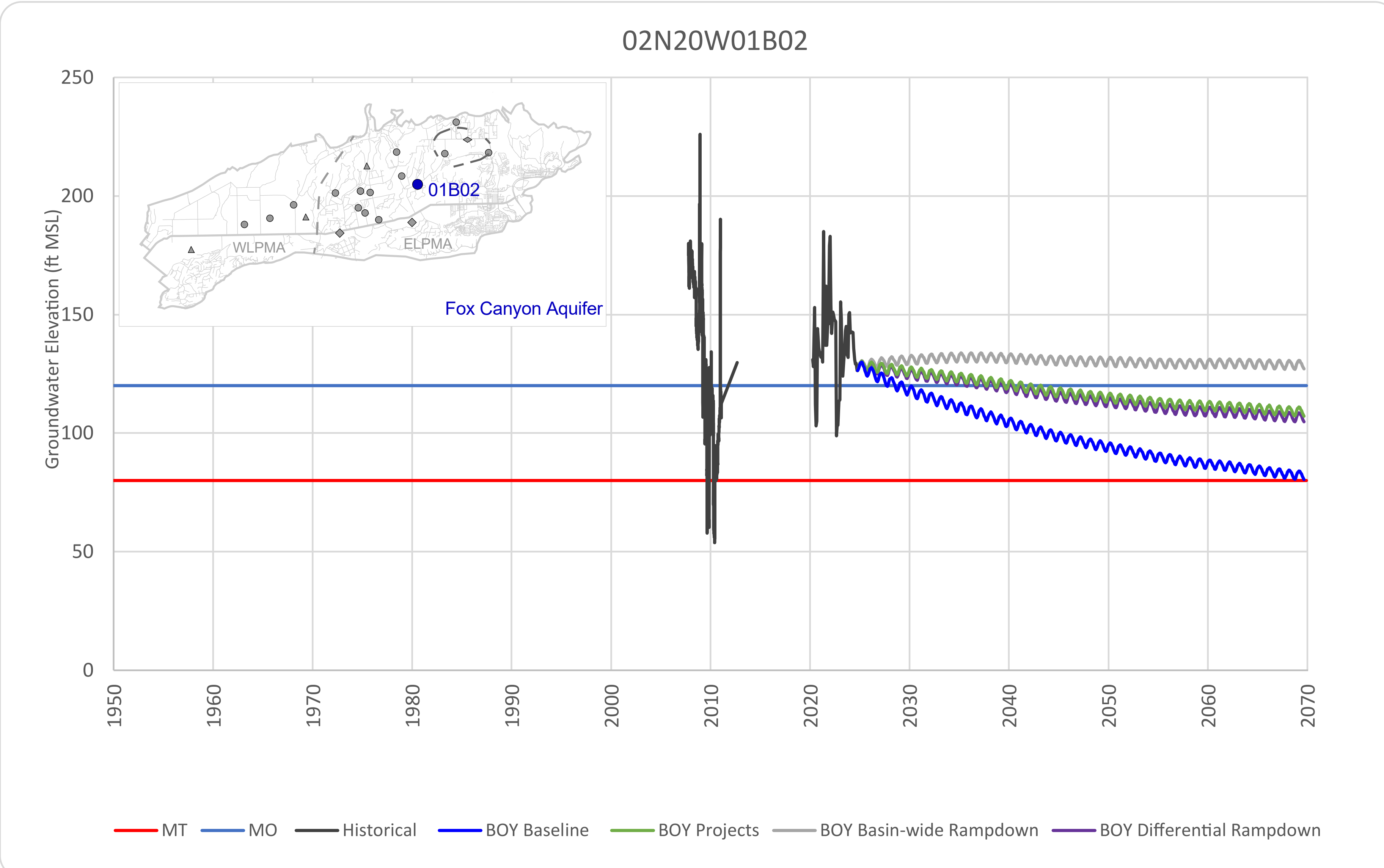


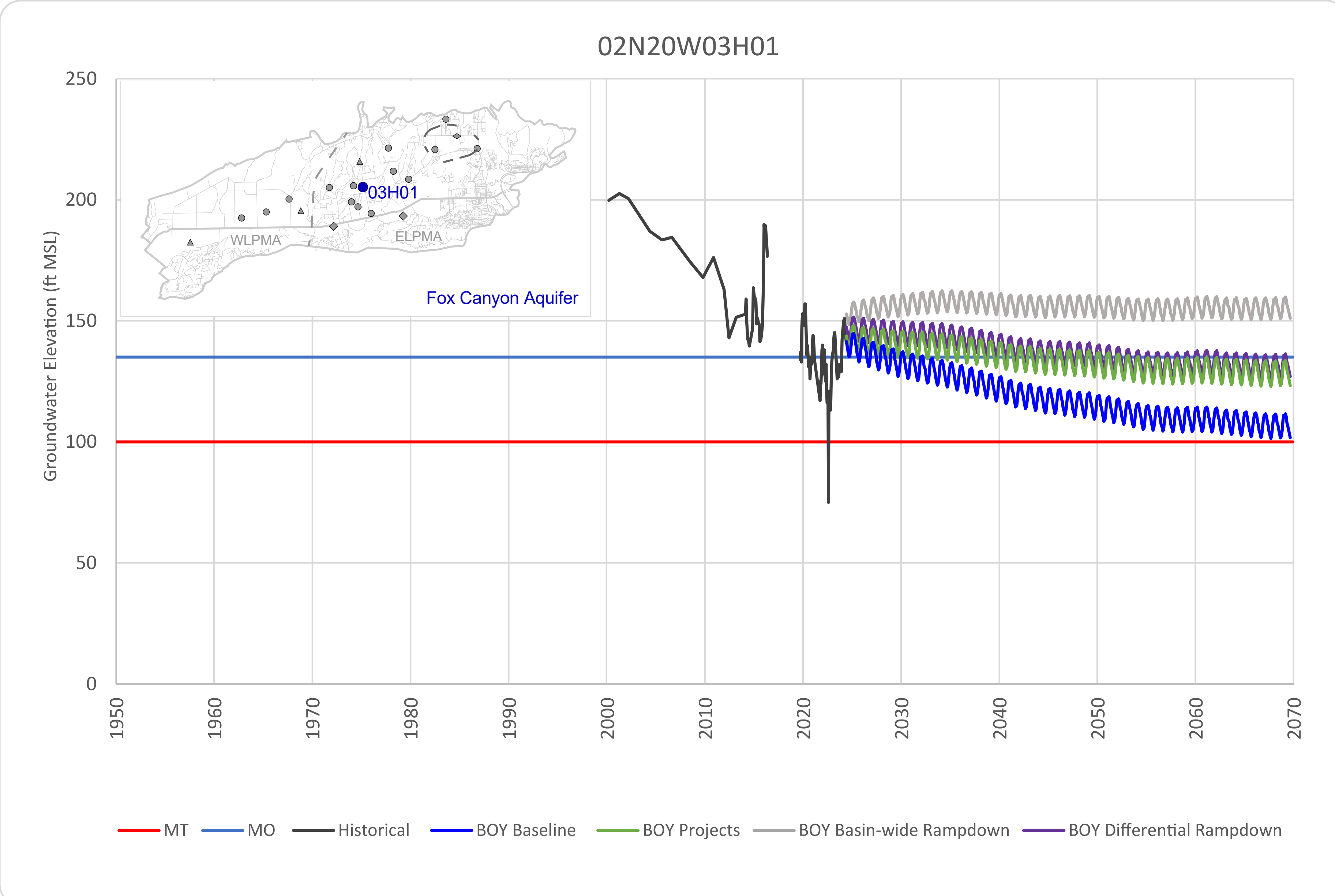
02N20W08F01
Groundwater Elevation (ft MSL)
0
-50
-100
-150
-200
-250
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
08F01
WLPMA
ELPMA
Screened in Multiple Aquifers
MO
MT
Historical
BOY Baseline
BOY Projects
Basin-wide Rampdown
Redistributed Projects
Redistributed Projects 2


