MENARD COUNTY
UNDERGROUND WATER DISTRICT

MANAGEMENT PLAN

2022 - 2027

Re-Adopted:
June 15, 2022

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CH 1 DISTRICT MISSION & OVERVIEW

1.1 DISTRICT MISSION

The mission of the Menard County Underground Water District (the District) is to develop, promote and implement water conservation and management strategies to a) conserve, preserve, and protect the surface and groundwater supplies of the District, b) protect and enhance recharge, c) prevent waste and pollution, d) effect efficient use of groundwater within the District and e) to protect the landowners of water rights within the District from impairment of their groundwater quality and quantity.

1.2 GUIDING PRINCIPLES

The District recognizes that its groundwater resources are of utmost importance to the economy and environment, first to the citizens of Menard County and then to the region.

The District is created for the purpose of conserving, preserving and protecting groundwater supply quantity and quality in the District by consistently adhering to Chapter 36 of the Texas Water Code. The District conducts administrative and technical activities and programs to achieve these purposes by acquiring, understanding and beneficially employing scientific data on the District's aquifers and their hydrogeologic qualities and identifying the extent and location of water supply within the District, for the purpose of developing sound management procedures, preventing depletion of the aquifers underlying the District to protect springs, stream flows and groundwater supplies to assure an adequate supply of water for future municipal, domestic, agricultural and commercial use, and protecting the private property rights of landowners by ensuring that landowners continue to have an adequate groundwater supply underlying their land. The District does this by promulgating rules for permitting and regulation of spacing, production and transportation of groundwater resources in the District to protect the quantity and quality of the resource, educating the public and regulating for conservation and beneficial use of the water, and to prevent pollution of groundwater resources by cooperating and coordinating with other groundwater conservation districts with which the District shares aquifer resources.

1.3 TIME PERIOD FOR THIS PLAN

This plan becomes effective upon adoption by the Board of Directors and approval by the Texas Water Development Board executive administrator. This new plan remains in effect for a five-year period or until a revised plan is approved, whichever is earlier.

1.4 GENERAL DESCRIPTION OF THE DISTRICT

The citizens of Menard County, recognizing the importance of protecting and maximizing beneficial use of the scarce water resources of the county and the necessity for protecting integrity of the county's groundwater quality, introduced legislation in the 71st Regular Legislative Session (1991) for creation of the District. A confirmation election was held on August 14, 1999, with 119 (94%) of the votes cast in favor of confirming the creation of the District and 7 (6%) against. The District is governed by a five-member locally-elected Board of Directors. The directors serve staggered two-year terms, assuring the District's responsiveness to voters' approval or disapproval of the local management of their groundwater and/or the services provided by the District.

Location and Extent
The Menard County Underground Water District comprises the entire area of Menard County which is not included within the boundaries of the Hickory Underground Water Conservation District No. 1. It covers an area of approximately 502,703 acres (785.5 square miles) in the west-central part of Texas. Land elevations within the District range from 1,890 to 2,700 feet above mean sea level. Total county population is 2,336 including the county seat, the City of Menard (population 1,606).

Topography
The District lies within the Colorado River Basin and is bisected by the San Saba River, the headwaters of which are located in Menard and Schleicher Counties near Ft. McKavett. There are numerous creeks which are tributaries of the San Saba. Drainage of the river is in a generally eastward direction.

The Edwards-Trinity (Plateau) Aquifer is made up of lower Cretaceous age Trinity Group formations and overlying limestones and dolomites of the Comanche Peak, Edwards, and the Georgetown formations. It ranges in thickness from 0 to 250 feet. Springs issuing from the Aquifer form the headwaters for the San Saba River, which flows eastward, and supply several creeks which are tributary to the San Saba.

The Edwards-Trinity (Plateau) Aquifer outcrops over the majority of the area in the District with exception of the alluvial areas along the San Saba River and its tributaries and a small portion of the southeastern corner of the county. Underlying the Edwards Trinity (Plateau) Aquifer in the eastern half of the district is a down-dip portion of the Hickory Aquifer. The Ellenburger-San Saba Aquifer has a few small outcrops in the eastern part of the county.

The Hickory Aquifer is comprised of Cambrian-age sands and gravels eroded from the granites of the Llano uplift in central Texas. There is no outcrop area of the Hickory Aquifer in Menard County, but the Aquifer down-dips fairly uniformly to the west, underlying the Edwards-Trinity (Plateau) Aquifer in the eastern half of the county.

1.5 REGIONAL COOPERATION AND COORDINATION

Regional Water Planning
The District has been active in the Region F, Regional Water Planning Group meetings to provide input in developing and adopting the 2001, 2006, 2011, 2016, and 2021 Regional plans. As the Regional Planning Group moves toward adopting future Regional Plans the District will continue to participate in the planning process.

Groundwater Management Area
Groundwater Management Area 7 covers all or part of thirty-three counties and includes twenty groundwater conservation districts. These GCD's manage groundwater resources at the local level in all or part of twenty-four counties within GMA 7 and surrounding areas. The District continues to actively participate in meetings and discussions to determine a feasible future desired condition of the aquifers within the management area and district.

West Texas Regional Groundwater Alliance

Since 1999 the District has been involved in coordination of district activities with other GCD's managing the Edwards-Trinity (Plateau) Aquifer. In 1988, four groundwater conservation districts; Coke County UWCD, Glasscock County UWCD, Irion County WCD, and Sterling County UWCD signed an original Cooperative Agreement. As new districts were created, they too signed the Cooperative Agreement. In the fall of 1996, the original Cooperative Agreement was redrafted and the West Texas Regional Groundwater Alliance was created. The regional alliance consists of seventeen locally created and locally funded groundwater conservation districts covering all or part of twenty-two counties, which encompass approximately 18.2 million acres or 28,368 square miles, of West Central Texas. This West Texas region is as diverse as the State of Texas. Due to the diversity of this region, each member district provides its own unique programs to best serve its constituents. Current member districts are:

Coke Co. UWCD	Kimble Co. GCD	Plateau UWC & SD
Crockett Co. GCD	Lipan-Kickapoo WCD	Santa Rita UWCD
Glasscock GCD	Lone Wolf GCD	Sterling Co. UWCD
Hickory UWCD # 1	Menard Co. UWD	Sutton Co. UWCD
Hill Country UWCD	Middle Pecos GCD	Reeves County GCD
Irion Co. WCD	Permian Basin UWCD	Wes-Tex GCD

This Alliance was created because the local districts have a common objective: to facilitate the conservation, preservation and protection of groundwater supplies, protection and enhancement of recharge, prevention of waste and pollution, and beneficial use of water and related resources. Local districts monitor water-related activities which include but are not limited to the State's largest industries of farming, ranching and oil and gas production. The alliance provides coordination essential to the activities of these member districts as they monitor these activities in order to accomplish their objectives.

CH 2 GROUNDWATER RESOURCES & MANAGEMENT

2.1 GROUNDWATER RESOURCES

Edwards-Trinity (Plateau) Aquifer

The Edwards-Trinity (Plateau) Aquifer is the principal aquifer in the District. The saturated thickness of the formation is from 100–300 feet throughout most of the county, except an area in the northwestern corner of the county where it is only 50-100 feet. The water levels have generally remained constant or have fluctuated only with seasonal use or with unusually large deviations from average annual rainfall. The formation is fractured, with the water supply lying in the joints and fractures of the limestone. The limestone is porous, and recharge to the aquifer is rapid because of the existence of horizontal and vertical dissolution channels in the limestone. The Edwards –Trinity (Plateau) Aquifer underlies 578,196 acres of the county. There is little storage in the aquifer, as most of the recharge and lateral inflows into the aquifer are discharged into streams. There are very few high-production wells in this formation in the District, but supplies are presently believed to be sufficient for domestic and livestock use in the sparsely populated county where wells are drilled into the fractures and joints. Most Edwards-Trinity (Plateau) Aquifer wells in the District pump less than 15 gallons per minute. Water quality is good, though generally very hard, with 98.5% of the water supply in the District from this formation having Total Dissolved Solids (TDS) concentrations below 1,000 mg/l.3

Hickory Aquifer

The Hickory Aquifer has an average saturated thickness of 400-600 feet in the northeast corner of the district and 200-400 feet in the southeast quarter. There is no recharge to the aquifer within the District, but recoverable storage in the District is estimated to be about 4,500,000 acre-feet. The water quality varies, with only about 56% of the supply in the District having TDS <1,000 mg/l.4 The extent of radionuclides, which are known to exist in other areas of the aquifer, is not yet known in Menard County. However, all of the formation within the District is down-dip from the outcrop area, so it is probable that the Hickory Aquifer water supply within the District will contain these radioactive decay products in most areas.

Ellenburger-San Saba Aquifer

The Ellenburger-San Saba Aquifer consists of upper Cambrian limestone and sandstone San Saba Formation overlain by the Ordovician limestone and dolomite Ellenburger formation. The latter is highly porous and outcrops in several small areas along the San Saba River in the eastern part of the county. The quality of the water pumped in the District is good, with TDS less than 1,000mg/l.

2.2 MANAGEMENT OF GROUNDWATER SUPPLIES

The District monitors and evaluates groundwater conditions, regulates production and the transport of groundwater out of the District consistent with this plan, the District Rules and TWC Chapter 36. Production is regulated as needed to conserve groundwater, and protect groundwater users, while not unnecessarily or adversely limiting production or impacting the economic viability of the public, landowners and private groundwater users. In consideration of the importance of groundwater to the economy and culture of the District, the District

identifies and engages in activities and practices that permit groundwater production and, as appropriate, protects the aquifer and groundwater in accordance with this Management Plan and the District's Rules. A monitoring well network is maintained to monitor aquifer conditions within the District. The District makes a regular assessment of water supply and groundwater storage conditions and reports those conditions as appropriate in public meetings of the Board or public announcements.

The District adopts Rules to regulate groundwater withdrawals by means of well spacing and production limits as appropriate to implement this Plan. In making a determination to grant a permit or limit groundwater withdrawals, the District considers the available evidence and, as appropriate and applicable, weigh the public benefit against the individual needs and hardship.

In pursuit of the District's mission of protecting the groundwater resources, the District may require adjustment of groundwater withdrawals in accordance with the Rules and Management Plan. To achieve this purpose, the District may, at the Board's discretion after notice and hearing, amend or revoke any permit for non-compliance, or reduce the production authorized by permit for the purpose of protecting the aquifer and groundwater availability. The determination to seek the amendment of a permit will be based on aquifer conditions observed by the District as stated in the District's Rules. The determination to seek revocation of a permit will be based on compliance and non-compliance with the District's Rules and regulations. The District will enforce the terms and conditions of permits and the Rules of the District, as necessary, by fine and enjoining the permit holder in a court of competent jurisdiction as provided for in TWC § 36.102.

The District uses reasonable and necessary technical resources at its disposal to evaluate the groundwater resources available within the District and determines the effectiveness of regulatory or conservation measures. A primary function of the district is to obtain and analyze data about aquifer supplies and hydraulic conditions to develop more effective management of the resource. The District will continue to establish monitor wells to gather baseline data concerning aquifer levels. The District will take readings from the monitor wells on a regular basis, make reports thereon to the Board of Directors, and maintain cumulative records of the water levels in the wells.

The District recognizes the importance of public education to encourage efficient use, implement conservation practices, prevent waste, and preserve the integrity of groundwater and will seek opportunities to educate the public on water conservation issues and other matters relevant to the protection of the aquifer resources through public meetings, newspaper articles, and other means which may become available.

2.3 ESTIMATED AVAILABLE GROUNDWATER

DFC / MAG

Estimate of modeled available groundwater in the District are based on desired future conditions. Texas Water Code § 36.001 defines modeled available groundwater as "the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108." The joint planning process set forth in

Texas Water Code § 36.108 must be collectively conducted by all groundwater conservation districts within the same GMA.

A new MAG report will become available and incorporated into the groundwater management plan later this year.

Please refer to Appendix A – GAM Run 16-026 MAG v.2

2.3.1 Estimate of The Annual Amount of Recharge From Precipitation

Please refer to Appendix C - GAM Run 21-004

2.3.2 Estimate of The Annual Volume of Water That Discharges From The Aquifer To Springs and Any Surface Water Bodies

Please refer to Appendix C - GAM Run 21-004

2.3.3 Estimate of The Annual Volume of Flow Into The District

Please refer to Appendix C - GAM Run 21-004

2.3.4 Estimate of The Annual Volume of Flow Out of The District

Please refer to Appendix C - GAM Run 21-004

2.3.5 Estimate of The Annual Volume of Flow Between Aquifers in the District

Please refer to Appendix C - GAM Run 21-004

2.3.6 Surface Water Resources

Please refer to Appendix B- Estimated Historical Water Use/2022 State Water Plan

2.3.7 Projected Total Water Demand

Please refer to Appendix B- Estimated Historical Water Use/2022 State Water Plan

2.3.8 Estimate of the Historical Groundwater Use

Please refer to Appendix B- Estimated Historical Water Use/2022 State Water Plan

2.4 Consideration of The Water Supply Needs

Projected water supply needs for the District indicate that demand will exceed supply for Municipal use.

Please refer to Appendix B

2.4.1 Consideration of The Water Management Strategies

Preservation and protection of groundwater quantity and quality has been the guiding principle of the District since its creation. The goals and objectives of this plan provide guidance in the performance of existing District activities and practices. Water Management strategies for this shortfall include conservation by demand reduction. District Rules address groundwater withdrawals by means of spacing and/or production limits, waste, and well drilling completion as well as capping and plugging of unused or abandoned wells. These Rules are meant to provide equitable conservation and preservation of groundwater resources, protect vested property rights

and prevent confiscation of property. The district continues to encourage conservation to meet the projected strategies in the TWDB 2022 State Water Plan and the TWDB Estimated Historical Water Use.

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

MENARD COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
IRRIGATION, MENARD, COLORADO (F)							
IRRIGATION CONSERVATION - MENARD COUNTY	DEMAND REDUCTION [MENARD]	183	366	549	549	549	549
SUBORDINATION - MENARD COUNTY IRRIGATION	COLORADO RUN-OF-RIVER [MENARD]	537	537	537	537	537	537
		720	**903**	**1,086**	**1,086**	**1,086**	**1,086**
MENARD, COLORADO (F)							
MUNICIPAL CONSERVATION - MENARD	DEMAND REDUCTION [MENARD]	5	5	5	5	5	5
SUBORDINATION - MENARD COUNTY IRRIGATION	COLORADO RUN-OF-RIVER [MENARD]	1,000	1,000	1,000	1,000	1,000	1,000
		1,005	**1,005**	**1,005**	**1,005**	**1,005**	**1,005**
MINING, MENARD, COLORADO (F)							
MINING CONSERVATION - MENARD COUNTY	DEMAND REDUCTION [MENARD]	46	45	40	35	30	26
		46	**45**	**40**	**35**	**30**	**26**
Sum of Projected Water Management Strategies (acre-feet)		**1,771**	**1,953**	**2,131**	**2,126**	**2,121**	**2,117**

Please refer to Appendix B

2.4.2 Actions, Procedures, Performance, and Avoidance Necessary to Effectuate the Management Plan

The District will implement and utilize the provisions of this plan as a guide for determining the direction and/or priority for District activities. Operations of the District and all agreements entered into by the District will be consistent with the provisions of this plan.

The District has adopted Rules for the management of groundwater resources and will amend those Rules as necessary pursuant to TWC Chapter 36 and the provisions of this plan. Rules will be adhered to and enforced. The promulgation and enforcement of the Rules will be based on the best technical evidence available. The District will seek cooperation in the implementation of this plan and the management of groundwater supplies within the District.

Please refer to Appendix D for a copy of the District's Rules

2.4.3 Methodology for Tracking Progress

The methodology that the District will use to trace the progress in achieving the management goals as prescribed by TWC 36.1071(a) will be as follows:

The District General Manager will prepare and present an annual report to the Board of Directors on District performance regarding management plan goals and objectives for the preceding year during the first meeting of each year. The annual report will be maintained at the District office.

2.4.4 Evidence of Coordination with Regional Surface Water Management Entities

Evidence of the coordination with Regional Surface Water Management Entities is included in Appendix F.

CH 3 GOALS, MANAGEMENT OBJECTIVES, & PEFORMANCE STANDARDS

3.1 Goal 1 - §36.1071(a)(1) Providing the Most Efficient Use of Groundwater

The District, through programs and its Rules, strives to ensure the most efficient use of groundwater in order to sustain available resources for the future while maintaining the economic growth and respecting private property rights of the District.

Management Objective 1.1
The District will require that all wells be registered in accordance with its current Rules.

Performance Standard 1.1
The Board of Directors will receive quarterly briefings by the General Manager regarding the District's well registration program new wells. The registration data will also be included in the Annual Report to the Board of Directors.

3.2 Goal 2 - §36.1071(a)(2) Controlling and Preventing Waste of Groundwater

An important goal of the District is to implement strategies that will control and prevent the waste of groundwater. The District believes education to its citizens is the best way to prevent waste of groundwater in the District.

Management Objective 2.1
The district will annually provide information to the public on eliminating and reducing wasteful practices in the use of groundwater by publishing information on groundwater waste reduction at least once a year by giving public presentations.

Performance Standard 2.1
Record the number of shows, demonstrations, events, or educational talks presented and report this to the district board of directors in an annual report.

3.3 Goal 3 – §36.1071(a)(4) Addressing Conjunctive Surface Water Management Issues

The surface water and groundwater interaction is a vital factor in understanding the hydrology of Menard County. The District understands the importance of this interaction, and puts a lot of resources towards research and education of our surface/groundwater interactions.

Management Objective 3.1
The District will hold one annual joint planning meeting with the Menard County Water Control & Improvement District No. 1 to discuss conjunctive use issues.

Performance Standard 3.1
Information from that meeting will be included in the District's Annual Report. Minutes of the joint planning meeting will also be kept in the District office.

3.4 GOAL 4 – §36.1071(A)(5) ADDRESSING NATURAL RESOURCE ISSUES

The District understands that the groundwater is a natural resource that must be maintained and researched. The District is committed to continuously learn more about our aquifers.

Management Objective 4.1
The District will minimize the potential contamination of groundwater by monitoring the spacing and completion of wells.

Performance Standard 4.1
All new registered wells drilled within the District will be in accordance with District Spacing Rules, and maintain information on registered wells to be reported quarterly at regular Board Meetings.

3.5 GOAL 5- §36.1071(A)(6) ADDRESSING DROUGHT CONDITIONS

Groundwater in the District is very affected by drought, and therefore one of the District's main concerns. The Texas Water Development Board provides a very useful website for information on drought called "Water Data for Texas", which can be found here: **waterdatafortexas.org/drought.**

Management Objective 5.1
Report a drought update will be given at least quarterly at the regularly called Board meetings.

Performance Standard
Minutes of the Board meetings will be kept in the District Office.

Management Objective 5.2
Publication in the local newspaper of a notice for need to conserve water once each month during times that the LCRA stream gauge at Menard has readings of less than 8 cfs for the duration of a week or more. The notice will include a link to the TWDB drought website at http://www.twdb.state/tx.us/DATA/drought/index.asp.

Performance Standard
Stream gauge readings will be reported to the board of directors at the Board Meetings at least quarterly during the duration of time when the LCRA stream gauge at Menard has readings less than 8cfs for the duration of a week or more.

3.6 Goal 6 - §36.1071(a)(7) Addressing Conservation

The District will continue to be a source for available informational materials and programs to improve public awareness of efficient use, wasteful practices and conservation measures including the water conservation best management practices guide presented by the Water Conservation Advisory Council: http://www.savetexaswater.org/bmp/.

Management Objective 6.1

The District will publish in the local newspaper an article on water conservation and availability of information materials in the District Office.

Performance Standard 5.1

Printed publication information will be included in the District's Annual Report to be provided to the Board of Directors.

3.7 Goal 7 - §36.1071(a)(8) Addressing the Desired Future Conditions established under §36.108

The District uses the best available science to establish its DFC.

Management Objective 7.1

The District has an ongoing program using its monitoring network of water wells to assess groundwater resources. The District will measure quarterly wells within the water level monitoring network through steel tape, and/or electronic sensors.

Performance Standard 7.1

Report to the Board of Directors at least quarterly on monitor well levels of at least 5 wells. The water level report will also be included in the District's Annual Report.

3.8 Management Goals Not Applicable

Controlling and Preventing Subsidence (36.1071(a)(3))

The rigid geologic framework of the region precludes significant subsidence from occurring. This management goal is not applicable to the operations of the District, according to Figure 5.1 and Figure 5.2 of the Texas Water Development Board's subsidence risk report, 'Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping'. The District has reviewed this report and found that the risk of subsidence is very low for Menard County. The District will continue to look for signs of subsidence and respond to any reports of potential subsidence in the District.

Addressing Recharge Enhancement (36.1071(a)(7))

The diverse topography and limited knowledge of any specific recharge sites makes any type of recharge enhancement project economically unfeasible. This management goal is not applicable to the operation of the District.

Addressing Rainwater Harvesting (36.1071(a)(7))

The semiarid nature of the area within the District makes the cost of rainwater harvesting projects economically unfeasible. Educational material and programs on rainwater harvesting are provided by the Texas AgriLife Extension Service. This management goal is not applicable to the operations of the District.

Addressing Precipitation Enhancement (36.1071(a)(7))
The management goal is not applicable to the District as there is not a precipitation enhancement program unique to the District. The District recognizes the benefits of precipitation enhancement, and can find educational materials with the West Texas Weather Modification Association.

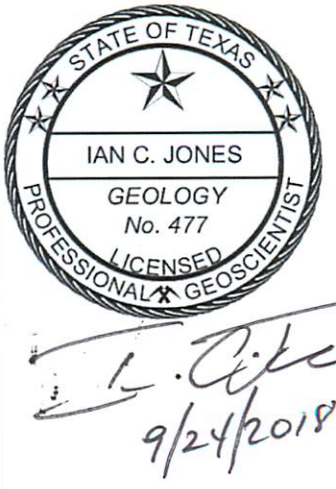
Addressing Brush Control (36.1071(a)(7))
The District recognizes the benefits of brush control through increased spring flows and the enhancement of native turf which limits runoff. However, most brush control projects within the District are carried out and funded through the NRCS and ample educational material and programs on brush control are provided by the Texas AgriLife Extension Service. This management goal is not applicable to the operations of the District.

APPENDIX A

GAM RUN 16-026 MAG VERSION 2

GAM Run 16-026 MAG Version 2: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 7

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-6641
September 21, 2018



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GAM RUN 16-026 MAG VERSION 2: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-6641
September 21, 2018

EXECUTIVE SUMMARY:

We have prepared estimates of the modeled available groundwater for the relevant aquifers of Groundwater Management Area 7—the Capitan Reef Complex, Dockum, Edwards-Trinity (Plateau), Ellenburger-San Saba, Hickory, Ogallala, Pecos Valley, Rustler, and Trinity aquifers. The estimates are based on the desired future conditions for these aquifers adopted by the groundwater conservation districts in Groundwater Management Area 7 on September 22, 2016 and March 22, 2018. The explanatory reports and other materials submitted to the Texas Water Development Board (TWDB) were determined to be administratively complete on June 22, 2018.

The original version of GAM Run 16-026 MAG inadvertently included modeled available groundwater estimates for areas declared not relevant by the groundwater management area and areas that had no desired future conditions for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers. GAM Run 16-026 MAG Version 2 (this report) contains updates that only include relevant portions of these aquifers in the reported total modeled available groundwater estimates and Tables 5 and 6 for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers.

The modeled available groundwater values are summarized by decade for the groundwater conservation districts (Tables 1, 3, 5, 7, 9, 11, 13) and for use in the regional water planning process (Tables 2, 4, 6, 8, 10, 12, 14). The modeled available groundwater estimates are 26,164 acre-feet per year in the Capitan Reef Complex Aquifer; 2,324 acre-feet per year in the Dockum Aquifer; 474,464 acre-feet per year in the undifferentiated Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers; 22,616 acre-feet per year in the Ellenburger-San Saba Aquifer; 49,936 acre-feet per year in the Hickory Aquifer; 6,570 to 8,019 acre-feet per year in the Ogallala Aquifer; and 7,040 acre-feet per year in the Rustler Aquifer. The modeled available groundwater estimates were extracted from results of model runs using

the groundwater availability models for the Capitan Reef Complex Aquifer (Jones, 2016); the High Plains Aquifer System (Deeds and Jigmond, 2015); the minor aquifers of the Llano Uplift Area (Shi and others, 2016), and the Rustler Aquifer (Ewing and others, 2012). In addition, the alternative 1-layer model for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers (Hutchison and others, 2011) was used for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers, except for Kinney and Val Verde counties. In these two counties, the alternative Kinney County model (Hutchison and others, 2011) and the model associated with a hydrogeological study for Val Verde County and the City of Del Rio (EcoKai Environmental, Inc. and Hutchison, 2014), respectively, were used to estimate modeled available groundwater. The Val Verde County/Del Rio model covers Val Verde County. This model was used to simulate multiple pumping scenarios indicating the effects of a proposed wellfield. The model indicated the effects of varied pumping rates and wellfield locations. These model runs were used by Groundwater Management Area 7 as the basis for the desired future conditions for Val Verde County.

