Appendix E

Results of Modeled Groundwater Impacts from New Well Pumping

MONTGOMERY & ASSOCIATES
Water Resource Consultants

TECHNICAL MEMORANDUM

DATE: November 2, 2023 PROJECT #: 9050.2201

TO: Scotts Valley Water District

FROM: Georgina King, P.G., C.Hg.

PROJECT: New Production Well - Grace Way Well

SUBJECT: Results of Modeled Groundwater Impacts from Proposed Well Extraction

INTRODUCTION

Scotts Valley Water District (SVWD or District) is planning a new production well to provide redundancy to the District's water system which relies almost entirely on groundwater. A well site has been selected at the District-owned property at 5297 Scotts Valley Drive, Scotts Valley, California. To evaluate the impacts on groundwater from pumping at this location, the Santa Margarita Basin groundwater model (Model) was used to simulate additional drawdown caused by the proposed well on nearby production wells and monitoring wells.

MODEL SIMULATION ASSUMPTIONS

An existing basin model was updated and improved as part of the Groundwater Sustainability Plan (GSP) process. The 2022 Santa Margarita Basin GSP (M&A, 2022) Appendix 2E documents construction of the Model. The Model predictive simulation period is from Water Year (WY) 2019 through WY 2073 and includes hydrology reflecting climate change. The climate change conditions applied to the Model are a statistical sample of 4 global circulation models in the CMIP5 ensemble. During the predictive period, the overall effects of climate change are slightly lower average annual precipitation and a warming trend.

The baseline simulation used in the GSP is the modeled condition where no projects or management actions planned as part of GSP implementation are included. That baseline simulation was revised slightly to reflect the District's most recent plans to take Wells 11A and 11B out of production due to age and deteriorating well conditions. Future pumping from WY 2024 and after is based on an assumed annual 1% increase in demand using WY 2023 extraction as the starting point. Figure 1 shows the extraction distribution for District wells in the baseline simulation. Well locations are shown on Figure 2.

The proposed well will be screened in both the Lompico and Butano aquifers, as are existing Orchard, Well 3B, and the soon-to-be-constructed replacement of Well 3B.

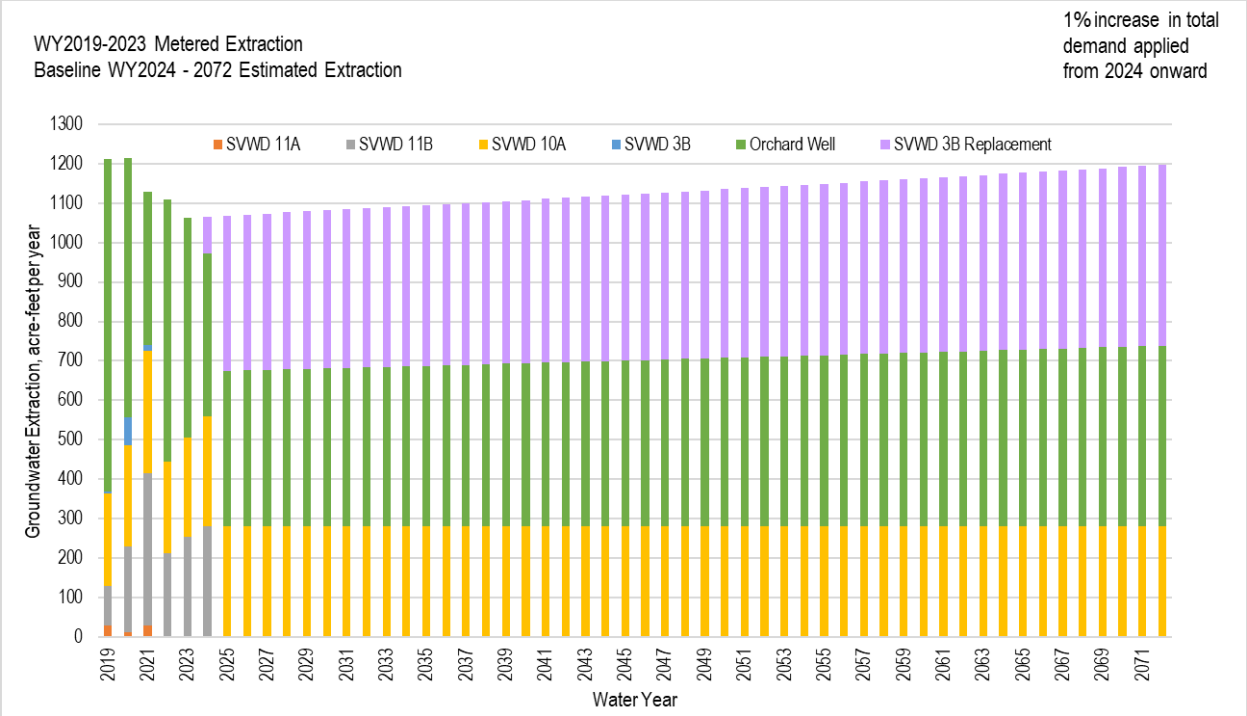

Figure 1. District Extraction Distribution for the Baseline (No Project) Scenario

The project scenario assumes the same annual District extraction as the baseline simulation but adds the proposed well in WY 2025. Extraction from the Orchard Well, Well 3B's replacement well, and the proposed well is divided equally after accounting for extraction from Well 10A.

