

GAM Run 09-014 Addendum

by Mr. Wade Oliver

Texas Water Development Board
Groundwater Availability Modeling Section
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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 September 21, 2010.

EXECUTIVE SUMMARY:

This addendum to GAM Run 09-014 presents the results of three additional model runs of the modified groundwater model for the Dockum Aquifer. These three runs achieve average drawdowns between 2010 and 2060 of 25, 30, and 35 feet over Groundwater Management Area 1. To achieve 25 feet of drawdown, total pumping was kept at the level for the last year of the historical-calibration portion of the model (1997), which is 12,967 acre-feet per year. To achieve an average of 30 feet of drawdown, pumping was increased to 21,226 acre-feet per year. For the final model run, an average of 35 feet of drawdown was achieved by pumping 31,179 acre-feet per year over Groundwater Management Area 1.

REQUESTOR:

Mr. Steve Walthour of North Plains Groundwater Conservation District on behalf of Groundwater Management Area 1.

DESCRIPTION OF REQUEST:

Mr. Walthour indicated that Groundwater Management Area 1 would be interested in the average drawdown in the Dockum Aquifer resulting from pumping less than the range of pumping scenarios presented in GAM Run 09-014 (Oliver, 2010). The three model runs presented here utilize constant pumping rates applied between 2010 and 2060 to achieve average drawdowns of 25, 30, and 35 feet over Groundwater Management Area 1. The 25-foot model run represents pumping kept constant at the level for the last year of the historical-calibration portion of the model (1997).

METHODS:

The recently modified groundwater model for the Dockum Aquifer (Oliver and Hutchison, 2010) was used to simulate average water level declines (drawdowns) between 2010 and 2060 within Groundwater Management Area 1. This model is a modified version of the groundwater availability model documented in Ewing and others (2008) and was completed in order to more effectively simulate predictive conditions. The pumping input to the model was determined iteratively to achieve average drawdowns of 25, 30, and 35 feet, each of which is less than the lowest pumping scenario presented in GAM Run 09-014 (Oliver, 2010).

As an addendum to GAM Run 09-014, the three groundwater model runs presented here utilize the same methods and assumptions presented in Oliver (2010). Please refer to GAM Run 09-014 for additional details about the methods and assumptions used in the model runs.

RESULTS:

Tables 1, 2, and 3 present pumping and average drawdown for the lower portion of the Dockum Aquifer for the 25, 30, and 35 foot drawdown scenarios, respectively. These results are divided by county, groundwater conservation district, and groundwater management area. For the average 25-foot drawdown scenario over Groundwater Management Area 1, pumping

was held constant at 12,967 acre-feet per year. This corresponds to the same level of pumping for the last year of the historical-calibration portion of the model (1997). For the 30-foot average drawdown scenario, pumping was increased to 21,226 acre-feet per year. Finally, to achieve a 35-foot average drawdown between 2010 and 2060, pumping in the Groundwater Management Area 1 portion of the Dockum Aquifer was set to 31,179 acre-feet per year.

The drawdowns through time for each of the above model runs are depicted in Figure 1. Figure 1 also contains the results of the model runs in GAM Run 09-014 which applied constant pumping through time. The three model runs documented in this report are referred to as the “25-foot drawdown scenario,” “30-foot drawdown scenario,” and “35-foot drawdown scenario.” The seven additional model runs shown depict reduced and increased pumping relative to the “Base Scenario 2”, which refers to the constant pumping rate in GAM Run 09-014 that achieves 51 feet of drawdown between 2010 and 2060.

REFERENCES AND ASSOCIATED MODEL RUNS:

- Ewing, J.E., Jones, T.L., Yan, T., Vreugdenhil, A.M., Fryar, D.G., Pickens, J.F., Gordon, K., Nicot, J.P., Scanlon, B.R., Ashworth, J.B., Beach, J., 2008, Groundwater Availability Model for the Dockum Aquifer – Final Report: contract report to the Texas Water Development Board, 510 p.
- Oliver, W., Hutchison, W.R., 2010, Modification and recalibration of the Groundwater Availability Model of the Dockum Aquifer: Texas Water Development Board, 114 p.
- Oliver, W., 2010, GAM Run 09-014: Texas Water Development Board, GAM Run 09-014 Draft Report, 44 p.

Table 1. Pumping and average drawdown for the lower portion of the Dockum Aquifer for the 25-foot average drawdown scenario by decade for each county, groundwater conservation district (GCD), and groundwater management area (GMA). Pumping is in acre-feet per year. Drawdown is in feet. UWCD is the abbreviation for Underground Water Conservation District.

