BRAZOS G
WATER PLANNING GROUP

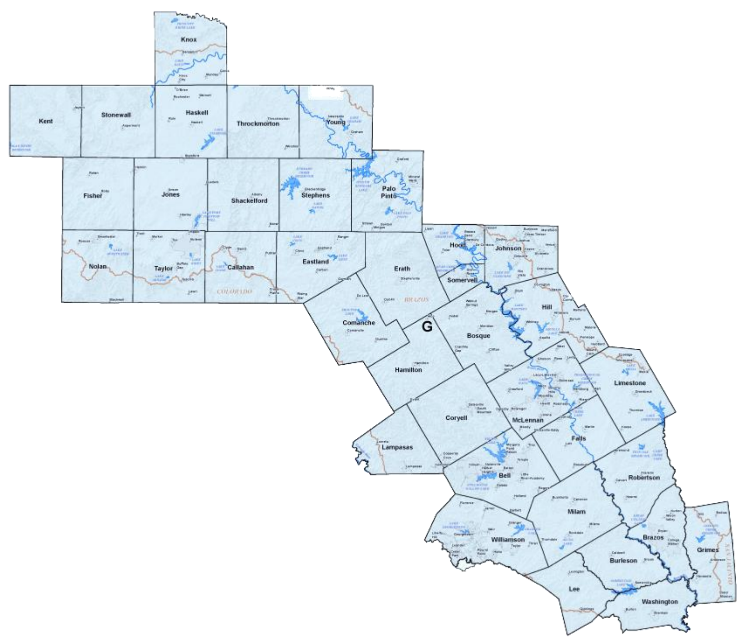
Texas Water Development Board

2016 Brazos G Regional Water Plan

Volume I

Executive Summary and Regional Water Plan

December 2015



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2016 Brazos G Regional Water Plan

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Executive Summary

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Executive Summary

ES.1 Background

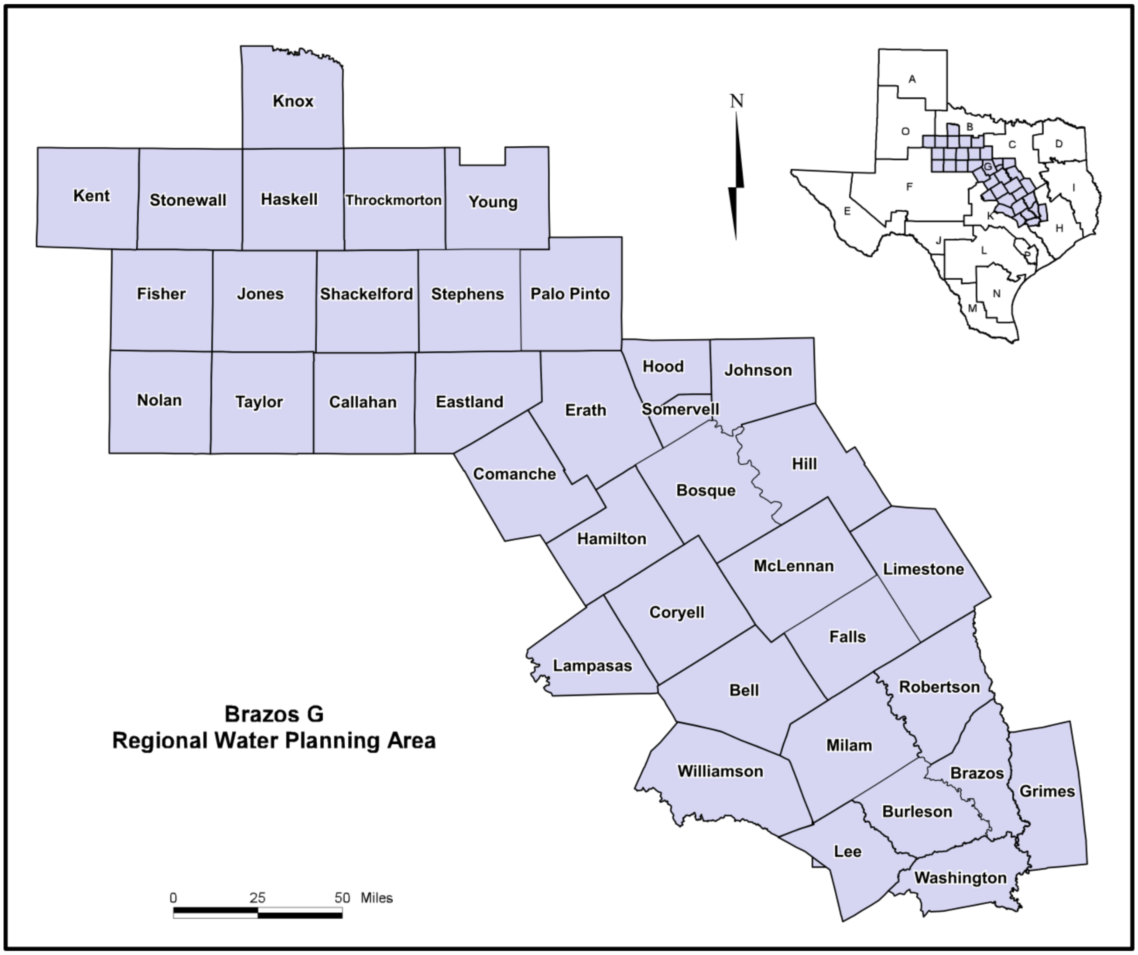
Since 1957, the Texas Water Development Board (TWDB) has been charged with preparing a comprehensive and flexible long-term plan for the development, conservation, and management of the state's water resources. The current state water plan, Water for Texas, January 2012, was produced by the TWDB and based on approved regional water plans pursuant to requirements of Senate Bill 1 (SB1), enacted in 1997 by the 75th Legislature, and further modified by subsequent legislation. As stated in SB1, the purpose of the regional water planning effort is to:

> "Provide for the orderly development, management, and conservation of water resources and preparation for and response to drought conditions in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of that particular region."

SB1 also provides that future regulatory and financing decisions of the Texas Commission on Environmental Quality (TCEQ) and the TWDB be consistent with approved regional plans.

The TWDB is the state agency designated to coordinate the overall statewide planning effort. The Brazos G Area, which is comprised of all or portions of 37 counties (Figure ES-1), is one of the State's 16 regional water planning areas established by the TWDB. The Brazos G Regional Water Planning Group (BGRWPG) was originally appointed by the TWDB to represent a wide range of legislatively-defined stakeholder interests and acts as the steering and decision-making body of the regional planning effort. As members (who serve without pay) leave the planning group, new members are appointed by the BGRWPG through solicitation of nominations. The BGRWPG adopted bylaws to govern its operations and, in accordance with its bylaws, designated the Brazos River Authority (BRA) as the administrative agency and principal contractor to receive grants from the TWDB to develop the water plan. Mr. Trey Buzbee currently serves as the Regional Planning Project Manager for the BRA, assisted by Jennifer White. The BGRWPG selected HDR Engineering, Inc. as the prime consultant for the planning and engineering tasks necessary for plan development.

Figure ES-1. Brazos G Regional Water Planning Area



The BGRWPG consists of 23 voting members who represent the following 12 interest groups:

- the public,
- counties,
- municipalities,
- industries,
- agriculture,
- the environment,
- small businesses,
- electric-generating utilities,
- river authorities,
- water districts,
- water utilities, and
- groundwater management areas.

The BGRWPG also includes several non-voting members who participate in the deliberations of the BGRWPG, and contribute excellent knowledge and insight to the group. Table ES-1 lists the voting and non-voting members and interest groups represented on the BGRWPG who contributed to the development of the 2016 Brazos G Regional Water Plan (both current and recently resigned).

The regional water plans are developed on a 5-year cycle, with previous plans developed in 2001, 2006, and 2011. In accordance with legislative and rule requirements, all of the regional water plans must be completed and adopted by December 1, 2015. The TWDB will then compile the 16 plans into the 2017 State Water Plan. The regional water plans will continue to be updated every 5 years.

Table ES-1. Current and Recent Brazos G RWPG Members

Interest Group	Name	Affiliation
Voting Members		
Agricultural	Judge Dale Spurgin (past Chair) Wayne Wilson (Chair)	Judge, Jones County Rancher, Brazos County
Counties	County Commissioner Tim Brown Judge Travis Floyd Judge Mike Sutherland	Bell County Knox County Burleson County
Electric Generating Utilities	Brian Patrick (resigned Dec. 2014) Gary Spicer	Luminant Luminant
Environmental	Kevin Wagner	Texas Water Resources Institute
Industry	Jim Hodson (passed away Sept. 2014) Randy Waclawczyk (resigned 2014)	ALCOA RRW Consulting
Municipalities	David Blackburn (resigned Nov. 2014) Jim Briggs Alva Cox Larry Groth (resigned Nov. 2014) Tommy O'Brien Kenny Weldon	City of Temple City of Georgetown City of Granbury City of Waco City of Abilene City of Stephenville
Public	Gary Newman	Trio Development
River Authorities	Phil Ford (Secretary)	Brazos River Authority
Small Business	Gail L. Peek (Vice Chair)	Beard Kultgen Brophy Bostwick & Dickson
Water Districts	Joe Cooper Kelly Kinard	Middle Trinity GCD West Central Texas MWD
Groundwater Management Areas	Dale Adams Zach Holland Mike McGuire Judy Parker Gary Westbrook	Wes-Tex GCD Bluebonnet GCD Rolling Plains GCD Clearwater Underground WCD Post Oak Savannah GCD
Water Utilities	Charles Beseda	Birome WSC

Table ES-1. Current and Recent Brazos G RWPG Members

Interest Group	Name	Affiliation
Non-Voting Members		
Llano Estacado (O) RWPG Liaison	Mike McClendon	Brazos River Authority
Region C RWPG Liaison	Bill Ceverha	Self-Employed
Region F RWPG Liaison	John Grant	Region F Chair
Lower Colorado (K) RWPG Liaison	Mark Jordan	Lower Colorado River Authority
Region H RWPG Liaison	David Collinsworth	Brazos River Authority
LCRA Representative	James Kowis	Lower Colorado River Authority
TWDB Project Manager	Lann Bookout	Texas Water Development Board
Texas Parks and Wildlife Dept.	Jennifer Bronson	Texas Parks and Wildlife Dept.
Texas Dept. of Agriculture	E.W. Wesley	Texas Department of Agriculture

The planning horizon to be used is the 50-year period from 2020 to 2070. This planning period allows for long-term forecast of future water demands and supplies sufficiently in advance of needs to allow for appropriate water management measures to be implemented. As required by statute, the TWDB has promulgated planning rules and guidelines to focus the efforts and to provide for general consistency among the planning areas so that the regional plans can then be aggregated into the overall State Water Plan.

The 2016 Brazos G Regional Water Plan is organized in accordance with TWDB guidelines by chapter as follows.

- Chapter 1 Description of the Brazos G Area
- Chapter 2 Projected Population and Water Demands
- Chapter 3 Evaluation of Current Water Supplies
- Chapter 4 Comparison of Water Demands with Water Supplies to Determine Needs
- Chapter 5 County and Wholesale Water Provider Plans (Volume I)
- Chapter 5 Evaluation of Water Management Strategies (Volume II)
- Chapter 6 Consistency with Long Term Protection of the State's Water, Agricultural and Natural Resources
- Chapter 7 Drought Response Information, Activities and Recommendations
- Chapter 8 Recommendations for Unique Stream Segments, Unique Reservoir Sites and Other Legislative Policy Recommendations
- Chapter 9 Infrastructure Financing

Chapter 10 Public Participation and Adoption of Plan

Chapter 11 Implementation and Comparison to the 2011 Brazos G Regional Water Plan

ES.2 Description of the Brazos G Area

The Brazos G Area can be described by a single word—**diverse**. From the piney woods of Brazos and Grimes Counties to the rolling plains of Nolan County; from sparsely populated Stonewall County to Williamson County, often listed as the fastest growing county in the nation; from the prodigious Carrizo-Wilcox Aquifer in the southeast to the meager dribbles from windmills in Shackelford County; from 44 inches of annual rainfall in the east to 24 inches annually in the west (in a good year); from the Chisholm Trail through Stephens County to the NAFTA trail known as Interstate Highway 35 (IH-35); these diverse characteristics make for a wide variation in water supplies, demands, and availability of affordable options to meet needs.

ES.3 Population and Water Demand Projections

The TWDB publishes population and water demand projections for each county in the state for use by the regional water planning groups. In the Brazos G Area, population projections were developed for 197 municipal water user groups (WUGs), which are defined as cities with a population greater than 500 in 2010, and water supply corporations and utilities using water volumes of 280 acre-feet (acft) or more in 2010. To account for people living outside the cities or service areas of defined WUGs, projections are also developed for a 'county-other' category of municipal water use for each of the 37 counties in the region. Several utilities have grown into WUG size since the 2011 Plan, and the 2016 Plan includes 8 more municipal WUGs than the 2011 Plan, including Texas A&M University, which was included as part of the City of College Station WUG in the 2011 Plan, but has been separated out for the 2016 Plan.

Figure ES-2 illustrates population growth in the entire Brazos G Regional Water Planning Area (BGRWPA) for 1900 to 2010 and projected growth for 2020 to 2070.

Population trends may be further understood by dividing the planning region into three subregions: the northwestern Rolling Plains, the central IH-35 Corridor, and the southeastern Lower Basin. Figure ES-3 illustrates historical population growth in the three sub-regions from 1900 to 2010 and projected growth from 2020 to 2070. Projected growth is greatest in the IH-35 Corridor.

Water demand projections have been compiled for six categories of water use: (1) Municipal, (2) Manufacturing, (3) Steam-Electric Cooling, (4) Mining, (5) Irrigation, and (6) Livestock. Each of the non-municipal uses is aggregated on a county basis, and is defined as a separate water user group (WUG) within each county. The TWDB has developed and provided water demand projections for each of the five non-municipal WUGs in each of the 37 counties in the Brazos G Area.

Figure ES-2. Historical and Projected Brazos G Area Population

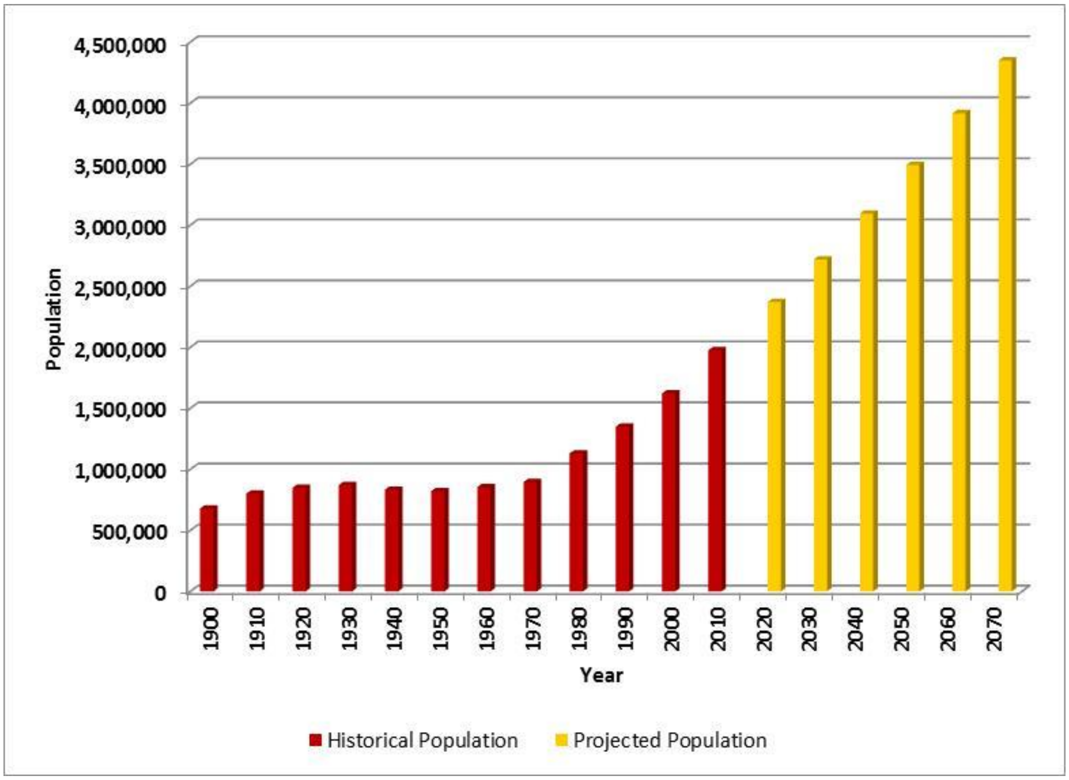
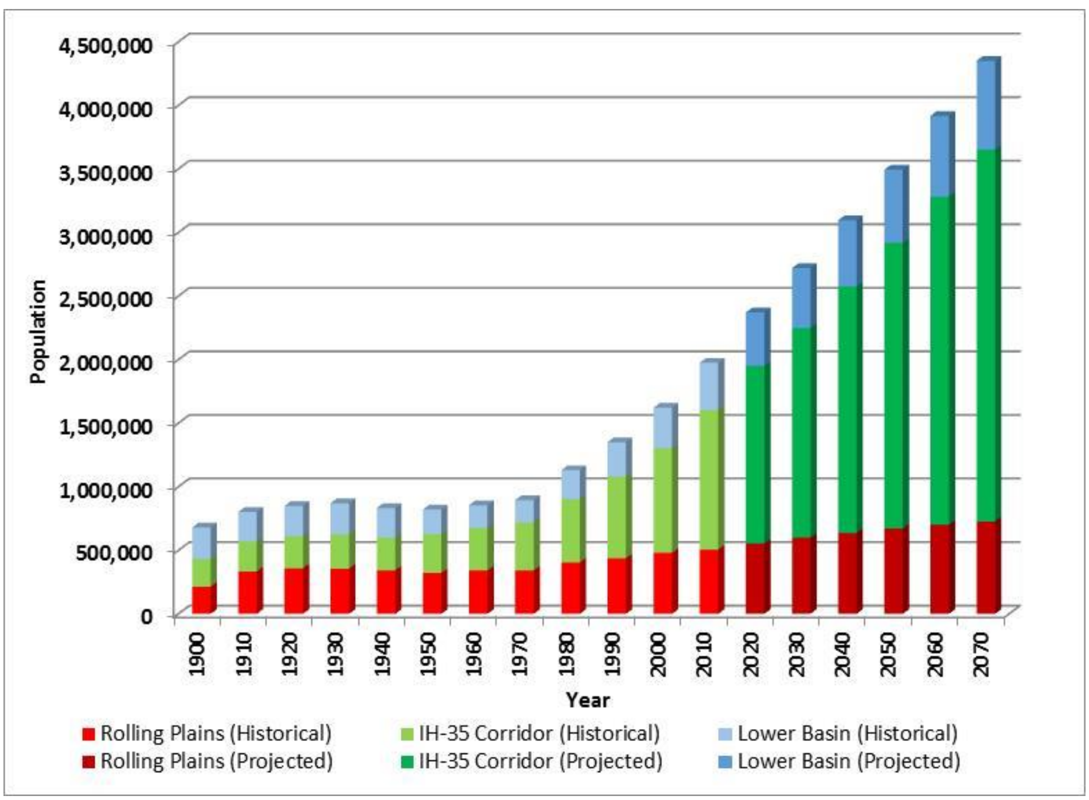


Figure ES-3. Historical and Projected Population by Subregion



Annual total water use for the region is projected to increase from 853,170 acft in 2010 to 1,478,295 acft in 2070, a 73 percent increase, as shown in Figure ES-4. The six types of water use as percentages of total water use are shown for 2010 and 2070 in Figure ES-5. Municipal and steam-electric water use as percentages of the total water use are projected to increase from 2010 to 2070, while mining, irrigation, and livestock water use are projected to decrease as percentages of the total. Manufacturing use is projected to retain at about the same percentage of the total water use.

Population and water demand projections for each WUG category are presented in Table ES-2, which is a report generated by the TWDB's DB17 database application. Population projections for each municipal WUG and water demands for each WUG and WWP in the Brazos G Area are presented in Appendix L, which contains detailed reports from DB17.

Figure ES-4. Projected Total Water Demand

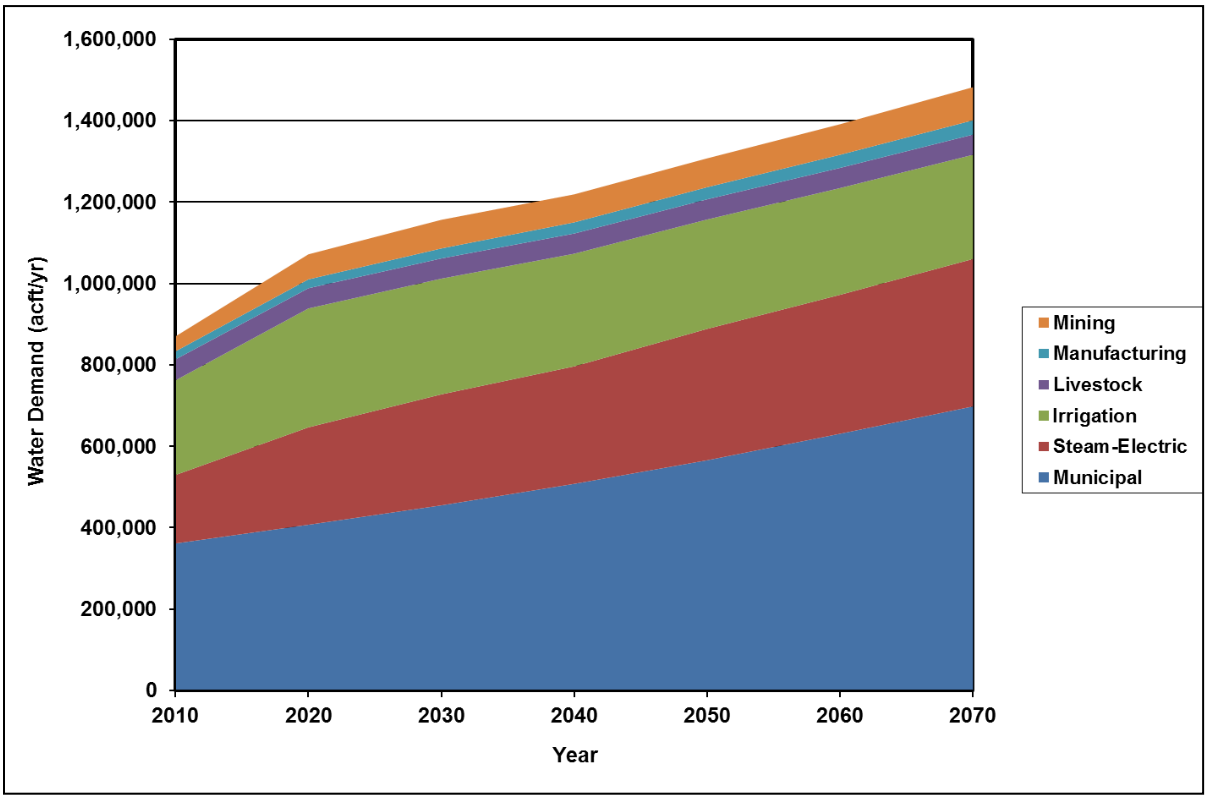
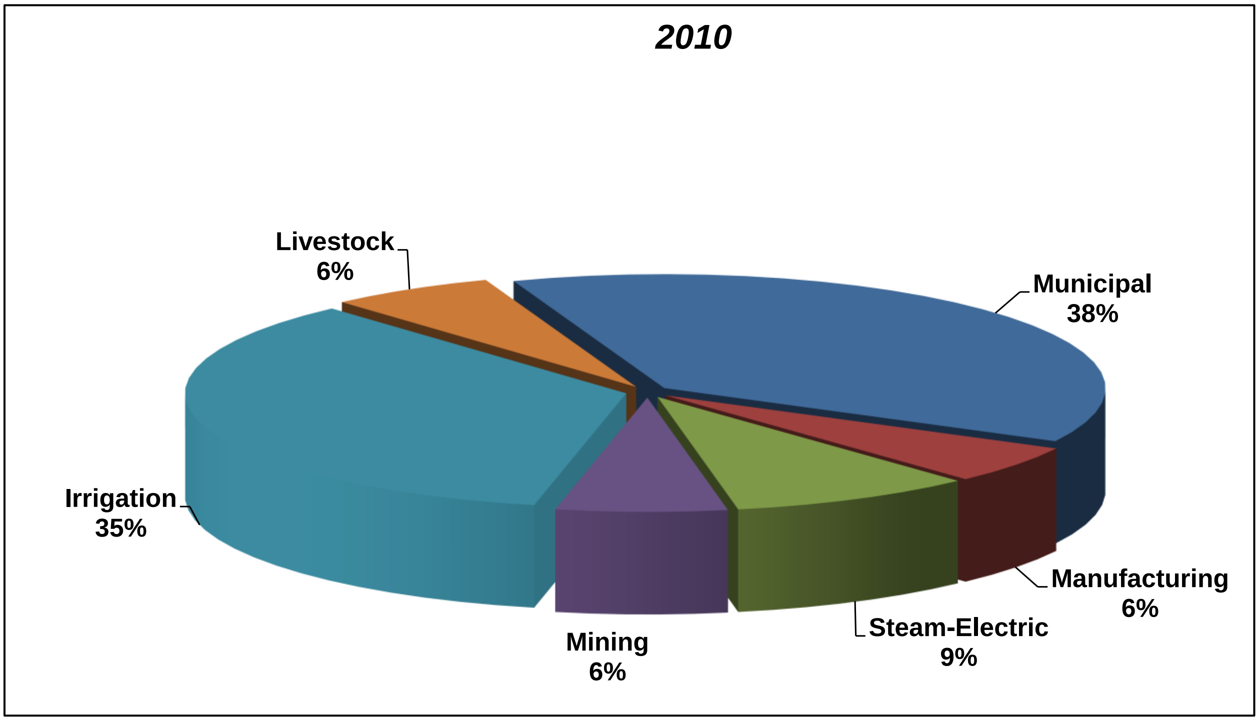


Figure ES-5. Total Water Demand in 2010 and 2070



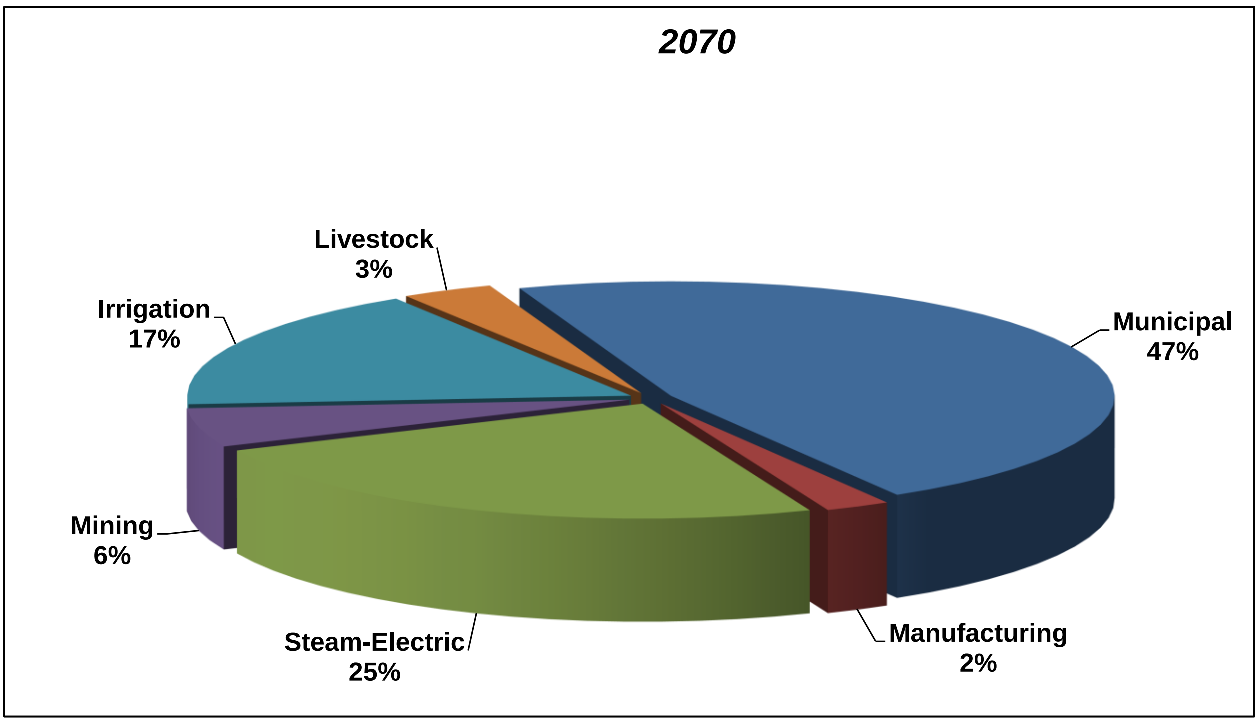


Table ES-2. Population, Water Demands, and Needs Projections by WUG Category (DB17 Report)

REGION G	2020	2030	2040	2050	2060	2070
MUNICIPAL						
POPULATION	2,052,854	2,373,753	2,713,083	3,093,516	3,468,428	3,856,114
DEMANDS (acre-feet per year)	362,711	407,517	455,417	511,562	569,831	630,472
EXISTING SUPPLIES (acre-feet per year)	475,109	473,037	469,939	462,157	459,100	456,266
NEEDS (acre-feet per year)*	(23,116)	(50,914)	(87,636)	(134,096)	(181,183)	(232,185)
COUNTY-OTHER						
POPULATION	318,210	346,943	383,924	401,028	449,769	494,928
DEMANDS (acre-feet per year)	40,383	43,281	47,866	49,815	56,767	63,357
EXISTING SUPPLIES (acre-feet per year)	40,169	40,031	40,057	40,170	40,676	40,914
NEEDS (acre-feet per year)*	(9,198)	(10,862)	(14,496)	(15,548)	(21,313)	(27,217)
MANUFACTURING						
DEMANDS (acre-feet per year)	21,848	24,554	27,270	29,687	32,223	34,977
EXISTING SUPPLIES (acre-feet per year)	26,247	28,795	30,077	31,270	32,494	33,940
NEEDS (acre-feet per year)*	(7,179)	(7,263)	(8,620)	(9,771)	(11,040)	(12,319)
MINING						
DEMANDS (acre-feet per year)	61,586	70,381	68,875	70,949	75,038	81,409
EXISTING SUPPLIES (acre-feet per year)	21,165	21,133	21,099	21,067	21,033	21,001
NEEDS (acre-feet per year)*	(41,731)	(50,127)	(50,494)	(53,675)	(57,802)	(64,121)
STEAM ELECTRIC POWER						
DEMANDS (acre-feet per year)	239,299	272,711	288,696	322,702	341,364	362,386
EXISTING SUPPLIES (acre-feet per year)	279,241	280,555	279,298	280,080	279,340	275,170
NEEDS (acre-feet per year)*	(70,834)	(88,264)	(99,300)	(128,694)	(144,204)	(162,658)
LIVESTOCK						
DEMANDS (acre-feet per year)	49,650	49,650	49,650	49,650	49,650	49,650
EXISTING SUPPLIES (acre-feet per year)	49,650	49,650	49,650	49,650	49,650	49,650
NEEDS (acre-feet per year)*	0	0	0	0	0	0
IRRIGATION						
DEMANDS (acre-feet per year)	292,091	284,321	276,847	268,840	262,305	256,044
EXISTING SUPPLIES (acre-feet per year)	215,562	209,152	202,681	202,413	205,381	204,856
NEEDS (acre-feet per year)*	(83,218)	(83,258)	(83,455)	(77,447)	(70,261)	(67,066)
REGION TOTALS						
POPULATION	2,371,064	2,720,696	3,097,007	3,494,544	3,918,197	4,351,042
DEMANDS (acre-feet per year)	1,067,568	1,152,415	1,214,621	1,303,205	1,387,178	1,478,295
EXISTING SUPPLIES (acre-feet per year)	1,107,143	1,102,353	1,092,801	1,086,807	1,087,674	1,081,797
NEEDS (acre-feet per year)*	(235,276)	(290,688)	(344,001)	(419,231)	(485,803)	(565,566)

*WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The needs shown in the WUG Category Summary report are calculated by first deducting the WUG split's projected demand from its total existing water supply volume. If the WUG split has a greater existing supply volume than projected demand in any given decade, this amount is considered a surplus volume. Before aggregating the difference between supplies and demands to the WUG category level, calculated surpluses are updated to zero so that only the WUGs with needs in the decade are included with the Needs totals.

ES.4 Water Supply

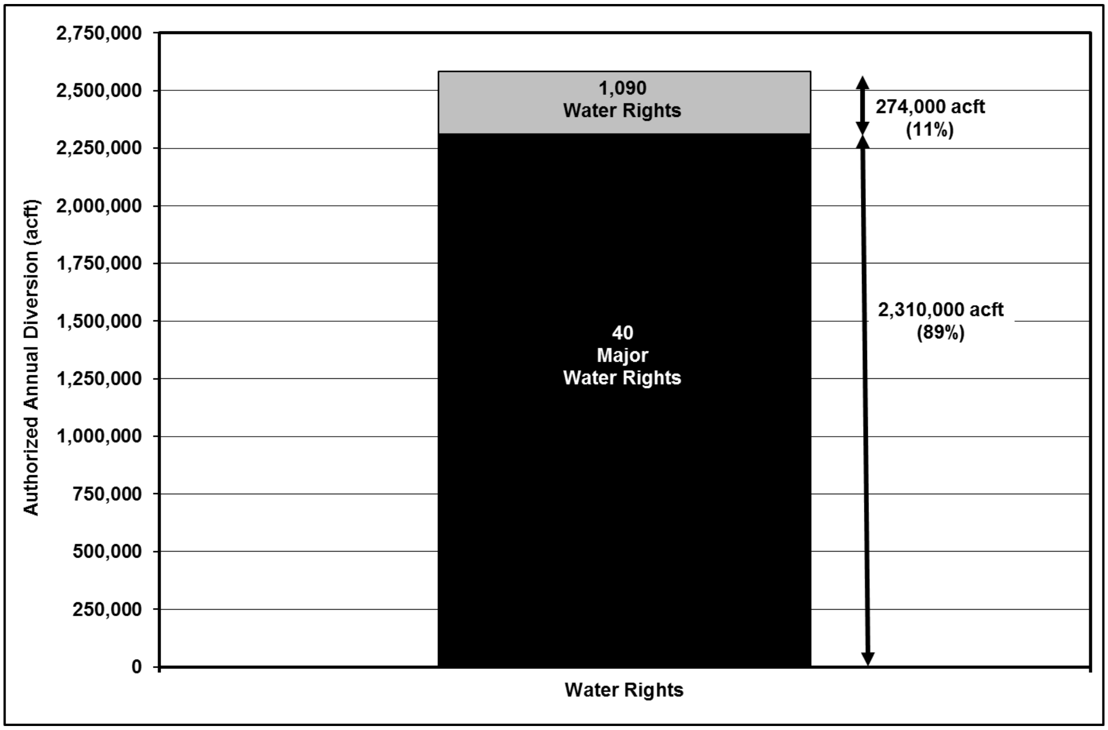
ES.4.1 Surface Water Supplies

Streamflow in the Brazos River and its tributaries, along with reservoirs in the Brazos River Basin and Colorado River Basin, comprise the surface water supply of the Brazos G Area. Diversions and use of this surface water occurs throughout the entire region. However, the supply of surface water varies greatly through the region due to the large variation in rainfall and a correspondingly large variation in evaporation rates. The principal tributaries to the Brazos River in the planning area are the Clear Fork, the Double Mountain Fork, the Salt Fork, Bosque River, Little River, Navasota River, Little Brazos River and Yegua Creek. Major water supply reservoirs are owned by the BRA (three in the planning region), U.S. Army Corps of Engineers (nine in the region), West Central Texas MWD, the City of Abilene, and Texas Utilities. The western part of the region is heavily dependent on surface water sources, partly due to the absence of large quantities of groundwater.

The State of Texas owns the surface water resources of the State, and issues water rights to utilize surface water. A total of 1,130 water rights currently exist in the Brazos River Basin, with a total authorized diversion of 2,584,000 acft/yr, of which 964 rights with total authorized diversions of 1,323,000 acft/yr are located in the BGRWPA. It is important to note that a small percentage of the water rights make up a large percentage of the authorized diversion volume. In the Brazos River Basin, 40 water rights (3.7 percent) make up 2,310,000 acft/yr (89.7 percent) of the authorized diversion volume. The remaining 1,090 water rights consist primarily of small irrigation rights distributed throughout the river basin. Figure ES-6 shows a comparison of significant water rights in the Brazos River Basin by number of rights and diversion volume.

The Brazos Basin Water Availability Model (Brazos WAM) Run 3 maintained by the TCEQ was used to determine surface water supply available to WUGs and WWPs in the Brazos G Area. The model input data were modified to account for expected future return flows (discharge of wastewater effluent), future sedimentation conditions for major reservoirs, and existing subordination agreements. The resulting model is termed the Brazos G WAM. Firm yield supply was computed for each major reservoir (greater than 5,000 acft authorized storage capacity), and smaller reservoirs that serve as municipal water supplies. Supplies for run-of-river water rights are based on the minimum annual supply (computed on a monthly basis). Surface water supplies were allocated to individual WUGs and WWPs based upon a listing of water right ownership as maintained by TCEQ, and contractual agreements between water rights holders and wholesale customers. Supplies were constrained based upon facility limitations to access the raw water supply, such as intake capacity and water treatment plant capacity.

Figure ES-6. Comparison of Water Rights in the Brazos River Basin



ES.4.2 Groundwater Supplies

Groundwater supplies in 21 counties in the Brazos G Area are regulated by 13 Groundwater Conservation Districts (GCDs). These GCDs are part of Groundwater Management Areas 6, 7, 8, 12, and 14, which are tasked with determining Desired Future Conditions (DFCs) and the Modeled Available Groundwater (MAG) for the jointly-regulated aquifers in their areas. The GCDs and GMAs affecting the Brazos G Area are shown in Figure ES-7. The MAG serves as the maximum annual supply that can be developed from an aquifer within a county for the purposes of regional water planning. For aquifers without a MAG determination, water availability estimates used in the 2011 Plan were adopted by the BGRWPG for use in the 2016 Plan.

Fifteen aquifers underlie parts of the Brazos G Area and, if developed fully, can provide a combined reliable supply of about 634,369 acft/yr, (2020 decade) based on the MAGs and other availability estimates for aquifers without a MAG estimate. As currently developed, a total groundwater supply of 396,771 acft/yr exists in the planning area (2020 estimate). The Seymour Aquifer supplies significant quantities of water in the western part of the region. Other aquifers that are depended on in the western part of the region are the Dockum and the Edwards-Trinity. The Trinity and Edwards-BFZ (Northern Segment) are heavily relied upon in the IH-35 corridor and to the west. In the eastern part of the region, the Carrizo-Wilcox is a prolific water supply with lesser amounts pumped from the Queen City, Sparta, and Brazos River Alluvium.

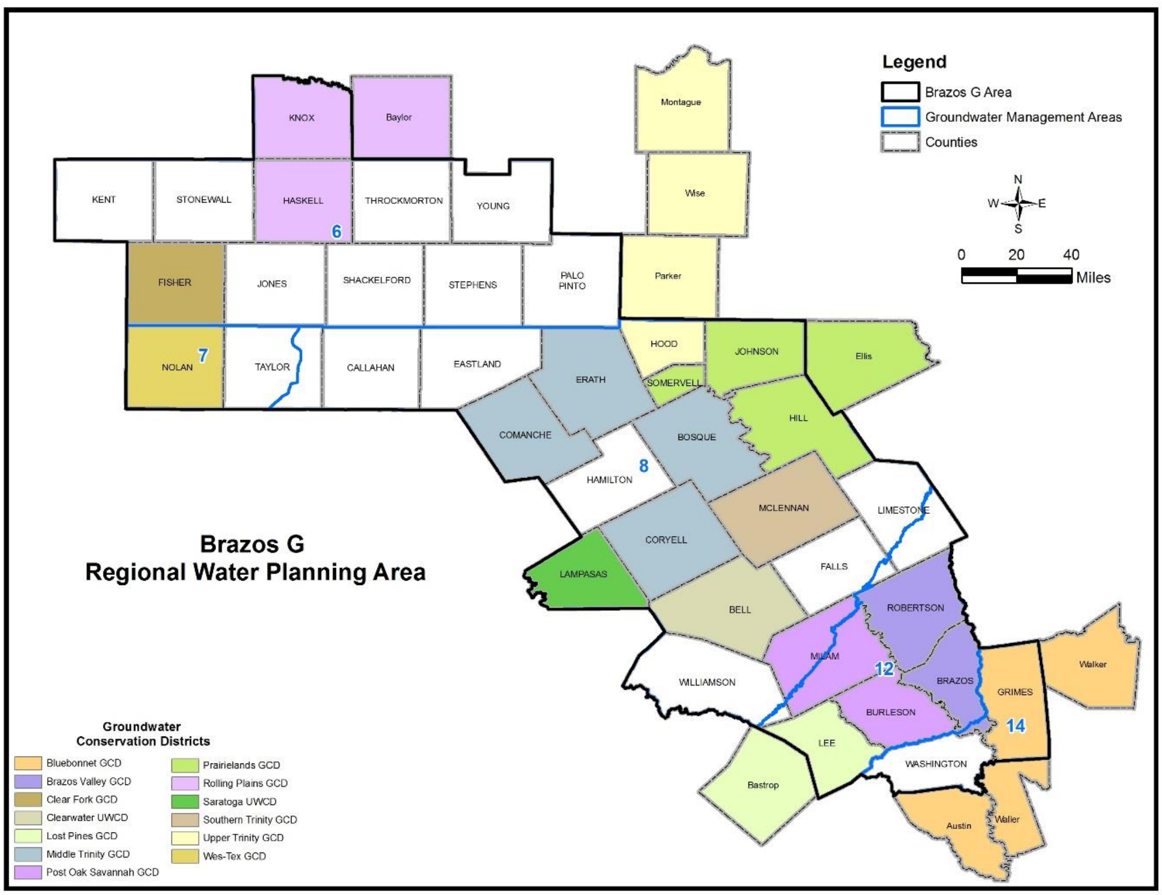
MAG was allocated to each existing user based upon currently installed well capacity for municipal WUGs and WWPs, and recent pumping estimates for county-aggregated WUGs. When the existing capacities exceeded the MAG, supplies adjusted proportionally so that the MAG would not be exceeded.

Existing water supplies by WUG category are presented in Table ES-2. Detailed water availability and water supply summaries from DB17 are presented in Appendix L.

ES.4.3 Water Quality

Natural salt pollution has been recognized as a serious and widespread water quality problem in the Brazos River Basin. No other pollution source, man-made or natural, has had the impact of the natural salt sources located in the upper basin. Due to these water quality issues, some sources of water—particularly from Lake Whitney, Lake Granbury, and Possum Kingdom Reservoir—may limit their suitability for some uses and require higher cost, advanced treatment (desalination). As the Brazos River flows to the Gulf, inflows from tributaries dilute the concentration of dissolved minerals, improving the quality of water.

Figure ES-7. Groundwater Conservation Districts and Groundwater Management Areas

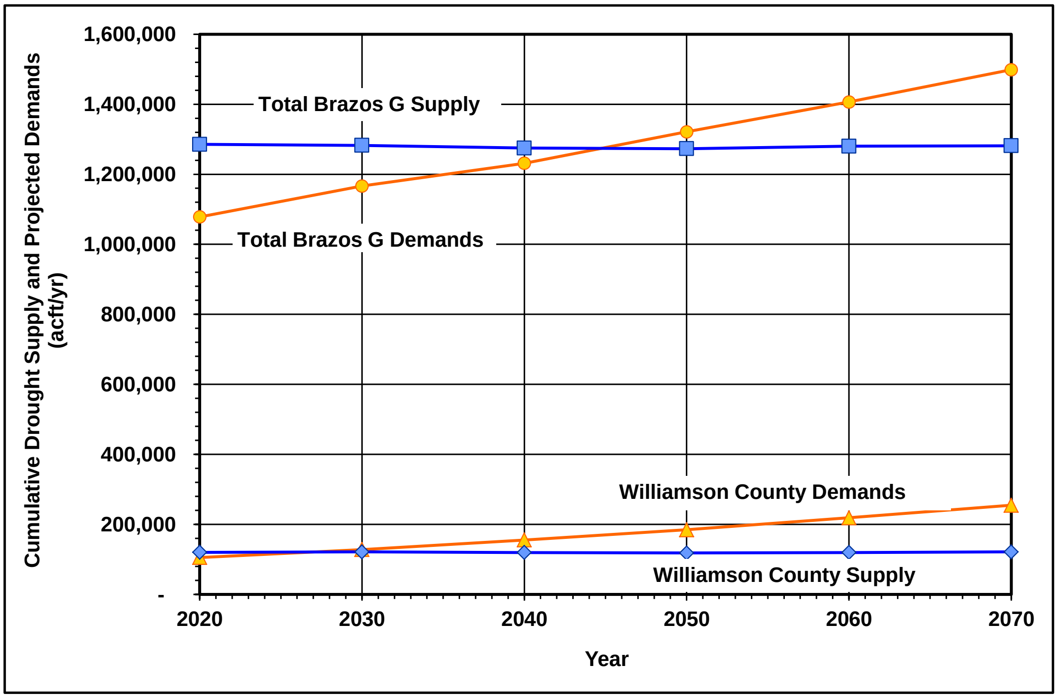


ES.4.4 Supply and Demand Comparison

Supplies are compared with projected demands, and shortages (needs) or surpluses are computed for each WUG and WWP. Table ES-2 presents a summary of identified water needs by WUG category. Detailed tabulations of water needs from various DB17 reports are presented in Appendix L.

A comparison of total supplies available (developed groundwater supplies and firm surface water) with demand for all use categories in the planning area shows a surplus past the year 2040. These mask shortages that are projected to occur to individual water supply entities and water user groups. Figure ES-8 illustrates this issue by summarizing demands and supplies for the Brazos G Area, and for Williamson County. Shortages are projected for Williamson County starting about the year 2030, while overall regional supplies are projected to exceed regional demands until past the year 2040. Even within most counties that have projected overall surpluses, there are individual entities that do not have sufficient supply to meet projected needs. Every county in the Brazos G Area has at least one WUG with a projected shortage.

Figure ES-8. Comparison of Supplies and Demands for Brazos G Area and Williamson County



ES.4.5 Water Supply Strategies to Meet Needs

The water management strategies in Table ES-3 were identified by the BGRWPG as potentially feasible to meet shortages. These strategies were evaluated by the consultant team and compared to criteria adopted by the BGRWPG. Chapter 1 of Volume II discusses the methods by which the strategies were evaluated. Technical evaluations of the potentially feasible water management strategies are presented in Chapters 2 through 13 of Volume II.

Table ES-3. Potentially Feasible Water Management Strategies Evaluated for the 2016 Brazos G Regional Water Plan

Chapter (Volume II)	***Water Management Strategy and Description***
2	**Water Conservation** (implement accelerated use of various water conservation techniques to achieve water savings above what is already included in the TWDB water demand projections)
3	**Wastewater Reuse** (use highly treated wastewater treatment plant effluent to meet non-potable and potable water needs)
4	**New Reservoirs** (new or updated evaluations of the following proposed new reservoirs) • Brushy Creek Reservoir • Cedar Ridge Reservoir • Coryell County Off-Channel Reservoir • City of Groesbeck Off-Channel Reservoir • Palo Pinto Off-Channel Reservoir • Little River Off-Channel Reservoir • Main Stem Off-Channel Reservoir • Meridian Off-Channel Reservoir • Lake Creek Reservoir • South Bend Reservoir • Throckmorton Reservoir • Turkey Peak Dam – Lake Palo Pinto Enlargement • Peach Creek Off-Channel Reservoir
5	**Acquisition of Existing Supplies** • Lake Aquilla Augmentation • Purchase from Possum Kingdom Reservoir
6	**Conjunctive Use** (conjunctively use surface water supplies with available groundwater supplies) • Lake Granger Augmentation • Oak Creek Reservoir and Champion Well Field
7	**Management of Existing Supplies** • Lake Belton to Lake Stillhouse Hollow Pipeline • Brushy Creek Regional Utility Authority System • Control of Naturally Occurring Salinity • Gibbons Creek Reservoir Expansion • Millers Creek Reservoir Augmentation • Lake Aquilla Storage Reallocation • Lake Granger Storage Reallocation • Lake Stillhouse Hollow Reallocation • Lake Whitney Reallocation • BRA Sediment Reduction Program • BRA System Operation of Reservoirs
8	**Regional Water Supply Projects** • Bosque County Regional Project • East Williamson County Water Supply Project • Somervell County Water Supply Project • West Central Brazos Water Distribution System
9	**Groundwater** • Regional Groundwater for Bryan • Local Groundwater for College Station • Regional Groundwater for Williamson County
10	**Aquifer Storage and Recovery** (Inject or percolate excess surface water into groundwater aquifers, storing for future use) • City of Bryan ASR • City of College Station ASR • Johnson County SUD and Acton MUD ASR • Lake Granger ASR • Waco and McLennan County ASR
11	**Brackish Groundwater**

12	**Miscellaneous Strategies** (various pipelines, treatment plants and groundwater wells to meet projected needs of water user groups and wholesale water providers)
13	**Brush Control** (increase deep percolation and discharge to streams by removing unwanted brush)

ES.5 Water Plan Findings

Municipal demands are developed assuming a hot, dry year, and 2011 was selected as the basis for estimating daily per capita use values (GPCD) for each WUG. Through review of GPCD data developed from water use reports submitted to the TWDB, the BGRWPG identified multiple instances where GPCD values needed to be adjusted. GPCD values were adjusted either because of improper coding of data into the water use reports database, or because of anomalies in the 2011 data, frequently caused by drought restrictions implemented during the summer of 2011 that reduced water use substantially and rendered the GPCD for 2011 inappropriate for use in planning. The Brazos G Regional Water Planning Group worked closely with a number of WUGs and the TWDB to resolve these discrepancies and adopt reasonable GPCD values for the affected WUGs.

Conservation is considered first as a water management strategy for all WUGs with identified needs before any other water management strategies. Table ES-4 presents a summary of Second-Tier water needs, which are those water needs remaining after implementation of conservation and direct reuse strategies. A detailed presentation of Second-Tier water needs for each WUG and WWP is included in Appendix L. The individual plans for each WUG also includes a presentation of Second-Tier water needs.

