PANHANDLE GROUNDWATER

CONSERVATION DISTRICT

MANAGEMENT PLAN

Approved by the

Panhandle Groundwater Conservation District

Board of Directors

August 20, 2008

TABLE OF CONTENTS

DISTRICT MISSION

The Panhandle Groundwater Conservation District (PGCD) will strive to develop, promote, and implement water conservation, augmentation, and management strategies to protect water resources for the benefit of the citizens, economy, and environment of the District.

TIME PERIOD FOR THIS PLAN

This plan, which uses a five-year planning horizon, becomes effective upon adoption by the Board of Directors, and remains in effect until a revised plan is certified, or October 1, 2013, whichever is earlier. Management plans are to be revised at least every 5 years under §356.3.

HISTORY OF GROUNDWATER MANAGEMENT

Groundwater planning and the authority of groundwater regulation dates back to the very first statue Vernon's Civil Statutes of the State of Texas, in Article 7880-3c, by the Texas Legislature in 1949.

In Article 7880-c3, B “Such Districts shall and are herby authorizes to exercise any one or more of the following:

(8) develop comprehensive plans for the most efficient use of the underground water of the underground reservoir or subdivision there of and for the control and prevention of waste of such underground water, which plans shall specify in such detail as may be practicable, the acts, procedure, performance and avoidance which are or may be necessary to effect such plans, including specifications therefore; to carry out research projects, develop information and determine limitations, if any, which should be made on the withdrawal of underground water from the underground reservoir or subdivision thereof; to collect and preserve information regarding the use of such underground water and the practicability of recharge of the underground water subdivision thereof; to publish such plans and information, bring them to the notice and attention of the users of such underground water within the District, and to encourage their adoption and execution;”

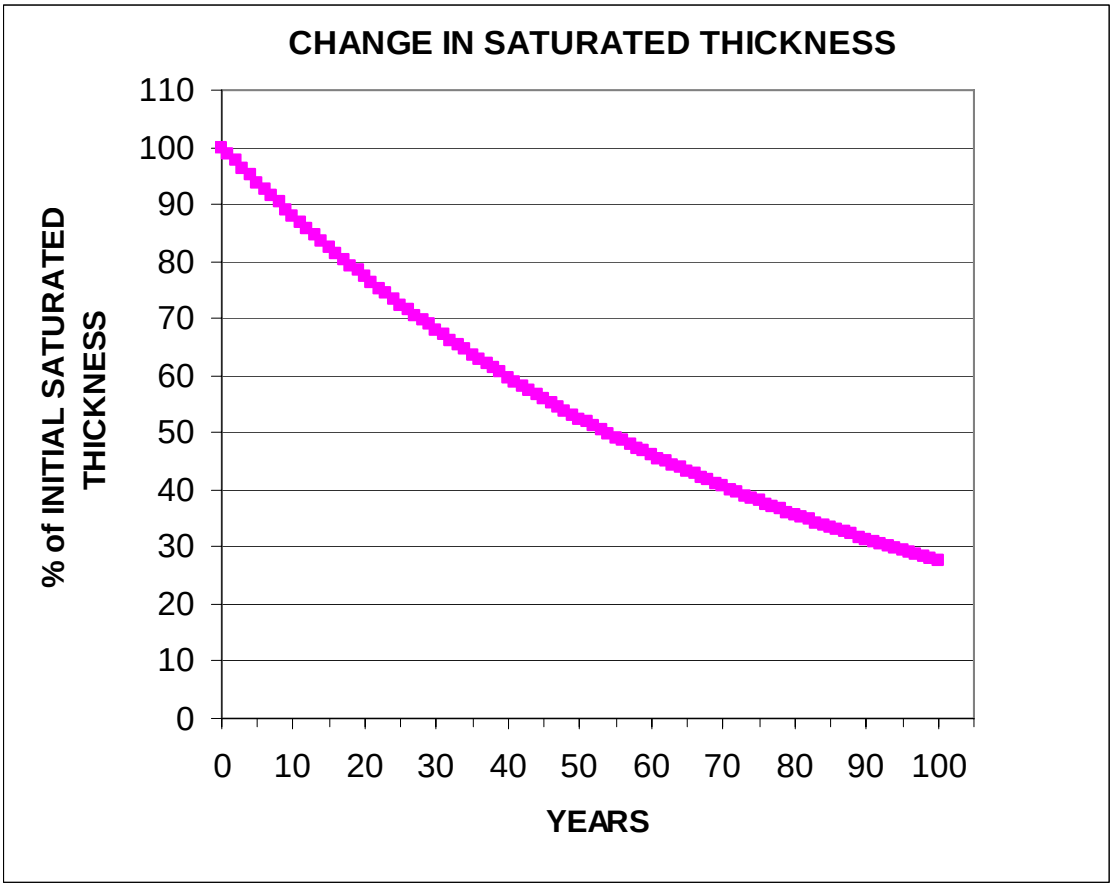
Planning has been updated several times since first drafted. Notably, in 1973 Article 7883-c was codified into Chapter 52 of the Texas Water Code. Chapter 52 was substantially revised in 1985 by the Texas legislature and was re-codified into Chapter 36 of the Texas Water Code by the Legislature in 1995.

In 1997 the Legislature significantly amended the groundwater planning process again and instructed the Texas Water Development Board (TWDB) to perform a review and certification process on all groundwater districts’ management plans. The Legislature, in almost every session since 1997, looked at groundwater management and made modifications to the process. Substantial changes in the planning and management of groundwater again took affect in 2005 with the passage of HB 1776, which requires districts

in the same management area to conduct joint planning that must initially be completed by September 1, 2010.

STATEMENT OF GUIDING PRINCIPLES

The District recognizes that the groundwater resources of the region are of vital importance. The Ogallala aquifer, the main aquifer within the District, is a limited groundwater resource and must be conserved and preserved for future generations. The preservation of this most valuable resource can be managed in a prudent and cost effective manner through conservation, education, regulation and permitting. The District's overall management standard is to have 50 percent of current supplies, or saturated thickness, still available fifty 50 after the first certification of this plan. The TWBD originally certified this plan in 1998. Therefore, the District's management standard is to have 50% of the 1998 saturated thickness remaining in 2048. The management standard goal will be extended to 2058 following the 50/50 depletion management trendline achieving accelerated conservation (see figure below). Maintenance of the 50 percent standard is accomplished using the District's depletion rules and procedures. Implementation of the 50 percent standard will be accomplished by production limits on the contiguous property each water rights holder owns or controls. This management document is the tool to focus the thoughts and actions of those given the responsibility for the execution of District activities.



50/50 Depletion Management Trendline

Managed Available Groundwater Estimate

Groundwater Management Area One has not yet set Desired Future Conditions (DFC) of the aquifer, so no Managed Available Groundwater (MAG) numbers have been received from TWDB. The District is actively working with the other member districts within Groundwater Management Area 1 towards determining the desired future conditions for each aquifer located within the district. Once these are established an estimate of the managed available groundwater will be determined. The District expects that any future DFCs will substantially align with the District's Statement of Guiding Principles.

