

Technical Memorandum

To: Groundwater Management Area 15
From: Michael R. Keester, P.G.
Reviewed By: Andrew Donnelly, P.G. – Daniel B. Stephens & Associates, Inc.
Date: March 3, 2021
Project: 2021 Joint Planning
Subject: Summary of Modeling Results

The purpose of this memo is to provide a brief summary of the modeling results for GMA 15. On October 8, 2019 we provided a summary of modeling results for a total of eight different scenarios. The technical memorandum discussing the scenarios included several tables and charts depicting the pumping amounts and associated average drawdown for the units of the Gulf Coast Aquifer System.

Predicted Pumping

Upon review of the modeling results by the GMA 15 members, during a meeting on November 15, 2019 scenario GMA15_2019_001_v1 was adopted as the predicted pumping distribution for reviewing the nine factors for proposed desired future conditions. Since the technical memorandum summarizing the scenarios was provided on October 8, 2019, we have updated the pumping distribution with minor changes to the predicted pumping when requested by GMA 15 members. Table 1 summarizes the current pumping input amounts by decade for each county, or portion of county, within GMA 15 using the same aquifer divisions of pumping as the current Modeled Available Groundwater (MAG) values (Goswami, 2017). The attached Supplementary Table 1 provides a more detailed summary of the pumping input values. For comparison to the input pumping values, Table 2 provides the current MAG values.

While the pumping input values are GMA 15's best estimate of future pumping from the GCAS, the model is not capable of simulating the full amount of pumping in all areas. As part of the model results, an output pumping value which represents the amount of pumping that the model could actually simulate is provided in a water budget file. It is the pumping amount from the budget file that represents the anticipated future MAG values. Table 3 summarizes the output pumping amounts and Table 4 provides the difference between the input and the output pumping amounts.

Table 1. Abbreviated summary, correlated to the current Modeled Available Groundwater table from Goswami (2017), of the pumping input values for portions of counties located within GMA 15.

County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Aransas	GCAS	1,544	1,544	1,544	1,544	1,544	1,544	1,544
Bee	GCAS	8,015	8,015	8,015	8,015	8,015	8,015	8,015
Calhoun	GCAS	7,575	7,575	7,575	7,575	7,575	7,575	7,575
Colorado	Chic./Evan.	71,716	71,716	71,716	71,716	71,716	71,716	71,716
Colorado	Jasper	919	919	919	919	919	919	919
DeWitt	GCAS	18,060	18,060	18,060	18,060	18,060	18,060	18,060
Fayette	GCAS	7,187	7,453	7,756	8,101	8,496	8,947	8,947
Goliad	GCAS	6,124	6,299	6,474	6,649	6,825	7,000	7,000
Jackson	GCAS	90,604	90,604	90,604	90,604	90,604	90,604	90,604
Karnes	GCAS	11,388	11,388	4,003	4,003	4,003	4,003	4,003
Lavaca	GCAS	20,627	20,627	20,627	20,627	20,627	20,627	20,627
Matagorda	Chic./Evan.	38,881	38,881	38,881	38,881	38,881	38,881	38,881
Refugio	Jasper	0	0	0	0	0	0	0
Refugio	GCAS	5,863	5,863	5,863	5,863	5,863	5,863	5,863
Victoria	GCAS	60,044	60,044	60,044	60,044	60,044	60,044	60,044
Wharton	Chic./Evan.	181,413	181,413	181,413	181,413	181,413	181,413	181,413

Table 2. Modeled Available Groundwater values from Goswami (2017).

County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Aransas	GCAS	1,542	1,542	1,542	1,542	1,542		
Bee	GCAS	9,466	9,441	9,441	9,389	9,389		
Calhoun	GCAS	7,565	7,565	7,565	7,565	7,565		
Colorado	Chic./Evan.	75,286	75,286	73,087	73,087	71,940		
Colorado	Jasper	596	596	596	596	596		
DeWitt	GCAS	15,476	15,476	14,546	14,485	14,485		
Fayette	GCAS	1,853	1,853	1,853	1,853	1,853		
Goliad	GCAS	11,539	11,539	11,539	11,539	11,552		
Jackson	GCAS	90,485	90,485	90,485	90,485	90,485		
Karnes	GCAS	10,196	10,196	3,015	2,917	2,751		
Lavaca	GCAS	20,253	20,253	20,253	20,253	20,253		
Matagorda	Chic./Evan.	38,828	38,828	38,828	38,828	38,828		
Refugio	Jasper	5,526	5,526	5,526	5,526	5,526		
Refugio	GCAS	321	321	321	321	321		
Victoria	GCAS	44,974	49,970	54,966	54,966	59,963		
Wharton	Chic./Evan.	181,168	181,168	181,168	181,168	181,168		

Table 3. Abbreviated summary, correlated to the current Modeled Available Groundwater table from Goswami (2017), of the pumping output values for portions of counties located within GMA 15.

