APPENDIX M

Dudek CMWD Model Peer Review

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

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1 Background

The FCGMA Board of Directors (Board) is relying on the numerical groundwater model developed by Calleguas Municipal Water District (CMWD) to estimate the sustainable yield for the East Las Posas Management Area (ELPMA) of the Las Posas Valley Basin. In March 2019, Dudek performed an independent peer review of the CMWD numerical model to provide a qualitative assessment of model uncertainty and comment on the suitability of the numerical model for use in preparation of the GSP. This report builds on the previous peer review by providing a quantitative assessment of the CMWD model uncertainty.

CMWD performed a *local* sensitivity analysis of its model prior to this review in order to evaluate how the calibrated model parameters affect the model outputs; such analyses start with a set of parameter values obtained via model calibration and adjust one parameter value at a time. We conducted a *global* sensitivity analysis (GSA) that keys off the local sensitivity analysis. The GSA assigns a confidence interval to each parameter, and allows multiple parameters to vary at once within their corresponding confidence intervals. The results of the GSA provide a quantitative assessment of uncertainty in estimates of recharge to the Fox Canyon Aquifer (FCA), contribution of streambed percolation from the Arroyo Las Posas (Arroyo), and sustainable yield.

2 Uncertainty Analysis

Numerical groundwater models are useful tools that integrate knowledge of the physical components of a natural system into a unified mathematical representation. Our understanding of the physical system is imperfect, and the mathematical representation of the system is simplified. Consequently, there is uncertainty inherent in all numerical models.

In the CMWD model, groundwater production in the calibrated historical model is not a source of uncertainty as it was reported by pumpers starting in 1985 and metered after 1994. Recharge, on the other hand, is a primary source of uncertainty. The total recharge includes areal recharge from precipitation that infiltrates beyond the root zone, recharge from infiltration along the Arroyo, irrigation return flows, percolation pond infiltration, septic system infiltration and pipeline losses. Approximately 47% of total recharge in the model is areal recharge primarily due to rainfall that infiltrates beyond the root zone. The amount of rainfall is well-constrained, but the estimate of how much of it recharges the groundwater is uncertain. Another 51% of the total recharge is derived from infiltration from the Arroyo. Previous investigations by CMWD estimated the amount of water that infiltrated from the Arroyo during dry weather flows (Larry Walker and Associates, 2012 and 2013). These investigations are valuable in providing some constraints on estimates of infiltration from the Arroyo, but uncertainty remains. Areal recharge is less uncertain than the amount of infiltration from the Arroyo because the former represents a large-scale spatial average, while the latter is more localized and, hence, affected more by spatial variability.

Our uncertainty analysis of the CMWD numerical model focuses on three key components: (1) model sensitivity to the calibrated parameter choices, (2) uncertainty in the sustainable yield for the ELPMA, and (3) uncertainty in the predicted groundwater elevations that were incorporated into the selection process for the minimum thresholds (MTs) in the ELPMA. Below we describe the methods and results for each component of the uncertainty analysis.

2.1 Global Sensitivity Analysis

To quantify model sensitivity to the calibrated parameters, we performed a global sensitivity analysis of the CMWD numerical model. The analysis focused on 23 parameters that produced the largest change in mean absolute error (MAE) during CMWD's local sensitivity analysis (results of the CMWD local sensitivity analysis are provided in Appendix A). Each of these 23 uncertain parameters, P, was represented as αP, where α is a random multiplier that has a uniform distribution on the interval [α_{min}, α_{max}]. For time-dependent parameters, such as the inflow into Arroyo and areal recharge, α ranged from 0.5 to 1.5, and for time-independent parameters, such as hydraulic conductivities and storage coefficients, we specified α_{min} and α_{max} as 0.1 and 10, respectively.

The global sensitivity analysis was done with the DAKOTA software developed by Department of Energy's Sandia National Laboratories. The DAKOTA project has passed through the DOE's rigorous quality assurance process and "delivers both state-of-the-art research and robust, usable software for optimization and UQ [Uncertainty Quantification]. Broadly, the DAKOTA software's advanced parametric analyses enable design exploration, model calibration, risk analysis, and quantification of margins and uncertainty with computational models." We used DAKOTA to randomly generate and post process 100 realizations of the CMWD model. These realizations were generated by treating the 23 input parameters as mutually independent random variables distributed uniformly on their respective intervals of variability (Table 1), and by using Latin Hypercube Monte Carlo (MC) with 4 bins to sample these distributions. This number of MC realizations is determined by the formula (23 + 2) x 4, as described in the DAKOTA manual (Adams et al., 2018; page 1387).

We performed the global sensitivity analysis on two model-generated metrics: (1) the global head residual (root mean square error or RMSE), and (2) annualized estimates of recharge into the FCA. Figure 1 presents results of the GSA for RMSE in terms of Sobol's indices. Sobol's indices provide a relative rank of model sensitivity to variations in a given parameter. The GSA of RMSE shows that the model's simulated head distribution is sensitive to the parametric characterization of the Arroyo and surrounding water-bearing units. Uncertainty in the Arroyo's streambed conductivity and inflow accounts for 9% of the RMSE variance. The hydraulic parameters of the Upper San Pedro (USP) in the vicinity of the Arroyo account for 38% of the RMSE variance. Further, the GSA indicates that the model simulated head distribution is most sensitive to the vertical hydraulic conductivity of the USP underlying the Arroyo, which directly impacts the migration of water from the creek into the USP and FCA. RMSEs for the 100 random realizations are substantially larger than that for the original model. This indicates that the original parameterization is tightly-fitted to historical water level data.

The aquifer properties overlying the Moorpark anticline and Las Posas syncline account for an additional 34% of the RMSE variance. Over half of this is controlled by the horizontal conductivity above the Las Posas syncline, which controls head distribution across the northern section of the USP. Vertical hydraulic conductivity along the Moorpark anticline accounts for 14% of the RMSE variance. In this zone, the USP is the uppermost saturated model layer. Therefore, the specified vertical hydraulic conductivity controls the rate at which recharged water at the ground surface infiltrates into the underlying water table.

Results of the GSA for recharge into the FCA (Figure 2) demonstrate that the flux is most sensitive to the vertical hydraulic conductivity in the uppermost layer of the USP overlying the Moorpark Anticline. Variations in this parameter account for 27% of the variance in model-estimated recharge to the FCA. The horizontal hydraulic conductivities in model layer 3 overlying the Moorpark and Las Posas synclines account for an additional 19% of the recharge variance.

The hydraulic properties of the USP underlying the Arroyo account for 7% of the variance in recharge to the FCA. The ALP streambed conductivity, inflow, and flow-to-width ratio account for an additional 9% in the overall recharge variability. The fact that recharge into the FCA is more sensitive to the hydraulic parameters far from the Arroyo suggests that the modeled hydraulic properties in the anticline and syncline structures of the basin impact the horizontal migration of water and that recharge to this area of the FCA is mostly from the USP into the FCA. The USP has been consequently depleted via groundwater extractions in the underlying FCA.

2.2 Quantification of Sustainable Yield Uncertainty

Sustainable management strategies are guided by the attempt to limit significant loss of groundwater storage across the ELPMA. Storage loss in the ELPMA is largely controlled by three principal factors: (1) groundwater extractions in the FCA; (2) areal recharge due to precipitation, irrigation return flows, and recharged water through percolation ponds; and (3) infiltration through the Arroyo streambed. Because groundwater extractions have been reported since 1985, extractions are not a source of uncertainty. Although there is some uncertainty associated with areal recharge, its largest component, rainfall, was estimated by two separate methods that produced comparable estimates for the historical period (5,119 AFY in the USGS BCM model approach versus 5,302 AFY in the DBSA approach). Additionally, predictions of future climatic conditions are constrained by DWR, and are, therefore, assumed to be a known forcing during future predictions of the ELPMA's response to different management scenarios. Therefore, our analysis considers the uncertainty in model-estimates of annual change in storage, recharge to the FCA, and infiltration from the Arroyo.

To quantify uncertainty in these factors we computed the standard deviation in each metric using the original model plus the 100 random realizations. In what follows, we address the uncertainty in these mechanisms and discuss its impact on uncertainty in estimation of the sustainable yield of the ELPMA.

2.2.1 Uncertainty Estimates of Annual Change in Storage

To estimate the uncertainty associated with model's predictions of annual change in storage, we calculated the standard deviation (a measure of predictive uncertainty) of the average annual change in storage for the 101 realizations (the original calibrated model plus the 100 random realizations based off of it). Recognizing that the RMSEs associated with the 100 random realizations were substantially larger than the RMSE of the original model, we used an inverse weighting approach based on RMSE to calculate the standard deviation. Average annual change in storage for realizations with lower RMSEs were weighted more heavily than those with larger RMSEs. Weights, w_i, were assigned according to the formula

$$w_i = \frac{A}{R_i}$$

where A is a scaling constant that ensures that

$$\sum_{i=1}^{101} w_i = 1$$

and R_i is the RMSE for realization i. We then calculated the weighted mean and standard deviation of the 101 average annual changes in storage as

$$\bar{S} = \sum_{i=1}^{101} w_i S_i$$

and

$$\sigma_S = \left[\sum_{i=1}^{101} w_i (S_i - \bar{S})^2\right]^{1/2}$$

This analysis yields a standard deviation confidence interval for annual storage change of $\pm$ 1,700 AFY.

2.2.2 Uncertainty in Estimates of Recharge to the FCA

We characterized uncertainty in the recharge to the FCA by quantifying the standard deviation in FCA recharge using the original model plus the 100 Monte Carlo realizations. As with storage, model realization calculations of recharge to the FCA were inversely weighted based on RMSEs. This analysis yields a standard deviation confidence interval of recharge to the FCA of $\pm$ 1,300 AFY.

2.2.3 Uncertainty in Estimates of Arroyo Las Posas Infiltration

Inflows into the Arroyo are constrained by projections of declining discharge from the Simi Valley Water Pollution Control facility in the future. At the same time, infiltration from the Arroyo streambed is not well-constrained and constitutes a source of uncertainty.

To estimate this uncertainty, we computed the average annual streambed infiltration across all 100 Monte Carlo realizations used for the GSA. As with annual change in storage, model realization calculations of infiltration from Arroyo Las Posas were inversely weighted based on RMSE as described above. This analysis yields a standard deviation confidence interval of annual infiltration from Arroyo Las Posas of $\pm$ 2,500 AFY.

2.2.4 Uncertainty in Estimates of Future Sustainable Yield

Annual average change in storage incorporates uncertainty in estimates of recharge to the FCA and infiltration from the Arroyo Las Posas. Because the management strategies for the ELPMA are guided by reducing significant loss of storage, we use uncertainty in the average annual storage change to characterize uncertainty in the sustainable yield in the ELPMA.

To map uncertainty in the model estimates of the storage change onto the sustainable pumping rate, we generated a linear regression between the predicted future average annual change in storage and groundwater extractions under the Future Baseline, Reduction without Projects (1), and Reduction without Projects (2) management scenarios (for a description of these model scenarios, see the GSP). This regression takes the form of $\Delta S = C_o P + C_1$, where ΔS is the estimated annual change in storage, P is groundwater production rate, and C_o and C_1 are fitting parameters that constrain the regression. Figure 3 shows the results of this regression. This regression indicates that the estimated groundwater production that induces no long-term change in groundwater storage under future conditions without projects, the sustainable yield, is 17,800 AFY. To generate estimates of uncertainty in the sustainable production rate for the ELPMA, we model ΔS as a Gaussian variable whose mean is given by the future storage change estimates using the calibrated CMWD model, and standard deviation is that of the computed annual average storage change across the 101 model realizations described above.

Because ΔS and *P* are linearly related, groundwater extractions, *P*, must follow a Gaussian distribution similar to the change in storage. The Gaussian distribution of *P* has the mean equal to the model-forced pumping rate, and the standard deviation equal to that of the storage change normalized by the fitting parameter C_o. This analysis produces a sustainable yield uncertainty of $\pm$ 2,300 AFY.

2.3 Quantification of Minimum Threshold Uncertainty

Efficacy of the management strategies in the ELPMA are measured through the quantitative comparison of measured groundwater elevations to MTs and measurable objectives (MOs) at key wells located in the Epworth Gravels, Shallow Alluvium, FCA, and Grimes Canyon Aquifer. Parametric uncertainty in aquifer properties translates into uncertainty in the predicted water levels under fixed groundwater extraction and recharge rates, which introduces uncertainty in the proposed MTs for key wells across the ELPMA.

To quantify uncertainty in the proposed MTs, we ran six additional simulations under the Future Baseline Scenario conditions. In this model scenario, climate conditions were governed by DWR climate change factors for 1930-1979 conditions, groundwater extractions were kept at the average 2015-2017 production rates (22,000 AFY), and discharges to the Arroyo were decreased stepwise to a total reduction of 5,200 AFY by 2040. Because the model performance of the 100 Monte Carlo realizations, as defined by RMSE, was worse than the calibrated model developed by CMWD, we limited perturbations to only 7 parameters that account for 60% of the RMSE variance and 70% of the recharge to the FCA variance in the GSA. In addition, we reduced α_{min} and α_{max} to $\pm$10% of the calibrated parameter value.

To ensure that these parameter changes result in a model performance that matches the original model, we ran each realization under the historical conditions and calculated a global head residual. The ranges of multipliers and corresponding RMSE for each realization are shown in Table 2. RMSEs for these simulations are comparable to the residual calculated using the calibrated model developed by CMWD.

Figures 4 to 19 show the range of simulated water levels from these six simulations at 16 wells in the ELPMA selected for minimum threshold monitoring. The range of predicted water levels is shown underneath each simulated hydrograph to highlight the compounding effect of parameter uncertainty on predicted water levels over the 50-year duration of the simulation.

Results from these future scenarios suggest that simulated water levels are most uncertain in the Shallow Alluvium that is directly adjacent to the Arroyo. At 02N20W09Q08, the range of simulated heads reaches approximately 30 feet in April 2068. At 02N20W12MMW1, the range of simulated heads reaches a maximum spread of 15 feet in March 2068.

Simulated heads at the key wells in the FCA range from 4 to 11 feet at the end of the 50-year simulation. Hydraulic heads at the wells located in the northern section of the model generally are less variable than those in the wells in the southern section near the Arroyo. For example, wells 19J01, 28N03, and 31B01 have simulated heads that range by $\pm$4 to $\pm$6 feet. Wells 10G01, 10J01, and 10D02, which are located near the Arroyo, have a range of simulated heads that span $\pm$10 feet at the end of the future baseline simulation.

To propagate this uncertainty into the proposed MTs for each key well, we calculated the range of simulated heads at each well as a function of time, *R(t)*, and placed uncertainty around each minimum threshold of $\pm R(t)/2$. This uncertainty is shown in the simulated water level hydrographs in Figures 20 to 35 for the various future scenarios examined by CMWD.

3 Concluding Remarks Regarding the CMWD Numerical Model

Analysis of uncertainty in model calculations of historical annual change in storage, recharge into the FCA, and infiltration from Arroyo Las Posas yielded confidence intervals of 1,700 AFY, 1,300 AFY, and 2,500 AFY, respectively. Annual average change in storage broadly reflects the effects of all stresses in the model and incorporates uncertainty embedded in the other two mechanisms. The relative magnitude of the uncertainty in recharge to the FCA and infiltration from the Arroyo indicates that the Arroyo Las Posas remains a critical component of the overall uncertainty in storage changes in the ELPMA.

Avoiding long term loss of storage is proposed to determine the sustainable yield of the ELPMA; applying the annual change in storage confidence interval to the estimated groundwater production that induces no long-term change in groundwater storage under future conditions without projects, produces a sustainable yield of 17,800 AFY ± 2,300 AFY.

4 References

Adams, B. M., M. S. Ebeida, M. S. Eldred, and others (2018). Dakota, A MultiLevel Parallel Object-Oriented Framework for Design Optimization, Parameter Estimation, Uncertainty Quantification, and Sensitivity Analysis: Version 6.9 Reference Manual, Sandia National Laboratories, SAND2014-2015, July 2014, Updated November 13, 2018.

Engle, D. (2012). Phase I Study: Surface Flow and Groundwater Recharge in Arroyo Las Posas, Larry Walker Associates, Memorandum dated January 15, 2012 from Diana Engle to Susan Mulligan, General Manager at Calleguas Municipal Water District

Engle, D. (2013). Draft data report for the Phase II Program for Long-Term Monitoring of Flow and Recharge in Arroyo Las Posas, Memorandum dated August 12, 2013 from Diana Engle to Bryan Bondy at Calleguas Municipal Water Distric

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	0	1	2	3	4	5	6	7
RchZ1	1	0.59097	0.59097	1.0722	1.3707	1.3707	1.3707	0.95265
RchZ2	1	1.4635	0.54571	0.89701	1.4635	1.4635	0.89701	1.4635
RchZ3	1	0.74087	0.74087	0.74087	1.2034	0.74087	1.2653	0.74087
ALP Inflow	1	1.3505	0.69114	1.1527	1.1527	0.69114	1.1527	0.84208
ALP K	1	0.72465	1.3011	0.98144	1.3011	0.72465	0.72465	1.1298
ALP F-W	1	1.2537	1.1129	0.76148	1.2537	1.1129	0.76148	1.1129
HFB	1	2.6892	1.2814	6.3244	2.6892	9.7638	9.7638	2.6892
KzL1Z1	1	2.732	2.732	7.3455	2.732	8.9433	2.1696	7.3455
KzL2Z5	1	2.8021	7.4498	2.8021	9.3915	2.5247	2.5247	2.8021
KzL2Z4	1	9.6778	0.12391	9.6778	0.12391	5.8812	5.8812	4.7833
KhL2Z8	1	4.3403	9.8623	0.42689	0.42689	4.3403	6.755	4.3403
KhL3Z11	1	5.0158	5.0158	5.0158	5.0158	6.4438	0.80426	9.688
KhL3Z10	1	5.9095	9.2428	0.81745	5.9095	5.9095	0.81745	5.9095
KzL3Z8	1	3.7992	8.9021	8.9021	7.0315	2.1064	2.1064	2.1064
KzL4Z11	1	3.1492	6.1551	6.1551	2.0518	8.7553	2.0518	2.0518
KzL4Z13	1	5.7639	2.957	5.7639	9.6197	5.7639	2.957	1.846
KhL5Z20	1	7.0032	9.9078	7.0032	9.9078	7.0032	9.9078	9.9078
KhL5Z17	1	4.6131	5.8652	2.1333	2.1333	2.1333	2.1333	4.6131
KhL19	1	2.0484	8.0206	2.0484	6.7926	5.034	6.7926	5.034
KhL7Z25	1	3.1953	6.7718	1.5934	3.1953	3.1953	3.1953	1.5934
SsL2Z2	1	7.0131	1.9762	1.9762	1.9762	8.6816	7.0131	1.9762
SsL3Z3	1	3.328	0.23752	0.23752	6.826	3.328	6.826	6.826
SsL5Z7	1	6.9885	7.5456	7.5456	6.9885	7.5456	6.9885	6.9885
RMSE	23.09	62.26	54.83	54.83	61.88	64.13	53.82	59.03
Recharge to FCA [AFY]	14,638	18,417	15,776	17,622	18,576	17,127	17,224	17,160
Annual CIS [AFY]	2264.16	5514.12	35.81	3149.91	6411.49	2793.69	3880.61	3734.42
Average Arroyo Infiltration [AFY]	14033.7	20688.2	16471.7	18883.4	19795.8	14560.3	19791.2	17565.4

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	8	9	10	11	12	13	14	15
Rch1	1.0722	0.95265	0.59097	1.0722	1.3707	0.59097	1.0722	0.59097
Rch2	1.4635	0.89701	0.89701	1.4635	1.4635	0.54571	0.54571	0.89701
Rch3	0.74087	0.74087	1.2653	1.2034	1.2034	1.2034	0.85893	0.85893
ALP Inflow	1.1527	1.1527	1.3505	1.3505	1.1527	1.3505	0.84208	1.1527
ALP K	1.1298	1.1298	0.98144	0.72465	1.3011	1.1298	1.3011	1.3011
ALP F-W	1.1129	0.76148	1.2537	0.76148	1.2537	0.59328	0.59328	1.2537
HFB	1.2814	6.3244	6.3244	1.2814	1.2814	2.6892	2.6892	6.3244
KzL1Z1	2.1696	7.3455	2.732	2.1696	8.9433	7.3455	2.1696	2.732
KzL2Z5	2.5247	7.4498	7.4498	7.4498	7.4498	2.8021	2.8021	9.3915
KzL2Z4	0.12391	5.8812	4.7833	0.12391	0.12391	5.8812	9.6778	0.12391
KhL2Z8	9.8623	4.3403	9.8623	9.8623	4.3403	6.755	6.755	4.3403
KhL3Z11	6.4438	5.0158	0.80426	5.0158	9.688	9.688	0.80426	0.80426
KhL3Z10	5.9095	5.9095	0.81745	5.9095	2.5932	2.5932	5.9095	5.9095
KzL3Z8	3.7992	2.1064	8.9021	7.0315	8.9021	8.9021	8.9021	2.1064
KzL4Z11	2.0518	3.1492	2.0518	8.7553	2.0518	2.0518	8.7553	2.0518
KzL4Z13	9.6197	5.7639	1.846	9.6197	1.846	2.957	9.6197	2.957
KhL5Z20	0.92629	2.8576	0.92629	9.9078	2.8576	7.0032	7.0032	2.8576
KhL5Z17	5.8652	5.8652	5.8652	7.9172	5.8652	4.6131	4.6131	7.9172
KhL19	8.0206	8.0206	8.0206	2.0484	6.7926	6.7926	5.034	5.034
KhL7Z25	8.8901	8.8901	8.8901	1.5934	1.5934	3.1953	8.8901	6.7718
SsL2Z2	7.0131	8.6816	3.8345	7.0131	7.0131	3.8345	3.8345	3.8345
SsL3Z3	8.1137	3.328	3.328	0.23752	0.23752	6.826	0.23752	6.826
SsL5Z7	1.0312	1.0312	6.9885	7.5456	6.9885	7.5456	1.0312	1.0312
RMSE	63.47	69.23	46.05	60.94	51.7	53.84	56.81	57.4
Recharge to FCA [AFY]	15,833	15,770	18,197	18,991	18,801	18,496	15,126	15,570
Annual CIS [AFY]	4661.92	3719.90	5528.78	7120.07	8306.47	4408.17	772.41	3143.63
Average Arroyo Infiltration [AFY]	18300.7	15024.2	18375.5	21744.2	19318.5	22568.6	17921.6	17992.7

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	16	17	18	19	20	21	22	23
Rch1	0.95265	0.59097	0.95265	1.3707	0.59097	0.95265	0.95265	1.3707
Rch2	0.89701	0.54571	0.89701	0.54571	0.54571	1.0827	1.0827	0.89701
Rch3	1.2653	1.2653	0.85893	1.2034	0.85893	1.2034	0.85893	0.74087
ALP Inflow	1.3505	0.69114	0.84208	0.69114	1.1527	0.84208	1.1527	1.3505
ALP K	0.72465	1.3011	1.1298	0.98144	1.1298	0.98144	0.72465	0.98144
ALP F-W	1.1129	0.76148	1.2537	0.76148	1.2537	1.1129	0.76148	1.2537
HFB	1.2814	2.6892	9.7638	9.7638	6.3244	6.3244	1.2814	1.2814
KzL1Z1	2.732	8.9433	2.732	2.1696	7.3455	7.3455	7.3455	7.3455
KzL2Z5	9.3915	9.3915	9.3915	7.4498	9.3915	2.5247	9.3915	2.5247
KzL2Z4	0.12391	4.7833	5.8812	9.6778	5.8812	0.12391	0.12391	0.12391
KhL2Z8	9.8623	6.755	9.8623	4.3403	9.8623	6.755	0.42689	4.3403
KhL3Z11	0.80426	6.4438	9.688	0.80426	9.688	9.688	6.4438	0.80426
KhL3Z10	0.81745	2.5932	5.9095	0.81745	9.2428	0.81745	9.2428	0.81745
KzL3Z8	8.9021	8.9021	2.1064	8.9021	2.1064	3.7992	7.0315	7.0315
KzL4Z11	2.0518	8.7553	6.1551	6.1551	3.1492	6.1551	6.1551	8.7553
KzL4Z13	1.846	5.7639	9.6197	2.957	9.6197	9.6197	1.846	9.6197
KhL5Z20	9.9078	2.8576	0.92629	9.9078	7.0032	9.9078	2.8576	0.92629
KhL5Z17	7.9172	5.8652	4.6131	2.1333	4.6131	5.8652	2.1333	7.9172
KhL19	2.0484	8.0206	6.7926	2.0484	6.7926	6.7926	6.7926	8.0206
KhL7Z25	1.5934	8.8901	6.7718	8.8901	3.1953	1.5934	6.7718	8.8901
SsL2Z2	7.0131	3.8345	7.0131	1.9762	1.9762	1.9762	8.6816	8.6816
SsL3Z3	8.1137	3.328	3.328	3.328	8.1137	6.826	8.1137	8.1137
SsL5Z7	1.0312	6.9885	1.0312	2.7326	7.5456	6.9885	2.7326	1.0312
RMSE	57.61	47.61	55.76	46.33	62.94	54.05	57.87	59.49
Recharge to FCA [AFY]	15,351	17,005	15,660	14,838	18,601	17,241	16,141	15,689
Annual CIS [AFY]	3360.10	1743.72	2597.60	-325.70	3438.47	2812.04	3816.60	3506.22
Average Arroyo Infiltration [AFY]	20668.7	16066.1	15662.6	15044.1	21699.6	17518.6	16804.8	15810.1

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	24	25	26	27	28	29	30	31
Rch1	0.95265	1.3707	1.3707	0.59097	0.95265	1.3707	0.59097	0.59097
Rch2	1.0827	1.0827	0.54571	0.89701	0.54571	0.54571	1.0827	1.0827
Rch3	1.2653	0.85893	1.2653	0.74087	0.74087	1.2653	1.2653	1.2653
ALP Inflow	1.1527	1.3505	0.69114	0.69114	1.1527	1.1527	1.1527	0.69114
ALP K	0.98144	0.72465	0.72465	0.72465	1.3011	1.1298	0.98144	0.98144
ALP F-W	1.1129	1.2537	0.59328	0.76148	0.76148	0.59328	0.76148	0.59328
HFB	9.7638	1.2814	9.7638	9.7638	6.3244	2.6892	6.3244	9.7638
KzL1Z1	8.9433	8.9433	2.732	7.3455	7.3455	2.1696	8.9433	7.3455
KzL2Z5	2.8021	2.5247	2.8021	9.3915	9.3915	9.3915	2.8021	2.5247
KzL2Z4	4.7833	0.12391	4.7833	4.7833	0.12391	0.12391	5.8812	4.7833
KhL2Z8	0.42689	6.755	9.8623	9.8623	9.8623	0.42689	9.8623	6.755
KhL3Z11	9.688	5.0158	5.0158	5.0158	9.688	5.0158	5.0158	5.0158
KhL3Z10	2.5932	2.5932	5.9095	9.2428	5.9095	2.5932	0.81745	2.5932
KzL3Z8	2.1064	2.1064	2.1064	3.7992	3.7992	3.7992	3.7992	3.7992
KzL4Z11	2.0518	8.7553	6.1551	2.0518	2.0518	2.0518	2.0518	3.1492
KzL4Z13	9.6197	5.7639	5.7639	2.957	1.846	5.7639	5.7639	1.846
KhL5Z20	2.8576	9.9078	0.92629	0.92629	9.9078	9.9078	2.8576	7.0032
KhL5Z17	4.6131	2.1333	4.6131	2.1333	5.8652	2.1333	2.1333	4.6131
KhL19	6.7926	2.0484	8.0206	2.0484	5.034	5.034	5.034	2.0484
KhL7Z25	3.1953	3.1953	1.5934	8.8901	1.5934	6.7718	6.7718	8.8901
SsL2Z2	1.9762	3.8345	7.0131	7.0131	8.6816	3.8345	1.9762	7.0131
SsL3Z3	0.23752	6.826	3.328	0.23752	0.23752	3.328	3.328	8.1137
SsL5Z7	7.5456	6.9885	2.7326	1.0312	2.7326	7.5456	1.0312	7.5456
RMSE	51.4	59.77	42.5	50.89	60.29	49.58	62.66	48.42
Recharge to FCA [AFY]	18,490	18,241	15,679	15,108	16,097	17,322	16,267	16,383
Annual CIS [AFY]	5070.24	4748.89	1626.16	1995.11	3445.63	3773.63	3185.47	1998.76
Average Arroyo Infiltration [AFY]	18081.6	20250.7	13949.4	14056.1	21807.7	17370.8	19980.4	15610.3

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	32	33	34	35	36	37	38	39
Rch1	0.95265	1.0722	1.3707	1.0722	1.3707	0.95265	0.59097	1.0722
Rch2	0.89701	0.89701	0.89701	0.89701	1.4635	0.54571	0.89701	0.54571
Rch3	1.2653	1.2034	0.85893	0.85893	0.85893	0.74087	1.2034	0.85893
ALP Inflow	1.3505	0.84208	0.84208	0.69114	0.84208	0.69114	0.69114	1.1527
ALP K	1.3011	0.98144	1.3011	1.3011	0.72465	1.3011	0.72465	1.1298
ALP F-W	0.59328	1.1129	1.2537	1.2537	1.1129	1.2537	0.76148	1.2537
HFB	2.6892	9.7638	6.3244	1.2814	1.2814	6.3244	2.6892	2.6892
KzL1Z1	2.732	2.732	7.3455	2.732	2.1696	2.1696	2.1696	8.9433
KzL2Z5	2.8021	2.5247	7.4498	7.4498	2.5247	9.3915	2.5247	9.3915
KzL2Z4	4.7833	9.6778	5.8812	4.7833	4.7833	5.8812	5.8812	0.12391
KhL2Z8	4.3403	4.3403	6.755	6.755	6.755	9.8623	4.3403	4.3403
KhL3Z11	6.4438	5.0158	5.0158	9.688	5.0158	0.80426	5.0158	0.80426
KhL3Z10	5.9095	2.5932	9.2428	9.2428	9.2428	2.5932	0.81745	9.2428
KzL3Z8	3.7992	7.0315	3.7992	3.7992	7.0315	8.9021	8.9021	7.0315
KzL4Z11	2.0518	2.0518	8.7553	6.1551	8.7553	2.0518	8.7553	3.1492
KzL4Z13	1.846	9.6197	2.957	1.846	5.7639	9.6197	2.957	5.7639
KhL5Z20	7.0032	0.92629	2.8576	7.0032	7.0032	7.0032	0.92629	9.9078
KhL5Z17	5.8652	5.8652	7.9172	4.6131	4.6131	4.6131	5.8652	4.6131
KhL19	8.0206	8.0206	5.034	2.0484	6.7926	5.034	6.7926	8.0206
KhL7Z25	3.1953	3.1953	1.5934	6.7718	8.8901	3.1953	1.5934	8.8901
SsL2Z2	7.0131	3.8345	3.8345	8.6816	7.0131	7.0131	8.6816	1.9762
SsL3Z3	6.826	3.328	8.1137	8.1137	3.328	8.1137	0.23752	8.1137
SsL5Z7	6.9885	2.7326	7.5456	2.7326	7.5456	6.9885	2.7326	7.5456
RMSE	57.86	45.49	59.6	54.05	63.37	55.68	37.61	61.11
Recharge to FCA [AFY]	16,262	18,498	18,768	15,553	17,887	16,325	18,433	15,300
Annual CIS [AFY]	6019.80	3063.31	4440.96	1386.45	3953.16	618.14	1657.09	4004.76
Average Arroyo Infiltration [AFY]	22308.6	14899.8	17547.1	16181.7	16472.6	16758.0	13747.4	21510.7

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	40	41	42	43	44	45	46	47
Rch1	0.59097	0.59097	1.0722	1.0722	1.0722	0.59097	0.95265	1.0722
Rch2	1.0827	0.89701	1.4635	1.4635	1.4635	0.89701	0.54571	1.0827
Rch3	1.2653	1.2034	1.2034	0.74087	1.2034	1.2653	0.74087	0.85893
ALP Inflow	1.3505	1.1527	1.1527	0.84208	0.84208	1.3505	0.84208	1.3505
ALP K	0.72465	0.98144	1.3011	1.1298	0.72465	0.72465	0.98144	0.98144
ALP F-W	0.59328	0.59328	0.59328	0.59328	0.76148	1.1129	0.76148	1.2537
HFB	1.2814	2.6892	9.7638	2.6892	2.6892	2.6892	9.7638	9.7638
KzL1Z1	2.1696	8.9433	2.732	2.1696	8.9433	2.732	2.1696	2.732
KzL2Z5	7.4498	7.4498	2.5247	7.4498	7.4498	9.3915	7.4498	7.4498
KzL2Z4	9.6778	9.6778	5.8812	9.6778	5.8812	4.7833	9.6778	5.8812
KhL2Z8	9.8623	0.42689	4.3403	9.8623	6.755	6.755	0.42689	9.8623
KhL3Z11	5.0158	6.4438	5.0158	6.4438	0.80426	6.4438	5.0158	6.4438
KhL3Z10	9.2428	0.81745	0.81745	2.5932	2.5932	0.81745	9.2428	0.81745
KzL3Z8	2.1064	3.7992	8.9021	7.0315	8.9021	2.1064	3.7992	3.7992
KzL4Z11	3.1492	2.0518	3.1492	3.1492	8.7553	8.7553	3.1492	3.1492
KzL4Z13	1.846	5.7639	1.846	5.7639	2.957	5.7639	9.6197	2.957
KhL5Z20	9.9078	0.92629	9.9078	0.92629	2.8576	7.0032	2.8576	2.8576
KhL5Z17	7.9172	2.1333	2.1333	4.6131	5.8652	5.8652	5.8652	5.8652
KhL19	6.7926	5.034	8.0206	5.034	2.0484	6.7926	8.0206	5.034
KhL7Z25	3.1953	6.7718	3.1953	3.1953	6.7718	1.5934	6.7718	1.5934
SsL2Z2	8.6816	7.0131	3.8345	3.8345	1.9762	8.6816	8.6816	1.9762
SsL3Z3	0.23752	8.1137	3.328	6.826	8.1137	0.23752	8.1137	3.328
SsL5Z7	2.7326	7.5456	1.0312	7.5456	2.7326	6.9885	7.5456	2.7326
RMSE	60.38	42.45	67.34	55.27	65.5	53.77	53.81	66.55
Recharge to FCA [AFY]	16,048	17,966	15,540	18,971	16,710	17,836	17,263	16,834
Annual CIS [AFY]	3881.39	4374.91	4017.83	5593.20	3859.28	4556.37	2151.72	4135.94
Average Arroyo Infiltration [AFY]	21632.2	16901.8	19589.6	15776.5	15294.2	16863.2	21576.4	18680.8