General Description

PGCD consists of Carson, Donley, Gray, Roberts and Wheeler counties, along with parts of Armstrong, Hutchinson, Hemphill, and Potter counties. The District was created by the Legislature in 1955, when it began operating in portions of Gray, Carson, Potter, and Armstrong counties. Elections were held in 1988, 1991, 1994, 1997 and 2000 to annex the remaining portions of the District within the present boundaries. The current Board of Directors is: John R. Spearman Jr., President;, Danny Hardcastle, Vice President; Jason Green, Secretary; and Directors Jim Thompson, Charles Bowers, Phillip Smith, Billy Van Crawford, Tom Cambridge, and Steve Hale. General Manager of the District is C. E. Williams.

PGCD's areal extent is 6,309 square miles. The District's economy is dominated by agricultural and petrochemical production. The agricultural income sources include beef cattle production, wheat, corn, milo, peanuts, soybeans, sunflowers, hay crops and cotton. Petroleum production also contributes significantly to the income of the District. There are also chemical, manufacturing, and nuclear weapons industries located in the District.

Within the District boundaries, there are over 4,400 irrigation wells capable of producing water to meet the needs of the agricultural community. The District has 355 municipal or public supply wells, 443 wells for industrial use, and oil and gas secondary recovery (water flood) operations. The remaining wells are registered, non-permitted water supplies for household and livestock consumption.

Location and Extent

PGCD has an area of approximately four million acres located in the Panhandle region of Texas, extending from west of Amarillo to the Oklahoma border. The Canadian River to the north and Salt Fork of the Red River to the south generally border it.

Topography and Drainage

The area contains rolling plains that are used for cattle production, cultivation and oil and gas activities. There is a substantial area of flat plains that contain numerous playa basins. This area is used primarily for crop production. The altitude of the land surface ranges from 2,005 feet to 3,800 feet above mean sea level. The District lies within, and between, the drainage systems of both the Canadian River Basin and the Red River Basin.

Groundwater Resources

The primary aquifer within the District is found in sediments of the Ogallala Formation of Miocene age. The High Plains aquifer, the primary source of groundwater, yields water from the unconsolidated sands, clay and silt of the Ogallala Formation. Groundwater movement is generally to the northeast, away from groundwater and topographic highs and towards the surface drainage system. There are areas where flow is toward groundwater lows that have developed as a result of production in large well fields. Areas where irrigation wells are co-located with municipal well fields have experienced significant water table declines. Other irrigated areas have demonstrated varying water level declines.

The Seymour aquifer, classified as a major aquifer by the State of Texas, provides some water in the southeast corner of Wheeler County. The Seymour aquifer consists of isolated areas of alluvium, composed of poorly sorted gravel, conglomerate, sand and silty clay. The Seymour aquifer is found in the sediment of the Seymour Formation, which was deposited in the Quaternary Period. There have been no significant declines in the Seymour aquifer within the District, but the water quality may have been degraded due to past oilfield activities.

There are three minor aquifers within the District. The Blaine aquifer is a minor aquifer located in the southern portion of Wheeler County. The aquifer is contained in the Permian age Blaine Formation. The water is found in solution channels formed by dissolving deposits of anhydrite and halite within the formation. The dissolving salts raise the Total Dissolved Solids to levels above drinking water standards, so the Blaine aquifer is used mainly for agricultural purposes.

The Dockum Group, which contains the Santa Rosa Formation, furnishes limited amounts of household, livestock and irrigation water within the District. The Dockum Group contains Triassic age shales, sandstones and siltstones where it is found within the District. Water production from the Dockum Group aquifers occurs in Armstrong, Potter and southwest Carson counties.

In 2008, the portion of the Ogallala aquifer within the District had an estimated 77,000,000 acre-feet of water in storage (Panhandle Regional Water Plan (PRWP) 2006; PGCD calculations, 2008). Estimated water in storage in the Dockum aquifer is 5,338,853 acre-feet (Table 1-7, PRWP, 2006; PGCD calculations, 2008). The estimated recoverable water in storage for the Seymour and Blaine aquifers are 159,000 acre-feet and 140,000 acre-feet, respectively (PRWP, 2001; PGCD calculations, 2002, no updates in PWRP 2006). The Whitehorse Group furnishes small amounts of water where no other sources are available. No recoverable water estimates were available for the Whitehorse Aquifer in the 2006 PRWP, since the State of Texas does not recognize it as a minor aquifer. The estimated recoverable water was, therefore, estimated to be equal to 10 times average historical pumpage as outlined in the 2001 PRWP (Appendix L, PRWP, 2001; PGCD calculations, 2002). Total estimated groundwater resources within the District are summarized in Table 1.

AQUIFER	ESTIMATED STORED WATER, acre-feet
Ogallala	77,000,000
Dockum	5,338,853
Blaine	159,000
Seymour	140,000
Whitehorse	75,000
DISTRICT TOTAL	82,712,853

Table 1. Estimated stored water in the District aquifers

Groundwater Recharge

Primary sources of recharge to the Ogallala aquifer are infiltration of water from playa lakes and infiltration of precipitation. Localized infiltration of water from playa lakes is the main recharge mechanism in the part of the District located “above the caprock”, which generally includes the southern two-thirds of Carson County, northwest Armstrong county, the eastern one-fourth of Gray County, a small area in southern Roberts County and the eastern third of Potter county. The surface soils in this area are known as the Blackwater Draw formation. The recharge rates of the aquifer in this area are low, due to high evaporation rates and a low infiltration rate. The recharge of the Ogallala aquifer is not sufficient to meet the water needs in this area, and the saturated thickness of the aquifer is declining. Infiltration of precipitation over a general area is the main recharge mechanism in the remainder of the District. Recent studies show that recharge rates in these “below the

caprock" areas are varied from 0 to 1.38 inches per year. Additional data and analysis will be required before accurate recharge estimates are available for use in groundwater supply calculations. Current analysis of groundwater resources is based on historical data and available data sets to generate digital descriptions of the aquifers, (i.e. groundwater modeling) as well as the available published estimates of recharge. Recharge as a source of supply has been considered an insignificant source in the District's water supply estimations.

Published recharge rates for the aquifers are found in the Groundwater Availability Study (TWDB Report # 341, 1993), the Panhandle Region Groundwater Availability Model (GAM, 2001) and in the PRWP 2001. Additional information on the Ogallala was obtained from TWDB Report 288, 1984. There are many published recharge rates for the Ogallala Aquifer that vary significantly. The values listed in the table were determined to be the most representative of the conditions found in this District. No recharge data for the Whitehorse aquifers was located. The District estimated recharge to the Whitehorse formation aquifers based on soil types and infiltration data from the United States Department of Agriculture-Natural Resources Conservation Service soil surveys (Estimates of Recharge to the Whitehorse Aquifer, PGCD, 2001). The recharge rates for the Dockum, Seymour and Blaine aquifers are extracted from the PRWP (Appendix L, PRWP, 2001). The Dockum Group aquifers are under confined conditions in Carson County and the southeastern part of Potter County. Recharge in that area is insignificant (BEG Report of Investigation # 161, 1986). The Dockum Group is exposed on the surface in the northwest two-thirds of Potter County. Recharge in that area is based on recharge data from the PRWP. Estimated recharge to the aquifers is summarized in Table 2.

