GAM Run 10-041 MAG

By Mohammad Masud Hassan, P.E.

Edited and finalized by Marius Jigmond to reflect statutory changes effective September 1, 2011

Texas Water Development Board
Groundwater Availability Modeling Section
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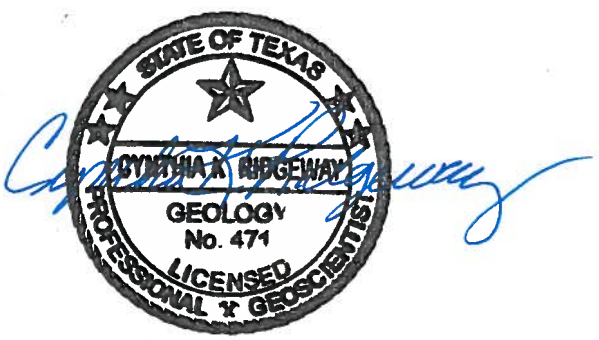

Cynthia K. Ridgeway, the Manager of the Groundwater Availability Modeling Section and Interim Director of the Groundwater Resources Division, is responsible for oversight of work performed by employees under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G. 471 on December 8, 2011.

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EXECUTIVE SUMMARY:

The modeled available groundwater for the Yegua-Jackson Aquifer as a result of the desired future condition adopted by the members of Groundwater Management Area 13 is approximately 31,700 acre-feet per year. This is shown divided by county, regional water planning area, and river basin in Table 1 for use in the regional water planning process. Modeled available groundwater is summarized by county, regional water planning area, river basin, and groundwater conservation district in tables 2 through 5. The estimates were extracted from Groundwater Availability Modeling Task 10-012, Scenario 4, which Groundwater Management Area 13 used as the basis for developing their desired future condition for the Yegua-Jackson Aquifer.

REQUESTOR:

Mr. Mike Mahoney of Evergreen Underground Water Conservation District on behalf of Groundwater Management Area 13

DESCRIPTION OF REQUEST:

In a letter dated August 31, 2010 and received September 2, 2010, Mr. Mike Mahoney provided the Texas Water Development Board (TWDB) with the desired future condition of the Yegua-Jackson Aquifer adopted by the members of Groundwater Management Area 13. The desired future condition for the Yegua-Jackson Aquifer in Groundwater Management Area 13, as shown in Resolution No. R 2010-02, is as follows:

> *"In reference to* [Groundwater Availability Model] *Run T10-012, Table C-1, the committee has considered, the base scenario of an average drawdown of 0.0 feet, Scenario 2.5 an average drawdown of 1 foot, Scenario 3.0 an average drawdown of 1 foot, and Scenario 4.0 an average drawdown of 2 feet for the Yegua-Jackson Aquifer; and*
>
> [...] *the district members of the Groundwater Management Area 13, adopt Scenario 4.0, and an average drawdown of 2 feet for the Yegua-Jackson Aquifer."*

In response to receiving the adopted desired future condition, the Texas Water Development Board has estimated the modeled available groundwater for the Yegua-Jackson Aquifer in Groundwater Management Area 13.

METHODS:

The Texas Water Development Board previously completed several predictive groundwater availability model simulations of the Yegua-Jackson Aquifer to assist the members of Groundwater Management Area 13 in developing a desired future condition for this aquifer. The location of Groundwater Management Area 13, the Yegua-Jackson Aquifer, and the groundwater availability model cells that represent the aquifer are shown in Figure 1. As described in Resolution No. R 2010-02, the management area considered Scenario 4 of Groundwater Availability Modeling (GAM) Task 10-012 when developing a desired future condition for the

Yegua-Jackson Aquifer (Oliver, 2010). Since the above desired future condition is met in Scenario 4 of GAM Task 10-012, the estimated pumping for Groundwater Management Area 13 presented here was taken directly from this simulation. The pumping was then divided by county, regional water planning area, river basin, and groundwater conservation district (Figure 2).

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the model run using the groundwater availability model for the Yegua-Jackson Aquifer are described below:

- The results presented in this report are taken from Scenario 4 in GAM Task 10-012 (Oliver, 2010). See GAM Task 10-012 for a full description of the methods, assumptions, and results for the groundwater availability model run.

- Version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer was used for this analysis. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model.

- Cells were assigned to individual counties, river basins, regional water planning areas, and groundwater conservation districts as shown in the March 23, 2010 version of the file that associates the model grid to political and natural boundaries for the Yegua-Jackson Aquifer.

- The model results presented in this report were extracted from all areas of the model representing the units comprising the Yegua-Jackson Aquifer. This includes some areas outside the "official" boundary of the aquifer shown in the 2007 State Water Plan (TWDB, 2007).