For the predictive simulation, the assumed annual volume extracted by the proposed well starts in WY 2025 at 270 acre-feet per year (AFY) with a projected annual demand increase of 1%, until WY 2073 when 313 AFY is extracted (Figure 3). The Model has monthly time steps and so annual pumping is apportioned to each month based on historical monthly demand in the District. The average monthly pumping is shown on the lower chart of Figure 3. Figure 4 shows project scenario annual extraction for all District wells, including the proposed well.

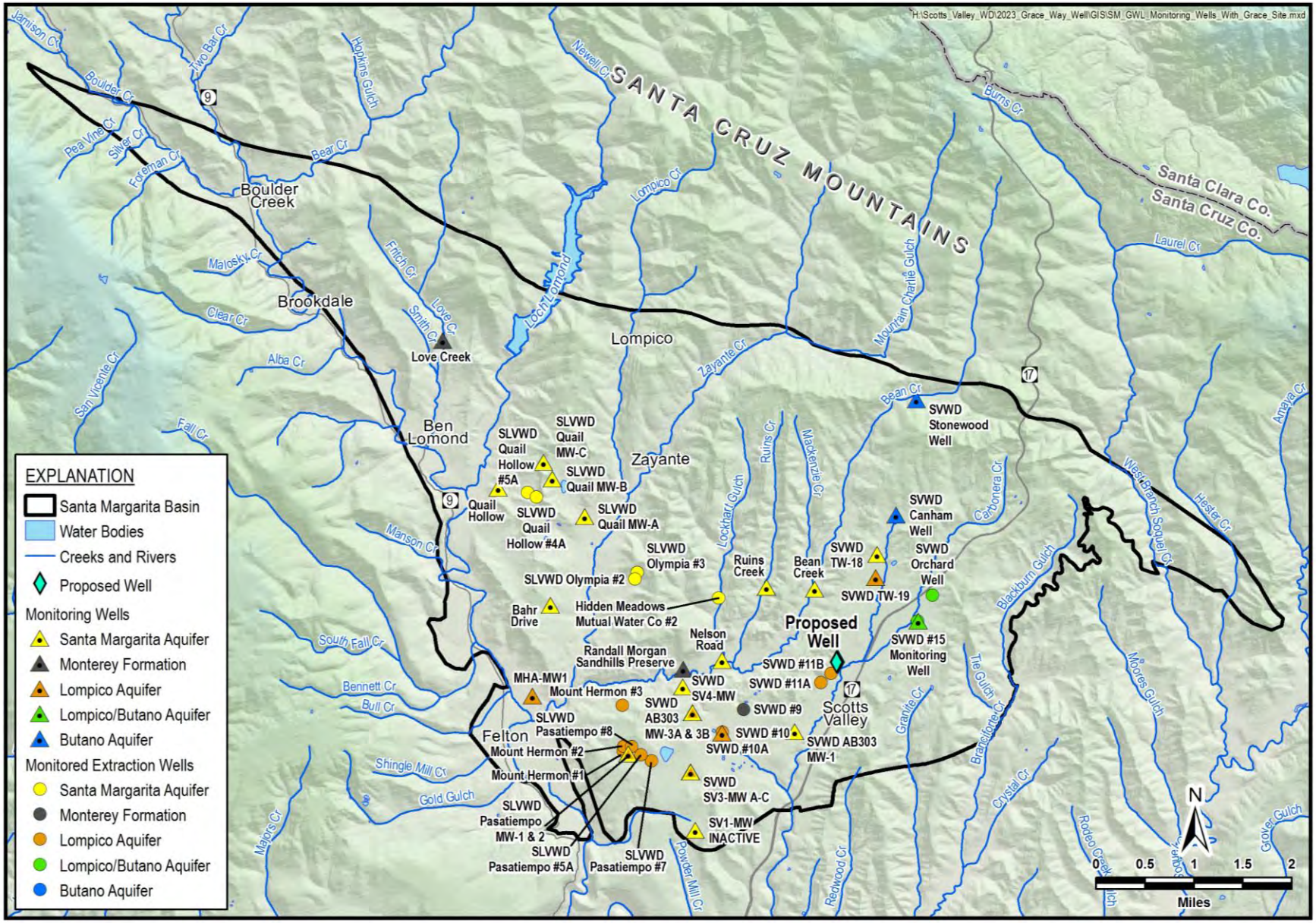

Figure 2. Santa Margarita Basin Well Locations

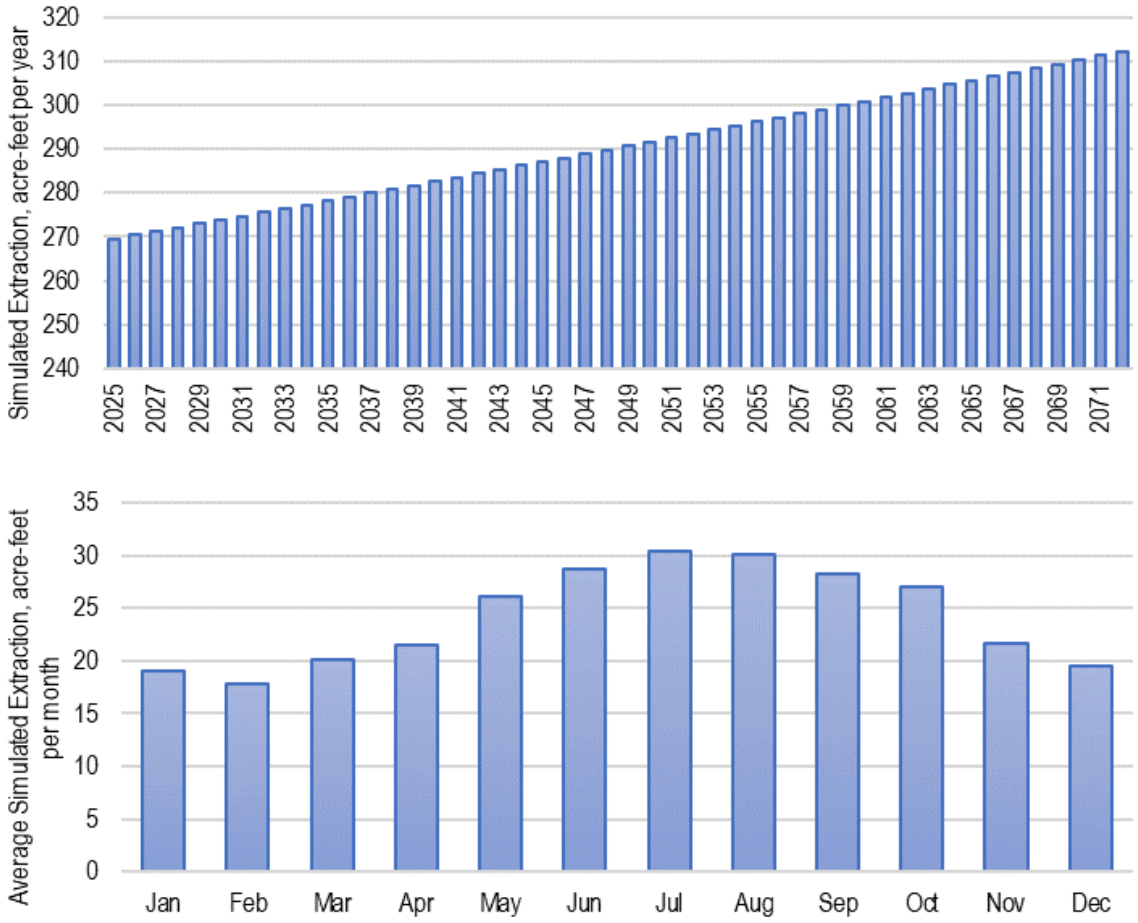

Figure 3. Assumed Simulated Extraction at Proposed Well

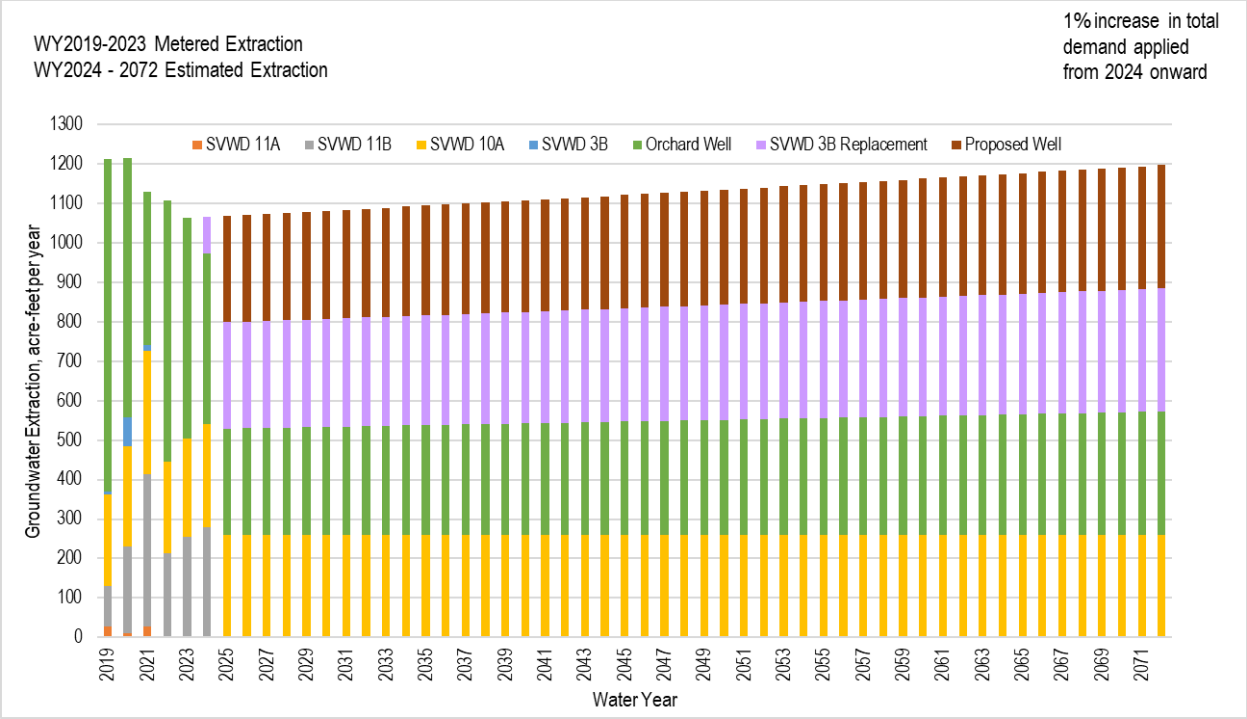

Figure 4. District Extraction Distribution Under the Project Scenario

