KT GROUNDWATER

# Technical Memorandum

| | |
|---|---|
| **To:** | Dr. Quinn McColly<br>Managing Director – Water Resources<br>Conservation Equity Management, LP |
| **From:** | Michael R. Keester, P.G. |
| **Date:** | April 11, 2025 |
| **Subject:** | Groundwater flow modeling and simulated effects of pumping from the proposed Pine Bliss LLC well field |

STATE OF TEXAS
MICHAEL R. KEESTER
GEOLOGY
10331
LICENSED
PROFESSIONAL GEOSCIENTIST
04/11/2025

To support your permitting efforts with the Neches & Trinity Valleys Groundwater Conservation District ("NTVGCD"), we reviewed modeling files provided to the NTVGCD and conducted additional simulations. Specifically, our work involved verifying the simulated pumping amounts within the pumping files, conducting simulations with the Carrizo Wilcox Groundwater Availability Model ("GAM") developed by Panday and others (2020), and evaluated the simulated effect of the proposed Pine Bliss LLC ("Pine Bliss") pumping. For the simulations, we used two versions of the GAM, namely:

- "Base GAM" where the aquifer properties are as defined by Panday and others (2020)
- "GAM (Sy = 0.07)" where we adjusted the specific yield to be closer to typical values

Within MODFLOW, the modeling code used for the GAM, we can represent storage of water in the aquifer layers several ways. In the GAM, Panday and others (2020) set the model to use a storage coefficient (calculated from a specific storage value) when water levels are above the top of the aquifer (that is, confined aquifer conditions) and specific yield when water levels are below the top of the aquifer (that is, unconfined or water-table aquifer conditions). The storage coefficient is typically between 0.001 and 0.00001 (Freeze and Cherry, 1979) and reflects the drainage from storage due to changes in pressure in the confined aquifer system. The specific yield values for sandy materials, such as the aquifers simulated by the GAM, typically range from 0.1 to 0.3 (Freeze and Cherry, 1979) and represent the amount of water that can drain from the pore space in the aquifer. Based on the typical values, the specific yield is typically at least 100 times more than the storage coefficient.

In the GAM, Panday and others (2020) applied a constant specific yield value of 0.0007 (unitless) in all nodes which is more representative of a confined aquifer system. As a justification for the value, they reported that the GAM is not sensitive to changes in the specific yield. However, in a regional model where most calibration water level data are from aquifers under confined conditions, the insensitivity is due to a lack of data and is not an indication that the selected value is accurate for the unconfined aquifer conditions. The effect of their choice for the specific yield is that when simulated water levels fall below the top of the aquifer (that is, the aquifer becomes unconfined), the model continues to calculate water available from storage as if the system is confined.

To evaluate the simulated effects of the proposed pumping with a specific yield value that is more representative of typical values, we updated the specific yield values in all nodes by increasing it to 0.07. While the updated specific yield value is still less than the minimum literature value, it is 100 times greater than the value assigned by the GAM authors. In addition, it provides a conservative estimate near the lower end of the typical range which we can use to evaluate the difference in simulated effects from proposed pumping.

# Approach

We conducted four simulations with the model. Table 1 summarizes the modeling simulations conducted.

**Table 1. Summary of model simulations.**

| Simulation | Description |
|---|---|
| **Base GAM (Sy = 0.0007)** | The GMA 11 MAG predictive simulation with no change to the specific yield |
| **GAM (Sy = 0.07)** | The Base GAM with the specific yield changed to 0.07 |
| **Base GAM (Sy = 0.0007) w/Scenario** | The GMA 11 MAG predictive run simulation with no change to the specific yield plus the scenario pumping |
| **GAM (Sy = 0.07) w/Scenario** | The Base GAM with the specific yield changed to 0.07 plus the scenario pumping |

For the scenario simulations we verified the pumping matched the permit applications. Table 2 summarizes the pumping applied within the model scenarios. Like previous modeling work, pumping from the well field began in model stress period 13 (representing 2025) and ended after stress period 62 for 50 years of pumping. Figure 1 illustrates the location of the simulated wells.

**Table 2. Pumping applied in the scenario.**

| Aquifer | Well | Gallons per Year | Acre-Feet per Year |
|---|---|---|---|
| Queen City | QC-1 | 118,260,000 | 362.9 |
| | QC-2 | 118,260,000 | 362.9 |
| | QC-3 | 157,680,000 | 483.9 |
| | QC-4 | 223,380,000 | 685.5 |
| | QC-5 | 262,800,000 | 806.5 |
| | QC-6 | 328,500,000 | 1,008.1 |
| | QC-7 | 105,120,000 | 322.6 |
| | QC-8 | 105,120,000 | 322.6 |
| | QC-9 | 118,260,000 | 362.9 |
| | QC-10 | 170,820,000 | 524.2 |
| | QC-11 | 118,260,000 | 362.9 |
| | *Total Queen City* | *1,826,460,000* | *5,605* |
| Middle Wilcox | WLX-1 | 262,800,000 | 806.5 |
| | WLX-2 | 249,660,000 | 766.2 |
| | WLX-3 | 341,640,000 | 1,048.5 |
| | WLX-4 | 341,640,000 | 1,048.5 |
| | WLX-5 | 367,920,000 | 1,129.1 |
| | WLX-6 | 473,040,000 | 1,451.7 |
| | WLX-7 | 236,520,000 | 725.9 |
| | WLX-8 | 315,360,000 | 967.8 |
| | WLX-11 | 236,520,000 | 725.9 |
| | WLX-12 | 249,660,000 | 766.2 |
| | WLX-13 | 262,800,000 | 806.5 |
| | *Total Middle Wilcox* | *3,337,560,000* | *10,243* |
| | ***Total Pine Bliss*** | ***5,164,020,000*** | ***15,848*** |

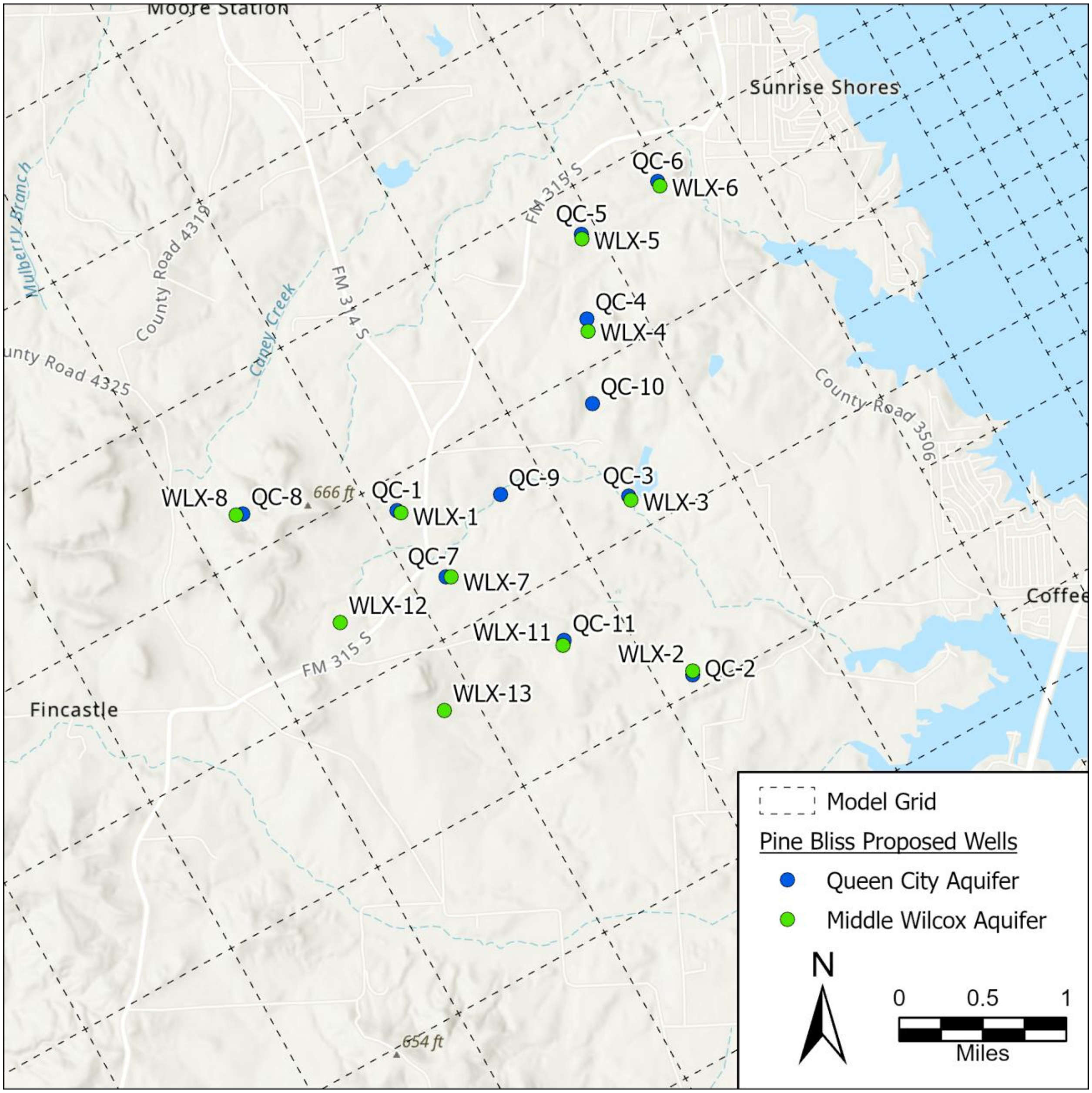



**Figure 1.** **Location of simulated wells.**

# Results

We began with a review of the local effects of the simulated pumping. The Pine Bliss well field will produce from the Queen City and Middle Wilcox aquifers. As expected, updating the specific yield value results in slower water level decline as more water is available from storage. Figure 2 illustrates the differences between the simulations.

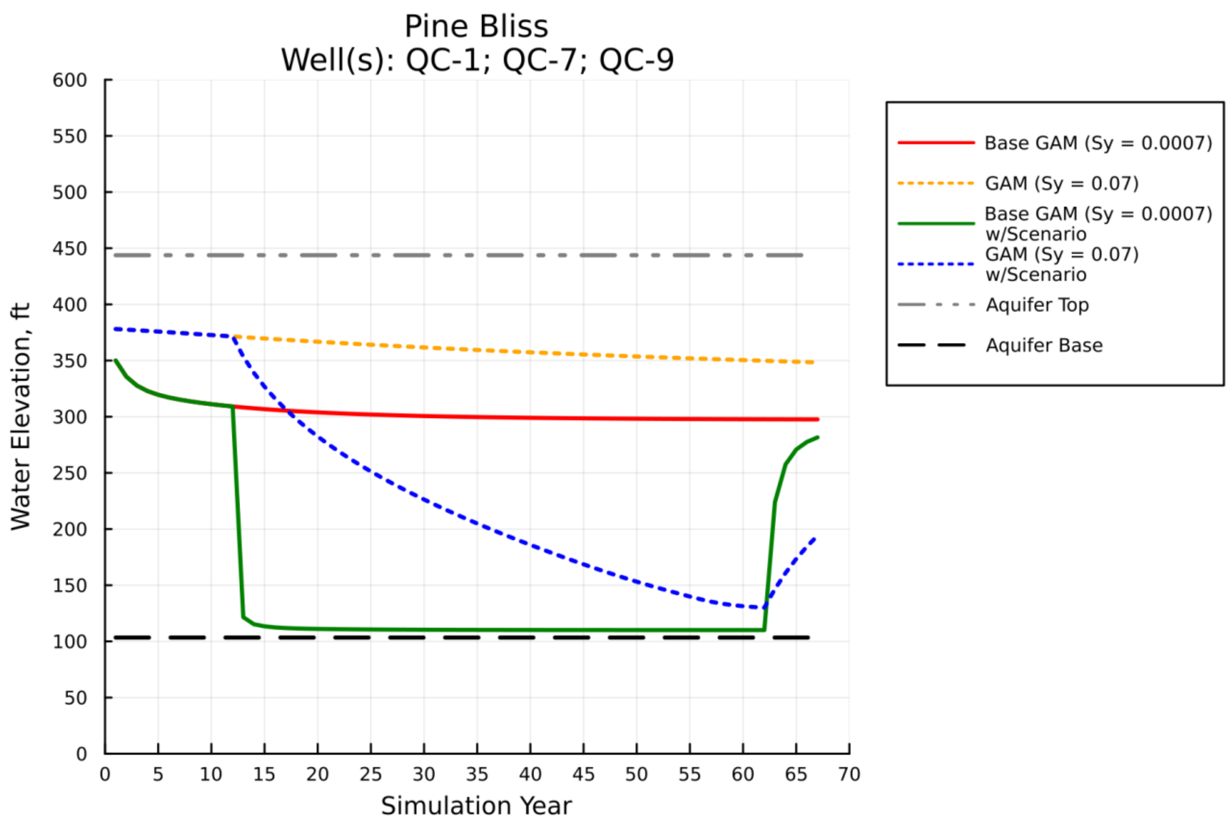



**Figure 2.** **Simulated water level at the model node representing wells QC-1, QC-7, and QC-9.**

As shown in Figure 2, the higher specific yield values (yellow and blue dotted lines) result in starting about 25 feet higher. In the simulation without Pine Bliss pumping, the water level remains about 50 feet higher at the end of the predictive period. With the Pine Bliss pumping, the water level declines to the base of the aquifer almost immediately with the low specific yield (green line). However, the water level declines slower with the higher specific yield (blue line).

Importantly, the GAM automatically reduces pumping when water levels fall below 10 percent of the layer thickness. For the Pine Bliss simulation with the low specific yield (green line) the pumping never reaches the full amount and is only about 100 acre-feet per year during the simulation period. However, as shown on Figure 3 for the wells discussed above, the pumping with the higher specific yield meets the target for most of the pumping period prior to declining in the last few years.

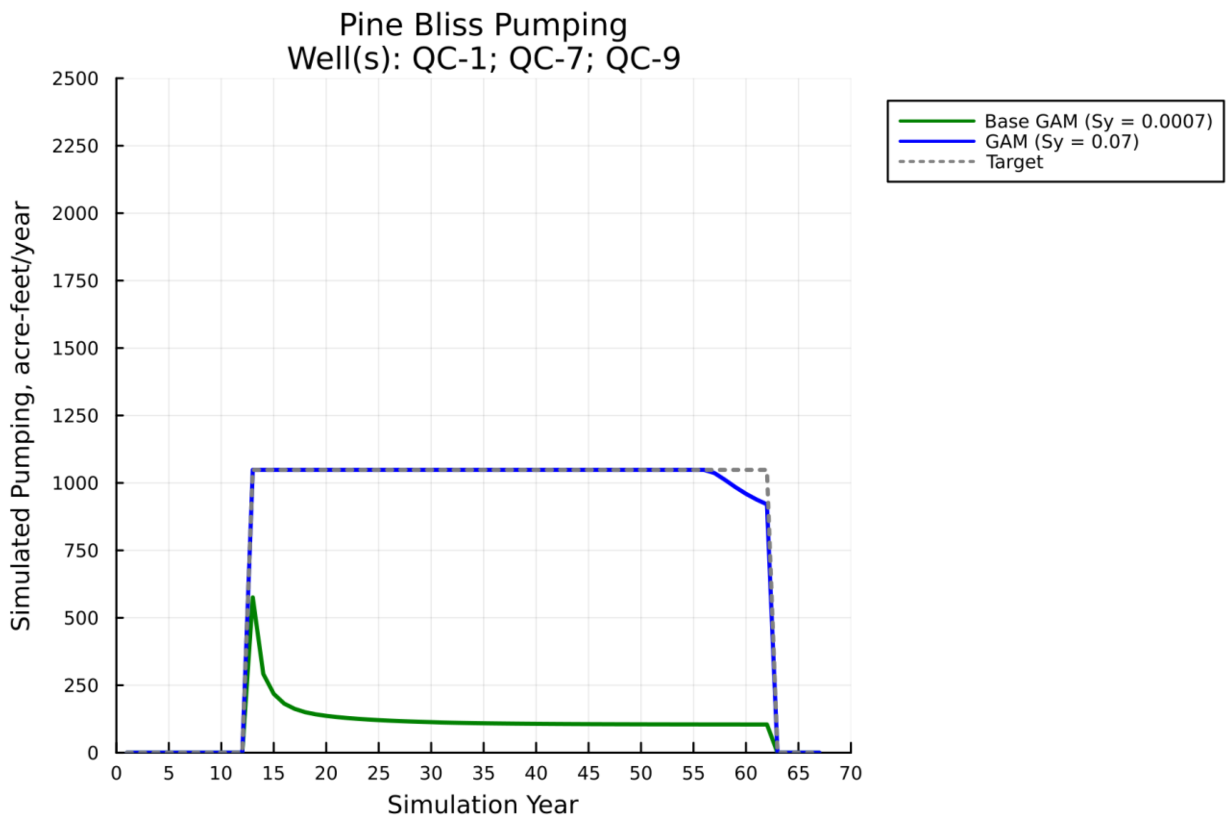



**Figure 3. Simulated Pine Bliss pumping at the model node representing wells QC-1, QC-7, and QC-9.**

Review of the results from each of the proposed Pine Bliss wells indicates the model with higher specific yield is able to maintain the target pumping rate for several years prior to decreasing (Figure 4 blue line). Using the published GAM, the Pine Bliss proposed pumping was never able to reach the target level which is not representative of our understanding of the physical aquifer system. Also, while the model could not maintain the pumping in our higher specific yield version, our update to the model specific yield is still less than the range of typical values. Site specific testing and monitoring during production during the first few years will better inform the real-world aquifer characteristics. The ability of the model to maintain pumping for more than a decade illustrates the aquifer's ability to support the proposed pumping based on our current understanding of the physical hydrogeologic system.