<i>Average Drawdown: 25-feet</i>	Pumping						Average Drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Armstrong	80	80	80	80	80	80	0	4	8	12	15	19
Carson	121	121	121	121	121	121	1	10	19	27	34	41
Dallam	2,756	2,756	2,756	2,756	2,756	2,756	2	12	21	26	29	30
Hartley	1,705	1,705	1,705	1,705	1,705	1,705	1	14	25	36	44	51
Moore	5,033	5,033	5,033	5,033	5,033	5,033	1	8	14	20	23	27
Oldham	1,066	1,066	1,066	1,066	1,066	1,066	0	0	0	1	1	1
Potter	769	769	769	769	769	769	0	3	5	7	8	10
Randall	954	954	954	954	954	954	0	5	9	13	16	19
Sherman	485	485	485	485	485	485	2	20	36	48	59	70
GCD												
High Plains UWCD No. 1	7,934	7,934	7,934	7,934	7,934	7,934	1	14	28	39	46	48
North Plains GCD	9,164	9,164	9,164	9,164	9,164	9,164	2	13	23	31	37	41
Panhandle GCD	811	811	811	811	811	811	0	4	8	11	14	16
GMA												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	12,967	12,967	12,967	12,967	12,967	12,967	1	7	13	18	22	25
GMA 2	9,608	9,608	9,608	9,608	9,608	9,608	1	10	20	29	34	37
GMA 3	4,234	4,234	4,234	4,234	4,234	4,234	0	0	0	0	0	0
GMA 6	71	71	71	71	71	71	0	1	2	2	3	4
GMA 7	23,805	23,805	23,805	23,805	23,805	23,805	1	2	3	4	5	5

Table 2. Pumping and average drawdown for the lower portion of the Dockum Aquifer for the 30-foot average drawdown scenario by decade for each county, groundwater conservation district (GCD), and groundwater management area (GMA). Pumping is in acre-feet per year. Drawdown is in feet. UWCD is the abbreviation for Underground Water Conservation District.

<i>Average Drawdown: 30-feet</i>	Pumping						Average Drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Armstrong	582	582	582	582	582	582	6	14	18	21	23	26
Carson	283	283	283	283	283	283	12	27	35	41	45	48
Dallam	4,034	4,034	4,034	4,034	4,034	4,034	6	23	31	37	40	42
Hartley	3,568	3,568	3,568	3,568	3,568	3,568	4	19	30	40	49	56
Moore	5,395	5,395	5,395	5,395	5,395	5,395	5	13	18	23	27	30
Oldham	2,975	2,975	2,975	2,975	2,975	2,975	0	0	1	1	1	2
Potter	1,681	1,681	1,681	1,681	1,681	1,681	2	5	7	9	11	12
Randall	2,119	2,119	2,119	2,119	2,119	2,119	2	9	14	18	22	24
Sherman	591	591	591	591	591	591	12	34	49	61	71	79
GCD												
High Plains UWCD No. 1	8,614	8,614	8,614	8,614	8,614	8,614	1	15	28	39	46	49
North Plains GCD	12,119	12,119	12,119	12,119	12,119	12,119	5	21	31	39	45	50
Panhandle GCD	2,237	2,237	2,237	2,237	2,237	2,237	5	11	14	17	19	21
GMA												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	9,608	9,608	9,608	9,608	9,608	9,608	1	10	20	29	34	37
GMA 3	4,234	4,234	4,234	4,234	4,234	4,234	0	0	0	0	0	0
GMA 6	71	71	71	71	71	71	0	1	2	2	3	4
GMA 7	23,805	23,805	23,805	23,805	23,805	23,805	1	2	3	4	5	5

Table 3. Pumping and average drawdown for the lower portion of the Dockum Aquifer for the 35-foot average drawdown scenario by decade for each county, groundwater conservation district (GCD), and groundwater management area (GMA). Pumping is in acre-feet per year. Drawdown is in feet. UWCD is the abbreviation for Underground Water Conservation District.

<i>Average Drawdown: 35-foot</i>	Pumping						Average Drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Armstrong	1,187	1,187	1,187	1,187	1,187	1,187	13	23	25	27	29	31
Carson	478	478	478	478	478	478	26	41	45	48	49	50
Dallam	5,574	5,574	5,574	5,574	5,574	5,574	11	34	42	47	50	53
Hartley	5,813	5,813	5,813	5,813	5,813	5,813	8	24	36	46	54	61
Moore	5,832	5,832	5,832	5,832	5,832	5,832	9	18	23	27	30	34
Oldham	5,275	5,275	5,275	5,275	5,275	5,275	0	1	1	2	2	3
Potter	2,780	2,780	2,780	2,780	2,780	2,780	4	7	9	11	13	14
Randall	3,524	3,524	3,524	3,524	3,524	3,524	4	14	20	24	27	29
Sherman	719	719	719	719	719	719	24	50	64	74	81	87
GCD												
High Plains UWCD No. 1	9,433	9,433	9,433	9,433	9,433	9,433	1	15	29	40	46	49
North Plains GCD	15,679	15,679	15,679	15,679	15,679	15,679	10	29	39	47	53	58
Panhandle GCD	3,957	3,957	3,957	3,957	3,957	3,957	10	17	19	21	23	24
GMA												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	31,179	31,179	31,179	31,179	31,179	31,179	7	18	24	29	32	35
GMA 2	9,608	9,608	9,608	9,608	9,608	9,608	1	10	20	29	34	37
GMA 3	4,234	4,234	4,234	4,234	4,234	4,234	0	0	0	0	0	0
GMA 6	71	71	71	71	71	71	0	1	2	2	3	4
GMA 7	23,805	23,805	23,805	23,805	23,805	23,805	1	2	3	4	5	5

