GAM run 05-34

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REQUESTOR:

Ed Walker, General Manager for Wintergarden Groundwater Conservation District

DESCRIPTION OF REQUEST:

Mr. Walker requested the following information for his district from the southern part of the Groundwater Availability Model (GAM) for the Queen City, Sparta, and Carrizo-Wilcox aquifers:

- the annual volume of water exiting from the aquifer in the Wintergarden Groundwater Conservation District with the water level remaining the same.

METHODS:

To address the request, we:

- ran the steady-state GAM for the southern part of the Queen City, Sparta, and Carrizo-Wilcox aquifers and extracted groundwater budget information for Dimmit, La Salle, and Zavala counties. We summed all volumes of water exiting the counties, which included lateral flow out, leakage to younger layers, evapotranspiration, and net stream leakage.

PARAMETERS AND ASSUMPTIONS:

We used the following assumptions in this analysis:

- see Deeds and others (2003) and Kelley and others (2004) for assumptions and limitations of the GAM;
- recharge represents long-term average climatic conditions;
- the steady-state GAM represents pre-development (no pumpage) with no change to water levels; and
- we included in our analysis all model cells whose centroid fell within Dimmit, La Salle, and Zavala county boundaries.

RESULTS:

Recharge and Water budget

A groundwater budget summarizes how the model estimates water entering and leaving the aquifer. The groundwater budget for the steady-state model is shown in Table 1. Lateral flow in and out represent groundwater flowing into and out of the aquifer(s) across county boundaries. Upward leakage to younger layers in Table 1 represents the exchange of groundwater between aquifer formations. Total recharge represents contributions to the aquifer from precipitation entering the system where the geologic unit containing the aquifer is exposed at the land surface. Evapotranspiration in Table 1 represents the process by which plants pull and use water directly from the aquifer. Net stream leakage reflects the interaction of the aquifer with surface water bodies.

The total recharge for Dimmit, La Salle, and Zavala counties from the GAM is 48,452 acre-feet per year. Some groundwater conservation districts consider recharge for their management plans to equal total recharge. Other groundwater conservation districts consider a net value, such as total recharge minus evapotranspiration, which is 45,050 acre-feet per year.

Table 1. Groundwater flow budget for Dimmit, La Salle, and Zavala counties in the steady-state GAM of the southern part of the Queen City, Sparta, and Carrizo-Wilcox aquifers.

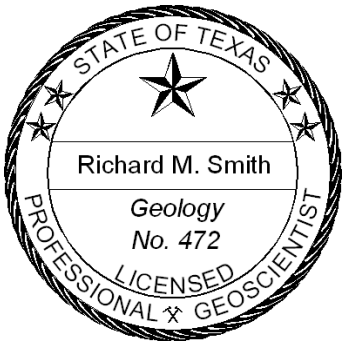
Flow Term	*Flow (acre-feet/year)*
Lateral flow in	28,213
Lateral flow out	-20,682
Upward leakage to younger layers	-14,568
Total recharge	48,452
Evapotranspiration	-3,402
Net stream leakage	-37,834

In Table 1, a negative sign refers to flow out of the aquifer in Dimmit, La Salle, and Zavala counties and a positive sign refers to flow into the aquifer in Dimmit, La Salle, and Zavala counties. All numbers are rounded to the nearest 1 acre-foot. Values are probably only accurate to two significant figures. Based on this table, the total volume leaving the counties under steady-state predevelopment conditions with no pumping is approximately 76,486 acre-feet per year.

REFERENCES:

Deeds, N., Kelley, V., Fryar, D., and Jones, T., 2003, Groundwater availability model for the southern Carrizo-Wilcox aquifer: final report prepared for the Texas Water Development Board by INTERA Inc.

Kelley, V. A., Deeds, N. E., Fryar, D. G., Nicot, J. P., Jones, T. L., Dutton, A. R., Bruehl, G., Unger-Holtz, T., and Machin J. L., 2004, Groundwater availability model for the Queen City and Sparta aquifers: final report prepared for the Texas Water Development Board by INTERA Inc.



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