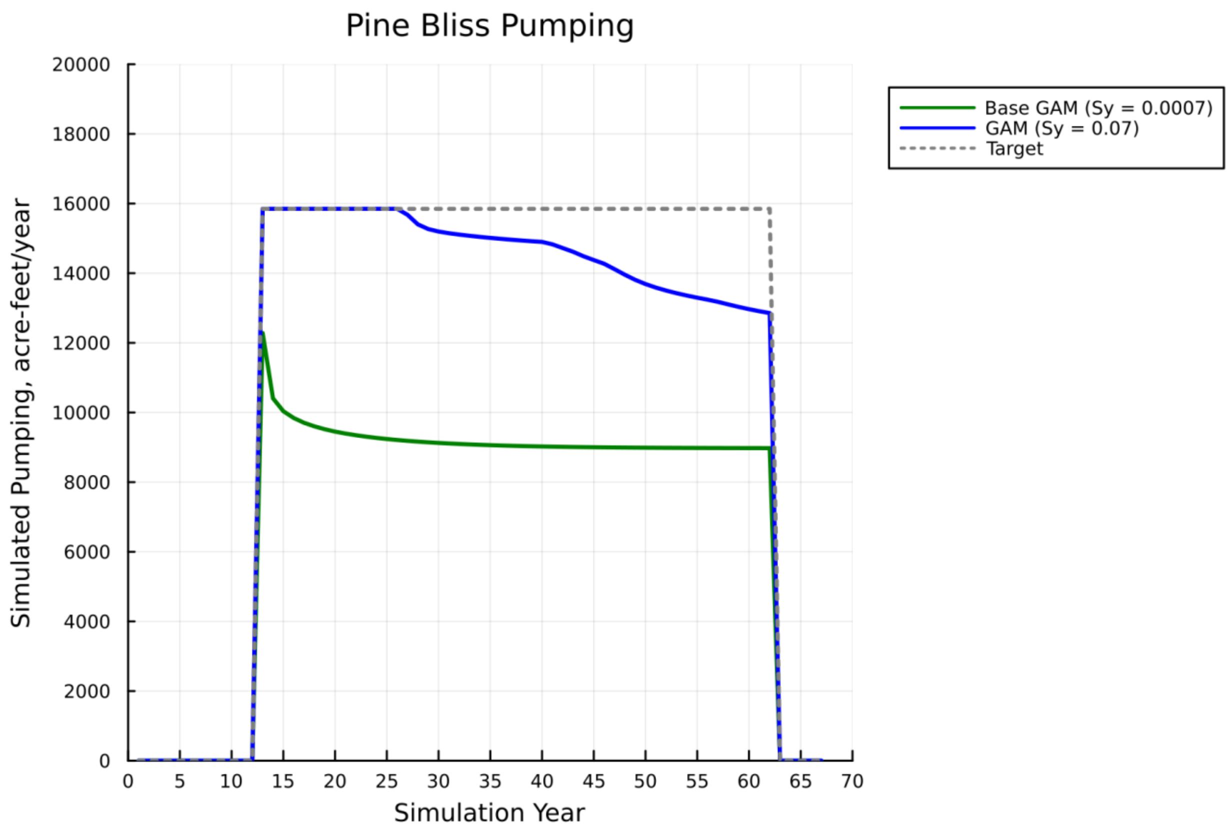



**Figure 4. Simulated Pine Bliss pumping from the Queen City and Middle Wilcox.**

Overall, the results with the closer to typical specific yield show much less drawdown with production rates nearer to the target annual volumes. Attached are hydrographs and simulated pumping for each of the simulated wells. In addition, attached are charts with the total simulated pumping for the Pine Bliss well field.

In addition to the hydrographs, we calculated the average water level decline during the 50-year pumping period within Henderson County due to the proposed pumping (Table 3). We calculated the average drawdown as the simulated water level at the end of stress period 12 minus the simulated water level at the end of stress period 62 divided by the number of nodes in the county without consideration to the area the cell represents. Results with the closer to typical specific yield show about 9 feet and 39 feet of additional average drawdown for the Queen City and Middle Wilcox aquifers, respectively, associated with the proposed Pine Bliss pumping.

**Table 3. Summary of average drawdown in Henderson County at the end of the 50-year pumping period.**

| Aquifer* | Base GAM (Sy = 0.0007) | GAM (Sy = 0.07) | Base GAM (Sy = 0.0007) w/Scenario | GAM (Sy = 0.07) w/Scenario |
|---|---|---|---|---|
| Alluvium | 6 | 2 | 14 | 3 |
| Sparta | 28 | 9 | 44 | 10 |
| Weches | 10 | 5 | 31 | 12 |
| Queen City | 24 | **10** | 50 | **19** |
| Reklaw | 33 | 22 | 72 | 40 |
| Carrizo Sand | 25 | 14 | 55 | 26 |
| Upper Wilcox | 17 | 10 | 71 | 59 |
| Middle Wilcox | 13 | **9** | 54 | **48** |
| Lower Wilcox | 22 | 28 | 59 | 61 |

*highlighted aquifers are where the Pine Bliss wells will produce

# Summary and Conclusions

Panday and others (2020) applied a specific yield value in the GAM which is representative of a confined aquifer rather than an unconfined aquifer. The effect of their choice is that if water levels fall below the top of the aquifer the GAM continues to calculate water available from storage as if the system is confined. Since the proposed Pine Bliss Well Field pumping is expected to draw water levels below the top of the aquifer, using a specific yield value closer to the typical range for the aquifer material is appropriate for evaluating the potential effects of production.

To conduct the evaluation, we updated the specific yield of the GAM to 0.07 or 100 times more than the value used by the model authors. As expected, the simulations result in less drawdown as more water is available from storage. In addition, the GAM can more closely maintain the target pumping amount. By more closely maintaining the target pumping amount, and by being able to maintain the full amount for several years, the simulated effects are more reasonable with regard to our current understanding of the hydrogeologic conditions.

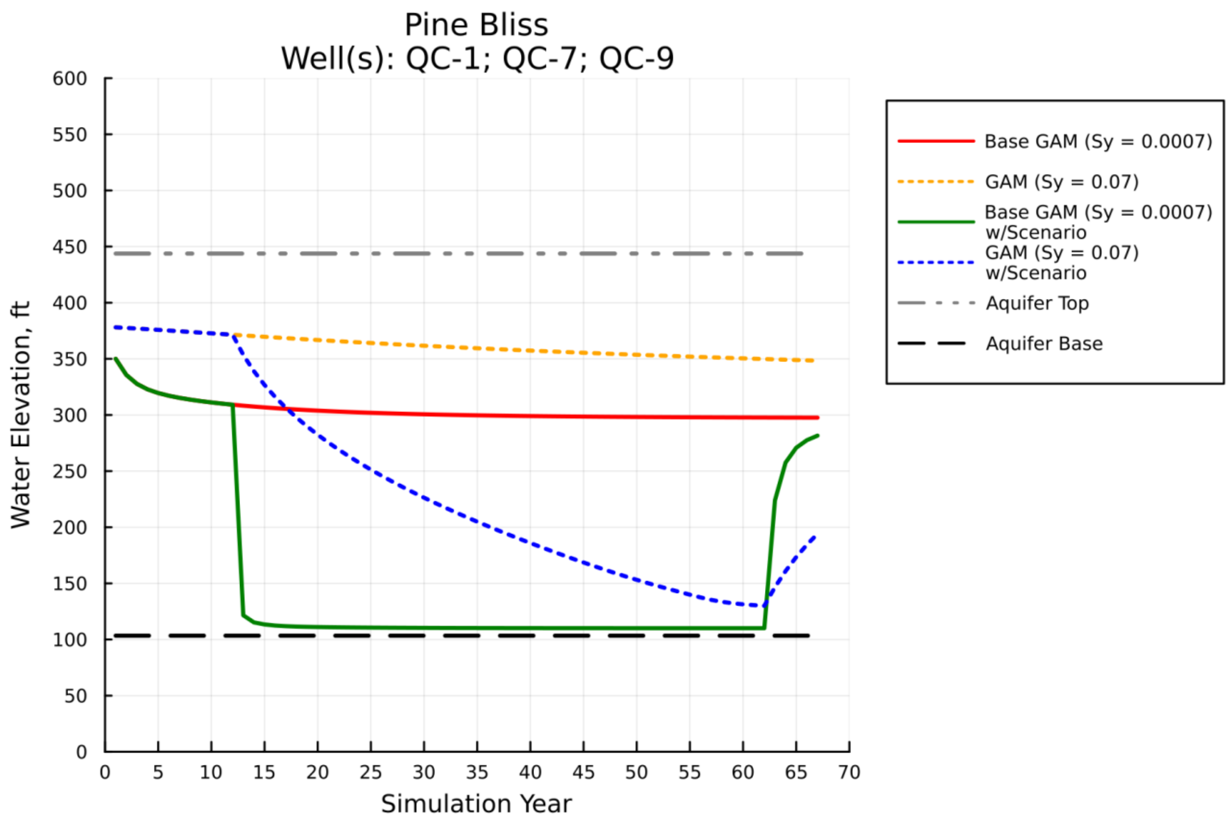
Using the model with the specific yield closer to typical values, the additional average drawdown in Henderson County increases by 9 feet and 39 feet for the Queen City and Middle Wilcox aquifers, respectively, due to the proposed Pine Bliss pumping. Most of the additional drawdown occurs in and near the proposed well field with the greatest effect being on the proposed pumping wells. While we do expect water level decline in the aquifer, we do not expect the proposed pumping will inhibit the ability of other property owners to use the groundwater resources beneath their land.

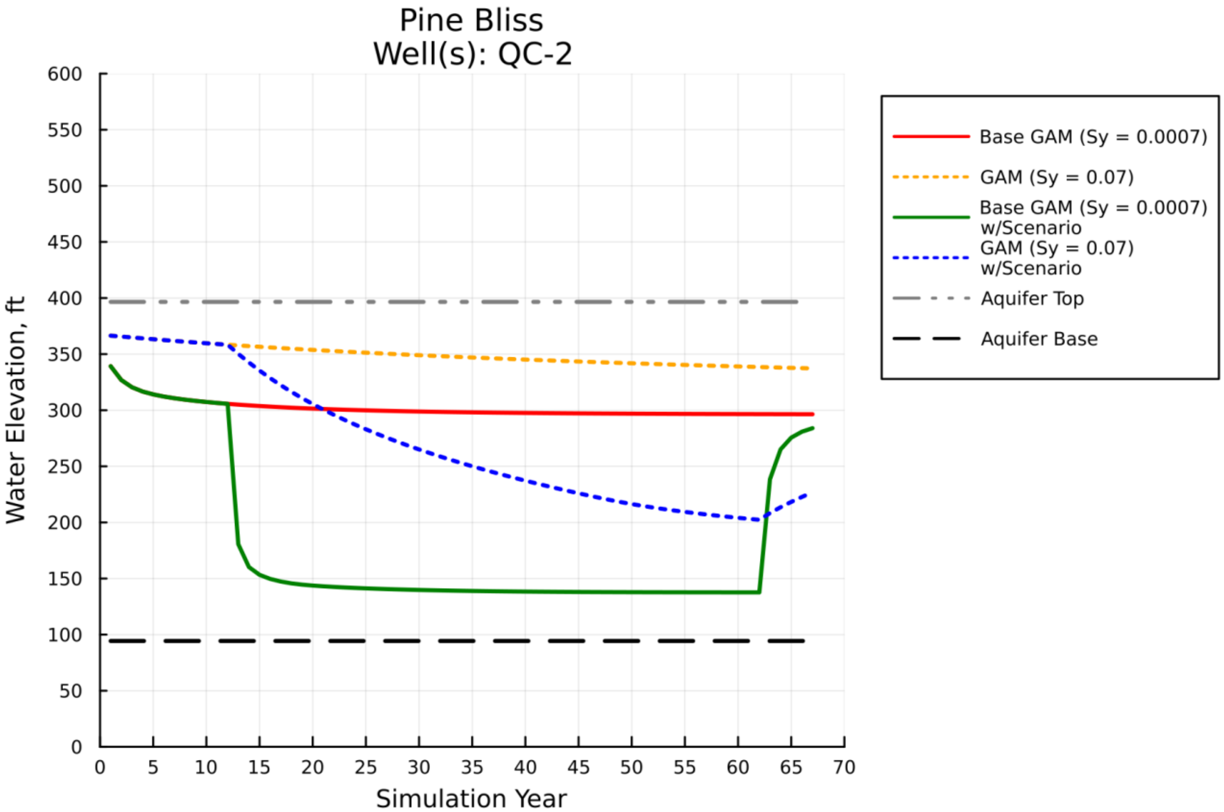
# References

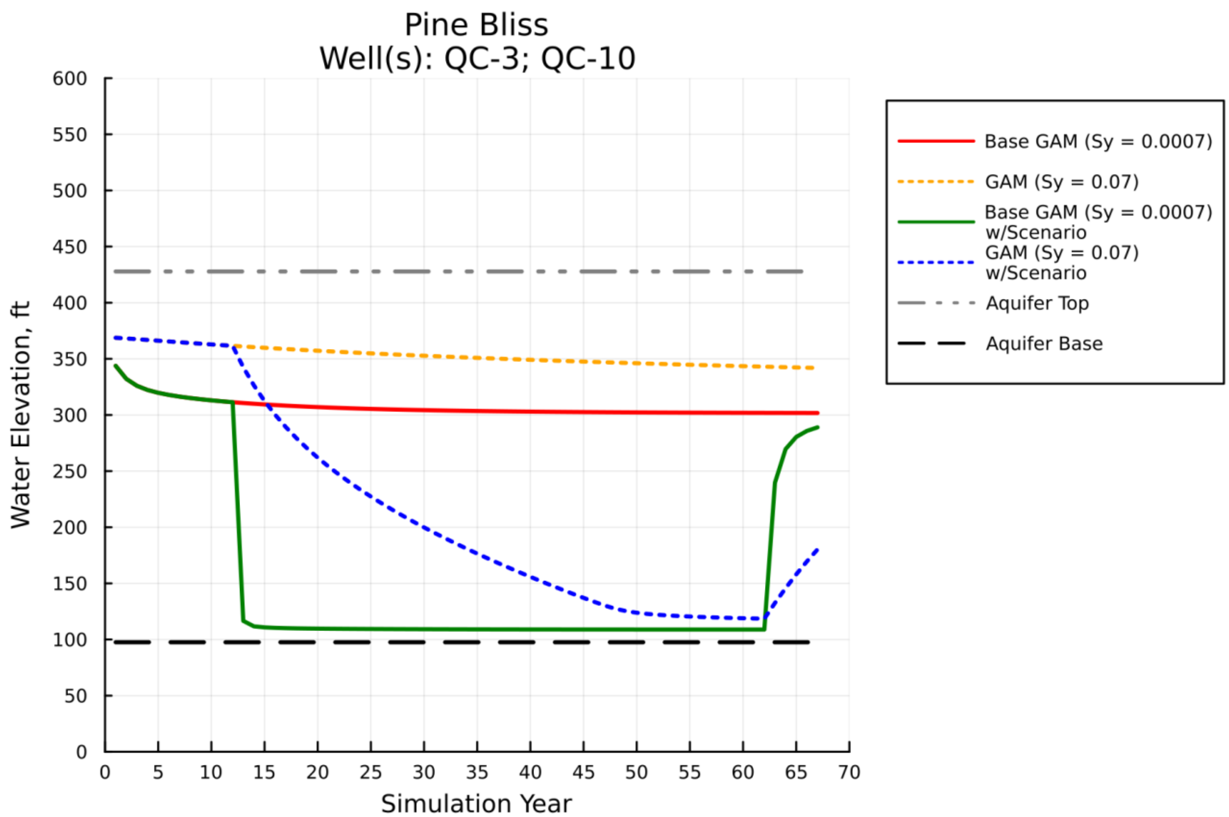
Freeze, R.A. and Cherry, J.W., 1979, Groundwater: 604 p.

