

Las Posas Valley Groundwater Basin Technical Advisory Committee Regular Meeting

Tuesday April 7, 2026, 2:00 PM

Via Zoom:

<https://us02web.zoom.us/j/84168071218?pwd=Kv42H0XegH4TthbvJUgzTrzACgXM8b.1>

Webinar ID: 841 6807 1218

Passcode: 150451

NOTICE OF MEETING

NOTICE IS HEREBY GIVEN that the Las Posas Basin Technical Advisory Committee (TAC) will hold a regular meeting via Zoom at **2:00 PM on Tuesday April 7, 2026**.

AGENDA

- A. Call to Order**
- B. Roll Call**
- C. Agenda Review**
- D. Public Comments**
- E. TAC Member Comments**
- F. Regular Agenda**

1. Approve Minutes from Previous Meeting

The TAC will review and consider adoption of minutes from the previous meeting held on February 3, 2026; draft minutes for which are attached beginning on agenda page 3.

2. Committee Consultation Request: East Las Posas Management Area Groundwater Model Update

The Las Posas Valley adjudication Judgment requires the Las Posas Valley Basin Watermaster to convene a collaborative and technically focused Study Group to develop an operations plan for the Calleguas Municipal Water District (CMWD) Aquifer Storage and Recovery (ASR) Project Operations Plan. The Judgment also requires that the TAC be consulted on the work of the Study Group prior to finalization of the ASR Project Operations Plan and subsequent Court adoption.

CMWD and their consultant Intera, Inc. (Intera) developed a numerical flow model to support management of the East Las Posas Management Area (ELPMA) and refine operational plans for the Las Posas Basin ASR Project in 2018. The historical period represented in this model was recently extended and validated through 2023, documented in a memorandum dated February 12, 2026. The Watermaster requested the TAC review the model documentation memorandum and provide a recommendations by April 24, 2026, including specific consideration of:

- 1. ASR operations and its use as the preferred modeling tool for development of the Calleguas ASR Project Operations Plan.
- 2. General basin wide use for the ELPMA replacing the existing model in use.

The TAC will discuss the updated model and associated documentation report, focused on the items above. The Watermaster committee consultation request and ELPMA groundwater model documentation Technical Memorandum prepared by Intera are attached starting on agenda page 9. The Watermaster has requested the TAC provide feedback and recommendations by April 24, 2026.

3. Watermaster Response to TAC Recommendation Report – Draft Las Posas Valley Basin Groundwater Sustainability Plan Water Year 2025 Annual Report, dated March 15, 2025

The Watermaster prepared a response to the TAC Recommendation Report regarding the draft Water Year 2025 Groundwater Sustainability Plan Annual Report. The response is dated March 15, 2026 and was presented to the Watermaster Board on March 25, 2026 (agenda page 226). The TAC will discuss the Watermaster response report.

4. Update on Upcoming Committee Consultation Review Requests

The TAC will receive an update on the schedule for upcoming committee consultations from the Watermaster representative. Known current and upcoming consultation are summarized in the table below:

Consultation Description	Expected Request Date	Expected Review Due Date
ELPMA Groundwater Model Update	3/25/2026	4/24/2026
Monitoring Network Review and Evaluation	TBD	TBD
Calleguas ASR Project Operations Plan	TBD	TBD

5. Schedule for Completing Current Committee Consultations and Recommendation Reports

The TAC will discuss the schedule for completing current consultation requests from the Watermaster.

G. Items for Future Agenda

Potential items for future agenda will be considered by the TAC

H. Adjourn

Attachment 1

Minutes of February 3, 2026 TAC Regular Meeting

Las Posas Valley Groundwater Basin Technical Advisory Committee Regular Meeting

Meeting Minutes
for
February 3, 2026

A. Call to Order

Chair Taylor welcomed attendees to the regular meeting of the Las Posas Valley Technical Advisory Committee (TAC) and called the meeting to order at 2:01 pm.

B. Roll Call

All voting TAC members were present (via Zoom):

- Dr. Bob Abrams – Present
- Vice Chair Tony Morgan – Present
- Chair Chad Taylor – Present

All non-voting TAC members were present (via Zoom):

- Kim Loeb – Present
- Bryan Bondy – Present

Mr. Taylor reported a quorum of the TAC was present with all three voting members and both non-voting members present.

C. Agenda Review

Chair Taylor reminded the TAC and attendees that an agenda for the meeting was published on the Watermaster website and that notification of the meeting was provided by the Watermaster. He asked the TAC members and public attendees for comments on items on the agenda. No comments were provided.

D. Public Comments

Chair Taylor offered an opportunity for members of the public to raise items not on the agenda, no comments were provided.

E. TAC Member Comments

Mr. Taylor asked if TAC members had comments on items not on the agenda; none were raised.

F. Regular Agenda

1. Approve Minutes from Previous Meeting

Chair Taylor asked the TAC to discuss the draft minutes from the January 20, 2026 regular TAC meeting, which were included in the agenda packet.

Dr. Abrams, Mr. Bondy, and Mr. Loeb all contributed edits to the draft minutes to refine specific language. Mr. Taylor made changes to the text while in response to these edits.

Chair Taylor offered an opportunity for public attendees to provide comments on the draft minutes; none were raised.

Chair Taylor asked whether the TAC was comfortable accepting the minutes as edited, and no objections were raised.

MOTION: Mr. Morgan moved to accept the revised minutes of the January 20, 2026 meeting

SECOND: Dr. Abrams seconded the motion

VOTE: Unanimously approved

2. Draft Recommendation Report Review: Draft Basin Optimization Yield Study Report

Chair Taylor turned to discussion of the draft Recommendation Report regarding the draft Basin Optimization Yield Study (BOY Study). The draft Recommendation Report was prepared following TAC discussion of the draft BOY Study in the January 6 and January 20, 2026 TAC meetings and the written comments provided by TAC members. He noted that all written comments from TAC members were included with the draft Recommendation Report. He asked the TAC for comments, corrections, and other changes to the draft Recommendation Report.

Dr. Abrams provided editorial comments correcting typos and other inconsistencies in the draft. Mr. Taylor made these changes in the document as edits were provided.

Mr. Bondy commented that in the introduction of the Recommendation Report the purposes of the BOY Study included identifying the need for rampdown. He questioned whether that was a purpose of the BOY Study. This text was edited for clarification of how rampdown is addressed in the BOY Study.

Mr. Bondy commented on how the Optimization Yield and Operational Yield were presented in the BOY Study. He specifically pointed out that the operational yield identified only the groundwater use and not the in-lieu use. The TAC discussed the relationship between Operational Yield and annual pumping allocations. Mr. Loeb provided that the Recommendation Report and prior TAC discussion identified the need for clarification of the relationship between Optimization Yield, Operational Yield, and pumping allocation. Mr. Taylor offered additional text for inclusion in the Recommendation Report to highlight the need for modifications of the BOY Study relating to these concepts. The TAC collaborated on developing these changes to the Recommendation Report.

Mr. Bondy raised a question regarding the inclusion of no-project scenarios in the BOY Study and suggested that text be added to the Recommendation Report requesting explanation to differentiate pumping reductions in the BOY Study and rampdown as defined in the Judgment. Mr. Loeb reminded the TAC that the no-project scenario was included in the BOY Study in response to previous requests from the TAC. The TAC coordinated in the development of Recommendation Report text requesting clarification of the no-project associated pumping reductions in the BOY Study.

Mr. Bondy suggested that the third recommendation in the Recommendation Report be removed as it was not a significant as the other recommendations. The other TAC members agreed, and Mr. Taylor removed the related text.

Mr. Taylor offered time for members of the public to provide feedback on the draft Recommendation Report to the TAC.

Mr. Rob Grether commented that he appreciated that the TAC decided to remove recommendation three from the draft Recommendation Report. That comment referenced

differential rampdown. Mr. Grether pointed out that while this concept is referenced many times in the BOY Study, it is not allowed in the Judgment. Mr. Grether expressed a concern that including this concept in the BOY Study risks confusing readers who may assume that differential rampdown is an authorized method for managing pumping in the Las Posas Valley basin. He noted that this is an item the Policy Advisory Committee (PAC) will raise in their review of the BOY Study. He also referenced the provisions in the Judgment that give the Watermaster does the authority to order water rights holders in localized areas to reduce or cease extraction where undesirable results are occurring or likely to occur. This approach preserves allocation rights but restricts pumping in specific impacted locations.

No other public comments were raised.

Mr. Taylor summarized the review process for the TAC and other attendees, noting that the TAC Recommendation Report related to the draft BOY Study was edited during the meeting. He reminded the TAC that the Recommendation Report was due to the Watermaster by February 16, 2026 and there were no other regular TAC meetings before that due date. He asked the TAC if there was the need for additional review and discussion of the revised Recommendation Report. Mr. Bondy indicated that the additional question regarding differential pumping reduction raised by Mr. Grether could be considered to have been handled in Recommendation Report request to clarify rampdown in the BOY Study. Mr. Morgan offered that the differential reduction Mr. Grether referred to is a policy issue that will be addressed by the PAC's comments on the BOY Study. The TAC added language to the Recommendation Report indicating that differential pumping reductions should be considered informational.

Chair Taylor asked the TAC if there were any objections to voting to accept the Recommendation Report as revised during the meeting and none were raised. Dr. Abrams noted that the TAC was aware of all the changes as they were made during the meeting on a copy of the Recommendation Report shared through Zoom.

Chair Taylor asked for additional comments from the TAC and public and none were raised. The TAC voted to accept the revised Recommendation Report. No dissenting opinions were expressed.

MOTION: Dr. Abrams moved to accept the revised Recommendation Report of the draft BOY Study

SECOND: Dr. Morgan seconded the motion

VOTE: Unanimously approved

3. Draft Recommendation Report Review: Draft Water Year 2025 Annual Report

Chair Taylor advanced to discussion of the draft Recommendation Report on the draft Water Year 2025 Annual Report for the Las Posas Valley Basin. He reminded the TAC and other attendees that this draft Recommendation Report was also circulated in the agenda for the meeting. Mr. Taylor asked the TAC for comments on the draft Recommendation Report.

Mr. Bondy asked if the recommendation to include surface water gaging was appropriate for inclusion in the Recommendation Report as it had not been discussed in detail within the TAC and specific recommendations had not been developed. Dr. Abrams indicated that this recommendation was based on a comment he made in response to discussion of the limited surface water discharge gaging in the Annual Report. The TAC briefly discussed this item and decided to remove the recommendation.

Chair Taylor asked for additional comments from the TAC and public and none were received.

Chair Taylor noted that there were some revisions to the Recommendation Report and if the TAC had reservations accepting the revised report. None were raised and the TAC voted to accept the revised Recommendation Report. Mr. Taylor asked if there were any dissenting opinions that should be captured in the Recommendation Report and none were raised by TAC members.

MOTION: Mr. Morgan moved to accept the revised TAC Recommendation Report in response to the draft Water Year 2025 Annual Report for the Las Posas Valley Basin

SECOND: Dr. Abrams seconded the motion

VOTE: Unanimously approved

4. Continued Discussion of Request for TAC Members to Sign Acknowledgement and Agreement to be Bound to the Protective Order Regarding United Water Conservation District Model

Chair Taylor reminded the TAC that the question of an signing an acknowledgement to be bound by the protective order agreement for accessing the United Water Conservation District (UWCD) Model of the West Las Posas Management Area (WLPMA) was still under discussion and asked that they resume that conversation. He noted that a list of testing questions was included in the agenda.

Dr. Abrams offered that the testing questions could be introduced with a general summarizing statement in an email that includes short versions of the main testing questions. The other TAC members agreed and authorized the Chair Taylor to send the email to the Watermaster in his capacity as the Administrator of the TAC.

Chair Taylor asked for public comments; none were raised.

5. Update on Upcoming Committee Consultation Review Requests

Chair Taylor reviewed the consultation request table in the agenda and asked Mr. Loeb if the TAC should be aware of any other upcoming requests. Mr. Loeb said there were no other known requests for TAC consultation not on the existing list.

Neither the other TAC members or public attendees raised additional upcoming items for TAC consultation.

6. Schedule for Completing Current Committee Consultations and Recommendation Reports

Chair Taylor confirmed with the TAC that the two active consultation reviews, the draft Basin Optimization Yield Study and the draft Water Year 2025 Annual Report, would be complete with the finalization and submittal of the Recommendation Reports accepted by the TAC in previous agenda items. He committed to submitting these finalized reports to the Watermaster immediately.

No public comments were received.

G. Items for Future Agenda

Chair Taylor asked if TAC members or the public wanted to bring items to the TAC's attention for consideration in future TAC meeting agendas. Dr. Abrams informed the TAC he has schedule conflicts for the April 21, 2026 and May 5, 2026 regular meetings. No other comments were provided.

H. Adjourn

Chair Taylor thanked the TAC members and public for attending and made a motion to adjourn the meeting.

MOTION: Chair Taylor moved to adjourn the meeting at 3:12 pm

SECOND: Dr. Abrams seconded the motion

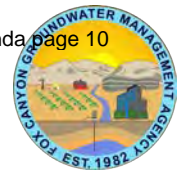
VOTE: Unanimously approved

Attachment 2

Watermaster Request: Committee Consultation on the ELMPA Groundwater Model Update

FOX CANYON GROUNDWATER MANAGEMENT AGENCY

LAS POSAS VALLEY WATERMASTER



MEMORANDUM

Date: March 25, 2026
To: Las Posas Valley Watermaster Technical Advisory Committee
From: Kudzai F. Kaseke, Assistant Groundwater Manager
Subject: Committee Consultation on the ELMPA Groundwater Model Update

Dear Las Posas Valley Watermaster Technical Advisory Committee (TAC):

Pursuant to Article VIII of the Judgment in *Las Posas Valley Water Rights Coalition, et al. v. Fox Canyon Groundwater Management Agency*, Santa Barbara Superior Court Case No. VENC100509700 (Judgment), the Watermaster shall, with Committee consultation, convene a collaborative and technically focused ASR Study Group to develop and recommend the Calleguas ASR Project Operations Plan (POP) for Court adoption. The Calleguas ASR POP shall be designed to allow the maximum beneficial use of Basin storage space subject to the No-Injury Rule. Once approved by the Court, the Calleguas ASR Project Operations Plan will become an integrated component of the Physical Solution. (Judgment, § 8.1).

Calleguas Municipal Water District (CMWD), with the support of its consultant Intera, first developed a numerical flow model to support Las Posas Valley Basin groundwater management, East Las Posas Management Area (ELPMA), and refine operational plans for the Las Posas Basin ASR Project in 2018. The model was calibrated using data spanning 1970 through 2015. CMWD has continued to maintain the ELPMA model since its initial development and recently extended the model to 2023 and validated its calibration as documented in its February 12, 2026, Technical Memorandum. This updated model documentation, titled "Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model," is attached for review.

Watermaster requests that the TAC review the updated ELPMA groundwater model and provide a recommendation regarding its suitability for use in evaluating:

1. Aquifer Storage and Recovery operations and its use as the preferred modeling tool for development of the Calleguas ASR Project Operations Plan.
2. General basin wide use for the ELPMA replacing the existing model in use.

Your committee's recommendation report is due April 24, 2026.

Please contact me at 805-654-2010 or LPV.Watermaster@venturacounty.gov with any questions or concerns.



TECHNICAL MEMORANDUM

To: Calleguas Municipal Water District

From: Tyler Hatch, PhD, PE; Trevor Jones, PhD; Leila Saberi, PhD; Melanie Beck; Erick Fox; Nathan Hatch; Abhishek Singh, PhD, PE, INTERA Incorporated

Date: February 12, 2026

Re: Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

1.0 Introduction

INTERA has been supporting Calleguas Municipal Water District (CMWD) with updates to the numerical groundwater flow model (INTERA, 2018) of the East Las Posas Management Area (ELPMA). This model, herein referred to as the ELPMA model, was first developed in 2018 to support groundwater management and CMWD's ASR operations. The model was calibrated to groundwater elevations and other data measured over the period from January 1970 through December 2015 and was used to support development of the Las Posas Valley Basin (LPV Basin) Groundwater Sustainability Plan (GSP). Since then, CMWD has continued to maintain and update the model to align with regional assumptions, integrate new information, and address recommendations from Fox Canyon Groundwater Management Agency's (FCGMA) Technical Advisory Committee. A summary of these interim model updates is provided in Section 2, with details in Attachment A.

This memorandum documents the changes made to the ELPMA model following the interim model updates described in Attachment A. The purpose of this update is to support the development of the CMWD Aquifer Storage and Recovery (ASR) Project Operations Plan, which is required under the judgment in *Las Posas Valley Water Rights Coalition v. Fox Canyon Groundwater Management Agency* (Judgment; Santa Barbara Superior Court Case No. VENC100509700).

INTERA was asked to extend the model from December 2015 to March 2023 and validate the calibration against observed groundwater levels. This extension/validation period included the late 2022 CMWD ASR emergency imported water recovery operational event (Bondy Groundwater Consulting, Inc., 2023). The validation looked at the model's ability to simulate observed groundwater levels before, during, and after this event.

Unlike the 1970 to 2015 historical calibration period, the 2016 to 2023 validation period incorporated high-frequency pressure transducer and ASR data, which provides detailed characterization of aquifer responses across the ELPMA to ASR operations (Bondy Groundwater Consulting Inc., 2023). Results showed that the model tended to overestimate groundwater elevations after 2015 and underestimate declines during the emergency imported water recovery operational event, especially in the northern part of the ELPMA. To improve the model's performance after 2015, the following model updates were completed:

- **Stress Period Refinement:** The stress periods (the interval of input data provided to the model) for 2022 through the end of the simulation were refined from monthly to daily to improve the model's ability to resolve high-resolution transducer data from CMWD.
- **Model Layer Refinement:** The model layering was refined to improve the local hydrostratigraphy using newly available data, including those collected at new deep monitoring wells CMWD constructed in 2017 and 2019. Due to differences in the characteristics of the Fox Canyon Aquifer (FCA) in the north, where it uplifts and outcrops, and areas south of the Fairview Fault, the single model layer used to represent the FCA was split into two. This improved the model's ability to represent local confining conditions in northern ELPMA and along the Moorpark anticline.
- **Calibration Update:** Due to the changes in model layering, the model was recalibrated to refine modeled aquifer properties and improve the representation of groundwater levels, including fluctuations associated with ASR operations.

A summary of interim model updates is provided in Section 2. Section 3 provides an explanation of the datasets updated during the extension of the model in time. Section 4 summarizes how the hydrostratigraphy and model layering were updated. Section 5 describes the model calibration set up and results. Section 6 provides the summary and conclusions.

2.0 Summary of Interim Model Updates

The ELPMA model version used as the starting point for this update included the revisions summarized below (detailed in Attachment A).

Since its use for the LPV Basin GSP, the ELPMA model has been updated to improve the following:

- **Underflows into the ELPMA:** Underflow recharge from Happy Camp Canyon was updated to use a set of 10 specified flux cells where the canyon joins the main part of the basin (Figure 2.1). Because the Happy Camp Canyon area has very limited geologic or hydrologic data and is located outside of the LPV Basin, it was removed from the active model domain. The specified flux values for each model cell were constrained using the Basin Characterization Model (BCM; Flint et al., 2013; Flint and Flint, 2014). The updated boundary condition corrects the area of elevated heads in the eastern part of the model domain, identified in FCGMA (2019).
- **Model Layer Types:** Model layers 6 (the Santa Barbara Clay) and 7 (the Grimes Canyon Aquifer [GCA]) were changed from confined to model convertible layers, allowing the model to dynamically represent confined or unconfined conditions based on the groundwater head. The previous version of the model represented these layers as confined due to the lack of information in the Happy Camp Canyon area. Because this area is no longer in the active model domain, the GCA and Santa Barbara Clay can be modeled as convertible layers.

- **Model Layer Elevations:** The bottom of the GCA was updated to correct areas where some wells identified as being screened in the GCA via their well logs were screened below the bottom of the model.
- **Distributed Recharge:** Recharge was updated to include return flows from septic systems, outdoor water use in urban areas (M&I), and water distribution system leakage (Dudek, 2019b; DBS&A, 2017). In addition, to be consistent with the numerical groundwater flow modeling for the West Las Posas Management Area, agricultural return flows were increased from 10% to 20% of the agricultural pumping (UWCD, 2018). These return flows were applied to irrigated areas overlying the Shallow Alluvial aquifer and Epworth Gravels aquifer.
- **Stream flows in Arroyo Simi/Las Posas:** Stream flows in Arroyo Simi/Las Posas were updated to: (i) correct for a unit conversion issue when representing direct discharges from the Moorpark Wastewater Treatment Plant to Arroyo Simi/Las Posas, and (ii) account for Simi Valley Water Quality Control Plant Discharges measured on Arroyo Simi at Hitch Boulevard when estimating runoff generated from within the ELPMA.
- **Groundwater Pumping:** Pre-1985 pumping was revised based on additional information and analysis. Additional pumping records provided by Ventura County Waterworks Districts #1 and #19, Zone Mutual Water Company, and Berylwood Mutual Water Company were incorporated into the model. Pre-1985 pumping for the Egg City chicken ranch (03N19W19N03S, 03N19W19K02S, 03N19W19P02S) was extrapolated back to the well drill date using the 1985 to 1990 average pumping rate. Pumping from well 02N20W08Q01S was removed from the model as water levels and records indicate it pumps from the West Las Posas Management Area (WLPMA) rather than ELPMA despite being located east of the current WLPMA/ELPMA boundary (Attachment A).
- **Initial Conditions:** Initial heads in the Upper San Pedro formation, FCA, and GCA were revised to better reflect observed water levels in the 1970s in the central, eastern, and northern portion of ELPMA and account for groundwater levels and trends measured back to the 1930s. The previous version of the model focused on measured groundwater levels from 1970 to 2015 only.
- **Aquifer Properties:** Aquifer parameters were refined in the Shallow Alluvial aquifer (model layer 1 near the Arroyo); the bottom layer representing the Upper San Pedro formation (model layer 3); the Clay Marker Bed (model layer 4) in the north and north-east of the Moorpark Anticline; the FCA (model layer 5) between areas influenced by the Arroyo and areas minimally influenced by the Arroyo, along the eastern portion of the Moorpark anticline and in the northeast where the FCA outcrops; the Santa Barbara Clay (model layer 6) near the GCA (model layer 7) outcrop; and the GCA downgradient of Happy Camp Canyon specified flux boundary condition discussed above.

The scaled mean absolute error (MAE) and the scaled root mean square error (RMSE) of the interim model (Attachment A) are 0.02 and 0.03, respectively, or 2-3% of the variability in observed water levels. This is an improvement over the initial model version (INTERA, 2018), which had scaled MAE and scaled

RMSE of 0.03 and 0.04, respectively. Both versions of the ELPMA model are calibrated well above industry standards of 0.1 (or 10%) scaled RMSE or scaled MAE.

3.0 Model Extension

For this model update, time-varying input datasets (time-series) in the model were extended to March 2023. The packages in the model with time-series include recharge, evapotranspiration, streamflow routing, general head boundary conditions, constrained head boundary conditions, and wells. The general head and constrained head boundary conditions are constant through time and were extended using the same values used in the previous versions of ELPMA model (INTERA, 2018).

Updates to the recharge, evapotranspiration, streamflow routing, and well packages are described in the following subsections.

3.1 Simulation Time Period and Temporal Discretization (DIS)

The simulation period of prior versions of the model was January 1970 through December 2015. These versions of the model were temporally discretized using monthly stress periods (INTERA, 2018; Attachment A).

For this update, the model was extended from December 2015 to March 2023. January 2016 through December 2021 uses a monthly stress period. Starting in January 2022, the model uses a daily stress period to:

- Better represent CMWD's ASR emergency imported water recovery operational event.
- Capture short-term aquifer responses measured in monitoring wells equipped with pressure transducers.

The ELPMA model specifies boundary conditions (e.g., pumping, recharge, stream flow) and aquifer properties (e.g., hydraulic conductivity, specific storage) in units of feet and days. Under the temporal discretization scheme with monthly stress periods (January 1970 through December 2021), boundary conditions are applied as constant rates for the duration of each month. For the January 2022 through March 2023 period, when the model utilizes a daily stress period, boundary conditions continue to be applied as monthly average rates, except for injection and extraction at CMWD's ASR wells, which are defined at a daily resolution.

Additional details on how this was applied for the MODFLOW recharge (RCH), evapotranspiration (EVT), stream flow routing (SFR2), and well (WEL) boundary condition packages are included below.

3.2 Recharge (RCH)

The ELPMA model uses the MODFLOW Recharge (RCH) package to represent distributed recharge from native and non-native water supplies (INTERA, 2018). The model extension uses the same components of recharge as the previous versions of the model. The extension for each recharge source is described below.

3.2.1 Rainfall and Focused Tributary Recharge

Recharge from rainfall and small tributaries is constrained using the 1980 to 2010 averages (normals) extracted from the Basin Characterization Model (Flint et al, 2013; Flint and Flint, 2014), scaled by monthly rainfall totals measured at the Somis Bard climate station (Station 190, maintained by Ventura County Watershed Protection District [VCWPD]; Figure 3.1). The methods used to integrate these two datasets into an estimate of native recharge are described in INTERA (2018).

3.2.2 Agricultural Return Flows

Agricultural return flows in irrigated areas that overlie the Epworth Gravels aquifer and Shallow Alluvial aquifer were extended using agricultural pumping data received from the FCGMA. To quantify these return flows, INTERA assumed that 20% of the groundwater pumping used to irrigate these parcels returned to the underlying groundwater system (Attachment A). The extent of the irrigated area for the January 2016 through March 2023 period is assumed to remain constant and equal to the 2015 irrigable acreage.

3.2.3 M&I Return Flows and System Losses

M&I return flows for the extension period were estimated for the portions of Ventura County Waterworks District No. 1's (VCWWD-1) service area that overlie the Shallow Alluvial aquifer (Attachment A). To quantify these return flows, INTERA used monthly water delivery data provided by VCWWD-1 for the extension period, scaled by the fraction of VCWWD-1's service area that overlies the Shallow Alluvial aquifer (Attachment A). Of this, 65% was assumed to be used outdoor irrigation, and 10.5% of the outdoor irrigation was assumed to percolate to groundwater (Attachment A).

A system loss of 5% of total municipal water deliveries was assumed to recharge the ELPMA, adjusted for the portion of VCWWD-1's service area over the Shallow Alluvial aquifer. This is consistent with the approach taken for the interim model updates (Attachment A).

3.2.4 Moorpark Wastewater Treatment Facility Percolation

Treated effluent from the Moorpark WWTP is either used via recycled water for outdoor application within the VCWWD-1 service area or discharged to percolation ponds located in southern ELPMA. From January 2016 through December 2019, VCWWD-1 reported total monthly effluent discharges from the Moorpark WWTP. Consistent with the previous modeling, all reported effluent was assumed to be discharged to the percolation ponds.

Starting in 2019, the California State Water Resources Control Board updated their waste discharge reporting database to require dischargers to specify treated effluent end uses.¹ For the Moorpark WWTP, these end uses include discharge to land surface (i.e., percolation ponds) and outdoor irrigation.

¹ <https://data.ca.gov/dataset/volumetric-annual-report-of-wastewater-and-recycled-water/resource/fd190d10-063a-4304-8889-e99ca42e9186>

Using the more detailed reporting, INTERA extended the percolation pond recharge volumes by applying land surface discharge volumes for waste discharge permit number WDR100001453.

3.2.5 Septic System Return Flows

Septic system return flows were applied where septic parcels overlie the Shallow Alluvial aquifer or Epworth Gravels aquifer. Monthly averages calculated for the 2012 to 2015 time period were used to represent septic system return flows for the extension period.

3.2.6 Total Recharge

Recharge from the native and non-native water supplies described above were aggregated into a single MODFLOW RCH package. These recharge rates were held constant throughout each month of the extension period, so each daily stress period used the same rate in cubic feet per day as the equivalent monthly stress period.

Table 1 summarizes the average annual recharge simulated in the ELPMA model, by source (native vs. non-native) and simulation period. Figure 3.2 presents the monthly total recharge to the ELPMA separated into native and non-native components. Over the 2016 to 2023 period, recharge to the ELPMA averaged approximately 8,300 acre-feet per year (AFY), which is approximately 17% lower than the 1985 to 2015 average (Table 1). This reduction in recharge reflects the drier-than-average conditions encountered since 2015 and the reduction in Moorpark WWTP discharges to percolation ponds.

Table 1. Summary of Distributed Recharge in the ELPMA model

Recharge Category		Average Annual Recharge (AFY)	
		1985 to 2015	2016 to 2023
Non-Native Recharge	M&I	269	271
	Agricultural	1,224	1,175
	Septic Systems	81	53
	Water Distribution System Leakage	197	198
	Moorpark WWTP Percolation Ponds	1,479	1,090
Native Recharge	Rainfall and Focused Tributary Recharge	6,637	5,649
Total		9,886	8,256

Notes: AFY = Acre-Feet per Year; M&I = Municipal and Industrial; WWTP = Wastewater Treatment Plant.

3.3 Evapotranspiration (EVT)

Evapotranspiration (EVT) along the Arroyo Simi/Las Posas corridor is simulated using the MODFLOW EVT package (INTERA, 2018). For the extension period, monthly EVT parameters were held constant and equal to the monthly values used for 2012 to 2015. Because these parameters are defined in units of length and length per time (e.g., feet or feet per day), no additional modifications were required to implement this package for the portion of the model that utilizes daily stress periods.

3.4 Streamflow Routing (SFR)

The ELPMA model simulates surface water flows, and their interactions with underlying groundwater, using the MODFLOW Streamflow Routing (SFR2) package (INTERA, 2018) and includes flows in Arroyo Simi/Las Posas from Simi Valley, as well as surface water runoff generated within the ELPMA. These modeled flows were extended through March 2023. The modeled characteristics of Arroyo Simi/Las Posas – such as stream reach lengths, streambed conductance, flow-width curves, etc. – were not modified as part of this update.

3.4.1 Inflows to Arroyo Simi/Las Posas

The inflows to Arroyo Simi/Las Posas were updated using surface water flow data measured on Arroyo Simi at Madera Road Bridge (Gage 803)² and reported discharges from the Simi Valley Water Quality Control Plant (SVWQCP). Modeled flows in the Arroyo Simi/Las Posas at the uppermost reach in the ELPMA are equal to the sum of these two data sources, adjusted for ET and losses that occur upgradient of the ELPMA (INTERA, 2018; Attachment A).

3.4.1.1 Surface Water Flows Measured at Gage 803

VCWPD has operated and maintained Gage 803 since 1933 and has published daily average flow measurements through October 2015. Since 2015, VCWPD has made data, where available, accessible through their public hydrology server.³ For the model extension period, provisional data for water years 2016 through 2020, and the period from October 1, 2022, through March 30, 2023, were available. At the time of this model update, VCWPD's public hydrology server reported that data for water years 2021 and 2022 were missing or unavailable.

To estimate flows during periods with missing or unavailable data, INTERA used an analogous year approach based on total water year precipitation (INTERA, 2018). Specifically, for each water year with missing flow data at Gage 803 (2021 and 2022), historical streamflow measurements were selected from years with the most similar total precipitation, based on data from the VCWPD Somis-Bard Gage (Gage 190). Monthly flows from the selected analogous year were then scaled by the ratio of annual precipitation totals to reflect conditions in the missing year. The analogous water years selected for 2021 and 2022 were 2013 and 1972, respectively (Figure 3.3).

3.4.1.2 SVWQCP Discharges

SVWQCP discharges treated effluent to Arroyo Simi downstream of Gage 803, but upstream of the ELPMA (INTERA, 2018). For this model update, monthly discharge volumes to Arroyo Simi from the City of Simi Valley for the period from January 2016 to March 2023 were included. Figure 3.4 shows the total volume of SVWQCP discharges to the Arroyo Simi/Las Posas over the entire model period.

² Simi Valley dewatering wells discharge to Arroyo Simi upstream of Gage 803.

³ <https://vcwatershed.net/hydrodata>. Data for Gage 803 were last accessed on December 11, 2025.

3.4.1.3 Total Inflows to Arroyo Simi/Las Posas

Total modeled surface water flows entering the ELPMA through Arroyo Simi/Las Posas are shown in Figure 3.5. These data show that flows entering the ELPMA have declined by approximately 22% over the past 10 years, with an average annual inflow of approximately 19,100 AFY from water year 1971 through 2015 and 14,800 AFY from water year 2016 through 2022.⁴

3.4.2 Runoff within the ELPMA

In addition to upstream inflows, the runoff generated from within the ELPMA is estimated for the model extension period and added to the SFR package. These estimates are based on the difference in flow measurements between Gage 803 and Gage 841 on Arroyo Las Posas at Hitch Boulevard (INTERA, 2018).

3.5 Wells (WEL)

3.5.1 Groundwater Injection and Extraction

The ELPMA model simulates groundwater injection and extraction using the MODFLOW Well (WEL) package. The injection and extraction data in the WEL package were extended using two primary sources:

- FCGMA semi-annual extraction reports, which provide well by well pumping data categorized by water use type, and
- Injection and extraction records from CMWD for the ASR Wellfields.

The following sections detail how the extraction and injection data were assigned to each well for the monthly and daily stress periods.

3.5.1.1 FCGMA Extraction Data Processing

FCGMA has historically required operators in the LPV Basin to report semi-annual extractions over different reporting periods, based on well-use type (Table 2). Prior to 2022, extraction reporting occurred on a calendar year basis. In 2021, to better align their reporting system with the Sustainable Groundwater Management Act (SGMA), FCGMA transitioned their extraction reporting from a calendar year to water year reporting system. Starting in 2022, all operators in the LPV Basin were required to report over the same two reporting periods (October 1 through March 31, and April 1 through September 30), regardless of use type. The semi-annual reporting periods over the 2016 to 2023 model extension period are summarized in Table 2.

⁴ The period from October 1, 2022, through March 31, 2023, was excluded from the averaging period because it does not cover a complete water year.

Table 2. Summary of Reporting Periods for Year Codes

Years	Report Number	Use Type	Reporting Period	Months
2016 – 2020	1	Domestic, M&I	Jan 1 – Jun 30	6
	2		Jul 1 – Dec 31	6
	1	Agricultural	Jan – Jul 31	7
	2		Aug 1 – Dec 31	5
2021 (Transition Year)	1	Domestic, M&I	Jan 1 – Jun 30	6
	2		Jul 1 – Sept 30	3
	1	Agricultural	Jan – Jul 31	7
	2		Aug 1 – Sept 30	2
2022 - 2023	1	Domestic, M&I,	Oct 1 – March 31	6
	2	Agricultural	Apr 1 – Sept 30	6

Consistent with the previous version of the model, the semi-annual extraction reports were converted to monthly extraction rates based on use type:

- Agricultural pumping was distributed using an inverse-precipitation weighting scheme and rainfall measurements collected at the VCWPD Somis-Bard station (INTERA, 2018).
- Domestic, Municipal, and Industrial (M&I) pumping was distributed evenly across the reporting period.

3.5.1.2 ASR Data Processing

CMWD provided injection and extraction data for 18 ASR wells. These data were used to compute a net monthly rate for each well (injection minus extraction). No additional adjustments were made to the net monthly rate.

3.5.1.3 Conversion to Daily Stress Periods (Jan 2022 – Mar 2023)

To better represent the CMWD ASR emergency imported water recovery operational event, the WEL package uses daily injection/extraction rates for the period from January 1, 2022, through March 31, 2023. For non-ASR wells, the monthly pumping rates are held constant and equal to the monthly average rates calculated using the approaches described above. For ASR wells, injection and extraction data are defined using net daily injection and extraction data provided by CMWD.

3.5.1.4 Wells Added to the Model

As part of the model extension, nine new wells were identified and incorporated into the model (Figure 3.6, Table 3). These wells were added based on records provided by FCGMA and VCWPD. Eight of these wells are used for agricultural irrigation, and one well is used for M&I. Well logs and construction information for all nine wells were obtained from VCWPD’s well database and the California Department of Water Resource’s Online System of Well Completion Reports (OSWCR). Pumping rates for all nine wells were assigned using FCGMA’s semi-annual extraction reports (Section 3.5.1).

Table 3. Summary of Wells Added to the ELPMA Model

Well Name	Use Type	Screen Top	Screen Bottom	X	Y	Row	Column
03N20W24P03S	Agricultural	205.3	-204.7	6280796	1940822	82	106
03N20W27N05S	M&I	-83.0	-543.0	6268331	1936931	101	43
02N20W04R03S	Agricultural	-452.8	-952.8	6267867	1926419	154	41
03N19W20N01S	Agricultural	57.3	-262.7	6290860	1941614	78	156
02N20W01L01S	Agricultural	-75.1	-475.1	6280303	1926471	154	103
03N20W27B03S	Agricultural	-0.1	-460.1	6271837	1940714	83	61
02N20W01J01S	Agricultural	360.0	-340.0	6283053	1927123	151	117
02N19W18E01S	Agricultural	261.0	161.0	6284480	1918399	194	124
03N20W26J02S	Agricultural	21.6	-458.4	6277577	1937337	99	90

Notes: Screen top and bottom are shown in feet above mean sea level. X and Y coordinates are referenced to NAD 83 California Zone 5.

3.5.2 Subsurface Underflows from the Happy Camp Canyon Area

As described in Attachment A, this version of the ELPMA model uses the WEL package to represent underflow recharge from the Happy Camp Canyon area. For the extension period, recharge through these boundary cells was held constant and equal to the 2012 to 2015 monthly averages.

4.0 Model Layer Refinements

After extending the model, INTERA evaluated its performance in reproducing groundwater elevations over the 2016 to 2023 period at select wells in and around CMWD’s ASR Wellfields (Figure 4.1). Figures 4.2 through 4.5 show hydrographs comparing observed groundwater elevations (blue markers) and simulation results from the extended model (red line). While the extended model captured general trends near the ASR Wellfields (Figures 4.2 and 4.3), the results show that the model tended to overestimate heads during extension period and did not fully capture groundwater level fluctuations during the ASR emergency imported water recovery operational event, especially north of the Fairview fault (e.g., see wells 03N19E30E07-I and 03N19W30D01S in Figure 4.4). To investigate potential causes of these results, INTERA performed preliminary manual parameter adjustments and identified the need to improve the hydrostratigraphic model to better represent local aquifer conditions and improve calibration across the ELPMA.

The hydrostratigraphic improvements focused on two primary areas:

- North of the Fairview Fault:** In this area, measured groundwater elevations indicate that the FCA behaves as a semi-confined to confined aquifer. However, the previous version of the model simulates the FCA as a single, thick aquifer layer that becomes unconfined near the outcrop areas (INTERA, 2018). To address this, the hydrostratigraphic model was updated to

incorporate lithologic and geophysical data from CMWD's new monitoring well, MW-2, located north of the Fairview fault (03N19W30E07-S/I/D; shown in Figure 4.1) and the FCA was split into two layers to allow for simulation of variable confining conditions.

- **Moorpark Anticline:** The Moorpark Anticline is a prominent feature in the ELPMA that influences groundwater flow and fluctuations across the ELPMA (FCGMA, 2019). In 2019, CMWD constructed a clustered monitoring well, MW-3, near the base of the Moorpark anticline (02N20W11B01S, 02N20W11B02S, and 02N20W11B03S; shown in Figure 4.1), providing new information on the prominence of the anticline and depth and thickness of the FCA in this region. The hydrostratigraphic model was updated in this area to integrate this new information.

4.1 Review of Geophysical and Lithological data

The hydrostratigraphic model updates were based on a review of geophysical, lithologic, and water-level data in the two areas of interest. Geophysical logs were digitized and compared with tops and bottoms of the model layers to locally revise the top and bottom elevations of the FCA (model layer 5) and determine the depths to split the FCA into two model layers. INTERA evaluated 80 geophysical logs near the ASR Wellfields and in areas identified to benefit from calibration refinements. Each geophysical log was reviewed for distinct transitions in resistivity within the depth interval interpreted as the FCA. If a geophysical log did not show a distinct transition in resistivity to use as the selection for the location of the layer split, nearby geophysical logs were used. Lithological logs, where available, were used alongside the geophysical logs to guide the layer split.

Based on the quality and spatial distribution of the geophysical logs, INTERA used 55 of the 80 geophysical logs to revise the hydrostratigraphic model (Appendix A). The well log data were used to develop revised surface elevation contours for the top and bottom of the FCA within the boundaries shown in Figure 4.6. The contours and interpolation parameters were iteratively adjusted to 1) honor the geophysical and well log data; 2) create surfaces that matched the interpreted hydrostratigraphy; and 3) smoothly transition the revised surface elevation to match the existing hydrostratigraphic model outside of the areas shown in Figure 4.6.

4.2 Updates to Top and Bottom of Fox Canyon Aquifer

North of the Fairview fault, the top elevation of the FCA ranges from 850 feet mean sea level (ft. msl) near the northern outcrop to -400 ft. msl near the Fairview fault (Figure 4.6). Near the Fairview fault, the updated surface is 90 feet lower than previous interpretations (Figure 4.7). The steep uplift towards the northern boundary is consistent with previous interpretations and highlights the structural complexity of the ELPMA. Along the base of the Moorpark anticline, the top of the FCA ranges from approximately 75 ft. msl to -100 ft. msl (Figure 4.6). This interpretation raises the top of the FCA by as much as approximately 300 feet, enhancing the prominence of the Moorpark anticline (Figure 4.7).

The geophysical logs from wells constructed north of the Fairview fault also indicate that the FCA is thicker than previously interpreted. In this area, the bottom of the FCA ranges from 200 ft. msl to -875 ft. msl, about 100 to 350 feet deeper than previous interpretations (Figures 4.8 and 4.9; see also

geophysical logs for 03N19W30D02S and 03N19W30E07-D in Appendix A). Combined, the higher top and lower bottom FCA boundaries result in a local aquifer geometry that is 200 to 300 feet thicker than represented in previous model versions. Along the Moorpark anticline, the bottom of the FCA was raised to maintain consistent thickness with earlier model versions.

Other model layers were adjusted corresponding to the updated elevations of the FCA. For example, the bottom of the FCA moved down due to the interpretation at CMWD MW-2, so the model layers representing the Santa Barbara Clay and GCA also moved down.

4.3 Splitting the Fox Canyon Aquifer into Two Model Layers

As described in Section 4.1, geophysical and lithologic logs from the 55 wells used to update the top and bottom FCA elevations were also used to determine the depth at which the FCA was divided into two layers. These selections for the 55 wells are provided in Appendix A. To extend this split across the entire FCA, INTERA calculated the fraction of total FCA thickness assigned to the upper and lower layer at each well and interpolated these fractions across the model grid. The use of fractions prevented the possibility of the FCA pinching out when extended beyond the well locations. Interpolation was performed using Inverse Distance Weighting, and the results were converted back to an elevation using the layer top elevation and the layer thickness at each grid cell. The resulting surface showing the elevation of the modeled split in the FCA is shown in Figure 4.10.

4.4 Impacts to Model Pumping

INTERA modified the groundwater well layer assignments to account for the model layer elevation revisions. Where well construction information was available, wells were assigned to the model layers based on their screen intervals and pumping rates were assigned based on relative layer transmissivities. In cases where well construction information was not available, wells were assigned using the model layering and transmissivity weighting scheme described in INTERA (2018).

5.0 Model Calibration

Previous model calibration efforts relied on conventional manual adjustment of model input parameters and boundary conditions to achieve a reasonable match to groundwater elevations measured between January 1, 1970, and December 31, 2015 (INTERA, 2018; Attachment A). As described in Section 2, over this period, the model was calibrated well above industry standards and successfully reproduced both long-term groundwater elevation trends and shorter-term groundwater elevation changes related to CMWD's ASR operations.

Since 2015, CMWD has expanded their groundwater monitoring network to improve characterization of groundwater level trends and fluctuations. This expansion includes a new nested monitoring well in northern ELPMA (MW-2), a new clustered monitoring well in southern ELPMA (MW-3), and pressure transducers deployed in a total of 57 wells across the ELPMA (Figure 5.1). This network provides sub-daily groundwater elevation measurements, improving the temporal and spatial resolution of observed responses within the FCA and GCA. Importantly, the enhanced monitoring network provides new data

on ASR responses in key areas of the ELPMA: north of the Fairview fault, south of the Moorpark anticline, and east of CMWD's ASR Wellfield No. 2. As described below, the ELPMA model was recalibrated to incorporate these new data into the modeling framework.

5.1 Calibration Set-up and Approach

As described in Section 4.0, INTERA first applied manual calibration methods consistent with the original model development (INTERA 2018, Attachment A) to improve performance during the extension period. However, validation of results for both water levels and drawdowns led to changes in the model structure, so a broader, more extensive recalibration was undertaken. To re-evaluate and estimate local aquifer properties, INTERA used PEST++ (White et al., 2020) for re-calibration, as described below.

5.1.1 Approach

The updated ELPMA model was calibrated using PESTPP-IES, a global, ensemble-based parameter estimation method that implements the iterative Ensemble Kalman smoother technique (White et al., 2020; Doherty, 2018; Evenson et al., 2021). Unlike traditional automated calibration methods, which rely on local sensitivities (or derivatives) to converge on a single, optimal parameter set, PESTPP-IES uses an ensemble of model realizations to iteratively update parameter values and estimate their uncertainty (Evenson et al., 2021). Each ensemble member represents a plausible realization of the model given the initial range of parameter values and observed data. Importantly, through this approach, PESTPP-IES not only identifies parameter sets that satisfactorily reproduce the observed data, but also explicitly quantifies parameter and predictive uncertainty.

For this model update, the goal of calibration refinement was to:

- Reduce the model's tendency to overestimate heads across the ELPMA during the 2016 to 2023 period (see Figures 4.2 through 4.5).
- Better represent groundwater elevation changes associated with ASR operations.
- Account for improvements to the conceptual model and data collected since the model was last updated (Attachment A).

Since most ELPMA wells are primarily screened within the FCA and GCA, the calibration focused on adjusting parameters in these aquifers and in the clay beds that separate them from each other and the overlying Upper San Pedro Formation. Other parts of the model – such as the Upper San Pedro Formation, Epworth Gravels aquifer, Shallow Alluvial aquifer, and Arroyo Simi/Las Posas – were not modified during calibration. However, model fit in the Upper San Pedro, Epworth Gravels aquifer, and Shallow Alluvial aquifer was evaluated during calibration to ensure that changes to the FCA, GCA, and surrounding clay beds did not degrade calibration in other parts of the model.

5.1.2 Model Parameters

Five parameter groups were updated during model calibration: horizontal and vertical hydraulic conductivity, specific storage, specific yield, and fault conductance.

5.1.2.1 Aquifer Property Parameterization

Pilot points were used to represent spatial heterogeneity in horizontal and vertical hydraulic conductivity, specific yield, and specific storage parameters within the FCA, GCA, and adjacent clay layers (RamaRao et al., 1995). These pilot points were evenly spaced at 1800 feet (or 9 grid cells) and were interpolated across the model using ordinary kriging to define aquifer parameters in each model cell. Separate pilot point sets were used for model layers 4 through 8, allowing aquifer property distributions to vary independently by layer. To maintain consistency with the previous model structure, the pilot points were used to define parameter multipliers applied to the aquifer property values shown in Attachment A. These original values, which were informed by lithologic and aquifer test data, served as the initial parameters for PESTPP-IES calibration (Attachment A).

5.1.2.2 Hydraulic Flow Barrier Conductance Parameterization

Eight unique hydraulic flow barriers (HFBs) are defined in the ELPMA model as structural features that influence groundwater flow in the FCA and GCA. These segments represent the Fairview Fault, Moorpark Anticline, Long Canyon Syncline, lateral branches of the Somis Fault Zone, and unnamed, relatively well-identified faults (Figure 5.2). HFB conductance was parameterized using zoned multipliers, applied to baseline conductance values from INTERA (2018). HFB parameters were grouped to ensure internal consistency along each structural feature but were allowed to vary by depth across the model. To provide additional flexibility, the Fairview Fault and Moorpark anticline flow barriers were subdivided into seven and three segments, respectively (Figure 5.2). These HFBs were targeted for segmented refinement by PESTPP-IES to improve calibration.

5.1.2.3 Initial Parameter Distributions

PESTPP-IES was used to estimate approximately 19,500 parameters that constrain the aquifer properties and fault conductance in the FCA, GCA, and clay marker beds that overlie and separate these aquifers. Table 4 summarizes the parameterization, including the number of parameters, by type and layer, the initial parameter bounds, and the prior uncertainty assigned to each parameter. These values define the prior distributions used in calibration. The prior distributions were assumed to be Gaussian, with mean and variance equal to the initial parameters values and uncertainty ranges shown in Table 4.

Table 4. ELPMA Model Calibration Parameterization Scheme

Parameter Type	Model Layer / Fault Segment	Initial Parameter Range		Parameter Multiplier Bounds	
		Min.	Max.	Min.	Max.
Horizontal Hydraulic Conductivity (HK; ft/d)	4	1×10^{-5}	5	0.1	10
	5				
	6	0.01	100		
	7	1×10^{-5}	20		
	8	0.1	80		
Vertical Hydraulic Conductivity (VK; ft/d)	4	1×10^{-5}	1	0.1	10
	5				
	6	0.001	10		
	7	1×10^{-5}	2		
	8	0.001	8		
Specific Yield (Sy; unitless)	4	0.05	0.1	0.1	10
	5				
	6	0.1	0.25		
	7	0.2	0.2		
	8	0.2	0.25		
Specific Storage (Ss; ft ⁻¹)	4	1×10^{-5}	1×10^{-4}	0.1	10
	5				
	6	5×10^{-5}	1×10^{-4}		
	7	5×10^{-5}	5×10^{-5}		
	8	5×10^{-5}	5×10^{-5}		
HFB (ft ² /d)	Fairview Fault	1×10^{-4}	0.1	0.01	100
	Long Canyon Syncline	1×10^{-6}	0.01		
	Moorpark Anticline	0.001	0.1		
	Somis Fault Zone	0.1	0.1		
	Unnamed, Relatively Well Identified Faults	1×10^{-4}	0.1		

Notes: Model layers 5 and 6 represent the FCA. Model Layers 4 and 7 represent clay marker beds. Model layer 8 represents the GCA. Additional constraints were placed on the specific yield parameters to ensure that the calibrated values remained within the range of 0.005 and 0.45.

Units: ft = feet; d = day

5.2 Observation Data

The ELPMA model was calibrated to groundwater elevations measured at a network of 121 wells comprised of production wells and dedicated monitoring wells (Figure 5.1, Appendix B). Groundwater elevations measured from this network were separated into four different calibration datasets:

1. Original Calibration Targets.
2. VCWPD Periodic Measurements Collected after 2015.
3. CMWD Transducer Data Collected after 2015 from Non-ASR Wells.
4. CMWD Transducer Data Collected after 2015 from ASR Wells.

Each data set is summarized below. The quantitative observation thresholds and filtering methods are included in Appendix B along with processed and raw hydrographs for each well.

5.2.1 Original Calibration Targets

The previous version of the ELPMA model was calibrated to manual groundwater elevation measurements obtained from CMWD and VCWPD. With the exception of well 03N19W30M02S, which is screened in the Epworth Gravels aquifer, these data were not changed or re-evaluated for this model calibration.

At well 03N19W30M02S, groundwater elevations measured below 580 ft. msl were excluded from the calibration dataset (Appendix B). Measurements lower than 580 ft. msl at this well are approximately 40 feet lower than the contemporaneous daily maximum water levels and are likely influenced by nearby pumping.

5.2.2 VCWPD Periodic Measurements Collected after 2015

VCWPD provided periodic groundwater elevation measurements from January 1, 2016, through March 31, 2023. These data consist of semi-annual to monthly manual measurements that include data flags characterizing the conditions under which the measurements were collected. The data provided by VCWPD were filtered to exclude measurements flagged as questionable or collected under pumping conditions.

5.2.3 CMWD Transducer Data Collected after 2015 from Non-ASR Wells

Since 2015, CMWD has monitored 39 non-ASR wells (20 pumping wells and 19 monitoring wells) using pressure transducers. For this model update, CMWD provided pressure transducer data that had been processed into daily maximum, minimum, and average water level elevations. These data did not include measurement flags indicating whether the water levels were logged under static or pumping conditions.

Because these wells are often operated or located near active wells, and the modeled groundwater level in the cells that contain these wells do not represent truly static conditions, INTERA used the daily average water level as calibration targets. INTERA reviewed each hydrograph and applied water level cutoffs to remove anomalous data (e.g., see water level measurements that exceed 500 ft. msl at well 02N20W01B02S in Appendix B). Additionally, the data were further processed into monthly average time series through December 31, 2021, and 3-day average time series after December 31, 2021, to better match the model's temporal resolution.

5.2.3.1 Additional Observation Filtering

Since 2021, groundwater elevations measured at well 03N20W35J01S have been approximately 75 feet higher than those measured previously at the same well. Groundwater level measurements at this well may be equilibrating to the Upper San Pedro (Bondy Groundwater Consulting, Inc., 2023). Because of this, pre-2015 water levels measured at this well were used for calibration, consistent with previous model versions, but water levels measured post-2015 were not included in the 2016 to 2023 calibration dataset.

Groundwater elevations measured at wells 03N20W25R04S, 03N19W31H01S, 03N19W31B01S, and 02N20W04R03S show significant daily variability, with fluctuations often exceeding 60 feet (Appendix B). The daily variability measured at these wells suggests that the measurements may be influenced by nearby pumping. To account for this, a 15-day moving average was applied to reduce measurement noise, while preserving long-term trends related to regional pumping and CWMD's ASR operations.

5.2.4 CMWD Transducer Data Collected after 2015 from ASR Wells.

CMWD continuously monitors groundwater levels in 18 of their ASR wells. For this model update, CMWD provided groundwater level data for all 18 wells. These data had been converted to hourly- or daily-average water levels. Like the non-ASR dataset, INTERA visually inspected each hydrograph and applied water level cutoff thresholds to remove anomalous data (Appendix B). These ASR transducer data were further processed to monthly- and 3-day average time series, consistent with the non-ASR well transducer datasets and the model's temporal resolution.

5.2.4.1 Additional Observation Considerations

During the ASR emergency imported water recovery operational event, CMWD limited operation of wells 02N20W01B01S, 02N20W01B02S, 03N19W31M03S, 03N19W31D06S, 03N19W31D03S, and 02N20W01E02S to prioritize collection of static groundwater elevation data. Because these wells are located in ASR Wellfields No. 1 and 2, they provide a valuable representation of local aquifer responses to ASR operations. These wells were given high priority in the calibration process to ensure that the model accurately reproduces localized aquifer response to injection and recovery operations.

Dynamic water levels measured at four pumping wells, 03N19W31D02S, 03N19W31D05S, 03N19W31E02S, and 03N19W31M04S, were also included in the calibration dataset because they exhibited a clean drawdown signal representative of the emergency imported water recovery operational event. These observations provide additional constraints on simulated water levels in ASR

Wellfield No. 2. To avoid biasing the model toward reproducing pumping levels, calibration focused on matching aquifer response trends rather than the lowest water levels measured at these wells.

5.2.5 Summary of Calibration Dataset

Table 5 summarizes the final calibration dataset by aquifer and period. The entire 54-year model simulation period is constrained by approximately 16,800 groundwater elevation measurements, approximately 60% of which were collected after 2015 (Table 5). The much higher data density in the last 8 years of the model simulation reflects CMWD’s efforts to equip groundwater wells with pressure transducers, providing high-frequency data and improving characterization of groundwater level responses to regional pumping, climate conditions, Arroyo Simi/Las Posas flows, and ASR operations. Importantly, the post-2015 data density implicitly places higher weight on matching recent ELPMA conditions during the calibration process. Combined with the daily ASR injection and extraction records (Section 3.5.1), these measurements increase confidence in the ability to reproduce aquifer responses to ASR activities.

Table 5. Summary of Model Calibration Targets (Groundwater Elevations)

Aquifer	1970 to 2015		2016 to 2021		2022 to 2023	
	Stress Period Duration	Number of Observations	Stress Period Duration	Number of Observations	Stress Period Duration	Number of Observations
EGA/SAA	Monthly	951	Monthly	396	Daily	916
Upper San Pedro	Monthly	1,280	Monthly	447	Daily	722
Fox Canyon	Monthly	3,948	Monthly	2,329	Daily	4,278
Grimes Canyon	Monthly	762	Monthly	248	Daily	557
Total	Monthly	6,941	Monthly	3,420	Daily	6,473

Notes: EGA = Epworth Gravels Aquifer; SAA = Shallow Alluvial Aquifer

5.3 Calibration Objectives

Model calibration was assessed using quantitative and qualitative metrics. Quantitative metrics included the mean error (ME):

$$ME = \frac{1}{n} \sum_{i=0}^n (h_{sim,i} - h_{m,i})$$

Mean absolute error (MAE):

$$MAE = \frac{1}{n} \sum_{i=0}^n |h_{sim,i} - h_{m,i}|$$

And root mean square error (RMSE):

$$RMSE = \left[\frac{1}{n} \sum_{i=0}^n (h_{sim,i} - h_{m,i})^2 \right]^{0.5}$$

Where:

- h_{sim} = simulated groundwater elevation
- h_m = measured groundwater elevation
- n = number of observations

Each metric provides insight into the accuracy of simulated heads and potential model biases, such as systematic over- or under-estimate of modeled heads and their responses to ASR activities. In addition to these metrics, spatial error maps and the correlation between simulated and measured heads were examined.

Since the ELPMA was well-calibrated prior to this update, the objective of the current calibration was to maintain or improve these statistics across the full model domain, with a focus on simulated ASR responses. In addition, model calibration was qualitatively assessed by visually comparing model results to measured groundwater elevations and through a qualitative evaluation of model aquifer property distributions and their relation to the parameter fields shown in Attachment A.

5.4 Calibration Results

5.4.1 Calibration Statistics

Table 6 shows the revised model calibration statistics by aquifer and across the entire model domain, broken down into three separate model periods:

- **1970 to 2015**, which represents the previous model simulation period. Calibration statistics during this period provide a direct comparison to INTERA (2018) and subsequent updates to the model (Attachment A) to evaluate whether the updated calibration has maintained or improved previous calibration efforts.
- **2016 to 2023**, which represents the model extension period. Calibration statistics during this period provide a direct measure of how well the model reproduces recent groundwater conditions, including during the ASR emergency imported water recovery operational event.
- **1970 to 2023**, which represents the entire updated model simulation period. Calibration statistics during this period provide a measure of how well the updated model reproduces the entire record of measurement in the ELPMA.

Table 6. Updated ELPMA Model Calibration Statistics

Aquifer / Formation	Period	Range of Observed Water Levels (ft.)	Mean Error (ft.)	Mean Absolute Error (ft.)	Root Mean Square Error (ft.)
EGA / SAA	1970 to 2015	575	1.0	7.7	11.4
	2016 to 2023	380	-1.1	8.4	10.9
	1970 to 2023	585	-0.2	8.1	11.1
Upper San Pedro	1970 to 2015	345	2.5	9.3	14.4
	2016 to 2023	395	-6.8	12.4	19.0
	1970 to 2023	395	-1.9	10.8	16.8
FCA	1970 to 2015	491	0.4	12.8	17.7
	2016 to 2023	318	-0.5	10.3	15.8
	1970 to 2023	491	-0.2	11.3	16.6
GCA	1970 to 2015	284	-1.0	9.5	12.2
	2016 to 2023	277	-3.2	7.1	9.4
	1970 to 2023	286	-2.2	8.3	10.8
Entire Model	1970 to 2015	620	0.7	11.1	15.8
	2016 to 2023	614	-1.6	10.1	15.3
	1970 to 2023	630	-0.6	10.5	15.5

Notes: ft. = feet; FCA = Fox Canyon aquifer; GCA = Grimes Canyon aquifer; EGA = Epworth Gravels aquifer; SAA = Shallow Alluvial aquifer

Over the full simulation period, the updated ELPMA model has a scaled MAE and scaled RMSE of approximately 1.7% and 2.5%, respectively (Table 6).⁵ These values exceed industry standards for scaled calibration metrics (Spitz and Moreno, 1996; Rumbaugh and Rumbaugh, 2005).

Over the 1970 to 2015 period, the updated model has a scaled MAE and RMSE of 1.8% and 2.6%, improving on the model performance described in Section 2. Importantly, the updated model's ME is approximately 3 feet lower than previous versions, reducing the model's tendency to slightly overestimate heads across the ELPMA. Over the 2016 to 2023 period, the scaled MAE and RMSE are approximately 1.6% and 2.5%, respectively. These metrics are similar to the historical period and, importantly, show that recalibration improved the model's ability to simulate recent groundwater conditions and aquifer responses during the CMWD ASR emergency imported water recovery operational event. See Section 5.4.2 for more details.

The final distributions of aquifer properties and HFB conductance values are shown in Appendix C and individual well calibration statistics, with estimates of model uncertainty, are included in Appendix D. Correlations between simulated and observed groundwater levels and simulated hydrographs are shown in Figures 5.3 through 5.6 and Appendix E, respectively. In addition, Figures 5.7 through 5.10 show the distribution of model errors, represented as the root mean square error by well. Collectively, these figures demonstrate that the updated model shows limited bias, both in the spatial and vertical distributions of model error.

5.4.2 Model Performance Evaluation at Select Hydrographs

To evaluate model performance improvements, INTERA developed hydrographs that compare measured groundwater elevations with different versions of the ELPMA model (Figures 5.11 through 5.13). In these charts, the blue symbols represent measured groundwater elevations, the red lines represent simulation results from the previous model version (extended through March 2023)⁶, and the black lines represent results from the updated, re-calibrated ELPMA model. These hydrographs illustrate model performance in and around ASR Wellfields No. 1 and 2 (see well locations Figure 4.1) and are the same set of wells presented in Section 4. Importantly, Figures 5.11 through 5.13 show wells that were inactive during CMWD's ASR emergency imported water recovery operational event but are located in areas where drawdown was measured (Bondy Groundwater Consulting, Inc. 2023). The comparison of measured and simulated heads at these wells quantifies the model's improved ability to reproduce aquifer responses to ASR operations.

Figure 5.11 compares simulated and measured groundwater elevations near CMWD's ASR Wellfield No. 2. The previous model reproduces general trends in these wells but overestimates groundwater elevations by about 15 to 17 feet (12 to 16% of the measured range) and underrepresents the lows observed during CMWD's emergency imported water storage recovery event. In contrast, the updated

⁵ The normalized root mean square error (RMSE) and normalized mean absolute error (MAE) are equal to the RMSE and MAE divided by the range in measured observations, respectively.

⁶ This version of the model represents the FCA using a single model layer and did not incorporate the model layer revisions described in Section 4.

model reduces the overestimation bias and more accurately matches the groundwater elevation measured in 2022. Similar improvements occur near ASR Wellfield No. 1, where model errors decreased by approximately 15 to 20 feet (Figure 5.12).

West of ASR Wellfield No. 2 and south of the Fairview Fault, the previous model shows similar overestimation bias at well 03N20W25R04S, with the simulated heads averaging 21 feet higher than corresponding measurements (Figure 5.13). At well 03N20W36A02S, the previous model reproduced groundwater elevations well through 2015 but overestimates heads in the extension period, particularly in 2019, when CMWD increased storage of imported water in the ELPMA. At both wells, the updated model better reproduces groundwater level trends and responses to regional pumping and ASR operations.

North of the Fairview Fault, the previous model (Attachment A) does not capture the long-term groundwater elevation trends or the emergency imported water recovery operational event responses at either wells 03N19W30E07-I or 03N19W30D01S (Figure 5.13). At both wells, the updated model significantly reduces error and more accurately simulates groundwater level declines measured during ASR emergency imported water recovery operational event (Figure 5.13). These simulation results are a notable improvement in representing aquifer response to ASR operations north of the Fairview fault.

Across the ELPMA, the updated model accurately reproduces groundwater level trends and fluctuations (Table 6). However, the model struggles to match observations at CMWD's new well cluster, MW-3, in South Las Posas (see well locations in Figure 4.1 and hydrographs in Figure 5.14). Measurements at wells 02N20W11B01S and 02N20W11B02S show vertical upward gradients in the FCA, with 02N20W11B01S consistently 40 to 50 feet higher than 02N20W11B02S and exhibiting a more dampened response to regional pumping. The updated model does not capture these vertical gradients or differences in regional pumping responses. It is noted that this well is on the south side of the Moorpark Anticline; therefore, groundwater levels in this monitoring well cluster may be impacted by localized folding and faulting. ASR responses were not observed to propagate to this part of the ELPMA during the 2022 emergency imported water recovery operational event (Bondy Groundwater Consulting, Inc., 2023).

5.4.3 Evaluation of Simulated ASR Responses

To quantify the updated model's performance in representing ASR responses across the ELPMA, INTERA ran a "No ASR" scenario in which injection and extraction from CMWD's ASR Wellfield was turned off for the period from July 1, 2022, through December 7, 2022 (Bondy Groundwater Consulting, Inc., 2023). Drawdown associated with the ASR emergency imported water recovery operational event was then calculated by subtracting the simulated heads from the updated model run from the "No ASR" scenario. The simulation results are compared to the drawdowns estimated by Bondy Groundwater Consulting, Inc. (2023), which were developed by calculating the difference between groundwater elevation lows measured in December 2022 and an estimate of groundwater elevations in the absence of ASR pumping calculated using the slope of water level declines measured between January and June 2022 (Table 7).

The updated model closely matches the observed drawdowns (Table 7). Across the 9 wells with measured ASR responses, the average model error is 1.8 feet. At all wells except 03N19W31B01S, 03N19W31D07S, and 03N19W31H01S, this difference is within the model uncertainty (Appendix D). At

03N19W31B01S, regional water level decline rates varied between January 2022 and June 2022, while at 03N19W31D07S, the December 2022 low was estimated using nearby measurements. At well 03N19W31H01S, groundwater levels were only measured during a portion of the ASR emergency imported water recovery operational event and, therefore, the measured drawdown estimates are uncertain (Bondy Groundwater Consulting, Inc., 2023).

Given these uncertainties, the simulation results show good agreement with the observed drawdowns at both wells.

Table 7. Summary of Measured and Simulated Drawdowns at Non-ASR wells in the Fox and Grimes Canyon Aquifers during CMWD’s ASR Emergency Imported Water Recovery Operational Event

Well	Aquifer	Maximum Estimated Drawdown (ft) ^a	Maximum Simulated Drawdown (ft)
02N19W07K02S	FCA	Not Detected	0.0
02N20W01A01S	FCA	Insufficient Data	25.9
02N20W01E03S	FCA	18.4	11.6
02N20W02D02S	FCA	Not Detected	0.8
02N20W03H01S	FCA	Not Detected	0.3
02N20W03J01S	FCA	Not Detected	0.3
02N20W04B01S	FCA	Not Detected	0.2
02N20W04R03S	FCA	Not Detected	0.2
02N20W11B01S	FCA	Not Detected	0.3
02N20W11B02S	FCA	Not Detected	0.3
03N19W30D01S	FCA	10.8	13.4
03N19W30E07-I	FCA	12.9	16.1
03N19W31B01S	FCA	22	30.9
03N19W31D07S	FCA	36	46.8
03N19W31H01S	FCA	Not Detected	21.4
03N20W25R04S	FCA	32	28.5
03N20W35J01S	FCA	N/A ^b	13.2
03N20W35R02S	FCA	20.5	16.2
03N20W36A02S	FCA	Insufficient Data	29.5
03N20W36A04S	FCA	Insufficient Data	29.5
03N20W36G01S	FCA	27	27.2
03N20W36P01S	FCA	N/A ^b	20.3
03N19W30E07-D	GCA	3.4	9.0

Notes:

^aDrawdown estimates from Bondy Groundwater Consulting, Inc. (2023).

^bBondy Groundwater Consulting, Inc. (2023) notes that water levels measured in these wells were not representative of conditions in the FCA or the pressure transducer / well was being rehabilitated.

6.0 Summary and Conclusions

6.1 Summary

The ELPMA model was updated to extend the simulation period from December 2015 to March 2023. Over this extension period, the model tended to overestimate groundwater elevations and underestimate measured drawdowns during CMWD's ASR emergency imported water recovery operational event. To improve model performance during this period, new lithologic and geophysical data were incorporated into the conceptual model of the ELPMA, which led to a refinement of the model layering and hydrostratigraphic interpretation of the FCA. These hydrostratigraphic revisions refined the FCA thickness in the northern ELPMA and enhanced the prominence of the Moorpark anticline in southern ELPMA. To improve the model's ability to represent variably confining conditions across dominant structural features that control groundwater flow, the FCA was split into two model layers.

To improve model performance and account for these structural revisions, the ELPMA model was recalibrated with PESTPP-IES, a global, ensemble-based parameter estimation method that implements the iterative Ensemble Kalman smoother technique (White et al., 2020; Doherty, 2018; Evenson et al., 2021). The calibration efforts focused on refining model properties in the FCA and GCA to improve consistency between simulated and observed groundwater levels. Calibration using a tool like PESTPP-IES allowed systematic analysis and treatment of model parameterization to capture detailed information about aquifer system responses in the observation data. Calibration was focused on simulating regional groundwater levels in the basin with an additional focus on aquifer responses to ASR injection and extraction from the CWMD ASR Project.

The updated ELPMA was constrained with best available data, including high-frequency pressure transducer and ASR data that significantly improve characterization of groundwater level trends and responses to ASR operations. The model to measurement fit is well above industry standards, with a scaled MAE and RMSE of approximately 1.8% and 2.6%, respectively. The ME of the updated model is less than 1 foot, a 3-foot improvement over the previous model versions, indicating that the model accurately reproduces regional groundwater elevations and improves on the ability to simulate groundwater level fluctuations associated with ASR activities. These improvements to an already well-calibrated model demonstrate the model is a robust analysis tool to support ASR operations planning in the ELPMA.

6.2 Additional Considerations and Opportunities for Future Model Improvements

The model update and recalibration required a series of technical assumptions and simplifications to represent complex hydrogeologic conditions in the ELPMA. These assumptions, along with recognized limitations (INTERA, 2018), influence the interpretation and use of model results. The following bullets summarize aspects of the model that should be considered when using the tool for planning purposes and identify opportunities for future model improvements.

- **Spatial Resolution:**

The ELPMA model is spatially discretized using a 200-foot grid to capture the local variability observed in the groundwater monitoring network for the LPV Basin. While this discretization provides high-resolution estimates of local groundwater level fluctuations, groundwater conditions simulated by the model represent spatially averaged conditions that are not meant to replicate pumping water levels at an individual well. As a result, observed drawdowns may be larger than the simulated results.

- **Data Simplifications for Model Extension:**

Simulated evapotranspiration along Arroyo Simi/Las Posas uses the same monthly pattern for 2000 through 2023. This implicitly assumes that EVT does not change year to year or that the areal coverage of non-native phreatophytes along the Arroyo has not changed since 2000. Additional measurements of the change in spatial extent of phreatophytes along Arroyo Simi/Las Posas would improve the model's representation of EVT losses in the ELPMA. In addition, the subsurface inflows from Happy Camp Canyon were extended using an average value from the last 5 years of the model. This assumes subsurface inflow is not very sensitive to variations in annual hydrology. The contribution of this to the basin water budget is small.

The effect of these assumptions on evaluating ASR responses in the ELPMA are expected to be minimal, as EVT losses are limited to the Shallow Alluvial aquifer and subsurface inflows from Happy Camp Canyon occur only in the GCA, far from the ASR Wellfields.

- **Non-ASR Pumping Data Resolution and Distribution:**

Pumping data are reported to FCGMA semi-annually. These groundwater extraction reports increase confidence in annual water budgets that drive regional groundwater trends, but lack the temporal resolution required to accurately capture monthly and seasonal pumping variations and groundwater level fluctuations (INTERA, 2018). While the assumptions used to distribute semi-annual extraction reports to monthly pumping volumes provide a reasonable first-order estimate, there is uncertainty in the timing and distribution of pumping stresses. Higher frequency data, such as monthly data collected via Automated Metering Infrastructure (AMI), if available, would improve monthly representation of pumping stresses in the model.

- **Hydrogeologic Conceptual Model:**

The hydrostratigraphic revisions implemented in this model update have improved representation of the FCA in the northern ELPMA and along the Moorpark anticline. However, uncertainty in the hydrogeologic conceptual model of the south of the Moorpark anticline remains, impacting the model's ability to represent groundwater elevations measured at CMWD's new clustered monitoring wells (MW-3). The effects of this hydrogeologic conceptual model uncertainty on evaluating ASR responses is expected to be minimal because ASR

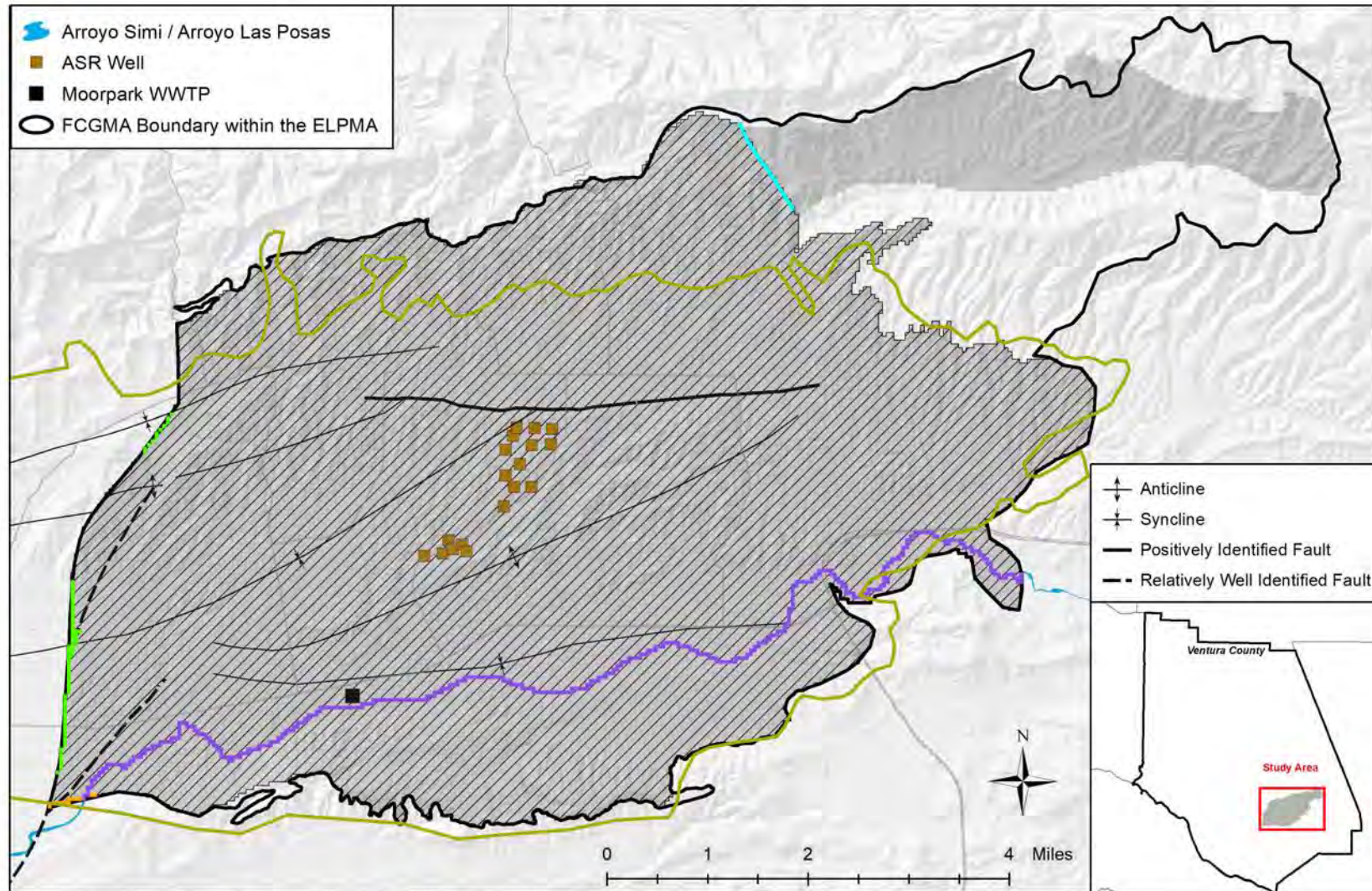
responses did not propagate to MW-3 during CMWD's emergency imported water recovery operational event.

Additional information, from new wells or geophysical studies, could lead to future updates to the hydrogeological interpretation and offer additional insights to groundwater occurrence and movement in the ELPMA.

7.0 References

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Boundary Conditions - Layer 1

- Specified Head Cell
- Stream Cell

Boundary Conditions - Layer 3

- General Head Boundary Cell (GHB)

Boundary Conditions - Layer 7

- Specified Flux (Revised Model Only)

Active Model Area

- Active Model Area (Revised)
- Active Model Area (Original)
- Las Posas Valley Groundwater Basin (Bulletin 118, 2016)



Figure 2.1
ELPMA Model Domain and Boundary Conditions
ELPMA Groundwater Model Technical Memorandum

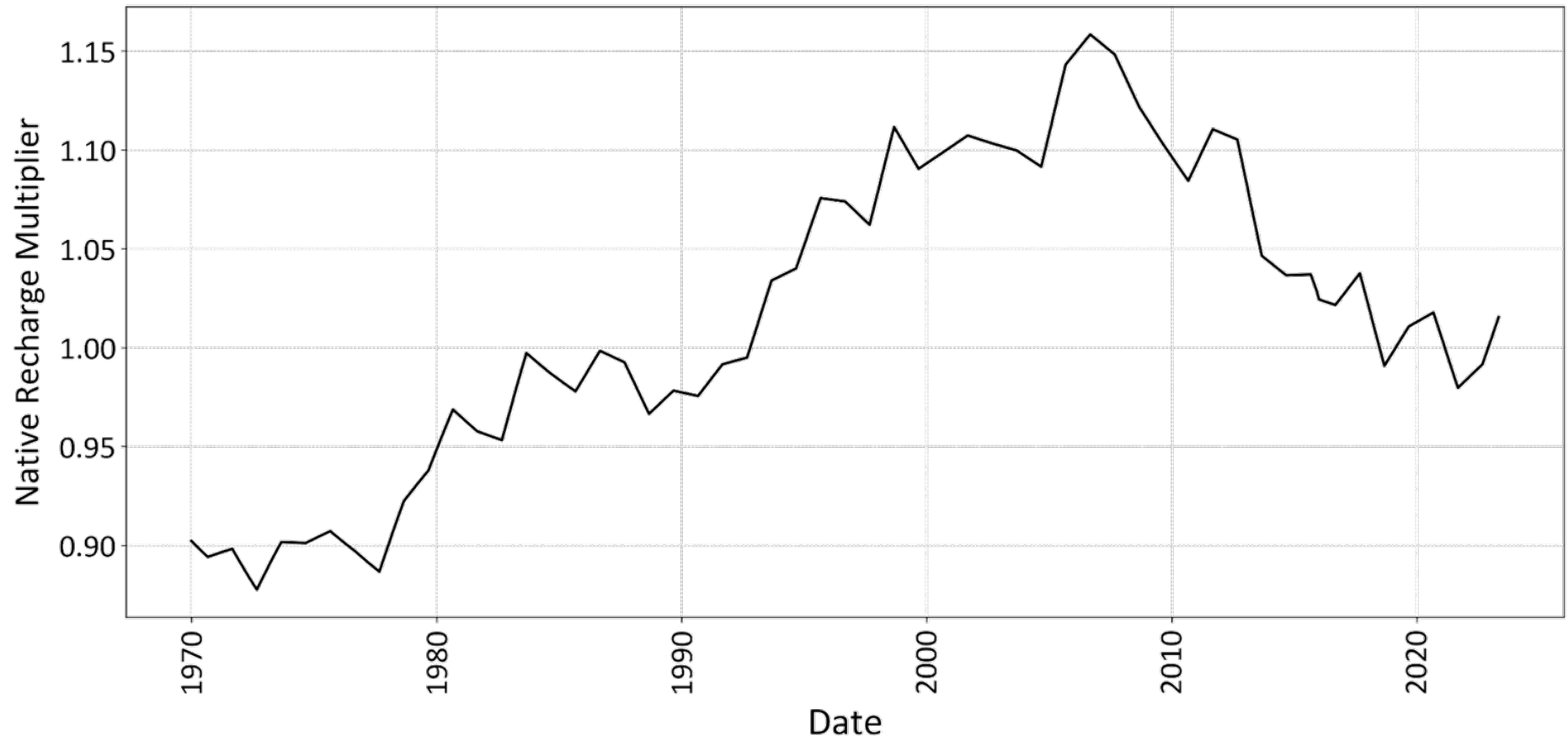


Figure 3.1
Native Recharge Scaling Factors Over the 1970 to 2023
Simulation Period
ELPMA Groundwater Model Technical Memorandum



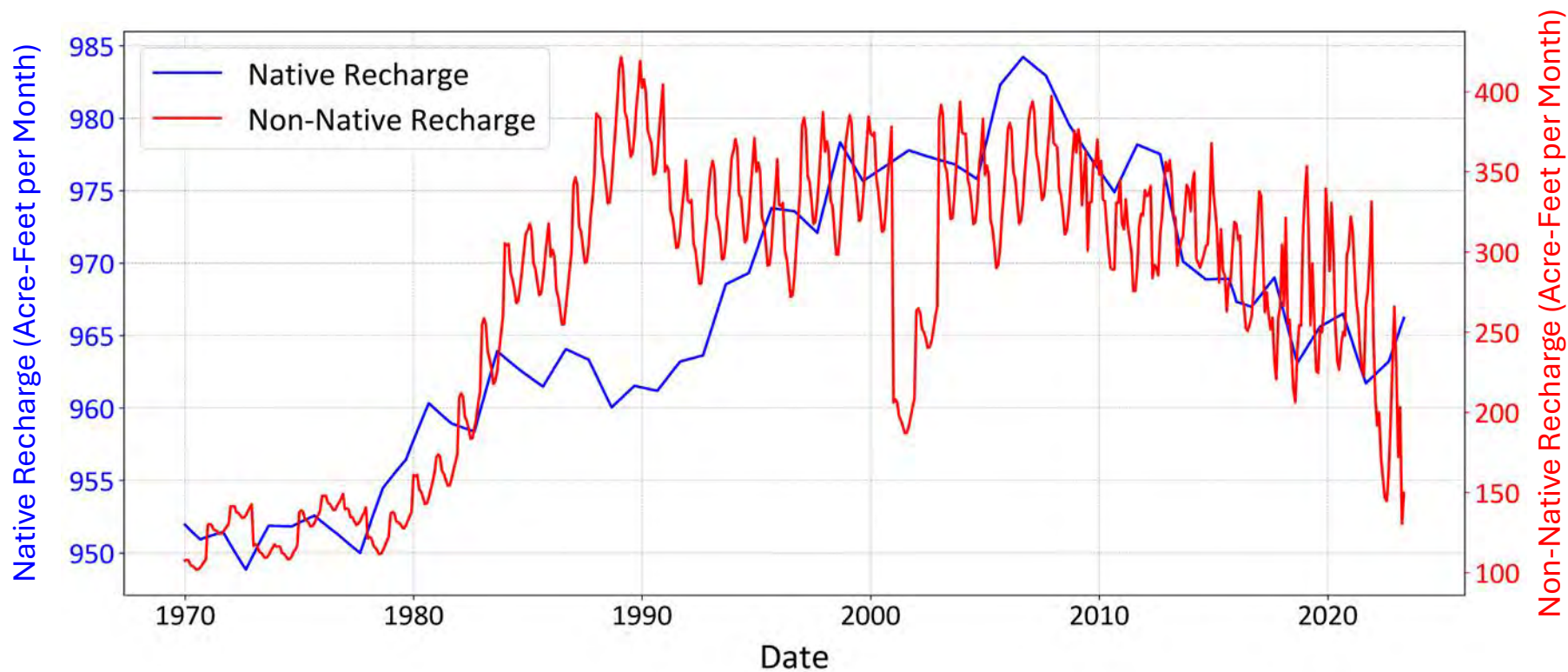
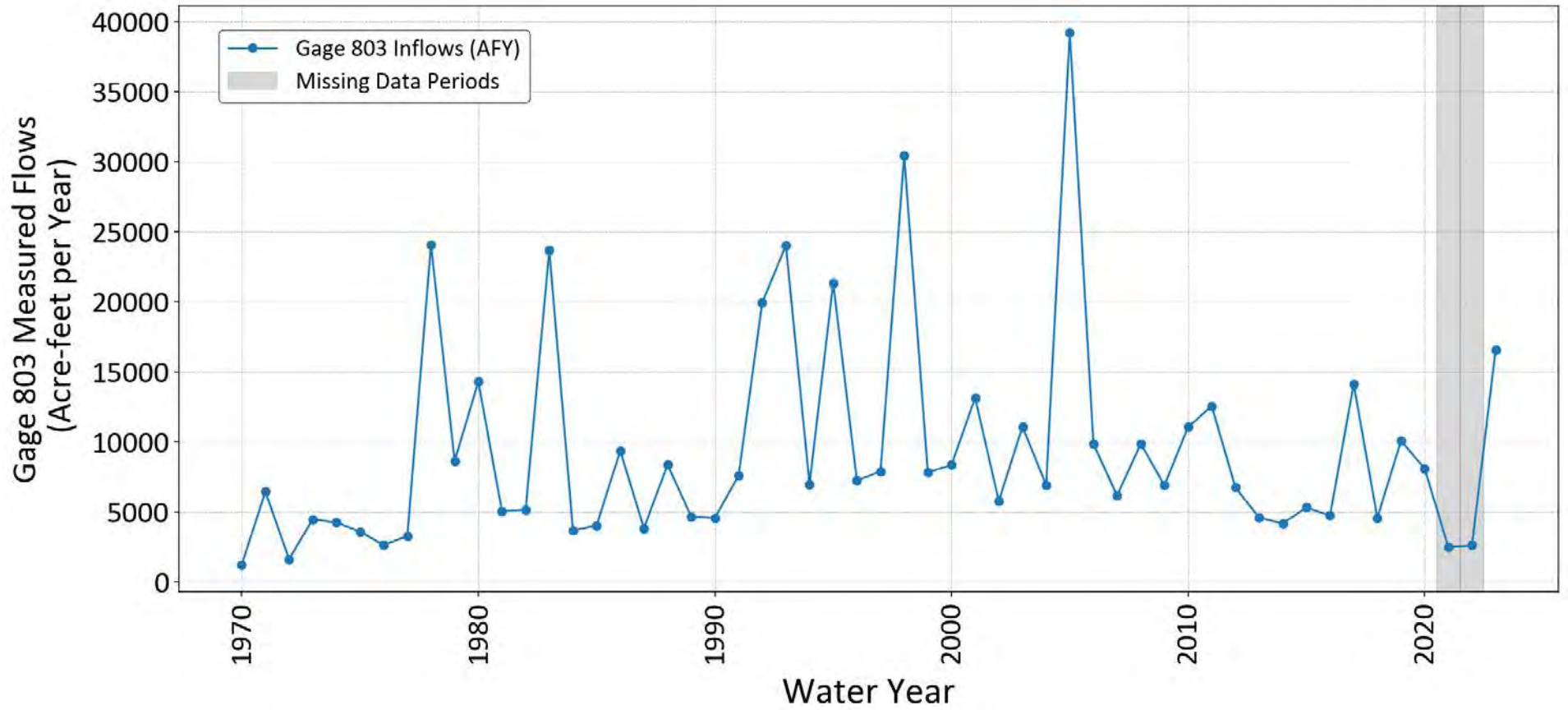


Figure 3.2
Native vs Non-Native Recharge in the ELPMA
ELPMA Groundwater Model Technical Memorandum

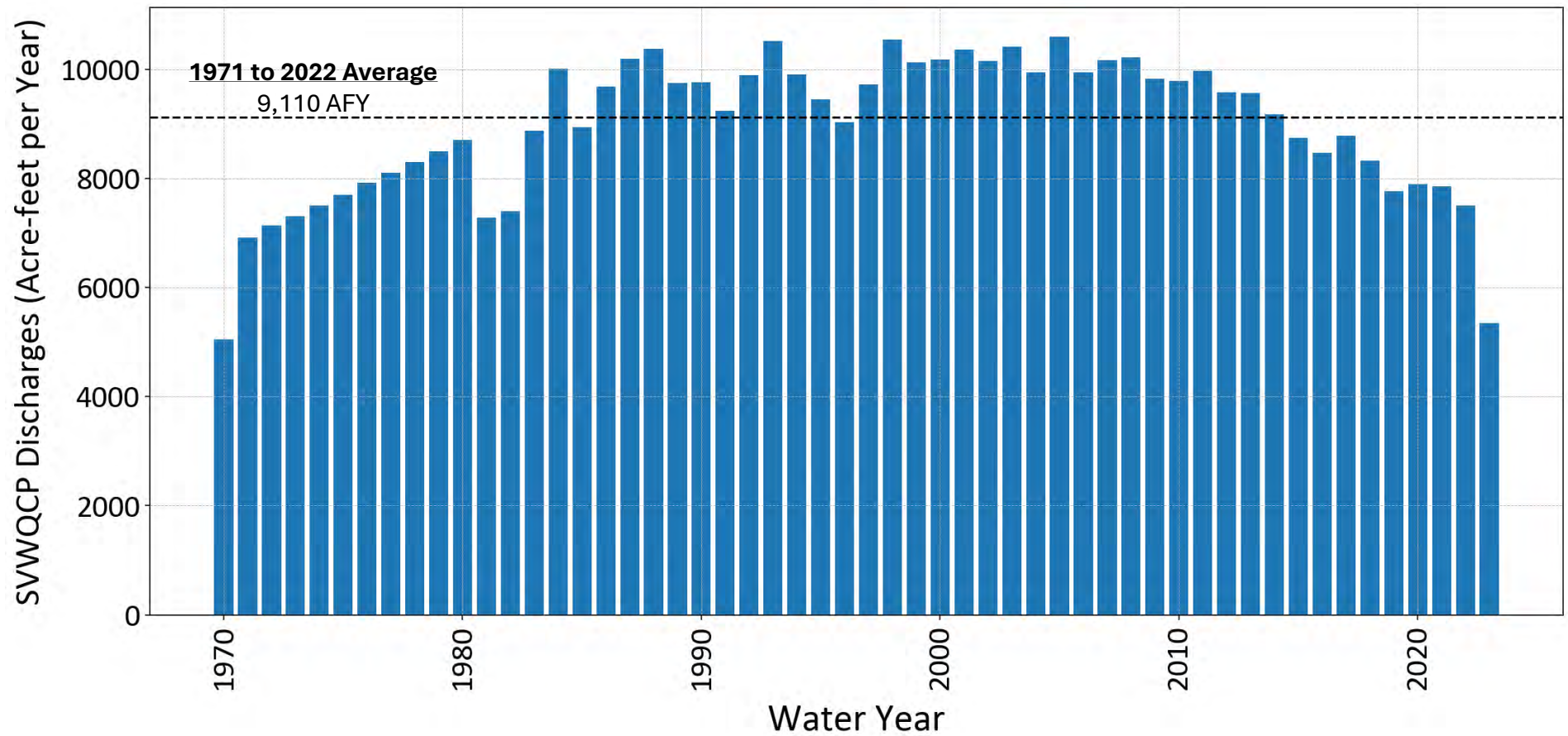


Notes:

Gray-shaded areas indicate water years with missing data that were estimated using analogous water years. See description in Section 3.4.1.



Figure 3.3
 Surface Water Flows Measured at Gage 803
 from 1970 through 2023
 ELPMA Groundwater Model Technical Memorandum



Notes:

SVWQCP = Simi Valley Water Quality Control Plant

1970 and 2023 excluded from average because the simulation period does not include the entire water year.



Figure 3.4
 Annual Discharge from SVWQCP to the
 Arroyo Simi/Las Posas
 ELPMA Groundwater Model Technical Memorandum

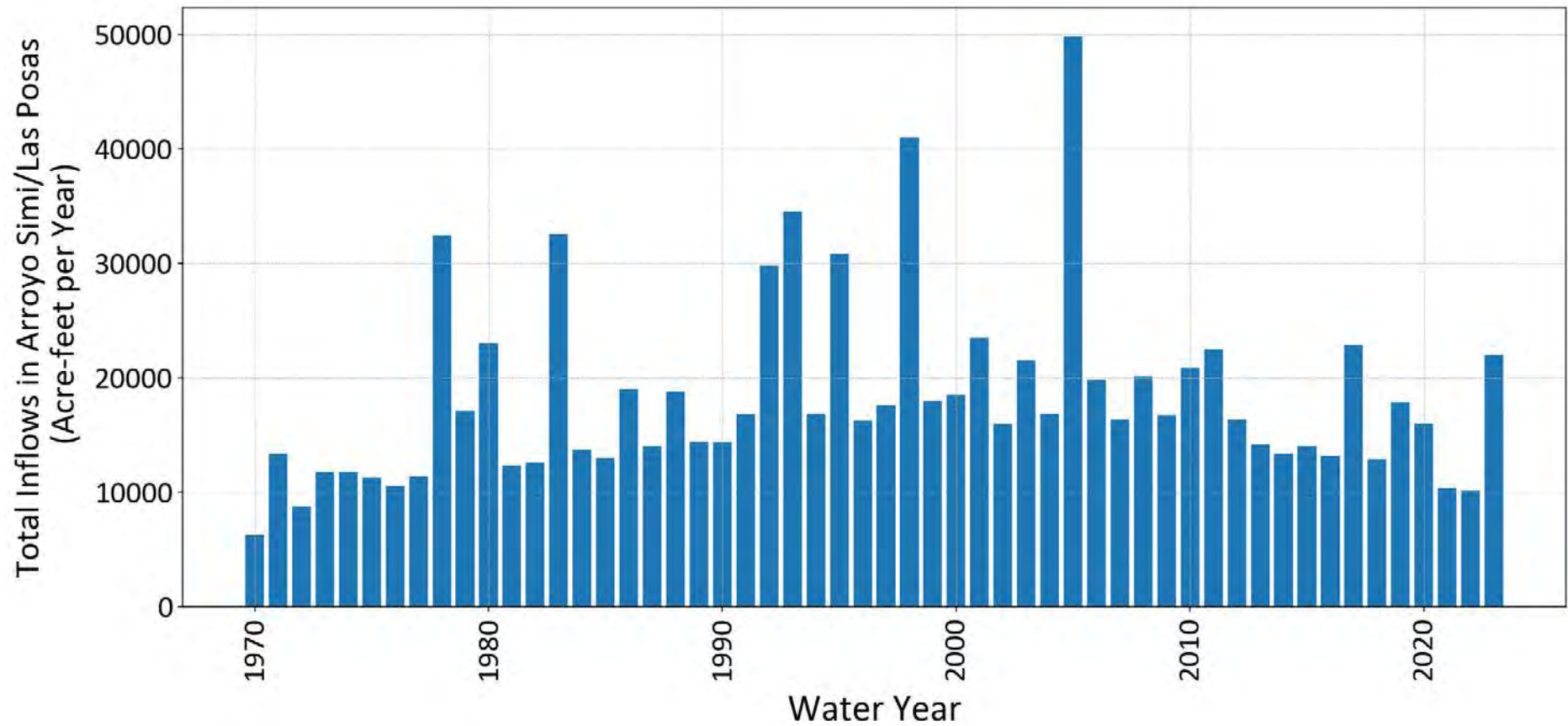
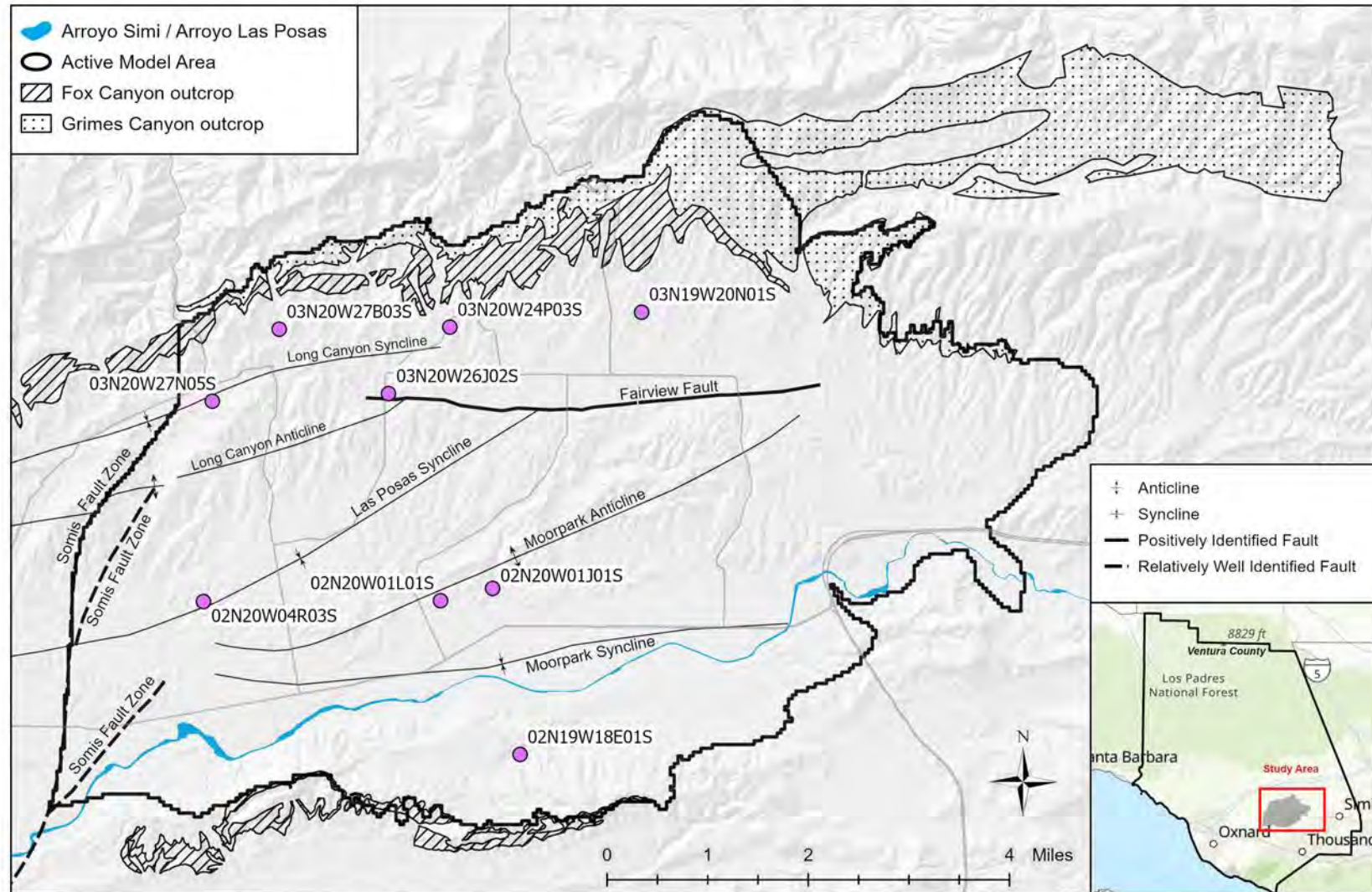


Figure 3.5
 Annual Total Inflows Entering Arroyo Simi/Las Posas at the Model Boundary from 1970 to 2023
 ELPMA Groundwater Model Technical Memorandum



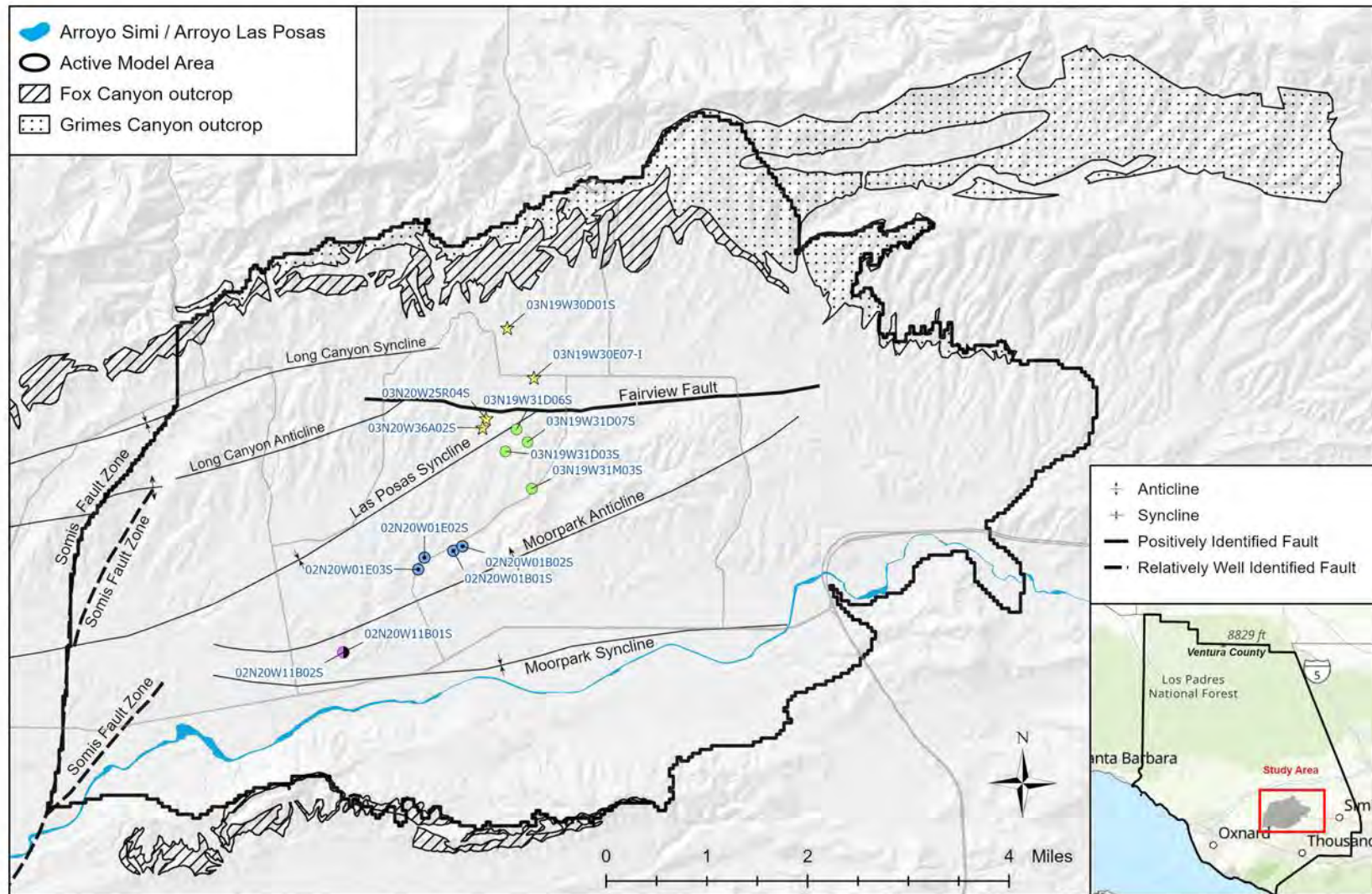


New Extraction Wells in the ELPMA

- Groundwater Extraction Wells Added to the ELPMA Model



Figure 3.6
 Location of New Extraction Wells within
 Model Domain
 ELPMA Groundwater Model Technical Memorandum



Select Wells in the ELPMA

- Wells in the Vicinity of ASR WellField No. 1
- Wells in the Vicinity of ASR WellField No. 2
- ★ Non-ASR Wells
- New CMWD Monitoring Well in South Las Posas



Figure 4.1
Select Wells in the ELPMA Model
 ELPMA Groundwater Model Technical Memorandum

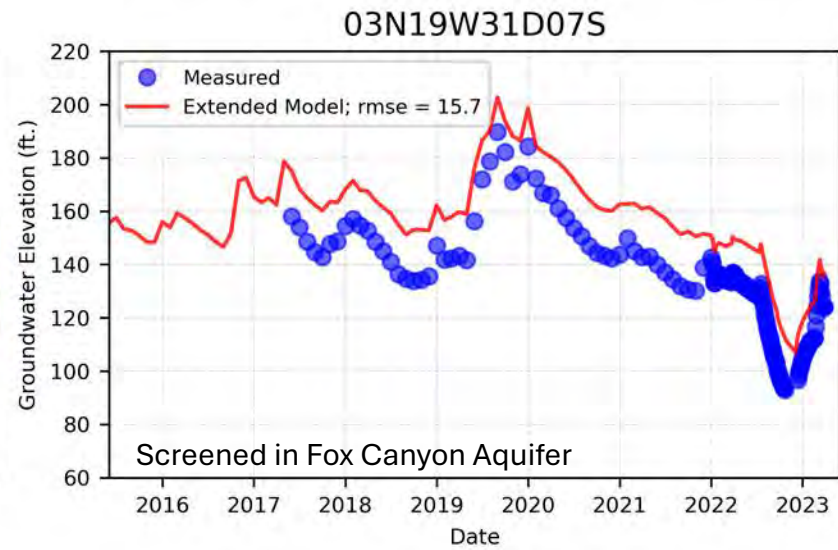
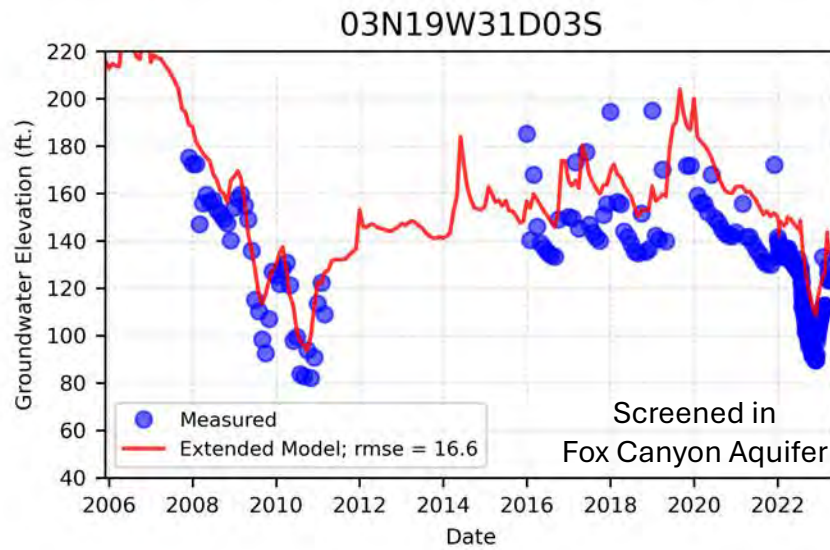
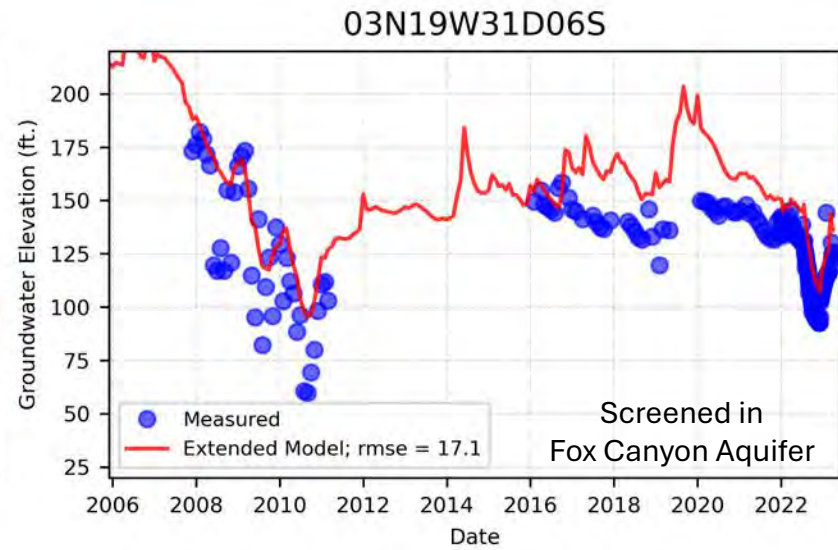
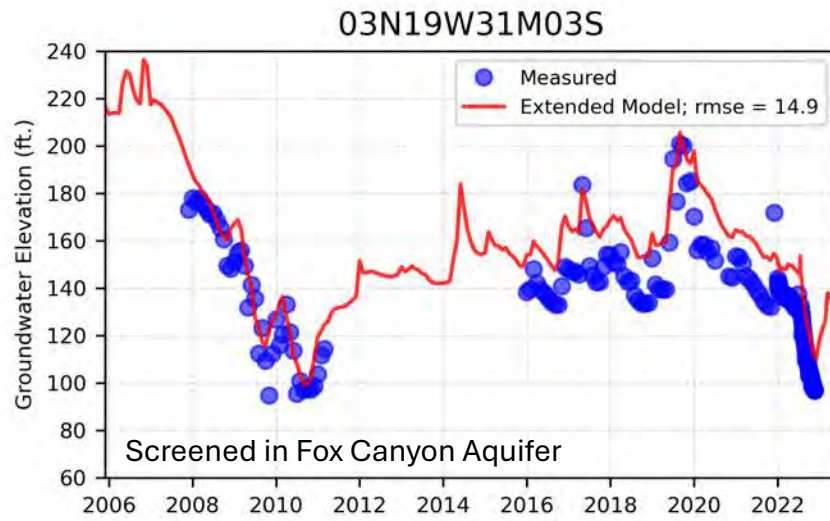


Figure 4.2
Evaluation of Extended Model
ASR Wellfield No. 2
ELPMA Groundwater Model Technical Memorandum

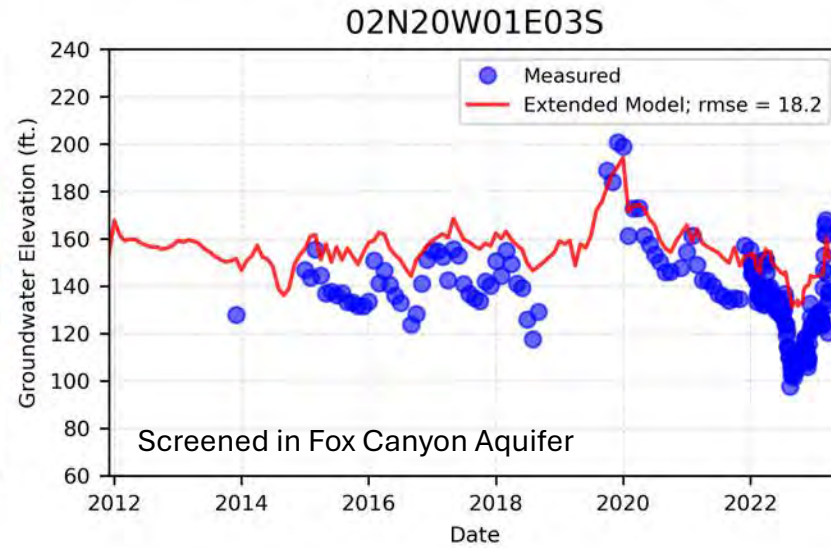
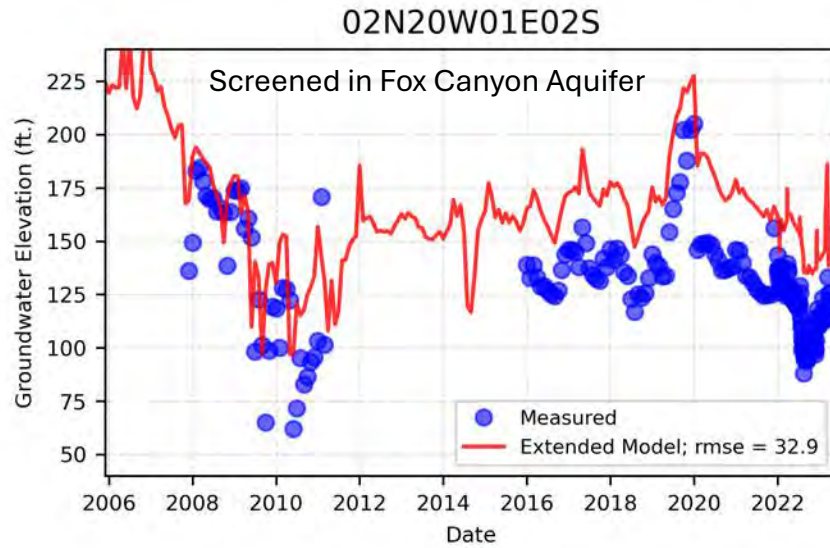
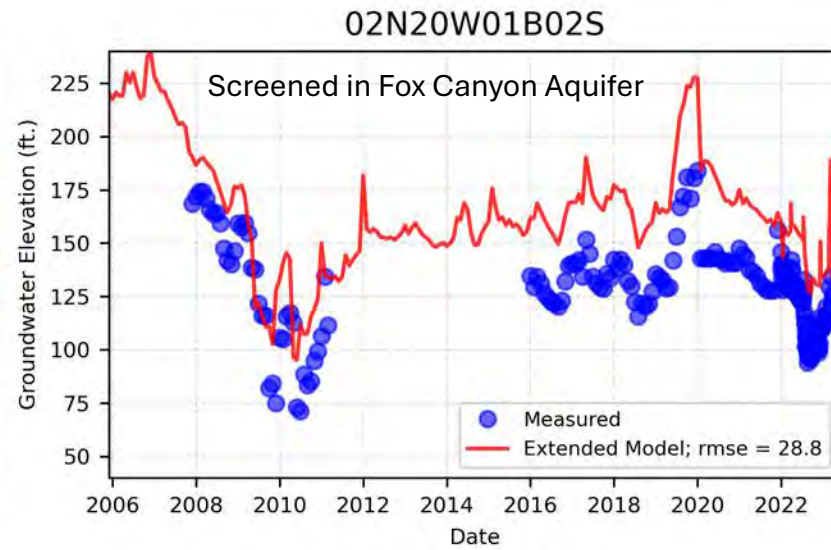
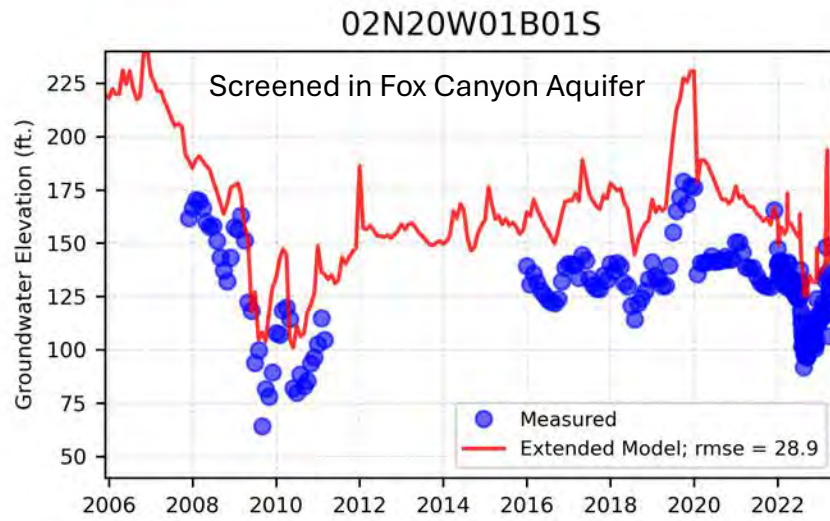


Figure 4.3
Evaluation of Extended Model
ASR Wellfield No. 1
ELPMA Groundwater Model Technical Memorandum

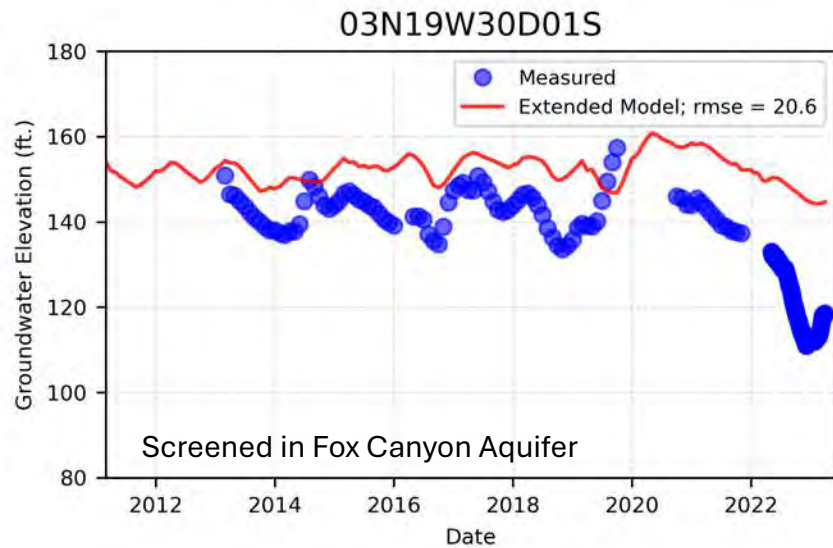
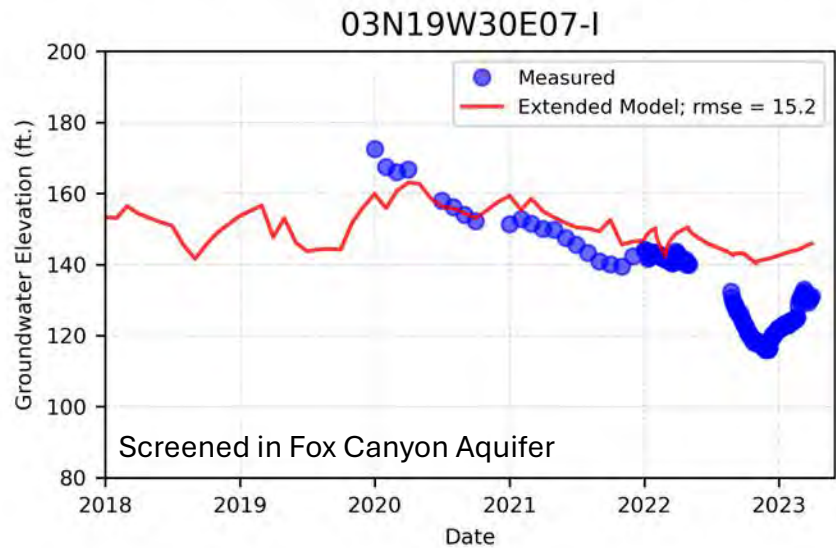
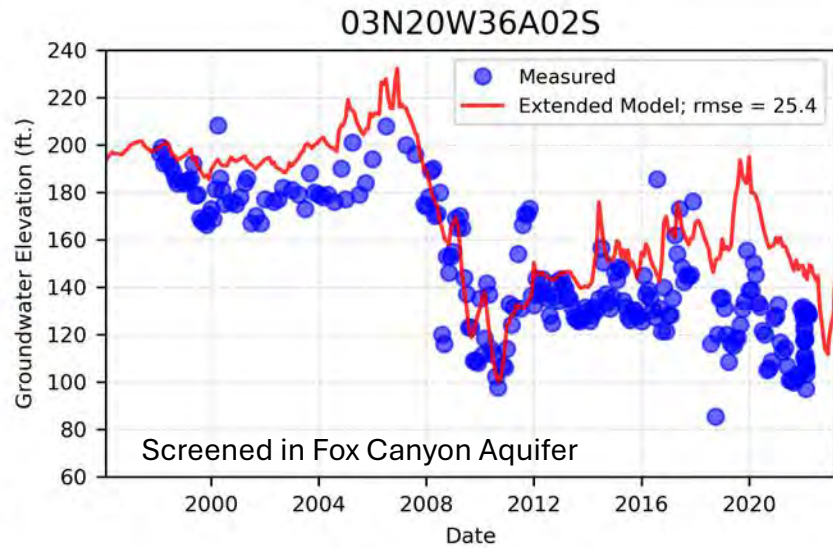
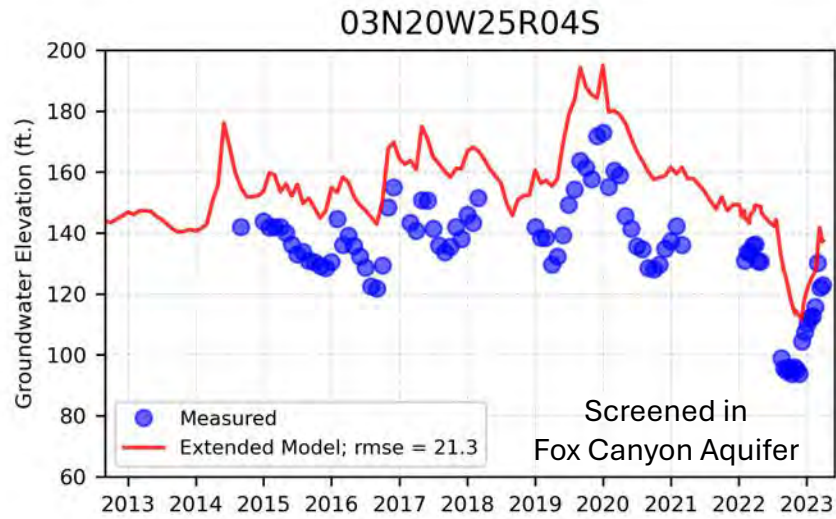
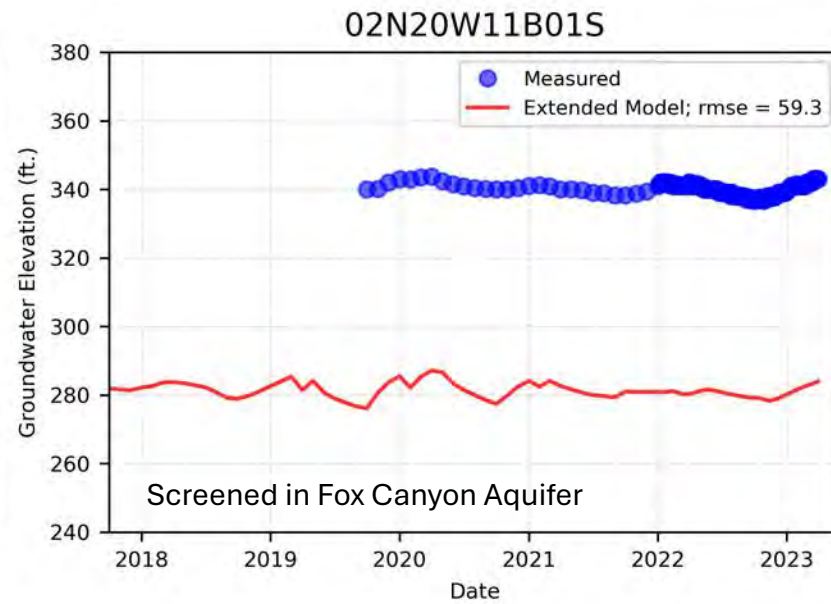
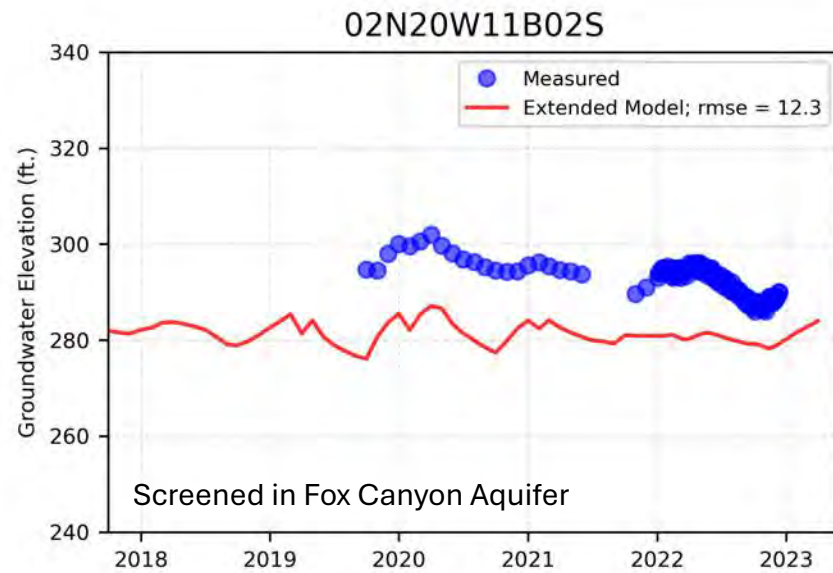


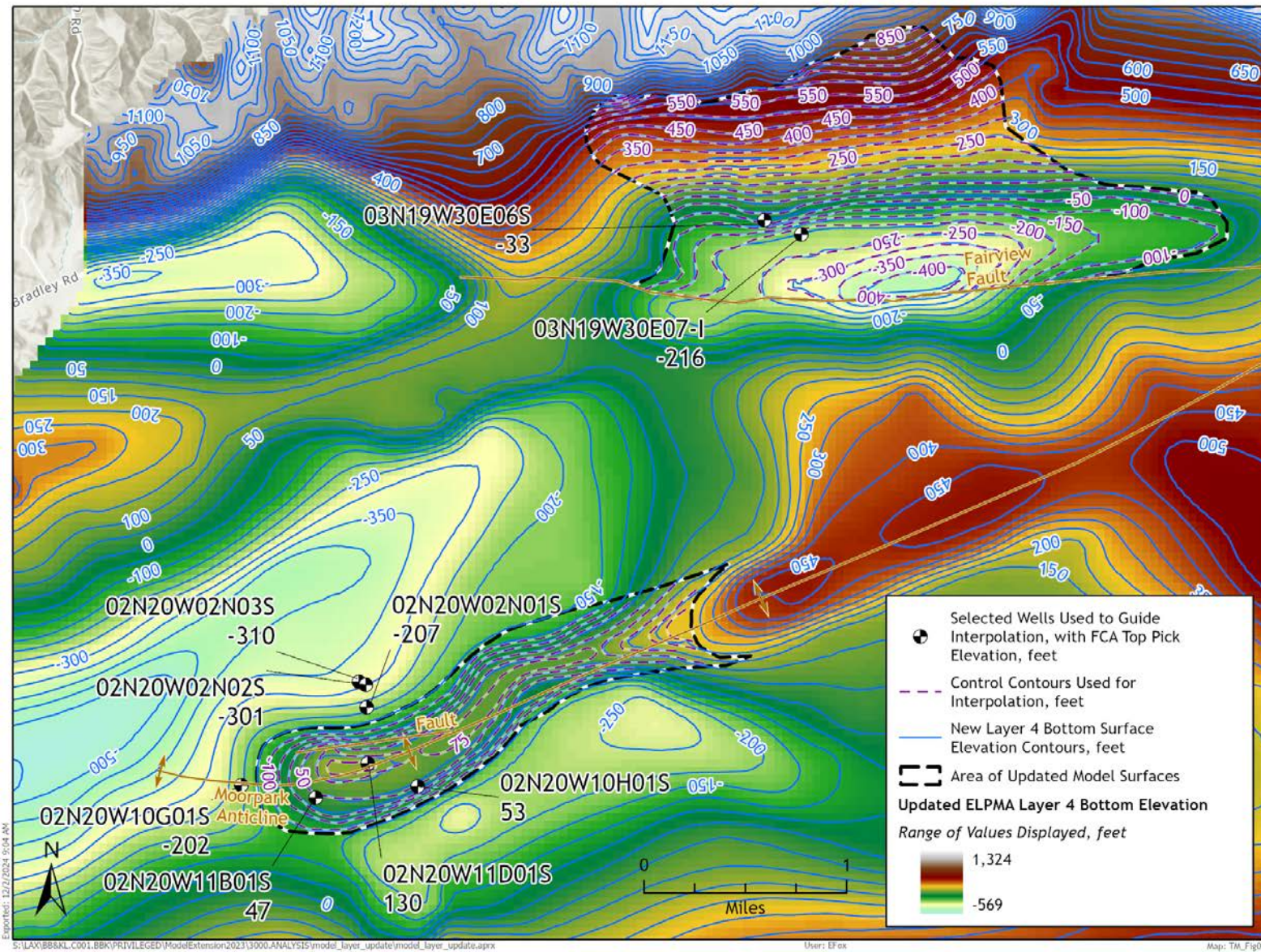
Figure 4.4
 Evaluation of Extended Model
 Non-ASR Wells near Wellfield No. 2
 ELPMA Groundwater Model Technical Memorandum



SWN	Screen Interval	Aquifer
02N20W11B01S	665-725	FCA Lower
02N20W11B02S	415-515	FCA Upper



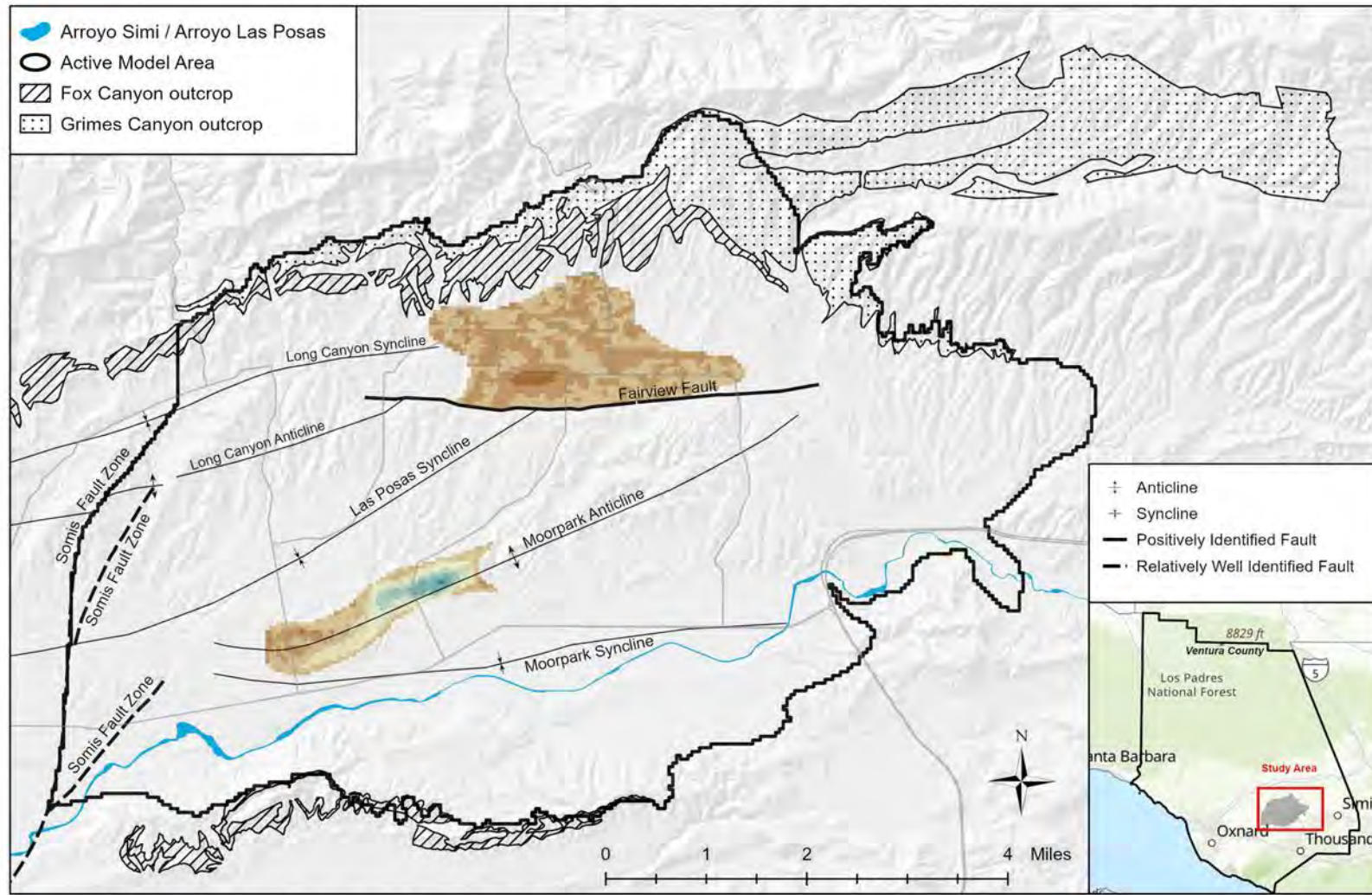
Figure 4.5
 Evaluation of Extended Model
 CMWD MW-3 in South Las Posas
 ELPMA Groundwater Model Technical Memorandum



Notes:
 The bottom of model layer 4, and top of model layer 5, represents the top of the Fox Canyon aquifer.