AQUIFER NAME	RATE, ac-ft /acre/year	AREA, acres	REFERENCES & DATA SOURCES
BLAINE	0.096	148,576	Table 3-3 & Appx. L, PRWP; (Duffin, 1992)
DOCKUM	0.0017	176,000	Table 3-4 & Appx. L, PRWP, 2001; PGCD calculations, 2002
OGALLALA			
Blackwater Draw	0.02	878,996	BEG Report of Investigation #288, 1984; Appx. K, PRWP,
Off Blackwater Draw	0.38	2,250,274	BEG Studies 2006-2008
Total Ogallala		3,139,270	
SEYMOUR	0.096	41,602	Table 3-2 & Appx. L, PRWP; (Duffin, 1992)
WHITEHORSE	0.02	491,800	PRWP, 2001; PGCD, 2002

Table 2. Recharge estimates

The GAM run 08-28 determined the amount of recharge to the Ogallala over the District as estimated by modeling to be 97,206 acre-feet per year.

The District has determined that the most feasible method of increasing natural recharge is to increase rainfall by initiating a rainfall enhancement program. This will decrease irrigation demand and increase recharge in those areas where recharge takes place. Cloud seeding operations began in May 2000. The purpose of the cloud seeding program is to add additional rainfall over an extended period (PGCD, 2000). One additional inch of rainfall could provide 2300 acre-feet of additional recharge within the District each year (PGCD, 2001).

Inflows, Outflows, and Cross-Formational Flows

Inflows, outflows, and cross-formational flows were calculated by the TWDB using the GAM in GAM run 08-28. Estimated volumes of each are in the Table 3 below.

Discharge from Ogallala to surface water	103,899 acre-feet per year
Inflows into the Ogallala in the District	22,862 acre-feet per year
Outflows from the Ogallala to outside the District	17,026 acre-feet per year
Cross-formational flow between aquifers in the District	0 acre-feet per year*

Table 3: Estimated Inflows, Outflows, and Cross-Formational Flows

* The models do not consider flow into or out of the Ogallala from other formations.

Surface Water Resources of Panhandle Groundwater Conservation District

Lake Meredith and Lake Greenbelt are the two major surface impoundments used to supply water to cities inside and outside the District. There are also numerous other small reservoirs used for agricultural purposes and environmental needs. Lake Meredith is located in parts of Hutchinson, Moore and Potter counties, and is operated by the Canadian River Municipal Water Authority (CRMWA) as a municipal and industrial water supply for 11 member cities of the Authority. The lake is owned by the United States Bureau of Reclamation and is operated as a National Recreation Area by the National Park Service. Water rights to impound water in the lake (up to 500,000 acre-feet may be held in conservation storage), and to divert water from it for municipal and industrial uses, are held by the Authority under certificates of adjudication issued by the State of Texas. Lake Meredith provides a primary supply for most of the cities that receive its water. Supplemental water is obtained from the High Plains Aquifer to complete the cities' needs. Water from the lake is blended with local groundwater by several cities. Other cities use

the Lake water to supply their base demand, and rely upon their groundwater supplies to meet their peak demands. Pampa and Amarillo, which are within the boundaries of the District, follow the latter procedure. Calculated annual firm yield of Lake Meredith is 76,000 acre-feet, although permits originally granted to the Authority were for greater amounts. However, for planning calculations, it is assumed to supply an average of 30,000 acre-feet per year (CRMWA, 2008), including during drought conditions, throughout the planning period to the year 2050. The Authority has a contract to provide 7.163 percent of the normal water supply from Lake Meredith to Pampa and 37 percent to Amarillo. CRMWA allocated 1,800 and 11,117 acre-feet of the Lake Meredith supply to Pampa and Amarillo respectively, for calendar year 2008.(CRMWA, 2008).

The second surface impoundment is Greenbelt Lake, located in Donley County. Greenbelt Municipal & Industrial Water Authority (Greenbelt) is the proprietor and operator. The possible annual supply from this impoundment is 9,400 acre-feet; however, during the 2007 fiscal year for Greenbelt (July 2006 – June 2007), the yield was 2,891 acre-feet (Greenbelt, 2008). Therefore, it will be assumed to supply an average of 2,891 acre-feet per year, including during drought conditions, throughout the planning period to the year 2050. The Authority provided 242 acre-feet to Clarendon and 34 acre-feet to Hedley in 2007.

The chart below shows the total projected surface water supply in 2060 for each county in the District in acre-feet according to Volume 3 of the 2007 State Water Planning Database. The county values are not adjusted to account for land area within the District.

2060 Surface Water Supplies	
Armstrong	121
Potter	18,092
Hutchinson	2,434
Carson	584
Donley	1,988
Gray	7,332
Roberts	587
Wheeler	2,141

Current Groundwater Supplies of Panhandle Groundwater Conservation District

Table 1 shows the current available groundwater supplies within the District. The values in the table were extracted from Appendix L, PRWP, 2001, and Table 1-7, PRWP, 2006. The District management standard is to have at least 50 percent of the 1998 benchmarked available groundwater, measured as saturated thickness, to be remaining in the year 2048. This will be accomplished by managing the groundwater usage within the District. The district rules mandate that the rate of decline within any monitoring sub-region (defined by rule and mapped as at least a nine square mile area) should not exceed the maximum allowable decline of 1.25 percent of saturated thickness. The Board reserves the right to adjust the allowable withdrawals or percentage of the aquifer remaining, if the need arises. The District has been split into 13 Management Areas, each with an assigned floor rate ranging from 0.1 to 0.5 acre-feet per acre, below which the District Board may not reduce allowable pumping.

Historical Groundwater Pumpage Estimates

The chart below summarizes the historical groundwater pumpage estimates for the most recent 5 years for which data was available as reported by the TWDB Water Use Survey Database. All values were corrected from the TWDB database to only include the maximum production from all known wells within the District in Hutchinson County.

