Status Report on Modeling Results for the Sparta, Queen City, and Carrizo-Wilcox Aquifers Scenarios S-1, S-2 and S-3

Presented to

BVGCD Board of Directors

By Ground Water Consultants, LLC

August 8, 2019

GMA12 Simulations Descriptions

- All initial runs include estimated historic pumping for 2011 to 2018
- S-1- Full permitted pumping for 2020 to 2070. Half of total permitted pumping increase added in 2019.
- S-2- Anticipated ramp up of pumping for 2019 to 2070. 2070 pumping either the total permitted or estimated total demand based on demand projections.

GMA 12 Simulations Descriptions (cont.)

- S-3- Same as S-2 except only increasing pumping to half of total permitted amount in 2070 or to current MAG
- S-4 to S-6- The same as S-1 to S-3 except with reduced recharge:
 - Recharge for 2026 to 2030 is 75 percent of average
 - Recharge for 2051 to 2060 is 75 percent of average
 - Recharge for rest of predictive simulation is average recharge included in the updated model

Pumping Assumptions

- Details on pumping assumptions reviewed at GMA 12 meeting in May
- Some review and minor adjustments of pumping in initial runs will be needed before proceeding with developing DFC runs.
- Pumping for non-GCD areas did not change for all six simulations

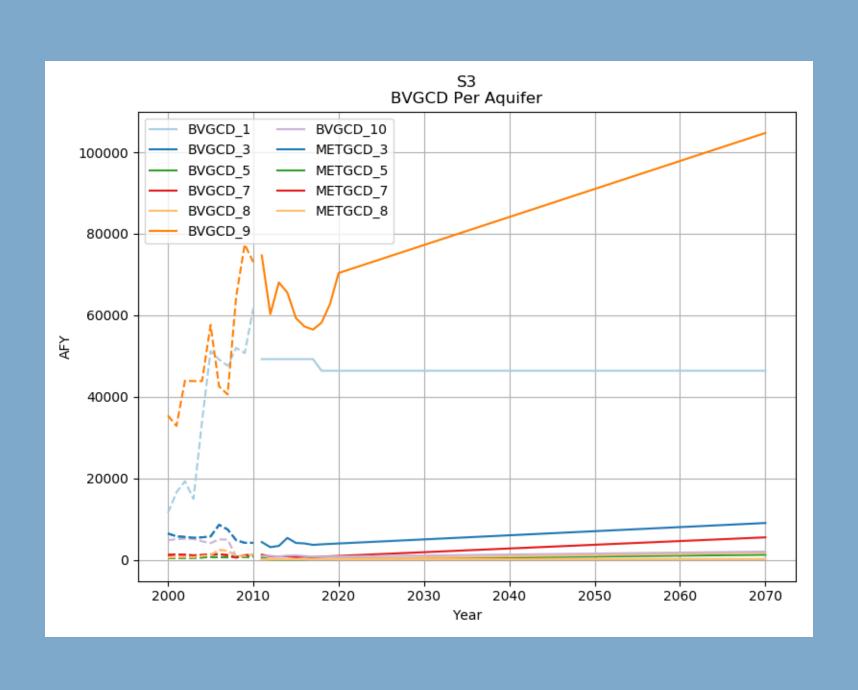
Groundwater Management Area #12 Henderson Trinidad Itasca Blum Rι Corsicana Cuney Frost Navarro LAKE MAP LEGEND Dublin. LAKE Walnut Springs Hillsboro LAKE STRIKER Jacksonville Morgan PALESTINE Hill GMA #12 Iredell Hico LAKE Angus FAIRFIELD JACKSONVILLE CherokeeReklaw Bosque Abbott Dawson Anderson Aguilla Rusk LAKE River Basin West Vortham Palestine Cranfills Gap Coolidge LAKE Reservoir Lerov Ross Alto Mexia Hamilton Cities TRADINGHOUSE Elkhart Valley Mills Teague CREEK RESERVOIR Bellmead Counties Hallsburg Limestone Land Crawford McLennan Hamilton Wells Grapeland Major Aquifers Groesbeck Waco Riesel Cenozoic Pecos Alluvium Evant Latexo Gatesville Thornton Robinson McGregor Seymour Coryell HOUSTON Crocket Houston Lorena Gulf Coast Marlin Cosse. Moody BELTON Carrizo - Wilcox (outcrop) LAKE Lott Falls Carrizo - Wilcox (downdip) Troy Trinity ampasas Bremond Lovelady Hueco - Mesilla Bolson Groveton Copperas Cove Temple Killeen Rosebud Madison Ogallala Robertson Lampasas BellBelton STILLHOUSE Edwards - Trinity Plateau (outcrop) Madisonvi OAE RES Salado Rogers Edwards - Trinity Plateau (downdip) Po Hearne Holland Cameron Edwards BFZ (outcrop) GEORGETOWN Florence Point Blank Kurten BUCHANAN Jarrell Edwards BFZ (downdip) 79 WEERL Bartlett CREEK RESERVOIR Walker Burne (Bertram Trinity (outcrop) GRANGER LAKE CIRRONS Burnet Liberty Hill Williamson CREEK RESERVOIS Rockdále Trinity (downdip) Coldspring Georgetown ollege Station Grimes Leander San Jacinto Marble Falls New Waverly Taylor Burlesorsnook Shepherd LAKE Cedar Park Round Rock No claims are made to the accuracy or completeness CONROR Willis of the data nor to its suitability for a particular use. he scale and compilation of all information shown here is Pflugerville Navasota Lexington approximate: Montgomery Cleveland TRAVES Map prepared by Mark Hayes Texas Weller Development Board GIS Section LAKE Montgomery gin Manor Lakeway Travis Plum Grove Magnolia LAKE Shenandoah Washington Austin BASTROP **Dripping Springs** Daytor Tomball Pine Island LAKE Waller Round Top Mustang Ridge Humble ADDICES Hays RESERVOIR Smithyil Austin Austin Wimberley Uhland Jersey Village Harris SHELDON CANTON Mont Belvier Fayetteville RESERVOIR Pattison Lockhart San Marcos Caldwell Comal Sealy Houston La Porte Bellaire Columbus Fulshear Pasadena Waelder 1 inch equals 26 miles **New Braunfels** Luling LAKE Sugar Land

