GAM Run 12-002 MAG: Modeled Available Groundwater for the Edwards (Balcones Fault Zone) Aquifer in Groundwater Management Area 10 for Kinney County

by Jerry Shi, Ph.D.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-5076
July 24, 2012

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EXECUTIVE SUMMARY:

The modeled available groundwater for the Groundwater Management Area 10 portion of the Edwards (Balcones Fault Zone) Aquifer in Kinney County is listed by river basin and regional water planning area in Table 1, and groundwater conservation district in Table 2. This model run incorporates the desired future condition for the area adopted by the members of Groundwater Management Area 10 of maintaining a minimum water level of 1,184 feet above mean sea level in well number 70-38-902. The modeled available groundwater from the Edwards (Balcones Fault Zone) Aquifer in Groundwater Management Area 10 in Kinney County that results from the requested desired future condition is approximately 6,300 acre-feet per year from 2010 to 2060.

REQUESTOR:

Mr. Rick Illgner of Edwards Aquifer Authority on behalf of Groundwater Management Area 10.

DESCRIPTION OF REQUEST:

In a letter dated August 24, 2010, Mr. Illgner provided the Texas Water Development Board (TWDB) with the desired future condition of the Edwards (Balcones Fault Zone) Aquifer in Groundwater Management Area 10 in Kinney County. The desired future condition for the aquifer, as described in Resolution No. 2010-08 and adopted

August 4, 2010 by the groundwater conservation districts within Groundwater Management Area 10, are described below:

> *The district members of Groundwater Management Area 10 adopt the scenario for Kinney County that the DFC [Desired Future Condition] shall be that the water level in well number 70-38-902 shall not fall below 1184 feet MSL [Mean Sea Level]*

METHODS, PARAMETERS AND ASSUMPTIONS:

The desired future condition for Kinney County was achieved in a new model run (Shi and others, 2012). The new model run is an update of Scenario 3 of Groundwater Availability Modeling (GAM) Task 10-027 (revised) (Hutchison, 2011). Both model runs were based on the MODFLOW-2000 model developed by the TWDB to assist with the joint planning process regarding the Kinney County Groundwater Conservation District (Hutchison and others, 2011). In both model runs, the total pumping in Kinney County was maintained at approximately 77,000 acre-feet per year to achieve the desired future condition. Details regarding this new model run are summarized in Shi and others (2012).

The location of the Edwards (Balcones Fault Zone) Aquifer is shown in Figure 1.

RESULTS:

The modeled available groundwater from the Groundwater Management Area 10 portion of the Edwards (Balcones Fault Zone) Aquifer in Kinney County that stems from the desired future condition is approximately 6,300 acre-feet per year (Tables 1 and 2). These tables contain the modeled available groundwater for the aquifer subdivided by regional water planning area, river basin, and groundwater conservation district for use in the regional water planning process. These areas are shown in Figure 2.

LIMITATIONS:

The groundwater model used in developing estimates of modeled available groundwater is the best available scientific tool that can be used to estimate the pumping that will achieve the desired future conditions. Although the groundwater model used in this analysis is the best available scientific tool for this purpose, it, like

all models, has limitations. In reviewing the use of models in environmental regulatory decision-making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

A key aspect of using the groundwater model to develop estimates of modeled available groundwater is the need to make assumptions about the location in the aquifer where future pumping will occur. As actual pumping changes in the future, it will be necessary to evaluate the amount of that pumping as well as its location in the context of the assumptions associated with this analysis. Evaluating the amount and location of future pumping is as important as evaluating the changes in groundwater levels, spring flows, and other metrics that describe the condition of the groundwater resources in the area that relate to the adopted desired future condition.

Given these limitations, users of this information are cautioned that the modeled available groundwater numbers should not be considered a definitive, permanent description of the amount of groundwater that can be pumped to meet the adopted desired future condition. Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. Texas Water Development Board makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor future groundwater pumping as well as whether or not they are achieving their desired future conditions. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with Texas Water Development Board to refine these modeled available groundwater numbers given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future.

REFERENCES:

Hutchison, William R., 2011, GAM Task 10-027 (revised): Texas Water Development Board, GAM Task 10-027 Report, 8 p.

Hutchison, William R., Shi, Jerry, and Jigmond, Marius, 2011, Groundwater Flow Model of the Kinney County Area, Texas Water Development Board, 138 p.

National Research Council, 2007, Models in Environmental Regulatory Decision Making, Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p.

