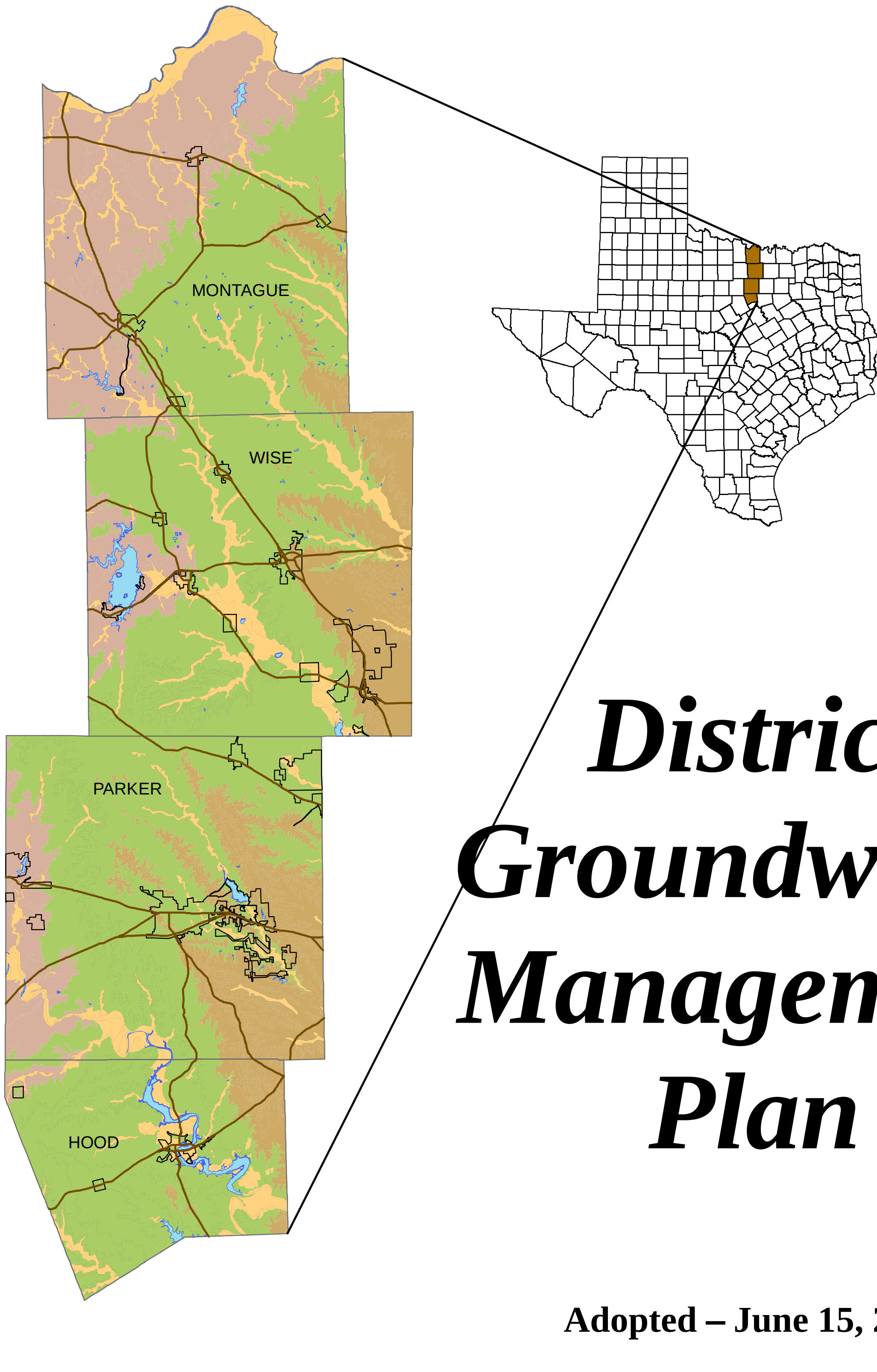
Upper Trinity Groundwater Conservation District



District Groundwater Management Plan

Adopted – June 15, 2020

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I. DISTRICT MISSION

The Mission of the Upper Trinity Groundwater Conservation District (District) is to develop rules to provide protection to existing wells, prevent waste, promote conservation, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifer, insure that the residents of Montague, Wise, Parker, and Hood counties maintain local control over their groundwater, and operate the District in a fair and equitable manner for all residents of the District.

II. PURPOSE OF THE GROUDWATER MANAGEMENT PLAN

The 75th Texas Legislature established a comprehensive regional and statewide water planning process in 1997. A critical component of that far-reaching overhaul of the Texas' water planning process included a requirement that each groundwater conservation district develop a groundwater management plan (plan) that defines the water needs and supply within each District and defines the goals the District will use to manage the groundwater in order to meet the stated needs or demonstrate that the needs exceed available groundwater supplies. Information from each District's plan is incorporated into the regional and state water plans. The plan is also used as the basis for the development of the District's permitting and groundwater management rules.

The time period for this plan is five years from the date of approval by the TWDB. This plan will be reviewed and readopted with or without amendments at least once every five years, or more frequently if deemed necessary or appropriate by the District Board. This plan will remain in effect until it is replaced by a revised plan approved by the TWDB

In addition, Chapter 36, Texas Water Code (Chapter 36), requires joint planning among Districts located within the same Groundwater Management Area (GMA). Among other activities conducted pursuant to this joint planning process, the Districts within each GMA must establish desired future conditions for all aquifers located in whole or in part within the GMA. The desired future conditions established through this process are then submitted to the Texas Water Development Board (TWDB), which is required to provide each District with estimates concerning the amount of groundwater that can be produced from each aquifer annually within each county located in the GMA in order to achieve the desired future conditions established for each aquifer. This quantified annual water budget for each aquifer is known as the modeled available groundwater or MAG amount. Chapter 36 requires that technical information, such as the desired future conditions of the aquifers within a District's jurisdiction and the amount of modeled available groundwater from such aquifers, be included in the District's plan. This technical information is used as a guide for a District's regulatory and management policies. This groundwater plan for the District is required by Chapter 36 and was developed in accordance with the administrative rules of the TWDB. Chapter 36 and the TWDB require use of projections of future water demands, surface water availability, water management strategies, and groundwater use provided to the District by the TWDB from the State Water Plan in the plan. This plan will be used to: (1) serve as a planning tool for the District in its management and operations; (2) provide general information about the District and its groundwater resources; (3) provide technical information concerning groundwater resources, water supply, and demand; (4) establish goals, management objectives, and performance standards for the District; (5) serve as a resource to help guide the District's development of additional technical information on local groundwater resources, use, and demand; and (5) support the District's development of its well permitting and regulatory program. The District considers the collection and development of site-specific data on groundwater use in Hood, Montague, Parker, and Wise counties and the groundwater sources of these counties to be a high priority. This plan will be updated as the District develops the site-specific data on local groundwater use and aquifer conditions. Although the District must review and readopt the plan at least once every five years, it is not restricted from doing so more frequently if deemed appropriate by the District.

III. DISTRICT INFORMATION

A. Creation

The Upper Trinity Groundwater Conservation District (the District) was created by the passage of Senate Bill 1983 by the 80th Texas Legislature under the authority of Section 59, Article XVI, of the Texas Constitution, and in accordance with Chapter 36, by the Act of May 25, 2007, 80th Leg., R.S., Ch. 1343, 2007 Tex. Gen. Laws 4583, codified at TEX. SPEC. DIST. LOC. LAWS CODE ANN. Ch. 8830, as amended (the District Act). The creation of the District was overwhelmingly confirmed by the citizens of Hood, Montague, Parker, and Wise counties on November 6, 2007, in an election called for that purpose. The District was created to serve a public use and benefit, and is essential to accomplish the objectives set forth in Section 59, Article XVI, of the Texas Constitution. The purpose of the District is to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, consistent with the objectives of Chapter 36 and Section 59, Article XVI, Texas Constitution.

B. Directors

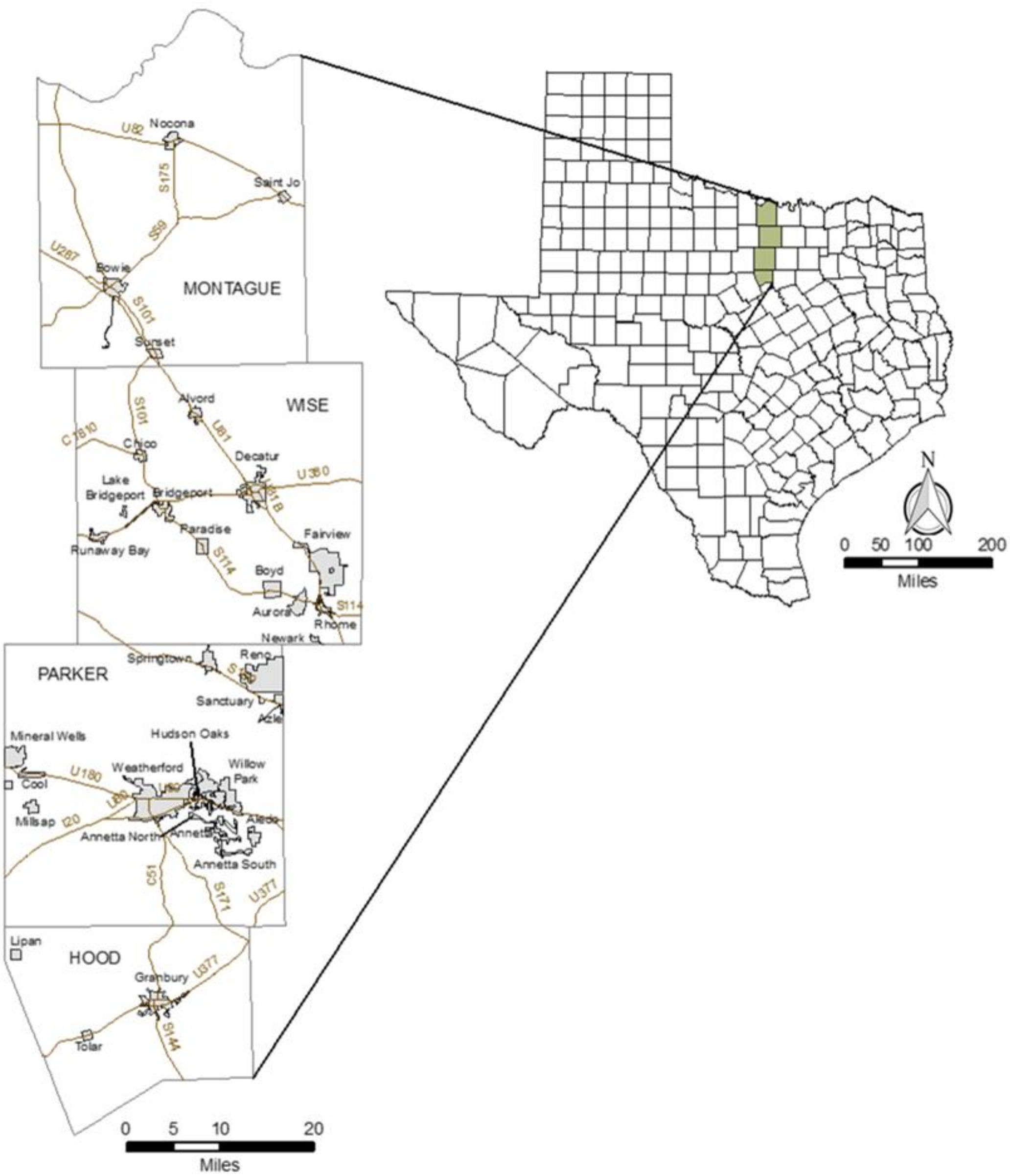
The Board of Directors consists of eight members, two from each of the following four counties: Hood, Montague, Parker, and Wise. The directors for each county are appointed by their respective commissioners' courts and serve staggered four-year terms. Each Director is eligible for multiple consecutive terms.

C. Location, Topography and Drainage

The area encompassed by the District is approximately 3,200 square miles and is coextensive with the boundaries of Hood, Montague, Parker and Wise counties. The topography of the District can be generally classified as high to gently rolling prairies with elevations ranging from approximately 850 to 1,300 feet above mean sea level in Montague County, an average of 800 feet in Wise County, 700 to 1,200 feet in Parker County and 600 to 1,000 feet above sea level in Hood County.

The District falls in the drainage area of three separate major river basins. The northern part of Montague County is drained by the Red River, while the Denton-Elm and West forks of the Trinity River drain the east-central and southern parts of the county, respectively. Tributaries of the Trinity River drain Wise County, the northeastern part of Parker County, and the very northeastern corner of Hood County. The southwestern part of Parker County and the vast majority of Hood County are drained by the Brazos River and its tributaries.

Figure 1. Locations and boundaries of the District.



D. Groundwater Resources in the District

Groundwater resources in the four counties making up the District include the Cretaceous-age Trinity Aquifer, the Pennsylvanian and Permian age Cross Timbers Aquifer (previously described as the Paleozoic aquifers) , and alluvial deposits. The Trinity Aquifer is recognized by the TWDB as a major aquifer in Texas, and the Cross Timbers Aquifer was recently designated by the TWDB as a minor aquifer in Texas. The TWDB defines a major aquifer as one that supplies large quantities of water over large areas of the state and defines a minor aquifer as one that supplies relatively small quantities of water over large areas of the state or supplies large quantities of water over small areas of the state (Ashworth and Hopkins, 1995). A generalized stratigraphic section representative of the hydrogeology of the District is provided in **Table 1**.

Major Aquifer – the Trinity Aquifer

The Trinity Aquifer, shown in **Figure 2**, is defined by the TWDB as a major aquifer composed of several individual aquifers contained within the Trinity Group. In the District, the Trinity Aquifer consists of the aquifers of the Paluxy Sand, the Glen Rose Formation, the Twin Mountains Formation, and the Antlers Formation. The Antlers Formation is the coalescence of the Paluxy and Twin Mountains formations north of the line where the Glen Rose Formation thins to extinction. This occurs approximately in central Wise County (**Figure 3**). The Cretaceous-age Fredericksburg and Washita Groups are generally considered confining units and they overlie the subcrop portion of the Trinity Aquifer in the easternmost areas of the District.

The Paluxy Sand consists of sand, silt, and clay, with sand dominating. The sand and silts in the aquifer are primarily fine-grained, well sorted, and poorly cemented (Bené and others, 2004). Coarse-grained sand is found in the lower sections grading up to fine-grained sand with shale and clay in the upper section (Nordstrom, 1982). In general, natural groundwater flow in the Paluxy Sand is east to southeast (Langley, 1999). Wells completed into the Paluxy Sand typically yield small to moderate quantities of water that is fresh to slightly saline (Nordstrom, 1982). Where the Glen Rose Formation is absent, the Paluxy Sand is equivalent to the upper sands of the Antlers Formation (Baker and others, 1990).

The Glen Rose Formation consists primarily of limestone with some shale, sandy-shale, and anhydrite. In general, the aquifer yields small quantities of water in localized areas (Baker and others, 1990). Groundwater flow in the Glen Rose Formation is generally to the east and southeast.

Table 1. General Stratigraphy (Bené and others 2004; McGowen and others, 1967; 1972; Brown and others, 1972).

<table>
<tr><th rowspan="2">System</th><th rowspan="2">Hydrogeologic Characteristic</th><th rowspan="2">Group</th><th colspan="2">Formation</th></tr>
<tr><th>North</th><th>South</th></tr>
<tr><td></td><td>Water-Bearing</td><td></td><td colspan="2">alluvial deposits</td></tr>
<tr><td rowspan="7">Cretaceous</td><td>Confining Units (locally productive)</td><td>Washita</td><td colspan="2">Weno
Denton
Fort Worth
Duck Creek
Kiamichi</td></tr>
<tr><td rowspan="3">Confining Units (locally productive)</td><td rowspan="3">Fredericksburg</td><td rowspan="2">Goodland</td><td>Edwards</td></tr>
<tr><td>Comanche Peak</td></tr>
<tr><td>Walnut Clay</td><td>Walnut Clay</td></tr>
<tr><td rowspan="3">Aquifer</td><td rowspan="3">Trinity</td><td rowspan="3">Antlers</td><td>Paluxy</td></tr>
<tr><td>Glen Rose</td></tr>
<tr><td>Twin Mountains</td></tr>
<tr><td>Permian</td><td>Water-Bearing</td><td>Bowie</td><td colspan="2">Nocona
Archer City
Markley
Thrifty and Graham, undivided</td></tr>
<tr><td rowspan="13">Pennsylvanian</td><td rowspan="7">Water-Bearing</td><td rowspan="7">Canyon</td><td colspan="2">Colony Creek Shale</td></tr>
<tr><td colspan="2">Ranger</td></tr>
<tr><td colspan="2">Ventioner</td></tr>
<tr><td colspan="2">Jasper Creek</td></tr>
<tr><td colspan="2">Chico Ridge Limestone</td></tr>
<tr><td colspan="2">Willow Point</td></tr>
<tr><td colspan="2">Palo Pinto</td></tr>
<tr><td rowspan="6">Water-Bearing</td><td rowspan="6">Strawn</td><td colspan="2">Mineral Wells</td></tr>
<tr><td colspan="2">Brazos River</td></tr>
<tr><td colspan="2">Mingus</td></tr>
<tr><td colspan="2">Buck Creek Sandstone</td></tr>
<tr><td colspan="2">Grindstone Creek</td></tr>
<tr><td colspan="2">Lazy Bend</td></tr>
</table>

Figure 2. Outcrop and subcrop of the Trinity Aquifer in the District.

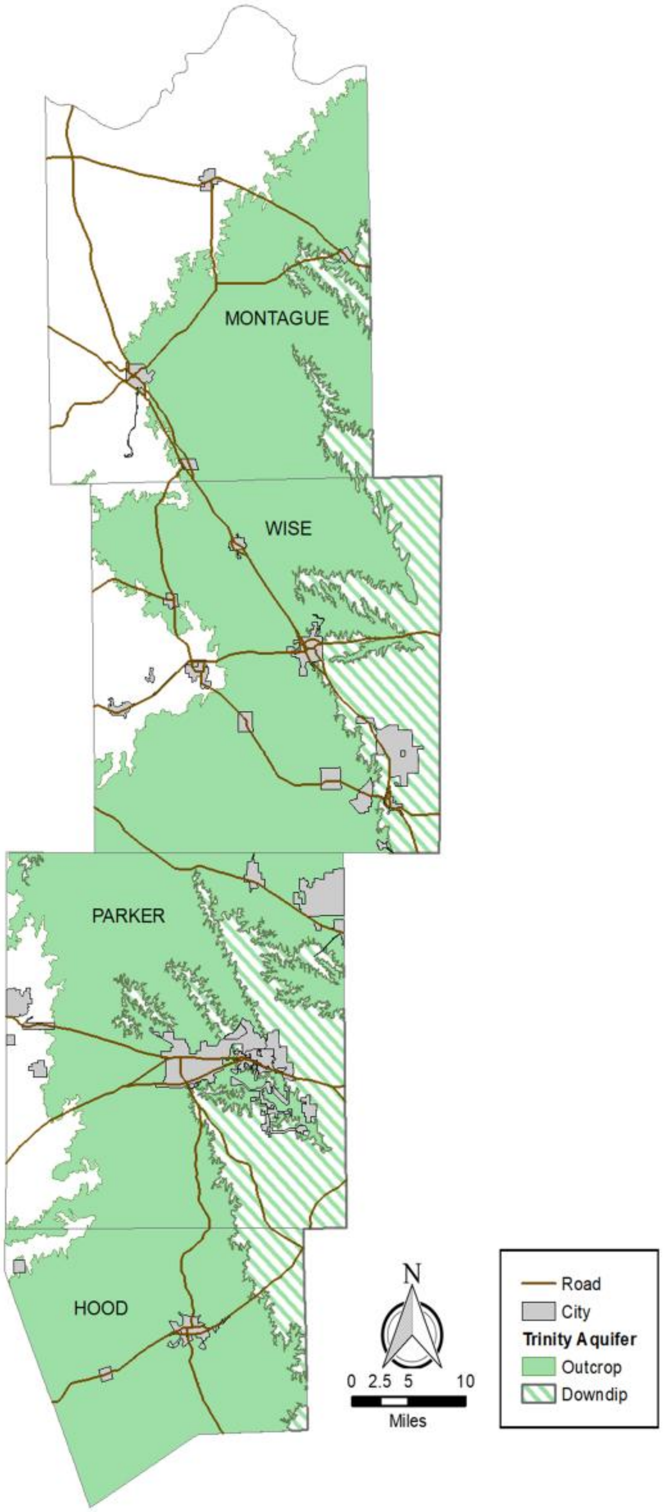
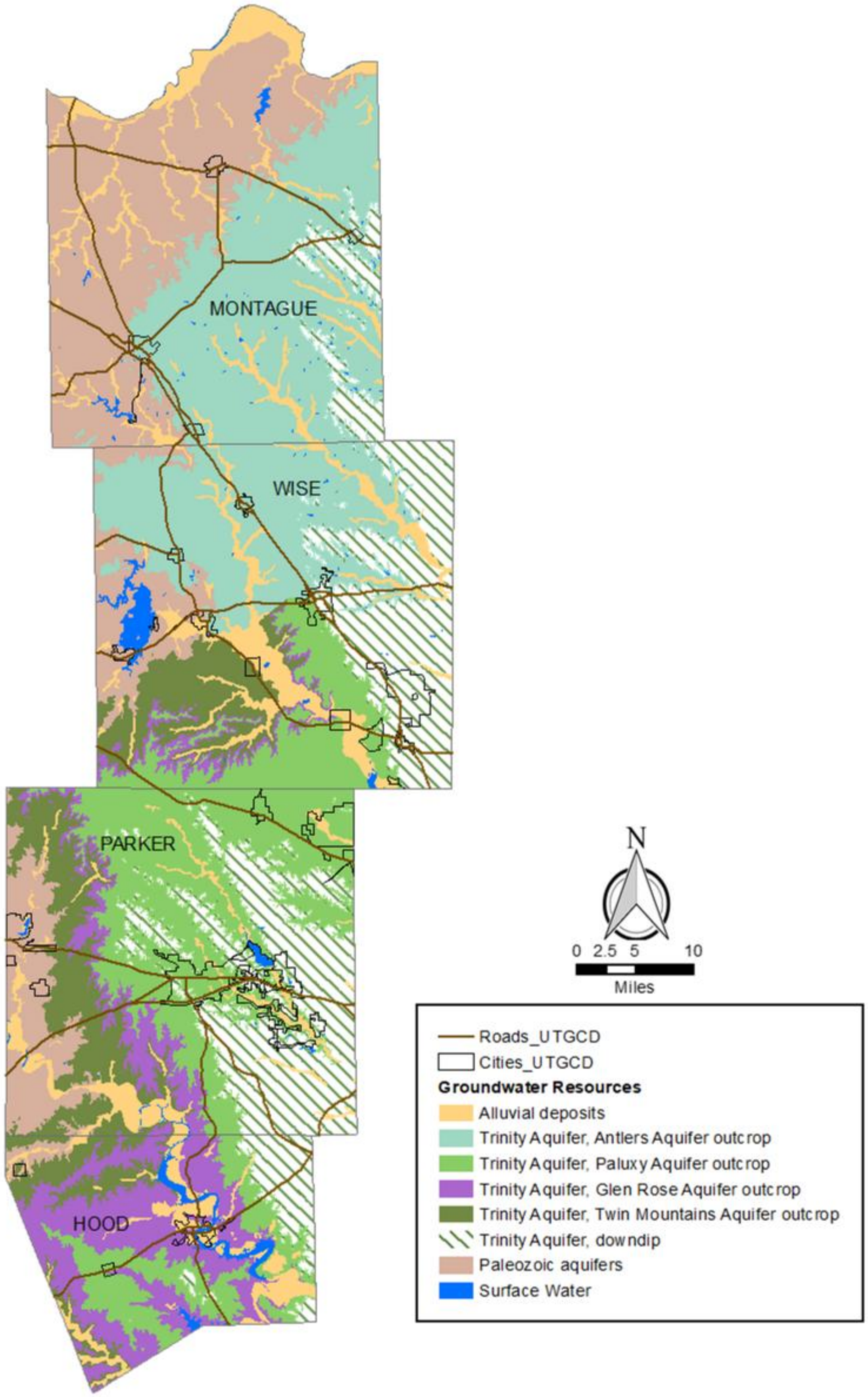


Figure 3. Groundwater resources in the District.



The Twin Mountains Formation consists predominantly of medium- to coarse-grained sand, silty clay, and conglomerates. A massive sand is found in the lower portion of the formation while less sand is found in the upper portion of the aquifer due to increased interbedding of shale and clay (Nordstrom, 1982). In general, wells are primarily completed into the lower part of the aquifer. Where the Glen Rose Formation is absent, the Twin Mountains Formation is equivalent to the lower sands of the Antlers Formation (Baker and others, 1990). Typically, wells completed into the Twin Mountains Formation yield fresh and slightly saline water in moderate to large quantities (Nordstrom, 1982). Groundwater flow in this formation is generally to the east and southeast.

Typically, the Antlers Formation consists of a basal conglomerate and sand overlain by poorly consolidated sand interbedded with discontinuous clay layers (Nordstrom, 1982). Considerably more clay is found in the middle portion of the formation than in the upper and lower portions. Limestone is also found in the middle portion near the updip limit of the Glen Rose Formation. Generally, groundwater flow in the Antlers Formation is to the east and southeast. Well yield in the Antlers Formation is similar to that in the Twin Mountains Formation with subcrop wells generally more productive than those in the outcrop areas.

Minor Aquifer – The Cross Timbers Aquifer

Several Pennsylvanian- and Permian-age formations in the District are capable of producing usable quantities of groundwater. These formations were previously referred to collectively as the Paleozoic aquifers (see **Figure 3**), however recently, in response to a request from the District, the TWDB designated these formations as the Cross Timbers Aquifer, a minor aquifer. Literature regarding these formations is very limited and, therefore, information regarding their hydrologic characteristics is also limited. The Paleozoic aquifers are a significant source of groundwater in northern and western portions of Montague County, west-central Wise County, and western Parker County where the Trinity Aquifer is absent. Based on information in the TWDB groundwater database (TWDB, b) as of November 2009, the percentage of wells in the District completed into the Paleozoic aquifers is 78.2, 14.8, 5.4, and 0.0 percent for Montague, Wise, Parker, and Hood counties, respectively.

From youngest to oldest, the formations of the Wichita, Cisco-Bowie, Canyon, and Strawn groups make up the Cross Timbers Aquifer. The Bowie Group consists of the Nocona Formation (mudstone with sandstone and siltstone in thin lenticular beds throughout), the Archer City Formation (predominantly mudstone with thin siltstone beds and sandstone), the Markley Formation (mudstone with local thin beds of sandstone in upper portion and mudstone and shale with some coal and limestone below), and the undivided Thrifty and Graham formations (predominantly mudstone and shale with thin sandstone beds and some sandstone sheets locally and two limestone members).

The underlying Canyon Group is comprised of the Colony Creek Shale (shale with some siltstone, local thin to medium beds of sandstone, and limestone lentils), the Ranger Limestone (predominantly limestone with local thin shale beds), the Ventioner Formation (shale and mudstone with numerous sandy and silty lenses and thin to medium beds), the Jasper Creek Formation (upper portion predominantly shale with thin siltstone beds throughout and isolated massive sandstone lenses and lower portion shale with thin limestone lentils and local thin and lenticular thick sandstone beds), the Chico Ridge Limestone (predominantly limestone with local shale beds), the Willow Point Formation (shale and claystone locally silty and sandy with local thin beds of sandstone and several limestone beds in lower portion and a single coal bed), and the Palo Pinto Formation (predominantly limestone and marl with some sandstone and shale). Sandstone lenses found in the Canyon Group are locally important to the occurrence of groundwater (Bayha, 1967).

The Strawn Group consists of the Mineral Wells Formation (shale containing local sandstone beds and a few limestone beds), the Brazos River Formation (sandstone with local lenses of conglomerate and mudstone), the Mingus Formation (sandy shale with one thin coal seam and some limestone beds), the Buck Creek Sandstone (sandstone), the Grindstone Creek Formation (shale, in part sandy, with local thin coal beds and sandstone lentils and limestone beds with some shale), and the Lazy Bend Formation (shale, in part sandy or silty, with local coal beds and limestone beds).

The Cross Timbers Aquifer is the primary source of water in Montague County (Bayha, 1967) as indicated by the high percentage of wells completed into these aquifers in the county. Bayha (1967) indicates that groundwater is difficult to trace in these aquifers due to the complex depositional sequence.

Other Water-Bearing Formations

Alluvial Deposits

Some alluvial deposits of Pleistocene to Recent age are capable of producing water in the District, especially along the Red River in Montague County and the Brazos River in Parker County. The majority of these sediments are stream deposits but some are of windblown origin. The alluvial deposits, consisting of sand, gravel, silt, and clay, yield small to large quantities of fresh water. Based on information in the TWDB groundwater database (TWDB, 2009b) as of November 2009, the percentage of wells in the District completed into alluvial deposits is 10.0, 0.4, 3.0, and 0.1 percent for Montague, Wise, Parker, and Hood counties, respectively.

IV. ESTIMATES OF TECHNICAL INFORMATION REQUIRED BY 31TAC 356.52/TWC § 36.1071

A. Modeled Available Groundwater in the District based on adopted Desired Future Conditions – 31TAC 356.52(a)(5)(A)/TWC §36.1071(e)(3)(A)

The Texas Legislature has established that the preferred method of managing groundwater in Texas is through rules developed by a groundwater conservation district. A groundwater conservation district is a district created under Texas Constitution, Article III, Section 52 or Article XVI, Section 59, which has the authority to regulate the spacing of water wells, the production from water wells, or both. Many groundwater conservation districts boundaries are consistent with political boundaries such as county boundaries and, as such, are not consistent with hydrologic boundaries which would need to be considered in the cohesive management of an aquifer.

Modeled available groundwater is defined 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."

In 2005 the Texas legislature recognized that aquifers may need to be managed based on hydrologic boundaries, and not just the political boundaries, such as county boundaries, that defined many groundwater conservation districts. That year legislation was passed requiring joint planning among groundwater conservation districts within a common groundwater management area (GMA). These GMAs are required to meet at least annually, and are charged with developing desired future conditions (DFCs) by which any aquifer deemed relevant by a GMA will be managed. The District only has one TWDB-designated major or minor aquifer within its boundaries—the northern Trinity Aquifer, which is a major aquifer. GMA 8 adopted DFC's for the northern Trinity and Woodbine aquifers on January 31, 2017 that submittal package can be found here: http://www.twdb.texas.gov/groundwater/dfc/docs/GMA8_DFCExpRep.pdf. The TWDB MAG report has been provided in Table 3, and can be found here: http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR17-029_MAG.pdf

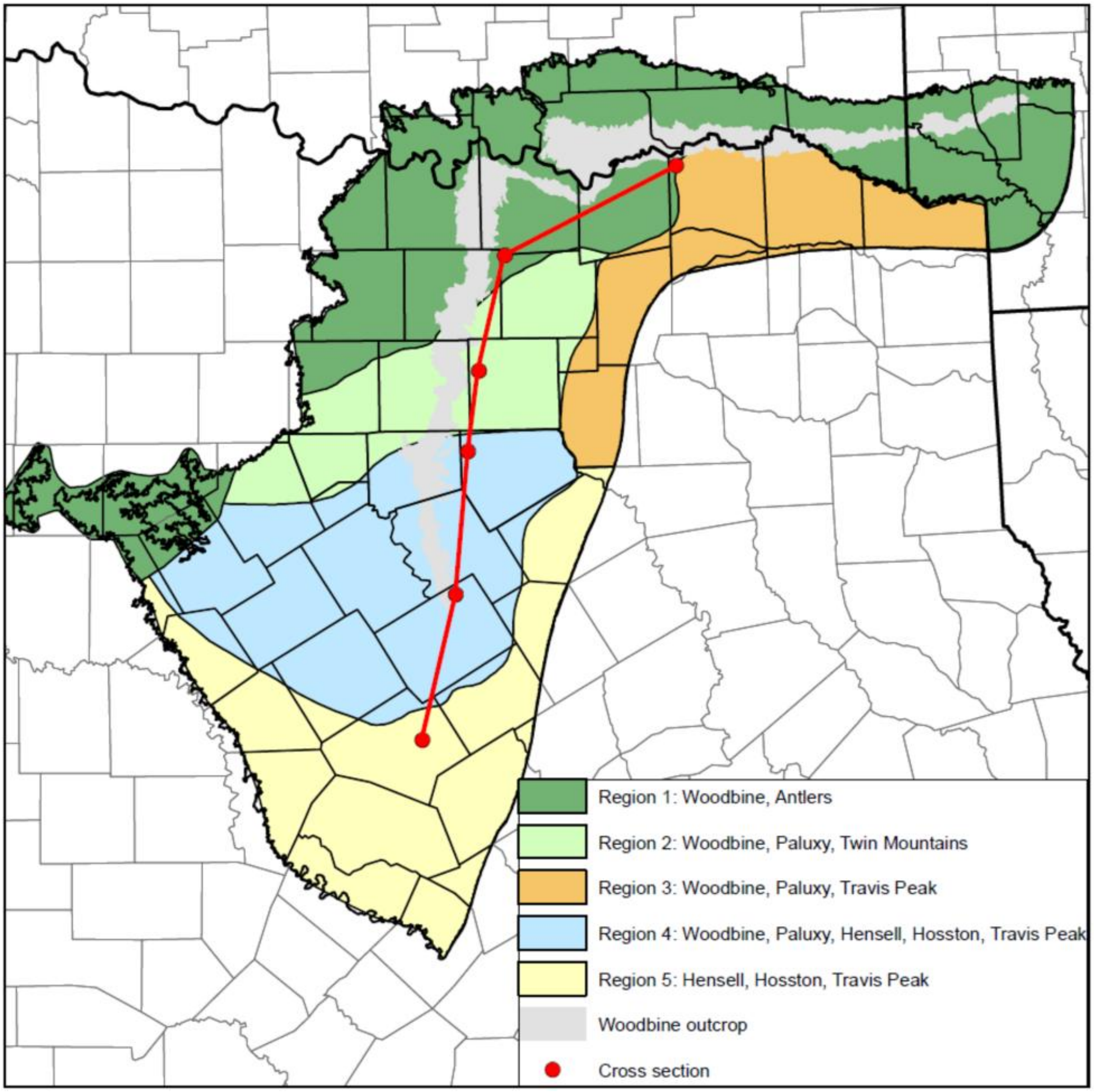
<u>Selected Management Conditions</u>

The different hydrogeologic units comprising the Trinity Aquifer within each of the five hydrogeologic regions have been evaluated according to their hydrostratigraphy, hydraulic properties, and lithology and the extent to which those hydrogeologic units are differentiable at different locations. Based upon that evaluation, the GMA 8 district representatives utilized the aquifer definitions in **Table 2** to define the spatial and vertical extent for which to adopt DFCs for GMA 8.. A map showing the regions identified in **Table 2** can be found in **Figure 4.**

Table 2. Spatial and Vertical extents for which to adopt DFCs for GMA 8.

Model Terminology	Region 1	Region 2	Region 3	Region 4	Region 5
Woodbine Aquifer	Woodbine	Woodbine	Woodbine	Woodbine	Woodbine (no sand)
Washita/ Fredericksburg Groups	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg
Paluxy Aquifer	Antlers	Paluxy	Paluxy	Paluxy	Paluxy (no sand)
Glen Rose Formation	Antlers	Glen Rose	Glen Rose	Glen Rose	Glen Rose
Hensell Aquifer	Antlers	Twin Mountains	Travis Peak	Hensell/ Travis Peak	Hensell/ Travis Peak
Pearsall Formation	Antlers	Twin Mountains	Travis Peak	Pearsall/ Sligo	Pearsall/ Sligo
Hosston Aquifer	Antlers	Twin Mountains	Travis Peak	Hosston/ Travis Peak	Hosston/ Travis Peak

Figure 4. Hydrogeologic Regions for the Trinity and Woodbine Aquifer in GMA 8.



Because the GAM was used as a means of defining desired future conditions as well as estimating the managed available groundwater, the following discussion is couched in terms of hydrostratigraphic nomenclature and model layers consistent with the GAM.

The desired future conditions were specified based upon average drawdown from the year 2010 through the year 2070 on a county, District and aquifer (model layer) basis. **Table 3** summarizes the desired future conditions for the four counties comprising the District for the Northern Trinity Aquifer. For example, for the Downdip portion of the Twin Mountains aquifer in Hood County, the specified management goal (desired future condition) is defined "from estimated year 2010 conditions, the average drawdown of the

Downdip portion of the Twin Mountains Aquifer should not exceed approximately 46 feet after 50 years" (Shi, 2017). All of the desired future conditions are specified in (Shi, 2017) in a similar format.