Figure 4.6
 Top Elevation of the Fox Canyon Aquifer North of Fairview Fault and along Moorpark Anticline
 ELPMA Groundwater Model Technical Memorandum





Change in Top Elevation of the Fox Canyon Aquifer (feet)

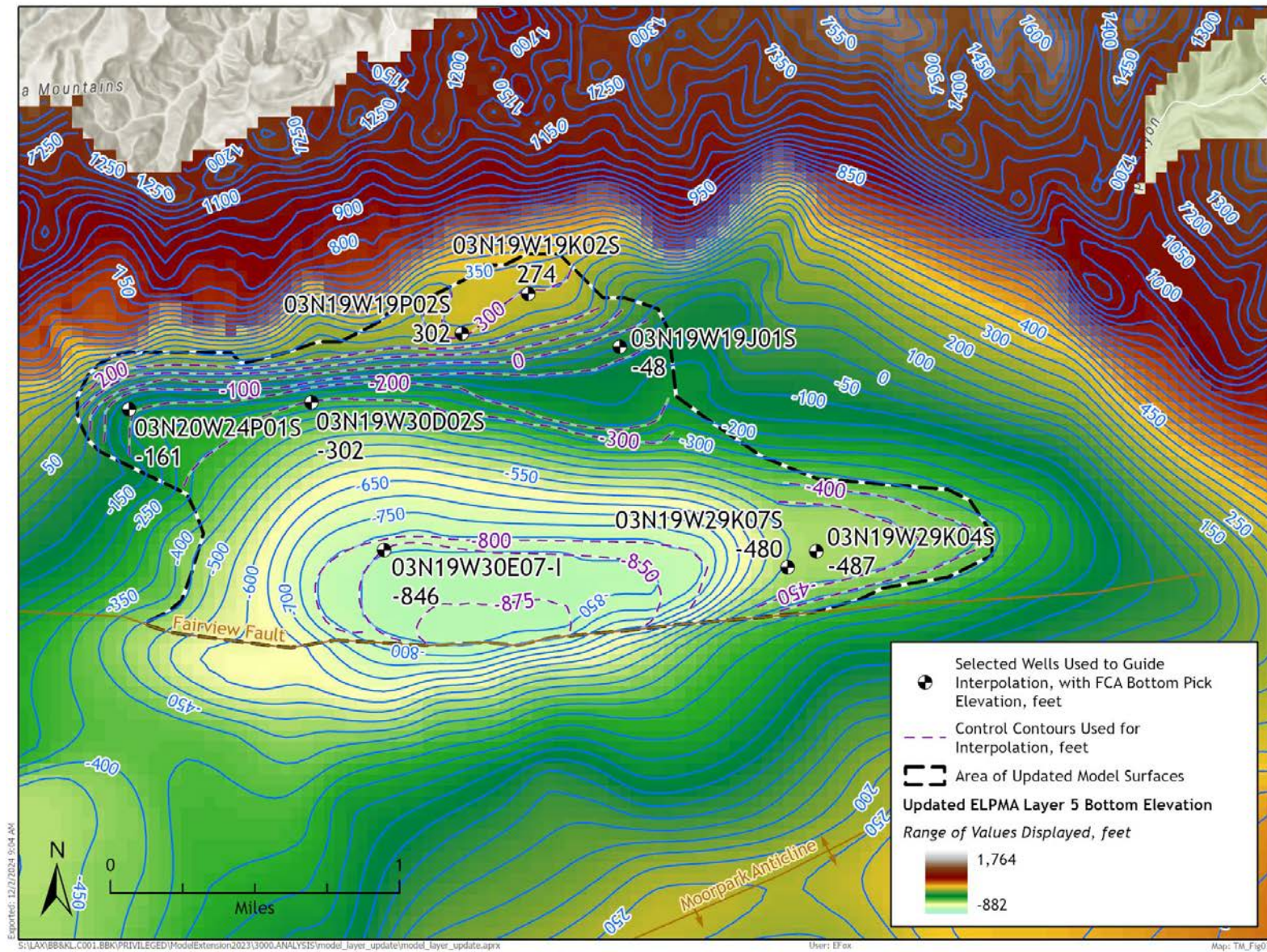


Notes:

Negative values denote areas where the top elevation of the Fox Canyon aquifer is lower than previously interpreted.



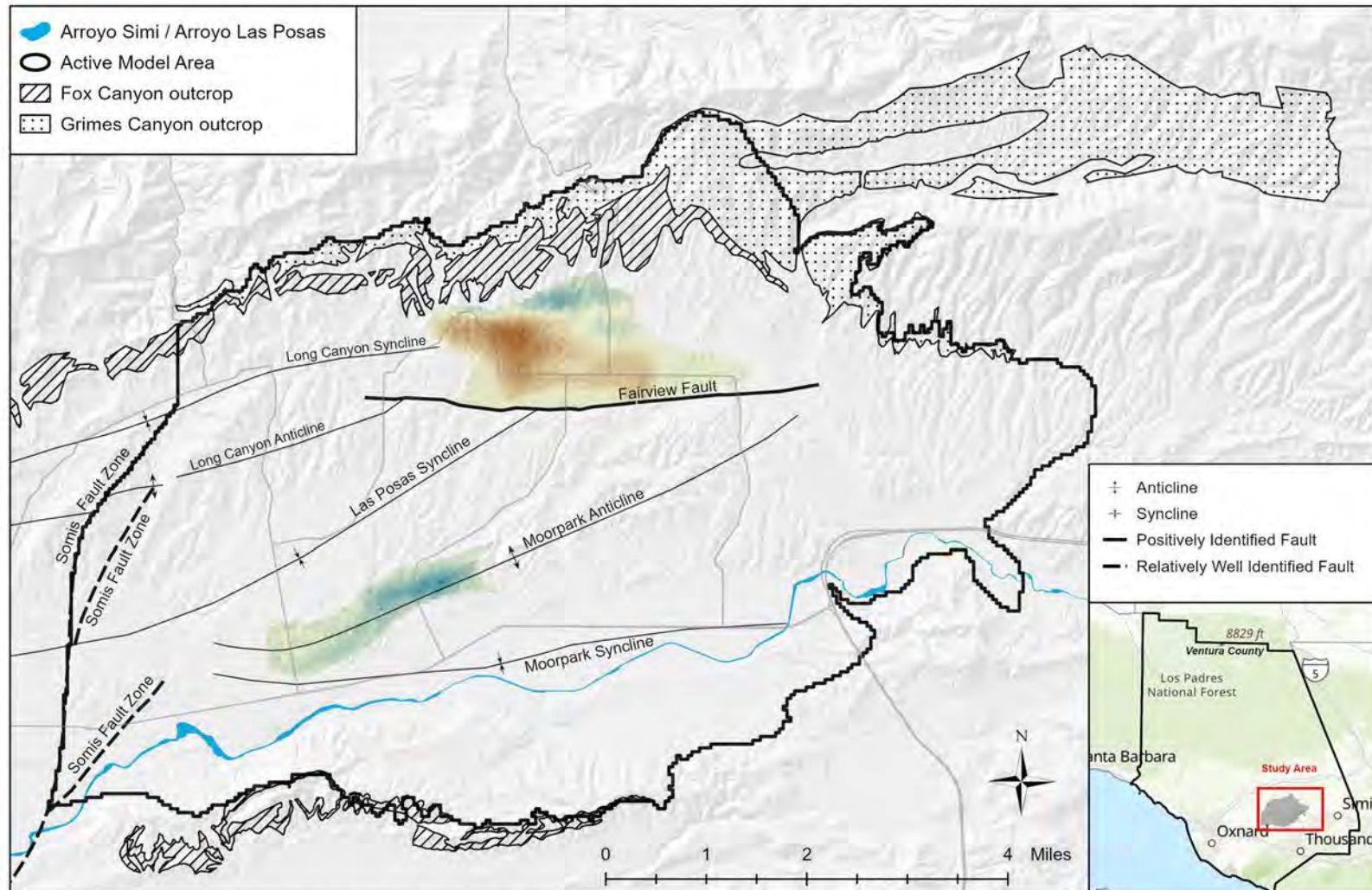
Figure 4.7
 Change in Top Elevation of the Fox Canyon Aquifer
 ELPMA Groundwater Model Technical Memorandum



Notes:
 Prior to splitting the FCA into two model layers, the bottom of model layer 5, and top of model layer 6, represented the bottom of the FCA.

Figure 4.8
 Bottom Elevation of the Fox Canyon Aquifer
 ELPMA Groundwater Model Technical Memorandum



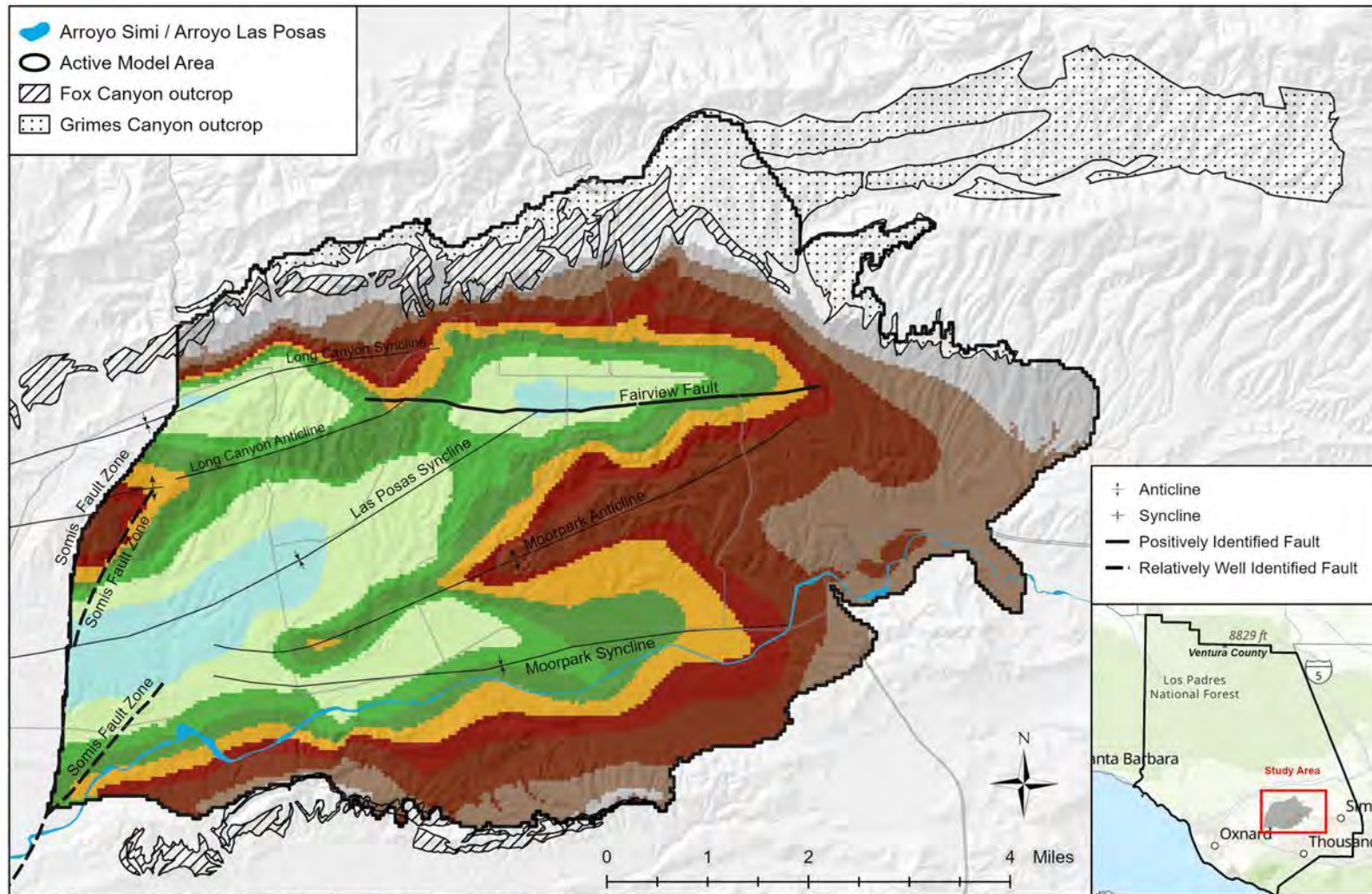


Notes:

Negative values denote areas where the bottom elevation of the Fox Canyon aquifer is lower than previously interpreted.



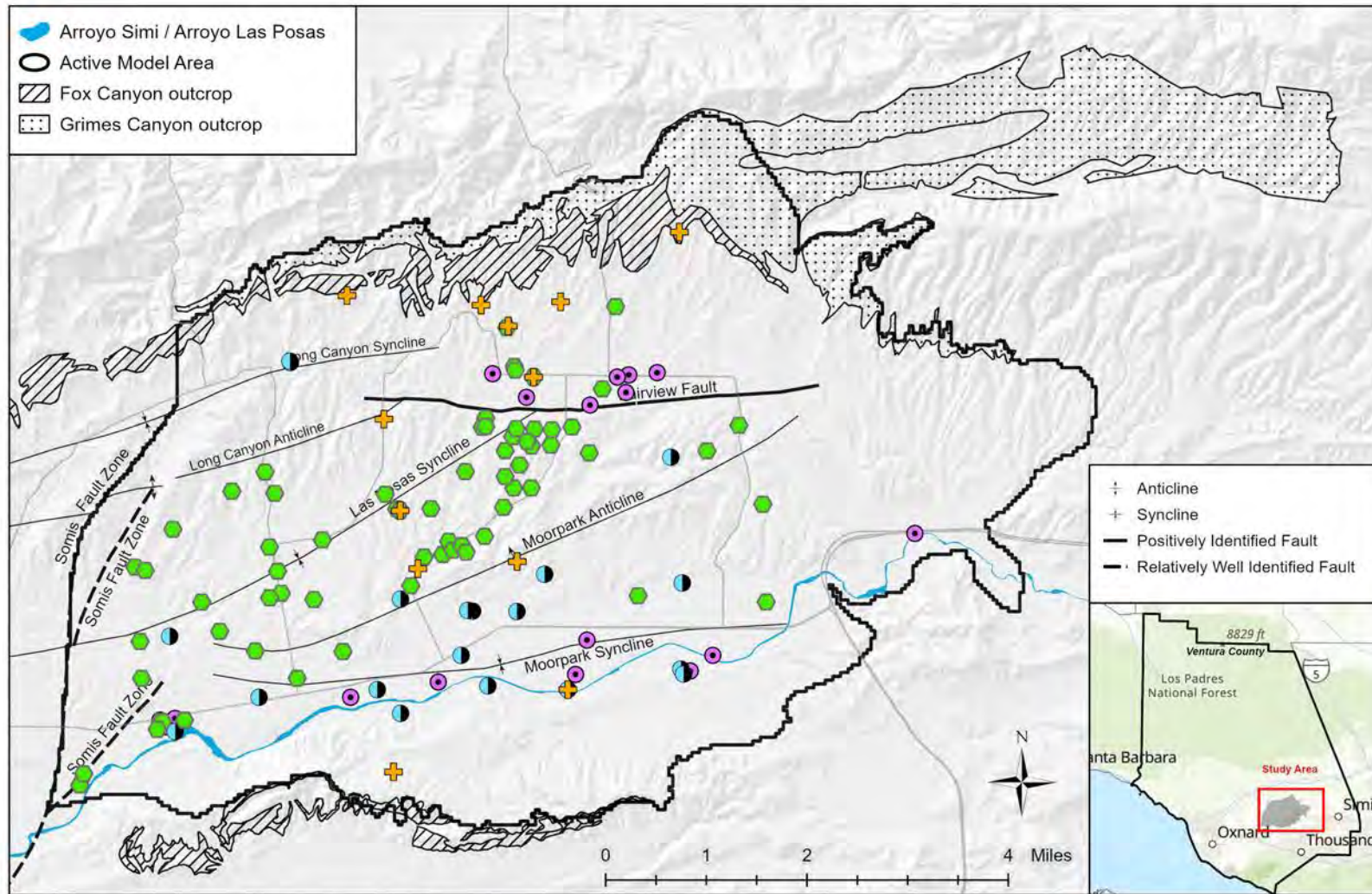
Figure 4.9
Change in Bottom Elevation of the Fox Canyon Aquifer
ELPMA Groundwater Model Technical Memorandum



Elevation of the Fox Canyon Aquifer Layer Split (Bottom of Model Layer 5)

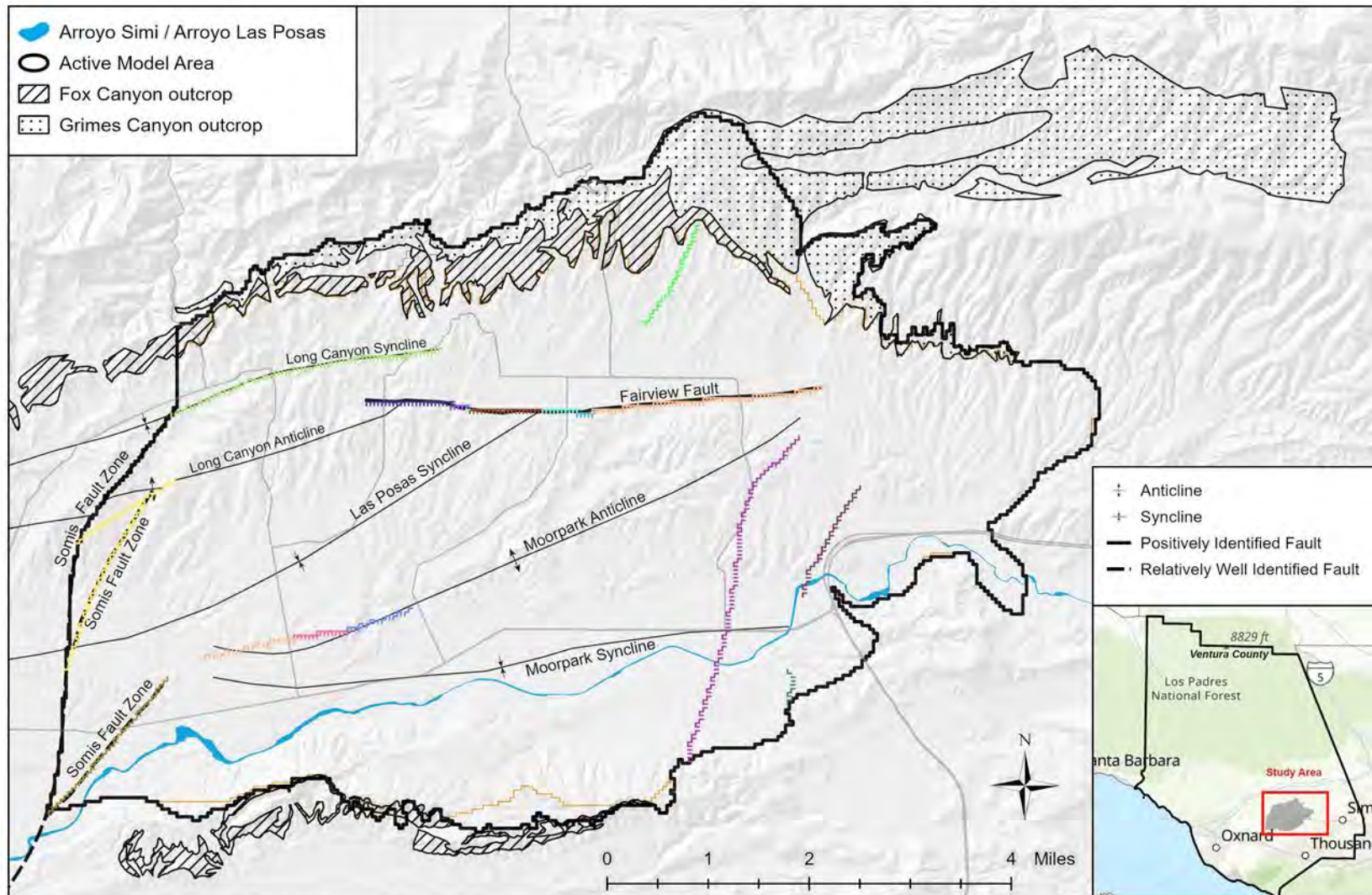


Figure 4.10
 Elevation of the Fox Canyon Aquifer Layer Split
 ELPMA Groundwater Model Technical Memorandum



Groundwater Monitoring Network in the ELPMA

Figure 5.1
Groundwater Monitoring Network in the ELPMA
ELPMA Groundwater Model Technical Memorandum



**HFB Parameter Segmentation
(Segment Number)**

- | | | | | | | | |
|---|---|---|---|----|----|----|----|
| 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 |
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |



Figure 5.2
Modeled Faults and Parameter Segmentation
 ELPMA Groundwater Model Technical Memorandum

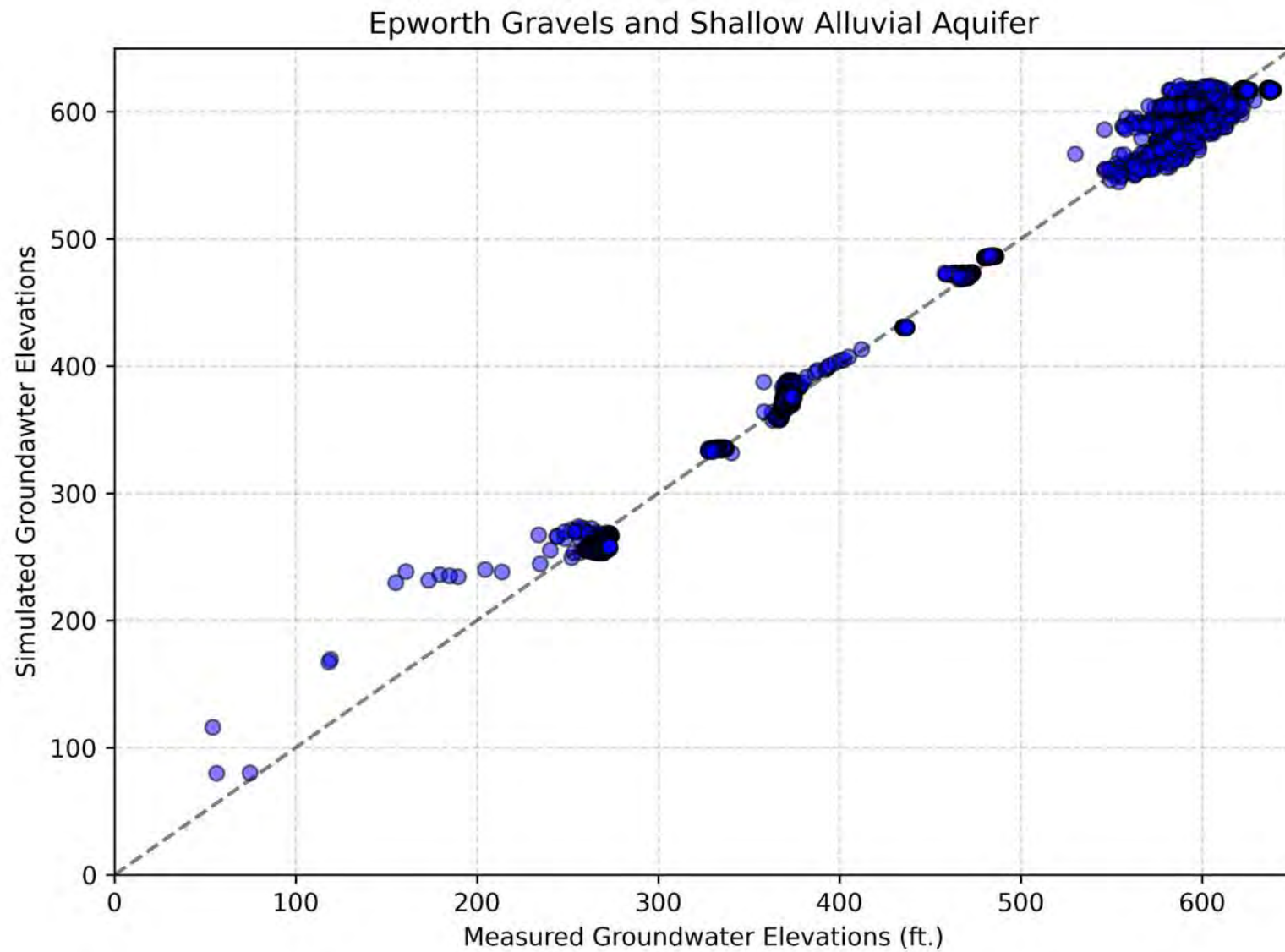


Figure 5.3
Measured versus Simulated Groundwater Elevation
Epworth Gravels and Shallow Alluvial Aquifer
ELPMA Groundwater Model Technical Memorandum



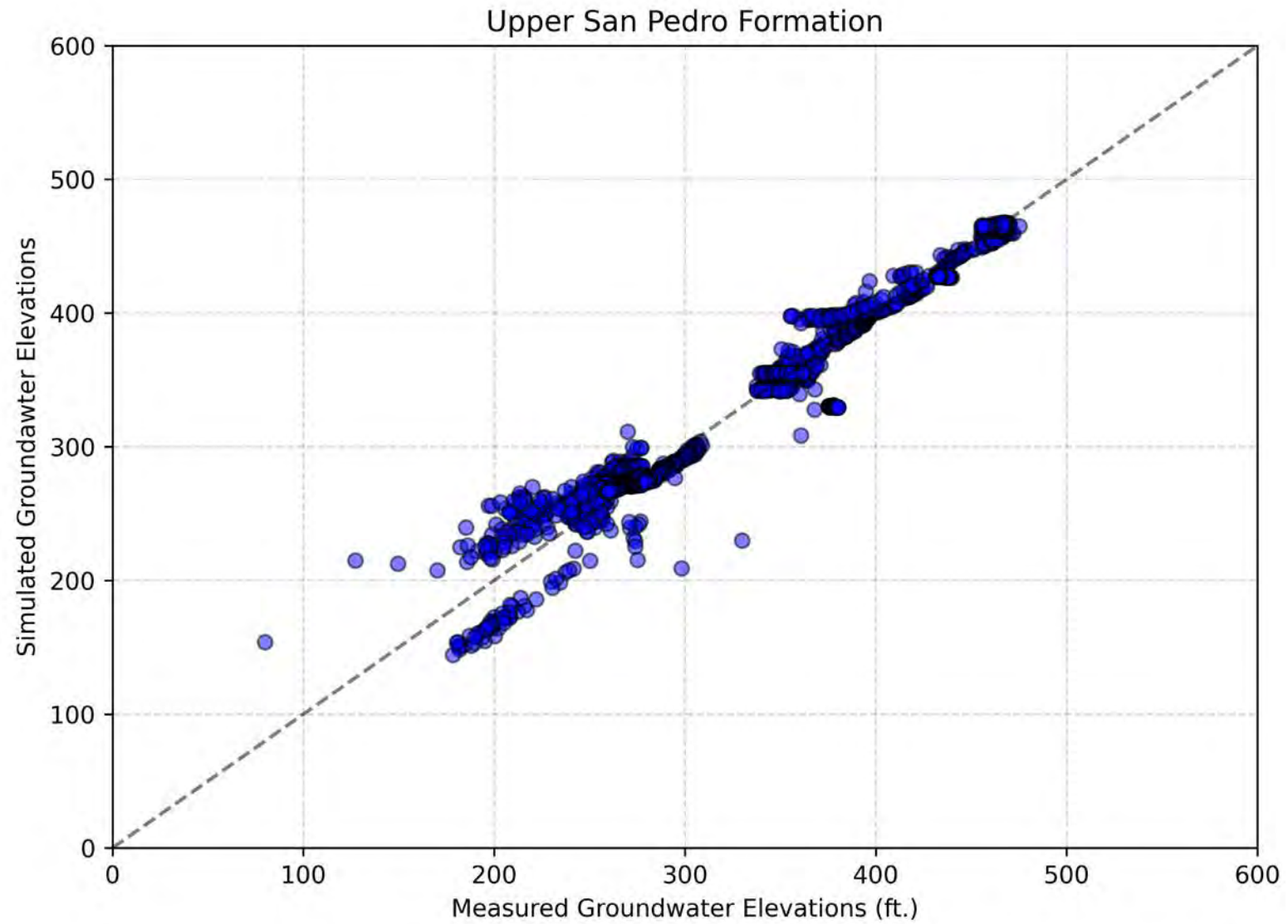


Figure 5.4
Measured versus Simulated Groundwater Elevation
Upper San Pedro Formation
ELPMA Groundwater Model Technical Memorandum



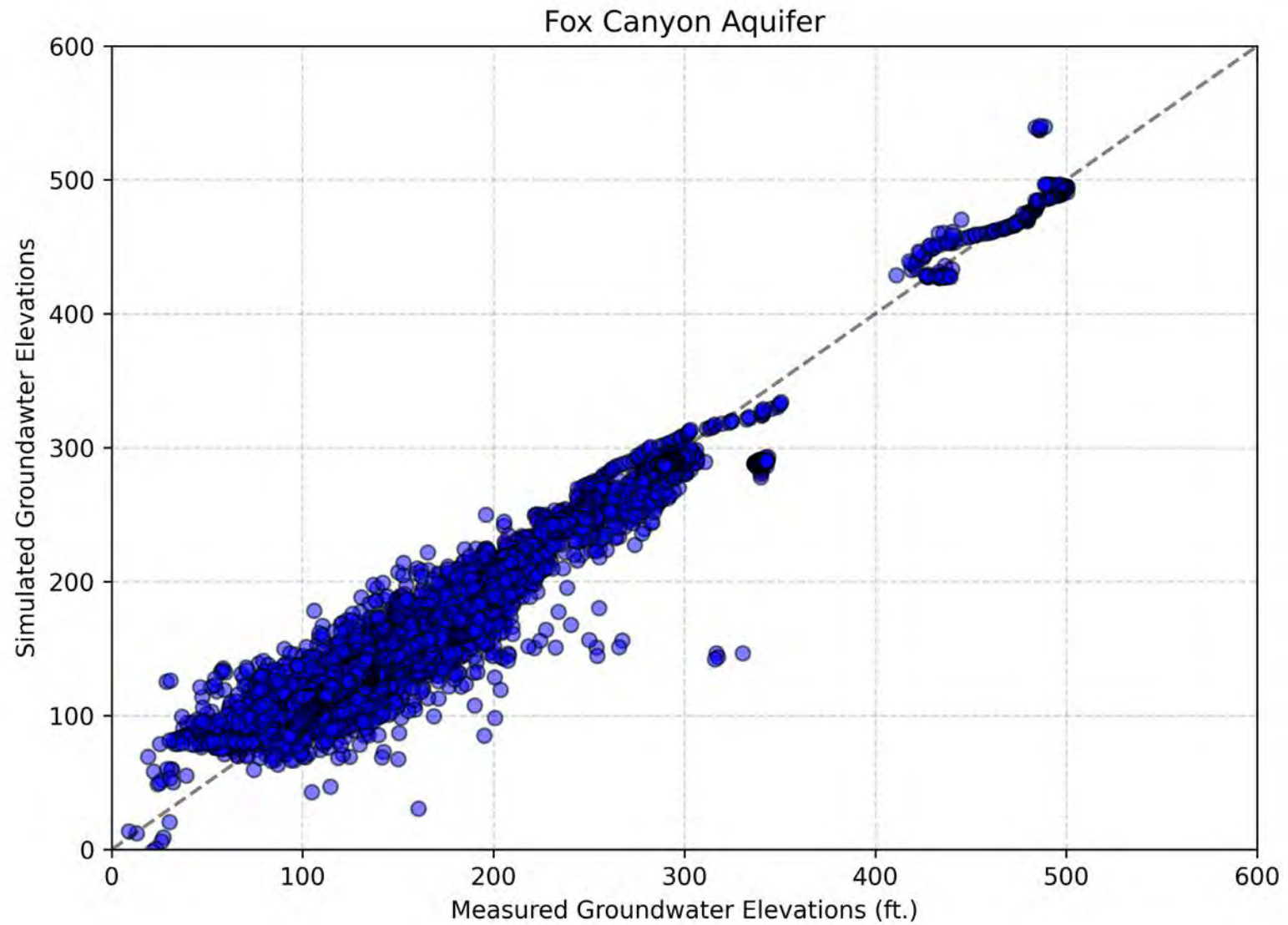


Figure 5.5
Measured versus Simulated Groundwater Elevation
Fox Canyon Aquifer
ELPMA Groundwater Model Technical Memorandum



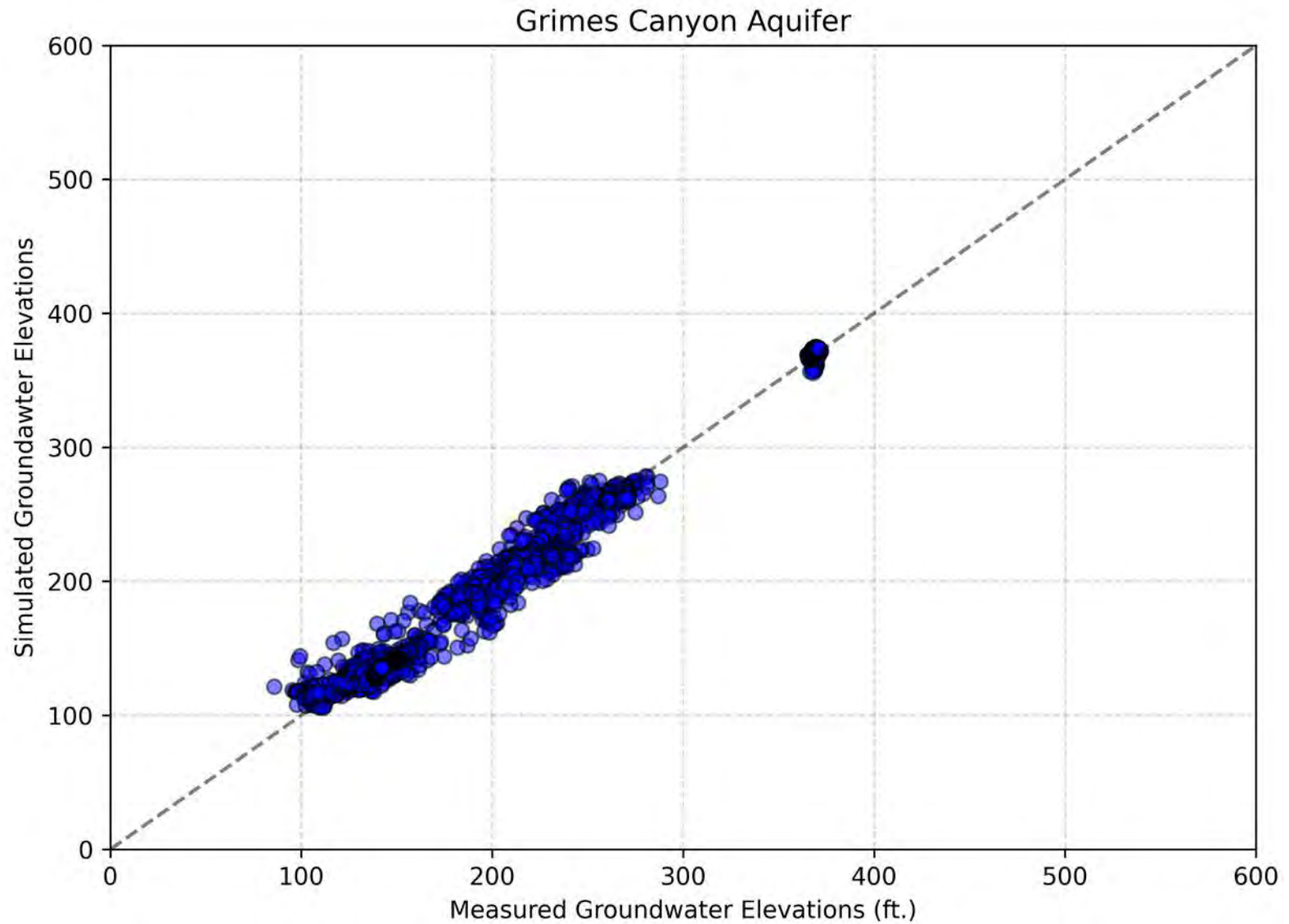
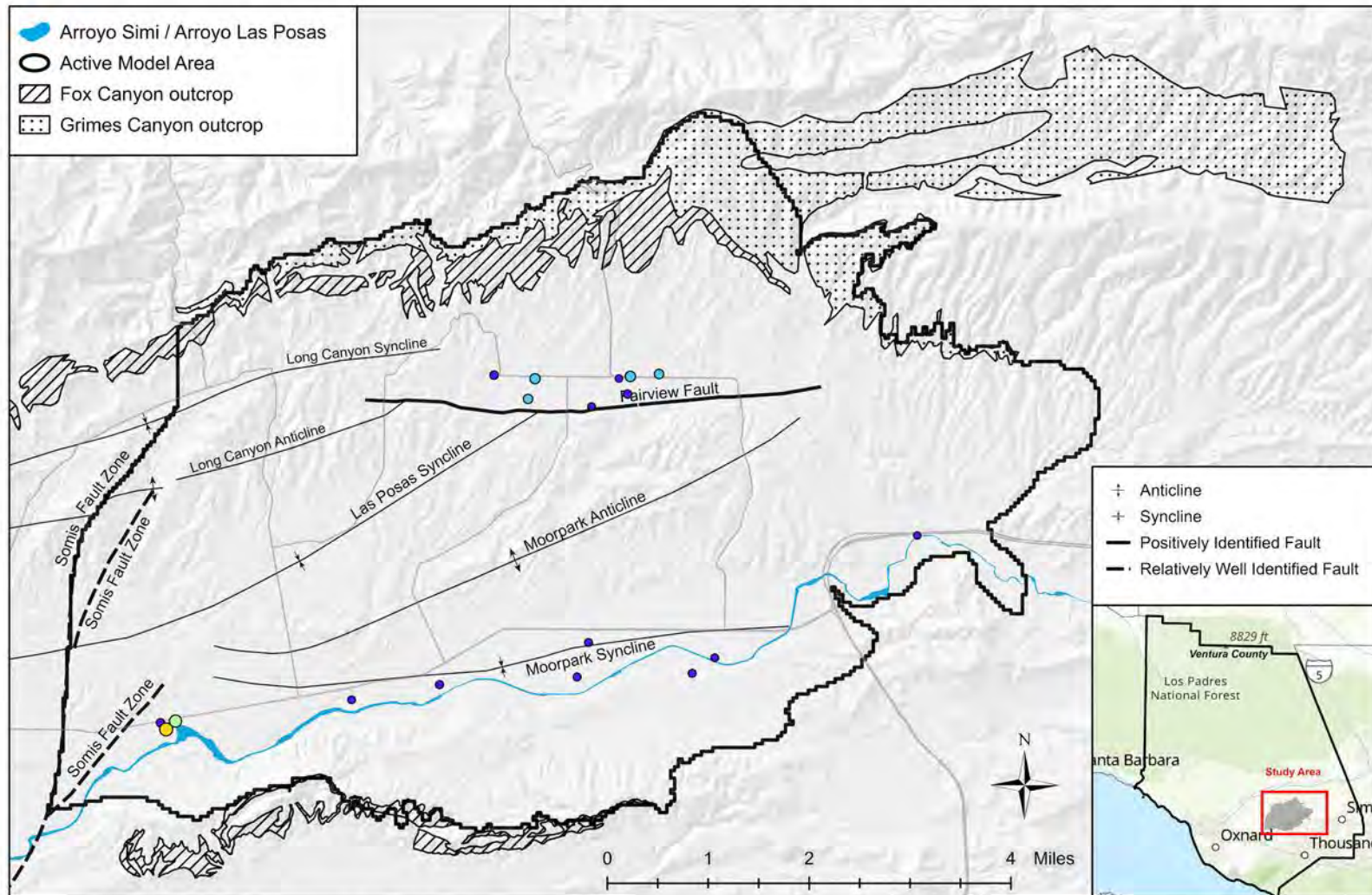


Figure 5.6
Measured versus Simulated Groundwater Elevation
Grimes Canyon Aquifer
ELPMA Groundwater Model Technical Memorandum



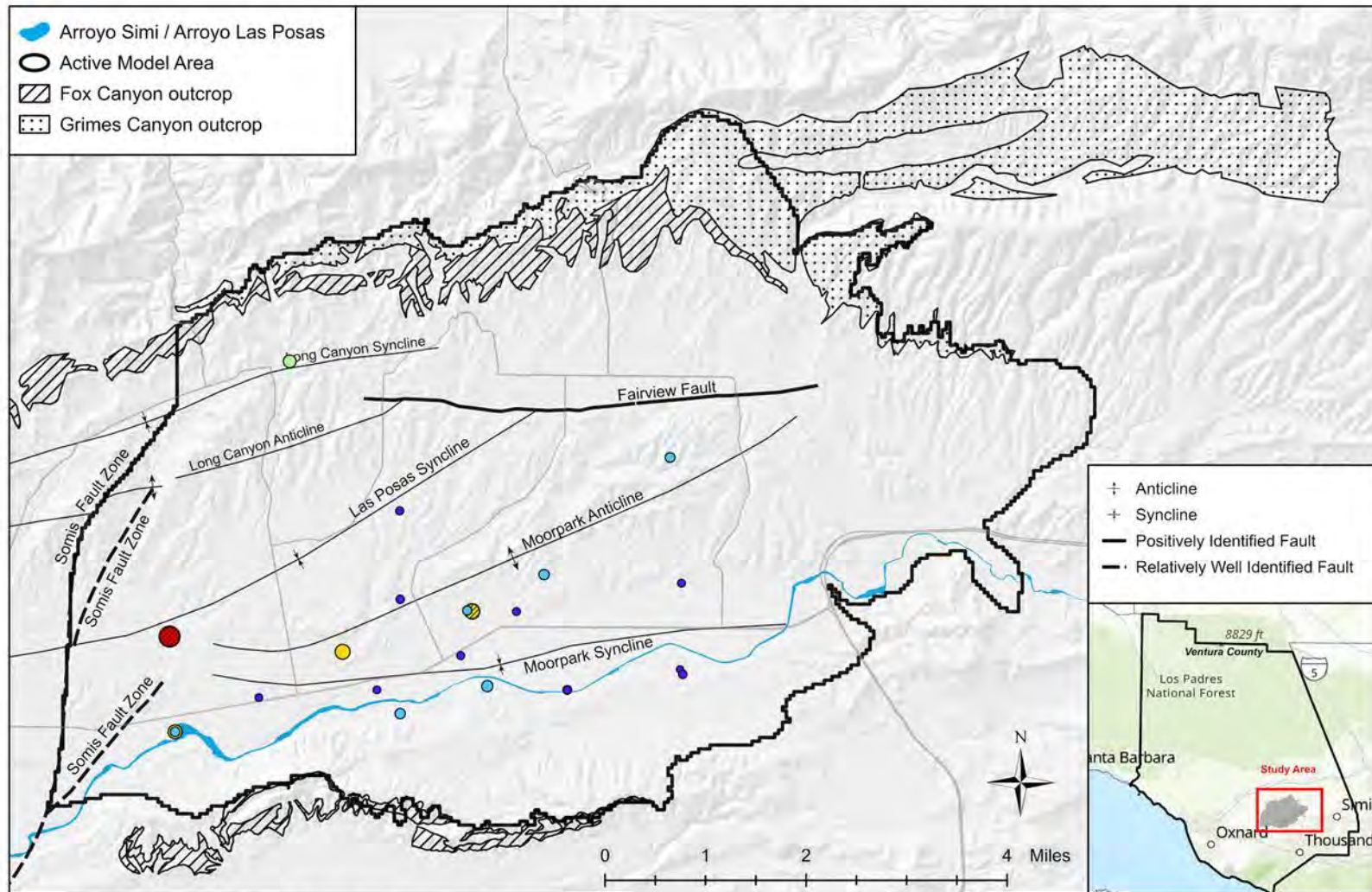


Epworth Gravels and Shallow Alluvial Aquifer Modeled Residuals (RMSE; feet)

- 0.3 - 10.0 ○ 25.1 - 35.0 ● 50.1 - 101.0
- 10.1 - 25.0 ● 35.1 - 50.0



Figure 5.7
Spatial Distribution of Model Residuals
Epworth Gravels and Shallow Alluvial Aquifer
ELPMA Groundwater Model Technical Memorandum



Upper San Pedro Modeled Residuals (RMSE; feet)

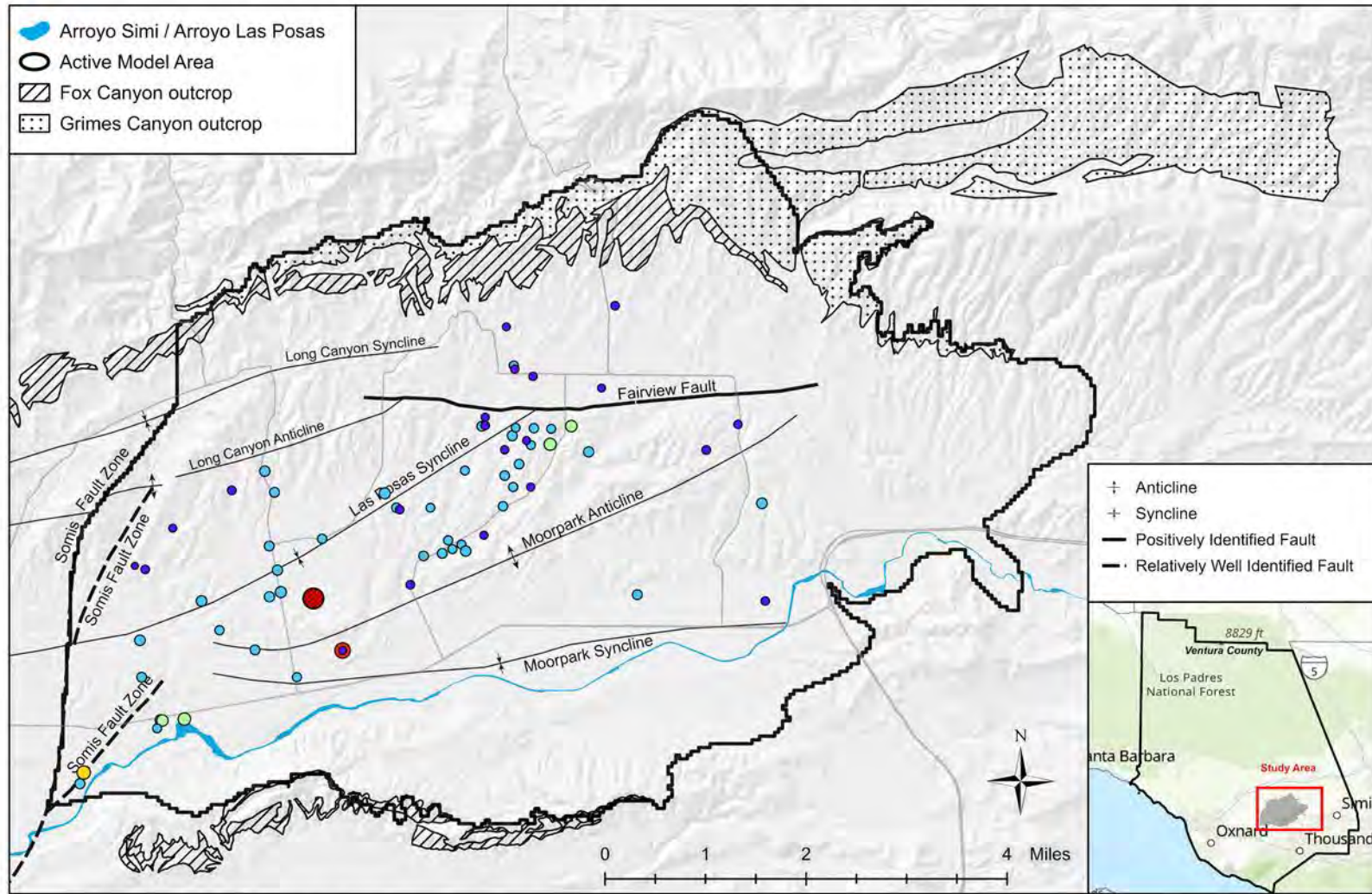
- 0.3 - 10.0 ○ 25.1 - 35.0 ● 50.1 - 101.0
- 10.1 - 25.0 ● 35.1 - 50.0

Notes:

Wells 02N20W01Q01S (yellow) and 02N20W09B01S (red) are symbolized with a hatched fill to reflect the limited data available to inform model calibration at this location. Groundwater elevations have been measured at each well twice and once, respectively. These wells have been included in calibration dataset for consistency with the previous model.



Figure 5.8
Spatial Distribution of Model Residuals
Upper San Pedro Formation
 ELPMA Groundwater Model Technical Memorandum



Fox Canyon Aquifer Modeled Residuals (RMSE; feet)

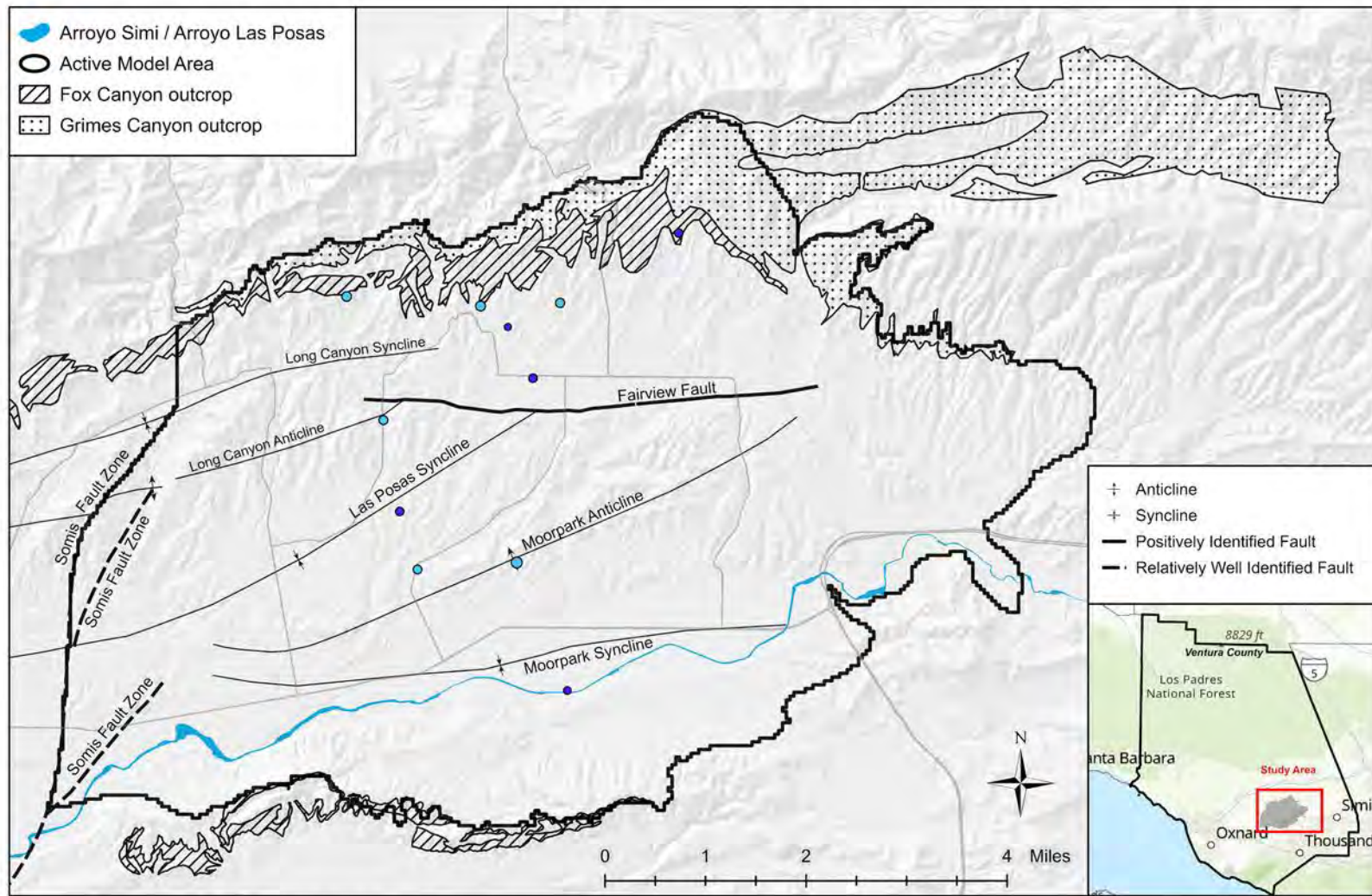
- 0.3 - 10.0
- 10.1 - 25.0
- 25.1 - 35.0
- 35.1 - 50.0
- 50.1 - 101.0

Notes:

Well O2N20W02N03S (red) is symbolized with a hatched fill to reflect the limited data available to inform model calibration at this location. Groundwater elevations were measured periodically at this well starting in 1995 and have not been measured since 2012.



Figure 5.9
Spatial Distribution of Model Residuals
Fox Canyon Aquifer
 ELPMA Groundwater Model Technical Memorandum



Grimes Canyon Aquifer Modeled Residuals (RMSE; feet)

- 0.3 - 10.0 ○ 25.1 - 35.0 ● 50.1 - 101.0
- 10.1 - 25.0 ● 35.1 - 50.0



Figure 5.10
Spatial Distribution of Model Residuals
Grimes Canyon Aquifer
 ELPMA Groundwater Model Technical Memorandum

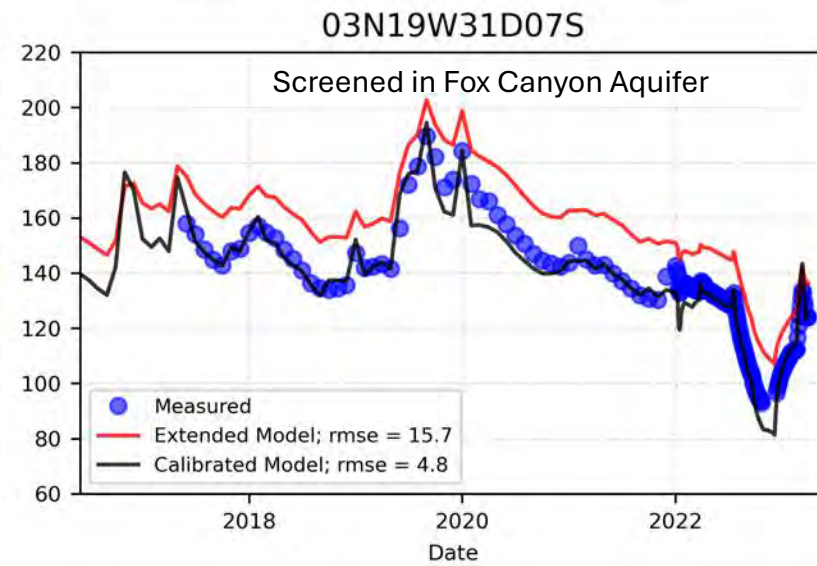
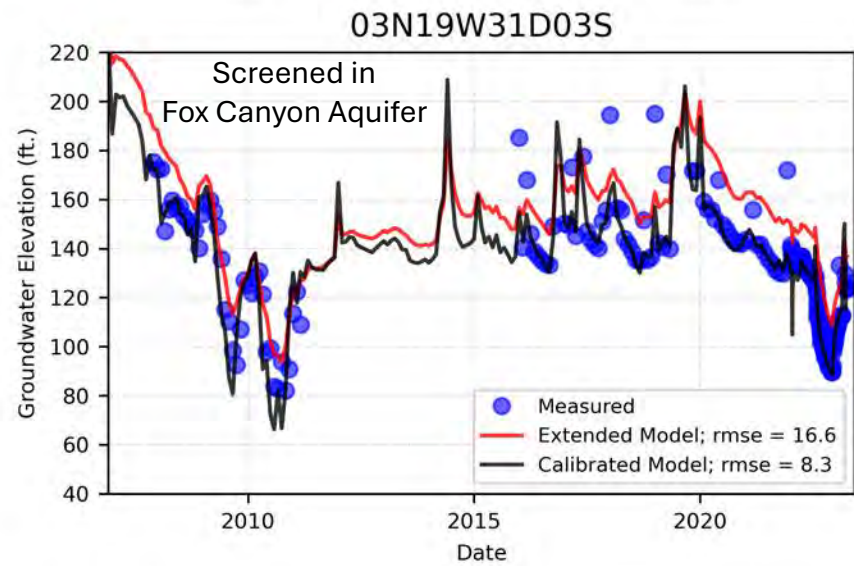
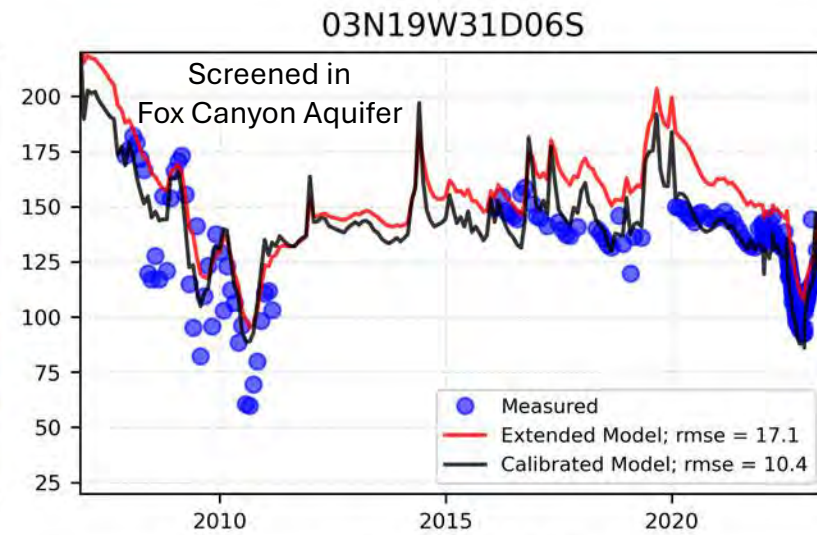
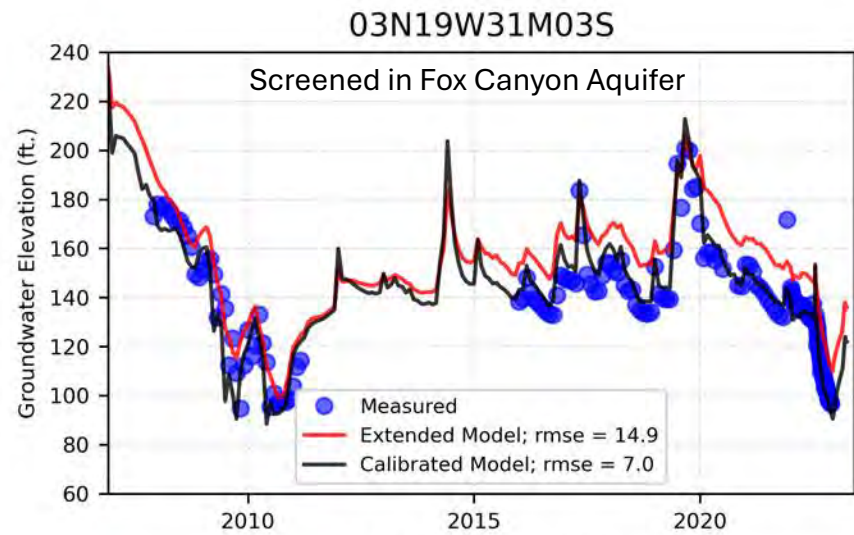


Figure 5.11
Comparison of Model Versions
ASR Wellfield No. 2
ELPMA Groundwater Model Technical Memorandum

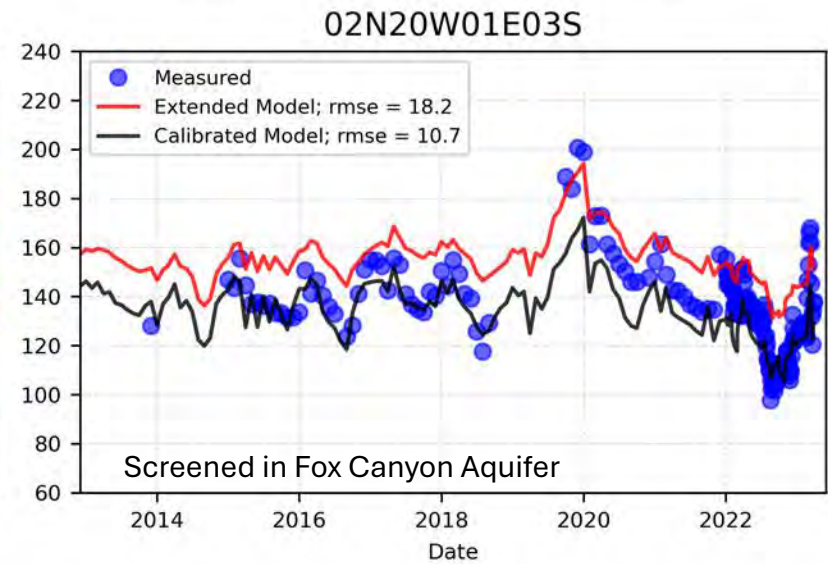
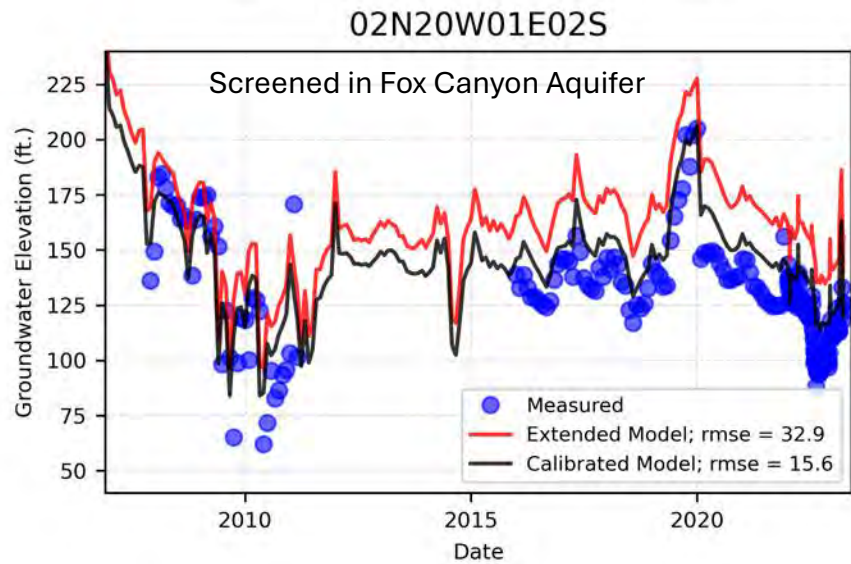
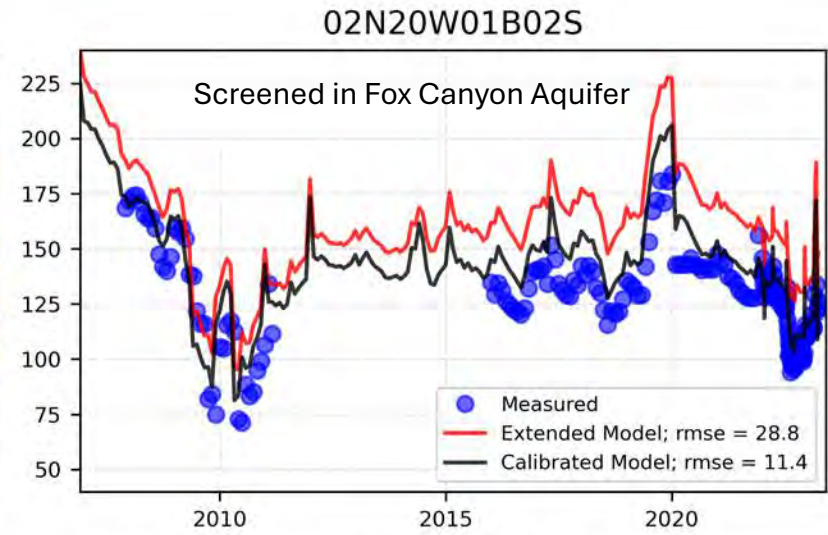
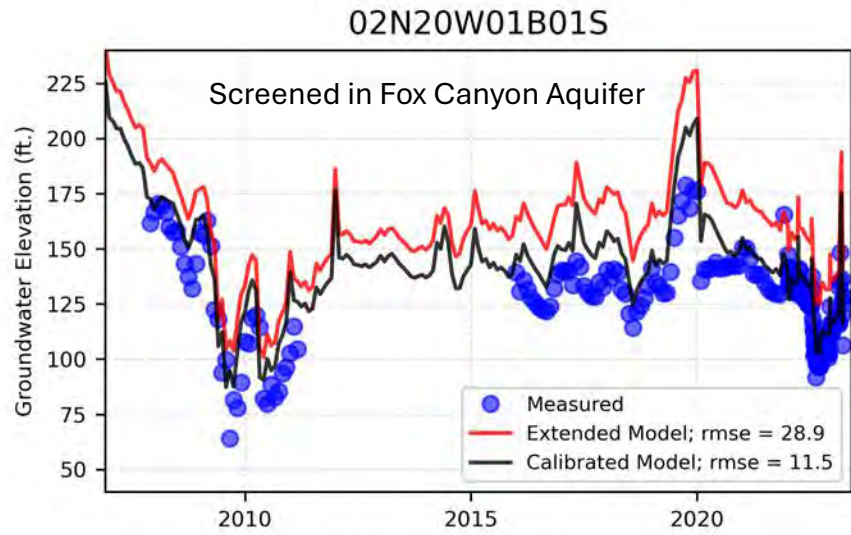


Figure 5.12
 Comparison of Model Versions
 ASR Wellfield No. 1
 ELPMA Groundwater Model Technical Memorandum

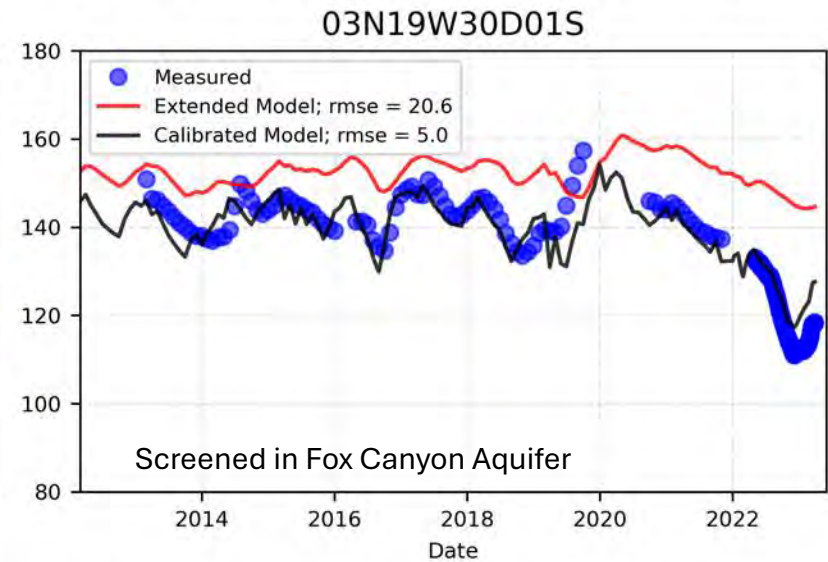
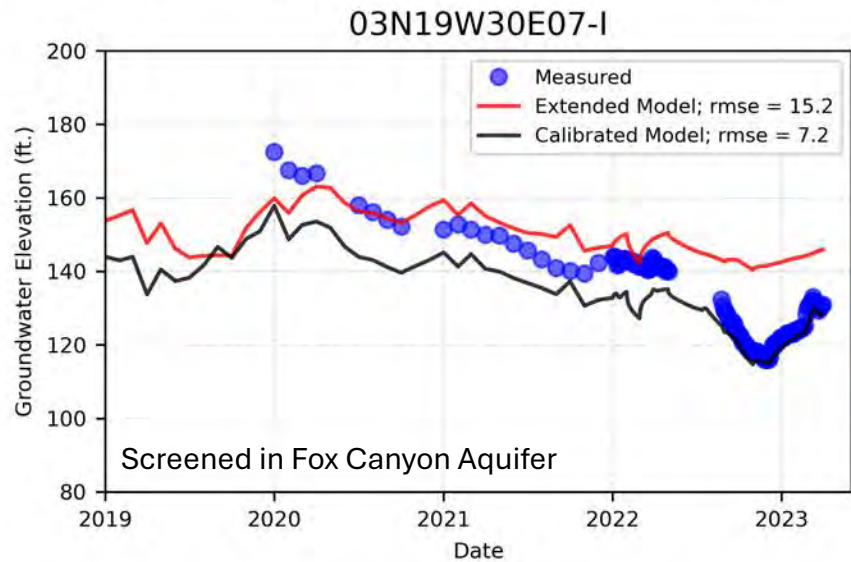
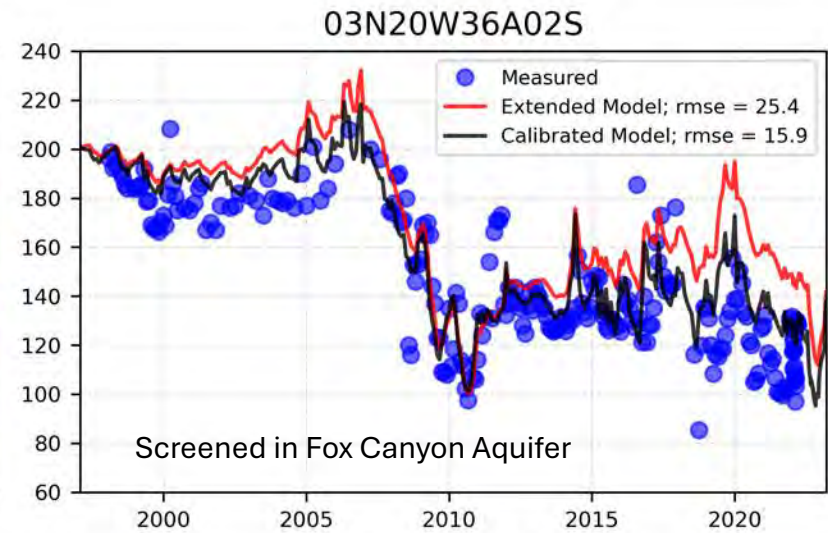
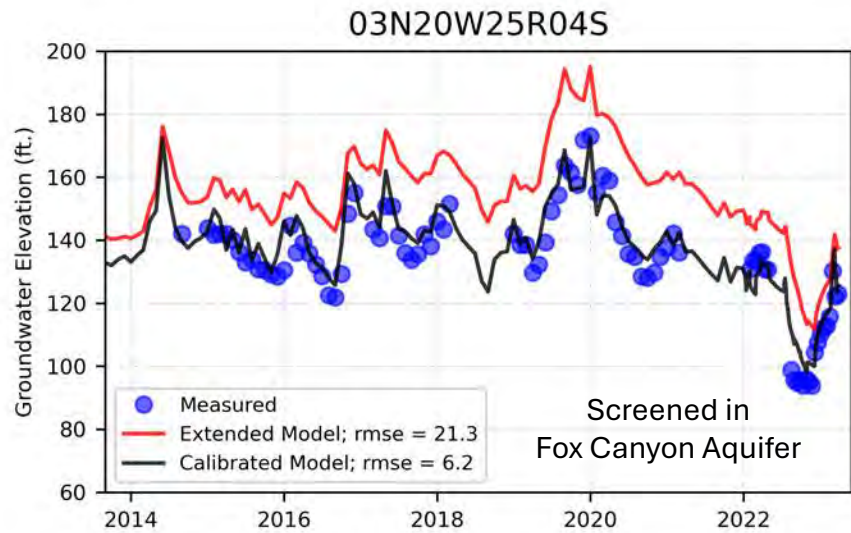
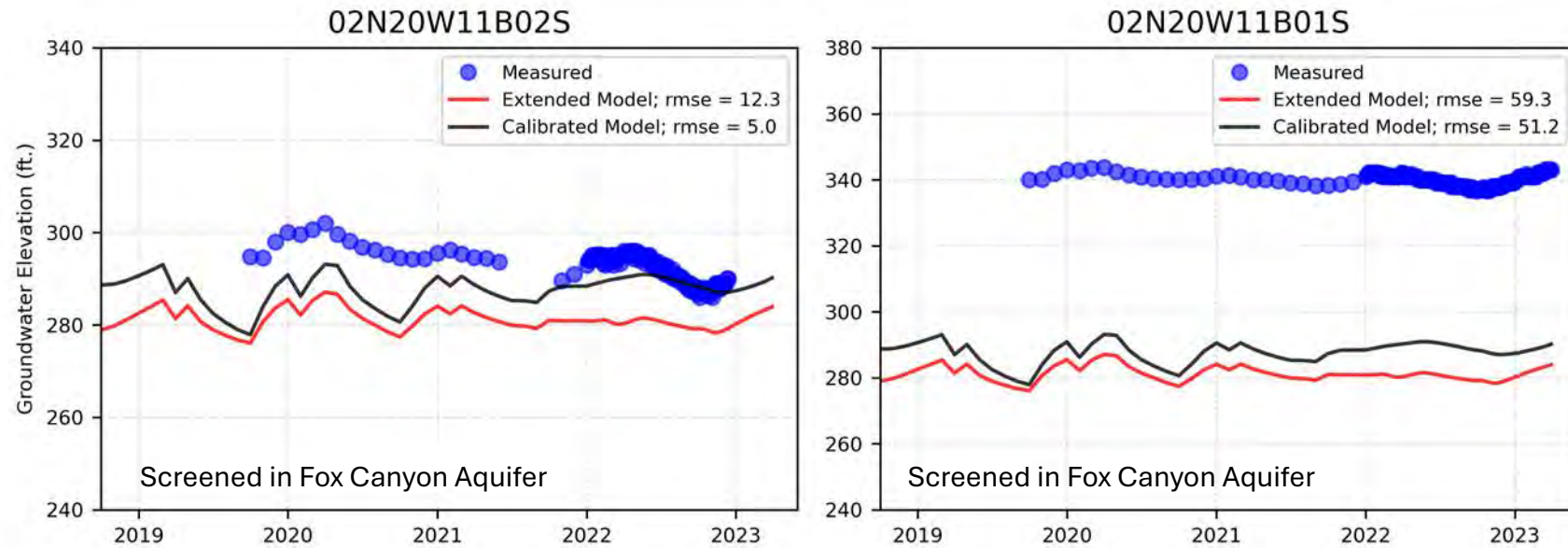


Figure 5.13
 Comparison of Model Versions
 Non-ASR Wells near Wellfield No. 2
 ELPMA Groundwater Model Technical Memorandum



SWN	Screen Interval	Aquifer
02N20W11B01S	665-725	FCA Lower
02N20W11B02S	415-515	FCA Upper



Figure 5.14
 Comparison of Model Versions
 CMWD MW-3 in South Las Posas
 ELPMA Groundwater Model Technical Memorandum

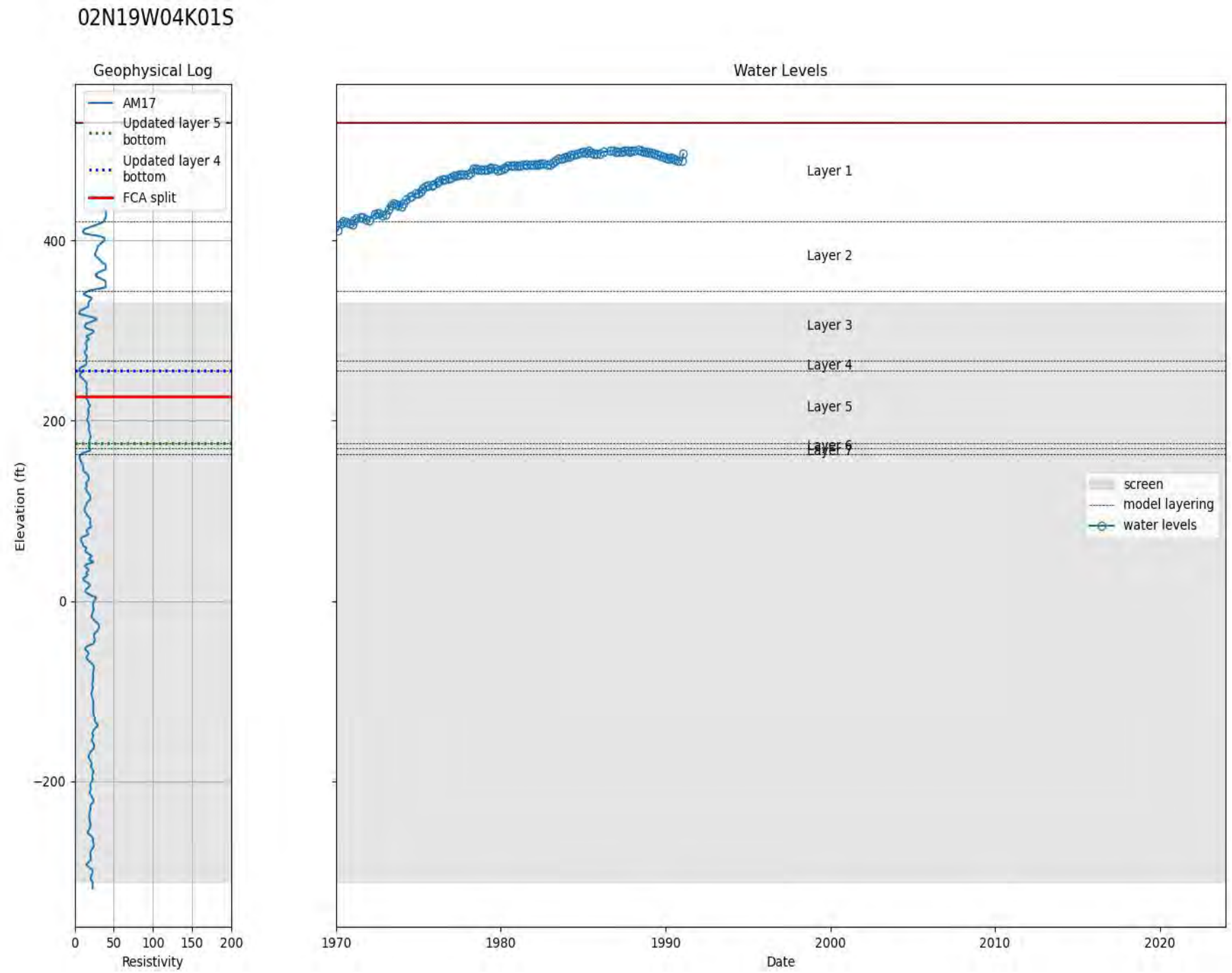


Figure A.1
Geophysical Log and Water Level Data for
02N19W04K01S
ELPMA Groundwater Model Technical Memorandum



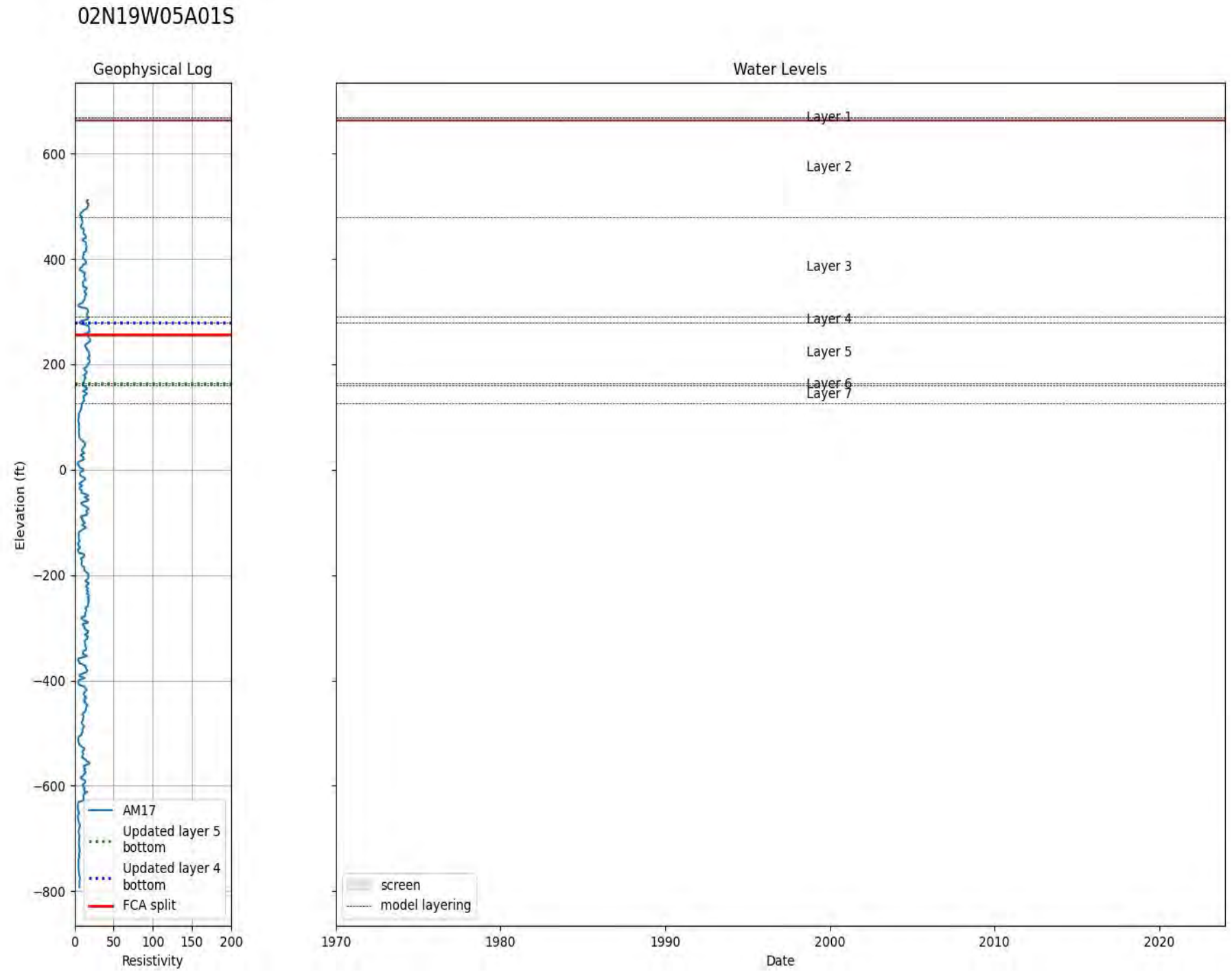


Figure A.2
Geophysical Log and Water Level Data for
02N19W05A01S
ELPMA Groundwater Model Technical Memorandum



02N19W06E01S

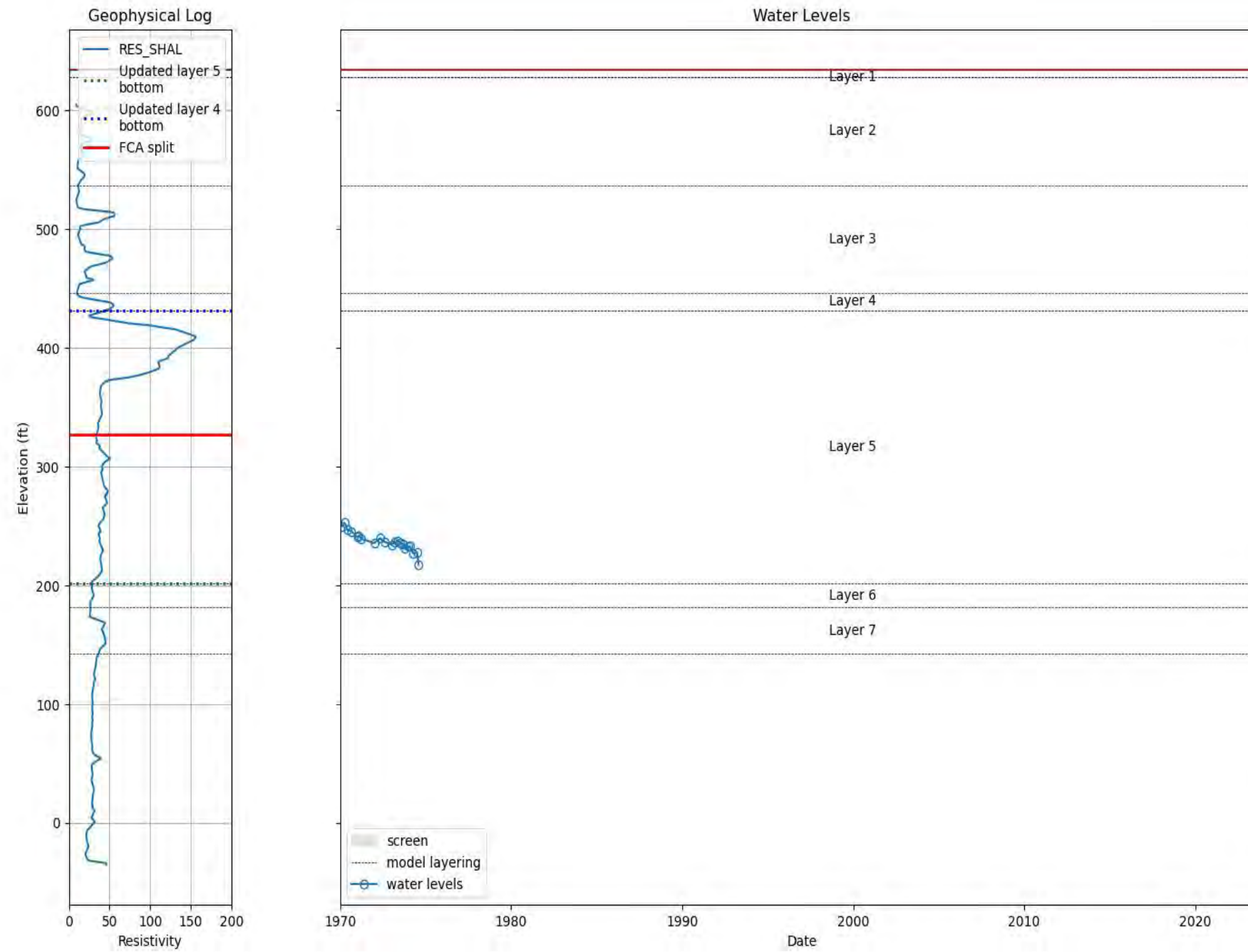


Figure A.3
Geophysical Log and Water Level Data for
02N19W06E01S
ELPMA Groundwater Model Technical Memorandum



02N20W01B01S ASR-2

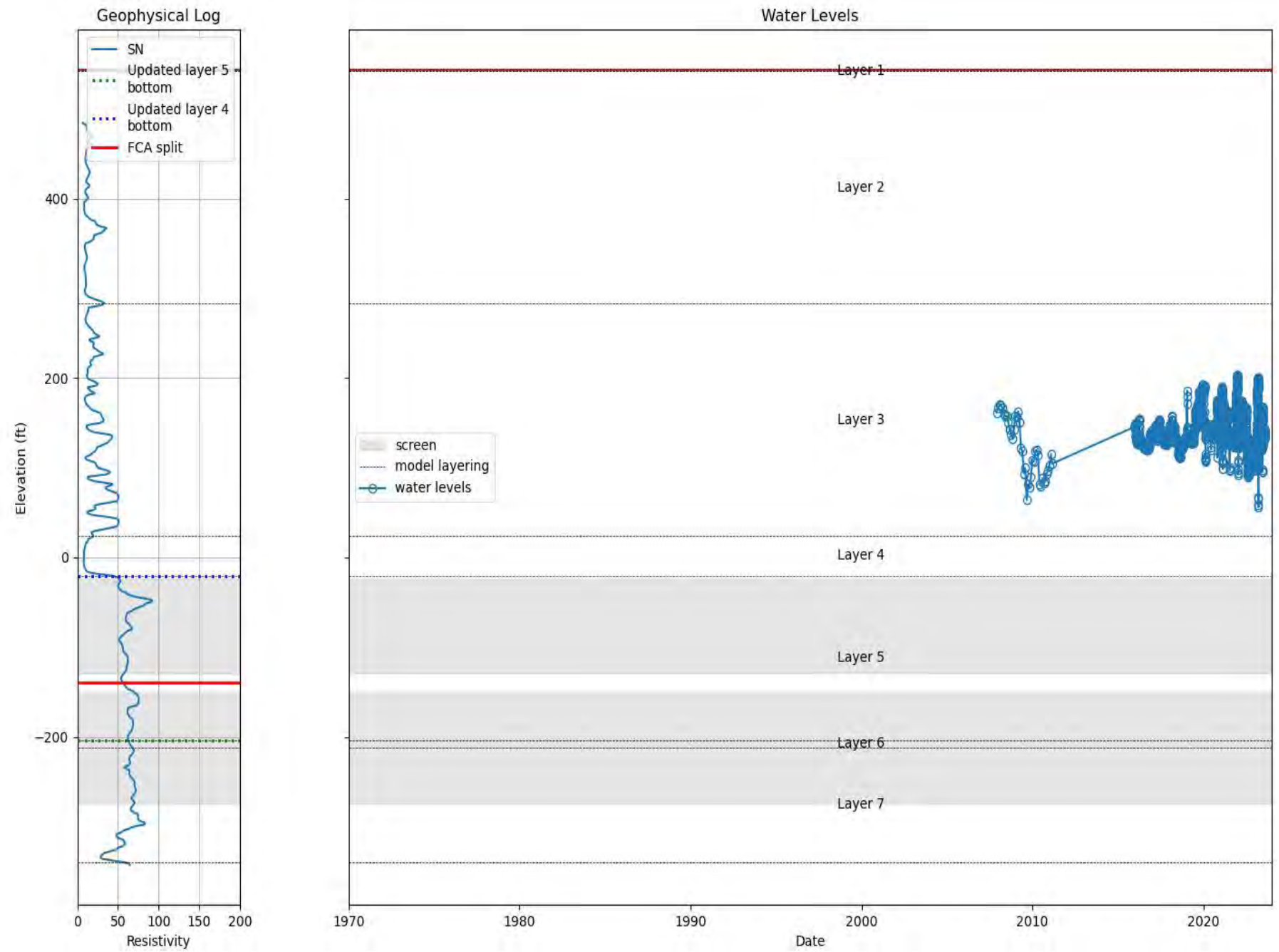


Figure A.4
Geophysical Log and Water Level Data for
02N20W01B01S (ASR-2)
ELPMA Groundwater Model Technical Memorandum



02N20W01B02S ASR-3

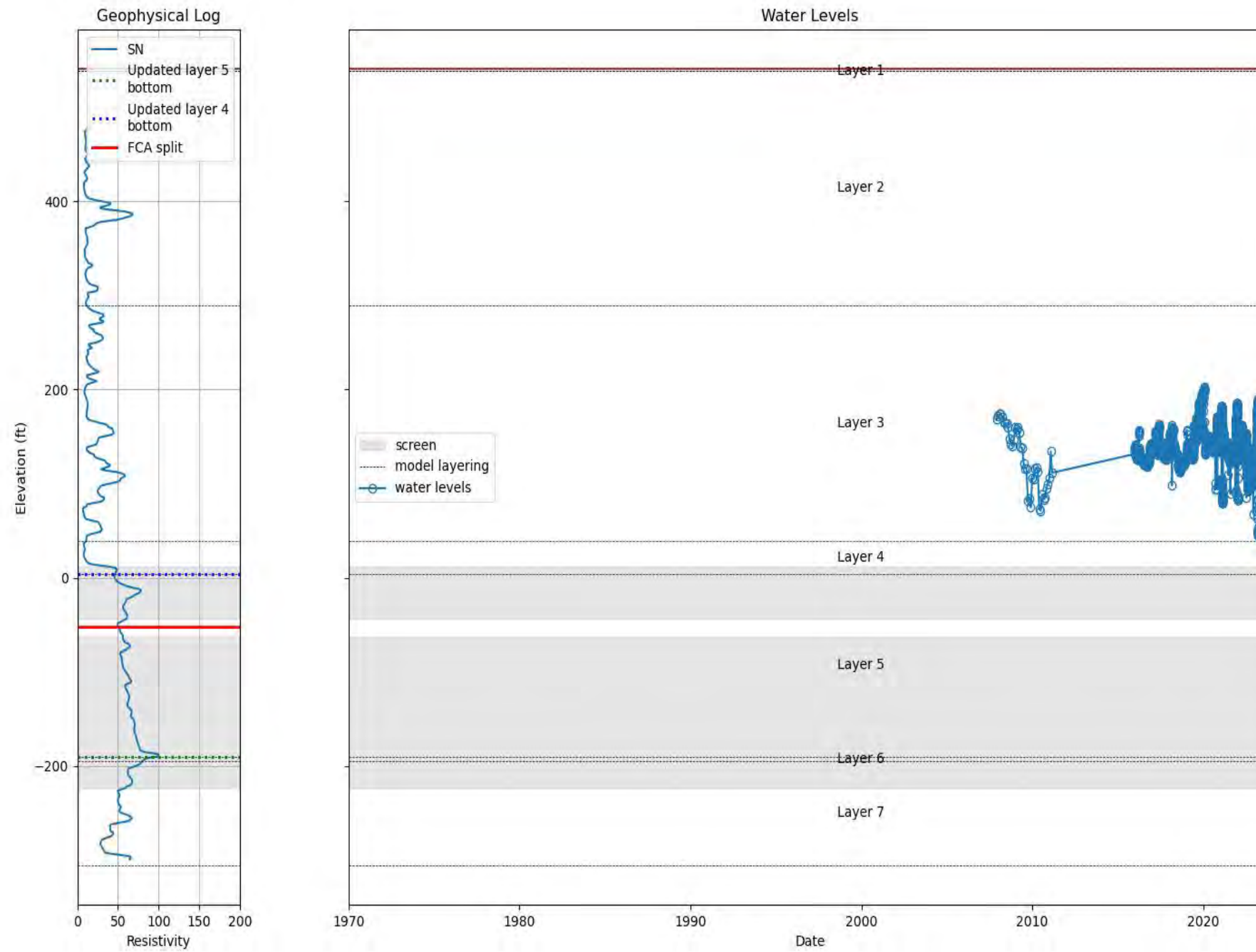


Figure A.5
Geophysical Log and Water Level Data for
02N20W01B02S (ASR-3)
ELPMA Groundwater Model Technical Memorandum



02N20W01B03S ASR-4

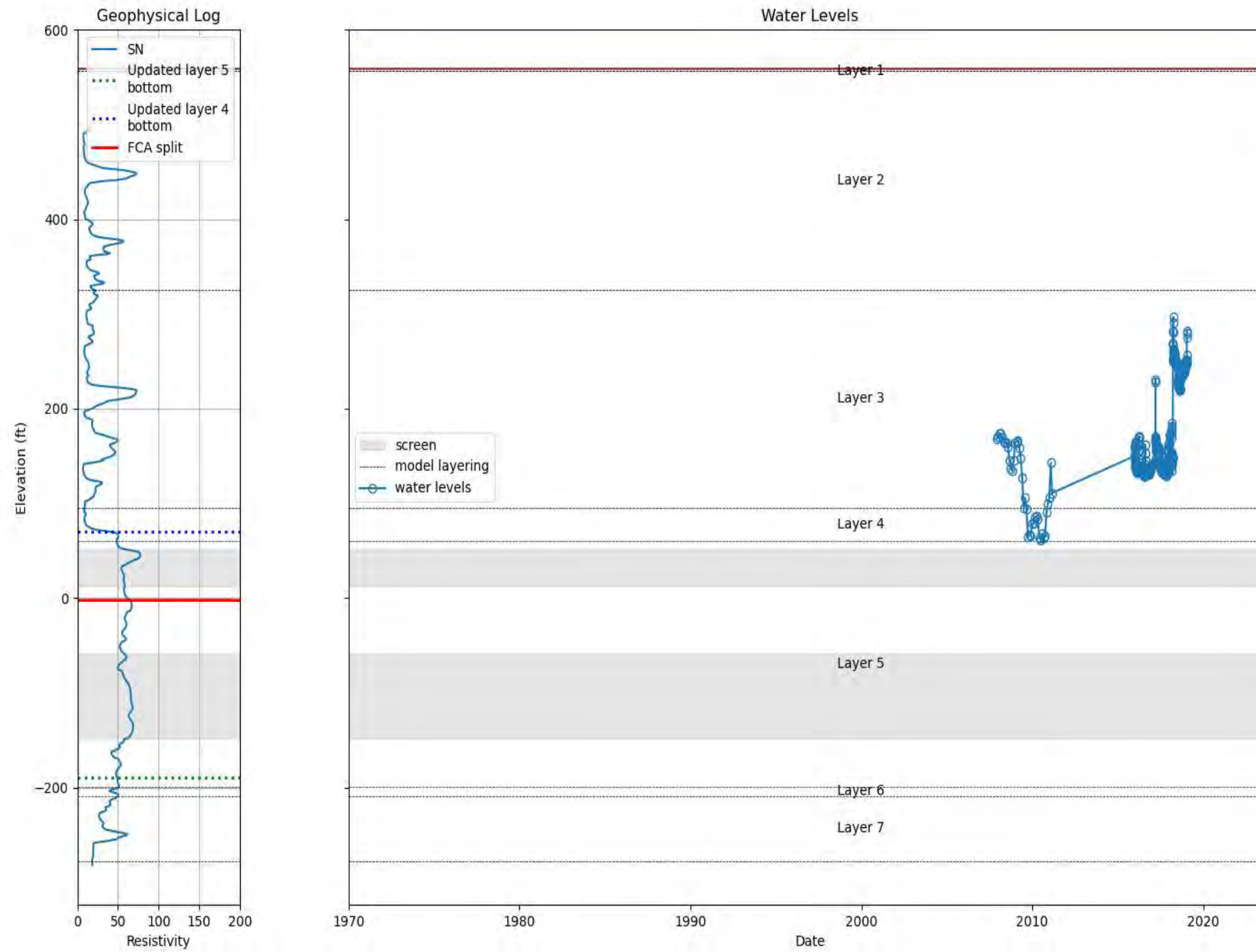


Figure A.6
Geophysical Log and Water Level Data for
02N20W01B03S (ASR-4)
ELPMA Groundwater Model Technical Memorandum



