

**DRAFT TECHNICAL MEMORANDUM**

**To:** Steve Walthour, General Manager, North Plains Groundwater Conservation District  
**From:** Neil Deeds, INTERA  
**Date:** March 16, 2016  
**RE:** DRAFT GMA-1 Predictive Runs

**1 INTRODUCTION**

Four predictive runs were completed for GMA-1 with the TWDB High Plains Aquifer System GAM. These runs represent variations of the run described in the memo submitted to TWDB August 31<sup>st</sup>, 2015, titled “DRAFT GMA-1 Predictive Runs Performed Under TWDB Contract for Development of the High Plains Aquifer System Groundwater Availability Model.”

Four new runs were completed. The guidelines for these runs are provided by GMA-1 representatives. Variations in the scenarios are described below.

**Run 2016.1:** New initial pumping rates in the Ogallala Aquifer were set for all counties in North Plains GCD (NPGCD), along with target rates for year 2020 for four of the counties in NPGCD as follows (acre-feet per year):

County	2012	2013	2014	2015	2016	2020
Dallam	371,965	399,272	393,624	314,899	400,000	390,000
Hansford	218,793	201,914	211,634	169,307	277,961	
Hartley	458,696	458,998	442,058	353,646	450,000	400,000
Hutchinson	72,230	69,716	73,992	59,194	74,000	
Lipscomb	55,572	42,519	48,791	39,033	55,000	
Moore	234,688	228,297	209,907	167,926	235,000	215,000
Ochiltree	109,213	98,280	106,278	85,022	115,000	
Sherman	348,012	346,685	361,336	289,069	365,000	400,000

In the same run, new 2070 drawdown targets were set for three counties in High Plains Water District (HPWD), and in Randall County where no district exists. Specifically, Armstrong (14’), Potter (11’), Randall (21’), and Randall-No GCD (21’).

As with the August 31<sup>st</sup>, 2015 run, Dockum targets were set as a fraction of available drawdown, specifically, NPGCD-west (0.40), Panhandle GCD (PGCD) (0.50), HPWD (0.50), No-GCD (0.50).

In Run 2016.1, the saturated thickness where pumping was curtailed was set to 30 feet.

**Run 2016.2:** Same as 2016.1, except saturated thickness where pumping was curtailed was set to 10 feet.

**Run 2016.3:** Same as Run 2016.1, except that some Dockum targets are now based on average drawdown after 50 years (in 2062). Specifically, Panhandle GCD (30'), HPWD (40'), Oldham County-No GCD (30'), Randall County – No GCD (40').

The Ogallala was treated the same as Run 2016.1.

**Run 2016.4:** Same as 2016.3, except saturated thickness where pumping was curtailed was set to 10 feet.

For all of these runs, pumping in GMA-2 was set to the 2012 estimated rate, multiplied by a factor of 1.5. Limited sensitivity analyses indicated that GMA-1 results were not very sensitive to GMA-2 pumping rates.

## 2 RESULTS

The results are provided in the form of tables for each of the runs. Tables 1 – 6 for each run are identical in format and content to Tables 1 – 6 provided in the August 31, 2015 memo. Note that tables are prefixed with the run number, e.g. Table 6, Run 4 is titled 2016.4.6. The run results are presented sequentially.

In most cases, targets were met. The fraction remaining goals for the Ogallala Aquifer (Table 1) were within 0.01 for all cases. The fraction remaining goals were also met for the Dockum Aquifer (Table 2) within 0.01 for all cases. The new drawdown goals for portions of counties in HPWD were met within one or two feet (Table 4) except in Potter County. Pumping was set to nearly zero, but drawdown exceeded 11 feet in all cases. The drawdown goals for Dockum were met for the Districts and counties specified.

The effect of decreasing the saturated thickness at which pumping was curtailed was to increase availability slightly in some counties. For example, in Dallam County in 2016 the target pumping was 400,000 acre-feet/year. When the minimum was 30', only 395,000 acre-feet/year was achieved, while a 10' minimum allowed the full 400,000 acre-feet/year to be achieved.

**Table 2016.1.1: Groundwater in storage and fraction remaining by zone for the Ogallala Aquifer in GMA-1.**

Ogallala	Groundwater In Storage (af)							Fraction Remaining from 2012				
	2012	2015	2020	2030	2040	2050	2062	'20	'30	'40	'50	'62
North Plains GCD - West	58,258,886	54,744,394	48,754,920	39,318,583	32,109,285	26,993,778	23,384,113	0.84	0.67	0.55	0.46	0.40
North Plains GCD - East	68,850,807	67,881,893	64,430,190	57,030,843	49,808,488	42,768,448	34,552,698	0.94	0.83	0.72	0.62	0.50
Hemphill County UWCD	15,434,318	15,372,022	15,048,787	14,346,870	13,653,101	12,988,228	12,233,445	0.98	0.93	0.88	0.84	0.79
Panhandle GCD	76,865,219	75,962,435	71,217,735	62,076,829	53,726,195	46,245,903	38,426,808	0.93	0.81	0.70	0.60	0.50
High Plains UWCD No. 1	3,073,984	3,019,557	2,881,922	2,598,118	2,338,804	2,116,154	1,901,538	0.94	0.84	0.76	0.69	0.62
No GCD	9,635,730	9,479,316	8,843,921	7,660,755	6,642,722	5,802,760	5,017,554	0.92	0.79	0.69	0.60	0.52

**Table 2016.1.2: Fraction remaining by zone for the Dockum Aquifer in GMA-1.**

Zone	Fraction Remaining from 2012				
	2020	2030	2040	2050	2062
North Plains GCD - West	0.90	0.75	0.63	0.52	0.41
Panhandle GCD	0.91	0.78	0.68	0.59	0.50
High Plains UWCD No. 1	0.88	0.77	0.67	0.59	0.50
No GCD	0.90	0.78	0.67	0.59	0.50

**Table 2016.1.3: Available groundwater and average drawdown in the Rita Blanca Aquifer for the Dallam County in GMA-1.**

Rita Blanca	Available Groundwater (afy)							Average Drawdown (ft)					
County	2015 <sup>1</sup>	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
Dallam	6,197	6,207	6,197	6,177	6,145	6,151	5,914	13	27	39	47	53	57

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.1.4: Available groundwater and average drawdown in the Ogallala Aquifer for the counties comprising GMA-1.**

Ogallala	Available Groundwater (afy)								Average Drawdown (ft)					
County	2015	2016	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
<b>North Plains GCD</b>														
Dallam	305,394	395,833	382,326	281,008	220,018	160,754	97,119	65,050	15	29	40	47	52	54
Hansford	169,191	276,822	275,769	272,655	271,968	270,280	269,478	269,128	17	41	66	89	116	134
Hartley	353,307	450,493	398,675	271,523	212,904	154,435	90,846	58,543	20	37	49	58	64	65
Hutchinson	59,153	74,151	62,975	64,522	65,831	66,075	65,956	64,791	13	33	53	73	95	110
Lipscomb	39,006	55,112	267,540	266,710	267,370	266,591	266,556	266,546	12	34	55	75	99	115
Moore	167,811	235,480	215,441	172,620	139,703	105,016	67,650	47,446	20	41	57	69	77	80
Ochiltree	84,963	115,225	244,446	243,931	244,670	244,050	244,085	244,094	13	37	61	84	112	130
Sherman	288,843	364,947	399,146	348,894	282,462	212,744	136,775	93,843	24	53	75	91	104	108
<b>District Total</b>	<b>1,467,668</b>	<b>1,968,063</b>	<b>2,246,318</b>	<b>1,921,863</b>	<b>1,704,926</b>	<b>1,479,945</b>	<b>1,238,465</b>	<b>1,109,441</b>						
<b>Hemphill County UWCD</b>														
Hemphill	21,935	55,176	54,535	54,409	54,609	54,501	54,539	54,557	4	11	18	25	33	38
<b>Panhandle GCD</b>														
Armstrong	7,495	57,669	58,142	53,413	48,300	43,459	38,076	34,777	6	16	25	34	42	47
Carson	129,714	181,368	192,661	184,263	170,395	153,767	134,054	121,448	12	29	44	57	71	79
Donley	39,476	69,404	75,012	76,288	73,162	67,872	60,901	56,275	5	13	21	27	33	37
Gray	41,540	171,475	181,601	175,267	163,099	148,713	131,744	121,136	9	25	40	53	66	74
Hutchinson	74	10,106	15,777	16,740	15,197	13,324	11,454	10,171	14	41	67	91	115	129
Potter	7,349	15,775	17,014	15,818	14,480	13,181	11,635	10,670	3	7	10	13	17	18
Roberts	79,284	359,716	431,798	455,129	428,388	390,246	342,747	311,054	20	55	87	117	148	166
Wheeler	13,534	114,844	130,782	138,810	137,761	132,311	123,308	116,837	8	23	35	47	59	66
<b>District Total</b>	<b>318,466</b>	<b>980,357</b>	<b>1,102,787</b>	<b>1,115,728</b>	<b>1,050,782</b>	<b>962,873</b>	<b>853,919</b>	<b>782,368</b>						