SIMULATION RESULTS

Predicted change in groundwater levels at the proposed well and other nearby wells in response to pumping over the predictive simulation are shown on hydrographs for each well. Changes in groundwater levels at both monitoring and extraction wells are summarized in Table 1.

Table 1. Summary of Difference in Groundwater Levels between Project Scenario and Baseline

Wells	Distance from Proposed Well (feet)	Groundwater Level Difference between Project Scenario and Baseline (feet)		
		Maximum Lowering	Maximum Rise	Average Difference
Proposed Well	---	31	0	-22
Well 11B	750	18	0	-13
Well 11A	1,460	16	0	-11
Well 3B / 3B Replacement	4,900	0	89	+63
SVWD Monitor #15	4,900	0	43	+31
SVWD TW-19	4,900	0	1.5	+0.9
Orchard Well	6,200	0	99	+69
Well 10A (monitored by Well 10)	7,400	9	0	-6

Notes: positive average difference indicates groundwater levels rise and negative average difference indicates groundwater levels decline.
Wells in italics are Representative Monitoring Points in the GSP.

Under the project scenario, groundwater levels at the proposed well are lowered as much as 31 feet below baseline (no project conditions), with an average drawdown of 22 feet over the entire simulation. A hydrograph showing how groundwater elevations fluctuate over the simulation period are shown on Figure 5.

Even though there is localized groundwater level drawdown associated with pumping the proposed well, there will not be impacts to domestic wells because the area around the proposed well is within the District's service area and there are no domestic drinking water wells nearby. Simulated impacts to municipal water supply wells are described below.