02N21W11J03S
Groundwater Elevation (ft MSL)
20
0
-20
-40
-60
-80
-100
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
11J03
WLPMA
ELPMA
Fox Canyon Aquifer
MO
MT
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Redistributed Projects
BOY Redistributed Projects 2

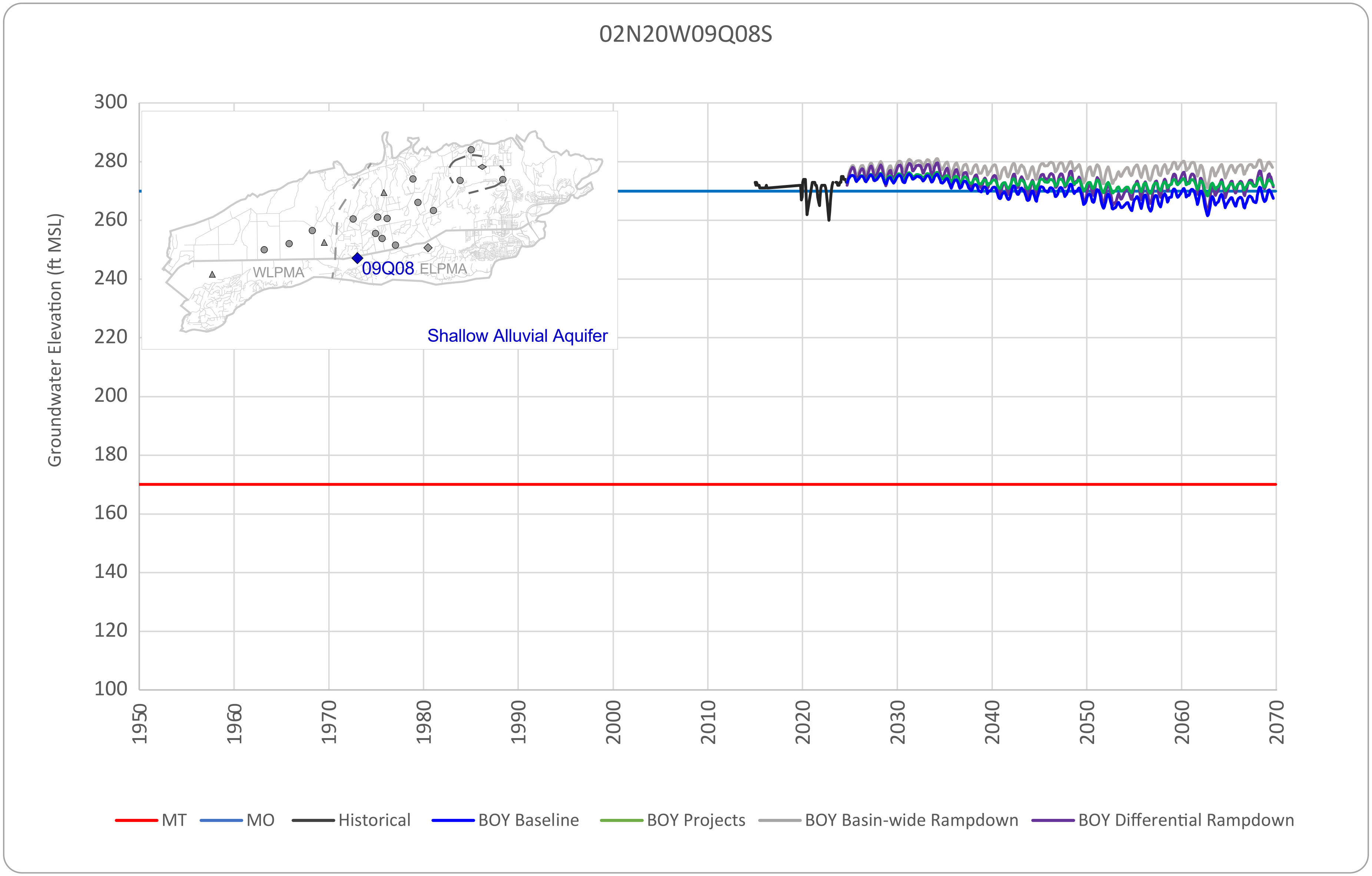


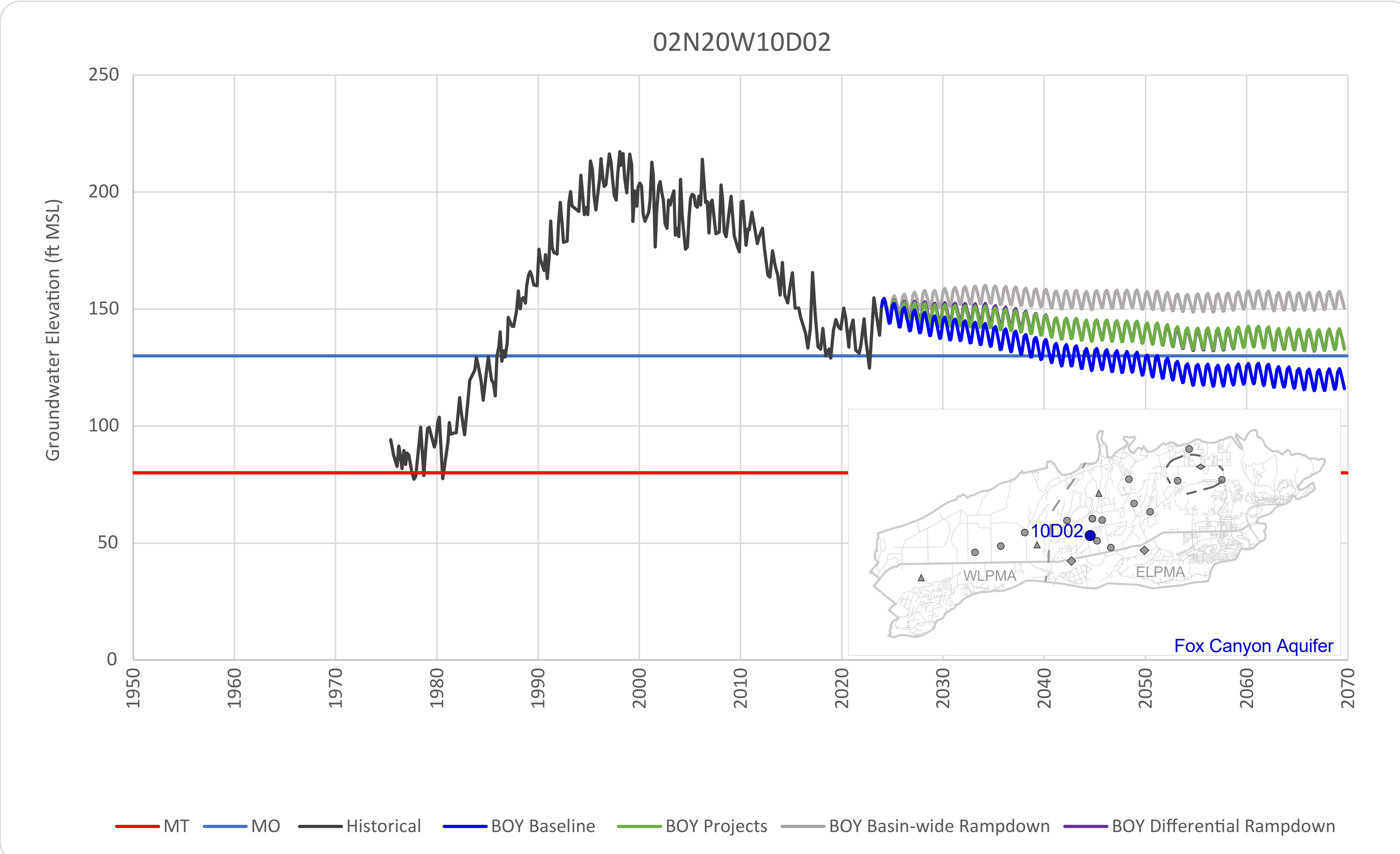
02N21W12H01S
Groundwater Elevation (ft MSL)
20
0
-20
-40
-60
-80
-100
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
12H01
WLPMA
ELPMA
Fox Canyon Aquifer
MO
MT
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Redistributed Projects
BOY Redistributed Projects 2