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.1.4 continued: Available groundwater and average drawdown in the Ogallala Aquifer for the counties comprising GMA-1.**

<b>High Plains Water District</b>														
Armstrong	1,073	1,262	2,017	1,891	1,781	1,641	1,291	1,050	2	6	9	11	14	15
Potter	149	3	3	4	4	3	3	3	2	4	7	10	13	15
Randall	26,175	32,084	33,571	31,504	28,589	25,322	21,657	19,554	3	8	12	16	19	21
<b>District Total</b>	<b>27,397</b>	<b>33,349</b>	<b>35,591</b>	<b>33,399</b>	<b>30,374</b>	<b>26,966</b>	<b>22,951</b>	<b>20,607</b>						
<b>No GCD</b>														
Hartley	240	18,432	19,581	17,637	14,563	11,140	7,448	5,236	5	12	18	22	24	24
Hutchinson	5,643	18,853	16,492	14,432	13,390	12,973	13,170	14,395	6	16	25	34	44	51
Moore	2,237	8,167	8,956	8,597	7,612	6,185	4,530	3,584	5	11	15	18	20	21
Oldham	13,775	40,879	44,720	40,191	33,473	26,065	18,397	15,907	3	7	10	12	13	14
Randall	18,039	23,890	24,894	23,944	21,952	19,504	16,550	14,684	3	8	12	16	19	21
<b>Total</b>	<b>39,934</b>	<b>110,221</b>	<b>114,643</b>	<b>104,801</b>	<b>90,990</b>	<b>75,867</b>	<b>60,095</b>	<b>53,806</b>						
<b>GMA-1 Total</b>	<b>1,875,400</b>	<b>3,147,166</b>	<b>3,553,874</b>	<b>3,230,200</b>	<b>2,931,681</b>	<b>2,600,152</b>	<b>2,229,969</b>	<b>2,020,779</b>						

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.1.5: Available groundwater and average drawdown in the Dockum Aquifer for the counties comprising GMA-1.**

Dockum County	Available Groundwater (afy)								Average Drawdown (ft)					
	2015	2016	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
<b>North Plains GCD</b>														
Dallam	2,755	13,955	13,952	13,909	13,945	13,906	13,905	13,905	30	76	117	154	192	213
Hartley	1,793	12,807	11,405	10,555	10,345	10,352	10,681	11,104	21	50	76	99	126	142
Moore	1,604	4,972	4,719	4,442	4,416	4,330	4,177	4,076	9	21	31	39	48	52
Sherman	484	125	125	124	125	124	90	85	16	36	51	62	70	73
<b>District Total</b>	<b>6,636</b>	<b>31,859</b>	<b>30,201</b>	<b>29,030</b>	<b>28,831</b>	<b>28,712</b>	<b>28,853</b>	<b>29,170</b>						
<b>Panhandle GCD</b>														
Armstrong	138	7,858	9,906	12,495	13,315	13,442	13,152	12,842	5	14	23	30	39	44
Carson	29	73	94	150	194	235	282	313	7	16	25	33	41	45
Potter	914	44,474	54,040	54,323	51,441	47,922	43,830	41,202	5	14	22	29	37	42
<b>District Total</b>	<b>1,081</b>	<b>52,405</b>	<b>64,040</b>	<b>66,968</b>	<b>64,950</b>	<b>61,599</b>	<b>57,264</b>	<b>54,357</b>						
<b>High Plains Water District</b>														
Armstrong	33	100	57	0	0	0	0	0	1	5	9	15	22	26
Potter	434	17	12	0	0	0	0	0	3	11	20	30	40	47
Randall	1,597	945	1,317	1,628	1,777	1,866	1,937	1,973	7	15	22	29	37	41
<b>District Total</b>	<b>2,064</b>	<b>1,062</b>	<b>1,386</b>	<b>1,628</b>	<b>1,777</b>	<b>1,866</b>	<b>1,937</b>	<b>1,973</b>						
<b>No GCD</b>														
Hartley	226	44,750	45,955	46,482	46,751	46,518	46,138	45,697	10	30	49	68	89	103
Moore	0	242	440	603	545	533	522	505	5	13	20	25	31	34
Oldham	1,128	254,584	295,905	294,702	276,446	254,367	228,150	212,059	9	27	45	60	77	86
Randall	1,006	9,875	14,074	17,659	18,658	18,753	18,448	18,054	8	19	29	38	47	53
<b>Total</b>	<b>2,360</b>	<b>309,451</b>	<b>356,374</b>	<b>359,446</b>	<b>342,400</b>	<b>320,171</b>	<b>293,258</b>	<b>276,315</b>						
<b>GMA-1 Total</b>	<b>12,141</b>	<b>394,777</b>	<b>452,001</b>	<b>457,072</b>	<b>437,958</b>	<b>412,348</b>	<b>381,312</b>	<b>361,815</b>						

**Table 2016.1.6: Groundwater in storage and fraction remaining from 2012 in the Ogallala Aquifer for counties comprising GMA-1.**

Ogallala County	Groundwater In Storage (af)								Fraction Remaining from 2012				
	2012	2015	2020	2030	2040	2050	2062	2070	'20	'30	'40	'50	'62
<b>North Plains GCD</b>													
Dallam	14,671,925	13,780,883	12,194,040	9,810,080	8,033,504	6,810,347	6,004,835	5,788,831	0.83	0.67	0.55	0.46	0.41
Hansford	23,999,740	23,499,747	22,254,715	19,723,282	17,226,621	14,796,746	11,980,003	10,161,126	0.93	0.82	0.72	0.62	0.50
Hartley	16,109,356	14,899,515	12,934,107	10,351,058	8,422,630	7,086,251	6,206,509	5,986,101	0.80	0.64	0.52	0.44	0.39
Hutchinson	6,283,204	6,138,287	5,856,123	5,224,580	4,564,721	3,918,708	3,183,164	2,722,310	0.93	0.83	0.73	0.62	0.51
Lipscomb	17,979,150	17,880,482	16,931,538	14,901,331	13,006,665	11,179,281	9,040,585	7,636,013	0.94	0.83	0.72	0.62	0.50
Moore	9,531,217	9,010,018	8,062,275	6,603,459	5,452,417	4,616,974	3,997,846	3,782,025	0.85	0.69	0.57	0.48	0.42
Ochiltree	20,588,713	20,348,826	19,354,815	17,157,193	14,993,048	12,862,742	10,345,519	8,686,066	0.94	0.83	0.73	0.62	0.50
Sherman	17,946,388	17,048,100	15,409,446	12,431,301	10,107,130	8,413,865	7,138,841	6,673,077	0.86	0.69	0.56	0.47	0.40
District Total	127,109,693	122,605,858	112,997,059	96,202,284	81,806,736	69,684,914	57,897,302	51,435,549	0.89	0.76	0.64	0.55	0.46
<b>Hemphill County UWCD</b>													
Hemphill	15,434,318	15,372,022	15,048,787	14,346,870	13,653,101	12,988,228	12,233,445	11,757,736	0.98	0.93	0.88	0.84	0.79
<b>Panhandle GCD</b>													
Armstrong	4,418,838	4,390,635	4,102,863	3,567,290	3,087,687	2,662,598	2,222,312	1,969,163	0.93	0.81	0.70	0.60	0.50
Carson	14,900,617	14,533,317	13,644,490	11,910,848	10,329,770	8,924,001	7,469,828	6,634,766	0.92	0.80	0.69	0.60	0.50
Donley	4,372,716	4,295,059	4,022,028	3,503,564	3,038,977	2,634,834	2,226,949	1,998,735	0.92	0.80	0.69	0.60	0.51
Gray	13,723,357	13,607,295	12,765,177	11,144,748	9,666,519	8,347,311	6,971,036	6,172,961	0.93	0.81	0.70	0.61	0.51
Hutchinson	877,413	870,844	820,953	715,416	614,210	521,737	426,395	372,014	0.94	0.82	0.70	0.59	0.49
Potter	1,610,450	1,579,081	1,484,391	1,308,250	1,153,425	1,019,324	883,063	806,067	0.92	0.81	0.72	0.63	0.55
Roberts	29,922,260	29,671,432	27,858,680	24,288,565	20,980,065	17,981,566	14,809,145	12,946,618	0.93	0.81	0.70	0.60	0.49
Wheeler	7,039,568	7,014,771	6,519,137	5,638,114	4,855,500	4,154,476	3,418,004	2,986,946	0.93	0.80	0.69	0.59	0.49
District Total	76,865,219	75,962,434	71,217,719	62,076,795	53,726,153	46,245,847	38,426,732	33,887,270	0.93	0.81	0.70	0.60	0.50

