GAM Run 08-28

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> May 16, 2008

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 include:

(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 groundwater availability model run is to provide information to the Panhandle Groundwater Conservation District needed for its groundwater management plan. The groundwater management plan for the Panhandle Groundwater Conservation District is due for approval by the Executive Administrator of the Texas Water Development Board before October 24, 2008.

This report discusses the methods, assumptions, and results from model runs using the groundwater availability models for the northern and southern parts of the Ogallala Aquifer. Table 1 summarizes the groundwater availability model data required by statute for the Panhandle Groundwater Conservation Districts groundwater management plan.

The Seymour, Blaine, and Dockum aquifers also underlie the Panhandle Groundwater Conservation District. If the district would like information for the Seymour, Blaine, and Dockum aquifers, they may request it from the Groundwater Technical Assistance Section of the Texas Water Development Board.

METHODS:

We ran the groundwater availability models for the northern and southern parts of the Ogallala Aquifer and (1) extracted water budgets for each year of the 1979 through 1988

(northern part of the Ogallala Aquifer model) and 1980 through 1999 (southern part of the Ogallala Aquifer model) 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 northern and southern parts of the Ogallala Aquifer located within the district.

PARAMETERS AND ASSUMPTIONS:

- We used version 2.01 of the groundwater availability model for the northern part of the Ogallala Aquifer (Dutton, 2004) and version 1.01 of the groundwater availability model for the southern part of the Ogallala Aquifer (Blandford and others, 2003)

- See Dutton and others (2001) and Dutton (2004) for assumptions and limitations of the model for the northern part of the Ogallala Aquifer. Root mean squared error for this model is 53 feet. This error has more of an effect on model results where the aquifer is thin.

- See Blandford and others (2003) for assumptions and limitations of the model for the southern part of the Ogallala Aquifer. Root mean squared error for this model is 47 feet. This error will have more of an effect on model results where the aquifer is thin.

- We used Processing Modflow for Windows (PMWIN) version 5.3 (Chiang and Kinzelbach, 2001) 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. Selected components were extracted from the groundwater budget and averaged over the duration of the calibrated portion of the model run—1979 through 1988 (northern part of the Ogallala Aquifer model) and 1980 through 1999 (southern part of the Ogallala Aquifer model). 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 aquifers (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 Panhandle Groundwater 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. Negative values indicate water is leaving the aquifer system using the parameters or boundaries listed in the table.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Northern part of the Ogallala	96,778
	Southern part of the Ogallala	428*
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Northern part of the Ogallala	-103,310
	Southern part of the Ogallala	-589
Estimated annual volume of flow into the district within each aquifer in the district	Northern part of the Ogallala	21,894
	Southern part of the Ogallala	968
Estimated annual volume of flow out of the district within each aquifer in the district	Northern part of the Ogallala	-16,593
	Southern part of the Ogallala	-433
Estimated net annual volume of flow between each aquifer in the district	Ogallala and underlying units	0**

* Estimated value may also include return flow from irrigation.
**The models do not consider flow into or out of the Ogallala from other formations.

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Cynthia K. Ridgeway, P.G., on May 16, 2008.