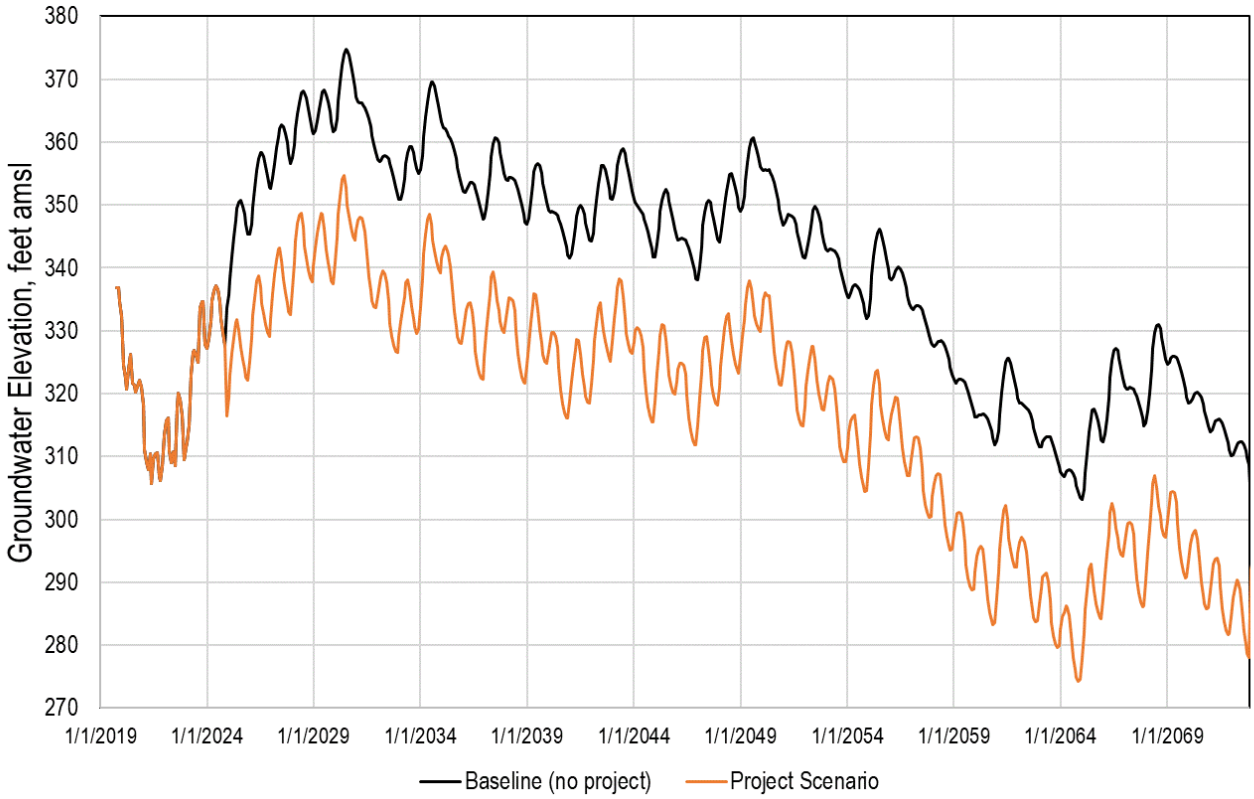

Figure 5. Simulated Groundwater Elevations at Proposed Well Screened in Lompico and Butano Aquifers

Groundwater elevations for the baseline and project scenario at nearby extraction wells and Representative Monitoring Points (RMPs) in the GSP screened in the Lompico or Butano aquifers are provided on Figure 6 through Figure 12. Wells screened in the Santa Margarita aquifer and Monterey Formation, which occur above the Lompico and Butano aquifers, have no response to pumping at the proposed well and therefore hydrographs are not included.

A well's groundwater level response from the proposed well pumping depends on how much water it extracts and on its proximity to the proposed well. Of all the District extraction wells, Well 10A is farthest away (1.4 miles or 7,400 feet) from the proposed well and Well 11B (0.14 miles or 750 feet away) is the closest. Distances of the wells from the proposed well are included in Table 1. By adding the proposed well as an additional supply source, groundwater levels in existing Lompico/Butano aquifer extraction wells (Well 3B/3B Replacement and Orchard Well) increase in the project scenario over the baseline because their pumping is reduced (Figure 8 and Figure 11). There is reduced pumping in these wells because their combined extraction can be spread between 3 wells once the proposed well comes online. Wells 11A and 11B will experience the greatest impact because they are closest to the proposed well, but since these wells are planned to be taken out of production, the potential operational impact to them is immaterial. Well 10A is simulated to have up to 9 feet of drawdown which is a minimal operational impact.

Wells that are RMPs have minimum thresholds and measurable objectives included on the hydrographs. With the proposed well pumping, groundwater elevations in RMPs remain above their respective minimum thresholds through 2042, when the SMGWA needs to achieve sustainability. After WY 2058, Well 11A and SVWD Monitor #15 project scenario groundwater elevations begin to fall below the minimum thresholds which is considered an undesirable result per the GSP. Although SVWD Monitor #15 levels fall below its minimum threshold, the project scenario improves groundwater levels in the existing area of Lompico/Butano aquifer extraction area (Well 3B/3B Replacement and Orchard Well) over baseline conditions. Projects and management actions are expected to be implemented well before 2042 to raise groundwater levels closer to measurable objectives, therefore providing the buffer needed to prevent groundwater levels falling below the minimum thresholds simulated in the project scenario hydrographs on Figure 7 and Figure 9. Since projects and management actions have not yet been developed, they were not included in the baseline scenario. SVWD TW-19, a RMP in the Butano aquifer, has a slight increase in levels due to the project allowing for less extraction at Well 3B/3B Replacement and Orchard Well (Figure 10). Project scenario groundwater levels in SVWD TW-19 do not fall below minimum thresholds over the model simulation.