**Table 2016.1.6 continued: Groundwater in storage and fraction remaining from 2012 in the Ogallala Aquifer for counties comprising GMA-1.**

Ogallala	Groundwater In Storage (af)								Fraction Remaining from 2012				
County	2012	2015	2020	2030	2040	2050	2062	2070	'20	'30	'40	'50	'62
<b>High Plains Water District</b>													
<b>Armstrong</b>	169,520	164,755	153,843	131,603	112,390	96,259	81,634	74,965	0.91	0.78	0.66	0.57	0.48
<b>Potter</b>	334,379	331,599	325,095	308,497	291,018	274,087	255,490	244,401	0.97	0.92	0.87	0.82	0.76
<b>Randall</b>	2,570,085	2,523,203	2,402,984	2,158,018	1,935,396	1,745,808	1,564,414	1,468,339	0.93	0.84	0.75	0.68	0.61
<b>District Total</b>	3,073,984	3,019,557	2,881,922	2,598,118	2,338,804	2,116,154	1,901,538	1,787,705	0.94	0.85	0.76	0.69	0.62
<b>No GCD</b>													
<b>Hartley</b>	908,097	899,854	801,450	638,283	518,099	437,983	388,074	377,474	0.88	0.70	0.57	0.48	0.43
<b>Hutchinson</b>	3,937,385	3,879,960	3,676,579	3,241,341	2,810,386	2,400,961	1,946,584	1,669,518	0.93	0.82	0.71	0.61	0.49
<b>Moore</b>	492,564	478,653	428,075	344,609	285,123	244,720	216,937	208,673	0.87	0.70	0.58	0.50	0.44
<b>Oldham</b>	2,031,746	1,998,077	1,813,777	1,509,899	1,284,628	1,135,291	1,045,112	1,019,117	0.89	0.74	0.63	0.56	0.51
<b>Randall</b>	2,265,938	2,221,861	2,118,839	1,919,705	1,738,421	1,579,275	1,418,303	1,328,893	0.94	0.85	0.77	0.70	0.63
<b>Total</b>	9,635,730	9,478,405	8,838,720	7,653,837	6,636,657	5,798,230	5,015,010	4,603,675	0.92	0.79	0.69	0.60	0.52
<b>GMA-1 Total</b>	232,118,944	226,438,276	210,984,207	182,877,904	158,161,451	136,833,373	115,474,027	103,471,935	0.91	0.79	0.68	0.59	0.50



**Table 2016.2.1: Groundwater in storage and fraction remaining by zone for the Ogallala Aquifer in GMA-1.**

Ogallala	Groundwater In Storage (af)							Fraction Remaining from 2012				
Zone	2012	2015	2020	2030	2040	2050	2062	'20	'30	'40	'50	'62
North Plains GCD - West	58,258,886	54,721,246	48,547,547	39,061,115	31,768,513	26,549,871	22,822,249	0.83	0.67	0.55	0.46	0.39
North Plains GCD - East	68,850,807	67,867,342	64,397,191	57,006,381	49,791,027	42,757,393	34,549,107	0.94	0.83	0.72	0.62	0.50
Hemphill County UWCD	15,434,318	15,372,022	15,048,240	14,345,671	13,651,680	12,986,712	12,231,878	0.97	0.93	0.88	0.84	0.79
Panhandle GCD	76,865,219	75,959,418	71,199,970	62,041,186	53,681,569	46,195,501	38,370,632	0.93	0.81	0.70	0.60	0.50
High Plains UWCD No. 1	3,073,984	3,018,303	2,879,354	2,593,481	2,331,406	2,103,911	1,881,662	0.94	0.84	0.76	0.68	0.61
No GCD	9,635,730	9,472,283	8,820,458	7,615,092	6,577,161	5,715,745	4,901,652	0.92	0.79	0.68	0.59	0.51

**Table 2016.2.2: Fraction remaining by zone for the Dockum Aquifer in GMA-1.**

Zone	Fraction Remaining from 2012				
	2020	2030	2040	2050	2062
North Plains GCD - West	0.90	0.75	0.62	0.51	0.40
Panhandle GCD	0.91	0.78	0.68	0.59	0.50
High Plains UWCD No. 1	0.88	0.77	0.67	0.59	0.50
No GCD	0.90	0.78	0.67	0.59	0.50

**Table 2016.2.3: Available groundwater and average drawdown in the Rita Blanca Aquifer for the Dallam County in GMA-1.**

Rita Blanca	Available Groundwater (afy)							Average Drawdown (ft)					
County	2015 <sup>1</sup>	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
Dallam	6,197	6,207	6,197	6,177	6,145	6,151	5,914	13	27	39	47	53	57

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.2.4: Available groundwater and average drawdown in the Ogallala Aquifer for the counties comprising GMA-1.**

Ogallala	Available Groundwater (afy)								Average Drawdown (ft)					
County	2015	2016	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
<b>North Plains GCD</b>														
Dallam	312,426	400,754	390,609	288,941	229,601	170,226	104,708	71,048	15	30	41	49	54	56
Hansford	169,191	276,822	275,769	272,655	271,968	270,280	269,478	269,128	17	41	66	89	116	134
Hartley	353,403	450,899	400,792	273,444	215,857	157,979	94,199	61,301	20	37	50	59	65	66
Hutchinson	59,153	74,151	62,975	64,522	65,831	66,075	65,956	64,791	13	33	53	73	95	110
Lipscomb	39,006	55,112	267,540	266,710	267,370	266,591	266,556	266,547	12	34	55	75	99	115
Moore	167,811	235,482	215,441	172,621	139,709	105,042	67,695	47,491	20	41	57	69	77	80
Ochiltree	84,963	115,225	244,446	243,931	244,670	244,050	244,085	244,094	13	37	61	84	112	130
Sherman	288,843	364,947	399,146	348,920	282,538	212,885	136,920	93,946	24	53	75	91	104	108
<b>District Total</b>	<b>1,474,796</b>	<b>1,973,392</b>	<b>2,256,718</b>	<b>1,931,744</b>	<b>1,717,544</b>	<b>1,493,128</b>	<b>1,249,597</b>	<b>1,118,346</b>						
<b>Hemphill County UWCD</b>														
Hemphill	21,935	55,302	54,761	54,640	54,815	54,684	54,701	54,709	4	11	18	25	33	38
<b>Panhandle GCD</b>														
Armstrong	7,495	57,976	58,602	53,821	48,652	43,762	38,349	35,065	6	16	26	34	42	47
Carson	129,825	181,423	192,719	184,317	170,443	153,808	134,089	121,481	12	29	44	57	71	79
Donley	39,491	70,819	76,925	78,237	74,944	69,493	62,383	57,704	5	14	21	27	33	37
Gray	41,540	171,664	182,087	175,968	163,729	149,267	132,280	121,649	9	25	40	53	66	74
Hutchinson	74	10,106	15,777	16,740	15,197	13,324	11,454	10,171	14	41	67	91	115	129
Potter	7,789	16,399	17,742	16,538	15,141	13,791	12,205	11,216	3	7	11	14	17	19
Roberts	79,284	359,716	431,798	455,129	428,388	390,246	342,747	311,054	20	55	87	117	148	166
Wheeler	13,711	116,334	133,554	141,727	140,359	134,609	125,426	119,017	9	23	36	47	59	66
<b>District Total</b>	<b>319,209</b>	<b>984,437</b>	<b>1,109,204</b>	<b>1,122,477</b>	<b>1,056,853</b>	<b>968,300</b>	<b>858,933</b>	<b>787,357</b>						

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.2.4 continued: Available groundwater and average drawdown in the Ogallala Aquifer for the counties comprising GMA-1.**