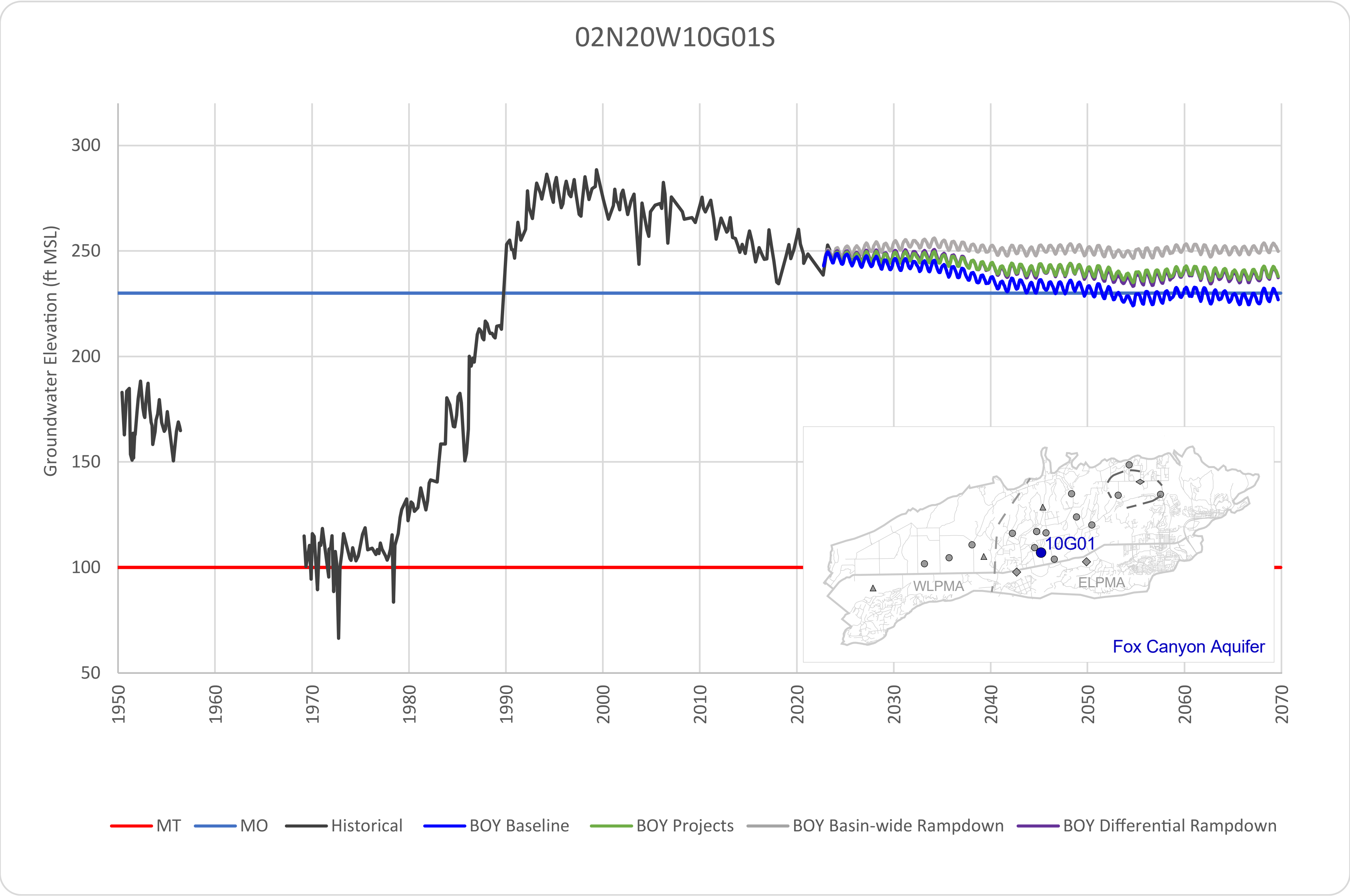

02N20W01B02
Groundwater Elevation (ft MSL)
250
200
150
100
50
0
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
01B02
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