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	48	49	50	51	52	53	54	55
Rch1	0.59097	1.0722	0.95265	0.95265	1.0722	1.3707	0.95265	0.95265
Rch2	1.4635	1.4635	1.4635	0.54571	1.4635	0.89701	0.54571	1.0827
Rch3	1.2034	0.74087	1.2653	1.2653	1.2653	0.85893	0.85893	0.74087
ALP Inflow	0.69114	1.1527	1.3505	0.69114	0.69114	1.3505	0.69114	0.84208
ALP K	1.1298	0.98144	0.72465	1.3011	1.1298	1.1298	0.98144	0.72465
ALP F-W	1.2537	1.1129	1.1129	0.59328	0.59328	1.1129	0.59328	0.76148
HFB	2.6892	6.3244	1.2814	2.6892	9.7638	2.6892	2.6892	9.7638
KzL1Z1	7.3455	8.9433	8.9433	7.3455	7.3455	2.1696	7.3455	7.3455
KzL2Z5	7.4498	2.8021	2.8021	2.8021	2.5247	9.3915	7.4498	2.5247
KzL2Z4	9.6778	5.8812	4.7833	9.6778	4.7833	5.8812	9.6778	9.6778
KhL2Z8	9.8623	4.3403	6.755	0.42689	0.42689	0.42689	0.42689	4.3403
KhL3Z11	0.80426	9.688	0.80426	6.4438	9.688	6.4438	5.0158	5.0158
KhL3Z10	2.5932	0.81745	2.5932	5.9095	2.5932	9.2428	9.2428	2.5932
KzL3Z8	8.9021	7.0315	7.0315	7.0315	2.1064	3.7992	3.7992	2.1064
KzL4Z11	3.1492	6.1551	3.1492	3.1492	3.1492	6.1551	8.7553	6.1551
KzL4Z13	5.7639	9.6197	9.6197	9.6197	2.957	9.6197	2.957	2.957
KhL5Z20	7.0032	2.8576	7.0032	7.0032	7.0032	9.9078	2.8576	0.92629
KhL5Z17	2.1333	2.1333	5.8652	5.8652	4.6131	2.1333	7.9172	4.6131
KhL19	5.034	8.0206	5.034	8.0206	5.034	6.7926	2.0484	2.0484
KhL7Z25	8.8901	1.5934	3.1953	8.8901	6.7718	3.1953	6.7718	6.7718
SsL2Z2	1.9762	7.0131	3.8345	7.0131	3.8345	7.0131	7.0131	8.6816
SsL3Z3	3.328	0.23752	3.328	0.23752	8.1137	6.826	3.328	6.826
SsL5Z7	7.5456	7.5456	2.7326	7.5456	2.7326	1.0312	1.0312	1.0312
RMSE	55.76	65.74	70.93	48.88	53.55	67.41	50.69	57.47
Recharge to FCA [AFY]	17,520	19,465	16,804	15,830	15,474	15,513	14,785	15,521
Annual CIS [AFY]	3475.55	7005.53	4769.78	736.56	2446.88	2443.41	218.35	2712.64
Average Arroyo Infiltration [AFY]	16084.1	18830.4	19765.2	15771.3	14656.1	20544.0	14587.7	19916.1

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	56	57	58	59	60	61	62	63
Rch1	0.59097	0.95265	1.3707	1.0722	1.3707	0.95265	1.0722	0.95265
Rch2	0.54571	0.54571	1.4635	0.89701	1.0827	1.0827	1.4635	1.4635
Rch3	1.2653	1.2034	1.2034	0.85893	1.2034	0.85893	1.2034	1.2653
ALP Inflow	1.1527	0.84208	1.3505	1.3505	0.69114	0.84208	0.69114	1.3505
ALP K	1.1298	1.1298	0.98144	1.1298	1.1298	1.3011	1.1298	0.98144
ALP F-W	0.59328	1.2537	0.76148	0.76148	1.1129	1.1129	0.59328	1.1129
HFB	9.7638	6.3244	1.2814	6.3244	2.6892	9.7638	9.7638	9.7638
KzL1Z1	2.732	7.3455	8.9433	2.732	8.9433	8.9433	8.9433	8.9433
KzL2Z5	2.5247	2.8021	9.3915	7.4498	2.8021	9.3915	7.4498	7.4498
KzL2Z4	9.6778	0.12391	4.7833	5.8812	0.12391	5.8812	9.6778	4.7833
KhL2Z8	4.3403	6.755	4.3403	6.755	4.3403	4.3403	0.42689	0.42689
KhL3Z11	6.4438	0.80426	6.4438	6.4438	0.80426	9.688	0.80426	9.688
KhL3Z10	9.2428	0.81745	5.9095	2.5932	0.81745	5.9095	2.5932	9.2428
KzL3Z8	7.0315	8.9021	7.0315	2.1064	2.1064	3.7992	8.9021	7.0315
KzL4Z11	3.1492	6.1551	8.7553	3.1492	6.1551	8.7553	6.1551	3.1492
KzL4Z13	1.846	9.6197	1.846	5.7639	1.846	2.957	9.6197	1.846
KhL5Z20	2.8576	7.0032	0.92629	0.92629	0.92629	7.0032	9.9078	9.9078
KhL5Z17	4.6131	2.1333	2.1333	5.8652	7.9172	2.1333	4.6131	2.1333
KhL19	2.0484	5.034	5.034	5.034	6.7926	2.0484	2.0484	6.7926
KhL7Z25	1.5934	8.8901	3.1953	6.7718	8.8901	3.1953	6.7718	1.5934
SsL2Z2	8.6816	1.9762	7.0131	1.9762	3.8345	1.9762	8.6816	8.6816
SsL3Z3	6.826	8.1137	8.1137	0.23752	3.328	3.328	0.23752	6.826
SsL5Z7	6.9885	1.0312	6.9885	1.0312	7.5456	2.7326	2.7326	1.0312
RMSE	45.37	55.95	57.38	57.51	39.45	62.14	57.38	65.61
Recharge to FCA [AFY]	17,951	15,221	19,085	15,699	17,242	16,148	15,382	15,400
Annual CIS [AFY]	4483.22	988.98	6982.01	2945.57	4484.71	2402.31	2123.53	4131.45
Average Arroyo Infiltration [AFY]	17257.6	14162.4	16625.9	15832.1	14594.1	17381.3	15569.2	19907.9

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	64	65	66	67	68	69	70	71
Rch1	1.3707	0.59097	1.0722	0.59097	1.3707	0.95265	1.3707	0.59097
Rch2	1.0827	0.54571	1.0827	0.54571	0.89701	1.4635	0.89701	0.54571
Rch3	0.74087	0.85893	0.85893	1.2653	0.74087	1.2653	0.74087	0.74087
ALP Inflow	1.3505	0.84208	1.1527	1.3505	0.69114	0.84208	0.84208	0.69114
ALP K	0.98144	0.98144	1.1298	0.98144	0.72465	1.3011	0.98144	0.98144
ALP F-W	0.59328	0.76148	0.59328	0.59328	1.1129	0.76148	0.76148	1.2537
HFB	1.2814	1.2814	2.6892	1.2814	9.7638	2.6892	1.2814	6.3244
KzL1Z1	2.1696	7.3455	2.732	2.1696	2.732	8.9433	7.3455	2.732
KzL2Z5	2.5247	2.8021	9.3915	2.5247	2.8021	2.8021	7.4498	9.3915
KzL2Z4	9.6778	0.12391	5.8812	9.6778	0.12391	9.6778	4.7833	5.8812
KhL2Z8	6.755	6.755	4.3403	9.8623	4.3403	0.42689	0.42689	0.42689
KhL3Z11	0.80426	9.688	5.0158	9.688	9.688	9.688	0.80426	0.80426
KhL3Z10	5.9095	5.9095	0.81745	0.81745	2.5932	0.81745	9.2428	9.2428
KzL3Z8	3.7992	3.7992	2.1064	8.9021	2.1064	2.1064	3.7992	7.0315
KzL4Z11	8.7553	6.1551	3.1492	6.1551	2.0518	2.0518	2.0518	8.7553
KzL4Z13	5.7639	1.846	1.846	5.7639	2.957	5.7639	1.846	2.957
KhL5Z20	2.8576	7.0032	0.92629	9.9078	7.0032	7.0032	0.92629	0.92629
KhL5Z17	4.6131	7.9172	2.1333	7.9172	4.6131	7.9172	7.9172	5.8652
KhL19	5.034	2.0484	2.0484	2.0484	2.0484	8.0206	5.034	2.0484
KhL7Z25	8.8901	8.8901	6.7718	3.1953	3.1953	6.7718	1.5934	6.7718
SsL2Z2	1.9762	8.6816	8.6816	1.9762	1.9762	8.6816	7.0131	3.8345
SsL3Z3	6.826	6.826	0.23752	0.23752	6.826	6.826	8.1137	8.1137
SsL5Z7	1.0312	7.5456	2.7326	6.9885	2.7326	2.7326	7.5456	6.9885
RMSE	76.25	50.06	48	50.87	52.02	56.79	47.63	46.41
Recharge to FCA [AFY]	16,008	16,512	16,254	15,051	17,734	15,776	17,290	16,500
Annual CIS [AFY]	3430.15	1538.74	4460.98	3307.84	647.94	3474.25	4087.31	765.19
Average Arroyo Infiltration [AFY]	17267.4	17621.9	16215.3	22801.4	14478.6	16621.4	15472.1	14313.7

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	72	73	74	75	76	77	78	79
Rch1	0.95265	1.3707	0.59097	1.0722	1.3707	0.95265	1.0722	0.95265
Rch2	1.0827	1.0827	1.0827	1.0827	0.54571	1.4635	1.0827	0.54571
Rch3	1.2034	1.2653	0.85893	1.2653	1.2034	1.2034	0.85893	1.2653
ALP Inflow	1.3505	0.69114	0.84208	1.3505	0.69114	1.1527	0.84208	1.3505
ALP K	0.72465	1.1298	1.1298	1.3011	1.3011	1.3011	0.72465	0.72465
ALP F-W	1.1129	1.2537	1.2537	0.76148	0.76148	0.59328	1.1129	1.1129
HFB	9.7638	1.2814	6.3244	6.3244	6.3244	1.2814	9.7638	6.3244
KzL1Z1	2.1696	2.1696	2.1696	2.1696	2.1696	2.1696	8.9433	7.3455
KzL2Z5	9.3915	2.5247	2.5247	9.3915	7.4498	2.8021	2.5247	9.3915
KzL2Z4	4.7833	4.7833	0.12391	0.12391	4.7833	9.6778	4.7833	0.12391
KhL2Z8	4.3403	6.755	9.8623	0.42689	0.42689	6.755	9.8623	6.755
KhL3Z11	6.4438	9.688	0.80426	9.688	0.80426	0.80426	9.688	6.4438
KhL3Z10	5.9095	2.5932	9.2428	9.2428	5.9095	2.5932	2.5932	9.2428
KzL3Z8	8.9021	7.0315	7.0315	7.0315	3.7992	7.0315	3.7992	7.0315
KzL4Z11	8.7553	8.7553	6.1551	3.1492	6.1551	3.1492	6.1551	3.1492
KzL4Z13	5.7639	1.846	2.957	2.957	2.957	9.6197	5.7639	2.957
KhL5Z20	2.8576	2.8576	0.92629	9.9078	7.0032	0.92629	2.8576	2.8576
KhL5Z17	7.9172	2.1333	7.9172	5.8652	4.6131	7.9172	7.9172	2.1333
KhL19	8.0206	6.7926	2.0484	5.034	2.0484	5.034	8.0206	6.7926
KhL7Z25	6.7718	1.5934	3.1953	8.8901	1.5934	1.5934	1.5934	8.8901
SsL2Z2	7.0131	8.6816	8.6816	3.8345	1.9762	8.6816	3.8345	8.6816
SsL3Z3	0.23752	3.328	6.826	0.23752	0.23752	6.826	8.1137	0.23752
SsL5Z7	6.9885	6.9885	2.7326	1.0312	6.9885	2.7326	2.7326	7.5456
RMSE	58.78	48.28	43.52	64.14	43.02	53.48	65.7	50.29
Recharge to FCA [AFY]	18,886	17,366	16,120	15,374	15,592	16,724	16,392	18,423
Annual CIS [AFY]	6443.75	4238.66	3499.11	4052.37	792.59	5242.69	2413.33	5984.77
Average Arroyo Infiltration [AFY]	15519.0	20107.5	15545.3	20004.6	15492.9	15633.4	15684.8	20688.2

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	80	81	82	83	84	85	86	87
Rch1	1.0722	0.59097	1.0722	1.3707	1.0722	1.0722	0.59097	1.3707
Rch2	1.0827	0.89701	0.89701	1.0827	1.0827	1.0827	1.4635	0.54571
Rch3	1.2034	1.2034	0.85893	0.74087	0.85893	0.74087	1.2653	1.2034
ALP Inflow	0.69114	0.84208	1.1527	0.84208	0.84208	1.1527	0.69114	1.1527
ALP K	1.3011	0.72465	0.72465	1.1298	1.3011	0.98144	0.98144	1.3011
ALP F-W	1.2537	0.59328	0.59328	0.76148	1.2537	1.2537	1.1129	0.76148
HFB	6.3244	1.2814	6.3244	9.7638	2.6892	9.7638	6.3244	6.3244
KzL1Z1	2.732	8.9433	2.1696	8.9433	2.732	2.1696	7.3455	8.9433
KzL2Z5	2.8021	7.4498	2.5247	2.5247	2.8021	9.3915	2.5247	9.3915
KzL2Z4	4.7833	9.6778	5.8812	0.12391	9.6778	4.7833	4.7833	9.6778
KhL2Z8	0.42689	6.755	0.42689	6.755	0.42689	6.755	9.8623	9.8623
KhL3Z11	6.4438	6.4438	6.4438	6.4438	0.80426	0.80426	6.4438	9.688
KhL3Z10	0.81745	5.9095	0.81745	2.5932	5.9095	9.2428	2.5932	0.81745
KzL3Z8	8.9021	2.1064	8.9021	2.1064	8.9021	7.0315	8.9021	7.0315
KzL4Z11	3.1492	2.0518	6.1551	6.1551	8.7553	8.7553	6.1551	8.7553
KzL4Z13	9.6197	1.846	9.6197	1.846	1.846	9.6197	5.7639	2.957
KhL5Z20	9.9078	9.9078	2.8576	9.9078	0.92629	2.8576	0.92629	2.8576
KhL5Z17	4.6131	4.6131	7.9172	5.8652	7.9172	5.8652	7.9172	5.8652
KhL19	8.0206	6.7926	8.0206	2.0484	8.0206	6.7926	6.7926	5.034
KhL7Z25	8.8901	1.5934	8.8901	6.7718	1.5934	6.7718	8.8901	8.8901
SsL2Z2	8.6816	8.6816	1.9762	3.8345	1.9762	7.0131	1.9762	3.8345
SsL3Z3	6.826	8.1137	3.328	8.1137	6.826	3.328	6.826	0.23752
SsL5Z7	7.5456	6.9885	2.7326	6.9885	6.9885	1.0312	1.0312	2.7326
RMSE	52.41	50.63	58.95	57.33	45.44	74.33	58.84	63.15
Recharge to FCA [AFY]	16,239	15,816	16,205	17,368	17,701	15,990	15,737	16,739
Annual CIS [AFY]	1715.01	1031.80	2202.57	3497.42	3386.10	3920.89	2866.10	3720.76
Average Arroyo Infiltration [AFY]	15724.7	16842.4	16615.0	14838.8	17641.8	18135.4	13001.9	18957.4

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	88	89	90	91	92	93	94	95
Rch1	1.3707	1.3707	1.0722	0.95265	0.59097	1.1785	1.4721	0.57537
Rch2	0.89701	0.54571	1.0827	1.4635	1.4635	0.50638	1.3009	0.77863
Rch3	0.85893	1.2034	0.74087	0.74087	0.85893	0.8461	1.1827	1.327
ALP Inflow	0.84208	0.84208	1.3505	1.3505	0.69114	1.337	1.0742	0.91347
ALP K	1.1298	0.72465	1.3011	1.3011	1.1298	1.3271	1.1856	1.1856
ALP F-W	1.1129	1.2537	1.1129	0.59328	0.59328	1.0091	1.2825	1.2825
HFB	1.2814	6.3244	1.2814	1.2814	2.6892	3.8229	7.3548	3.8229
KzL1Z1	8.9433	2.732	7.3455	8.9433	2.732	1.6775	8.3199	4.3554
KzL2Z5	7.4498	2.8021	2.8021	2.5247	2.8021	5.6843	7.5737	4.8549
KzL2Z4	5.8812	9.6778	5.8812	0.12391	5.8812	4.6382	4.6382	5.9114
KhL2Z8	9.8623	9.8623	0.42689	4.3403	0.42689	5.5805	1.6667	3.7822
KhL3Z11	5.0158	9.688	6.4438	6.4438	9.688	9.6482	2.5063	9.6482
KhL3Z10	9.2428	0.81745	9.2428	9.2428	5.9095	5.6197	3.2703	5.6197
KzL3Z8	2.1064	8.9021	3.7992	2.1064	7.0315	4.097	1.8417	5.5757
KzL4Z11	8.7553	2.0518	3.1492	8.7553	6.1551	5.0475	5.1415	5.0475
KzL4Z13	9.6197	2.957	1.846	5.7639	2.957	9.4008	6.9401	9.4008
KhL5Z20	2.8576	7.0032	0.92629	9.9078	0.92629	2.7598	8.817	5.8326
KhL5Z17	7.9172	2.1333	7.9172	7.9172	7.9172	7.4412	7.4412	4.3485
KhL19	6.7926	8.0206	8.0206	8.0206	6.7926	2.1118	8.8569	6.8698
KhL7Z25	1.5934	3.1953	3.1953	6.7718	6.7718	7.3181	4.0566	2.5292
SsL2Z2	3.8345	3.8345	3.8345	3.8345	7.0131	2.9869	0.8806	0.8806
SsL3Z3	6.826	3.328	8.1137	0.23752	8.1137	4.453	5.6286	9.992
SsL5Z7	6.9885	2.7326	1.0312	1.0312	1.0312	5.7699	5.7699	4.611
RMSE	61.88	51.64	58.79	77.29	53.4	56.67	63.95	56.23
Recharge to FCA [AFY]	18,665	15,309	15,591	15,766	15,431	18,317	17,895	16,985
Annual CIS [AFY]	4315.08	814.38	3005.58	4612.60	2596.40	4284.05	4519.74	2186.33
Average Arroyo Infiltration [AFY]	16600.4	17469.4	14901.0	20104.5	13004.2	20296.5	19383.0	18221.4

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

Table 1
Multipliers used for the 100 Monte Carlo Realizations

RLZN	96	97	98	99	100
Rch1	0.96481	1.4721	0.96481	0.57537	1.1785
Rch2	1.1041	1.1041	0.77863	0.50638	1.3009
Rch3	0.8461	0.56827	1.1827	1.327	0.56827
ALP Inflow	1.337	0.91347	0.68061	1.0742	0.68061
ALP K	0.78268	0.78268	0.70848	0.70848	1.3271
ALP F-W	1.0091	0.60976	0.82432	0.60976	0.82432
HFB	8.3456	2.3077	7.3548	8.3456	2.3077
KzL1Z1	6.7426	8.3199	6.7426	4.3554	1.6775
KzL2Z5	1.932	5.6843	1.932	7.5737	4.8549
KzL2Z4	5.9114	0.54365	7.9407	7.9407	0.54365
KhL2Z8	5.5805	3.7822	1.6667	9.884	9.884
KhL3Z11	7.199	7.199	2.8447	2.8447	2.5063
KhL3Z10	1.2976	9.3509	3.2703	1.2976	9.3509
KzL3Z8	9.5977	1.8417	4.097	5.5757	9.5977
KzL4Z11	8.5212	0.95131	5.1415	0.95131	8.5212
KzL4Z13	6.9401	1.0134	1.0134	3.7966	3.7966
KhL5Z20	2.7598	1.4048	8.817	5.8326	1.4048
KhL5Z17	7.5426	1.4405	1.4405	7.5426	4.3485
KhL19	8.8569	2.1118	2.9629	2.9629	6.8698
KhL7Z25	7.3181	7.8412	2.5292	7.8412	4.0566
SsL2Z2	7.4547	8.1353	8.1353	2.9869	7.4547
SsL3Z3	4.453	1.2126	1.2126	9.992	5.6286
SsL5Z7	1.4424	7.9216	4.611	7.9216	1.4424
RMSE	73.42	49.57	45.5	49.06	61.72
Recharge to FCA [AFY]	16,091	17,367	14,498	17,286	15,917
Annual CIS [AFY]	3759.23	6018.80	-384.51	2884.80	3673.71
Average Arroyo Infiltration [AFY]	17961.2	16623.8	14223.1	19709.7	14512.4

Notes:

L denotes model layer

Z denotes model zone

Kh denotes horizontal hydraulic conductivity

Kz denotes vertical hydraulic conductivity

Ss denotes specific storage

ALP denotes Arroyo Las Posas

HFB_C denotes Hydraulic Flow Barrier Conductanc

Rch denotes recharge parameter

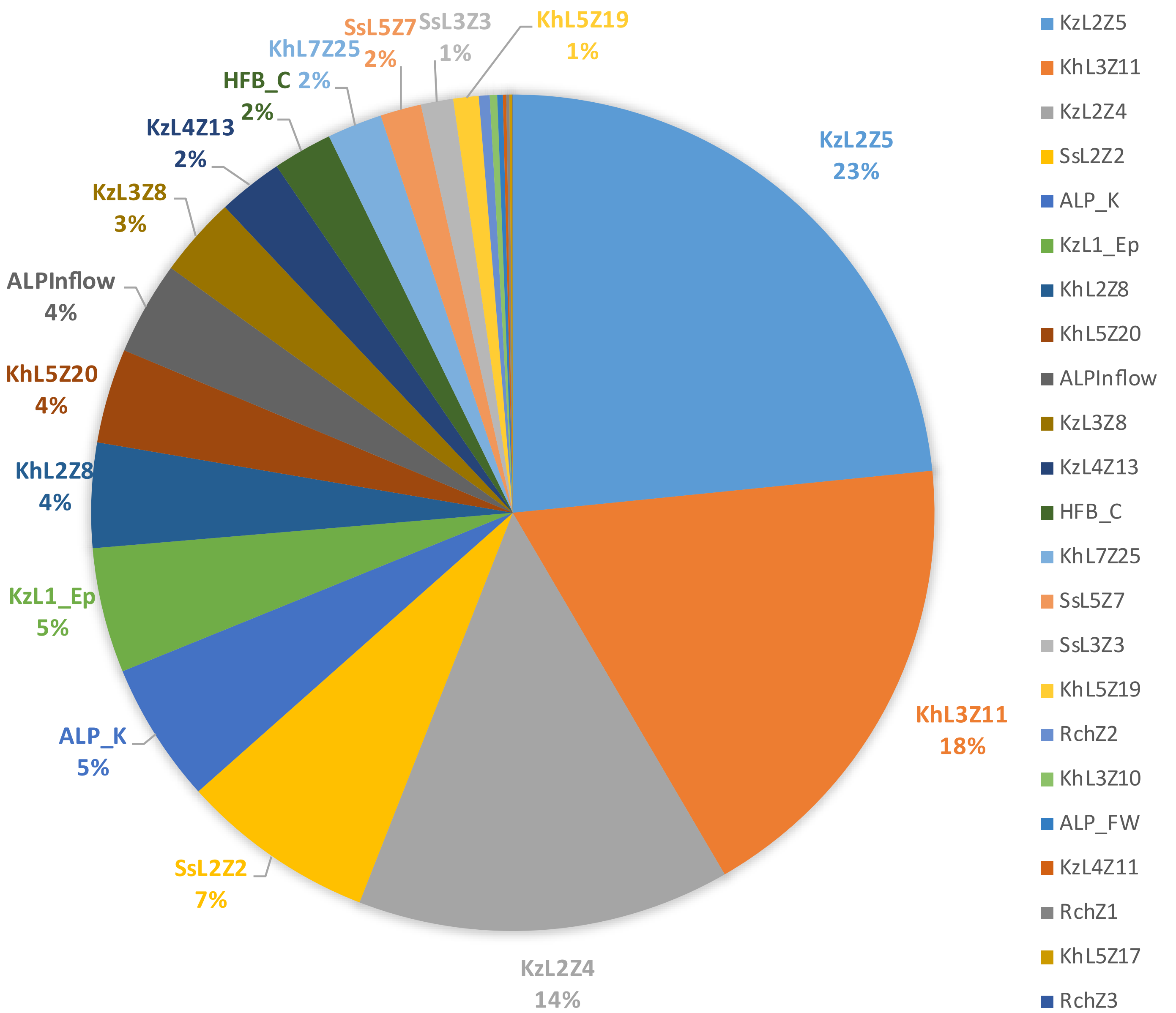
Table 2

Parameter multipliers used in the 6 alternate realizations of the Future Baseline Simulation

	KzL2Z4	KzL2Z5	KhL2Z8	KhL3Z10	KhL3Z11	KhL5Z20	ALP_K	RMSE
R001	0.983	1.08	0.988	1.07	0.95	1.06	0.946	23.33
R002	0.918	0.982	1.1	0.925	0.91	0.944	1.05	22.96
R003	1.04	1.03	0.921	0.999	1.01	0.972	0.985	23.06
R004	1.01	1.04	0.959	0.937	0.976	1.03	1.09	23.03
R005	0.939	0.943	1.05	1.08	1.07	1.07	1	23.25
R006	1.1	0.922	1.01	1.01	1.04	0.91	0.909	23.22

Table 3
Parameters used in Global Sensitivity Analysis

Variable Name	Multiplier Range	Description
RchZ1	[0.5, 1.5]	Recharge, Epworth Gravels Aquifer
RchZ2	[0.5, 1.5]	Elevated Recharge Zone in the Eastern segment of the model
RchZ3	[0.5, 1.5]	Distributed Recharge Excluding RchZ1, RchZ2, and Shallow Alluvium
ALPInflow	[0.5, 1.5]	Inflow into the uppermost reach of the Arroyo Las Posas
ALP_K	[0.5, 1.5]	Arroyo Las Posas Streambed Conductivity
ALP_FW	[0.5, 1.5]	Arroyo Las Posas Flow-to-width ratio
HFB_C	[0.1, 10]	Horiztonal Flow Barrier Conductance
KzL1Z1	[0.1, 10]	Vertical Hydraulic Conductivity Layer 1 Zone 1
KzL2Z5	[0.1, 10]	Vertical Hydraulic Conductivity Layer 2 Zone 5
KzL2Z4	[0.1, 10]	Vertical Hydraulic Conductivity Layer 2 Zone 4
KhL2Z8	[0.1, 10]	Horizontal Hydraulic Conductivity Layer 2 Zone 8
SsL2Z2	[0.1, 10]	Specific Storage Layer 2 Zone 2
KhL3z11	[0.1, 10]	Horizontal Hydraulic Conductivity Layer 3 Zone 11
KhL3Z10	[0.1, 10]	Horizontal Hydrualic Conductivity Layer 3 Zone 10
KzL3Z8	[0.1, 10]	Vertical Hydraulic Conductivity Layer 3 Zone 8
SsL3Z3	[0.1, 10]	Specific Storage Layer 3 Zone 3
KzL4Z11	[0.1, 10]	Vertical Hydraulic Conductivity Layer 4 Zone 11
KzL4Z13	[0.1, 10]	Vertical Hydraulic Conductivity Layer 4 Zone 13
KhL5Z20	[0.1, 10]	Horizontal Hydraulic Conductivity Layer 5 Zone 20
KhL5Z17	[0.1, 10]	Horizontal Hydraulic Conductivity Layer 5 Zone 17
KhL5Z19	[0.1, 10]	Horizontal Hydraulic Conductivity Layer 5 Zone 19
SsL5Z7	[0.1, 10]	Specific Storage Layer 5 Zone 7
KhL7Z25	[0.1, 10]	Horizontal Hydraulic Conductivity Layer 7 Zone 25



Notes:
Parameter descriptions are provided in Table 3
Parameter Zone Maps are included in Appendix A

SOURCE:

FIGURE 1

Sobol' indices for RMSE

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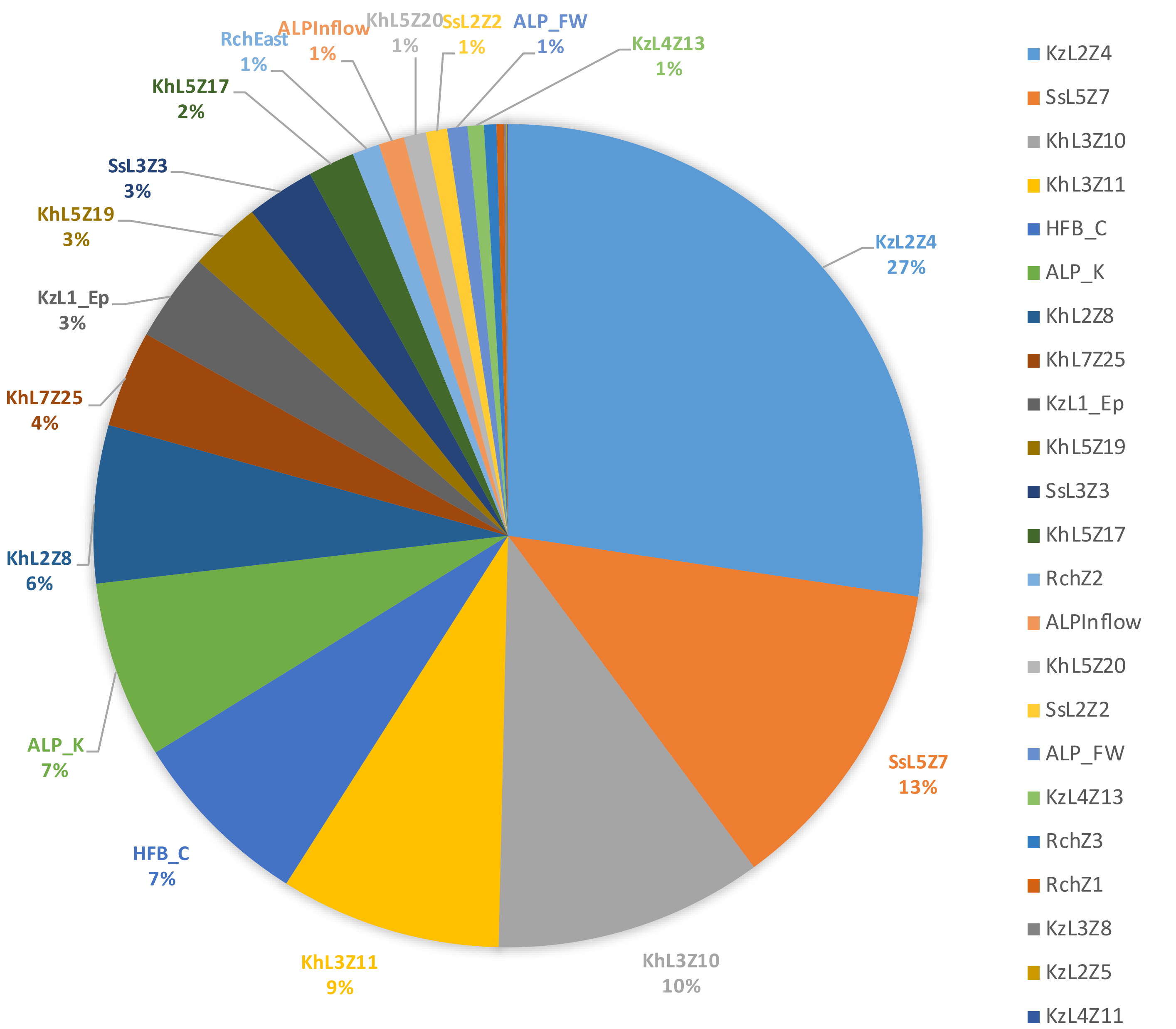
DUDEK



Notes:
Parameter descriptions are provided in Table 3
Parameter Zone Maps are included in Appendix A

SOURCE:

FIGURE 2

Sobol' indices for Recharge to the FCA

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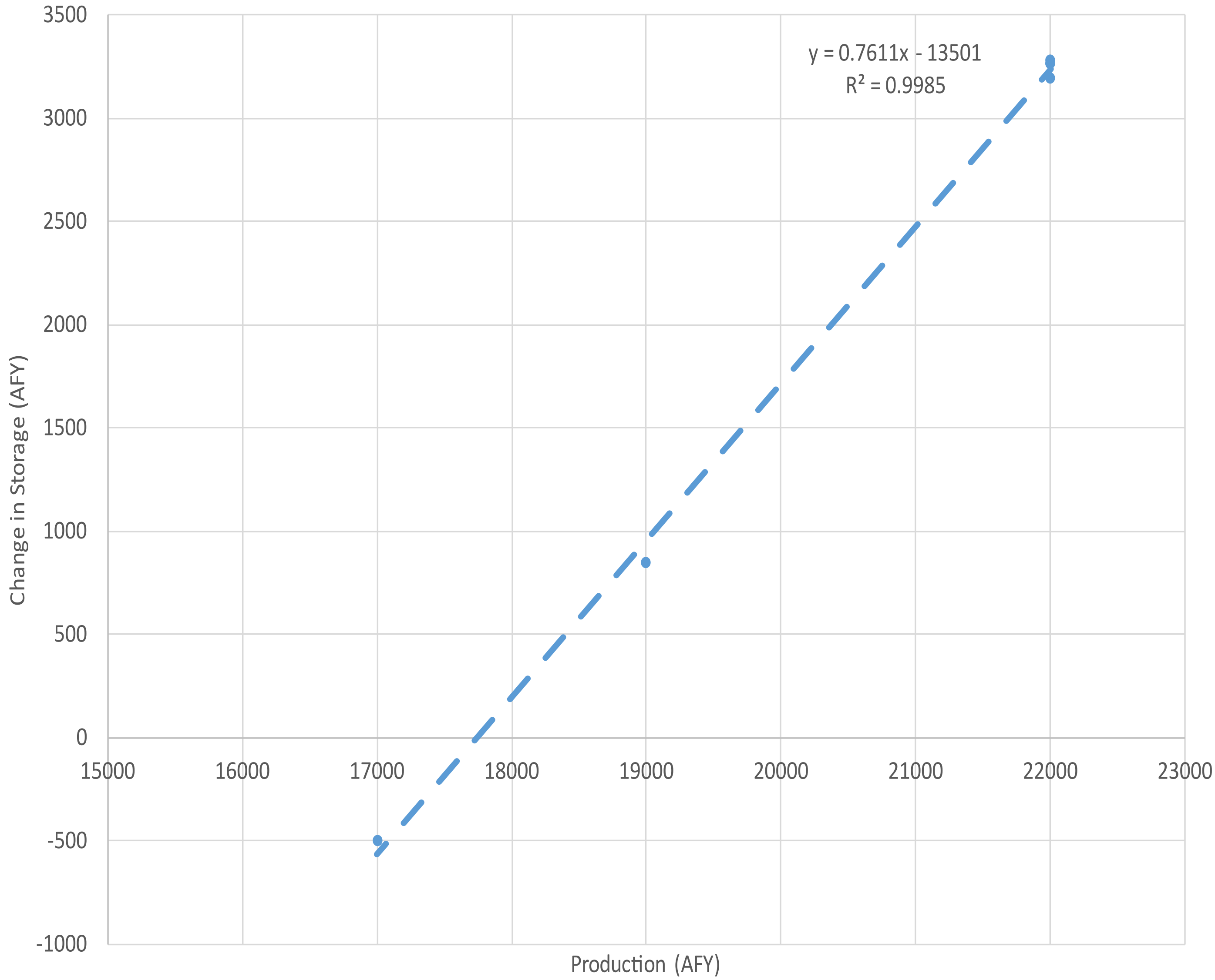

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SOURCE:

FIGURE 3

Linear Regression between Pumping and Future Storage Change during the 30-year sustaining period