<b>High Plains Water District</b>														
Armstrong	1,202	1,416	2,206	2,058	1,921	1,781	1,547	1,320	3	6	9	12	15	16
Potter	149	3	3	4	4	3	3	3	2	4	7	10	13	15
Randall	26,384	32,126	33,612	31,531	28,609	25,338	21,669	19,565	3	8	12	16	19	21
<b>District Total</b>	<b>27,735</b>	<b>33,545</b>	<b>35,821</b>	<b>33,593</b>	<b>30,534</b>	<b>27,122</b>	<b>23,219</b>	<b>20,888</b>						
<b>No GCD</b>														
Hartley	240	19,027	20,442	18,744	15,874	12,548	8,677	6,182	5	13	19	23	25	26
Hutchinson	5,643	19,203	17,190	15,352	14,243	13,792	13,909	15,059	6	16	25	35	45	51
Moore	2,287	8,733	9,577	9,184	8,125	6,636	4,907	3,903	5	11	16	19	21	22
Oldham	15,466	42,643	47,439	43,216	36,618	29,576	22,202	19,137	3	7	11	13	14	15
Randall	18,143	23,890	24,894	23,950	21,969	19,529	16,578	14,711	3	8	12	16	19	21
<b>Total</b>	<b>41,779</b>	<b>113,496</b>	<b>119,542</b>	<b>110,446</b>	<b>96,829</b>	<b>82,081</b>	<b>66,273</b>	<b>58,992</b>						
<b>GMA-1 Total</b>	<b>1,885,454</b>	<b>3,160,172</b>	<b>3,576,046</b>	<b>3,252,900</b>	<b>2,956,575</b>	<b>2,625,315</b>	<b>2,252,723</b>	<b>2,040,292</b>						

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.2.5: Available groundwater and average drawdown in the Dockum Aquifer for the counties comprising GMA-1.**

Dockum County	Available Groundwater (afy)								Average Drawdown (ft)						
	2015	2016	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070	
<b>North Plains GCD</b>															
Dallam	2,755	13,955	13,952	13,909	13,945	13,906	13,905	13,905	30	77	118	154	192	214	
Hartley	1,793	12,807	11,405	10,555	10,345	10,352	10,681	11,104	21	50	76	100	126	143	
Moore	1,604	4,972	4,719	4,442	4,416	4,330	4,177	4,076	9	21	31	39	48	52	
Sherman	484	125	125	124	125	124	90	85	16	36	51	62	71	74	
<b>District Total</b>	<b>6,636</b>	<b>31,859</b>	<b>30,201</b>	<b>29,030</b>	<b>28,831</b>	<b>28,712</b>	<b>28,853</b>	<b>29,170</b>							
<b>Panhandle GCD</b>															
Armstrong	138	7,858	9,930	12,545	13,372	13,497	13,204	12,893	5	14	23	30	39	44	
Carson	29	73	94	150	194	235	282	313	7	16	25	33	41	45	
Potter	914	44,483	54,049	54,330	51,447	47,927	43,833	41,205	5	14	22	29	37	42	
<b>District Total</b>	<b>1,081</b>	<b>52,414</b>	<b>64,073</b>	<b>67,025</b>	<b>65,013</b>	<b>61,659</b>	<b>57,319</b>	<b>54,411</b>							
<b>High Plains Water District</b>															
Armstrong	33	100	57	0	0	0	0	0	1	5	9	15	22	26	
Potter	434	17	12	0	0	0	0	0	3	11	20	30	40	47	
Randall	1,597	945	1,317	1,628	1,777	1,866	1,937	1,973	7	15	22	29	37	41	
<b>District Total</b>	<b>2,064</b>	<b>1,062</b>	<b>1,386</b>	<b>1,628</b>	<b>1,777</b>	<b>1,866</b>	<b>1,937</b>	<b>1,973</b>							
<b>No GCD</b>															
Hartley	226	44,750	45,955	46,482	46,751	46,518	46,138	45,697	10	30	49	68	89	103	
Moore	0	242	440	604	559	534	522	505	5	13	20	26	31	34	
Oldham	1,128	254,610	295,931	294,725	276,465	254,382	228,161	212,069	9	27	45	60	77	87	
Randall	1,006	9,875	14,074	17,659	18,658	18,753	18,448	18,054	8	19	29	38	47	53	
<b>Total</b>	<b>2,360</b>	<b>309,477</b>	<b>356,400</b>	<b>359,470</b>	<b>342,433</b>	<b>320,187</b>	<b>293,269</b>	<b>276,325</b>							
<b>GMA-1 Total</b>	<b>12,141</b>	<b>394,812</b>	<b>452,060</b>	<b>457,153</b>	<b>438,054</b>	<b>412,424</b>	<b>381,378</b>	<b>361,879</b>							

**Table 2016.2.6: Groundwater in storage and fraction remaining from 2012 in the Ogallala Aquifer for counties comprising GMA-1.**

Ogallala County	Groundwater In Storage (af)								Fraction Remaining from 2012				
	2012	2015	2020	2030	2040	2050	2062	2070	'20	'30	'40	'50	'62
<b>North Plains GCD</b>													
Dallam	14,671,925	13,764,050	12,148,396	9,699,361	7,839,988	6,528,591	5,633,248	5,373,455	0.83	0.66	0.53	0.44	0.38
Hansford	23,999,740	23,499,747	22,254,715	19,723,282	17,226,621	14,796,740	11,979,998	10,161,110	0.93	0.82	0.72	0.62	0.50
Hartley	16,109,356	14,899,163	12,928,123	10,329,793	8,375,696	7,004,810	6,080,714	5,834,322	0.80	0.64	0.52	0.43	0.38
Hutchinson	6,283,204	6,138,287	5,856,123	5,224,575	4,564,693	3,918,630	3,183,018	2,722,128	0.93	0.83	0.73	0.62	0.51
Lipscomb	17,979,150	17,880,482	16,931,538	14,901,331	13,006,665	11,179,281	9,040,573	7,635,996	0.94	0.83	0.72	0.62	0.50
Moore	9,531,217	9,010,017	8,062,150	6,602,935	5,451,228	4,614,515	3,992,825	3,774,728	0.85	0.69	0.57	0.48	0.42
Ochiltree	20,588,713	20,348,826	19,354,815	17,157,193	14,993,048	12,862,742	10,345,518	8,686,064	0.94	0.83	0.73	0.62	0.50
Sherman	17,946,388	17,048,016	15,408,878	12,429,026	10,101,601	8,401,955	7,115,462	6,641,657	0.86	0.69	0.56	0.47	0.40
District Total	127,109,693	122,588,588	112,944,738	96,067,496	81,559,540	69,307,264	57,371,356	50,829,460	0.89	0.76	0.64	0.55	0.45
<b>Hemphill County UWCD</b>													
Hemphill	15,434,318	15,372,022	15,048,240	14,345,671	13,651,680	12,986,712	12,231,878	11,756,148	0.97	0.93	0.88	0.84	0.79
<b>Panhandle GCD</b>													
Armstrong	4,418,838	4,390,635	4,102,032	3,565,672	3,085,617	2,660,203	2,219,437	1,965,778	0.93	0.81	0.70	0.60	0.50
Carson	14,900,617	14,533,005	13,644,098	11,910,402	10,329,280	8,923,466	7,469,229	6,634,134	0.92	0.80	0.69	0.60	0.50
Donley	4,372,716	4,295,022	4,017,354	3,494,304	3,027,511	2,622,148	2,213,257	1,984,546	0.92	0.80	0.69	0.60	0.51
Gray	13,723,357	13,607,295	12,764,116	11,141,318	9,661,809	8,341,900	6,965,264	6,166,983	0.93	0.81	0.70	0.61	0.51
Hutchinson	877,413	870,844	820,948	715,369	614,095	521,569	426,200	371,818	0.94	0.82	0.70	0.59	0.49
Potter	1,610,450	1,576,900	1,480,355	1,302,786	1,147,444	1,013,074	876,655	799,650	0.92	0.81	0.71	0.63	0.54
Roberts	29,922,260	29,671,432	27,858,680	24,288,555	20,980,020	17,981,436	14,808,901	12,946,272	0.93	0.81	0.70	0.60	0.49
Wheeler	7,039,568	7,014,285	6,512,387	5,622,780	4,835,793	4,131,705	3,391,689	2,957,511	0.93	0.80	0.69	0.59	0.48
District Total	76,865,219	75,959,418	71,199,970	62,041,186	53,681,569	46,195,501	38,370,632	33,826,692	0.93	0.81	0.70	0.60	0.50

**Table 2016.2.6 continued: Groundwater in storage and fraction remaining from 2012 in the Ogallala Aquifer for counties comprising GMA-1.**

