

## Technical Memorandum

**TO:** Mr. Alan Day, General Manager  
Brazos Valley Groundwater Conservation District

**FROM:** Christopher Drabek, P.G., and James Beach, P.G.

**SUBJECT:** Review of the Fazzino Investments LP Simsboro Aquifer Evaluation Report

**DATE:** September 1, 2023

### Introduction

On behalf of the Brazos Valley Groundwater Conservation District (BVGCD, District), Advanced Groundwater Solutions, LLC (AGS) has reviewed the Aquifer Evaluation Report (AER) prepared by Thornhill Group, Inc. (TGI) in support of a permit application for Fazzino Investments LP (Fazzino) for six proposed new wells to be completed in the Simsboro Aquifer with a withdrawal amount of 10,348 acre-feet per year (ac-ft/yr). The proposed wells are located on three tracts of property with Property 1 located about 8.8 miles to the northwest of the City of Hearne, Property 2 located about 4 miles to the west of the City of Hearne and Property 3 located about 4 miles to the south of the City of Hearne. The locations of the three Fazzino properties and the proposed Fazzino wells are shown on Figure 1. The AER dated July 25, 2023 was submitted to BVGCD on July 26, 2023. The AER was submitted to address BVGCD Rule 8.4(b)(7)(B) for wells capable of producing 800 or more acre-feet per year and discusses the potential impacts of groundwater production from the Simsboro Aquifer of the proposed new wells in the west part of Robertson County.

AGS has evaluated the hydrogeological conditions, mapping of BVGCD permitted and registered Simsboro wells within one mile of the proposed Fazzino wells and the water level drawdown estimates developed using the Texas Water Development Board (TWDB) Groundwater Availability Model (GAM) and analytical tools presented in the submitted aquifer evaluation report.

### Proposed Fazzino Investments LP Wells

The six proposed Fazzino wells have maximum production rates that range from 900 to 2,100 gallons per minute (gpm) and an annual permit allocation of 10,348 acre-feet. Table 1 below provides a summary of the maximum production rate in gpm and the annual permitted allocation in acre-feet for each of the proposed Fazzino wells.

Well	Maximum Production Rate (gpm)	Annual Permit Allocation (acre-feet)
1	1,000	1,290
2	1,000	1,290
3	2,100	2,710
4	2,100	2,710
5	920	1,187
6	900	1,161

Table 1. Proposed Fazzino Investments LP Well Maximum Production Rate and Annual Permit Allocation

The locations of the six proposed Fazzino wells are shown below on Figure 1.

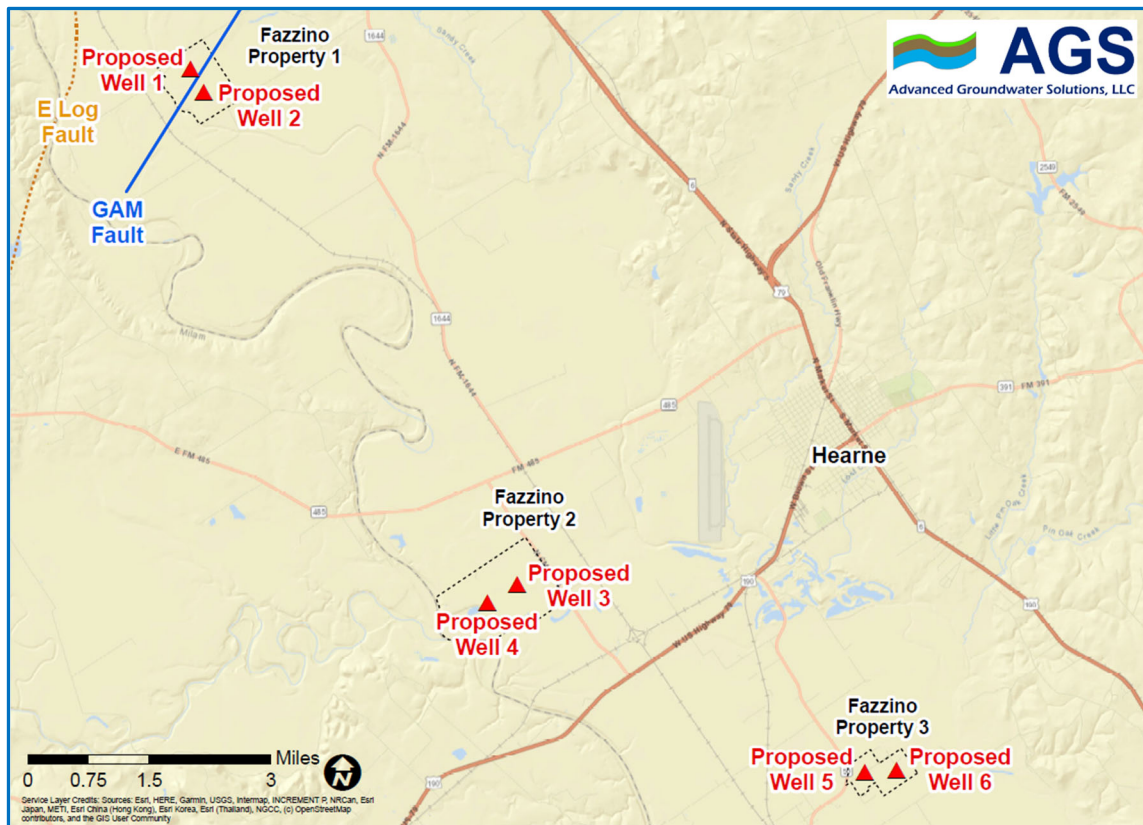


Figure 1. Proposed Fazzino Investments LP Well Location Map

## Hydrogeologic Conditions

### Rule 8.4(b)(7)(B)(1)

AGS has evaluated the hydrogeological conditions presented in the AER and generally agrees with the information presented in this section.

The AER estimates the top of the Simsboro Aquifer to occur at depths between 360 and 390 feet below ground level (bgl) and the base of the Simsboro Aquifer to occur at depths between 820 and 840 feet bgl in the vicinity of the proposed Fazzino wells. TGI estimates the Simsboro Aquifer to occur in the approximate depth intervals of about 970 to 1,480 feet bgl and about 1,355 to 1,965 feet bgl at Fazzino Properties 2 and 3, respectively.