County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Aransas	GCAS	1,544	1,544	1,544	1,544	1,544	1,544	1,544
Bee	GCAS	8,015	8,015	8,015	7,994	7,994	7,994	7,994
Calhoun	GCAS	7,575	7,575	7,575	7,575	7,575	7,575	7,575
Colorado	Chic./Evan.	71,716	71,716	71,716	71,716	71,716	71,716	71,716
Colorado	Jasper	919	919	919	919	919	919	919
DeWitt	GCAS	17,968	17,948	17,923	17,839	17,818	17,794	17,794
Fayette	GCAS	7,173	7,400	7,688	8,016	8,392	8,666	8,666
Goliad	GCAS	6,124	6,299	6,474	6,649	6,825	7,000	7,000
Jackson	GCAS	90,604	90,604	90,604	90,604	90,604	90,604	90,604
Karnes	GCAS	10,739	10,555	3,408	3,402	3,230	2,956	2,956
Lavaca	GCAS	20,427	20,427	20,422	20,422	20,415	20,411	20,411
Matagorda	Chic./Evan.	38,881	38,881	38,881	38,881	38,881	38,881	38,881
Refugio	Jasper	0	0	0	0	0	0	0
Refugio	GCAS	5,863	5,863	5,863	5,863	5,863	5,863	5,863
Victoria	GCAS	60,044	60,044	60,044	60,044	60,044	60,044	60,044
Wharton	Chic./Evan.	181,413	181,413	181,413	181,413	181,413	181,413	181,413

Table 4. Difference between input and output pumping amounts.

County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Aransas	GCAS	0	0	0	0	0	0	0
Bee	GCAS	0	0	0	21	21	21	21
Calhoun	GCAS	0	0	0	0	0	0	0
Colorado	Chic./Evan.	0	0	0	0	0	0	0
Colorado	Jasper	0	0	0	0	0	0	0
DeWitt	GCAS	92	112	137	221	242	265	265
Fayette	GCAS	13	54	68	85	103	281	281
Goliad	GCAS	0	0	0	0	0	0	0
Jackson	GCAS	0	0	0	0	0	0	0
Karnes	GCAS	649	833	596	601	773	1,047	1,047
Lavaca	GCAS	200	200	205	205	212	216	216
Matagorda	Chic./Evan.	0	0	0	0	0	0	0
Refugio	Jasper	0	0	0	0	0	0	0
Refugio	GCAS	0	0	0	0	0	0	0
Victoria	GCAS	0	0	0	0	0	0	0
Wharton	Chic./Evan.	0	0	0	0	0	0	0

Average Drawdown

To calculate the average drawdown from the modeling results, we subtracted the simulated water level on December 31, 2080 from the simulated water level on January 1, 2000. These dates represent the end of the predictive period and the end of the calibration period, respectively, and represent the calculation period adopted during the November 15, 2019 GMA 15 meeting. The calculations performed only included model cells that did not go “dry” during the simulation and that are part of the Texas Water Development Board (TWDB) defined aquifer footprint. Table 5 provides the simulated average drawdown using the TWDB Groundwater Availability Model (Chowdhury and others, 2004) with the GMA 15 adopted pumping file. Table 6 provides a comparison of the current and potential Desired Future Conditions (DFCs) using the same aquifer divisions as were used for the previous round of joint planning.

Table 5. Calculated simulated average drawdown from January 1, 2000 through December 31, 2080.

County	Chicot	Evangeline	Chic./Evan.	Burkeville	Jasper	GCAS
Aransas	0	6	0	—	—	0
Bee	1	8	6	8	6	6
Calhoun	-1	10	3	3	—	3
Colorado	12	26	20	24	28	23
DeWitt	0	5	4	16	34	20
Fayette	—	11	11	43	54	44
Goliad	-4	-2	-3	7	14	5
Jackson	15	20	18	14	22	17
Karnes	—	0	0	22	27	23
Lavaca	7	7	7	17	32	18
Matagorda	5	17	9	16	—	10
Refugio	0	7	3	3	—	3
Victoria	-4	6	1	5	8	3
Wharton	15	12	13	24	27	19

Table 6. Comparison of the current and potential DFCs.