Ogallala	Groundwater In Storage (af)								Fraction Remaining from 2012				
County	2012	2015	2020	2030	2040	2050	2062	2070	'20	'30	'40	'50	'62
<b>High Plains Water District</b>													
<b>Armstrong</b>	169,520	164,173	152,211	128,334	107,716	90,056	72,936	64,769	0.90	0.76	0.64	0.53	0.43
<b>Potter</b>	334,379	331,599	325,087	308,468	290,968	274,000	255,215	243,982	0.97	0.92	0.87	0.82	0.76
<b>Randall</b>	2,570,085	2,522,531	2,402,056	2,156,679	1,932,722	1,739,855	1,553,511	1,454,653	0.93	0.84	0.75	0.68	0.60
<b>District Total</b>	3,073,984	3,018,303	2,879,354	2,593,481	2,331,406	2,103,911	1,881,662	1,763,404	0.94	0.84	0.76	0.68	0.61
<b>No GCD</b>													
<b>Hartley</b>	908,097	899,854	799,197	631,298	505,285	418,444	361,687	349,020	0.88	0.70	0.56	0.46	0.40
<b>Hutchinson</b>	3,937,385	3,879,951	3,675,073	3,237,360	2,805,525	2,395,675	1,941,070	1,664,051	0.93	0.82	0.71	0.61	0.49
<b>Moore</b>	492,564	478,587	425,905	339,625	278,356	236,722	208,198	199,905	0.86	0.69	0.57	0.48	0.42
<b>Oldham</b>	2,031,746	1,992,342	1,801,739	1,487,419	1,249,965	1,086,120	973,034	934,961	0.89	0.73	0.62	0.53	0.48
<b>Randall</b>	2,265,938	2,221,549	2,118,544	1,919,390	1,738,030	1,578,784	1,417,663	1,328,153	0.93	0.85	0.77	0.70	0.63
<b>Total</b>	9,635,730	9,472,283	8,820,458	7,615,092	6,577,161	5,715,745	4,901,652	4,476,090	0.92	0.79	0.68	0.59	0.51
<b>GMA-1 Total</b>	232,118,944	226,410,614	210,892,760	182,662,926	157,801,356	136,309,133	114,757,180	102,651,794	0.91	0.79	0.68	0.59	0.49

**Table 2016.3.1: Groundwater in storage and fraction remaining by zone for the Ogallala Aquifer in GMA-1.**

Ogallala Zone	Groundwater In Storage (af)							Fraction Remaining from 2012				
	2012	2015	2020	2030	2040	2050	2062	'20	'30	'40	'50	'62
North Plains GCD - West	58,258,886	54,738,516	48,599,868	39,195,913	32,015,731	26,927,539	23,348,222	0.84	0.67	0.55	0.46	0.40
North Plains GCD - East	68,850,807	67,867,342	64,397,191	57,006,386	49,791,055	42,757,477	34,549,271	0.94	0.83	0.72	0.62	0.50
Hemphill County UWCD	15,434,318	15,372,022	15,048,787	14,346,870	13,653,101	12,988,228	12,233,445	0.98	0.93	0.88	0.84	0.79
Panhandle GCD	76,865,219	75,962,434	71,218,291	62,079,619	53,732,171	46,255,837	38,442,249	0.93	0.81	0.70	0.60	0.50
High Plains UWCD No. 1	3,073,984	3,019,557	2,881,872	2,597,740	2,337,910	2,114,689	1,899,473	0.94	0.84	0.76	0.69	0.62
No GCD	9,635,730	9,478,405	8,838,971	7,655,950	6,642,307	5,808,592	5,031,994	0.92	0.79	0.69	0.60	0.53

**Table 2016.3.2: Fraction remaining by zone for the Dockum Aquifer in GMA-1.**

Zone	Fraction Remaining from 2012				
	2020	2030	2040	2050	2062
North Plains GCD - West	0.90	0.75	0.63	0.52	0.41
Panhandle GCD	0.93	0.82	0.72	0.65	0.57
High Plains UWCD No. 1	0.86	0.72	0.60	0.51	0.42
No GCD	0.94	0.86	0.79	0.74	0.68

**Table 2016.3.3: Available groundwater and average drawdown in the Rita Blanca Aquifer for the Dallam County in GMA-1.**

Rita Blanca County	Available Groundwater (afy)							Average Drawdown (ft)					
	2015 <sup>1</sup>	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
Dallam	6,197	6,207	6,197	6,177	6,145	6,151	5,914	13	27	39	47	53	57

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.3.4: Available groundwater and average drawdown in the Ogallala Aquifer for the counties comprising GMA-1.**

Ogallala	Available Groundwater (afy)								Average Drawdown (ft)					
County	2015	2016	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
<b>North Plains GCD</b>														
Dallam	305,394	395,833	382,326	281,008	220,018	160,754	97,119	65,050	15	29	40	47	52	54
Hansford	169,191	276,822	275,769	272,655	271,968	270,280	269,478	269,128	17	41	66	89	116	134
Hartley	353,307	450,493	398,675	271,523	212,904	154,435	90,846	58,544	20	37	49	58	64	65
Hutchinson	59,153	74,151	62,975	64,522	65,831	66,075	65,956	64,791	13	33	53	73	95	110
Lipscomb	39,006	55,112	267,540	266,710	267,370	266,591	266,556	266,546	12	34	55	75	99	115
Moore	167,811	235,480	215,441	172,620	139,703	105,016	67,650	47,446	20	41	57	69	77	80
Ochiltree	84,963	115,225	244,446	243,931	244,670	244,050	244,085	244,094	13	37	61	84	112	130
Sherman	288,843	364,947	399,146	348,894	282,462	212,744	136,775	93,843	24	53	75	91	104	108
<b>District Total</b>	<b>1,467,668</b>	<b>1,968,063</b>	<b>2,246,318</b>	<b>1,921,863</b>	<b>1,704,926</b>	<b>1,479,945</b>	<b>1,238,465</b>	<b>1,109,442</b>						
<b>Hemphill County UWCD</b>														
Hemphill	21,935	55,176	54,535	54,409	54,609	54,501	54,539	54,557	4	11	18	25	33	38
<b>Panhandle GCD</b>														
Armstrong	7,495	57,669	58,142	53,413	48,302	43,461	38,080	34,782	6	16	25	34	42	47
Carson	129,714	181,368	192,661	184,263	170,395	153,767	134,054	121,448	12	29	44	57	71	79
Donley	39,476	69,404	75,012	76,288	73,162	67,872	60,901	56,275	5	13	21	27	33	37
Gray	41,540	171,475	181,601	175,267	163,099	148,713	131,744	121,136	9	25	40	53	66	74
Hutchinson	74	10,106	15,777	16,740	15,197	13,324	11,454	10,171	14	41	67	91	115	129
Potter	7,349	15,775	17,015	15,820	14,483	13,186	11,642	10,678	3	7	10	13	16	18
Roberts	79,284	359,716	431,798	455,129	428,388	390,246	342,747	311,054	20	55	87	117	148	166
Wheeler	13,534	114,844	130,782	138,810	137,761	132,311	123,308	116,837	8	23	35	47	59	66
<b>District Total</b>	<b>318,466</b>	<b>980,357</b>	<b>1,102,788</b>	<b>1,115,730</b>	<b>1,050,787</b>	<b>962,880</b>	<b>853,930</b>	<b>782,381</b>						

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.



**Table 2016.3.4 continued: Available groundwater and average drawdown in the Ogallala Aquifer for the counties comprising GMA-1.**

<b>High Plains Water District</b>														
Armstrong	1,073	1,262	2,017	1,891	1,781	1,642	1,293	1,052	2	6	9	11	13	15
Potter	149	3	3	4	4	3	3	3	2	4	7	10	13	15
Randall	26,175	32,084	33,571	31,504	28,589	25,322	21,657	19,553	3	8	12	16	19	21
<b>District Total</b>	<b>27,397</b>	<b>33,349</b>	<b>35,591</b>	<b>33,399</b>	<b>30,374</b>	<b>26,967</b>	<b>22,953</b>	<b>20,608</b>						
<b>No GCD</b>														
Hartley	240	18,432	19,581	17,638	14,566	11,147	7,457	5,246	5	12	18	22	24	24
Hutchinson	5,643	18,853	16,492	14,432	13,390	12,973	13,170	14,395	6	16	25	34	44	51
Moore	2,237	8,167	8,956	8,597	7,612	6,186	4,532	3,585	5	11	15	18	20	21
Oldham	13,775	40,879	44,721	40,203	33,517	26,224	18,628	16,173	3	7	10	12	13	14
Randall	18,039	23,890	24,894	23,944	21,952	19,504	16,550	14,684	3	8	12	16	19	21
<b>Total</b>	<b>39,934</b>	<b>110,221</b>	<b>114,644</b>	<b>104,814</b>	<b>91,037</b>	<b>76,034</b>	<b>60,337</b>	<b>54,083</b>						
<b>GMA-1 Total</b>	<b>1,875,400</b>	<b>3,147,166</b>	<b>3,553,876</b>	<b>3,230,215</b>	<b>2,931,733</b>	<b>2,600,327</b>	<b>2,230,224</b>	<b>2,021,071</b>						