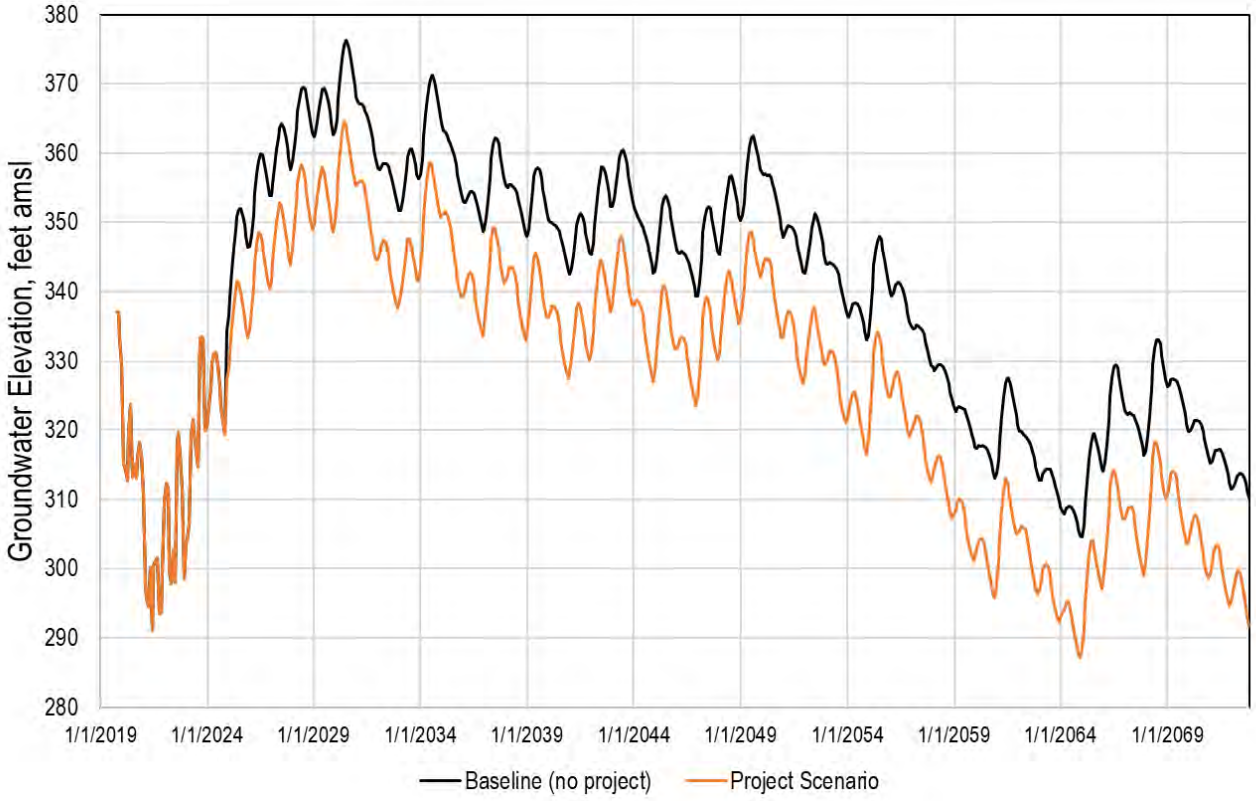

Figure 6. Simulated Groundwater Elevations at SVWD's Well 11B Screened in Lompico Aquifer

Figure 7. Simulated Groundwater Elevations at SVWD's Well 11A Screened in Lompico Aquifer

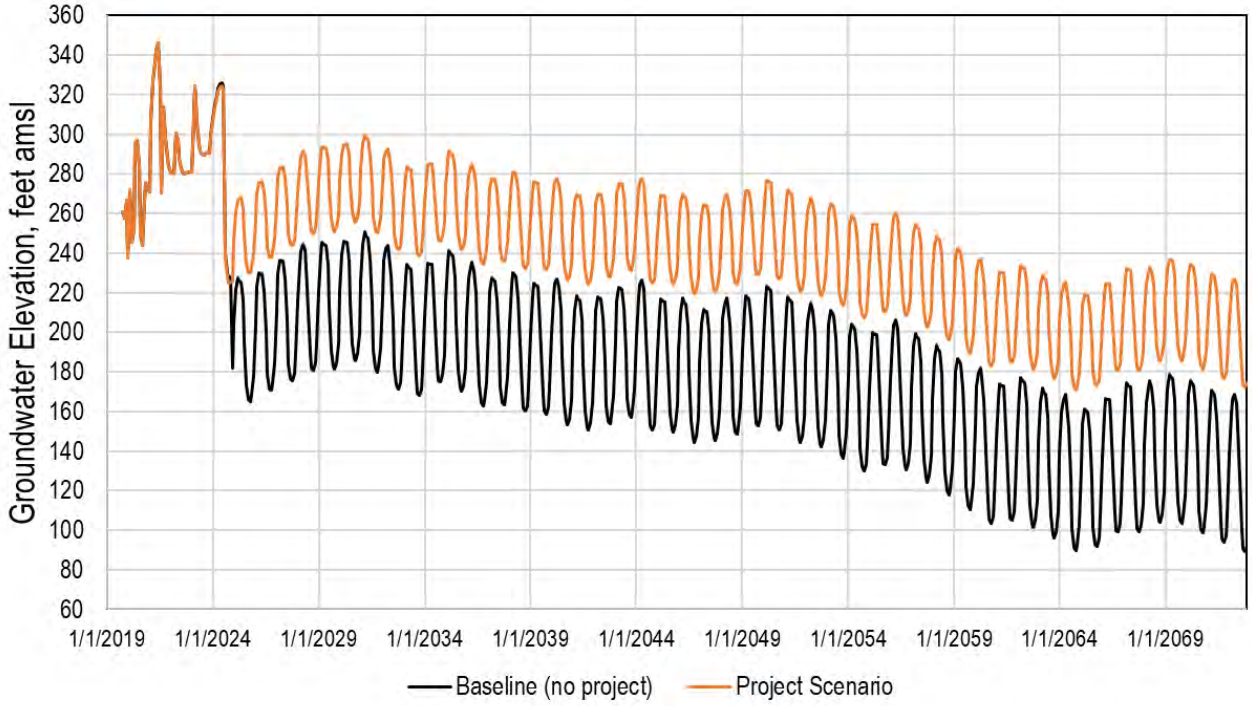

Figure 8. Simulated Groundwater Elevations at SVWD's Well 3B/3B Replacement Screened in Lompico and Butano Aquifers