Shi, Jerry, Ridgeway, Cindy, and French, Larry, 2012, Draft GAM Task Report 12-002: Modeled Available Groundwater in Kinney County (April 11, 2012).

Texas Water Development Board, 2007, Water for Texas – 2007—Volumes I-III; Texas Water Development Board Document No. GP-8-1, 392 p.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 IN KINNEY COUNTY. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Kinney	J	Nueces	6,319	6,319	6,319	6,319	6,319	6,319
		Rio Grande	2	2	2	2	2	2
Total			**6,321**	**6,321**	**6,321**	**6,321**	**6,321**	**6,321**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 BY GROUNDWATER CONSERVATION DISTRICT FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Kinney County GCD	6,321	6,321	6,321	6,321	6,321	6,321

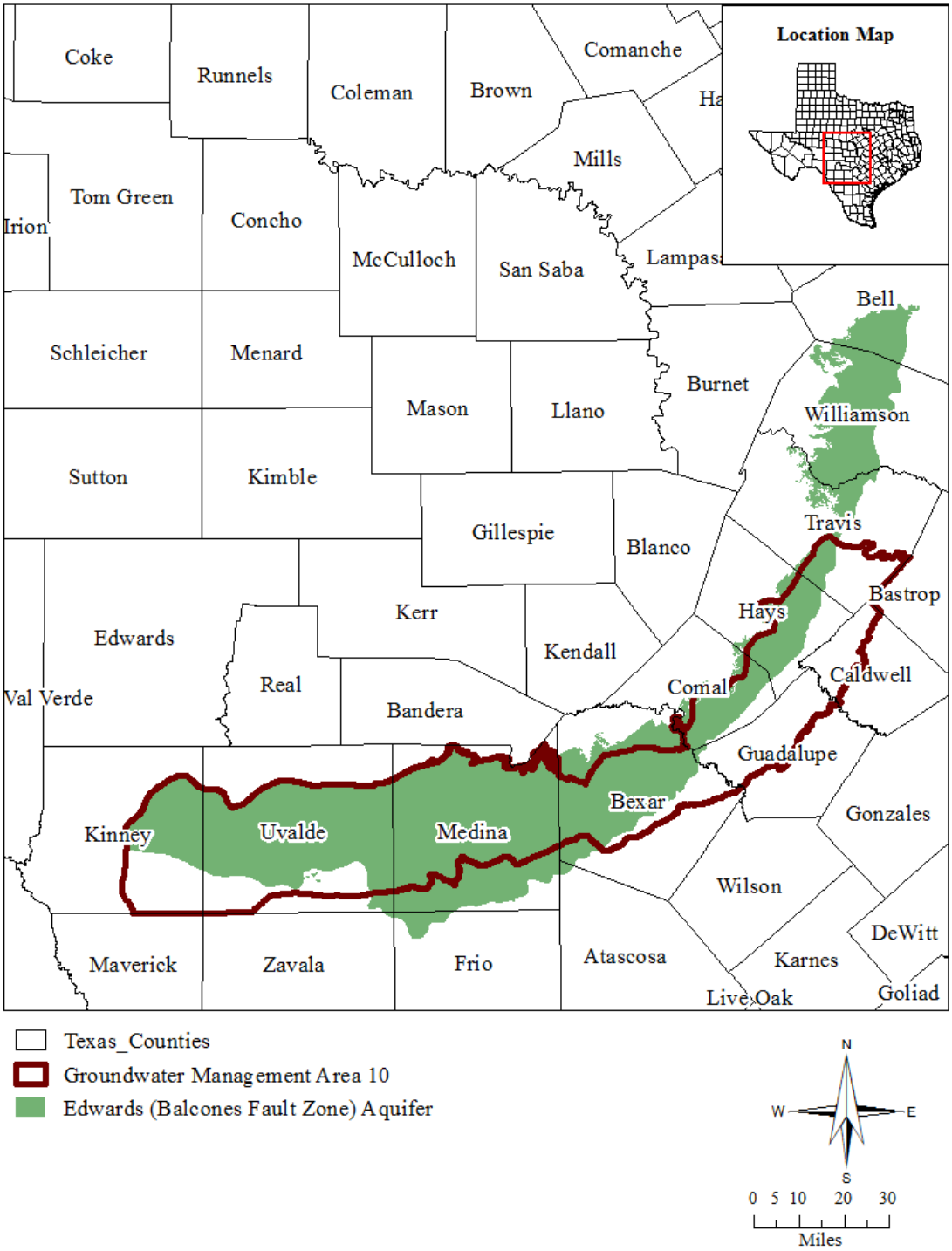

FIGURE 1. MAP SHOWING THE BOUNDARY OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER ACCORDING TO THE 2007 STATE WATER PLAN (TWDB, 2007).