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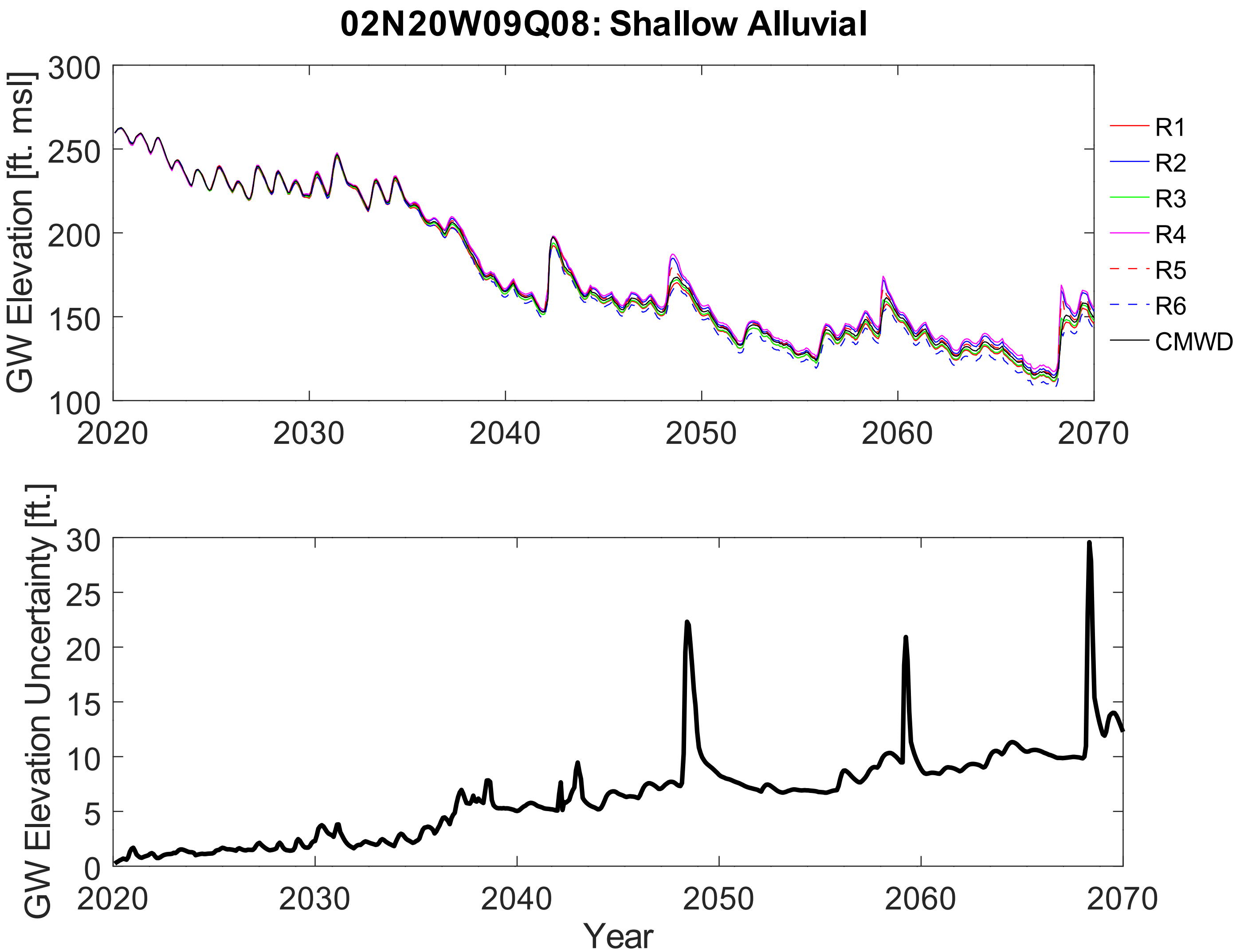
DUDEK



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SOURCE:

FIGURE 4

Simulated Heads at 02N20W09Q08

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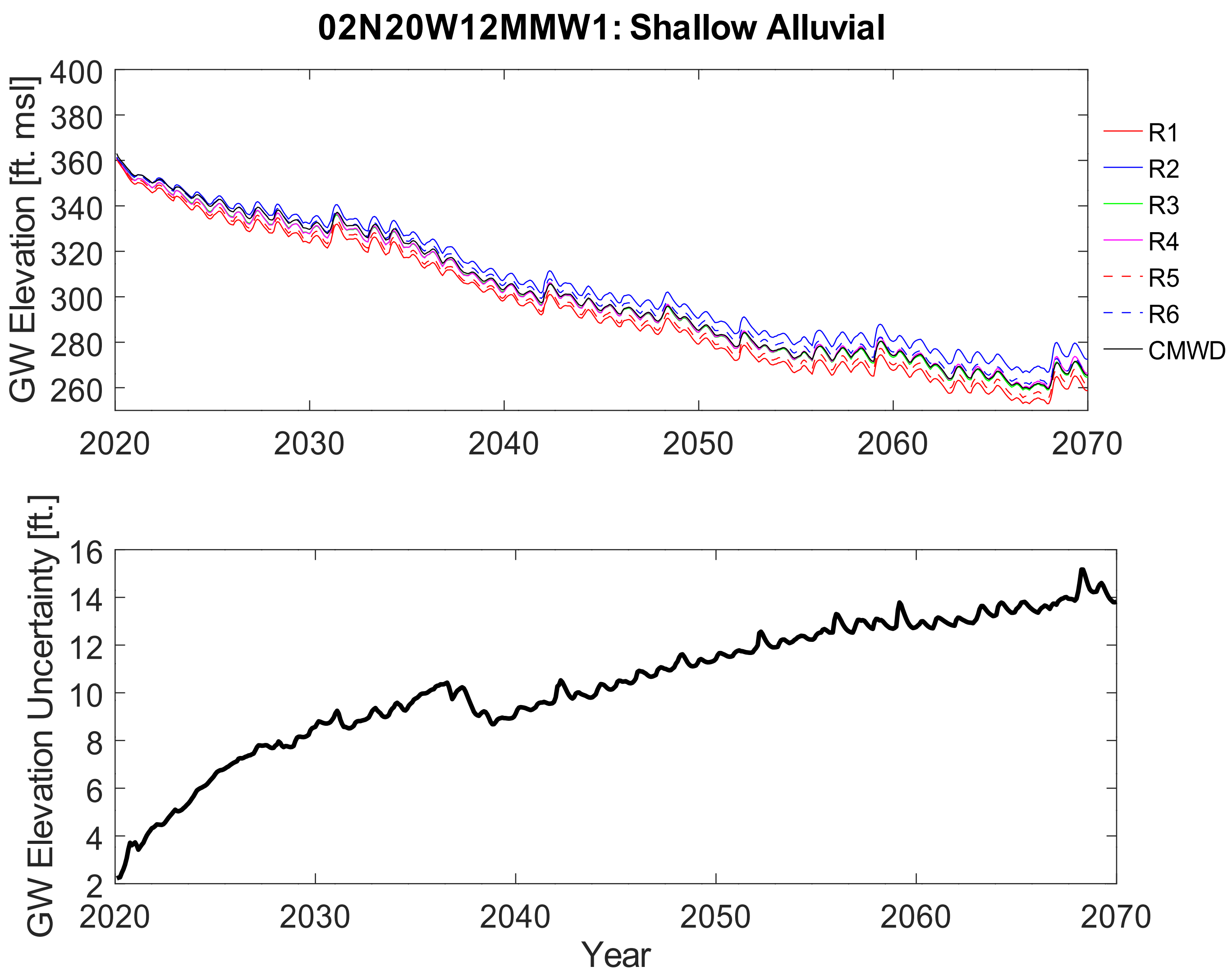

SOURCE:

FIGURE 5

Simulated Heads at 02N20M12MMW1

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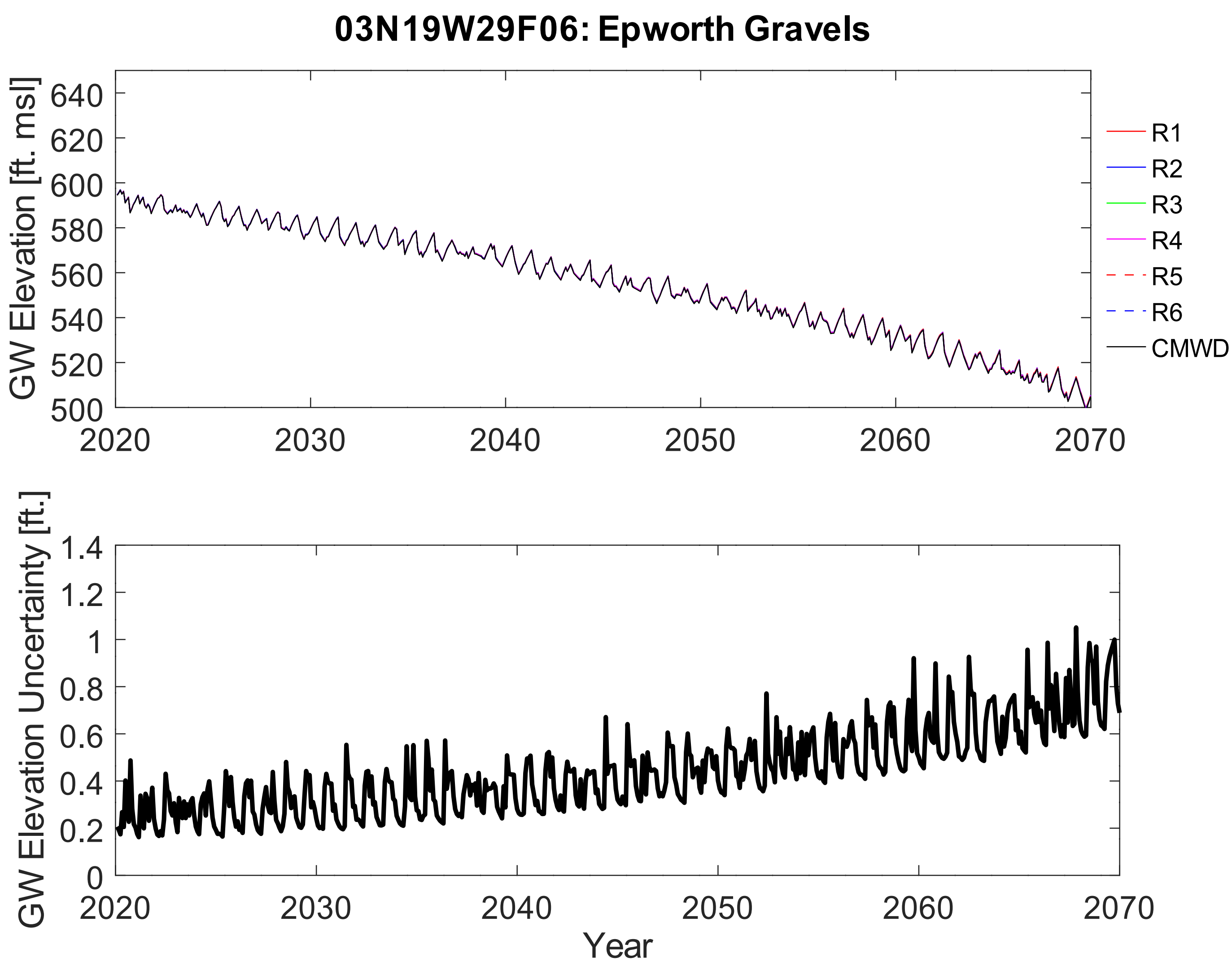

SOURCE:

FIGURE 6

Simulated Heads at 03N19W29F06

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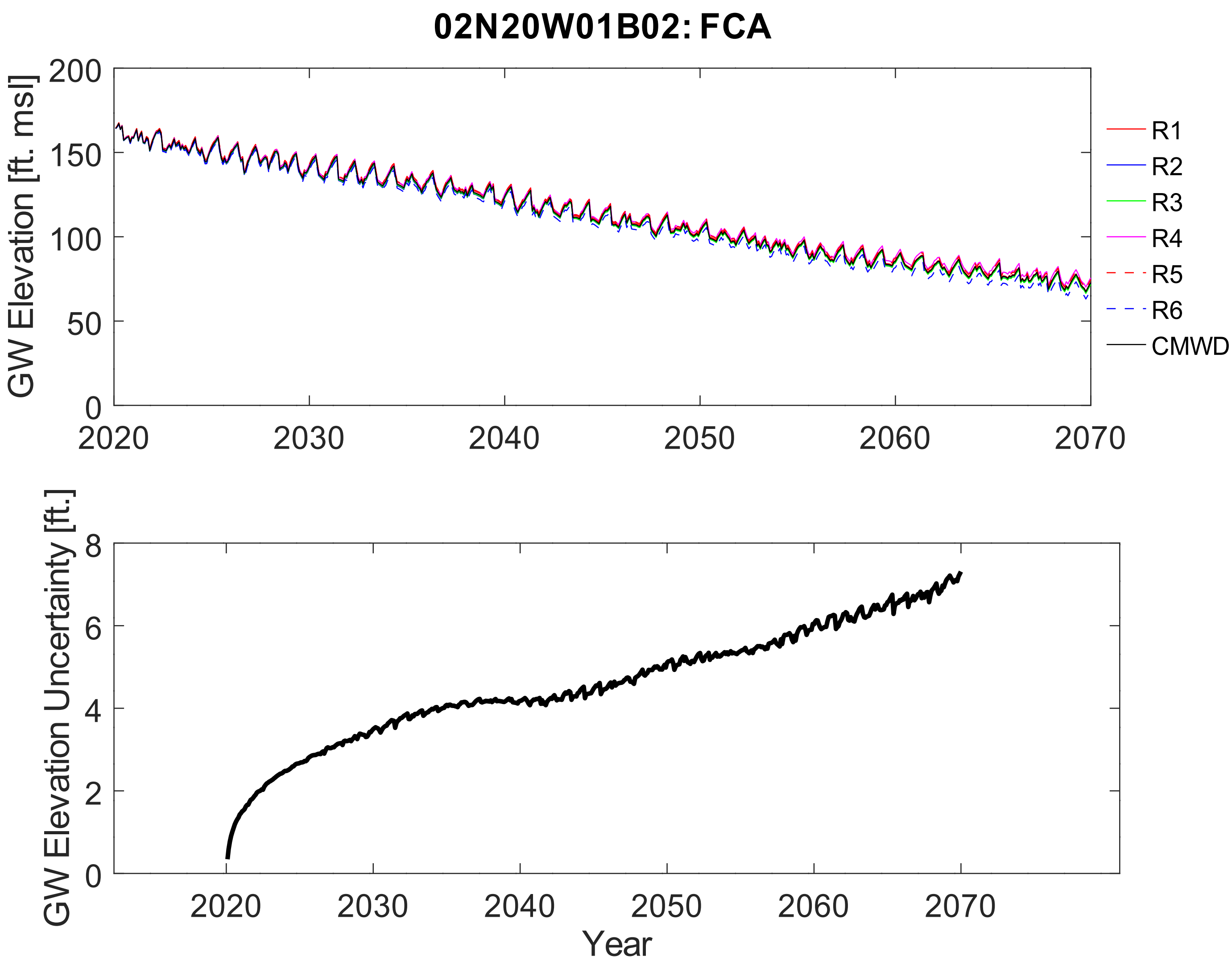
DUDEK



SOURCE:

FIGURE 7

Simulated Heads at 02N20W01B02

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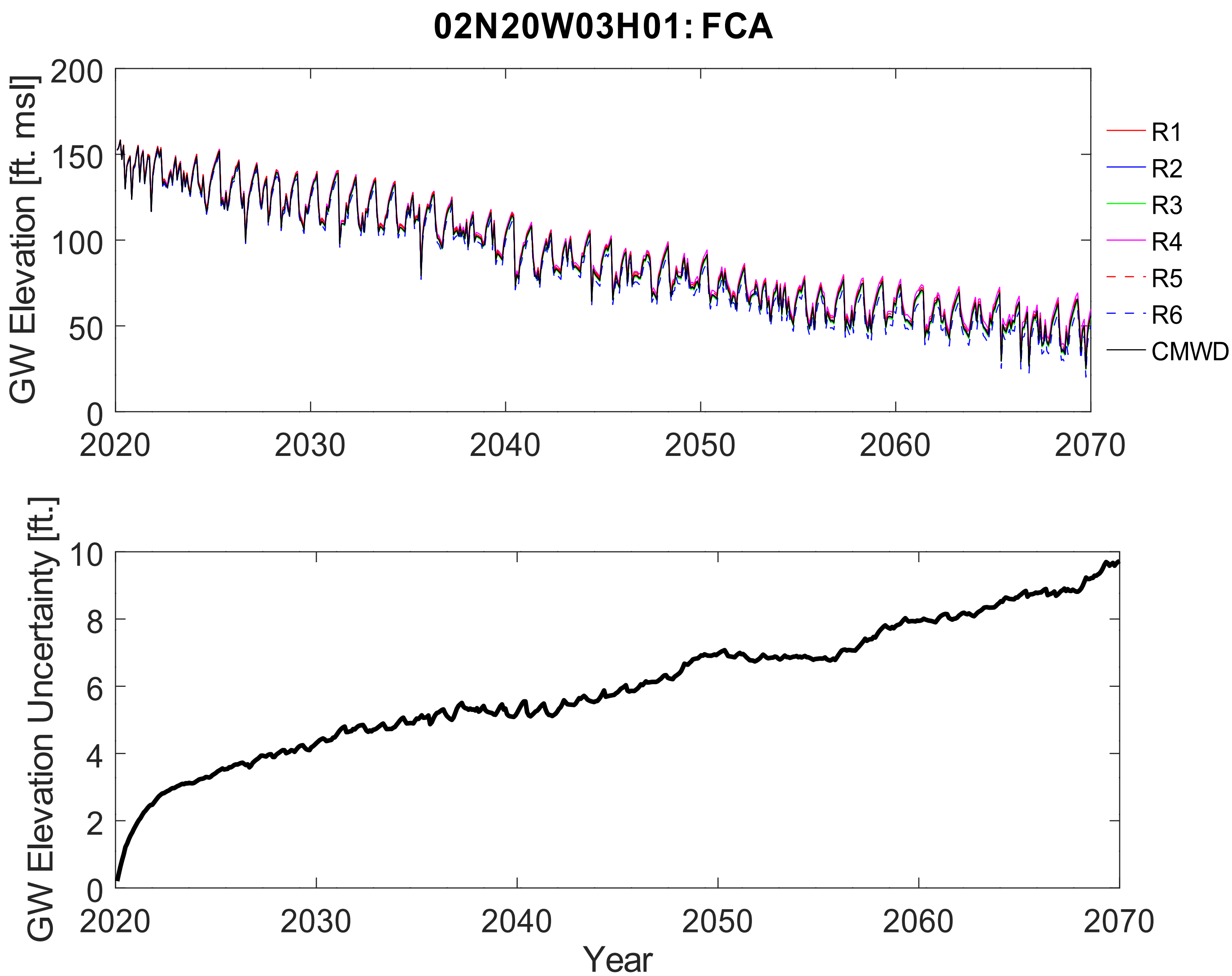
DUDEK



SOURCE:

FIGURE 8

Simulated Heads at 02N20W03H01

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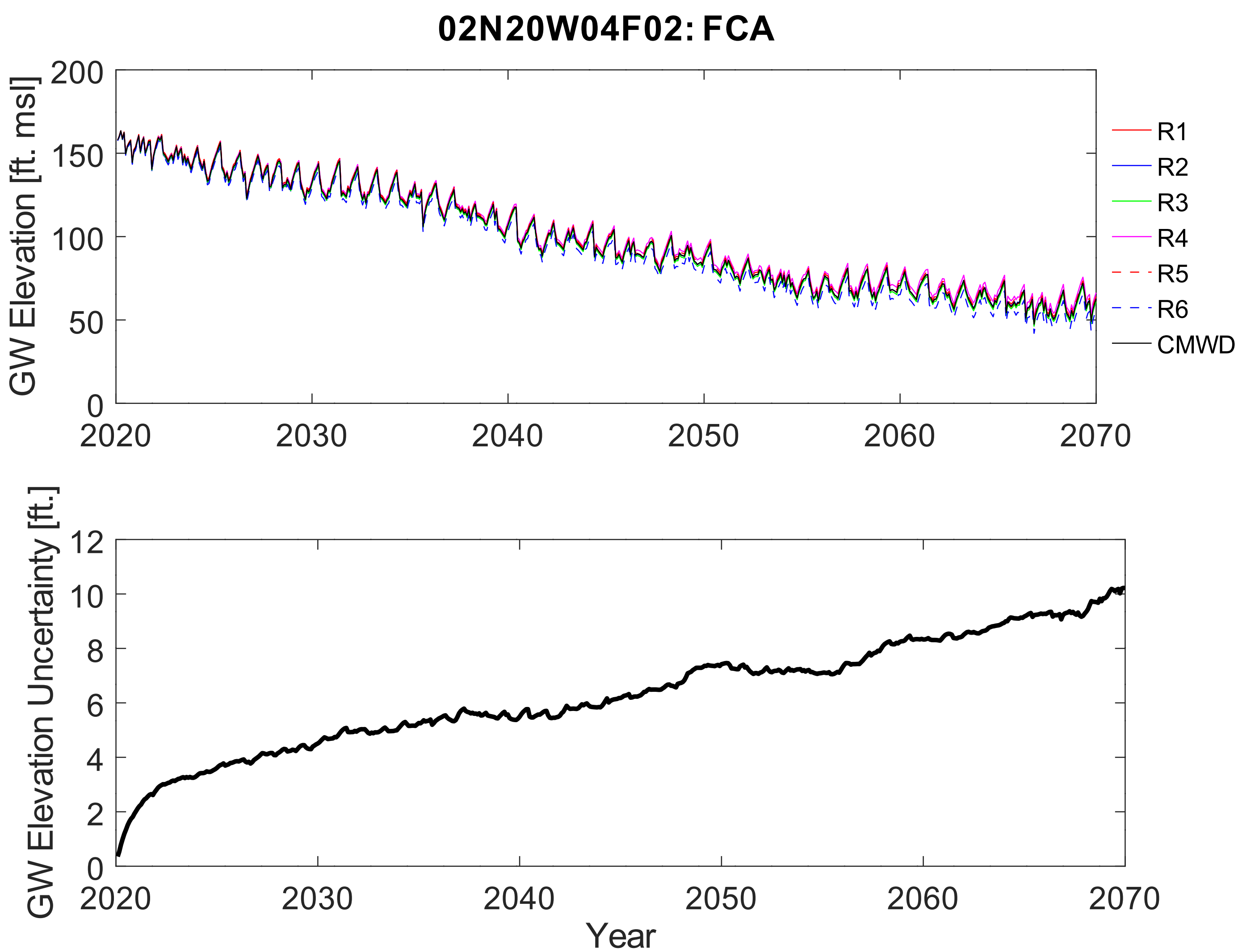
DUDEK



SOURCE:

FIGURE 9

Simulated Heads at 02N20W04F02

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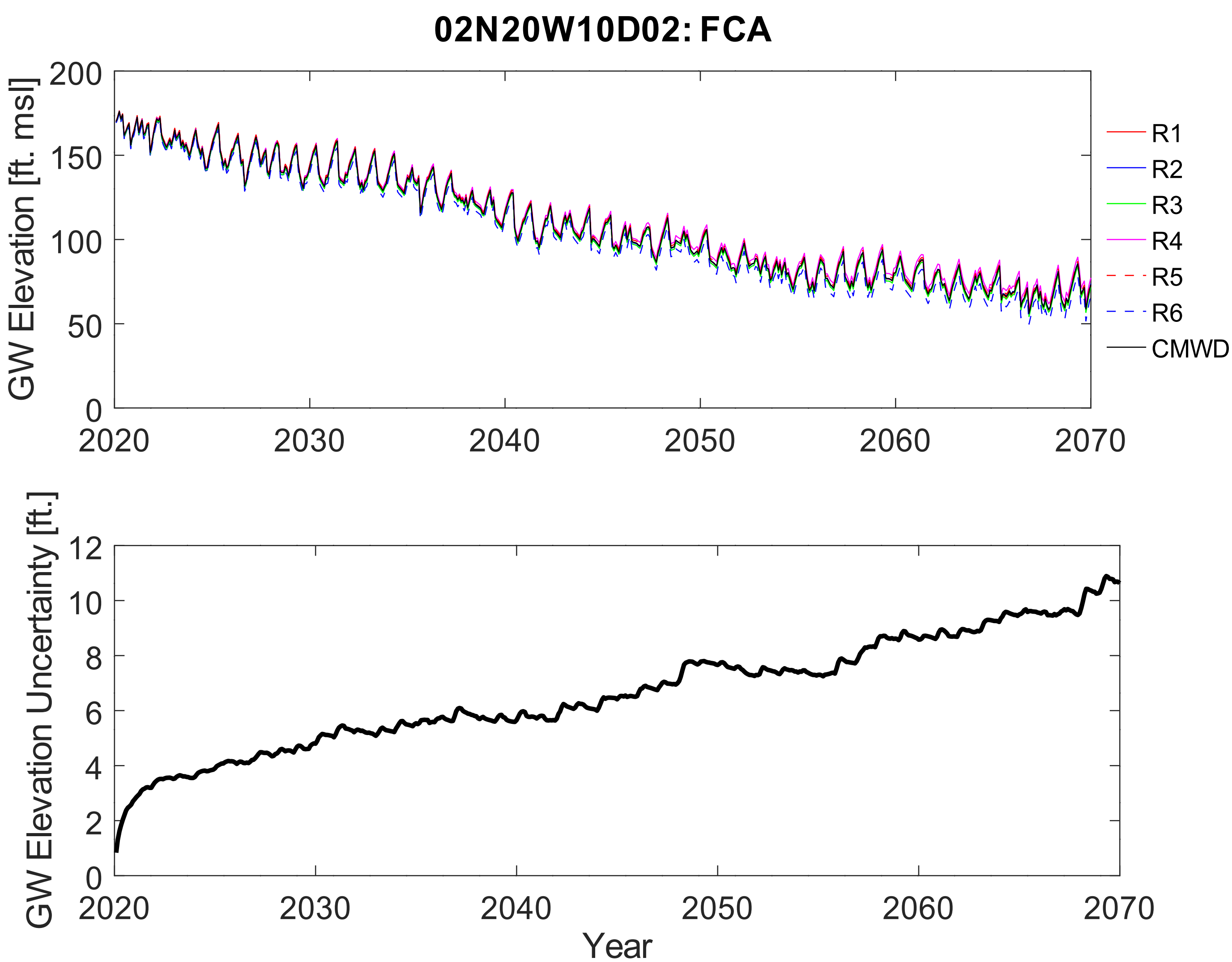
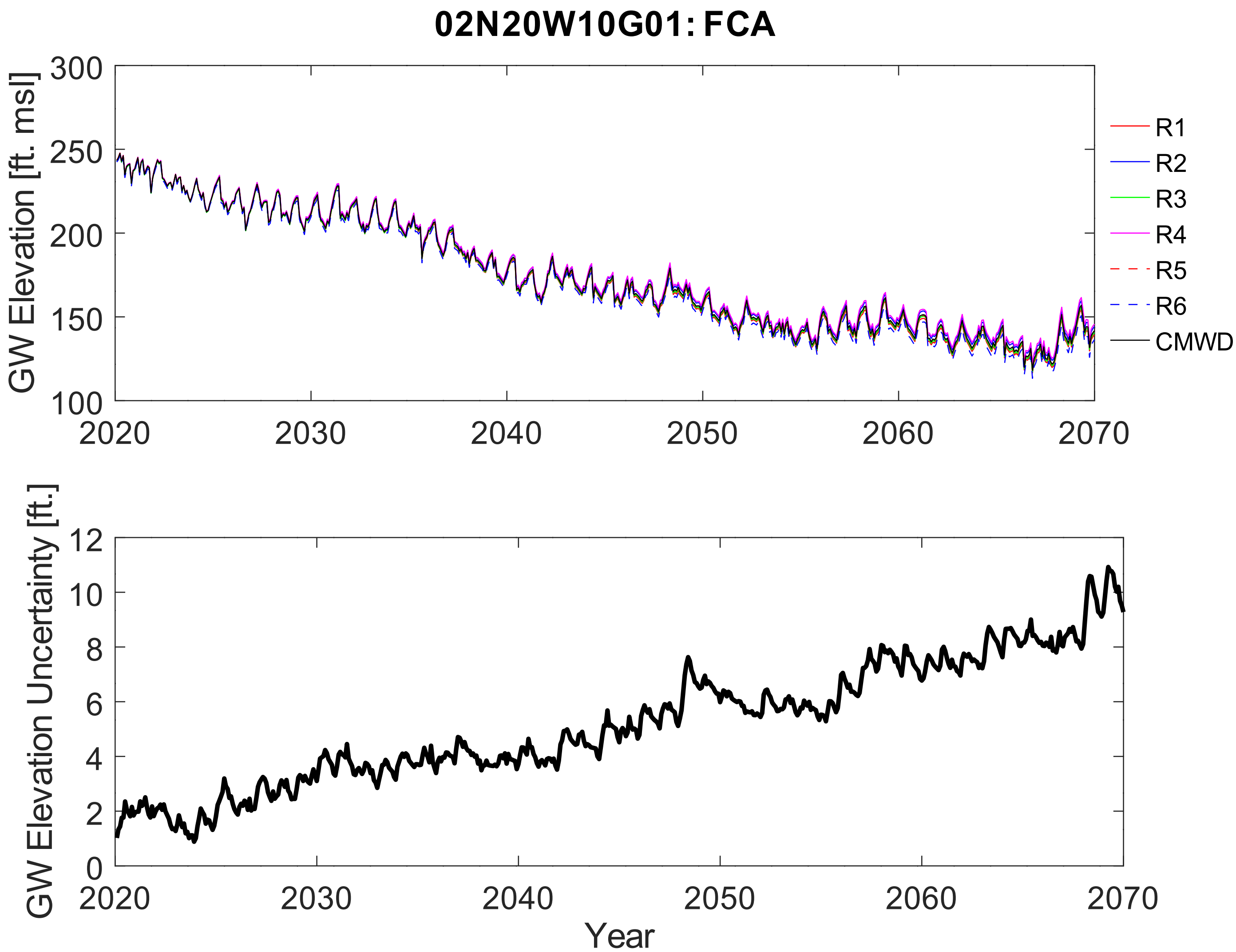
DUDEK



SOURCE:

FIGURE 10

Simulated Heads at 02N20W10D02



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SOURCE:

FIGURE 11

Simulated Heads at 02N20W10G01

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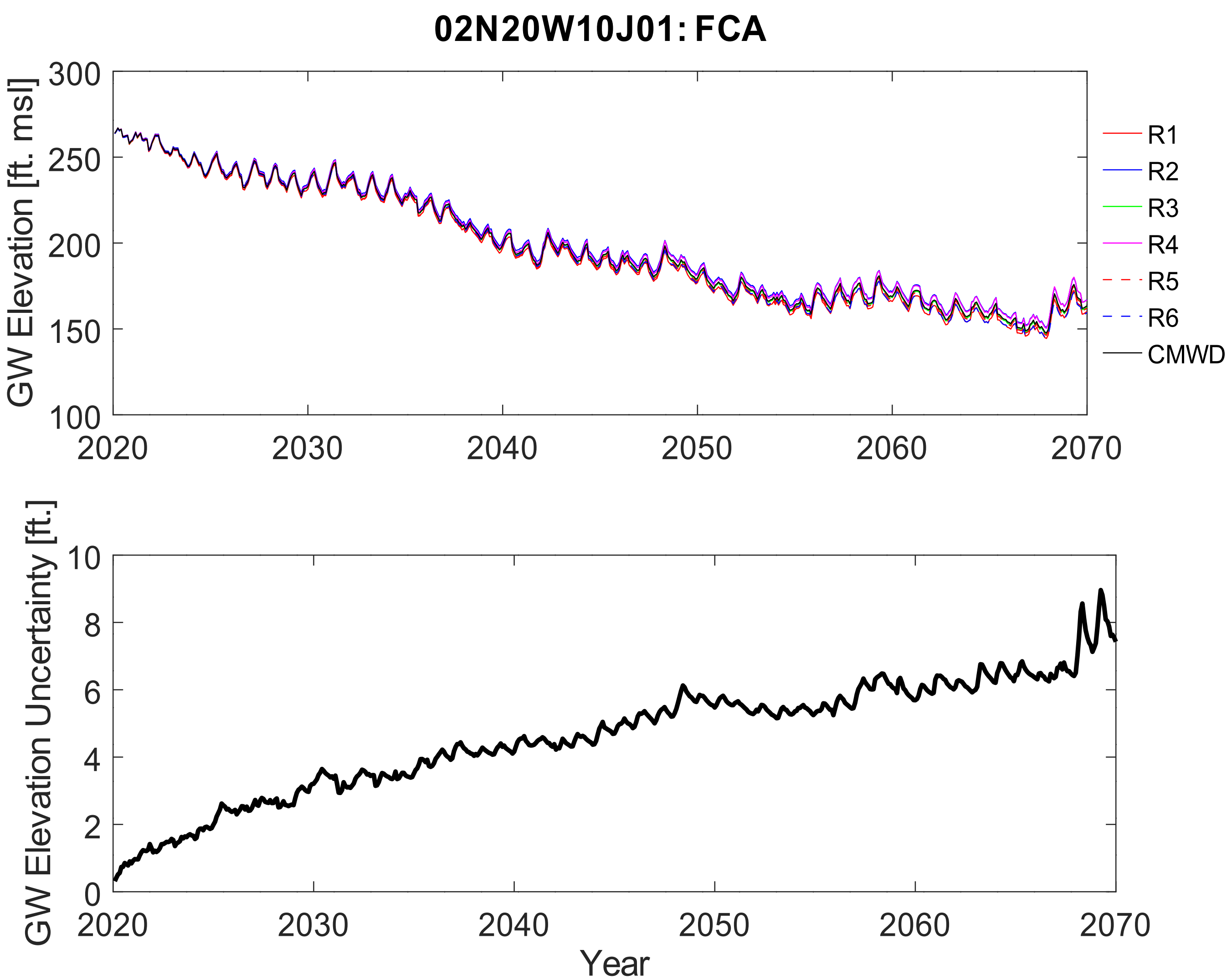


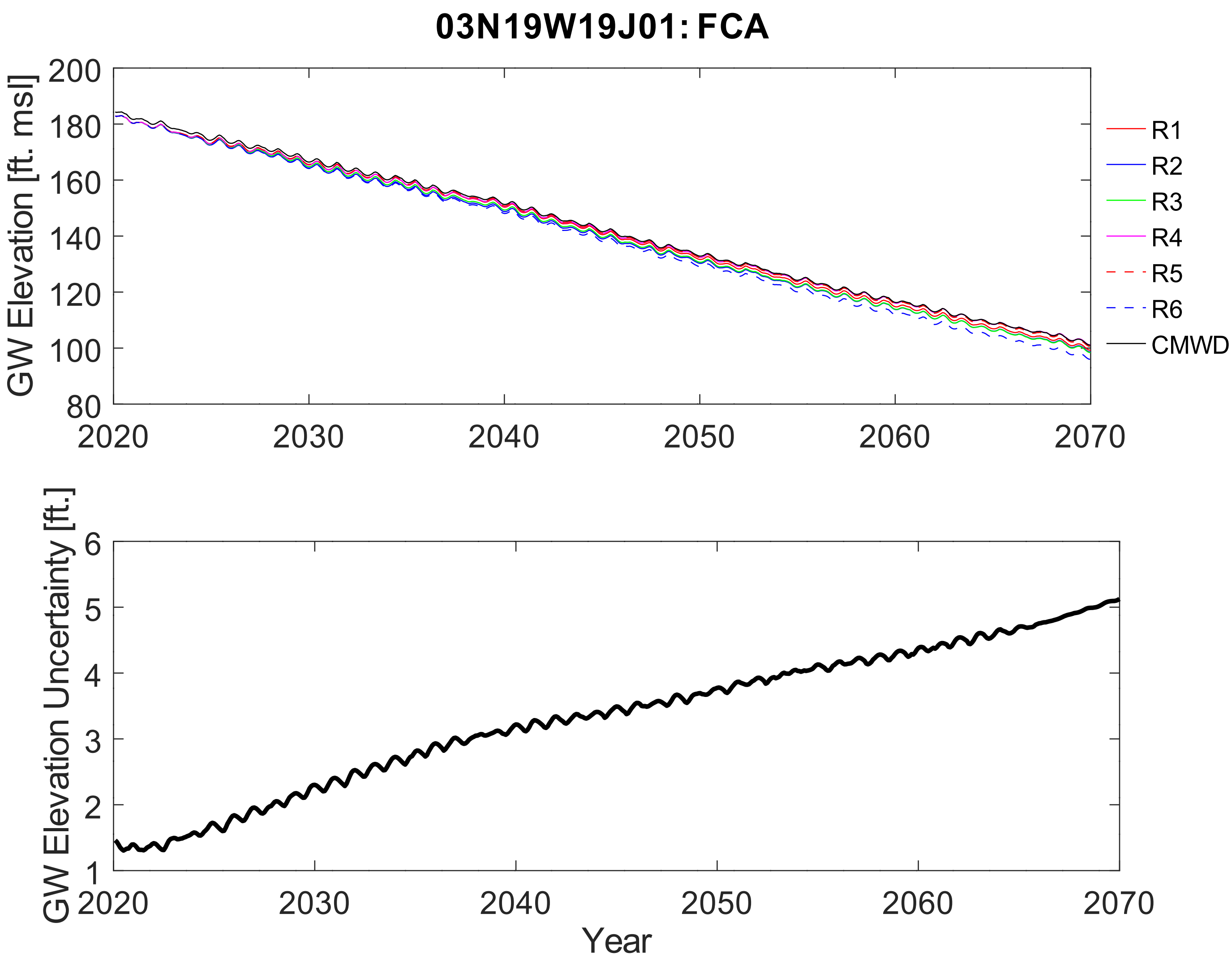
SOURCE:

FIGURE 12

Simulated Heads at 02N20W10J01

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



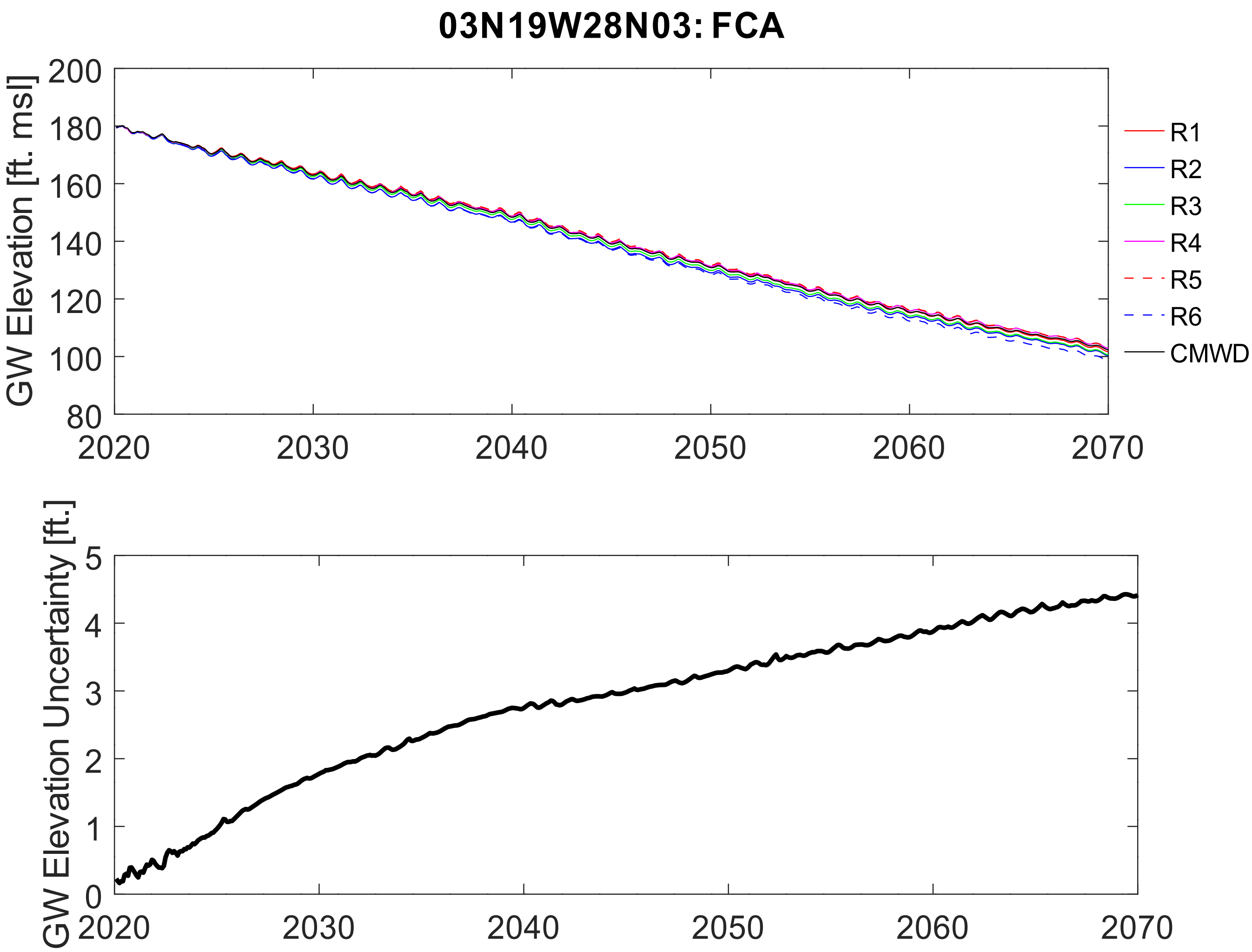
SOURCE:

FIGURE 13

Simulated Heads at 03N19W19J01

DUDEK

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



Path: Z:\Projects\

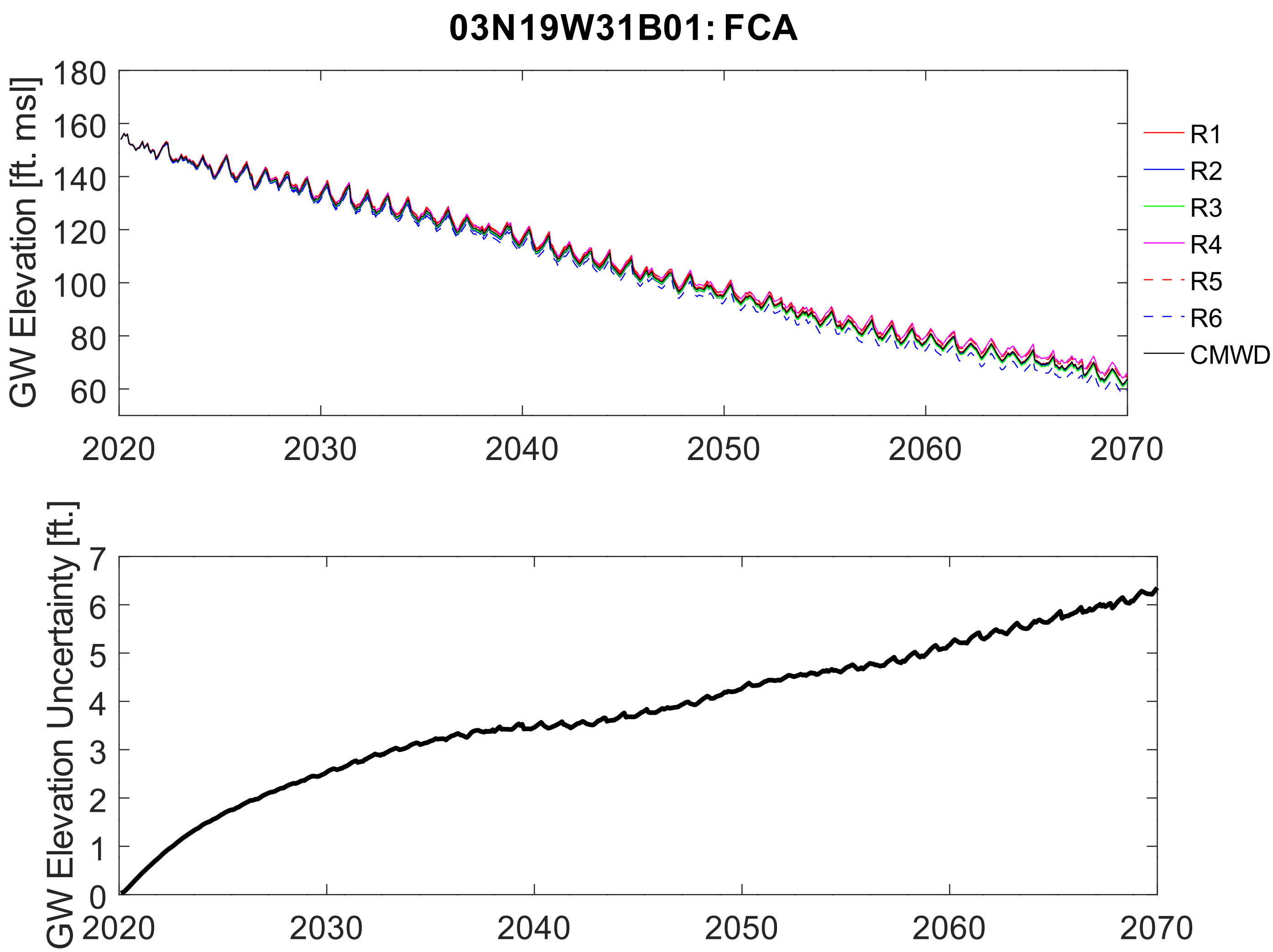
SOURCE:

FIGURE 14

Simulated Heads at 03N19W28N03

DUDEK

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



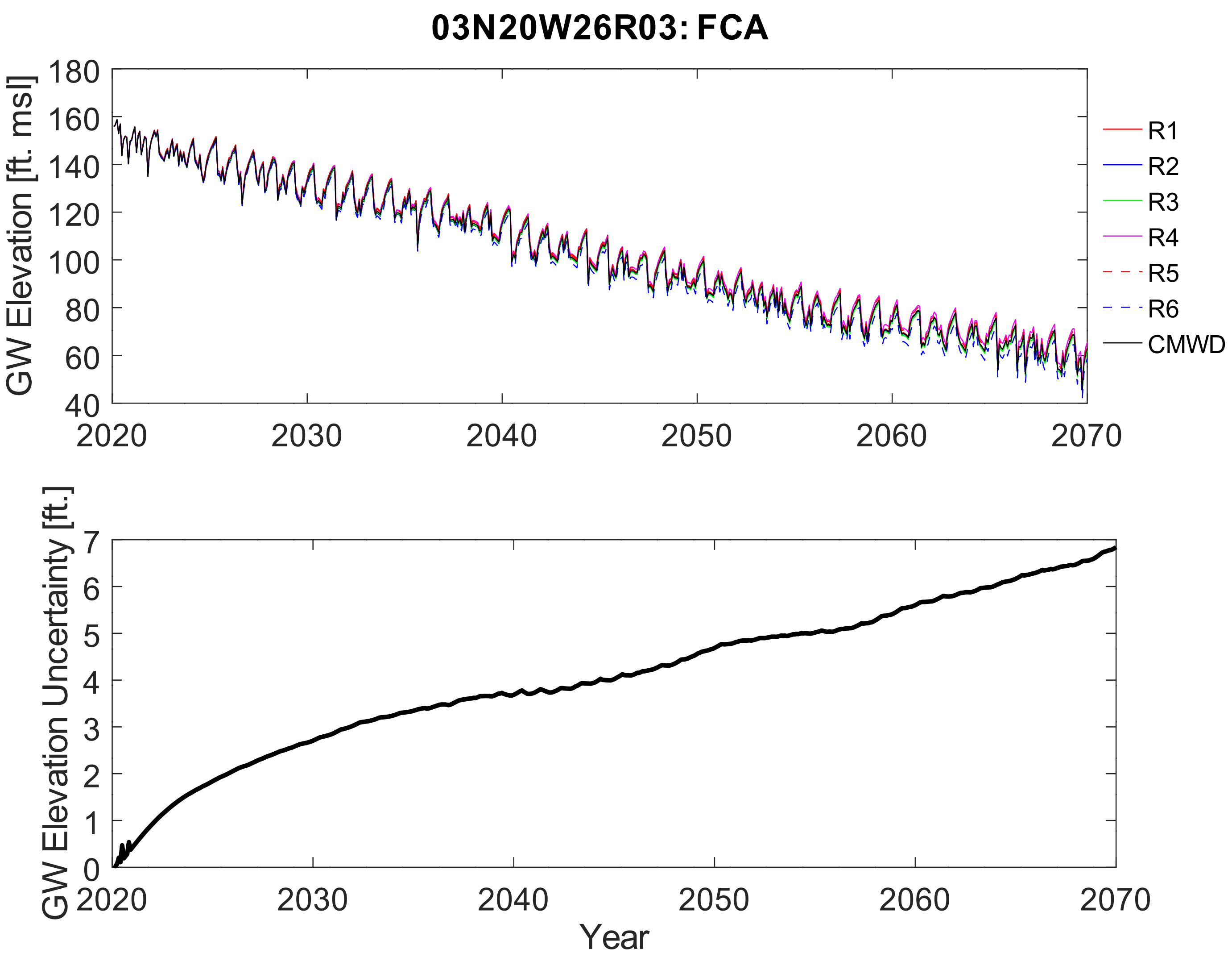
SOURCE:

FIGURE 15

Simulated Heads at 03N19W31B01

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



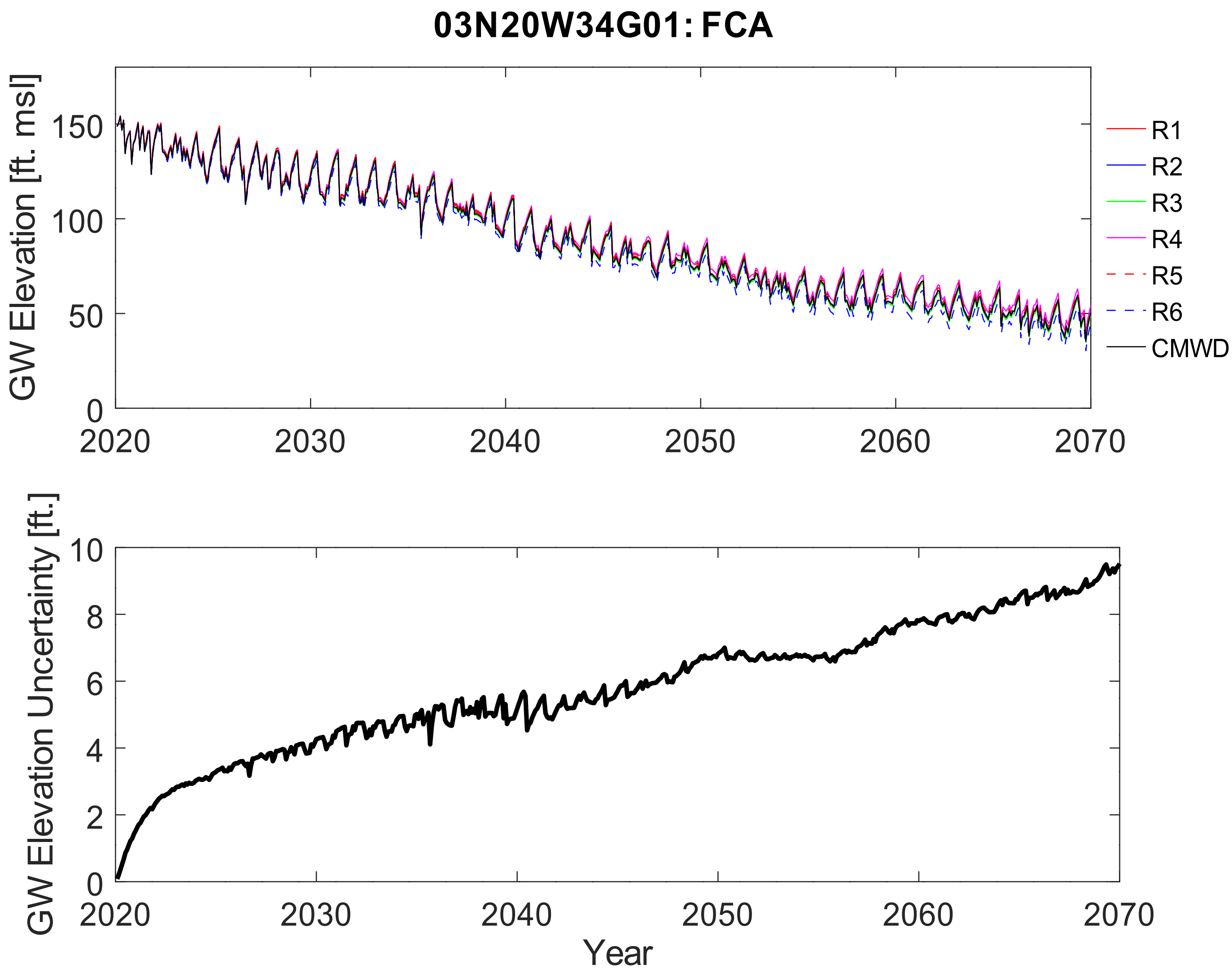
SOURCE:

FIGURE 16

Simulated Heads at 03N20W26R03

DUDEK

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



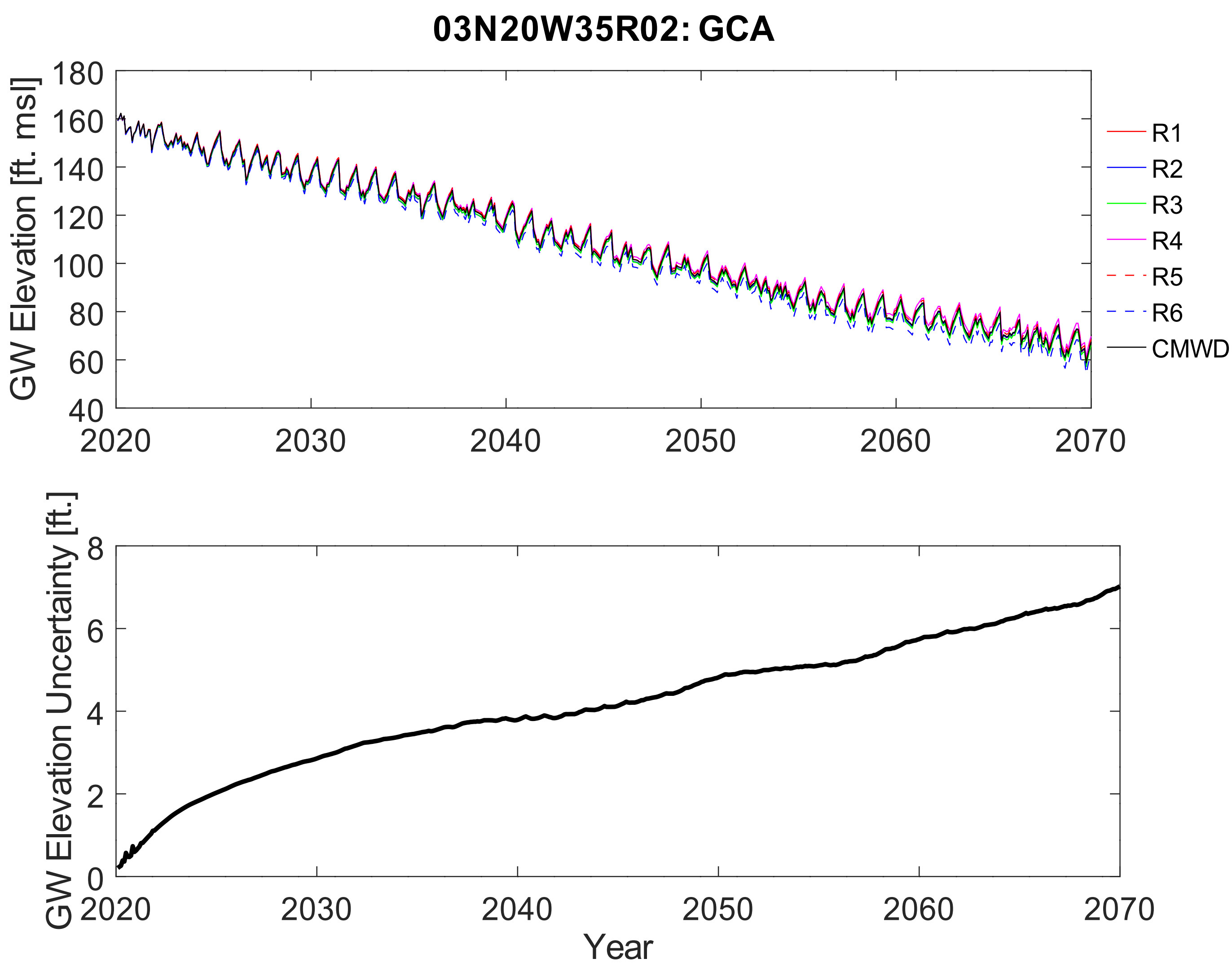
SOURCE:

FIGURE 17

Simulated Heads at 03N20W34G01

DUDEK

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



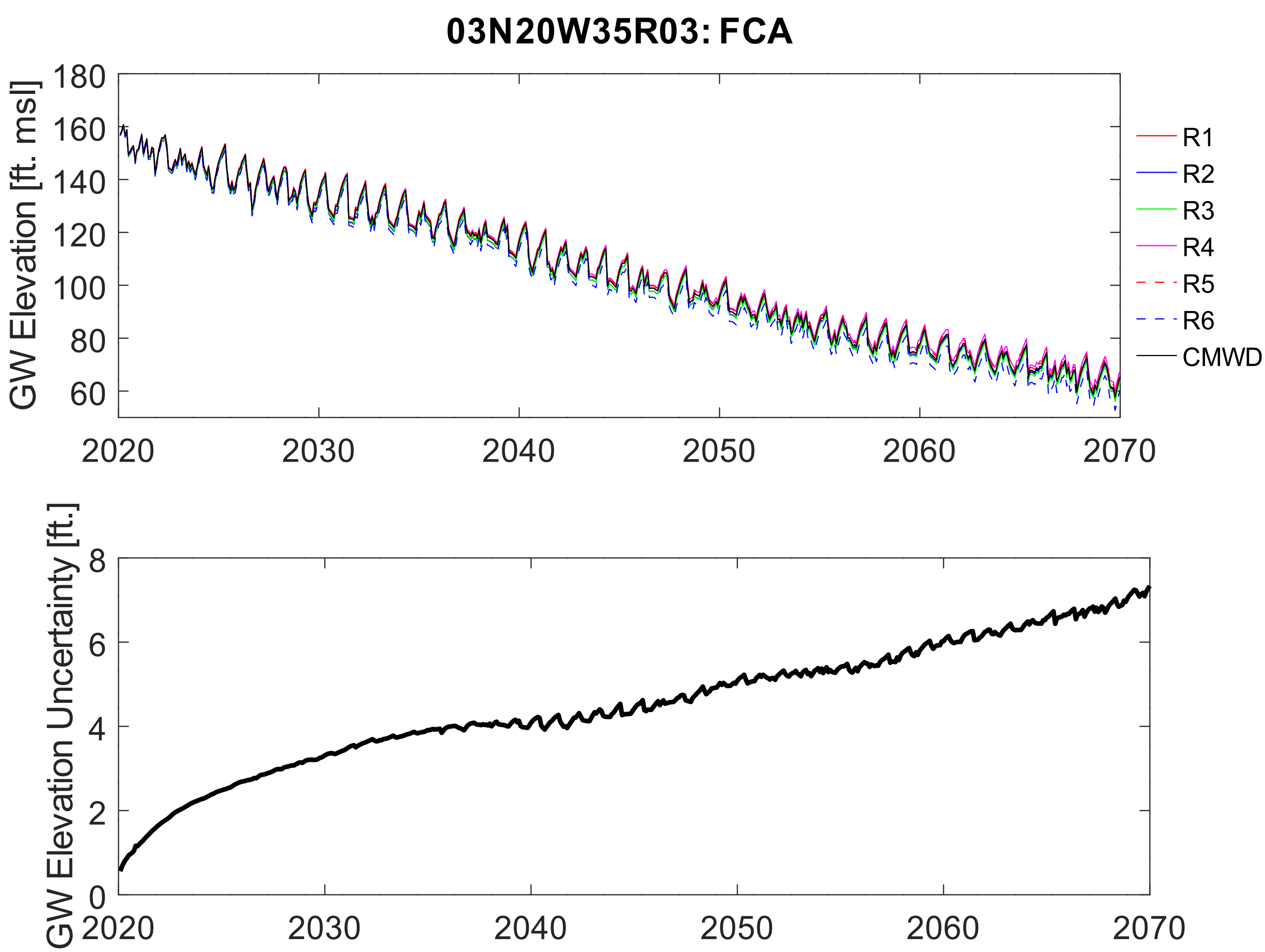
SOURCE:

FIGURE 18

Simulated Heads at 03N20W35R02

DUDEK

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



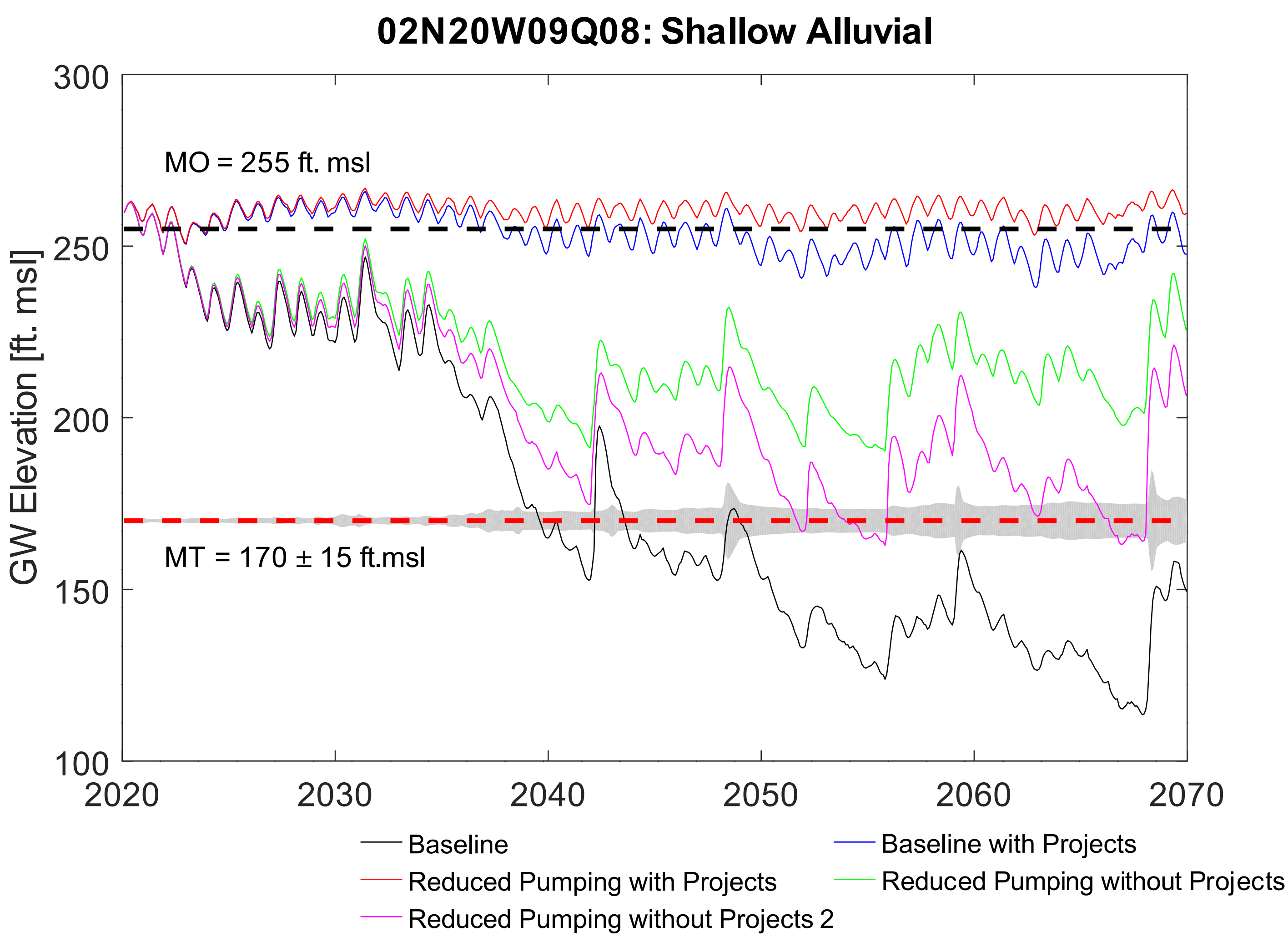
SOURCE:

FIGURE 19

Simulated Heads at 03N20W35R03

DUDEK

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



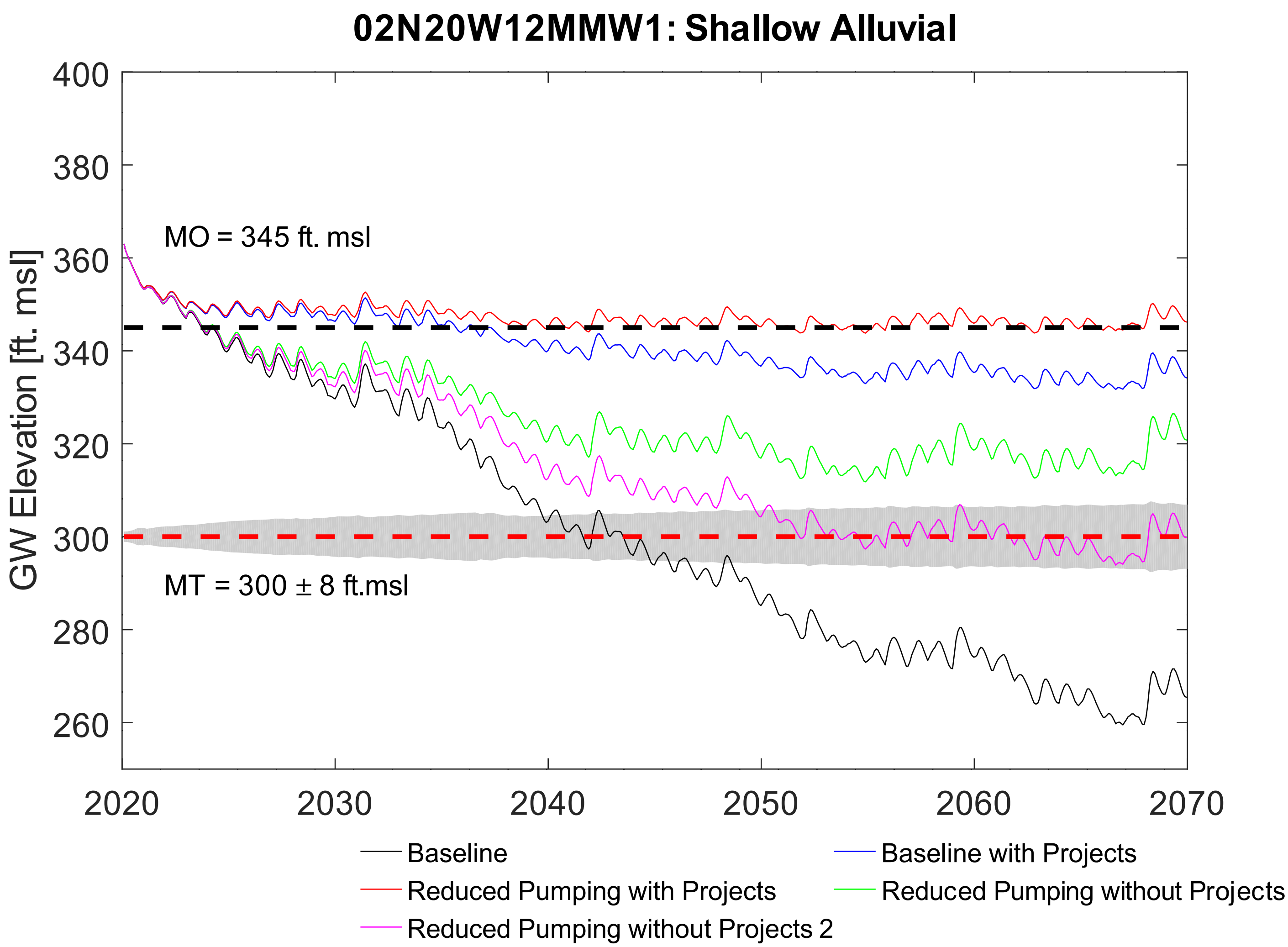
SOURCE:

FIGURE 20

Predicted Groundwater Elevations at 02N20W09Q08

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



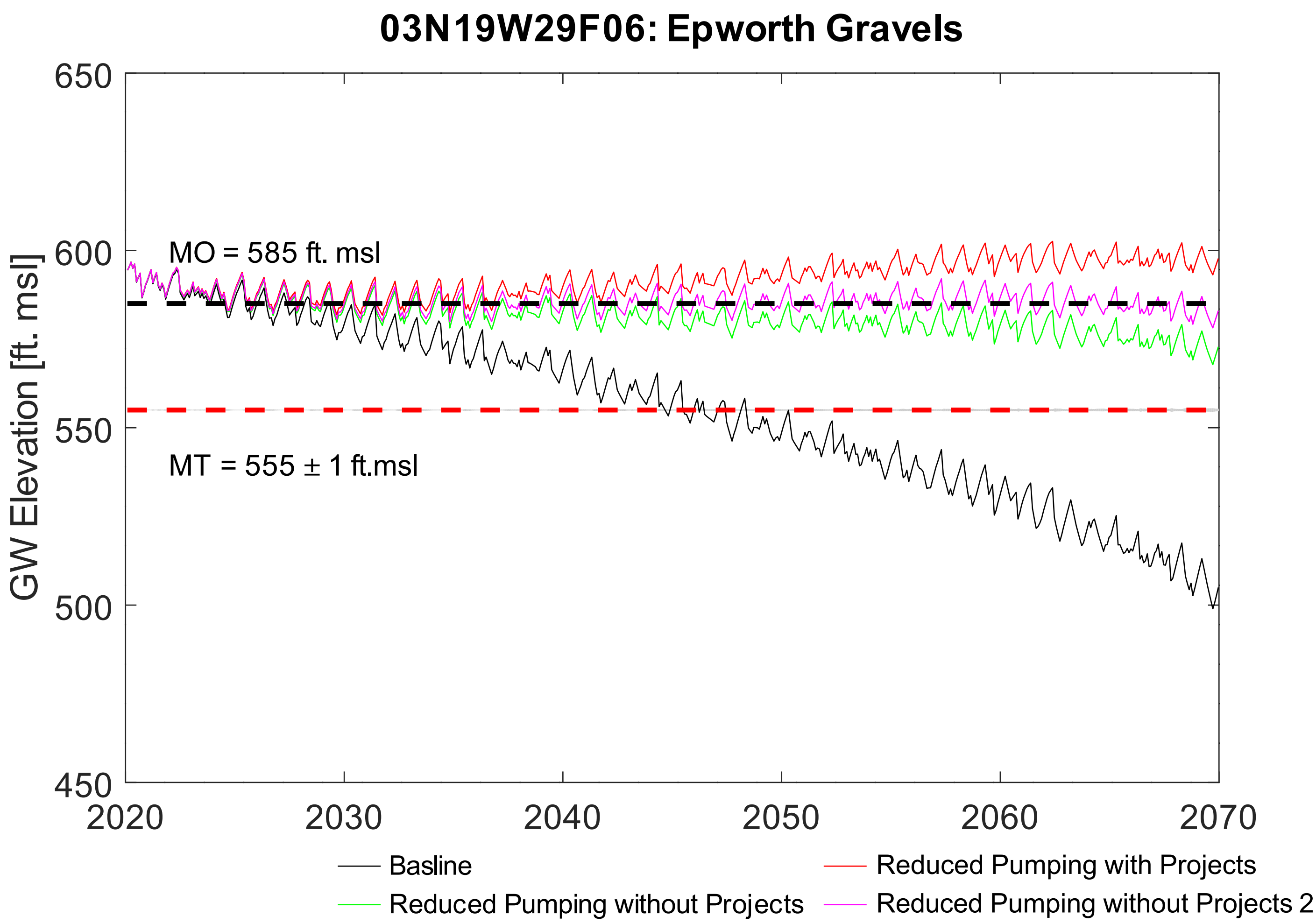
Path: Z:\Projects\

SOURCE:

FIGURE 21

Predicted Groundwater Elevations at 02N20M12MMW1

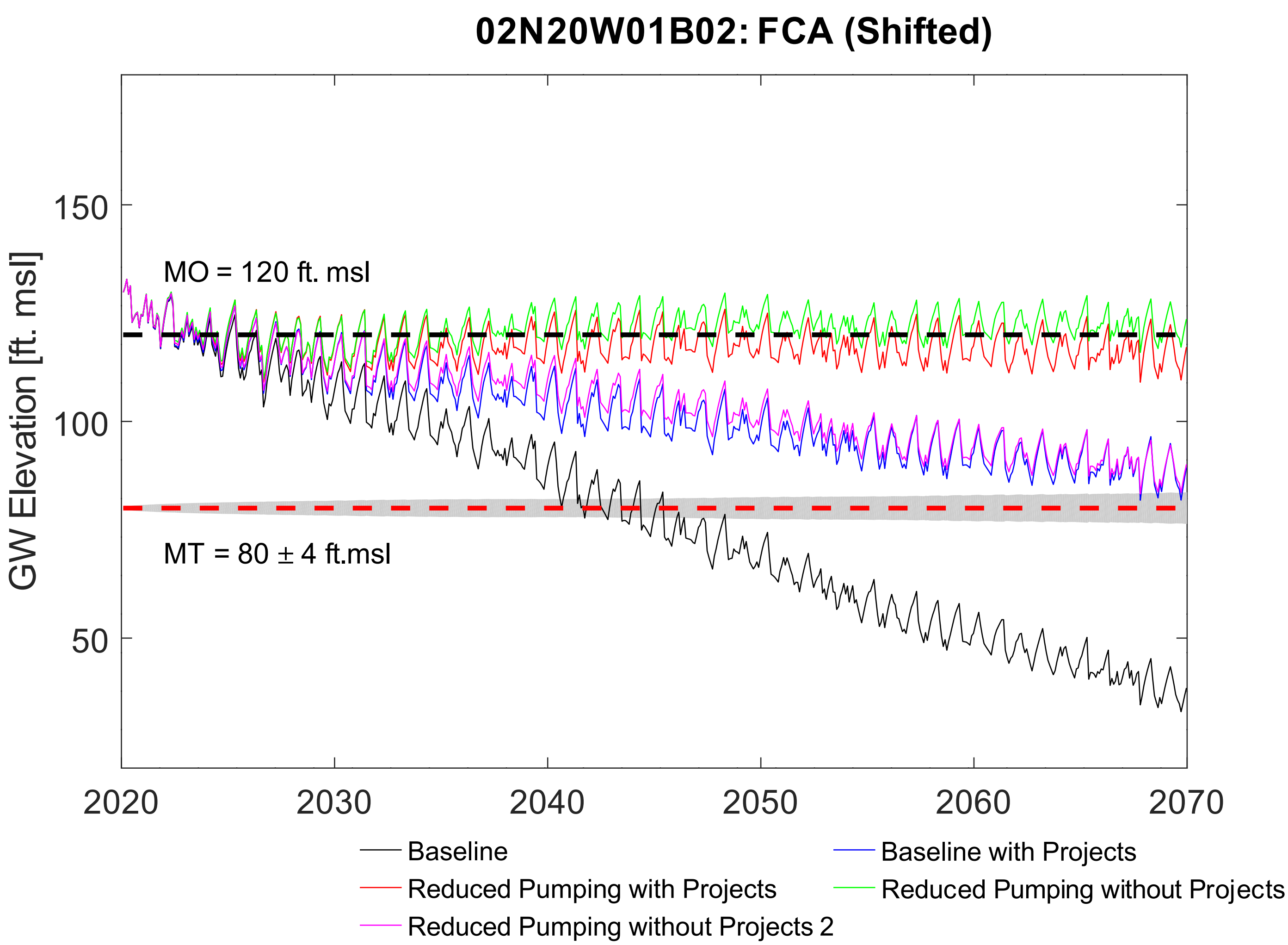
DUDEK



SOURCE:

FIGURE 22

Predicted Groundwater Elevations at 03N19W29F06

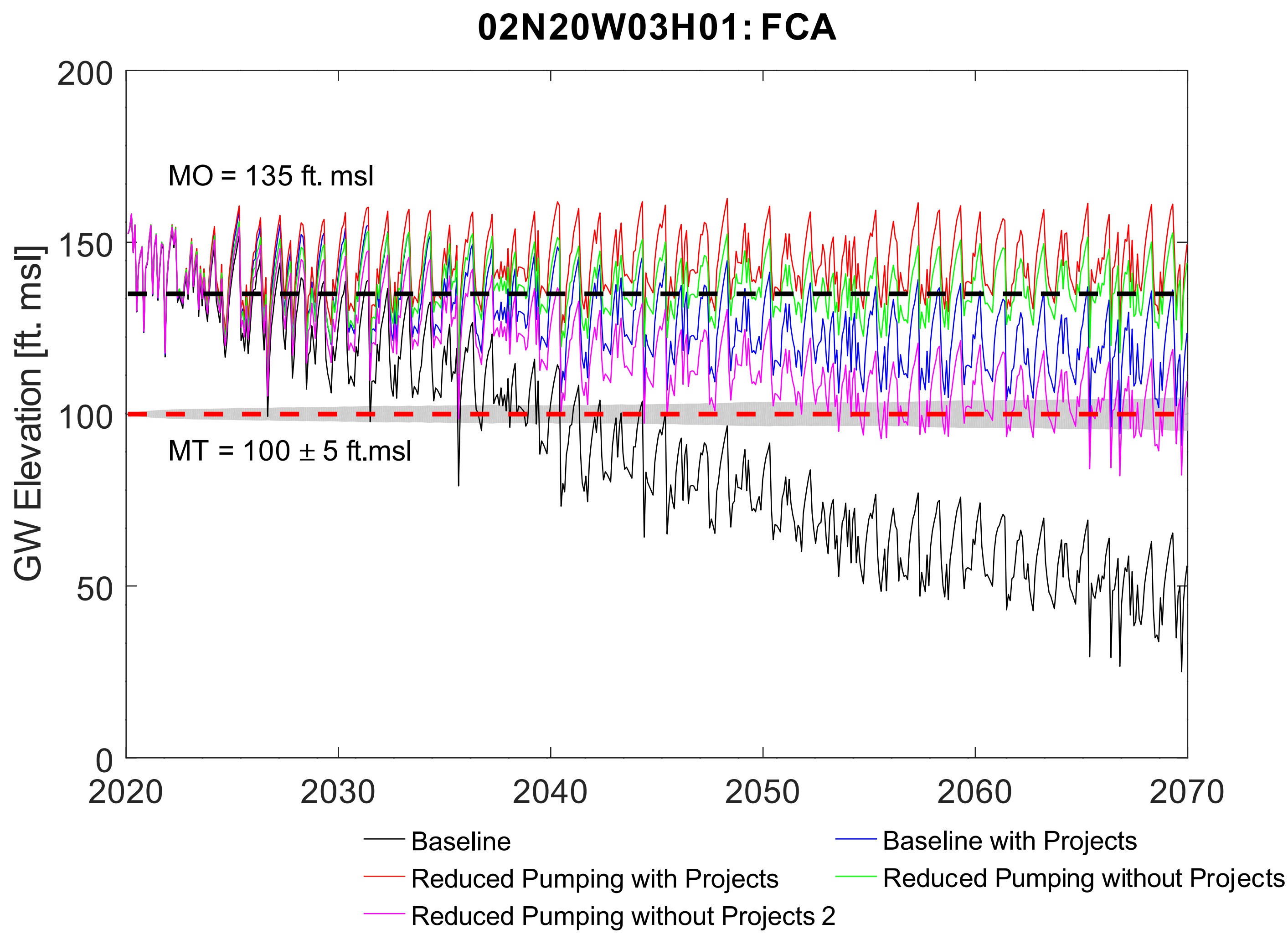


SOURCE:

FIGURE 23

Predicted Groundwater Elevations at 02N20W01B02

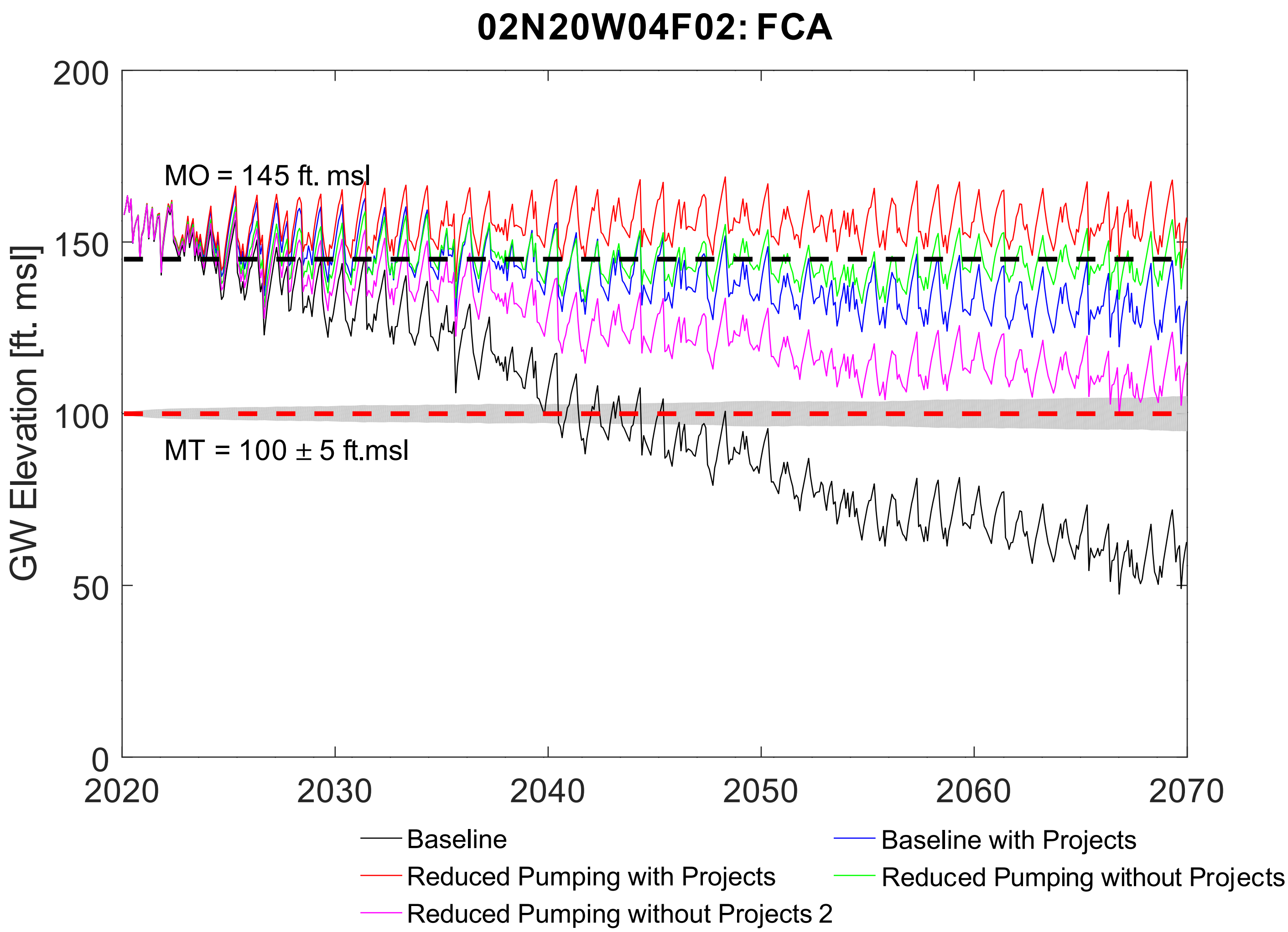
DUDEK



SOURCE:

FIGURE 24

Predicted Groundwater Elevations at 02N20W03H01



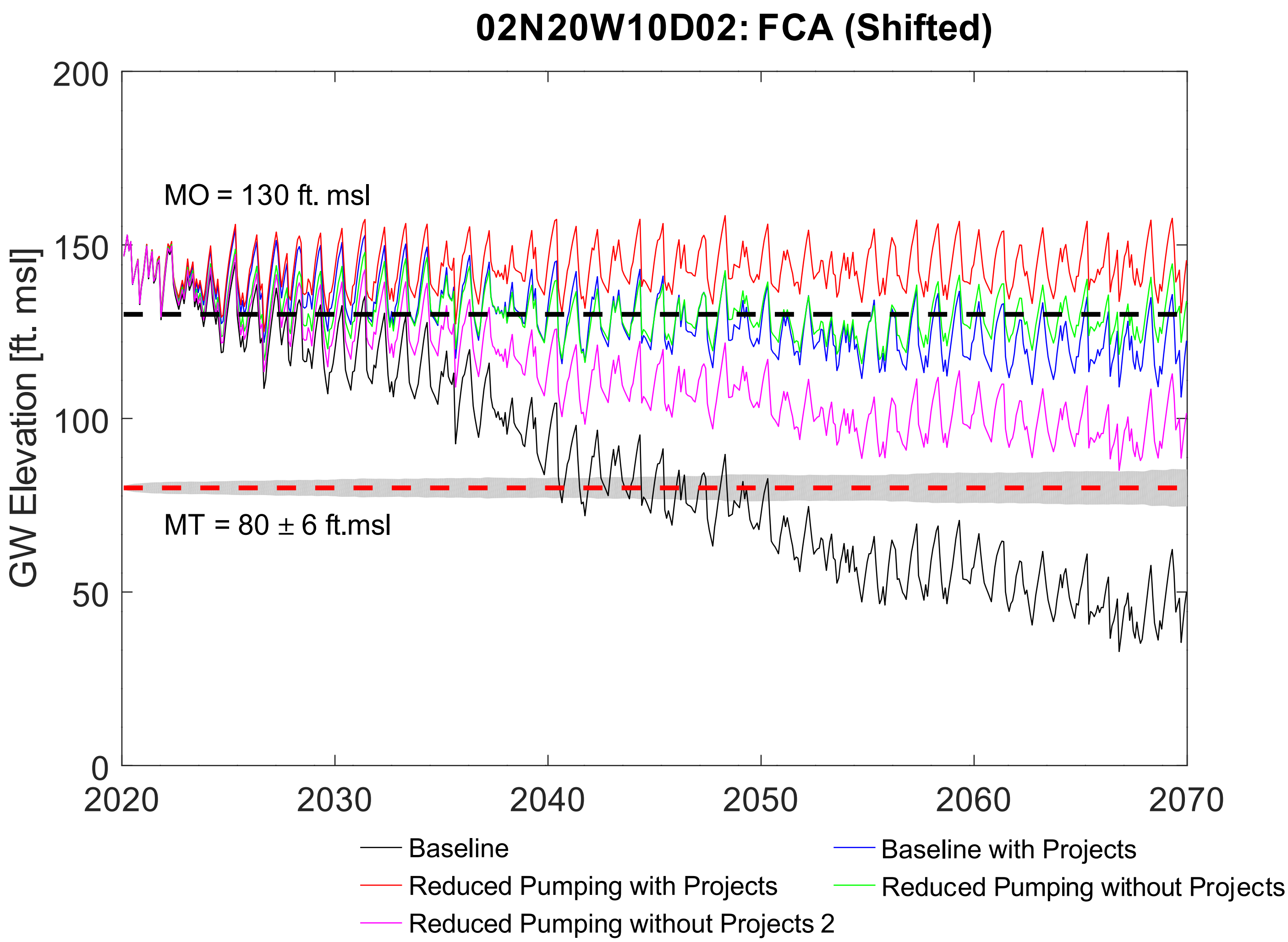
SOURCE:

FIGURE 25

Predicted Groundwater Elevations at 02N20W04F02

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK

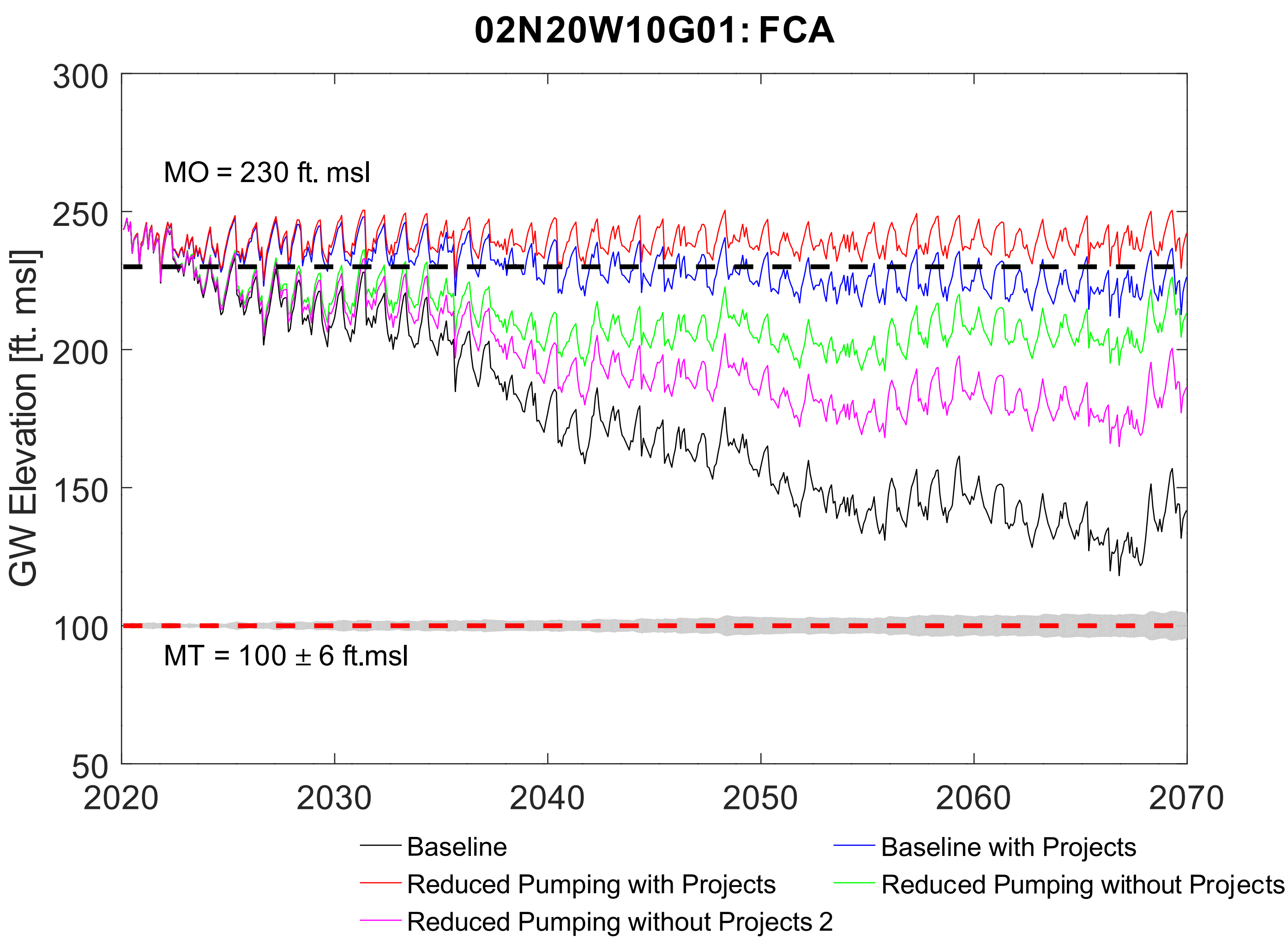


SOURCE:

FIGURE 26

Predicted Groundwater Elevations at 02N20W10D02

DUDEK



Path: Z:\Projects\

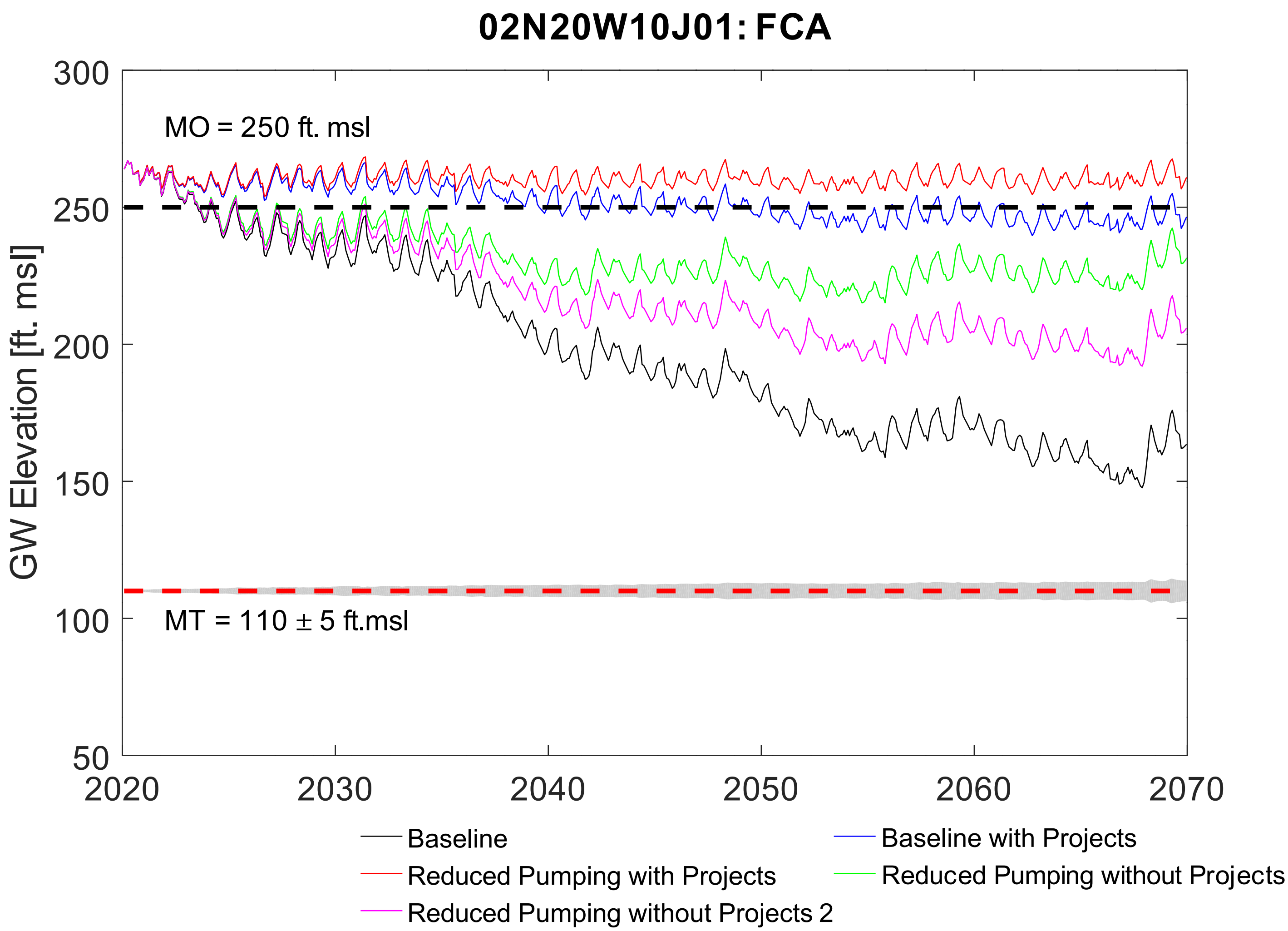
SOURCE:

FIGURE 27

Predicted Groundwater Elevations at 02N20W10G01

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK

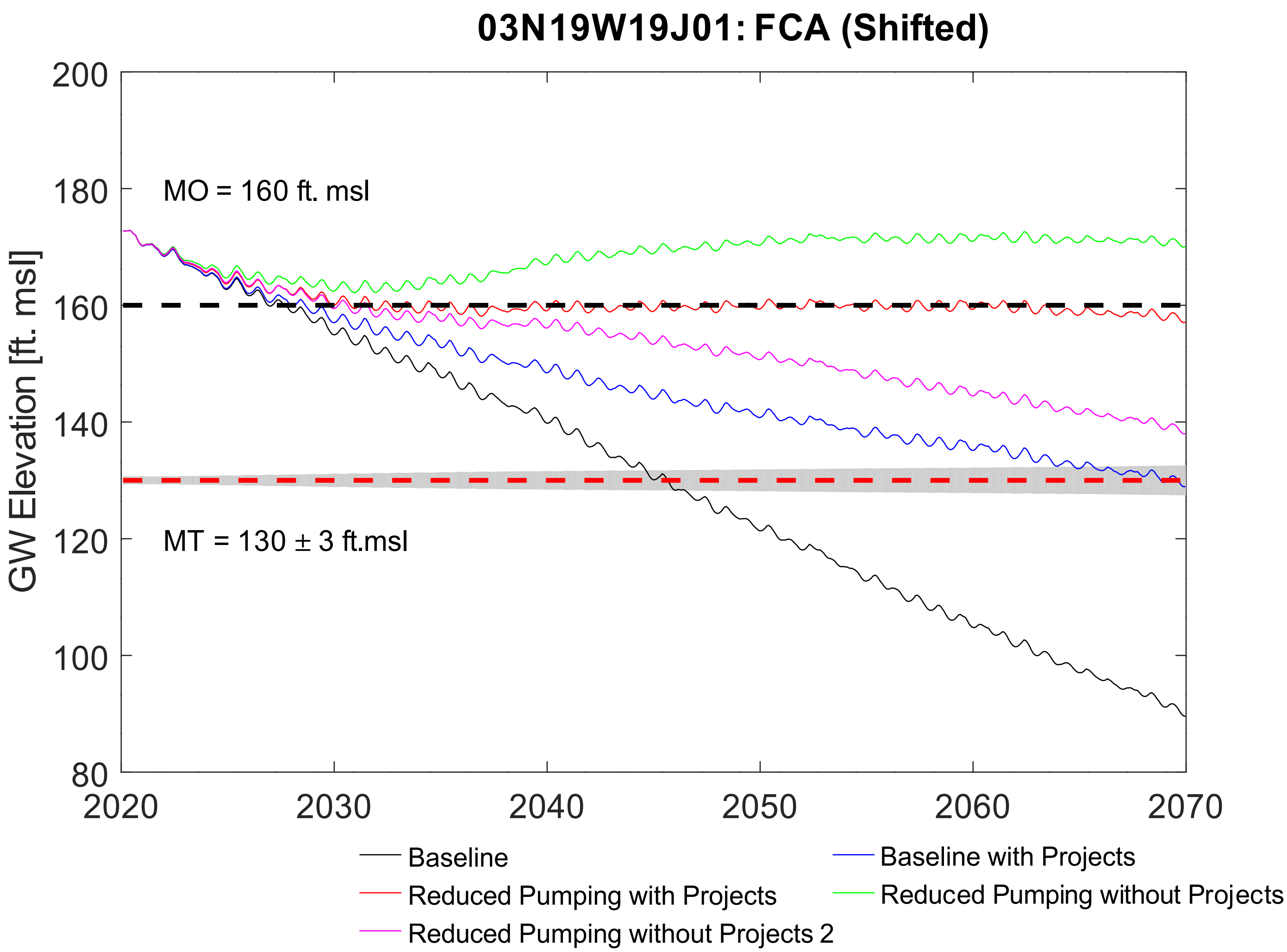


SOURCE:

FIGURE 28

Predicted Groundwater Elevations at 02N20W10J01

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



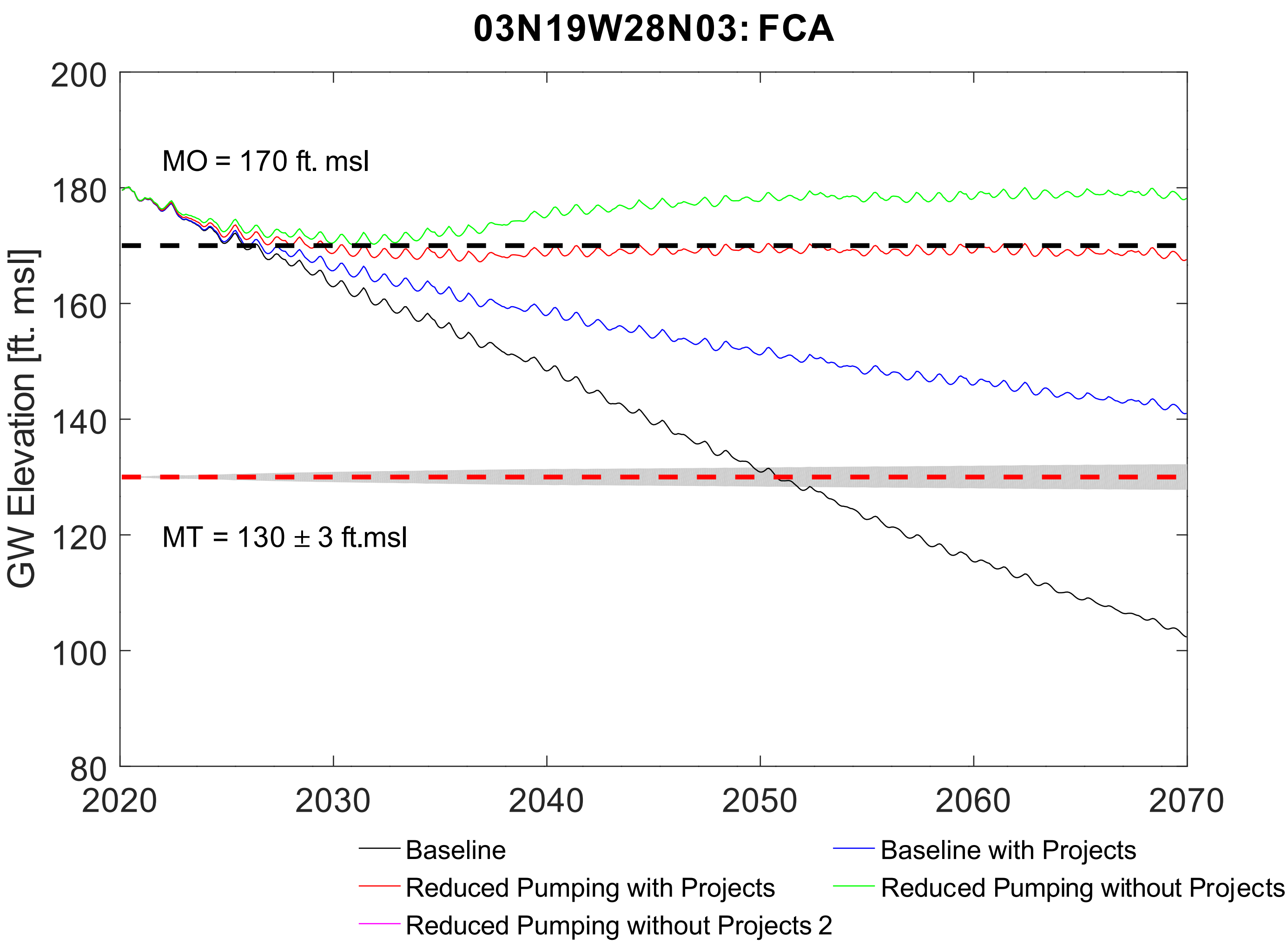
SOURCE:

FIGURE 29

Predicted Groundwater Elevations at 03N19W19J01

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



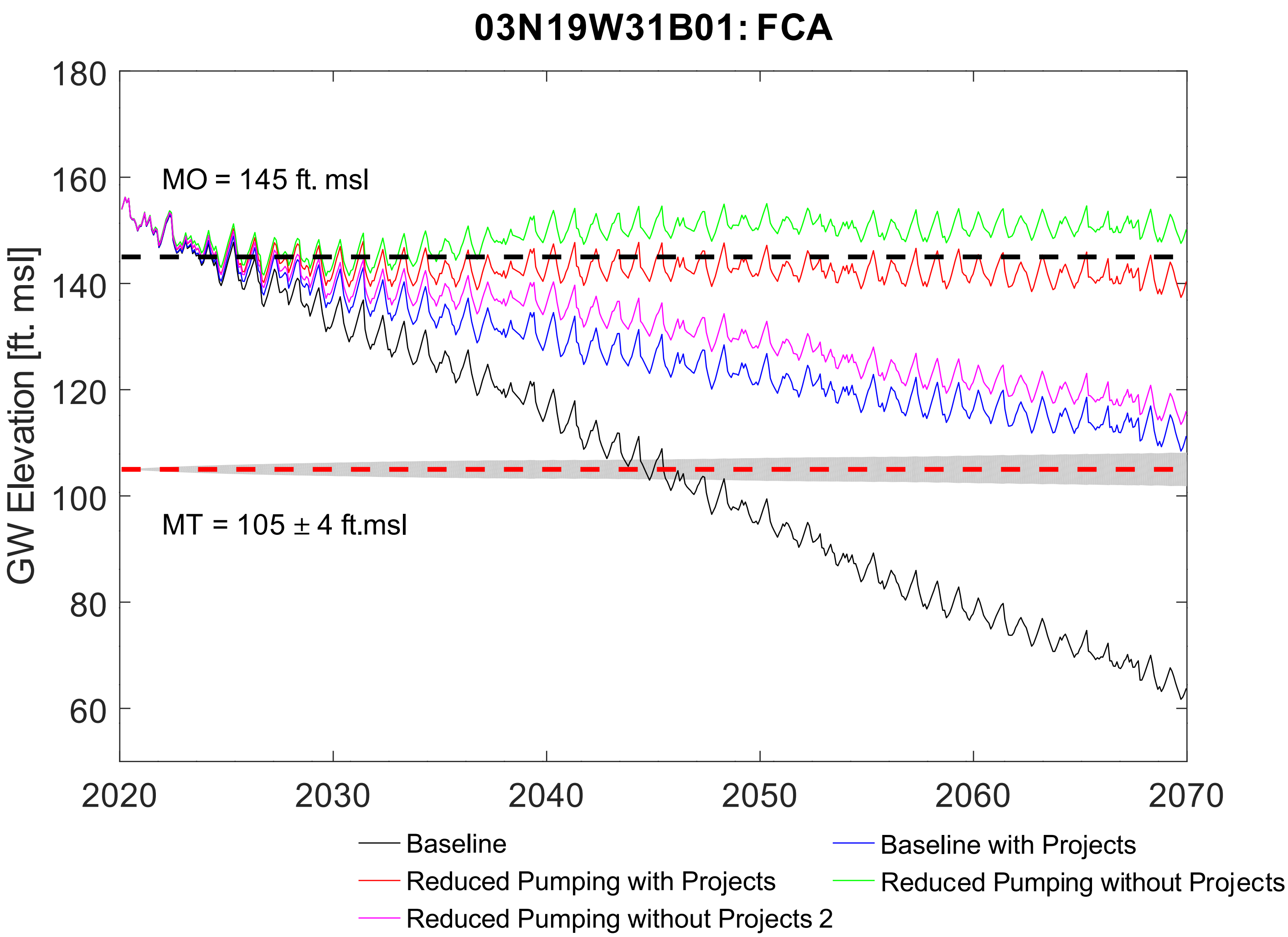
SOURCE:

FIGURE 30

Predicted Groundwater Elevations at 03N19W28N03

DUDEK

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



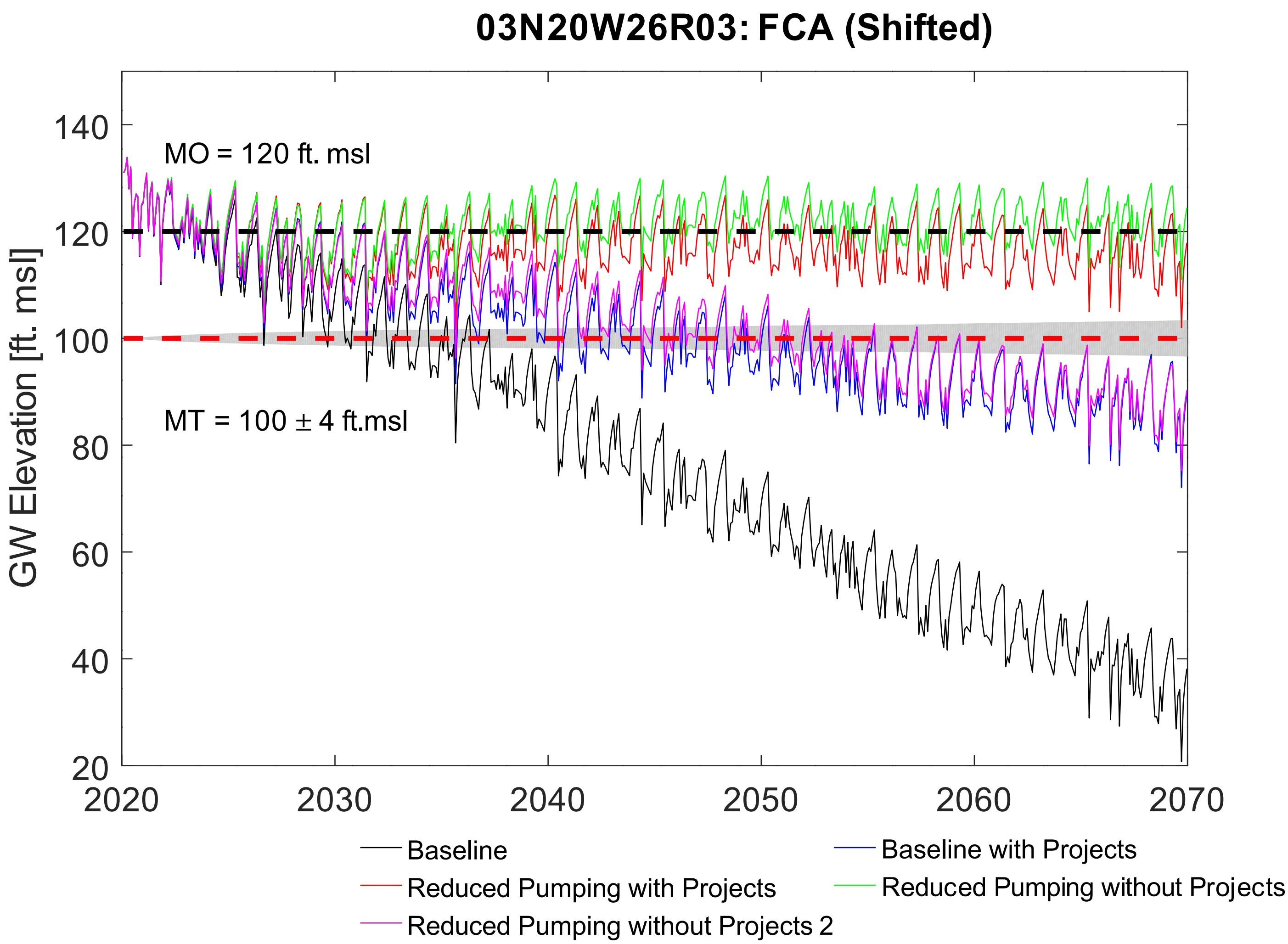
SOURCE:

