



**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

**DISTRICT MANAGEMENT PLAN**

*Adopted July 17, 2007*

*Certified by TWDB Sept. 17, 2007*

**Repealed and New Plan Adopted July 10, 2012**

*Certified by TWDB September 27, 2012*

**Amended and Adopted June 27, 2017**

*Certified by TWDB August 24, 2017*

***Amended and Adopted May 12, 2022***

*Certified by TWDB June 29, 2022*

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## **I. DISTRICT MISSION**

The mission of the Hemphill County Underground Water Conservation District is to conserve and protect the groundwater resources of Hemphill County by ensuring sustainable development through local management and the best available science.

## **II. PURPOSE OF THE MANAGEMENT PLAN**

The District's management plan satisfies the requirements of SB 1, SB 2, HB 1763, Texas Water Code (TWC) Chapter 36, and the rules and requirements of TWDB.

This plan further addresses the process established by the District to monitor changes in the aquifer, communicate to the public the findings made by the District, and ensure that the plan can adapt through time to meet the needs of the stakeholders of Hemphill County.

## **III. DISTRICT INFORMATION**

### **A. Creation**

The Texas Legislature in 1949 authorized the creation of underground water conservation districts to perform certain prescribed duties, functions, and to hold specific powers as set forth in Article 7880-3c, Texas Civil Statutes, now codified as Chapter 36, Texas Water Code. In 1994, a committee appointed by the Hemphill County Commissioners' Court reviewed the need for Hemphill County to either join an existing groundwater district or, in accordance with the Texas Constitution, seek the creation of a single county groundwater district. After investigating other districts and discussions within the county, the committee recommended that a single-county district be created. The Hemphill County Underground Water Conservation District was created the following year by the Hemphill County Underground Water Conservation District Act passed by the Texas Legislature (Act of May 19, 1995, 74<sup>th</sup> Leg., R.S., ch. 157, 1995 Tex. Gen. Laws 1007) which is now Chapter 8894, Texas Special District Local Laws Code. The District was confirmed by a local election held in Hemphill County on November 4, 1997, with 88% of the voters in favor of the District.

### **B. Directors**

The District's Board of Directors is composed of five members elected to serve staggered four-year terms. All directors are elected to serve as directors-at-large. Elections are held in May of even-numbered years. The Board of Directors holds its regular meetings at the District Offices located at 211 N 2<sup>nd</sup> Street, Canadian, Texas, at least quarterly. All meetings of the Board of Directors are public meetings noticed and held in accordance with applicable public meeting requirements.

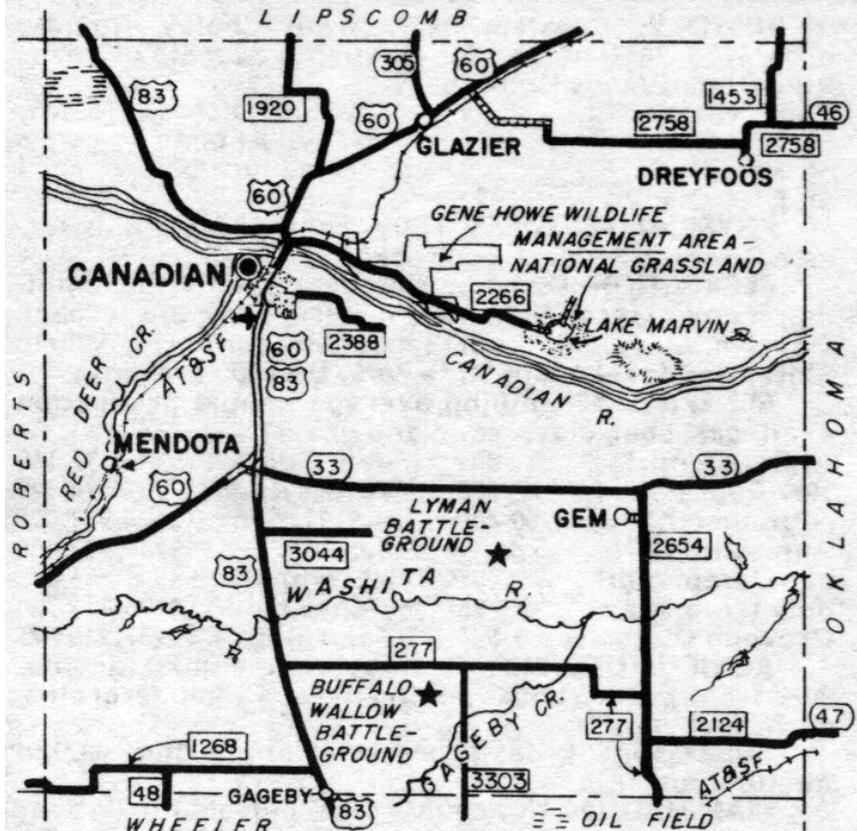
**C. Authority**

The District derives its authority to manage groundwater within the District by virtue of the powers granted and authorized pursuant to: Article XVI, Section 59, Texas Constitution; Chapter 36, Texas Water Code; and Chapter 8894, Texas Special District Local Laws Code . The District, acting under such authority, assumes all the rights and responsibilities of a groundwater conservation district specified in Chapter 36, Texas Water Code.

**D. Location and Extent**

The District (*see* Exhibit A) is located in Hemphill County and its boundaries are coterminous with the boundaries of the County. This area encompasses approximately 900 square miles, contains approximately 594,560 acres, and has a current population of 3,382 according to the 2020 United States Census. The District lies in the rolling plains on the eastern edge of the Texas Panhandle. It is bordered on the east by Oklahoma, on the south by Wheeler County, on the west by Roberts County, and on the north by Lipscomb County. Industries within the county include agricultural, petroleum, tourism and hunting.

**EXHIBIT A  
HEMPHILL COUNTY UNDERGROUND WATER  
CONSERVATION DISTRICT BOUNDARY**



## **E. Topography and Drainage**

Total elevation relief in the county is approximately 835 feet. The maximum elevation, approximately 3005 feet above mean sea level, is in the southwest corner of the county. The minimum elevation, approximately 2170 feet above mean sea level, is in the Canadian River bottoms at the Oklahoma state line. A small portion of the county in the southwest is in the generally level Llano Estacado (Staked Plains) portion of the Texas Panhandle. The remainder of the county consists of eroded areas surrounding the rivers. The southwest and west portions of the county contain flat-topped mesas surrounded by tributary creeks and arroyos. A significant escarpment is present between the plains areas and the Canadian River drainages. A similar escarpment is present along portions of Red Deer Creek. Generally, the terrain is rougher in the west and smoother in the east. Areas of sand dunes are located in the area north of the Canadian River. Several river terraces are present along the Canadian River.

Two of the main drainage systems flow from west to east through the county. These are the Canadian and Washita Rivers. These Rivers originate outside the county boundaries. Red Deer Creek, located in the western part of the county, also originates outside the county and flows in a northerly direction in the western part of the county. The three main drainage systems are described below.

The Canadian River originates in New Mexico, flows across the Texas Panhandle from west to east, and continues into Oklahoma, joining the Arkansas River near the Oklahoma-Arkansas border. The Canadian River and its feeder creeks drain approximately 50% of the county land area.

The headwaters for Red Deer Creek are located in Gray County, although annual flow is not typically present until you reach Hemphill County near the southwest corner before joining the Canadian River just west of the City of Canadian. Red Deer Creek drains approximately 10% of the county.

The Washita River originates outside of Hemphill County, between Red Deer Creek and the southwest corner of the county. The river flows east across the county, into Oklahoma, and into Lake Texoma on the Red River between Texas and Oklahoma. The Washita River and associated feeder creeks drain roughly the southern 40% of Hemphill County. Gageby Creek, originating in Wheeler County to the south, is a major tributary.

Streams feeding into the two rivers generally flow north or south for a short distance into the mainstream. The rivers and creeks are fed by stream flow from outside the county, surface runoff within the county and from groundwater discharges to springs and seeps located near the stream heads or along the stream courses. The discharging groundwater is from the Ogallala aquifer.

## **F. Groundwater Resources in Hemphill County**

The primary aquifer in the District is the Ogallala Aquifer. Water-saturated sediments of the Ogallala formation form the aquifer. The Ogallala sediments rest on Permian age *red beds*. Limited exposures of the red beds are found at several locations on the south side of the Canadian River channel. These red bed exposures contain fine-grained sands with gypsum streaks. There are additional red bed exposures in the Washita River channel just east of the county line in Oklahoma.

The general geologic section in Hemphill County has Permian red beds at the base, with coarse sand and gravel lenses near the base of the Ogallala formation.

Above the base of the Ogallala, the formation contains sands, sandstone, gravels and clays with occasional caliche. In the western part of the county, at higher elevations, there are fine sand and clay with interbedded caliche.

There are extensive sand hills and sand dune deposits overlying the Ogallala formation north of the Canadian River. Additional sand areas are located in the southeast corner of the county along and southeast of Hackberry Creek, and just north of the Washita River.

Water produced from the Ogallala sediments is generally of good quality. In the areas where the Ogallala sediments are thin, water may be produced from the underlying red beds as well as the overlying Ogallala sediments. Water from such wells may be of lesser quality. The incised Canadian River channel also contains saturated sediments; water quality in these sediments may be of a lesser quality than that produced from the Ogallala.

## **IV. STATEMENT OF GUIDING PRINCIPLES**

The District recognizes the importance of groundwater resources in Hemphill County to our industries, our community and our heritage. This plan addresses the processes established by the District to monitor changes in the aquifer, educate the public about the findings made by the District, and ensure that the plan can adapt through time to meet the needs of the citizens of Hemphill County.

## **V. CRITERIA FOR PLAN APPROVAL**

### **A. Planning Horizon**

The time period for this plan is five years from the date of approval by the executive administrator of TWDB or, if appealed, on approval by TWDB. This plan is being submitted as part of the five-year review and re-adoption process as required by § 36.1072(e), Texas Water Code. This management plan will remain in effect until a revised plan is approved by the executive administrator or TWDB.

### **B. Board Resolution**

A certified copy of the Hemphill County Underground Water Conservation District resolution adopting this plan is included in Appendix A – Board Resolution.

**C. Plan Adoption**

*Evidence that the plan was adopted after notice and hearing 31 TAC § 356.53(a)(3); § 36.1071(a);*

Copies of notices documenting that the plan was adopted following appropriately noticed hearings are included at Appendix B – Notice of Meetings.

**D. Coordination with Surface Water Management Entities**

*Evidence that following notice and hearing the District coordinated in the development of its management plan with surface water management entities. TWC § 36.1071(a); § 356.51;*

A copy of the email transmitting this plan to surface water management entities is included at Appendix C – Correspondence to Surface Water Management Entities.

**VI. ESTIMATES REQUIRED BY 31 TEX. ADMIN CODE (TAC) § 356.52(a)(5)(A) Implementing TWC § 36.1071(e)(3)**

**A. Modeled available groundwater in the district based on the desired future condition established under TWC § 36.108 - 31 TAC 356.52(a)(5)(A) Implementing TWC §36.1071(e)(3)(A)**

Modeled available groundwater is defined by TWC § 36.001(25) as “the amount of water that the executive administrator [of TWDB] determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108.” The District is in Groundwater Management Area 1 (GMA 1). The member districts of GMA 1 have completed the joint planning process to determine the desired future conditions of the aquifers in the GMA.

The Ogallala aquifer is the sole major aquifer available to producers in Hemphill County and it is therefore the only aquifer in which we will address in this Plan.

1. Ogallala Aquifer

a. Desired Future Conditions:

On August 26, 2021, the joint planning committee for GMA 1 adopted the following desired future condition for the portion of the Ogallala Aquifer that lies within the jurisdiction of the Hemphill County Underground Water Conservation District, which is to have at least 80% of the volume in storage remaining for each 50-year period between 2018 and 2080 in Hemphill County..

b. Modeled Available Groundwater:

The modeled available groundwater value for the 2021 DFC was not available at the time of development of this plan. However, the modeled available

groundwater value for the Ogallala Aquifer in Hemphill County provided for the DFC adopted on November 2, 2016, by GMA 1, was developed through TWDB GAM Run 16-029MAG, and is set forth in Appendix D. This plan will be amended and re-adopted upon receipt of the modeled available groundwater value for the 2021 DFC.

**B. Amount of groundwater being used within the District on an annual basis – 31 TAC § 356.52(a)(5)(B) Implementing TWC §36.1071(e)(3)(B))**

The amount of groundwater being used within the District on an annual basis as provided by the Texas Water Development Board is shown in Appendix E Estimated Historical Water Use and 2022 State Water Plan Data Set Page 3. All values are in acre-feet.

**C. Annual amount of recharge from precipitation to the groundwater resources within the district – 31 TAC §356.52(a)(5)(C) Implementing TWC §36.1071(e)(3)(C)**

The estimate of the annual volume of recharge to the Ogallala Aquifer in Hemphill County as based on GAM Run 22-001 simulations provided by TWDB to the District for use in this plan, as set forth in Appendix F page 7.

**D. For each aquifer, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers – 31 TAC § 356.52(a)(5)(D) Implementing TWC § 36.1071(e)(3)(D)**

The estimate of the annual volume of water discharged from the Ogallala Aquifer in Hemphill County to surface water systems is based on GAM run 22-001 simulations provided by TWDB to the District for use in this plan and is set forth in Appendix F page 7.

**E. Annual volume of flow into and out of the District within each aquifer and between aquifers in the District, if a groundwater availability model is available – 31 TAC § 356.52(a)(5)(E) Implementing TWC § 36.1071(e)(3)(E)**

The estimates of the volume of water flowing into and out of the District within each aquifer and between aquifers in the District are based on GAM Run 22-001 simulations provided by TWDB to the District for use in this plan and are set forth in Appendix F page 7 and further clarifies that the Ogallala aquifer is the only aquifer modeled for the District.

**F. Projected surface water supply in the District, according to the most recently adopted state water plan - 31 TAC § 356.52(a)(5)(F) Implementing TWC § 36.1071(e)(3)(F)**

The projected surface water supply within the District, according to the most recently adopted state water plan as provided by TWDB, is set forth in Appendix E Estimated Historical Water Use and 2022 State Water Plan Data Set Page 4. All values are in acre-

feet.

**G. Projected total demand for water in the District according to the most recently adopted state water plan - 31 TAC § 356.5(a)(5)(G) Implementing TWC § 36.1071(e)(3)(G)**

The projected total demand for water in Hemphill County from the 2022 State Water Plan is set forth in Appendix E Estimated Historical Water Use and 2022 State Water Plan Datasets Page 5.

**VII. CONSIDERATION OF THE WATER SUPPLY NEEDS AND WATER MANAGEMENT STRATEGIES INCLUDED IN THE ADOPTED STATE WATER PLAN - TWC § 36.1071(e)(4)**

**A. Water Supplies** - The most recent state water plan is the 2022 State Water Plan. In Hemphill County, there are no water needs identified for any user group in any decade. Water needs are identified when the projected water demand of a Water User Group (WUG) exceeds the projected water supplies of the WUG. See Appendix E Page 6.

**B. Water Management Strategies** - While no shortages were identified in the 2022 State Water Plan, a water management strategy recommended for the City of Canadian is demand reduction through municipal conservation. Municipal conservation strategies include a variety of activities that either reduce everyday water consumption or increase water use efficiency, allowing more to be done with the same amount of water. Examples of municipal conservation strategies include low flow plumbing fixtures, water conservation pricing structure, water system audits, and landscape irrigation restrictions. Demand reduction is also a recommended water management strategy for agricultural use. Demand reduction in agriculture is primarily achieved through conservation strategies and some livestock conservation based on best management practices. Irrigation conservation strategies include changes to irrigation methods, equipment, and crops. For example, conversion to Low Energy Precision Application systems and irrigation scheduling, as well as other activities associated with irrigation best management practices can help producers reduce their water use. Like municipal conservation, irrigation conservation strategies tend to be an aggregate of multiple best management practices, any one or several of which could be implemented to achieve the estimated water savings of the strategy. See Appendix E Page 7.

**VIII. MANAGEMENT OF GROUNDWATER SUPPLIES – 31 TAC § 356.52(a)(4)**

The District will manage the supply of groundwater within the District to both conserve the 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 the District, the District will seek to identify and engage in such activities and practices, that, if implemented, may result in more efficient use of groundwater.