AGS reviewed available electric log data in the vicinity of the proposed Fazzino wells and estimates that the top of the Simsboro Aquifer to occur at depth of about 300 feet bgl and the base of the Simsboro Aquifer to occur a depth of about 785 feet near the Fazzino Property 1. AGS estimates the Simsboro Aquifer to occur in the approximate depth intervals of about 975 to 1,560 feet bgl and about 1,440 to 2,020 feet bgl at Fazzino Properties 2 and 3, respectively.

Site specific information will be available once the test holes are drilled and logged for each of the proposed Fazzino wells.

TGI mentions faulting that has been inferred by TWDB/BEG mapping about 5 to 7 miles north of Fazzino Property 1 and that if present could trend closer to Property 1. The TWDB Central Portion of the Sparta, Queen City and Carrizo-Wilcox Aquifers GAM includes a fault that is position between proposed Fazzino Wells 1 and 2. There are limited electric logs in the immediate vicinity of proposed Wells 1 and 2, but a better understanding of the faulting will be gained as additional wells are drilled in logged in this area. AGS and Ground Water Consultants have mapped a fault using electric logs that is to the west of Proposed Wells 1 and 2. The location of these faults is shown on Figure 1 of this memorandum.

## Simsboro Aquifer Wells Within 1-mile of the Proposed Fazzino

### Investments LP Wells

#### Rule 8.4(b)(7)(B)(2)

Table 1 in the TGI AER provides information on the BVGCD permitted or registered Simsboro wells within one mile of the proposed Fazzino wells and locations of the permitted or registered wells are shown on Figure 6 and Figures 6a through 6f in the TGI AER. The table does not include information on the well screened interval.

AGS reviewed permitted and registered well data available from BVGCD and identified four additional BVGCD permitted wells that are located within 1-mile of the proposed Fazzino wells that were not included in Table 1 of the Fazzino AER. Table 2 below provides a summary of the additional permitted wells identified by AGS.

Permit	Permit Holder	Well
BVDO-0343	Corpora Farms	3
BVR-4236	Private	Domestic
BVR-4363	Private	Domestic 2
BVR-1861	Privarte	Stock

Table 2. Addition BVGCD Permitted Wells Identified by AGS Within 1-mile of the Proposed Fazzino Investments LP Wells

## Interference Drawdown Estimates

### Rule 8.4(b)(7)(B)(3)

BVGCD Rule 8.4(b)(7)(B)(3) requires an estimate of water level drawdown caused by the well(s) pumping at the permitted rate for 1 year and 10 years at a distance of up to five miles from the well(s) using Version 3.02 of the Central Portion of the Sparta, Queen City and Carrizo-Wilcox Aquifers GAM (INTERA Incorporated and others, 2020). An estimate of the drawdown at locations of existing registered and permitted wells in the BVGCD database that are located within one mile and screen the same aquifer as the well(s) is required to be developed using an analytical tool.

Appropriate analytical models are generally used to provide estimates of pumping effects at or near the well(s) over shorter time horizons. Regional numerical models like the TWDB GAMs are generally used to account for regional variability in the aquifer such as changes in transmissivity and faulting as well as recharge, leakage between aquifers, stream-aquifer interaction, other pumping, and other factors impacting water levels. Appropriate numerical models can provide more reliable estimates of pumping effects on a more regional scale and over longer time horizons.

### Groundwater Availability Model Simulation

TGI used the TWDB Central Portion of the Sparta, Queen City and Carrizo-Wilcox Aquifer GAM to estimate drawdown that results from continuously pumping the proposed Fazzino wells at a combined rate of 10,348 ac-ft/yr for 1 year and 10 years. A copy of the TGI 1-year and 10-year GAM simulated interference drawdown illustrations from the AER (TGI Figures 8 and 9) are attached to this memorandum. Tables 1 and 2 in the TGI AER shows GAM simulated 1-year and 10-year drawdown estimates at most BVGCD permitted and registered Simsboro wells within a 1-mile and 5-mile radius of the proposed Fazzino wells. The TGI report did not discuss the GAM simulation methodology, but the TGI GAM model results appear to be reasonable based on AGS simulation verification runs.

In the AGS verification runs, two GAM simulations were completed with the first simulation (the baseline run) using the unmodified Groundwater Management Area (GMA) 12 “S-19” Desired Future Condition (DFC) run and with the second simulation (the modified run) being identical to the baseline except that the requested 10,348 ac-ft/yr of pumping was included in the MODFLOW

WEL file. The simulated water levels from each simulation were compared by subtracting the simulated water level elevations of the baseline run from the modified run. This comparison isolates the pumping effects of the requested pumping. GMA 12 “S-19” includes additional regional pumping, which gradually increases through time. GMA 12 “S-19” was approved in 2021 and does not include all of the pumping from the Simsboro Aquifer that has been permitted by BVGCD in the area in the past year.

Table 3 below provides a summary of the AGS GAM simulated drawdown estimates at 1-Mile and 5-Miles from each pair of the proposed Fazzino wells after pumping 10,348 ac-ft/yr for 1-year and 10 years.

Fazzino Property	AGS GAM Simulated Drawdown After 1-Year of Pumping at 1-mile (feet)	AGS GAM Simulated Drawdown After 1-Year of Pumping at 5-miles (feet)	AGS GAM Simulated Drawdown After 10-Years of Pumping at 1-mile (feet)	AGS GAM Simulated Drawdown After 10-Years of Pumping at 5-miles (feet)
1	12-18	<10-15	16-24	<10-22
2	32-35	<10-26	36-40	12-33
3	21-26	17-38	29-34	20-42

Table 3. AGS GAM Simulated Drawdown After Proposed Fazzino Investments LP Pumping of 10,348 ac-ft/yr for 1-Year and 10-Years

The AGS GAM simulations show slightly higher simulated drawdown than the TGI simulations, however the drawdown estimates in each simulation are generally within about 10 feet or less. AGS is showing higher drawdown estimates related to Fazzino Properties 2 and 3 in Table 3 above than what are shown in the TGI table on Page 7 of the AER. AGS has reviewed the combined effects of the proposed Fazzino pumping at distances of 1- and 5-miles from each pair of wells on the individual Fazzino properties.