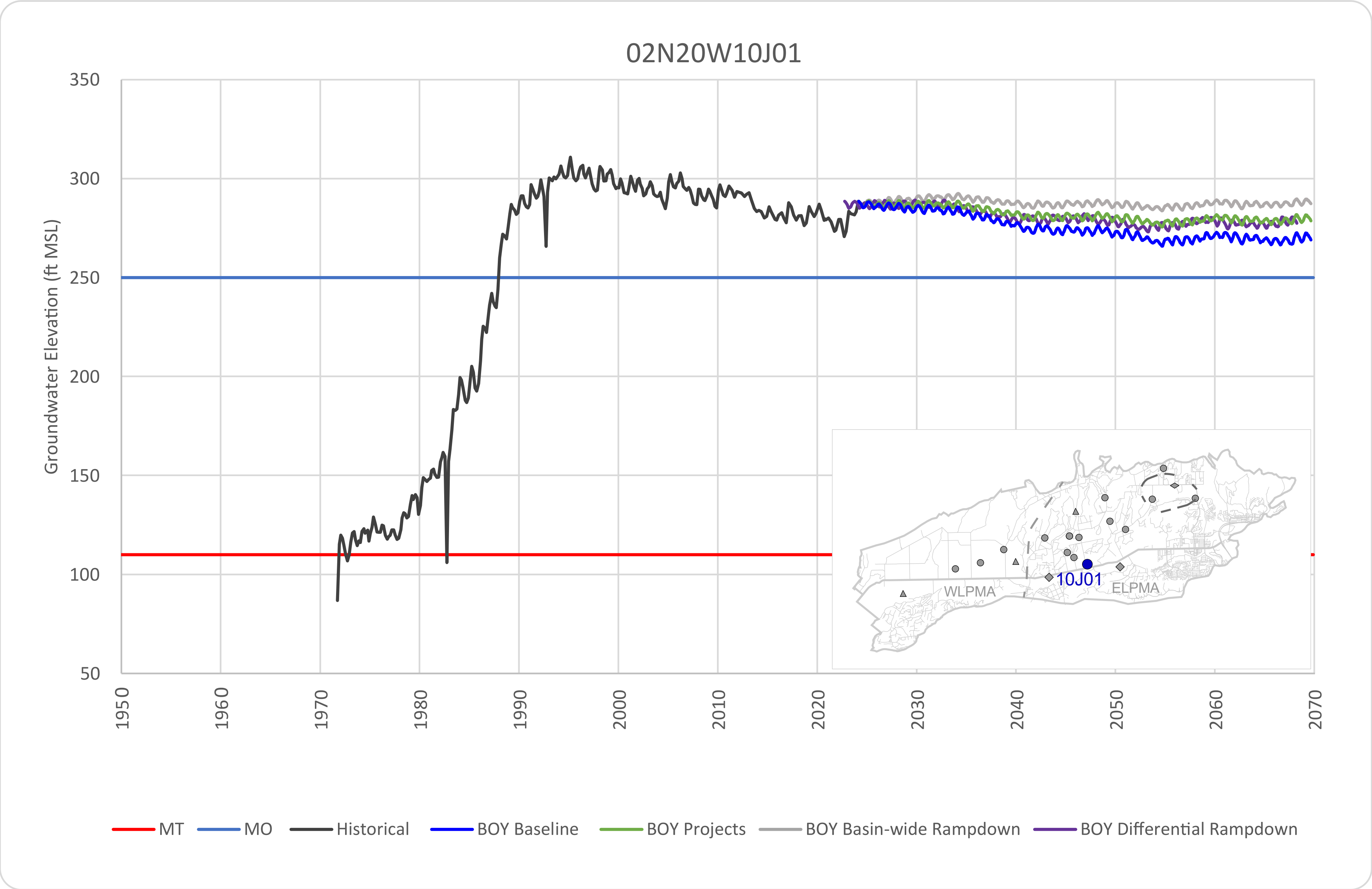


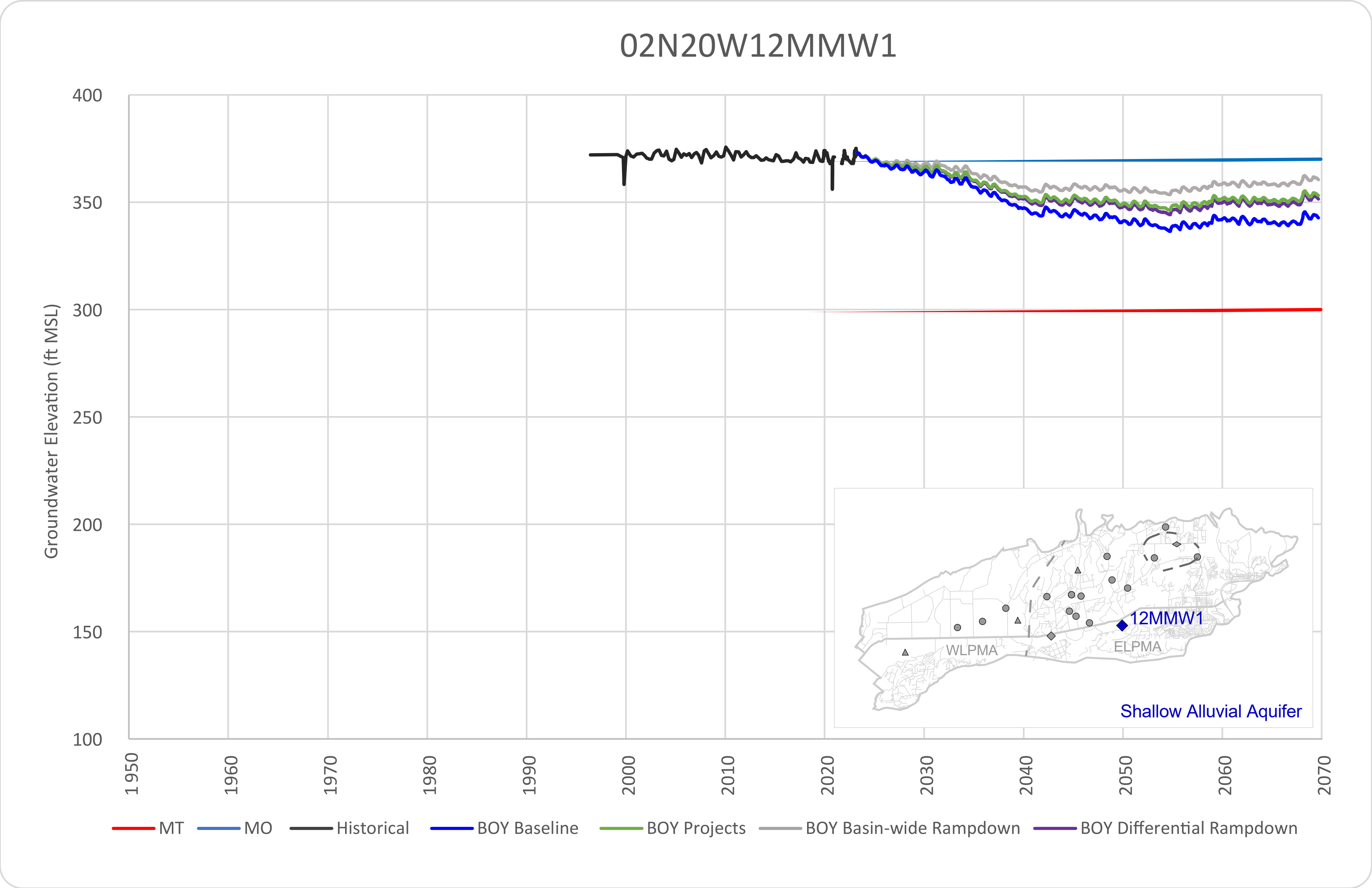
02N20W03H01
Groundwater Elevation (ft MSL)
250
200
150
100
50
0
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
03H01
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