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.3.5: Available groundwater and average drawdown in the Dockum Aquifer for the counties comprising GMA-1.**

Dockum County	Available Groundwater (afy)								Average Drawdown (ft)					
	2015	2016	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
<b>North Plains GCD</b>														
Dallam	2,755	13,955	13,952	13,909	13,945	13,906	13,905	13,905	30	76	117	154	192	213
Hartley	1,793	12,807	11,405	10,555	10,345	10,352	10,681	11,104	21	50	76	99	126	142
Moore	1,604	4,972	4,719	4,442	4,416	4,330	4,177	4,076	9	21	31	39	47	52
Sherman	484	125	125	124	125	124	90	85	16	36	51	62	70	73
<b>District Total</b>	<b>6,636</b>	<b>31,859</b>	<b>30,201</b>	<b>29,030</b>	<b>28,831</b>	<b>28,712</b>	<b>28,853</b>	<b>29,170</b>	<b>24</b>	<b>59</b>	<b>91</b>	<b>118</b>	<b>148</b>	<b>165</b>
<b>Panhandle GCD</b>														
Armstrong	138	5,658	7,150	9,023	9,614	9,704	9,493	9,270	5	13	20	27	34	38
Carson	29	53	68	108	140	169	203	225	6	15	23	30	37	42
Potter	914	32,021	38,909	39,112	37,037	34,504	31,557	29,665	4	10	16	21	26	29
<b>District Total</b>	<b>1,081</b>	<b>37,732</b>	<b>46,127</b>	<b>48,243</b>	<b>46,791</b>	<b>44,377</b>	<b>41,253</b>	<b>39,160</b>	<b>4</b>	<b>11</b>	<b>18</b>	<b>24</b>	<b>30</b>	<b>34</b>
<b>High Plains Water District</b>														
Armstrong	33	166	96	0	0	0	0	0	1	3	7	11	15	18
Potter	434	29	21	0	0	0	0	0	3	9	16	24	32	37
Randall	1,597	1,575	2,195	2,714	2,961	3,111	3,228	3,289	9	19	28	36	44	49
<b>District Total</b>	<b>2,064</b>	<b>1,770</b>	<b>2,312</b>	<b>2,714</b>	<b>2,961</b>	<b>3,111</b>	<b>3,228</b>	<b>3,289</b>	<b>8</b>	<b>16</b>	<b>24</b>	<b>32</b>	<b>40</b>	<b>44</b>
<b>No GCD</b>														
Hartley	226	42,620	43,766	44,269	44,525	44,303	43,941	43,521	9	27	44	59	78	89
Moore	0	230	419	575	528	509	497	481	5	13	19	25	30	33
Oldham	1,128	111,290	129,354	128,828	120,848	111,196	99,735	92,701	4	11	18	24	30	34
Randall	1,006	6,320	9,007	11,302	11,941	12,002	11,806	11,555	7	15	24	31	40	45
<b>Total</b>	<b>2,360</b>	<b>160,460</b>	<b>182,546</b>	<b>184,974</b>	<b>177,842</b>	<b>168,010</b>	<b>155,979</b>	<b>148,258</b>	<b>5</b>	<b>14</b>	<b>22</b>	<b>30</b>	<b>38</b>	<b>42</b>
<b>GMA-1 Total</b>	<b>12,141</b>	<b>231,821</b>	<b>261,186</b>	<b>264,961</b>	<b>256,425</b>	<b>244,210</b>	<b>229,313</b>	<b>219,877</b>						

**Table 2016.3.6: Groundwater in storage and fraction remaining from 2012 in the Ogallala Aquifer for counties comprising GMA-1.**

Ogallala County	Groundwater In Storage (af)								Fraction Remaining from 2012				
	2012	2015	2020	2030	2040	2050	2062	2070	'20	'30	'40	'50	'62
<b>North Plains GCD</b>													
Dallam	14,671,925	13,780,883	12,194,040	9,810,080	8,033,504	6,810,347	6,004,835	5,788,831	0.83	0.67	0.55	0.46	0.41
Hansford	23,999,740	23,499,747	22,254,715	19,723,282	17,226,621	14,796,746	11,980,003	10,161,126	0.93	0.82	0.72	0.62	0.50
Hartley	16,109,356	14,899,515	12,934,107	10,351,061	8,422,648	7,086,288	6,206,581	5,986,224	0.80	0.64	0.52	0.44	0.39
Hutchinson	6,283,204	6,138,287	5,856,123	5,224,580	4,564,721	3,918,708	3,183,164	2,722,310	0.93	0.83	0.73	0.62	0.51
Lipscomb	17,979,150	17,880,482	16,931,538	14,901,331	13,006,665	11,179,281	9,040,585	7,636,013	0.94	0.83	0.72	0.62	0.50
Moore	9,531,217	9,010,018	8,062,275	6,603,471	5,452,449	4,617,039	3,997,965	3,782,185	0.85	0.69	0.57	0.48	0.42
Ochiltree	20,588,713	20,348,826	19,354,815	17,157,193	14,993,048	12,862,742	10,345,519	8,686,066	0.94	0.83	0.73	0.62	0.50
Sherman	17,946,388	17,048,100	15,409,446	12,431,301	10,107,130	8,413,865	7,138,841	6,673,077	0.86	0.69	0.56	0.47	0.40
District Total	127,109,693	122,605,858	112,997,059	96,202,299	81,806,786	69,685,016	57,897,493	51,435,832	0.89	0.76	0.64	0.55	0.46
<b>Hemphill County UWCD</b>													
Hemphill	15,434,318	15,372,022	15,048,787	14,346,870	13,653,101	12,988,228	12,233,445	11,757,736	0.98	0.93	0.88	0.84	0.79
<b>Panhandle GCD</b>													
Armstrong	4,418,838	4,390,635	4,103,026	3,568,023	3,089,254	2,665,255	2,226,580	1,974,623	0.93	0.81	0.70	0.60	0.50
Carson	14,900,617	14,533,317	13,644,675	11,911,925	10,332,170	8,928,035	7,476,079	6,642,627	0.92	0.80	0.69	0.60	0.50
Donley	4,372,716	4,295,059	4,022,028	3,503,564	3,038,977	2,634,834	2,226,949	1,998,735	0.92	0.80	0.69	0.60	0.51
Gray	13,723,357	13,607,295	12,765,177	11,144,748	9,666,519	8,347,311	6,971,036	6,172,961	0.93	0.81	0.70	0.61	0.51
Hutchinson	877,413	870,844	820,953	715,416	614,210	521,737	426,395	372,014	0.94	0.82	0.70	0.59	0.49
Potter	1,610,450	1,579,081	1,484,615	1,309,264	1,155,476	1,022,623	888,061	812,250	0.92	0.81	0.72	0.63	0.55
Roberts	29,922,260	29,671,432	27,858,680	24,288,565	20,980,065	17,981,566	14,809,145	12,946,618	0.93	0.81	0.70	0.60	0.49
Wheeler	7,039,568	7,014,771	6,519,137	5,638,114	4,855,500	4,154,476	3,418,004	2,986,946	0.93	0.80	0.69	0.59	0.49
District Total	76,865,219	75,962,434	71,218,291	62,079,619	53,732,171	46,255,837	38,442,249	33,906,774	0.93	0.81	0.70	0.60	0.50

**Table 2016.3.6 continued: Groundwater in storage and fraction remaining from 2012 in the Ogallala Aquifer for counties comprising GMA-1.**

