Groundwater Management Plan

Adopted August 1, 2017

Post Oak Savannah Groundwater Conservation District
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GROUNDWATER MANAGEMENT PLAN

1. DISTRICT MISSION

The Post Oak Savannah Groundwater Conservation District (POSGCD) mission is to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and to protect groundwater users, by adopting and enforcing Rules consistent with state law. The District will accomplish this mission by imposing spacing requirements, regulating production, requiring permits for wells and production, establishing water drawdown levels and monitoring groundwater levels and production, making appropriate adjustments to allowable and permitted production, and encouraging conservation.

2. TIME PERIOD OF THIS PLAN

This plan will become effective upon adoption by the POSGCD Board of Directors ("Board") and approval as administratively complete by the Texas Water Development Board. The plan will remain in effect for five (5) years after the date of certification, and thereafter until a revised plan is adopted and approved.

3. BACKGROUND

The POSGCD was created in Milam and Burleson counties by HB 1784, 77th Legislature, 2001, and a local confirmation election in November 2002. The purpose of this bill is to provide a locally controlled groundwater district to conserve and preserve groundwater, protect groundwater users, protect and recharge groundwater, prevent pollution or waste of groundwater in the central Carrizo-Wilcox area, control subsidence caused by withdrawal of water from the groundwater reservoirs in that area, and regulate the transport of water out of the boundaries of the districts. The POSGCD has 10 directors, 5 from each county. It does not have the power to tax and receives all of its revenue from fees imposed on municipal/commercial pumpers and transporters of groundwater. Successful confirmation elections were held in November 2002 in both counties in accordance with Sections 36.017, 36.018, and 36.019, Water Code, and Section 41.001, Election Code.

The POSGCD is a member of Groundwater Management Area 12 (GMA 12) and Groundwater Management Area 8 (GMA 8), whose areal extents are shown in Figure 1. To help establish desired future conditions (DFCs) for the relevant aquifers within the boundaries of GMA 12 and GMA 8, POSGCD will consider groundwater availability models (GAMs) and other data or information. As part of the joint planning process, POSGCD will establish management goals and objectives that are consistent with the DFCs adopted by GMA 8 and GMA 12.

4. GROUNDWATER RESOURCES

Located within the District's boundaries are portions of the Trinity, Wilcox, Carrizo, Queen City, Sparta, Yegua/Jackson, and the Brazos River Alluvium aquifers. Figure 2 shows the locations of the outcrops of these aquifers based on the surface geology mapped by Barnes (1994), Kelley and others (2004), Deeds and others (2010), and Shah and Houston (2007). In Figure 2, the outcrop area for the Carrizo Aquifer includes the outcrop area associated with the Reklaw Formation, the outcrop area for the Queen City Aquifer includes

the outcrop area associated with the Weches Formation, and the outcrop area for the Sparta Aquifer includes the outcrop area for the Catahoula Formation. Within the District, the Trinity Aquifer does not outcrop and is overlaid primarily by the Midway Formation. Table 4-1 provides the area associated with each aquifer outcrop.

Table 4-1. Aquifer Outcrop Areas in the District

Aquifer and/or Geologic Formation	Outcrop Area (square miles)
Midway Formation	346
Wilcox	348
Carrizo/Reklaw	70
Queen City/Weches	159
Sparta	76
Cook Mountain/Yegua-Jackson /Catahoula	321
Brazos River Alluvium	161
Shallow Alluvium	215
Total	1,699

(a) Northern Trinity Aquifer. The northern Trinity Aquifer is located in the northwest corner of Milam County. The Trinity Aquifer comprises five geological formations considered to be relevant aquifers by GMA 8. These geologic formations are the Paluxy Aquifer, the Glen Rose Aquifer, the Travis Peak Aquifer, the Hensell Aquifer, and the Hosston Aquifer. The top and bottom surfaces for these geological formations are defined by the Updated Northern Trinity and Woodbine Aquifers GAM (Kelley and others, 2014).

(b) Wilcox Aquifer. The Wilcox aquifer is a major regional aquifer system. The outcrop of the Wilcox Aquifer forms a southwest to northeast trending belt through central Milam County; the downdip portion of the Wilcox Aquifer underlies southern Milam County and all of Burleson County. Freshwater exists in the Wilcox Aquifer in both Milam County and Burleson County. The Wilcox Aquifer comprises three geological formations that are considered to be relevant aquifers by GMA 12. These three geologic formations are the Hooper, the Simsboro, and the Calvert Bluff. The top and bottom surfaces for these three geological formations are defined by their model layer in the Central Carrizo GAM (Dutton and others, 2003). The Upper Wilcox Aquifer is associated with the Calvert Bluff Formation. The Middle Wilcox Aquifer is associated with the Simsboro Formation. The Lower Wilcox Aquifer is associated with the Hooper Formation.

The unconfined portion of the Upper Wilcox Aquifer is where the Central Carrizo GAM (Dutton and others, 2003) simulates the water level in the Calvert Bluff Formation to be below the top of the Calvert Bluff Formation at January 2000. The unconfined portion of the Middle Wilcox Aquifer is where the Central Carrizo GAM (Dutton and others, 2003) simulates the water level in the Simsboro Formation to be below the top of the Simsboro Formation at January 2000. The unconfined portion of the Lower Wilcox Aquifer is where the Central Carrizo GAM (Dutton and others, 2003) simulates the water level in the Hooper Formation to be below the top of the Hooper Formation at

January 2000.

(c) Carrizo Aquifer. The Carrizo Aquifer is a regional aquifer system that occurs throughout most of the District. The outcrop of the Carrizo Aquifer forms a southwest to northeast trending belt through southern Milam County; the downdip portion of the Carrizo Aquifer underlies southern Milam County and all of Burleson County. Freshwater exists in the Carrizo Aquifer in both Milam County and Burleson County. The aquifer is a source of groundwater for numerous domestic wells and several large public water supply systems. The top and bottom surfaces for the Carrizo Aquifer are represented by its model layer in the Central Carrizo GAM (Dutton and others, 2003). The unconfined portion of the Carrizo Aquifer is where the Central Carrizo GAM (Dutton and others, 2003) simulates the water level in the Carrizo Formation to be below the top of the Carrizo Formation at January 2000.

(d) Queen City. The Queen City Aquifer outcrops across a 5- to 8-mile-wide zone that is generally aligned along the Milam-Burleson County line. The aquifer extends down dip in Burleson County and is a source of groundwater for domestic wells and some public water supply wells. Freshwater exists in the Queen City Aquifer in both Milam County and Burleson County. The top and bottom surfaces for the Queen City Aquifer are represented by its model layer in the Central Carrizo GAM (Kelley and others, 2004). The unconfined portion of the Queen City Aquifer is defined as the area where the Central Carrizo GAM (Kelly and others, 2004) simulates the water table to be below the top of the Queen City Aquifer at January 2000.

