GAM Run 08-52

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EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h), states that, in developing its groundwater management plan, groundwater conservation districts shall use groundwater availability modeling information provided by the Executive Administrator of the Texas Water Development Board in conjunction with any available site-specific information provided by the district for review and comment to the Executive Administrator. Information derived from groundwater availability models that shall be included in groundwater management plans includes:

(1) the annual amount of recharge from precipitation to the groundwater resources within the district, if any;
(2) for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; and
(3) the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The purpose of this model run is to provide information to the Sutton County Underground Water Conservation District for its groundwater management plan. The groundwater management plan for the Sutton County Underground Water Conservation District is due for approval by the executive administrator of the Texas Water Development Board before March 5, 2009.

This report discusses the method, assumptions, and results from model runs using the groundwater availability model for the Edwards-Trinity (Plateau) Aquifer. Table 1 summarizes the groundwater availability model data required by statute for the Sutton County Underground Water Conservation District's groundwater management plan.

METHODS:

We ran the groundwater availability model for the Edwards-Trinity (Plateau) Aquifer and (1) extracted water budgets for each year of the 1980 through 1999 period and (2) averaged the annual water budget values for recharge, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper), and net inter-aquifer flow (lower) for the portion of the Edwards-Trinity (Plateau) Aquifer located within the district.

PARAMETERS AND ASSUMPTIONS:

- We used version 1.01 of the groundwater availability model for the Edwards-Trinity (Plateau) Aquifer. See Anaya and Jones (2004) for assumptions and limitations of the model for the Edwards-Trinity (Plateau) Aquifer.

- The Edwards-Trinity (Plateau) Aquifer model includes two layers representing the Edwards Group and equivalent limestone hydrostratigraphic units (Layer 1) and the undifferentiated Trinity Group hydrostratigraphic units (Layer 2) in the district (Table 2).

- The root mean square error (a measure of the difference between simulated and actual water levels during model calibration) of the Edwards-Trinity (Plateau) groundwater availability model for the period of 1990 to 2000 is 143 feet, or six percent of the range of measured water levels.

- We used Processing Modflow for Windows (PMWIN) version 5.3 (Chiang and Kinzelbach, 2001) as the interface to process model output results for the Edwards-Trinity (Plateau) groundwater availability model.

RESULTS:

A groundwater budget summarizes the water entering and leaving the aquifer according to the groundwater availability model. Selected components were extracted from the groundwater budget for the aquifers located within the district and averaged over the duration of the calibrated portion of the model run (1980 to 1999) in the district, as shown in Table 1. The components of the modified budgets shown in Table 1 include:

- Precipitation recharge—This is the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifer (where the aquifer is exposed at land surface) within the district.

- Surface water outflow—This is the total water exiting the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).

- Flow into and out of district—This component describes lateral flow within the aquifer between the district and adjacent counties.

- Flow between aquifers—This describes the vertical flow, or leakage, between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs. "Inflow" to an aquifer from an overlying or underlying aquifer will always equal the "Outflow" from the other aquifer.

The information needed for the district's management plan is summarized in Table 1. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as district or county boundaries, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

Table 1: Summarized information needed for the Sutton County Underground Water Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards Group and equivalent limestone	26,888
	Undifferentiated Trinity Group	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards Group and equivalent limestone	26,628
	Undifferentiated Trinity Group	0
Estimated annual volume of flow into the district within each aquifer in the district	Edwards Group and equivalent limestone	19,363
	Undifferentiated Trinity Group	5,763
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards Group and equivalent limestone	13,683
	Undifferentiated Trinity Group	12,175
Estimated net annual volume of flow between each aquifer in the district	Edwards into Trinity	6,057

REFERENCES:

Anaya, R., and Jones, I., 2004, Groundwater availability model for the Edwards-Trinity (Plateau) and Cenozoic Pecos Alluvium aquifer systems, Texas: Texas Water Development Board, GAM Report, 208 p., http://www.twdb.state.tx.us/gam/eddt_p/eddt_p.htm

Chiang, W., and Kinzelbach, W., 2001, Groundwater Modeling with PMWIN, 346 p.
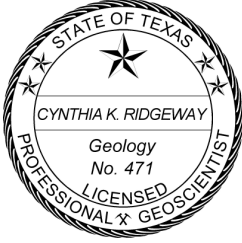
Cynthia K. Ridgeway is Manager of the Groundwater Availability Modeling Section and is responsible for oversight of work performed by employees under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G., on July 7, 2008.