REQUESTOR:

Mr. Joel Pigg, chair of Groundwater Management Area 7 districts.

DESCRIPTION OF REQUEST:

In letters dated November 22, 2016 and March 26, 2018, Dr. William Hutchison on behalf of Groundwater Management Area 7 provided the TWDB with the desired future conditions for the Capitan, Dockum, Edwards-Trinity (Plateau), Ellenburger-San Saba, Hickory, Ogallala, Pecos Valley, Rustler, and Trinity aquifers in Groundwater Management Area 7. Groundwater Management Area 7 provided additional clarifications through emails to the TWDB on March 23, 2018 and June 12, 2018 for the use of model extents (Dockum, Ellenburger-San Saba, Hickory, Ogallala, Rustler aquifers), the use of aquifer extents (Capitan Reef Complex, Edwards-Trinity [Plateau], Pecos Valley, and Trinity aquifers), and desired future conditions for the Edwards-Trinity (Plateau) Aquifer of Kinney and Val Verde counties.

The final adopted desired future conditions as stated in signed resolutions for the aquifers in Groundwater Management Area 7 are reproduced below:

Capitan Reef [Complex] Aquifer

> Total net drawdown of the Capitan Reef [Complex] Aquifer not to exceed 56 feet in Pecos County (Middle Pecos [Groundwater Conservation District]) in 2070 as compared with 2006 aquifer levels (Reference: Scenario 4, GMA 7 Technical Memorandum 15-06, 4-8-2015).

Dockum Aquifer

Total net drawdown of the Dockum Aquifer not to exceed 14 feet in Reagan County (Santa Rita [Groundwater Conservation District]) in 2070, as compared with 2012 aquifer levels.

Total net drawdown of the Dockum Aquifer not to exceed 52 feet in Pecos County (Middle Pecos [Groundwater Conservation District]) in 2070, as compared with 2012 aquifer levels.

Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers

Average drawdown for [the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers] in the following [Groundwater Management Area] 7 counties not to exceed drawdowns from 2010 to 2070 […].

County	[…] Average Drawdowns from 2010 to 2070 [feet]
Coke	0
Crockett	10
Ector	4
Edwards	2
Gillespie	5
Glasscock	42
Irion	10
Kimble	1
Menard	1
Midland	12
Pecos	14
Reagan	42
Real	4
Schleicher	8
Sterling	7
Sutton	6

Taylor	0
Terrell	2
Upton	20
Uvalde	2

Total net drawdown *[of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers]* in Kinney County in 2070, as compared with 2010 aquifer levels, shall be consistent with maintenance of an annual average flow of 23.9 [cubic feet per second] and an annual median flow of 23.9 [cubic feet per second] at Las Moras Springs […].

Total net drawdown [of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers] in Val Verde County in 2070, as compared with 2010 aquifer levels, shall be consistent with maintenance of an average annual flow of 73-75 [million gallons per day] at San Felipe Springs.

Minor Aquifers of the Llano Uplift Area

Total net drawdowns of [Ellenburger-San Saba Aquifer] levels in 2070, as compared with 2010 aquifer levels, shall not exceed the number of feet set forth below, respectively, for the following counties and districts:

County	[Groundwater Conservation District]	Drawdown in 2070 (feet)
Gillespie	Hill Country [Underground Water Conservation District]	8
Mason	Hickory [Underground Water Conservation District] no. 1	14
McCulloch	Hickory [Underground Water Conservation District] no. 1	29
Menard	Menard County [Underground Water District] and Hickory [Underground Water Conservation District] no. 1	46
Kimble	Kimble County [Groundwater Conservation District] and Hickory	18

	[Underground Water Conservation District] no. 1	
San Saba	Hickory [Underground Water Conservation District] no. 1	5

Total net drawdown of [Hickory Aquifer] levels in 2070, as compared with 2010 aquifer levels, shall not exceed the number of feet set forth below, respectively, for the following counties and districts:

County	[Groundwater Conservation District]	Drawdown in 2070 (feet)
Concho	Hickory [Underground Water Conservation District No. 1]	53
Gillespie	Hill Country UWCD	9
Mason	Hickory [Underground Water Conservation District No. 1]	17
McCulloch	Hickory [Underground Water Conservation District No. 1]	29
Menard	Menard UWD and Hickory [Underground Water Conservation District No. 1]	46
Kimble	Kimble County [Groundwater Conservation District] and Hickory [Underground Water Conservation District No. 1]	18
San Saba	Hickory [Underground Water Conservation District No. 1]	6

Ogallala Aquifer

> Total net [drawdown] of the Ogallala Aquifer in Glasscock County (Glasscock [Groundwater Conservation District]) in 2070, as compared with 2012 aquifer levels, not to exceed 6 feet […].

Rustler Aquifer

> Total net drawdown of the Rustler Aquifer in Pecos County (Middle Pecos GCD) in 2070 not to exceed 94 feet as compared with 2009 aquifer levels.

Additionally, districts in Groundwater Management Area 7 voted to declare that the following aquifers or parts of aquifers are non-relevant for the purposes of joint planning:

- The Blaine, Igneous, Lipan, Marble Falls, and Seymour aquifers.
- The Edwards-Trinity (Plateau) Aquifer in Hickory Underground Water Conservation District No. 1, the Lipan-Kickapoo Water Conservation District, Lone Wolf Groundwater Conservation District, and Wes-Tex Groundwater Conservation District.
- The Ellenburger-San Saba Aquifer in Llano County.
- The Hickory Aquifer in Llano County.
- The Dockum Aquifer outside of Santa Rita Groundwater Conservation District and Middle Pecos Groundwater Conservation District.
- The Ogallala Aquifer outside of Glasscock County.

In response to a several requests for clarifications from the TWDB in 2017 and 2018, the Groundwater Management Area 7 Chair, Mr. Joel Pigg, and Groundwater Management Area 7 consultant, Dr. William R. Hutchison, indicated the following preferences for verifying the desired future condition of the aquifers and calculating modeled available groundwater volumes in Groundwater Management Area 7:

Capitan Reef Complex Aquifer

> Calculate modeled available groundwater values based on the official aquifer boundaries.
>
> Assume that modeled drawdown verifications within 1 foot achieve the desired future conditions.

Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers

Calculate modeled available groundwater values based on the official aquifer boundaries.

Assume that modeled drawdown verifications within 1 foot achieve the desired future conditions.

Kinney County

Use the modeled available groundwater values and model assumptions from GAM Run 10-043 MAG Version 2 (Shi, 2012) to maintain annual average springflow of 23.9 cubic feet per second and a median flow of 24.4 cubic feet per second at Las Moras Springs from 2010 to 2060.

Val Verde County

There is no associated drawdown as a desired future condition. The desired future condition is based solely on simulated springflow conditions at San Felipe Spring of 73 to 75 million gallons per day. Pumping scenarios—50,000 acre-feet per year—in three well field locations, and monthly hydrologic conditions for the historic period 1969 to 2012 meet the desired future conditions set by Groundwater Management Area 7 (EcoKai and Hutchison, 2014; Hutchison 2018b).

Minor Aquifers of the Llano Uplift Area

Calculate modeled available groundwater values based on the spatial extent of the Ellenburger-San Saba and Hickory aquifers in the groundwater availability model for the aquifers of the Llano Uplift Area and use the same model assumptions used in Groundwater Management Area 7 Technical Memorandum 16-02 (Hutchison 2016g).

Drawdown calculations do not take into consideration the occurrence of dry cells where water levels are below the base of the aquifer.

Assume that modeled drawdown verifications within 1 foot achieve the desired future conditions.

Dockum Aquifer

Calculate modeled available groundwater values based on the spatial extent of the groundwater availability model for the Dockum Aquifer.

Modeled available groundwater analysis excludes pass-through cells.

Assume that modeled drawdown verifications within 1 foot achieve the desired future conditions.

Ogallala Aquifer

Calculate modeled available groundwater values based on the official aquifer boundary and use the same model assumptions used in Groundwater Management Area Technical Memorandum 16-01 (Hutchison, 2016f).

Modeled available groundwater analysis excludes pass-through cells.

Well pumpage decreases as the saturated thickness of the aquifer decreases below a 30-foot threshold.

Assume that modeled drawdown verifications within 1 foot achieve the desired future conditions.

Rustler Aquifer

Use 2008 as the baseline year and run the model from 2009 through 2070 (end of 2008/beginning of 2009 as initial conditions), as used in the submitted predictive model run.

Use 2008 recharge conditions throughout the predictive period.

Calculate modeled available groundwater values based on the spatial extent of the groundwater availability model for the Rustler Aquifer.

General-head boundary heads decline at a rate of 1.5 feet per year.

Use the same model assumptions used in Groundwater Management Area 7 Technical Memorandum 15-05 (Hutchison, 2016d).

Assume that modeled drawdown verifications within 1 foot achieve the desired future conditions.

METHODS:

As defined in Chapter 36 of the Texas Water Code (TWC, 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.

For relevant aquifers with desired future conditions based on water-level drawdown, water levels simulated at the end of the predictive simulations were compared to specified

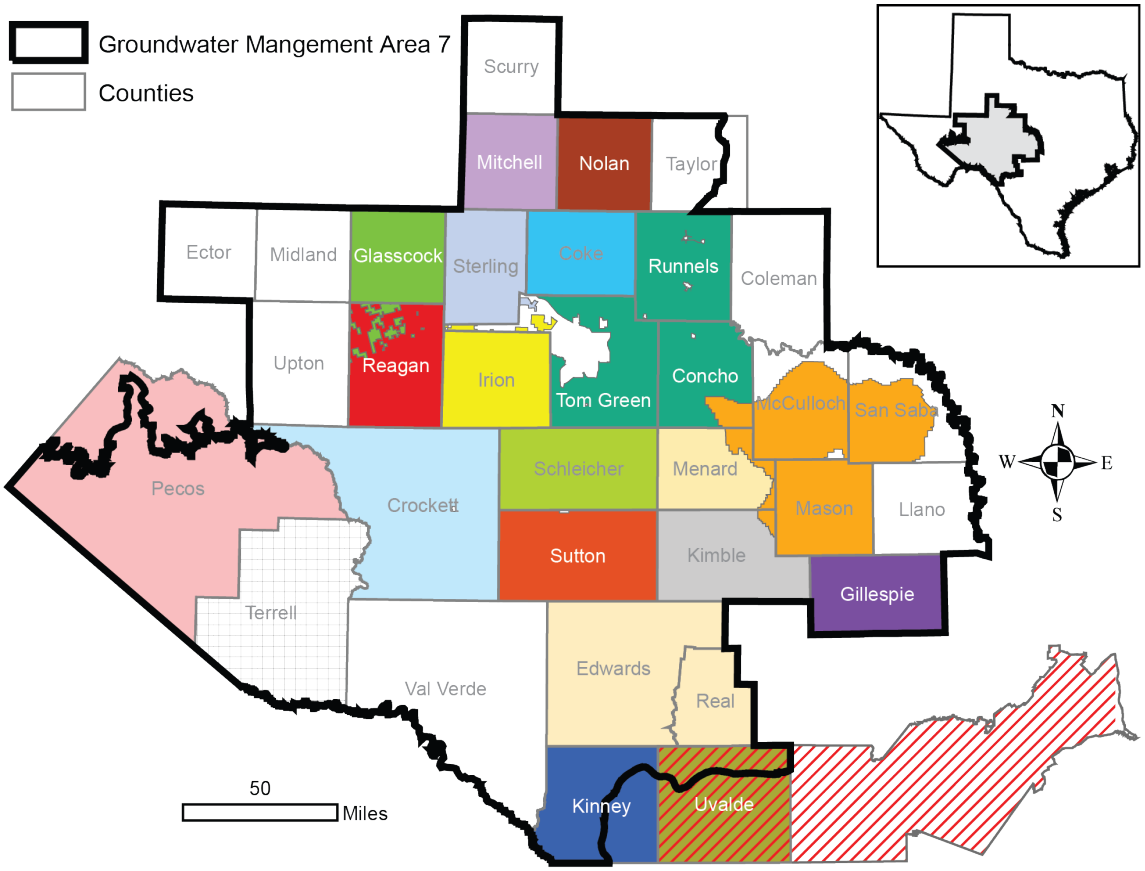
baseline water levels. In the case of the High Plains Aquifer System (Dockum and Ogallala aquifers) and the minor aquifers of the Llano Uplift area (Ellenburger-San Saba and Hickory aquifers), baseline water levels represent water levels at the end of the calibrated transient model are the initial water level conditions in the predictive simulation—water levels at the end of the preceding year. In the case of the Capitan Reef Complex, Edwards-Trinity (Plateau), Pecos Valley, and Trinity, and Rustler aquifers, the baseline water levels may occur in a specified year, early in the predictive simulation. These baseline years are 2006 in the groundwater availability model for the Capitan Reef Complex Aquifer, 2010 in the alternative model for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers, 2012 in the groundwater availability model for the High Plains Aquifer System, 2010 in the groundwater availability model for the minor aquifers of the Llano Uplift area, and 2009 in the groundwater availability model for the Rustler Aquifer. The predictive model runs used average pumping rates from the historical period for the respective model except in the aquifer or area of interest. In those areas, pumping rates are varied until they produce drawdowns consistent with the adopted desired future conditions. Pumping rates or modeled available groundwater are reported in 10-year intervals.

Water-level drawdown averages were calculated for the relevant portions of each aquifer. Drawdown for model cells that became dry during the simulation—when the water level dropped below the base of the cell—were excluded from the averaging. In Groundwater Management Area 7, dry cells only occur during the predictive period in the Ogallala Aquifer of Glasscock County. Consequently, estimates of modeled available groundwater decrease over time as continued simulated pumping predicts the development of increasing numbers of dry model cells in areas of the Ogallala Aquifer in Glasscock County. The calculated water-level drawdown averages were compared with the desired future conditions to verify that the pumping scenario achieved the desired future conditions.

In Kinney and Val Verde counties, the desired future conditions are based on discharge from selected springs. In these cases, spring discharge is estimated based on simulated average spring discharge over a historical period maintaining all historical hydrologic conditions—such as recharge and river stage—except pumping. In other words, we assume that past average hydrologic conditions—the range of fluctuation—will continue in the future. In the cases of Kinney and Val Verde counties, simulated spring discharge is based on hydrologic variations that took place over the periods 1950 through 2005 and 1968 through 2013, respectively. The desired future condition for the Edwards-Trinity (Plateau) Aquifer in Kinney County is similar to the one adopted in 2010 and the associated modeled available groundwater is based on a specific model run—GAM Run 10-043 (Shi, 2012).

Modeled available groundwater values for the Ellenburger-San Saba and Hickory aquifers were determined by extracting pumping rates by decade from the model results using

ZONBUDUSG Version 1.01 (Panday and others, 2013). For the remaining relevant aquifers in Groundwater Management Area 7 modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Decadal modeled available groundwater for the relevant aquifers are reported by groundwater conservation district and county (Figure 1; Tables 1, 3, 5, 7, 9, 11, 13), and by county, regional water planning area, and river basin (Figures 2 and 3; Tables 2, 4, 6, 8, 10, 12, 14).



Groundwater Conservation Districts

- Coke County UWCD
- Crockett County GCD
- Edwards Aquifer Authority
- Glasscock GCD
- Hickory UWCD No. 1
- Hill Country UWCD
- Irion County WCD
- Kimble County GCD
- Kinney County GCD
- Lipan-Kickapoo WCD
- Lone Wolf GCD
- Menard County UWD
- Middle Pecos GCD
- Plateau UWC and Supply District
- Real-Edwards Conservation and Reclamation District
- Santa Rita UWCD
- Sterling County UWCD
- Sutton County UWCD
- Terrell County GCD
- Uvalde County UWCD
- Wes-Tex GCD

FIGURE 1. MAP SHOWING THE GROUNDWATER CONSERVATION DISTRICTS (GCD) IN GROUNDWATER MANAGEMENT AREA 7. NOTE: THE BOUNDARIES OF THE EDWARDS AQUIFER AUTHORITY OVERLAP WITH THE UVALDE COUNTY UNDERGROUND WATER CONSERVATION DISTRICT (UWCD).

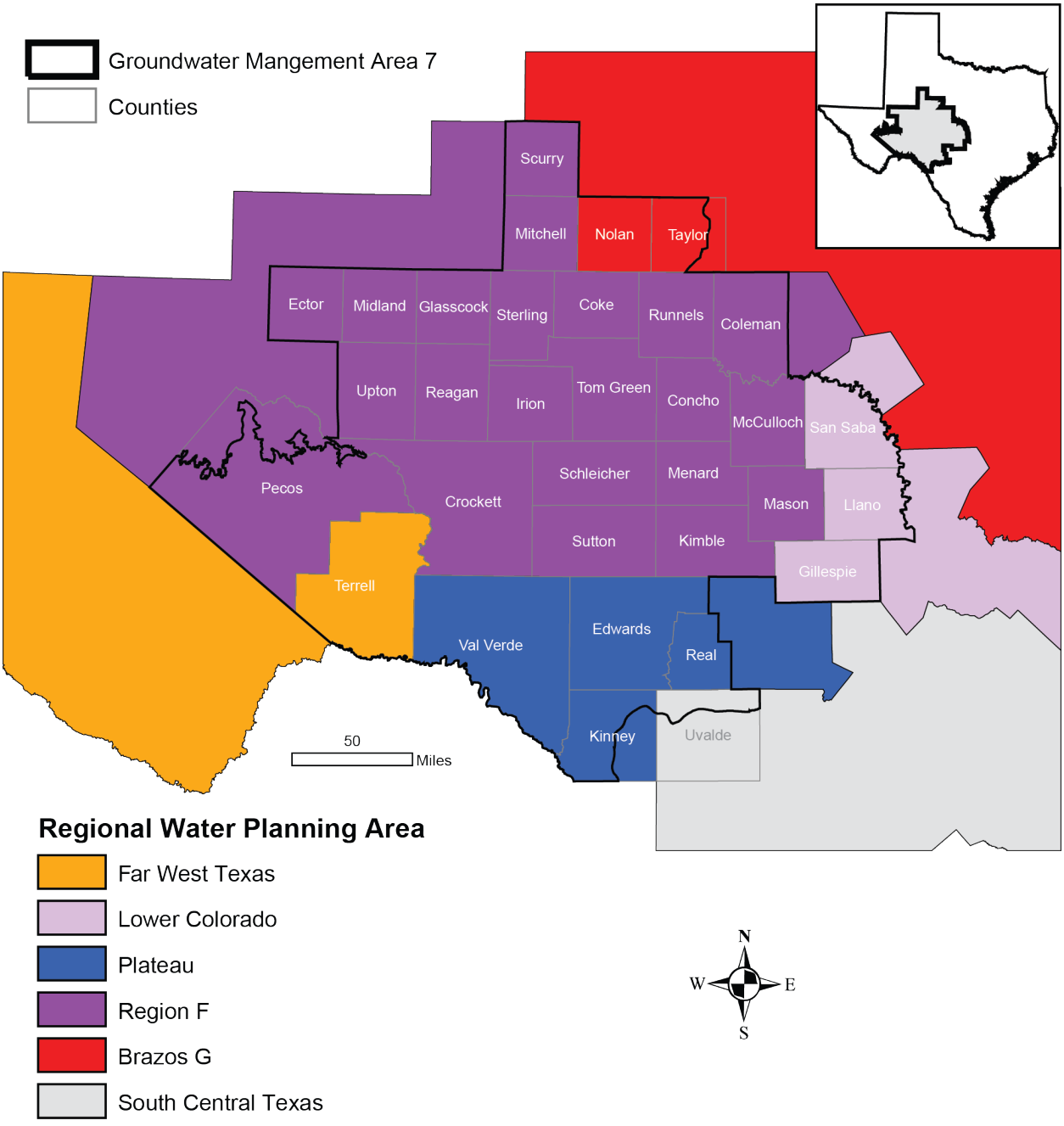


FIGURE 2. MAP SHOWING REGIONAL WATER PLANNING AREAS IN GROUNDWATER MANAGEMENT AREA 7.

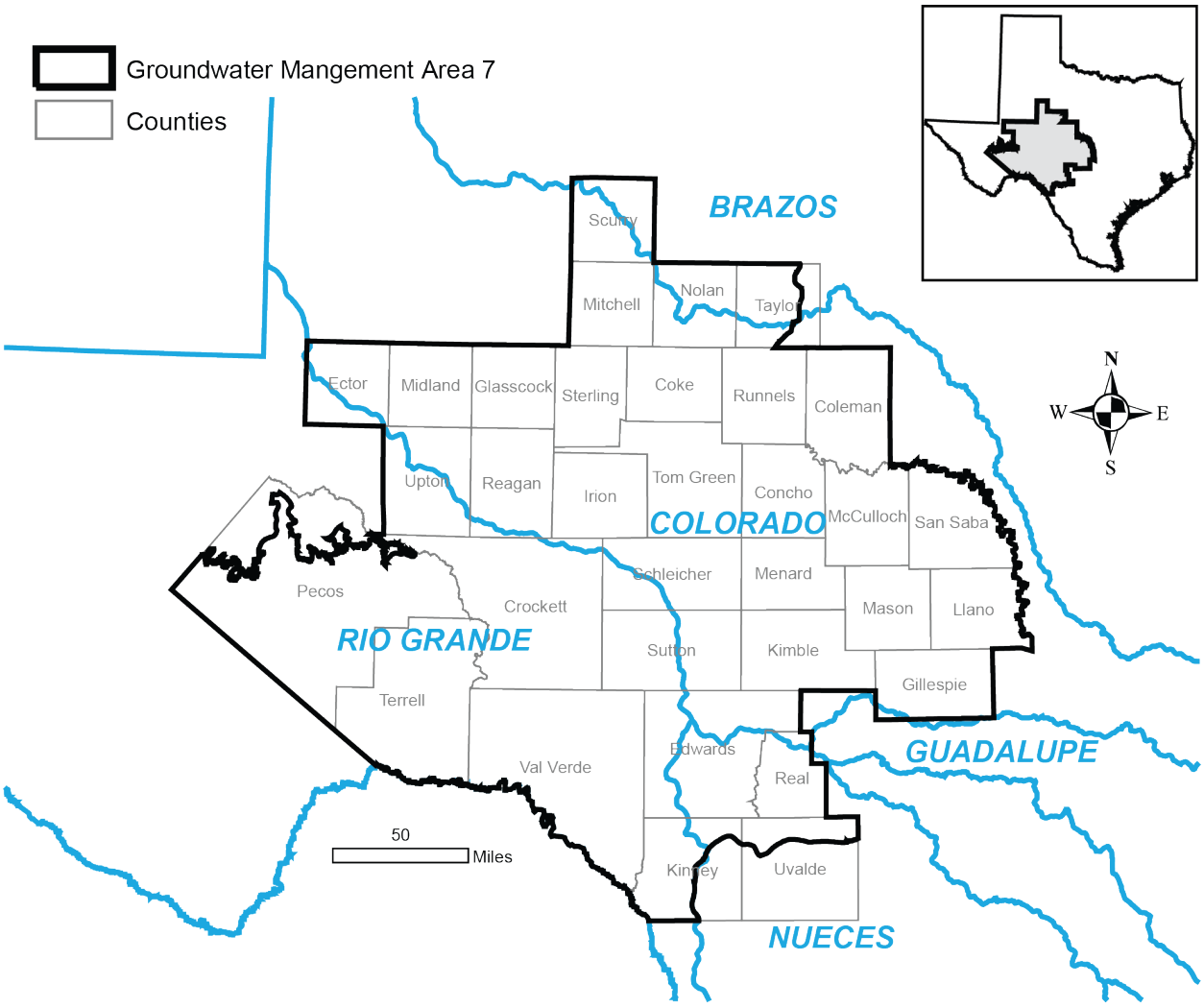


FIGURE 3. MAP SHOWING RIVER BASINS IN GROUNDWATER MANAGEMENT AREA 7. THESE INCLUDE PARTS OF THE BRAZOS, COLORADO, GUADALUPE, NUECES, AND RIO GRANDE RIVER BASINS.

PARAMETERS AND ASSUMPTIONS:

Capitan Reef Complex Aquifer

Version 1.01 of the groundwater availability model of the eastern arm of the Capitan Reef Complex Aquifer was used. See Jones (2016) for assumptions and limitations of the groundwater availability model. See Hutchison (2016h) for details on the assumptions used for predictive simulations.