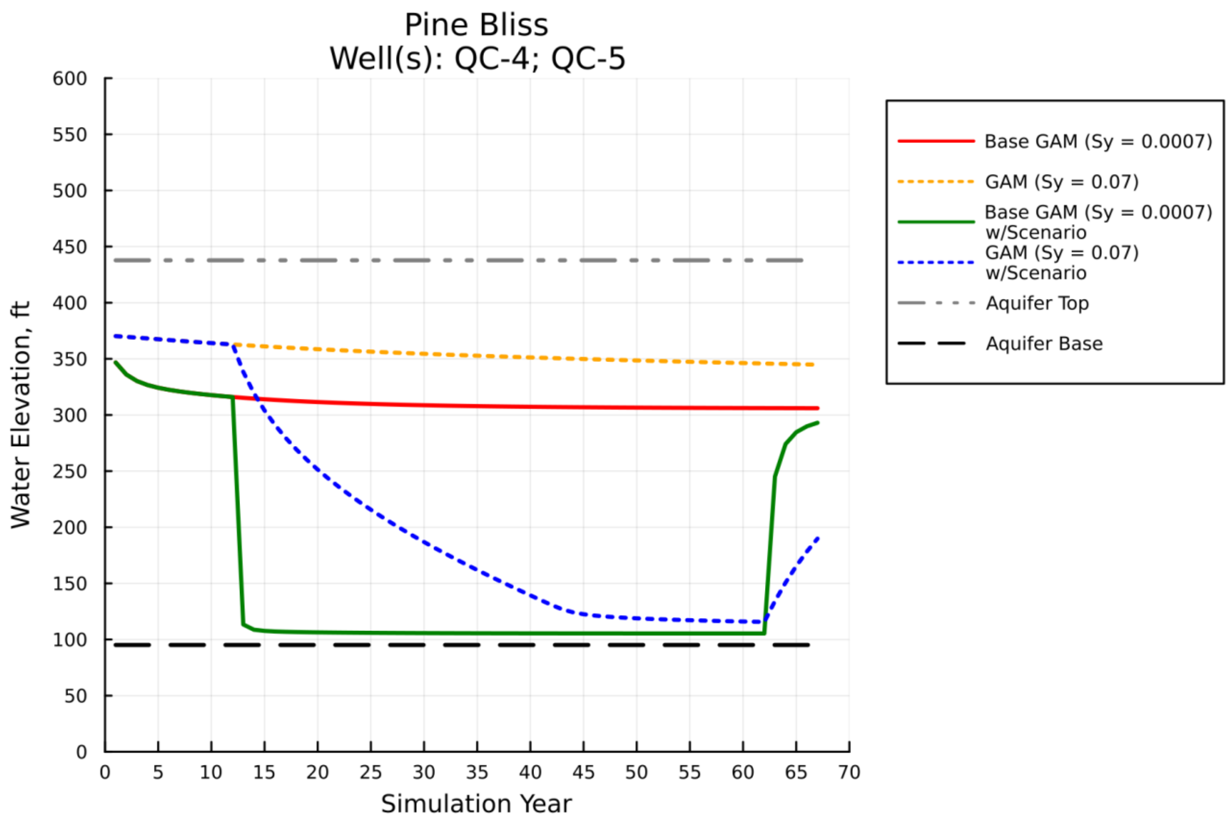
Panday, S., Rumbaugh, J., Hutchison, W.R., and Schorr, S., 2020, Numerical Model Report: Groundwater Availability Model for the Northern Portion of the Queen City, Sparta, and Carrizo-Wilcox Aquifers: Texas Water Development Board Contract Number # 1648302063, 200 p.

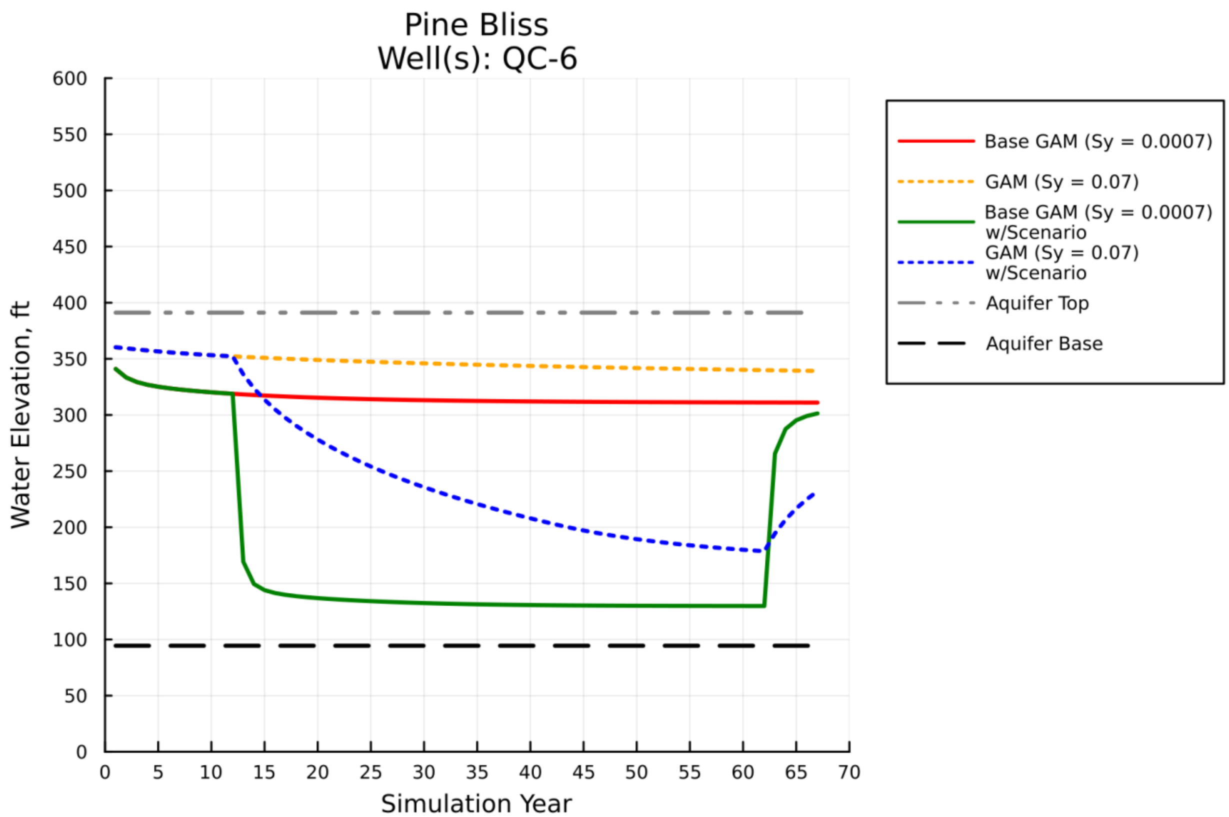
# Simulated Hydrographs for Pine Bliss Proposed Wells

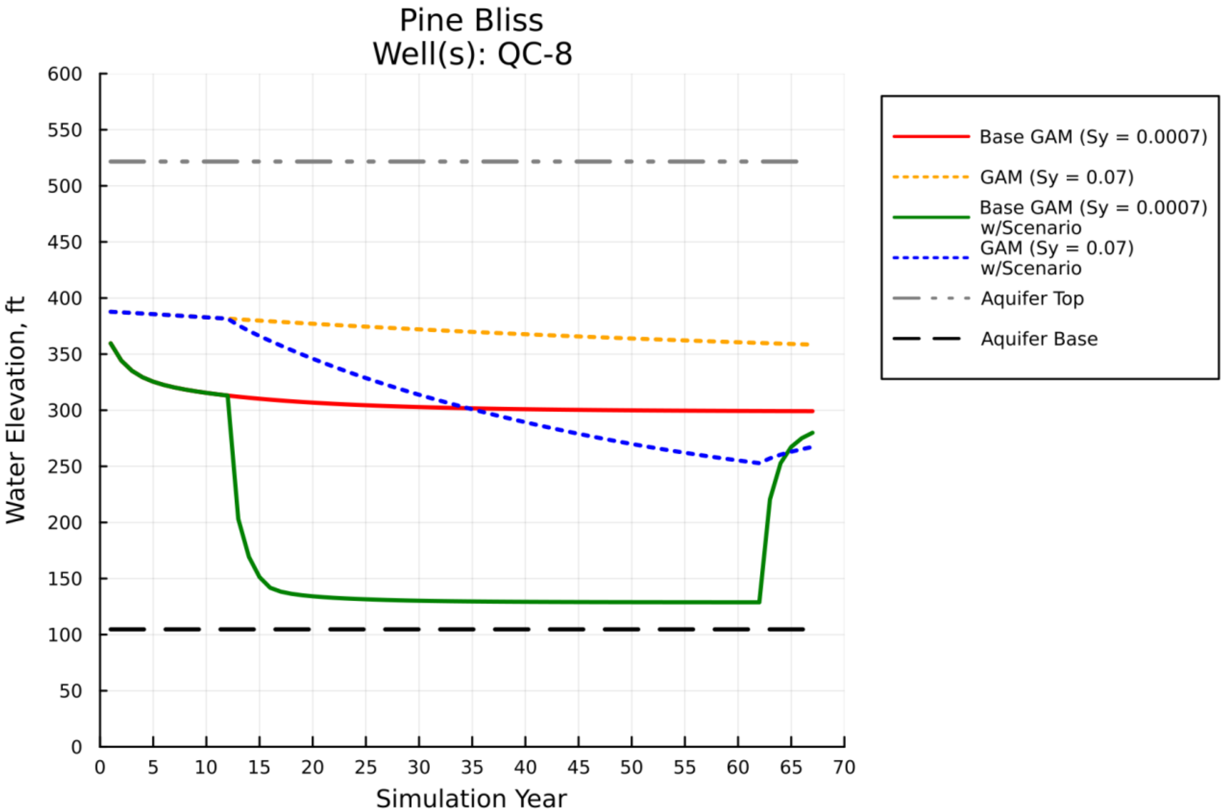

Pine Bliss
Well(s): QC-1; QC-7; QC-9
Water Elevation, ft
Simulation Year
0
50
100
150
200
250
300
350
400
450
500
550
600
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

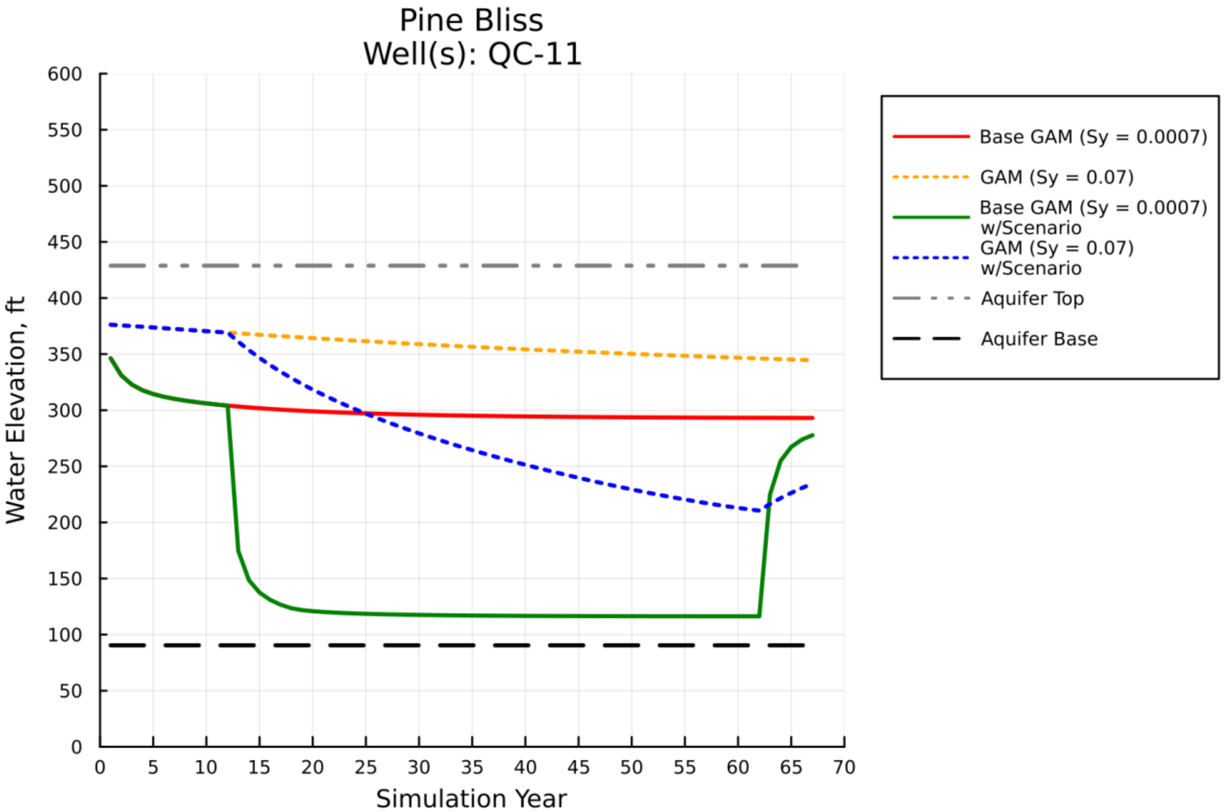

Pine Bliss
Well(s): QC-2
Water Elevation, ft
Simulation Year
0
50
100
150
200
250
300
350
400
450
500
550
600
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

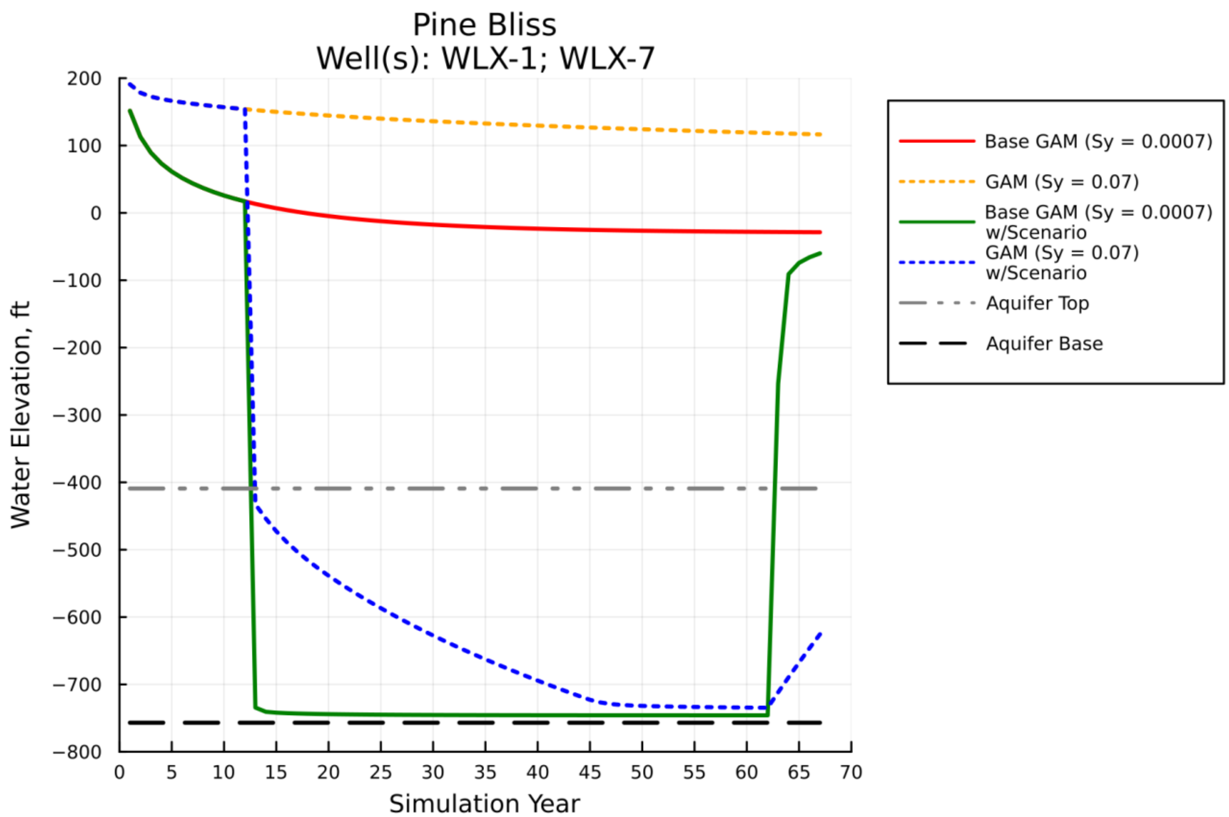

Pine Bliss
Well(s): QC-3; QC-10
Water Elevation, ft
Simulation Year
600
550
500
450
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

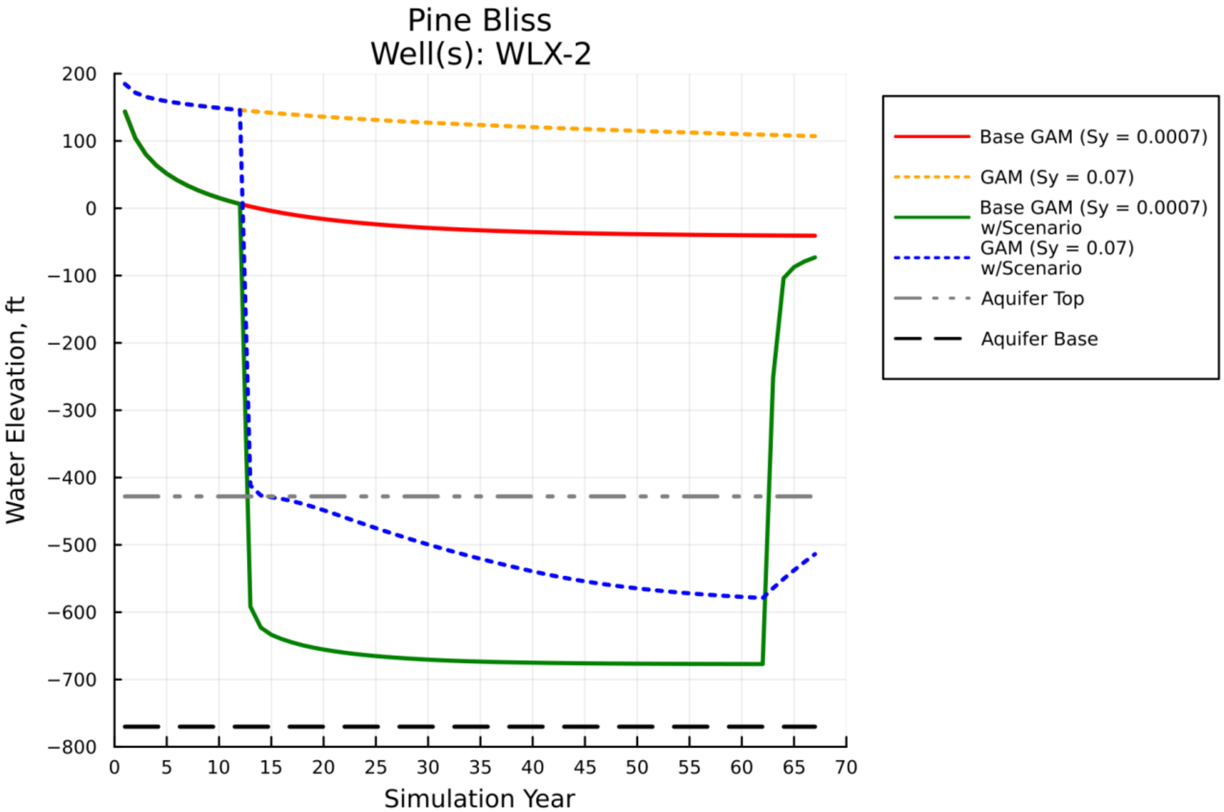

Pine Bliss
Well(s): QC-4; QC-5
Water Elevation, ft
Simulation Year
600
550
500
450
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