Historical Groundwater Pumpage Summary Unit: Acre Feet (ac-ft)	
1999	157,631
2000	199,538
2001	151,575
2002	165,390
2003	190,820

Projected Total Demands for Water Within the District From All Sources

Using corrected numbers from the 2007 State Water Plan, we have projected that the total water demands for the District will be 220,071 acre-feet, by the year 2060. Table 4 below has the projections for each county in the District, as published in Volume 3 of the 2007 State Water Planning Database. Each projection takes into account population growth, rainfall, conservation measures, and water use from all sources. Hutchinson County's values are adjusted to District boundaries using the maximum production from all known wells. The demand numbers in the State Water Plan for Hutchinson County are as follows: 2010: 90,623 ac-ft, 2030: 89,423 ac-ft, 2060: 77,928 ac-ft. Armstrong County values have been adjusted using approximately 92% of the land area for county specific uses. Potter County values have been adjusted using approximately 94% of the land area for county specific uses. Roberts County numbers have been corrected from the 2007 State Water Plan because of an error in the irrigation estimates for Roberts County. Original findings in Roberts County showed approximately 10,000 acres of irrigated land, but the final numbers were calculated using18,000 acres. The demand numbers in the State Water

State Water Plan are as follows: 2010: 23,122 ac-ft, 2030: 21,431 ac-ft, 2060: 15,718 ac-ft. All figures show supply values for the county in which it is used, not the county of production.

	Year 2010		Year 2030		Year 2060	
County	**Currently Developed Supply**	**Demand**	**Planned Developed Supply**	**Estimated Demand**	**Planned Developed Supply**	**Estimated Demand**
Armstrong	17,260	10,427	17,302	9,751	17,759	7,378
Carson	130,955	99,277	117,482	92,159	99,646	67,843
Donley	37,003	22,373	32,703	20,894	23,110	15,744
Gray	55,882	37,320	52,996	35,953	48,454	29,297
Hutchinson	784	17	784	17	784	17
Potter	80,708	61,392	75,568	70,817	71,355	85,112
Roberts	14,533	8,931	14,207	8,332	13,120	6,257
Wheeler	19,378	10,741	19,838	10,315	22,254	8,423
TOTAL	**356,503**	**250,478**	**330,880**	**248,238**	**296,482**	**220,071**

Table 4. Supply and Demand comparison by County (includes surface water) in years indicated. Units are acre-feet.

Potential Demand and Supply Issues and Solutions

A need is determined if the projected demands exceed the supply. The total need for a county is based on the difference of the total supply and total demands for the county. While there may be a need for one or more counties, there may be sufficient supply for the District.The supply and demand balances for counties wholly or partly within the District are summarized in the following charts.

County	Total Water		
	Supply	**Demand**	**Need**
ARMSTRONG	17,260	10,427	0

CARSON	130,995	99,277	0
DONLEY	37,003	22,373	0
GRAY	55,882	37,320	0
HUTCHINSON	784	17	0
POTTER	80,708	61,392	0
ROBERTS	14,533	8,931	0
WHEELER	19,678	10,741	0
TOTAL	**356,843**	**250,503**	**0**

Table 5. Year 2010 Needs by County (acre-feet/year).

Table 6 shows the District's estimated needs in 2060.

County	Total Water		
	Supply	Demand	Need
ARMSTRONG	17,759	7,378	0
CARSON	99,646	67,843	0
DONLEY	23,110	15,744	0
GRAY	48,454	29,297	0
HUTCHINSON	784	17	0
POTTER	71,355	85,112	-16,996
ROBERTS	13,120	6,257	0
WHEELER	22,254	8,423	0
TOTAL	**296,482**	**220,071**	**-16,996**

Table 6: Year 2060 Needs by County (acre-feet/year).

The supply, demand, and need values came from Volume 3 of the 2007 State Water Planning Database, which determined the most likely set of conditions for each county. Hutchinson County's values are adjusted to District boundaries based on maximum production of existing wells in the portion of Hutchinson County that is in the District. However, the District believes that these numbers are designed for regional planning. The methodology is not accurate on a local basis. The shortage in Potter County is municipal and agricultural. Much of the irrigated agricultural land in Potter County is being subdivided into housing tracts, thus reducing the demand for irrigation water. The City of Amarillo, the basis of the 2060 Potter County demand, has additional undeveloped groundwater rights in Roberts, Hartley, Randall and Potter counties that should enable the overall Potter County

demand to be met. Other shortages will most likely be in localized agricultural areas of Armstrong and Carson counties. Some agricultural areas have already experienced shortages, and in places where the economics of pumping groundwater are not feasible, have ceased pumping. The supplies available from surface and groundwater seem to be sufficient to meet the needs of most of the agricultural communities during this planning period. One District goal is to gather more accurate irrigation use information and incorporate additional information into revised plans. Large-scale water exporting projects will significantly alter the water balances within the District, if implemented. Several such projects have been proposed. Water management strategies in the 2007 State Water Plan that could be used to mitigate the projected 2060 need in Potter County include municipal conservation, manufacturing conservation, drilling additional groundwater wells by the City of Amarillo or CRMWA, and irrigation conservation.

Current and Projected Groundwater Demands

The current and projected groundwater demands within the District are summarized in Table 7.

PRODUCTION LOCATION	YEAR PRODUCED	
	2010	2060
Armstrong	10,556	7,494
Carson	117,957	86,523
Donley	22,097	15,468
Gray	35,520	27,497
Hutchinson	17	17
Potter	41,725	53,767
Roberts	92,122	176,218
Wheeler	10,741	8,423
DISTRICT TOTALS	**330,735**	**375,407**

Table 7. Current and projected groundwater production within the Panhandle Groundwater Conservation District, measured in acre-feet

The year 2010 water use estimates are based on the PRWP Tables 3-22 and District Water Transportation Reports. Each county was examined to determine the source of the water demand. Armstrong, Carson, Donley, Roberts and Wheeler counties were considered to use 100 percent local groundwater. In Armstrong County, irrigation demand was reduced in order to account for the portion of the county outside the District. The Donley County total water demand was adjusted for municipal use since the cities of Clarendon and Hedley use surface water from Greenbelt. The Gray County total water demand was reduced by the Pampa municipal demand, since the city obtains the majority of its water from Lake Meredith. Part of the municipal water demand for Randall County was included in the groundwater totals in order to account for the groundwater pumped from the Carson County well field by the City of Amarillo and furnished to municipal users in Randall County. The city of Amarillo lies partially in Randall County and also sells water to the City of Canyon, located entirely in Randall County. The Potter County groundwater demand was calculated by adjusting for (a.) the municipal demand to account for municipal water obtained from Lake Meredith and the Carson County well field; (b.) part of the irrigation demand to account for that portion of the county outside the PGCD; (c.) the

manufacturing demand to account for Carson County well field water furnished to manufacturers; (d) steam generation requirement which includes recycled wastewater, Lake Meredith water and Carson County well field water. After these deductions, 7,700 acre-feet from a newly permitted well field in northeastern Potter County was added. The part of Hutchinson County that is within the District uses groundwater for livestock and domestic rural housing. Part of the current municipal demand in Hutchinson and Potter counties is met by water pumped in Carson County. The estimated 2010 groundwater withdrawal within the District was 330,735 acre-feet.

