POSGCD Assessment of PS4-2mod for Development of DFCs

Presented to: GMA 12 Meeting
Milano, Texas

April 16, 2026

Presented by:

INTERA

Outline

- Management of GW Resources
  - 3rd year review
  - OPMAN
  - Unreasonable Impacts
  - Five-year
  - TWDB Grant
- Assessment of PS4-2
  - Development of PS4-2
  - Socioeconomic
  - Property Rights
  - Sustainability
  - Water Budgets
- Concerns

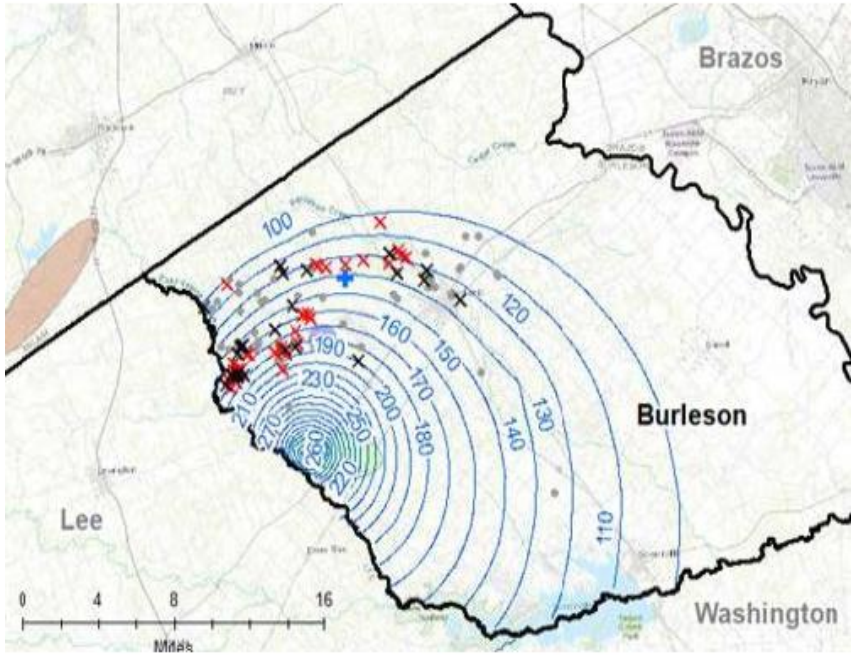
INTERA

POSGCD Management of Groundwater Resources

INTERA

Third Joint Planning Cycle Vote on POSGCD Request to Reduce Production in the GAM Pumping File

In, 2021, GMA 12 voted 4–1 (with POSGCD opposing) to not only to maintain Carrizo Aquifer pumping rate in the GAM simulations at 15,000 af/yr for the Vista Ridge Project but to keep that pumping rate until 2070, which is 18 years beyond when the 40-year Vista Ridge permit expires



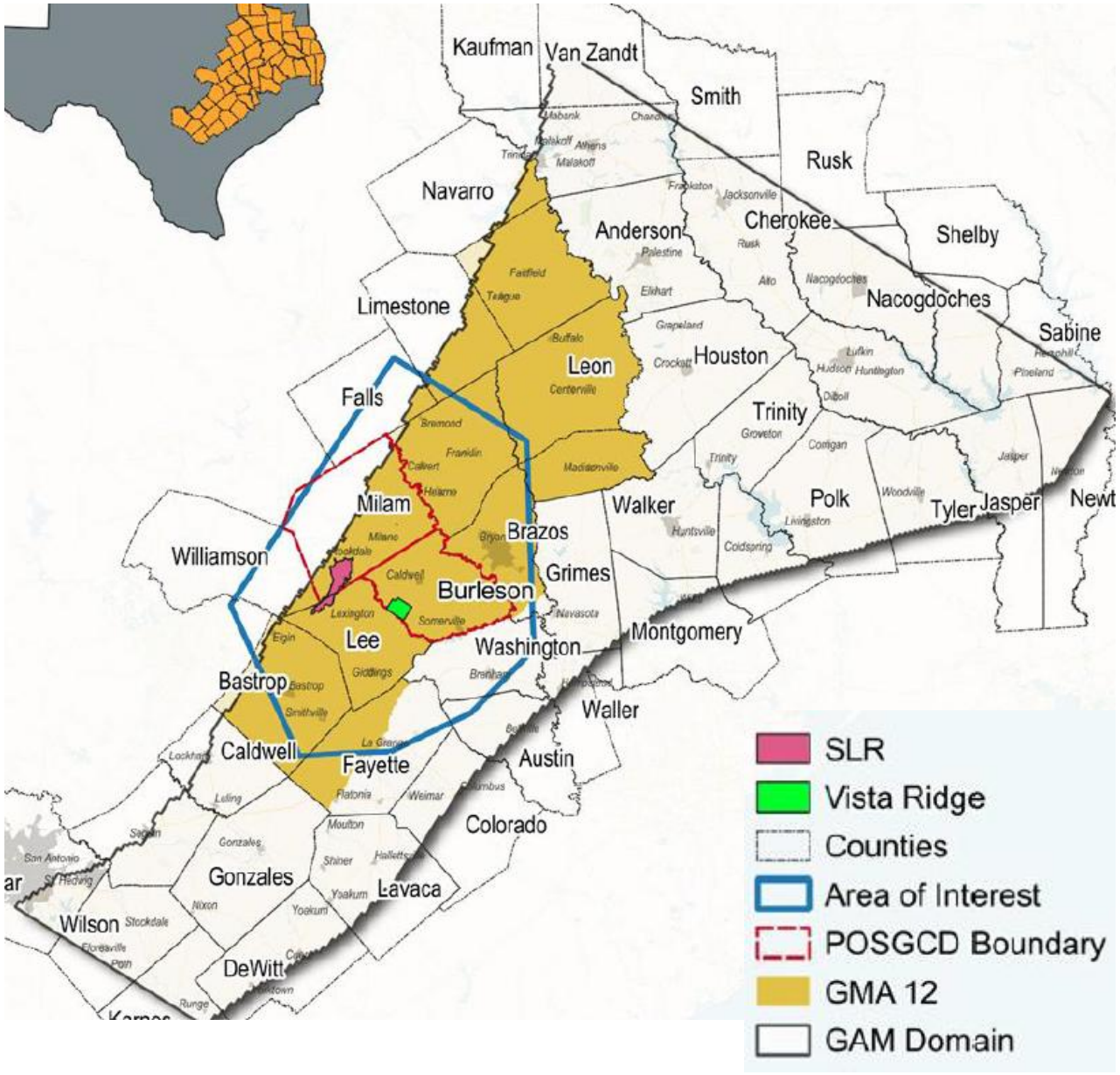
POSGCD Carrizo Production (AFY)	Impacted* Wells		
	2029	2039	2049
18,200	71	114	141
12,200	36	69	97

* Impacted define as water level drops to less than 15 feet above pump setting

Note: Figure and table from Feb and June 2021 GMA 12 Meetings

Development of OPMAN: Reclamation Grant ($550K)

- Objective
  - Enhance GAM to develop an **OP**erations and **MAN**agement Model (**OPMAN**)
  - Apply OPMAN to help guide management decisions
  - Curtailment of permits to achieve management goals
  - Apply OPMAN to investigate long-term sustainability
- OPMAN (Blue Polygon)
  - Update geology
  - Extend historical calibration (1930 to 2021)
  - Simulate >50 aquifer pumping tests
  - Simulate three years of Vista Ridge Pumping
  - Incorporate predictive uncertainty



Unreasonable Impacts

Rule 16.4.6 Unreasonable Impacts

In order to help achieve a balance between production and conservation of groundwater resources, the District will consider the impacts from an aggregate of wells associated with one or more operating permits to be unreasonable if pumping from the aggregate wells, by themselves and without contribution of pumping from wells not part of the aggregate of permitted wells, cause any of the following:

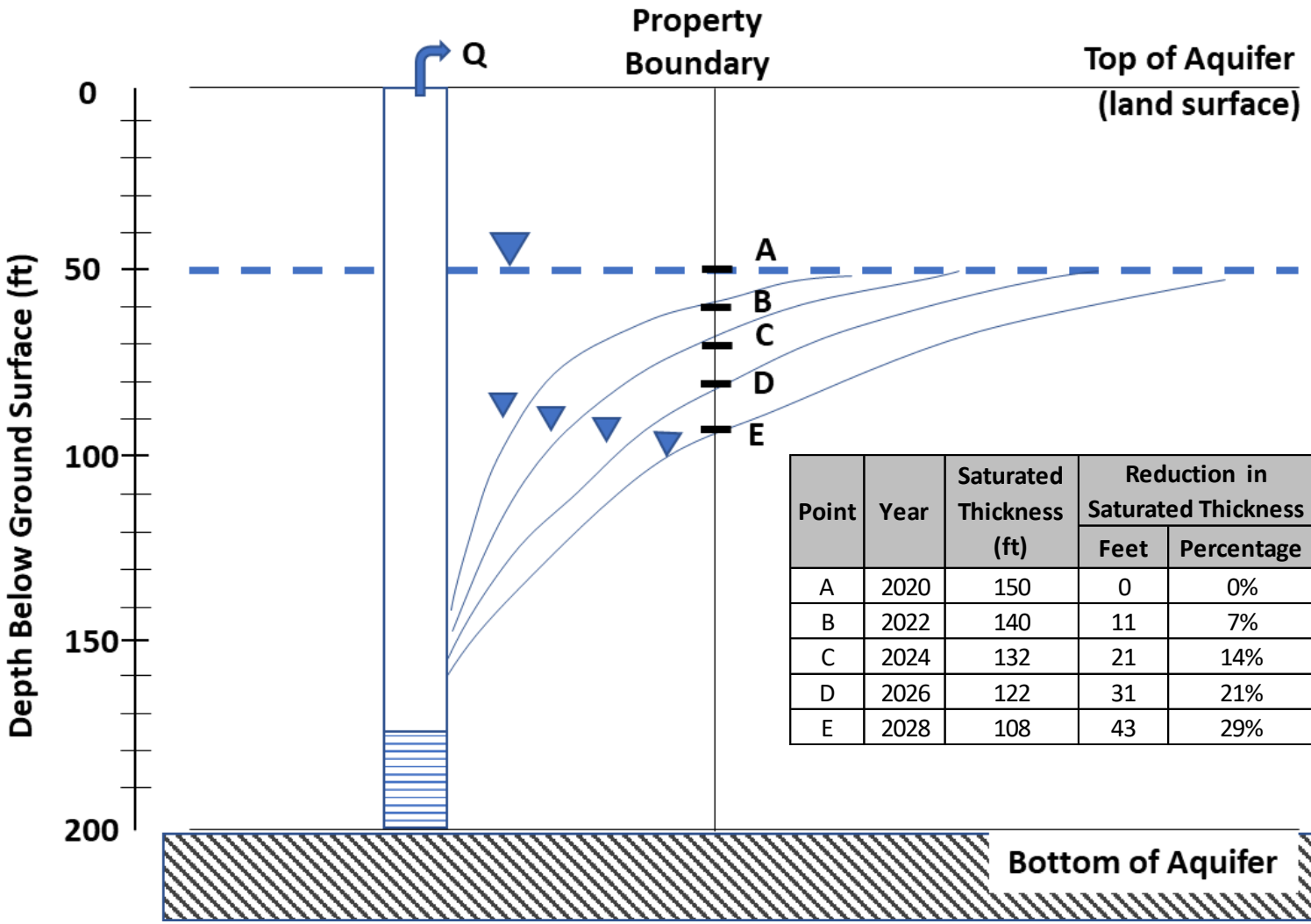
c) More than a 30-foot reduction and more than a 25% reduction in the saturated thickness of the aquifer being pumped by the aggregate wells at any well location outside of one or more operating permits' property or along any part of the boundary of the operating permits' property;

d) More than a 100-foot reduction and more than a 40% reduction in the pressure head above the top of the aquifer at any well location outside of one or more operating permits' property or along any part of the boundary of the operating permits' property;

e) The District has the authority to set the baseline value for a saturated thickness and an artesian pressure on a case by case basis for a baseline year that is not before 2010

Unreasonable Impacts: Unsaturated Thickness

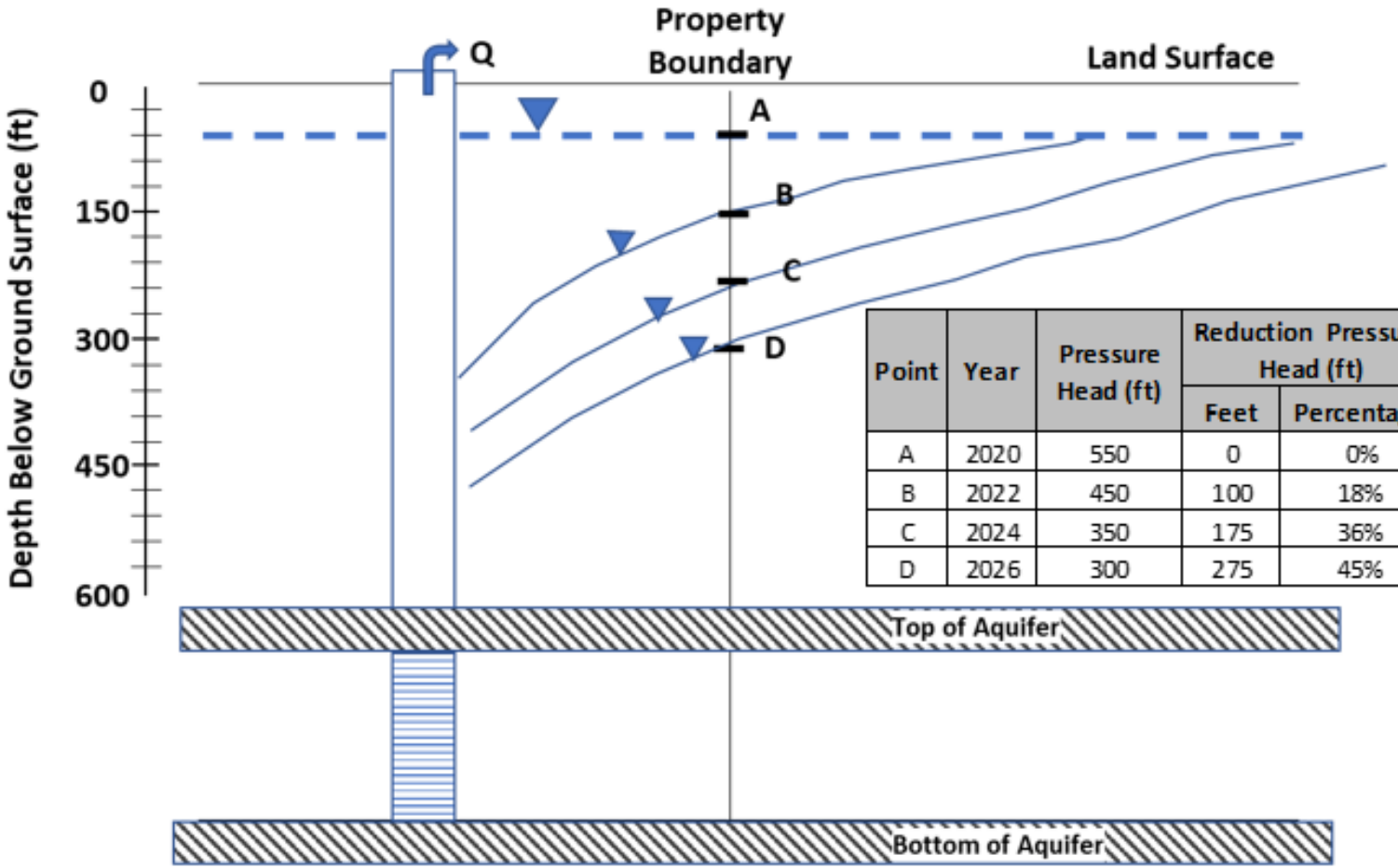
> 30-foot reduction and >25% reduction in the saturated aquifer thickness



Point	Year	Saturated Thickness (ft)	Reduction in Saturated Thickness		Unreasonable Impact Reductions	
			Feet	Percentage	>30-ft	>25%
A	2020	150	0	0%	No	No
B	2022	140	11	7%	No	No
C	2024	132	21	14%	No	No
D	2026	122	31	21%	Yes	No
E	2028	108	43	29%	Yes	Yes