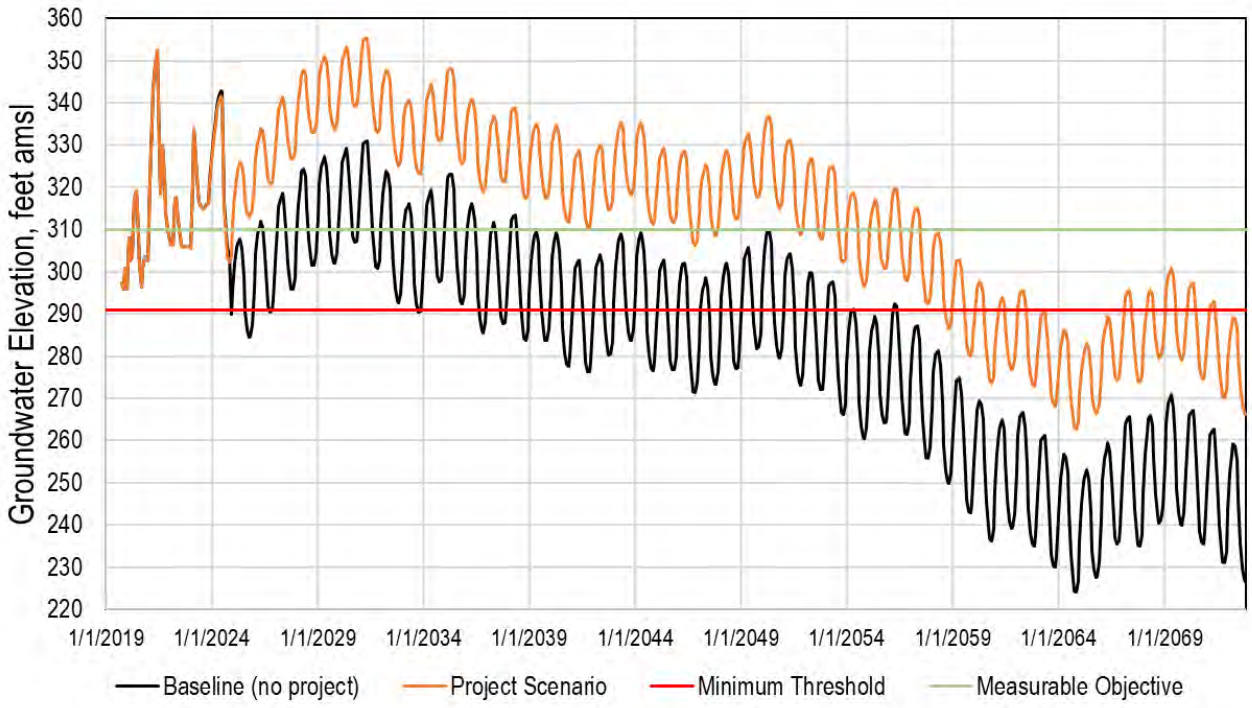

Figure 9. Simulated Groundwater Elevations at SVWD Monitor #15 Screened in Lompico and Butano Aquifers

Figure 10. Simulated Groundwater Elevations at SVWD TW-19 Screened in Butano Aquifer

