CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT

District Management Plan

Originally Adopted – April 16, 2007

Revision One – Adopted May 21, 2012

Revision Two – Adopted TBD 2017

Central Texas Groundwater Conservation District

District Management Plan

REVISION RECORD

Date Adopted	Effective Date	Affected Sections or General Comments
4/16/07	4/16/07	Original Adoption
5/21/12	5/21/12	Revision 1: 5 year Statutory Review, General Revisions, and New Chapter 36 Requirements Including DFCs
TBD	TBD	Revision 2: 5 year Statutory Review and General Revisions

I. DISTRICT MISSION

The mission of the Central Texas Groundwater Conservation District (District) is to protect and enhance the groundwater resources of Burnet County while protecting groundwater users and maintaining the economic vitality of the communities it serves, by adopting and enforcing rules consistent with State law.

II. PURPOSE OF THE MANAGEMENT PLAN

Senate Bill 1 (SB 1), enacted by the 75th Texas Legislature in 1997, and Senate Bill 2 (SB 2), enacted by the 77th Texas Legislature in 2001, established a comprehensive statewide planning process and the actions necessary for districts to manage and conserve the groundwater resources of the state of Texas. These bills required all underground water conservation districts to develop a management plan which defines the water needs and supply within each district and the goals each district will use to manage the underground water in order to meet its needs. In addition, the 79th Texas Legislature enacted HB 1763 in 2005 that requires joint planning among districts that are in the same Groundwater Management Area (GMA). These districts must establish the desired future conditions of the aquifers within their respective GMAs. Through this process, the districts will submit the desired future conditions to the executive administrator of the Texas Water Development Board (TWDB) who will provide each district with the estimates concerning the modeled available groundwater in the management area based on the desired future conditions of the aquifers in the area. Technical information, such as the desired future conditions of the aquifers within the District's jurisdiction and the amount of modeled available groundwater from such aquifers is required by statute to be included in the District's management plan and will guide the District's regulatory and management policies. This management plan is intended to satisfy the requirements of SB 1, SB 2, HB 1763, the statutory requirements of Texas Water Code (TWC) Chapter 36, and the rules and requirements of the TWDB.

This plan is required by the TWC and developed in accordance with instruction from the TWDB. The TWC and the TWDB require use of certain data provided by the TWDB. The projections of future water demands, surface water availability, water management strategies, and groundwater use in Burnet County were all provided to the District by TWDB. This document should be considered as a PLAN and will be used to identify activities or programs that the District will develop. The District considers the collection and development of site-specific data on groundwater use in Burnet County and the groundwater sources of Burnet County to be a high priority. This Plan will be updated as the District develops the site-specific data on the local groundwater use and aquifer conditions. The District is not restricted by the TWC or TWDB as to the frequency with which the Plan may be updated if considered it is appropriate by the District, but is required to be updated every five years.

III. DISTRICT INFORMATION

A. Creation

The 79th Texas Legislature (Regular Session) created the District in 2005 by passage of SB 967 and the enabling act was amended by the 83rd Texas Legislature (Regular Session) by passage of SB 168. The citizens of Burnet County confirmed creation of the District by an election held on September 24, 2005. The District was formed to protect the underground water resources for the citizens of Burnet County. To manage the groundwater resources under its jurisdiction the District is charged with the rights and responsibilities specified in its enabling legislation; the provisions of Chapter 36 of the Texas Water Code; this Management Plan, and the District Rules.

B. Directors

The Board of Directors consists of five members. These five directors are elected by the voters of Burnet County and serve a four-year term. The District observes the same four precincts as the Burnet County Commissioners with one at-large position. Director terms are staggered on a two-year interval. Elections are held in even numbered years. A director may serve consecutive terms.

C. Authority

The District has the rights and responsibilities provided for in TWC Chapter 36 and 31 Texas Administrative Code (TAC) Chapter 356. The District is charged with undertaking hydrogeological studies, adopting a management plan, providing for the permitting of certain water wells and implementing programs to achieve statutory mandates. The District has rule-making authority to implement the policies and procedures needed to manage the groundwater resources of Burnet County.

D. Location and Extent

The boundaries of the District are the same as Burnet County. (Figure 1) This area encompasses approximately 1,019 square miles (approximately 652,160 acres). The District is bounded by Lampasas County to the north, Bell and Williamson Counties to the east, Travis and Blanco Counties to the south, and Llano and San Saba Counties to the west. Burnet County has a vibrant economy.

E. Topography and Drainage

Burnet County is located on the margin of two geographic regions. The eastern portion of the County is located in the Hill Country Region of the Balcones Escarpment. The western portion of the County is located in the Llano Uplift Region. The Colorado River and its tributaries drain the western and southern portions of the County. The tributaries of the Brazos River drain the northern and eastern portions the County.

F. Groundwater Resources of Burnet County

Burnet County enjoys a variety of groundwater resources. TWDB recognizes one major and three minor aquifers in the County. In addition to the aquifers defined by TWDB, there also exist two local water bearing formations that are important sources of water in Burnet County. The TWBD classifies groundwater sources as major or minor aquifers. Major aquifers are defined by TWDB as aquifers that are capable of producing large yields to wells or that produce groundwater over a large area. TWDB has established no definition for a large area, but a large yield may be considered as greater than 500 gallons per minute. Minor aquifers are defined by TWDB as aquifers that may be capable of producing only limited yields to wells or that produce groundwater over a limited area. TWDB has established no definition for a limited area, but a limited yield may be less than 100 gallons per minute. Many localized sources of groundwater may not be listed as a major or minor aquifer by TWDB. However, TWDB recognizes that these classifications, or lack thereof, have no bearing on the local importance of a particular source of groundwater. The District is committed to better defining the extent and character of the complex groundwater resources of Burnet County. The geologic layers and hydrogeologic units of Burnet County can be found in Table 1.

Central Texas Groundwater Conservation District Boundary

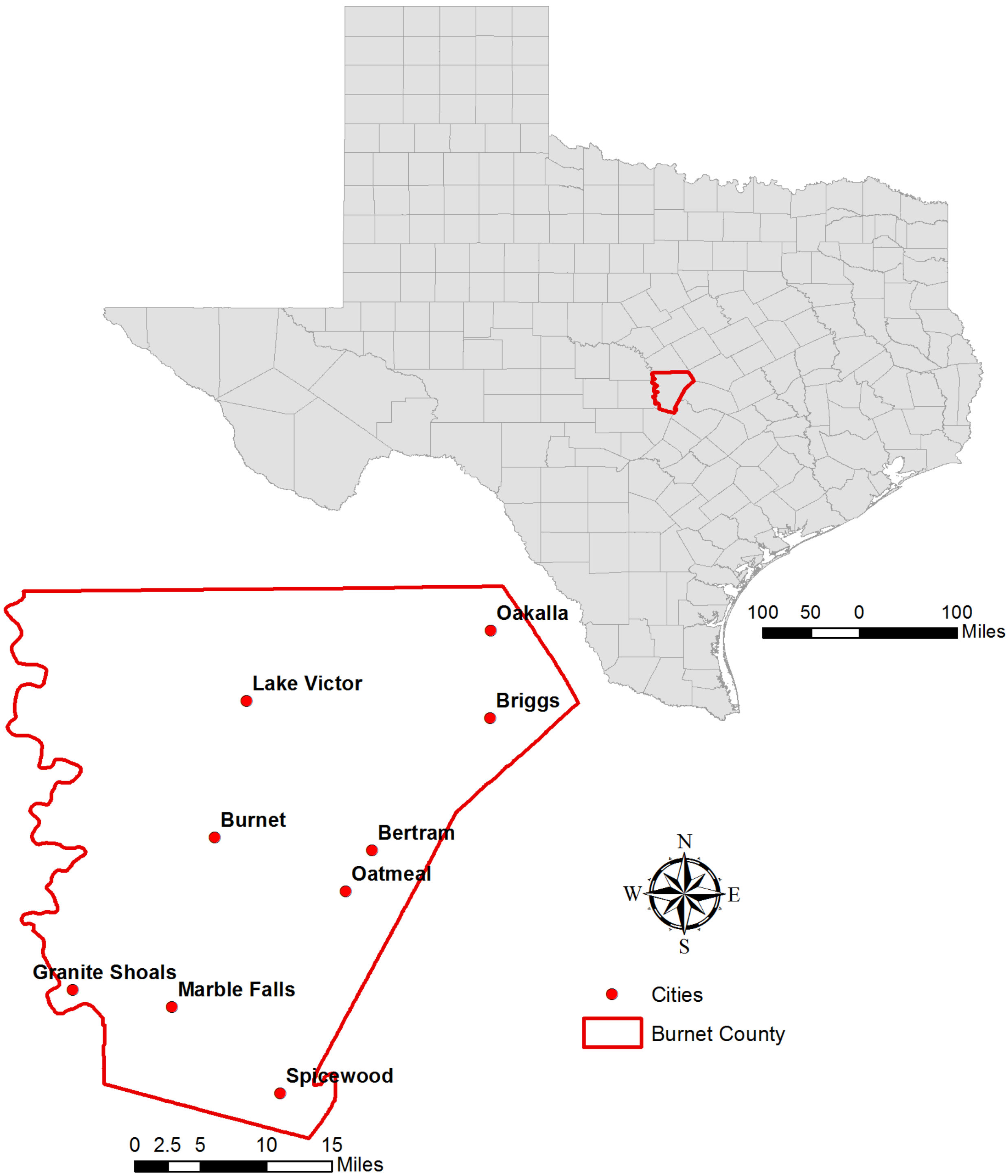

Figure 1, Location and Boundaries of the Central Texas Groundwater Conservation District

Major Aquifer

The only major aquifer located in Burnet County is the Trinity aquifer. (Figure 2)

Trinity Aquifer

The Trinity aquifer is composed of three subdivisions; the Upper Trinity; the Middle Trinity and the Lower Trinity aquifers. The Upper Trinity aquifer is composed of the Paluxy Sand and Glen Rose Formation; the Middle Trinity aquifer is composed of the Hensell Sand and Cow Creek Limestone; and the Lower Trinity aquifer is composed of the Sligo Limestone and Hosston Sand.

The following descriptions are taken from the District's report *Trinity Aquifer Characterization and Groundwater Availability Assessment Burnet County, 2011*.

Hosston Sand Formation

The Hosston is present in the extreme eastern and southeastern part of Burnet County. The outcrop equivalent of the Hosston is the Sycamore Sand, which outcrops along the Colorado River. Well yields are often small, generally less than 20 gallons per minute (gpm). The unit is generally non-water bearing, except beneath the surface of Lake Travis where more permeable facies exist. Well data from southeastern Burnet County appear to support this conclusion. The Hosston, some distance north of Lake Travis, is generally thin and not a significant source of groundwater. The Hosston has not been found in the western or northwestern part of the Trinity aquifer area of the District. The Hosston is not considered a significant source of groundwater in the District.

Cow Creek Limestone Member

The Cow Creek ranges in thickness from 35 feet in the west to about 140 feet in the east. The Cow Creek is defined as the interval from the base of the Hensell Sand to the Hosston or the Ellenburger/Smithwick. The Cow Creek, being below the Hensell sand is saturated, but yielded no significant groundwater during drilling of the District monitor wells. The Cow Creek is not considered a significant source of groundwater in the District.

Hensell Sand Member

The Hensell Sand is the primary source of groundwater in the Trinity aquifer of the District. Except for wells completed in the Ellenburger below the Trinity in the western part of the Trinity area, the vast majority of wells are completed in the Hensell. Well yields in the Hensell are generally in the range of 10-40 gpm. However, along Hwy. SH-29, well yields are frequently estimated to be greater than 50 gpm, and even up to 100+ gpm. A City of Burnet well was operated at 250 gpm for short periods.

Glen Rose Limestone

The Glen Rose overlies the Hensell Sand and is a limited source of groundwater in the District. The primary limitation is saturated thickness. Thus, the Glen Rose is a source of groundwater in the District, but is dependent upon location.

Paluxy Formation

The Paluxy overlies the Glen Rose and is present in the upland inter-stream areas. The formation is thin and unrecognizable during drilling. The Paluxy is not a source of groundwater in the District.