Table ES-4. Summary of Second-Tier Water Needs (DB17 Report)

REGION G

	2020	2030	2040	2050	2060	2070
MUNICIPAL	16,816	34,689	55,505	89,499	122,970	160,278
COUNTY-OTHER	9,198	10,862	14,367	14,887	19,764	24,485
MANUFACTURING	5,236	4,830	5,622	6,494	7,445	8,476
MINING	39,404	46,029	45,095	48,055	51,895	57,769
STEAM ELECTRIC POWER	58,036	68,799	69,841	79,600	88,310	90,857
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	76,217	71,668	67,811	65,623	59,517	56,359

The 2016 Brazos G Regional Water Plan includes recommendations for 99,573 acft/yr of municipal conservation savings and another 46,662 acft/yr for wastewater reuse. The conservation savings are in excess of those already included in the TWDB demand projections. Conservation savings for municipal users reflect a 1% annual reduction in GPCD until a target of 140 gallons per capita per day is reached. Conservation recommendations for several entities in Williamson County go beyond this and call for a reduction to a target of 120 GPCD by 2070.

Water management strategies recommended to meet water needs are presented by WUG in Appendix L and by WWP in Chapter 5. Table ES-5 includes a summary of recommended strategies.

Table ES-5. Summary of Strategies Recommended for WUGs and/or WWPs

Recommended Strategies	WUG/ WWP using Strategy [1]	1st Decade Average Annual Unit Cost ($/acft)	Supply Developed						Total Project Cost
			2020	2030	2040	2050	2060	2070	
Municipal Conservation	93	$478	10,845	30,658	46,765	61,587	73,849	81,664	NA
Irrigation Conservation	10	$230	4,431	7,168	9,739	9,453	9,175	8,940	NA
Industrial Conservation	19	ND	2,399	6,684	12,564	14,853	16,081	17,526	ND
Advanced Conservation	6	$470	39	81	1,233	4,036	9,700	17,909	NA
Advanced Industrial Conservation	2	ND	5,279	5,279	5,279	5,279	6,690	16,817	NA
Voluntary Redistribution	5	ND	1,205	1,676	1,262	1,547	2,043	2,574	NA
Leave Needs Unmet	15	ND	56,916	59,998	58,116	61,814	72,014	85,347	NA
Purchase Additional Water	27	$903	12,180	21,818	21,327	21,247	20,971	21,065	NA
Increase WTP Capacity	7	$1,000	18,983	30,436	32,981	33,946	35,273	36,554	$122,634,000
Reuse	21	$635	35,077	35,833	36,785	38,794	41,957	46,662	$76,898,000
Millers Creek Reservoir Augmentation	7	$740	2,833	3,013	3,194	3,374	3,554	3,735	$99,896,000
Throckmorton Reservoir	1	$601	3,540	3,540	3,540	3,540	3,540	3,540	$28,041,000
Turkey Peak Reservoir	1	$643	8,100	8,100	8,100	8,100	8,100	8,100	$83,363,000
Little River OCR	4	$800	0	56,150	56,150	56,150	56,150	56,150	$487,611,000
Blaine Groundwater	3	$887	876	876	876	876	876	876	$6,093,000
Brazos River Alluvium Groundwater	2	$530	4,000	4,000	4,000	4,700	4,700	5,100	$23,948,000
Carrizo Groundwater	11	$974	30,384	31,143	31,402	35,504	29,244	21,406	$231,702,609
Dockum Groundwater	2	$7,368	450	450	540	540	540	540	$13,116,000
Edwards Groundwater	8	$1,061	4,481	4,478	4,475	4,487	4,501	4,513	$45,324,000
Gulf Coast Groundwater	4	$1,036	7,359	7,678	7,554	7,453	7,367	7,338	$41,016,000
Other Groundwater	5	$1,513	1,256	1,256	1,246	1,246	1,246	1,246	$15,340,000
Seymour Groundwater	1	$571	1,571	1,345	1,193	1,116	1,041	1,041	$9,817,000
Sparta Groundwater	2	$972	740	790	790	790	825	825	$6,398,000
Trinity Groundwater	23	$1,358	12,546	13,023	10,979	10,521	10,445	10,963	$152,155,000
Woodbine Groundwater	5	$908	1,700	560	0	0	285	285	$11,624,000
Yegua-Jackson Groundwater	1	$656	4,452	5,565	5,565	5,565	5,565	5,565	$32,957,000
Rehab Existing Wells	2	$49	0	0	0	173	173	185	$35,000
Lake Granger ASR	1	$870	9,050	9,050	9,050	9,050	9,050	9,050	$99,820,000
McLennan County ASR	1	$677	8,000	8,000	8,000	8,000	8,000	8,000	$43,940,000

Table ES-5. Summary of Strategies Recommended for WUGs and/or WWPs

Recommended Strategies	WUG/ WWP using Strategy [1]	1st Decade Average Annual Unit Cost ($/acft)	Supply Developed						Total Project Cost
			2020	2030	2040	2050	2060	2070	
College Station ASR	1	$3,069	2,800	2,800	2,800	2,800	2,800	2,800	$63,850,000
Belton to Stillhouse Pipeline	1	$154	30,000	30,000	30,000	30,000	30,000	30,000	$38,069,000
Purchase from Walnut Creek Mine	1	$500	0	0	0	9,000	9,000	9,000	NA
Lake Aquilla Augmentation	3	$926	14,700	14,700	14,700	14,700	14,700	14,700	$79,627,000
Lake Aquilla Reallocation	1	$865	2,400	2,400	2,400	2,400	2,400	2,400	$21,887,000
Bosque County Interconnection	6	$2,277	1,070	1,070	1,070	1,070	1,070	1,070	$22,372,000
Brushy Creek Reservoir	1	$481	1,450	1,450	1,450	1,450	1,450	1,450	$20,836,000
Cedar Ridge Reservoir	1	$1,031	26,575	26,575	26,575	26,575	26,575	26,575	$290,868,000
Coryell County OCR	3	$1,405	0	3,135	3,135	3,135	3,135	3,135	$42,246,000
Gibbons Creek Reservoir Expansion	1	$359	2,605	2,605	2,605	2,605	2,605	2,605	$12,979,000
Groesbeck OCR	1	$617	1,755	1,755	1,755	1,755	1,755	1,755	$11,909,000
Reallocation of Supplies	9	$330	40,574	47,927	54,849	61,366	63,360	61,786	NA
Oak Creek Reservoir Conjunctive Management	1	ND	1,575	1,575	1,575	1,575	1,575	1,575	NA
WCBWDS	5	$2,492	1,400	1,400	1,400	1,400	1,400	1,400	$21,148,000
Somervell County Water Supply Project	2	$4,305	900	900	1,084	1,084	1,084	1,084	$35,249,000
East Williamson County Water Project	5	$1,173	8,400	8,400	8,400	8,400	8,400	8,400	$42,127,000
BCRUA Water Supply Project	4	$994	67,000	67,000	67,000	67,000	67,000	67,000	$314,847,000
BRA System Operation	6	$20	95,223	101,871	109,174	125,682	155,969	166,952	$23,582,000
Restructure Contracts	1	ND	890	1,028	167	1,306	1,444	1,583	NA

ND - costs and/or supply from strategy not determined
1 – Number of WUG/WWPs that are using the strategy in the final adopted regional water plan

Total new supplies of water into the Brazos G Area total 397,655 acft/yr, comprised of newly developed groundwater, supply transferred from other regions, newly developed surface water supplies, or supplies made available through conservation or augmentation of existing facilities. These totals do not reflect water trades between users of existing supplies in Brazos G, but represent entirely new supplies to the Brazos G Area. Total project costs for these new supplies exceed $2.5 billion.

System operation of the Brazos River Authority's reservoirs can increase supplies in the Brazos G Area by nearly 167,000 acft/yr (assuming interruptible supplies can be firmed up through conjunctive operation with other sources), with additional supplies available to the Region H Area in the lower basin. This strategy would more efficiently utilize the existing resources of the BRA by expanding the supply that can be developed from the BRA's existing reservoirs, thus delaying the need for new reservoirs to meet growing needs in the basin. Related to this, overdrafting of Lake Granger when the reservoir is nearly full and injecting part of this supply into the Trinity Aquifer through an Aquifer Storage and Recovery (ASR) project can yield an additional 9,050 acft/yr of supply when the ASR well field is operated in conjunction with Lake Granger to meet demands.

Existing supplies combined with recommended water management strategies do not exceed the Modeled Available Groundwater (MAG) from any aquifer in any county. This is a planning requirement which limits the number of available water management strategies in some cases. For example, in Burleson County, all remaining MAG from the Carrizo-Wilcox Aquifer is slated to be transported out of the Brazos G Area for use in Regions K and L through a contract that the San Antonio Water System (SAWS) recently entered into with a group developing what is known as the Vista Ridge project. A small portion of the water is recommended to be sold to Williamson County entities.

During the Brazos G regional water planning process, water management strategies such as additional development of Carrizo-Wilcox Aquifer groundwater and the Lake Granger Augmentation Project were preferred options to include in the 2016 Brazos G Regional Water Plan. When confronted by the Modeled Available Groundwater (MAG) limitations of these two options, the BGRWPG has little alternative but to make the Little River Off-Channel Reservoir a recommended strategy.

Future utilization of existing supplies and new water management strategies will increase use from the water supply sources available to users in the Brazos G Area.

Alternative water management strategies are presented in Table ES-6. An alternative strategy can replace a recommended strategy by a vote of the regional water planning group at a regularly scheduled meeting without needing to pursue the process prescribed by the TWDB for amending a regional water plan.

Table ES-6. Alternative Water Management Strategies (DB17 Report)

WUG Entity Name	WMS Sponsor Region	WMS Name	Source Name	Water Management Strategy Supplies 2020	2030	2040	2050	2060	2070	Unit Cost 2020	Unit Cost 2070
ABILENE	G	POSSUM KINGDOM TO ABILENE	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	14,800	14,800	14,800	14,800	14,800	14,800	$2586	$1063
ASPERMONT	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	33	47	62	76	90	105	$0	$0
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE GRANGER AUGMENTATION-PH 1	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	17,017	17,017	17,017	17,017	17,017	17,017	$0	$0
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE GRANGER AUGMENTATION-PH 1	G | TRINITY AQUIFER | WILLIAMSON COUNTY	8,509	8,509	8,509	8,509	8,509	8,509	$584	$305
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE GRANGER AUGMENTATION-PH 2	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	18,107	18,107	18,107	18,107	18,107	18,107	$0	$0
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE GRANGER AUGMENTATION-PH 2	G | CARRIZO-WILCOX AQUIFER | MILAM COUNTY	28,118	28,118	28,118	28,118	28,118	28,118	$1611	$458
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	SEDIMENT REDUCTION PROGRAM (LAKE LIMESTONE WATERSHED)	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	0	177	355	532	710	888	N/A	$167
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	STORAGE REALLOCATION OF LAKE GRANGER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	1,940	1,940	1,940	1,940	1,940	1,940	$1552	$314
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	STORAGE REALLOCATION OF LAKE WHITNEY	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	20,842	20,842	20,842	20,842	20,842	20,842	$361	$4
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	STORAGE REALLOCATION OF STILLHOUSE HOLLOW RESERVOIR	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	2,643	2,643	2,643	2,643	2,643	2,643	$1177	$19
BRYAN	G	CARRIZO AQUIFER DEVELOPMENT	G | CARRIZO-WILCOX AQUIFER | ROBERTSON COUNTY	3,826	3,826	4,171	5,565	11,826	19,478	$1006	$323
COLLEGE STATION	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	6,000	6,000	6,000	6,000	6,000	6,000	$1065	$547
COLLEGE STATION - UNASSIGNED WATER VOLUMES	G	DPR- COLLEGE STATION	G | DIRECT REUSE	2,800	2,800	2,800	2,800	2,800	2,800	$3484	$1805
COUNTY-OTHER, CORYELL	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	0	0	0	100	200	525	N/A	$1309
COUNTY-OTHER, HASKELL	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	53	76	100	123	146	170	$0	$0
COUNTY-OTHER, HOOD	G	ACTON MUD REDUCTION TO HOOD COUNTY-OTHER	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	968	344	77	121	22	0	$977	N/A
GLEN ROSE	G	SOMERVELL COUNTY WSP	G | BRAZOS RUN-OF-RIVER	0	0	0	0	50	50	N/A	$1059

Table ES-6. Alternative Water Management Strategies (DB17 Report)

				Water Management Strategy Supplies							
WUG Entity Name	**WMS Sponsor Region**	**WMS Name**	**Source Name**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Unit Cost 2020**	**Unit Cost 2070**
HALLSBURG	G	REUSE- WMARSS WACO EAST	G | DIRECT REUSE	31	31	31	31	31	31	$869	$191
HASKELL	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	176	254	332	410	488	566	$0	$0
HUTTO	G	LITTLE RIVER OCR	G | LITTLE RIVER OFF-CHANNEL LAKE/RESERVOIR	0	378	2,181	4,001	6,215	8,499	N/A	$350
IRRIGATION, BELL	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	1,200	1,200	1,200	1,200	1,200	1,250	$66	$66
IRRIGATION, MCLENNAN	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	1,200	1,200	1,200	1,200	1,200	1,200	$66	$66
IRRIGATION, MCLENNAN	G	TRINITY AQUIFER DEVELOPMENT	G | TRINITY AQUIFER | MCLENNAN COUNTY	1,000	1,000	1,000	1,000	1,000	1,000	$1047	$86
IRRIGATION, PALO PINTO	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	2,494	2,392	2,299	2,260	2,222	2,188	$66	$66
JOHNSON COUNTY SUD	G	TRINITY - JOHNSON COUNTY ASR	G | TRINITY AQUIFER ASR | JOHNSON COUNTY	2,000	2,000	2,000	2,000	2,000	2,000	$1131	$640
KNOX CITY	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	72	104	136	167	199	231	$0	$0
MANUFACTURING, BELL	G	REUSE-BCWCID #1 NORTH	G | DIRECT REUSE	1,000	1,000	1,000	1,360	1,360	1,360	$765	$765
MANUFACTURING, BURLESON	G	CALDWELL REDUCTION TO BURLESON MANUFACTURING	G | CARRIZO-WILCOX AQUIFER | BURLESON COUNTY	0	50	50	50	85	85	N/A	$500
MART	G	REUSE- WMARSS WACO EAST	G | DIRECT REUSE	134	134	134	134	134	134	$869	$191
MERIDIAN	G	MERIDIAN OCR	G | MERIDIAN OFF-CHANNEL LAKE/RESERVOIR	615	615	615	615	615	615	$3961	$1220
MINING, MCLENNAN	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	0	0	0	1,050	1,050	1,050	N/A	$66
MUNDAY	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	74	107	140	173	205	238	$0	$0
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	13,815	13,511	13,208	12,905	12,601	12,298	$1308	$313
PALO PINTO COUNTY MWD #1 - UNASSIGNED WATER VOLUMES	G	PALO PINTO OCR	G | LAKE PALO PINTO OFF-CHANNEL LAKE/RESERVOIR	3,110	3,110	3,110	3,110	3,110	3,110	$980	$169
RIESEL	G	REUSE- WMARSS WACO EAST	G | DIRECT REUSE	43	43	43	43	43	43	$869	$191
ROUND ROCK	G	TRINITY - WILLIAMSON COUNTY ASR	G | TRINITY AQUIFER ASR | WILLIAMSON COUNTY	0	0	0	0	9,050	9,050	N/A	$368
RULE	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	12	18	23	29	34	40	$0	$0
VENUS	G	WOODBINE AQUIFER DEVELOPMENT	G | WOODBINE AQUIFER | JOHNSON COUNTY	0	150	150	450	450	450	N/A	$203
WACO - UNASSIGNED WATER VOLUMES	G	REUSE- WMARSS WACO EAST	G | DIRECT REUSE	0	0	0	0	0	0	N/A	N/A
Region G Total Alternative WMS Supplies				152,632	152,543	154,393	159,481	177,112	187,430		

Irrigation needs are much greater than in previous plans because of differences in determining available supplies and some substantial increases in irrigation demands, notably in Burleson County. For the first time in the history of the Brazos G regional water planning process, the BGRWPG has recommended that irrigation and mining needs in some counties remain unmet, because there are no water management strategies identified that can economically meet those needs. A small unmet need of 7 acft is recognized in 2020 for Possum Kingdom WSC in Palo Pinto County which will be met through drought management. A summary of unmet needs is presented in Table ES-7.

Table ES-7. Unmet Needs in the Brazos G Area (acft/yr)

REGION G

	2020	2030	2040	2050	2060	2070
MUNICIPAL	7	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	19,144	26,184	27,715	32,173	37,830	44,827
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	37,757	33,814	30,401	29,640	34,184	40,519

*WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The unmet needs shown in the WUG Unmet Needs report are calculated by first deducting the WUG split's projected demand from the sum of its total existing water supply volume and all associated recommended water management strategy water volumes. If the WUG split has a greater future supply volume than projected demand in any given decade, this amount is considered a surplus volume. In order to display only unmet needs associated with the WUG split, these surplus volumes are updated to a zero and the unmet needs water volumes are shown as absolute values.

Implementation of the 2016 Brazos G Regional Water Plan provides for the development of new water supplies that will be reliable in the event of a repeat of the most severe drought on record. Implementation of all recommended water management strategies would often provide supplies sufficient to meet more than the projected needs with which the strategies are associated. The BGRWPG explicitly recognizes the difference between additional supplies and projected needs as "System Management Supplies" and has recommended water management strategies that would supply in excess of some needs in the 2016 Brazos G Regional Water Plan for the following reasons:

- So that water management strategies are identified to replace any planned strategies that may fail to develop, through legal, economic or other reasons;
- To serve as additional supplies in the event that rules, regulations, or other restrictions limit use of any planned strategies;
- To facilitate development of specific projects being pursued by local entities for reasons that may not be captured in the supply and demand projections used to identify future supply shortages; and/or
- To ensure adequate supplies in the event of a drought more severe than that which occurred historically.

ES.6 Other Aspects of the 2016 Brazos G Regional Water Plan

In addition to providing a roadmap for development of supplies to meet future water needs in the basin, the 2016 Brazos G Regional Water Plan includes other elements of value and interest to water supply managers and others in the Brazos G Area.

- The plan provides a concise summary of physiographic, hydrologic and natural resources in the Brazos G Area,
- The plan provides a comprehensive understanding of how water supplies have been developed and are managed in the Brazos G Area,
- The plan provides recommendations for drought management and emergency supply measures that may assist water managers with developing plans for their systems, and
- The plan includes recommendations to the TWDB and the Texas Legislature regarding key water policy issues and the direction of water supply management in Texas.

1

Description of the Brazos G Area

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1 Description of the Brazos G Area

1.1 Background

Senate Bill 1 (SB1), which was passed into law in June 1997 and enacted by the 75th Texas Legislature, stemmed from increased awareness of Texas' vulnerability to drought and of the limitations of existing water supplies to meet the needs of the state's growing population. Senate Bill 2 (SB2), enacted in September 2001, expanded on the regional water planning process as created by SB1, and provided for further analysis and planning for water resources in the state. With rapidly growing populations, the need to adequately plan for existing and future water needs is vital to the economic health of the region and State. Some areas of the State are already facing near-term water shortages, and the projected population is expected to double by 2060. The purpose of SB1 and SB2 is to ensure that the water needs of all Texans are met in the 21st century.

The SB1/SB2 legislation calls for a "bottom up" water planning process wherein Regional Water Planning Groups (RWPGs) are formed with members representing a minimum of 11 different interests, including the environment, industry, municipalities, water authorities, and the public. The Texas Water Development Board (TWDB) has established 16 regional water planning areas; each with its own RWPG. Each RWPG is tasked with preparing a regional water plan for its area that assesses the available water supplies, the projected demands on these supplies and identifies a means to meet future water needs while maintaining long-term protection of the State's resources.

In accordance with SB2 (as amended), all of the regional water plans must be completed and adopted by December 1, 2015. The TWDB must approve them and compile the 16 plans into one statewide plan by January 5, 2017. The regional water plans will continue to be updated every 5 years.

1.1.1 Brazos G Regional Water Planning Area

The Brazos G Regional Water Planning Area (BGRWPA), shown in Figure 1-1, comprises all or portions of 37 central Texas counties. The Brazos G Area is about 31,600 square miles in area, or 12 percent of the State's total area. About 90 percent of the region lies in the Brazos River Basin. Figure 1-2 shows the major features of the BGRWPA, such as major cities, reservoirs, and highways. This figure also shows that parts of several counties extend into the Red, Trinity, Colorado, and San Jacinto River Basins. Cities in the region with current populations greater than 50,000 are Abilene, Bryan, Cedar Park, College Station, Killeen, Round Rock, Temple, and Waco[1].

The region's geography varies from the rugged, uneven terrain and sandy soils of Kent and Knox Counties in the northwest to the hilly, forested areas and rich soils in Grimes and Washington Counties in the southeast. In the central part of the region are the Blackland Prairies in Hill and McLennan Counties.[2]

[1] U.S. Census Bureau, *2010 Census*, http://www.census.gov/2010census/

[2] The Dallas Morning News, *1997-1998 Texas Almanac*, 1998.

Figure 1-1. Location Map

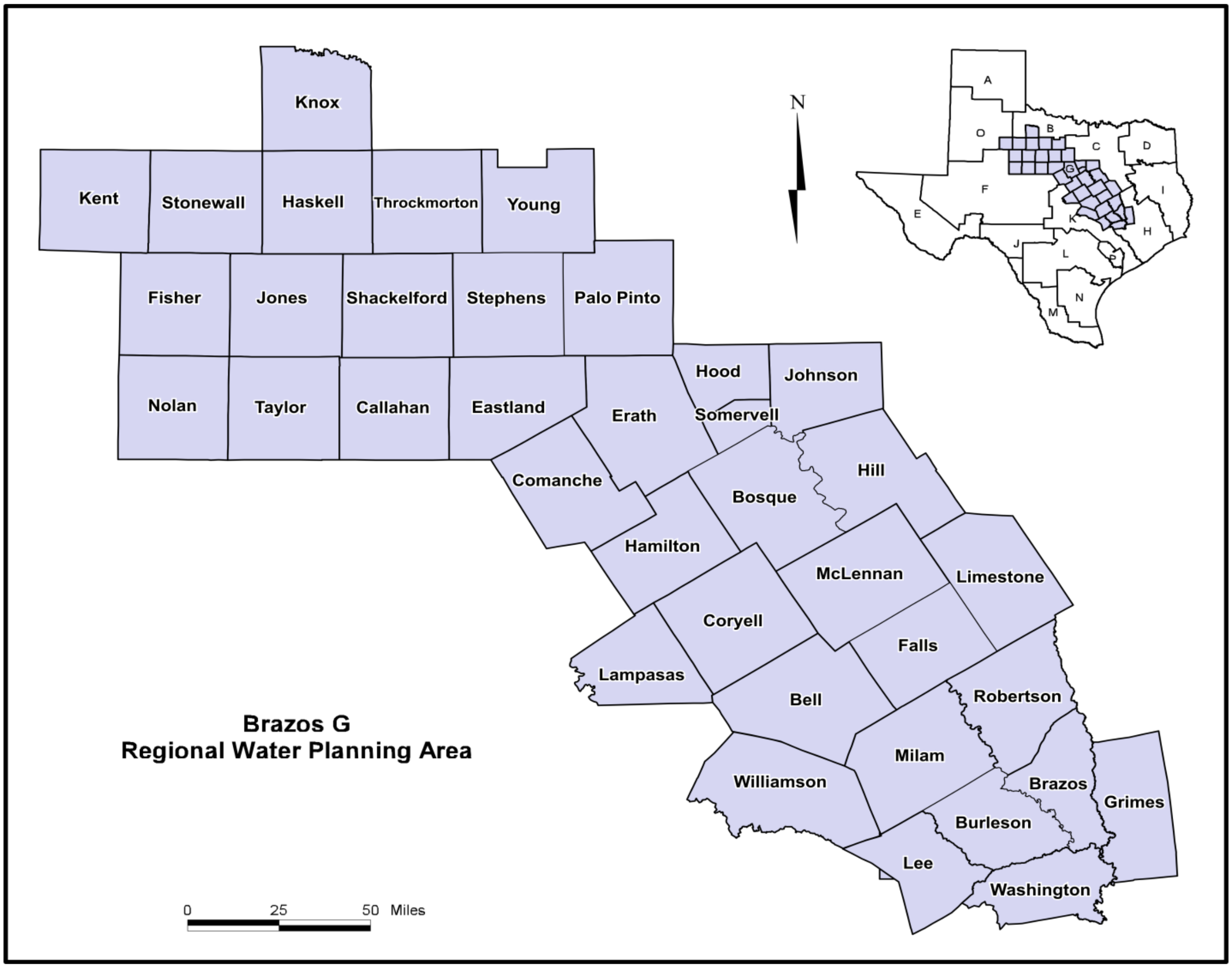
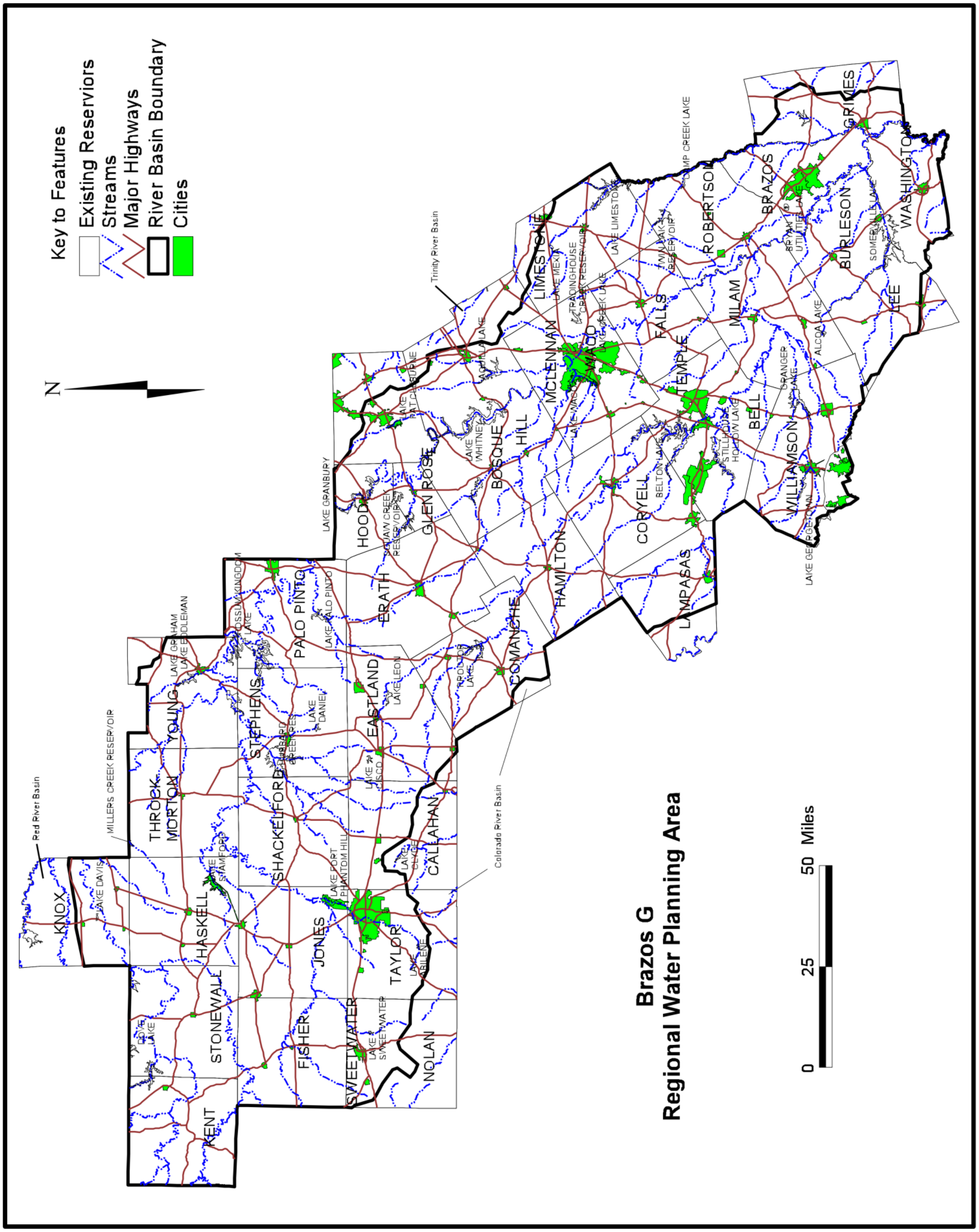


Figure 1-2. Major Features of the Brazos G Area



Members of the Brazos G RWPG who contributed to the development of the 2016 Brazos G Regional Water Plan are listed in Table 1-1. These members represent 12 interest groups: the public, counties, municipalities, industries, agriculture, the environment, small businesses, electric-generating utilities, river authorities, water districts, groundwater management areas and water utilities. The Brazos G RWPG has retained the services of engineering firms and other specialists to assist the RWPG with the preparation of the regional plan, and it has designated the Brazos River Authority (BRA) as its administrative contracting agency.

Table 1-1. Current and Recent Brazos G RWPG Members

Interest Group	Name	Affiliation
Voting Members		
Agricultural	Judge Dale Spurgin (past Chair) Wayne Wilson (Chair)	Judge, Jones County Rancher, Brazos County
Counties	County Commissioner Tim Brown Judge Travis Floyd Judge Mike Sutherland	Bell County Knox County Burleson County
Electric Generating Utilities	Brian Patrick (resigned Dec. 2014) Gary Spicer	Luminant Luminant
Environmental	Kevin Wagner	Texas Water Resources Institute
Industry	Jim Hodson (passed away Sept. 2014) Randy Waclawczyk (resigned 2014)	ALCOA RRW Consulting
Municipalities	David Blackburn (resigned Nov. 2014) Jim Briggs Alva Cox Larry Groth (resigned Nov. 2014) Tommy O'Brien Kenny Weldon	City of Temple City of Georgetown City of Granbury City of Waco City of Abilene City of Stephenville
Public	Gary Newman	Trio Development
River Authorities	Phil Ford (Secretary)	Brazos River Authority
Small Business	Gail L. Peek (Vice Chair)	Beard Kultgen Brophy Bostwick & Dickson
Water Districts	Joe Cooper Kelly Kinard	Middle Trinity GCD West Central Texas MWD
Groundwater Management Areas	Dale Adams Zach Holland Mike McGuire Judy Parker Gary Westbrook	Wes-Tex GCD Bluebonnet GCD Rolling Plains GCD Clearwater Underground WCD Post Oak Savannah GCD

Table 1-1. Current and Recent Brazos G RWPG Members

Interest Group	Name	Affiliation
Water Utilities	Charles Beseda	Birome WSC
Non-Voting Members		
Llano Estacado (O) RWPG Liaison	Mike McClendon	Brazos River Authority
Region C RWPG Liaison	Bill Ceverha	Self-Employed
Region F RWPG Liaison	John Grant	Region F Chair
Lower Colorado (K) RWPG Liaison	Mark Jordan	Lower Colorado River Authority
Region H RWPG Liaison	David Collinsworth	Brazos River Authority
LCRA Representative	James Kowis	Lower Colorado River Authority
TWDB Project Manager	Lann Bookout	Texas Water Development Board
Texas Parks and Wildlife Dept.	Jennifer Bronson	Texas Parks and Wildlife Dept.
Texas Dept. of Agriculture	E.W. Wesley	Texas Department of Agriculture

1.2 Population

1.2.1 Regional Trends

Figure 1-3 illustrates population growth in the entire BGRWPA for 1900 to 2010 and projected growth for 2020 to 2070. Historical population data for each county in the BGRWPA are displayed in Appendix A, as well as regional and State population totals, for 1990 to 2010.

From 1900 to 1970, population in the Brazos G Area grew slowly at an average rate of 0.4 percent per year from 680,093 people to 895,682. During the same period, the total population of Texas grew at an average rate of 1.9 percent annually, from 3,048,710 to 11,196,730. Beginning in the 1970s, however, both the State's and the region's population began to increase at faster rates. Growth in the region was about 2 percent annually, which approximates the State's total growth rate of 2 percent. Population in the BGRWPA is expected to increase by an average of 1.3 percent annually, reaching 4.35 million by 2070. This is roughly double the census population in 2010.

Population trends may be further understood by dividing the BGRWPA into three subregions: the northwestern Rolling Plains, the central IH-35 Corridor, and the southeastern Lower Basin. Table A-2 in Appendix A provides historical population data for all counties in each subregion from 1900 to 2010.

Figure 1-3. Historical and Projected BGWRPA Population

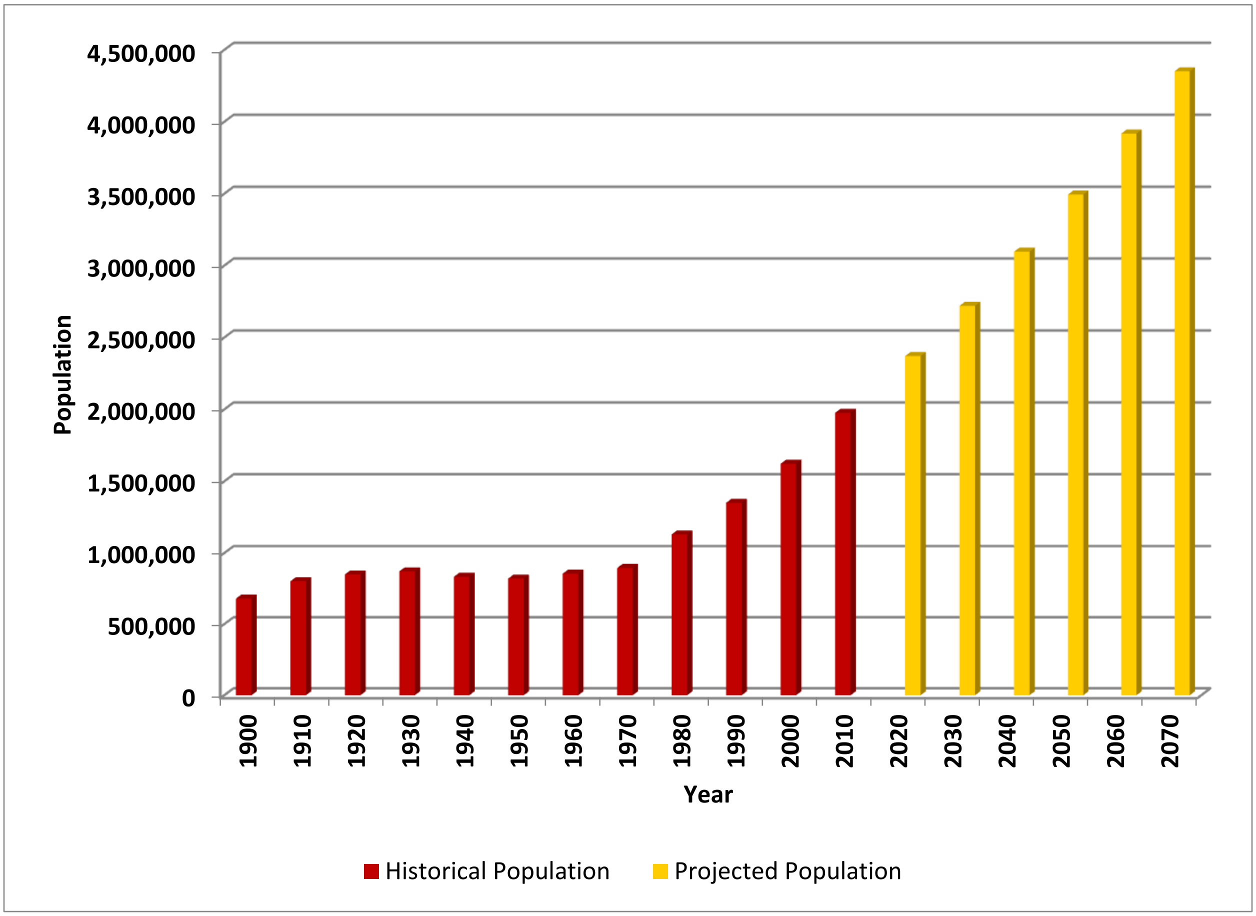


Figure 1-4 illustrates historical population growth in the three subregions from 1900 to 2010 and projected growth from 2020 to 2070. Figures 1-5 and 1-6 illustrate population distribution by county for years 2020 and 2070, respectively. The greatest growth is projected to occur along the IH-35 corridor, which connects some of the larger cities in the region and the state. Table 1-2 presents 2010 populations and projected populations for 2020 and 2070 for the major cities in each subregion. Major cities are defined as those having at least 10,000 people in 2010. This table also presents the percent change in populations from 2020 to 2070 in each city. The overall division of the population between large cities and rural areas is expected to increase from 56.6 percent in 2010 to 65.6 percent by 2070.

1.2.2 Rolling Plains

The counties in the Rolling Plains subregion are Knox, Kent, Stonewall, Haskell, Throckmorton, Young, Fisher, Jones, Shackelford, Stephens, Palo Pinto, Nolan, Taylor, Callahan, Eastland, Erath, Hood, Somervell, Comanche, Hamilton, Bosque, Coryell, and Lampasas. These counties, with about 25 percent of the BGRWPA's population in 2010, have grown moderately since 1970 at an average rate of 0.8 percent per year. Major cities in this subregion include Abilene, Copperas Cove, Gatesville, Mineral Wells, Stephenville, and Sweetwater.

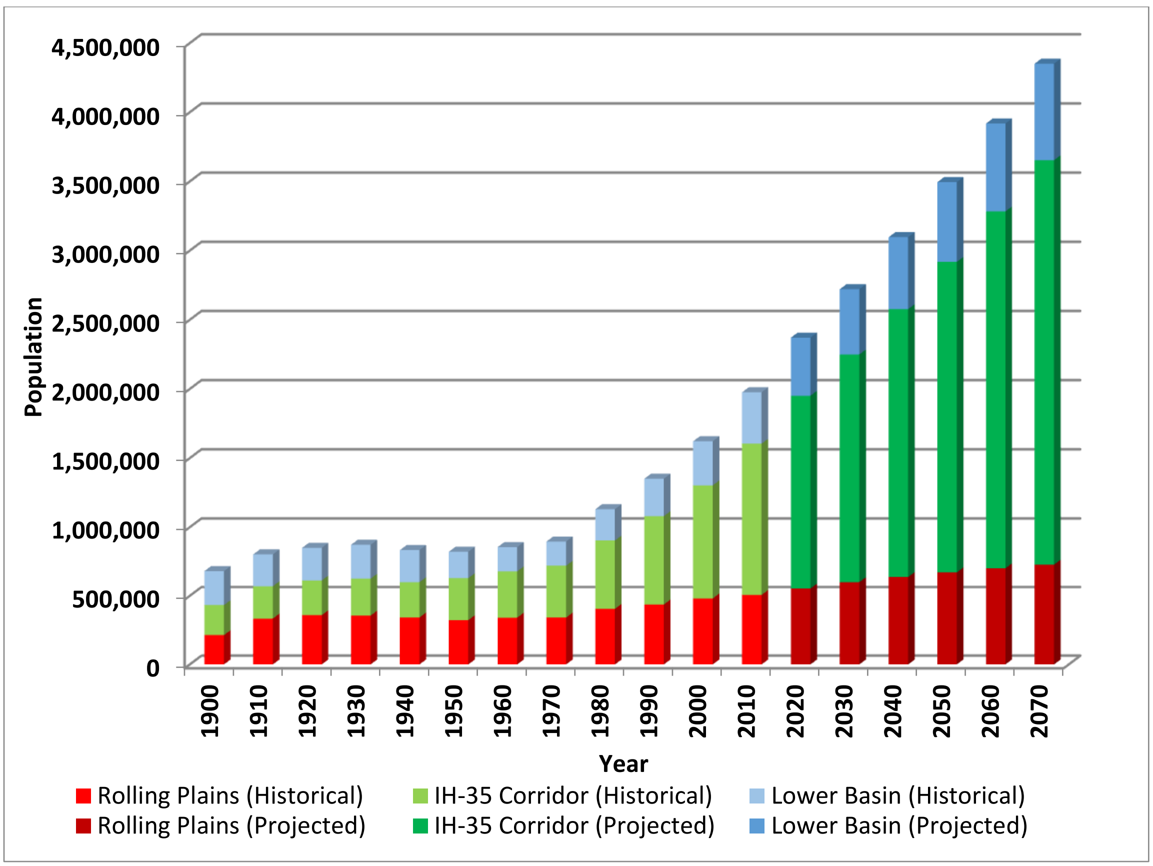
1.2.3 IH-35 Corridor

The counties in the IH-35 Corridor are Johnson, Hill, McLennan, Bell, and Williamson. Population growth in these counties has been rapid since 1970, averaging 2.4 percent annually. In this subregion, cities with a current population greater than 10,000 include Belton, Burleson, Cedar Park, Cleburne, Fort Hood, Georgetown, Harker Heights, Hewitt, Hutto, Killeen, Leander, Robinson, Round Rock, Taylor, Temple, and Waco[3]. Total population in the IH-35 Corridor was about 56 percent of the region's total in year 2010, and it is expected to keep growing rapidly.

1.2.4 Lower Basin

Counties in the Lower Basin are Limestone, Falls, Milam, Robertson, Lee, Burleson, Brazos, Washington, and Grimes. This subregion also has seen a relatively high growth rate averaging 1.5 percent annually since 1970. Major cities include Brenham, Bryan, and College Station. The Lower Basin had 19 percent of the population of the BGRWPA in 2010.

Figure 1-4. Historical and Projected Population by Subregion



[3] U.S. Census Bureau, *2010 Census*, http://www.census.gov/2010census/

Figure 1-5. 2020 Population Distribution by County

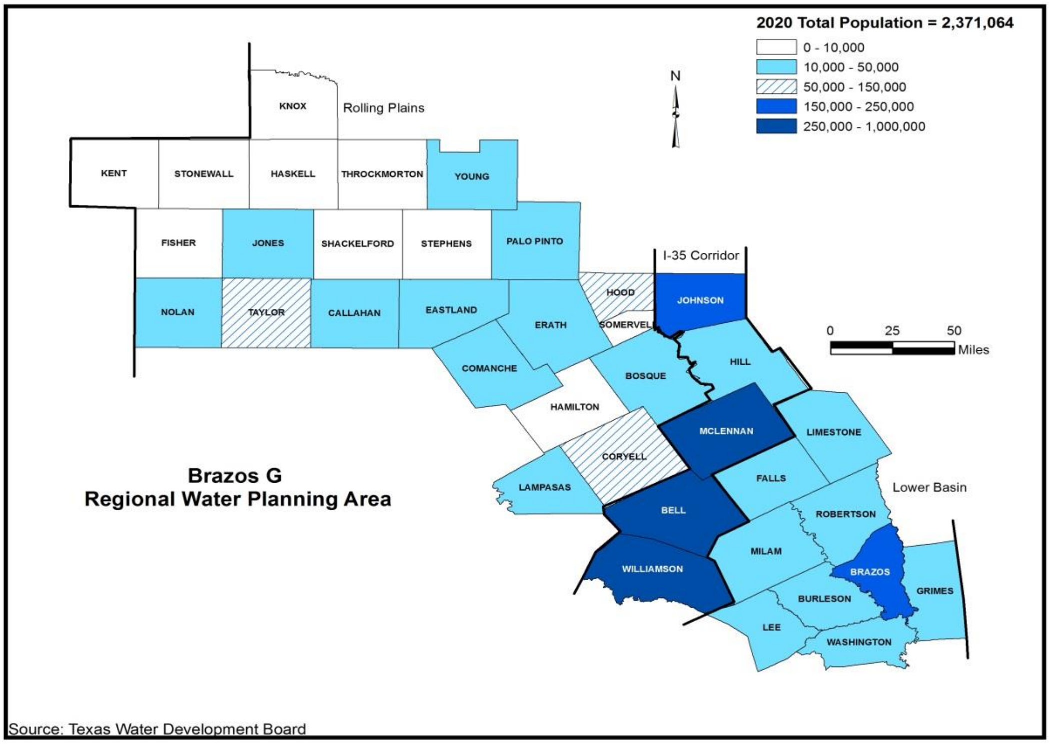


Figure 1-6. 2070 Population Distribution by County

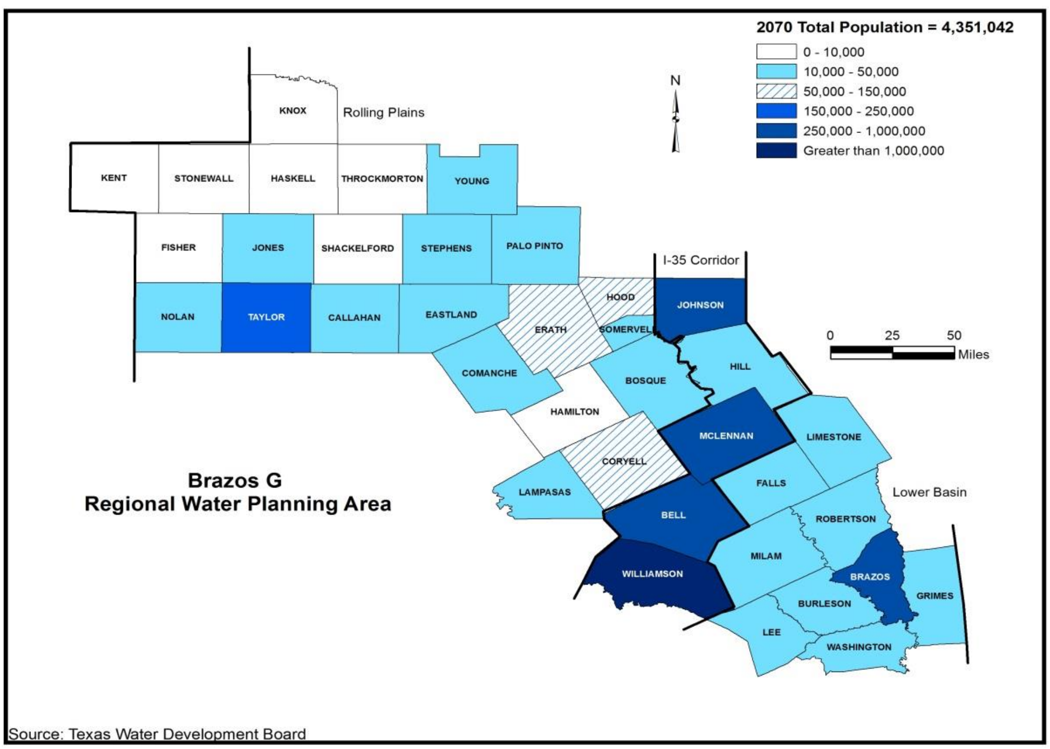


Table 1-2. Population of Major Cities in the BGRWPA (> 10,000 People in 2010)

City	County	Population Data[1]			% Change
		2010	**2020**	**2070**	**(2020 to 2070)**
Rolling Plains					
Abilene	Jones, Taylor	117,063	125,179	144,711	15.6
Copperas Cove	Coryell	32,032	36,989	64,130	73.4
Gatesville	Coryell	15,751	17,990	30,554	69.8
Mineral Wells[2]	Palo Pinto	14,644	15,907	19,577	23.1
Stephenville	Erath	17,123	19,041	27,948	46.8
Sweetwater	Nolan	10,906	11,564	13,852	19.8
IH-35 Corridor					
Belton	Bell	18,216	21,841	40,404	85.0
Burleson[2]	Johnson	29,111	35,167	68,170	93.8
Cedar Park	Williamson	48,448	71,518	79,329	10.9
Cleburne	Johnson	29,337	32,501	53,517	64.7
Fort Hood	Bell, Coryell	29,589	33,333	33,711	1.1
Georgetown	Williamson	47,400	72,507	196,604	171.2
Harker Heights	Bell	26,700	32,012	59,222	85.0
Hewitt	McLennan	13,549	15,543	25,976	67.1
Hutto	Williamson	14,698	31,492	114,500	263.6
Killeen	Bell	127,921	153,371	283,732	85.0
Leander	Williamson	25,444	41,071	293,630	614.9
Robinson	McLennan	10,509	12,665	23,945	89.1
Round Rock[2]	Williamson	98,525	150,712	408,660	171.2
Taylor	Williamson	15,191	17,209	27,182	58.0
Temple	Bell	66,102	79,253	146,616	85.0
Waco	McLennan	124,805	133,769	180,673	35.1
Lower Basin					
Brenham	Washington	15,716	17,355	22,430	29.2
Bryan	Brazos	76,201	88,434	181,797	105.6
College Station	Brazos	93,857	102,140	215,545	111.0
Total, Major Cities	**—**	**1,118,838**	**1,410,128**	**2,852,142**	**102.3**
% of Region Total	**—**	**56.6**	**59.5**	**65.6**	
Total, Rural Areas	**—**	**856,996**	**960,936**	**1,498,900**	**56.0**
% of Region Total	**—**	**43.4**	**40.5**	**34.4**	
Region Total	**—**	**1,975,834**	**2,371,064**	**4,351,042**	**83.5**

[1] 2010 population data obtained from U.S. Census. 2020 and 2070 projections are based on TWDB.
[2] Represents only the portion of the city located in Region G

1.3 Economic Activities

The BGRWPA includes all or part of the following metropolitan statistical areas as defined by the Texas State Data Center: Abilene, Waco, Dallas-Fort Worth-Arlington Killeen-Temple-Fort Hood, Austin-Round Rock, and College Station-Bryan. The economy of the region can be divided into the following general sectors: agriculture, agribusiness, mineral production, wholesale and retail trade, and varied manufacturing. Table 1-3 lists 2012 payrolls and employment in the BGRWPA by subregion and economic sector.[4] As of this writing, 2012 was the most recent year for which such data were available. Payroll and employment in the Brazos G Area were concentrated along the IH-35 Corridor, which in 2012 had a total payroll of about $13.9 billion and employment of approximately 346,000 people. Primary economic activities were manufacturing, retail trade, and services, accounting for about 57 percent of the region's total payroll in 2012.

Table 1-3. 2012 Economic Data[1] (x$1,000)

Economic Sector	Rolling Plains	IH-35 Corridor	Lower Basin	Region Total
Agricultural, Forestry, Fishing	$6,105	$1,285	$2,108	$9,498
	$339,872	$224,190	$162,000	$726,062
Construction	$379,258	$886,111	$233,040	$1,498,409
Manufacturing	$645,818	$1,620,704	$538,842	$2,805,364
Transportation, Public Utilities	$210,420	$476,377	$116,660	$803,457
Wholesale Trade	$227,361	$1,421,829	$181,716	$1,830,906
Retail Trade	$604,373	$1,318,080	$366,310	$2,288,763
Finance, Insurance, Real Estate	$355,709	$1,066,580	$188,966	$1,611,255
Services	$1,930,654	$4,892,228	$1,013,945	$7,836,827
Unclassified	$185,172	$463,300	$116,465	$764,937
Not Categorized	$64,620	$486,964	$84,209	$635,793
Total Payroll	$5,354,838	$13,892,954	$3,251,418	$22,499,210
Total Employed	162,625	345,854	94,811	603,290
1 - Source: U.S. Census Bureau.				

