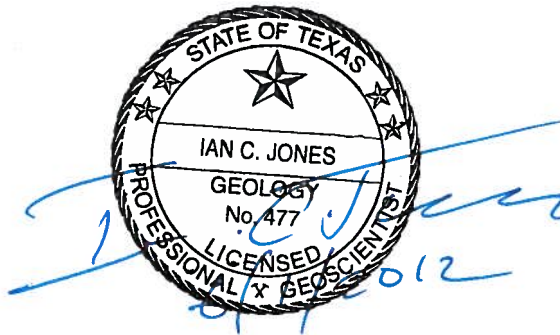# GAM Run 11-020: Hudspeth County Underground Water Conservation District No. 1 Management Plan

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Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6641
June 1, 2012

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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 the groundwater management plan includes:

- the annual amount of recharge from precipitation to the groundwater resources within the district, if any;

- 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

- the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The purpose of this report is to provide Part 2 of a two-part package of information from the Texas Water Development Board to Hudspeth County Underground Water Conservation District management plan to fulfill the requirements noted above. The groundwater management plan for Hudspeth County Underground Water Conservation District is due for approval by the Executive Administrator of the Texas Water Development Board before January 8, 2013.

This report discusses the method, assumptions, and results from model runs using the groundwater flow model for the Bone Spring-Victorio Peak Aquifer. Table 1 summarizes the groundwater availability model data required by the statute, and

Figure 1 shows the area of the model from which the values in the table were extracted. If after review of the figure, Hudspeth County Underground Water Conservation District No. 1 determines that the district boundaries used in the assessment do not reflect current conditions, please notify the Texas Water Development Board immediately.

METHODS:

The groundwater flow model for the Bone Spring-Victorio Peak Aquifer was run for this analysis. The water budget for each year of the transient model period was extracted and the average 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 portions of the aquifers located within the district are summarized in this report. The transient period used to calculate the average water budget is 1980 through 2002.

PARAMETERS AND ASSUMPTIONS:

Bone Spring-Victorio Peak Aquifer

- The hybrid version of the groundwater flow model for the Bone Spring-Victorio Peak Aquifer was used for this analysis. See Hutchison (2008) for assumptions and limitations of the groundwater flow model for the northern part of the Bone Spring-Victorio Peak Aquifer. This model is under review for consideration to be one of the TWDB groundwater availability models.

- This groundwater flow model includes one layer, which generally corresponds to the Bone Spring-Victorio Peak Aquifer, Diablo Plateau and parts of the Capitan Reef Complex Aquifer.

- The standard deviation of residuals (a measure of the difference between simulated and actual water levels during model calibration) in the groundwater availability model is 31 feet for the Bone Spring-Victorio Peak Aquifer (Hutchison, 2008). This standard deviation is about one percent of the range of measured water levels (Hutchison, 2008).

RESULTS:

A groundwater budget summarizes the amount of 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 calibration and verification portion of the model runs in the district, as shown in Table 1. The components of the modified budget shown in Table 1 include:

- Precipitation recharge—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—The total water discharging from the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).

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

- Flow between aquifers—The net vertical flow 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 a district or county boundary, 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 (see Figure 1).

TABLE 1: SUMMARIZED INFORMATION FOR THE BONE SPRING-VICTORIO PEAK AQUIFER THAT IS NEEDED FOR HUDSPETH COUNTY UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT. THESE FLOWS INCLUDE BRACKISH WATERS.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Bone Spring-Victorio Peak Aquifer	256
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Bone Spring-Victorio Peak Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Bone Spring-Victorio Peak Aquifer	110,805
Estimated annual volume of flow out of the district within each aquifer in the district	Bone Spring-Victorio Peak Aquifer	39,825
Estimated net annual volume of flow between each aquifer in the district	Bone Spring-Victorio Peak Aquifer	0