Unreasonable Impacts: Pressure Head

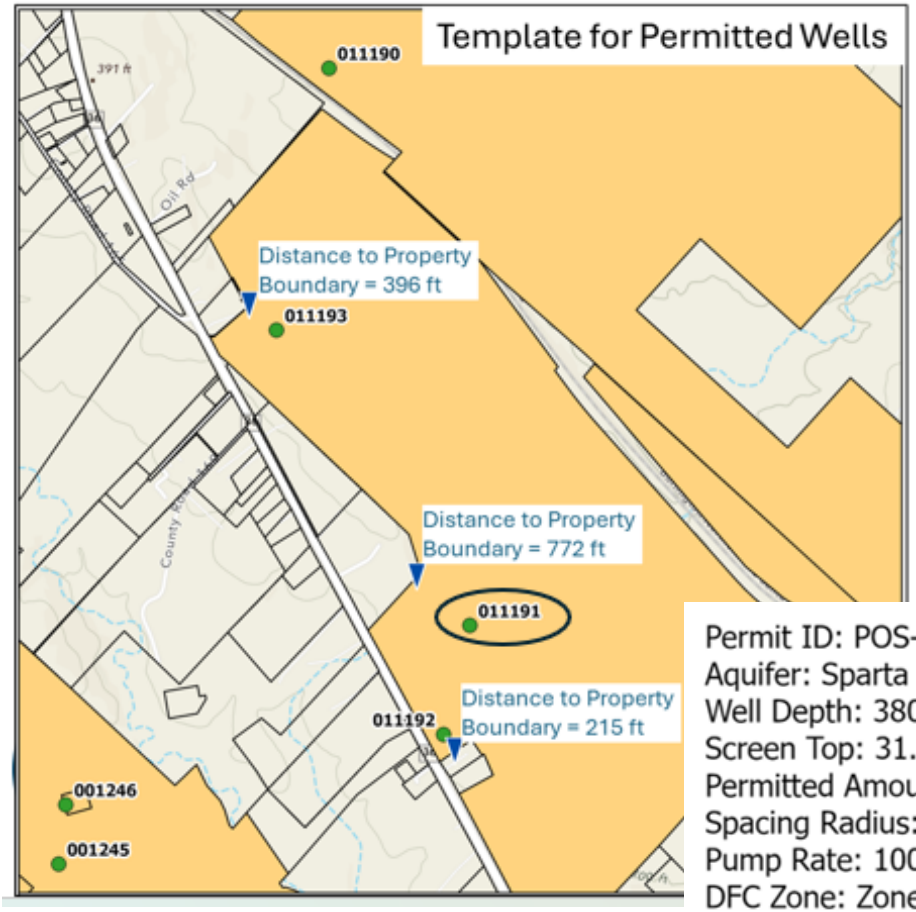
>100-foot reduction and >40% reduction in the pressure head above the top of the aquifer



Point	Year	Pressure Head (ft)	Reduction Pressure Head (ft)		Unreasonable Impact Reductions	
			Feet	Percentage	>100-ft	>40%
A	2020	550	0	0%	No	No
B	2022	450	100	18%	Yes	No
C	2024	350	175	36%	Yes	No
D	2026	300	275	45%	Yes	Yes

Five-Year Review

- Objective
  - Concurrently review >300 production permits associated with >500 wells
- Evaluations
  - Well spacing
  - Desired Future Conditions
  - Protective Drawdown Limits
  - Maximum Allowable Production
  - Production history
  - Unreasonable Impacts



Permit ID: POS-D&OM-0017 Well ID: PO-011191
Aquifer: Sparta Well Status: Active
Well Depth: 380.0 (fbgs) Elv.: 331.4 (ft)
Screen Top: 31.4 (famsl) Screen Bot: -48.6 (famsl)
Permitted Amount: 158.33 (AFY)
Spacing Radius: 200.0 (ft)
Pump Rate: 100.0 (GPM)
DFC Zone: Zone1 SP
PDL Area: Area 1.0
Permit Owner: JB Rancho
Property ID: BURLESON-10642-21594
Lat: 30.499722 Lon: -96.672222
Pump Elevation: 111.4 (famsl)

OPMAN-6: TWDB Grant ($600K)

- Objective
  - Enhance GAM to develop an **OP**erations and **MAN**agement Model (**OPMAN**)
  - Update Sparta and Queen City Aquifers
  - Incorporate water quality assessment
  - Apply OPMAN to investigate long-term sustainability
- OPMAN (Blue Polygon)
  - Update geology, faults, sand maps
  - Extend historical calibration (1930 to 2024)
  - Convert to MODFLOW 6
  - Particle tracking and groundwater dating
  - Incorporate subsidence

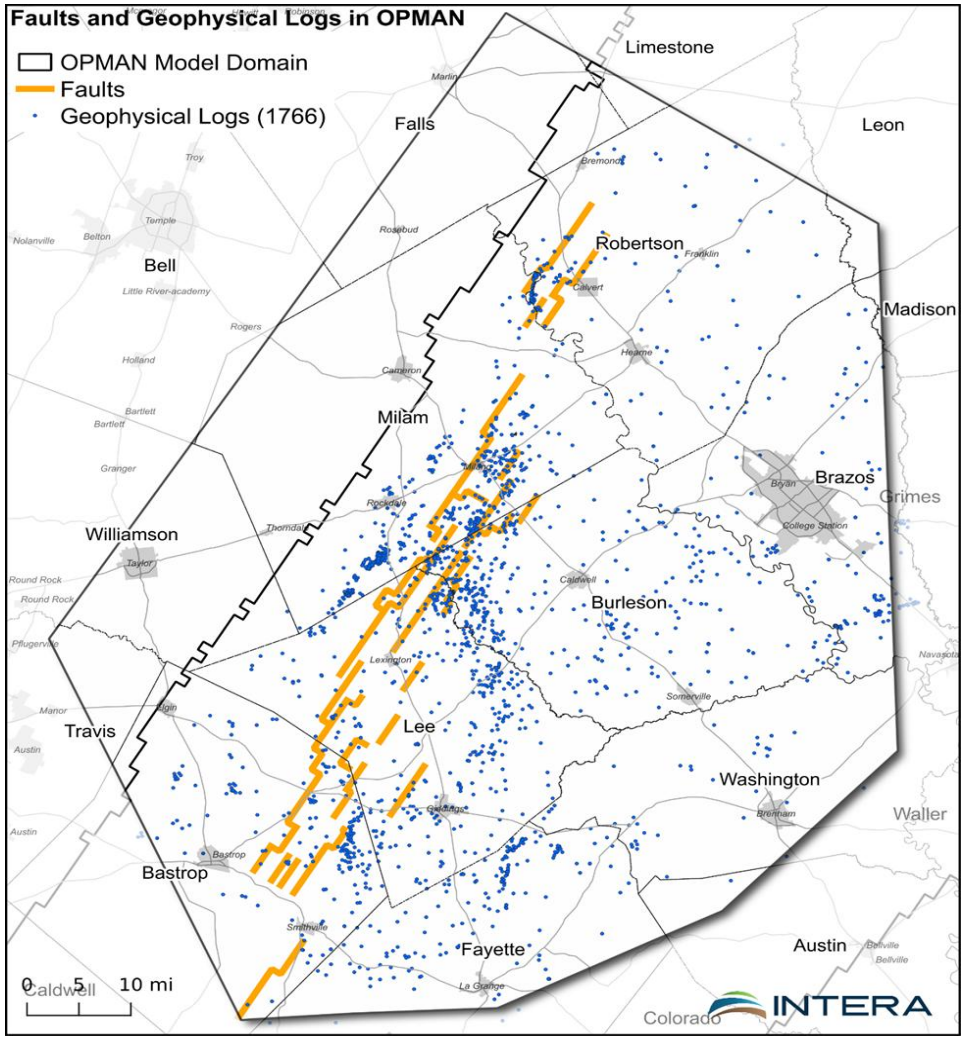


Figure 4-1. Map showing AOI covered by the domain for the OPMAN model and geophysical logs interpreted to locate faults and update the tops and bottoms of the Carrizo, Calvert Bluff, Simsboro, and Hooper aquifers. (reprint from Young et al. (2025))

Assessment of PS4-2mod

POSGD Development of PS-4 series

Overarching Goals

- Maintain the same DFCs for 4th Planning Cycle
- Represent all permits in GAM pumping file

Rules for Adjusting Pumping File

- No change in Layer 1
- Removed all existing pumping below layer 1
- Added in permitted pumping multiplied by ramping the permit producing using:

  2025 - 2030: 25% 2050-2060: 60%

  2030 - 2050: 50% 2060-2080: 75%

- If **2024** reported pumping for a permit was greater than this "ramped" value, the reported pumping was used instead, where the reported volume was divided equally among the wells in the permits. For example, Vista Ridge was kept at a constant ~50,000 afy.
-