Year 2060 water use estimates are based on the PRWP Table 3-31, District Water Use Estimates, existing and pending District use permits, water production reporting from entities and known organized water supply projects. Each county was examined to determine the source of the water demand. Adjustments similar to the 2010 adjustments were made for Armstrong, Carson, Donley, Gray and Wheeler counties. Part of the municipal water demand for Randall County was included in the groundwater total in order to account for the groundwater pumped by the City of Amarillo from the Proposed Roberts County well field and furnished to municipal users in Randall County. The City of Amarillo lies partially in Randall County and also sells water to the City of Canyon, located entirely in Randall County. The Potter County groundwater demand was calculated by taking the total water demand less (a.) the municipal demand to account for municipal water obtained from Lake Meredith and the CRMWA Roberts County well field; (b.) part of the Irrigation demand to account for that portion of the county outside the District (c.) part of the manufacturing demand to account for the water from Carson County well field furnished to manufacturing; and part of the livestock demand to account for feedlots in Potter County but outside the District boundary. After these deductions, 7,700 acre-feet from a newly

permitted well field in northeastern Potter County was added. The total Hutchinson County water considers only livestock use on the rangeland that is located in the District. The Roberts County demand includes the county base use from Table 3-31, 69,000 acre feet for the CRMWA groundwater project, and an estimate for two possible future groundwater projects. The estimated 2060 groundwater demand is 375,407 acre–feet, which includes 160,500 acre-feet to be exported outside of the District.

Municipal Water Supplies

The District has provided individual water assessments for the cities of Claude, Groom, Lefors, McLean, Miami, Mobeetie, Panhandle, Shamrock, Skellytown, Wheeler and White Deer. These assessments analyzed the needs of each city, and encourage those cities that have shortfalls to develop either additional surface water supplies or purchase additional groundwater rights. Lefors, McLean, Shamrock, Skellytown and Wheeler may experience a shortage of drinking water within the next 30 years. Discussions of individual city needs follow.

Claude

The city of Claude currently receives all of its municipal supply from the Ogallala Aquifer and has sufficient supply to meet its needs through 2030. A new well field site southeast of the city has a saturated thickness between 80 and 100 feet, and could be developed to meet long-term needs. New wells could produce 100 to 150 gpm. Two new wells would be required to meet the 2050 peak demands. The reliability of the water is moderate, depending on the other users of the aquifer.

Groom

The city of Groom derives all of its municipal water supply from the Ogallala Aquifer and in 1995 had approximately 7,461 acre-feet of supply to meet its needs until 2045. An additional well was drilled in 2003 to ensure future municipal supplies.

Panhandle

The city of Panhandle derives all of its municipal supply from the Ogallala Aquifer. The 2003 assessment showed the City has sufficient supply to meet its needs through 2036. It was projected that two additional wells would be needed to meet the peak demands of the city in 2050, and one was drilled in 2005. The quantity of water is available near the city is adequate, the reliability is moderate, depending on other users of the aquifer.

Skellytown

The city of Skellytown in Carson County relies solely on the Ogallala Aquifer for its municipal water supply. Four production wells are currently used by the city and will provide enough supply to meet the needs until 2014. Additional new wells in the southeastern portion of Skellytown could provide up to 200 gpm each. One additional well could supply the city's needs until 2050. If drawdown is excessive, an additional well may be needed.

White Deer

The city of White Deer derives its municipal supply from the Ogallala Aquifer. The city has adequate supply from its existing well fields to reach the year 2037. Two new wells in the southeastern portion of White Deer would be sufficient to supply the city's peak demand through 2050.

Lefors

The city of Lefors obtains its water supply from the Ogallala Aquifer. The city recently installed a new well with a production rate of 275 gpm. Based on the supply of this well and two other active wells, Lefors should be able to provide the city's anticipated need through 2050 (approximately 90 acre-feet/year). However, the city is experiencing some problems with elevated chloride concentrations in some of its wells. These water quality concerns could require Lefors to seek additional alternative locations for groundwater supply.

McLean

The city of McLean obtains its municipal supply from the Ogallala Aquifer. Five production wells are used by the city and will supply the McLean's needs through 2020. Two additional wells drilled northeast of the city could provide enough supply to meet the city's needs through 2050. There appears to be sufficient groundwater in the area to provide McLean's needs until 2050. The reliability is moderate, depending on other Ogallala users and well production rates.

Shamrock

The city of Shamrock uses the Ogallala Aquifer to supply all of the city's municipal water. The eleven production wells currently used by Shamrock can supply the city through 2032. Shamrock could seek new groundwater rights for additional wells in the Ogallala west and northwest of the city. Also, it may be possible for the city to utilize two minor aquifers, the Seymour and the Blaine, to blend with water from the Ogallala to extend the supply. Shamrock needs an additional total of approximately 2,900 acre-feet of water rights to meet its needs through 2050.

Wheeler

The city of Wheeler currently derives its municipal potable water supply from the Ogallala Aquifer from four production wells. It is estimated that these could supply enough

water to meet the city's needs through 2058, however, the quality of the available water is an issue. To meet primary drinking water standards for nitrate concentrations, the city is blending water from only two of the production wells since the nitrate concentration in one of the wells exceeds the MCL of 10 mg/l. The practice of blending water from the two wells limits the amount of water taken from the larger of the two production wells, in effect reducing the production capacity of the well. Nitrate levels in the two existing water wells have been steadily increasing since 1983. These levels are expected to continue to rise, eventually rendering the water in the two existing wells non-potable. Should this occur an alternate source of water will have to be found, or the current well water would require treatment to reduce the levels of nitrate to below the drinking water standards. Recent exploration for water has revealed a potential source of acceptable groundwater located to the north of the city.

Short term needs in Wheeler can be met with additional groundwater supplies. Reliability is moderate to poor depending on nitrate concentration levels and potential movement or expansion of the nitrate contamination in the aquifer.

Miami

The city of Miami has approximately 40,000 acre-feet of recoverable groundwater reserves. These reserves appear to meet the needs of the city for at least the next 100 years (City of Miami, Texas Water Assessment, March, 1998).

Pampa

Pampa has sufficient water resources to meet projected demands. No needs were identified or predicted for Pampa's municipal use (Table 6, PRWP).

Amarillo

Amarillo currently has sufficient reserves of groundwater and surface water rights to meet their anticipated needs through 2060. Infrastructure for the groundwater reserves will need to be constructed to utilize part of the groundwater reserves.

County-Other, Potter County

The county-other demands in Potter County are approximately 2,100 acre-feet per year by 2060. Small water supply corporations supply a portion of these demands. The majority of the county-other supply in Potter County is from unincorporated rural wells. It is anticipated that this pattern will continue over the planning period. As a result, it is difficult to project a single strategy to meet the projected county-other needs (12,560 acre-feet by 2050). It is assumed that as demands increase, additional rural municipal wells will be installed.

Drought Conditions

The District will insure that each Multiple Well Permit issued contains a drought contingency plan. The plans will be reviewed periodically and compared to published drought indices.