The model has five layers: Layer 1, the Edwards-Trinity (Plateau) and Pecos Valley aquifers; Layer 2, the Dockum Aquifer and the Dewey Lake Formation; Layer 3, the Rustler Aquifer; Layer 4, a confining unit made up of the Salado and Castile formations, and the overlying portion of the Artesia Group; and Layer 5, the Capitan Reef Complex Aquifer, part of the Artesia Group, and the Delaware Mountain Group. Layers 1 through 4 are intended to act solely as boundary conditions facilitating groundwater inflow and outflow relative to the Capitan Reef Complex Aquifer (Layer 5).

The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

The model was run for the interval 2006 through 2070 for a 64-year predictive simulation. Drawdowns were calculated by subtracting 2006 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.

During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging.

Drawdown averages and modeled available groundwater volumes are based on the official aquifer boundary within Groundwater Management Area 7.

Dockum and Ogallala Aquifers

Version 1.01 of the groundwater availability model for the High Plains Aquifer System by Deeds and Jigmond (2015) was used to construct the predictive model simulation for this analysis. See Hutchison (2016f) for details of the initial assumptions.

The model has four layers which represent the Ogallala and Pecos Valley Alluvium aquifers (Layer 1), the Edwards-Trinity (High Plains) and Edwards-Trinity (Plateau) aquifers (Layer 2), the Upper Dockum Aquifer (Layer 3), and the Lower Dockum Aquifer (Layer 4). Pass-through cells exist in layers 2 and 3 where the Dockum Aquifer was absent but provided 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 of drawdowns and modeled available groundwater.

The model was run with MODFLOW-NWT (Niswonger and others, 2011). The model uses the Newton formulation and the upstream weighting package, which automatically reduces pumping as heads drop in a particular cell, as defined by the user. This feature may simulate the declining production of a well as saturated thickness decreases. Deeds and Jigmond (2015) modified the MODFLOW-NWT code to use a saturated thickness of 30 feet as the threshold—instead of percent of the saturated thickness—when pumping reductions occur during a simulation. It is important for groundwater management areas 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.

The model was run for the interval 2013 through 2070 for a 58-year predictive simulation. Drawdowns were calculated by subtracting 2012 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.

During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging. Modeled available groundwater analysis excludes pass-through cells.

Drawdown averages and modeled available groundwater volumes are based on the model boundaries within Groundwater Management Area 7 for the Dockum Aquifer and official aquifer boundaries for the Ogallala Aquifer.

Pecos Valley, Edwards-Trinity (Plateau) and Trinity Aquifers

The single-layer alternative groundwater flow model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers used for this analysis. This model is an update to the previously developed groundwater availability model documented in Anaya and Jones (2009). See Hutchison and others (2011a) and Anaya and Jones (2009) for assumptions and limitations of the model. See Hutchison (2016e; 2018c) for details on the assumptions used for predictive simulations.

The groundwater model has one layer representing the Pecos Valley Aquifer and the Edwards-Trinity (Plateau) Aquifer. In the relatively narrow area where both aquifers are present, the model is a lumped representation of both aquifers.

The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

The model was run for the interval 2006 through 2070 for a 65-year predictive simulation. Drawdowns were calculated by subtracting 2010 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7. Comparison of 2010 simulated and measured water levels indicate a root mean squared error of 84 feet or 3 percent of the range in water-level elevations.

Drawdowns for cells with water levels below the base elevation of the cell ("dry" cells) were included in the averaging.

Drawdown averages and modeled available groundwater volumes are based on the official aquifer boundaries within Groundwater Management Area 7.

Edwards-Trinity (Plateau) Aquifer of Kinney County

All parameters and assumptions for the Edwards-Trinity (Plateau) Aquifer of Kinney County in Groundwater Management Area 7 are described in GAM Run 10-043 MAG Version 2 (Shi, 2012). This report assumes a planning period from 2010 to 2070.

The Kinney County Groundwater Conservation District model developed by Hutchison and others (2011b) was used for this analysis. The model was calibrated to water level and spring flux collected from 1950 to 2005.

The model has four layers representing the following hydrogeologic units (from top to bottom): Carrizo-Wilcox Aquifer (layer 1), Upper Cretaceous Unit (layer 2), Edwards (Balcones Fault Zone) Aquifer/Edwards portion of the Edwards-Trinity (Plateau) Aquifer (layer 3), and Trinity portion of the Edwards-Trinity (Plateau) Aquifer (layer 4).

The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

The model was run for the interval 2006 through 2070 for a 65-year predictive simulation. Drawdowns were calculated by subtracting 2010 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.

Modeled available groundwater volumes are based on the official aquifer boundaries within Groundwater Management Area 7 in Kinney County.

Edwards-Trinity (Plateau) Aquifer of Val Verde County

The single-layer numerical groundwater flow model for the Edwards-Trinity (Plateau) Aquifer of Val Verde County was used for this analysis. This model is based on the previously developed alternative groundwater model of the Kinney County area documented in Hutchison and others (2011b). See EcoKai (2014) for assumptions and

limitations of the model. See Hutchison (2016e; 2018b) for details on the assumptions used for predictive simulations, including recharge and pumping assumptions.

The groundwater model has one layer representing the Edwards-Trinity (Plateau) Aquifer of Val Verde County.

The model was run with MODFLOW-2005 (Harbaugh, 2005).

The model was run for a 45-year predictive simulation representing hydrologic conditions of the interval 1968 through 2013. Simulated spring discharge from San Felipe Springs was then averaged over duration of the simulation. The resultant pumping rate that met the desired future conditions was applied to the predictive period—2010 through 2070—based on the assumption that average conditions over the predictive period are the same as those over the historic period represented by the model run.

Modeled available groundwater volumes are based on the official aquifer boundaries within Groundwater Management Area 7 in Val Verde County.

Rustler Aquifer

Version 1.01 of the groundwater availability model for the Rustler Aquifer by Ewing and others (2012) was used to construct the predictive model simulation for this analysis. See Hutchison (2016d) for details of the initial assumptions, including recharge conditions.

The model has two layers, the top one representing the Rustler Aquifer, and the other representing the Dewey Lake Formation and the Dockum Aquifer.

The model was run with MODFLOW-NWT (Niswonger and others, 2011).

The model was run for the interval 2009 through 2070 for a 61-year predictive simulation. Drawdowns were calculated by subtracting 2009 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7. During predictive simulations, there were no cells where water levels were below the base elevation of the cell (“dry” cells). Therefore, all drawdowns were included in the averaging.

Drawdown averages and modeled available groundwater volumes are based on the model boundaries within Groundwater Management Area 7.

Minor aquifers of the Llano Uplift Area

We used version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift Area. See Shi and others (2016) for assumptions and limitations of the model. See Hutchison (2016g) for details of the initial assumptions.

The model contains eight layers: Trinity Aquifer, Edwards-Trinity (Plateau) Aquifer, and younger alluvium deposits (Layer 1), confining units (Layer 2), Marble Falls Aquifer and equivalent units (Layer 3), confining units (Layer 4), Ellenburger-San Saba Aquifer and equivalent units (Layer 5), confining units (Layer 6), Hickory Aquifer and equivalent units (Layer 7), and Precambrian units (Layer 8).

The model was run with MODFLOW-USG beta (development) version (Panday and others, 2013). Perennial rivers and reservoirs were simulated using the MODFLOW-USG river package. Springs were simulated using the MODFLOW-USG drain package.

Drawdown averages and modeled available groundwater volumes are based on the model boundaries within Groundwater Management Area 7.

The model was run for the interval 2011 through 2070 for a 60-year predictive simulation. Drawdowns were calculated by subtracting 2010 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7. During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging.

RESULTS:

The modeled available groundwater estimates are 26,164 acre-feet per year in the Capitan Reef Complex Aquifer, 474,464 acre-feet per year in the undifferentiated Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers, 22,616 acre-feet per year in the Ellenburger-San Saba Aquifer, 49,936 acre-feet per year in the Hickory Aquifer, 6,570 to 7,925 acre-feet per year in the Ogallala Aquifer, 2,324 acre-feet per year in the Dockum Aquifer, and 7,040 acre-feet per year in the Rustler Aquifer.

The modeled available groundwater for the respective aquifers has been summarized by aquifer, county, and groundwater conservation district (Tables 1, 3, 5, 7, 9, 11, and 13). The modeled available groundwater is also summarized by county, regional water planning area, river basin, and aquifer for use in the regional water planning process (Tables 2, 4, 6, 8, 10, 12, and 14). The modeled available groundwater for the Ogallala Aquifer that achieves the desired future conditions adopted by districts in Groundwater Management Area 7 decreases from 7,925 to 6,570 acre-feet per year between 2020 and 2070 (Tables 9 and 10). This decline is attributable to the occurrence of increasing numbers of cells where

water levels were below the base elevation of the cell ("dry" cells) in parts of Glasscock County. Please note that MODFLOW-NWT automatically reduces pumping as water levels decline.

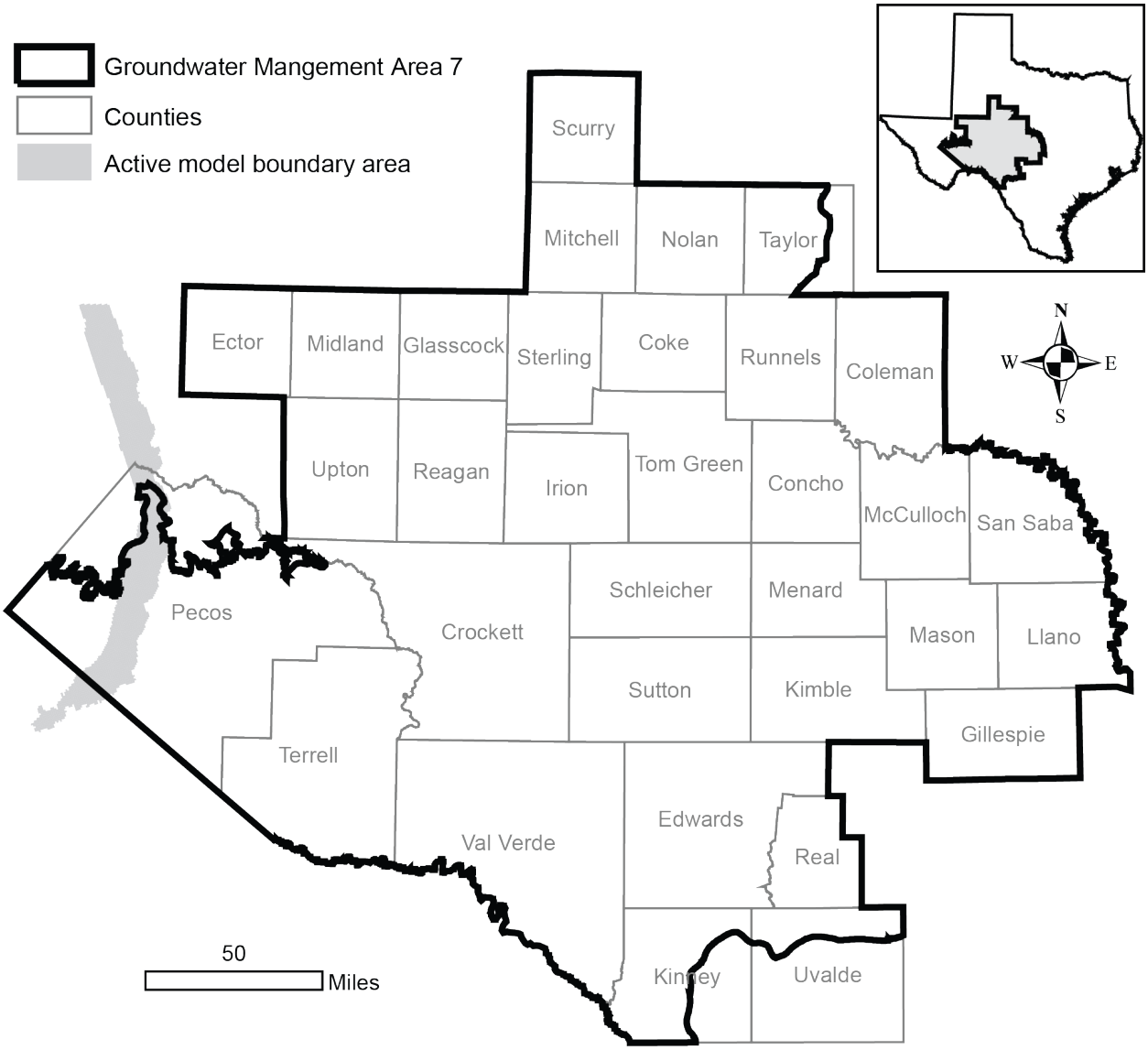


FIGURE 4. MAP SHOWING THE AREAS COVERED BY THE CAPITAN REEF COMPLEX AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE EASTERN ARM OF THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2006 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. GCD IS THE ABBREVIATION FOR GROUNDWATER CONSERVATION DISTRICT.

District	County	Year							
		2006	2010	2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	26,164	26,164	26,164	26,164	26,164	26,164	26,164	26,164
	Total	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**
GMA 7		**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Pecos	F	Rio Grande	26,164	26,164	26,164	26,164	26,164	26,164
		Total	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**
GMA 7			**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**

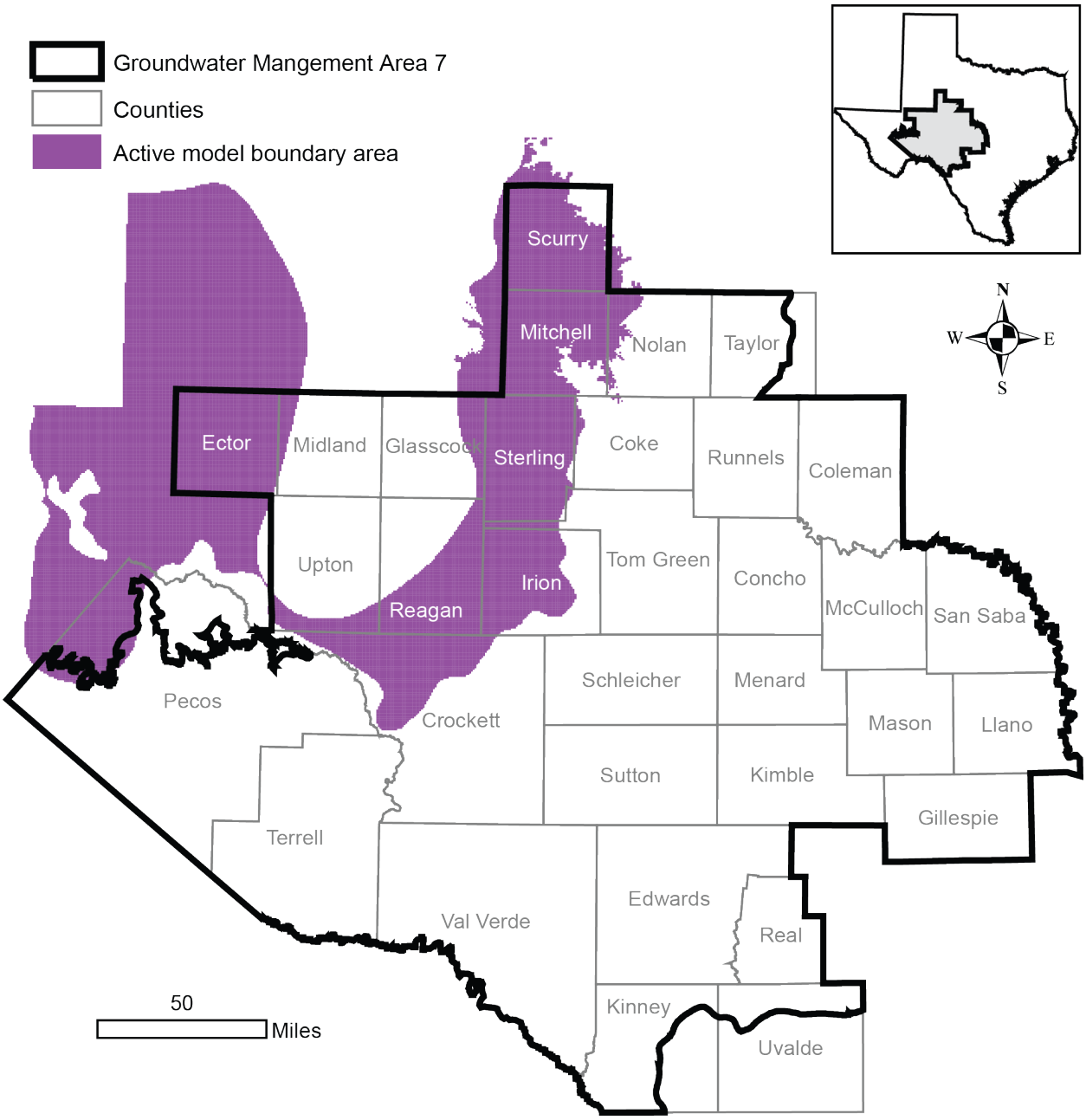


FIGURE 5. MAP SHOWING AREAS COVERED BY THE DOCKUM AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HIGH PLAINS AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2013 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. GCD AND UWCD ARE THE ABBREVIATIONS FOR GROUNDWATER CONSERVATION DISTRICT AND UNDERGROUND WATER CONSERVATION DISTRICT, RESPECTIVELY.

District	County	Year						
		2013	2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	2,022	2,022	2,022	2,022	2,022	2,022	2,022
	Total	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**
Santa Rita UWCD	Reagan	302	302	302	302	302	302	302
	Total	**302**	**302**	**302**	**302**	**302**	**302**	**302**
GMA 7		**2324**	**2,324**	**2,324**	**2,324**	**2,324**	**2,324**	**2,324**

Note: The modeled available groundwater for Santa Rita Underground Water Conservation District excludes parts of Reagan County that fall within Glasscock Groundwater Conservation District. The year 2013 is used because the 2012 desired future condition baseline year for the Dockum Aquifer is an initial condition in the predictive model run.

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Pecos	F	Rio Grande	2,022	2,022	2,022	2,022	2,022	2,022
		Total	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**
Reagan	F	Colorado	302	302	302	302	302	302
		Rio Grande	0	0	0	0	0	0
		Total	**962**	**962**	**962**	**962**	**962**	**962**
GMA 7			**2,324**	**2,324**	**2,324**	**2,324**	**2,324**	**2,324**

Note: The modeled available groundwater for Reagan County excludes parts of Reagan County that fall outside of Santa Rita Underground Water Conservation District.

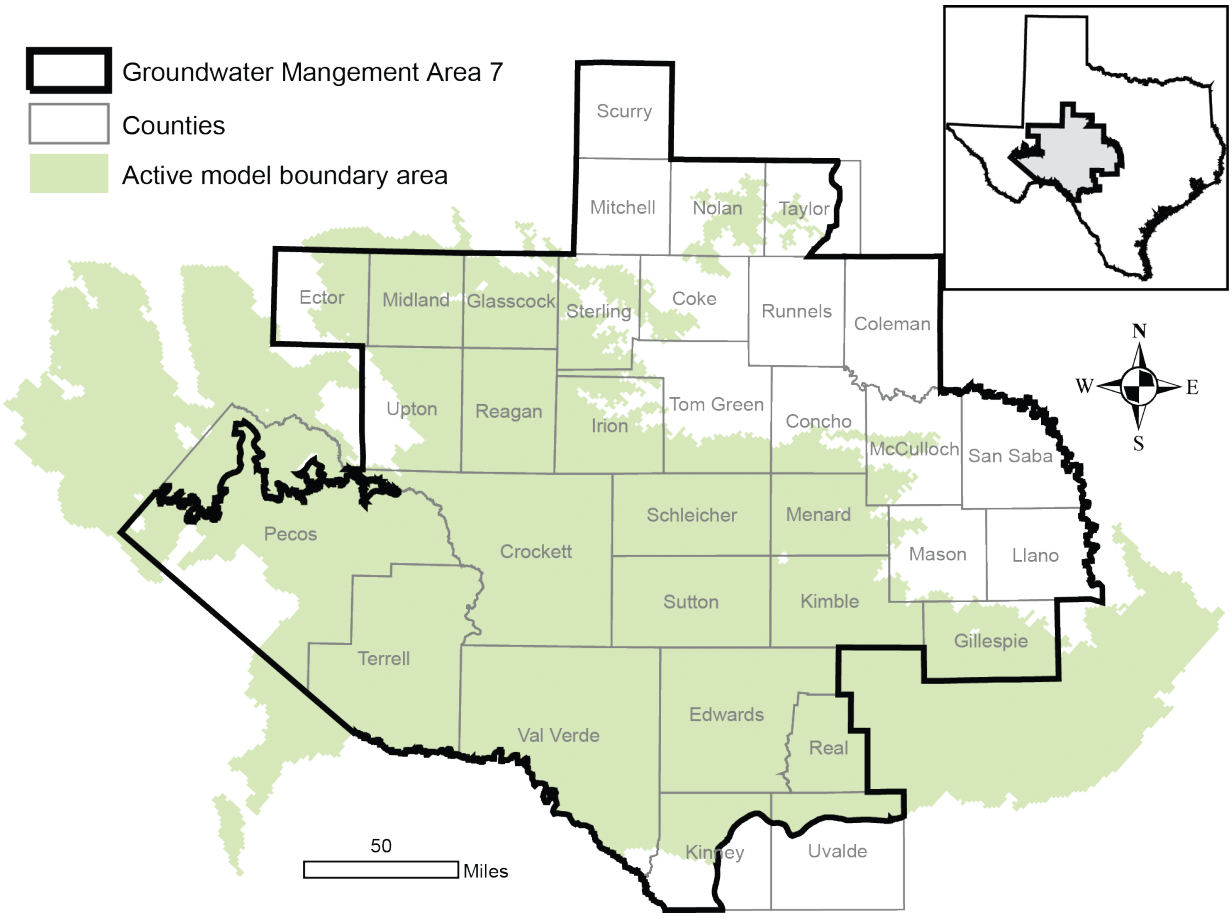


FIGURE 6. MAP SHOWING THE AREAS COVERED BY THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN THE GROUNDWATER AVAILABILITY MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7.

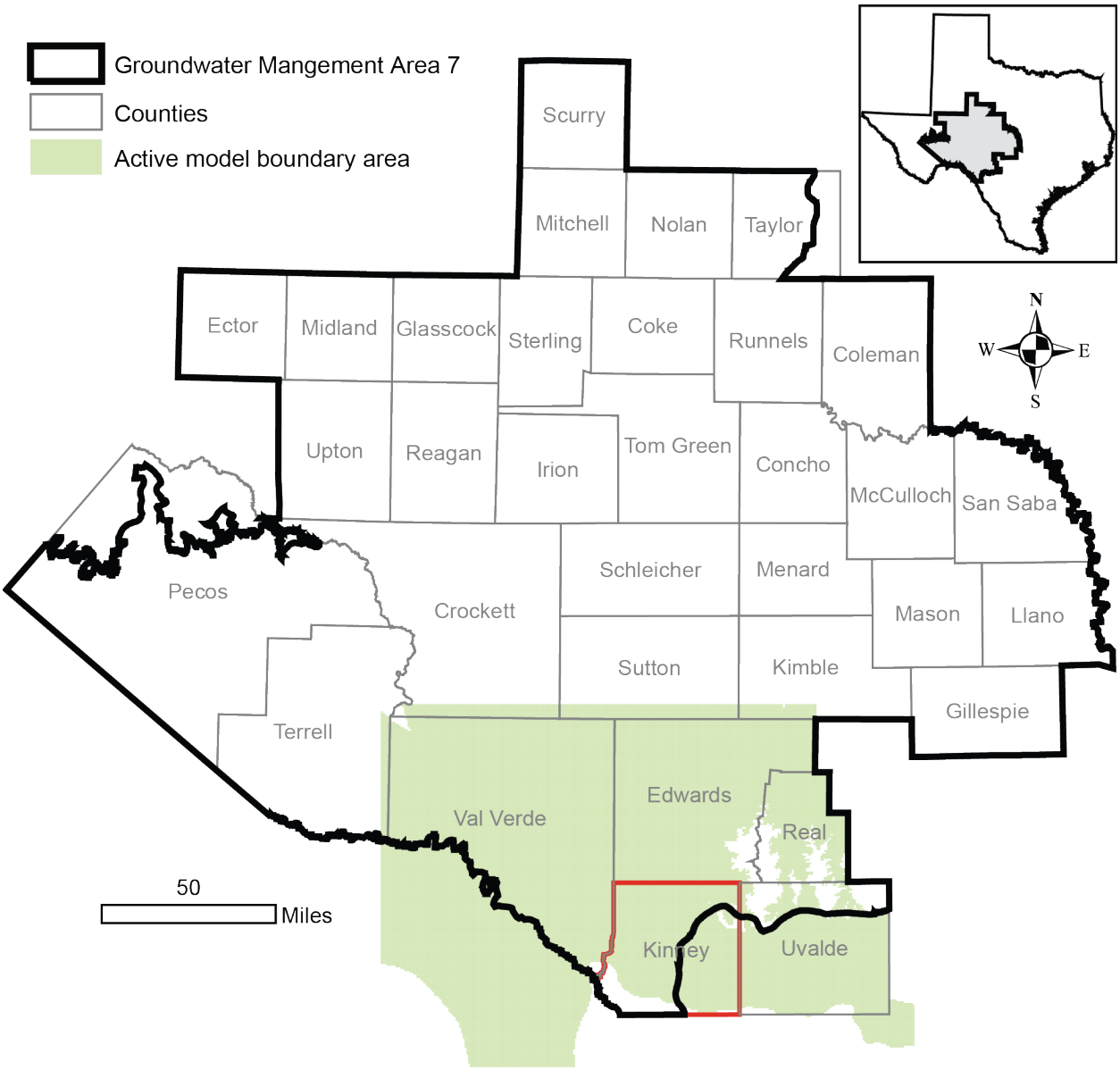


FIGURE 7. MAP SHOWING THE AREAS COVERED BY THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN THE ALTERNATIVE MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN KINNEY COUNTY.

