Mesquite Groundwater Conservation District

DISTRICT GROUNDWATER MANAGEMENT PLAN

2024

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District Mission

The mission of the Mesquite Groundwater Conservation District is to develop, promote, and implement water conservation, augmentation, and management strategies to protect groundwater resources for the present and future benefit of the citizens, economy, and environment of the District.

Time Period for This Plan

This plan uses a ten-year planning horizon, becomes effective upon adoption by the Board of Directors, and remains in effect until a revised plan is approved, or until October 1, 2029, whichever is earlier. This plan will be readopted with or without changes by the District and submitted to the Texas Water Development Board (TWDB) for approval at least every five years.

Statement of Guiding Principles

The District recognizes that the water resources of the region are of vital importance. The utilization of this most valuable resource can be managed in a prudent and cost-effective manner through a variety of actions including education, cooperation, monitoring, permitting, and regulation. A basic understanding of the aquifers and their hydrogeologic properties, as well as a quantification of resources is the foundation from which to build prudent planning measures. This management document is intended as a tool to focus the thoughts and actions of those given the responsibility for the execution of district activities throughout the ten-year period that is the focus of this plan, i.e. (2018-2028).

General Description of Mesquite GCD

The District was originally created as Collingsworth County Underground Water Conservation District by the citizens of Collingsworth County through election in November 1986. Selected parcels from Childress County were added by individual landowner petition in May 2007. Hall County also joined the District by petition and confirmation election in May 2007. The present District name was adopted in October 2007. Selected parcels from Briscoe County have been added by individual landowner petition since the fall of 2012. Mesquite Groundwater Conservation District (Mesquite GCD) encompasses all of Collingsworth and Hall Counties and parts of northern Childress County and eastern Briscoe County. The District has an economy dominated by agricultural production. Agricultural income is derived primarily from peanuts, cotton, wheat, and beef production. About sixty-five percent of the District is rangeland, thirty percent is cropland, and the rest are urban, transportation, or water areas. Recreational hunting leases and production of petroleum also contribute to the economy within the District.

According to current District records, there are more than eight hundred irrigation wells in the District. Approximately six hundred twenty meters are installed within the District. Some are located on wells while others are located at irrigation pivots or drip irrigation stations. Several municipal and public supply wells are located within the District. The remaining wells are un-permitted water supplies for household and livestock consumption.

Location and Extent of Mesquite GCD

Mesquite GCD has an area of 1,870 square miles, or 1,196,358 acres, and is situated in the southeastern Panhandle of the State of Texas. The District is bounded on the east by Beckham and Harmon Counties of the State of Oklahoma; on the north by Wheeler County; on the west by Donley County & the remainder of Briscoe County and on the south by Motley County and the remainder of Childress County. The principal towns within the District are Wellington and Dodson in Collingsworth County; Memphis, Estelline, and Turkey in Hall County; and Quitaque in Briscoe County. There are no towns within the Childress County portion of the District.

Topography and Drainage of Mesquite GCD

The District consists of rolling plains heavily dissected by Red River drainage. The elevation of the land surface ranges from 1,576 to 2,817 feet above mean sea level.

Mesquite GCD lies entirely within the drainage systems of the Red River Basin. The Salt Fork and the Prairie Dog Town Fork of the Red River enter the District in the west, traverse the District and exit through the east. The Southern part of Hall County drains into the North Pease River. The Elm Creek watershed lies in the northeastern portion of the District. The Buck Creek watershed is in the central portion of the District.

Groundwater Resources of Mesquite GCD

The Seymour and Blaine aquifers are the primary sources of groundwater in the District. The Seymour strata typically overlies the Blaine Formation and/or Whitehorse Group.

The Seymour Aquifer is a major aquifer in Texas and consists of isolated areas of alluvium that are erosional remnants of a larger area. As defined by TWDB, it is composed of remnants of the Seymour Formation, the Lingos Formation, and younger alluvial deposits, all of Quaternary age. The aquifer is found in parts of many north-central and Panhandle counties of Texas, and in the District is present in four distinct and separate areas referred to as “Pods”. It consists of discontinuous beds of poorly sorted gravel, conglomerate, sand, and silty clay deposited during the Quaternary Period by eastward-flowing streams. Saturated thickness is typically between five and eighty feet. Aquifer thickness may exceed 250 feet in isolated spots in the western portion of Collingsworth County. The thickness in the eastern portion of the county is generally too thin to support irrigation. The aquifer is also generally thinner in Hall County but does support irrigation. This aquifer is under water-table conditions in most of its extent, but artesian conditions may occur where the water-bearing zone is overlain by clay. The lower, more permeable part of the aquifer produces the greatest amount of groundwater. Water quality is generally fresh to slightly saline, but some high saline problems occur. Nitrate concentrations in excess of drinking water standards are common.

The Seymour Aquifer comprises about twenty-three percent of the District area and provides about seventy-seven percent of the irrigation water in the District. Yields of wells range from five gallons per minute to as much as 1,000 gallons per minute depending upon saturated thickness, with yields averaging about 300 gallons per minute.

The Blaine Aquifer is composed of anhydrite and gypsum with interbedded dolomite and clay and is an important source of groundwater in the District. The Blaine Formation crops out in a band from Wheeler County south through Collingsworth and Childress Counties to Fisher County and extends westward in the subsurface to adjacent counties. In Collingsworth County the Blaine is found along the Salt Fork of Red River north to Wheeler County and east to the Oklahoma state line. The Blaine is also found South and East of Wellington, extending east to the Oklahoma state line and south to the Prairie Dog Town Fork of the Red River. There are also small areas in the northeast and southeast corners of Hall County. Recharge occurs fairly rapidly and travels primarily in the numerous solution channels of the Blaine under water-table conditions. Overall water quality is poor and salinity may be high, limiting the use of water for human and livestock consumption. Depth to water ranges from a few feet to greater than 200 feet. Well depths range up to 300 feet below ground surface. Well yields vary from a few gallons per minute up to 1,000 gallons per minute. Although water in storage is generally under water-table conditions, larger yields are often associated with those areas of the aquifer that are confined by relatively impervious beds. Dry holes or wells of low yield are commonly found adjacent to wells of moderate to high yields because of the uneven nature in confining beds and the occurrence of the water in solution zones. Groundwater not intercepted by wells tends to discharge naturally in areas of lower topography through seeps and springs. The Blaine Aquifer comprises about twenty-four percent of the District area and provides about nineteen percent of the irrigation water pumped in the District.

The Whitehorse Group is a Permian formation occurring in beds of shale, sand, gypsum, anhydrite, and dolomite. It constitutes the remainder of the District not occupied by the Seymour and Blaine, generally located in the south and west portions of Hall County and the western part of Collingsworth County. It has many of the same characteristics as the Blaine Formation. Recharge values were calculated using procedures from the Panhandle Regional Plan and Panhandle GCD. Water quality is fair to poor, and well yields vary greatly. Principal use is for livestock water, with some irrigation use in Hall County. The Whitehorse comprises about fifty-three percent of the land area of the District and provides approximately four percent of the irrigation water within the District.

Some maps indicate small areas of the Ogallala Aquifer present in extreme western and northwestern areas of the District. Data from wells in this area is not consistent with typical Ogallala characteristics, and indicate that these wells are actually pumping from the underlying formations.

Technical Information

The Groundwater Management Plan Data packet provided by TWDB is in Appendix A. The Groundwater Availability Model GAM Run 23-013(for Management Plan) provided by TWDB is in Appendix B. The Groundwater Availability Model GAM Run 21-011 MAG(for Modeled Available Groundwater) provided by TWDB is in Appendix C. All other technical and administrative information required by the Texas Administrative Code can be found in the later Appendices.

Management of Groundwater Supplies

Since inception in 1986, the District has managed and will continue to manage the supply of groundwater within the District to conserve and protect the limited resource while seeking to maintain the economic viability of all resource user groups, both public and private. The District's aquifer water level observation network will continue to be utilized to monitor changing conditions of groundwater supplies within the District. The District has budgeted for two automated water level recorders that will be installed within the District during the upcoming budget year. They will allow for a greater understanding of the dynamic nature of the District's aquifers. The District continues to make periodic assessment of groundwater supplies and storage conditions and cooperates with investigations of groundwater resources within the District. All of the data gathered during these activities are reported to the Texas Water Development Board and to the public.

The District uses all available sources to obtain aquifer recharge, supply and usage information for long-range planning purposes. This includes providing local data input and actively participating in meetings of the Seymour Aquifer Groundwater Availability Modeling (GAM) program. The District also participates in the Panhandle Regional Water Planning Group and uses published data available from it as well as that available from the Texas Water Development Board. Finally, the District relies most heavily on specific local data obtained by District personnel in monitoring water levels and quality, irrigation usage, crops and other local conditions and activities.

The District supports brush control as a management practice to maintain and improve groundwater supplies in the District and region. Several invasive brush species exist within the District that have been shown to negatively impact soil moisture and shallow groundwater resources.

In pursuit of the District's mission, in the future, the District may require reduction of groundwater withdrawals to amounts that would lessen adverse effects to the aquifers. The District will enforce its rules by enjoining water users in a court of competent jurisdiction, as provided in TWC 36.102, if required, after exhausting other voluntary or cooperative remedies. The District utilizes all technical resources at its disposal to evaluate the groundwater resources available within the District and to determine the effectiveness of conservation or regulatory measures.

The District provides input to the planning process at the GMA 6 and Region A planning meetings and their resulting reports. The District supports the Water Management Strategies identified as relevant within Region A. In particular, the District has a keen interest in promoting agricultural irrigation conservation since that industry is the largest user of groundwater within the District. To that end, the District has rules that require metering, prohibit irrigation water runoff, and prohibit the installation of pivot end guns. These rules directly support the Region A Water Management Strategy of agricultural irrigation conservation. Municipal water use is also very important since most of the Districts residents rely on municipal or regional water systems for their drinking water. The projected needs listed in the TWDB estimated historical water use data plan packet (Appendix A) are primarily irrigation in Briscoe, Collingsworth, and Hall Counties. Municipal needs exist for Childress, and the Red River Authority WUG in Childress County beginning in 2060 and for Memphis beginning in 2030. The relevant Water Management Strategies are conservation, developing new water supplies, water audits, leak repairs, and advanced water treatment. Advanced water treatment will likely be required in the District soon due to excessive nitrates. The District will provide technical support to those projects as they develop.

Actions, Procedures, Performance, and Avoidance for Plan Implementation

The District continues to utilize the provisions of this plan as a guidepost for determining the direction or priority of all District activities. All operations of the District and agreements entered into by the District will continue to be consistent with the provisions of this plan.

The District has, and will amend as necessary, rules relating to the permitting of wells, depletion, and the production of groundwater. The rules adopted by the District shall be pursuant to Chapter Thirty-Six of the Texas Water Code and the provisions of this plan. They can be found online https://mesquitegcd.gov/wp-content/uploads/2021/10/2015_Rules.pdf

The relevant factors that will continue to be considered in deciding to grant or deny a permit or limit groundwater withdrawals include:

1. The purpose of the District and its rules;
2. The equitable conservation and preservation of the resource; and
3. The economic hardship resulting from granting or denying a permit or the terms prescribed by the rules.

The District treats all citizens with equality. A public or private user may appeal to the District Board for discretion in enforcement of the provisions of the rules or contingency plans on grounds of economic hardship or unique local conditions. In granting of discretion to any rule, the District's Board considers the potential for adverse effects on adjacent owners and aquifer conditions. The exercise of said discretion by the Board shall not be construed as limiting the power of the District's Board of Directors.

The District will seek cooperation and coordination with landowners, operators, and appropriate local, regional, and state management entities in the implementation of this plan.

Desired Future Conditions

The District is in Groundwater Management Area (GMA) 6. The District is participating in the GMA collaborative process. The current Desired Future Conditions for the Aquifers within the District and the GMA were established The Desired Future Conditions for Groundwater Management Area 6 are based on water level drawdowns defined as the difference in well water levels between the baseline year (2010) and 2080. Desired Future Conditions were set for the Blaine and Seymour Aquifers in the District. There is no Desired Future Condition set for the Trinity Group Aquifers in GMA 6, because it has been determined to be not relevant for joint planning. There is no Desired Future Condition set for the Dockum or Ogallala Aquifers within the District because those aquifers do not supply water within the District's boundary. The Desired Future Conditions for the Seymour and Blaine aquifers within the District are as follows:

- Seymour Aquifer
    - The Desired Future Condition for Pod One in Childress and Collingsworth Counties, located in the District, is that condition whereby the total decline in water levels will be no more than thirty-three feet during the period from 2010 – 2080.
    - The Desired Future Condition for Pod Two in Hall County, located in the District, is that condition whereby the total decline in water levels will be no more than fifteen feet during the period from 2010 – 2080.
    - The Desired Future Condition for Pod Three in Briscoe and Hall Counties, located in the District, is that condition whereby the total decline in water levels will be no more than fifteen feet during the period from 2010 -2080.
- Blaine Aquifer
    - The Desired Future Condition for that part of Childress County North of the Red River, located in the District, and all of Collingsworth and Hall Counties, also located within the District; is that condition whereby the total decline in water levels will be no more than nine feet during the period from 2010 – 2080.
    - The Desired Future Condition for that part of Childress County south of the Red River located in the District is that condition whereby the total decline in water levels will be no more than two feet during the period from 2010 – 2080.

The Desired Future Conditions were approved at the GMA and District level as part of the joint planning process. They were then provided to TWDB for the purpose of calculating Modeled Available Groundwater.

Modeled Available Groundwater

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. Mesquite GCD is required to consider Modeled Available Groundwater, along with 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 and several other factors when issuing permits in order to manage groundwater in a manner that will achieve the aquifers' Desired Future Conditions.

The District's Modeled Available Groundwater is provided in further detail in the TWDB GAM Run 21-011MAG report provided in Appendix C.

GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

Tracking Progress in Achieving Goals and Management Objectives:

The District's General Manager will prepare and submit an Annual Report to the Board of Directors on the District's performance with regards to achieving each stated management goal and objective during the preceding fiscal year. This Annual Report will be presented to the Board of Directors at the regular monthly meeting no later than June of the following year. Each Annual Report will be maintained on file at the District office.

Goal 1: Addressing Conservation

1.1 Management Objective: Conduct water quality analyses of requested wells

1.1a Performance Standard: Conduct water quality analyses within forty-eight hours of request. A summary of these analyses will be provided in the Annual Report to the District's Board.

1.2 Management Objective: Publicize groundwater conservation issues through local newspapers, group presentations, schools, and other media opportunities.

1.2a Performance Standard: Publicize groundwater conservation issues using the above outlets on at least one occasion by September 30th each year. Use the TWDB conservation page and best management practices where applicable. (http://www.twdb.texas.gov/conservation/BMPs/index.asp) A summary of this publicity will be provided in the Annual Report to the District's Board.

Goal 2: Providing the Most Efficient Use of Groundwater

2.1 Management Objective: Monitor flow-meters on wells to facilitate water usage efficiency studies

2.1a. Performance Standard: Record pumping data from at least 90% of flow-meter locations by May 1st each year. A summary of these meter readings will be provided in the Annual Report to the District's Board.

2.2 Management Objective: Publicize the need for efficient use of groundwater through local newspapers, group presentations, schools, and other media opportunities

2.2a. Performance Standard: Publicize groundwater efficiency issues using the above outlets on at least one occasion by September 30th each year. A summary of this publicity will be provided in the Annual Report to the District's Board.

Goal 3: Controlling and Preventing Waste of Groundwater

3.1 Management Objective: Identify and address local irrigation practices which are wasteful of groundwater resources

3.1a. Performance Standard: Educate the public on wasteful irrigation practices with at least one news article, group presentation, or other local publicity opportunity by September 30th each year. A summary of this publicity will be provided in the Annual Report to the District's Board.

Goal 4: Addressing Drought Conditions

4.1 Management Objective: Maintain the District drought contingency plan

4.1a. Performance Standard: Review and update the District's Drought Contingency Plan by September 30th, at least once annually. A summary of this review will be included in the Annual Report to the District's Board.

4.1b. Performance Standard: Incorporate newly annexed areas into the District's Drought Contingency Plan within a year of annexation. A summary of this action will be included in the Annual Report to the District's Board.
TWDB's drought information page is http://waterdatafortexas.org/drought/

Goal 5: Addressing Recharge Enhancement

5.1 Management Objective: Recharge Enhancement

5.1a. Performance Standard: Review the District's Recharge Enhancement Feasibility Study by September 30th, at least once annually. A summary of the Feasibility Study review will be included in the Annual Report to the District's Board.

5.1b. Performance Standard: If opportunity and funding become available, team with private or public entities on Recharge Enhancement projects within the District. A summary of the opportunities, funding, and projects (if any) will be included in the Annual Report to the District's Board.

Goal 6: Addressing Rainwater Harvesting

6.1 Management Objective: Rainwater Harvesting

6.1a Performance Standard: Publish article in newspaper of standard circulation or other publications or presentations at least once per year regarding rainwater harvesting with a focus on any projects established within the District. A summary of this publicity will be included in the Annual Report to the District's Board.

6.1b. Performance Standard: Include a summary of Rainwater Harvesting Projects within the District in the Annual Report to the District's Board.