The GAM estimated drawdown contours appear to be influenced by faults included in the GAM, which are in the same general area as faults that have been mapped by GWC and AGS using local geophysical logs and other hydrogeologic data. The influence of the GAM faults is more noticeable near Fazzino Property 1.

AGS has reviewed this AER based on the hydrogeologic information available today, the information provided by the applicant, and the models and tools available at this time. New scientific or hydrogeologic information or updated models may change the findings of this review.

### Analytical Model Simulation

TGI used an analytical model based on the Theis non-equilibrium equation to estimate theoretical potentiometric head declines at and surrounding the proposed wells. The TGI AER did not discuss the input parameters used in the analytical modeling.

AGS simulated the drawdown at the pumping wells using the Theis analytical model and estimated the drawdown at one foot from the well. A transmissivity of 65,320 gallons per day per foot (gpd/ft) and a storage value of 0.000171 were used in the AGS analytical simulations with each proposed Fazzino well pumping its average annual production rate. The transmissivity and storage values used in the AGS analytical simulations represent an average of the Simsboro Aquifer parameters in the GAM at the proposed Fazzino well locations.

AGS was able to generally recreate the 1-year simulation results of the TGI analytical modeling. The TGI 10-year analytical simulation appears to underestimate the drawdown compared to simulations performed by AGS using the aquifer parameters as described above. Simulated drawdown could be less if TGI used a larger storage value in the 10-year simulation. Figure 2 below shows the estimated AGS analytical modeling drawdown contours that result from pumping 10,348 ac-ft/yr for 10-years.

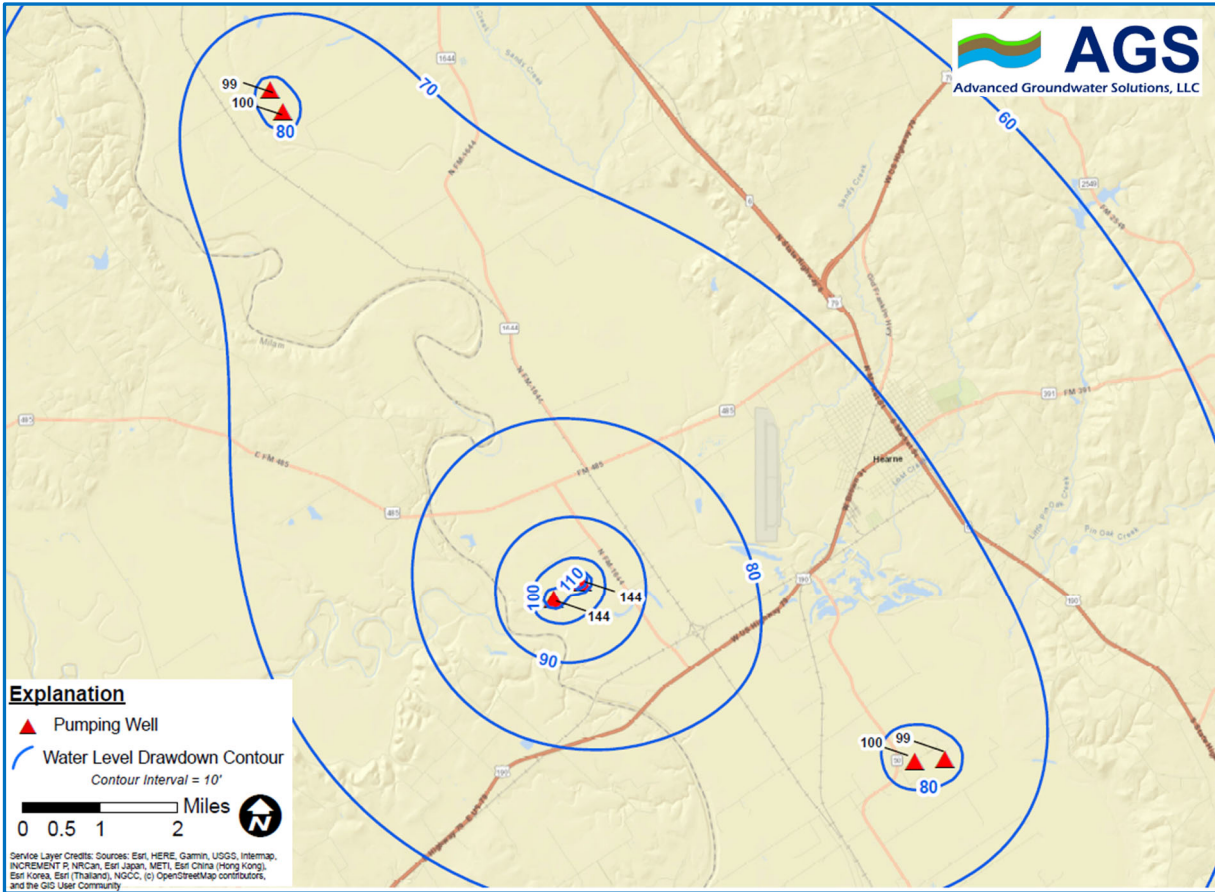


Figure 2. AGS This Analytical Simulated Drawdown After Proposed Fazzino Investments LP Pumping of 10,348 ac-ft/yr for 10-Years

Table 4 below provides a summary of the AGS simulated drawdown estimates at 1-foot from each of the proposed Fazzino wells after pumping 10,348 ac-ft/yr for 1-year and 10 years.