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code, "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. This is distinct from "managed available groundwater," shown in the draft version of this report dated December 15, 2010, which was a permitting value and accounted for the estimated use of the aquifer exempt from permitting. This change was made to reflect changes in statute by the 82nd Texas Legislature, effective September 1, 2011.

Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits. The estimated amount of pumping exempt from permitting, which the Texas Water Development Board is now required to develop after soliciting input from applicable groundwater conservation districts, will be provided in a separate report.

RESULTS:

The modeled available groundwater for the Yegua-Jackson Aquifer in Groundwater Management Area 13 consistent with the desired future condition is approximately 31,700 acre-feet per year. This has been divided by county, regional water planning area, and river basin for each decade between 2010 and 2060 for use in the regional water planning process (Table 1).

The modeled available groundwater is also summarized by county, regional water planning area, river basin, and groundwater conservation district as shown in tables 2 through 5. In Table 5, the modeled available groundwater both excluding and including areas outside of a groundwater conservation district is shown.

LIMITATIONS:

The groundwater model used in developing estimates of modeled available groundwater is the best available scientific tool that can be used to estimate the pumping that will achieve the desired future conditions. Although the groundwater model used in this analysis is the best available scientific tool for this purpose, it, like all models, has limitations. In reviewing the use of models in environmental regulatory decision-making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

A key aspect of using the groundwater model to develop estimates of modeled available groundwater is the need to make assumptions about the location in the aquifer where future pumping will occur. As actual pumping changes in the future, it will be necessary to evaluate the amount of that pumping as well as its location in the context of the assumptions associated with this analysis. Evaluating the amount and location of future pumping is as important as evaluating the changes in groundwater levels, spring flows, and other metrics that describe the condition of the groundwater resources in the area that relate to the adopted desired future condition(s).

Given these limitations, users of this information are cautioned that the modeled available groundwater numbers should not be considered a definitive, permanent description of the amount of groundwater that can be pumped to meet the adopted desired future condition. Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor future groundwater pumping as well as whether or not they are achieving their desired future conditions. Because of the limitations of the model and the assumptions in this analysis, it is important that the groundwater

conservation districts work with the TWDB to refine the modeled available groundwater numbers given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future.

REFERENCES:

Oliver, W., 2010, GAM Task 10-012 Model Run Report: Texas Water Development Board, GAM Task 10-012 Report, 48 p.

Deeds, N.E., Yan, T., Singh, A., Jones, T.L., Kelley, V.A., Knox, P.R., Young, S.C., 2010, Groundwater availability model for the Yegua-Jackson Aquifer: Final report prepared for the Texas Water Development Board by INTERA, Inc., 582 p.

National Research Council, 2007, Models in Environmental Regulatory Decision Making. Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p.

Texas Water Development Board, 2007, Water for Texas – 2007—Volumes I-III; Texas Water Development Board Document No. GP-8-1, 392 p.

Table 1: Modeled available groundwater for the Yegua-Jackson Aquifer in Groundwater Management Area 13. Results are in acre-feet per year and are divided by county, regional water planning area, and river basin.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Atascosa	L	Nueces	855	855	855	855	855	855
Frio	L	Nueces	0	0	0	0	0	0
Gonzales	L	Guadalupe	980	980	980	980	980	980
		Lavaca	3	3	3	3	3	3
Karnes	L	Guadalupe	112	112	112	112	112	112
		Nueces	34	34	34	34	34	34
		San Antonio	628	628	628	628	628	628
La Salle	L	Nueces	91	91	91	91	91	91
McMullen	N	Nueces	179	179	179	179	179	179
Webb	M	Nueces	11,969	11,969	11,969	11,969	11,969	11,969
		Rio Grande	8,030	8,030	8,030	8,030	8,030	8,030
Wilson	L	Guadalupe	48	48	48	48	48	48
		Nueces	184	184	184	184	184	184
		San Antonio	606	606	606	606	606	606
Zapata	M	Rio Grande	7,999	7,999	7,999	7,999	7,999	7,999
Total			**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 2: Modeled available groundwater for the Yegua-Jackson Aquifer summarized by county in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	2020	2030	2040	2050	2060
Atascosa	855	855	855	855	855	855
Frio	0	0	0	0	0	0
Gonzales	983	983	983	983	983	983
Karnes	774	774	774	774	774	774
La Salle	91	91	91	91	91	91
McMullen	179	179	179	179	179	179
Webb	19,999	19,999	19,999	19,999	19,999	19,999
Wilson	838	838	838	838	838	838
Zapata	7,999	7,999	7,999	7,999	7,999	7,999
Total	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 3: Modeled available groundwater for the Yegua-Jackson Aquifer summarized by regional water planning area in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year.