Ogallala	Groundwater In Storage (af)								Fraction Remaining from 2012				
County	2012	2015	2020	2030	2040	2050	2062	2070	'20	'30	'40	'50	'62
<b>High Plains Water District</b>													
<b>Armstrong</b>	169,520	164,755	153,845	131,624	112,464	96,421	81,947	75,389	0.91	0.78	0.66	0.57	0.48
<b>Potter</b>	334,379	331,599	325,095	308,518	291,084	274,221	255,742	244,751	0.97	0.92	0.87	0.82	0.76
<b>Randall</b>	2,570,085	2,523,203	2,402,932	2,157,598	1,934,362	1,744,047	1,561,784	1,465,153	0.93	0.84	0.75	0.68	0.61
<b>District Total</b>	3,073,984	3,019,557	2,881,872	2,597,740	2,337,910	2,114,689	1,899,473	1,785,293	0.94	0.85	0.76	0.69	0.62
<b>No GCD</b>													
<b>Hartley</b>	908,097	899,854	801,455	638,349	518,300	438,394	388,811	378,477	0.88	0.70	0.57	0.48	0.43
<b>Hutchinson</b>	3,937,385	3,879,960	3,676,579	3,241,343	2,810,387	2,400,962	1,946,585	1,669,519	0.93	0.82	0.71	0.61	0.49
<b>Moore</b>	492,564	478,653	428,082	344,643	285,201	244,851	217,142	208,931	0.87	0.70	0.58	0.50	0.44
<b>Oldham</b>	2,031,746	1,998,077	1,813,905	1,511,073	1,287,946	1,141,430	1,055,119	1,032,206	0.89	0.74	0.63	0.56	0.52
<b>Randall</b>	2,265,938	2,221,861	2,118,950	1,920,542	1,740,473	1,582,955	1,424,337	1,336,679	0.94	0.85	0.77	0.70	0.63
<b>Total</b>	9,635,730	9,478,405	8,838,971	7,655,950	6,642,307	5,808,592	5,031,994	4,625,812	0.92	0.79	0.69	0.60	0.52
<b>GMA-1 Total</b>	232,118,944	226,438,276	210,984,980	182,882,478	158,172,275	136,852,362	115,504,654	103,511,447	0.91	0.79	0.68	0.59	0.50

**Table 2016.4.1: Groundwater in storage and fraction remaining by zone for the Ogallala Aquifer in GMA-1.**

Ogallala Zone	Groundwater In Storage (af)							Fraction Remaining from 2012				
	2012	2015	2020	2030	2040	2050	2062	'20	'30	'40	'50	'62
North Plains GCD - West	58,258,886	54,721,246	48,547,548	39,061,131	31,768,557	26,549,974	22,822,441	0.83	0.67	0.55	0.46	0.39
North Plains GCD - East	68,850,807	67,867,342	64,397,191	57,006,381	49,791,027	42,757,393	34,549,107	0.94	0.83	0.72	0.62	0.50
Hemphill County UWCD	15,434,318	15,372,022	15,048,240	14,345,671	13,651,680	12,986,712	12,231,878	0.97	0.93	0.88	0.84	0.79
Panhandle GCD	76,865,219	75,959,418	71,200,546	62,044,019	53,687,648	46,205,621	38,386,403	0.93	0.81	0.70	0.60	0.50
High Plains UWCD No. 1	3,073,984	3,018,303	2,879,308	2,593,107	2,330,509	2,102,457	1,879,642	0.94	0.84	0.76	0.68	0.61
No GCD	9,635,730	9,472,283	8,820,712	7,617,290	6,583,147	5,727,197	4,921,246	0.92	0.79	0.68	0.60	0.51

**Table 2016.4.2: Fraction remaining by zone for the Dockum Aquifer in GMA-1.**

Zone	Fraction Remaining from 2012				
	2020	2030	2040	2050	2062
North Plains GCD - West	0.90	0.75	0.62	0.51	0.40
Panhandle GCD	0.93	0.82	0.72	0.65	0.57
High Plains UWCD No. 1	0.86	0.72	0.60	0.51	0.42
No GCD	0.94	0.86	0.79	0.73	0.68

**Table 2016.4.3: Available groundwater and average drawdown in the Rita Blanca Aquifer for the Dallam County in GMA-1.**

Rita Blanca County	Available Groundwater (afy)							Average Drawdown (ft)					
	2015 <sup>1</sup>	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
Dallam	6,197	6,207	6,197	6,177	6,145	6,151	5,914	13	27	39	47	53	57

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.4.4: Available groundwater and average drawdown in the Ogallala Aquifer for the counties comprising GMA-1.**

Ogallala	Available Groundwater (afy)								Average Drawdown (ft)					
County	2015	2016	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
<b>North Plains GCD</b>														
Dallam	312,426	400,754	390,609	288,941	229,601	170,226	104,708	71,048	15	30	41	49	54	56
Hansford	169,191	276,822	275,769	272,655	271,968	270,280	269,478	269,128	17	41	66	89	116	134
Hartley	353,403	450,899	400,792	273,444	215,857	157,979	94,199	61,301	20	37	50	59	65	66
Hutchinson	59,153	74,151	62,975	64,522	65,831	66,075	65,956	64,791	13	33	53	73	95	110
Lipscomb	39,006	55,112	267,540	266,710	267,370	266,591	266,556	266,547	12	34	55	75	99	115
Moore	167,811	235,482	215,441	172,621	139,709	105,042	67,695	47,491	20	41	57	69	77	80
Ochiltree	84,963	115,225	244,446	243,931	244,670	244,050	244,085	244,094	13	37	61	84	112	130
Sherman	288,843	364,947	399,146	348,920	282,538	212,885	136,920	93,946	24	53	75	91	104	108
<b>District Total</b>	1,474,796	1,973,392	2,256,718	1,931,744	1,717,544	1,493,128	1,249,597	1,118,346						
<b>Hemphill County UWCD</b>														
Hemphill	21,935	55,302	54,761	54,640	54,815	54,684	54,701	54,709	4	11	18	25	33	38
<b>Panhandle GCD</b>														
Armstrong	7,495	57,976	58,602	53,821	48,653	43,765	38,353	35,069	6	16	26	34	42	47
Carson	129,825	181,423	192,719	184,317	170,443	153,808	134,089	121,481	12	29	44	57	71	79
Donley	39,491	70,819	76,925	78,237	74,944	69,493	62,383	57,704	5	14	21	27	33	37
Gray	41,540	171,664	182,087	175,968	163,729	149,267	132,280	121,649	9	25	40	53	66	74
Hutchinson	74	10,106	15,777	16,740	15,197	13,324	11,454	10,171	14	41	67	91	115	129
Potter	7,789	16,399	17,742	16,538	15,142	13,794	12,209	11,220	3	7	10	14	17	18
Roberts	79,284	359,716	431,798	455,129	428,388	390,246	342,747	311,054	20	55	87	117	148	166
Wheeler	13,711	116,334	133,554	141,727	140,359	134,609	125,426	119,017	9	23	36	47	59	66
<b>District Total</b>	319,209	984,437	1,109,204	1,122,477	1,056,855	968,306	858,941	787,365						

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.4.4 continued: Available groundwater and average drawdown in the Ogallala Aquifer for the counties comprising GMA-1.**

<b>High Plains Water District</b>														
Armstrong	1,202	1,416	2,206	2,059	1,922	1,784	1,553	1,327	3	6	9	12	15	16
Potter	149	3	3	4	4	3	3	3	2	4	7	10	13	15
Randall	26,384	32,126	33,612	31,531	28,609	25,338	21,669	19,565	3	8	12	16	20	21
<b>District Total</b>	<b>27,735</b>	<b>33,545</b>	<b>35,821</b>	<b>33,594</b>	<b>30,535</b>	<b>27,125</b>	<b>23,225</b>	<b>20,895</b>						
<b>No GCD</b>														
Hartley	240	19,027	20,442	18,744	15,877	12,553	8,685	6,191	5	13	19	23	25	26
Hutchinson	5,643	19,203	17,190	15,352	14,243	13,792	13,909	15,059	6	16	25	35	45	51
Moore	2,287	8,733	9,577	9,185	8,126	6,638	4,908	3,903	5	11	16	19	21	22
Oldham	15,466	42,643	47,439	43,228	36,678	29,684	22,423	19,467	3	7	11	13	14	15
Randall	18,143	23,890	24,894	23,950	21,969	19,529	16,578	14,711	3	8	12	16	19	21
<b>Total</b>	<b>41,779</b>	<b>113,496</b>	<b>119,542</b>	<b>110,459</b>	<b>96,893</b>	<b>82,196</b>	<b>66,503</b>	<b>59,331</b>						
<b>GMA-1 Total</b>	<b>1,885,454</b>	<b>3,160,172</b>	<b>3,576,046</b>	<b>3,252,914</b>	<b>2,956,642</b>	<b>2,625,439</b>	<b>2,252,967</b>	<b>2,040,646</b>						

<sup>1</sup>2015 rates are identical to the last year of the calibrated model (2012) except in NPGCD where other rates were provided by NPGCD staff.