Results

	PS3-19	PS3-19*
	POSGCD	POSGCD
SP	32	45
QC	30	28
CZ	162	155
CB	158	156
SB	277	284
HP	176	179

Carrizo-Wilcox values for PA3-19* are within 3% of PS3-19

*with POSGCD pumping used for PS-4, PS-4mod, and PS4-mod2

DFC Comparison Between PS3-19 and PS4-2mod

Notable Changes in DFCs*

- BVGCD
  - Calvert Bluff : 26% ⬆
  - Simsboro: 40% ⬆
  - Hooper : 30% ⬆
- POSGCD
  - Calvert Bluff: 15% ⬆
  - Simsboro: 28% ⬆
  - Hooper 25% ⬆
- Fayette
  - Carrizo 17% ⬆

GCD	Aquifer	PS3-19	PS4-2 Modified_V2
BVGCD	Sparta	50.5	56.9
	Queen City	42.3	46.3
	Carrizo	75.8	83.3
	Calvert Bluff	94	118.5
	Simsboro	202.2	282.6
	Hooper	145.9	190.2
FAYETTE	Sparta	47	56.5
	Queen City	76.2	95.8
	Carrizo	148.2	173.3
	Calvert Bluff	153.8	184.4
	Simsboro	219.3	275.5
	Hooper	132.6	181.6
LPGCD	Sparta	21.9	21.5
	Queen City	29.5	31.4
	Carrizo	140.5	138.7
	Calvert Bluff	139.3	141.2
	Simsboro	249.5	261.3
	Hooper	146.7	157.2
METGCD	Sparta	26.1	22.2
	Queen City	21.5	18.9
	Carrizo	49.8	45.1
	Calvert Bluff	59.6	58.2
	Simsboro	79.3	84.7
	Hooper	73.7	76.1
POSGCD	Sparta	33.5	46
	Queen City	32	30
	Carrizo	168.8	170.3
	Calvert Bluff	163.6	188.9
	Simsboro	287.8	369
	Hooper	189.5	236.4

* Calculation determine by INTERA Excel Sheet

Notable change from PS3-19

2011-2080 POSGCD Simsboro –PS4-2-modv2

GAM

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	21	14											21
20-40	28	17									3	1	24
40-60	50	29		1		1	2	6	3	3	3		31
60-80	50	26				2	5	6	6	1		2	28
80-100	36	21			4	4	6	1	2	1	2	2	14
100-150	70	6		1	2	8	3	6	8	2	4	4	32
150-200	51	1	4	3	2	6	4	2	3	1	4	11	11
200-250	36	1	2	3	6	6	4	5	1	6	2	0	1
250-500	197	1	1	13	52	27	21	32	19	10	12	4	6
500+	106			10	43	29	6	16	2				
TOTAL	645	116	7	31	109	83	51	74	44	24	30	24	168

Well Impact
Dry – 168 (26%)
>50% - 364 (56%)

OPMAN

2011 Water Column (ft)	Total Wells	Outcrop	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%+
0-20	15	13											15
20-40	34	24				1		1	1				31
40-60	43	23	1		3	3	2		1			1	32
60-80	44	20		3	3	1		4	1	2		1	29
80-100	47	12		2	1		3	3		2	1	1	34
100-150	69	6		4	4	1	6	3	3		4	7	37
150-200	48	2			3	3	2	5	5	6	4	5	15
200-250	51				4	4	3	12	8	6	1	1	12
250-500	191	1	2	55	20	19	25	17	14	13	10	5	11
500+	98		5	44	30	6	4		4	5			
TOTAL	640	101	8	108	68	38	45	45	37	34	20	21	216

Well Impact
Dry – 216 (34%)
>50% - 373 (58%)

INTERA

Prediction of Adverse Socioeconomic Impacts Through 2080

GCD	Aquifer	Eligible Wells	2080 N Dry	2080 % Dry
BVGCD	Sparta	642	14	2.2
	Queen City	615	2	0.3
	Carrizo	170	19	11.2
	Calvert Bluff	856	62	7.2
	Simsboro	367	7	1.9
	Hooper	171	1	0.6
	TOTAL	**2821**	**105**	**3.7**
FCGCD	Sparta	2	0	0
	Queen City	1	0	0
	Calvert Bluff	1	0	0
	TOTAL	**4**	**0**	**0**
LPGCD	Sparta	146	0	0
	Queen City	331	1	0.3
	Carrizo	190	5	2.6
	Calvert Bluff	513	10	1.9
	Simsboro	286	9	3.1
	Hooper	310	0	0
	TOTAL	**1776**	**25**	**1.4**

GCD	Aquifer	Eligible Wells	2080 N Dry	2080 % Dry
METGCD	Sparta	441	0	0
	Queen City	632	0	0
	Carrizo	300	0	0
	Calvert Bluff	1423	0	0
	Simsboro	724	0	0
	Hooper	564	0	0
	TOTAL	**4084**	**0**	**0**
POSGCD	Sparta	1172	4	0.3
	Queen City	1081	3	0.3
	Carrizo	461	8	1.7
	Calvert Bluff	725	29	4
	Simsboro	653	168	25.7
	Hooper	797	6	0.8
	TOTAL	**4889**	**218**	**4.5**

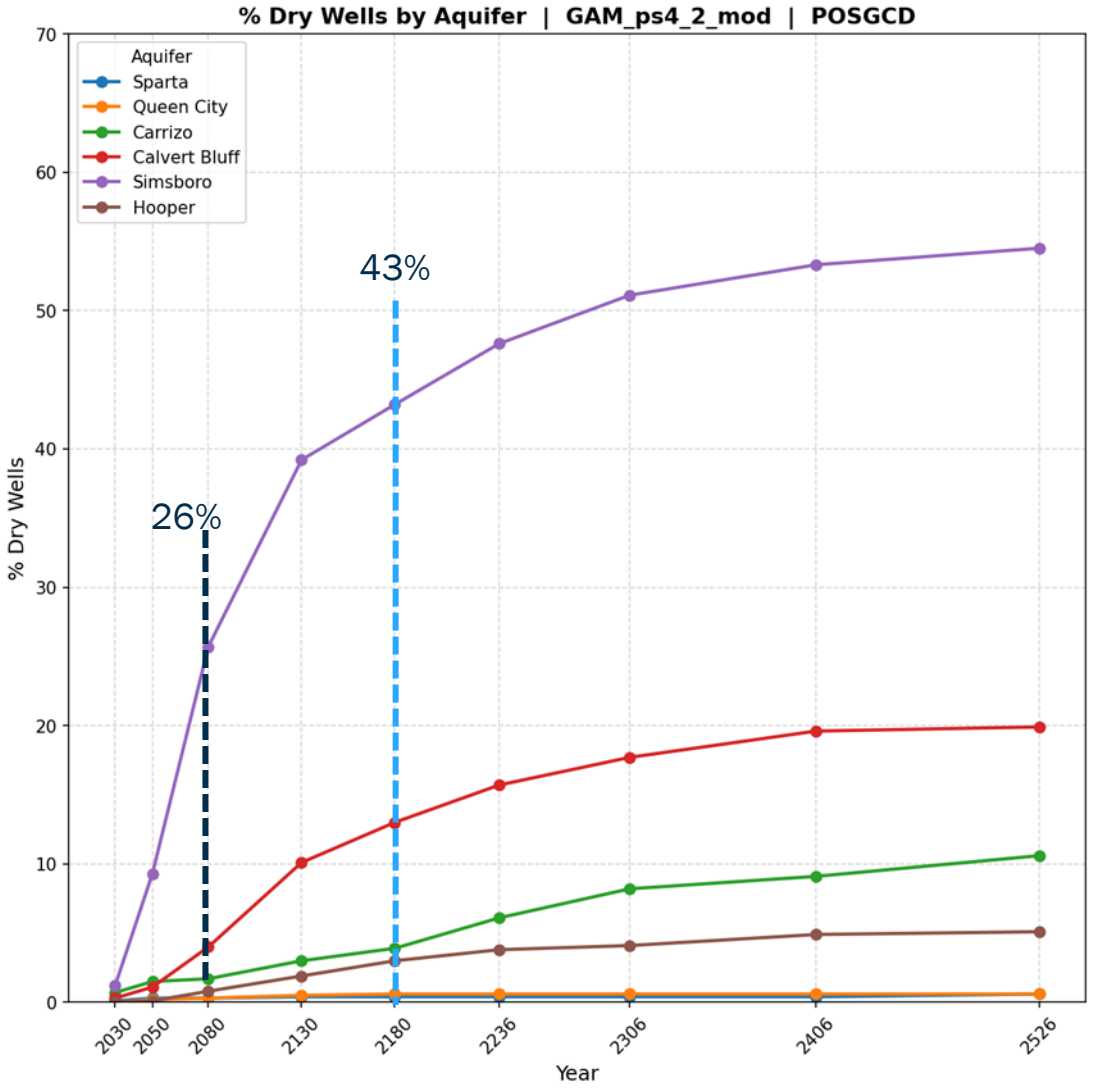
****Most significant Adverse Impact is POSGCD Simsboro wells. ******