Regional Water Planning Area	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
L	3,541	3,541	3,541	3,541	3,541	3,541
M	27,998	27,998	27,998	27,998	27,998	27,998
N	179	179	179	179	179	179
Total	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 4: Modeled available groundwater for the Yegua-Jackson Aquifer summarized by river basin in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year.

River Basin	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Guadalupe	1,140	1,140	1,140	1,140	1,140	1,140
Lavaca	3	3	3	3	3	3
Nueces	13,312	13,312	13,312	13,312	13,312	13,312
Rio Grande	16,029	16,029	16,029	16,029	16,029	16,029
San Antonio	1,234	1,234	1,234	1,234	1,234	1,234
Total	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 5: Modeled available groundwater for the Yegua-Jackson Aquifer summarized by groundwater conservation district (GCD) in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year. UWCD refers to Underground Water Conservation District.

Groundwater Conservation District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Evergreen UWCD	2,467	2,467	2,467	2,467	2,467	2,467
Gonzales County UWCD	865	865	865	865	865	865
McMullen GCD	179	179	179	179	179	179
Wintergarden GCD	91	91	91	91	91	91
Total (excluding non-district areas)	**3,602**	**3,602**	**3,602**	**3,602**	**3,602**	**3,602**
No District	28,116	28,116	28,116	28,116	28,116	28,116
Total (including non-district areas)	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

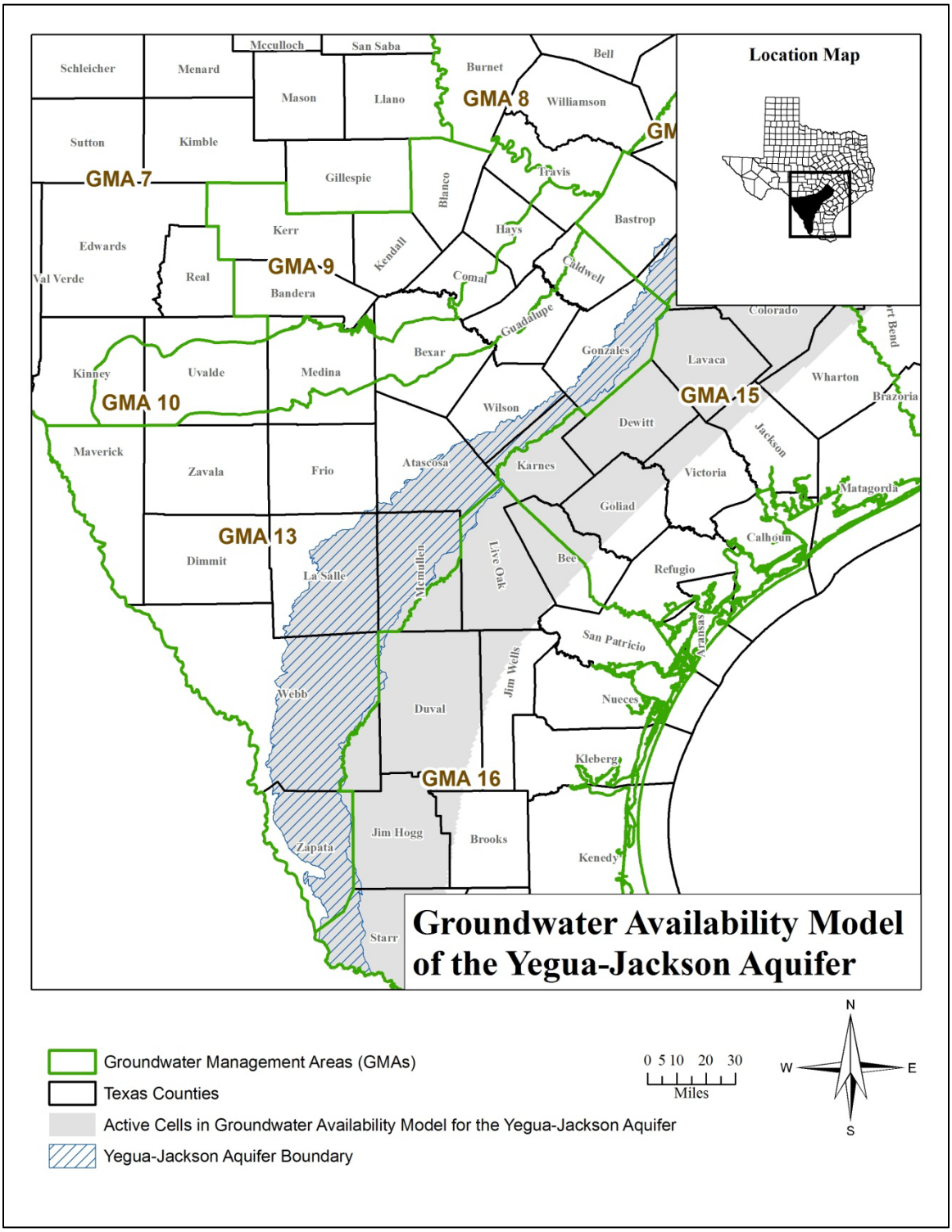

Figure 1: Map showing the areas covered by the groundwater availability model for the Yegua-Jackson Aquifer.