(e) Sparta Aquifer. The Sparta Aquifer outcrops across a 3- to 5-mile-wide zone trending southwest- northeast just north of Highway 21 in Burleson County. The Sparta extends downdip to the southeast throughout much of Burleson County. Like the Queen City Aquifer, the Sparta is used for numerous domestic water wells and some small public water supply systems in the District. Freshwater exists in the Sparta Aquifer in Burleson County. The top and bottom surfaces for the Sparta Aquifer are represented by its model layer in the Central Carrizo GAM (Kelley and others, 2004). The unconfined portion of the Sparta Aquifer is defined as the area where the Central Carrizo GAM (Kelly and others, 2004) simulates the water table to be below the top of the Sparta Aquifer at January 2000.

(f) Yegua/Jackson Aquifer. The Yegua/Jackson Aquifer outcrops across a 6- to 10-mile-wide zone trending southwest-northeast south of Highway 21 in Burleson County. The Yegua/Jackson Aquifer extends down-dip to the southeast through much of Burleson County. The Yegua/Jackson Aquifer includes to all four geologic units (the upper Yegua, the lower Yegua, the upper Jackson, and the lower Jackson), represented by the model layers in the Yegua/Jackson GAM (Deeds and others, 2010). In Burleson County, the Yegua/Jackson Aquifer provides small to moderate amounts of freshwater to domestic and irrigation wells and to a few public water systems.

(g) Brazos River Alluvium Aquifer. The Brazos River Alluvium Aquifer is comprised of floodplain and terrace deposits of the Brazos River along the eastern boundary of Milam and Burleson counties. The Brazos River Alluvium Aquifer occurs only as an unconfined aquifer in POSGCD, and the majority of it exists in Burleson County. The Brazos River Alluvium supplies freshwater to many irrigation wells and several domestic wells. For

the most part, the water discharges from the alluvium mainly through seepage to the Brazos River, evapotranspiration, and wells. The bottom surface for the Brazos River Alluvium is represented by the Brazos River Alluvium Aquifer GAM (Ewing and Jigmond, 2016).

(h) Shallow Alluvium Aquifers. Shallow alluvium aquifers have not been completely mapped across POSGCD. The aquifers represent floodplain and terrace deposits near major tributaries to the Brazos River. These aquifers are generally less than 30 feet thick, are characterized by mixtures of coarse sands and fine-grain materials, and are often well connected hydrologically to nearby streams. The areas of these aquifers are denoted by alluvium deposits denoted in the Bureau of Economic Geology map of surface geology (Proctor and others, 1974).

5. MANAGEMENT ZONES

The District is divided into groundwater management zones for the purpose of evaluating and managing groundwater resources recognizing the different characteristics and anticipated future development of the aquifers in the District.

The District will establish and enforce Rules for the spacing of wells, the maximum allowable production of groundwater per acre of land located over an aquifer, require permits for production, regulate drawdown and provide for a reduction in the maximum allowable production and permitted production of groundwater per acre of land based on the different surface and subsurface characteristics and different evaluation and monitoring within the Management Zones.

The Management Zones are as follows:

(a) Brazos River Alluvium Management Zone. This management zone is located along the eastern boundaries of the District in Milam and Burleson counties and is coterminous with the boundaries of the Brazos Alluvium outcrop in Figure 2. This zone extends to the depth of the water bearing alluvial sediments of the Brazos River Alluvium.

(b) Trinity Management Zone. This management zone includes the northern Trinity Aquifer, which is located beneath the footprint of the Midway outcrop shown in Figure 2. This management zone also includes the Midway Formation, which is generally a clayey deposit with low transmissivity.

(c) Sparta Management Zone. The Sparta Management Zone includes all of the water-bearing formations of the Sparta Aquifer found in the District.

(d) Queen City Management Zone. The Queen City Management Zone includes all of the water-bearing formations of the Queen City Aquifer found in the District.

(e) Carrizo Management Zone. The Carrizo Management Zone includes all of the water-bearing formations of the Carrizo Aquifer found in the District.

(f) Upper Wilcox Management Zone. The Upper Wilcox Management Zone includes all of the water-bearing formations of the Calvert Bluff Formation found in the District.

(g) Middle Wilcox Management Zone. The Middle Wilcox Management Zone includes all of the water-bearing formations of the Simsboro Formation found in the District.

(h) Lower Wilcox Management Zone. The Lower Wilcox Management Zone includes all of the water-bearing formations of the Hooper Formation found in the District.

(i) Yegua/Jackson Management Zone. This zone includes the outcrop and downdip portions of the geologic units of the Yegua and the Jackson formations of the Yegua/Jackson Aquifer, which occur in the southern portion of Burleson County.

(j) Shallow Management Zone for each Management Zone listed above items (b) through (i). This management zone corresponds to all deposits that occur at a depth of 400 feet or less, as measured from land surface, except for deposits associated with the Brazos River Alluvium. The Shallow Management Zone is not mutually exclusive from the aquifer management zones (b) through (i) but the uppermost portion of those management zones. The purpose of monitoring the Shallow Management zone is to characterize the water levels in the unconfined portions of the aquifers.

6. MANAGEMENT OF GROUNDWATER SUPPLIES

The District will evaluate and monitor groundwater conditions and regulate production consistent with this plan and the District Rules. Production will be regulated, as needed, to conserve groundwater, and protect groundwater users, in a manner not to unnecessarily and adversely limit production or impact the economic viability of the public, landowners and private groundwater users. In consideration of the importance of groundwater to the economy and culture of the District, the District will identify and engage in activities and practices that will permit groundwater production and, as appropriate, protect the aquifer and groundwater in accordance with this Management Plan and the District's rules. A monitoring well network will be maintained to monitor aquifer conditions within the District. The District will make a regular assessment of water supply and groundwater storage conditions and will report those conditions, as appropriate, in public meetings of the Board or public announcements. The District will undertake investigations, and cooperate with third-party investigations, of the groundwater resources within the District, and the results of the investigations will be made available to the public upon being presented at a meeting of the Board.

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

The factors that the District may consider in making a determination to grant a drilling and operating or operating permit or limit groundwater withdrawals will include:

1. The purpose of the rules of the District;
2. The equitable distribution of the resource;
3. The economic hardship resulting from grant or denial of a permit, or the terms prescribed by the permit;
4. This Management Plan and DFCs of the District as adopted in Joint Planning under Tex. Water Code, Sec. 36.108; and
5. The potential effect the permit may have on the aquifer, and groundwater users.