The District shall implement a management program based on actual aquifer conditions, measured annually by the District as part of its water level measuring program, and maximum withdrawal rates modified over time to ensure that the desired future conditions are achieved. The District may designate multiple management areas and sub-management areas. Initially, Management Area North will be that portion of the District which is located north of the Canadian River while Management Area South will be that portion of the District that is located south of the Canadian River. The District's management criteria are: (1) a decline rate of no more than 1% reduction in the saturated thickness for three consecutive years; and (2) an average minimum aquifer storage level of 80% of volume in storage remaining for each 50-year period between 2018 and 2080. The District will amend its rules as necessary to implement any changes to Chapter 36 of the Texas Water Code and to implement any future groundwater management strategies as well as the goals and objectives of this plan.

It is recognized by the District that the long-term sustainable storage goal of the aquifer is dependent upon long-term water use characteristics within the District and adjoining areas of the Ogallala that communicate with the boundaries of the District. The District will continue to participate in long-term studies of the aquifer with the GMA 1 Joint Planning Group, Region A Water Planning Area, TWDB, and other entities as appropriate.

Management will be accomplished using well spacing standards, production limits, production reporting, and the monitoring of aquifer conditions.

The District will continue to take measurements using a sufficient number of monitoring wells distributed throughout the county on an annual basis. The District will work with new permittees and existing users to add and delete additional monitor wells to ensure an adequate monitoring network is maintained.

Drought conditions will be monitored and acknowledged in the course of managing the aquifer.

#### **IX. ACTION, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION - TWC § 36.1071(e)(2)**

The District will implement the goals and provisions of this management plan and will utilize the objectives of this management plan as a guideline in its decision-making. The District will ensure that its planning efforts, operations, and activities will be consistent with the provisions of this plan and will be executed in a manner that is fair to all stakeholders.

The District has adopted rules in accordance with Chapter 36 of the Texas Water Code, and the District may amend its rules as necessary to comply with changes to Chapter 36 of the Texas Water Code and its management plan, and to insure the best management of the groundwater within the District according to present and projected aquifer conditions. The District will seek the input of its constituents during the implementation of this plan and any amendment of the District's rules. The enforcement and continued development of the District's rules will be based on the best scientific and technical evidence available to the District. A copy of the District's Rules is available for review at the District office and [https://www.twdb.texas.gov/groundwater/conservation\\_districts/gcdinfo2.asp](https://www.twdb.texas.gov/groundwater/conservation_districts/gcdinfo2.asp) then, on that page go to "Hemphill Co. UWCD-Current Rules".

The District will encourage cooperation and coordination in the implementation of this plan. All operations and activities of the District will be performed in a manner that encourages cooperation with the appropriate state, regional or local water entities.

**X. METHODOLOGY FOR TRACKING DISTRICT’S PROGRESS IN ACHIEVING ITS MANAGEMENT GOALS - 31 TAC §356.52(a)(4)**

The District’s General Manager (GM) shall prepare and submit an Annual Report to the Board of Directors (Board) of the District. The Annual Report will include an update on the District’s performance regarding achieving its management goals and objectives based on the fiscal year ending September 30th. The GM will present the Annual Report prior to the end of the following fiscal year. Upon its adoption by the Board, the Board will maintain a copy of the Annual Report on file for public inspection at the District’s offices.

**XI. GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS**

The management goals, objectives and performance standards of the District in the areas specified in 31 TAC §§ 356.51 and 356.52 are addressed below:

**Management Goals**

**A. Providing the Most Efficient Use of Groundwater – 31 TAC § 356.52(a)(1)(A) Implementing TWC § 36.1071(a)(1)**

**A.1 Objective** – Each year, the District will require all new exempt or non-exempt wells that are constructed within the boundaries of the District to be registered or permitted with the District in accordance with the District Rules.

**A.1 Performance Standard** – The number of exempt and non-exempt wells registered or permitted by the District for the year will be incorporated into the Annual Report.

**A.2 Objective** – Each year, the District will regulate the production of groundwater by maintaining a permitting system within the boundaries of the District in accordance with the District Rules.

**A.2 Performance Standard** – Each year, a summary of the number and type of applications for the permitted use of groundwater in the District, and the disposition of those applications, will be included in the Annual Report.

**B. Controlling and Preventing Waste of Groundwater – 31 TAC § 356.52(a)(1)(B) Implementing TWC § 36.1071(a)(2)**

**B.1. Objective** – Each year, the District will evaluate its rules to determine whether any amendments are recommended that would decrease the amount of waste of groundwater within the District.

**B1. Performance Standard** – The District will include a discussion of the annual evaluation of the District Rules and its determination of whether any amendments to the rules are recommended to prevent the waste of groundwater in the Annual Report.

- B2. Objective** – The District will monitor the Texas Railroad Commission website to identify the location and status of all salt water or waste disposal wells permitted to operate within the District.
- B2. Performance Standard** – Each year a summary of the information collected from the Texas Railroad Commission website regarding the location and status of all injection or waste disposal wells permitted to operate within the District will be included in the Annual Report.
- B.3. Objective** – Each year the District will track the results of all mechanical integrity tests performed on any injection or waste disposal injection wells permitted by the Texas Railroad Commission to operate within the District.
- B.3. Performance Standard** - Each year a summary of the results of all mechanical integrity tests performed on the injection or waste disposal wells permitted to operate within the District will be included in the Annual Report.
- B.4. Objective** – Each year the District will monitor newspapers of general circulation in Hemphill County for the notice of the drilling and operation of injection or disposal wells to be located within the District and attempt to obtain a benchmark for BTEX and Total Chlorides from samples of selected wells within 1 mile of the injection or disposal well activity.
- B.4. Performance Standard** – Each year the District will subscribe to newspapers of general circulation in Hemphill County and prepare a report to be included in the Annual Report which describes the number and location of new water quality benchmark sites.
- C. Controlling and Preventing Subsidence - 31 TAC § 356.52(a)(1)(C) Implementing TWC § 36.1071(a)(3)**

We have reviewed TWDB’s subsidence risk report *Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping* – TWDB Contract Number 1648302062, by LRE Water, as to its applicability to the District. The District participated in providing additional data to LRE. The Ogallala Aquifer is a major aquifer that is unconsolidated. Figure 4.33 on page 4-55 demonstrates that Hemphill County is a medium risk for future subsidence; however, there is a considerable amount of area that showed insufficient data. Risk factors for the Ogallala are primarily aquifer lithology, pre-consolidation level and anticipated water-level decline. Interferometric Synthetic Aperture Radar (InSAR) data acquisition and processing is cited as being an appropriate investigation and monitoring approach. It was also suggested that the SUB-WT (Leake and Galloway, 2007) be incorporated into the recently revised GAM. Due to costs associated with additional monitoring utilizing InSAR, the newness of such data and the projected minimal declines in the aquifer in Hemphill County, this goal is not applicable to the District for this planning period.

- D. Conjunctive Surface Water Management Issues – 31 TAC § 356.52(a)(1)(D) Implementing TWC § 36.1071(a)(4)**
- D.1. Objective** – Each year, the District will participate in the regional planning process by attending the Region A – Panhandle Water Planning Group meetings to encourage the development of surface water supplies as alternatives to groundwater usage to meet the needs of appropriate water user groups in the Region.
- D.1. Performance Standard** – Each year, the attendance of a District representative at a minimum of 50 percent of the Region A Panhandle Water Planning Group meetings will be reflected in the District’s Annual Report and will include the number of meetings attended, the dates, and the name of the District representative who attended.
- D.2. Objective** – Each year, the District will participate in the Texas Clean Rivers Program Canadian and Red River Basins Annual Advisory Committees Meeting by attending the meeting or obtaining a copy of the Annual Basin Summary Report for the Canadian and Red River Basins as presented by the Red River Authority of Texas.
- D.2. Performance Standard** – Each year, the District will obtain a copy of the Annual Basin Summary Report for the Canadian and Red River Basins as presented by the Red River Authority of Texas and a summary of the report as it relates to the site(s) monitored in Hemphill County will be included in the Annual Report.
- E. Natural Resource Issues Which Impact the Use and Availability of Groundwater and Which are Impacted by the Use of Groundwater - 31 TAC § 356.52(a)(1)(E) Implementing TWC § 36.1071(a)(5)**
- E.1. Objective** - The District will establish and maintain a point source monitoring network.
- E.1. Performance Standard** - Each year the District will collect water quality samples from at least 80% of the monitoring sites designated in the point source monitoring network and provide a status report on the number of wells tested and a summary of the testing results in the Annual Report.
- E.2. Objective** - The District will establish and maintain a non-point source groundwater monitoring network.
- E.2. Performance Standard** - Each year the District will collect water quality samples from at least 80% of the monitoring sites designated in the non-point source monitoring network and include a status report on the number of wells tested and a summary of the testing results in the Annual Report.
- F. Drought Conditions - 31 TAC § 356.52(a)(1)(F) Implementing TWC § 36.1071(a)(6)**
- F.1. Objective** – Each quarter, the District will monitor the drought conditions for the

High Plains Region and prepare a letter briefing the City Manager of the City of Canadian as to the drought conditions for Hemphill County. The source of the drought information may include information provided by the Texas Water Development Board drought information page found at <http://www.twdb.state.tx.us/DATA/drought/> or other resources.

- F.1. Performance Standard** – A summary of the District’s briefings provided to the City Manager will be included in the Annual Report.
- G. Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, and Brush Control, Where Appropriate and Cost Effective - 31 TAC § 356.52(a)(1)(G) Implementing TWC § 36.1071(a)(7)**
- G.1. Objective (Conservation)** - Each year the District will promote conservation by distributing conservation brochures/literature to the public.
- G.1. Performance Standard (Conservation)** – Each year, the annual report will include a summary of the District activity during the year to promote conservation.
- G.2. Objective (Conservation)** – Annually, the District will submit an article or advertisement regarding water conservation for publication to at least one newspaper of general circulation in Hemphill County.
- G.2. Performance Standard (Conservation)** – A copy of the article or advertisement submitted by the District for publication to a newspaper or general circulation in the District regarding water conservation will be included in the Annual Report.
- G.3. Objective (Conservation)** – The District will develop or implement a pre-existing educational program for use on at least one public school campus located in the District to educate students on the importance of water as a natural resource, water conservation or the prevention of contamination.
- G.3. Performance Standard (Conservation)** – A summary of the educational program developed or implemented by the District for use in public or private schools located within the District will be included in the Annual Report.
- G.4. Objective (Rainwater Harvesting)** - Each year the District will promote rainwater harvesting by distributing brochures/literature to the public.
- G.4. Performance Standard (Rainwater Harvesting)** – Each year, the annual report will include a summary of the District activity during the year to promote rainwater harvesting.
- G.5. Objective (Brush Control)** – Each year the District will promote brush control by distributing brochures/literature to the public.
- G.5. Performance Standard (Brush Control)** – Each year, the annual report will include a summary of the District activity during the year to promote brush control.
- G.6. Precipitation Enhancement** - Due to the costs associated with developing and

maintaining a precipitation enhancement program, this goal is not applicable to the Hemphill County Underground Water Conservation District.

**G.7 Recharge Enhancement** - Due to other federal agencies overseeing the installation and funding of terraces to manage run-off and enhance recharge in Hemphill County, this goal is not applicable to the District during this planning cycle.

**H. Addressing, in a Quantitative Manner, the Desired Future Conditions of the Groundwater Resources Adopted Under TWC § 36.108 - 31 TAC § 356.52(a)(1)(H) Implementing- § 36.1071(a)(8)**

**H.1. Objective** – Each year the District will evaluate the status of the Ogallala Aquifer utilizing a water level monitoring network within the District boundaries.

**H1. Performance Standard** – Each year the District will obtain water level measurements from at least 80% of the wells designated in the water level monitoring network and a report on the number of water level measurements obtained will be included in the Annual Report.

**H.2 Objective** - Each year the District will monitor the status of attaining the Desired Future Condition.

**H.2 Performance Standard** – Each year the District will calculate the volume of water in place using the annual water level measurements, compare this volume to the volume of water in storage for each 50-year period between 2018 and 2080, and include the results in the Annual Report.

# Appendix A



**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

RESOLUTION AND ORDER NO. 2022-03

OF THE BOARD OF DIRECTORS OF THE HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT ADOPTING AN AMENDED MANAGEMENT PLAN

WHEREAS, the Hemphill County Underground Water Conservation District (“District”) was created in 1995 by the Texas Legislature. *See* Act of May 19, 1995, 74<sup>th</sup> Leg., R.S., ch. 157, 1995 Tex. Gen. Laws 1007;

WHEREAS, the District has “the rights, powers, privileges, functions, and duties” provided by Chapter 36, Texas Water Code. *See* TEX. SPEC. DIST. LOCAL LAWS CODE § 8894.0101;

WHEREAS, the District has been created “to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater . . . .” TEX. WATER CODE § 36.0015(a);

WHEREAS, pursuant to the Texas Water Code, the District must develop and adopt a Management Plan. TEX. WATER CODE ANN. § 36.1071;

WHEREAS, the last Management Plan adopted by the District was adopted on June 27, 2017;

WHEREAS, pursuant to the Texas Water Code, the District must review and readopt its Management Plan “with or without revisions” at least once every five years. TEX. WATER CODE ANN. § 36.1072(e);

WHEREAS, on April 14, 2022, the Board approved a draft amended Management Plan for consideration for adoption by the Board;

WHEREAS, the amended Management Plan is intended to achieve compliance with the various mandates of Chapter 36 and to update the District’s management goals and objectives;

WHEREAS, the District shall adopt an amended Management Plan “[a]fter notice and hearing.” TEX. WATER CODE ANN. § 36.1071(g);

WHEREAS, on May 12, 2022, the District held a public hearing for the purpose of providing interested members of the public the opportunity to appear and provide oral or written comments to the District related to the proposed adoption of the amended Management Plan;

WHEREAS, the District provided advance notice of the public hearing by posting Notice of Public Hearing on Proposed Management Plan on April 18, 2022 at the District office and at the Hemphill County Courthouse;

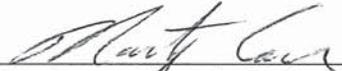
WHEREAS, the District has received no public comments regarding its draft amended Management Plan; and

WHEREAS, the Board has reviewed the proposed amended Management Plan (as set out in Exhibit A which is attached hereto and incorporated for all purposes) and finds that it is consistent with the District's statutory authority and that it should be adopted.

NOW, THEREFORE, BE IT RESOLVED AND ORDERED BY THE BOARD OF DIRECTORS OF THE HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT THAT:

Section 1. The proposed amended Management Plan, which is attached to this Resolution and Order as Exhibit A, is hereby adopted as the District's Management Plan.

PASSED AND APPROVED BY THE BOARD OF DIRECTORS OF THE HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT THIS 12th DAY OF MAY, 2022.

  
\_\_\_\_\_  
Chairman, Board of Directors

ATTEST:

  
\_\_\_\_\_  
Secretary, Board of Directors

APPROVED AS TO FORM:

  
\_\_\_\_\_  
ANDREW S. (DREW) MILLER  
General Counsel

**PROPOSED MANAGEMENT PLAN**

EXHIBIT A



**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

**DISTRICT MANAGEMENT PLAN**

*Adopted July 17, 2007*

*Certified by TWDB Sept. 17, 2007*

**Repealed and New Plan Adopted July 10, 2012**

*Certified by TWDB September 27, 2012*

**Amended and Adopted June 27, 2017**

*Certified by TWDB August 24, 2017*

***Amended and Adopted*** \_\_\_\_\_

***Certified by TWDB*** \_\_\_\_\_

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## I. DISTRICT MISSION

The mission of the Hemphill County Underground Water Conservation District is to conserve and protect the groundwater resources of Hemphill County, by ensuring sustainable development through local management and the best available science.

## II. PURPOSE OF THE MANAGEMENT PLAN

The District's management plan satisfies the requirements of SB 1, SB 2, HB 1763, the statutory requirements of Texas Water Code (TWC) Chapter 36, and the rules and requirements of TWDB.

This plan further addresses the process established by the District to monitor changes in the aquifer, communicate to the public the findings made by the District, and ensure that the plan can adapt through time to meet the needs of the stakeholders of Hemphill County.