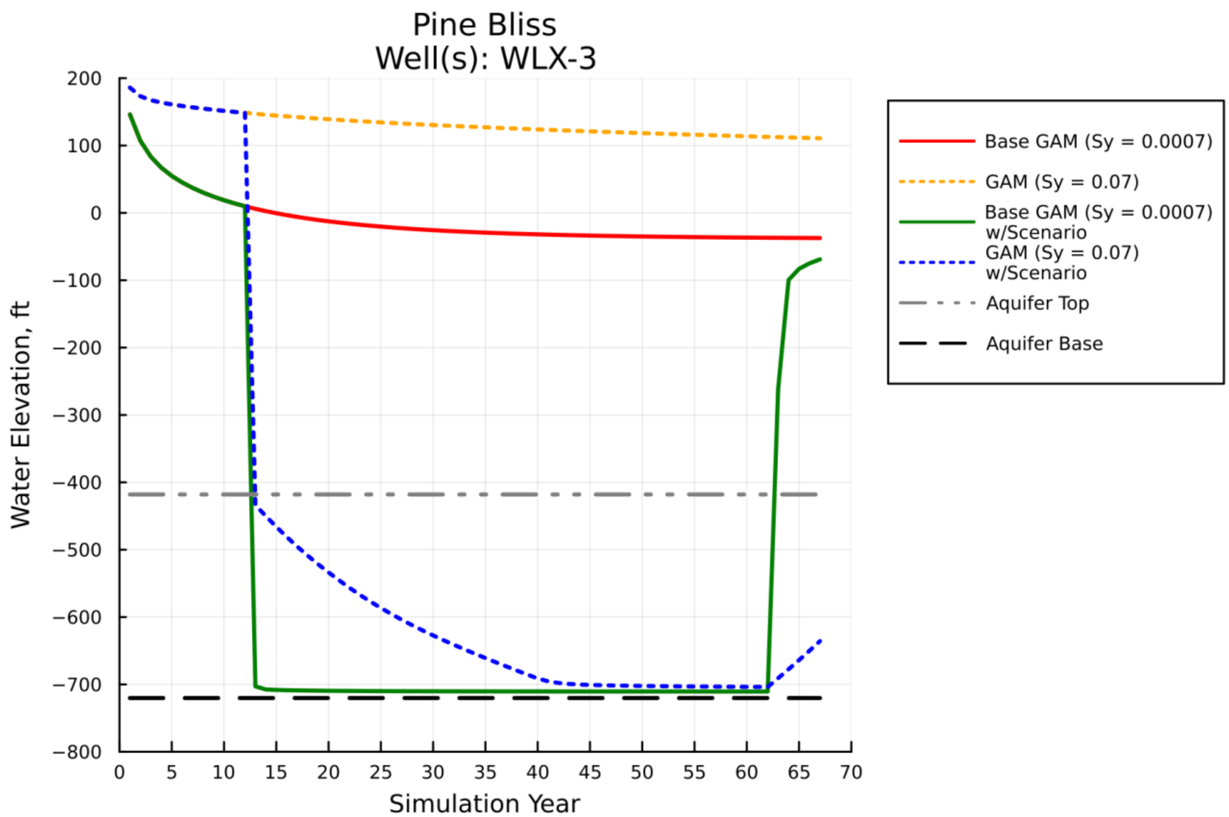

Pine Bliss
Well(s): QC-6
Water Elevation, ft
Simulation Year
0
50
100
150
200
250
300
350
400
450
500
550
600
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

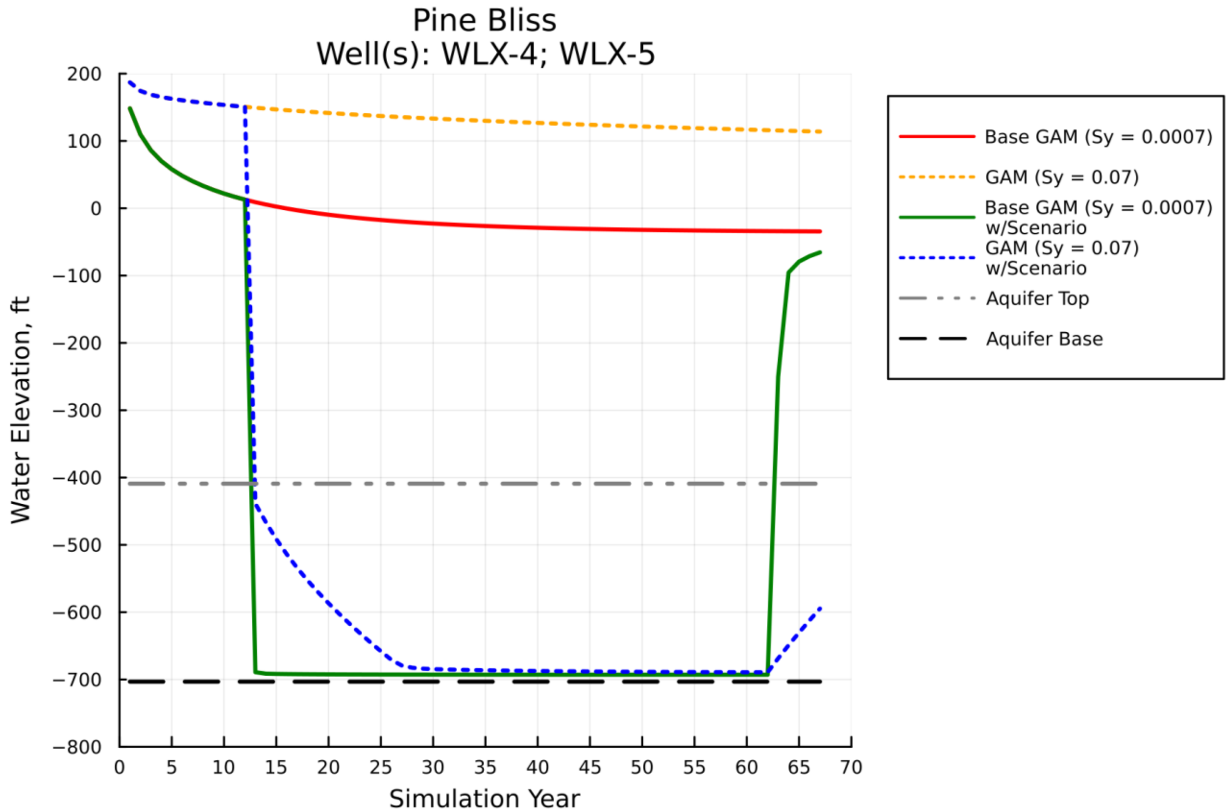

Pine Bliss
Well(s): QC-8
Water Elevation, ft
Simulation Year
0
50
100
150
200
250
300
350
400
450
500
550
600
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

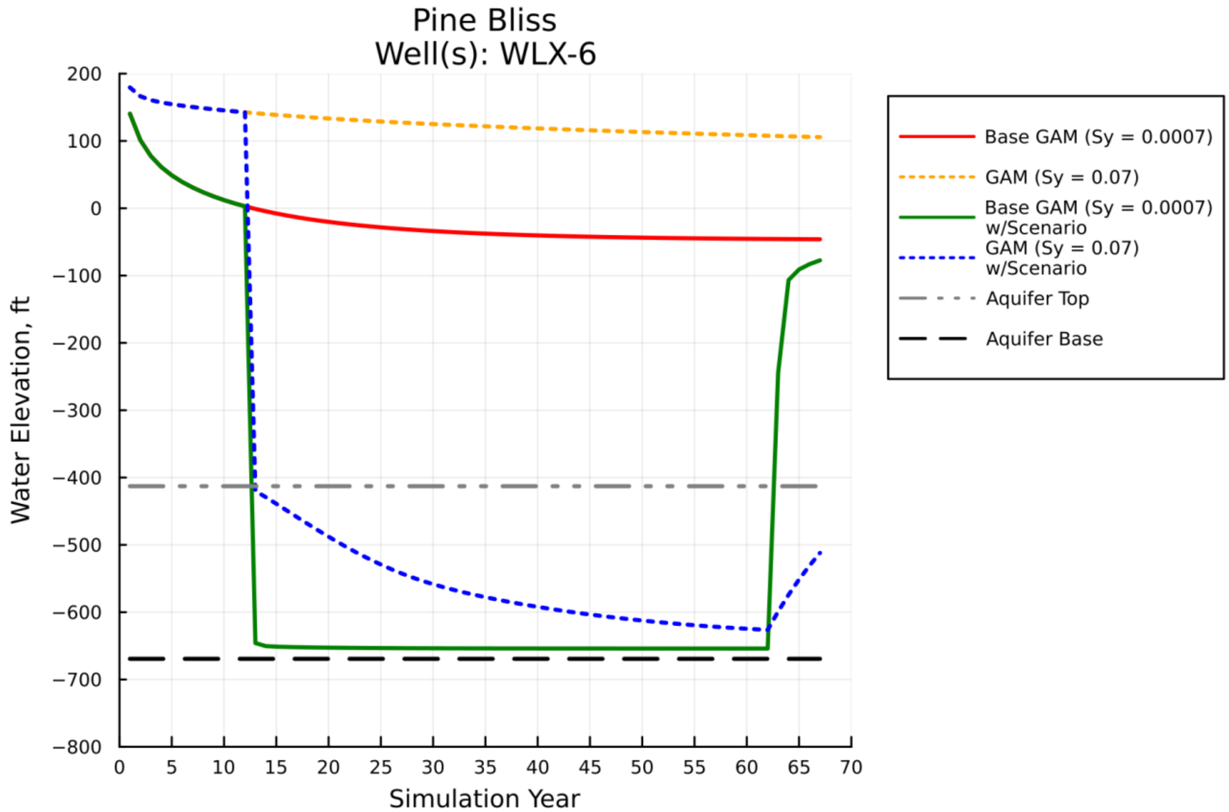

Pine Bliss
Well(s): QC-11
Water Elevation, ft
Simulation Year
0
50
100
150
200
250
300
350
400
450
500
550
600
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

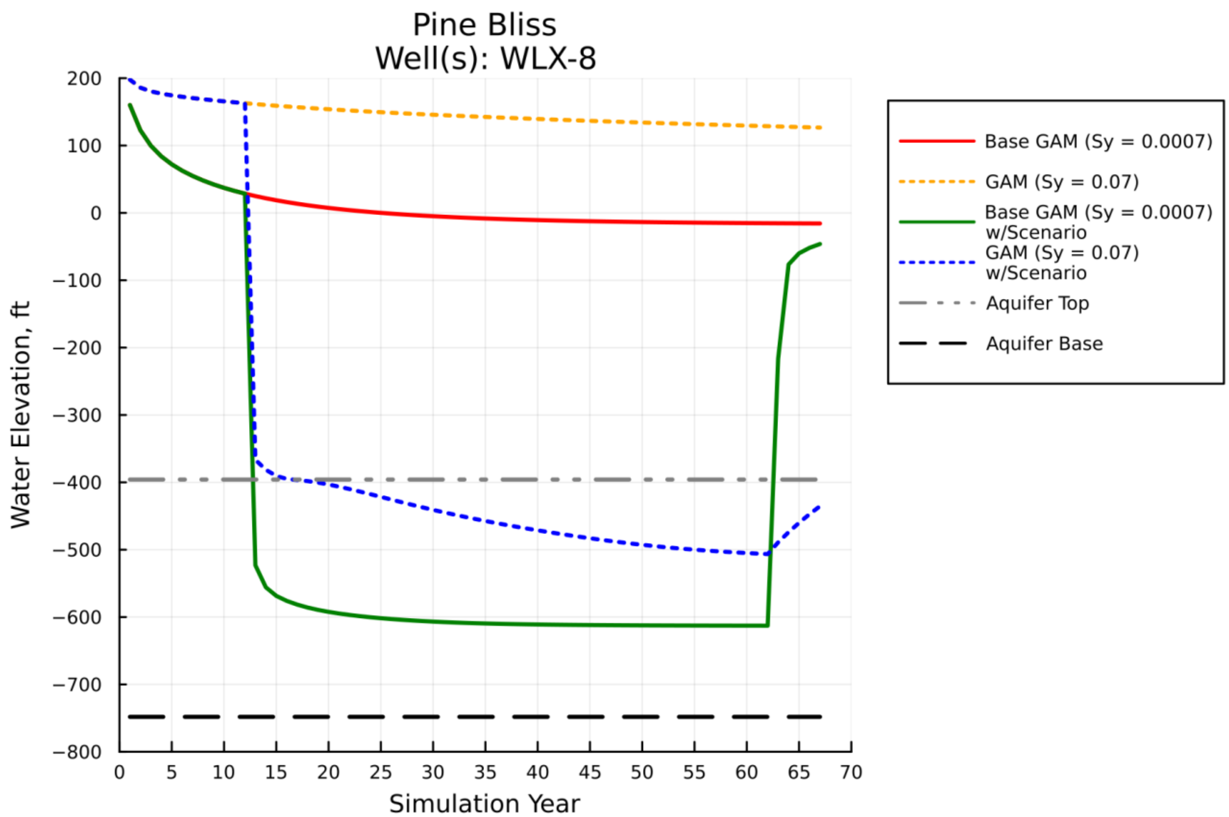

Pine Bliss
Well(s): WLX-1; WLX-7
Water Elevation, ft
Simulation Year
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

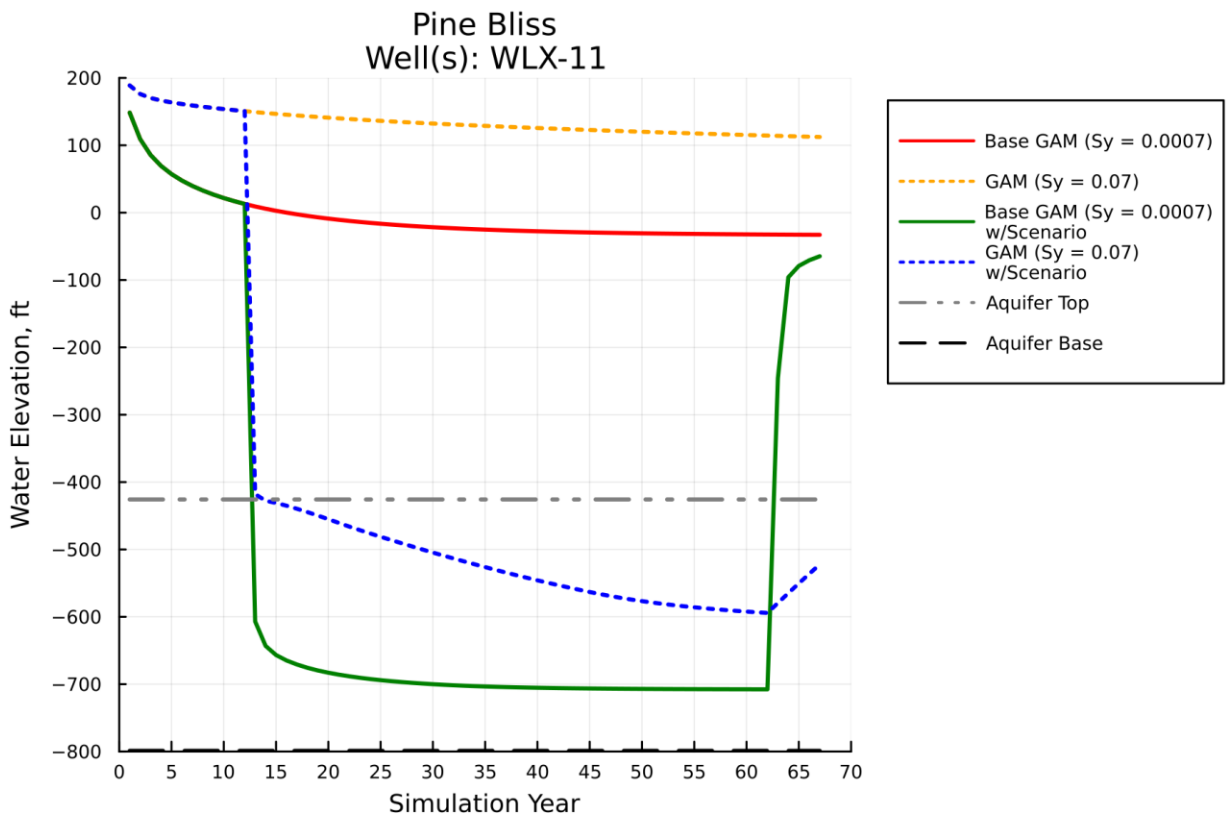

Pine Bliss
Well(s): WLX-2
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
Water Elevation, ft
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