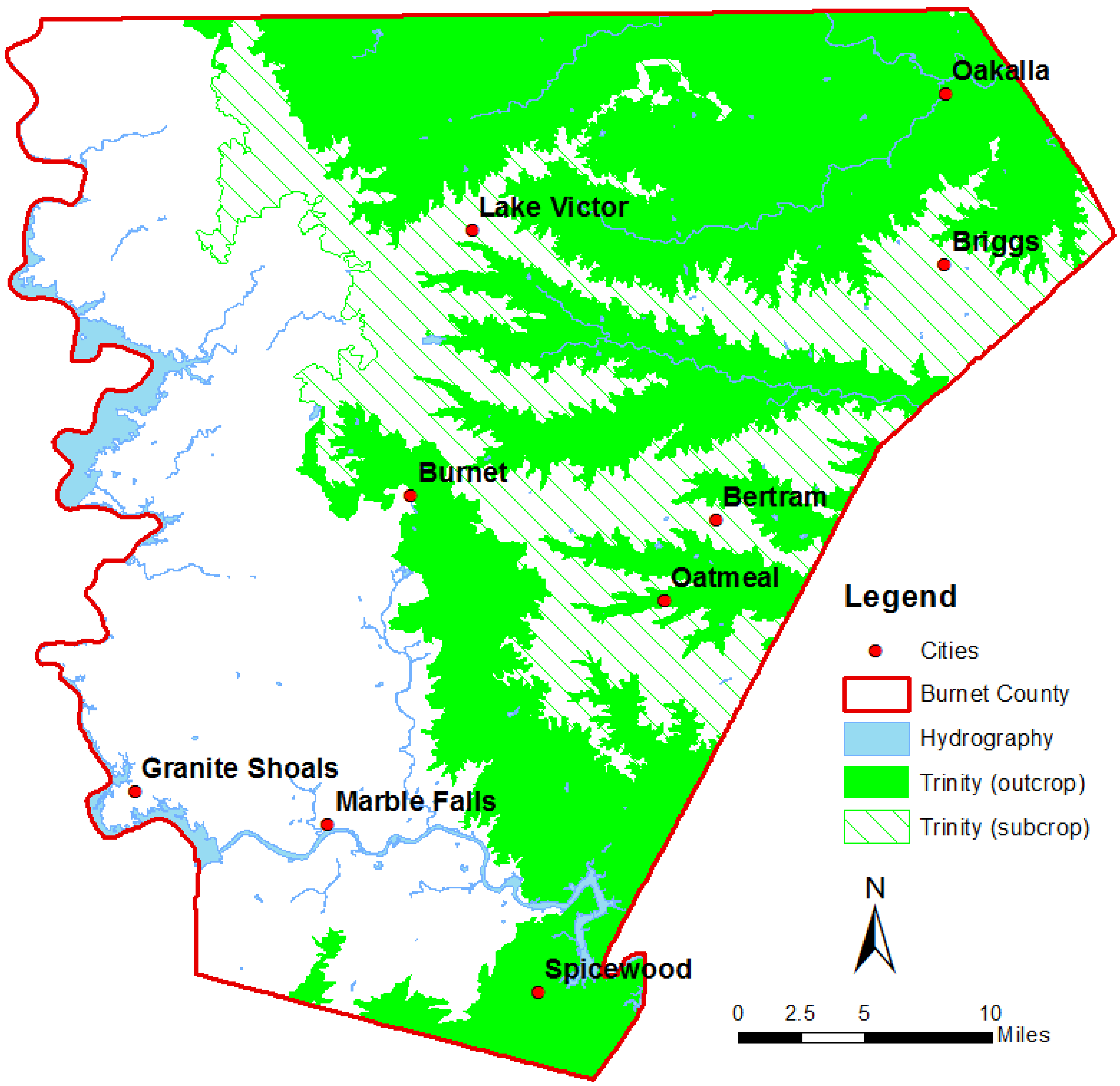

Figure 2, Occurrence of the Trinity Aquifer in Burnet County

Minor Aquifers

There are three minor aquifers within Burnet County which include the Marble Falls, Ellenburger-San Saba, and Hickory. In some areas wells produce water from formations which are not recognized as major or minor aquifers and may not have a large area of occurrence but which are vitally important local sources of groundwater. The information available on the characteristics of each of these minor aquifers and unrecognized formations is limited, particularly when compared to the data currently existing on major aquifers like the Trinity Aquifer. Even though TWDB recognizes the potential local importance of unrecognized sources of groundwater little or no research may have been devoted to defining the extent or characterizing these resources. This is particularly true where local groundwater management agencies did not exist.

Marble Falls Aquifer

The Marble Falls aquifer occurs in several separated outcrops. Water occurs in fractures and solution cavities in the limestone of the Marble Falls Formation of the Pennsylvanian Bend Group. Maximum thickness of the formation is 600 feet, but the thickness in Burnet County is unclear. The quality of water produced from the aquifer is suitable for most purposes. The Marble Falls aquifer is not known to have a down-dip extent in Burnet County and may occur only in the several outcrop areas. (Ashworth and Hopkins, 1995) The recharge zone of the aquifer in Burnet County is approximately 15,790 acres. (Figure 3)

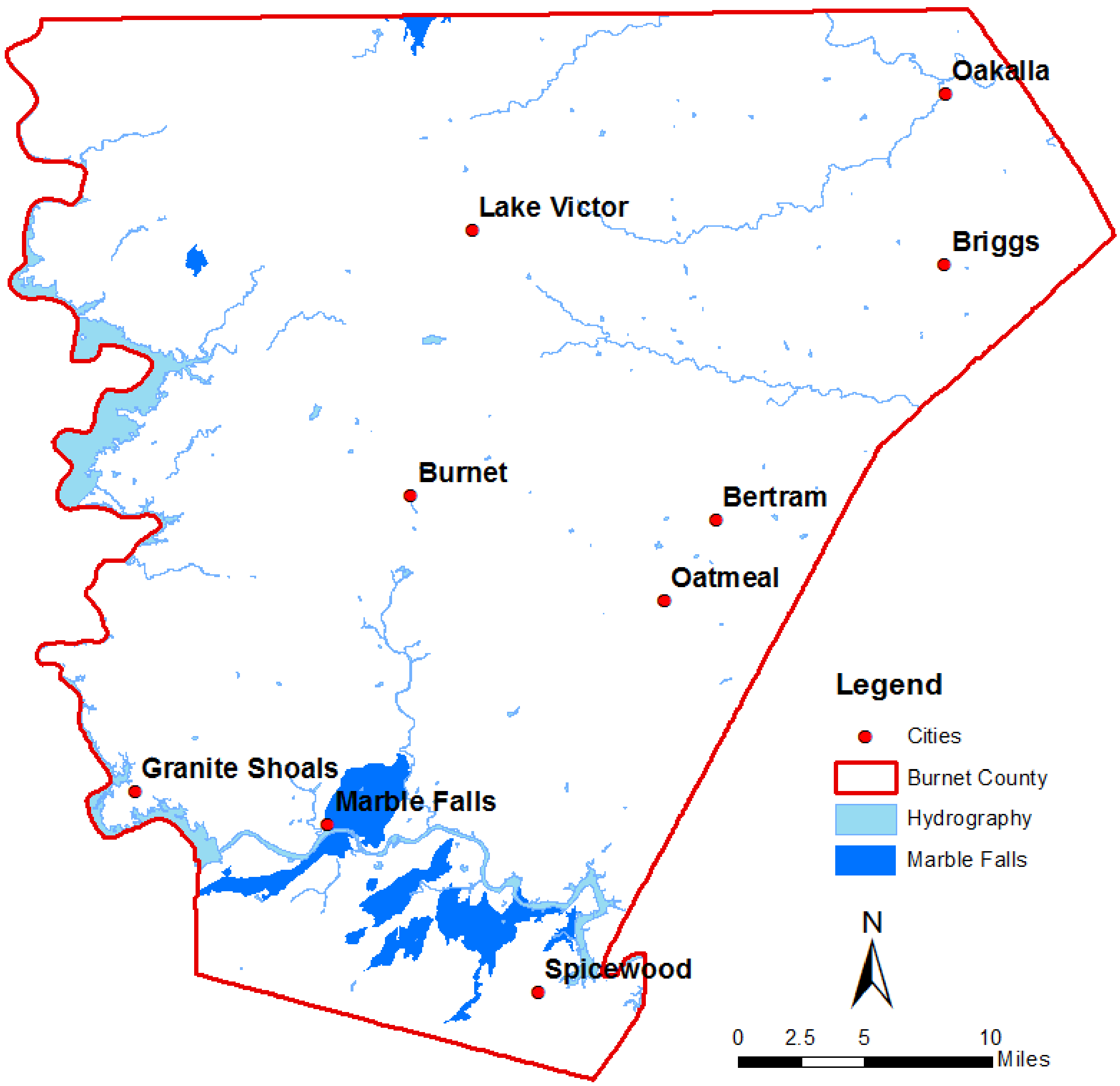

Figure 3, Occurrence of the Marble Falls Aquifer in Burnet County

Ellenburger-San Saba Aquifer

The Ellenburger-San Saba aquifer occurs along the margin of the Llano Uplift in Central Texas. Discontinuous outcrops of the aquifer surround older rocks of the uplift, and the remaining downdip portion may extend to depths of up to 3,000 feet below land surface. It is unknown if the aquifer reaches this depth in Burnet County. The aquifer is compartmentalized by block faulting. The aquifer is composed of the limestone and dolomite of the San Saba Member of the Wilberns Formation of late Cambrian age, and the Honeycut, Gorman, and Tanyard formations of the Ellenburger Group of early Ordovician age. Water occurs in solution cavities formed along faults and related fractures. Water produced from the aquifer may be hard but have less than 1,000 mg/l dissolved solids. (Ashworth and Hopkins, 1995) The recharge zone for the aquifer in Burnet County is approximately 110,413 acres. (Figure 4)

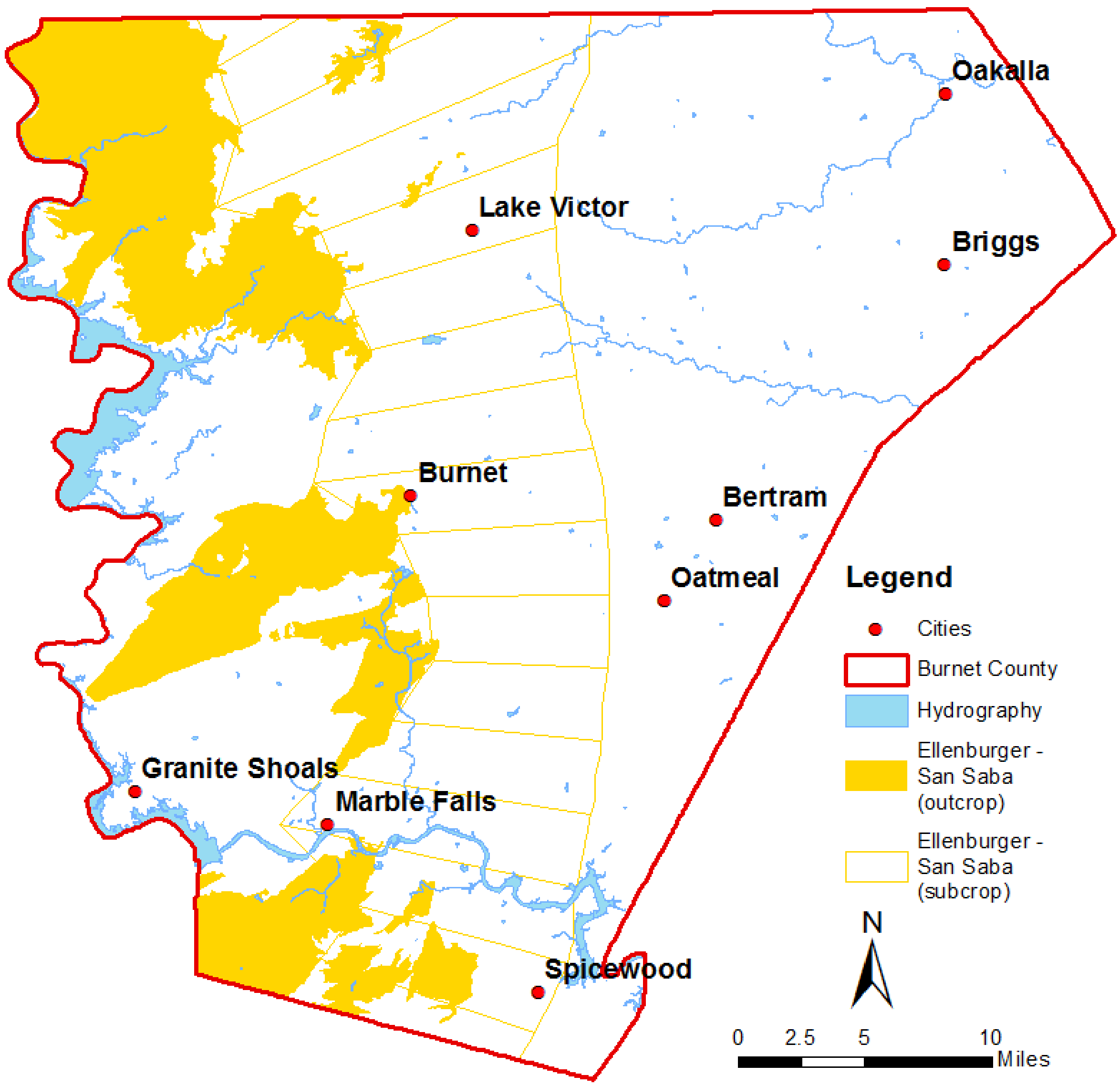

Figure 4, Occurrence of the Ellenburger- San Saba Aquifer in Burnet County

Hickory Aquifer

The Hickory aquifer occurs in the Llano Uplift region of Central Texas. Non-continuous Hickory Sandstone outcrops may overlie or flank exposed Precambrian rocks forming the central uplift core. The downdip (artesian) portion of the aquifer surrounds the uplift and may extend to depths approaching 4,500 feet. It is unknown if the aquifer occurs at this depth in Burnet County. The Hickory Sandstone Member of the Cambrian Riley Formation is one of the oldest sedimentary rock formations in Texas. In the southern and eastern extents of the aquifer, the Hickory consists of two units. The flow of the Hickory aquifer is restricted due to block faulting. Water from the aquifer is generally fresh, but locally may have alpha particle and radium concentrations in excess of drinking water standards. The water may contain radon gas. The Hickory may produce water with iron concentrations exceeding drinking water standards. (Ashworth and Hopkins, 1995) Water which exceeds a drinking water standard must be treated to meet or exceed the drinking water standard established by the United States Environmental Protection Agency before it may be distributed by a public water supply system. The recharge zone of the aquifer in Burnet County is approximately 8,590 acres. (Figure 5)