## III. DISTRICT INFORMATION

### A. Creation

The Texas State Legislature in 1949 authorized the creation of Underground underground Water water Conservation conservation Districts districts to perform certain prescribed duties, functions, and to hold specific powers as set forth in Article 7880-3c, Texas Civil Statutes, now codified in as Chapter 36, of the Texas Water Code. In 1994, a committee appointed by the Hemphill County Commissioners' Court reviewed the need for Hemphill County to either join an existing groundwater district or, in accordance with the Texas Constitution statute, seek the creation form of a single county groundwater conservation district. After investigating other districts and discussions within the county, the committee recommended that a single single county district be formed created. The Hemphill County Underground Water Conservation District was created the following year by the Hemphill County Underground Water Conservation District Act passed by the Texas Legislature (Act of May 19, 1995, 74<sup>th</sup> Leg., R.S., ch. 157, 1995 Tex. Gen. Laws 1007) which has is now been codified and is in as Chapter 8894, Texas Special District Local Laws Code. (See Appendix A) The District was confirmed by a local election held in Hemphill County on November 4, 1997, with 88% of the voters in favor of the District.

### B. Directors

The District's Board of Directors is composed of five members elected to serve staggered four-year terms. All directors are elected to serve as directors at-large. All e Elections are held in May of even even-numbered years. The Board of Directors holds its regular meetings at the District Offices located at 906 S 211 N 2<sup>nd</sup> Street, Canadian, Texas, on the second Tuesday of each month unless otherwise posted at least quarterly. All meetings of the Board of Directors are public meetings noticed and held in accordance with applicable public meeting requirements.

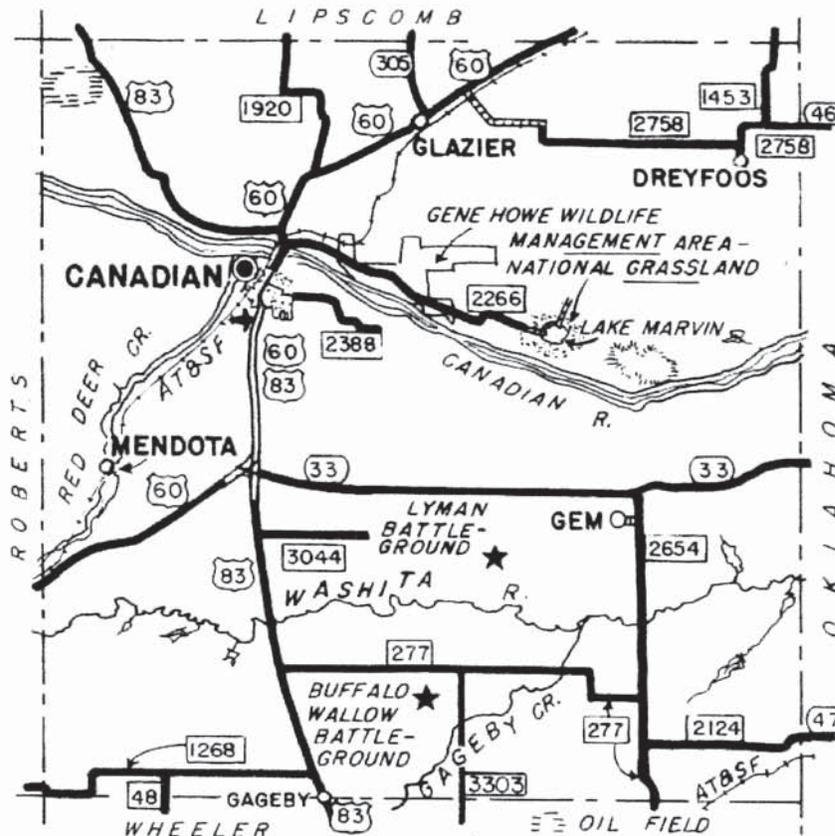
**C. Authority**

The District derives its authority to manage groundwater within the District by virtue of the powers granted and authorized pursuant to: Section 59, Article XVI, Section 59, Texas Constitution; Chapter 36, Texas Water Code; and Chapter 8894, Texas Special District Local Laws Code the District's enabling act, the Act of May 19, 1995, 74<sup>th</sup> Leg., R.S., ch. 157, 1995 Tex. Gen. Laws 1007 (See Appendix A). The District, acting under such authority, assumes all the rights and responsibilities of a groundwater conservation district specified in Chapter 36, of the Texas Water Code.

**D. Location and Extent**

The District (*see* Exhibit A) is located in Hemphill County and its boundaries are coterminous with the boundaries of the County. This area encompasses approximately 900 square miles, contains approximately 594,560 acres, and has a current population of 3,3824,129 according to the 20202016 United States Census. The District lies in the rolling plains on the eastern edge of the Texas Panhandle. It is bordered on the east by Oklahoma, on the south by Wheeler County, on the west by Roberts County, and on the north by Lipscomb County. Industries within the county include agricultural, petroleum, tourism and hunting.

**EXHIBIT A  
HEMPHILL COUNTY UNDERGROUND WATER  
CONSERVATION DISTRICT BOUNDARY**



## E. Topography and Drainage

Total elevation relief in the county is approximately 835 feet. The maximum elevation, approximately 3005 feet above ~~[mean?]~~ sea level, is in the southwest corner of the county. The minimum elevation, approximately 2170 feet above mean sea level, is in the Canadian River bottoms at the Oklahoma state line. A small portion of the county in the southwest ~~is located in~~ is in the generally level Llano Estacado (Staked Plains) portion of the Texas Panhandle. The remainder of the county ~~is located in~~ inconsists of eroded areas surrounding the rivers. The southwest and west portions of the county contain ~~flat~~ flat-topped mesas surrounded by tributary creeks and arroyos. A significant escarpment is present between the plains areas and the Canadian River drainages. A similar escarpment is present along portions of Red Deer Creek. Generally, the terrain is rougher in the west and smoother in the east. Areas of sand dunes ~~are located in~~ are located in the area north of the Canadian River. Several river terraces are present along the Canadian River.

Two of the main drainage systems flow from west to east through the county. These are the Canadian and Washita Rivers. These Rivers originate outside the county boundaries. Red Deer Creek, located in the western part of the county, also originates outside the county and flows in a northerly direction in the western part of the county. The three main drainage systems are described below.

The Canadian River originates in New Mexico, flows across the Texas Panhandle from west to east, and continues into Oklahoma, joining the Arkansas River near the Oklahoma-Arkansas border. The Canadian River and ~~the~~ its feeder creeks drain approximately 50% of the county land area.

The headwaters for Red Deer Creek ~~are located in~~ are located in Gray County, although annual flow is not typically present until you reach Hemphill County near the southwest corner before joining the Canadian River just west of the ~~town~~ City of Canadian. Red Deer Creek drains approximately 10% of the county ~~area~~.

The Washita River originates outside of Hemphill County, between Red Deer Creek and the southwest corner of the county. The river flows east across the county, into Oklahoma, and into Lake Texoma on the Red River between Texas and Oklahoma. The Washita River and associated feeder creeks drain roughly the southern 40% of Hemphill County. Gageby Creek, originating in Wheeler County to the south, is a major tributary.

Streams feeding into the two rivers generally flow north or south for a short distance into the ~~main stream~~ mainstream. The rivers and creeks are fed by stream flow from outside the county, surface runoff within the county and from groundwater discharges to springs and seeps located near the stream heads or along the stream courses. The discharging groundwater is from the Ogallala aquifer.

## **F. Groundwater Resources in Hemphill County**

The primary aquifer in the District is the Ogallala Aquifer. Water-saturated sediments of the Ogallala formation form the aquifer. The Ogallala sediments rest on Permian age ~~“Red-red Bedsbeds”~~. Limited exposures of the red beds are found at several locations on the south side of the Canadian River channel. These red bed exposures contain ~~fine-fine-~~grained sands with gypsum streaks. There are additional red bed exposures in the Washita River channel just east of the county line in Oklahoma.

The general geologic section in Hemphill County has Permian ~~Red-red Beds-beds~~ at the base, with coarse sand and gravel lenses near the base of the Ogallala formation.

Above the base of the Ogallala, the formation contains sands, sandstone, gravels and clays with occasional caliche. In the western part of the county, at higher elevations, there are fine sand and clay with interbedded caliche.

There are extensive sand hills and sand dune deposits overlying the Ogallala formation north of the Canadian River. Additional sand areas ~~are located in~~ are located in the southeast corner of the county along and southeast of Hackberry Creek, and just north of the Washita River.

Water produced from the Ogallala sediments is generally of good quality. In the areas where the Ogallala sediments are thin, water may be produced from the underlying ~~Red red Beds-beds~~ as well as the overlying Ogallala sediments. Water from such wells may be of lesser quality. The incised Canadian River channel also contains saturated sediments; water quality in these sediments may ~~not be of as good a~~ lesser quality as than that produced from the Ogallala.

## **IV. STATEMENT OF GUIDING PRINCIPLES**

The District recognizes the importance of ~~the~~ groundwater resources in Hemphill County to our industries, our community and our heritage. This plan ~~further~~ addresses the processes established by the District to monitor changes in the aquifer, educate the public about the findings made by the District, and ensure that the plan can adapt through time to meet the needs of the citizens of Hemphill County.

## **V. CRITERIA FOR PLAN APPROVAL**

### **A. Planning Horizon**

The time period for this plan is five years from the date of approval by the executive administrator of TWDB or, if appealed, on approval by ~~the~~-TWDB. This plan is being submitted as part of the five-year review and re-adoption process as required by § TWDB 36.1072(e), Texas Water Code. This management plan will remain in effect until a revised ~~management plan~~ is approved by the executive administrator or ~~the~~-TWDB.

### **B. Board Resolution**

A certified copy of the Hemphill County Underground Water Conservation District resolution adopting ~~the~~ this plan is located in is included in Appendix A – Board Resolution.

**C. Plan Adoption**

*Evidence that the plan was adopted after notice and hearing 31 TAC § 356.53(a)(3); § 36.1071(a);*

~~Public~~ Copies of notices documenting that the plan was adopted following appropriately public-noticed meetings and hearings are located in are included in Appendix B – Notice of Meetings.

**D. Coordination with Surface Water Management Entities**

*Evidence that following notice and hearing the District coordinated in the development of its management plan with surface water management entities. TWC § 36.1071(a); § 356.51;*

A copy of ~~n the~~ letter email transmitting a copy of this plan to surface water management entities is included located in Appendix C – Letter Correspondence to Surface Water Management Entities.

**VI. ~~ESTIMATES OF TECHNICAL INFORMATION REQUIRED BY 31 TEX. ADMIN CODE (TAC) § 356.52(a)(5)(A) Implementing TWC § 36.1071(e)(3) + 31 TAC 356.52~~**

**A. ~~Modeled available groundwater in the district based on the desired future condition established under TWC § 36.108 - 1071(e)(3)(A) – 31 TAC 356.52(a)(5)(A) Implementing TWC § 36.1071(e)(3)(A) under TWC § 36.1071(e)(3)(A)~~**

Modeled available groundwater is defined by TWC § 36.001–(25) as “the amount of water that the executive administrator [of TWDB] determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108.” The District ~~is located in~~ is in Groundwater Management Area MA 1 (GMA 1). The ~~GCDs~~ member districts of GMA 1 have completed the joint planning process to determine the desired future conditions of the aquifers in the GMA.

The Ogallala a Aquifer is the sole major aquifer available to producers in Hemphill County and it is therefore the only aquifer in which we will address in this Plan.

1. Ogallala Aquifer

a. Desired Future Conditions:

On ~~November 2, 2016~~ August 26, 2021, the joint planning committee for GMA 1 adopted the following desired future condition for the portion of the Ogallala Aquifer that lies within the jurisdiction of the Hemphill County Underground

Water Conservation District, ~~is which is~~ to have at least 80% of the volume in storage remaining for each 50-year period between 2018 and 2080 in Hemphill County in 50 years, for the period 2012-2062.

b. Modeled Available Groundwater:

The modeled available groundwater value for the 2021 DFC was not available at the time of development of this plan. However, the modeled available groundwater value for the Ogallala Aquifer in Hemphill County provided for the DFC adopted on November 2, 2016, by GMA 1, was provided-developed through by TWDB GAM Run 16-029MAG, and is set forth in Appendix D. This plan will be amended and re-adopted upon receipt of the modeled available groundwater value for the 2021 DFC.

**B. Amount of groundwater being used within the District on an annual basis – 31 TAC § 356.52(a)(5)(B) Implementing TWC §36.1071(e)(3)(B)**

The amount of groundwater being used within the District on an annual basis as provided by the Texas Water Development Board is shown in Appendix E Estimated Historical Water Use and 2022+7 State Water Plan Data Set Page 3. All values are in ~~acre~~-acre-feet.

**C. Annual amount of recharge from precipitation to the groundwater resources within the district – 31 TAC §356.52(a)(5)(C) Implementing TWC §36.1071(e)(3)(C)**

The estimate of the annual volume of recharge to the Ogallala Aquifer in Hemphill County ~~is as~~ based on GAM Run ~~22+6-001+0~~ simulations provided by TWDB to the District for use in this plan, ~~and is as~~ set forth in Appendix F page ~~76~~.

**D. For each aquifer, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers – 31 TAC § 356.52(a)(5)(D) Implementing TWC § 36.1071(e)(3)(D)**

The estimate of the annual volume of water discharged from the Ogallala Aquifer in Hemphill County to surface water systems is based on GAM run ~~22+6-001+0~~ simulations provided by TWDB to the District for use in this plan and is set forth in Appendix F page ~~76~~.

**E. Annual volume of flow into and out of the District within each aquifer and between aquifers in the District, if a groundwater availability model is available – 31 TAC § 356.52(a)(5)(E) Implementing TWC § 36.1071(e)(3)(E)**

The estimates of the volume of water flowing into and out of the District within each aquifer and between aquifers in the District are based on GAM Run ~~22-001+6-0+0~~ simulations provided by TWDB to the District for use in this plan and are set forth in

Appendix F page 76 and further clarifies that the Ogallala aquifer is the only aquifer modeled for the District.

**F. Projected surface water supply in the District, according to the most recently adopted state water plan - 31 TAC § 356.52(a)(5)(F) Implementing TWC § 36.1071(e)(3)(F)**

The projected surface water supply within the District, according to the most recently adopted state water plan as provided by the Texas Water Development Board TWDB, is shown set forth in Appendix E Estimated Historical Water Use and 2022 State Water Plan Data Set Page 4. All values are in acre-feet. See Appendix E Estimated Historical Water Use and 2012 State Water Plan Data Set Pages 5 Projected Surface Water Supplies.

**G. Projected total demand for water in the district-District according to the most recently adopted state water plan - 31 TAC § 356.5(a)(5)(G) Implementing TWC § 36.1071(e)(3)(G)**

The projected total demand for water in demands for Hemphill County from the 2022-17 State Water Plan are is set forth in Appendix E Estimated Historical Water Use and 2022-17 State Water Plan Datasets Page 56.

**VII. CONSIDERATION OF THE WATER SUPPLY NEEDS AND WATER MANAGEMENT STRATEGIES INCLUDED IN THE ADOPTED STATE WATER PLAN - TWC § 36.1071(e)(4)**

**A. Water Supplies** - The most recent state water plan is the 2017-2022 State Water Plan. In Hemphill County, there are no water needs identified for any user group in any decade. Water needs are identified when the projected water demand of a Water User Group (WUG) exceeds the projected water supplies of the WUG. See Appendix E Page 67.

**B. Water Management Strategies** - While no shortages were identified in the 2022-17 State Water Plan, a Water Management management Strategies strategy recommended for the City of Canadian wasere demand reduction through conservationmunicipal conservation. Municipal conservation water management strategies include a variety of activities that either reduce everyday water consumption or increase water use efficiency, allowing more to be done with the same amount of water. Examples of municipal conservation strategies includes activities such as low flow plumbing fixtures, water conservation pricing structure, water system audits, or and landscape irrigation restrictions, water audits and leak repair for the City of Canadian, and The Demand reduction is also a other recommended water management strategy for agricultural usewas demand reduction was for irrigation. Demand reduction in agriculture -Agricultural conservation is primarily achieved though irrigation conservation strategies and some livestock conservation based on best management practices. Irrigation conservation strategies include changes to irrigation methods, equipment, and crops. For example, conversion to Low

Energy Precision Application systems and irrigation scheduling, as well as other activities associated with irrigation best management practices, can help producers reduce their water use. Like municipal conservation, irrigation conservation strategies tend to be an aggregate of multiple best management practices, any one or several of which could be implemented to achieve the estimated water savings of the strategy.~~the strategy recommended was that conservation be implemented.~~ See Appendix E Page 78.

#### **VIII. MANAGEMENT OF GROUNDWATER SUPPLIES — 31 TWAC § 356.52(a)(4)**

The District will manage the supply of groundwater within the District ~~in order to~~ both conserve the 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 the District, the District will seek to identify and engage in such activities and practices, that, if implemented, ~~may~~would result in more efficient use of groundwater.