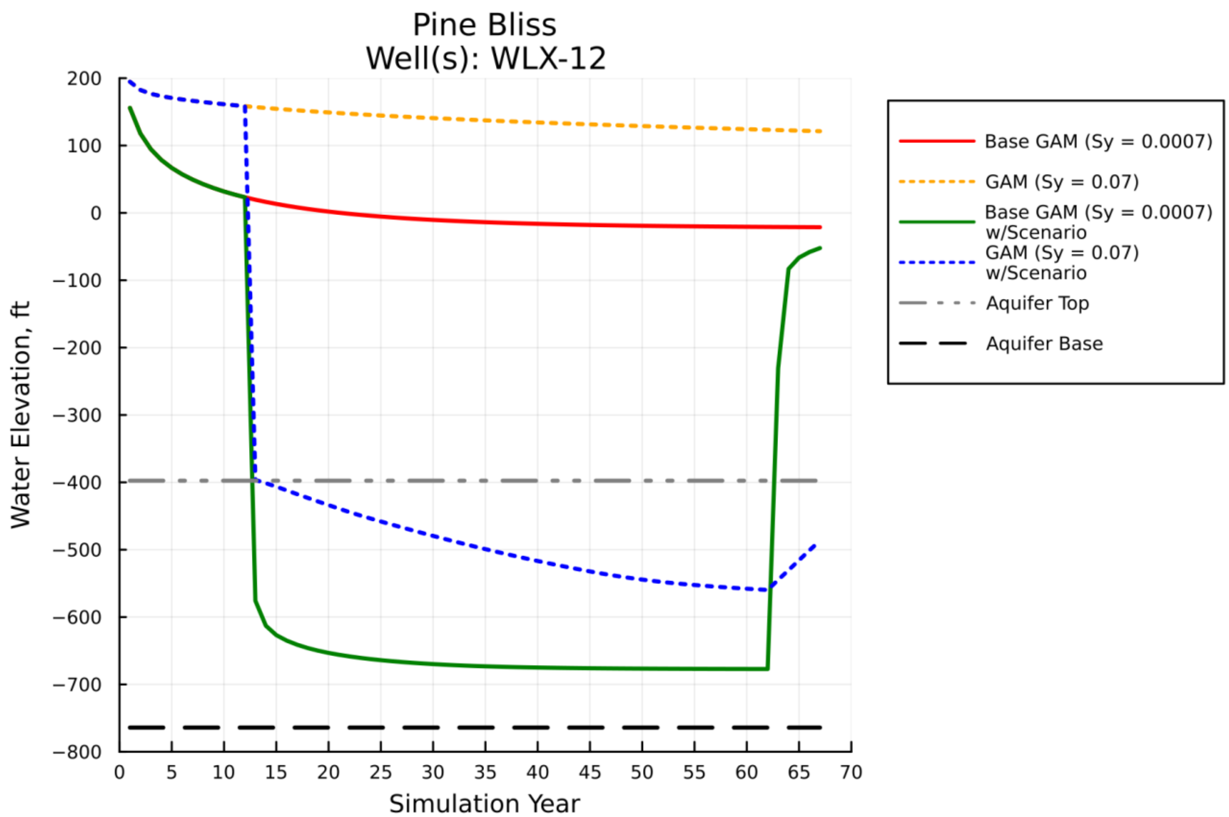

Pine Bliss
Well(s): WLX-3
Water Elevation, ft
Simulation Year
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

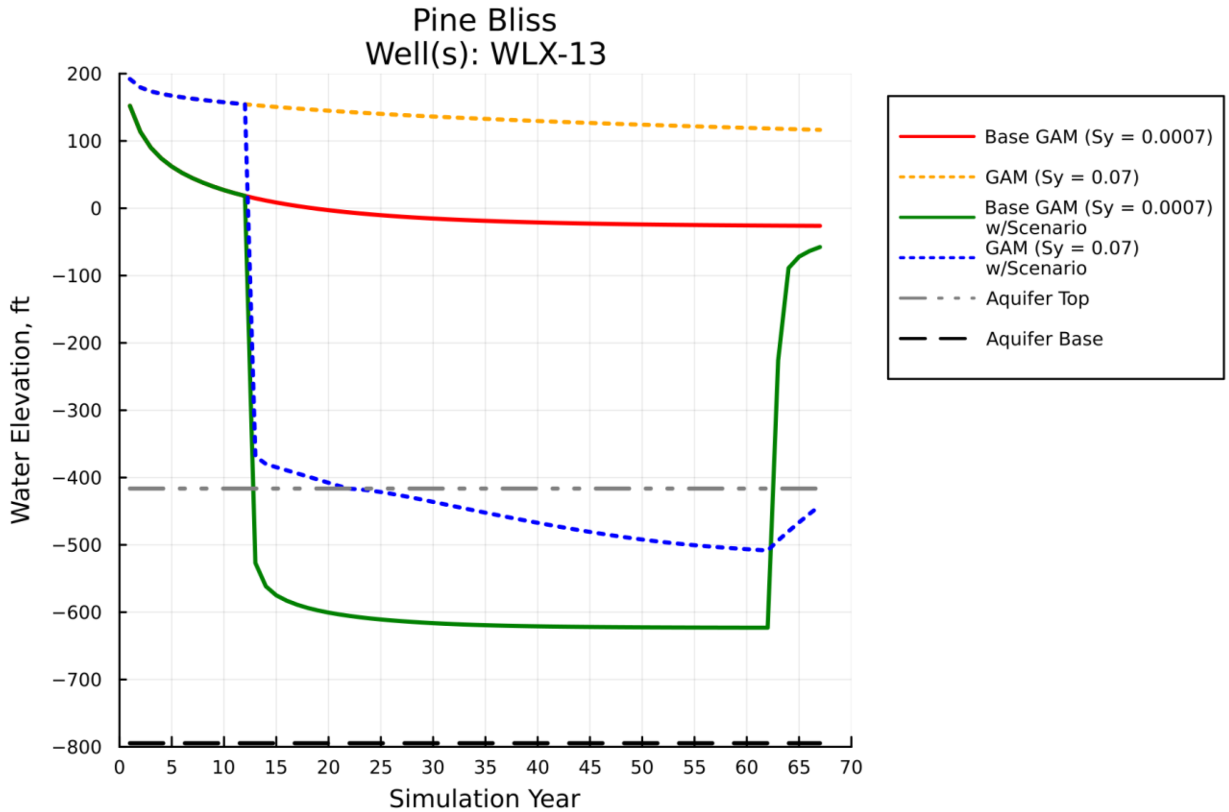

Pine Bliss
Well(s): WLX-4; WLX-5
Water Elevation, ft
Simulation Year
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base


Pine Bliss
Well(s): WLX-6
Water Elevation, ft
Simulation Year
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

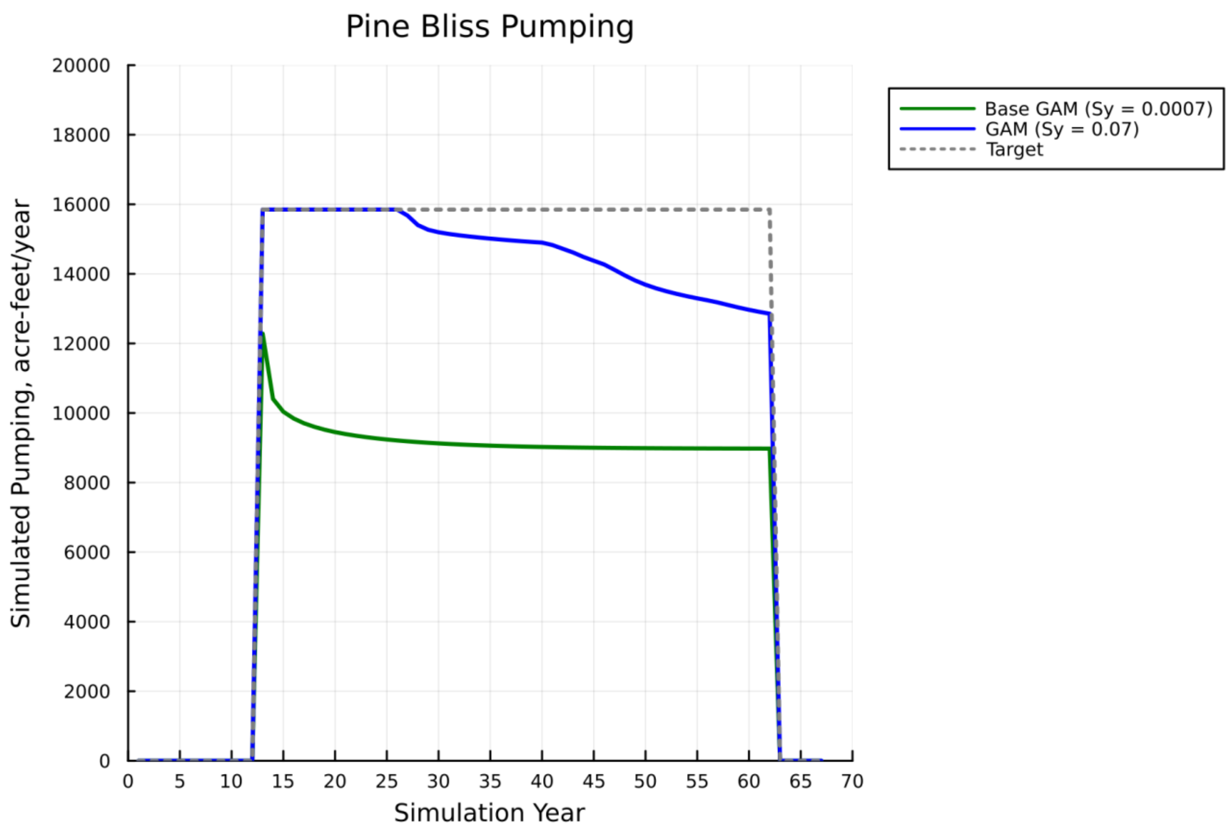

Pine Bliss
Well(s): WLX-8
Water Elevation, ft
Simulation Year
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

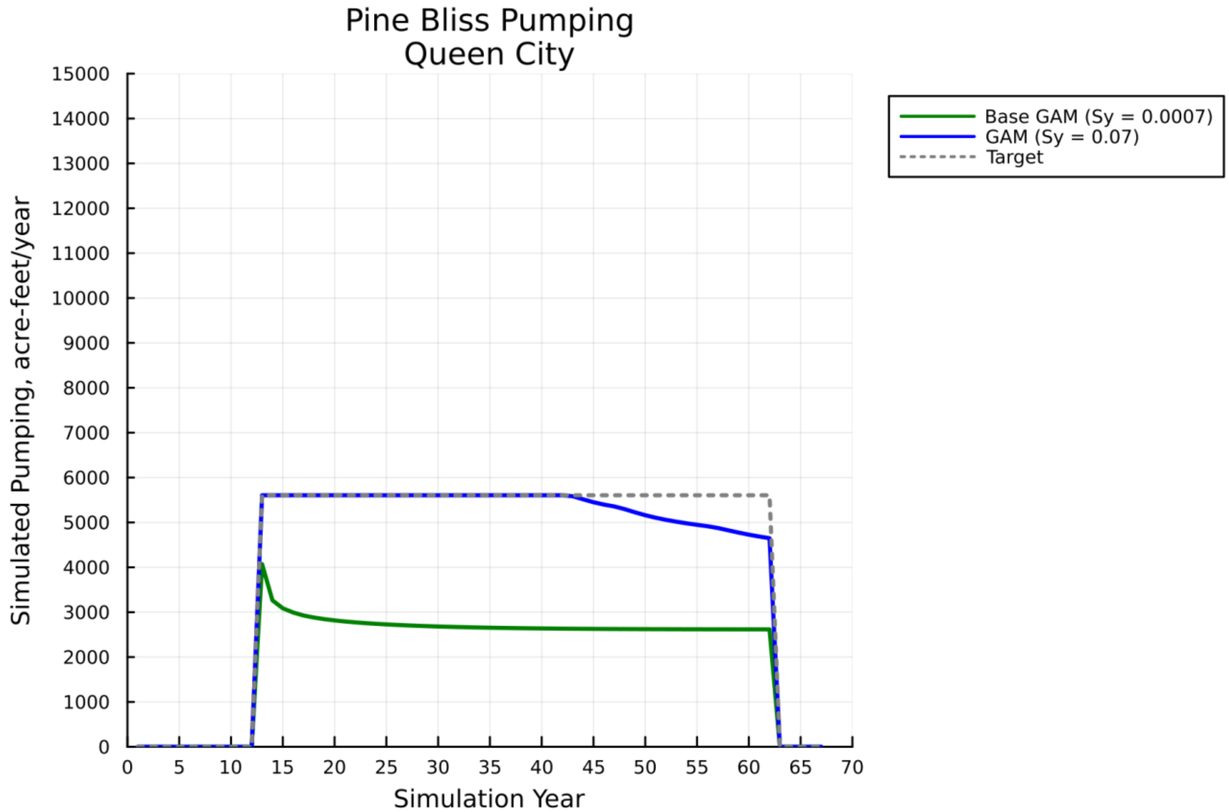

Pine Bliss
Well(s): WLX-11
Water Elevation, ft
Simulation Year
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

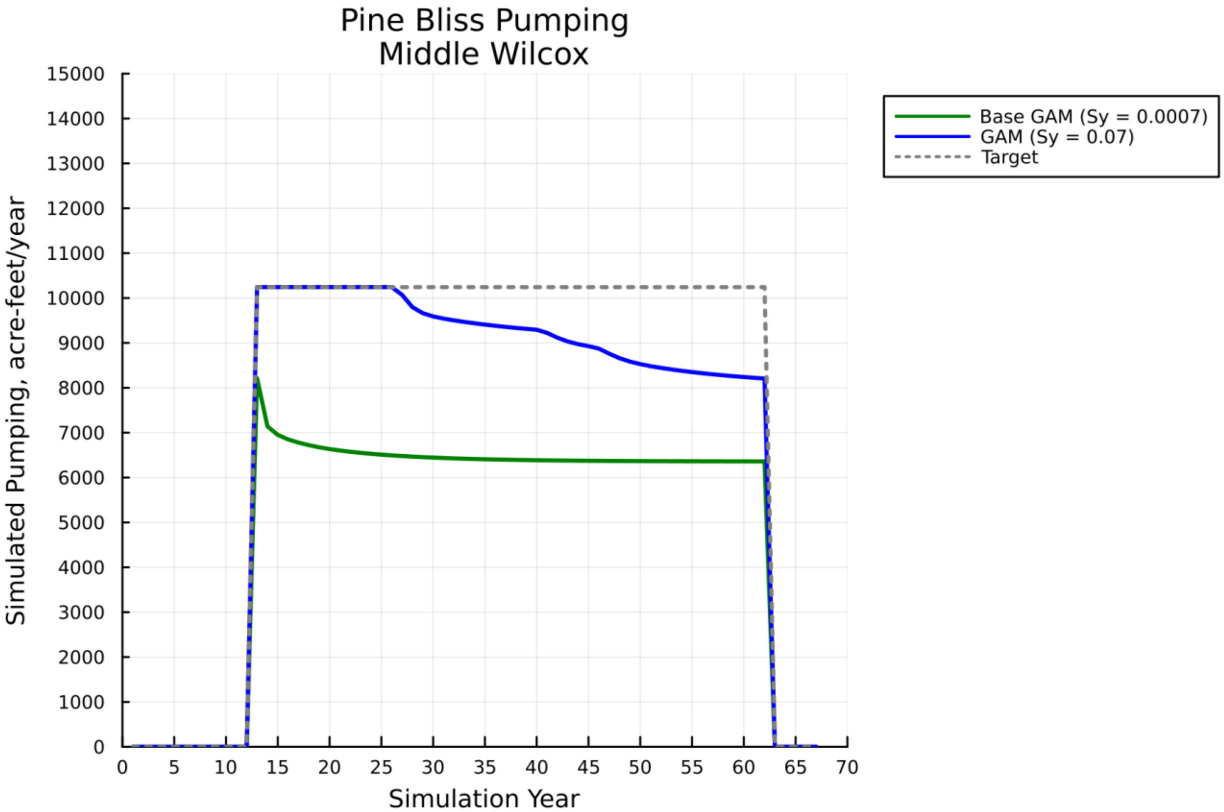

Pine Bliss
Well(s): WLX-12
Water Elevation, ft
Simulation Year
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