GOALS, MANAGEMENT OBJECTIVES, AND PERFORMANCE STANDARDS

Management of Groundwater Supplies

For almost fifty years, PGCD has managed the supply of groundwater within the District. The District will continue to manage groundwater in order to conserve and preserve the limited resource while seeking to maintain the economic viability of all resource user groups, public and private. In consideration of the economic and cultural activities occurring within its boundaries, the District will continue to identify and engage in such activities and practices that, if implemented, would result in a reduction of groundwater use. The observation network will continue to be reviewed and maintained in order to monitor

changing storage conditions of groundwater supplies within the District. The District will make a periodic assessment of water supply and groundwater storage conditions and will report those conditions to the Board and to the public. The District will continue to undertake, as necessary, and co-operate with, investigations of the groundwater resources within the District, and will make the results of investigations available to the public, upon adoption by the Board.

The District has, or will amend as necessary, rules to regulate groundwater withdrawals by means of spacing, depletion, and production limits. The relevant factors to be considered in making the determination to grant a permit or limit groundwater withdrawals will include:

1. The purpose of the District and its rules;

2. The equitable conservation and preservation of the resource; and

3. The economic hardship resulting from granting or denying a permit or the terms prescribed by the rules.

In pursuit of the District's mission of preserving and protecting the resource, the District may require reduction of groundwater withdrawals to amounts that would lessen adverse affects to the aquifer. To achieve this purpose, the District may, at the Board's discretion, amend any permits after notice and hearing. The District's determination to seek a permit amendment will be based on current and projected aquifer conditions observed by the District. The District will enforce the permit terms and conditions and the District rules by enjoining the permit holder in a court of competent jurisdiction, as provided for in TWC 36.102, if required, after exhausting other remedies.

The District will utilize all technical resources at its disposal to evaluate the resources

resources available within the District and to determine the effectiveness of regulatory or conservation measures. A public or private user may appeal to the Board for discretion in enforcement of the provisions of the water supply deficit contingency plan on grounds of adverse economic hardship or unique local conditions. The exercise of this discretion by the Board shall not be construed as limiting the power of the Board.

Actions, Procedures, Performance, and Avoidance for Plan Implementation

The District will implement the provisions of this plan, and will utilize the provisions of this plan, as a guidepost for determining the direction or priority for all District activities. All operations of the District, all agreements entered into by the District, and any additional planning efforts in which the District may participate, will be consistent with the provisions of this plan.

The District has adopted, and will amend as necessary, rules relating to the permitting of wells, depletion and the production of groundwater. The rules adopted by the District shall be pursuant to Texas Water Code, Chapter 36, and the provisions of this plan. All rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on the best technical evidence available. The District Rules may be downloaded at www.pgcd.us.

The District shall treat all citizens equally. Citizens may apply to the District for discretion in enforcement of the rules on grounds of adverse economic effect or unique local characteristics. In granting of discretion to any rule, the Board shall consider the potential for adverse effect on adjacent owners and aquifer conditions. The exercise of said discretion, by the Board, shall not be construed as limiting the power of the Board.

The District will seek cooperation in the implementation of this plan and the management of groundwater supplies within the District. All activities of the District will be undertaken in cooperation and coordination with local owners and the appropriate state, regional or local water management entities.

Tracking Progress in Achieving Goals and Management Objectives

The methodology that the District will use to trace its progress in achieving all of its management goals on an annual basis will be as follows:

The planned tasks and activities related to each goal and its management objectives will be recorded. The accomplishment of each task will be recorded. The reports and records will be used to provide information for an annual status report. The status of each management objective will be reported in the annual report to the Board. Implementation of this system is included in Goal 6, Management Objective 6.1.

The District manager prepares and presents an annual report to the Board of Directors during the last monthly Board of Directors meeting each calendar year, beginning December 1999. The manager's report will cover the District's performance in achieving the management goals and objectives. Included will be the number of instances each activity was engaged in during the year, referenced to the expenditure of staff time, so that the effectiveness and efficiency of each activity may be evaluated. Copies of the annual report will be maintained on file at the District office.

Goal 1.0 Retain 50 percent of current supplies in 50 years, extending the 50/50 depletion management trendline to 2058.

Management Objective 1.1

The District will develop and maintain a system to annually track and evaluate current supplies.

Actions and Procedures

1. Determine a baseline (1998) groundwater saturated thickness in the District.

2. Track and review changes in water supplies.

Performance Standards

1. The baseline (1998) saturated thickness, for the District, will be annually updated using the newest redbed information.

2. Update and print for public use a saturated thickness map at least every 5 years.

Management Objective 1.2

Conserve water and prevent waste by implementing PGCD Rule 15 - “Depletion”.

Actions and Procedures

1. Review compliance with the District acceptable decline rate of 1.25 percent of saturated thickness annually.

2. Review the acceptable decline rate each five years.

3. Review the acceptable decline rate if requested by Landowner Petition.

4. Adopt production limits, drilling moratoriums, and install flow meters, as required.

Performance Standard

1. Evaluate annual groundwater measurements for declines greater than 1.25 percent of saturated thickness by August 31st annually.

2. Evaluate the sum of all groundwater declines since 1998 for any area breaking the 50 percent of saturated thickness as recalculated every five years in the 50/50 depletion management trendline by September 30th annually.

3. Hold public meetings and hearings as necessary to designate new Study Areas and Conservation Areas by October 31st annually.

4. Complete a five-year review within five years of the rule adoption date (December 2004).

5. Review all public comments to petition or rule within 60 days of receipt of a petition.

6. Determine permitted water pumping volume within 60 days of establishing a Conservation Area.

6. Adopt production limits, drilling moratoriums and verify installation of required flow meters, within 60 days of establishing Conservation Area.

Goal 2.0 Implement strategies that will provide the most efficient groundwater use.

Management Objective 2.1

Encourage efficient groundwater use by continuing a program of annual groundwater static level measurements and reporting.

Actions and Procedures

1. Measure water levels of the wells in the District's water level network.

2. Generate annual depletion maps from the water level measurements.

3. Install additional monitoring wells in locations designed to evaluate the effects of high-impact pumping operations.

4. Install and maintain automatic data gathering equipment on wells as needed.

Performance Standard

1. Measure 90 percent of the wells in the water level network annually by March 1st.

2. Record the water level measurement data annually by March 30th.

3. Publish an annual depletion map by July 31st annually.

4. Obtain Internal Revenue Service approval of the annual depletion map by December 30th annually.

5. Evaluate efficiency of monitoring network and install monitoring wells as needed.

Management Objective 2.2

Encourage efficient groundwater use by increasing the use of Low Energy Precision Application (LEPA), low pressure and other efficient sprinkler systems, which will decrease the use of less efficient row irrigation. This will be accomplished by increasing the use of the District's Agricultural Water Conservation Equipment Loan Program, as long as TWDB funds are available and economically competitive.

Actions and Procedures

1. Increase awareness of the loan program by publicity releases in local newspapers and the District's newsletter, the *Panhandle Water News* (*PWN).*

2. Provide timely response to loan applicants.

Performance Standard

1. Include a reminder about the loan program in each quarterly issue of *PWN*, as long as funds are available at competitive rates.