The District shall implement a management program based on actual aquifer conditions, measured annually by the District ~~in conjunction with~~ as part of its the water level measuring program, and maxium withdrawal production allocation rates modified over time to ensure that the ~~d~~Desired ~~f~~Future ~~c~~Conditions are achieved. The District may designate multiple management areas and sub- management areas. Initially, Management Area North will be that portion of the District which is located North-north of the Canadian River and ~~while~~ Management Area South will be that portion of the District that is located South-south of the Canadian River. The District's management criteria are: (1) a decline rate of no more than 1% reduction in the saturated thickness for ~~3~~three consecutive years; and (2) an average minimum aquifer storage level of 80% of volume in storage remaining for each 50-year period between 2018 and 2080, ~~the calculated 2012 volume in storage remaining in 50 years.~~ The District will amend ~~the District's~~ its rules as necessary to implement ~~the any~~ changes to Chapter 36 of the Texas Water Code and to implement any future groundwater management strategies as well as the goals and objectives of this plan.

It is recognized by the District that the long-term sustainable storage goal of the aquifer is dependent upon long-term water use characteristics ~~of within~~ the District and adjoining areas of the Ogallala that communicate with the boundaries of the District. The District will continue to participate in long-term studies of the aquifer with the GMA 1 Joint Planning Group, Region A Water Planning Area, ~~the Texas Water Development Board-TWDB,~~ and other entities ~~when available~~ as appropriate.

Management will be accomplished ~~thru the use of~~ using well spacing standards, production limits, production reporting, and the monitoring of aquifer conditions.

The District will continue to take measurements an ~~using a~~ adequate-sufficient number of monitoring wells ~~water-levels~~ distributed throughout the county on an annual basis. The District will work with new permittees and existing users to add ~~or and~~ delete additional monitor wells to ensure an adequate monitoring network is maintained.

Drought conditions will be monitored and acknowledged in the course of management of the aquifer.

**IX. ACTION, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION - TWC §36.1071(e)(2)**

The District will implement the goals and provisions of this management plan and will utilize the objectives of this management plan as a guideline in its decision-making. The District will ensure that its planning efforts, operations, and activities will be consistent with the provisions of this plan and will be executed in a manner that is fair to all stakeholders.

The District has adopted rules in accordance with Chapter 36 of the Texas Water Code, and the District may amend its rules as necessary to comply with changes to Chapter 36 of the Texas Water Code and its ,revised Mmanagement Plansplan, and to insure the best management of the groundwater within the District according to present and projected aquifer conditions. The District will seek the input of its constituents during the development-implementation of this plan and the-any amendment of the District's rules.— The enforcement and continued development of the-the District's rules of-the-District will be based on the best scientific and technical evidence available to the District. A copy of the District's Rules is available for review at the District office and will be available for review or for download on the District's Website: [www.hemphilluwcd.org](http://www.hemphilluwcd.org) once the site is revised and restored to the web.

The District will encourage cooperation and coordination in the implementation of this plan. All operations and activities of the District will be performed in a manner that encourages cooperation with the appropriate state, regional or local water entities.

**X. METHODOLOGY FOR TRACKING DISTRICT'S PROGRESS IN ACHIEVING ITS MANAGEMENT GOALS - 31 TAC §356.52(a)(64)-and TWC §36.1071(a)**

The ~~General Manager of the District's~~ General Manager (GM) shall prepare and submit an Annual Report to the Board of Directors (Board) of the District. The Annual Report will include an update on the District's performance ~~with regard to~~regarding achieving its management goals and objectives based on the fiscal year ending September 30th. The ~~general manager of the District-GM~~ will present the Annual Report prior to the end of the followingnext fiscal year. Upon its adoption by the Board, the Board will maintain a copy of the Annual Report on file for public inspection at the District's offices.

## XI. GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

The management goals, objectives and performance standards of the District in the areas specified in 31 TAC §§ 356.51 and §356.52 are addressed below:

### Management Goals

- A. **Providing the Most Efficient Use of Groundwater – 31 TAC §\_356.52(a)(1)(A) Implementing TWC §\_36.1071(a)(1)**
  - A.1 **Objective** – Each year, the District will require all new exempt or non-exempt wells that are constructed within the boundaries of the District to be registered or permitted with the District in accordance with the District Rules.
  - A.1 **Performance Standard** – The number of exempt and non-exempt wells registered or permitted by the District for the year will be incorporated into the Annual Report.
  - A.2 **Objective** – Each year, the District will regulate the production of groundwater by maintaining a permitting system within the boundaries of the District in accordance with the District Rules.
  - A.2 **Performance Standard** – Each year, a summary of the number and type of applications for the permitted use of groundwater in the District, and the disposition of those applications, will be included in the Annual Report.
- B. **Controlling and Preventing Waste of Groundwater – 31 TAC §\_356.52(a)(1)(B) Implementing TWC §\_36.1071(a)(2)**
  - B.1. **Objective** – Each year, the District will evaluate ~~the District~~ its rules to determine whether any amendments are recommended that would decrease the amount of waste of groundwater within the District.
  - B.1. **Performance Standard** – The District will include a discussion of the annual evaluation of the District Rules and its determination of whether any amendments to the rules are recommended to prevent the waste of groundwater in the Annual Report.
  - B.2. **Objective** – The District will monitor the Texas Railroad Commission website to identify the location and status of all salt water or waste disposal wells permitted to operate within the District.
  - B.2. **Performance Standard** – Each year a summary of the information collected from the Texas Railroad Commission website regarding the location and status of all injection or waste disposal wells permitted to operate within the District will be included in the Annual Report.

- B.3. **Objective** – Each year the District will track the results of all mechanical integrity tests performed on any injection or waste disposal injection wells permitted by the Texas Railroad Commission to operate within the District.
  - B.3. **Performance Standard** - Each year a summary of the results of all mechanical integrity tests performed on the injection or waste disposal wells permitted to operate within the District will be included in the Annual Report.
  - B.4. **Objective**– Each year the District will monitor newspapers of general circulation in Hemphill County for the notice of the drilling and operation of injection or disposal wells to be located within the District and attempt to obtain a benchmark for BTEX and Total Chlorides from samples of selected wells within 1 mile of the injection or disposal well activity.
  - B.4. **Performance Standard** – Each year the District will subscribe to newspapers of general circulation in Hemphill County and prepare a report to be included in the Annual Report which describes the number and location of new water quality benchmark sites.
- C. **Controlling and Preventing Subsidence - 31 TAC §\_356.52(a)(1)(C) Implementing TWC §\_36.1071(a)(3)**

~~This goal is not applicable to the Hemphill County Underground Water Conservation District. We have reviewed the TWDB's subsidence risk report *Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping* – TWDB Contract Number 1648302062, by LRE Water, as to its applicability to the District. – The District participated in providing additional data to LRE. - The Ogallala Aquifer is a major aquifer that is unconsolidated. – Figure 4.33 on page 4-55 demonstrates that Hemphill County is a medium risk for future subsidence; however, there is a considerable amount of area that showed insufficient data. Risk factors for the Ogallala are primarily aquifer lithology, pre-consolidation level and anticipated water-level decline. – Interferometric Synthetic Aperture Radar (InSAR) data acquisition and processing is cited as being an appropriate investigation and monitoring approach. – It was also suggested that the SUB-WT (Leake and Galloway, 2007) be incorporated into the recently revised GAM. – Due to costs associated with additional monitoring utilizing InSAR, the newness of such data and the projected minimal declines in the aquifer in Hemphill County, this goal is not applicable to the District for this planning period.~~

- D. **Conjunctive Surface Water Management Issues – 31 TAC §\_356.52(a)(1)(D) Implementing TWC §\_36.1071(a)(4)**
- D.1. **Objective** – Each year, the District will participate in the regional planning process by attending the Region A – Panhandle Water Planning Group meetings to encourage the development of surface water supplies as alternatives to groundwater usage to meet the needs of appropriate water user groups in the Region.

- D.1. Performance Standard** – Each year, the attendance of a District representative at a minimum of 50 percent of the Region A Panhandle Water Planning Group meetings will be reflected in the District’s Annual Report and will include the number of meetings attended, the dates, and the name of the District representative who attended.
- D.2. Objective** – Each year, the District will participate in the Texas Clean Rivers Program Canadian and Red River Basins Annual Advisory Committees Meeting by attending the meeting or obtaining a copy of the Annual Basin Summary Report for the Canadian and Red River Basins as presented by the Red River Authority of Texas.
- D.2. Performance Standard** – Each year, the District will obtain a copy of the Annual Basin Summary Report for the Canadian and Red River Basins as presented by the Red River Authority of Texas and a summary of the report as it relates to the site(s) monitored in Hemphill County will be included in the Annual Report.
- E. Natural Resource Issues Which Impact the Use and Availability of Groundwater and Which are Impacted by the Use of Groundwater - 31 TAC §\_356.52(a)(1)(E) Implementing TWC §\_36.1071(a)(5)**
- E.1. Objective** - The District will establish and maintain a point source contamination monitoring network.
- E.1. Performance Standard** - Each year the District will collect water quality samples from at least 80% of the monitoring siteswells designated in the point source monitoring network and provide a status report on the number of wells tested and a summary of the testing results in the Annual Report.
- E.2. Objective** - The District will establish and maintain a non-point source groundwater contamination monitoring network of monitoring wells.
- E.2. Performance Standard** - Each year the District will collect water quality samples from at least 80% of the monitoring siteswells designated in the non-point source monitoring network and include a status report on the number of wells tested and a summary of the testing results in the Annual Report.
- F. Drought Conditions - 31 TAC §\_356.52(a)(1)(F) Implementing TWC §\_36.1071(a)(6)**
- F.1. Objective** – Each quarter, the District will monitor the drought conditions for the High Plains Region and prepare a letter briefing the City Manager of the City of Canadian as to the drought conditionsPalmer Drought Severity Index (PDSI) Level for Hemphill County. The source of the drought information may include information provided by the Texas Water Development Board drought information page found at <http://www.twdb.state.tx.us/DATA/drought/> or other resources.
- F.1. Performance Standard** – A summary of the District’s briefings provided to the City Manager will be included in the Annual Report.

- G. Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, and Brush Control, Where Appropriate and Cost Effective - 31 TAC §\_356.52(a)(1)(G) Implementing TWC §\_36.1071(a)(7)**
- G.1. Objective (Conservation)** - Each year the District will promote conservation by distributing conservation brochures/literature to the public.
- G.1 Performance Standard (Conservation)** – Each year, the annual report will include a summary of the District activity during the year to promote conservation.
- G.2 Objective (Conservation)** – Annually, the District will submit an article or advertisement regarding water conservation for publication to at least one newspaper of general circulation in Hemphill County.
- G.2 Performance Standard (Conservation)** – A copy of the article or advertisement submitted by the District for publication to a newspaper or general circulation in the District regarding water conservation will be included in the Annual Report.
- G.3 Objective (Conservation)** – The District will develop or implement a pre-existing educational program for use on at least one public school campus located in the District to educate students on the importance of water as a natural resource, water conservation or the prevention of contamination.
- G.3. Performance Standard (Conservation)** – A summary of the educational program developed or implemented by the District for use in public or private schools located within the District will be included in the Annual Report.
- G.4 Objective (Rainwater Harvesting)** - Each year the District will promote rainwater harvesting by distributing brochures/literature to the public.
- G.4 Performance Standard (Rainwater Harvesting)** – Each year, the annual report will include a summary of the District activity during the year to promote rainwater harvesting.
- G.5 Objective (Brush Control)** – Each year the District will promote brush control by distributing brochures/literature to the public.
- G.5 Performance Standard (Brush Control)** – Each year, the annual report will include a summary of the District activity during the year to promote brush control.
- G.6 Precipitation Enhancement** - Due to the costs associated with developing and maintaining a precipitation enhancement program, this goal is not applicable to the Hemphill County Underground Water Conservation District.
- G.7 -Recharge Enhancement** - Due to other federal agencies overseeing the installation and funding of terraces to manage run-off and enhance recharge in Hemphill County, this goal is not applicable to the District during this planning cycle.

**H. Addressing, in a Quantitative Manner, the Desired Future Conditions of the Groundwater Resources Adopted Under TWC § 36.108 - 31 TAC § 356.52(a)(1)(H) ~~Implementing- TWC 36.108, § 36.1071(a)(8)~~**

**H.1. Objective** – Each year the District will evaluate the status of the Ogallala Aquifer utilizing a water level monitoring network within the District boundaries.

**H1. Performance Standard** – Each year the District will obtain water level measurements from at least 80% of the wells designated in the water level monitoring network and a report on the number of water level measurements obtained will be included in the Annual Report.

**H.2 Objective** - Each year the District will monitor the status of attaining the Desired Future Condition.

**H.2 Performance Standard** – Each year the District will calculate the volume of water in place using the annual water level measurements, compare this volume to the ~~initial 2012~~ volume of water in storage for each 50-year period between 2018 and 2080, and include the results in the Annual Report.

**~~I. Recharge Enhancement and Precipitation Enhancement~~**

~~— Due to the costs associated with developing and maintaining a precipitation enhancement program, this goal is not applicable to the Hemphill County Underground Water Conservation District~~

**~~XII. MANAGEMENT GOALS DETERMINED NOT APPLICABLE TO THE DISTRICT~~**

**~~A. Controlling and Preventing Subsidence – 31 TAC § 356.5(a)(1)(C)~~**

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

**~~B. Recharge Enhancement and Precipitation Enhancement – 31 TAC § 356.5(a)(1)(G)~~**

~~At this time, goals relating to recharge enhancement and precipitation enhancement are not considered to be cost-effective and would cause the District to increase taxes.~~

# Appendix B



**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

FILED

APR 19 2022

SYLVIA GUERRERO  
CLERK COUNTY COURT  
HEMPHILL COUNTY TEXAS



HEMPHILL COUNTY  
Underground Water Conservation District  
*Conserving a Texas Oasis*

## NOTICE OF PUBLIC HEARING ON PROPOSED MANAGEMENT PLAN

The Hemphill County Underground Water Conservation District ("District") will conduct a public hearing concerning the District's amendment of its Management Plan. The purpose of the public hearing is to provide interested members of the public the opportunity to appear and provide oral or written comments to the District related to the proposed plan.

Date: Thursday, May 12, 2022  
Time: 6:00 PM  
Location: Hemphill County UWCD Board Room  
211 N. 2nd Street  
Canadian, Texas 79014

Pursuant to Chapter 36, Texas Water Code, the District is obligated to periodically update its Management Plan in order to achieve compliance with the mandates of Chapter 36. The amended Plan would update the District's management goals and objectives. All interested persons are encouraged to review the proposed amended Management Plan for themselves by obtaining a copy from the District, as provided below.

Any person may appear in person, or by authorized representative, at the public hearing on the proposed new Management Plan. Written comments on the proposed new Management Plan must be filed with the District by no later than the close of the public hearing. Written comments may be filed as follows: (1) by hand delivery at the official address of the District, 211 N. 2nd Street, Canadian, Texas 79014; (2) by mail to P.O. Box 1142, Canadian, Texas 79014; or (3) by hand delivery to the presiding officer at the public hearing. A copy of the proposed amended Management Plan may be obtained from the District by: (1) calling (806) 323-8350; or (2) visiting the offices of the District at 211 N. 2nd Street, Canadian, Texas.

ISSUED THIS 18th DAY OF APRIL, 2022.

Janet Guthrie  
General Manager  
Hemphill County Underground Water Conservation District

Posted by Seciah Quezada @ 9:36 April 19 for Sylvia Guerrero Clerk  
14901.00100/DMIL/MISC/1424611v.1



HEMPHILL COUNTY  
Underground Water Conservation District  
*Conserving a Texas Oasis*

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ISSUED THIS 18th DAY OF APRIL, 2022.