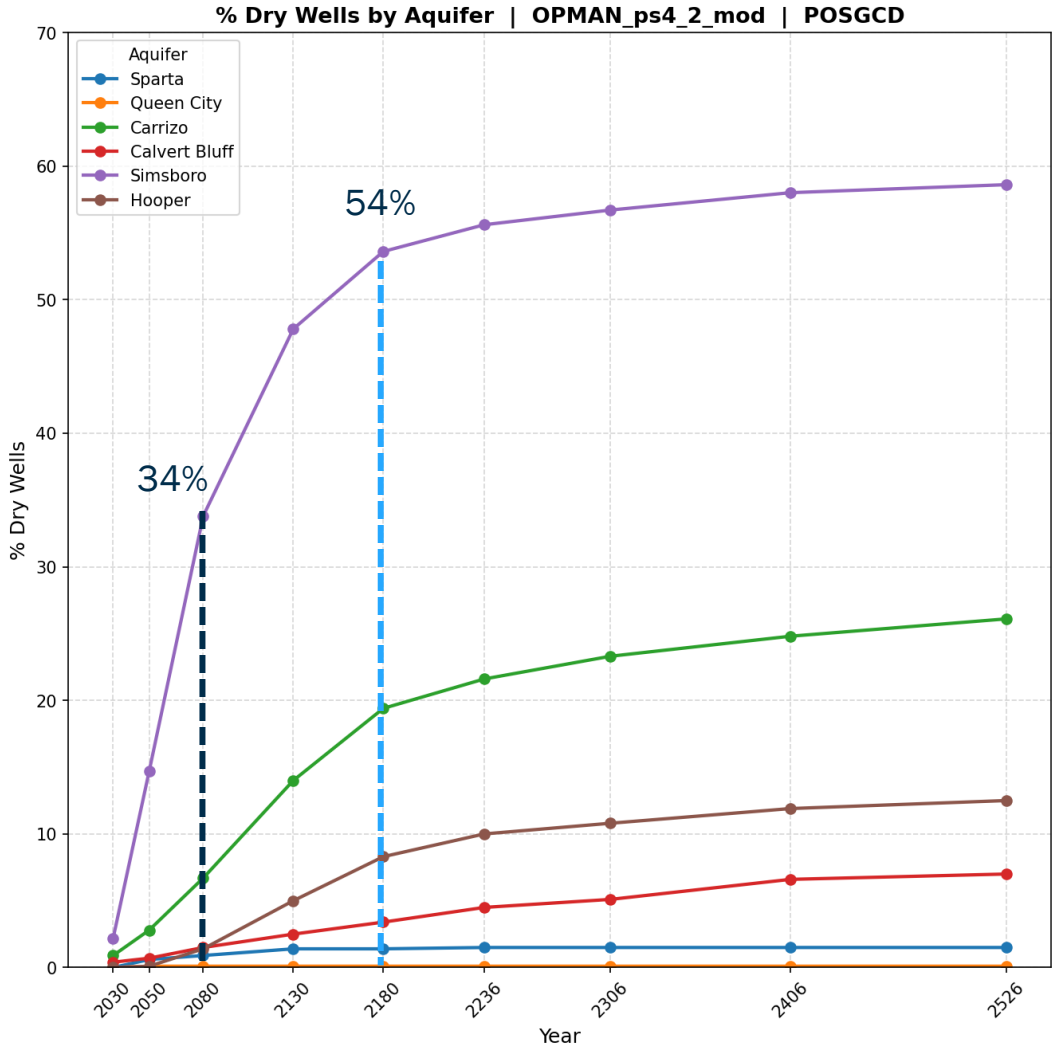
OPMAN PS4-2-modv2				
GCD	**Aquifer**	**Eligible Wells**	**2080 N Dry**	**2080 % Dry**
POSGCD	Sparta	1172	11	0.9
	Queen City	1080	1	0.1
	Carrizo	463	31	6.7
	Calvert Bluff	731	11	1.5
	Simsboro	640	216	33.8
	Hooper	797	11	1.4
	TOTAL	**4883**	**281**	**5.8**
ALL	**TOTAL**	**13577**	**375**	**2.8**

INTERA

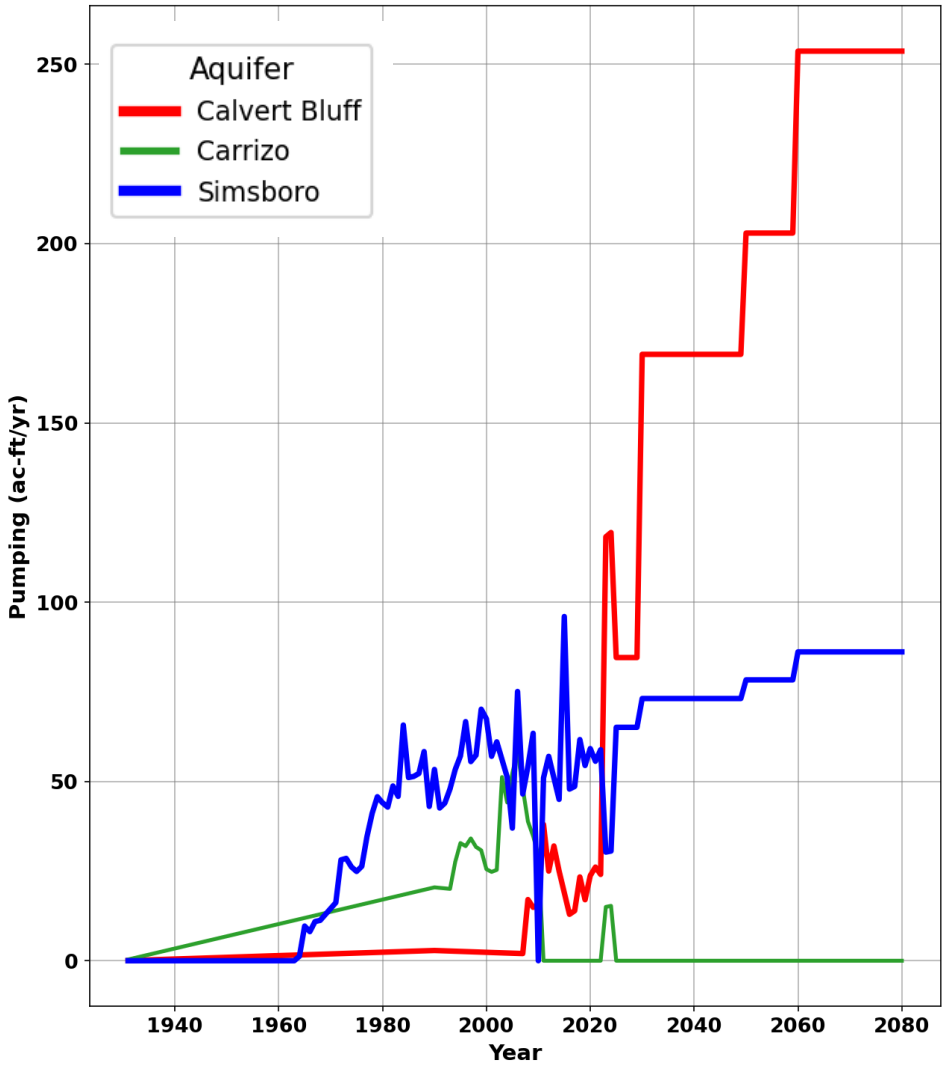
Prediction of Adverse Socioeconomic Impacts Through 2080