The transport of groundwater out of the District will be regulated by the District according to the Rules of the District.

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

A contingency plan to cope with the effects of water supply deficits due to climatic or other conditions will be developed by the District and will be adopted by the Board after notice and hearing. In developing the contingency plan, the District will consider all relevant factors, including, but not limited to, the economic effect of conservation measures upon all water resource user groups, the local implications of the degree and effect of changes in water storage conditions, the unique hydrogeologic conditions of the aquifers within the District and the appropriate conditions under which to implement the contingency plan.

The District will employ reasonable and necessary technical resources at its disposal to evaluate the groundwater resources available within the District and to determine the effectiveness of regulatory or conservation measures. A public or private user may appeal to the Board for discretion in enforcement of the provisions of the water supply deficit contingency plan on grounds of adverse economic hardship or unique local conditions. The exercise of discretion by the Board shall not be construed as limiting the power of the Board.

7. DESIRED FUTURE CONDITIONS

The District shall participate in the joint planning process in GMAs 8 and 12 as defined per TWC § 36.108, including establishment of DFCs for management areas within the District. In its evaluation of potential DFCs, the District shall consider results from GAMs, scientific reports, and the conditions of the aquifer within the management zones.

(a) DFCs Adopted by GMA 12. The District's DFCs for the area covered by GMA 12 are provided in Tables 7-1, 7-2, and 7-3 for both the 2010 and 2015 Joint Planning cycles. For each of the aquifers, the DFC average drawdowns are for the area covered by each aquifer in Milam and Burleson counties.

For the Queen City, Sparta, Carrizo and Wilcox aquifers (Table 7-1), the stratigraphy was defined using the TWDB GAM for the Queen City and Sparta Aquifers (Kelley and others, 2004) during both planning cycles. The DFCs from the 2010 Joint Planning cycle correspond with the Modeled Available Groundwater (MAG) values provided in Section 8. These DFCs are average drawdowns calculated by the Kelley and others (2004) model for a 60-year period beginning January 2000 and ending December 2059. The DFCs from the 2015 Joint Planning cycle are the most current POSGCD DFCs, but at the time of the current plan, the MAG values have not yet been calculated using these DFCs. These DFCs are average drawdowns calculated by the Kelley and others (2004) model for a 70-year period beginning January 2000 and ending December 2069.

For the Yegua-Jackson Aquifer (Table 7-2), the stratigraphy was defined using the TWDB GAM for the Yegua-Jackson Aquifer (Deeds and others, 2010) during both planning cycles. The DFCs from the 2010 Joint Planning cycle correspond with the MAG values provided in Section 8. These DFCs are average drawdowns calculated by the Deeds and others (2010) model for the 60-year period beginning January 2000 and ending December 2059. The DFCs from the 2015 Joint Planning cycle are the most current POSGCD DFCs, but at the time of the current plan, the MAG values have not yet been calculated using these DFCs. These DFCs are average drawdowns calculated by the Deeds and others (2010) model for a 60-year period beginning January 2010 and ending December 2069.

For the Brazos River Alluvium Aquifer (Table 7-3), there was no TWDB GAM available during the either joint planning period for GMA 12. The DFCs for the 2010 Joint Planning cycle represent declines in the saturated thickness measured in District monitoring well network over a 50-year period. The 50-year period begins January 2010 and ends December 2059. The DFCs for the 2015 Joint Planning cycle represent declines in the saturated thickness measured in District monitoring well network over a 60-year period. The 60-year period begins in January 2010 and ends on December 2069.

Table 7-1. Adopted DFCs for the Queen City, Sparta, Carrizo and Wilcox aquifers

Aquifer	2010 Joint Planning	2015 Joint Planning
	Average Drawdown between January 2000 and December 2059 (ft)	Average Drawdown between January 2000 and December 2069 (ft)
Sparta	30	28
Queen City	30	30
Carrizo	65	67
Upper Wilcox (Calvert Bluff Fm)	140	149
Middle Wilcox (Simsboro Fm)	300	318
Lower Wilcox (Hooper Fm)	180	205

Table 7-2. Adopted DFCs for the Yegua-Jackson Aquifer

Aquifer	2010 Joint Planning	2015 Joint Planning
	Average Drawdown between January 2000 and December 2059 (ft)	Average Drawdown between January 2010 and December 2069 (ft)
Yegua-Jackson	100	100

Table 7-3. Adopted DFCs for the Brazos River Alluvium Aquifer

County	2010 Joint Planning	2015 Joint Planning
	Average Decrease in Saturated Thickness between January 2010 and December 2059 (ft)	Average Decrease in Saturated Thickness between January 2010 and December 2069 (ft)
Milam in GMA 12	5	5
Burleson in GMA 12	6	6

(b) DFCs Adopted by GMA 8. On the date of this Plan's adoption, the District did not have any permitted wells in the portion of the Brazos River Alluvium Aquifer and the Trinity Aquifer in GMA 8. POSGCD participated in the GMA 8 joint planning process to help establish DFCs for the Brazos River Alluvium Aquifer and the Trinity Aquifer within the District boundaries, but for the purpose of this Plan, the District considers the portion of the Brazos River Alluvium Aquifer within GMA 8 as a non-relevant aquifer. The District will not monitor water levels in the GMA 8 portion of the Brazos River Alluvium until the GMA 8 portion of the Brazos River Alluvium is deemed as a relevant aquifer by the District. The District will also not monitor water levels in the Trinity Aquifer until there is at least one permitted well that pumps from the Trinity Aquifer.

The District's DFCs for the area covered by GMA 8 are provided in Table 7-4 for both the 2010 and 2015 Joint Planning cycles. The DFCs from the 2010 Joint Planning cycle correspond with the MAG values provided in Section 8. These DFCs are average

drawdowns for a 50-year period that begins January 2000 and ends December 2049. The average drawdowns are for areas covered by each aquifer in Milam County as defined by the stratigraphy provided by the TWDB GAM for the Northern Trinity Aquifer (Bené and others, 2004). The DFCs from the 2015 Joint Planning cycle are the most current POSGCD DFCs, but at the time of the current plan, the MAG values have not yet been calculated using these DFCs. These DFCs are average drawdowns for a 60-year period that begins on January 2010 and ends on December 2070. The average drawdowns are for areas covered by each aquifer in Milam County as defined by the stratigraphy provided by the TWDB Updated GAM for the Northern Trinity and Woodbine Aquifers (Kelley and others, 2014).

Table 7-4. Adopted DFCs for the Trinity Aquifer.