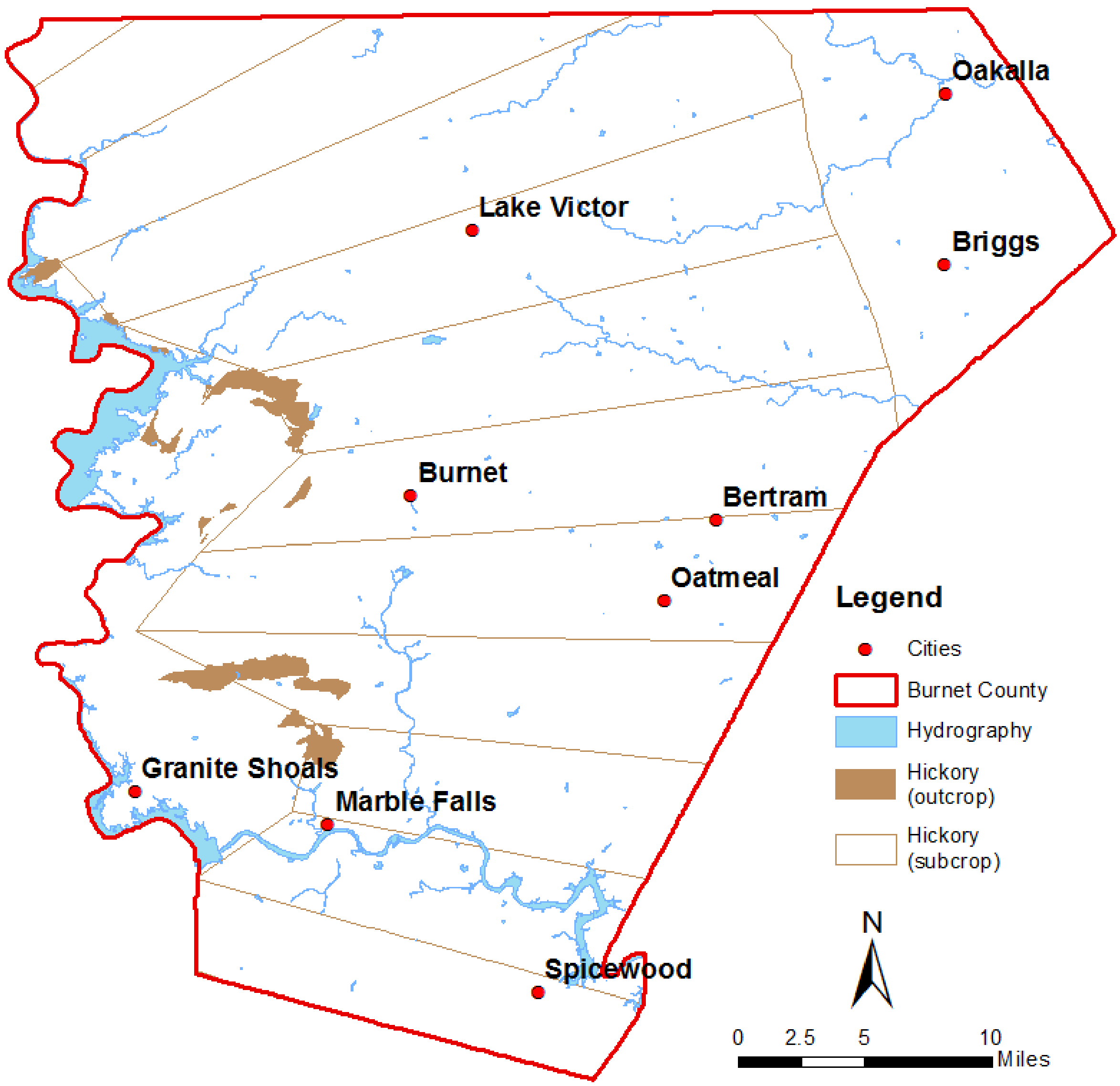

Figure 5, Occurrence of the Hickory Aquifer in Burnet County

Local Water Bearing Formations

In addition to the aquifers that TWDB has identified, there also exist two local water bearing formations within Burnet County. The District recognizes these as the Granite and Granite Gravel aquifers. The District has been committed to developing characteristics and hydrologic data for these aquifers, and will continue to do so in the future.

Granite Gravel Aquifer

The following descriptions come from the District's report *Hydrogeologic Assessment of the Granite Gravel Aquifer in Burnet County, Texas, 2011.*

The Granite Gravel Aquifer is a local water bearing formation located in the southwest portion of Burnet County (Figure 6). It is located in what is known as the Llano Uplift area of Central Texas. The Llano Uplift is a structural anomaly that has exposed ancient Precambrian rock in the midst of the younger Cretaceous aged Edwards Plateau. The Precambrian Town Mountain Granite is part of the core of the Llano uplift and is the formation that forms the Granite Gravel Aquifer. The Town Mountain Granite is described as being coarse-grained, pink, quartz-plagioclase-microcline rock. In Burnet County much of the formation is decomposed and weathered on the surface and down to the bedrock.

The Granite Gravel Aquifer is composed of weathered or decomposed Town Mountain Granite. A solid bedrock of granite forms the base of the aquifer and its depth below surface can vary greatly. The saturated thickness of the aquifer is dependent on the depth to the bedrock which can range from a few feet in some locations, and up toward 100 ft in others. There exist locations in which the granite bedrock is exposed to the surface or just beneath it, therefore these areas contain little to no granite gravel. Flow in the Granite Gravel Aquifer is controlled by the depth to the top of the granite bedrock and presence of adjacent geologic formations that have been juxtaposed to the granite in some instances. The variations in the depth to the granite bedrock cause well yields to vary widely throughout the aquifer. Estimated well yields for the aquifer can range from as little as 5 gpm up to 100+ gpm.

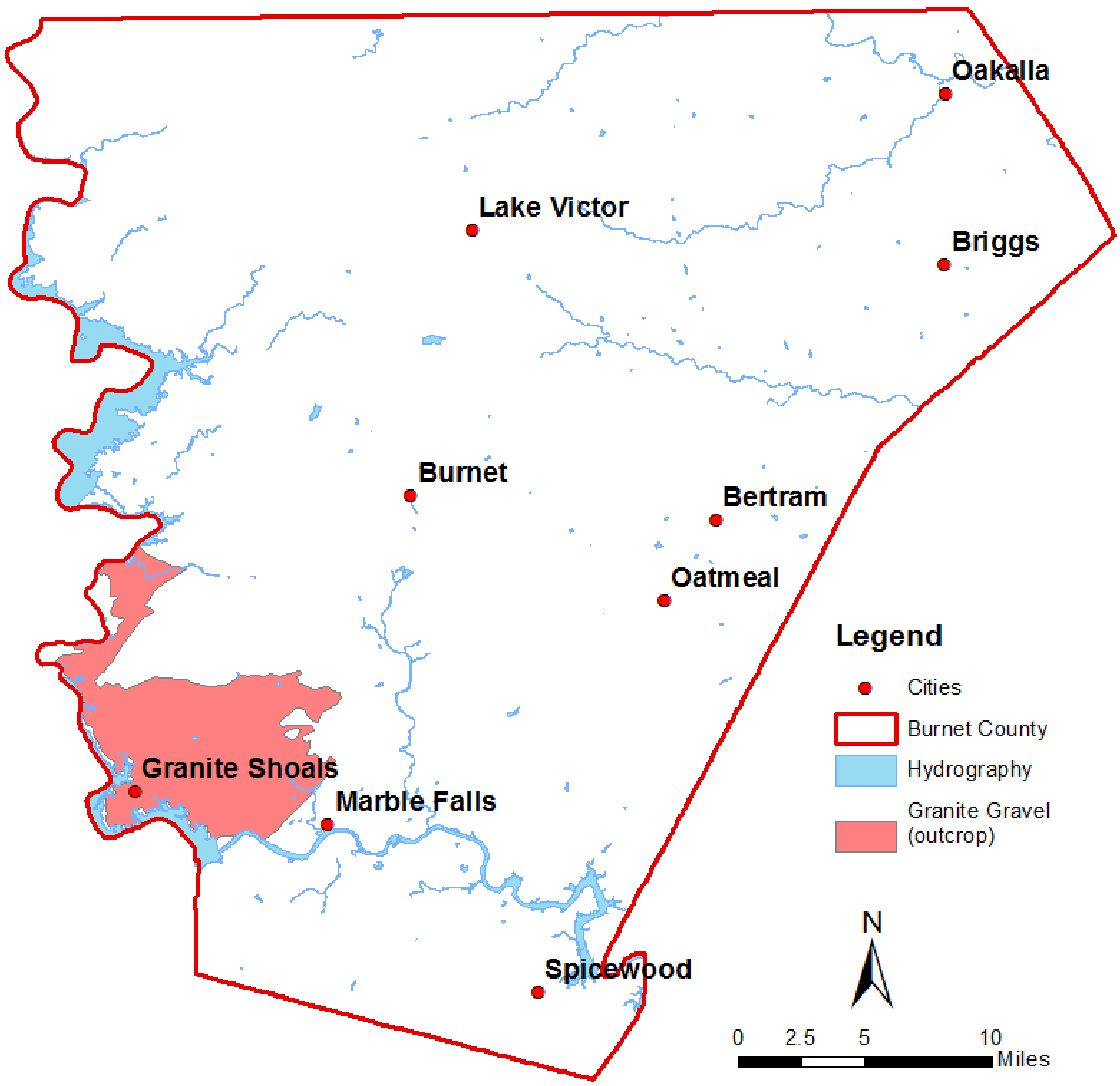

Figure 6: Occurrence of Granite Gravel Aquifer in Burnet County

Granite Aquifer

The Granite Aquifer is a general name for the water bearing formation that is composed of various Precambrian formations, which consist mostly of Town Mountain Granite and Valley Spring Gneiss among others. In Burnet County the Granite Aquifer outcrops in the western part of the county mainly along the highland lakes west of HWY 281 (Figure 7). The downdip portion surrounds the Llano Uplift and generally dips to the east. The Granite Aquifer is a fractured aquifer system that is highly diversified in nature. Wells completed in the Granite Aquifer are generally suitable only for domestic use because well yields are typically low (less than 25 gpm) and many cannot sustain continuous pumping (Partridge, 2011).