Goal 7: Addressing the Desired Future Conditions Adopted by the District

7.1 Management Objective: Monitor static water levels in selected wells

7.1a. Performance Standard: Measure the static water level in at least 100 wells within the District by April 1st each year. A summary of the results from this work will be provided in the Annual Report to the Districts Board.

7.2 Management Objective: Complete hydrographs in monitored wells

7.2a. Performance Standard: Complete hydrographs in monitored wells by September 30 each year and deliver hydrograph reports to the District's Board at their next regularly scheduled meeting. Hydrographs will be analyzed for decline as compared the stated DFC in order to track the District's progress in achieving the desired future conditions. A summary of this activity will be discussed in the Annual Report to the District's Board.

Goal 8: Controlling and Preventing Subsidence

SUBSIDENCE POTENTIAL & RISK
The primary aquifers in the Mesquite District are the Seymour and the Blaine. The Seymour is a typical sand and gravel aquifer. The Blaine formation is primarily silt, clay and gypsum.

Subsidence in the Seymour was evaluated using the Texas Aquifer Potential Subsidence Prediction Screening Tool Version 1.0, TWDB, 2018. Representative wells from the individual Seymour Pods were evaluated. The evaluations were located in Collingsworth, Childress, and Hall counties. District water level data was used. Well data was extracted from District & TWDB files. The model default aquifer properties for the selected aquifers were accepted. Calculated subsidence risk values were in the range of 3. 9 to 4, Low Risk. This calculation did not consider the underlying Permian Blaine Formation and Whitehorse Group, which have significant gypsum layers and are subject to subsidence due to collapse in the underlying gypsum-rich formations.

Large areas of the District contain Blaine Formation and other Permian age sediments. These formations contain significant volumes of gypsum, a highly soluble rock. Cavities, Sinkholes, and Caves, are common due to the ease that the gypsum is dissolved by groundwater. The presence of the cavities in wells was documented and mapped on TWDB Report XXX, September 2016, Figure 11-1. Subsidence can occur around wells producing water from the Blaine and Seymour aquifers due to the collapse of the material surrounding the cavities.
Sinkholes were also documented and mapped in TWDB Report XXX. Figure 11-2 provides aerial photography of an existing sinkhole and a developing sinkhole site. A map of sinkholes is provided in Figure 3 of the report. Sinkholes are most common in the northern parts of Hall and Childress counties, although they are present throughout the District.
There is no feasible way to prevent the groundwater from dissolving gypsum, therefore, this goal is considered not applicable in the District.

Based on the characteristics of Permian formations, the subsidence Risk is considered medium to high according to the TWDB 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, March 2017:
http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp

Goal 9: Addressing Natural Resource Issues

8.1 Management Objective: Maintain a program to identify, locate and obtain closures of abandoned wells

3.2a Perform site inspections and complete an open or uncovered well report for each well reported or located by the District within 30 days of receipt of the report of such well. A summary of these site inspections and results will be provided in the Annual Report to the District's Board.

3.2b Notify owner of open or uncovered well described in 3.2a and seek compliance with Rules and statute. A summary of these notifications and their results will be included in the Annual Report to the District's Board.

SB-1 MANAGEMENT GOALS
DETERMINED NOT APPLICABLE

The following five goals mandated to be addressed by Senate Bill 1 of the 75th Texas Legislature, 1997, have been determined not to apply to the Mesquite Groundwater Conservation District for the reasons stated below.

Not Applicable Goal 1: Addressing Conjunctive Surface Water Management Issues

There are not currently any surface water impoundments within the District.

Not Applicable Goal 2: Addressing Precipitation Enhancement

Precipitation enhancement projects are presently not cost effective within the District.

Not Applicable Goal 3: Addressing Brush Control

The District plans to work cooperatively with the Natural Resources Conservation Service and the local Soil Conservation Board on brush control projects in the future when conservation funds are made available for such practices.

APPROVAL AND ADOPTION

The Directors of the Mesquite Groundwater Conservation District met in a properly noticed open session following the Groundwater Management Plan Hearing. After some discussion, the Director's approved and adopted the plan by resolution. A Copy of that resolution is provided in Appendix D. Public notices for the hearing are provided in Appendix E

Appendix A

Management Plan Data Pack

Estimated Historical Groundwater Use And 2022 State Water Plan Datasets:

Mesquite Groundwater Conservation District

Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
June 11, 2023

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:

http://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 Grayson Dowlearn, Grayson.dowlearn@twdb.texas.gov, (512) 475-1552.

DISCLAIMER:

The data presented in this report represents the most up to date WUS and 2022 SWP data available as of 6/11/2023. 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 to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

http://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).

The values presented in the data tables of this report are county-based. In cases where groundwater conservation districts cover only a portion of one or more counties the data values are modified with an apportioning multiplier to create new values that more accurately represent conditions within district boundaries. The multiplier used in the following formula is a land area ratio: (data value * (land area of district in county / land area of county)). For two of the four SWP tables (Projected Surface Water Supplies and Projected Water Demands) only the county-wide water user group (WUG) data values (county other, manufacturing, steam electric power, irrigation, mining and livestock) are modified using the multiplier. WUG values for municipalities, water supply corporations, and utility districts are not apportioned; instead, their full values are retained when they are located within the district, and eliminated when they are located outside (we ask each district to identify these entity locations).

The remaining SWP tables (Projected Water Supply Needs and Projected Water Management Strategies) are not modified because district-specific values are not statutorily required. Each district needs only “consider” the county values in these tables.

In the WUS table every category of water use (including municipal) is apportioned. Staff determined that breaking down the annual municipal values into individual WUGs was too complex.

TWDB recognizes that the apportioning formula used is not ideal but it is the best available process with respect to time and staffing constraints. If a district believes it has data that is more accurate it can add those data to the plan with an explanation of how the data were derived. Apportioning percentages that the TWDB used are listed above each applicable table.

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.

BRISCOE COUNTY *0% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2018	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2017	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2016	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2015	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2014	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2013	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2012	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2011	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2010	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2009	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2008	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2007	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2006	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2005	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0
2004	GW	0	0	0	0	0	0	0
	SW	0	0	0	0	0	0	0

CHILDRESS COUNTY *6.05% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	3	0	0	0	884	14	901
	SW	83	0	0	0	0	2	85
2018	GW	3	0	0	0	887	14	904
	SW	84	0	0	0	0	2	86
2017	GW	2	0	0	0	852	13	867
	SW	90	0	0	0	0	1	91
2016	GW	2	0	0	0	913	12	927
	SW	93	0	0	0	0	1	94
2015	GW	1	0	0	0	698	12	711
	SW	94	0	0	0	0	1	95
2014	GW	1	0	0	0	1,226	12	1,239
	SW	90	0	0	0	0	1	91
2013	GW	1	0	0	0	801	12	814
	SW	91	0	0	0	0	1	92
2012	GW	2	0	0	0	1,123	15	1,140
	SW	98	0	0	0	0	2	100
2011	GW	2	0	0	0	1,056	17	1,075
	SW	107	0	0	0	0	2	109
2010	GW	4	0	0	0	572	17	593
	SW	99	0	0	0	0	2	101
2009	GW	5	0	0	0	1,066	17	1,088
	SW	100	2	0	0	0	2	104
2008	GW	7	0	0	0	831	18	856
	SW	105	2	0	0	0	2	109
2007	GW	7	0	0	0	568	22	597
	SW	96	2	0	0	0	2	100
2006	GW	8	0	0	0	600	18	626
	SW	108	2	0	0	0	2	112
2005	GW	7	0	0	0	805	19	831
	SW	87	3	0	0	0	2	92
2004	GW	7	0	0	0	646	2	655
	SW	107	3	0	0	0	19	129

COLLINGSWORTH COUNTY

100% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	576	0	0	0	45,512	339	46,427
	SW	5	0	0	0	100	10	115
2018	GW	603	0	0	0	46,278	339	47,220
	SW	5	0	0	0	150	10	165
2017	GW	602	0	0	0	46,843	327	47,772
	SW	4	0	0	0	100	10	114
2016	GW	612	0	0	0	53,044	374	54,030
	SW	6	0	0	0	100	12	118
2015	GW	581	0	0	0	37,635	371	38,587
	SW	5	0	0	0	50	11	66
2014	GW	616	0	0	0	49,355	362	50,333
	SW	5	0	0	0	92	11	108
2013	GW	612	0	0	0	52,086	362	53,060
	SW	4	0	0	0	133	11	148
2012	GW	638	0	0	0	55,159	430	56,227
	SW	6	0	0	0	142	13	161
2011	GW	728	0	0	0	60,399	472	61,599
	SW	6	0	0	0	100	15	121
2010	GW	608	0	0	0	48,566	465	49,639
	SW	14	0	0	0	100	14	128
2009	GW	659	0	0	0	46,736	540	47,935
	SW	17	0	0	0	100	17	134
2008	GW	659	0	0	0	67,840	521	69,020
	SW	12	0	0	0	100	16	128
2007	GW	693	0	0	0	35,393	276	36,362
	SW	24	0	0	0	308	9	341
2006	GW	747	0	0	0	51,085	780	52,612
	SW	11	0	0	0	100	24	135
2005	GW	685	0	0	0	51,090	472	52,247
	SW	7	0	0	0	125	15	147
2004	GW	682	0	0	0	56,751	57	57,490
	SW	6	0	0	0	117	517	640

HALL COUNTY

100% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	482	0	0	0	32,042	420	32,944
	SW	121	0	0	0	0	105	226
2018	GW	489	0	0	0	30,374	420	31,283
	SW	102	0	0	0	0	105	207
2017	GW	496	0	0	0	32,232	408	33,136
	SW	89	0	0	0	0	102	191
2016	GW	564	0	0	0	35,129	214	35,907
	SW	105	0	0	0	0	54	159
2015	GW	559	1	0	0	27,513	211	28,284
	SW	105	0	0	0	0	53	158
2014	GW	579	0	0	0	39,059	260	39,898
	SW	99	0	0	0	0	65	164
2013	GW	596	0	0	0	31,096	208	31,900
	SW	99	0	0	0	0	52	151
2012	GW	632	0	0	0	34,813	236	35,681
	SW	106	0	0	0	0	59	165
2011	GW	685	0	0	0	36,870	303	37,858
	SW	114	0	0	0	0	76	190
2010	GW	595	0	0	0	34,122	301	35,018
	SW	112	0	0	0	0	75	187
2009	GW	485	0	0	0	28,342	295	29,122
	SW	135	0	0	0	0	74	209
2008	GW	508	0	0	0	36,468	295	37,271
	SW	177	0	0	0	0	74	251
2007	GW	502	0	0	0	22,101	228	22,831
	SW	192	0	0	0	0	57	249
2006	GW	545	0	0	0	22,909	268	23,722
	SW	177	0	0	0	0	67	244
2005	GW	533	0	0	0	24,052	242	24,827
	SW	186	0	0	0	0	60	246
2004	GW	578	0	0	0	28,148	26	28,752
	SW	208	0	0	0	0	228	436

Projected Surface Water Supplies
TWDB 2022 State Water Plan Data

BRISCOE COUNTY

0% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
O	County-Other, Briscoe	Red	Red Run-of-River	0	0	0	0	0	0
O	Irrigation, Briscoe	Red	Red Run-of-River	0	0	0	0	0	0
O	Silverton	Red	Mackenzie Lake/Reservoir	128	128	128	128	128	128
	Sum of Projected Surface Water Supplies (acre-feet)			**128**	**128**	**128**	**128**	**128**	**128**

CHILDRESS COUNTY

6.05% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
A	Childress	Red	Greenbelt Lake/Reservoir	1,008	1,070	1,127	1,188	1,139	1,071
A	Irrigation, Childress	Red	Red Run-of-River	1	1	1	1	1	1
A	Livestock, Childress	Red	Red Livestock Local Supply	3	3	3	3	3	3
A	Red River Authority of Texas	Red	Greenbelt Lake/Reservoir	144	152	160	169	163	152
	Sum of Projected Surface Water Supplies (acre-feet)			**1,156**	**1,226**	**1,291**	**1,361**	**1,306**	**1,227**

COLLINGSWORTH COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
A	Irrigation, Collingsworth	Red	Red Run-of-River	851	851	851	851	851	851
A	Livestock, Collingsworth	Red	Red Livestock Local Supply	29	29	29	29	29	29
A	Red River Authority of Texas	Red	Greenbelt Lake/Reservoir	10	10	11	11	10	9
	Sum of Projected Surface Water Supplies (acre-feet)			**890**	**890**	**891**	**891**	**890**	**889**

HALL COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
A	Irrigation, Hall	Red	Red Run-of-River	52	52	52	52	52	52
A	Livestock, Hall	Red	Red Livestock Local Supply	91	91	91	91	91	91
A	Memphis	Red	Greenbelt Lake/Reservoir	23	24	25	25	24	22
A	Red River Authority of Texas	Red	Greenbelt Lake/Reservoir	62	65	67	69	64	59
	Sum of Projected Surface Water Supplies (acre-feet)			**228**	**232**	**235**	**237**	**231**	**224**

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.

BRISCOE COUNTY

0% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
O	County-Other, Briscoe	Red	0	0	0	0	0	0
O	Irrigation, Briscoe	Red	0	0	0	0	0	0
O	Livestock, Briscoe	Red	0	0	0	0	0	0
O	Quitaque	Red	106	104	102	102	101	101
O	Silverton	Red	128	124	121	120	120	120
		Sum of Projected Water Demands (acre-feet)	**234**	**228**	**223**	**222**	**221**	**221**

CHILDRESS COUNTY

6.05% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
A	Childress	Red	1,624	1,657	1,685	1,722	1,767	1,814
A	County-Other, Childress	Red	0	0	0	0	0	0
A	Irrigation, Childress	Red	856	856	856	856	856	856
A	Livestock, Childress	Red	21	28	29	30	31	33
A	Red River Authority of Texas	Red	232	236	239	245	252	258
		Sum of Projected Water Demands (acre-feet)	**2,733**	**2,777**	**2,809**	**2,853**	**2,906**	**2,961**

COLLINGSWORTH COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
A	County-Other, Collingsworth	Red	71	66	60	55	50	46
A	Irrigation, Collingsworth	Red	47,471	42,542	39,713	38,215	33,451	33,451
A	Livestock, Collingsworth	Red	459	583	607	633	660	688
A	Red River Authority of Texas	Red	142	155	167	179	192	203
A	Wellington Municipal Water System	Red	524	540	548	566	581	595
		Sum of Projected Water Demands (acre-feet)	**48,667**	**43,886**	**41,095**	**39,648**	**34,934**	**34,983**

HALL COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
A	County-Other, Hall	Red	84	76	65	54	65	57
A	Irrigation, Hall	Red	31,792	31,792	31,792	31,792	31,792	31,792

A	Livestock, Hall	Red	340	357	375	394	414	435
A	Memphis	Red	386	385	375	372	372	372
A	Red River Authority of Texas	Red	89	98	105	113	104	111
A	Turkey Municipal Water System	Red	120	121	119	119	119	119
	Sum of Projected Water Demands (acre-feet)		**32,811**	**32,829**	**32,831**	**32,844**	**32,866**	**32,886**

Projected Water Supply Needs
TWDB 2022 State Water Plan Data

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

BRISCOE COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
O	County-Other, Briscoe	Red	60	63	65	65	65	65
O	Irrigation, Briscoe	Red	7,251	-4,234	-4,234	-4,234	-4,234	-4,234
O	Livestock, Briscoe	Red	67	53	38	22	6	1
O	Quitaque	Red	212	214	216	216	217	217
O	Silverton	Red	0	4	7	8	8	8
	Sum of Projected Water Supply Needs (acre-feet)		**0**	**-4,234**	**-4,234**	**-4,234**	**-4,234**	**-4,234**

CHILDRESS COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
A	Childress	Red	0	0	0	0	-163	-344
A	County-Other, Childress	Red	1	1	1	1	1	0
A	Irrigation, Childress	Red	198	202	205	208	213	217
A	Livestock, Childress	Red	72	27	9	0	0	0
A	Red River Authority of Texas	Red	0	0	0	0	-23	-49
	Sum of Projected Water Supply Needs (acre-feet)		**0**	**0**	**0**	**0**	**-186**	**-393**

COLLINGSWORTH COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
A	County-Other, Collingsworth	Red	17	13	11	8	6	4
A	Irrigation, Collingsworth	Red	-6,867	-10,133	-9,283	-9,595	-9,741	-9,069
A	Livestock, Collingsworth	Red	54	0	0	0	0	0
A	Red River Authority of Texas	Red	0	0	0	0	0	0
A	Wellington Municipal Water System	Red	-524	-540	-548	-566	-581	-595
	Sum of Projected Water Supply Needs (acre-feet)		**-7,391**	**-10,673**	**-9,831**	**-10,161**	**-10,322**	**-9,664**

HALL COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
A	County-Other, Hall	Red	0	0	0	0	0	0
A	Irrigation, Hall	Red	-15,637	-14,325	-11,397	-8,194	-5,206	-6,480
A	Livestock, Hall	Red	66	49	31	12	0	0
A	Memphis	Red	10	-28	-62	-102	-142	-146

A	Red River Authority of Texas	Red	21	12	5	0	0	0
A	Turkey Municipal Water System	Red	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet)		**-15,637**	**-14,353**	**-11,459**	**-8,296**	**-5,348**	**-6,626**