Model Layers- Aquifer

- Layer 1- Colorado and Brazos River Alluvium
- Layer 2- Shallow flow systems
- Layer 3- Sparta Aquifer
- Layer 4- Weches Formation
- Layer 5- Queen City Aquifer
- Layer 6- Reklaw Formation
- Layer 7- Carrizo Aquifer
- Layer 8- Calvert Bluff Aquifer
- Layer 9- Simsboro Aquifer
- Layer 10- Hooper Aquifer





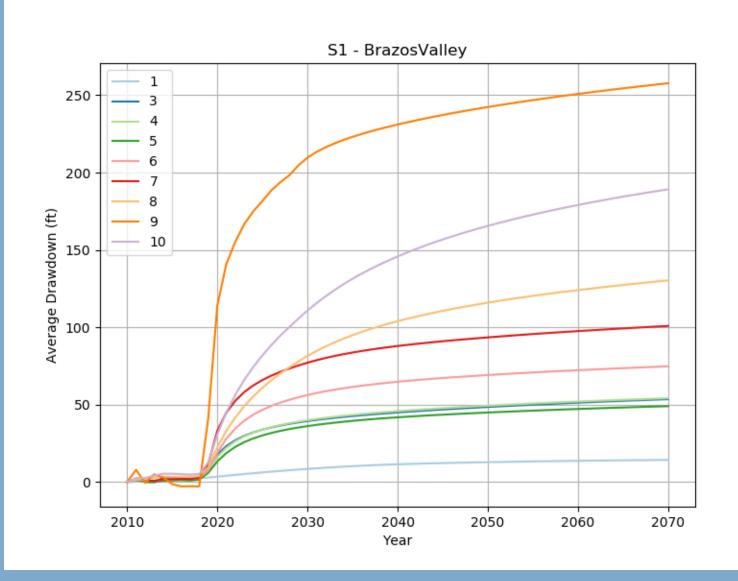


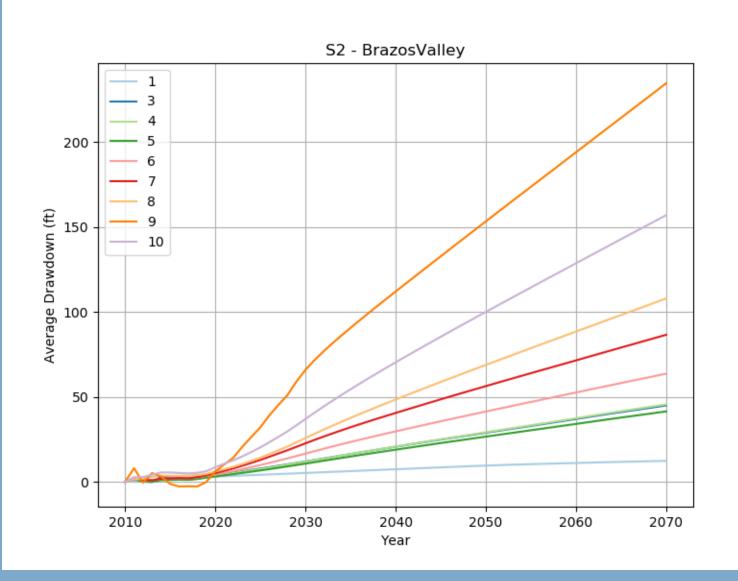
Results Show Minimal Impacts of Reduced Recharge