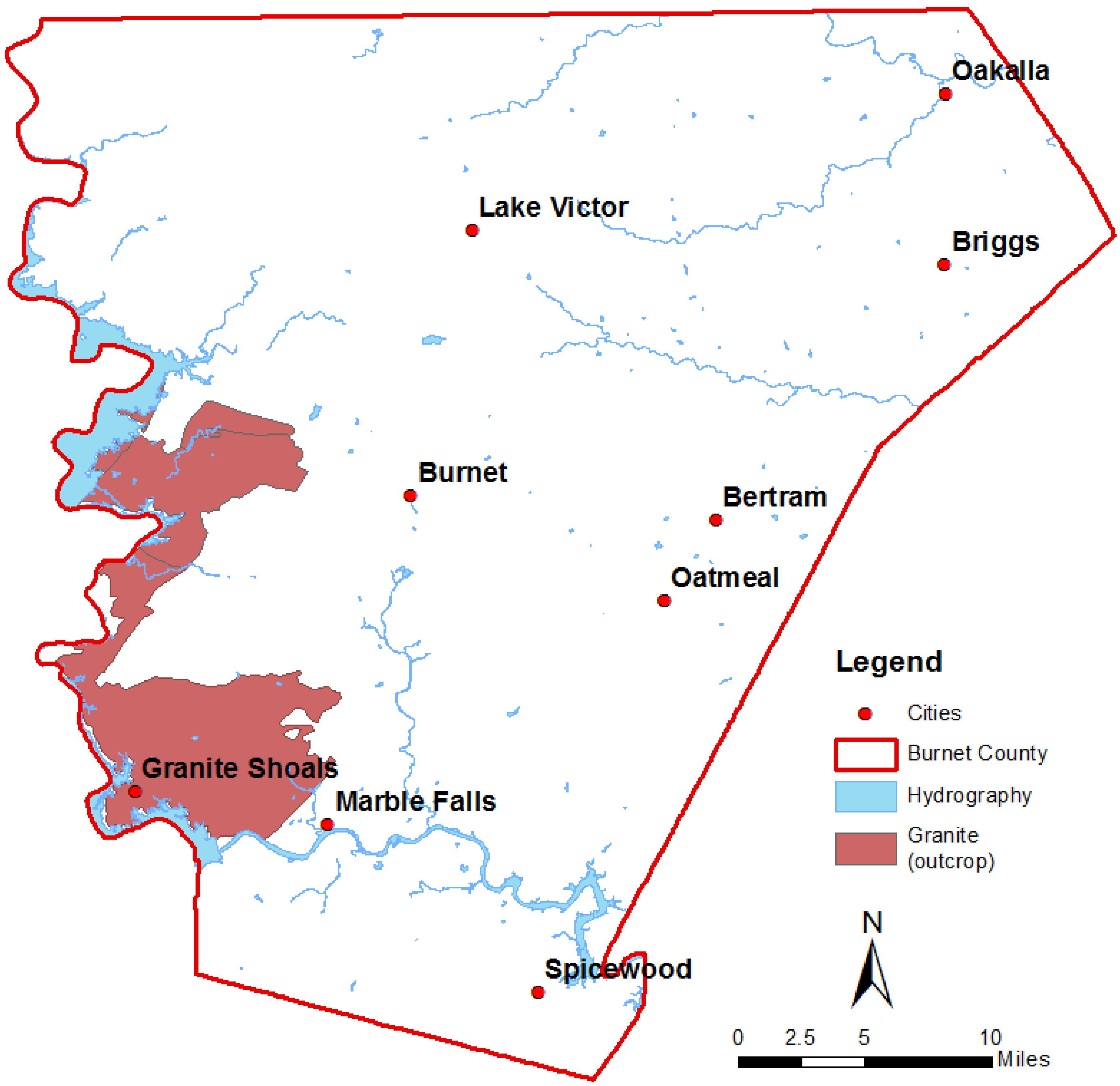

Figure 7: Occurrence of Granite Aquifer in Burnet County

Geologic Units					
Era	**System**	**Group**	**Formation**	**Member or Unit**	**Hydrogeologic Units**
Cenozoic	Quaternary	Pleistocene to Recent floodplain (alluvium and fluviatile terrace deposits)			localized alluvial aquifers
Mesozoic	Cretaceous	Edwards Group	Segovia Formation		Edwards Plateau Aquifer (Edwards Trinity aquifer)
			Fort Terrett Formation	Kirchburg evaporite Mbr.	
				Dolomite Member	
				Burrowed Member	
				Basal Nodular Bed Member	confining bed (Edwards Trinity aquifer)
		Trinity Group	Glen Rose Limestone	Upper Member	Upper and Middle Trinity Aquifer (Edwards Trinity aquifer)
			Travis Peak equivalent: Hensell Sand / Bexar	Lower Member	
			Travis Peak equivalent: Cow Creek Limestone		
			Travis Peak equivalent: Hammett Shale		confining bed
			Travis Peak equivalent: Sligo / Sycamore Sand / Hosston		Lower Trinity aquifer
Paleozoic	Pennsylvanian	Canyon Group	undivided		confining beds
		Strawn Group	undivided		
		Bend Group	Smithwick	undivided	
			Marble Falls Limestone		Marble Falls aquifer
	Mississippian and Devonian	Composed of youngest to oldest -- Barnett Formation(Miss.),Chappel Limestone(Miss) Houy Formation(Dev) and the Stribling Formation (Dev)			Usually confining beds
	Ordovician	Ellenberger Group	Honeycut Formation	undivided	Ellenburger-San Saba aquifer
			Gorman Formation	undivided	
			Tanyard Formation	Staendebach Member	
				Threadgill Member	
	Cambrian	Moore Hollow Group	Wilberns Formation	San Saba Member	
				Point Peak Member	confining beds
				Morgan Creek Limestone Mbr	
				Welge Sandstone Member	Mid-Cambrian aquifer
			Riley Formation	Lion Mountain Sandstone Mbr	
				Cap Mountain Limestone Mbr	confining beds
				Hickory Sandstone Member	Hickory aquifer
Precambrian			Llanite; Six Mile Granite; Town Mountain Granite; Red Mountain Gneiss; Mafic igneous rocks; Lost Creek Gneiss	Oat Creek Granite; Pegmatite and quartz veins; Melaryolite dikes; Coal Creek Serpentine; Packsaddle Schist; Valley Springs Gneiss	Usually confining beds

Table 1, Geologic and hydrogeologic units of Burnet County (after Preston and others, 1996).

IV. STATEMENT OF GUIDING PRINCIPLES

The District recognizes that the groundwater resources of Burnet County and the Central Texas region are of vital importance to the many users who are dependent on theses valuable resources. The District will strive to manage and conserve this most valuable resource in a prudent and cost effective manner through education, cooperation and development of a comprehensive understanding of the aquifers. The District's management plan is intended to serve as a tool to focus the thoughts and actions of those given the responsibility for the execution of the District's activities.

V. CRITERIA FOR PLAN CERTIFICATION

A. Planning Horizon

The time period for this plan is 10 years from the date of approval by the TWDB. This plan will be reviewed as required and necessary. The District will consider the necessity to amend the plan and re-adopt the plan with or without amendments as required by TWC 36.1072(e)

This management plan will remain in effect until replaced by a revised management plan approved by the TWDB.

B. Board Resolution

A certified copy of the Central Texas Groundwater Conservation District resolution adopting the plan is located in Appendix A - District Resolution.

C. Plan Adoption

Public notices documenting that the plan was adopted following appropriate public meetings and hearings are located in Appendix B – Notice of Meetings.

D. Coordination with Surface Water Management Entities

Letters transmitting copies of this plan to the Lower Colorado River Authority and the Brazos River Authority are located in Appendix C – Letters to Surface Water Management Entities.

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

A. Modeled available groundwater in the district based on the desired future condition established under TWC 36.108—TWC § 36.10701(e)(3)(A)

Modeled available groundwater (MAG) is defined in TWC §36.001 as "the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition." The desired future conditions (DFCs) of the aquifer may only be determined through joint planning with other groundwater conservation districts (GCDs) in the same groundwater management area (GMA) as required by the 79th Legislature with the passage of HB 1763 into law. The District is located in GMA 8. The GCDs of GMA 8 first adopted desired future conditions in 2007 and 2008. The first desired future conditions were adopted for the Trinity aquifer on September 17, 2008 and for the Ellenburger-San Saba, Hickory, and Marble Falls aquifers on May 19, 2008. GMA 8 passed a resolution to readopt desired future conditions for all aquifers in GMA 8 on April 27, 2011. The desired future conditions shall continue in effect until amended, superseded, or repealed.

The desired future conditions of each aquifer are for a 50 year outlook. The modeled available groundwater for the District is derived from the adopted desired future conditions of each aquifer. For the Trinity aquifer within the District, the TWDB used the Northern Trinity/Woodbine Groundwater Availability Model (GAM) version 1.01 to evaluate the modeled available groundwater numbers. A GAM did not exist at the time the current DFCs were adopted for the Ellenburger-San Saba, Hickory, and Marble Falls aquifers, however the TWDB had aquifer assessment reports developed for all three aquifers. The modeled available groundwater values for the three minor aquifers come from the following TWDB aquifer assessments: Ellenburger-San Saba-AA 10-15 MAG, Hickory- AA 10-16 MAG, Marble Falls- AA 10-17 MAG.

The District recognizes that there are several localized sources of groundwater in Burnet County which have not been recognized as major or minor aquifers but which are of vital local importance as a source of water supply. The TWDB or other State agencies have not researched or characterized these groundwater sources. The District has and will continue to expand the knowledge of these important local resources so that management of these aquifers may be established in the future.

Trinity Aquifer

a. Selected Management Conditions

An updated model for the Trinity aquifer, version 2.01 of the Northern Trinity/Woodbine Aquifer GAM, has been created and accepted by the TWDB. At the time of this writing, proposed DFCs have been submitted and are awaiting final approval. The District has identified some significant discrepancies from the current GAM, version 1.01, and the actual hydrostratigraphy within the district. The TWDB and GMA 8 have been informed of this issue and the problem was addressed in the GAM update of version 2.01. When new DFC and MAG numbers become available, this plan will be updated to include them.

In the interim period between now and when the proposed DFCs and resulting MAGs are finalized, the District will be using the current MAG numbers for managing the Trinity aquifer by treating it as one unit and distributing the MAG throughout. When the new MAG numbers are available, this plan will be updated to reflect the new data.

The desired future conditions of the Trinity aquifer are:

Paluxy: The average drawdown of the Paluxy aquifer should not exceed approximately 1 foot after 50 years.

Glen Rose: The average drawdown of the Glen Rose aquifer should not exceed approximately 1 foot after 50 years.

Hensell: The average drawdown of the Hensell aquifer should not exceed approximately 11 feet after 50 years.

Hosston: The average drawdown of the Hosston aquifer should not exceed approximately 29 feet after 50 years.

b. Groundwater Availability

The total estimated modeled available groundwater for the Trinity aquifer in Burnet County is 3,546 acre-feet per year which is based on the amounts of groundwater that could be pumped while maintaining the selected management conditions in each aquifer subdivision discussed above. The MAG is broken down for each subdivision within the Trinity aquifer. The following MAG values come from TWDB report GAM Run 10-063 MAG:

Paluxy:	182 ac-ft/yr
Glen Rose:	205 ac-ft/yr
Hensell:	690 ac-ft/yr
Hosston:	2,469 ac-ft/yr
Total:	3,546 ac-ft/yr.

As mentioned above, there are significant discrepancies between the model and the actual aquifer conditions. The District will use the Trinity MAG for the entire Trinity aquifer and treat it as one unit.

Minor Aquifers

Since the adoption of the current DFCs, there has been a new model created by the TWDB, the Llano Uplift Region GAM version 1.01. At the time of this writing, proposed DFCs have been submitted and are awaiting final approval for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers. When new DFC and MAG numbers become available, this plan will be updated to include them.

To assess the groundwater availability of these aquifers the District made iterative calculations of the potential effects of increasing amounts of pumping to determine if the preferred management conditions could be upheld. The calculations employed a methodology that considered the estimated annual aquifer recharge, the area of the unconfined portion of the aquifer, the average aquifer thickness and the effective aquifer porosity (coefficient of storage) to assess the effects of pumping over a 50-year period. As previously discussed, there is relatively little data currently available on the minor aquifers and unrecognized groundwater-bearing formations in Burnet County. To account for this scarcity of data, conservative assumptions were employed for the average aquifer thickness and effective porosity (or coefficient of storage) to complete the calculations of availability for each aquifer.

a. Selected Management Conditions

The District selected the maintenance of the saturated thickness in the unconfined portions of the aquifers over a 50-year horizon as the preferred management condition to define the desired future condition of the aquifers and the sustainable amount of groundwater use for each aquifer. Again, due to the relatively low amount of information currently available on the minor aquifers in the District, the District exercised caution in selecting the management criterion for each aquifer. The following 50-year criteria were applied to the individual minor aquifers to assess the amounts of sustainable use:

Marble Falls aquifer – Maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.

Ellenburger-San Saba aquifer – Maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.

Hickory aquifer – Maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.

b. Groundwater Availability

The total estimated modeled available groundwater values for the three minor aquifers come from TWDB aquifer assessments: Marble Falls aquifer AA 10-17 MAG, Ellenburger- San Saba AA10-15 MAG, and Hickory AA 10-16 MAG.

Marble Falls aquifer –The total estimated modeled available groundwater for the Marble Falls aquifer in Burnet County is 1,978 acre-feet per year.

Ellenburger-San Saba aquifer – The total estimated modeled available groundwater for the Ellenburger-San Saba aquifer in Burnet County is 5,526 acre-feet per year.

Hickory aquifer – The total estimated modeled available groundwater for the Hickory aquifer in Burnet County is 2,148 acre-feet per year.

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

The amount of groundwater being used within the District on an annual basis is provided by the TWDB and is listed in Appendix G.

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

The estimate of the annual amount of recharge to the Trinity aquifer in the District is based on the TWDB Northern Trinity/Woodbine aquifers GAM version 2.01. The estimate of the annual amount of recharge to the Marble Falls, Ellenburger-San Saba, and Hickory aquifers is based on version 1.01 of the Llano Uplift Region GAM. The TWDB GAM Run 16-006 (Appendix H) contains the recharge estimates from precipitation amounts for the Trinity, Marble Falls, Ellenburger-San Saba, and Hickory aquifers.

1. Trinity Aquifer Recharge = 13,831 acre-feet per year

2. Marble Falls Aquifer Recharge = 2,181 acre-feet per year

3. Ellenburger-San Saba Aquifer = 68,860 acre-feet per year

4. Hickory Aquifer = 331 acre-feet per year

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—TWC §36.1071(e)(3)(D)

The estimate of the annual amount of water discharged to surface water systems by the Trinity aquifer is based on the Northern Trinity/Woodbine GAM version 2.01. The estimate of the annual amount of water discharged to surface water systems by the Marble Falls, Ellenburger-San Saba, and Hickory aquifers is based on version 1.01 of the Llano Uplift Region GAM. The values presented are from GAM Run 16-006 (Appendix H). Known historical spring measurements from Burnet County are listed in Appendix F.

1. Trinity Aquifer = 13,727 acre feet per year

2. Marble Falls Aquifer = 10,771 acre-feet per year

3. Ellenburger-San Saba Aquifer = 69,378 acre-feet per year

4. Hickory Aquifer = 3,302 acre-feet per year

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 — TWC §36.1071 (e)(3)(E)

The estimate of the annual volume of flow into and out of the district within each aquifer and between aquifers in the district from the Trinity aquifer is based on the Northern Trinity/Woodbine GAM version 2.01. The estimate of the annual volume of flow into and out of the district within each aquifer and between aquifers in the district from the Marble Falls, Ellenburger-San Saba, and Hickory aquifers is based on version 1.01 of the Llano Uplift Region GAM. The values presented are from GAM Run 16-006 (Appendix H).