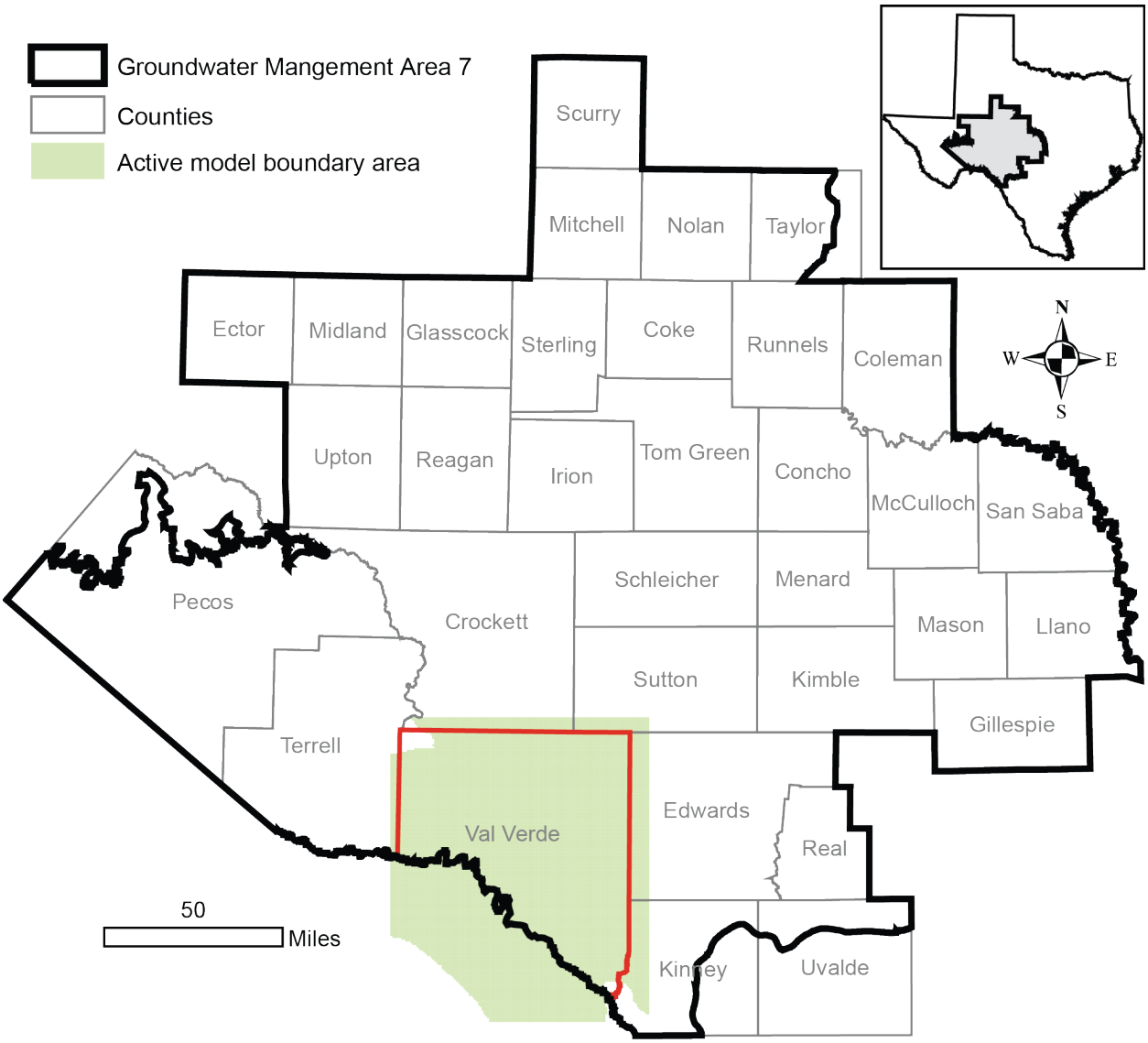


FIGURE 8. MAP SHOWING THE AREAS COVERED BY THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN THE GROUNDWATER FLOW MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN VAL VERDE COUNTY.

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY, FOR EACH DECADE BETWEEN 2006 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT, WCD IS WATER CONSERVATION DISTRICT, UWD IS UNDERGROUND WATER DISTRICT, UWC IS UNDERGROUND WATER CONSERVATION, AND C AND R DISTRICT IS CONSERVATION AND RECLAMATION DISTRICT.

District	County	Year						
		2010	2020	2030	2040	2050	2060	2070
Coke County UWCD	Coke	997	997	997	997	997	997	997
	Total	**997**	**997**	**997**	**997**	**997**	**997**	**997**
Crockett County GCD	Crockett	4,675	4,675	4,675	4,675	4,675	4,675	4,675
	Total	**4,675**	**4,675**	**4,675**	**4,675**	**4,675**	**4,675**	**4,675**
Glasscock GCD	Glasscock	65,186	65,186	65,186	65,186	65,186	65,186	65,186
	Reagan	40,835	40,835	40,835	40,835	40,835	40,835	40,835
	Total	**106,021**	**106,021**	**106,021**	**106,021**	**106,021**	**106,021**	**106,021**
Hill Country UWCD	Gillespie	4,979	4,979	4,979	4,979	4,979	4,979	4,979
	Total	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**
Irion County WCD*	Irion	3,289	3,289	3,289	3,289	3,289	3,289	3,289
	Total	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**
Kimble County GCD	Kimble	1,282	1,282	1,282	1,282	1,282	1,282	1,282
	Total	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**
Kinney County GCD	Kinney	70,341	70,341	70,341	70,341	70,341	70,341	70,341
	Total	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**

TABLE 5. (CONTINUED).

District	County	Year						
		2010	2020	2030	2040	2050	2060	2070
Menard County UWD	Menard	2,217	2,217	2,217	2,217	2,217	2,217	2,217
	Total	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**
Middle Pecos GCD	Pecos	117,309	117,309	117,309	117,309	117,309	117,309	117,309
	Total	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**
Plateau UWC and Supply District	Schleicher	8,034	8,034	8,034	8,034	8,034	8,034	8,034
	Total	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**
Real-Edwards C and R District	Edwards	5,676	5,676	5,676	5,676	5,676	5,676	5,676
	Real	7,523	7,523	7,523	7,523	7,523	7,523	7,523
	Total	**13,199**	**13,199**	**13,199**	**13,199**	**13,199**	**13,199**	**13,199**
Santa Rita UWCD	Reagan	27,398	27,398	27,398	27,398	27,398	27,398	27,398
	Total	**27,398**	**27,398**	**27,398**	**27,398**	**27,398**	**27,398**	**27,398**
Sterling County UWCD	Sterling	2,495	2,495	2,495	2,495	2,495	2,495	2,495
	Total	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**
Sutton County UWCD	Sutton	6,400	6,400	6,400	6,400	6,400	6,400	6,400
	Total	**6,400**	**6,400**	**6,400**	**6,400**	**6,400**	**6,400**	**6,400**
Terrell County GCD	Terrell	1,420	1,420	1,420	1,420	1,420	1,420	1,420
	Total	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**
Uvalde County UWCD	Uvalde	1,993	1,993	1,993	1,993	1,993	1,993	1,993
	Total	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**

TABLE 5. (CONTINUED).

District	County	Year						
		2010	2020	2030	2040	2050	2060	2070
No district		102,415	102,415	102,415	102,415	102,415	102,415	102,415
GMA 7		**474,464**	**474,464**	**474,464**	**474,464**	**474,464**	**474,464**	**474,464**

*The modeled available groundwater for Irion County WCD only includes the portion of the district that falls within Irion County.

TABLE 6. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Coke	F	Colorado	997	997	997	997	997	997
		Total	**997**	**997**	**997**	**997**	**997**	**997**
Crockett	F	Colorado	20	20	20	20	20	20
		Rio Grande	5,427	5,427	5,427	5,427	5,427	5,427
		Total	**5,447**	**5,447**	**5,447**	**5,447**	**5,447**	**5,447**
Ector	F	Colorado	4,925	4,925	4,925	4,925	4,925	4,925
		Rio Grande	617	617	617	617	617	617
		Total	**5,542**	**5,542**	**5,542**	**5,542**	**5,542**	**5,542**
Edwards	J	Colorado	2,305	2,305	2,305	2,305	2,305	2,305
		Nueces	1,631	1,631	1,631	1,631	1,631	1,631
		Rio Grande	1,740	1,740	1,740	1,740	1,740	1,740
		Total	**5,676**	**5,676**	**5,676**	**5,676**	**5,676**	**5,676**
Gillespie	K	Colorado	4,843	4,843	4,843	4,843	4,843	4,843
		Guadalupe	136	136	136	136	136	136
		Total	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**
Glasscock	F	Colorado	65,186	65,186	65,186	65,186	65,186	65,186
		Total	**65,186**	**65,186**	**65,186**	**65,186**	**65,186**	**65,186**

TABLE 6. (CONTINUED).

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Irion	F	Colorado	3,289	3,289	3,289	3,289	3,289	3,289
		Total	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**
Kimble*	F	Colorado	1,282	1,282	1,282	1,282	1,282	1,282
		Total	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**
Kinney	J	Nueces	12	12	12	12	12	12
		Rio Grande	70,329	70,329	70,329	70,329	70,329	70,329
		Total	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**
Menard*	F	Colorado	2,217	2,217	2,217	2,217	2,217	2,217
		Total	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**
Midland	F	Colorado	23,233	23,233	23,233	23,233	23,233	23,233
		Total	**23,233**	**23,233**	**23,233**	**23,233**	**23,233**	**23,233**
Pecos	F	Rio Grande	117,309	117,309	117,309	117,309	117,309	117,309
		Total	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**
Reagan	F	Colorado	68,205	68,205	68,205	68,205	68,205	68,205
		Rio Grande	28	28	28	28	28	28
		Total	**68,233**	**68,233**	**68,233**	**68,233**	**68,233**	**68,233**
Real	J	Colorado	277	277	277	277	277	277
		Guadalupe	3	3	3	3	3	3
		Nueces	7,243	7,243	7,243	7,243	7,243	7,243
		Total	**7,523**	**7,523**	**7,523**	**7,523**	**7,523**	**7,523**

TABLE 6. (CONTINUED).

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Schleicher	F	Colorado	6,403	6,403	6,403	6,403	6,403	6,403
		Rio Grande	1,631	1,631	1,631	1,631	1,631	1,631
		Total	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**
Sterling	F	Colorado	2,495	2,495	2,495	2,495	2,495	2,495
		Total	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**
Sutton	F	Colorado	388	388	388	388	388	388
		Rio Grande	6,022	6,022	6,022	6,022	6,022	6,022
		Total	**6,410**	**6,410**	**6,410**	**6,410**	**6,410**	**6,410**
Taylor	G	Brazos	331	331	331	331	331	331
		Colorado	158	158	158	158	158	158
		Total	**489**	**489**	**489**	**489**	**489**	**489**
Terrell	E	Rio Grande	1,420	1,420	1,420	1,420	1,420	1,420
		Total	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**
Upton	F	Colorado	21,243	21,243	21,243	21,243	21,243	21,243
		Rio Grande	1,126	1,126	1,126	1,126	1,126	1,126
		Total	**22,369**	**22,369**	**22,369**	**22,369**	**22,369**	**22,369**
Uvalde	L	Nueces	1,993	1,993	1,993	1,993	1,993	1,993
		Total	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**
Val Verde	J	Rio Grande	50,000	50,000	50,000	50,000	50,000	50,000
		Total	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**
GMA 7			**474,464**	**474,464**	**474,464**	**474,464**	**474,464**	**474,464**

*The modeled available groundwater for Kimble and Menard counties excludes the parts of the counties that fall within Hickory Underground Water Conservation District No. 1.

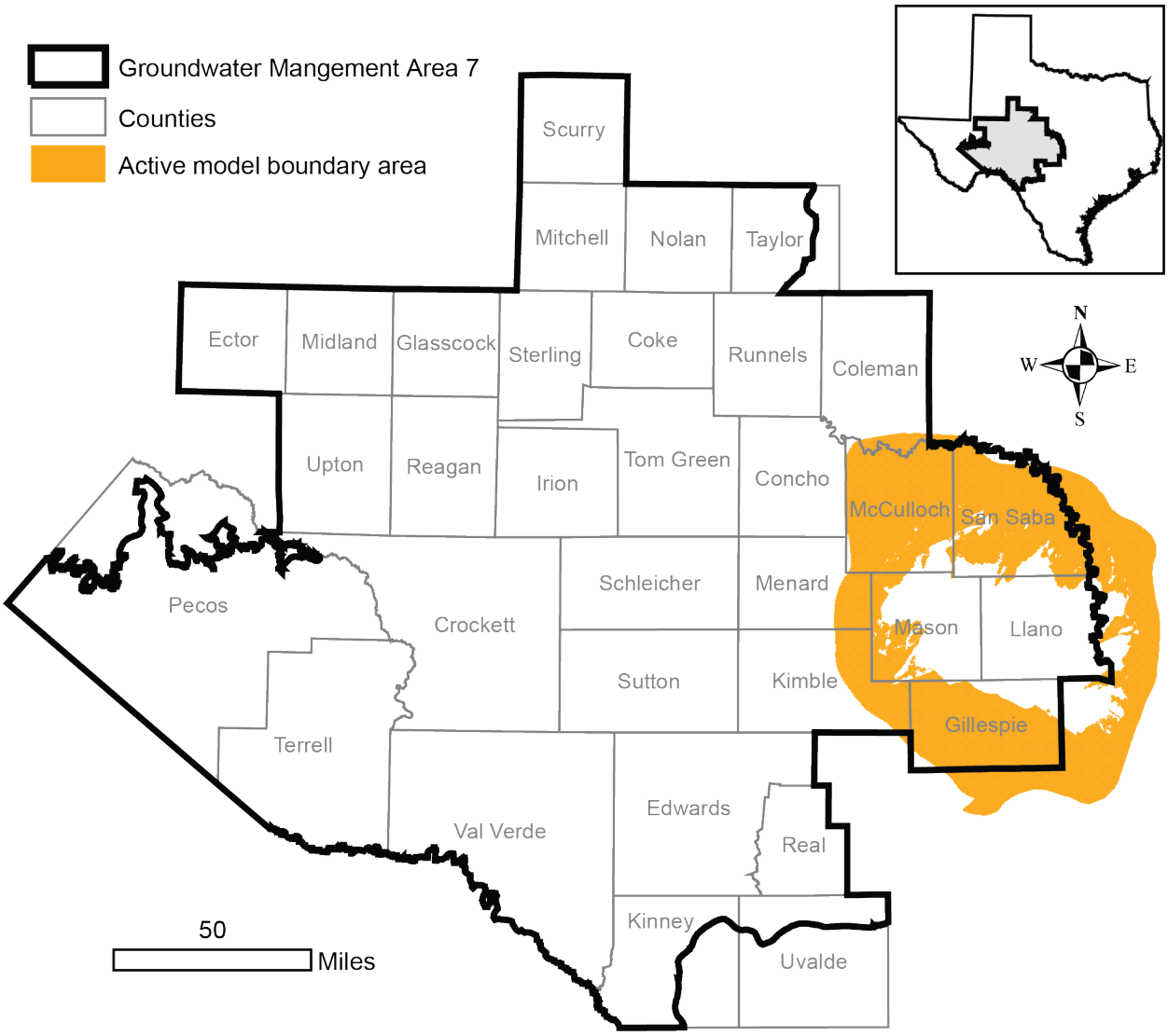


FIGURE 9. MAP SHOWING THE AREAS COVERED BY THE ELLENBURGER-SAN SABA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS OF THE LLANO UPLIFT AREA IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2011 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS THE ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT AND UWD IS UNDERGROUND WATER DISTRICT.

District	County	Year						
		2011	2020	2030	2040	2050	2060	2070
Hickory UWCD No. 1	Kimble	344	344	344	344	344	344	344
	Mason	3,237	3,237	3,237	3,237	3,237	3,237	3,237
	McCulloch	3,466	3,466	3,466	3,466	3,466	3,466	3,466
	Menard	282	282	282	282	282	282	282
	San Saba	5,559	5,559	5,559	5,559	5,559	5,559	5,559
	Total	**12,887**	**12,887**	**12,887**	**12,887**	**12,887**	**12,887**	**12,887**
Hill Country UWCD	Gillespie	6,294	6,294	6,294	6,294	6,294	6,294	6,294
	Total	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**
Kimble County GCD	Kimble	178	178	178	178	178	178	178
	Total	**178**	**178**	**178**	**178**	**178**	**178**	**178**
Menard County UWD	Menard	27	27	27	27	27	27	27
	Total	**27**	**27**	**27**	**27**	**27**	**27**	**27**
No District	McCulloch	898	898	898	898	898	898	898
	San Saba	2,331	2,331	2,331	2,331	2,331	2,331	2,331
	Total	**3,229**	**3,229**	**3,229**	**3,229**	**3,229**	**3,229**	**3,229**
GMA 7		**22,616**	**22,616**	**22,616**	**22,616**	**22,616**	**22,616**	**22,616**

Note: The year 2011 is used because the 2010 desired future condition baseline year for the Ellenburger-San Saba Aquifer is an initial condition in the predictive model run.

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Gillespie	K	Colorado	6,294	6,294	6,294	6,294	6,294	6,294
		Total	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**
Kimble	F	Colorado	521	521	521	521	521	521
		Total	**521**	**521**	**521**	**521**	**521**	**521**
Mason	F	Colorado	3,237	3,237	3,237	3,237	3,237	3,237
		Total	**3,237**	**3,237**	**3,237**	**3,237**	**3,237**	**3,237**
McCulloch	F	Colorado	4,364	4,364	4,364	4,364	4,364	4,364
		Total	**4,364**	**4,364**	**4,364**	**4,364**	**4,364**	**4,364**
Menard	F	Colorado	309	309	309	309	309	309
		Total	**309**	**309**	**309**	**309**	**309**	**309**
San Saba	K	Colorado	7,890	7,890	7,890	7,890	7,890	7,890
		Total	**7,890**	**7,890**	**7,890**	**7,890**	**7,890**	**7,890**
GMA 7			**22,616**	**22,616**	**22,616**	**22,616**	**22,616**	**22,616**

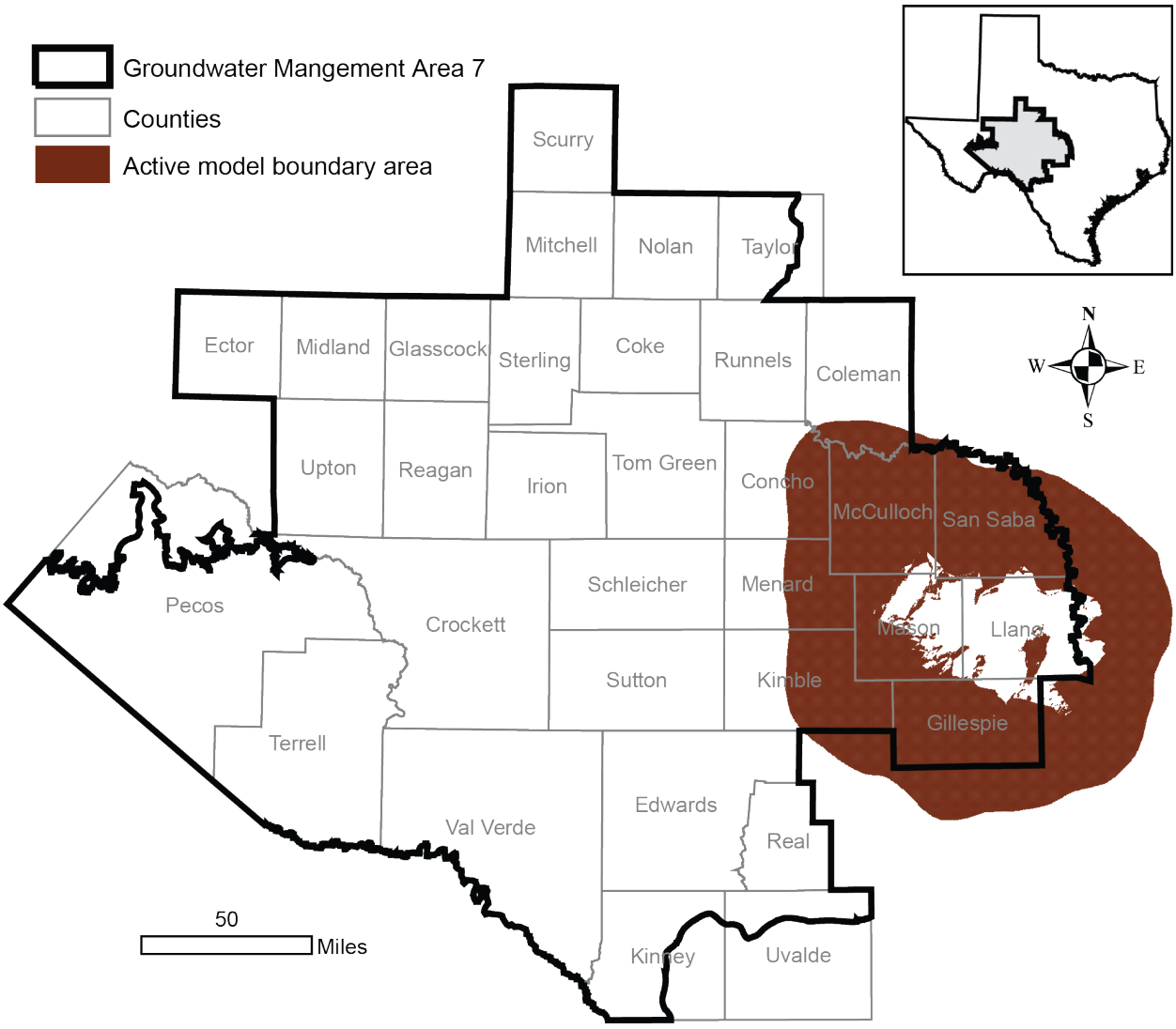


FIGURE 10. MAP SHOWING AREAS COVERED BY THE HICKORY AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS OF THE LLANO UPLIFT AREA IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2011 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS THE ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT AND UWD IS UNDERGROUND WATER DISTRICT.

District	County	Year						
		2011	2020	2030	2040	2050	2060	2070
Hickory UWCD No. 1	Concho	13	13	13	13	13	13	13
	Kimble	42	42	42	42	42	42	42
	Mason	13,212	13,212	13,212	13,212	13,212	13,212	13,212
	McCulloch	21,950	21,950	21,950	21,950	21,950	21,950	21,950
	Menard	2,600	2,600	2,600	2,600	2,600	2,600	2,600
	San Saba	7,027	7,027	7,027	7,027	7,027	7,027	7,027
	Total	**44,843**	**44,843**	**44,843**	**44,843**	**44,843**	**44,843**	**44,843**
Hill Country UWCD	Gillespie	1,751	1,751	1,751	1,751	1,751	1,751	1,751
	Total	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**
Kimble County GCD	Kimble	123	123	123	123	123	123	123
	Total	**123**	**123**	**123**	**123**	**123**	**123**	**123**
Lipan-Kickapoo WCD	Concho	13	13	13	13	13	13	13
	Total	**13**	**13**	**13**	**13**	**13**	**13**	**13**
Menard County UWD	Menard	126	126	126	126	126	126	126
	Total	**126**	**126**	**126**	**126**	**126**	**126**	**126**
No District	McCulloch	2,427	2,427	2,427	2,427	2,427	2,427	2,427
	San Saba	652	652	652	652	652	652	652
	Total	**3,080**	**3,080**	**3,080**	**3,080**	**3,080**	**3,080**	**3,080**
GMA 7		**49,936**	**49,936**	**49,936**	**49,936**	**49,936**	**49,936**	**49,936**

Note: The year 2011 is used because the 2010 desired future condition baseline year for the Hickory Aquifer is an initial condition in the predictive model run.