Aquifer	2010 Joint Planning	2015 Joint Planning
	Average Drawdown between January 2000 and December 2049 (ft)	Average Drawdown between January 2010 and December 2070 (ft)
Paluxy	252	--
Glen Rose	294	212
Travis Peak	--	345
Hensell	337	229
Hosston	344	345

(c) Protective Drawdown Limits (PDLs) for Shallow Management Zone Water Levels
On the date of this Plan's adoption, neither GMA 12 nor 8 has established DFCs for the shallow unconfined sections of the aquifers within the GMAs. The District therefore developed the PDLs in Table 7-5 independently in order to limit drawdown in the shallow up-dip regions of the aquifers within the District. These PDLs were developed to help protect the production capacity of existing wells in the shallow unconfined portions of the aquifer where the water level above the well screen tends to be less than in the deep confined portions of the aquifer.

Table 7-5 PDL Threshold values for Average Drawdown for the Shallow Management Zones

Aquifer	Average Drawdown (ft) that Occurs between January 2000 and December 2069 in the Shallow Management Zone
Sparta	20
Queen City	20
Carrizo	20
Upper Wilcox (Calvert Bluff Fm)	20
Middle Wilcox (Simsboro Fm)	20
Lower Wilcox (Hooper Fm)	20
Yegua	20
Jackson	20

8. MODELED AVAILABLE GROUNDWATER (MAG)

Based on DFCs adopted by GMA 8 and GMA 12, the TWDB is required by TWC § 36.108 9(o) to provide the District with a MAG for each DFC. Table 8-1 lists the MAGs received by the District from the TWDB based on DFCs from the 2010 planning cycle. The TWDB has not yet provided GMA 8 nor GMA 12 with revised MAGs based on DFCs from the 2015 joint planning cycle.

Table 8-1. Modeled Available Groundwater Values Calculated by the TWDB based on the DFCs adopted by GMA 8 and 12

GAM	Aquifer	Modeled available groundwater in acre-ft/year (AFY)					
		2010	2020	2030	2040	2050	2060
Brazos River Alluvium	GMA 8: Declared a Non-Relevant Aquifer	NA	NA	NA	NA	NA	NA
	GMA 12: Milam and Burleson County[1]	25,138	25,138	25,138	25,138	25,138	25,138
Aquifers in Trinity GAM	Paluxy[2]	0	0	0	0	0	0
	Glen Rose[2]	149	149	149	149	149	149
	Hensell[2]	36	36	36	36	36	36
	Hosston[2]	103	103	103	103	103	103
	Subtotal	*288*	*288*	*288*	*288*	*288*	*288*
Aquifers in the Queen City/ Sparta GAM	Sparta[3]	1,570	2,245	4,041	5,612	6,734	6,734
	Queen City[4]	430	468	502	502	502	502
	Carrizo[5]	4,025	4,706	5,177	6,118	6,353	7,059
	Upper Wilcox (Calvert	502	1,038	1,038	1,038	1,038	1,038
	Middle Wilcox	36,507	38,468	37,899	40,041	46,027	48,501
	Lower Wilcox (Hooper	899	2,960	4,139	4,433	4,433	4,422
	Subtotal	*43,933*	*49,885*	*52,796*	*57,744*	*65,087*	*68,256*
Yegua-Jackson Aquifer	Yegua-Jackson Aquifer[6]	12,923	12,923	12,923	12,923	12,923	12,923
	TOTAL	*82,282*	*88,234*	*91,145*	*96,093*	*103,43*	*106,605*

[1] GTA Aquifer Assessment 10-20 MAG (Bradley, 2011)
[2] GAM RUN 10-063 MAG (Oliver and Bradley, 2011)
[3] GAM RUN 10-046 MAG (Oliver, 2012c)
[4] GAM RUN 10-045 MAG (Oliver, 2012b)
[5] GAM RUN 10-044 MAG (Oliver, 2012a)
[6] GAM RUN 10-060MAG (Oliver, 2012d)
NA – not applicable

9. WATER WELL INVENTORY

The District will assign permitted wells to a management zone and to an aquifer based on the location of the well's screen or well depth using the Rules of the District. If no well screen information is available, then a permitted well will be assigned to a management zone and to an aquifer based on the total depth of the well. The assignment of the permitted well will be made at the time of permit. The District will assign exempt wells to a management zone and to an aquifer based on available information for the exempt well. The District will use the assignments to help track the permitted pumping and production for each aquifer and for each management zone.

10. GROUNDWATER MONITORING

The District will maintain a monitoring well network that will be used by the District to obtain measured water levels. Groundwater monitoring will be designed to monitor changes

in groundwater conditions over time. The District encourages well owners to volunteer wells to be used as part of the monitoring network. The District will accept wells into, or replace an existing well in, the monitoring network. The selection process will consider the well proximity to other monitoring wells, to permitted and exempt wells, to streams, and to geographic and political boundaries. If no suitable well locations can be found to meet the monitoring objectives in a specific aquifer or management zone, the District may evaluate the benefits of converting an oil and gas well to a water well, drilling and installing a new well, or using modeled water levels for that area until such time as a suitable well can be obtained for monitoring.

The District shall perform groundwater monitoring. The monitoring of the wells will be performed under the direction of the general manager, by trained personnel using a Standard Operating Procedure adopted by the District. The District may coordinate with the neighboring groundwater conservation districts for the purpose of supplementing its monitoring data and of improving the consistency in the collection, management, and analysis of hydrogeological data in GMA 12.

11. THRESHOLD LEVELS AND ANALYSIS OF GROUNDWATER LEVEL DATA

The District shall use threshold levels to help achieve its DFCs and to conserve and preserve groundwater availability and protect groundwater users. The District shall administer separate threshold levels for each management zone based on the Rules of the District. As part of its evaluation and determinations, the District may also consider the pumping-induced impacts to groundwater resources, including production occurring outside of the District. The District will consider threshold levels based on one or more of the following metrics: estimated total annual production, measured water level change, and predicted water level change.

Among the factors to be considered to guide the District's actions are evaluating thresholds for declines in water levels established in the District's Rules. District actions which can be initiated if a threshold level has been exceeded are: additional aquifer studies to collect and analyze additional information, a re-evaluation of the Management Plan or rules, and/or a change in the Management Plan or rules.

12. PRODUCTION AND SPACING OF WELLS

Production and spacing of all wells within the District will be regulated by the District according to the Rules of the District. Well spacing and the rate of production of the well will be dependent on the management zone and the aquifer associated with the well, and other factors included in the Rules of the District.

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

The District will implement this plan and utilize it as a guide for the ongoing evaluation, and the planning and establishing, of priorities for all District conservation and regulatory activities. All programs, permits and related operations of the District, and any additional planning efforts in which the District may participate will be consistent with this plan.