Trinity Aquifer

Flow into the aquifer within the District = 2,908 acre-feet per year

Flow out of the District within the aquifer = 12,285 acre-feet per year

Movement between aquifer subdivisions in the District:

From Trinity aquifer to Marble Falls aquifer = 8 acre-feet per year

From Trinity aquifer to Ellenburger-San Saba aquifer=255 acre-feet per year

From Hickory aquifer to Trinity aquifer = 1 acre-feet per year

Marble Falls Aquifer

Flow into the aquifer within the District = 10 acre-feet per year

Flow out of the District within the aquifer = 60 acre-feet per year

Movement between aquifer subdivisions in the District:

From Trinity aquifer to Marble Falls aquifer = 8 acre-feet per year

From Ellenburger-San Saba aquifer to Marble Falls aquifer =1,165 acre-feet per year

Ellenburger-San Saba Aquifer

Flow into the aquifer within the District = 20,593 acre-feet per year

Flow out of the District within the aquifer = 7,663 acre-feet per year

Movement between aquifer subdivisions in the District:

From Ellenburger-San Saba aquifer to Marble Falls aquifer = 1,165 acre-feet per year

From Trinity aquifer to Ellenburger-San Saba aquifer=255 acre-feet per year

From Hickory aquifer to Ellenburger-San Saba aquifer = 7,631 acre-feet per year

Hickory Aquifer

Flow into the aquifer within the District = 7,955 acre-feet per year

Flow out of the District within the aquifer = 6,374 acre-feet per year

Movement between aquifer subdivisions in the District:

From Hickory aquifer to Trinity aquifer = 1 acre-feet per year

From Hickory aquifer to Ellenburger-San Saba aquifer =7,631 acre-feet per year

F. Projected surface water supply in the district, according to the most recently adopted state water plan— TWC §36.1071(e)(3)(F)

SEE APPENDIX G: Projected Surface Water Supplies TWDB 2017 State Water Plan Data

G. Projected total demand for water in the district according to the most recently adopted state water plan— TWC §36.1071(e)(3)(G)

SEE APPENDIX G: Projected Water Demands TWDB 2017 State Water Plan Data

VII. CONSIDER THE WATER SUPPLY NEEDS AND WATER MANAGEMENT STRATEGIES INCLUDED IN THE ADOPTED STATE WATER PLAN— TWC §36.1071(E)(4)

SEE APPENDIX G: Projected Water Supply Needs and Projected Water Management Strategies TWDB 2017 State Water Plan Data

VIII. DETAILS ON THE DISTRICT MANAGEMENT OF GROUNDWATER

The District will manage the use of groundwater within the District in order to conserve the resource while seeking to maintain the economic viability of all resource user groups, public and private. The District seeks to manage the groundwater resources of the District as practicably as possible as defined in the plan by the management goals established for each aquifer or aquifer subdivision. The Texas Legislature established that groundwater conservation districts are the preferred method of groundwater management in Section 36.0015 of the Texas Water Code. In consideration of the economic and cultural activities occurring within the District, the District will identify and engage in such activities and practices, that if implemented may result in the conservation of groundwater in the District. The District will manage groundwater resources through rules developed and implemented in accordance with Chapter 36 of the Texas Water Code and the provisions of the District Act.

An extensive monitoring well network has been established and maintained in order to monitor changing storage conditions of groundwater supplies within the District. The District will make a regular assessment of water supply and groundwater storage conditions and will report those conditions to the District Board of Directors and to the public. The District may undertake, as necessary, investigations of the groundwater resources within the District and will make the results of investigations available to the public. The District will cooperate with investigations of the groundwater resources of the District undertaken by other local political subdivisions or agencies of the State of Texas.

In order to better manage groundwater resources the District may establish management zones for; and adopt different rules for: (1) each aquifer, subdivision of an aquifer, or geologic strata located in whole or in part within the boundaries of the District; or (2) each geographic area overlying an aquifer or subdivision of an aquifer located in whole or in part within the boundaries of the district.

For the purpose of managing the use of groundwater within the District, the District may define sustainable use as the use of an amount of groundwater in the District as a whole or any management zone established by the District that does not exceed:

a) The desired future conditions of aquifers in the District established by the District prior to the establishment of the desired future condition of aquifers in a groundwater management area in which the District is located or
b) The desired future conditions of aquifers within the District established by a groundwater management area in which the District is participating or

c) The amount of modeled available groundwater resulting from the establishment of a desired future aquifer condition established by the District or a groundwater management area in which the District is located or
d) The amount of annual recharge of the aquifer or aquifer subdivision in which the use occurs as recognized by the District or
e) Any other criteria established by the District as being a threshold of use beyond which further use of the aquifer or aquifer subdivision may result in a specified undesirable or injurious condition

The District has adopted rules that protect existing or historic use of groundwater in the District prior to the effective date of the rules to the maximum extent practicable consistent with this plan and the goals and objectives set forth herein. The District may impose more restrictive permit conditions on new permit applications and permit amendment applications to increase use by historic users if the limitations:
a) Apply to all subsequent new permit applications and permit amendment applications to increase use by historic users, regardless of the type or location of use;
b) Bear a reasonable relationship to the District's existing management plan; and
c) Are reasonably necessary to protect existing use

The District has adopted rules to regulate groundwater withdrawals by means of spacing and/or production limits. The relevant factors to be considered in making a determination to grant or deny a permit or limit groundwater withdrawals shall include those set forth in the District Act, Chapter 36 of the Texas Water Code, and the rules of the District. The District has and will continue to employ technical resources, as needed, to evaluate the groundwater resources available within the District and to determine the effectiveness of regulatory or conservation measures. In consideration of particular individual, localized or District-wide conditions, including without limitation climactic conditions, the District may by rule allow an increase or impose a decrease in the total production in a management zone above or below the sustainable amount for a period of time considered necessary by the District in order to accomplish the purposes set forth in Chapter 36, Water Code, or the District Act. The exercise of said discretion by the Board shall not be construed as limiting the power of the Board.

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

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

Rules adopted by the District for the permitting of wells and the use of groundwater shall comply with TWC Chapter 36, including §36.113, and the provisions of this management plan. All rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on the best technical evidence available to the District. The District's rules can be found at www.centraltexasgcd.org.

X. METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS – 31 TAC 356.52(a)(4)

The District will prepare and present an Annual Report to the Board of Directors on District performance in regards to achieving management goals and objectives for the fiscal year. The report will be presented within 120 days following the completion of the District's fiscal year, beginning with FY2007. The Board will maintain the report on file, for public inspection at the District's offices upon adoption in a regular noticed meeting of the Board.

XI. GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

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

Management Goals

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

1. Objective: Each year the District will require the registration of all wells within the District's jurisdiction.

   Performance Standard: Each year the number of all registered wells within the District will be presented in the District's annual report.

2. Objective: Each year the District will require permits for all non-exempt use of groundwater in the District as defined in the District's rules, in accordance with adopted procedures.

   Performance Standard: Each year a summary of the number of applications for the permitted use of groundwater and the disposition of the applications will be will be presented in the District's annual report.

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

Objective: Each year, the District will provide information on eliminating and reducing the waste of groundwater and focusing on water quality protection. This may be accomplished annually by at least one of the following methods:

a. compile literature packets for distribution to schools in Burnet County;
b. conduct classroom presentations;
c. sponsor an educational program/curriculum;
d. post information on the District's web site;
e. submit newspaper articles for publication;

f. conduct public presentations;
g. set up displays at public events;
h. distribute brochures/literature.

Performance Standard: The annual report will include a summary of the District activities during the year to disseminate educational information on eliminating and reducing the wasteful use of groundwater focusing on water quality protection.

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

Objective: Senate Bill 660 passed by the 82nd Texas Legislature requires that each Regional Water Planning Group (RWPG) will have a representative from each groundwater management area (GMA). Currently the District is the only GCD in GMA 8 that is also in the Lower Colorado Regional Water Planning Group (Region K). Each year, the District will participate in the regional planning process by attending Region K meetings.

Performance Standard: Each year, attendance at Region K meetings by a representative of the District will be reflected in the District's annual report and will include the number of meetings attended and the dates.

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

Objective: Each year the District will monitor a minimum of 20 monitor wells to measure the compliance of the desired future conditions of the aquifers. The hydrographs of the monitor wells with be made available on the Districts website and available to the public at request.

Performance Standard: Each year, the District's Annual Report will provide a status report on the number of wells measured and the monitoring results.

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

Objective: The District has a Drought Management Plan that addresses drought conditions locally. The Drought Management Plan lists several stages of conservation depending on the severity of the present drought conditions. Issuing a drought stage requires Board action.

Performance Standard: At least quarterly, a report of the current drought status will be given at a regular Board Meeting and action can be taken on the drought stage. Each year the District's Annual Report will provide the minutes of each board meeting pertaining to the drought management plan.

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

1. Objective: Each year, the District will promote rainwater harvesting by posting information on rainwater harvesting on the District web site.

   Performance Standard: Each year, the annual report will include a copy of the information on rainwater harvesting that is provided on the District web site.

2. Objective: Each year, the District will provide information relating to recharge enhancement and brush control on the District web site.

   Performance Standard: Each year, the District annual report will include a copy of the information that has been provided on the District web site relating to recharge enhancement and brush control.

3. Objective: Each year, the District will promote conservation by at least one of the following methods:
   a. conduct an annual contest on water conservation;
   b. distribute conservation literature packets to schools in Burnet County;
   c. conduct classroom conservation presentations;
   d. sponsor an educational conservation program/curriculum;
   e. post conservation information on the District's web site;
   f. provide a newspaper article on conservation for publication;
   g. publish an article on conservation in the District newsletter;
   h. conduct a public conservation presentation;
   i. set up a conservation display at a public event or;
   j. distributing conservation brochures/literature to the public.

   Performance Standard: Each year, the annual report will include a summary of the District activity during the year to promote conservation.

G. Addressing the Desired Future Conditions of the Groundwater Resources – 31 TAC 356.52 (a)(1)(H) (Implementing TWC §36.1071(a)(8))

Objective: For each aquifer that has approved desired future conditions (DFCs) and has assigned MAG numbers from the TWDB, the District will assess if they are sufficient and are being met accordingly.

Performance Standard: Each year the District will use its monitor well program to make assessments of the drawdowns of the various aquifers. The drawdowns will be compared to historical averages and trends to monitor the Districts compliance of the desired future conditions. A report of the drawdowns will be included in the Districts annual report.

XII. MANAGEMENT GOALS DETERMINED NOT-APPLICABLE TO THE DISTRICT

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

This category of management goal is not applicable to the District because the major water producing formations in the District are composed primarily of competent limestone. The structural competency of the aquifer materials significantly limits the potential for the occurrence of land surface subsidence in the District.

B. Addressing Precipitation Enhancement-31 TAC 356.52 (a)(1)(G)

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. The cost of operating a single-county precipitation enhancement program is prohibitive and would require the District to increase taxes in Burnet County. Therefore, this category of management goal is not applicable to the District.

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APPENDIX A-RESOLUTION READOPTING MANAGEMENT PLAN

Reserved for Resolution

APPENDIX B-NOTICE OF HEARING FOR PLAN ADOPTION

Reserved for Notice of Hearing

APPENDIX C-Surface Water Coordination

The attached letter was sent to the following entities:

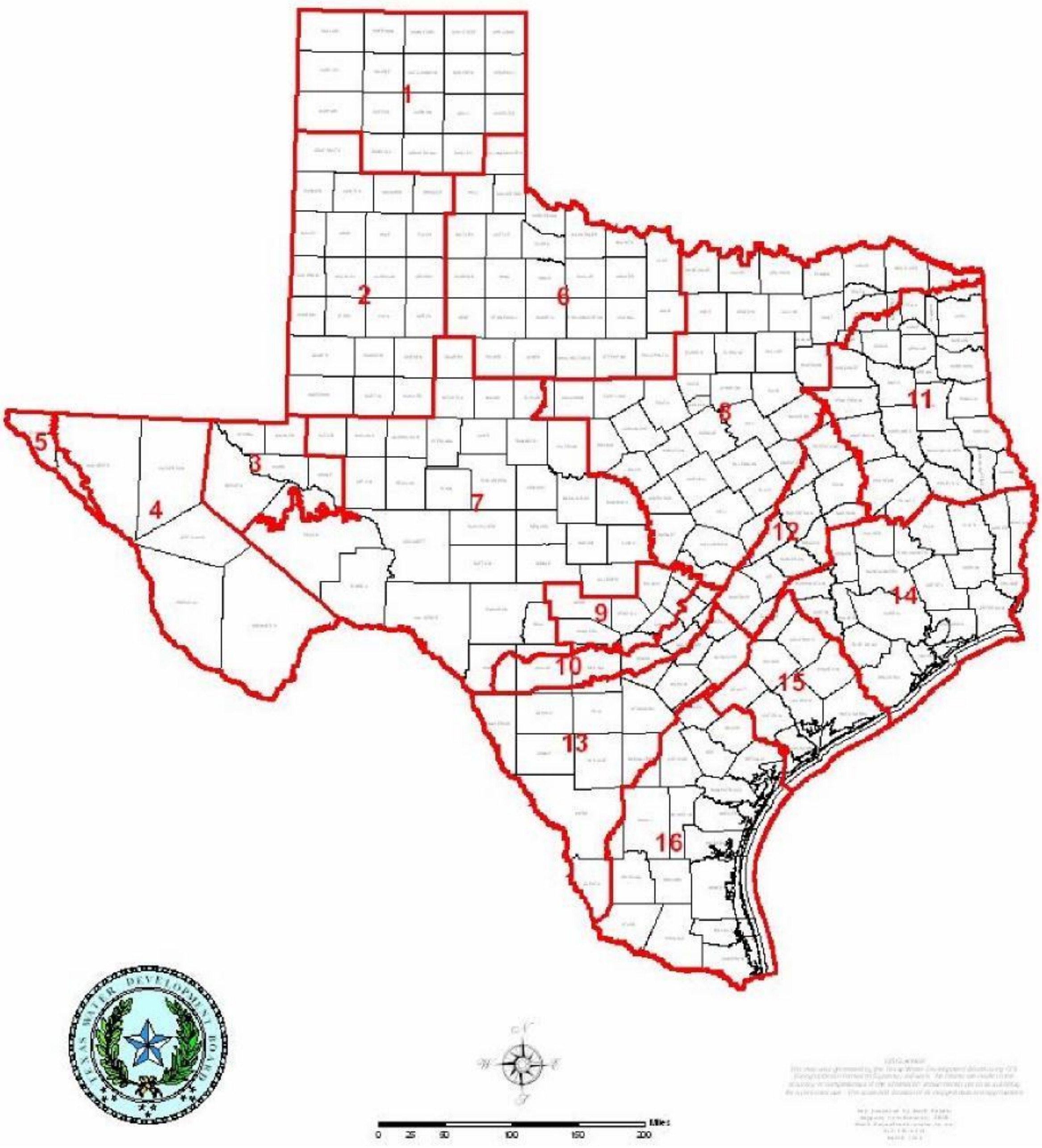
Reserved for future correspondence

APPENDIX D-Correspondence Letter

Reserved for copy of letter sent to surface water entities.

