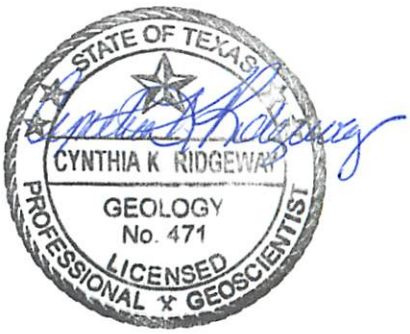
GAM Run 10-061 MAG

By Mr. Wade Oliver

Edited and finalized by Ian Jones, Ph.D., P.G. to reflect statutory changes effective September 1, 2011

Texas Water Development Board
Groundwater Availability Modeling Section
(512) 463-3132
December 6, 2011



Cynthia K. Ridgeway, the Manager of the Groundwater Availability Modeling Section and Interim Director of the Groundwater Resources Division, 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. 471 on December 6, 2011.

This page is intentionally left blank

EXECUTIVE SUMMARY:

The modeled available groundwater for the Bone Spring–Victorio Peak Aquifer as a result of the desired future condition adopted by the members of Groundwater Management Area 4 is approximately 101,400 acre-feet per year. This is shown divided by county, regional water planning area, and river basin in Table 1 for use in the regional water planning process. The estimate was taken from the model simulation documented in Groundwater Availability Modeling Task 10-006, which the members of Groundwater Management Area 4 reviewed when developing their desired future condition. In this simulation, the "net pumping" that achieves the desired future condition was reported as approximately 71,000 acre-feet per year. For this report, an irrigation return flow factor of 30 percent was used to convert net pumping to total pumping. This factor was provided by the district and is consistent with its current rules.

REQUESTOR:

Ms. Janet Adams of Jeff Davis County Underground Water Conservation District on behalf of Groundwater Management Area 4

DESCRIPTION OF REQUEST:

In a letter dated August 13, 2010, Ms. Janet Adams provided the Texas Water Development Board (TWDB) with the desired future condition of the Bone Spring–Victorio Peak Aquifer adopted by the members of Groundwater Management Area 4. The desired future condition for the aquifer, as presented in Resolution No. R 2010-01 and adopted August 13, 2010 by the groundwater conservation districts within Groundwater Management Area 4, is shown below:

> *For Hudspeth County* [Underground Water Conservation District] *No.1* [zero] *0 foot drawdown for the Bone Springs–Victorio Peak Aquifer.*

In response to receiving the adopted desired future condition, the Texas Water Development Board has estimated the modeled available groundwater for the Bone Spring–Victorio Peak Aquifer in Groundwater Management Area 4.

METHODS:

Groundwater Management Area 4 contains the Bone Spring–Victorio Peak Aquifer, a minor aquifer in Texas as defined in the 2007 State Water Plan (TWDB, 2007). The locations of the aquifer and Hudspeth County Underground Water Conservation District No. 1 are shown in Figure 1.

Using several groundwater flow models for the Bone Spring–Victorio Peak Aquifer (Hutchison, 2008), the Texas Water Development Board previously completed a series of simulations in order to assess the impact of different levels of pumping on the aquifer over a 50 year period. The simulations are documented in Groundwater Availability Modeling (GAM) Task 10-006 (Hutchison, 2010). See Hutchison (2010) for a full description of the methods, assumptions, and results of the model simulations. See Hutchison (2008) for details on the development, calibration, and applicability of the groundwater flow models.

In GAM Task 10-006, the "net pumping" that achieves zero drawdown after 50 years (which matches the desired future condition above) is approximately 71,000 acre-feet per year. Here, "net pumping" refers to the total volume of water pumped from the aquifer minus the portion that returns to the aquifer as irrigation return flow. Irrigation return flow is that portion of pumped groundwater that infiltrates past the root zone and recharges the aquifer.

The amount of irrigation return flow is estimated to be approximately 30 percent of the total volume of water pumped from the aquifer in the district. According to Hudspeth County Underground Water Conservation District No. 1, this is consistent with their current district rules. Using this factor, the net pumping reported in Hutchison (2010) was converted to total pumping for the results presented below. If the district believes a different irrigation return flow factor would be more appropriate, they may submit a revised factor, along with a description of how it was developed, to the Texas Water Development Board for consideration.

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code, "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired condition. This is distinct from "managed available groundwater," shown in the draft version of this report dated November 22, 2010, which was a permitting value and accounted for the estimated use of the aquifer exempt from permitting. This change was made to reflect changes in statute by the 82nd Texas Legislature, effective September 1, 2011.

Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits. The estimated amount of pumping exempt from permitting, which the Texas Water Development Board is now required to develop after soliciting input from applicable groundwater conservation districts, will be provided in a separate report.

RESULTS:

The modeled available groundwater for the Bone Spring–Victorio Peak Aquifer in Groundwater Management Area 4 consistent with the desired future condition is approximately 101,400 acre-feet per year. The estimated "net pumping" of 71,000 acre-feet per year (Hutchison, 2010) was converted to total pumping from the aquifer using the irrigation return flow factor of 30 percent as shown below:

$$Q_{Total} = \frac{Q_{Net}}{(1 - IRF)}$$

Where

Q_{Total} = total pumping in acre-feet per year,

Q_{Net} = net pumping in acre-feet per year, and

IRF = the irrigation return flow factor (unitless).