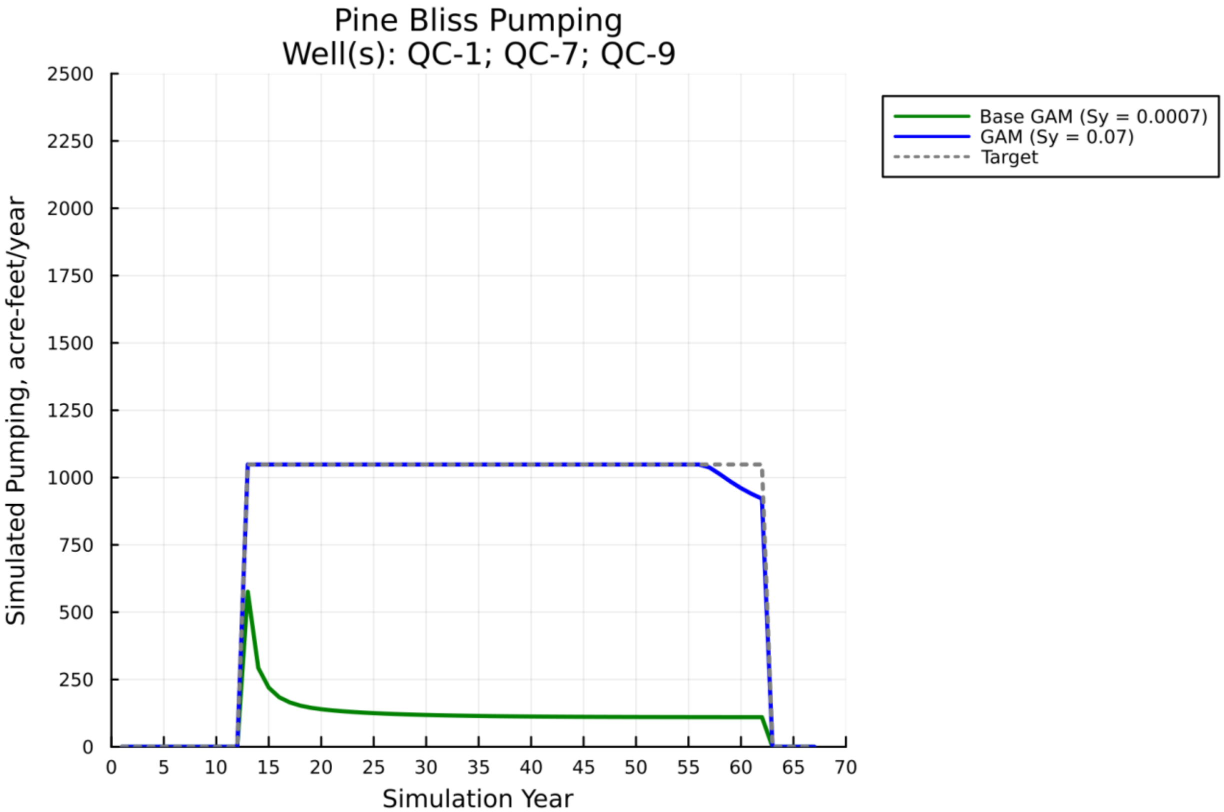

Pine Bliss
Well(s): WLX-13
Water Elevation, ft
Simulation Year
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Base GAM (Sy = 0.0007) w/Scenario
GAM (Sy = 0.07) w/Scenario
Aquifer Top
Aquifer Base

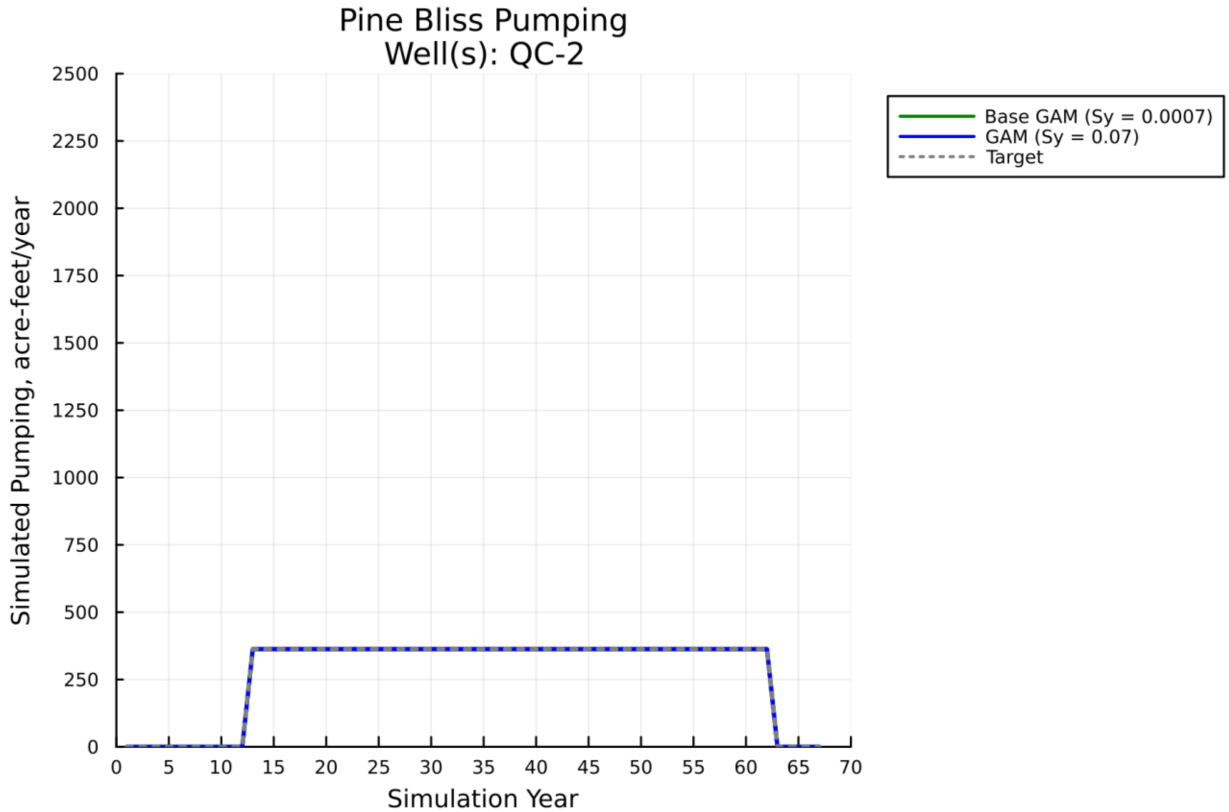
# Simulated Pumping for Pine Bliss Proposed Wells

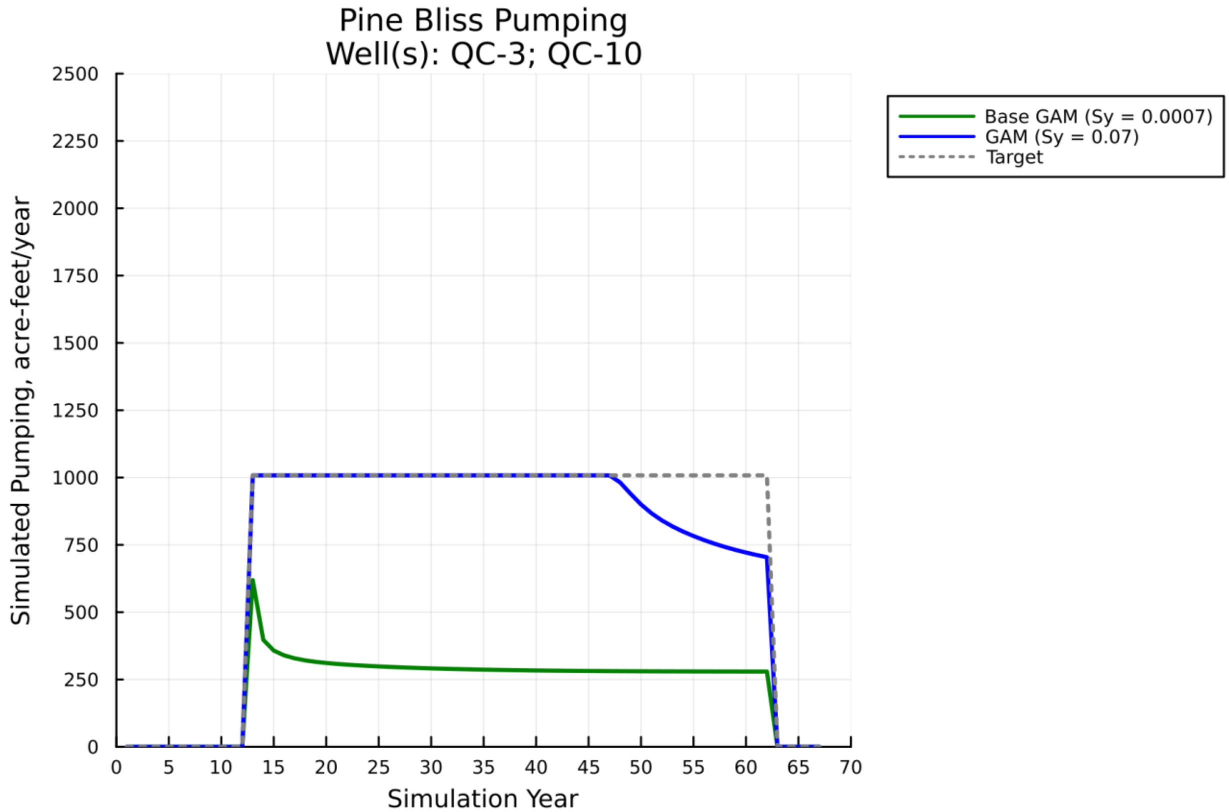

Pine Bliss Pumping
Simulated Pumping, acre-feet/year
Simulation Year
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target

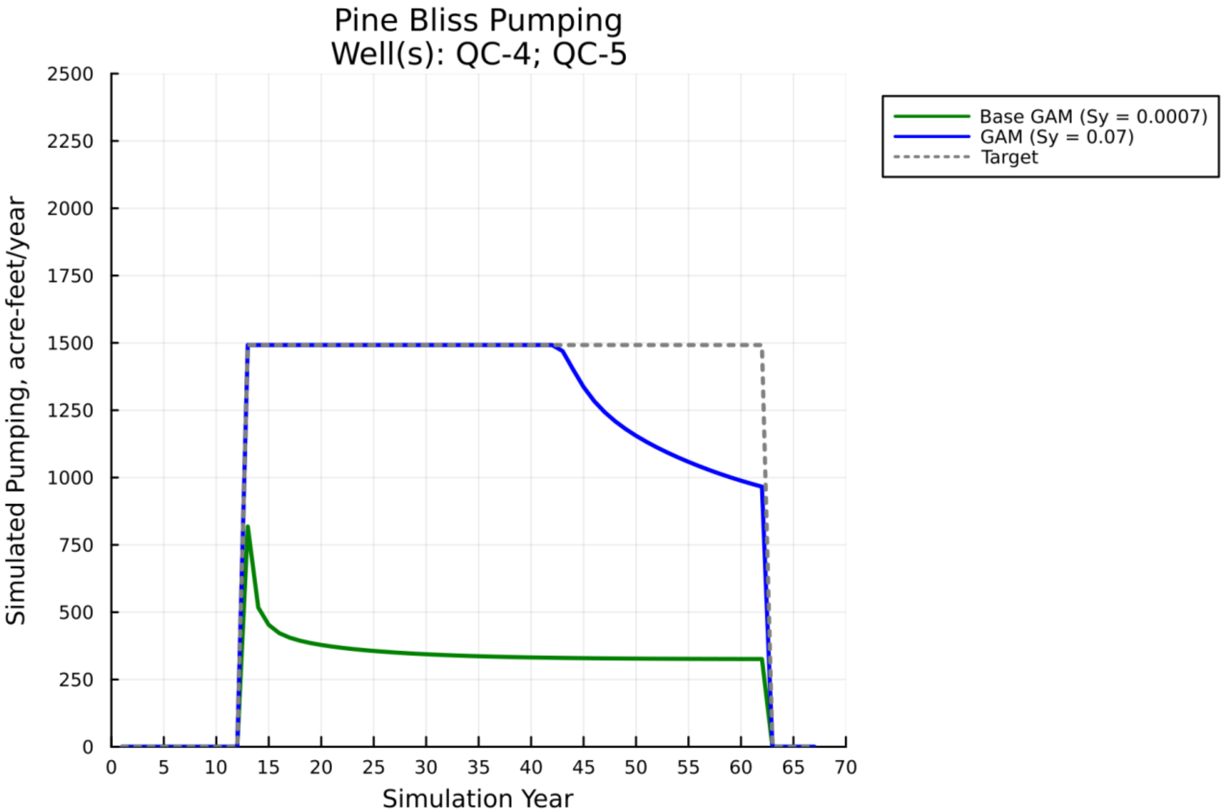

Pine Bliss Pumping
Queen City
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

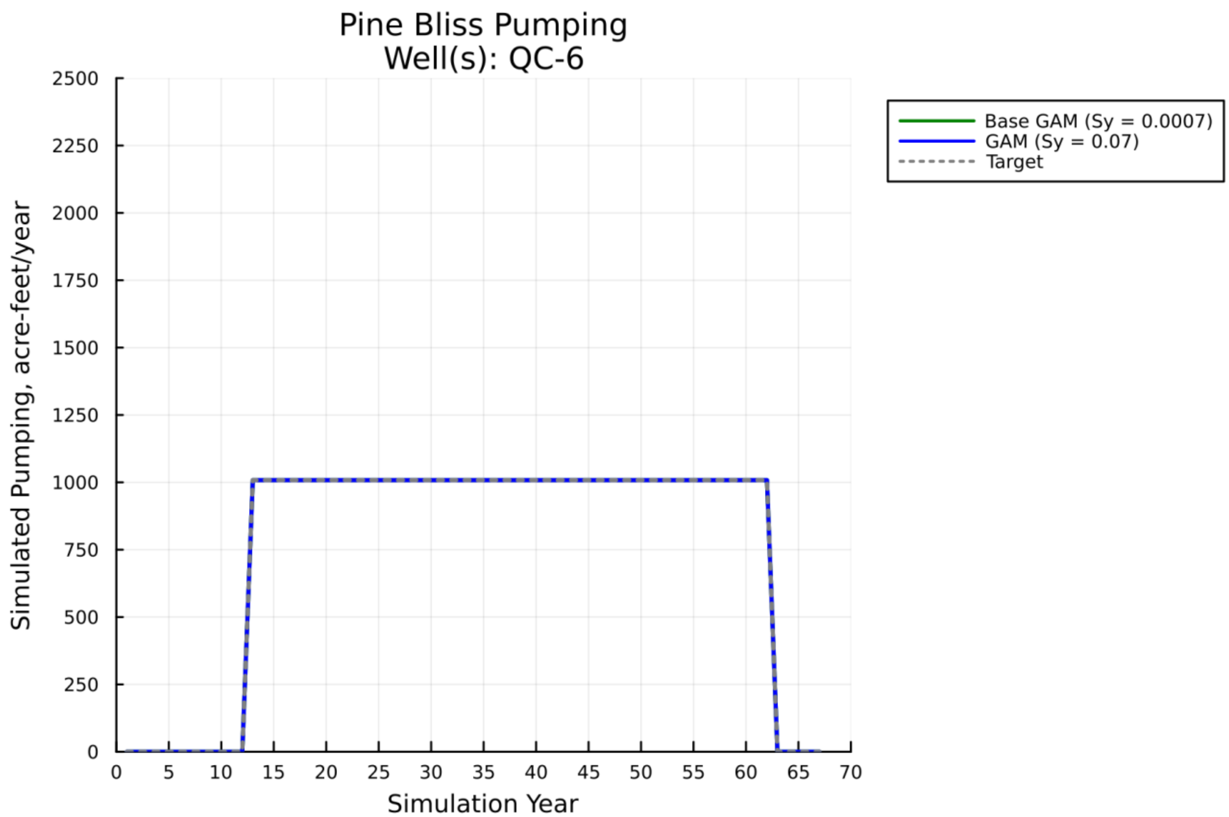

Pine Bliss Pumping
Middle Wilcox
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

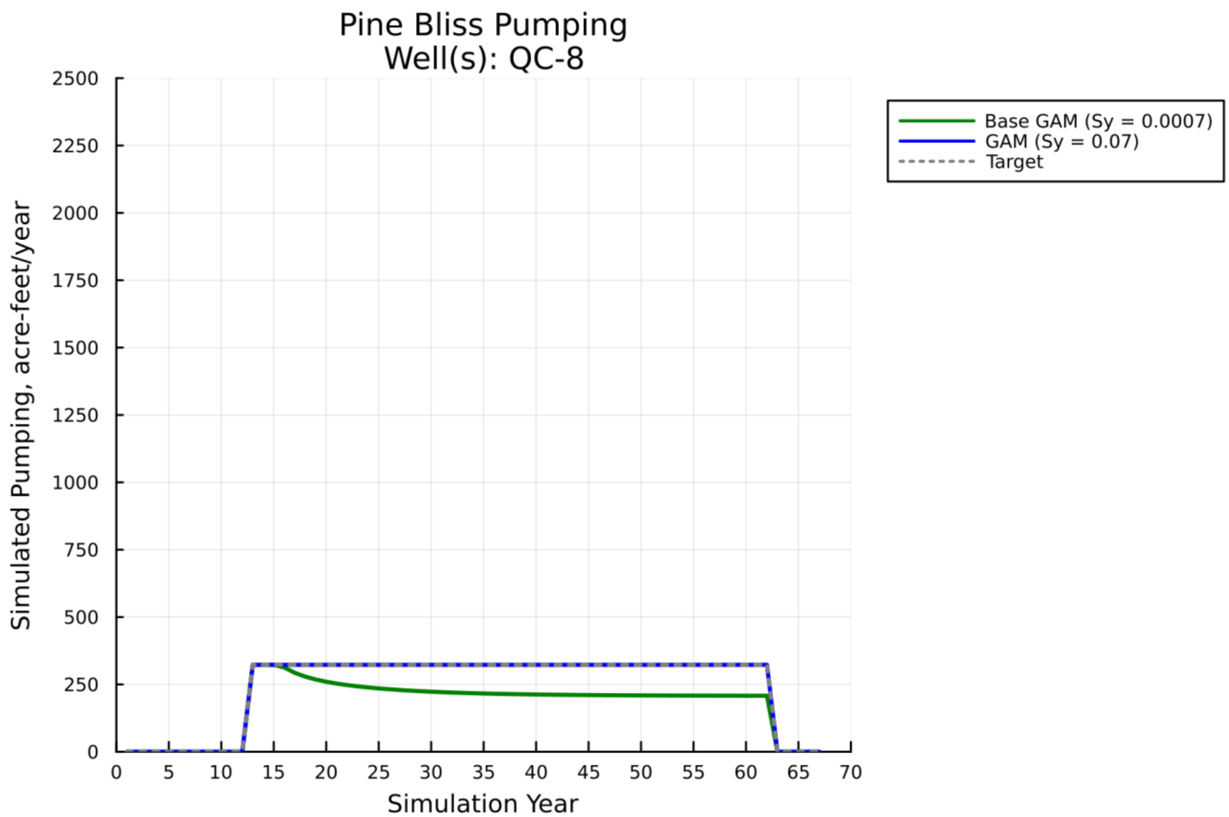

Pine Bliss Pumping
Well(s): QC-1; QC-7; QC-9
Simulated Pumping, acre-feet/year
Simulation Year
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target