County	Aquifer	Current DFC	Potential DFC
		(01/01/2000 – 12/31/2069)	(01/01/2000 – 12/31/2080)
Aransas	GCAS	0	0
Bee	GCAS	7	6
Calhoun	GCAS	5	3
Colorado	Chic./Evan.	17	20
Colorado	Jasper	23	28
DeWitt	GCAS	17	20
Fayette	GCAS	16	44
Goliad	GCAS	10	5
Jackson	GCAS	15	17
Karnes	GCAS	22	23
Lavaca	GCAS	18	18
Matagorda	Chic./Evan.	11	9
Refugio	GCAS	5	3
Victoria	GCAS	5	3
Wharton	Chic./Evan.	15	13

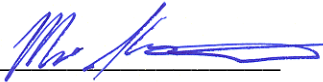
Summary

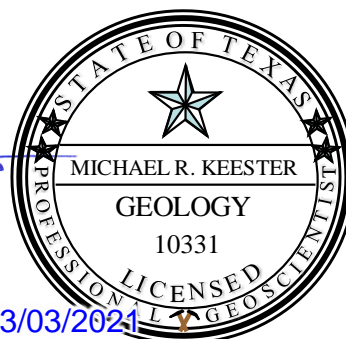
The tables providing in this technical memorandum are a brief summary and update of the modeling information provided in our October 8, 2019 modeling update. The average drawdown values may be used by GMA 15 as their proposed DFCs. The pumping output values also provide GMA 15 members with a reasonable estimate of their MAG values associated with the average drawdown values.

If you have any questions, please let us know.

Geoscientist Seal

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 Michael R. Keester, P.G.
 Senior Project Manager | Hydrogeologist



Supplementary Table 1. Summary of the pumping input values for portions of counties located within GMA 15.

County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Aransas	Chicot	1,544	1,544	1,544	1,544	1,544	1,544	1,544
	Evangeline	0	0	0	0	0	0	0
	Chic./Evan.	1,544	1,544	1,544	1,544	1,544	1,544	1,544
	Burkeville	0	0	0	0	0	0	0
	Jasper	0	0	0	0	0	0	0
	GCAS	1,544	1,544	1,544	1,544	1,544	1,544	1,544
Bee	Chicot	3,132	3,132	3,132	3,132	3,132	3,132	3,132
	Evangeline	4,626	4,626	4,626	4,626	4,626	4,626	4,626
	Chic./Evan.	7,758	7,758	7,758	7,758	7,758	7,758	7,758
	Burkeville	14	14	14	14	14	14	14
	Jasper	243	243	243	243	243	243	243
	GCAS	8,015	8,015	8,015	8,015	8,015	8,015	8,015
Calhoun	Chicot	7,518	7,518	7,518	7,518	7,518	7,518	7,518
	Evangeline	58	58	58	58	58	58	58
	Chic./Evan.	7,575	7,575	7,575	7,575	7,575	7,575	7,575
	Burkeville	0	0	0	0	0	0	0
	Jasper	0	0	0	0	0	0	0
	GCAS	7,575	7,575	7,575	7,575	7,575	7,575	7,575
Colorado	Chicot	31,623	31,623	31,623	31,623	31,623	31,623	31,623
	Evangeline	40,093	40,093	40,093	40,093	40,093	40,093	40,093
	Chic./Evan.	71,716	71,716	71,716	71,716	71,716	71,716	71,716
	Burkeville	0	0	0	0	0	0	0
	Jasper	919	919	919	919	919	919	919
	GCAS	72,635	72,635	72,635	72,635	72,635	72,635	72,635
DeWitt	Chicot	836	836	836	836	836	836	836
	Evangeline	5,450	5,450	5,450	5,450	5,450	5,450	5,450
	Chic./Evan.	6,286	6,286	6,286	6,286	6,286	6,286	6,286
	Burkeville	330	330	330	330	330	330	330
	Jasper	11,444	11,444	11,444	11,444	11,444	11,444	11,444
	GCAS	18,060	18,060	18,060	18,060	18,060	18,060	18,060
Fayette	Chicot	0	0	0	0	0	0	0
	Evangeline	301	317	333	350	368	386	386
	Chic./Evan.	301	317	333	350	368	386	386
	Burkeville	192	201	212	223	234	246	246
	Jasper	6,694	6,935	7,212	7,529	7,894	8,315	8,315
	GCAS	7,187	7,453	7,756	8,101	8,496	8,947	8,947

Supplementary Table 1. Summary of the pumping input values for portions of counties located within GMA 15.

