

TO: PWPG Modeling Committee

CC: Van Kelley, Intera; Kyle Ingham, PRPC

FROM: Simone Kiel

SUBJECT: Ogallala Aquifer Availability

DATE: November 6, 2009

The availability for the Ogallala aquifer was determined for two planning considerations:

- **Source availability:** this is the maximum amount of water available by county and basin that meets the management goals adopted by the PWPG. For the 2011 water plan, the management goals are to have 40 percent of the aquifer storage remaining in 50 years for the four western counties (Dallam, Hartley, Sherman and Moore Counties), 80 percent of the storage remaining in Hemphill County, and 50 percent of the storage remaining in the other counties in the PWPA.
- **Water User Group (WUG) availability:** this is the amount of water that is currently available to a water user group. WUG availability considers geographic constraints, infrastructure (production capacity) and water rights (if information is available). Water demands were also considered.

The source availability was determined using the current Northern Ogallala GAM model. Pumpage was estimated for each one-square mile grid cell and adjusted annually to meet the management criteria for the different areas. The source availability was summed for each county/basin. For counties that are partially located in the Southern Ogallala GAM (Oldham, Potter, Randall and Armstrong Counties), the availabilities determined for the 2006 water plan for the Southern Ogallala GAM areas were used. Each of these counties fall under the 50% management goal, which is consistent with the 1.25% depletion goal that was used in the 2006 plan. The groundwater availabilities for the Ogallala Aquifer are shown on Table 1.

The allocation of the groundwater to water user groups considered geographic constraints, production capacity and water rights. To assist with the allocation of water to irrigation and municipal users, the model run for source availability (described above) was used. Model grid cells were assigned to a specific user using data provided by the Groundwater Conservation Districts, TCEQ and TWDB (see attached Figure). The availabilities were estimated based on the summation of the pumpage for the associated grid cells. For irrigation water users, the lesser of the demands or the availabilities were assigned to the irrigation WUG. Six counties were shown to have irrigation demands greater than the estimated water availability. These include Dallam, Hartley, Hansford, Hutchinson, Moore and Sherman Counties.

The allocation to municipal water users considered several factors, including the availabilities determined using the GAM, production capacities and information received from the water user. Allocations to other users (manufacturing, livestock and mining) were generally not constrained if there was sufficient supply in the county. Water supplies to manufacturing users that receive supply from a wholesale water provider were limited if the wholesale water provider did not have sufficient supplies.

The allocation of Ogallala water by county is shown on Table 2. The amount of Ogallala water that is not allocated to a specific user group is shown on Table 3.

Based on these allocations and the updated water demands, there are 24 water user groups (not considering county and basin splits) with projected shortages over the planning period. A list of these user groups with the projected shortages are shown on Table 4.

Table 1
Available Supply from the Ogallala Aquifer
 (Values are in Acre-feet per year)

County	Basin	2010	2020	2030	2040	2050	2060
Armstrong	Red	56,291	47,666	42,659	37,938	34,185	30,650
Carson	Canadian	90,024	80,392	72,084	64,820	58,078	52,091
Carson	Red	108,208	98,153	88,409	79,836	71,804	64,245
Childress	Red	0	0	0	0	0	0
Collingsworth	Red	1,072	1,071	1,070	1,069	1,068	1,067
Dallam	Canadian	290,088	253,072	225,124	198,739	173,986	151,305
Donley	Red	90,450	81,347	76,005	69,672	63,613	58,017
Gray	Canadian	41,659	36,998	35,051	32,396	29,457	26,480
Gray	Red	145,280	120,031	108,768	98,250	88,157	79,154
Hall	Red	0	0	0	0	0	0
Hansford	Canadian	279,085	258,780	238,529	217,640	195,835	174,892
Hartley	Canadian	413,782	361,195	314,995	273,474	236,815	204,661
Hemphill	Canadian	27,130	24,127	23,715	23,586	23,417	23,446
Hemphill	Red	55,821	20,527	20,414	20,198	20,256	20,133
Hutchinson	Canadian	153,829	129,548	119,798	108,985	98,239	87,979
Lipscomb	Canadian	260,989	253,488	247,761	234,999	219,735	203,198
Moore	Canadian	172,388	164,319	142,529	122,138	103,539	86,974
Ochiltree	Canadian	257,903	236,618	215,489	195,506	176,566	159,017
Oldham	Canadian	29,284	30,018	29,530	28,468	28,216	27,749
Oldham	Red	2,546	2,610	2,568	2,476	2,454	2,413
Potter	Canadian	33,285	25,599	22,894	20,157	18,126	16,139
Potter	Red	7,800	6,287	5,790	5,403	5,090	4,845
Randall	Canadian	0	0	0	0	0	0
Randall	Red	74,440	69,663	66,697	60,842	64,746	64,207
Roberts	Canadian	358,334	322,556	306,054	285,524	262,825	238,459
Roberts	Red	17,000	16,962	16,855	15,896	14,684	13,474
Sherman	Canadian	316,971	298,567	262,820	229,557	198,809	169,672
Wheeler	Red	120,205	114,819	112,163	106,500	99,802	92,993
TOTAL		3,403,864	3,054,413	2,797,771	2,534,069	2,289,502	2,053,260