2. Provide an article about the loan program to all local newspapers, annually.

3. Process all loan applications within 30 days.

4. Provide opportunity for agriculture loan each year.

Management Objective 2.3

Encourage efficient groundwater use by disseminating educational information regarding the current conservation practices for efficient use of water resources.

Actions and Procedures

1. Publish a newsletter

2. Distribute irrigation efficiency information

Performance Standard

1. Publish *Panhandle Water News* (*PWN*) quarterly.

2. Participate in the Farm and Ranch Show annually.

3. Coordinate with county extension agents and experiment station to distribute irrigation efficiency by information.

Management Objective 2.4

Encourage efficient groundwater use by maintaining local control and the private ownership of groundwater rights.

Actions and Procedures

1. Maintain active membership and participation in the Texas Alliance of Groundwater Districts (TAGD), Texas Water Conservation Association (TWCA), and Groundwater Management Districts Association (GMDA).

2. Monitor the Texas Register, Federal Register, Texas Legislative Notices, TAGD, TWCA, and GMDA, via Internet and publications, for groundwater proposals affecting private property rights each week.

3. Attend legislative hearings and give testimony on groundwater issues that might potentially affect private property rights of groundwater users.

4. Monitor, review and make comments, as appropriate, on rules, regulations, and programs initiated by Texas Commission on Environmental Quality and TWDB, which concern groundwater use.

Performance Standard

1. Annually, attend and participate in 80 percent of TAGD, TWCA and GMDA meetings and functions.

2. Review each source periodically.

3. Annually attend, monitor and give testimony, as appropriate, on pertinent legislative issues affecting groundwater usage and private ownership of groundwater.

4. Annually attend, monitor and make comment, as appropriate, on rules, regulations, programs and orders issued by TCEQ and TWDB.

Management Objective 2.5

Encourage efficient groundwater use by continuing a program of flow meter installation, monitoring and water use by crop and irrigation type.

Actions and Procedures

1. Read and record flow meter data from all meters in the District.
2. Maintain and replace meters as required.
3. Provide annual reports to cooperating landowners.
4. Provide the previous year's crop water use information to TWDB.

Performance Standard

1. Read and record flow meter data quarterly.
2. Replace damaged or inoperative meters within 14 days of reported failure.
3. Prepare summary reports for cooperating operators by June 1st annually.
4. Prepare an analysis of crop use information by July 1st annually.
5. Provide previous year's water use data to TWDB by July 1st annually.

Goal 3.0 Implement strategies that will control and prevent groundwater waste or contamination.

Management Objective 3.1

Each year, take positive and prompt action to identify all reported wasteful practices within the District.

Actions and Procedures

1. Record each complaint or notice received or discovered.
2. Report each complaint to the landowner and/or operator.

3. Resolve the complaint and note the corrective action taken.

4. Report resolution of each complaint to the landowner/operator and to the Board.

Performance Standard

1. All notices or complaints will be recorded, investigated and reported to the landowner/operator, within two working days.

2. Resolve the complaint within seven working days and record the results of the resolution.

3. Report each complaint and resolution to the Board at the next meeting.

Management Objective 3.2

Control and prevent the contamination of groundwater, by continuing and expanding our program of groundwater quality monitoring.

Actions and Procedures

1. Annually collect samples from the District's water quality well network.

2. Develop and implement a program to test for petrochemicals near oil and gas industry injection well sites.

Performance Standards

1. Sample 80 percent of the odd numbered, even numbered, or wells exceeding drinking water standards in the water quality well network by October 15th each year.

2. Record all water quality measurement data within 30 days of sampling.

3. Provide the water quality data to the TWDB, PRWP and the public by December 31st each year.

4. By December 31, 2009, develop a procedure for collecting and analyzing a water sample for petrochemicals near all commercial injection well sites.

Goal 4.0 Implement strategies to address drought conditions.

Management Objective 4.1

Conduct emergency response/drought contingency planning.

Actions and Procedures

1. Insure drought contingency plans are required in all Multiple Well Permits issued by the District.

2. Review all drought contingency plans submitted as a result of permit requirements when the Palmer Drought Severity Index for any county in the District is less than –1.9.

Performance Standard

1. Multiple Well Permits have drought contingency plan requirements.

2. Reviews are conducted each time the index is less than –1.9.

3. Report the number of reviews during the past year in the annual report ot the District Board of Directors.

Goal 5.0 Implement strategies to address conjunctive surface water management issues.

Management Objective 5.1

Evaluate the impact of surface-water use on groundwater resources within the District.

Actions and Procedures

1. Provide comments on surface-water rights requests affecting the groundwater resources of the District.

2. Establish initial coordination with the two surface-water entities currently operating within the District on conjunctive use issues, in regards to regional planning efforts and then every five years thereafter.

Performance Standard

1. Provide comments to the surface water entities within 60 days of receipt of their request.

2. The initial coordination was completed by January 1, 2001; additional coordination will be completed by January 2006 and every five years afterward.

Goal 6.0 Implement strategies that will address natural resource issues that impact the use and availability of groundwater, and which are impacted by the use of groundwater.

Management objective 6.1

Monitor and report on the impacts of U.S. Fish and Wildlife listing of endangered species on local groundwater resources.

Actions and Procedures

1. Prepare an annual assessment statement.

Performance Standard

1. Report activities to the Board in the manager's report.

2. An assessment report statement will be included in the District's Annual Report.

Management Objective 6.2

Monitor the possible impacts of groundwater pumping on White Deer Creek.

Actions and Procedures

1. Record reports of flow from White Deer Creek.

2. Check annual decline maps for water level declines near White Deer Creek headwaters.

3. Compare flow reports to decline maps**.**

4. Prepare an annual assessment statement**.**

Performance Standard

1. Record stream flow data measurements bimonthly.

2. Prepare and include an assessment of impacts on White Deer creek in the District's Annual Report that includes flow reports and water level data.

Goal 7.0 Improve operating efficiency and customer service.

Management Objective 7.1

Continue to provide timely response to customer assistance requests.

Actions and Procedures

1. Provide pump flow tests.

2. Process well drilling permits.

3. Provide efficiency evaluations of pumping plants and sprinkler systems.

4. Review and revise District Rules, as necessary, to incorporate revisions required by new legislation.

5. Provide aquifer tests.

6. Provide the well camera as a service as requested.

Performance Standard

1. Provide at least 10 pump flow tests annually within 48 hours of the request or the landowners requested date.

2. Managers action on well drilling permits taken and permit returned to customer, within five working days of receipt.

3. Efficiency evaluations returned to customer within three working days of the efficiency test.

4. Review and revise, if needed, the District Rules by December 21st each even numbered year.

5. Conduct five aquifer pumping tests per year and report data to the TWDB for use in the GAM.

6. Provide the well camera service within 48 hours of request or the landowners requested date and return the information to the well operator within 48 hours.

Goal 8.0 Operate a rainfall enhancement program.

Management Objective 8.1
Operate the rainfall enhancement program.