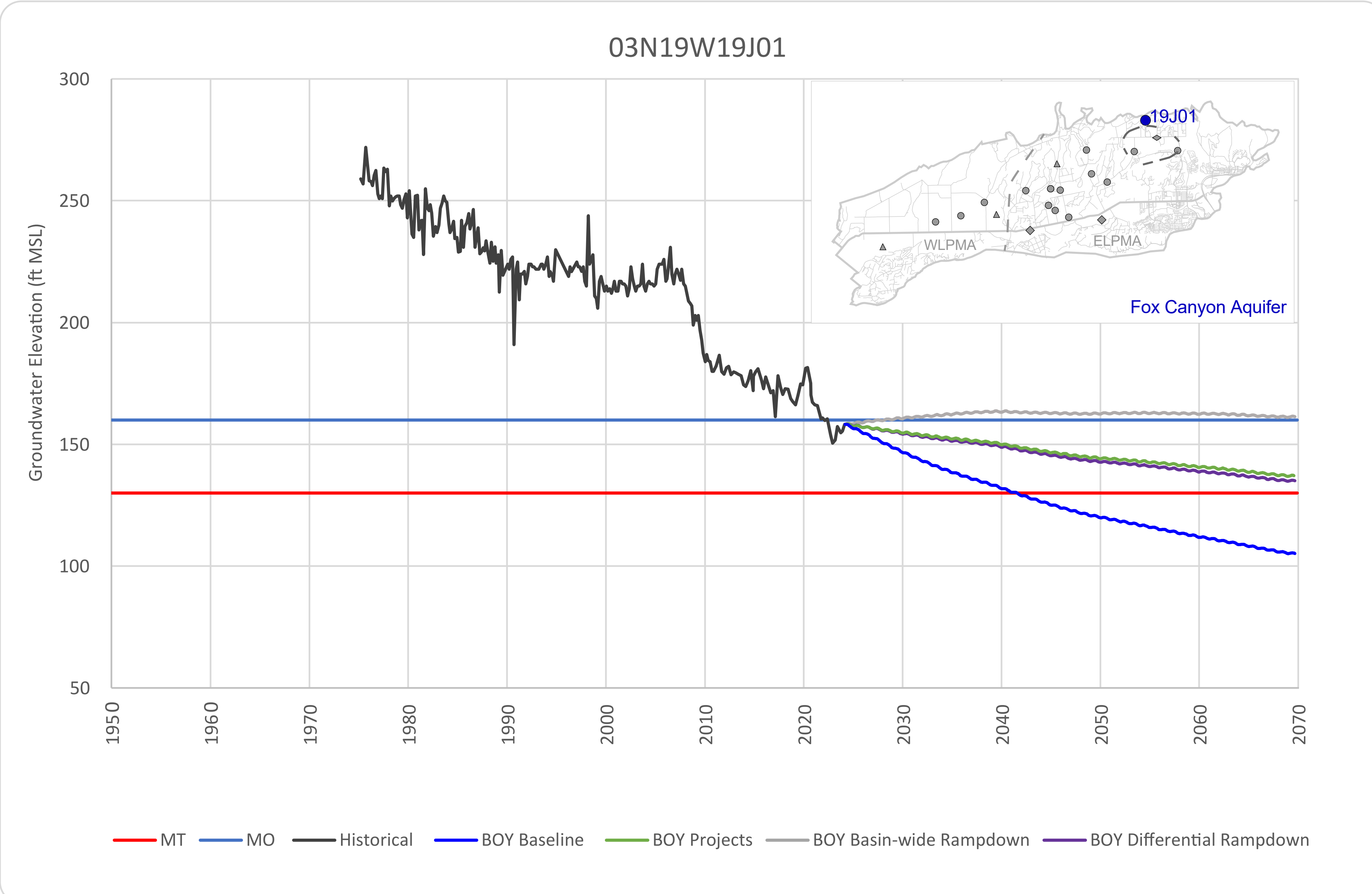

02N20W09Q08S
Groundwater Elevation (ft MSL)
300
280
260
240
220
200
180
160
140
120
100
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
WLPMA
09Q08
ELPMA
Shallow Alluvial Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

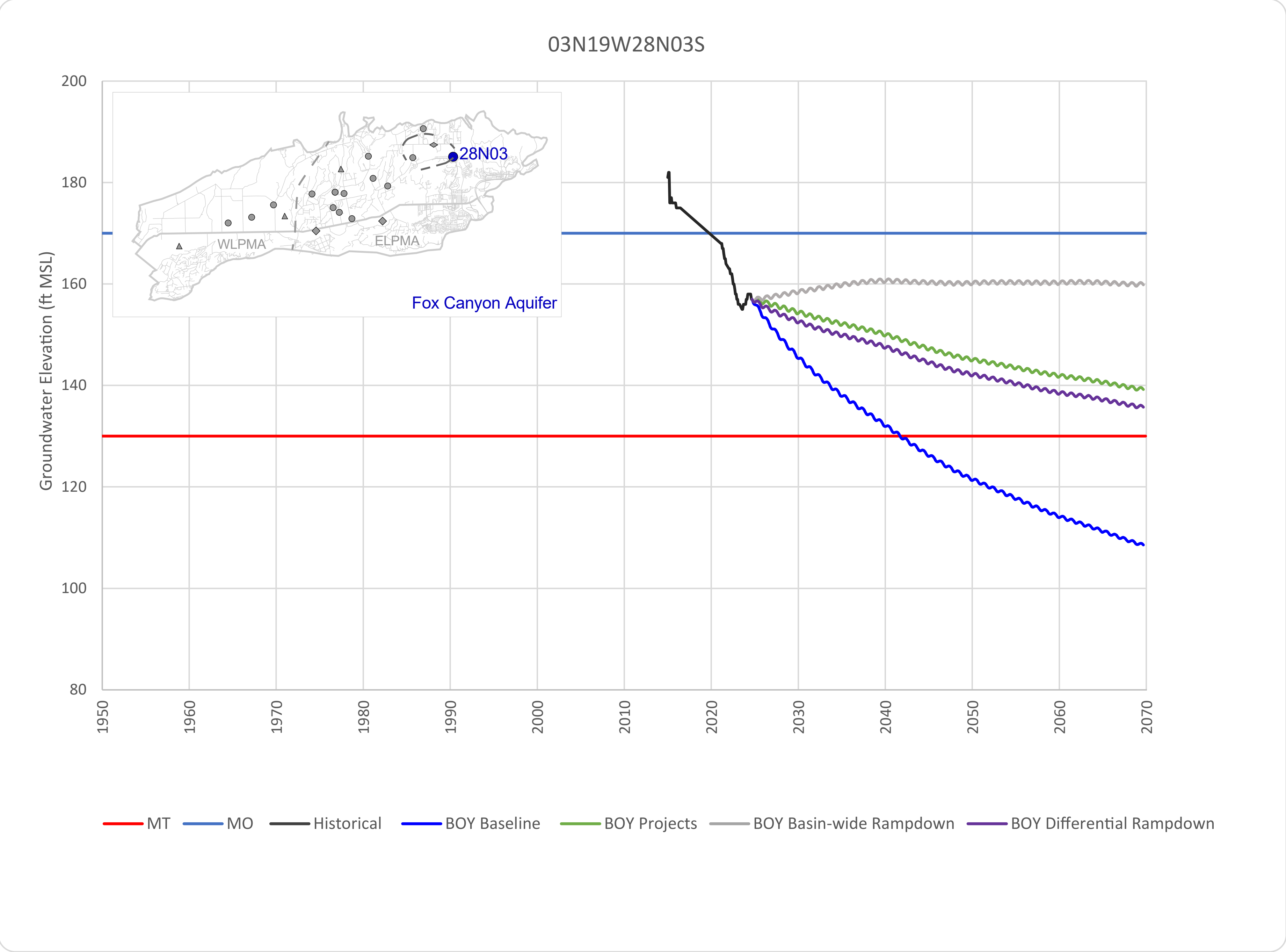

02N20W10D02
Groundwater Elevation (ft MSL)
250
200
150
100
50
0
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
10D02
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