Furthermore, as part of the GMA 8 joint planning process, the District requested that DFCs within their boundaries (Hood, Montague, Parker and Wise counties) be stated in terms of outcrop and downdip, rather than an average of the two. This request was based on recommendations submitted by the District in response to the 90- day public comment period. GMA 8 District Representatives unanimously approved this request at the September 29, 2016, GMA 8 meeting.

Table 3. Desired Future Conditions and Modeled Available Groundwater for the northern Trinity Aquifer in the District.

County	Trinity Sub-Aquifer	Desired Future Condition(1) Outcrop	Desired Future Condition(1) Downdip	Modeled Available Groundwater(2) Outcrop (AFY)	Modeled Available Groundwater(2) Downdip (AFY)
Hood	Paluxy	5	NA	159	NA
	Glen Rose	7	28	653	103
	Twin Mountains	4	46	3,662	7,937(3)
Hood County Total		NA	NA	4,474	8,040
Parker	Antlers	11	NA	2,897	NA
	Paluxy	5	1	2,607	50
	Glen Rose	10	28	2,289	873
	Twin Mountains	1	46	1,066	2,082
Parker County Total		NA	NA	8,859	3,005
Wise	Antlers	34	142	7,677	2,057
Wise County Total		NA	NA	7,677	2,057
Montague	Antlers	18	NA	3,875	NA
Montague County Total		NA	NA	3,875	NA
District Total		**NA**	**NA**	**24,885**	**13,102**

(1) Average drawdown in feet after 50 years from the year 2010(DFC Report dated01/19/2018)

(2) 2070 MAG from GAM Run 17-029 MAG (Shi, 2018)

(3) GAM Run 17-029 MAG includes MAG values for the Travis Peak (89), Hensell (36) & Hosston (53) for Hood County, however no DFCs were set for these sub-aquifers within the Upper Trinity as they only occur in a very small portion in Southeast Hood County. That area will be managed as the Twin Mountains.

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

See Appendix A

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

See Appendix B

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

See Appendix B

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

See Appendix B

F. Projected surface water supply in the District, according to the most recently adopted State Water Plan – 31 TAC 356.52(a)(5)(F)/TWC §36.1071(e)(3)(F)

See Appendix A

G. Projected total demand for water in the District according to the most recently adopted State Water Plan – 31 TAC 356.52(a)(5)(G)/TWC §36.1071(e)(3)(G)

See Appendix A

H. Consider the Water supply needs included in the most recently adopted State Water Plan – TWC §36.1071(E)(4)

As part of the development of this plan, the District's Board of Directors considered the water supply needs that have been identified through the regional water planning process. Water supply needs are the potential shortages that could occur, if no projects are developed on implemented to address growing demands or other supply limitations.

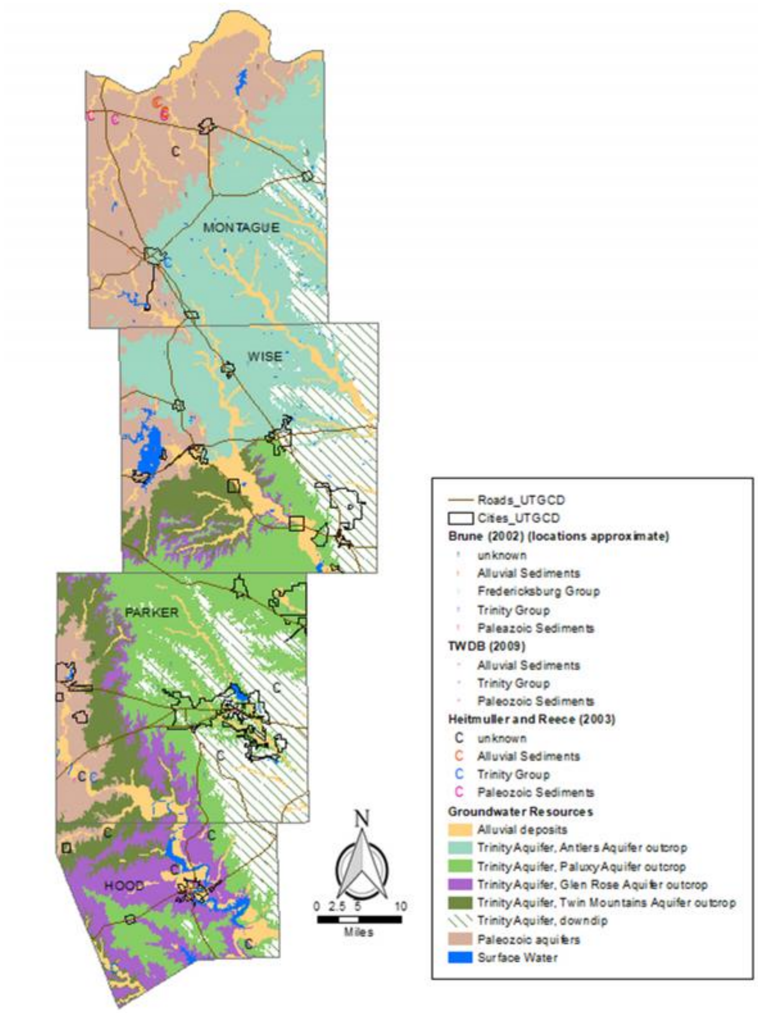
Within the boundaries of the District, future water supply needs are shown to occur for these categories: municipal (Acton Mud, Aledo, Alvord, Aurora, Azle, Bolivar WSC, Boyd, Bridgeport, Chico, Cresson, Decatur, Fort Worth, Parker County MUD, Springtown, Tolar, Weatherford, and Willow Park), irrigation, mining, manufacturing, steam electric, and non-municipal domestic use (county other).TWDB Estimated Historical Water Use/2017 Texas State Water Plan report, included as Appendix A to this plan, contains the detailed projected water supply needs that have been projected to occur within the District.

I. Consider the Water Management Strategies included in the most recently adopted State Water Plan – TWC §36.1071(E)(4)

As part of the development of this plan, the District's Board of Directors has also considered the water management strategies that were identified through the regional water planning process. These strategies have been identified for the purpose of addressing projected water supply needs.

Within the boundaries of the District, there are several water management strategies to develop added aquifer supplies from the Trinity Aquifer for municipal and county-other users. TWDB Estimated Historical Water Use/2017 Texas State Water Plan report, included as Appendix A to this plan, contains the water management strategies identified for the four counties within the District and projected volumes of water those strategies would potentially provide.

Figure 5. Documented springs in the District.



V. Details on the District Management of Groundwater

The District is acutely aware that its decisions regarding the permitting and regulation of water wells may have a significant impact on the manner in which water is provided to support human, animal, and plant life, land development, public water supplies, commercial and industrial operations, agriculture, and other economic growth in the District. The District Board takes its responsibilities very seriously with regard to these decisions and the impacts they may have on the property rights of the citizens of the District, and desires to undertake its approach to the development of a regulatory system in a careful, measured, and deliberate manner. In that regard, the District accumulated and considered as much data and information as is practicable on the groundwater resources located within its boundaries before developing permanent rules and regulations which impose permitting or groundwater production regulations on water wells.

The District began its initial studies and analysis of the aquifers and groundwater use patterns within its boundaries in early 2008 in an attempt to both catch up with then-ongoing discussions regarding the development of desired future conditions of the aquifers by the existing groundwater conservation districts in GMA-8, and to develop some baseline information on which decisions could be made for the development of temporary rules governing water wells. In August 2008, the District adopted its first set of temporary rules, which pioneer the District's information-gathering initiative. The District then spent the next decade gathering and studying data in order to ensure any permanent rules were based on the best available science. Among other things, the initial temporary rules required non-exempt wells to be registered with the District, have meters installed to record the amount of groundwater produced, and submit records of the amounts produced to the District. These well owners are also required to submit fee payments to the District based upon the amount of groundwater produced.

In addition, all new wells are required to be registered with the District and comply with the minimum well spacing requirements of the District. The minimum well spacing requirements were developed by the District to try to limit the off-property impacts of new wells to existing registered wells and adjoining landowners. They include minimum tract size requirements, spacing requirements from the property line on the tract where the well is drilled, and spacing requirements from registered wells in existence at the time the new well is proposed. The spacing distances were developed through hydrogeologic modeling of the varying sizes of the cones of depression of various well capacities, and such distances naturally increase with increases in well capacities. Well interference problems caused by wells being located too close to each other have historically been one of the predominant problems for wells completed in the Trinity Aquifer in the District and throughout GMA-8 and GMA-9. The District's spacing requirements should go a long way toward prospectively limiting such well interference problems between new wells and between new and existing wells.

On August 19, 2019, the District's Board of Directors adopted permanent rules to allow for the long-term management of the groundwater resources within the District. A copy of those rules can be found at:

https://uppertrinitygcd.com/pdf/UTGCD-RULES.pdf

These rules maintained the requirements included in the previous temporary rules, described above, and also added permitting requirements for non-exempt wells. This permitting system includes two separate types of permits:

Historic Use Permits:

- Applies to wells that were currently in operation, approved or for which an administratively complete application was submitted on or before December 31, 2019;
- Allocations of groundwater are meant to protect the investment backed expectations of well owners and are based on the maximum historic use for well or well system or maximum or the maximum designed and planned production amount.

Operating Permits:

- Applies to wells or well systems established after December 31, 2019;
- Allocations of groundwater are based on the surface acreage owned or controlled by the applicant.

The District has also established a monitoring well network at key locations throughout the four counties to monitor water levels and aquifer conditions over time. Information from the well network will be assimilated along with groundwater production and use reports and estimates, well location and completion data, information on aquifer recharge rates and other hydrogeologic properties, and other information in a database in order to better understand and manage the groundwater resources of the area. Information gleaned from these efforts has been used in the past and will continue to be used by the District in the future in the establishment of desired future conditions for the aquifers, in the monitoring of actual conditions of the aquifers and calibration of modeled conditions, in making planning decisions, and in the development of permanent District rules that may include a permitting system for water wells.

Chapter 36 requires the District to both adopt and enforce rules that will achieve the desired future conditions established for the aquifers in the District. Ideally, the District will be able to establish desired future conditions and implement rules that will promote and provide for sustainable groundwater production throughout the District for the current and future generations of citizens of the District. However, the science and information to be developed by the District may ultimately indicate that such a goal of sustainability, or perhaps even some less idealistic goal, is not achievable without reductions in groundwater production. Once again, if the District determines that groundwater production must be reduced in the future in order to achieve the desired future conditions, it will do so extremely cautiously and with due care and consideration for the possible economic impacts and other effects on the citizens and businesses of the District and their property rights and interests.

Chapter 36 and the District Act afford the District a number of options and tools for the management of groundwater and possible approaches to the regulation of production. Chapter 36 allows the District to be more protective of existing or historic wells and their use than it is of wells that have not yet been drilled. It allows the District to adopt dissimilar regulatory approaches for wells completed in separate aquifers or in different geographic regions of the District, in order to address critical areas or to otherwise tailor-make regulations that are more suitable for a particular aquifer or area. Groundwater management strategies employed for the outcrop of the aquifer may differ from those utilized in subcrop areas. The District may adopt production regulations that authorize production from a well based upon its past or existing use, the acreage or size of the tract of the property on which it is located, the level of decline in the aquifer where the well is located, or other reasonable and appropriate criteria as authorized by law.

Because the District is in a high-density growth area near the Dallas-Fort Worth Metroplex, the District will thoroughly investigate groundwater-to-surface-water conversion management strategies used in other parts of the states. Many of these regulatory approaches have been studied for decades and include methods to fairly reduce groundwater production in high-growth suburban and urban regions, and may prove to be the most appropriate for the District to pursue if it is required to reduce groundwater in order to achieve the desired future conditions established for the aquifers. However, groundwater reduction and surface water conversion management strategies can take many years to implement and represent a considerable capital investment for water users, as securing alternate sources of water supply by economically feasible means is an arduous endeavor that typically involves a very large number of stakeholders and overcoming numerous technical, legal, and financial hurdles. The District will ensure that it has thoroughly evaluated the alternatives and implications of pursuing such management strategies before opting for them, and has allowed a reasonable and sufficient amount of time for them to be implemented. This may necessitate the short-term allowance of groundwater production in excess of annual pumping goals or limits designed to achieve desired future conditions, and nothing in this plan shall be construed to limit the ability of the District to utilize that regulatory flexibility.

The District has and will continue to promote water conservation and public awareness in its management efforts and may investigate and pursue conservation incentive-based management strategies that encourage or reward conservation. In many cases, conservation and public awareness strategies can be among the most cost-efficient means to reduce water use, and thus groundwater production, and will be thoroughly investigated and promoted by the District.

Water quantity issues are only part of the District's concern and regulatory purview. Water quality issues are equally important. The District is very concerned about protection of the quality of the groundwater resources in the four counties and will continue to pursue management strategies to protect those resources from contamination, which can threaten to undermine groundwater conservation efforts by rendering the resource unusable. The District has implemented an injection well monitoring program to monitor and evaluate permit applications submitted to the Railroad Commission of Texas and the Texas Commission on Environmental Quality for injection of various types of waste into the geologic formations underlying the freshwater aquifers in the District. The District works with injection well permit applicants to insure that any concerns it may have regarding threats to groundwater resources are addressed and, if necessary, will vigorously protest an injection application before those state agencies to ensure such resource protection. The District also has adopted and will enforce well completion standards for the drilling and completion of water wells, as well as standards for the capping and plugging of abandoned or deteriorated water wells.

VI. ACTIONS, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION

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

Rules adopted by the District for the permitting of wells and the use of groundwater shall comply with Chapter 36, the District Act, and the provisions of this plan. All rules will be adhered to and enforced. The development and enforcement of the rules will be based on the best technical evidence available to the District. A copy of the rules is included in Appendix C, and can be found here: https://uppertrinitygcd.com/pdf/UTGCD-RULES.pdf

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

VII. METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS

The General Manager of the District will prepare and submit an Annual Report which will include an update on the District's performance in regards to achieving management goals and objectives set forth herein. The General Manager of the District will annually present the Annual Report to the Board of Directors after its completion. The District will maintain a copy of the Annual Report on file at the District's offices for members of the public to inspect upon adoption of the report by the board.

VIII. GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

Management Goals

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

A1. Objective - Each year the District will require registration of all new wells within the District.

A.1 Performance Standard - Annual reporting of well registration statistics will be included in the Annual Report provided to the Board of Directors.

A.2 Objective - Each year the District will monitor annual production from all non-exempt wells within the District.

A.2 Performance Standard - The District will require installation of meters on all non-exempt wells and reporting of production to the District. The annual production of groundwater from non-exempt wells will be included in the Annual Report provided to the Board of Directors.

A.3 Objective – Each year the District will monitor permitted groundwater production volumes.

A.3 Performance Standard – Annual permitted volume of groundwater will be included in the Annual Report provided to the Board of Directors.

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

B.1 Objective - Annual evaluation of the rules to determine if any amendments are recommended to decrease waste of groundwater within the District.

B.1 Performance Standard - Annual discussion of the evaluation of the rules and a reporting of whether any of the District rules require amendment to prevent waste of groundwater to be included in the Annual Report provided to the Board of Directors.

B.2 Objective - The District will encourage the elimination and reduction of groundwater waste through the collection of a water-use fee for non-exempt production wells within the District.

B.2 Performance Standard - Annual reporting of the total fees paid and total groundwater used by non-exempt wells will be included in the Annual Report provided to the Board of Directors.

B.3 Objective - Each year, the District will provide information to the public on eliminating and reducing wasteful practices in the use of groundwater by including information on groundwater waste reduction on the District's website.

B.3 Performance Standard - Each year, a copy of the information provided on the groundwater waste reduction page of the District's website will be included in the District's Annual Report to be given to the District's Board of Directors.

C. Addressing Conjunctive Surface Water Management Issues – 31TAC 356.52 (a)(1)(D)/TWC §36.1071(a)(4)

C.1 Objective - Each year the District will participate in the regional water planning process by attending at least one of the Region B, C or G Regional Water Planning Group Meetings to encourage the development of surface water supplies to meet the needs of water user groups within the District.

C.1 Performance Standard - The attendance of a District representative at any Regional Water Planning Group meeting will be noted in the Annual Report provided to the Board of Directors.

D. Addressing Natural Resource Issues which Impact the Use and Availability of Groundwater, and which are Impacted by the Use of Groundwater – 31TAC 356.52 (a)(1)(E)/TWC §36.1071(a)(5)

D.1 Objective – Ongoing monitoring and review of all applications submitted to the Railroad Commission of Texas to inject fluid into a reservoir productive of oil or gas within the boundaries of the District and all counties immediately adjacent to the District.

D.1. Performance Standard – Regular updates to the District's Board of Directors concerning injection well applications received and reviewed and inclusion of summary of all applications received and reviewed by the District in the Annual Report provided to the Board of Directors.

E. Addressing Drought Conditions – 31TAC 356.52 (a)(1)(F)/TWC §36.1071(a)(6)

E.1 Objective - Monthly review of drought conditions within the District using the Texas Water Development Board's monthly drought conditions presentation available at: http://waterdatafortexas.org/drought/drought-monitor)

E.1 Performance Standard – An annual review of drought conditions within the District will be included in the Annual Report provided to the Board of Directors and on the District website.

F. Addressing Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, and Brush Control, where Appropriate and Cost Effective – 31TAC 356.52 (a)(1)(G)/TWC §36.1071(a)(7)

Precipitation enhancement is not an appropriate or cost-effective program for the District at this time because there is not an existing precipitation enhancement program operating in nearby counties in which the District could participate and share costs. Given the relative youth of the District, development and running of a District-wide precipitation enhancement program is not considered a priority. The District has determined that addressing precipitation enhancement is not applicable to the District at this time.

Recharge enhancement is not an appropriate or cost-effective program for the District at this time. The District has determined that addressing recharge enhancement is not applicable to the District at this time.

Brush Control is not an appropriate or cost-effective program for the District at this time. The District has determined that addressing brush control is not applicable to the District at this time.

F.1 <u>Objective</u> - The District will annually submit an article regarding water conservation for publication to at least one newspaper of general circulation in the District counties.

F.1 <u>Performance Standard</u> - Each year, a copy of the conservation article will be included in the District's Annual Report to be given to the District's Board of Directors.

F.2 <u>Objective</u> - The District will annually submit an article regarding rain water harvesting for publication to at least one newspaper of general circulation in the District counties.

F.2 <u>Performance Standard</u> - Each year, a copy of the rain water harvesting article will be included in the District's Annual Report to be given to the District's Board of Directors.

F.3 <u>Objective</u> - Each year, the District will include an informative flier on water conservation within at least one mail out to groundwater non-exempt water users distributed in the normal course of business for the District.

F.3 <u>Performance Standard</u> - Each year, a copy of the water conservation mail-out flyer will be included in the District's Annual Report to be given to the District's Board of Directors.

G. Addressing the Desired Future Conditions of the Groundwater Resources – 31TAC (a)(1)(H)/TWC §36.1071(a)(8)

G.1 <u>Objective</u> - Within 3 years of Groundwater Management Plan adoption develop a Groundwater Monitoring Program within the District.

G.1 <u>Performance Standard</u> - Upon development, attachment of the District Groundwater Monitoring Program to the District's Annual Report to be given to the District's Board of Directors.

G.2 <u>Objective</u> - Upon approval of the District Monitoring Program – conduct water level measurements at least annually on groundwater resources within the District.

G.2 <u>Performance Standard</u> - Annual evaluation of water-level trends and the adequacy of the monitoring network to monitor aquifer conditions within the District and comply with the aquifer resources desired future conditions. The evaluation will be included in the District's Annual Report to be given to the District's Board of Directors. The District may also take into consideration any measurements made by the TWDB groundwater measurement team.

G.3 Objective - Monitor non-exempt pumping within the District for use in evaluating District compliance with aquifer desired future conditions.

G.3 Performance Standard - Annual reporting of groundwater used by non-exempt wells will be included in the Annual Report provided to the District's Board of Directors.

IX. MANAGEMENT GOALS DETERMINED NOT-APPLICABLE TO THE DISTRICT

A. Controlling and Preventing Subsidence – 31TAC 356.52 (a)(1)(C)/ TWC §36.1071(a)(3)

This category of management goal is not considered applicable to the District because the formations making up the aquifers of use are consolidated with little potential for subsidence within the District as a result of groundwater withdrawal. Mace and others (1994) studied the potential for subsidence resulting from the significant historical water-level declines observed in the northern Trinity Aquifer in central Texas. They concluded that even in the confined portions of the aquifer, where the largest declines have occurred, the subsidence expected would be only a small amount and would take a very long time to manifest itself.

More recently, the TWDB funded a study and development of a tool to assess the potential threat of subsidence: Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping – TWDB Contract Number 1648302062. The District has reviewed this report, and utilized the tool, and have concluded that the updated information indicates the downdip portions of the aquifer, which occur to the east of the District's boundary, have the greatest risk for future subsidence due to pumping. Based on this review, it has been determined that this management goal is not applicable to the District. However, the District will continue to monitor any new studies or information, related to this issue, that becomes available.

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APPENDIX A

Estimated Historical Water Use and 2017 State Water Plan Datasets: Upper Trinity Groundwater Conservation District

Estimated Historical Water Use And 2017 State Water Plan Datasets:

Upper Trinity Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
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(512) 463-7317
April 12, 2020

GROUNDWATER MANAGEMENT PLAN DATA:

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

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

The five reports included in this part are:

1. Estimated Historical Water 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 2017 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 2017 SWP data available as of 4/12/2020. 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 2017 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:

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

The 2017 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

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

Estimated Historical Water Use
TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2018. TWDB staff anticipates the calculation and posting of these estimates at a later date.

HOOD COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2017	GW	5,956	13	0	14	2,991	190	9,164
	SW	1,688	393	142	1,828	4,608	231	8,890
2016	GW	5,982	10	9	26	1,932	221	8,180
	SW	1,461	0	180	1,818	4,359	270	8,088
2015	GW	6,057	12	0	21	2,058	221	8,369
	SW	1,516	0	131	1,969	5,141	270	9,027
2014	GW	6,622	14	16	14	4,890	263	11,819
	SW	1,463	0	269	3,137	3,771	321	8,961
2013	GW	6,807	12	27	13	3,102	209	10,170
	SW	1,486	0	325	2,559	5,000	256	9,626
2012	GW	6,859	14	48	9	3,640	197	10,767
	SW	1,535	0	416	6	5,355	240	7,552
2011	GW	7,099	13	21	9	397	246	7,785
	SW	2,353	0	83	4	10,916	300	13,656
2010	GW	6,708	6	1,216	6	675	240	8,851
	SW	664	0	1,522	5	7,500	293	9,984
2009	GW	5,823	12	1,313	26	404	247	7,825
	SW	917	0	1,643	6	8,298	301	11,165
2008	GW	5,337	20	1,410	41	0	238	7,046
	SW	1,533	0	1,765	487	6,083	292	10,160
2007	GW	5,085	25	0	150	498	184	5,942
	SW	919	0	0	1,652	5,044	225	7,840
2006	GW	5,232	25	0	77	2,776	260	8,370
	SW	1,667	0	0	39	5,641	317	7,664
2005	GW	5,276	22	0	93	0	245	5,636
	SW	1,329	0	0	293	7,960	299	9,881
2004	GW	4,704	17	0	53	0	275	5,049
	SW	545	0	0	302	5,540	281	6,668
2003	GW	4,782	15	0	44	0	255	5,096
	SW	762	0	0	1,489	8,726	261	11,238
2002	GW	4,145	16	0	39	0	361	4,561
	SW	1,920	0	0	3,070	2,691	371	8,052

MONTAGUE COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2017	GW	892	0	0	0	398	72	1,362
	SW	1,472	0	0	0	0	1,359	2,831
2016	GW	885	0	6	0	332	64	1,287
	SW	1,393	0	25	0	10	1,227	2,655
2015	GW	912	0	64	0	299	63	1,338
	SW	1,406	0	255	0	9	1,182	2,852
2014	GW	1,070	0	373	0	490	60	1,993
	SW	1,229	0	1,490	0	0	1,139	3,858
2013	GW	1,188	0	508	0	465	56	2,217
	SW	1,435	0	2,031	0	0	1,068	4,534
2012	GW	1,393	0	892	0	530	51	2,866
	SW	1,675	1	3,570	0	0	957	6,203
2011	GW	1,526	0	218	0	739	59	2,542
	SW	1,801	1	870	0	0	1,127	3,799
2010	GW	1,354	0	616	0	695	59	2,724
	SW	1,751	1	719	0	0	1,110	3,581
2009	GW	1,261	0	530	0	874	66	2,731
	SW	1,593	1	620	0	0	1,255	3,469
2008	GW	1,131	0	444	0	131	63	1,769
	SW	1,594	1	520	0	0	1,204	3,319
2007	GW	983	0	0	0	91	76	1,150
	SW	1,426	1	0	0	0	1,442	2,869
2006	GW	1,255	0	0	0	387	67	1,709
	SW	1,829	1	0	0	12	1,272	3,114
2005	GW	1,195	0	0	0	172	69	1,436
	SW	1,697	1	0	0	0	1,310	3,008
2004	GW	1,091	0	0	0	158	72	1,321
	SW	1,884	1	0	0	0	1,345	3,230
2003	GW	1,139	0	0	0	57	75	1,271
	SW	1,725	1	0	0	0	1,393	3,119
2002	GW	1,124	0	0	0	268	74	1,466
	SW	1,426	1	0	0	0	1,370	2,797

PARKER COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2017	GW	7,189	21	0	0	707	145	8,062
	SW	8,111	32	745	0	432	1,297	10,617
2016	GW	7,123	18	2	0	875	152	8,170
	SW	7,992	31	358	0	287	1,371	10,039
2015	GW	6,958	14	53	0	798	152	7,975
	SW	7,839	29	1,242	0	267	1,368	10,745
2014	GW	7,041	14	46	0	1,158	148	8,407
	SW	7,443	22	683	0	127	1,338	9,613
2013	GW	7,136	16	123	0	919	117	8,311
	SW	10,830	30	1,185	0	152	1,049	13,246
2012	GW	8,798	20	288	0	28	97	9,231
	SW	7,850	49	1,901	565	156	870	11,391
2011	GW	9,047	25	16	0	185	229	9,502
	SW	8,102	62	994	604	77	2,060	11,899
2010	GW	7,938	16	2,450	0	182	226	10,812
	SW	6,756	54	3,414	464	27	2,035	12,750
2009	GW	7,285	16	1,926	0	44	157	9,428
	SW	6,536	53	3,009	741	88	1,408	11,835
2008	GW	6,196	15	1,401	0	73	129	7,814
	SW	7,476	40	2,393	2	117	1,164	11,192
2007	GW	6,508	7	0	0	60	177	6,752
	SW	6,578	89	887	2	20	1,591	9,167
2006	GW	7,130	14	0	0	474	178	7,796
	SW	8,542	98	887	9	16	1,601	11,153
2005	GW	5,901	11	0	0	206	132	6,250
	SW	7,818	73	698	3	190	1,185	9,967
2004	GW	5,192	10	0	0	130	65	5,397
	SW	7,182	78	840	0	124	1,242	9,466
2003	GW	5,365	8	0	0	39	74	5,486
	SW	6,676	85	1,269	703	381	1,389	10,503
2002	GW	5,302	8	0	0	64	89	5,463
	SW	6,568	72	2,431	703	293	1,685	11,752

WISE COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2017	GW	3,545	53	99	0	1,411	293	5,401
	SW	3,361	43	1,229	692	25	1,174	6,524
2016	GW	3,522	113	18	0	1,080	265	4,998
	SW	3,329	56	867	1,944	43	1,060	7,299
2015	GW	3,408	160	133	0	1,370	258	5,329
	SW	3,342	52	1,693	2,843	55	1,034	9,019
2014	GW	3,832	240	387	0	1,167	252	5,878
	SW	3,346	43	2,504	2,894	110	1,007	9,904
2013	GW	4,158	179	441	1	1,261	225	6,265
	SW	3,764	43	2,875	2,593	39	900	10,214
2012	GW	4,550	160	501	0	1,516	210	6,937
	SW	3,989	44	3,063	2,879	46	842	10,863
2011	GW	4,873	162	111	0	1,458	257	6,861
	SW	3,854	292	1,356	0	10	1,027	6,539
2010	GW	4,383	176	5,135	0	830	254	10,778
	SW	3,642	53	6,821	0	761	1,017	12,294
2009	GW	3,263	187	4,454	0	692	321	8,917
	SW	2,215	97	6,090	0	831	1,285	10,518
2008	GW	2,218	418	3,773	0	0	267	6,676
	SW	2,141	121	5,316	0	1,070	1,067	9,715
2007	GW	2,085	120	14	0	130	405	2,754
	SW	2,016	52	966	0	1,220	1,618	5,872
2006	GW	2,280	93	1	0	290	288	2,952
	SW	2,443	70	977	0	1,000	1,150	5,640
2005	GW	2,196	99	1	0	62	295	2,653
	SW	2,103	62	977	0	1,323	1,178	5,643
2004	GW	1,934	69	12	0	128	713	2,856
	SW	1,774	72	1,003	0	152	713	3,714
2003	GW	1,767	283	1	0	45	780	2,876
	SW	1,946	235	266	0	430	780	3,657
2002	GW	1,810	66	1	0	129	782	2,788
	SW	1,436	456	8,298	0	316	782	11,288

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

HOOD COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
G	ACTON MUD	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	5,724	5,738	5,734	5,720	5,708	5,698
G	COUNTY-OTHER, HOOD	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	335	335	335	335	335	335
G	GRANBURY	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	1,400	1,400	1,400	1,400	1,400	1,400
G	IRRIGATION, HOOD	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	4,060	4,060	4,060	4,060	4,060	4,060
G	LIVESTOCK, HOOD	BRAZOS	BRAZOS LIVESTOCK LOCAL SUPPLY	520	520	520	520	520	520
G	LIVESTOCK, HOOD	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	2	2	2	2	2	2
G	MANUFACTURING, HOOD	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	10,000	10,000	10,000	10,000	10,000	10,000
G	OAK TRAIL SHORES SUBDIVISION	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	571	571	571	571	571	571
G	STEAM ELECTRIC POWER, HOOD	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	43,447	43,447	43,447	43,447	43,271	40,337
	Sum of Projected Surface Water Supplies (acre-feet)			**66,059**	**66,073**	**66,069**	**66,055**	**65,867**	**62,923**

MONTAGUE COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
B	BOWIE	TRINITY	AMON G. CARTER LAKE/RESERVOIR	1,235	1,168	1,102	1,035	969	968
B	COUNTY-OTHER, MONTAGUE	RED	FARMERS CREEK/NOCONA LAKE/RESERVOIR	52	52	52	52	52	53

B	COUNTY-OTHER, MONTAGUE	TRINITY	AMON G. CARTER LAKE/RESERVOIR	131	131	130	130	131	132
B	IRRIGATION, MONTAGUE	RED	FARMERS CREEK/NOCONA LAKE/RESERVOIR	100	100	100	100	100	100
B	IRRIGATION, MONTAGUE	RED	RED RUN-OF-RIVER	108	108	108	108	108	108
B	LIVESTOCK, MONTAGUE	RED	RED LIVESTOCK LOCAL SUPPLY	1,165	1,165	1,165	1,165	1,165	1,165
B	LIVESTOCK, MONTAGUE	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	500	500	500	500	500	500
B	MANUFACTURING, MONTAGUE	RED	FARMERS CREEK/NOCONA LAKE/RESERVOIR	6	7	10	12	12	12
B	NOCONA	RED	FARMERS CREEK/NOCONA LAKE/RESERVOIR	1,102	1,101	1,098	1,096	1,096	1,095
	Sum of Projected Surface Water Supplies (acre-feet)			**4,399**	**4,332**	**4,265**	**4,198**	**4,133**	**4,133**

PARKER COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	ALEDO	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	651	898	1,208	1,152	1,122	1,031
C	AZLE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	337	337	333	314	331	336
C	COUNTY-OTHER, PARKER	BRAZOS	PALO PINTO LAKE/RESERVOIR	393	507	567	507	435	370
C	COUNTY-OTHER, PARKER	BRAZOS	TRINITY RUN-OF-RIVER	20	25	28	25	22	18
C	COUNTY-OTHER, PARKER	BRAZOS	TRWD LAKE/RESERVOIR SYSTEM	125	143	139	151	157	159
C	COUNTY-OTHER, PARKER	TRINITY	PALO PINTO LAKE/RESERVOIR	270	156	96	156	228	293
C	COUNTY-OTHER, PARKER	TRINITY	TRINITY RUN-OF-RIVER	13	8	5	8	11	15
C	COUNTY-OTHER, PARKER	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	86	44	23	47	83	126
C	FORT WORTH	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	7,783	10,277	9,729	9,338	8,852	8,363
C	HUDSON OAKS	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	229	281	313	245	146	132
C	HUDSON OAKS	TRINITY	WEATHERFORD LAKE/RESERVOIR	106	120	128	84	55	38
C	IRRIGATION, PARKER	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	393	393	393	393	393	393
C	IRRIGATION, PARKER	BRAZOS	BRAZOS RUN-OF-RIVER	92	92	92	92	92	92
C	IRRIGATION, PARKER	BRAZOS	TRINITY RUN-OF-RIVER	96	96	96	96	96	96

C	IRRIGATION, PARKER	TRINITY	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	107	107	107	107	107	107
C	IRRIGATION, PARKER	TRINITY	BRAZOS RUN-OF-RIVER	25	25	25	25	25	25
C	IRRIGATION, PARKER	TRINITY	TRINITY RUN-OF-RIVER	26	26	26	26	26	26
C	LIVESTOCK, PARKER	BRAZOS	BRAZOS LIVESTOCK LOCAL SUPPLY	524	524	524	524	524	524
C	LIVESTOCK, PARKER	BRAZOS	TRINITY LIVESTOCK LOCAL SUPPLY	591	591	591	591	591	591
C	LIVESTOCK, PARKER	TRINITY	BRAZOS LIVESTOCK LOCAL SUPPLY	379	379	379	379	379	379
C	LIVESTOCK, PARKER	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	428	428	428	428	428	428
C	MANUFACTURING, PARKER	BRAZOS	PALO PINTO LAKE/RESERVOIR	1	1	0	0	0	1
C	MANUFACTURING, PARKER	BRAZOS	TRWD LAKE/RESERVOIR SYSTEM	13	14	13	12	9	8
C	MANUFACTURING, PARKER	BRAZOS	WEATHERFORD LAKE/RESERVOIR	5	5	5	3	2	2
C	MANUFACTURING, PARKER	TRINITY	PALO PINTO LAKE/RESERVOIR	24	24	25	25	25	24
C	MANUFACTURING, PARKER	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	612	649	659	580	404	390
C	MANUFACTURING, PARKER	TRINITY	WEATHERFORD LAKE/RESERVOIR	239	236	229	166	121	91
C	MINERAL WELLS	BRAZOS	PALO PINTO LAKE/RESERVOIR	346	332	320	310	302	294
C	MINING, PARKER	BRAZOS	BRAZOS OTHER LOCAL SUPPLY	8	8	8	8	8	8
C	MINING, PARKER	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	27	22	16	11	6	0
C	MINING, PARKER	BRAZOS	TRINITY OTHER LOCAL SUPPLY	4	4	4	4	4	4
C	MINING, PARKER	TRINITY	BRAZOS OTHER LOCAL SUPPLY	6	6	6	6	6	6
C	MINING, PARKER	TRINITY	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	17	13	10	7	3	0
C	MINING, PARKER	TRINITY	TRINITY OTHER LOCAL SUPPLY	2	2	2	2	2	2
C	PARKER COUNTY SUD	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	561	561	561	561	561	561
C	PARKER COUNTY SUD	BRAZOS	PALO PINTO LAKE/RESERVOIR	294	294	294	294	294	294
C	RENO	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	49	45	40	35	28	22

C	SPRINGTOWN	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	340	340	340	340	340	327
C	STEAM ELECTRIC POWER, PARKER	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	260	237	209	185	165	147
C	STEAM ELECTRIC POWER, PARKER	TRINITY	WEATHERFORD LAKE/RESERVOIR	120	101	85	55	36	25
C	WALNUT CREEK SUD	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,455	1,736	2,130	2,936	4,634	6,443
C	WEATHERFORD	BRAZOS	TRWD LAKE/RESERVOIR SYSTEM	8	53	99	233	239	257
C	WEATHERFORD	BRAZOS	WEATHERFORD LAKE/RESERVOIR	138	135	134	139	142	143
C	WEATHERFORD	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	136	902	1,668	3,921	4,019	4,338
C	WEATHERFORD	TRINITY	WEATHERFORD LAKE/RESERVOIR	2,315	2,283	2,256	2,345	2,394	2,408
	Sum of Projected Surface Water Supplies (acre-feet)			**19,654**	**23,460**	**24,343**	**26,866**	**27,847**	**29,337**

WISE COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	AURORA	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	71	87	99	114	113	107
C	BOYD	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	144	142	195	227	267	224
C	BRIDGEPORT	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,294	1,412	1,466	1,704	1,704	1,704
C	CHICO	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	13	13	13	13	13	13
C	COUNTY-OTHER, WISE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	616	471	368	647	776	834
C	DECATUR	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,206	1,348	1,449	1,227	1,113	1,055
C	FORT WORTH	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,497	1,799	1,904	2,135	2,309	2,420
C	IRRIGATION, WISE	TRINITY	TRINITY RUN-OF-RIVER	139	139	139	139	139	139
C	IRRIGATION, WISE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	124	124	124	124	124	124
C	LIVESTOCK, WISE	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	1,117	1,117	1,117	1,117	1,117	1,117
C	MANUFACTURING, WISE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	2,160	2,256	2,234	2,160	2,129	2,097
C	MINING, WISE	TRINITY	TRINITY RUN-OF-RIVER	133	133	133	133	133	133

C	MINING, WISE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	2,896	2,896	2,896	2,896	2,896	2,896
C	RHOME	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	131	265	368	636	730	745
C	RUNAWAY BAY	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	350	353	344	365	370	396
C	STEAM ELECTRIC POWER, WISE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,494	1,328	1,813	1,741	2,091	2,078
C	WALNUT CREEK SUD	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	290	393	516	675	1,065	1,459
C	WEST WISE SUD	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	425	386	344	310	283	260
	Sum of Projected Surface Water Supplies (acre-feet)			**14,100**	**14,662**	**15,522**	**16,363**	**17,372**	**17,801**

Projected Water Demands
TWDB 2017 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.

