GAM Run 08-85 Addendum

by Mr. Wade Oliver

Texas Water Development Board
Groundwater Availability Modeling Section
(512) 463-3132
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Cynthia K. Ridgeway is the Manager of the Groundwater Availability Modeling Section and 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 May 21, 2010.

STATE OF TEXAS
CYNTHIA K RIDGEWAY
GEOLOGY
No. 471
LICENSED
PROFESSIONAL GEOSCIENTIST

EXECUTIVE SUMMARY:

The initial and final water volumes for the two pumping scenarios presented in Groundwater Availability Model Run 08-85 are presented by county.

REQUESTOR:

Mr. Jason Coleman of South Plains Underground Water Conservation District on behalf of Groundwater Management Area 2.

DESCRIPTION OF REQUEST:

Mr. Jason Coleman requested that we provide him with the initial and final volumes by county for each pumping scenario in Groundwater Availability Model Run 08-85 documented in Smith and others (2009).

METHODS:

Two pumping scenarios are presented in Smith and others (2009). In Scenario 1, pumping in each county is based on measured 10-year average water level declines. The overall average drawdown rate for the counties presented is 0.675 feet per year. In Scenario 2, pumping in each county from Scenario 1 is scaled up so that the overall average drawdown rate is one foot per year. The initial volume, representing the year 2008, was the same for each of these scenarios.

To calculate the initial and final volume for each of the scenarios, the groundwater availability model for the southern portion of the Ogallala Aquifer (Blandford and others, 2003) was rerun using the input files for Groundwater Availability Model Run 08-85. The results were then checked against the model run report (Smith and others, 2009) to confirm that they were identical.

The initial and final head values for each scenario were extracted using Groundwater Vistas Version 5.36 Build 10 (Environmental Simulations, Inc., 2007). In addition, the bottom of the Ogallala Aquifer and the specific yield (a storage property that describes the amount of water that can be drained from an unconfined aquifer) for each model cell was extracted.

With the beginning and ending water levels, cell bottom, and specific yield for each model cell, the volume in each cell for each scenario was then calculated as follows:

$$Cell\,Volume = \left(Water\ Level - Cell\ Bottom\right) \times S_y \times Cell\ Area$$

where

Cell Volume is the volume of water contained in each cell in acre-feet;
Water Level is the water level in the cell in feet above mean sea level;
Cell Bottom is the base of the aquifer in feet above mean sea level;
S_y is the specific yield (unitless); and

Cell Area is the area of each model cell in acres. Each cell is 1 square mile, which is 640 acres.

The total water volume in each county presented in Groundwater Availability Model Run 08-85 was then calculated as the sum of each cell that fell within the county. Cells that fell on the boundary between two counties were assigned to one county based on the centroid of the model cell to prevent double-accounting.

To more easily compare volumes, the percent of the initial volume remaining at the end of the model runs for each scenario was also calculated for each county.

RESULTS:

Table 1 shows the initial volume, final volume, and percent remaining for each scenario and county presented in Groundwater Availability Model Run 08-85. It should be noted that an updated model for the southern portion of the Ogallala Aquifer, which includes interaction with the underlying Edwards-Trinity (High Plains) Aquifer, has been released subsequent to GAM Run 08-85 (Smith and others, 2009). Results obtained using this updated model may result in slightly different volumes.

REFERENCES:

Blandford, T.N., Blazer, D.J., Calhoun, K.C., Dutton, A.R., Naing, T., Reedy, R.C., and Scanlon, B.R., 2003, Groundwater availability of the southern Ogallala Aquifer in Texas and New Mexico—Numerical simulations through 2050: Final Report prepared for the Texas Water Development Board by Daniel B. Stephens & Associates, Inc., 158 p.

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

Smith, R., Aschenbach, E., Wade, S., 2009, GAM Run 08-85: Texas Water Development Board, GAM Run 08-85 Report, 42 p.

Table 1. Ogallala Aquifer volumes and percent remaining by county for each scenario presented in Groundwater Availability Model Run 08-85 (Smith and others, 2009). Initial volume applies to both scenarios. All values are reported in acre-feet.

County	Initial volume (2008)	Final volume scenario 1 (2056)	Final volume scenario 2 (2056)	Percent remaining scenario 1 (2056)	Percent remaining scenario 2 (2056)
Armstrong	618,467	586,416	585,137	95	95
Bailey	3,114,859	2,067,833	1,678,154	66	54
Castro	9,978,141	3,869,775	1,731,400	39	17
Cochran	3,479,992	1,332,475	712,925	38	20
Crosby	11,422,802	10,409,103	9,944,026	91	87
Dawson	7,506,530	2,108,715	742,853	28	10
Deaf Smith	8,593,564	6,855,694	6,146,361	80	72
Floyd	13,065,507	10,469,236	9,321,865	80	71
Gaines	13,255,328	3,930,042	1,228,655	30	9
Garza	1,048,553	625,834	425,691	60	41
Hale	10,553,616	4,890,311	2,571,032	46	24
Hockley	5,845,049	3,619,114	2,612,310	62	45
Howard	2,359,282	2,307,545	2,294,639	98	97
Lamb	9,062,978	4,143,492	2,587,689	46	29
Lubbock	7,926,881	5,540,906	4,522,100	70	57
Lynn	5,632,040	4,681,028	4,409,381	83	78
Martin	7,137,905	6,952,269	6,840,174	97	96
Potter	302,962	301,963	300,845	100	99
Randall	4,638,760	4,524,043	4,498,868	98	97
Parmer	3,641,745	625,444	234,933	17	6
Terry	5,000,340	862,821	137,119	17	3
Yoakum	2,741,559	115,206	17,666	4	1