Table 2
Currently Available Supply from the Ogallala Aquifer to Water User Groups
 (Values are in Acre-feet per year)

County	2010	2020	2030	2040	2050	2060
Armstrong	6,679	6,170	5,974	5,692	5,179	4,670
Carson	74,983	65,132	62,380	58,656	48,435	46,468
Collingsworth	523	523	523	523	523	523
Dallam	157,110	141,594	125,714	111,173	98,043	85,817
Donley	32,807	30,396	29,430	27,915	24,885	21,857
Gray	32,689	30,107	29,326	28,411	26,552	24,336
Hansford	134,494	117,657	113,525	104,627	94,530	84,656
Hartley	117,794	107,886	96,492	86,091	76,421	67,683
Hemphill	6,048	5,930	5,601	5,027	4,476	3,985
Hutchinson	53,406	53,602	53,295	52,805	52,256	51,318
Lipscomb	19,490	18,090	17,503	16,496	14,755	13,042
Moore	93,559	86,070	78,897	71,547	64,134	57,185
Ochiltree	66,369	57,480	55,937	53,284	48,057	42,843
Oldham	4,713	4,397	4,285	4,101	3,730	3,345
Potter	13,524	12,515	11,992	11,459	10,796	10,039
Randall	31,591	29,303	28,274	27,165	25,012	22,894
Roberts	68,070	68,662	68,463	67,924	66,888	65,862
Sherman	153,277	137,254	121,164	106,723	93,766	81,643
Wheeler	15,476	13,653	13,172	12,321	11,057	9,863
Total	1,082,602	986,421	921,947	851,940	769,495	698,029