HOOD COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
G	ACTON MUD	BRAZOS	2,862	4,460	5,497	6,024	6,631	7,308
G	COUNTY-OTHER, HOOD	BRAZOS	2,820	2,179	1,898	1,930	1,814	1,582
G	COUNTY-OTHER, HOOD	TRINITY	3	5	5	3	5	6
G	CRESSON	BRAZOS	42	57	67	76	84	89
G	CRESSON	TRINITY	14	19	22	25	27	29
G	GRANBURY	BRAZOS	1,216	1,432	1,586	1,725	1,837	1,925
G	IRRIGATION, HOOD	BRAZOS	7,205	7,071	6,939	6,807	6,680	6,560
G	LIVESTOCK, HOOD	BRAZOS	520	520	520	520	520	520
G	LIVESTOCK, HOOD	TRINITY	2	2	2	2	2	2
G	MANUFACTURING, HOOD	BRAZOS	25	27	29	31	34	37
G	MINING, HOOD	BRAZOS	2,061	2,417	2,204	2,116	2,027	2,041
G	MINING, HOOD	TRINITY	17	19	18	17	16	16
G	OAK TRAIL SHORES SUBDIVISION	BRAZOS	357	351	345	344	345	348
G	STEAM ELECTRIC POWER, HOOD	BRAZOS	5,814	6,796	7,995	9,456	11,238	13,354
G	TOLAR	BRAZOS	120	139	153	166	176	184
	Sum of Projected Water Demands (acre-feet)		**23,078**	**25,494**	**27,280**	**29,242**	**31,436**	**34,001**

MONTAGUE COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
B	BOWIE	TRINITY	927	935	929	934	942	949
B	COUNTY-OTHER, MONTAGUE	RED	560	561	554	555	559	564
B	COUNTY-OTHER, MONTAGUE	TRINITY	752	751	743	744	750	756
B	IRRIGATION, MONTAGUE	RED	436	436	436	436	436	436
B	IRRIGATION, MONTAGUE	TRINITY	436	436	436	436	436	436
B	LIVESTOCK, MONTAGUE	RED	1,193	1,193	1,193	1,193	1,193	1,193
B	LIVESTOCK, MONTAGUE	TRINITY	398	398	398	398	398	398
B	MANUFACTURING, MONTAGUE	RED	5	6	8	10	10	10
B	MINING, MONTAGUE	RED	1,747	1,237	771	332	373	373
B	MINING, MONTAGUE	TRINITY	1,892	1,340	835	359	404	404
B	NOCONA	RED	740	751	751	758	766	772
B	ST. JO	TRINITY	161	162	160	161	162	163
	Sum of Projected Water Demands (acre-feet)		**9,247**	**8,206**	**7,214**	**6,316**	**6,429**	**6,454**

PARKER COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	ALEDO	TRINITY	822	1,262	1,900	1,992	1,991	1,990
C	ANNETTA	TRINITY	152	179	208	238	270	302
C	ANNETTA NORTH	TRINITY	67	71	76	83	91	100
C	ANNETTA SOUTH	TRINITY	63	60	58	57	57	57
C	AZLE	TRINITY	372	392	414	440	530	678
C	COUNTY-OTHER, PARKER	BRAZOS	4,161	5,234	5,741	7,086	9,319	12,323
C	COUNTY-OTHER, PARKER	TRINITY	2,866	1,617	973	2,183	4,886	9,735
C	CRESSON	TRINITY	68	75	83	92	104	118
C	FORT WORTH	TRINITY	12,373	19,140	21,862	23,960	25,530	27,120
C	HUDSON OAKS	TRINITY	458	618	779	795	795	795
C	IRRIGATION, PARKER	BRAZOS	385	385	385	385	385	385
C	IRRIGATION, PARKER	TRINITY	105	105	105	105	105	105
C	LIVESTOCK, PARKER	BRAZOS	896	896	896	896	896	896
C	LIVESTOCK, PARKER	TRINITY	648	648	648	648	648	648
C	MANUFACTURING, PARKER	BRAZOS	13	15	16	18	20	22
C	MANUFACTURING, PARKER	TRINITY	625	714	805	894	984	1,073
C	MINERAL WELLS	BRAZOS	346	332	320	310	302	294
C	MINING, PARKER	BRAZOS	1,973	2,498	2,484	2,525	2,557	2,706
C	MINING, PARKER	TRINITY	1,209	1,531	1,522	1,548	1,567	1,658
C	PARKER COUNTY SUD	BRAZOS	655	842	1,060	1,321	1,627	1,983
C	RENO	TRINITY	170	173	176	180	184	189
C	SPRINGTOWN	TRINITY	577	757	749	745	744	743
C	STEAM ELECTRIC POWER, PARKER	TRINITY	260	260	260	260	260	260
C	WALNUT CREEK SUD	TRINITY	1,455	1,659	1,921	2,463	3,635	4,758
C	WEATHERFORD	BRAZOS	298	348	408	660	1,034	1,509
C	WEATHERFORD	TRINITY	5,009	5,865	6,865	11,109	17,423	25,438
C	WILLOW PARK	TRINITY	759	904	1,074	1,483	1,924	2,366
		Sum of Projected Water Demands (acre-feet)	**36,785**	**46,580**	**51,788**	**62,476**	**77,868**	**98,251**

WISE COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	ALVORD	TRINITY	110	132	155	189	216	242
C	AURORA	TRINITY	134	159	186	224	263	311
C	BOLIVAR WSC	TRINITY	111	122	134	150	168	187
C	BOYD	TRINITY	217	229	316	392	547	593
C	BRIDGEPORT	TRINITY	1,294	1,551	1,822	2,496	3,322	4,149
C	CHICO	TRINITY	207	213	221	411	522	652
C	COUNTY-OTHER, WISE	TRINITY	3,667	3,565	3,485	5,039	6,465	7,794
C	DECATUR	TRINITY	2,319	3,149	4,060	5,240	6,157	7,156

C	FORT WORTH	TRINITY	2,380	3,350	4,278	5,477	6,660	7,848
C	IRRIGATION, WISE	TRINITY	1,324	1,324	1,324	1,324	1,324	1,324
C	LIVESTOCK, WISE	TRINITY	1,575	1,575	1,575	1,575	1,575	1,575
C	MANUFACTURING, WISE	TRINITY	2,660	2,979	3,277	3,539	3,858	4,206
C	MINING, WISE	TRINITY	10,320	11,159	12,337	13,975	15,378	17,694
C	NEW FAIRVIEW	TRINITY	163	199	236	286	334	392
C	NEWARK	TRINITY	195	249	345	462	643	858
C	RHOME	TRINITY	411	571	738	1,175	1,576	2,011
C	RUNAWAY BAY	TRINITY	350	388	428	514	584	700
C	STEAM ELECTRIC POWER, WISE	TRINITY	1,494	1,459	2,254	2,450	3,298	3,673
C	WALNUT CREEK SUD	TRINITY	290	376	465	566	835	1,077
C	WEST WISE SUD	TRINITY	425	424	427	435	449	464
		Sum of Projected Water Demands (acre-feet)	**29,646**	**33,173**	**38,063**	**45,919**	**54,174**	**62,906**

Projected Water Supply Needs
TWDB 2017 State Water Plan Data

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

HOOD COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
G	ACTON MUD	BRAZOS	4,322	2,742	1,700	1,155	533	-156
G	COUNTY-OTHER, HOOD	BRAZOS	-968	-344	-77	-121	-22	188
G	COUNTY-OTHER, HOOD	TRINITY	0	0	0	0	0	5
G	CRESSON	BRAZOS	6	1	-7	-19	-31	-40
G	CRESSON	TRINITY	2	1	-1	-2	-4	-6
G	GRANBURY	BRAZOS	890	674	520	358	246	158
G	IRRIGATION, HOOD	BRAZOS	325	459	591	723	850	970
G	LIVESTOCK, HOOD	BRAZOS	0	0	0	0	0	0
G	LIVESTOCK, HOOD	TRINITY	0	0	0	0	0	0
G	MANUFACTURING, HOOD	BRAZOS	10,000	9,998	9,996	9,994	9,991	9,988
G	MINING, HOOD	BRAZOS	-837	-1,193	-980	-892	-803	-817
G	MINING, HOOD	TRINITY	-17	-19	-18	-17	-16	-16
G	OAK TRAIL SHORES SUBDIVISION	BRAZOS	214	220	226	227	226	223
G	STEAM ELECTRIC POWER, HOOD	BRAZOS	37,783	36,801	35,602	34,141	32,183	27,133
G	TOLAR	BRAZOS	45	26	12	-1	-11	-19
	Sum of Projected Water Supply Needs (acre-feet)		**-1,822**	**-1,556**	**-1,083**	**-1,052**	**-887**	**-1,054**

MONTAGUE COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
B	BOWIE	TRINITY	308	233	173	101	27	19
B	COUNTY-OTHER, MONTAGUE	RED	3	5	11	10	6	2
B	COUNTY-OTHER, MONTAGUE	TRINITY	68	66	74	73	68	63
B	IRRIGATION, MONTAGUE	RED	1	1	1	1	1	1
B	IRRIGATION, MONTAGUE	TRINITY	0	0	0	0	0	0
B	LIVESTOCK, MONTAGUE	RED	0	0	0	0	0	0
B	LIVESTOCK, MONTAGUE	TRINITY	124	124	124	124	124	124
B	MANUFACTURING, MONTAGUE	RED	1	1	2	2	2	2
B	MINING, MONTAGUE	RED	-631	-120	-135	5	11	11
B	MINING, MONTAGUE	TRINITY	-684	-130	-146	4	12	12
B	NOCONA	RED	362	350	347	338	330	323
B	ST. JO	TRINITY	50	49	51	50	49	48
	Sum of Projected Water Supply Needs (acre-feet)		**-1,315**	**-250**	**-281**	**0**	**0**	**0**

PARKER COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	ALEDO	TRINITY	227	34	-294	-442	-471	-561
C	ANNETTA	TRINITY	202	175	146	116	84	52
C	ANNETTA NORTH	TRINITY	33	29	24	17	9	0
C	ANNETTA SOUTH	TRINITY	6	9	11	12	12	12
C	AZLE	TRINITY	-35	-55	-81	-126	-199	-342
C	COUNTY-OTHER, PARKER	BRAZOS	300	502	658	-1,338	-4,359	-8,074
C	COUNTY-OTHER, PARKER	TRINITY	205	155	111	-412	-2,285	-6,378
C	CRESSON	TRINITY	9	1	0	0	0	0
C	FORT WORTH	TRINITY	-460	-3,388	-6,734	-8,986	-10,864	-12,758
C	HUDSON OAKS	TRINITY	106	92	52	-68	-196	-227
C	IRRIGATION, PARKER	BRAZOS	476	476	476	476	476	476
C	IRRIGATION, PARKER	TRINITY	129	129	129	129	129	129
C	LIVESTOCK, PARKER	BRAZOS	352	352	352	352	352	352
C	LIVESTOCK, PARKER	TRINITY	255	255	255	255	255	255
C	MANUFACTURING, PARKER	BRAZOS	8	7	4	-1	-7	-9
C	MANUFACTURING, PARKER	TRINITY	332	277	190	-41	-352	-486
C	MINERAL WELLS	BRAZOS	0	0	0	0	0	0
C	MINING, PARKER	BRAZOS	759	229	238	191	154	0
C	MINING, PARKER	TRINITY	467	141	146	118	95	0
C	PARKER COUNTY SUD	BRAZOS	236	49	-169	-430	-736	-1,092
C	RENO	TRINITY	44	37	29	19	8	-3
C	SPRINGTOWN	TRINITY	-142	-322	-314	-310	-309	-321
C	STEAM ELECTRIC POWER, PARKER	TRINITY	120	78	34	-20	-59	-88
C	WALNUT CREEK SUD	TRINITY	0	77	209	473	999	1,685
C	WEATHERFORD	BRAZOS	-152	-160	-175	-288	-653	-1,109
C	WEATHERFORD	TRINITY	-2,558	-2,680	-2,941	-4,843	-11,010	-18,692
C	WILLOW PARK	TRINITY	-2	-147	-317	-726	-1,167	-1,609
	Sum of Projected Water Supply Needs (acre-feet)		**-3,349**	**-6,752**	**-11,025**	**-18,031**	**-32,667**	**-51,749**

WISE COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	ALVORD	TRINITY	41	19	-4	-38	-65	-91
C	AURORA	TRINITY	0	-9	-24	-47	-87	-141
C	BOLIVAR WSC	TRINITY	0	-14	-30	-51	-72	-96
C	BOYD	TRINITY	0	-14	-48	-92	-207	-296
C	BRIDGEPORT	TRINITY	0	-139	-356	-792	-1,618	-2,445
C	CHICO	TRINITY	-1	-7	-15	-205	-316	-446
C	COUNTY-OTHER, WISE	TRINITY	-467	-510	-533	-1,808	-3,105	-4,376
C	DECATUR	TRINITY	-1,113	-1,801	-2,611	-4,013	-5,044	-6,101

C	FORT WORTH	TRINITY	-88	-593	-1,318	-2,054	-2,835	-3,692
C	IRRIGATION, WISE	TRINITY	-381	-381	-381	-381	-381	-381
C	LIVESTOCK, WISE	TRINITY	0	0	0	0	0	0
C	MANUFACTURING, WISE	TRINITY	-250	-473	-793	-1,129	-1,479	-1,859
C	MINING, WISE	TRINITY	1,125	286	-892	-2,530	-4,118	-6,434
C	NEW FAIRVIEW	TRINITY	0	-36	-73	-123	-171	-229
C	NEWARK	TRINITY	0	-54	-150	-267	-448	-663
C	RHOME	TRINITY	0	-26	-90	-259	-566	-986
C	RUNAWAY BAY	TRINITY	0	-35	-84	-149	-214	-304
C	STEAM ELECTRIC POWER, WISE	TRINITY	0	-131	-441	-709	-1,207	-1,595
C	WALNUT CREEK SUD	TRINITY	0	17	51	109	230	382
C	WEST WISE SUD	TRINITY	0	-38	-83	-125	-166	-204
	Sum of Projected Water Supply Needs (acre-feet)		**-2,300**	**-4,261**	**-7,926**	**-14,772**	**-22,099**	**-30,339**

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

HOOD COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
ACTON MUD, BRAZOS (G)							
REALLOCATION OF SWATS CAPACITY TO ACTON MUD	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	195
		0	**0**	**0**	**0**	**0**	**195**
COUNTY-OTHER, HOOD, BRAZOS (G)							
TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [HOOD]	968	966	965	966	965	964
		968	**966**	**965**	**966**	**965**	**964**
COUNTY-OTHER, HOOD, TRINITY (G)							
TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [HOOD]	0	2	3	2	3	4
		0	**2**	**3**	**2**	**3**	**4**
CRESSON, BRAZOS (G)							
CONSERVATION - CRESSON	DEMAND REDUCTION [HOOD]	0	0	0	0	1	1
CONSERVATION, WATER LOSS CONTROL - CRESSON	DEMAND REDUCTION [HOOD]	0	0	0	0	0	0
CRESSON NEW WELLS IN TRINITY AQUIFER	TRINITY AQUIFER [PARKER]	32	35	36	36	35	33
TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [HOOD]	0	0	19	19	19	18
		32	**35**	**55**	**55**	**55**	**52**
CRESSON, TRINITY (G)							
CONSERVATION - CRESSON	DEMAND REDUCTION [HOOD]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - CRESSON	DEMAND REDUCTION [HOOD]	0	0	0	0	0	0
CRESSON NEW WELLS IN TRINITY AQUIFER	TRINITY AQUIFER [PARKER]	11	12	12	12	11	11
TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [HOOD]	0	0	6	6	6	6
		11	**12**	**18**	**18**	**17**	**17**
MINING, HOOD, BRAZOS (G)							
INDUSTRIAL WATER CONSERVATION	DEMAND REDUCTION [HOOD]	61	121	155	148	142	143
TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [HOOD]	1,104	1,102	1,103	1,104	1,105	1,105
		1,165	**1,223**	**1,258**	**1,252**	**1,247**	**1,248**
MINING, HOOD, TRINITY (G)							

INDUSTRIAL WATER CONSERVATION	DEMAND REDUCTION [HOOD]	1	1	1	1	1	1
TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [HOOD]	16	18	17	16	15	15
		17	**19**	**18**	**17**	**16**	**16**
TOLAR, BRAZOS (G)							
TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [HOOD]	0	0	0	12	12	24
		0	**0**	**0**	**12**	**12**	**24**
Sum of Projected Water Management Strategies (acre-feet)		**2,193**	**2,257**	**2,317**	**2,322**	**2,315**	**2,520**

MONTAGUE COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BOWIE, TRINITY (B)							
MUNICIPAL CONSERVATION - BOWIE	DEMAND REDUCTION [MONTAGUE]	27	43	40	48	64	81
		27	**43**	**40**	**48**	**64**	**81**
COUNTY-OTHER, MONTAGUE, RED (B)							
MUNICIPAL CONSERVATION - MONTAGUE COUNTY OTHER	DEMAND REDUCTION [MONTAGUE]	0	0	1	20	45	62
		0	**0**	**1**	**20**	**45**	**62**
COUNTY-OTHER, MONTAGUE, TRINITY (B)							
MUNICIPAL CONSERVATION - MONTAGUE COUNTY OTHER	DEMAND REDUCTION [MONTAGUE]	0	0	2	27	60	82
		0	**0**	**2**	**27**	**60**	**82**
IRRIGATION, MONTAGUE, RED (B)							
IRRIGATION CONSERVATION - MONTAGUE	DEMAND REDUCTION [MONTAGUE]	43	43	43	43	43	43
		43	**43**	**43**	**43**	**43**	**43**
IRRIGATION, MONTAGUE, TRINITY (B)							
IRRIGATION CONSERVATION - MONTAGUE	DEMAND REDUCTION [MONTAGUE]	44	44	44	44	44	44
		44	**44**	**44**	**44**	**44**	**44**
MINING, MONTAGUE, RED (B)							
MINING CONSERVATION - MONTAGUE	DEMAND REDUCTION [MONTAGUE]	437	309	193	83	93	93
		437	**309**	**193**	**83**	**93**	**93**
MINING, MONTAGUE, TRINITY (B)							
MINING CONSERVATION - MONTAGUE	DEMAND REDUCTION [MONTAGUE]	473	335	209	90	101	101
		473	**335**	**209**	**90**	**101**	**101**
Sum of Projected Water Management Strategies (acre-feet)		**1,024**	**774**	**532**	**355**	**450**	**506**

PARKER COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
ALEDO, TRINITY (C)							
CONSERVATION - ALEDO	DEMAND REDUCTION [PARKER]	3	8	19	27	33	40
CONSERVATION, WATER LOSS CONTROL - ALEDO	DEMAND REDUCTION [PARKER]	4	4	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	116	213	179	140	95
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	246	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	379
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	60	111	128
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	23	60	45	53	35
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	5	15	14	21	46
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	59	171	256	200	160
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	81	141	65	75
		7	**215**	**559**	**722**	**869**	**958**
ANNETTA, TRINITY (C)							
CONSERVATION - ANNETTA	DEMAND REDUCTION [PARKER]	1	1	2	3	5	6
CONSERVATION, WATER LOSS CONTROL - ANNETTA	DEMAND REDUCTION [PARKER]	1	1	0	0	0	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	90
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	4	14	31
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	7	5	3	7	8
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	1	1	2	11
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	17	15	17	26	38
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	7	10	8	18
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	32	0
		2	**27**	**30**	**38**	**94**	**202**
ANNETTA NORTH, TRINITY (C)							
CONSERVATION - ANNETTA NORTH	DEMAND REDUCTION [PARKER]	0	0	1	1	2	2
CONSERVATION, WATER LOSS CONTROL - ANNETTA NORTH	DEMAND REDUCTION [PARKER]	0	0	0	0	0	0

SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	17
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	2	4	6
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	0	1	1	1	2
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	1	1	3
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	4	9	7	7
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	2	4	2	3
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	10	0
		0	**0**	**8**	**18**	**27**	**40**

ANNETTA SOUTH, TRINITY (C)

CONSERVATION - ANNETTA SOUTH	DEMAND REDUCTION [PARKER]	0	0	1	1	1	1
CONSERVATION, WATER LOSS CONTROL - ANNETTA SOUTH	DEMAND REDUCTION [PARKER]	0	0	0	0	0	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	10
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1	3	3
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	0	1	1	1	1
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	1	1
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	3	5	4	4
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	1	2	1	2
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	7	0
		0	**0**	**6**	**10**	**18**	**22**

AZLE, TRINITY (C)

CONSERVATION - AZLE	DEMAND REDUCTION [PARKER]	1	3	4	6	9	14
CONSERVATION, WATER LOSS CONTROL - AZLE	DEMAND REDUCTION [PARKER]	2	2	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	70	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	151
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	14	29	51
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	20	14	14	11	15	14

	TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	13	3	4	3	5	19
	TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	34	40	60	54	64
	TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	19	32	17	30
			36	**56**	**81**	**126**	**199**	**343**
COUNTY-OTHER, PARKER, BRAZOS (C)								
	CONSERVATION - PARKER COUNTY	DEMAND REDUCTION [PARKER]	14	35	57	95	155	246
	CONSERVATION, WATER LOSS CONTROL - PARKER COUNTY	DEMAND REDUCTION [PARKER]	21	27	0	0	0	0
	DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	249	0
	PARKER COUNTY OTHER NEW WELLS IN TRINITY AQUIFER	TRINITY AQUIFER [PARKER]	118	153	171	153	131	112
	SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	3,008
	SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	43	491	1,019
	TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	3	6	32	234	274
	TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	2	2	11	93	368
	TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	8	16	182	892	1,266
	TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	8	102	288	598
	UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	848	0
	WEATHERFORD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	720	978	1,183
			153	**228**	**260**	**1,338**	**4,359**	**8,074**
COUNTY-OTHER, PARKER, TRINITY (C)								
	CONSERVATION - PARKER COUNTY	DEMAND REDUCTION [PARKER]	9	11	10	29	82	195
	CONSERVATION, WATER LOSS CONTROL - PARKER COUNTY	DEMAND REDUCTION [PARKER]	14	8	0	0	0	0
	DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	134	0
	PARKER COUNTY OTHER NEW WELLS IN TRINITY AQUIFER	TRINITY AQUIFER [PARKER]	82	47	29	47	69	88
	SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	2,376
	SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	13	258	805
	TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	1	1	10	122	218
	TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	3	48	291

TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	3	3	56	467	1,001
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	1	30	152	473
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	442	0
WEATHERFORD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	224	511	931
		105	**70**	**44**	**412**	**2,285**	**6,378**
CRESSON, TRINITY (C)							
CONSERVATION - CRESSON	DEMAND REDUCTION [PARKER]	0	1	1	1	1	1
CONSERVATION, WATER LOSS CONTROL - CRESSON	DEMAND REDUCTION [PARKER]	0	0	0	0	0	0
CRESSON NEW WELLS IN TRINITY AQUIFER	TRINITY AQUIFER [PARKER]	52	47	44	42	43	44
TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [HOOD]	0	0	24	23	23	23
		52	**48**	**69**	**66**	**67**	**68**
FORT WORTH, TRINITY (C)							
CONSERVATION - FORT WORTH	DEMAND REDUCTION [PARKER]	360	722	956	1,098	1,253	1,420
CONSERVATION, WATER LOSS CONTROL - FORT WORTH	DEMAND REDUCTION [PARKER]	1,237	1,692	657	478	256	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	296	0
FORT WORTH ALLIANCE DIRECT REUSE	DIRECT REUSE [TARRANT]	0	230	602	595	584	574
FORT WORTH DIRECT REUSE	DIRECT REUSE [TARRANT]	59	74	69	68	67	66
FORT WORTH FUTURE DIRECT REUSE	DIRECT REUSE [TARRANT]	0	570	627	620	608	597
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	696	1,281	1,035	633	211
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	4,719
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	2,338	3,002	1,733
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	84	45	585	492	264	130
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	53	10	150	149	229	419
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	115	1,172	1,471	2,187	2,105
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	1,290	695	1,418	945
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	67	0
		1,793	**4,154**	**7,389**	**9,039**	**10,864**	**12,919**
HUDSON OAKS, TRINITY (C)							
CONSERVATION - HUDSON OAKS	DEMAND REDUCTION [PARKER]	7	13	24	27	29	32

CONSERVATION – WASTE PROHIBITION, HUDSON OAKS	DEMAND REDUCTION [PARKER]	1	3	4	4	4	4
CONSERVATION, WATER LOSS CONTROL - HUDSON OAKS	DEMAND REDUCTION [PARKER]	2	2	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	40	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	63
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	10	18	21
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	2	9	8	60	60
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	2	1	3	8
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	6	26	43	32	26
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	12	24	10	13
		10	**27**	**77**	**117**	**196**	**227**

MANUFACTURING, PARKER, BRAZOS (C)

CONSERVATION, MANUFACTURING - PARKER COUNTY	DEMAND REDUCTION [PARKER]	0	0	0	0	1	1
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	2	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	5
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	2	1
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	1	1	2	1	2
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	1	2	1	1
		0	**1**	**2**	**4**	**7**	**10**

MANUFACTURING, PARKER, TRINITY (C)

CONSERVATION, MANUFACTURING - PARKER COUNTY	DEMAND REDUCTION [PARKER]	0	1	17	25	27	30
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	127	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	222
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	29	58	76
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	18	27	22	28	21
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	4	7	7	11	28
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	42	75	121	105	93

TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	35	66	34	44
		0	**65**	**161**	**270**	**390**	**514**
MINERAL WELLS, BRAZOS (C)							
CONSERVATION - MINERAL WELLS	DEMAND REDUCTION [PARKER]	0	1	0	0	0	1
CONSERVATION, WATER LOSS CONTROL - MINERAL WELLS	DEMAND REDUCTION [PARKER]	0	0	0	0	0	0
MUNICIPAL WATER CONSERVATION (RURAL) - MINERAL WELLS	DEMAND REDUCTION [PARKER]	8	3	0	0	0	0
		8	**4**	**0**	**0**	**0**	**1**
PARKER COUNTY SUD, BRAZOS (C)							
CONSERVATION - PARKER COUNTY SUD	DEMAND REDUCTION [PARKER]	2	6	11	18	27	40
CONSERVATION, WATER LOSS CONTROL - PARKER COUNTY SUD	DEMAND REDUCTION [PARKER]	3	3	0	0	0	0
PARKER COUNTY SUD - BRA SURPLUS (NEW WTP)	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM [RESERVOIR]	539	539	539	539	539	539
PARKER COUNTY SUD ADDITIONAL GROUNDWATER (NEW WELLS IN TRINITY AQUIFER)	TRINITY AQUIFER [PARKER]	0	0	0	0	513	513
		544	**548**	**550**	**557**	**1,079**	**1,092**
RENO, TRINITY (C)							
CONSERVATION - RENO	DEMAND REDUCTION [PARKER]	1	1	2	2	3	4
CONSERVATION, WATER LOSS CONTROL - RENO	DEMAND REDUCTION [PARKER]	1	1	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	8	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	11
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1	3	4
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	1	1	1	1	1
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	0	0	1
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	1	4	6	5	5
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	2	4	2	1
		2	**4**	**10**	**14**	**22**	**27**
SPRINGTOWN, TRINITY (C)							
CONSERVATION - SPRINGTOWN	DEMAND REDUCTION [PARKER]	2	5	7	10	12	15
CONSERVATION, WATER LOSS CONTROL - SPRINGTOWN	DEMAND REDUCTION [PARKER]	3	3	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	79	0

SPRINGTOWN NEW WELLS IN TRINITY AQUIFER	TRINITY AQUIFER [PARKER]	70	70	70	70	70	70
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	109
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	27	37	37
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	41	65	43	20	18	10
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	26	15	11	7	6	13
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	164	124	114	66	46
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	59	62	21	22
		142	**322**	**314**	**310**	**309**	**322**

STEAM ELECTRIC POWER, PARKER, TRINITY (C)

DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	34	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	52
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	9	15	18
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	6	9	7	7	5
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	2	1	2	6
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	16	27	38	28	22
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	13	20	9	10
		0	**23**	**51**	**75**	**95**	**113**

WALNUT CREEK SUD, TRINITY (C)

CONSERVATION - WALNUT CREEK SUD	DEMAND REDUCTION [PARKER]	5	11	19	33	61	95
CONSERVATION, WATER LOSS CONTROL - WALNUT CREEK SUD	DEMAND REDUCTION [PARKER]	8	7	0	0	0	0
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	13	15	21	44	148
		13	**31**	**34**	**54**	**105**	**243**

WEATHERFORD, BRAZOS (C)

CONSERVATION - WEATHERFORD	DEMAND REDUCTION [PARKER]	4	8	12	22	37	60
CONSERVATION – WASTE PROHIBITION, WEATHERFORD	DEMAND REDUCTION [PARKER]	1	3	3	6	11	16
CONSERVATION, WATER LOSS CONTROL - WEATHERFORD	DEMAND REDUCTION [PARKER]	3	6	56	10	15	22
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	90	0

SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	320
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	8	40	108
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	18	18	0	13	19	29
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	2	8	39
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	1	36	73	135
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	1	20	23	64
WEATHERFORD INDIRECT REUSE - LAKE WEATHERFORD/SUNSHINE	INDIRECT REUSE [PARKER]	126	125	126	126	125	125
WEATHERFORD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	45	225	208
		152	**160**	**199**	**288**	**666**	**1,126**

WEATHERFORD, TRINITY (C)

CONSERVATION - WEATHERFORD	DEMAND REDUCTION [PARKER]	67	126	206	370	630	1,018
CONSERVATION – WASTE PROHIBITION, WEATHERFORD	DEMAND REDUCTION [PARKER]	18	46	59	108	181	273
CONSERVATION, WATER LOSS CONTROL - WEATHERFORD	DEMAND REDUCTION [PARKER]	49	110	949	160	251	367
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	1,504	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	5,390
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	140	674	1,826
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	310	283	8	233	319	493
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	2	32	126	659
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	22	597	1,221	2,269
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	10	330	396	1,072
WEATHERFORD INDIRECT REUSE - LAKE WEATHERFORD/SUNSHINE	INDIRECT REUSE [PARKER]	2,114	2,115	2,114	2,114	2,115	2,115
WEATHERFORD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	759	3,798	3,510
		2,558	**2,680**	**3,370**	**4,843**	**11,215**	**18,992**

WILLOW PARK, TRINITY (C)

CONSERVATION - WILLOW PARK	DEMAND REDUCTION [PARKER]	3	6	11	20	32	47
CONSERVATION, WATER LOSS CONTROL - WILLOW PARK	DEMAND REDUCTION [PARKER]	4	4	0	0	0	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,438

SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	164	360	488
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	36	56	62	86	66
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	9	14	20	33	87
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	92	160	351	327	303
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	76	193	107	143
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	402	0
		7	**147**	**317**	**810**	**1,347**	**2,572**
Sum of Projected Water Management Strategies (acre-feet)		**5,584**	**8,810**	**13,531**	**19,111**	**34,213**	**54,243**

WISE COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
ALVORD, TRINITY (C)							
CONSERVATION - ALVORD	DEMAND REDUCTION [WISE]	0	1	2	3	4	5
CONSERVATION, WATER LOSS CONTROL - ALVORD	DEMAND REDUCTION [WISE]	1	1	0	0	0	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	40
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	4	10	13
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	0	0	3	4	4
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	1	2	4
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	1	17	18	17
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	0	10	6	8
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	22	0
		1	**2**	**4**	**38**	**66**	**91**
AURORA, TRINITY (C)							
CONSERVATION - AURORA	DEMAND REDUCTION [WISE]	0	1	2	3	4	6
CONSERVATION, WATER LOSS CONTROL - AURORA	DEMAND REDUCTION [WISE]	1	1	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	29	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	62

SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	5	13	21
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	2	4	4	6	6
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	2	1	3	8
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	5	11	22	24	26
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	5	12	8	12
		1	**9**	**24**	**47**	**87**	**141**

BOLIVAR WSC, TRINITY (C)

ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	3
CONSERVATION - BOLIVAR WSC	DEMAND REDUCTION [WISE]	0	1	1	2	3	4
CONSERVATION, WATER LOSS CONTROL - BOLIVAR WSC	DEMAND REDUCTION [WISE]	1	1	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	1	5	7	7
GAINESVILLE UNALLOCATED SUPPLY UTILIZATION	HUBERT H MOSS LAKE/RESERVOIR [RESERVOIR]	0	5	7	9	11	12
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	2	4	5	5
REMOVAL OF CHAPMAN SILT BARRIER	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	1	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	15
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	2	5
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	2	2
UTRWD - CONTRACT RENEWAL WITH COMMERCE FOR LAKE CHAPMAN WATER	INDIRECT REUSE [HOPKINS]	0	0	0	1	1	2
UTRWD - CONTRACT RENEWAL WITH COMMERCE FOR LAKE CHAPMAN WATER	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	1	1	1	3
UTRWD - RALPH HALL RESERVOIR AND REUSE	INDIRECT REUSE [FANNIN]	0	1	4	7	8	9
UTRWD - RALPH HALL RESERVOIR AND REUSE	RALPH HALL LAKE/RESERVOIR [RESERVOIR]	0	2	8	16	25	19
UTRWD UNALLOCATED SUPPLY UTILIZATION	INDIRECT REUSE [HOPKINS]	0	1	3	4	5	6
UTRWD UNALLOCATED SUPPLY UTILIZATION	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	3	6	8	10	11

UTRWD UNALLOCATED SUPPLY UTILIZATION	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	11	18	23	28	29
		1	**25**	**51**	**80**	**109**	**132**
BOYD, TRINITY (C)							
CONSERVATION - BOYD	DEMAND REDUCTION [WISE]	3	5	9	5	9	12
CONSERVATION, WATER LOSS CONTROL - BOYD	DEMAND REDUCTION [WISE]	6	17	22	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	70	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	131
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	10	31	44
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	0	3	8	15	12
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	2	7	16
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	9	43	57	55
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	4	24	18	26
		9	**22**	**48**	**92**	**207**	**296**
BRIDGEPORT, TRINITY (C)							
CONSERVATION - BRIDGEPORT	DEMAND REDUCTION [WISE]	18	34	55	83	122	166
CONSERVATION, WATER LOSS CONTROL - BRIDGEPORT	DEMAND REDUCTION [WISE]	6	6	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	532	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,049
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	408	1,071	1,046
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	26	55	63	112	96
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	6	14	18	45	128
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	67	158	353	170	442
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	74	195	140	209
		24	**139**	**356**	**1,120**	**2,192**	**3,136**
CHICO, TRINITY (C)							
CONSERVATION - CHICO	DEMAND REDUCTION [WISE]	3	5	7	14	19	26
CONSERVATION, WATER LOSS CONTROL - CHICO	DEMAND REDUCTION [WISE]	1	1	0	0	0	0

DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	70	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	148
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	11	32	50
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	0	0	8	15	14
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	5	10	100	104	117
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	0	46	57	62
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	0	26	19	29
		4	**11**	**17**	**205**	**316**	**446**

COUNTY-OTHER, WISE, TRINITY (C)

CONSERVATION - WISE COUNTY	DEMAND REDUCTION [WISE]	12	24	35	67	108	156
CONSERVATION, WATER LOSS CONTROL - WISE COUNTY	DEMAND REDUCTION [WISE]	18	18	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	499	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,044
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	81	225	354
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	21	31	62	107	95
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	6	8	18	42	127
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	53	88	345	408	440
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	42	191	132	208
WISE COUNTY WSD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	467	421	356	1,098	1,671	2,083
		497	**543**	**560**	**1,862**	**3,192**	**4,507**

DECATUR, TRINITY (C)