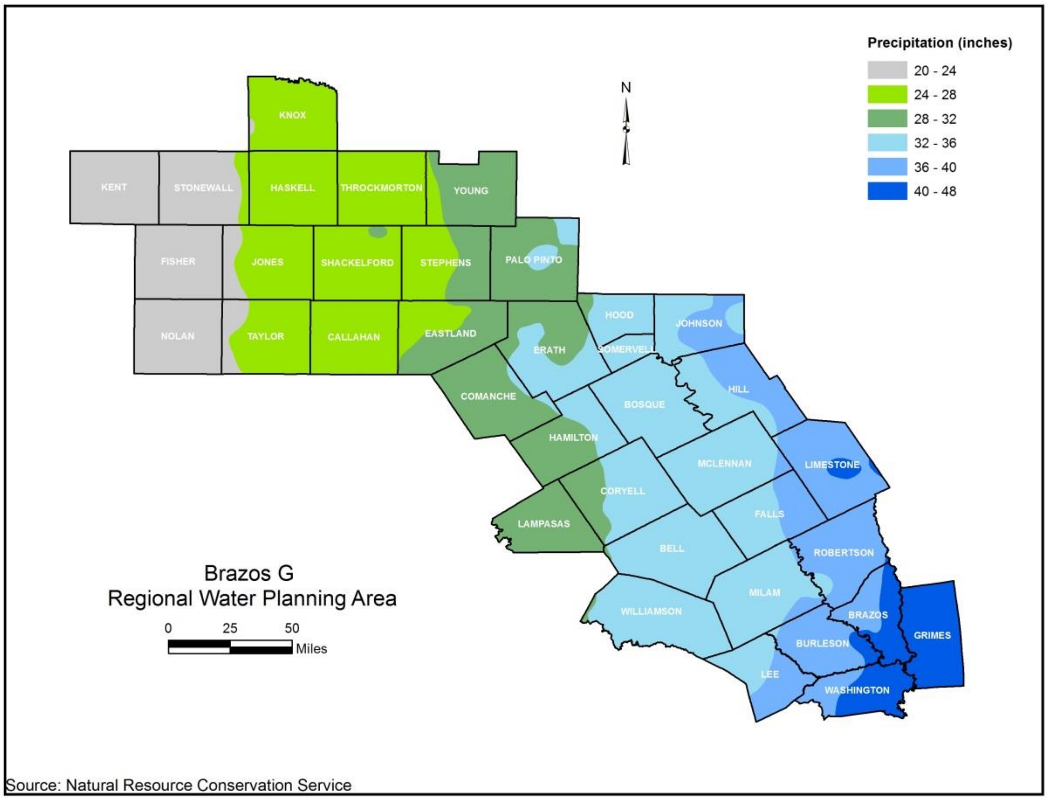
1.4 Climate

Temperatures in the Brazos G Area range from an average low of 35°F in January to an average high of 95°F in July. Average annual precipitation ranges from 20 to 24 inches in Kent County in the northwest corner of the region to 40 to 48 inches in Washington and

[4] U.S. Census Bureau, "2012 Economic Data," Online: available URL: http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

Grimes Counties in the southeast. Figure 1-7 depicts average annual precipitation for the entire region.

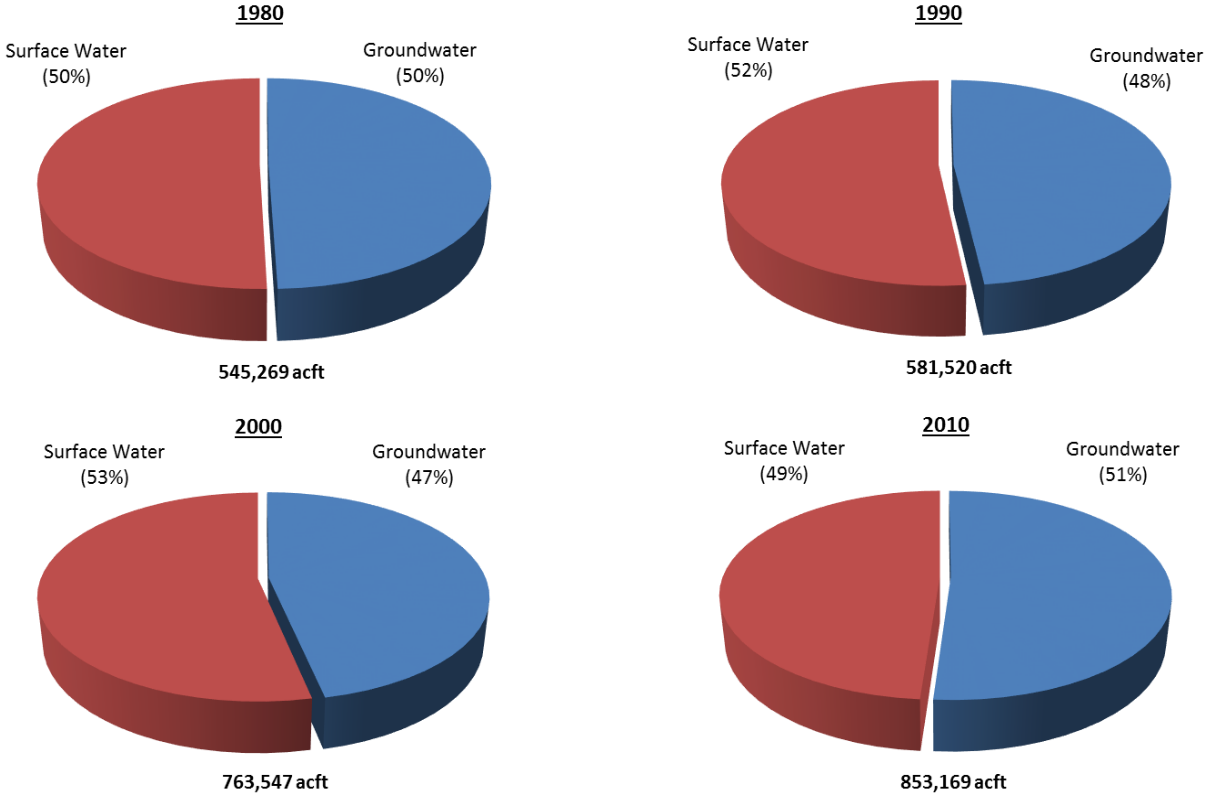
Figure 1-7. Average Annual Precipitation (1911 to 2010)



1.5 Sources of Water

Table A-3 in Appendix A provides historical data on use of groundwater and surface water within the BGRWPA from 1980 to 2010. These data suggest that the planning area has depended slightly more on surface water than on groundwater during the 1980s and 1990s. Figure 1-8 shows the proportion of surface water use to groundwater use in 1980, 1990, 2000, and 2010. While the proportions were equal in 1980, surface water use was greater by 2 percent in 1990, and 3 percent in 2000. In 2010, the surface water use was 2 percent less than groundwater.

Figure 1-8. BGRWPA Historical Water Use by Source



1.5.1 Groundwater

Aquifers[5,6,7]

Portions of six major and ten minor aquifers extend into the Brazos G Area (Figures 1-9 and 1-10). Major aquifers are defined generally as those aquifers that supply large amounts of water to large areas of the State. Minor aquifers are defined as those that supply large amounts of water to small areas of the State or provide small supplies to wide areas. Figure 1-11 shows historical water pumpage for each aquifer in the BGRWPA in 1980, 1990, 2000, and 2010. In 2010, about 69 percent of the groundwater pumped came from four aquifers: Brazos Valley Alluvium, Carrizo-Wilcox, Seymour, and Trinity. Table 1-4 depicts historical pumpage in 2010 and projected availability in 2070 of groundwater in each aquifer in the BGRWPA.

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[5] Texas Water Commission, *Groundwater Quality in Texas - An Overview of Natural and Man-Affected Conditions*, TWC Report No. 89-01, 1989.

[6] Texas Water Development Board (TWDB), *Water for Texas*, 1997.

[7] TWDB, *Estimated Groundwater Pumpage by County and Aquifer*, 2010.

Figure 1-9. Major Aquifers

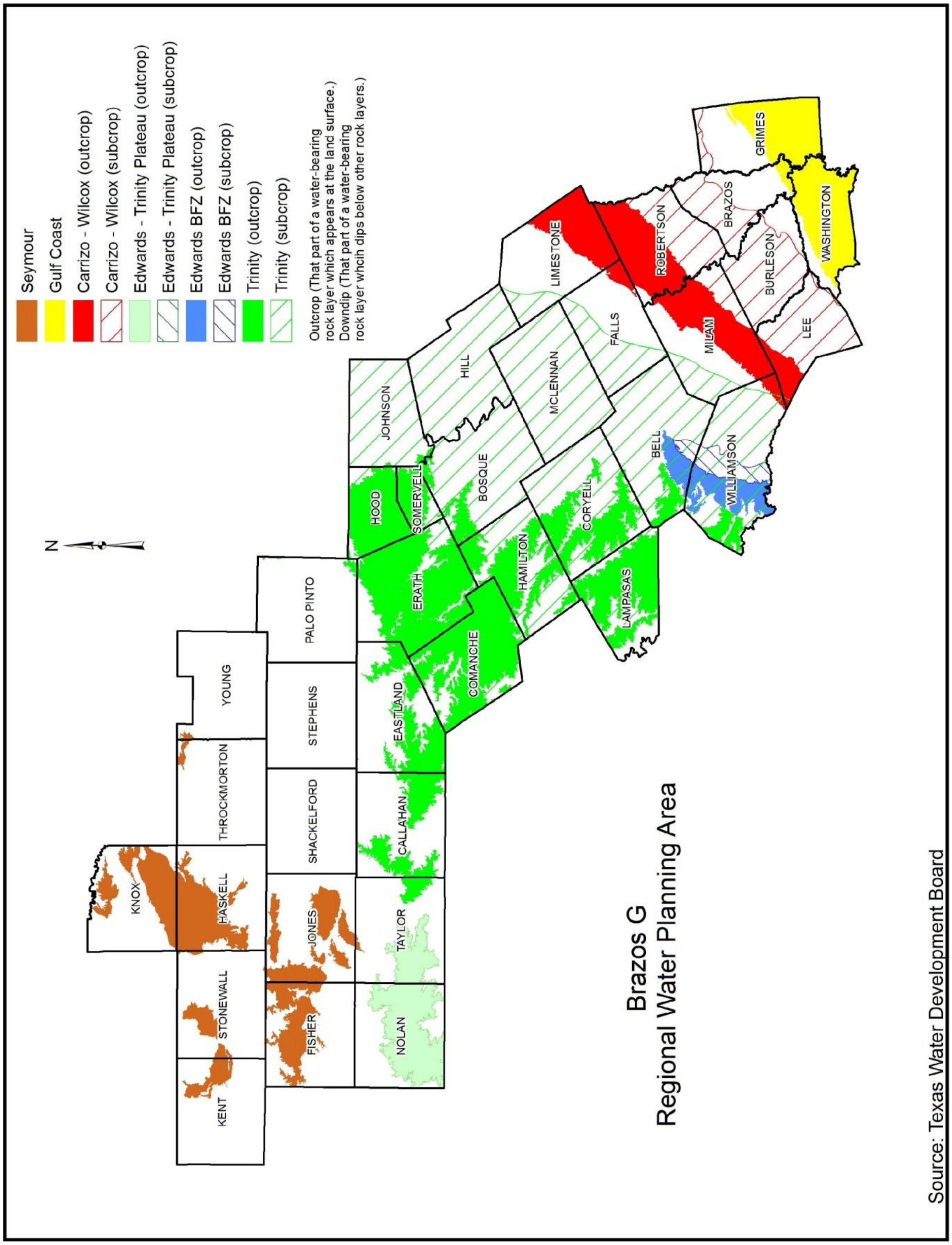


Figure 1-10. Minor Aquifers

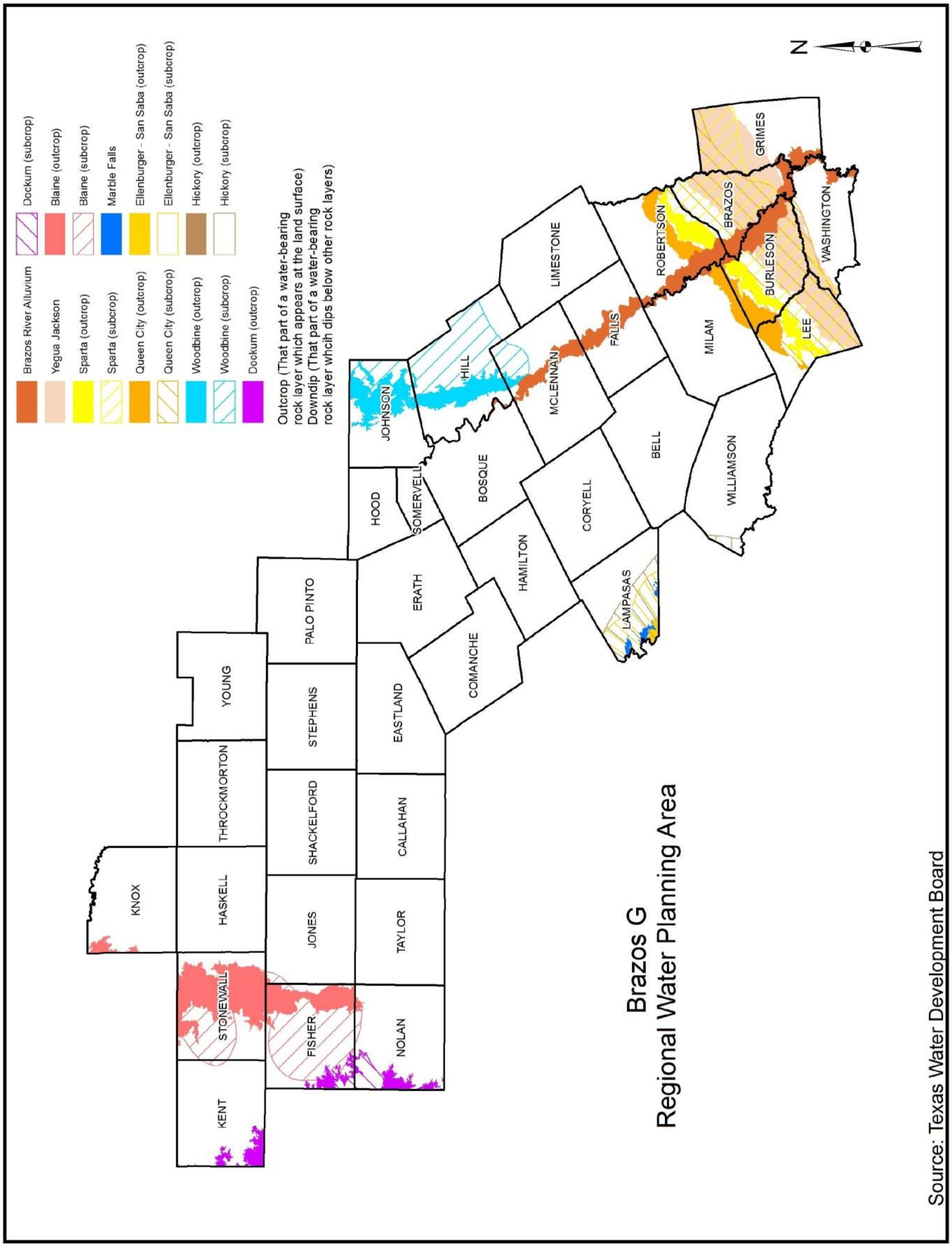
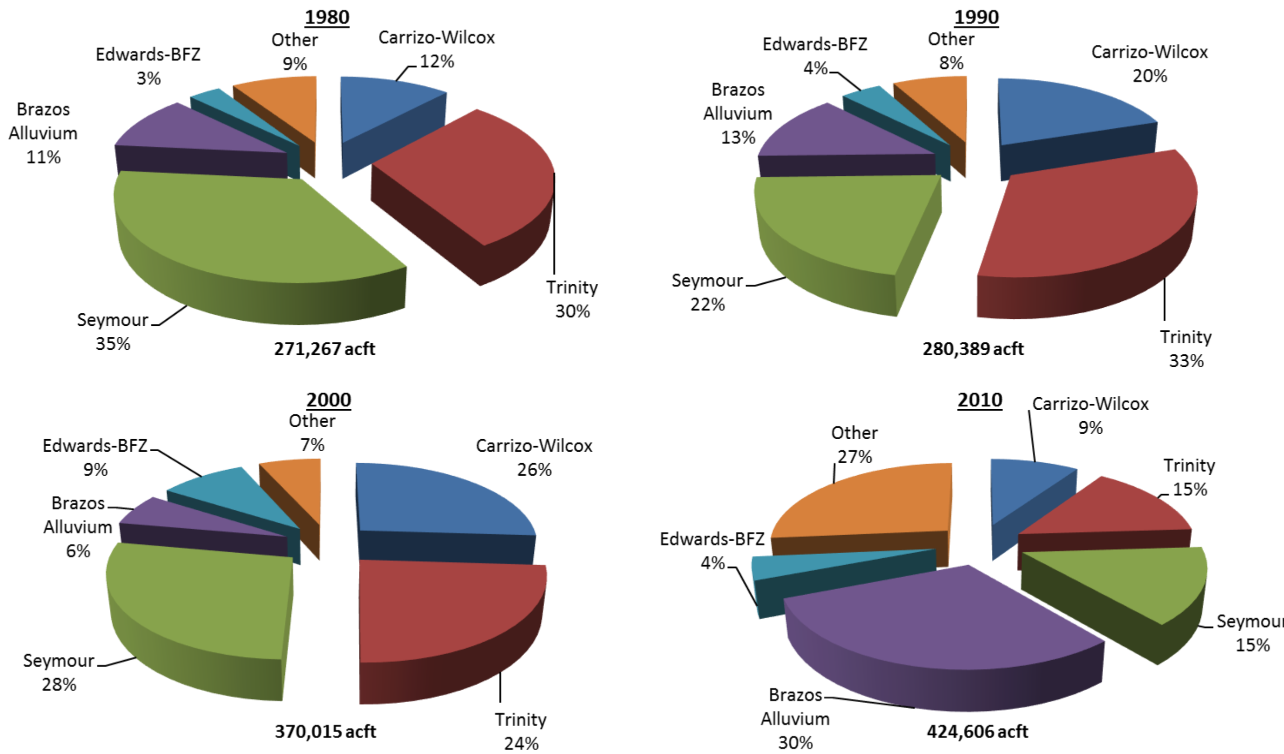


Figure 1-11. Brazos G Area Historical Water Pumpage by Aquifer



Source: Texas Water Development Board Water Use Survey Groundwater Pumpage Estimates - http://www2.twdb.texas.gov/ReportServerExt/Pages/ReportViewer.aspx?/wu/sumfinal_groundwater_pumpage

Fewer than half of the aquifers in the BGRWPA have potential for further development. Seven of them extend only slightly into the planning area. The aquifers that do offer potential for further development are all in the southeastern part of the region.

In the western part of the region, the Seymour Aquifer is the most significant in terms of usage and yield. The Seymour Aquifer, which has an uneven distribution, is highly developed, and most of its water is used for irrigation. The aquifer is prone to depletion if subjected to a combination of prolonged drought and heavy use, but groundwater supply in the aquifer has remained fairly constant. Also in the west, the fringes of three aquifers, the Dockum, Blaine, and Edwards-Trinity (Plateau), extend into the planning area, but these offer little room for further development. In the northeastern part of the region, there is a wide area with no major or minor aquifers, including Throckmorton, Young, Shackelford, Stephens, and Palo Pinto Counties. In these areas, locally occurring groundwater is not associated with a defined major or minor aquifer system and is primarily used for domestic and livestock purposes.

Table 1-4. Brazos G Area Aquifers

Aquifer	2010 Pumpage (acft)	2070 Availability (acft/yr)	Remarks
Western Area			
Seymour	62,600	83,074	Fully developed
Dockum	8,440	14,880	Limited extent within region
Blaine	410	14,562	Limited extent within region
Edwards-Trinity (Plateau)	2,550	1,182	Limited extent within region
Subtotal:	74,000	113,698	
Central Area			
Trinity	61,820	148,441	Overdeveloped in some areas
Edwards (BFZ)	18,740	9,921	Overdeveloped in drought
Woodbine	910	7,032	Limited extent within region
Marble Falls	20	2,837	Limited extent within region
Ellenburger-San Saba	30	2,593	Limited extent within region
Hickory	ND[1]	128	Limited extent within region
Subtotal:	81,520	170,952	
Southeastern Area			
Brazos River Alluvium	129,060	87,989	Overdeveloped in drought, water quality variable
Carrizo-Wilcox	40,060	217,751	Additional potential
Queen City	2,810	1,780	
Sparta	4,450	17,522	Additional potential
Gulf Coast	4,160	26,952	Additional potential
Navasota River Alluvium	ND[1]	2,216	
Yegua-Jackson	3,600	24,056	
Subtotal:	184,140	378,266	
Other and Undifferentiated	84,950	3,724	Many widely-scattered sources
Total:	424,610	666,640	

[1] ND indicates no data available.

The Trinity Aquifer is the most significant groundwater source in the central part of the BGRWPA. It is widespread and furnishes small to moderate amounts of groundwater in 17 counties. In the confined portions of the aquifer, however, development has resulted in significant declines in water levels.

In the southeastern part of the region, groundwater supplies are dominated by the Carrizo-Wilcox System and the Gulf Coast Aquifer. The Carrizo-Wilcox has significant potential for further development, but the Gulf Coast Aquifer in this area has low to moderate potential. Several minor aquifers also have potential for further development over wide areas in this sector. The Brazos Alluvium, which lies along the Brazos River, also extends into the central portion of the area and has some potential for additional development, but most of the BGRWPA's undeveloped groundwater lies in the southeastern sector.

The Trinity Aquifer and all other aquifers to the southeast have outcrop areas under water-table conditions and downdip areas with overlying confining layers where artesian conditions may occur. Most of these aquifers contain fresh water to considerable depths, and all contain slightly saline water just downdip (commonly to the southeast) of the fresh water. Maps in Appendix B show the locations of fresh water, defined as containing less than 1,000 milligrams per liter (mg/L) total dissolved solids (TDS), and slightly saline water, defined as having 1,000 to 3,000 mg/L TDS, within various aquifers. Maps are included for all aquifers within the BGRWPA that have availability estimated to exceed 5,000 acre-feet per year (acft/yr). The use of aquifers with groundwater containing more than 1,000 mg/L TDS is an option only where consumers can use the saline water or where special treatment (desalination or blending) is available. More detailed descriptions and availability of water from each aquifer in the BGRWPA are in Appendix B.

Major Springs

The BGRWPA contains few major springs, defined as springs with discharges commonly greater than 1 cubic foot per second (cfs). The majority of these issue from the Edwards-Balcones Fault Zone (BFZ) Aquifer in Bell and Williamson Counties and from the Marble Falls Aquifer in Lampasas County. Of the Edwards Aquifer springs, all but one are intermittent. The three largest Edwards springs are:

1. Salado Springs at Salado in Bell County along the Lampasas River with discharges ranging from 5 to 60 cfs.
2. Berry Springs, which is located 5 miles north of Georgetown in Williamson County, with discharges ranging from 0 to 50 cfs.
3. San Gabriel Springs at Georgetown in Williamson County with discharges ranging from 0 to 25 cfs.

Springs from the Marble Falls Aquifer include Hancock Park Springs along the Sulfur River, which is a tributary to the Lampasas River, with discharges reportedly ranging from 6 to 12 cfs, and Swimming Pool Springs at Hancock Park with a reported discharge of 1.3 to 1.6 cfs. Both springs are in the City of Lampasas in Lampasas County.

Some springs in the region significantly affect the quality of the water in the Brazos River. These are primarily the salt springs and seeps, such as those along Salt Croton and Croton Creeks, in the upper Brazos River Basin in Dickens, Kent, and Stonewall Counties. These natural saltwater sources cause the water in the main stem of the Brazos River above Possum Kingdom Lake to be too saline for most uses during low flow periods. For example, from 1963 to 1986, TDS and chloride concentrations in Croton Creek near Jayton averaged 7,933 mg/L and 3,169 mg/L, respectively. The mean values for TDS and chlorides in the Salt Croton Creek near Aspermont from 1969 to 1977 were 71,237 mg/L and 41,516 mg/L, respectively. Water in Possum Kingdom Lake usually contains more than 400 mg/L chloride and 1,200 mg/L TDS. The natural chloride pollution in the upper Brazos River affects water quality in the lower basin. In the Brazos River at Richmond, it has been estimated that 85 percent (or about 95 mg/L for the years 1946 to 1986)[8] of the chloride is from the upper basin.

There are many smaller springs in the Brazos G Area, but cataloging is inconsistent and incomplete. Only a few small springs have been cataloged in just nine of the 37 counties in the BGRWPA.[9] These springs flow substantially less than 1 cfs, and most flow only a few gallons per minute (1 cfs = 448.8 gpm).

1.5.2 Surface Water

The BGWRPA lies within the Brazos River Basin, the boundaries of which are the Red River Basin to the north, the Colorado River Basin to the west, the Trinity and San Jacinto River Basins to the east, and the counties of Fayette, Austin, Waller, and Montgomery to the south. The total drainage area for the Brazos River Basin is about 45,400 square miles, and of this about 28,400 square miles are in the BGRWPA.

The Brazos River is the third-largest river in Texas and the largest river between the Rio Grande River and the Red River in terms of total watershed area.[10] The Brazos River rises in three upper forks: the Double Mountain Fork, Salt Fork, and Clear Fork. Twenty-nine major reservoirs provide surface water to the BGRWPA. Major reservoirs, listed in Table 1-5, are defined as having an authorized conservation capacity greater than 10,000 acft. This table shows amounts of storage and annual use that the Texas Commission on Environmental Quality (TCEQ) authorizes for each reservoir. Figure 1-2 shows locations of some of the reservoirs in the BGRWPA, and Table A-5 in Appendix A provides more detailed information about all reservoirs in the BGRWPA with a permitted capacity greater than 2,500 acft. Diversions permitted for municipal, industrial, irrigation, and mining uses for each BGRWPA subregion are listed in Table 1-6. Total diversions permitted by use in each BGWRPA county are given in Table A-6 in Appendix A.

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[8] Ganze, C. Keith and Ralph A. Wurbs, “Compilation and Analysis of Monthly Salt Loads and Concentrations in the Brazos River Basin,” U.S. Army Corps of Engineers, Contract No. DACW63-88-M-0793, January 1989.

[9] Brune, Gunnar, *Major and Historical Springs of Texas: TWDB Report 189*, 1970.

[10] The Dallas Morning News, *2004-2005 Texas Almanac*, 2004.

Table 1-5. Major Reservoirs in BGRWPA (Authorized Capacity Greater than 10,000 acft)

Reservoir	Stream	County	Authorized Storage (acft)	Authorized Use (acft/yr)	Owner
Abilene	Elm Creek	Taylor	11,868	1,675	City of Abilene
Alcoa Lake	Sandy Creek	Milam	15,650	14,000	Aluminum Co. of America
Aquilla	Aquilla Creek	Hill	52,400	13,896	U.S. Army Corps of Engineers[1]
Belton	Leon River	Bell	469,600	130,257	U.S. Army Corps of Engineers[2]
Cisco	Sandy Creek	Eastland	45,000	2,027	City of Cisco
Cleburne	Nolan Creek	Johnson	25,600	6,000	City of Cleburne
Daniel	Gonzales Creek	Stephens	11,400	2,100	City of Breckenridge
Dansby Power Plant	Unnamed Trib. Brazos River	Brazos	15,227	850	City of Bryan
Fort Phantom Hill	Elm Creek	Jones	73,960	33,190	City of Abilene
Georgetown	North Fork San Gabriel River	Williamson	37,100	13,610	U.S. Army Corps of Engineers[1]
Gibbons Creek	Gibbons Creek	Grimes	32,084	9,740	Texas Municipal Power Agency
Graham/Eddleman	Flint Creek	Young	52,386	20,000	City of Graham
Granbury	Brazos River	Hood	155,000	64,712	Brazos River Authority
Granger	San Gabriel River	Williamson	65,500	19,840	U.S. Army Corps of Engineers[1]
Hubbard Creek	Hubbard Creek	Stephens	317,750	56,000	West Central Texas MWD
Leon	Leon River	Eastland	28,000	6,300	Eastland Co. WSD
Limestone	Navasota River	Robertson	225,400	65,074	Brazos River Authority
Millers Creek Lake[3]	Millers Creek	Baylor	30,696	5,000	North Central Texas MWA
Palo Pinto	Palo Pinto Creek	Palo Pinto	44,124	18,500	Palo Pinto MWD
Possum Kingdom	Brazos River	Palo Pinto	724,739	230,750	Brazos River Authority
Proctor	Leon River	Comanche	59,400	19,658	U.S. Army Corps of Engineers[1]
Somerville	Yegua Creek	Washington	160,110	48,000	U.S. Army Corps of Engineers[1]
Squaw Creek	Squaw Creek	Somervell	151,500	23,180	Texas Utilities Electric Co.
Stamford	Paint Creek	Haskell	60,000	10,000	City of Stamford
Stillhouse Hollow	Lampasas River	Bell	235,700	67,768	U.S. Army Corps of Engineers[1]

Table 1-5. Major Reservoirs in BGRWPA (Authorized Capacity Greater than 10,000 acft)

Reservoir	Stream	County	Authorized Storage (acft)	Authorized Use (acft/yr)	Owner
Tradinghouse	Tradinghouse Creek	McLennan	37,800	15,000	Texas Utilities Electric Co.
Truscott Brine	Bluff Creek	Knox	107,000	N/A	Red River Authority of Texas
Twin Oak	Duck Creek	Robertson	30,319	13,200	Texas Utilities Electric Co.
Waco	Bosque River	McLennan	192,062	192,062	U.S. Army Corps of Engineers[5]
Whitney	Brazos River	Hill	50,000	18,336	U.S. Army Corps of Engineers[1]
Totals	—	—	**3,517,375**	**1,025,334**	—

[1] Water rights held by the Brazos River Authority.
[2] Water rights held by the Brazos River Authority and the Department of the Army (Fort Hood).
[3] Millers Creek Lake is listed in Baylor County in Region B, but is used exclusively in the Brazos G Area.
[4] Storage authorization includes both Lake Stamford and College Lake
[5] Water rights held by the City of Waco.

Table 1-6. Permitted Surface Water Diversions by Subregion

Subregion	Permitted Diversion (acft/yr)[1]					
	Municipal	Industrial	Irrigation	Mining	Other[2]	Total
Rolling Plains	505,047	46,058	62,023	9,249	75	622,451
IH-35 Corridor	467,025	109,181	21,286	1,121	5	598,618
Lower Basin	204,415	170,977	97,179	2,385	1,480	476,436
Region Total	1,176,487	326,216	180,488	12,755	1,560	1,697,506

[1] Available supply may be less than the permitted diversion based on hydrologic conditions and priority of individual water rights.
[2] Category includes consumptive amounts for recreation and other uses as classified by the TCEQ.

1.6 Wholesale Water Providers

Wholesale water providers are defined in SB2 as any entity that sold more than 1,000 acft of wholesale water in any one year during the five years preceding the adoption of the last regional water plan. The Brazos G RWPG may also identify a provider who is expected to sell more than 1,000 acft per year of wholesale water during the 60-year planning period. There are 26 identified wholesale water providers in the BGRWPA, plus an additional six from outside Brazos G. These providers are listed in Table 1-7 and described below.

1.6.1 River Authorities

Brazos River Authority

The largest provider of water in the BGRWPA is the BRA. The BRA also operates water and wastewater treatment systems, has programs to assess and protect water quality, does water supply planning, and supports water conservation efforts in the Brazos River Basin. The BRA provides water from three wholly owned and operated reservoirs: Lake Granbury, Possum Kingdom Lake, and Lake Limestone. The BRA also owns water rights for the proposed Allens Creek Reservoir in Region H. In addition to these sources, the BRA contracts for conservation storage space in the eight U.S. Army Corps of Engineers reservoirs in the region: Lakes Proctor, Belton, Stillhouse Hollow, Georgetown, Granger, Somerville, Whitney, and Aquilla. The total permitted capacity of the 12 constructed reservoirs in the BRA system is approximately 2.3 million acft. The BRA holds rights for diversion in the region totaling 661,901 acft, and contracts to supply water to municipal, industrial, and agricultural water customers in the BGRWPA and other regions. The BRA's largest municipal customers in 2000 included Bell County Water Control and Improvement District No. 1, the City of Round Rock, and the Central Texas Water Supply Corporation.

In 2004, the BRA submitted a water rights application to the TCEQ requesting an additional firm supply appropriation of up to 421,449 acft/yr and an interruptible supply of up to 670,000 acft/yr. These additional supplies would be made available through coordinated operation of the BRA's system of reservoirs, as further described in Volume II, Chapter 7.10. The water right application is pending with the TCEQ.

Table 1-7. Wholesale Water Providers

Entity	Contract Amounts (acft/yr)[1]	Water Sources
Aquilla Water Supply	6,512	Lake Aquilla (BRA)
Bell County WCID No. 1	62,509	Lake Belton (BRA)
Bistone MWSD	5,405	Lake Mexia, Carrizo-Wilcox Aquifer
Bluebonnet WSC	7,125	Lake Belton (BRA)
Brazos River Authority	675,191[2]	Lakes Aquilla, Belton, Georgetown, Granbury, Granger, Limestone, Possum Kingdom, Proctor, Somerville, Stillhouse Hollow, Whitney

Table 1-7. Wholesale Water Providers

Entity	Contract Amounts (acft/yr)[1]	Water Sources
Central Texas WSC	10,240	Lake Stillhouse Hollow (BRA)
City of Abilene	37,911	Fort Phantom Hill, Hubbard Creek, Kirby
City of Anson	1,484	Hubbard Creek
City of Bryan	19,634	Carrizo-Wilcox Aquifer, Sparta Aquifer
City of Cedar Park	19,446	Highland Lakes System (LCRA)
City of Cleburne	9,393	Trinity Aquifer, Lake Aquilla, Lake Pat Cleburne, Reuse Supplies
City of Gatesville	5,652	Lake Belton
City of Mineral Wells	5,084	Lake Palo Pinto
City of Round Rock	28,761	Edwards BFZ Aquifer, Lake Stillhouse Hollow, Lake Georgetown
City of Stamford	3,252	Lake Stamford
City of Sweetwater	3,850	Dockum Aquifer
City of Temple	22,601	Lake Belton, run-of-river water right (Leon River)
City of Waco	52,211	Lake Waco, Lake Brazos, Reuse Supplies
Eastland County WSD	5,411	Lake Leon, Run-of-River Right
Heart of Texas Water Suppliers LLC	5,600	Carrizo-Wilcox Aquifer
Johnson County SUD	10,983	City of Mansfield (Region C), Lake Granbury, Trinity Aquifer
Kempner WSC	4,400	Lake Belton, Lake Stillhouse Hollow
North Central Texas MWA	1,797	Millers Creek Reservoir
Palo Pinto County MWD No. 1	9,414	Lake Palo Pinto
Upper Leon MWD	4,572	Lake Proctor (BRA)
West Central Texas MWD	27,900	Hubbard Creek Reservoir
Out of Region WWPs		
Colorado River MWD	15,000	Lake Ivie (to Brazos G)
Lower Colorado River Auth.	49,400[3]	Lake Travis (to Brazos G)
Trinity River Authority	ND	TRWD (Region C to Brazos G)
City of Fort Worth	ND	TRWD (Region C to Brazos G)
City of Arlington	ND	TRWD (Region C to Brazos G)
City of Mansfield	ND	TRWD (Region C to Brazos G)

[1] Contracted volumes through 2020
[2] Includes contracts in other regions.
[3] Brazos G contracts only.

1.6.2 Districts and Water Supply Corporations

Aquilla Water Supply District

Aquilla Water Supply District is located in Hill County, and obtains raw water from Lake Aquilla through a contract with the BRA. The district supplies treated water to five wholesale customers. The City of Hillsboro is the district's largest customer, with a contract to purchase up to 4,200 acft/yr.

Bell County WCID No. 1

Bell County WCID No. 1 obtains raw water from Lake Belton for distribution to its customers. Major customers include the U.S. Department of the Army (Fort Hood) and the Cities of Belton, Copperas Cove, Harker Heights, and Killeen. The District also provides treated water to customers under the customers' individual BRA contracts.

Bistone Municipal Water Supply District

The Bistone Municipal Water Supply District owns and operates Lake Mexia in Limestone County, with authorized diversions for municipal and industrial use of 2,887 acft/yr. The MWSD also utilizes groundwater from the Carrizo-Wilcox Aquifer. The MWSD serves the City of Mexia and other entities in Limestone County.

Bluebonnet Water Supply Corporation

The Bluebonnet Water Supply Corporation (WSC) is located in Bell County. The WSC obtains raw water from Lake Belton, and sells treated water to eight entities in the BGRWPA.

Central Texas Water Supply Corporation

Central Texas WSC contracts with the BRA to obtain raw water from Lake Stillhouse Hollow, and holds contracts to supply 17 entities in Bell, Williamson and Lampasas Counties.

Eastland County Water Supply District

The Eastland County Water Supply District owns and operates Lake Leon and has a water right to divert 5,800 acft/yr for municipal and industrial purposes and 500 acft/yr for irrigation. The district currently provides treated water to entities in Eastland County through the Cities of Eastland and Ranger.

Heart of Texas Water Suppliers LLC

The Heart of Texas Water Suppliers own and operate a well field in the Carrizo-Wilcox Aquifer in Williamson County and permits with the Lost Pines Groundwater Conservation District in Lee County for 3,300 acft/yr. Heart of Texas has a contract to provide 5,600 acft/yr to the City of Hutto.

North Central Texas Municipal Water Authority

North Central Texas Municipal Water Authority supplies treated water to entities in Knox, Haskell and Stonewall Counties. The district has water rights to divert 5,000 acft/yr of raw water from Millers Creek Reservoir for municipal, industrial, and mining purposes.

Palo Pinto County Municipal Water District No. 1

Palo Pinto County Municipal Water District No. 1 owns and operates Lake Palo Pinto, which is used to supply water to entities in Palo Pinto and Parker Counties (Region C). The district has rights to 18,500 acft a year for municipal and steam electric power uses. Treated water is supplied to the City of Mineral Wells (and its customers) and Lake Palo Pinto Water Association. The district is currently pursuing the Turkey Peak Reservoir project to increase its total reservoir storage capacity to the volume authorized in its water rights.

Upper Leon Municipal Water District

The Upper Leon Municipal Water District obtains water from Lake Proctor through contracts with the BRA. The MWD provides treated water to the Cities of Comanche, De Leon, Dublin, Gorman, and Hamilton. The MWD also has a contract to sell water to Stephenville.

West Central Texas Municipal Water District

The West Central Texas Municipal Water District owns and operates Hubbard Creek Reservoir, and provides water to the Cities of Abilene, Albany, Anson, and Breckenridge. This district has rights to 56,000 acft/yr of water for municipal, industrial, irrigation, and mining uses.

1.6.3 Municipal WUGs

City of Abilene

The City of Abilene obtains raw water from Lake Fort Phantom Hill, Lake Abilene, and Lake Kirby, all of which it owns and operates. The total permitted capacity of these reservoirs is about 94,300 acft. The City has the right to divert up to 37,365 acft/yr from these lakes for municipal, industrial, and irrigation uses. The City also uses surface water purchased from the West Central Texas Municipal Water District, and surface water purchased from CRMWD (Lake Ivie). The City has contracts to supply treated water to 14 entities in the BGRWPA and the Dyess Air Force Base, which is located in Abilene. The City also has a contract with the City of Hamlin to treat raw water from Hubbard Creek Lake that is purchased from the City of Anson.

City of Anson

The City of Anson receives surface water supplies from West Central Texas MWD and Lake Anson North. Although the City owns Lake Anson North, the water resource is unreliable and is not considered a supply. The City has a 1.8 MGD WTP for its own demand. Anson sells supply to Hawley WSC and City of Hamlin and contracts with Abilene to provide treatment for these supplies.

City of Bryan

The City of Bryan owns wells in the Carrizo-Wilcox Aquifer as well as a bed and banks water right permit for reuse of the city's wastewater effluent. The City of College Station, Wellborn SUD and Wickson Creek SUD have agreements with Bryan to purchase or sell potable water through metered lines. These connections are typically only used during times of high demand or in emergency situations.

City of Cleburne

The City of Cleburne obtains its water supply from Lake Pat Cleburne, Lake Aquilla, and groundwater from the Trinity Aquifer. The City of Cleburne also has contracted supplies from Lake Whitney that are not yet connected. The City of Cleburne provides treated supplies for manufacturing use and wastewater reuse supplies for steam-electric customers in Johnson County.

City of Gatesville

The City of Gatesville is supplied by a 5,898 acft/yr BRA contract for water from Lake Belton. The City provides treated supplies to five municipal water user groups in Coryell County including supply for all the projected demand for Coryell City Water Supply District.

Johnson County SUD

Johnson County Special Utility District (SUD) is located in Johnson, Hill, Ellis (Region C) and Tarrant (Region C) counties. The SUD obtains its water supply from groundwater from the Trinity Aquifer, and a contract with the Brazos River Authority for water from Lake Granbury and a contract with the City of Mansfield (10,089 acft/yr) for water from the Tarrant Regional Water District.

Kempner WSC

Kempner WSC has service area in portions of Coryell, Bell, Burnet (Region C) and Lampasas Counties. The WSC receives surface water supplies from the Brazos River Authority out of Lake Stillhouse Hollow. Kempner WSC sells supplies to the cities of Kempner, Copperas Cove, Lampasas, as well as to Salado WSC and Lampasas County-Mining.

City of Mineral Wells

City of Mineral Wells obtains raw water from Lake Mineral Wells and additional surface water supplies from Palo Pinto MWD #1. The city supplies treated water to ten water user groups in Palo Pinto and Parker County (Region C).

City of Round Rock

The City of Round Rock obtains raw water from the Edwards (BFZ) Aquifer and purchases additional water from the Brazos River Authority through Lake Stillhouse Hollow and Lake Georgetown. The City sells wholesale water to local providers in Williamson County. Round Rock is a participant in the Brushy Creek Regional Utility Authority project to obtain supplies from the Highland Lakes.

City of Stamford

The City of Stamford obtains supply from Lake Stamford and supplies water to several entities in Jones and Haskell Counties. The City of Stamford is authorized to store up to 60,000 acre-feet in Lake Stamford and to divert 10,000 acft/yr from Lake Stamford. The City also constructed a diversion structure on California Creek to divert from California Creek to Lake Stamford to augment supplies in the reservoir.

City of Sweetwater

The City of Sweetwater owns and operates two reservoirs in the BGRWPA, Lake Sweetwater and Lake Trammel, and a groundwater well field in the Dockum Aquifer. The City also owns and operates the Oak Creek Reservoir in Coke County (Region F) in the Colorado River Basin. The City of Sweetwater provides wholesale water to entities in Nolan and Fisher Counties, and the City of Bronte in Region F.

City of Temple

The City of Temple holds water rights for 15,804 acft/yr from a 500 acre-foot reservoir on the Leon River, and contracts with the Brazos River Authority for an additional 30,453 acft/yr from Lake Belton. The City provides supply to the Cities of Little River-Academy, Morgans Point Resort, and Troy, also supplies effluent from its wastewater treatment plan to a new generating station owned by Panda Power.

City of Cedar Park

The City of Cedar Park in Williamson County obtains supply from the Highland Lakes and provides wholesale water to entities in Williamson and Travis Counties. The City is a participant in the Brushy Creek Regional Utility Authority to develop additional supplies from the Highland Lakes.

City of Waco

The City of Waco obtains raw water from Lake Waco, and a small amount of groundwater from the Trinity Aquifer. In 2003, the City, in cooperation with the BRA and the U.S. Army Corps of Engineers, implemented a project to raise the water level in Lake Waco to provide for additional supply. With this additional supply, the City has the right to divert 79,870 acft/yr from Lake Waco for municipal, industrial, and irrigation uses. The City provides treated water to multiple neighboring communities and water supply corporations. The Waco Metropolitan Area Regional Sewerage System (WMARSS) facility is operated by the City of Waco on behalf of the member cities of Bellmead, Hewitt, Lacy Lakeview, Lorena, Robinson and Woodway. Effluent from the WMARSS is reused used to supply steam-electric cooling supply, and multiple other reuse projects are planned to offset potable water use for manufacturing and landscape irrigation in McLennan County.

1.6.4 Out-of-Region Wholesale Water Providers

Lower Colorado River Authority

The Lower Colorado River Authority (LCRA) manages much of the lower Colorado River Basin through the Highland Lake System (Lake Buchanan, Inks Lake, Lake LBJ, Lake Marble Balls, Lake Travis and Lake Austin) and is a significant regional water provider in Region K. The LCRA's two primary water supply reservoirs are Lakes Travis and Buchanan, with the rest of the Highland Lakes operating as balancing reservoirs. In the BGRWPA, LCRA provides raw water to the Cities of Cedar Park and Leander from Lake Travis. The cities of Cedar Park, Leander and Round Rock have formed the Brush Creek Regional Utility Authority (Brushy Creek RUA), and are pursuing additional supplies from the Highland Lakes, as described in Volume II, Chapter 7.2. The BRA and the LCRA have formed the Brazos-Colorado Water Alliance to identify water supply and treatment alternatives to meet the future needs of the Brazos and Colorado River Basins.

Colorado River Municipal Water District

Colorado River Municipal Water District (CRMWD) provides water to customers in the upper Colorado River Basin (Region F) and the City of Abilene in the BGRWPA. Treated water from the City of Snyder, a CRMWD member city, is supplied to the City of Rotan in Fisher County in the BGRWPA. The district owns and operates multiple sources of raw water including three reservoirs (O.H. Ivie, J.B. Thomas and E.V. Spence) and several groundwater well fields. In the BGRWPA, the district is contracted to provide up to 15,000 acft of raw water per year to the City of Abilene from Lake Ivie.

Other Wholesale Water Providers in Region C

The Trinity River Authority, City of Fort Worth, City of Arlington and the City of Mansfield provide supplies from Region C to WUGs and WWPs in Johnson County, and minor amounts of supply to Hill and Limestone Counties.

1.7 Current Water Users and Demand Centers

1.7.1 Regional Water Use

Total water use by each county in the BGRWPA is provided in Figure 1-12 for 2010. Water use can be classified into four general types of use: municipal, industrial, agricultural, and non-consumptive. Figure 1-13 shows historical water use by municipalities, industries, and agriculture in the BGRWPA. Industrial use can be further broken down into three sub-categories: manufacturing, steam-electric cooling, and mining. Agricultural use consists of the subcategories of water used for irrigation and livestock. Historical water use in the planning area for six categories is summarized in Table 1-8.

Historical water use data for all counties and categories of use in the BGRWPA are included in Appendix A. Historical surface water use greater than or equal to 1,000 acft is presented in Appendix D for each surface water right holder.

1.7.2 Municipal Use

Municipal water use includes water consumed by residences, commercial enterprises and institutions. Residential and commercial uses are categorized together because they are similar types of uses (i.e., they both use water primarily for drinking, cleaning, sanitation, air-conditioning, and landscape watering). Generally, municipal use does not include water use by large industries. Projections for future municipal use take into account population growth and anticipated efforts at water conservation. Municipal use of 326,414 acft accounted for about 38 percent of the region's total water use in 2010. Figure 1-14 shows municipal water use in each BGRWPA county in 2010.