The District will adopt rules relating to the permitting of wells, the production and transport

of groundwater and reducing permitted production. The rules adopted by the District shall be adopted pursuant to TWC Chapter 36 and provisions of this plan. All rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on technical data recommended by competent professionals and accepted by the Board.

The District shall treat all citizens equally. Citizens may apply to the District for a variance in enforcement of the rules on grounds of adverse economic effect or unique local conditions. In granting a variance to any rule, the Board shall consider the potential for adverse effect on adjacent landowners and the aquifer(s). The exercise of discretion by the Board shall not be construed as limiting the power of the Board.

The District will endeavor to cooperate with other agencies in the implementation of this plan and the management of groundwater supplies within the District. All activities of the District will be undertaken in a spirit of cooperation and coordination with the appropriate state and regional agencies.

14. METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS

The general manager of the District will prepare and present to the Board an annual report on the District's performance and accomplishment of the management goals and objectives. The presentation of the report will occur during the last monthly Board meeting each fiscal year, beginning after the adoption and certification of this plan. The report will include the number of instances in which each of the activities specified in the management objectives was engaged in during the fiscal year. Each activity will be referenced to the estimated expenditure of staff time and budget in accomplishment of the activity. The notations of activity frequency, staff time and budget will be referenced to the appropriate performance standard for each management objective describing the activity, so that the effectiveness and efficiency of the Districts operations may be evaluated. The Board will maintain the adopted report on file, for public inspection, at the District's offices. This methodology will apply to all management goals contained within this plan.

15. AQUIFER STORAGE AND RECOVERY PROJECTS

An Aquifer Storage and Recovery (ASR) project involves the injection of water into a geological formation for subsequent recovery and beneficial use. The District acknowledges that ASR projects can help to improve the overall management of water resources in GMA 12. However, the District also recognizes that poorly designed and instrumented ASR project can be operated in such a manner as to adversely affect the production capacity of existing wells located near the ASR project. As ASR projects are identified, the District will coordinate with the Texas Commission on Environmental Quality to provide data and/or technical expertise that could assist with the evaluation of the proposed ASR project.

16. MANAGEMENT GOALS, OBJECTIVES, & PERFORMANCE STANDARDS

16.1 Efficient Use of Groundwater

Management Objectives:

1. The District will maintain a monitoring well network with at least 100 monitoring wells to provide coverage across management zones and aquifers within the District. The District will measure water levels at the monitoring well locations at least once every calendar year. A written analysis of the water level measurements from the monitoring wells will be made available through a presentation to the Board of the District at least once every three years.
2. The District will provide educational leadership to citizens within the District concerning this subject. The activity will be accomplished annually through at least one printed publication, such as a brochure, and public speaking at service organizations and public schools as provided for in the District's Public Education Program.

Performance Standards:

1. Maintain a monitoring well network and its criteria, and measure at least 100 monitoring wells at least once every calendar year.
2. Number of monitoring wells measured annually by the District.
3. Written report presented to the Board to document that water levels at these monitoring wells have been measured a minimum of once each year.
4. The number of publications and speaking appearances by the District each year under the District's Public Education Program.

16.2 Controlling and Preventing Waste of Groundwater.

Management Objectives:

The District will provide educational leadership to citizens within the District concerning this subject. The activity will be accomplished annually through at least one printed publication, such as a brochure, and public speaking at service organizations and public schools as provided for in the District's Public Education Program. During years when District revenues are sufficient, the District will consider funding a grant to obtain a review, study, or report of pertinent groundwater issues, or to sponsor the attendance of students at summer camps/seminars that place emphasis on the conservation of water resources.

Performance Standards:

The number of publications and speaking appearances by the District each year, and the number of grants considered and students actually accepting and attending an educational summer camp or seminar.

16.3 Control and Prevent Subsidence

Management Objectives:

The District will monitor drawdowns with due consideration to the potential for land subsidence. At least once every three years, the District will assess the potential for land subsidence for areas where water levels have decreased more than 100 feet since the year 2000.

Performance Standards:

Within three years of the approval of this plan and every three years thereafter, the District will map any region where more than 100 feet of drawdown has occurred since the year 2000 and assess the potential for land subsidence. The results of the assessment will be discussed in a District Board meeting and be document in a presentation or a report.

16.4 Conservation of Groundwater including Rainwater Harvesting, Precipitation Enhancement, Brush Control, Conjunctive Use, and/or Recharge Enhancement of Groundwater Resources in the District

Management Objectives:

1. The District will provide educational leadership to citizens within the District concerning this subject. The educational efforts will be through at least one printed publication, such as a brochure, and at least one public speaking program at a service organization and/or public school as provided for in the District's Public Education Program. Each of the following topics will be addressed in that program:
    A. Conservation
    B. Rainwater Harvesting
    C. Brush Control
    D. Recharge Enhancement
    E. Conjunctive Use
    F. Precipitation Enhancement
2. During years when District revenues are sufficient, the District will consider sponsoring the attendance of students and/or teachers at summer camps/seminars that place emphasis on the conservation of groundwater, rainwater harvesting, brush control, groundwater recharge enhancement, conjunctive use, precipitation enhancement of water resources, or a combination of such groundwater management programs.
3. The District will encourage and support projects and programs to conserve and/or preserve groundwater, and/or enhance groundwater recharge, by annually funding the District's Groundwater Conservation and Enhancement Grant Program, during years when the District's revenues remain at a level sufficient to fund the program. The objective of this program is to obtain the active participation and cooperation of local water utilities, fire departments and public

agencies in the funding and successful completion of programs and projects that will result in the conservation of groundwater and the protection or enhancement of the aquifers in the District. The qualifying water conservation projects and programs will include, as appropriate, projects that: result in the conservation of groundwater, reduce the loss or waste of groundwater, recharge enhancement, rainwater harvesting, precipitation enhancement, brush control, or any combination thereof. The District's objective is to benefit the existing and future users of groundwater in the District by providing for the more efficient use of water, increasing recharge to aquifers, reducing waste, limiting groundwater level declines, and maintaining or increasing the amount of groundwater available, by awarding at least one grant under the program in each county annually.

Performance Standards:

1. The number of publications and speaking appearances by the District each year under the District's Public Education Program.
2. The number of students sponsored to attend a summer camp/seminar emphasizing the conservation of water.
3. Annual funding, when applicable, for the District's Groundwater Conservation and Enhancement Grant Program, and the number of projects and programs reviewed, approved, and funded under that program. A written report providing estimated benefit of the amount of groundwater conserved, of the recharge enhancement, and/or of addition groundwater protection provided by the program.
4. The number and content of reports submitted regarding sponsored programs.