FIGURE 31

Predicted Groundwater Elevations at 03N19W31B01

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK

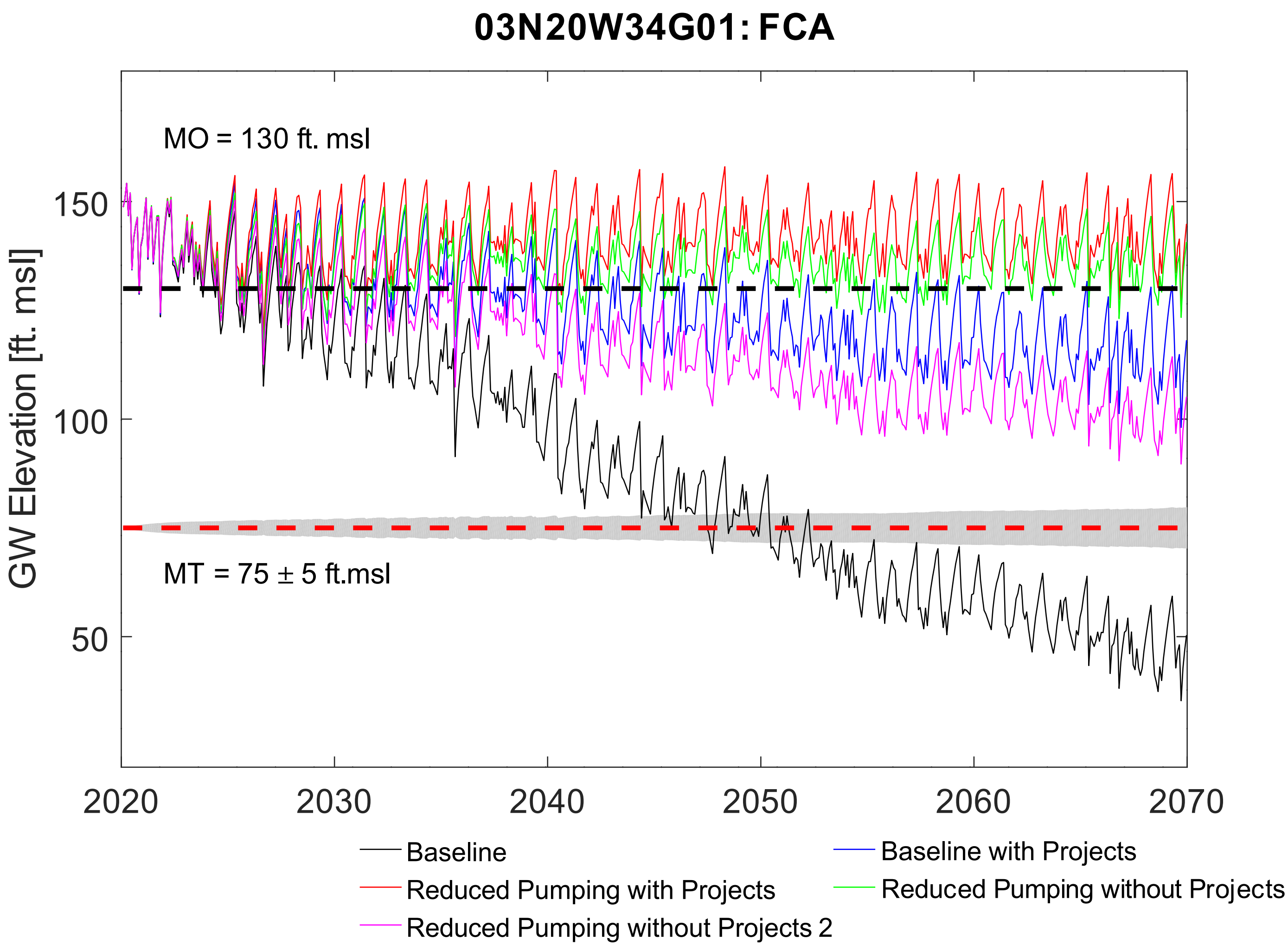


SOURCE:

FIGURE 32

Predicted Groundwater Elevations at 03N20W26R03

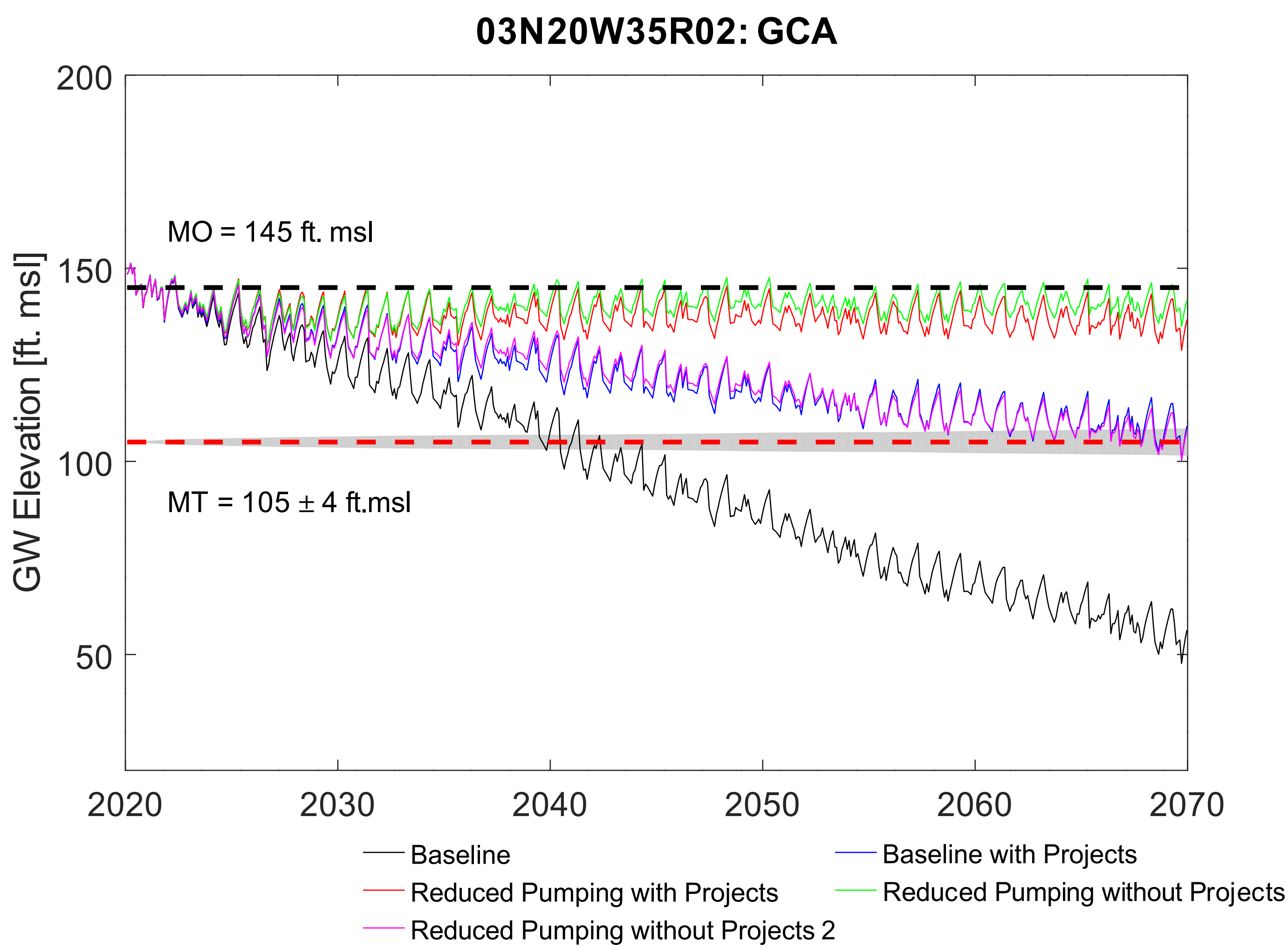
DUDEK



SOURCE:

FIGURE 33

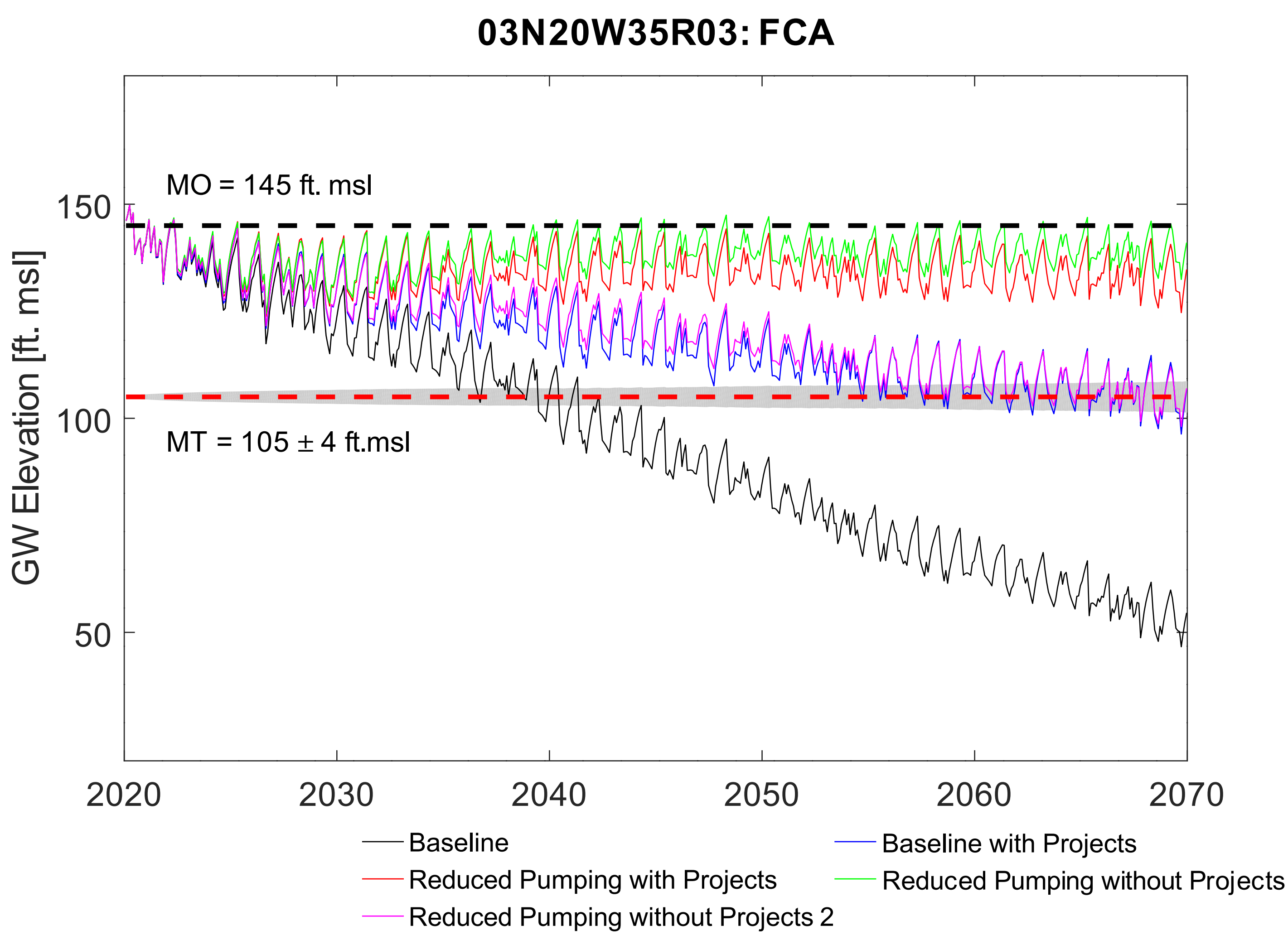
Predicted Groundwater Elevations at 03N20W34G01



SOURCE:

FIGURE 34

Predicted Groundwater Elevations at 03N20W35R02



SOURCE:

FIGURE 35

Predicted Groundwater Elevations at 03N20W35R03

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK

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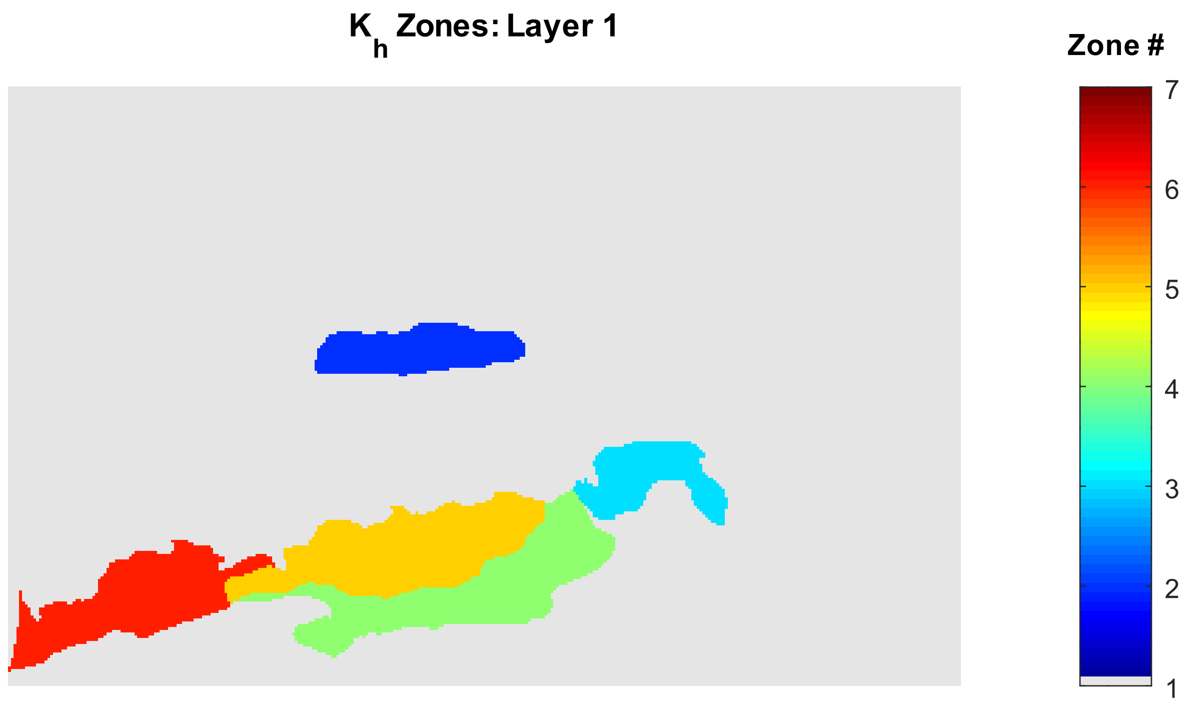
Appendix A

Zone Maps and Results of CMWD Local Sensitivity Analysis



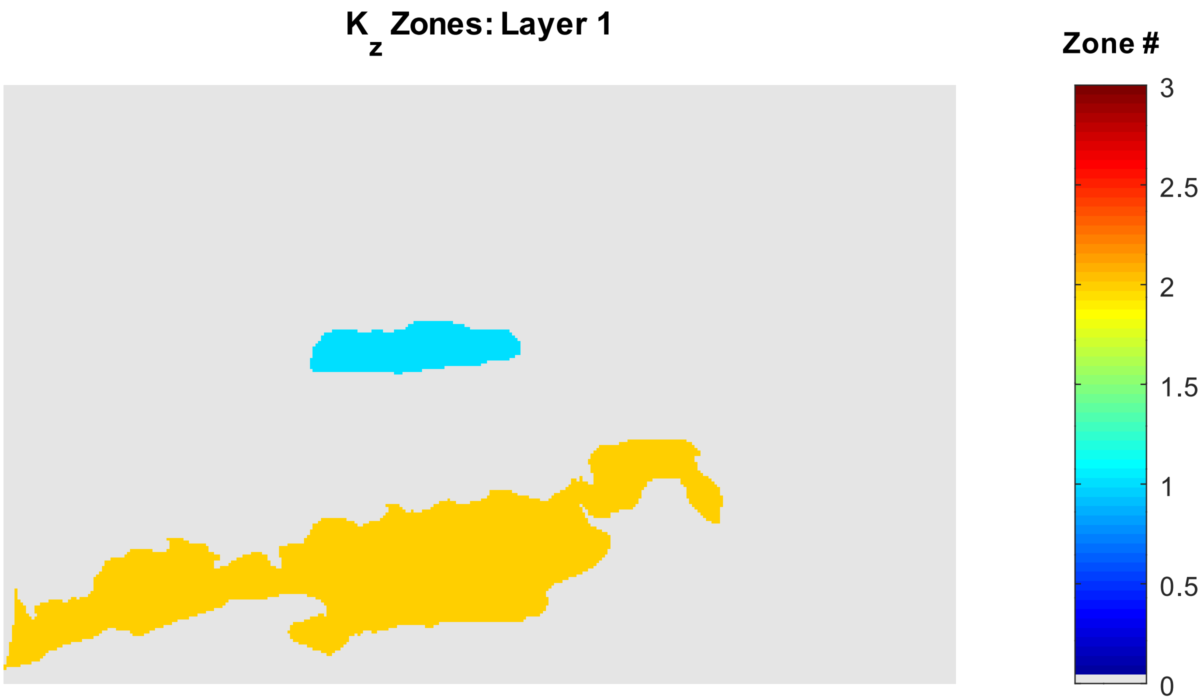
SOURCE:

FIGURE A.1

Horizontal Hydraulic Conductivity Zones for Model Layer 1

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



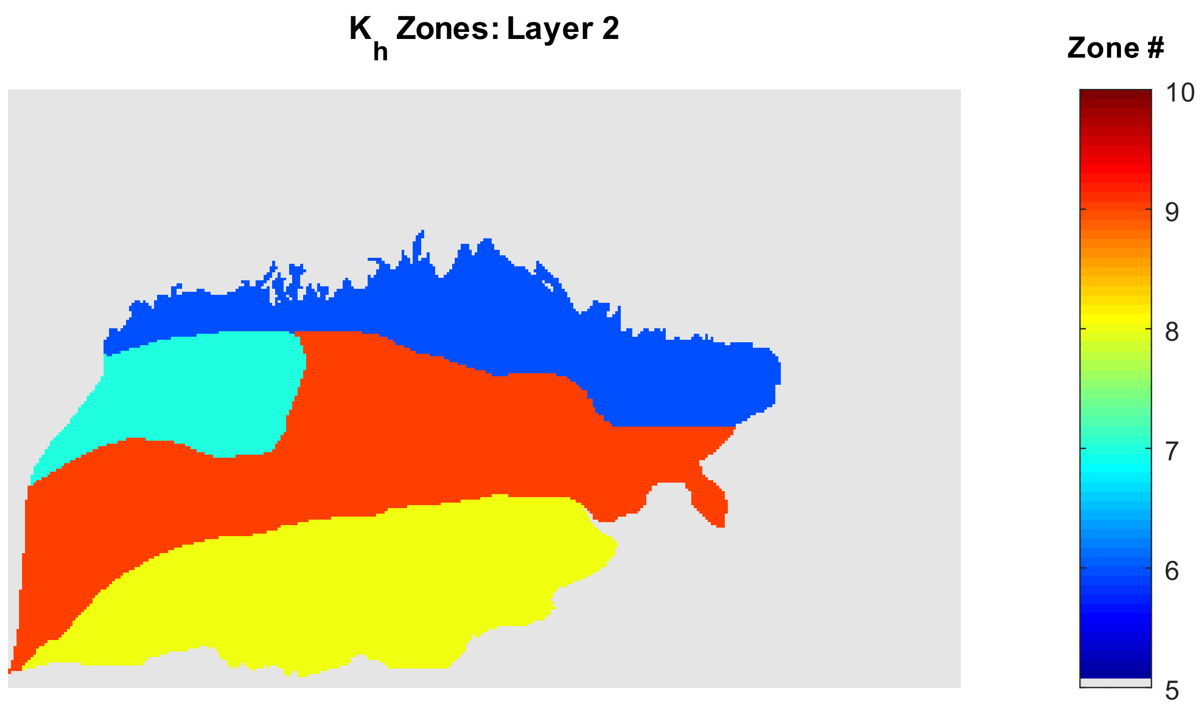
SOURCE:

FIGURE A.2

Vertical Hydraulic Conductivity Zones for Model Layer 1

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



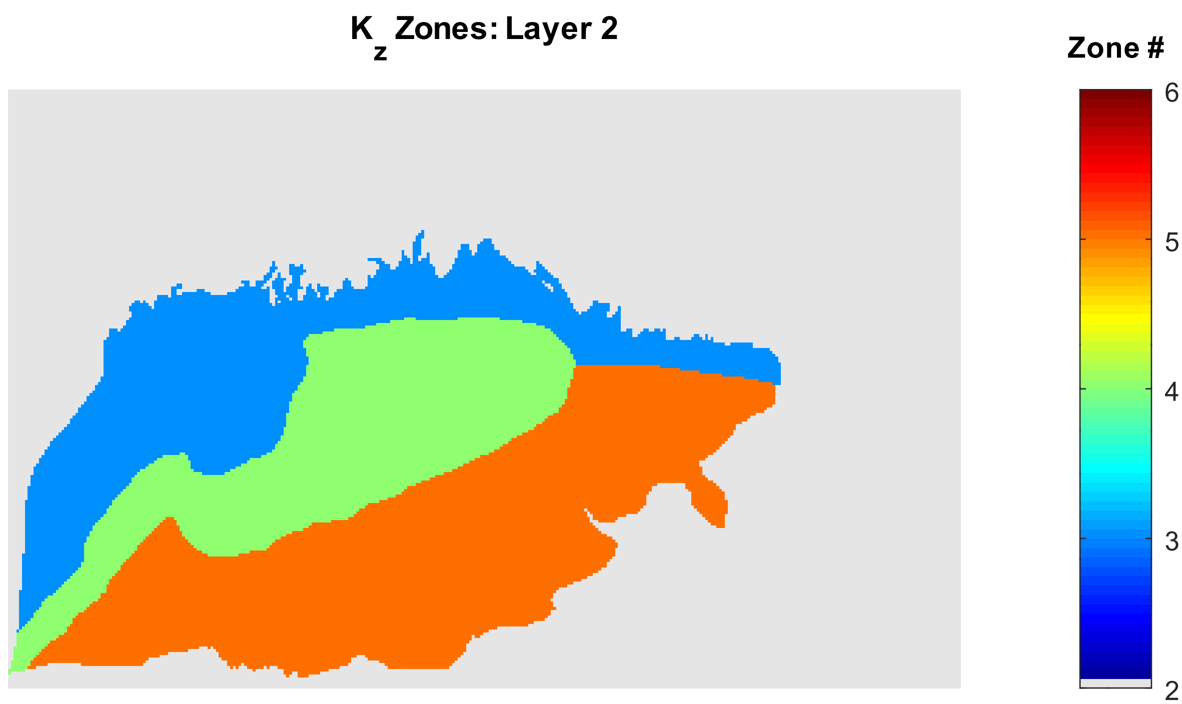
SOURCE:

FIGURE A.3

Horizontal Hydraulic Conductivity Zones for Model Layer 2

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



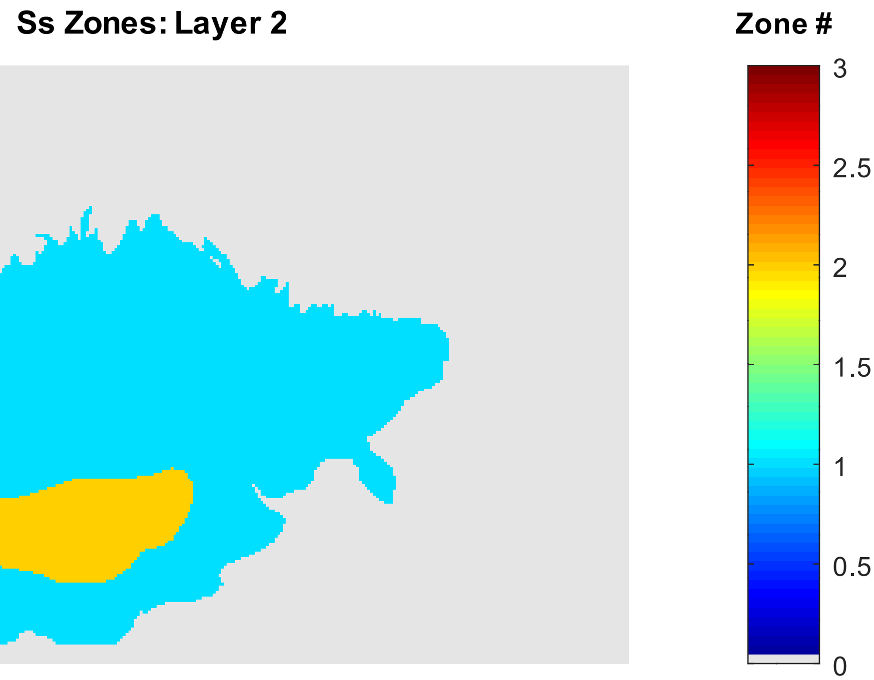
SOURCE:

FIGURE A.4

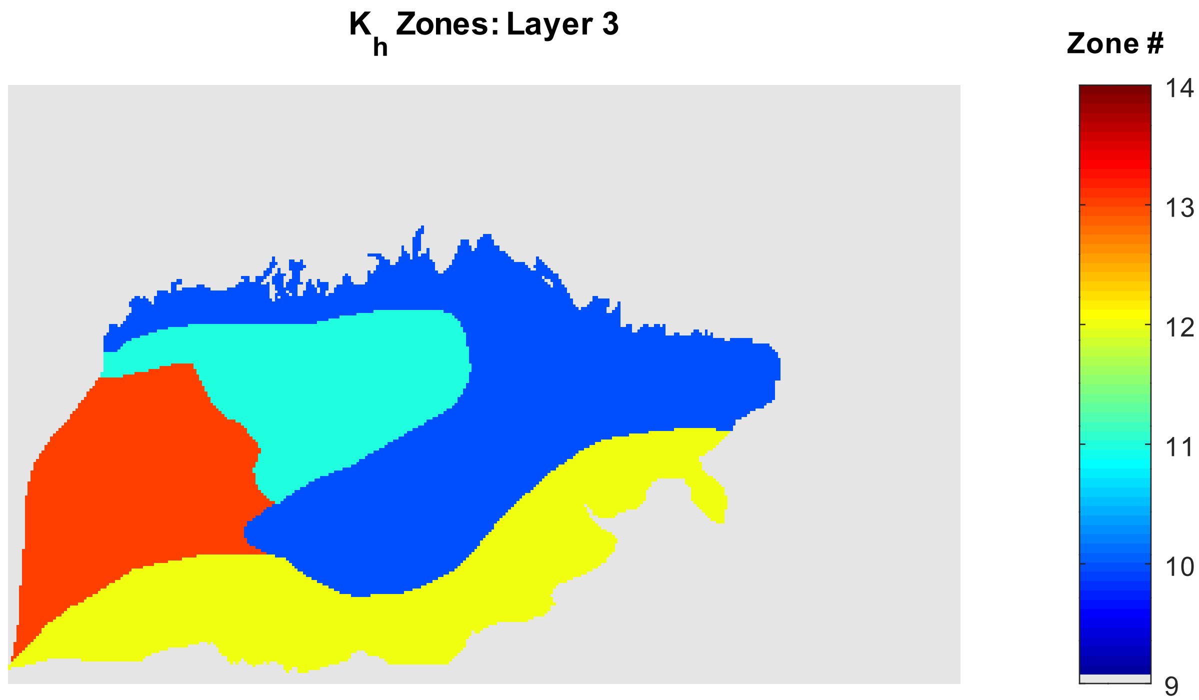
Vertical Hydraulic Conductivity Zones for Model Layer 2

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



Ss Zones: Layer 2
Zone #
3
2.5
2
1.5
1
0.5
0



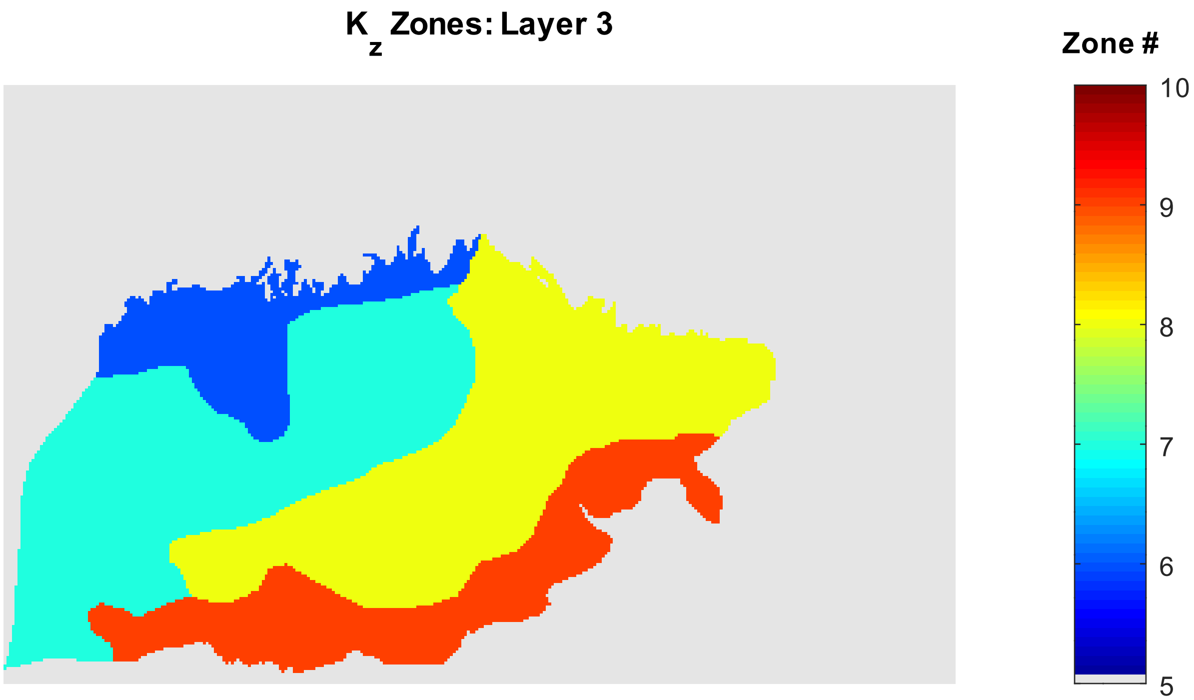
SOURCE:

FIGURE A.6

Horizontal Hydraulic Conductivity Zones for Model Layer 3

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



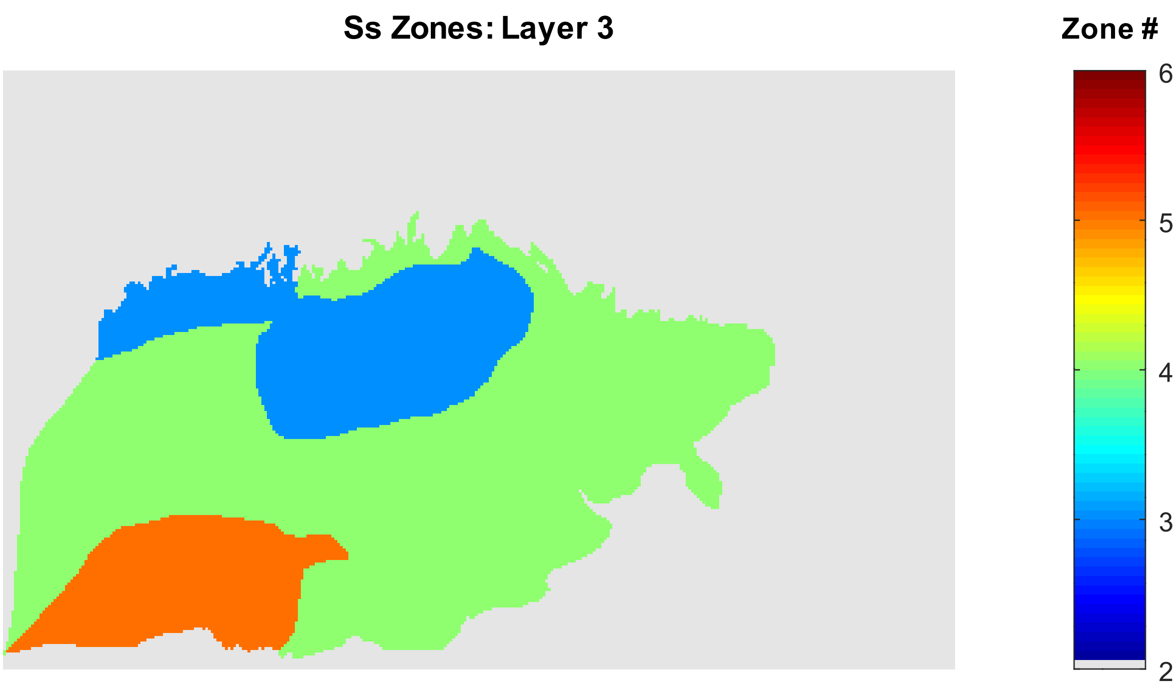
SOURCE:

FIGURE A.7

Vertical Hydraulic Conductivity Zones for Model Layer 3

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



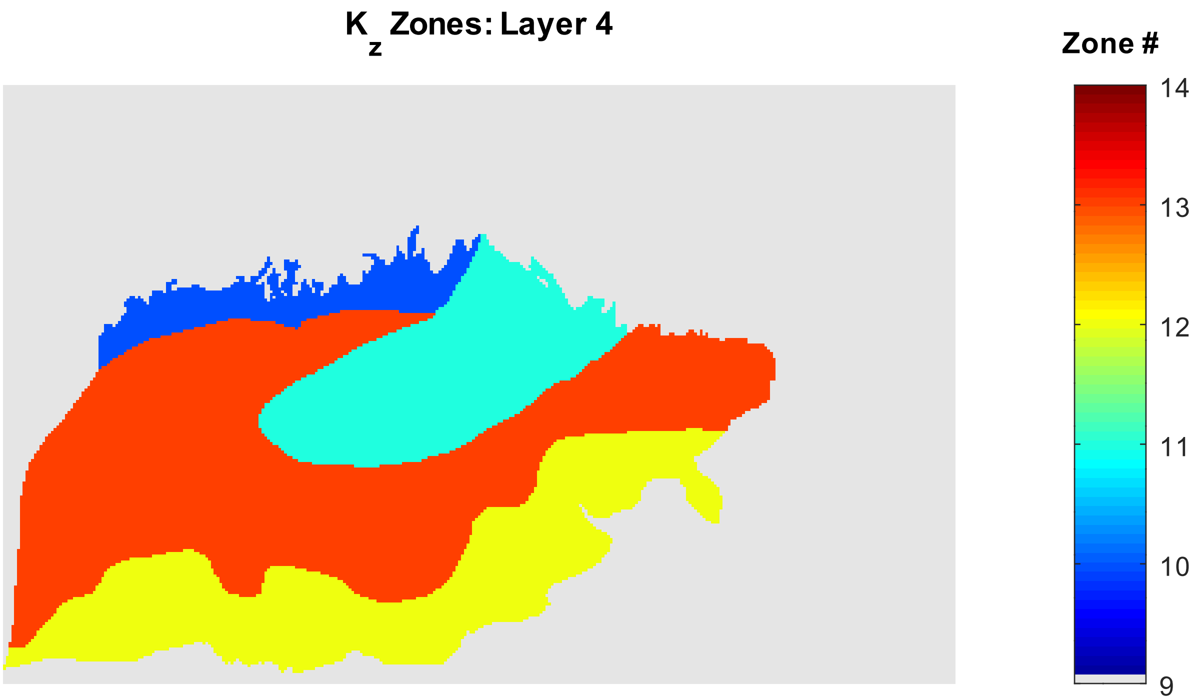
SOURCE:

FIGURE A.8

Specific Storage Zones for Model Layer 3

DUDEK

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



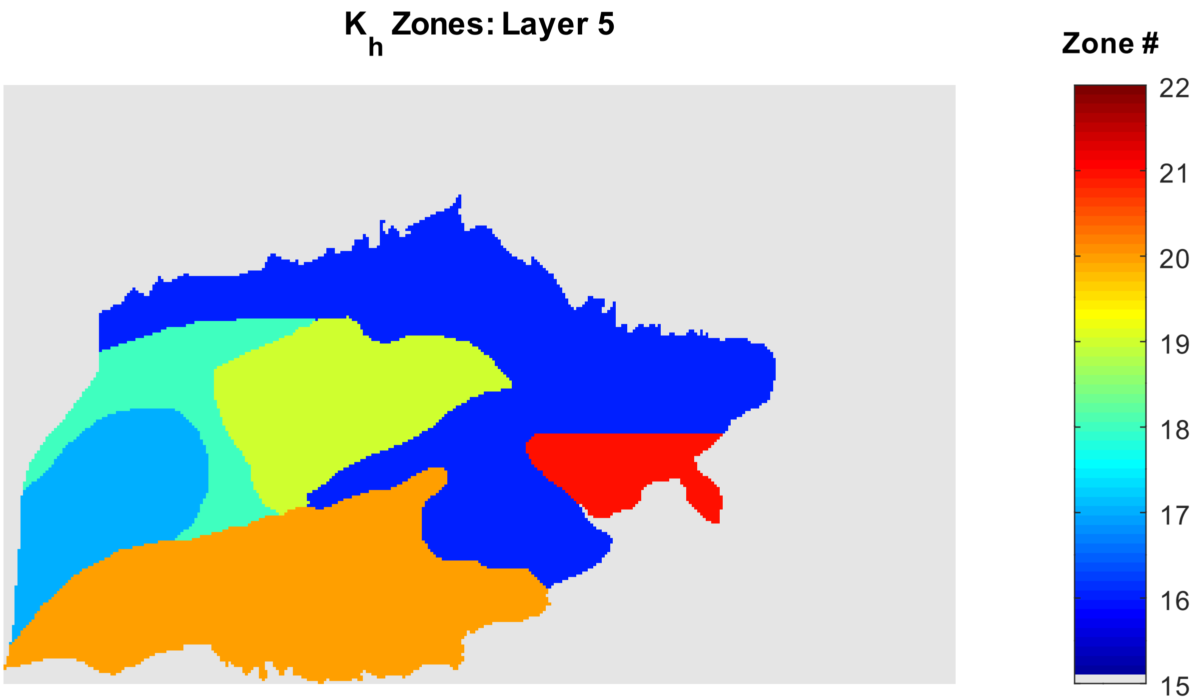
SOURCE:

FIGURE A.9

Vertical Hydraulic Conductivity Zones for Model Layer 4

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK

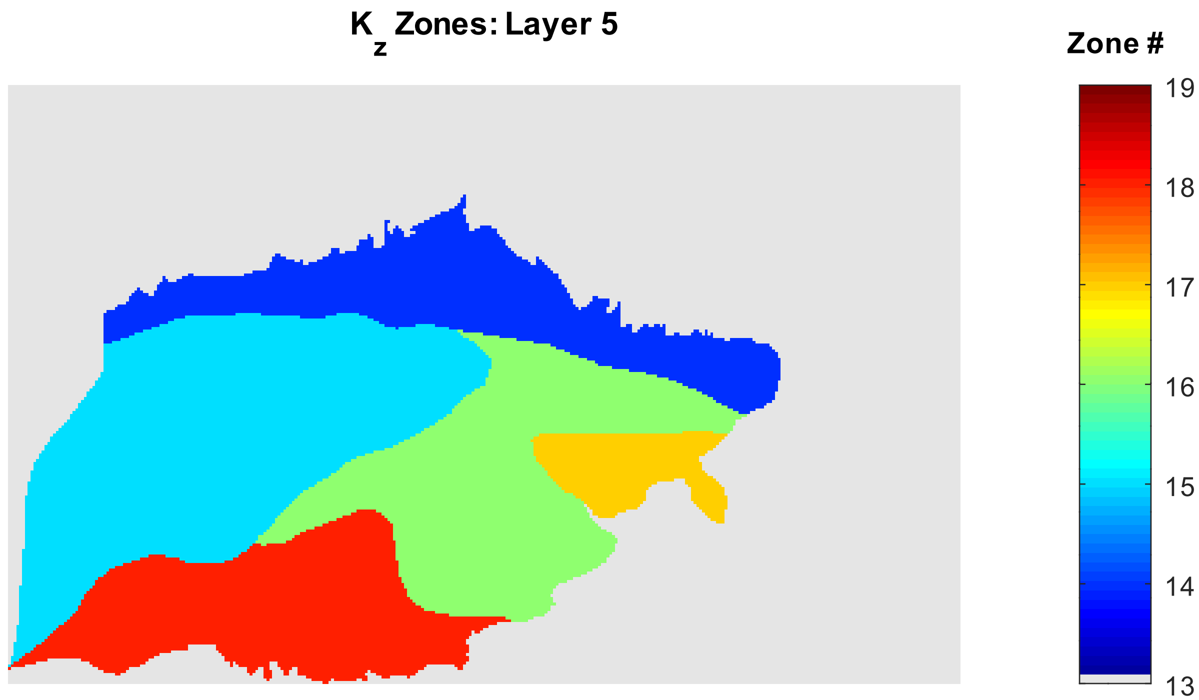


SOURCE:

FIGURE A.10

Horizontal Hydraulic Conductivity Zones for Model Layer 5

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area



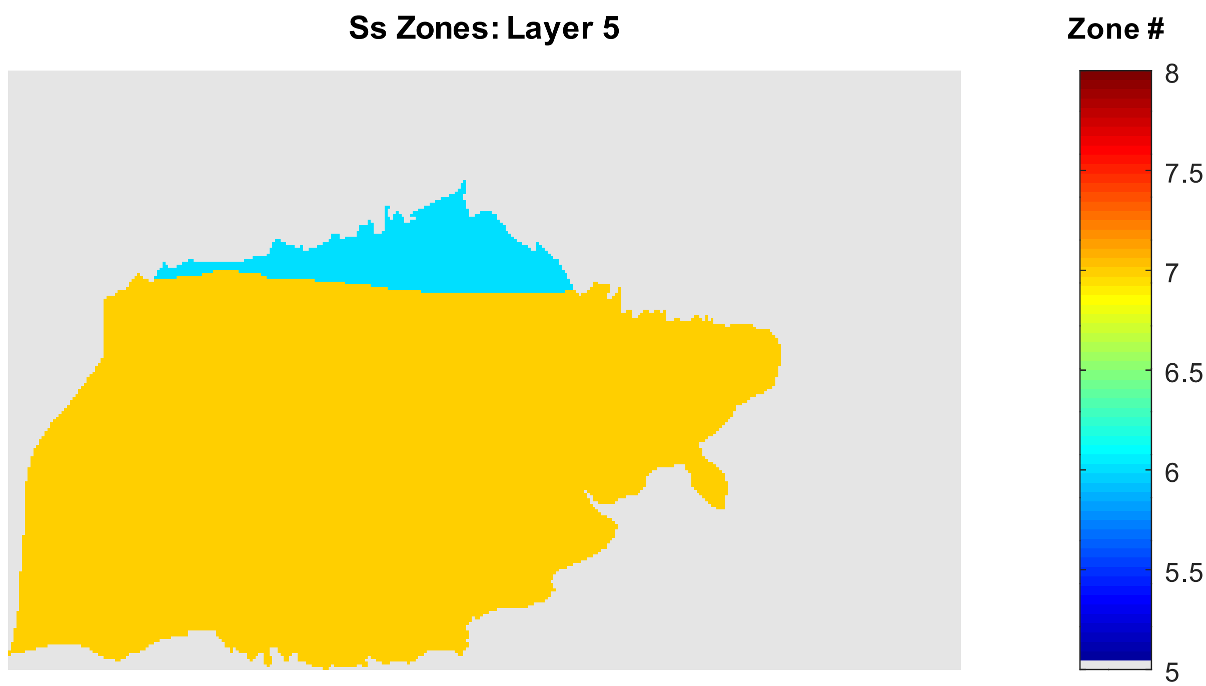
SOURCE:

FIGURE A.8

Vertical Hydraulic Conductivity Zones for Model Layer 5

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



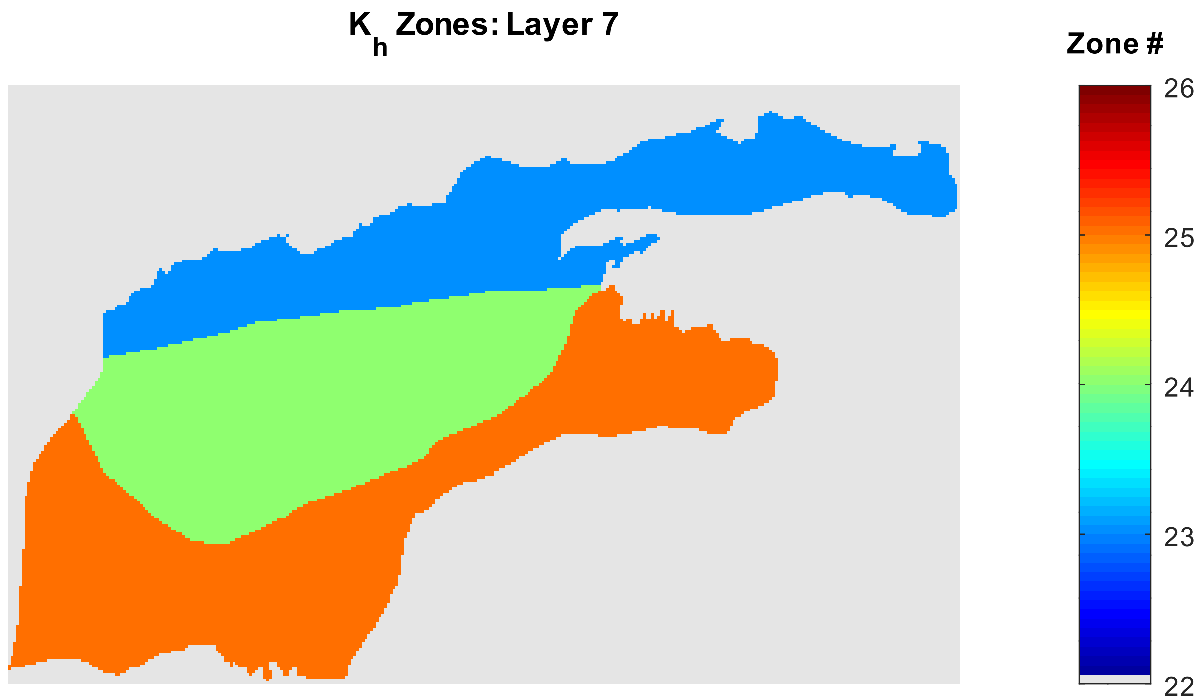
SOURCE:

FIGURE A.12

Specific Storage Zones for Model Layer 5

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK



SOURCE:

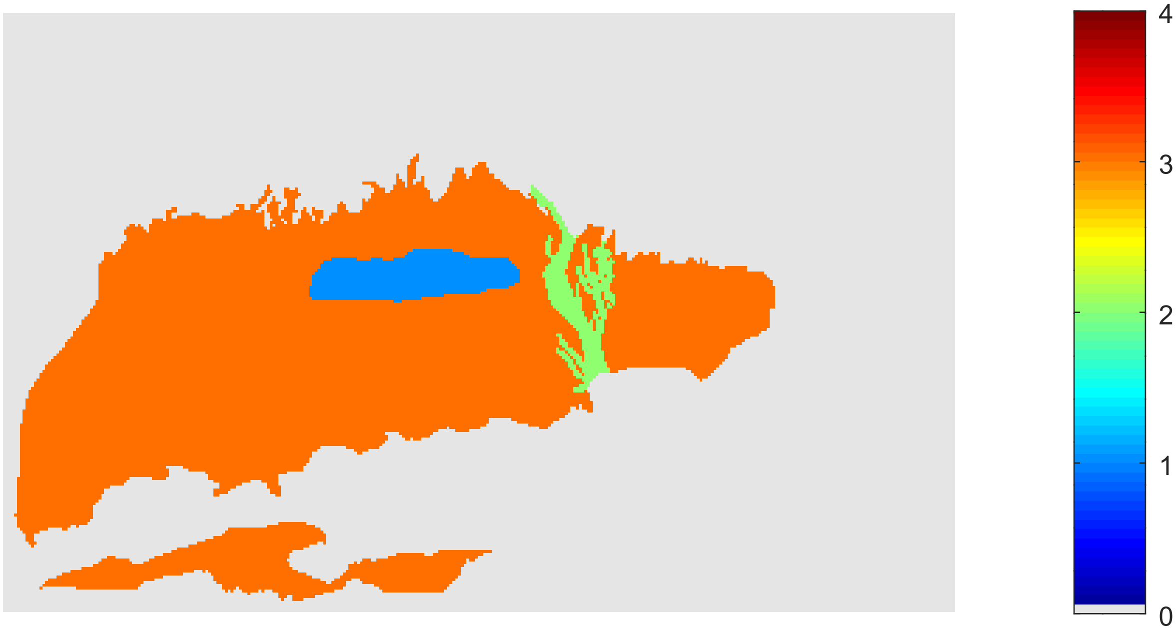
FIGURE A.13

Horizontal Hydraulic Conductivity Zones for Model Layer 7

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK

Recharge Zones



Path: Z:\Projects\

SOURCE:

FIGURE A.15

Recharge Zones

Peer Review of the Calleguas Municipal Water District Model for the East Las Posas Management Area

DUDEK

Table A.1
Recharge Parameter Local Sensitivity

Scenario	Zone	Multiplier	RMSE_ft	NormalizedRMSE	MAE_ft	NormalizedMAE	R2	Delta MAE_ft	InitialConverge
Baseline			23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	Yes
Z1_M1	1	0.5	36.9468	0.0596	22.9541	0.0370	0.9305	6.0233	Yes
Z1_M2	1	0.75	32.3398	0.0522	21.1329	0.0341	0.9468	4.2021	Yes
Z1_M3	1	1.25	28.7861	0.0465	20.1595	0.0325	0.9578	3.2287	Yes
Z1_M4	1	1.5	37.4857	0.0605	23.1301	0.0373	0.9285	6.1993	Yes
Z2_M1	2	0.5	23.7163	0.0383	17.2841	0.0279	0.9714	0.3533	Yes
Z2_M2	2	0.75	23.4316	0.0378	17.0850	0.0276	0.9721	0.1542	Yes
Z2_M3	2	1.25	23.0578	0.0372	16.8271	0.0272	0.9729	-0.1037	No
Z2_M4	2	1.5	22.9604	0.0371	16.7618	0.0270	0.9732	-0.1690	Yes
Z3_M1	3	0.5	23.6526	0.0382	17.2869	0.0279	0.9715	0.3561	Yes
Z3_M2	3	0.75	23.3772	0.0377	17.0462	0.0275	0.9722	0.1155	Yes
Z3_M3	3	1.25	23.1278	0.0373	16.9205	0.0273	0.9728	-0.0103	Yes
Z3_M4	3	1.5	23.0980	0.0373	16.9501	0.0274	0.9729	0.0193	Yes
Z4_M1	4	0.5	28.5966	0.0461	20.7469	0.0335	0.9584	3.8161	Yes
Z4_M2	4	0.75	24.6264	0.0397	17.6173	0.0284	0.9691	0.6865	Yes
Z4_M3	4	1.25	24.4108	0.0394	18.3295	0.0296	0.9697	1.3988	Yes
Z4_M4	4	1.5	27.6812	0.0447	21.1084	0.0341	0.9610	4.1776	Yes
Z5_M1	5	0.5	23.2031	0.0374	16.8244	0.0271	0.9726	-0.1064	Yes
Z5_M2	5	0.75	23.1849	0.0374	16.8617	0.0272	0.9726	-0.0691	Yes
Z5_M3	5	1.25	23.2892	0.0376	17.0312	0.0275	0.9724	0.1004	Yes
Z5_M4	5	1.5	23.4106	0.0378	17.1688	0.0277	0.9721	0.2380	Yes

Table A.2

Arroyo Las Posas Parameter Local Senstivity

Scenario	Parameter	Zone	Multiplier	RMSE_ft	Normalized RMSE	MAE_ft	Normalized MAE	R2	Delta MAE_ft	Initial Converged
Baseline				23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	Yes
FD_Z1_M1	Flow-Depth Curve	1	0.5	24.1972	0.0390	17.8790	0.0289	0.9702	0.9482	No
FD_Z1_M2	Flow-Depth Curve	1	0.75	23.5302	0.0380	17.2509	0.0278	0.9718	0.3201	Yes
FD_Z1_M3	Flow-Depth Curve	1	1.25	23.0591	0.0372	16.7740	0.0271	0.9729	-0.1568	Yes
FD_Z1_M4	Flow-Depth Curve	1	1.5	22.9840	0.0371	16.7092	0.0270	0.9731	-0.2215	Yes
FW_Z1_M1	Flow-Width Curve	1	0.5	27.7393	0.0448	20.8960	0.0337	0.9608	3.9652	Yes
FW_Z1_M2	Flow-Width Curve	1	0.75	24.0926	0.0389	17.7396	0.0286	0.9705	0.8088	Yes
FW_Z1_M3	Flow-Width Curve	1	1.25	22.9653	0.0371	16.7087	0.0270	0.9732	-0.2221	Yes
FW_Z1_M4	Flow-Width Curve	1	1.5	22.8854	0.0369	16.6436	0.0269	0.9734	-0.2872	No
Inflow_Z1_M1	Inflow	1	0.5	42.8054	0.0691	31.8418	0.0514	0.9068	14.9110	Yes
Inflow_Z1_M2	Inflow	1	0.75	28.8088	0.0465	20.6227	0.0333	0.9578	3.6919	Yes
Inflow_Z1_M3	Inflow	1	1.25	23.2937	0.0376	17.1009	0.0276	0.9724	0.1701	Yes
Inflow_Z1_M4	Inflow	1	1.5	24.9185	0.0402	18.3018	0.0295	0.9684	1.3710	Yes
RK_Z1_M1	Riverbed Conductivity	1	0.5	23.2105	0.0375	16.9301	0.0273	0.9726	-0.0007	Yes
RK_Z1_M2	Riverbed Conductivity	1	0.75	23.2124	0.0375	16.9304	0.0273	0.9726	-0.0004	Yes
RK_Z1_M3	Riverbed Conductivity	1	1.25	23.2145	0.0375	16.9310	0.0273	0.9726	0.0002	Yes
RK_Z1_M4	Riverbed Conductivity	1	1.5	23.2150	0.0375	16.9310	0.0273	0.9726	0.0002	Yes
RK_Z2_M1	Riverbed Conductivity	2	0.5	23.8181	0.0384	17.8981	0.0289	0.9711	0.9673	Yes
RK_Z2_M2	Riverbed Conductivity	2	0.75	23.3035	0.0376	17.1902	0.0277	0.9724	0.2594	Yes
RK_Z2_M3	Riverbed Conductivity	2	1.25	23.2721	0.0376	16.8952	0.0273	0.9724	-0.0356	Yes
RK_Z2_M4	Riverbed Conductivity	2	1.5	23.3636	0.0377	16.9405	0.0273	0.9722	0.0097	Yes
RK_Z3_M1	Riverbed Conductivity	3	0.5	23.3001	0.0376	17.0847	0.0276	0.9724	0.1539	Yes
RK_Z3_M2	Riverbed Conductivity	3	0.75	23.2326	0.0375	16.9646	0.0274	0.9725	0.0338	Yes
RK_Z3_M3	Riverbed Conductivity	3	1.25	23.2153	0.0375	16.9348	0.0273	0.9726	0.0040	Yes
RK_Z3_M4	Riverbed Conductivity	3	1.5	23.2216	0.0375	16.9460	0.0273	0.9726	0.0152	Yes
RK_Z4_M1	Riverbed Conductivity	4	0.5	24.1015	0.0389	17.4712	0.0282	0.9704	0.5404	Yes
RK_Z4_M2	Riverbed Conductivity	4	0.75	23.5100	0.0379	17.1110	0.0276	0.9719	0.1802	Yes
RK_Z4_M3	Riverbed Conductivity	4	1.25	23.0308	0.0372	16.8254	0.0272	0.9730	-0.1054	Yes
RK_Z4_M4	Riverbed Conductivity	4	1.5	22.9079	0.0370	16.7550	0.0270	0.9733	-0.1757	Yes
RK_Z5_M1	Riverbed Conductivity	5	0.5	24.4035	0.0394	17.7053	0.0286	0.9697	0.7745	Yes
RK_Z5_M2	Riverbed Conductivity	5	0.75	23.5459	0.0380	17.1529	0.0277	0.9718	0.2221	Yes
RK_Z5_M3	Riverbed Conductivity	5	1.25	23.0589	0.0372	16.8291	0.0272	0.9729	-0.1017	Yes

Table A.2

Arroyo Las Posas Parameter Local Senstivity

RK_Z5_M4	Riverbed Conductivity	5	1.5	22.9806	0.0371	16.7790	0.0271	0.9731	-0.1518	No
RK_Z6_M1	Riverbed Conductivity	All	0.5	27.7947	0.0449	20.9384	0.0338	0.9607	4.0076	Yes
RK_Z6_M2	Riverbed Conductivity	All	0.75	24.1103	0.0389	17.7516	0.0286	0.9704	0.8208	Yes
RK_Z6_M3	Riverbed Conductivity	All	1.25	22.9590	0.0370	16.7039	0.0270	0.9732	-0.2269	Yes
RK_Z6_M4	Riverbed Conductivity	All	1.5	22.8786	0.0369	16.6377	0.0268	0.9734	-0.2931	Yes

Table A.3
ET Parameter Local Sensitivity

Scenario	Parameter	Multiplier	RMSE_ft	Normalized RMSE	MAE_ft	Normalized MAE	R2	Delta MAE_ft	InitialConverge
Baseline			23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	Yes
EXT_Depth_M1	Extinction depth	0.5	23.2114	0.0375	16.9292	0.0273	0.9726	-0.0016	Yes
EXT_Depth_M2	Extinction depth	0.75	23.2125	0.0375	16.9299	0.0273	0.9726	-0.0009	Yes
EXT_Depth_M3	Extinction depth	1.25	23.2149	0.0375	16.9316	0.0273	0.9726	0.0008	Yes
EXT_Depth_M4	Extinction depth	1.5	23.2159	0.0375	16.9322	0.0273	0.9726	0.0014	Yes
ET_Rate_M1	ET Rate	0.5	23.0412	0.0372	16.8125	0.0271	0.9730	-0.1182	Yes
ET_Rate_M2	ET Rate	0.75	23.1196	0.0373	16.8667	0.0272	0.9728	-0.0641	Yes
ET_Rate_M3	ET Rate	1.25	23.3236	0.0376	17.0092	0.0274	0.9723	0.0784	Yes
ET_Rate_M4	ET Rate	1.5	23.4466	0.0378	17.1004	0.0276	0.9720	0.1696	Yes

Table A.4
Horizontal Hydraulic Conductivity Parameter Local Sensitivity

Scenario	Layer	Zone	Multiplier	RMSE_ft	Normalized RMSE	MAE_ft	Normalized MAE	R2	Delta MAE_ft	Initial Converge
Baseline				23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	yes
hk_L_1_Z_1_M_1	1	1	10	23.1389	0.0373	16.8463	0.0272	0.9728	-0.0844	No
hk_L_1_Z_1_M_2	1	1	5	23.1384	0.0373	16.8391	0.0272	0.9728	-0.0917	No
hk_L_1_Z_1_M_3	1	1	0.2	25.3497	0.0409	18.7726	0.0303	0.9673	1.8418	yes
hk_L_1_Z_1_M_4	1	1	0.1	28.2093	0.0455	20.1726	0.0326	0.9595	3.2418	yes
hk_L_1_Z_2_M_1	1	2	10	23.2117	0.0375	16.9352	0.0273	0.9726	0.0044	yes
hk_L_1_Z_2_M_2	1	2	5	23.2113	0.0375	16.9323	0.0273	0.9726	0.0015	yes
hk_L_1_Z_2_M_3	1	2	0.2	23.2144	0.0375	16.9298	0.0273	0.9726	-0.0010	yes
hk_L_1_Z_2_M_4	1	2	0.1	23.2140	0.0375	16.9292	0.0273	0.9726	-0.0016	yes
hk_L_1_Z_26_M_1	1	All	10	23.5271	0.0380	17.7004	0.0286	0.9718	0.7696	yes
hk_L_1_Z_26_M_2	1	All	5	23.2794	0.0376	17.1962	0.0277	0.9724	0.2654	yes
hk_L_1_Z_26_M_3	1	All	0.2	23.8160	0.0384	17.6507	0.0285	0.9711	0.7199	yes
hk_L_1_Z_26_M_4	1	All	0.1	24.2067	0.0391	18.0717	0.0292	0.9702	1.1409	yes
hk_L_1_Z_3_M_1	1	3	10	23.3134	0.0376	16.9341	0.0273	0.9723	0.0033	No
hk_L_1_Z_3_M_2	1	3	5	23.2166	0.0375	16.7991	0.0271	0.9726	-0.1317	yes
hk_L_1_Z_3_M_3	1	3	0.2	23.2746	0.0376	17.0535	0.0275	0.9724	0.1227	yes
hk_L_1_Z_3_M_4	1	3	0.1	23.2889	0.0376	17.0787	0.0276	0.9724	0.1479	yes
hk_L_1_Z_4_M_1	1	4	10	23.5723	0.0380	17.8918	0.0289	0.9717	0.9610	yes
hk_L_1_Z_4_M_2	1	4	5	23.2174	0.0375	17.2944	0.0279	0.9726	0.3636	yes
hk_L_1_Z_4_M_3	1	4	0.2	23.3774	0.0377	17.2260	0.0278	0.9722	0.2952	yes
hk_L_1_Z_4_M_4	1	4	0.1	23.4476	0.0378	17.3804	0.0280	0.9720	0.4496	yes
hk_L_1_Z_5_M_1	1	5	10	19.7357	0.0318	13.1580	0.0212	0.9998	-3.7728	No
hk_L_1_Z_5_M_2	1	5	5	23.3217	0.0376	17.0247	0.0275	0.9723	0.0939	yes
hk_L_1_Z_5_M_3	1	5	0.2	23.4521	0.0378	17.0987	0.0276	0.9720	0.1679	yes
hk_L_1_Z_5_M_4	1	5	0.1	23.6569	0.0382	17.2420	0.0278	0.9715	0.3112	yes
hk_L_2_Z_27_M_1	2	All	10	25.5748	0.0413	19.7980	0.0319	0.9667	2.8672	yes
hk_L_2_Z_27_M_2	2	All	5	24.2672	0.0392	18.4546	0.0298	0.9700	1.5238	yes
hk_L_2_Z_27_M_3	2	All	0.2	23.2088	0.0375	16.9043	0.0273	0.9726	-0.0265	yes
hk_L_2_Z_27_M_4	2	All	0.1	23.3587	0.0377	17.0970	0.0276	0.9722	0.1662	yes
hk_L_2_Z_6_M_1	2	6	10	23.2427	0.0375	16.9646	0.0274	0.9725	0.0338	yes
hk_L_2_Z_6_M_2	2	6	5	23.2294	0.0375	16.9497	0.0274	0.9725	0.0189	yes

Table A.4

Horizontal Hydraulic Conductivity Parameter Local Sensitivity

hk_L_2_Z_6_M_3	2	6	0.2	23.2048	0.0374	16.9183	0.0273	0.9726	-0.0125	yes
hk_L_2_Z_6_M_4	2	6	0.1	23.2013	0.0374	16.9131	0.0273	0.9726	-0.0177	yes
hk_L_2_Z_7_M_1	2	7	10	23.2180	0.0375	16.9464	0.0273	0.9726	0.0156	yes
hk_L_2_Z_7_M_2	2	7	5	23.2171	0.0375	16.9436	0.0273	0.9726	0.0128	yes
hk_L_2_Z_7_M_3	2	7	0.2	23.2113	0.0375	16.9125	0.0273	0.9726	-0.0183	yes
hk_L_2_Z_7_M_4	2	7	0.1	23.2123	0.0375	16.9063	0.0273	0.9726	-0.0245	yes
hk_L_2_Z_8_M_1	2	8	10	25.1614	0.0406	19.3045	0.0312	0.9678	2.3737	yes
hk_L_2_Z_8_M_2	2	8	5	24.1140	0.0389	18.2450	0.0294	0.9704	1.3143	yes
hk_L_2_Z_8_M_3	2	8	0.2	23.2193	0.0375	16.9148	0.0273	0.9726	-0.0160	yes
hk_L_2_Z_8_M_4	2	8	0.1	23.3312	0.0376	17.0655	0.0275	0.9723	0.1347	yes
hk_L_2_Z_9_M_1	2	9	10	23.2711	0.0376	17.1401	0.0277	0.9724	0.2093	yes
hk_L_2_Z_9_M_2	2	9	5	23.2737	0.0376	17.0696	0.0275	0.9724	0.1388	yes
hk_L_2_Z_9_M_3	2	9	0.2	23.1766	0.0374	16.9087	0.0273	0.9727	-0.0221	yes
hk_L_2_Z_9_M_4	2	9	0.1	23.1765	0.0374	16.9201	0.0273	0.9727	-0.0107	yes
hk_L_3_Z_10_M_1	3	10	10	24.4839	0.0395	18.4250	0.0297	0.9695	1.4942	yes
hk_L_3_Z_10_M_2	3	10	5	23.9293	0.0386	17.7858	0.0287	0.9709	0.8550	yes
hk_L_3_Z_10_M_3	3	10	0.2	23.4944	0.0379	17.0026	0.0274	0.9719	0.0718	yes
hk_L_3_Z_10_M_4	3	10	0.1	23.8978	0.0386	17.1578	0.0277	0.9709	0.2270	yes
hk_L_3_Z_11_M_1	3	11	10	23.2566	0.0375	17.1706	0.0277	0.9725	0.2398	yes
hk_L_3_Z_11_M_2	3	11	5	23.2342	0.0375	17.1177	0.0276	0.9725	0.1869	yes
hk_L_3_Z_11_M_3	3	11	0.2	23.7983	0.0384	17.1034	0.0276	0.9712	0.1726	yes
hk_L_3_Z_11_M_4	3	11	0.1	24.9773	0.0403	17.5247	0.0283	0.9683	0.5939	yes
hk_L_3_Z_12_M_1	3	12	10	23.2799	0.0376	16.9762	0.0274	0.9724	0.0454	No
hk_L_3_Z_12_M_2	3	12	5	23.2259	0.0375	16.9431	0.0273	0.9726	0.0123	yes
hk_L_3_Z_12_M_3	3	12	0.2	23.2423	0.0375	16.9193	0.0273	0.9725	-0.0115	yes
hk_L_3_Z_12_M_4	3	12	0.1	23.2518	0.0375	16.9157	0.0273	0.9725	-0.0151	yes
hk_L_3_Z_13_M_1	3	13	10	22.9047	0.0370	16.8880	0.0273	0.9733	-0.0428	yes
hk_L_3_Z_13_M_2	3	13	5	22.7646	0.0367	16.7761	0.0271	0.9736	-0.1547	yes
hk_L_3_Z_13_M_3	3	13	0.2	23.5296	0.0380	17.1709	0.0277	0.9718	0.2401	yes
hk_L_3_Z_13_M_4	3	13	0.1	23.5769	0.0380	17.2086	0.0278	0.9717	0.2778	yes
hk_L_3_Z_28_M_1	3	All	10	24.5764	0.0397	18.6546	0.0301	0.9693	1.7238	yes
hk_L_3_Z_28_M_2	3	All	5	23.6513	0.0382	17.8911	0.0289	0.9715	0.9603	yes
hk_L_3_Z_28_M_3	3	All	0.2	24.4849	0.0395	17.5723	0.0284	0.9695	0.6415	yes
hk_L_3_Z_28_M_4	3	All	0.1	26.0127	0.0420	18.1841	0.0293	0.9656	1.2533	yes

Table A.4

Horizontal Hydraulic Conductivity Parameter Local Sensitivity

hk_L_4_Z_14_M_1	4	14	10	23.2066	0.0374	16.8733	0.0272	0.9726	-0.0575	yes
hk_L_4_Z_14_M_2	4	14	5	23.1970	0.0374	16.8903	0.0273	0.9726	-0.0405	yes
hk_L_4_Z_14_M_3	4	14	0.2	23.2220	0.0375	16.9460	0.0273	0.9726	0.0152	yes
hk_L_4_Z_14_M_4	4	14	0.1	23.2232	0.0375	16.9483	0.0273	0.9726	0.0175	yes
hk_L_5_Z_15_M_1	5	15	10	23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	yes
hk_L_5_Z_15_M_2	5	15	5	23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	yes
hk_L_5_Z_15_M_3	5	15	0.2	23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	yes
hk_L_5_Z_15_M_4	5	15	0.1	23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	yes
hk_L_5_Z_16_M_1	5	16	10	26.7219	0.0431	20.3729	0.0329	0.9637	3.4421	yes
hk_L_5_Z_16_M_2	5	16	5	25.1204	0.0405	18.9461	0.0306	0.9679	2.0154	yes
hk_L_5_Z_16_M_3	5	16	0.2	22.8405	0.0369	16.2480	0.0262	0.9735	-0.6828	yes
hk_L_5_Z_16_M_4	5	16	0.1	23.1001	0.0373	16.3039	0.0263	0.9728	-0.6269	yes
hk_L_5_Z_17_M_1	5	17	10	26.3260	0.0425	19.8094	0.0320	0.9647	2.8786	yes
hk_L_5_Z_17_M_2	5	17	5	25.7592	0.0416	19.3272	0.0312	0.9662	2.3964	yes
hk_L_5_Z_17_M_3	5	17	0.2	26.2807	0.0424	18.6739	0.0301	0.9649	1.7431	yes
hk_L_5_Z_17_M_4	5	17	0.1	33.2893	0.0537	22.1315	0.0357	0.9436	5.2007	yes
hk_L_5_Z_18_M_1	5	18	10	25.3423	0.0409	18.6184	0.0300	0.9673	1.6876	No
hk_L_5_Z_18_M_2	5	18	5	24.7433	0.0399	18.1347	0.0293	0.9688	1.2039	No
hk_L_5_Z_18_M_3	5	18	0.2	22.2565	0.0359	16.3377	0.0264	0.9748	-0.5931	yes
hk_L_5_Z_18_M_4	5	18	0.1	22.3605	0.0361	16.4195	0.0265	0.9746	-0.5113	yes
hk_L_5_Z_19_M_1	5	19	10	26.9745	0.0435	20.1488	0.0325	0.9630	3.2180	No
hk_L_5_Z_19_M_2	5	19	5	26.1652	0.0422	19.5389	0.0315	0.9652	2.6081	No
hk_L_5_Z_19_M_3	5	19	0.2	25.5993	0.0413	18.1393	0.0293	0.9667	1.2085	yes
hk_L_5_Z_19_M_4	5	19	0.1	33.4388	0.0540	22.0746	0.0356	0.9431	5.1438	yes
hk_L_5_Z_20_M_1	5	20	10	29.5199	0.0476	22.6888	0.0366	0.9557	5.7580	yes
hk_L_5_Z_20_M_2	5	20	5	28.0120	0.0452	21.9107	0.0354	0.9601	4.9799	No
hk_L_5_Z_20_M_3	5	20	0.2	42.9983	0.0694	34.4745	0.0556	0.9059	17.5438	yes
hk_L_5_Z_20_M_4	5	20	0.1	61.7561	0.0997	49.0496	0.0792	0.8059	32.1188	yes
hk_L_5_Z_21_M_1	5	21	10	24.3879	0.0394	17.4920	0.0282	0.9697	0.5612	yes
hk_L_5_Z_21_M_2	5	21	5	24.0708	0.0388	17.4033	0.0281	0.9705	0.4725	yes
hk_L_5_Z_21_M_3	5	21	0.2	23.0787	0.0372	16.8530	0.0272	0.9729	-0.0778	No
hk_L_5_Z_21_M_4	5	21	0.1	23.0685	0.0372	16.8489	0.0272	0.9729	-0.0818	No
hk_L_5_Z_29_M_1	5	All	10	48.0653	0.0776	38.3371	0.0619	0.8825	21.4063	yes
hk_L_5_Z_29_M_2	5	All	5	44.4460	0.0717	35.1182	0.0567	0.8995	18.1874	yes

