GAM Run 08-13

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EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h), states that in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the executive administrator in conjunction with any available site-specific information provided by the district and acceptable to the executive administrator. Information derived from groundwater availability models that shall be included in groundwater management plans include:

(1) the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;
(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 Sterling County Underground Water Conservation District needed for its groundwater management plan. The groundwater management plan for the Sterling County Underground Water Conservation District is due for approval by the executive administrator of the Texas Water Development Board before January 25, 2011.

This report discusses the methods, assumptions, and results from a model run using the groundwater availability model for the Edwards-Trinity (Plateau) Aquifer. Table 2 summarizes the groundwater availability model data required by statute for the Sterling County Underground Water Conservation Districts 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 water budget values for recharge, surface water inflow, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper) and net inter-aquifer flow (lower) for the portions of the Edwards and the Trinity aquifers located within the district.

PARAMETERS AND ASSUMPTIONS:

- We used version 1.01 of the groundwater availability model for the Edwards-Trinity (Plateau) Aquifer.

- In the analysis, the pumpage distribution for each transient calibrated model is the same as described in Anaya and Jones (2004).

- The root mean squared error (a measure of the difference between simulated and actual water levels during model calibration) in 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 (Anaya and Jones, 2004).

- The Edwards-Trinity (Plateau) Aquifer model includes two layers representing the Edwards and associated limestones (Layer 1) and the undifferentiated Trinity units (Layer 2) in the district.

- We used Groundwater Vistas Version 5 (Environmental Simulations, Inc. 2007) as the interface to process model output.

RESULTS:

A groundwater budget summarizes the water entering and leaving the aquifer according to the groundwater availability model. The groundwater budget for the annual average values for the Edwards-Trinity (Plateau) Aquifer (1980 to 1999) in the district is shown in Table 1. The components of the modified budgets shown in Table 1 include:

- Surface water inflow and outflow—This is the total surface water entering the aquifer (inflow) through streams or reservoirs, and the total surface water exiting the aquifer (outflow) to streams, reservoirs, drains (springs), or through evapotranspiration (return of moisture to the air through both evaporation from the soil and transpiration or loss of water vapor by plants).

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

- Net inter-aquifer flow—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 can occur. “Inflow” to an aquifer from an overlying or underlying aquifer will always equal the “Outflow” from the other aquifer.

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

The information needed for the district's management plan is summarized in Table 2.

It is important to note that sub-regional water budgets for individual counties, such as Sterling County are not exact. This is due to the one-mile spacing of the model grid and because we assumed each model cell is assigned to a single county. The water budgets for an individual cell containing a county boundary are assigned to either one county or the other and therefore very minor variations in the county-wide budgets may be observed.

Although the Dockum Aquifer also occurs in Sterling County, a groundwater availability model is not yet available for the Dockum. If the Sterling County Underground Water Conservation District would like information for the Dockum Aquifer, the district can request it from the Groundwater Technical Assistance Section of the TWDB.

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, accessed on April 8, 2008.

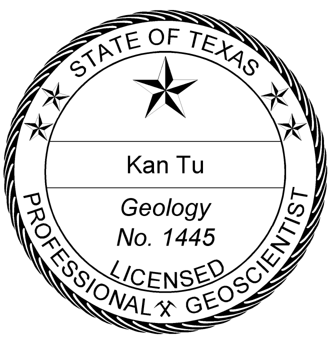
Environmental Simulations, Inc., 2007, Guide to Using Groundwater Vistas Version 5, 381 p.

Table 1: Selected flow terms for each aquifer layer, into and out of the Sterling Underground County Water Conservation District, averaged for the years 1980 to 1999 from the groundwater availability model of the Edwards-Trinity (Plateau) Aquifer. Flows are reported in acre-feet per year. Note: a negative value refers to flow out of the aquifer in the district. A positive value refers to flow into the aquifer in the district. All numbers are rounded to the nearest 1 acre-foot per year. Flow into and out of the confining layers are negligible compared to the aquifers and are not included.

Aquifer	Surface water inflow	Surface water outflow	Lateral inflow into district	Lateral outflow from district	Net inter-aquifer flow (upper)	Net inter-aquifer flow (lower)
Edwards (Plateau)	0	-2,913	1,149	-1,365	0	-1,254
Trinity (Plateau)	0	-3,270	559	-3,119	1,254	0

Table 2: Summarized information needed for the Sterling County Water Conservation District’s management plan. Note: a negative value refers to flow out of the aquifer in the district. A positive value refers to flow into the aquifer in the district. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot per year.

Management Plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Edward (Plateau)	4,415
	Trinity (Plateau)	5,921
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edward (Plateau)	-2,913
	Trinity (Plateau)	-3,270
Estimated annual volume of flow into the district within each aquifer in the district	Edward (Plateau)	1,149
	Trinity (Plateau)	559
Estimated annual volume of flow out of the district within each aquifer in the district	Edward (Plateau)	-1,365
	Trinity (Plateau)	-3,119
Estimated annual net volume of flow between each aquifer in the district	Edward (Plateau) into Trinity (Plateau)	1,254



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