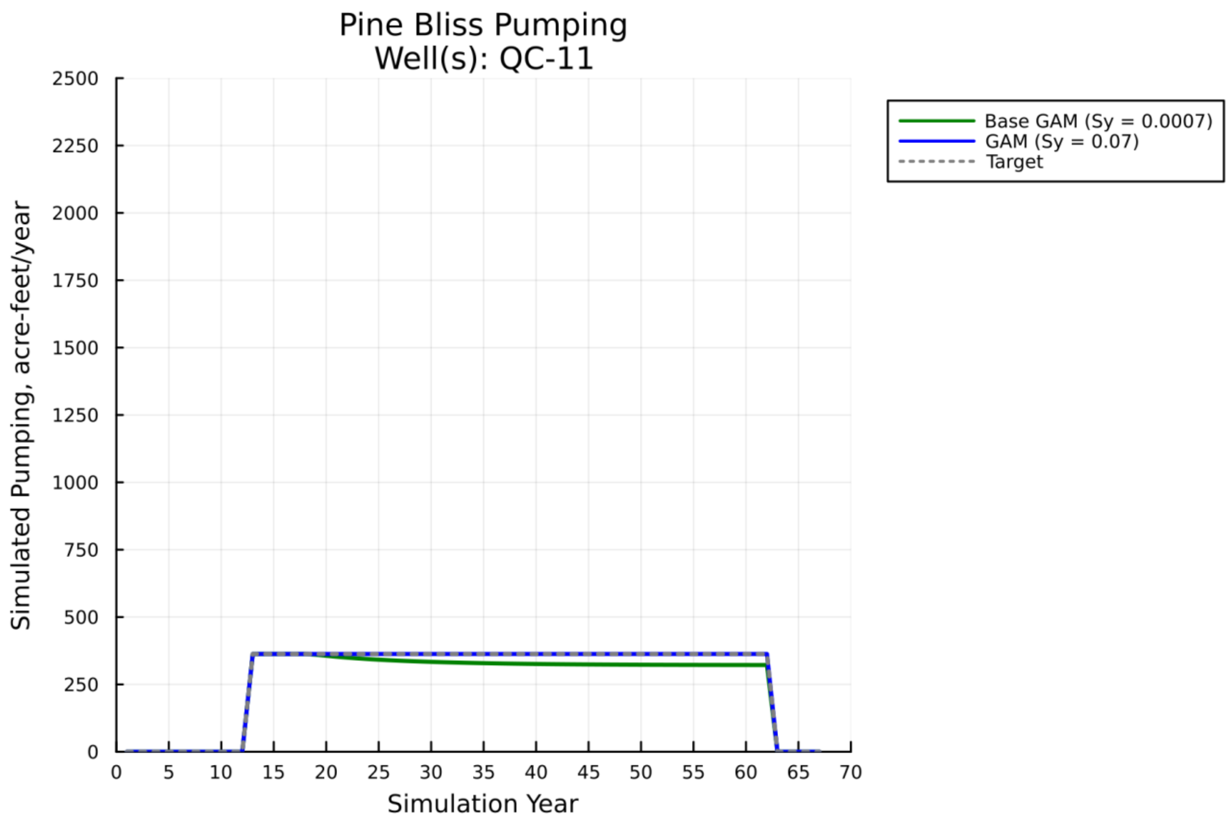

Pine Bliss Pumping
Well(s): QC-2
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

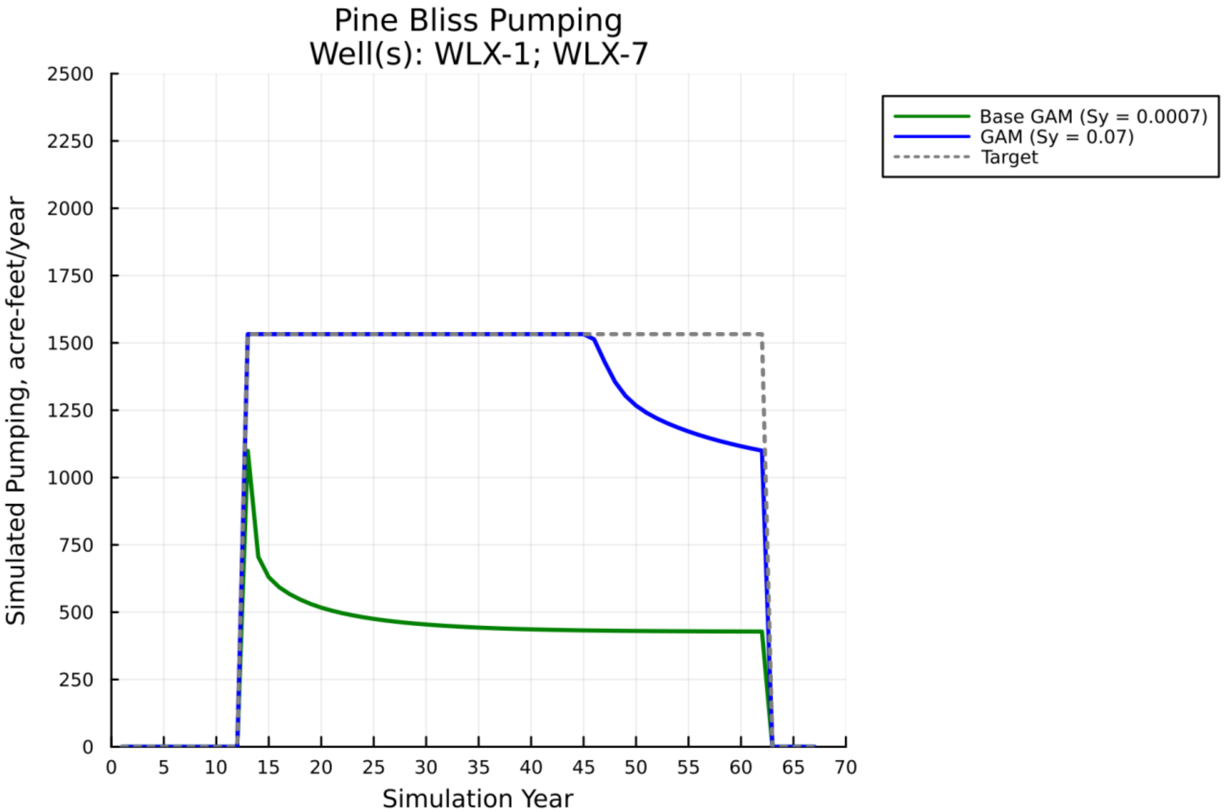

Pine Bliss Pumping
Well(s): QC-3; QC-10
Simulated Pumping, acre-feet/year
Simulation Year
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target

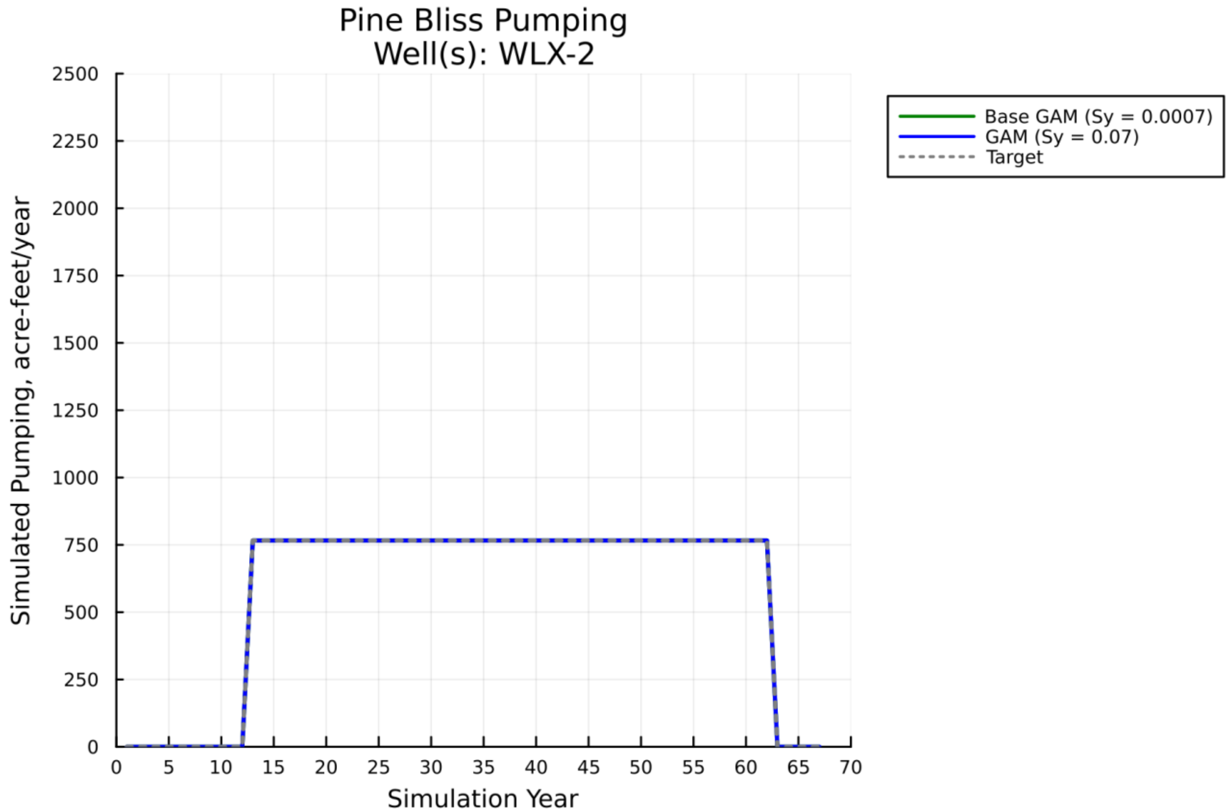

Pine Bliss Pumping
Well(s): QC-4; QC-5
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

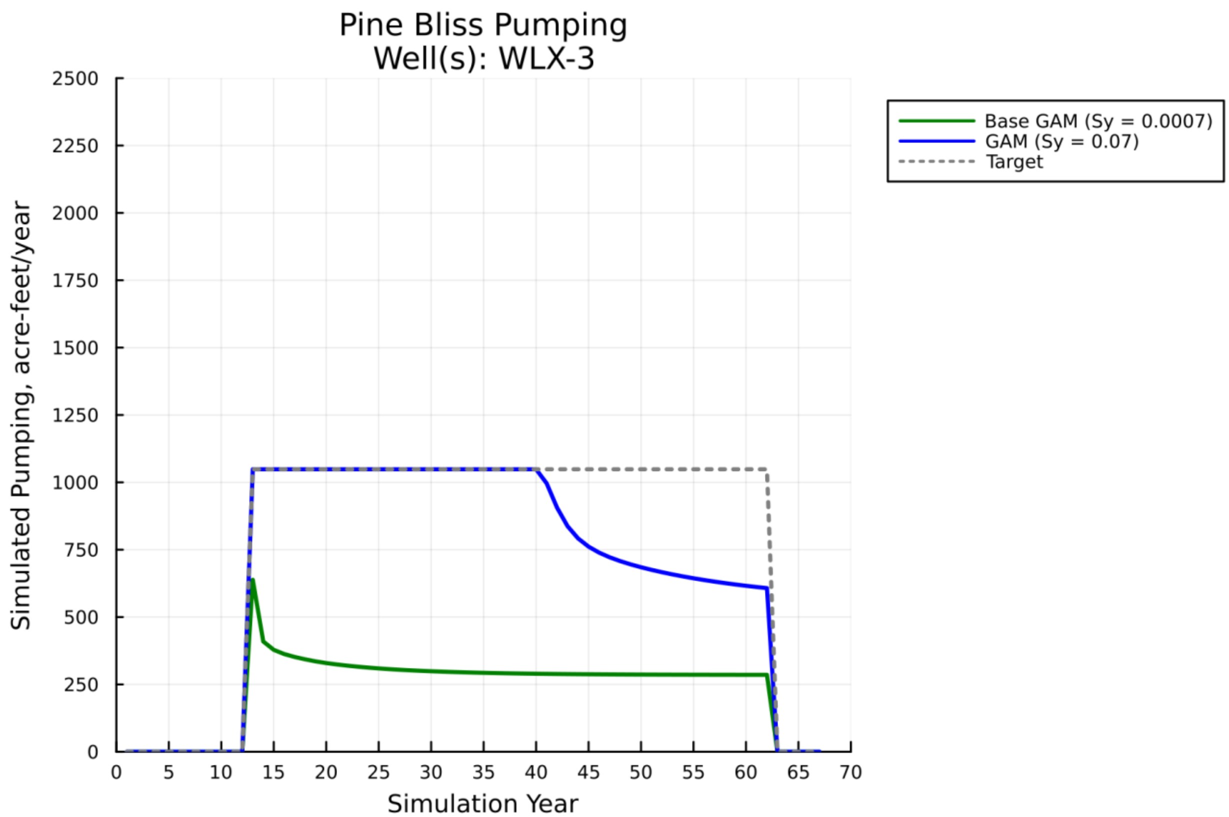

Pine Bliss Pumping
Well(s): QC-6
Simulated Pumping, acre-feet/year
Simulation Year
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target

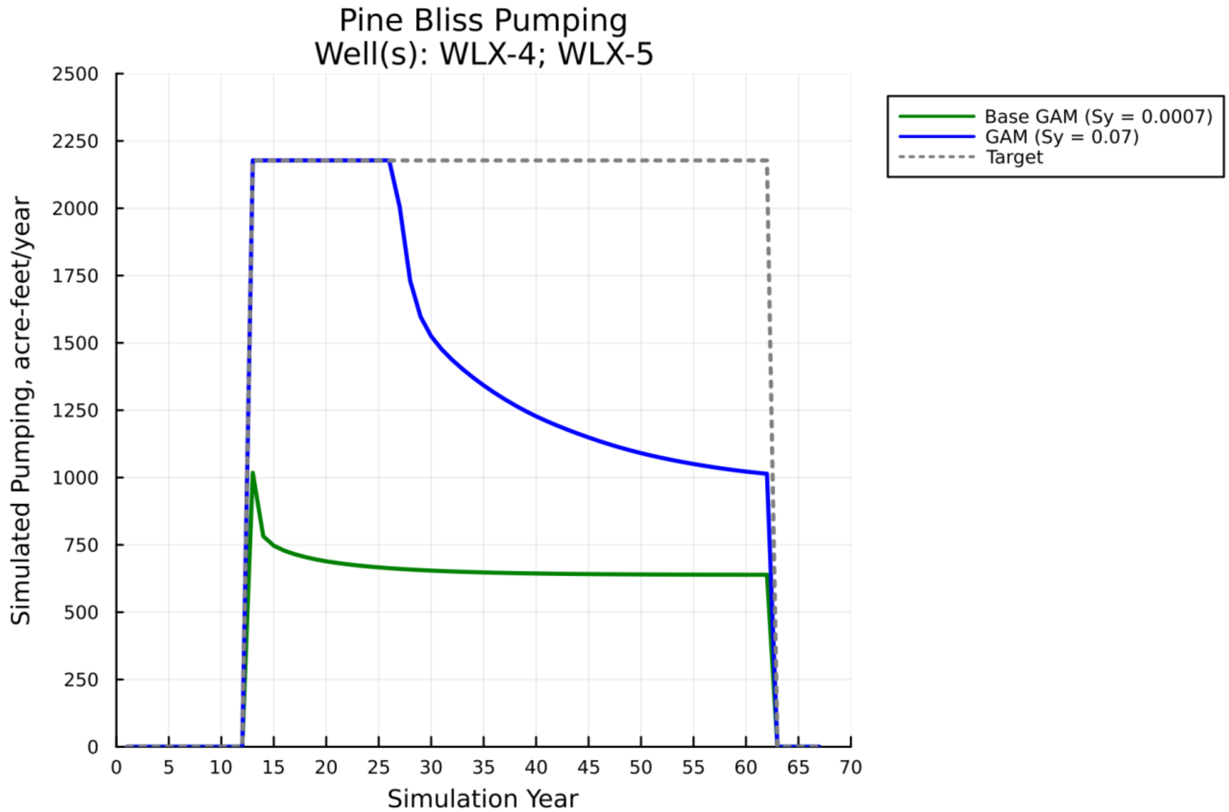

Pine Bliss Pumping
Well(s): QC-8
Simulated Pumping, acre-feet/year
Simulation Year
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target