Actions and Procedures

1. Operate the program within budget.

2. Operate a rain gauge network.

3. Maintain flight records, rain gauge network and archived radar data.

4. Complete required testing, monitoring and reporting according to the conditions of the permit issued by Texas Department of Licensing and Regulations (TDLR).

Performance Standard

1. Operate the program annually at least during the period April 1st to September 30th.

2. Calculate the baseline costs for an annual program by December 1st annually.

3. Collect and record rain gage readings at least bi-monthly, starting one month prior to seeding operations and continuing one month after the end of seeding operations.

4. Repair, replace or move rain gages as needed.

5. Maintain flight records and archived radar data.

6. Provide required rainfall monitoring, water quality testing and other required reports to TDLR prior to the established due dates.

Management Objective 8.2
Plan future rainfall enhancement activities

Actions and Procedures

1. Purchase selected equipment as needed to continue the program.

2. Provide timely notification to TDLR and National Oceanic and Atmospheric Administration of intent to continue program.

Performance Standard

1. New equipment is purchased within program budget.

2. TDLR and NOAA notified of intent to continue program by January 15th annually.

3. Complete annual report by January 1st, annually.

Management Objective 8.3

Educate the public about the Precipitation Enhancement Program and its benefits.

Actions and Procedures

1. Distribute precipitation enhancement program information.

Performance Standard

1. Publish an article about precipitation enhancement in at least 2 of the quarterly issues of *PWN.*

2. Provide an article about the precipitation enhancement program to all local newspapers annually

3. Give at least two presentations to a public or civic group regarding the precipitation enhancement program.

Goal 9: Conservation

Management Objective 9.1

Continue and expand, if necessary, the groundwater conservation educational programs within the District.

Actions and Procedures

1. Annually, make public elementary school presentations at 80 percent of the schools within the District.

2. Sponsor student attendance at water educational programs.

3. Maintain a District Internet information page.

4. Launch “The 10% Challenge” an aggressive conservation education initiative.

Performance Standards

1. Annually make a minimum of 10 civic educational presentations.

2. Annually make 37 elementary school presentations.

3. Publish the District’s water level monitoring data on the District web page annually by July 31st.

4. Annually, provide up to three scholarships to students residing within the District.

5. Publish water quality data on the District web page semi-annually by December 31, 2008.

6. By December 31, 2009, develop and implement a public relations and education campaign encouraging all users within the district to conserve 10 percent of their water use.

SB-1 MANAGEMENT GOALS DETERMINED NOT-APPLICABLE

Goal 10.0 Control and prevention of subsidence.

The rigid geologic framework of the region precludes significant subsidence from occurring due to groundwater pumping.

Goal 11.0 Desired Future Conditions of the Aquifer

Groundwater Management Area One has not yet set Desired Future Conditions (DFC) of the aquifer, so no Managed Available Groundwater (MAG) numbers have been received from TWDB. The District expects that any future DFCs will substantially align with the District's Statement of Guiding Principles.

Goal 12.0 Rainwater Harvesting

Although the District has a rainwater harvesting system and educates the public about rainwater harvesting, we have no set goal regarding rainwater harvesting.

Goal 13.0 Brush Control

The Canadian River Municipal Water Authority has a large brush control project along the Canadian River in the District, and the District encourages that action, but the District does not have a current goal regarding brush control.

Goal 14.0 Recharge Enhancement

The District has conducted or helped facilitate several recharge projects in recent years, one of which is ongoing regarding the possible construction of impoundment sites on intermittent waterways. Until the feasibility of such constructions is deemed feasible, the District will not have a goal regarding recharge enhancement.

SUMMARY DEFINITIONS

“Annually” - Shall mean the fiscal year, October 1st through September 30th.

“Waste” - as defined by Chapter 36 of Texas Water Code, means any one or more of the following:

1. Withdrawal of groundwater, from a groundwater reservoir, at a rate and in an amount that causes or threatens to cause intrusion into the reservoir of water unsuitable for agricultural, gardening, domestic, or stock raising purposes;
2. The flowing or producing of wells from a groundwater reservoir, if the water produced is not used for a beneficial purpose;
3. Escape of groundwater from a groundwater reservoir to any other reservoir or geologic strata that does not contain groundwater;
4. Pollution or harmful alteration of groundwater, in a groundwater reservoir, by salt water or by other deleterious matter admitted from another stratum or from the surface of the ground;
5. Willfully or negligently causing, suffering, or allowing groundwater to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well, unless such discharge is authorized by permit, rule, or order issued by the Commission, under Chapter 36 of the Texas Water Code;
6. Groundwater pumped for irrigation that escapes as irrigation tailwater onto lands other than that of the owner of the well, unless the occupant of the land receiving the discharge has granted permission.

“Abandoned Well” - shall mean a well or borehole the condition of which is causing, or is likely to cause, pollution of groundwater in the District and includes a well which is not in use or which contains no pumping equipment (open or uncovered well). A well or

borehole which is not in compliance with applicable law, including the Rules and Regulations of the District, the Texas Water Well Drillers Act, Texas Commission on Environmental Quality, or any other state or federal agency or political subdivision having jurisdiction, if presumed to be an abandoned or deteriorated well.

Board - the Board of Directors of the Panhandle Groundwater Conservation District.

CRMWA – Canadian River Municipal Water Authority

District or PGCD - the Panhandle Groundwater Conservation District.

DFC – Desired Future Condition

GAM – Groundwater Availability Model

GMDA - Groundwater Management Districts Association

Greenbelt – Greenbelt Municipal & Industrial Water Authority

LEPA – Low Energy Precision Application

Optimal - Shall be derived from the minimum number of observations determined by spatial, temporal, and District resource constraints, to adequately describe the aquifer system and responses to external influences.

Owner - shall mean and include any person that has the right to produce water from the land either by ownership, contract, lease, easement, or any other estate in the land.

PRWP –Regional Water Plan – Panhandle Water Planning Area, January 2001

PWPG – Panhandle Water Planning Group

PWN – Panhandle Water News

PWPA – Panhandle Water Planning Area, Region A

Saturated Thickness – The thickness, in feet, of the saturated material of the aquifer. In the Ogallala, this is measured by subtracting the elevation of the redbed formations from the elevation of the water table.

SB-1 – Senate Bill 1, passed in 1997 by the 75th Texas Legislature, signed by Gov. Bush.

SB-2 –Senate Bill 2, passed in 2001 by the 77th Texas Legislature, signed by Gov. Perry.

HB 1763- House Bill 1763 in 2005 by the 79th Texas Legislature, signed by Gov. Perry.

SB-3 – Senate Bill 3, passed in 2007 by the 80th Texas Legislature, signed by Gov. Perry.

WCAC - Water Conservation Advisory Council passed in 2007 by the 80th Texas Legislature, signed by Gov. Perry.

TCEQ – Texas Commission on Environmental Quality

TDLR – Texas Department of Licensing and Regulation

TWDB - Texas Water Development Board.

TWCA - Texas Water Conservation Association