GAM run 05-25

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Groundwater Availability Modeling Section
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REQUESTOR:

Lonnie Stewart, Bee Groundwater Conservation District (Bee GCD)

DESCRIPTION OF REQUEST:

Mr. Stewart requested that we use the groundwater availability model (GAM) for the central part of the Gulf Coast aquifer to estimate the amount of pumping in Bee County that will result in the following water level declines:

- 0 feet
- 10 feet
- 25 feet

METHODS:

To address the request, we:

- Extracted the first year pumping from the transient model (1980);
- Ran the steady-state predevelopment GAM for reference water levels;
- Ran the steady-state GAM using the first year pumping as a baseline. The steady-state model was chosen for the analysis because it simulates long-term water-level declines;
- Calculated water-level declines by subtracting long-term pumped water levels from predevelopment water levels; and
- Uniformly adjusted pumping volumes within Bee County, for each aquifer layer, until the average water-level decline in the county was approximately 0, 10, and 25 feet for that layer.

PARAMETERS AND ASSUMPTIONS:

In the analysis, we assumed that the pumping distribution would remain as it was in the baseline case. See Chowdhury and others (2004) for assumptions and limitations of the GAM for the central part of the Gulf Coast aquifer. We assumed future wells drilled into the Evangeline aquifer would not be screened any deeper than existing wells. We also assumed 1980 pumpage volumes and pumping distributions would remain constant for surrounding counties.

RESULTS:

The estimated pumping volumes are listed in Table 1. Because the water levels are referenced to predevelopment, zero water level declines correspond to zero pumping.

In the Chicot aquifer (layer 1) it was not possible to achieve a 25-foot head decline because as the pumping was increased model cells adjacent to the updip outcrop boundary went dry. Model cells go dry when the pumping exceeds the ability of the cell to transmit water and water levels in that cell drop below the base of the aquifer. When a model cell goes dry, the pumping from that cell turns off in the model. The maximum average water-level decline that could be achieved was 17 feet. Any additional pumping in the cells would result in more dry cells, which would lead to less total pumping. For the 25-foot decline scenario 93 cells go dry in layer 1 and three cells go dry in layer 2 (Evangeline aquifer). We calculated average water-level declines only for cells that did not go dry.

In the 10-foot decline calculations two model cells went dry in layer 1 and one cell went dry in layer 2.

Table 1 might be used to determine total useable groundwater by deciding on an acceptable average water-level decline and selecting the total pumping volume for that decline from the table. That pumping volume could be the maximum amount of useable groundwater without exceeding the selected water-level decline. Different acceptable water level declines may also be selected for each layer and the individual pumping volumes could then be added together.

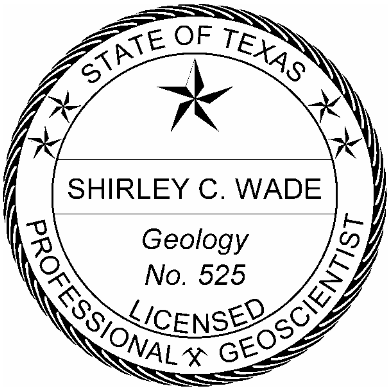
Table 1. Estimated pumping for water-level declines in the GAM for the central part of the Gulf Coast aquifer in Bee County.

Layer	Average Water Level Decline[1]	Pumping (acre-ft/year)
Chicot	0	0
Evangeline	0	0
Burkeville	0	0
Jasper	0	0
Total	**0**	**0**
Chicot	10	1,357
Evangeline	10	2,448
Burkeville	10	8
Jasper	10	42
Total	**10**	**3,855**
Chicot	17	1,815
Evangeline	25	6,642
Burkeville	25	243
Jasper	25	419
Total	**25**	**9,119**

[1]Within one foot – relative to predevelopment water levels

REFERENCES:

Chowdhury, A. H., Wade, S., Mace, R., E., and Ridgeway, C., 2004, Groundwater availability model of the central Gulf Coast Aquifer System: Numerical simulations through 1999, Texas Water Development Board, Model Summary Report, 113 p.



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