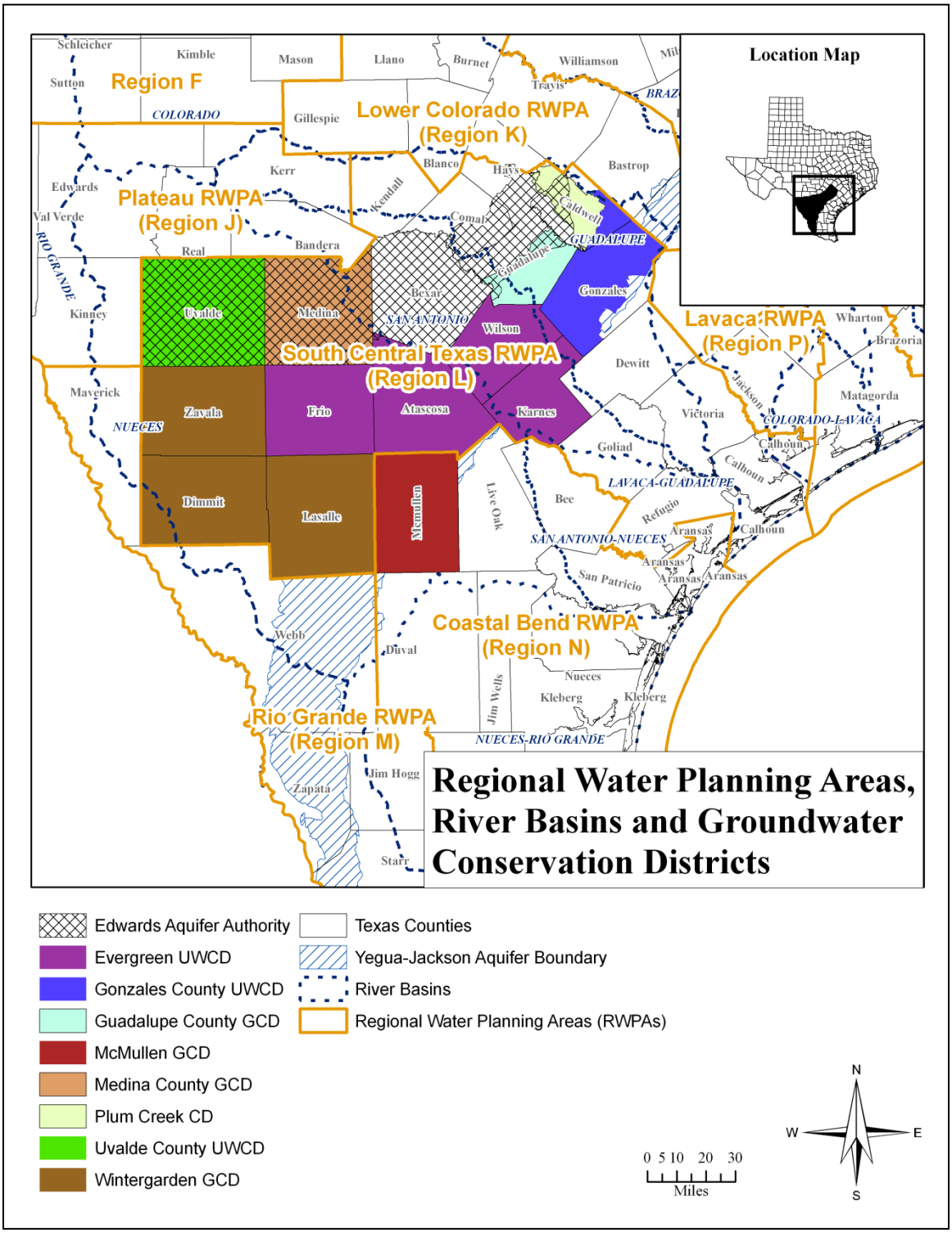

Figure 2: Map showing regional water planning areas (RWPAs), groundwater conservation districts (GCDs), counties, and river basins in Groundwater Management Area 13.