02N20W01C02S ASR-18

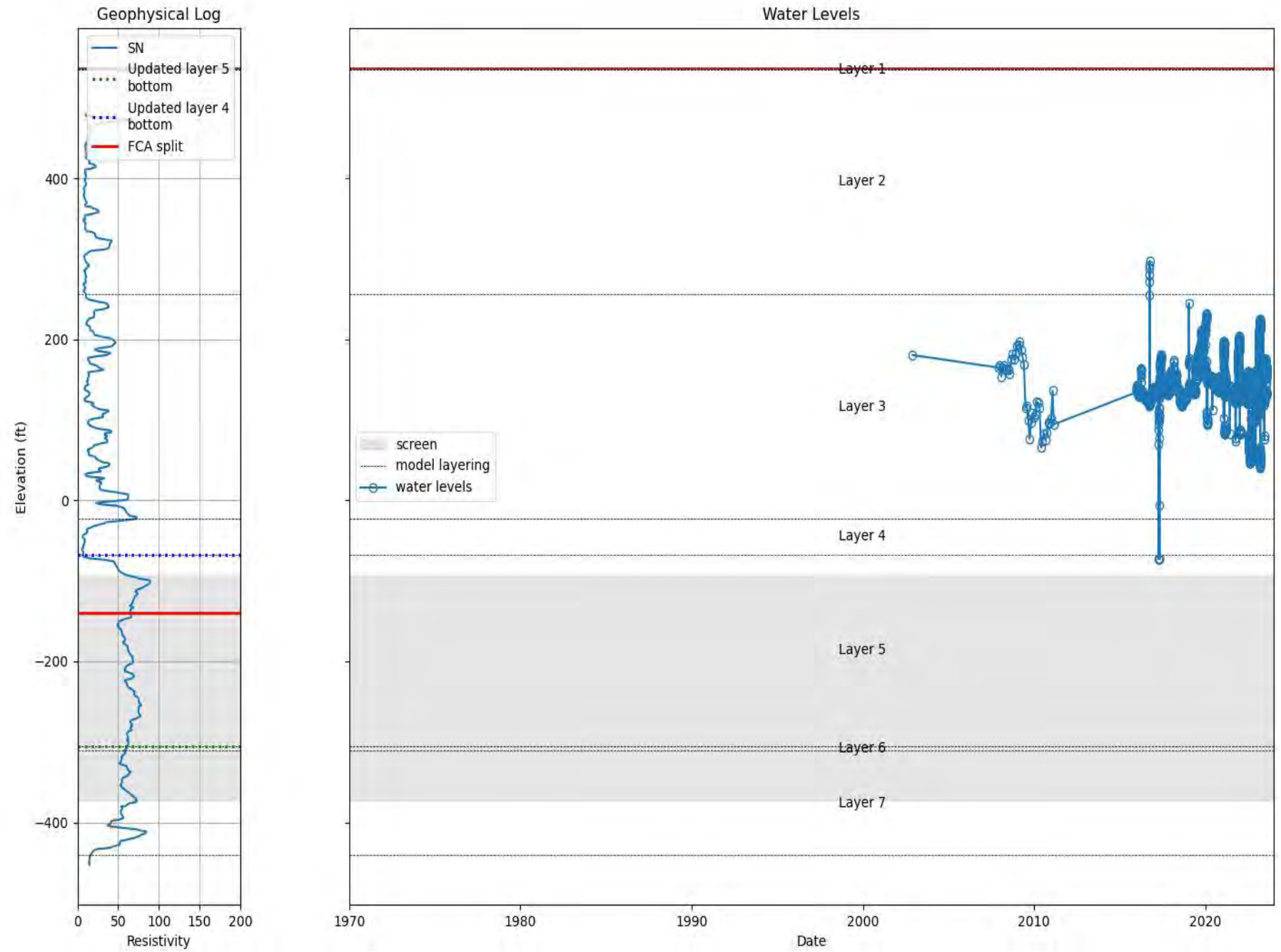


Figure A.7
Geophysical Log and Water Level Data for
02N20W01C02S (ASR-18)
ELPMA Groundwater Model Technical Memorandum



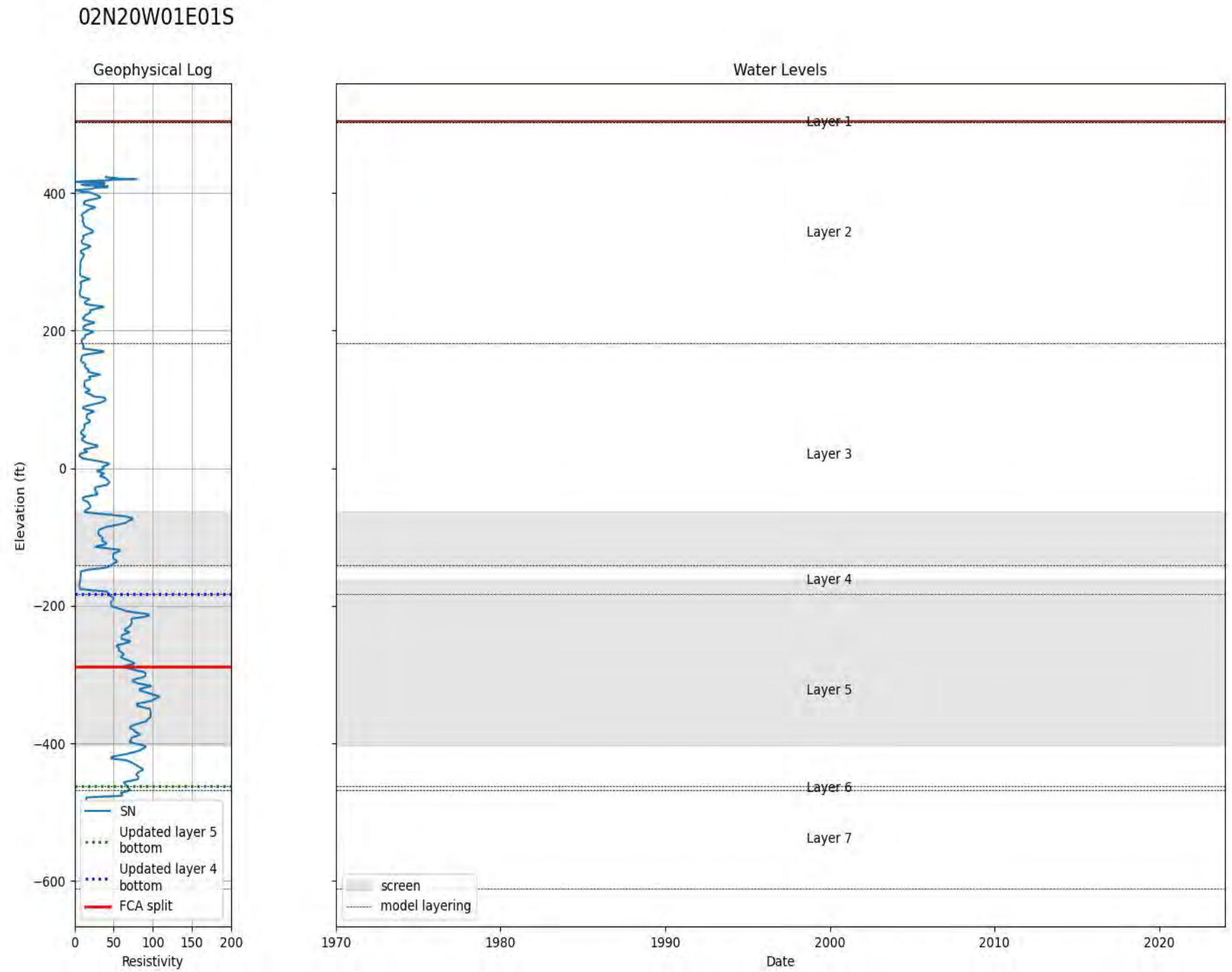


Figure A.8
Geophysical Log and Water Level Data for
02N20W01E01S
ELPMA Groundwater Model Technical Memorandum



02N20W01E02S ASR-17

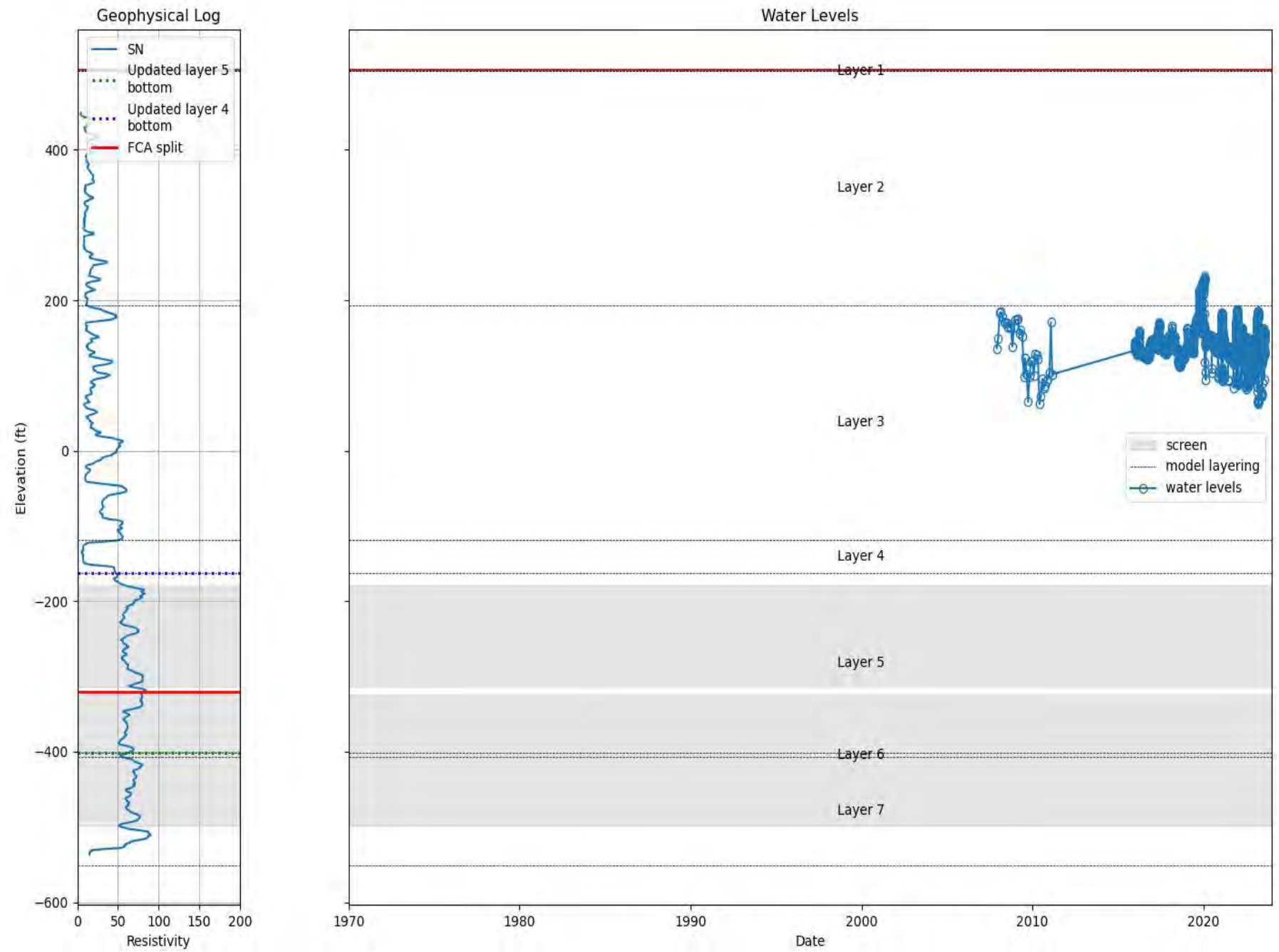


Figure A.9
Geophysical Log and Water Level Data for
02N20W01E02S (ASR-17)
ELPMA Groundwater Model Technical Memorandum



02N20W01F01S ASR-1

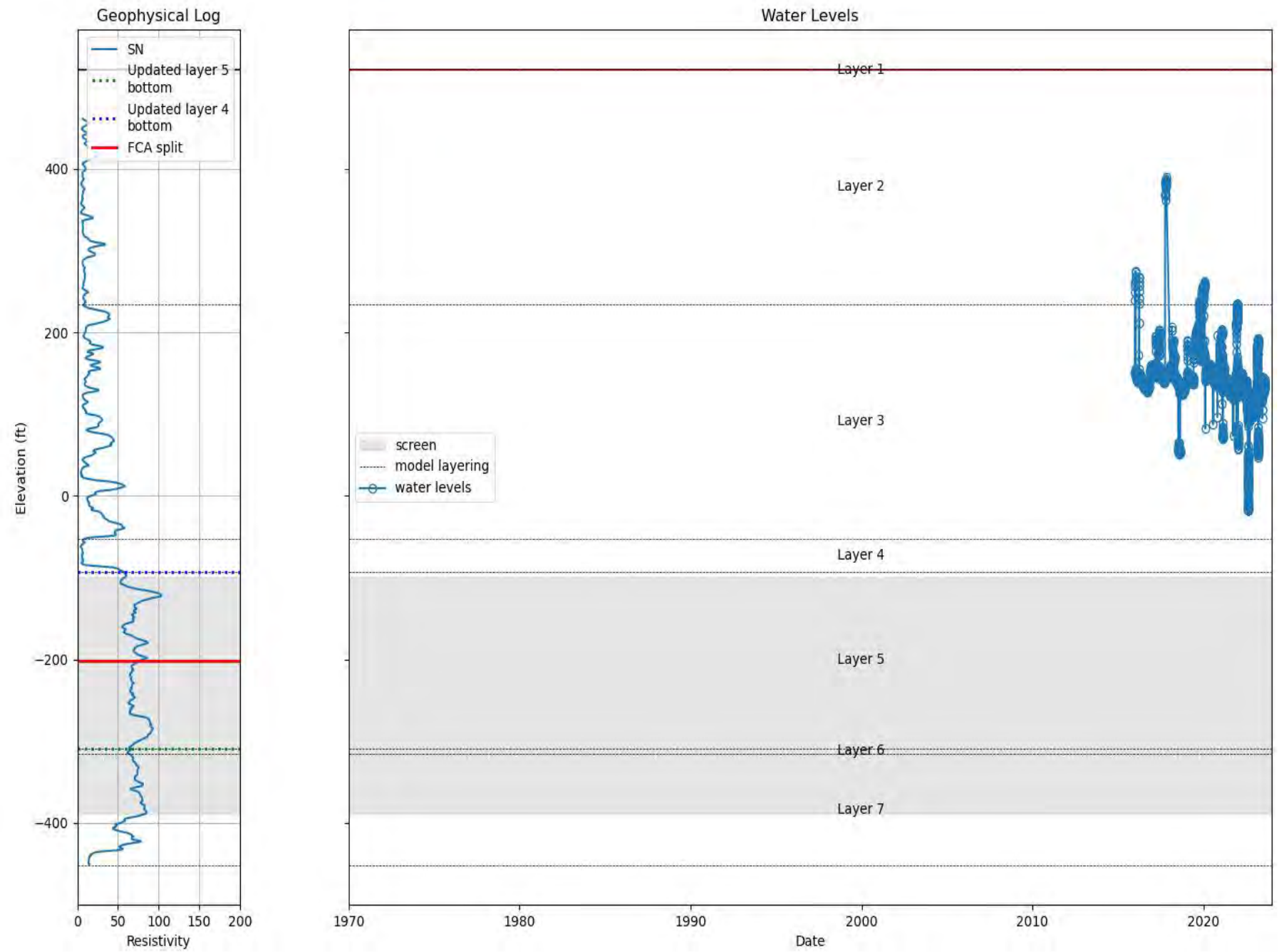


Figure A.10
Geophysical Log and Water Level Data for
02N20W01F01S (ASR-1)
ELPMA Groundwater Model Technical Memorandum



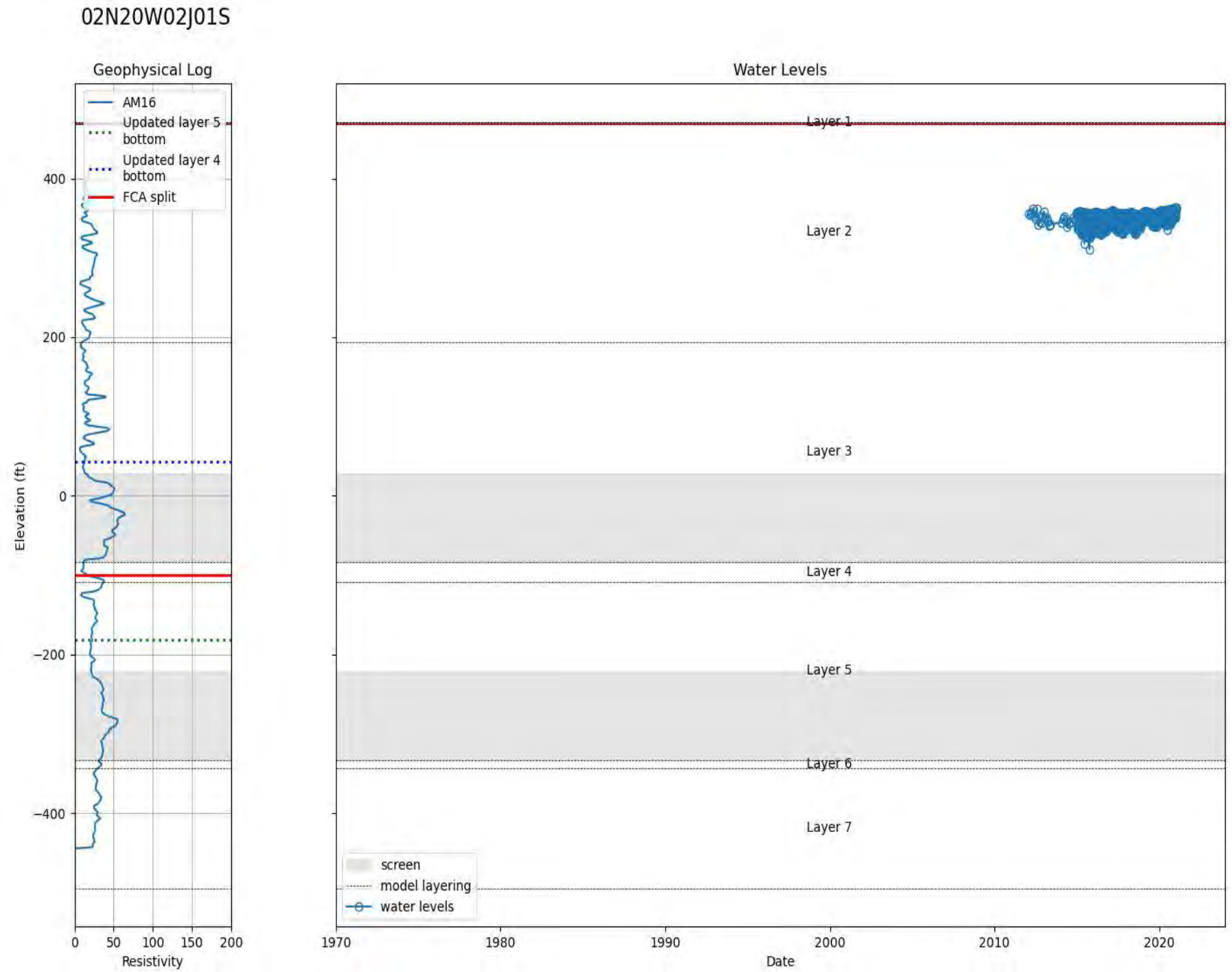


Figure A.11
Geophysical Log and Water Level Data for
02N20W02J01S
ELPMA Groundwater Model Technical Memorandum



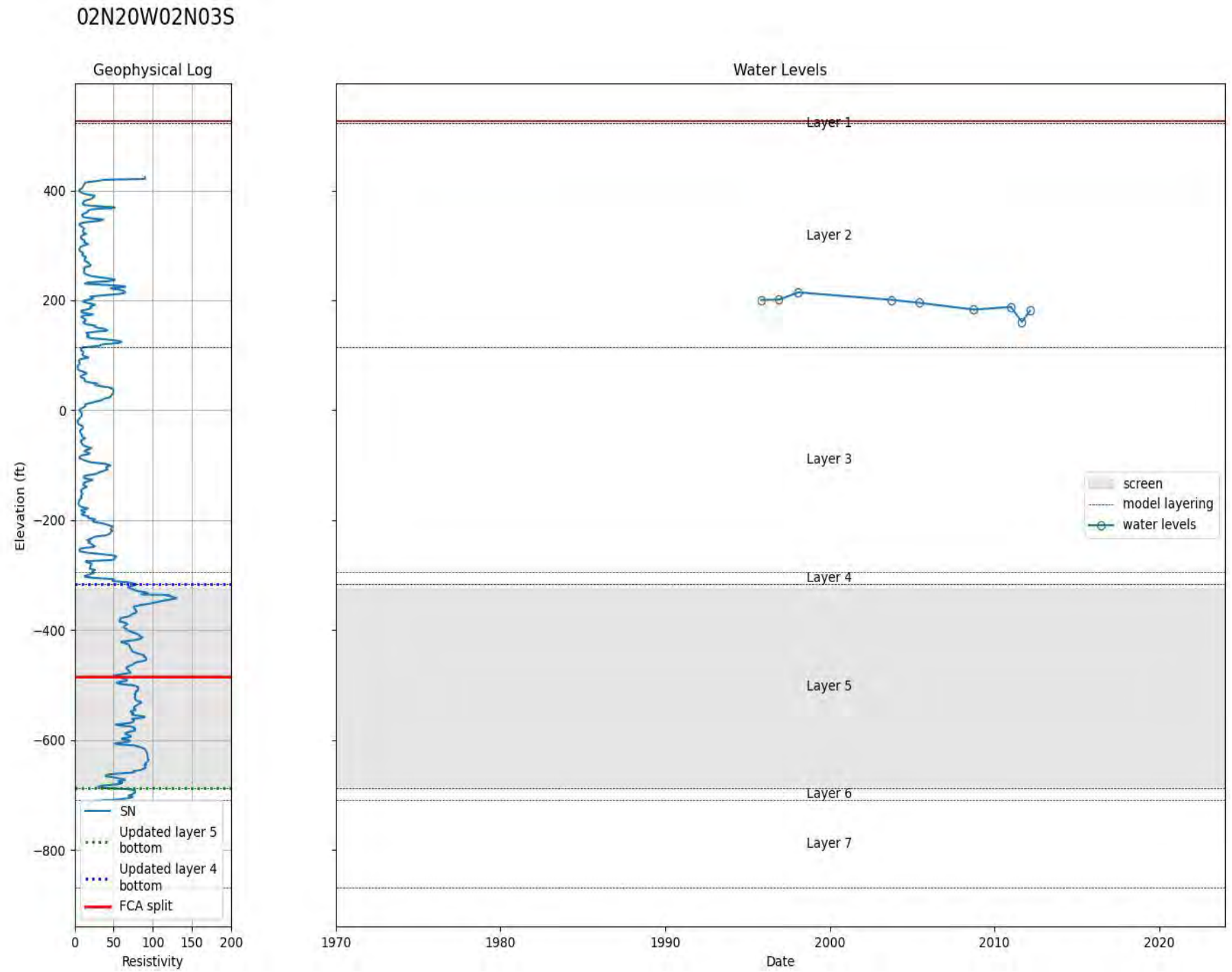


Figure A.12
 Geophysical Log and Water Level Data for
 02N20W02N03S
 ELPMA Groundwater Model Technical Memorandum



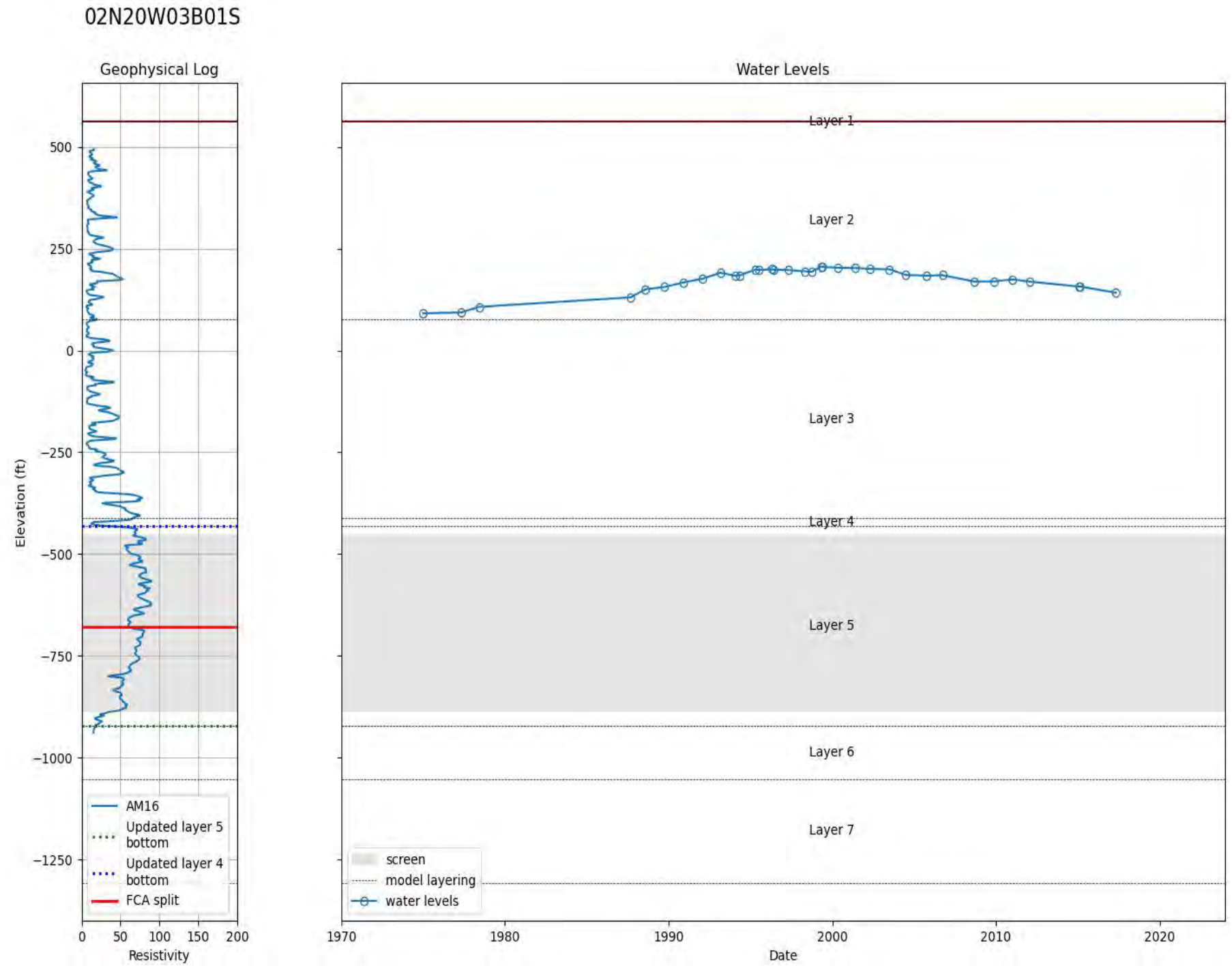


Figure A.13
Geophysical Log and Water Level Data for
02N20W03B01S
ELPMA Groundwater Model Technical Memorandum

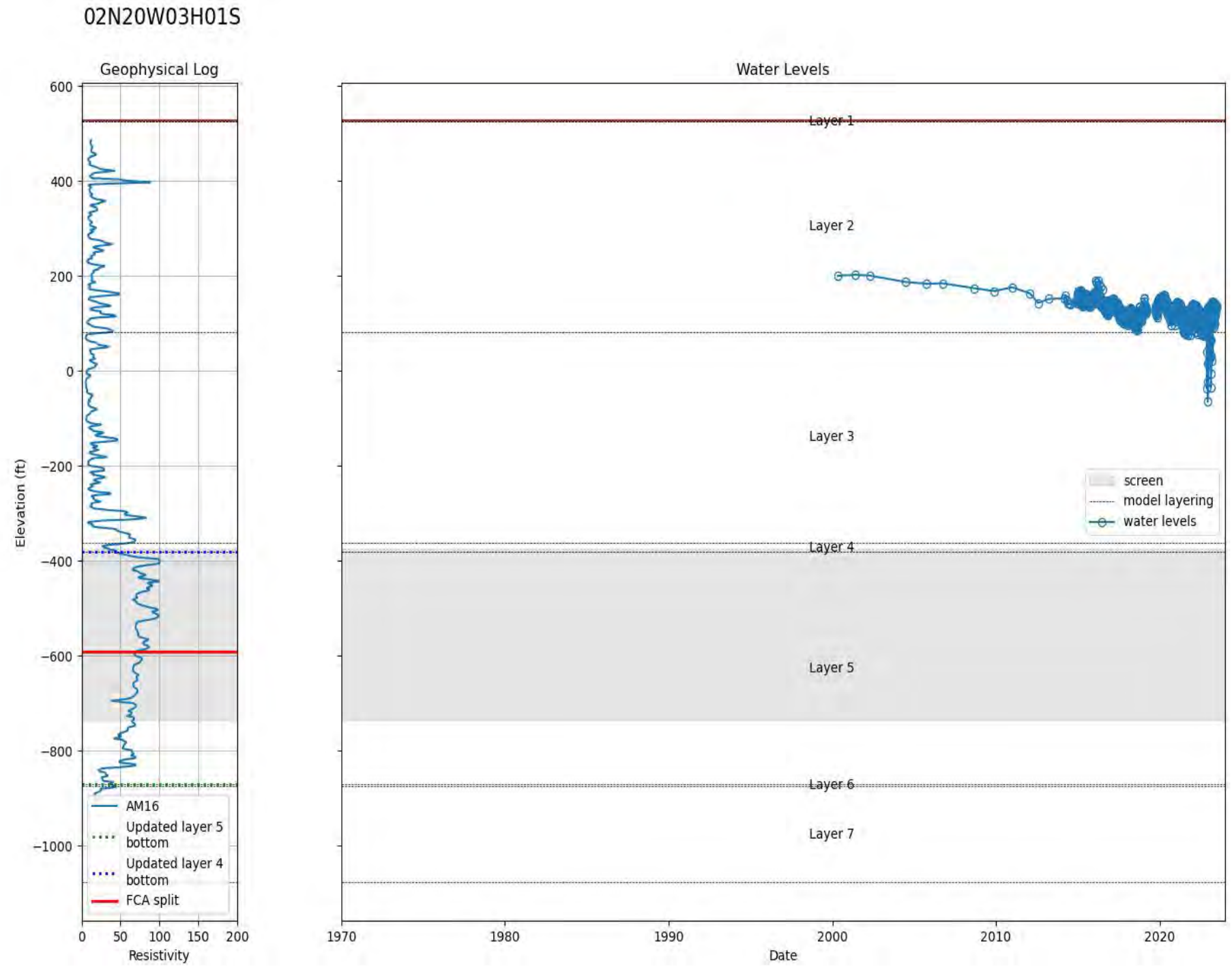


Figure A.14
Geophysical Log and Water Level Data for
02N20W03H01S
ELPMA Groundwater Model Technical Memorandum



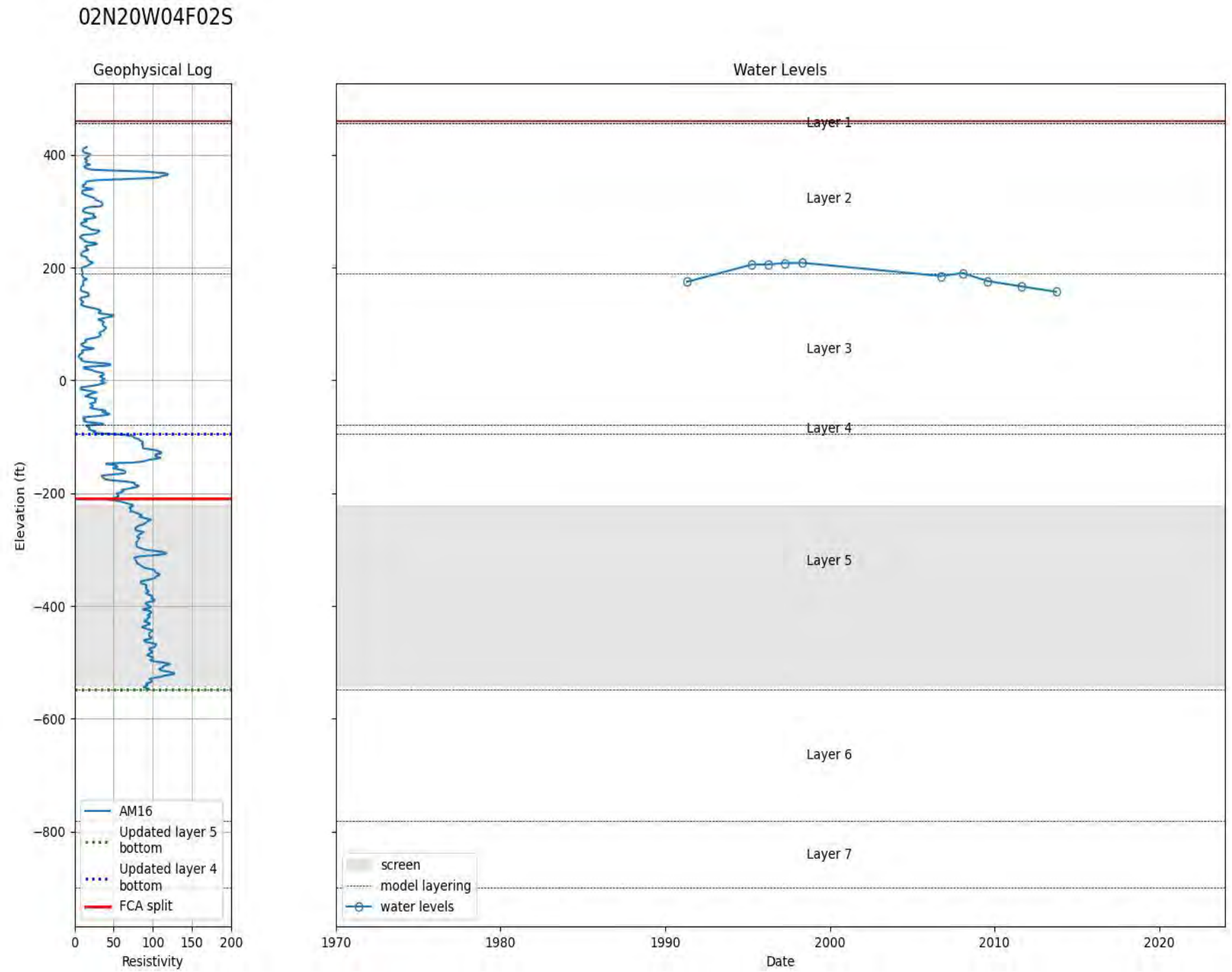


Figure A.15
Geophysical Log and Water Level Data for
02N20W04F02S
ELPMA Groundwater Model Technical Memorandum



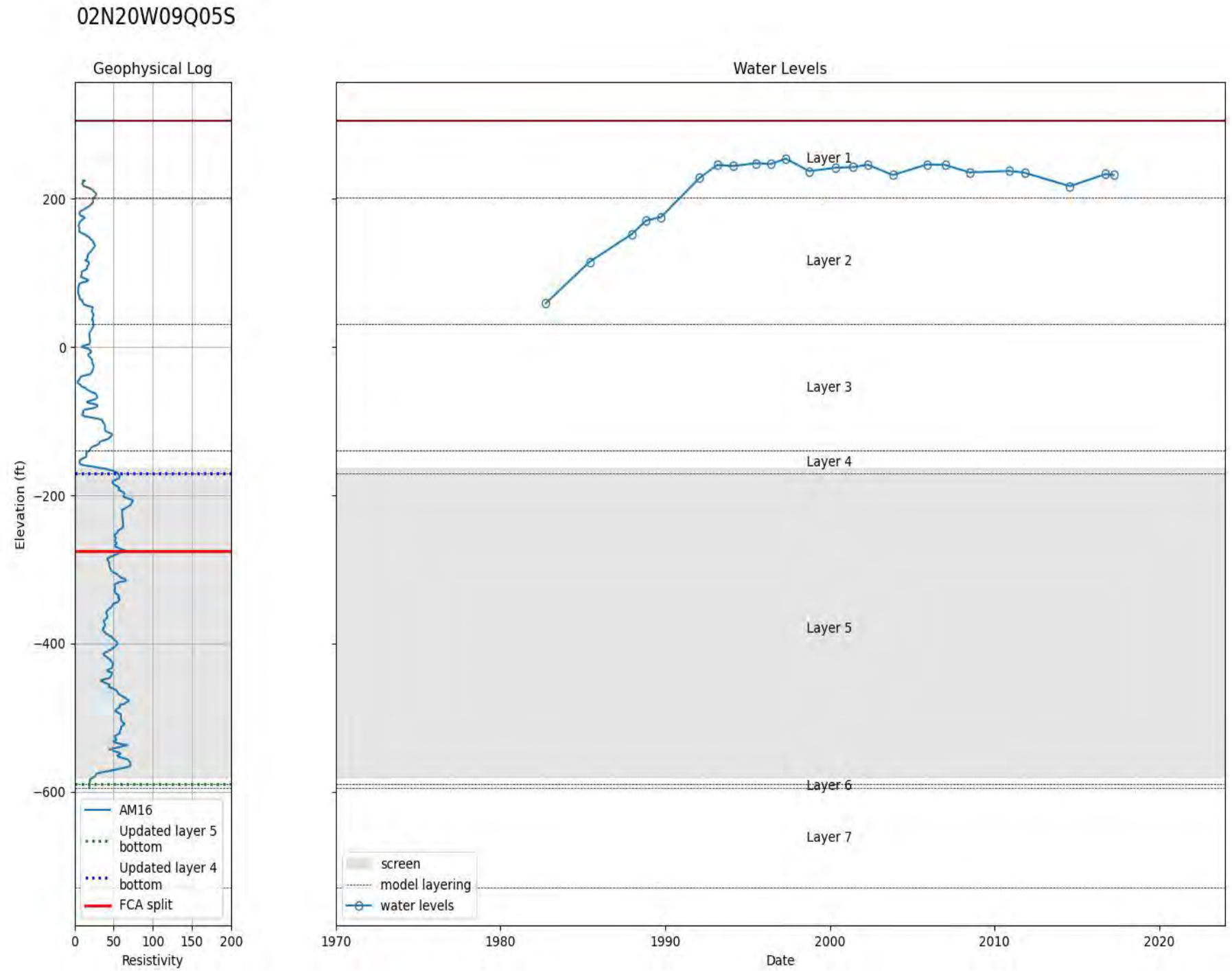


Figure A.16
 Geophysical Log and Water Level Data for
 02N20W09Q05S
 ELPMA Groundwater Model Technical Memorandum

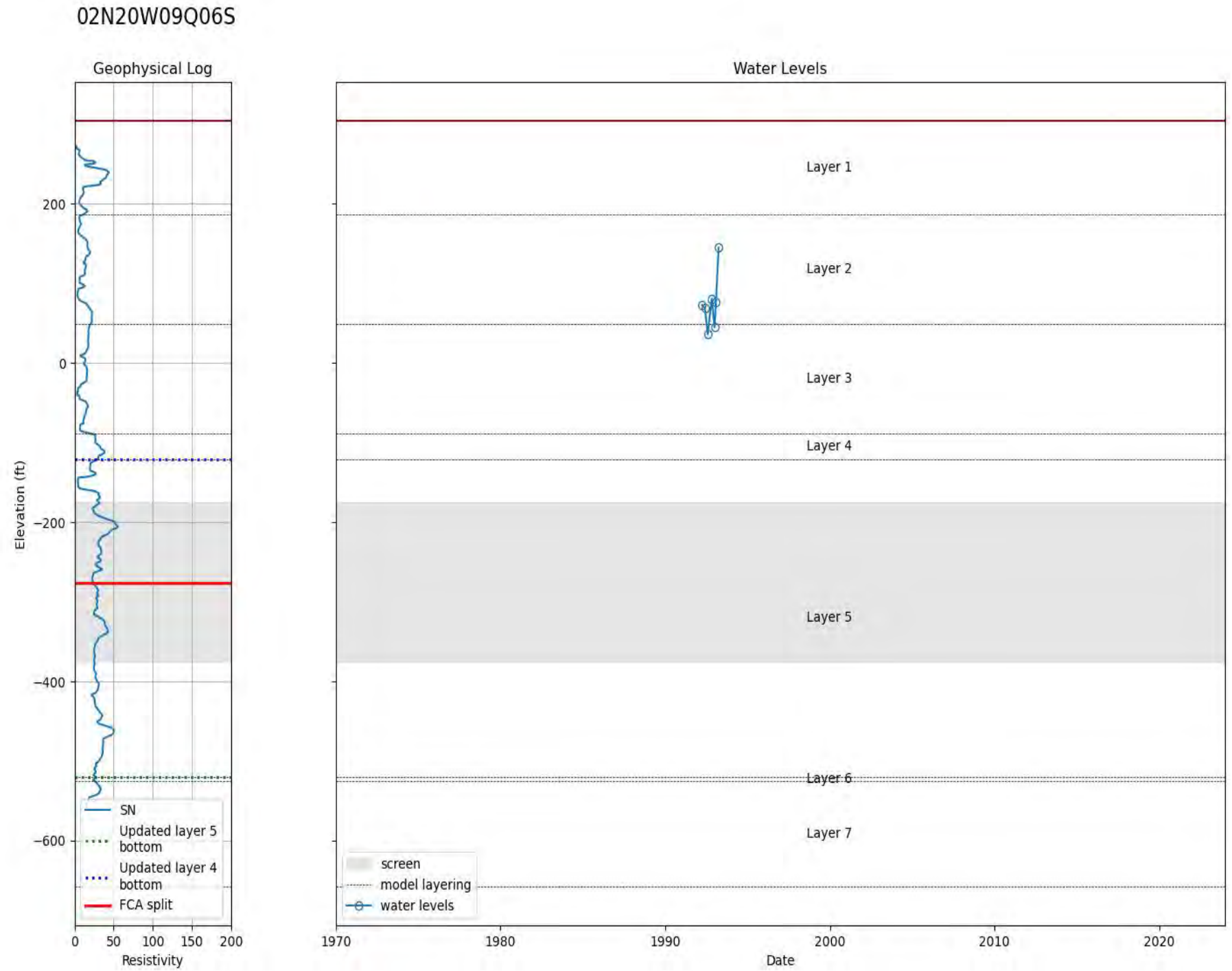


Figure A.17
Geophysical Log and Water Level Data for
02N20W09Q06S
ELPMA Groundwater Model Technical Memorandum



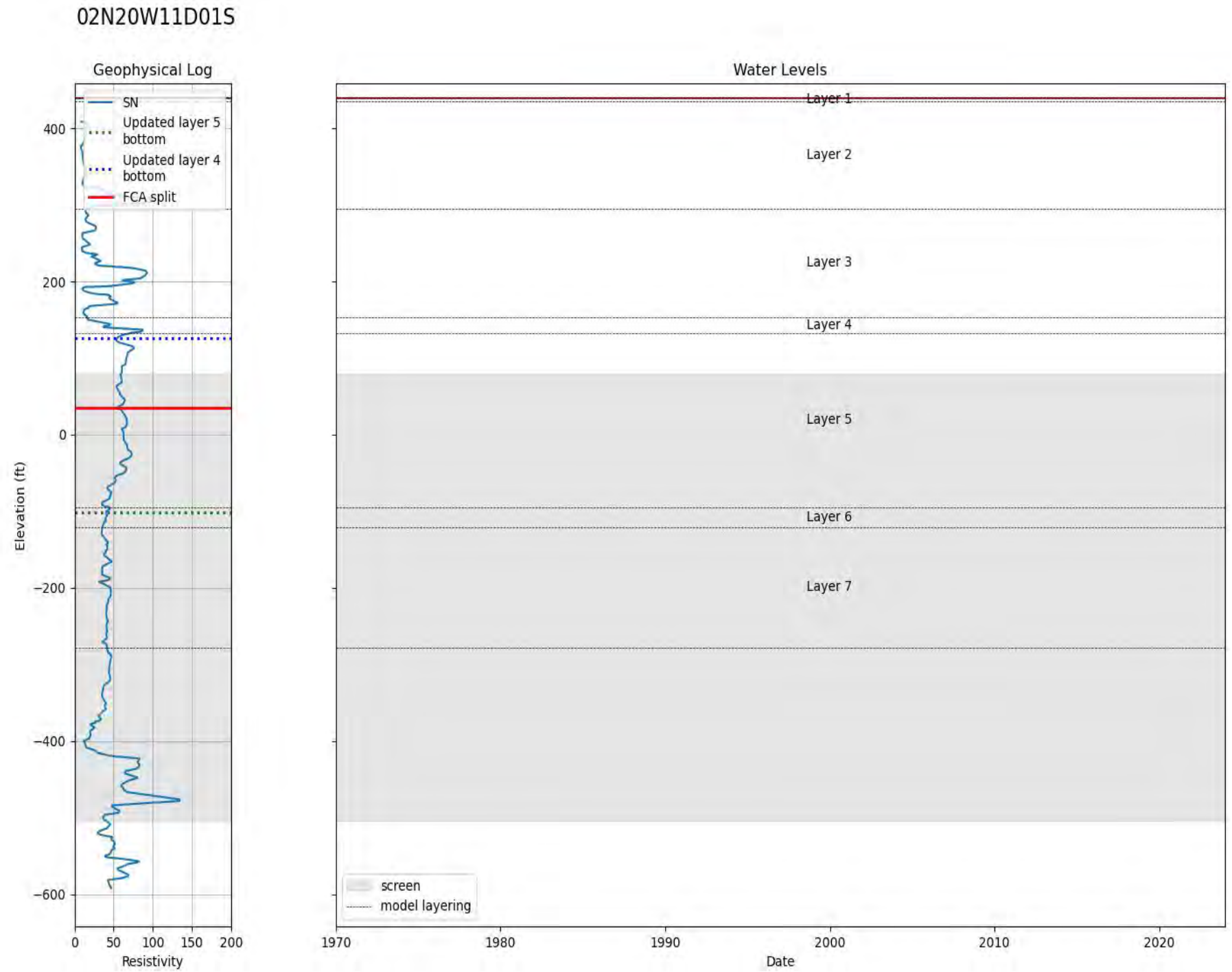


Figure A.18
Geophysical Log and Water Level Data for
02N20W11D01S
ELPMA Groundwater Model Technical Memorandum



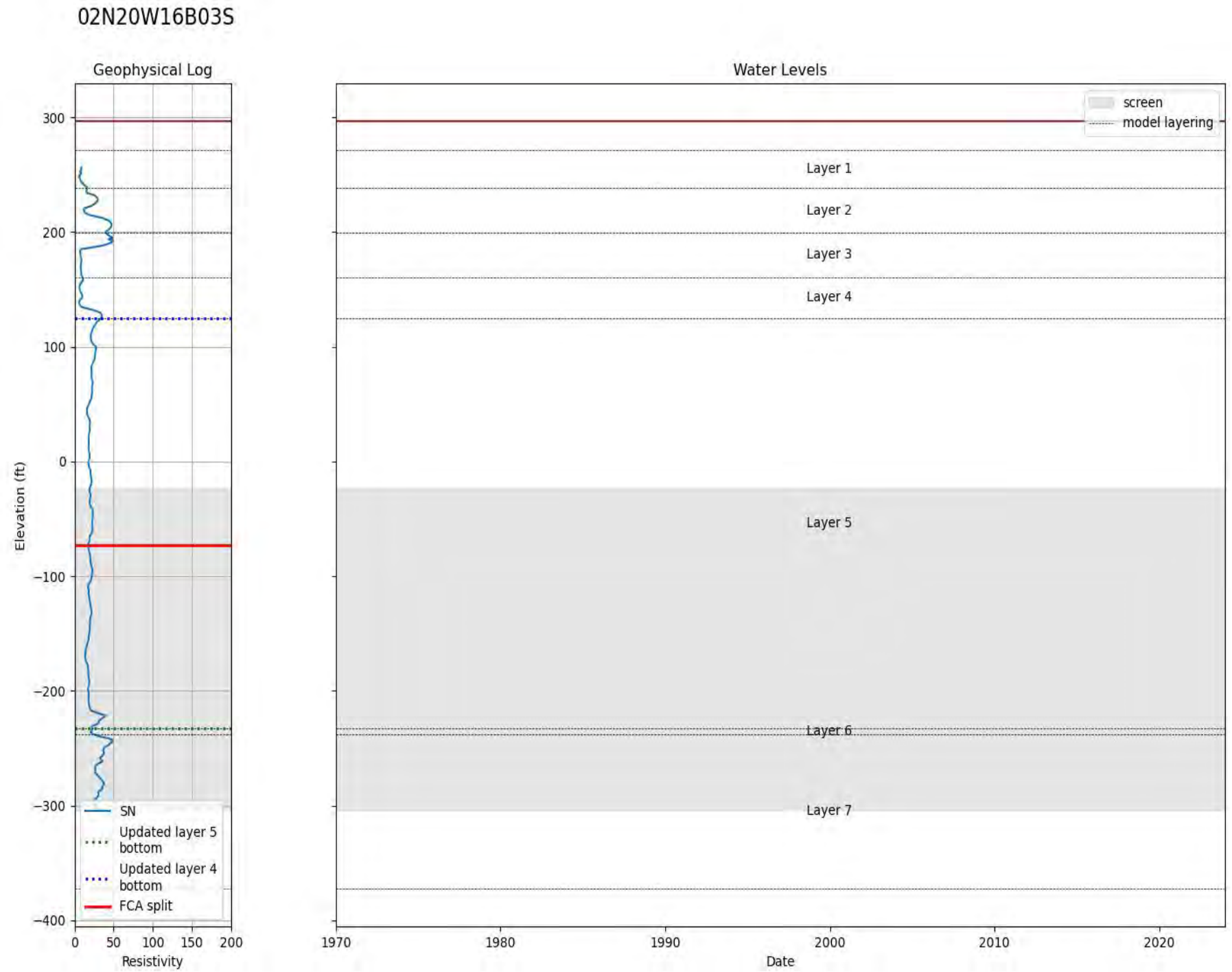


Figure A.19
Geophysical Log and Water Level Data for
02N20W16B03S
ELPMA Groundwater Model Technical Memorandum



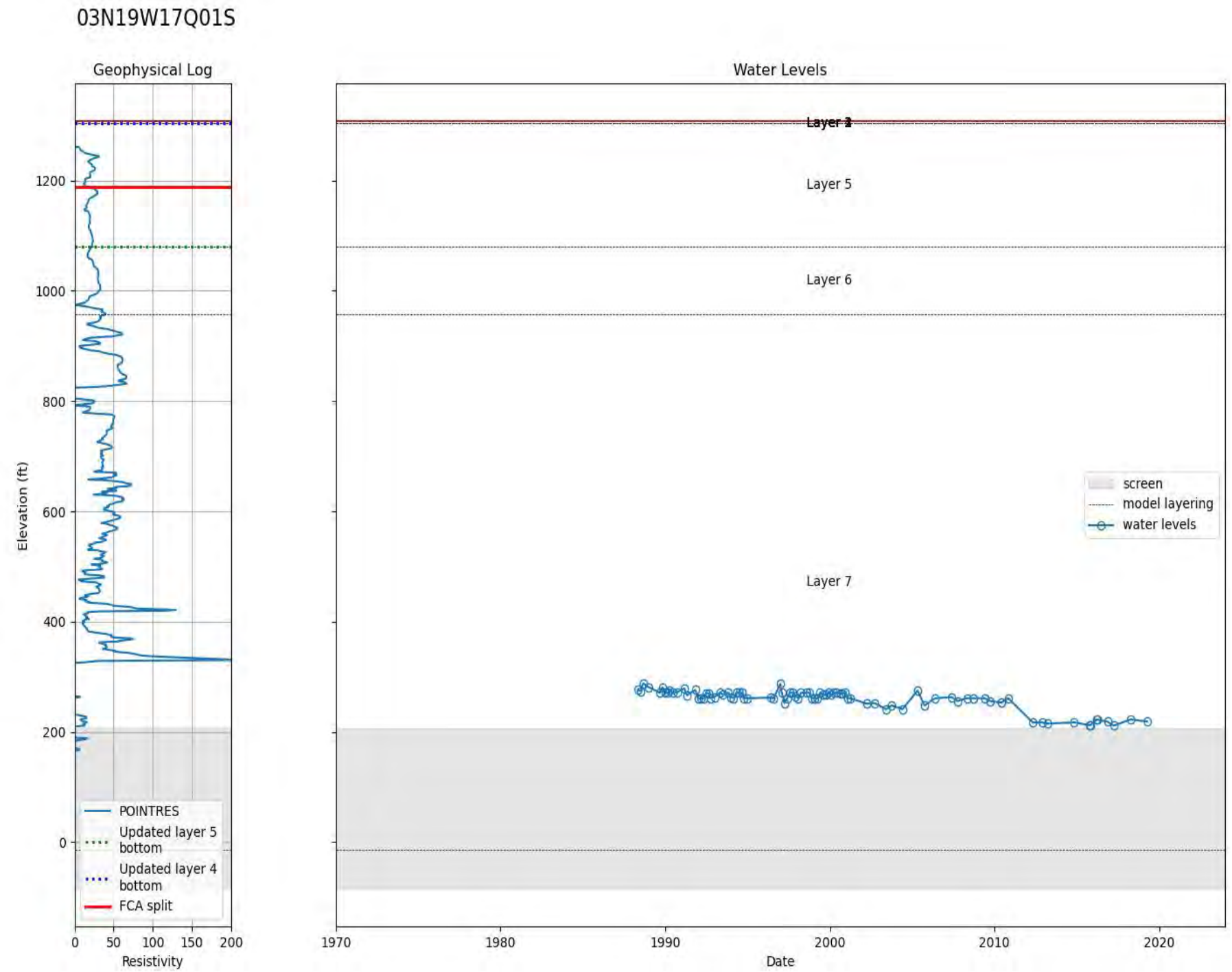


Figure A.20
Geophysical Log and Water Level Data for
03N19W17Q01S
ELPMA Groundwater Model Technical Memorandum



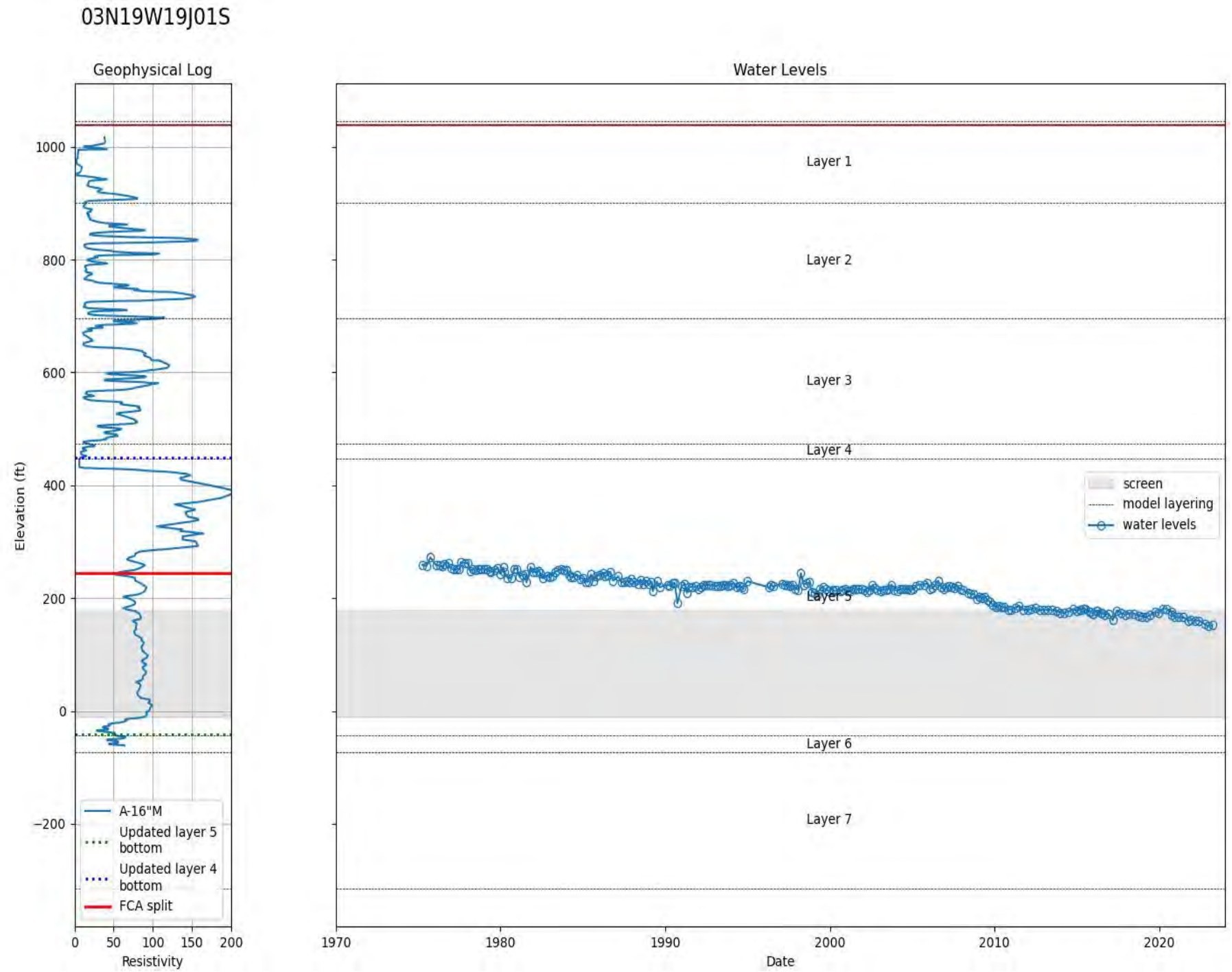


Figure A.21
Geophysical Log and Water Level Data for
03N19W19J01S
ELPMA Groundwater Model Technical Memorandum



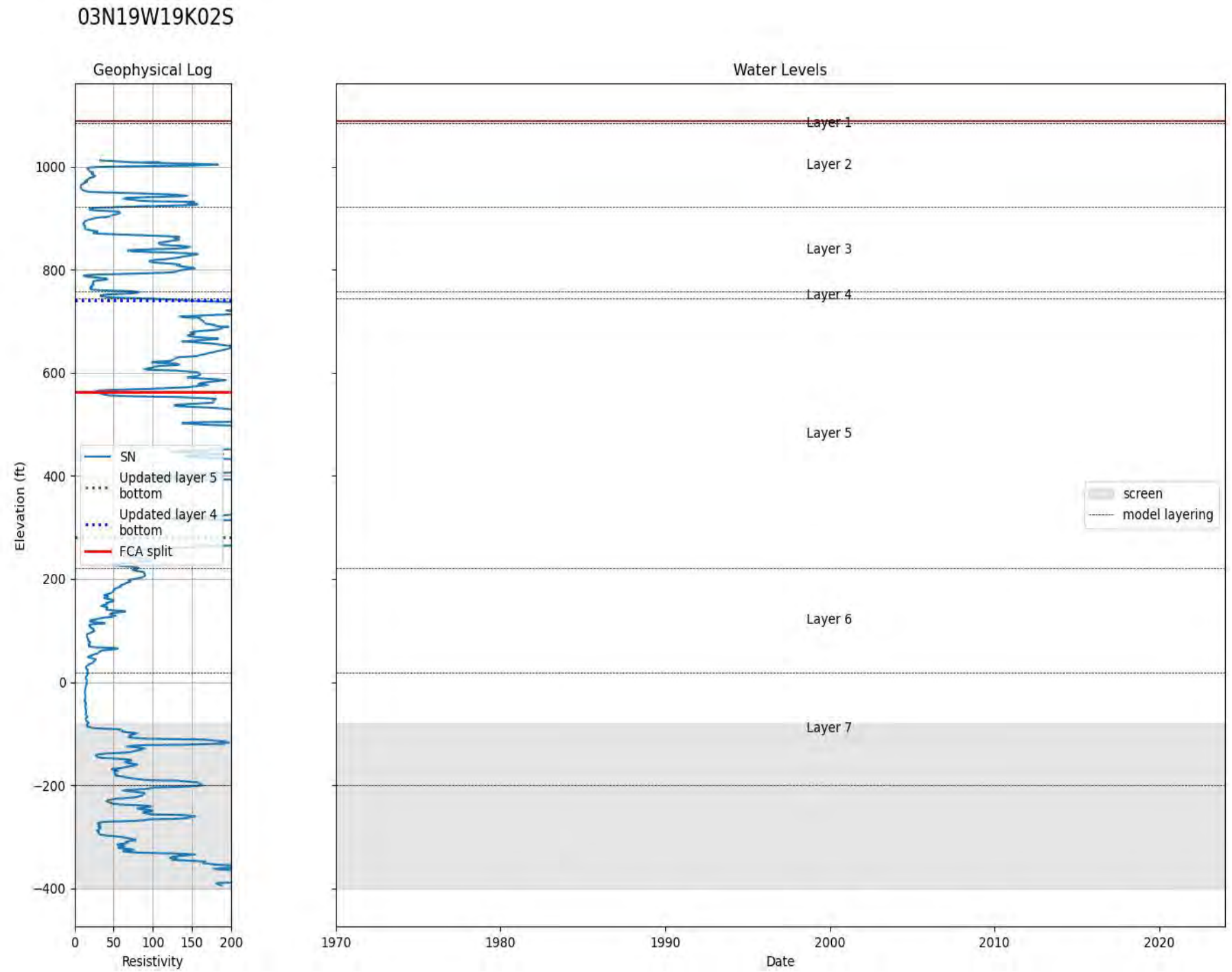


Figure A.22
Geophysical Log and Water Level Data for
03N19W19K02S
ELPMA Groundwater Model Technical Memorandum



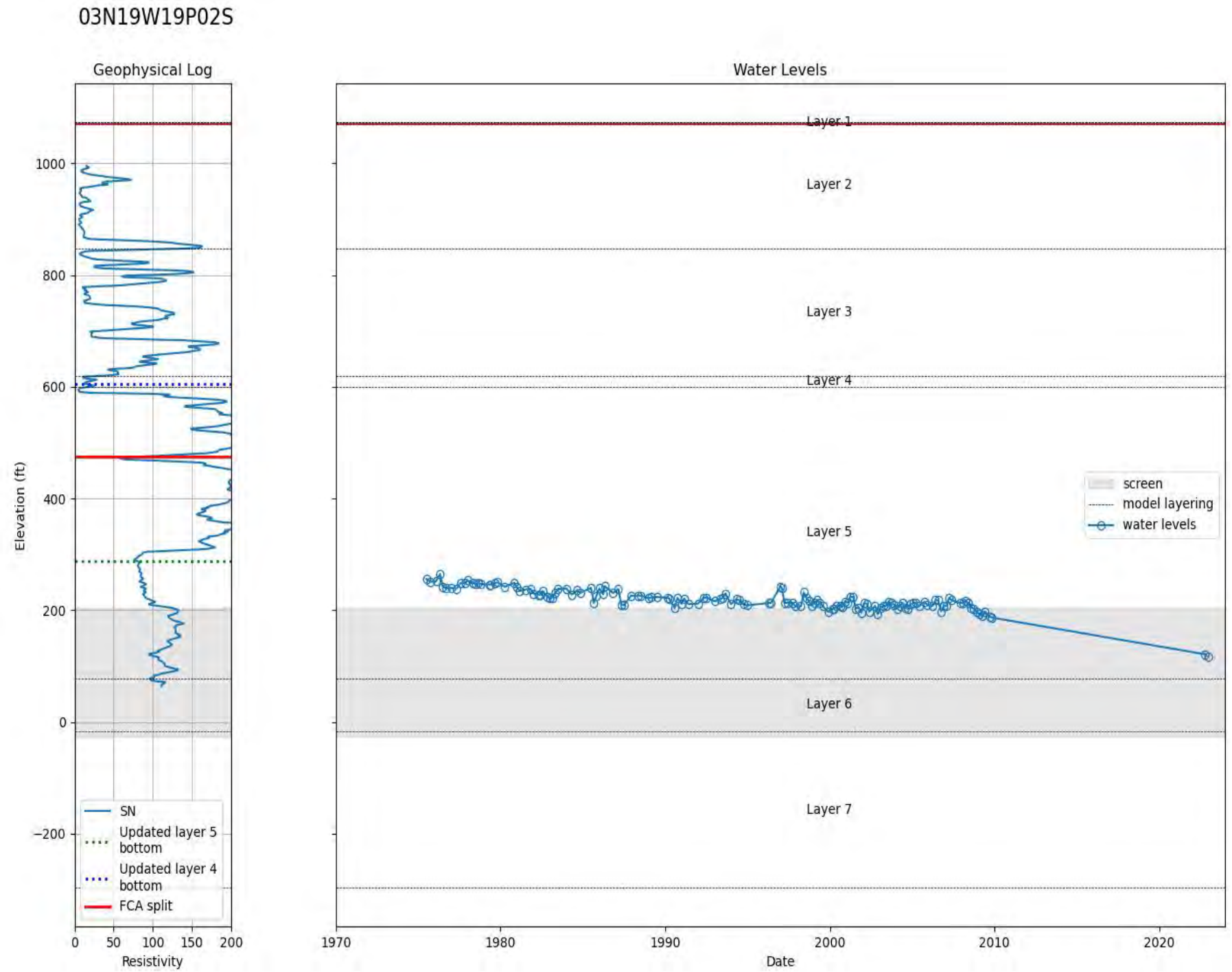


Figure A.23
Geophysical Log and Water Level Data for
03N19W19P02S
ELPMA Groundwater Model Technical Memorandum



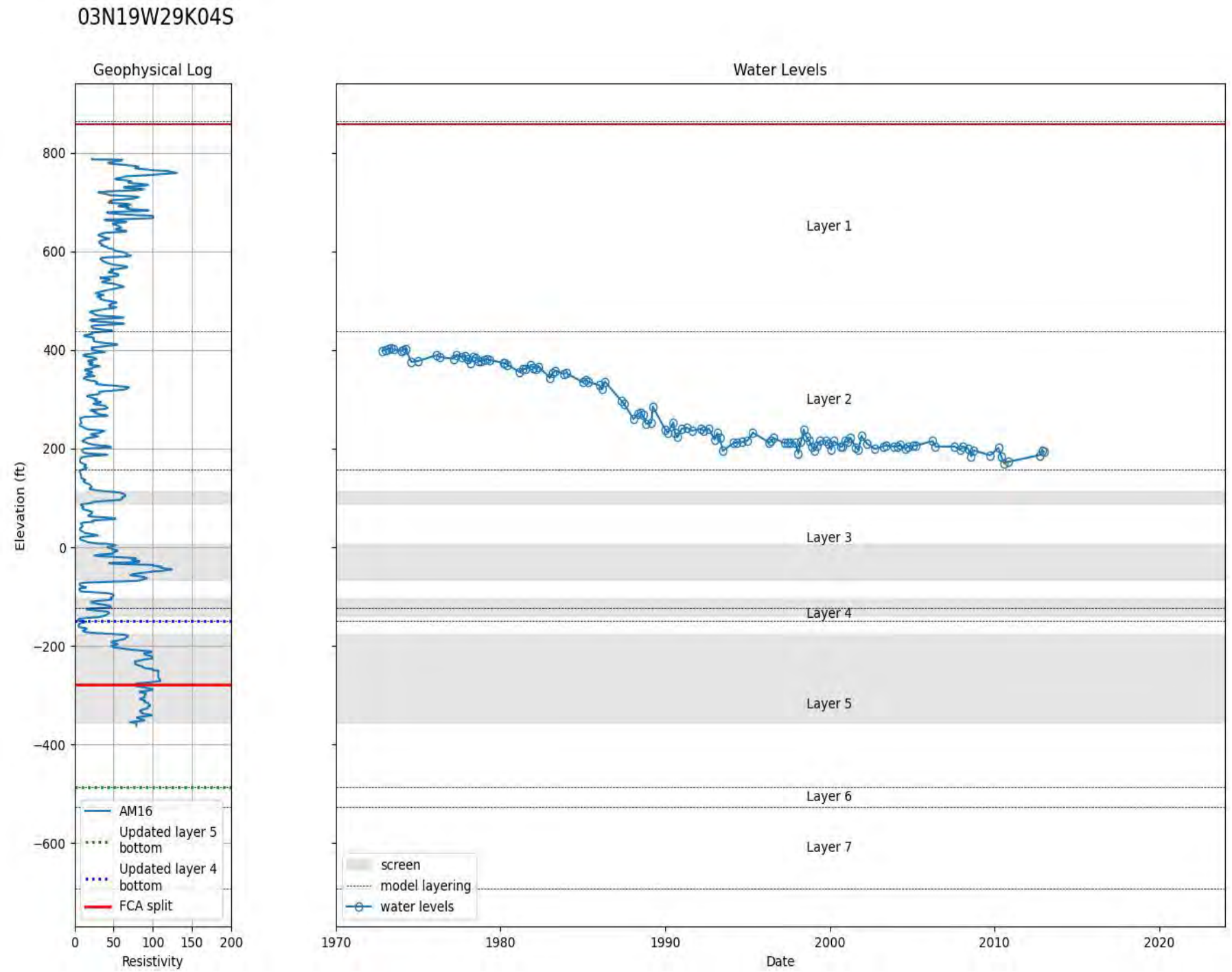


Figure A.24
Geophysical Log and Water Level Data for
03N19W29K04S
ELPMA Groundwater Model Technical Memorandum



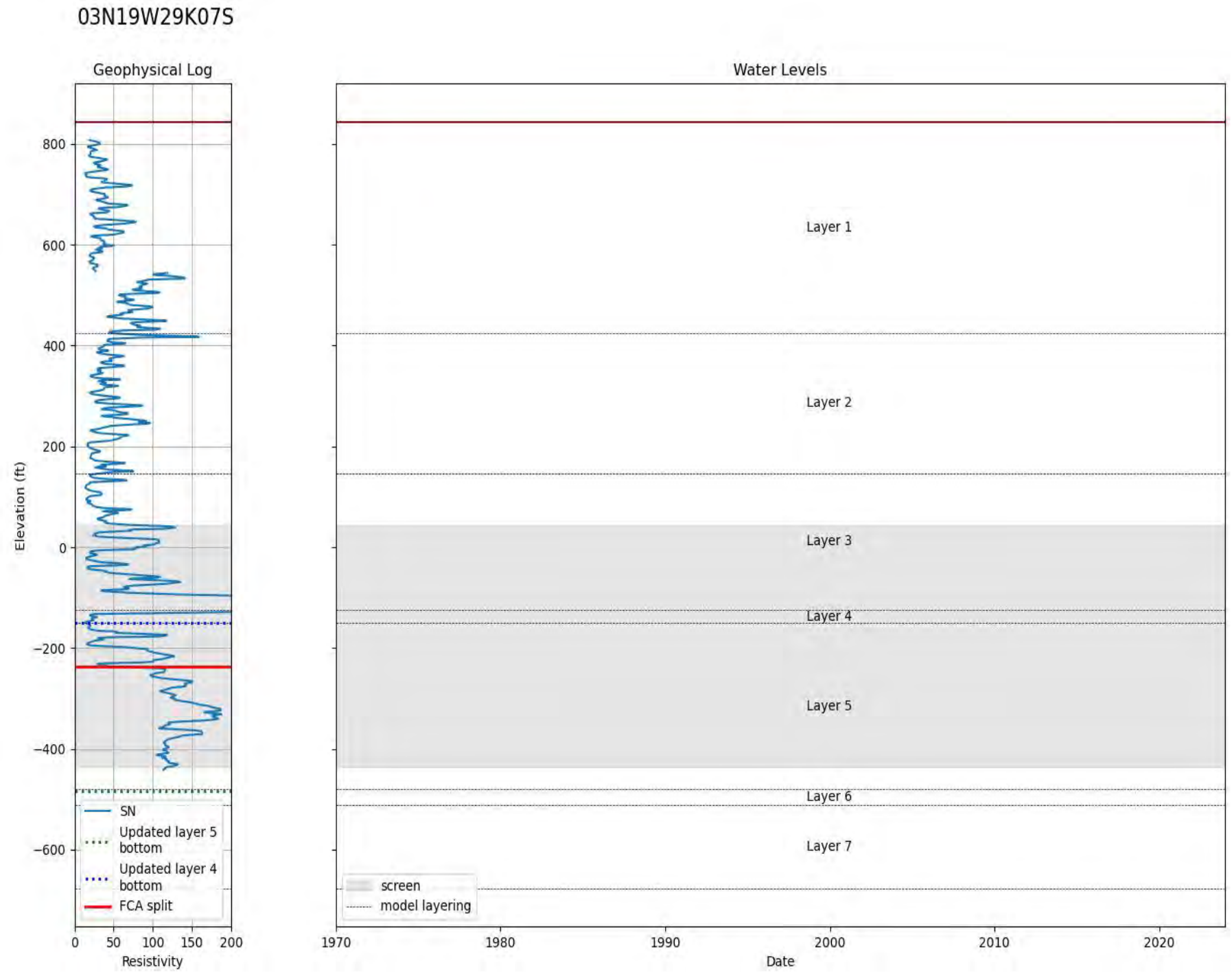


Figure A.25
Geophysical Log and Water Level Data for
03N19W29K07S
ELPMA Groundwater Model Technical Memorandum



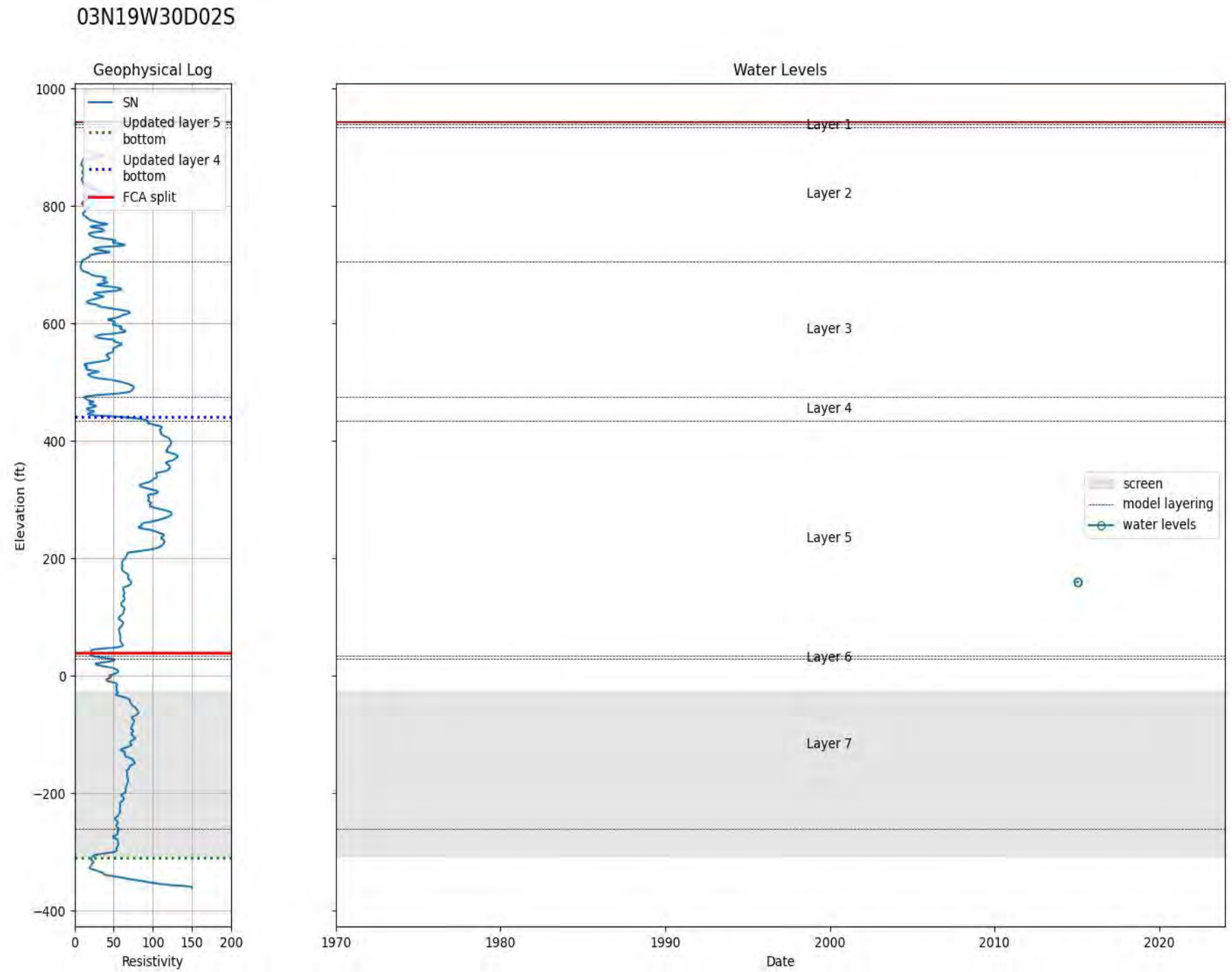


Figure A.26
Geophysical Log and Water Level Data for
03N19W30D02S
ELPMA Groundwater Model Technical Memorandum



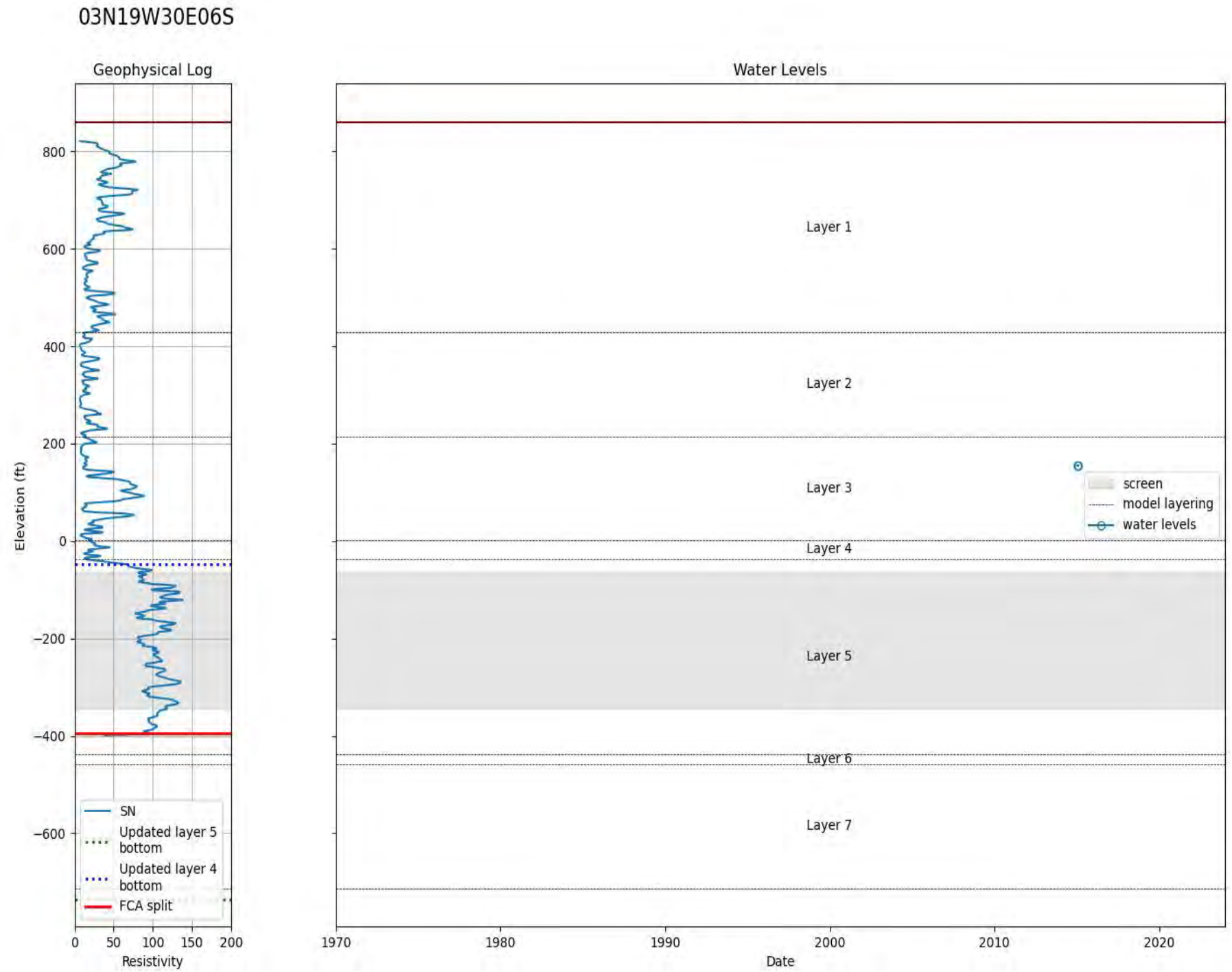


Figure A.27
Geophysical Log and Water Level Data for
03N19W30E06S
ELPMA Groundwater Model Technical Memorandum



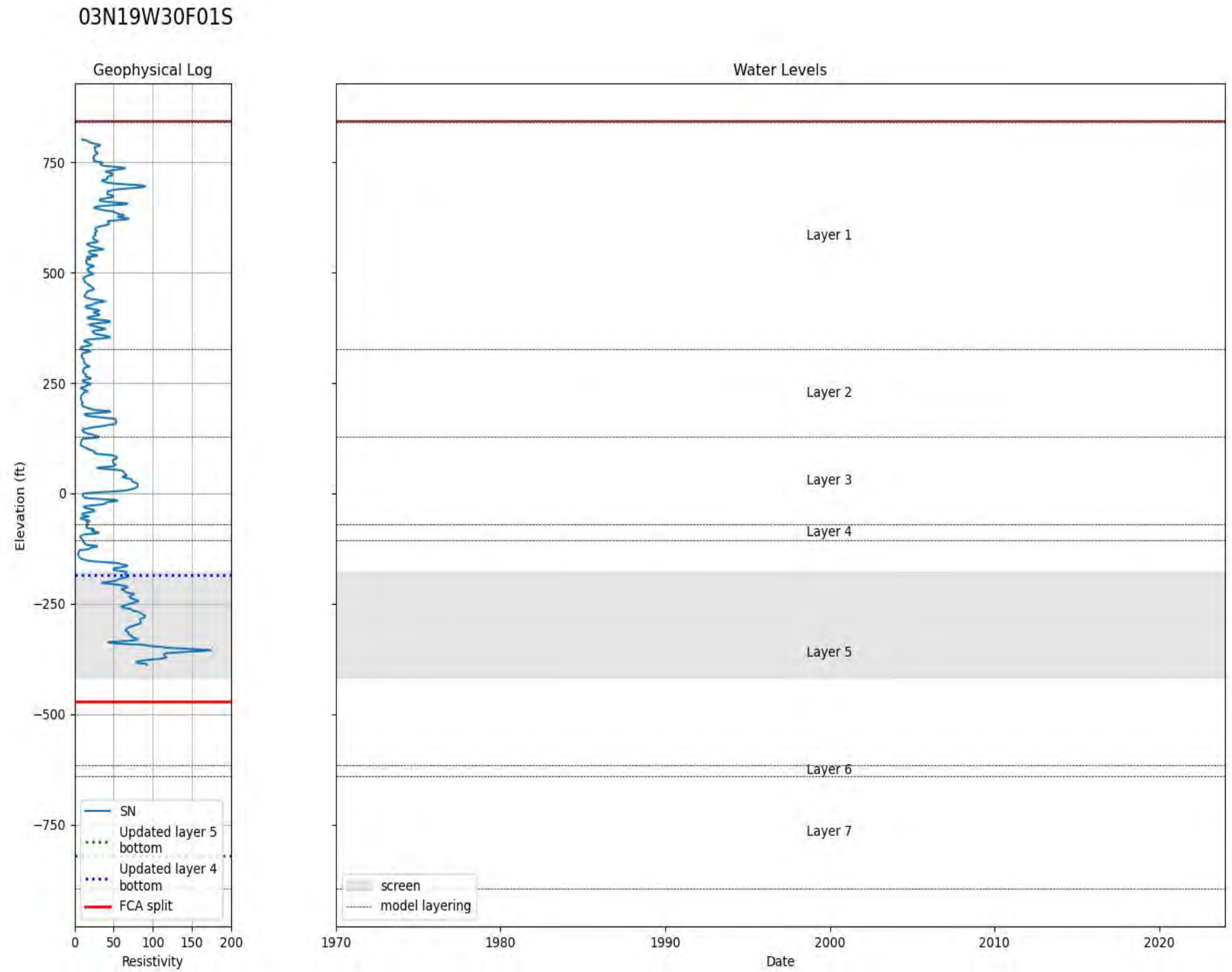


Figure A.28
Geophysical Log and Water Level Data for
03N19W30F01S
ELPMA Groundwater Model Technical Memorandum



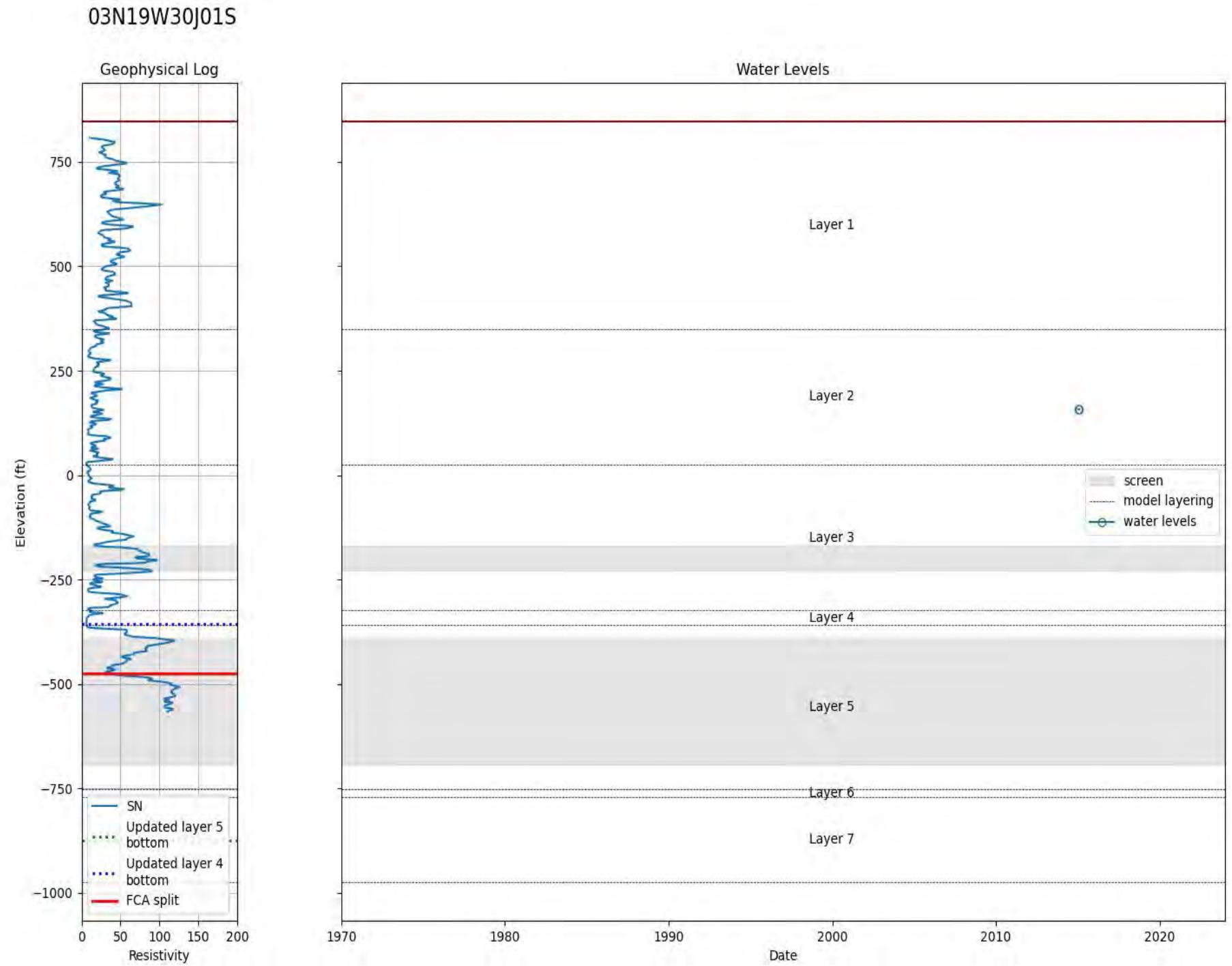


Figure A.29
Geophysical Log and Water Level Data for
03N19W30J01S
ELPMA Groundwater Model Technical Memorandum



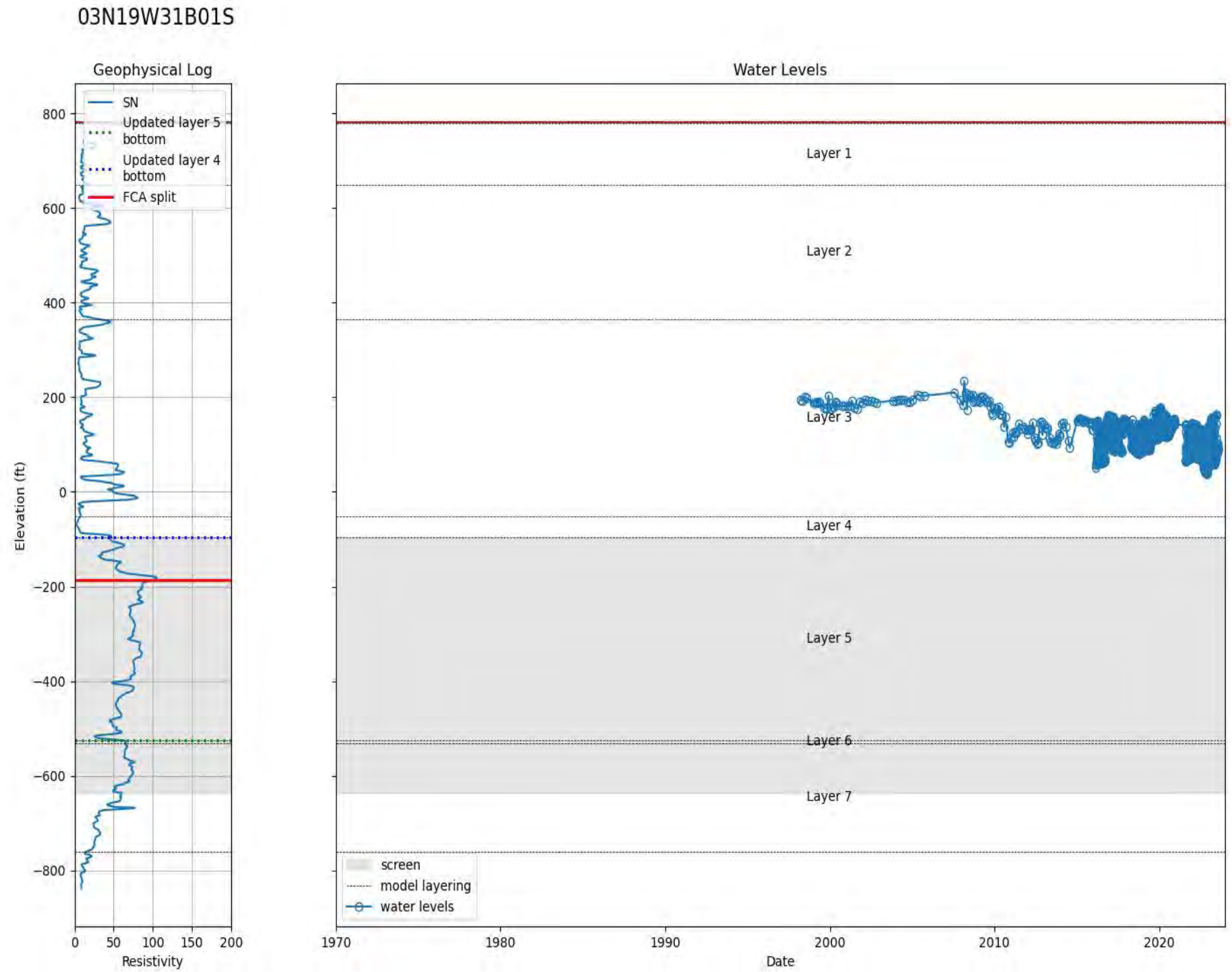


Figure A.30
Geophysical Log and Water Level Data for
03N19W31B01S
ELPMA Groundwater Model Technical Memorandum



03N19W31C01S ASR-7b

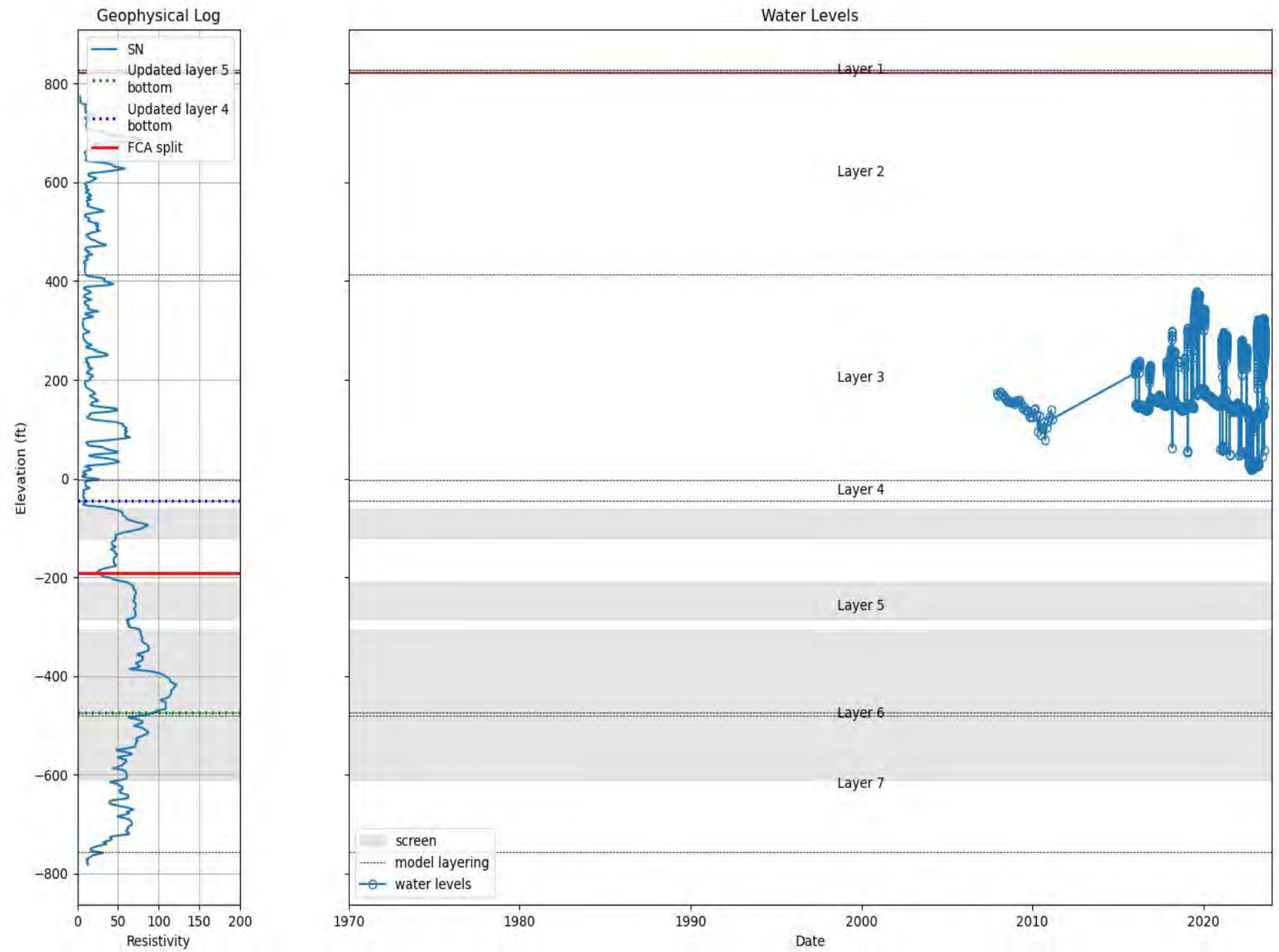


Figure A.31
Geophysical Log and Water Level Data for
03N19W31C01S (ASR-7)
ELPMA Groundwater Model Technical Memorandum



03N19W31C02S ASR-8

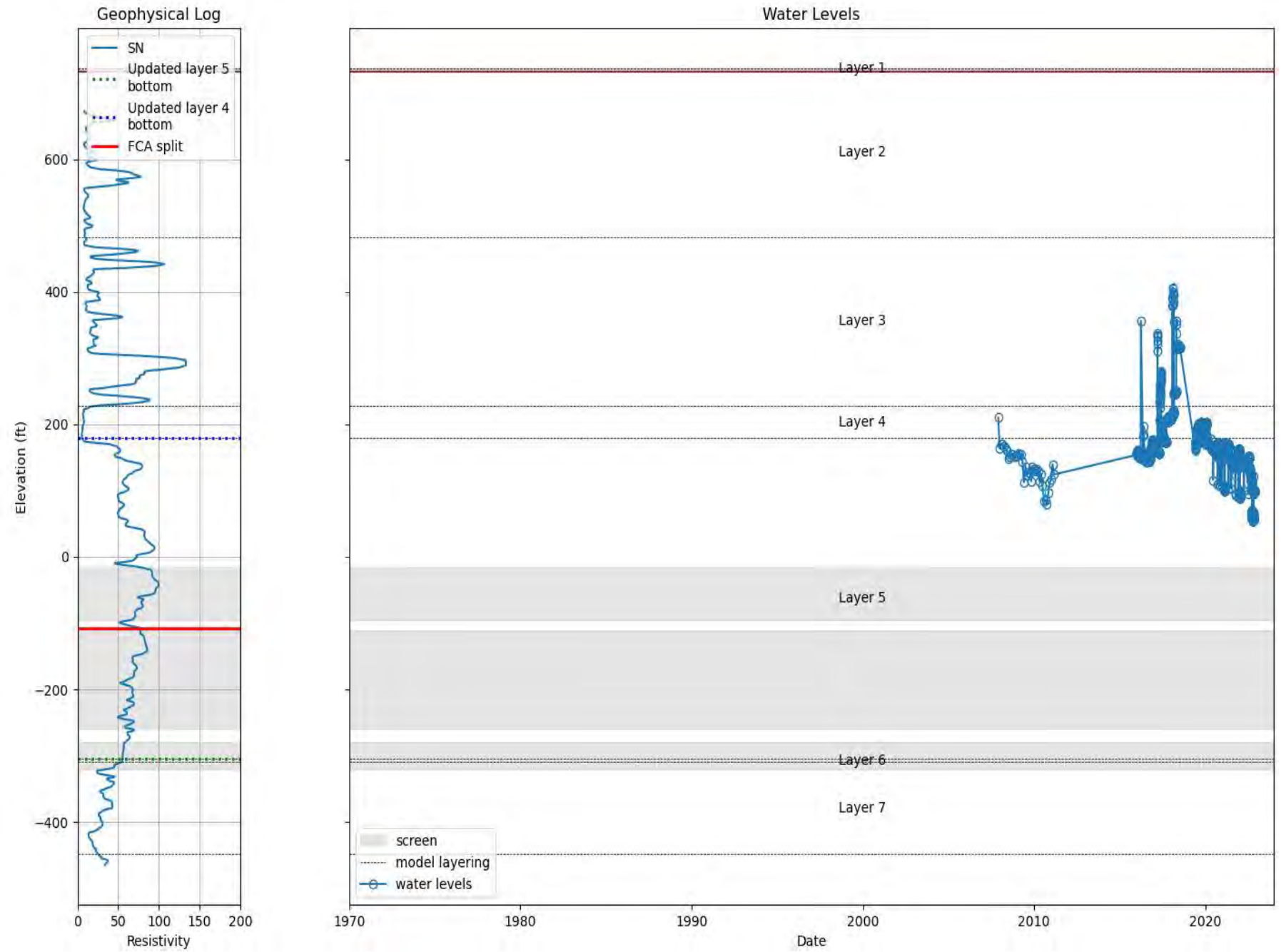


Figure A.32
Geophysical Log and Water Level Data for
03N19W31C02S (ASR-8)
ELPMA Groundwater Model Technical Memorandum



03N19W31D02S ASR-10

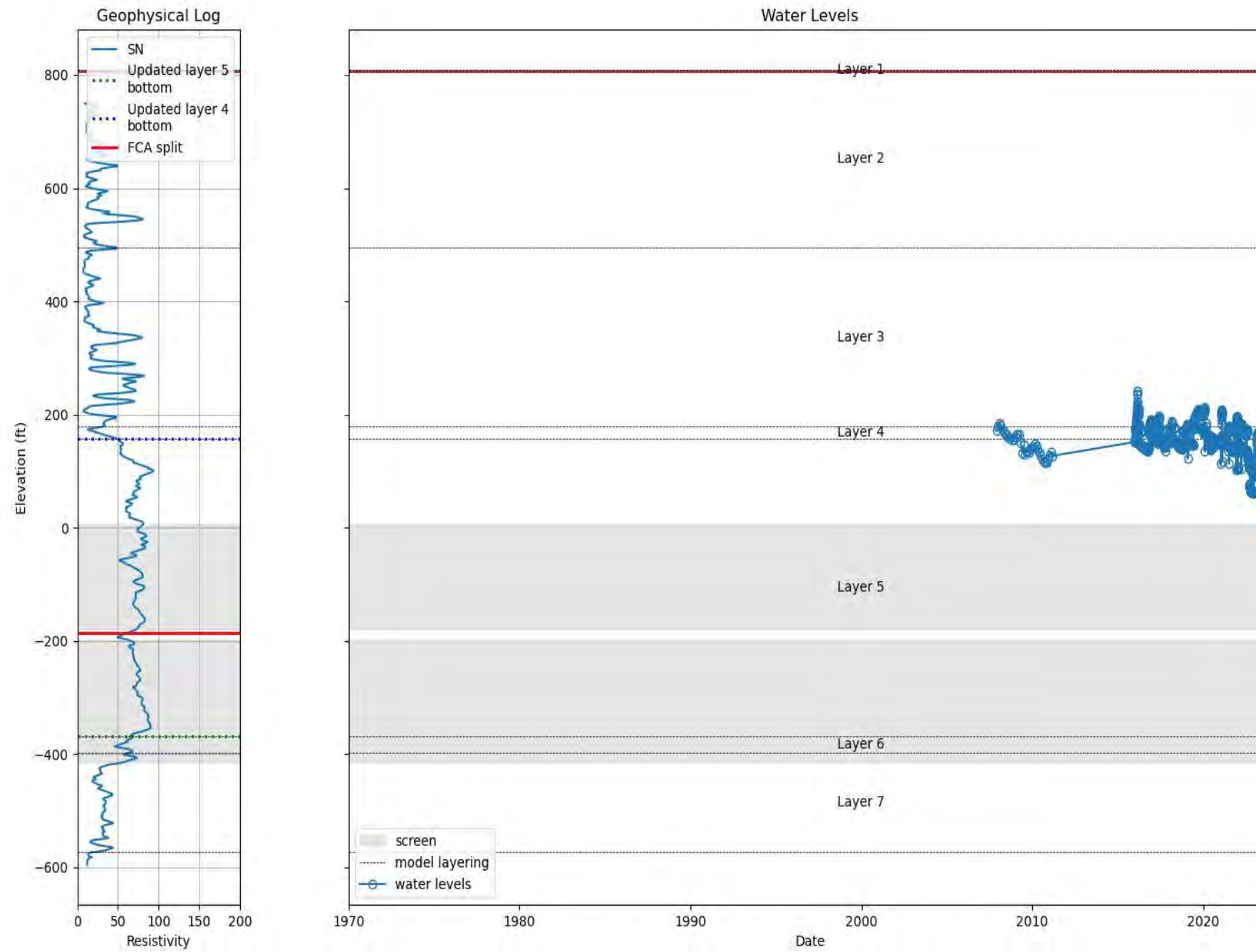


Figure A.33
Geophysical Log and Water Level Data for
03N19W31D02S (ASR-10)
ELPMA Groundwater Model Technical Memorandum



03N19W31D03S ASR-15

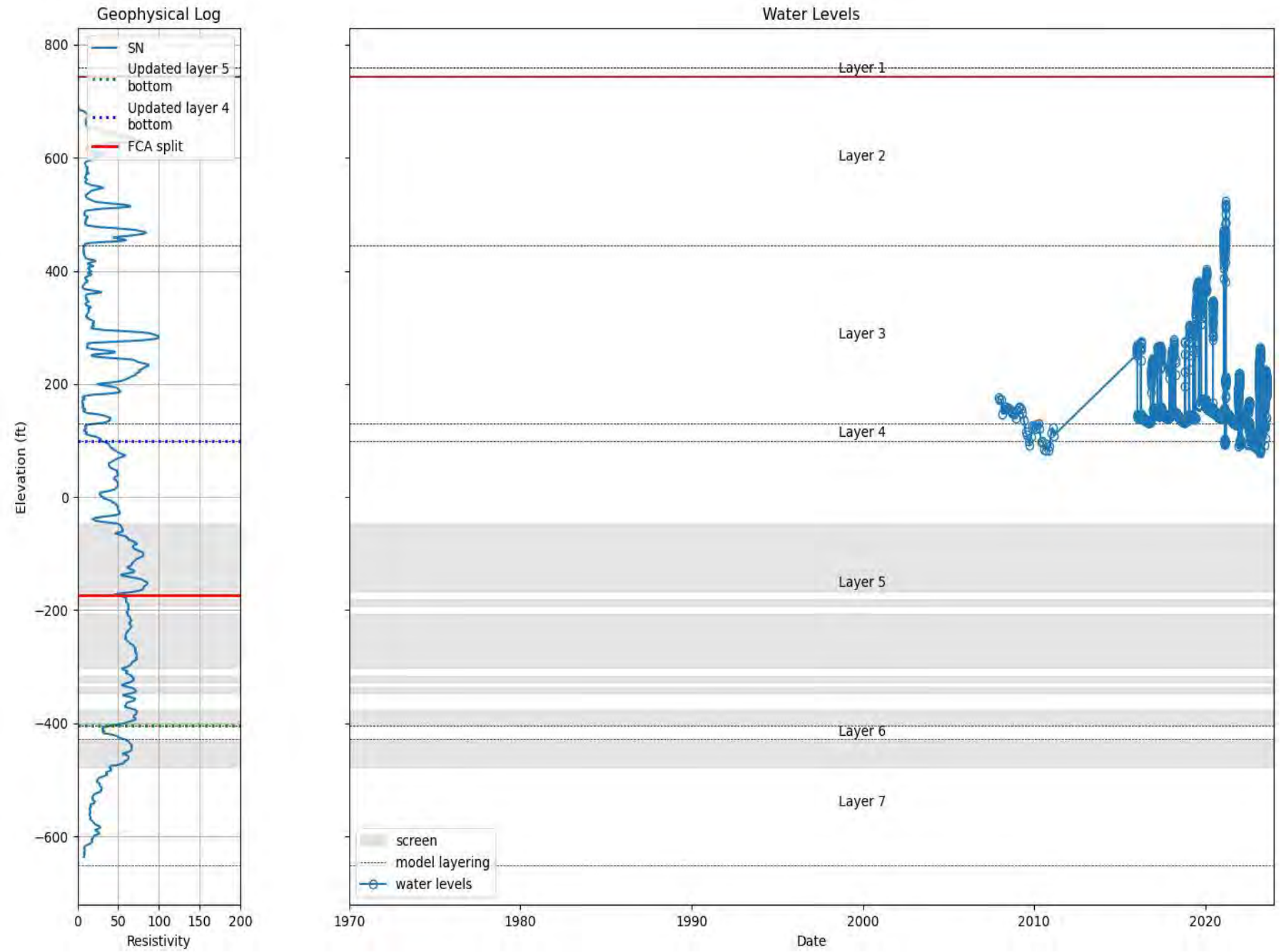


Figure A.34
Geophysical Log and Water Level Data for
03N19W31D03S (ASR-15)
ELPMA Groundwater Model Technical Memorandum



03N19W31D04S ASR-9

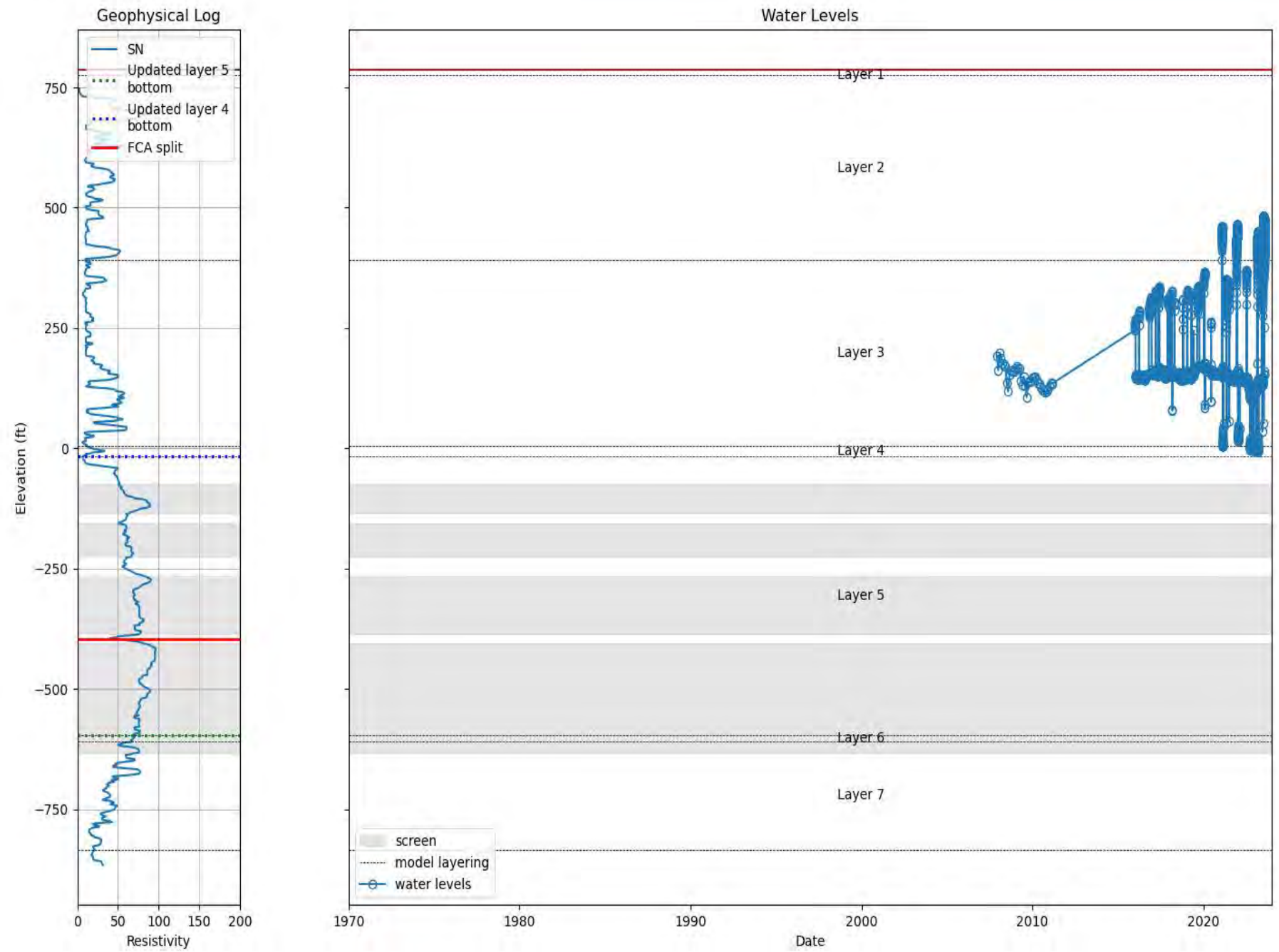


Figure A.35
Geophysical Log and Water Level Data for
03N19W31D04S (ASR-9)
ELPMA Groundwater Model Technical Memorandum



03N19W31D05S ASR-16

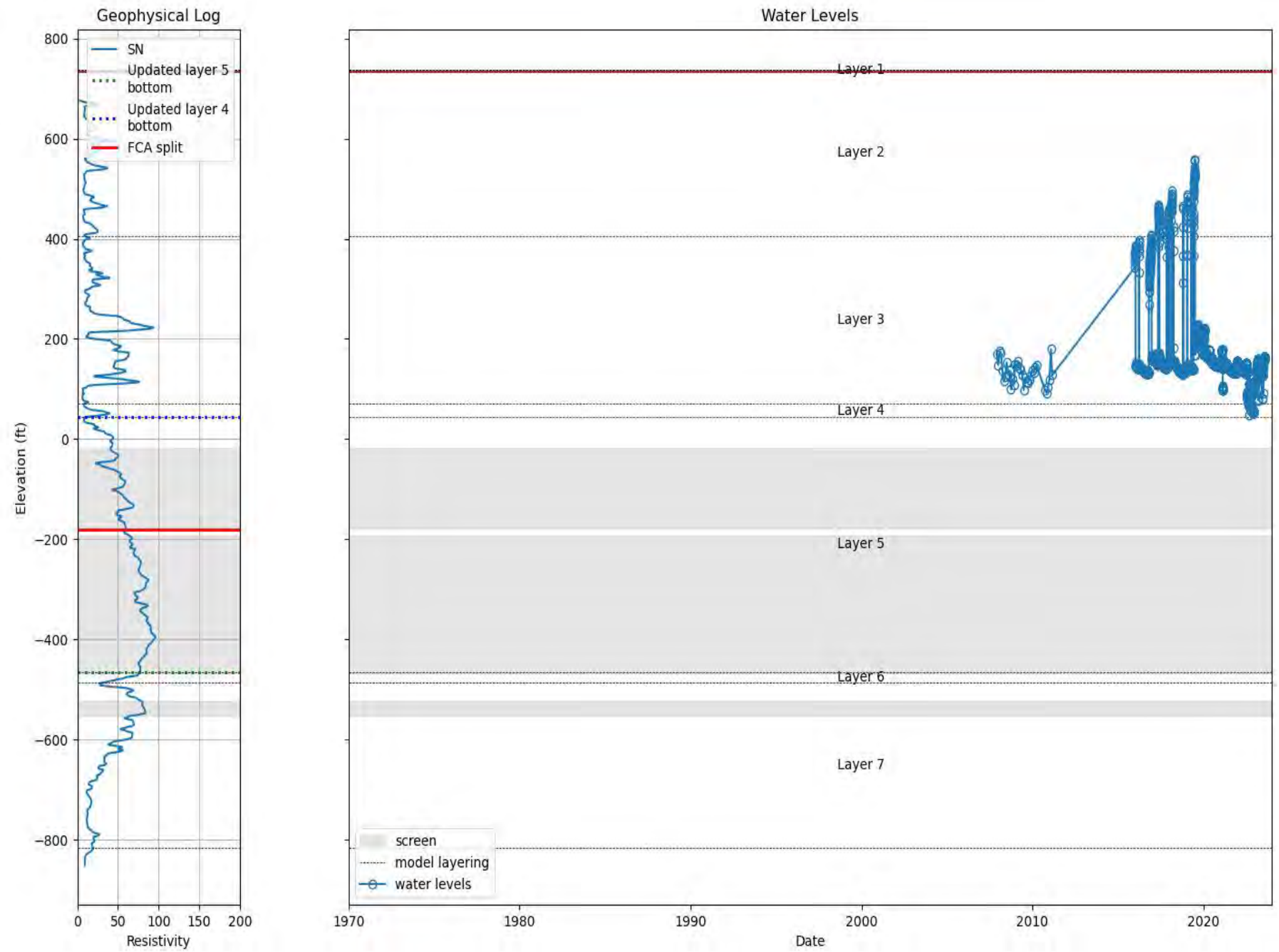


Figure A.36
Geophysical Log and Water Level Data for
03N19W31D05S (ASR-16)
ELPMA Groundwater Model Technical Memorandum