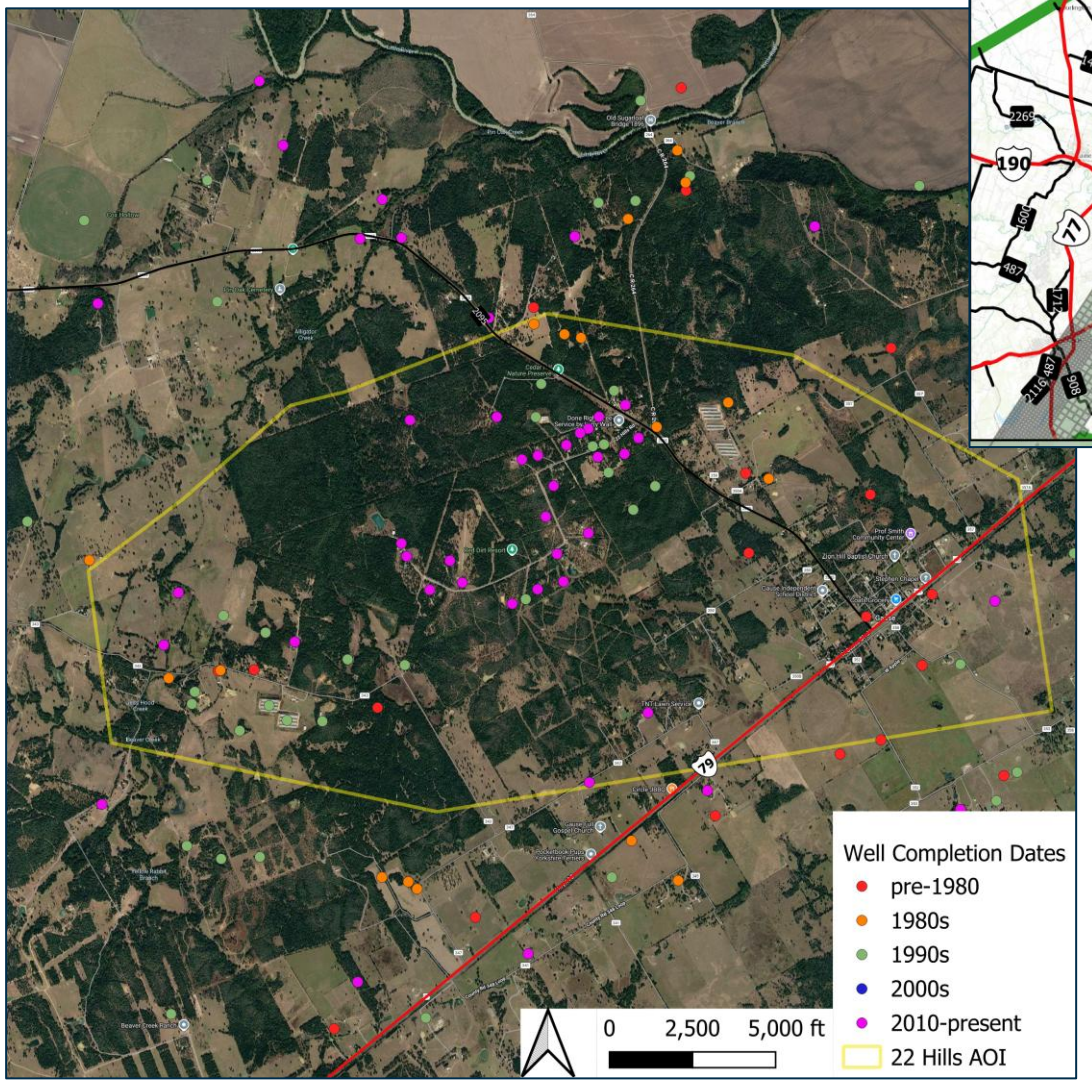
****Adverse Impacts steadily increase beyond 2180 ****

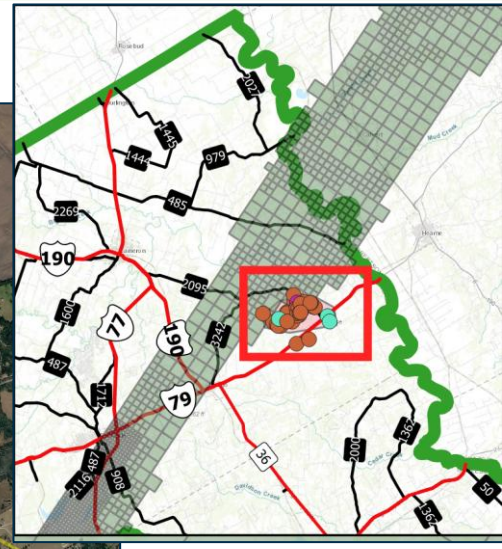




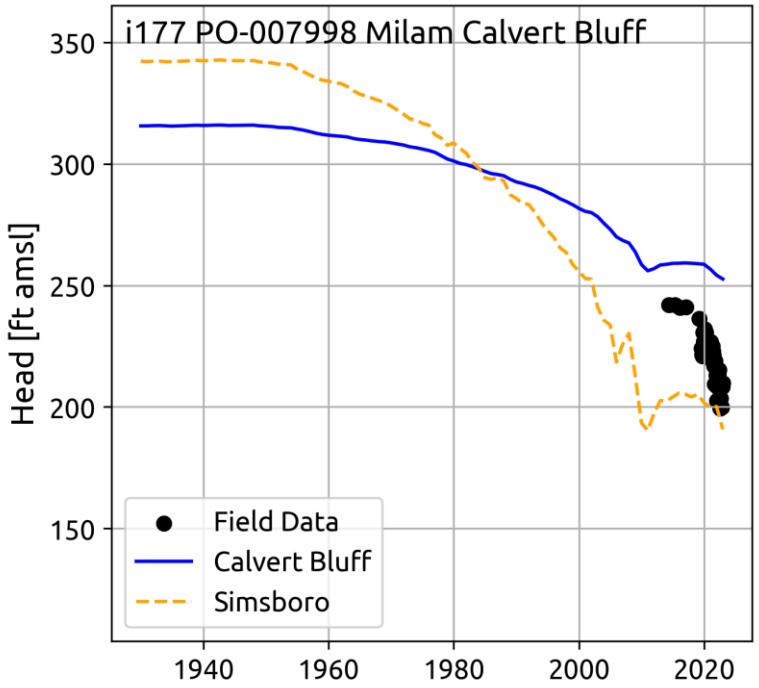
Simboro Depressurization Impacts Calvert Bluff Wells In 22 Hills Near Gause Texas