Figure 1-12. 2010 Total Water Use by County

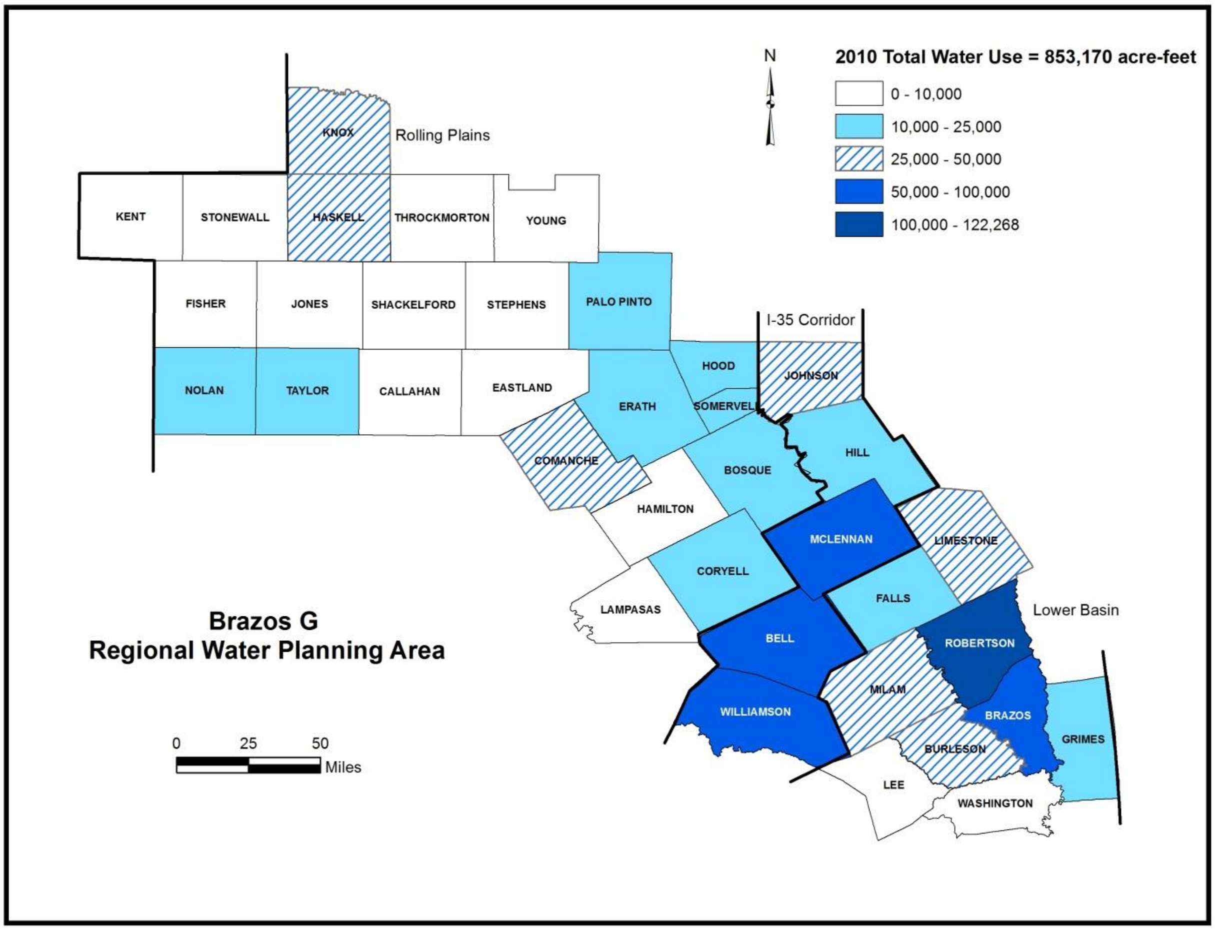


Figure 1-13. BGRWPA Historical Water Use by Type

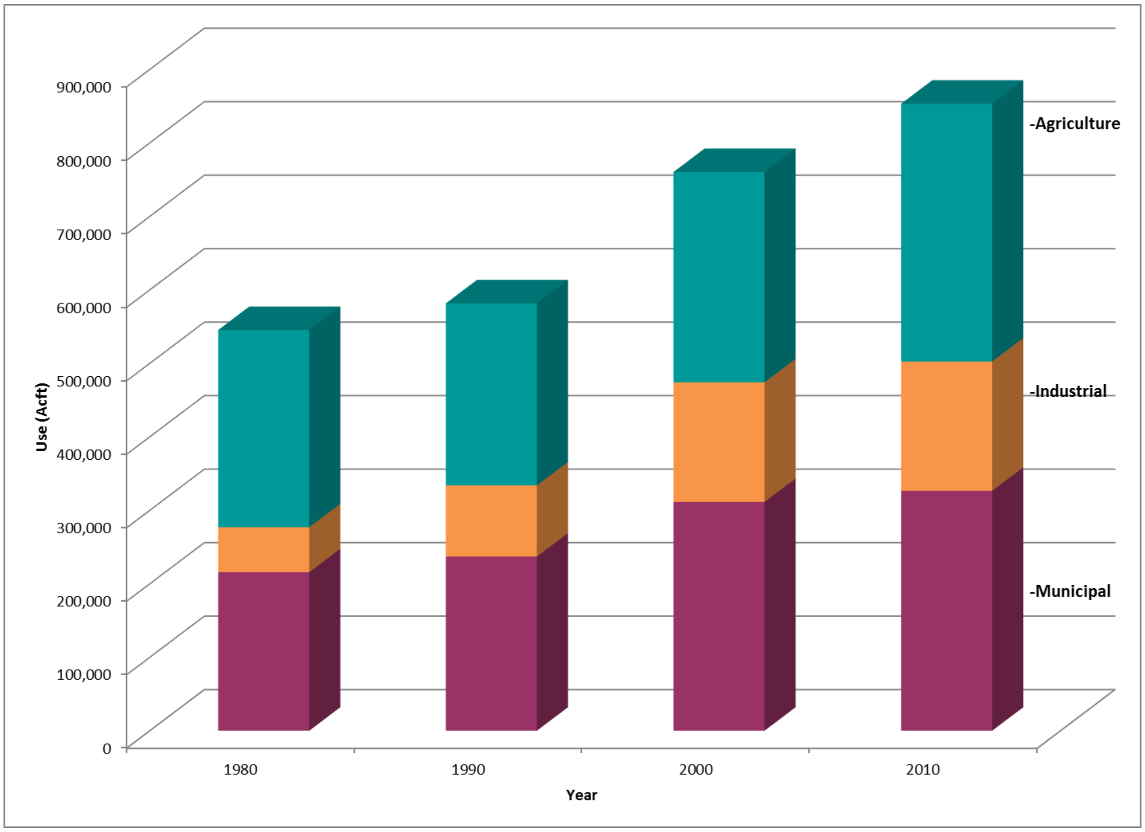
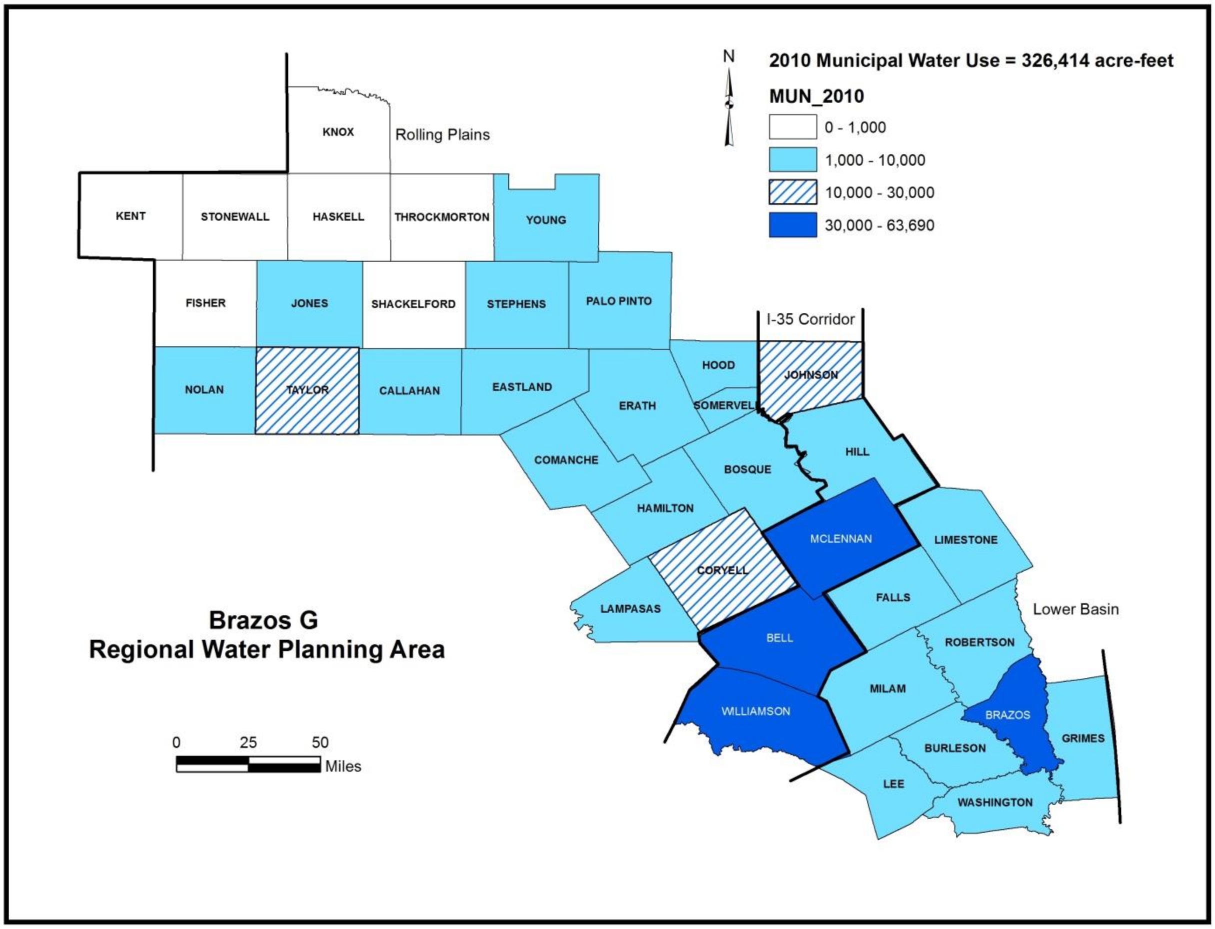


Table 1-8. BGRWPA Historical Water Use (acft/yr)

Category	1980	1990	2000	2010
Municipal Use	215,744	236,955	311,291	326,414
Manufacturing Use	21,124	32,240	60,522	46,131
Steam-Electric Use	28,686	57,657	97,921	76,545
Mining Use	11,413	6,944	4,382	53,383
Irrigation Use	229,387	200,954	232,911	298,754
Livestock Use	38,915	46,770	53,222	51,943
Total Use	545,269	581,520	760,249	853,170
Percent of State Total	**3.74**	**3.99**	**4.69**	**6.16**
Source: Texas Water Development Board				

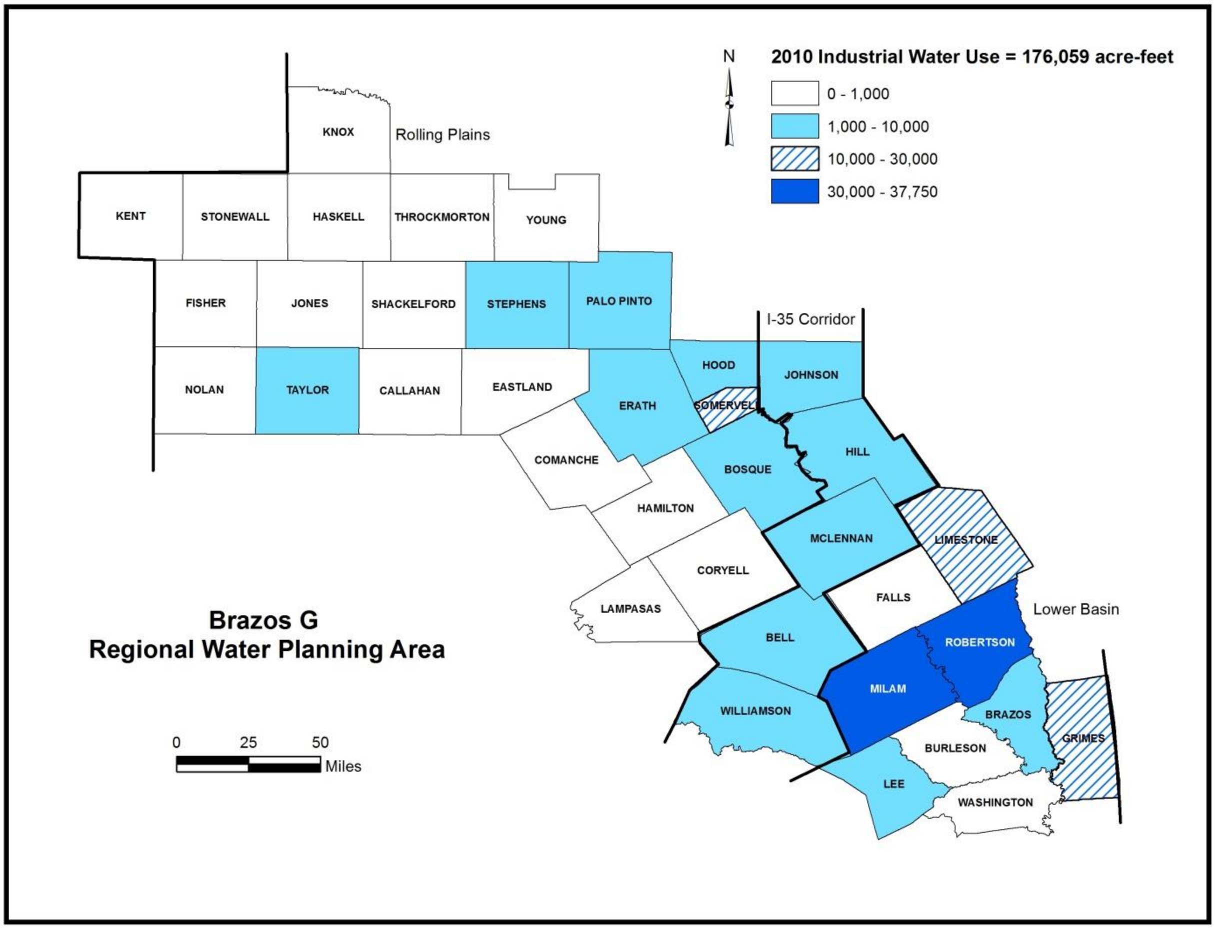
Figure 1-14. 2010 Municipal Water Use



1.7.3 Industrial Use

Industrial use consists of water used for manufacturing, for steam-electric cooling during power generation, and for mining operations. Projections for industrial use take into account expected growth of industries, population changes, available mineral reserves, and production rates. In 2010, industrial use was 176,059 acft, or about 21 percent of the total water used in the BGRWPA. Refer to Figure 1-15 for 2010 industrial water use by county.

Figure 1-15. 2010 Industrial Water Use (Manufacturing, Steam-Electric Cooling, and Mining)



Manufacturing

Manufacturing use is water used for producing finished goods. Manufacturing use was 46,131 acft in 2010, or 26 percent of total industrial water usage that year.

Steam-Electric Cooling

This category is water used during the power-generation process and is typically losses due to forced evaporation during cooling. Water that is diverted and not consumed (i.e., return flow) is not included in the power-generation total. Water use for steam-electric cooling in 2010 was 76,545 acft, or 43 percent of total industrial water use.

Mining

Mining use is water consumed for exploration and production of oil and gas, and for mining of lignite, sand, gravel, and such. Mining use in 2010 was 53,383 acft, or 30 percent of the total industrial water use.

1.7.4 Agricultural Use

Agricultural use is water used for irrigation and for watering livestock. Agricultural use was 350,697 acft in 2010 or 41 percent of the BGRWPA's total water use. Refer to Figure 1-16 for agricultural water use by each county in the planning area in 2010.

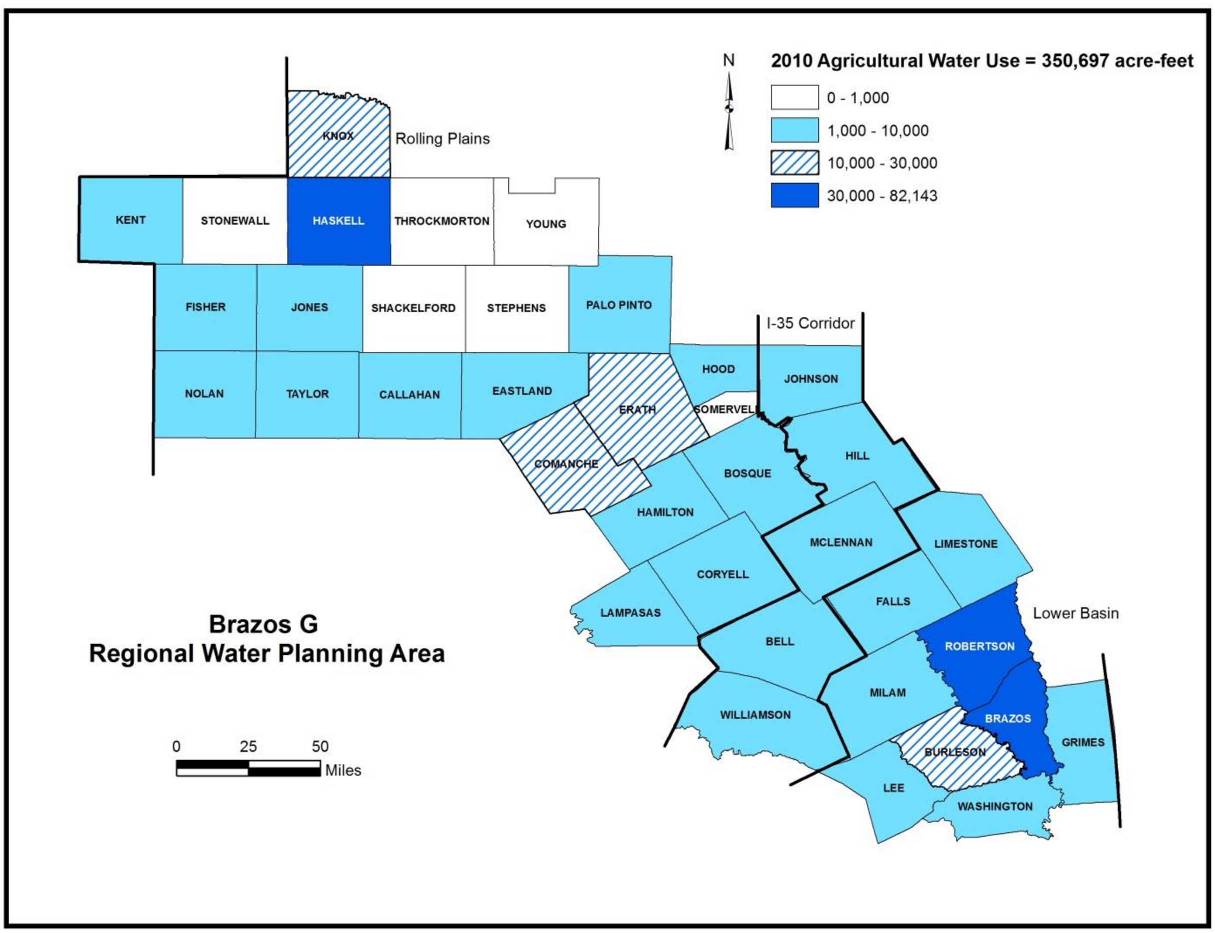
Irrigation

Irrigation use in 2010 totaled 298,754 acft, or about 85 percent of the total agricultural water use. Refer to Appendix F for more detailed information about irrigation use in the BGRWPA.

Livestock Watering

The estimate of use for livestock watering is based on a determination of the total number of livestock in the region. A uniform water-consumption rate for each type of animal is applied to this total number. The categories of livestock considered are cattle and calves; poultry; sheep and lambs; and hogs and pigs. Livestock watering totaled 51,943 acft, or 15 percent of agricultural use in 2010. Refer to Appendix F for more detailed information on water used for livestock.

Figure 1-16. 2010 Agricultural Water Use (Livestock and Irrigation)



1.7.5 Non-Consumptive Use

Non-consumptive use is water that is diverted and then returned to the river basin with minimal change in volume and temperature, or is used but never leaves the river system. The majority of non-consumptive water use in the BGRWPA is associated with recreational use and the return flow from power generation. Water-related recreational activities include boating, camping, fishing, and swimming. Recreational use in the BGRWPA is supported by numerous state parks and by public facilities for boating and camping at various lakes and reservoirs.

Navigation is another form of non-consumptive use. Other than small watercraft used primarily for recreation on lakes and rivers, the BGRWPA includes no use of water for navigation. No water management strategy considered by the BGRWPG will affect navigation, either in the BGRWPA or in adjacent regions.

Power generation demands large amounts of water for cooling equipment. Twenty steam-electric power-generating facilities were operating in the BGRWPA in 2008 (BEG, 2008). Most of the diverted water was returned to the Brazos River Basin. Water that is lost to evaporation during the cooling process is considered industrial use, and is discussed in Section 1.7.3.

1.8 Natural Resources

1.8.1 Regional Vegetation

The BGRWPA lies within several different ecoregions, or vegetational areas[11] which are relatively homogenous areas in terms of geography, hydrology, and land use. Figure 1-17 shows the locations of the five ecoregions in the BGRWPA: the Rolling Plains, Blackland Prairies, Post Oak Savannah, Cross Timbers and Prairies, and Edwards Plateau. A general description for each ecoregion is provided below. More detailed information is provided in Appendix E.

Rolling Plains

The Rolling Plains are part of the Great Plains of the central United States. The Rolling Plains region covers about 24 million acres of gently rolling to moderately rough terrain. The region is bordered on the west by the Caprock Escarpment, on the south by the Edwards Plateau, and on the east by the Cross Timbers and Prairies region. Annual precipitation averages about 22 to 30 inches, and elevations range from 800 to 3,000 feet above sea level. The eastern part of the Rolling Plains is called the Reddish Prairie. Soils vary from coarse sands in outwash terraces near streams to tight clays or red-bed clays and shales.

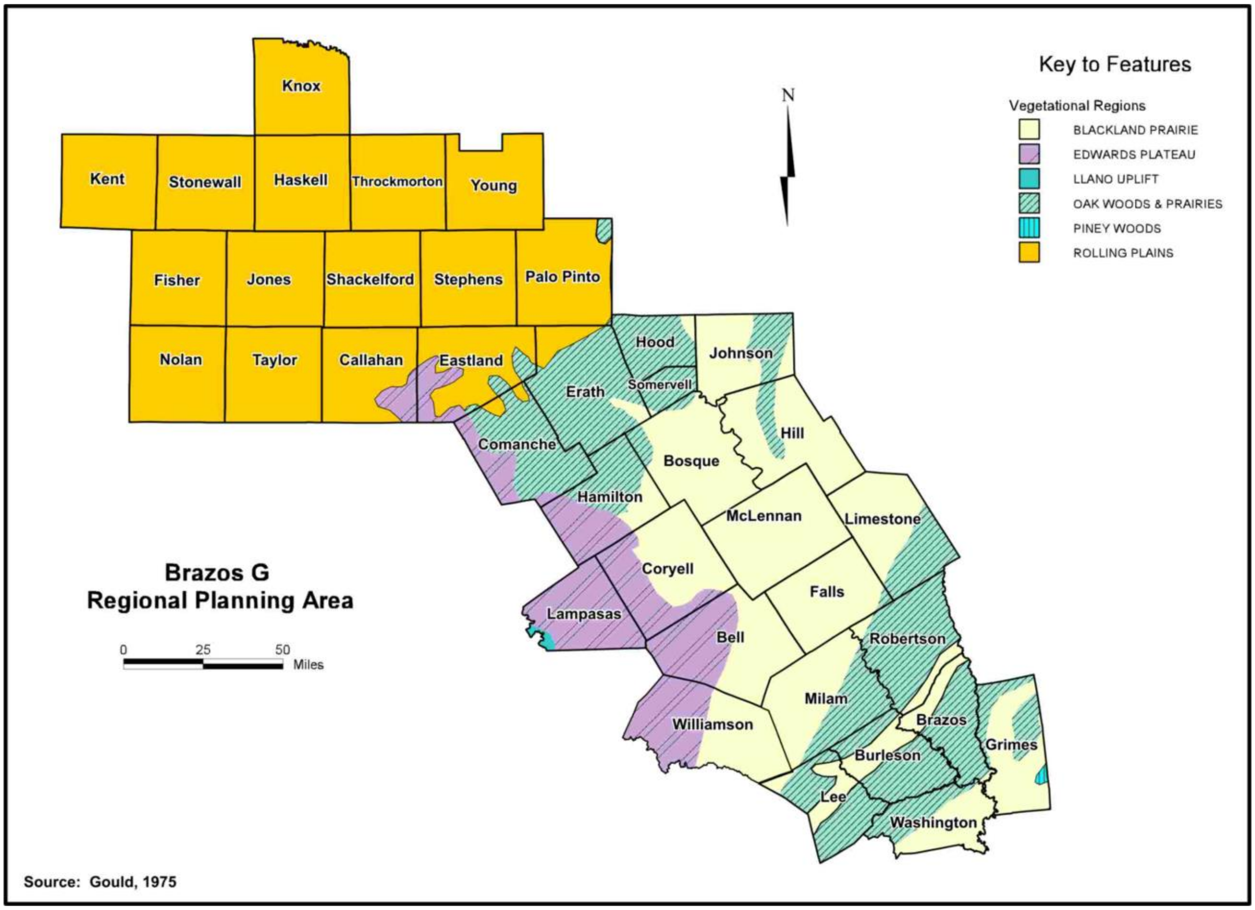
Blackland Prairies

The Blackland Prairies region consists of nearly level to gently rolling topography. It covers about 11.5 million acres from Grayson and Red River Counties in northeast

[11] Gould, F.W., *The Grasses of Texas*, Texas A&M University Press, College Station, Texas, 1975.

Texas to Bexar County in the south-central part of the State where it merges with the brush land of the Rio Grande Plains. Annual precipitation is 30 to 45 inches, and elevations range from 300 to 800 feet above sea level. The term blackland comes from the uniformly dark-colored, calcareous clays in the Alfisols (fertile mineral soils). Soils in the Blackland Prairies are interspersed with gray-colored, acidic sandy loams. This highly fertile region has widely been used for agriculture, but it is increasingly used for ranching.[12] Experts estimate that less than one percent of the Blackland Prairies remain in a near-natural condition.[13]

Figure 1-17. Ecoregions of the Brazos G Area



Post Oak Savannah

The Post Oak Savannah covers about 8.5 million acres in east-central Texas and consists of closely associated and intermingled prairies and woodlands on slightly acidic sandy or clay loams. Topography in this region is gently rolling to hilly, with moderate to deeply dissected drainage paths. Soils in uplands are generally light-colored, acidic

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[12] Gould, F.W. and Schuster, J.L. and Hatch, S.L., *Texas Plants B, An Ecological Summary*, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, 1990.

[13] Smeins and Diamond, 1986.

sandy loams or sands, and soils in bottomlands are light-brown to dark-gray acidic sandy loams or clays. Much of this vegetational area is used for crops and grazing.

Cross Timbers and Prairies

The Cross Timbers and Prairies vegetational area covers about 17 million acres in north-central Texas. Geology in this area is diverse, and the topography varies from gently rolling to hilly to deeply dissected. Rapid surface drainage is typical throughout the region. Soils are typically brown, neutral-to-slightly acidic, sandy or clay loams.

Edwards Plateau

The Edwards Plateau area covers about 24 million acres. This includes a large portion of the Hill Country in west-central Texas, the Llano Uplift, and the Stockton Plateau. Average annual precipitation increases from west to east across this region. Limestone or caliche typically underlie the shallow, variably-textured soils, although granitic rock underlies soil in the Llano Uplift. Land use in this vegetational area is dominated by ranching of cattle, sheep, and goats. This region reportedly once was dominated by a grassland or an open savannah climax community, except in steep canyons and slopes where junipers and oaks were dominant. The widespread disturbance associated with grazing livestock eventually allowed brush and tree species to spread widely throughout the original grasslands and savannahs.

1.8.2 Regional Geology

Figure1-18 shows the varied geology of the planning area. Generally, the formations in the northwest part of the planning area are the older Blaine and San Angelo Formations of the Paleozoic era. The central part of the planning area is typically dominated by younger formations from the Cretaceous era, such as the Trinity Group; the Navarro and Taylor Groups; and the Austin, Eagle Ford, Woodbine, and U. Washita Groups. The youngest formations are in the southern part of the planning area. These formations include the Cook Mountain, Weches, Sparta, and Yegua, among others. Many areas near streams and rivers are dominated by alluvial deposits.

1.8.3 Soils

The soils of the upper Brazos River Basin are agriculturally and ecologically important. Throughout the Brazos G Area, soils are varied and are influenced by both geology and surface drainage. Figure 1-19 shows the locations of different orders of soil in the BGRWPA. These soil types are briefly described in the following subsections.

Figure 1-18. Geology of the Brazos G Area

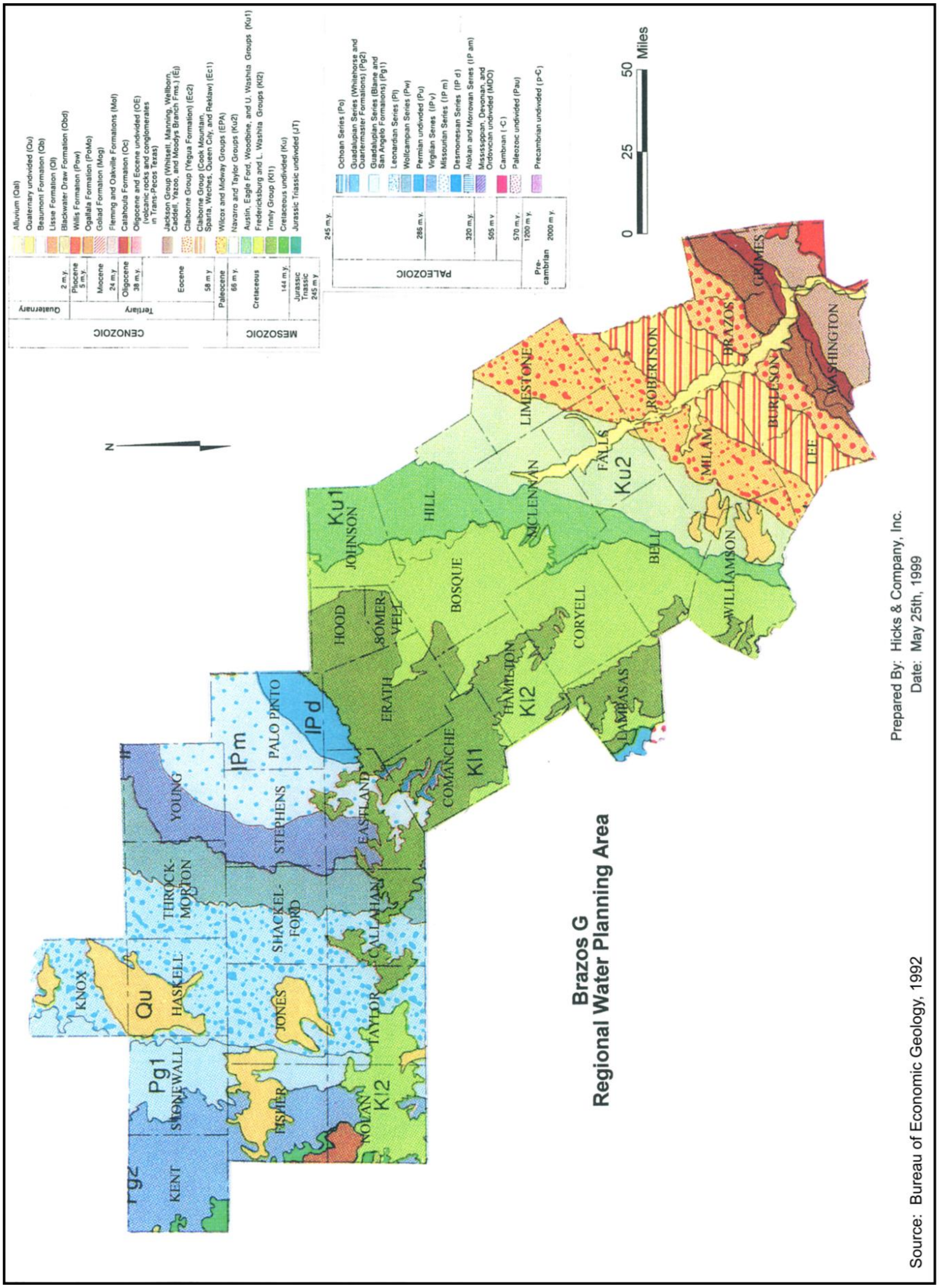
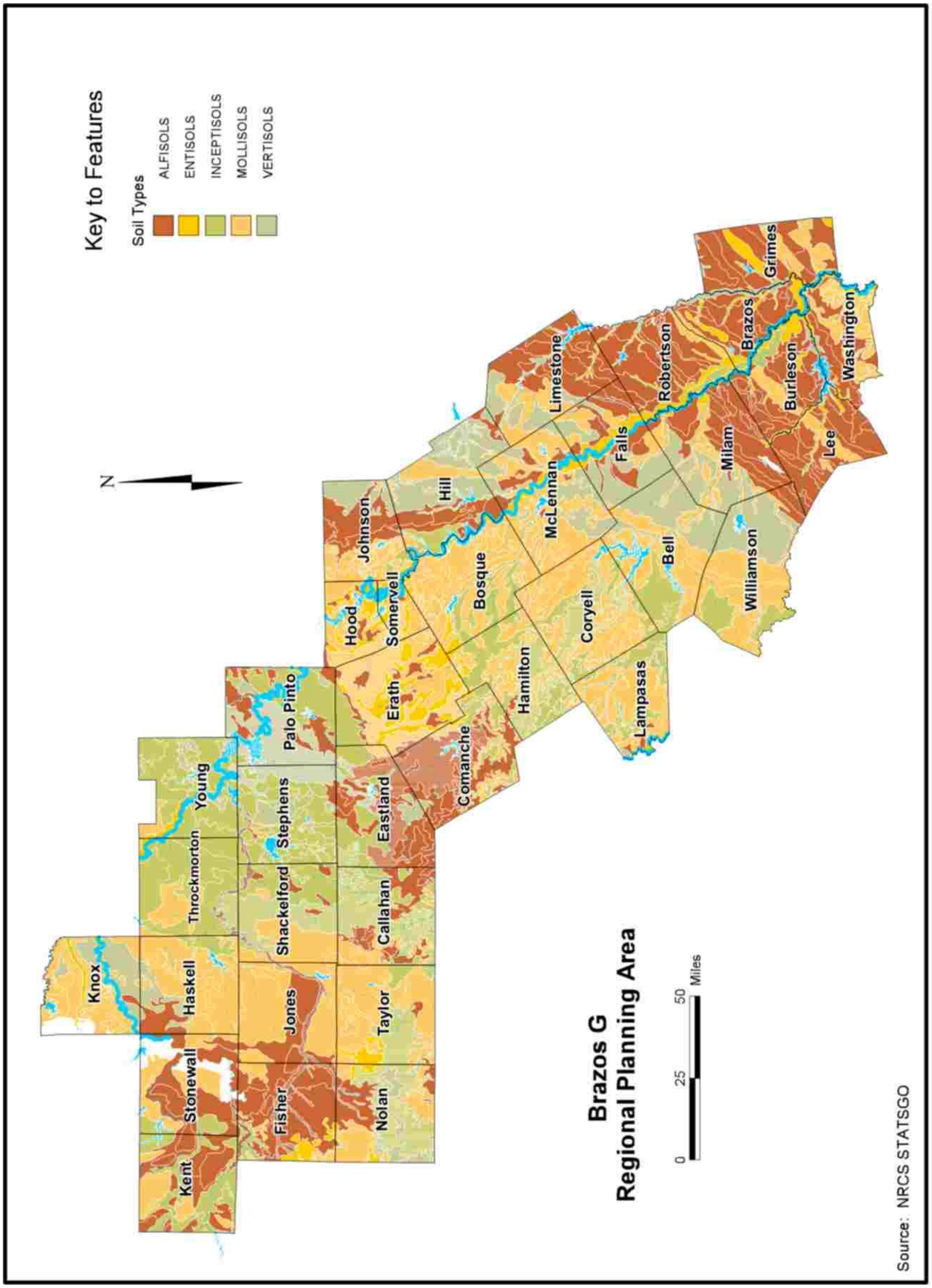


Figure 1-19 Soils of the Brazos G Area



Alfisols

Alfisols are mineral soils with a gray-to-brown surface horizon. These soils form under humid, cool-to-hot areas of native grasslands. They are productive and favor good crop yields.

Entisols

Entisols are typical of rangeland in west and southwest Texas. In this order, soils range from infertile sands and bedrock to highly productive soils on recent alluvium. A characteristic common to all Entisols is the lack of significant profile development.

Inceptisols

Inceptisols are thought to form relatively quickly from the alteration of parent material. Productivity varies among soils in this order, and it is affected by factors such as levels of organic matter and drainage. Typically, Inceptisols have slightly higher profile development than Entisols.

Mollisols

Mollisols are considered important agriculturally and are characterized by a thick, dark surface horizon. These soils develop under grassland-prairie vegetation typical of the central United States. Mollisols cover more land area in the United States than any other soil order.

Vertisols

Vertisols have a high clay content and therefore may develop deep cracks from shrinking during dry periods. The fine texture of Vertisols and their tendency to shrink excessively makes them generally unstable for building foundations and even for some agricultural uses.

1.8.4 Wetlands

Wetlands are defined by the U.S. Army Corps of Engineers as areas that, due to a combination of hydrologic and soil conditions, are capable of supporting hydrophytic vegetation. In the Brazos G Area, wetlands are found primarily in narrow strips along rivers and streams.

As a natural resource, wetlands are especially valued because of their location on the landscape, the wide variety of ecological functions they perform, and the uniqueness of their plant and animal communities. Many wetlands are also valued for their aesthetic qualities, as sites for educational research, as sites of historic and archaeological importance, and as locations for storing or conveying floodwaters. Wetlands provide high-quality habitats for wildlife, including foraging and nesting areas for birds and spawning and nursery areas for fish.

1.8.5 Water Resources

Rivers and reservoirs are important ecological resources for the Brazos G Area. These support diverse aquatic plants and animals as well as terrestrial wildlife living along the banks. Important rivers and creeks in the planning area include the Brazos, Leon, Bosque, Lampasas, Navasota, San Gabriel, South Wichita, Little, Clear Fork of the Brazos, and Yegua Creek. These rivers contribute to unique vegetational communities that provide habitat for wildlife. There are more than 40 species of aquatic amphibians, reptiles, and mammals in the planning area. Waterfowl heavily use the mature, hardwood, bottomland forests and forested wetlands often associated with rivers. Aquatic habitats include riffles and pools, which support both invertebrates and fish.

Reservoirs (Figure1-20) provide habitat for inland fish stocks and waterfowl. Many reservoirs in the planning area provide habitat for fish stocks and waterfowl including Lake Stamford, Hubbard Creek Reservoir, Possum Kingdom Lake, Lake Leon, Lake Proctor, Lake Whitney, Lake Stillhouse Hollow, Lake Belton, Lake Waco, and Lake Somerville.

Although few in number, the major springs and seeps in the planning area that produce frequent flows are often rich in wildlife habitat and ecological diversity. Springs represent a transition from groundwater to surface water. Where frequent springflow occurs, an abundance of moisture is provided, resulting in diverse vegetational communities unique to such areas. Typical vegetation includes willows, cottonwoods, hackberry, elms, rushes, sedges, and smartweed. These vegetational communities often provide optimal habitat for native wildlife.

1.8.6 Wildlife Resources

Biotic Provinces

Just as Texas has been divided into major ecoregions,[14] the State has also been classified into biotic provinces based on the distribution of topographic features, climate, vegetation types, and terrestrial vertebrates [15] (Figure 1-21). The BGRWPA includes the Kansan, Austroriparian, Balconian, and Texan biotic provinces.

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[14] Gould, Op. Cit., 1975.

[15] Blair, 1950.

Figure 1-20. Water Resources of the Brazos G Area

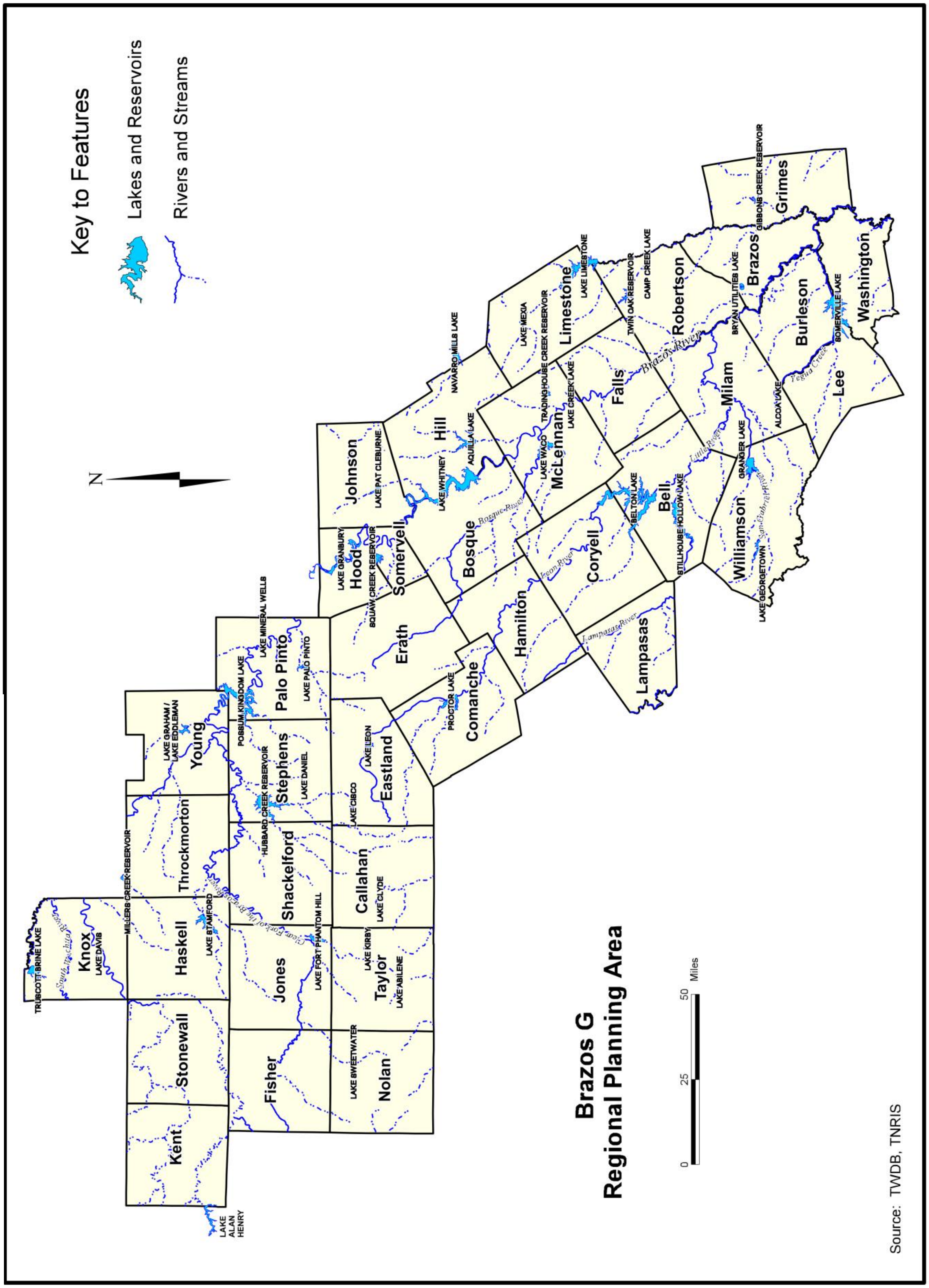
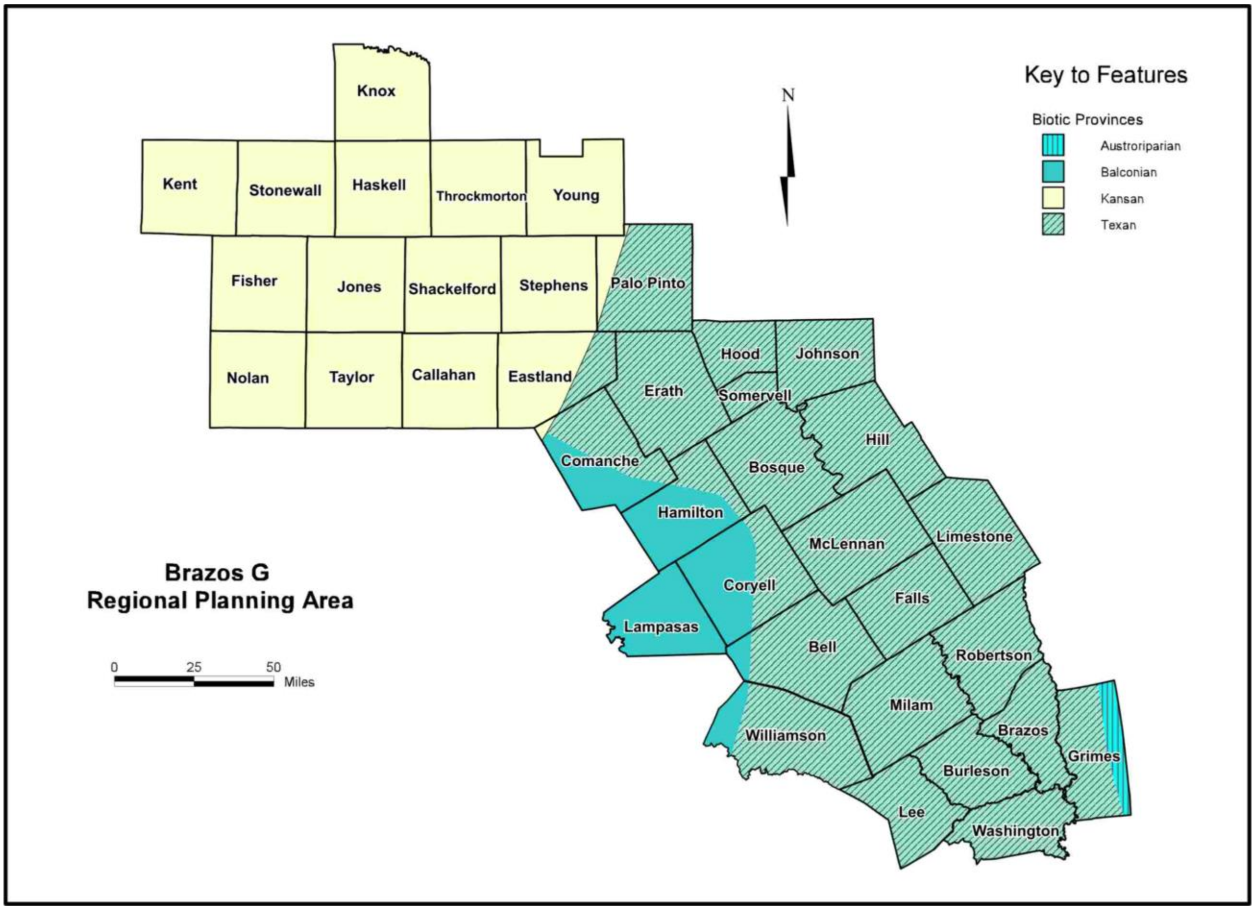


Figure 1-21. Biotic Provinces of the Brazos G Area



Kansan

The Kansan province runs southward from the Texas panhandle and across the Rolling Plains area of the Brazos G Area. It meets the Texan biotic province at the western boundary of the Cross Timbers and Prairies vegetational area. There is little available moisture in the province, and moisture that is available decreases from east to west. The plant associations vary. However, they fall into three general categories of associations: the mixed-grass plains, the mesquite-grass association, and the short-grass plains.

Austroriparian

The western fringe of the Austroriparian province extends into the southeastern rim of the Brazos G Area. This province comprises the pine and hardwood forests of the eastern Gulf Coastal plain. The province is limited to the west due to low moisture. However, vegetational communities found in the westward extensions of the province occur along drainageways where environmental conditions allow.

Balconian

The Balconian province includes most of the Edwards Plateau excluding the region west of the Pecos River. The Edwards Plateau is a physio-graphically discrete unit. It has a variety of wildlife, and its vegetation is different from that found in adjacent provinces.

The abundant vertebrate species are a mixture of Austroriparian, Tamaulipan, Chihuahuan, and Kansan.

Most of the Balconian province lies on Cretaceous limestone, but igneous intrusives and sediments of Precambrian age are exposed in the Llano Uplift. Limestone caverns and springs are common features of this province. Massive outcrops of limestone are characteristic of the stream canyons, and limestone fragments occur at the surface over almost the entire area.

Rainfall amounts typically decrease from east to west. The most characteristic plant association is the juniper-oak scrub. Mesquite is also distributed throughout the province.

Texan

The Texan biotic province has no true endemic species of vertebrates. In this area, western species tend to encroach into open habitats, and eastern species encroach along the many wooded drainageways extending through the landscape. The Texan province has supported 49 species of mammals, 39 species of snakes, 16 species of lizards, 2 types of land turtles, 18 types of toads and frogs (anurans), and 5 species of salamander (urodeles).

Threatened and Endangered Species

In planning water-management strategies, one major consideration is the potential impact on threatened and endangered species. There are a total of 16 species listed as threatened or endangered by the U. S. Fish and Wildlife Service that could potentially occur in the Brazos G Area. Some of the more widely seen of these are the golden-cheeked warbler (Dendroica chrysoparia), the black-capped vireo (Vireo atricapillus), and the bald eagle (Haliaeetus leucocephalus). Appendix E contains a complete list of threatened and endangered species in each county in the BGRWPA.

1.8.7 Agricultural Resources

Agriculture is a mainstay of the BGRWPA rural economy. Among livestock, cattle were the most significant component, approaching 1.66 million head with an additional 81,000 dairy cows in 2012. Over 17 million acres, or about 87 percent of BGRWPA's total area, were classified as farmland in 2012. Of the 17 million acres of farmland, about 4.3 million acres were classified as cropland, of which about 2.7 million acres were harvested. Refer to Appendix F for detailed listings of agricultural information for the BGRWPA.

The Texas Department of Agriculture has specified several Agricultural Statistics Districts for the purpose of keeping records. The districts within the BGRWPA are 2N and 2S (Rolling Plains), 3 (Cross Timbers), 4 (Blacklands), 5S (South East), 7 (Lampasas County), and 8N (South Central).

Rolling Plains

Counties in the Rolling Plains (Districts 2N and 2S) are Fisher, Haskell, Jones, Kent, Knox, Nolan, Stonewall, and Taylor. The major dryland products are extensive row-crops, such as cotton, and wheat. Irrigation comes from the Seymour Aquifer where available. Major crops include wheat and cotton. Hay and silage are also produced, but because of low rainfall, their acreage is much less than in other districts in the BGRWPA.

Cross Timbers

The Cross Timbers counties (District 3) are Callahan, Comanche, Eastland, Erath, Hood, Palo Pinto, Shackelford, Somervell, Stephens, Throckmorton, and Young. Combined, these counties lead the State in dairy production. This is due to several factors such as available groundwater from the Trinity Aquifer, soils suitable for forage production, topography conducive to dairy operation, and an existing infrastructure. The major crops produced in the Cross Timbers are hay and silage, with smaller amounts of peanuts, pecans, and vegetables irrigated from the Trinity Aquifer.

Blacklands

The Blacklands counties (District 4) are Bell, Bosque, Coryell, Falls, Hamilton, Hill, Johnson, Limestone, McLennan, Milam, and Williamson. Lampasas County (District 7) is included for the purposes of this analysis. The Blacklands is noted for dryland production of corn for grain, grain sorghum, wheat for grazing and grain, cotton, and hay. Irrigation in the Blacklands is limited by lack of sufficient groundwater supply.

South East and South Central Texas

South East and South Central Texas counties (District 5S and 8N) are Brazos, Burleson, Grimes, Lee, Robertson, and Washington. This subregion has limited row-crop agriculture because suitable topography and soils are limited. Hay and silage are the major agricultural products. The Brazos River Bottoms counties (Brazos, Burleson, and Robertson) produce most of the crops in the subregion, including corn for grain, grain sorghum, and cotton. The Brazos River Alluvium is the major source of groundwater for the Brazos River Bottoms.

1.9 Threats and Constraints to Water Supply

Projected population growth in the region, particularly along the IH-35 Corridor, will strain existing municipal supplies. The population of Williamson County within Region G, for example, is expected to increase more than four-fold by the year 2070 to about 1,523,206 people. Water will become even more valuable, especially in the western and central parts of the BGRWPA, due to limited options for new reservoirs and because the aquifers in these areas have limited potential for further development.

Other concerns include the high content of chloride in surface-water runoff from the upper Brazos River Basin. Water with high chloride content is more expensive to treat and therefore places capital constraints on suppliers who obtain surface water from affected streams and reservoirs.