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Concho	F	Colorado	27	27	27	27	27	27
		Total	**27**	**27**	**27**	**27**	**27**	**27**
Gillespie	K	Colorado	1,751	1,751	1,751	1,751	1,751	1,751
		Total	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**
Kimble	F	Colorado	165	165	165	165	165	165
		Total	**165**	**165**	**165**	**165**	**165**	**165**
Mason	F	Colorado	13,212	13,212	13,212	13,212	13,212	13,212
		Total	**13,212**	**13,212**	**13,212**	**13,212**	**13,212**	**13,212**
McCulloch	F	Colorado	24,377	24,377	24,377	24,377	24,377	24,377
		Total	**24,377**	**24,377**	**24,377**	**24,377**	**24,377**	**24,377**
Menard	F	Colorado	2,725	2,725	2,725	2,725	2,725	2,725
		Total	**2,725**	**2,725**	**2,725**	**2,725**	**2,725**	**2,725**
San Saba	K	Colorado	7,680	7,680	7,680	7,680	7,680	7,680
		Total	**7,680**	**7,680**	**7,680**	**7,680**	**7,680**	**7,680**
GMA 7			**49,936**	**49,936**	**49,936**	**49,936**	**49,936**	**49,936**

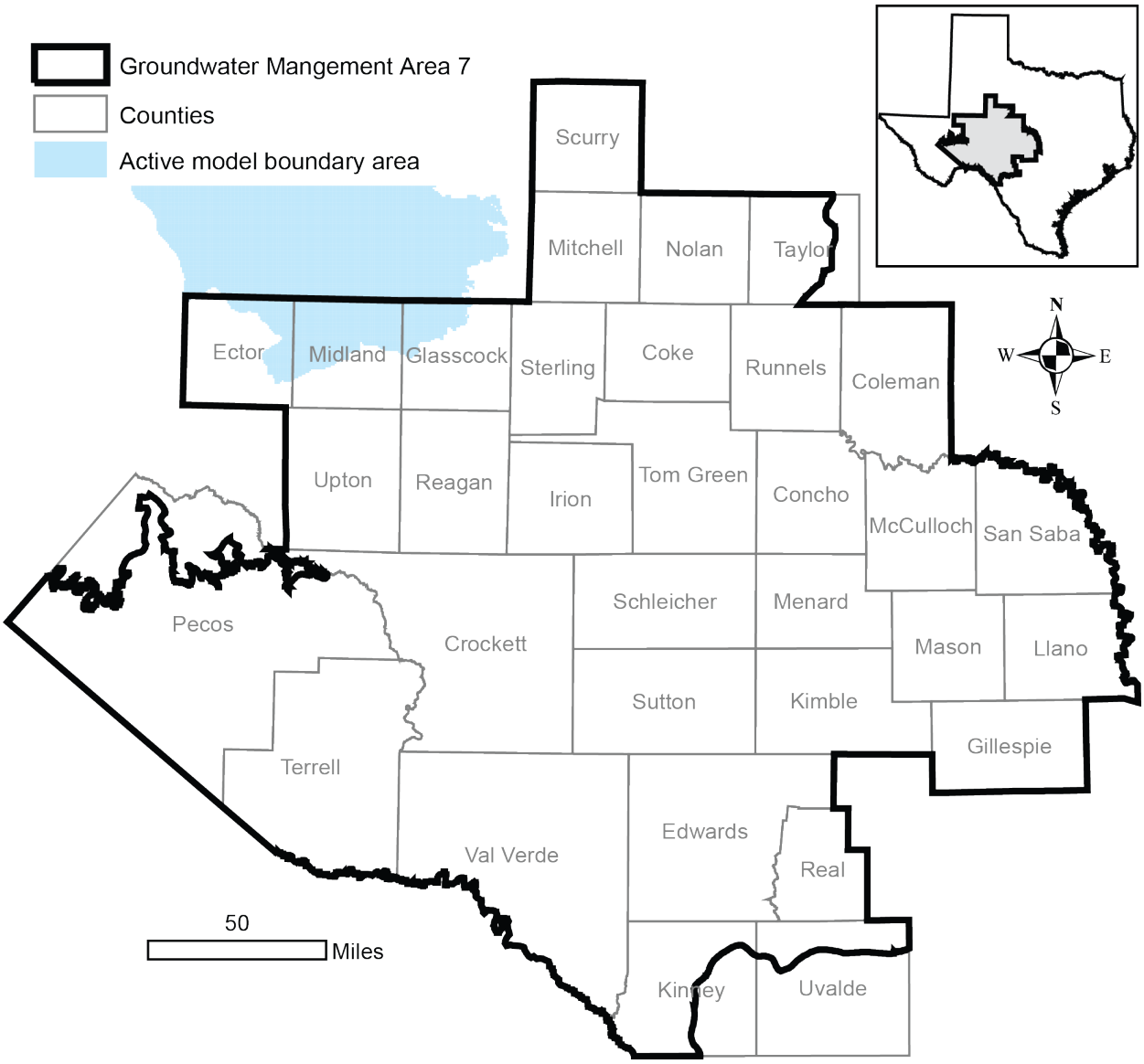


FIGURE 11. MAP SHOWING THE AREAS COVERED BY THE OGALLALA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HIGH PLAINS AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2013 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year						
		2013	2020	2030	2040	2050	2060	2070
Glasscock GCD	Glasscock	8,019	7,925	7,673	7,372	7,058	6,803	6,570
	Total	**8,019**	**7,925**	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**
GMA 7		**8,019**	**7,925**	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**

Note: The year 2013 is used because the 2012 desired future condition baseline year for the Ogallala Aquifer is an initial condition in the predictive model run.

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Glasscock	F	Colorado	7,925	7,673	7,372	7,058	6,803	6,570
		Total	**7,925**	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**
GMA 7			**7,925**	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**

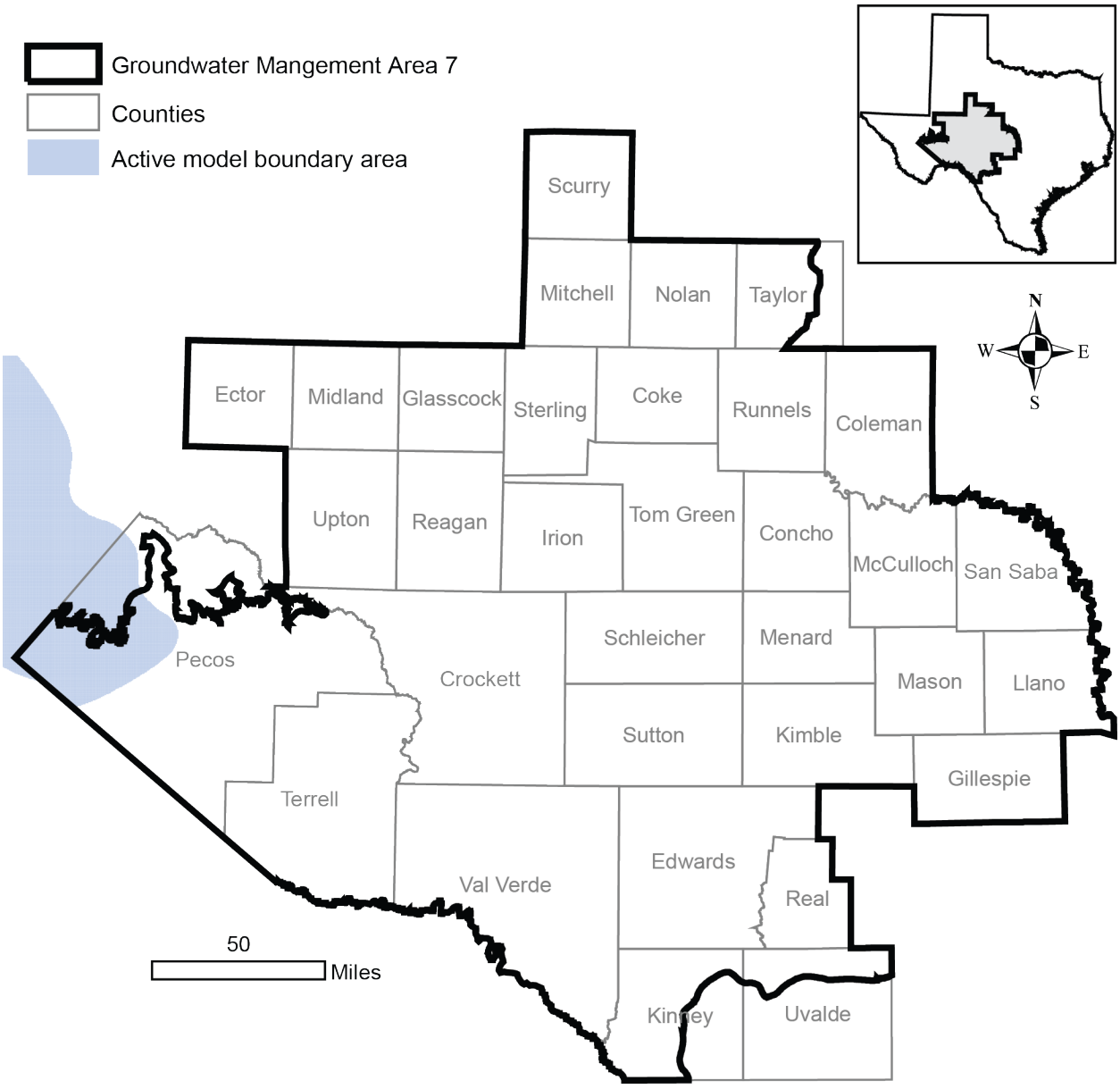


FIGURE 12. MAP SHOWING AREAS COVERED BY THE RUSTLER AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 13. MODELED AVAILABLE GROUNDWATER FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2009 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year							
		2009	2010	2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	7,040	7,040	7,040	7,040	7,040	7,040	7,040	7,040
	Total	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**

TABLE 14. MODELED AVAILABLE GROUNDWATER FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year					
			2020	2030	2040	2050	2060	2070
Pecos	F	Rio Grande	7,040	7,040	7,040	7,040	7,040	7,040
		Rio Grande	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**

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 historical 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 streamflow are specific to a particular historical 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.

Model "Dry" Cells

The predictive model run for this analysis results in water levels in some model cells dropping below the base elevation of the cell during the simulation. In terms of water level, the cells have gone dry. However, as noted in the model assumptions the transmissivity of the cell remains constant and will produce water.

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APPENDIX B

ESTIMATED HISTORICAL GROUNDWATER USE AND 2017 STATE WATER PLAN DATASETS: MENARD COUNTY UNDERGROUND WATER DISTRICT

Estimated Historical Groundwater Use And 2022 State Water Plan Datasets:

Menard County Underground Water District

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

GROUNDWATER MANAGEMENT PLAN DATA:

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

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

The five reports included in this part are:

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

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

DISCLAIMER:

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

The WUS dataset can be verified at this web address:

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

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

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 perfect 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.

MENARD COUNTY

86.48% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	15	0	0	0	387	241	643
	SW	213	0	0	0	1,653	42	1,908
2018	GW	23	0	0	0	374	240	637
	SW	219	0	0	0	2,933	42	3,194
2017	GW	22	0	0	0	564	232	818
	SW	225	0	0	0	1,363	41	1,629
2016	GW	22	0	0	0	330	223	575
	SW	214	0	0	0	2,902	40	3,156
2015	GW	40	0	0	0	443	220	703
	SW	207	0	0	0	3,177	39	3,423
2014	GW	62	0	0	0	347	213	622
	SW	214	0	0	0	3,540	37	3,791
2013	GW	75	0	0	0	403	214	692
	SW	223	0	0	0	4,086	38	4,347
2012	GW	85	0	0	0	867	194	1,146
	SW	246	0	0	0	841	34	1,121
2011	GW	87	0	0	0	287	225	599
	SW	316	0	0	0	3,674	40	4,030
2010	GW	79	0	182	0	738	235	1,234
	SW	259	0	47	0	1,056	42	1,404
2009	GW	299	3	92	0	702	289	1,385
	SW	0	0	23	0	678	51	752
2008	GW	265	3	2	0	0	253	523
	SW	0	0	0	0	881	45	926
2007	GW	220	3	0	0	917	300	1,440
	SW	0	0	0	0	905	53	958
2006	GW	250	3	0	0	1,348	292	1,893
	SW	0	0	0	0	847	52	899
2005	GW	226	3	0	0	186	279	694
	SW	0	0	0	0	1,219	49	1,268
2004	GW	221	3	0	0	121	273	618
	SW	0	0	0	0	980	68	1,048

Projected Surface Water Supplies
TWDB 2022 State Water Plan Data

MENARD COUNTY

86.48% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
F	IRRIGATION, MENARD	COLORADO	COLORADO RUN-OF-RIVER	1,687	1,687	1,687	1,687	1,687	1,687
F	LIVESTOCK, MENARD	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	42	42	42	42	42	42
F	MENARD	COLORADO	COLORADO RUN-OF-RIVER	139	139	139	139	139	139
	Sum of Projected Surface Water Supplies (acre-feet)			**1,868**	**1,868**	**1,868**	**1,868**	**1,868**	**1,868**

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.

MENARD COUNTY *86.48% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
F	COUNTY-OTHER, MENARD	COLORADO	80	77	74	74	73	73
F	IRRIGATION, MENARD	COLORADO	3,168	3,168	3,168	3,168	3,168	3,168
F	LIVESTOCK, MENARD	COLORADO	254	254	254	254	254	254
F	MENARD	COLORADO	350	342	336	335	335	335
F	MINING, MENARD	COLORADO	939	926	823	715	620	538
	Sum of Projected Water Demands (acre-feet)		**4,791**	**4,767**	**4,655**	**4,546**	**4,450**	**4,368**

Projected Water Supply Needs
TWDB 2022 State Water Plan Data

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

MENARD COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
F	COUNTY-OTHER, MENARD	COLORADO	0	0	0	0	0	0
F	IRRIGATION, MENARD	COLORADO	0	0	0	0	0	0
F	LIVESTOCK, MENARD	COLORADO	0	0	0	0	0	0
F	MENARD	COLORADO	-211	-203	-197	-196	-196	-196
F	MINING, MENARD	COLORADO	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet)		**-211**	**-203**	**-197**	**-196**	**-196**	**-196**

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

MENARD COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
IRRIGATION, MENARD, COLORADO (F)							
IRRIGATION CONSERVATION - MENARD COUNTY	DEMAND REDUCTION [MENARD]	183	366	549	549	549	549
SUBORDINATION - MENARD COUNTY IRRIGATION	COLORADO RUN-OF-RIVER [MENARD]	537	537	537	537	537	537
		720	**903**	**1,086**	**1,086**	**1,086**	**1,086**
MENARD, COLORADO (F)							
MUNICIPAL CONSERVATION - MENARD	DEMAND REDUCTION [MENARD]	5	5	5	5	5	5
SUBORDINATION - MENARD COUNTY IRRIGATION	COLORADO RUN-OF-RIVER [MENARD]	1,000	1,000	1,000	1,000	1,000	1,000
		1,005	**1,005**	**1,005**	**1,005**	**1,005**	**1,005**
MINING, MENARD, COLORADO (F)							
MINING CONSERVATION - MENARD COUNTY	DEMAND REDUCTION [MENARD]	46	45	40	35	30	26
		46	**45**	**40**	**35**	**30**	**26**
Sum of Projected Water Management Strategies (acre-feet)		**1,771**	**1,953**	**2,131**	**2,126**	**2,121**	**2,117**

APPENDIX C

GAM RUN 21-004: MENARD COUNTY UNDERGROUND WATER DISTRICT MANAGEMENT PLAN

GAM Run 21-004: Menard County Underground Water District Management Plan

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Texas Water Development Board
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October 8, 2021

Shirley C. Wade
10/8/2021

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GAM RUN 21-004: MENARD COUNTY UNDERGROUND WATER DISTRICT MANAGEMENT PLAN

Shirley Wade, Ph.D., P.G.
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October 8, 2021

EXECUTIVE SUMMARY:

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

The TWDB provides data and information to the Menard County Underground Water 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 and this information includes:

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

The groundwater management plan for the Menard County Underground Water District should be adopted by the district on or before March 1, 2022 and submitted to the executive administrator of the TWDB on or before March 31, 2022. The current management plan for the Menard County Underground Water District expires on May 30, 2022.

We used two groundwater availability models to estimate the management plan information for the aquifers within the Menard County Underground Water District. Information for the Hickory and Ellenburger-San Saba aquifers is from version 1.01 of the groundwater availability model for the minor aquifers of the Llano Uplift Region (Shi and others, 2016a and b). Information for the Edwards-Trinity (Plateau) Aquifer is from version 1.01 of the groundwater availability model for the Edwards-Trinity (Plateau) Aquifer (Anaya and Jones, 2009).

This report replaces the results of GAM Run 17-028 (Boghici and Shi, 2017), as the approach used for analyzing model results has been since refined to more accurately delineate flows between hydraulically connected units and because of updates to the spatial grid file used to define county, groundwater conservation district, and aquifer boundaries. In addition, this analysis includes results from the final groundwater availability model for the minor aquifers of the Llano Uplift Region, whereas only the draft model was available at the time of publication for GAM Run 17-028. Tables 1 through 3 summarize the groundwater availability model data required by statute. Figures 1, 3, and 5 show the area of the models from which the values in the tables were extracted. Figures 2, 4, and 6 provide generalized diagrams of the groundwater flow components provided in Tables 1 through 3. If, after review of the figures, the Menard County Underground Water District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability models mentioned above were used to estimate information for the Menard County Underground Water District management plan. Water budgets were extracted for the historical model period for the Hickory and Ellenburger-San Saba aquifers (1981-2010) using ZONEBUDGET USG Version 1.00 (Panday and others, 2013). Water budgets were extracted for the historical model period for the Edwards-Trinity (Plateau) Aquifer (1981-2000) 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:

Hickory and Ellenburger-San Saba aquifers

- We used version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift Region to analyze the Hickory and Ellenburger-San Saba aquifers. See Shi and others (2016a and b) for assumptions and limitations of the model.
- The groundwater availability model for the minor aquifers in the Llano Uplift Region contains eight layers (from top to bottom):
    - Layer 1 — Cretaceous age and younger water-bearing units
    - Layer 2 — Permian and Pennsylvanian age confining units
    - Layer 3 — the Marble Falls Aquifer and equivalent
    - Layer 4 — Mississippian age confining units
    - Layer 5 — the Ellenburger-San Saba Aquifer and equivalent
    - Layer 6 — Cambrian age confining units
    - Layer 7 — the Hickory Aquifer and equivalent, and
    - Layer 8 — Precambrian age confining units
- Individual water budgets for the district were determined for the Ellenburger-San Saba Aquifer (Layer 5) and the Hickory Aquifer (Layer 7). The Marble Falls Aquifer does not occur within the Menard County Underground Water District and therefore no groundwater budget values are included for it in this report.
- Water budget terms were averaged for the period 1981 to 2010 (stress periods 2 through 31)
- The model was run with MODFLOW-USG (Panday and others, 2013).

Edwards-Trinity (Plateau) Aquifer

- We used version 1.01 of the groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers to analyze the Edwards-Trinity (Plateau) Aquifer. See Anaya and Jones (2009) for assumptions and limitations of the model.
- The groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers contains two layers. Within Menard County Underground Water District, these generally represent the Edwards Group and equivalent limestone hydrostratigraphic units of the Edwards-Trinity (Plateau) Aquifer (Layer 1) and the undifferentiated Trinity Group hydrostratigraphic units or equivalent units of the Edwards-Trinity (Plateau) Aquifer (Layer 2).
- An Individual water budget for the district was determined for the Edwards-Trinity (Plateau) Aquifer (Layers 1 and 2, combined). The Pecos Valley Aquifer does not occur within the Menard County Underground Water District and therefore no groundwater budget values are included for it in this report.
- Water budget terms were averaged for the period 1981 to 2000 (stress periods 2 through 21)
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Hickory, Ellenburger-San Saba, and Edwards-Trinity (Plateau) aquifers located within the Menard County Underground Water 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. 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 HICKORY AQUIFER THAT IS NEEDED FOR THE MENARD COUNTY UNDERGROUND WATER DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Hickory Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Hickory Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Hickory Aquifer	1,723
Estimated annual volume of flow out of the district within each aquifer in the district	Hickory Aquifer	4,202
Estimated net annual volume of flow between each aquifer in the district	Into the Hickory Aquifer from equivalent units outside the official Hickory Aquifer extent	299
	Into the Hickory Aquifer from the Cambrian age confining unit	2,446
	From the Hickory Aquifer to the Precambrian age confining unit	219

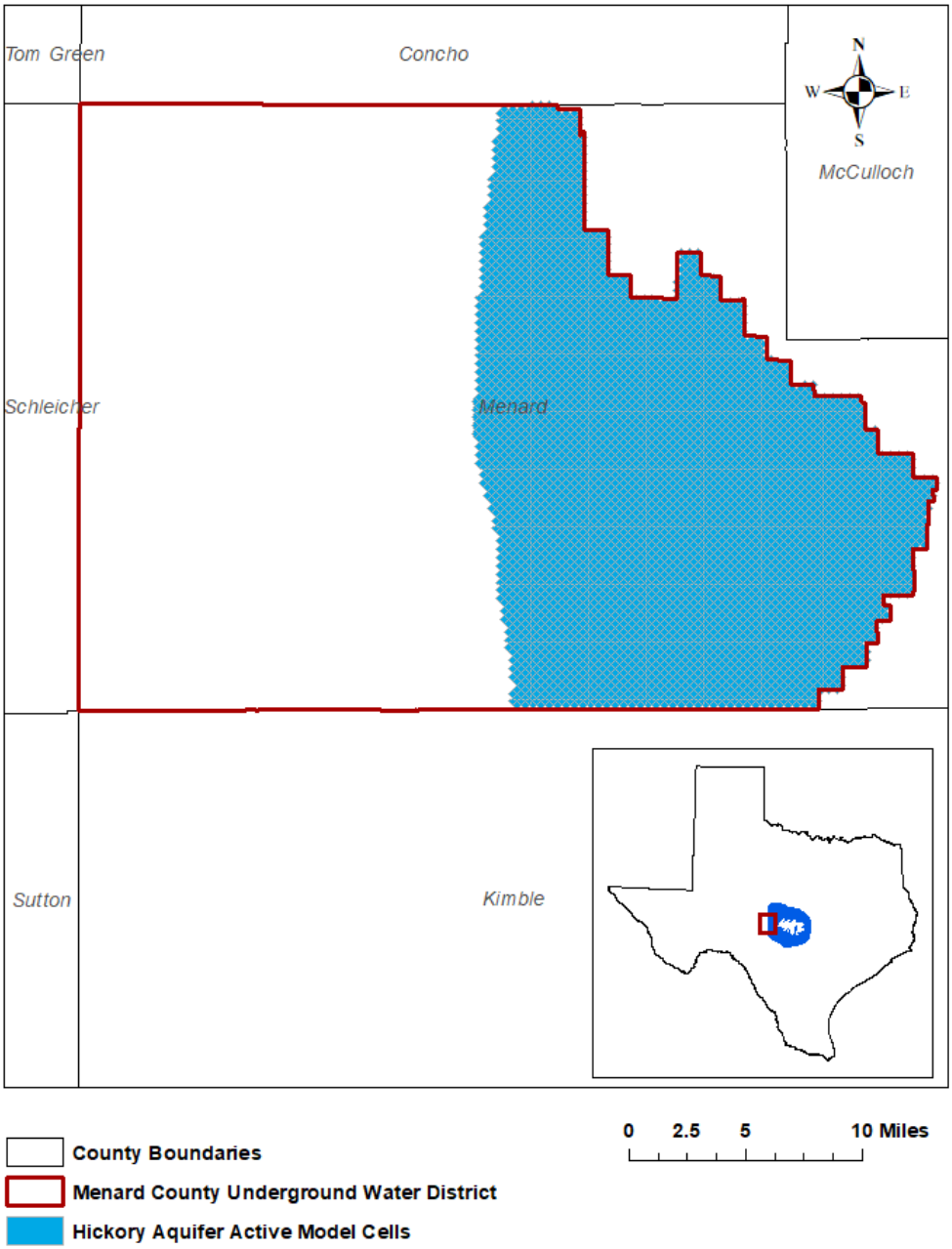
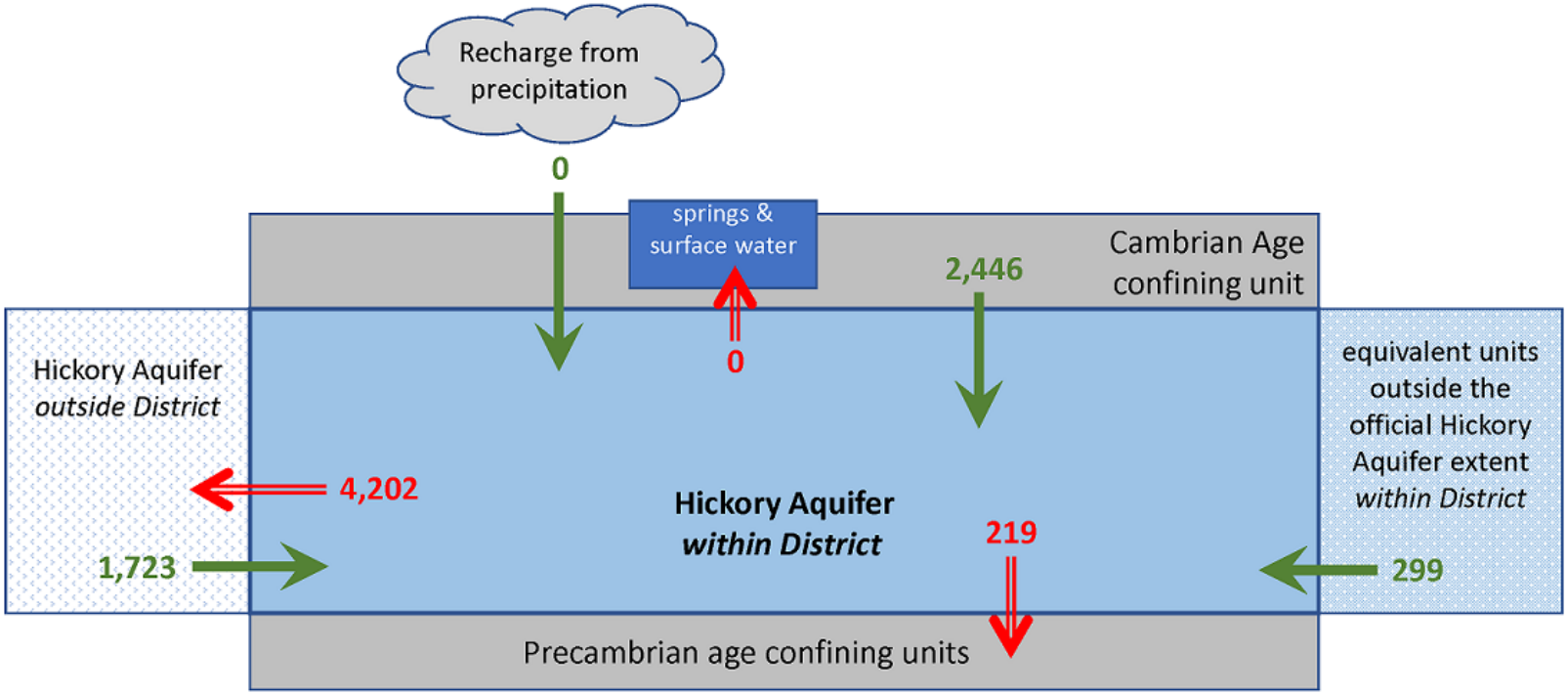


FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN THE LLANO UPLIFT REGION FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE HICKORY AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).