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

BRISCOE COUNTY

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
County-Other, Briscoe, Red (O)							
Briscoe County-Other Municipal Water Conservation	DEMAND REDUCTION [Briscoe]	8	6	5	6	6	7
		8	**6**	**5**	**6**	**6**	**7**
Irrigation, Briscoe, Red (O)							
Briscoe County Irrigation Water Conservation	DEMAND REDUCTION [Briscoe]	793	1,321	1,448	1,248	1,136	1,066
		793	**1,321**	**1,448**	**1,248**	**1,136**	**1,066**
Quitaque, Red (O)							
Briscoe County - Quitaque Municipal Water Conservation	DEMAND REDUCTION [Briscoe]	5	3	2	2	2	2
		5	**3**	**2**	**2**	**2**	**2**
Silverton, Red (O)							
Briscoe County - Silverton Municipal Water Conservation	DEMAND REDUCTION [Briscoe]	3	0	0	0	0	0
		3	**0**	**0**	**0**	**0**	**0**
Sum of Projected Water Management Strategies (acre-feet)		**809**	**1,330**	**1,455**	**1,256**	**1,144**	**1,075**

CHILDRESS COUNTY

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Childress, Red (A)							
Develop Ogallala Aquifer In Donley County - Greenbelt MIWA	Ogallala Aquifer [Donley]	0	0	0	0	163	344
Municipal Conservation - Childress	DEMAND REDUCTION [Childress]	19	20	21	21	22	22
		19	**20**	**21**	**21**	**185**	**366**
Irrigation, Childress, Red (A)							
Irrigation Conservation - Childress County	DEMAND REDUCTION [Childress]	655	1,095	2,194	2,547	2,704	2,854
		655	**1,095**	**2,194**	**2,547**	**2,704**	**2,854**
Red River Authority of Texas, Red (A)							
Develop Ogallala Aquifer In Donley County - Greenbelt MIWA	Ogallala Aquifer [Donley]	0	0	0	0	23	49
Municipal Conservation - Red River Authority	DEMAND REDUCTION [Childress]	0	9	10	11	11	12
		0	**9**	**10**	**11**	**34**	**61**

		674	1,124	2,225	2,579	2,923	3,281
Sum of Projected Water Management Strategies (acre-feet)		**674**	**1,124**	**2,225**	**2,579**	**2,923**	**3,281**

COLLINGSWORTH COUNTY

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Irrigation, Collingsworth, Red (A)							
Irrigation Conservation - Collingsworth County	DEMAND REDUCTION [Collingsworth]	2,610	3,966	7,955	9,658	9,419	9,757
		2,610	**3,966**	**7,955**	**9,658**	**9,419**	**9,757**
Red River Authority of Texas, Red (A)							
Develop Ogallala Aquifer In Donley County - Greenbelt MIWA	Ogallala Aquifer [Donley]	0	0	0	0	2	3
		0	**0**	**0**	**0**	**2**	**3**
Wellington Municipal Water System, Red (A)							
Advanced Treatment - Wellington	Seymour Aquifer [Collingsworth]	560	560	560	560	560	560
Develop Seymour Aquifer Supplies - Wellington	Seymour Aquifer [Collingsworth]	0	100	100	100	100	100
Municipal Conservation - Wellington	DEMAND REDUCTION [Collingsworth]	7	7	8	8	8	8
		567	**667**	**668**	**668**	**668**	**668**
Sum of Projected Water Management Strategies (acre-feet)		**3,177**	**4,633**	**8,623**	**10,326**	**10,089**	**10,428**

HALL COUNTY

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Irrigation, Hall, Red (A)							
Irrigation Conservation - Hall County	DEMAND REDUCTION [Hall]	1,898	3,025	6,317	7,232	7,518	7,796
		1,898	**3,025**	**6,317**	**7,232**	**7,518**	**7,796**
Memphis, Red (A)							
Develop Ogallala Aquifer In Donley County - Greenbelt MIWA	Ogallala Aquifer [Donley]	0	0	0	1	3	7
Develop Ogallala Aquifer Supplies - Memphis	Ogallala Aquifer [Donley]	0	150	150	150	150	150
Municipal Conservation - Memphis	DEMAND REDUCTION [Hall]	7	7	7	7	7	7
		7	**157**	**157**	**158**	**160**	**164**
Red River Authority of Texas, Red (A)							
Develop Ogallala Aquifer In Donley County - Greenbelt MIWA	Ogallala Aquifer [Donley]	0	0	0	0	10	19
		0	**0**	**0**	**0**	**10**	**19**
Turkey Municipal Water System, Red (A)							
Develop Ogallala Aquifer Supplies - Turkey	Ogallala and Edwards-Trinity-High Plains Aquifers [Briscoe]	0	100	100	100	100	100

Municipal Conservation - Turkey	DEMAND REDUCTION [Hall]	1	1	1	1	1	1
Water Audit And Leak Repair - Turkey	DEMAND REDUCTION [Hall]	4	4	4	4	4	4
		5	**105**	**105**	**105**	**105**	**105**
Sum of Projected Water Management Strategies (acre-feet)		**1,910**	**3,287**	**6,579**	**7,495**	**7,793**	**8,084**

Appendix B

GAM Run 20-013

GAM RUN 23-013: MESQUITE GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

Dwight Zedric Q. Capus, GIT and Grayson Dowlearn, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-936-2404
July 14, 2023

EXECUTIVE SUMMARY:

Texas Water Code § 36.1071(h), 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 Mesquite Groundwater 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. Part 2 is the required groundwater availability modeling information, which includes:

1. the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;

2. the annual volume of water that discharges from the aquifer to springs and any surface-water bodies, including lakes, streams, and rivers, for each aquifer within the district; 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 Mesquite Groundwater Conservation District should be adopted by the district on or before September 21, 2023, and submitted to the TWDB Executive Administrator on or before October 21, 2023. The current management plan for the Mesquite Groundwater Conservation District expires on December 20, 2023.

The management plan information for the aquifers within Mesquite Groundwater Conservation District was extracted from two groundwater availability models. We used the groundwater availability model for the High Plains Aquifer System (Deeds and Jigmond, 2015, and Deeds and others, 2015) to estimate management plan information for the Ogallala Aquifer. We used the groundwater availability model for the Seymour Aquifer (Ewing and others, 2004) to estimate management plan information for the Seymour and Blaine aquifers.

This report replaces the results of GAM Run 18-010 (Shi, 2018). 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. Tables 1 through 3 summarize the groundwater availability model data required by statute. Figures 1, 3, and 5 show the areas of the respective models from which the values in Tables 1 through 3 were extracted. Figures 2, 4, and 6 provide a generalized diagram of the groundwater flow components provided in Tables 1 through 3. If, after review of the figures, the Mesquite Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

The flow components presented in this report do not represent the full groundwater budget. If additional inflow and outflow information would be helpful for planning purposes, the district may submit a request in writing to the TWDB Groundwater Modeling Department for the full groundwater budget.

METHODS:

In accordance with Texas Water Code § 36.1071(h), the groundwater availability models mentioned above were used to estimate information for the Mesquite Groundwater Conservation District management plan. Water budgets were extracted for the historical calibration period for the Ogallala Aquifer (1980 through 2012) and the Seymour and Blaine aquifers (1980 through 1998) 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 High Plains Aquifer System (Deeds and Jigmond, 2015, and Deeds and others, 2015) 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:
    - Layer 1 represents the Ogallala and Pecos Valley aquifers
    - Layer 2 represents the Rita Blanca, the Edwards-Trinity (Plateau), and the Edwards-Trinity (High Plains) aquifers
    - Layer 3 represents the upper portion of the Dockum Aquifer
    - Layer 4 represents the lower portion of the Dockum Aquifer
- Budget values were estimated only for the Ogallala Aquifer within Mesquite Groundwater Conservation District.
- Water budget terms were averaged for the period 1980 through 2012 (stress periods 52 through 84).
- The model was run with MODFLOW-NWT (Niswonger and others, 2011).

Seymour and Blaine aquifers

- We used version 1.01 of the groundwater availability model for the Seymour Aquifer (Ewing and others, 2004) to analyze the Seymour and Blaine aquifers. See Ewing and others (2004) for assumptions and limitations of the model.
- The groundwater availability model for the Seymour Aquifer contains the two layers:
  - Layer 1 represents the Seymour Aquifer
  - Layer 2 represents the Blaine Aquifer
- Water budget terms were averaged for the period 1980 through 1998 (stress periods 61 through 288). The last modeled stress period representing the year 1999 was not included because of incorrect pumping values.
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000)

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving an aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Ogallala, Seymour, and Blaine aquifers located within Mesquite Groundwater Conservation District and averaged over the historical calibration periods, as shown in Tables 1 through 3.

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 Tables 1 through 3. Figures 1, 3, and 5 show the areas of the respective models from which the values in Tables 1 through 3 were extracted. Figures 2, 4, and 6 provide a generalized diagram of the groundwater flow components provided in Tables 1 through 3. 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 for the Mesquite Groundwater Conservation District 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	647
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Ogallala Aquifer	670
Estimated annual volume of flow into the district within each aquifer in the district	Ogallala Aquifer	434
Estimated annual volume of flow out of the district within each aquifer in the district	Ogallala Aquifer	420
Estimated net annual volume of flow between each aquifer in the district	Ogallala Aquifer	Not Applicable*

*** The Ogallala Aquifer was the only hydrogeological unit simulated by the model within the Mesquite Groundwater Conservation District.**

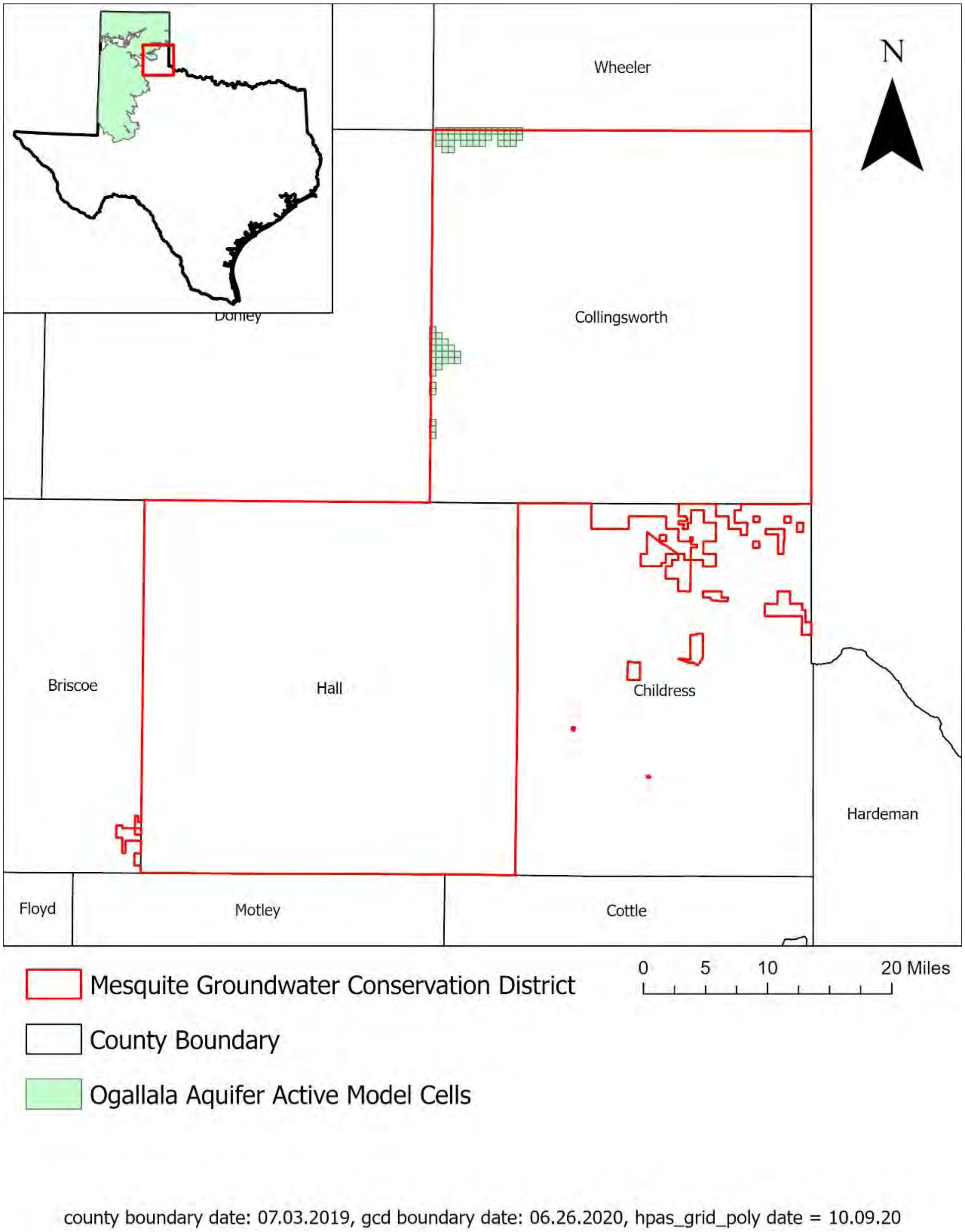


Figure 1: Area of the groundwater availability model for the High Plains Aquifer System from which the information in Table 1 was extracted (the Ogallala Aquifer extent within the district boundary).

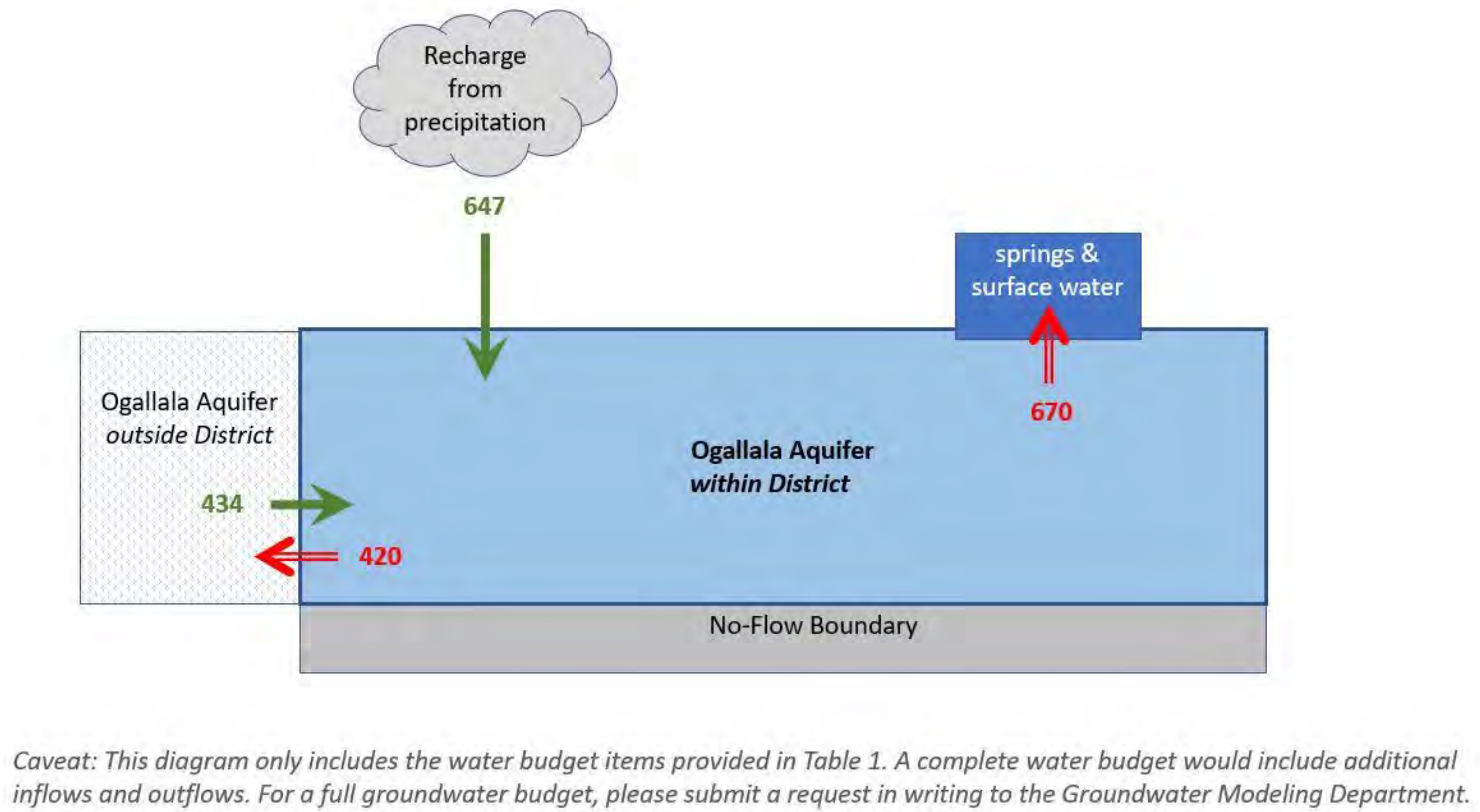


Figure 2: Generalized diagram of the summarized budget information from Table 1, representing directions of flow for the Ogallala Aquifer within the Mesquite Groundwater Conservation District. Flow values are expressed in acre-feet per year.