County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Goliad	Chicot	420	423	426	430	433	436	436
	Evangeline	5,006	5,026	5,045	5,065	5,084	5,104	5,104
	<i>Chic./Evan.</i>	<i>5,426</i>	<i>5,449</i>	<i>5,472</i>	<i>5,494</i>	<i>5,517</i>	<i>5,540</i>	<i>5,540</i>
	Burkeville	444	507	570	633	697	760	760
	Jasper	254	343	433	522	611	700	700
	GCAS	6,124	6,299	6,474	6,649	6,825	7,000	7,000
Jackson	Chicot	66,055	66,055	66,055	66,055	66,055	66,055	66,055
	Evangeline	24,549	24,549	24,549	24,549	24,549	24,549	24,549
	<i>Chic./Evan.</i>	<i>90,604</i>	<i>90,604</i>	<i>90,604</i>	<i>90,604</i>	<i>90,604</i>	<i>90,604</i>	<i>90,604</i>
	Burkeville	0	0	0	0	0	0	0
	Jasper	0	0	0	0	0	0	0
	GCAS	90,604	90,604	90,604	90,604	90,604	90,604	90,604
Karnes	Chicot	0	0	0	0	0	0	0
	Evangeline	105	105	105	105	105	105	105
	<i>Chic./Evan.</i>	<i>105</i>	<i>105</i>	<i>105</i>	<i>105</i>	<i>105</i>	<i>105</i>	<i>105</i>
	Burkeville	988	988	628	628	628	628	628
	Jasper	10,295	10,295	3,270	3,270	3,270	3,270	3,270
	GCAS	11,388	11,388	4,003	4,003	4,003	4,003	4,003
Lavaca	Chicot	3,117	3,117	3,117	3,117	3,117	3,117	3,117
	Evangeline	12,664	12,664	12,664	12,664	12,664	12,664	12,664
	<i>Chic./Evan.</i>	<i>15,781</i>	<i>15,781</i>	<i>15,781</i>	<i>15,781</i>	<i>15,781</i>	<i>15,781</i>	<i>15,781</i>
	Burkeville	151	151	151	151	151	151	151
	Jasper	4,695	4,695	4,695	4,695	4,695	4,695	4,695
	GCAS	20,627	20,627	20,627	20,627	20,627	20,627	20,627
Matagorda	Chicot	31,755	31,755	31,755	31,755	31,755	31,755	31,755
	Evangeline	7,126	7,126	7,126	7,126	7,126	7,126	7,126
	<i>Chic./Evan.</i>	<i>38,881</i>	<i>38,881</i>	<i>38,881</i>	<i>38,881</i>	<i>38,881</i>	<i>38,881</i>	<i>38,881</i>
	Burkeville	0	0	0	0	0	0	0
	Jasper	0	0	0	0	0	0	0
	GCAS	38,881	38,881	38,881	38,881	38,881	38,881	38,881
Refugio	Chicot	3,229	3,229	3,229	3,229	3,229	3,229	3,229
	Evangeline	2,634	2,634	2,634	2,634	2,634	2,634	2,634
	<i>Chic./Evan.</i>	<i>5,863</i>	<i>5,863</i>	<i>5,863</i>	<i>5,863</i>	<i>5,863</i>	<i>5,863</i>	<i>5,863</i>
	Burkeville	0	0	0	0	0	0	0
	Jasper	0	0	0	0	0	0	0
	GCAS	5,863	5,863	5,863	5,863	5,863	5,863	5,863

Supplementary Table 1. Summary of the pumping input values for portions of counties located within GMA 15.

County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Victoria	Chicot	32,173	32,173	32,173	32,173	32,173	32,173	32,173
	Evangeline	27,871	27,871	27,871	27,871	27,871	27,871	27,871
	<i>Chic./Evan.</i>	<i>60,044</i>	<i>60,044</i>	<i>60,044</i>	<i>60,044</i>	<i>60,044</i>	<i>60,044</i>	<i>60,044</i>
	Burkeville	0	0	0	0	0	0	0
	Jasper	0	0	0	0	0	0	0
	GCAS	60,044	60,044	60,044	60,044	60,044	60,044	60,044
Wharton	Chicot	114,866	114,866	114,866	114,866	114,866	114,866	114,866
	Evangeline	66,547	66,547	66,547	66,547	66,547	66,547	66,547
	<i>Chic./Evan.</i>	<i>181,413</i>	<i>181,413</i>	<i>181,413</i>	<i>181,413</i>	<i>181,413</i>	<i>181,413</i>	<i>181,413</i>
	Burkeville	0	0	0	0	0	0	0
	Jasper	0	0	0	0	0	0	0
	GCAS	181,413	181,413	181,413	181,413	181,413	181,413	181,413