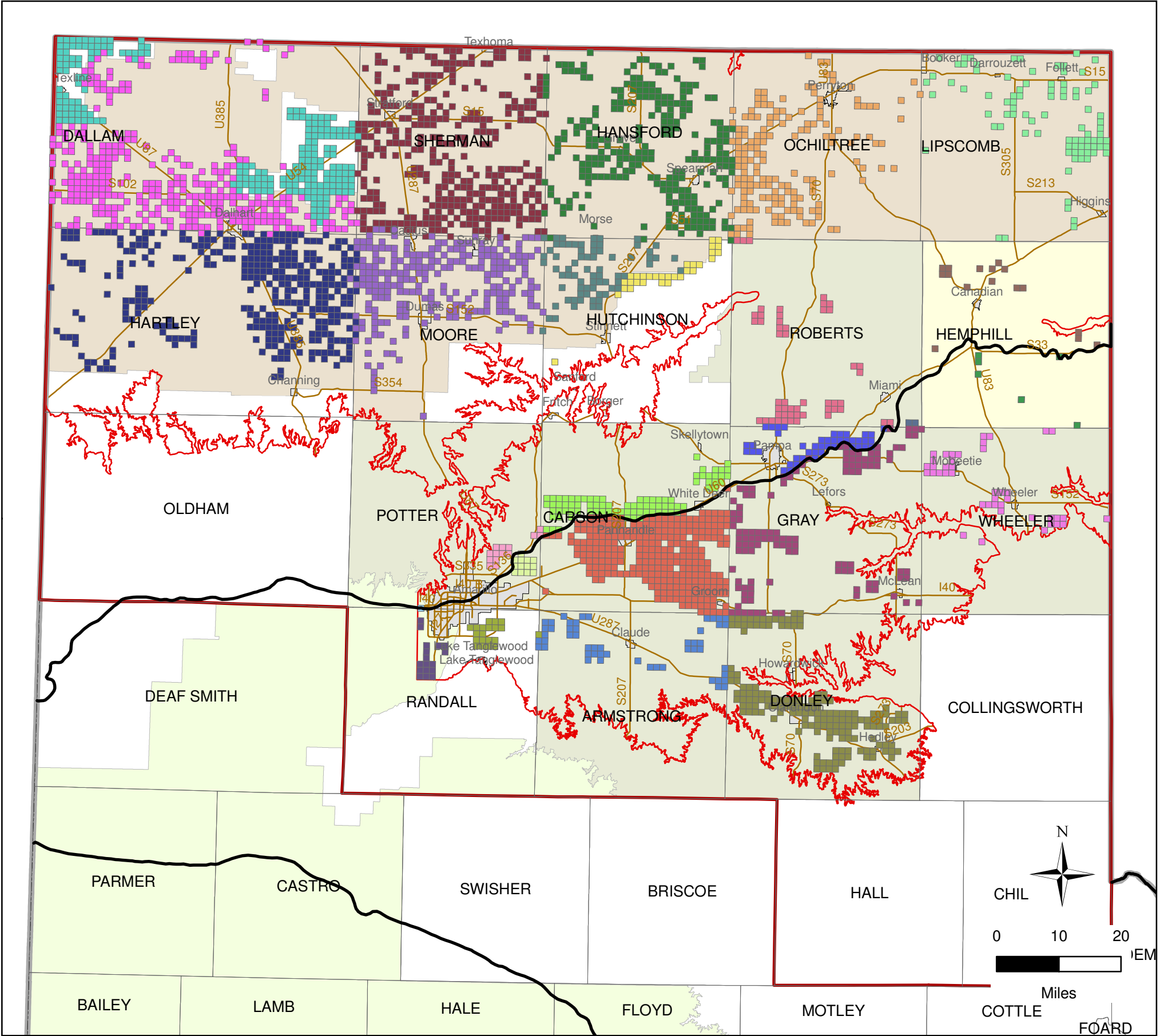
Table 3
Unallocated Supply from the Ogallala Aquifer
 (Values are in Acre-feet per year)

County	2010	2020	2030	2040	2050	2060
Armstrong	49,612	41,496	36,685	32,246	29,006	25,980
Carson	123,249	113,413	98,113	86,000	81,447	69,868
Collingsworth	549	548	547	546	545	544
Dallam	132,978	111,478	99,410	87,566	75,943	65,488
Donley	57,643	50,951	46,575	41,757	38,728	36,160
Gray	154,250	126,922	114,493	102,235	91,062	81,298
Hansford	144,591	141,123	125,004	113,013	101,305	90,236
Hartley	295,988	253,309	218,503	187,383	160,394	136,978
Hemphill	76,903	38,724	38,528	38,757	39,197	39,594
Hutchinson	100,423	75,946	66,503	56,180	45,983	36,661
Lipscomb	241,499	235,398	230,258	218,503	204,980	190,156
Moore	78,829	78,249	63,632	50,591	39,405	29,789
Ochiltree	191,534	179,138	159,552	142,222	128,509	116,174
Oldham	27,117	28,231	27,813	26,843	26,940	26,817
Potter	27,561	19,371	16,692	14,101	12,420	10,945
Randall	42,849	40,360	38,423	33,677	39,734	41,313
Roberts	307,264	270,856	254,446	233,496	210,621	186,071
Sherman	163,694	161,313	141,656	122,834	105,043	88,029
Wheeler	104,729	101,166	98,991	94,179	88,745	83,130
Total	2,321,262	2,067,992	1,875,824	1,682,129	1,520,007	1,355,231

Table 4
Projected Water Shortages in the Panhandle Region
 (Values are in Acre-feet per year)