CONSERVATION - DECATUR	DEMAND REDUCTION [WISE]	31	68	122	175	226	286
CONSERVATION, WATER LOSS CONTROL - DECATUR	DEMAND REDUCTION [WISE]	12	12	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1,447	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	4,622
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	748	1,296	1,566

TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	261	324	382	284	308	211
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	165	74	98	86	120	282
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	821	1,092	1,599	1,176	973
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	516	884	382	460
WISE COUNTY WSD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	644	502	401	623	737	795
		1,113	**1,801**	**2,611**	**4,399**	**5,692**	**9,195**

FORT WORTH, TRINITY (C)

CONSERVATION - FORT WORTH	DEMAND REDUCTION [WISE]	69	126	187	251	327	411
CONSERVATION, WATER LOSS CONTROL - FORT WORTH	DEMAND REDUCTION [WISE]	238	296	128	110	67	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	77	0
FORT WORTH ALLIANCE DIRECT REUSE	DIRECT REUSE [TARRANT]	0	40	118	136	152	166
FORT WORTH DIRECT REUSE	DIRECT REUSE [TARRANT]	11	13	13	16	17	19
FORT WORTH FUTURE DIRECT REUSE	DIRECT REUSE [TARRANT]	0	100	123	142	159	173
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	122	251	237	165	61
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,366
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	535	783	502
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	16	8	115	113	69	38
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	10	2	29	34	60	121
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	20	229	336	571	609
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	252	159	370	273
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	18	0
		344	**727**	**1,445**	**2,069**	**2,835**	**3,739**

IRRIGATION, WISE, TRINITY (C)

CONSERVATION, IRRIGATION - WISE COUNTY	DEMAND REDUCTION [WISE]	0	0	1	1	1	1
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	143	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	187
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	47	65	63

TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	248	108	74	36	31	17
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	158	25	20	11	12	23
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	273	212	201	117	79
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	100	111	38	37
		406	**406**	**407**	**407**	**407**	**407**

MANUFACTURING, WISE, TRINITY (C)

CONSERVATION, MANUFACTURING - WISE COUNTY	DEMAND REDUCTION [WISE]	0	0	1	1	1	1
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	436	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,480
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	204	390	502
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	59	99	78	92	68
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	14	26	23	36	90
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	150	283	437	354	312
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	134	242	115	147
WISE COUNTY MANUFACTURING NEW WELLS	TRINITY AQUIFER [WISE]	250	250	250	250	250	250
WISE COUNTY WSD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	128	143	147	169	175	176
		378	**616**	**940**	**1,404**	**1,849**	**3,026**

MINING, WISE, TRINITY (C)

SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,110
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	151	273	377
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	122	120	147	115	130	102
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	78	28	38	34	51	134
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	304	421	645	494	468
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	199	356	160	221
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	610	0
WISE COUNTY MINING REUSE	DIRECT REUSE [WISE]	0	0	87	1,234	2,401	4,022
		200	**452**	**892**	**2,535**	**4,119**	**6,434**

NEW FAIRVIEW, TRINITY (C)

CONSERVATION - NEW FAIRVIEW	DEMAND REDUCTION [WISE]	1	1	2	4	6	8
CONSERVATION, WATER LOSS CONTROL - NEW FAIRVIEW	DEMAND REDUCTION [WISE]	1	1	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	25	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	56
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	4	11	19
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	33	61	90	101	104
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	1	2	7
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	1	6	16	20	24
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	3	9	6	11
		2	**36**	**73**	**124**	**171**	**229**

NEWARK, TRINITY (C)

CONSERVATION - NEWARK	DEMAND REDUCTION [WISE]	1	2	3	6	11	17
CONSERVATION, WATER LOSS CONTROL - NEWARK	DEMAND REDUCTION [WISE]	1	1	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	67	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	166
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	8	29	56
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	50	126	196	266	301
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	2	5	20
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	1	14	35	53	70
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	6	20	17	33
		2	**54**	**150**	**267**	**448**	**663**

RHOME, TRINITY (C)

CONSERVATION - RHOME	DEMAND REDUCTION [WISE]	5	13	22	40	58	80
CONSERVATION, WATER LOSS CONTROL - RHOME	DEMAND REDUCTION [WISE]	2	2	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	180	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	417

SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	26	81	141
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	3	12	19	38	38
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	3	6	15	51
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	8	36	109	146	176
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	17	60	48	83
		7	**27**	**90**	**260**	**566**	**986**

RUNAWAY BAY, TRINITY (C)

CONSERVATION - RUNAWAY BAY	DEMAND REDUCTION [WISE]	5	9	13	17	22	28
CONSERVATION, WATER LOSS CONTROL - RUNAWAY BAY	DEMAND REDUCTION [WISE]	2	2	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	68	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	127
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	15	31	43
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	7	13	12	15	12
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	4	4	6	16
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	17	37	65	55	53
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	17	36	18	25
		7	**36**	**84**	**149**	**215**	**304**

STEAM ELECTRIC POWER, WISE, TRINITY (C)

DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	429	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	734
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	82	192	249
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	35	81	63	90	67
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	8	21	19	36	90
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	88	230	353	347	309
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	109	195	113	146
		0	**131**	**441**	**712**	**1,207**	**1,595**

WALNUT CREEK SUD, TRINITY (C)

CONSERVATION - WALNUT CREEK SUD	DEMAND REDUCTION [WISE]	1	3	5	7	14	22
CONSERVATION, WATER LOSS CONTROL - WALNUT CREEK SUD	DEMAND REDUCTION [WISE]	1	2	0	0	0	0
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	3	4	5	10	33
		2	**8**	**9**	**12**	**24**	**55**

WEST WISE SUD, TRINITY (C)

CONSERVATION - WEST WISE SUD	DEMAND REDUCTION [WISE]	1	3	4	6	7	9
CONSERVATION, WATER LOSS CONTROL - WEST WISE SUD	DEMAND REDUCTION [WISE]	2	2	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	56	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	90
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	14	27	30
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	9	15	11	12	9
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	2	3	3	4	11
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	22	41	60	45	38
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	20	31	15	18
		3	**38**	**83**	**125**	**166**	**205**
Sum of Projected Water Management Strategies (acre-feet)		**3,001**	**5,083**	**8,285**	**15,907**	**23,868**	**35,587**

APPENDIX B

GAM Run 17-029 MAG: Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

GAM Run 19-018: Upper Trinity Groundwater Conservation District Groundwater Management Plan

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Groundwater Management Area 8

Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
January 19, 2018

STATE OF TEXAS
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GAM RUN 17-029 MAG: MODELED AVAILABLE GROUNDWATER FOR THE TRINITY, WOODBINE, EDWARDS (BALCONES FAULT ZONE), MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 8

Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
January 19, 2018

EXECUTIVE SUMMARY:

The Texas Water Development Board (TWDB) has calculated the modeled available groundwater estimates for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Groundwater Management Area 8. The modeled available groundwater estimates are based on the desired future conditions for these aquifers adopted by groundwater conservation district representatives in Groundwater Management Area 8 on January 31, 2017. The district representatives declared the Nacatoch, Blossom, and Brazos River Alluvium aquifers to be non-relevant for purposes of joint planning. The TWDB determined that the explanatory report and other materials submitted by the district representatives were administratively complete on November 2, 2017.

The modeled available groundwater values for the following relevant aquifers in Groundwater Management Area 8 are summarized below:

- Trinity Aquifer (Paluxy) – The modeled available groundwater ranges from approximately 24,500 to 24,600 acre-feet per year between 2010 and 2070, and is

summarized by groundwater conservation districts and counties in Table 1, and by river basins, regional planning areas, and counties in Table 13.

- Trinity Aquifer (Glen Rose) – The modeled available groundwater is approximately 12,700 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in Table 2, and by river basins, regional planning areas, and counties in Table 14.
- Trinity Aquifer (Twin Mountains) – The modeled available groundwater ranges from approximately 40,800 to 40,900 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in Table 3, and by river basins, regional planning areas, and counties in Table 15.
- Trinity Aquifer (Travis Peak) – The modeled available groundwater ranges from approximately 93,800 to 94,000 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in in Table 4, and by river basins, regional planning areas, and counties in Table 16.
- Trinity Aquifer (Hensell) – The modeled available groundwater is approximately 27,300 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 5, and by river basins, regional planning areas, and counties in Table 17.
- Trinity Aquifer (Hosston) – The modeled available groundwater ranges from approximately 64,900 to 65,100 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 6, and by river basins, regional planning areas, and counties in Table 18.
- Trinity Aquifer (Antlers) – The modeled available groundwater ranges from approximately 74,500 to 74,700 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in Table 7, and by river basins, regional planning areas, and counties in Table 19.
- Woodbine Aquifer – The modeled available groundwater is approximately 30,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 8, and by river basins, regional planning areas, and counties in Table 20.
- Edwards (Balcones Fault Zone) Aquifer – The modeled available groundwater is 15,168 acre-feet per year from 2010 to 2060, and is summarized by groundwater conservation districts and counties in Table 9, and by river basins, regional planning areas, and counties in Table 21.

- Marble Falls Aquifer – The modeled available groundwater is approximately 5,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 10, and by river basins, regional planning areas, and counties in Table 22.
- Ellenburger-San Saba Aquifer – The modeled available groundwater is approximately 14,100 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in Table 11, and by river basins, regional planning areas, and counties in Table 23.
- Hickory Aquifer – The modeled available groundwater is approximately 3,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 12, and by river basins, regional planning areas, and counties in Table 24.

The modeled available groundwater values for the Trinity Aquifer (Paluxy, Glen Rose, Twin Mountains, Travis Peak, Hensell, Hosston, and Antlers subunits), Woodbine Aquifer, and Edwards (Balcones Fault Zone) Aquifer are based on the official aquifer boundaries defined by the TWDB. The modeled available groundwater values for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers are based on the modeled extent, as clarified by Groundwater Management Area 8 on October 9, 2017.

The modeled available groundwater values estimated for counties may be slightly different from those estimated for groundwater conservation districts because of the process for rounding the values. The modeled available groundwater values for the longer leap years (2020, 2040, and 2060) are slightly higher than shorter non-leap years (2010, 2030, 2050, and 2070).

REQUESTOR:

Mr. Drew Satterwhite, General Manager of North Texas Groundwater Conservation District and Groundwater Management Area 8 Coordinator.

DESCRIPTION OF REQUEST:

In a letter dated February 17, 2017, Mr. Drew Satterwhite provided the TWDB with the desired future conditions of the Trinity (Paluxy), Trinity (Glen Rose), Trinity (Twin Mountains), Trinity (Travis Peak), Trinity (Hensell), Trinity (Hosston), Trinity (Antlers), Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers. The desired future conditions were adopted as Resolution No. 2017-01 on January 31, 2017 by the groundwater conservation district representatives in

Groundwater Management Area 8. The following sections present the adopted desired future conditions for these aquifers:

Trinity and Woodbine Aquifers

The desired future conditions for the Trinity and Woodbine aquifers are expressed as water level decline or drawdown in feet over the planning period 2010 to 2070 relative to the baseline year 2009, based on a predictive simulation by Beach and others (2016).

The county-based desired future conditions for the Trinity Aquifer subunits, excluding counties in the Upper Trinity Groundwater Conservation District, are listed below (dashes indicate areas where the subunits do not exist and therefore no desired future condition was proposed):

County	Adopted Desired Future Condition (feet of drawdown below 2009 levels)							
	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	19	83	—	300	137	330	—
Bosque	—	6	49	—	167	129	201	—
Brown	—	—	2	—	1	1	1	2
Burnet	—	—	2	—	16	7	20	—
Callahan	—	—	—	—	—	—	—	1
Collin	459	705	339	526	—	—	—	570
Comanche	—	—	1	—	2	2	3	9
Cooke	2		—	—	—		—	176
Coryell	—	7	14	—	99	66	130	—
Dallas	123	324	263	463	348	332	351	—
Delta	—	264	181	—	186	—	—	—
Denton	22	552	349	716	—	—	—	395
Eastland	—	—	—	—	—	—	—	3
Ellis	61	107	194	333	301	263	310	—
Erath	—	1	5	6	19	11	31	12
Falls	—	144	215	—	462	271	465	—
Fannin	247	688	280	372	269	—	—	251
Grayson	160	922	337	417	—	—	—	348
Hamilton	—	2	4	—	24	13	35	—
Hill	20	38	133	—	298	186	337	—
Hunt	598	586	299	370	324	—	—	—

County	Adopted Desired Future Condition (feet of drawdown below 2009 levels)							
	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Johnson	2	-61	58	156	179	126	235	—
Kaufman	208	276	269	381	323	309	295	—
Lamar	38	93	97	—	114	—	—	122
Lampasas	—	—	1	—	6	1	11	—
Limestone	—	178	271	—	392	183	404	—
McLennan	6	35	133	—	471	220	542	—
Milam	—	—	212	—	345	229	345	—
Mills	—	1	1	—	7	2	13	—
Navarro	92	119	232	—	290	254	291	—
Red River	2	21	36	—	51	—	—	13
Rockwall	243	401	311	426	—	—	—	—
Somervell	—	1	4	31	51	26	83	—
Tarrant	7	101	148	315	—	—	—	148
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	85	—	141	50	146	—
Williamson	—	—	77	—	173	74	177	—

The desired future conditions for the counties in the Upper Trinity Groundwater Conservation District are further divided into outcrop and downdip areas, and are listed below (dashes indicate areas where the subunits do not exist):

Upper Trinity GCD County (crop)	Adopted Desired Future Conditions (feet of drawdown below 2009 levels)			
	Antlers	Paluxy	Glen Rose	Twin Mountains
Hood (outcrop)	—	5	7	4
Hood (downdip)	—	—	28	46
Montague (outcrop)	18	—	—	—
Montague (downdip)	—	—	—	—
Parker (outcrop)	11	5	10	1
Parker (downdip)	—	1	28	46
Wise (outcrop)	34	—	—	—
Wise (downdip)	142	—	—	—

Edwards (Balcones Fault Zone) Aquifer

The desired future conditions adopted by Groundwater Management Area 8 for the Edwards (Balcones Fault Zone) Aquifer are intended to maintain minimum stream and spring flows under the drought of record in Bell, Travis, and Williamson counties over the planning period 2010 to 2070. The desired future conditions are listed below:

County	Adopted Desired Future Condition
Bell	Maintain at least 100 acre-feet per month of stream/spring flow in Salado Creek during a repeat of the drought of record
Travis	Maintain at least 42 acre-feet per month of aggregated stream/spring flow during a repeat of the drought of record
Williamson	Maintain at least 60 acre-feet per month of aggregated stream/spring flow during a repeat of the drought of record

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

The desired future conditions for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties are intended to maintain 90 percent of the aquifer saturated thickness over the planning period 2010 to 2070 relative to the baseline year 2009.

Supplemental Information from Groundwater Management Area 8

After review of the explanatory report and model files, the TWDB emailed a request for clarifications to Mr. Drew Satterwhite on August 7, 2017. On September 8, 2017, Mr. Satterwhite provided the TWDB with a technical memorandum from James Beach, Jeff Davis, and Brant Konetchy of LBG-Guyton Associates. On October 9, 2017, Mr. Satterwhite sent the TWDB two emails with additional information and clarifications. The information and clarifications are summarized below:

a. For the Trinity and Woodbine aquifers, an additional error tolerance defined as five feet of drawdown between the adopted desired future condition and the simulated drawdown is included with the original error tolerance of five percent. Thus, if the drawdown from the predictive simulation is within five feet or five percent from the desired future condition, then the predictive simulation is considered to meet the desired future condition.

   Groundwater Management Area 8 provided a new MODFLOW-NWT well package, simulated head file, and simulated budget file on October 9, 2017. The TWDB determined that the distribution of pumping in the new model files was consistent with the explanatory report.

The TWDB evaluates if the simulated drawdown from the predictive simulation meets the desired future condition by county. However, Groundwater Management Area 8 also provided desired future conditions based on groundwater conservation district and the whole groundwater management area.

b. For the Edwards (Balcones Fault Zone) Aquifer in Bell, Travis, and Williamson counties, the coordinator for Groundwater Management Area 8 clarified that TWDB uses GAM Run 08-010 MAG by Anaya (2008) from the last cycle of desired future conditions with all associated assumptions including a baseline year of 2000.

c. For the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties, Groundwater Management Area 8 adjusted the desired future condition from "maintain 90 percent of the saturated thickness" to "maintain *at least* 90 percent of the saturated thickness". Groundwater Management Area 8 also provided estimated pumping to use for the predictive simulation by TWDB.

d. The Trinity, Woodbine, and Edwards (Balcones Fault Zone) aquifers are based on the official aquifer boundary while the Marble Falls, Ellenburger-San Saba, and Hickory aquifers include the portions both inside and outside the official aquifer boundaries (modeled extent).

e. The sliver of the Edwards-Trinity (Plateau) Aquifer was declared to be non-relevant by Groundwater Management Area 8.

METHODS:

The desired future conditions for Groundwater Management Area 8 are based on multiple criteria. For the Trinity and Woodbine aquifers, the desired future conditions are defined as water-level declines or drawdowns over the course of the planning period 2010 through 2070 relative to the baseline year 2009. The desired future conditions for the Edwards (Balcones Fault Zone) Aquifer are based on stream and spring flows under the drought of record over the planning period 2010 to 2070. For the Marble Falls, Ellenburger-San Saba, and Hickory aquifers, the desired future conditions are to maintain aquifer saturated thickness between 2010 and 2070 relative to the baseline year 2009. The methods to calculate the desired future conditions are discussed below.

Trinity and Woodbine Aquifers

The desired future conditions for the Trinity and Woodbine aquifers in Groundwater Management Area 8 are based on a predictive simulation by Beach and others (2016), which used the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014). The predictive simulation contained 61 annual stress periods corresponding to 2010 through 2070, with an initial head equal to 2009 of the calibrated groundwater availability model. The desired future conditions are the drawdowns between 2009 and 2070.

Because the baseline year 2009 for the desired future conditions falls within the calibration period 1890 to 2012 of the groundwater availability model, the water levels for the baseline year have been calibrated to observed data and, thus, they were directly used as the initial water level (head) condition of the predictive simulation.

The drawdowns between 2009 and 2070 are calculated from composite heads. Appendix A presents additional details on methods used to calculate composite head and associated average drawdown values for the Trinity and Woodbine aquifers.

Edwards (Balcones Fault Zone) Aquifer

Per Groundwater Management Area 8 (clarification dated September 1, 2017), the results from GAM Run 08-010 MAG by Anaya (2008) are used for the current round of joint planning. The following summarizes the approach used:

- Ran the model for 141 years, starting with a 100-year initial stress period (pre-1980) followed by 21 years of historical monthly stress periods (1980 to 2000), then 10 years of predictive annual stress periods (2001 to 2010), and ending with 10 years of predictive monthly stress periods (2011 to 2020) to represent a simulated repeat of the 1950s' drought of record.

- Used pumpage and recharge distributions provided to TWDB by the Groundwater Management Area 8 consultant.

- Adjusted pumpage in Williamson County to meet the desired future conditions.

- Extracted projected discharge for drain cells representing Salado Creek in Bell County and drain cells representing aggregated springs and streams in Williamson and Travis counties, respectively, for each of the stress periods from 2011 through 2020 to verify that the desired future conditions were met.

- Determined which stress period reflected the worst case monthly scenario for Salado Springs during a repeat of the 1950s' drought of record.
- Generated modeled available groundwater for all three desired future conditions based on the lowest monthly springflow volume for Salado Springs during a simulated repeat of the 1950s' drought of record.

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

The TWDB constructed a predictive simulation to analyze the desired future conditions for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties within Groundwater Management Area 8. This simulation used the groundwater availability model for the minor aquifers in the Llano Uplift region by Shi and others (2016). The predictive simulation contains 61 annual stress periods corresponding to the planning period 2010 through 2070 with an initial head condition from 2009.

Because the baseline year 2009 for the desired future conditions falls within the model calibration period 1980 to 2010, and the water levels for the baseline year have been calibrated to observed data, the simulated head from 2009 of the calibrated groundwater availability model was directly used as the initial water level (head) condition of the predictive simulation.

Additional details on the predictive simulation and methods to estimate the drawdowns between 2009 and 2070 are described in Appendix B.

Modeled Available Groundwater

Once the predictive simulations met the desired future conditions, the modeled available groundwater values were extracted from the MODFLOW cell-by-cell budget files. Annual pumping rates were then divided by county, river basin, regional water planning area, and groundwater conservation district within Groundwater Management Area 8 (Figures 1 through 13 and Tables 1 through 24).

Modeled Available Groundwater and Permitting

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

PARAMETERS AND ASSUMPTIONS:

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

Trinity and Woodbine Aquifers

- Version 2.01 of the updated groundwater availability model for the northern Trinity and Woodbine aquifers by Kelley and others (2014) was used to construct the predictive model simulation for this analysis (Beach and others, 2016).
- The predictive model was run with MODFLOW-NWT (Niswonger and others, 2011).
- The model has eight layers that represent units younger than the Woodbine Aquifer and the shallow outcrop of all aquifers (Layer 1), the Woodbine Aquifer (Layer 2), the Fredericksburg and Washita units (Layer 3), and various combinations of the subunits that comprise the Trinity Aquifer (Layers 4 to 8).
- Multiple model layers could represent an aquifer where it outcrops. For example, the Woodbine Aquifer could span Layers 1 to 2 and the Trinity Aquifer (Hosston) could contain Layers 1 through 8. The aquifer designation in model layers was defined in the model grid files produced by TWDB.
- The predictive model simulation contains 61 transient annual stress periods with an initial head equal to 2009 of the calibrated groundwater availability model.
- The predictive simulation had the same hydrogeological properties and hydraulic boundary conditions as the calibrated groundwater availability model except groundwater recharge and pumping.
- The groundwater recharge for the predictive model simulation was the same as stress period 1 of the calibrated groundwater availability model (steady state period) except stress periods representing 2058 through 2060, which contained lower recharge representing severe drought conditions.
- In the predictive simulation, additional pumping was added to certain counties and some pumping in Layer 1 was moved to lower layer(s) to avoid the automatic pumping reduction enacted by the MODFLOW-NWT code (Beach and others, 2016).

- During the predictive simulation model run, some model cells went dry (Appendix C). Dry cells occur during a model run when the simulated water level in a cell falls below the bottom of the cell.
- Estimates of modeled drawdown and available groundwater from the model simulation were rounded to whole numbers.

Edwards (Balcones Fault Zone) Aquifer

- Version 1.01 of the groundwater availability model for the northern segment of the Edwards (Balcones Fault Zone) Aquifer (Jones, 2003) was used to construct the predictive model simulation for the analysis by Anaya (2008).
- The model has one layer that represents the Edwards (Balcones Fault Zone) Aquifer.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).
- The predictive model simulation contains the calibrated groundwater availability model (253 monthly stress periods), stabilization (10 annual stress periods), and drought conditions (120 monthly stress periods).
- The boundary conditions for the stabilization and drought periods (except recharge and pumping) were the same in the predictive simulation as the last stress period (stress period 253) of the calibrated groundwater availability model.
- The groundwater recharge for the stabilization and drought periods and pumping information were from Groundwater Management Area 8 consultant.
- The groundwater pumping in Williamson County was adjusted as needed during the predictive model run simulation to match the desired future conditions.
- Estimates of modeled spring and stream flows from the model simulation were rounded to whole numbers.

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

- Version 1.01 of the groundwater availability model for the minor aquifers in Llano Uplift region by Shi and others (2016) was used to develop the predictive model simulation used for this analysis.
- The model has eight layers: Layer 1 (the Trinity Aquifer, Edwards-Trinity (Plateau) Aquifer, and younger alluvium deposits), Layer 2 (confining units), Layer 3 (the Marble Falls Aquifer and equivalent unit), Layer 4 (confining units), Layer 5 (Ellenburger-San Saba Aquifer and equivalent unit), Layer 6 (confining units), Layer 7 (the Hickory Aquifer and equivalent unit), and Layer 8 (Precambrian units).

- The model was run with MODFLOW-USG beta (development) version (Panday and others, 2013).
- The predictive model simulation contains 61 annual stress periods (2010 to 2070) with the initial head equal to 2009 of the calibrated groundwater availability model.
- The boundary conditions for the predictive model except recharge and pumping were the same in the predictive simulation of the last stress period of the calibrated groundwater availability model.
- The groundwater recharge for the predictive model simulation was set equal to the average of all stress periods (1982 to 2010) of the calibrated model except the first stress period.
- The groundwater pumping was initially set to the last stress period of the calibrated groundwater availability model. Additional pumping per county was then added to the model cells of the three aquifers based on the modeled extent to match the total pumping data for each aquifer provided by Groundwater Management area 8.
- During the predictive model run, some active model cells went dry (Appendix D). Dry cells occur during a model run when the simulated water level in a cell falls below the bottom of the cell.
- Estimates of modeled saturated aquifer thickness values were rounded to one decimal point.

RESULTS:

The modeled available groundwater for the Trinity Aquifer (Paluxy) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 24,499 acre-feet per year for the non-leap (shorter) years (2010, 2030, 2050, and 2070) to 24,565 acre-feet per year for the leap (longer) years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 1. Table 13 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Glen Rose) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 12,701 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 12,736 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 2. Table 14 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Twin Mountains) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 40,827 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 40,939 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 3. Table 15 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Travis Peak) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 93,757 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 94,016 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 4. Table 16 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Hensell) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 27,257 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 27,331 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 5. Table 17 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Hosston) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 64,922 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 65,098 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 6. Table 18 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Antlers) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 74,471 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 74,677 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 7. Table 19 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Woodbine Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 30,554 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 30,636 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 8. Table 20 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Edwards (Balcones Fault Zone) Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 remains at 15,168 acre-feet per year from 2010 to 2060. The modeled available groundwater is summarized by groundwater conservation district and county in Table 9. Table 21 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Marble Falls Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 5,623 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 5,639 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 10. Table 22 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Ellenburger-San Saba Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 14,050 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 14,089 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 11. Table 23 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Hickory Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 3,574 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 3,585 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 12. Table 24 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