Well	AGS Simulated Drawdown After 1-Year of Pumping (feet)	AGS Simulated Drawdown After 10-Years of Pumping (feet)
1	73	99
2	74	100
3	118	144
4	118	144
5	74	100
6	73	99

Table 4. AGS This Analytical Simulated Drawdown at the Proposed Fazzino Investments LP Wells After 1-Year and 10-Years of Pumping 10,348 ac-ft/yr

### Estimated Long-term impacts at the Proposed Fazzino Investments LP Wells based on the GMA 12 2021 DFC Run

As a way of evaluating potential long-term estimated water level decline at the proposed Fazzino wells, AGS plotted the simulated water level decline at each well location based on the 2021 GMA 12 DFC/Modeled Available Groundwater (MAG) projections for the Simsboro Aquifer as shown on the attached Figures 3 through 8. The water level projections shown in the attached figures are from the TWDB approved DFC/MAG run known as GMA 12 “S-19”, but do not include the local impacts from the proposed Fazzino wells included in the AER, nor do they include all of the pumping from the Simsboro Aquifer that has been permitted in the area in the past year. The DFC run includes pumping estimates from the Groundwater Conservation Districts in GMA 12 as of about December 2021 that yield DFCs so that the TWDB can estimate the MAG. The detailed assumptions for the DFC simulation can be found in the GMA 12 Explanatory Report (Daniel B. Stephens & Associates and others, 2022) and documentation of the TWDB MAG run can be found in GAM Run 21-017 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 12 (Shi and Harding, 2022).

The graphs illustrate the relationship between the land surface, estimated static water level through time and the estimated base of the Simsboro Aquifer based on review of available local electric logs near the locations of the proposed Fazzino wells.

Water levels available for a domestic well (BVGCD BVR-1283) are shown on Figure 3. The well screen sands of the Simsboro Aquifer in the depth interval of about 450 to 460 feet below land



surface. BVR-1283 is located about 1 mile southwest of proposed Fazzino Well 1. Water levels available from a private domestic well (BVGCD BVR-1506) are shown on Figure 5. The well screen sands of the Simsboro Aquifer and the total depth of the well is 1,250 feet bls. BVR-1506 is located about 1.3 miles north-northwest of proposed Fazzino Well 3.

Available drawdown in wells in the Simsboro Aquifer will decline over time based on the DFC simulation. In other words, the line with green dots does not include the impact of the proposed Fazzino wells. Although not evaluated or discussed in detail herein, these levels of water level decline in wells and artesian head decline in the aquifer will have some impact on vertical leakage, intercepted discharge, reduction in confined and unconfined storage, and potential flow directions in the aquifer. Pumping by the proposed wells will have some of the same type effects on the aquifer.

## Conclusions

The submitted AER generally addresses the requirements defined by BVGCD Rule 8.4(b)(7)(B) for wells capable of producing 800 or more acre-feet per year.

The TGI GAM simulations look reasonable and AGS was able to recreate the TGI simulation results. There are minor differences in the simulated drawdown estimated by TGI and AGS near the proposed Fazzino well locations, but these can most likely be attributed to differences in the approach to the GAM simulation(s).

AGS was able to generally recreate the TGI analytical simulation results of pumping the requested permitted amount of 10,348 ac-ft/yr for 1-year from the proposed Fazzino wells. The 10-year analytical simulation results in the TGI AER appear to underestimate the drawdown compared to simulations performed by AGS using the same aquifer parameters used in the 1-year simulations. The TGI simulated drawdown could be less if a larger storage value was used in the 10-year simulation.

AGS is documenting the differences but does not consider them to be major for the purposes of this report.

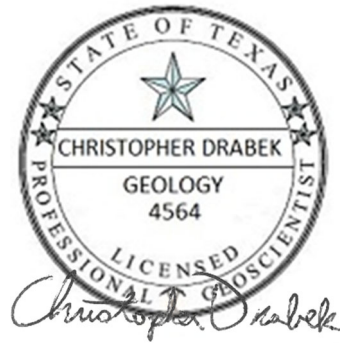
## References

Daniel B. Stephens & Associates, INTERA Incorporated, and Ground Water Consultants, LLC, 2022, Desired Future Condition Explanatory Report for Groundwater Management Area 12, 859 p.

INTERA Incorporated, D.B. Stephens & Associates, and Ground Water Consultants, LLC, 2020, GMA 12 Update to the Groundwater Availability Model for the Central Portion of the Sparta, Queen City, Carrizo-Wilcox Aquifers: Update to Improve Representation of the Transmissive Properties of the Simsboro Aquifer in the Vicinity of the Vista Ridge Well Field, 30 p.

Shi, J. and Harding, J., 2022, GAM RUN 21-017 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 12, 36 p.

## Geoscientist's Seal:



The seal appearing on this document was authorized by Christopher Drabek, P.G. 4564 on 9/1/2023.  
Advanced Groundwater Solutions, LLC (TBPG Firm Registration No. 50639)