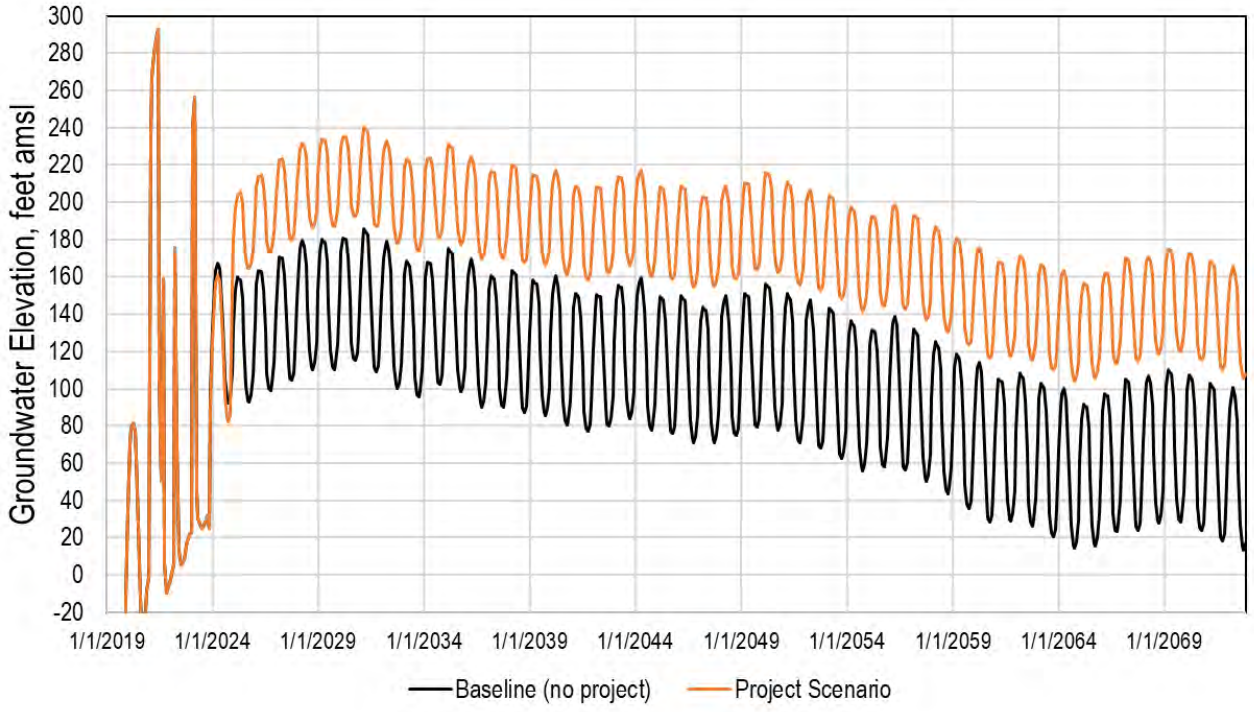

Figure 11. Simulated Groundwater Elevations at SVWD's Orchard Well Screened in Lompico and Butano Aquifers

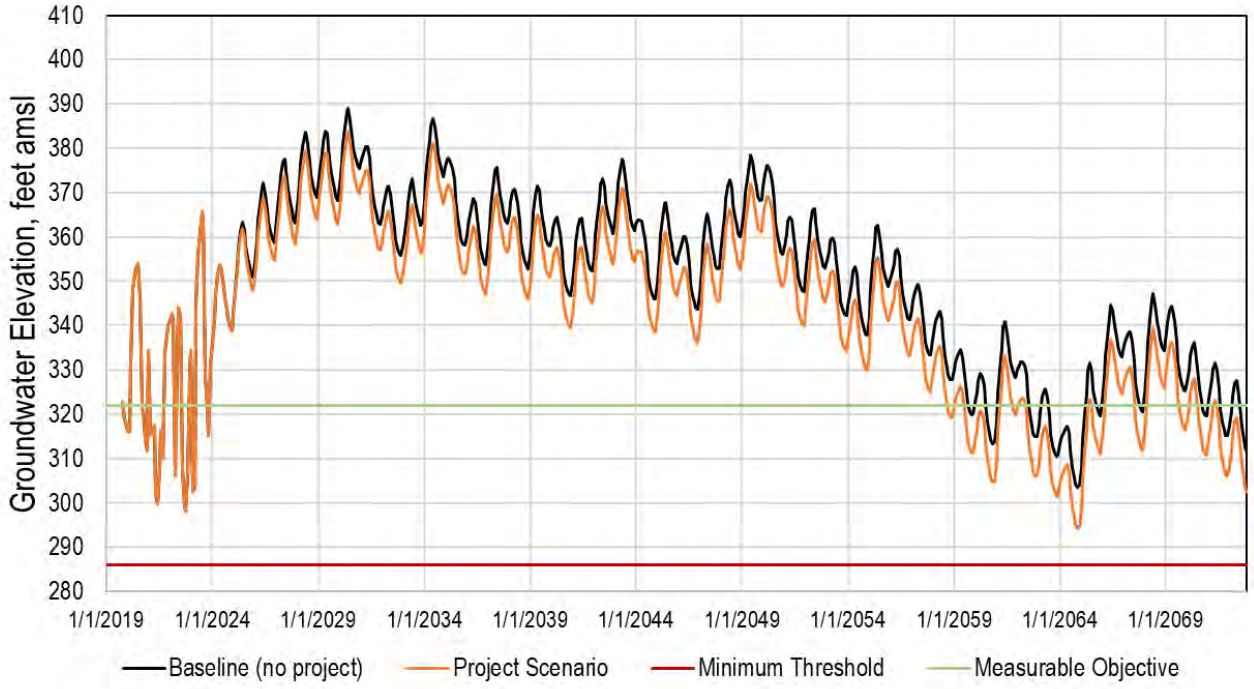

Figure 12. Simulated Groundwater Elevations at SVWD's Well 10/10A Screened in Lompico Aquifer

CONCLUSIONS

Pumping 270 to 313 AFY (88 to 102 million gallon per year) at the proposed well will cause groundwater levels in the immediate vicinity of the proposed well to fall as much as 31 feet below no project levels. North of the proposed well, Well 3B/3B Replacement, SVWD Monitor #15, SVWD TW-19, and Orchard Well experience increased groundwater levels because the proposed well allows pumping in existing District water supply wells to be reduced. South of the proposed well, Well 11A, Well 11B, and Well 10 may experience between 9 to 18 feet of groundwater level decline. The project scenario demonstrates that the proposed well allows pumping to be redistributed, which improves groundwater levels in existing Lompico/Butano aquifer wells and minimally causes drawdown in Lompico aquifer wells to the south.

When projects and management actions are implemented to reduce native groundwater extraction, the proposed well should not cause groundwater levels at RMPs to fall below minimum thresholds.

REFERENCES

Montgomery & Associates [M&A]. 2022. Santa Margarita Basin Groundwater Sustainability Plan, prepared for the Santa Margarita Groundwater Agency, January.