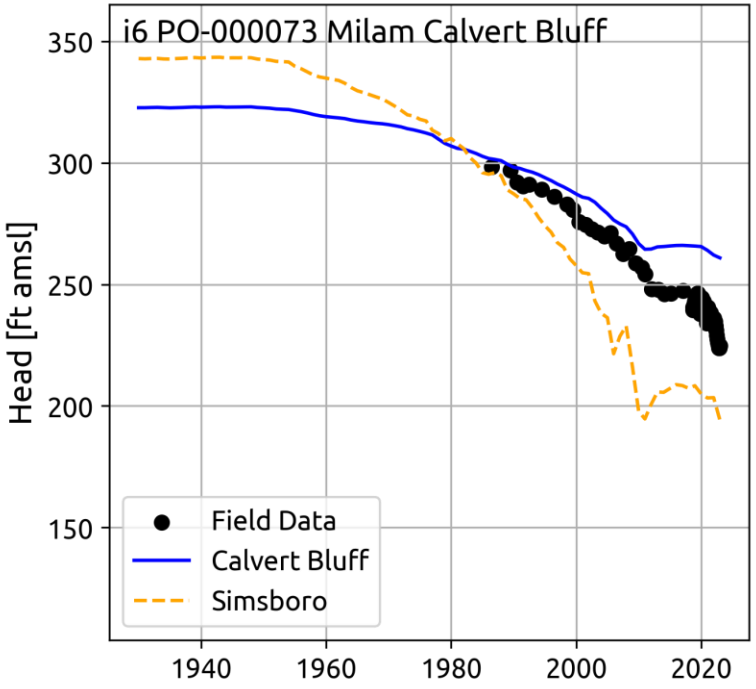


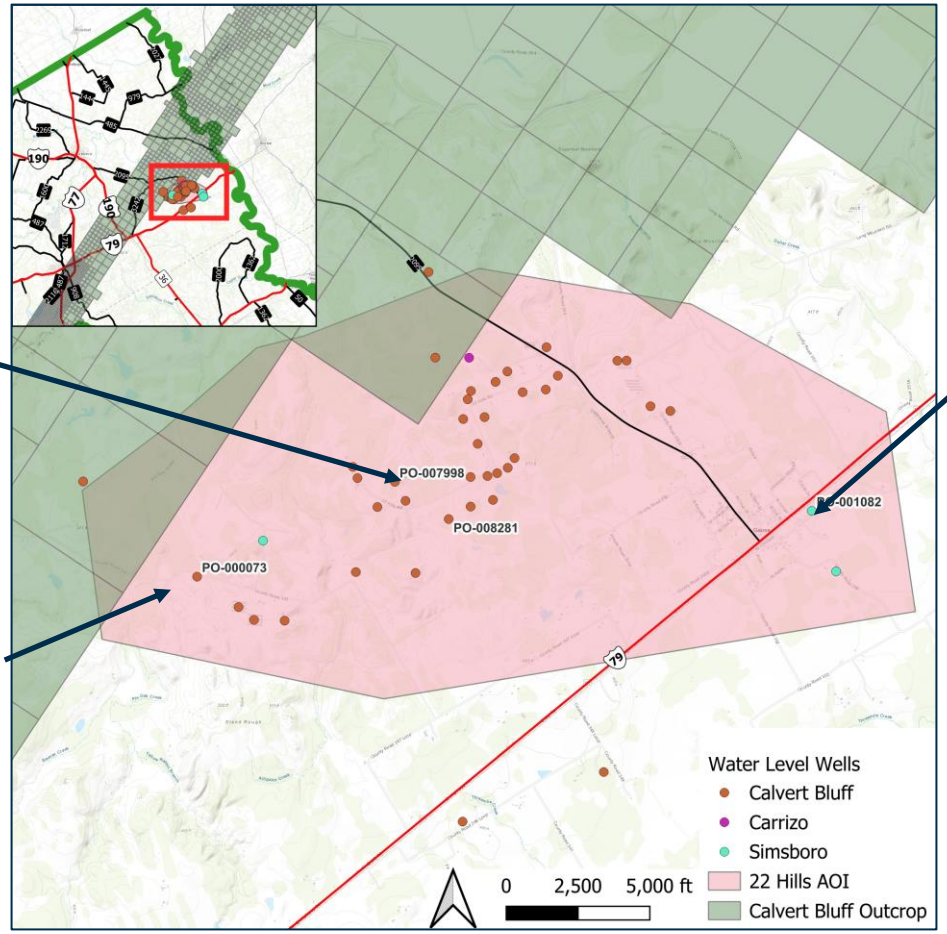


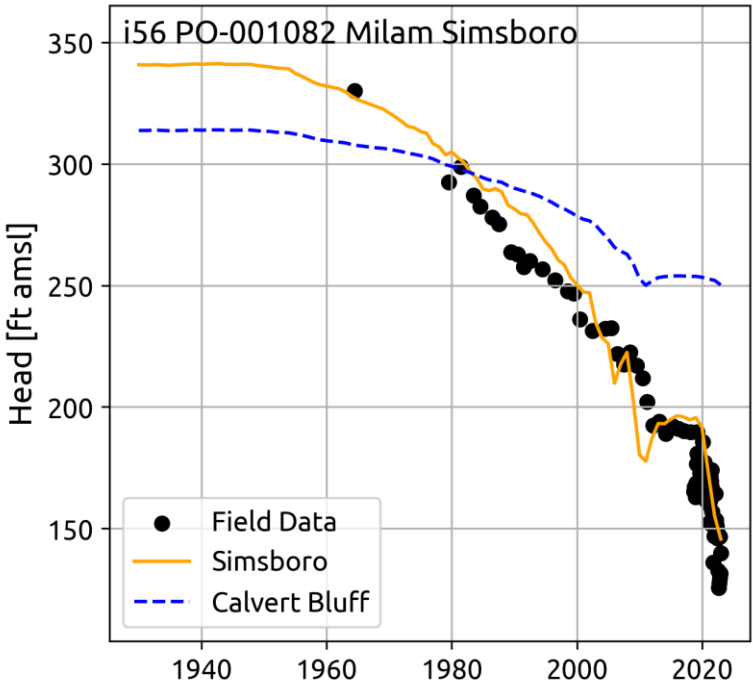


Wells With Water Levels

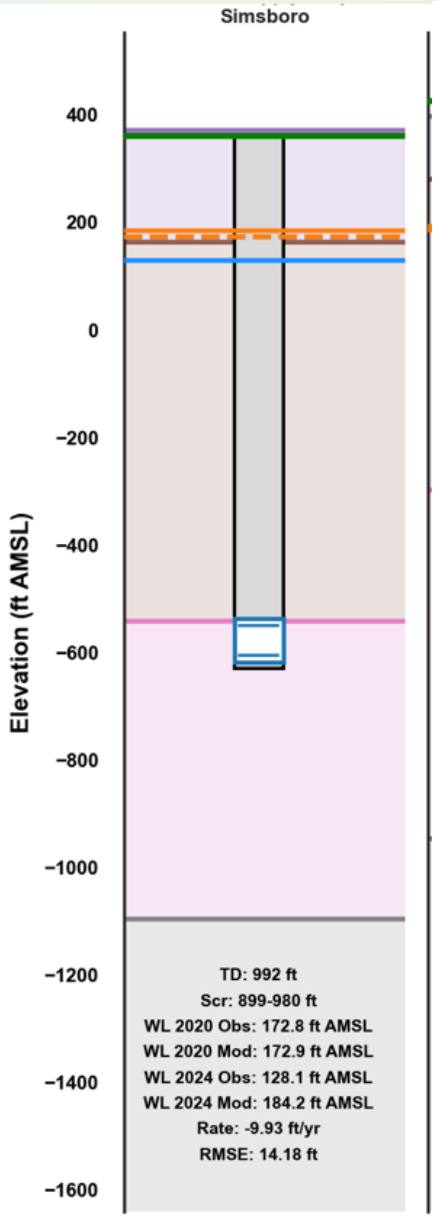




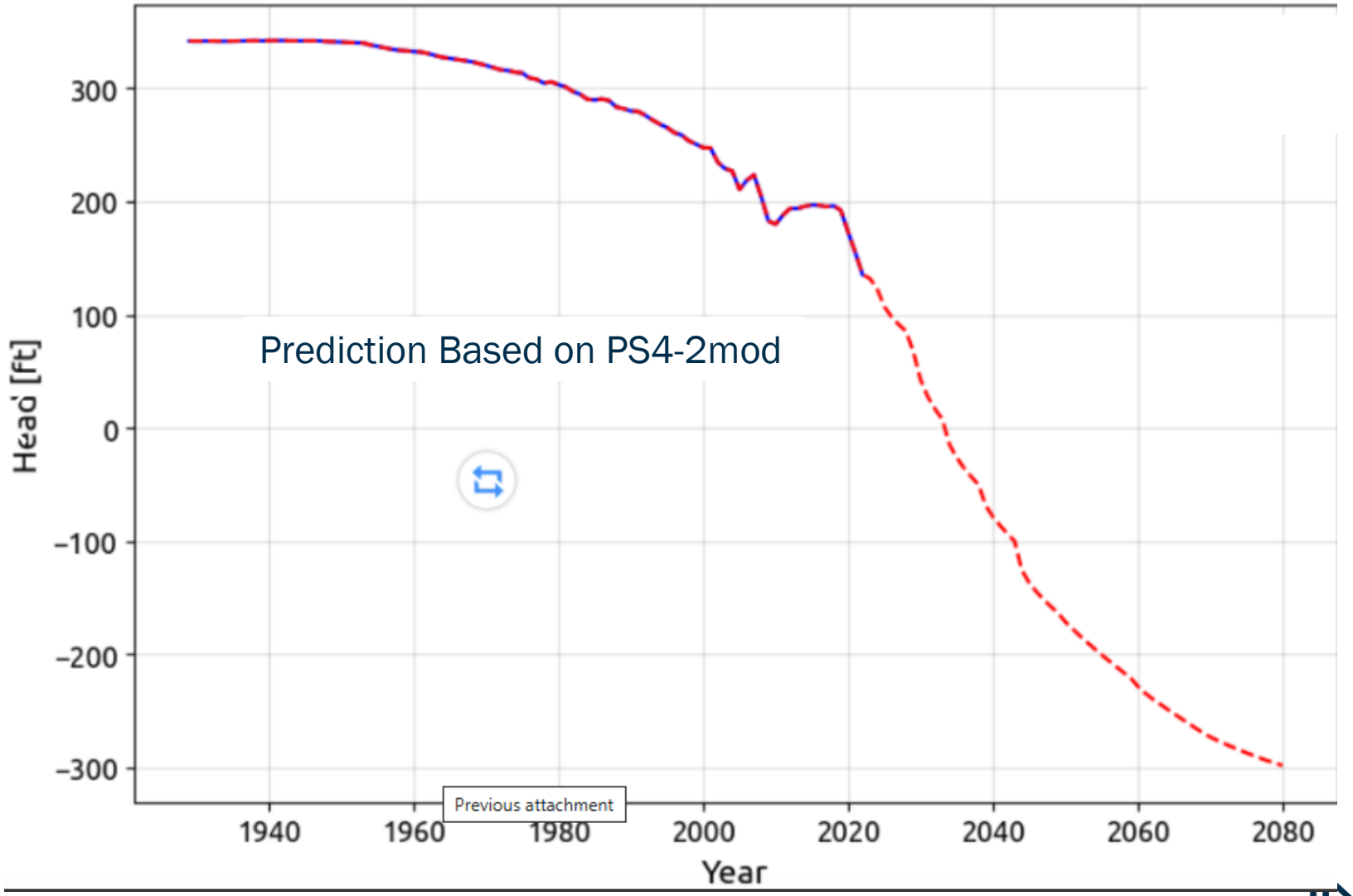




Projected Drawdown for Gause Well (Simsboro)