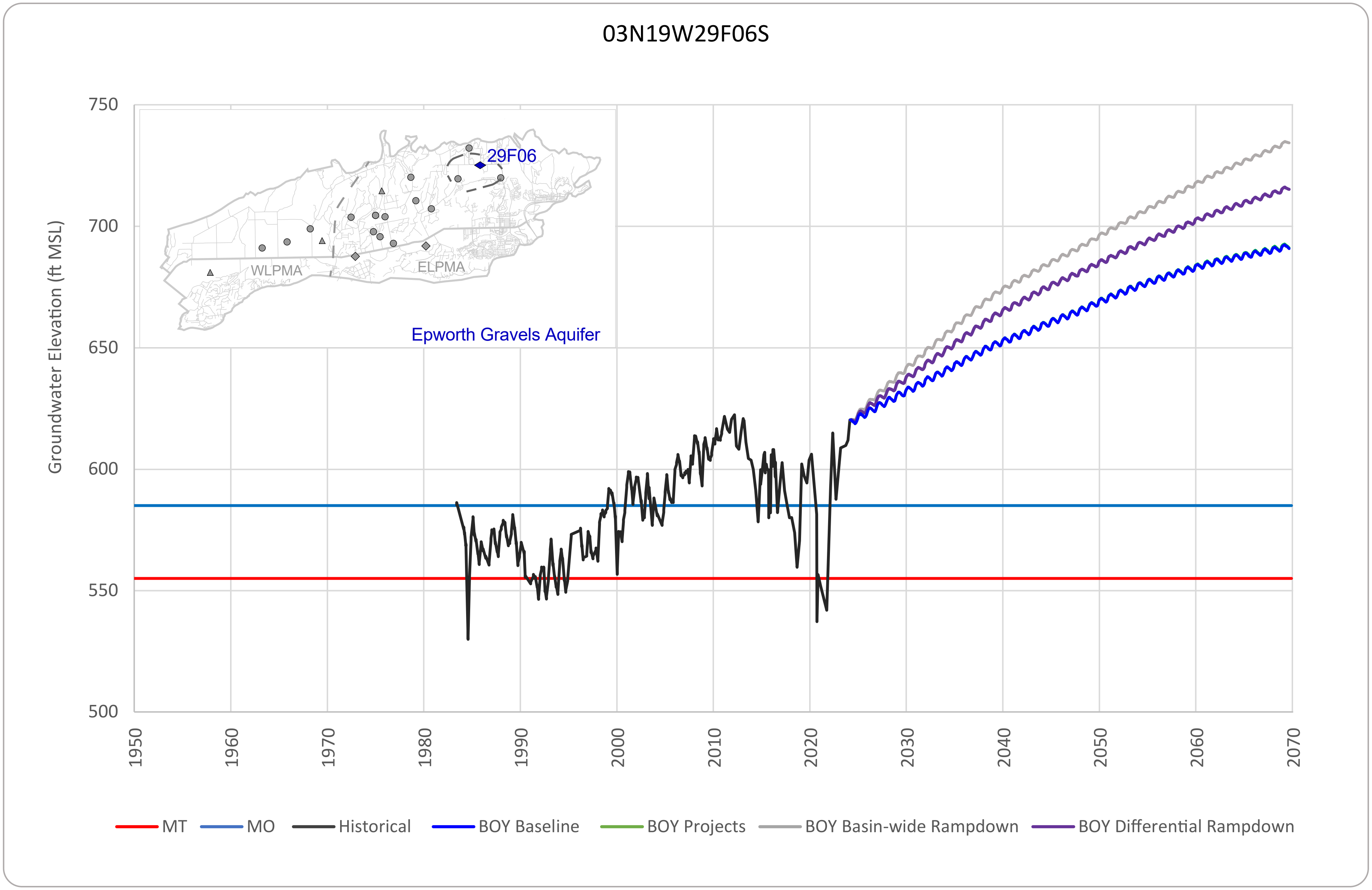

02N20W10G01S
Groundwater Elevation (ft MSL)
300
250
200
150
100
50
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
10G01
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

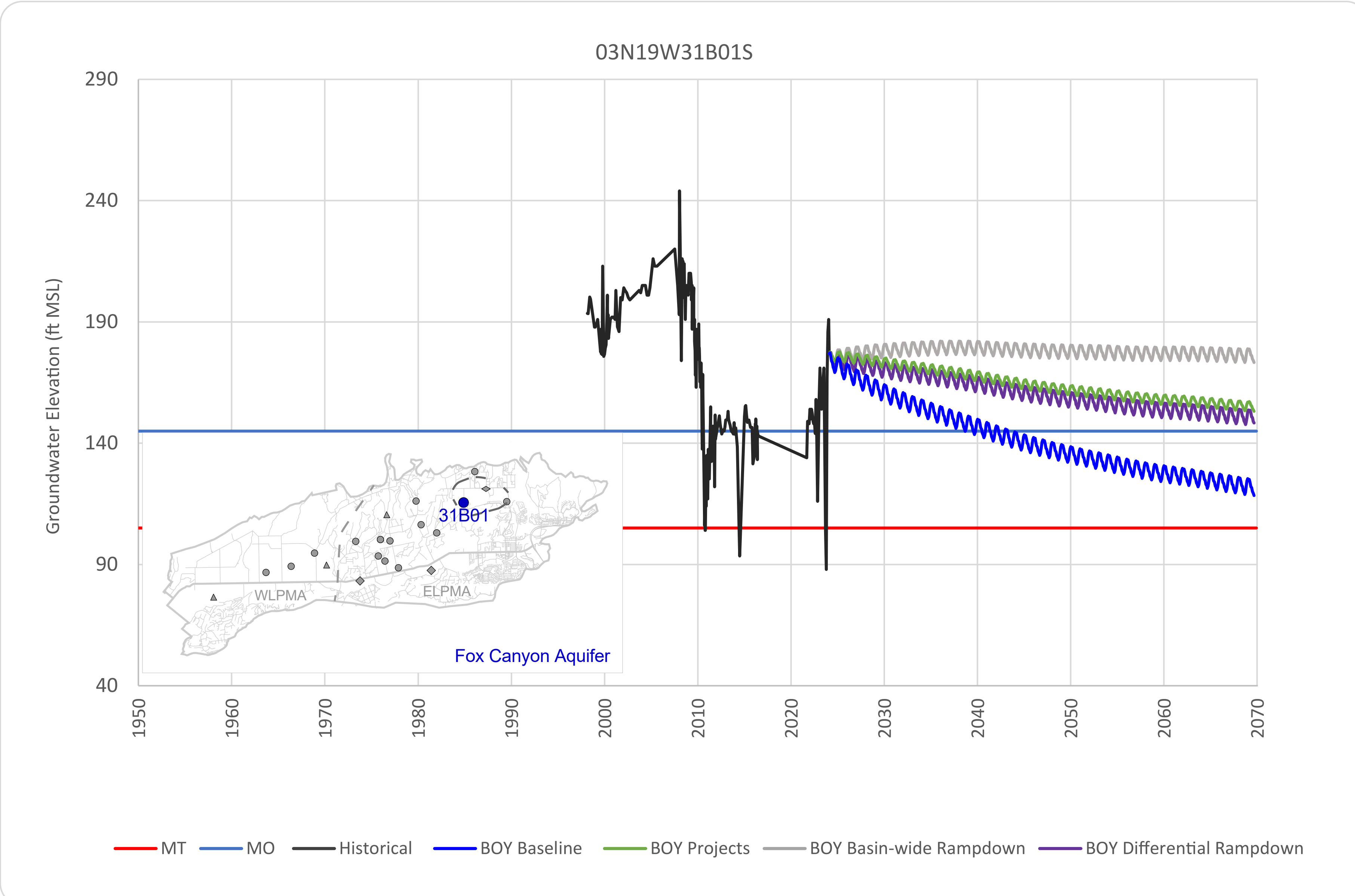

02N20W10J01
Groundwater Elevation (ft MSL)
350
300
250
200
150
100
50
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
10J01
WLPMA
ELPMA
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