**Table 2016.4.5: Available groundwater and average drawdown in the Dockum Aquifer for the counties comprising GMA-1.**

Dockum	Available Groundwater (afy)								Average Drawdown (ft)					
County	2015	2016	2020	2030	2040	2050	2062	2070	2020	2030	2040	2050	2062	2070
<b>North Plains GCD</b>														
Dallam	2,755	13,955	13,952	13,909	13,945	13,906	13,905	13,905	30	77	118	154	192	214
Hartley	1,793	12,807	11,405	10,555	10,345	10,352	10,681	11,104	21	50	76	100	126	143
Moore	1,604	4,972	4,719	4,442	4,416	4,330	4,177	4,076	9	21	31	39	47	52
Sherman	484	125	125	124	125	124	90	85	16	36	51	62	71	74
<b>District Total</b>	6,636	31,859	30,201	29,030	28,831	28,712	28,853	29,170	24	59	91	119	148	166
<b>Panhandle GCD</b>														
Armstrong	138	5,658	7,150	9,032	9,628	9,718	9,507	9,283	5	13	20	27	34	38
Carson	29	53	68	108	140	169	203	225	6	15	23	30	37	42
Potter	914	32,028	38,915	39,118	37,041	34,507	31,560	29,667	4	10	16	21	26	29
<b>District Total</b>	1,081	37,739	46,133	48,258	46,809	44,394	41,270	39,175	4	11	18	24	30	34
<b>High Plains Water District</b>														
Armstrong	33	166	96	0	0	0	0	0	1	3	7	11	15	18
Potter	434	29	21	0	0	0	0	0	3	9	16	24	32	37
Randall	1,597	1,575	2,195	2,714	2,961	3,111	3,228	3,289	9	19	28	36	45	49
<b>District Total</b>	2,064	1,770	2,312	2,714	2,961	3,111	3,228	3,289	8	16	24	32	40	45
<b>No GCD</b>														
Hartley	226	42,620	43,766	44,269	44,525	44,303	43,941	43,521	9	27	44	59	78	89
Moore	0	230	419	575	533	509	497	481	5	13	19	25	30	33
Oldham	1,128	111,301	129,364	128,837	120,854	111,201	99,739	92,704	4	11	18	24	30	34
Randall	1,006	6,320	9,007	11,302	11,941	12,002	11,806	11,555	7	15	24	31	40	45
<b>Total</b>	2,360	160,471	182,556	184,983	177,853	168,015	155,983	148,261	5	14	22	30	38	42
<b>GMA-1 Total</b>	12,141	231,839	261,202	264,985	256,454	244,232	229,334	219,895						



**Table 2016.4.6: Groundwater in storage and fraction remaining from 2012 in the Ogallala Aquifer for counties comprising GMA-1.**

Ogallala	Groundwater In Storage (af)								Fraction Remaining from 2012				
County	2012	2015	2020	2030	2040	2050	2062	2070	'20	'30	'40	'50	'62
<b>North Plains GCD</b>													
Dallam	14,671,925	13,764,050	12,148,396	9,699,361	7,839,988	6,528,591	5,633,248	5,373,455	0.83	0.66	0.53	0.44	0.38
Hansford	23,999,740	23,499,747	22,254,715	19,723,282	17,226,621	14,796,740	11,979,998	10,161,110	0.93	0.82	0.72	0.62	0.50
Hartley	16,109,356	14,899,163	12,928,123	10,329,796	8,375,710	7,004,854	6,080,793	5,834,433	0.80	0.64	0.52	0.43	0.38
Hutchinson	6,283,204	6,138,287	5,856,123	5,224,575	4,564,693	3,918,630	3,183,018	2,722,128	0.93	0.83	0.73	0.62	0.51
Lipscomb	17,979,150	17,880,482	16,931,538	14,901,331	13,006,665	11,179,281	9,040,573	7,635,996	0.94	0.83	0.72	0.62	0.50
Moore	9,531,217	9,010,017	8,062,151	6,602,948	5,451,258	4,614,574	3,992,938	3,774,890	0.85	0.69	0.57	0.48	0.42
Ochiltree	20,588,713	20,348,826	19,354,815	17,157,193	14,993,048	12,862,742	10,345,518	8,686,064	0.94	0.83	0.73	0.62	0.50
Sherman	17,946,388	17,048,016	15,408,878	12,429,026	10,101,601	8,401,955	7,115,462	6,641,658	0.86	0.69	0.56	0.47	0.40
<b>District Total</b>	<b>127,109,693</b>	<b>122,588,588</b>	<b>112,944,739</b>	<b>96,067,512</b>	<b>81,559,584</b>	<b>69,307,367</b>	<b>57,371,548</b>	<b>50,829,734</b>	<b>0.89</b>	<b>0.76</b>	<b>0.64</b>	<b>0.55</b>	<b>0.45</b>
<b>Hemphill County UWCD</b>													
Hemphill	15,434,318	15,372,022	15,048,240	14,345,671	13,651,680	12,986,712	12,231,878	11,756,148	0.97	0.93	0.88	0.84	0.79
<b>Panhandle GCD</b>													
Armstrong	4,418,838	4,390,635	4,102,197	3,566,408	3,087,197	2,662,896	2,223,787	1,971,376	0.93	0.81	0.70	0.60	0.50
Carson	14,900,617	14,533,005	13,644,285	11,911,477	10,331,685	8,927,498	7,475,484	6,641,992	0.92	0.80	0.69	0.60	0.50
Donley	4,372,716	4,295,022	4,017,354	3,494,304	3,027,511	2,622,148	2,213,257	1,984,546	0.92	0.80	0.69	0.60	0.51
Gray	13,723,357	13,607,295	12,764,116	11,141,318	9,661,809	8,341,900	6,965,264	6,166,983	0.93	0.81	0.70	0.61	0.51
Hutchinson	877,413	870,844	820,948	715,369	614,095	521,569	426,200	371,818	0.94	0.82	0.70	0.59	0.49
Potter	1,610,450	1,576,900	1,480,579	1,303,808	1,149,538	1,016,469	881,821	806,053	0.92	0.81	0.71	0.63	0.55
Roberts	29,922,260	29,671,432	27,858,680	24,288,555	20,980,020	17,981,436	14,808,901	12,946,272	0.93	0.81	0.70	0.60	0.49
Wheeler	7,039,568	7,014,285	6,512,387	5,622,780	4,835,793	4,131,705	3,391,689	2,957,511	0.93	0.80	0.69	0.59	0.48
<b>District Total</b>	<b>76,865,219</b>	<b>75,959,418</b>	<b>71,200,546</b>	<b>62,044,019</b>	<b>53,687,648</b>	<b>46,205,621</b>	<b>38,386,403</b>	<b>33,846,551</b>	<b>0.93</b>	<b>0.81</b>	<b>0.70</b>	<b>0.60</b>	<b>0.50</b>

**Table 2016.4.6 continued: Groundwater in storage and fraction remaining from 2012 in the Ogallala Aquifer for counties comprising GMA-1.**

Ogallala	Groundwater In Storage (af)								Fraction Remaining from 2012				
County	2012	2015	2020	2030	2040	2050	2062	2070	'20	'30	'40	'50	'62
<b>High Plains Water District</b>													
<b>Armstrong</b>	169,520	164,173	152,213	128,358	107,796	90,234	73,281	65,244	0.90	0.76	0.64	0.53	0.43
<b>Potter</b>	334,379	331,599	325,088	308,489	291,034	274,134	255,469	244,334	0.97	0.92	0.87	0.82	0.76
<b>Randall</b>	2,570,085	2,522,531	2,402,007	2,156,260	1,931,679	1,738,089	1,550,892	1,451,487	0.93	0.84	0.75	0.68	0.60
<b>District Total</b>	3,073,984	3,018,303	2,879,308	2,593,107	2,330,509	2,102,457	1,879,642	1,761,065	0.94	0.84	0.76	0.68	0.61
<b>No GCD</b>													
<b>Hartley</b>	908,097	899,854	799,203	631,371	505,518	418,925	362,582	350,251	0.88	0.70	0.56	0.46	0.40
<b>Hutchinson</b>	3,937,385	3,879,951	3,675,073	3,237,360	2,805,526	2,395,676	1,941,072	1,664,052	0.93	0.82	0.71	0.61	0.49
<b>Moore</b>	492,564	478,587	425,912	339,662	278,442	236,871	208,438	200,207	0.86	0.69	0.57	0.48	0.42
<b>Oldham</b>	2,031,746	1,992,342	1,801,866	1,488,671	1,253,577	1,093,263	985,454	951,125	0.89	0.73	0.62	0.54	0.49
<b>Randall</b>	2,265,938	2,221,549	2,118,658	1,920,226	1,740,084	1,582,462	1,423,700	1,335,941	0.94	0.85	0.77	0.70	0.63
<b>Total</b>	9,635,730	9,472,283	8,820,712	7,617,290	6,583,147	5,727,197	4,921,246	4,501,576	0.92	0.79	0.68	0.59	0.51
<b>GMA-1 Total</b>	232,118,944	226,410,614	210,893,545	182,667,599	157,812,568	136,329,354	114,790,717	102,695,074	0.91	0.79	0.68	0.59	0.49