16.5 Conjunctive Use of Surface and Groundwater

Management Objective:

The District will confer annually with the Brazos River Authority (BRA) on cooperative opportunities for conjunctive resource management.

Performance Standard:

1. The number of conferences with the BRA on conjunctive resource management.
2. The number of times each year in which the applicant, general manager or the Board considers conjunctive use in the permitting process.

16.6 Drought Management Strategy

The aquifers within the District are substantially resistant to water level declines during drought conditions. As a result, the District does not have a drought management strategy based on precipitation metrics such as the Palmer Drought Index. The District management strategy is to review and to verify enforcement of Drought Management Plans adopted by District permit holders and entities that contract to purchase water from District permit holders.

Management Objective:

When permits or contracts are issued, as applicable, the District will confirm that all entities have an Drought Management Plan or Drought Contingency Plan that has been

approved by the Texas Commission on Environmental Quality or another regulatory agency in the State of Texas.

Performance Standard:

State approved Drought Management Plans or Drought Contingency Plans on file at the District Offices.

16.7 Natural Resource Issues That Impact the Use and Availability of Groundwater and Which are Impacted by the Use of Groundwater

Management Objectives:

1. The District will confer at least once every two years with appropriate agencies on the impact of groundwater resources in the District.
2. The District will evaluate permit applications for new wells and the information submitted by the applicants on those wells prior to drilling. The District will assess the impact of these wells on the groundwater resources in the District.
3. The District will implement the POSGCD Well Closure Program. The objective of the well closure program is to obtain the closure and plugging of derelict and abandoned wells in a manner that is consistent with state law, for the protection of the aquifers, the environment, and the public safety. The District will conduct a program to identify, inspect, categorize and cause abandoned and derelict water, oil and gas wells to be closed and plugged, by annually funding the program or segments or phases of the program appropriate to be funded in such fiscal year. The District will fund the closure of at least one abandoned well during years when the District's revenues remain at a level sufficient to fund the program.

Performance Standards:

1. The number of conferences with a representative of appropriate agencies.
2. Reports to the Board on the number of new well permit applications filed, and the possible impacts of those new wells on the groundwater resources in the District.
3. Annual funding, when applicable, for the District's Well Closure Program, and the number of wells closed and plugged as a result of the Well Closure Program.

16.8 Groundwater Well Assistance Program

Management Objective:

Beginning in 2018, the District will maintain a Groundwater Well Assistance Program (GWAP). The primary purpose of the GWAP is to help restore a water supply to well owners in the District who own wells that have experienced significant adverse impacts, and where applicable to address well conditions to prevent significant adverse impacts, from groundwater level declines caused by aquifer-wide groundwater pumping in GMA 12. A secondary purpose of the GWAP is to improve the POSGCD monitoring program and the POSGCD's understanding of groundwater aquifer systems in POSGCD by increasing the number of monitoring wells in the monitoring well network and by performing localized hydrogeological studies at these monitoring locations.

Performance Standard:

GWAP adopted before the end of 2018.

16.9 Mitigation

Management Objective:

The District will require filing with the District of mitigation plans required by the District or any State agency regarding impacts caused by groundwater pumping in the District.

Performance Standards:

1. Mitigation plans on file at the District that are related to groundwater pumping in the District.
2. Report of impacts and predicted impacts on well owners in the District on file at the District Offices.

16.10 Desired Future Conditions (DFCs)

Management Objective:

At least once every three years, the District will monitor water levels and evaluate whether the change in water levels is in conformance with the DFCs adopted by the District. The District will estimate total annual groundwater production for each aquifer based on the water use reports, estimated exempted use, and other relevant information, and compare these production estimates to the MAGs listed in Table 8-1.

Performance Standards:

1. At least once every three years, the general manager will report to the Board the measured water levels obtained from the monitoring wells within each Management Zone, the average measured drawdown for each Management Zone calculated from the measured water levels of the monitoring wells within the Management Zone, a comparison of the average measured drawdowns for each Management Zone with the DFCs for each Management Zone, and the District's progress in conforming with the DFCs.
2. At least once every three years, the general manager will report to the Board the total permitted production and the estimated total annual production for each aquifer and compare these amounts to the MAGs listed in Table 8-1 for each aquifer.

17. PROJECTED WATER DEMANDS

The projected net water demands (in acre-feet) within the District based on the 2017 State Water Plan are compiled in Allen (2017), provided as **Appendix A**. The District also established future Municipal Groundwater Use Demands in the District for planning purposes. The methodology and results of that effort are as follows:

Method for Establishing Future Municipal Use Demands of Groundwater. The District adopted a resolution, dated March 11, 2003, establishing production rights for Local Water Utilities within the District (water supply corporations, special utility districts, municipal

utility districts and cities), as a rule. This rule allowed these Local Water Utilities to obtain a permit to produce a volume of water annually according to one of two methods:

1. An amount equal to the highest annual pumpage it reported from wells within the District in any consecutive twelve months prior to September 31, 2001; or
2. The Local Water Utility could present to the Board a Long-Term Plan prepared by a qualified engineer that projects the annualized long-term water needs as the official projection of the water required by that Local Water Utility in the planning period (for not more than forty [40] years) for providing retail water service within that Local Water Utility's defined service area. If a Local Water Utility adopted this plan on or before March 30, 2004, and the Board found the highest annual pumpage projected in the Long-Term Plan (the "Plan Amount") was not unreasonable, the Local Water Utility was authorized to obtain a permit to pump and produce up to the Plan Amount. Table 17-1 below contains the results of this effort.

Table 17-1 Municipal Use Groundwater Demands Projected through 2044

Producer	Estimated Acre-Feet per
Burleson County	
Apache Hills	11
Birch Creek	16
Burl. Co. MUD	73
Burl. Investm.	7
Cade Lakes	123
Centerline	21
Caldwell	1,969
Snook	154
Somerville	670
Clara Hills	5
Clay	7
Cooks Point	10
Deanville	350
Lakeview	21
Little Oak Forrest	5
Lyons	106
Post Oak Hill	11
Shupak Utilities	19
Tunis	108
Whispering Woods	7
Wilderness Sound	15
Total for Burleson Co.	3,708
Milam County	
Alcoa	702
Rockdale	2,129
Gause	74
Marlow	108
Milano	673
Minerva	28
North Milam	369
Southwest Milam	2,492
Total for Milam Co.	6,575
DISTRICT TOTALS	10,283

18. PROJECTED WATER SUPPLIES WITHIN THE DISTRICT

The projected surface water supplies (in acre-feet) within the District based on the 2017 State Water Plan are compiled in Allen (2017), provided as **Appendix A**.