As of July 27, 2015, the presence of zebra mussels, an invasive species impacting water quality in reservoirs and water supply infrastructure, has been identified in Lake Waco and Lake Belton.[16]

1.9.1 Susceptibility of Water Supplies to Drought

Groundwater

The 15 aquifers within the BGRWPA vary in drought resistance, but all tend to have more resistance than most surface-water reservoirs. Most of the thick, deep, and extensive sand aquifers with moderate to high transmissivity react very slowly to droughts. Their supplies are virtually drought-proof even during long droughts. These aquifers, such as the Carrizo-Wilcox and Gulf Coast Aquifers, store enormous amounts of water. Somewhat thinner, yet still extensive, sand aquifers with low to moderate transmissivity commonly are only slightly less drought-resistant. These aquifers include the Trinity, Woodbine, Queen City, Sparta, and Hickory.

During long droughts, shallow alluvial aquifers from which large withdrawals are made experience water level declines that are relatively large in comparison to total saturated thickness. Supplies from these aquifers, such as the Seymour and Brazos River Alluvium Aquifers, can be affected by drought but generally only by extended droughts. In extended droughts, available well yields are typically reduced, and pumps must run longer for a given level of supply.

In thin aquifers with shallow supplies, drought resistance may not be adequate. Such aquifers in the BGRWPA include the Dockum, Blaine, and Edwards-Trinity (Plateau). Also, shallow supplies in or near outcrop areas of aquifers, even of major aquifers, may have limited drought resistance.

Aquifers composed of limestone and/or dolomite commonly are the least drought-resistant. This is because these aquifers typically have only about one-tenth as much storage per cubic foot as sand aquifers. For limestone aquifers, the amount of well development is also an important factor in drought resistance. Thus, the Edwards (BFZ) Aquifer, with more developed well capacity than is available in extended droughts, is the least drought-resistant of all the aquifers in the BGRWPA. Depending on location and exact local conditions, springflows and some Edwards (BFZ) well supplies are substantially reduced in only moderate droughts. In contrast, the Marble Falls and Ellenburger-San Saba Aquifers, which are relatively undeveloped by wells, can more slowly discharge a part of their stored water during long droughts.

In the Brazos G Area, for supplies drawing from the Edwards (BFZ) Aquifer, drought planning is critical. All of the other aquifers in the region are drought resistant due to their inherent characteristics.

[16] Texas Parks and Wildlife Department, letter commenting on the Initially Prepared 2016 Brazos G Regional Water Plan, August 14, 2015 (see Chapter 10 and Appendix I).

Surface Water

Surface water supplies in the region vary greatly, as annual rainfall ranges from 20 to 24 inches in Kent County in the northwest, to 40 to 48 inches in Grimes County in the southeast. Evaporation rates show a similarly wide variation, with the highest rates occurring in the northwestern part of the region.

Drought originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation plus transpiration). It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with drought and can intensify its severity.

Hydrological drought is associated with the effects of periods of precipitation shortfalls on surface water supply. The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency affects the water supply. Firm yields of reservoirs are estimated based on water that would be available through a repeat of the historic drought of record, which includes the effects of reduced runoff and high evaporation rates during the drought period. Water supply from run-of-the-river diversions are estimated based on water that would be available[17] through a repeat of the drought of record as well, but without the benefit of using stored water. The water supply estimates throughout this water plan are reliable through a repeat of the drought of record and are therefore not particularly susceptible to drought-induced shortages. However, the northwestern counties of the Brazos G Area are currently suffering through a particularly dry spell and data indicate new record drought conditions may be occurring.

In 2009, 2011, 2012, and 2013 priority water rights calls were made in the Brazos Basin. In July 2013 TCEQ issued an Order for the Brazos Basin including Possum Kingdom Lake and below Possum Kingdom Lake. The Order suspended or modified approximately 900 water rights in the Brazos Basin in 21 counties. The Order required the owners of larger reservoirs affected by the Order to submit pass-through plans, detailing their response to the priority call. The priority call was rescinded on October 10, 2013.

On April 9, 2014 the TCEQ directed that a new Watermaster be appointed for the Brazos River Basin including Possum Kingdom Lake and the watershed below the reservoir. The purpose of the Watermaster is to maintain compliance with water rights by monitoring stream flows, reservoir levels and water use. It is also the responsibility of the Watermaster to mediate the curtailment of water use if a priority call is initiated.

[17] Estimates of municipal and industrial run-of-river diversions are for 100 percent reliability. For irrigation uses, run-of-river reliability less than 100 percent is often acceptable.

1.9.2 Identified Water Quality Problems

Water quality varies throughout the upper, middle and lower portions of the BGRWPA. Water quality is generally good in aquifers and in the tributaries of the Brazos River. However, high concentrations of chloride are found in the main stem of the Brazos River. Three factors affecting water quality in the Brazos G Area are wastewater disposal, high-density agricultural activities, and naturally-occurring saline contamination.[18] Except for the third factor, these threats are associated with the growth of both population and the economy, which are expected to continue in the future.

Water quality data collection and assessment studies have been conducted since 1991 through the Texas Clean Rivers Program (CRP). Through collaborative efforts with other agencies and basin residents, the BRA identifies and evaluates water quality and watershed management issues, establishes priorities for corrective actions, and implements activities to improve and protect the Brazos River basin. Identified surface water quality problems within the BGRWPA are summarized according to specific regions in the basin, and are based on information from the Texas Clean Rivers Program Basin Highlights Reports[19], which are updated periodically.

Upper Basin Region

The Upper Basin Region includes the Salt and Double Mountain Forks and the Clear Fork of the Brazos River. Water quality data reveal water quality in the upper basin is impacted by high total dissolved solids (primarily chloride) concentrations. While this region contributes only 14 to 18 percent of the total Brazos River flow, the area contributes 45 to 55 percent of the total dissolved minerals and about 75 to 85 percent of the dissolved salts.

Upper Central Basin Activity Region

The Upper Central Basin of the Brazos River includes eight lakes, five watersheds, and a variety of land uses interconnected throughout the watersheds. The Upper Central Basin Region generally covers from Bell County north to Hood County. Numerous watershed protection and management projects are being conducted in this region to address declining water quality due to impacts from industrial, agricultural, municipal, and natural causes. On-going activities and water quality issues in this area include:

- In 2002, the BRA began a special study on Lake Granbury to assess impacts from septic systems in the coves throughout the lake.
- The BRA currently monitors Aquilla Creek at FM 933 in this watershed. TCEQ has been monitoring Lake Aquilla as a result of its placement on the State's 303 (d) list for impairments due to high concentrations of atrazine.
- The Bosque River Watershed drains approximately 1,652 square miles and discharges into Lake Waco. Elevated bacteria, nutrient and algal growth are

[18] Texas Natural Resource Conservation Commission (TNRCC), *Summary Report: Regional Assessments of Water Quality Pursuant to the Texas Clean Rivers Act (Senate Bill 818)*, 1992.

[19] Brazos River Authority (BRA), Texas Clean Rivers Program, https://www.brazos.org/crpHome.asp..

concerns for this watershed, due to high non-point source pollution activity generally attributed to confined animal feeding operations. There are several on-going activities undertaken by the State, BRA, City of Waco, and local entities to monitor and reduce pollution in this watershed.

- A number of sites in the Leon River watershed show concerns for elevated bacteria and nutrient concentrations, as well as depressed dissolved oxygen.
- Lake Stillhouse Hollow experiences above average water quality conditions and the watershed of the reservoir remains primarily undeveloped. Discharging into the Lampasas River downstream of the reservoir, Salado Creek is experiencing concerns from elevated nutrient concentrations.

Lower Central Basin Activity Region

Portions of the Lower Central Basin are subject to non-point source discharges and nutrient loading from agricultural activities. Data indicate that Cottonwood Branch in Brazos County near Bryan has very high concentrations of nutrients and elevated bacteria levels. Lakes Limestone and Granger also show concerns for nutrient loading that is contributing to increased aquatic plant growth.

Lower Basin Activity Region

The BRA monitors eight sites in the Yegua Creek watershed, including two sites on Lake Somerville. The lake, which spans 11,460 acres, has experienced several fish kills. Lake Somerville has experienced both elevated and depressed pH levels, which may be attributed to fluctuations in blue-green algae populations.

1.9.3 Identified Threats to Agricultural and Natural Resources

Drought and water quality are the two primary threats to agricultural and natural resources in the Brazos G Area.

Threats to Agricultural Resources

Drought is the primary threat to agricultural resources in the Brazos G Area. During long droughts, surface water supplies for unconfined livestock are diminished. If the drought extends through the season for growing forages, production is reduced due to the lack of forageable food. Additional threats to livestock arise from the reduced water supply for rural water systems that are not interconnected or that are not supplied by a reliable source. This is especially true in the northwest part of the region. Water for confined livestock (e.g., dairy cattle and poultry) and for crop irrigation typically comes from groundwater.

Water quality can also pose a threat to agricultural resources. Increased levels of salts and total dissolved solids may damage certain crops and require additional water for irrigation. High levels of salts can accumulate and reduce the ability of crops to uptake soil moisture, and can create a hardpan effect on surface soils that impedes percolation of irrigated water. As water quality degrades, crop selection and production may be limited. An additional threat to crop production is the migration into agricultural land of municipal well fields to supply groundwater to growing cities. Groundwater Conservation

Districts and Underground Water Conservation Districts have been created in part to manage groundwater supplies that may have competing interests.

Threats to Natural Resources

The Brazos River Basin within the BGRWPA is a freshwater eco-region that is defined as primarily temperate coastal rivers and lakes habitat, with high ranking habitats for fish, reptiles and amphibian species.[20] Identified threats to these biological resources stem from the combined effects of land use disturbance, reduced stream flow from prolonged droughts as well as current and future water diversions from water supply projects, lower lake levels, and impacted quality of surface and groundwater. Declining flows can affect the availability and quality of aquatic habitats and streamside vegetation and also contribute to changes in water temperature and chemistry. As discussed in Section 1.9.2, water quality in the Brazos River Basin has been degraded by increased concentrations of chlorides, dissolved metals, ammonia, nitrates, and phosphates, pesticides, algae, and fecal coliform bacteria. Under lower flow conditions, greater effects from pesticide contamination could occur through higher concentrations of chlorinated hydrocarbons and organic-phosphates. A summary of potential effects that identified threats would have on biological resources is presented in Table 1-9. The water resources impacted by water quality concerns identified in Section 1.9.2 within the Brazos River Basin are presented in Table 1-10.

Reduced stream flows and reservoir levels, which are brought on by drought and increases in water use, pose the greatest potential threat to aquatic species in the region. Lower stream flows would alter the proportion of stream runs, riffles, pools, and backwater sloughs and decrease the wetted perimeter (total available habitat). These changes in habitat may benefit some species, primarily hardy, generalist species, but would negatively impact most species and result in reduced species richness. Riparian vegetation is also threatened by less over bank flooding and a shift to more mesic (drier) conditions with a decline in those species that are dependent on flooding processes (cottonwood, willow, and pecan) and an increase in species tolerating drier conditions (hackberry and mesquite).

[20] Abell, R.A, D.M. Olson, E. Dinerstein, P.T. Hurley, J.T. Diggs, W. Eichbaum, S. Walters, W. Wettengel, T. Allnutt, C.J. Loucks, and P. Hedao. 2000. Freshwater Eco-regions of North America – A Conservation Assessment. World Wildlife Fund. Island Press. Washington D.C. 320 pp.

Table 1-9. Summary of Regional Threats to Biological Resources in the Brazos River Basin

Threat	Potential Effects to Aquatic Organisms	Potential Effects to Riparian Vegetation
	Rivers & Streams	
Lower Streamflows	Decreased stream runs, riffles, pools, and backwater sloughs resulting in lower habitat diversity and species richness.	Less overbank flooding and shift to more mesic (drier) conditions with decline in species dependent on flooding processes and increase in species tolerating drier conditions.
Lower Water Quality	Lower habitat suitability; lower habitat diversity, species richness, and abundance; possible direct and indirect adverse effects from point and non-point source contaminants.	Potentially enhanced growth from higher concentrations of phosphorus, nitrates, and other nutrients; but increased growth could be suppressed by lower water tables from declining flows, increased salinities or exposure to contaminants.
	Reservoirs	
Lower Reservoir Levels	If prolonged, less available habitat resulting in lower species diversity & species abundance. If seasonal, potential positive effects through enhanced fishery production, depending on timing and duration of subsequent rising lake levels.	Increase in growth of shoreline herbaceous and woody vegetation during lower lake levels, but growth suppressed or reversed by rising lake levels and seasonal inundation.
Lower Water Quality	Lower habitat suitability; lower habitat diversity, species richness, and species abundance.	Potentially enhanced growth from higher concentrations of phosphorus, nitrates, and other nutrients; but growth suppressed or reversed through lower water tables from declining flows, increased salinities or exposure to contaminants.
	Bays & Estuaries	
Reduced freshwater inflows	Possible change in hydrological dynamics of estuary. Projected effects would be minimal due to limited coastal marsh habitats associated with the Brazos River Estuary.	Effects considered minimal due to limited coverage resulting from previous levee construction and river channelization.

Table 1-10. Location of Threats to Biological Resources Related to Water Quality in the Brazos Basin

Identified Threats	Upper Basin	Upper Central Basin	Lower Central Basin	Lower Basin
Increased Chlorides	Salt and Double Mountain Forks; Clear Fork; White River Lake	Upper Brazos River	Lake Limestone	
Fecal Coliform Bacteria	Millers Creek	Upper Brazos River; Possum Kingdom Lake; Lake Granbury; Lake Whitney; Bosque River; Lake Waco; Lake Proctor; Leon River; Lake Belton	Central Brazos River	Lower Brazos River
Dissolved Oxygen				Lower Brazos River

Table 1-10. Location of Threats to Biological Resources Related to Water Quality in the Brazos Basin

Identified Threats	Upper Basin	Upper Central Basin	Lower Central Basin	Lower Basin
Increased Nutrients[1]	Clear Fork of the Brazos; Deadman Creek; California Creek	Bosque River; Lake Waco; Lake Proctor, Leon River; Lake Belton; Salado Creek	Central Brazos River; Still Creek/Thompson Creek; Lake Limestone; Lake Granger	Lower Brazos River
Algae		Upper Brazos River; Bosque River; Lake Waco		Lower Brazos River
Pesticides & Heavy Metals	Upper Brazos River	Upper Brazos River; Aquilla Creek		

[1] Includes: Ammonia, Phosphorus, Nitrogen, Nitrate-Nitrogen

1.10 Drought Preparations

Drought contingency plans are required by the State for wholesale water suppliers, irrigation districts, and retail water suppliers. In addition, water conservation plans are required for surface water right-holders that supply 1,000 acft/yr or more for non-irrigation use and 10,000 acft/yr for irrigation use. In addition, conservation plans are commonly included in the management plans of Groundwater Conservation Districts or Underground Water Conservation Districts.

Chapter 7 presents a more comprehensive discussion of drought preparation in the Brazos G Area.

1.11 Existing Programs and Goals

1.11.1 Groundwater Regulation

Priority Groundwater Management Areas (PGMAs)

The Texas Legislature authorized the TCEQ to identify and delineate priority groundwater management areas (PGMAs) as “those areas of the state that are experiencing or that are expected to experience, within the immediately following 25-year period, critical groundwater problems, including shortages of surface water or groundwater, land subsidence resulting from groundwater withdrawal, and contamination of groundwater supplies” (§Section 35.007, Chapter 35, Title 2, Texas Water Code).

Following a PGMA designation, TCEQ may recommend creating a groundwater conservation district (GCD) and citizens in the PGMA have two years to establish one. If a GCD is not established in the required timeframe, a GCD will be established that is consistent with the original TCEQ recommendation, which will be governed by a locally elected board of directors.

TCEQ designated two PGMA areas in the BGRWPA, the Central Texas-Trinity Aquifer PGMA and the Northern Trinity and Woodbine Aquifers PGMA, shown on Figure 1-22. TCEQ designated the Central Texas-Trinity Aquifer PGMA on October 31, 2008. Counties in this PGMA include Bosque, Coryell, Hill, McLennan, and Somervell. The Northern Trinity and Woodbine Aquifers PGMA was designated on February 11, 2009. This PGMA includes Collin, Cooke, Dallas, Denton, Ellis, Fannin, Grayson, Hood, Johnson, Montague, Parker, Tarrant, and Wise counties. Only Hood and Johnson Counties are in the Brazos G Area.

At the time of this plan, all affected counties in the PGMA areas are part of GCDs. In 2007 the Upper Trinity GCD was formed, which includes Hood County. In May 2009, Bosque County joined the Middle Trinity GCD. The Tablerock GCD, which included Coryell County, was dissolved by the Legislature; Coryell County joined the Middle Trinity GCD in 2009. In 2009, the Texas Legislature created the Prairielands GCD and the Southern Trinity GCD. The Prairieland GCD includes Johnson, Hill and Somervell counties. At this time, only McLennan County is part of the Southern Trinity GCD.

Groundwater Conservation Districts and Groundwater Management Areas

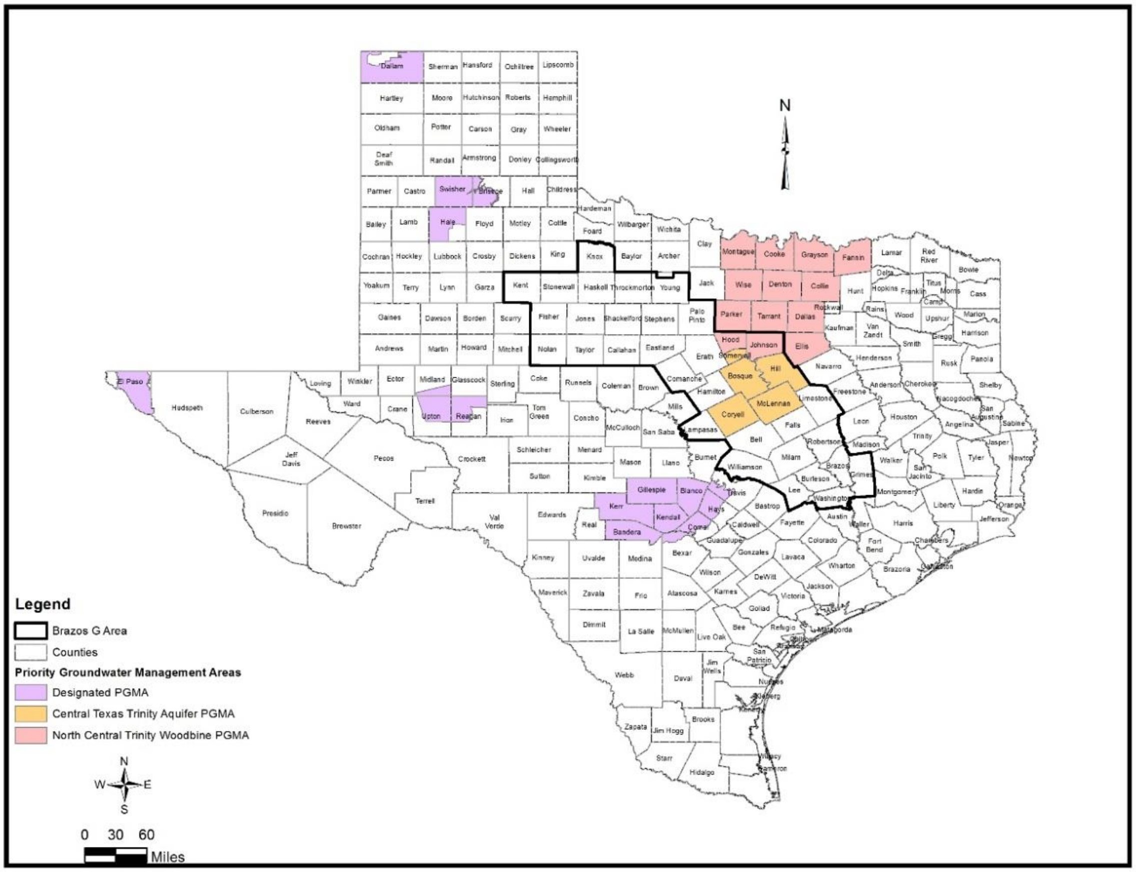
There are thirteen GCDs in the BGRPA, as shown on Figure 1-23 and listed in Table 1-11. All GCDs are required to develop and implement a management plan to manage groundwater resources. A list of the dates the GCDs' management plans were approved is shown on Table 1-11.

In 2001, Senate Bill 2 of the 77th Texas Legislature authorized the TWDB to designate Groundwater Management Areas (GMAs) that would include all major and minor aquifers of the state. Sixteen GMAs were delineated and adopted by the TWDB in 2002 and cover all major and minor aquifers in Texas. The BGRWPA intersects GMAs 6, 7, 8, 12, and 14. These GMAs are shown on Figure 1-23 and are listed in Table 1-12.

In 2005, House Bill 1763 of the 79th Texas Legislature required GCDs in groundwater management areas to meet and define the Desired Future Conditions (DFCs) of the groundwater resources within the groundwater management area. The legislation requires that the DFCs be defined by September 1, 2010 and every 5 years thereafter. This requires joint planning among the GCDs in each GMA to determine Desired Future Conditions.

Desired Future Conditions are defined by statute to be "the desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one or more specified future times as defined by participating groundwater conservation districts within a groundwater management area as part of the joint groundwater planning process." The most common DFCs are based on the volume of groundwater in storage over time, water levels (limiting decline within the aquifer), water quality (limiting deterioration of quality) or spring flow (defining a minimum flow to sustain).

Figure 1-22. Priority Groundwater Management Areas



After the DFCs are determined by the GMAs, the TWDB performs quantitative analysis to determine the amount of groundwater available for production that does not cause the DFC to be violated. For aquifers where a Groundwater Availability Model (GAM) exists, the GAM is used to develop the MAG (Modeled Available Groundwater). The MAG estimated through this process is then used by RWPGs as the available groundwater for the planning period. For aquifers or local groundwater that may not be listed as a minor or major aquifer, the water availability is based on historical use and available hydrogeological records. Table 1-12 shows the status of the Desired Future Conditions development, and the status of the determination of Managed Available Groundwater for each GMA in the BGRWPA.

Figure 1-23. Groundwater Conservation Districts and Groundwater Management Areas Located Wholly or Partially within the Brazos G Area

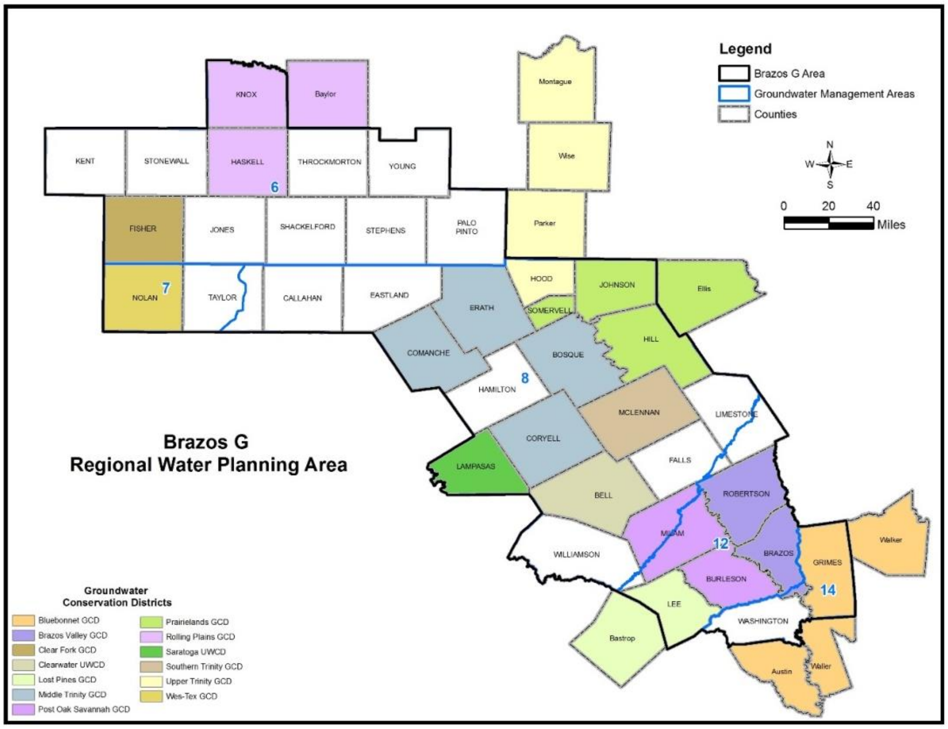


Table 1-11. GCD Management Plan Approval Dates

Name of GCD	Date Plan Approved
Bluebonnet Groundwater Conservation District	12/02/2013
Brazos Valley Groundwater Conservation District	6/07/2010
Clear Fork Groundwater Conservation District	10/20/2015
Clearwater Groundwater Conservation District	4/13/2011
Lost Pines Groundwater Conservation District	11/07/2012
Middle Trinity Groundwater Conservation District	5/14/2012
Post Oak Savannah Groundwater Conservation District	12/17/2012
Prairielands Groundwater Conservation District	7/30/2012
Rolling Plans Groundwater Conservation District	9/15/2015
Saratoga Groundwater Conservation District	10/16/2014
Southern Trinity Groundwater Conservation District	9/15/2015
Upper Trinity Groundwater Conservation District	9/15/2015
Wes-Tex Conservation District	2/10/2015

Table 1-12. Groundwater Conservation Districts, Aquifers, Desired Future Conditions (DFCs), and Modeled Available Groundwater (MAG) Status by GMA for the Brazos G Area (as of November 2015)

Aquifer	Major or Minor Aquifer?	Desired Future Conditions Status	Modeled Available Groundwater Status
Groundwater Management Area 6			
Clear Fork GCD, Rolling Plains GCD			
Seymour	Major	Adopted 7/22/2010, amended 7/19/2011	Adopted 12/9/2011
Dockum	Minor	Adopted 7/22/2010	Adopted 12/9/2011
Blaine	Minor	Adopted 7/22/2010, amended 7/19/2011	Adopted 12/9/2011
Groundwater Management Area 7			
Wes-Tex GCD			
Aquifer	**Major or Minor Aquifer?**	**Desired Future Conditions Status**	**Modeled Available Groundwater Status**
Edwards-Trinity(Plateau)	Major	Adopted 7/29/2010	Adopted 11/12/2012
Dockum	Minor	Adopted 7/29/2010	Adopted 2/22/2012
Groundwater Management Area 8			
Clearwater UWCD, Middle Trinity GCD, Post Oak Savannah GCD*, Prairielands GCD, Saratoga UWCD, Southern Trinity GCD, Upper Trinity GCD			
Aquifer	**Major or Minor Aquifer?**	**Desired Future Conditions Status**	**Modeled Available Groundwater Status**
Trinity	Major	Adopted 4/7/2011	Adopted 12/14/2011
Edwards (BFZ)	Major	Adopted 4/27/2011	Adopted 12/14/2011
Brazos River Alluvium	Minor	Adopted 4/27/2011, amended 6/23/2011	Adopted 12/9/2011
Ellenburger-San Saba	Minor	Adopted 4/27/2011	Adopted 12/30/2011
Hickory	Minor	Adopted 4/27/2011	Adopted 12/7/2011
Marble Falls	Minor	Adopted 4/27/2011	Adopted 12/9/2011
Woodbine	Minor	Adopted 4/27/2011, amended 6/23/2011	Adopted 6/29/2012

Table 1-12. Groundwater Conservation Districts, Aquifers, Desired Future Conditions (DFCs), and Modeled Available Groundwater (MAG) Status by GMA for the Brazos G Area (as of November 2015)

Groundwater Management Area 12			
Brazos Valley GCD, Post Oak Savannah GCD*, Lost Pines GCD			
Aquifer	**Major or Minor Aquifer?**	**Desired Future Conditions Status**	**Modeled Available Groundwater Status**
Carrizo-Wilcox	Major	Adopted 8/11/2010	Adopted 7/9/2012
Brazos River Alluvium	Minor	Adopted 8/11/2010	Adopted 7/9/2012
Queen City	Minor	Adopted 8/11/2010	Adopted 7/9/2012
Sparta	Minor	Adopted 8/11/2010	Adopted 7/9/2012
Yegua-Jackson	Minor	Adopted 6/30/2011	Adopted 7/9/2012
Groundwater Management Area 14			
Bluebonnet GCD			
Aquifer	**Major or Minor Aquifer?**	**Desired Future Conditions Status**	**Modeled Available Groundwater Status**
Carrizo-Wilcox	Major	Adopted 8/25/2010	Adopted 11/18/2011
Gulf Coast	Major	Adopted 8/25/2010	Adopted 11/18/2011
Brazos River Alluvium	Minor	Adopted 8/25/2010	Adopted 6/22/2011
Queen City	Minor	Adopted 8/25/2010	Adopted 7/9/2012
Sparta	Minor	Adopted 8/25/2010	Adopted 2/18/2011
Yegua-Jackson	Minor	Adopted 8/25/2010	Adopted 7/9/2012
* Post Oak Savannah GCD is in GMA 8 and GMA 12			

1.11.2 Texas Clean Rivers Act

In 1991, the 72nd Legislature passed the Texas Clean Rivers Act[21] to establish for the first time a watershed basis for water quality planning in Texas.[22,23] The Act requires each river basin in the State to be assessed for water quality and management strategies on an on-going basis. It also requires reports to be provided to the TCEQ every even-numbered year.[24] The Act provides specific guidelines for accomplishing the water quality assessments, including: (1) comprehensive assessments on a watershed basis with emphasis on non-point sources, nutrients, and toxic materials; (2) delegation of

[21] Senate Bill 818, amending the Texas Water Code, Sections 5.103, 5.105, 26.011; T.A.C. Sections 320.1-320.9

[22] TNRCC, Op. Cit., 1992.

[23] TNRCC, Op. Cit., 1999.

[24] BRA, "Planning and Environmental Division", [Online] Available URL: http://www.brazos.org/home.htm, 1999.

responsibility for assessments to river authorities; (3) formation of river basin steering committees; (4) discharge permitting on a basin-wide basis; and (5) assessment fees charged to wastewater permittees and water right holders.

The BRA is a partner with the TCEQ in the Clean Rivers Program for the BGRWPA. The program provides funding for BRA staff to assess water quality in the Brazos River Basin and to document local problems. Also, the program provides fee payers with site-specific information on water quality such as receiving water assessments and flow data. The 2004 Report[25] for the Brazos River Basin provides an assessment of water quality for the basin, drawing attention to: (1) the need for more long-term data on water quality, (2) a continued emphasis on the Basin Steering Committee for direction and comment on the water quality assessment program, (3) continued assistance in water quality monitoring from local partners in the Basin Monitoring Program, (4) emphasis on assessing and maintaining data, and (5) development of a geographical information system for the basin. The 2004 Report provides detailed findings about water quality and related items for selected sub-watersheds of the basin. The findings most relevant to the BGRWPA were summarized in Section 1.9.2.

1.11.3 Clean Water Act

The 1972 Federal Water Pollution Control Act, which as amended is called the Clean Water Act, is the federal law with the most impact on water quality protection in the BGRWPA. As amended in 1977 and again in 1987, the Clean Water Act: (1) establishes the framework for monitoring and controlling industrial and municipal point-source discharges through the National Pollutant Discharge Elimination System (NPDES), (2) authorizes federal assistance for the construction of municipal wastewater treatment facilities, and (3) requires cities to obtain permits for stormwater or non-point-source discharges.[26] The Clean Water Act also includes provisions to protect specific aquatic resources. Section 303 establishes a non-degradation policy for high quality waters and provides for establishment of state standards for receiving water quality. Section 401 allows states to enforce water quality requirements for federal projects such as dams. Section 404 provides safeguards for wetlands and other waters from the discharge of dredged or fill material. Section 305 calls for the TCEQ to prepare and submit a water quality inventory to the U.S. Environmental Protection Agency.[27] Other provisions protect particular types of ecosystems such as lakes (Section 314), estuaries (Section 320), and oceans (Section 403).[28] Several of these provisions are relevant to specific water quality concerns in the BGRWPA.

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[25] BRA, Op. Cit., 2004.

[26] 33 USCA, Sections 1251 through 1387.

[27] TWDB, 1997.

[28] Adler, R.W., Landman, J. and Cameron, D., *The Clean Water Act: Twenty Years Later*, Island Press, Washington D.C., 1993.

1.11.4 Safe Drinking Water Act

The Safe Drinking Water Act, passed in 1974 and amended in 1986 and 1996, allows the U.S. Environmental Protection Agency to set standards for drinking water quality. These standards are divided into two categories: National Primary Drinking Water Regulations (primary standards that must be met by all public water suppliers) and National Secondary Water Regulations (secondary standards that are not enforceable, but are recommended). Primary standards protect water quality by limiting levels of contaminants that are known to adversely affect public health and that are anticipated to occur in water. Secondary standards have been set for contaminants that may affect cosmetic or aesthetic qualities of water (e.g., taste, odor, or color). For some constituents, the State of Texas has secondary standards that differ from the National standards.

1.11.5 Source Water Assessment and Protection Program

The TCEQ's Source Water Assessment and Protection (SWAP) Program can be an important part of water resource management. The SWAP Program, authorized by the Safe Drinking Water Act, assists local jurisdictions in preventing contamination of drinking water supplies. It identifies sources of public drinking water, determines potential contaminants, assesses water systems' susceptibility to contamination, and informs the public of the results. It is part of a comprehensive, integrated approach to clean ground and surface water undertaken by the TCEQ.

The centerpiece of the SWAP Program is a focus on prevention. Water can be easily contaminated, but it is difficult and expensive to clean up. Through the SWAP Program, by preventing contamination, jurisdictions are able to avoid the cost of removing contamination and maintain clean, reliable sources for drinking water.

The SWAP Program is designed to assist Texas communities in protecting their drinking water sources. Its goal is to increase public awareness of the importance of protecting drinking water sources and actions that can be taken to protect those sources. The SWAP Process involves seven steps:

1. Delineation (or mapping) of source water protection areas, any areas surrounding a drinking water source, whether from ground or surface water;
2. Conducting an inventory of actual or potential sources of contamination in the delineated area;
3. Conducting an analysis of the relative susceptibility of the water supply to those contamination sources and presenting the results to the public water supply in the form of a Source Water Susceptibility Assessment Report. These results provide insights into activities near your water sources and serve as the starting point for implementing source water protection.
4. Working with selected local communities to make information available to the public;
5. Voluntary application of best management practices to prevent contamination, such as land use practices, regulations and permits, structural

measures, good housekeeping practices, public education and emergency response planning;

6. Monitoring and continually assessing source water supplies; and,
7. Conducting triennial sampling and continually monitoring, assessing and conducting protection activities.

By conducting continual monitoring, assessment and protection activities, communities can minimize potential sources of contamination and protect source water supplies over the long-term.

1.11.6 State Water Availability Modeling Initiatives

TCEQ Water Availability Models (WAMs)

Water Availability Models (WAMs) are computer-based simulation models used to determine water available to surface water rights under Texas' priority system. These models are used to evaluate water availability for newly requested water rights or water right amendments. The models are also used for regional water planning. There are twenty individual WAMs that cover the twenty-three river basins in Texas, including coastal basins. The period of record most WAMs is approximately 1940 through 1997, although the hydrology has been extended for the Colorado WAM through 2013. There are two WAM scenarios used and maintained by TCEQ staff:

- Full Authorization (Run3) – In the Full Authorization scenario all water rights utilize their full authorized amounts. This scenario is used to evaluate perpetual water rights and amendments.
- Current Conditions (Run 8) – The Current Conditions scenario Includes return flows, current reservoir conditions and has water rights diversions based on historical use. This scenario is used to evaluate term water rights.

Most of the Brazos G Planning Area falls within the area covered by the Brazos WAM. Existing supplies and future water management strategies were evaluated using a modified WAM Run 3. The modified WAM Run 3 includes existing and future sediment conditions for reservoirs. Application of the Brazos WAM to determine current surface water supplies is described in Chapter 3 and application of the Brazos WAM to determine supplies available to potentially feasible water management strategies is described in Volume II.

TWDB Groundwater Availability Models (GAMs)

Groundwater Availability Models (GAMs) were developed under the direction of the TWDB. The GAMs cover most of the major and minor aquifers within Texas. Based on the agreed upon Desired Future Conditions (DFCs), the GAMs are run as described in Section 1.11.1 to develop the Modeled Available Groundwater (MAG) to be used as the maximum groundwater supply available from an aquifer within a county for use in the regional water plan.

1.12 Previous Water Supply Planning in the Brazos G Area

As discussed in previous sections, the Brazos G Area is a large diverse area with varying needs of water users in the different parts of the region. In response to these different needs, the region has a history of successful local water supply planning and development. These studies are too numerous to identify and list in entirety here. Some of the more recent studies include:

- Bosque County water treatment and distribution study to address water needs in Bosque County in the central Brazos River Basin. The study was completed in March 2004.[29]
- The Brazos River Authority and Tarrant Regional Water District sponsored a water supply study for Parker and Johnson Counties in the central Brazos River Basin to meet the growing needs of this area. Phase 1 of the study was completed in April 2004.[30]
- The West Central Brazos River Basin Regional Water Treatment and Distribution Facility Study evaluated water needs in the upper Brazos River Basin. This study was completed in August 2004.[31]
- Bell/Williamson Regional Water Supply Facility Plan included eight participants in southern Bell County and northern Williamson County. The study recommended the cooperation of these eight participants in development of infrastructure and water supply projects.
- The City of Abilene and the Cities of Midland and San Angelo (Region F) have formed the West Texas Water Partnership (WTWP) to identify and secure long-range water supplies for the three cities and the surrounding region. Results from ongoing studies will be reflected in future regional water plans.
- The Falls Hill Limestone and McLennan Counties Regional Water Facility Planning Study is an ongoing TWDB supported study to evaluate water management strategies for the 2016 Region G Water Plan. The primary focuses of the study are to address water quality issues, develop a regional water system to replace and/or supplement multiple current systems, provide reliable water supply and interconnect existing facilities.

Brief summaries of the *Brazos G Regional and State Water Plans* and several studies completed recently are presented in the following sections.

[29] Carter-Burgess, March 2004, Bosque County Regional Water Treatment and Distribution Facilities Plan, Final Report to the Brazos River Authority.

[30] Freese and Nichols, April 2004, Regional Water Supply and Wastewater Service Study for Johnson and Parker Counties, Phase I.

[31] Freese and Nichols, August 2004, West Central Brazos River Basin Regional Water Treatment and Distribution Facility Plan.

1.12.1 Brazos G Regional and State Water Plans

Since SB1 was passed in 1997, the Brazos G Regional Planning Group has completed three rounds of planning, with regional plans adopted in 2001, 2006 and 2011. These regional plans have been rolled up with 15 other regional plans into the State Water Plan in 2002, 2007 and 2012, respectively. Each successive plan has been updated to reflect the most relevant information at the time. This section provides a brief summary of each of the Brazos G Regional water Plans and the State Water Plans.

2001 Brazos G Regional Water Plan[32]

The 2001 Brazos G Regional Water Plan found that on a regional basis, there are sufficient water supplies to meet the projected demands. In year 2050, the region was projected to have a surplus of about 500,000 acre-feet per year, yet there were some entities that did not have enough water to meet projected needs. The highest growth areas were identified along the I-35 corridor in the central part of the region, straining existing groundwater supplies. Slower economic growth and implementation of previous long-term planning in the upper Brazos G Area resulted in fewer municipal needs in this part of the region. However, water quality concerns in the upper Brazos River Basin can limit water supplies.

The major recommended strategies in the 2001 plan included four new major reservoirs, reallocation of hydropower storage in Lake Whitney, coordinated operation of reservoir systems for the Brazos River Authority and the City of Abilene, chloride control in the upper Brazos River Basin, and further development of groundwater from the Carrizo-Wilcox Aquifer. Since the plan was completed, the California Creek Diversion Project, a recommended strategy in the 2001 plan for the City of Stamford to supplement supplies from Lake Stamford, has been constructed and is operational. Other smaller projects also have been completed or are in the design phase.

The recommended new major reservoirs include:

- Millican Reservoir (Bundic Dam Site)
- Little River Reservoir
- South Bend Reservoir (long-term strategy)
- Breckenridge Reservoir (long-term strategy)

2006 Brazos G Regional Water Plan[33]

In the 2006 plan, a comparison of total supplies available in the region with demand for all use categories in the region shows a surplus past the year 2050. These mask shortages that are projected to occur to individual water supply entities and water user groups. Shortages were shown for entities in 32 of the 37 counties in the Brazos G Area. Water management strategies that were evaluated included advanced water conservation, wastewater reuse, system operation of Brazos River Authority Reservoirs,

[32] Brazos G Regional Planning Group, 2001 Brazos G Regional Water Plan.

[33] Brazos G Regional Planning Group, 2006 Brazos G Regional Water Plan.

conjunctive use, desalination, aquifer storage and recovery, brush management, weather modification, six new on-channel and five new off-channel reservoirs, regional interconnection, Carrizo-Wilcox aquifer development and voluntary redistribution. The total supply from these recommended water supplies is over 590,000 acre-feet per year at an estimated cost of over $1 billion.

2011 Brazos G Regional Water Plan[34]

In the 2011 plan, a comparison of total supplies available in the region (developed groundwater supplies and firm surface water) with demand for all use categories in the region shows a surplus past the year 2040. These mask shortages that are projected to occur to individual water supply entities and water user groups. Shortages are projected for Williamson County starting at about the year 2020, while overall regional supplies are projected to exceed regional demands until past the year 2040. Even within most counties that have projected overall surpluses, there are individual entities that do not have sufficient supply to meet projected needs. Shortages were shown for entities in 31 of the 37 counties in the Brazos G Area. The recommended water management strategies included advanced water conservation, wastewater reuse, system operation of Brazos River Authority Reservoirs, conjunctive use, brush management, four new reservoirs, regional interconnection, additional groundwater development, voluntary redistribution, and multiple miscellaneous pipelines and treatment plan expansions. The total supply from these recommended water supplies is over 587,000 acre-feet per year at an estimated cost of over $3 billion.

Water for Texas 2002[35] was the first State Water Plan to be adopted by the TWDB after the passage of SB1 in 1997. It was estimated that by 2050, almost 900 cities statewide (representing 38 percent of the projected population) and other water users will need either to reduce demand (through conservation and/or drought management) or develop additional sources of water beyond those currently available to meet their needs during droughts. The proposed water management strategies had an estimated cost of $17.9 billion.

Water for Texas 2007[36]

The state was projected to grow from 21 million people in 2000 to approximately 46 million people in 2060. It was estimated that Texas would need 8.8 million acre-feet of water by 2060 to meet this growth. The 16 Regional Water Planning Groups identified 4,500 water management strategies to provide an additional 9.0 million acre-feet of water. The estimated cost of these strategies was approximately $30.7 billion. Without this investment there would be a potential $9.1 billion impact to businesses and workers by 2020 with increased impact of $98.4 billion by 2060.

[34] Brazos G Regional Planning Group, 2011 Brazos G Regional Water Plan.

[35] Texas Water Development Board, Water for Texas, 2002 Texas State Water Plan.

[36] Texas Water Development Board, Water for Texas, 2007 Texas State Water Plan.

Water for Texas 2012[37]

The 16 Regional Water Planning Groups (Planning Groups) identified a total of 2,569 water user groups. Of those groups, 895 (35 percent) in 2020 would have water supply needs if the state were facing drought conditions, increasing to 1,085 (42 percent) in 2060. The Water Planning groups recommended feasible water management strategies to meet most of those needs. Solutions proposed by the Planning Groups include strategies such as the use of currently developed surface water and groundwater sources, conservation, reuse, new interbasin transfers, and development of additional groundwater and surface water resources. 26 new reservoirs were recommended by the Planning Groups to meet identified needs of the water user groups. The Planning Groups estimated total capital costs over the next 50 years to meet needs for additional water supplies at $53 billion, including $27 billion to implement strategies for municipal water user groups. Meeting these costs will require a long-term financial commitment from local political subdivisions, regional authorities, and the State of Texas.

All three state water plans incorporated recommendations from the respective Brazos G Regional Water Plans.

1.12.2 Bosque County Regional Water Treatment and Distribution Facilities Plan

The *2001 Brazos G Regional Water Plan* identified several water users in Bosque County with shortages over the planning period. In an attempt to address this widely known shortage, the Brazos River Authority, Texas Water Development Board, and the Cities of Clifton and Meridian jointly sponsored a study to determine the regional water needs and to evaluate existing and proposed water facilities.

The study evaluated four alternatives to supply water to the different users, including individual treatment and delivery systems to a regional facility that would serve all participants. The study recommended the regional facility, which would include expansion of the City of Clifton's water treatment plant and interconnections to the other participants, including Clifton, Childress WSC, Meridian, Valley Mills and Walnut Springs.

1.12.3 Regional Water Supply and Wastewater Service Study for Johnson and Parker Counties, Phase I

The Brazos River Authority and Tarrant Regional Water District (TRWD) jointly commissioned a study to investigate the feasibility of developing regional water supply and wastewater treatment facilities to serve the unmet needs of the two counties. The first phase of an anticipated two-phase study was completed in April 2004. The primary objective of the first phase was to identify and evaluate raw water supply and water and wastewater treatment concepts of mutual interest to the Authority, TRWD and their primary wholesale customers. Subject to the Phase I identification of concepts deemed

[37] Texas Water Development Board, Water for Texas, 2012 Texas State Water Plan.

worthy of additional study, a Phase II study may further study those options that show promise from an engineering, economic, water quality and institutional standpoint.

Phase I of the study identified several water supply scenarios to serve water user groups with projected shortages in each county. The study focused on concepts that would blend the higher TDS water from the Brazos Basin with lower TDS water from the Trinity River Basin to reduce the need to desalinate the Brazos Basin water. The study concluded that a regional water treatment plant in northwest Johnson County treating a blend of BRA and TRWD water could economically serve a large area of northwest Johnson, southwest Tarrant and southeast Parker counties, including the new growth in Fort Worth's extraterritorial jurisdiction. A second option involved a plant in northeast Johnson County which could supply a large area with unmet needs including the rapidly growing areas around Mansfield and Burleson. Phase II of the study is intended to provide more detailed information required by stakeholders to allow them to further evaluate these concepts in relation to their own interests and potential participation in a regional system. Phase II has not been initiated to date.

1.12.4 West Central Brazos River Basin Regional Water Treatment and Distribution Facility Study

The Brazos River Authority, Texas Water Development Board, and the U.S. Economic Development Administration sponsored a water treatment and distribution study for water users in the upper Brazos River Basin. This study was initiated in response to the significant drought that occurred in the late 1990s and subsequent years, and developed a plan to meet demands 25 percent greater than projected needs in order to account for the future uncertainties of droughts.

The West Central Brazos River Basin Regional Water Treatment and Distribution Facility Plan evaluated the water needs in an 18-county area, assessed the economic impacts of water shortages and identified a plan to develop and efficiently utilize the water resources in the area. Specific concerns identified in the study included water quality of surface water sources, limited groundwater sources, and limited existing infrastructure to move water from areas with supply to areas with needs.

Recognizing the vulnerability of small surface lakes and the uncertainty of groundwater, this study focused on interconnecting existing supply sources and developing new supplies to provide a safe level of supply to water users and increase the reliability of existing sources to promote economic growth in the region. Collectively, over 25 potential water management strategies were evaluated to meet specific needs in the region. In addition, three general strategies (brush control, weather modification and salt water control) were reviewed as potential means to improve water quality and quantity in the region.

The study conducted numerous hydraulic analyses to evaluate the possibility of moving water through existing and improved infrastructure, including the West Central Brazos Distribution System in Stephens County (formerly the Kerr-McKee pipeline). Two scenarios demonstrated the greatest potential impact to the region:

- Interconnection between Abilene and North Central Texas MWA

- Interconnections among Shackelford WSC, Stephens County Rural WSC and the City of Throckmorton using the West Central Brazos Distribution System

Other major strategies recommended in this study include:

- Regional water treatment plant to treat water from Possum Kingdom Lake
- Connection from Lake Stamford to Throckmorton
- Turkey Peak Reservoir in Palo Pinto County
- Diverting water from the Clear Fork of the Brazos River to Hubbard Creek Lake and increasing the capacity to transport water to Abilene

2

Projected Population and Water Demands

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2 Projected Population and Water Demands

2.1 Introduction

The TWDB publishes population and water demand projections, respectively, for each county in the state for use by the regional water planning groups. Population projections were developed for municipal Water User Groups (WUGs), which are defined as cities with a population greater than 500 in 2010, water supply corporations and special utility districts using volumes of 280 acft or more in 2010, and ‘County-Other’ to capture those people living outside the cities or WUG-sized water supply corporation/special utility districts for each county. In the Brazos G Area, population projections were completed for 234 municipal WUGs, including County-Other. Water demand projections were developed by type of use—specific municipal WUG demands for cities and other water utilities (along with a ‘County-Other’ for each county) and countywide demands for manufacturing, steam-electric, mining, irrigation, and livestock.

The TWDB has adopted several revisions to the population and water demand projections for the Brazos G Area, as forwarded by the Brazos G RWPG. Revisions have been made to the census-based population projections, and municipal, manufacturing, irrigation and steam-electric water demand projections. Revisions to the population and municipal water demand projections for cities resulted from requests from individual cities and changes to gpcd values. Water demand projections for manufacturing, irrigation and steam-electric use were revised to reflect input from industry and the Brazos G RWPG.

2.2 Population Projections

As shown in Figure 2-1, the population of the 37-county area is projected to increase from 1,972,449 in 2010 to 4,351,042 in 2070, an increase of 133 percent (2.2 percent annual growth). This is somewhat greater than the projected statewide population growth during the same period of 119 percent, (2.0 percent annually). In 2070, it is projected that 35 percent of the Brazos G Area population will live in Williamson County, 16 percent in Bell County, 7 percent in Johnson County, 8 percent in McLennan County, 10 percent in Brazos County, 3 percent in Coryell County, 4 percent in Taylor County, and 16 percent in each of the remaining counties. Projections and growth rates for each of the 37 counties and 233 cities, other utilities, and ‘County-Other’ in the region are presented in Table 2-1.

Growth in the Brazos G Area is concentrated along the IH-35 corridor, stretching from Williamson County in the south to Johnson County in the north. Growth is also taking place along US Highway 183 in Williamson and Lampasas Counties, Taylor and Jones Counties (Abilene area), and Brazos County (Bryan/College Station area). Williamson County is projected to be the fastest growing county between 2010 and 2070, growing at 2.4 percent annually. Bell, Brazos, Coryell, Hood, Johnson, and Young Counties are all projected to grow at more than 1.0 percent annually. A comparison of the annual growth rates for all the counties is shown in Figure 2-2.