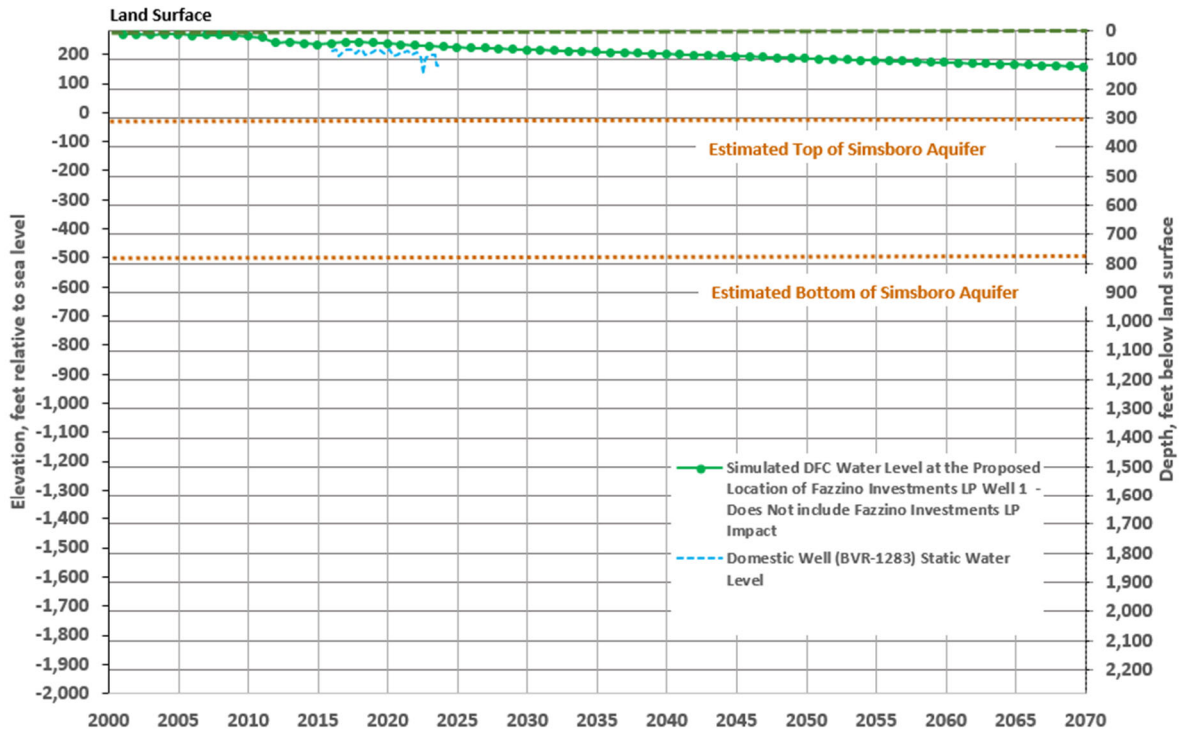


Figure 3. Projected DFC Water Level Change at Proposed Fazzino Investments LP Well 1

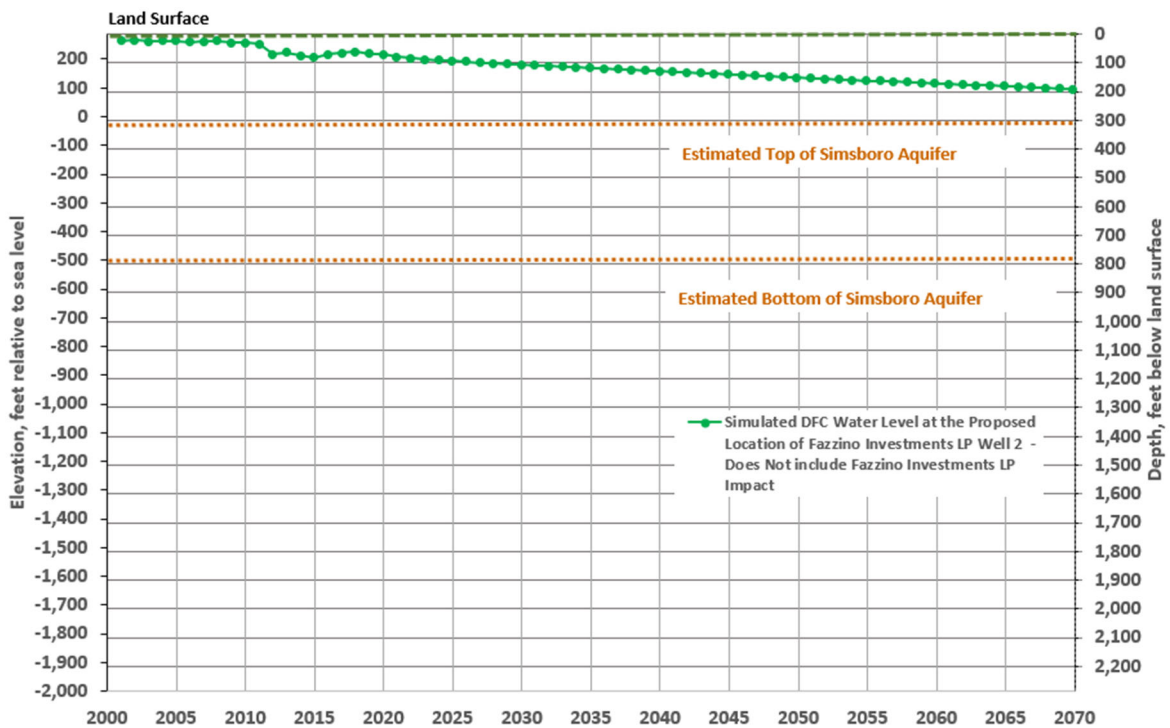


Figure 4. Projected DFC Water Level Change at Proposed Fazzino Investments LP Well 2

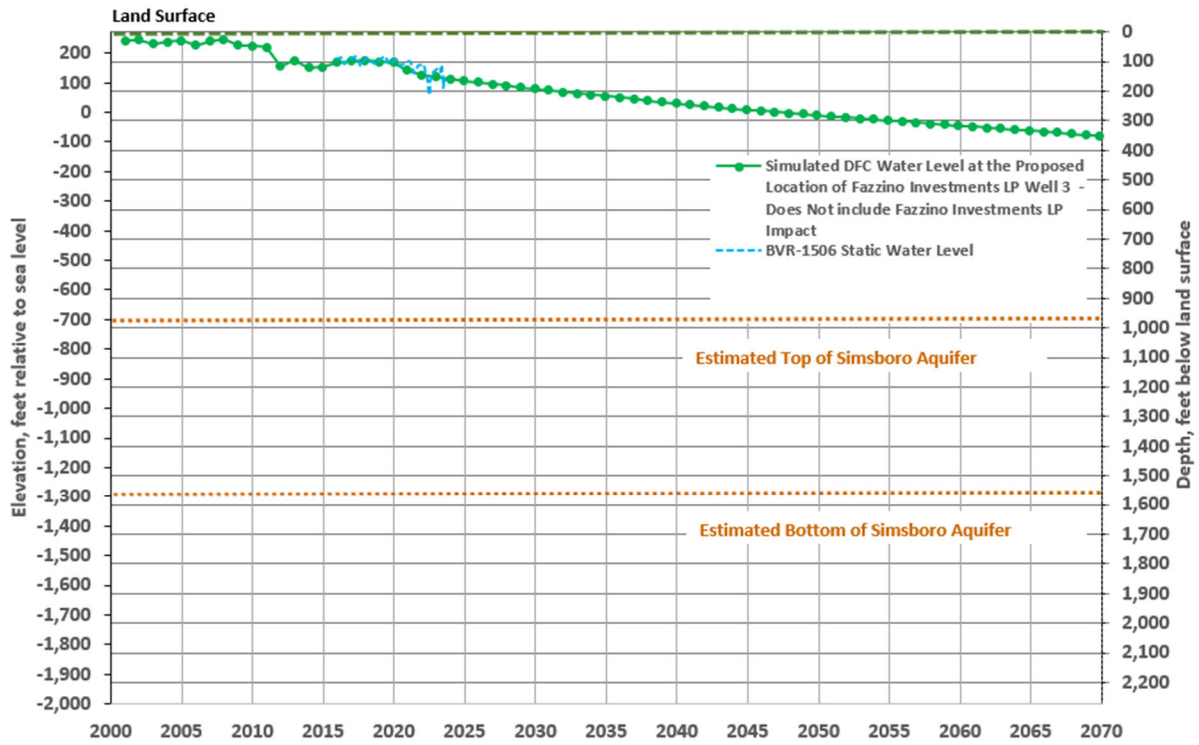


Figure 5. Projected DFC Water Level Change at Proposed Fazzino Investments LP Well 3