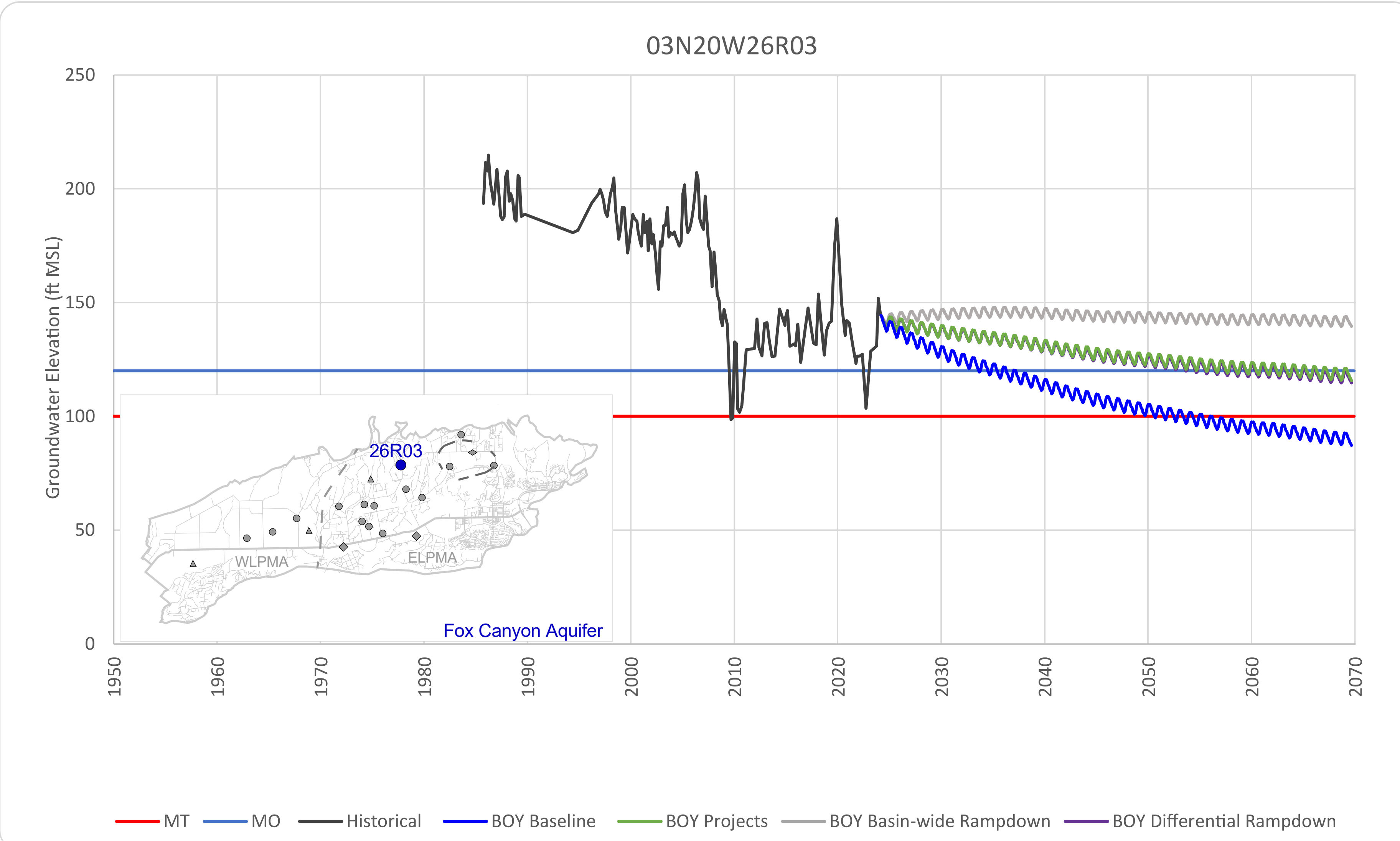

02N20W12MMW1
Groundwater Elevation (ft MSL)
400
350
300
250
200
150
100
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
12MMW1
WLPMA
ELPMA
Shallow Alluvial Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

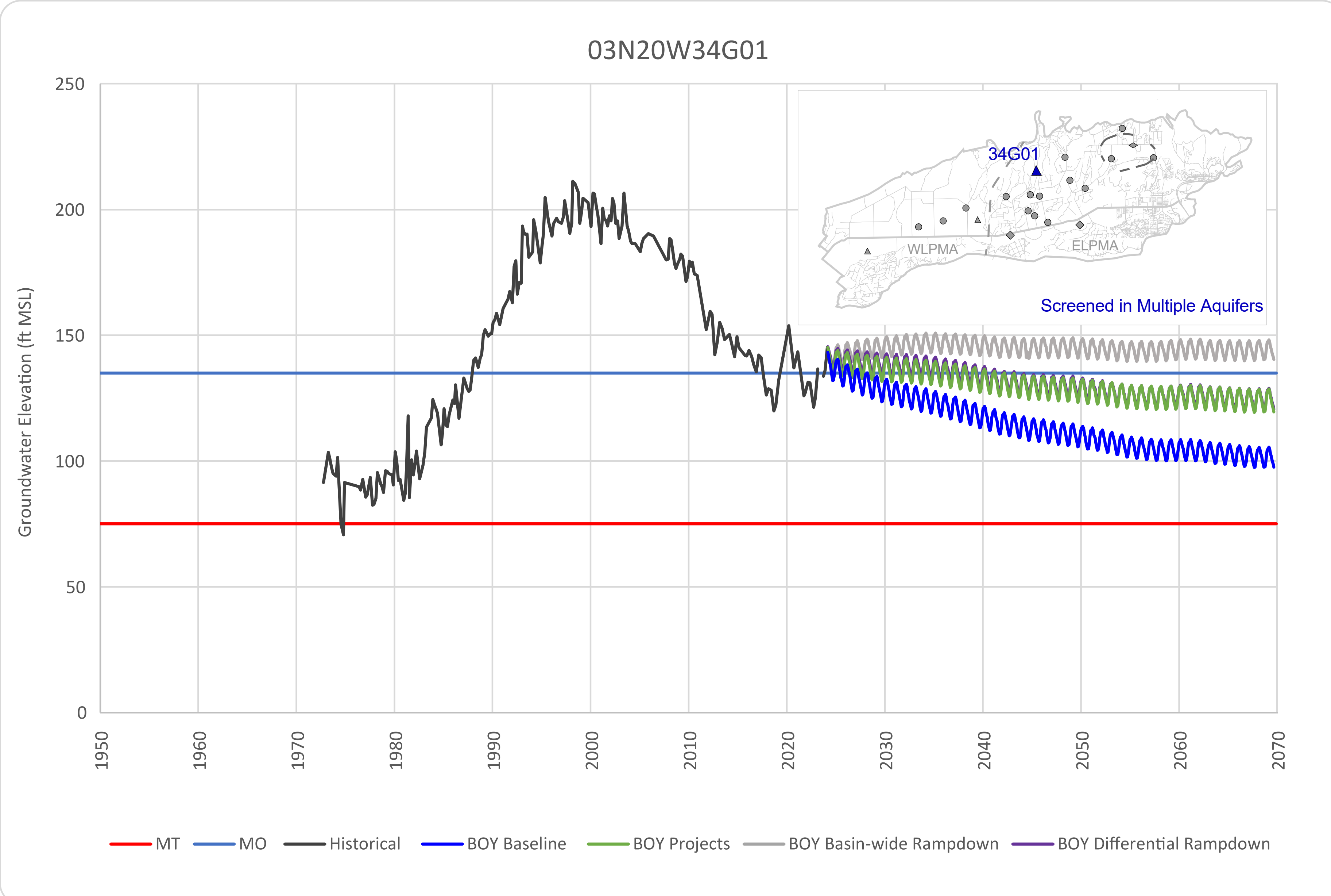

03N19W19J01
Groundwater Elevation (ft MSL)
300
250
200
150
100
50
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
19J01
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