APPENDIX E-GROUNDWATER MANAGEMENT AREAS

Groundwater Management Areas In Texas



APPENDIX F-SPRINGS OF BURNET COUNTY

Springs and Spring Discharge Rates in Burnet County

Spring	Aquifer	Discharge (acre-feet/year)
BT-57-22-202[1]	San Saba Ls. of Ellenburger-San Saba aquifer	8.07
Delaware Springs[1]	San Saba Ls. of Ellenburger-San Saba aquifer	500.03
BT-57-14-902[1]	San Saba Ls. of Ellenburger-San Saba aquifer	64.52
Big Spring[1]	San Saba Ls. of Ellenburger-San Saba aquifer	701.66
	Total=	**1,274.28**
Holland & Sand Springs[1]	Ellenburger Gp of Ellenburger-San Saba aquifer	3.06
BT_57-14-903[1]	Ellenburger Gp of Ellenburger-San Saba aquifer	8.07
Patterson Springs[1]	Ellenburger Gp of Ellenburger-San Saba aquifer	4.74
Ebeling Springs[2]	Ellenburger Gp of Ellenburger-San Saba aquifer	690.30
Tanyard Springs[2]	Ellenburger Gp of Ellenburger-San Saba aquifer	5.11
Persimmon Springs[2]	Ellenburger Gp of Ellenburger-San Saba aquifer	89.49
Mud Springs[2]	Ellenburger Gp of Ellenburger-San Saba aquifer	69.04
Boiling Springs[2]	Ellenburger Gp of Ellenburger-San Saba aquifer	43.47
Soldier Spring[2]	Ellenburger Gp of Ellenburger-San Saba aquifer	24.29
Greenwood Springs[3]	Ellenburger Gp of Ellenburger-San Saba aquifer	-
Wolf Springs[3]	Ellenburger Gp of Ellenburger-San Saba aquifer	-
Williams Springs[3]	Ellenburger Gp of Ellenburger-San Saba aquifer	-
Sulphur Springs[4]	Ellenburger Gp of Ellenburger-San Saba aquifer	-
	Total=	**937.57**
Krause Springs[2]	Marble Falls aquifer	485.77
	Total=	**485.77**
Buzzard Roost Spring[1]	Tanyard Fm. of Ellenburger-San Saba aquifer	16.13
BT-57-15-709[1]	Tanyard Fm. of Ellenburger-San Saba aquifer	1.61
Lemons South Spring[1]	Tanyard Fm. of Ellenburger-San Saba aquifer	20.97
Lemons Middle Spring[1]	Tanyard Fm. of Ellenburger-San Saba aquifer	35.49
Lemons Park Office Spring[1]	Tanyard Fm. of Ellenburger-San Saba aquifer	140.33
	Total=	**214.53**
BT-57-30-801[1]	Honeycut Fm. of Ellenburger-San Saba aquifer	322.60
Boil Springs[1]	Honeycut Fm. of Ellenburger-San Saba aquifer	241.95
Horseshoe Springs[1]	Honeycut Fm. of Ellenburger-San Saba aquifer	96.78
Felps Spring[1]	Honeycut Fm. of Ellenburger-San Saba aquifer	646.82
	Total=	**1,308.15**
Pecan Spring[1]	Unknown origin	14.48
Flatrock Springs[1]	Unknown origin	130.30
	Total=	**144.78**
	Burnet County Total=	**4,365.08**

1 - Data from USGS, 2003.

2 - Data from Brune, 1981.

3 - These springs were mentioned in Brune, 1981; however, no discharge values were given.

4 - No discharge values were given for these springs because they are currently under seven meters of water due to the creation of the Marble Falls Reservoir.

APPENDIX G-2017 STATE WATER PLAN DATASETS

Estimated Historical Water Use And 2017 State Water Plan Datasets:

Central Texas Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
January 19, 2017

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 1/19/2017. 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) or Rima Petrossian (rima.petrossian@twdb.texas.gov or 512-936-2420).

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

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2015. TWDB staff anticipates the calculation and posting of these estimates at a later date.

BURNET COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2014	GW	2,922	55	41	0	238	311	3,567
	SW	4,025	0	1	0	252	212	4,490
2013	GW	3,099	45	14	0	322	298	3,778
	SW	4,473	0	2	0	368	197	5,040
2012	GW	3,089	50	31	0	1,360	356	4,886
	SW	4,857	0	2	0	308	223	5,390
2011	GW	3,317	7	1,575	0	725	690	6,314
	SW	5,474	0	1,651	0	350	480	7,955
2010	GW	2,877	6	1,734	0	1,000	666	6,283
	SW	4,547	0	1,816	0	500	5,016	11,879
2009	GW	2,549	9	1,766	0	103	398	4,825
	SW	4,530	248	1,755	0	1,481	4,556	12,570
2008	GW	2,348	8	1,716	0	109	354	4,535
	SW	4,803	251	1,690	0	2,063	3,392	12,199
2007	GW	2,054	8	104	0	88	518	2,772
	SW	3,856	215	6	0	1,329	3,310	8,716
2006	GW	2,503	9	124	0	440	474	3,550
	SW	4,350	430	24	0	693	5,518	11,015
2005	GW	3,767	9	108	0	185	507	4,576
	SW	3,296	205	20	0	715	4,734	8,970
2004	GW	2,144	8	111	0	101	262	2,626
	SW	3,520	431	1,496	0	1,591	4,100	11,138
2003	GW	3,784	6	124	0	145	278	4,337
	SW	3,004	548	1,473	0	730	4,813	10,568
2002	GW	2,190	9	630	0	114	196	3,139
	SW	3,667	546	1,486	0	36	5,453	11,188
2001	GW	2,031	7	647	0	114	205	3,004
	SW	3,791	652	1,417	0	36	4,367	10,263
2000	GW	1,990	3	647	0	78	419	3,137
	SW	3,709	720	0	0	25	4,797	9,251

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

BURNET COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	BURNET	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,226	3,226	3,226	3,226	3,226	3,226
K	CHISHOLM TRAIL SUD	BRAZOS	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	66	79	92	103	113	121
K	COTTONWOOD SHORES	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	495	495	495	495	495	495
K	COUNTY-OTHER, BURNET	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	2,205	2,205	2,205	2,205	2,205	2,205
K	GRANITE SHOALS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	830	830	830	830	830	830
K	HORSESHOE BAY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	700	700	700	700	700	700
K	IRRIGATION, BURNET	COLORADO	COLORADO RUN-OF-RIVER	276	276	276	276	276	276
K	IRRIGATION, BURNET	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	416	416	416	416	416	416
K	KEMPNER WSC	BRAZOS	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	135	160	181	201	220	237
K	KINGSLAND WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	56	58	67	77	78	80
K	LIVESTOCK, BURNET	BRAZOS	BRAZOS LIVESTOCK LOCAL SUPPLY	311	311	311	311	311	311
K	LIVESTOCK, BURNET	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	210	210	210	210	210	210
K	MANUFACTURING, BURNET	COLORADO	COLORADO RUN-OF-RIVER	1,503	1,503	1,503	1,503	1,503	1,503
K	MANUFACTURING, BURNET	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	500	500	500	500	500	500
K	MARBLE FALLS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,000	3,000	3,000	3,000	3,000	3,000

Estimated Historical Water Use and 2017 State Water Plan Dataset:
Central Texas Groundwater Conservation District
January 19, 2017
Page 4 of 10

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	MEADOWLAKES	COLORADO	COLORADO RUN-OF-RIVER	567	567	567	567	567	567
K	MEADOWLAKES	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	75	75	75	75	75	75
			Sum of Projected Surface Water Supplies (acre-feet)	**14,571**	**14,611**	**14,654**	**14,695**	**14,725**	**14,752**

Estimated Historical Water Use and 2017 State Water Plan Dataset:
Central Texas Groundwater Conservation District
January 19, 2017
Page 5 of 10

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.

BURNET COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	BERTRAM	BRAZOS	410	488	554	619	677	728
K	BURNET	BRAZOS	8	9	10	12	13	14
K	BURNET	COLORADO	1,840	2,193	2,492	2,784	3,047	3,277
K	CHISHOLM TRAIL SUD	BRAZOS	70	83	95	106	116	124
K	COTTONWOOD SHORES	COLORADO	227	269	304	339	371	399
K	COUNTY-OTHER, BURNET	BRAZOS	1,166	1,380	1,558	1,736	1,896	2,038
K	COUNTY-OTHER, BURNET	COLORADO	2,340	2,392	2,106	2,217	2,416	2,698
K	GRANITE SHOALS	COLORADO	653	768	868	967	1,056	1,136
K	HORSESHOE BAY	COLORADO	747	1,049	1,302	1,545	1,760	1,946
K	IRRIGATION, BURNET	BRAZOS	553	553	553	553	553	553
K	IRRIGATION, BURNET	COLORADO	951	951	951	951	951	951
K	KEMPNER WSC	BRAZOS	135	160	181	201	220	237
K	KINGSLAND WSC	COLORADO	46	54	62	68	75	80
K	LIVESTOCK, BURNET	BRAZOS	311	311	311	311	311	311
K	LIVESTOCK, BURNET	COLORADO	524	524	524	524	524	524
K	MANUFACTURING, BURNET	COLORADO	1,109	1,248	1,384	1,502	1,636	1,782
K	MARBLE FALLS	COLORADO	2,332	3,369	4,839	5,609	6,127	6,386
K	MEADOWLAKES	COLORADO	849	1,021	1,167	1,307	1,430	1,538
K	MINING, BURNET	BRAZOS	1,123	1,353	1,595	1,814	2,066	2,353
K	MINING, BURNET	COLORADO	3,367	4,059	4,784	5,441	6,197	7,059
		Sum of Projected Water Demands (acre-feet)	**18,761**	**22,234**	**25,640**	**28,606**	**31,442**	**34,134**

Estimated Historical Water Use and 2017 State Water Plan Dataset:
Central Texas Groundwater Conservation District
January 19, 2017
Page 6 of 10

Projected Water Supply Needs
TWDB 2017 State Water Plan Data

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

BURNET COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	BERTRAM	BRAZOS	-40	-118	-184	-249	-307	-358
K	BURNET	BRAZOS	6	5	4	2	1	0
K	BURNET	COLORADO	2,793	2,440	2,141	1,849	1,586	1,356
K	CHISHOLM TRAIL SUD	BRAZOS	0	0	0	0	0	0
K	COTTONWOOD SHORES	COLORADO	268	226	191	156	124	96
K	COUNTY-OTHER, BURNET	BRAZOS	412	198	20	-158	-318	-460
K	COUNTY-OTHER, BURNET	COLORADO	2,981	2,929	3,215	3,104	2,905	2,623
K	GRANITE SHOALS	COLORADO	177	62	-38	-137	-226	-306
K	HORSESHOE BAY	COLORADO	101	-201	-454	-697	-912	-1,098
K	IRRIGATION, BURNET	BRAZOS	0	0	0	0	0	0
K	IRRIGATION, BURNET	COLORADO	623	623	623	623	623	623
K	KEMPNER WSC	BRAZOS	0	0	0	0	0	0
K	KINGSLAND WSC	COLORADO	10	4	5	9	3	0
K	LIVESTOCK, BURNET	BRAZOS	205	205	205	205	205	205
K	LIVESTOCK, BURNET	COLORADO	144	144	144	144	144	144
K	MANUFACTURING, BURNET	COLORADO	903	764	628	510	376	230
K	MARBLE FALLS	COLORADO	1,418	381	-1,089	-1,859	-2,377	-2,636
K	MEADOWLAKES	COLORADO	-207	-379	-525	-665	-788	-896
K	MINING, BURNET	BRAZOS	0	0	0	0	0	0
K	MINING, BURNET	COLORADO	-1,011	-1,703	-2,428	-3,085	-3,841	-4,703
		Sum of Projected Water Supply Needs (acre-feet)	**-1,258**	**-2,401**	**-4,718**	**-6,850**	**-8,769**	**-10,457**

Estimated Historical Water Use and 2017 State Water Plan Dataset:
Central Texas Groundwater Conservation District
January 19, 2017
Page 7 of 10

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

BURNET COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BERTRAM, BRAZOS (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	62	73	83	93	102	109
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - ELLENBURGER-SAN SABA AQUIFER	ELLENBURGER-SAN SABA AQUIFER [BURNET]	180	180	180	180	180	180
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	500	884	884	884	884	884
MUNICIPAL CONSERVATION - BERTRAM	DEMAND REDUCTION [BURNET]	41	64	91	126	164	204
		783	**1,201**	**1,238**	**1,283**	**1,330**	**1,377**
BURNET, BRAZOS (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	2	2	2	2	3	3
MUNICIPAL CONSERVATION - BURNET	DEMAND REDUCTION [BURNET]	1	1	2	3	4	4
		3	**3**	**4**	**5**	**7**	**7**
BURNET, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	368	439	498	557	609	655
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	1,000	2,000	2,000	2,000	2,000	2,000
MUNICIPAL CONSERVATION - BURNET	DEMAND REDUCTION [BURNET]	183	281	403	568	736	913
		1,551	**2,720**	**2,901**	**3,125**	**3,345**	**3,568**
CHISHOLM TRAIL SUD, BRAZOS (K)							
ADDITIONAL ADVANCED CONSERVATION - CHISHOLM TRAIL SUD	DEMAND REDUCTION [BURNET]	0	0	0	6	12	19
CHISHOLM TRAIL SUD WTP EXPANSION	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR]	49	45	7	39	22	73
GEORGETOWN WTP EXPANSION	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	5	5	0	0
MUNICIPAL WATER CONSERVATION (SUBURBAN) - CHISHOLM TRAIL SUD	DEMAND REDUCTION [BURNET]	3	10	13	15	16	17
		52	**55**	**25**	**65**	**50**	**109**