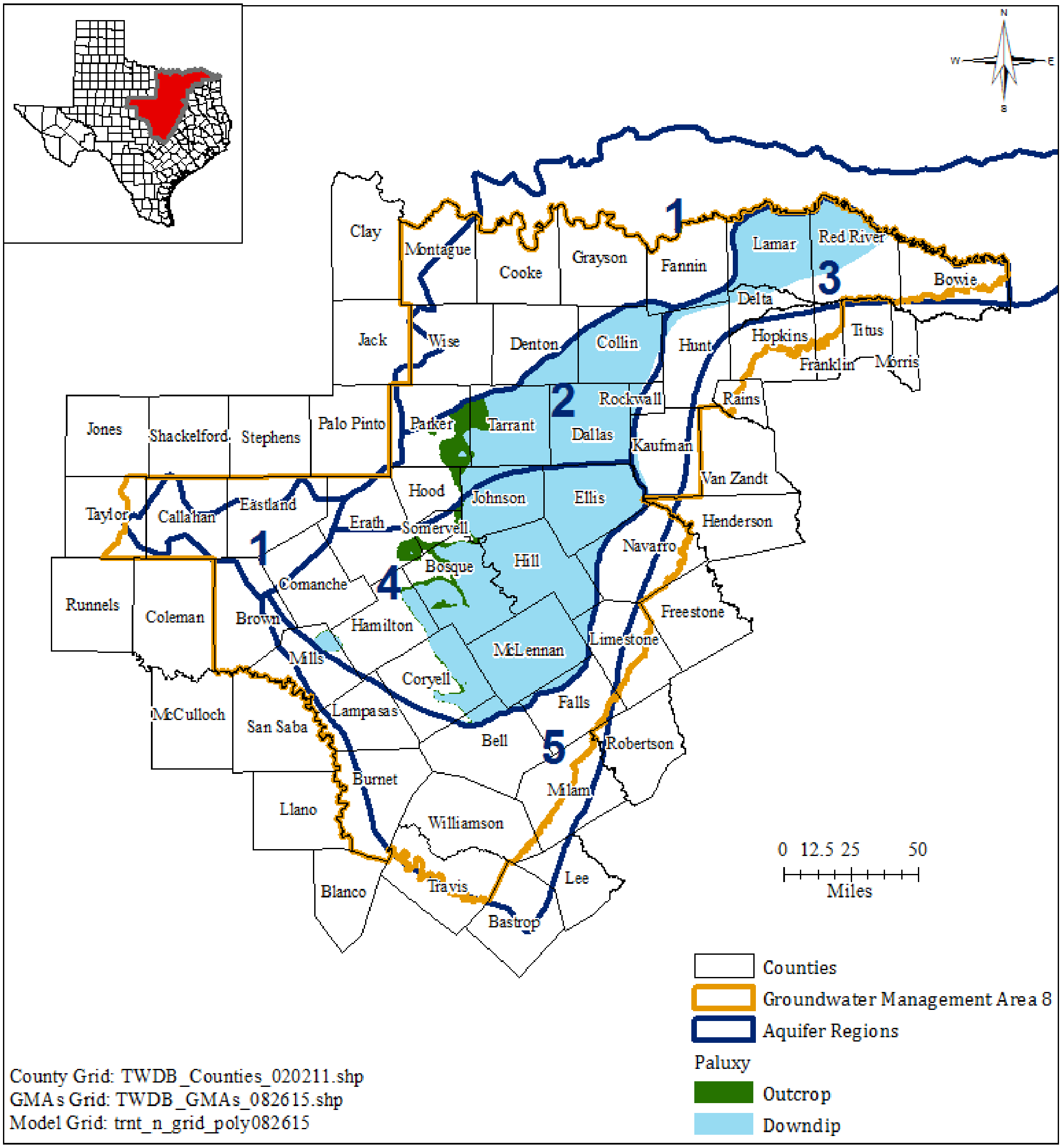

FIGURE 1. MAP SHOWING THE TRINITY AQUIFER (PALUXY) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

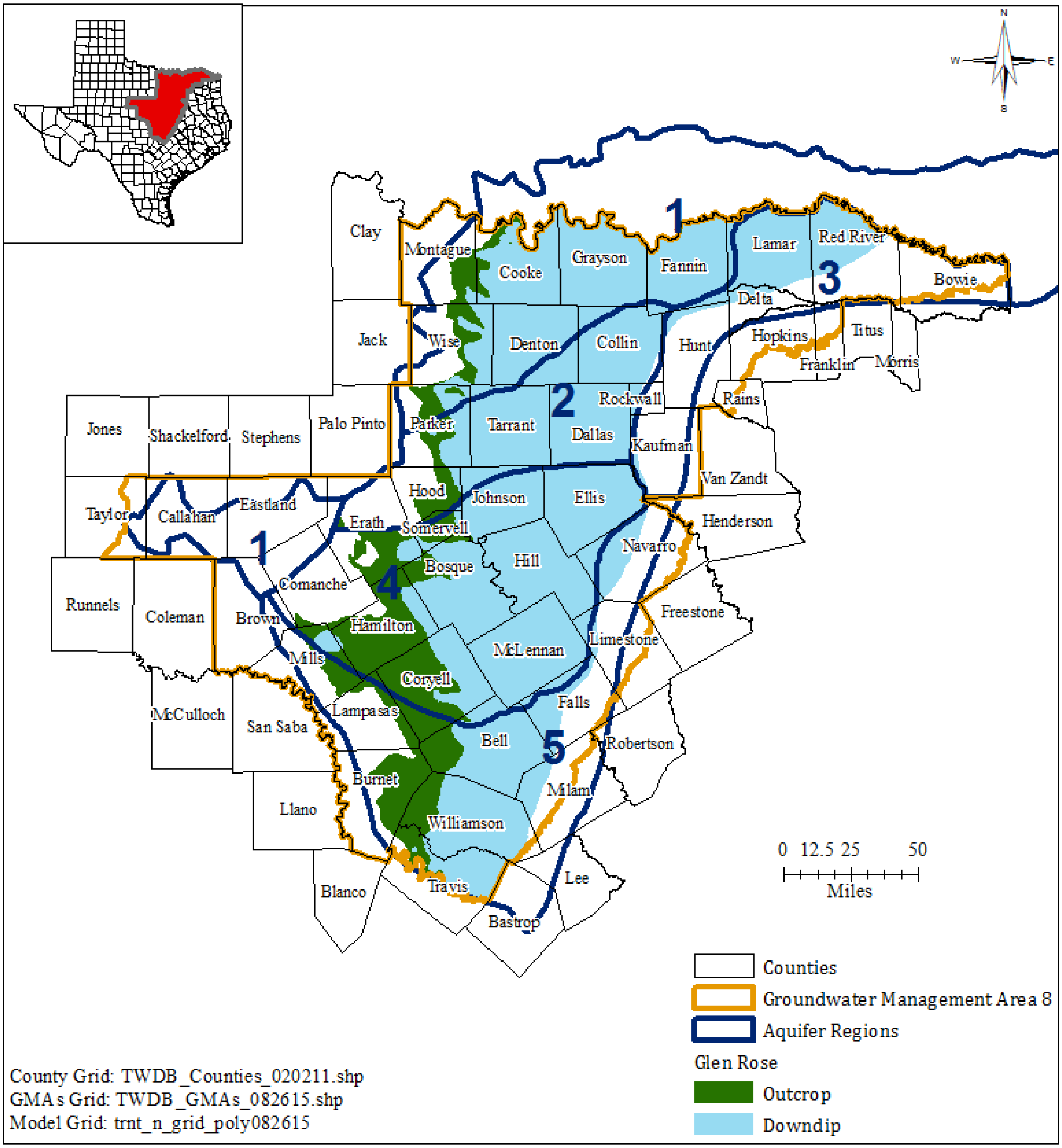

FIGURE 2. MAP SHOWING THE TRINITY AQUIFER (GLEN ROSE) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

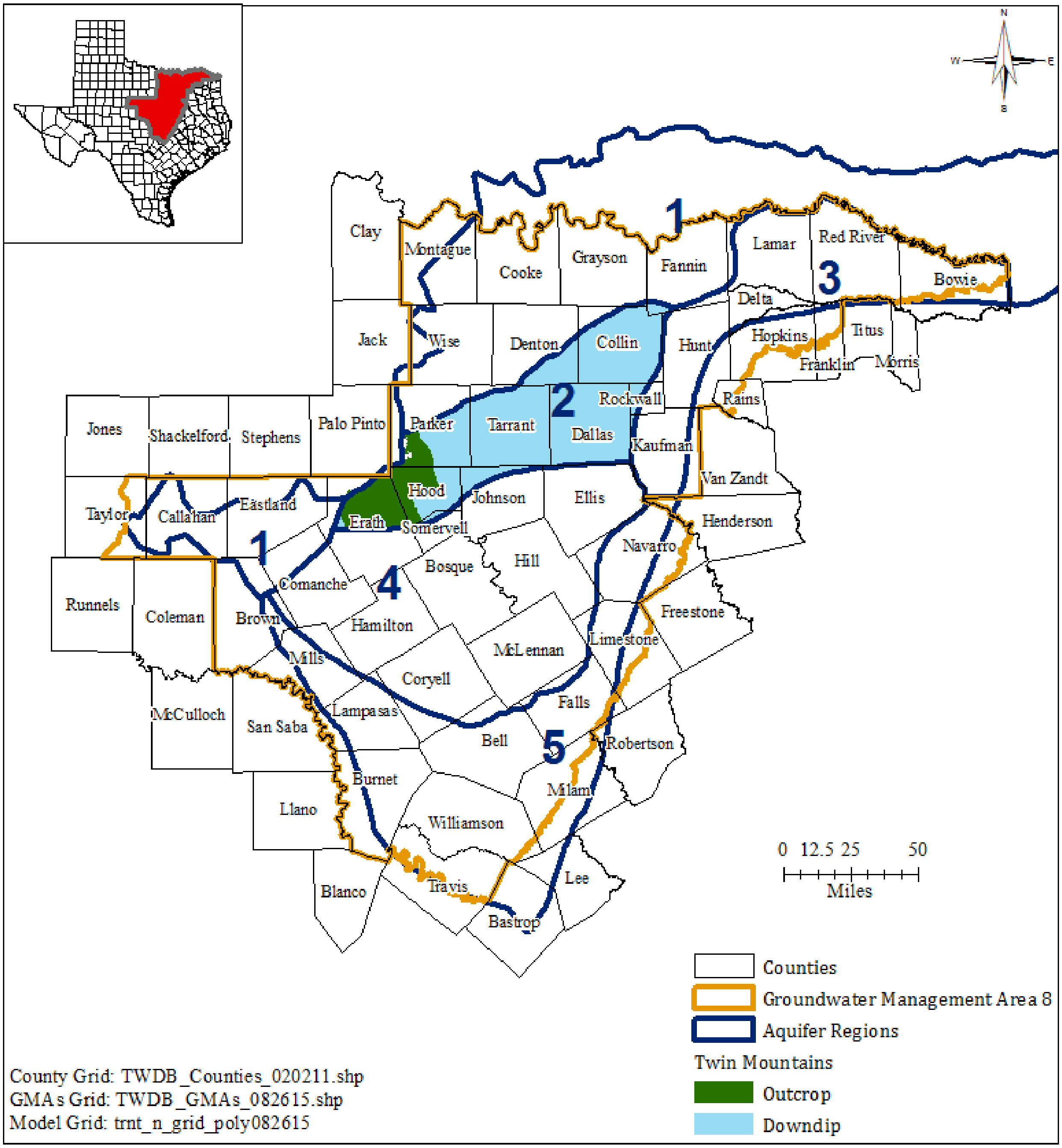

FIGURE 3. MAP SHOWING THE TRINITY AQUIFER (TWIN MOUNTAINS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

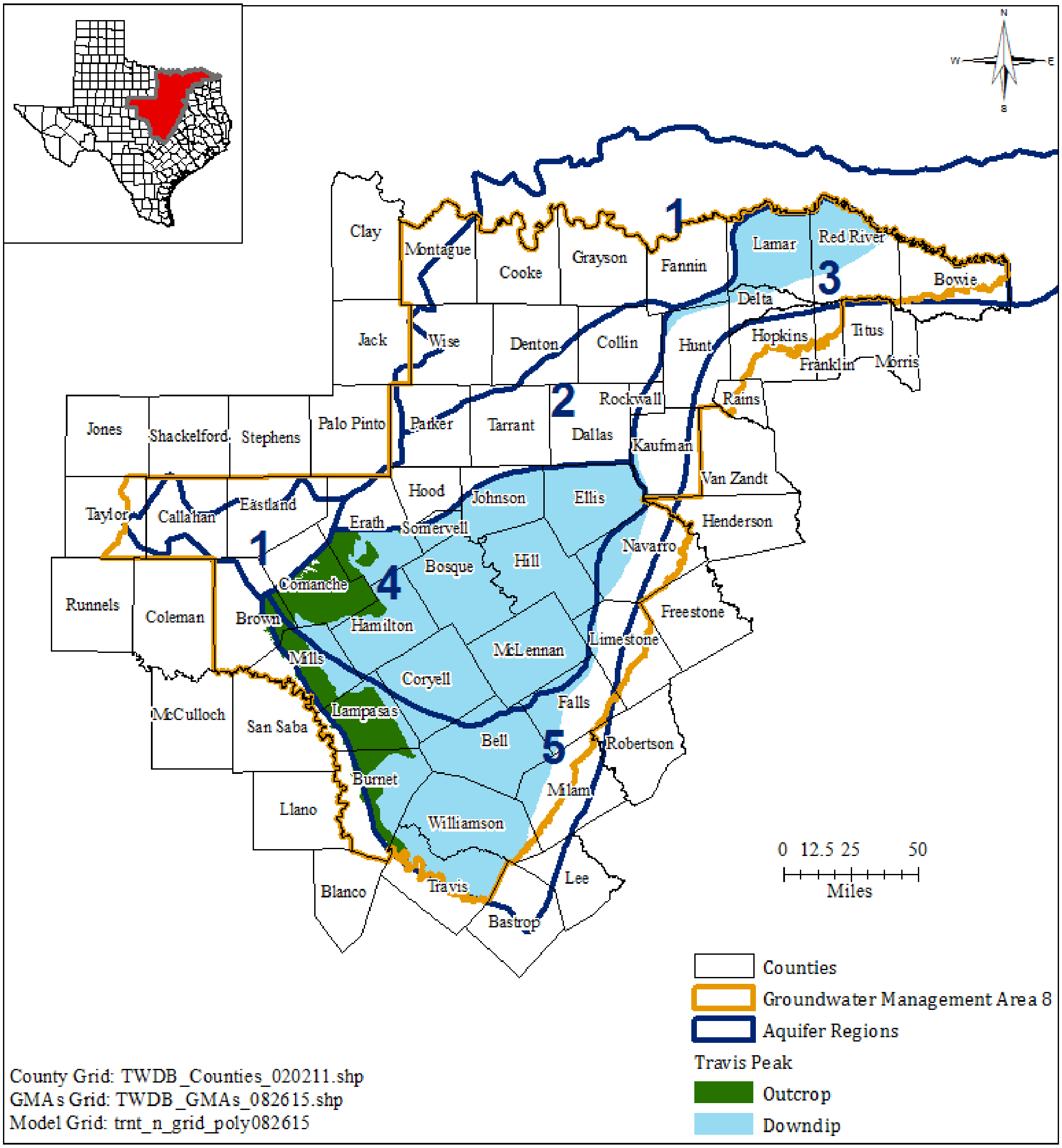

FIGURE 4. MAP SHOWING THE TRINITY AQUIFER (TRAVIS PEAK) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

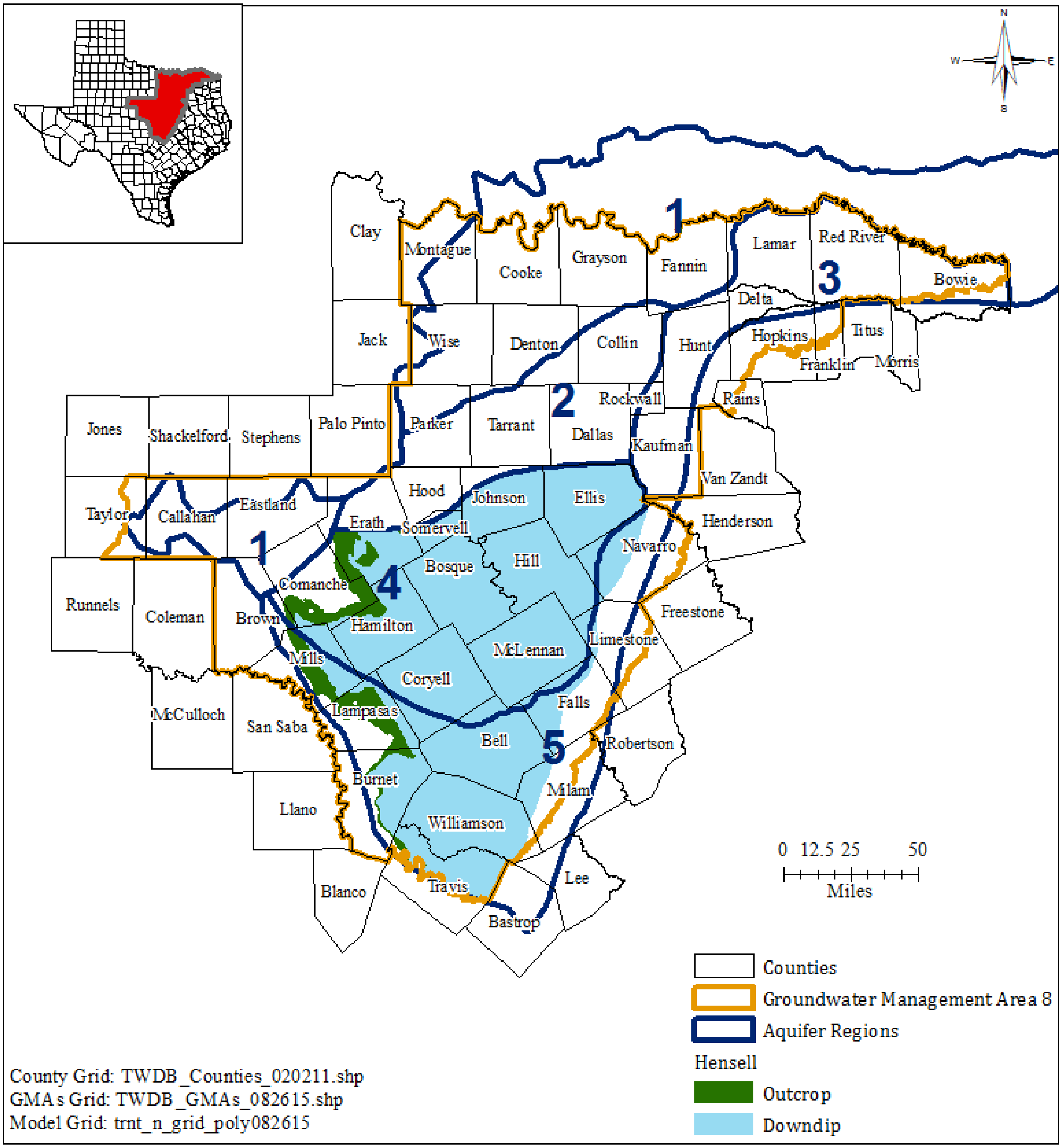

FIGURE 5. **MAP SHOWING THE TRINITY AQUIFER (HENSELL) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.**

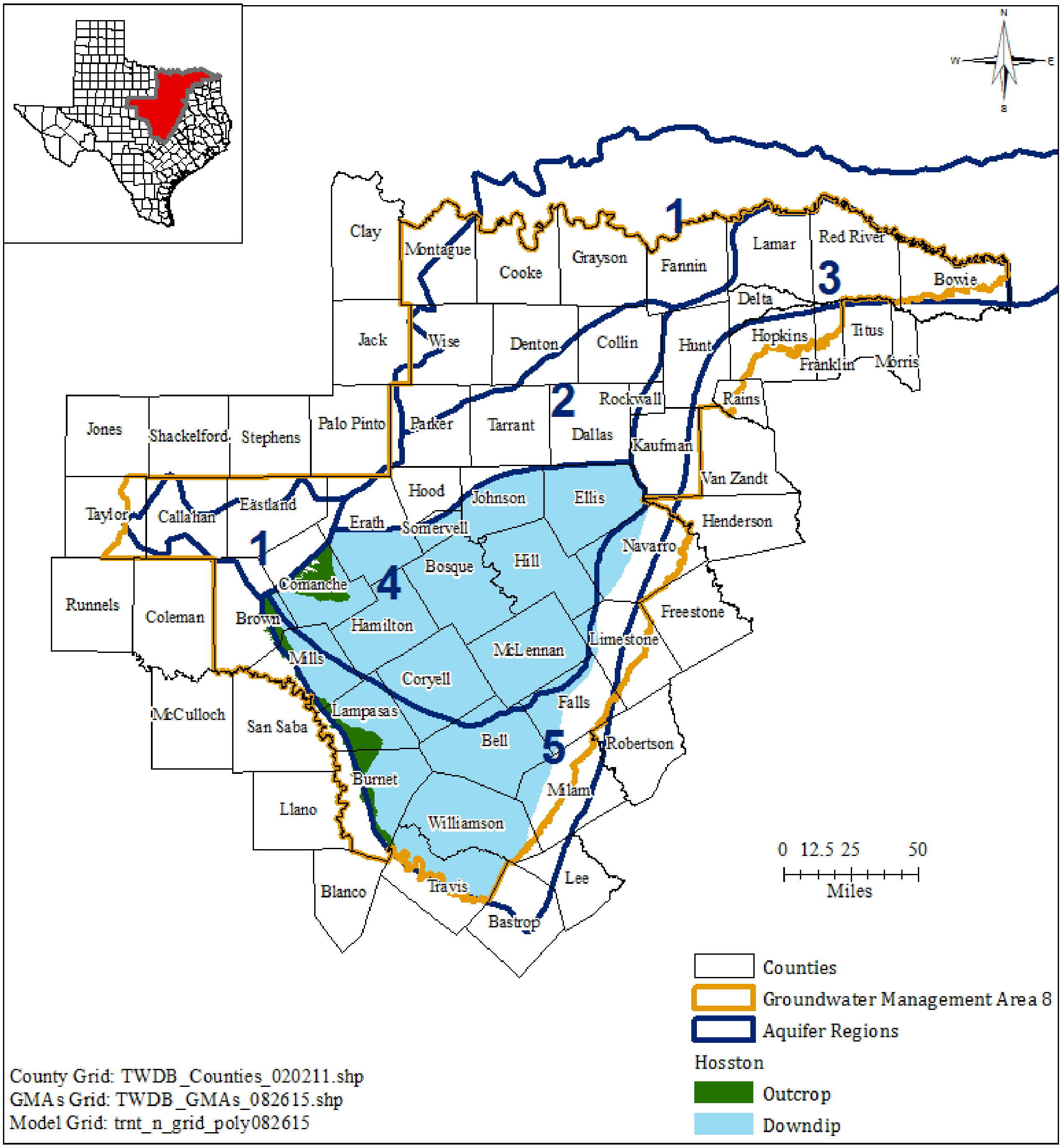

FIGURE 6. MAP SHOWING THE TRINITY AQUIFER (HOSSTON) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

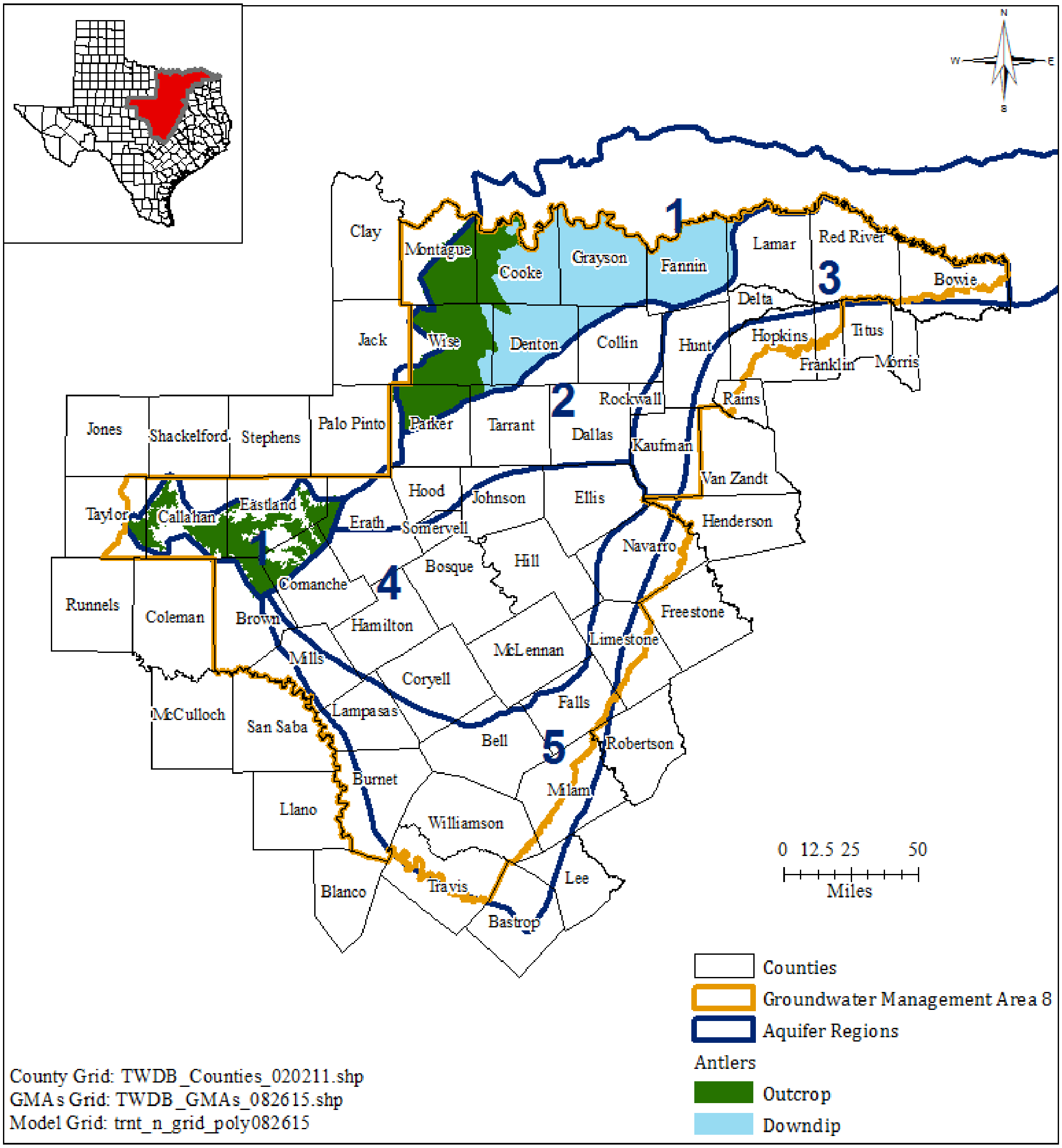

FIGURE 7. MAP SHOWING THE TRINITY AQUIFER (ANTLERS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

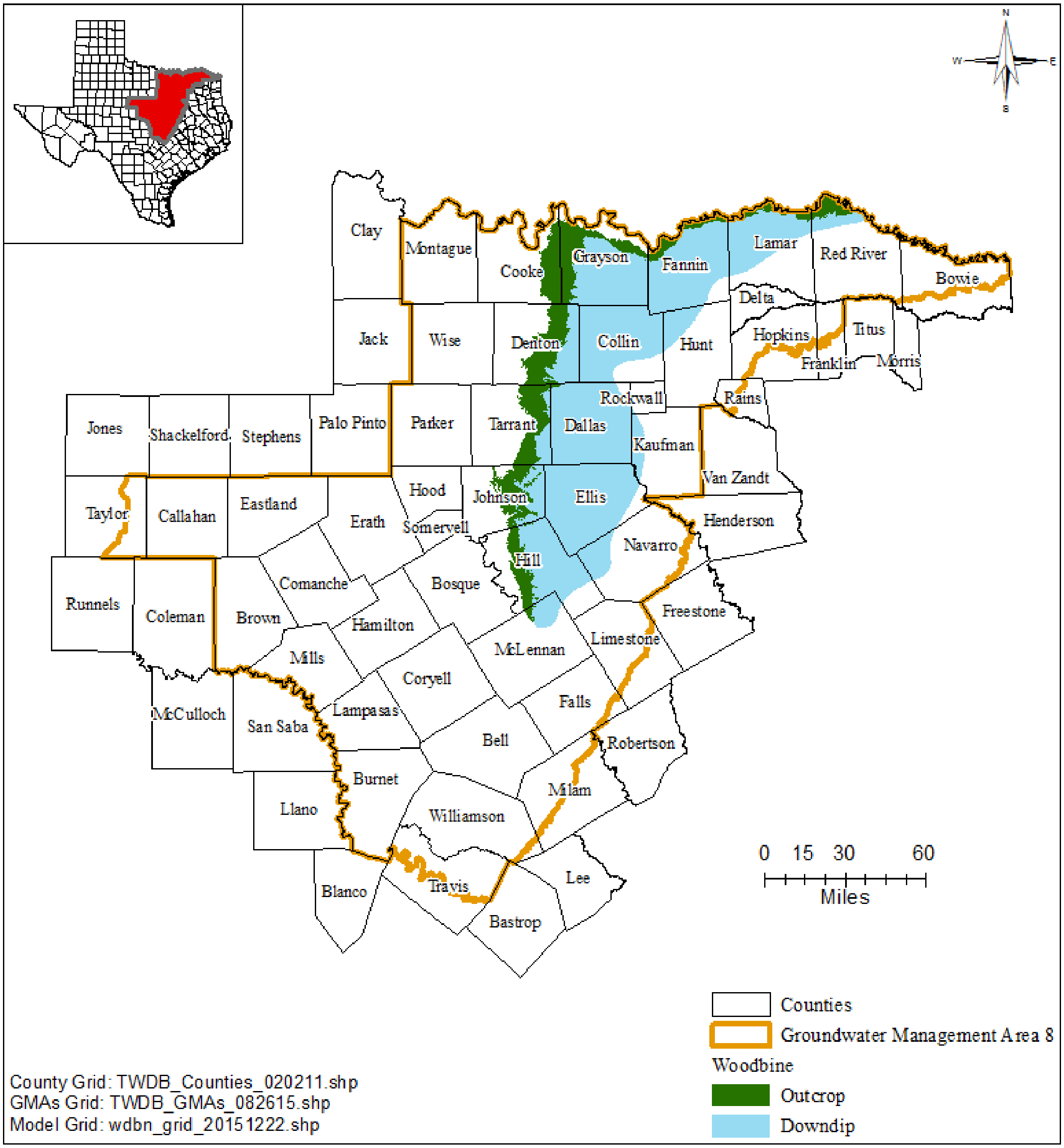

FIGURE 8. MAP SHOWING THE WOODBINE AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

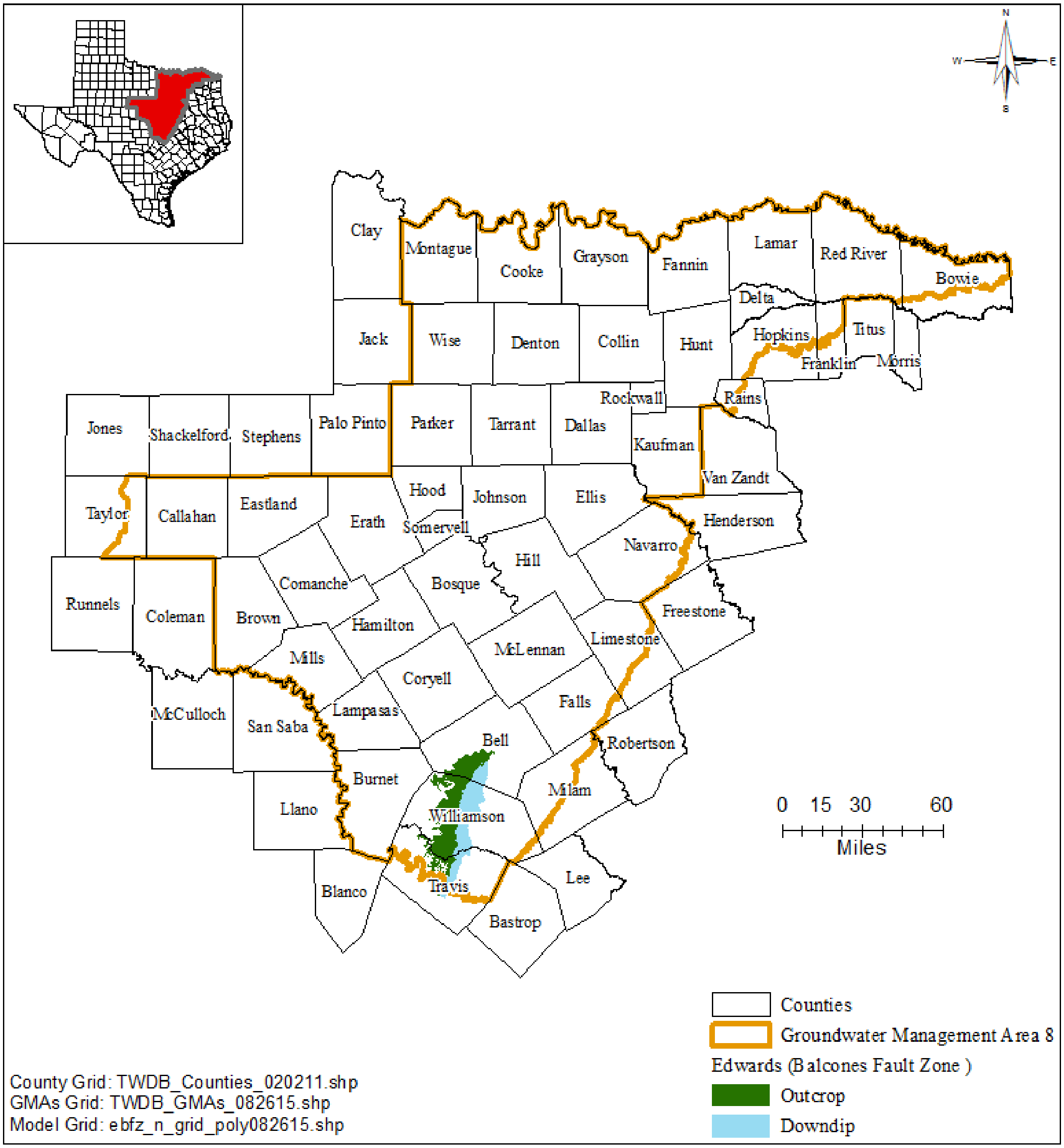

FIGURE 9. MAP SHOWING THE EDWARDS (BALCONES FAULT ZONE) AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER.

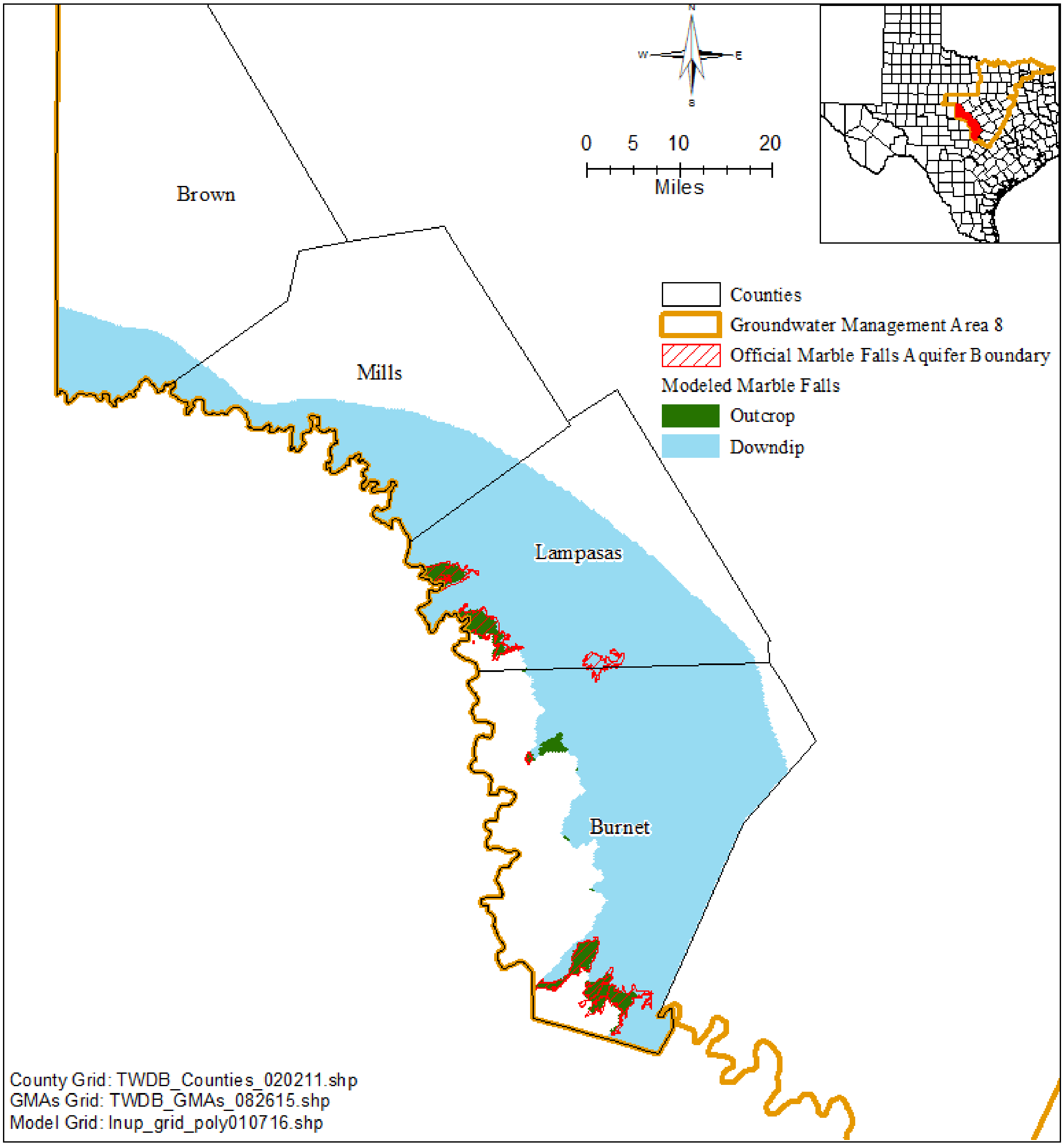

FIGURE 10. MAP SHOWING THE MARBLE FALLS AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

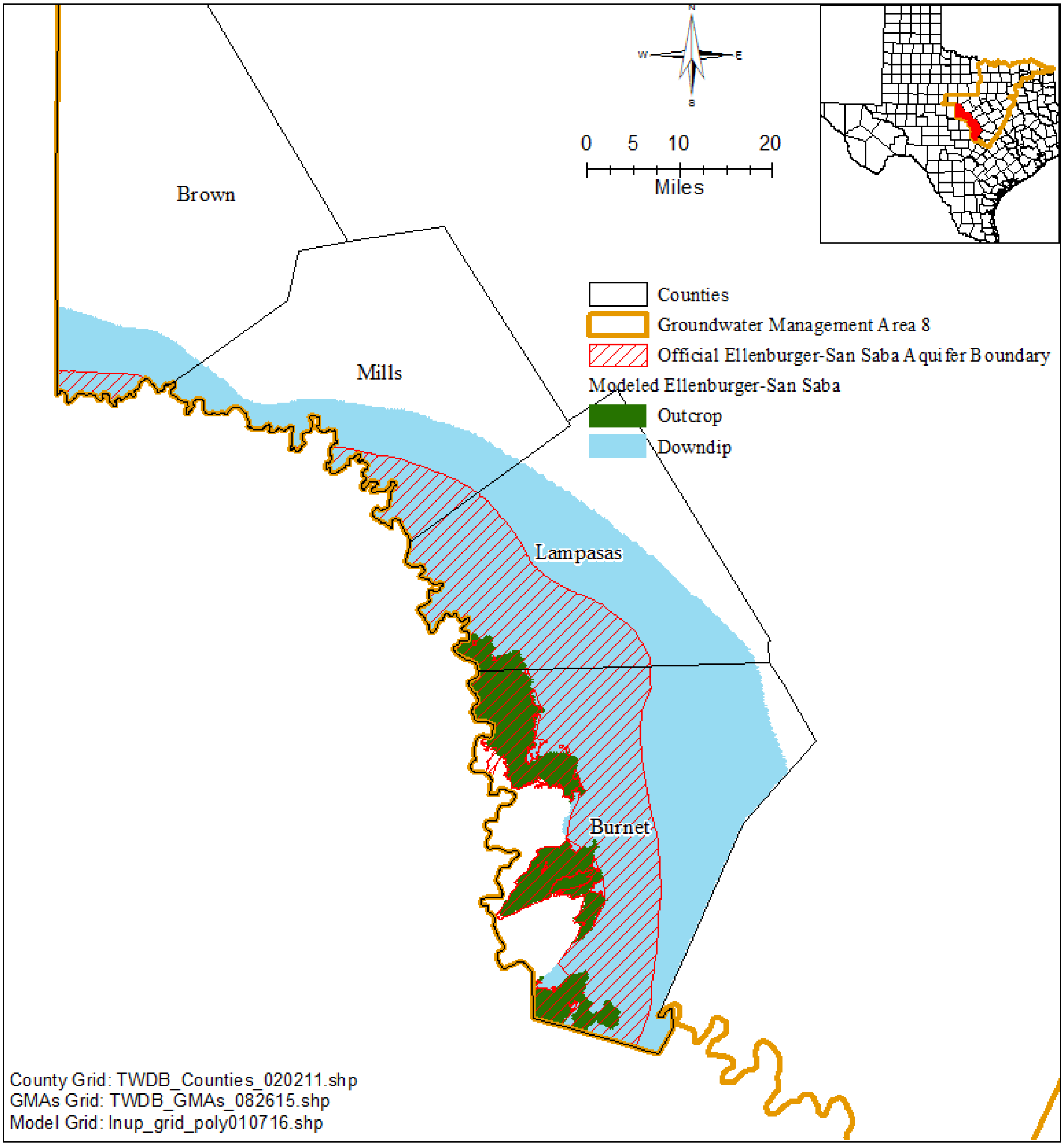

FIGURE 11. MAP SHOWING THE ELLENBURGER-SAN SABA AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

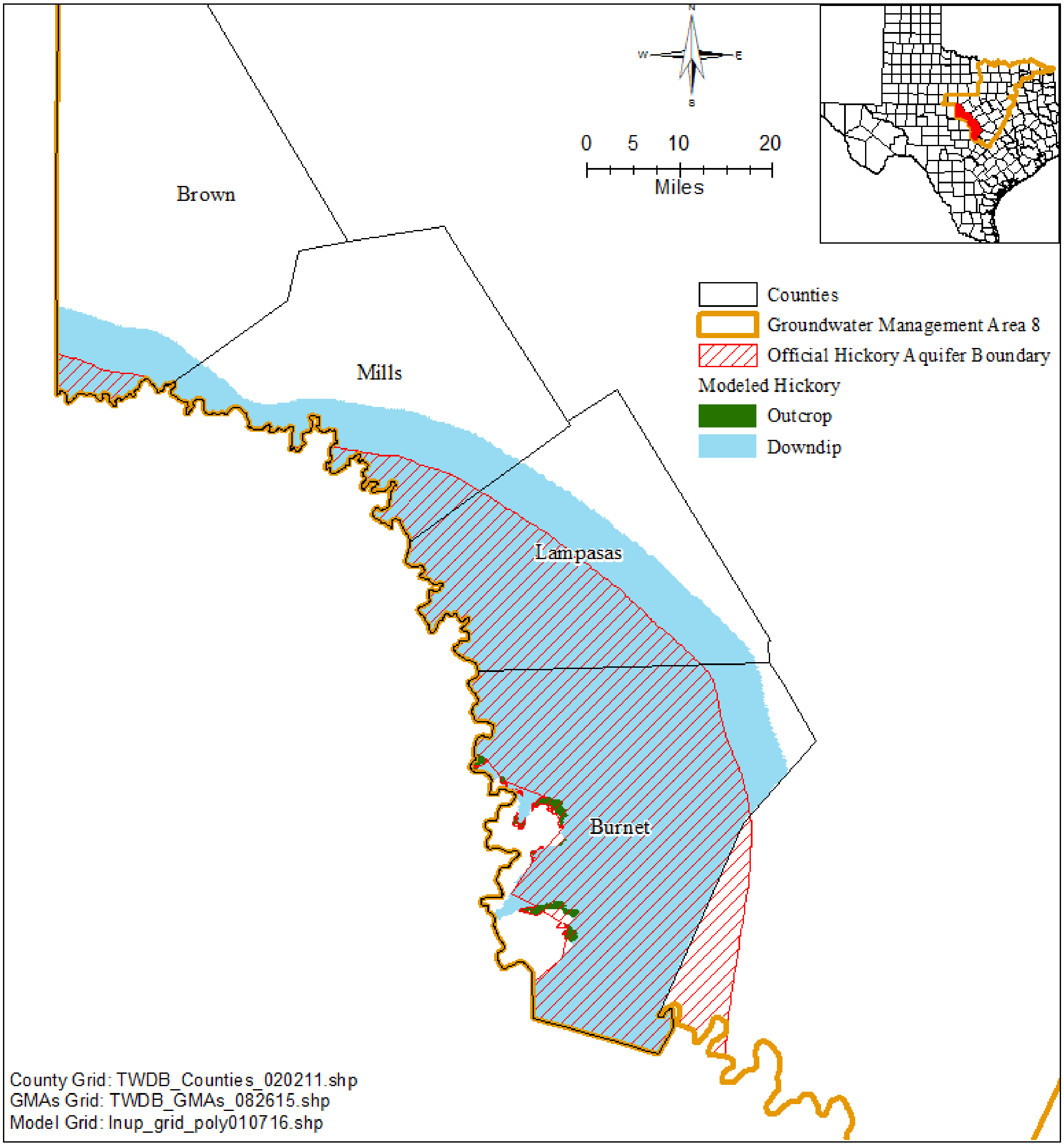

FIGURE 12. MAP SHOWING THE HICKORY AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

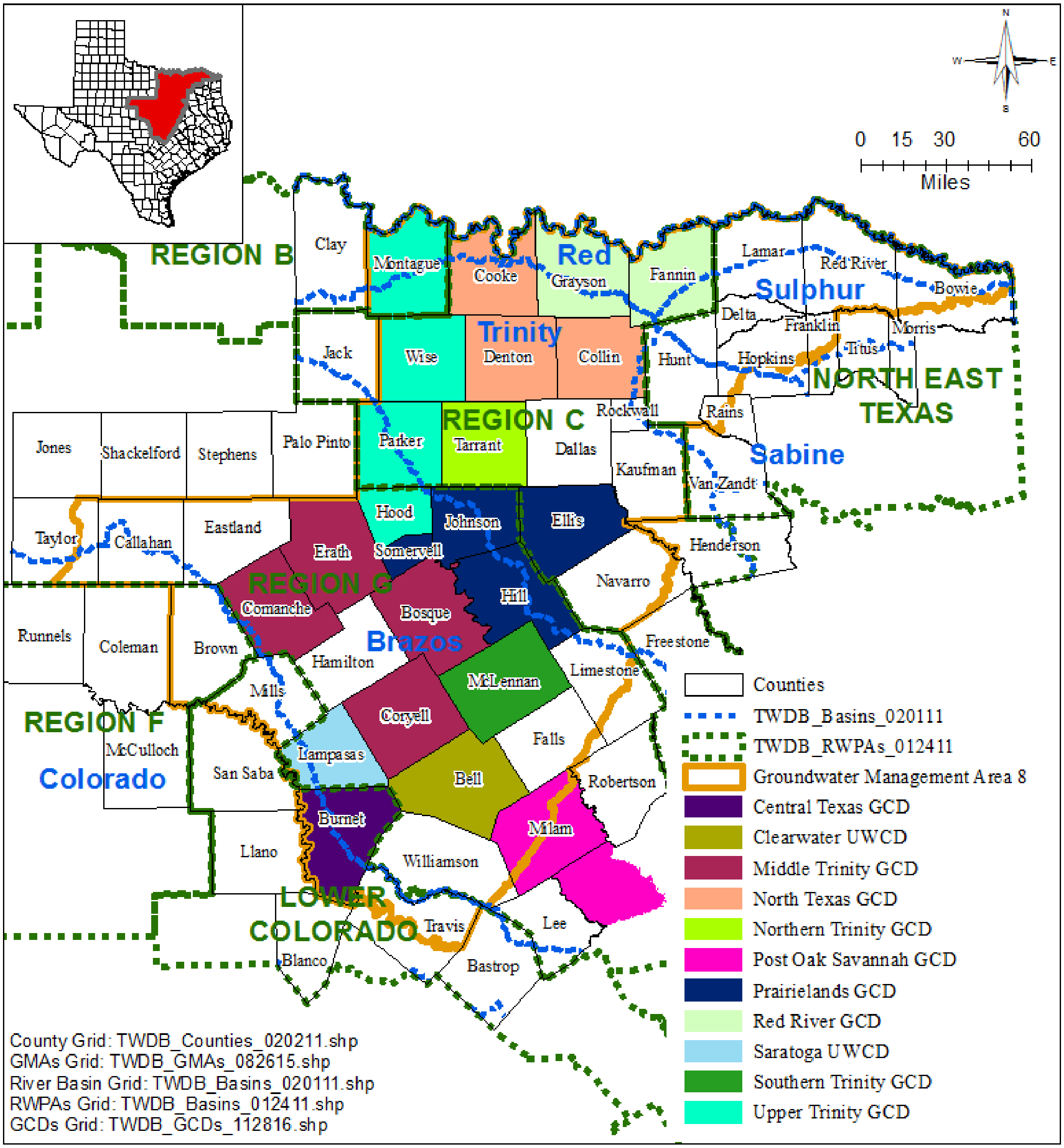

FIGURE 13. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND RIVER BASINS ASSOCIATED WITH GROUNDWATER MANAGEMENT AREA 8.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Clearwater UWCD	Bell	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Middle Trinity GCD	Bosque	204	356	358	356	358	356	358	356
Middle Trinity GCD	Coryell	0	0	0	0	0	0	0	0
Middle Trinity GCD	Erath	38	61	61	61	61	61	61	61
Middle Trinity GCD Total		**242**	**417**	**419**	**417**	**419**	**417**	**419**	**417**
North Texas GCD	Collin	616	1,547	1,551	1,547	1,551	1,547	1,551	1,547
North Texas GCD	Denton	1,532	4,819	4,832	4,819	4,832	4,819	4,832	4,819
North Texas GCD Total		**2,148**	**6,366**	**6,383**	**6,366**	**6,383**	**6,366**	**6,383**	**6,366**
Northern Trinity GCD	Tarrant	**11,285**	**8,957**	**8,982**	**8,957**	**8,982**	**8,957**	**8,982**	**8,957**
Prairielands GCD	Ellis	510	442	443	442	443	442	443	442
Prairielands GCD	Hill	400	352	353	352	353	352	353	352
Prairielands GCD	Johnson	4,851	2,440	2,447	2,440	2,447	2,440	2,447	2,440
Prairielands GCD	Somervell	3	14	14	14	14	14	14	14
Prairielands GCD Total		**5,764**	**3,248**	**3,257**	**3,248**	**3,257**	**3,248**	**3,257**	**3,248**
Red River GCD	Fannin	389	2,087	2,092	2,087	2,092	2,087	2,092	2,087
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		**389**	**2,087**	**2,092**	**2,087**	**2,092**	**2,087**	**2,092**	**2,087**
Southern Trinity GCD	McLennan	**319**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Upper Trinity GCD	Hood (outcrop)	106	159	159	159	159	159	159	159
Upper Trinity GCD	Parker (outcrop)	2,100	2,607	2,614	2,607	2,614	2,607	2,614	2,607
Upper Trinity GCD	Parker (downdip)	221	50	50	50	50	50	50	50
Upper Trinity GCD Total		**2,427**	**2,816**	**2,823**	**2,816**	**2,823**	**2,816**	**2,823**	**2,816**
No District	Dallas	231	358	359	358	359	358	359	358
No District	Delta	56	56	56	56	56	56	56	56
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	0	0	0	0	0	0	0	0
No District	Hunt	3	3	3	3	3	3	3	3
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	16	8	8	8	8	8	8	8

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	3	6	6	6	6	6	6	6
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	190	177	177	177	177	177	177	177
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		**499**	**608**	**609**	**608**	**609**	**608**	**609**	**608**
Groundwater Management Area 8		**23,073**	**24,499**	**24,565**	**24,499**	**24,565**	**24,499**	**24,565**	**24,499**

UWCD: Underground Water Conservation District.