03N19W31D06S ASR-6b

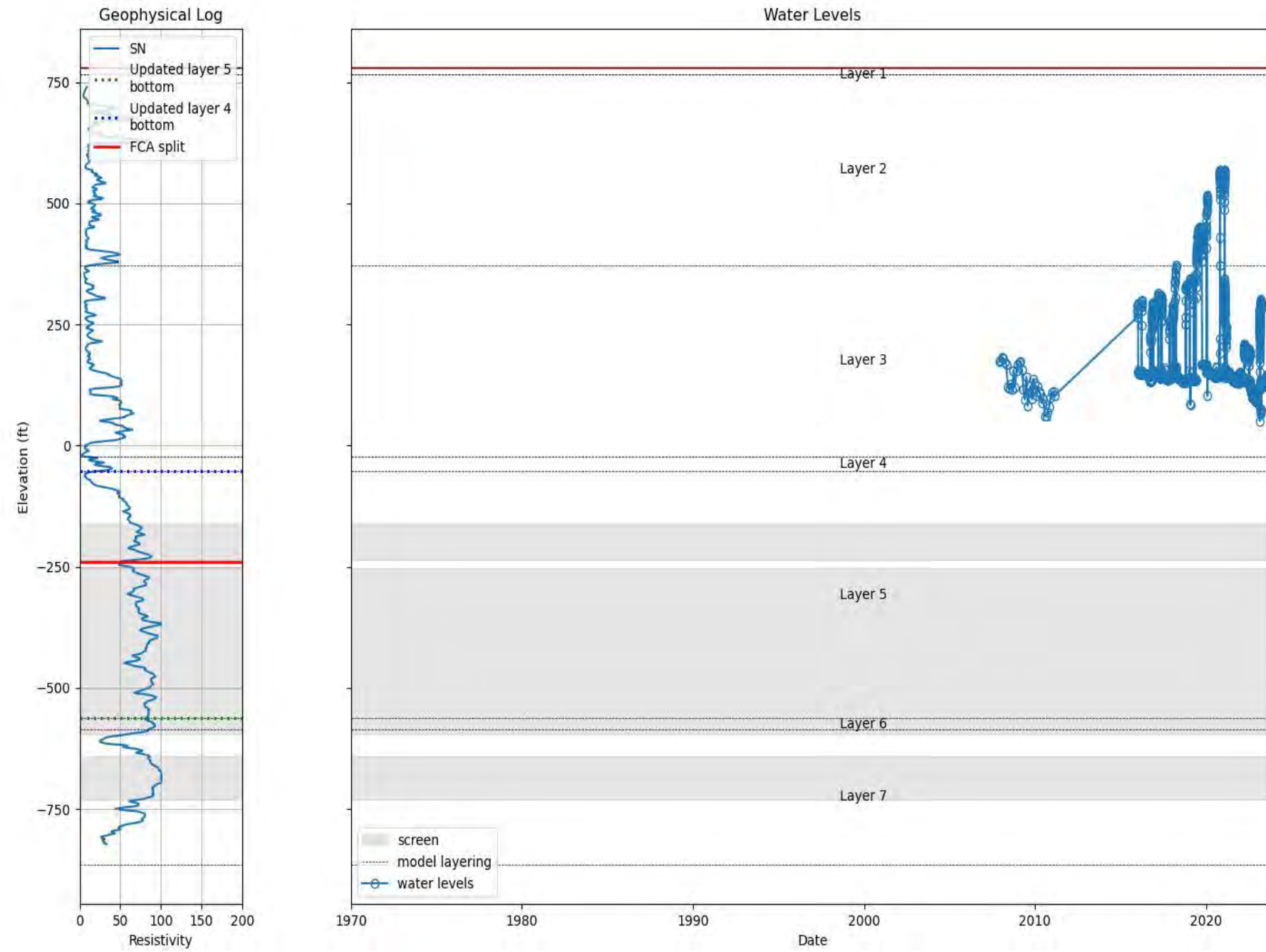


Figure A.37
Geophysical Log and Water Level Data for
03N19W31D06S (ASR-6)
ELPMA Groundwater Model Technical Memorandum



03N19W31E02S ASR-14B

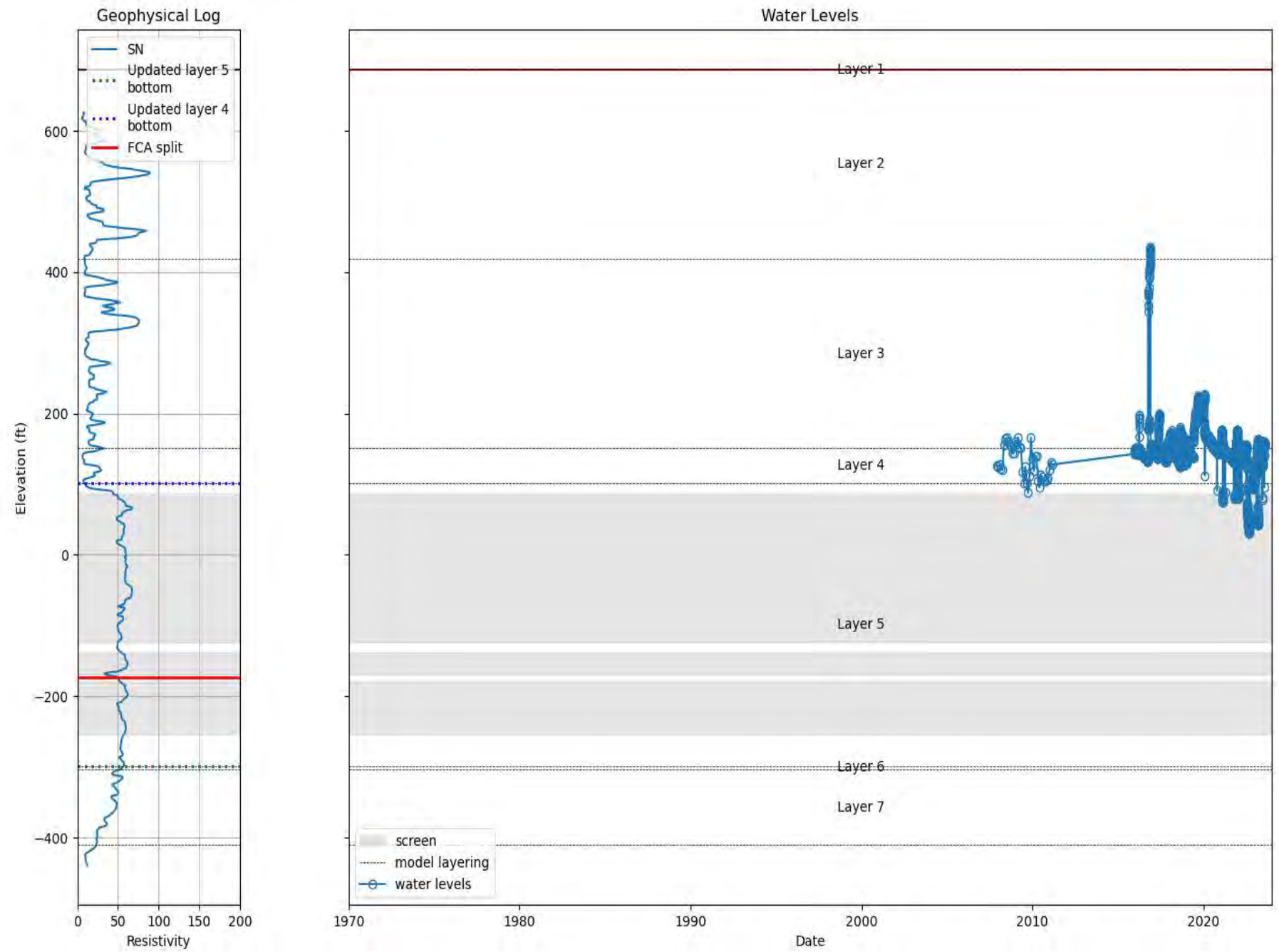


Figure A.38
Geophysical Log and Water Level Data for
03N19W31E02S (ASR-14)
ELPMA Groundwater Model Technical Memorandum



03N19W31E03S ASR-11

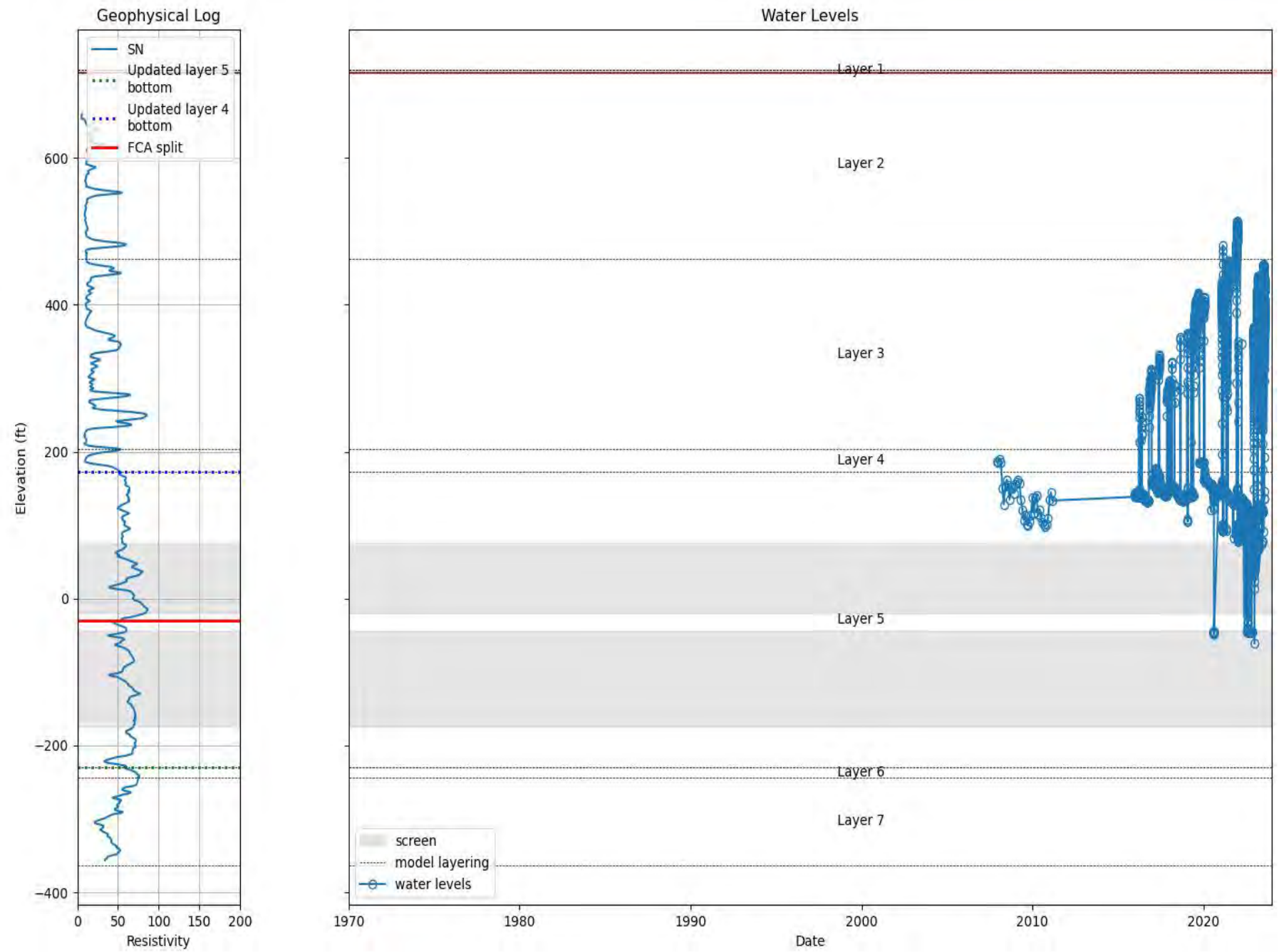


Figure A.39
Geophysical Log and Water Level Data for
03N19W31E03S (ASR-11)
ELPMA Groundwater Model Technical Memorandum



03N19W31M03S ASR-5

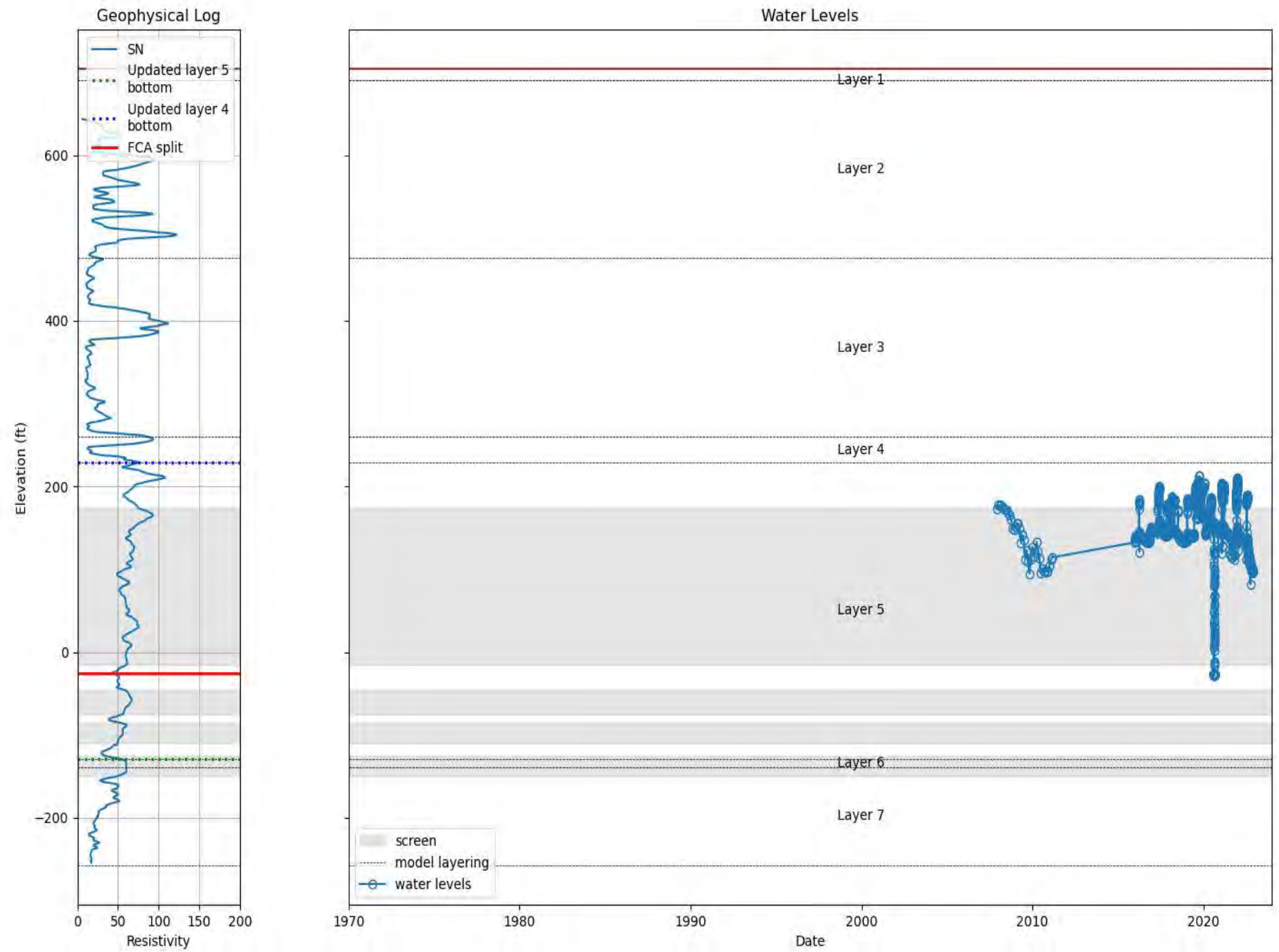


Figure A.40
Geophysical Log and Water Level Data for
03N19W31M03S (ASR-5)
ELPMA Groundwater Model Technical Memorandum



03N19W31M04S ASR-12

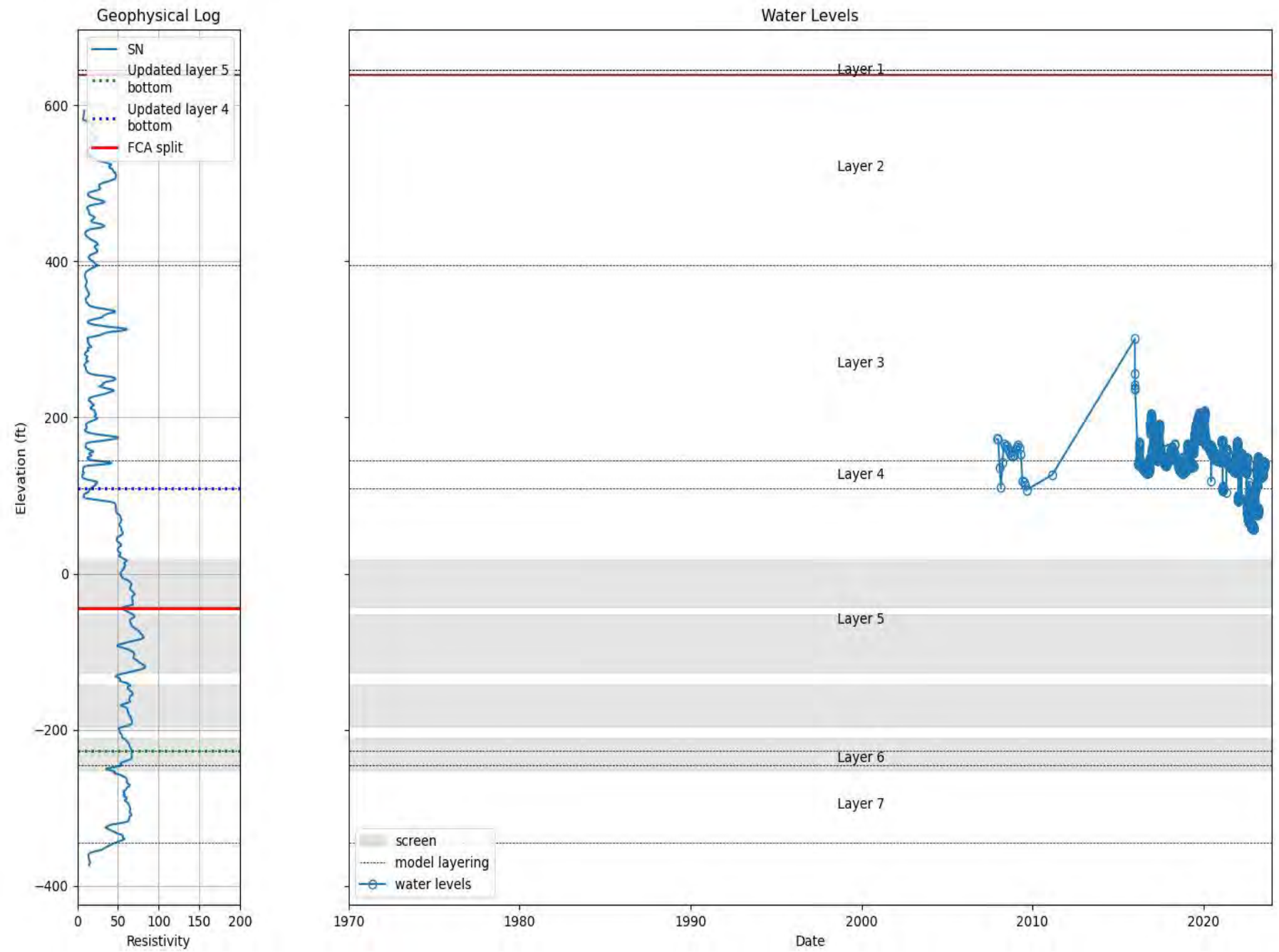


Figure A.41
Geophysical Log and Water Level Data for
03N19W31M04S (ASR-12)
ELPMA Groundwater Model Technical Memorandum



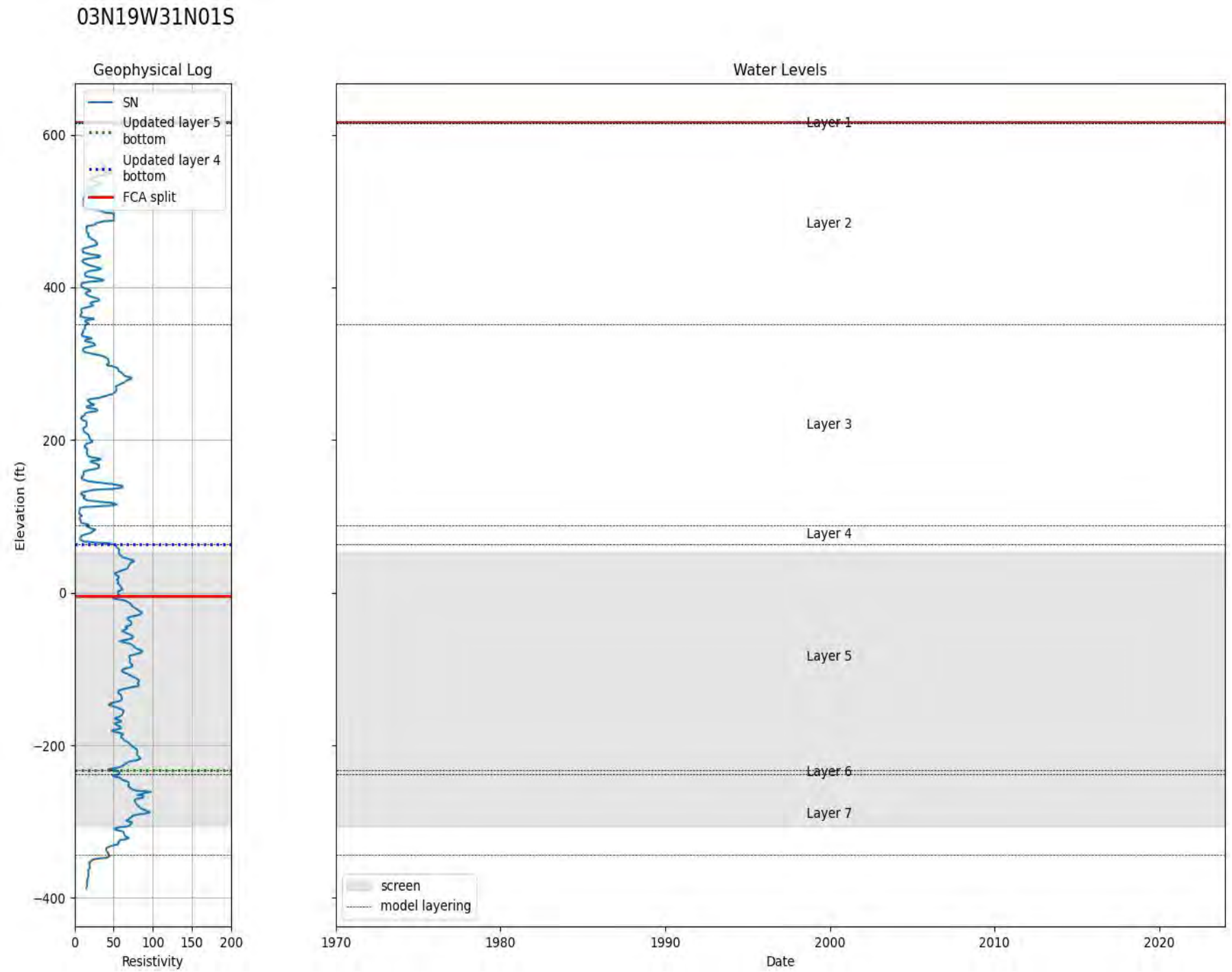


Figure A.42
Geophysical Log and Water Level Data for
03N19W31N01S
ELPMA Groundwater Model Technical Memorandum



03N19W31N02S ASR-13

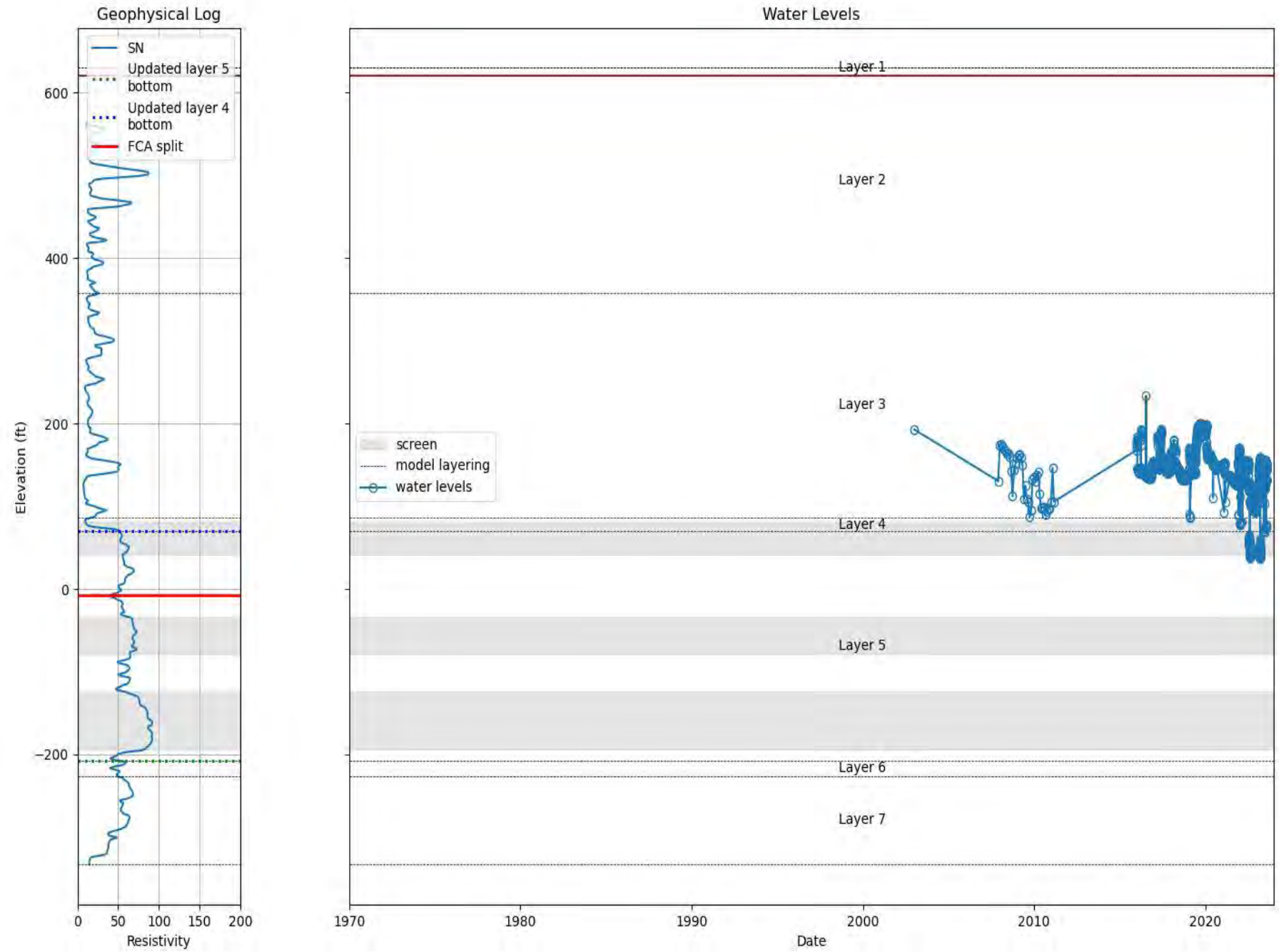


Figure A.43
Geophysical Log and Water Level Data for
03N19W31N02S (ASR-13)
ELPMA Groundwater Model Technical Memorandum



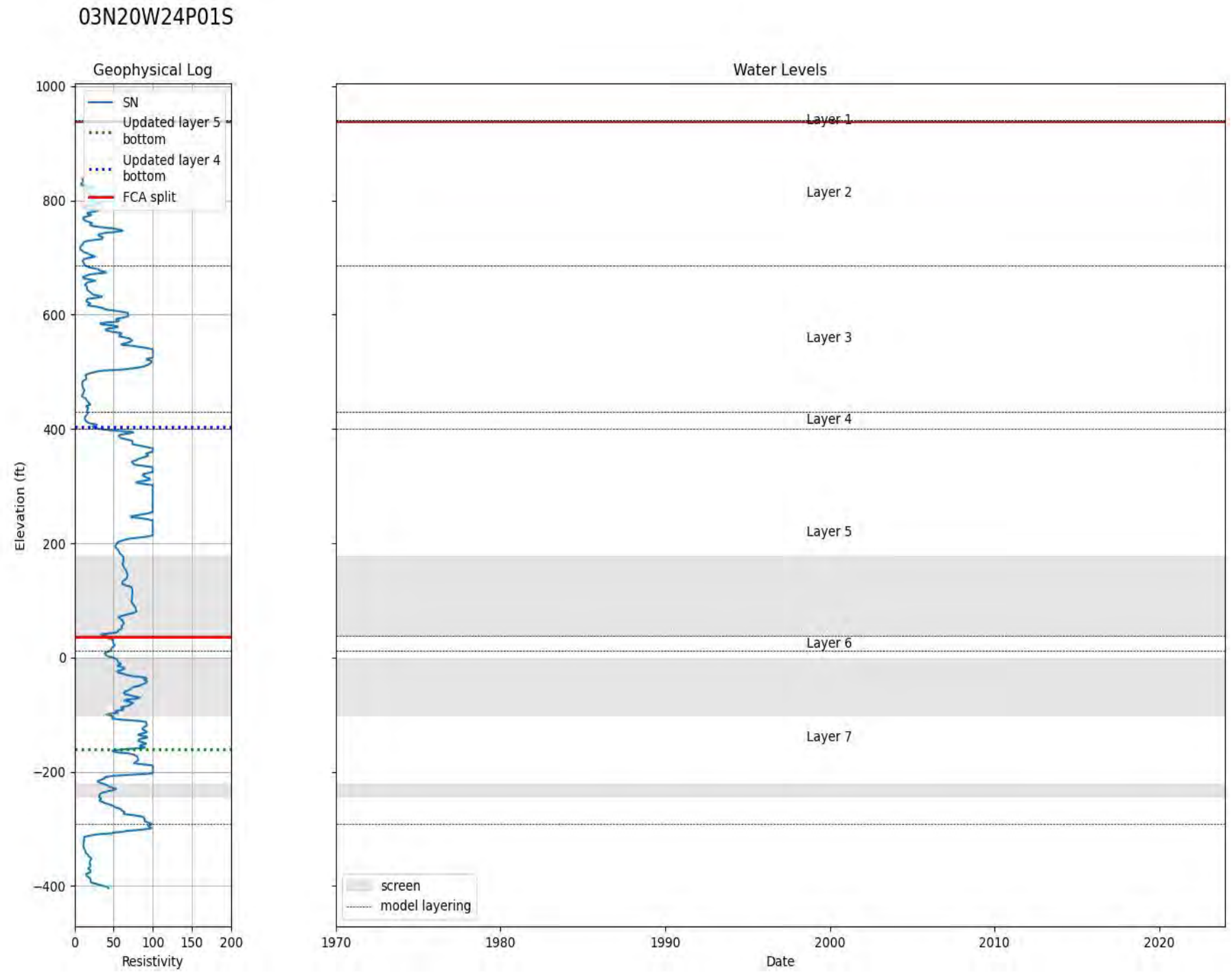


Figure A.44
Geophysical Log and Water Level Data for
03N20W24P01S
ELPMA Groundwater Model Technical Memorandum



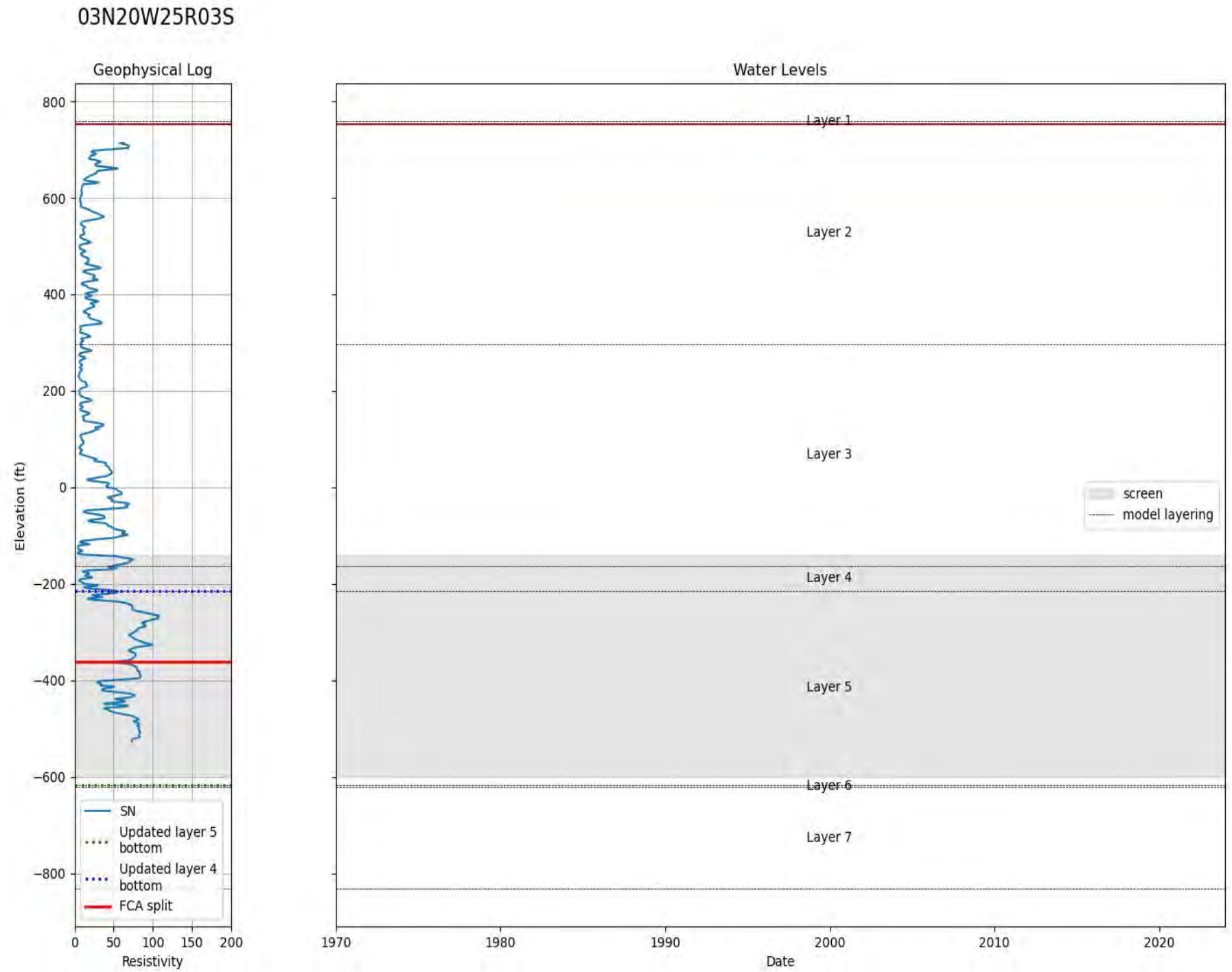


Figure A.45
Geophysical Log and Water Level Data for
03N20W25R03S
ELPMA Groundwater Model Technical Memorandum



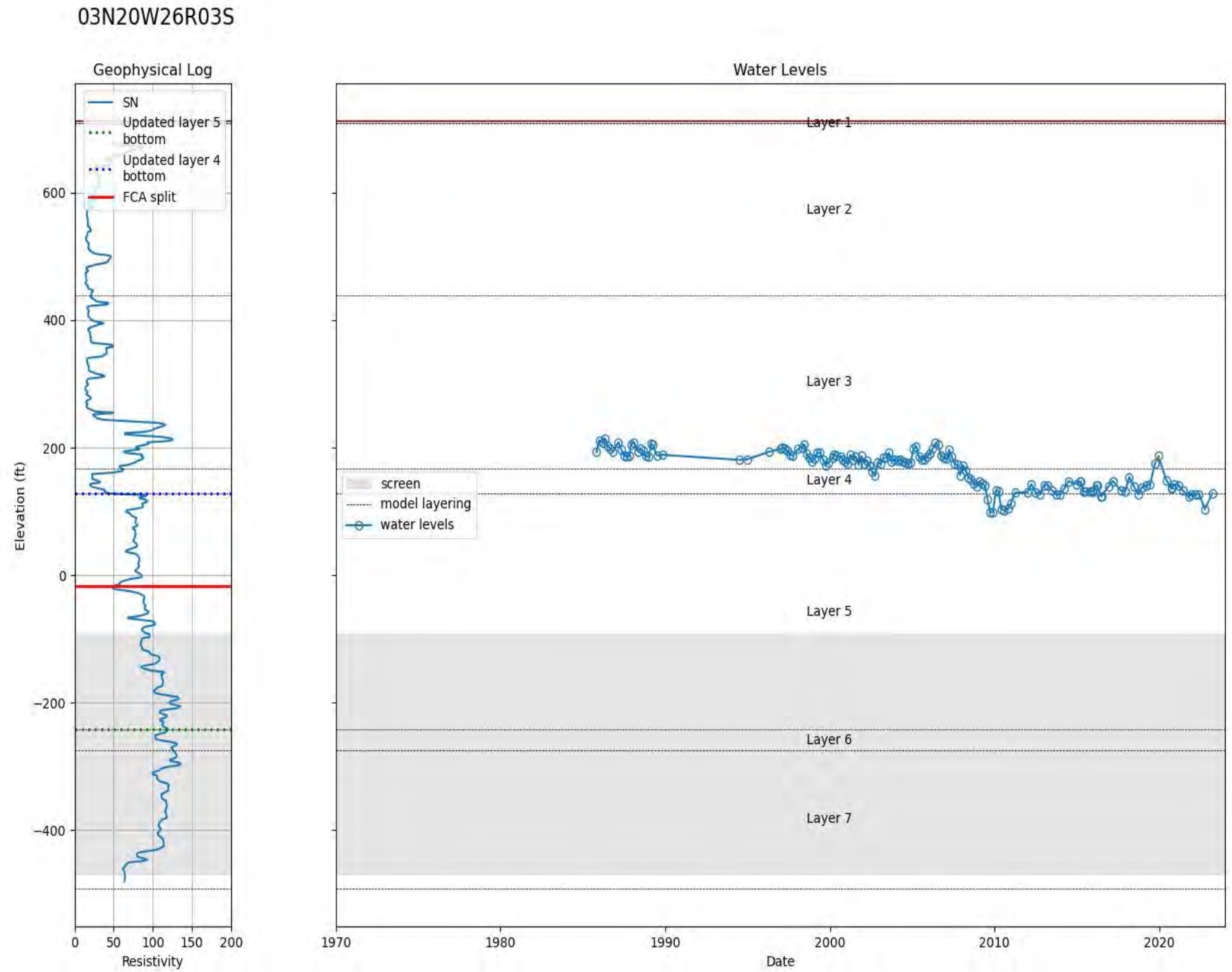


Figure A.46
Geophysical Log and Water Level Data for
03N20W26R03S
ELPMA Groundwater Model Technical Memorandum



03N20W27B01S

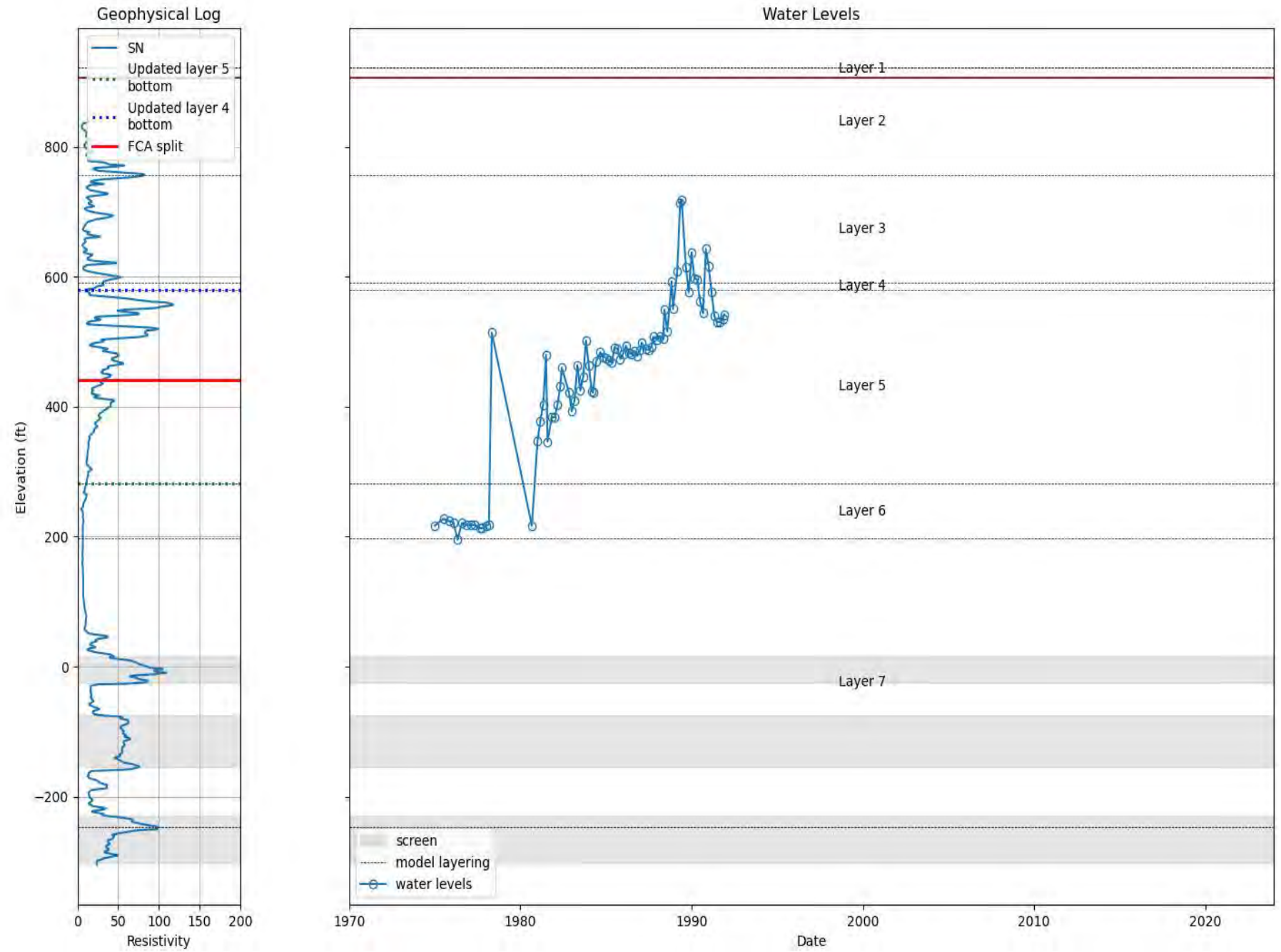


Figure A.47
Geophysical Log and Water Level Data for
03N20W27B01S
ELPMA Groundwater Model Technical Memorandum



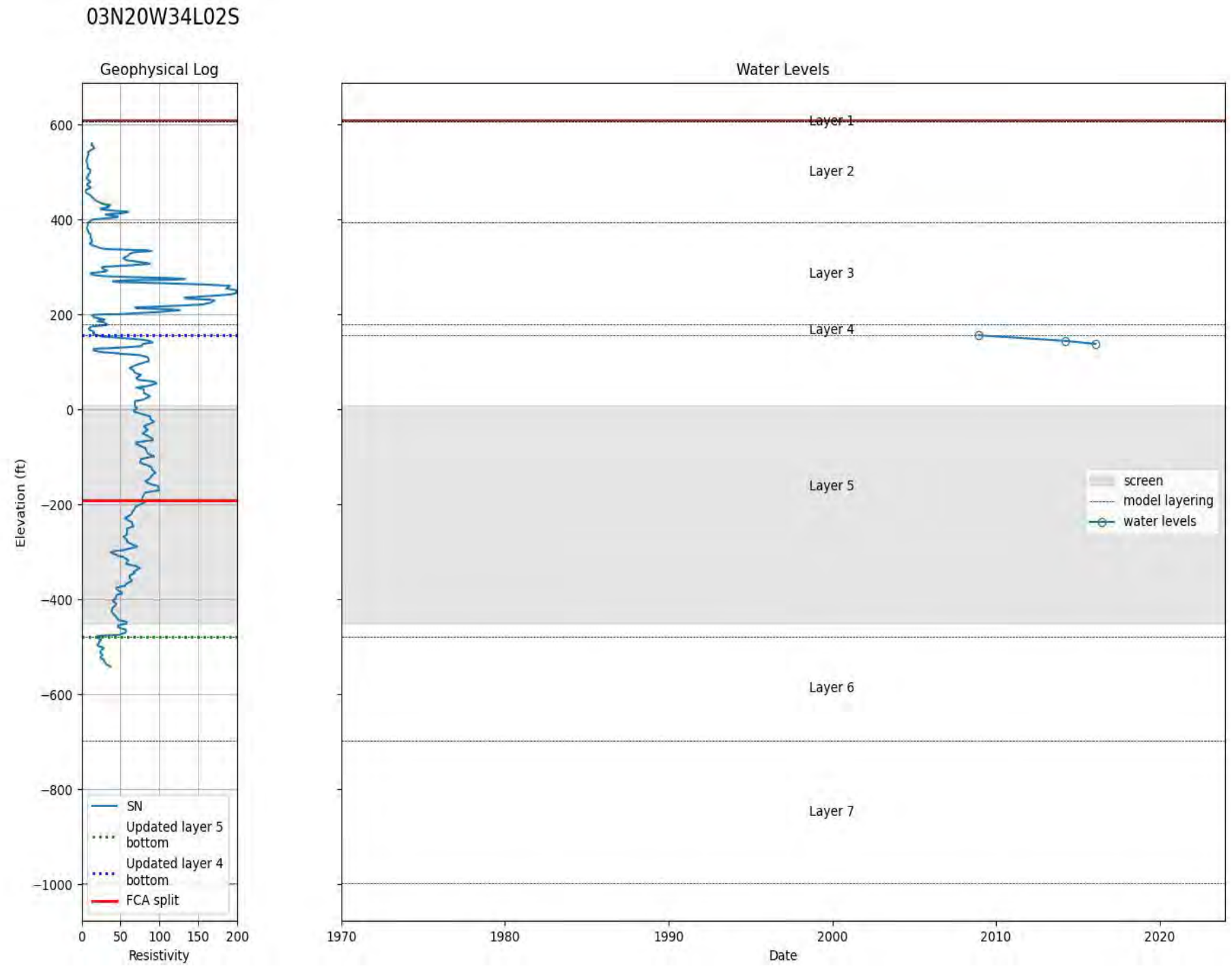


Figure A.48
Geophysical Log and Water Level Data for
03N20W34L02S
ELPMA Groundwater Model Technical Memorandum



03N20W35R02S P7 (USGS Nest)

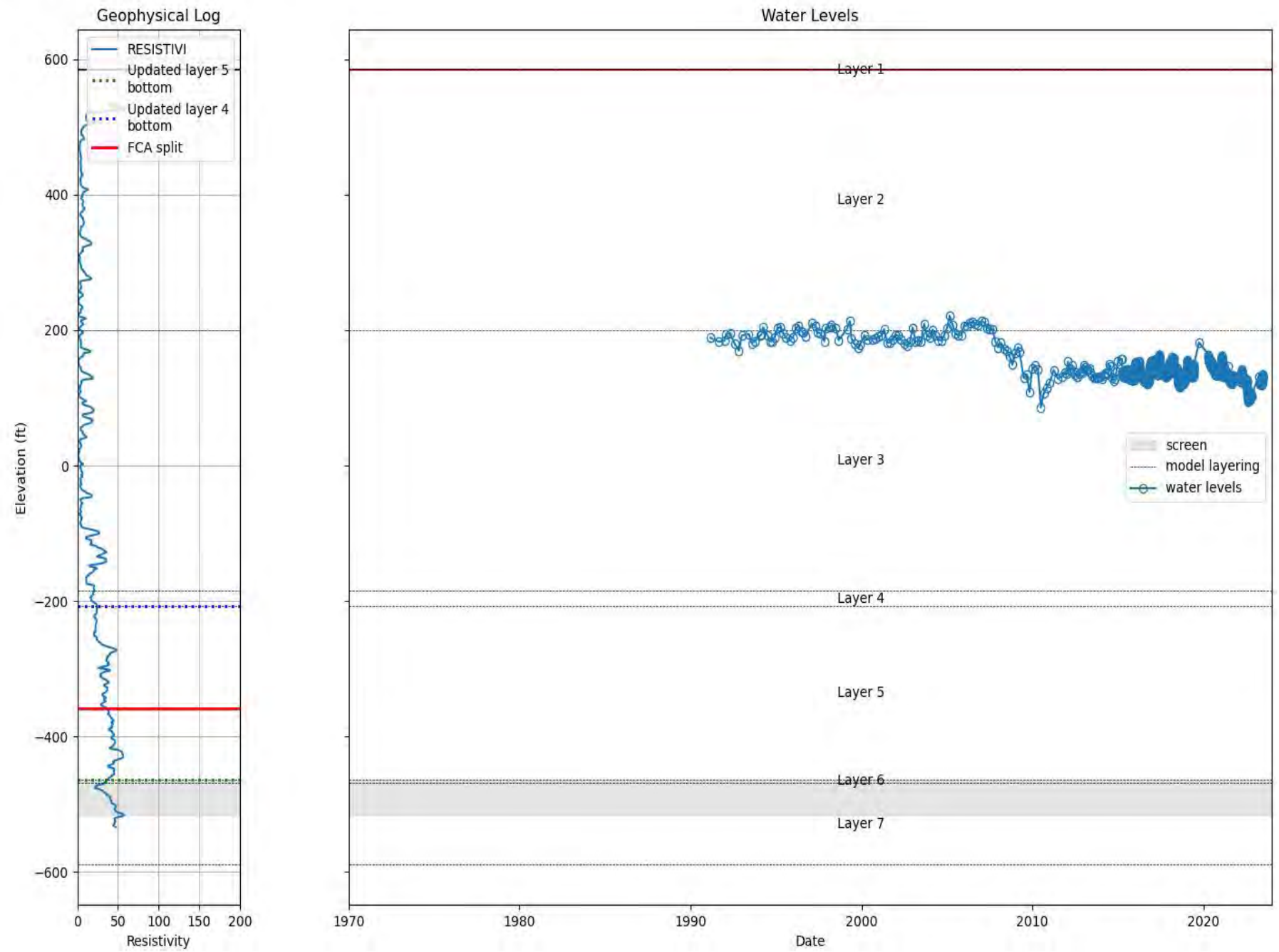


Figure A.49
Geophysical Log and Water Level Data for
03N20W35R02S (USGS)
ELPMA Groundwater Model Technical Memorandum



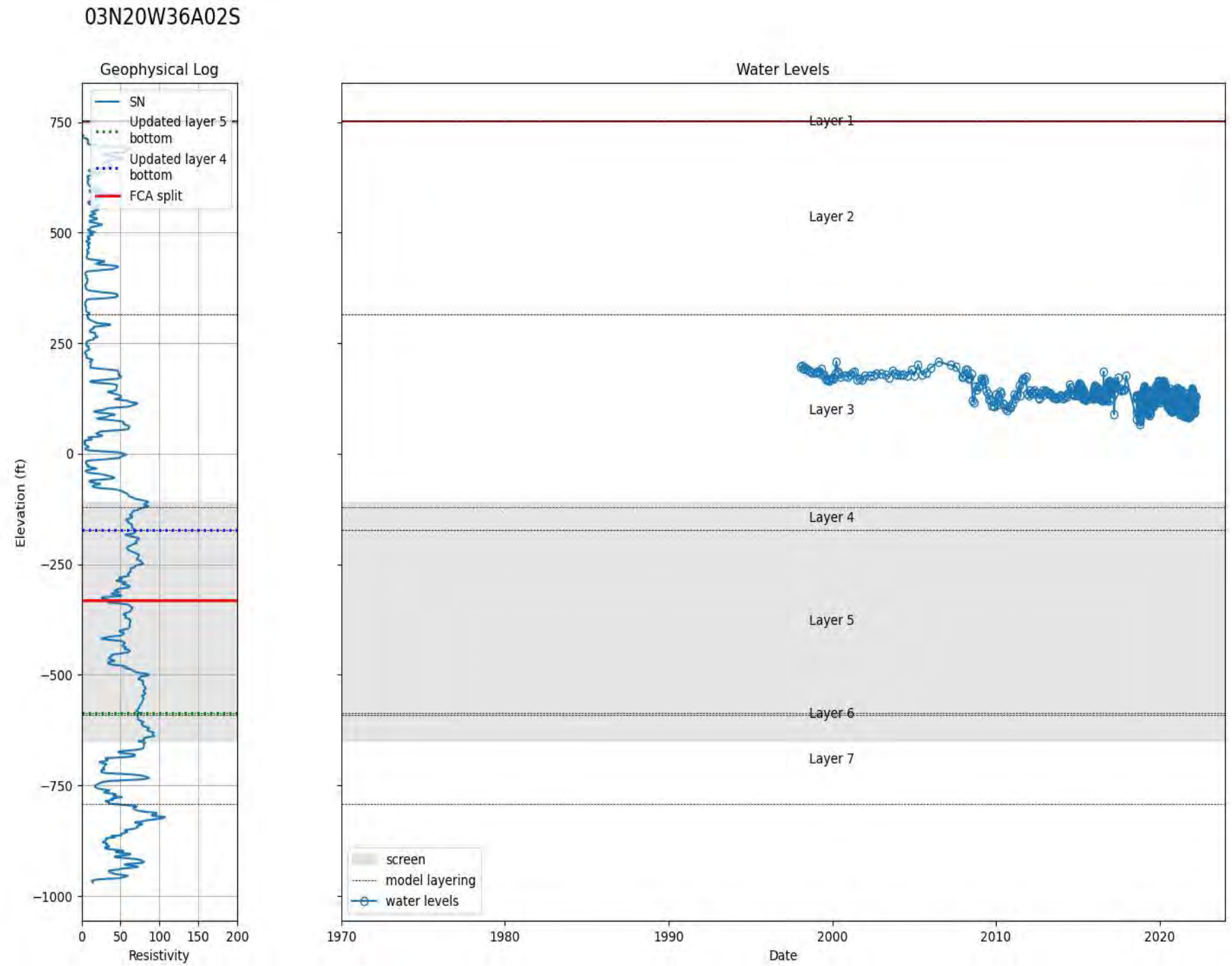


Figure A.50
Geophysical Log and Water Level Data for
03N20W36A02S
ELPMA Groundwater Model Technical Memorandum



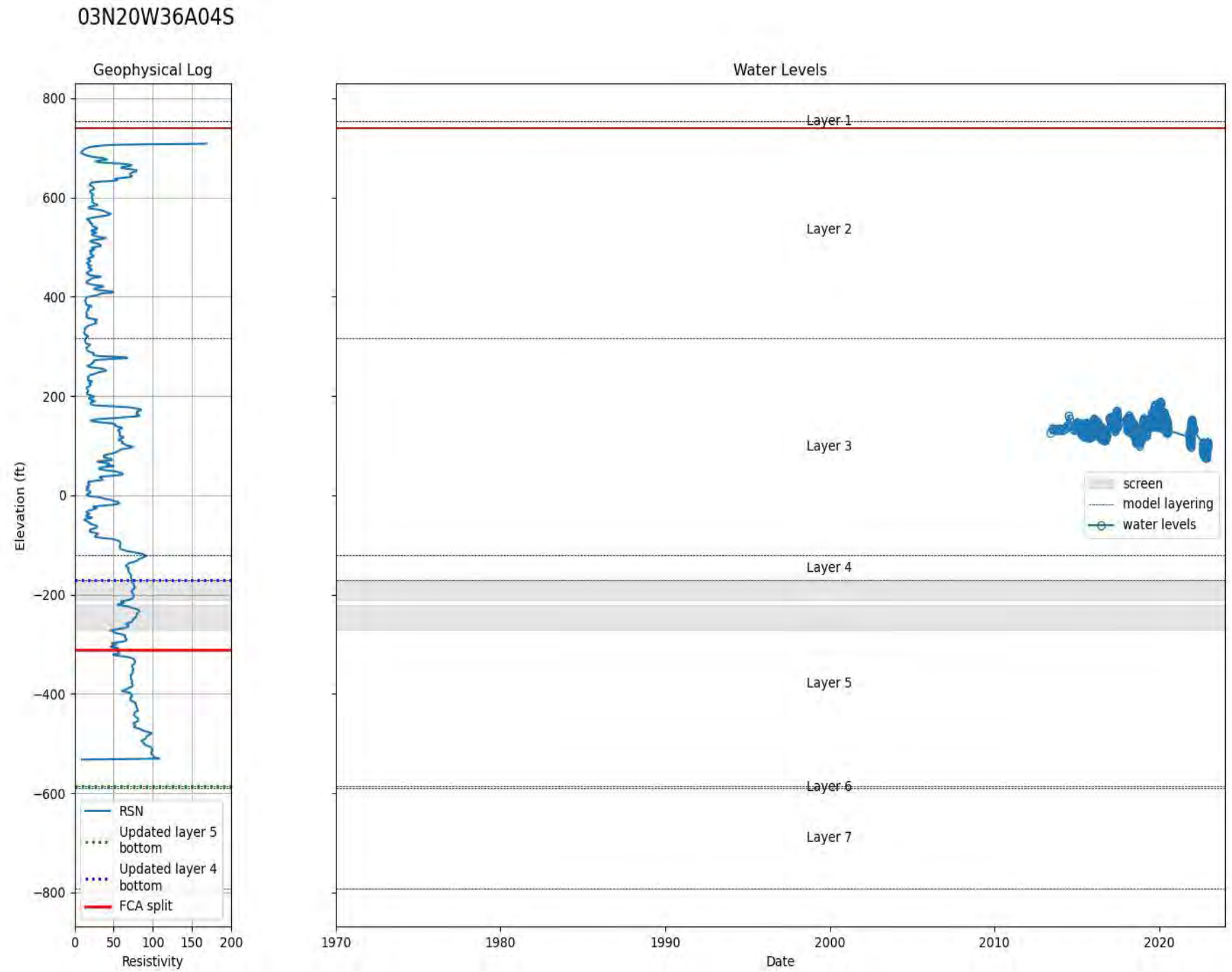


Figure A.51
Geophysical Log and Water Level Data for
03N20W36A04S
ELPMA Groundwater Model Technical Memorandum



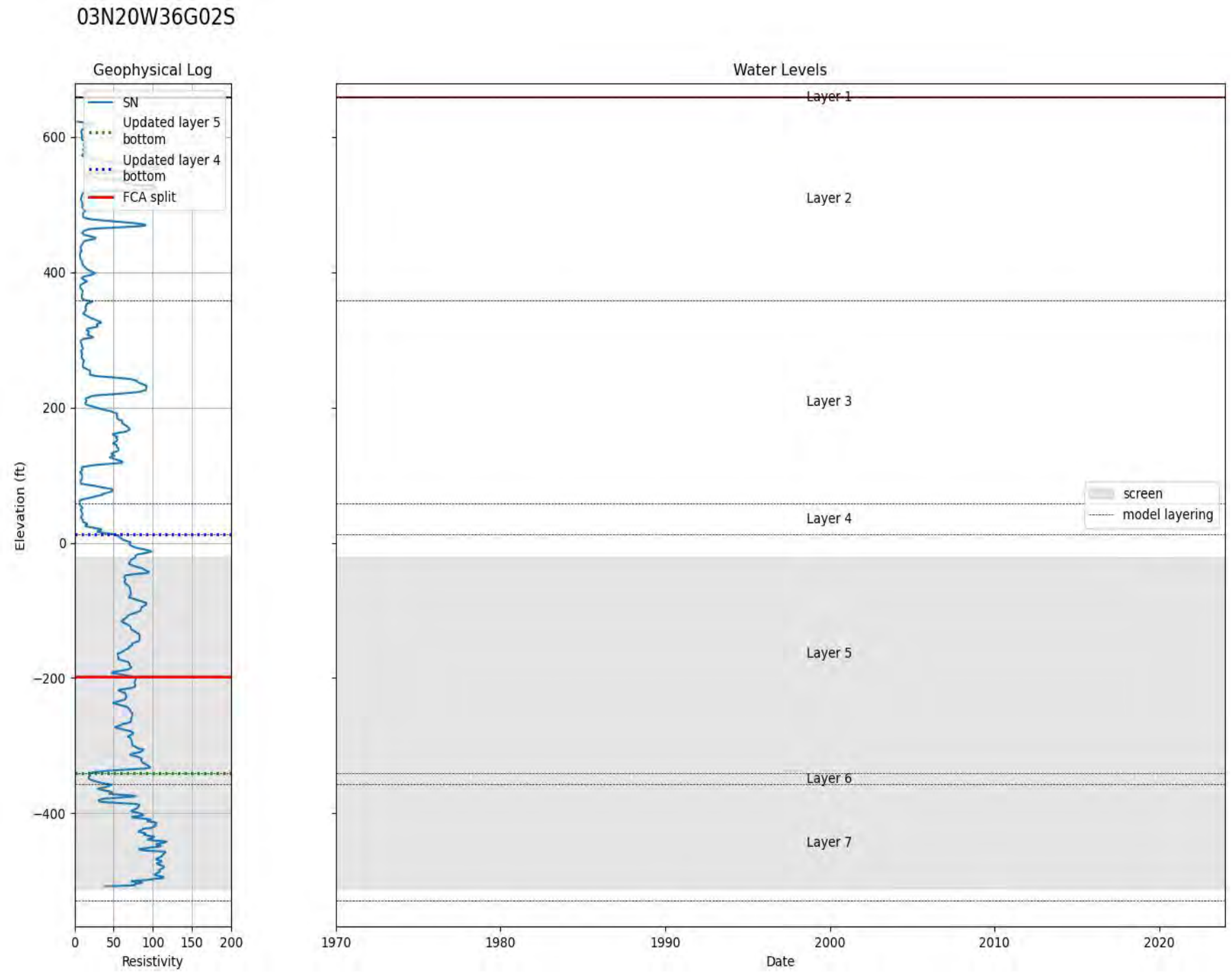


Figure A.52
Geophysical Log and Water Level Data for
03N20W36G02S
ELPMA Groundwater Model Technical Memorandum



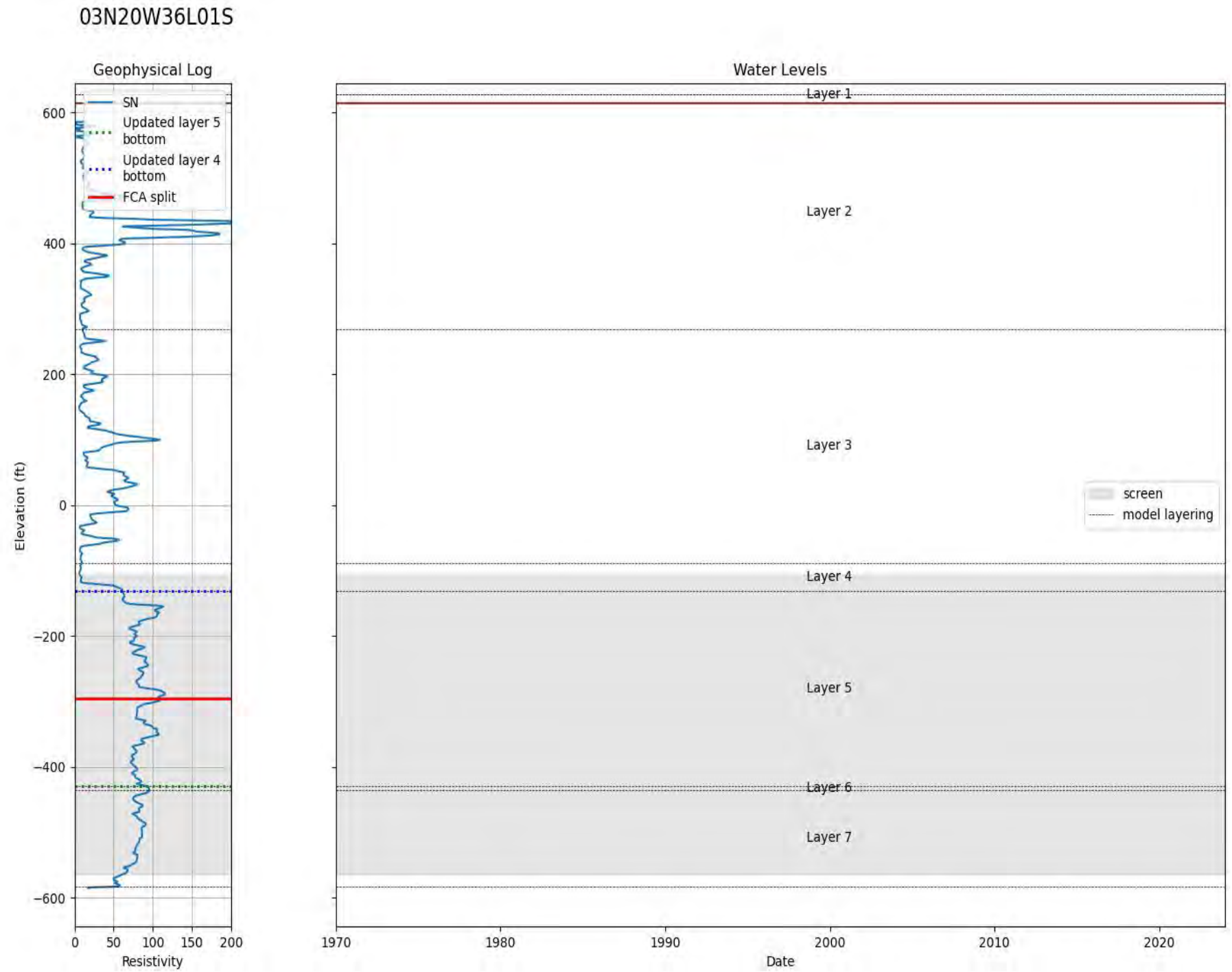


Figure A.53
Geophysical Log and Water Level Data for
03N20W36L01S
ELPMA Groundwater Model Technical Memorandum



02N20W11B01S CMWD MW-3

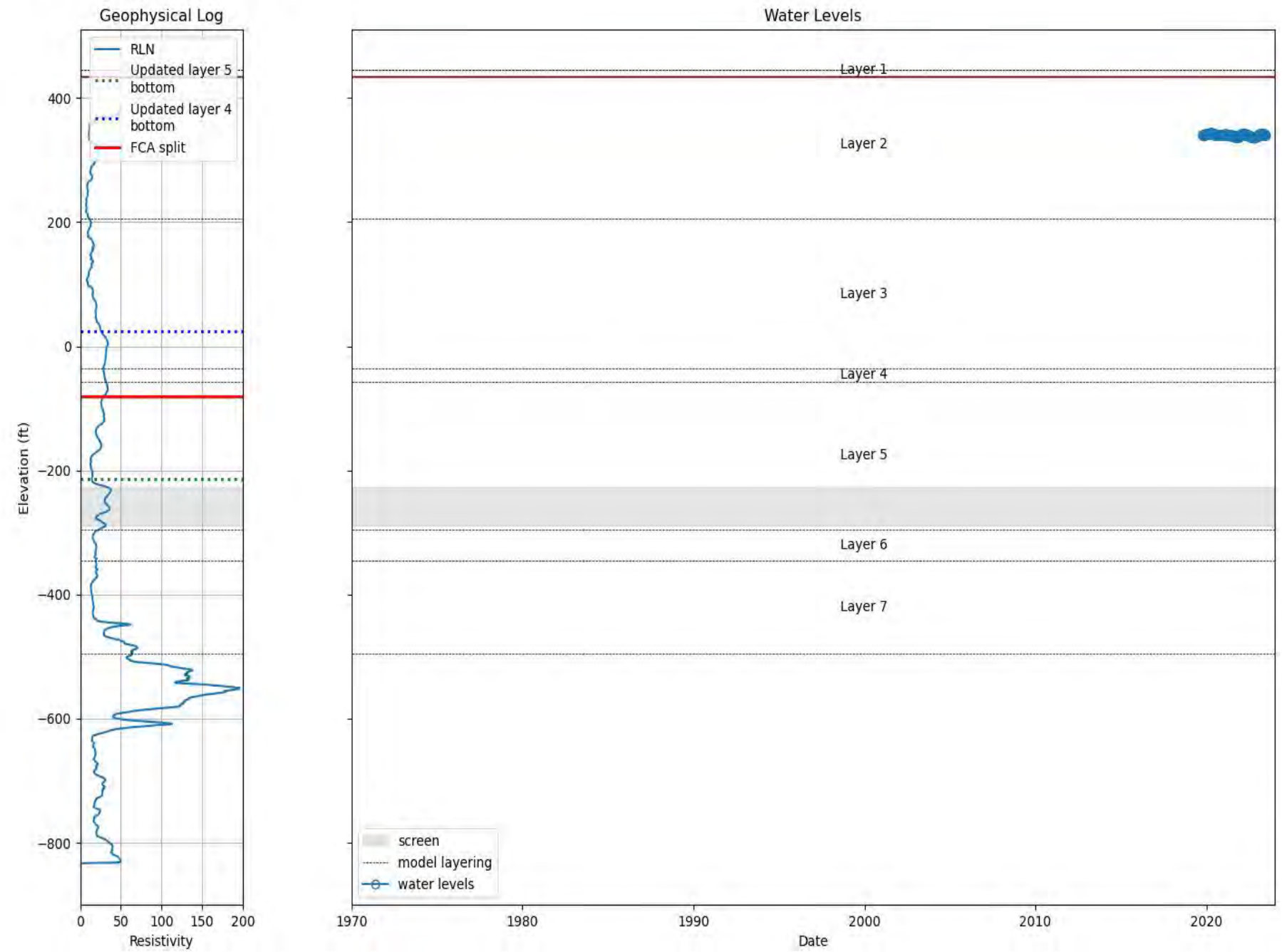


Figure A.54
Geophysical Log and Water Level Data for
02N20W11B01S (CMWD MW-3)
ELPMA Groundwater Model Technical Memorandum



03N19W30E07-D CMWD MW-2

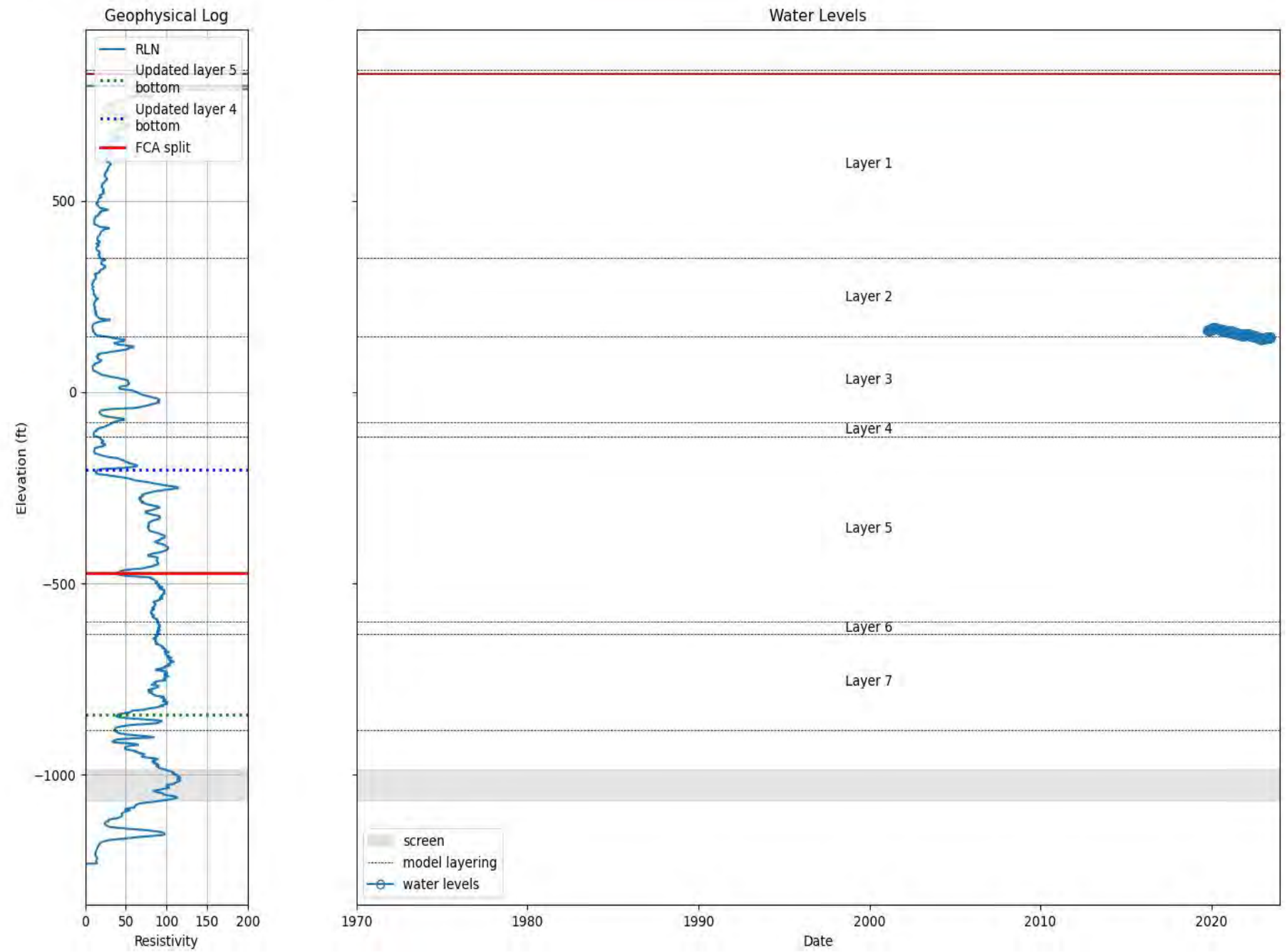


Figure A.55
Geophysical Log and Water Level Data for
03N19W30E07S (CMWD MW-2)
ELPMA Groundwater Model Technical Memorandum





Appendix B

Summary of Calibration Well Information

RE: Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

Table B-1. Calibration Well Information

SWN	Record of Measurement			Aquifer	Layer Assignment	Measurement Thresholds ^a	Additional Notes
	Starting Year	Ending Year	No. of Msmts				
02N19W03A01S	1972	1991	108	EGA/SAA	1		
02N19W04K01S	1970	1991	124	FCA	5		
02N19W05K01S	1975	2020	219	USP	3	>480	
02N19W05M01S	1970	1981	66	FCA	5		
02N19W06E01S	1970	1974	21	GCA	8		
02N19W06F01S	1974	2023	126	USP	3		3-day rolling average used after 2021
02N19W06N03S	1970	2002	126	USP	2		
02N19W07A03S	1970	1980	56	EGA/SAA	1		
02N19W07G01S	2015	2023	189	EGA/SAA	1		3-day rolling average used after 2021
02N19W07K02S	2015	2023	217	GCA	8		3-day rolling average used after 2021
02N19W07K03S	2015	2023	222	USP	3		3-day rolling average used after 2021
02N19W07K04S	2015	2023	216	USP	2		3-day rolling average used after 2021
02N19W08G01S	1995	1995	1	USP	2		
02N19W08G03S	1970	1994	119	USP	2		
02N19W08H02S	1996	2022	125	EGA/SAA	1	>480	
02N19W09E01S	2015	2023	221	EGA/SAA	1		3-day rolling average used after 2021
02N20W01A01S	2013	2022	147	FCA	5		3-day rolling average used after 2021
02N20W01B01S	2007	2023	267	FCA	5	> 300	
02N20W01B02S	2007	2023	263	FCA	5	>300, <= 350	3-day rolling average used after 2021
02N20W01B03S	2007	2018	67	FCA	5	>300	
02N20W01C02S	2002	2023	238	FCA	5	>300	
02N20W01E02S	2007	2023	261	FCA	5	>300	
02N20W01E03S	2013	2023	223	GCA	8		3-day rolling average used after 2021
02N20W01F01S	2016	2023	221	FCA	5	>400	

Table B-1. Calibration Well Information

SWN	Record of Measurement			Aquifer	Layer Assignment	Measurement Thresholds ^a	Additional Notes
	Starting Year	Ending Year	No. of Msmts				
02N20W01M01S	1973	2010	155	FCA	5	>250	
02N20W01Q01S	1970	1971	9	USP	2		
02N20W01Q02S	2000	2000	2	USP	3		
02N20W02D02S	1975	2022	198	FCA	5		3-day rolling average used after 2021
02N20W02J01S	2012	2021	98	USP	2		3-day rolling average used after 2021
02N20W02N03S	1995	2012	9	FCA	5		
02N20W03B01S	1975	2017	34	FCA	5		
02N20W03H01S	2000	2023	242	FCA	5		3-day rolling average used after 2021
02N20W03J01S	2008	2023	295	FCA	5		3-day rolling average used after 2021
02N20W03K03S	2020	2023	7	FCA	5	>200	
02N20W04B01S	2015	2023	173	FCA	5		3-day rolling average used after 2021
02N20W04F01S	2008	2008	1	FCA	5		
02N20W04F02S	1991	2013	10	FCA	5		
02N20W04R03S	2016	2022	60	FCA	5		15-day rolling average used after 2021
02N20W09B01S	2014	2014	1	USP	3		
02N20W09C01S	2011	2011	1	FCA	5		
02N20W09F01S	1975	2017	124	FCA	5		
02N20W09Q01S	1974	2002	18	EGA	1		
02N20W09Q04S	1978	2008	18	EGA	1		
02N20W09Q05S	1982	2017	24	FCA	5		
02N20W09Q07S	1998	2015	5	FCA	5		
02N20W09Q08S	2014	2023	234	EGA/SAA	1		3-day rolling average used after 2021
02N20W09R01S	1974	2017	85	FCA	5		
02N20W10D02S	1975	2023	231	FCA	5	>250	

Table B-1. Calibration Well Information

SWN	Record of Measurement			Aquifer	Layer Assignment	Measurement Thresholds ^a	Additional Notes
	Starting Year	Ending Year	No. of Msmts				
02N20W10G01S	1970	2023	210	FCA	5	>300	
02N20W10J01S	1971	2023	288	FCA	5		
02N20W10K02S	2014	2023	241	USP	2		3-day rolling average used after 2021
02N20W11B01S	2019	2023	179	FCA	5		3-day rolling average used after 2021
02N20W11B02S	2019	2022	139	FCA	5		3-day rolling average used after 2021
02N20W11B03S	2019	2023	141	USP	2		3-day rolling average used after 2021
02N20W12G02S	1970	2002	180	USP	2		
02N20W12J01S	1970	1980	58	USP	3		
02N20W12MMW1	1996	2023	295	EGA/SAA	1		3-day rolling average used after 2021
02N20W12MMW2	1996	2017	74	EGA/SAA	1		
02N20W12MMW3	1996	2017	79	USP	2		
02N20W12N01S	1993	1993	1	USP	2		
02N20W14H01S	2018	2018	1	GCA	8		
02N20W16A02S	1991	1999	29	USP	3		
02N20W16A03S	1991	1999	29	USP	3		
02N20W16A04S	1991	1999	29	USP	2		
02N20W16C01S	1970	1971	17	FCA	5		
02N20W17J01S	1975	2002	73	FCA	5		
02N20W17J06S	2014	2023	236	FCA	5		3-day rolling average used after 2021
03N19W17Q01S	1988	2019	87	GCA	8	>400	
03N19W19J01S	1975	2023	254	FCA	5		
03N19W19P02S	1975	2022	147	GCA	8	>400	
03N19W28N03S	2012	2023	230	FCA	5		3-day rolling average used after 2021
03N19W29E02S	1972	1982	38	EGA/SAA	1		

Table B-1. Calibration Well Information

SWN	Record of Measurement			Aquifer	Layer Assignment	Measurement Thresholds ^a	Additional Notes
	Starting Year	Ending Year	No. of Msmts				
03N19W29F06S	1983	2023	365	EGA/SAA	1	>650	3-day rolling average used after 2021
03N19W29M02S	2015	2015	2	EGA/SAA	1		
03N19W29M03S	2015	2015	2	EGA/SAA	1		
03N19W30D01S	2013	2023	191	FCA	5		3-day rolling average used after 2021
03N19W30D02S	2015	2015	2	GCA	8		
03N19W30E03S	1970	2008	125	FCA	5		
03N19W30E06S	2015	2015	2	FCA	5		
03N19W30E07-D	2019	2023	175	GCA	8		3-day rolling average used after 2021
03N19W30E07-I	2020	2023	135	FCA	5		3-day rolling average used after 2021
03N19W30E07-S	2019	2023	177	EGA/SAA	1		3-day rolling average used after 2021
03N19W30J01S	2015	2015	2	FCA	5		
03N19W30M02S	1991	2023	107	EGA/SAA	1		3-day rolling average used after 2021
03N19W30Q01S	2015	2015	2	EGA/SAA	1		
03N19W31B01S	1998	2023	227	FCA	5	>= 750	15-day rolling average used after 2021
03N19W31C01S	2007	2023	205	FCA	5	>400	
03N19W31C02S	2007	2022	199	FCA	5	>450	
03N19W31D02S	2007	2023	290	FCA	5	>300	
03N19W31D03S	2007	2023	251	FCA	5	>550	
03N19W31D04S	2007	2023	243	FCA	5	>500	
03N19W31D05S	2007	2023	257	FCA	5	>600	
03N19W31D06S	2007	2023	239	FCA	5	>600	
03N19W31D07S	2017	2023	191	FCA	5		3-day rolling average used after 2021
03N19W31E02S	2007	2023	288	FCA	5	>500	
03N19W31E03S	2007	2023	199	FCA	5	>600	

Table B-1. Calibration Well Information

SWN	Record of Measurement			Aquifer	Layer Assignment	Measurement Thresholds ^a	Additional Notes
	Starting Year	Ending Year	No. of Msmts				
03N19W31H01S	2009	2022	159	FCA	6		15-day rolling average used after 2021
03N19W31M03S	2007	2022	222	FCA	5	>300	
03N19W31M04S	2007	2023	254	FCA	5	>400	
03N19W31N02S	2003	2023	248	FCA	5	>300	
03N19W32A01S	1985	2000	86	FCA	5		
03N19W32G01S	1975	1984	53	USP	3		
03N19W33P03S	1970	2000	46	FCA	5		
03N20W23L01S	1972	2023	200	GCA	8	>300	
03N20W24J01S	1975	1985	21	GCA	8		
03N20W25H01S	1972	2022	232	EGA/SAA	1	>650	
03N20W25R04S	2014	2023	89	FCA	5		15-day rolling average used after 2021
03N20W26R03S	1985	2023	157	GCA	8	>300	
03N20W27H01S	1983	2023	78	USP	3	>300	
03N20W27H03S	1998	2021	86	USP	3	>350	
03N20W34G01S	1972	2023	215	FCA	5	>300	
03N20W34K01S	1975	2017	31	FCA	5		
03N20W34L02S	2008	2016	3	FCA	5		
03N20W35J01S	2000	2023	280	FCA	5		3-day rolling average used after 2021
03N20W35R01S	1973	2017	156	FCA	5		
03N20W35R02S	1991	2023	317	GCA	8	>250	3-day rolling average used after 2021
03N20W35R03S	1991	2023	156	FCA	5	>300	
03N20W35R04S	1991	2023	306	USP	3	<250; >350	3-day rolling average used after 2021
03N20W36A02S	1998	2022	241	FCA	5	<= 550; >= 700	3-day rolling average used after 2021
03N20W36A04S	2013	2022	130	FCA	5		3-day rolling average used after 2021

Table B-1. Calibration Well Information

SWN	Record of Measurement			Aquifer	Layer Assignment	Measurement Thresholds ^a	Additional Notes
	Starting Year	Ending Year	No. of Msmts				
03N20W36G01S	1998	2023	357	FCA	5		3-day rolling average used after 2021
03N20W36P01S	2013	2022	71	FCA	5		3-day rolling average used after 2021

Notes: EGA = Epworth Gravels aquifer; SAA = Shallow Alluvial aquifer; USP = Upper San Pedro formation; FCA = Fox Canyon aquifer; GCA = Grimes Canyon aquifer

^a Values in this column are used as conditional filters on the raw datasets to exclude anomalous measurements

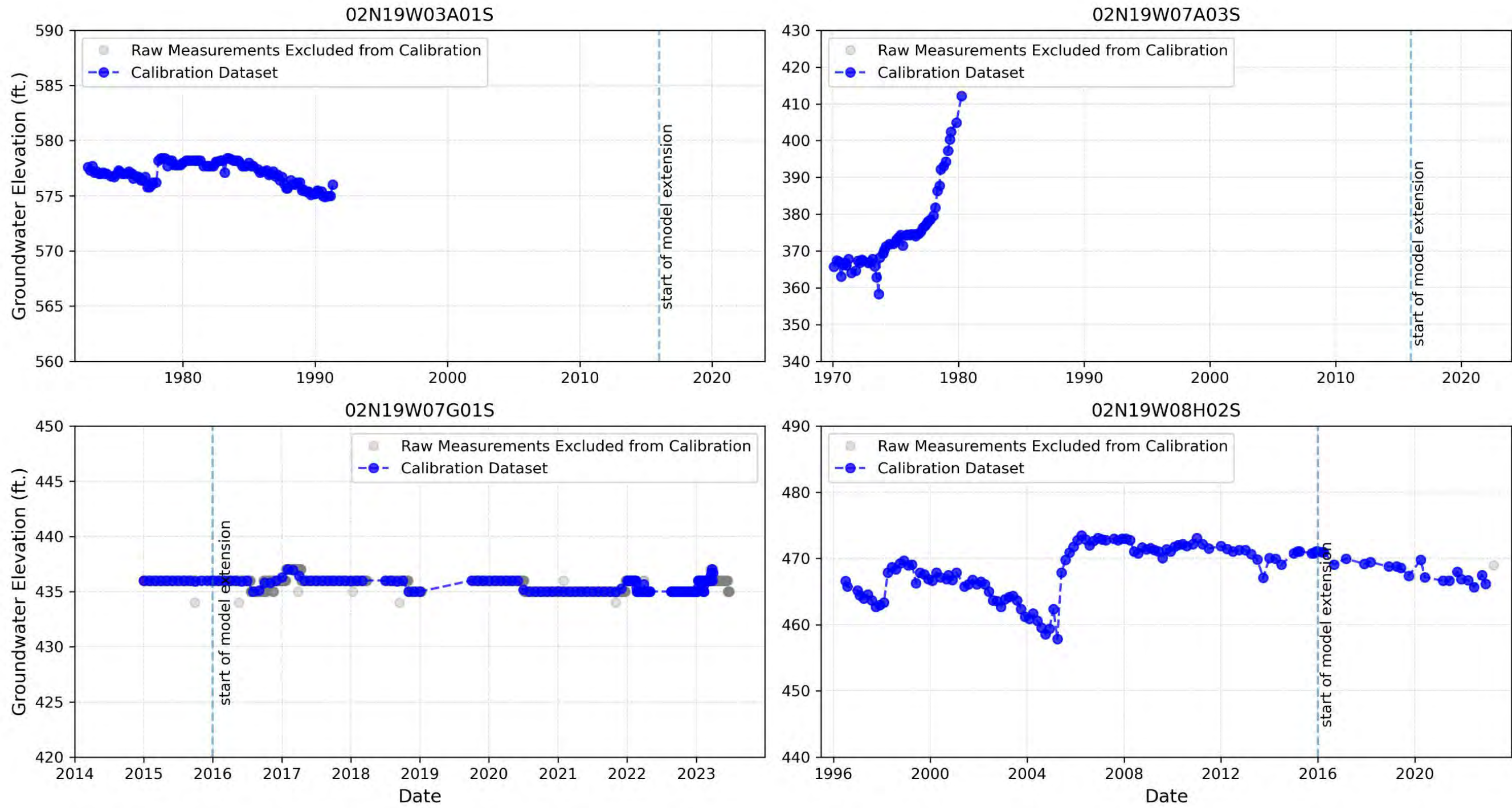


Figure B-1a: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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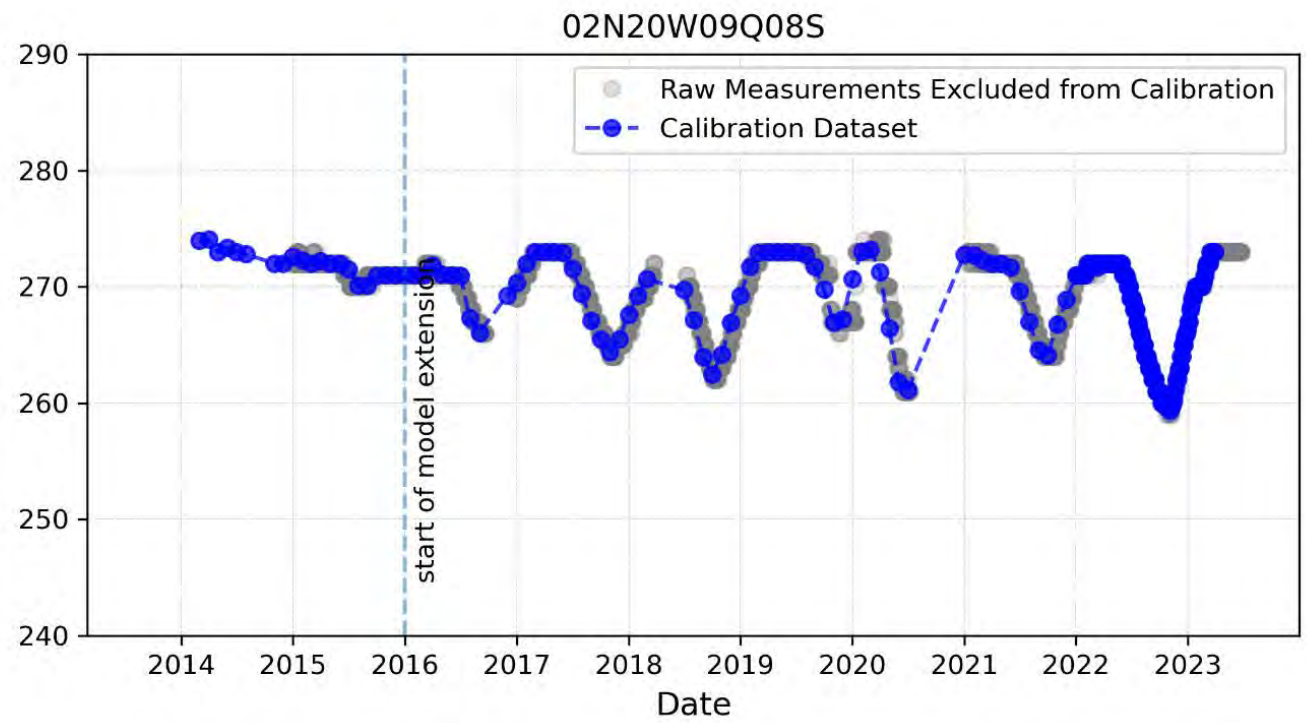
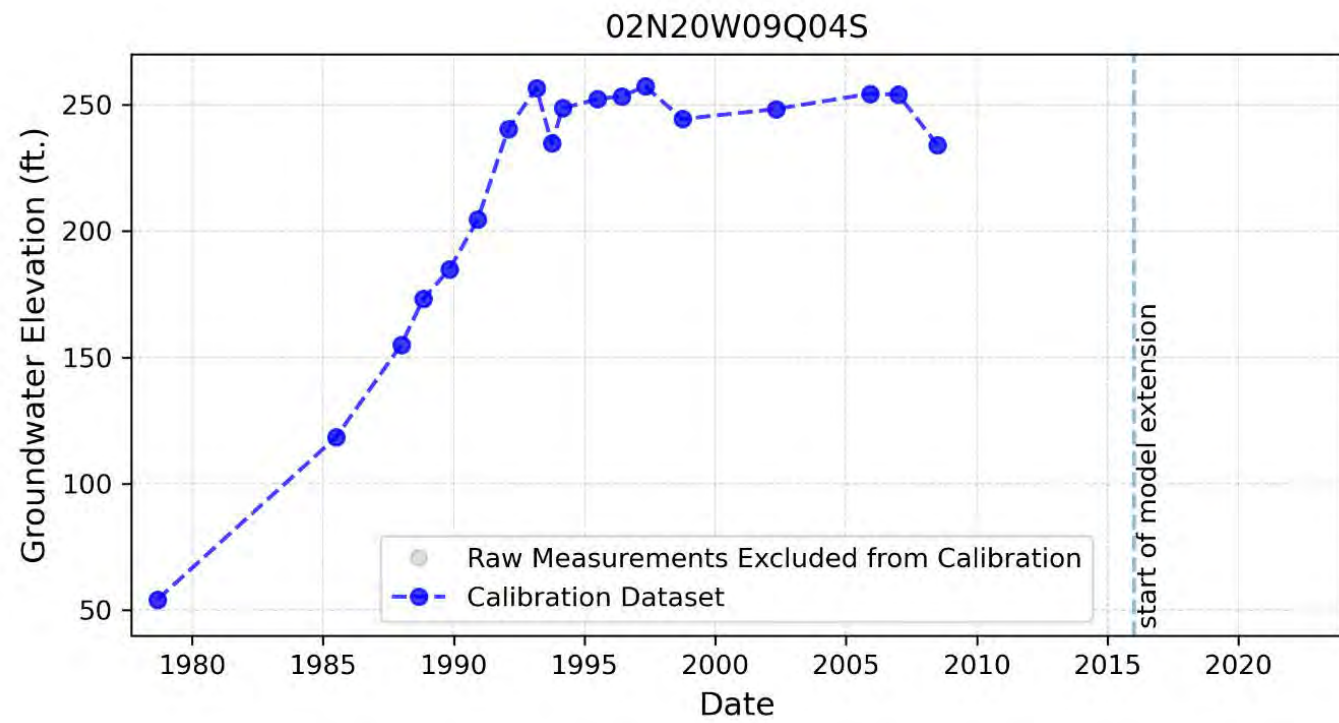
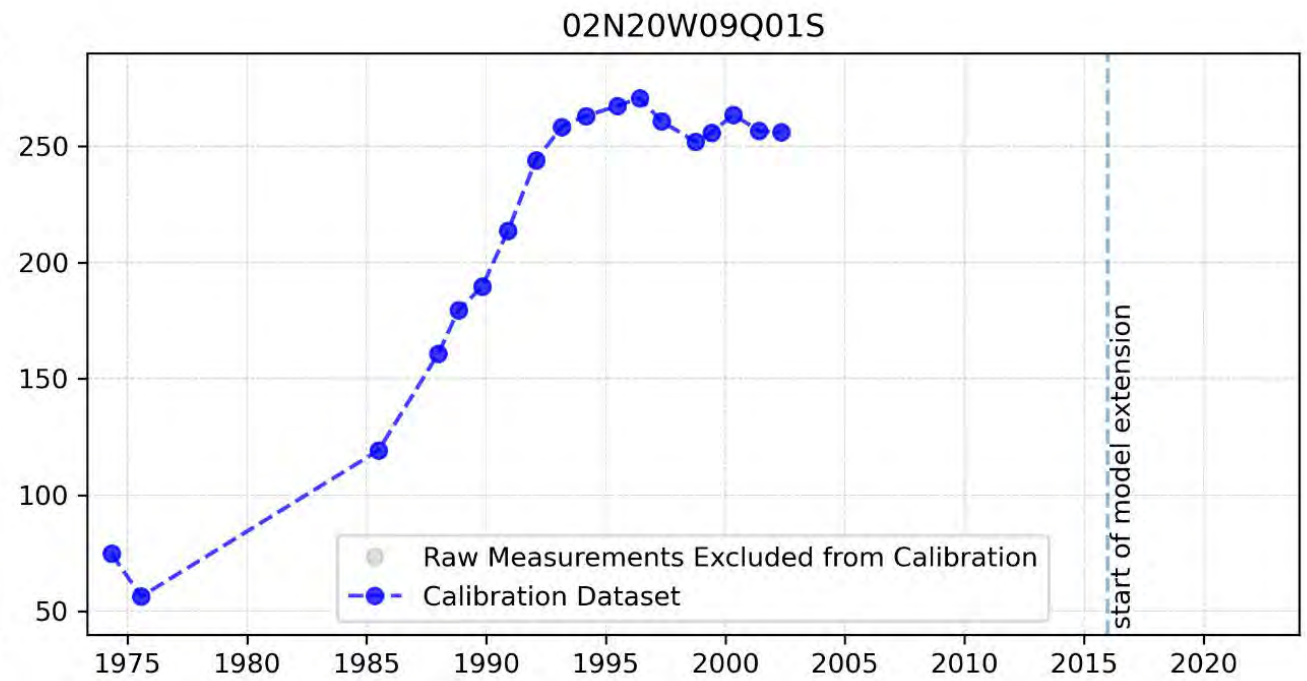
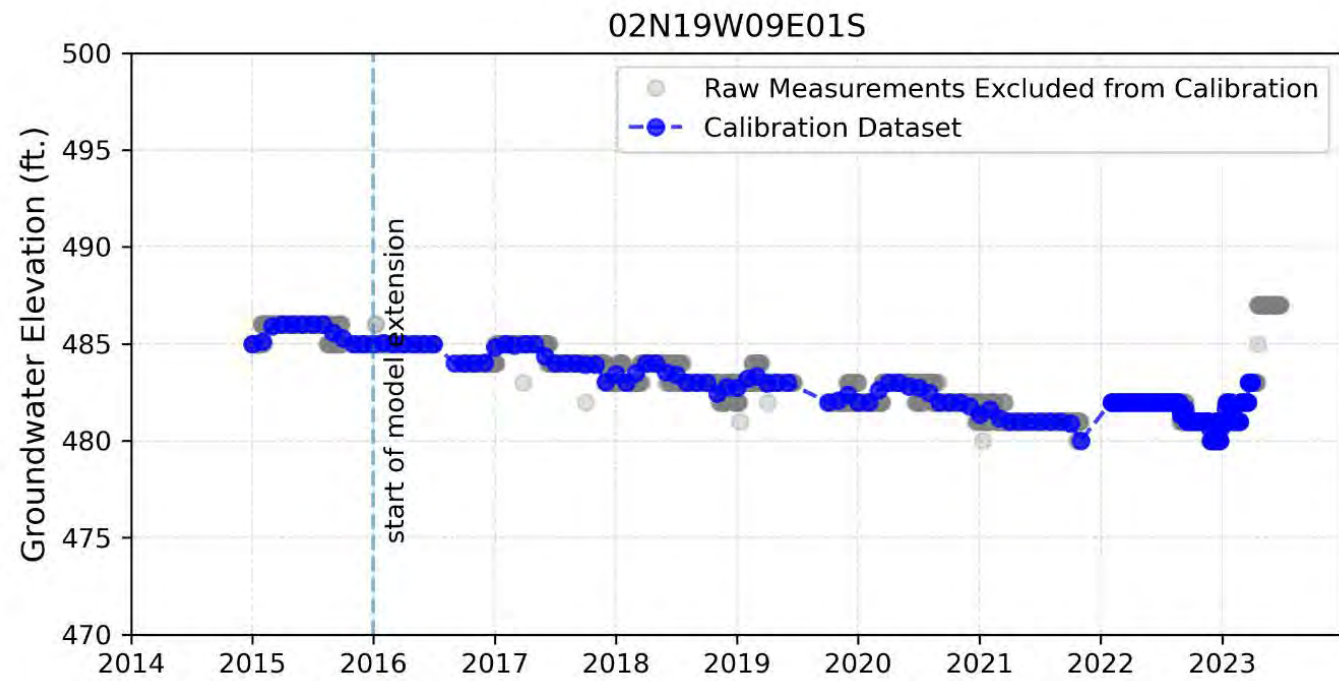


Figure C -1b: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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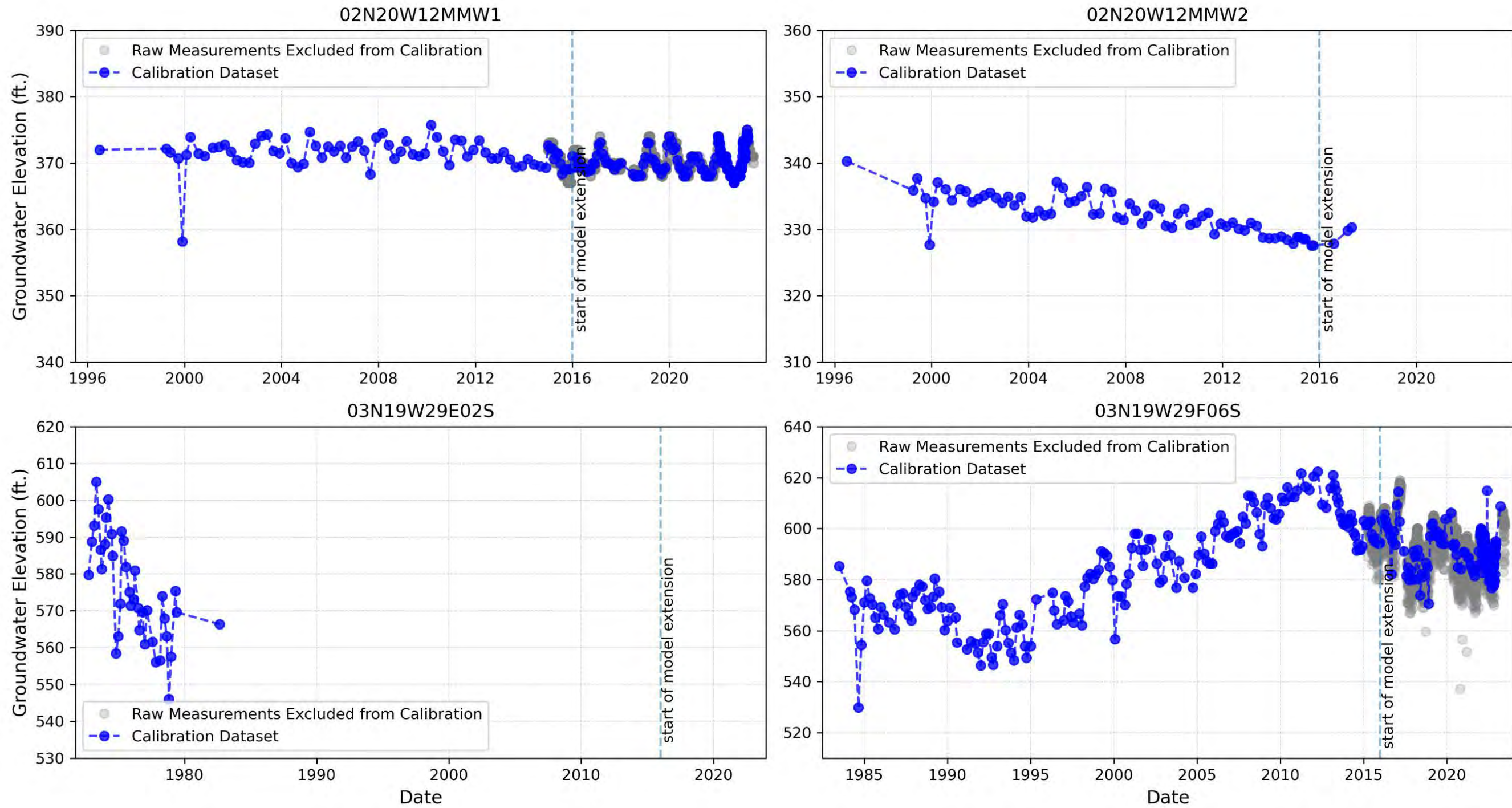


Figure B-1c: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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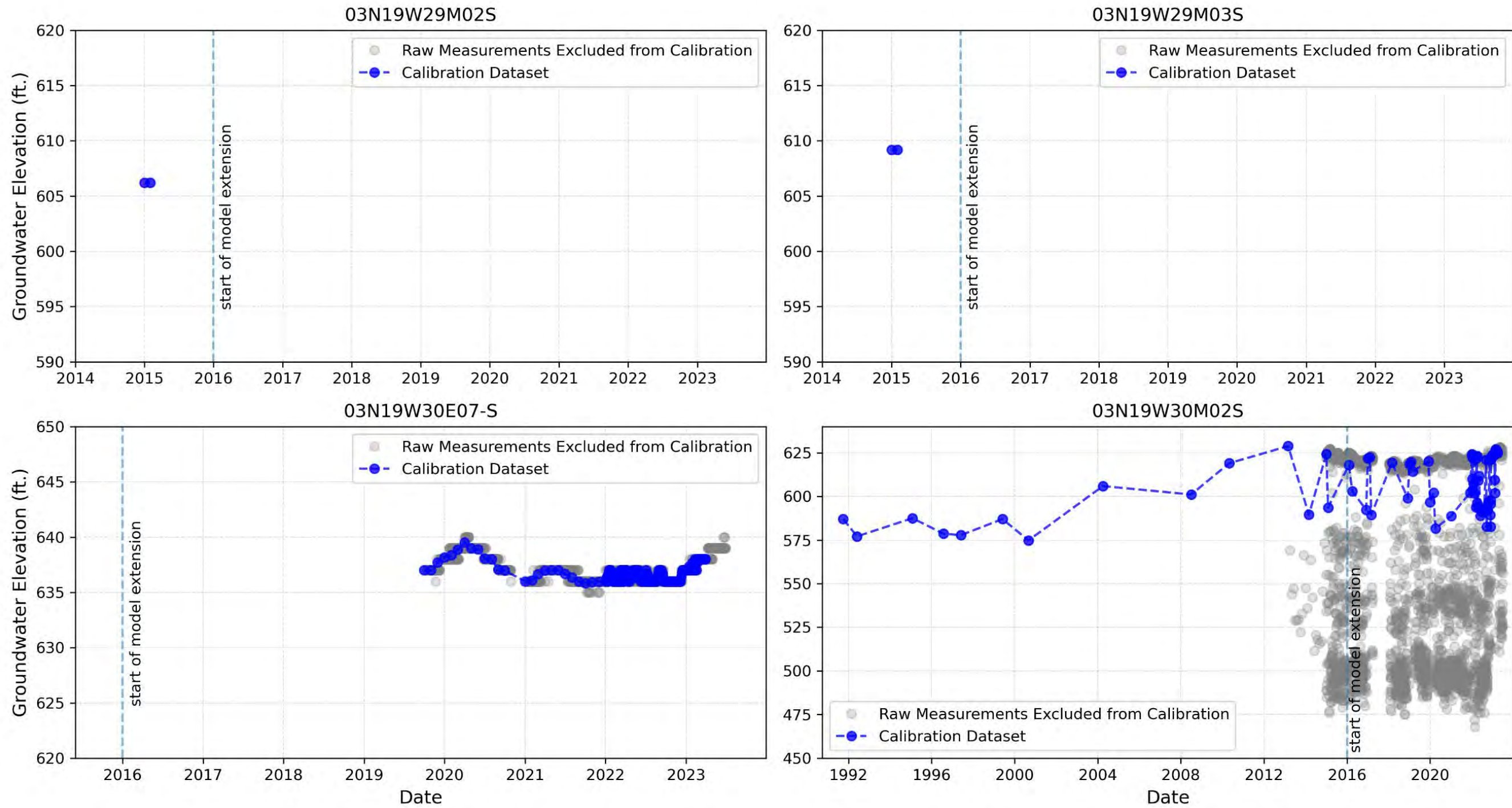


Figure B-1d: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

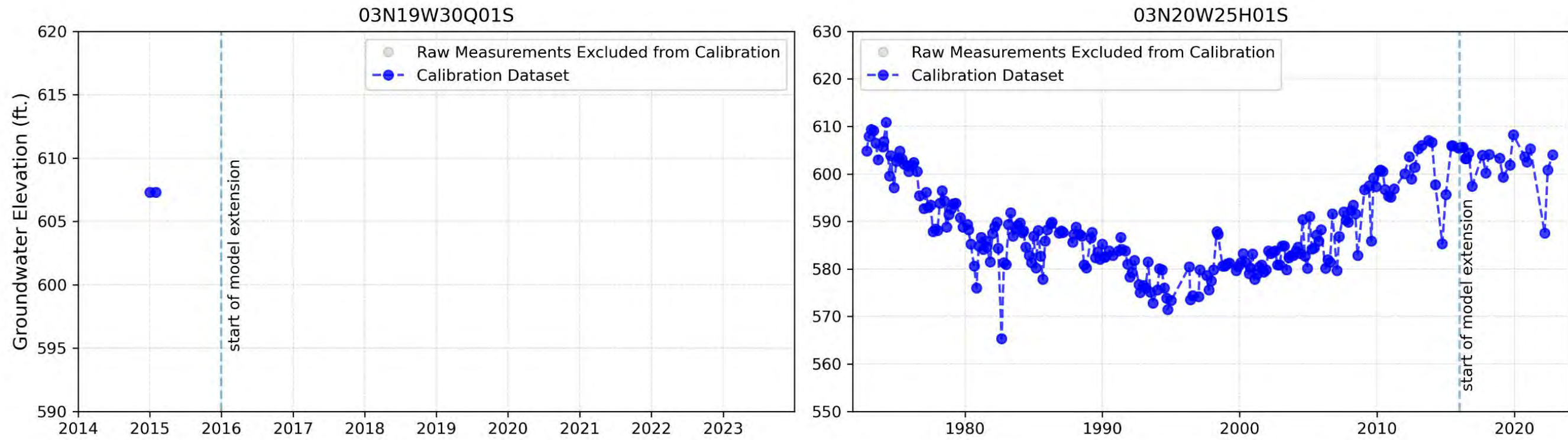


Figure B-1e: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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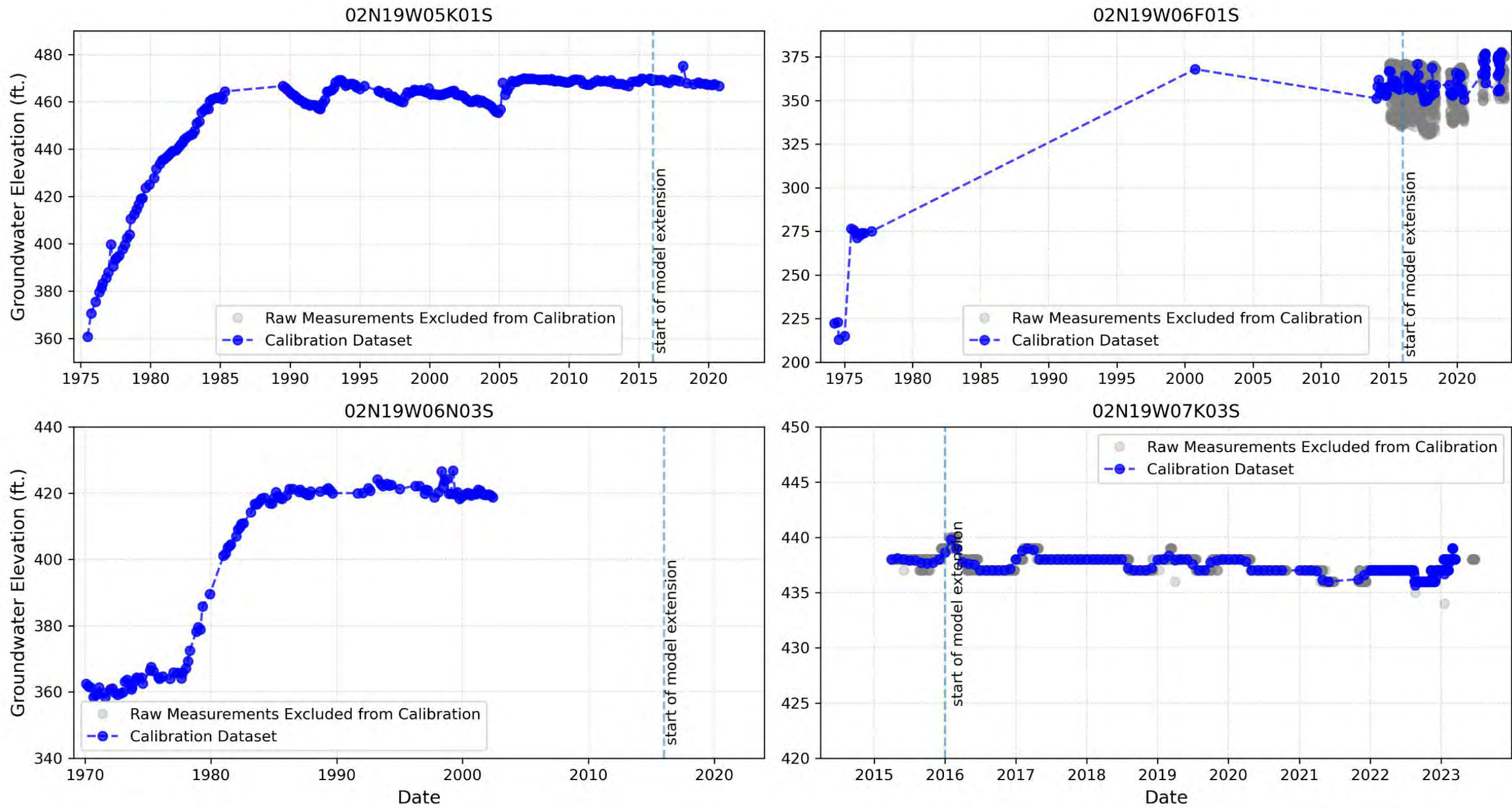