Table 2: Summarized information for the Seymour Aquifer for the Mesquite Groundwater Conservation District 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	Seymour Aquifer	43,600
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Seymour Aquifer	4,267
Estimated annual volume of flow into the district within each aquifer in the district	Seymour Aquifer	1,684
Estimated annual volume of flow out of the district within each aquifer in the district	Seymour Aquifer	964
Estimated net annual volume of flow between each aquifer in the district	From Seymour Aquifer to Blaine Aquifer	12,807
	To Seymour Aquifer from underlying confining units	7,943
	From Seymour Aquifer to Seymour equivalent units in Oklahoma	60

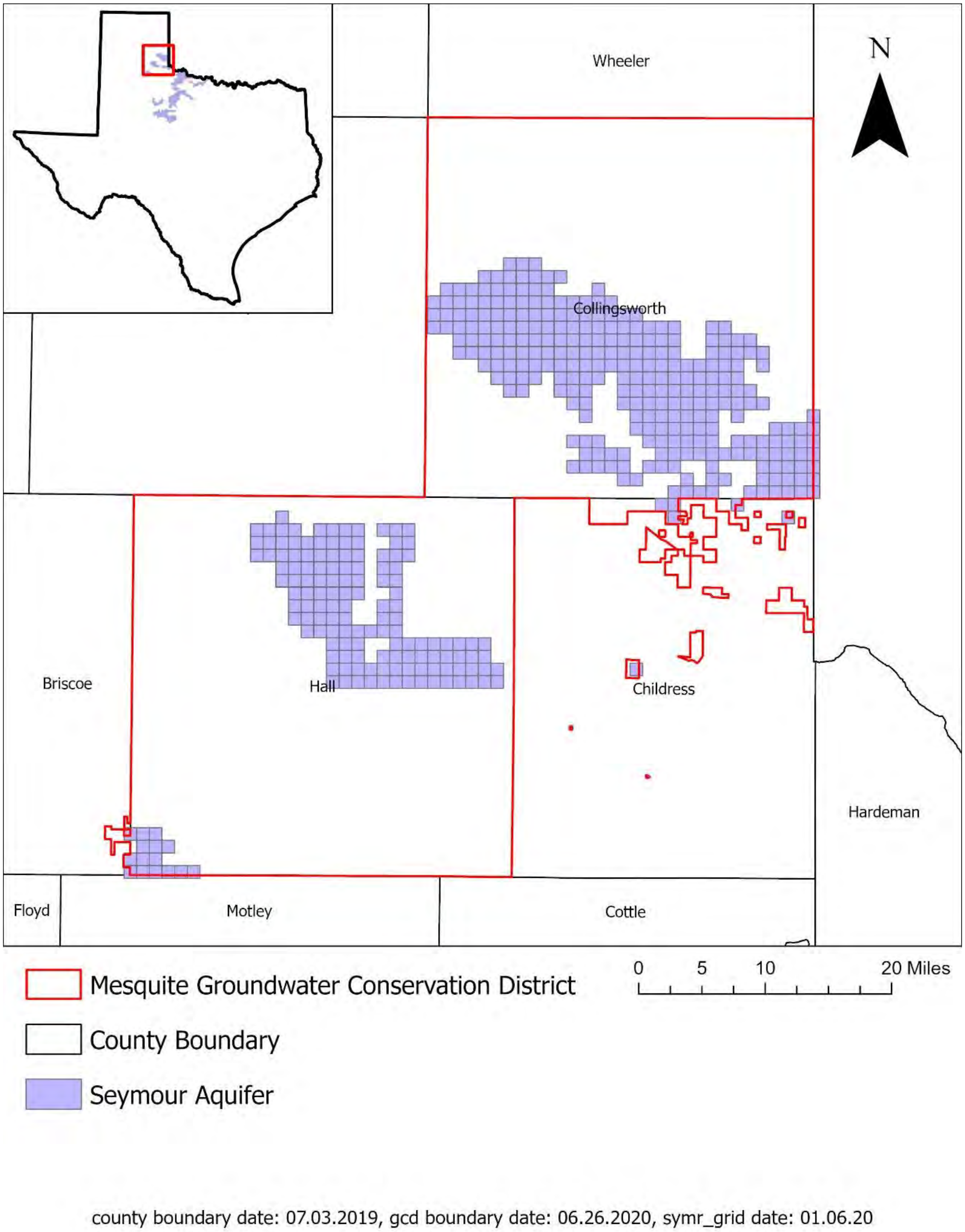
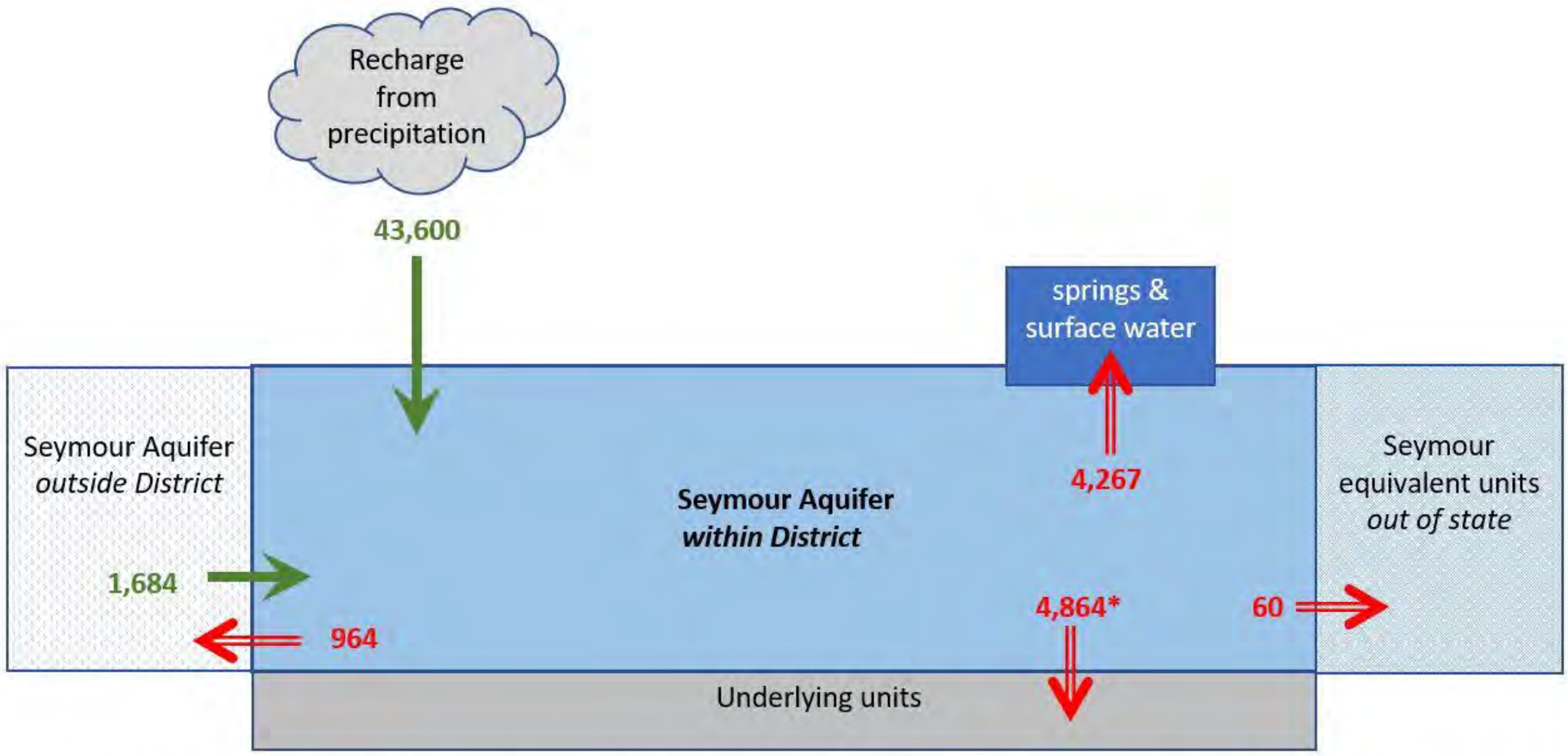


Figure 3: Area of the groundwater availability model for the Seymour Aquifer from which the information in Table 2 was extracted (the Seymour Aquifer extent within the district boundary).



* Flow from Underlying units within District includes net flow of 12,807 acre-feet per year from Seymour Aquifer to Blaine Aquifer and 7,943 acre-feet per year to Seymour Aquifer from underlying confining units

Caveat: This diagram only includes the water budget items provided in Table 2. A complete water budget would include additional inflows and outflows. For a full groundwater budget, please submit a request in writing to the Groundwater Modeling Department.

Figure 4: Generalized diagram of the summarized budget information from Table 2, representing directions of flow for Seymour Aquifer within Mesquite Groundwater Conservation District. Flow values are expressed in acre-feet per year.

Table 3: Summarized information for the Blaine Aquifer for the Mesquite Groundwater Conservation District 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	Blaine Aquifer	23,766
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Blaine Aquifer	21,668
Estimated annual volume of flow into the district within each aquifer in the district	Blaine Aquifer	12,088
Estimated annual volume of flow out of the district within each aquifer in the district	Blaine Aquifer	17,054
Estimated net annual volume of flow between each aquifer in the district	To Blaine Aquifer from Seymour Aquifer	12,807
	To Blaine Aquifer from Permian confining units	13,663
	From Blaine Aquifer to Blaine equivalent units in Oklahoma	3,911

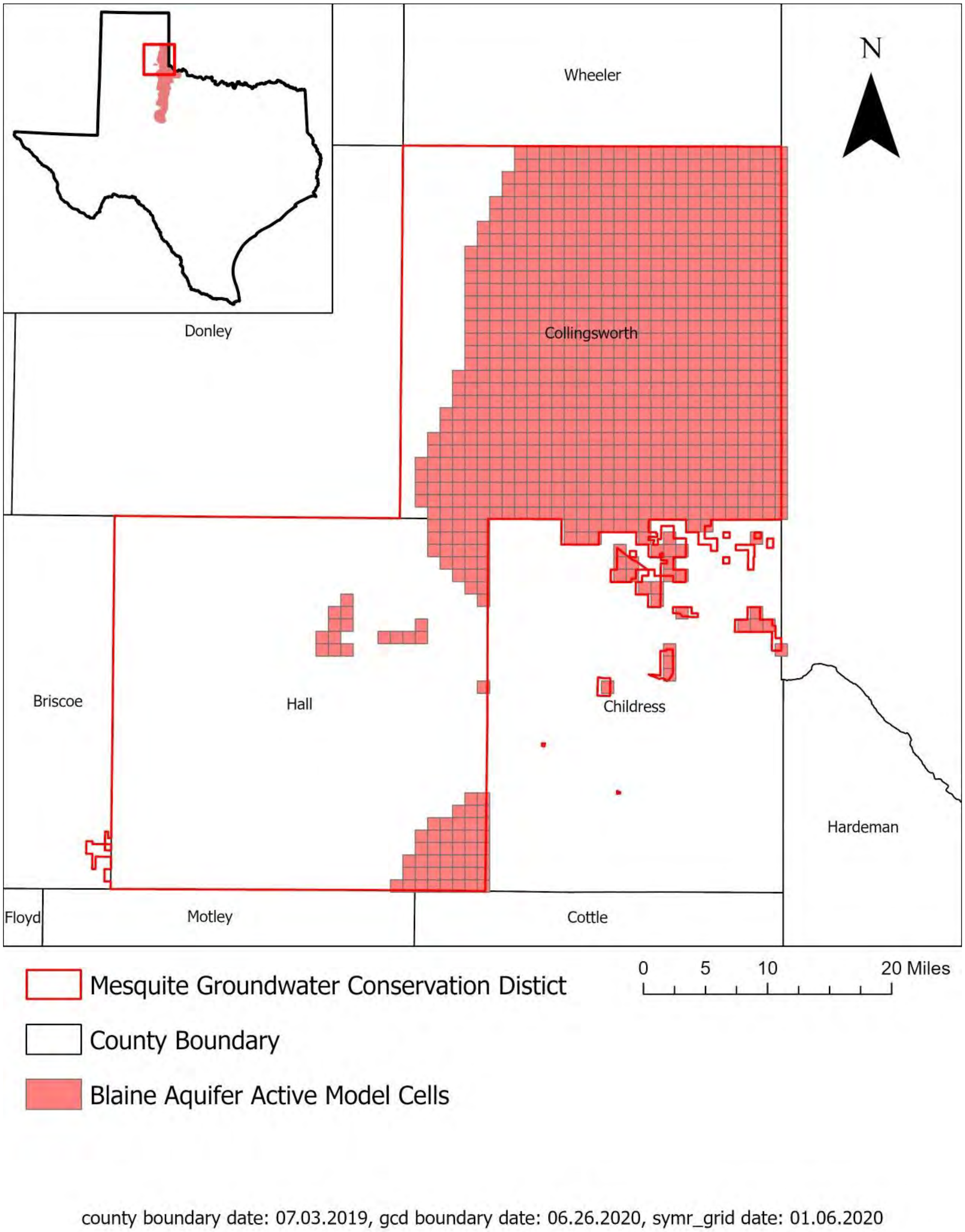
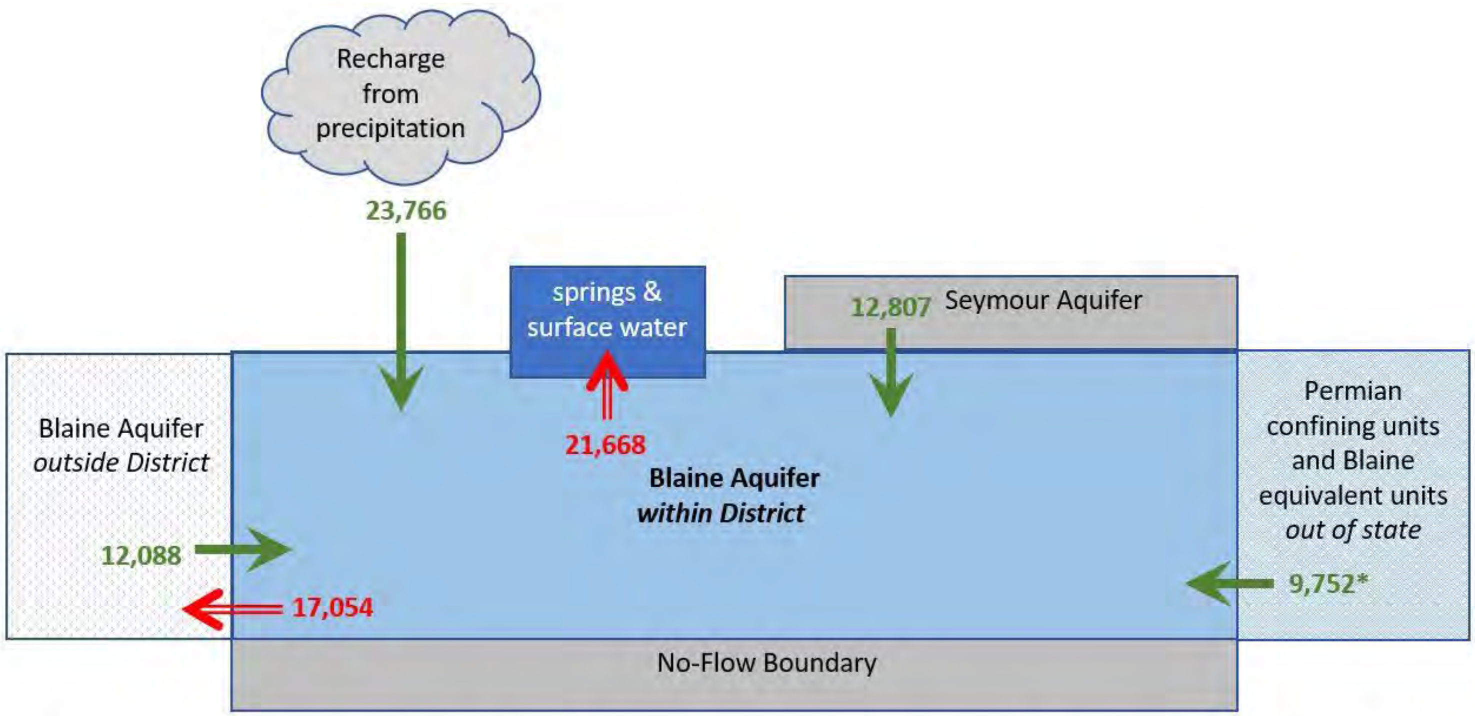


Figure 5: Area of the groundwater availability model for the Seymour Aquifer from which the information in Table 3 was extracted (the Blaine Aquifer extent within the district boundary).



* Flow from Permian confining units and Blaine equivalent units out of state includes net flow of 13,663 acre-feet per year to Blaine Aquifer from Permian confining units and 3,911 acre-feet per year from Blaine Aquifer to equivalent units in Oklahoma

Caveat: This diagram only includes the water budget items provided in Table 3. A complete water budget would include additional inflows and outflows. For a full groundwater budget, please submit a request in writing to the Groundwater Modeling Department.

Figure 6: Generalized diagram of the summarized budget information from Table 3, representing directions of flow for the Blaine Aquifer within the Mesquite Groundwater Conservation District. Flow values are expressed in acre-feet per year

LIMITATIONS:

The groundwater models used in completing this analysis are the best available scientific tools 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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Texas Water Code § 36.1071.