Estimated Historical Water Use and 2017 State Water Plan Dataset:
Central Texas Groundwater Conservation District
January 19, 2017
Page 8 of 10

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
COTTONWOOD SHORES, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	45	54	61	68	74	80
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	376	700	700	700	700	700
MUNICIPAL CONSERVATION - COTTONWOOD SHORES	DEMAND REDUCTION [BURNET]	22	21	20	19	21	23
		443	**775**	**781**	**787**	**795**	**803**
COUNTY-OTHER, BURNET, BRAZOS (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	175	207	234	260	284	306
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	500	1,000	1,000	1,000	1,000	1,000
MUNICIPAL CONSERVATION - BURNET COUNTY-OTHER	DEMAND REDUCTION [BURNET]	60	93	83	80	87	94
		735	**1,300**	**1,317**	**1,340**	**1,371**	**1,400**
COUNTY-OTHER, BURNET, COLORADO (K)							
BRUSH CONTROL	COLORADO RUN-OF-RIVER [BURNET]	425	425	425	425	425	425
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	351	359	316	333	362	405
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	1,735	2,813	2,813	2,813	2,813	2,813
		2,511	**3,597**	**3,554**	**3,571**	**3,600**	**3,643**
GRANITE SHOALS, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	33	38	43	48	53	57
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	250	250	250
		33	**38**	**43**	**298**	**303**	**307**
HORSESHOE BAY, COLORADO (K)							
DIRECT REUSE - HORSESHOE BAY	DIRECT REUSE [LLANO]	50	50	50	50	50	50
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	187	262	326	386	440	487
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	150	500	500	1,000	1,000
MUNICIPAL CONSERVATION - HORSESHOE BAY	DEMAND REDUCTION [BURNET]	75	194	343	519	710	901

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
		312	**656**	**1,219**	**1,455**	**2,200**	**2,438**
KEMPNER WSC, BRAZOS (K)							
BRA SYSTEM OPERATIONS-LITTLE RIVER	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR]	213	230	237	252	254	257
MUNICIPAL WATER CONSERVATION (SUBURBAN) - KEMPNER WSC	DEMAND REDUCTION [BURNET]	5	14	14	13	14	16
		218	**244**	**251**	**265**	**268**	**273**
KINGSLAND WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	2	3	3	3	4	4
		2	**3**	**3**	**3**	**4**	**4**
MARBLE FALLS, COLORADO (K)							
DIRECT REUSE - MARBLE FALLS	DIRECT REUSE [BURNET]	11	11	11	11	11	11
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	466	674	968	1,122	1,225	1,277
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	500	4,000	4,000	4,000	4,000	4,000
MUNICIPAL CONSERVATION - MARBLE FALLS	DEMAND REDUCTION [BURNET]	234	587	1,016	1,397	1,764	2,059
		1,211	**5,272**	**5,995**	**6,530**	**7,000**	**7,347**
MEADOWLAKES, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BURNET]	170	204	233	261	286	308
MUNICIPAL CONSERVATION - MEADOWLAKES	DEMAND REDUCTION [BURNET]	84	188	309	443	573	708
		254	**392**	**542**	**704**	**859**	**1,016**
MINING, BURNET, COLORADO (K)							
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - ELLENBURGER-SAN SABA AQUIFER	ELLENBURGER-SAN SABA AQUIFER [BURNET]	1,500	1,500	1,500	1,500	1,500	1,500
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - HICKORY AQUIFER	HICKORY AQUIFER [BURNET]	0	500	1,000	1,800	1,800	1,800
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - MARBLE FALLS AQUIFER	MARBLE FALLS AQUIFER [BURNET]	0	0	0	0	1,000	1,500
		1,500	**2,000**	**2,500**	**3,300**	**4,300**	**4,800**
Sum of Projected Water Management Strategies (acre-feet)		**9,608**	**18,256**	**20,373**	**22,731**	**25,432**	**27,092**

Estimated Historical Water Use and 2017 State Water Plan Dataset:
Central Texas Groundwater Conservation District
January 19, 2017
Page 10 of 10

APPENDIX H- GAM RUN 16-006

GAM RUN 16-006: CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

Jerry (Jianyou) Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Section
(512) 463-5076
June 20, 2016

STATE OF TEXAS
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PROFESSIONAL GEOSCIENTIST

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GAM RUN 16-006: CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

Jerry (Jianyou) Shi, Ph.D., P.G.
Texas Water Development Board
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(512) 463-5076
June 20, 2016

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2015), 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. Information derived from groundwater availability models that shall be included in the groundwater management plan includes:

- The annual amount of recharge from precipitation, if any, to the groundwater resources within the district;
- 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
- The annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

This report—Part 2 of a two-part package of information from the TWDB to the Central Texas Groundwater Conservation District—fulfills the requirements noted above. Part 1 of the two-part package is the Estimated Historical Water Use/State Water Plan data report. The district will receive this data report from the TWDB Groundwater Technical Assistance Section. Questions about the data report can be directed to Mr. Stephen Allen, stephen.allen@twdb.texas.gov, (512) 463-7317.

The groundwater management plan for the Central Texas Groundwater Conservation District should be adopted by the district on or before April 7, 2017, and submitted to the executive administrator of the TWDB on or before May 7, 2017. The current management plan for the Central Texas Groundwater Conservation District expires on July 6, 2017.

There are four aquifers identified by TWDB in the Central Texas Groundwater Conservation District: the Trinity, the Marble Falls, the Ellenburger-San Saba, and the Hickory aquifers. Two groundwater availability models were used to extract the management plan information for the aquifers within the Central Texas Groundwater Conservation District. Information for the Trinity Aquifer was extracted from version 2.01 of the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014). Information for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers was extracted from version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift region (Shi and others, 2016, under final review).

This report discusses the methods, assumptions, and results from the model runs for the Trinity, Marble Falls, Ellenburger-San Saba, and Hickory aquifers described above. This model run report replaces the results of GAM Run 10-066 (Aschenbach, 2011), which only included information for the Trinity Aquifer extracted using version 1.01 of the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Bené and others, 2004).Tables 1 through 4 summarize the groundwater availability model data required by statute. Figures 1 through 4 show the areas of the models from which the values in Tables 1 through 4 were extracted.

If after review of the figures Central Texas Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers was used to extract information for the Trinity Aquifer. The water budget for the Trinity Aquifer within the Central Texas Groundwater Conservation District was extracted for selected years of 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 Trinity Aquifer within the district are summarized in this report.

The water budgets for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers within the Central Texas Groundwater Conservation District were extracted for selected years of the historical model period (1981 through 2010) using ZONEBUDGET USG Version 1.00. The average annual water budget values for recharge, surface-water outflow, inflow to the district, and outflow from the district for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Trinity Aquifer

- We used version 2.01 of the updated 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: Layer 1 (the surficial outcrop area of the units in layers 2 through 8 and units younger than Woodbine Aquifer), Layer 2 (Woodbine Aquifer and pass-through cells), Layer 3 (Washita and Fredericksburg, Edwards (Balcones Fault Zone), and pass-through cells), and Layers 4 through 8 (Trinity Aquifer).

- Perennial rivers and reservoirs were simulated using MODFLOW-NWT river package. Ephemeral streams, flowing wells, springs, and evapotranspiration in riparian zones along perennial rivers were simulated using MODFLOW-NWT drain package. For this management plan, groundwater discharge to surface water includes groundwater leakage to all of the river and drain boundaries minus the groundwater loss along the riparian zone.

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

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

- We used version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift region. See Shi and others (2016) for assumptions and limitations of the model.

- The groundwater availability model for the minor aquifers in Llano Uplift region contains 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).

- Perennial rivers and reservoirs were simulated using MODFLOW-USG river package. Springs were simulated using MODFLOW-USG drain package. For this management plan, groundwater discharge to surface water includes groundwater leakage to the river and drain boundaries.

- The model was run with MODFLOW-USG beta (development) version (Panday and others, 2013).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the models for the Trinity Aquifer and the Marble Falls, Ellenburger-San Saba, and Hickory aquifers within the district and averaged over the historical duration, as shown in Tables 1 through 4.

- 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.

- Surface-water outflow—The total water discharging from the aquifer (outflow) to surface-water features such as streams, reservoirs, and drains (springs).

- Flow into and out of district—The lateral flow within the aquifer between the district and adjacent counties.

- Flow between aquifers—The net vertical flow between aquifers. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer that define the amount of leakage that occurs.

The information needed for the district's management plan is summarized in Tables 1 through 4. 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 THAT IS NEEDED FOR CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST ONE ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	13,831
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Trinity Aquifer	13,727
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	2,908
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	12,285
Estimated net annual volume of flow between each aquifer in the district*	From Trinity Aquifer to Marble Falls Aquifer	8
	From Trinity Aquifer to Ellenburger-San Saba Aquifer	255
	From Hickory Aquifer to Trinity Aquifer	1

*Flows between each aquifer in the district were extracted from the groundwater availability model for the minor aquifers in the Llano Uplift region (see Tables 2 through 4).

TABLE 2: SUMMARIZED INFORMATION FOR THE MARBLE FALLS AQUIFER THAT IS NEEDED FOR CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST ONE ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Marble Falls Aquifer	2,181
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Marble Falls Aquifer	10,771
Estimated annual volume of flow into the district within each aquifer in the district	Marble Falls Aquifer	10
Estimated annual volume of flow out of the district within each aquifer in the district	Marble Falls Aquifer	60
Estimated net annual volume of flow between each aquifer in the district	From Trinity Aquifer to Marble Falls Aquifer	8
	From Ellenburger-San Saba Aquifer to Marble Falls Aquifer	1,165

TABLE 3: SUMMARIZED INFORMATION FOR ELLENBURGER-SAN SABA AQUIFER THAT IS NEEDED FOR CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST ONE ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Ellenburger-San Saba Aquifer	68,860
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Ellenburger-San Saba Aquifer	69,378
Estimated annual volume of flow into the district within each aquifer in the district	Ellenburger-San Saba Aquifer	20,593
Estimated annual volume of flow out of the district within each aquifer in the district	Ellenburger-San Saba Aquifer	7,663
Estimated net annual volume of flow between each aquifer in the district*	From Trinity Aquifer to Ellenburger-San Saba Aquifer	255
	From Ellenburger-San Saba Aquifer to Marble Falls Aquifer	1,165
	From Hickory Aquifer to Ellenburger-San Saba Aquifer	7,631

*The estimated volume of flow from the brackish portion of the Ellenburger-San Saba formations to the Ellenburger-San Saba Aquifer in the Central Texas Groundwater Conservation District is 3,697 acre-feet per year and was not included in the management plan requirement results. The estimated volume of flow from the Ellenburger-San Saba Aquifer to the brackish portion of the Ellenburger-San Saba formations in the Central Texas Groundwater Conservation District is 9,860 acre-feet per year and was not included in the management plan requirement results.

TABLE 4: SUMMARIZED INFORMATION FOR THE HICKORY AQUIFER THAT IS NEEDED FOR CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST ONE ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Hickory Aquifer	331
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Hickory Aquifer	3,302
Estimated annual volume of flow into the district within each aquifer in the district	Hickory Aquifer	7,955
Estimated annual volume of flow out of the district within each aquifer in the district	Hickory Aquifer	6,374
Estimated net annual volume of flow between each aquifer in the district*	From Hickory Aquifer to Trinity Aquifer	1
	From Hickory Aquifer to Ellenburger-San Saba Aquifer	7,631

*The estimated volume of flow from the brackish portion of the Hickory Formation to the Hickory Aquifer in the Central Texas Groundwater Conservation District is two acre-feet per year and was not included in the management plan requirement results. The estimated volume of flow from the Hickory Aquifer to the brackish portion of the Hickory Formation in the Central Texas Groundwater Conservation District is 1,097 acre-feet per year and was not included in the management plan requirement results.