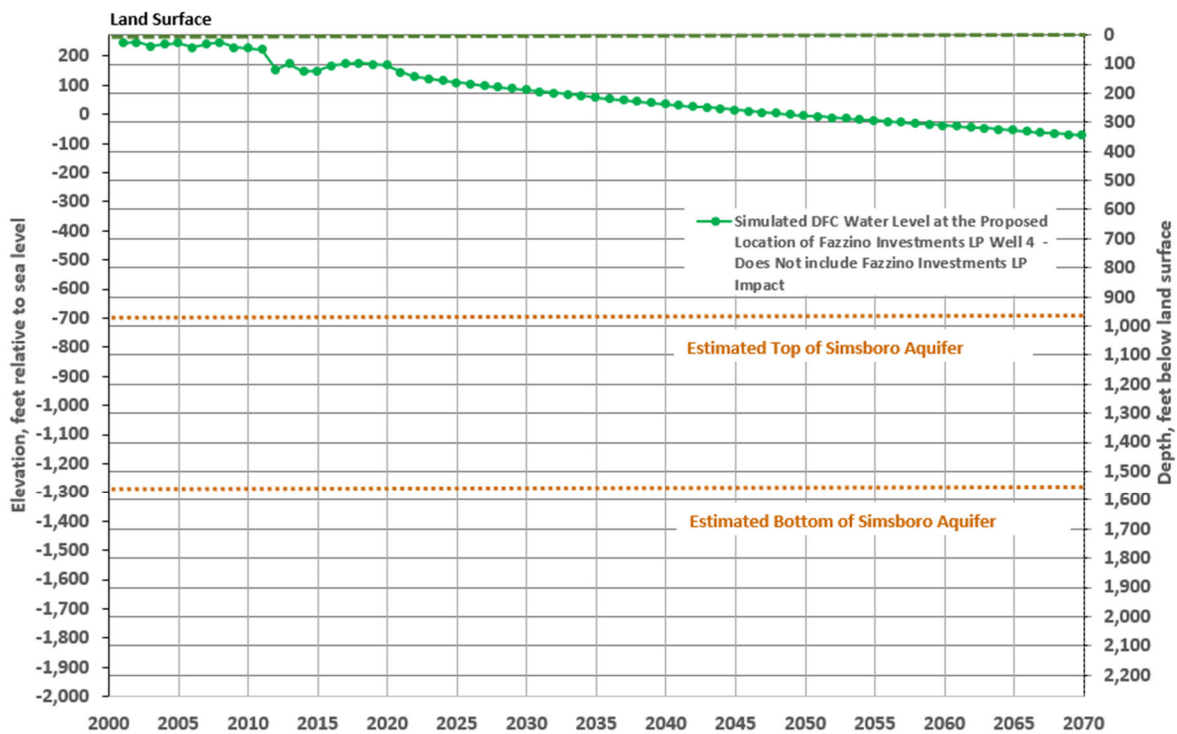


Figure 6. Projected DFC Water Level Change at Proposed Fazzino Investments LP Well 4

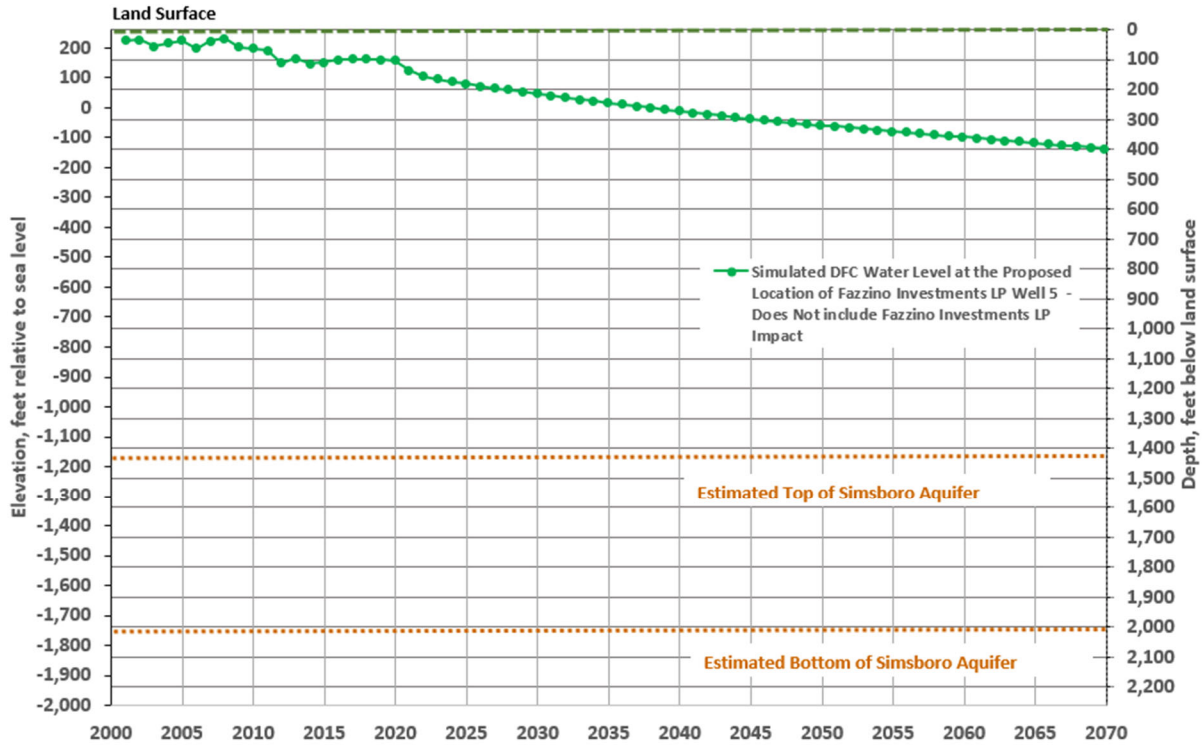


Figure 7. Projected DFC Water Level Change at Proposed Fazzino Investments LP Well 5