  
Janet Guthrie  
General Manager  
Hemphill County Underground Water Conservation District

*Done 4/18/22 District office by Janet Guthrie @ 9:30 am*



**HEMPHILL COUNTY**  
Underground Water Conservation District  
*Conserving a Texas Oasis*

## NOTICE OF OPEN MEETING

### **BOARD MEETING AGENDA** **Thursday, May 12, 2022**

Notice is now given that the Hemphill County Underground Water Conservation District Board of Directors will meet immediately following the public hearing scheduled to convene at 6:00 pm on Thursday, May 12, 2022, in the Hemphill County Underground Water Conservation District Board Room, located at 211 N 2<sup>nd</sup> Street, Canadian, TX. At this meeting, the following business may be considered and recommended for board action:

#### AGENDA

- 1) Establishment of Quorum
- 2) Public Comment
- 3) **Consent Agenda**
  - (a) Review and Approval of minutes of the board meetings held as follows:
    - April 14, 2022 - Regular Board Meeting
- 4) **Action Agenda**
  - (a) Approve Management Report from General Manager, discussing recent meetings attended, well registrations and permits acted on by the General Manager, status of any administratively incomplete applications, field and water quality lab activity report, activities related to District's education program, rainfall information
  - (b) Approve April 30, 2022 Financial Reports, Ratify Bills Paid for April, 2022
  - (c) Take up, Consider and Take Action to Approve Application H-2021-07 for a Large Production Permit Renewal and Amendment by Joyce C. Craft for 375 Acre Feet per year for Agricultural Purposes
  - (d) Take up, Consider and Take Action to Approve Application H-2022-08 for a Large Production Permit Renewal and Amendment by Mary Elliott, for 350 Acre Feet per year for Agricultural Purposes.
  - (e) Take Sworn Statement of Newly Elected Directors
  - (f) Issue Oath of Office to Newly Elected Directors
  - (g) Elect Officers: President, Vice President and Secretary
  - (h) Authorize addition of new Director to bank signature cards, authorize the removal of former Director from bank signature card and removal of former employee from safe deposit box signature card.
  - (i) Designate Hemphill County UWCD GMA 1 Representative
  - (j) Discuss Management Plan Hearing and Take up, Consider and Take Action to Approve the Amended Management Plan and Adopt Resolution and Order No. 2022-03
  - (k) Take action to execute the Authorized Representative Deletion/Update Form with TexPool.
  - (l) Discuss and Take Action to Authorize a Memorial honoring former board member

and president Mark Meek.

- (m) Meet with Ray Brady to discuss and possible action on status report
- (n) Legislative Update
- (o) Budget Work Session
- 5) Discussion Agenda**
  - (a) Discuss Items for Future Board Meeting Agendas and Set Next Meeting Date and Time
- 6) Adjournment**

In this Notice of Open Meeting (“Notice”), the posting of an agenda item to be discussed in open session is not intended to limit or require discussion of that matter in open session if it is otherwise appropriate to discuss the matter in closed session. If, during the discussion of any agenda item, a matter is raised that is appropriate for discussion in closed session the board may, as permitted by the Texas Open Meetings Act, adjourn into closed session to deliberate on the matter. Additionally, the posting of an agenda item as a matter to be discussed in closed session is not intended to limit or require discussion of that matter in closed session. In open session, the Board may discuss and take action on any matter for which notice has been given in this Notice, including an item posted for closed session. In no event, however, will the Board take action on any agenda item in closed session, whether it be posted for open or closed session discussion.

PERSONS WITH DISABILITIES WHO PLAN TO ATTEND THIS MEETING AND WHO MAY NEED AUXILIARY AIDS OR SERVICES SUCH AS INTERPRETERS FOR PERSONS WHO ARE DEAF OR HEARING IMPAIRED, READERS, LARGE PRINT, OR BRAILLE, ARE REQUESTED TO CONTACT JANET GUTHRIE AT 806 323-8350 TWO (2) WORKDAYS PRIOR TO THE MEETING SO THAT APPROPRIATE ARRANGEMENTS CAN BE MADE.

I, the undersigned authority, do hereby certify that the above Notice of Meeting of the Board of Directors of the Hemphill County Underground Water Conservation District, is a true and correct copy of said Notice; and that I posted a true and correct copy at a place convenient to the public at the District office, at 211 N 2<sup>nd</sup> Street, Canadian, Texas and the Notice was posted on May 10, at 10:45 am and will remain so posted continuously for at least 72 hours immediately preceding the day of said Meeting; a true and correct copy of the Notice was furnished to the Hemphill County Clerk.

Dated this 10 day of May, 2022  
Hemphill County Underground Water Conservation District

By: \_\_\_\_\_

*Janet Guthrie*  
Janet Guthrie, General Manager



**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

**NOTICE OF OPEN MEETING**

**BOARD MEETING AGENDA**  
**Thursday, May 12, 2022**

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AGENDA

- 1) Establishment of Quorum
- 2) Public Comment
- 3) **Consent Agenda**
  - (a) Review and Approval of minutes of the board meetings held as follows:
    - April 14, 2022 - Regular Board Meeting
- 4) **Action Agenda**
  - (a) Approve Management Report from General Manager, discussing recent meetings attended, well registrations and permits acted on by the General Manager, status of any administratively incomplete applications, field and water quality lab activity report, activities related to District’s education program, rainfall information
  - (b) Approve April 30, 2022 Financial Reports, Ratify Bills Paid for April, 2022
  - (c) Take up, Consider and Take Action to Approve Application H-2021-07 for a Large Production Permit Renewal and Amendment by Joyce C. Craft for 375 Acre Feet per year for Agricultural Purposes
  - (d) Take up, Consider and Take Action to Approve Application H-2022-08 for a Large Production Permit Renewal and Amendment by Mary Elliott, for 350 Acre Feet per year for Agricultural Purposes.
  - (e) Take Sworn Statement of Newly Elected Directors
  - (f) Issue Oath of Office to Newly Elected Directors
  - (g) Elect Officers: President, Vice President and Secretary
  - (h) Authorize addition of new Director to bank signature cards, authorize the removal of former Director from bank signature card and removal of former employee from safe deposit box signature card.
  - (i) Designate Hemphill County UWCD GMA 1 Representative
  - (j) Discuss Management Plan Hearing and Take up, Consider and Take Action to Approve the Amended Management Plan and Adopt Resolution and Order No. 2022-03
  - (k) Take action to execute the Authorized Representative Deletion/Update Form with TexPool.
  - (l) Discuss and Take Action to Authorize a Memorial honoring former board member

**RECEIVED**  
 11:16 am  
 MAY 06 2022  
 SYLVIA GUERRERO  
 CLERK COUNTY COURT  
 HEMPHILL COUNTY TEXAS

and president Mark Meek.

(m) Meet with Ray Brady to discuss and possible action on status report

(n) Legislative Update

(o) Budget Work Session

**5) Discussion Agenda**

(a) Discuss Items for Future Board Meeting Agendas and Set Next Meeting Date and Time

**6) Adjournment**

In this Notice of Open Meeting ("Notice"), the posting of an agenda item to be discussed in open session is not intended to limit or require discussion of that matter in open session if it is otherwise appropriate to discuss the matter in closed session. If, during the discussion of any agenda item, a matter is raised that is appropriate for discussion in closed session the board may, as permitted by the Texas Open Meetings Act, adjourn into closed session to deliberate on the matter. Additionally, the posting of an agenda item as a matter to be discussed in closed session is not intended to limit or require discussion of that matter in closed session. In open session, the Board may discuss and take action on any matter for which notice has been given in this Notice, including an item posted for closed session. In no event, however, will the Board take action on any agenda item in closed session, whether it be posted for open or closed session discussion.

PERSONS WITH DISABILITIES WHO PLAN TO ATTEND THIS MEETING AND WHO MAY NEED AUXILIARY AIDS OR SERVICES SUCH AS INTERPRETERS FOR PERSONS WHO ARE DEAF OR HEARING IMPAIRED, READERS, LARGE PRINT, OR BRAILLE, ARE REQUESTED TO CONTACT JANET GUTHRIE AT 806 323-8350 TWO (2) WORKDAYS PRIOR TO THE MEETING SO THAT APPROPRIATE ARRANGEMENTS CAN BE MADE.

I, the undersigned authority, do hereby certify that the above Notice of Meeting of the Board of Directors of the Hemphill County Underground Water Conservation District, is a true and correct copy of said Notice; and that I posted a true and correct copy at a place convenient to the public at the District office, at 211 N 2<sup>nd</sup> Street, Canadian, Texas and the Notice was posted on May 6, at 10:45 am and will remain so posted continuously for at least 72 hours immediately preceding the day of said Meeting; a true and correct copy of the Notice was furnished to the Hemphill County Clerk.

Dated this 6 day of May, 2022  
Hemphill County Underground Water Conservation District

By: Janet Guthrie  
Janet Guthrie, General Manager

Posted on 5/6/22 @ 11:17am by Sylvia Guerrero, Clerk

# Appendix C



**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

## Janet Guthrie

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**To:** Kent Satterwhite; Chad Pernel; Dustin Meyer; info@rra.texas.gov  
**Subject:** ADOPTED MANAGEMENT PLAN HEMPHILL CO UWCD 2022  
**Attachments:** Hemphill Co UWCD 2022 Mgmt Plan with exhibits FINAL.pdf

To Whom It May Concern:

Please find attached the management plan adopted by the board of directors of the Hemphill County Underground Water Conservation District. You are being provided a copy of the plan in accordance with state statute or Texas Water Development Rule.

If you have any questions, please feel free to reach out to me.

Thank you so much,

**Janet Guthrie**

*General Manager*

HEMPHILL COUNTY UNDERGROUND  
WATER CONSERVATION DISTRICT

Phone: 806-323-8350 Mobile: 806-323-3063

P.O. Box 1142, 211 N 2<sup>nd</sup> Street, Canadian, TX 79014

Email: [j.guthrie@hemphilluwcd.org](mailto:j.guthrie@hemphilluwcd.org)

# Appendix D

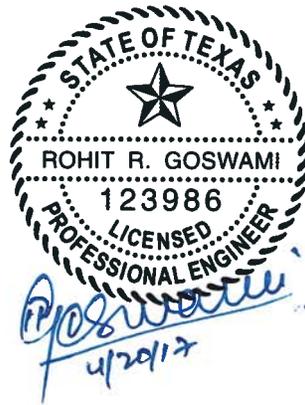


**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

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**GAM RUN 16-029 MAG:  
MODELED AVAILABLE GROUNDWATER  
FOR THE AQUIFERS IN GROUNDWATER  
MANAGEMENT AREA 1**

Rohit Raj Goswami, Ph.D., P.E.  
Texas Water Development Board  
Groundwater Division  
Groundwater Availability Modeling Section  
(512) 463-0495  
April 19, 2017



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# **GAM RUN 16-029 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 1**

Rohit Raj Goswami, Ph.D., P.E.  
Texas Water Development Board  
Groundwater Division  
Groundwater Availability Modeling Section  
(512) 463-0495  
April 19, 2017

## ***EXECUTIVE SUMMARY:***

The modeled available groundwater for Groundwater Management Area 1 for the Ogallala Aquifer (inclusive of the Rita Blanca Aquifer) is summarized by decade for the groundwater conservation districts (Table 1) and for use in the regional water planning process (Table 2). The modeled available groundwater estimates range from 3,553,273 acre-feet per year in 2020 to 2,236,434 acre-feet per year in 2062 (Table 1). The modeled available groundwater for Groundwater Management Area 1 for the Dockum Aquifer is summarized by decade for the groundwater conservation districts (Table 3) and for use in the regional water planning process (Table 4). The modeled available groundwater estimates for the Dockum Aquifer range from 261,079 acre-feet per year in 2020 to 229,900 acre-feet per year in 2062 (Table 4). The modeled available groundwater estimates were extracted from results of a model run using the groundwater availability model for the High Plains Aquifer System (version 1.01). The model run files, which meet the desired future conditions for the relevant aquifers in Groundwater Management Area 1, were submitted to the Texas Water Development Board (TWDB) as part of the Desired Future Conditions Explanatory Report for Groundwater Management Area 1 (Deeds and Walthour, 2016). The Executive Administrator of the TWDB determined that the explanatory report and other materials were administratively complete on March 10, 2017.

## ***REQUESTOR:***

Mr. Kyle G. Ingham, chair of Groundwater Management Area 1.

### ***DESCRIPTION OF REQUEST:***

On December 16, 2016, Mr. Kyle G. Ingham provided the TWDB with the desired future conditions of the Ogallala Aquifer (inclusive of the Rita Blanca Aquifer) and the Dockum Aquifer adopted by the groundwater conservation districts in Groundwater Management Area 1 on November 2, 2016. The Blaine Aquifer in Wheeler County was designated non-relevant. The desired future conditions for the aquifers in Groundwater Management Area 1, as described in Resolution No. 2016-2, are described below:

#### **Ogallala Aquifer (inclusive of the Rita Blanca Aquifer)**

- At least 40 percent of volume in storage remaining in 50 years, for the period 2012-2062 collectively in Dallam, Hartley, Moore, and Sherman counties;
- At least 50 percent of volume in storage remaining in 50 years, for the period 2012-2062 collectively in Hansford, Lipscomb, and Ochiltree counties and that portion of Hutchinson County with North Plains [Groundwater Conservation District];
- At least 50 percent of volume in storage remaining in 50 years, for the period 2012-2062 in Carson, Donley, Gray, Hutchinson, Oldham, Roberts, and Wheeler counties; and portions of Armstrong and Potter counties within the Panhandle [Groundwater Conservation District];
- At least 80 percent of volume in storage remaining in 50 years, for the period 2012-2062, within the Hemphill County;
- Approximately 20 feet of total average drawdown in 50 years for the period 2012-2062 collectively in Randall County and in Armstrong and Potter counties within the High Plains [Underground Water Conservation District No. 1].

#### **Dockum Aquifer**

- At least 40 percent of the available drawdown remaining in 50 years for the period 2012-2062 collectively for Dallam, Hartley, Moore, and Sherman counties[;]
- No more than 30 feet average decline in water levels in 50 years for the period 2012-2062 collectively in Carson and Oldham counties and in Armstrong and Potter counties within the Panhandle [Groundwater Conservation District]; and
- The total average drawdown is approximately 40 feet in 50 years for the period 2012-2062, collectively in Randall County, and in Armstrong and Potter counties within the High Plains [Underground Water Conservation District No. 1].

## ***METHODS:***

The groundwater availability model for the High Plains Aquifer System was run using the model files submitted with the explanatory report. The modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Annual pumping rates for the Ogallala Aquifer (inclusive of the Rita Blanca Aquifer) and Dockum Aquifer were divided by county and groundwater conservation district, subtotaled by groundwater conservation district, and then summed for all of Groundwater Management Area 1 (Figures 1 and 3 and Tables 1 and 3). Modeled available groundwater for the Ogallala Aquifer (inclusive of the Rita Blanca Aquifer) and Dockum Aquifer were also divided by county, river basin, regional water planning area, and groundwater conservation district (Figures 2 and 4 and Tables 2 and 4).

## **Modeled Available Groundwater and Permitting**

Chapter 36 of the Texas Water Code defines “modeled available groundwater” as the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits.