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**35**	**423**	**425**	**423**	**425**	**423**	**425**	**423**
Clearwater UWCD	Bell	**775**	**971**	**974**	**971**	**974**	**971**	**974**	**971**
Middle Trinity GCD	Bosque	576	728	731	728	731	728	731	728
Middle Trinity GCD	Comanche	3	41	41	41	41	41	41	41
Middle Trinity GCD	Coryell	0	120	120	120	120	120	120	120
Middle Trinity GCD	Erath	263	1,078	1,081	1,078	1,081	1,078	1,081	1,078
Middle Trinity GCD Total		**842**	**1,967**	**1,973**	**1,967**	**1,973**	**1,967**	**1,973**	**1,967**
North Texas GCD	Collin	84	83	83	83	83	83	83	83
North Texas GCD	Denton	121	338	339	338	339	338	339	338
North Texas GCD Total		**205**	**421**	**422**	**421**	**422**	**421**	**422**	**421**
Northern Trinity GCD	Tarrant	**1,070**	**793**	**795**	**793**	**795**	**793**	**795**	**793**
Post Oak Savannah GCD	Milam	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prairielands GCD	Ellis	58	50	50	50	50	50	50	50
Prairielands GCD	Hill	116	115	115	115	115	115	115	115
Prairielands GCD	Johnson	1,780	1,632	1,636	1,632	1,636	1,632	1,636	1,632
Prairielands GCD	Somervell	81	146	146	146	146	146	146	146
Prairielands GCD Total		**2,035**	**1,943**	**1,947**	**1,943**	**1,947**	**1,943**	**1,947**	**1,943**
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Saratoga UWCD	Lampasas	**65**	**68**	**68**	**68**	**68**	**68**	**68**	**68**
Southern Trinity GCD	McLennan	**845**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Upper Trinity GCD	Hood (outcrop)	483	653	655	653	655	653	655	653
Upper Trinity GCD	Hood (downdip)	81	103	103	103	103	103	103	103
Upper Trinity GCD	Parker (outcrop)	2,593	2,289	2,295	2,289	2,295	2,289	2,295	2,289
Upper Trinity GCD	Parker (downdip)	1,063	873	876	873	876	873	876	873
Upper Trinity GCD Total		**4,220**	**3,918**	**3,929**	**3,918**	**3,929**	**3,918**	**3,929**	**3,918**

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District	Brown	0	0	0	0	0	0	0	0
No District	Dallas	135	131	132	131	132	131	132	131
No District	Delta	0	0	0	0	0	0	0	0
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	168	218	218	218	218	218	218	218
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	12	189	189	189	189	189	189	189
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Rockwall	0	0	0	0	0	0	0	0
No District	Travis	898	971	974	971	974	971	974	971
No District	Williamson	695	688	690	688	690	688	690	688
No District Total		**1,908**	**2,197**	**2,203**	**2,197**	**2,203**	**2,197**	**2,203**	**2,197**
Groundwater Management Area 8		**12,000**	**12,701**	**12,736**	**12,701**	**12,736**	**12,701**	**12,736**	**12,701**

UWCD: Underground Water Conservation District.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Middle Trinity GCD	Erath	**3,443**	**5,017**	**5,031**	**5,017**	**5,031**	**5,017**	**5,031**	**5,017**
North Texas GCD	Collin	163	2,201	2,207	2,201	2,207	2,201	2,207	2,201
North Texas GCD	Denton	997	8,366	8,389	8,366	8,389	8,366	8,389	8,366
North Texas GCD Total		**1,160**	**10,567**	**10,596**	**10,567**	**10,596**	**10,567**	**10,596**	**10,567**
Northern Trinity GCD	Tarrant	**7,329**	**6,917**	**6,936**	**6,917**	**6,936**	**6,917**	**6,936**	**6,917**
Prairielands GCD	Ellis	0	0	0	0	0	0	0	0
Prairielands GCD	Johnson	539	384	385	384	385	384	385	384
Prairielands GCD	Somervell	150	174	174	174	174	174	174	174
Prairielands GCD Total		**689**	**558**	**559**	**558**	**559**	**558**	**559**	**558**
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Upper Trinity GCD	Hood (outcrop)	3,379	3,662	3,672	3,662	3,672	3,662	3,672	3,662
Upper Trinity GCD	Hood (downdip)	7,143	7,759	7,780	7,759	7,780	7,759	7,780	7,759
Upper Trinity GCD	Parker (outcrop)	1,600	1,066	1,069	1,066	1,069	1,066	1,069	1,066
Upper Trinity GCD	Parker (downdip)	3,459	2,082	2,088	2,082	2,088	2,082	2,088	2,082
Upper Trinity GCD Total		**15,581**	**14,569**	**14,609**	**14,569**	**14,609**	**14,569**	**14,609**	**14,569**
No District	Dallas	2,282	3,199	3,208	3,199	3,208	3,199	3,208	3,199
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		**2,282**	**3,199**	**3,208**	**3,199**	**3,208**	**3,199**	**3,208**	**3,199**
Groundwater Management Area 8		**30,484**	**40,827**	**40,939**	**40,827**	**40,939**	**40,827**	**40,939**	**40,827**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**1,906**	**3,464**	**3,474**	**3,464**	**3,474**	**3,464**	**3,474**	**3,464**
Clearwater UWCD	Bell	**1,957**	**8,270**	**8,293**	**8,270**	**8,293**	**8,270**	**8,293**	**8,270**
Middle Trinity GCD	Bosque	5,255	7,678	7,699	7,678	7,699	7,678	7,699	7,678
Middle Trinity GCD	Comanche	9,793	6,160	6,177	6,160	6,177	6,160	6,177	6,160
Middle Trinity GCD	Coryell	3,350	4,371	4,383	4,371	4,383	4,371	4,383	4,371
Middle Trinity GCD	Erath	8,263	11,815	11,849	11,815	11,849	11,815	11,849	11,815
Middle Trinity GCD Total		**26,661**	**30,024**	**30,108**	**30,024**	**30,108**	**30,024**	**30,108**	**30,024**
Post Oak Savannah GCD	Milam	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prairielands GCD	Ellis	5,583	5,032	5,046	5,032	5,046	5,032	5,046	5,032
Prairielands GCD	Hill	3,700	3,550	3,559	3,550	3,559	3,550	3,559	3,550
Prairielands GCD	Johnson	5,602	4,941	4,955	4,941	4,955	4,941	4,955	4,941
Prairielands GCD	Somervell	2,560	2,847	2,854	2,847	2,854	2,847	2,854	2,847
Prairielands GCD Total		**17,445**	**16,370**	**16,414**	**16,370**	**16,414**	**16,370**	**16,414**	**16,370**
Red River GCD	Fannin	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Saratoga UWCD	Lampasas	**1,669**	**1,599**	**1,603**	**1,599**	**1,603**	**1,599**	**1,603**	**1,599**
Southern Trinity GCD	McLennan	**13,252**	**20,635**	**20,691**	**20,635**	**20,691**	**20,635**	**20,691**	**20,635**
Upper Trinity GCD	Hood (downdip)	**70**	**89**	**89**	**89**	**89**	**89**	**89**	**89**
No District	Brown	680	394	395	394	395	394	395	394
No District	Dallas	0	0	0	0	0	0	0	0
No District	Delta	0	0	0	0	0	0	0	0
No District	Falls	1,158	1,434	1,438	1,434	1,438	1,434	1,438	1,434
No District	Hamilton	1,685	2,207	2,213	2,207	2,213	2,207	2,213	2,207
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	1,011	2,275	2,282	2,275	2,282	2,275	2,282	2,275
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Travis	3,442	4,113	4,125	4,113	4,125	4,113	4,125	4,113
No District	Williamson	3,026	2,883	2,891	2,883	2,891	2,883	2,891	2,883

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District Total		**11,002**	**13,306**	**13,344**	**13,306**	**13,344**	**13,306**	**13,344**	**13,306**
Groundwater Management Area 8		**73,962**	**93,757**	**94,016**	**93,757**	**94,016**	**93,757**	**94,016**	**93,757**

UWCD: Underground Water Conservation District.

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**51**	**1,888**	**1,894**	**1,888**	**1,894**	**1,888**	**1,894**	**1,888**
Clearwater UWCD	Bell	**355**	**1,096**	**1,099**	**1,096**	**1,099**	**1,096**	**1,099**	**1,096**
Middle Trinity GCD	Bosque	2,909	3,835	3,845	3,835	3,845	3,835	3,845	3,835
Middle Trinity GCD	Comanche	188	204	204	204	204	204	204	204
Middle Trinity GCD	Coryell	1,679	2,196	2,202	2,196	2,202	2,196	2,202	2,196
Middle Trinity GCD	Erath	3,446	5,137	5,151	5,137	5,151	5,137	5,151	5,137
Middle Trinity GCD Total		**8,222**	**11,372**	**11,402**	**11,372**	**11,402**	**11,372**	**11,402**	**11,372**
Post Oak Savannah GCD	Milam	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prairielands GCD	Ellis	0	0	0	0	0	0	0	0
Prairielands GCD	Hill	237	225	226	225	226	225	226	225
Prairielands GCD	Johnson	1,530	1,083	1,086	1,083	1,086	1,083	1,086	1,083
Prairielands GCD	Somervell	1,822	1,973	1,978	1,973	1,978	1,973	1,978	1,973
Prairielands GCD Total		**3,589**	**3,281**	**3,290**	**3,281**	**3,290**	**3,281**	**3,290**	**3,281**
Saratoga UWCD	Lampasas	**730**	**712**	**715**	**712**	**715**	**712**	**715**	**712**
Southern Trinity GCD	McLennan	**3,018**	**4,698**	**4,711**	**4,698**	**4,711**	**4,698**	**4,711**	**4,698**
Upper Trinity GCD	Hood (downdip)	**45**	**36**	**36**	**36**	**36**	**36**	**36**	**36**
No District	Brown	6	4	4	4	4	4	4	4
No District	Dallas	0	0	0	0	0	0	0	0
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	1,221	1,671	1,675	1,671	1,675	1,671	1,675	1,671
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	224	607	608	607	608	607	608	607
No District	Navarro	0	0	0	0	0	0	0	0
No District	Travis	919	1,141	1,144	1,141	1,144	1,141	1,144	1,141
No District	Williamson	772	751	753	751	753	751	753	751
No District Total		**3,142**	**4,174**	**4,184**	**4,174**	**4,184**	**4,174**	**4,184**	**4,174**
Groundwater Management Area 8		**19,152**	**27,257**	**27,331**	**27,257**	**27,331**	**27,257**	**27,331**	**27,257**

UWCD: Underground Water Conservation District.

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**1,799**	**1,379**	**1,382**	**1,379**	**1,382**	**1,379**	**1,382**	**1,379**
Clearwater UWCD	Bell	**1,375**	**7,174**	**7,193**	**7,174**	**7,193**	**7,174**	**7,193**	**7,174**
Middle Trinity GCD	Bosque	2,289	3,762	3,772	3,762	3,772	3,762	3,772	3,762
Middle Trinity GCD	Comanche	9,504	5,864	5,881	5,864	5,881	5,864	5,881	5,864
Middle Trinity GCD	Coryell	1,661	2,161	2,167	2,161	2,167	2,161	2,167	2,161
Middle Trinity GCD	Erath	4,637	6,383	6,400	6,383	6,400	6,383	6,400	6,383
Middle Trinity GCD Total		**18,091**	**18,170**	**18,220**	**18,170**	**18,220**	**18,170**	**18,220**	**18,170**
Post Oak Savannah GCD	Milam	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prairielands GCD	Ellis	5,575	5,026	5,040	5,026	5,040	5,026	5,040	5,026
Prairielands GCD	Hill	3,413	3,272	3,281	3,272	3,281	3,272	3,281	3,272
Prairielands GCD	Johnson	4,061	3,853	3,863	3,853	3,863	3,853	3,863	3,853
Prairielands GCD	Somervell	736	843	845	843	845	843	845	843
Prairielands GCD Total		**13,785**	**12,994**	**13,029**	**12,994**	**13,029**	**12,994**	**13,029**	**12,994**
Saratoga UWCD	Lampasas	**907**	**857**	**859**	**857**	**859**	**857**	**859**	**857**
Southern Trinity GCD	McLennan	**10,212**	**15,937**	**15,980**	**15,937**	**15,980**	**15,937**	**15,980**	**15,937**
Upper Trinity GCD	Hood (downdip)	**25**	**53**	**53**	**53**	**53**	**53**	**53**	**53**
No District	Brown	624	356	358	356	358	356	358	356
No District	Dallas	0	0	0	0	0	0	0	0
No District	Falls	1,157	1,434	1,438	1,434	1,438	1,434	1,438	1,434
No District	Hamilton	325	385	386	385	386	385	386	385
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	650	1,467	1,471	1,467	1,471	1,467	1,471	1,467
No District	Navarro	0	0	0	0	0	0	0	0
No District	Travis	2,357	2,783	2,791	2,783	2,791	2,783	2,791	2,783
No District	Williamson	2,050	1,933	1,938	1,933	1,938	1,933	1,938	1,933
No District Total		**7,163**	**8,358**	**8,382**	**8,358**	**8,382**	**8,358**	**8,382**	**8,358**
Groundwater Management Area 8		**53,357**	**64,922**	**65,098**	**64,922**	**65,098**	**64,922**	**65,098**	**64,922**

UWCD: Underground Water Conservation District.

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (ANTLERS) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Middle Trinity GCD	Comanche	9,320	5,839	5,855	5,839	5,855	5,839	5,855	5,839
Middle Trinity GCD	Erath	1,663	2,628	2,636	2,628	2,636	2,628	2,636	2,628
Middle Trinity GCD Total		**10,983**	**8,467**	**8,491**	**8,467**	**8,491**	**8,467**	**8,491**	**8,467**
North Texas GCD	Collin	629	1,961	1,966	1,961	1,966	1,961	1,966	1,961
North Texas GCD	Cooke	4,117	10,514	10,544	10,514	10,544	10,514	10,544	10,514
North Texas GCD	Denton	11,427	16,545	16,591	16,545	16,591	16,545	16,591	16,545
North Texas GCD Total		**16,173**	**29,020**	**29,101**	**29,020**	**29,101**	**29,020**	**29,101**	**29,020**
Northern Trinity GCD	Tarrant	**1,908**	**1,248**	**1,251**	**1,248**	**1,251**	**1,248**	**1,251**	**1,248**
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	6,872	10,708	10,738	10,708	10,738	10,708	10,738	10,708
Red River GCD Total		**6,872**	**10,708**	**10,738**	**10,708**	**10,738**	**10,708**	**10,738**	**10,708**
Upper Trinity GCD	Montague (outcrop)	1,421	3,875	3,886	3,875	3,886	3,875	3,886	3,875
Upper Trinity GCD	Parker (outcrop)	3,321	2,897	2,905	2,897	2,905	2,897	2,905	2,897
Upper Trinity GCD	Wise (outcrop)	9,080	7,677	7,698	7,677	7,698	7,677	7,698	7,677
Upper Trinity GCD	Wise (downdip)	3,699	2,057	2,062	2,057	2,062	2,057	2,062	2,057
Upper Trinity GCD Total		**17,521**	**16,506**	**16,551**	**16,506**	**16,551**	**16,506**	**16,551**	**16,506**
No District	Brown	1,743	1,052	1,055	1,052	1,055	1,052	1,055	1,052
No District	Callahan	1,804	1,725	1,730	1,725	1,730	1,725	1,730	1,725
No District	Eastland	5,613	5,732	5,747	5,732	5,747	5,732	5,747	5,732
No District	Lamar	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Taylor	17	13	13	13	13	13	13	13
No District Total		**9,177**	**8,522**	**8,545**	**8,522**	**8,545**	**8,522**	**8,545**	**8,522**
Groundwater Management Area 8		**62,634**	**74,471**	**74,677**	**74,471**	**74,677**	**74,471**	**74,677**	**74,471**

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE WOODBINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
North Texas GCD	Collin	2,427	4,251	4,263	4,251	4,263	4,251	4,263	4,251
North Texas GCD	Cooke	1,646	800	802	800	802	800	802	800
North Texas GCD	Denton	3,797	3,607	3,616	3,607	3,616	3,607	3,616	3,607
North Texas GCD Total		**7,870**	**8,658**	**8,681**	**8,658**	**8,681**	**8,658**	**8,681**	**8,658**
Northern Trinity GCD	Tarrant	**2,646**	**1,138**	**1,141**	**1,138**	**1,141**	**1,138**	**1,141**	**1,138**
Prairielands GCD	Ellis	2,471	2,073	2,078	2,073	2,078	2,073	2,078	2,073
Prairielands GCD	Hill	752	586	588	586	588	586	588	586
Prairielands GCD	Johnson	3,880	1,980	1,985	1,980	1,985	1,980	1,985	1,980
Prairielands GCD Total		**7,103**	**4,639**	**4,651**	**4,639**	**4,651**	**4,639**	**4,651**	**4,639**
Red River GCD	Fannin	5,495	4,920	4,934	4,920	4,934	4,920	4,934	4,920
Red River GCD	Grayson	5,056	7,521	7,541	7,521	7,541	7,521	7,541	7,521
Red River GCD Total		**10,551**	**12,441**	**12,475**	**12,441**	**12,475**	**12,441**	**12,475**	**12,441**
Southern Trinity GCD	McLennan	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
No District	Dallas	1,957	2,796	2,804	2,796	2,804	2,796	2,804	2,796
No District	Hunt	463	763	765	763	765	763	765	763
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	61	49	49	49	49	49	49	49
No District	Navarro	65	68	68	68	68	68	68	68
No District	Red River	3	2	2	2	2	2	2	2
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		**2,549**	**3,678**	**3,688**	**3,678**	**3,688**	**3,678**	**3,688**	**3,678**
Groundwater Management Area 8		**30,719**	**30,554**	**30,636**	**30,554**	**30,636**	**30,554**	**30,636**	**30,554**

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2000	2010	2020	2030	2040	2050	2060	2070
Clearwater UWCD	Bell	**949**	**6,469**	**6,469**	**6,469**	**6,469**	**6,469**	**6,469**	**6,469**
No District	Travis	1,201	5,237	5,237	5,237	5,237	5,237	5,237	5,237
No District	Williamson	13,813	3,462	3,462	3,462	3,462	3,462	3,462	3,462
Groundwater Management Area 8		**15,981**	**15,168**	**15,168**	**15,168**	**15,168**	**15,168**	**15,168**	**15,168**

UWCD: Underground Water Conservation District.

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE MARBLE FALLS AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**2,220**	**2,736**	**2,744**	**2,736**	**2,744**	**2,736**	**2,744**	**2,736**
Saratoga UWCD	Lampasas	**363**	**2,837**	**2,845**	**2,837**	**2,845**	**2,837**	**2,845**	**2,837**
No District	Brown	0	25	25	25	25	25	25	25
No District	Mills	20	25	25	25	25	25	25	25
No District Total		**20**	**50**	**50**	**50**	**50**	**50**	**50**	**50**
Groundwater Management Area 8		**2,603**	**5,623**	**5,639**	**5,623**	**5,639**	**5,623**	**5,639**	**5,623**

UWCD: Underground Water Conservation District.

TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**5,256**	**10,827**	**10,857**	**10,827**	**10,857**	**10,827**	**10,857**	**10,827**
Saratoga UWCD	Lampasas	**351**	**2,593**	**2,601**	**2,593**	**2,601**	**2,593**	**2,601**	**2,593**
No District	Brown	1	131	131	131	131	131	131	131
No District	Mills	0	499	500	499	500	499	500	499
No District Total		**1**	**630**	**631**	**630**	**631**	**630**	**631**	**630**
Groundwater Management Area 8		**5,608**	**14,050**	**14,089**	**14,050**	**14,089**	**14,050**	**14,089**	**14,050**

UWCD: Underground Water Conservation District.

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**1,088**	**3,413**	**3,423**	**3,413**	**3,423**	**3,413**	**3,423**	**3,413**
Saratoga UWCD	Lampasas	**0**	**113**	**114**	**113**	**114**	**113**	**114**	**113**
No District	Brown	0	12	12	12	12	12	12	12
No District	Mills	0	36	36	36	36	36	36	36
No District Total		**0**	**48**	**48**	**48**	**48**	**48**	**48**	**48**
Groundwater Management Area 8		**1,088**	**3,574**	**3,585**	**3,574**	**3,585**	**3,574**	**3,585**	**3,574**

UWCD: Underground Water Conservation District.

TABLE 13. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	0	0	0	0	0	0
Bosque	Region G	Brazos	358	356	358	356	358	356
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	1,551	1,547	1,551	1,547	1,551	1,547
Coryell	Region G	Brazos	0	0	0	0	0	0
Dallas	Region C	Trinity	359	358	359	358	359	358
Delta	Northeast Texas	Sulphur	56	56	56	56	56	56
Denton	Region C	Trinity	4,832	4,819	4,832	4,819	4,832	4,819
Ellis	Region C	Trinity	443	442	443	442	443	442
Erath	Region G	Brazos	61	61	61	61	61	61
Falls	Region G	Brazos	0	0	0	0	0	0
Fannin	Region C	Sulphur	2,092	2,087	2,092	2,087	2,092	2,087
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	0	0	0	0	0	0
Hill	Region G	Brazos	348	347	348	347	348	347
Hill	Region G	Trinity	5	5	5	5	5	5
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	3	3	3	3	3	3
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	880	878	880	878	880	878
Johnson	Region G	Trinity	1,567	1,562	1,567	1,562	1,567	1,562
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	8	8	8	8	8	8
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	6	6	6	6	6	6
Mills	Lower Colorado	Colorado	0	0	0	0	0	0
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	52	52	52	52	52	52
Red River	Northeast Texas	Sulphur	125	125	125	125	125	125

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	14	14	14	14	14	14
Tarrant	Region C	Trinity	8,982	8,957	8,982	8,957	8,982	8,957
Subtotal			**21,742**	**21,683**	**21,742**	**21,683**	**21,742**	**21,683**
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	159	158	159	158	159	158
Hood (outcrop)	Region G	Trinity	0	0	0	0	0	0
Parker (outcrop)	Region C	Brazos	34	34	34	34	34	34
Parker (outcrop)	Region C	Trinity	2,580	2,573	2,580	2,573	2,580	2,573
Parker (downdip)	Region C	Trinity	50	50	50	50	50	50
Subtotal			**2,823**	**2,815**	**2,823**	**2,815**	**2,823**	**2,815**
Groundwater Management Area 8			**24,565**	**24,498**	**24,565**	**24,498**	**24,565**	**24,498**

TABLE 14. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	974	971	974	971	974	971
Bosque	Region G	Brazos	731	728	731	728	731	728
Brown	Region F	Colorado	0	0	0	0	0	0
Burnet	Lower Colorado	Brazos	188	188	188	188	188	188
Burnet	Lower Colorado	Colorado	236	235	236	235	236	235
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	83	83	83	83	83	83
Comanche	Region G	Brazos	22	22	22	22	22	22
Comanche	Region G	Colorado	18	18	18	18	18	18
Coryell	Region G	Brazos	120	120	120	120	120	120
Dallas	Region C	Trinity	132	131	132	131	132	131
Delta	Northeast Texas	Sulphur	0	0	0	0	0	0
Denton	Region C	Trinity	339	338	339	338	339	338
Ellis	Region C	Trinity	50	50	50	50	50	50
Erath	Region G	Brazos	1,081	1,078	1,081	1,078	1,081	1,078
Falls	Region G	Brazos	0	0	0	0	0	0
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	218	218	218	218	218	218
Hill	Region G	Brazos	115	114	115	114	115	114
Hill	Region G	Trinity	1	1	1	1	1	1
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	953	950	953	950	953	950
Johnson	Region G	Trinity	683	681	683	681	683	681
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Lampasas	Region G	Brazos	68	68	68	68	68	68
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
McLennan	Region G	Brazos	0	0	0	0	0	0
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	96	96	96	96	96	96
Mills	Lower Colorado	Colorado	93	93	93	93	93	93
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Red River	Northeast Texas	Sulphur	0	0	0	0	0	0
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	146	146	146	146	146	146
Tarrant	Region C	Trinity	795	793	795	793	795	793
Travis	Lower Colorado	Brazos	0	0	0	0	0	0
Travis	Lower Colorado	Colorado	974	971	974	971	974	971
Williamson	Region G	Brazos	623	621	623	621	623	621
Williamson	Region G	Colorado	0	0	0	0	0	0
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	67	67	67	67	67	67
Subtotal			**8,806**	**8,781**	**8,806**	**8,781**	**8,806**	**8,781**
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	655	653	655	653	655	653
Hood (downdip)	Region G	Brazos	83	83	83	83	83	83
Hood (downdip)	Region G	Trinity	20	20	20	20	20	20
Parker (outcrop)	Region C	Brazos	87	87	87	87	87	87
Parker (downdip)	Region C	Brazos	7	7	7	7	7	7
Parker (outcrop)	Region C	Trinity	2,208	2,202	2,208	2,202	2,208	2,202
Parker (downdip)	Region C	Trinity	869	866	869	866	869	866
Subtotal			**3,929**	**3,918**	**3,929**	**3,918**	**3,929**	**3,918**
Groundwater Management Area 8			**12,735**	**12,699**	**12,735**	**12,699**	**12,735**	**12,699**

TABLE 15. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	2,207	2,201	2,207	2,201	2,207	2,201
Dallas	Region C	Trinity	3,208	3,199	3,208	3,199	3,208	3,199
Denton	Region C	Trinity	8,389	8,366	8,389	8,366	8,389	8,366
Ellis	Region C	Trinity	0	0	0	0	0	0
Erath	Region G	Brazos	5,031	5,017	5,031	5,017	5,031	5,017
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	133	133	133	133	133	133
Johnson	Region G	Trinity	252	251	252	251	252	251
Kaufman	Region C	Trinity	0	0	0	0	0	0
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	174	174	174	174	174	174
Tarrant	Region C	Trinity	6,936	6,917	6,936	6,917	6,936	6,917
Subtotal			**26,330**	**26,258**	**26,330**	**26,258**	**26,330**	**26,258**
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	3,672	3,662	3,672	3,662	3,672	3,662
Hood (downdip)	Region G	Brazos	7,761	7,740	7,761	7,740	7,761	7,740
Hood (downdip)	Region G	Trinity	19	19	19	19	19	19
Parker (outcrop)	Region C	Brazos	1,069	1,066	1,069	1,066	1,069	1,066
Parker (downdip)	Region C	Brazos	778	776	778	776	778	776
Parker (downdip)	Region C	Trinity	1,310	1,306	1,310	1,306	1,310	1,306
Subtotal			**14,609**	**14,569**	**14,609**	**14,569**	**14,609**	**14,569**
Groundwater Management Area 8			**40,939**	**40,827**	**40,939**	**40,827**	**40,939**	**40,827**

TABLE 16. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	8,293	8,270	8,293	8,270	8,293	8,270
Bosque	Region G	Brazos	7,699	7,678	7,699	7,678	7,699	7,678
Brown	Region F	Brazos	3	3	3	3	3	3
Brown	Region F	Colorado	392	391	392	391	392	391
Burnet	Lower Colorado	Brazos	2,950	2,943	2,950	2,943	2,950	2,943
Burnet	Lower Colorado	Colorado	523	521	523	521	523	521
Comanche	Region G	Brazos	6,128	6,111	6,128	6,111	6,128	6,111
Comanche	Region G	Colorado	49	49	49	49	49	49
Coryell	Region G	Brazos	4,383	4,371	4,383	4,371	4,383	4,371
Dallas	Region C	Trinity	0	0	0	0	0	0
Delta	Northeast Texas	Sulphur	0	0	0	0	0	0
Ellis	Region C	Trinity	5,046	5,032	5,046	5,032	5,046	5,032
Erath	Region G	Brazos	11,849	11,815	11,849	11,815	11,849	11,815
Falls	Region G	Brazos	1,438	1,434	1,438	1,434	1,438	1,434
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	2,213	2,207	2,213	2,207	2,213	2,207
Hill	Region G	Brazos	3,304	3,295	3,304	3,295	3,304	3,295
Hill	Region G	Trinity	256	255	256	255	256	255
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	1,932	1,927	1,932	1,927	1,932	1,927
Johnson	Region G	Trinity	3,022	3,014	3,022	3,014	3,022	3,014
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Lampasas	Region G	Brazos	1,528	1,523	1,528	1,523	1,528	1,523
Lampasas	Region G	Colorado	76	75	76	75	76	75
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	20,691	20,635	20,691	20,635	20,691	20,635
Milam	Region G	Brazos	0	0	0	0	0	0

County	**RWPA**	**River Basin**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Mills	Lower Colorado	Brazos	706	703	706	703	706	703
Mills	Lower Colorado	Colorado	1,576	1,572	1,576	1,572	1,576	1,572
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Red River	Northeast Texas	Sulphur	0	0	0	0	0	0
Somervell	Region G	Brazos	2,854	2,847	2,854	2,847	2,854	2,847
Travis	Lower Colorado	Brazos	1	1	1	1	1	1
Travis	Lower Colorado	Colorado	4,124	4,112	4,124	4,112	4,124	4,112
Williamson	Region G	Brazos	2,885	2,877	2,885	2,877	2,885	2,877
Williamson	Region G	Colorado	5	5	5	5	5	5
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			**93,926**	**93,666**	**93,926**	**93,666**	**93,926**	**93,666**
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	89	89	89	89	89	89
Subtotal			**89**	**89**	**89**	**89**	**89**	**89**
Groundwater Management Area 8			**94,015**	**93,755**	**94,015**	**93,755**	**94,015**	**93,755**

TABLE 17. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	1,099	1,096	1,099	1,096	1,099	1,096
Bosque	Region G	Brazos	3,845	3,835	3,845	3,835	3,845	3,835
Brown	Region F	Colorado	4	4	4	4	4	4
Burnet	Lower Colorado	Brazos	1,761	1,757	1,761	1,757	1,761	1,757
Burnet	Lower Colorado	Colorado	133	132	133	132	133	132
Comanche	Region G	Brazos	181	180	181	180	181	180
Comanche	Region G	Colorado	24	24	24	24	24	24
Coryell	Region G	Brazos	2,202	2,196	2,202	2,196	2,202	2,196
Dallas	Region C	Trinity	0	0	0	0	0	0
Ellis	Region C	Trinity	0	0	0	0	0	0
Erath	Region G	Brazos	5,151	5,137	5,151	5,137	5,151	5,137
Falls	Region G	Brazos	0	0	0	0	0	0
Hamilton	Region G	Brazos	1,675	1,671	1,675	1,671	1,675	1,671
Hill	Region G	Brazos	225	224	225	224	225	224
Hill	Region G	Trinity	1	1	1	1	1	1
Johnson	Region G	Brazos	618	616	618	616	618	616
Johnson	Region G	Trinity	468	467	468	467	468	467
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lampasas	Region G	Brazos	713	711	713	711	713	711
Lampasas	Region G	Colorado	1	1	1	1	1	1
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	4,711	4,698	4,711	4,698	4,711	4,698
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	172	172	172	172	172	172
Mills	Lower Colorado	Colorado	436	435	436	435	436	435
Navarro	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	1,978	1,973	1,978	1,973	1,978	1,973
Travis	Lower Colorado	Brazos	1	1	1	1	1	1
Travis	Lower Colorado	Colorado	1,144	1,141	1,144	1,141	1,144	1,141
Williamson	Region G	Brazos	753	751	753	751	753	751
Williamson	Region G	Colorado	0	0	0	0	0	0
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			**27,296**	**27,223**	**27,296**	**27,223**	**27,296**	**27,223**
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	36	36	36	36	36	36
Subtotal			**36**	**36**	**36**	**36**	**36**	**36**
Groundwater Management Area 8			**27,332**	**27,259**	**27,332**	**27,259**	**27,332**	**27,259**