Figure B-2a: Calibration Dataset for the Upper San Pedro Formation

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

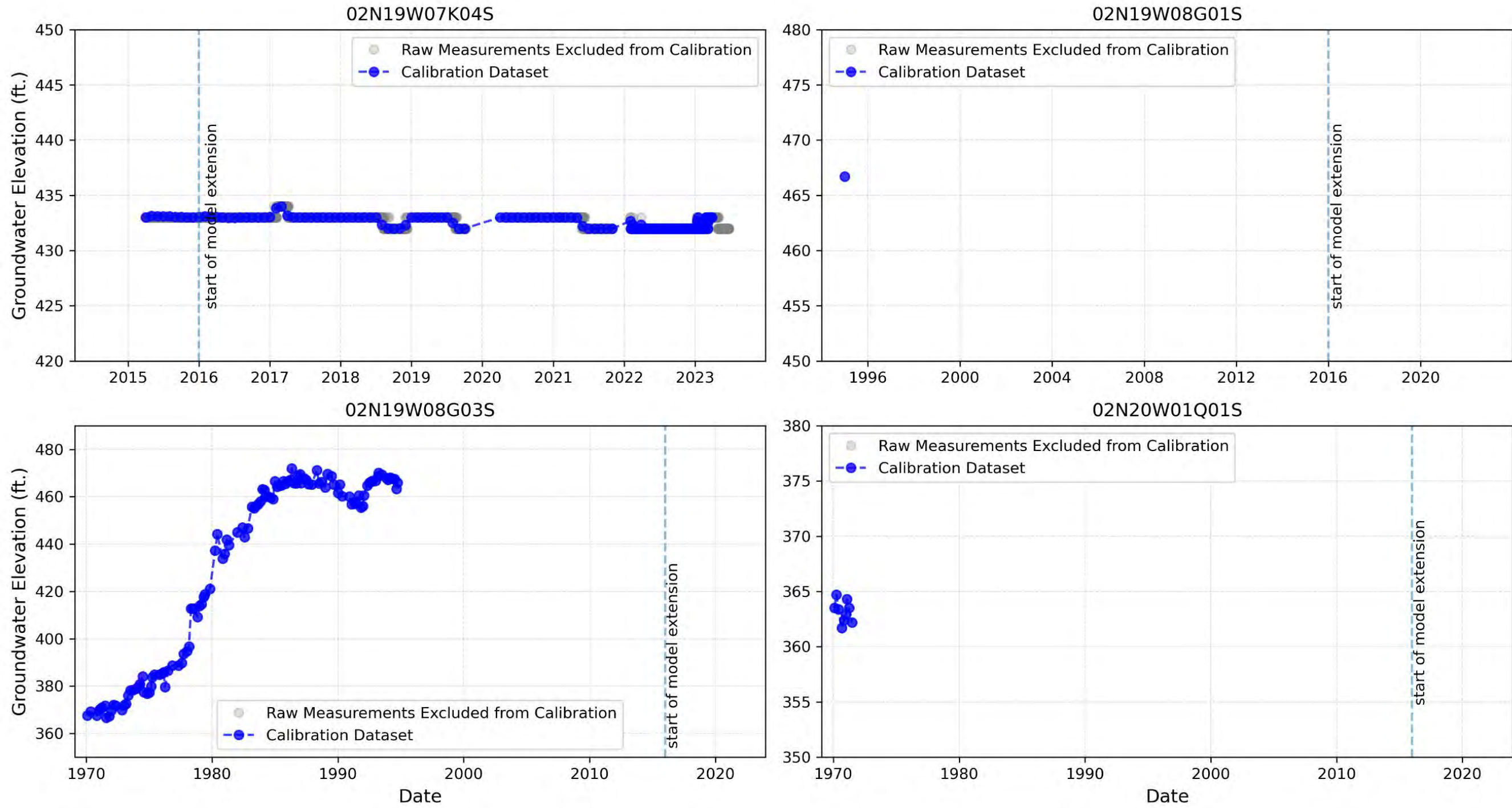


Figure B-2b: Calibration Dataset for the Upper San Pedro Formation

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

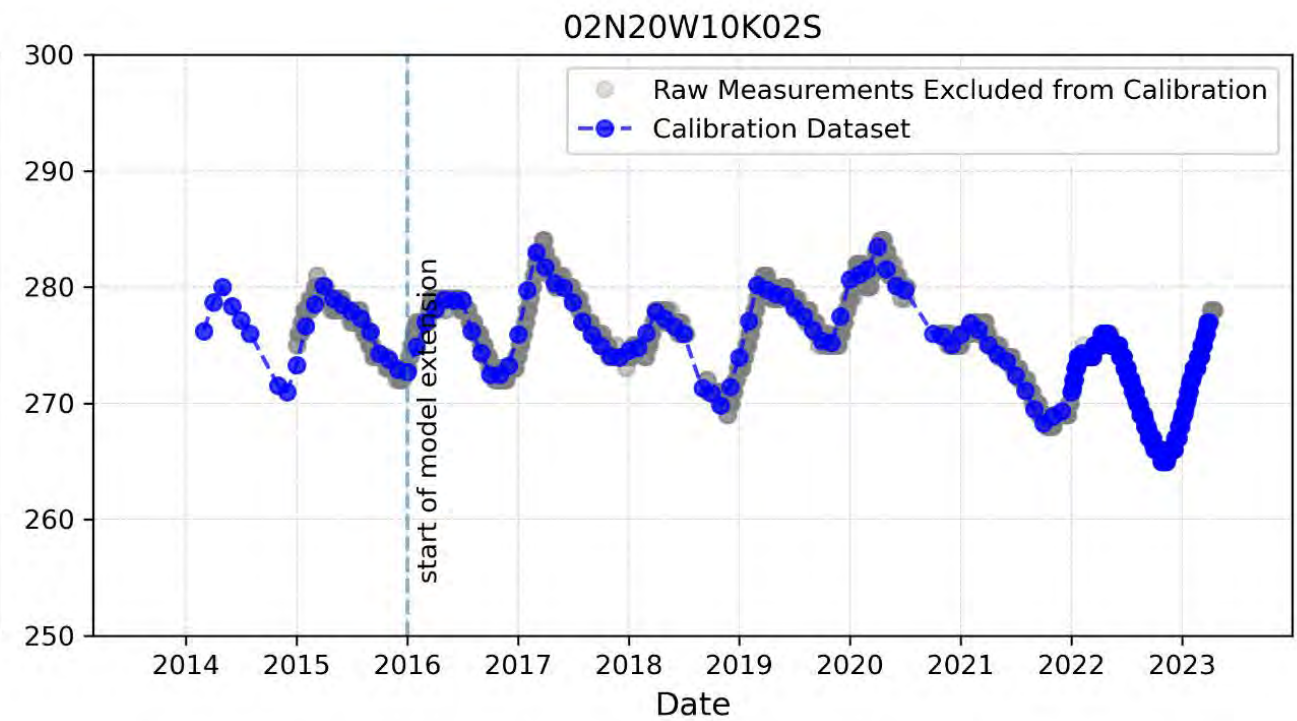
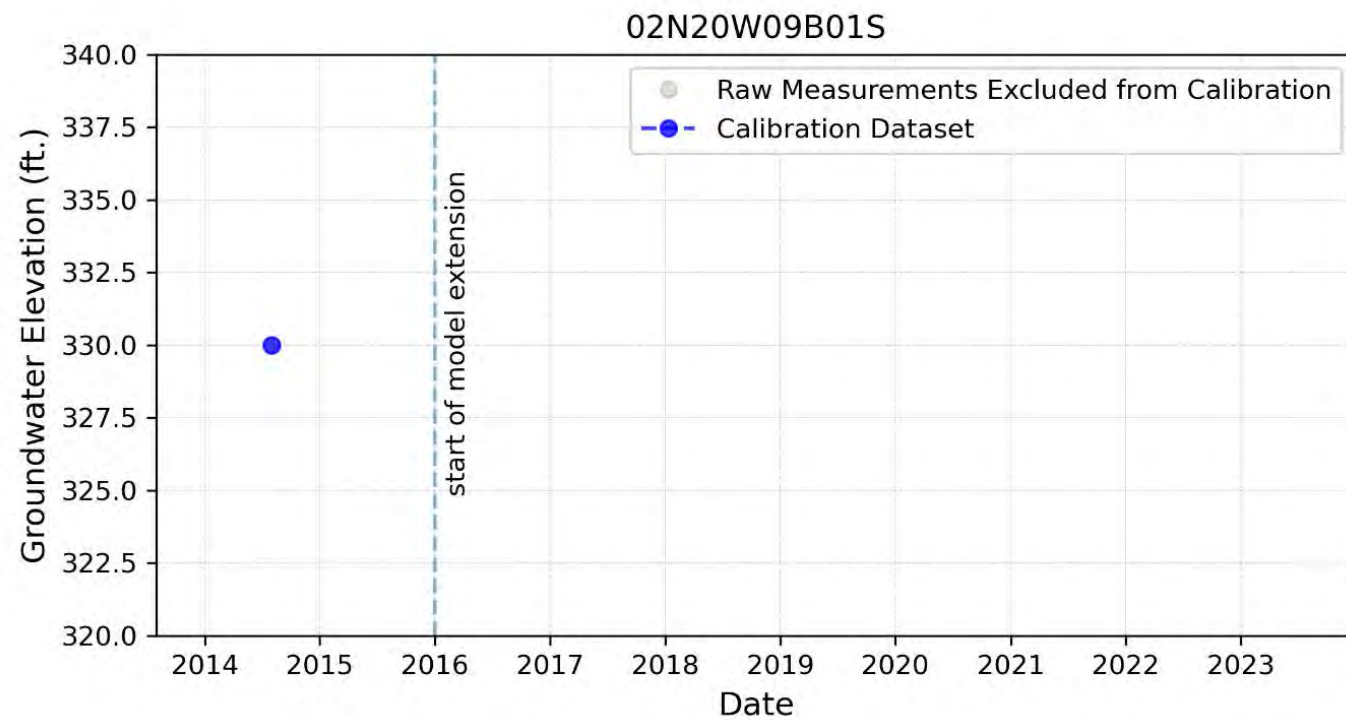
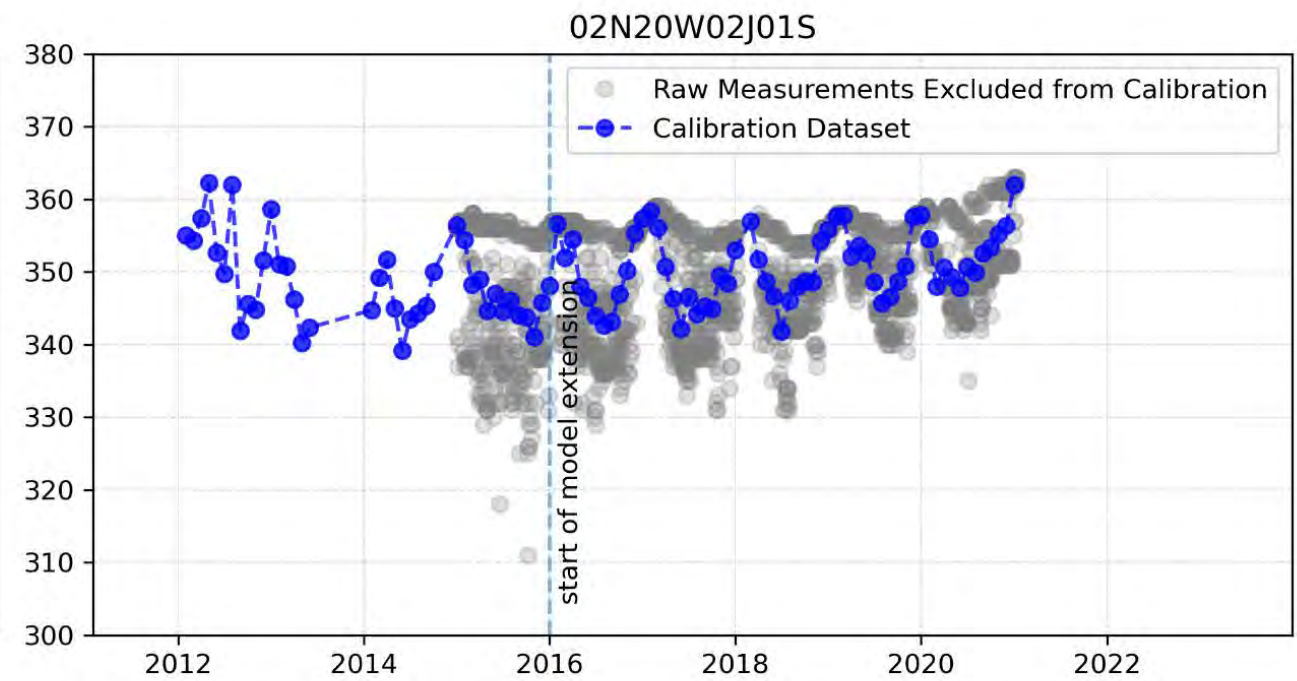
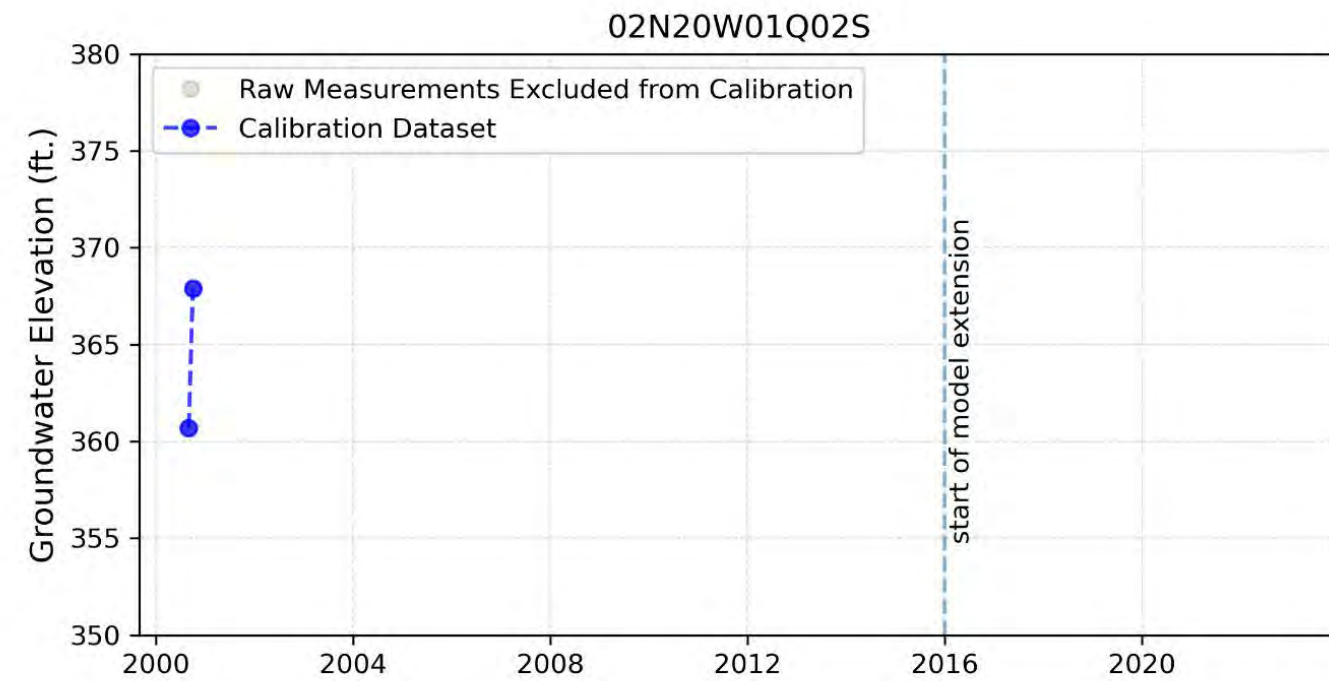


Figure B-2c: Calibration Dataset for the Upper San Pedro Formation

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

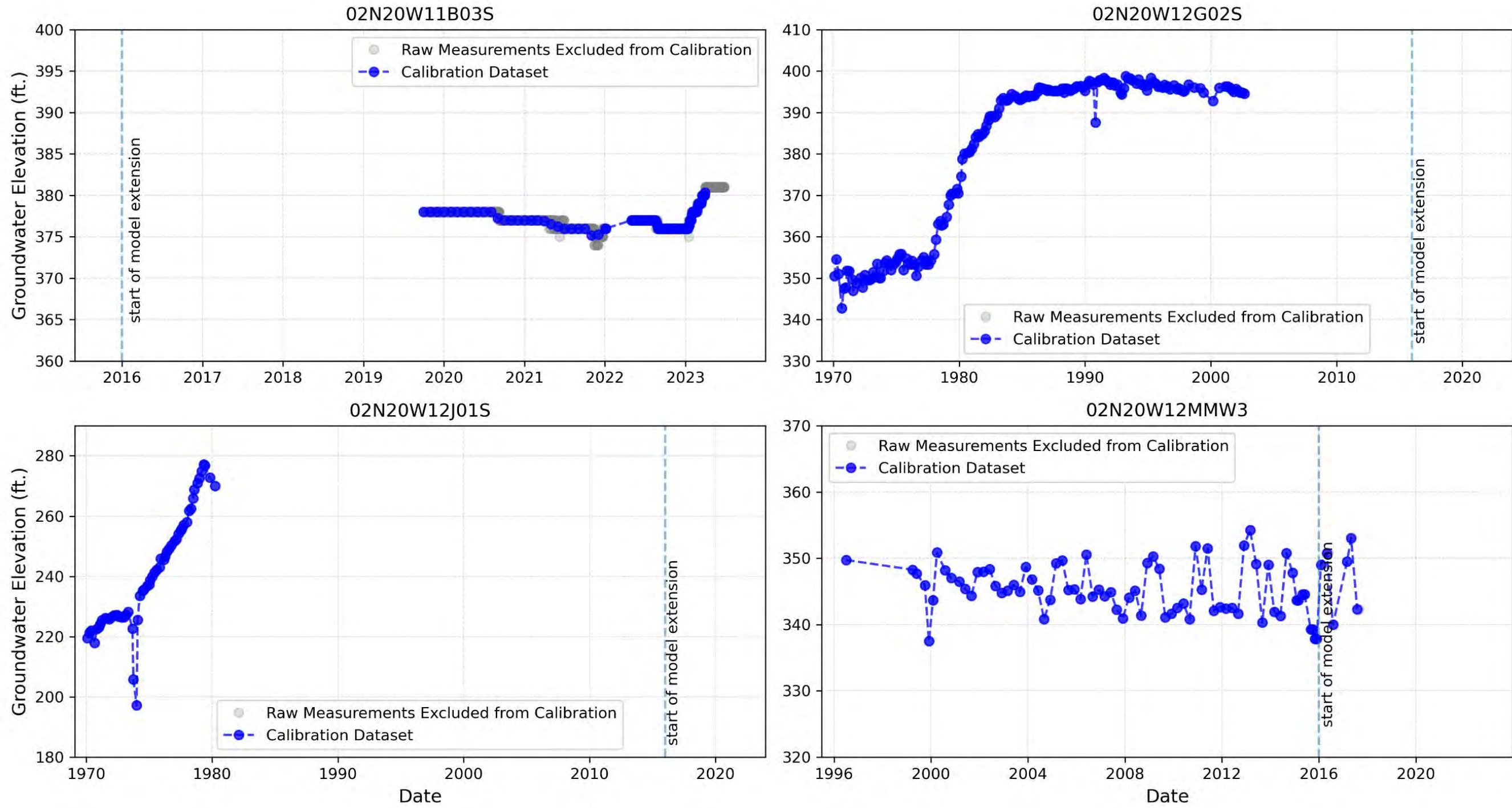


Figure B-2d: Calibration Dataset for the Upper San Pedro Formation

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

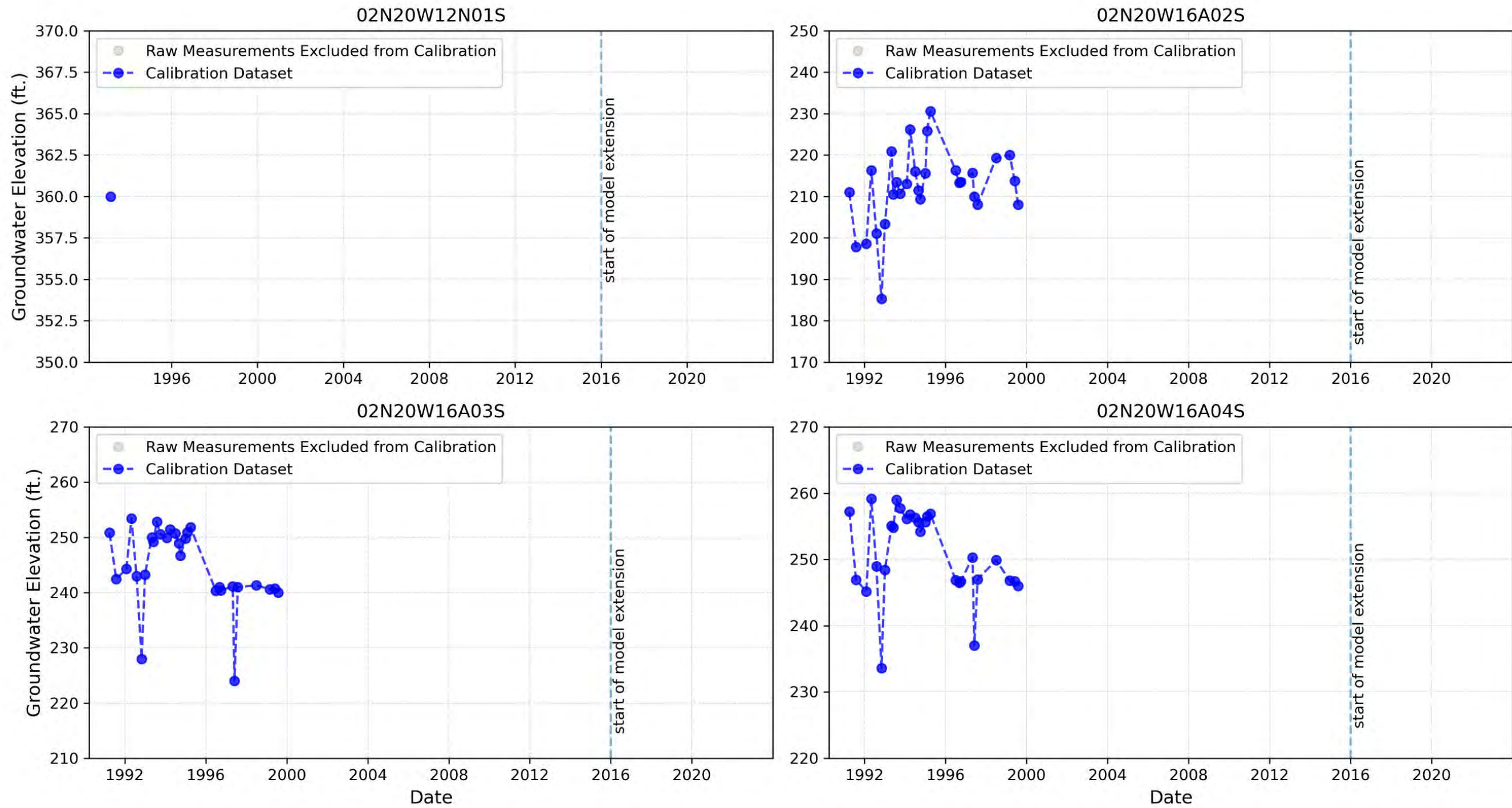


Figure B-2e: Calibration Dataset for the Upper San Pedro Formation

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

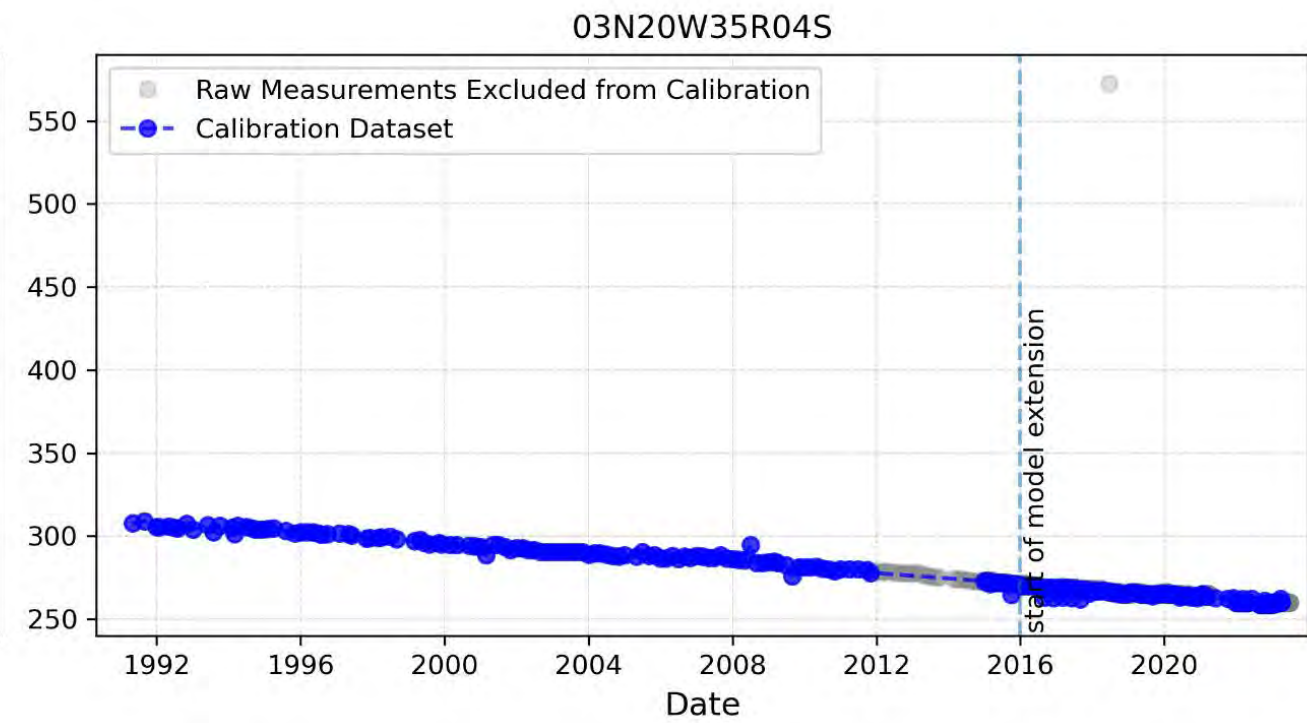
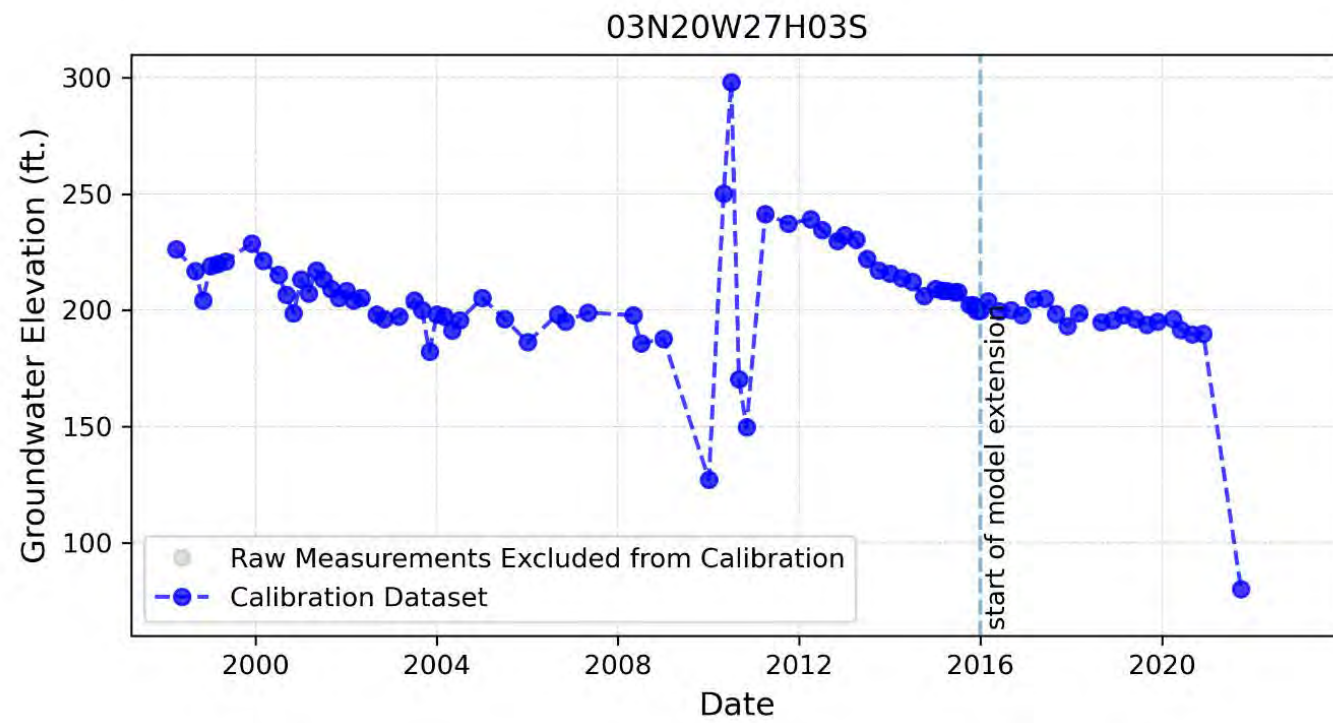
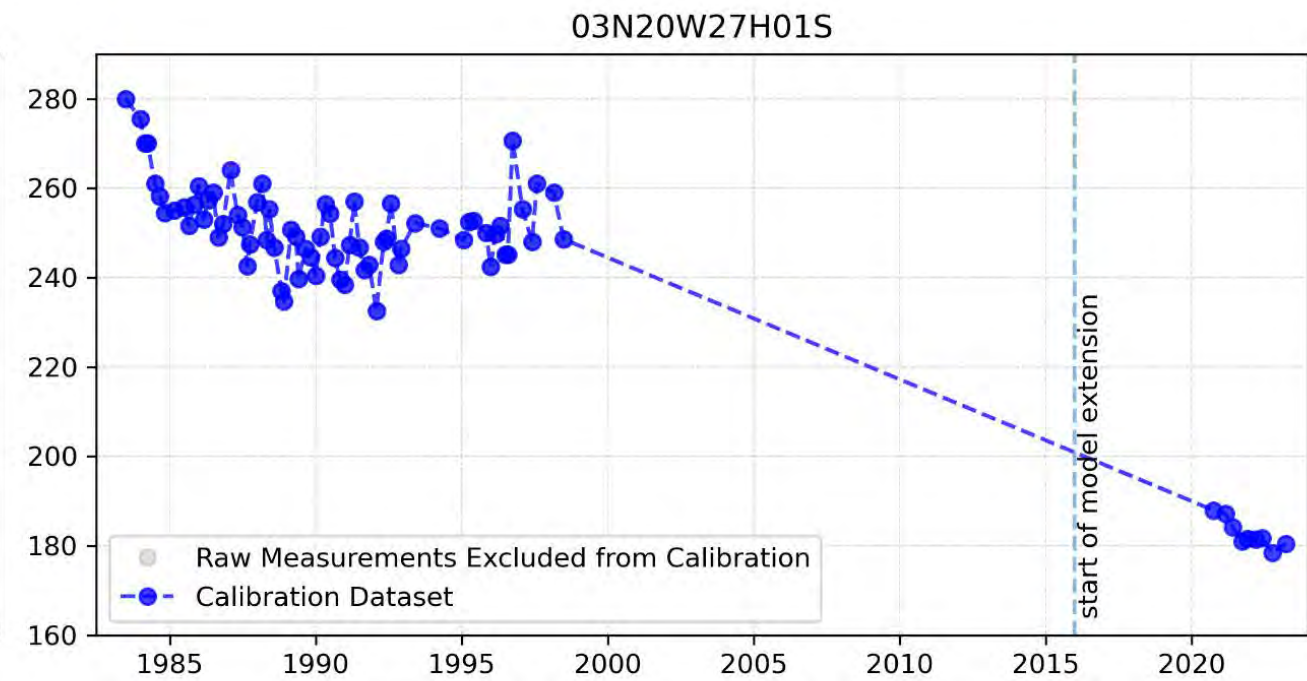
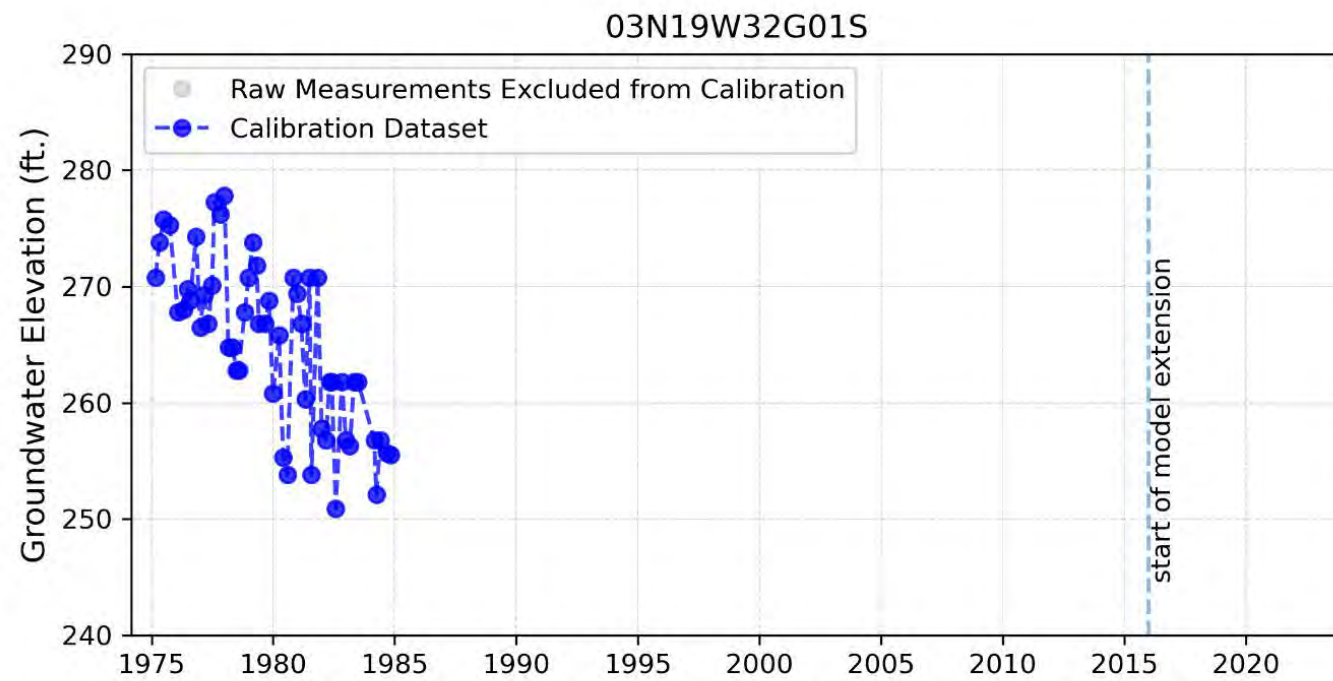


Figure B-2f: Calibration Dataset for the Upper San Pedro Formation

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

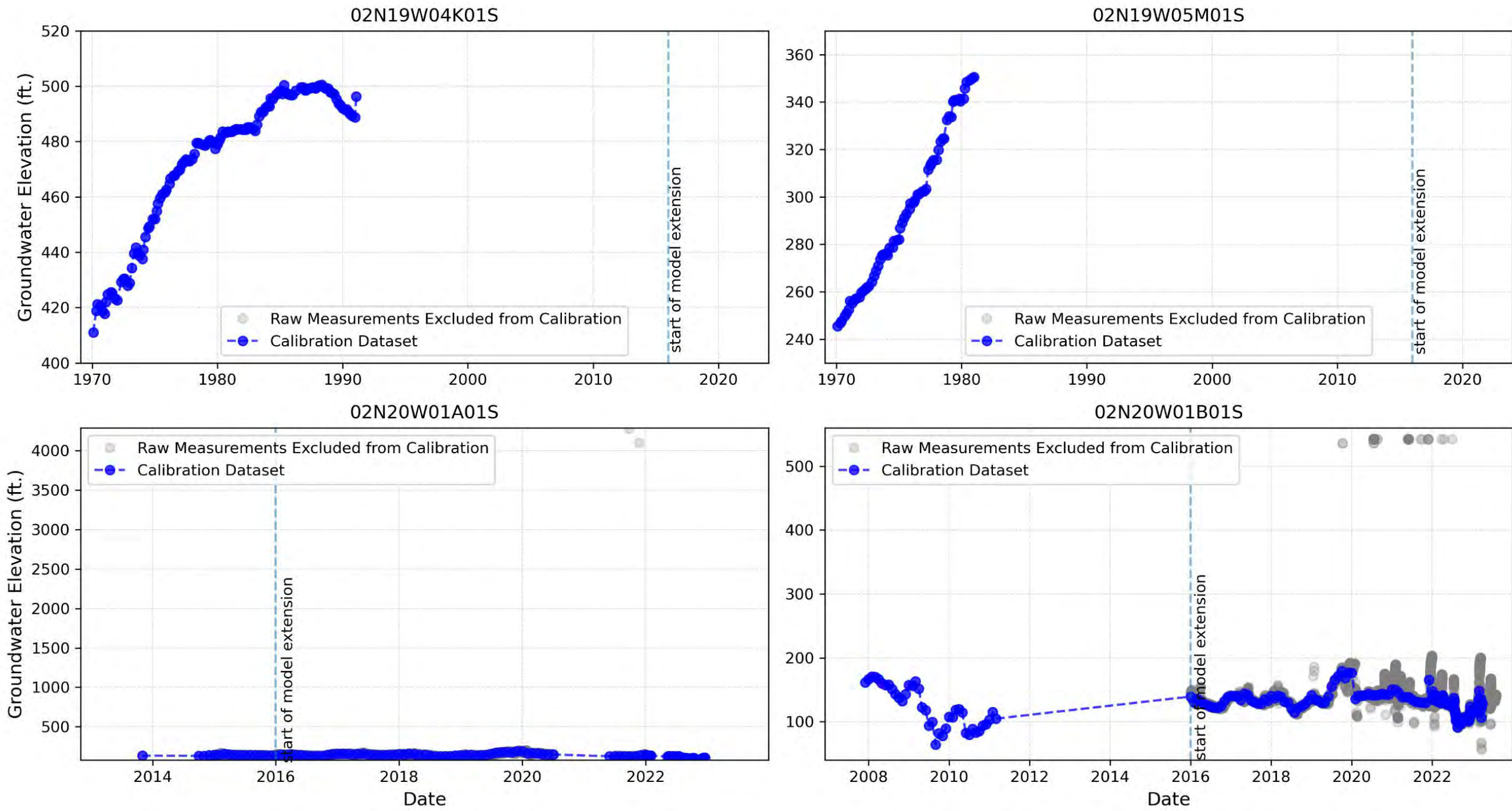


Figure B-3a: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

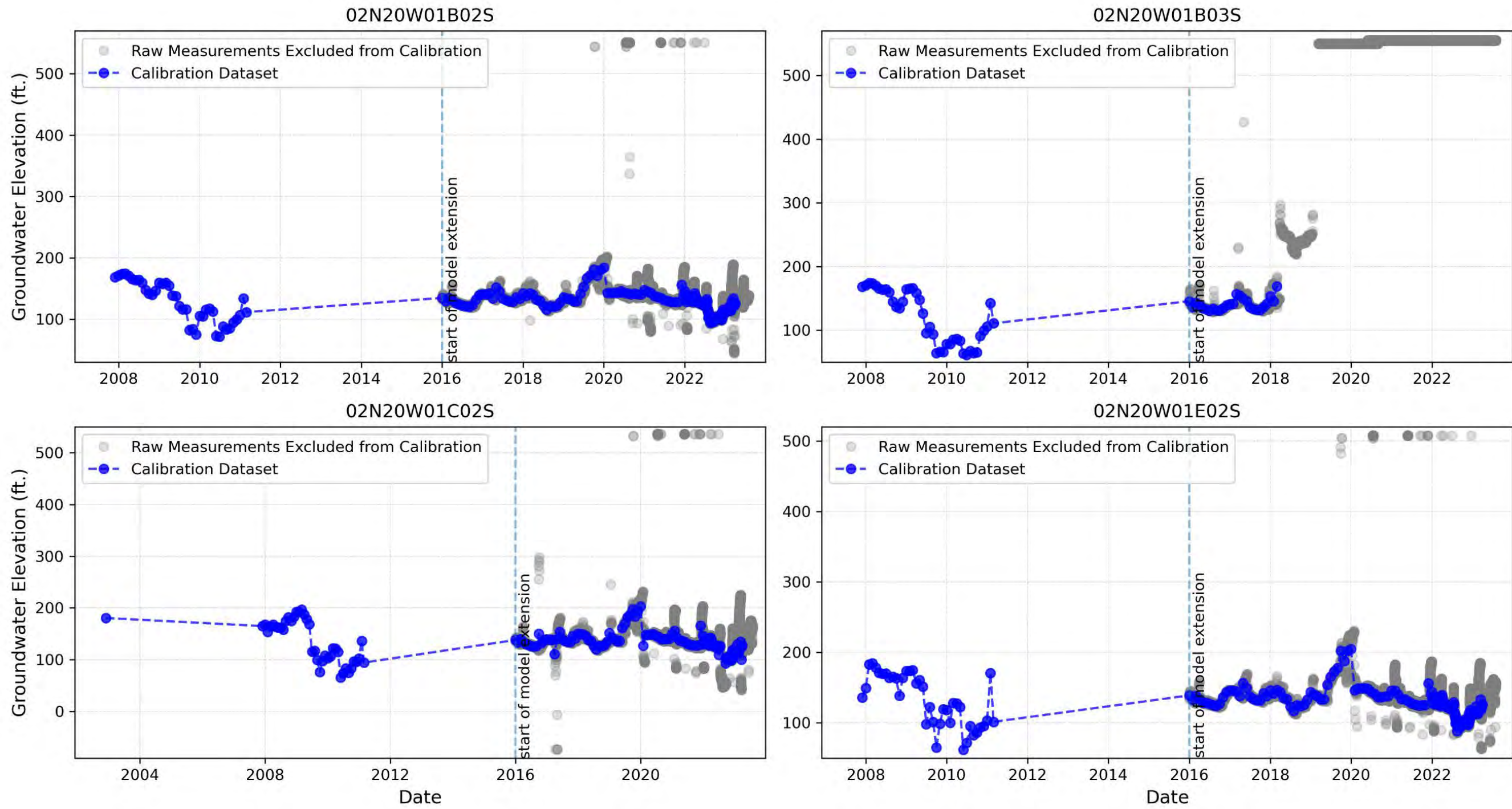


Figure B-3b: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

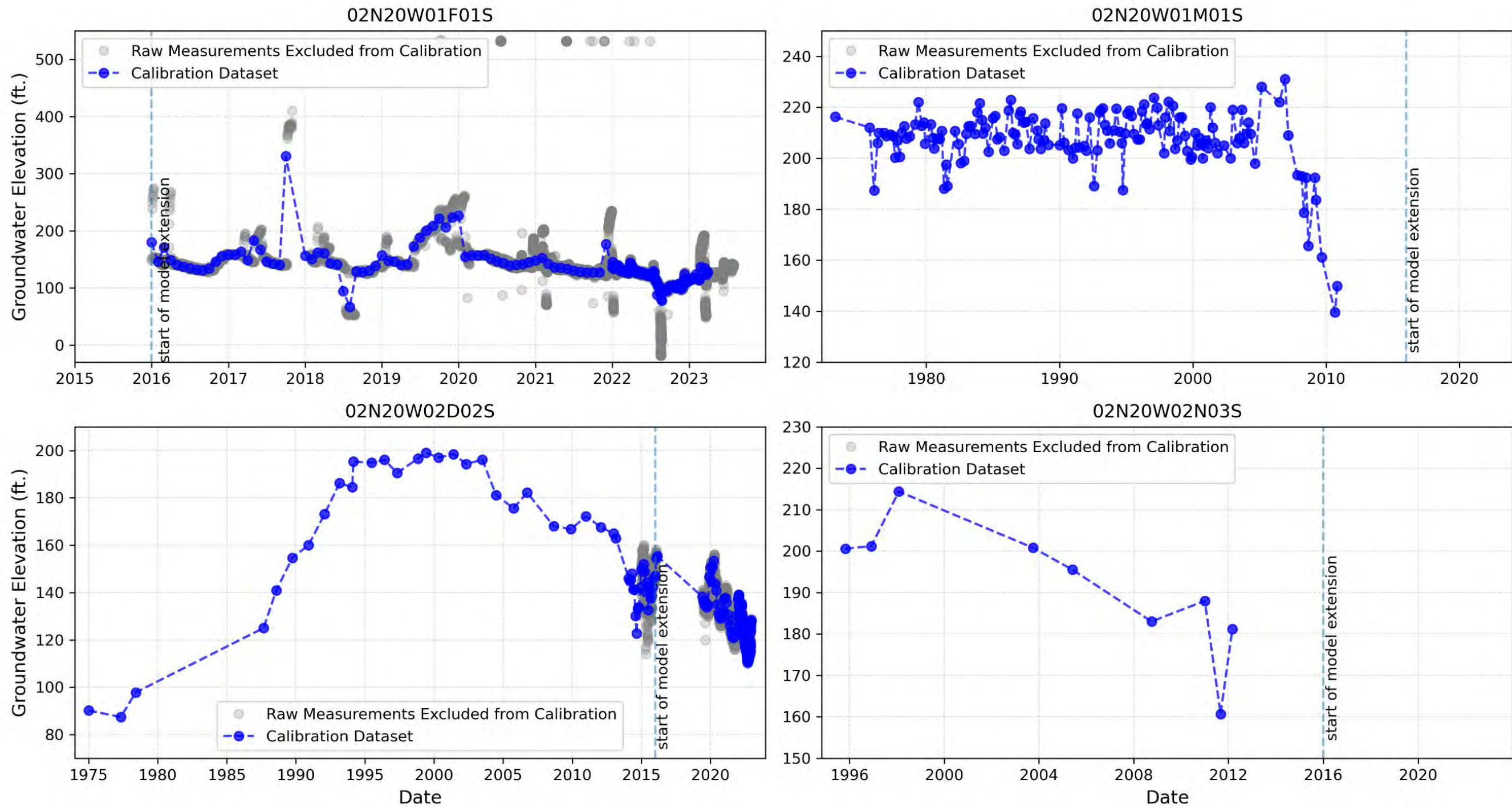


Figure B-3c: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

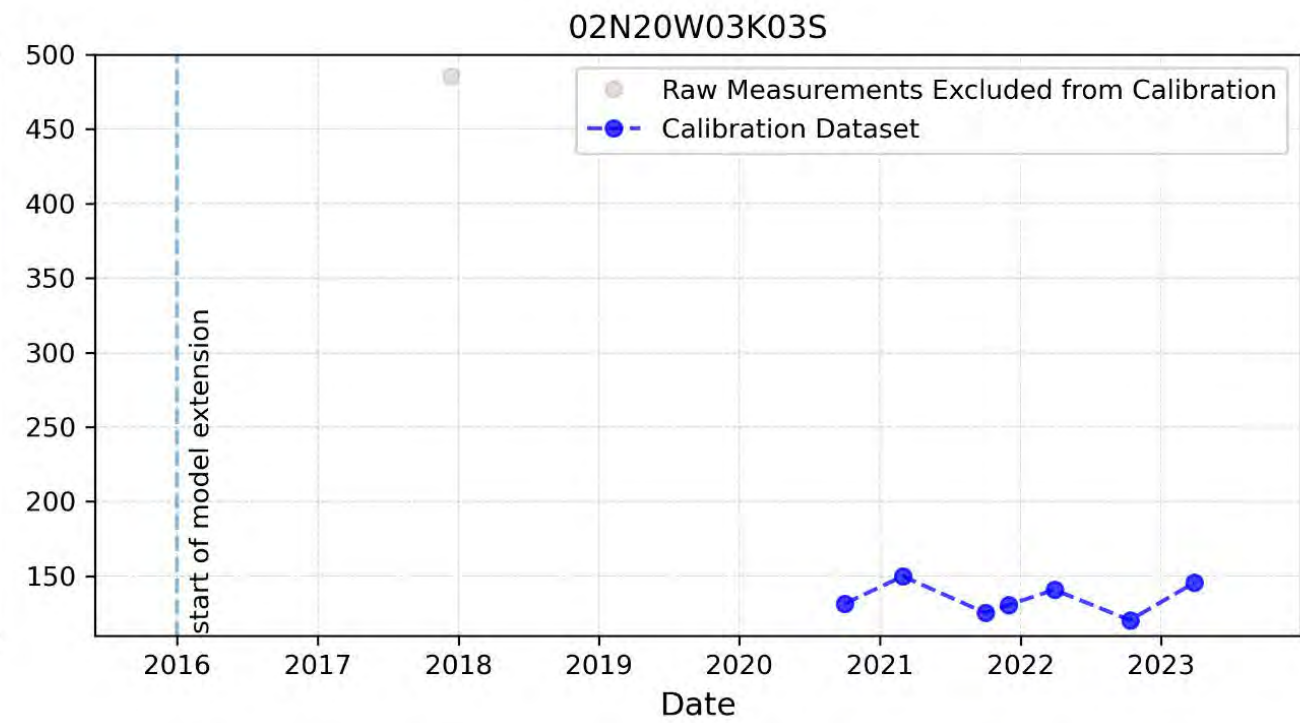
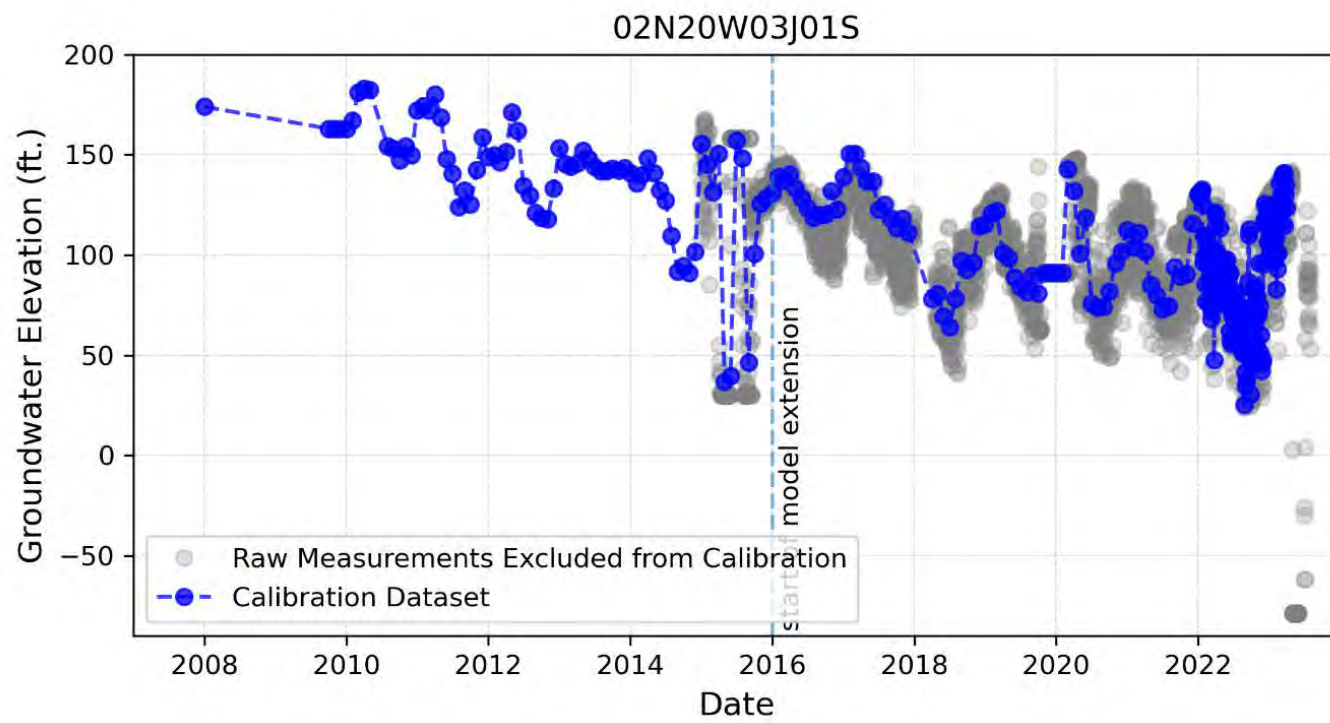
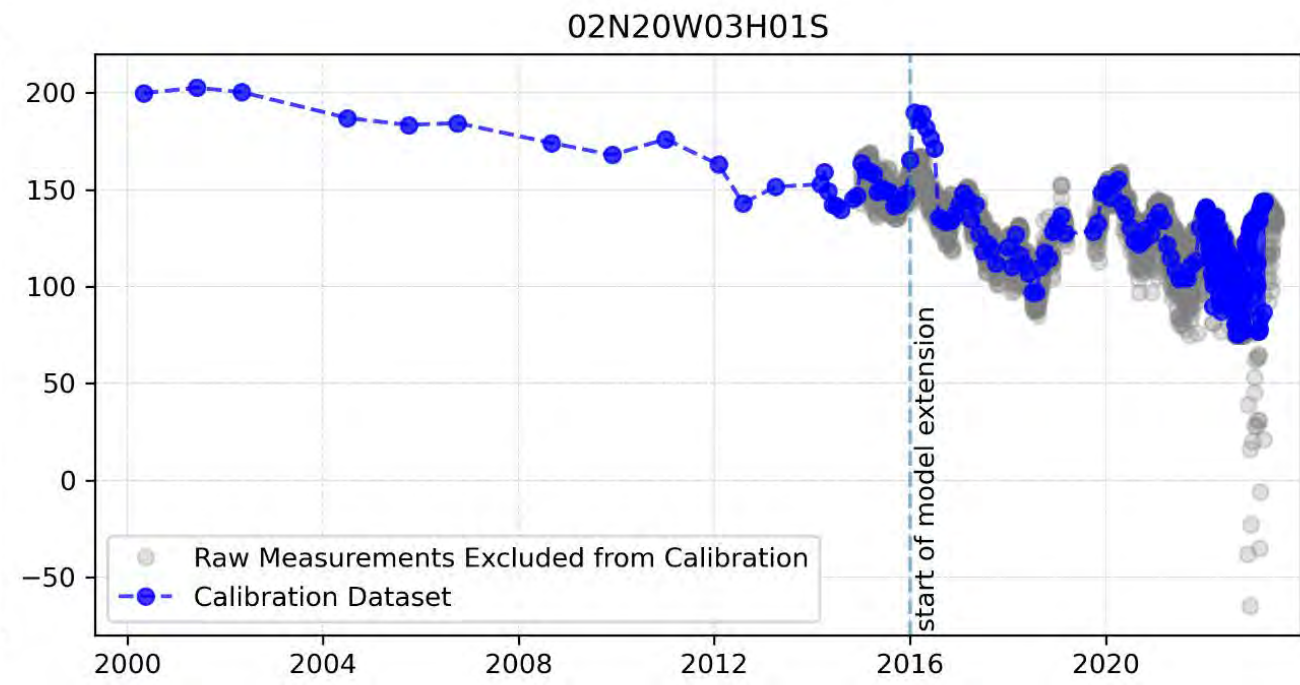
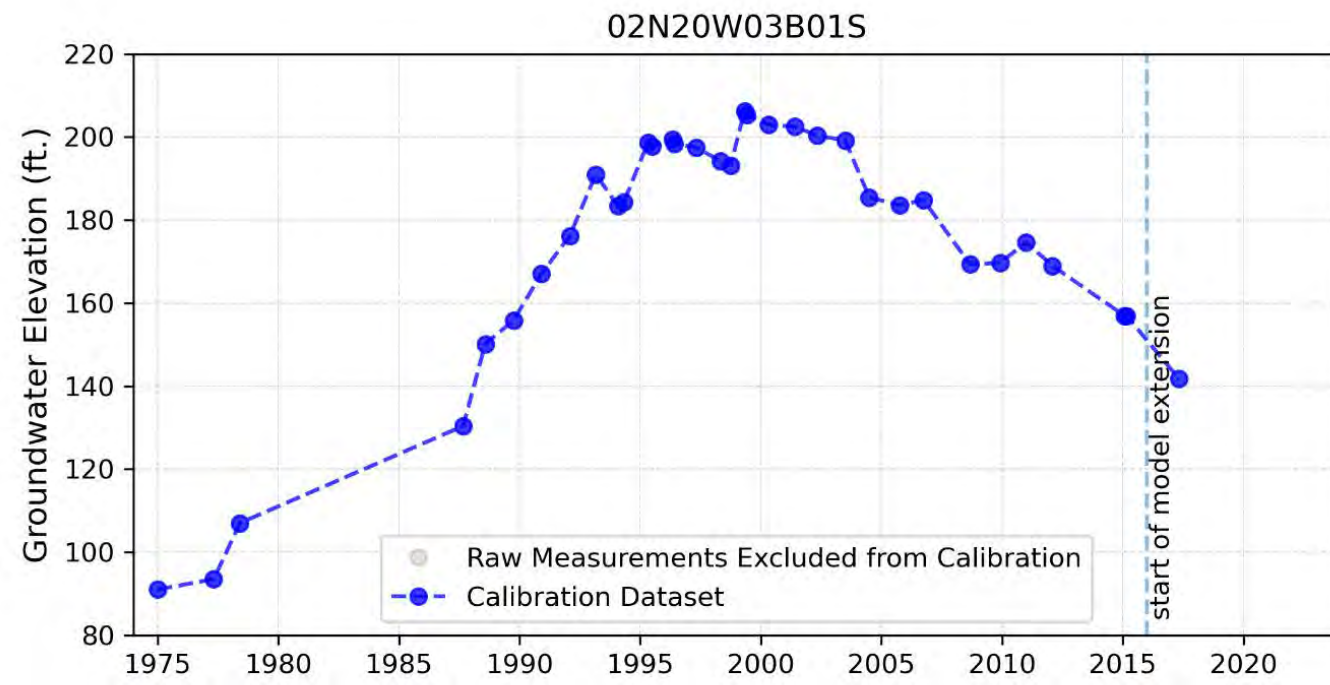


Figure B-3d: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

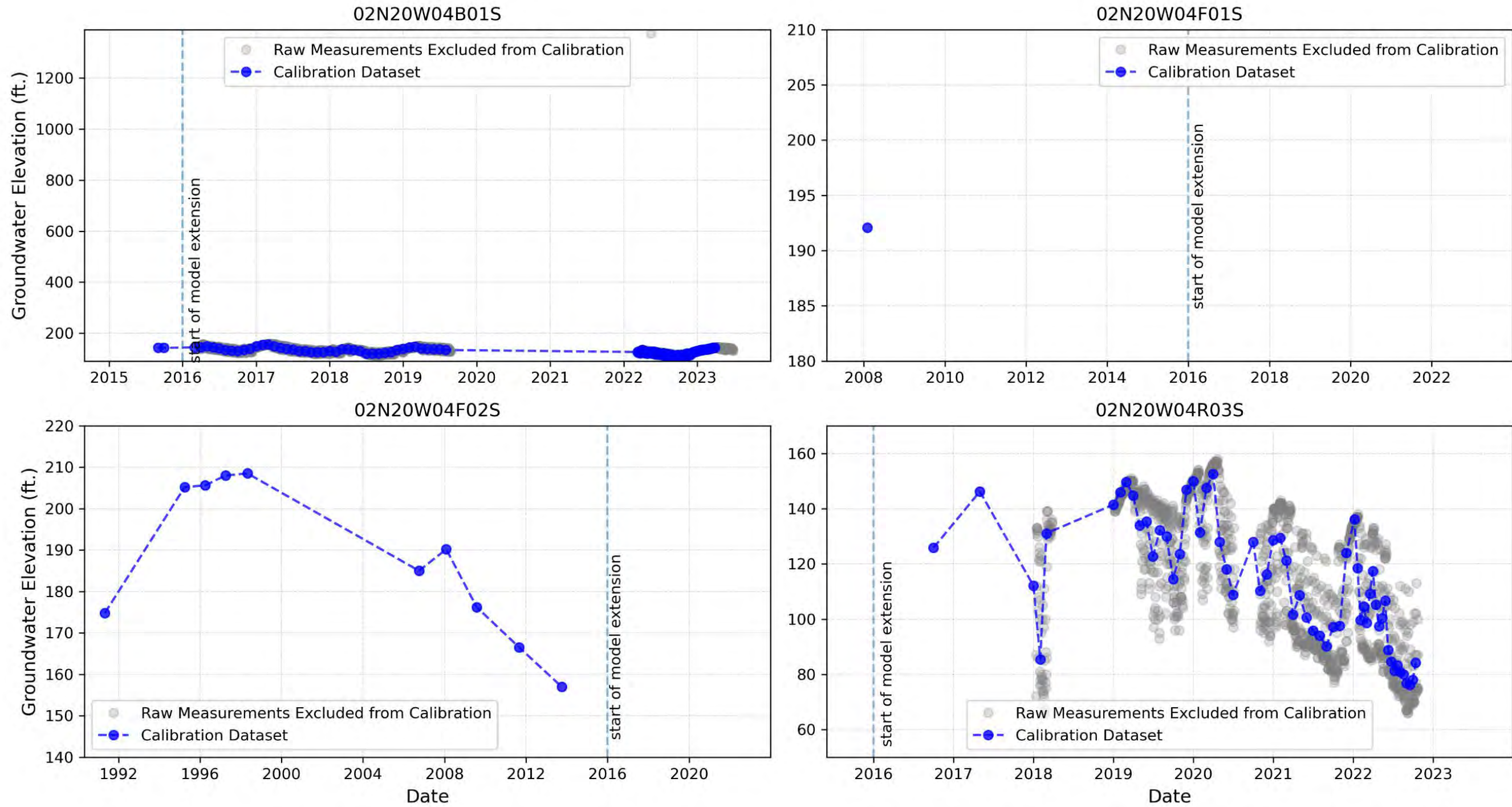


Figure B-3e: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

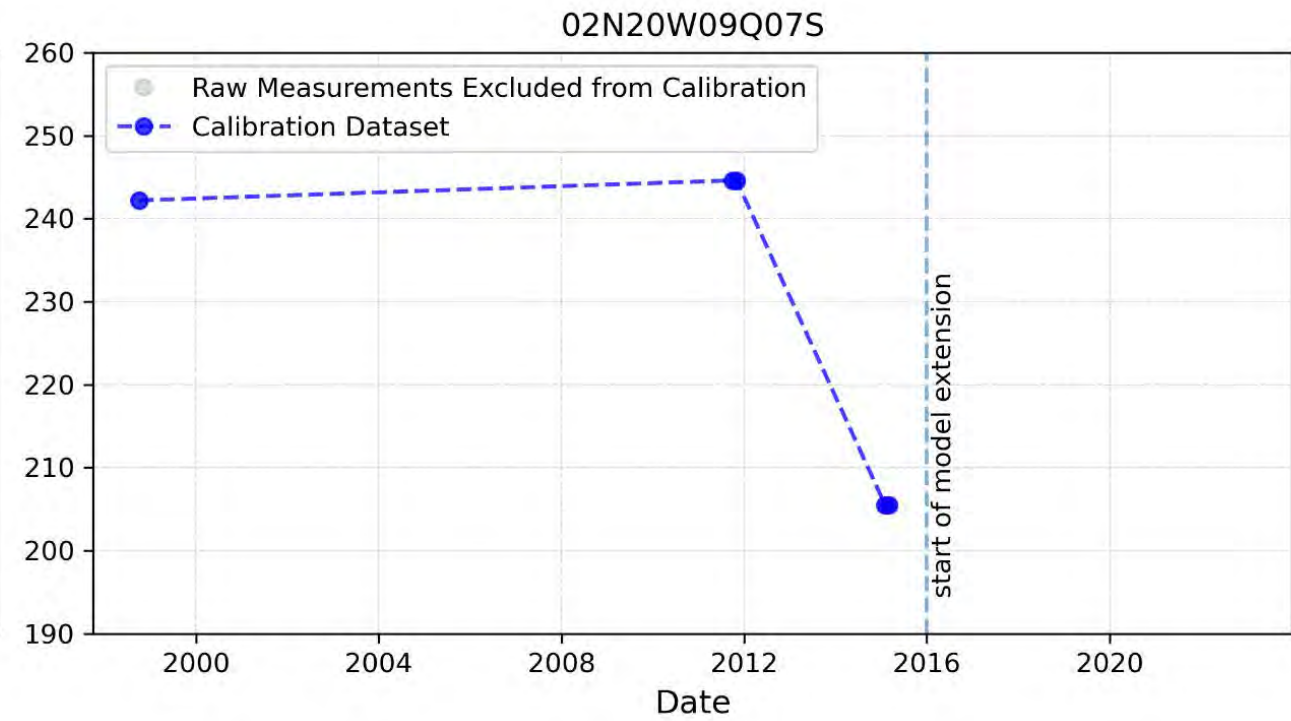
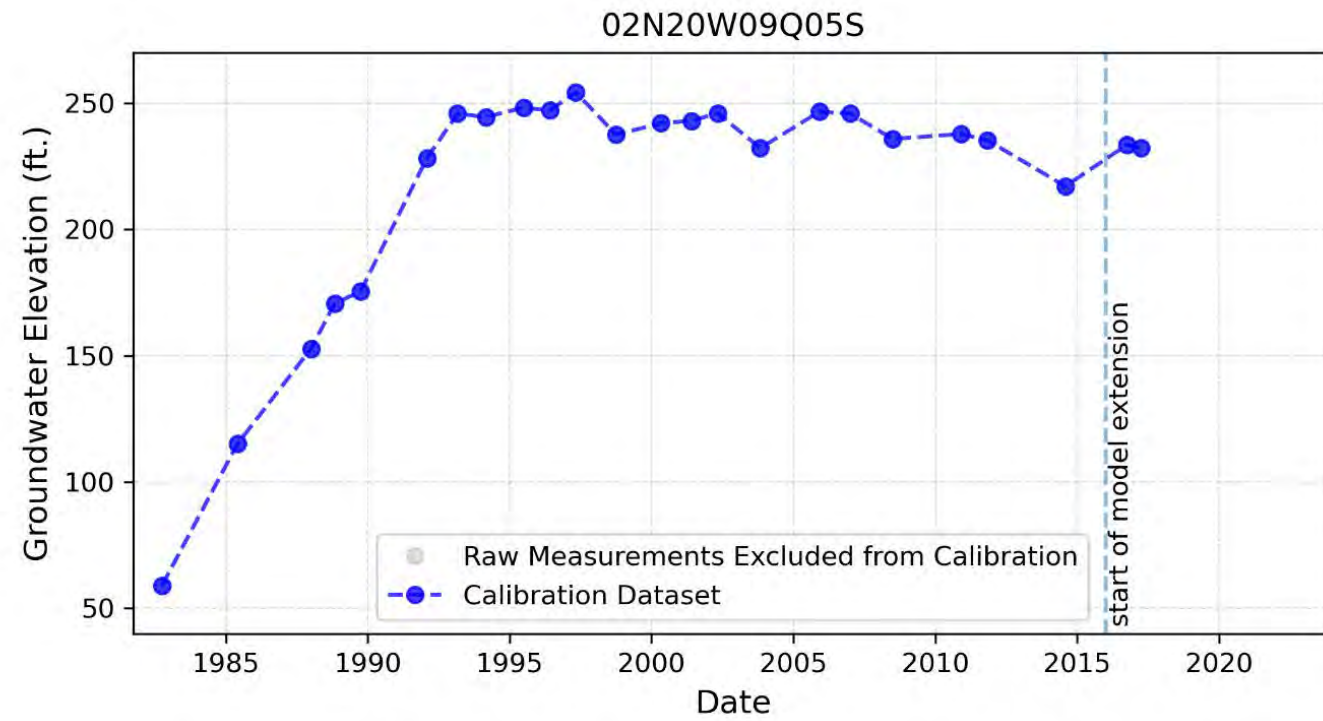
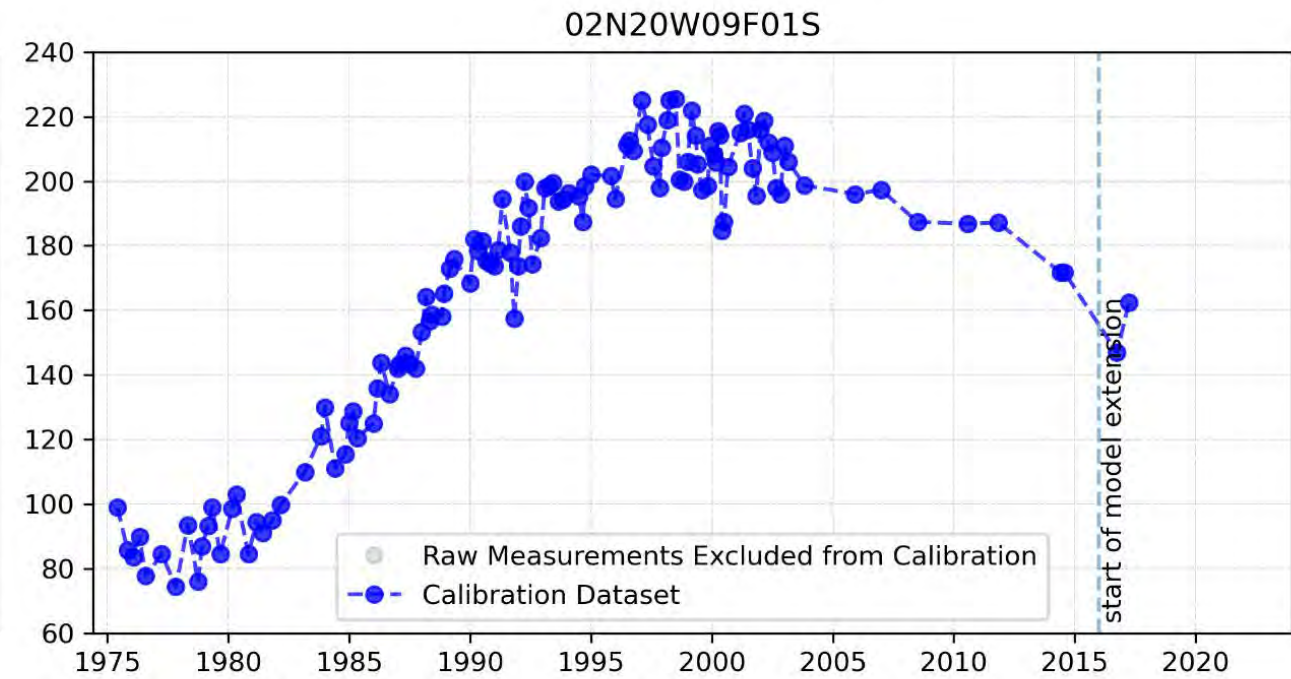
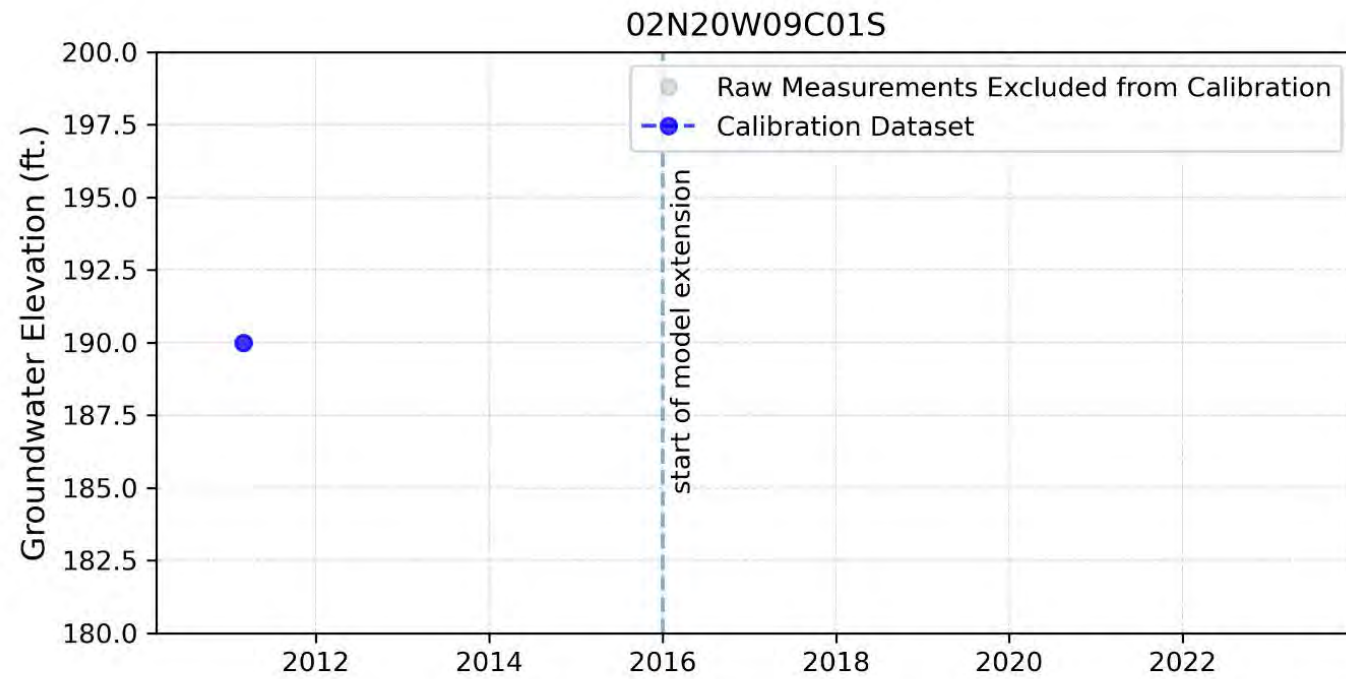


Figure B-3f: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

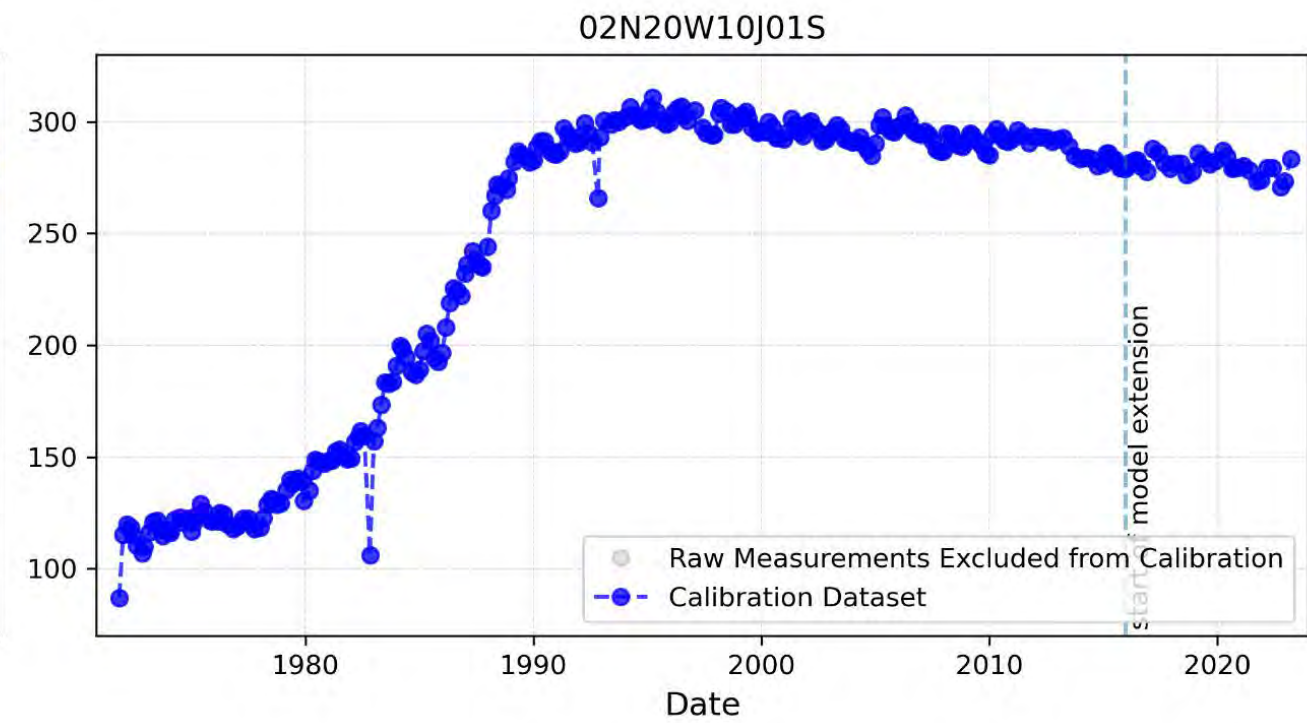
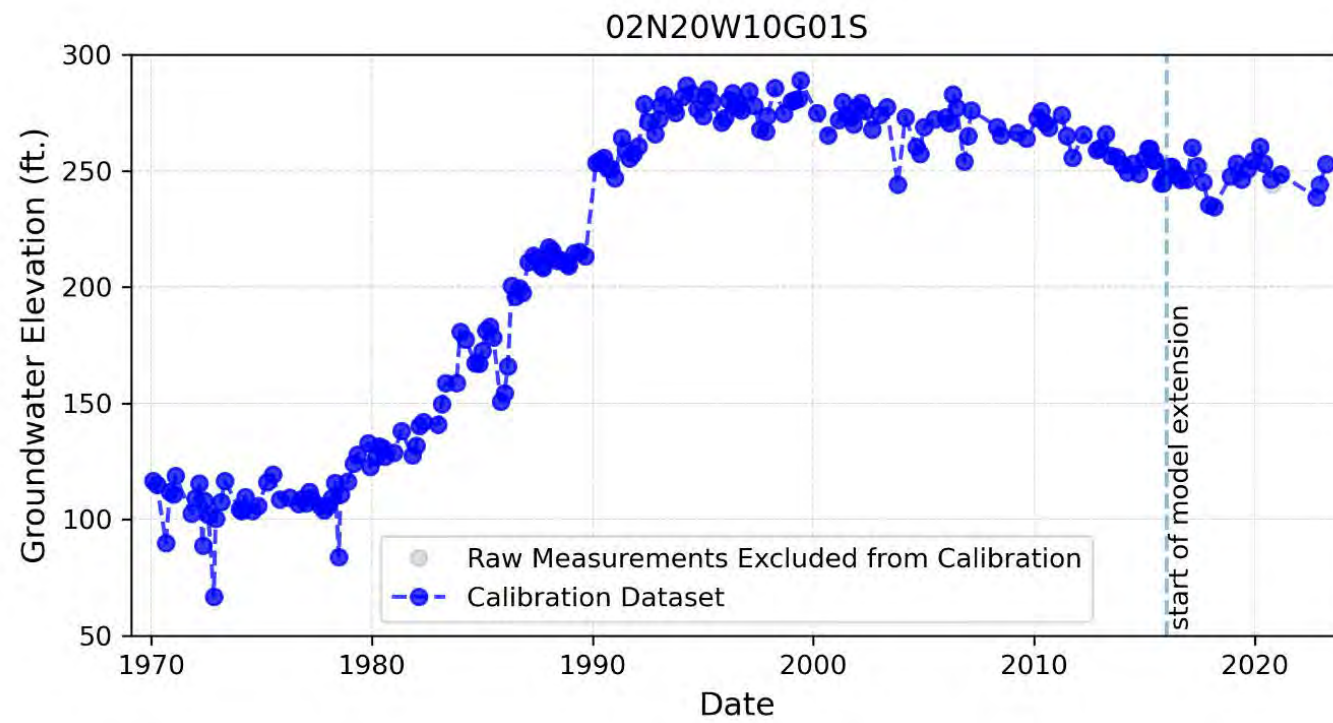
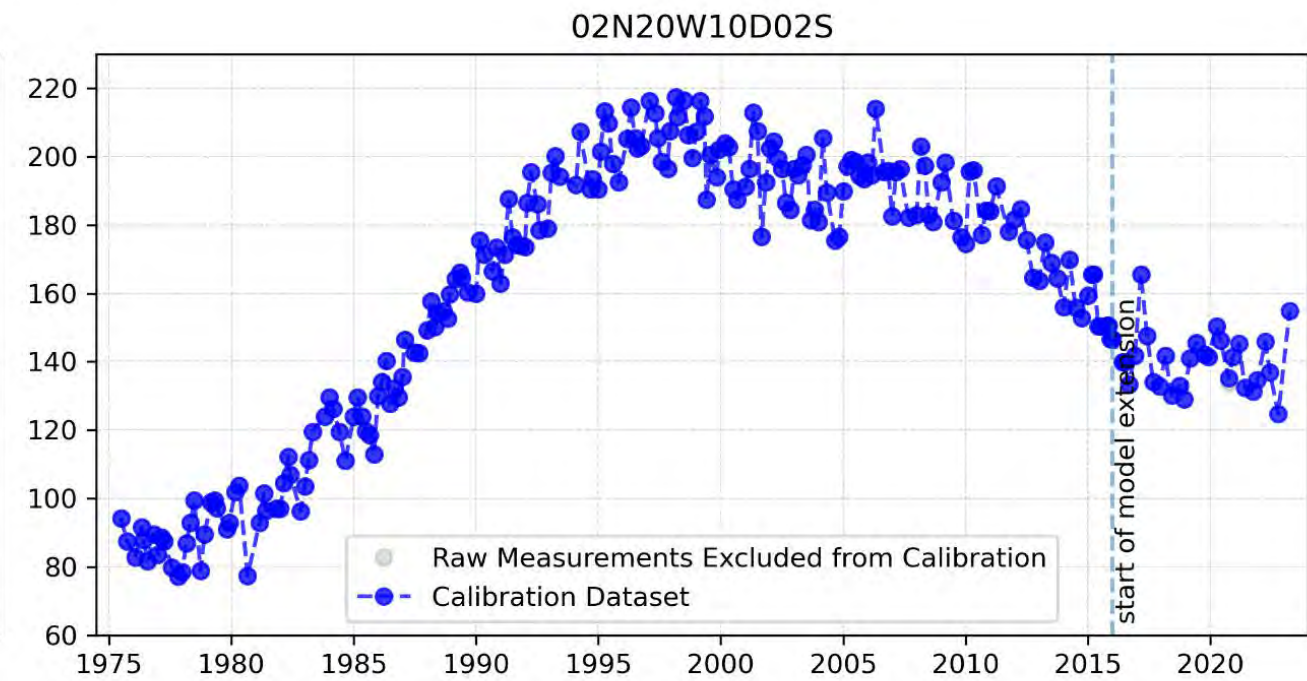
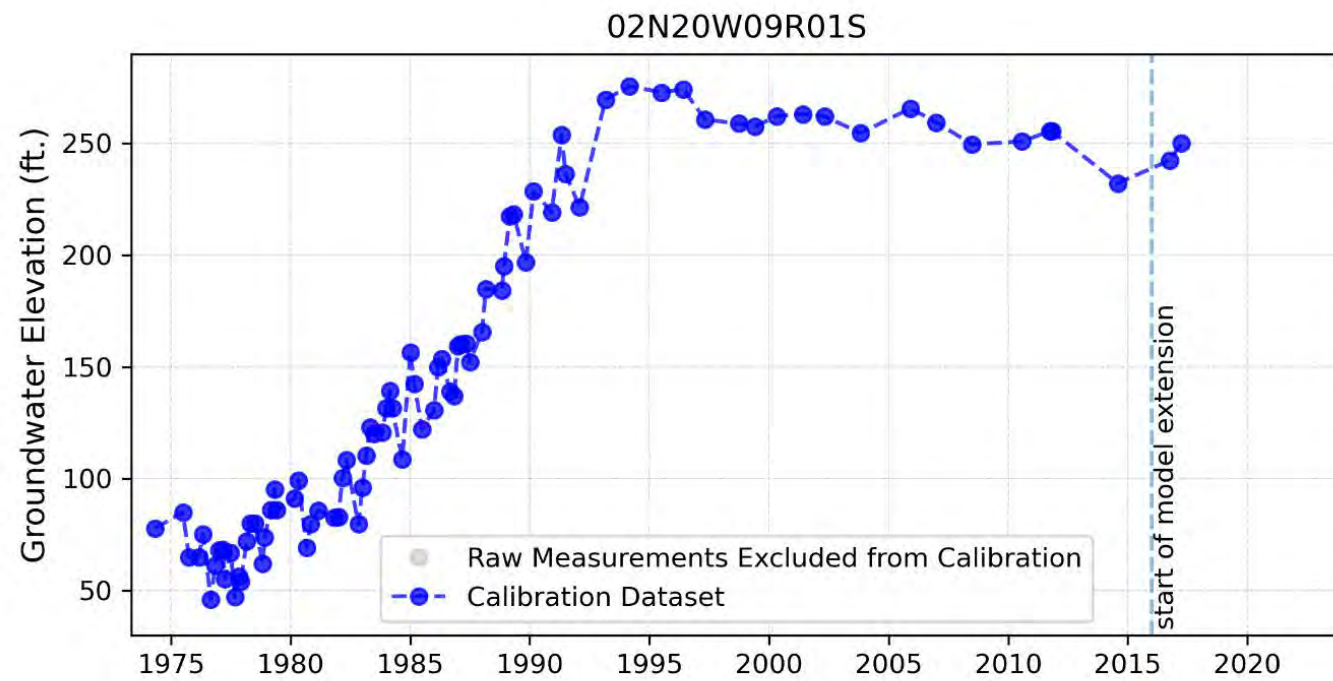


Figure B-3g: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

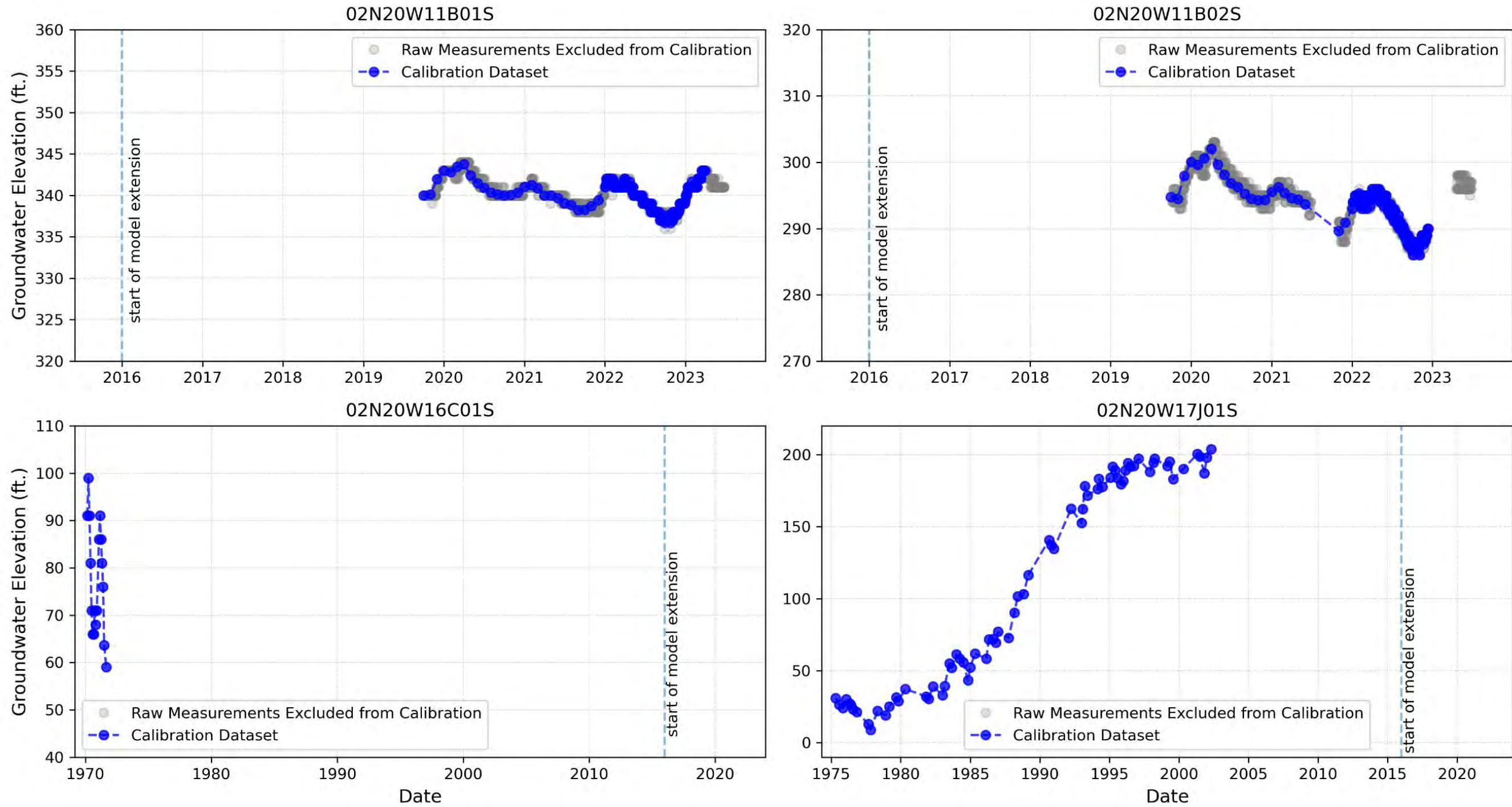


Figure B-3h: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

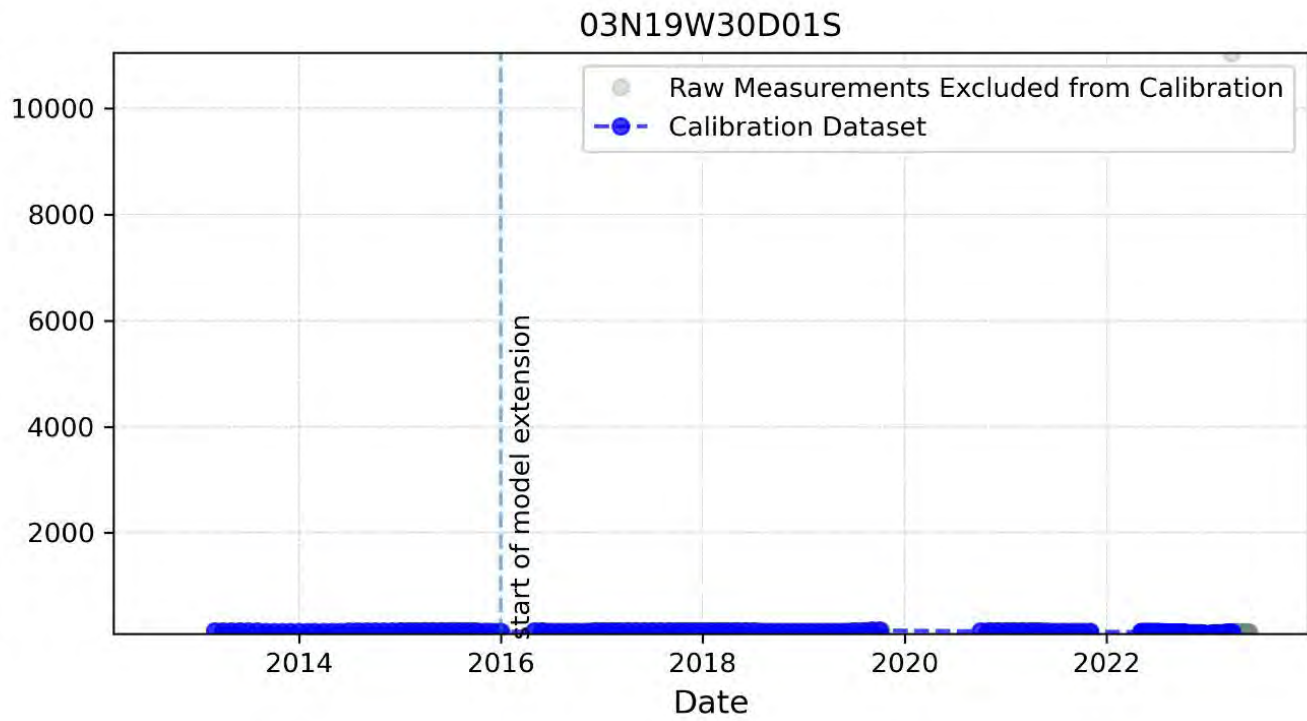
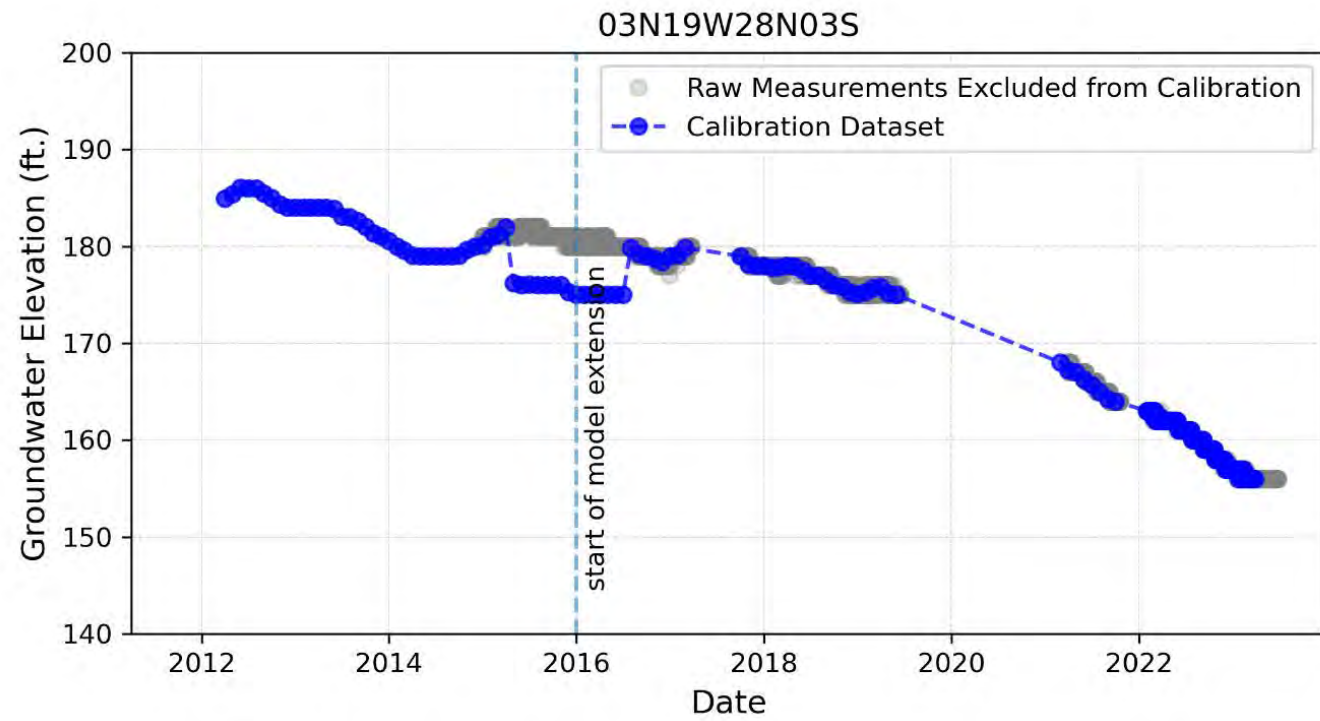
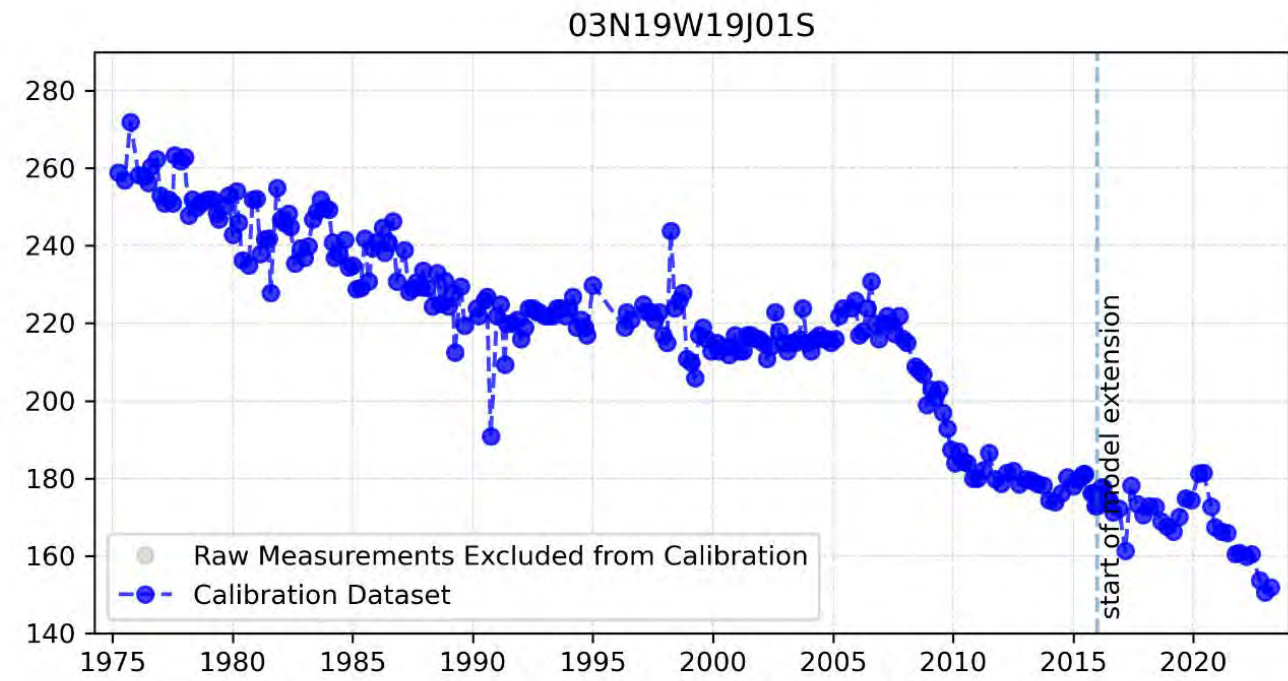
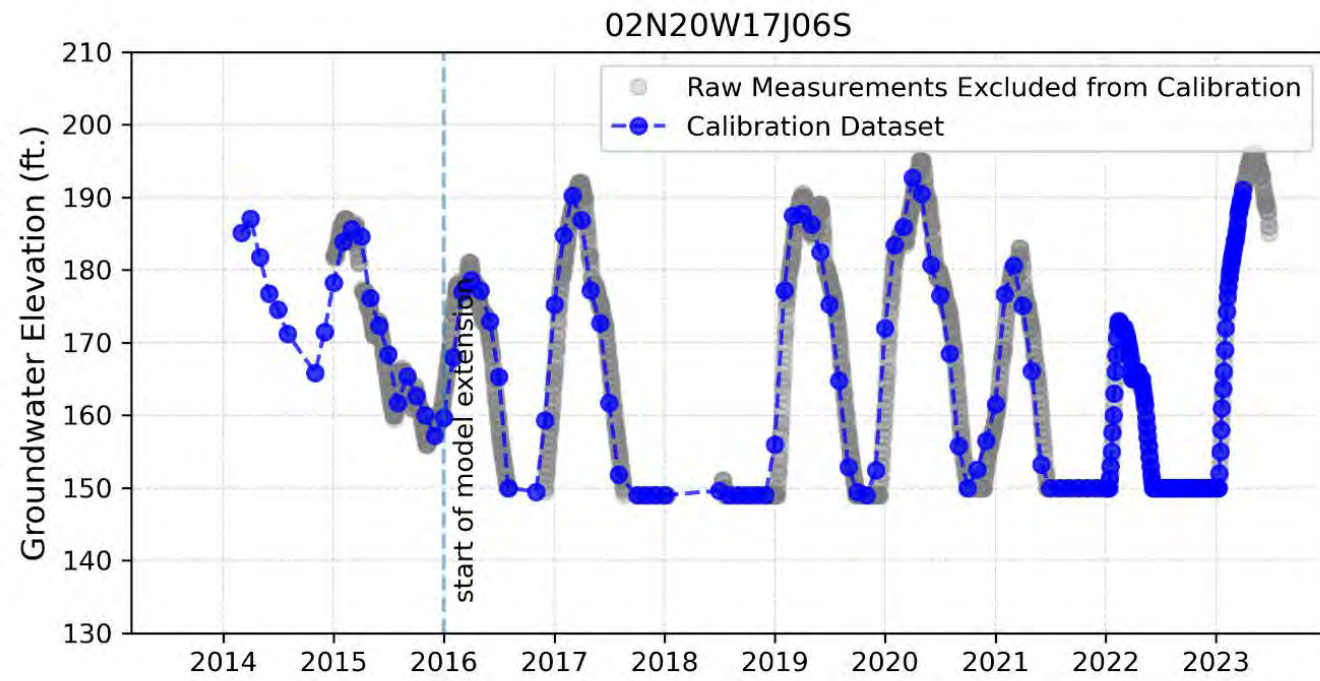


Figure B-3i: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

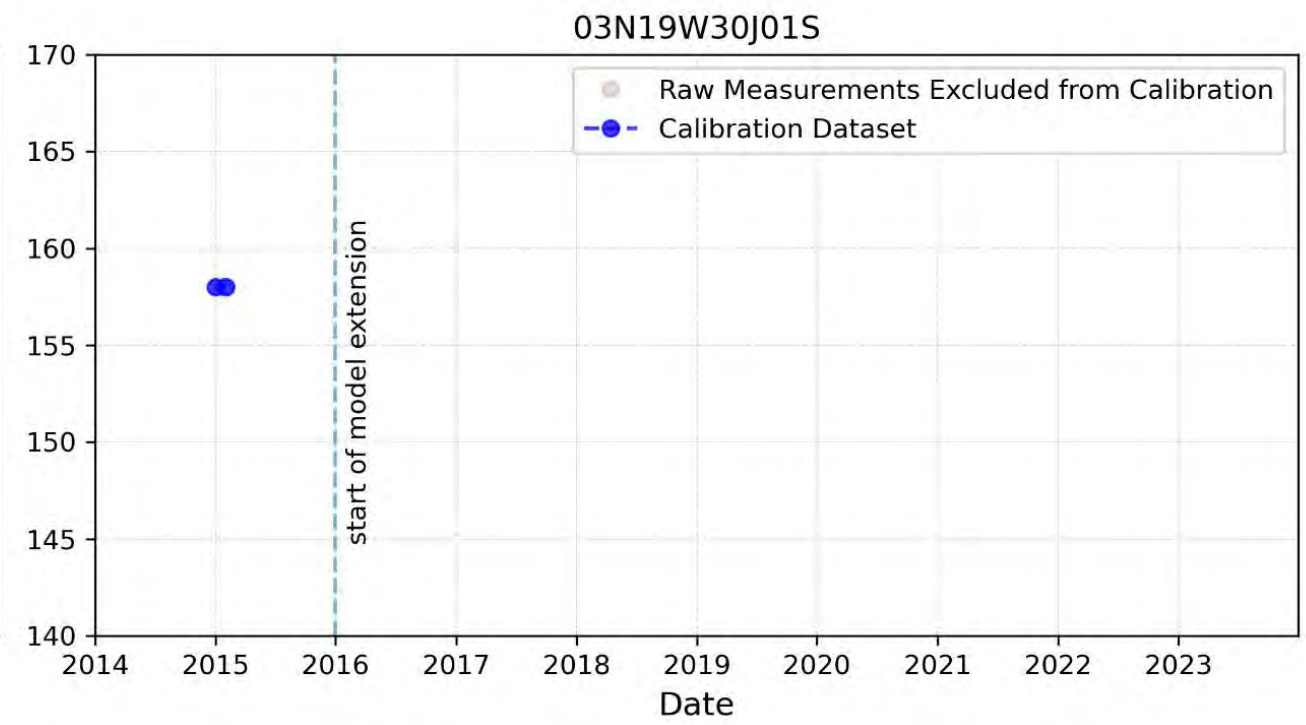
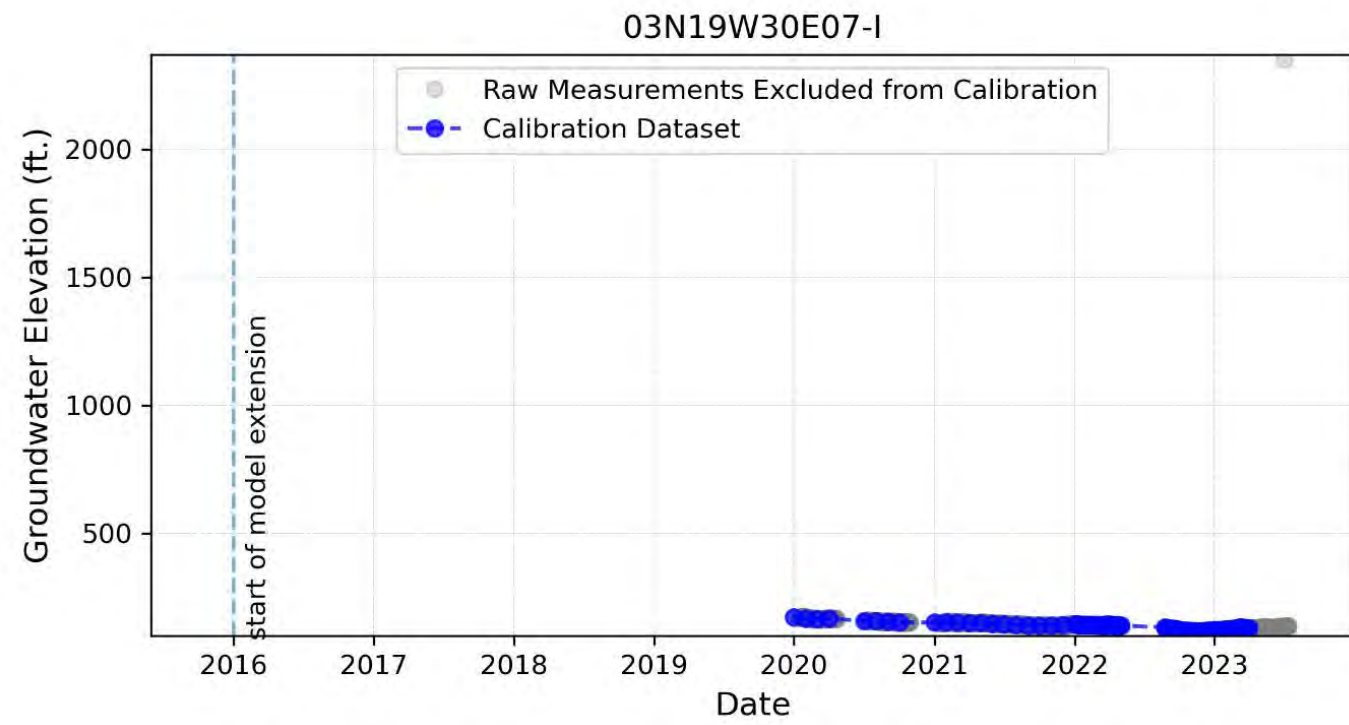
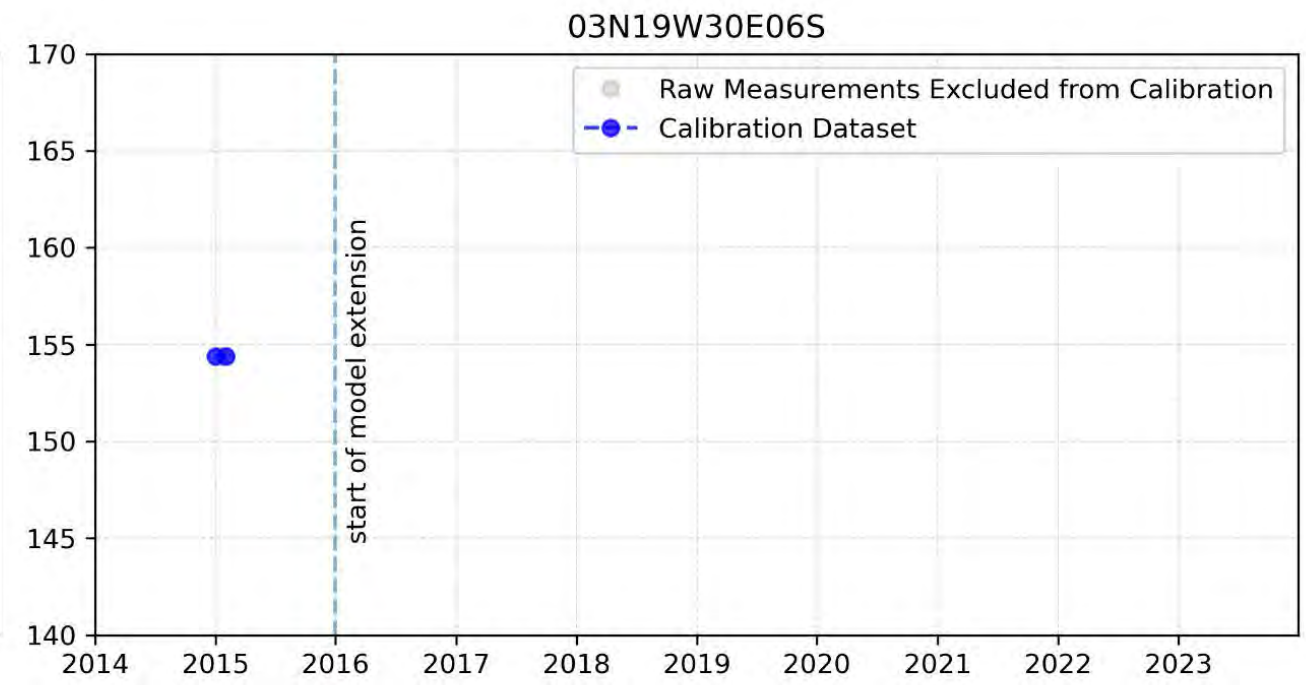
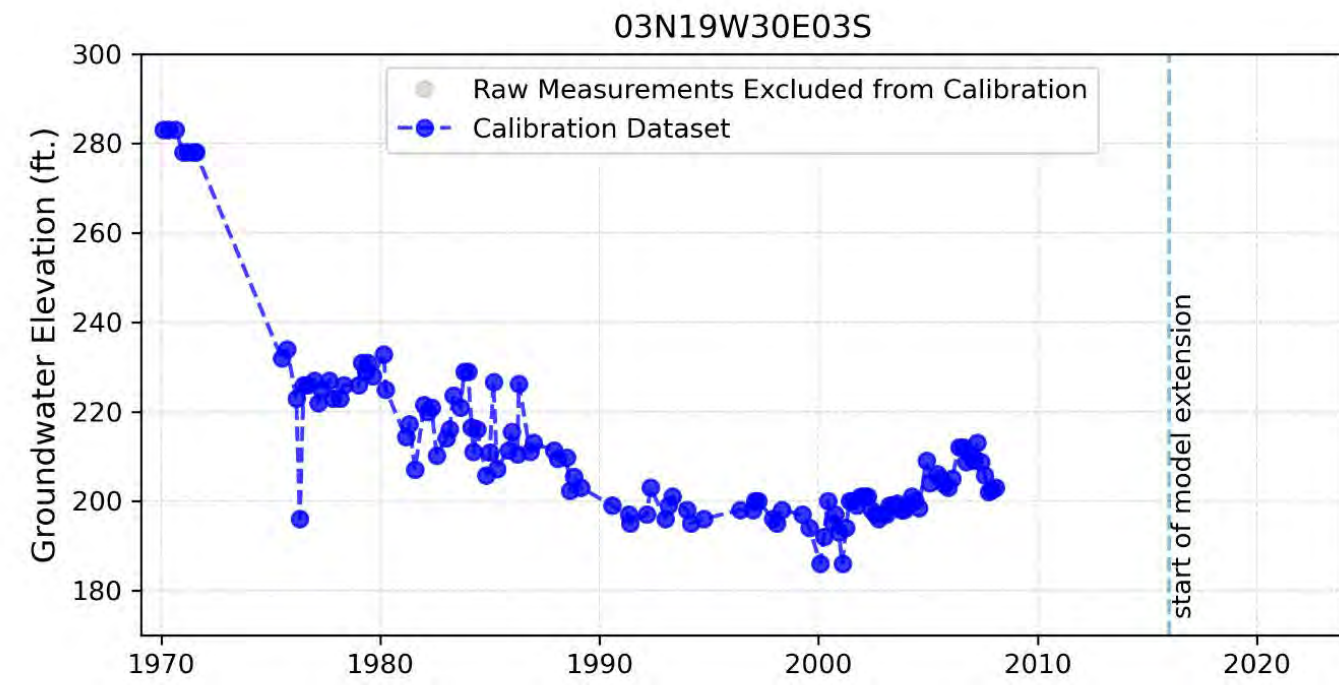