Table 18-1 lists the projected groundwater supplies within the District in acre-feet per year according to the 2017 State Water Plan Data. The District has participated and will

participate in future regional water planning, and will consider the water supply needs and water management strategies included in the adopted state water plan.

Table 18-1. Projected Groundwater Supplies in acre-feet per year Within the District According the 2017 State Water Plan data

WUG Entity Name	Source Name	Source Subtype	2020	2030	2040	2050	2060	2070
Burleson County								
Caldwell	Carrizo-Wilcox Aquifer	Groundwater	2,352	2,352	2,352	2,352	2,352	2,352
County-Other, Burleson	Carrizo-Wilcox Aquifer	Groundwater	550	550	550	550	550	550
County-Other, Burleson	Queen City Aquifer	Groundwater	323	323	323	323	323	323
Deanville WSC	Carrizo-Wilcox Aquifer	Groundwater	701	701	701	701	701	701
Irrigation, Burleson	Brazos River Alluvium Aquifer	Groundwater	21,640	21,640	21,640	21,640	21,640	21,640
Irrigation, Burleson	Carrizo-Wilcox Aquifer	Groundwater	204	204	204	204	204	204
Irrigation, Burleson	Yegua-Jackson Aquifer	Groundwater	1,118	1,118	1,118	1,118	1,118	1,118
Manufacturing, Burleson	Sparta Aquifer	Groundwater	139	139	139	139	139	139
Milano WSC	Carrizo-Wilcox Aquifer	Groundwater	250	234	232	232	241	245
Mining, Burleson	Carrizo-Wilcox Aquifer	Groundwater	0	0	0	0	0	0
Snook	Sparta Aquifer	Groundwater	475	475	475	475	475	475
Somerville	Sparta Aquifer	Groundwater	891	891	891	891	891	891
Southwest Milam WSC	Carrizo-Wilcox Aquifer	Groundwater	205	184	154	167	167	158
		TOTAL	*28,848*	*28,811*	*28,779*	*28,792*	*28,801*	*28,796*
Milam County								
Bell-Milam Falls WSC	Trinity Aquifer	Groundwater	79	79	77	77	76	74
Bell-Milam Falls WSC	Trinity Aquifer	Groundwater	352	349	343	342	336	329
Buckholts	Trinity Aquifer	Groundwater	122	122	122	122	122	122
Irrigation, Milam	Brazos River Alluvium Aquifer	Groundwater	3,082	3,082	3,082	3,082	3,082	3,082
Irrigation, Milam	Carrizo-Wilcox Aquifer	Groundwater	2,221	2,066	1,828	2,043	2,135	2,135
Irrigation, Milam	Queen City Aquifer	Groundwater	53	56	56	56	56	56
Milano WSC	Carrizo-Wilcox Aquifer	Groundwater	260	240	237	237	249	255
Mining, Milam	Carrizo-Wilcox Aquifer	Groundwater	14	14	14	14	14	14
Mining, Milam	Trinity Aquifer	Groundwater	0	0	0	0	0	0
Rockdale	Carrizo-Wilcox Aquifer	Groundwater	2,000	1,860	1,396	1,589	1,672	1,672
Southwest Milam WSC	Carrizo-Wilcox Aquifer	Groundwater	1,625	1,443	1,202	1,307	1,314	1,261

WUG Entity Name	Source Name	Source Subtype	2020	2030	2040	2050	2060	2070
Thorndale	Carrizo-Wilcox Aquifer	Groundwater	229	229	229	229	229	229
Steam Electric Power, Milam	Carrizo-Wilcox Aquifer	Groundwater	15,786	13,009	12,943	14,444	15,084	15,074
		TOTAL	*25,823*	*22,549*	*21,529*	*23,542*	*24,369*	*24,303*

19. PROJECTED WATER NEEDS AND WATER STRATEGIES

The projected water supply needs and water management strategies (in acre-feet) within the District based on the 2017 State Water Plan are compiled in Allen (2017), provided as **Appendix A**.

20. ESTIMATED GROUNDWATER USE WITHIN THE DISTRICT

The estimated historical water use (in acre-feet) within the District based on the TWDB Historical Water Use Survey is compiled in Allen (2017), provided as **Appendix A**.

21. ESTIMATED ANNUAL RECHARGE OF GROUNDWATER RESOURCES WITHIN THE DISTRICT

The estimated annual recharge from precipitation to groundwater by aquifer (in acre-feet) within the District is compiled in GAM Run 16-015 (Ballew, 2017), provided as **Appendix B**.

22. ESTIMATED ANNUAL DISCHARGES FROM THE AQUIFER TO SPRINGS AND ANY SURFACE WATER BODIES, INCLUDING LAKES, STREAMS AND RIVERS

The estimated annual discharges from each aquifer to springs and any surface water bodies, including lakes, streams, and rivers (in acre-feet) within the District are compiled in GAM Run 16-015 (Ballew, 2017), provided as **Appendix B**.

23. ESTIMATED ANNUAL GROUNDWATER FLOW INTO AND OUT OF THE DISTRICT WITHIN EACH AQUIFER AND BETWEEN AQUIFERS IN THE DISTRICT

The estimated annual groundwater flow into and out of the District within each aquifer and between aquifers (in acre-feet) within the District is compiled in GAM Run 16-015 (Ballew, 2017), provided as **Appendix B**.