## ***PARAMETERS AND ASSUMPTIONS:***

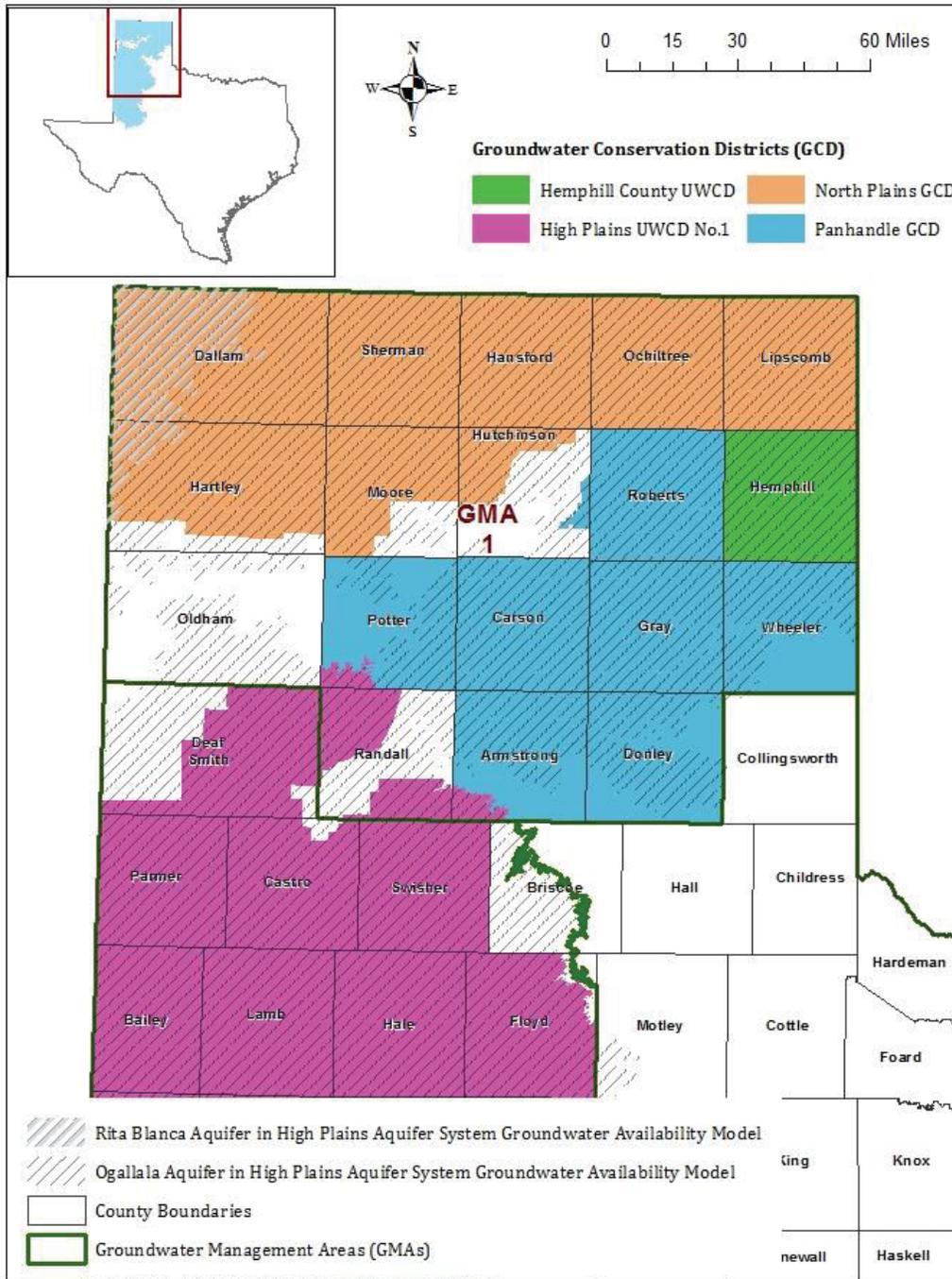
The parameters and assumptions for the groundwater availability are described below:

- Version 1.01 of the groundwater availability model for the High Plains Aquifer System was used for this analysis. See Deeds and Jigmond (2015) for assumptions and limitations of the groundwater availability model.
- This groundwater availability model includes 4 layers which generally represent the Ogallala Aquifer and other younger geologic units (Layer 1), geologic units that directly overlie the Dockum Aquifer, the Rita Blanca and Edwards-Trinity (High Plains) aquifers (Layer 2), upper portion of the Dockum Aquifer (Layer 3), and the lower portion of the Dockum Aquifer (Layer 4).
- The model was run with MODFLOW-NWT (Niswonger and others, 2011) which is based on MODFLOW-2005 (Harbaugh, 2005).
- The analysis assumed model extent within Texas for all aquifers except for the Rita Blanca Aquifer, which assumed the official TWDB mapped aquifer boundary.

- Only the cells in Lower Dockum (Layer 4) were considered while processing results (desired future conditions and modeled available groundwater) for the Dockum Aquifer. The Groundwater Management Area consultant, Dr. Deeds (INTERA, Incorporated), confirmed this on March 6, 2017, in response to a clarification letter sent by Groundwater staff to Groundwater Management Area 1 on February 27, 2017. Mr. Ingham, chair of Groundwater Management Area 1, agreed with the assumptions while responding to the clarification letter on March 21, 2017.

### ***RESULTS:***

The modeled available groundwater estimates for the Ogallala Aquifer (including the Rita Blanca Aquifer) range from 3,553,273 acre-feet per year in 2020 to 2,236,434 acre-feet per year in 2062 (Table 1). The modeled available groundwater estimates for the Dockum Aquifer range from 261,079 acre-feet per year in 2020 to 229,900 acre-feet per year in 2062 (Table 3). Modeled available groundwater estimates for each aquifer are summarized by groundwater conservation district and by county, river basin, and regional water planning area for use in the regional water planning process (Figures 1 to 4 and Tables 1 to 4). Small differences of values between table summaries are due to rounding.



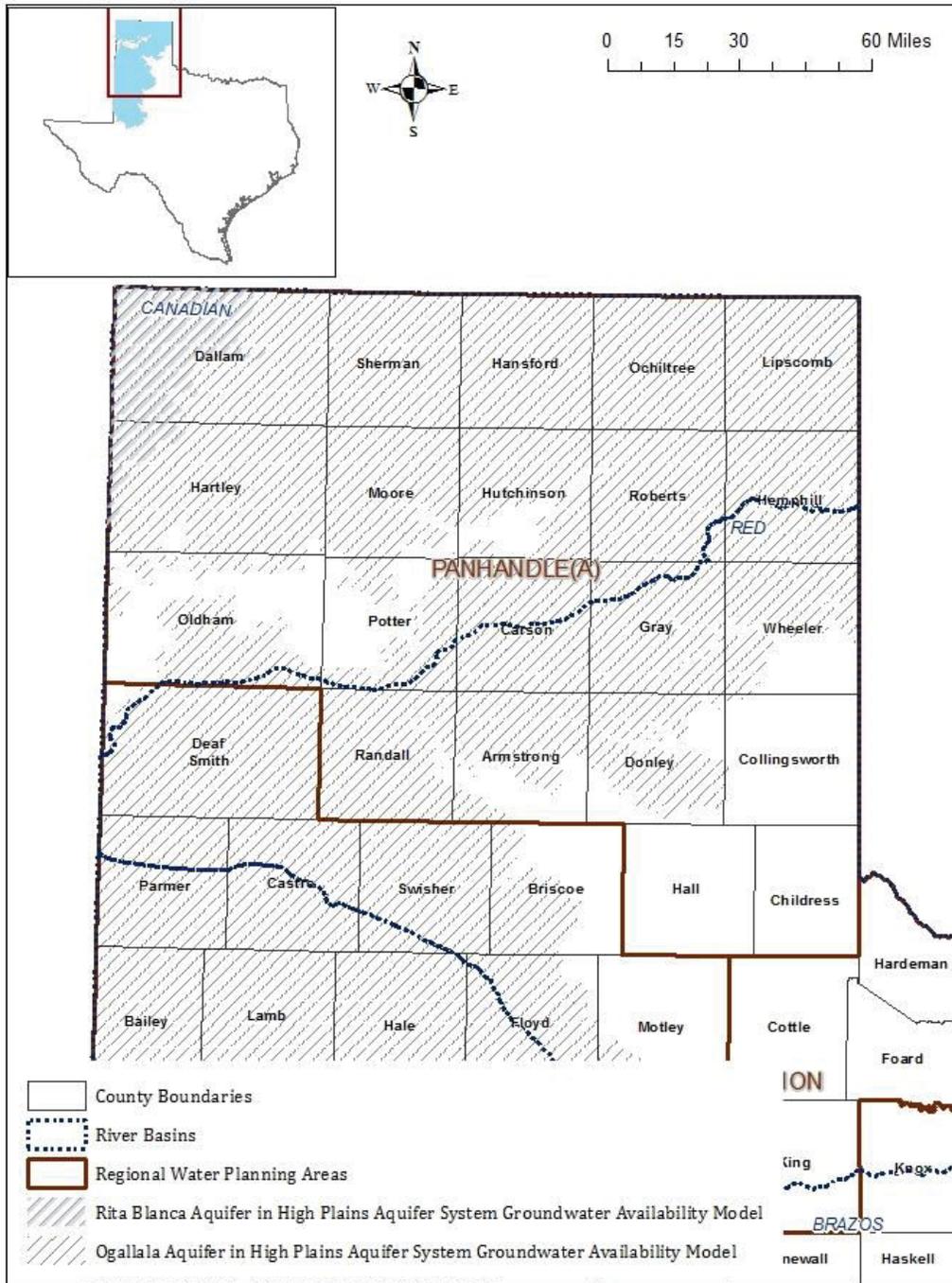
**FIGURE 1. MAP SHOWING THE OGALLALA AND RITA BLANCA AQUIFERS AND GROUNDWATER CONSERVATION DISTRICTS IN GROUNDWATER MANAGEMENT AREA 1 OVERLAIN BY THE GROUNDWATER AVAILABILITY MODEL EXTENT FOR THE HIGH PLAINS AQUIFER SYSTEM.**

**TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AND RITA BLANCA AQUIFERS IN GROUNDWATER MANAGEMENT AREA 1 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE (2020 TO 2060) AND THE YEAR 2062. VALUES ARE IN ACRE-FEET PER YEAR.**

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2062
High Plains UWCD No. 1	Armstrong	Ogallala	1,286	1,048	866	723	610	591
High Plains UWCD No. 1	Potter	Ogallala	225	225	225	223	221	221
High Plains UWCD No. 1	Randall	Ogallala	39,084	37,987	32,477	28,334	25,018	24,459
<b>High Plains UWCD No. 1 Total</b>		<b>Ogallala</b>	<b>40,595</b>	<b>39,260</b>	<b>33,568</b>	<b>29,280</b>	<b>25,849</b>	<b>25,271</b>
Hemphill County UWCD Total	Hemphill	Ogallala	52,196	52,218	52,267	52,305	52,336	52,341
North Plains GCD	Dallam	Ogallala/Rita Blanca	387,471	287,205	225,573	166,890	112,864	103,258
North Plains GCD	Hansford	Ogallala	275,016	272,656	271,226	270,281	269,589	269,479
North Plains GCD	Hartley	Ogallala	397,585	271,523	212,321	154,433	100,407	90,842
North Plains GCD	Hutchinson	Ogallala	62,803	64,522	65,652	66,075	66,027	65,956
North Plains GCD	Lipscomb	Ogallala	266,809	266,710	266,640	266,591	266,559	266,557
North Plains GCD	Moore	Ogallala	214,853	172,621	139,322	105,016	73,384	67,650
North Plains GCD	Ochiltree	Ogallala	243,778	243,932	244,002	244,051	244,082	244,085
North Plains GCD	Sherman	Ogallala	398,056	348,895	281,690	212,744	148,552	136,776
<b>North Plains GCD Total</b>		<b>Ogallala/Rita Blanca</b>	<b>2,246,371</b>	<b>1,928,064</b>	<b>1,706,426</b>	<b>1,486,081</b>	<b>1,281,464</b>	<b>1,244,603</b>

**Table 1 (Continued)**

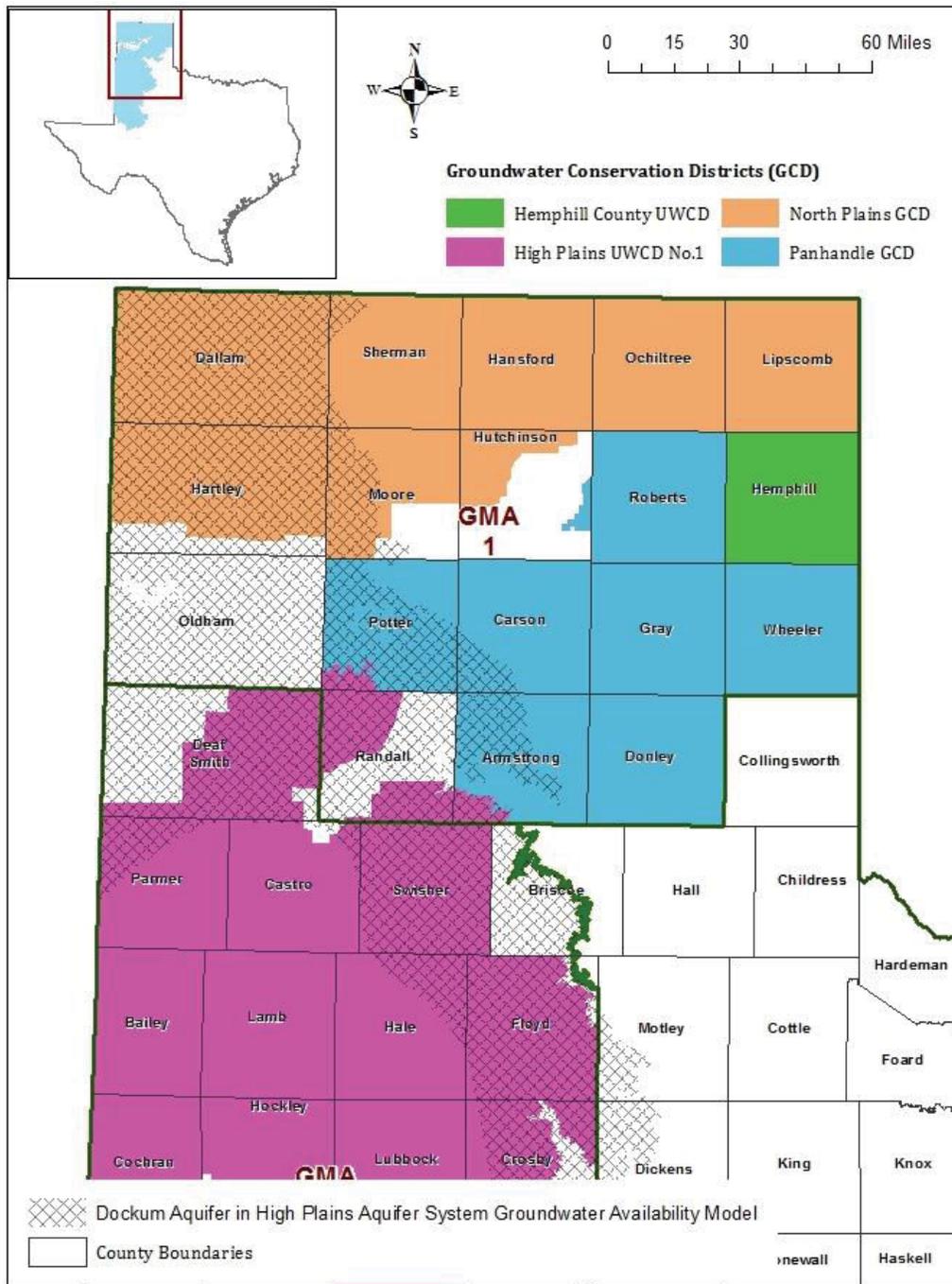
<b>Groundwater Conservation District</b>	<b>County</b>	<b>Aquifer</b>	<b>2020</b>	<b>2030</b>	<b>2040</b>	<b>2050</b>	<b>2060</b>	<b>2062</b>
Panhandle GCD	Armstrong	Ogallala	57,984	53,414	48,170	43,462	38,860	38,080
Panhandle GCD	Carson	Ogallala	192,135	184,263	169,931	153,767	137,215	134,055
Panhandle GCD	Donley	Ogallala	74,808	76,289	72,962	67,873	62,058	60,901
Panhandle GCD	Gray	Ogallala	181,105	175,267	162,653	148,713	134,431	131,744
Panhandle GCD	Hutchinson	Ogallala	15,734	16,740	15,156	13,324	11,742	11,455
Panhandle GCD	Potter	Ogallala	16,969	15,820	14,442	13,162	11,836	11,609
Panhandle GCD	Roberts	Ogallala	430,618	455,129	427,218	390,247	350,459	342,748
Panhandle GCD	Wheeler	Ogallala	130,425	138,810	137,385	132,312	124,778	123,309
<b>Panhandle GCD Total</b>		<b>Ogallala</b>	<b>1,099,778</b>	<b>1,115,732</b>	<b>1,047,917</b>	<b>962,860</b>	<b>871,379</b>	<b>853,901</b>
No District-County	Hartley	Ogallala	19,528	17,639	14,527	11,147	8,016	7,458
No District-County	Moore	Ogallala	8,932	8,598	7,592	6,186	4,788	4,532
No District-County	Oldham	Ogallala	44,599	40,203	33,423	26,207	19,590	18,617
No District-County	Randall	Ogallala	24,826	23,945	21,864	19,471	17,012	16,541
No District-County	Hutchinson	Ogallala	16,448	14,432	13,353	12,973	13,089	13,170
<b>No District-County Total</b>		<b>Ogallala</b>	<b>114,333</b>	<b>104,817</b>	<b>90,759</b>	<b>75,984</b>	<b>62,495</b>	<b>60,318</b>
<b>GMA 1 - Total</b>		<b>Ogallala/Rita Blanca</b>	<b>3,553,273</b>	<b>3,240,091</b>	<b>2,930,937</b>	<b>2,606,510</b>	<b>2,293,523</b>	<b>2,236,434</b>



**FIGURE 2. MAP SHOWING THE OGALLALA AND RITA BLANCA AQUIFERS AND REGIONAL WATER PLANNING AREAS, COUNTIES, AND RIVER BASINS IN GROUNDWATER MANAGEMENT AREA 1 OVERLAIN BY THE GROUNDWATER AVAILABILITY MODEL EXTENT FOR THE HIGH PLAINS AQUIFER SYSTEM.**