Appendix C
GAM Run 21-011

GAM RUN 21-011 MAG:
MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 6

Jevon Harding, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-463-7979
November 14, 2022

11/3/2022
Date

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GAM RUN 21-011 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 6

Jevon Harding, P.G.
Texas Water Development Board
Groundwater Division
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512-463-7979
November 14, 2022

EXECUTIVE SUMMARY:

The Texas Water Development Board (TWDB) estimated the modeled available groundwater values for the following relevant aquifers in Groundwater Management Area 6:

- Seymour Aquifer – The modeled available groundwater ranges from 157,895 to 181,289 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district, county, and Seymour Aquifer pod in Table 1, and by county, regional water planning area, river basin, and Seymour Aquifer pod in Table 2.
- Blaine Aquifer – The modeled available groundwater ranges from 70,924 to 74,029 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county in Table 3, and by county, regional water planning area, and river basin in Table 4.
- Ogallala Aquifer – The modeled available groundwater remains at 409 acre-feet per year throughout the period from 2020 to 2080. Values are summarized by groundwater conservation district and county in Table 5, and by county, regional water planning area, and river basin in Table 6.
- Dockum Aquifer – The modeled available groundwater ranges from 171 to 172 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county in Table 7, and by county, regional water planning area, and river basin in Table 8.

Figure 1 shows the county and groundwater conservation district boundaries represented by the divisions in Tables 1, 3, 5, and 7. Figure 2 shows the regional water planning area, river basin, and county boundaries represented by the divisions in Tables 2, 4, 6, and 8.

The modeled available groundwater estimates are based on the revised desired future conditions for the Seymour, Blaine, Ogallala, and Dockum aquifers adopted by groundwater conservation district (or district) representatives in Groundwater Management Area 6 on September 29, 2022.

The district representatives declared the following aquifers to be non-relevant for purposes of joint planning: the entire Cross Timbers Aquifer; the Blaine Aquifer in Motley, Knox, Dickens, Kent, Jones, Stonewall, and Wilbarger counties; the Ogallala Aquifer in Collingsworth and Dickens counties; the Dockum Aquifer in Dickens and Kent counties. Additionally, the following portions of the Seymour Aquifer were also declared non-relevant for the purposes of joint planning: the entirety of Pods 5, 9, 10, 12, 13, 14, 15; the portion of Pod 3 in Briscoe County; the portion of Pod 4 in Wichita and Wilbarger counties; the portion of Pod 7 in Stonewall County; the portion of Pod 8 in Throckmorton and Young counties; the portion of Pod 11 in Jones and Stonewall counties.

The TWDB determined that the explanatory report and other materials submitted by the district representatives were administratively complete on November 10, 2022.

REQUESTOR:

Mr. Mike McGuire, General Manager of Rolling Plains Groundwater Conservation District and Groundwater Management Area 6 Coordinator.

DESCRIPTION OF REQUEST:

In a letter dated January 17, 2022, Mr. Mike McGuire provided the TWDB with the desired future conditions of the Seymour, Blaine, Ogallala, and Dockum aquifers. The desired future conditions were first adopted on November 18, 2021 by district representatives in Groundwater Management Area 6 as part of the joint planning process. After review of the submittal, the TWDB sent an email to Mr. McGuire on June 7, 2022 requesting missing model files, confirmation of the methodology and assumptions used, and clarifications on minor inconsistencies in the wording of the desired future conditions and non-relevant statements. On June 16, 2022, Mr. McGuire and the Groundwater Management Area 6 consultants provided the missing model files and responses to clarifications (Appendix A). They provided confirmation that the assumptions used by the TWDB were consistent with those used by Groundwater Management Area 6. To address the TWDB clarifications, they also provided a new version of the desired future conditions resolution that corrected clerical errors and included additional non-relevant aquifer statements. District representatives in Groundwater Management Area 6 signed and adopted revised desired future conditions resolutions September 29, 2022. The final desired future conditions are:

Seymour Aquifer (as stated in Resolution 21-005)

a. *The Desired Future Condition for Pod 1 in Childress & Collingsworth Counties, located in the Mesquite and Gateway Groundwater Conservation Districts, is that condition whereby the total decline in water levels will be no more than 33 feet during the period from 2010 - 2080*
b. *The Desired Future Condition for Pod 2 in Hall County, located in Mesquite Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 15 feet during the period from 2010 - 2080*
c. *The Desired Future Condition for Pod 3 in Briscoe, Hall & Motley Counties, located in the Mesquite and Gateway Groundwater Conservation Districts, is that condition whereby the total decline in water levels will be no more than 15 feet during the period from 2010 - 2080*
d. *The Desired Future Condition for Pod 4 in Childress, Foard, and Hardeman counties, located in the Mesquite and Gateway Groundwater Conservation Districts, is that condition whereby the total decline in water levels will be no more than 1 foot during the period from 2010 - 2080*
e. *The Desired Future Condition for Pod 6 in Knox County, located in Rolling Plains Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 18 feet during the period from 2010 – 2080*
f. *The Desired Future Condition for that part of Pod 7 Baylor, Haskell. and Knox Counties, located in Rolling Plains Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 18 feet during the period from 2010 - 2080*
g. *The Desired Future Condition for that part of Pod 8 in Baylor County, located in Rolling Plains Groundwater Conservation District is that condition whereby the total water level decline will be no more than 18 feet during the period from 2010 - 2080*
h. *The Desired Future Condition for that part of Pod 11 in Fisher County, located in Clear Fork Groundwater Conservation District is that condition whereby the total water level decline will be no more than 1 foot during the period from 2010 - 2080*
i. *The Seymour Aquifer Pods 5, 9, 10, 12, 13, 14, 15, that part of 3 in Briscoe County, that part of 4 in Wichita and Wilbarger counties, that part of 7 in Stonewall County, that part of 8 in Throckmorton and Young counties, and that part of 11 in Jones and Stonewall counties have been determined to be non-relevant for joint planning purposes.*

Blaine Aquifer (as stated in Resolution 21-004)

a. *The Desired Future Condition for that part of Childress County North of the Red River, located in the Mesquite Groundwater Conservation District, all of Collingsworth and Hall Counties, also located within the Mesquite Groundwater Conservation District; and that part of Childress County North of the Red River located in the Gateway Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 9 feet during the period from 2010-2080*
b. *The Desired Future Condition for that part of Childress County south of the Red River located in the Mesquite & Gateway Groundwater Conservation Districts; and all of Cottle and Hardeman Counties, also located within the Gateway Groundwater Conservation District, is that condition whereby the total decline in water levels will be no more than 2 feet during the period from 2010-2080*
c. *The Desired Future Condition for Fisher County, located within the Clear Fork Groundwater Conservation District, is that condition whereby the total decline in water levels will be no more than 4 feet during the period from 2010-2080*
d. *The Desired Future Condition for King County, located within the Gateway Groundwater Conservation District, is that condition whereby the total decline in water levels will be no more than 7 feet during the period from 2010-2080*
e. *The Desired Future Condition for Foard County, located within the Gateway Groundwater Conservation District, is that condition whereby the total decline in water levels will be no more than 10 feet during the period from 2010-2080*
f. *The Blaine Aquifer in Motley County, located within the Gateway Groundwater Conservation District, and in Knox County, located within the Rolling Plains Groundwater Conservation District, has been determined to be non-relevant for joint planning purposes*
g. *The Blaine Aquifer in Dickens, Kent, Jones, Stonewall and Wilbarger Counties, not located within a Groundwater Conservation District, has been determined to be non-relevant for joint planning purposes.*

Ogallala Aquifer (as stated in Resolution 21-003)

a. *The Desired Future Condition for Motley County. located in the Gateway Groundwater Conservation District. is that condition with average drawdown of up to 28 feet between 2013 and 2080.*
b. *The Ogallala Aquifer in Collingsworth County. located in the Mesquite Groundwater Conservation District. is insignificant or nonexistent, and is determined to be non-relevant for joint planning purposes*
c. *The Ogallala Aquifer in Dickens County. not located within a Groundwater Conservation District, is determined to be non-relevant for joint planning purposes.*

Dockum Aquifer (as stated in Resolution 21-001)

a. The Desired Future Condition for Fisher County, located in the Clear Fork Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 28 feet during the period from 2013 - 2080

b. The Desired Future Condition for Motley County, located in the Gateway Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 28 feet during the period from 2013 - 2080

c. The Dockum Aquifer in Dickens & Kent Counties, not located within a Groundwater Conservation District, has been determined to be non-relevant for joint planning purposes.

Cross Timbers Aquifer (as stated in Resolution 21-002)

The Cross Timbers Aquifers within Groundwater Management Area 6 have been determined to be non-relevant for joint planning purposes.

METHODS:

The desired future conditions for Groundwater Management Area 6 are based on water-level declines, or drawdowns, defined as the difference in water levels between a baseline year and 2080. Depending on the aquifer, one of three groundwater availability models were used to estimate drawdowns over the specified time interval and to calculate modeled available groundwater.

The groundwater availability model for the Seymour Aquifer in Baylor, Haskell, and Knox counties (Jigmond and others, 2014) was used for Pod 7 of the Seymour Aquifer and the groundwater availability model for the Seymour and Blaine aquifers (Version 1.01; Ewing and others, 2004) was used for the remainder of the Seymour Aquifer and the Blaine Aquifer. Both models were run using predictive model files submitted with the explanatory report (Brady, 2022).

Modeled water levels for these two models were extracted for the years 2010 and 2080 and drawdown was calculated as the difference in water level between those two years. Drawdown averages were calculated by aquifer for each area specified in the desired future conditions. The calculated drawdown averages were compared with the desired future conditions and TWDB staff verified that the pumping scenario in the submitted model files achieved the desired future conditions.

The groundwater availability model for the High Plains Aquifer System (Version 1.01; Deeds and Jigmond, 2015) was used for calculations in the Ogallala and Dockum aquifers. This model was run using the predictive model files for "Scenario 19" submitted with the explanatory report for Groundwater Management Area 2 (Hutchison 2021a, 2021b). Modeled water levels for this model were extracted for the years 2013 and 2080 and drawdown calculated as the difference in water level between those two years. Drawdown averages were calculated by aquifer for each area specified in the desired future conditions. The calculated drawdown averages were compared with the desired future conditions and TWDB staff verified that the pumping scenario in the submitted model files achieved the desired future conditions.

The modeled available groundwater values for all three models were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Tables 1, 3, 5, and 7 present modeled available groundwater by county and groundwater conservation district for the Seymour, Blaine, Ogallala, and Dockum aquifers, respectively. Tables 2, 4, 6, and 8 present modeled available groundwater for regional planning purposes by county, river basin, and regional water planning area for the Seymour, Blaine, Ogallala, and Dockum aquifers, respectively.

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code (2011), "modeled available groundwater" is 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 modeled available groundwater estimates are described below:

Seymour Aquifer (Pod 7)

- The groundwater availability model for the Seymour Aquifer in Haskell, Knox, and Baylor Counties was the base model for this analysis. See Jigmond and others (2014) for the assumptions and limitations of the historical calibrated model. Groundwater

Management Area 6 constructed a predictive model simulation to extend the base model to 2080 for planning purposes. See Brady (2022) for the assumptions of this predictive model simulation.

- This groundwater availability model includes one layer, which represents the Seymour Aquifer.
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- Drawdown was calculated as the difference in modeled head (water level) between the baseline year 2010 (stress period 347) and the final year 2080 (stress period 418). Average drawdowns were calculated as the sum of drawdowns for all model cells within a specified area divided by the number of cells in that specified area.
- Although the original groundwater availability model was only calibrated to 2005, an analysis during the previous round of joint planning (Shi, 2017; Appendix A) verified that the measured water levels did not change significantly for the period from 2005 to 2010. For this reason, the TWDB considers it acceptable to use 2010 as the reference year for drawdown calculations.
- Cells in which the modeled head (water level) was below the bottom of the cell are considered "dry." Cells that were already dry during the baseline year were not included in the drawdown calculation. In cells that became dry during the simulation, the drawdown calculation used the elevation of the bottom of the cell, rather than the modeled head. In this model, transmissivity of "dry" cells remains constant and pumping from those cells continues, so the modeled available groundwater calculation can include pumping in cells where the modeled head is below the bottom of the cell.
- The most recent TWDB model grid file dated January 6, 2020 (symr_hkb_grid_poly010620.csv) was used to assign model cells to counties, groundwater management areas, groundwater conservation districts, river basins, and regional water planning areas.
- The drawdown averages and modeled available groundwater values were calculated using the active model extent of Layer 1 for Pod 7 of the Seymour Aquifer. The modeled extent of Pod 7 of the Seymour Aquifer is coincident with the official TWDB Seymour Aquifer boundary of Pod 7, shown in Figure 3.
- The modeled available groundwater was calculated based on the pumping scenario provided with the Groundwater Management Area 6 Explanatory Report (Brady, 2022).

- Estimates of modeled available groundwater from the model simulation were rounded to whole numbers.

Seymour Aquifer (except Pod 7) and Blaine Aquifer

- Version 1.01 of the groundwater availability model for the Seymour and Blaine aquifers was the base model for this analysis. See Ewing and others (2004) for the assumptions and limitations of the historical calibrated model. Groundwater Management Area 6 constructed a predictive model simulation to extend the base model to 2080 for planning purposes. See Brady (2022) for the assumptions of this predictive model simulation.
- The model has two layers that represent the Seymour Aquifer (Layer 1) and the Blaine Aquifer as well as other geologic units that underlie the Seymour Aquifer (Layer 2).
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- Drawdown was calculated as the difference in modeled head (water level) between the baseline year 2010 (initial heads) and the final year 2080 (stress period 70). Average drawdowns were calculated as the sum of drawdowns for all model cells within a specified area divided by the number of cells in that specified area.
- Although the original groundwater availability model was only calibrated to 1999, an analysis during the previous round of joint planning (Shi, 2017; Appendix A) verified that the measured water levels did not change significantly for the period from 1999 to 2010. For this reason, the TWDB considers it acceptable to use 2010 as the reference year for drawdown calculations.
- Cells in which the head (water level) was below the bottom of the cell were considered "dry." Cells that were already dry during the baseline year were not included in the drawdown calculation. In cells that became dry during the simulation, the drawdown calculation used the elevation of the bottom of the cell, rather than the modeled head. Pumping in dry cells was excluded from the modeled available groundwater calculations for the decades after the cell went dry.
- The most recent TWDB model grid file dated January 6, 2020 (symr_grid_poly010620.csv) was used to assign model cells to counties, groundwater management areas, groundwater conservation districts, river basins, and regional water planning areas. Cells that intersected a particular Seymour Aquifer pod were assigned to that pod.

- To be consistent with the desired future conditions defined by district representatives in Groundwater Management Area 6, the drawdown averages and modeled available groundwater values were calculated using the active model extent of Layers 1 and 2 for the Seymour and Blaine aquifers, respectively. The modeled extent of the Seymour Aquifer is coincident with the official TWDB Seymour Aquifer boundary, shown in Figure 3. The modeled extent of Layer 2 extends significantly beyond the official TWDB Blaine Aquifer boundary (Figure 4) and includes formations that are not equivalent to the Blaine Aquifer. However, since the modeled pumping was only implemented in areas roughly coincident with the official TWDB Blaine Aquifer boundary, the TWDB considers this an acceptable simplification.
- The modeled available groundwater was calculated based on the pumping scenario provided with the Groundwater Management Area 6 Explanatory Report (Brady, 2022).
- Estimates of modeled available groundwater from the model simulation were rounded to whole numbers.

Ogallala and Dockum aquifers

- Version 1.01 of the groundwater availability model for the High Plains Aquifer System was the base model for this analysis. See Deeds and Jigmond (2015) for the assumptions and limitations of the historical calibrated model. Groundwater Management Area 6 used the predictive model simulation "Scenario 19" constructed by Groundwater Management Area 2 to extend the base model to 2080 for planning purposes. See Hutchison (2021a, 2021b) for the assumptions of this predictive model simulation.
- The model has four layers which represent the Ogallala and Pecos Valley Alluvium aquifers (Layer 1); the Edwards-Trinity (High Plains), Rita Blanca, and Edwards-Trinity (Plateau) aquifers (Layer 2); the Upper Dockum Aquifer (Layer 3); and the Lower Dockum Aquifer (Layer 4).
- The model was run with MODFLOW-NWT (Niswonger and others, 2011).
- Drawdown was calculated as the difference in modeled head between the baseline year 2013 (initial heads) and the final year 2080 (stress period 68). Average drawdowns were calculated as the sum of drawdowns for all model cells within a specified area divided by the number of cells in that specified area.
- To be consistent with the desired future conditions defined by district representatives in Groundwater Management Area 6, the drawdown averages and

modeled available groundwater values were calculated using the active model extent of Layer 1 and the combination of Layers 3 and 4 for the Ogallala and Dockum aquifers, respectively. Within Groundwater Management Area 6, the modeled extent of the Ogallala and Dockum aquifers are coincident with the official TWDB aquifer boundaries, shown in Figures 5 and 6, respectively.