24. REFERENCES

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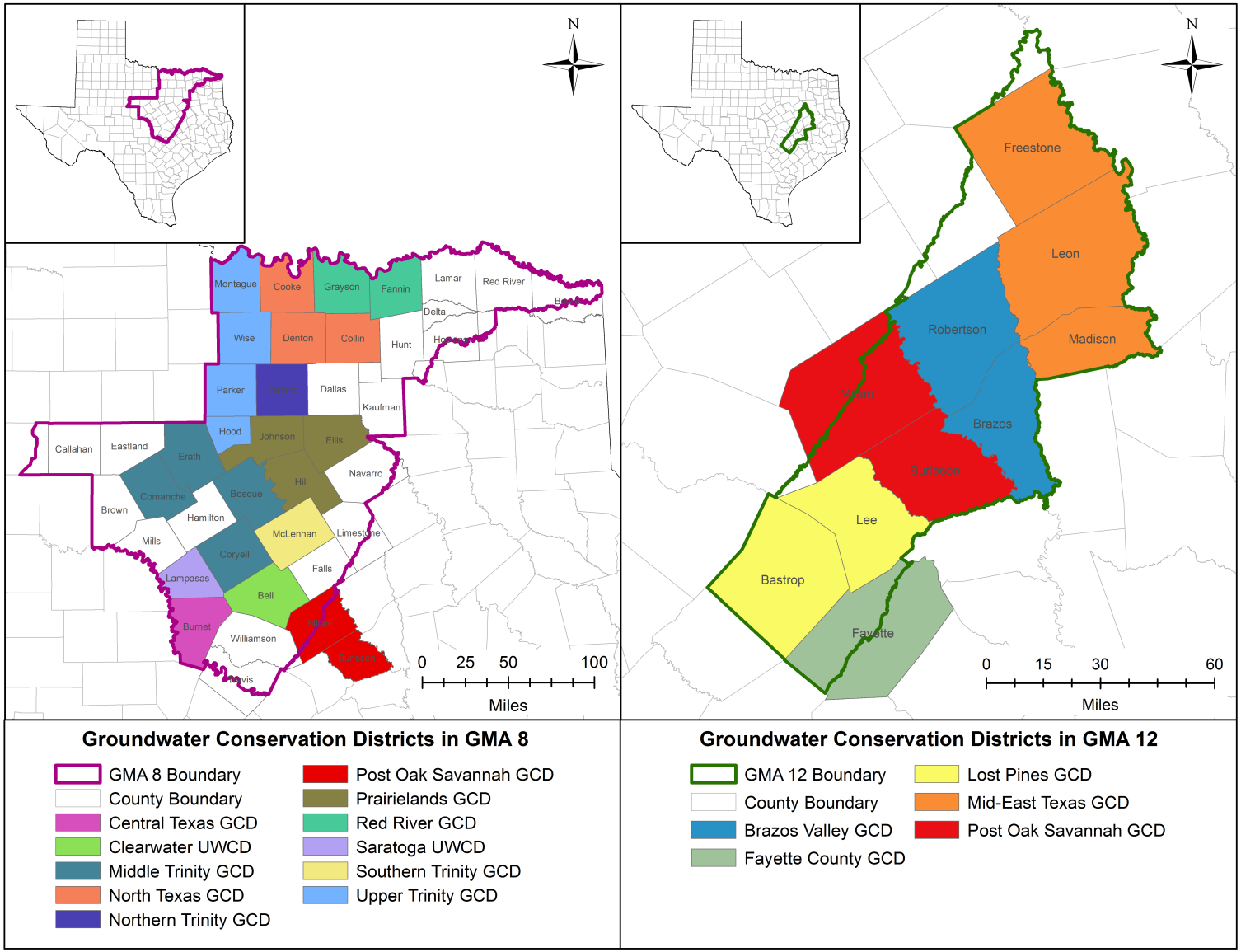

Figure 1. **Counties and Groundwater Districts Associated with Groundwater Management Areas 8 and 12**

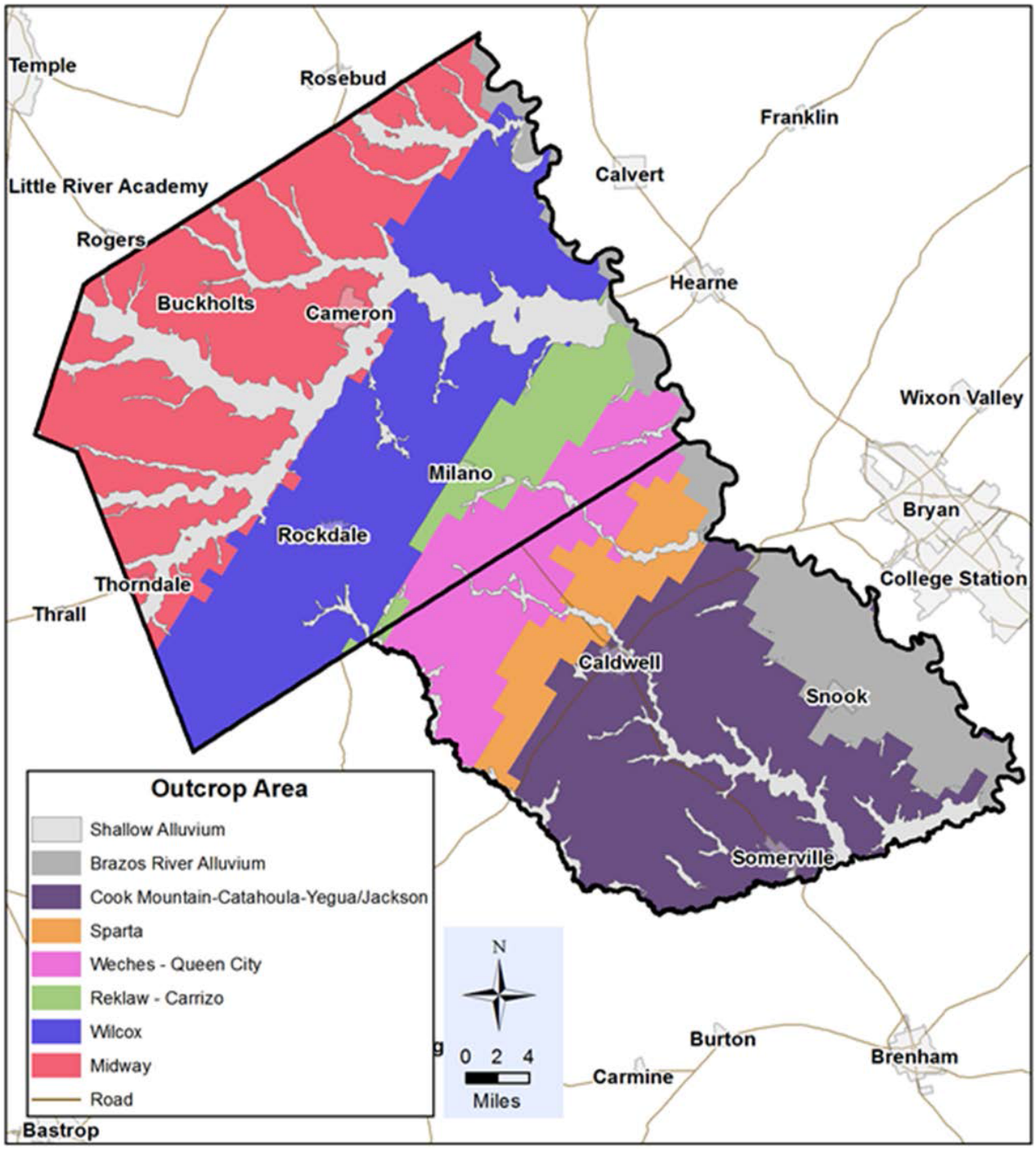

Figure 2. Outcrops Associated with Aquifers and Geological Formations in the District