Figure 2-1. Population Projections

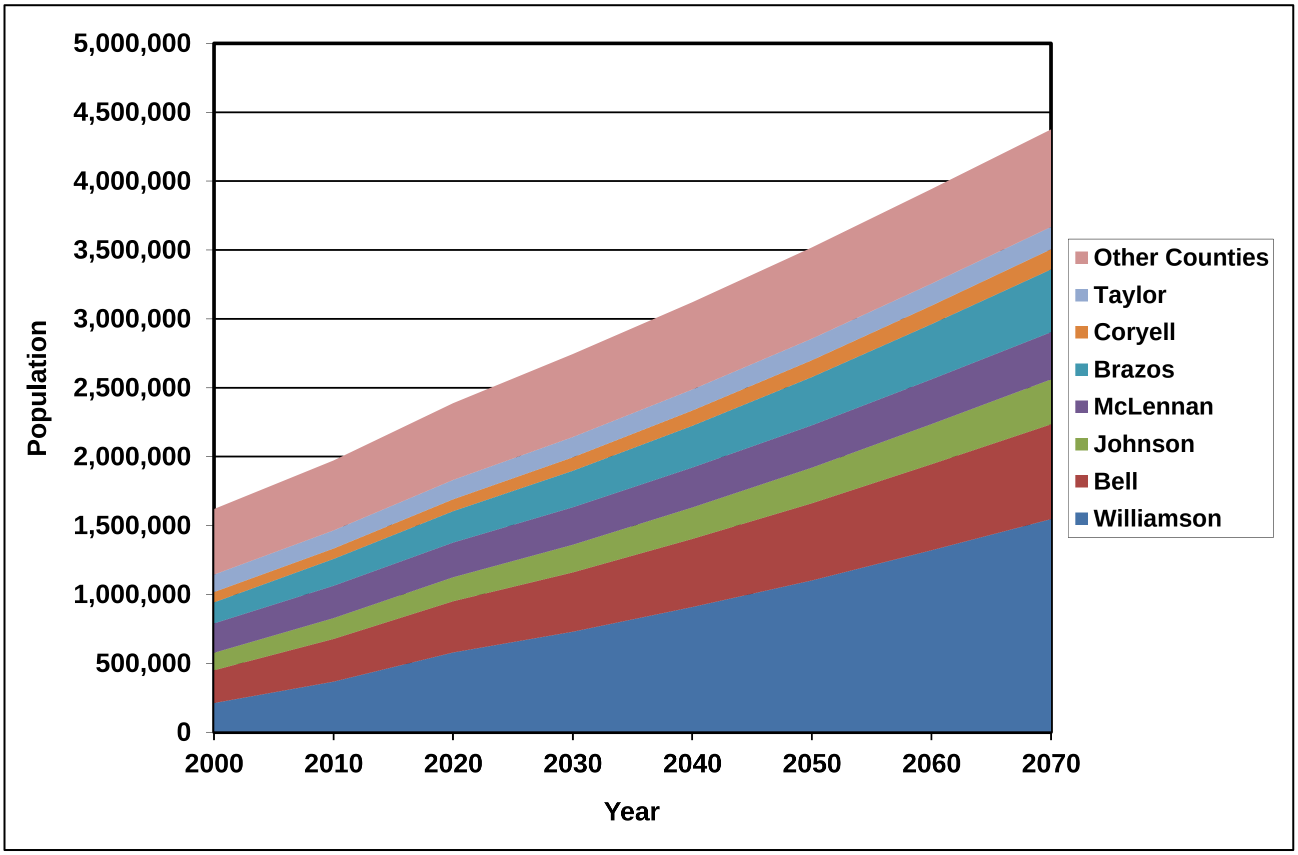


Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Bell County										
439 WSC	5,274	5,598	7,584	8,435	9,318	10,292	11,369	12,559	0.60%	1.36%
Armstrong WSC	1,980	2,143	2,283	2,416	2,561	2,710	2,856	3,000	0.79%	0.56%
Bartlett (P)	818	690	828	958	1,101	1,247	1,390	1,531	-1.69%	1.34%
Bell-Milam-Falls WSC (P)	1,980	2,153	2,301	2,442	2,596	2,754	2,909	3,061	0.84%	0.59%
Belton	14,623	18,216	21,841	25,287	29,041	32,897	36,680	40,404	2.22%	1.34%
Chisholm Trail SUD (P)	454	2,478	2,971	3,440	3,951	4,476	4,990	5,497	18.50%	1.34%
Dog Ridge WSC	3,534	2,623	3,145	3,642	4,182	4,737	5,282	5,818	-2.94%	1.34%
East Bell County WSC (P)	2,274	3,011	3,641	4,240	4,893	5,563	6,221	6,868	2.85%	1.38%
Elm Creek WSC (P)	1,445	1,947	2,376	2,784	3,229	3,686	4,134	4,575	3.03%	1.43%
Fort Hood CDP (P)	17,282	15,174	17,282	17,282	17,282	17,282	17,282	17,282	-1.29%	0.22%
Harker Heights	17,308	26,700	32,012	37,064	42,566	48,218	53,763	59,222	4.43%	1.34%
Holland	1,102	1,121	1,138	1,154	1,171	1,189	1,206	1,223	0.17%	0.15%
Jarrell-Schwertner WSC (P)	1,231	1,141	1,369	1,584	1,820	2,061	2,298	2,531	-0.76%	1.34%

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Kempner WSC (P)	2,471	1,671	2,004	2,320	2,664	3,018	3,365	3,707	-3.84%	1.34%
Killeen	86,911	127,921	153,371	177,572	203,934	231,012	257,581	283,732	3.94%	1.34%
Little River-Academy	1,645	1,961	2,231	2,488	2,768	3,056	3,338	3,616	1.77%	1.03%
Moffat WSC	3,732	3,931	4,101	4,263	4,440	4,621	4,799	4,974	0.52%	0.39%
Morgans Point Resort	2,989	4,170	5,179	6,139	7,184	8,258	9,312	10,349	3.39%	1.53%
Nolanville	2,150	4,259	6,061	7,774	9,640	11,557	13,438	15,289	7.07%	2.15%
Pendleton WSC	2,431	2,592	2,075	2,174	2,283	2,395	2,504	2,612	0.64%	0.01%
Rodgers	1,117	1,218	1,305	1,388	1,478	1,570	1,661	1,750	0.87%	0.61%
Salado WSC	3,847	4,391	5,453	5,950	6,491	7,047	7,592	8,129	1.33%	1.03%
Temple	54,514	66,102	79,253	91,759	105,381	119,374	133,103	146,616	1.95%	1.34%
Troy	1,378	1,645	1,874	2,091	2,328	2,571	2,810	3,045	1.79%	1.03%
West Bell County WSC	5,456	4,263	5,112	5,456	5,456	5,456	5,456	5,456	-2.44%	0.41%
County-Other	28	3,116	5,166	10,545	16,824	23,205	29,347	35,261	60.19%	4.13%
Bell County Total	237,974	310,235	371,956	430,647	494,582	560,252	624,686	688,107	2.69%	1.34%
Bosque County										
Childress Creek WSC	2,091	2,382	2,656	2,901	3,027	3,105	3,155	3,186	1.31%	0.49%
Clifton	3,542	3,442	3,838	4,192	4,374	4,488	4,560	4,604	-0.29%	0.49%
Cross Country WSC (P)	178	660	736	803	838	860	874	882	14.00%	0.48%
Meridian	1,491	1,493	1,664	1,818	1,897	1,946	1,978	1,997	0.01%	0.49%
Valley Mills (P)	1,120	1,190	1,327	1,449	1,512	1,551	1,576	1,591	0.61%	0.49%
Walnut Springs	755	827	922	1,007	1,051	1,078	1,095	1,106	0.92%	0.49%
County-Other	8,027	8,218	9,167	10,014	10,448	10,719	10,891	10,996	0.24%	0.49%
Bosque County Total	17,204	18,212	20,310	22,184	23,147	23,747	24,129	24,362	0.57%	0.49%
Brazos County										
Bryan	65,660	76,201	88,434	93,544	119,410	138,980	159,588	181,797	1.50%	1.46%
College Station	57,404	83,714	102,140	132,690	141,952	164,492	188,719	215,545	3.85%	1.59%
Texas A&M University	10,486	10,143	11,851	12,000	12,000	12,000	12,000	12,000	-0.33%	0.28%
Wellborn SUD	6,550	8,106	9,309	10,667	12,073	13,793	15,636	17,668	2.15%	1.31%
Wickson Creek SUD (P)	5,743	8,004	9,752	11,724	13,767	16,266	18,943	21,895	3.38%	1.69%
County-Other	6,572	8,683	6,168	4,040	3,795	4,363	5,249	6,624	2.82%	-0.45%
Brazos County Total	152,415	194,851	227,654	264,665	302,997	349,894	400,135	455,529	2.49%	1.43%
Burleson County										
Caldwell	3,449	4,104	4,896	5,060	5,275	5,312	5,412	5,498	1.75%	0.49%
Deanville WSC	2,570	2,900	3,598	3,663	3,816	3,790	3,840	3,885	1.22%	0.49%
Milano WSC (P)	1,447	1,730	1,867	2,008	2,098	2,188	2,259	2,318	1.80%	0.49%
Snook	568	511	552	594	620	647	668	685	-1.05%	0.49%
Somerville	1,704	1,376	1,485	1,597	1,669	1,741	1,797	1,844	-2.12%	0.49%

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Southwest Milam WSC (P)	293	741	800	860	899	938	968	993	9.72%	0.49%
County-Other	6,439	5,825	5,341	6,164	6,461	7,119	7,498	7,799	-1.00%	0.49%
Burleson County Total	16,470	17,187	18,539	19,946	20,838	21,735	22,442	23,022	0.43%	0.49%
Callahan County										
Baird	1,623	1,496	1,496	1,496	1,496	1,496	1,496	1,496	-0.81%	0.00%
Clyde	3,344	3,713	3,971	4,251	4,404	4,483	4,541	4,579	1.05%	0.35%
Coleman County WSC (P)	392	150	161	172	178	182	184	185	-9.16%	0.35%
Cross Plains	1,068	982	1,051	1,125	1,165	1,186	1,201	1,211	-0.84%	0.35%
Potosi WSC (P)	70	70	75	81	84	85	86	87	0.00%	0.36%
County-Other	6,408	7,133	7,728	8,379	8,734	8,919	9,056	9,142	1.08%	0.41%
Callahan County Total	12,905	13,544	14,482	15,504	16,061	16,351	16,564	16,700	0.48%	0.35%
Comanche County										
Comanche	4,482	4,335	4,499	4,678	4,799	4,956	5,090	5,217	-0.33%	0.31%
De Leon	2,433	2,246	2,331	2,424	2,486	2,568	2,637	2,703	-0.80%	0.31%
County-Other	7,111	7,393	7,672	7,976	8,182	8,450	8,679	8,894	0.39%	0.31%
Comanche County Total	14,026	13,974	14,502	15,078	15,467	15,974	16,406	16,814	-0.04%	0.31%
Coryell County										
Copperas Cove (P)	29,455	31,457	35,928	40,796	46,213	50,948	55,996	61,021	0.66%	1.11%
Coryell City Water Supply District	3,221	4,334	4,950	5,620	6,367	7,019	7,715	8,407	3.01%	1.11%
Elm Creek WSC (P)	320	358	408	464	525	579	637	694	1.13%	1.11%
Fort Hood CDP (P)	16,429	14,415	16,051	16,429	16,429	16,429	16,429	16,429	-1.30%	0.22%
Gatesville	15,591	15,751	17,990	20,427	23,139	25,510	28,038	30,554	0.10%	1.11%
Kempner WSC	3,409	2,712	3,097	3,517	3,984	4,392	4,827	5,260	-2.26%	1.11%
Multi-County WSC (P)	2370	2517	2874	3264	3697	4076	4480	4882	0.60%	1.11%
County-Other	4,183	3,844	4,807	7,254	10,398	13,148	16,077	18,993	-0.84%	2.70%
Coryell County Total	74,978	75,388	86,105	97,771	110,752	122,101	134,199	146,240	0.05%	1.11%
Eastland County										
Cisco	3,851	3,899	4,048	4,136	4,140	4,141	4,141	4,141	0.12%	0.10%
Eastland	3,769	3,960	4,111	4,201	4,205	4,205	4,205	4,205	0.50%	0.10%
Gorman	1,236	1,083	1,125	1,149	1,150	1,150	1,150	1,150	-1.31%	0.10%
Ranger	2,584	2,468	2,562	2,618	2,621	2,621	2,621	2,621	-0.46%	0.10%
Rising Star	835	835	867	886	887	887	887	887	0.00%	0.10%
Stephens Regional SUD (P)	13	121	126	129	129	129	129	129	24.99%	0.11%
County-Other	6,009	6,217	6,450	6,593	6,598	6,599	6,599	6,599	0.34%	0.10%
Eastland County Total	18,297	18,583	19,289	19,712	19,730	19,732	19,732	19,732	0.16%	0.10%
Erath County										

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Dublin	3,754	3,654	4,063	4,525	4,915	5,287	5,639	5,964	-0.27%	0.82%
Stephenville	14,921	17,123	19,041	21,205	23,033	24,777	26,425	27,948	1.39%	0.82%
County-Other	14,326	17,113	19,031	21,193	23,020	24,763	26,410	27,932	1.79%	0.82%
Erath County Total	33,001	37,890	42,135	46,923	50,968	54,827	58,474	61,844	1.39%	0.82%
Falls County										
Bell-Milam-Falls WSC (P)	915	1,199	1,302	1,368	1,383	1,350	1,391	1,433	2.74%	0.30%
Burceville-Eddy (P)	2	4	4	4	4	4	4	4	7.18%	0.00%
East Bell County WSC (P)	612	300	325	342	346	337	348	358	-6.88%	0.30%
Golinda	336	413	448	471	476	465	479	493	2.08%	0.30%
Lott	724	759	824	866	875	855	880	907	0.47%	0.30%
Marlin	6,628	5,967	6,483	6,812	6,883	6,721	6,925	7,135	-1.05%	0.30%
Rosebud	1,493	1,412	1,534	1,612	1,628	1,590	1,638	1,688	-0.56%	0.30%
Tri-County SUD (P)	2,614	2,629	2,856	3,001	3,032	2,961	3,051	3,143	0.06%	0.30%
West Brazos WSC (P)	1,820	1,366	1,484	1,559	1,575	1,538	1,585	1,633	-2.83%	0.30%
County-Other	3,432	3,817	4,153	4,362	4,408	4,305	4,435	4,570	1.07%	0.30%
Falls County Total	18,576	17,866	19,413	20,397	20,610	20,126	20,736	21,364	-0.39%	0.30%
Fisher County										
Bitter Creek WSC (P)	1,150	839	845	845	845	845	845	845	-3.10%	0.01%
Roby	673	643	648	648	648	648	648	648	-0.45%	0.01%
Rotan	1,611	1,508	1,519	1,519	1,519	1,519	1,519	1,519	-0.66%	0.01%
County-Other	910	984	989	989	989	989	989	989	0.78%	0.01%
Fisher County Total	4,344	3,974	4,001	4,001	4,001	4,001	4,001	4,001	-0.89%	0.01%
Grimes County										
Dobbin-Plantersville WSC	1,560	1,976	2,363	2,737	3,021	3,321	3,570	3,787	2.39%	1.09%
G&W WSC	1,023	2,441	3,760	5,033	5,999	7,020	7,867	8,606	9.09%	2.12%
Navasota	6,789	7,049	7,291	7,525	7,703	7,891	8,047	8,183	0.38%	0.25%
Wickson Creek SUD (P)	2,792	3,090	3,368	3,636	3,839	4,054	4,232	4,388	1.02%	0.59%
County-Other	11,388	12,048	12,659	13,248	13,696	14,168	14,561	14,903	0.56%	0.36%
Grimes County Total	23,552	26,604	29,441	32,179	34,258	36,454	38,277	39,867	1.23%	0.68%
Hamilton County										
Hamilton	2,977	3,095	3,114	3,172	3,172	3,172	3,172	3,172	0.39%	0.04%
Hico	1,341	1,379	1,385	1,404	1,404	1,404	1,404	1,404	0.28%	0.03%
Multi-County WSC (P)	630	669	676	696	696	696	696	696	0.60%	0.07%
County-Other	3,281	3,374	3,387	3,431	3,431	3,431	3,431	3,431	0.28%	0.03%
Hamilton County Total	8,229	8,517	8,562	8,703	8,703	8,703	8,703	8,703	0.34%	0.04%
Haskell County										

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Haskell	3,106	3,322	3,330	3,364	3,382	3,415	3,466	3,540	0.67%	0.11%
Rule	698	636	638	644	648	654	664	678	-0.93%	0.11%
Stamford (P)	43	33	34	34	34	34	35	36	-2.61%	0.15%
County-Other	2,246	1,908	1,911	1,931	1,940	1,961	1,988	2,031	-1.62%	0.10%
Haskell County Total	6,093	5,899	5,913	5,973	6,004	6,064	6,153	6,285	-0.32%	0.11%
Hill County										
Brandon-Irene WSC (P)	2,009	1,796	1,937	2,062	2,147	2,234	2,301	2,354	-1.11%	0.45%
Hill County WSC	2,467	2,913	3,141	3,344	3,482	3,624	3,731	3,818	1.68%	0.45%
Files Valley WSC (P)	1,963	2,449	2,641	2,812	2,927	3,047	3,137	3,210	2.24%	0.45%
Hillsboro	8,232	8,456	9,117	9,707	10,106	10,518	10,830	11,083	0.27%	0.45%
Hubbard	1,586	1,423	1,535	1,634	1,701	1,770	1,823	1,866	-1.08%	0.45%
Itasca	1,503	1,644	1,773	1,888	1,965	2,045	2,106	2,155	0.90%	0.45%
Johnson County SUD (P)	177	202	218	232	242	252	259	265	1.33%	0.45%
Parker WSC (P)	371	275	297	316	329	343	353	361	-2.95%	0.45%
White Bluff Community WS	1,000	1,875	2,022	2,153	2,241	2,333	2,402	2,458	6.49%	0.45%
Whitney	1,833	2,087	2,250	2,396	2,495	2,596	2,673	2,736	1.31%	0.45%
Woodrow-Osceola WSC	5,396	3,900	4,205	4,477	4,661	4,851	4,995	5,112	-3.19%	0.45%
County-Other	5,784	8,069	8,692	9,256	9,639	10,030	10,327	10,571	3.39%	0.45%
Hill County Total	32,321	35,089	37,828	40,277	41,935	43,643	44,937	45,989	0.83%	0.45%
Hood County										
Acton MUD (P)	12,222	13,689	19,725	31,885	39,831	43,891	48,381	53,347	1.14%	2.29%
Cresson (P)	82	227	372	512	612	698	764	815	10.72%	2.15%
Granbury	5,718	7,978	10,249	12,441	14,012	15,365	16,404	17,200	3.39%	1.29%
Oak Trail Shores Subdivision	2,985	3,049	3,113	3,175	3,219	3,257	3,286	3,308	0.21%	0.14%
Tolar	504	681	858	1,029	1,152	1,257	1,338	1,400	3.06%	1.21%
County-Other	17,508	22,875	26,999	22,057	19,285	19,679	18,612	16,269	2.71%	-0.57%
Hood County Total	39,019	48,499	61,316	71,099	78,111	84,147	88,785	92,339	2.20%	1.08%
Johnson County										
Acton MUD (P)	101	245	382	542	707	888	1,083	1,292	9.27%	2.81%
Alvarado	3,288	3,785	4,257	4,808	5,377	6,001	6,674	7,394	1.42%	1.12%
Bethany WSC	3,000	3,466	3,909	4,426	4,959	5,544	6,175	6,850	1.45%	1.14%
Bethesda WSC (P)	14,650	13,493	15,541	17,931	20,397	23,102	26,019	29,141	-0.82%	1.29%
Burleson (P)	17,514	29,111	35,167	42,845	50,022	54,635	60,711	68,170	5.21%	1.43%
Cleburne	26,005	29,337	32,501	36,195	40,006	44,185	48,693	53,517	1.21%	1.01%
Cresson (P)	60	108	154	208	263	324	389	459	6.05%	2.44%
Crowley	0	31	61	96	132	171	213	258		3.59%
Fort Worth	0	0	0	0	0	5,000	8,000	10,000		

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Godley	879	1,009	1,133	1,278	1,427	1,591	1,767	1,956	1.39%	1.11%
Grandview	1,358	1,561	1,754	1,980	2,213	2,468	2,743	3,037	1.40%	1.12%
Johnson County SUD (P)	28,333	32,415	37,334	43,076	49,001	55,498	62,507	70,006	1.36%	1.29%
Joshua	4,528	5,910	7,222	8,754	10,335	12,069	13,939	15,940	2.70%	1.67%
Keene	5,003	6,106	7,154	8,377	9,639	11,023	12,516	14,113	2.01%	1.41%
Mansfield (P)	622	1,652	2,630	3,772	4,950	6,242	7,636	9,128	10.26%	2.89%
Mountain Peak SUD (P)	1,200	1,585	1,951	2,378	2,819	3,302	3,823	4,381	2.82%	1.71%
Parker WSC (P)	1,753	2,464	3,139	3,928	4,742	5,634	6,596	7,626	3.46%	1.90%
Rio Vista	656	873	1,080	1,321	1,570	1,843	2,137	2,452	2.90%	1.74%
Venus (P)	1,892	2,895	3,335	3,848	4,377	4,957	5,583	6,253	4.35%	1.29%
County-Other	15,969	14,888	15,131	14,810	15,224	13,937	13,843	13,994	-0.70%	-0.10%
Johnson County Total	126,811	150,934	173,835	200,573	228,160	258,414	291,047	325,967	1.76%	1.29%
Jones County										
Abilene (P)	5,488	5,145	5,457	5,776	6,000	6,192	6,351	6,481	-0.64%	0.39%
Anson	2,556	2,430	2,577	2,728	2,834	2,925	3,000	3,061	-0.50%	0.39%
Hamlin	2,248	2,124	2,253	2,385	2,477	2,557	2,622	2,676	-0.57%	0.39%
Hawley	646	634	673	712	740	763	783	799	-0.19%	0.39%
Hawley WSC (P)	5,006	4,682	4,966	5,256	5,460	5,635	5,780	5,898	-0.67%	0.39%
Stamford (P)	3,593	3,091	3,278	3,470	3,605	3,720	3,816	3,894	-1.49%	0.39%
County-Other	1,248	2,096	2,220	2,349	2,442	2,520	2,585	2,637	5.32%	0.38%
Jones County Total	20,785	20,202	21,424	22,676	23,558	24,312	24,937	25,446	-0.28%	0.39%
Kent County										
Jayton	513	534	528	540	540	540	540	540	0.40%	0.02%
County-Other	346	274	270	276	276	276	276	276	-2.31%	0.01%
Kent County Total	859	808	798	816	816	816	816	816	-0.61%	0.02%
Knox County										
Knox City	1,219	1,130	1,169	1,217	1,242	1,271	1,295	1,315	-0.76%	0.25%
Munday	1,527	1,300	1,345	1,400	1,429	1,463	1,490	1,512	-1.60%	0.25%
County-Other	1,507	1,289	1,333	1,386	1,415	1,449	1,475	1,498	-1.55%	0.25%
Knox County Total	4,253	3,719	3,847	4,003	4,086	4,183	4,260	4,325	-1.33%	0.25%
Lampasas County										
Copperas Cove (P)	137	575	1,061	1,588	1,994	2,410	2,778	3,109	15.42%	2.85%
Kempner	1,004	1,089	1,207	1,334	1,432	1,533	1,622	1,702	0.82%	0.75%
Kempner WSC (P)	3,081	7,958	8,817	9,747	10,465	11,199	11,849	12,433	9.95%	0.75%
Lampasas	6,786	6,681	7,402	8,183	8,786	9,402	9,947	10,438	-0.16%	0.75%
Lometa	782	856	949	1,049	1,126	1,205	1,275	1,338	0.91%	0.75%
County-Other	5,972	2,518	2,364	2,199	2,071	1,940	1,825	1,721	-8.27%	-0.63%

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Lampasas County Total	17,762	19,677	21,800	24,100	25,874	27,689	29,296	30,741	1.03%	0.75%
Lee County										
Aqua WSC (P)	2,604	2,460	2,833	3,185	3,387	3,461	3,510	3,537	-0.57%	0.61%
Giddings	5,105	4,881	5,621	6,320	6,721	6,868	6,966	7,019	-0.45%	0.61%
Lee County WSC (P)	4,125	6,213	7,155	8,045	8,556	8,742	8,867	8,934	4.18%	0.61%
Lexington	1,178	1,177	1,355	1,524	1,620	1,656	1,679	1,692	-0.01%	0.61%
Southwest Milam WSC (P)	227	258	297	334	355	363	368	371	1.29%	0.61%
County-Other	2,418	1,623	1,870	2,103	2,238	2,285	2,319	2,336	-3.91%	0.61%
Lee County Total	15,657	16,612	19,131	21,511	22,877	23,375	23,709	23,889	0.59%	0.61%
Limestone County										
Coolidge	848	955	1,096	1,215	1,312	1,418	1,505	1,581	1.20%	0.84%
Groesbeck	4,291	4,328	4,377	4,419	4,453	4,490	4,520	4,547	0.09%	0.08%
Mart (P)	0	2	5	8	10	12	14	16		3.53%
Mexia	6,563	7,459	8,637	9,632	10,440	11,326	12,047	12,683	1.29%	0.89%
Thornton	524	526	529	532	534	536	538	540	0.04%	0.04%
Tri-County SUD (P)	1,059	1,080	1,108	1,132	1,151	1,172	1,189	1,204	0.20%	0.18%
County-Other	8,766	9,034	9,384	9,677	9,917	10,180	10,393	10,581	0.30%	0.26%
Limestone County Total	22,051	23,384	25,136	26,615	27,817	29,134	30,206	31,152	0.59%	0.48%
McLennan County										
Bellmead	9,214	9,901	10,457	11,100	11,668	12,239	12,808	13,367	0.72%	0.50%
Beverly Hills	2,113	1,995	2,142	2,312	2,462	2,613	2,764	2,911	-0.57%	0.63%
Bruceville-Eddy (P)	1,488	1,471	1,580	1,705	1,816	1,927	2,038	2,147	-0.11%	0.63%
Chalk Bluff WSC	2,700	2,646	2,646	2,646	2,646	2,646	2,646	2,646	-0.20%	0.00%
Coryell City Water Supply District (P)	469	631	763	915	1,049	1,184	1,319	1,451	3.01%	1.40%
Crawford	705	717	727	739	749	759	769	779	0.17%	0.14%
Cross County WSC (P)	2,372	2,409	2,439	2,474	2,505	2,536	2,567	2,598	0.15%	0.13%
Elm Creek WSC (P)	1,343	1,631	1,865	2,135	2,373	2,613	2,852	3,087	1.96%	1.07%
Gholson	922	1,061	1,174	1,305	1,420	1,536	1,652	1,765	1.41%	0.85%
Golinda	87	146	194	250	299	349	398	446	5.31%	1.88%
Hallsburg	518	507	545	588	626	665	703	740	-0.21%	0.63%
Hewitt	11,085	13,549	15,543	17,848	19,884	21,932	23,973	25,976	2.03%	1.09%
Lacy-Lakeview	5,764	6,489	7,076	7,755	8,354	8,957	9,558	10,148	1.19%	0.75%
Lorena	1,433	1,691	1,900	2,142	2,356	2,571	2,785	2,995	1.67%	0.96%
Mart (P)	2,273	2,207	2,370	2,558	2,724	2,891	3,057	3,221	-0.29%	0.63%
McGregor	4,727	4,987	5,198	5,442	5,657	5,874	6,090	6,302	0.54%	0.39%
Moody	1,400	1,371	1,472	1,589	1,692	1,796	1,899	2,001	-0.21%	0.63%
North Bosque WSC	1,350	1,950	2,436	2,998	3,494	3,993	4,490	4,978	3.75%	1.57%

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Riesel	973	1,007	1,035	1,067	1,096	1,125	1,154	1,182	0.34%	0.27%
Robinson	7,845	10,509	12,665	15,157	17,358	19,572	21,779	23,945	2.97%	1.38%
Tri-County SUD (P)	112	141	165	193	217	242	267	291	2.33%	1.21%
Valley Mills (P)	3	13	22	32	41	50	59	68	15.79%	2.80%
Waco	113,726	124,805	133,769	144,132	153,286	162,493	171,668	180,673	0.93%	0.62%
West	2,692	2,807	2,901	3,009	3,105	3,201	3,297	3,391	0.42%	0.32%
West Brazos WSC (P)	1,614	1,208	1,297	1,400	1,491	1,583	1,674	1,763	-2.86%	0.63%
Western Hills WS	2,744	2,964	3,142	3,348	3,530	3,713	3,896	4,075	0.77%	0.53%
Woodway	8,733	8,452	9,075	9,795	10,431	11,070	11,708	12,333	-0.33%	0.63%
County-Other	25,112	27,641	27,613	27,582	27,558	27,531	27,503	27,478	0.96%	-0.01%
McLennan County Total	213,517	234,906	252,211	272,216	289,887	307,661	325,373	342,757	0.96%	0.63%
Milam County										
Bell-Milam-Falls WSC (P)	1,327	1,610	1,707	1,808	1,880	1,971	2,049	2,122	1.95%	0.46%
Buckholts	387	515	546	579	602	631	656	679	2.90%	0.46%
Cameron	5,634	5,552	5,884	6,233	6,481	6,796	7,065	7,318	-0.15%	0.46%
Milano WSC (P)	1,568	1,828	1,938	2,053	2,134	2,238	2,326	2,410	1.55%	0.46%
Rockdale	5,439	5,595	5,929	6,282	6,531	6,848	7,120	7,375	0.28%	0.46%
Southwest Milam WSC (P)	5,419	6,018	6,378	6,756	7,025	7,366	7,658	7,932	1.05%	0.46%
Thorndale	1,278	1,334	1,414	1,498	1,558	1,633	1,698	1,759	0.43%	0.46%
County-Other	3,186	2,305	2,438	2,584	2,685	2,817	2,929	3,034	-3.19%	0.46%
Milam County Total	24,238	24,757	26,234	27,793	28,896	30,300	31,501	32,629	0.21%	0.46%
Nolan County										
Bitter Creek WSC (P)	1,116	1,150	1,220	1,288	1,335	1,385	1,426	1,461	0.30%	0.40%
Roscoe	1,378	1,322	1,402	1,481	1,535	1,593	1,639	1,679	-0.41%	0.40%
Sweetwater	11,415	10,906	11,564	12,213	12,656	13,135	13,520	13,852	-0.46%	0.40%
County-Other	1,893	1,838	1,948	2,057	2,131	2,212	2,278	2,333	-0.29%	0.40%
Nolan County Total	15,802	15,216	16,134	17,039	17,657	18,325	18,863	19,325	-0.38%	0.40%
Palo Pinto County										
Graford	578	584	635	681	713	742	764	781	0.10%	0.49%
Mineral Wells (P)	14,770	14,644	15,907	17,072	17,858	18,585	19,139	19,577	-0.09%	0.49%
Possum Kingdom WSC	1,414	1,668	1,812	1,945	2,035	2,117	2,180	2,230	1.67%	0.49%
Stephens Regional SUD (P)	13	35	39	41	43	45	46	47	10.41%	0.49%
Strawn	739	653	710	762	797	829	854	873	-1.23%	0.49%
County-Other	9,512	10,527	11,432	12,270	12,834	13,357	13,756	14,071	1.02%	0.48%
Palo Pinto County Total	27,026	28,111	30,535	32,771	34,280	35,675	36,739	37,579	0.39%	0.48%
Robertson County										
Bremond	876	929	1,027	1,127	1,219	1,315	1,407	1,497	0.59%	0.80%

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Calvert	1,426	1,192	1,192	1,192	1,192	1,192	1,192	1,192	-1.78%	0.00%
Franklin	1,470	1,564	1,728	1,896	2,052	2,214	2,369	2,519	0.62%	0.80%
Hearne	4,690	4,459	4,459	4,459	4,459	4,459	4,459	4,459	-0.50%	0.00%
Robertson County WSC	2,529	2,760	3,049	3,346	3,620	3,907	4,181	4,446	0.88%	0.80%
Tri-County SUD (P)	838	845	934	1,025	1,109	1,196	1,280	1,361	0.08%	0.80%
Wellborn SUD (P)	0	0	1,804	2,067	2,340	2,673	3,031	3,425		
Wickson Creek SUD (P)	0	0	275	297	319	341	363	385		
County-Other	4,171	4,873	3,890	4,741	5,491	6,228	6,892	7,487	1.57%	0.72%
Robertson County Total	16,000	16,622	18,358	20,150	21,801	23,525	25,174	26,771	0.38%	0.80%
Shackelford County										
Albany	1,921	2,034	2,302	2,463	2,450	2,465	2,466	2,466	0.57%	0.32%
Stephens Regional SUD (P)	13	13	14	14	14	14	14	14	0.00%	0.12%
County-Other	1,368	1,331	1,242	1,189	1,193	1,188	1,187	1,187	-0.27%	-0.19%
Shackelford County Total	3,302	3,378	3,558	3,666	3,657	3,667	3,667	3,667	0.23%	0.14%
Somervell County										
Glen Rose	2,122	2,444	2,730	3,050	3,281	3,459	3,610	3,731	1.42%	0.71%
County-Other	4,687	6,046	6,752	7,544	8,114	8,554	8,929	9,227	2.58%	0.71%
Somervell County Total	6,809	8,490	9,482	10,594	11,395	12,013	12,539	12,958	2.23%	0.71%
Stephens County										
Breckenridge	5,868	5,780	5,959	6,178	6,276	6,340	6,387	6,419	-0.15%	0.17%
Fort Belknapp WSC (P)	35	48	50	52	53	53	54	54	3.21%	0.20%
Possum Kingdom WSC (P)	141	73	76	79	80	81	81	82		
Stephens Regional SUD (P)	2,482	2,323	2,395	2,483	2,523	2,549	2,567	2,580	-0.66%	0.18%
County-Other	1,148	1,406	1,447	1,501	1,523	1,540	1,552	1,558	2.05%	0.17%
Stephens County Total	9,674	9,630	9,927	10,293	10,455	10,563	10,641	10,693	-0.05%	0.17%
Stonewall County										
Aspermont	1,021	919	926	928	928	928	928	928	-1.05%	0.02%
County-Other	672	571	575	576	576	576	576	576	-1.62%	0.01%
Stonewall County Total	1,693	1,490	1,501	1,504	1,504	1,504	1,504	1,504	-1.27%	0.02%
Taylor County										
Abilene (P)	110,438	111,918	119,722	125,260	129,837	133,464	136,172	138,230	0.13%	0.35%
Coleman County WSC (P)	140	95	102	107	111	114	116	118	-3.80%	0.36%
Hawley WSC (P)	677	484	518	542	562	578	589	598	-3.30%	0.35%
Merkel	2,637	2,590	2,771	2,899	3,005	3,089	3,152	3,199	-0.18%	0.35%
Potosi WSC (P)	3,430	4,605	4,927	5,154	5,343	5,492	5,603	5,688	2.99%	0.35%
Steamboat Mountain WSC	3,342	4,485	4,798	5,020	5,204	5,349	5,457	5,540	2.99%	0.35%
Tuscola	714	742	794	831	861	885	903	917	0.39%	0.35%

Table 2-1. Historical and Projected Population by City/County

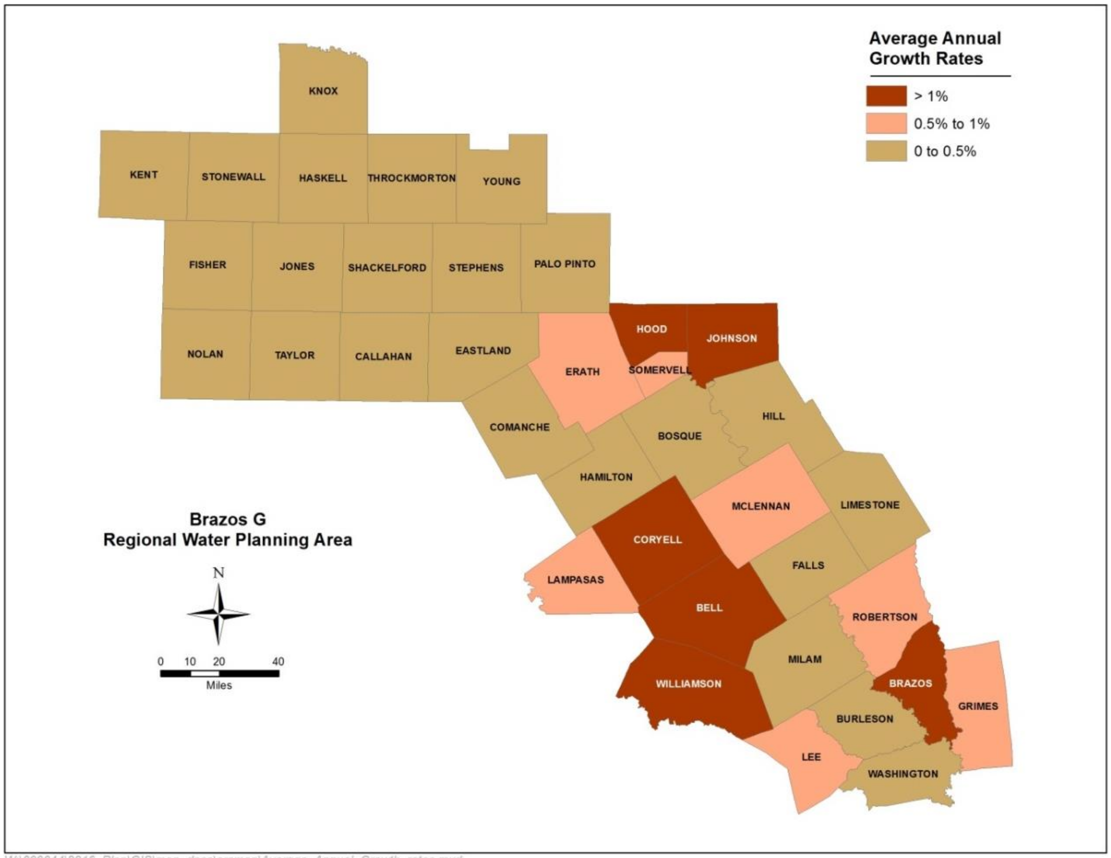
City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Tye	1,158	1,242	1,329	1,391	1,441	1,482	1,512	1,534	0.70%	0.35%
County-Other	4,019	5,345	5,714	5,979	6,197	6,369	6,500	6,599	2.89%	0.35%
Taylor County Total	126,555	131,506	140,675	147,183	152,561	156,822	160,004	162,423	0.38%	0.35%
Throckmorton County										
Fort Belknapp WSC (P)	105	179	180	180	180	180	180	180	5.48%	0.01%
Stephens Regional SUD (P)	79	138	139	139	139	139	139	139	5.74%	0.01%
Throckmorton	905	828	831	831	831	831	831	831	-0.89%	0.01%
County-Other	761	496	496	496	496	496	496	496	-4.19%	0.00%
Throckmorton County Total	1,850	1,641	1,646	1,646	1,646	1,646	1,646	1,646	-1.19%	0.01%
Washington County										
Brenham	13,507	15,716	17,355	18,886	19,929	20,966	21,772	22,430	1.53%	0.59%
County-Other	16,866	18,002	18,844	19,630	20,166	20,698	21,112	21,450	0.65%	0.29%
Washington County Total	30,373	33,718	36,199	38,516	40,095	41,664	42,884	43,880	1.05%	0.44%
Williamson County										
Bartlett (P)	857	933	1,027	1,097	1,184	1,278	1,384	1,494	0.85%	0.79%
Bell-Milam-Falls WSC (P)	274	214	327	411	515	628	755	887	-2.44%	2.40%
Blockhouse MUD	4,452	6,175	6,417	6,417	6,417	6,417	6,417	6,417	3.33%	0.06%
Brushy Creek MUD	11,322	12,705	17,636	19,198	19,198	19,198	19,198	19,198	1.16%	0.69%
Cedar Park (P)	25,508	48,448	71,518	79,329	79,329	79,329	79,329	79,329	6.63%	0.83%
Chisholm Trail SUD (P)	11,202	15,519	23,739	29,821	37,396	45,554	54,804	64,369	3.31%	2.40%
Fern Bluff MUD	5,319	5,691	5,932	5,932	5,932	5,932	5,932	5,932	0.68%	0.07%
Florence	1,054	1,136	1,238	1,313	1,407	1,508	1,623	1,742	0.75%	0.72%
Georgetown	28,339	47,400	72,507	91,085	114,220	139,136	167,390	196,604	5.28%	2.40%
Granger	1,299	1,419	1,568	1,678	1,816	1,964	2,132	2,306	0.89%	0.81%
Hutto	1,250	14,698	31,492	43,919	59,394	76,060	94,959	114,500	27.95%	3.48%
Jarrell	614	984	1,446	1,787	2,212	2,670	3,189	3,726	4.83%	2.24%
Jarrell-Schwertner WSC (P)	2,720	2,216	3,389	4,258	5,339	6,504	7,825	9,191	-2.03%	2.40%
Jonah Water SUD	7,962	8,489	12,985	16,312	20,456	24,918	29,978	35,210	0.64%	2.40%
Leander	7,596	25,444	41,071	69,551	115,635	188,502	238,648	293,630	12.85%	4.16%
Liberty Hill	1,409	967	1,479	1,858	2,330	2,838	3,414	4,010	-3.69%	2.40%
Manville WSC (P)	5,273	6,093	9,320	11,708	14,682	17,885	21,517	25,272	1.46%	2.40%
Pflugerville	0	300	458	576	722	880	1,059	1,244		2.40%
Round Rock (P)	60,060	98,525	150,712	189,329	237,417	289,207	347,936	408,660	5.07%	2.40%
Southwest Milam (P)	1,245	1,210	1,850	2,325	2,915	3,551	4,273	5,018	-0.28%	2.40%
Taylor	13,575	15,191	17,209	18,702	20,561	22,563	24,834	27,182	1.13%	0.97%
Thorndale (P)	0	2	3	3	4	5	7	8		2.34%
Thrall	710	839	1,000	1,119	1,267	1,426	1,607	1,794	1.68%	1.27%

Table 2-1. Historical and Projected Population by City/County

City/County	Historical		Projections[1]						Annual Percent Growth	
	2000	2010	2020	2030	2040	2050	2060	2070	2000-2010	2010-2070
Williamson County MUD #10	4	3,047	4,660	5,855	7,342	8,944	10,760	12,638	94.17%	2.40%
Williamson County MUD #11	65	1,872	2,863	3,597	4,510	5,495	6,610	7,764	39.94%	2.40%
Williamson County MUD #9	2,058	2,709	4,143	5,205	6,527	7,951	9,566	11,236	2.79%	2.40%
Williamson-Travis County MUD #1 (P)	4,179	4,617	4,596	4,596	4,596	4,596	4,596	4,596	1.00%	-0.01%
County-Other	12,960	39,689	71,170	88,710	111,606	113,031	147,127	179,249	11.84%	2.54%
Williamson County Total	211,306	366,532	561,755	705,691	884,929	1,077,970	1,296,869	1,523,206	5.66%	2.40%
Young County										
Fort Belknapp WSC (P)	3,349	3,630	3,784	3,993	4,142	4,300	4,454	4,603	0.81%	0.40%
Graham	8,716	8,903	9,281	9,792	10,159	10,546	10,924	11,289	0.21%	0.40%
Newcastle	575	585	610	644	668	693	718	742	0.17%	0.40%
County-Other	1,349	1,686	1,757	1,852	1,923	1,996	2,067	2,136	2.26%	0.40%
Young County Total	13,989	14,804	15,432	16,281	16,892	17,535	18,163	18,770	0.57%	0.40%
Brazos G Total	1,619,716	1,972,449	2,371,064	2,720,696	3,097,007	3,494,544	3,918,197	4,351,042	1.99%	1.33%

Notes:
[1] Projections from Texas Water Development Board
(P) Partial

Figure 2-2. Projected Annual County Growth Rates in the Brazos G Regional Water Planning Area



2.2.1 Revisions to Population Projections

The TWDB and the Brazos G RWPG developed revisions to population projections for specific municipal WUGs in the Brazos G Area for the 2016 Plan. There are 15 new WUGs whose populations have grown sufficiently to be included as WUGs in the 2016 Plan, based on information provided by the TWDB, including Armstrong WSC (Bell County), Deanville WSC (Burleson County), Coryell City WSD (Coryell and McLennan County), Multi-County WSC (Coryell and Hamilton County), Golinda (Falls and McLennan County), Dobbin-Plantersville (Grimes County), G&W WSC (Grimes County), Hill County WSC (Hill County), Crowley (Johnson County), Buckholts (Milam County), Possum Kingdom WSC (Palo Pinto and Stephens County), Thorndale (Williamson County), Williamson County MUD #9, Williamson County MUD #10, and Williamson County MUD #11. In addition, two new WUGs from adjacent regions have service areas in Brazos G including Pflugerville (Williamson County) and Fort Worth (Johnson County). Texas A&M University is a new WUG in Brazos County which was previously considered as part of College Station's population. Approved population revisions are detailed in Table 2-2. WUGs with suggested revisions can be classified into three categories:

1. Requested changes based on correspondence with Municipal WUGs due to build-out projections and other planning documents.

2. Requested changes for consistency with Water Use Survey and calculated consumptive use based on gallons per capita per day (gpcd).
3. Two WUGs were removed including Decordova and Wells Branch MUD. Decordova was removed as a WUG and its population was associated with Acton MUD, which provides retail water supply. Wells Branch MUD was removed as a WUG in Brazos G since all of its service area is in the Region K portion of Williamson County.

Approved population revisions are detailed in Table 2-2. TWDB reviewed the list of WUGs and identified the cause of many of the differences which included:

A. Not all of the WUGs' systems were included in the Water Use Survey (WUS);
B. Some of the non-city WUGs' customers are inside city limits and those shared populations are accounted for in the Cities' populations;
C. A WUG may have overestimated population on the WUS using a higher persons per connection factor (resulting in lower gpcd);
D. The WUS population estimate may have included seasonal population (resulting in lower gpcd); and
E. In some cases, data entry errors were identified.

Table 2-2. TWDB Approved Revisions to the 2016 Population Projections

Plan	County	WUG	Draft and Revised (2016) Population Projection					
			2020	2030	2040	2050	2060	2070
Draft	BELL	439 WSC	5,875	6,139	6,426	6,721	7,010	7,295
Revised	BELL	439 WSC	7,584	8,435	9,318	10,292	11,369	12,559
Draft	BELL	COUNTY-OTHER	6,817	12,806	19,706	26,792	33,746	40,590
Revised	BELL	COUNTY-OTHER	5,166	10,545	16,824	23,205	29,347	35,261
Draft	BELL	PENDLETON WSC	2,730	2,861	3,004	3,151	3,295	3,437
Revised	BELL	PENDLETON WSC	2,075	2,174	2,283	2,395	2,504	2,612
Draft	BELL	SALADO WSC	4,856	5,298	5,780	6,275	6,761	7,239
Revised	BELL	SALADO WSC	5,453	5,950	6,491	7,047	7,592	8,129
Draft	BRAZOS	BRYAN	84,350	93,544	103,066	114,716	127,196	140,956
Revised	BRAZOS	BRYAN	88,434	93,544	119,410	138,980	159,588	181,797
Draft	BRAZOS	COLLEGE STATION	104,052	126,999	150,765	179,841	210,991	245,335
Revised	BRAZOS	COLLEGE STATION	102,140	132,690	141,952	164,492	188,719	215,545
Draft	BRAZOS	COUNTY-OTHER	8,340	9,731	11,326	13,278	15,369	17,675
Revised	BRAZOS	COUNTY-OTHER	6,168	4,040	3,795	4,363	5,249	6,624
Draft	BURLESON	CALDWELL	4,427	4,763	4,976	5,190	5,359	5,498
Revised	BURLESON	CALDWELL	4,896	5,060	5,275	5,312	5,412	5,498
Draft	BURLESON	COUNTY-OTHER	6,279	6,758	7,059	7,363	7,604	7,799
Revised	BURLESON	COUNTY-OTHER	5,341	6,164	6,461	7,119	7,498	7,799
Draft	BURLESON	DEANVILLE WSC	3,129	3,366	3,517	3,668	3,787	3,885

Table 2-2. TWDB Approved Revisions to the 2016 Population Projections

Plan	County	WUG	Draft and Revised (2016) Population Projection					
			2020	2030	2040	2050	2060	2070
Revised	BURLESON	DEANVILLE WSC	3,598	3,663	3,816	3,790	3,840	3,885
Draft	HOOD	ACTON MUD	15,163	16,586	17,606	18,484	19,158	19,675
Revised	HOOD	ACTON MUD	19,725	31,885	39,831	43,891	48,381	53,347
Draft	HOOD	COUNTY-OTHER	28,273	33,484	37,220	40,436	42,909	44,803
Revised	HOOD	COUNTY-OTHER	26,999	22,057	19,285	19,679	18,612	16,269
Draft	HOOD	DECORDOVA	3,288	3,872	4,290	4,650	4,926	5,138
Revised	HOOD	DECORDOVA	-	-	-	-	-	-
Draft	JOHNSON	BURLESON	33,528	38,685	44,006	49,841	56,135	62,871
Revised	JOHNSON	BURLESON	35,167	42,845	50,022	54,635	60,711	68,170
Draft	JOHNSON	COUNTY-OTHER	16,770	18,970	21,240	23,731	26,419	29,293
Revised	JOHNSON	COUNTY-OTHER	15,131	14,810	15,224	13,937	13,843	13,994
Draft	JOHNSON	FORT WORTH						
Revised	JOHNSON	FORT WORTH	-	-	-	5,000	8,000	10,000
Draft	ROBERTSON	COUNTY-OTHER	5,969	7,105	8,150	9,242	10,286	11,297
Revised	ROBERTSON	COUNTY-OTHER	3,890	4,741	5,491	6,228	6,892	7,487
Draft	ROBERTSON	WELLBORN SUD						
Revised	ROBERTSON	WELLBORN SUD	1,804	2,067	2,340	2,673	3,031	3,425
Draft	ROBERTSON	WICKSON CREEK SUD						
Revised	ROBERTSON	WICKSON CREEK SUD	275	297	319	341	363	385
Draft	WILLIAMSON	BLOCKHOUSE MUD	8,326	9,918	11,900	14,035	16,456	18,959
Revised	WILLIAMSON	BLOCKHOUSE MUD	6,417	6,417	6,417	6,417	6,417	6,417
Draft	WILLIAMSON	BRUSHY CREEK MUD	14,432	15,710	17,301	19,015	20,958	22,967
Revised	WILLIAMSON	BRUSHY CREEK MUD	17,636	19,198	19,198	19,198	19,198	19,198
Draft	WILLIAMSON	CEDAR PARK	63,308	80,974	101,850	108,018	108,018	108,018
Revised	WILLIAMSON	CEDAR PARK	81,639	85,666	89,688	89,688	89,688	89,688
Draft	WILLIAMSON	COUNTY-OTHER	70,474	86,753	108,150	147,510	199,135	252,514
Revised	WILLIAMSON	COUNTY-OTHER	71,170	88,710	111,606	113,031	147,127	179,249
Draft	WILLIAMSON	LEANDER	47,733	64,226	84,764	106,883	131,965	157,900
Revised	WILLIAMSON	LEANDER	41,071	69,551	115,635	188,502	238,648	293,630
Draft	WILLIAMSON	WELLS BRANCH MUD	1,073	1,348	1,691	2,060	2,479	2,911
Revised	WILLIAMSON	WELLS BRANCH MUD	-	-	-	-	-	-
Draft	WILLIAMSON	WILLIAMSON-TRAVIS COUNTY MUD#1	7,062	8,872	11,125	13,552	16,304	19,150
Revised	WILLIAMSON	WILLIAMSON-TRAVIS COUNTY MUD#1	4,596	4,596	4,596	4,596	4,596	4,596

2.3 Water Demand Projections

Water demand projections have been compiled for each type of consumptive water use (municipal, manufacturing, steam-electric, mining, irrigation, and livestock); projections for non-consumptive water uses, such as navigation, hydroelectric generation, environmental flows, and recreation, are not presented. As shown in Table 2-3, total water use for the area is projected to increase from 853,170 acft in 2010 to 1,478,731 acft in 2070, a 70 percent increase. The trend in total water use is shown in Figure 2-3. The six types of water use as percentages of total water use are shown for 2010 and 2070 in Figure 2-4. The projections indicate that municipal, manufacturing, mining and steam-electric water use as percentages of the total water use increase from 2010 to 2070, while irrigation, and livestock water use are projected to decrease as percentages of the total. A water demand projection summary sheet for each county, broken down by type of use, is presented in Section 4.