Hudspeth

Legend

Hudspeth County UWCD No. 1

County Boundaries

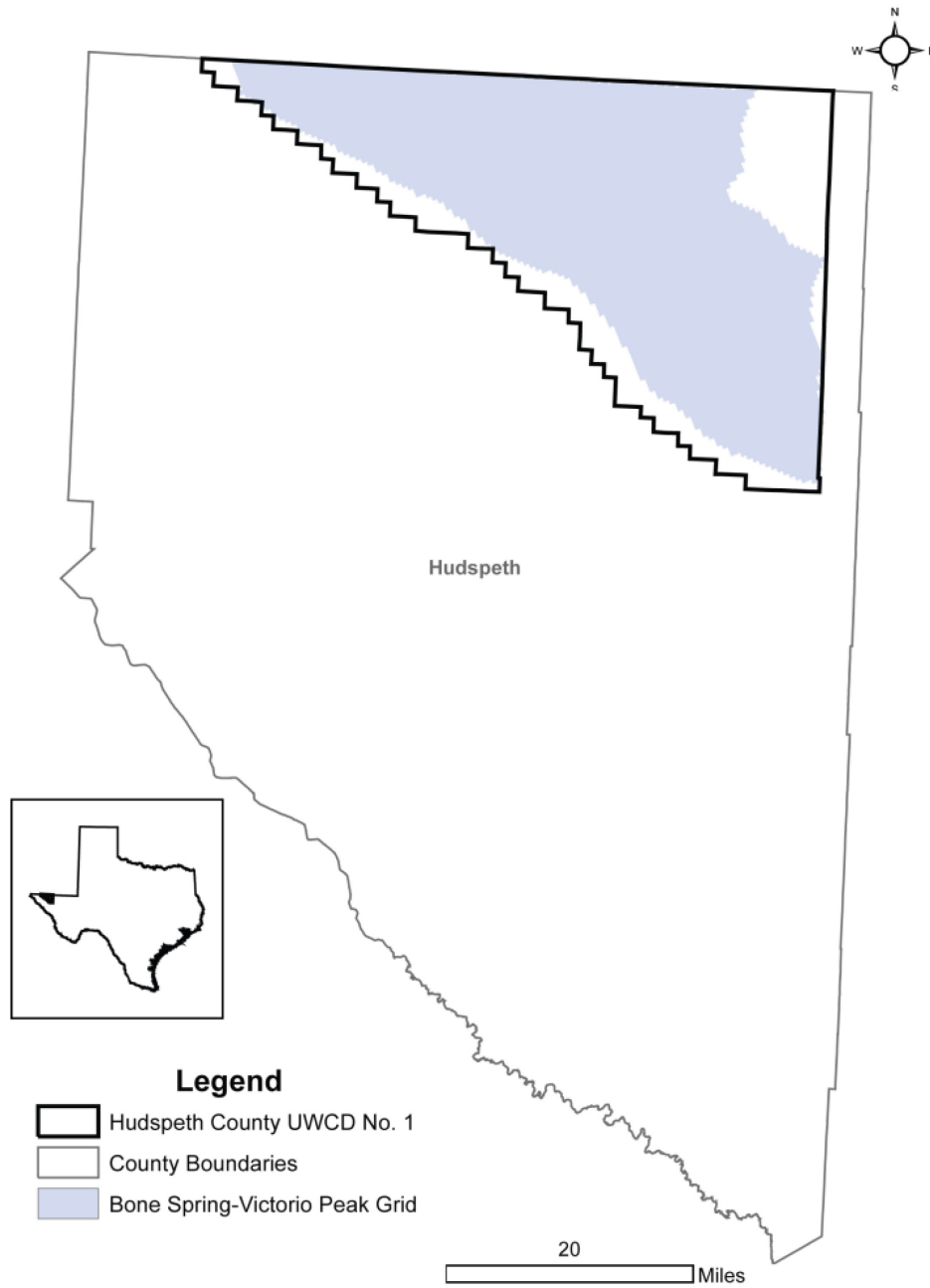Bone Spring-Victorio Peak Grid

20
Miles

FIGURE 1: AREA OF THE GROUNDWATER FLOW MODEL FOR THE BONE SPRING-VICTORIO PEAK AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS

The groundwater model(s) used in completing this analysis is the best available scientific tool that can be used to meet the stated objective(s). To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. 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 evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and interaction with streams are specific to particular historic time periods.

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 related 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 groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need

to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

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

Hutchison, W.R., 2008, Preliminary Groundwater Flow Model Dell City Area, Hudspeth and Culberson Counties, Texas: El Paso Water Utilities, EPWU Hydrogeology Report 08-01, 351 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.