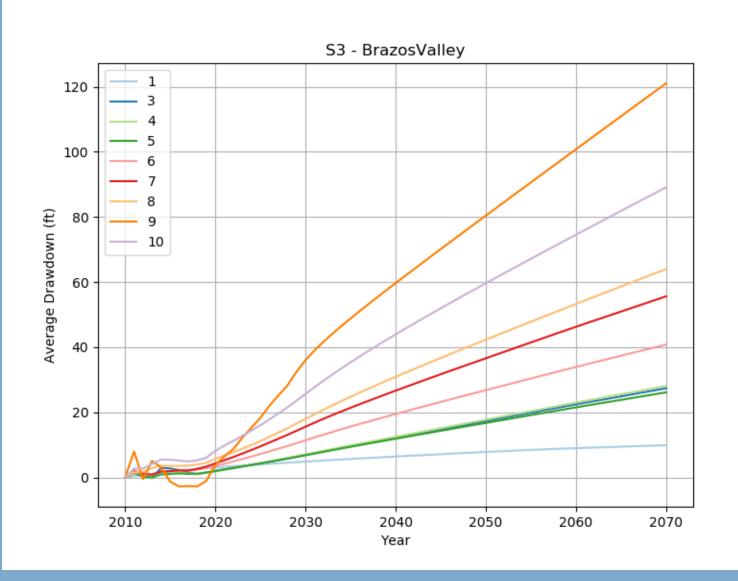
	S-1 Drawd	lown (feet)	S-2 Drawd	lown (feet)	S-3 Drawdown (feet)			
	Without Drought	With Drought	Without Drought	With Drought	Without Drought	With Drought		
Sparta	27	28	15	16	11	12		
Queen City	34	35	20	21	14	16		
Carrizo	166	167	126	127	73	74		
Calvert Bluff	180	181	148	149	81	82		
Simsboro	349	350	317	317	161	162		
Hooper	196	197	167	168	88	89		

Lost Pines GCD Results

Drawdowns from Runs S-1, S-2, and S-3







Brazos Valley - S-1

	Current DFC (feet)	Current MAG in 2070	S-1 Drawdown in 2070 (feet)	S-1 Pumpage in 2070 (acre-feet)
Sparta	12	9,019	54	13,161
Queen City	12	1,200	49	1,269
Carrizo	61	5,494	101	5,498
Calvert Bluff	125	1,757	130	1,726
Simsboro	295	96,198	258	147,235
Hooper	207	2,000	189	2,139

Brazos Valley - S-2

	Current DFC (feet)	Current MAG in 2070	S-2 Drawdown in 2070 (feet)	S-2 Pumpage in 2070 (acre-feet)
Sparta	12	9,019	45	13,161
Queen City	12	1,200	41	1,269
Carrizo	61	5,494	87	5,498
Calvert Bluff	125	1,757	108	1,726
Simsboro	295	96,198	235	147,235
Hooper	207	2,000	157	2,139

Brazos Valley - S-3

	Current DFC (feet)	Current MAG in 2070	S-3 Drawdown in 2070 (feet)	S-3 Pumpage in 2070 (acre-feet)
Sparta	12	9,019	27	9,019
Queen City	12	1,200	26	1,215
Carrizo	61	5,494	56	5,498
Calvert Bluff	125	1,757	64	1,726
Simsboro	295	96,198	121	104,714
Hooper	207	2,000	89	2,000

Summary of Average Drawdowns

CCD		Spa	ırta		Queen City				Carrizo			
GCD	DFC	S-1	S-2	S-3	DFC	S-1	S-2	S-3	DFC	S-1	S-2	S-3
Brazos Valley	12	54	45	27	12	49	41	26	61	101	87	56
Fayette County	47	30	20	16	64	57	38	28	110	141	96	63
Lost Pines	5	27	15	11	15	34	20	14	62	166	126	73
Mid-East Texas	5	34	31	20	2	26	23	16	80	47	42	31
Post Oak Savannah	28	28	23	10	30	26	21	11	67	201	172	99

CCD	(Calver	t Bluf	f		Sims	boro		Hooper			
GCD	DFC	S-1	S-2	S-3	DFC	S-1	S-2	S-3	DFC	S-1	S-2	S-3
Brazos Valley	125	130	108	64	295	258	235	121	207	189	157	89
Fayette County												
Lost Pines	100	180	148	81	240	349	317	161	165	196	167	88
Mid-East Texas	90	61	54	39	138	81	74	48	125	77	66	46
Post Oak Savannah	149	211	176	98	318	376	342	170	205	247	207	110

Summary

- Inclusion of drought has minimal impact on results
- As shown in 2018 work by DB Stephens, average drawdowns in the Wilcox are less than with the previous GAM. Average drawdowns in the Sparta, Queen City, and Carrizo are higher in BVGCD as were anticipated due to updated model improvements

Next Steps

- Some additional adjustments of pumping will be needed before moving forward with runs leading to development of DFCs
 - Fayette County GCD pumping will be increased to current MAG levels
 - Mid-East Texas GCD pumping will be changed to correct MAG levels
 - Post Oak Savannah GCD ramp up of pumping will be adjusted
- With a to be developed "baseline pumping file S-4" pumping will be adjusted in GCDs so that average drawdowns are near 2016 GMA 12 DFCs

Next Steps

- Pumping outside of the five GMA 12 GCDs will remain the same for the new predictive simulations
- Work will begin in upcoming months regarding developing DFCs for the Brazos River Alluvium and Yegua-Jackson aquifers



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