**TABLE 2. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE OGALLALA AND RITA BLANCA AQUIFERS IN GROUNDWATER MANAGEMENT AREA 1 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA) FOR EACH DECADE (2020 TO 2060). VALUES ARE IN ACRE-FEET PER YEAR.**

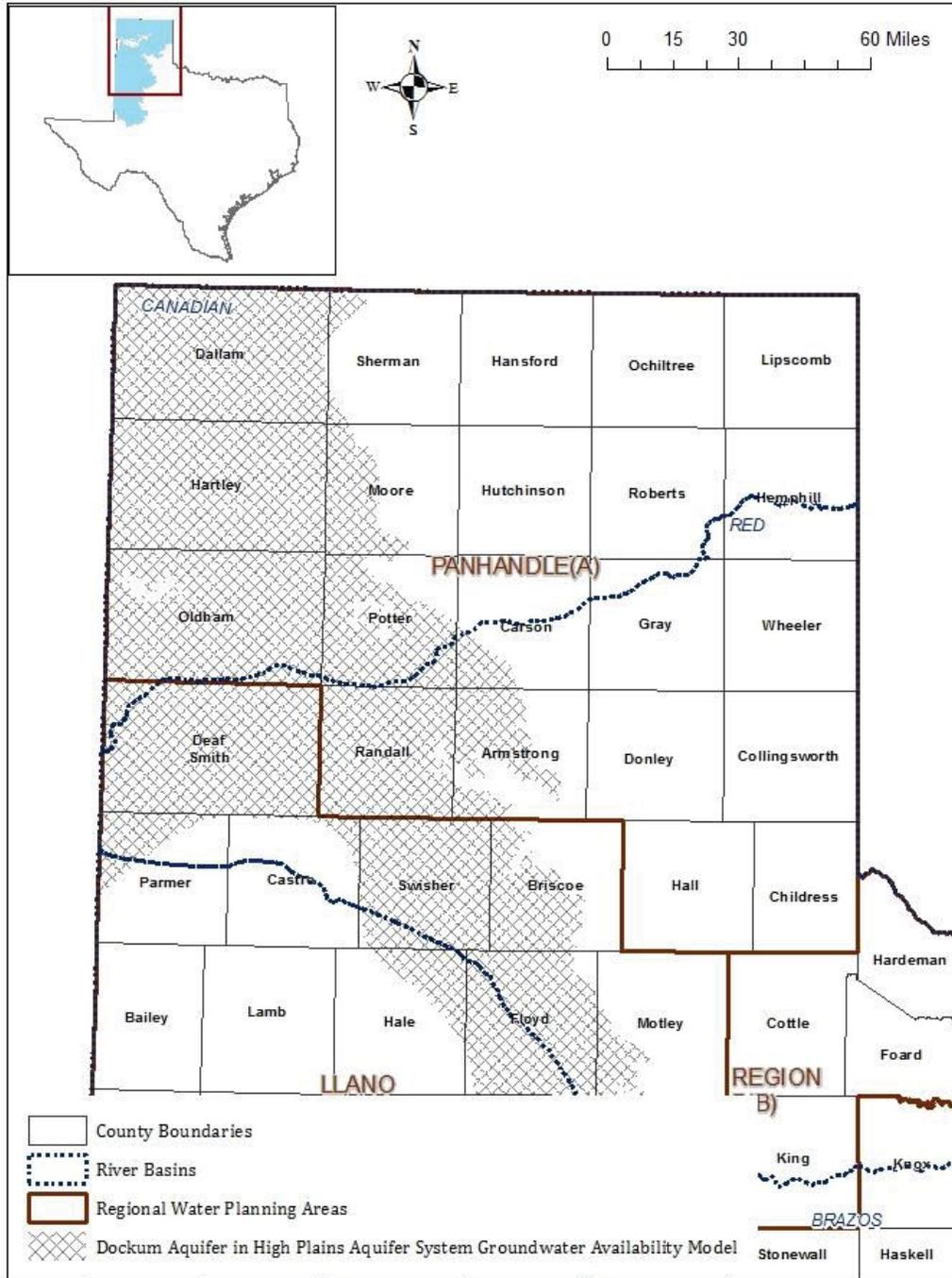
County	RWPA	River Basin	Aquifer	2020	2030	2040	2050	2060
Armstrong	A	Red	Ogallala	59,270	54,462	49,036	44,185	39,470
Carson	A	Canadian	Ogallala	77,157	74,542	69,042	62,520	55,902
Carson	A	Red	Ogallala	114,978	109,721	100,889	91,247	81,313
Dallam	A	Canadian	Ogallala/Rita Blanca	387,471	287,205	225,573	166,890	112,864
Donley	A	Red	Ogallala	74,808	76,289	72,962	67,873	62,058
Gray	A	Canadian	Ogallala	44,778	42,146	37,337	32,130	27,432
Gray	A	Red	Ogallala	136,327	133,121	125,316	116,583	106,999
Hansford	A	Canadian	Ogallala	275,016	272,656	271,226	270,281	269,589
Hartley	A	Canadian	Ogallala	417,113	289,162	226,848	165,580	108,423
Hemphill	A	Canadian	Ogallala	27,789	30,260	31,999	33,363	34,058
Hemphill	A	Red	Ogallala	24,407	21,958	20,268	18,942	18,278
Hutchinson	A	Canadian	Ogallala	94,985	95,694	94,161	92,372	90,858
Lipscomb	A	Canadian	Ogallala	266,809	266,710	266,640	266,591	266,559
Moore	A	Canadian	Ogallala	223,785	181,219	146,914	111,202	78,172
Ochiltree	A	Canadian	Ogallala	243,778	243,932	244,002	244,051	244,082
Oldham	A	Canadian	Ogallala	37,367	34,376	29,078	23,039	17,800
Oldham	A	Red	Ogallala	7,232	5,827	4,345	3,168	1,790
Potter	A	Canadian	Ogallala	9,552	9,196	8,519	7,898	7,214
Potter	A	Red	Ogallala	7,642	6,849	6,148	5,487	4,843
Randall	A	Red	Ogallala	63,910	61,932	54,341	47,805	42,030
Roberts	A	Canadian	Ogallala	408,968	430,269	401,642	365,119	326,457
Roberts	A	Red	Ogallala	21,650	24,860	25,576	25,128	24,002
Sherman	A	Canadian	Ogallala	398,056	348,895	281,690	212,744	148,552
Wheeler	A	Red	Ogallala	130,425	138,810	137,385	132,312	124,778
<b>GMA 1 Total</b>				<b>3,553,273</b>	<b>3,240,091</b>	<b>2,930,937</b>	<b>2,606,510</b>	<b>2,293,523</b>



**FIGURE 3. MAP SHOWING THE DOCKUM AQUIFER AND GROUNDWATER CONSERVATION DISTRICTS IN GROUNDWATER MANAGEMENT AREA 1 OVERLAIN BY THE GROUNDWATER AVAILABILITY MODEL EXTENT FOR THE HIGH PLAINS AQUIFER SYSTEM.**

**TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 1 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE (2020 TO 2060) AND THE YEAR 2062. VALUES ARE IN ACRE-FEET PER YEAR.**

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2062
High Plains UWCD No. 1	Armstrong	Dockum	96	0	0	0	0	0
High Plains UWCD No. 1	Potter	Dockum	21	0	0	0	0	0
High Plains UWCD No. 1	Randall	Dockum	2,189	2,714	2,954	3,111	3,214	3,229
<b>High Plains UWCD No. 1 Total</b>		<b>Dockum</b>	<b>2,306</b>	<b>2,714</b>	<b>2,954</b>	<b>3,111</b>	<b>3,214</b>	<b>3,229</b>
North Plains GCD	Dallam	Dockum	14,192	14,188	14,186	14,184	14,184	14,184
North Plains GCD	Moore	Dockum	4,801	4,532	4,493	4,417	4,289	4,261
North Plains GCD	Hartley	Dockum	11,602	10,766	10,524	10,560	10,815	10,895
North Plains GCD	Sherman	Dockum	127	127	127	127	95	93
<b>North Plains GCD Total</b>		<b>Dockum</b>	<b>30,722</b>	<b>29,613</b>	<b>29,330</b>	<b>29,288</b>	<b>29,383</b>	<b>29,433</b>
Panhandle GCD	Armstrong	Dockum	7,131	9,024	9,588	9,704	9,535	9,494
Panhandle GCD	Carson	Dockum	68	108	140	169	198	204
Panhandle GCD	Potter	Dockum	38,803	39,113	36,937	34,505	32,008	31,558
<b>Panhandle GCD Total</b>		<b>Dockum</b>	<b>46,002</b>	<b>48,245</b>	<b>46,665</b>	<b>44,378</b>	<b>41,741</b>	<b>41,256</b>
No District-County	Hartley	Dockum	43,647	44,269	44,404	44,304	44,022	43,941
No District-County	Moore	Dockum	418	575	527	509	500	498
No District-County	Oldham	Dockum	129,001	128,829	120,518	111,196	101,413	99,736
No District-County	Randall	Dockum	8,983	11,302	11,909	12,002	11,855	11,807
<b>No District-County Total</b>		<b>Dockum</b>	<b>182,049</b>	<b>184,975</b>	<b>177,358</b>	<b>168,011</b>	<b>157,790</b>	<b>155,982</b>
<b>GMA 1 Total</b>		<b>Dockum</b>	<b>261,079</b>	<b>265,547</b>	<b>256,307</b>	<b>244,788</b>	<b>232,128</b>	<b>229,900</b>



**FIGURE 4. MAP SHOWING THE DOCKUM AQUIFER AND REGIONAL WATER PLANNING AREAS, COUNTIES, AND RIVER BASINS IN GROUNDWATER MANAGEMENT AREA 1 OVERLAIN BY THE GROUNDWATER AVAILABILITY MODEL EXTENT FOR THE HIGH PLAINS AQUIFER SYSTEM.**

**TABLE 4. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 1 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA) FOR EACH DECADE (2020 TO 2060). VALUES ARE IN ACRE-FEET PER YEAR.**

County	RWPA	River Basin	Aquifer	2020	2030	2040	2050	2060
Armstrong	A	Red	Dockum	7,227	9,024	9,588	9,704	9,535
Carson	A	Canadian	Dockum	4	10	15	19	23
Carson	A	Red	Dockum	64	98	125	150	175
Dallam	A	Canadian	Dockum	14,192	14,188	14,186	14,184	14,184
Hartley	A	Canadian	Dockum	55,249	55,035	54,928	54,864	54,837
Moore	A	Canadian	Dockum	5,219	5,107	5,020	4,926	4,789
Oldham	A	Canadian	Dockum	128,938	128,771	120,466	111,146	101,365
Oldham	A	Red	Dockum	63	58	52	50	48
Potter	A	Canadian	Dockum	38,641	38,983	36,832	34,409	31,900
Potter	A	Red	Dockum	183	130	105	96	108
Randall	A	Red	Dockum	11,172	14,016	14,863	15,113	15,069
Sherman	A	Canadian	Dockum	127	127	127	127	95
<b>GMA 1 Total</b>			<b>Dockum</b>	<b>261,079</b>	<b>265,547</b>	<b>256,307</b>	<b>244,788</b>	<b>232,128</b>

### ***LIMITATIONS:***

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

“Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results.”

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historic time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

The TWDB is available to work with groundwater conservation districts to use ongoing data collection programs to compare the predictions of the model against how the aquifer responds to the actual amount and location of pumping. Besides groundwater pumping and use trends, historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

**REFERENCES:**

- Deeds, N.E., and Walthour, S.D., 2016, Groundwater Management Area 1 (GMA 1), Desired Future Conditions Explanatory Report (Groundwater Management Area 1), December 12, 2016.
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- Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models, U.S. Geological Survey Groundwater Software.
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- National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., [http://www.nap.edu/catalog.php?record\\_id=11972](http://www.nap.edu/catalog.php?record_id=11972).
- Texas Water Code, 2011, <http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf>.

# Appendix E



**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

# Estimated Historical Groundwater Use And 2022 State Water Plan Datasets: Hemphill County Underground Water Conservation District

Texas Water Development Board  
Groundwater Division  
Groundwater Technical Assistance Section  
stephen.allen@twdb.texas.gov  
(512) 463-7317  
January 10, 2022

## ***GROUNDWATER MANAGEMENT PLAN DATA:***

This package of water data reports (part 1 of a 2-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five-year groundwater management plan. Each report in the package addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan checklist. The checklist can be viewed and downloaded from this web address:

<https://www.twdb.texas.gov/groundwater/docs/GCD/GMPChecklist0113.pdf>

The five reports included in this part are:

1. Estimated Historical Groundwater Use (checklist item 2)  
*from the TWDB Historical Water Use Survey (WUS)*
2. Projected Surface Water Supplies (checklist item 6)
3. Projected Water Demands (checklist item 7)
4. Projected Water Supply Needs (checklist item 8)
5. Projected Water Management Strategies (checklist item 9)  
*from the 2022 Texas State Water Plan (SWP)*

Part 2 of the 2-part package is the groundwater availability model (GAM) report for the District (checklist items 3 through 5). The District should have received, or will receive, this report from the Groundwater Availability Modeling Section. Questions about the GAM can be directed to Dr. Shirley Wade, shirley.wade@twdb.texas.gov, (512) 936-0883.

***DISCLAIMER:***

The data presented in this report represents the most up-to-date WUS and 2022 SWP data available as of 1/10/2022. Although it does not happen frequently, either of these datasets are subject to change pending the availability of more accurate WUS data or an amendment to the 2022 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

<https://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/>

The 2022 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317).

# Estimated Historical Water Use

## TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2020. TWDB staff anticipates the calculation and posting of these estimates at a later date.

### HEMPHILL COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	540	0	163	0	5,273	978	6,954
	SW	0	0	41	0	0	172	213
2018	GW	592	0	382	0	5,916	978	7,868
	SW	0	0	95	0	0	172	267
2017	GW	733	0	309	0	5,542	944	7,528
	SW	0	0	77	0	0	167	244
2016	GW	778	1	171	0	5,691	1,053	7,694
	SW	0	0	43	0	0	186	229
2015	GW	640	1	316	0	3,079	1,043	5,079
	SW	0	0	79	0	0	184	263
2014	GW	796	1	540	0	2,972	1,014	5,323
	SW	0	0	135	0	0	179	314
2013	GW	823	1	543	0	6,469	963	8,799
	SW	0	0	136	0	0	170	306
2012	GW	891	1	537	0	9,019	1,034	11,482
	SW	0	0	134	0	0	183	317
2011	GW	937	2	51	0	10,258	1,059	12,307
	SW	0	0	13	0	0	186	199
2010	GW	731	2	491	0	4,549	902	6,675
	SW	0	0	259	0	0	159	418
2009	GW	732	4	535	0	3,821	1,003	6,095
	SW	0	0	282	0	0	177	459
2008	GW	775	3	579	0	9,140	1,082	11,579
	SW	0	0	305	0	0	192	497
2007	GW	691	2	0	0	5,769	1,294	7,756
	SW	0	0	0	0	0	229	229
2006	GW	671	2	0	0	7,187	1,991	9,851
	SW	0	0	0	0	0	351	351
2005	GW	666	2	0	0	6,824	1,223	8,715
	SW	0	0	0	0	0	216	216
2004	GW	676	2	0	0	1,451	314	2,443
	SW	0	0	0	0	0	1,206	1,206

# Projected Surface Water Supplies

## TWDB 2022 State Water Plan Data

### HEMPHILL COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
A	LIVESTOCK, HEMPHILL	CANADIAN	CANADIAN LIVESTOCK LOCAL SUPPLY	248	248	248	248	248	248
A	LIVESTOCK, HEMPHILL	RED	RED LIVESTOCK LOCAL SUPPLY	173	173	173	173	173	173
<b>Sum of Projected Surface Water Supplies (acre-feet)</b>				<b>421</b>	<b>421</b>	<b>421</b>	<b>421</b>	<b>421</b>	<b>421</b>

