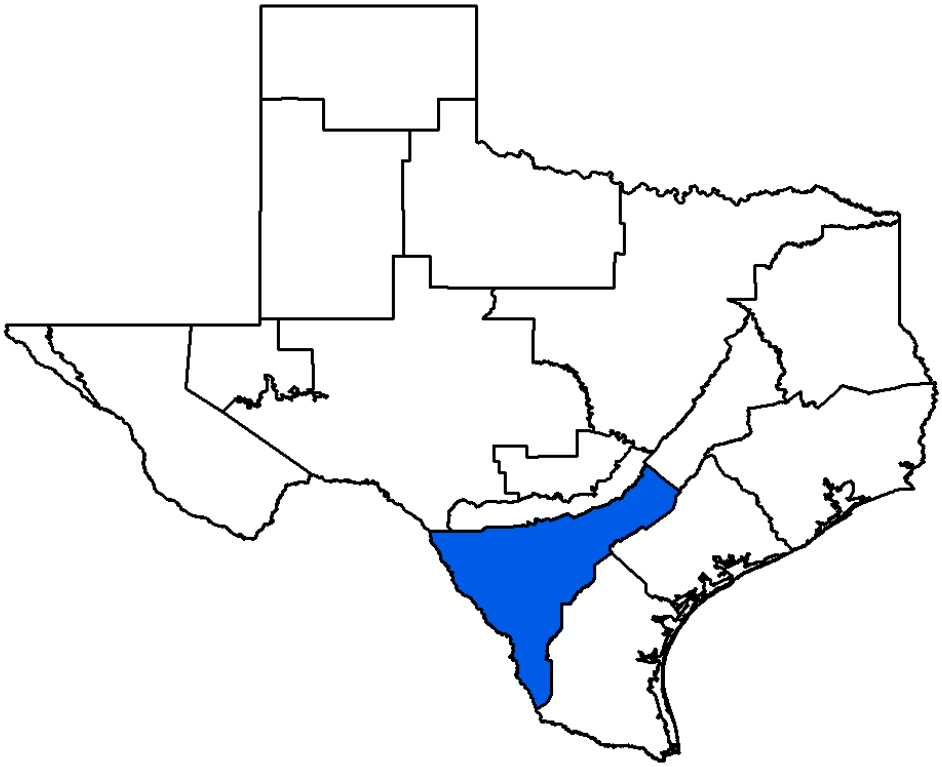
GMA 13 Technical Memorandum 16-04
Draft 2

Yegua-Jackson Aquifer: GAM Predictive Simulations



Prepared for:
Groundwater Management Area 13

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Table of Contents

List of Tables

1.0 Introduction

The Yegua-Jackson Aquifer is a minor aquifer within the boundaries of eight counties of GMA 13. In 2010, GMA 13 adopted desired future conditions for the Yegua-Jackson after considering the results of ten alternative GAM simulations using the Groundwater Availability Model (GAM) for the Yegua-Jackson Aquifer. The GAM is documented in Deeds and others (2010), and the ten alternative simulations are documented in Oliver (2010).

As part of its process to consider updated proposed desired future conditions, this technical memorandum supplements the analysis of Oliver (2010) by modifying the pumping in Gonzales and Karnes counties to account for increased use by the oil and gas industry, and extending the time period of the simulations to 2070.

Table 1 presents the 2012 estimated pumping (from the TWDB pumping data base) organized by county, and the simulated pumping for each county used in Scenario 4.0 of Oliver (2010). The simulated pumping became the basis for the modeled available groundwater (MAG) for the Yegua-Jackson Aquifer in GMA 13. It should be noted that TWDB's estimated pumping in 2012 assumed no pumping in the mining category (i.e. no groundwater pumping associated with oil and gas). Evergreen UWCD and Gonzales UWCD provided updated oil and gas pumping estimates for 2012, 2013 and 2014.

Table 1. Estimates of Historic Pumping and Simulated Pumping from Oliver (2010)

County	2012 Estimated Pumping (TWDB)	Simulated Pumping in 2060 (Oliver, 2010)
Atascosa	396	856
Gonzales	687	975
Karnes	271	776
La Salle	54	92
McMullen	29	180
Webb	4	19,999
Wilson	177	840
Zapata	159	8,000

In Gonzales County, groundwater pumping from the Yegua-Jackson Aquifer for oil and gas activities peaked at 2,500 AF/yr. Oil and gas related groundwater pumping in Karnes County peaked at 1,741 AF/yr according to data provided by the UWCD.

After reviewing monitoring well data and initial model runs, Gonzales County UWCD requested that pumping be increased to achieve a drawdown of 3 feet. This required adding an additional 1,500 AF/yr of pumping in Gonzales County (above the 2,500 AF/yr historic oil and gas related pumping). These amounts were added to the TWDB estimated historic use pumping estimates to update the simulation in Oliver (2010).

Table 2 summarizes the pumping that was used for the simulation described in this technical memorandum.

Table 2. Assumed Pumping for Updated Simulation

County	Assumed Pumping for Updated Simulation (AF/yr)
Atascosa	856
Gonzales	4,687
Karnes	2,012
La Salle	92
McMullen	180
Webb	19,999
Wilson	840
Zapata	8,000

The model input file from Oliver (2010) for his Scenario 4.0 was used to develop the pumping input file for this simulation by increasing pumping in Gonzales County by a factor of 4.81, and increasing pumping in Karnes County by a factor of 2.59. In addition, an additional 10 years was added to the simulation to extend it to 2070.

2.0 Simulation Results

The simulation results were processed and average drawdown was calculated for each county, and total pumping was obtained from the model output file (i.e. the cbb file). The Yegua-Jackson GAM is somewhat unique in that the assignment of aquifer does not necessarily conform to specific model layers like most GAM's in Texas. The model's grid file was used to define area used in the drawdown calculations.

The model grid file includes a specification labeled "ib", which designates the aquifer unit for a particular model cell (designated by its layer, row, column) as follows:

- 0 = Inactive cell
- 1 = Catahoula
- 2 = Upper Jackson
- 3 = Lower Jackson
- 4 = Upper Yegua
- 5 = Lower Yegua
- 6 = Conduit cells

The conduit cells (and the inactive cells) were not included in the calculation of drawdown. Drawdowns in all cells labeled 1 to 5 in the ib array were summed for each county and divided by the total number of cells labeled 1 to 5 in the ib array for each county. Pumping was also summed in a similar fashion (i.e. summation of all calls labeled 1 to 5 in the ib array for each county).

The results are summarized in Table 3. The current DFC is also shown in Table 3.

Table 3. Summary of Average Drawdown and Output Pumping

County	Current DFC (from 2010 to 2060)	Average Drawdown (ft) from 2010 to 2070	Pumping (AF/yr)
Atascosa	0	0	856
Gonzales	1	3	4,710
Karnes	1	1	2,057
La Salle	0	0	92
McMullen	0	0	179
Webb	3	4	19,986
Wilson	1	1	827
Zapata	3	3	7,982

3.0 References

Deeds, N.E., Yan, T., Singh, A., Jones, T., Kelley, V.A., Knox, P.R., and Young, S.C., 2010. Final Report, Groundwater Availability Model for the Yegua-Jackson Aquifer. Prepared for the Texas Water Development Board, March 2010, 582p.

Oliver, W., 2010, GAM Task 10-012 Model Run Report. Texas Water Development Board, Groundwater Availability Modeling Section, August 9, 2010, 48p.