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

FIGURE 2: GENERALIZED DIAGRAM OF THE SUMMARIZED BUDGET INFORMATION FROM TABLE 1, REPRESENTING DIRECTIONS OF FLOW FOR THE HICKORY AQUIFER WITHIN MENARD COUNTY UNDERGROUND WATER DISTRICT. FLOW VALUES EXPRESSED IN ACRE-FEET PER YEAR.

TABLE 2: SUMMARIZED INFORMATION FOR THE ELLENBURGER-SAN SABA AQUIFER THAT IS NEEDED FOR THE MENARD COUNTY UNDERGROUND WATER DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Ellenburger-San Saba Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Ellenburger-San Saba Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Ellenburger-San Saba Aquifer	126
Estimated annual volume of flow out of the district within each aquifer in the district	Ellenburger-San Saba Aquifer	269
Estimated net annual volume of flow between each aquifer in the district	Into the Ellenburger-San Saba Aquifer from equivalent units outside the official Ellenburger-San Saba Aquifer extent	151
	Into the Ellenburger-San Saba Aquifer from Marble Falls equivalent units outside the official Marble Falls Aquifer extent	41
	Into the Ellenburger-San Saba Aquifer from the Mississippian age confining unit	1,427
	From the Ellenburger-San Saba Aquifer to Cambrian age confining units	1,468

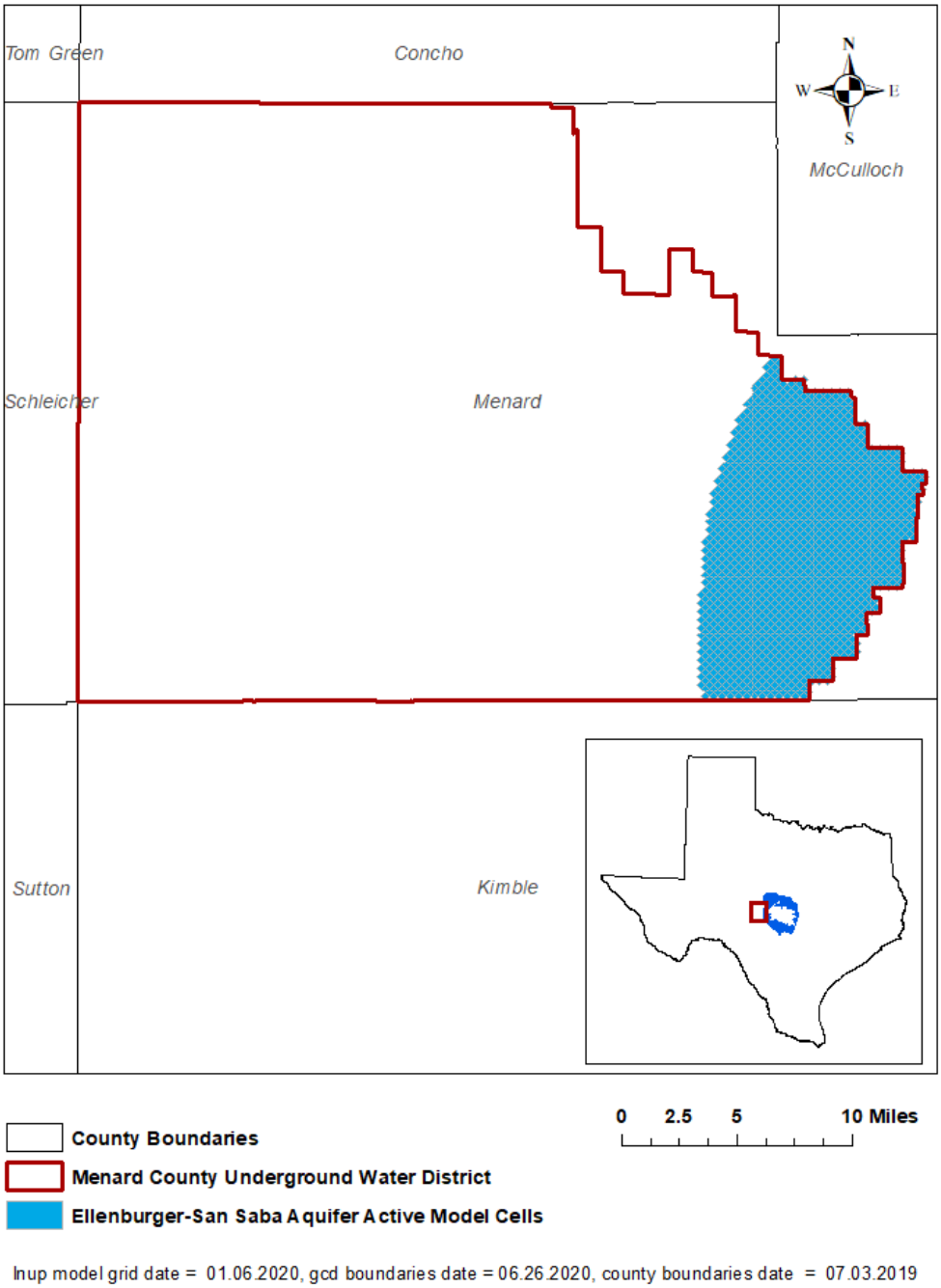
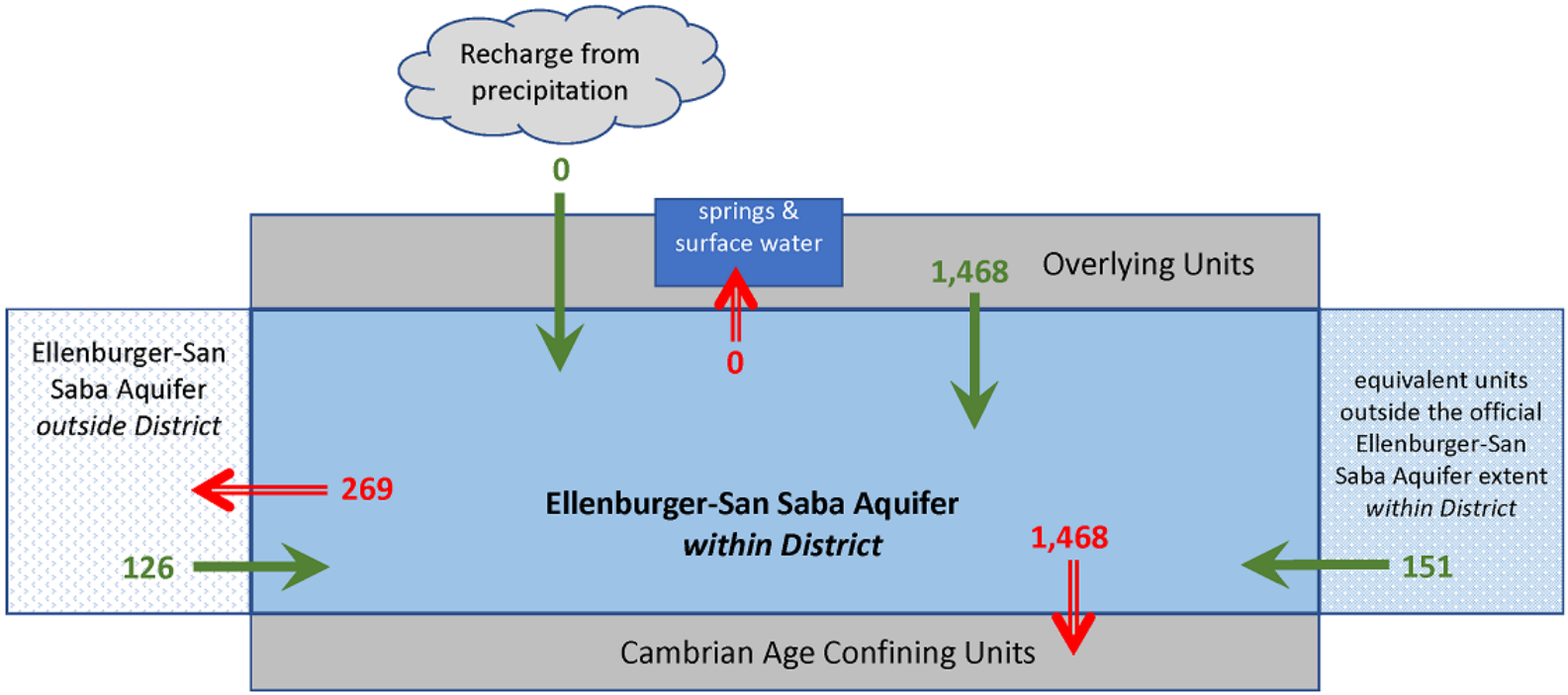


FIGURE 3: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN THE LLANO UPLIFT REGION FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE ELLENBURGER-SAN SABA AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).



* Flow from overlying units includes 1,427 acre-feet per year from the Mississippian age confining unit and 41 acre-feet per year from the Marble Falls equivalent units outside the official Marble Falls Aquifer extent.

Caveat: This diagram only includes the water budget items provided in Table 2. A complete water budget would include additional inflows and outflows. If the District requires values for additional water budget items, please contact TWDB.

FIGURE 4: GENERALIZED DIAGRAM OF THE SUMMARIZED BUDGET INFORMATION FROM TABLE 2, REPRESENTING DIRECTIONS OF FLOW FOR THE ELLENBURGER-SAN SABA AQUIFER WITHIN MENARD COUNTY UNDERGROUND WATER DISTRICT. FLOW VALUES EXPRESSED IN ACRE-FEET PER YEAR.

TABLE 3: SUMMARIZED INFORMATION FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER THAT IS NEEDED FOR THE MENARD COUNTY UNDERGROUND WATER DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau) Aquifer	19,408
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers.	Edwards-Trinity (Plateau) Aquifer	20,298
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	10,106
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	10,113
Estimated net annual volume of flow between each aquifer in the district	From the Edwards-Trinity (Plateau) Aquifer to Pennsylvanian and Permian underlying confining units[1]	3,658

[1] Calculated from the groundwater availability model for the Minor Aquifers of the Llano Uplift Region of Texas. This value is only the fraction of the flux for the area of the Edwards-Trinity Plateau within the model area of the groundwater availability model for the Minor Aquifers of the Llano Uplift Region of Texas.

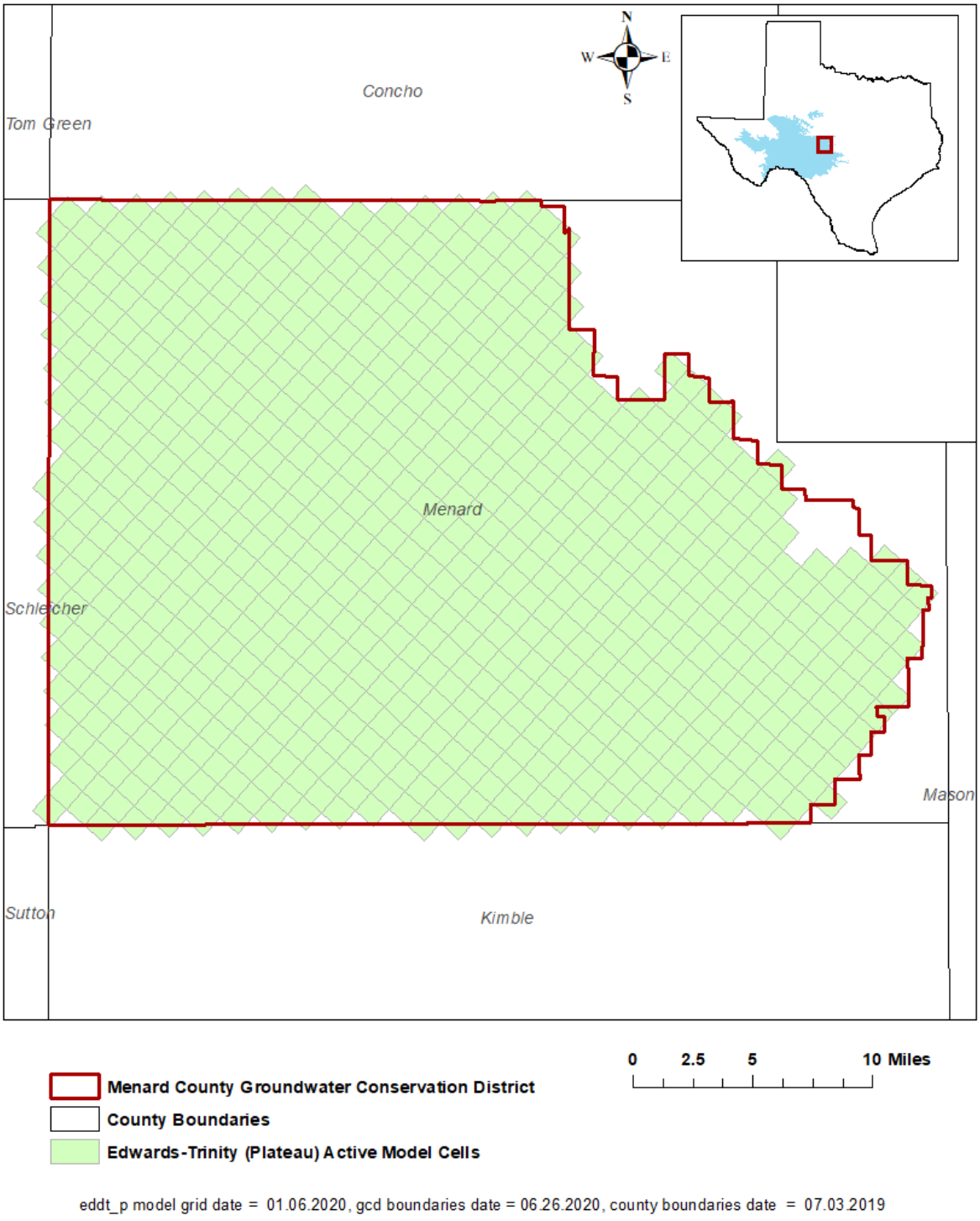
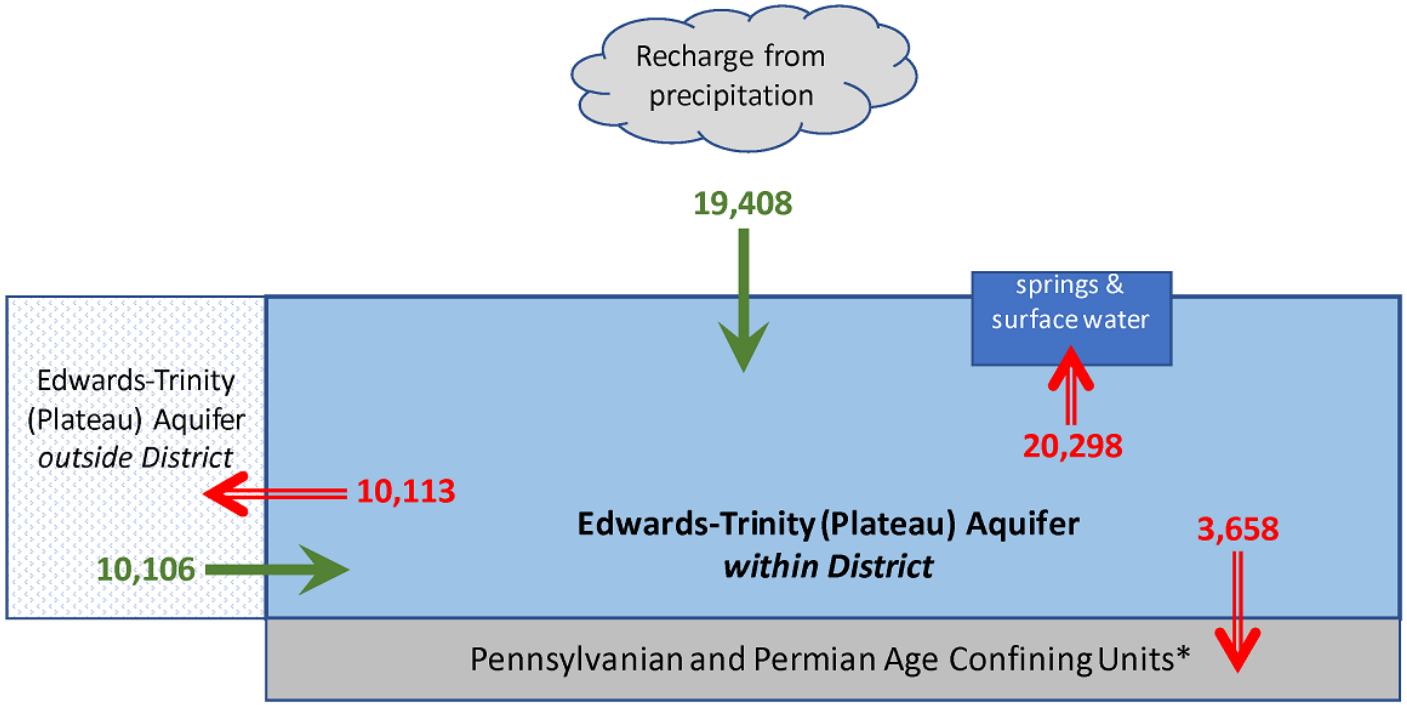


FIGURE 5: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AND PECOS VALLEY AQUIFERS FROM WHICH THE INFORMATION IN TABLE 3 WAS EXTRACTED (THE EDWARDS-TRINITY (PLATEAU) AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).



* Flow from the Edwards-Trinity (Plateau) Aquifer to Pennsylvanian and Permian age confining units based on the Groundwater Availability Model for the Minor Aquifers of the Llano Uplift Region of Texas.

Caveat: This diagram only includes the water budget items provided in Table 3. A complete water budget would include additional inflows and outflows. If the District requires values for additional water budget items, please contact TWDB.

FIGURE 6: GENERALIZED DIAGRAM OF THE SUMMARIZED BUDGET INFORMATION FROM TABLE 3, REPRESENTING DIRECTIONS OF FLOW FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER WITHIN MENARD COUNTY UNDERGROUND WATER DISTRICT. FLOW VALUES 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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Shi, J., Boghici, R., Kohlrenken, W., and Hutchison, W.R., 2016a, Conceptual Model Report: Minor Aquifers of the Llano Uplift Region of Texas. Texas Water Development Board Report, 306 p., http://www.twdb.texas.gov/groundwater/models/gam/llano/Llano_Uplift_Conceptual_Model_Report_Final.pdf.

Shi, J., Boghici, R., Kohlrenken, W., and Hutchison, W.R., 2016b, Numerical Model Report: Minor Aquifers of the Llano Uplift Region of Texas (Marble Falls, Ellenburger-San Saba, and Hickory). Texas Water Development Board Report, 435 p., http://www.twdb.texas.gov/groundwater/models/gam/llano/Llano_Uplift_Numerical_Model_Report_Final.pdf.

Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf

APPENDIX D
DISTRICT RULES

RULES OF THE MENARD COUNTY UNDERGROUND WATER DISTRICT

Section 1 - ADOPTION AND PURPOSE OF RULES

1.01 The Rules of the Menard County Underground Water District are hereby published as of the 14th day of April, 2015.

These Rules are adopted and ratified pursuant to Section 59 of Article XVI of the Texas Constitution, and with Acts of the 70th Legislature (1987), p.2010, Ch. 439, S.B. 1525 (hereinafter the "District Act") and Chapters 35 and 36 of the Texas Water Code, as the rules of the Menard County Underground Water District. Each rule as worded herein has been in effect since the date of passage and as may be hereafter amended.

1.02 Purpose of Rules. The rules, regulations, and modes of procedure set forth hereunder are and have been adopted for the purpose of conserving, preserving, protecting and recharging the groundwater in the District and are adopted under the District's statutory authority to prevent waste and protect rights of owners of interests in groundwater.

1.03 Use and Effect of Rules. These rules shall be used as guides in the exercise of the powers conferred by law and in the accomplishment of the District Act. They shall not be construed as a limitation or restriction upon the exercise of any discretion, where such is authorized; nor shall they in any event be construed to deprive the Board of the exercise of any powers, duties, or jurisdiction conferred by law, nor may they be construed to limit or restrict the amount and character of data or information which may be required for the proper administration of the District Act and laws of the State of Texas.

1.04 Amending of Rules. The Board may, following proper notice and hearing, amend these Rules or adopt new rules from time to time.

1.05 Suspension of Rules. Except for the Rules governing Transport Permits, the Board may suspend or waive a rule, in whole or in part, upon the showing of good cause or when, in the discretion of the Board, the particular facts or circumstances render such waiver of the Rule appropriate in a given instance.

1.06 Severability. If any provision of any Rule or its application to any person or circumstance is held invalid, illegal, or unenforceable, the invalidity does not effect other provisions or applications of the Rule which can be given effect without the invalid provision or application, and to this end, the provisions of the Rule are severable.

1.07 Heading and Captions. The section and other headings and captions contained in these rules are for reference purposes only and do not affect in any way the meaning or interpretation of these Rules.

SECTION 2 - DEFINITIONS

2.01 In the administration of its duties the Menard County Underground Water District defines terms as set forth in Chapter 36 of the Texas Water Code. Unless the context indicates a contrary meaning, the specific terms hereinafter defined shall have the following meaning in these rules:

(a) (a) **"Abandoned Well"** means a well that has not been used for six consecutive months. A well is not considered to be abandoned in the following cases:

(1) it is a non-deteriorated well which contains the casing, pump, and pump column in good condition; or

(2) it is a non-deteriorated well which has been capped.

(b) **"Acre-foot"** is the amount of water necessary to cover one acre of land to a depth of one foot, approximately 325,851 gallons.

(c) **"Agent"** means the person authorized to act on behalf of the landowner with respect to transactions involving the Menard County Underground Water District.

(d) **"Agricultural crop"** means food or fiber grown for resale or commercial purposes that provides human or animal food, or clothing.

(e) "**Agricultural well**" means any well devoted solely to raising food for consumption by humans and animals, or fiber for clothing. If any part of the well production is used for any other purpose, including processing of food or fiber, the well does not qualify as an agricultural well.

(f) **"Applicant"** means the owner of the land on which the well(s) or proposed well(s) are located, unless the landowner authorizes another person to act on his/her behalf with respect to transactions involving the District.