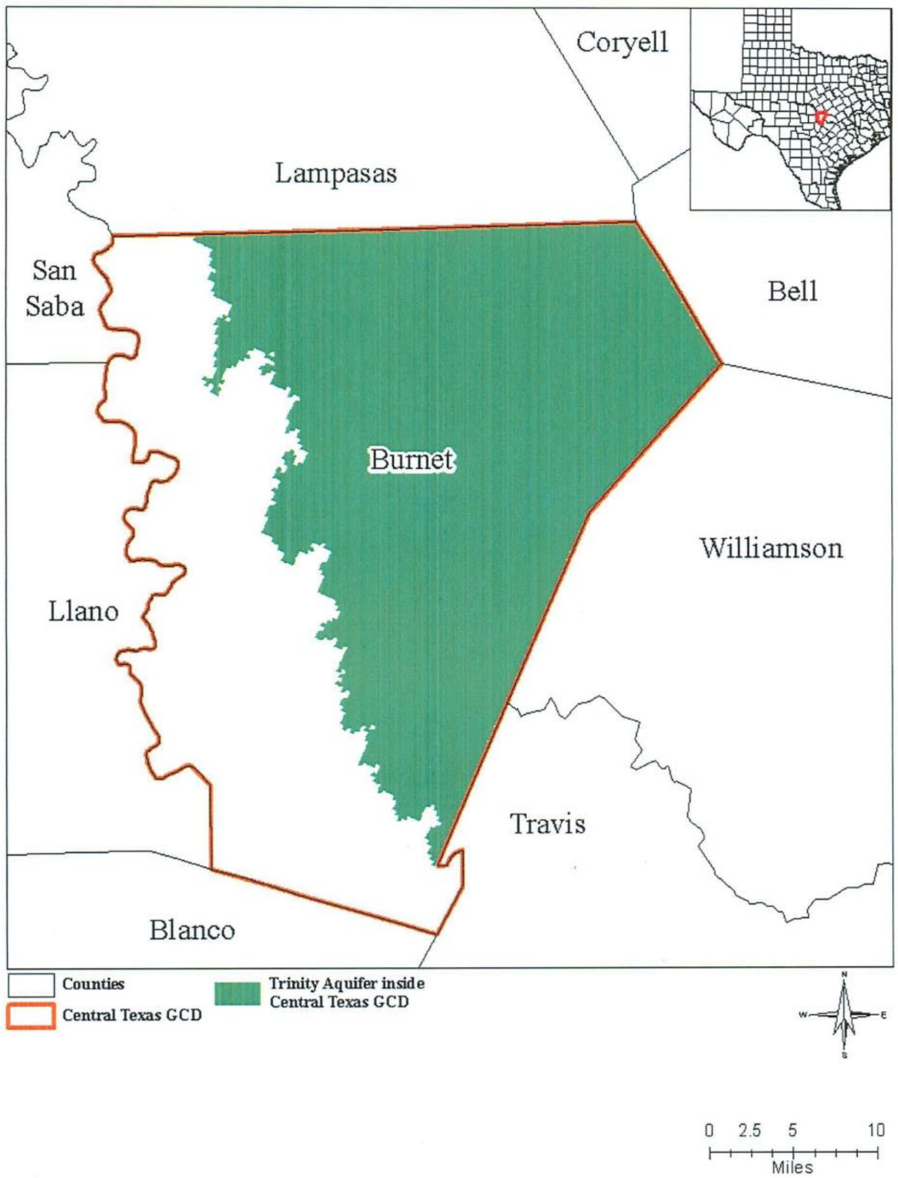

FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE TRINITY AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED FOR THE CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT (GCD).

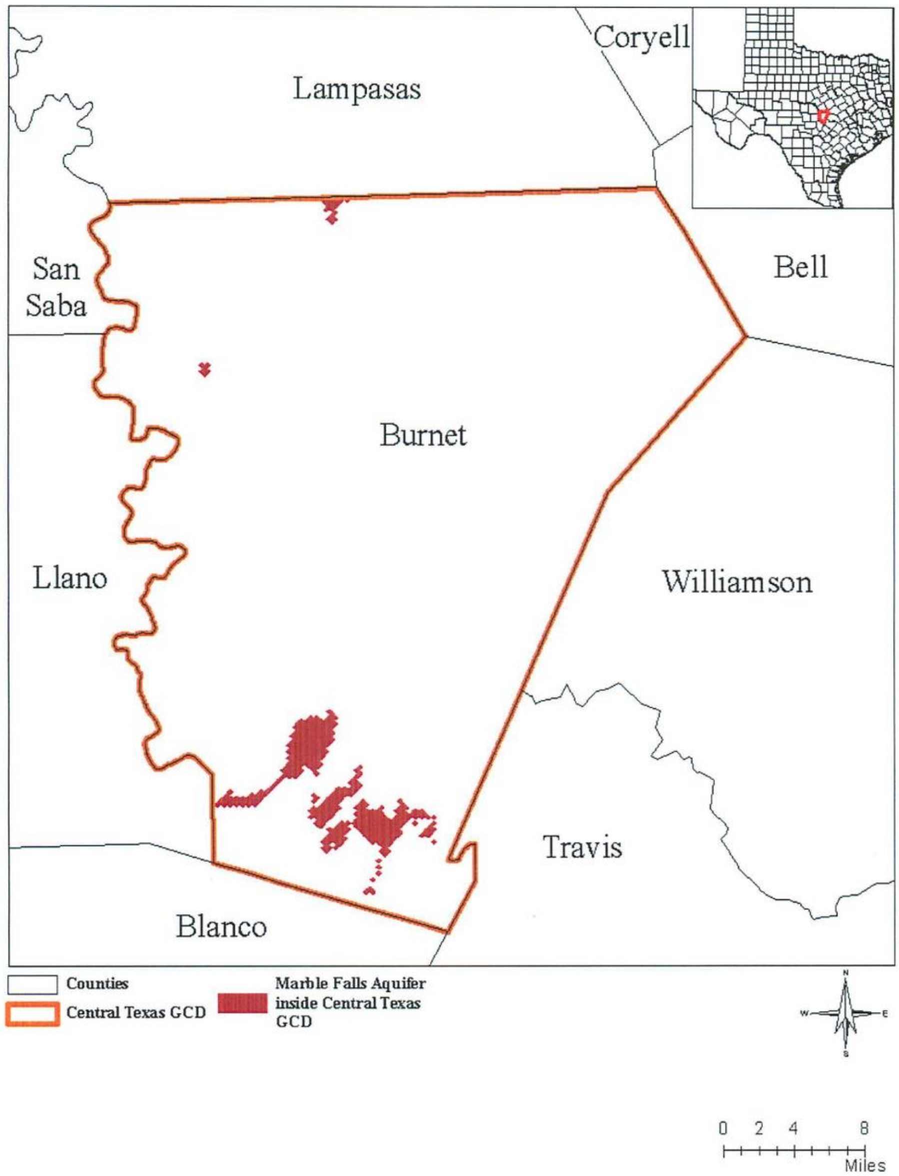

FIGURE 2: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE MARBLE FALLS AQUIFER FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED FOR THE CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT (GCD).

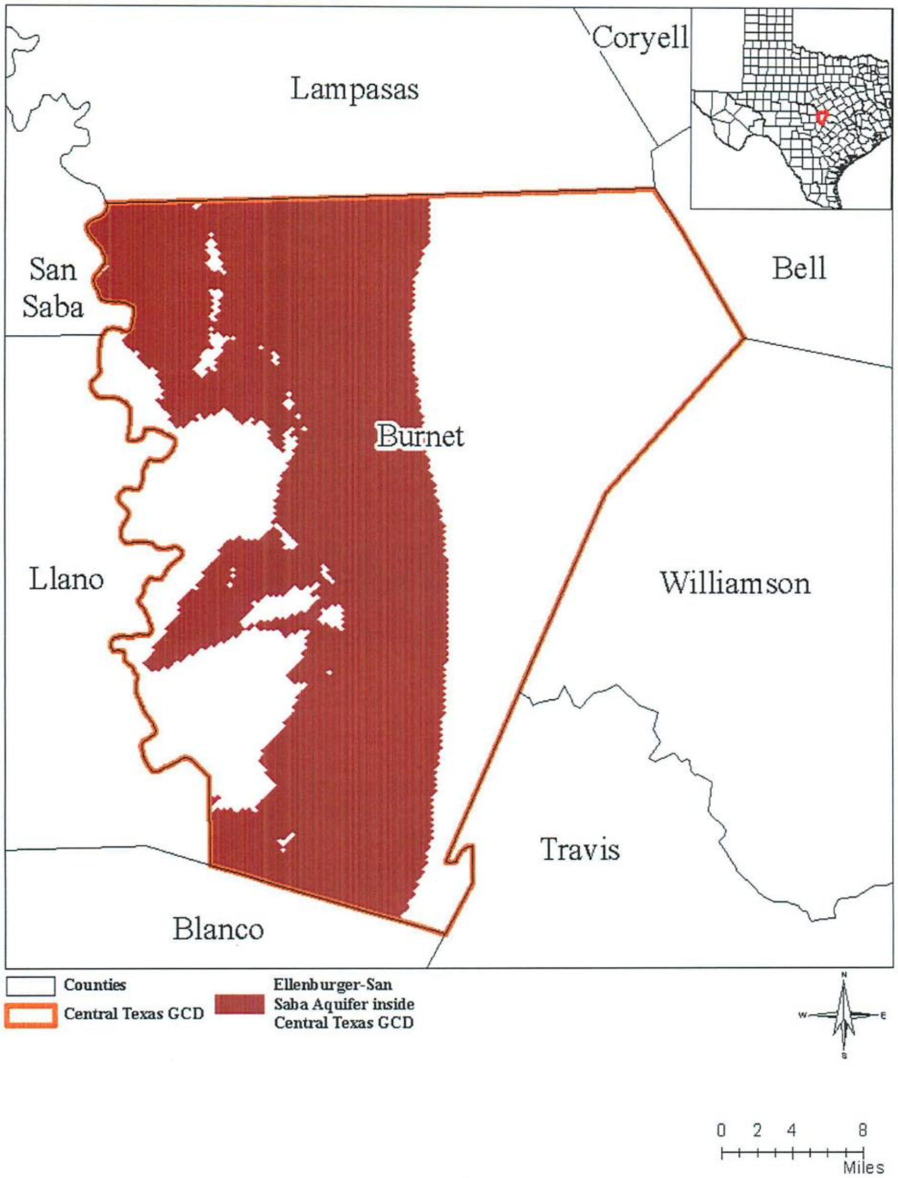

FIGURE 3: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE ELLENBURGER-SAN SABA AQUIFER FROM WHICH THE INFORMATION IN TABLE 3 WAS EXTRACTED FOR THE CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT (GCD).

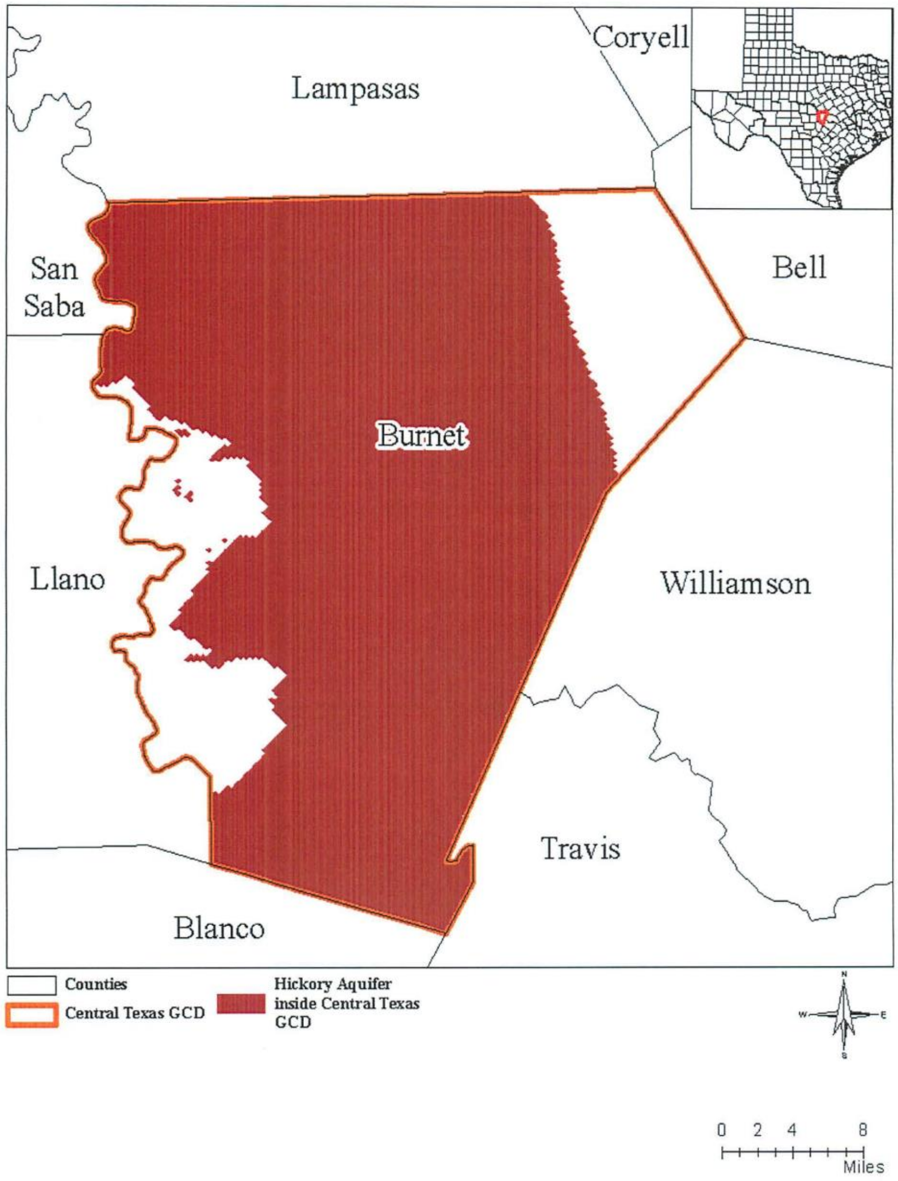

FIGURE 4: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE HICKORY AQUIFER FROM WHICH THE INFORMATION IN TABLE 4 WAS EXTRACTED FOR THE CENTRAL TEXAS GROUNDWATER CONSERVATION DISTRICT (GCD).

LIMITATIONS:

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

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

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of 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 interaction with streams are specific to particular historic time periods.

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

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

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