WUG	Basin	County	Projected Water Supply Shortages (Ac-ft/yr)					
			2010	2020	2030	2040	2050	2060
AMARILLO	CANADIAN	POTTER	0	0	576	2,218	3,897	5,309
AMARILLO	RED	POTTER	0	0	410	1,581	2,778	3,784
SPEARMAN	CANADIAN	HANSFORD	0	0	276	611	831	849
SUNRAY	CANADIAN	MOORE	0	0	0	27	108	127
COUNTY-OTHER	CANADIAN	POTTER	0	0	0	299	708	1,043
COUNTY-OTHER	RED	POTTER	0	103	329	586	866	1,096
COUNTY-OTHER	RED	RANDALL	0	5	597	1,273	2,009	2,619
MANUFACTURING	CANADIAN	HUTCHINSON	0	0	664	1,244	1,752	2,450
MANUFACTURING	CANADIAN	MOORE	173	800	1,033	1,396	1,718	2,067
MANUFACTURING	CANADIAN	POTTER	0	0	33	57	35	43
MANUFACTURING	RED	POTTER	0	0	0	568	1,352	2,171
MANUFACTURING	RED	RANDALL	0	0	0	0	0	12
STEAM ELECTRIC POWER	CANADIAN	MOORE	75	99	117	128	136	154
IRRIGATION	CANADIAN	DALLAM	132,889	140,984	148,630	149,134	133,737	117,396
IRRIGATION	CANADIAN	HANSFORD	0	856	1,337	4,402	2,933	1,496
IRRIGATION	CANADIAN	HARTLEY	181,732	180,523	183,457	179,983	161,368	142,079
IRRIGATION	CANADIAN	HUTCHINSON	15,008	12,175	11,652	10,612	7,534	5,455
IRRIGATION	CANADIAN	MOORE	52,317	48,090	52,425	54,994	50,321	45,420
IRRIGATION	CANADIAN	SHERMAN	72,532	69,367	79,690	82,955	77,118	69,190
LIVESTOCK	RED	CHILDRESS	0	70	72	73	75	77
AMARILLO	RED	RANDALL	0	0	762	2,977	5,288	7,268
BORGER	CANADIAN	HUTCHINSON	0	0	188	376	464	526
CACTUS	CANADIAN	MOORE	0	0	204	262	309	354
CANYON	RED	RANDALL	0	0	0	16	388	690
DUMAS	CANADIAN	MOORE	0	387	1,163	1,672	2,219	2,478
GRUVER	CANADIAN	HANSFORD	0	77	229	282	333	334
LEFORS	RED	GRAY	0	0	0	29	35	36
MEMPHIS	RED	HALL	0	81	140	140	140	142
		Total	454,726	453,617	483,984	497,895	458,452	414,665

Irrigation Zones



Irrigation Zones					
	IRR-ARMSTRONG-PGCD-RedRB		IRR-HANSFORD-NPGCD-CanadianRB		IRR-POTTER-PGCD-CanadianRB
	IRR-CARSON-PGCD-CanadianRB		IRR-HARTLEY-NPGCD-CanadianRB		IRR-POTTER-PGCD-RedRB
	IRR-CARSON-PGCD-RedRB		IRR-HEMPHILL-HemphillGCD-CanadianRB		IRR-RANDALL-HighPlainsGCD-RedRB
	IRR-DALLAM-NPGCD-CanadianRB		IRR-HUTCHINSON-NPGCD-CanadianRB		IRR-RANDALL-noGCD-RedRB
	IRR-DALLAM-noGCD-CanadianRB		IRR-HUTCHINSON-noGCD-CanadianRB		IRR-ROBERTS-PGCD-CanadianRB
	IRR-DONLEY-PGCD-RedRB		IRR-LIPSCOMB-NPGCD-CanadianRB		IRR-ROBERTS-PGCD-RedRB
	IRR-GRAY-PGCD-CanadianRB		IRR-MOORE-NPGCD-CanadianRB		IRR-SHERMAN-NPGCD-CanadianRB
	IRR-GRAY-PGCD-RedRB		IRR-OCHILTREE-NPGCD-CanadianRB		IRR-WHEELER-PGCD-RedRB
			IRR-POTTER-HighPlainsGCD-RedRB		IRR-HEMPHILL-HemphillGCD-REDRB