# Projected Water Demands

## TWDB 2022 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

### HEMPHILL COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
A	CANADIAN	CANADIAN	823	906	978	1,057	1,130	1,199
A	COUNTY-OTHER, HEMPHILL	CANADIAN	97	95	92	94	95	95
A	COUNTY-OTHER, HEMPHILL	RED	42	41	41	41	41	42
A	IRRIGATION, HEMPHILL	CANADIAN	3,919	3,919	3,919	3,919	3,919	3,919
A	IRRIGATION, HEMPHILL	RED	1,760	1,760	1,760	1,760	1,760	1,760
A	LIVESTOCK, HEMPHILL	CANADIAN	663	680	699	718	739	760
A	LIVESTOCK, HEMPHILL	RED	454	466	478	492	505	520
A	MANUFACTURING, HEMPHILL	CANADIAN	4	4	4	4	4	4
A	MANUFACTURING, HEMPHILL	RED	1	2	2	2	2	2
A	MINING, HEMPHILL	CANADIAN	926	706	498	293	89	27
A	MINING, HEMPHILL	RED	1,388	1,057	746	439	134	41
<b>Sum of Projected Water Demands (acre-feet)</b>			<b>10,077</b>	<b>9,636</b>	<b>9,217</b>	<b>8,819</b>	<b>8,418</b>	<b>8,369</b>

# Projected Water Supply Needs

## TWDB 2022 State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

### HEMPHILL COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
A	CANADIAN	CANADIAN	165	181	196	211	226	240
A	COUNTY-OTHER, HEMPHILL	CANADIAN	0	0	0	0	0	0
A	COUNTY-OTHER, HEMPHILL	RED	0	0	0	0	0	0
A	IRRIGATION, HEMPHILL	CANADIAN	0	0	0	0	0	0
A	IRRIGATION, HEMPHILL	RED	0	0	0	0	0	0
A	LIVESTOCK, HEMPHILL	CANADIAN	0	0	0	0	0	0
A	LIVESTOCK, HEMPHILL	RED	0	0	0	0	0	0
A	MANUFACTURING, HEMPHILL	CANADIAN	0	0	0	0	0	0
A	MANUFACTURING, HEMPHILL	RED	1	0	0	0	0	0
A	MINING, HEMPHILL	CANADIAN	0	0	0	0	0	0
A	MINING, HEMPHILL	RED	0	0	0	0	0	0
<b>Sum of Projected Water Supply Needs (acre-feet)</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

# Projected Water Management Strategies

## TWDB 2022 State Water Plan Data

### HEMPHILL COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
<b>CANADIAN, CANADIAN (A)</b>							
MUNICIPAL CONSERVATION - CANADIAN	DEMAND REDUCTION [HEMPHILL]	10	11	12	13	14	15
		<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
<b>IRRIGATION, HEMPILL, CANADIAN (A)</b>							
IRRIGATION CONSERVATION - HEMPILL COUNTY	DEMAND REDUCTION [HEMPHILL]	67	134	203	267	330	393
		<b>67</b>	<b>134</b>	<b>203</b>	<b>267</b>	<b>330</b>	<b>393</b>
<b>IRRIGATION, HEMPILL, RED (A)</b>							
IRRIGATION CONSERVATION - HEMPILL COUNTY	DEMAND REDUCTION [HEMPHILL]	30	60	91	120	148	176
		<b>30</b>	<b>60</b>	<b>91</b>	<b>120</b>	<b>148</b>	<b>176</b>
<b>Sum of Projected Water Management Strategies (acre-feet)</b>		<b>107</b>	<b>205</b>	<b>306</b>	<b>400</b>	<b>492</b>	<b>584</b>

# Appendix F

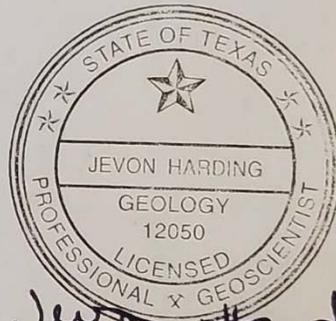


**HEMPHILL COUNTY**  
**Underground Water Conservation District**  
*Conserving a Texas Oasis*

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**GAM RUN 22-001: HEMPHILL COUNTY  
UNDERGROUND WATER CONSERVATION DISTRICT  
MANAGEMENT PLAN**

Jevon Harding, P.G.  
Texas Water Development Board  
Groundwater Division  
Groundwater Availability Modeling Department  
(512) 463-7979  
January 31, 2022



*Jevon Harding*  
1-20-22

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# GAM RUN 22-001: HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT MANAGEMENT PLAN

Jevon Harding, P.G.  
Texas Water Development Board  
Groundwater Division  
Groundwater Availability Modeling Department  
(512) 463-7979  
January 31, 2022

## ***EXECUTIVE SUMMARY:***

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2011), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the Executive Administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the Executive Administrator.

The TWDB provides data and information to the Hemphill County Underground Water Conservation District in two parts. Part 1 is the Estimated Historical Water Use/State Water Plan dataset report, which will be provided to you separately by the TWDB Groundwater Technical Assistance Department. Please direct questions about the water data report to Mr. Stephen Allen at 512-463-7317 or [stephen.allen@twdb.texas.gov](mailto:stephen.allen@twdb.texas.gov). Part 2 is the required groundwater availability modeling information, and this information includes:

1. the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;
2. for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface-water bodies, including lakes, streams, and rivers; and
3. the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The groundwater management plan for the Hemphill County Underground Water Conservation District should be adopted by the district on or before May 26, 2022 and

submitted to the executive administrator of the TWDB on or before June 25, 2022. The current management plan for the Hemphill County Underground Water Conservation District expires on August 24, 2022.

We used the groundwater availability model for the High Plains Aquifer System version 1.01 (Deeds and Jigmond, 2015) to estimate the management plan information for the Ogallala Aquifer within the Hemphill County Underground Water Conservation District.

This report replaces the results of GAM Run 16-010 (Goswami, 2016). Values may differ from the previous report as a result of routine updates to the spatial grid file used to define county, groundwater conservation district, and aquifer boundaries, which can impact the calculated water budget values. Additionally, the approach used for analyzing model results is reviewed during each update and may have been refined to better delineate groundwater flows. This report also includes a new figure to help groundwater conservation districts better visualize water budget components that was not included in the previous report. Table 1 summarizes the groundwater availability model data required by statute. Figure 1 shows the area of the model from which the values in the tables were extracted. Figure 2 provides generalized diagrams of the groundwater flow components provided in Table 1. If, after review of the figures, the Hemphill County Underground Water Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

### ***METHODS:***

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability model mentioned above was used to estimate information for the Hemphill County Underground Water Conservation District management plan. Water budgets were extracted for the historical period from 1980 to 2012 for the Ogallala Aquifer using ZONEBUDGET Version 3.01 (Harbaugh, 2009). The average annual water budget values for recharge, surface-water outflow, inflow to the district, outflow from the district, and the flow between aquifers within the district are summarized in this report.

### ***PARAMETERS AND ASSUMPTIONS:***

#### ***Ogallala Aquifer***

- We used version 1.01 of the groundwater availability model for the High Plains Aquifer System to analyze the Ogallala Aquifer. See Deeds and others (2015) and Deeds and Jigmond (2015) for assumptions and limitations of the model.

- The groundwater availability model for the High Plains Aquifer System contains four layers (from top to bottom):
  - Layer 1 — Ogallala Aquifer,
  - Layer 2 — Rita Blanca, Edwards-Trinity (High Plains), and Edwards-Trinity (Plateau) aquifers,
  - Layer 3 — the upper portion of the Dockum Aquifer and equivalent units, and
  - Layer 4 — the lower portion of the Dockum Aquifer and equivalent units
- An individual water budget for the district was determined for the Ogallala Aquifer (Layer 1). The Rita Blanca, Edwards-Trinity (High Plains), Edwards-Trinity (Plateau), and Dockum aquifers do not occur within the Hemphill County Underground Water Conservation District and therefore no groundwater budget values are included for it in this report.
- Water budget terms were averaged for the period 1980 to 2012 (stress periods 52 through 84)
- The model was run with MODFLOW-NWT (Niswonger and others, 2011).

## ***RESULTS:***

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Ogallala Aquifer located within the Hemphill County Underground Water Conservation District and averaged over the historical calibration period, as shown in Table 1.

1. Precipitation recharge—the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.
2. Surface-water outflow—the total water discharging from the aquifer (outflow) to surface-water features such as streams, reservoirs, and springs.
3. Flow into and out of district—the lateral flow within the aquifer between the district and adjacent counties.

4. Flow between aquifers—the net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

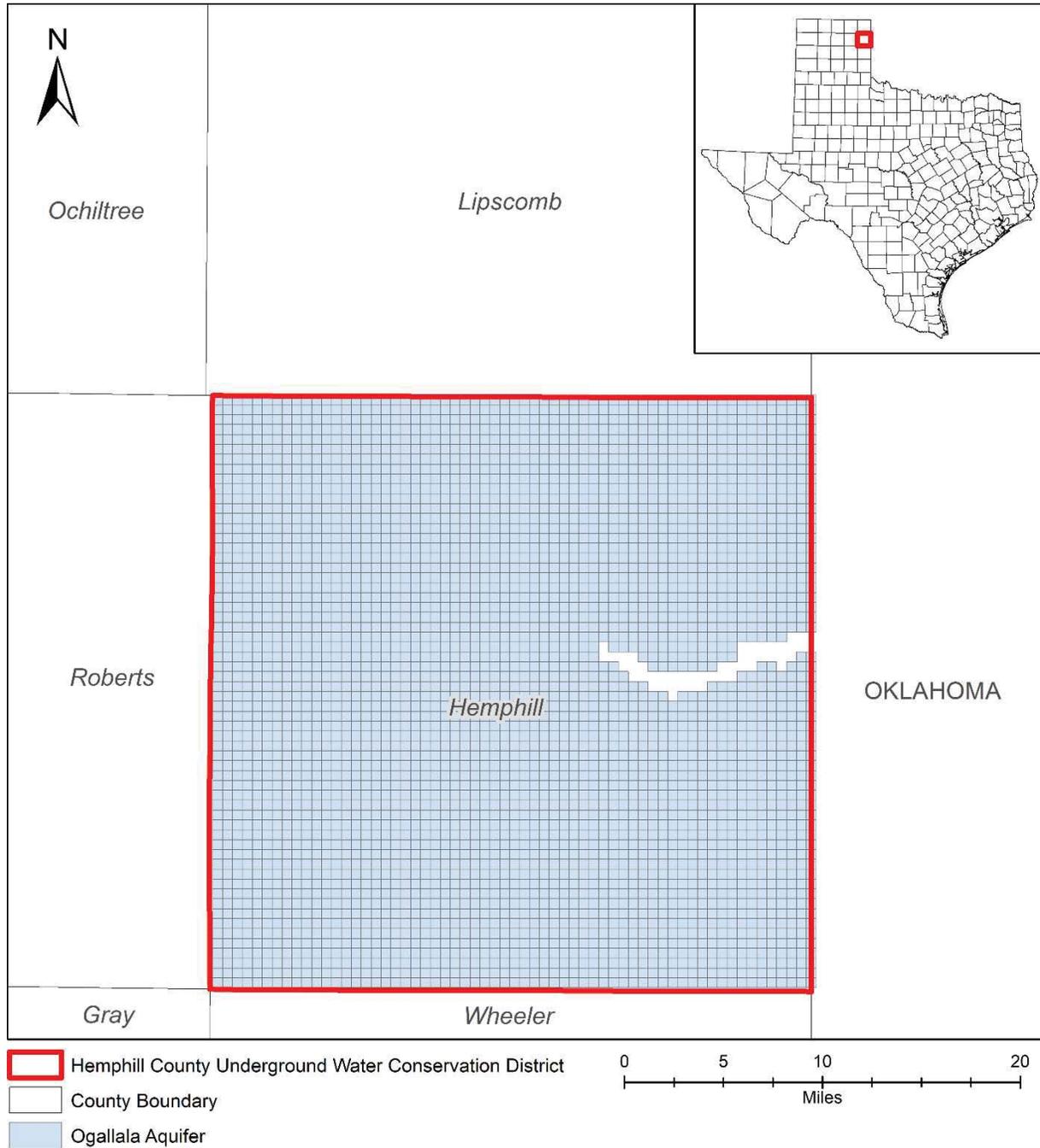
The information needed for the district's management plan is summarized in Table 1. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

**TABLE 1: SUMMARIZED INFORMATION FOR THE OGALLALA AQUIFER THAT IS NEEDED FOR THE HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT’S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.**

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Ogallala Aquifer	34,352
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers.	Ogallala Aquifer	34,024
Estimated annual volume of flow into the district within each aquifer in the district	Ogallala Aquifer	20,078
Estimated annual volume of flow out of the district within each aquifer in the district	Ogallala Aquifer	5,082
Estimated net annual volume of flow between each aquifer in the district <sup>1</sup>	From the Ogallala Aquifer into underlying units	Not applicable

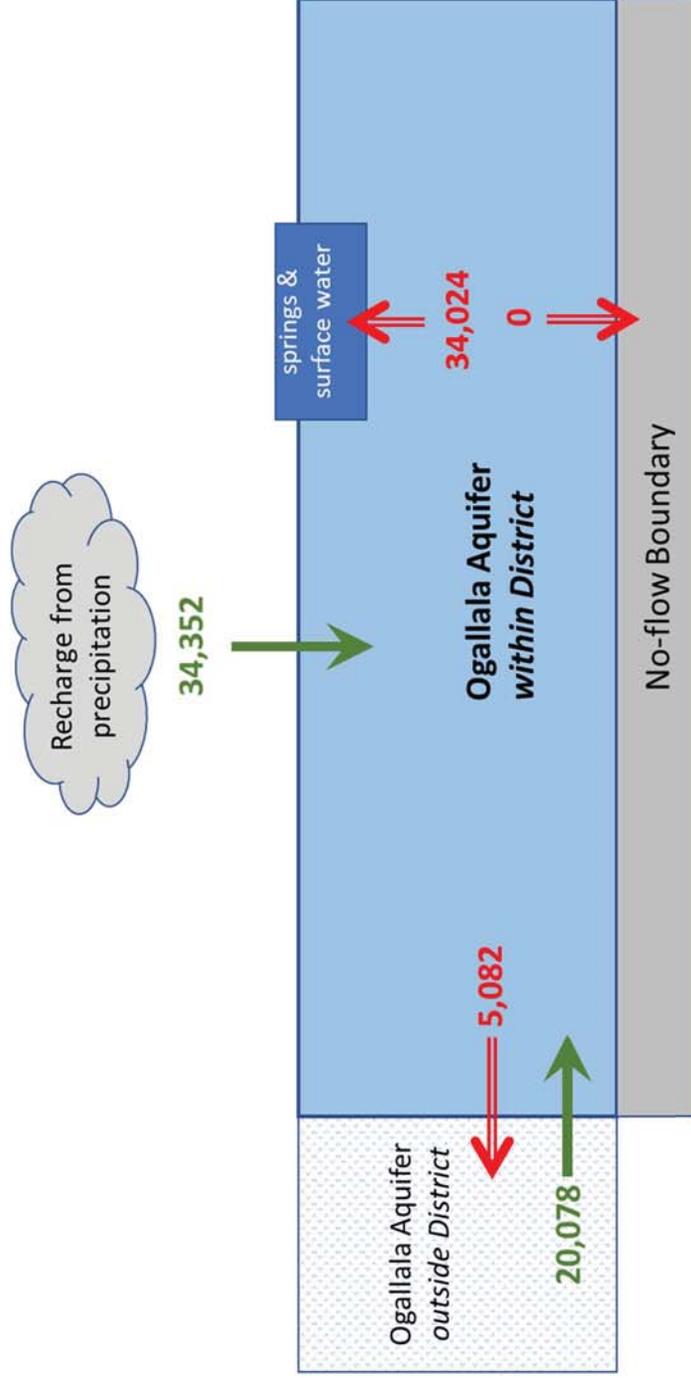
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<sup>1</sup> The model does not simulate any formations underlying the Ogallala Aquifer within the district boundaries.



GCD boundary data = 06.26.2020, county boundary date =07.03.2019, hpas model grid date = 01.06.2020

**FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE OGALLALA FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE OGALLALA AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).**



*Caveat: This diagram only includes the water budget items provided in Table 1. A complete water budget would include additional inflows and outflows. If the District requires values for additional water budget items, please contact TWDB.*

**FIGURE 2: GENERALIZED DIAGRAM OF THE SUMMARIZED BUDGET INFORMATION FROM TABLE 1, REPRESENTING DIRECTIONS OF FLOW FOR THE OGALLALA AQUIFER WITHIN HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT. FLOW VALUES EXPRESSED IN ACRE-FEET PER YEAR (AFY).**

### ***LIMITATIONS:***

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

*“Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results.”*

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historical pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and interaction with streams are specific to particular historic time periods.

Because the application of the groundwater models was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

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