Figure B-3j: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

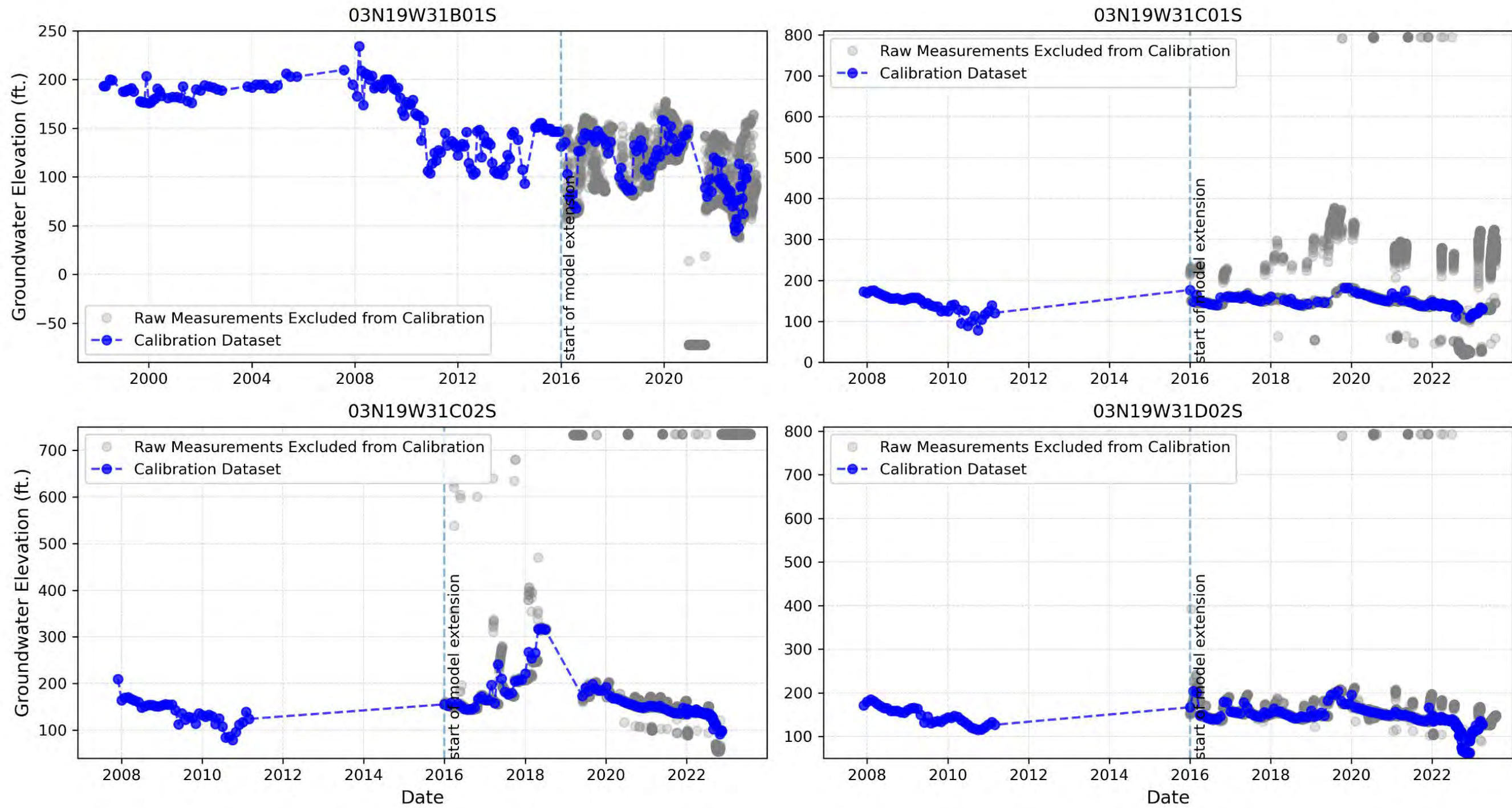


Figure B-3k: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

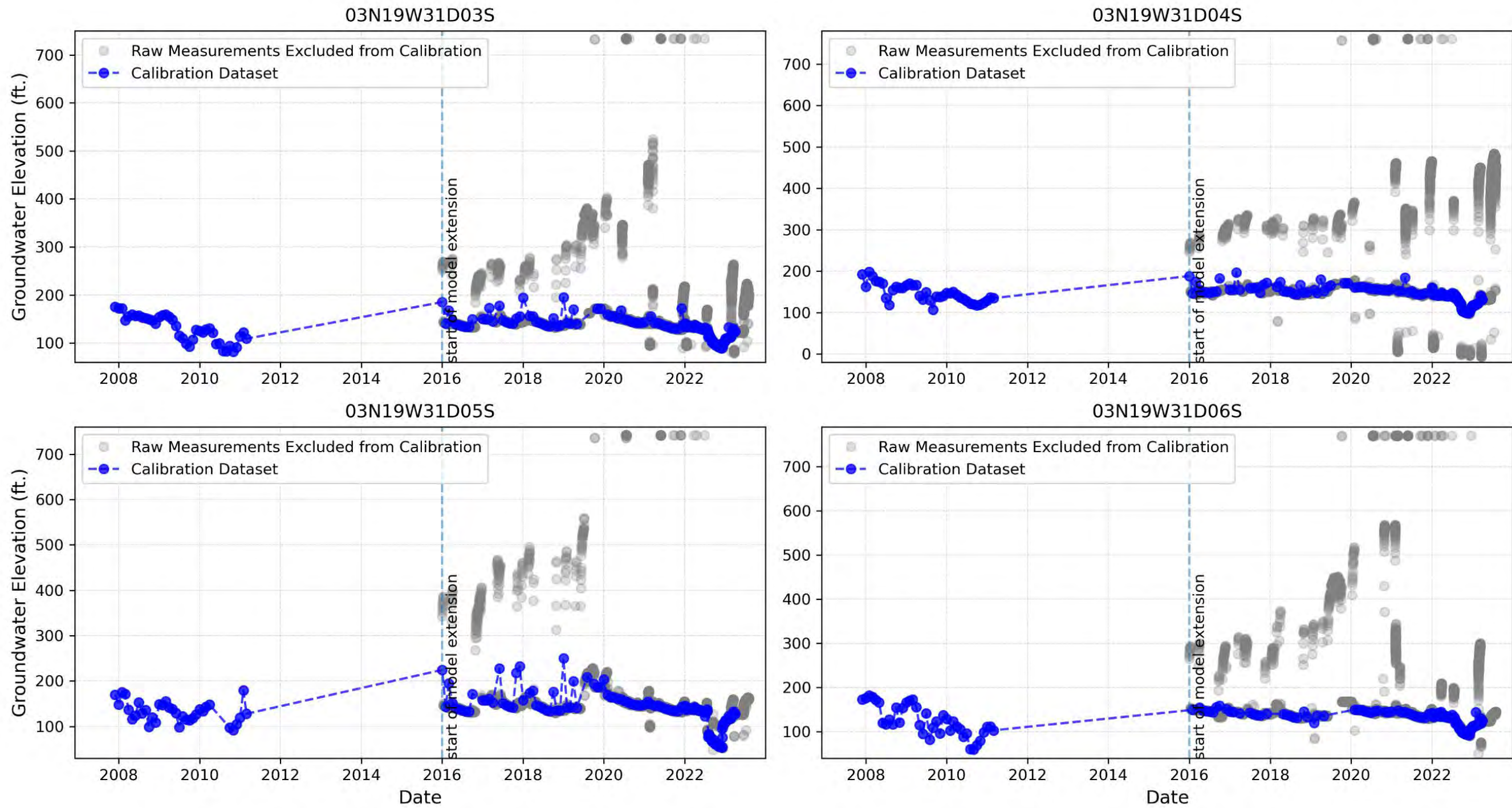


Figure B-3I: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

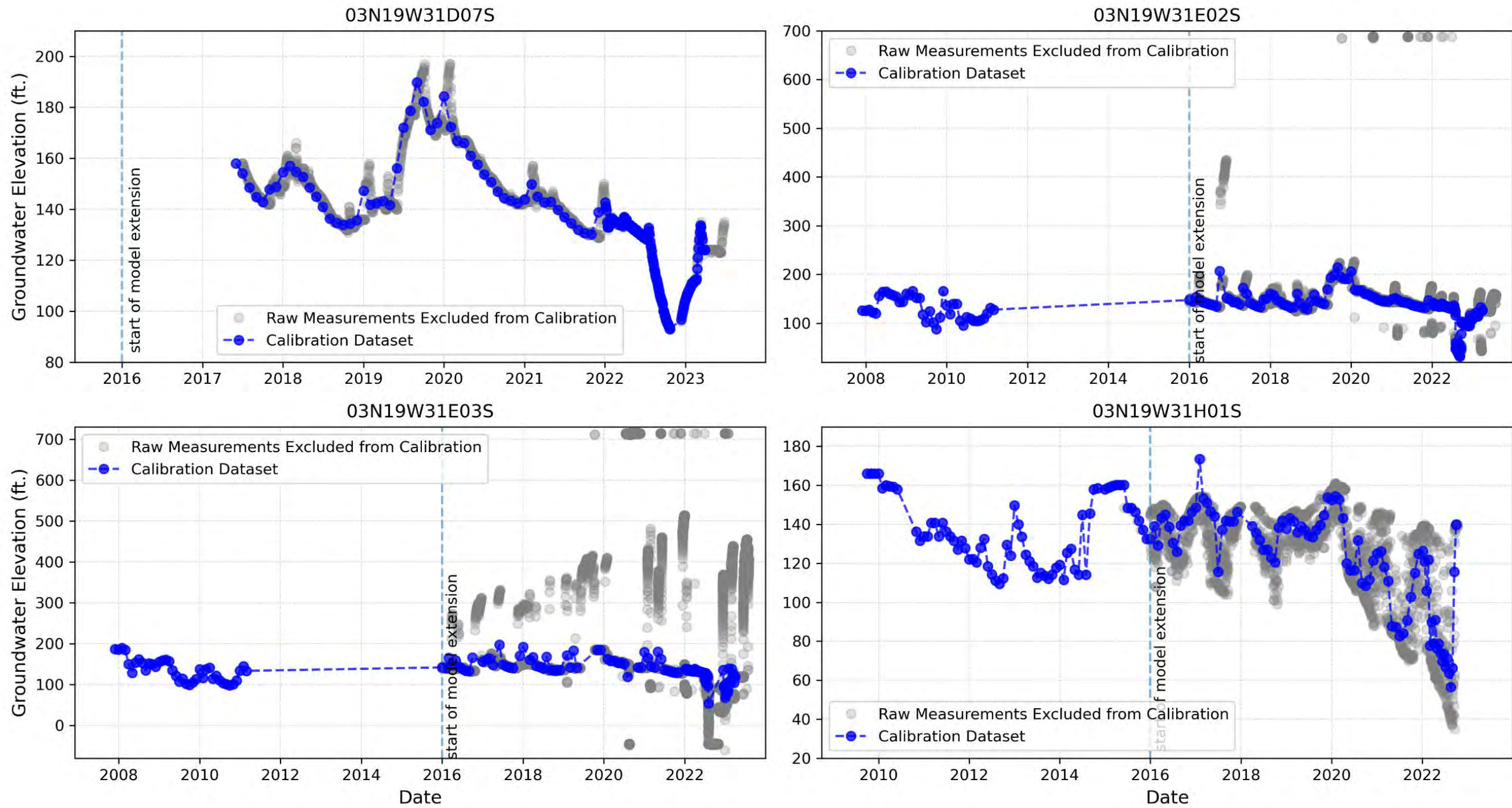


Figure B-3m: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

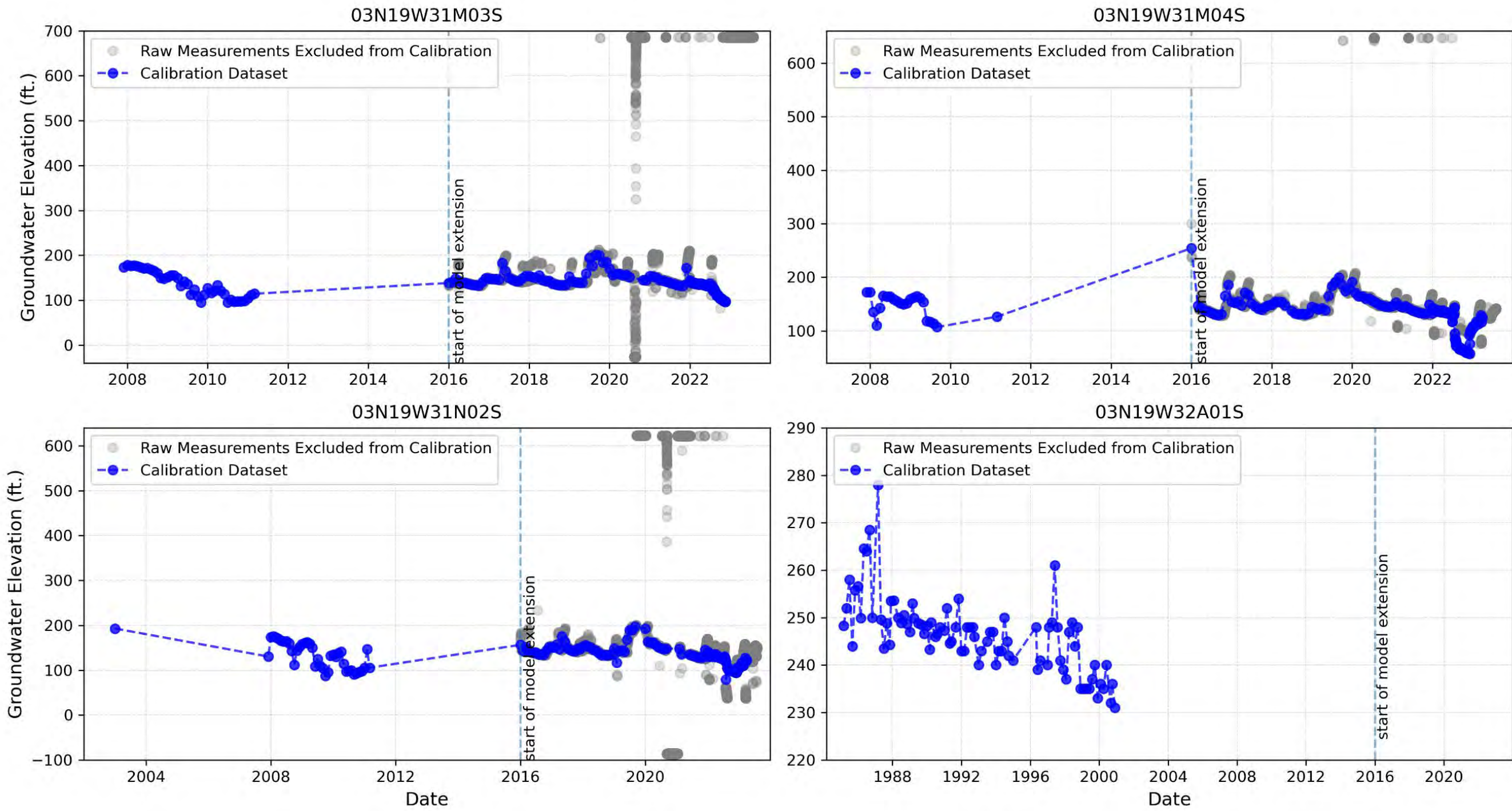


Figure B-3n: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

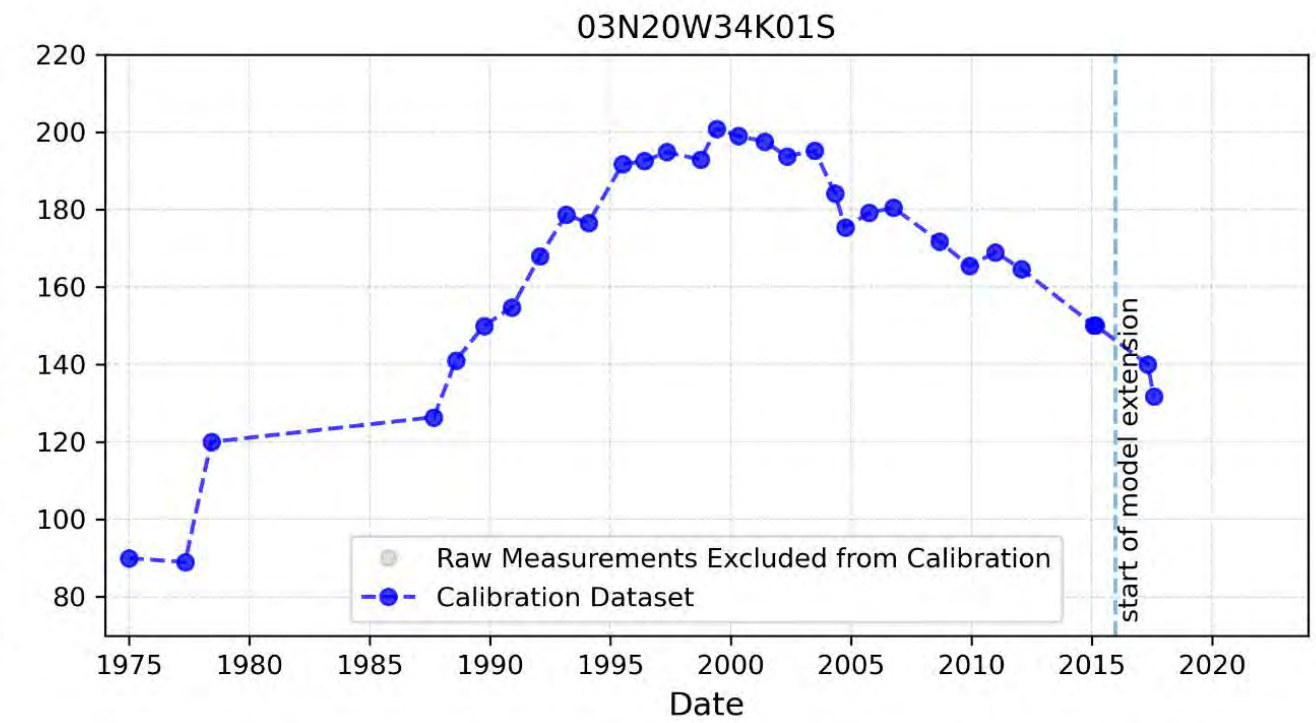
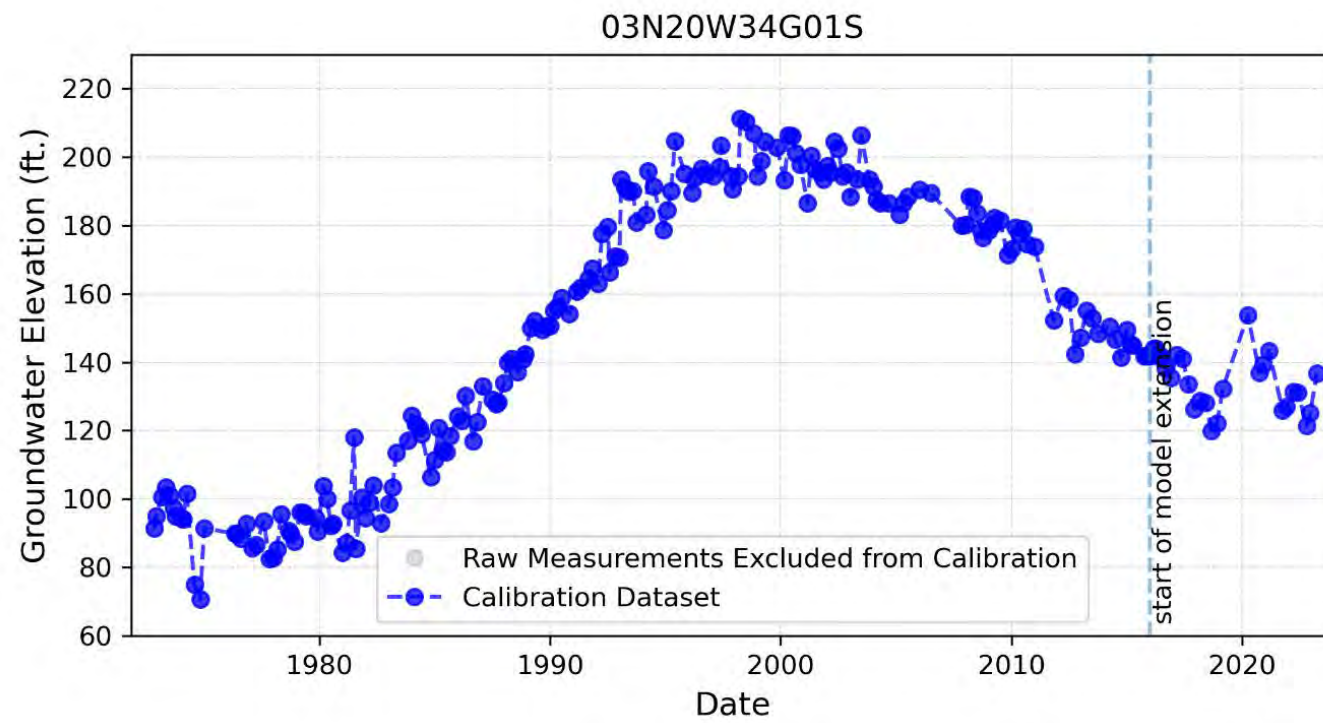
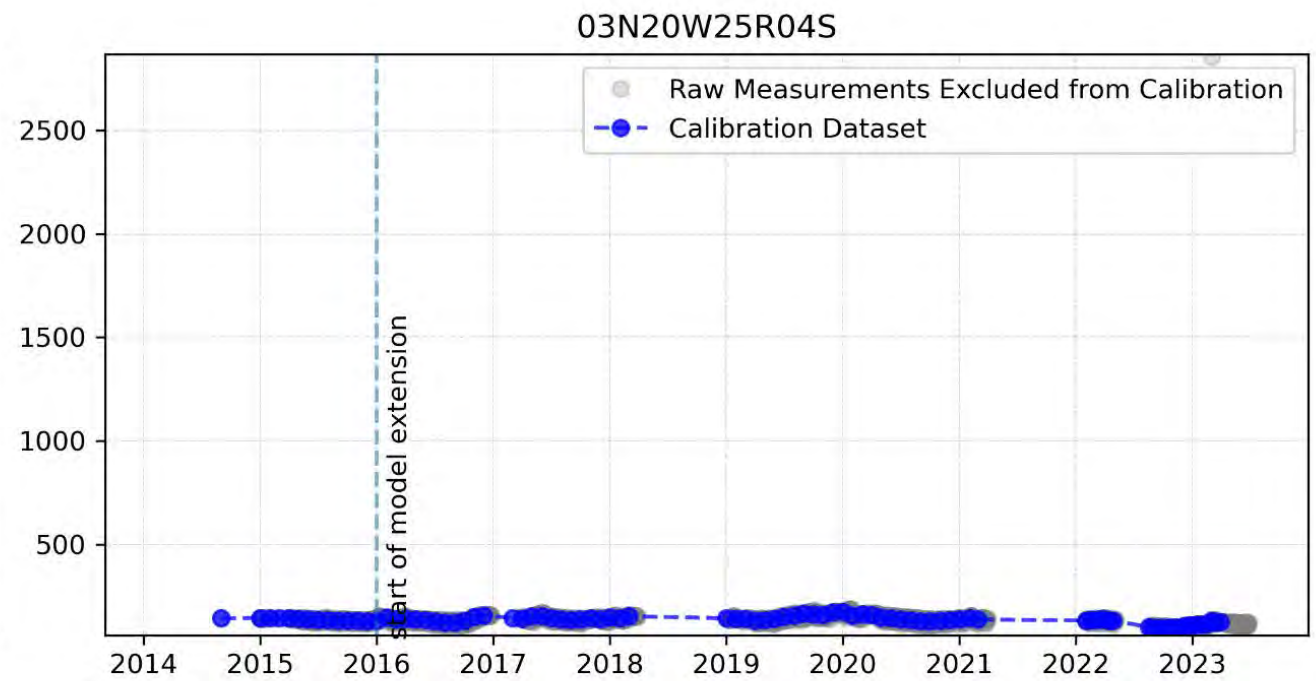
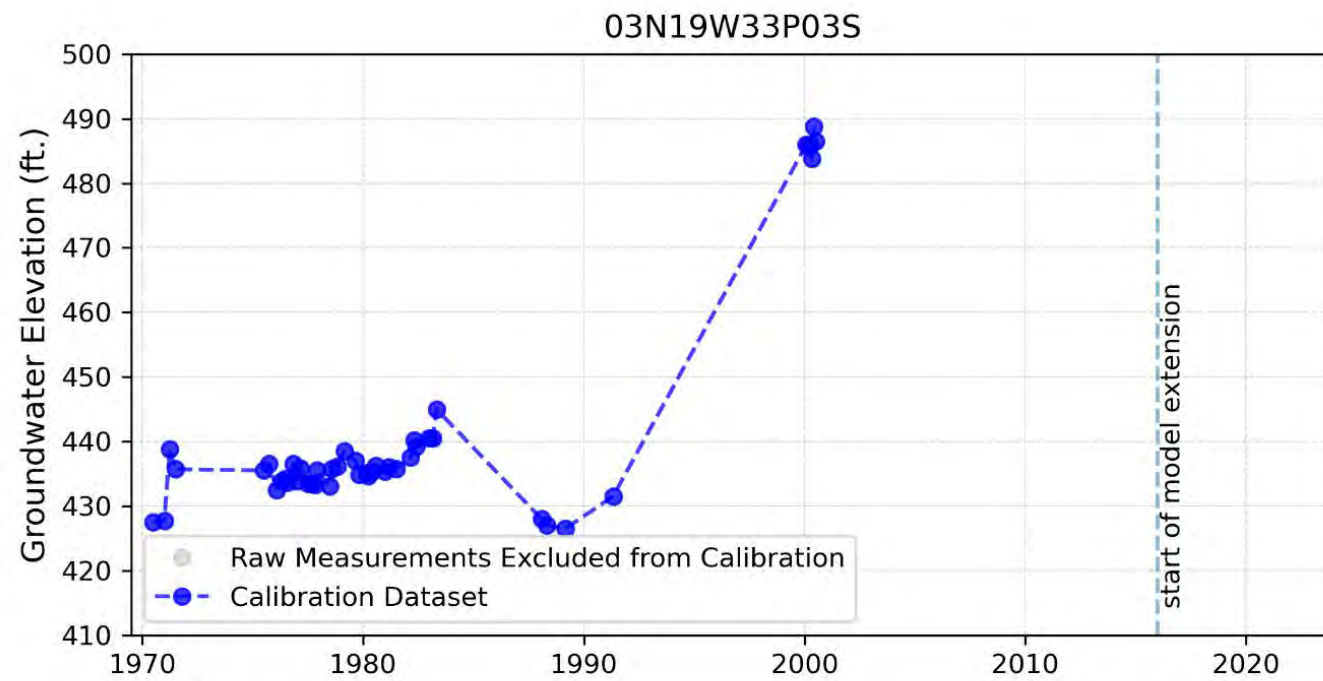


Figure B-30: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

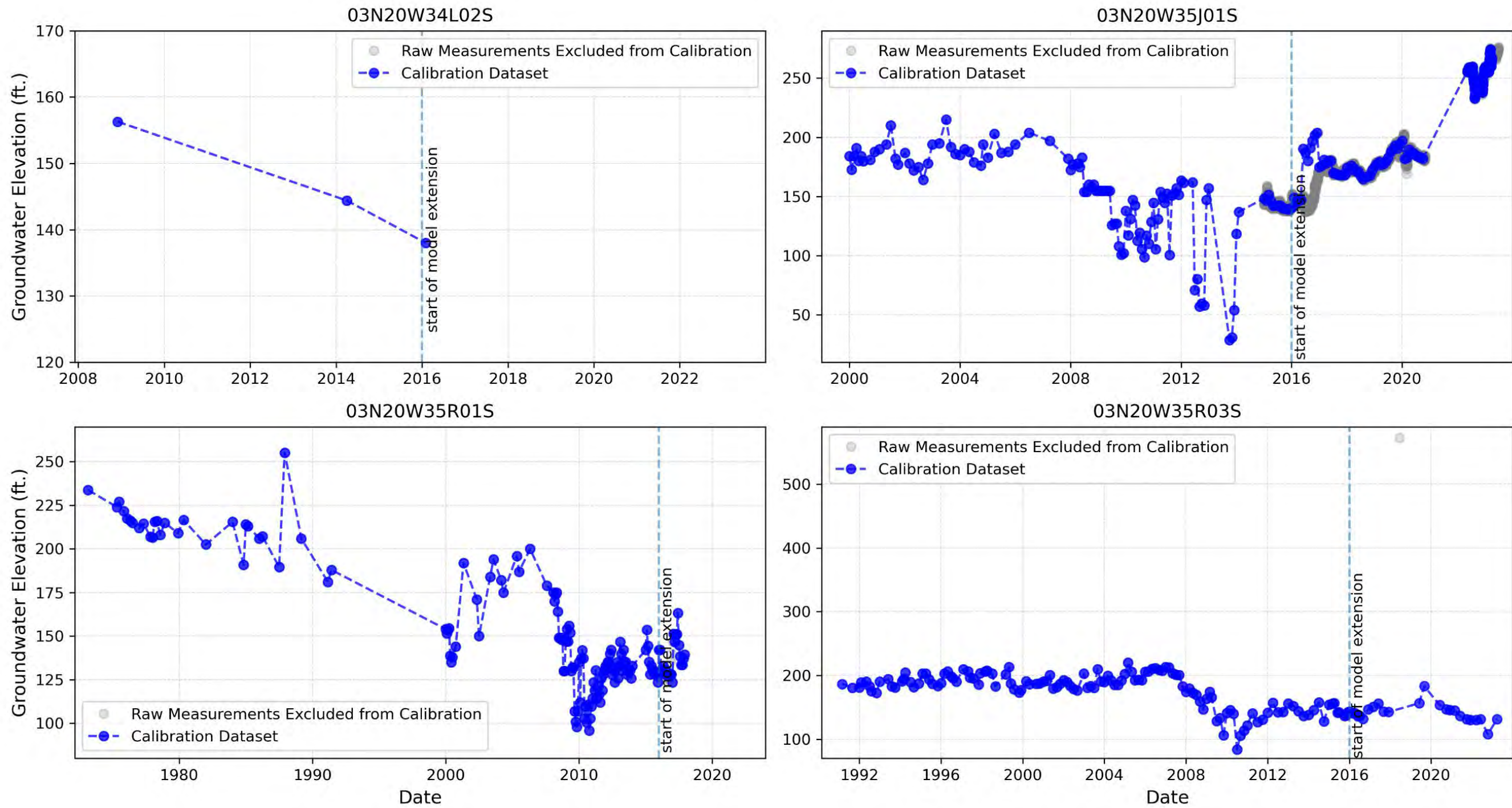


Figure B-3p: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

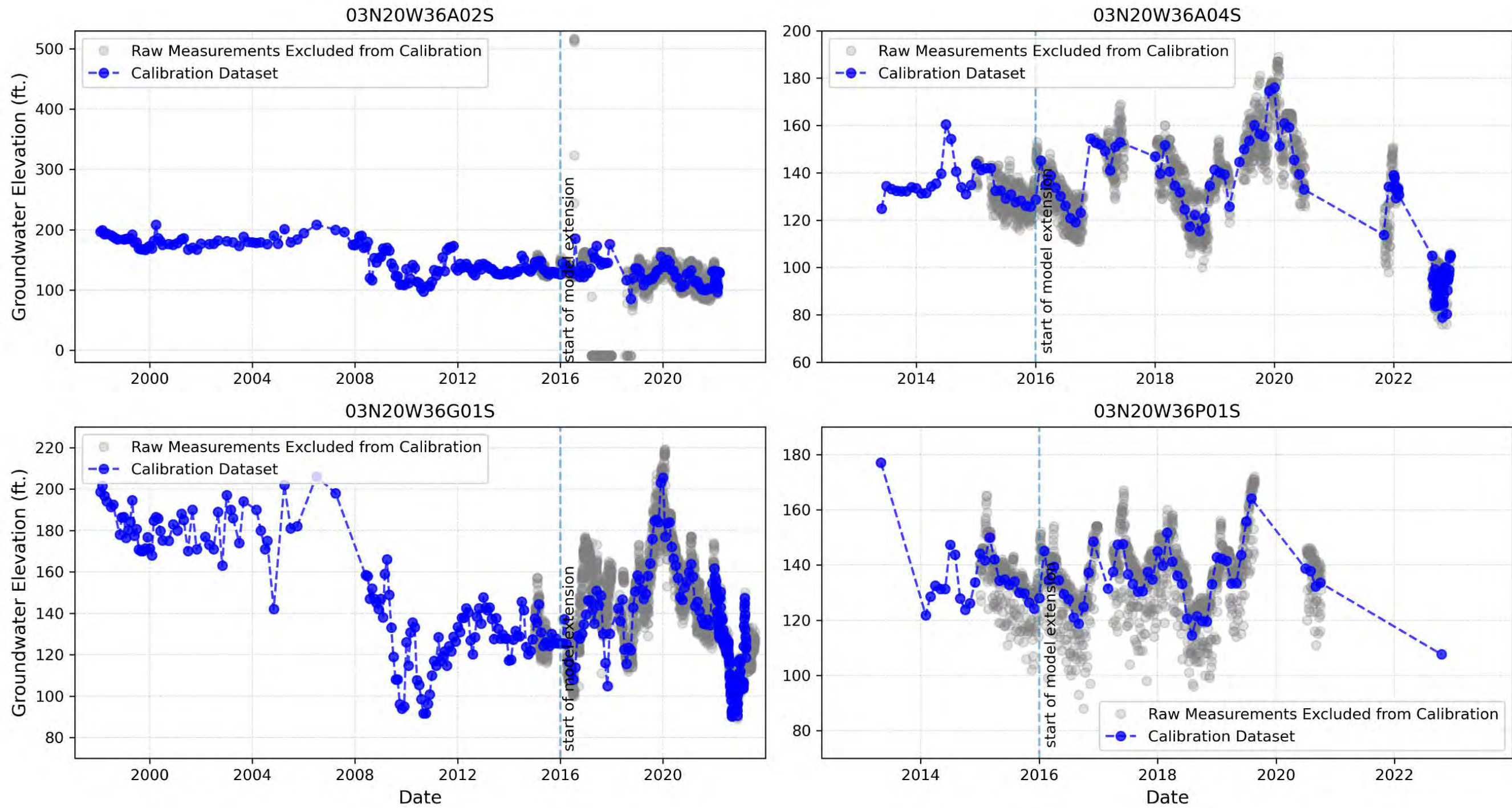


Figure B-3q: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

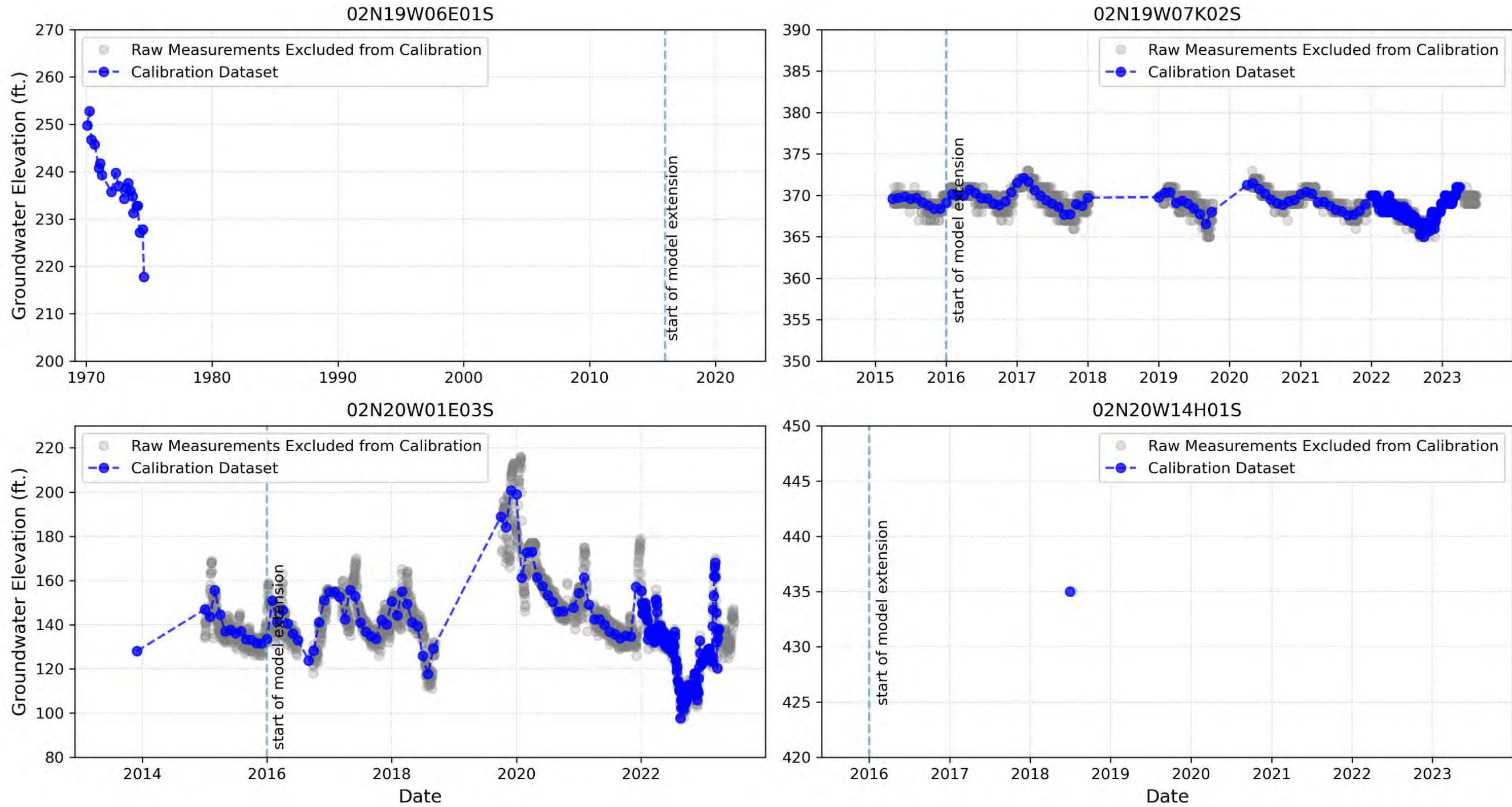


Figure B-4a: Calibration Dataset for the Grimes Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

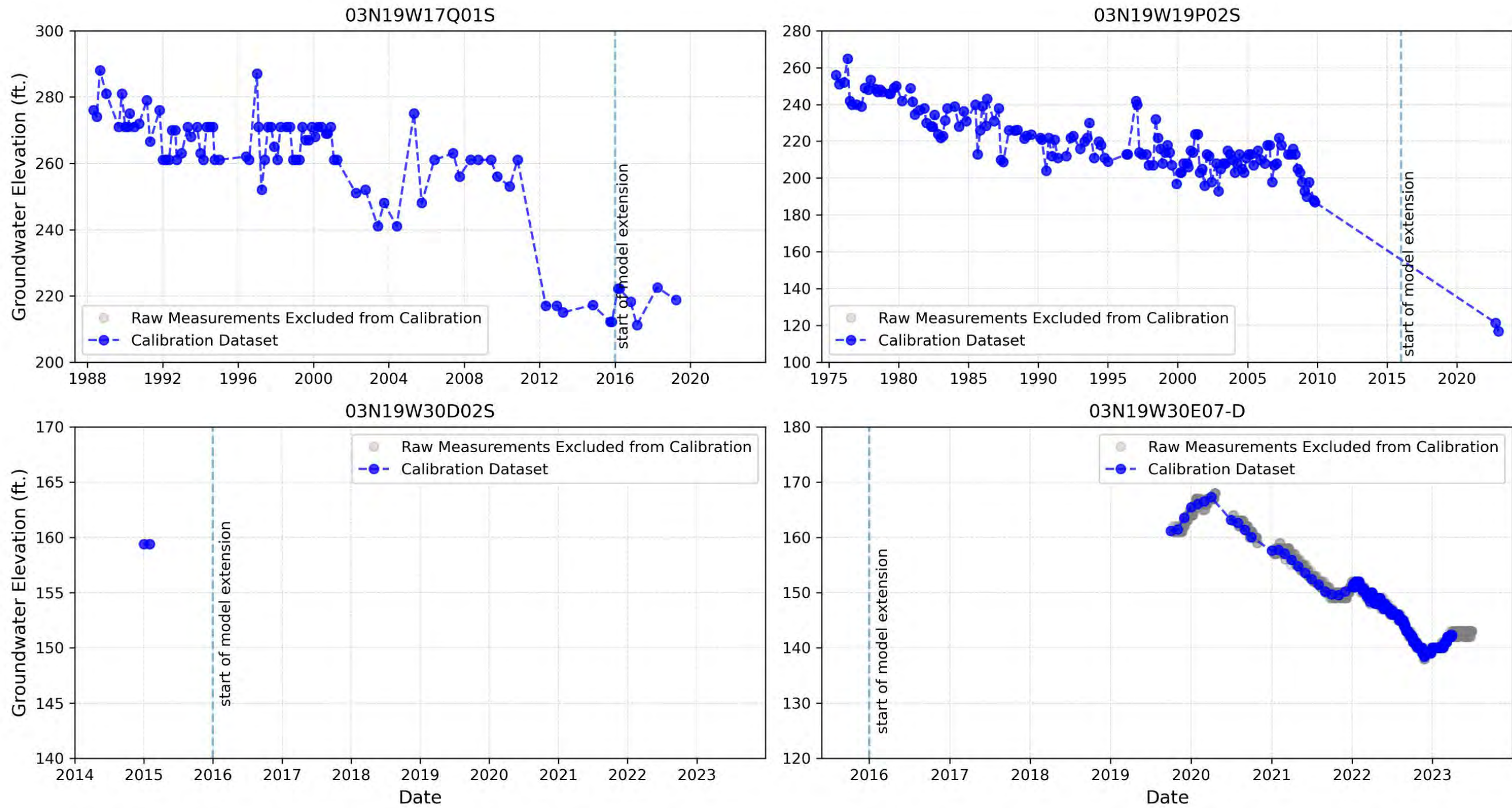


Figure B-4b: Calibration Dataset for the Grimes Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

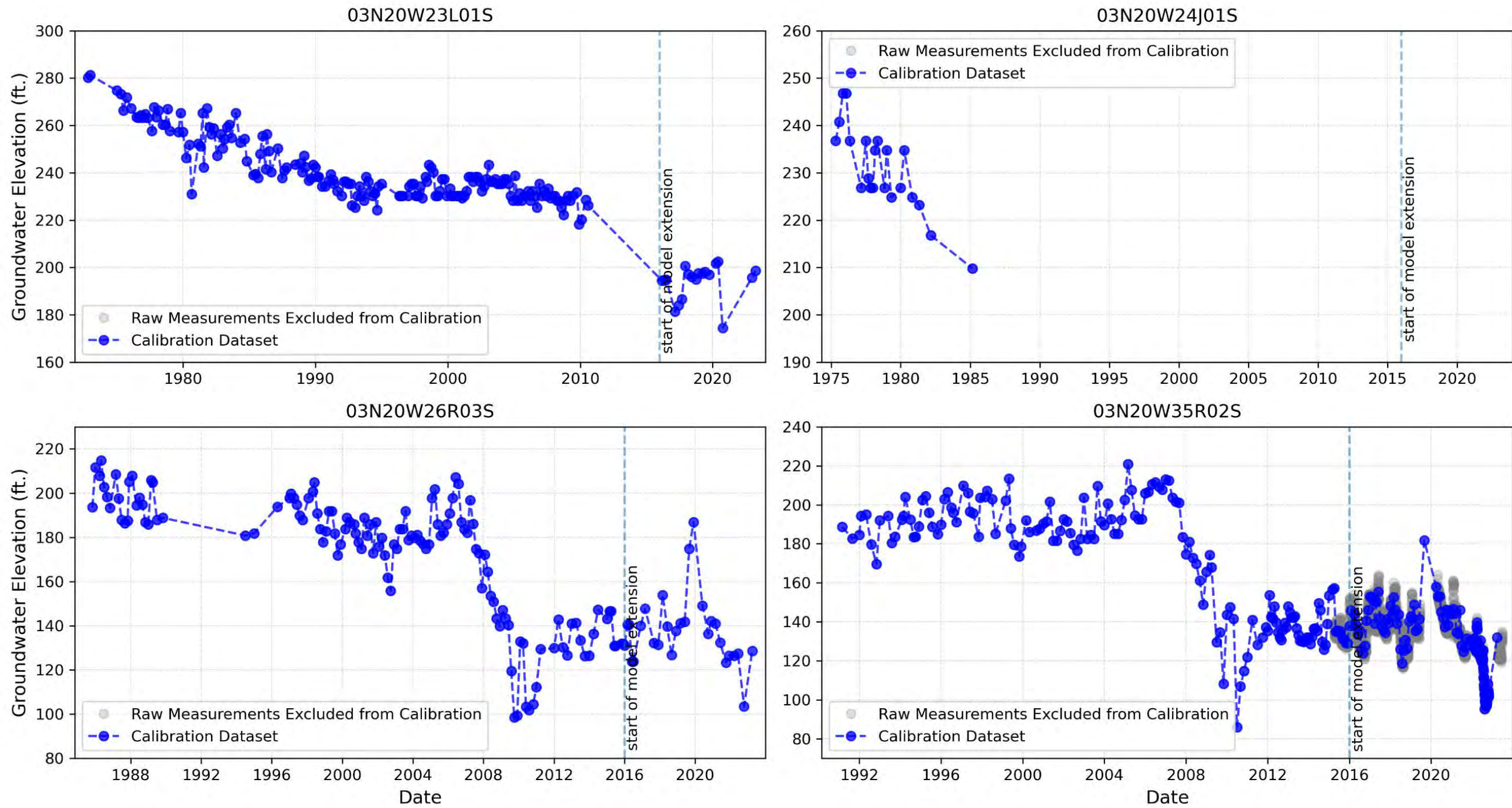


Figure B-4c: Calibration Dataset for the Grimes Canyon Aquifer

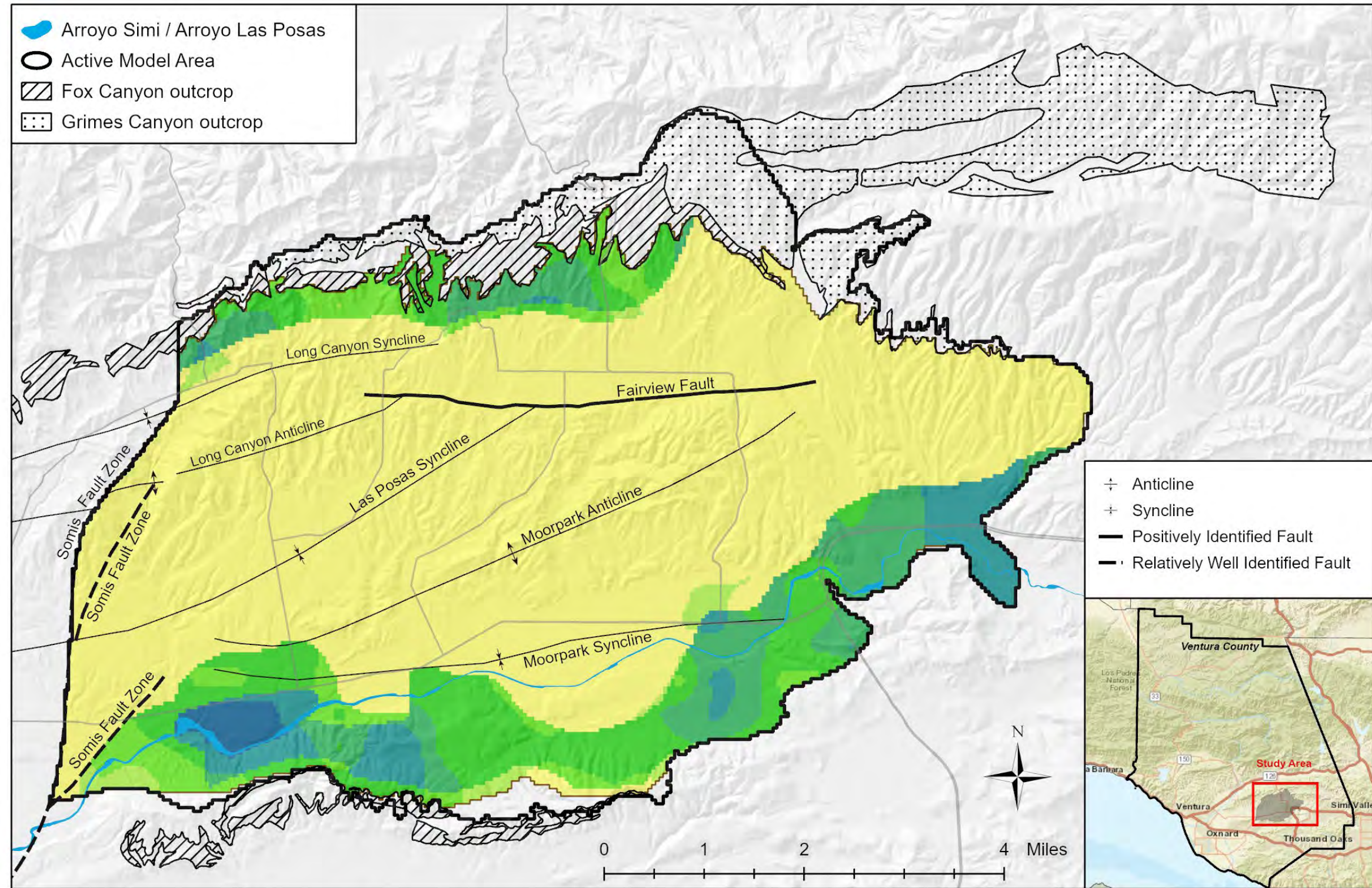
Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model



Appendix C

Calibrated Aquifer Properties

RE: Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

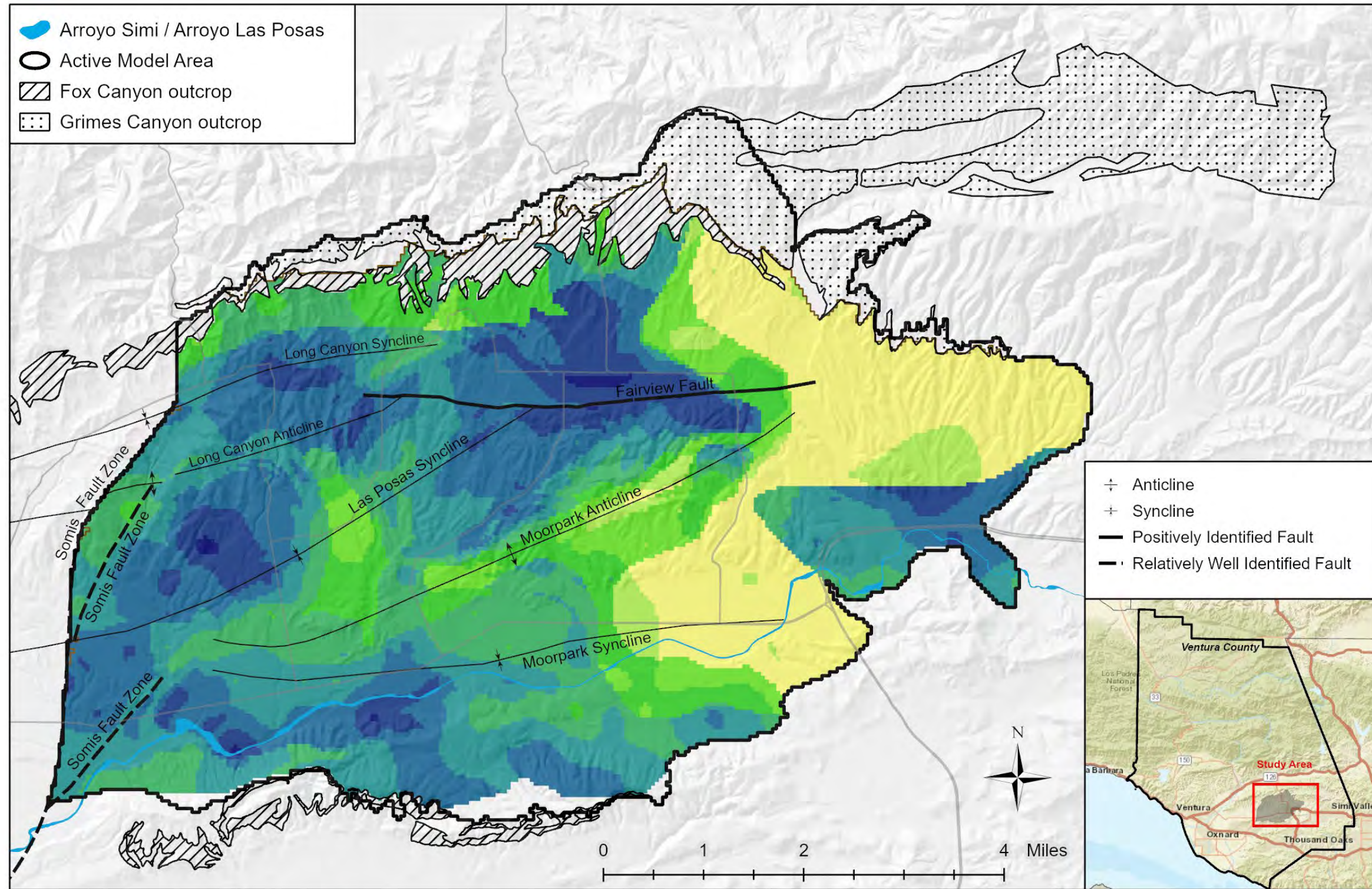


Confining Bed Horizontal Hydraulic Conductivity (ft/day) - Layer 4



Figure C.1
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



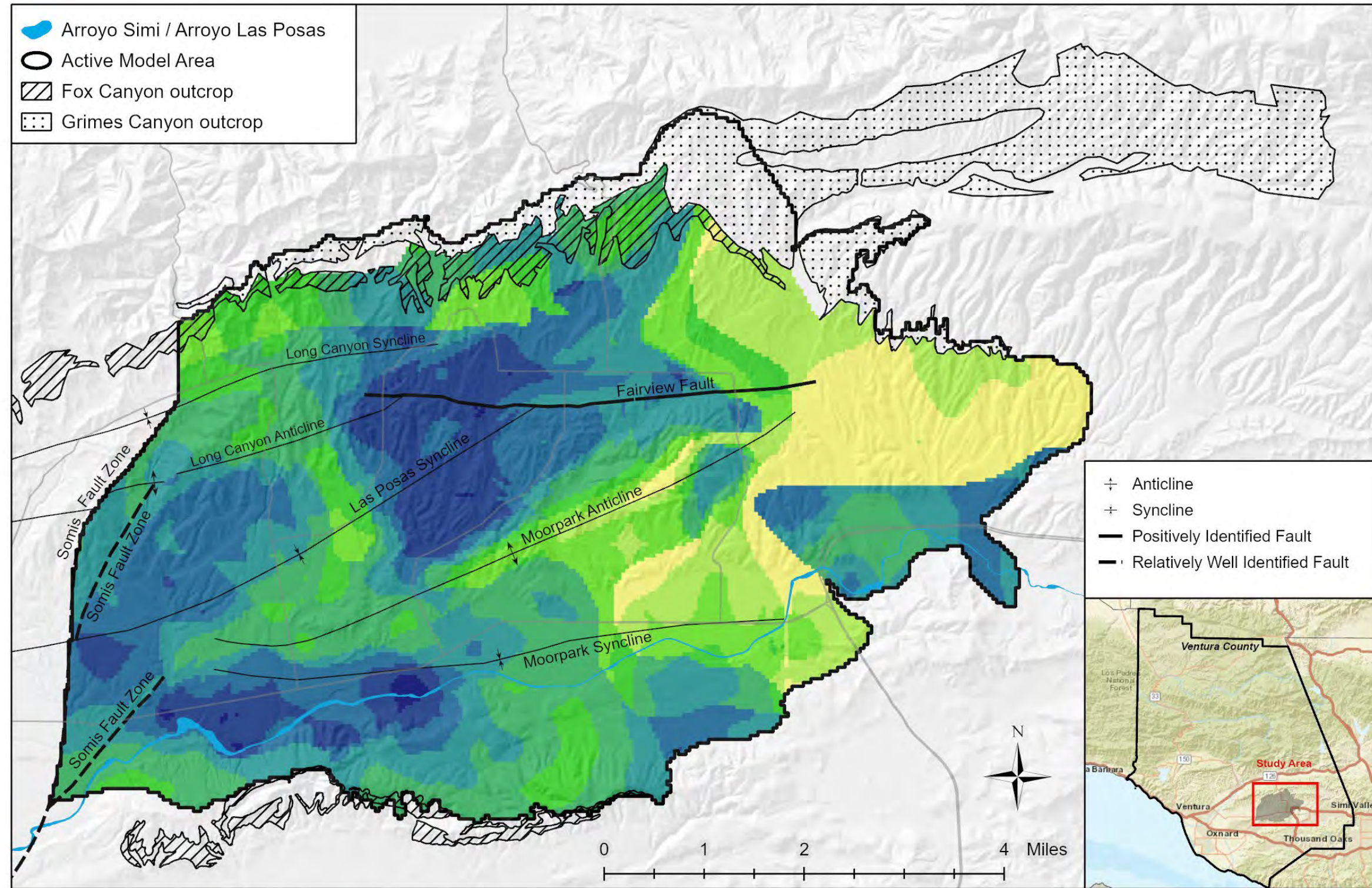


Fox Canyon (Upper) Horizontal Hydraulic Conductivity (ft/day) - Layer 5



Figure C.2
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



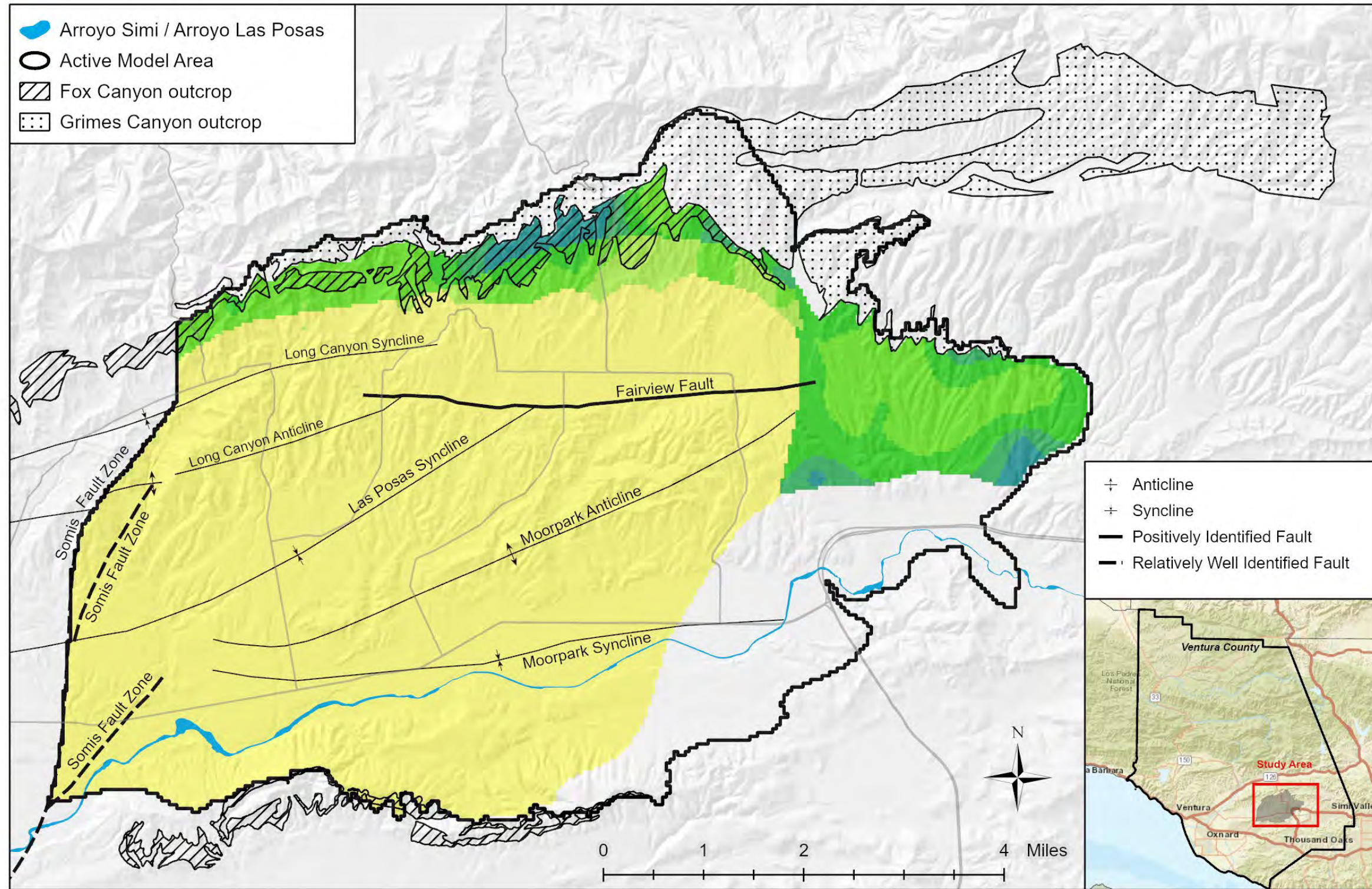


Fox Canyon Aquifer (Lower) Horizontal Hydraulic Conductivity (ft/day) - Layer 6



Figure C.3
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



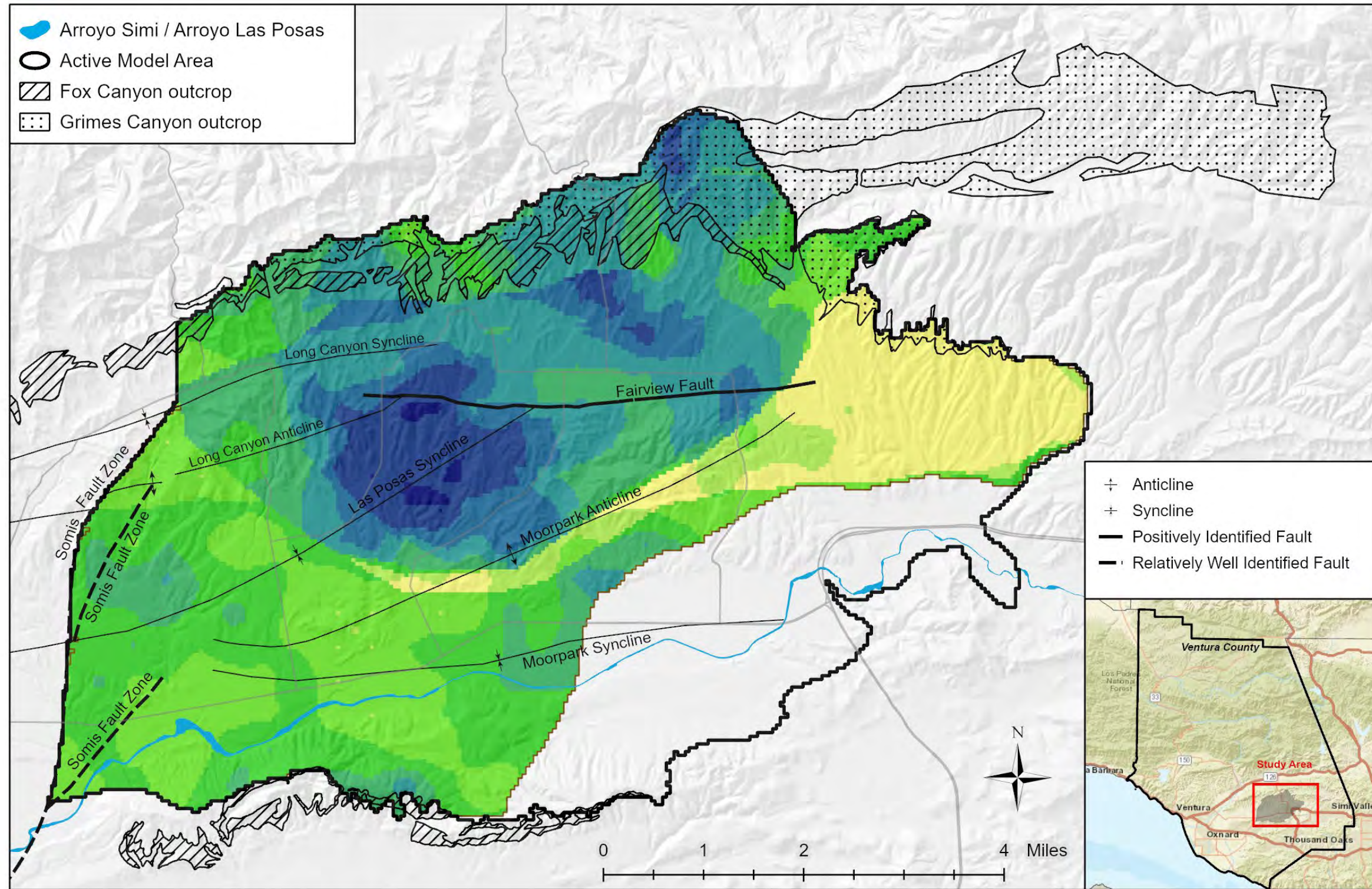


Confining Bed Horizontal Hydraulic Conductivity (ft/day) - Layer 7



Figure C.4
 Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



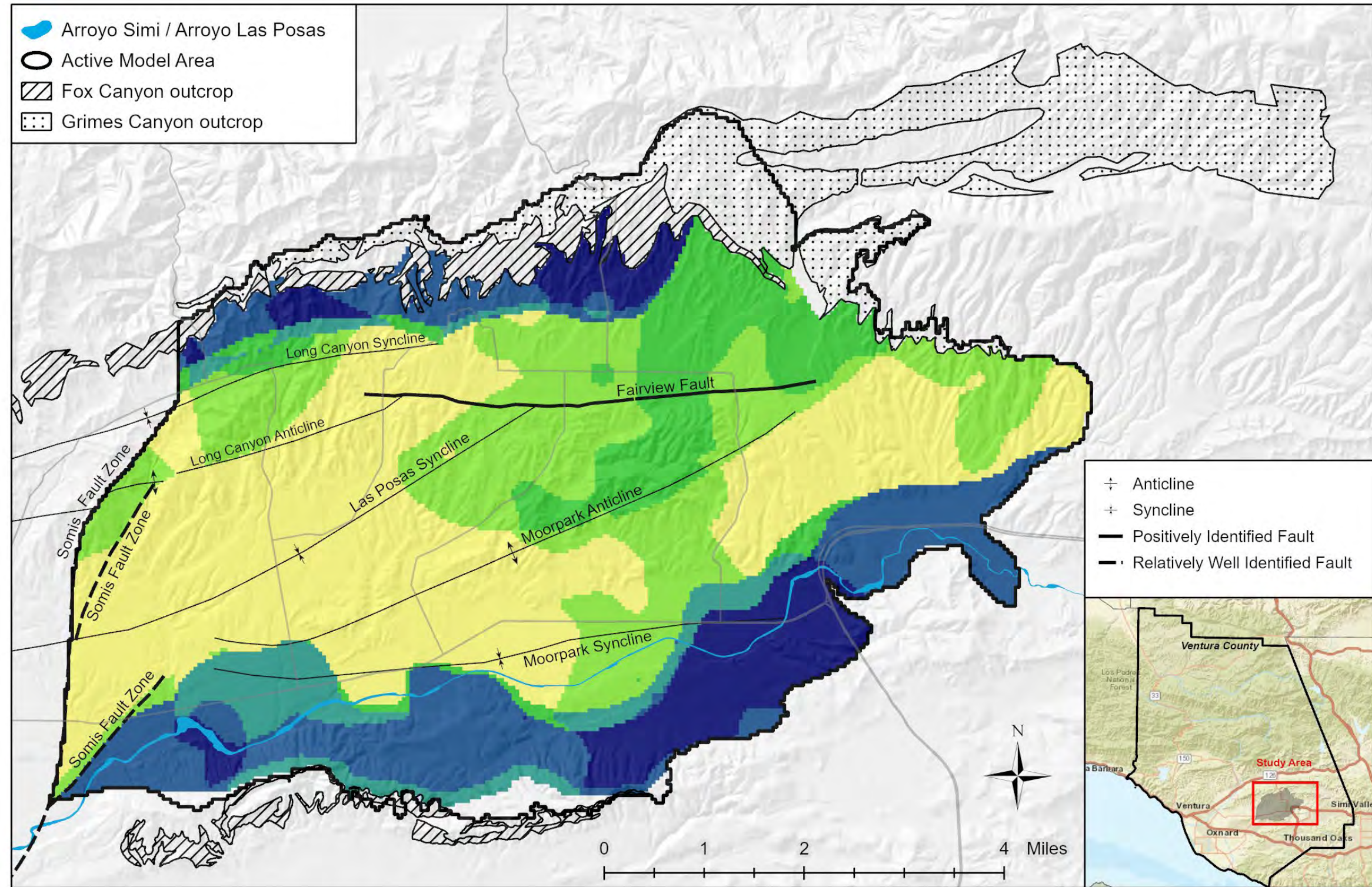


Grimes Canyon Aquifer Horizontal Hydraulic Conductivity (ft/day) - Layer 8



Figure C.5
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



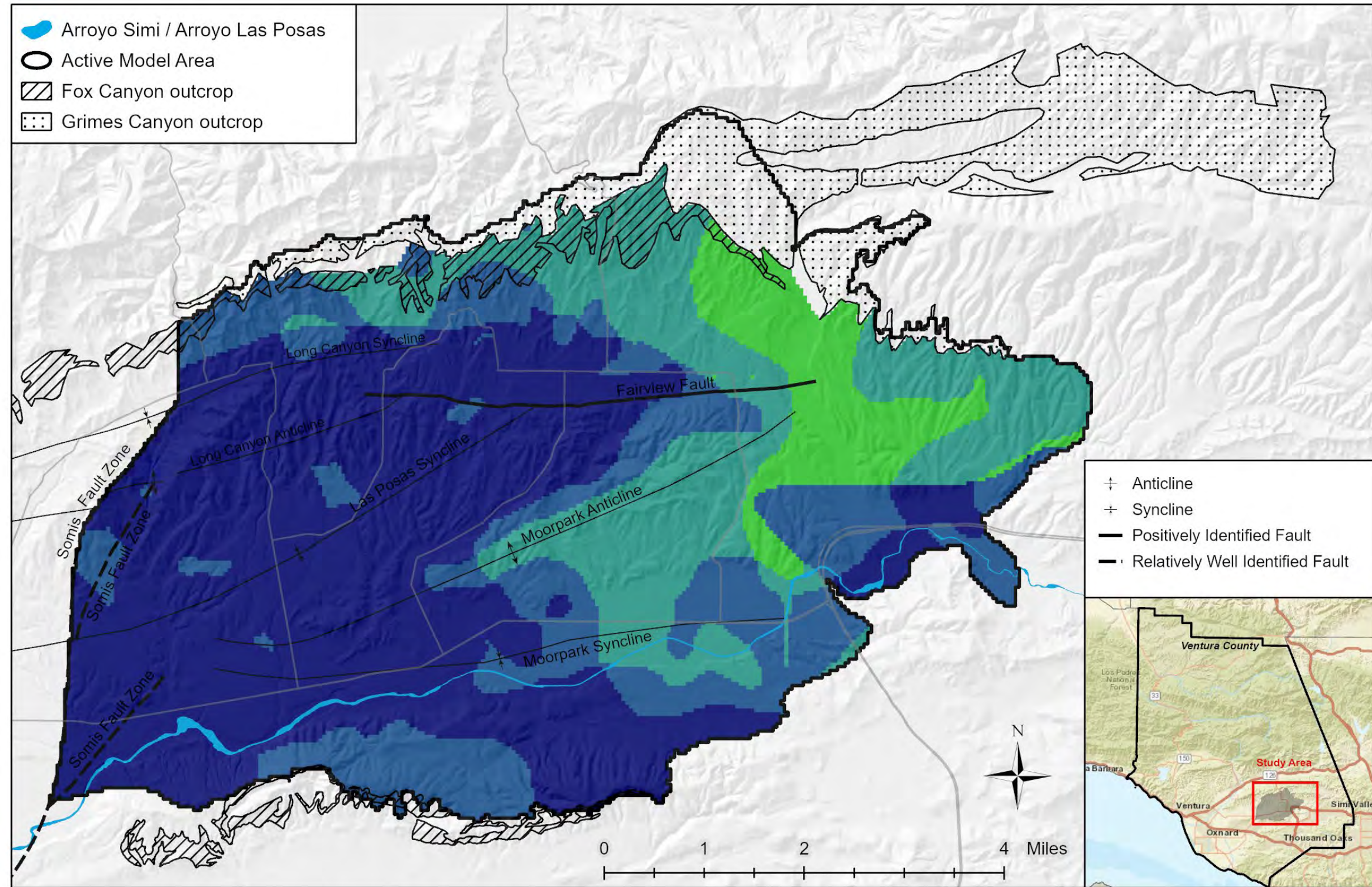


Confining Bed Vertical Hydraulic Conductivity (ft/day) - Layer 4



Figure C.6
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



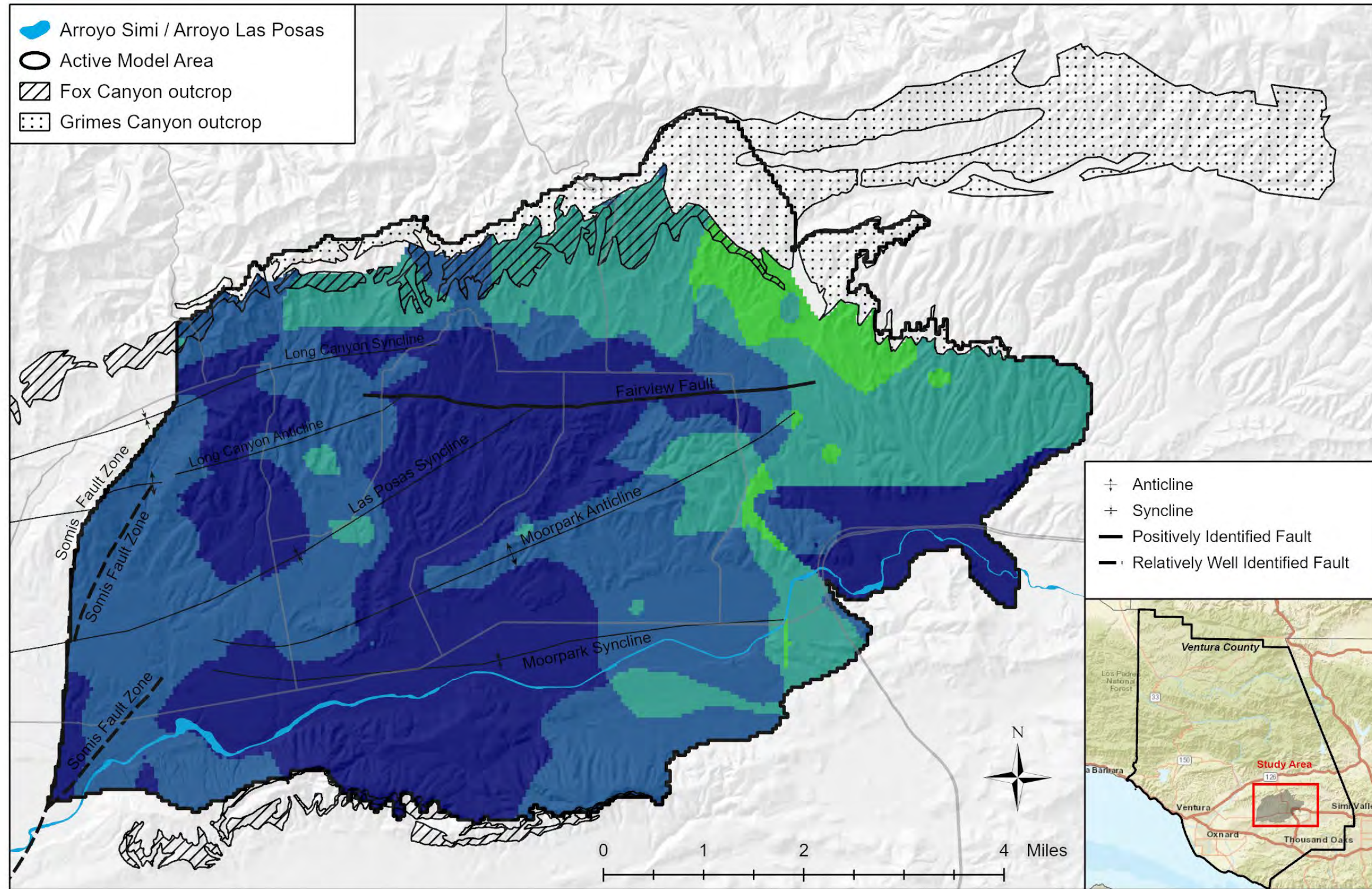


Fox Canyon Aquifer (Upper) Vertical Hydraulic Conductivity (ft/day) - Layer 5

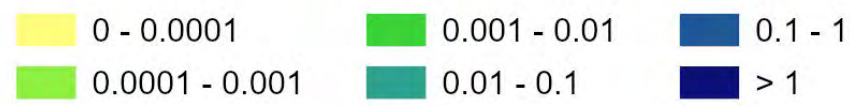


Figure C.7
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum





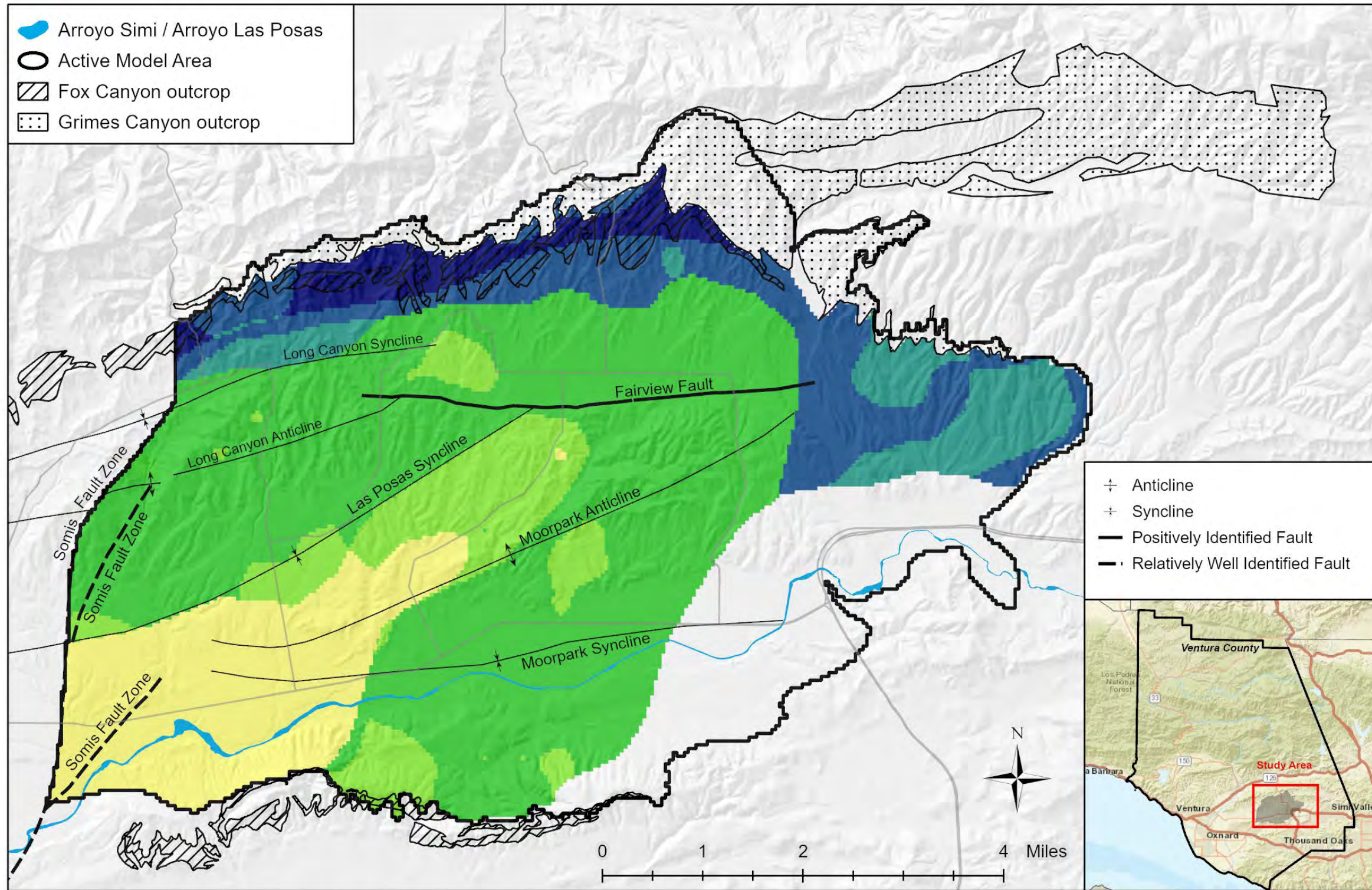
Fox Canyon Aquifer (Lower) Vertical Hydraulic Conductivity (ft/day) - Layer 6



DRAFT

Figure C.8
 Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum





Confining Bed Vertical Hydraulic Conductivity (ft/day) - Layer 7

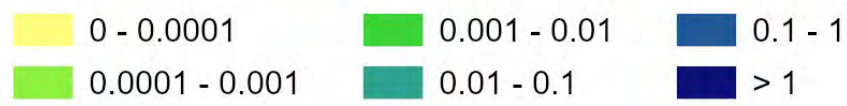
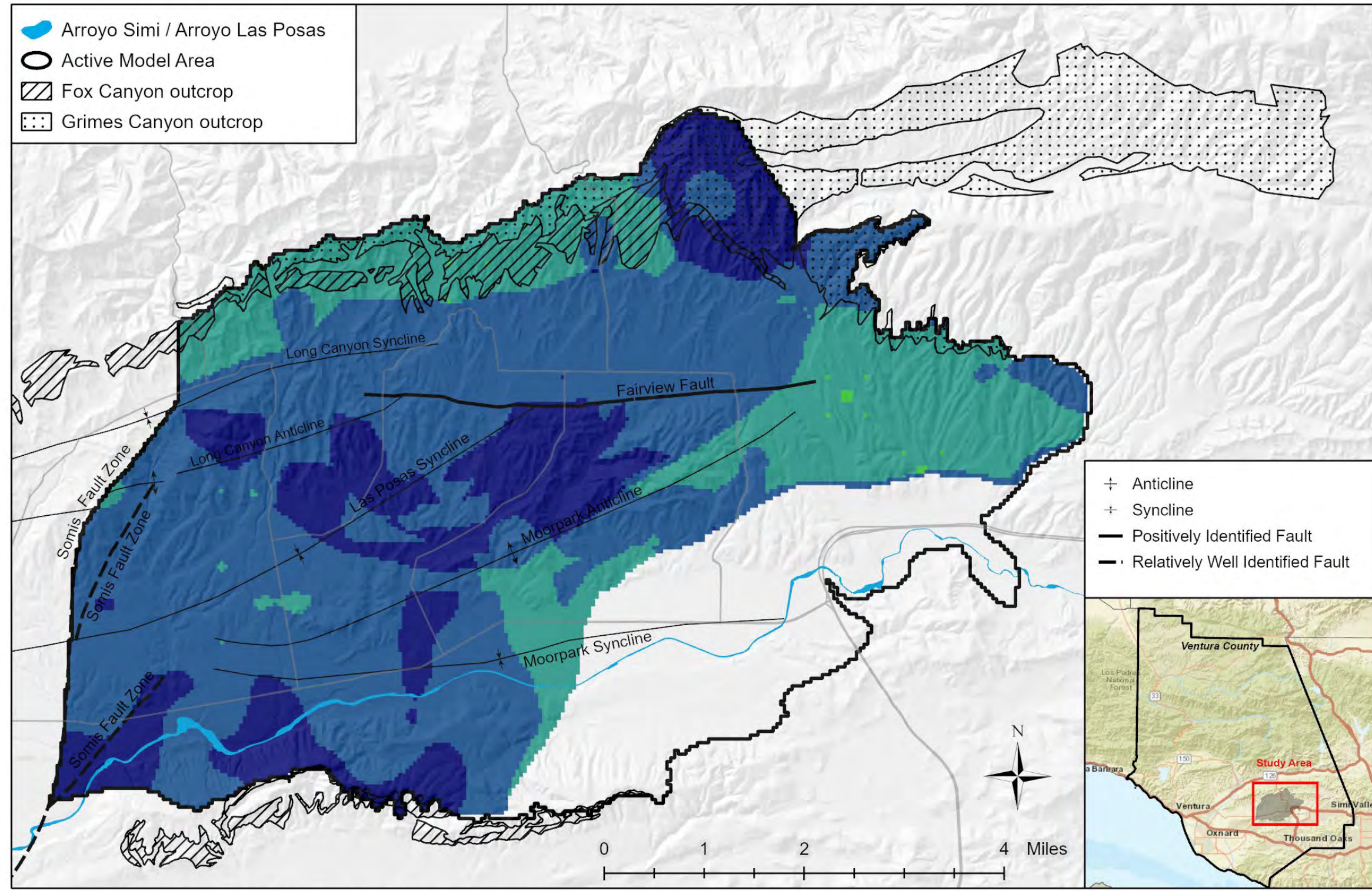


Figure C.9
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



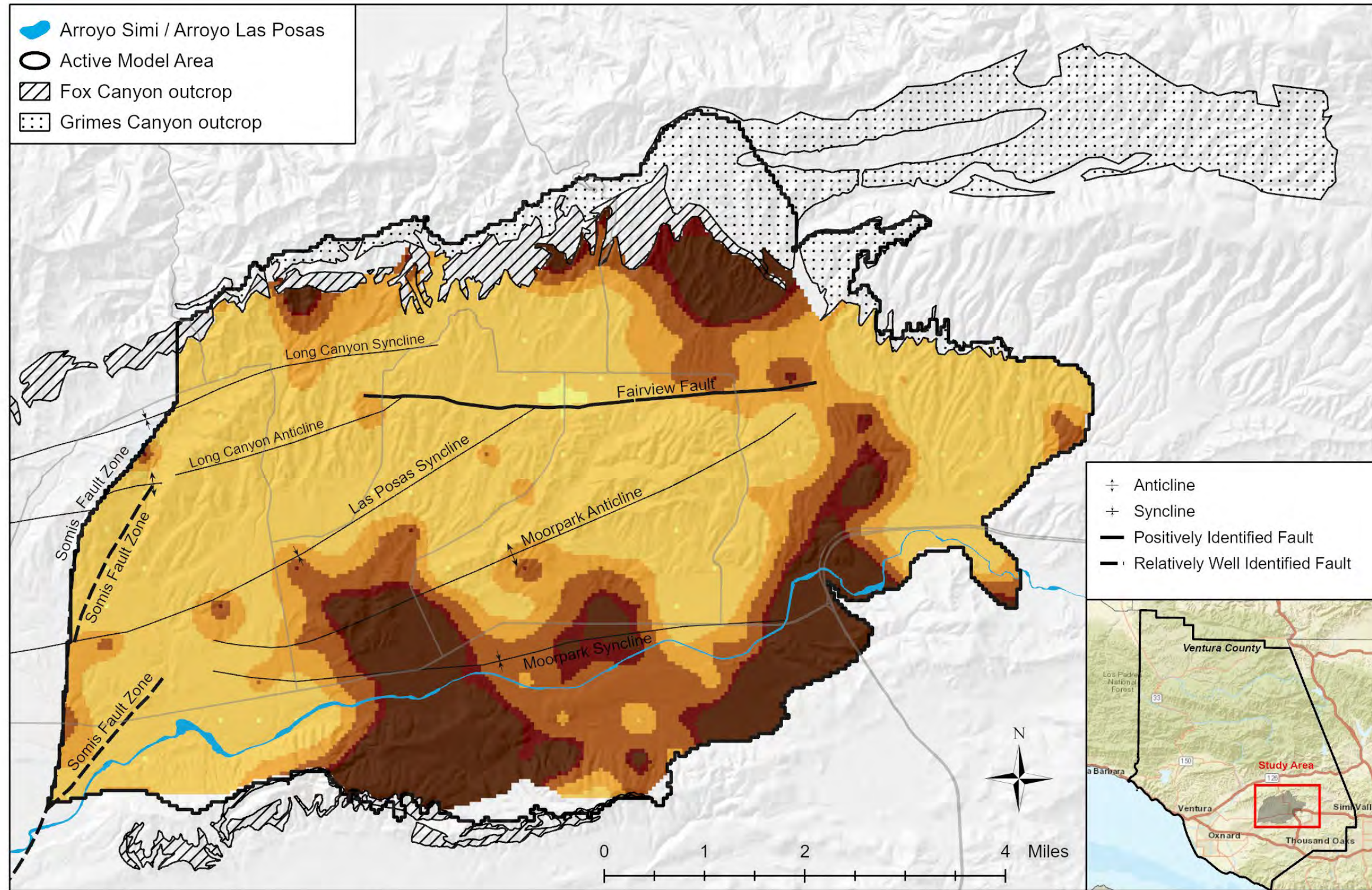


Grimes Canyon Aquifer Vertical Hydraulic Conductivity (ft/day) - Layer 8



Figure C.10
 Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum





Confining Bed Specific Storage (1/ft) - Layer 4

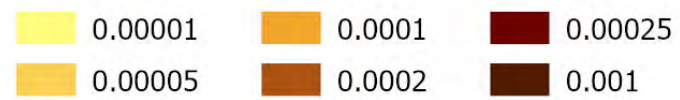
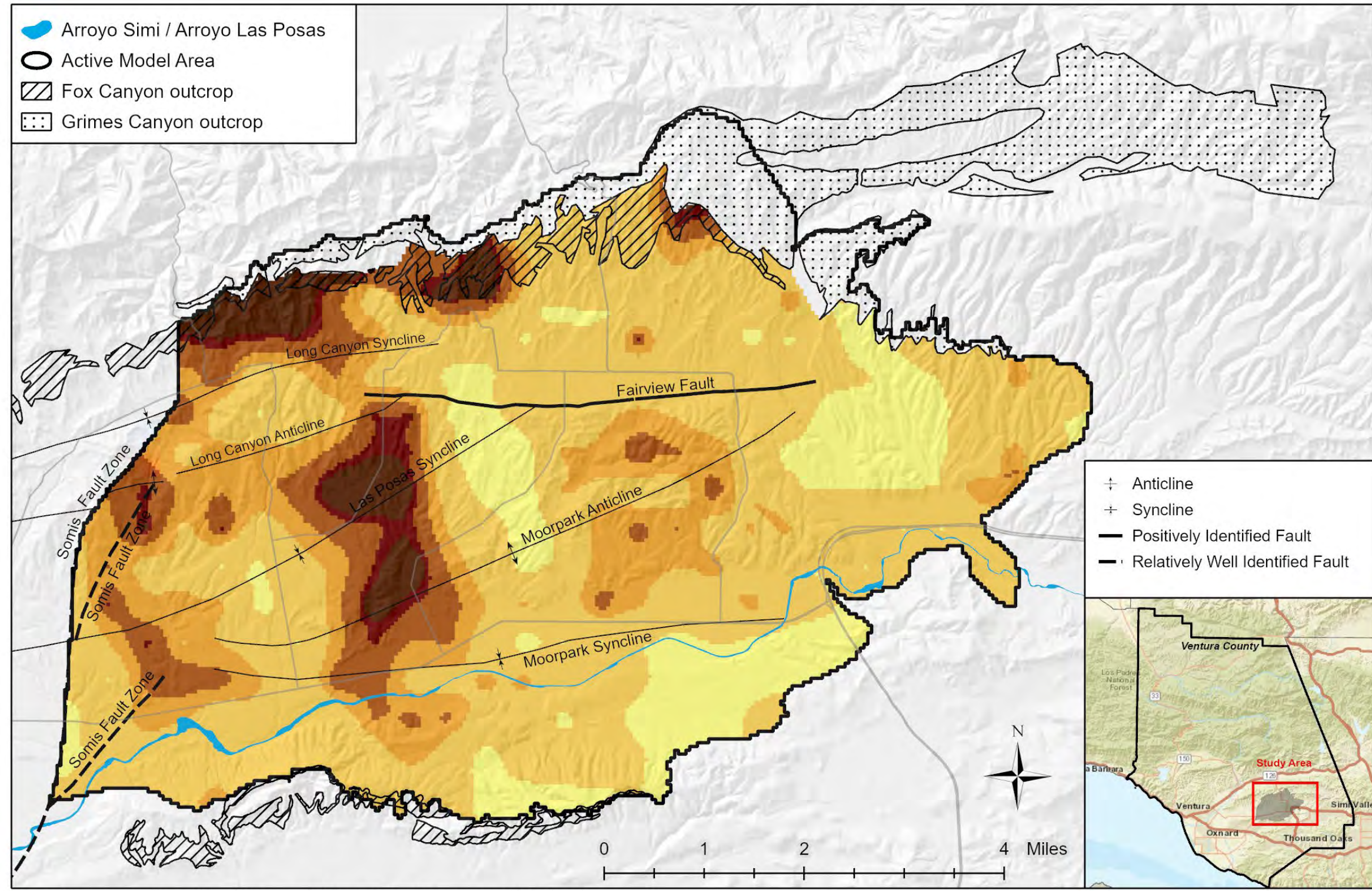


Figure C.11
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum

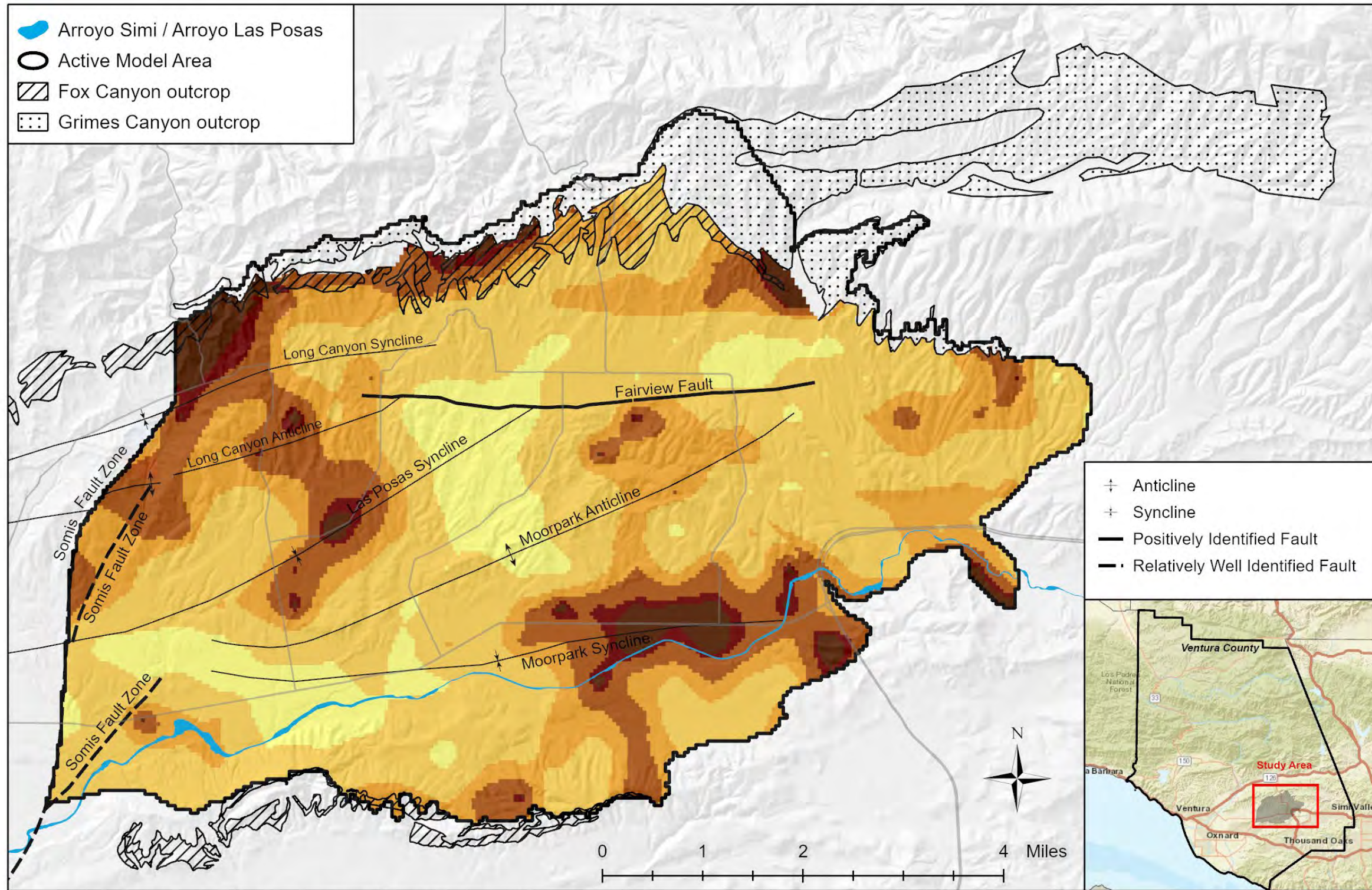


Fox Canyon Aquifer (Upper) Specific Storage (1/ft) - Layer 5

0.00001	0.0001	0.00025
0.00005	0.0002	0.001

Figure C.12
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum





Fox Canyon Aquifer (Lower) Specific Storage (1/ft) - Layer 6

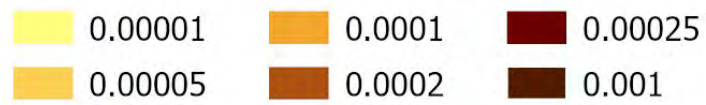
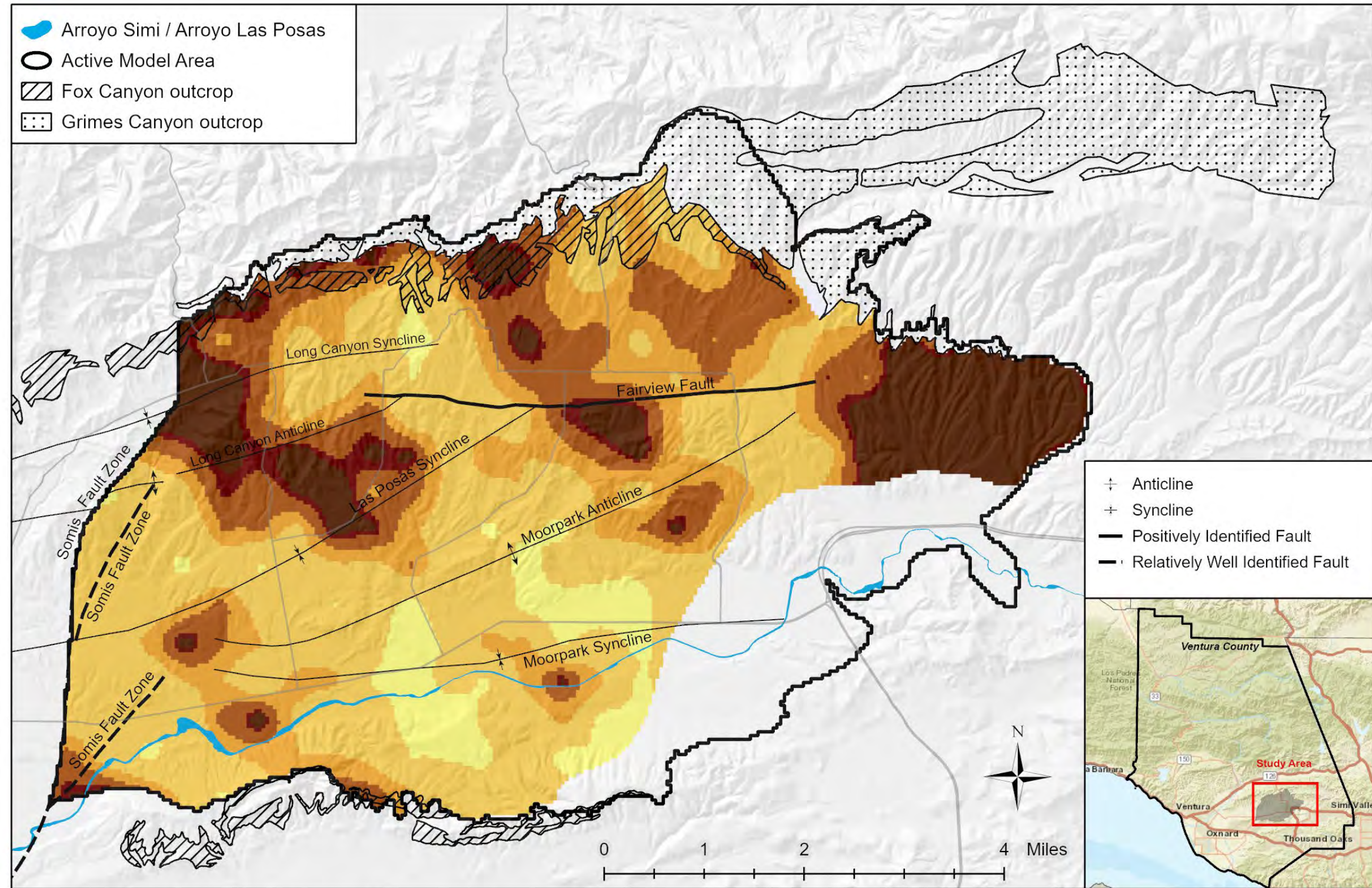


Figure C.13
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum

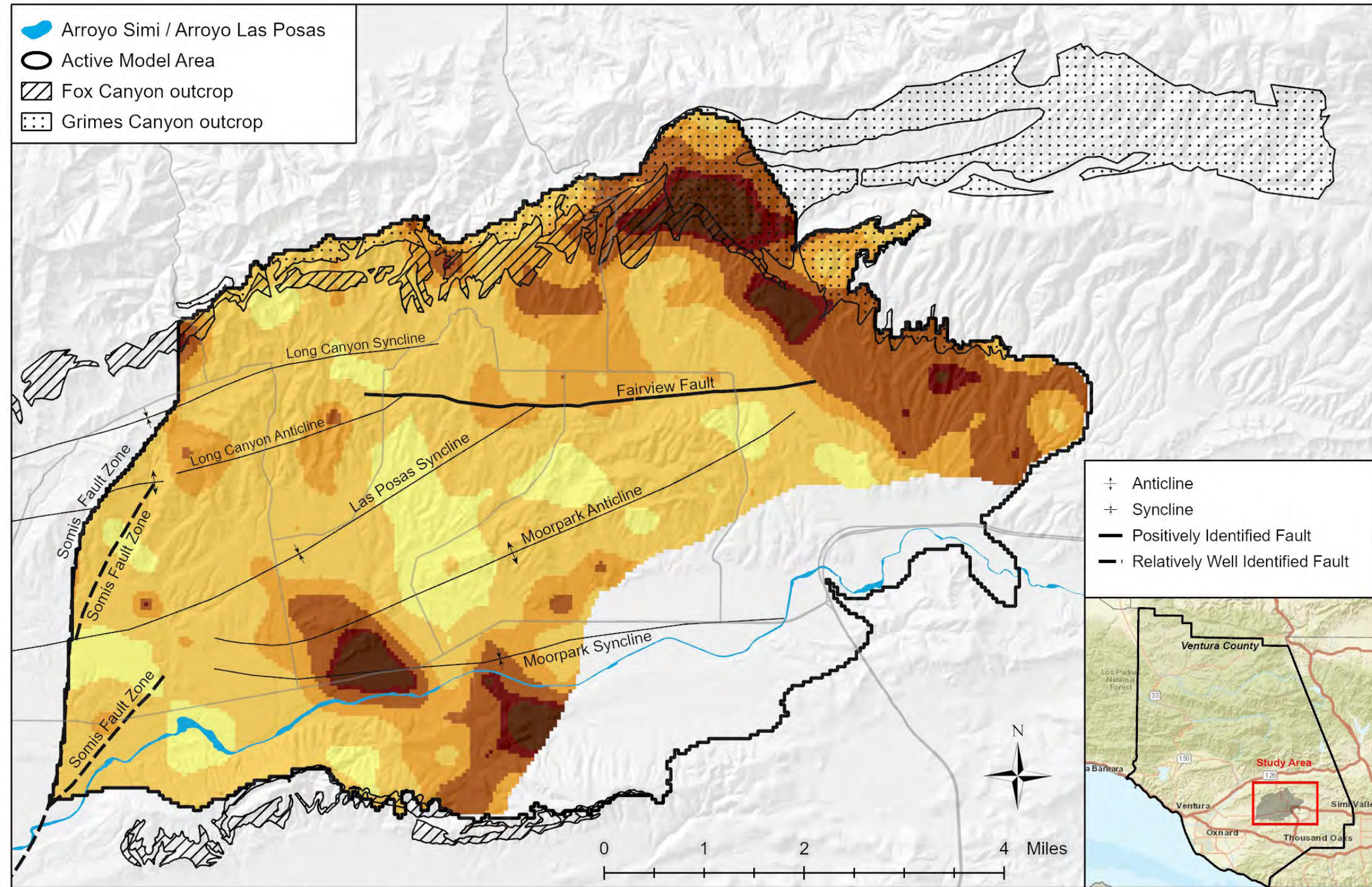




Confining Bed Specific Storage (1/ft) - Layer 7



Figure C.14
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum

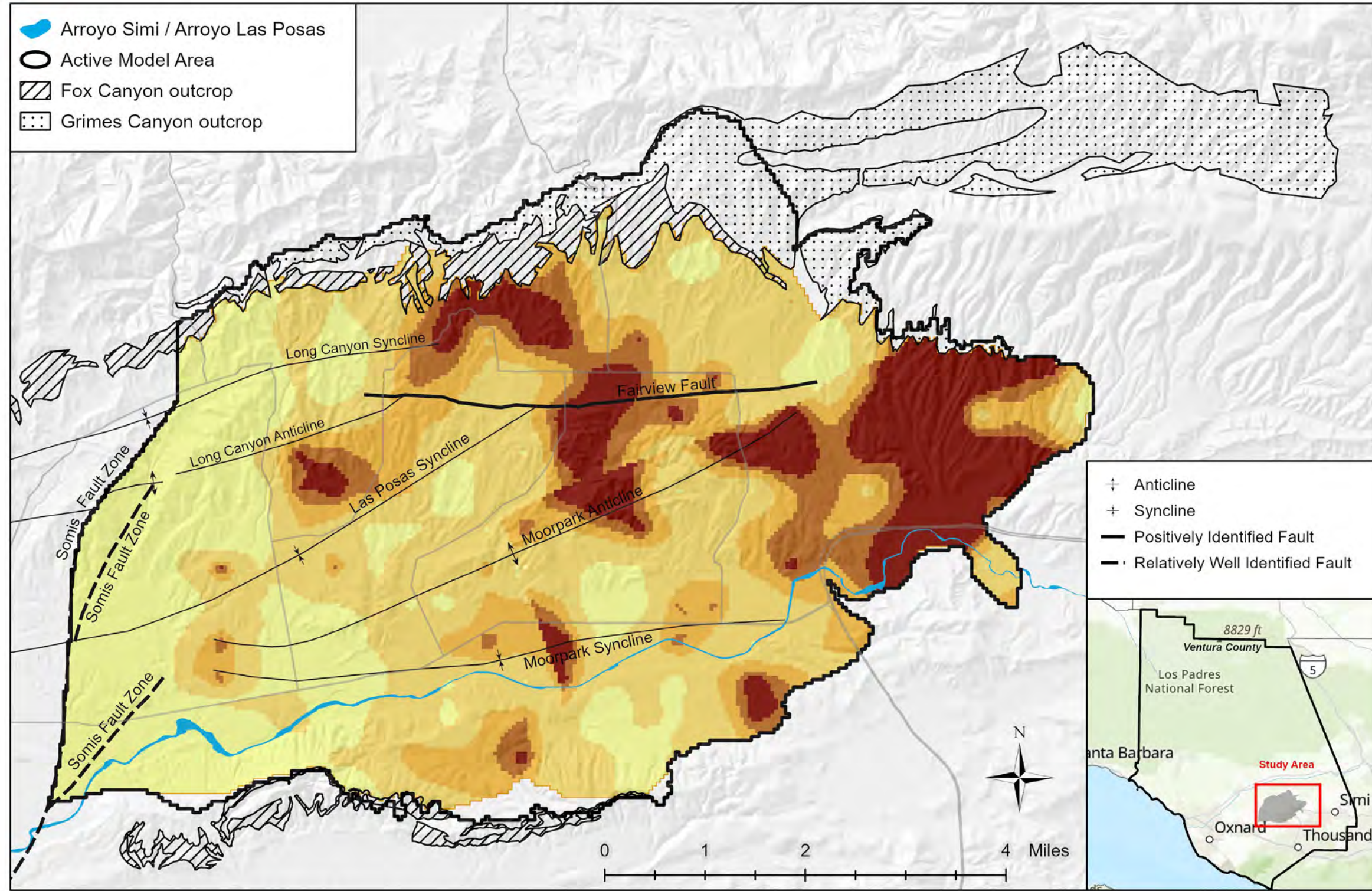


Grimes Canyon Aquifer Specific Storage (1/ft) - Layer 8

0.00001	0.0001	0.00025
0.00005	0.0002	0.001

Figure C.15
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum





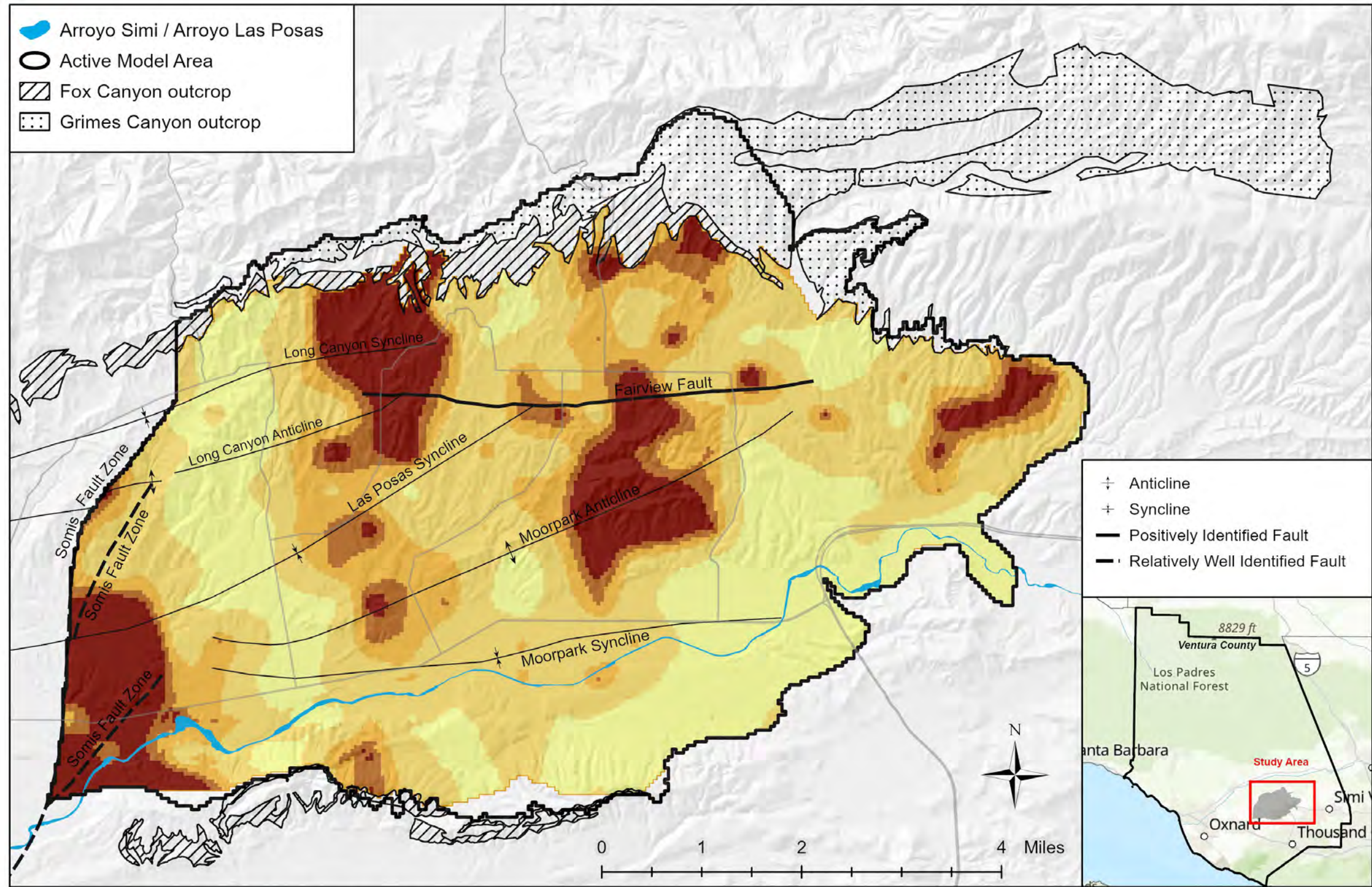
Confining Bed Specific Yield (-) - Layer 4

0.00 - 0.05	0.16 - 0.25	0.36 - 0.45
0.06 - 0.15	0.26 - 0.35	

+ Anticline
 + Syncline
 — Positively Identified Fault
 - - - Relatively Well Identified Fault

Figure C.16
 Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum





Fox Canyon Aquifer (Upper) Specific Yield (-) - Layer 5

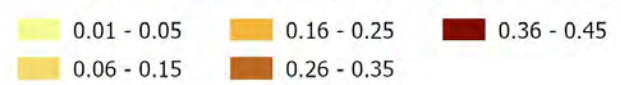


Figure C.17
 Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



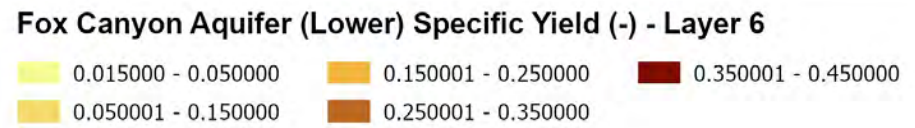
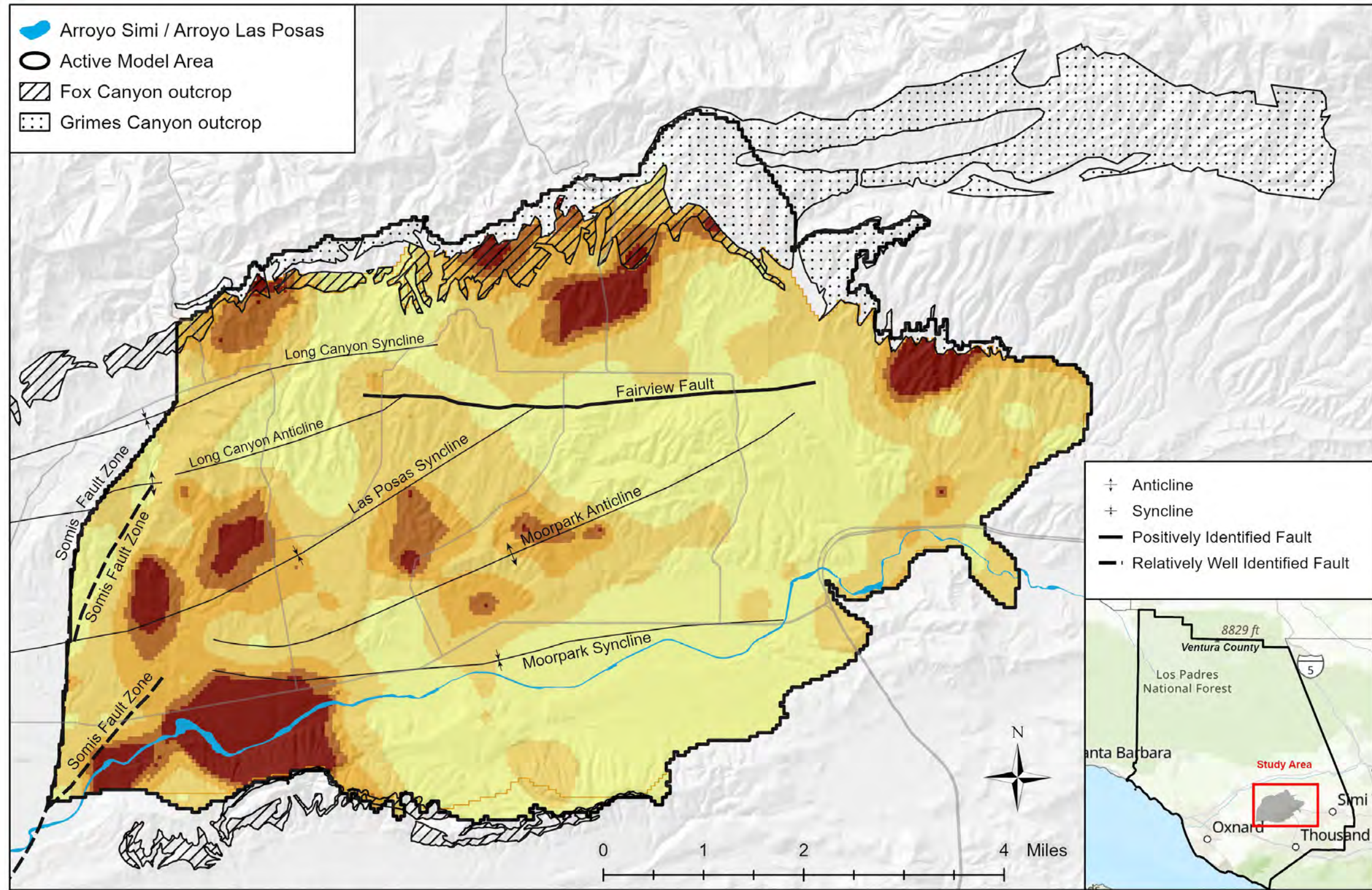