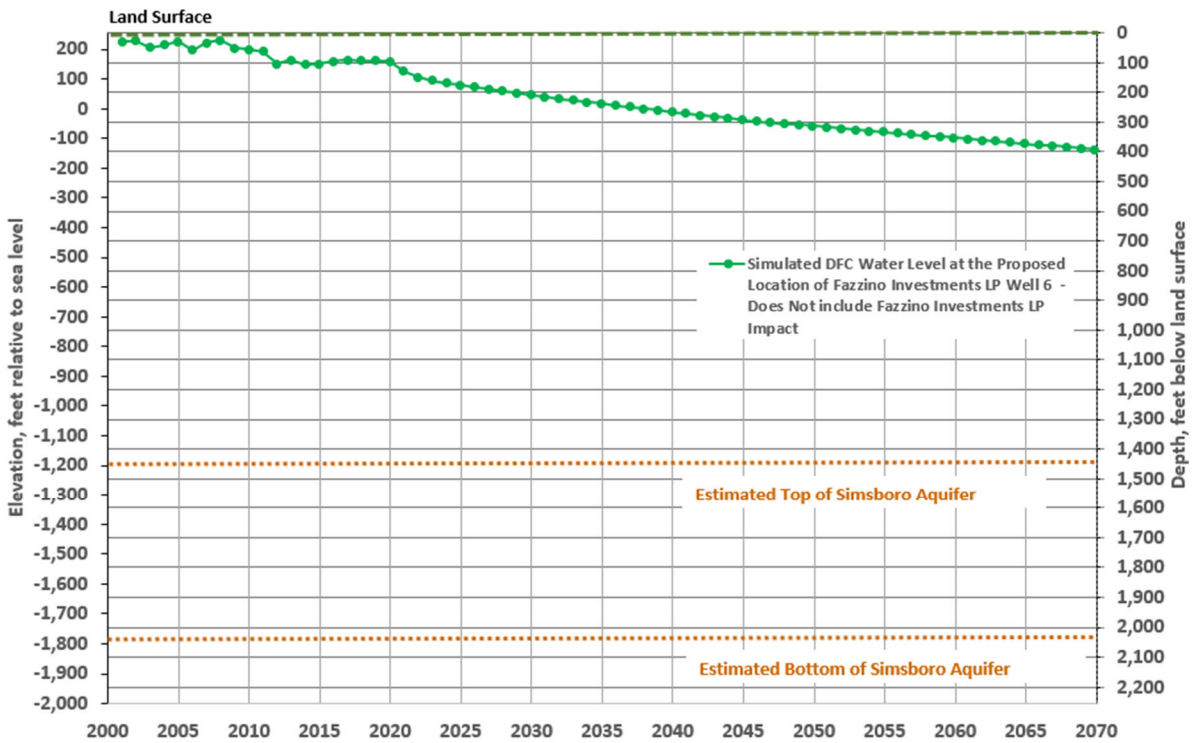
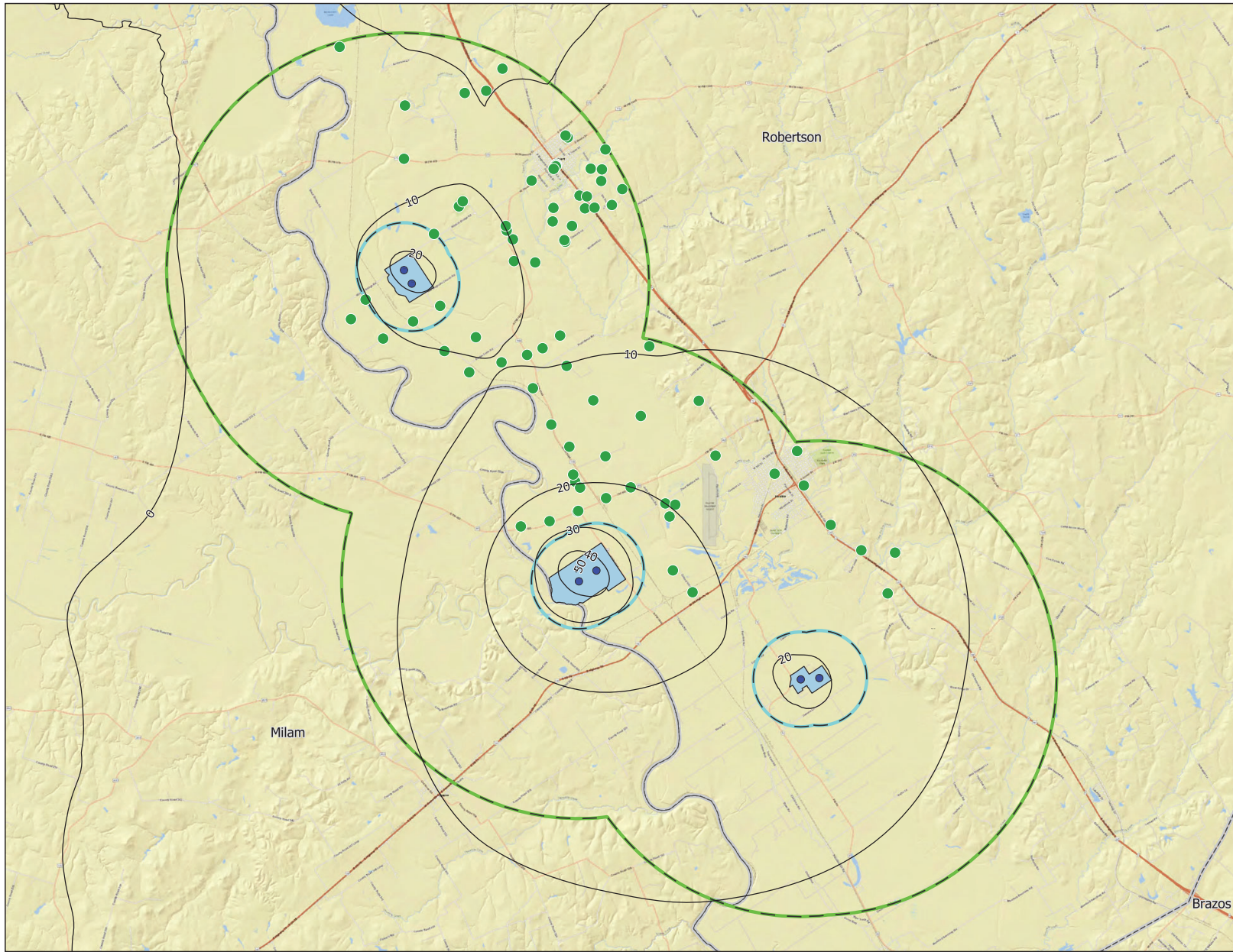