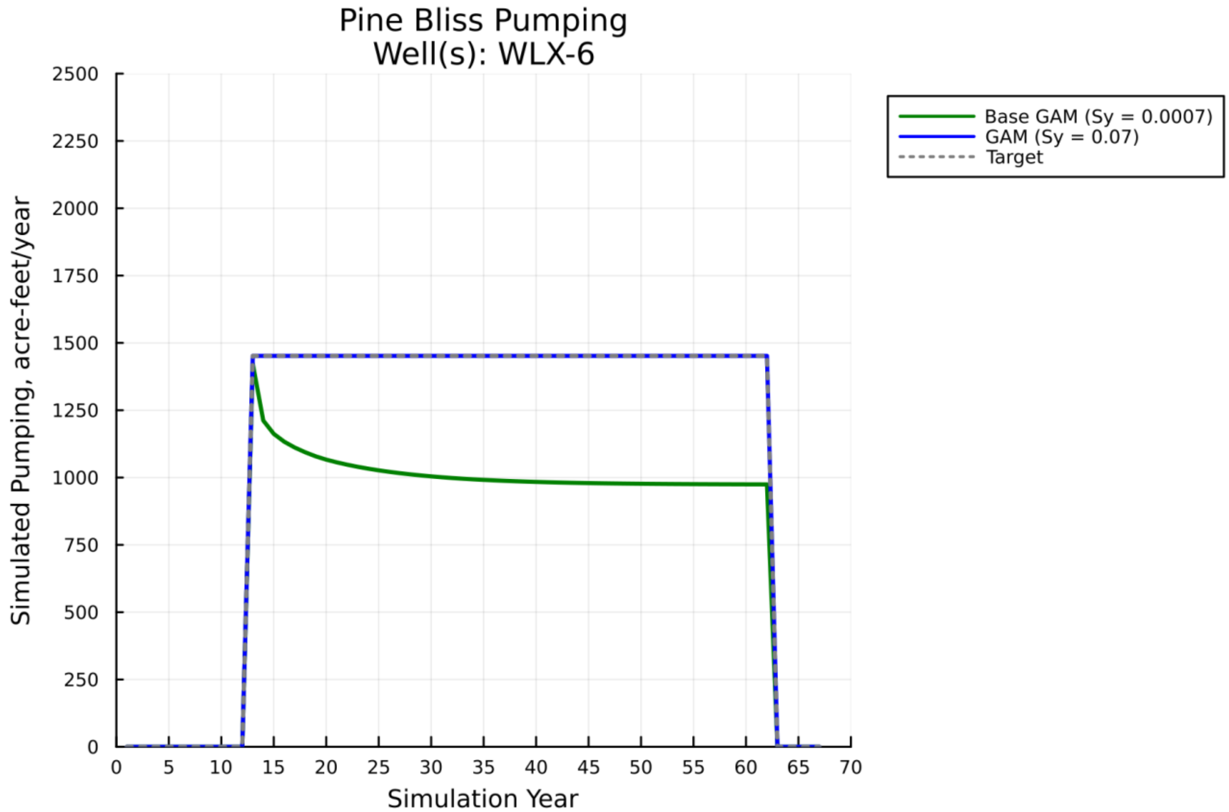

Pine Bliss Pumping
Well(s): QC-11
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

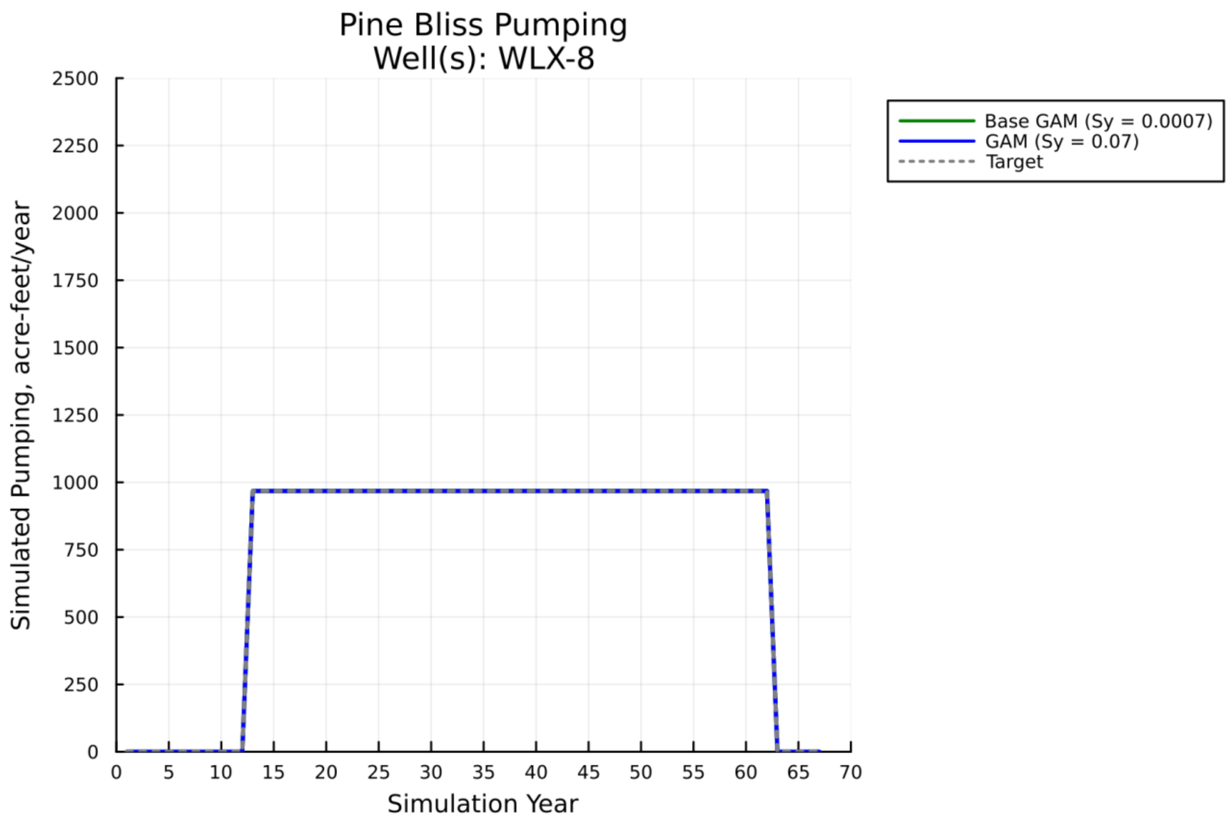

Pine Bliss Pumping
Well(s): WLX-1; WLX-7
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

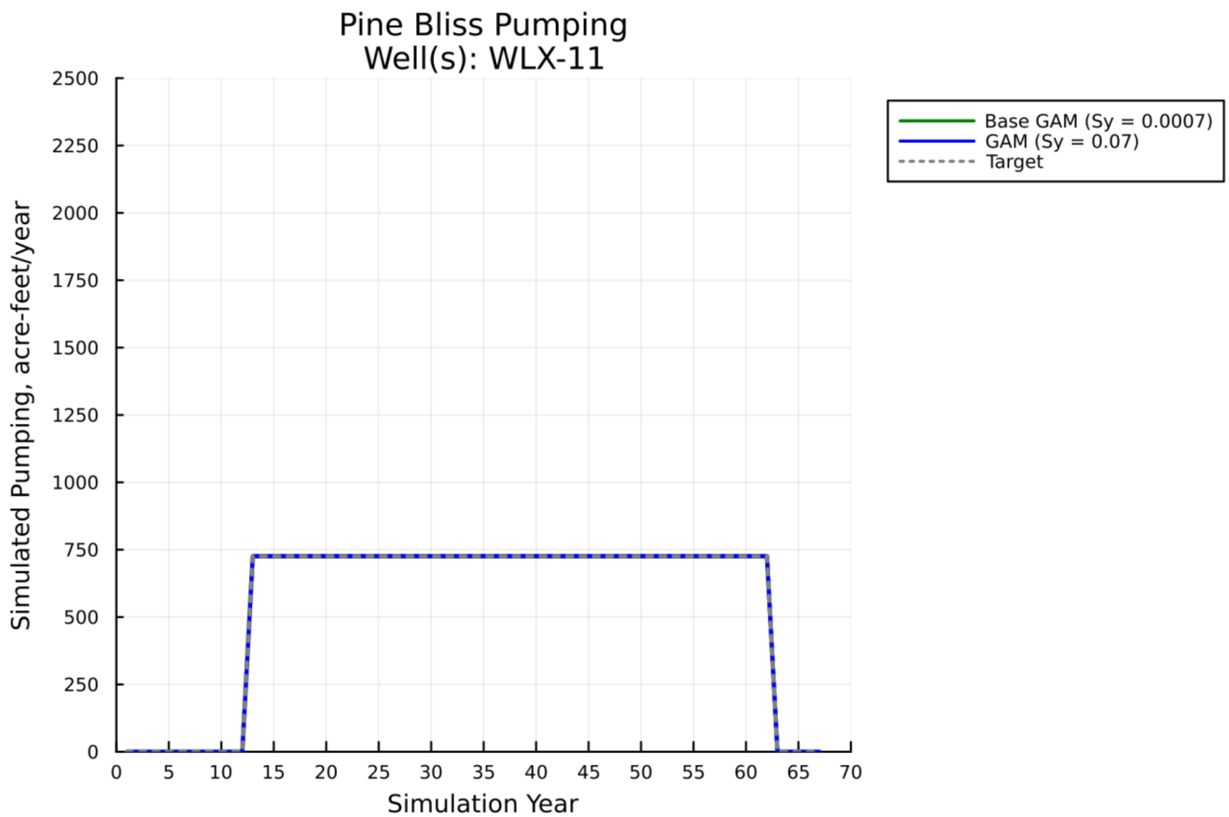

Pine Bliss Pumping
Well(s): WLX-2
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

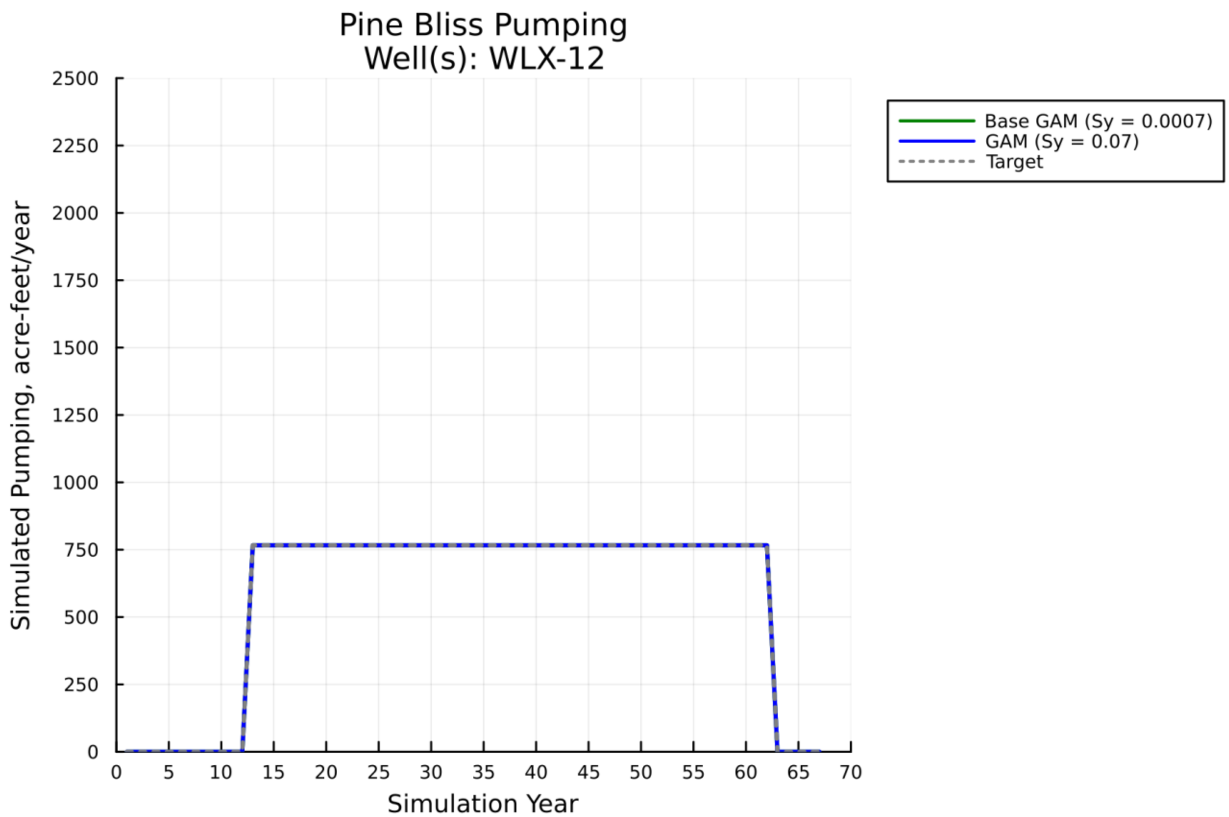

Pine Bliss Pumping
Well(s): WLX-3
Simulated Pumping, acre-feet/year
Simulation Year
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target

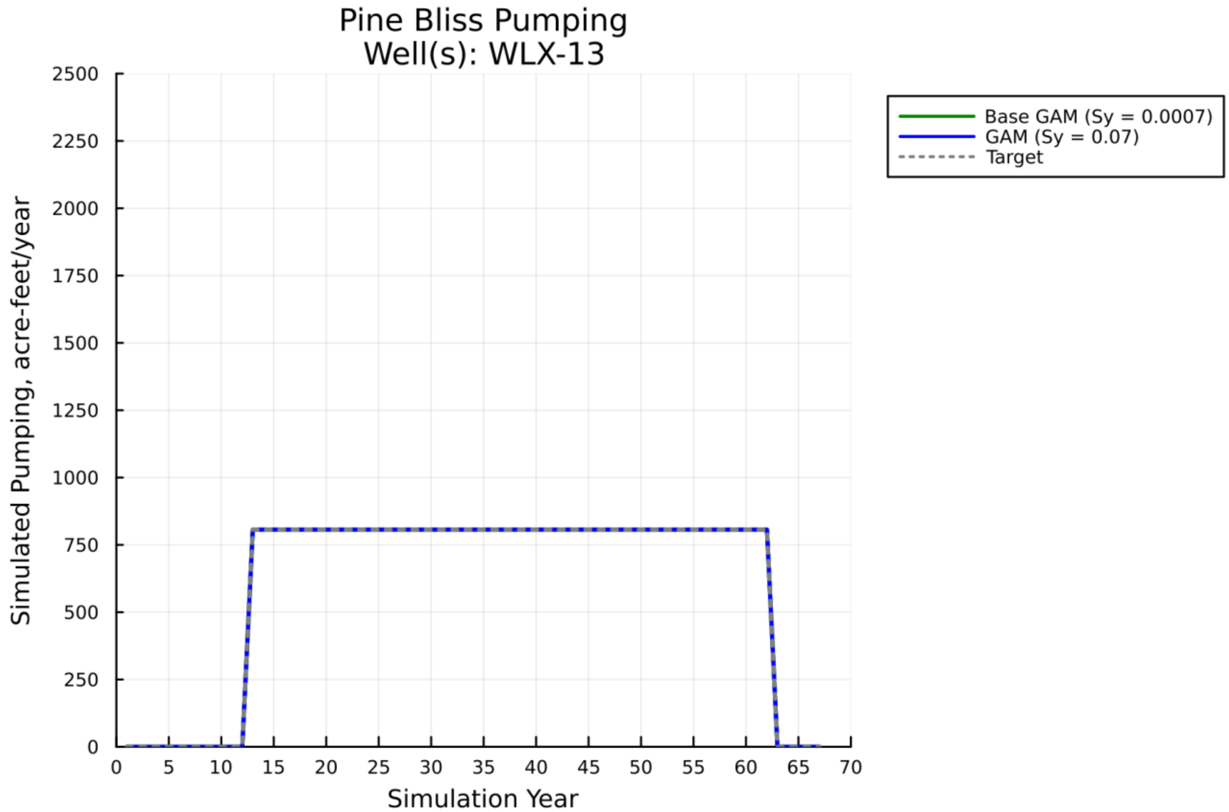

Pine Bliss Pumping
Well(s): WLX-4; WLX-5
Simulated Pumping, acre-feet/year
Simulation Year
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target


Pine Bliss Pumping
Well(s): WLX-6
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70


Pine Bliss Pumping
Well(s): WLX-8
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70


Pine Bliss Pumping
Well(s): WLX-11
Simulated Pumping, acre-feet/year
Simulation Year
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target


Pine Bliss Pumping
Well(s): WLX-12
Simulated Pumping, acre-feet/year
Simulation Year
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target


Pine Bliss Pumping
Well(s): WLX-13
Simulated Pumping, acre-feet/year
Simulation Year
Base GAM (Sy = 0.0007)
GAM (Sy = 0.07)
Target
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70