2.3.1 Revisions to Municipal Demand Projections

The TWDB and the Brazos G RWPG developed revisions to municipal demand projections for specific municipal WUGs in the Brazos G Area for the 2016 Plan. Any WUG with a population revision detailed in Table 2-2 would result in a demand revision as well. TWDB requested that water use in the 2016 regional water plans be based on estimates for gallons per capita daily (gpcd) from the 2011 Water Use Surveys, unless evidence suggested that another year or set of years (averaged) would be more appropriate.

2.3.2 Municipal Water Demand

Municipal water use is defined as water that is used by households (e.g., drinking, bathing, food preparation, dishwashing, laundry, flushing toilets, lawn watering and landscaping, swimming pools), commercial establishments, (e.g., restaurants, car washes, hotels, laundromats, and office buildings) and for fire protection, public recreation and sanitation. This type of water must meet safe-drinking water standards as specified by Federal and State laws and regulations.

Table 2-3. Brazos G Area Total Water Demand by Type of Use (acft/yr)

Water Use	Historical		Projections[1]					
	2000	2010	2020	2030	2040	2050	2060	2070
Municipal	311,291	326,414	403,550	451,228	503,717	561,807	627,029	694,265
Manufacturing	60,522	46,131	21,848	24,554	27,270	29,687	32,223	34,977
Steam-Electric	97,921	76,545	239,299	272,711	288,696	322,702	341,364	362,386
Mining	4,382	53,383	61,586	70,381	68,875	70,949	75,038	81,409
Irrigation	232,911	298,754	292,091	284,321	276,847	268,840	262,305	256,044
Livestock	53,222	51,943	49,650	49,650	49,650	49,650	49,650	49,650
Brazos G Total	760,249	853,170	1,068,024	1,152,845	1,215,055	1,303,635	1,387,609	1,478,731

1 Projections from Texas Water Development Board

Figure 2-3. Projected Total Water Demand

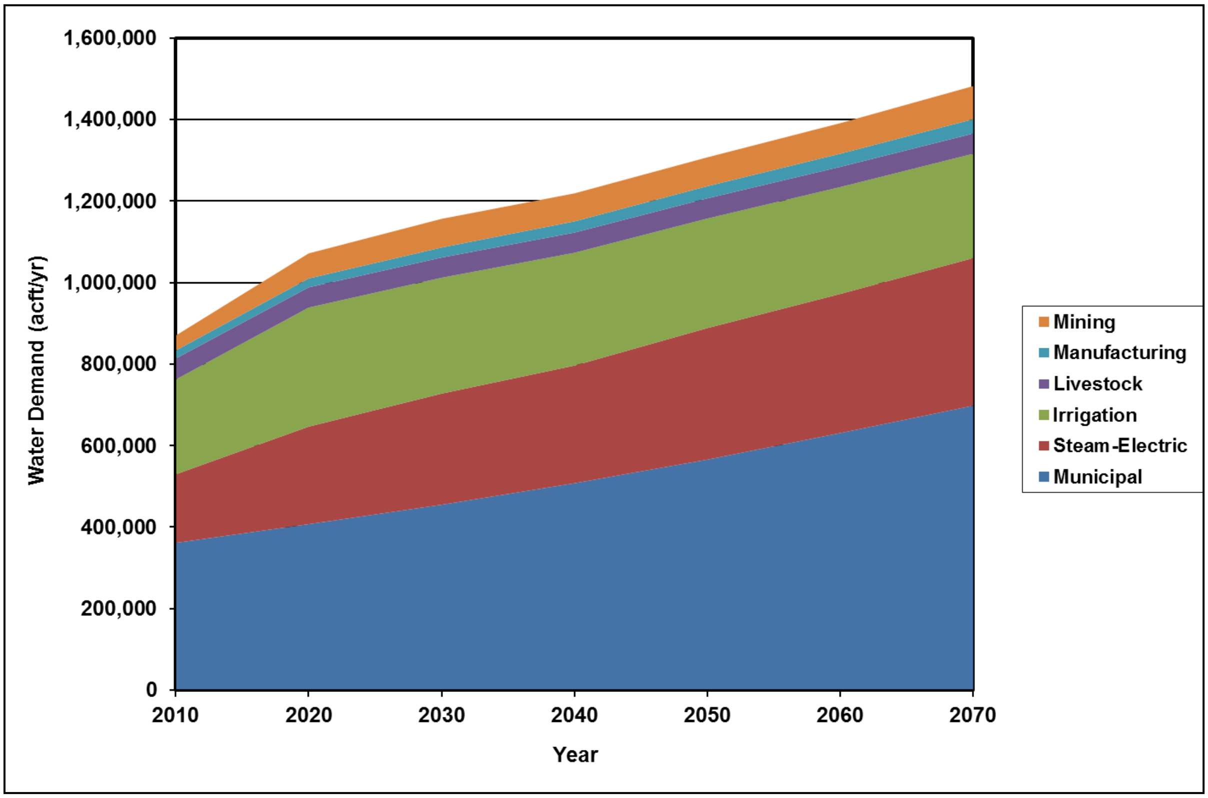
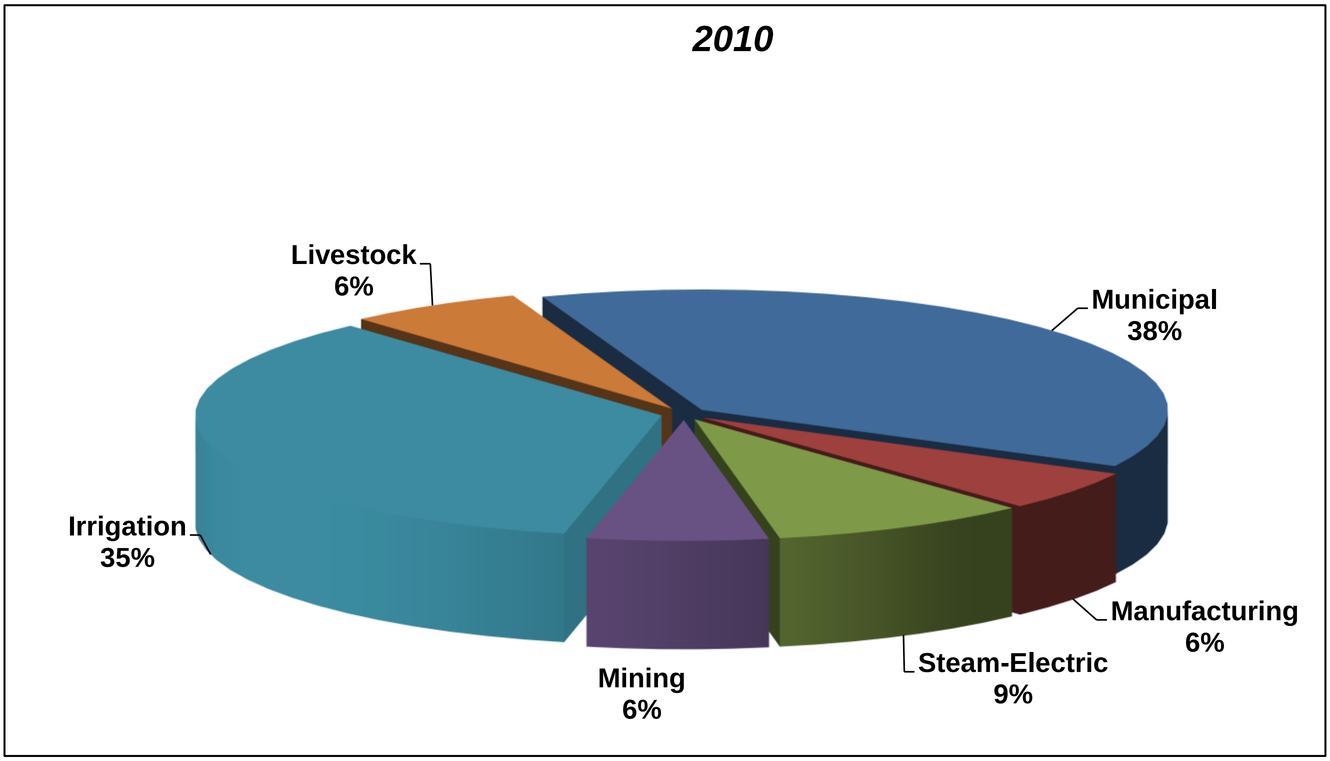
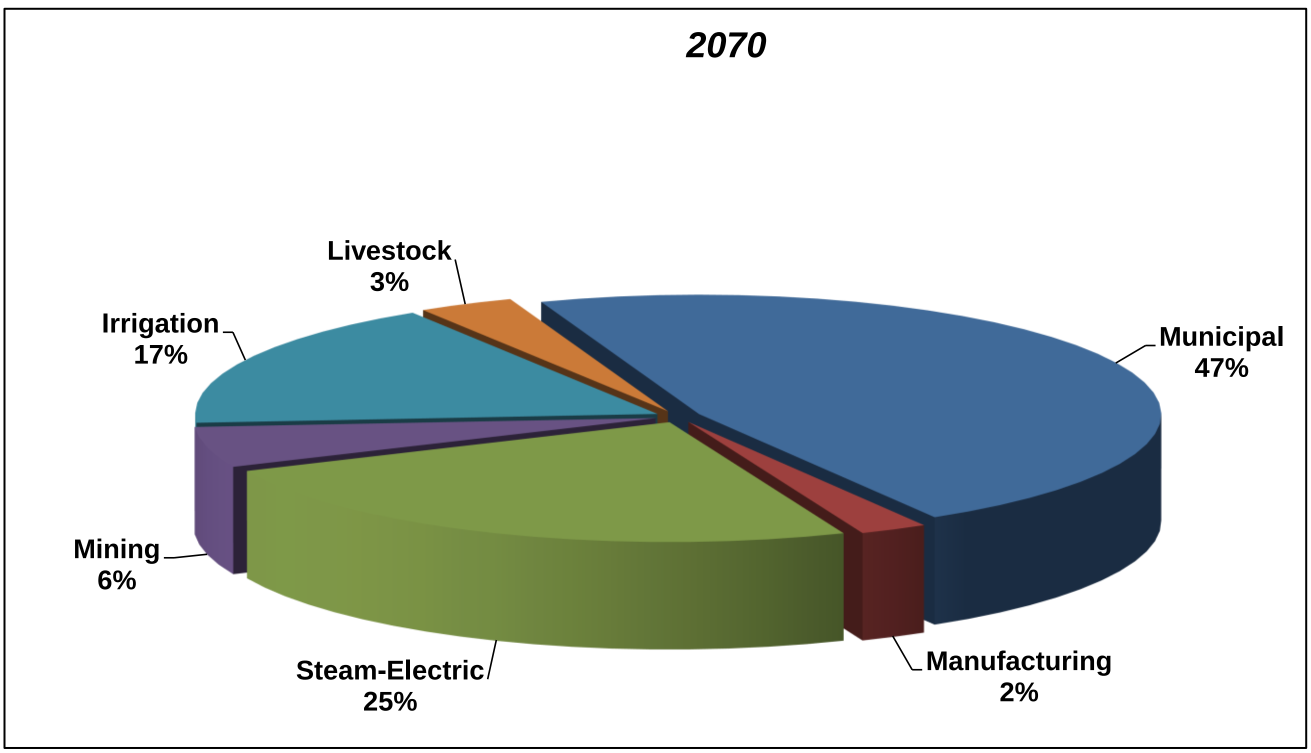


Figure 2-4. Total Water Demand by Type of Use in 2010 and 2070





Municipal water demand projections are computed by multiplying the projected population of an entity by the entity's projected per capita water use, adjusted downward for expected conservation savings due primarily to continued implementation of the 1991 State Water-Efficient Plumbing Act. Full implementation of the Act – retrofit of all existing fixtures with water-efficient fixtures and water-efficient fixtures installed in all new construction – was assumed to occur by Year 2045.

Table 2-4 presents projected per capita water use for water user groups in the Brazos G Area. These per capita water use rates reflect reductions due to implementation of the 1991 State Water-Efficient Plumbing Act. These reductions vary depending on the rural/urban nature of each Water User Group and projected growth, and range from 0 gallons per capita per day (gpcd) to 20 gpcd. Per capita water use varies widely in the Brazos G Area, ranging between 62 gpcd to 487 gpcd. The base year (2011) average gpcd for Brazos G was 146 gpcd. Lower per capita water uses are typically associated with smaller, rural water utilities where outside water use for lawns or landscaping is limited, or is supplemented with individual residential wells and/or stock tanks. Larger per capita water use is typically associated with areas having large suburban residential growth or established urban areas having significant commercial water use, or locations with high seasonal use but smaller year round population (e.g., Texas A&M University). The Conservation Task Force formed by the 78th Texas Legislature has recommended a statewide target per capita water use of 140 gpcd.[1]

Annual municipal water use for the region is projected to increase by 290,715 acft between 2020 and 2070, from 403,350 acft to 694,265 acft, a 72 percent increase. As can be seen in Figure 2-5 seven counties - Bell, Brazos, Coryell, Johnson, McLennan, Taylor, and Williamson - are projected to account for 84 percent of the total municipal water use in 2070. Municipal water use projections for all 37 counties and 234 cities, other utilities, and 'County-Other' in the region are presented in Table 2-5.

The 72 percent projected increase in municipal water demand over the 2020–2070 planning horizon is less than the projected population increase of 83 percent due to expected savings in per capita water use resulting from continued implementation of the 1991 State Water-Efficient Plumbing Act.

[1] Water Conservation Implementation Task Force, Report to the 79th Texas Legislature, Texas Water Development Board, Special Report, Austin, Texas, November 2004.

Table 2-4. Per Capita Water Use for Water User Groups in the Brazos G Regional Water Planning Area (gpcd)

Water User Group	Per Capita Use Rates (GPCD)							Reduction due to Plumbing Fixtures Act (2020 to 2070)
	Base (2011)	2020	2030	2040	2050	2060	2070	
439 WSC	133	123	120	118	117	117	117	6
ABILENE	172	162	158	155	153	153	153	9
ACTON MUD	139	130	125	123	123	123	122	8
ALBANY	258	248	244	241	240	239	239	9
ALVARADO	105	96	92	89	88	87	87	8
ANSON	137	127	123	119	118	118	118	9
AQUA WSC	156	147	143	141	140	140	140	7
ARMSTRONG WSC	168	159	154	151	150	149	149	9
ASPERMONT	250	241	236	233	233	232	232	9
BAIRD	153	144	139	135	135	135	135	9
BARTLETT	181	171	167	164	162	162	161	10
BELLMEAD	115	106	102	99	98	97	97	9
BELL-MILAM FALLS WSC	142	134	130	128	126	126	126	7
BELTON	165	156	152	150	149	148	148	7
BETHANY WSC	93	84	80	77	76	76	76	8
BETHESDA WSC	197	187	183	181	179	179	179	8
BEVERLY HILLS	115	105	101	97	96	96	96	9
BITTER CREEK WSC	128	118	114	110	110	110	110	9
BLOCKHOUSE MUD	126	118	115	114	113	113	113	5
BOSQUE COUNTY-OTHER	132	124	121	119	118	118	118	6
BRANDON-IRENE WSC	128	118	113	110	109	109	109	9
BRAZOS COUNTY-OTHER	142	131	130	130	129	128	128	3
BRECKENRIDGE	161	152	147	144	142	142	142	9
BREMOND	174	164	159	156	155	155	155	9
BRENHAM	219	210	206	203	202	202	202	8
BRUCEVILLE-EDDY	174	165	161	158	157	156	156	9
BRUSHY CREEK MUD	231	221	218	217	216	216	215	6
BRYAN	168	158	155	152	151	151	151	8
BUCKHOLTS	118	111	108	105	103	103	104	7
BURLESON	143	135	132	130	129	129	129	6
BURLESON COUNTY-OTHER	114	103	97	97	97	96	96	7

Table 2-4. Per Capita Water Use for Water User Groups in the Brazos G Regional Water Planning Area (gpcd)

Water User Group	Per Capita Use Rates (GPCD)							Reduction due to Plumbing Fixtures Act (2020 to 2070)
	Base (2011)	2020	2030	2040	2050	2060	2070	
CALDWELL	197	187	184	182	180	180	180	7
CALLAHAN COUNTY-OTHER	80	71	67	64	63	62	62	8
CALVERT	152	142	137	135	135	134	134	8
CAMERON	216	206	202	198	197	197	197	10
CEDAR PARK	197	190	188	187	187	186	186	3
CHALK BLUFF WSC	99	91	87	84	83	82	82	8
CHILDRESS CREEK WSC	147	138	134	132	130	130	130	8
CHISHOLM TRAIL SUD	174	166	164	163	162	162	162	4
CISCO	168	159	155	151	149	149	149	10
CLEBURNE	172	163	159	156	155	155	155	8
CLIFTON	173	163	159	156	154	154	154	9
CLYDE	82	73	69	66	64	64	64	9
COLEMAN COUNTY SUD	120	112	109	105	102	105	106	6
COLLEGE STATION	177	168	164	162	161	160	160	7
COMANCHE	113	103	99	96	94	94	94	10
COMANCHE COUNTY-OTHER	103	94	90	86	85	84	84	9
COOLIDGE	156	147	143	141	140	139	139	7
COPPERAS COVE	116	106	102	99	98	98	98	8
CORYELL CITY WATER SUPPLY DISTRICT	154	146	143	141	140	140	140	6
CORYELL COUNTY-OTHER	114	105	103	103	102	102	102	3
CRAWFORD	191	183	178	175	173	173	173	10
CRESSON	143	137	133	131	129	130	130	7
CROSS COUNTRY WSC	158	150	147	144	143	142	142	8
CROSS PLAINS	162	152	148	144	144	143	143	9
CROWLEY	141	146	130	129	131	130	128	18
DE LEON	95	85	81	78	76	76	76	9
DEANVILLE WSC	121	115	115	115	115	115	115	1
DOBBIN-PLANTERSVILLE WSC	76	69	67	66	65	65	65	4
DOG RIDGE WSC	135	124	120	117	116	115	115	9
DUBLIN	94	84	80	76	75	75	75	9
EAST BELL WSC	118	109	106	103	102	102	101	8

Table 2-4. Per Capita Water Use for Water User Groups in the Brazos G Regional Water Planning Area (gpcd)

Water User Group	Per Capita Use Rates (GPCD)							Reduction due to Plumbing Fixtures Act (2020 to 2070)
	Base (2011)	2020	2030	2040	2050	2060	2070	
EASTLAND	150	141	137	134	132	131	131	9
EASTLAND COUNTY-OTHER	90	81	77	73	72	71	71	9
ELM CREEK WSC	104	96	92	91	90	89	89	6
ERATH COUNTY-OTHER	134	125	121	119	118	117	117	8
FALLS COUNTY-OTHER	123	113	109	105	105	104	104	9
FERN BLUFF MUD	190	183	181	180	179	179	179	4
FILES VALLEY WSC	146	137	133	131	129	129	129	8
FISHER COUNTY-OTHER	113	104	99	96	96	95	95	9
FLORENCE	95	86	82	79	78	78	78	8
FORT BELKNAPP WSC	107	99	96	94	92	92	92	7
FORT HOOD	215	204	200	197	197	197	196	8
FORT WORTH	185	176	172	170	170	170	169	6
FRANKLIN	142	132	128	125	124	124	123	9
G & W WSC	112	104	101	100	99	99	99	5
GATESVILLE	229	220	216	213	212	212	212	8
GEORGETOWN	205	196	194	193	192	192	192	4
GHOLSON	126	118	114	112	110	110	110	8
GIDDINGS	188	178	174	171	170	170	170	8
GLEN ROSE	200	191	187	184	183	183	183	8
GODLEY	99	91	87	86	85	84	84	7
GOLINDA	95	88	85	83	81	80	81	7
GORMAN	88	79	74	71	70	70	70	9
GRAFORD	95	86	81	79	77	77	77	9
GRAHAM	266	256	252	249	247	247	247	10
GRANBURY	115	106	103	101	100	100	100	6
GRANDVIEW	102	93	89	86	85	85	84	8
GRANGER	130	121	117	114	112	112	112	9
GRIMES COUNTY-OTHER	136	126	122	118	118	117	117	9
GROESBECK	149	140	137	134	132	132	132	8
HALLSBURG	141	133	128	124	124	123	123	10
HAMILTON	162	153	149	146	144	144	144	10

Table 2-4. Per Capita Water Use for Water User Groups in the Brazos G Regional Water Planning Area (gpcd)

Water User Group	Per Capita Use Rates (GPCD)							Reduction due to Plumbing Fixtures Act (2020 to 2070)
	Base (2011)	2020	2030	2040	2050	2060	2070	
HAMILTON COUNTY-OTHER	121	111	107	103	103	103	103	9
HAMLIN	178	168	163	160	160	160	159	9
HARKER HEIGHTS	182	174	171	169	168	167	167	6
HASKELL	148	139	135	131	130	129	129	10
HASKELL COUNTY-OTHER	129	119	114	112	112	111	111	8
HAWLEY	109	99	95	92	90	90	91	9
HAWLEY WSC	78	69	65	63	61	61	61	8
HEARNE	161	152	147	143	143	142	142	9
HEWITT	165	156	152	149	148	148	148	8
HICO	125	116	112	109	107	106	106	10
HILL COUNTY WSC	128	121	119	117	117	116	116	5
HILL COUNTY-OTHER	106	99	98	97	96	96	96	4
HILLSBORO	200	190	186	183	182	182	182	9
HOLLAND	97	88	84	81	79	78	78	10
HOOD COUNTY-OTHER	102	93	88	88	88	87	87	6
HUBBARD	98	88	84	80	80	79	79	8
HUTTO	113	107	105	105	105	105	105	2
ITASCA	88	79	75	72	70	70	70	9
JARRELL	76	67	64	63	63	62	62	5
JARRELL-SCHWERTNER WSC	133	121	118	115	114	114	114	7
JAYTON	164	156	150	147	147	145	145	10
JOHNSON COUNTY SUD	124	115	111	109	108	108	108	7
JOHNSON COUNTY-OTHER	103	95	92	90	89	89	89	6
JONAH WATER SUD	137	126	123	121	120	120	120	6
JONES COUNTY-OTHER	119	112	110	108	107	107	107	5
JOSHUA	127	118	114	112	111	110	110	7
KEENE	70	61	60	60	60	60	60	1
KEMPNER	158	149	147	144	143	143	143	7
KEMPNER WSC	164	156	153	151	150	150	150	6
KENT COUNTY-OTHER	118	109	104	104	104	104	104	6
KILLEEN	122	113	110	108	107	107	107	6

Table 2-4. Per Capita Water Use for Water User Groups in the Brazos G Regional Water Planning Area (gpcd)

Water User Group	Per Capita Use Rates (GPCD)							Reduction due to Plumbing Fixtures Act (2020 to 2070)
	Base (2011)	2020	2030	2040	2050	2060	2070	
KNOX CITY	195	185	180	178	178	177	177	8
KNOX COUNTY-OTHER	102	92	87	85	84	84	84	8
LACY-LAKEVIEW	106	97	94	92	91	90	90	7
LAMPASAS	154	144	139	136	135	135	135	9
LAMPASAS COUNTY-OTHER	131	120	119	119	118	117	118	2
LEANDER	114	107	105	104	104	104	104	3
LEE COUNTY WSC	122	113	110	108	107	107	107	7
LEE COUNTY-OTHER	104	93	88	87	87	86	86	7
LEXINGTON	169	159	155	153	151	151	151	9
LIBERTY HILL	106	95	92	91	90	90	89	6
LIMESTONE COUNTY-OTHER	94	85	81	78	76	76	76	9
LITTLE RIVER-ACADEMY	160	151	147	144	143	143	143	8
LOMETA	177	168	164	161	160	160	159	9
LORENA	154	145	141	139	138	138	137	8
LOTT	91	81	77	74	73	72	72	9
MANSFIELD	252	245	242	241	240	240	240	5
MANVILLE WSC	148	139	136	135	134	134	134	5
MARLIN	254	244	239	236	235	235	235	9
MART	142	133	128	126	124	124	123	9
MCGREGOR	146	137	133	129	128	127	127	9
MCLENNAN COUNTY-OTHER	123	114	110	107	105	105	105	9
MERIDIAN	129	119	115	112	111	110	110	9
MERKEL	120	111	106	103	101	101	101	9
MEXIA	70	60	60	60	60	60	60	0
MILAM COUNTY-OTHER	122	110	108	108	107	107	107	3
MILANO WSC	110	101	98	95	94	94	94	8
MINERAL WELLS	155	146	142	139	137	137	137	9
MOFFAT WSC	113	104	101	98	97	96	96	8
MOODY	124	115	110	107	105	105	105	10
MORGANS POINT RESORT	111	103	99	98	97	97	97	6
MOUNTAIN PEAK SUD	290	280	277	275	274	274	273	7

Table 2-4. Per Capita Water Use for Water User Groups in the Brazos G Regional Water Planning Area (gpcd)

Water User Group	Per Capita Use Rates (GPCD)							Reduction due to Plumbing Fixtures Act (2020 to 2070)
	Base (2011)	2020	2030	2040	2050	2060	2070	
MULTI-COUNTY WSC	95	87	83	81	79	79	79	8
MUNDAY	180	170	165	162	162	162	162	8
NAVASOTA	184	175	171	168	166	166	166	9
NEWCASTLE	97	88	85	82	79	78	78	10
NOLAN COUNTY-OTHER	114	104	100	97	96	95	95	9
NOLANVILLE	212	204	201	199	199	199	199	5
NORTH BOSQUE WSC	235	227	224	222	221	221	221	6
OAK TRAIL SHORES SUBDIVISION	111	102	99	96	94	94	94	8
PALO PINTO COUNTY-OTHER	93	83	79	75	74	74	74	9
PARKER WSC	104	95	92	89	89	88	89	7
PENDLETON WSC	116	105	101	100	99	99	99	7
PFLUGERVILLE	155	148	147	146	146	146	146	2
POSSUM KINGDOM WSC	392	383	379	376	375	375	375	8
POTOSI WSC	146	138	135	133	132	131	131	7
RANGER	171	161	157	153	153	152	152	9
RIESEL	126	117	114	111	109	108	109	9
RIO VISTA	133	124	120	118	117	117	117	7
RISING STAR	112	103	99	96	94	94	94	9
ROBERTSON COUNTY WSC	81	72	68	66	64	64	64	8
ROBERTSON COUNTY-OTHER	111	101	96	96	95	95	95	6
ROBINSON	181	172	168	166	165	165	165	7
ROBY	175	167	163	160	158	157	157	10
ROCKDALE	184	175	170	167	165	165	165	9
ROGERS	127	118	114	111	109	109	109	9
ROSCOE	137	127	123	119	118	118	118	9
ROSEBUD	111	101	96	93	93	93	93	8
ROTAN	114	105	100	97	96	96	96	9
ROUND ROCK	152	143	141	139	139	139	138	5
RULE	133	125	119	116	116	116	116	9
SALADO WSC	292	283	280	277	276	276	276	6
SHACKELFORD COUNTY-OTHER	99	90	85	81	80	80	80	9

Table 2-4. Per Capita Water Use for Water User Groups in the Brazos G Regional Water Planning Area (gpcd)

Water User Group	Per Capita Use Rates (GPCD)							Reduction due to Plumbing Fixtures Act (2020 to 2070)
	Base (2011)	2020	2030	2040	2050	2060	2070	
SNOOK	307	298	293	289	288	289	288	10
SOMERVELL COUNTY-OTHER	117	109	106	104	102	102	102	7
SOMERVILLE	170	160	155	152	152	152	152	8
SOUTHWEST MILAM WSC	152	144	140	137	136	136	136	8
STAMFORD	237	227	223	219	218	218	218	9
STEAMBOAT MOUNTAIN WSC	84	76	73	72	70	70	70	6
STEPHENS COUNTY-OTHER	105	96	92	89	88	87	87	9
STEPHENS REGIONAL SUD	107	98	94	91	89	89	89	10
STEPHENVILLE	134	125	121	118	117	116	116	8
STONEWALL COUNTY-OTHER	116	106	101	101	99	99	99	6
STRAWN	182	172	169	165	164	163	163	10
SWEETWATER	153	143	138	135	134	134	134	9
TAYLOR	157	147	143	141	139	139	139	8
TAYLOR COUNTY-OTHER	113	103	99	95	95	95	95	8
TEMPLE	229	219	216	214	213	212	212	7
TEXAS A & M UNIVERSITY	487	476	472	469	468	468	468	8
THORNDALE	125	116	112	109	108	107	107	9
THORNTON	126	118	114	110	108	108	107	11
THRALL	89	79	76	74	73	72	72	7
THROCKMORTON	205	196	191	188	188	187	187	9
THROCKMORTON COUNTY-OTHER	96	86	81	81	81	81	81	5
TOLAR	134	125	121	119	118	117	117	8
TRI-COUNTY SUD	119	110	106	103	101	101	101	9
TROY	90	81	77	74	73	72	72	8
TUSCOLA	97	89	85	82	80	80	80	9
TYE	134	125	121	118	116	116	116	9
VALLEY MILLS	184	175	171	168	166	166	166	9
VENUS	174	167	165	163	163	162	162	5
WACO	220	211	207	204	202	202	202	9
WALNUT SPRINGS	103	94	90	87	85	86	86	8
WASHINGTON COUNTY-OTHER	124	115	111	108	106	106	106	9

Table 2-4. Per Capita Water Use for Water User Groups in the Brazos G Regional Water Planning Area (gpcd)

Water User Group	Per Capita Use Rates (GPCD)							Reduction due to Plumbing Fixtures Act (2020 to 2070)
	Base (2011)	2020	2030	2040	2050	2060	2070	
WELLBORN SUD	186	176	173	172	171	170	170	6
WEST	160	151	147	144	142	142	142	9
WEST BELL COUNTY WSC	149	138	134	131	131	130	130	7
WEST BRAZOS WSC	138	128	123	120	120	119	119	9
WESTERN HILLS WS	62	60	60	60	60	60	60	0
WHITE BLUFF COMMUNITY WS	198	192	190	189	188	188	188	4
WHITNEY	180	171	167	165	163	163	163	8
WICKSON CREEK SUD	99	91	89	87	86	86	85	5
WILLIAMSON COUNTY MUD #10	196	191	190	189	189	189	189	2
WILLIAMSON COUNTY MUD #11	185	180	178	178	178	178	178	2
WILLIAMSON COUNTY MUD #9	188	180	177	176	176	176	176	4
WILLIAMSON COUNTY-OTHER	148	139	135	134	133	133	133	6
WILLIAMSON-TRAVIS COUNTY MUD #1	126	116	113	112	111	111	111	5
WOODROW-OSCEOLA WSC	92	82	77	74	74	74	74	8
WOODWAY	352	342	338	334	333	333	333	10
YOUNG COUNTY-OTHER	119	109	104	102	102	101	101	8
Minimum	**62**	**60**	**60**	**60**	**60**	**60**	**60**	
Maximum	**487**	**476**	**472**	**469**	**468**	**468**	**468**	
Mean	**146**	**137**	**133**	**131**	**130**	**130**	**130**	

Figure 2-5. Municipal Water Demand Projections

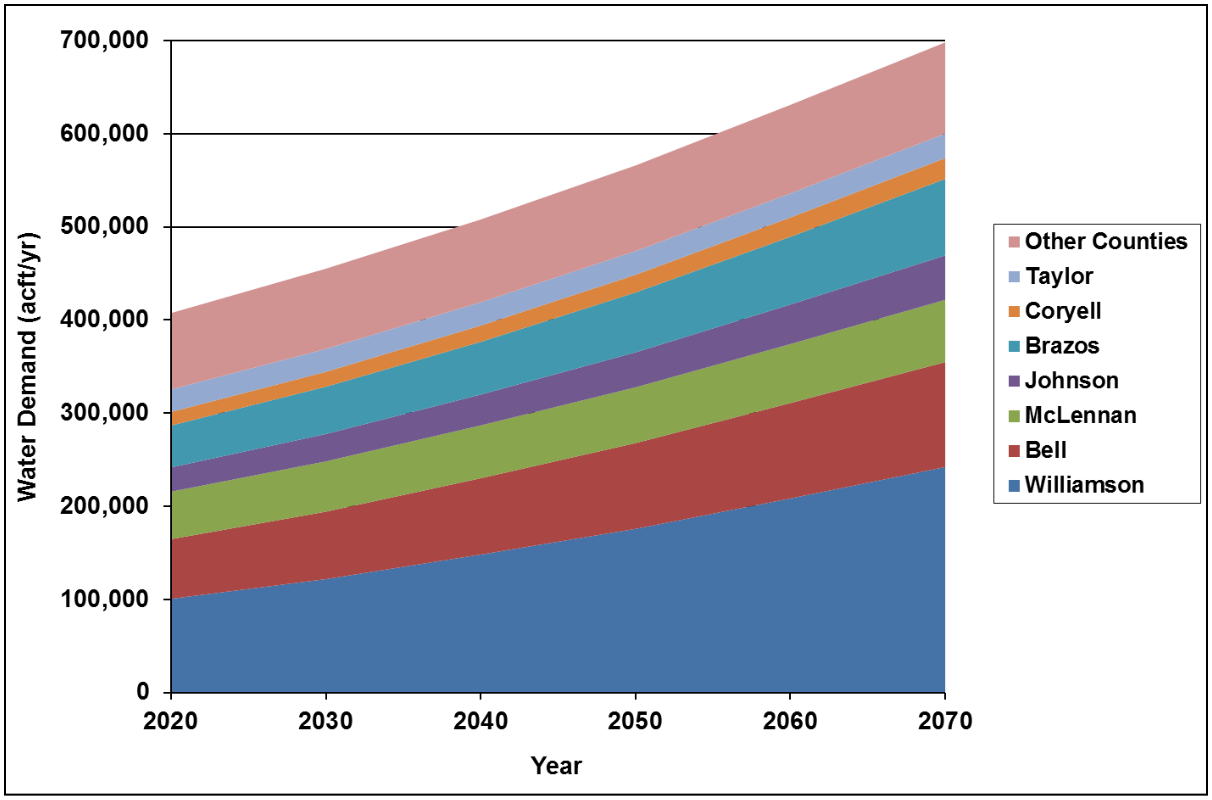


Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Bell County						
439 WSC	1,044	1,134	1,233	1,351	1,489	1,644
Armstrong WSC	406	418	434	454	478	502
Bartlett (P)	159	179	202	226	252	277
Bell-Milam-Falls WSC (P)	344	356	371	390	411	432
Belton	3,807	4,306	4,872	5,480	6,099	6,715
Chisholm Trail SUD (P)	553	632	721	814	906	998
Dog Ridge WSC	438	488	547	613	682	751
East Bell County WSC (P)	442	497	560	630	702	775
Elm Creek WSC (P)	254	288	327	370	413	457
Fort Hood CDP (P)	3,954	3,870	3,815	3,810	3,804	3,804
Harker Heights	6,224	7,079	8,042	9,061	10,087	11,106
Holland	112	108	106	105	106	107
Jarrell-Schwertner WSC (P)	186	209	235	264	294	324

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Kempner WSC (P)	350	398	451	507	565	622
Killeen	19,467	21,902	24,713	27,748	30,864	33,969
Little River-Academy	377	409	447	490	534	578
Moffat WSC	479	481	487	500	517	536
Morgans Point Resort	595	684	787	897	1,009	1,121
Nolanville	1,382	1,749	2,154	2,575	2,991	3,401
Pendleton WSC	245	246	255	266	277	289
Rodgers	172	177	183	192	202	213
Salado WSC	1,726	1,863	2,017	2,182	2,348	2,514
Temple	19,485	22,186	25,212	28,415	31,644	34,842
Troy	169	180	193	209	228	247
West Bell County WSC	789	816	800	798	797	797
County-Other	870	1,716	2,711	3,733	4,719	5,668
Bell County Total	64,029	72,371	81,875	92,080	102,418	112,689
Bosque County						
Childress Creek WSC	410	436	446	453	459	464
Clifton	700	745	763	775	786	793
Cross Country WSC (P)	124	132	135	138	139	141
Meridian	222	234	238	241	244	246
Valley Mills (P)	259	276	284	288	293	295
Walnut Springs	97	101	102	103	105	106
County-Other	1,271	1,357	1,395	1,420	1,440	1,453
Bosque County Total	3,083	3,281	3,363	3,418	3,466	3,498
Brazos County						
Bryan	15,696	16,243	20,342	23,492	26,926	30,652
College Station	19,178	24,320	25,726	29,619	33,927	38,728
Texas A&M University	6,322	6,350	6,309	6,292	6,289	6,288
Wellborn SUD	1,837	2,070	2,318	2,634	2,982	3,368
Wickson Creek SUD (P)	991	1,155	1,332	1,558	1,809	2,088
County-Other	904	590	551	629	752	947
Brazos County Total	44,928	50,728	56,578	64,224	72,685	82,071
Burleson County						

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Caldwell	1,027	1,043	1,073	1,073	1,091	1,108
Deanville WSC	465	471	490	487	493	499
Milano WSC (P)	212	220	224	231	237	243
Snook	184	195	201	209	216	221
Somerville	266	277	285	296	305	313
Southwest Milam WSC (P)	129	135	138	143	147	151
County-Other	615	673	703	771	809	841
Burleson County Total	2,898	3,014	3,114	3,210	3,298	3,376
Callahan County						
Baird	241	233	227	226	226	226
Clyde	324	327	325	323	326	329
Coleman County WSC (P)	20	21	21	21	21	22
Cross Plains	179	186	188	191	193	194
Potosi WSC (P)	12	13	13	13	13	13
County-Other	613	627	628	627	634	639
Callahan County Total	1,389	1,407	1,402	1,401	1,413	1,423
Comanche County						
Comanche	521	519	515	522	535	548
De Leon	223	220	216	219	224	230
County-Other	805	800	791	800	819	839
Comanche County Total	1,549	1,539	1,522	1,541	1,578	1,617
Coryell County						
Copperas Cove (P)	4,266	4,655	5,133	5,586	6,122	6,666
Coryell City Water Supply District	809	899	1,006	1,101	1,208	1,316
Elm Creek WSC (P)	44	48	54	58	64	70
Fort Hood CDP (P)	3,672	3,679	3,627	3,622	3,617	3,616
Gatesville	4,424	4,939	5,532	6,066	6,658	7,253
Kempner WSC	541	602	674	738	810	882
Multi-County WSC (P)	278	302	333	362	396	431
County-Other	564	838	1,195	1,507	1,840	2,172
Coryell County Total	14,598	15,962	17,554	19,040	20,715	22,406
Eastland County						

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Cisco	719	716	701	693	691	691
Eastland	648	643	629	621	619	619
Gorman	99	95	91	90	90	90
Ranger	463	460	450	448	447	447
Rising Star	100	98	95	93	93	93
Stephens Regional SUD (P)	14	14	14	13	13	13
County-Other	583	565	542	529	527	527
Eastland County Total	2,626	2,591	2,522	2,487	2,480	2,480
Erath County						
Dublin	382	403	421	444	472	499
Stephenville	2,659	2,867	3,047	3,241	3,448	3,645
County-Other	2,665	2,880	3,066	3,264	3,472	3,671
Erath County Total	5,706	6,150	6,534	6,949	7,392	7,815
Falls County						
Bell-Milam-Falls WSC (P)	195	200	198	191	197	203
Burceville-Eddy (P)	1	1	1	1	1	1
East Bell County WSC (P)	40	41	40	39	40	41
Golinda	44	44	44	42	43	45
Lott	75	75	73	70	71	73
Marlin	1,771	1,827	1,820	1,772	1,823	1,878
Rosebud	173	174	170	165	170	175
Tri-County SUD (P)	350	355	348	335	344	354
West Brazos WSC (P)	213	215	212	206	212	218
County-Other	526	531	520	504	518	533
Falls County Total	3,388	3,463	3,426	3,325	3,419	3,521
Fisher County						
Bitter Creek WSC (P)	112	108	104	104	104	104
Roby	121	118	116	115	114	114
Rotan	178	170	165	164	163	163
County-Other	115	110	106	106	105	105
Fisher County Total	526	506	491	489	486	486
Grimes County						

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Dobbin-Plantersville WSC	182	205	223	243	260	276
G&W WSC	436	568	669	779	871	952
Navasota	1,428	1,439	1,446	1,466	1,493	1,518
Wickson Creek SUD (P)	343	359	372	389	405	419
County-Other	1,789	1,804	1,810	1,865	1,911	1,955
Grimes County Total	4,178	4,375	4,520	4,742	4,940	5,120
Hamilton County						
Hamilton	534	529	517	511	510	510
Hico	180	176	171	168	167	167
Multi-County WSC (P)	66	65	63	62	62	62
County-Other	423	411	397	395	394	394
Hamilton County Total	1,203	1,181	1,148	1,136	1,133	1,133
Haskell County						
Haskell	519	509	498	496	502	513
Rule	89	86	84	85	86	88
Stamford (P)	9	9	9	9	9	9
County-Other	255	247	243	245	248	253
Haskell County Total	872	851	834	835	845	863
Hill County						
Brandon-Irene WSC (P)	256	262	265	273	281	287
Hill County WSC	425	444	457	473	486	497
Files Valley WSC (P)	405	419	428	441	453	463
Hillsboro	1,945	2,027	2,077	2,144	2,204	2,255
Hubbard	151	153	152	158	162	166
Itasca	156	158	158	161	165	168
Johnson County SUD (P)	29	29	30	31	32	33
Parker WSC (P)	32	33	33	34	35	36
White Bluff Community WS	434	458	474	491	505	517
Whitney	431	449	461	475	488	500
Woodrow-Osceola WSC	384	385	388	402	412	421
County-Other	968	1,011	1,042	1,077	1,105	1,131
Hill County Total	5,616	5,828	5,965	6,160	6,328	6,474

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Hood County						
Acton MUD (P)	2,862	4,460	5,497	6,024	6,631	7,308
Cresson (P)	56	76	89	101	111	118
Granbury	1,216	1,432	1,586	1,725	1,837	1,925
Oak Trail Shores Subdivision	357	351	345	344	345	348
Tolar	120	139	153	166	176	184
County-Other	2,823	2,184	1,903	1,933	1,819	1,588
Hood County Total	7,434	8,642	9,573	10,293	10,919	11,471
Johnson County						
Acton MUD (P)	56	76	98	122	149	177
Alvarado	456	493	536	589	653	722
Bethany WSC	367	396	430	472	524	581
Bethesda WSC (P)	3,259	3,679	4,126	4,641	5,218	5,841
Burleson (P)	5,315	6,333	7,298	7,920	8,782	9,855
Cleburne	5,927	6,446	7,010	7,678	8,445	9,276
Cresson (P)	24	31	39	47	57	67
Crowley	10	14	19	25	31	37
Fort Worth	0	0	0	951	1,520	1,899
Godley	115	125	137	151	167	184
Grandview	182	197	214	234	260	287
Johnson County SUD (P)	4,808	5,379	5,999	6,728	7,557	8,457
Joshua	951	1,115	1,292	1,494	1,722	1,968
Keene	487	564	648	741	842	949
Mansfield (P)	721	1,024	1,337	1,681	2,055	2,455
Mountain Peak SUD (P)	613	737	868	1,013	1,172	1,342
Parker WSC (P)	333	402	475	559	652	753
Rio Vista	150	178	207	241	279	320
Venus (P)	624	710	801	904	1,016	1,137
County-Other	1,613	1,529	1,534	1,391	1,377	1,391
Johnson County Total	26,011	29,428	33,068	37,582	42,478	47,698
Jones County						
Abilene (P)	992	1,023	1,041	1,062	1,087	1,109

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Anson	367	375	378	388	397	405
Hamlin	424	436	445	458	469	478
Hawley	75	76	76	77	79	81
Hawley WSC (P)	383	383	381	383	391	399
Stamford (P)	834	865	885	910	932	951
County-Other	279	289	296	303	310	316
Jones County Total	3,354	3,447	3,502	3,581	3,665	3,739
Kent County						
Jayton	92	91	89	89	88	88
County-Other	33	32	32	32	32	32
Kent County Total	125	123	121	121	120	120
Knox County						
Knox City	242	245	248	253	257	261
Munday	256	259	260	266	270	274
County-Other	138	135	134	137	139	141
Knox County Total	636	639	642	656	666	676
Lampasas County						
Copperas Cove (P)	126	182	222	265	304	340
Kempner	202	219	231	246	259	272
Kempner WSC (P)	1,539	1,669	1,770	1,882	1,987	2,084
Lampasas	1,193	1,278	1,343	1,421	1,500	1,573
Lometa	179	193	203	216	228	239
County-Other	317	292	275	256	240	227
Lampasas County Total	3,556	3,833	4,044	4,286	4,518	4,735
Lee County						
Aqua WSC (P)	466	511	536	544	551	555
Giddings	1,120	1,231	1,289	1,307	1,324	1,334
Lee County WSC (P)	908	991	1,035	1,048	1,060	1,067
Lexington	242	265	277	281	284	286
Southwest Milam WSC (P)	48	53	55	56	56	57
County-Other	195	207	218	222	224	226
Lee County Total	2,979	3,258	3,410	3,458	3,499	3,525

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Limestone County						
Coolidge	180	195	207	222	235	247
Groesbeck	688	677	668	665	668	672
Mart (P)	1	2	2	2	2	3
Mexia	581	648	702	762	810	853
Thornton	70	68	66	65	65	65
Tri-County SUD (P)	136	134	133	133	134	136
County-Other	892	878	867	871	886	902
Limestone County Total	2,548	2,602	2,645	2,720	2,800	2,878
McLennan County						
Bellmead	1,241	1,269	1,296	1,339	1,397	1,457
Beverly Hills	252	261	268	281	297	312
Bruceville-Eddy (P)	292	307	322	338	357	376
Chalk Bluff WSC	269	258	249	245	244	244
Coryell City Water Supply District (P)	125	147	166	186	207	227
Crawford	149	147	147	147	149	151
Cross County WSC (P)	409	406	403	405	409	413
Elm Creek WSC (P)	200	221	241	262	285	308
Gholson	155	167	178	190	204	218
Golinda	19	24	28	32	36	40
Hallsburg	81	84	87	92	97	102
Hewitt	2,711	3,036	3,329	3,643	3,975	4,305
Lacy-Lakeview	772	817	859	908	966	1,025
Lorena	309	339	367	396	429	461
Mart (P)	352	368	383	401	423	445
McGregor	796	808	820	840	869	899
Moody	189	196	202	211	223	235
North Bosque WSC	619	751	870	990	1,112	1,233
Riesel	136	136	136	137	140	144
Robinson	2,437	2,855	3,229	3,618	4,020	4,418
Tri-County SUD (P)	21	23	25	28	31	33
Valley Mills (P)	5	7	8	10	11	13

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Waco	31,576	33,377	35,005	36,840	38,861	40,887
West	490	495	500	509	523	538
West Brazos WSC (P)	186	193	201	212	224	236
Western Hills WS	212	226	238	250	262	274
Woodway	3,477	3,703	3,905	4,129	4,362	4,594
County-Other	3,533	3,409	3,306	3,249	3,236	3,233
McLennan County Total	51,013	54,030	56,768	59,888	63,349	66,821
Milam County						
Bell-Milam-Falls WSC (P)	255	264	269	279	290	300
Buckholts	68	70	71	73	76	79
Cameron	1,359	1,409	1,441	1,500	1,556	1,612
Milano WSC (P)	220	225	228	236	244	253
Rockdale	1,159	1,198	1,222	1,269	1,317	1,364
Southwest Milam WSC (P)	1,021	1,055	1,078	1,121	1,163	1,204
Thorndale	184	188	190	197	204	211
County-Other	300	313	324	339	351	364
Milam County Total	4,566	4,722	4,823	5,014	5,201	5,387
Nolan County						
Bitter Creek WSC (P)	162	164	165	170	175	179
Roscoe	200	204	205	211	217	222
Sweetwater	1,852	1,893	1,913	1,977	2,030	2,079
County-Other	228	231	232	237	243	249
Nolan County Total	2,442	2,492	2,515	2,595	2,665	2,729
Palo Pinto County						
Graford	61	62	63	64	66	67
Mineral Wells (P)	2,593	2,708	2,775	2,856	2,935	3,002
Possum Kingdom WSC	777	826	858	889	915	936
Stephens Regional SUD (P)	5	5	5	5	5	5
Strawn	137	144	147	152	156	159
County-Other	1,063	1,079	1,082	1,111	1,140	1,165
Palo Pinto County Total	4,636	4,824	4,930	5,077	5,217	5,334
Robertson County						

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Bremond	189	201	213	229	244	260
Calvert	190	183	180	180	179	179
Franklin	256	272	288	307	328	348
Hearne	757	734	715	713	711	711
Robertson County WSC	246	256	267	282	300	319
Tri-County SUD (P)	115	121	128	136	145	154
Wellborn SUD (P)	356	401	450	511	578	653
Wickson Creek SUD (P)	28	30	31	33	35	37
County-Other	439	512	589	665	734	796
Robertson County Total	2,576	2,710	2,861	3,056	3,254	3,457
Shackelford County						
Albany	640	673	662	662	661	661
Stephens Regional SUD (P)	2	2	2	2	2	2
County-Other	125	113	108	107	107	107
Shackelford County Total	767	788	772	771	770	770
Somervell County						
Glen Rose	583	638	677	709	738	763
County-Other	822	892	941	982	1,022	1,056
Somervell County Total	1,405	1,530	1,618	1,691	1,760	1,819
Stephens County						
Breckenridge	1,012	1,020	1,013	1,011	1,017	1,022
Fort Belknapp WSC (P)	6	6	6	6	6	6
Possum Kingdom WSC (P)	33	34	34	34	34	35
Stephens Regional SUD (P)	262	260	255	253	254	255
County-Other	156	155	152	151	152	152
Stephens County Total	1,469	1,475	1,460	1,455	1,463	1,470
Stonewall County						
Aspermont	250	245	242	242	241	241
County-Other	68	65	65	64	64	64
Stonewall County Total	318	310	307	306	305	305
Taylor County						
Abilene (P)	21,750	22,165	22,507	22,884	23,303	23,652

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Coleman County WSC (P)	13	13	13	13	14	14
Hawley WSC (P)	40	40	40	40	40	41
Merkel	343	345	347	350	357	362
Potosi WSC (P)	761	779	794	809	823	836
Steamboat Mountain WSC	410	413	417	422	429	435
Tuscola	79	79	79	79	81	82
Tye	186	188	190	193	197	199
County-Other	660	660	662	678	690	700
Taylor County Total	24,242	24,682	25,049	25,468	25,934	26,321
Throckmorton County						
Fort Belknapp WSC (P)	20	20	19	19	19	19
Stephens Regional SUD (P)	16	15	15	14	14	14
Throckmorton	182	178	175	175	174	174
County-Other	48	45	45	45	45	45
Throckmorton County Total	266	258	254	253	252	252
Washington County						
Brenham	4,079	4,359	4,542	4,747	4,922	5,070
County-Other	2,424	2,438	2,436	2,463	2,505	2,545
Washington County Total	6,503	6,797	6,978	7,210	7,427	7,615
Williamson County						
Bartlett (P)	197	205	217	232	251	270
Bell-Milam-Falls WSC (P)	49	60	74	89	107	126
Blockhouse MUD	845	828	819	814	812	811
Brushy Creek MUD	4,366	4,693	4,659	4,639	4,635	4,634
Cedar Park (P)	15,209	16,693	16,616	16,584	16,571	16,569
Chisholm Trail SUD (P)	4,412	5,471	6,818	8,280	9,948	11,678
Fern Bluff MUD	1,216	1,204	1,196	1,191	1,189	1,189
Florence	119	121	125	132	141	152
Georgetown	15,944	19,787	24,665	29,960	36,006	42,273
Granger	212	220	232	247	268	289
Hutto	3,767	5,189	6,992	8,937	11,144	13,428
Jarrell	109	129	156	187	222	259

Table 2-5. Projected Municipal Water Demand by WUG/County in the Brazos G Area (acft/yr)

City/County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Jarrell-Schwertner WSC (P)	461	561	690	833	1,000	1,174
Jonah Water SUD	1,830	2,239	2,768	3,350	4,023	4,722
Leander	4,905	8,145	13,470	21,914	27,724	34,098
Liberty Hill	158	192	237	286	343	402
Manville WSC (P)	1,452	1,789	2,220	2,691	3,233	3,794
Pflugerville	76	95	118	144	173	203
Round Rock (P)	24,148	29,808	37,049	44,943	53,991	63,377
Southwest Milam (P)	297	363	448	541	649	762
Taylor	2,840	3,006	3,241	3,522	3,869	4,232
Thorndale (P)	1	1	1	1	1	1
Thrall	89	95	105	116	130	145
Williamson County MUD #10	996	1,243	1,556	1,892	2,274	2,670
Williamson County MUD #11	577	719	900	1,095	1,315	1,544
Williamson County MUD #9	834	1,034	1,290	1,566	1,882	2,210
Williamson-Travis County MUD #1 (P)	599	584	576	572	571	570
County-Other	11,047	13,448	16,746	16,880	21,924	26,688
Williamson County Total	96,755	117,922	143,984	171,638	204,396	238,270
Young County						
Fort Belknapp WSC (P)	420	429	435	445	460	475
Graham	2,666	2,764	2,830	2,918	3,018	3,119
Newcastle	60	61	61	61	63	65
County-Other	214	215	219	227	234	242
Young County Total	3,360	3,469	3,545	3,651	3,775	3,901
Brazos G Total	**403,550**	**451,228**	**503,717**	**561,807**	**627,029**	**694,265**

Notes:
[1] Projections from Texas Water Development Board
(P) Partial

2.3.3 Manufacturing Water Demand

Manufacturing is an integral part of the economy of the Brazos G Area, and water is critical to the manufacturing process for many industries. It can be used in a variety of ways, including as a component of the final product, as a cooling agent during the manufacturing process, or for cleaning/wash-down of parts and/or products. In the Brazos G Area, industries that are major water users include food and kindred products, apparel, fabricated metal, machinery, stone and concrete production, and micro-chip production.