TABLE 18. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	7,193	7,174	7,193	7,174	7,193	7,174
Bosque	Region G	Brazos	3,772	3,762	3,772	3,762	3,772	3,762
Brown	Region F	Brazos	3	3	3	3	3	3
Brown	Region F	Colorado	355	353	355	353	355	353
Burnet	Lower Colorado	Brazos	1,027	1,025	1,027	1,025	1,027	1,025
Burnet	Lower Colorado	Colorado	355	354	355	354	355	354
Comanche	Region G	Brazos	5,875	5,858	5,875	5,858	5,875	5,858
Comanche	Region G	Colorado	6	6	6	6	6	6
Coryell	Region G	Brazos	2,167	2,161	2,167	2,161	2,167	2,161
Dallas	Region C	Trinity	0	0	0	0	0	0
Ellis	Region C	Trinity	5,040	5,026	5,040	5,026	5,040	5,026
Erath	Region G	Brazos	6,400	6,383	6,400	6,383	6,400	6,383
Falls	Region G	Brazos	1,438	1,434	1,438	1,434	1,438	1,434
Hamilton	Region G	Brazos	386	385	386	385	386	385
Hill	Region G	Brazos	3,026	3,018	3,026	3,018	3,026	3,018
Hill	Region G	Trinity	255	254	255	254	255	254
Johnson	Region G	Brazos	1,311	1,307	1,311	1,307	1,311	1,307
Johnson	Region G	Trinity	2,553	2,546	2,553	2,546	2,553	2,546
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lampasas	Region G	Brazos	786	783	786	783	786	783
Lampasas	Region G	Colorado	72	72	72	72	72	72
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	15,980	15,937	15,980	15,937	15,980	15,937
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	376	375	376	375	376	375
Mills	Lower Colorado	Colorado	1,096	1,093	1,096	1,093	1,096	1,093
Navarro	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	845	843	845	843	845	843
Travis	Lower Colorado	Brazos	0	0	0	0	0	0
Travis	Lower Colorado	Colorado	2,791	2,783	2,791	2,783	2,791	2,783
Williamson	Region G	Brazos	1,933	1,928	1,933	1,928	1,933	1,928
Williamson	Region G	Colorado	5	5	5	5	5	5

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			**65,046**	**64,868**	**65,046**	**64,868**	**65,046**	**64,868**
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	53	53	53	53	53	53
Subtotal			**53**	**53**	**53**	**53**	**53**	**53**
Groundwater Management Area 8			**65,099**	**64,921**	**65,099**	**64,921**	**65,099**	**64,921**

TABLE 19. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (ANTLERS) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Brown	Region F	Brazos	48	48	48	48	48	48
Brown	Region F	Colorado	1,007	1,004	1,007	1,004	1,007	1,004
Callahan	Region G	Brazos	444	443	444	443	444	443
Callahan	Region G	Colorado	1,285	1,282	1,285	1,282	1,285	1,282
Collin	Region C	Trinity	1,966	1,961	1,966	1,961	1,966	1,961
Comanche	Region G	Brazos	5,855	5,839	5,855	5,839	5,855	5,839
Cooke	Region C	Red	2,191	2,184	2,191	2,184	2,191	2,184
Cooke	Region C	Trinity	8,353	8,330	8,353	8,330	8,353	8,330
Denton	Region C	Trinity	16,591	16,545	16,591	16,545	16,591	16,545
Eastland	Region G	Brazos	5,194	5,180	5,194	5,180	5,194	5,180
Eastland	Region G	Colorado	553	552	553	552	553	552
Erath	Region G	Brazos	2,636	2,628	2,636	2,628	2,636	2,628
Fannin	Region C	Red	0	0	0	0	0	0
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Red	6,678	6,660	6,678	6,660	6,678	6,660
Grayson	Region C	Trinity	4,059	4,048	4,059	4,048	4,059	4,048
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Tarrant	Region C	Trinity	1,251	1,248	1,251	1,248	1,251	1,248
Taylor	Region G	Brazos	5	5	5	5	5	5
Taylor	Region G	Colorado	9	9	9	9	9	9
Subtotal			**58,125**	**57,966**	**58,125**	**57,966**	**58,125**	**57,966**
Counties in Upper Trinity GCD								
Montague (outcrop)	Region B	Red	154	154	154	154	154	154
Montague (outcrop)	Region B	Trinity	3,732	3,721	3,732	3,721	3,732	3,721
Parker (outcrop)	Region C	Brazos	257	256	257	256	257	256
Parker (outcrop)	Region C	Trinity	2,648	2,640	2,648	2,640	2,648	2,640
Wise (outcrop)	Region C	Trinity	7,698	7,677	7,698	7,677	7,698	7,677

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Wise (downdip)	Region C	Trinity	2,062	2,057	2,062	2,057	2,062	2,057
Subtotal			**16,551**	**16,505**	**16,551**	**16,505**	**16,551**	**16,505**
Groundwater Management Area 8			**74,676**	**74,471**	**74,676**	**74,471**	**74,676**	**74,471**

TABLE 20. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE WOODBINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	4,263	4,251	4,263	4,251	4,263	4,251
Cooke	Region C	Red	262	261	262	261	262	261
Cooke	Region C	Trinity	540	538	540	538	540	538
Dallas	Region C	Trinity	2,804	2,796	2,804	2,796	2,804	2,796
Denton	Region C	Trinity	3,616	3,607	3,616	3,607	3,616	3,607
Ellis	Region C	Trinity	2,078	2,073	2,078	2,073	2,078	2,073
Fannin	Region C	Red	3,553	3,544	3,553	3,544	3,553	3,544
Fannin	Region C	Sulphur	551	550	551	550	551	550
Fannin	Region C	Trinity	829	827	829	827	829	827
Grayson	Region C	Red	5,615	5,599	5,615	5,599	5,615	5,599
Grayson	Region C	Trinity	1,926	1,922	1,926	1,922	1,926	1,922
Hill	Region G	Brazos	285	284	285	284	285	284
Hill	Region G	Trinity	303	302	303	302	303	302
Hunt	Northeast Texas	Sabine	269	268	269	268	269	268
Hunt	Northeast Texas	Sulphur	165	165	165	165	165	165
Hunt	Northeast Texas	Trinity	330	329	330	329	330	329
Johnson	Region G	Brazos	24	24	24	24	24	24
Johnson	Region G	Trinity	1,961	1,956	1,961	1,956	1,961	1,956
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	49	49	49	49	49	49
McLennan	Region G	Brazos	0	0	0	0	0	0
Navarro	Region C	Trinity	68	68	68	68	68	68
Red River	Northeast Texas	Red	2	2	2	2	2	2
Rockwall	Region C	Trinity	0	0	0	0	0	0
Tarrant	Region C	Trinity	1,141	1,138	1,141	1,138	1,141	1,138
Groundwater Management Area 8			**30,634**	**30,553**	**30,634**	**30,553**	**30,634**	**30,553**

TABLE 21. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN. MODELED AVAILABLE GROUNDWATER VALUES ARE FROM GAM RUN 08-010MAG BY ANAYA (2008).

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Bell	Region G	Brazos	6,469	6,469	6,469	6,469	6,469	6,469
Travis	Lower Colorado	Brazos	275	275	275	275	275	275
Travis	Lower Colorado	Colorado	4,962	4,962	4,962	4,962	4,962	4,962
Williamson	Region G	Brazos	3,351	3,351	3,351	3,351	3,351	3,351
Williamson	Region G	Colorado	101	101	101	101	101	101
Williamson	Lower Colorado	Brazos	6	6	6	6	6	6
Williamson	Lower Colorado	Colorado	4	4	4	4	4	4
Groundwater Management Area 8			**15,168**	**15,168**	**15,168**	**15,168**	**15,168**	**15,168**

TABLE 22. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE MARBLE FALLS AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	25	25	25	25	25	25
Burnet	Lower Colorado	Brazos	1,387	1,383	1,387	1,383	1,387	1,383
Burnet	Lower Colorado	Colorado	1,357	1,353	1,357	1,353	1,357	1,353
Lampasas	Region G	Brazos	1,958	1,952	1,958	1,952	1,958	1,952
Lampasas	Region G	Colorado	887	885	887	885	887	885
Mills	Lower Colorado	Brazos	1	1	1	1	1	1
Mills	Lower Colorado	Colorado	24	24	24	24	24	24
Groundwater Management Area 8			**5,639**	**5,623**	**5,639**	**5,623**	**5,639**	**5,623**

TABLE 23. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	131	131	131	131	131	131
Burnet	Lower Colorado	Brazos	3,833	3,822	3,833	3,822	3,833	3,822
Burnet	Lower Colorado	Colorado	7,024	7,005	7,024	7,005	7,024	7,005
Lampasas	Region G	Brazos	1,685	1,680	1,685	1,680	1,685	1,680
Lampasas	Region G	Colorado	916	913	916	913	916	913
Mills	Lower Colorado	Brazos	93	93	93	93	93	93
Mills	Lower Colorado	Colorado	407	406	407	406	407	406
Groundwater Management Area 8			**14,089**	**14,050**	**14,089**	**14,050**	**14,089**	**14,050**

TABLE 24. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	12	12	12	12	12	12
Burnet	Lower Colorado	Brazos	1,240	1,236	1,240	1,236	1,240	1,236
Burnet	Lower Colorado	Colorado	2,183	2,177	2,183	2,177	2,183	2,177
Lampasas	Region G	Brazos	80	79	80	79	80	79
Lampasas	Region G	Colorado	34	34	34	34	34	34
Mills	Lower Colorado	Brazos	7	7	7	7	7	7
Mills	Lower Colorado	Colorado	29	29	29	29	29	29
Groundwater Management Area 8			**3,585**	**3,574**	**3,585**	**3,574**	**3,585**	**3,574**

LIMITATIONS:

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

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

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

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

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

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Appendix A

Comparison between Desired Future Conditions and Simulated Drawdowns for the Trinity and Woodbine Aquifers

Drawdown values for the Trinity and Woodbine aquifers between 2009 and 2070 were based on the simulated head values at individual model cells extracted from predictive simulation head file submitted by Groundwater Management Area 8.

The Paluxy, Glen Rose, Twin Mountains, Travis Peak, Hensell, Hosston, and Antlers are subunits of the Trinity Aquifer. These subunits and Woodbine Aquifer exist in both outcrop and downdip areas (Figures 1 through 8). Kelley and others (2014) further divided these aquifers into five (5) regions, each with unique aquifer combinations and properties (table below and Figures 1 through 8).

<table>
<tr><th>Model Layer</th><th>Region 1</th><th>Region 2</th><th>Region 3</th><th colspan="2">Region 4</th><th colspan="2">Region 5</th></tr>
<tr><td>2</td><td colspan="4">Woodbine</td><td colspan="3">Woodbine (no sand)</td></tr>
<tr><td>3</td><td colspan="7">Washita/Fredericksburg</td></tr>
<tr><td>4</td><td rowspan="5">Antlers</td><td colspan="4">Paluxy</td><td colspan="2">Paluxy (no sand)</td></tr>
<tr><td>5</td><td colspan="6">Glen Rose</td></tr>
<tr><td>6</td><td rowspan="3">Twin Mountains</td><td rowspan="3" colspan="2">Travis Peak</td><td>Hensell</td><td rowspan="3">Travis Peak</td><td>Hensell</td></tr>
<tr><td>7</td><td>Pearsall/Sligo</td><td>Pearsall/Sligo</td></tr>
<tr><td>8</td><td>Hosston</td><td>Hosston</td></tr>
</table>

Vertically, the Trinity and Woodbine aquifers could contain multiple model layers and some of the model cells are pass-through cells with a thickness of one foot. To account for variable model cells from multiple model layers for the same aquifer, Beach and others (2016) adopted a method presented by Van Kelley of INTERA, Inc., which calculated a single composite head from multiple model cells with each adjusted by transmissivity. This composite head took both the head and hydraulic transmissivity at each cell into calculation, as shown in the following equation:

$$Hc = \frac{\sum_{i=UL}^{LL} T_i H_i}{\sum_{i=UL}^{LL} T_i}$$

Where:

Hc = Composite Head (feet above mean sea level)

T_i = Transmissivity of model layer i (square feet per day)

H_i = Head of model layer i (feet above mean sea level)

LL = Lowest model layer representing the regional aquifer

UL = Uppermost model layer representing the regional aquifer.

The average head for the same aquifer in a county (*Hc_County*) was then calculated using the following equation:

$$Hc\_County = \frac{\sum_{i=1}^{n} Hc_i}{n}$$

Where:

Hc_County = Average composite head for a county (feet above mean sea level)

Hc_i = Composite Head at a lateral location as defined in last step (feet above mean sea level)

n = Total lateral (row, column) locations of an aquifer in a county.

Drawdown of the aquifer in a county (*DD_County*) was calculated using the following equation:

$$DD\_County = Hc\_County_{2009} - Hc\_County_{2070}$$

Where:

Hc_County_{2009} = Average head of an aquifer in a county in 2009 as defined above (feet above mean sea level)

Hc_County_{2070} = Average head of an aquifer in a county in 2070 as defined above (feet above mean sea level).

Model cells with head values below the cell bottom in 2009 were excluded from the calculation. Also, head was set at the cell bottom if it fell below the cell bottom at 2070.

In comparison with a simple average calculation based on total model cell count, use of composite head gives less weight to cells with lower transmissivity values (such as pass-through cells, cells with low saturation in outcrop area, or cells with lower hydraulic conductivity) in head and drawdown calculation.

Per Groundwater Management Area 8, a desired future condition was met if the simulated drawdown from the desired future condition was within five percent or five feet. Using the head output file submitted by Groundwater Management Area 8 and the method described above, the TWDB calculated the drawdowns (Tables A1 and A2) and performed the comparison against the corresponding desired future conditions by county (Tables A3, A4, A5, and A6). The review by the TWDB indicates that the predictive simulation meets the desired future conditions (Tables A7 and A8).

TABLE A1. SIMULATED DRAWDOWN VALUES OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. DRAWDOWNS ARE IN FEET.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	19	83	—	294	137	330	—
Bosque	—	6	49	—	167	129	201	—
Brown	—	—	2	—	1	1	1	2
Burnet	—	—	2	—	16	7	20	—
Callahan	—	—	—	—	—	—	—	1
Collin	459	705	339	526	—	—	—	570
Comanche	—	—	1	—	2	2	3	9
Cooke	2	—	—	—	—	—	—	179
Coryell	—	7	14	—	100	66	130	—
Dallas	123	324	263	463	350	332	351	—
Delta	—	264	181	—	186	—	—	—
Denton	19	552	349	716	—	—	—	398
Eastland	—	—	—	—	—	—	—	3
Ellis	61	107	194	333	305	263	310	—
Erath	—	1	5	6	19	11	31	11
Falls	—	144	215	—	460	271	465	—
Fannin	247	688	280	372	269	—	—	251
Grayson	157	922	337	417	—	—	—	348
Hamilton	—	2	4	—	24	13	35	—
Hill	16	38	133	—	299	186	337	—
Hunt	598	586	299	370	324	—	—	—
Johnson	3	-61	58	156	184	126	235	—
Kaufman	208	276	269	381	323	309	295	—
Lamar	38	93	97	—	114	—	—	122
Lampasas	—	—	1	—	6	1	11	—
Limestone	—	178	271	—	393	183	404	—
McLennan	6	35	133	—	468	220	542	—
Milam	—	—	212	—	344	229	345	—
Mills	—	1	1	—	7	2	13	—
Navarro	92	119	232	—	291	254	291	—
Red River	2	21	36	—	51	—	—	13
Rockwall	243	401	311	426	—	—	—	—
Somervell	—	1	4	31	52	26	83	—
Tarrant	6	101	148	315	—	—	—	149

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	85	—	142	51	148	—
Williamson	—	—	76	—	172	73	176	—

—: Not available.

TABLE A2. SIMULATED DRAWDOWN VALUES OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. DRAWDOWNS ARE IN FEET.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	5	7	4	—
Hood (downdip)	—	27	46	—
Montague (outcrop)	—	—	—	18
Montague (downdip)	—	—	—	—
Parker (outcrop)	5	10	1	11
Parker (downdip)	1	28	46	—
Wise (outcrop)	—	—	—	35
Wise (downdip)	—	—	—	142

—: Not available.

TABLE A3. RELATIVE DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE PERCENT ARE HIGHLIGHTED.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	0%	0%	—	-2%	0%	0%	—
Bosque	—	0%	0%	—	0%	0%	0%	—
Brown	—	—	0%	—	0%	0%	0%	0%
Burnet	—	—	0%	—	0%	0%	0%	—
Callahan	—	—	—	—	—	—	—	0%
Collin	0%	0%	0%	0%	—	—	—	0%
Comanche	—	—	0%	—	0%	0%	0%	0%
Cooke	0%	—	—	—	—	—	—	2%
Coryell	—	0%	0%	—	1%	0%	0%	—
Dallas	0%	0%	0%	0%	1%	0%	0%	—
Delta	—	0%	0%	—	0%	—	—	—
Denton	-16%	0%	0%	0%	—	—	—	1%
Eastland	—	—	—	—	—	—	—	0%
Ellis	0%	0%	0%	0%	1%	0%	0%	—
Erath	—	0%	0%	0%	0%	0%	0%	-9%
Falls	—	0%	0%	—	0%	0%	0%	—
Fannin	0%	0%	0%	0%	0%	—	—	0%
Grayson	-2%	0%	0%	0%	—	—	—	0%
Hamilton	—	0%	0%	—	0%	0%	0%	—
Hill	-25%	0%	0%	—	0%	0%	0%	—
Hunt	0%	0%	0%	0%	0%	—	—	—
Johnson	33%	0%	0%	0%	3%	0%	0%	—
Kaufman	0%	0%	0%	0%	0%	0%	0%	—
Lamar	0%	0%	0%	—	0%	—	—	0%
Lampasas	—	—	0%	—	0%	0%	0%	—
Limestone	—	0%	0%	—	0%	0%	0%	—
McLen—n	0%	0%	0%	—	-1%	0%	0%	—
Milam	—	—	0%	—	0%	0%	0%	—
Mills	—	0%	0%	—	0%	0%	0%	—
—varro	0%	0%	0%	—	0%	0%	0%	—
Red River	0%	0%	0%	—	0%	—	—	0%
Rockwall	0%	0%	0%	0%	—	—	—	—

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Somervell	—	0%	0%	0%	2%	0%	0%	—
Tarrant	-17%	0%	0%	0%	—	—	—	1%
Taylor	—	—	—	—	—	—	—	0%
Travis	—	—	0%	—	1%	2%	1%	—
Williamson	—	—	-1%	—	-1%	-1%	-1%	—

—: Not available.

TABLE A4. RELATIVE DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE PERCENT ARE HIGHLIGHTED.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	0%	0%	0%	—
Hood (downdip)	—	-4%	0%	—
Montague (outcrop)	—	—	—	0%
Montague (downdip)	—	—	—	—
Parker (outcrop)	0%	0%	0%	0%
Parker (downdip)	0%	0%	0%	—
Wise (outcrop)	—	—	—	3%
Wise (downdip)	—	—	—	0%

—: Not available.

TABLE A5. DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE FEET ARE HIGHLIGHTED.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	0	0	—	-6	0	0	—
Bosque	—	0	0	—	0	0	0	—
Brown	—	—	0	—	0	0	0	0
Burnet	—	—	0	—	0	0	0	—
Callahan	—	—	—	—	—	—	—	0
Collin	0	0	0	0	—	—	—	0
Comanche	—	—	0	—	0	0	0	0
Cooke	0	—	—	—	—	—	—	3
Coryell	—	0	0	—	1	0	0	—
Dallas	0	0	0	0	2	0	0	—
Delta	—	0	0	—	0	—	—	—
Denton	-3	0	0	0	—	—	—	3
Eastland	—	—	—	—	—	—	—	0
Ellis	0	0	0	0	4	0	0	—
Erath	—	0	0	0	0	0	0	-1
Falls	—	0	0	—	-2	0	0	—
Fannin	0	0	0	0	0	—	—	0
Grayson	-3	0	0	0	—	—	—	0
Hamilton	—	0	0	—	0	0	0	—
Hill	-4	0	0	—	1	0	0	—
Hunt	0	0	0	0	0	—	—	—
Johnson	1	0	0	0	5	0	0	—
Kaufman	0	0	0	0	0	0	0	—
Lamar	0	0	0	—	0	—	—	0
Lampasas	—	—	0	—	0	0	0	—
Limestone	—	0	0	—	1	0	0	—
McLennan	0	0	0	—	-3	0	0	—
Milam	—	—	0	—	-1	0	0	—
Mills	—	0	0	—	0	0	0	—
Navarro	0	0	0	—	1	0	0	—
Red River	0	0	0	—	0	—	—	0
Rockwall	0	0	0	0	—	—	—	—

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Somervell	—	0	0	0	1	0	0	—
Tarrant	-1	0	0	0	—	—	—	1
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	0	—	1	1	2	—
Williamson	—	—	-1	—	-1	-1	-1	—

—: Not available.

TABLE A6. DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN THE ERROR TOLERANCE OF FIVE FEET.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	0	0	0	—
Hood (downdip)	—	-1	0	—
Montague (outcrop)	—	—	—	0
Montague (downdip)	—	—	—	—
Parker (outcrop)	0	0	0	0
Parker (downdip)	0	0	0	—
Wise (outcrop)	—	—	—	1
Wise (downdip)	—	—	—	0

—: Not available.

TABLE A7. COMPARISON OF SIMULATED DRAWDOWNS WITH THE DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN BOTH ERROR TOLERRANCES OF FIVE PERCENT AND FIVE FEET AT THE SAME TIME. THUS, PREDICTIVE SIMULATION MEETS ALL DESIRED FUTURE CONDITIONS.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	MEET	MEET	—	MEET	MEET	MEET	—
Bosque	—	MEET	MEET	—	MEET	MEET	MEET	—
Brown	—	—	MEET	—	MEET	MEET	MEET	MEET
Burnet	—	—	MEET	—	MEET	MEET	MEET	—
Callahan	—	—	—	—	—	—	—	MEET
Collin	MEET	MEET	MEET	MEET	—	—	—	MEET
Comanche	—	—	MEET	—	MEET	MEET	MEET	MEET
Cooke	MEET	—	—	—	—	—	—	MEET
Coryell	—	MEET	MEET	—	MEET	MEET	MEET	—
Dallas	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Delta	—	MEET	MEET	—	MEET	—	—	—
Denton	MEET	MEET	MEET	MEET	—	—	—	MEET
Eastland	—	—	—	—	—	—	—	MEET
Ellis	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Erath	—	MEET	MEET	MEET	MEET	MEET	MEET	MEET
Falls	—	MEET	MEET	—	MEET	MEET	MEET	—
Fannin	MEET	MEET	MEET	MEET	MEET	—	—	MEET
Grayson	MEET	MEET	MEET	MEET	—	—	—	MEET
Hamilton	—	MEET	MEET	—	MEET	MEET	MEET	—
Hill	MEET	MEET	MEET	—	MEET	MEET	MEET	—
Hunt	MEET	MEET	MEET	MEET	MEET	—	—	—
Johnson	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Kaufman	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Lamar	MEET	MEET	MEET	—	MEET	—	—	MEET
Lampasas	—	—	MEET	—	MEET	MEET	MEET	—
Limestone	—	MEET	MEET	—	MEET	MEET	MEET	—
McLennan	MEET	MEET	MEET	—	MEET	MEET	MEET	—
Milam	—	—	MEET	—	MEET	MEET	MEET	—
Mills	—	MEET	MEET	—	MEET	MEET	MEET	—
Navarro	MEET	MEET	MEET	—	MEET	MEET	MEET	—

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Red River	MEET	MEET	MEET	—	MEET	—	—	MEET
Rockwall	MEET	MEET	MEET	MEET	—	—	—	—
Somervell	—	MEET	MEET	MEET	MEET	MEET	MEET	—
Tarrant	MEET	MEET	MEET	MEET	—	—	—	MEET
Taylor	—	—	—	—	—	—	—	MEET
Travis	—	—	MEET	—	MEET	MEET	MEET	—
Williamson	—	—	MEET	—	MEET	MEET	MEET	—

—: Not available.

TABLE A8. COMPARISON OF SIMULATED DRAWDOWNS WITH THE DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN BOTH ERROR TOLERRANCES OF FIVE PERCENT AND FIVE FEET AT THE SAME TIME. THUS, PREDICTIVE SIMULATION MEETS ALL DESIRED FUTURE CONDITIONS.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	MEET	MEET	MEET	—
Hood (downdip)	—	MEET	MEET	—
Montague (outcrop)	—	—	—	MEET
Montague (downdip)	—	—	—	—
Parker (outcrop)	MEET	MEET	MEET	MEET
Parker (downdip)	MEET	MEET	MEET	—
Wise (outcrop)	—	—	—	MEET
Wise (downdip)	—	—	—	MEET

—: Not available.

Appendix B

Comparison between Desired Future Conditions and Simulated Saturated Thickness for the Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Brown, Burnet, Lampasas, and Mills Counties

The predictive simulation used to evaluate the desired future conditions and the modeled available groundwater values for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties within Groundwater Management Area 8 involves rewriting all relevant MODFLOW-USG packages to reflect the predictive simulation. The initial pumping for the predictive simulation was based on the last stress period of the groundwater availability model. In its clarification, Groundwater Management Area 8 also provided estimated pumping to use for the predictive simulation by TWDB (Table B1).

These pumping values from Groundwater Management Area 8 are more than the pumpage from the last stress period of the groundwater availability model. This surplus pumping for each aquifer was redistributed uniformly in each county according to its modeled extent.

The head file from the model output was used to calculate the remaining saturated thickness (*ST*) within the modeled extent for each aquifer between 2009 and 2070 using the following equation:

$$ST = \frac{\sum_{i=1}^{n}\left(h2070_i - e_i\right)}{\sum_{i=1}^{n}\left(h2009_i - e_i\right)}$$

Where:

n = Total model cells in a county

$h2009_i$ = Head of 2009 at model cell i (feet)

$h2070_i$ = Head of 2070 at model cell i (feet)

e_i = Bottom elevation of model cell i (feet).

Model cells with head values below the cell bottom in 2009 were excluded from the calculation. Also, head was set at the cell bottom if it fell below the cell bottom at 2070.

The comparison between the simulated remaining saturated thickness and the desired future conditions is presented in Table B2. Table B2 indicates that the predictive simulation meets the desired future conditions of the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties.

TABLE B1. GROUNDWATER PUMPING RATES FOR THE MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES PROVIDED BY GROUNDWATER MNAAGMENT AREA 8.

County	Aquifer	2010 to 2070 (acre-feet per year)
Burnet	Marble Falls	2,736
Lampasas	Marble Falls	2,837
Brown	Marble Falls	25
Mills	Marble Falls	25
Burnet	Ellenburger-San Saba	10,827
Lampasas	Ellenburger-San Saba	2,593
Brown	Ellenburger-San Saba	131
Mills	Ellenburger-San Saba	499
Burnet	Hickory	3,413
Lampasas	Hickory	113
Brown	Hickory	12
Mills	Hickory	36

TABLE B2. COMPARISON BETWEEN SIMULATED REMAINING AQUIFER SATURATED THICKESS AND DESIRED FUTURE CONDITIONS OF MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES.

County	Aquifer	Remaining Aquifer Saturated Thickness Defined by Desired Future Condition	Simulated Remaining Aquifer Saturated Thickness	Is Desired Future Condition Met?
Brown	Marble Falls	at least 90%	99.8%	Yes
Brown	Ellenburger-San Saba	at least 90%	99.9%	Yes
Brown	Hickory	at least 90%	99.9%	Yes
Burnet	Marble Falls	at least 90%	98.8%	Yes
Burnet	Ellenburger-San Saba	at least 90%	99.3%	Yes
Burnet	Hickory	at least 90%	99.5%	Yes
Lampasas	Marble Falls	at least 90%	98.2%	Yes
Lampasas	Ellenburger-San Saba	at least 90%	99.0%	Yes
Lampasas	Hickory	at least 90%	99.5%	Yes
Mills	Marble Falls	at least 90%	99.5%	Yes
Mills	Ellenburger-San Saba	at least 90%	99.7%	Yes
Mills	Hickory	at least 90%	99.8%	Yes

Appendix C

Summary of Dry Model Cell Count for the Trinity and Woodbine Aquifers

TABLE C1. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (PALUXY) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Dallas	Denton	Johnson	Tarrant
Total Active Official Aquifer Model Cells	12,062	14,532	3,520	11,627	15,389
2009 (baseline)	0	0	0	17	3
2010	0	0	9	0	3
2011	1	0	49	0	3
2012	4	0	83	0	17
2013	8	0	140	0	47
2014	35	0	196	0	91
2015	49	0	264	0	146
2016	64	0	306	0	209
2017	72	0	349	0	291
2018	83	0	385	0	373
2019	93	0	428	0	460
2020	99	0	482	0	555
2021	109	0	550	0	620
2022	115	0	622	0	684
2023	125	0	695	0	746
2024	129	0	780	0	802
2025	138	0	879	0	862
2026	147	0	957	0	919
2027	151	0	1,018	0	964
2028	159	0	1,087	0	995
2029	166	0	1,171	0	1,038
2030	173	0	1,262	0	1,072
2031	176	0	1,326	0	1,101
2032	180	0	1,379	0	1,137
2033	187	0	1,420	0	1,156
2034	193	0	1,461	0	1,194
2035	201	0	1,492	0	1,224
2036	204	0	1,520	0	1,240
2037	209	0	1,554	0	1,274
2038	212	0	1,584	0	1,292
2039	215	0	1,607	0	1,317
2040	217	0	1,627	0	1,347
2041	224	0	1,659	0	1,362
2042	228	0	1,682	0	1,377

Year	Collin	Dallas	Denton	Johnson	Tarrant
2043	235	0	1,710	0	1,409
2044	239	0	1,735	0	1,425
2045	242	0	1,755	0	1,438
2046	247	0	1,777	0	1,455
2047	250	0	1,790	0	1,477
2048	251	0	1,807	0	1,497
2049	253	0	1,823	0	1,517
2050	254	0	1,834	0	1,530
2051	258	2	1,847	0	1,539
2052	264	2	1,860	0	1,562
2053	266	2	1,874	0	1,585
2054	270	3	1,883	0	1,594
2055	272	3	1,893	0	1,606
2056	275	3	1,902	0	1,621
2057	276	3	1,923	0	1,634
2058	280	4	1,929	0	1,650
2059	282	4	1,934	0	1,666
2060	286	4	1,943	0	1,679
2061	288	4	1,947	0	1,693
2062	288	4	1,961	0	1,701
2063	290	5	1,973	0	1,712
2064	291	5	1,977	0	1,726
2065	292	5	1,988	0	1,739
2066	295	5	1,996	0	1,752
2067	297	6	2,002	0	1,760
2068	300	7	2,009	0	1,769
2069	304	7	2,017	0	1,778
2070	305	7	2,024	0	1,784

TABLE C2. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (GLEN ROSE) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Bell	Burnet	Coryell	Erath	Hamilton	Hood	Johnson	Mills	Parker	Travis
Total Active Official Aquifer Model Cells	23,737	22,534	41,647	20,905	36,944	14,461	12,342	10,615	11,389	14,552
2009 (baseline)	0	0	11	0	0	0	15	0	8	25
2010	0	0	11	0	0	0	15	0	9	29
2011	0	0	11	0	0	0	15	0	12	29
2012	0	0	11	0	0	0	15	0	15	29
2013	0	0	11	1	0	0	15	1	19	29
2014	0	1	11	1	0	1	15	1	22	31
2015	0	1	11	1	0	1	15	1	23	32
2016	0	1	12	1	0	1	15	1	30	33
2017	0	1	12	2	0	2	15	1	37	34
2018	0	1	12	3	0	2	15	1	38	34
2019	0	1	14	3	0	2	16	1	44	34
2020	0	1	14	3	0	2	16	1	46	34
2021	0	1	14	3	0	3	16	1	48	35
2022	0	1	14	3	0	3	16	1	49	38
2023	0	1	14	3	0	3	17	1	54	41
2024	0	1	15	3	0	3	17	1	58	45
2025	0	1	15	3	0	3	17	1	65	47
2026	0	1	15	3	0	5	19	1	72	48
2027	0	1	15	4	0	5	21	1	78	50
2028	0	1	15	4	0	5	21	1	82	51
2029	0	1	15	4	0	6	22	1	84	51
2030	0	1	15	4	0	6	22	1	90	54
2031	0	1	15	8	0	6	22	1	99	54
2032	0	1	15	8	0	8	23	1	103	55
2033	0	1	15	8	0	8	23	1	105	56
2034	0	1	15	9	0	9	23	1	108	56
2035	0	1	15	9	0	10	23	1	109	57
2036	0	1	15	9	0	12	23	1	110	58
2037	0	1	15	9	0	13	23	1	110	58
2038	0	1	15	9	0	14	23	1	113	59

Year	Bell	Burnet	Coryell	Erath	Hamilton	Hood	Johnson	Mills	Parker	Travis
2039	0	2	15	9	0	14	23	1	113	59
2040	0	2	15	9	0	14	23	1	116	60
2041	0	2	15	9	0	16	23	1	119	60
2042	0	2	15	10	1	16	23	1	122	61
2043	0	2	15	10	2	16	23	1	124	61
2044	0	2	15	10	2	18	24	1	125	62
2045	0	2	15	10	2	18	25	1	131	63
2046	0	2	15	10	2	18	25	1	131	63
2047	0	2	16	10	3	18	25	1	134	64
2048	0	2	16	10	4	18	26	1	137	64
2049	0	2	16	11	4	20	26	1	139	65
2050	0	2	16	11	4	22	26	1	143	65
2051	0	2	16	12	5	22	29	1	144	66
2052	1	2	16	12	5	22	31	1	147	66
2053	3	2	16	12	7	24	32	1	149	67
2054	4	2	17	12	7	27	32	1	151	67
2055	4	2	17	12	7	27	34	1	152	67
2056	4	2	17	12	7	30	34	1	152	68
2057	6	2	17	13	7	31	34	1	156	69
2058	7	2	17	13	7	31	34	1	159	69
2059	7	2	17	13	7	31	34	1	164	69
2060	7	2	17	13	8	34	34	1	166	69
2061	7	2	17	13	8	34	34	1	165	69
2062	7	2	17	13	9	35	34	1	168	69
2063	7	2	17	14	9	36	34	1	168	69
2064	7	2	17	16	9	36	34	1	172	69
2065	8	2	17	16	9	36	34	2	176	69
2066	8	2	17	16	10	36	34	2	180	69
2067	8	3	17	19	10	36	34	2	184	69
2068	8	3	17	19	11	38	34	2	188	69
2069	8	3	17	20	11	38	34	2	191	69
2070	8	4	17	20	11	41	34	2	194	69

TABLE C3. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Denton	Erath	Hood	Johnson	Parker	Tarrant
Total Active Official Aquifer Model Cells	10,560	46,642	37,444	6,816	30,830	40,713
2009 (baseline)	0	20	0	0	0	0
2010	0	27	0	0	0	0
2011	0	33	0	0	0	0
2012	0	40	0	0	0	0
2013	0	44	0	0	0	0
2014	0	48	0	0	0	0
2015	0	53	0	0	0	0
2016	0	56	0	0	0	0
2017	0	61	0	0	0	0
2018	0	65	0	0	0	0
2019	0	68	1	0	0	0
2020	0	71	1	0	0	0
2021	0	76	1	0	1	0
2022	0	80	1	0	4	0
2023	0	81	1	0	8	2
2024	0	85	4	0	13	6
2025	0	88	7	0	16	10
2026	0	91	15	0	17	16
2027	0	94	18	0	18	25
2028	0	97	23	0	18	32
2029	0	101	28	0	23	36
2030	0	107	33	0	24	41
2031	1	108	41	0	25	48
2032	1	111	46	0	25	53
2033	1	119	56	0	26	56
2034	1	122	64	0	27	66
2035	1	123	68	0	27	74
2036	2	126	75	0	29	93
2037	2	131	82	0	29	127
2038	2	134	95	0	30	170
2039	2	136	100	0	31	231
2040	2	137	114	0	32	289
2041	2	143	129	0	32	354

Year	Denton	Erath	Hood	Johnson	Parker	Tarrant
2042	2	146	137	0	32	426
2043	2	150	150	0	32	500
2044	2	154	165	0	32	587
2045	3	157	178	0	34	648
2046	4	161	194	0	35	711
2047	4	167	212	0	36	767
2048	4	171	228	0	38	832
2049	5	174	242	0	38	889
2050	7	176	251	0	38	930
2051	8	178	262	0	38	996
2052	8	181	272	2	38	1,057
2053	9	184	282	7	38	1,114
2054	9	186	297	13	39	1,169
2055	9	189	313	19	40	1,234
2056	10	194	320	26	40	1,303
2057	11	196	330	33	41	1,366
2058	14	207	336	41	42	1,435
2059	14	211	341	49	42	1,508
2060	15	221	351	57	42	1,595
2061	16	221	363	67	43	1,681
2062	17	223	368	75	43	1,783
2063	18	224	375	83	43	1,899
2064	20	228	385	94	45	1,988
2065	22	229	393	105	46	2,104
2066	23	231	401	115	47	2,188
2067	24	233	408	130	47	2,285
2068	27	236	416	139	47	2,364
2069	31	240	424	155	47	2,468
2070	35	242	429	168	47	2,553