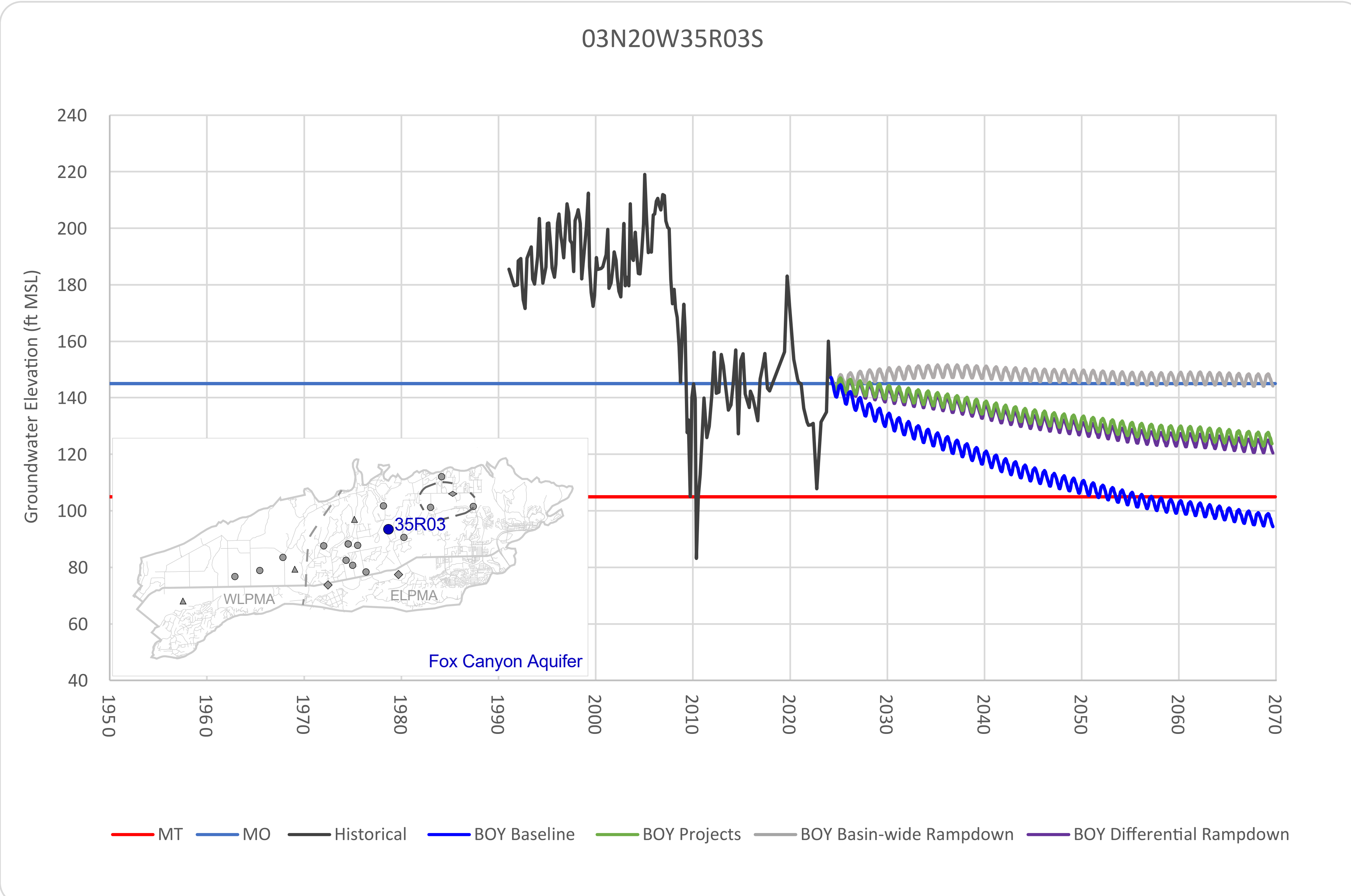

03N19W28N03S
Groundwater Elevation (ft MSL)
200
180
160
140
120
100
80
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
28N03
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown

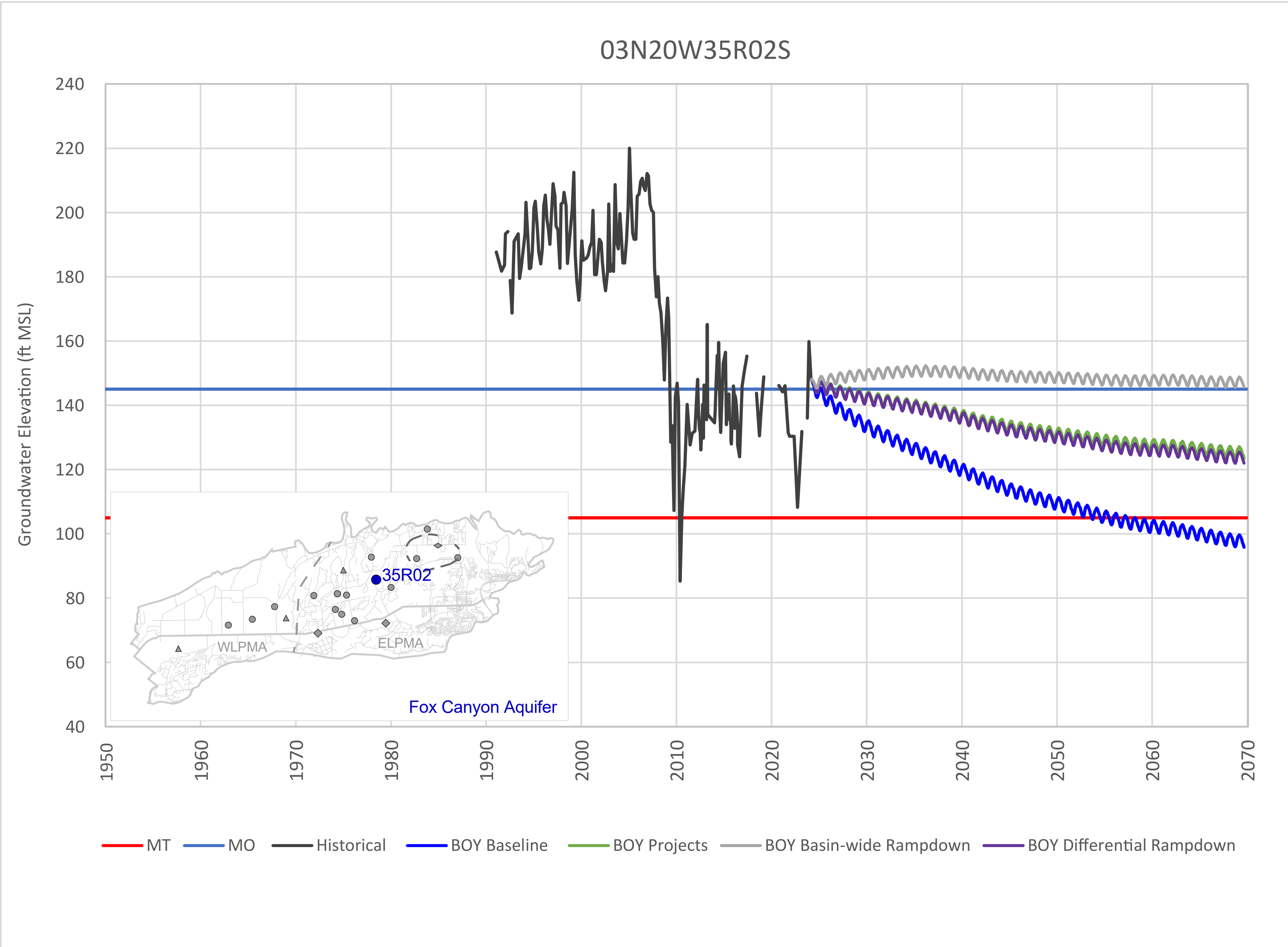

03N19W29F06S
Groundwater Elevation (ft MSL)
750
700
650
600
550
500
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
29F06
WLPMA
ELPMA
Epworth Gravels Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown


03N19W31B01S
Groundwater Elevation (ft MSL)
290
240
190
140
90
40
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
31B01
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown


03N20W26R03
Groundwater Elevation (ft MSL)
250
200
150
100
50
0
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
26R03
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown


03N20W34G01
250
200
150
100
50
0
Groundwater Elevation (ft MSL)
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
34G01
WLPMA
ELPMA
Screened in Multiple Aquifers
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown


03N20W35R03S
Groundwater Elevation (ft MSL)
240
220
200
180
160
140
120
100
80
60
40
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
35R03
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown



03N20W35R02S
Groundwater Elevation (ft MSL)
240
220
200
180
160
140
120
100
80
60
40
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
35R02
WLPMA
ELPMA
Fox Canyon Aquifer
MT
MO
Historical
BOY Baseline
BOY Projects
BOY Basin-wide Rampdown
BOY Differential Rampdown