Groundwater Management Area 1 Average Drawdown Using Constant Pumping Through Time

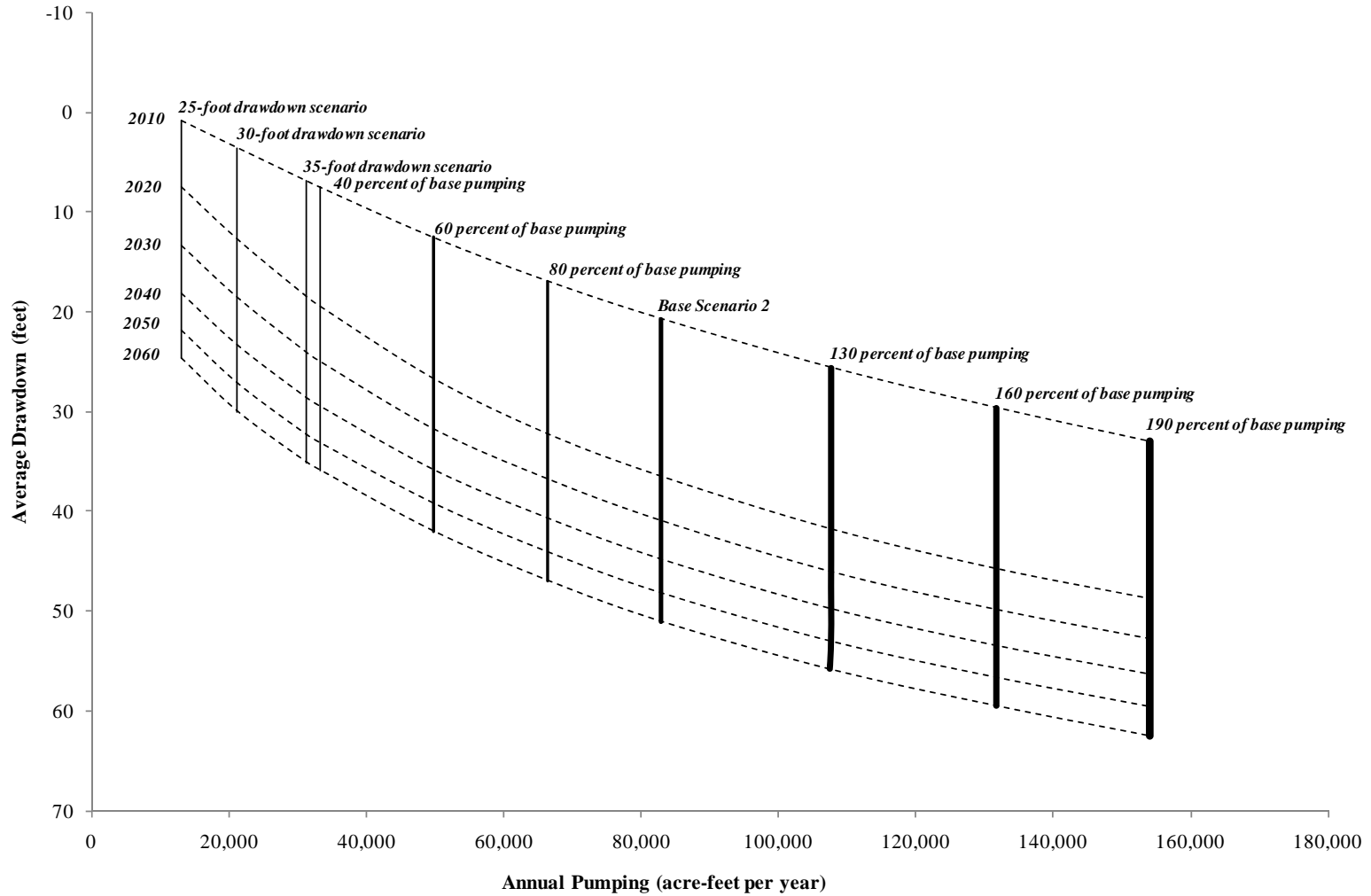


Figure 1. Average drawdown for the lower portion of the Dockum Aquifer in Groundwater Management Area 1 through time.