(g) **"Authorized Well Site"** means:

(1) The location of a proposed well on an application duly filed with the District until such application is denied; or

(2) The location of a proposed well on a valid permit. (An authorized well site is not a permit to drill); or

(3) A well which produces in excess of 25,000 gallons of water per day and which was in existence at the time the District was created or at the time the area was annexed into the District and is not considered to be an abandoned well or deteriorated well; or

(4) A well drilled after the District was created or after the area was annexed into the District that has a properly completed Well Registration on file in the District office and such well has not been "abandoned" by the well owner.

(h) **"Beneficial Use**" means

1) agricultural, gardening, domestic, stock raising, municipal, mining, manufacturing, industrial, commercial, recreational, purposes; or

2) exploring for, producing, handling, or treating oil, gas, sulphur or other minerals;

(i) **"Bentonite"** means a sodium hydrous aluminum silicate clay mineral (montmorillonite) commercially available in powdered, granular, or pellet form which may be mixed with potable water and used to provide a seal in the annular space between the well casing and borehole wall or used in the plugging of wells.

(j) **"Board"** means the Board of Directors of the Menard County Underground Water District, consisting of five (5) duly elected members.

(k) **"Capped Well"** means a well that is closed or capped with a covering capable of preventing surface pollutants from entering the well and sustaining weight of at least 400 pounds and constructed in such a way that the covering cannot be easily removed by hand.

(l) **"Casing"** means a tubular watertight structure installed in the excavated or drilled hole, temporarily or permanently, to maintain the hole sidewalls against caving, and, along with cementing and/or bentonite grouting, to confine groundwater to its zone of origin and prevent surface contaminant infiltration. Casing diameter is the inside diameter of a well casing.

(m) **"Cement"** means a neat Portland construction cement mixture of not more than seven (7) gallons of water per 94-pound sack of dry cement, or a cement slurry which contains cement along with bentonite, gypsum, or other additives. All manufacturer's recommendations regarding water content for the mix must be strictly adhered to.

(n) **"Completion"** means sealing off the access of undesirable water to the well bore by proper casing and/or cementing procedures and adherence to State standards for completion.

(o) **"Deteriorated Well"** means a well, the condition of which will cause, or is likely to cause, pollution of groundwater.

(p) **"District"** means the Menard County Underground Water District, with its principal office in Menard, Texas. Where applications, reports, and other papers are required to be filed with or sent to "the District", this means the District's Headquarters, the address of which is 210 E. San Saba Avenue, P. O. Box 1215, Menard, Texas 76859.

(q) **"Domestic Well"** means a well that will produce water to be used exclusively to supply the needs of a single household for drinking, washing, cooking, landscape watering, family gardening and watering of domestic animals, for which no monetary consideration is given or received. (An

exempt well). This includes the use of water for home landscapes and home gardening on no more than two acres of land.

(r) **"Drilling Permit"** means a permit issued by the District for the drilling, re-working, re-drilling or re-equipping of a properly spaced well that may produce more than 25,000 gallons of water per day (17.4 gallons per minute).

(s) **"Drilled to Density"** means no more than a cumulative total of four (4) wells shall be permitted per survey section consisting of 640 acres, more or less (that is, 1 well per 160 acres).

(t) **"Exempt Well"** means any well for which the District is prohibited from requiring a permit under Texas Water Code § 36.117. In general, § 36.117 exempts wells for domestic and livestock watering use which are equipped with pumps that cannot produce more than 25,000 gallons per day, and certain wells for hydrocarbon production. Wells used to supply water to facilities used primarily for feeding livestock are exempt; however, wells used to irrigate pasture land or crops are not exempt. For all purposes herein, an exempt well shall be exempt from permitting requirements, but shall comply with the registration requirements set forth hereunder in Section 9.

(u) **"Groundwater"** means water percolating below the earth's surface within the District, but does not include water produced with oil in the production of gas and oil.

(v) **"Installer"** means an individual who installs or repairs pumps and equipment for hire or compensation.

(w) **"Monitoring well"** is a well used to measure some property of the groundwater aquifer it penetrates.

(x) **"Open or Uncovered Well"** means any artificial excavation drilled or dug for the purpose of producing groundwater and that is not capped or covered as required by the Texas Water Code.

(y) **"Open meeting law"** is defined by Chapter 551, Texas Government Code.

(z) **"Operating permit"** the permit issued by the district pursuant to Section 9 hereunder for a water well which is not an exempt well, allowing groundwater to be withdrawn from a well in a designated amount for a designated purpose for a designated time within the District boundaries..

(aa) **"Operator"** means and includes any person, firm, partnership, or corporation or other legal entity that has the right to produce water from the land either by ownership, contract, lease, easement or any other estate in the land.

(bb) **"Permitted Well"** means any artificial excavation drilled or dug for the purpose of producing groundwater that:

(1) is not exempt as defined by Section 36.117 the Water Code;

(2) is equipped to produce more than 25,000 gallons of water per day; and

(3) is in compliance with the District's permitting requirements.

(cc) **"Person"** means any individual, partnership, firm, state governmental agency, political subdivision, corporation or other legal entity.

(dd) **"Plugging"** means an absolute sealing of the well bore.

(ee) **"Pollution"** is the alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any water in the District that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property or to public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

(ff) **"Power of Attorney"** means a form signed by an owner of land granting authority to another person to act on his/her behalf with respect to transactions involving the District.

(gg) **"Preregistration"** means the completion of an Exempt Well Registration Form prior to the drilling and production of water.

(hh) **"Presiding Officer"** means the President, Vice-President, Secretary, or other Board Member presiding at any hearing or other proceeding.

(ii) "**Public records law**" is defined by Chapter 552, Government Code.

(jj) **"Pump installation"** means the procedures employed in the placement, and preparation for operation, of equipment and materials used to obtain water from a well, including construction involved in establishing seals and safeguards as necessary to protect the water from contamination. The term includes repairs to an existing pump.

(kk) **"Production"** means all water withdrawn from the ground, measured at the well head.

(ll) **"Registered Well"** means and includes any artificial excavation to produce or that is producing water for any purpose that has been properly recorded with the District.

(mm) **"Rules"** are the rules of the District complied herein, as may be amended or supplemented from time to time.

(nn) **"Transport Permit"** means an authorization issued by the District for the transfer or transport of a specific amount of groundwater out of the District for a designated period of time for a designated purposed..

(oo) "**Transportation facility**" is any system for transporting water, which may include a pipeline, channel, ditch, watercourse or other natural or artificial facilities, or any combination of such facilities, pertaining to any or all water which is produced from a well or wells located or to be located within the District, any or all of which is used or intended for use outside the boundaries of the District.

(pp) **"Undesirable Water"** means water that is injurious to human health, to vegetation, to land, or to fresh water, or water that can cause pollution.

(qq) **"Waste"** means any one or more of the following:

(1)Withdrawal of groundwater from a groundwater reservoir at a rate and in an amount that causes or threatens to cause intrusion into the reservoir of water unsuitable for agricultural, gardening, domestic, or livestock raising purposes;

(2)The flowing or producing of wells from a groundwater reservoir if the water produced is not used for beneficial purpose;

(3)The escape of groundwater from a groundwater reservoir to any other reservoir or geologic strata that does not contain groundwater;

(4)The pollution or harmful alteration of groundwater in a groundwater reservoir by saltwater or by other deleterious matter admitted from another stratum or from the surface of the ground;

(5)Willfully or negligently causing, suffering, or permitting groundwater to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or order issued by the Texas Natural Resource Conservation Commission under chapter 26; or

(6) Groundwater pumped for irrigation that escapes as irrigation tailwater onto land other than that of the owner of the well unless permission has been granted by the occupant of the land receiving the discharge; or

(7) for water produced from an artesian well, "waste" has the meaning assigned by Section 11.205 of the Texas Water Code..

(rr) **"Water"** or **"Underground Water"** means groundwater.

(ss) **"Well"** or **"Water Well"** means and includes any artificial excavation constructed for the purpose of exploring for or producing or withdrawing groundwater, together with any device employed for such withdrawal.

(tt) "**Well operator**" means a person who operates a well or water distribution system supplied by a well.

(uu) **"Well Report"** means a record made at the time of drilling, showing the depth, thickness, character of the different strata penetrated, location of any water bearing strata, depth, size and character of casing installed, together with any other data or information required by the State or this Board and recorded on forms prescribed either by the State regulatory agency with jurisdiction thereof or by this Board .

(vv) **"Well system"** means a group of wells connected or tied together by a pipeline and/or storage facilities.

(ww) **"Withdraw"** means the act of extracting groundwater from beneath the land surface by pumping or some other method.

SECTION 3 - BOARD

3.01 DIRECTORS.

The District is governed by a board of five (5) directors.

(a) Each director must qualify to serve as director in the manner provided by Sections 52.108 and 51.079, Texas Water Code.
(b) Directors serve staggered four-year terms.
(c) A director serves until his successor has been qualified.
(d) A director is not entitled to compensation for his service on the board, but may be reimbursed for expenses in carrying out the business of the district.

3.02 PURPOSE OF BOARD. The Board of Directors' purpose is to determine policy and regulate withdrawal of groundwater in such a manner as to conserve and protect the aquifers within the district boundaries. Its responsibilities include the adoption and enforcement of reasonable rules and to exercise its rights, powers and duties to implement the provisions of the District Act and Chapter 36 of the Texas Water Code.

3.03 ELECTION OF DIRECTORS. On the first Saturday in May of the second year after the year in which the District has held its confirmation election, an election shall be held for the election of directors. The five directors receiving the highest number of votes are directors for the district. The three directors receiving the highest number of votes shall serve four-year terms, the remaining two shall serve two-year terms. Thereafter, on the same date in each subsequent second year, the appropriate number of directors shall be elected to the board.

3.04 ADMINISTRATION The Board of Directors shall administer the District in accordance with the provisions of Subchapter C, sections 36.051-36.059 and 36.061-36.068, Texas Water Code.

3.05 MEETINGS. The board will hold regular monthly meetings as established from time to time by resolution. At the request of the president or at least two board members, the board may hold special meetings. All meetings will be noticed and conducted in accordance with the Texas Open Meetings Law.

SECTION 4 - GENERAL MANAGER

4.01 AUTHORITY OF MANAGER. The general manager employed or contracted with by the District of the District shall have full authority to manage and operate the affairs of the District subject only to the orders of the board.

4.02 DIRECTOR MAY BE MANAGER. A director may be employed as general manager of the District. The compensation of a general manager who also serves as a director shall be established by the other directors.

SECTION 5 - GENERAL PROCEDURAL PROVISIONS

5.0I COMPUTING TIME In computing any period of time prescribed or allowed by these rules, by order of the Board, or by any applicable statute, the day of the act, event or default from which the designated period of time begins to run, is not to be included, but the last day of the period so computed is to be included, unless it be a Saturday, Sunday or legal holiday, in which event the period runs until the end of the next day which is neither a Saturday, Sunday nor a legal holiday.

5.02 TIME LIMIT Applications, requests,or other papers or documents required or permitted to be filed under these rules or by law must be received for filing at the District's office at Menard, Texas. The date of receipt and not the date of posting is determinative.

5.03 METHODS OF SERVICE UNDER THE RULES. Except as otherwise expressly provide elsewhere in these Rules, any notice or document required by these Rules to be served or delivered may be delivered to the recipient, or the recipient's authorized representative, in person, by courier receipted delivery, by certified mail sent to the recipient's last known address, or by telephonic document transfer to the recipient's current telecopier number.

Service by mail is complete upon deposit in any depository of the United States Postal Service. Service by telephonic document transfer is complete upon transfer, except that any transfer occuring after 5:00 p.m. in the recipient's time zone shall be deemed to be completed the following business day.

If service is by mail, and the recipient has the right, or is required, to do some act within a prescribed period of time after service, three days will be added to the prescribed period from the date of deposit in the post office.

Where service by other methods has proved impossible, the service is complete upon publication of notice in a newspaper with general circulation in the District..

5.04 MINUTES AND RECORDS OF THE DISTRICT: All official documents, reports, records and minutes of the District will be available for public inspection and copying in accordance with the Texas Open Records Act. Upon written application of any person, the District will furnish copies of its public records. Persons who are furnished copies may be assessed a copying charge, pursuant to policies established by the Manager. A list of charges for the copies will be furnished by the District.

5.05 PROCEDURES NOT OTHERWISE PROVIDED FOR: If, in connection with any hearing, the Board determines that there are no statutes or other applicable rules resolving particular procedural questions then before the Board, the Board will direct the parties to follow procedures consistent with the purpose of these Rules and Chapter 36 of the Texas Water Code.

SECTION 6 -- ENFORCEMENT OF RULES

6.01 SHOW CAUSE ORDERS AND COMPLAINTS: The Board, either on its own motion or upon receipt of sufficient written protest or complaint, may at any time, after due notice to all interested parties, cite any person operating within the District to appear before it in a public hearing and require him or her to show cause why his or her operating authority or permit should not be suspended, canceled, or otherwise restricted and limited, for failure to comply with the Rules, orders or regulations of the Board or the relevant statutes of the State, or for failure to abide by the terms and provisions of the permit or operating authority itself. The matter of evidence and all other matters of procedure at any such hearing will be conducted in accordance with these rules of procedure and practice.

6.02 INSTITUTION OF SUIT. If it appears that a person has violated, is violating, or is threatening to violate any provision of the District Rules, the District may institute and conduct a suit for enforcement of these rules pursuant to provisions of Chapter 36.102 of the Texas Water Code, as amended.

(1) the District may enforce these rules by injunction, mandatory injunction, or other appropriate remedy in court;

(2) The Board may recover reasonable civil penalties pursuant to such suit, not to exceed $5,000 per day per violation, and each day of a continuous violation constitutes a separate violation.

(3) Penalty under this rule is in addition to penalties which may be imposed pursuant to any other law of the State; and

(4) If the District prevails in any suit to enforce its rules the District may seek and the Court shall grant, in the same action, recovery of attorney's fees, costs for expert witnesses, and other costs incurred by the District before the Court.

SECTION 7 – WASTE

7.01 PROHIBITION OF WASTE

(a) Groundwater, whether from a permitted or non-permitted well, shall not be produced within, or used within or without the District, in such a manner or under such conditions as to constitute waste as defined in Rule 2(qq) hereof. .

b) Surface impoundments of groundwater within the District shall not exceed one acre-foot per

640 acres, or 3,000 gallons on tracts less than 10 acres.

c) After April 15, 2015, the District shall not issue new permits for furrow irrigation.

(d) Any person producing or using groundwater shall use every reasonable precaution, in accordance with reasonable methods, to stop and prevent waste of such water.

(e) No person shall pollute or harmfully alter the character of the groundwater reservoir of the District by means of salt water or other deleterious substance admitted from some other stratum or strata or from the surface of the ground.

SECTION 8 -- CAPPING OR SEALING OF WELLS

8.01 SEALING PROHIBITED WELLS. a) The District may, upon obtaining a court order, seal wells that are prohibited from withdrawing groundwater within the District, to ensure that a well is not operated in violation of the District Rules. A well may be sealed when:

(1) no application has been made for a permit to drill a new water well which is not excluded or exempted; or
(2) no application form has been filed for an operating permit to withdraw groundwater from an existing well which comes under the permit requirements as a result of a change in condition set forth in Rule 10.07.
(3) no operating permit has been issued prior to the drilling of a non-exempt well; or
(4) the Board has denied, canceled or revoked a drilling permit or an operating permit.

b) The well may be sealed by physical means, and tagged to indicate that the well has been sealed by the District, and other appropriate action may be taken as necessary to preclude operation of the well or to identify unauthorized operation of the well.

c) Tampering with, altering, damaging, or removing the seal of a sealed well, or in any other way violating the integrity of the seal, or pumping of groundwater from a well that has been sealed constitutes a violation of these rules and subjects the person performing that action, as well as any well owner or primary operator who authorizes or allows that action, to such penalties as provided by the District Rules.

SECTION 9. WELL REGISTRATION

9.01 WELL REGISTRATION

Well Registration is required for all existing and future wells, whether exempt or non-exempt in the District and shall be filed with the District on a form and in the manner required by the District.

9.02 PREREGISTRATION FOR ALL NEW WELLS. Prior to the drilling of any new well, a completed application for the drilling of a well (Notice of Intent to Drill) must be filed with the District on its prescribed forms.

9.03 WELL REGISTRATION INFORMATION. Preregistration (Notice of Intent to Drill) forms for new wells and well registration forms for existing wells predating the adoption of these Rules shall include the following information:

(1)name and address of the well owner;

(2) location or proposed location of the well, including the county, section, block, survey number, abstract number, longitude and latitude, acreage or lot size, and the number of feet to the nearest non-parallel property lines;

(3) distance in feet to nearest well;
(4) well use or proposed use;
(5) location of use or proposed use;
(6) The following information shall be included, to the extent known for an existing well, and within thirty days following completion for a new well:
(i) date drilled;
(ii) well depth;
(iii) casing type and size
(iv) pump type;
(v)) pump HP; and
(vi) gallons per minute (GPM) being produced.

(7) signed statement by the applicant indicating:
(i) Whether the well is used, or proposed to be used, for domestic purposes on 10 acres or more of land or is exempt from permitting; and
(ii) that the applicant for a new well will furnish the District with a completed Well Registration form within 30 days after completion of the well;

(8) Such additional data as may be required by the Board.

(9) The preregistration (Notice of Intent to Drill) and/or registration forms shall be signed by the owner of the land or his duly appointed agent, including a partner, operator, driller, or any other person who has the authority to construct the well and/or operate the well for the proposed use.

(10) In order to provide for the registration of existing water wells that are subject to the rules and regulations of the District, it shall be the policy of this Board that District personnel and/or designated agents acting for the District may register wells drilled and equipped within the District which the land owner or his/her agent has not registered; provided that such wells were not drilled, equipped, and operated (pumped) in such a manner as to violate any rules and regulations of the District..

9.04 PRELIMINARY DETERMINATION OF EXEMPT STATUS. The District staff will review the preregistration application filed and make a preliminary determination as to whether the well meets drilling and operating permit exclusions and exemptions provided in these Rules and Section 36.117 of the Texas Water Code. The District staff must inform the applicant of their determination within five (5) business days. If the preliminary determination is that the well is exempt from the requirements for an operating or transport permit, the applicant may begin drilling immediately upon receiving of notification of the determination.

If the District determines the well is not exempt, the applicant will proceed in accordance with Rules 10.02-10.06 below

9.05 VIOLATION OF DISTRICT RULES. It is a violation of the District Rules for a well owner, well operator, or water well driller to drill any well until a well preregistration (Notice of Intent to Drill) form has been filed with the District and approved.

SECTION 10. PERMITS

10.01 DRILLING PERMIT REQUIRED FOR NON-EXEMPT WELLS.

(a) No person shall hereafter begin to drill a new well, or re-work, or re-drill an existing well or increase the size or make other modifications to wells without having first applied to the District and been issued a permit to do so, unless the well after drilling or after other modifications will be exempt as defined in Rule 2(t) and Section 36.117 of the Texas Water Code..

(b) No permit shall be required for the drilling of water supply wells exempt under the provisions of Section 36.117, Texas Water Code, as amended (being generally wells used for the production of oil, gas, or other minerals and water wells used in conjunction therewith).

However, water wells drilled after September 1, 1997, to supply water for hydrocarbon production activities must meet the spacing requirements of the district unless no space is available within 300 feet of the production well or central injection station. These wells must be registered with the district before drilling (§36.117(e)).

(c) Drilling a well without a permit or operating a well at a higher rate of production than the rate approved for the well is declared to be illegal, wasteful per se, and a nuisance

(d) Permits are required for wells:

(1)all wells, other than those used solely for domestic or livestock use on a tract of land larger than 10 acres which are drilled and completed to produce less than 25,000 gallons per day or are otherwise exempt by law;

2) wells used for domestic and livestock use on tracts of 100 acres or less in size that are less than 400 feet deep and pump more than 9 gpm.

(3) that produce or will produce water used for Industrial and/or manufacturing purposes;

(4) that produce or will produce water used for commercial and/or municipal purposes;

(5) that produce or will produce water used for irrigation; and

(6) that produce or will produce water used for recreational or esthetic purposes;

(7) that produce or will produce water for all other non-exempt uses.

(e) All wells newly permitted after April 15, 2015, including wells for which a permit is amended for a new use pursuant to Rule 10.07 (1)-(4), shall be required to have a meter installed that will accurately measure the amount of water produced from the well. District personnel are authorized to inspect the meters during regular business hours following reasonable notice to the landowner.

(f) All wells newly permitted after April 15, 2015 will be required to submit an annual water use report. The annual water use report must be submitted to the District on or before January 31st of each year. Request will be made to owners of wells permitted before April 15, 2015 to submit a voluntary water use report.

(g) After April 15, 2015 irrigation permits will not be granted for furrow irrigation.

(h) Permits shall include the following information, submitted on the application forms provided by the District:

(1) name and address of the well operator, or authorized person to whom the permit is issued.

(2) name and address of the fee owner of the land on which the well is to be drilled.

(3)location of the proposed well or including the county, section, block, survey, abstract, latitude and longitude coordinates, and the number of feet to the nearest property lines;

(4)The location of all wells located within a mile radius of the proposed well, and the names and addresses of the owners of said wells..

(5) distance in feet to nearest well;

(6) nature or purpose of proposed well use;

(7) location of proposed use;

(8) well status - new, producing, abandoned, capped, or plugged;

(9) well description including:

(i) date drilled;

(ii) well depth;

(iii) casing type and size;

(iv) surface completion;

(v) pump type;

(vi) pump HP; and

(vii) on applications for new wells submitted after April 15, 2015, the type and size of meter to be installed to measure production

(viii) gallons per minute (GPM) being produced.

(ix) maximum quantity of water proposed to be produced each month

(x) a statement that the applicant will comply with the District's management plan and rules.

(xi) a statement that the applicant will comply with well plugging guidelines and report closure to the commission

(10) such additional data as may be required by the Board.

(11) date of application

(i) All permits issued or well sites authorized under these Rules are conditional, and the Board may revoke its authorization if the person to whom the authorization was issued does not comply with the Rules of the District; does not comply with the terms and conditions stated in the drilling permit; or abandons the well. The District shall provide reasonable notice and opportunity for hearing before revoking the authorization.

10.02 PERMIT APPLICATION PROCEDURES.

(a)_ The Board shall issue or cause to be issued a drilling permit for a properly spaced well upon proper application executed, sworn to, and filed by the owner or his/her agent with the District , accompanied by the required deposits or fees, containing the matters specified below, and approved at a hearing of the Board pursuant to Rule 10.03 A drilling permit is required for each new non-exempt well, or for alteration in size or pumping capacity of existing wells, except in the case of a dry hole where another well may be drilled, at the applicant's own risk, using the same permit subject to the requirements of Sections 10.02-10.06. All applications shall be in writing, on forms provided by the District and contain the information called for in the application form and shall be prepared in accordance with all instructions which may have been issued by the Board with respect to the filing of an application. An application shall be considered properly filed when completed, signed, sworn to and tendered to the District or to a person duly designated by the District to receive the same. Otherwise, the application will not be considered.

(b) Rules for entities filing applications:

(1) If the applicant is an individual, the application shall be signed by the applicant or his duly appointed agent.
The agent shall be requested to present satisfactory evidence of his authority to represent the applicant, such as lease contract, power of attorney, etc.

(2) If the application is by a partnership, the applicant shall be designated by the firm name followed by the words "a Partnership" and the application shall be signed by at least one of the general partners who is duly authorized to bind all of the partners.

(3) In the case of a corporation, public district, county or municipality, the application shall be signed by a duly authorized official. A copy of the resolution or other authorization to make the application may be required by the officer or agent receiving the application.

(4) In the case of an estate or guardianship, the application shall be signed by the duly appointed guardian or representative of the estate.

(c) Such applications shall be submitted on forms supplied by the District and shall include the following:

(1) All information required pursuant to Rule 10.01 (e) above..

(2 The type of application - new well, rework, redrill, replacement, or other.

(3) The proposed use of the well to be drilled, whether test well, irrigation, industrial, or municipal, or other.
(4 Farm / Ranch data - Total acreage.
(5) Each applicant requesting new or additional production in excess of 500 acre-feet per year shall provide the District with a study by a licensed hydrogeologist or hydrogeological engineer evaluating the impact of the proposed production on aquifer water levels within the District boundaries. The study shall employ a statistically valid trend analysis or computer model, or other method generally acceptable to professional hydrologists and to the District.
(6) An agreement by the applicant that the completed well registration form (furnished by the District) and well report will be furnished to the District by the applicant upon completion of this well and prior to the production of water therefrom (except for such production as may be necessary to the drilling and testing of such well.)