Table A.4

Horizontal Hydraulic Conductivity Parameter Local Sensitivity

hk_L_5_Z_29_M_3	5	All	0.2	61.7363	0.0996	45.9806	0.0742	0.8061	29.0498	yes
hk_L_5_Z_29_M_4	5	All	0.1	91.4646	0.1476	64.6407	0.1043	0.5743	47.7099	yes
hk_L_6_Z_22_M_1	6	22	10	23.0698	0.0372	16.9080	0.0273	0.9729	-0.0228	yes
hk_L_6_Z_22_M_2	6	22	5	23.0898	0.0373	16.8875	0.0273	0.9729	-0.0433	yes
hk_L_6_Z_22_M_3	6	22	0.2	23.2718	0.0376	16.9588	0.0274	0.9724	0.0280	yes
hk_L_6_Z_22_M_4	6	22	0.1	23.2810	0.0376	16.9633	0.0274	0.9724	0.0325	yes
hk_L_7_Z_23_M_1	7	23	10	25.0235	0.0404	18.8024	0.0303	0.9681	1.8716	No
hk_L_7_Z_23_M_2	7	23	5	24.2841	0.0392	18.2401	0.0294	0.9700	1.3093	No
hk_L_7_Z_23_M_3	7	23	0.2	24.3123	0.0392	17.1524	0.0277	0.9699	0.2216	yes
hk_L_7_Z_23_M_4	7	23	0.1	26.6208	0.0430	18.4898	0.0298	0.9639	1.5590	yes
hk_L_7_Z_24_M_1	7	24	10	26.1017	0.0421	19.0164	0.0307	0.9653	2.0856	No
hk_L_7_Z_24_M_2	7	24	5	25.3302	0.0409	18.4858	0.0298	0.9674	1.5550	No
hk_L_7_Z_24_M_3	7	24	0.2	23.2768	0.0376	16.2963	0.0263	0.9724	-0.6345	yes
hk_L_7_Z_24_M_4	7	24	0.1	24.7241	0.0399	17.3484	0.0280	0.9689	0.4176	yes
hk_L_7_Z_25_M_1	7	25	10	26.6286	0.0430	20.2538	0.0327	0.9639	3.3230	yes
hk_L_7_Z_25_M_2	7	25	5	24.8084	0.0400	18.6980	0.0302	0.9687	1.7672	yes
hk_L_7_Z_25_M_3	7	25	0.2	23.3409	0.0377	16.7526	0.0270	0.9723	-0.1781	yes
hk_L_7_Z_25_M_4	7	25	0.1	23.4875	0.0379	16.8005	0.0271	0.9719	-0.1303	yes
hk_L_7_Z_30_M_1	7	All	10	37.7954	0.0610	28.6782	0.0463	0.9273	11.7474	No
hk_L_7_Z_30_M_2	7	All	5	31.4673	0.0508	23.9353	0.0386	0.9496	7.0045	No
hk_L_7_Z_30_M_3	7	All	0.2	28.1366	0.0454	20.5320	0.0331	0.9597	3.6012	yes
hk_L_7_Z_30_M_4	7	All	0.1	34.9864	0.0565	25.7374	0.0415	0.9377	8.8066	yes

Table A.5
Vertical Hydraulic Conductivity Local Sensitivity

Scenario	Layer	Zone	Multiplier	RMSE_ft	Normalized RMSE	MAE_ft	Normalized MAE	R2	Delta MAE_ft	Initial Converge
Baseline				23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	yes
vka_L_1_Z_1_M_1	1	1	10	34.6179	0.0559	22.4025	0.0362	0.9390	5.4717	yes
vka_L_1_Z_1_M_2	1	1	5	26.9893	0.0436	19.4137	0.0313	0.9629	2.4829	yes
vka_L_1_Z_1_M_3	1	1	0.2	23.4871	0.0379	17.0601	0.0275	0.9719	0.1293	yes
vka_L_1_Z_1_M_4	1	1	0.1	23.5476	0.0380	17.1110	0.0276	0.9718	0.1803	yes
vka_L_1_Z_2_M_1	1	2	10	23.2406	0.0375	16.9274	0.0273	0.9725	-0.0034	yes
vka_L_1_Z_2_M_2	1	2	5	23.2369	0.0375	16.9275	0.0273	0.9725	-0.0033	yes
vka_L_1_Z_2_M_3	1	2	0.2	23.2316	0.0375	17.0316	0.0275	0.9725	0.1009	No
vka_L_1_Z_2_M_4	1	2	0.1	23.4311	0.0378	17.2581	0.0278	0.9721	0.3273	yes
vka_L_1_Z_25_M_1	1	All	10	23.2406	0.0375	16.9274	0.0273	0.9725	-0.0034	yes
vka_L_1_Z_25_M_2	1	All	5	23.2369	0.0375	16.9275	0.0273	0.9725	-0.0033	yes
vka_L_1_Z_25_M_3	1	All	0.2	23.2316	0.0375	17.0316	0.0275	0.9725	0.1009	No
vka_L_1_Z_25_M_4	1	All	0.1	23.4311	0.0378	17.2581	0.0278	0.9721	0.3273	yes
vka_L_2_Z_26_M_1	2	All	10	23.6046	0.0381	17.5582	0.0283	0.9717	0.6274	yes
vka_L_2_Z_26_M_2	2	All	5	23.4005	0.0378	17.3478	0.0280	0.9721	0.4170	yes
vka_L_2_Z_26_M_3	2	All	0.2	26.3054	0.0424	19.2456	0.0311	0.9648	2.3148	No
vka_L_2_Z_26_M_4	2	All	0.1	31.7072	0.0512	24.3566	0.0393	0.9488	7.4258	yes
vka_L_2_Z_3_M_1	2	3	10	23.2248	0.0375	16.9501	0.0274	0.9726	0.0193	yes
vka_L_2_Z_3_M_2	2	3	5	23.2228	0.0375	16.9471	0.0273	0.9726	0.0163	yes
vka_L_2_Z_3_M_3	2	3	0.2	23.2113	0.0375	16.9092	0.0273	0.9726	-0.0216	yes
vka_L_2_Z_3_M_4	2	3	0.1	23.2165	0.0375	16.9030	0.0273	0.9726	-0.0278	yes
vka_L_2_Z_4_M_1	2	4	10	23.1177	0.0373	17.1281	0.0276	0.9728	0.1973	yes
vka_L_2_Z_4_M_2	2	4	5	23.0350	0.0372	17.0122	0.0275	0.9730	0.0814	yes
vka_L_2_Z_4_M_3	2	4	0.2	23.5803	0.0381	16.9138	0.0273	0.9717	-0.0170	No
vka_L_2_Z_4_M_4	2	4	0.1	23.7283	0.0383	16.9506	0.0274	0.9714	0.0199	yes
vka_L_2_Z_5_M_1	2	5	10	23.3906	0.0377	17.1280	0.0276	0.9722	0.1972	yes
vka_L_2_Z_5_M_2	2	5	5	23.3465	0.0377	17.0882	0.0276	0.9723	0.1574	yes
vka_L_2_Z_5_M_3	2	5	0.2	24.7783	0.0400	18.0140	0.0291	0.9688	1.0832	yes
vka_L_2_Z_5_M_4	2	5	0.1	28.2121	0.0455	20.9566	0.0338	0.9595	4.0259	yes
vka_L_3_Z_27_M_1	3	All	10	23.3151	0.0376	17.2916	0.0279	0.9723	0.3608	No
vka_L_3_Z_27_M_2	3	All	5	23.2512	0.0375	17.2033	0.0278	0.9725	0.2725	yes
vka_L_3_Z_27_M_3	3	All	0.2	26.5512	0.0428	19.2625	0.0311	0.9641	2.3318	yes

Table A.5
Vertical Hydraulic Conductivity Local Sensitivity

vka_L_3_Z_27_M_4	3	All	0.1	33.0835	0.0534	25.3030	0.0408	0.9443	8.3722	yes
vka_L_3_Z_6_M_1	3	6	10	23.1970	0.0374	16.9240	0.0273	0.9726	-0.0068	yes
vka_L_3_Z_6_M_2	3	6	5	23.1990	0.0374	16.9247	0.0273	0.9726	-0.0061	yes
vka_L_3_Z_6_M_3	3	6	0.2	23.2761	0.0376	16.9721	0.0274	0.9724	0.0413	yes
vka_L_3_Z_6_M_4	3	6	0.1	23.3429	0.0377	17.0254	0.0275	0.9723	0.0946	yes
vka_L_3_Z_7_M_1	3	7	10	23.1381	0.0373	16.9392	0.0273	0.9728	0.0084	yes
vka_L_3_Z_7_M_2	3	7	5	23.1451	0.0373	16.9357	0.0273	0.9727	0.0049	yes
vka_L_3_Z_7_M_3	3	7	0.2	23.6993	0.0382	17.1220	0.0276	0.9714	0.1913	yes
vka_L_3_Z_7_M_4	3	7	0.1	24.3682	0.0393	17.4926	0.0282	0.9698	0.5618	yes
vka_L_3_Z_8_M_1	3	8	10	23.0916	0.0373	17.0233	0.0275	0.9729	0.0925	yes
vka_L_3_Z_8_M_2	3	8	5	23.0928	0.0373	16.9915	0.0274	0.9729	0.0607	yes
vka_L_3_Z_8_M_3	3	8	0.2	23.7050	0.0383	17.0908	0.0276	0.9714	0.1600	yes
vka_L_3_Z_8_M_4	3	8	0.1	24.1073	0.0389	17.3195	0.0279	0.9704	0.3887	yes
vka_L_3_Z_9_M_1	3	9	10	23.3262	0.0376	17.0848	0.0276	0.9723	0.1540	yes
vka_L_3_Z_9_M_2	3	9	5	23.3010	0.0376	17.0554	0.0275	0.9724	0.1246	yes
vka_L_3_Z_9_M_3	3	9	0.2	23.5707	0.0380	17.1212	0.0276	0.9717	0.1904	yes
vka_L_3_Z_9_M_4	3	9	0.1	24.4665	0.0395	17.7889	0.0287	0.9695	0.8581	yes
vka_L_4_Z_10_M_1	4	10	10	23.0953	0.0373	16.8308	0.0272	0.9729	-0.1000	yes
vka_L_4_Z_10_M_2	4	10	5	23.1187	0.0373	16.8494	0.0272	0.9728	-0.0814	yes
vka_L_4_Z_10_M_3	4	10	0.2	23.5105	0.0379	17.1687	0.0277	0.9719	0.2379	yes
vka_L_4_Z_10_M_4	4	10	0.1	23.7862	0.0384	17.3352	0.0280	0.9712	0.4044	yes
vka_L_4_Z_11_M_1	4	11	10	26.5570	0.0429	19.9093	0.0321	0.9641	2.9785	yes
vka_L_4_Z_11_M_2	4	11	5	24.6719	0.0398	18.6335	0.0301	0.9690	1.7027	yes
vka_L_4_Z_11_M_3	4	11	0.2	30.9708	0.0500	22.9118	0.0370	0.9512	5.9810	yes
vka_L_4_Z_11_M_4	4	11	0.1	34.4599	0.0556	26.0980	0.0421	0.9396	9.1673	yes
vka_L_4_Z_12_M_1	4	12	10	23.2785	0.0376	17.0365	0.0275	0.9724	0.1057	yes
vka_L_4_Z_12_M_2	4	12	5	23.2666	0.0375	17.0179	0.0275	0.9725	0.0871	yes
vka_L_4_Z_12_M_3	4	12	0.2	23.3308	0.0376	16.8983	0.0273	0.9723	-0.0325	yes
vka_L_4_Z_12_M_4	4	12	0.1	23.8947	0.0386	17.2670	0.0279	0.9709	0.3362	No
vka_L_4_Z_13_M_1	4	13	10	26.5969	0.0429	20.5430	0.0332	0.9640	3.6122	yes
vka_L_4_Z_13_M_2	4	13	5	24.3734	0.0393	18.6359	0.0301	0.9698	1.7051	yes
vka_L_4_Z_13_M_3	4	13	0.2	24.3983	0.0394	17.5239	0.0283	0.9697	0.5932	yes
vka_L_4_Z_13_M_4	4	13	0.1	24.8965	0.0402	17.8283	0.0288	0.9685	0.8975	yes
vka_L_4_Z_28_M_1	4	All	10	32.7024	0.0528	25.3517	0.0409	0.9456	8.4209	yes

Table A.5
Vertical Hydraulic Conductivity Local Sensitivity

vka_L_4_Z_28_M_2	4	All	5	28.5258	0.0460	21.8114	0.0352	0.9586	4.8806	yes
vka_L_4_Z_28_M_3	4	All	0.2	37.9976	0.0613	29.8132	0.0481	0.9265	12.8824	yes
vka_L_4_Z_28_M_4	4	All	0.1	47.1202	0.0760	38.2103	0.0617	0.8870	21.2795	yes
vka_L_5_Z_14_M_1	5	14	10	23.0691	0.0372	16.8570	0.0272	0.9729	-0.0738	yes
vka_L_5_Z_14_M_2	5	14	5	23.0866	0.0373	16.8656	0.0272	0.9729	-0.0652	yes
vka_L_5_Z_14_M_3	5	14	0.2	23.6411	0.0381	17.1321	0.0276	0.9716	0.2013	yes
vka_L_5_Z_14_M_4	5	14	0.1	23.9680	0.0387	17.2930	0.0279	0.9708	0.3622	yes
vka_L_5_Z_15_M_1	5	15	10	23.2033	0.0374	16.9241	0.0273	0.9726	-0.0067	yes
vka_L_5_Z_15_M_2	5	15	5	23.2045	0.0374	16.9248	0.0273	0.9726	-0.0060	yes
vka_L_5_Z_15_M_3	5	15	0.2	23.2552	0.0375	16.9572	0.0274	0.9725	0.0264	yes
vka_L_5_Z_15_M_4	5	15	0.1	23.3068	0.0376	16.9885	0.0274	0.9724	0.0577	yes
vka_L_5_Z_16_M_1	5	16	10	23.2234	0.0375	16.9572	0.0274	0.9726	0.0264	yes
vka_L_5_Z_16_M_2	5	16	5	23.2217	0.0375	16.9531	0.0274	0.9726	0.0223	yes
vka_L_5_Z_16_M_3	5	16	0.2	23.1881	0.0374	16.8725	0.0272	0.9726	-0.0583	yes
vka_L_5_Z_16_M_4	5	16	0.1	23.1571	0.0374	16.8263	0.0272	0.9727	-0.1045	yes
vka_L_5_Z_17_M_1	5	17	10	23.2147	0.0375	16.9314	0.0273	0.9726	0.0006	yes
vka_L_5_Z_17_M_2	5	17	5	23.2146	0.0375	16.9313	0.0273	0.9726	0.0005	yes
vka_L_5_Z_17_M_3	5	17	0.2	23.2102	0.0375	16.9286	0.0273	0.9726	-0.0022	yes
vka_L_5_Z_17_M_4	5	17	0.1	23.2070	0.0374	16.9267	0.0273	0.9726	-0.0041	yes
vka_L_5_Z_18_M_1	5	18	10	23.4164	0.0378	17.1285	0.0276	0.9721	0.1977	yes
vka_L_5_Z_18_M_2	5	18	5	23.3760	0.0377	17.0911	0.0276	0.9722	0.1604	yes
vka_L_5_Z_18_M_3	5	18	0.2	23.9814	0.0387	17.4535	0.0282	0.9707	0.5227	yes
vka_L_5_Z_18_M_4	5	18	0.1	26.0097	0.0420	19.0806	0.0308	0.9656	2.1498	yes
vka_L_5_Z_29_M_1	5	All	10	23.3482	0.0377	17.1357	0.0277	0.9723	0.2049	No
vka_L_5_Z_29_M_2	5	All	5	23.3076	0.0376	17.0875	0.0276	0.9724	0.1567	yes
vka_L_5_Z_29_M_3	5	All	0.2	25.0370	0.0404	18.2474	0.0294	0.9681	1.3166	yes
vka_L_5_Z_29_M_4	5	All	0.1	28.6882	0.0463	21.5576	0.0348	0.9581	4.6268	yes
vka_L_6_Z_19_M_1	6	19	10	23.1644	0.0374	16.8919	0.0273	0.9727	-0.0389	yes
vka_L_6_Z_19_M_2	6	19	5	23.1730	0.0374	16.8982	0.0273	0.9727	-0.0326	yes
vka_L_6_Z_19_M_3	6	19	0.2	23.2839	0.0376	16.9917	0.0274	0.9724	0.0609	yes
vka_L_6_Z_19_M_4	6	19	0.1	23.3176	0.0376	17.0195	0.0275	0.9723	0.0888	yes
vka_L_6_Z_20_M_1	6	20	10	23.8107	0.0384	17.6424	0.0285	0.9712	0.7116	yes
vka_L_6_Z_20_M_2	6	20	5	23.6437	0.0382	17.4778	0.0282	0.9716	0.5470	yes
vka_L_6_Z_20_M_3	6	20	0.2	23.1584	0.0374	16.6079	0.0268	0.9727	-0.3229	yes

Table A.5

Vertical Hydraulic Conductivity Local Sensitivity

vka_L_6_Z_20_M_4	6	20	0.1	23.3322	0.0377	16.7010	0.0270	0.9723	-0.2298	yes
vka_L_6_Z_21_M_1	6	21	10	23.5328	0.0380	17.2603	0.0279	0.9718	0.3295	yes
vka_L_6_Z_21_M_2	6	21	5	23.3910	0.0377	17.1171	0.0276	0.9722	0.1863	yes
vka_L_6_Z_21_M_3	6	21	0.2	23.1617	0.0374	16.8772	0.0272	0.9727	-0.0536	yes
vka_L_6_Z_21_M_4	6	21	0.1	23.1536	0.0374	16.8692	0.0272	0.9727	-0.0616	yes
vka_L_6_Z_30_M_1	6	All	10	24.0155	0.0388	17.8298	0.0288	0.9707	0.8990	yes
vka_L_6_Z_30_M_2	6	All	5	23.7702	0.0384	17.5955	0.0284	0.9713	0.6647	yes
vka_L_6_Z_30_M_3	6	All	0.2	23.4630	0.0379	16.7962	0.0271	0.9720	-0.1346	yes
vka_L_6_Z_30_M_4	6	All	0.1	24.1132	0.0389	17.1789	0.0277	0.9704	0.2481	yes
vka_L_7_Z_22_M_1	7	22	10	23.2110	0.0375	16.9286	0.0273	0.9726	-0.0022	yes
vka_L_7_Z_22_M_2	7	22	5	23.2113	0.0375	16.9288	0.0273	0.9726	-0.0020	yes
vka_L_7_Z_22_M_3	7	22	0.2	23.2278	0.0375	16.9423	0.0273	0.9725	0.0115	yes
vka_L_7_Z_22_M_4	7	22	0.1	23.2462	0.0375	16.9573	0.0274	0.9725	0.0265	yes
vka_L_7_Z_23_M_1	7	23	10	23.2156	0.0375	16.9327	0.0273	0.9726	0.0019	yes
vka_L_7_Z_23_M_2	7	23	5	23.2154	0.0375	16.9325	0.0273	0.9726	0.0017	yes
vka_L_7_Z_23_M_3	7	23	0.2	23.2057	0.0374	16.9223	0.0273	0.9726	-0.0085	yes
vka_L_7_Z_23_M_4	7	23	0.1	23.1962	0.0374	16.9122	0.0273	0.9726	-0.0186	yes
vka_L_7_Z_24_M_1	7	24	10	23.2180	0.0375	16.9377	0.0273	0.9726	0.0069	yes
vka_L_7_Z_24_M_2	7	24	5	23.2175	0.0375	16.9369	0.0273	0.9726	0.0061	yes
vka_L_7_Z_24_M_3	7	24	0.2	23.1991	0.0374	16.9062	0.0273	0.9726	-0.0246	yes
vka_L_7_Z_24_M_4	7	24	0.1	23.1873	0.0374	16.8844	0.0272	0.9726	-0.0464	yes
vka_L_7_Z_31_M_1	7	All	10	23.2171	0.0375	16.9375	0.0273	0.9726	0.0067	yes
vka_L_7_Z_31_M_2	7	All	5	23.2167	0.0375	16.9367	0.0273	0.9726	0.0059	yes
vka_L_7_Z_31_M_3	7	All	0.2	23.2054	0.0374	16.9095	0.0273	0.9726	-0.0213	yes
vka_L_7_Z_31_M_4	7	All	0.1	23.2034	0.0374	16.8923	0.0273	0.9726	-0.0385	yes

Table A.6
Specific Storage Local Sensitivity

Scenario	Layer	Zone	Multiplier	RMSE_ft	Normalized RMSE	MAE_ft	Normalized MAE	R2	Delta MAE_ft	Initial Converge
Baseline				23.2137	0.0375	16.9308	0.0273	0.9726	0.0000	Yes
ss_L_2_Z_1_M_1	2	1	10	23.7162	0.0383	17.3510	0.0280	0.9714	0.4202	Yes
ss_L_2_Z_1_M_2	2	1	5	23.4327	0.0378	17.1074	0.0276	0.9721	0.1766	Yes
ss_L_2_Z_1_M_3	2	1	0.2	23.1717	0.0374	16.8974	0.0273	0.9727	-0.0333	Yes
ss_L_2_Z_1_M_4	2	1	0.1	23.1665	0.0374	16.8934	0.0273	0.9727	-0.0374	Yes
ss_L_2_Z_10_M_1	2	All	10	27.0344	0.0436	19.8101	0.0320	0.9628	2.8793	yes
ss_L_2_Z_10_M_2	2	All	5	24.6207	0.0397	18.0397	0.0291	0.9692	1.1089	yes
ss_L_2_Z_10_M_3	2	All	0.2	23.0361	0.0372	16.8105	0.0271	0.9730	-0.1203	yes
ss_L_2_Z_10_M_4	2	All	0.1	23.0166	0.0371	16.7980	0.0271	0.9730	-0.1328	yes
ss_L_2_Z_2_M_1	2	2	10	26.3199	0.0425	19.2661	0.0311	0.9648	2.3353	Yes
ss_L_2_Z_2_M_2	2	2	5	24.3370	0.0393	17.8224	0.0288	0.9699	0.8916	Yes
ss_L_2_Z_2_M_3	2	2	0.2	23.0744	0.0372	16.8411	0.0272	0.9729	-0.0897	Yes
ss_L_2_Z_2_M_4	2	2	0.1	23.0594	0.0372	16.8323	0.0272	0.9729	-0.0985	Yes
ss_L_3_Z_11_M_1	3	All	10	26.6085	0.0429	20.0473	0.0324	0.9640	3.1165	yes
ss_L_3_Z_11_M_2	3	All	5	24.5190	0.0396	18.2856	0.0295	0.9694	1.3548	yes
ss_L_3_Z_11_M_3	3	All	0.2	23.0826	0.0372	16.7950	0.0271	0.9729	-0.1358	yes
ss_L_3_Z_11_M_4	3	All	0.1	23.0718	0.0372	16.7834	0.0271	0.9729	-0.1474	yes
ss_L_3_Z_3_M_1	3	3	10	24.4162	0.0394	18.2024	0.0294	0.9697	1.2716	Yes
ss_L_3_Z_3_M_2	3	3	5	23.5663	0.0380	17.4125	0.0281	0.9717	0.4817	Yes
ss_L_3_Z_3_M_3	3	3	0.2	23.2149	0.0375	16.8840	0.0272	0.9726	-0.0468	Yes
ss_L_3_Z_3_M_4	3	3	0.1	23.2174	0.0375	16.8803	0.0272	0.9726	-0.0505	Yes
ss_L_3_Z_4_M_1	3	4	10	24.9009	0.0402	18.6919	0.0302	0.9685	1.7611	No
ss_L_3_Z_4_M_2	3	4	5	23.8510	0.0385	17.6288	0.0284	0.9711	0.6980	Yes
ss_L_3_Z_4_M_3	3	4	0.2	23.1332	0.0373	16.8634	0.0272	0.9728	-0.0674	Yes
ss_L_3_Z_4_M_4	3	4	0.1	23.1250	0.0373	16.8581	0.0272	0.9728	-0.0727	Yes
ss_L_3_Z_5_M_1	3	5	10	24.0382	0.0388	17.4439	0.0281	0.9706	0.5131	Yes
ss_L_3_Z_5_M_2	3	5	5	23.5463	0.0380	17.1397	0.0277	0.9718	0.2089	Yes
ss_L_3_Z_5_M_3	3	5	0.2	23.1555	0.0374	16.8960	0.0273	0.9727	-0.0348	Yes
ss_L_3_Z_5_M_4	3	5	0.1	23.1486	0.0374	16.8920	0.0273	0.9727	-0.0388	Yes
ss_L_5_Z_12_M_1	5	All	10	27.9559	0.0451	20.6454	0.0333	0.9602	3.7146	yes
ss_L_5_Z_12_M_2	5	All	5	25.5352	0.0412	19.2499	0.0311	0.9668	2.3191	yes

Table A.6
Specific Storage Local Sensitivity

ss_L_5_Z_12_M_3	5	All	0.2	22.9136	0.0370	16.3922	0.0265	0.9733	-0.5386	yes
ss_L_5_Z_12_M_4	5	All	0.1	22.9488	0.0370	16.3889	0.0264	0.9732	-0.5419	yes
ss_L_5_Z_6_M_1	5	6	10	22.6682	0.0366	16.6077	0.0268	0.9739	-0.3231	Yes
ss_L_5_Z_6_M_2	5	6	5	22.9456	0.0370	16.7808	0.0271	0.9732	-0.1500	Yes
ss_L_5_Z_6_M_3	5	6	0.2	23.2724	0.0376	16.9619	0.0274	0.9724	0.0311	Yes
ss_L_5_Z_6_M_4	5	6	0.1	23.2798	0.0376	16.9658	0.0274	0.9724	0.0350	Yes
ss_L_5_Z_7_M_1	5	7	10	28.0887	0.0453	20.8408	0.0336	0.9599	3.9100	Yes
ss_L_5_Z_7_M_2	5	7	5	25.6911	0.0415	19.3889	0.0313	0.9664	2.4581	Yes
ss_L_5_Z_7_M_3	5	7	0.2	22.8500	0.0369	16.3622	0.0264	0.9734	-0.5686	Yes
ss_L_5_Z_7_M_4	5	7	0.1	22.8767	0.0369	16.3561	0.0264	0.9734	-0.5747	Yes
ss_L_7_Z_13_M_1	7	All	10	22.1461	0.0357	15.9645	0.0258	0.9750	-0.9663	yes
ss_L_7_Z_13_M_2	7	All	5	21.8797	0.0353	16.0588	0.0259	0.9756	-0.8720	yes
ss_L_7_Z_13_M_3	7	All	0.2	24.3044	0.0392	17.8933	0.0289	0.9699	0.9625	yes
ss_L_7_Z_13_M_4	7	All	0.1	24.9813	0.0403	18.5837	0.0300	0.9682	1.6529	yes
ss_L_7_Z_8_M_1	7	8	10	21.8666	0.0353	15.9174	0.0257	0.9757	-1.0134	Yes
ss_L_7_Z_8_M_2	7	8	5	22.1987	0.0358	16.2293	0.0262	0.9749	-0.7015	Yes
ss_L_7_Z_8_M_3	7	8	0.2	24.1315	0.0389	17.8390	0.0288	0.9704	0.9082	Yes
ss_L_7_Z_8_M_4	7	8	0.1	24.7895	0.0400	18.4979	0.0299	0.9687	1.5671	Yes
ss_L_7_Z_9_M_1	7	9	10	21.9488	0.0354	16.0617	0.0259	0.9755	-0.8691	Yes
ss_L_7_Z_9_M_2	7	9	5	22.3103	0.0360	16.4983	0.0266	0.9747	-0.4325	Yes
ss_L_7_Z_9_M_3	7	9	0.2	23.3885	0.0377	16.8891	0.0273	0.9722	-0.0417	Yes
ss_L_7_Z_9_M_4	7	9	0.1	23.4160	0.0378	16.8865	0.0272	0.9721	-0.0442	Yes

Table A.7
Specific Yield Local Sensitivity

Scenario	Layer	Zone	Multiplier	RMSE_ft	Normalized RMSE	MAE_ft	Normalized MAE	R2	Delta MAE_ft	Initial Converge
Baseline				23.21375	0.03746026	16.93079	0.02732139	0.972581	0	Yes
sy_L_1_Z_1_M_1	1	1	1.5	23.24431	0.03750958	17.02737	0.02747723	0.972509	0.09657511	Yes
sy_L_1_Z_1_M_2	1	1	1.25	23.21261	0.03745843	16.94439	0.02734334	0.972584	0.01360174	Yes
sy_L_1_Z_1_M_3	1	1	0.75	23.35091	0.03768161	17.13716	0.02765441	0.972256	0.20637198	Yes
sy_L_1_Z_1_M_4	1	1	0.5	24.15719	0.03898269	17.75693	0.02865454	0.970307	0.82613936	Yes
sy_L_1_Z_2_M_1	1	2	1.5	23.33699	0.03765913	17.04494	0.02750559	0.972289	0.11414546	Yes
sy_L_1_Z_2_M_2	1	2	1.25	23.27182	0.03755397	16.98304	0.02740571	0.972444	0.05225152	Yes
sy_L_1_Z_2_M_3	1	2	0.75	23.16437	0.03738057	16.88902	0.02725398	0.972698	-0.04177221	Yes
sy_L_1_Z_2_M_4	1	2	0.5	23.12452	0.03731627	16.85813	0.02720413	0.972792	-0.07266644	Yes
sy_L_1_Z_3_M_1	1	3	1.5	23.56785	0.03803167	17.22875	0.02780221	0.971738	0.29796248	Yes
sy_L_1_Z_3_M_2	1	3	1.25	23.37418	0.03771914	17.06248	0.02753389	0.972201	0.1316855	Yes
sy_L_1_Z_3_M_3	1	3	0.75	23.09234	0.03726434	16.85067	0.02719209	0.972867	-0.08012658	Yes
sy_L_1_Z_3_M_4	1	3	0.5	23.01088	0.03713289	16.82272	0.02714699	0.973058	-0.10807649	Yes
sy_L_1_Z_9_M_1	1	All	1.5	23.73199	0.03829655	17.38128	0.02804835	0.971343	0.45048815	yes
sy_L_1_Z_9_M_2	1	All	1.25	23.44298	0.03783017	17.12626	0.02763682	0.972037	0.19546999	yes
sy_L_1_Z_9_M_3	1	All	0.75	23.05415	0.03720271	16.82261	0.02714681	0.972957	-0.10818493	yes
sy_L_1_Z_9_M_4	1	All	0.5	22.97197	0.03707011	16.81041	0.02712713	0.973149	-0.12038024	yes
sy_L_2_Z_10_M_1	2	All	1.5	24.20057	0.0390527	17.63805	0.02846269	0.970201	0.70725497	yes
sy_L_2_Z_10_M_2	2	All	1.25	23.66083	0.03818172	17.25609	0.02784633	0.971515	0.32530296	yes
sy_L_2_Z_10_M_3	2	All	0.75	22.88348	0.0369273	16.70147	0.02695133	0.973356	-0.22932458	yes
sy_L_2_Z_10_M_4	2	All	0.5	22.71474	0.03665501	16.60132	0.02678971	0.973747	-0.32947524	yes
sy_L_2_Z_4_M_1	2	4	1.5	23.45728	0.03785326	17.13385	0.02764907	0.972003	0.20306171	Yes
sy_L_2_Z_4_M_2	2	4	1.25	23.33071	0.037649	17.02612	0.02747523	0.972304	0.09533135	Yes
sy_L_2_Z_4_M_3	2	4	0.75	23.11149	0.03729524	16.84998	0.02719098	0.972822	-0.08081404	Yes
sy_L_2_Z_4_M_4	2	4	0.5	23.02817	0.0371608	16.78448	0.02708529	0.973018	-0.14630719	Yes
sy_L_2_Z_5_M_1	2	5	1.5	23.90824	0.03858097	17.41113	0.02809651	0.970916	0.48033665	Yes
sy_L_2_Z_5_M_2	2	5	1.25	23.53035	0.03797117	17.15206	0.02767845	0.971828	0.2212691	Yes
sy_L_2_Z_5_M_3	2	5	0.75	22.96724	0.03706247	16.77165	0.02706458	0.973161	-0.15914473	Yes
sy_L_2_Z_5_M_4	2	5	0.5	22.80572	0.03680182	16.67906	0.02691517	0.973537	-0.25173126	Yes
sy_L_3_Z_11_M_1	3	All	1.5	23.80748	0.03841837	17.65085	0.02848336	0.971161	0.72006003	yes
sy_L_3_Z_11_M_2	3	All	1.25	23.44221	0.03782892	17.25029	0.02783697	0.972039	0.31950234	yes
sy_L_3_Z_11_M_3	3	All	0.75	23.27242	0.03755493	16.84293	0.0271796	0.972443	-0.08786331	yes

Table A.7

Specific Yield Local Sensitivity

sy_L_3_Z_11_M_4	3	All	0.5	23.98352	0.03870244	17.17232	0.02771115	0.970733	0.24152795	yes
sy_L_3_Z_6_M_1	3	6	1.5	23.3657	0.03770547	17.08161	0.02756477	0.972221	0.15081811	Yes
sy_L_3_Z_6_M_2	3	6	1.25	23.25538	0.03752745	16.99701	0.02742825	0.972483	0.06622001	Yes
sy_L_3_Z_6_M_3	3	6	0.75	23.28922	0.03758205	16.90843	0.02728531	0.972403	-0.02236104	Yes
sy_L_3_Z_6_M_4	3	6	0.5	23.5987	0.03808146	16.98844	0.02741441	0.971664	0.05764427	Yes
sy_L_3_Z_7_M_1	3	7	1.5	23.50882	0.03793643	17.39077	0.02806365	0.97188	0.4599742	Yes
sy_L_3_Z_7_M_2	3	7	1.25	23.32634	0.03764194	17.12524	0.02763517	0.972315	0.19444344	Yes
sy_L_3_Z_7_M_3	3	7	0.75	23.22979	0.03748615	16.87225	0.02722692	0.972543	-0.05853994	Yes
sy_L_3_Z_7_M_4	3	7	0.5	23.51018	0.03793861	17.06265	0.02753417	0.971877	0.1318594	Yes
sy_L_3_Z_8_M_1	3	8	1.5	23.35048	0.0376809	17.016	0.02745889	0.972257	0.08520594	Yes
sy_L_3_Z_8_M_2	3	8	1.25	23.28026	0.03756758	16.97174	0.02738746	0.972424	0.04094333	Yes
sy_L_3_Z_8_M_3	3	8	0.75	23.1512	0.03735933	16.89336	0.02726099	0.972729	-0.03743197	Yes
sy_L_3_Z_8_M_4	3	8	0.5	23.09326	0.03726583	16.8599	0.02720699	0.972865	-0.07089416	Yes

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