Figure C.18
Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



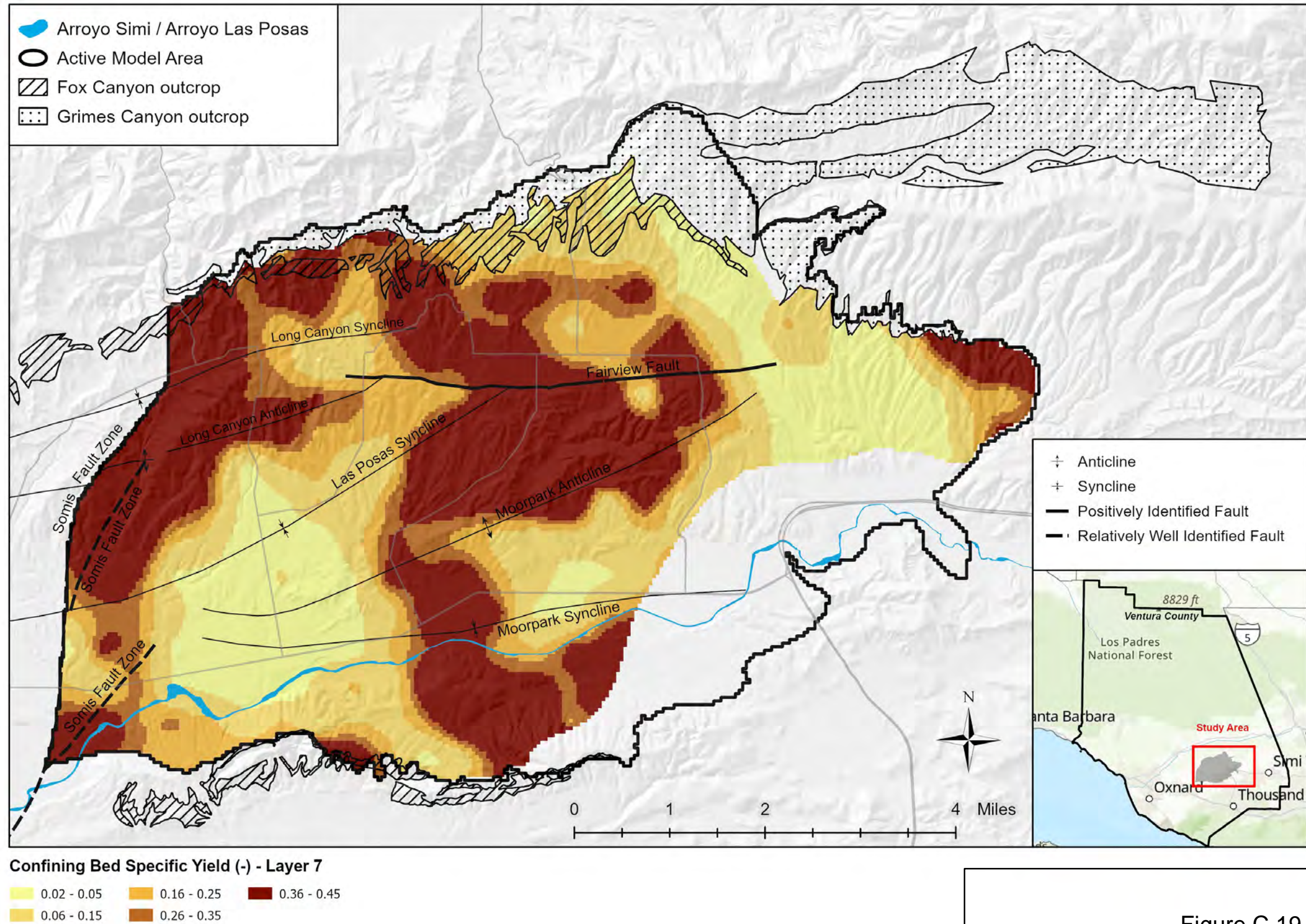


Figure C.19
 Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum



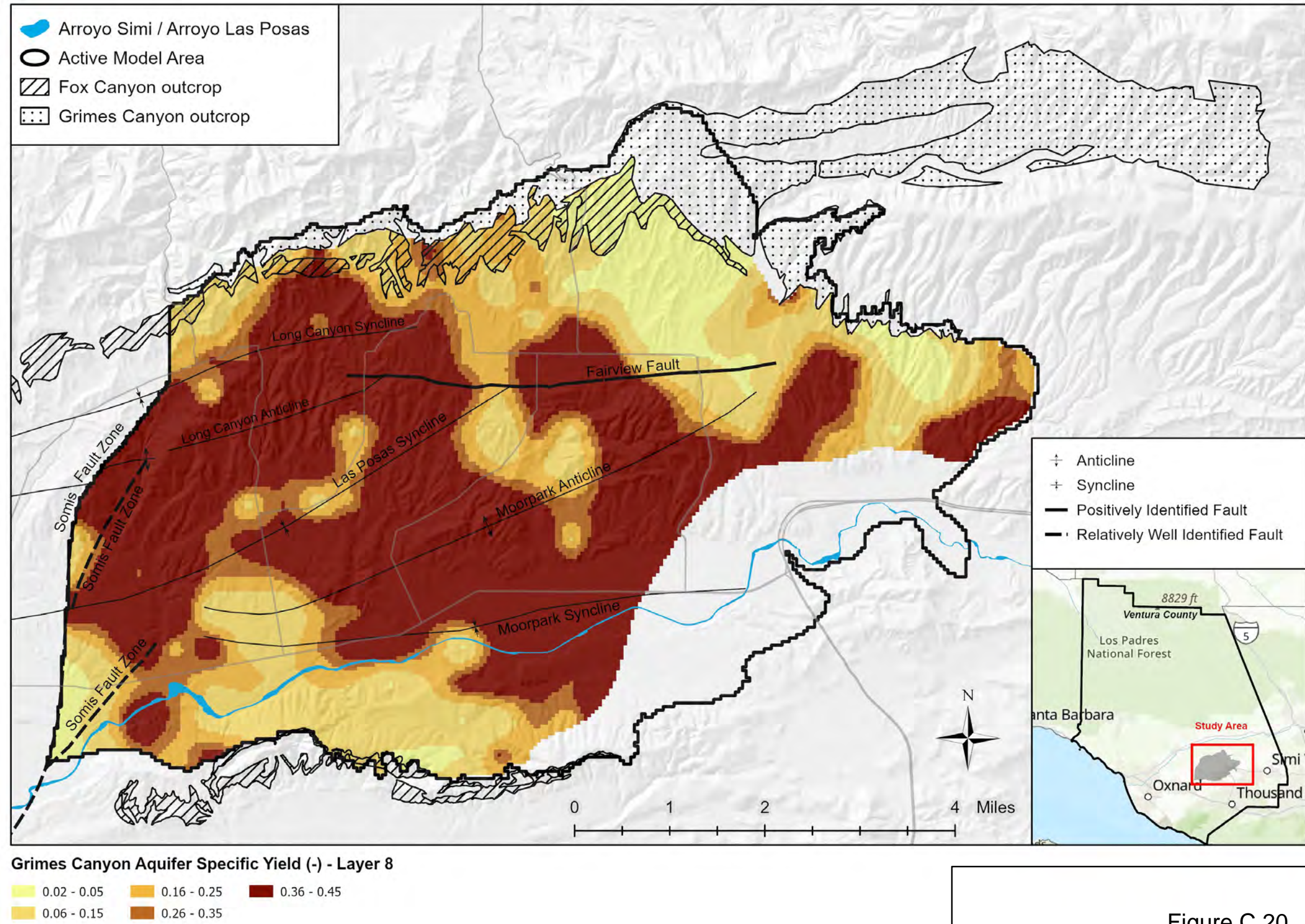
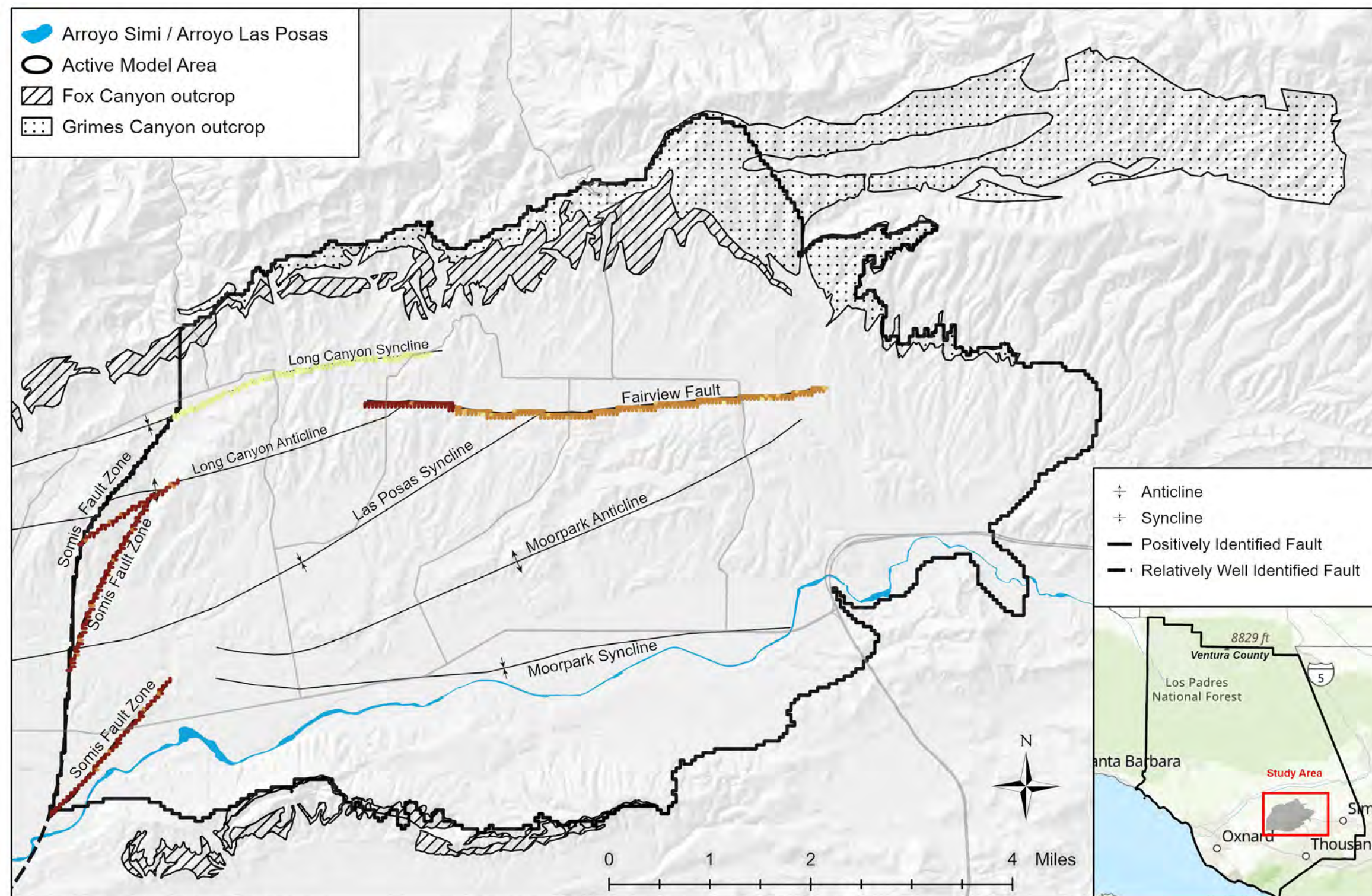


Figure C.20
 Calibrated Aquifer Properties
 ELMA Groundwater Model Technical Memorandum





Hydraulic Flow Barriers - Layer 2

- | | |
|---------------------|---------------------|
| 1.15e-05 - 1.00e-03 | 1.01e-02 - 1.00e+00 |
| 1.01e-03 - 1.00e-02 | 1.01e+00 - 1.00e+01 |



Figure C.21
Calibrated HFBs
 ELMA Groundwater Model Technical Memorandum

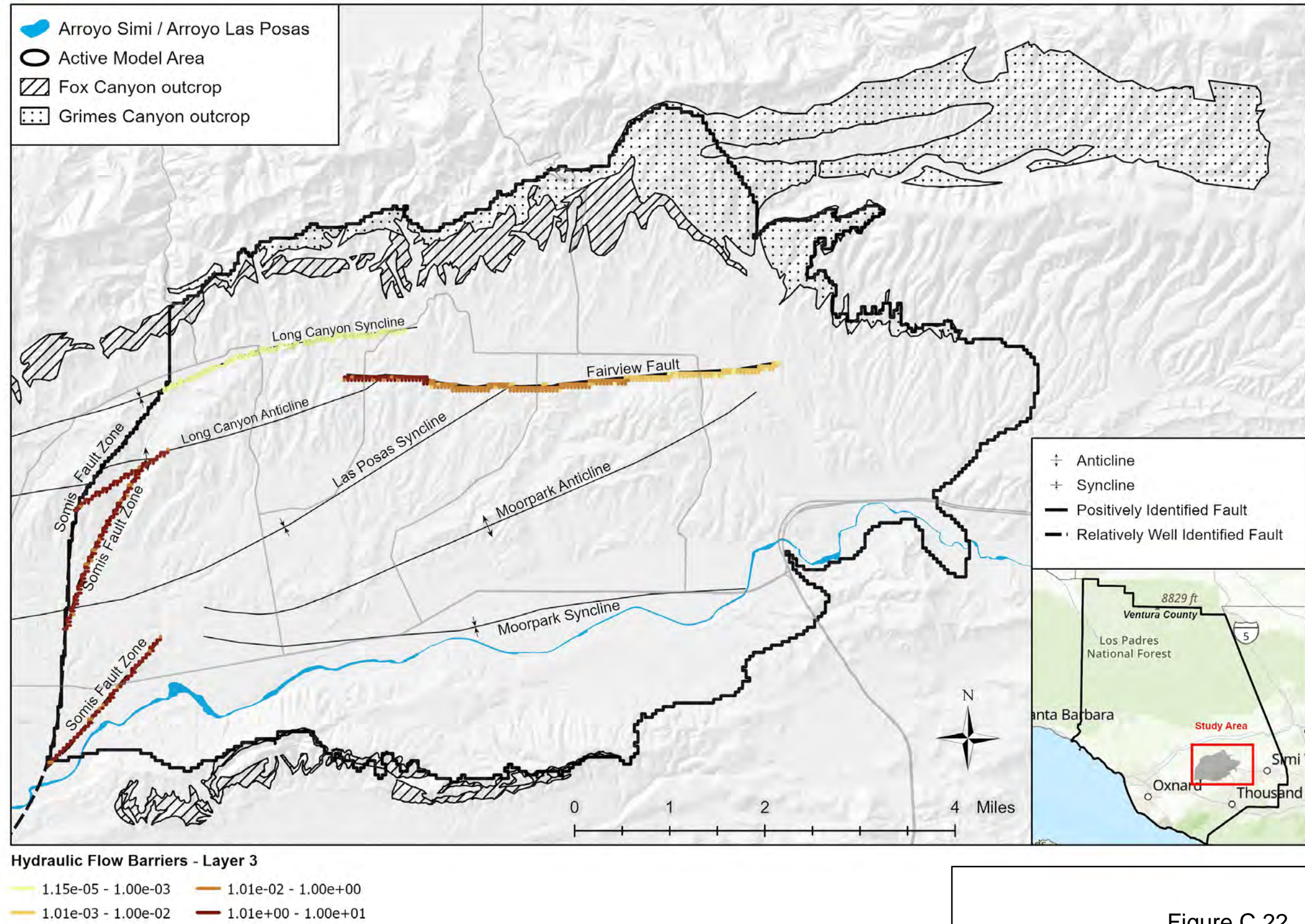
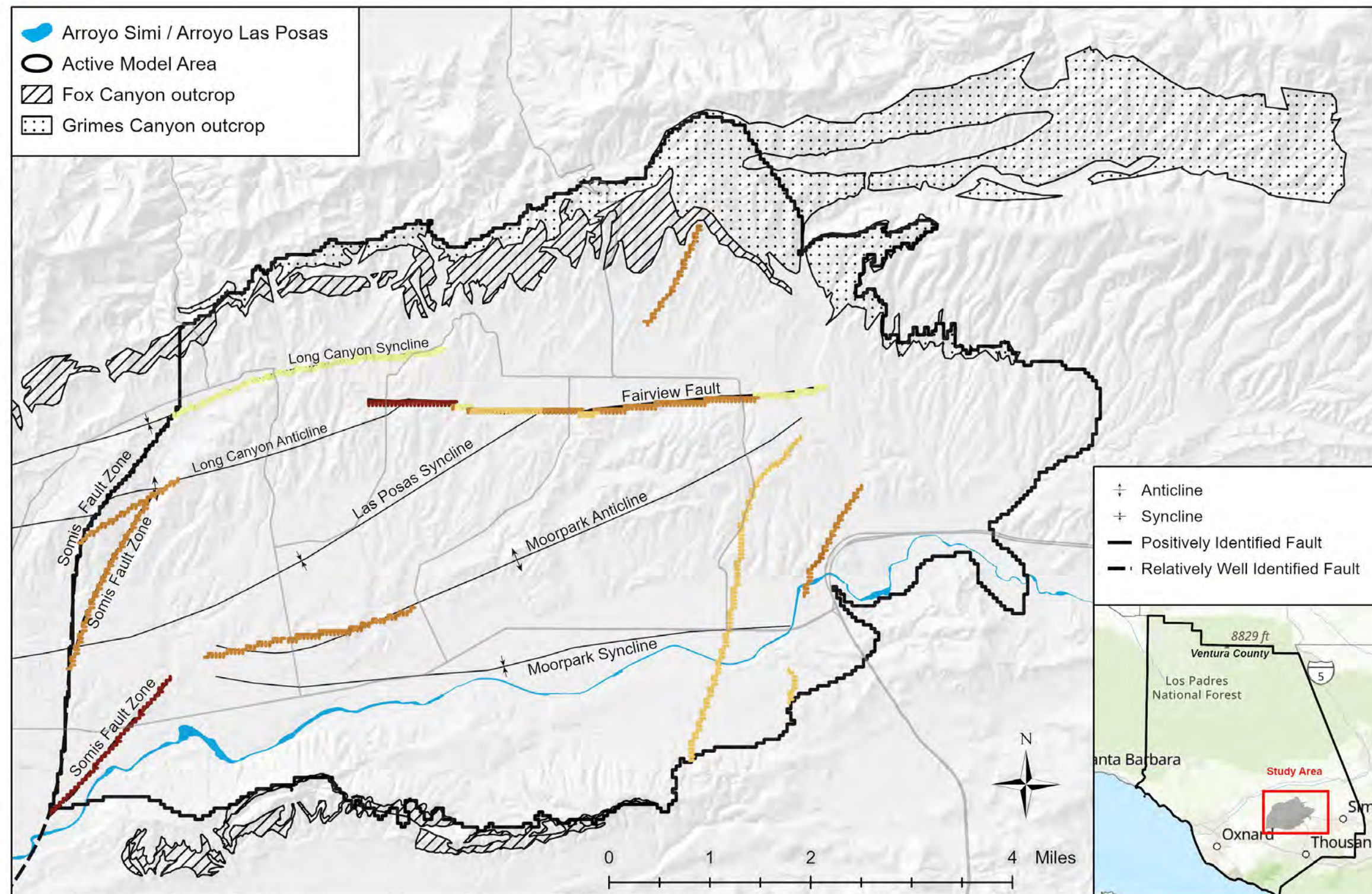


Figure C.22
 Calibrated HFBs
 ELMA Groundwater Model Technical Memorandum





Hydraulic Flow Barriers - Layer 5



Figure C.23
Calibrated HFBs
 ELMA Groundwater Model Technical Memorandum

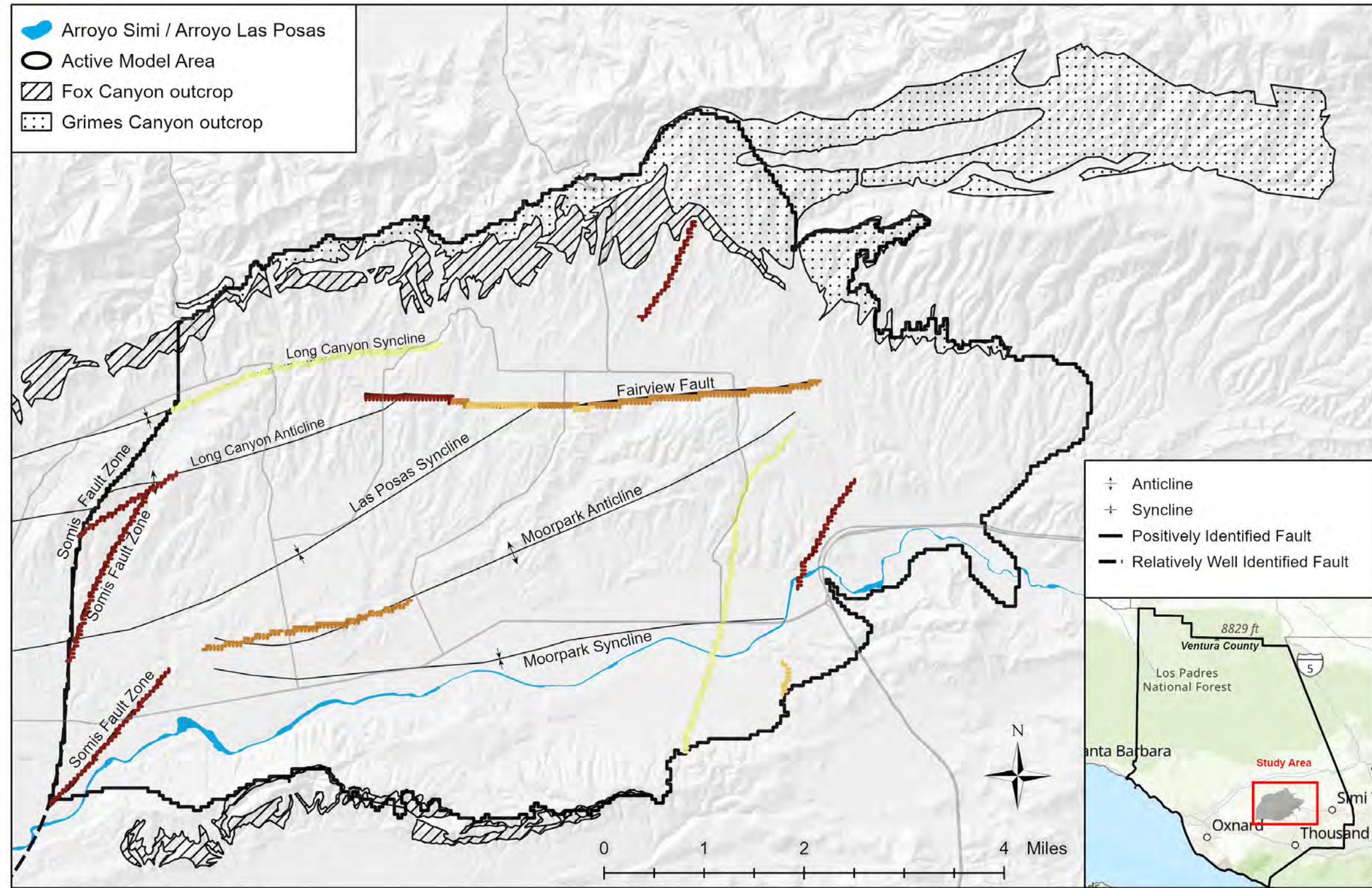


Figure C.24
 Calibrated HFBs
 ELMA Groundwater Model Technical Memorandum



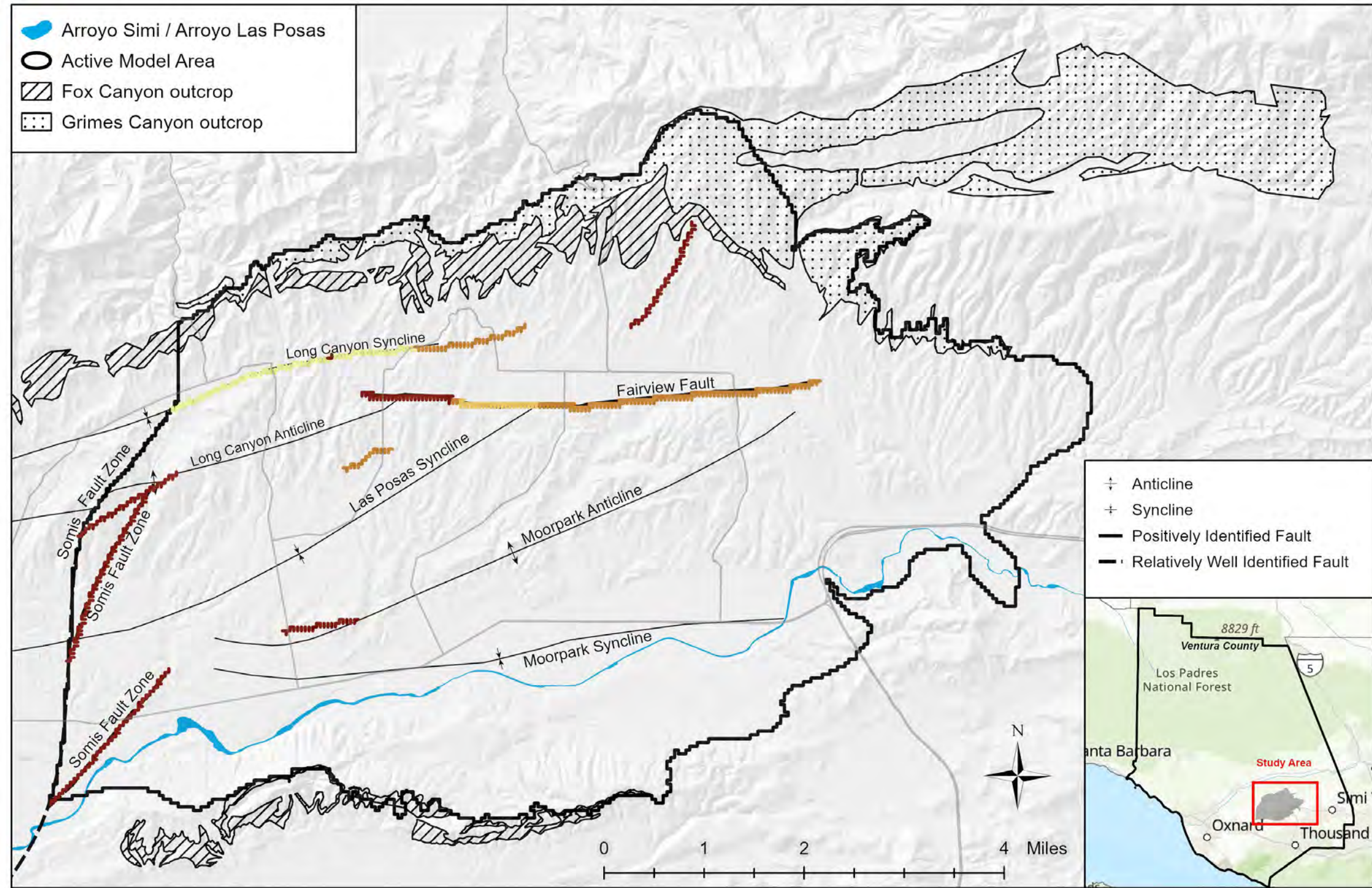


Figure C.25
 Calibrated HFBS
 ELMA Groundwater Model Technical Memorandum





Appendix D

Calibration Summary Statistics and Residuals

RE: Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

Table D-1. Model Calibration Statistics Summarized by Well

SWN	Aquifer	ME (ft)	MAE (ft)	RMSE (ft)	Uncertainty (ft) ^a
02N19W03A01S	EGA/SAA	-0.2	1.0	1.1	0.0
02N19W04K01S	FCA	0.9	7.4	9.3	2.2
02N19W05K01S	USP	-0.3	4.0	5.6	0.7
02N19W05M01S	FCA	7.9	14.8	16.1	12.8
02N19W06E01S	GCA	-12.8	22.0	22.4	14.5
02N19W06F01S	USP	8.6	16.2	20.7	7.9
02N19W06N03S	USP	-3.0	3.8	4.6	0.7
02N19W07A03S	EGA/SAA	-0.2	5.0	5.6	1.2
02N19W07G01S	EGA/SAA	-5.0	5.0	5.1	0.2
02N19W07K02S	GCA	1.0	3.2	4.0	4.4
02N19W07K03S	USP	-10.3	10.3	10.3	0.8
02N19W07K04S	USP	-4.9	4.9	4.9	0.3
02N19W08G01S	USP	1.1	1.1	1.1	0.7
02N19W08G03S	USP	2.9	7.2	9.2	1.7
02N19W08H02S	EGA/SAA	3.7	3.9	5.4	0.8
02N19W09E01S	EGA/SAA	3.7	3.7	3.9	0.2
02N20W01A01S	FCA	3.7	5.4	6.5	4.6
02N20W01B01S	FCA	8.0	9.2	11.5	4.8
02N20W01B02S	FCA	7.9	9.4	11.4	4.8
02N20W01B03S	FCA	11.9	15.6	20.8	4.7
02N20W01C02S	FCA	5.0	9.2	12.6	4.9
02N20W01E02S	FCA	11.5	13.7	15.6	5.0
02N20W01E03S	GCA	-6.6	8.5	10.7	5.1
02N20W01F01S	FCA	5.8	10.0	16.6	5.0
02N20W01M01S	FCA	-3.7	7.4	9.7	3.7
02N20W01Q01S	USP	-12.0	12.0	12.2	0.1
02N20W01Q02S	USP	-46.2	46.2	46.6	28.3
02N20W02D02S	FCA	-11.2	11.5	13.6	5.5
02N20W02J01S	USP	5.1	6.2	7.3	1.2
02N20W02N03S	FCA	-52.9	52.9	66.1	13.9
02N20W03B01S	FCA	-14.0	14.7	16.7	5.8
02N20W03H01S	FCA	-5.1	14.7	18.8	5.7

Table D-1. Model Calibration Statistics Summarized by Well

SWN	Aquifer	ME (ft)	MAE (ft)	RMSE (ft)	Uncertainty (ft) ^a
02N20W03J01S	FCA	-1.0	19.3	23.8	6.1
02N20W03K03S	FCA	-16.4	16.4	19.2	6.1
02N20W04B01S	FCA	-1.9	4.6	5.4	5.6
02N20W04F01S	FCA	0.3	0.3	0.3	6.3
02N20W04F02S	FCA	-6.0	6.9	8.7	7.0
02N20W04R03S	FCA	17.8	18.7	22.2	8.0
02N20W09B01S	USP	-100.2	100.2	100.2	2.2
02N20W09C01S	FCA	21.3	21.3	21.3	7.8
02N20W09F01S	FCA	11.2	14.2	16.5	7.4
02N20W09Q01S	EGA	21.9	23.1	30.8	5.8
02N20W09Q04S	EGA	26.7	27.4	35.2	7.0
02N20W09Q05S	FCA	9.5	16.8	22.9	7.1
02N20W09Q07S	FCA	12.9	21.8	26.2	5.9
02N20W09Q08S	EGA/SAA	-6.5	6.7	7.9	1.9
02N20W09R01S	FCA	21.4	27.8	32.8	7.6
02N20W10D02S	FCA	8.7	10.5	12.8	6.7
02N20W10G01S	FCA	-6.9	12.9	16.5	6.2
02N20W10J01S	FCA	0.6	9.5	13.3	4.3
02N20W10K02S	USP	0.7	2.8	3.5	2.8
02N20W11B01S	FCA	-51.2	51.2	51.2	2.4
02N20W11B02S	FCA	-3.6	3.8	5.0	2.4
02N20W11B03S	USP	-47.0	47.0	47.0	1.3
02N20W12G02S	USP	0.2	4.2	5.2	0.9
02N20W12J01S	USP	23.6	23.6	24.9	9.5
02N20W12MMW1	EGA/SAA	3.4	4.2	6.3	2.7
02N20W12MMW2	EGA/SAA	2.6	3.1	3.8	0.8
02N20W12MMW3	USP	-1.1	3.4	4.2	1.4
02N20W12N01S	USP	-20.6	20.6	20.6	6.2
02N20W16A02S	USP	40.5	40.5	41.6	5.5
02N20W16A03S	USP	8.0	13.1	15.2	5.5
02N20W16A04S	USP	12.0	13.2	15.6	3.7
02N20W16C01S	FCA	-3.9	9.6	12.1	4.0

Table D-1. Model Calibration Statistics Summarized by Well

SWN	Aquifer	ME (ft)	MAE (ft)	RMSE (ft)	Uncertainty (ft) ^a
02N20W17J01S	FCA	18.4	31.2	37.7	10.3
02N20W17J06S	FCA	10.6	14.9	17.2	6.7
03N19W17Q01S	GCA	-3.6	6.9	8.5	10.8
03N19W19J01S	FCA	-2.8	7.8	9.5	6.1
03N19W19P02S	GCA	6.8	9.7	12.5	5.7
03N19W28N03S	FCA	5.3	6.5	7.2	6.4
03N19W29E02S	EGA/SAA	17.0	17.5	20.3	0.0
03N19W29F06S	EGA/SAA	2.7	12.8	14.6	0.6
03N19W29M02S	EGA/SAA	-2.9	2.9	2.9	0.6
03N19W29M03S	EGA/SAA	-7.2	7.2	7.2	0.6
03N19W30D01S	FCA	1.4	4.0	5.0	4.2
03N19W30D02S	GCA	0.3	0.3	0.3	6.6
03N19W30E03S	FCA	1.8	9.6	12.1	4.0
03N19W30E06S	FCA	-7.7	7.7	7.7	4.2
03N19W30E07-D	GCA	-8.6	8.6	8.8	4.7
03N19W30E07-I	FCA	-5.9	5.9	7.2	4.3
03N19W30E07-S	EGA/SAA	-19.2	19.2	19.2	0.7
03N19W30J01S	FCA	-4.6	4.6	4.6	4.6
03N19W30M02S	EGA/SAA	1.3	11.9	14.4	0.6
03N19W30Q01S	EGA/SAA	-3.3	3.3	3.3	0.6
03N19W31B01S	FCA	6.7	19.8	26.1	4.3
03N19W31C01S	FCA	-7.7	9.9	11.3	4.2
03N19W31C02S	FCA	-13.4	15.9	29.8	4.8
03N19W31D02S	FCA	-6.2	9.0	11.1	4.4
03N19W31D03S	FCA	-2.7	4.8	8.3	4.2
03N19W31D04S	FCA	-12.0	12.7	14.4	4.3
03N19W31D05S	FCA	-2.3	12.1	17.8	4.3
03N19W31D06S	FCA	-1.8	7.6	10.4	4.2
03N19W31D07S	FCA	-2.0	3.5	4.8	4.2
03N19W31E02S	FCA	-0.6	9.5	15.6	4.5
03N19W31E03S	FCA	-1.9	9.7	14.7	4.2
03N19W31H01S	FCA	-7.4	16.0	19.4	4.8

Table D-1. Model Calibration Statistics Summarized by Well

SWN	Aquifer	ME (ft)	MAE (ft)	RMSE (ft)	Uncertainty (ft) ^a
03N19W31M03S	FCA	-0.4	5.1	7.0	4.8
03N19W31M04S	FCA	2.6	7.6	12.7	5.1
03N19W31N02S	FCA	0.9	6.8	13.6	5.6
03N19W32A01S	FCA	7.7	8.4	9.9	8.3
03N19W32G01S	USP	15.7	15.7	16.4	5.4
03N19W33P03S	FCA	5.9	14.6	21.6	4.7
03N20W23L01S	GCA	-11.0	13.1	15.6	6.4
03N20W24J01S	GCA	15.4	15.4	16.2	5.9
03N20W25H01S	EGA/SAA	1.5	7.5	9.1	0.2
03N20W25R04S	FCA	3.1	5.1	6.2	4.1
03N20W26R03S	GCA	4.9	8.2	11.5	3.8
03N20W27H01S	USP	-1.4	11.1	14.7	8.2
03N20W27H03S	USP	-3.0	31.4	33.9	9.7
03N20W34G01S	FCA	-2.8	18.4	20.7	6.1
03N20W34K01S	FCA	-12.4	14.5	16.7	6.1
03N20W34L02S	FCA	5.4	6.5	9.7	4.9
03N20W35J01S	FCA	0.6	14.4	23.9	4.0
03N20W35R01S	FCA	3.3	9.4	13.9	3.9
03N20W35R02S	GCA	0.2	6.8	9.2	3.9
03N20W35R03S	FCA	-4.6	6.6	8.7	3.4
03N20W35R04S	USP	1.1	6.1	6.5	4.0
03N20W36A02S	FCA	6.2	12.0	15.9	3.9
03N20W36A04S	FCA	3.4	6.4	8.5	4.3
03N20W36G01S	FCA	1.1	8.9	11.9	3.9
03N20W36P01S	FCA	7.8	9.2	10.7	3.9

Notes: EGA = Epworth Gravels aquifer; SAA = Shallow Alluvial aquifer; USP = Upper San Pedro formation; FCA = Fox Canyon aquifer; GCA = Grimes Canyon aquifer; ME = Mean Error; MAE = Mean Absolute Error; RMSE = Root Mean Square Error; ft = feet

^a Values in this column are calculated using 1.96 times the standard deviation in simulated heads at the calibration well across all model realizations.

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Appendix E

Simulated versus Observed Groundwater Hydrographs

RE: Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model



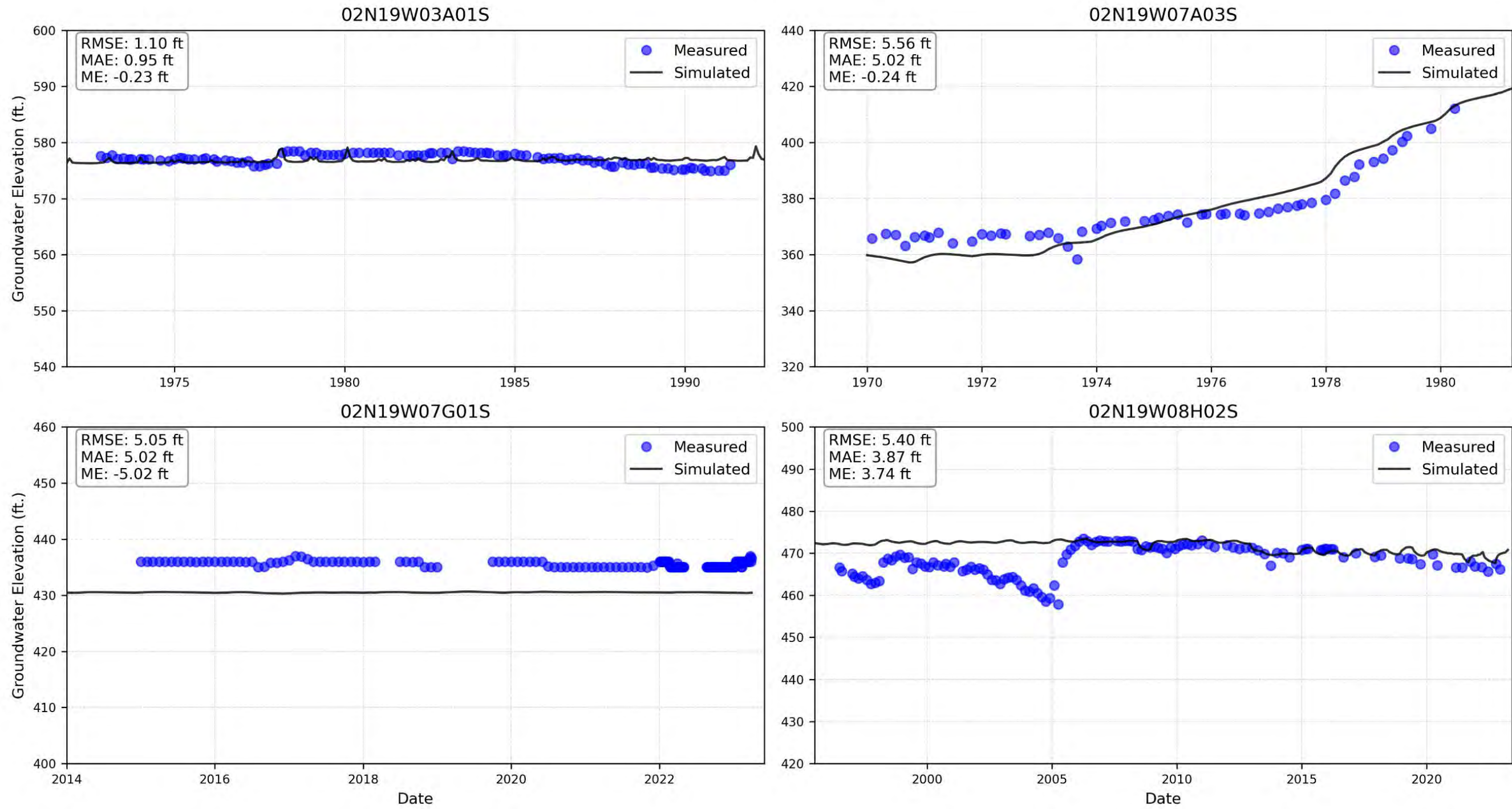


Figure E-1a: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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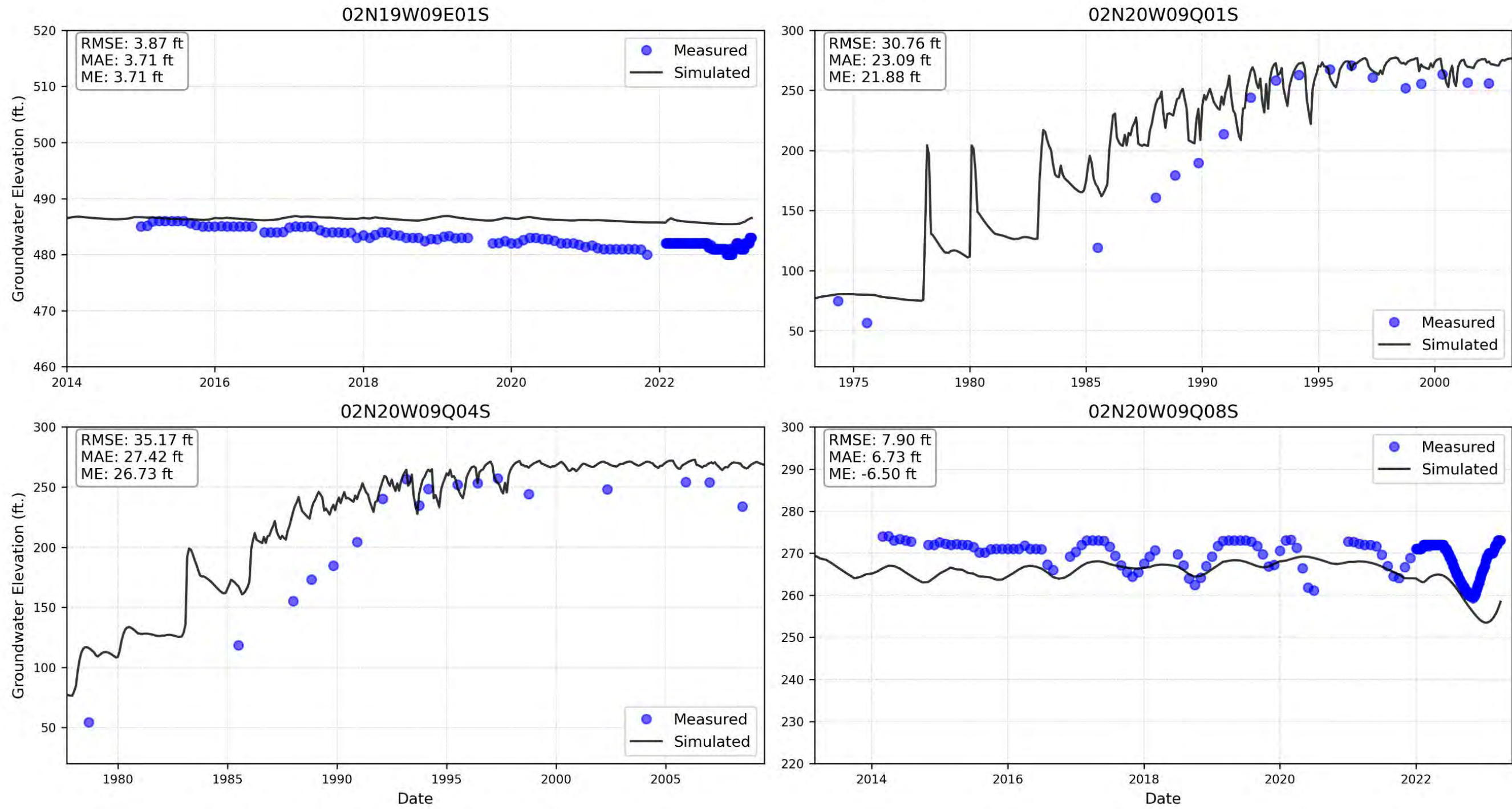


Figure E-1b: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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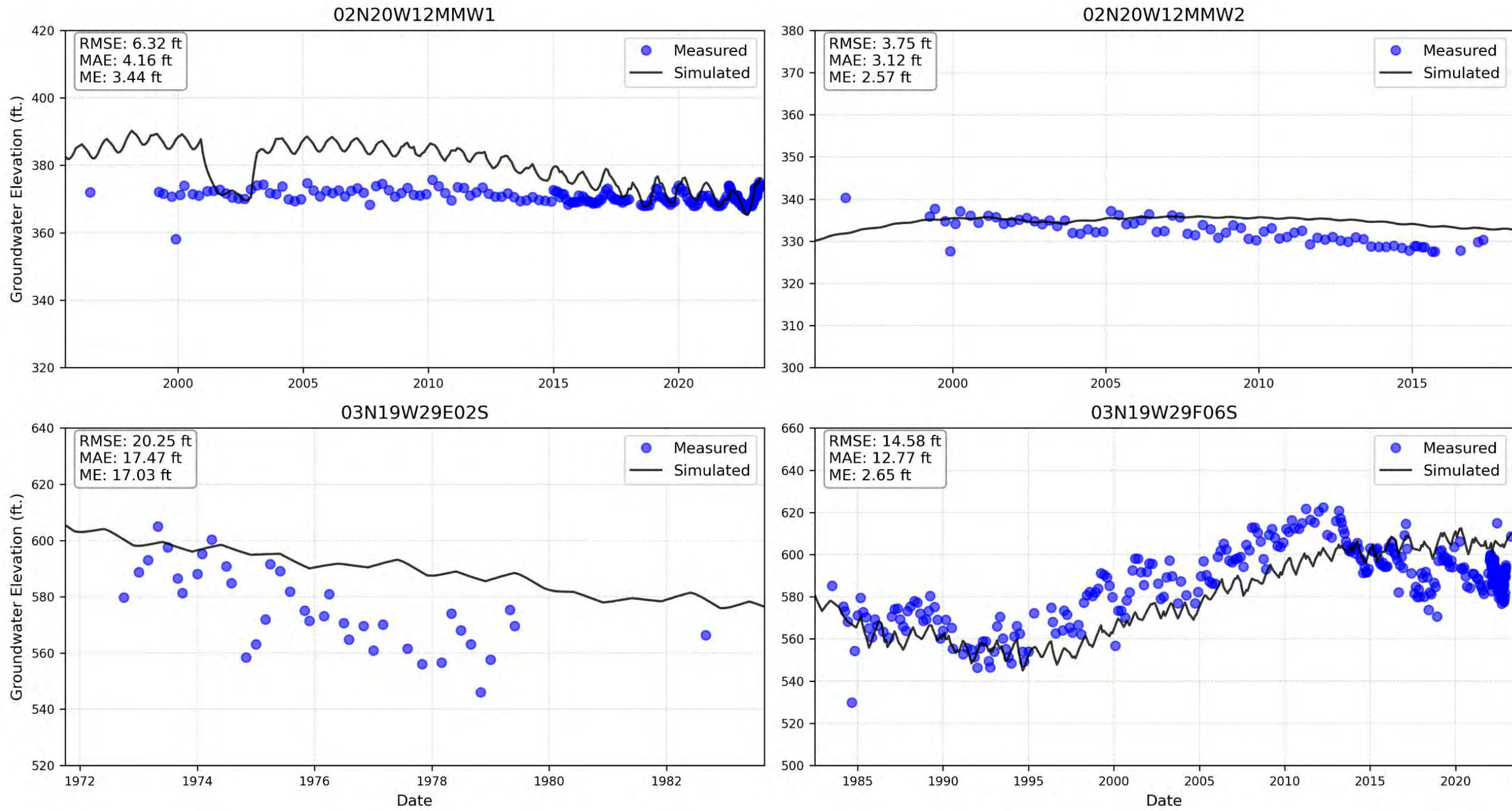


Figure E-1c: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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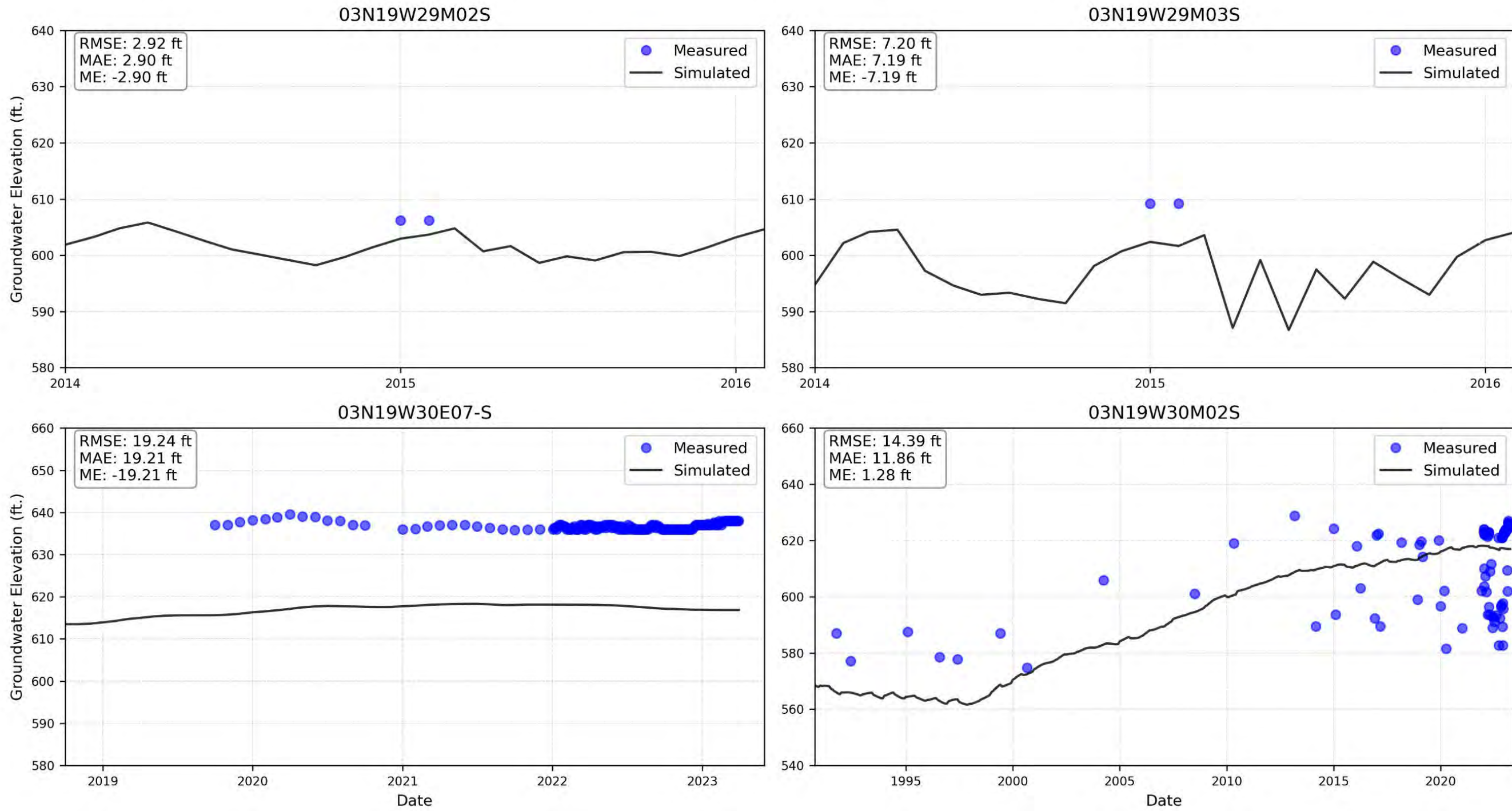


Figure E-1d: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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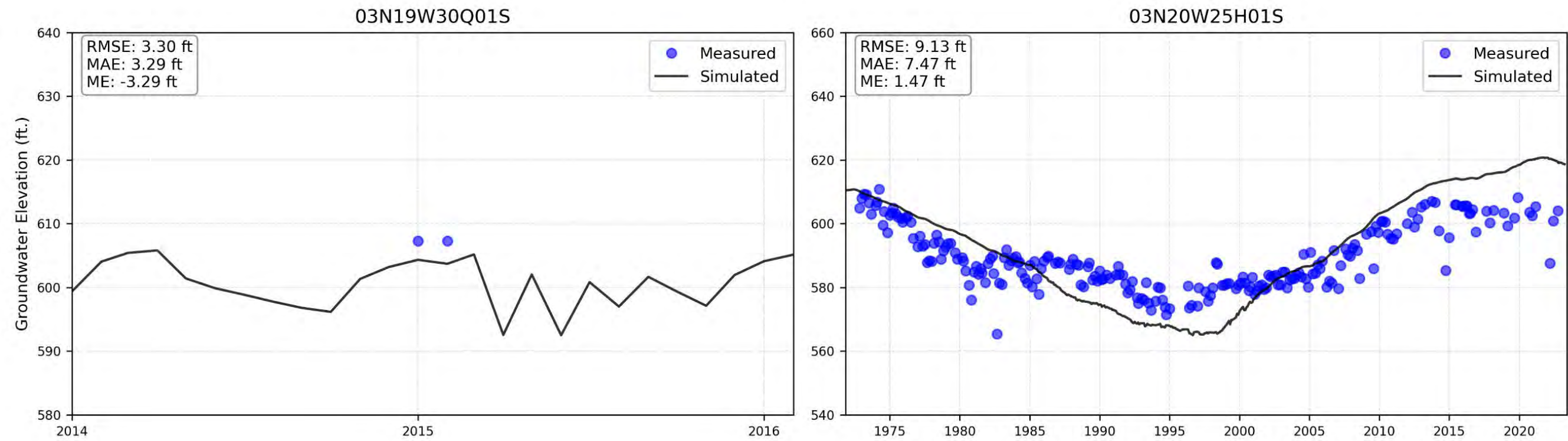


Figure E-1e: Calibration Dataset for the Epworth Gravels Aquifer and Shallow Alluvial Aquifer

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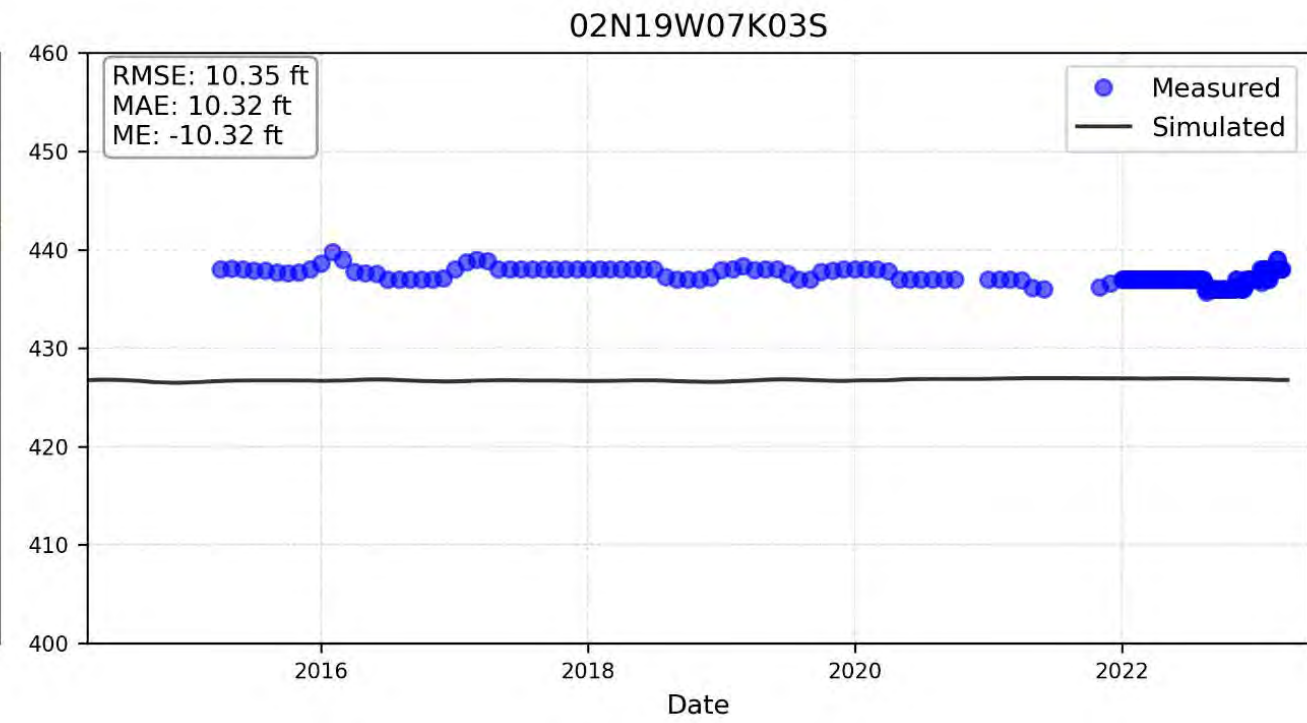
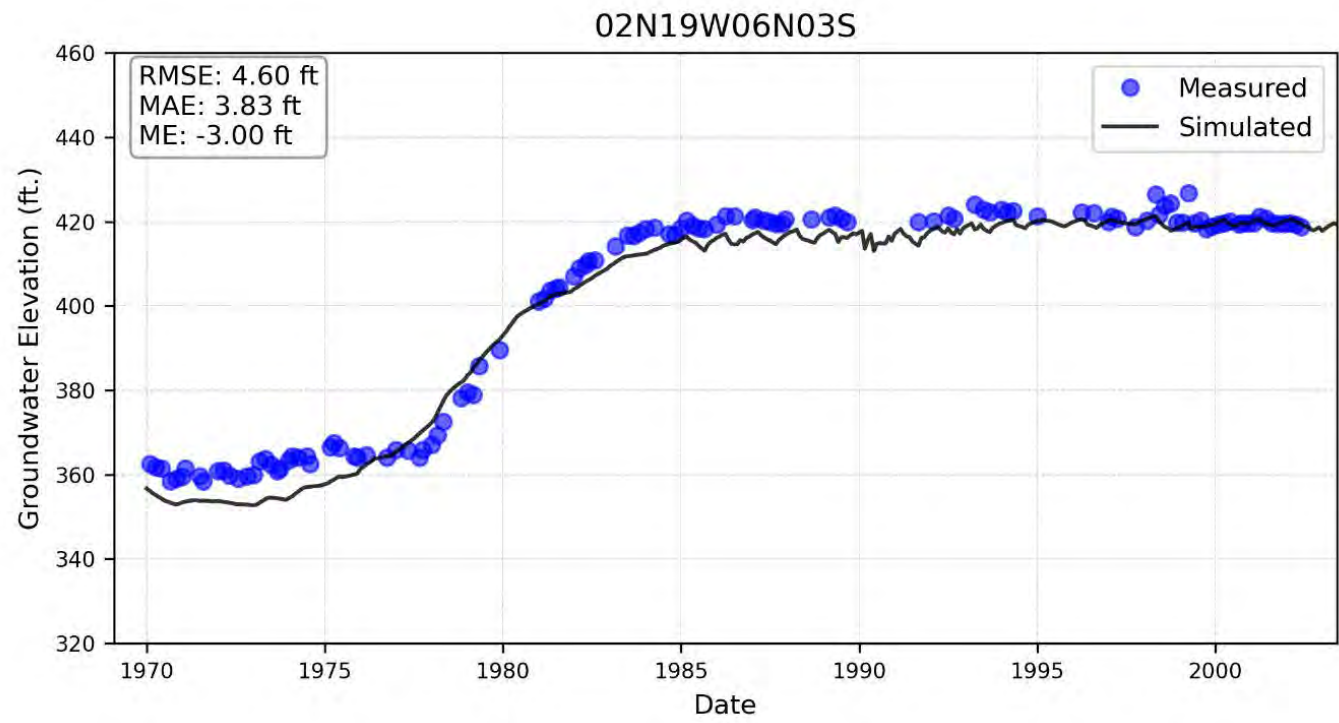
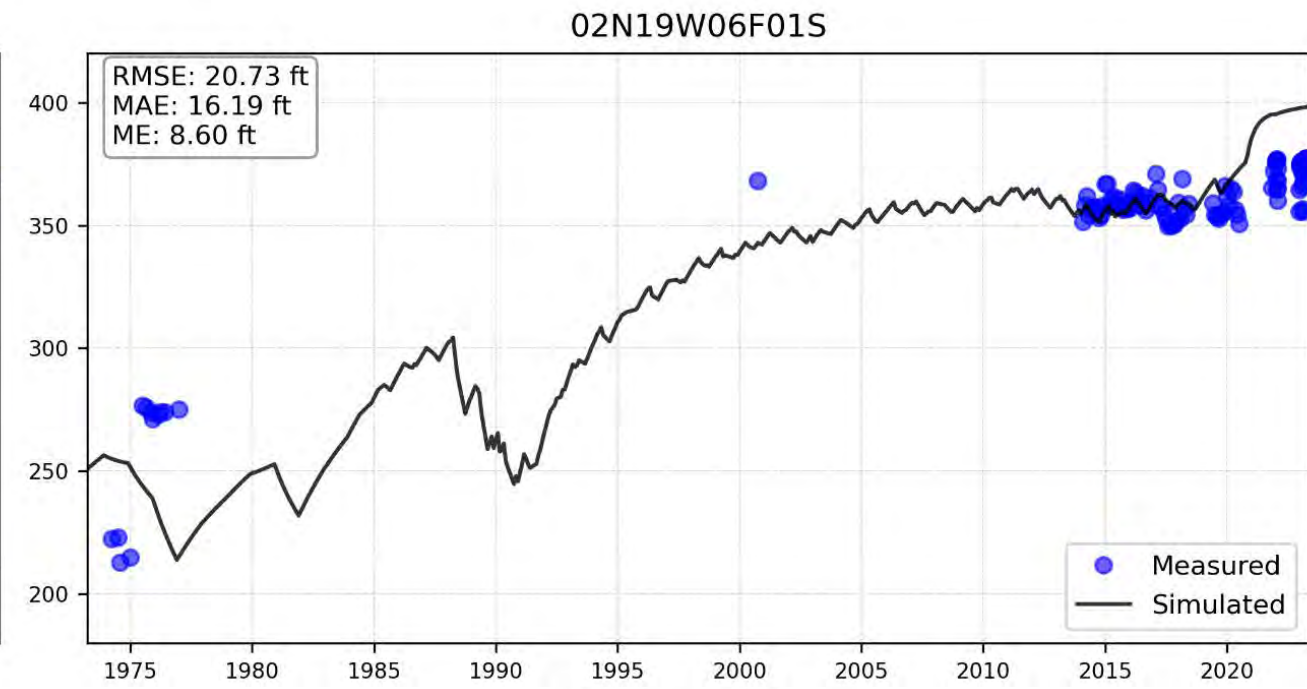
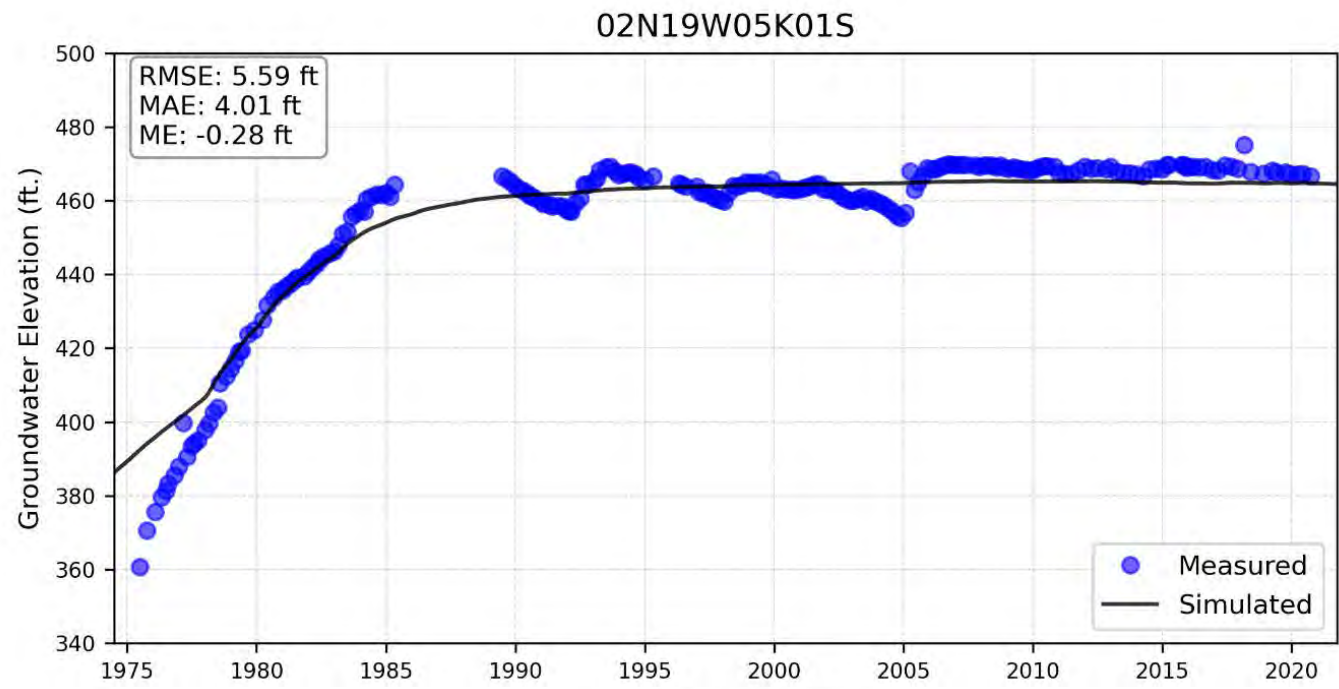


Figure E-2a: Calibration Dataset for the Upper San Pedro Formation

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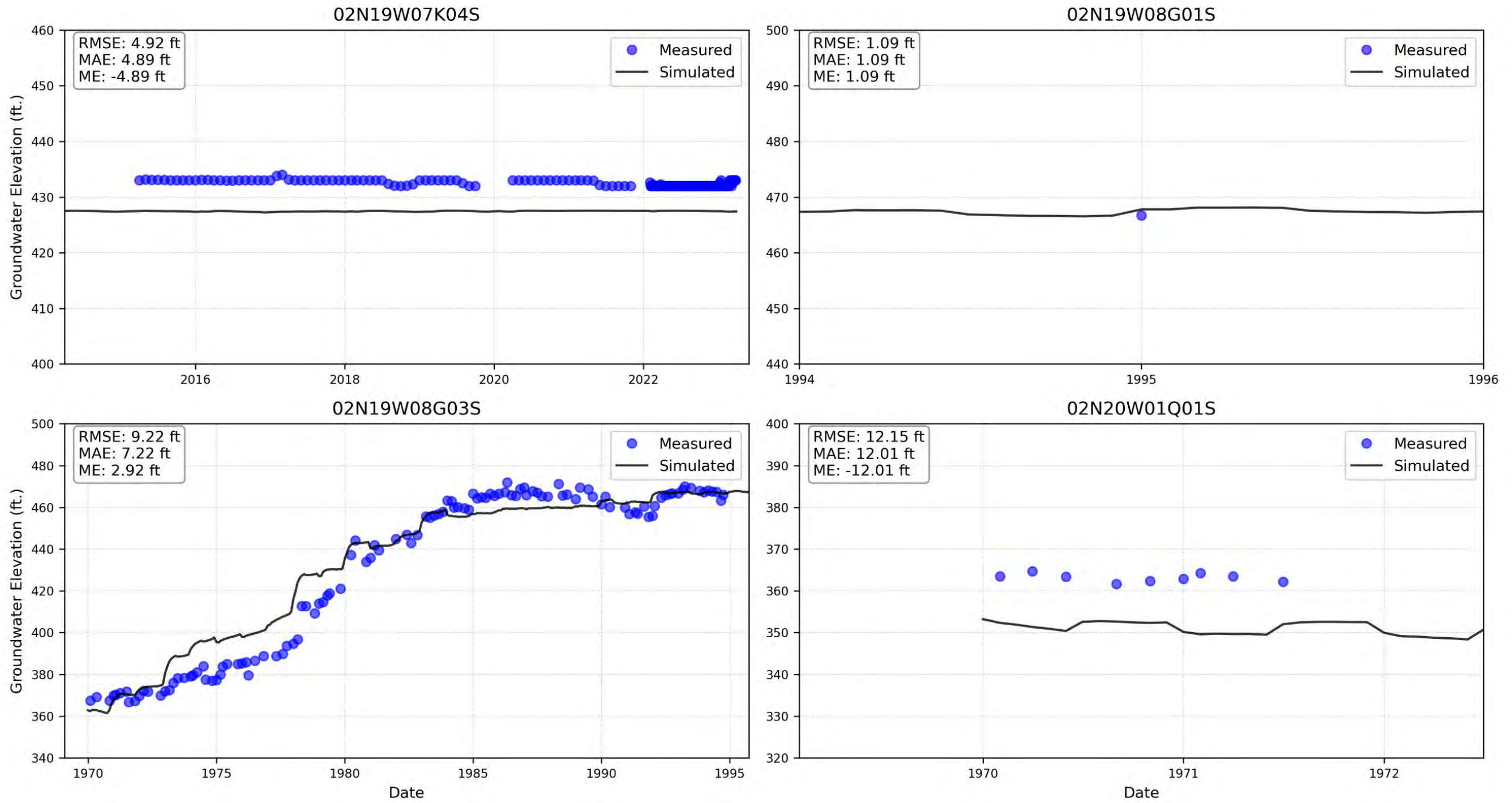


Figure E-2b: Calibration Dataset for the Upper San Pedro Formation

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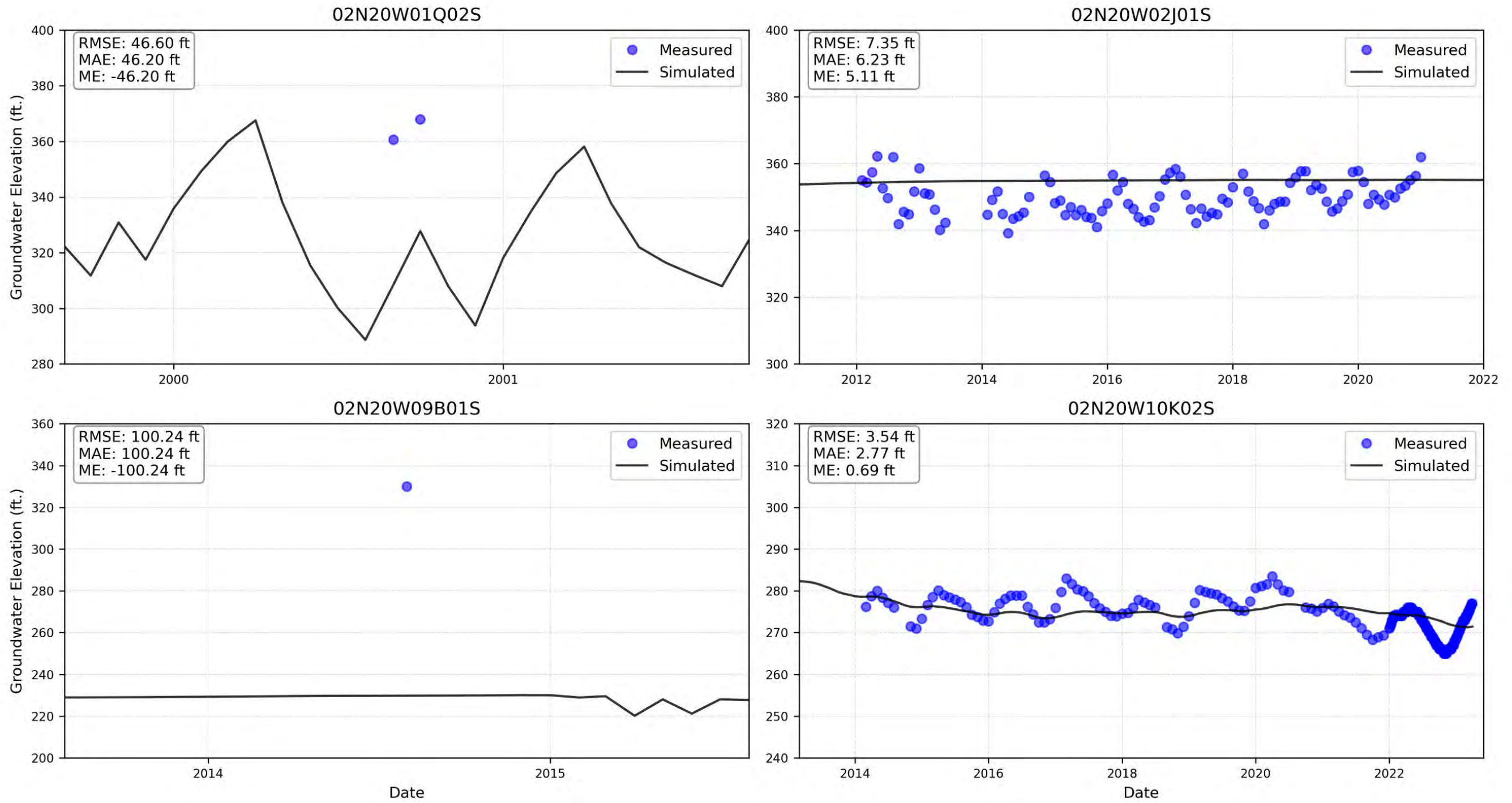


Figure E-2c: Calibration Dataset for the Upper San Pedro Formation

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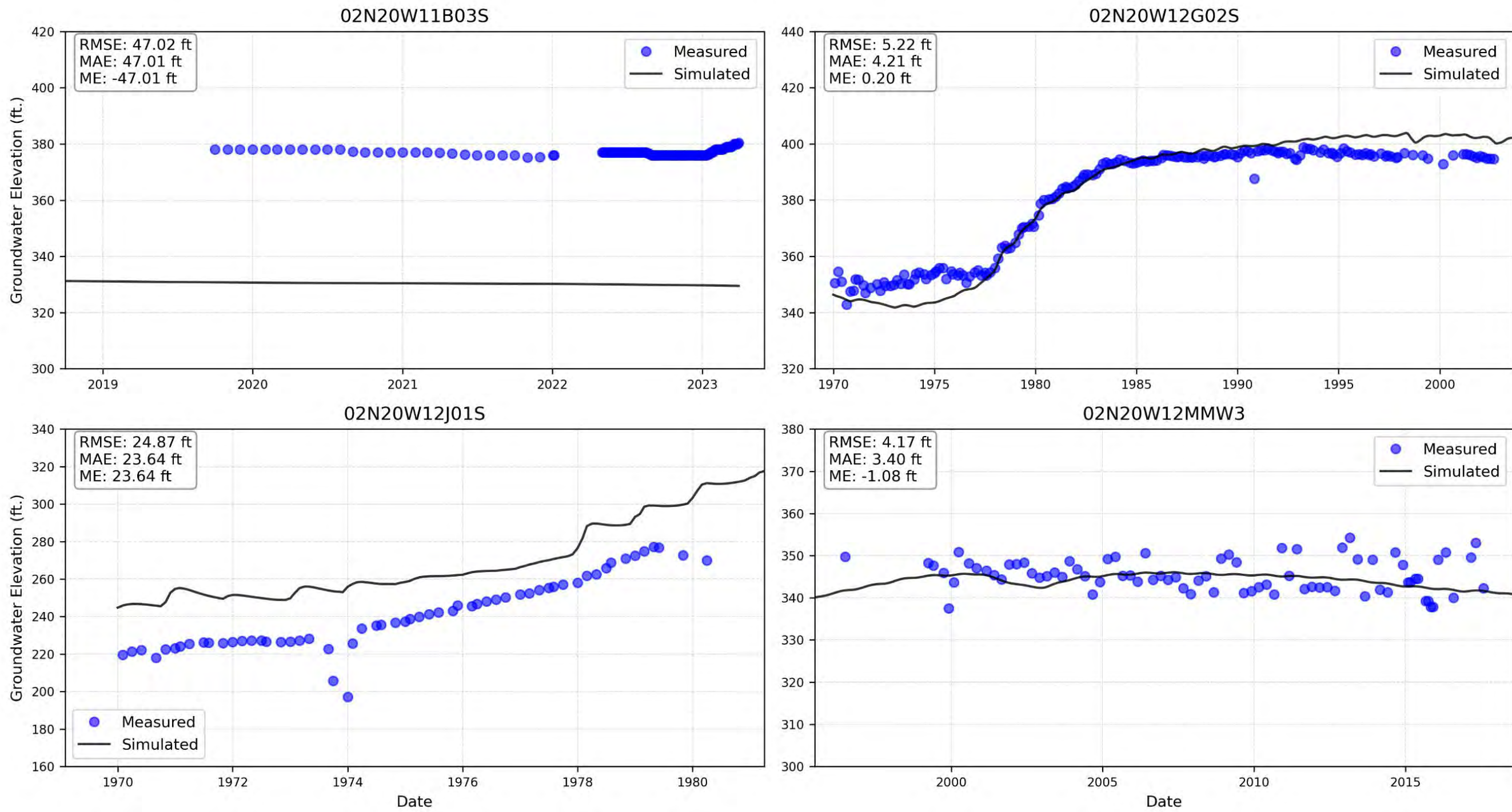


Figure E-2d: Calibration Dataset for the Upper San Pedro Formation

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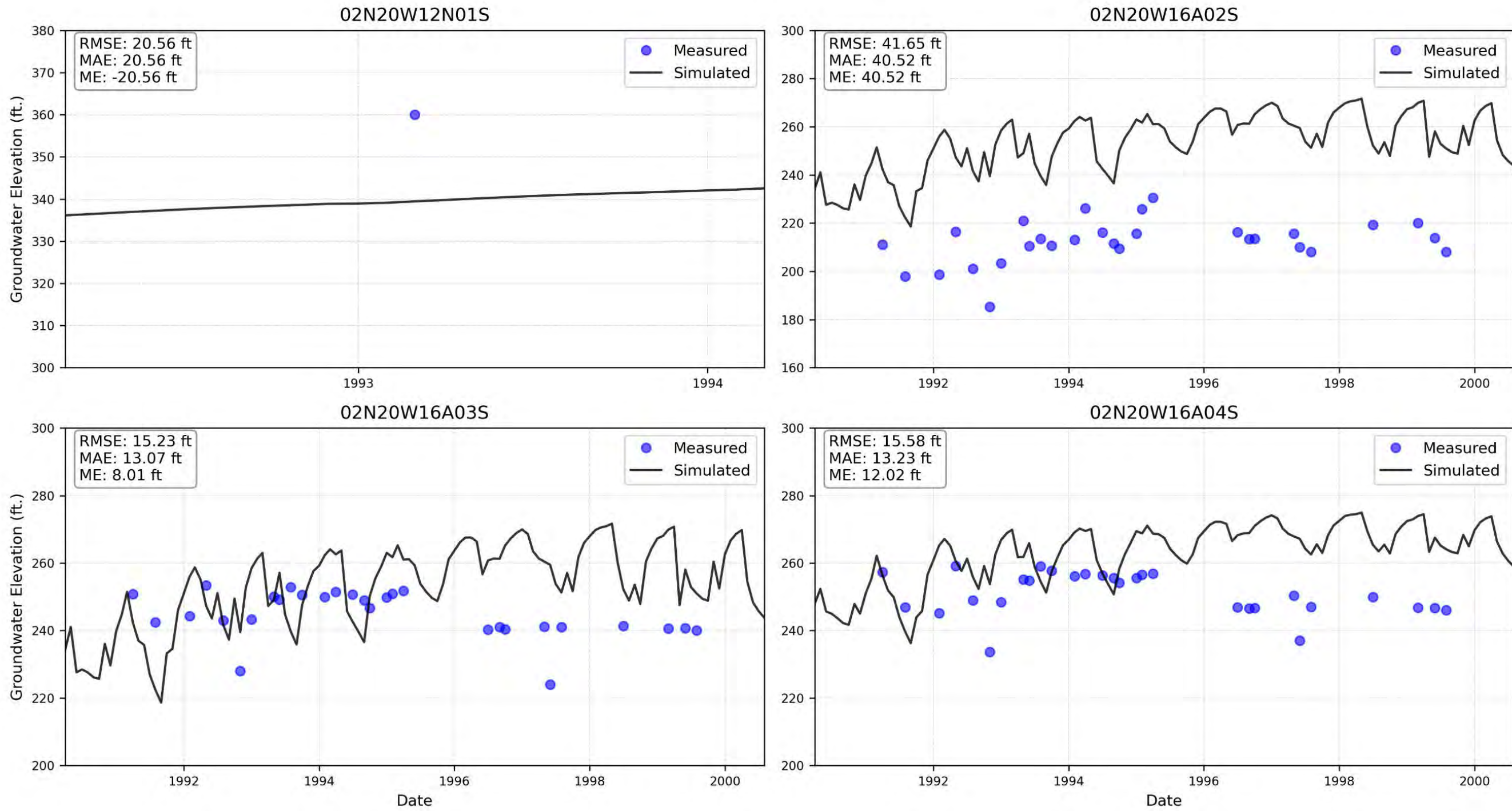


Figure E-2e: Calibration Dataset for the Upper San Pedro Formation

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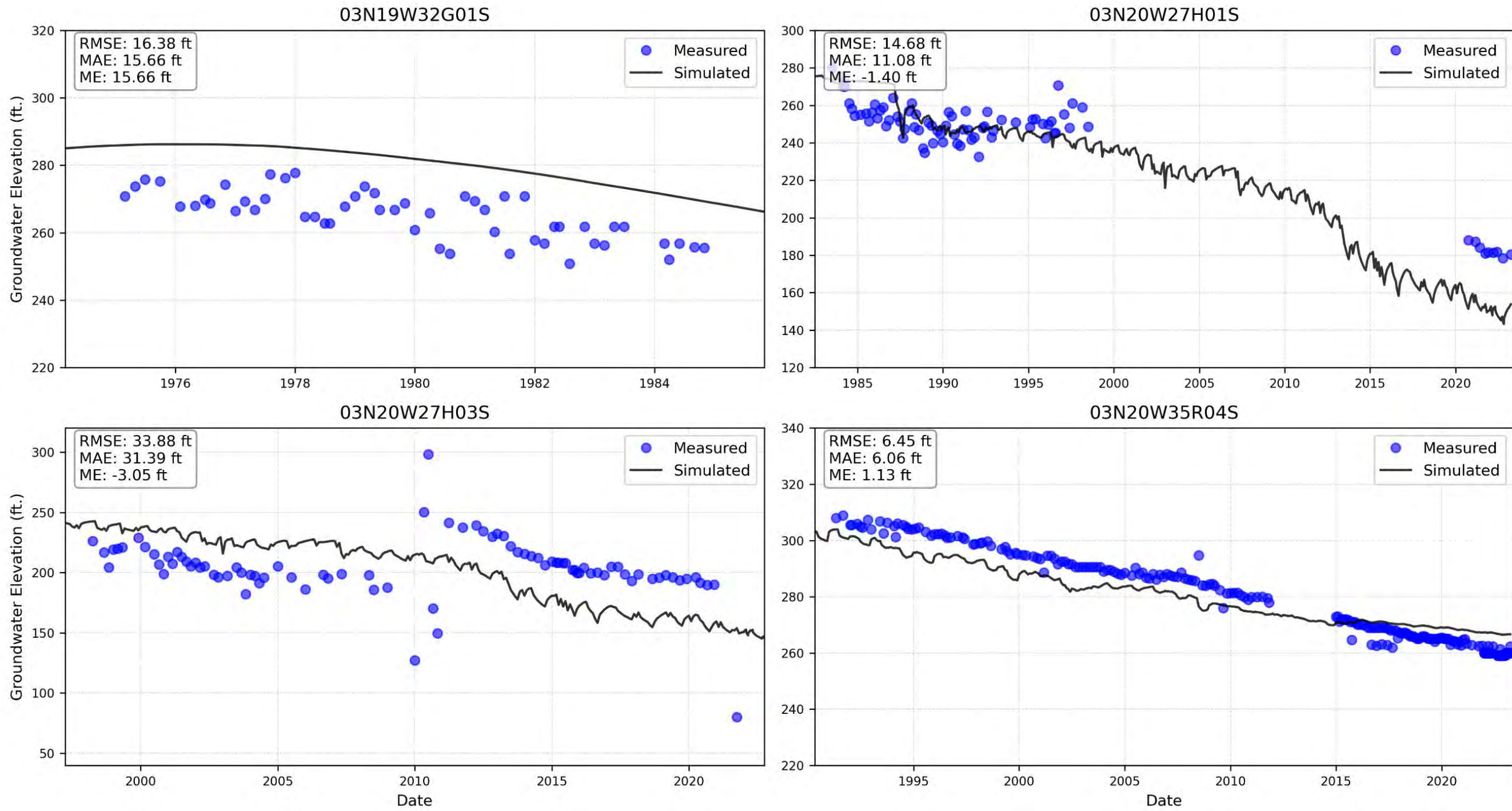


Figure E-2f: Calibration Dataset for the Upper San Pedro Formation

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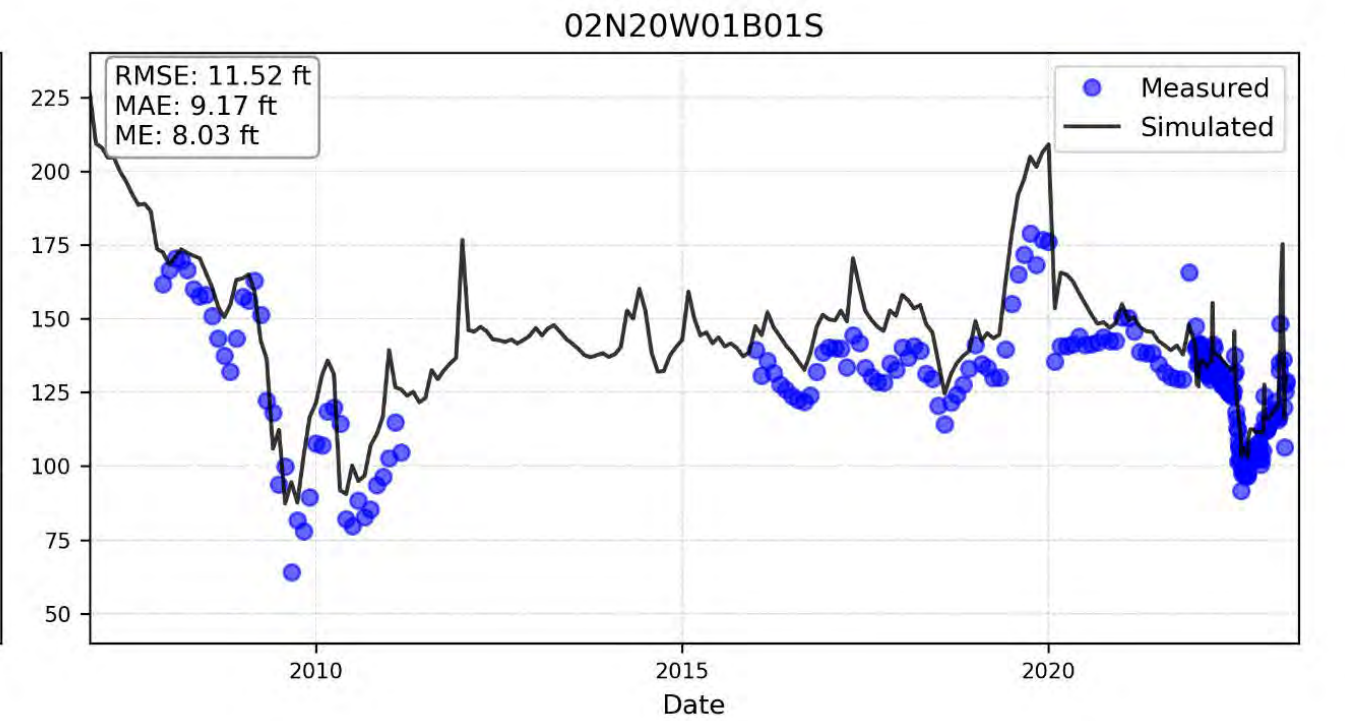
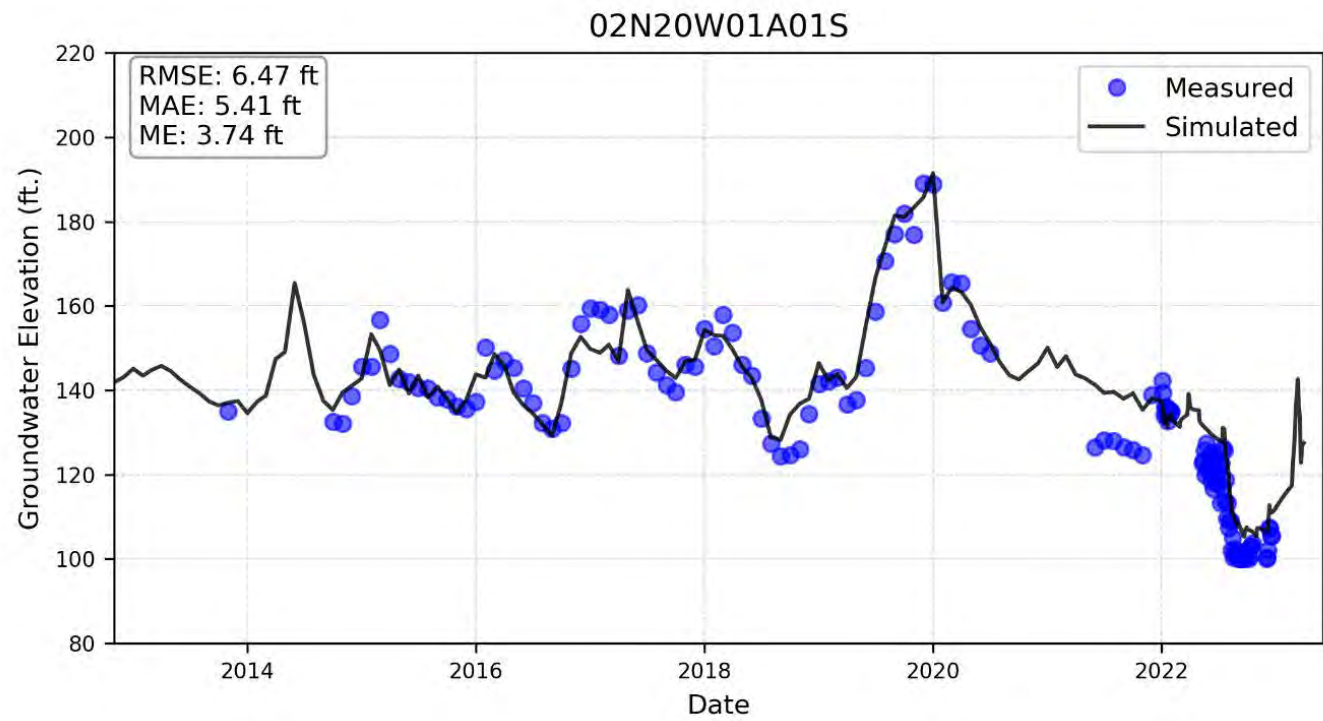
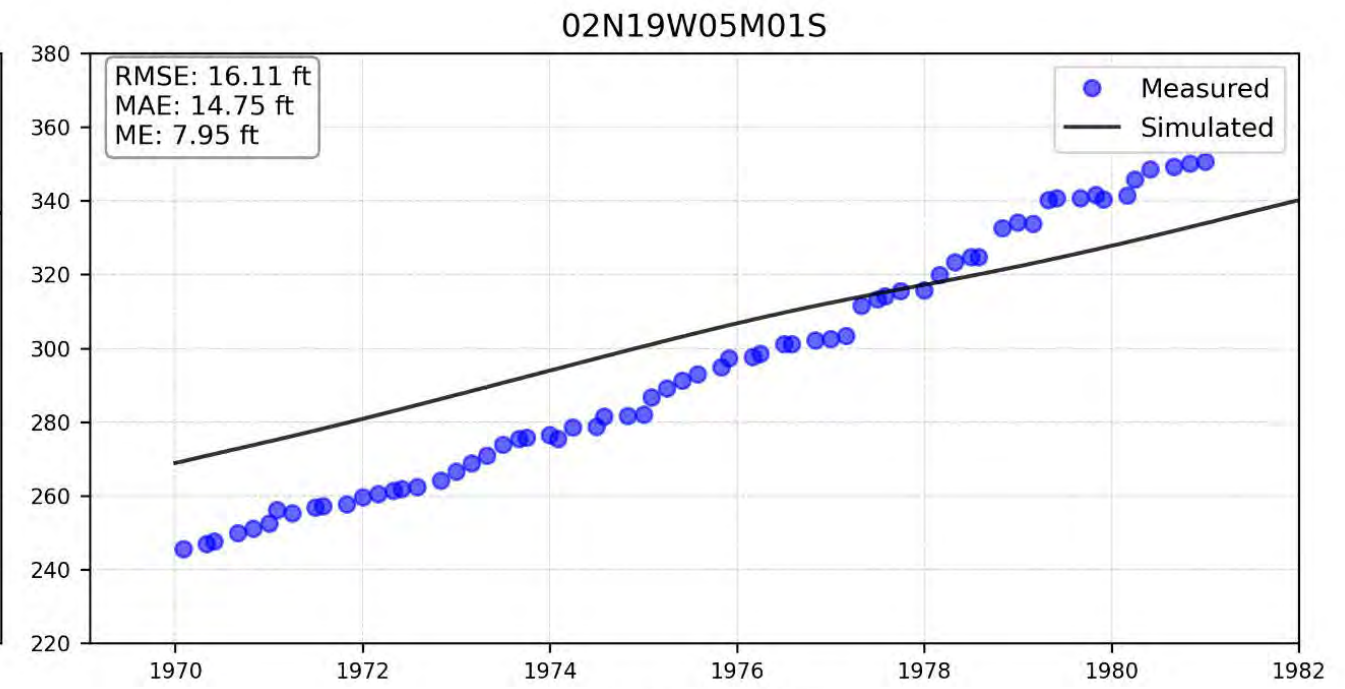
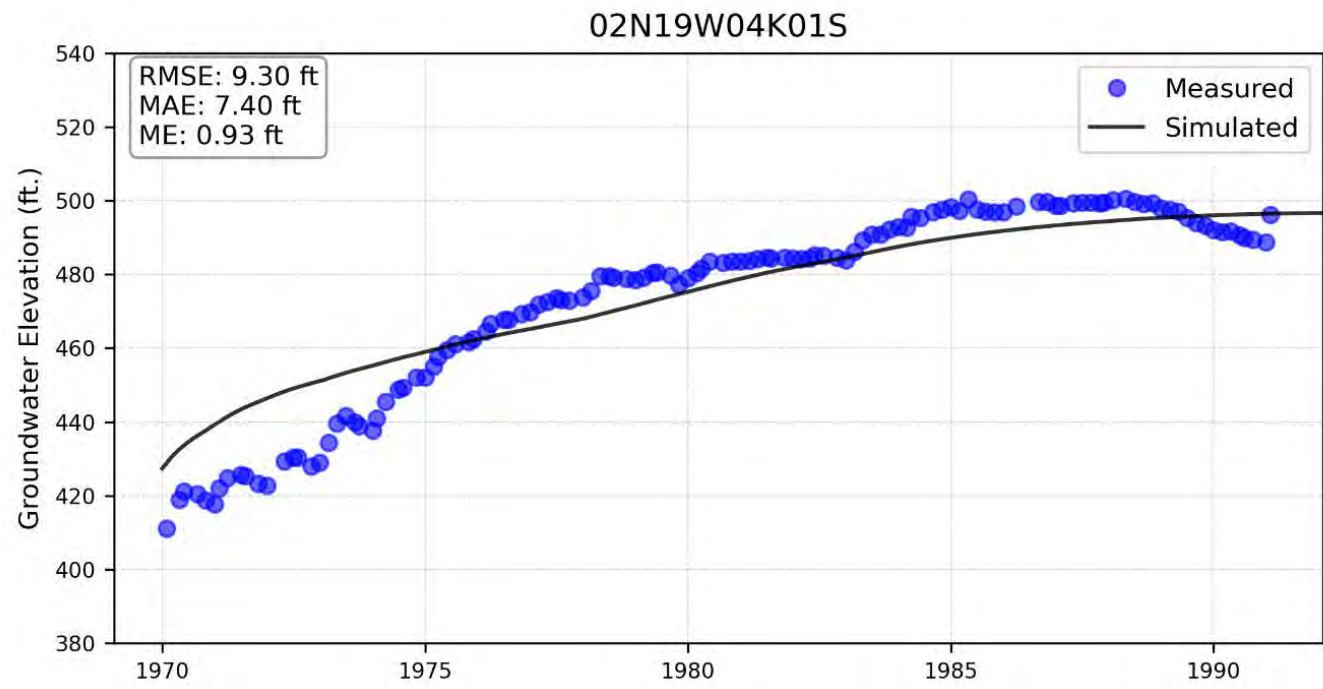


Figure E-3a: Calibration Dataset for the Fox Canyon Aquifer

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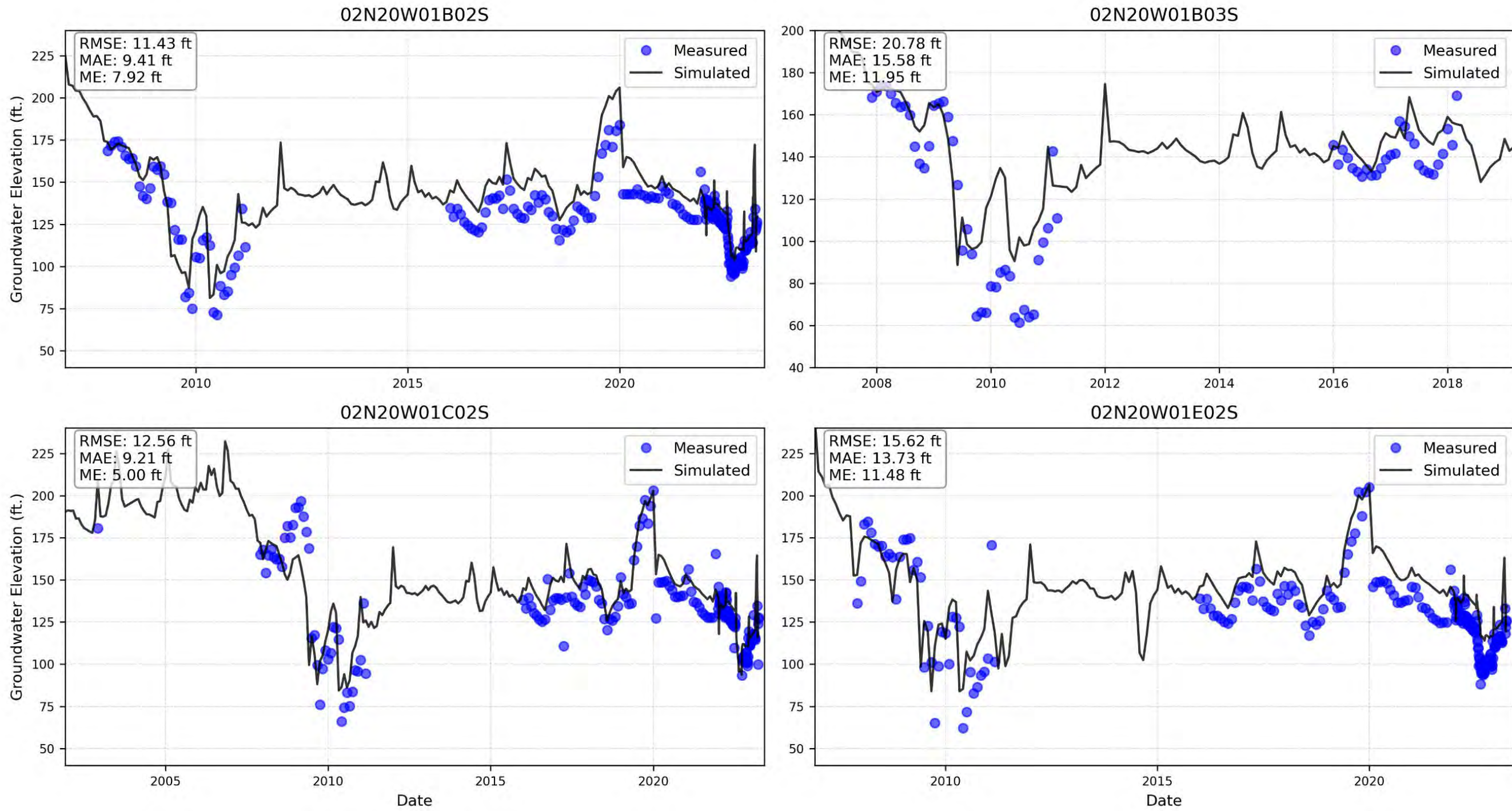


Figure E-3b: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

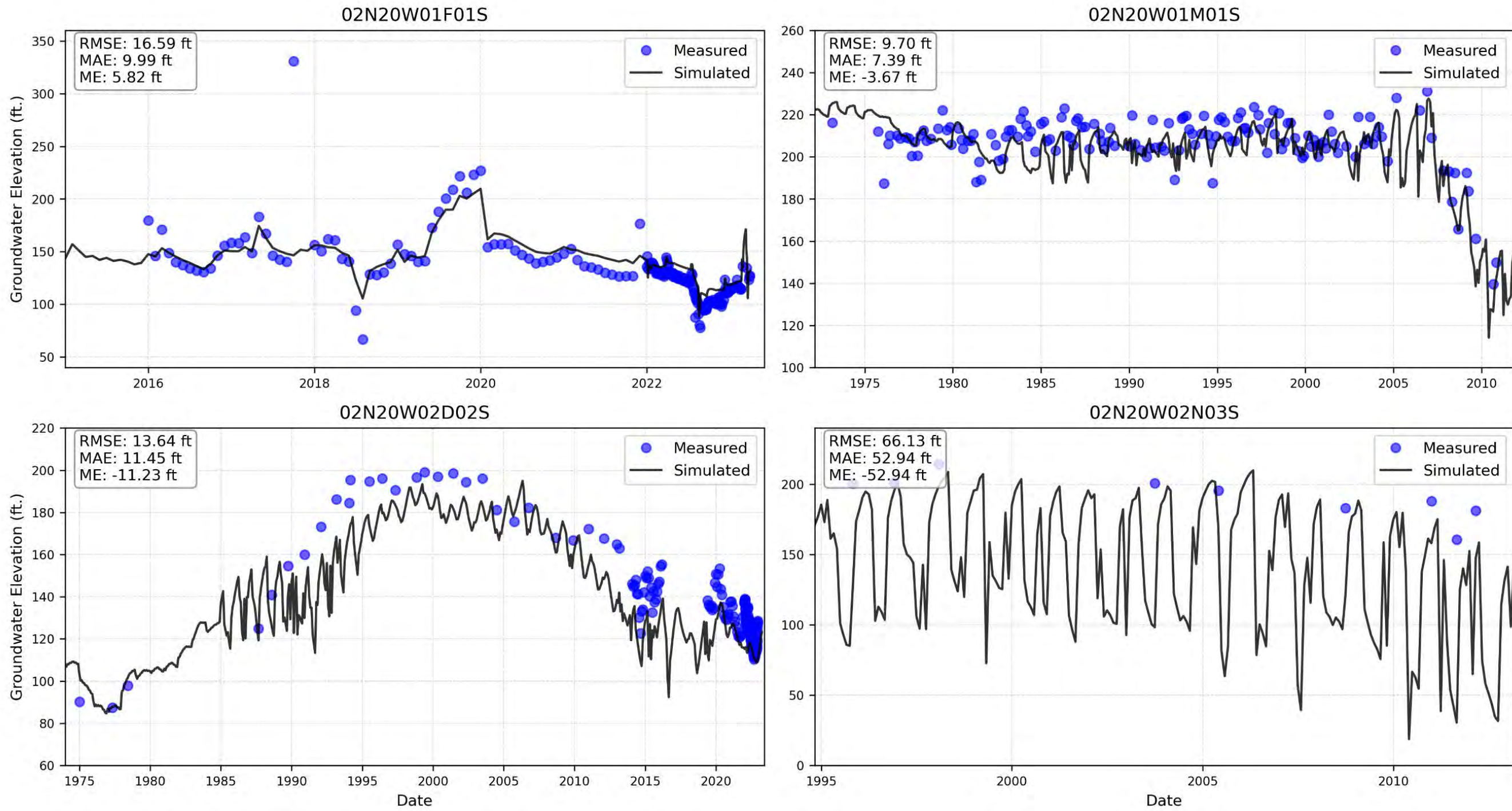


Figure E-3c: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

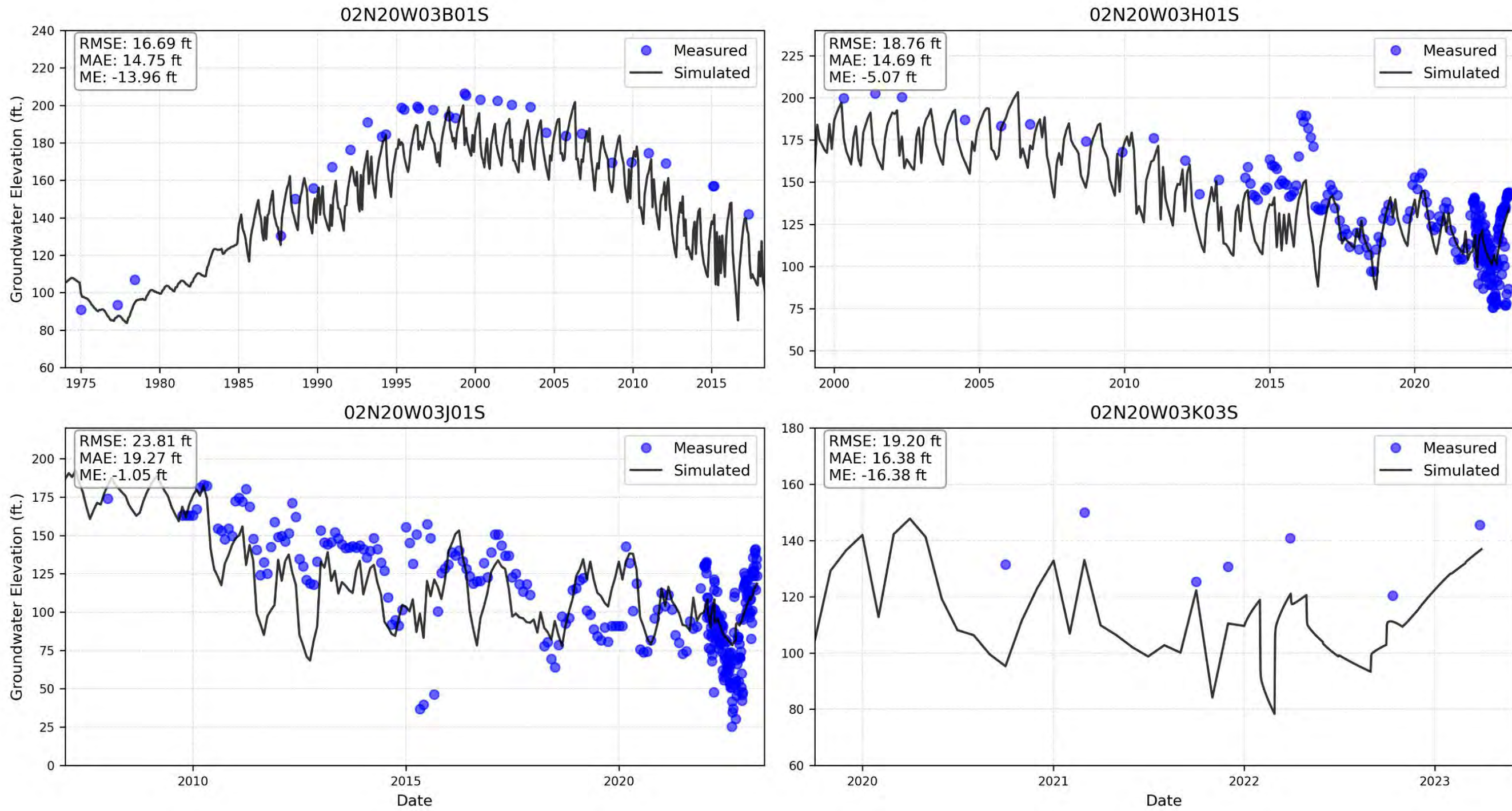


Figure E-3d: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

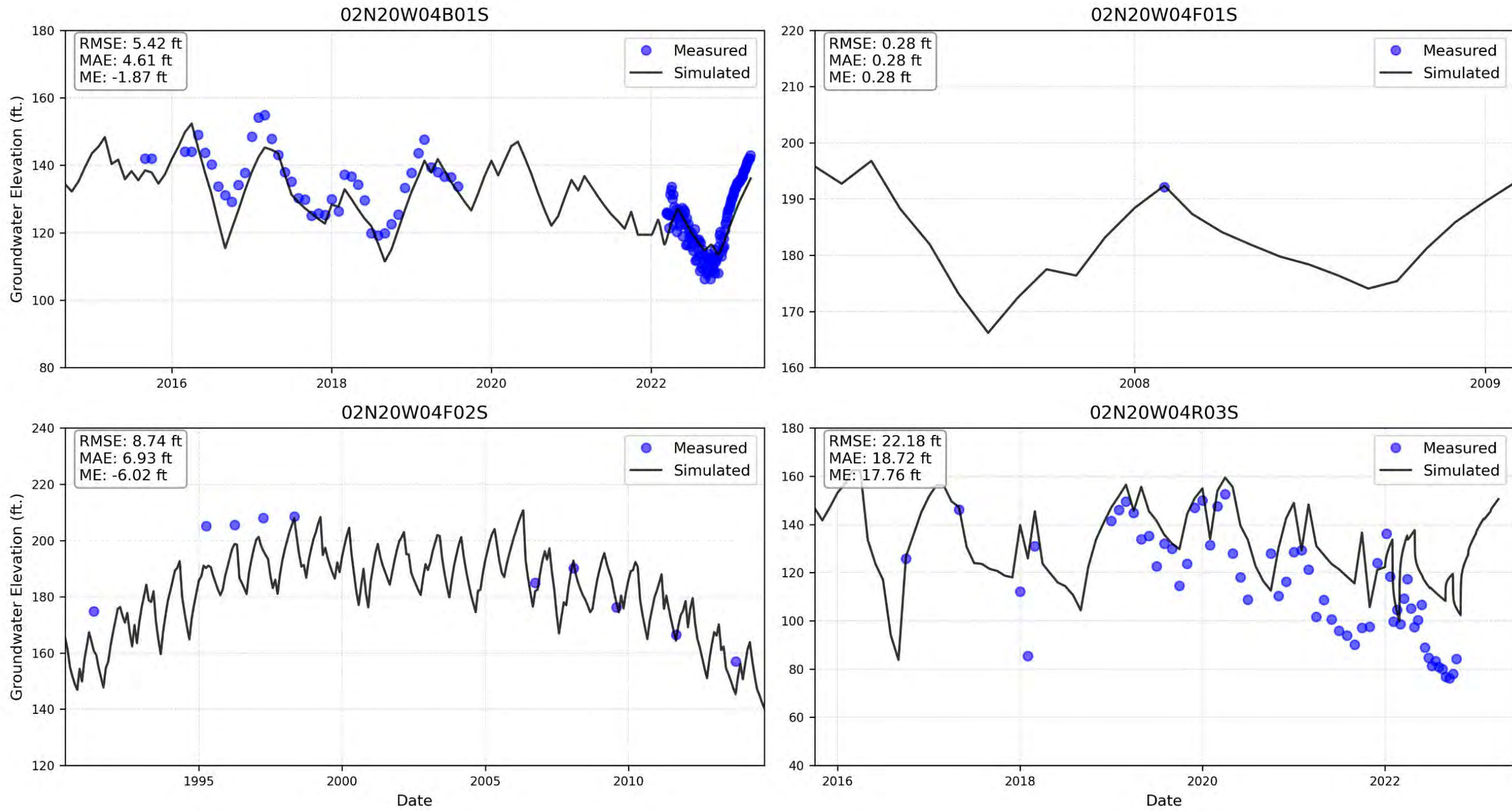


Figure E-3e: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

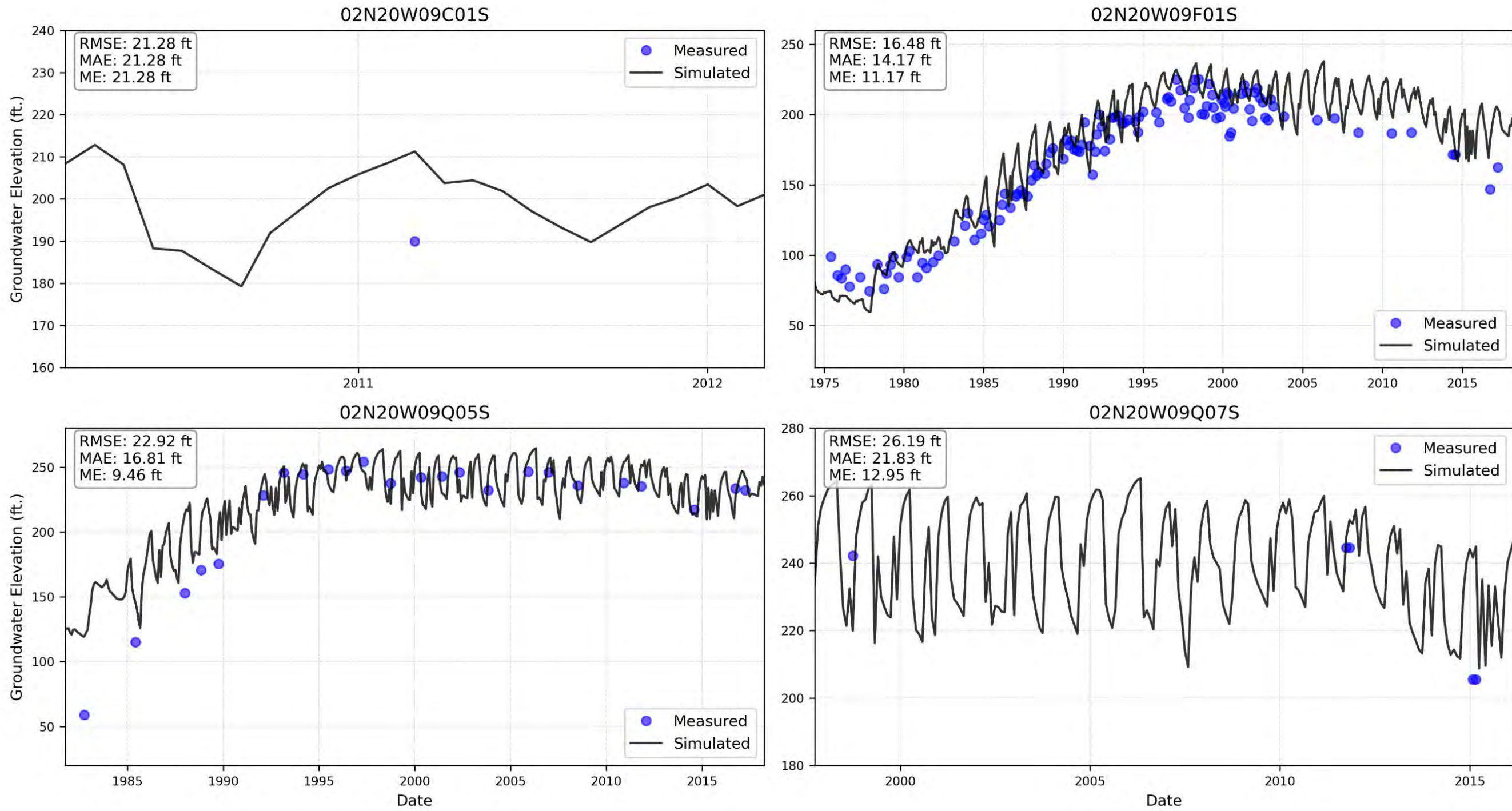


Figure E-3f: Calibration Dataset for the Fox Canyon Aquifer

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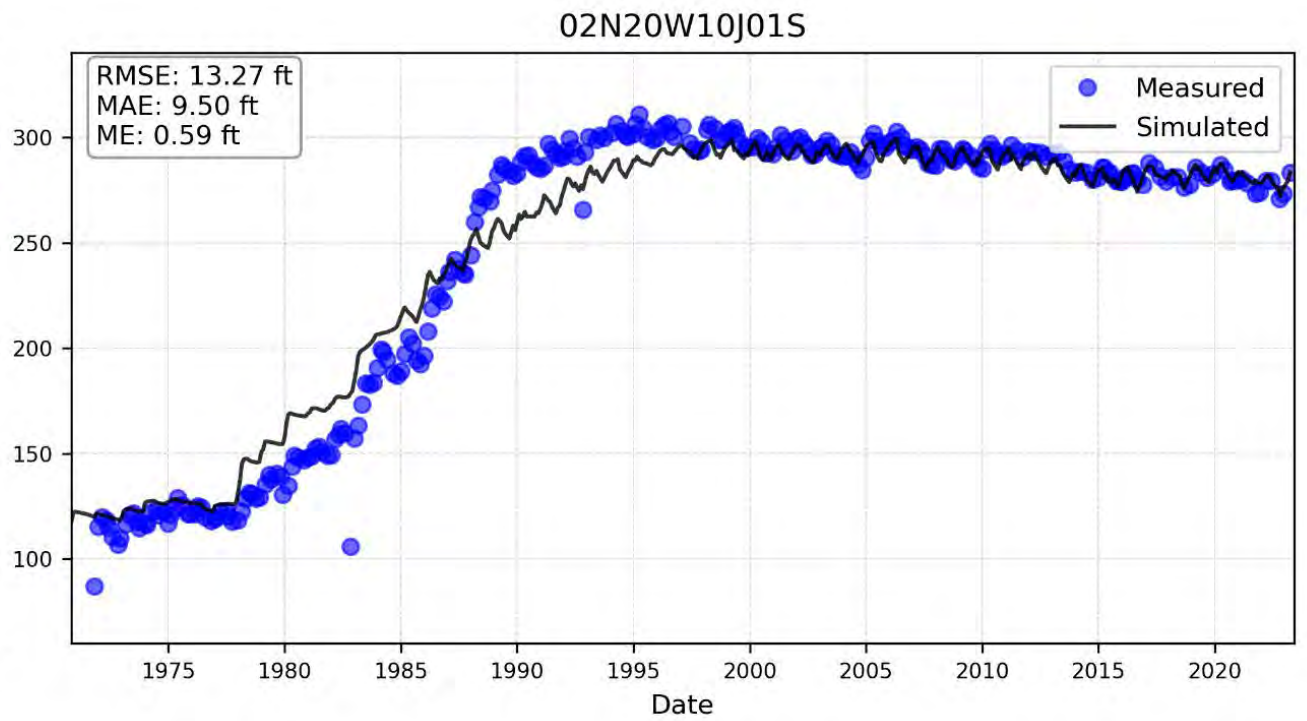
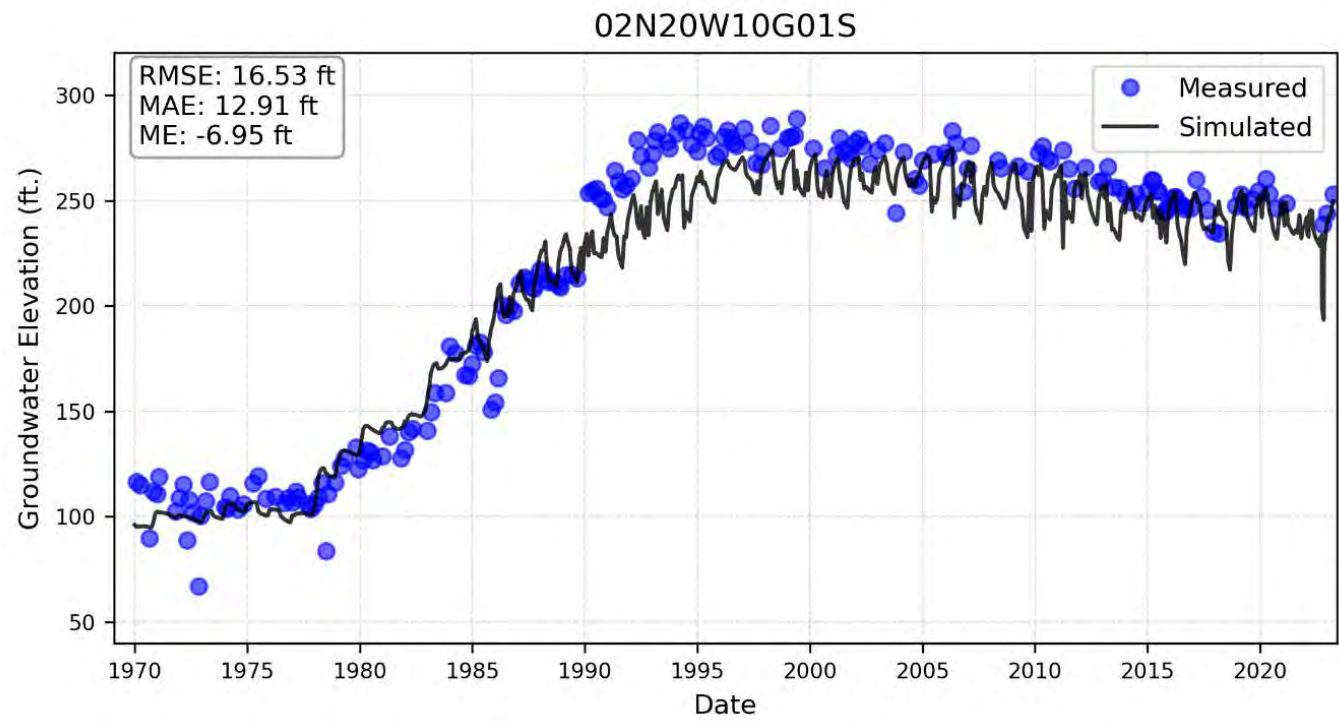
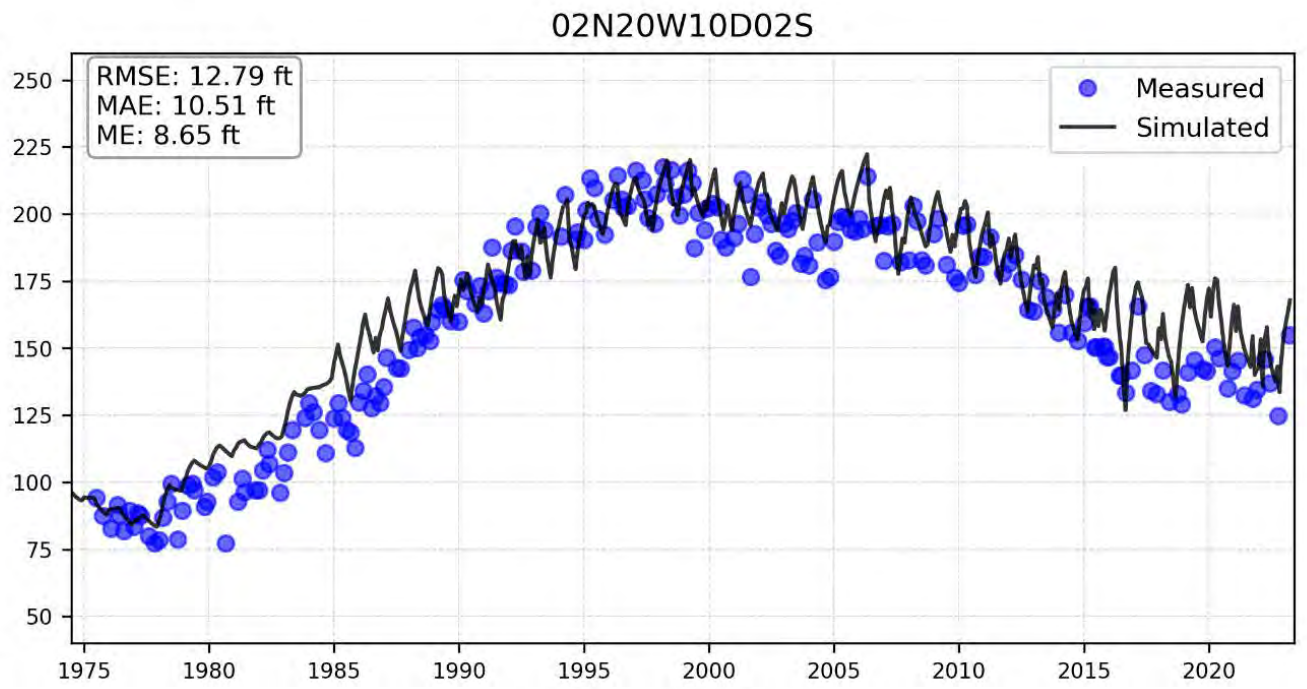
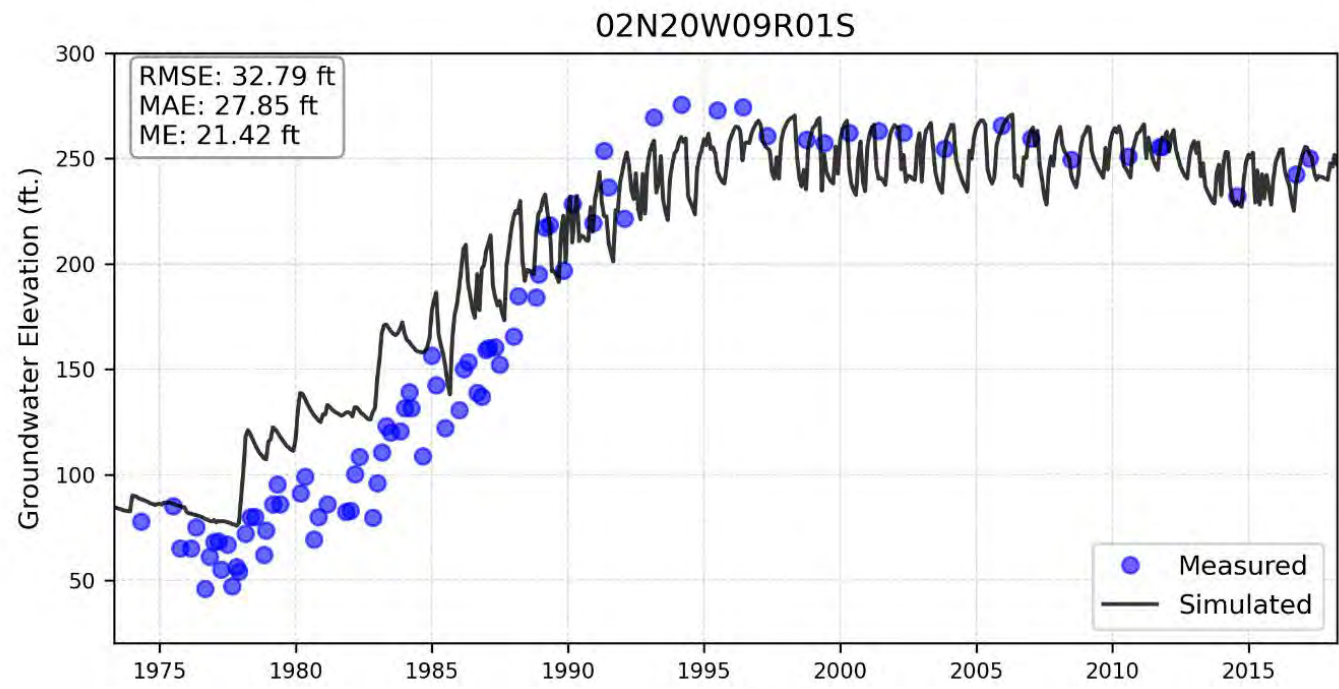