10.03 NOTICE OF PERMIT HEARING. Once the district receives an administratively complete original application for a permit, permit renewal, or permit amendment, the Manager shall, at least ten days prior to the hearing date, issue a written notice indicating a date and time for a hearing by the Board on the application in accordance with these rules. Not less than ten days before the hearing, notice of the hearing shall be mailed by certified mail to the applicant and shall be published in a newspaper of general circulation within the county.

As many applications may be scheduled for one hearing as the manager deems necessary. Any person that wishes to be heard as a potential party to a hearing must, at least five business days prior to the hearing date, provide the District with written notice of that person's intent to appear at the hearing. If the Manager decides to contest the application, he/she must, at least five (5) business days prior to the hearing date, provide the applicant with written notice of his/her intent to contest the application.

Hearings may be held in conjunction with any regular or special meeting of the Board which are noticed and conducted pursuant to the Texas Open Meetings Law, Chapter 551 Texas Government Code.

10.04 FACTORS TO BE CONSIDERED BY THE BOARD IN ISSUING A PERMIT. In determining whether to issue a permit, and in setting the terms of the permit, the Board will consider the purposes of the District Act, and other relevant factors, including but not limited to :

(1) The District management plan
(2) whether the proposed use unreasonably affects existing groundwater and surface water resources;
(3) The quality, quantity, and availability of alternative water supplies
(4) the impact of granting the permit on other landowners' historical usage and rights in groundwater
(5) effect on granting the permit on drawdown of the water table or reduction in artesian pressure or spring flow
(6) the applicant has agreed to avoid waste and practice conservation
(7) the applicant has agreed that reasonable diligence will be used to protect groundwater quality and that the applicant will follow plugging guidelines at the time of well closure.

The application may be granted in whole, in part, or may be amended.

If neither the manager of the District nor any other person contests the application, the Board shall grant the permit.

10.05 TIME LIMIT FOR WELL COMPLETION FOLLOWING ISSUANCE OF PERMIT.

(a) Any drilling permit granted hereunder shall remain valid if the work permitted shall have been completed within **six (6)** months from the filing date of the application. It shall thereafter be void. Provided, however, that the District, for good cause, may extend the life of such permit for an additional **four (4)** months if an application for such extension shall have been made to the District during the first

six (6) month period. Provided, further, that when it is made known to the District that a proposed project will take more time to complete, the District, upon receiving written application may grant such time as is reasonably necessary to complete such project.

(b)If a newly drilled well is a dry hole or the production is marginal, the drilling permit may be used to drill another well, at the applicant's own risk, until a producing well is discovered and completed provided that:

(1) the dry hole or marginal well is properly plugged;
(2) the new location for another well meets all of the spacing requirements of the District;
(3) the driller furnishes to the District a properly completed well report and/or well plugging report on each newly drilled well; and

10.06 REQUIREMENT OF DRILLER'S WELL REPORT, CASING AND PUMP DATA

(a) Complete records shall be kept and reports thereof made to the District concerning the drilling, maximum production potential, equipping and completion of all wells drilled either by a licensed driller or an individual land owner. Such records shall include an accurate driller's log, any electric log which shall have been made, and such additional data concerning the description of the well, its potential, hereinafter referred to as "maximum rate of production" and its actual equipment as may be required by the District. Such records shall be filed with the District within 60 days after the completion of the well.

Subject to the Water Well Drillers rules, every licensed well driller shall deliver either in person, by fax, e-mail, or send by first-class mail, a photocopy of the State Well Report to the District within 60 days from the completion or cessation of drilling, deepening, or otherwise altering a well.

No person shall produce water from any well hereafter drilled and equipped within the District, except that necessary to the drilling and testing of such well and equipment, unless or until the District has been furnished an accurate driller's log, any electric log which shall have been made, and a registration of the well correctly furnishing all available information required on the forms furnished by the District.

10.07 PERMIT TERM.

A permit grants a permanent right to the well owner to produce water in the amount stated therein, and in accordance with the terms of the permit setting the rate, quantity, purpose, and location of the production, until there is a change, or proposed change, in any of the following:

(1) amount of water produced
(2) location of the well
(3) purpose of use of the water
(4) location of use of the water
(5) ownership of the well
(6) a finding by the District in accordance with 10.08(c) that a depletion in aquifer levels has persisted for a period of a year or more following the establishment of baseline levels in four quadrants of the District and b) a finding by the District, following notice and a public meeting, that it is necessary to reduce permitted production in order to conserve and preserve the District's groundwater supplies .

Upon the occurrence, or proposed occurrence of any change in any one or more conditions 1-5 set forth above, the well owner must file a new application for a well permit with the District, to be acted upon in the same manner, and in accordance with the same procedures hereinabove set forth in Rules 10.02 -10.06 as for an original permit application.

Upon the occurrence of condition 6, the District will notify all permit holders in the affected quadrant or other division of the District and forward to them applications for new permits, which applications will be acted upon as set forth in Rules 10.02 - 10.06.All permitted production within the quadrant or division will be reduced proportionately.

10.08 REVOCATION AND FORFEITURE

(a) A permit may be revoked for non-compliance with District rules following notice and a show cause hearing as set forth in Rule 6.02 above;

(1) If the well should be commenced or drilled at a different location than the location given on the drilling permit application and the new location is in violation of the District rules, the drilling or operation of such well may be enjoined by the District pursuant to Chapter 36 , Texas Water Code, as amended and/or the District may initiate enforcement proceedings under Rule 6. The District shall have the right to confirm reported distances and inspect the wells or well locations.

(2) Failure to abide by the rules of the district concerning drilling permits, and by the terms and limitations of the permit itself, is a violation of the law and/or the rules of the district and subjects the land owner, the driller, and the pump installer to legal action by the district. A violation occurs on the first day the drilling, alteration, or operation of a well begins and continues each day thereafter until the appropriate permits are approved

(b) A permit may be forfeited in whole or in part, for four (4) years non-production from a permitted well. A partial forfeiture shall be made of that portion of a well's permitted production which has not been produced during four consecutive years.

(c) The District shall maintain monitor wells within the District boundaries which shall be measured quarterly to establish baseline data for water level declines. Based on studies of no less than five-year's duration, if the District determines that pumping within the District is depleting the aquifer, the District may, upon notice and hearing, reduce the volume of production of a permitted well.

10.09 LIMITATIONS ON PERMITTED PRODUCTION.. In order to conserve, preserve and protect the underground water resources of the county, total combined permitting under Sections 10 and 12 of these Rules shall be limited to a total annual permitted production of 2,194 acre feet in the Edwards - Trinity aquifer, 743 acre-feet in the Ellenburger-San Saba aquifer, and 1,015 acre-feet in the Hickory aquifer, those being the Modeled Available Groundwater numbers that can be produced to implement the Districts' Desired Future conditions.

Once the production limits have been reached within each aquifer, no further operating or transport permits will be issued in those respective aquifers until either:

a) a permit terminates because of the occurrence of one of the events set forth in Rule 10.03(1) through (5); or

(b) a permit has been forfeited pursuant to Rule 10.08.

SECTION 11. WELL SPACING

11.01 – MINIMUM SPACING OF WELLS

(1) Distance Requirements. (a) Wells shall be drilled at least four hundred (400) feet from the nearest existing well or authorized well site and at least fifty (50) feet from the nearest property line; and

.

(b) The Board, in order to prevent waste or confiscation of property, may grant exceptions to permit drilling within shorter distances than those described when the Board shall determine that such exceptions are necessary either to prevent waste or confiscation of property, except that no subdivision of property made subsequent to the adoption of the original spacing requirement will be considered in determining whether or not property is being confiscated within the terms of the spacing requirements.

(c) A well must be located a minimum horizontal distance of 50 feet from a water-tight sewage facility or a liquid waste collection facility.

(d) A well must be located a minimum horizontal distance of 150 feet away from any contamination area such as existing or proposed livestock or poultry yard, privies, and septic system absorption fields.

(e) No well may be located within 500 feet of a sewage treatment plant, solid waste disposal site, land irrigated by sewage plant effluent, sewage wet well, sewage pumping station, or drainage structure or facilities containing industrial waste discharges or sewage treatment system water.

(f) The Board reserves the right in particular subterranean water zones and/or reservoirs to enter special orders increasing or decreasing distances provided by this rule.

(2) Well Density.

(a) Subject to paragraph (a) (1) et seq. above, no more than a cumulative total of four 4 wells per survey section (one (1) well per 160 acres), whether drilled prior to or subsequent to enactment of this rule shall be permitted (hereinafter referred to as "drilled to density"). In the event the applicant owns less than a full section, then the number of wells permitted for said tract shall be proportionately reduced. For example, if an owner has 480 acres, 1/160 = x/480. 3/480=x/480. The owner may drill 3 wells on the property.

In determining the total number of permitted wells allowed per tract over 40 acres, if the calculation indicates a fraction of a well up to and including 0.500 of a well, the number shall be rounded down to the last full well; if the calculation indicates a fraction of a well 0.501 of a well and above, the number shall be rounded up to the next full well. District personnel shall use the most current tax roll for obtaining the acreage involved. In the event, the acreage is not listed in the tax roll, then the acreage listed on the ownership map or other legal documentation provided by applicant shall be used.

In applying this rule, if the property is “Drilled to Density”, the District may issue a drilling permit for a test well or a replacement well. The land owner or his agent must within 4 months of the issuance of the permit or extension date thereof declare in writing which well he desires to produce. Within 30 days after determining which well will be retained for production, the well that is not to be produced shall be plugged and a properly completed Plugging Report shall be submitted to the District on forms supplied by the District. Failure to abide by the rules of the district concerning the plugging of these wells is a violation of the law and/or the rules of the district and subjects the land owner to legal action by the district. A violation occurs at the end of the 30 day period and continues each day thereafter until the appropriate action is taken to plug the well.

11.02 -- EXCEPTIONS TO SPACING RULE

(a) In order to protect vested property rights, to prevent waste, to prevent confiscation of property, or to protect correlative rights, the Board may grant exception to the above spacing regulations. This rule shall not be construed so as to limit the power of the Board, and the powers stated are cumulative only of all other powers possessed by the Board.

(b) If the property is “Drilled to Density” and one of the properly spaced wells is incapable of producing in excess of five (5) gpm, the District may issue an additional permit for that property.

(c)

(c) If an exception to such spacing regulations is desired, the application shall be submitted by the applicant in writing to the Board at its District Office on forms furnished by the District. The application shall explain the circumstances justifying an exception to the spacing provisions. The application shall be accompanied by a plat or sketch, drawn to scale of one (1) inch equaling six hundred sixty (660) feet. The plat or sketch shall show thereon the property lines in the immediate area and shall show accurately to scale all wells within one (1) mile of the proposed well site. The application shall also contain the names and addresses of all property owners adjoining the tract on which the well is to be located and the ownership of the wells within one mile of the proposed location. Such application and plat shall be

certified by some person actually acquainted with the facts who shall state that all the facts therein are true and correct.

(d) Such exception may be granted ten (10) days after written notice has been given to the applicant and all adjoining owners and all well owners within one mile of the proposed location and after a public hearing at which all interested parties may appear and be heard, and after the Board has decided that an exception should be granted. Provided, however, that if all such owners execute a waiver in writing stating that they do not object to the granting of such exception, the Board may thereupon proceed to decide upon the granting or refusing of such application without notice of hearing except to the applicant. The applicant may also waive notice or hearing or both.

(e) An application for an exception to the spacing rule is considered to be contested when a written notice of protest or opposition is filed with the Board on or before the date on which such application has been set for hearing and the protestant(s) or intervener(s) appear at the hearing held on the application. Where neither protestants nor interveners so appear and offer testimony or evidence in support of their contentions, or raise a question of law with reference to any pending application, the application may be considered as non-contested.

(f) Exceptions to the spacing rule will not be granted for property subdivided after the adoption and effective date of these rules. Owners of property subdivided after that date will be required to furnish water from a single well to all tracts contained within the boundary of 160 acres.

SECTION 12. TRANSPORTATION OF WATER FROM THE DISTRICT

12.01 APPLICATION REQUIRED. In order to conserve, preserve, protect, and prevent waste of, the groundwater in the District ,all persons or entities desiring to transport groundwater outside of the boundaries of the District must make application and obtain permits from the District before installing and/or operating a transportation facility and/or pipeline and or equipment.

12.02 EXCEPTION. A permit is not required if the groundwater is to be used on the property of a landowner that straddles the district boundary.

12.03 APPLICATION PROCEDURE.. Such applications for transport permits shall be on forms provided by the District and shall be in accordance with and contain the information called for in the form of application. Applications not submitted on District forms will not be considered.

(a)Application Requirements: The permit provided for herein must be applied for and filed with the District on the form or forms promulgated by the District hereunder and such permit must be obtained from the District prior to the proposed transporting of water, all in accordance with the provisions of this rule. The application shall be in writing and sworn to and executed by a party having knowledge of the facts called for on the form. Knowingly or unknowingly falsifying information on a permit application will render the application and the permit null and void. The following information shall be provided in or be submitted with an application :

(9) the name, post office address and place of the principal office or residence of the applicant;

(10) the name and address of the property owner(s) and the legal description of the land upon which the well(s) are, or will be, located to produce water to be transported;

(11) the coordinates (latitude and longitude) of the well or wells from which water is to be produced for transport outside the District;

(9) the names and addresses of the property owners within one mile of the location of the well(s) from which water is to be transported and the location of any wells on those properties;

(10) the nature and purposes of the proposed use and the amount of water to be used for each purpose;
(11) the number of acre-feet of water proposed to be used for each purpose
(12) the time schedule for construction and/or operation of the facility;

(8) a complete construction and operations plan that includes, but not limited to, information as to:

(i) a technical description of the proposed well(s) and production facility, including the depth of the well(s) the casing diameter, type and setting of the casing, the perforation interval of the casing, cementing information, and the size of the pump(s);

(ii) a technical description of the facilities to be used for the conveyance of the water;

(13) the volume of water to be transported monthly;

(10) a hydrogeologists's or hydraulic engineer's report on the effect of the proposed transportation on the quantity and quality of water available within the District;

(14) identification of any other possible sources which could be used for the stated purposes, including but not limited to treated water, reuse water and return flows, together with the quality and quantity of such alternate sources;
(15) a water conservation plan and a drought management plan;
(14) an environmental impact statement
(15) a socio-economic study showing the impact on the District economy and community of removing the water from the District
(16) a map or plat drawn on a scale not less than one inch equals 660 feet, showing substantially:
(i) The location of the existing or proposed well
(ii) the location of the existing or proposed water transporting facilities; and
(iii) the location of the proposed or increased use or uses.
(17) to establish baseline data static water levels of existing well(s) within a radius of one mile shall be obtained either form original drillers reports or by measurement of District personnel;
(18) additional information that may be required by the Board;
(19) the application must be accompanied by anon-refundable application fee in the amount of $2500.00.

The District shall determine whether the application, maps, and other materials comply with the requirements of this Act. The District may require amendment of the application, maps, or other materials to achieve necessary compliance.

12.02 NOTICE AND PUBLIC HEARING

Pursuant to Section 36.122 of the Texas Water Code, The District shall give notice of the application and hold a public hearing.

(1) Notice.

(a) The District shall mail, by first class mail, notice of such hearing on the application not less than thirty (30) days before the date set for District consideration of the transportation permit application. Notice shall be mailed to:
(i) the applicant, whose application has been filed with the District; and
(ii) the property owners within one (1) mile of the location of the well(s) from which water is to be produced and transported.

(b) Due to the potential impact to wells in areas outside a one (1) mile radius, notice of the hearing on the application shall be published by the District in a newspaper of general circulation in the District.

The notices under a) and b) above shall include:

(i) the name and address of the applicant;
(ii) the date the application was filed;
(iii) the location of the well from which the water to be transported is produced or to be produced
(iv) the purpose for which the water is to be transported.
(v) the amount of water to be transported monthly;
(vi) a description of the transportation facility;

(vii) the time and place of the hearing; and
(viii) any additional information the District considers necessary.

(2) Hearing.

(a) The District shall conduct a hearing on each application within ninety (90) days of the filing of the administratively complete application.

(b) At the time and place stated in the notice, the District shall hold a hearing on the application. The hearing may be held in conjunction with any regular or special meeting of the District, or a special meeting may be called for the purpose of holding a hearing. Any person may appear at the hearing, in person or by attorney, or may enter his appearance in writing. Any person who appears may present evidence, orally or by affidavit, in support or in opposition to the issuance of the permit, and it may hear arguments.

(c) After the hearing, the District shall make a written decision granting or denying the application. The application may be granted in whole or in part. Any decision to grant a permit, in whole or in part, shall require a majority vote of Directors present.

12.03 FACTORS TO BE CONSIDERED BY THE DISTRICT PRIOR TO APPROVING A PERMIT.

Pursuant to TAC Section 36.122, before approving any permit for transport of groundwater outside of the District boundaries, the District shall consider the following:

i) the availability of water within the district and in the proposed receiving area during the period for which the water supply is requested
(ii) the availability of feasible and practical alternative supplies to the applicant
(iii) the amount and purposes of use in the proposed receiving areas of the water supply

(iv) the projected effect of the proposed transfer on aquifer conditions, depletion, subsidence, or effects on existing permit holders or other groundwater users within the district; and
(v) the approved regional water plan and certified district management plans

Such application shall not be approved unless the Board of Directors finds and determines: (a) that the transporting of water for use outside the District applied for will not substantially affect the quantity and quality of water available to any person or property within the District; (b) that all other feasible sources of water, including treated or re-use water, available to the person or entity requesting a permit have been developed and used to the fullest; and (c) that the proposed use, of any part of the proposed use, will not constitute waste as defined under the laws of the State of Texas. In evaluating the application, the District shall consider the quantity of water proposed to be transported; the term for which the transporting is requested; the safety of the proposed transportation facilities with respect to the contamination of the aquifer; the nature of the proposed use; whether the withdrawal of the groundwater requested is reasonable; whether such a withdrawal is contrary to the conservation and use of groundwater; whether the withdrawal is not otherwise detrimental to the public welfare; and such other factors as are consistent with the purposes of the District

12.04 ISSUANCE OF PERMITS

(1) Upon approval of an application, the District shall issue a permit to the applicant. The applicant's right to transport shall be limited to the extent and purposes stated in the permit.

(2) A permit shall not be transferable except with the approval of the Board. The transferee must meet all the requirements set forth in Rule 12

(3) The permit shall be in writing and signed by the Board President and attested by the Board Secretary and it shall contain substantially the following information:

(a) the name and address of the person to whom the permit is issued;
(b) the location of the well from which water is to be transported;
(c) the date the permit is issued;
(d) the expiration date of the permit, not to exceed five years from the issue date;
(e) the location in which the transported water is to be used;
(f) the purpose for which the transported water is to be used;
(g) a requirement that the water withdrawn under the transport permit be put to beneficial use at all times
(h) the maximum quantity of water to be transported out of the district monthly;
(i) any restrictions on the rate of withdrawal
(j) the time within which construction of the well transportation facilities, including conveyance facilities and equipment, will be started and completed;
(k) a statement that the permittee will comply with all well closure and plugging guidelines of the district
(l) a statement that the permitee will comply with any drought contingency plan prescribed by the District.
(m) any other information the District prescribes.

12.05 DENIAL OF PERMITS.

(1) In no event shall the Board approve a permit for transport which, together with all wells permitted pursuant to Rule 10 above, Could result in permitting withdrawal of a total number of acre-feet of water supply from the aquifer in excess of 19,223 acre-feet, which is the annual acre-feet of recharge to the Edwards-Trinity aquifer within the boundaries of Menard County, as estimated by the Texas Water Development Board.

(2) Further, the District reserves the right to reduce the production limits of any, or several, transport wells in the District, when the water levels in the well(s) within one (1) mile distance of such well drop to 85% of their original static water levels.

12.06 PERMIT EXTENSIONS, TRANSFERS AND REVOCATION.

(1) A permittee may apply for an extension of any permit granted under this subsection or for transfer of a permit to another person. The District shall consider and grant or deny such application for extension or transfer of a permit in the same manner as is provided herein for the application for a new permit.

(2) Any permit granted under this subsection shall be subject to revocation for nonuse or waste by the permittee, or for substantial deviation from the purposes or other terms stated in the permit.

12.07 EXPIRATION OF PERMITS.:

A transportation permit shall be issued for a maximum term of five (5) years. Upon expiration of a permit, the transferor must apply for a new permit. Permits will be automatically forfeited if construction of a transportation facility has not commenced within two (2) years of the issuance of the permit.

12.08 FEES.

Fees of one dollar ($1.00) per acre foot for water used in agriculture, and seventeen cents ($0.17) per thousand (1,000) gallons for all other uses, may be assessed by the District. Fees are due the first of each month, and are to be included with the monthly pumping report. In order to monitor and maintain the quality of the groundwater and to investigate the feasibility of enhanced recharge

12.09 SPACING OF WELLS..

Water wells to be used for the transportation of water out of the District shall be subject to spacing requirements as described in Rule 11 herein.

12.10 "GRANDFATHERED" WELLS.

The provisions of Sections 10.02 through 10.03 of this subsection shall not apply to transfer operations which commenced prior to March 2, 1997.

12.11 MONITORING AND REPORTING.

(1) All transporting facilities for wells subject to the requirements of this subsection shall be equipped with flow monitoring devices approved by the District and shall be available for District inspection at any time.

(2) The operator of a transportation facility shall be required to keep records and make reports available to the District, during normal business hours, to as to the operation of the transportation facility.

(3) Permittees shall submit reports to the District on a monthly basis, beginning at the time a permit is issued to operate. Such reports shall include, but is not limited to, the volume of water transported during the preceding month.

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12.12 RESPONSIBILITY. The owner of the transportation facility shall be charged with strict liability for the prevention of pollution and waste, by reason of the operations of said facility. when the water levels in the well(s) within a one-mile distance of such well drop to 85% of their original static water levels.

SECTION 13 - DEPOSITS AND FEES

13.01 DEPOSITS

Each application for a permit to drill a non-exempt well shall be accompanied by a non-refundable **$100.00 deposit** which shall be accepted by the District.

Each application for a transport permit shall be accompanied by a non-refundable **$2500.00 fee.**

SECTION 14 - ADMINISTRATIVE FEES

14.01 Fees

The District shall collect fees for all services provided outside of the District. The fees shall be established by the Board and be reviewed and revised as needed to cover the cost to the District.

APPENDIX E

RESOLUTION ADOPTING THE MANAGEMENT PLAN

MENARD COUNTY UNDERGROUND WATER DISTRICT

206 E San Saba Ave
Post Office Box 1215
Menard, Texas 76849

Office: 325-396-3670
E-mail: manager@MenardCountyUWD.org
Manager: Meredith Allen

Adoption of Management Plan 2022-2027

WHEREAS, The Menard County Underground Water Conservation District (the District) was created by the 71st Texas Legislature (1991) under the authority of Section 59, Article XVI, of the Texas Constitution, and in accordance with Chapter 35 and 36 of the Texas Water Code, as amended; and

WHEREAS, the District is required by Chapter 36, §36.1071 of the Texas Water Code to develop and adopt a Management Plan; and

WHEREAS, the District is required by Chapter 36, §36.1072 of the Texas Water Code to review and re-adopt the plan with or without revisions at least once every five years and to submit the adopted Management Plan to the Executive Administrator of the Texas Water Development Board for review and approval; and

WHEREAS, the District's readopted revised Management Plan shall be approved by the Executive Administrator if the plan is administratively complete; and

WHEREAS, the District Board of Directors, after reviewing the existing Management Plan, has determined that this plan should be revised and replaced with a new 5-Year Management Plan expiring in 2027; and

WHEREAS, the District Board of Directors has determined that the 5-Year Management Plan addresses the requirements of Chapter 36, §36.1071.

NOW, THEREFORE, be it resolved that the Board of Directors of the Menard County Underground Water District, following notice and hearing, hereby adopts this 5-Year Management Plan; and

FUTHER, be it resolved, that this new Management Plan shall become effective immediately upon adoption.

Adopted this 15th day of June 2022, by the Board of Directors of the Menard County Underground Water District.

S I Duncan

Presiding Officer

Attesting Signature

APPENDIX F

EVIDENCE OF NOTICES AND HEARINGS

PUBLIC NOTICE

MENARD COUNTY UNDERGROUND WATER DISTRICT
ADOPTION OF THE MANAGEMENT PLAN

The Menard County Underground Water District will hold a public hearing on the 2022-2027 Management Plan on Wednesday, June 15, 2022, at 2:00 p.m. on the 2nd floor of the Menard County Courthouse, 206 E. San Saba, Menard, Texas.

All citizens are invited to attend and may inspect the proposed management plan at the District office, Monday, Wednesday, or Thursday from 9:00 a.m. until 4:00 p.m. until June 15, 2021. For any questions, please contact Meredith Allen at manager@menardcountyuwd.org or by phone 325-396-3670.

Filed for Record in my Office
the 8th day of June 20 22
at 8:36 o'clock A M
Christy Eggleston
County Clerk, Menard County, Texas
By: C. Rojas, Deputy