The modeled available groundwater is shown in Table 1 divided by county, regional water planning area, and river basin for use in the regional water planning process. Notice that all of the pumping is located within the Far West Texas Regional Water Planning Area (Region E) and the Rio Grande River Basin.

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 condition. 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(s).

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. The TWDB 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 model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine the 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, W.R., 2008. Preliminary Groundwater Flow Model, Dell City Area, Hudspeth and Culberson Counties, Texas. El Paso Water Utilities Hydrogeology Report 08-01, July 2008, 435 p.

Hutchison, W.R., 2010, GAM Task 10-006: Texas Water Development Board, GAM Task 10-006 Report, 7 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.

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 Bone Spring–Victorio Peak Aquifer in Groundwater Management Area 4. Results are in acre-feet per year and are divided by county, regional water planning area, and river basin.

County	Regional Water Planning Area	Basin	Year					
			2010	2020	2030	2040	2050	2060
Hudspeth	E	Rio Grande	101,429	101,429	101,429	101,429	101,429	101,429

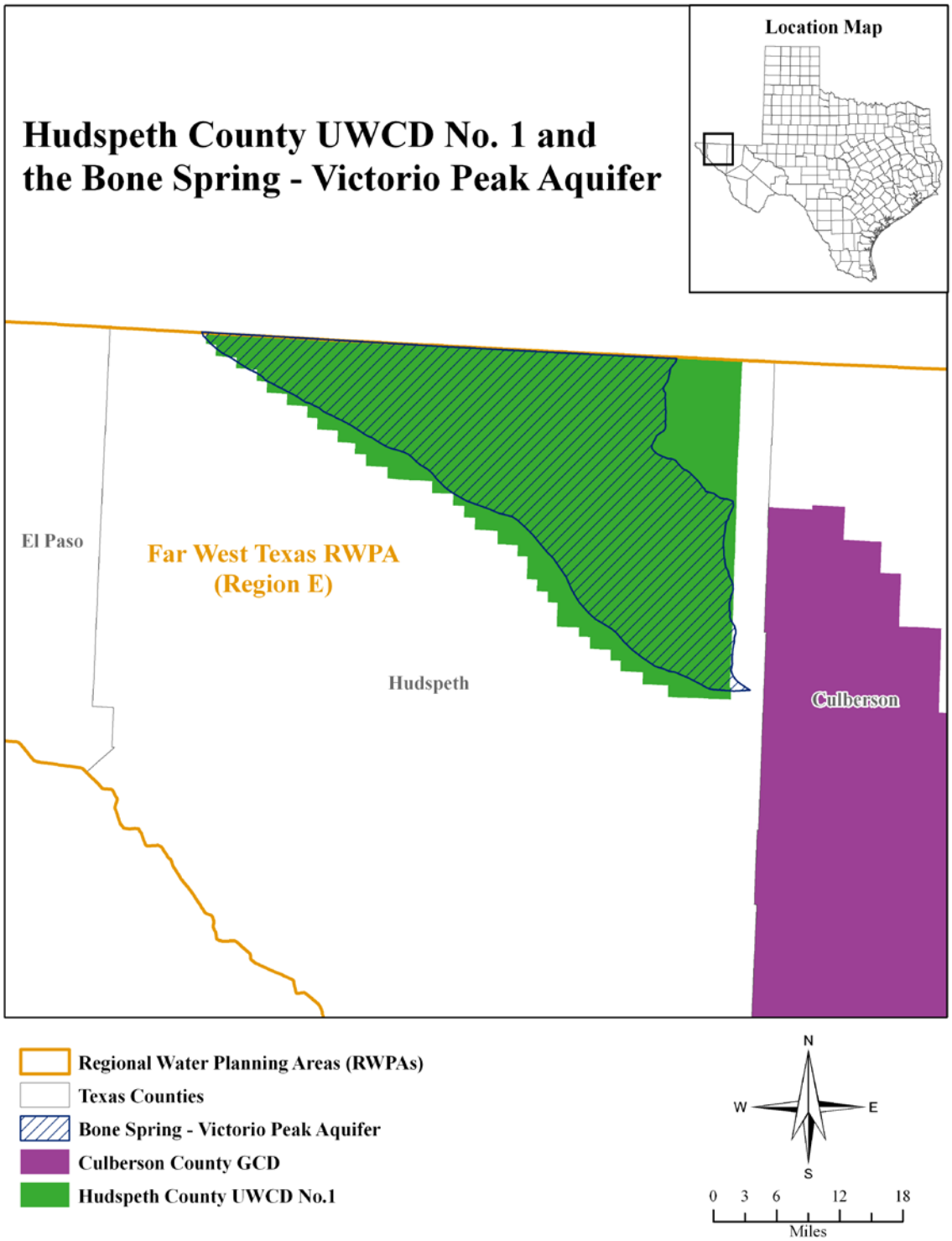


Figure 1. Map showing regional water planning areas (RWPAs), groundwater conservation districts (GCDs), and counties in the vicinity of the Bone Spring–Victorio Peak Aquifer in Groundwater Management Area 4.