- MODFLOW-NWT can be used to simulate the declining production of a well as saturated thickness decreases because it will automatically reduce pumping when heads (water levels) drop to a level defined by the user. Typically, the user-specified level at which the model reduces pumping is defined as a fraction of cell thickness. Deeds and Jigmond (2015) slightly modified the MODFLOW-NWT code to use a particular saturated thickness value (30 feet), rather than a fraction, as the threshold for reducing pumping. The modeled available groundwater calculation thus includes reduced pumping values in cells where modeled head drops below the 30-foot saturated thickness threshold and zero pumping in cells when modeled head drops below the bottom of the cell. The average drawdown calculation includes cells where the modeled head drops below the bottom of the cell.
- Pass-through cells exist in layers 2 and 3 where the Upper Dockum Aquifer was absent, but the cells provided a pathway for flow between the Lower Dockum and the Ogallala or Edwards-Trinity (High Plains) aquifers vertically. These pass-through cells were excluded from the calculations for average drawdown and modeled available groundwater.
- The most recent TWDB model grid file dated January 6, 2020 (hpas_grid_poly010620.csv) was used to assign model cells to counties, groundwater management areas, groundwater conservation districts, river basins, and regional water planning areas.
- The modeled available groundwater was calculated based on the pumping scenario ("Scenario 19") provided with the Groundwater Management Area 2 Explanatory Report (Hutchison, 2021a, 2021b).
- Estimates of modeled drawdown and available groundwater from the model simulation were rounded to whole numbers.

RESULTS:

The modeled available groundwater values for the relevant aquifers in Groundwater Management Area 6 are as follows:

- Seymour Aquifer – The modeled available groundwater ranges from 157,895 to 181,289 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district, county, and Seymour Aquifer pod in Table 1, and by county, regional planning area, river basin, and Seymour Aquifer pod in Table 2.

- Blaine Aquifer – The modeled available groundwater ranges from 70,924 to 74,029 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county in Table 3, and by county, regional planning area, and river basin in Table 4.
- Ogallala Aquifer – The modeled available groundwater remains at 409 acre-feet per year throughout the period from 2020 to 2080. Values are summarized by groundwater conservation district and county in Table 5, and by county, regional planning area, and river basin in Table 6.
- Dockum Aquifer – The modeled available groundwater ranges from 171 to 172 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county in Table 7, and by county, regional planning area, and river basin in Table 8.

District representatives in Groundwater Management Area 6 determined the Cross Timbers Aquifer was non-relevant for the purposes of joint planning; therefore, modeled available groundwater values were not calculated for that aquifer. Additionally, the modeled available groundwater values provided in this report do not include those portions of the Seymour, Blaine, Ogallala, and Dockum aquifers that district representatives in Groundwater Management Area 6 declared non-relevant for the purposes of joint planning.

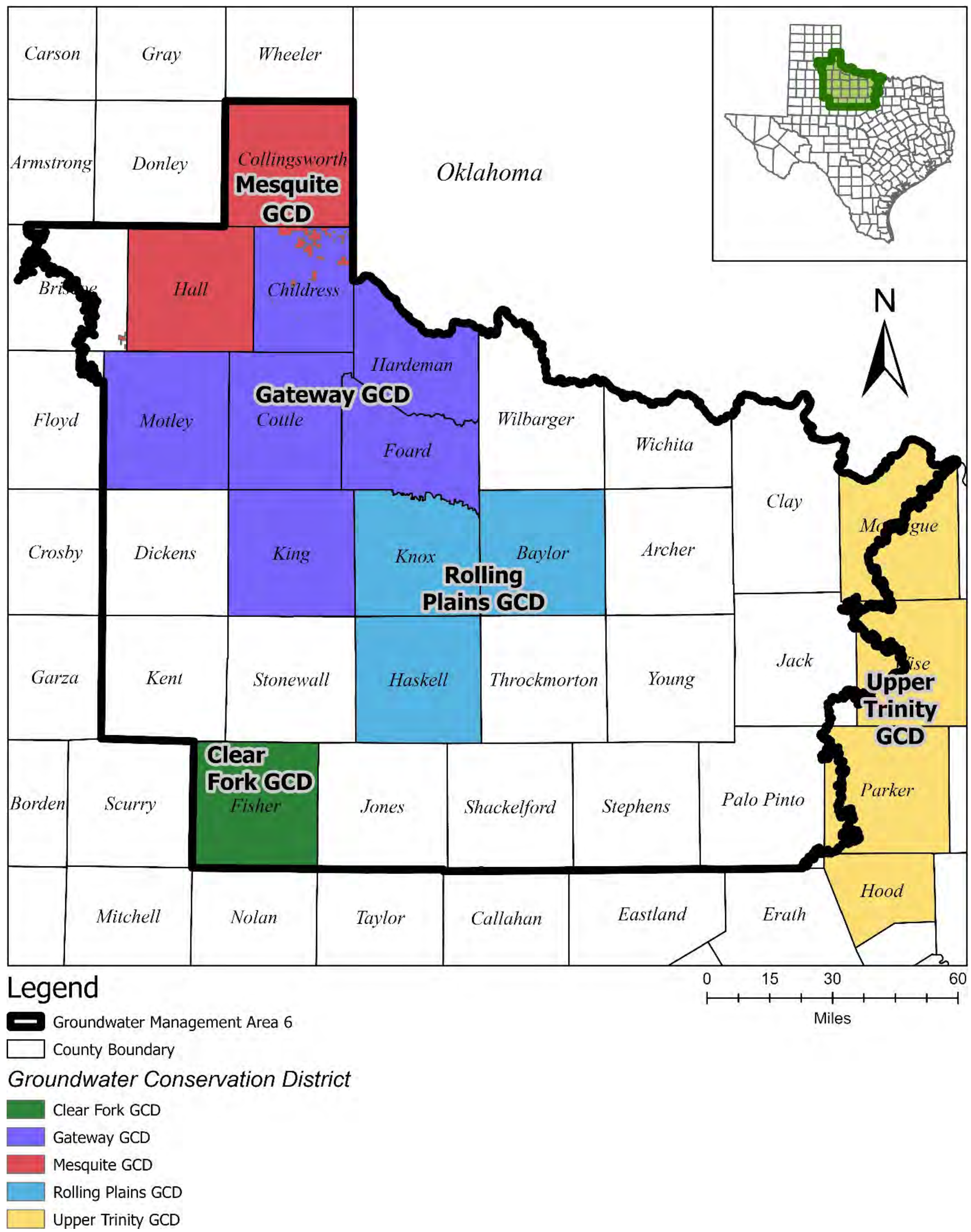

FIGURE 1. COUNTIES AND GROUNDWATER CONSERVATION DISTRICTS WITHIN GROUNDWATER MANAGEMENT AREA 6.

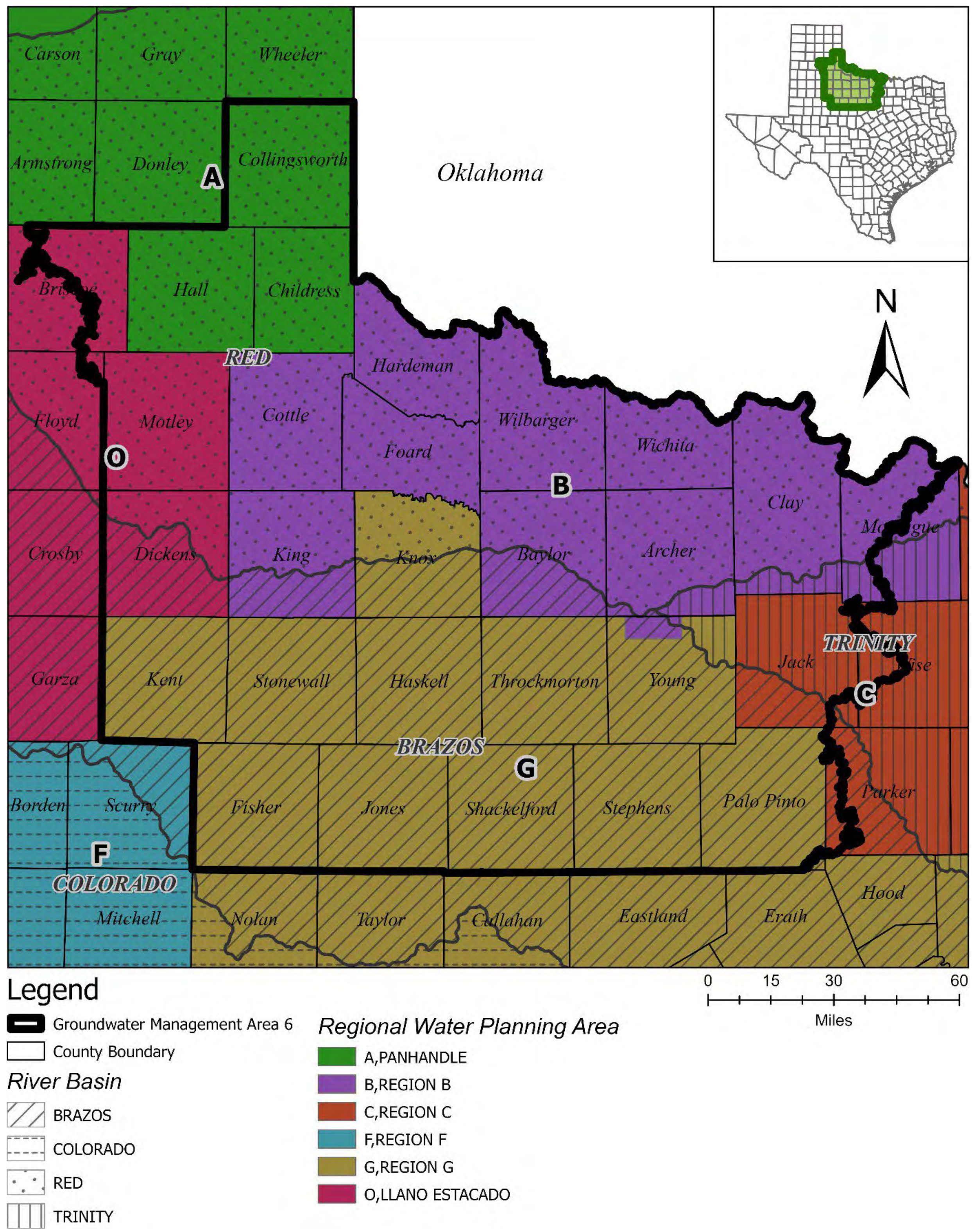

FIGURE 2. REGIONAL WATER PLANNING AREAS, RIVER BASINS, AND COUNTIES WITHIN GROUNDWATER MANAGEMENT AREA 6.

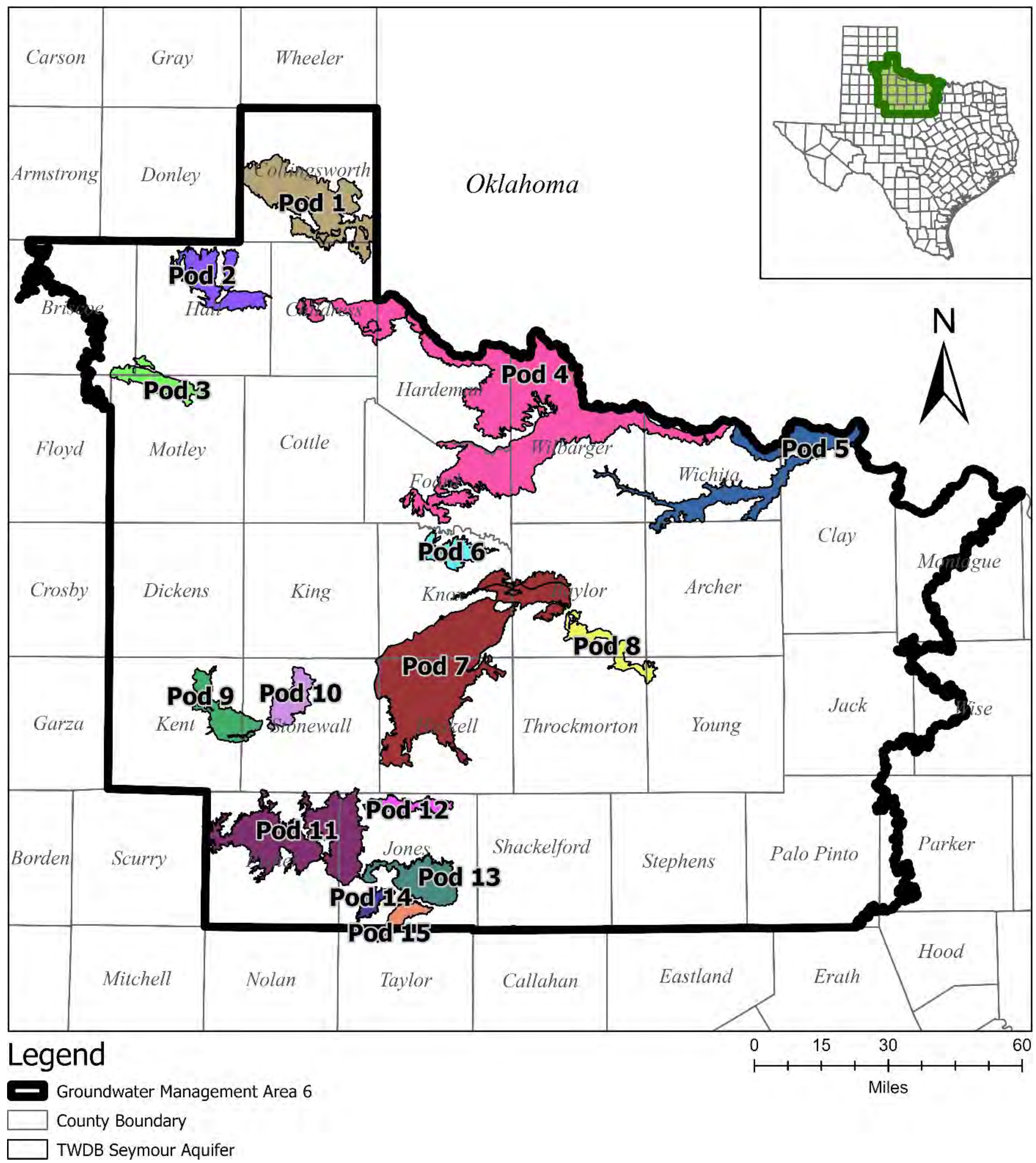

FIGURE 3. EXTENT OF THE SEYMOUR AQUIFER IN GROUNDWATER MANAGEMENT AREA 6.

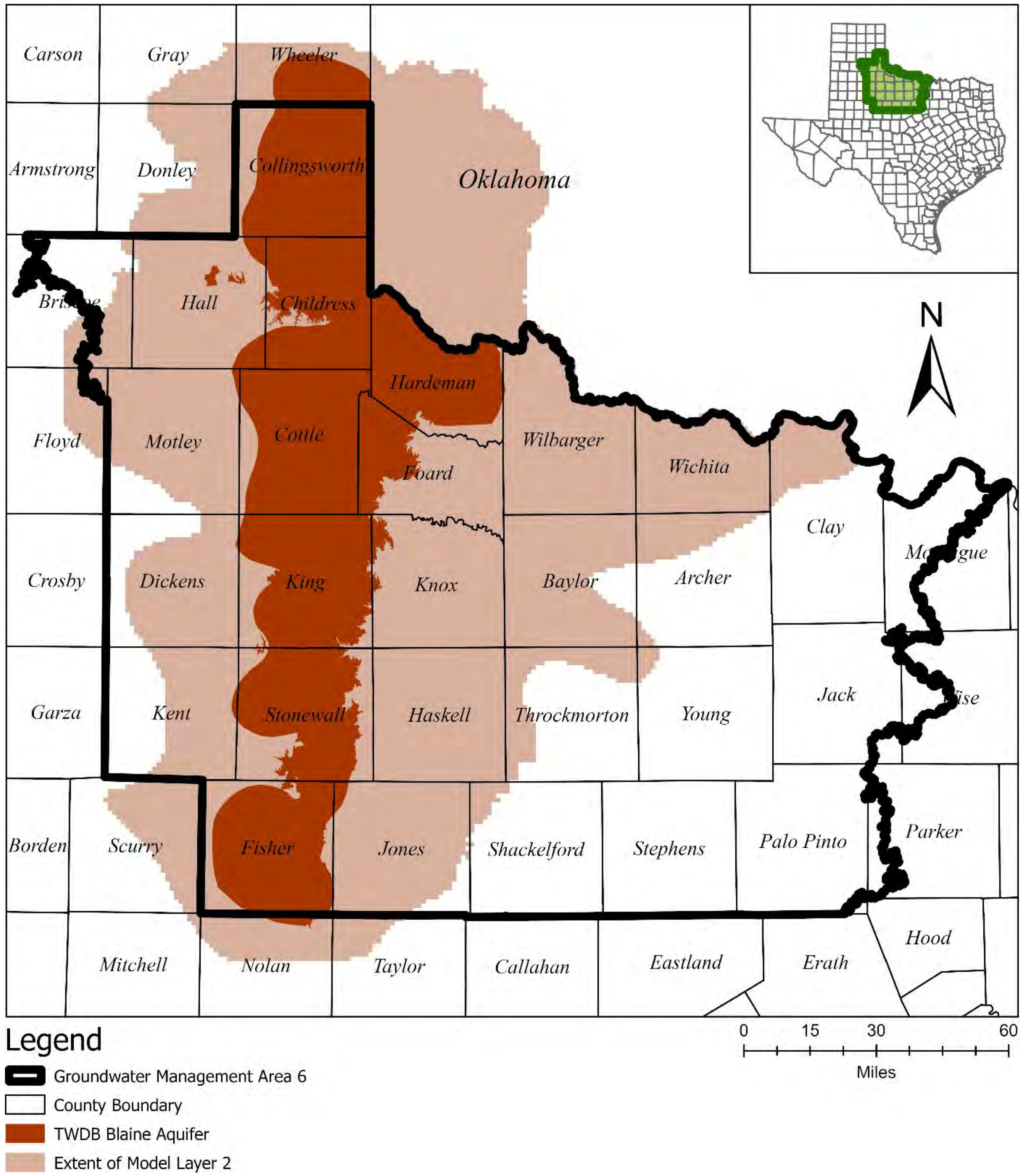

FIGURE 4. EXTENT OF THE BLAINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 OVERLAIN ON THE MODELED EXTENT OF LAYER 2 IN THE GROUNDWATER AVAILABILITY MODEL FOR THE SEYMOUR AND BLAINE AQUIFERS.