Figure E-3g: Calibration Dataset for the Fox Canyon Aquifer

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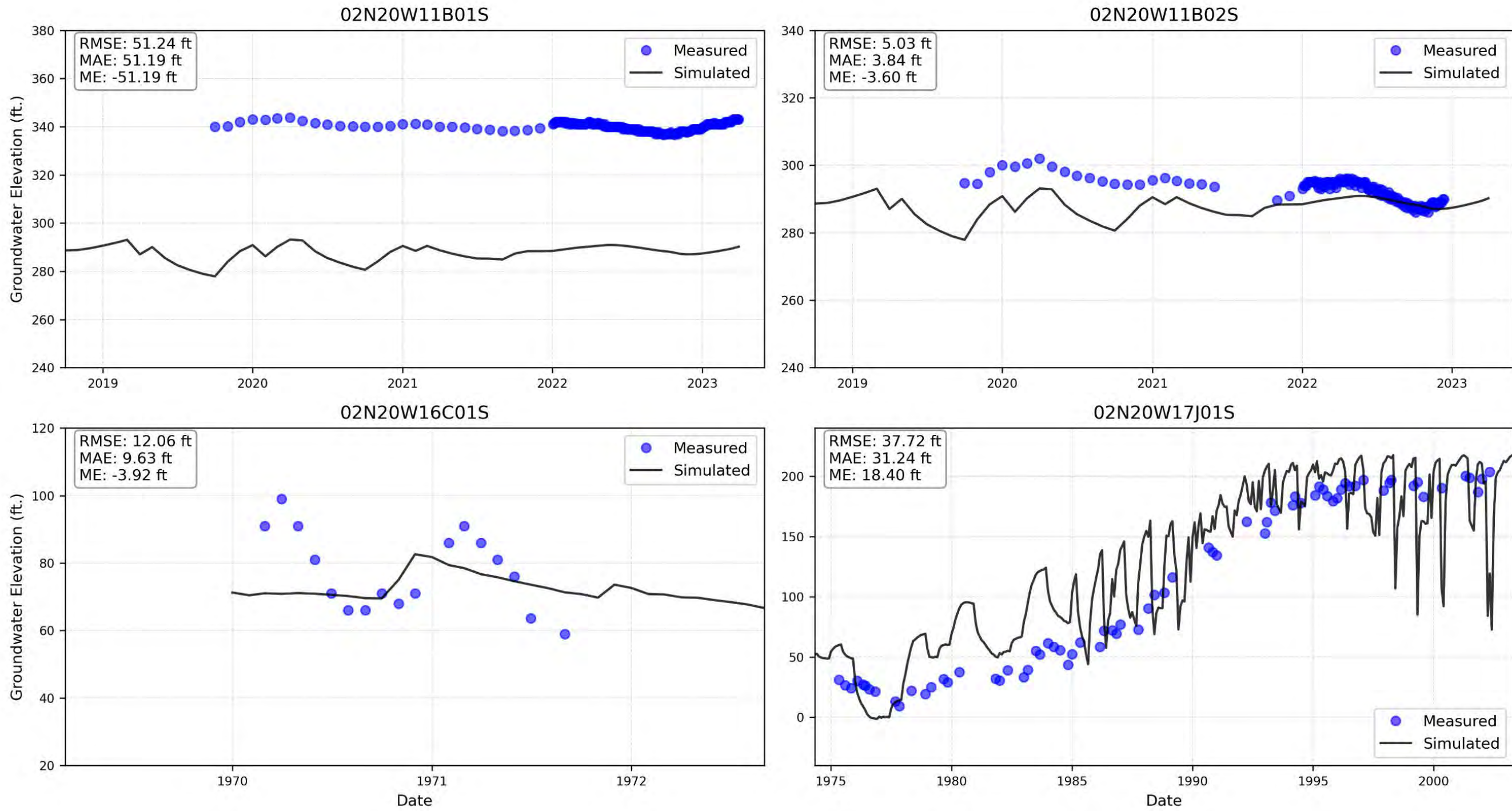


Figure E-3h: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

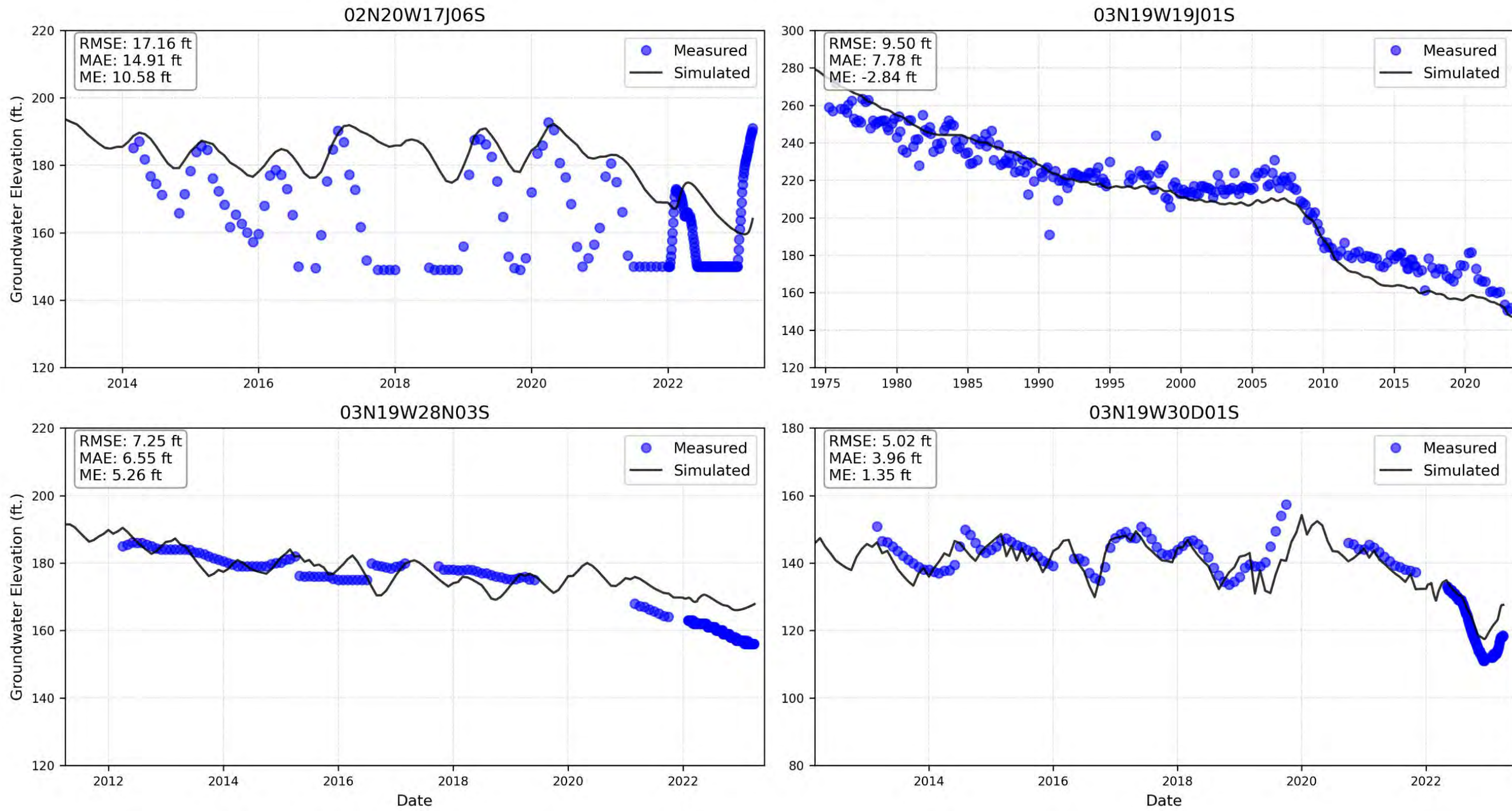


Figure E-3i: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

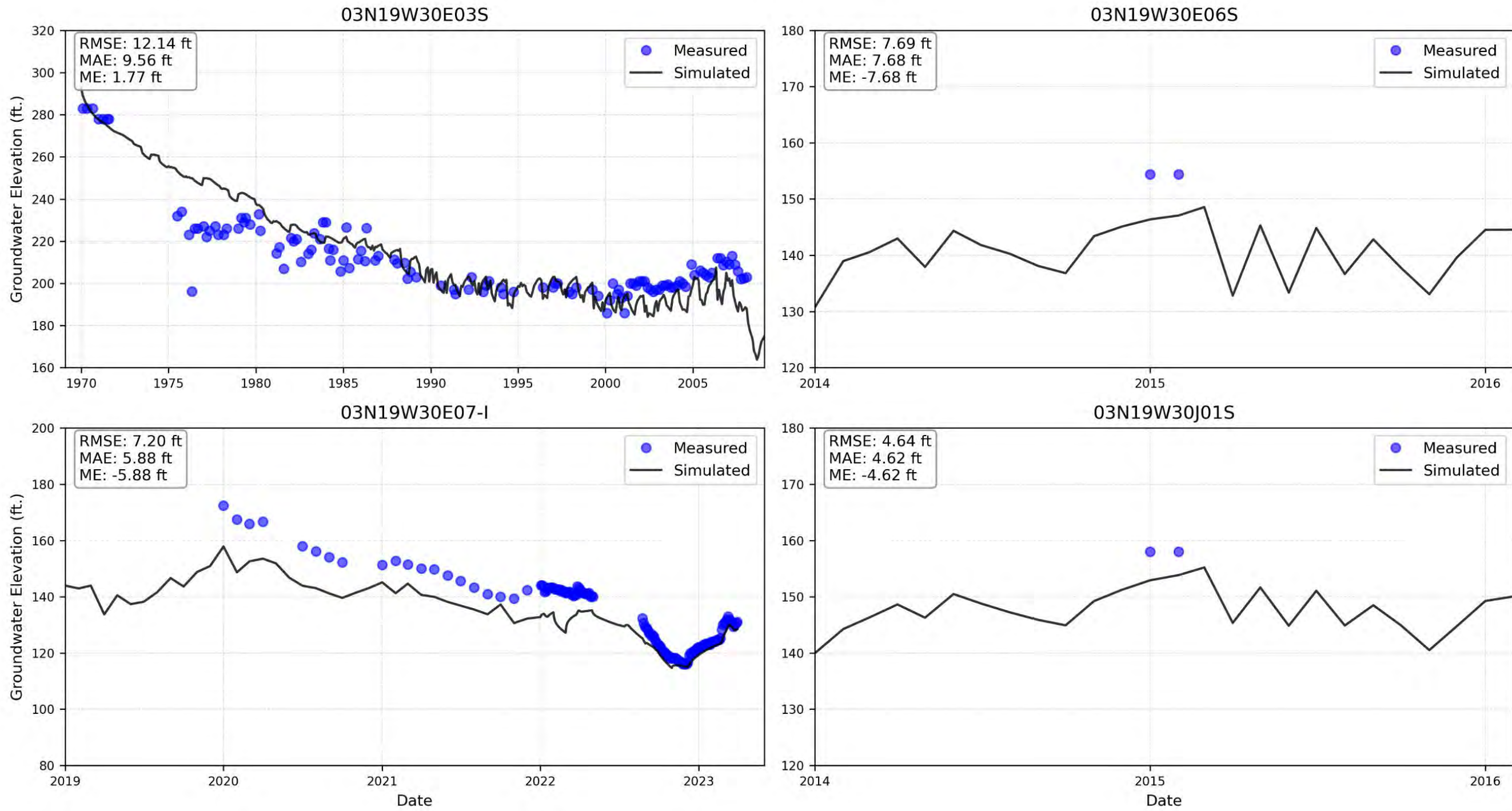


Figure E-3j: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

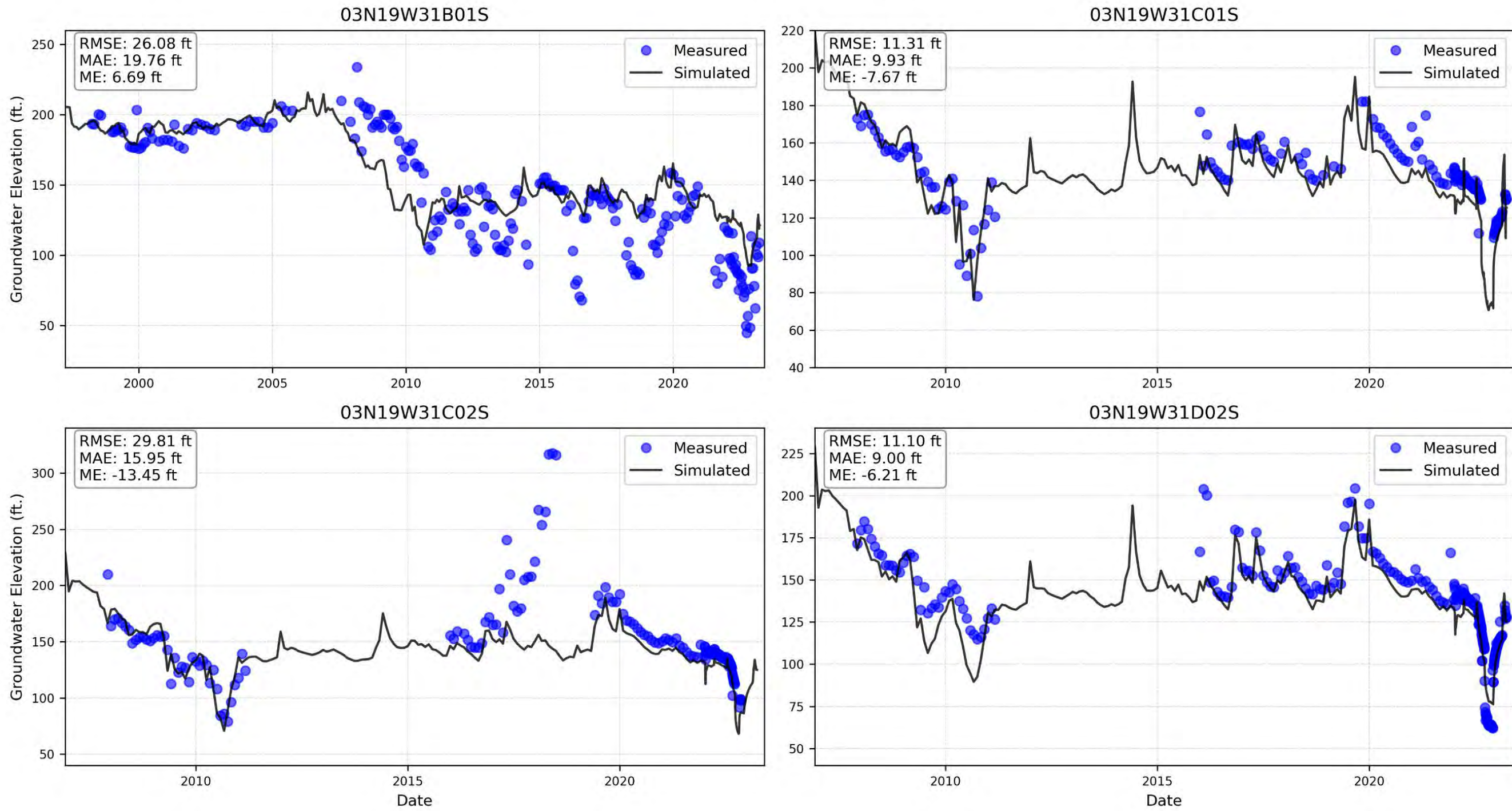


Figure E-3k: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

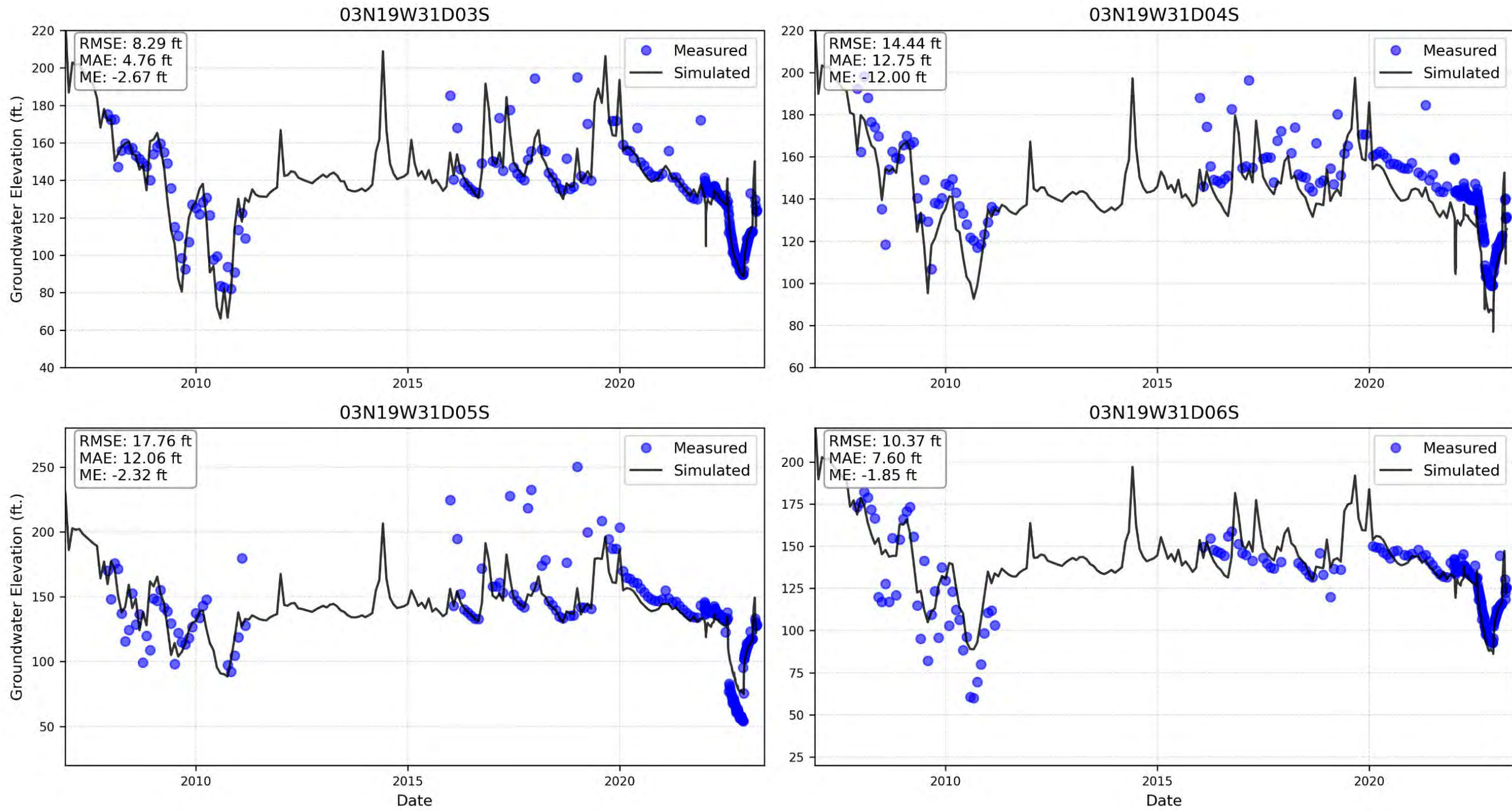


Figure E-3I: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

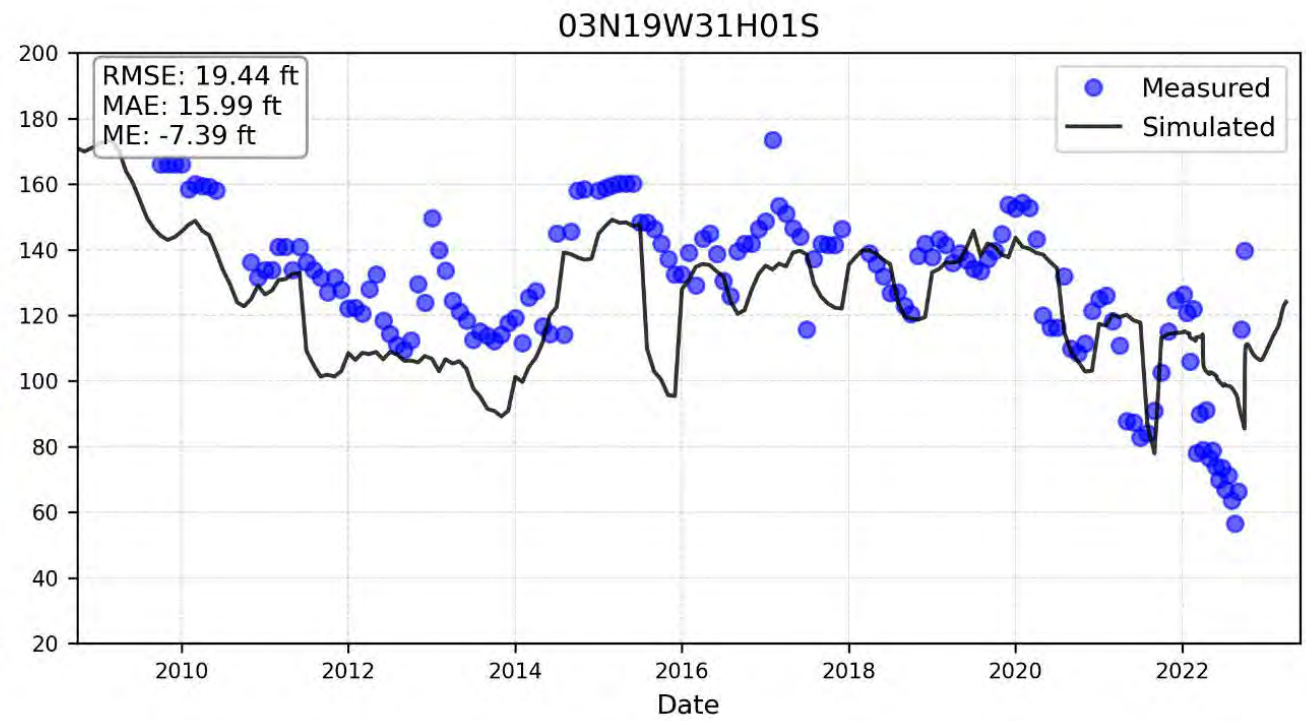
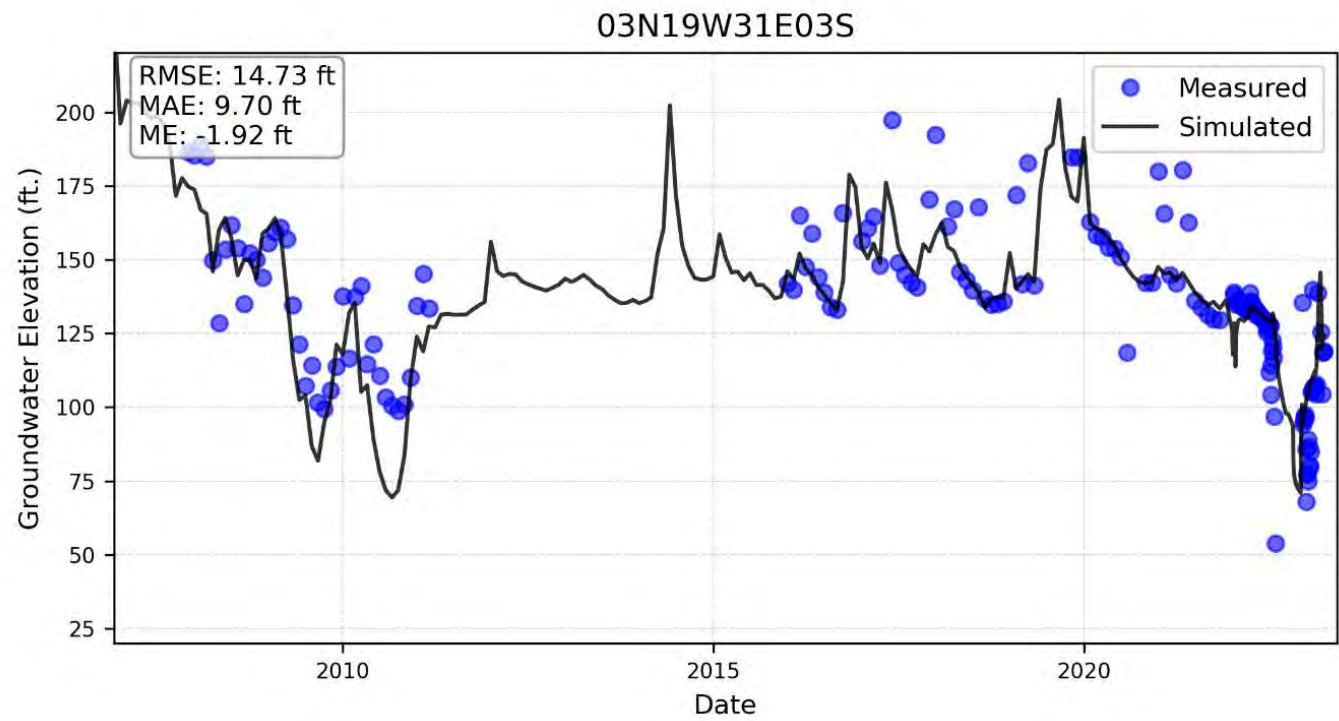
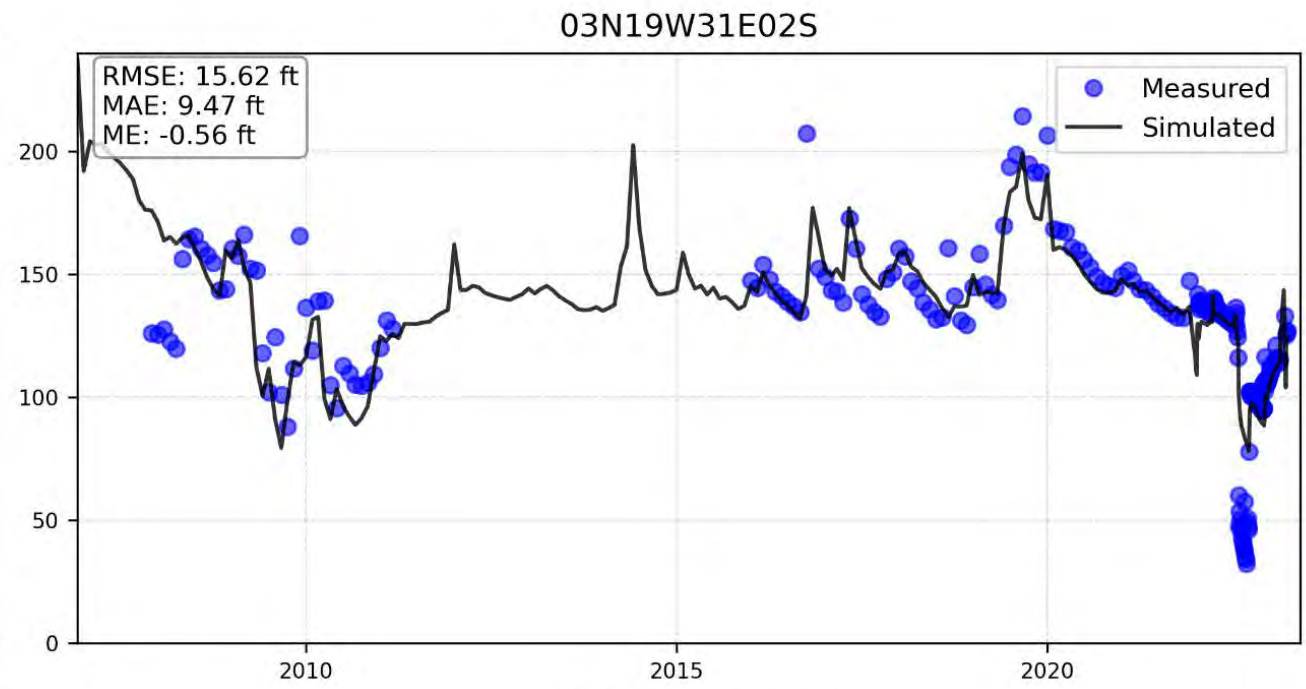
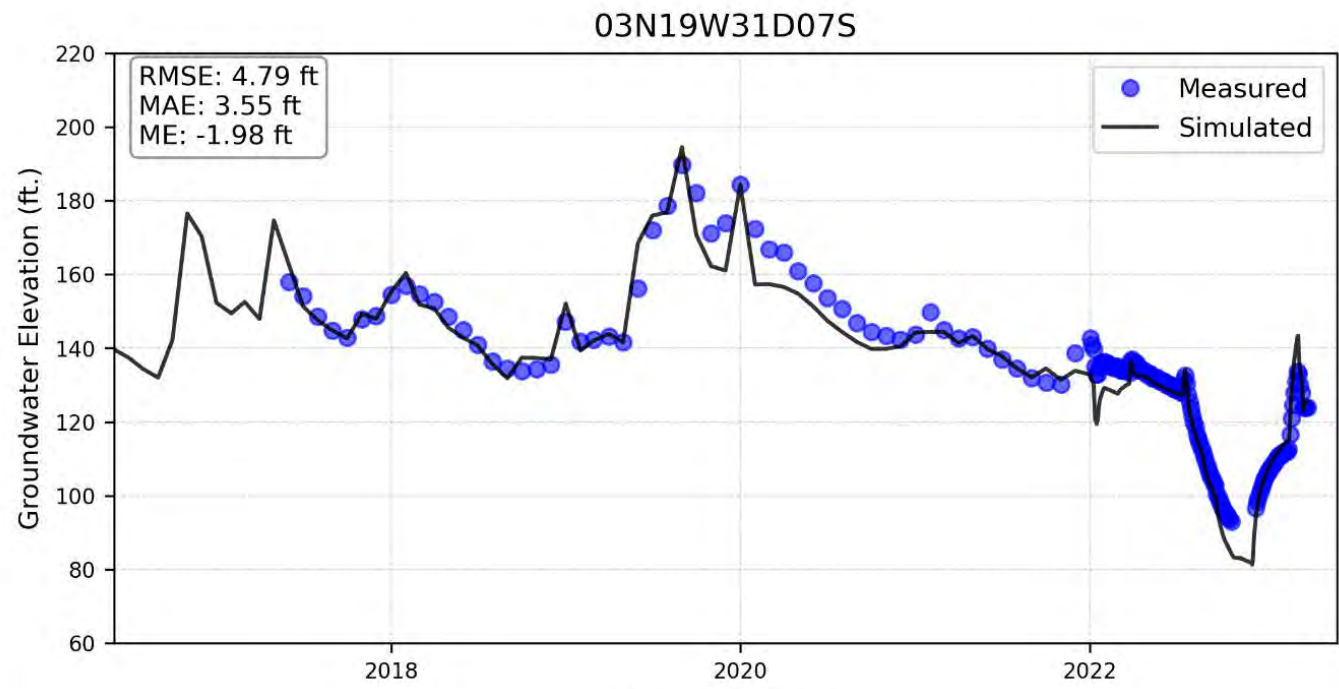


Figure E-3m: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

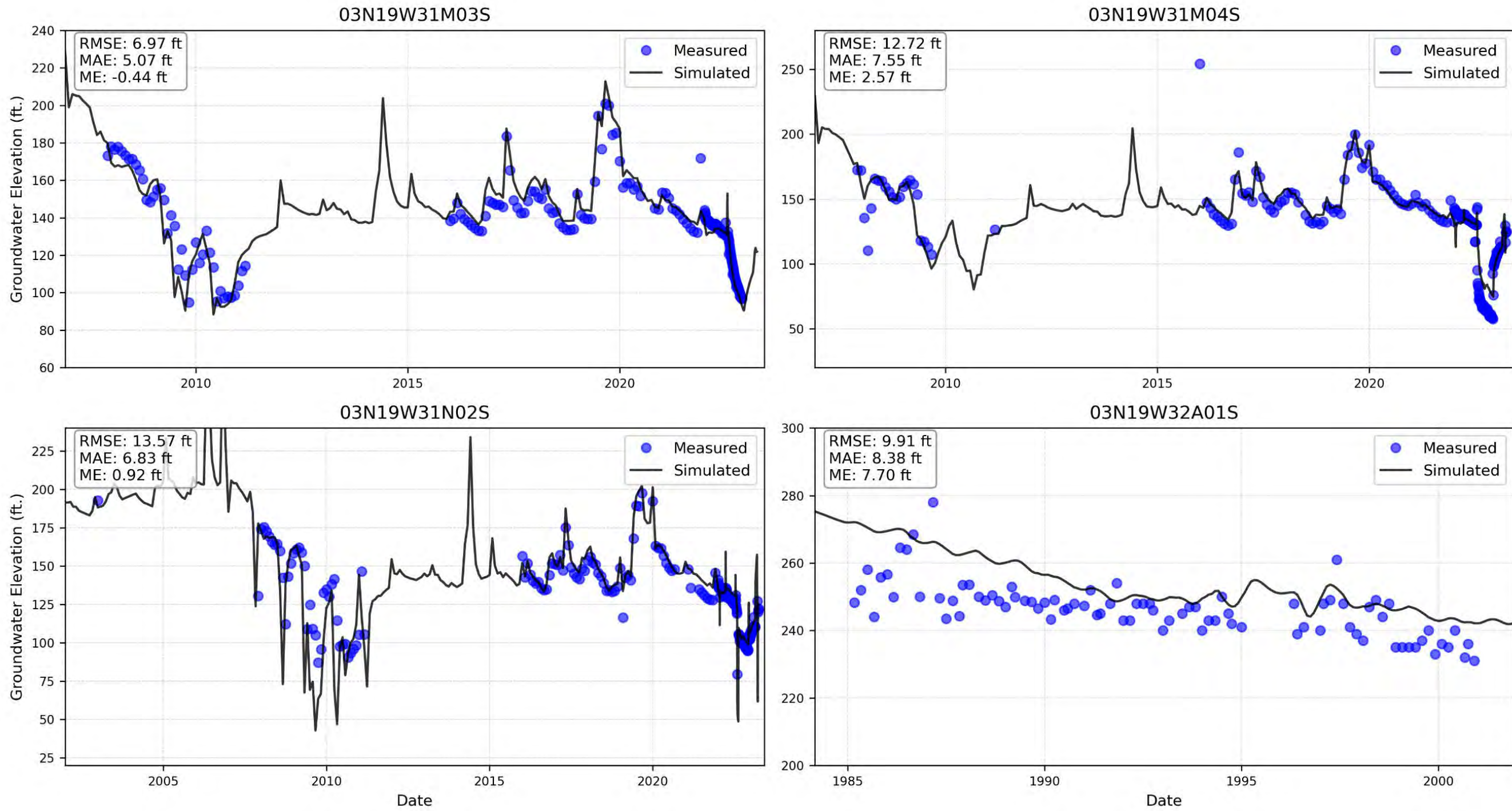


Figure E-3n: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

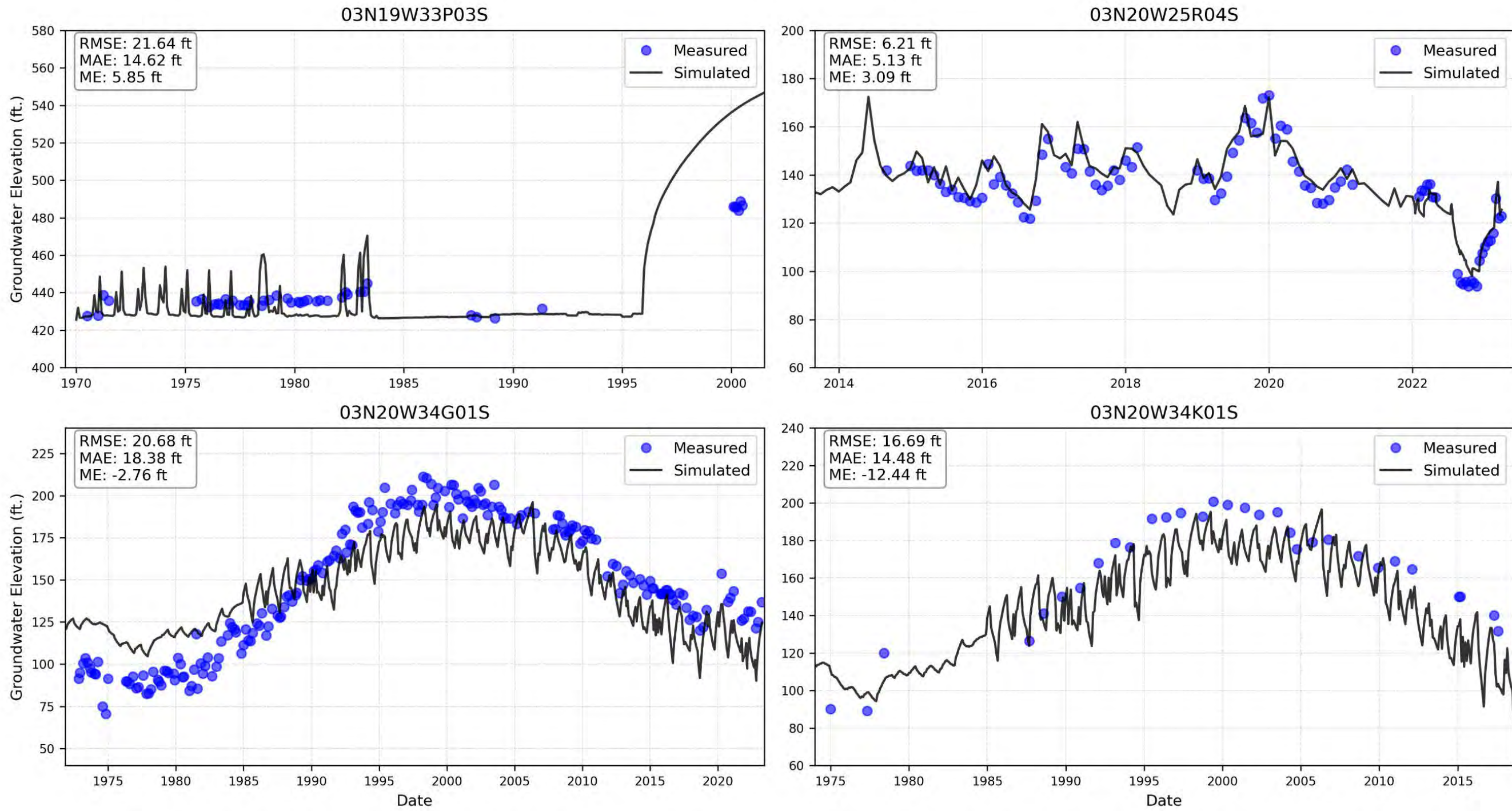


Figure E-3o: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

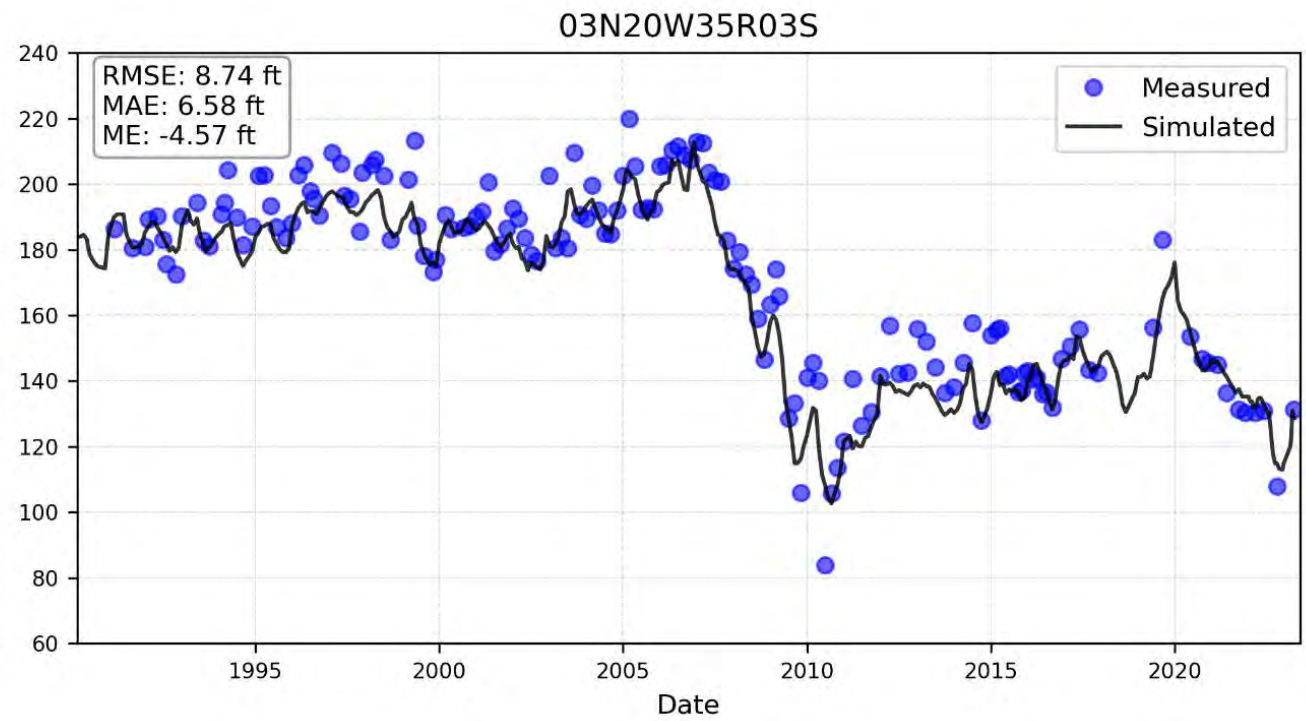
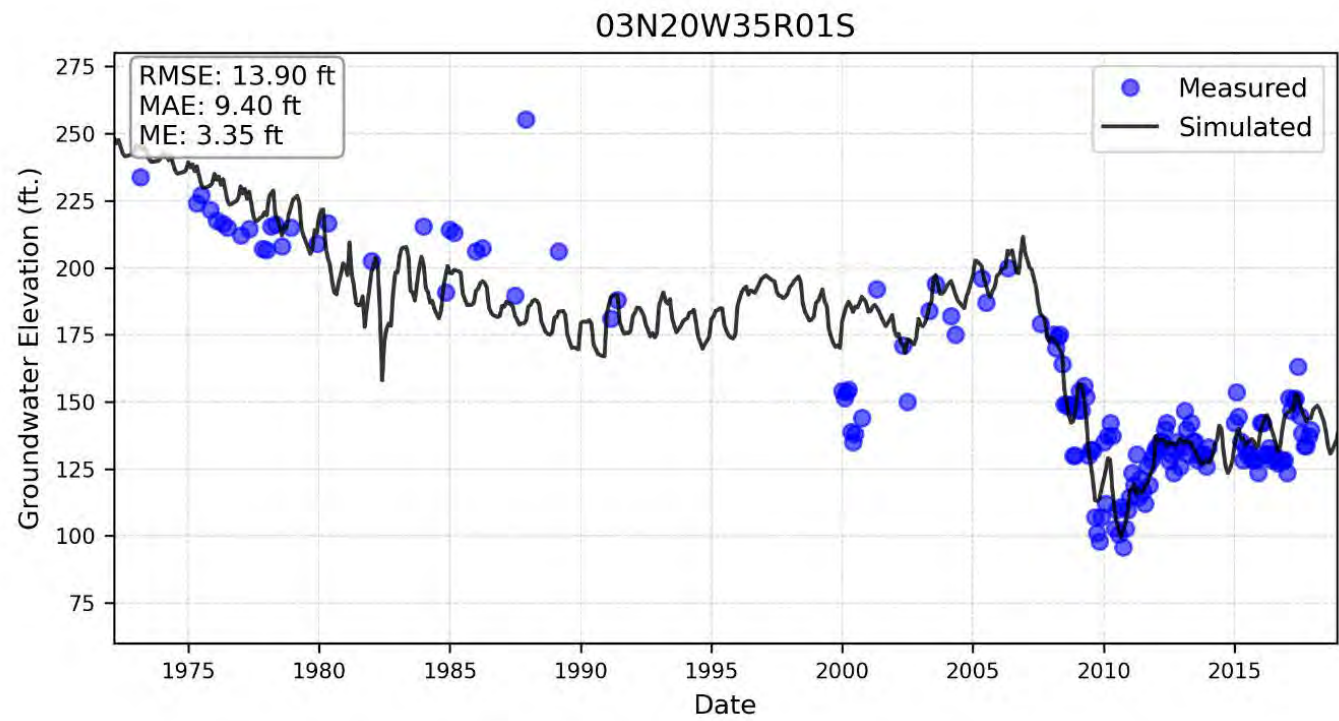
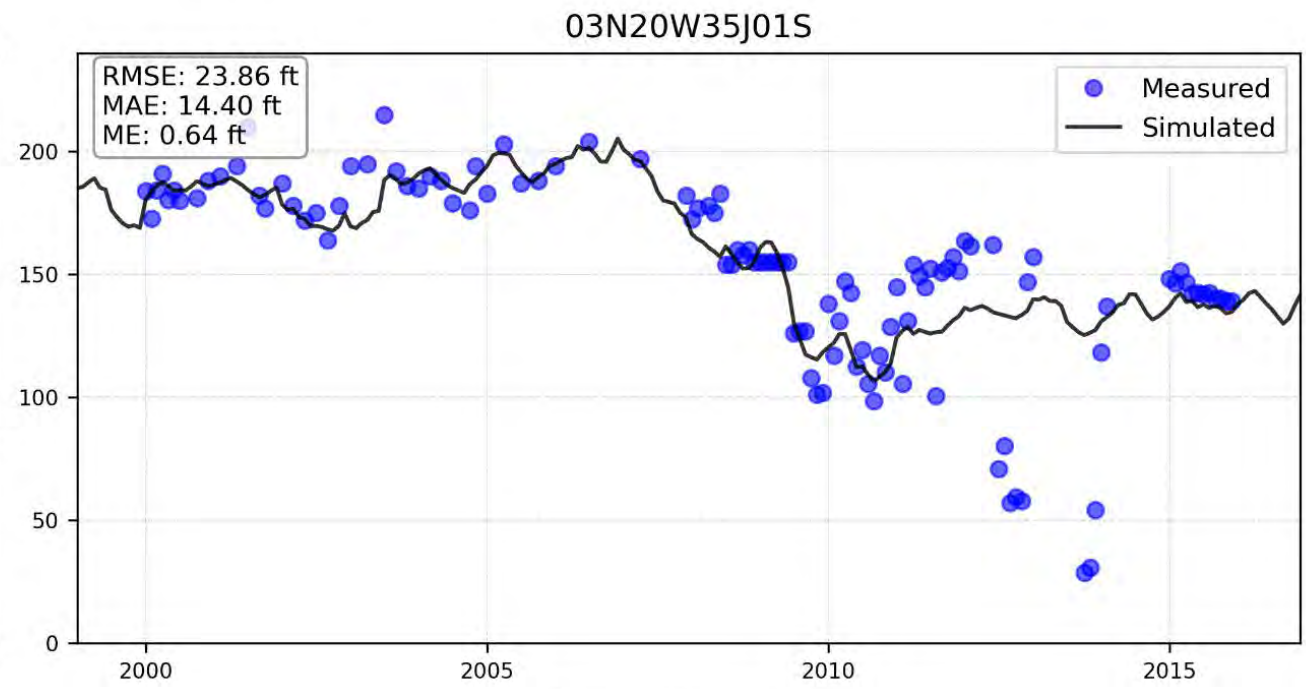
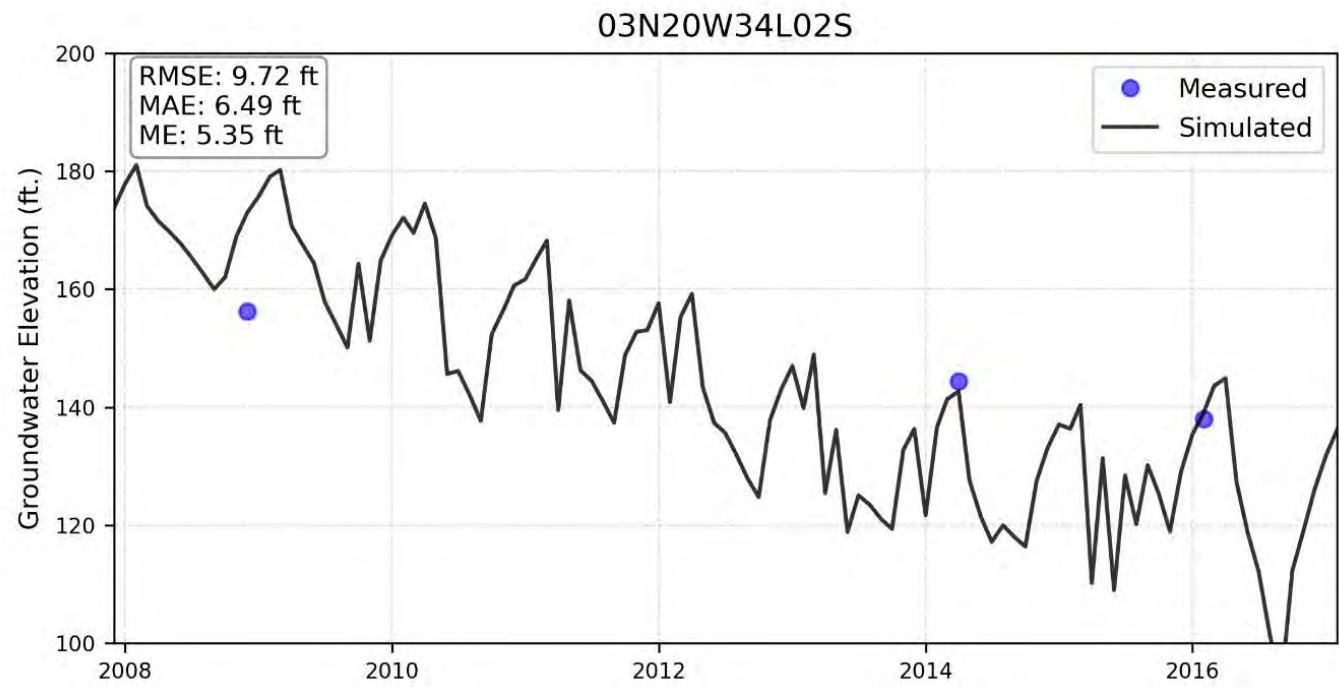


Figure E-3p: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

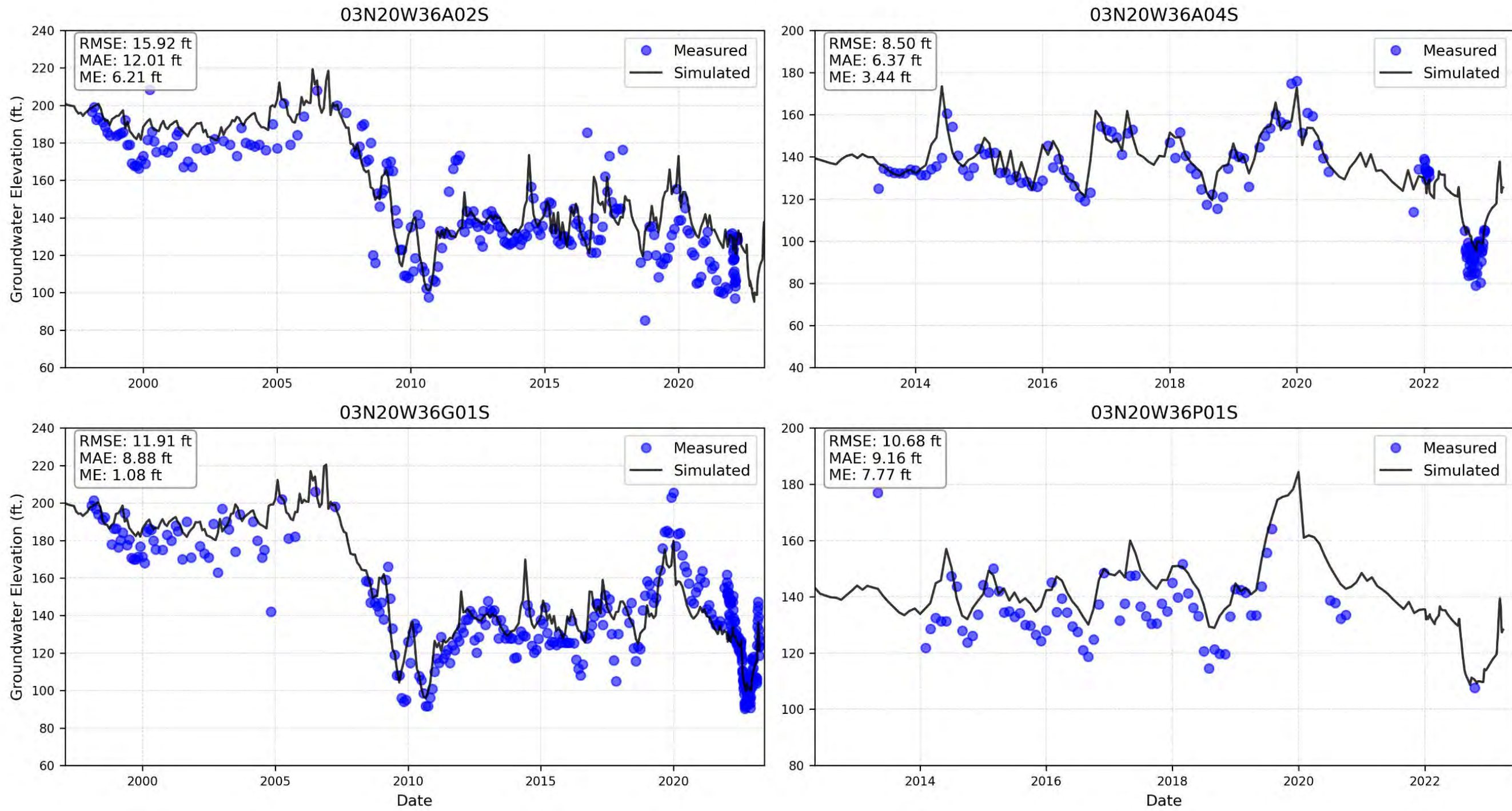


Figure E-3q: Calibration Dataset for the Fox Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

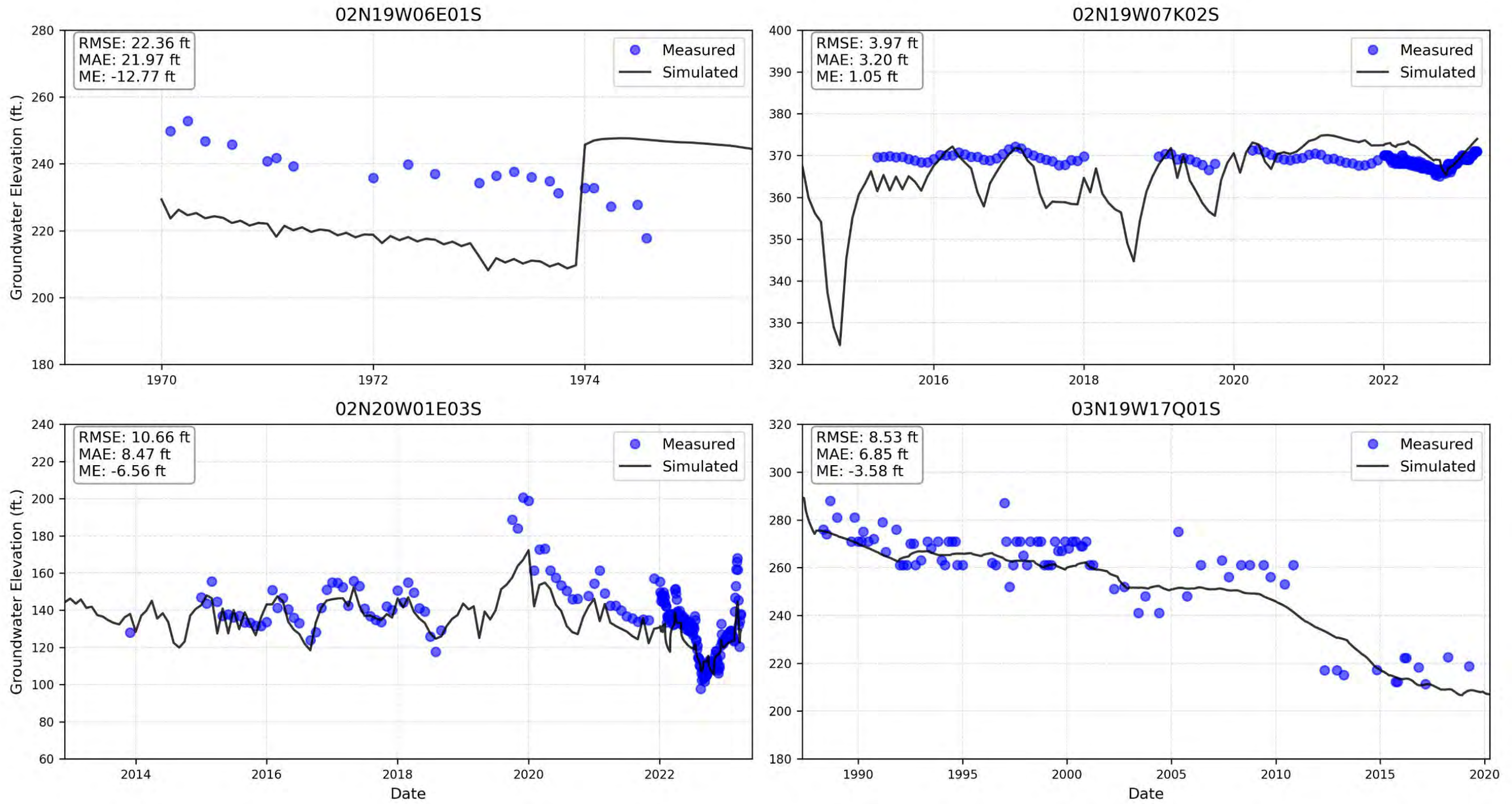


Figure E-4a: Calibration Dataset for the Grimes Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

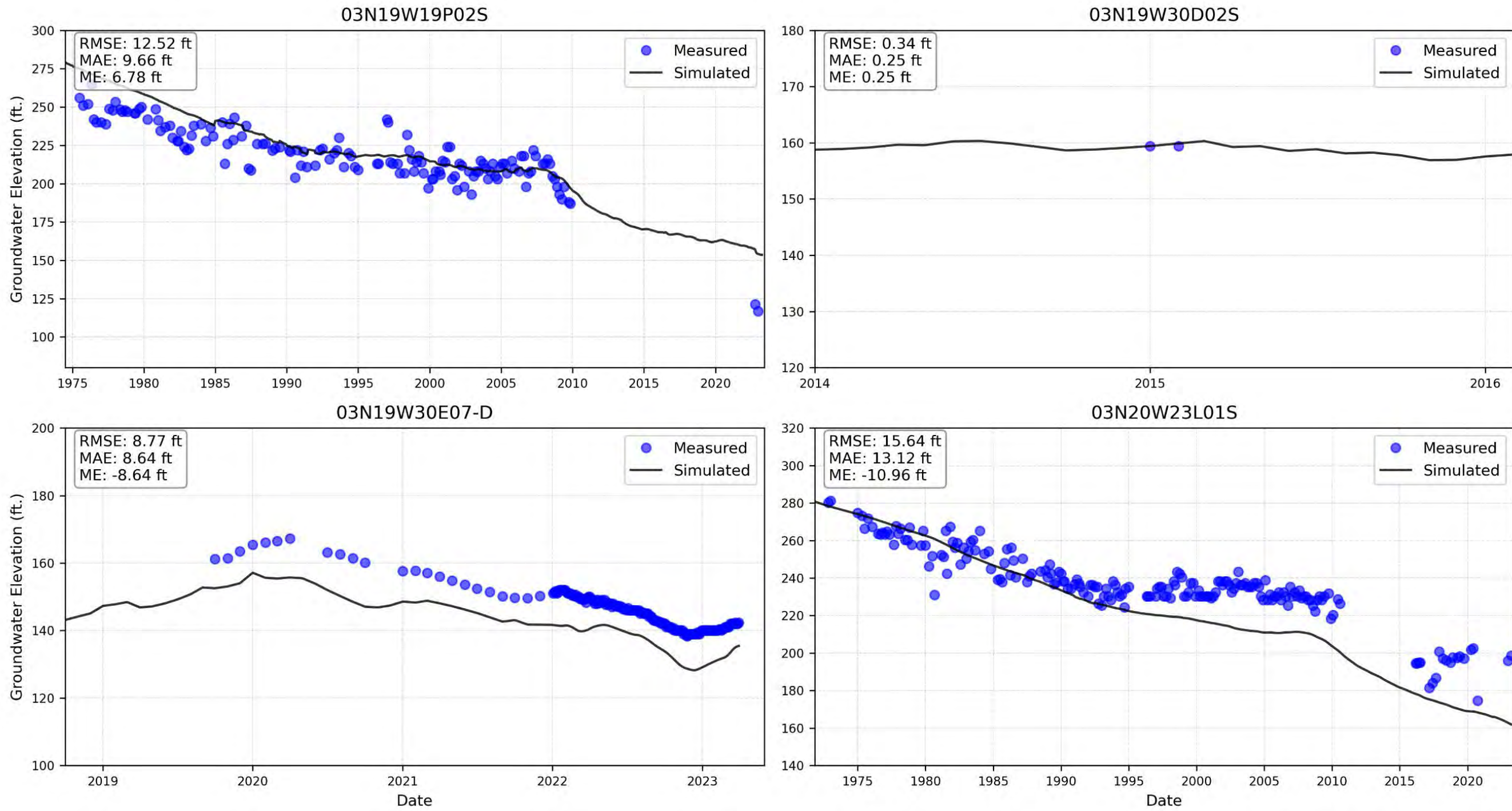


Figure E-4b: Calibration Dataset for the Grimes Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

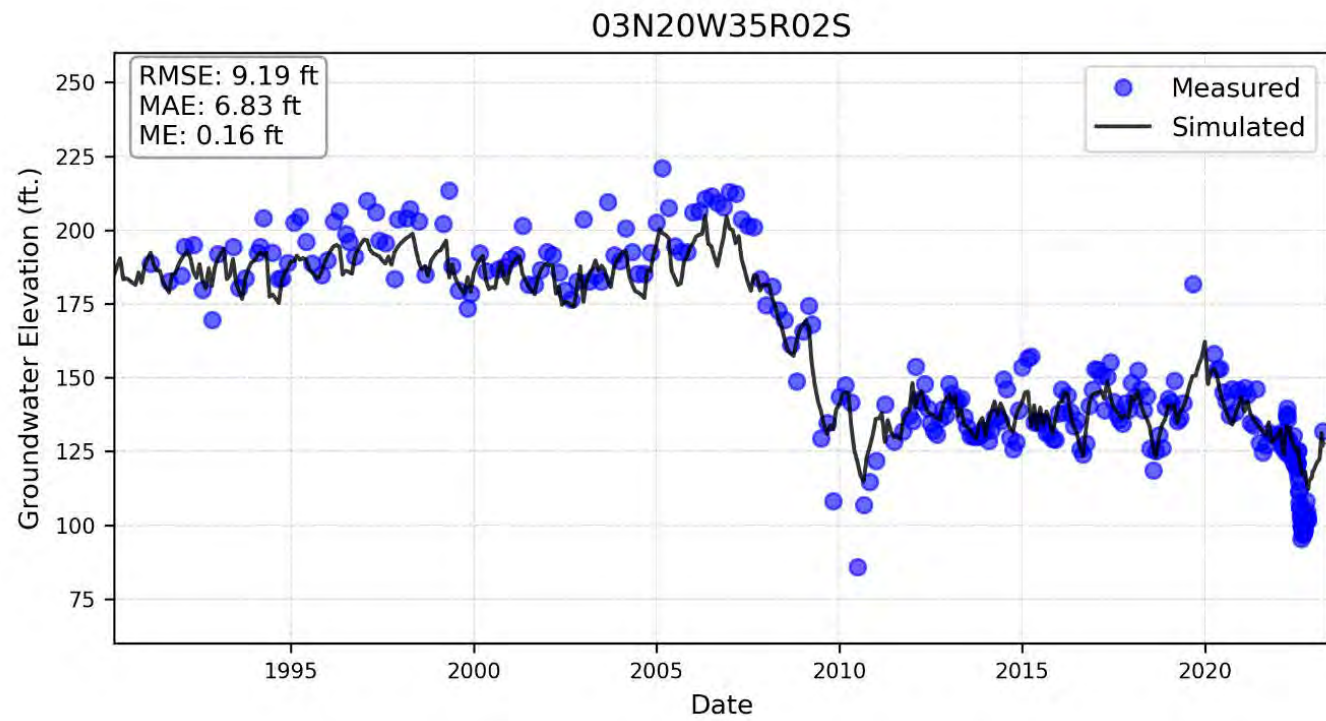
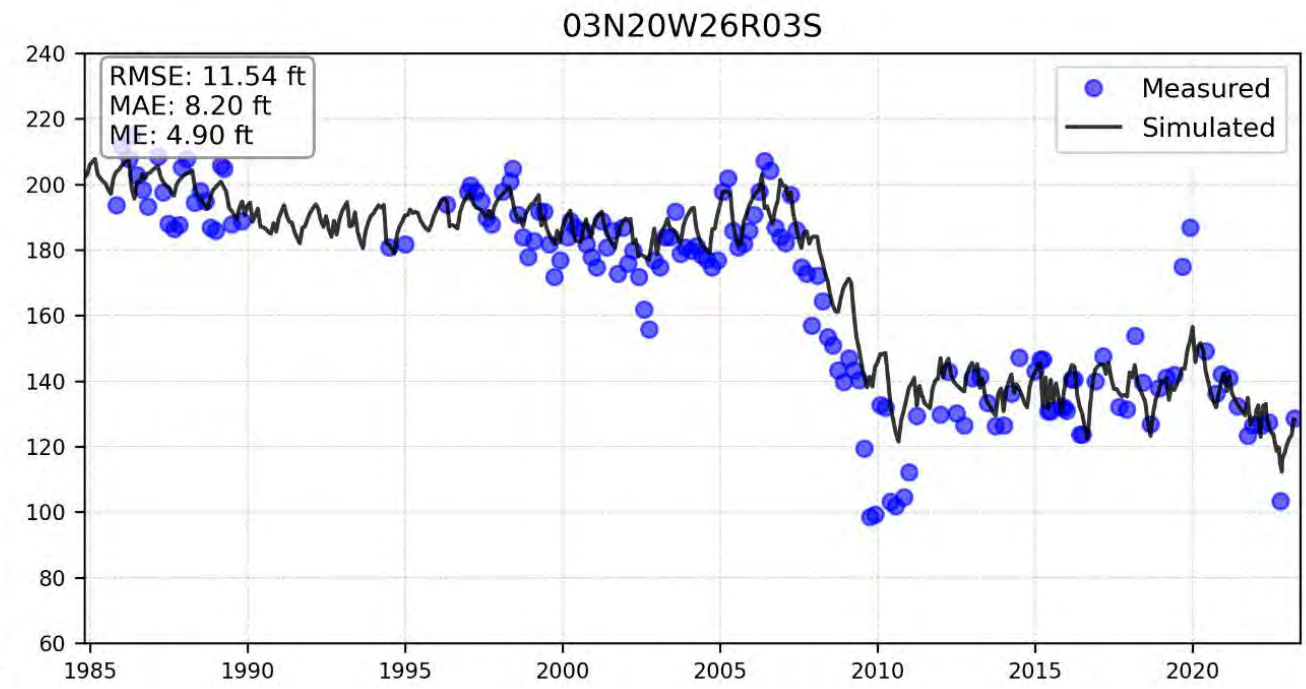
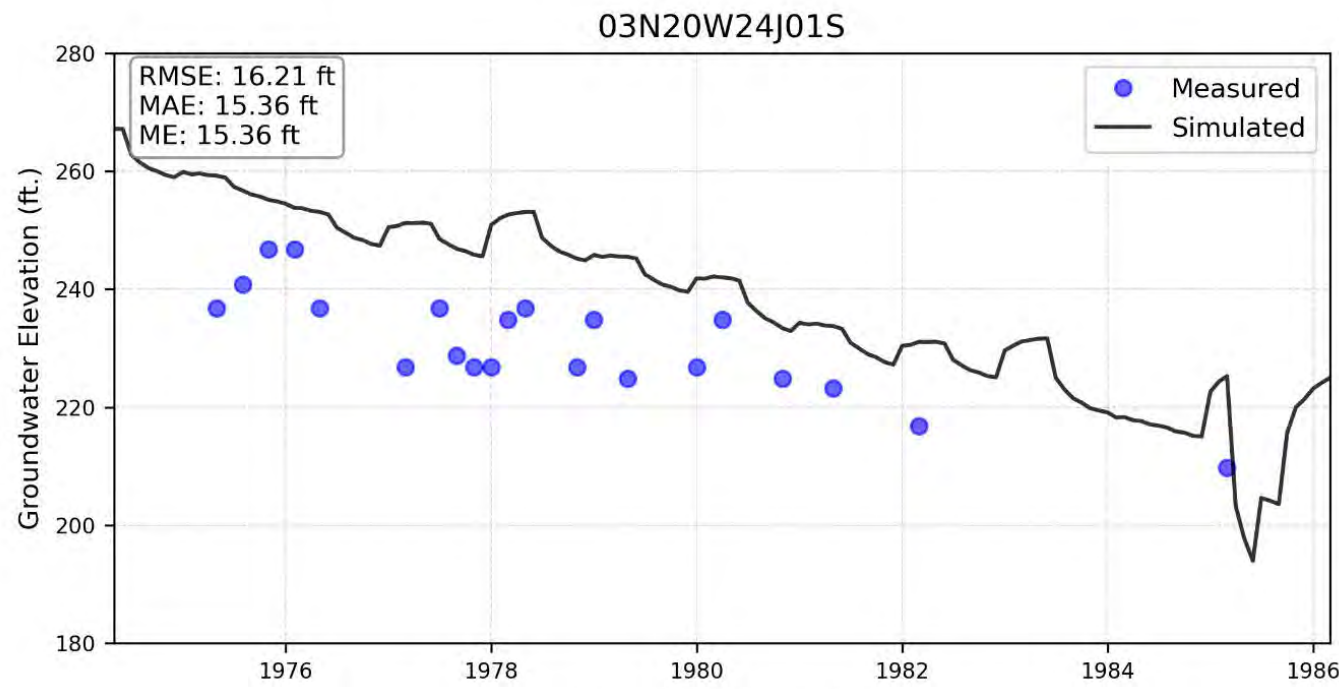


Figure E-4c: Calibration Dataset for the Grimes Canyon Aquifer

Documentation for the Extension and Updates to the East Las Posas Management Area (ELPMA) Groundwater Model

Attachment 3

Response Report to TAC Recommendation Report – Draft Las Posas Valley Basin Groundwater Sustainability Plan Water Year 2025 Annual Report, dated March 15, 2026

Item 22D – Watermaster Response Report, dated March 15, 2026
FCGMA Board Meeting, March 25, 2026

LAS POSAS VALLEY WATERMASTER RESPONSE REPORT

Date: March 15, 2026

To: Las Posas Valley Watermaster Board of Directors

From: Kudzai Farai Kaseke, Assistant Groundwater Manager (FCGMA)

Re: Response Report to TAC Recommendation Report – Draft Las Posas Valley Basin Groundwater Sustainability Plan Water Year 2025 Annual Report

The Las Posas Valley Watermaster (Watermaster) requested consultation from the Las Posas Valley Technical Advisory Committee (TAC) on the Draft Las Posas Valley Basin Groundwater Sustainability Plan (GSP) Water Year 2025 Annual Report. The Watermaster requested consultation in a memo to TAC dated January 15, 2026.

The TAC discussed and developed its recommendation report at January 20 and February 3, 2026, meetings. TAC's February 10, 2026 recommendation report included three recommendations and an attachment with 40 comments by each of the TAC members on specific sections of the draft Annual Report. Each of these recommendations is listed below followed by Watermaster's response. Watermaster's responses to the specific recommendations are attached.

RECOMMENDATION 1: PROVIDE ADDITIONAL DETAIL REGARDING HOW CHANGE IN STORAGE ESTIMATES ARE CALCULATED

The criteria for selecting the wells used and methods applied in estimating changes in groundwater storage are unclear and should be better documented. TAC review identified apparent inconsistencies in the information presented for wells in change in storage calculations, raising questions regarding the data and methods applied to these estimates. Specifically:

- Figure 2-32 uses 07R02 to estimate change in storage for one cell, but Figure 2-19 does not show WL data for that well. How was the change in storage determined?
 - Well 06R01 was used in another cell, but Figure 2-19 shows the WL data as NA. It is unclear what data was used to estimate change in storage.
 - Notably, there are other wells in this area with water level data, including 05D01, 32H03, 27H03, 25H01, 30D01, 07K02, 08H02. These do not appear to have been used to estimate the change in storage.
- The change in groundwater level value used for well 06R01 on Figure 2-32 is inconsistent with Figures 2-18 and 2-19, which do not report a change in groundwater level for this well.

- The 06R01 change in groundwater level value of -128.3 appears to exert a strong influence in the overall storage change result for the West Las Posas Management Area (WLPMA).
- This value should be verified and an explanation of the source of this value should be provided and caveated, as appropriate.
- The change in groundwater level value used for well 08L03 on Figure 2-32 is inconsistent with Figures 2-18 & 2-19, which do not report a change in groundwater level for this well.
 - The value of -16.7 used is inconsistent with other wells in western WLPMA (i.e., 08G04 and 17F05), which had positive changes in groundwater levels.
 - The 08L03 change in groundwater level value of -16.7 should be reassessed as it appears to exert a strong influence in the overall storage change result for WLPMA.
 - At a minimum, an explanation of the source of this value should be provided and caveated, as appropriate.
- The change in groundwater level value used for well 10D02 of -38.2 shown on Figure 2-19 and used in the storage change calculations (Figure 2-32), does not appear to be valid as it appears to have been calculated using an anomalous value from water year 2024 (see figure for this well in Appendix A).
 - This value should be reassessed as it appears to exert a strong influence in the overall storage change result for ELPMA.
 - At a minimum, the use of this value should be flagged.
- The series of linear regressions used for estimating storage changes presented in Table 2-8 are limited to the Fox Canyon Aquifer. Consider methods that could estimate storage changes in the other Las Posas Valley Basin (LPVB) aquifers.

1.1 Recommendations:

- Provide the criteria used to select which wells are included in the estimation of storage change.
- Clearly document the methodology used in estimating storage change and how individual wells affect the estimates.
- Consider flagging wells with anomalous change in water level values and/or those that individually influence change in storage estimates for large portions of the LPVB.
- Evaluate the potential to estimate annual changes in storage in the Shallow Alluvial, Grimes Canyon, and Epworth Gravels aquifers.

Response to Recommendation 1:

The methodology used to estimate storage change, and the criteria used to select the wells used in that estimation, were detailed in an appendix to the Annual Report submitted to DWR in 2022 and cited in the Water Year 2025 Annual Report. In general, a series of Thiessen Polygons was generated to define areas surrounding the representative monitoring sites, or key wells. In the ELPMA, nine key wells are screened solely within

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the Fox Canyon aquifer, which provide sufficient spatial discretization to generate storage change estimates. In the WLPMA, however, only three key wells are screened solely within the Fox Canyon aquifer. In order to estimate storage change within smaller polygons, an additional four wells screened solely in the Fox Canyon aquifer were incorporated into the storage change network. These wells were selected based on the strength of the correlation between groundwater elevations measured in the well and those measured at the closest key well.

At the time the storage change methodology was developed, Watermaster reviewed the potential to estimate annual changes in storage in the Shallow Alluvial, Grimes Canyon, and Epworth Gravels aquifers. There are few wells screened in these aquifers, and the relationship between storage change and water year type is insufficiently defined to make estimates of storage change in these aquifers reliable. As the monitoring network is further developed, these assumptions should be revisited.

As noted in the First Periodic Evaluation of the GSP, Watermaster is working to formalize agreements with other local agencies to ensure groundwater levels are measured routinely in both the fall and spring of each year. In water year 2025, however, not every well was measured within the spring measurement window. For instances where a well was not measured within that window, storage change was estimated by correlating the observed change at a nearby well to an estimated change at the monitoring well. The text and figures of the annual report have been updated to clarify this approach and address TAC comments. In particular, the text has been updated to note when an anomalous change in water level may influence the estimation of storage change and the figures have been changed to note which wells were used in the calculations.

RECOMMENDATION 2: REVIEW AND CONSIDER SIGNIFICANT EDITS TO TEXT IDENTIFIED BY TAC

There are significant text edits and requests for clarification identified through the TAC review that should be considered by the Watermaster in preparation for finalizing the WY 2025 Annual Report. Specific recommendations are referenced below

2.1 Recommendations:

- The Executive Summary indicates that resolutions, the Basin Optimization Plan, allocation system, and Basin Optimization Yield Study (BOY Study) have helped to fill data gaps. Please provide additional information regarding how these items have filled data gaps.
- Please contextualize conditions in the LPVB in relation to the BOY Study the Watermaster is working to complete along a similar timeline to the WY 2025 Annual Report. Specific discussion of the production in water year 2025 in comparison to the yield evaluations in the BOY Study would be beneficial for stakeholders.
- Section 2.1.1 references problems associated with collected water level data from well 02N21W16J03, including not being able to measure water levels in the well in water year 2025. Please explain why another well cannot take the place of well 02N21W16J03.

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- Please provide a quantification of the number of non-reporting wells alluded to in section 2-2 and include assessment of how much of the overall groundwater extraction from the LPVB these non-reporting wells represent.
- The titles for Figures 2-7, 2-8, 2-20, and 2-21 indicate that the figures include groundwater elevation contours, but contours are not included on these figures. Please change the titles of these figures to reflect only the information that is included in each figure.
- Please include explanations for wells without water level measurement values on figures, like well 30M02 on Figure 2-10 and multiple WLPMA wells on Figures 2-16 and 2-17.
- Please explain why groundwater elevations reported for wells 07K02 and 08H02 were not used in contouring East Las Posas Management Area (ELPMA) groundwater levels and why wells 17F05, 08G04, and 35P02 were not used in the WLPMA.
- The comparison of water storage credits accrued by Calleguas Municipal Water District (CMWD) at the end of 2015 and the end of 2025 in section 2.4.2 highlights the fact that no water has been stored in WLPMA by CMWD since the end of 2015. Please add information regarding this change in water storage practices.
- The total water available reported in section 2.4 is actually the volume of water use. Please add an explanation that the volume of water available exceeded these amounts because imported water purchases were not capped.
- Figure 2-32 is not referenced in the text, please add a reference to this figure in section 2.6.
- On Figures 2-16 and 2-17 well 12H01 located in the WLPMA has anomalous groundwater elevations compared to surrounding wells. Please either omit or note this anomalous value and pursue additional investigation into how representative the water levels from this well are and what aquifer they should be assigned to.
- On Figure 3-2 the wells without laboratory data are shown as '0/0'. It would be clearer to label these wells with 'NA/NA' or something similar to clearly show that groundwater sample analysis was not performed on samples from these wells, and not that the laboratory results were zero.
- Discussion of annual and cumulative storage changes in the ELPMA should include footnotes and explanations alerting readers that the values are inclusive of CMWD Aquifer Storage and Recovery (ASR) storage operations; thus, the values presented are not representative of storage changes attributable to ELPMA groundwater pumping. These notes should also include explanation of why CMWD ASR water is considered stored water and what that means.
- Please provide additional discussion of the variation in water levels in comparison to Minimum Thresholds which are shown on Figure 2-19 and summarized in section 3.1.1. Are the statements that groundwater production exceeds recharge intended to describe a local condition?

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- Please consider including ongoing work on the CMWD ASR project and the upcoming monitoring network evaluation in the discussion of planned activities for the upcoming water year in section 3.4.

Response to Recommendation 2:

The bulleted recommendations and requests for clarification listed under Recommendation #2 are excerpted from the specific technical comments provided by TAC members in the tabulated comments at the end of the recommendation report. Watermaster has reviewed the text edits and requests for clarification identified by TAC members and made edits to clarify the text, tables, and figures of the Annual Report. Detailed responses to each of the TAC member comments are included in the attached table.

RECOMMENDATION 3: REVIEW EDITORIAL COMMENTS PROVIDED BY TAC IN TABULATED COMMENT MATRIX

The TAC members each prepared detailed tabulated comments numbered by commentor with references to specific section and page numbers and quoted text. Many of these comments are editorial in nature and identify apparent errors and/or recommended edits in the draft WY 2025 Annual Report.

3.1 Recommendation:

Consider revising the text to address the comments in Comment ID numbers BB-1, 2, 3, 11, 12, and 13; BA-9, 10, and 11; and TM-4 and 5.

Response to Recommendation 3:

The text, tables, and figures of the Annual Report have been revised, where appropriate, in response to TAC member comments provided in the table attached to the recommendation report. Detailed responses to each of the TAC member comments are included in the attached table.

**Specific Comments from the Las Posas Valley Basin Technical Advisory Committee
Draft WY 2025 Annual Report**

Comment ID	Commentor	Technical or Editorial Comment	Topic	Page Number	Section ID	Quoted Text	Comment	Watermaster Response
BB-1	Bryan Bondy	Editorial	Groundwater Production	vi & 2-6	ES & Table 2-3	N/A	Executive Summary text and Table 2-3 values of LPV production are slightly different.	ES discussion corrected to match table.
BB-2	Bryan Bondy	Editorial	Groundwater Production	vi & 2-6	ES & Table 2-3	N/A	Executive Summary text says WY 25 groundwater production was ~6,000 AF higher than WY 24, but the difference between the production for these years in Table 2-3 is only 4,626 AF.	ES discussion corrected.
BB-3	Bryan Bondy	Editorial	Groundwater Production	vi & 2-14	ES & Table 2-8	N/A	Executive Summary text says ELPMA cumulative groundwater storage change is ~2,000 AF since 2016 while Table 2-8 says it was only 314 AF.	ES discussion corrected.
BB-4	Bryan Bondy	Technical	Change in Storage	N/A	Figure 2-32	N/A	The change in groundwater level value used for well 06R01 is inconsistent with Figures 2-18 & 2-19, which do not report a change in groundwater level for this well. The 06R01 change in groundwater level value of -128.3 appears to exert a strong influence in the overall storage change result for WLPMA. This value should be verified and an explanation of the source of this value should be provided and caveated, as appropriate.	Because groundwater elevations have not been consistently measured within the spring and fall measurement windows at several wells in the WLPMA, correlations were developed to project WLS from adjacent wells to wells used for the storage change calculation. This was done, instead of changing the polygons each year, to try to generate a stable set of estimated storage change areas for comparison to previous years. A paragraph has been added to the text to note this, and the water level correlation wells are noted on Figure 2-32. The spring 2024 groundwater elevation was not measured at well 06R01, which is why it isn't reported in Table 3-1 or shown on figures 2-18 or 2-19. A change in <i>estimated</i> water level between spring 2024 and spring 2025 is generated based on the water level correlations with nearby wells. This projected level is then used to estimate change in storage for the annual report.
BB-5	Bryan Bondy	Technical	Change in Storage	N/A	Figure 2-32	N/A	The change in groundwater level value used for well 08L03 is inconsistent with Figures 2-18 & 2-19, which do not report a change in groundwater level for this well. The value of -16.7 used is inconsistent with other wells in western WLPMA (i.e., 08G04 and 17F05), which had positive changes in groundwater levels. The 08L03 change in groundwater level value of -16.7 should be reassessed as it appears to exert a strong influence in the overall storage change result for WLPMA. At a minimum, an explanation of the source of this value should be provided and caveated, as appropriate.	Same explanation as above. In this case the spring 2024 and 2025 groundwater elevations were not measured at well 08L03 which is why it isn't shown on figures 2-18 or 2-19. A change in estimated water level between spring 2024 and spring 2025 is generated based on the water level correlations with nearby wells. This projected level is then used to estimate change in storage for the annual report.
BB-6	Bryan Bondy	Technical	Change in Storage	N/A	Figures 2-19 & 2-32	N/A	The change in groundwater level value used for well 10D02 of -38.2 shown on Figure 2-19 and used in the storage change calculations (Figure 2-32), does not appear to be valid as it appears to have been calculated using an anomalous value for WY 2024 (please see figure for this well in Appendix A). This value should be reassessed as it appears to exert a strong influence in the overall storage change result for ELPMA. At a minimum, the use of this value should be caveated.	A note has been added to the text.
BB-7	Bryan Bondy	Technical	Data Gaps	vii	ES	"These steps have helped to close data gaps identified in the GSP..."	It is unclear how the actions listed prior to the quoted text (i.e., resolutions, BOP, allocation system, and BOYS) have filled data gaps identified in the GSP.	Sentence has been revised

**Specific Comments from the Las Posas Valley Basin Technical Advisory Committee
Draft WY 2025 Annual Report**

Comment ID	Commentor	Technical or Editorial Comment	Topic	Page Number	Section ID	Quoted Text	Comment	Watermaster Response
BB-8	Bryan Bondy	Technical	ELPMA Storage	Various	Global Comment	N/A	Discussion of ELPMA annual and cumulative storage changes should be caveated to remind the reader that the values are inclusive of Calleguas ASR storage operations; thus, the values presented are not representative of storage changes attributable to ELPMA groundwater pumping.	Paragraph added to section 2.6.1.2
BB-9	Bryan Bondy	Technical	Groundwater Levels	Figures 2-16 & 2-17	N/A	N/A	Well 12H01 located in the WLPMA has anomalous groundwater level elevations compared to surrounding wells, which should be noted/caveated. Further investigation is warranted to determine if groundwater levels measured in this well are representative of the Fox Canyon Aquifer.	Groundwater elevations have been re-contoured.
BB-10	Bryan Bondy	Technical	Groundwater Levels	Figures 2-16 & 2-17	N/A	N/A	It is unclear why groundwater levels reported for wells 07K02 and 08H02 were not used in contouring of ELPMA groundwater levels. Same comment for wells 17F05, 08G04, and 35P02 in WLPMA.	Groundwater elevations have been re-contoured.
BB-11	Bryan Bondy	Technical	Groundwater Production	vi	ES & Table 2-3	"Groundwater elevations declined from the previous water year..."	Consider adding "generally" before "declined" to recognize the fact that groundwater levels did not fall in all monitored wells.	Added "generally" to the executive summary. Did not see an appropriate addition in Table 2-3.
BB-12	Bryan Bondy	Technical	Groundwater Production	N/A	Tables 2-3 & 2-6	N/A	Groundwater extraction values in Tables 2-3 and 2-6 do not agree (32,655 AF vs sum of values = 30,990 AF), a 1,665 AF difference.	Table 2-6 has been corrected.
BB-13	Bryan Bondy	Technical	Groundwater Production	N/A	Figures 2-28 & 2-29	N/A	The groundwater pumping bar for WY 2025 is inconsistent with the pumping value reported in Table 2-2.	The figures have been updated.
BB-14	Bryan Bondy	Technical	Total Water Available	2-12	2.4	N/A	The reported total water available is actually the water that was used, which is an OK proxy, but the text should note that the actual amount of water that was available exceeded these amounts because imported water purchases were not capped.	This is DWR 's terminology and is required under the regs.
BA-1	Bob Abrams	Technical	Improved explanation	2-1	Section 2.1.1	<i>The First Periodic Evaluation of the GSP recommended removing this well from the groundwater monitoring network, and groundwater elevations were not measured in this well in water year 2025. However, FCGMA is working toward a solution by which groundwater elevations could be measured using a sonic water level meter, albeit at a lower resolution than those measured by a direct groundwater level sounder.</i>	It would be useful to explain why another well cannot take its place, if that's the case.	There are limited wells with known screen intervals and long-term groundwater elevation records in the central WLPMA. This well was chosen based on a review of all the groundwater elevation records at the time the GSP was prepared. Selection of the representative monitoring points, or key wells, is discussed in the GSP. As funding becomes available, Watermaster will investigate opportunities to add dedicated monitoring wells to the LPV Basin.
BA-2	Bob Abrams	Editorial	Groundwater elevation figures	2-2	Section 2.1.2.2	<i>Groundwater flow direction information is limited by the relatively small number of monitoring wells screened solely within the Epworth Gravels aquifer. In both the fall of 2024 and spring of 2025, groundwater elevations were highest in well 30M05, and lowest in well 29F06 (Figures 2-7 and 2-8).</i>	There are no contours in these figures, as stated in the figure titles. Change titles.	Contour maps are required by the GSP regulations. Watermaster is working to formalize agreements with partner agencies to improve collection of groundwater monitoring data for inclusion in future reports.

**Specific Comments from the Las Posas Valley Basin Technical Advisory Committee
Draft WY 2025 Annual Report**

Comment ID	Commentor	Technical or Editorial Comment	Topic	Page Number	Section ID	Quoted Text	Comment	Watermaster Response
BA-3	Bob Abrams	Technical	Groundwater elevation figures	2-2	Section 2.1.2.2	Water year 2025 groundwater elevations in the Epworth Gravels aquifer were similar to, or slightly higher than water year 2024 groundwater elevations (Figures 2-9 and 2-10). Overall, groundwater elevations in the Epworth Gravels aquifer are higher than they were in 2015 (Figure 2-10).	Discuss the reason why is there no value for well 30M02 on Figure 2-10. It is understood that wells are not always accessible when staff arrive, but an explanation is warranted.	The map has been corrected to show that there was no change between spring 2024 and spring 2025.
BA-4	Bob Abrams	Technical	Need for additional information	2-3	Section 2.1.2.4	Within the ELPMA, groundwater elevations are generally highest along Arroyo Las Posas, in the southern part of the management area, as well as along the northeastern boundary of the management area (Figures 2-16 and 2-17).	Why no measurements in several WLPMA wells in fall? It is understood that wells are not always accessible when staff arrive, but an explanation is warranted.	Several wells are shown on the map as part of the broader monitoring network, but either are either not monitored regularly by CMWD, UWCD, or VCWPD, or have not been monitored in several years because of issues with the well. For instance CMWD reports that Well 32H02 has been dry, or had too little water to install a transducer since 2020. It is still shown on the maps in the event that groundwater elevations recover and this well can be measured again. A note has been added to Table 3-1 for all key wells that were not measured explaining why a key well was not measured during the monitoring period.
BA-5	Bob Abrams	Technical	Groundwater elevation figures	2-3	Section 2.1.2.5	<i>Groundwater elevation measurements in the Grimes Canyon aquifer are sparse and there are no key wells in the Grimes Canyon aquifer (Figures 2-20 and 2-21). Therefore, there are no wells with established minimum thresholds or measurable objectives against which current conditions can be evaluated.</i>	There are no contours on Figures 2-20 and 2-21. Titles should be changed.	Contour maps are required by the GSP regulations. Watermaster is working to formalize agreements with partner agencies to improve collection of groundwater monitoring data for inclusion in future reports. Additional data collection will allow for contouring in the future.
BA-6	Bob Abrams	Technical	Need for addition information	2-3	Section 2.1.2.5		As above, there should be discussion of why there were no measurements at 19P02 in spring. And no changes in WLMPA in fall. And no changes in ELMPA in spring.	Well 19P02, which is part of the broader monitoring network but is not a key well, was pumping in the spring. The change in groundwater levels could not be reported for wells 28A02 or 22G01 because those wells were not measured during the corresponding time period in WY 2024. These wells are also part of the monitoring network, but are not key wells. Watermaster is working to formalize agreements with partner agencies to improve collection of groundwater monitoring data for inclusion in future reports.
BA-7	Bob Abrams	Technical	Need for additional information	2-3	Section 2.1.3	<i>Gauge 841A, maintained by the Ventura County Watershed Protection District (VCWPD) in the Arroyo Simi, is the only current surface water monitoring point in the LPV Basin (Figure 2-25; Streamflow at Gauge 841A). The average daily flow in water year 2025 was approximately 42% of the average daily flow over the past 20 water years.</i>	Shouldn't another gage be added? This would help with annual reporting and basin sustainability. Discuss.	The number of surface water gauges wasn't identified as a data gap in the GSP. The discussion in the annual report is primarily to report water year hydrologic conditions as a setting for the basin conditions. Surface water studies have indicated that flow into and out of the Arroyo is complex and maintaining long-term records is challenging in an environment where the channel changes frequently (REF HERE). Before adding more stream gauges, additional work would need to be

**Specific Comments from the Las Posas Valley Basin Technical Advisory Committee
Draft WY 2025 Annual Report**

Comment ID	Commentor	Technical or Editorial Comment	Topic	Page Number	Section ID	Quoted Text	Comment	Watermaster Response
BA-8	Bob Abrams	Editorial	Verify number	2-7	Section 2.4.2	<i>At the end of the 2025 water year, CMWD had accrued approximately 25,192 AF of storage credits in the WLPMA...</i>	So, no ASR storage in the WIPMA since 2015? Maybe add a few words to state this?	A note has been added to the text indicating that CMWD has not delivered imported water in-lieu of groundwater pumping to the ELPMA or WLPMA since 2016.
BA-9	Bob Abrams	Editorial	Acronym needs definition	2-11	Section 2.5	<i>Similar to Tables 2-1 and 2-2, the groundwater extractions for water years 2021 and 2022 presented in Table 2-6 represent a combination of reported AMI-estimated extractions for the period from October 1, 2020, through September 30, 2022</i>	Please define AMI.	AMI is defined in the text - Section 2.2 Groundwater Extraction
BA-10	Bob Abrams	Editorial	Figure Notes error	Figure 2-28	Section 2.6	<i>1) Storage change for water years 2016 through 2022 is estimated using the VRGWFM</i>	The figure is for the ELPMA. Wasn't the Callegaus ELP model used for this?	Figure note has been revised to reference the correct model.
BA-11	Bob Abrams	Editorial	Figure Notes error	Figure 2-29	Section 2.6	<i>1) Storage change for water years 2016 through 2022 is estimated using the VRGWFM</i>	The figure is for the ELPMA. Wasn't the Callegaus ELP model used for this?	Figure note has been revised to reference the correct model.
BA-12	Bob Abrams	Editorial	Figure call-out	Figure 2-32	???		There does not appear to be a figure call-out for Figure 2-32 and no discussion either (e.g., why only show change of storage for Spring 2024-2025?)	The figure call out has been added. This figure is required by the SGMA regulations.
BA-13	Bob Abrams	Technical	Data for Figure 2-32	Figure 2-32	???		Where do the data come from for wells 08L03 and 06R01 on Figure 2-32? They are not shown on Figure 2-19.	Because groundwater elevations have not been consistently measured within the spring and fall measurement windows at several wells in the WLPMA, correlations were developed to project W/Ls from adjacent wells to wells used for the storage change calculation. This was done, instead of changing the polygons each year, to try to generate a stable set of estimated storage change areas for comparison to previous years. A paragraph has been added to the text to note this, and the water level correlation wells are noted on Figure 2-32.
BA-14	Bob Abrams	Technical	Relation to BOYS	3-4	Section 3.1.1	<i>The Watermaster is currently exploring an in-lieu surface water delivery project to reduce groundwater production in this area and allow groundwater elevations to recover to levels that are higher than the minimum thresholds.</i>	Is this in-lieu delivery project the same as the one in the BOYS? If so, would be useful to say so to avoid confusion.	A footnote has been added to the text.
TM-1	Tony Morgan	General Technical	GW elevations	vi	Exec Summary	<i>Continued declines in groundwater elevations in the WLPMA are not consistent with the sustainability goal for the LPV.</i>	The DRAFT BOYS shows several hydrographs with declining water levels for the various scenarios. Some start above the MT and end below the MT. This statement suggests that the wells with declining trends in the BOYS are not consistent with the sustainability goal of the basin?	The hydrographs in the BOY Study are modeled estimates of future conditions in both the WLPMA and ELPMA under different groundwater pumping scenarios. These scenarios indicated the anticipated decline in groundwater elevations that may occur at different pumping rates, and showed the groundwater production rates for which groundwater elevations are likely to remain above the minimum threshold. The BOY study used a less constrained evaluation of the future simulated groundwater elevation taking into consideration the uncertainties in the model. However, the BOY Study clearly states that the measured groundwater levels are the criteria for evaluating sustainability in the LPV Basin. Further, the BOY Study does not set a sustainability goal for the LPV.

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Comment ID	Commentor	Technical or Editorial Comment	Topic	Page Number	Section ID	Quoted Text	Comment	Watermaster Response
TM-2	Tony Morgan	Technical	basin sustainability	vi	Exec Summary	<i>Reported groundwater production from the LPV was 32,660 AF in water year 2025,</i>	Interesting that GW production in a critically dry year was less than the Operational Yield of 40,000 AFY and is within the range of the sustainable yield of 30,630+/- 3,500? AFY of the baseline scenario in BOYS (Table 3-2).	Comment noted. As stated in the annual report, the reported groundwater production is based on that received by FCGMA by January 26, 2026. This production is likely to be revised in the WY 2026 annual report.
TM-3	Tony Morgan	Technical	GW production	2-4	2-2	<i>...and do not include estimates of extractions from non-reporting wells based on AMI data</i>	Probably useful to quantify the number of non-reporting wells in the text and provide their estimated groundwater production. Are the non-reporting wells thought to account for <1% of the overall groundwater extractions or is it more significant?	The first paragraph of section 2-2 and Table 2-1 state that pumping reports have been received from approximately 86% of the operators in the Basin.
TM-4	Tony Morgan	General Editorial	editorial	2-4	2-2	<i>The estimated sustainable yield of the WLPMA ranges from approximately 10,200 to 12,600 AFY (FCGMA 2024). The estimated sustainable yield of the ELPMA ranges from approximately 16,900 to 21,500 AFY (FCGMA 2024).</i>	are these citations FCGMA 2024a or 2024b?	Citation has been changed to FCGMA 2024 universally and the references have been updated.
TM-5	Tony Morgan	General Editorial	editorial	2-10	2.4.2	<i>Table 2-5</i>	Rounding errors(?) in Table 2-5. See net injection totals for CY2018, 2019, 2020, WY2024, WY2025	The table has been corrected to eliminate the rounding errors.
TM-6	Tony Morgan	Technical	CMWD injections	2-11	2.5	<i>b Total water available in the LPV does not include CMWD ASR injections which are considered stored water in the ELPMA.</i>	Why are the CMWD injections not considered "available" in LPB? Aren't those waters available to CMWD?	Those waters are stored by CMWD for emergency purposes. They are not generally "available" in the context of available water. We'll have a better understanding of CMWD's planned operations into the future once the CMWD ASR Study Group prepares its report
TM-7	Tony Morgan	Technical	Table 2-8	2-14	2.6.1.2	<i>The series of linear regressions are limited to the FCA.</i>	Is it possible to provide an estimate of the storage change for the other aquifers by comparing similar water year types in the 2016-2022 and providing an inferred general range ? For example, Dry Years 2016 and 2018 showed -237 and -296 AF in the GC aquifer, so maybe a range of -240 to -300 AF would work for this table. Keep it simple, round the values to nearest 10 AF. Couldn't we further flesh out Table 2-8 with these ranges? They would need to have footnotes to explain how they were derived, but would provide a more complete picture albeit with some educated guesstimates. See separate sheet for example values.	The three aquifers for which we rely on the model to produce an estimate of groundwater storage change have limited wells, and limited production. While we could estimate the storage change based on water year type, the water year type does not always match the observed water level change, in part because the observations are limited and changes in operation of just a handful of wells, independent of water year type, can influence the estimate of the storage change. A note has been added to the text stating that the change in storage in the Shallow Alluvial, Grimes Canyon, and Epworth Gravels aquifers typically accounts for 10 to 30% of the total modeled change in storage for water years 2016-2022.
TM-8	Tony Morgan	Technical	groundwater production v. recharge	3-4	3.1.1	<i>...and likely reflects groundwater production that exceeds groundwater recharge</i>	Per Fig. 2-19 other nearest monitored wells are at or above the their respective MTs. Does this suggest that the "...groundwater production...exceeds groundwater recharge..." is only a localized hydrogeologic condition and not indicative of the overall conditions of the basin?	Even localized hydrogeologic conditions can cause undesirable results. The GSP defined undesirable results in 2 ways - the first is with a total number of wells in the management areas that are below an MT. The second is a length of time a single well can be below the MT.

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Comment ID	Commentor	Technical or Editorial Comment	Topic	Page Number	Section ID	Quoted Text	Comment	Watermaster Response
TM-9	Tony Morgan	Technical	change in groundwater storage	5-37	Figure 2-32		Figure 2-32 uses 07R02 to estimate change in storage for one cell, but Figure 2-19 does not show WL data for that well. How was the change in storage determined? Well 06R01 was used in another cell, but Figure 2-19 shows the WL data as NA. Where did the data to estimate change in storage come from? Why were other wells with WL data (e.g., 05D01, 32H03, 27H03, 25H01, 30D01, 07K02, 08H02) apparently not used to compute the change in storage? Suggest including the criteria used to select wells used to estimate change in storage.	Because groundwater elevations have not been consistently measured within the spring and fall measurement windows at several wells in the WLPMA, correlations were developed to project WLs from adjacent wells to wells used for the storage change calculation. This was done, instead of changing the polygons each year, to try to generate a stable set of estimated storage change areas for comparison to previous years. A paragraph has been added to the text to note this, and the water level correlation wells are noted on Figure 2-32.
TM-10	Tony Morgan	Technical	Nitrate		Figure 3-2		Figure 3-2 - the wells lacking lab data are shown as 0/0. Suggest relabeling them as NA/NA to reflect that the groundwater was not analyzed from this well, not that the lab result was zero.	The figure has been revised.
TM-11	Tony Morgan	Technical	Upcoming Activities	3-6	3.4	<i>Planned Activities for the Upcoming Water Year</i>	Should the Calleguas ASR Project Operations Plan be included? How about the monitoring / data gaps plan?	The Calleguas ASR Project Operations Plan is not a watermaster activity. CMWD is leading the development of that plan with Watermaster participation. While the Calleguas ASR Study Group has formed, it is not clear when the study will be ready.
TM-12	Tony Morgan	Technical	Representative Monitoring Wells	3-2	3.1.1	<i>Table 3-1</i>	No WLs reported for 16J03. This warrants an explanation in the text as to why WLs were not collected and what is being done to minimize the potential for this happening again.	Well 16J03 is discussed in section 2.1.1