TABLE C4. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (TRAVIS PEAK) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Burnet	Comanche	Erath	Johnson	Lampasas	McLennan	Travis
Total Active Official Aquifer Model Cells	46,474	78,137	39,220	28,386	63,905	50,973	30,318
2009 (baseline)	217	0	0	0	1	0	57
2010	176	0	1	0	1	0	59
2011	186	0	1	0	1	0	60
2012	218	0	1	0	1	0	63
2013	249	0	1	0	1	0	65
2014	271	0	1	0	1	0	68
2015	291	0	1	0	1	0	68
2016	314	0	3	0	1	0	70
2017	331	0	4	0	1	0	70
2018	345	0	5	0	1	0	71
2019	363	0	6	0	1	0	72
2020	378	0	11	0	1	0	72
2021	394	0	17	0	1	0	74
2022	400	0	29	0	1	0	74
2023	414	0	59	0	1	0	76
2024	424	0	93	0	1	0	77
2025	438	1	114	0	1	0	77
2026	450	9	130	0	1	0	79
2027	463	14	160	0	1	0	80
2028	474	14	183	0	1	0	80
2029	483	18	205	0	1	0	82
2030	494	30	238	0	1	0	82
2031	505	34	266	0	1	0	83
2032	512	35	299	0	1	0	83
2033	520	41	328	0	1	0	84
2034	527	54	343	0	1	0	85
2035	533	67	351	0	1	0	85
2036	543	72	370	0	1	0	87
2037	545	77	398	0	1	0	88
2038	554	85	414	0	1	0	88
2039	564	94	421	0	1	0	90
2040	571	103	435	0	1	1	90
2041	579	111	453	0	1	1	91
2042	588	116	481	0	1	1	92

Year	Burnet	Comanche	Erath	Johnson	Lampasas	McLennan	Travis
2043	599	116	497	0	1	1	93
2044	604	121	507	0	1	1	93
2045	609	128	520	0	1	1	94
2046	618	138	538	0	1	1	95
2047	623	146	557	0	1	2	97
2048	629	152	590	0	1	2	97
2049	634	160	606	0	1	2	98
2050	640	166	620	0	1	2	99
2051	644	172	638	1	1	2	100
2052	648	180	651	1	1	2	100
2053	654	186	665	1	1	2	101
2054	658	190	678	1	1	2	102
2055	670	194	690	1	1	2	103
2056	675	196	699	1	1	2	103
2057	678	199	711	1	1	2	104
2058	692	206	723	1	1	2	105
2059	702	216	746	1	1	2	106
2060	717	222	774	1	1	2	106
2061	714	225	776	1	1	2	106
2062	719	227	790	1	1	2	107
2063	723	231	799	1	1	3	107
2064	728	235	813	2	1	3	109
2065	730	238	822	3	1	3	109
2066	730	245	832	3	1	3	109
2067	734	252	841	3	1	3	110
2068	741	258	850	3	1	3	110
2069	745	264	861	6	1	3	111
2070	748	269	871	7	1	3	112

TABLE C5. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (HENSELL) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Erath	Lampasas
Total Active Official Aquifer Model Cells	21,880	25,364
2009 (baseline)	0	1
2010	0	1
2011	0	1
2012	0	1
2013	0	1
2014	0	1
2015	0	1
2016	0	1
2017	0	1
2018	0	1
2019	0	1
2020	0	1
2021	0	1
2022	0	1
2023	0	1
2024	0	1
2025	0	1
2026	0	1
2027	0	1
2028	0	1
2029	0	1
2030	0	1
2031	0	1
2032	0	1
2033	0	1
2034	0	1
2035	0	1
2036	0	1
2037	0	1
2038	0	1
2039	0	1
2040	1	1
2041	1	1
2042	3	1
2043	3	1

Year	Erath	Lampasas
2044	3	1
2045	6	1
2046	7	1
2047	7	1
2048	12	1
2049	14	1
2050	14	1
2051	18	1
2052	20	1
2053	22	1
2054	24	1
2055	25	1
2056	25	1
2057	30	1
2058	31	1
2059	35	1
2060	37	1
2061	37	1
2062	40	1
2063	42	1
2064	42	1
2065	44	1
2066	46	1
2067	46	1
2068	48	1
2069	50	1
2070	52	1

TABLE C6. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (HOSSTON) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Burnet	Comanche	Erath	Johnson	McLennan	Travis
Total Active Official Aquifer Model Cells	24,354	41,062	8,464	9,462	16,991	9,480
2009 (baseline)	217	0	0	0	0	57
2010	176	0	1	0	0	59
2011	186	0	1	0	0	60
2012	218	0	1	0	0	63
2013	247	0	1	0	0	65
2014	269	0	1	0	0	68
2015	288	0	1	0	0	68
2016	310	0	1	0	0	70
2017	325	0	1	0	0	70
2018	338	0	1	0	0	71
2019	353	0	1	0	0	72
2020	368	0	1	0	0	72
2021	382	0	2	0	0	74
2022	387	0	9	0	0	74
2023	400	0	25	0	0	76
2024	409	0	51	0	0	77
2025	423	1	66	0	0	77
2026	433	9	75	0	0	79
2027	444	14	93	0	0	80
2028	455	14	99	0	0	80
2029	463	18	105	0	0	82
2030	473	30	111	0	0	82
2031	484	34	118	0	0	83
2032	491	35	127	0	0	83
2033	498	41	132	0	0	84
2034	505	54	138	0	0	85
2035	511	67	143	0	0	85
2036	520	72	151	0	0	87
2037	522	77	158	0	0	88
2038	531	85	162	0	0	88
2039	541	94	162	0	0	90
2040	547	103	166	0	1	90
2041	555	111	174	0	1	91
2042	563	116	183	0	1	92
2043	570	116	187	0	1	93

Year	Burnet	Comanche	Erath	Johnson	McLennan	Travis
2044	575	121	192	0	1	93
2045	579	128	198	0	1	94
2046	588	138	206	0	1	95
2047	591	146	211	0	2	97
2048	597	152	219	0	2	97
2049	602	160	222	0	2	98
2050	607	166	227	0	2	99
2051	609	172	229	1	2	100
2052	613	180	232	1	2	100
2053	619	186	239	1	2	101
2054	623	190	246	1	2	102
2055	633	194	253	1	2	103
2056	637	196	259	1	2	103
2057	640	199	263	1	2	104
2058	651	206	269	1	2	105
2059	659	216	283	1	2	106
2060	673	222	294	1	2	106
2061	671	225	295	1	2	106
2062	675	227	297	1	2	107
2063	679	231	299	1	3	107
2064	684	235	305	2	3	109
2065	686	238	307	3	3	109
2066	686	245	310	3	3	109
2067	689	252	315	3	3	110
2068	696	258	317	3	3	110
2069	700	264	320	6	3	111
2070	703	269	323	7	3	112

TABLE C7. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (ANTLERS) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
Total Active Official Aquifer Model Cells	7,055	23,711	77,143	59,107	44,009	9,287	77,954	56,141	42,539	5,009	92,333
2009 (baseline)	0	123	0	0	74	0	0	0	0	0	0
2010	1	80	0	0	91	6	0	0	0	0	1
2011	3	85	0	5	94	13	0	0	0	0	5
2012	7	92	0	29	99	29	0	0	0	0	6
2013	11	99	0	95	108	34	0	0	0	1	6
2014	16	103	1	201	110	36	0	0	0	6	6
2015	22	111	2	341	111	36	0	0	0	15	8
2016	30	120	3	500	113	36	0	0	0	28	67
2017	37	130	4	616	115	36	2	0	0	40	221
2018	44	141	7	721	117	39	6	0	1	58	372
2019	47	156	10	806	120	44	10	0	1	78	484
2020	53	167	17	901	125	48	22	0	2	94	574
2021	57	176	27	1,017	127	51	29	0	2	111	654
2022	62	186	37	1,199	130	52	36	0	2	124	741
2023	67	202	49	1,375	130	60	48	0	6	140	810
2024	71	230	64	1,543	133	74	57	0	9	151	879
2025	77	270	76	1,692	137	81	72	0	19	158	947
2026	79	294	95	1,803	139	90	90	0	54	162	995
2027	83	327	111	1,903	149	102	101	0	84	167	1,053
2028	86	373	123	1,983	156	110	106	0	112	171	1,109
2029	90	422	140	2,056	162	128	117	0	141	179	1,180
2030	94	448	152	2,121	179	171	122	0	166	183	1,236

Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
2031	96	478	164	2,180	204	185	134	0	184	190	1,294
2032	100	517	175	2,244	221	197	140	0	206	195	1,368
2033	103	554	185	2,299	233	208	148	0	218	202	1,479
2034	105	617	199	2,364	236	222	152	0	234	208	1,551
2035	110	669	216	2,436	242	225	161	0	244	215	1,628
2036	111	710	222	2,517	249	232	168	0	254	222	1,713
2037	113	771	234	2,623	259	246	175	0	262	229	1,809
2038	116	836	245	2,708	282	262	184	0	270	236	1,879
2039	121	865	256	2,788	304	283	191	0	278	244	1,952
2040	122	913	264	2,879	321	303	195	0	285	256	2,029
2041	123	957	276	2,951	331	313	201	0	292	291	2,085
2042	126	998	292	3,038	344	326	205	0	295	349	2,130
2043	128	1,032	300	3,119	363	334	210	0	303	383	2,174
2044	130	1,074	307	3,189	380	351	215	0	305	414	2,214
2045	131	1,129	314	3,251	397	359	221	0	309	446	2,253
2046	131	1,171	323	3,336	412	372	230	0	312	472	2,291
2047	136	1,221	333	3,405	442	390	233	0	318	501	2,349
2048	137	1,266	340	3,465	453	415	239	0	319	533	2,382
2049	139	1,320	353	3,524	474	440	240	0	325	558	2,413
2050	141	1,351	361	3,589	502	455	244	0	326	583	2,442
2051	141	1,389	367	3,633	525	468	247	0	327	608	2,458
2052	143	1,435	376	3,688	548	482	254	0	331	632	2,480
2053	146	1,469	379	3,745	590	493	257	0	332	652	2,496
2054	147	1,510	384	3,788	619	506	258	0	334	671	2,518
2055	148	1,548	392	3,849	645	526	264	0	335	697	2,533
2056	149	1,585	399	3,897	668	548	267	0	337	719	2,545

Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
2057	150	1,626	402	3,948	681	564	270	0	340	754	2,558
2058	150	1,703	407	3,981	715	578	274	0	340	788	2,574
2059	152	1,750	411	4,028	733	606	280	1	346	817	2,586
2060	154	1,813	416	4,067	751	627	283	1	346	845	2,594
2061	155	1,846	424	4,115	756	637	283	1	350	872	2,607
2062	156	1,909	428	4,152	777	646	287	1	350	898	2,616
2063	158	1,944	434	4,193	793	673	288	1	350	930	2,629
2064	158	1,968	441	4,232	807	711	292	1	350	953	2,635
2065	158	2,001	448	4,260	821	744	294	1	350	966	2,642
2066	158	2,065	450	4,295	842	770	298	1	352	984	2,653
2067	160	2,117	454	4,335	854	792	301	1	354	1,005	2,665
2068	162	2,154	455	4,360	863	802	303	1	355	1,016	2,676
2069	162	2,198	459	4,395	876	825	303	1	359	1,017	2,684
2070	164	2,268	462	4,438	881	846	307	1	360	1,019	2,691

TABLE C8. SUMMARY OF DRY MODEL CELLS FOR THE WOODBINE AQUIFER FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Cooke	Denton	Fannin	Grayson	Johnson	Tarrant
Total Active Model Cells in Official Aquifer Boundary	11,762	5,700	11,991	15,443	17,911	8,407	8,901
2009 (baseline)	0	0	3	3	2	14	2
2010	0	4	3	3	3	16	2
2011	0	4	3	4	3	16	2
2012	0	4	3	4	5	16	2
2013	0	4	3	4	5	19	2
2014	0	4	3	5	6	23	2
2015	0	4	3	6	7	23	2
2016	0	5	3	6	8	23	2
2017	0	5	3	8	9	24	2
2018	0	5	3	9	10	26	2
2019	0	5	3	10	11	26	2
2020	0	5	3	11	11	26	2
2021	0	5	3	12	13	27	2
2022	0	5	3	12	14	28	2
2023	0	5	3	12	14	28	2
2024	0	5	4	13	14	29	2
2025	0	5	5	14	15	29	2
2026	0	5	5	15	15	30	2
2027	0	5	5	15	15	31	2
2028	0	6	5	15	15	33	2
2029	0	6	5	15	15	34	2
2030	0	6	5	15	15	36	2
2031	0	6	5	16	15	37	2
2032	0	6	5	17	16	37	2
2033	0	6	5	18	17	38	2
2034	0	6	5	20	18	40	2
2035	0	6	5	21	19	40	2
2036	0	6	5	22	19	41	2
2037	0	6	5	24	19	41	2
2038	0	6	5	25	23	42	2
2039	0	6	5	26	25	42	2
2040	0	6	5	27	25	42	2
2041	0	6	5	27	25	42	2

Year	Collin	Cooke	Denton	Fannin	Grayson	Johnson	Tarrant
2042	0	6	5	27	27	42	2
2043	0	6	5	27	27	42	2
2044	0	6	5	28	30	42	2
2045	0	6	5	29	31	43	2
2046	0	6	6	30	31	43	2
2047	0	6	6	30	31	43	2
2048	0	6	7	32	34	43	2
2049	0	6	8	35	34	43	2
2050	0	7	8	35	35	43	2
2051	0	8	8	35	35	43	2
2052	0	8	8	37	35	43	2
2053	0	8	8	38	35	44	2
2054	0	8	8	38	37	45	2
2055	0	9	8	38	38	45	2
2056	0	10	8	38	38	46	2
2057	0	10	9	39	38	46	2
2058	0	10	9	42	39	50	3
2059	0	10	9	44	40	52	3
2060	0	13	9	47	41	54	3
2061	0	14	9	47	41	53	3
2062	0	14	9	47	41	53	3
2063	0	17	9	47	42	55	3
2064	0	20	9	47	42	55	3
2065	0	21	9	47	42	56	3
2066	1	23	9	47	42	57	3
2067	1	23	9	48	45	58	3
2068	2	24	9	49	45	59	3
2069	2	24	9	50	45	59	3
2070	2	24	9	50	45	60	3

Appendix D

Summary of Dry Model Cell Count for the Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Brown, Burnet, Lampasas, and Mills Counties

TABLE D1. SUMMARY OF DRY MODEL CELLS FOR THE MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES FROM THE PREDICTIVE SIMULATION.

Year	Burnet	Lampasas	Burnet	Burnet
	Marble Falls		Ellenburger-San Saba	Hickory
Total Active Cells in modeled extent	10,810	7,614	13,618	14,334
2009 (baseline)	2298	611	709	111
2010	2353	631	724	112
2011	2363	638	735	112
2012	2376	641	744	113
2013	2386	642	758	113
2014	2391	646	769	113
2015	2395	650	776	113
2016	2397	653	781	115
2017	2405	654	787	117
2018	2406	657	795	117
2019	2409	659	801	118
2020	2413	661	804	118
2021	2419	661	809	118
2022	2419	661	810	118
2023	2421	661	811	118
2024	2422	662	813	119
2025	2423	662	817	120
2026	2425	664	821	120
2027	2426	665	821	120
2028	2428	666	823	120
2029	2433	667	824	122
2030	2433	669	824	123
2031	2435	670	825	123
2032	2436	671	828	123
2033	2438	671	830	123
2034	2440	672	832	124
2035	2441	673	832	124
2036	2441	675	833	124
2037	2442	676	833	124
2038	2442	677	834	125
2039	2443	678	837	126
2040	2443	678	837	126

Year	Burnet	Lampasas	Burnet	Burnet
	Marble Falls		Ellenburger-San Saba	Hickory
2041	2443	680	839	126
2042	2443	680	840	126
2043	2443	680	842	127
2044	2444	680	842	127
2045	2445	680	842	128
2046	2446	680	843	128
2047	2446	680	843	128
2048	2446	680	843	128
2049	2446	680	844	128
2050	2446	680	845	128
2051	2446	681	846	128
2052	2446	681	846	128
2053	2446	681	846	130
2054	2446	681	846	130
2055	2447	681	846	130
2056	2447	681	847	130
2057	2447	681	848	130
2058	2447	682	848	130
2059	2448	682	849	130
2060	2448	682	849	130
2061	2448	682	849	130
2062	2448	682	849	130
2063	2448	682	849	130
2064	2449	682	849	130
2065	2449	683	849	130
2066	2449	683	849	130
2067	2449	683	850	130
2068	2449	683	850	130
2069	2450	683	850	130
2070	2450	683	850	130

GAM Run 19-018: Upper Trinity Groundwater Conservation District Groundwater Management Plan

Jerry (Jianyou) Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
512-463-5076

November 1, 2019

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GAM RUN 19-018: UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT GROUNDWATER MANAGEMENT PLAN

Jerry (Jianyou) Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
512-463-5076
November 1, 2019

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 Upper Trinity Groundwater Conservation District in two parts. Part 1 is the Estimated Historical Water Use/State Water Plan dataset report, which will be provided to you separately by the TWDB Groundwater Technical Assistance Department. Please direct questions about the water data report to Mr. Stephen Allen at 512-463-7317 or stephen.allen@twdb.texas.gov. Part 2 is the required groundwater availability modeling information 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 Upper Trinity Groundwater Conservation District should be adopted by the district on or before June 17, 2019 and submitted to the Executive Administrator of the TWDB on or before July 17, 2020. The current management plan for the Upper Trinity Groundwater Conservation District expires on September15, 2020.

Information for the Trinity Aquifer in the Upper Trinity Groundwater Conservation District is from the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014). This report replaces the results of GAM Run 14-008 (Shi and Wade, 2015), as the approach used for analyzing model results has been since refined. In this report, the groundwater evapotranspiration discharge to riparian areas was not included in the total discharge to surface water bodies.

METHODS:

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

PARAMETERS AND ASSUMPTIONS:

Trinity and Woodbine Aquifers

- We used version 2.01 of the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers. See Kelley and others (2014) for assumptions and limitations of the model.

- The groundwater availability model for the northern portion of the Trinity and Woodbine aquifers contains eight layers that generally represent the following: Layer 1 (the surficial outcrop area of the units in layers 2 through 8 and units younger than Woodbine Aquifer), Layer 2 (Woodbine Aquifer), Layer 3 (Washita and Fredericksburg Groups, and the Edwards (Balcones Fault Zone) Aquifer), and Layers 4 through 8 (Trinity Aquifer). Layers 2 through 7 also include pass-through cells. The Woodbine and Edwards (Balcones Fault Zone) aquifers are not located within the Upper Trinity Groundwater Conservation District.

- Perennial rivers and reservoirs were simulated using the MODFLOW River package. Ephemeral streams, flowing wells, springs, and evapotranspiration in riparian zones along perennial rivers were simulated using the MODFLOW Drain package. Groundwater discharge to surface water bodies in the district was the sum of groundwater discharge from the MODFLOW river and drain packages minus the riparian zone evapotranspiration discharge.

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

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifers according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Trinity Aquifer located within the Upper Trinity Groundwater Conservation District and averaged over the historical calibration periods, as shown in Table 1.

1. Precipitation recharge—the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.
2. Surface-water outflow—the total water discharging from the aquifer (outflow) to surface-water features such as streams, reservoirs, and springs.
3. Flow into and out of district—the lateral flow within the aquifer between the district and adjacent counties.
4. Flow between aquifers—the net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

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

TABLE 1. SUMMARIZED INFORMATION FOR THE TRINITY AQUIFER FOR UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	129,019
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Trinity Aquifer	70,613
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	12,967
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	35,502
*Estimated net annual volume of flow between each aquifer in the district	From the overlying Fredericksburg and Washita groups into the Trinity Aquifer	26,667

*The model assumes there is no interaction between the Trinity Aquifer and any underlying water-bearing hydrogeologic units.

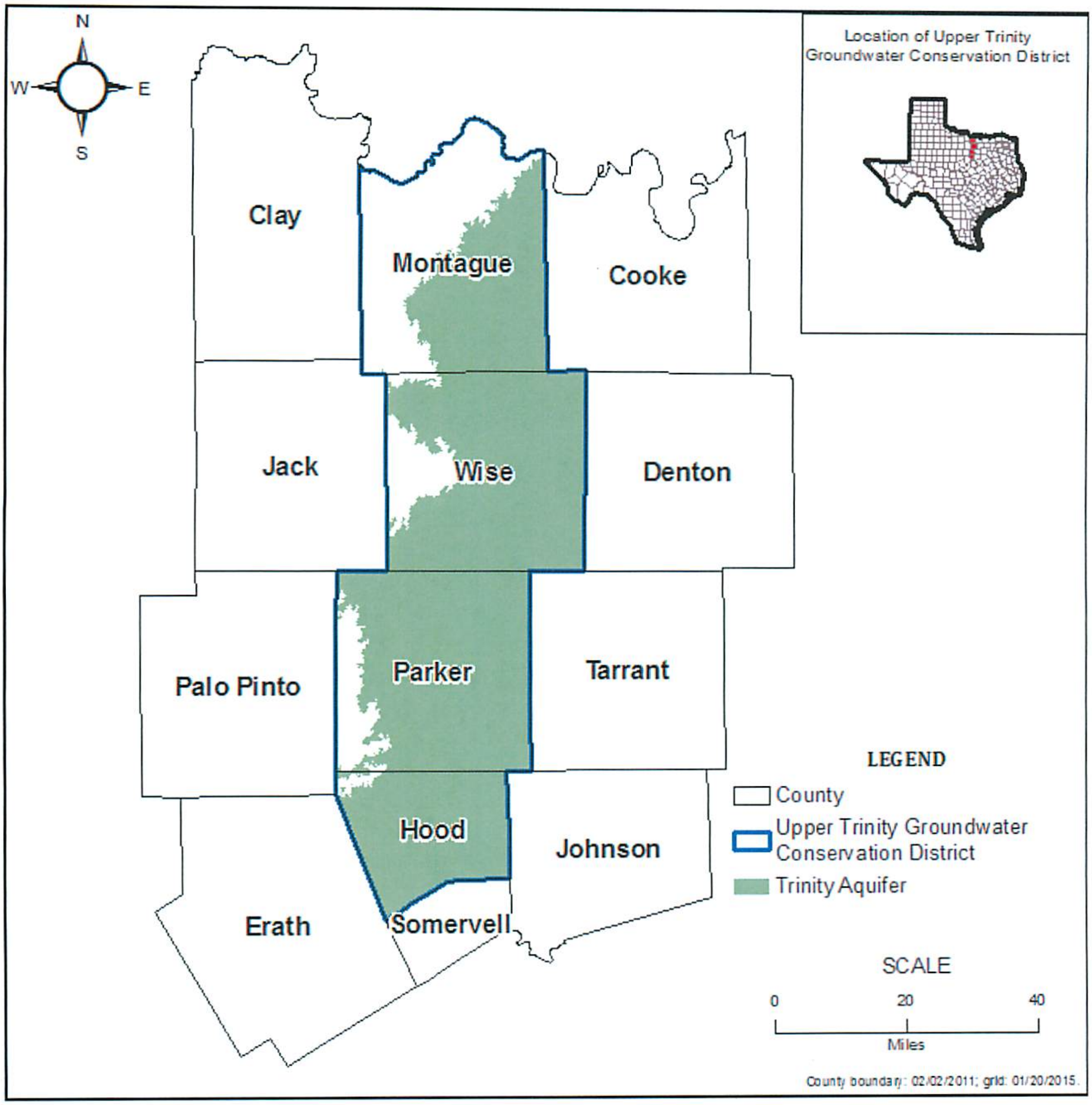

FIGURE 1 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE TRINITY AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

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 historical groundwater flow conditions includes the assumptions about the location in the aquifer where historical 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 historical 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. Historical precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models: U.S. Geological Survey Groundwater Software.

Kelley, V.A., Ewing, J., Jones, T.L., Young, S.C., Deeds, N., and Hamlin, S., 2014, Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers – Final Model Report, 984 p., http://www.twdb.texas.gov/groundwater/models/gam/trnt_n/Final_NTGAM_Vol%20I%20Aug%202014_Report.pdf

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Niswonger, R.G., Panday, S., and Ibaraki, M., 2011, MODFLOW-NWT, a Newton formulation for MODFLOW-2005: USGS, Techniques and Methods 6-A37, 44 p.

Shi, J. and Wade, S.C., 2015, GAM Run 14-008: Upper Trinity Groundwater Conservation District Management Plan, 10 p., https://www.twdb.texas.gov/groundwater/docs/GAMruns/GR14-008.pdf

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

APPENDIX C

District Rules

https://uppertrinitygcd.com/pdf/UTGCD-RULES.pdf

APPENDIX D

Resolution Adopting the Management Plan

RESOLUTION#20-002 ADOPTING A MANAGEMENT PLAN

THE STATE OF TEXAS	§
	§
UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT	§

Whereas, the Upper Trinity Groundwater Conservation District (the "District") was created as a groundwater conservation district by the 80th Texas Legislature under the authority of Section 59, Article XVI, of the Texas Constitution, and in accordance with Chapter 36 of the Texas Water Code by the Act of May 25, 2007, 80th Leg., R.S., ch. 1343, 2007 Tex. Gen. Laws 4583, codified at TEX. SPEC. DIST. LOC. LAWS CODE ANN. ch. 8830 ("the District Act");

Whereas, under the direction of the Board of Directors of the District (the "Board"), and in accordance with sections 36.1071 and 36.1072 of the Texas Water Code, and 31 Texas Administrative Code Chapter 356, the District has timely undertaken the development of its Management Plan;

Whereas, as part of the process of developing its Management Plan, the District requested and received the assistance of the Texas Water Development Board (the "TWDB") and worked closely with the TWDB staff to obtain staff's input and comments on the draft Management Plan and its technical and legal sufficiency;

Whereas, the Board and the staff of the District and the District's consultants and legal counsel reviewed and analyzed the District's best available data, groundwater availability modeling information, and other information and data required by the TWDB;

Whereas, the District issued the notice in the manner required by state law and held a public hearing on June 15, 2020 at the District's office located at 1859 W. Hwy 199, Springtown, Texas Springtown Texas, to receive public and written comments on the Management Plan. In order to facilitate social distancing and to slow the spread of COVID-19 (Coronavirus), this Hearing was made available and open to the public via videoconference. This was done in accordance with Section 418.016 of the Texas Government Code and actions taken by the Office of the Governor of Texas on March 16, 2020, suspending various provisions of Chapter 551 of the Texas Government Code;

Whereas, the District coordinated its planning efforts on a regional basis with the appropriate surface water management entities during the preparation of the Management Plan;

Whereas, the Board finds that the Management Plan meets all of the requirements of Chapter 36, Water Code, and 31 Texas Administrative Code Chapter 356; and

Whereas, after the public hearing, the Board of Directors met in a regular board meeting on June 15, 2020, properly noticed in accordance with appropriate law, and considered adoption of the attached Management Plan and approval of this resolution after due consideration of all comments received.

NOW, THEREFORE, BE IT RESOLVED THAT:

1. The above recitals are true and correct.

2. The Board of Directors of the Upper Trinity Groundwater Conservation District hereby adopts the attached Management Plan as the Management Plan for the District;

3. The Board President and the General Manager of the District are further authorized to take all steps necessary to implement this resolution and submit the Management Plan to the TWDB for its approval; and

4. The Board President and General Manager of the District are further authorized to take any and all action necessary to coordinate with the TWDB as may be required in furtherance of TWDB's approval pursuant to the provisions of Section 36.1072 of the Texas Water Code.

AND IT IS SO ORDERED.

Upon motion duly made by Director Majka, and seconded by Director Watts, and upon discussion, the Board of Directors voted 6 in favor, 0 opposed, 0 abstained, and 2 absent; the motion thereby PASSED on this 15 day of June, 2020.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT

By:____________________
President

____
Secretary

APPENDIX E

Evidence that the Management Plan was Adopted after Notice and Hearing

NOTICE OF REGULAR MEETING AND PUBLIC HEARING
OF THE
UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT

Join Zoom Meeting
https://us02web.zoom.us/j/81713420516
1 (346) 248-7799 – US
Meeting ID: 817 1342 0516

Monday, June 15, 2020
Public Hearing and Board Meeting begin at 5:00 PM
Regular Meeting begins at conclusion of Public Hearing

In order to facilitate social distancing and to slow the spread of COVID-19 (Coronavirus), and in accordance with Section 418.016 of the Texas Government Code and actions taken by the Office of the Governor of Texas on March 16, 2020, and subsequently, suspending various provisions of Chapter 551 of the Texas Government Code, this meeting of the Board of Directors (Board) of the Upper Trinity Groundwater Conservation District (District) will be conducted by online videoconference / teleconference.

For this meeting a members of the Board will be physically present at the Board's regular meeting location at the District office in Springtown, Texas. However, members of the public interested in joining the meeting must do so remotely in order to promote social distancing and to slow the spread of COVID-19 (Coronavirus). If you would like to join the meeting remotely to observe it, hear the communications that occur at the meeting and the public deliberations of the Board, or to comment on, support, or contest agenda items being considered by the Board, you may join the meeting at no charge online at the following address: https://us02web.zoom.us/j/81713420516. Members of the public may also access the meeting by telephone at the following number: (346) 248-7799. Use Meeting ID: 817 1342 0516. Long distance charges may apply to persons calling in to this number, depending upon their phone carrier and plan.

Any additional public information concerning the meeting or agenda items will be posted on the District's website "Meetings" page prior to or during the board meeting at: https://uppertrinitygcd.com/meetings/

Persons wanting to comment on an agenda item but otherwise not wishing to join the meeting may email comments to the following address: doug@uppertrinitygcd.com. Additionally, an audio recording of the meeting will be made, and can be requested after the conclusion of the meeting by sending a written request to the District at P.O. Box 1749, Springtown, Texas, 76082, or by email to: doug@uppertrinitygcd.com.

INTRODUCTORY MATTERS

1. Welcome guests and members of the public.

2. Roll call, establish a quorum, call Public Hearing and Board Meeting to order; declare the hearing and board meeting open to the public.

3. Moment of silence.

4. Public comment.

PUBLIC HEARING

1. Discussion and public comment on the District's 2020 Management Plan Update, including the adoption of Resolution 20-002 Adopting a Management Plan; take action as necessary.

2. Adjourn or continue Public Hearing for the District's 2020 Management Plan - At the conclusion of the hearing or any time or date thereafter, the proposed Management Plan may be adopted in the form presented or as amended based upon comments received from the public, the TWDB, District staff, attorneys, consultants, or members of the Board of Directors without any additional notice.

REGULAR BOARD MEETING

1. **Consent Agenda**: Each of these items is recommended by the Staff and approval thereof will be strictly on the basis of the Staff recommendations. Approval of the Consent Agenda authorizes the General Manager or his designee to implement each item in accordance with the Staff recommendations. The consent agenda will be approved as a block. Any Board member that has questions regarding any item on the consent agenda may have the item pulled and considered as a regular item on the agenda. Any items so pulled for separate discussion will be considered as the first items following approval of the consent agenda.
   A. Approval of minutes from Regular Board Meeting on May 18, 2020.
   B. Approval of bank statement ending May 29, 2020, and current financial reports of the District.
   C. Approval of Investment Report.
   D. Payment of bills/invoices received through June 15, 2020.
   E. Reimbursements for expenses incurred on behalf of the District through June 15, 2020.
2. Any items from consent agenda that were pulled for further discussion.
3. Discussion regarding the following requests for a second extension to drill approved water wells, take action as necessary:
   A. Non-Exempt Wells:
      1) Well ID 10150 for Stonegate Partners- Deer Creek LP in Parker County.
      2) Well ID 10151 for Stonegate Partners- Deer Creek LP in Parker County.
      3) Well ID 11001 for Aqua TX in Wise County.
      4) Well ID 11570 for Town of Annetta in Parker County.
      5) Well ID 11901 for Lackland Fairview, LLC in Wise County.
      6) Well ID 11992 for Town of Annetta in Parker County.
      7) Well ID 11993 for Town of Annetta in Parker County.
   B. Exempt Wells:
      1) Well ID 12805 for Anita McAlister in Montague County.
4. Discussion regarding providing financial assistance to District Staff Geologist, Blaine Hicks, in paying tuition for the Master of Science in Geoscience program offered by the Department of Chemistry, Geoscience, & Physics at Tarleton State University, including adoption of Resolution 20-003 To Provide a Tuition Assistance Program to District Employees; take action as necessary.
5. Discussion and update on Groundwater Management Area 8 and other Joint Planning activities; take action as necessary.
6. **Management Report on Administrative and Operational Issues**: The General Manager and staff will brief the Board on the following and any other items included in the General Manager's written report, which may be discussed, considered, and acted upon by the Board, including authorizing the initiation of, managing, or resolving enforcement action or litigation where applicable.
   A. General Manager's report

B. Report on delinquent customers of the District and take any necessary action for collection of delinquent fees

C. Report on Education and Outreach activities

D. Report on injection well applications filed with the Railroad Commission

E. Well Registration and Groundwater Production reports

7. Review line item expenditures and adopt budget amendment(s) as necessary.

8. Discussion regarding staff's supplemental insurance; take action as necessary.

9. General Counsel's Report: The District's legal counsel will brief the Board on pertinent legal issues and developments impacting the District since the last regular Board meeting, and legal counsel's activities on behalf of the District, including without limitation: waste injection; well monitoring activities; District rules enforcement activities; District Rules and District Management Plan development or implementation issues; groundwater-related legislative activities; joint planning and desired future conditions development activities; developments in groundwater case law and submission of legal briefs; contractual issues related to the District; open government, policy, personnel, and financial issues of the District; and other legal activities on behalf of the District, take action as necessary.

10. Determine time and place for next meeting.

11. New business to be placed on the next meeting agenda.

12. Adjourn board meeting.

The above agenda schedule represents an estimate of the order for the indicated items and is subject to change at any time. These public meetings and hearings are available to all persons regardless of disability. If you require special assistance to attend the meetings or hearings, please call or (817) 523- 5200 at least 24 hours in advance of the meeting to coordinate any special physical access arrangements.

At any time during a work session, meeting or hearing and in compliance with the Texas Open Meetings Act, Chapter 551, Government Code, Vernon's Texas Codes, Annotated, the Upper Trinity Groundwater Conservation District Board may meet in executive session on any of the above agenda items or other lawful items for consultation concerning attorney-client matters (§551.071); deliberation regarding real property (§551.072); deliberation regarding prospective gift (§551.073); personnel matters (§551.074); and deliberation regarding security devices (§551.076). Any subject discussed in executive session may be subject to action during an open meeting.

--Please visit the website – www.uppertrinitygcd.com

This is to certify that I, Doug Shaw, posted this agenda on the bulletin board of the Administrative Offices of the District at 1859 W. Highway 199, Springtown TX 76082, and also provided this agenda to the County Clerk in Parker County with a request that it be posted at or before 4:00 p.m. on the 12 of June.

Doug Shaw, General Manager

APPENDIX F

Evidence that the District Coordinated Development of the Management Plan with Surface Water Entities

Doug Shaw

From: Doug Shaw
Sent: Tuesday, June 16, 2020 12:58 PM
To: 'renglish@amud.com'; 'davidc@brazos.org'; 'citymanager@cityofbowietx.com'; 'lhenley@cityofnocona.com'; 'Rick Shaffer'; 'derrad@parkercountywater.com'; 'randy.whiteman@rra.texas.gov'; 'joliver@trwd.com'; 'wardk@trinityra.org'; 'steve@walnutcreeksud.org'
Subject: 2020 UTGCD Groundwater Management Plan Update
Attachments: UTGCD-2020 Managament Plan Update.pdf

All,

At a Public Hearing held in conjunction with their Regular June Board meeting, the Upper Trinity Groundwater Conservation District (District) Board of Directors adopted an update to the District's Management Plan. Chapter 36 of the Texas Water Code requires that groundwater districts update their management plan every 5 years, and the District's current plan expires this fall.

As required by the Texas Water Development Board, I have included a copy of the updated Management Plan to this email for your review. Please do not hesitate to contact me with any questions.

Thanks,
ds

Doug Shaw
General Manager
Upper Trinity Groundwater Conservation District
PO Box 1749, Springtown, 76082
Phone: 817-523-5200
Fax: 817-523-7687
www.uppertrinitygcd.com

Acton Municipal Utility District	renglish@amud.com
Brazos River Authority	davidc@brazos.org
City of Bowie	citymanager@cityofbowietx.com
City of Nocona	lhenley@cityofnocona.com
City of Weatherford	rshaffer@weatherfordtx.gov
Parker County Special Utility District	derrad@parkercountywater.com
Red River Authority	randy.whiteman@rra.texas.gov
Tarrant Regional Water District	joliver@trwd.com
Trinity River Authority	wardk@trinityra.org
Walnut Creek Special Utility District	steve@walnutcreeksud.org