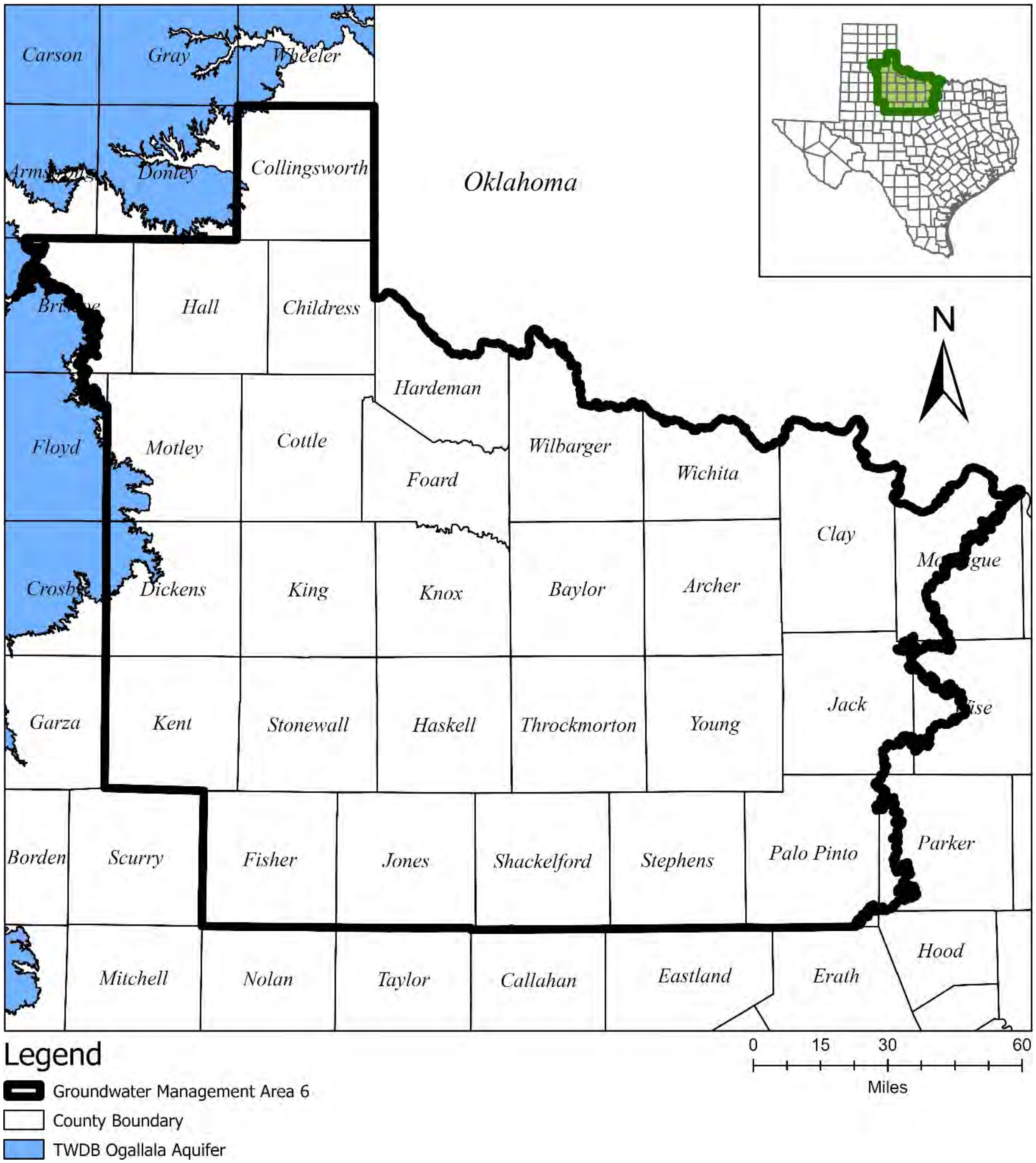

FIGURE 5. EXTENT OF OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 6.

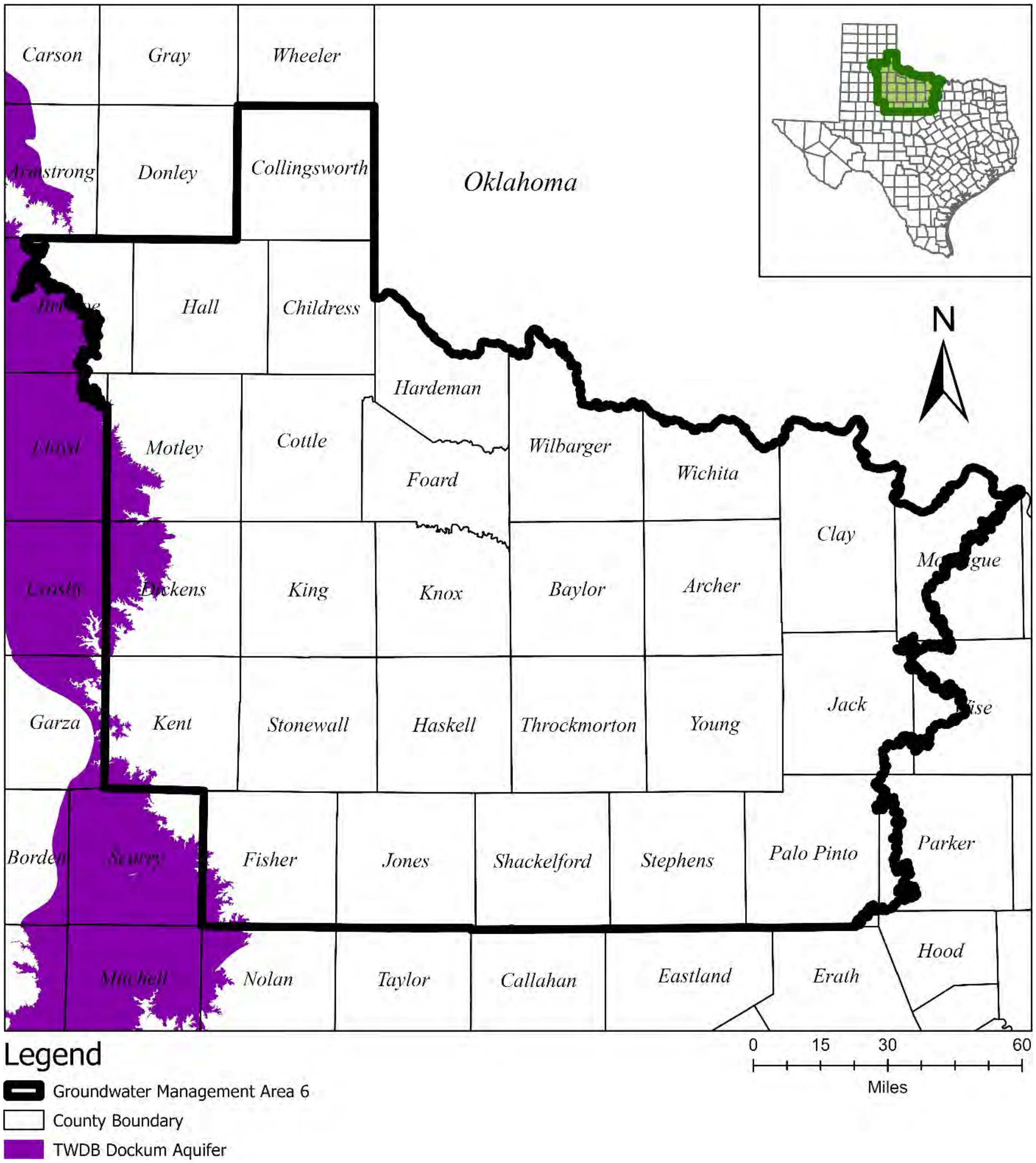

FIGURE 6. EXTENT OF DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 6

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE SEYMOUR AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	Pod Number	2020	2030	2040	2050	2060	2070	2080
Clear Fork GCD	Fisher	Seymour	11	6,700	6,132	6,132	6,472	6,473	6,131	5,900
Clear Fork GCD Total		Seymour		**6,700**	**6,132**	**6,132**	**6,472**	**6,473**	**6,131**	**5,900**
Gateway GCD	Childress	Seymour	1	50	61	61	61	61	50	50
Gateway GCD	Childress	Seymour	4	2,818	3,169	3,231	3,231	3,231	3,231	3,231
Gateway GCD	Foard	Seymour	4	10,699	3,779	4,209	6,900	6,628	2,777	4,049
Gateway GCD	Hardeman	Seymour	4	21,492	14,209	20,002	18,689	21,116	34,037	26,577
Gateway GCD	Motley	Seymour	3	4,830	6,679	4,830	4,830	3,961	3,961	4,830
Gateway GCD Total		Seymour		**39,889**	**27,897**	**32,333**	**33,711**	**34,997**	**44,056**	**38,737**
Mesquite GCD	Childress	Seymour	1	81	11	11	11	11	11	11
Mesquite GCD	Childress	Seymour	4	4	4	4	4	4	4	4
Mesquite GCD	Collingsworth	Seymour	1	41,232	31,492	28,579	27,165	22,334	22,769	29,639
Mesquite GCD	Hall	Seymour	2	10,961	12,307	14,886	18,417	20,437	18,417	15,391
Mesquite GCD	Hall	Seymour	3	4,444	4,444	4,726	4,444	5,353	6,178	4,726
Mesquite GCD Total		Seymour		**56,722**	**48,258**	**48,206**	**50,041**	**48,139**	**47,379**	**49,771**
Rolling Plains GCD	Baylor	Seymour	7*	1,430	1,427	1,430	1,427	1,430	1,427	1,430
Rolling Plains GCD	Baylor	Seymour	8	5,769	5,903	5,532	5,304	5,163	5,503	4,292
Rolling Plains GCD	Haskell	Seymour	7*	41,752	41,638	41,752	41,638	41,752	41,638	41,752
Rolling Plains GCD	Knox	Seymour	6	3,315	998	510	888	3,445	1,331	1,095
Rolling Plains GCD	Knox	Seymour	7*	25,712	25,642	25,712	25,642	25,712	25,642	25,712
Rolling Plains GCD Total		Seymour		**77,978**	**75,608**	**74,936**	**74,899**	**77,502**	**75,541**	**74,281**
Groundwater Management Area 6 Total				**181,289**	**157,895**	**161,607**	**165,123**	**167,111**	**173,107**	**168,689**

** Pod 7 values are calculated from the groundwater availability model for the Seymour Aquifer in Haskell, Knox, and Baylor (Jigmond and others, 2014). All other values are calculated from the groundwater availability model for the Seymour and Blaine aquifers (Ewing and others, 2004).*

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE SEYMOUR AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND POD FOR EACH DECADE BETWEEN 2030 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Aquifer	Pod Number	2030	2040	2050	2060	2070	2080
Baylor	B	Brazos	Seymour	7*	1,133	1,136	1,133	1,136	1,133	1,136
Baylor	B	Brazos	Seymour	8	5,903	5,532	5,304	5,163	5,503	4,292
Baylor	B	Red	Seymour	7*	294	294	294	294	294	294
Childress	A	Red	Seymour	1	72	72	72	72	61	61
Childress	A	Red	Seymour	4	3,173	3,235	3,235	3,235	3,235	3,235
Collingsworth	A	Red	Seymour	1	31,492	28,579	27,165	22,334	22,769	29,639
Fisher	G	Brazos	Seymour	11	6,132	6,132	6,472	6,473	6,131	5,900
Foard	B	Red	Seymour	4	3,779	4,209	6,900	6,628	2,777	4,049
Hall	A	Red	Seymour	2	12,307	14,886	18,417	20,437	18,417	15,391
Hall	A	Red	Seymour	3	4,444	4,726	4,444	5,353	6,178	4,726
Hardeman	B	Red	Seymour	4	14,209	20,002	18,689	21,116	34,037	26,577
Haskell	G	Brazos	Seymour	7*	41,638	41,752	41,638	41,752	41,638	41,752
Knox	G	Brazos	Seymour	7*	25,629	25,699	25,629	25,699	25,629	25,699
Knox	G	Red	Seymour	6	998	510	888	3,445	1,331	1,095
Knox	G	Red	Seymour	7*	13	13	13	13	13	13
Motley	O	Red	Seymour	3	6,679	4,830	4,830	3,961	3,961	4,830
Groundwater Management Area 6 Total					**157,895**	**161,607**	**165,123**	**167,111**	**173,107**	**168,689**

** Pod 7 values are calculated from the groundwater availability model for the Seymour Aquifer in Haskell, Knox, and Baylor (Jigmond and others, 2014). All other values are calculated from the groundwater availability model for the Seymour and Blaine aquifers (Ewing and others, 2004).*

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE BLAINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Clear Fork GCD	Fisher	Blaine	12,820	12,820	12,820	12,820	12,820	12,820	12,820
Clear Fork GCD Total		**Blaine**	**12,820**	**12,820**	**12,820**	**12,820**	**12,820**	**12,820**	**12,820**
Gateway GCD	Childress	Blaine	17,570	17,570	17,570	17,570	17,570	17,570	17,570
Gateway GCD	Cottle	Blaine	14,726	11,621	11,621	11,621	11,621	11,621	11,621
Gateway GCD	Foard	Blaine	6,565	6,565	6,565	6,565	6,565	6,565	6,565
Gateway GCD	Hardeman	Blaine	8,465	8,465	8,465	8,465	8,465	8,465	8,465
Gateway GCD	King	Blaine	49	49	49	49	49	49	49
Gateway GCD	Motley	Blaine	0	0	0	0	0	0	0
Gateway GCD Total		**Blaine**	**47,375**	**44,270**	**44,270**	**44,270**	**44,270**	**44,270**	**44,270**
Mesquite GCD	Childress	Blaine	5,940	5,940	5,940	5,940	5,940	5,940	5,940
Mesquite GCD	Collingsworth	Blaine	2,054	2,054	2,054	2,054	2,054	2,054	2,054
Mesquite GCD	Hall	Blaine	5,840	5,840	5,840	5,840	5,840	5,840	5,840
Mesquite GCD Total		**Blaine**	**13,834**	**13,834**	**13,834**	**13,834**	**13,834**	**13,834**	**13,834**
Groundwater Management Area 6 Total			**74,029**	**70,924**	**70,924**	**70,924**	**70,924**	**70,924**	**70,924**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE BLAINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Childress	A	Red	Blaine	23,510	23,510	23,510	23,510	23,510	23,510
Collingsworth	A	Red	Blaine	2,054	2,054	2,054	2,054	2,054	2,054
Cottle	B	Red	Blaine	11,621	11,621	11,621	11,621	11,621	11,621
Fisher	G	Brazos	Blaine	12,820	12,820	12,820	12,820	12,820	12,820
Foard	B	Red	Blaine	6,565	6,565	6,565	6,565	6,565	6,565
Hall	A	Red	Blaine	5,840	5,840	5,840	5,840	5,840	5,840
Hardeman	B	Red	Blaine	8,465	8,465	8,465	8,465	8,465	8,465
King	B	Brazos	Blaine	0	0	0	0	0	0
King	B	Red	Blaine	49	49	49	49	49	49
Groundwater Management Area 6 Total				**70,924**	**70,924**	**70,924**	**70,924**	**70,924**	**70,924**

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Gateway GCD	Motley	Ogallala	409	409	409	409	409	409	409
Groundwater Management Area 6 Total			**409**	**409**	**409**	**409**	**409**	**409**	**409**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Motley	O	Red	Ogallala	409	409	409	409	409	409
Groundwater Management Area 6 Total				**409**	**409**	**409**	**409**	**409**	**409**

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Clear Fork GCD	Fisher	Dockum	79	79	79	79	79	79	79
Gateway GCD	Motley	Dockum	93	93	92	92	92	92	92
Groundwater Management Area 6 Total			**172**	**172**	**171**	**171**	**171**	**171**	**171**

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Fisher	G	Brazos	Dockum	79	79	79	79	79	79
Motley	O	Red	Dockum	93	92	92	92	92	92
Groundwater Management Area 6 Total				**172**	**171**	**171**	**171**	**171**	**171**

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.

It is important for groundwater conservation districts to monitor groundwater pumping and groundwater levels in 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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Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf.