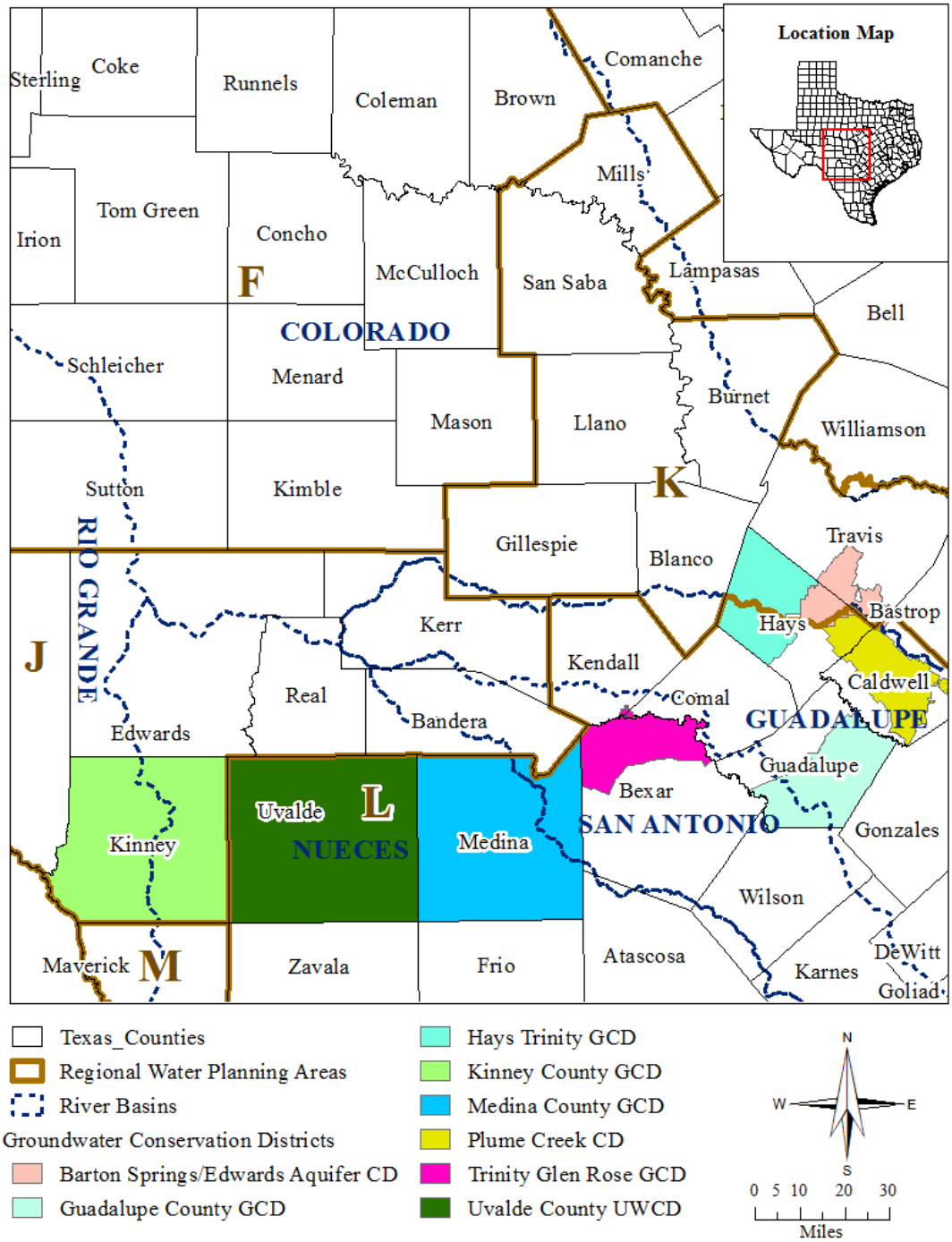

FIGURE 2. MAP SHOWING REGIONAL WATER PLANNING AREAS, GROUNDWATER CONSERVATION DISTRICTS, COUNTIES, AND RIVER BASINS IN AND NEIGHBORING GROUNDWATER MANAGEMENT AREA 10.