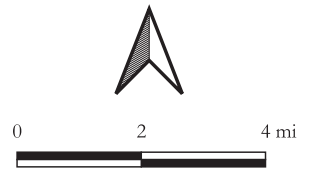
Figure 8. Projected DFC Water Level Change at Proposed Fazzino Investments LP Well 6





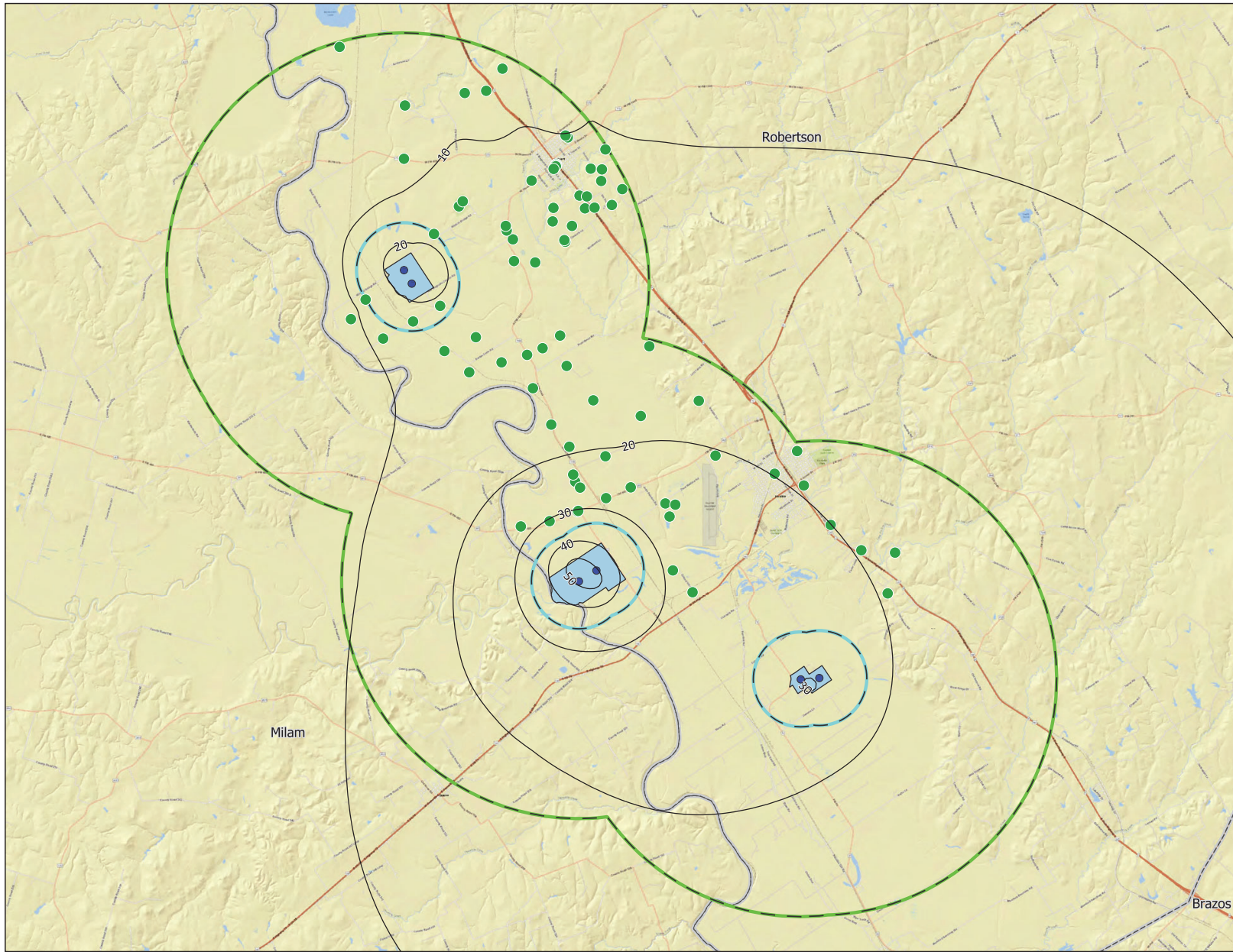
**Explanation**

- Proposed Wells
- 1 Mile Radius from Well Locations
- 5 Mile Radius from Well Locations
- 1-Year Modeled Drawdown - GAM  
Contour Interval = 10 feet
- Fazzino Property
- ▭ Counties
- BVGCD Reported Wells w/in 5 Miles**
- Simsboro



**Fazzino Investments, LP**

Figure 8: 1-Year GAM Drawdown Contours



**Explanation**

- Proposed Wells
- 1 Mile Radius from Well Locations
- 5 Mile Radius from Well Locations
- 10-Year Modeled Drawdown - GAM  
Contour Interval = 10 feet
- Fazzino Property
- ▭ Counties
- BVGCD Reported Wells w/in 5 Miles**
- Simsboro



**Fazzino Investments, LP**

Figure 9: 10-Year GAM Drawdown Contours