Appendix A

TWDB Clarifications sent to Mike McGuire on June 7, 2022 with Responses from Groundwater Management Area 6

Critical Clarifications (need action):
We recommend re-wording to the Ogallala Aquifer DFC from "28 feet" to "no more than 28 feet." Otherwise, the Ogallala DFC is unattainable. Note that this alternate wording will make it consistent with the GMA 6 DFCs in other aquifers.
GMA 6 response [6/16/22]: Ogallala Aquifer DFC Resolution has been reworded.

In the model files provided for the Seymour Pod 7 model, both the pumping file (titled "symr_hkb_ext2080.wel") and the recharge file ("symr_hkb_ext2080.rch") are blank. Please provide the correct versions of these files.
GMA 6 response [6/16/22]: These files have been resubmitted to TWDB via the OneDrive folder.

Please either provide a non-relevant statement or a DFC for the areas listed in the table below. This can be done by either adding additional sections to the DFC Resolutions or by making the changes listed in the "Recommendations" column.

Aquifer	Pod	County	GCD	Recommendations
Seymour	Pod 3	Briscoe	No District	
	Pod 4	Childress	Mesquite GCD	We recommend adding "and in Mesquite GCD" to the Pod 4 DFC definition [section d on pg 3 of Seymour DFC Resolution]- this definition produces drawdown values consistent with the Tech Memo.
Blaine		Wilbarger	No District	We recommend fixing the typo in the non-relevant definition [last paragraph on pg 2 of Blaine DFC Resolution] by replacing "Wheeler" County (not in GMA 6) with "Wilbarger" County

GMA 6 response [6/16/22]:
Pod 3 Briscoe No district has been added to the non-relevant portion of the resolution.
Pod 4 Mesquite GCD was added to the resolution

The Wheeler County reference is correct, we considered the DFC of GMA 1 in the Blaine Aquifer.

Other Clarifications (need acknowledgement):

Seymour & Blaine Aquifers:

We will provide MAG values calculated directly from the model files provided in the GMA 6 DFC Submittal packet. These MAG values will be lower than the maximum pumping theoretically available under the higher drawdown conditions allowable under GMA 6-defined DFCs. Please confirm that this methodology is acceptable to the GMA. Otherwise, please contact TWDB to request additional MAG value calculations.
GMA 6 response [6/16/22]: Please provide MAG values calculated directly from the model files provided in the GMA 6 DFC Submittal packet.

Please confirm that the Seymour/Blaine model input files for initial heads ("hed1999_lay1.dat" & "hed1999_lay2.dat") and for recharge ("AVG_RECH_sp241_sp300.dat") used during the current planning cycle are the same as the one submitted during the last planning cycle. The current GMA 6 submittal packet did not include these files but using the previous versions of the input files provides drawdown values consistent with the current values provided in the Technical Memo Appendix of the 2021 Explanatory Report.
GMA 6 response [6/16/22]: Confirm

Please confirm that the phrase "total decline in water levels during the period from 2010 - 2080" in the DFC Resolution means "the average water level decline in 2080, as compared to 2010 water levels." This method produces values consistent with those provided in the Technical Memo Appendix of the Explanatory Report.
GMA 6 response [6/16/22]: Confirm

Please confirm that the GMA accepts the following assumptions for calculating modeled drawdown: 1) exclude cells that start dry and 2) replace the head value in dry cells with the bottom elevation value of the cell. This method produces values consistent with those provided in the Technical Memo Appendix of the Explanatory Report.
GMA 6 response [6/16/22]: Confirm GMA accepts the assumptions.

Ogallala & Dockum Aquifers:

We will provide MAG values calculated directly from the model files provided in the GMA 2 DFC Submittal packet (consistent with Scenario 19, Technical Memorandum 20-01 (Hutchison)). These MAG values will be lower than the maximum pumping theoretically

available under the higher drawdown conditions allowable by GMA 6-defined DFCs. Please confirm that this methodology is acceptable to the GMA. Otherwise, please contact TWDB to request additional MAG value calculations.
GMA 6 response [6/16/22]: Confirm that this methodology is acceptable.

Please confirm that the phrase "average drawdown between 2013 and 2080" in the Ogallala DFC Resolution means "the average water level decline in 2080, as compared to 2013 water levels" (as opposed to an average annual drawdown for every year between 2013 and 2080).
GMA 6 response [6/16/22]: Confirm that the phrase means "the average water level decline in 2080, as compared to 2013 water levels".

Please confirm that the phrase "total decline in water levels during the period from 2013 - 2080" in the Dockum DFC Resolution means "the average water level decline in 2080, as compared to 2013 water levels."
GMA 6 response [6/16/22]: Conform [sic] that the phrase means "the average water level decline in 2080… ...."

Optional Clarifications*:
Typos in Adopted DFC table in Explanatory Report (does not match DFC Resolutions):
Blaine Aquifer
DFC in Foard County incorrectly listed as "2 ft" instead of "10 ft"
GMA 6 response [6/16/22]: Foard County Blaine DFC corrected in Explanatory Report

DFC in King County incorrectly listed as "7 ft" instead of "4 ft"
GMA 6 response [6/16/22]: King County Blaine DFC was corrected in the Resolution, it is supposed to be 7'

Missing entries for non-relevant counties: Dickens, Jones, Kent, Knox, Motley
GMA 6 response [6/16/22]: Non-relevant Counties were added to the Blaine DFC chart in the Explanatory Report.

**Note: Since TWDB considers the DFC Resolution documents, rather than the Explanatory Report, as the official definition of DFCs, TWDB does not officially require corrections to the Explanatory Report. However, because the Explanatory Report is often used as a simplified, more-readable summary of the legal DFC Resolution documents, we recommend correcting the Explanatory Report to match the DFC Resolutions in order to avoid confusion.*

Informational:

Please note that the following slivers of aquifer exist within GMA 6 but are so small that TWDB does not require a DFC or non-relevant statement.

Aquifer	Pod	County	GCD	Area
Seymour	Pod 2	Childress	Gateway GCD	0.02 mi^2
	Pod 3	Floyd	No District	0.06 mi^2
	Pod 7	King	Gateway GCD	0.03 mi^2
Ogallala		Hall	Mesquite GCD	0.12 mi^2

Appendix D
Board Resoultion of Approval

BOARD RESOLUTION OF
MESQUITE GROUNDWATER CONSERVATION DISTRICT
2024 REVISED GROUNDWATER MANAGEMENT PLAN

WHEREAS, Texas Water Code, Chapter 36, Section 36.1071 requires the Mesquite Groundwater Conservation District ("the District") to develop a comprehensive management plan to address specific management goals; and,

WHEREAS, the District issued Notice on March 26, 2024, of the 2024 Groundwater Management Plan Hearing to be held on April 25, 2024 at 7:00 p.m. DST by posting the said Notice on the District's website; by providing a copy of the Notice to the county clerk of each county in the District; and by publishing the said Notice in *The Red River Sun* on April 12, 2024; and,

WHEREAS, the District also gave notice of the District's intent to propose the adoption of the 2024 Revised Groundwater Management Plan at its April 25, 2024 regular Board Meeting; and,

WHEREAS, the District held a public hearing on April 25, 2024, to receive public comment regarding the proposed 2024 Revised Groundwater Management Plan which hearing was recorded; and,

WHEREAS, no members of the public appeared on April 25, 2024, to offer public comment regarding the proposed 2024 Revised Groundwater Management Plan and no oral, or written, public comment has been received by the District as of April 25, 2024; and,

WHEREAS, Texas Water Code, Section 36.1071 also requires the District to identify the performance standards and management objectives under which the District will operate to achieve its management goals; and,

WHEREAS, the Board of Directors of the Mesquite Groundwater Conservation District believes that the 2024 Revised Management Plan of the District reflects the best management of the groundwater for the District and meets the requirements of Section 36.1071 as applicable; and,

WHEREAS, the Board further believes that the description of activities, programs, and procedures of the District included in the 2024 Revised Groundwater Management Plan provide performance standards and management goals and objectives necessary to affect the Revised Plan in accordance with Section 36.1071.

NOW, THEREFORE, BE IT RESOLVED, AND IT IS HEREBY RESOLVED, THAT the Board of Directors of the Mesquite Groundwater

Conservation District does hereby adopt the 2024 Mesquite Groundwater Conservation District Revised Management Plan on this 25th day of April 2024.

Johnny Lindley, President

Curtis Scrivner, Secretary

Terry Canada, Vice-President

Matt Tarver, Director

Michael Souder, Director

Mat Montgomery, Director

Rex Fuston, Director

Zach Hightower, Director

Appendix E
Public Notice

OFFICE of the SECRETARY of STATE

Lynn Smith Log Off

Open Meeting Submission

TRD:	2024002107
Date Posted:	04/12/2024
Status:	Accepted
Agency Id:	1027
Date of Submission:	04/12/2024
Agency Name:	Mesquite Groundwater Conservation District
Board:	Mesquite Groundwater Conservation District
Date of Meeting:	04/25/2024
Time of Meeting:	07:00 PM (**##:## AM Local Time)**
Street Location:	303 8th Street
City:	Wellington
State:	TX
Liaison Name:	Lynn Smith
Liaison Id:	2
Additional Information Obtained From:	Whitney Wiebe @ 844-445-2800
Agenda:	MESQUITE GROUNDWATER CONSERVATION DISTRICT'S NOTICE OF PUBLIC HEARING FOR THE PURPOSE OF ADOPTING A REVISED MANAGEMENT PLAN

TO: ALL INTERESTED PERSONS.

The Mesquite Groundwater Conservation District ("District") will conduct a public hearing concerning the District's intent to adopt a revised Management Plan.

The public hearing is to provide interested members of the public the opportunity to appear and provide oral or written comments on the proposed revisions to the Management Plan.

Date, Time, and Place of Public Hearing.

The date, time and place of the public hearing is as follows:

Date: April 25, 2024
Time: 7:00 PM
Location: Memphis Public Library
303 South 8th Street
Memphis, Texas 79245.

Procedures for Submitting Public Comments
on the Revised Management Plan.

A. Oral Comments:

Any person may appear in person, or by authorized representative, at the public hearing regarding the proposed revisions to the District's Management Plan. Any person making an appearance must indicate their desire to make oral comments on the registration form provided by the District at the public hearing. A person must disclose any affiliation on the registration form and if applicable, the legal authority to speak for a person represented. Any other person attending the public hearing will be considered by the District to be an observer not desiring to make comment on the proposed Management Plan. The District will not consider any comments of an observer in its proceedings.

All persons must indicate on the registration form whether their comments are generally directed to the entire proposed revised Management Plan, or whether they are directed at specific items in the proposed revised Management Plan. If directed at specific items in the proposed revised Management Plan, the number of the items in the proposed revised Management Plan must be identified on the registration form. If it becomes apparent during the oral comments that what were indicated to be merely general comments are, in fact, specific comments, the presiding officer may ask the person to specifically identify the proposed items in the proposed revised Management Plan to which the oral comments are directed.

The presiding officer will establish the order of oral comments of persons at the hearing. As appropriate, the presiding officer may limit:

1. the number of times a person may speak;

2. the time period for oral comments;

3. cumulative, irrelevant, or unduly repetitious comments;

4. general comments that are so vague, undeveloped, or immaterial as to be impracticable for the District to ascertain the intent or purpose of the person making the general oral comments and that are otherwise unhelpful to the District in analyzing the proposed revisions to the Management Plan;

5. the time period for asking or responding to questions; and

6. other matters that come to the attention of the presiding officer as requiring limitation.

B. Written Comments:

1. Written comments on the proposed revisions to the Management Plan must be filed with the District by mail or hand-delivery at the District's office at 802 9th Street, Wellington, Texas 79095. All written comments must be filed with the District and date-stamped no later than Wednesday, April 17, 2024 at 4:00 p.m.
2. Written comments should be filed on 8½ x 11 inch paper and be typed or legibly written.

Written comments must indicate whether the comments are general and directed at all of the proposed revisions of the Management Plan, or whether they are directed at specific items in the proposed Management Plan. If directed at specific items in the proposed Management Plan, the number of the proposed item must be identified and followed by the comments on the specifically identified item of the Management Plan.

C. Response to Comments:

Please note that while the District Board and staff will consider both oral and written comments, the staff may not prepare written responses to these comments for review and consideration by the Board of Directors of the District when it deliberates on whether to adopt the proposed revisions to the District's Management Plan.

Procedure for Obtaining the Revised Management Plan.

Copies of the proposed Management Plan may be obtained from the District by:

1. telephoning (844) 445-2800;

2. e-mailing a request to the District at manager@mesquitegcd.gov

3 visiting the offices of the District at 802 9th Street, Wellington, Texas; or,

4. visiting the District's website at www.mesquitegcd.gov

Opportunity to Attend the Board Meeting
at which the Revised Management Plan May be Adopted.

A meeting of the District's Board of Directors will be held on April 25, 2024 at 7:00 PM at the Memphis Public Library, 303 South 8th Street, Memphis, Texas 79245. The meeting will then be recessed at 7:15 p.m. to conduct the public Hearing on the District's proposed Management Plan. The agenda item addressing adoption of the Management Plan will be addressed during the meeting, but after the Management Plan Hearing.

SUMMARY OF REVISIONS TO THE DISTRICT'S MANAGEMENT PLAN

(1) Addressing the strategies to achieve the Desired Future Conditions (DFC): Updated the Desired Future Condition from the previously approved DFCs to the currently approved DFCs. All current DFCs were included in a new appendix;

(2) Addressing providing for the most efficient use of groundwater within the District: Updated the date of required pumping data to be recorded by the District to May 1st of each year;

(3) Addressing strategies to enhance water supplies: The District is to review the recharge enhancement feasibility study annually; and

(4) Addressing Rainwater Harvesting: The District will annually publish a rainwater harvesting article in local newspapers, including any projects in the District.

Issued this

/s/ Whitney Wiebe
Whitney Wiebe, General Manager,
Mesquite Groundwater Cons

New Submission

MESQUITE GROUNDWATER CONSERVATION DISTRICT'S NOTICE OF PUBLIC HEARING FOR THE PURPOSE OF ADOPTING A REVISED MANAGEMENT PLAN

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Date:	**April 25, 2024**
Time:	**7:00 PM**
Location:	Memphis Public Library 303 South 8th Street Memphis, Texas 79245.

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Issued this

/s/ Whitney Wiebe
Whitney Wiebe, General Manager,
Mesquite Groundwater Conservation District

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Issued this

/s/ Whitney Wiebe
Whitney Wiebe, General Manager,
Mesquite Groundwater Conservation District

FILED
AT 9:11 O'CLOCK A M
APR 12 2024
JACKIE JOHNSON
County-District Clerk Collingsworth Co., Texas
By ________ Deputy

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Issued this

/s/ Whitney Wiebe
Whitney Wiebe, General Manager,
Mesquite Groundwater Conservation District

Mesquite Groundwater Conservation District

Whitney Wiebe <whitney@mesquitegcd.gov>

Management Plan

3 messages

Whitney Wiebe <whitney@mesquitegcd.gov> Mon, May 6, 2024 at 9:51 AM
To: greenbelt@valornet.com

To whom it may concern,

I have attached a copy of our Management Plan.

Have a great week.

--
Whitney Wiebe
General Manager
Mesquite Groundwater Conservation District
(844) 445-2800 (Office)
(806) 204-1177 (Cell)

2024 Mesquite GCD Management Plan.pdf
10868K

Mail Delivery Subsystem <mailer-daemon@googlemail.com> Mon, May 6, 2024 at 9:51 AM
To: whitney@mesquitegcd.gov

Address not found

Your message wasn't delivered to **greenbelt@valornet.com** because the address couldn't be found, or is unable to receive mail.

The response from the remote server was:

```
550 5.1.1 [R2] Recipient greenbelt@valornet.com does not exist here.
```

Final-Recipient: rfc822; greenbelt@valornet.com
Action: failed
Status: 5.1.1
Remote-MTA: dns; mx01.windstream.net. (129.159.105.98, the server for the domain valornet.com.)
Diagnostic-Code: smtp; 550 5.1.1 [R2] Recipient greenbelt@valornet.com does not exist here.

Last-Attempt-Date: Mon, 06 May 2024 07:51:22 -0700 (PDT)

---------- Forwarded message ----------
From: Whitney Wiebe <whitney@mesquitegcd.gov>
To: greenbelt@valornet.com
Cc:
Bcc:
Date: Mon, 6 May 2024 09:51:02 -0500
Subject: Management Plan
----- Message truncated -----

Whitney Wiebe <whitney@mesquitegcd.gov> Mon, May 6, 2024 at 9:53 AM
To: greenbeltwater@valornet.com

[Quoted text hidden]

2024 Mesquite GCD Management Plan.pdf
10868K

Mesquite Groundwater Conservation District

Whitney Wiebe <whitney@mesquitegcd.gov>

Mesquite Groundwater Management Plan

1 message

Whitney Wiebe <whitney@mesquitegcd.gov> Mon, May 6, 2024 at 8:08 AM
To: Fabian Heaney <fabian.heaney@rra.texas.gov>

Fabian,
I have attached a copy of the approved management plan for Mesquite Groundwater Conservation District.

Have a great week!

--
Whitney Wiebe
General Manager
Mesquite Groundwater Conservation District
(844) 445-2800 (Office)
(806) 204-1177 (Cell)

2024 Mesquite GCD Management Plan.pdf
10868K