- 1929 to 2020: drawdown ~150 ft (POSGCD 9%, VR-0%, Well-0.1%, BVGCD SB -86%)
- 2020 to 2080: drawdown ~ 488 ft (POSGCD 12%, VR-15%, Well-0.1%, BVGCD SB – 73%)



Long-Term Management/Sustainability

POSGCD Management Approach

- Fair Share Doctrine
- Unreasonable Impacts
- Proposed Productions does not provide long-term protection for landowners who what to conserve/protect their groundwater resource
- TWC, §36.108(d-2)

> "This subsection does not prohibit the establishment of desired future conditions that provide for the reasonable long-term management of groundwater resources consistent with the management goals under Section 36.1071"

POSGCD Water Budgets (GAM) for PS4-2mod

	Aquifer	Lateral Flow				Recharge	ET	Surface Water	Pumping	Storage	GHB	Vertical Flow
		LPGCD	BVGCD	METGCD	FCGCD							
1929 (OPMAN)	Sparta	-112	-496	0	0	8,474	0	-1,166	-901	-769	-844	-3,872
	Queen City	-938	-1,010	0	0	15,869	0	-8,264	-658	-3,071	0	3,597
	Carrizo	961	-2,195	0	0	4,744	0	-2,697	-1,091	-830	0	-169
	Calvert Bluff	270	-739	0	0	25,274	-16	-5,117	-736	-2,336	0	-14,605
	Simsboro	730	-15,275	0	0	16,953	0	-2,016	-25,105	4,754	0	19,354
	Hooper	-18	-423	0	0	13,142	-167	-4,516	-561	-3,744	0	-3,988

	Aquifer	Lateral Flow				Recharge	ET	Surface Water	Pumping	Storage	GHB	Vertical Flow
		LPGCD	BVGCD	METGCD	FCGCD							
2000 (OPMAN)	Sparta	-112	-496	0	0	8,474	0	-1,166	-901	-769	-844	-3,872
	Queen City	-938	-1,010	0	0	15,869	0	-8,264	-658	-3,071	0	3,597
	Carrizo	961	-2,195	0	0	4,744	0	-2,697	-1,091	-830	0	-169
	Calvert Bluff	270	-739	0	0	25,274	-16	-5,117	-736	-2,336	0	-14,605
	Simsboro	730	-15,275	0	0	16,953	0	-2,016	-25,105	4,754	0	19,354
	Hooper	-18	-423	0	0	13,142	-167	-4,516	-561	-3,744	0	-3,988

	Aquifer	Lateral Flow				Recharge	ET	Surface Water	Pumping	Storage	GHB	Vertical Flow
		LPGCD	BVGCD	METGCD	FCGCD							
2030 (OPMAN)	Sparta	-70	352	0	0	7,554	0	-881	-3,745	1,096	-127	-4,057
	Queen City	-875	-1,122	0	0	13,142	0	-7,478	-914	507	0	1,972
	Carrizo	6,498	147	0	0	3,553	0	-326	-14,444	2,124	0	-412
	Calvert Bluff	174	-2,211	0	0	18,992	0	5,993	-1,565	12,664	0	-34,963
	Simsboro	8,415	-24,283	0	0	12,316	0	3,418	-76,645	28,949	0	45,250
	Hooper	-421	-418	0	0	8,897	-160	-3,699	-1,285	2,701	0	-5,880

	Aquifer	Lateral Flow				Recharge	ET	Surface Water	Pumping	Storage	GHB	Vertical Flow
		LPGCD	BVGCD	METGCD	FCGCD							
2080 (OPMAN)	Sparta	5	409	0	0	7,554	0	43	-5,477	636	1,109	-4,531
	Queen City	-833	-1,495	0	0	13,142	0	-5,914	-1,242	395	0	484
	Carrizo	6,684	-219	0	0	3,553	0	3,871	-15,178	4,618	0	-7,977
	Calvert Bluff	690	-4,095	0	0	18,992	0	34,328	-2,333	15,141	0	-66,318
	Simsboro	17,849	-63,314	0	0	12,316	0	11,308	-94,799	22,045	0	89,329
	Hooper	-745	-1,271	0	0	8,897	-75	-1,423	-1,764	3,255	0	-7,669

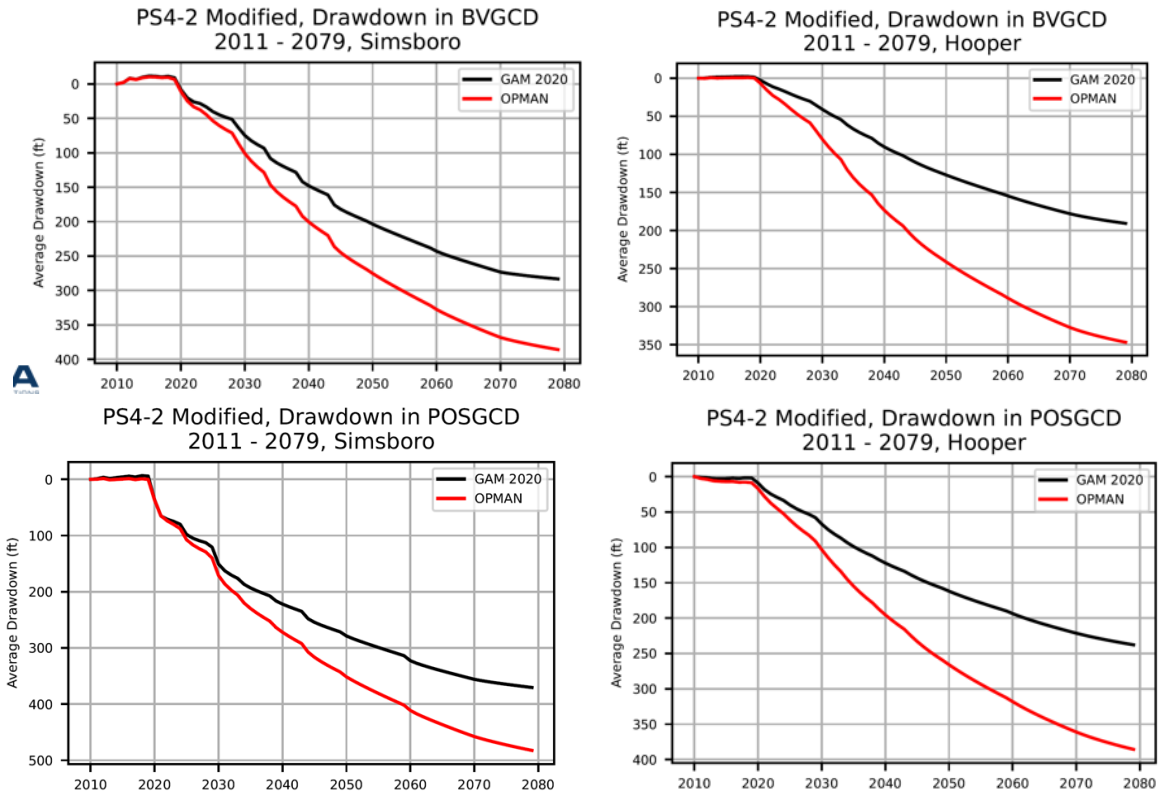
Positive = Into Aquifer
Negative = Out of Aquifer

INTERA GEOSCIENCE & ENGINEERING SOLUTIONS

Concerns

Concerns

- BVGCD Signed Settlement Agreement to Support DFC of 330 ft
  - Unclear if District has performed the science to “provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area” (TWC, §36.108(d-2))
- BVGCD Socio-economic study
  - Appears to be a study providing income that can be generated by selling water
- BVGCD Speculative Permits
  - Ex: Current Simboro permits are 335,000 afy (Spheros, April 2025)
- BVGCD has not yet Expressed Support for a Joint GMA 12 Mitigation Project
  - LPGCD and POSGCD support such a program
- Reliability of GAM Predictions
  - Strong evidence it is significantly underpredict drawdown for Carrizo-Wilcox Aquifer
- Curtailment Process
  - Considerable uncertainty regarding the technical and legal justifications/evidence for reduction in permitted amount



Note: presented on March 17, 2026