Manufacturing water demand was projected by the TWDB by taking industry-specific water demand coefficients, adjusted for water-use efficiencies (recycling/reuse), and applying them to growth trends for each industry. These growth trends assume expansion of existing capacity and building of new facilities; continuation of historical trends of interaction between oil price changes and industrial activity; and that the makeup of each county's manufacturing base remains constant throughout the 60-year planning horizon. The TWDB and the Brazos G RWPG developed revisions to the manufacturing demand projections for Milam County in the Brazos G Area for the 2016 Plan.

Manufacturing use is projected to increase 60 percent, from 21,848 acft in 2020 to 34,977 acft in 2070 (Table 2-6). The trend in manufacturing use by county is shown in Figure 2-6. Bosque, Johnson, McLennan, Brazos, and Williamson Counties account for 71 percent of the total use in 2070.

Table 2-6. Projected Manufacturing Water Demand in the Brazos G Area (acft/yr)

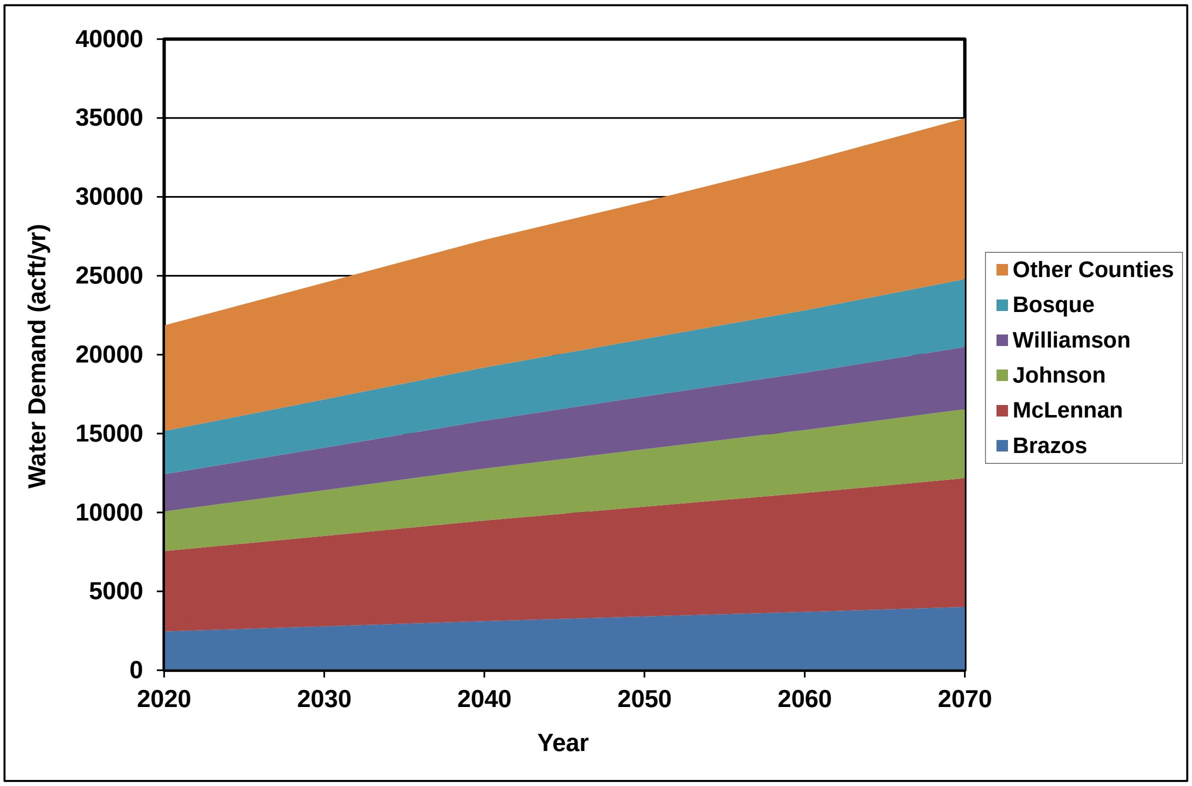
County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Bell	1,370	1,490	1,607	1,711	1,847	1,994
Bosque	2,739	3,058	3,372	3,643	3,959	4,302
Brazos	2,456	2,779	3,109	3,405	3,694	4,008
Burleson	139	161	183	203	221	241
Callahan	0	0	0	0	0	0
Comanche	36	39	41	43	46	49
Coryell	10	11	12	13	14	15
Eastland	72	77	82	85	91	97
Erath	80	88	96	103	112	122
Falls	1	1	1	1	1	1
Fisher	225	255	284	310	336	364
Grimes	361	408	455	497	539	585
Hamilton	5	6	7	8	9	10
Haskell	0	0	0	0	0	0
Hill	45	50	55	60	65	70
Hood	25	27	29	31	34	37
Johnson	2,517	2,903	3,295	3,646	3,994	4,375
Jones	0	0	0	0	0	0
Kent	0	0	0	0	0	0
Knox	0	0	0	0	0	0

Table 2-6. Projected Manufacturing Water Demand in the Brazos G Area (acft/yr)

County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Lampasas	185	199	213	226	243	261
Lee	13	14	15	16	17	18
Limestone	93	102	111	118	127	137
McLennan	5,087	5,724	6,373	6,955	7,532	8,157
Milam	12	12	12	14	14	14
Nolan	1,420	1,611	1,799	1,965	2,130	2,309
Palo Pinto	49	53	57	61	67	74
Robertson	133	154	176	197	214	232
Shackelford	0	0	0	0	0	0
Somervell	8	9	10	11	12	13
Stephens	9	10	11	12	13	14
Stonewall	0	0	0	0	0	0
Taylor	1,653	1,800	1,942	2,063	2,236	2,424
Throckmorton	0	0	0	0	0	0
Washington	692	757	822	879	951	1,029
Williamson	2,354	2,692	3,032	3,339	3,626	3,938
Young	59	64	69	72	79	87
Brazos G Total	**21,848**	**24,554**	**27,270**	**29,687**	**32,223**	**34,977**

[1] Projections from Texas Water Development Board

Figure 2-6. Manufacturing Water Demand Projections



2.3.4 Steam-Electric Water Demand

The steam-electric generation process uses water in boilers and for cooling. The projections for steam-electric water demand were developed by the TWDB and are based on power generation projections—determined by population and manufacturing growth—and on power generation capacity and fresh water use for that projected capacity. The TWDB and the Brazos G RWPG developed revisions to the steam-electric demand projections for Milam County in the Brazos G Area for the 2016 Plan. Grimes, Limestone, Milam, Robertson, and Somervell Counties account for 75 percent of total steam-electric water use in 2070. Steam-Electric water use is projected to increase 51 percent, from 239,299 acft in 2020 to 362,386 acft in 2070 (Table 2-7). This increase (Figure 2-7) in water use is attributable to the growing population in the State, and increased energy needs for manufacturing. Steam-electric water demands are expected to occur from expansion of existing plant capacity and new generating plants.

Table 2-7. Projected Steam-Electric Water Demand in the Brazos G Area (acft/yr)

County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Bell	4,220	4,934	5,804	6,865	8,157	9,693
Bosque	6,188	7,235	8,510	10,065	11,961	14,214
Brazos	503	406	460	312	405	384

Table 2-7. Projected Steam-Electric Water Demand in the Brazos G Area (acft/yr)

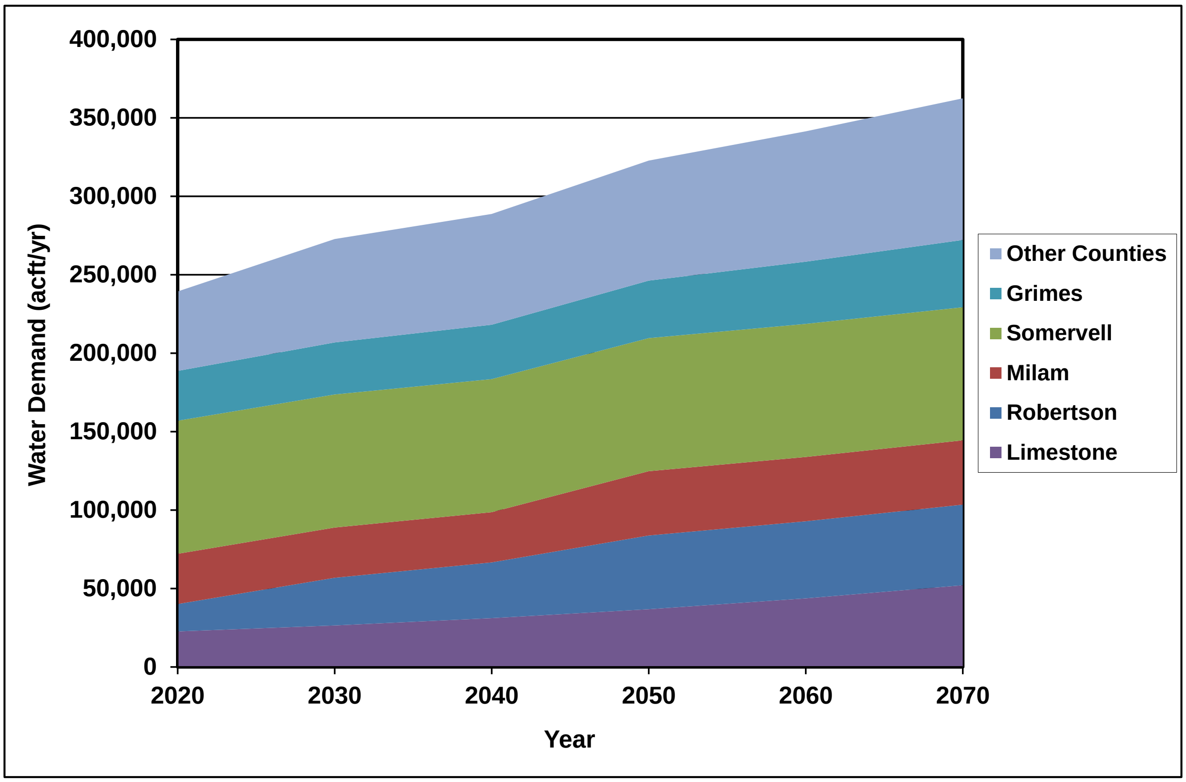
County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Burleson	0	0	0	0	0	0
Callahan	0	0	0	0	0	0
Comanche	0	0	0	0	0	0
Coryell	0	0	0	0	0	0
Eastland	0	0	0	0	0	0
Erath	0	0	0	0	0	0
Falls	0	0	0	0	0	0
Fisher	0	0	0	0	0	0
Grimes	31,760	33,160	34,660	36,660	39,660	42,905
Hamilton	0	0	0	0	0	0
Haskell	336	393	462	547	650	720
Hill	0	0	0	0	0	0
Hood	5,814	6,796	7,995	9,456	11,238	13,354
Johnson	7,000	7,000	7,000	7,000	7,000	7,000
Jones	333	294	396	364	484	518
Kent	0	0	0	0	0	0
Knox	0	0	0	0	0	0
Lampasas	0	0	0	0	0	0
Lee	0	0	0	0	0	0
Limestone	22,598	26,420	31,079	36,758	43,681	52,033
McLennan	6,990	8,914	9,683	11,155	11,929	12,756
Milam	32,023	32,023	32,023	40,989	40,989	40,989
Nolan	13,526	23,916	23,916	23,916	23,916	23,916
Palo Pinto	4,000	4,000	4,000	4,000	4,000	4,000
Robertson	17,461	30,380	35,512	46,984	49,133	51,381
Shackelford	0	0	0	0	0	0
Somervell	84,817	84,817	84,817	84,817	84,817	84,817
Stephens	0	0	0	0	0	0
Stonewall	0	0	0	0	0	0
Taylor	0	0	0	0	0	0
Throckmorton	0	0	0	0	0	0
Washington	0	0	0	0	0	0

Table 2-7. Projected Steam-Electric Water Demand in the Brazos G Area (acft/yr)

County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Williamson	0	0	0	0	0	0
Young	1,730	2,023	2,379	2,814	3,344	3,706
Brazos G Total	**239,299**	**272,711**	**288,696**	**322,702**	**341,364**	**362,386**

1 Projections adopted by the Texas Water Development Board, as requested by the BGRWPG (Appendix Q).

Figure 2-7. Steam-Electric Water Demand Projections



2.3.5 Mining Water Demand

Projections for mining water demand were developed by the TWDB and are based on projected production of mineral commodities, and historic rates of water use, moderated by water requirements of technological processes used in mining.

Mining use in the Brazos G Area is expected to increase 32 percent between 2020 and 2070, from 61,586 acft to 81,409 acft, largely due to the shale gas operations (Table 2-8). Robertson, Limestone, Williamson, Lee and Bell counties account for 78 percent of total mining water use in 2070 (Figure 2-8).

Table 2-8. Projected Mining Water Demand in the Brazos G Area (acft/yr)

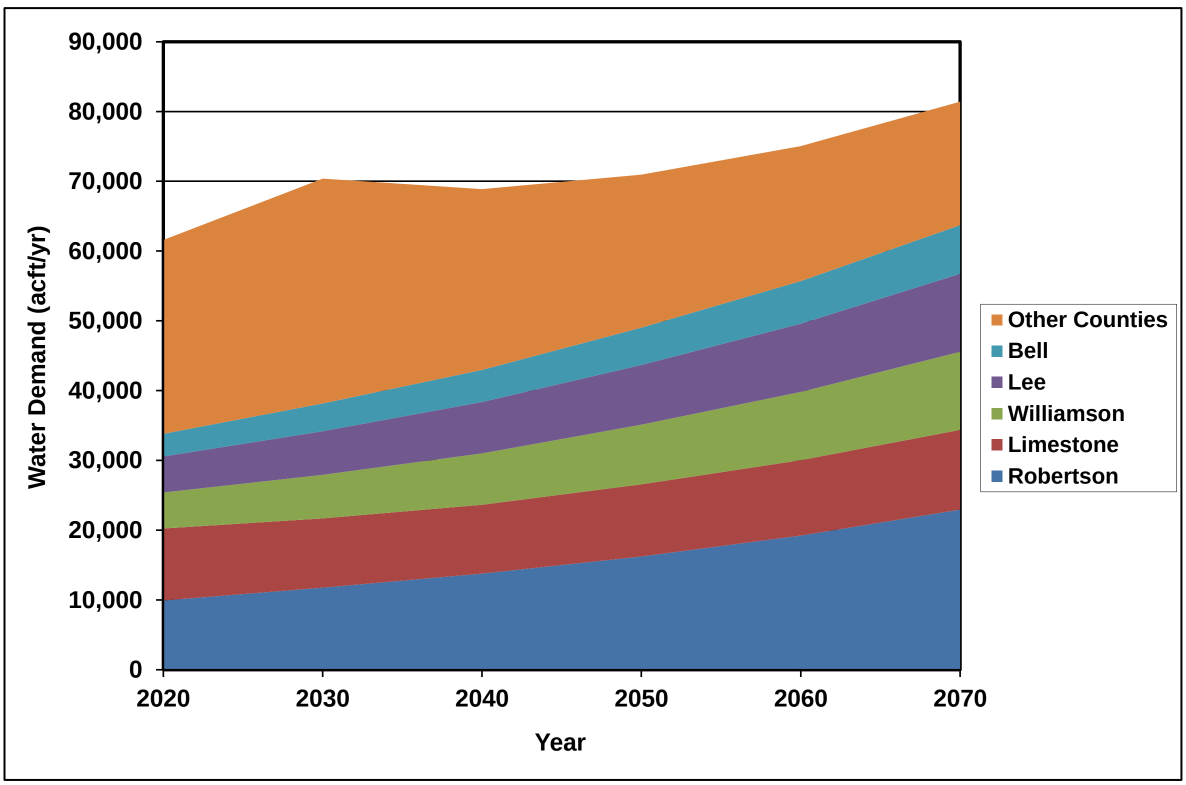
County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Bell	3,242	3,980	4,599	5,349	6,105	6,968
Bosque	1,972	2,071	1,892	1,872	1,833	1,821
Brazos	1,088	1,610	1,433	1,144	923	814
Burleson	995	1,923	1,512	1,100	686	428
Callahan	228	227	214	201	190	180
Comanche	444	525	363	276	188	128
Coryell	1,510	1,072	491	363	398	437
Eastland	1,164	1,173	929	714	518	432
Erath	505	536	376	304	232	177
Falls	225	246	259	286	307	331
Fisher	407	402	359	313	273	238
Grimes	323	602	471	340	209	128
Hamilton	393	236	101	0	0	0
Haskell	93	92	83	74	66	59
Hill	1,634	1,190	775	403	436	472
Hood	2,078	2,436	2,222	2,133	2,043	2,057
Johnson	4,126	2,788	1,515	1,013	1,161	1,336
Jones	239	234	218	199	183	169
Kent	38	38	35	32	29	26
Knox	15	15	14	14	14	14
Lampasas	198	221	241	261	286	313
Lee	3,180	7,289	7,767	8,304	8,904	9,631
Limestone	10,317	9,925	9,865	10,339	10,805	11,425
McLennan	2,538	3,000	3,060	3,508	3,832	4,216
Milam	14	14	14	14	14	14
Nolan	225	222	200	178	158	141
Palo Pinto	656	847	625	480	336	235
Robertson	9,913	11,753	13,768	16,222	19,217	22,940
Shackelford	562	747	558	442	328	243
Somervell	1,112	1,279	1,146	1,060	998	971
Stephens	5,064	5,141	4,458	3,825	3,257	2,773
Stonewall	584	576	512	446	388	338

Table 2-8. Projected Mining Water Demand in the Brazos G Area (acft/yr)

County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Taylor	391	391	366	346	329	315
Throckmorton	194	191	171	150	132	116
Washington	569	866	703	538	373	264
Williamson	5,163	6,247	7,364	8,555	9,782	11,186
Young	187	276	196	151	105	73
Brazos G Total	**61,586**	**70,381**	**68,875**	**70,949**	**75,038**	**81,409**

[1] Projections from Texas Water Development Board

Figure 2-8. Mining Water Demand Projections



2.3.6 Irrigation Water Demand

The irrigation water demand projections were developed by the TWDB and are based on specific assumptions regarding resource constraints, crop prices, crop yields, agricultural policy, and technological advances in irrigation systems. The TWDB and the Brazos G RWPG developed revisions to the irrigation demand projections for Haskell and Knox County in the Brazos G Area for the 2016 Plan.

Major crops grown in the region include feed grains, small grains, cotton, pecans, and peanuts. Table 2-9 shows that irrigation water demand will decrease 14 percent from 2020 to 2070, mostly attributable to technological advances in irrigation techniques as well as projected reductions in irrigated land. Figure 2-9 shows the trend in irrigation use, with Robertson, Haskell, Knox and Comanche counties accounting for 62 percent of total irrigation water use in 2070.

Table 2-9. Projected Irrigation Water Demand in the Brazos G Area (acft/yr)

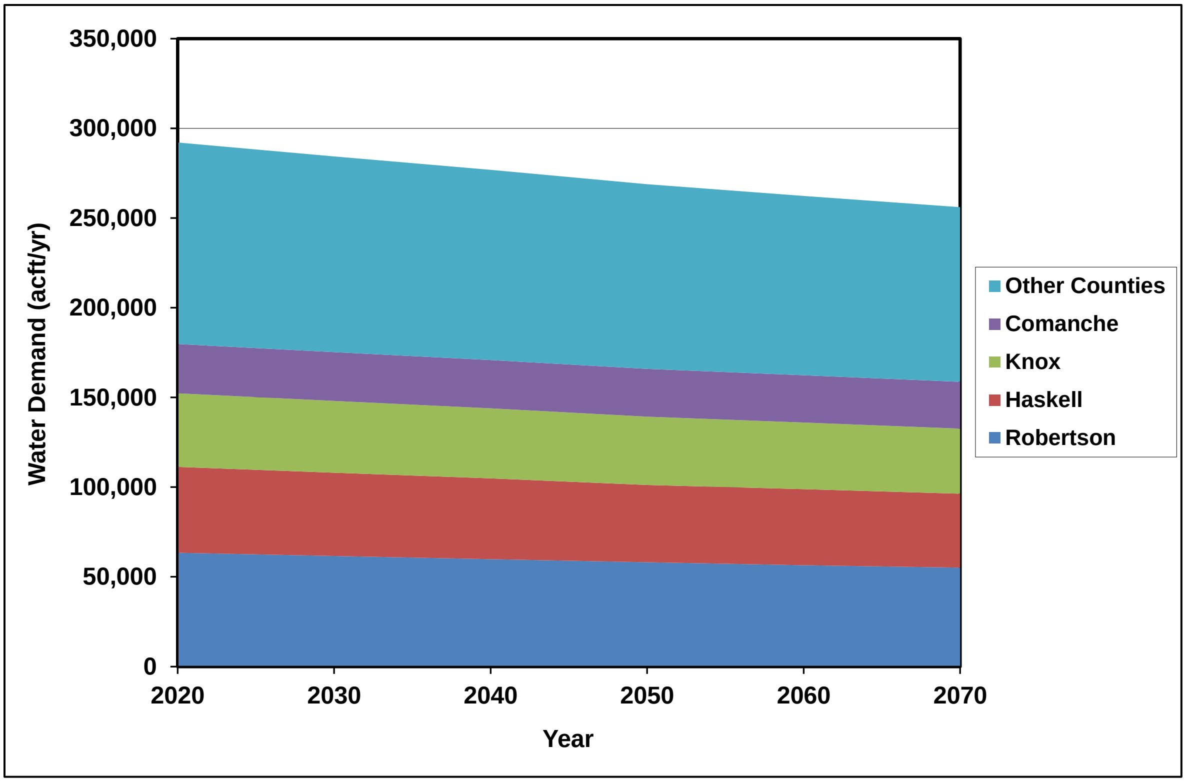
County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Bell	2,205	2,174	2,147	2,117	2,086	2,058
Bosque	2,128	2,094	2,060	2,029	1,998	1,968
Brazos	26,050	24,791	23,594	22,459	21,374	20,438
Burleson	22,855	21,904	21,057	20,115	19,216	18,469
Callahan	573	564	555	546	537	529
Comanche	27,458	27,175	26,894	26,617	26,342	26,076
Coryell	214	214	214	214	214	214
Eastland	6,819	6,829	6,837	6,840	6,843	6,850
Erath	6,383	6,290	6,198	6,107	6,018	5,933
Falls	4,301	4,163	4,027	3,898	3,772	3,658
Fisher	4,488	4,354	4,224	4,098	3,974	3,862
Grimes	0	0	0	0	0	0
Hamilton	507	504	495	471	448	436
Haskell	47,844	46,422	45,040	43,072	42,405	41,207
Hill	582	582	582	582	568	563
Hood	7,205	7,071	6,939	6,807	6,680	6,560
Johnson	141	141	141	141	141	141
Jones	2,870	2,784	2,701	2,620	2,542	2,471
Kent	1,235	1,198	1,166	1,134	1,102	1,073
Knox	41,033	40,025	39,041	38,082	37,147	36,278
Lampasas	387	382	377	372	370	366
Lee	459	446	434	421	409	398

Table 2-9. Projected Irrigation Water Demand in the Brazos G Area (acft/yr)

County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Limestone	0	0	0	0	0	0
McLennan	4,880	4,877	4,872	4,867	4,862	4,858
Milam	5,081	5,040	4,995	4,956	4,915	4,875
Nolan	7,413	7,217	7,024	6,842	6,663	6,497
Palo Pinto	3,138	3,097	3,063	3,022	2,981	2,944
Robertson	63,420	61,607	59,841	58,127	56,460	55,124
Shackelford	0	0	0	0	0	0
Somervell	83	82	82	81	80	79
Stephens	116	115	113	112	111	110
Stonewall	165	160	155	150	146	142
Taylor	1,557	1,519	1,481	1,444	1,406	1,373
Throckmorton	0	0	0	0	0	0
Washington	299	299	299	299	299	299
Williamson	151	151	151	151	151	151
Young	51	50	48	47	45	44
Brazos G Total	**292,091**	**284,321**	**276,847**	**268,840**	**262,305**	**256,044**

[1] Projections from Texas Water Development Board

Figure 2-9. Irrigation Water Demand Projections



2.3.7 Livestock Water Demand

In the 37-county Brazos G Area, the principal livestock type is dairy, with some beef cattle.

The Brazos G Area contains widespread cow-calf operators, with concentrated dairy production in Comanche and Erath Counties. The livestock water demand projections developed by the TWDB are based upon estimates of the maximum carrying capacity of the rangeland of the area and the estimated number of gallons of water per head of livestock per day. Additionally, economics of milk production and environmental impacts of the operations are major factors in the projections of the water demands for this category of livestock.

Livestock drinking water is obtained from wells, stock watering ponds, and streams. As can be seen in Table 2-10, it is projected that the annual livestock water demand will remain constant at 49,650 acft between 2020 and 2070.

Figure 2-10 shows the trend in livestock use, with Erath, Comanche, Lee, Falls and Milam counties accounting for 33 percent of total livestock water use in 2070.

Table 2-10. Projected Livestock Water Demand in the Brazos G Area (acft/yr)

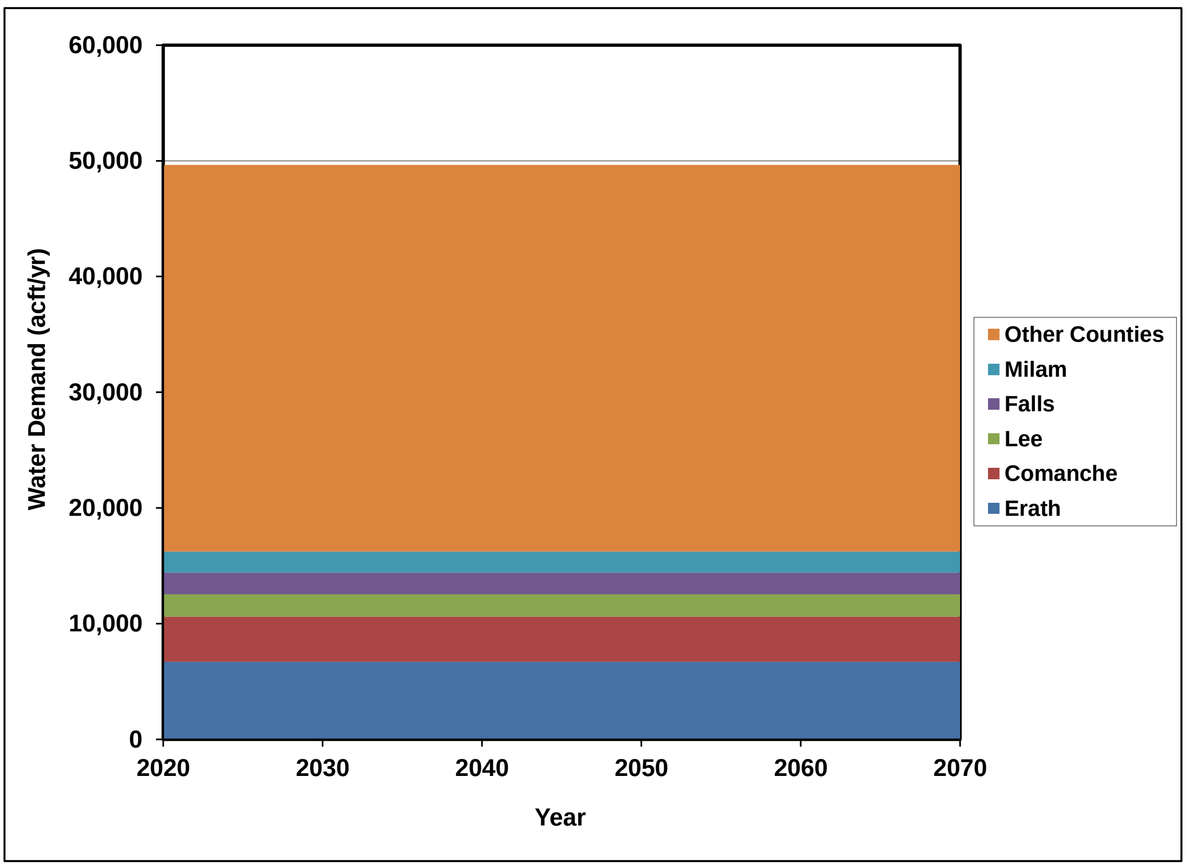
County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Bell	1,009	1,009	1,009	1,009	1,009	1,009
Bosque	989	989	989	989	989	989
Brazos	1,322	1,322	1,322	1,322	1,322	1,322
Burleson	1,508	1,508	1,508	1,508	1,508	1,508
Callahan	920	920	920	920	920	920
Comanche	3,895	3,895	3,895	3,895	3,895	3,895
Coryell	1,471	1,471	1,471	1,471	1,471	1,471
Eastland	1,127	1,127	1,127	1,127	1,127	1,127
Erath	6,702	6,702	6,702	6,702	6,702	6,702
Falls	1,878	1,878	1,878	1,878	1,878	1,878
Fisher	634	634	634	634	634	634
Grimes	1,503	1,503	1,503	1,503	1,503	1,503
Hamilton	1,677	1,677	1,677	1,677	1,677	1,677
Haskell	676	676	676	676	676	676
Hill	1,184	1,184	1,184	1,184	1,184	1,184
Hood	522	522	522	522	522	522
Johnson	1,613	1,613	1,613	1,613	1,613	1,613
Jones	853	853	853	853	853	853
Kent	320	320	320	320	320	320
Knox	987	987	987	987	987	987
Lampasas	1,232	1,232	1,232	1,232	1,232	1,232
Lee	1,935	1,935	1,935	1,935	1,935	1,935
Limestone	1,704	1,704	1,704	1,704	1,704	1,704
McLennan	1,584	1,584	1,584	1,584	1,584	1,584
Milam	1,822	1,822	1,822	1,822	1,822	1,822
Nolan	387	387	387	387	387	387
Palo Pinto	915	915	915	915	915	915
Robertson	1,612	1,612	1,612	1,612	1,612	1,612
Shackelford	840	840	840	840	840	840
Somervell	158	158	158	158	158	158
Stephens	486	486	486	486	486	486
Stonewall	458	458	458	458	458	458

Table 2-10. Projected Livestock Water Demand in the Brazos G Area (acft/yr)

County	Projected Demands[1]					
	2020	2030	2040	2050	2060	2070
Taylor	963	963	963	963	963	963
Throckmorton	672	672	672	672	672	672
Washington	1,661	1,661	1,661	1,661	1,661	1,661
Williamson	1,455	1,455	1,455	1,455	1,455	1,455
Young	976	976	976	976	976	976
Brazos G Total	**49,650**	**49,650**	**49,650**	**49,650**	**49,650**	**49,650**

[1] Projections from Texas Water Development Board

Figure 2-10. Livestock Water Demand Projections



2.3.8 Wholesale Water Providers

The TWDB's definition of a Wholesale Water Provider (WWP) is:

"A WWP is any person or entity, including river authorities and irrigation districts, that has contracts to sell more than 1,000 acft of water wholesale in any one year during the five years immediately preceding the adoption of the last Regional Water Plan. The Planning Groups shall include as wholesale water providers other persons and entities that enter, or that the Planning Group expects or recommends to enter, contracts to sell more than 1,000 acft/yr of wholesale water during the period covered by the plan."

Many entities within Brazos G obtain water supply through contracts with wholesale water suppliers. Table 2-11 provides a summary of the contractual demands for the identified Wholesale Water Providers within Brazos G. Additional information on the WWP contracts, supplies and needs can be found in Chapter 3, Table 3.1-3 and in Chapter 4, Section 4.3.

Table 2-11. Wholesale Water Providers Total Demands (acft/yr)

Wholesale Water Provider	Contracting Entities	2020	2030	2040	2050	2060	2070
Brazos River Authority[1]							
Lake Aquilla System	Table 3.1-3	11,403	11,403	11,403	11,403	11,403	11,403
Little River System	Table 3.1-3	251,643	251,643	251,643	251,643	251,643	251,643
Main Stem System	Table 3.1-3	247,595	247,595	247,595	247,595	247,595	247,595
Aquilla Water Supply District	Table 4.3-2	6,512	5,952	5,952	5,952	5,952	5,952
Bell County WCID No.1	Table 4.3-3	62,509	62,509	62,509	62,509	62,509	62,509
Bistone MWSD	Table 4.3-4	5,405	5,403	5,401	5,400	5,400	5,400
Bluebonnet WSC	Table 4.3-5	7,125	7,125	7,125	7,125	7,125	7,125
Central Texas WSC	Table 4.3-6	10,240	10,240	10,240	10,240	10,240	10,240
Eastland County WSD	Table 4.3-7	5,411	5,416	5,421	5,424	5,430	5,436
Heart of Texas Water Suppliers LLC	Table 4.3-8	5,600	5,600	5,600	5,600	5,600	5,600
North Central Texas MWA	Table 4.3-9	1,797	1,797	1,797	1,797	1,797	1,797
Palo Pinto County MWD No. 1	Table 4.3-10	9,414	9,515	9,570	9,641	9,712	9,771
Upper Leon MWD	Table 4.3-11	4,572	4,572	4,572	4,572	4,572	4,572
West Central Texas MWD	Table 4.3-12	27,900	27,900	27,900	27,900	27,900	27,900
City of Abilene[2]	Table 4.3-13	37,911	36,883	37,470	38,190	38,812	39,344
City of Anson[2]	Table 4.3-14	1,484	1,485	1,473	1,459	1,444	1,429
City of Bryan[2]	Table 4.3-15	19,634	18,990	24,084	30,345	37,058	44,602
City of Cedar Park[2]	Table 4.3-16	19,446	19,760	18,714	18,445	18,544	18,655
City of Cleburne[2,3]	Table 4.3-17	9,393	9,819	10,723	11,728	12,781	13,919
City of Gatesville[2]	Table 4.3-18	5,652	5,877	6,109	6,211	6,314	6,836
Johnson County SUD[2]	Table 4.3-19	10,983	11,746	12,574	13,540	14,635	15,821
Kempner WSC[2]	Table 4.3-20	4,400	4,539	4,816	5,087	5,343	5,584
City of Mineral Wells[2]	Table 4.3-21	5,084	5,230	5,320	5,391	5,462	5,521
City of Round Rock[2]	Table 4.3-22	28,761	35,287	43,219	52,111	62,404	73,086
City of Stamford[2]	Table 4.3-23	3,252	3,218	3,171	3,122	3,074	3,065

Table 2-11. Wholesale Water Providers Total Demands (acft/yr)

Wholesale Water Provider	Contracting Entities	2020	2030	2040	2050	2060	2070
City of Sweetwater[2]	Table 4.3-24	3,850	3,930	3,950	4,014	4,067	4,116
City of Temple[2]	Table 4.3-25	22,601	23,476	24,227	24,721	24,903	27,022
City of Waco[2,3]	Table 4.3-26	52,211	52,236	52,005	51,766	52,528	54,956
Total		**881,788**	**889,146**	**904,583**	**922,931**	**944,247**	**970,899**

1 - Contract volumes in Region G only
2 - Contract sales by WWPs include the city/WUG demands after conservation.
3 - Includes reuse contracts

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3

Evaluation of Current Water Supplies

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3 Evaluation of Current Water Supplies

3.1 Surface Water Supplies

Streamflow in the Brazos River and its tributaries, along with reservoirs in the Brazos River Basin, comprise a vast supply of surface water in the Brazos G Area. Diversions and use of this surface water occurs throughout the entire region with over 1,000 water rights currently issued. These water rights provide authorization for an owner to divert, store and use the water, however, they do not guarantee that a dependable supply will be available from the water source. The availability of water to a water right is dependent on several factors including hydrologic conditions (i.e., rainfall, runoff, springflow), priority date of the water right, quantity of authorized storage, and any special conditions associated with the water right (i.e., instream flow conditions, maximum diversion rate).

3.1.1 Texas Water Right System

The State of Texas owns the surface water within the state watercourses and is responsible for the appropriation of these waters. Surface water is currently allocated by the Texas Commission on Environmental Quality (TCEQ) for the use and benefit of all people of the state. Historically, Texas water law is based on a combination of the riparian and prior appropriation doctrines. The riparian doctrine extends from the Spanish and Mexican governments that ruled Texas prior to 1836. After 1840, the riparian doctrine provided landowners the rights to make reasonable use of water for irrigation or for other consumptive uses. In 1889, the prior appropriation doctrine was first adopted by Texas, which is based on the concept of “first in time is first in right.” Over the years, the combination of riparian and prior appropriation doctrines resulted in an essentially unmanageable system. Various types of water rights existed simultaneously and many rights were unrecorded. In 1967, the Texas Legislature passed the Water Rights Adjudication Act to merge the riparian water rights into the prior appropriation system, creating a unified water rights system. The adjudication process has taken many years, and is essentially complete. In the end, Certificates of Adjudication have been issued for entities recognized as having legitimate water rights. Today, individuals or groups seeking a new water right must submit an application to the TCEQ. The TCEQ determines if the water right will be issued and under what conditions. The water rights grant a certain quantity of water to be diverted and/or stored, a priority date, and often come with some restrictions on when and how the right may be utilized. Restrictions may include a maximum diversion rate and/or an instream flow restriction to protect existing water rights and provide environmental protection.

The priority date of a water right is essential to the operation of the water rights system. Each right is issued a priority date based on the date of first capture, or the appropriation date. The established priority system must be adhered to by all water right holders when diverting or storing water for use. A right holder must pass all water to downstream senior water rights when conditions are such that the senior water rights would not be satisfied otherwise.

3.1.2 Types of Water Rights

There are various types of water rights: Certificates of Adjudication, permits, term permits, and temporary permits. Certificates of Adjudication were issued in perpetuity for approved claims during the adjudication process. This type of water right was issued based on historical use rather than water availability. As a consequence, the amount of water to which rights exist exceeds the amount of water available during a drought for some streams. The TCEQ issues new permits only where drought flows are sufficient to meet the requested amount. Permits, like Certificates of Adjudication, are issued in perpetuity and may be bought and sold like other property interests. Term permits may be issued by the TCEQ in areas where waters are fully appropriated, but not yet being fully used. Term permits are usually issued for 10 years and may be renewed if, after 10 years, other water right holders are still not fully utilizing the water in the basin. Temporary permits are issued for up to 3 years. Temporary permits are issued mainly for road construction projects, where water is used to suppress dust, to compact soils, and to start the growth of new vegetation.

Water rights can include the right to divert and/or store the appropriated water. A run-of-the-river water right provides for the diversion of streamflows and does not include storage of water for use during dry periods. These rights have no authorization to store water, only the right to take water from the stream. A run-of-the-river right may be limited by streamflow, pumping rate, or diversion location.

Water rights, which include provisions for storage of water, allow a water right holder to impound streamflows for use at a later time. The storage provides water for use during dry periods, when water may not be available due to hydrologic conditions or because existing flows are required to be passed to downstream senior water rights.

While most water rights are diverted and used within the river basin of origin, water rights that divert from one river basin to another basin require an interbasin transfer permit. Several types of transfers that receive special consideration include emergency transfers, transfers of water from a river basin for use in an adjoining coastal basin (such as from the Brazos River Basin to the San Jacinto-Brazos Coastal Basin), diversions of less than 3,000 acft/yr, and diversions within any city or county that has any portion in the basin of origin.

3.1.3 Water Rights in the Brazos River Basin

The TCEQ maintains a database of all active water rights referred to as WRactive, which is available for download from the TCEQ website. The March 2015 version of this database was obtained from the TCEQ and the summary statistics that follow are based on the information contained in that particular version of the database. A total of 1,090 water rights exist in the Brazos River Basin, with a total authorized diversion of 2,584,000 acft/yr. It is important to note that a small percentage of the water rights make up a large percentage of the total authorized diversion volume. In the Brazos River Basin, 40 water rights (3.7 percent) make up 2,310,000 acft/yr (89 percent) of the authorized diversion volume. The remaining 1,050 water rights primarily consist of small irrigation rights distributed throughout the river basin. Figure 3.1-1 shows a comparison of significant water rights in the Brazos River Basin by number of rights and diversion volume.

The Brazos G Area includes the majority of the water rights in the Brazos River Basin. A total of 949 water rights exist in the Brazos G portion of the Brazos River Basin, with a total authorized diversion of 1,263,000 acft/yr. In the Brazos G portion of the Brazos River Basin, 28 water rights (2.9 percent) make up 1,040,000 acft/yr (82.3 percent) of the authorized diversion volume. The remaining 921 water rights primarily consist of small irrigation rights distributed throughout the area. Region H, located downstream of the Brazos G Area, has a total of only 38 water rights (3.5 percent) in the Brazos River Basin, but these include some very large rights and make up 1,164,000 acft/yr (45 percent) of the total authorized diversions. Other regions make up a small percentage of the remaining water rights and total authorized diversions in the basin, as shown in Figure 3.1-2. The authorized diversions in Region H generally consist of very large, senior priority, run-of-the-river water rights. In comparison, water rights in the Brazos G Area are larger in number and diversion volume; however, the water rights are generally junior in priority to those downstream in Region H. Therefore, in times of drought, when streamflows are low, diversions of water from streams in the Brazos G Area may be restricted for several of the water right holders. A comparison of the quantity of authorized diversions relative to the priority date of the water rights in Brazos G and Region H is presented in Figure 3.1-3. Major water rights are defined as having an authorized diversion of greater than 10,000 acft/yr or 5,000 acft of authorized storage. Figure 3.1-4 shows the location of major water rights in the Brazos River Basin. A list of all water rights, summarized from the TCEQ water right database for all rights in the Brazos G Area, is provided in Appendix G.

While Region H includes a large quantity of senior priority water rights, most of these water rights have very little storage associated with them and, therefore, may be described primarily as run-of-the-river water rights. The water rights in Brazos G are generally junior to those water rights in Region H; however, there is a substantial volume of reservoir storage associated with the water rights in Brazos G to provide a firm supply. The total authorized storage in the Brazos River Basin is approximately 4,115,000 acft, with 3,608,000 acft (87.7 percent) located in Brazos G. In Region H, the quantity of reservoir storage is 231,000 acft, or 5.6 percent of the total authorized storage volume in the river basin. The large quantity of reservoir storage in Brazos G provides for a firm supply of water during drought conditions, when streamflows are low and may be required to be passed through to downstream senior water rights in Region H. Figure 3.1-5 presents a comparison of the total authorized storage and annual diversion volume for the Brazos G Area and Region H.

Figure 3.1-1. Comparison of Water Rights in the Brazos River Basin

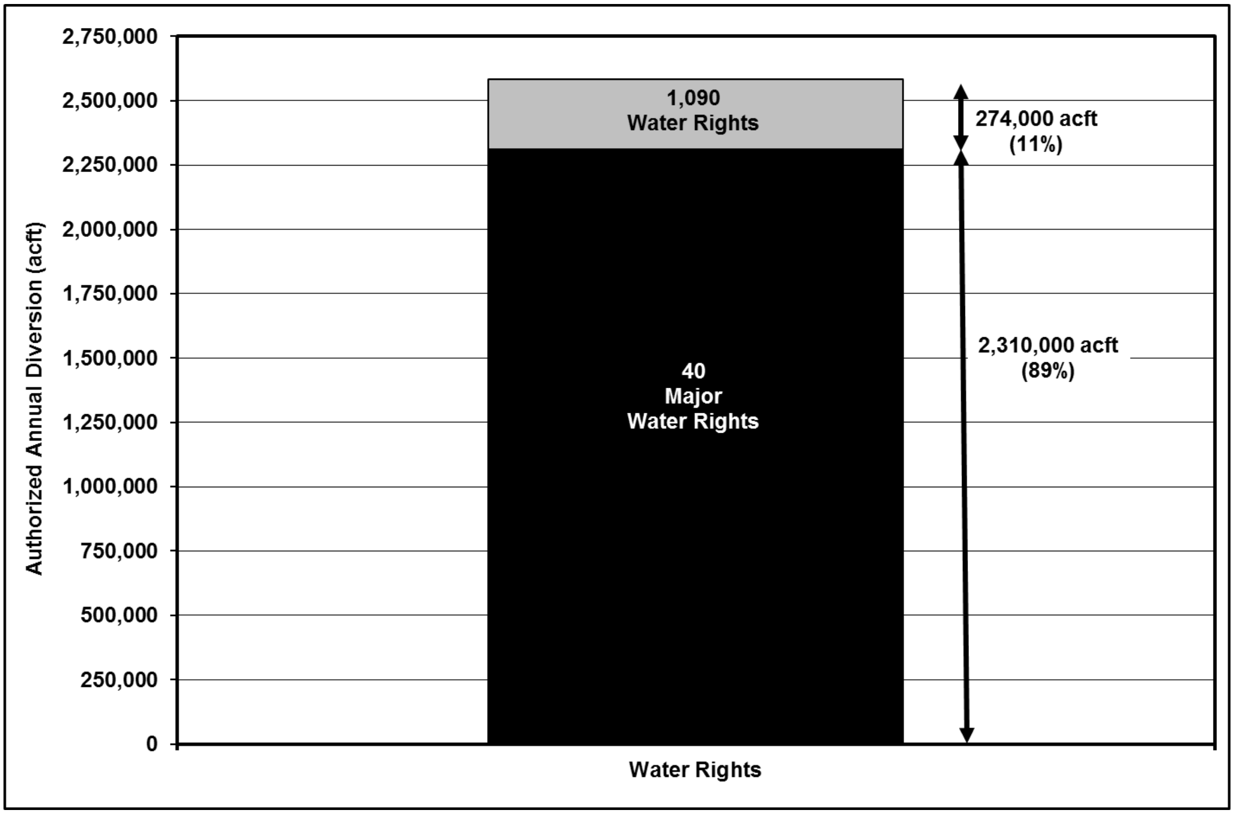


Figure 3.1-2. Comparison of Significant Water Rights in the Brazos River Basin by Number of Rights and Diversion Volume

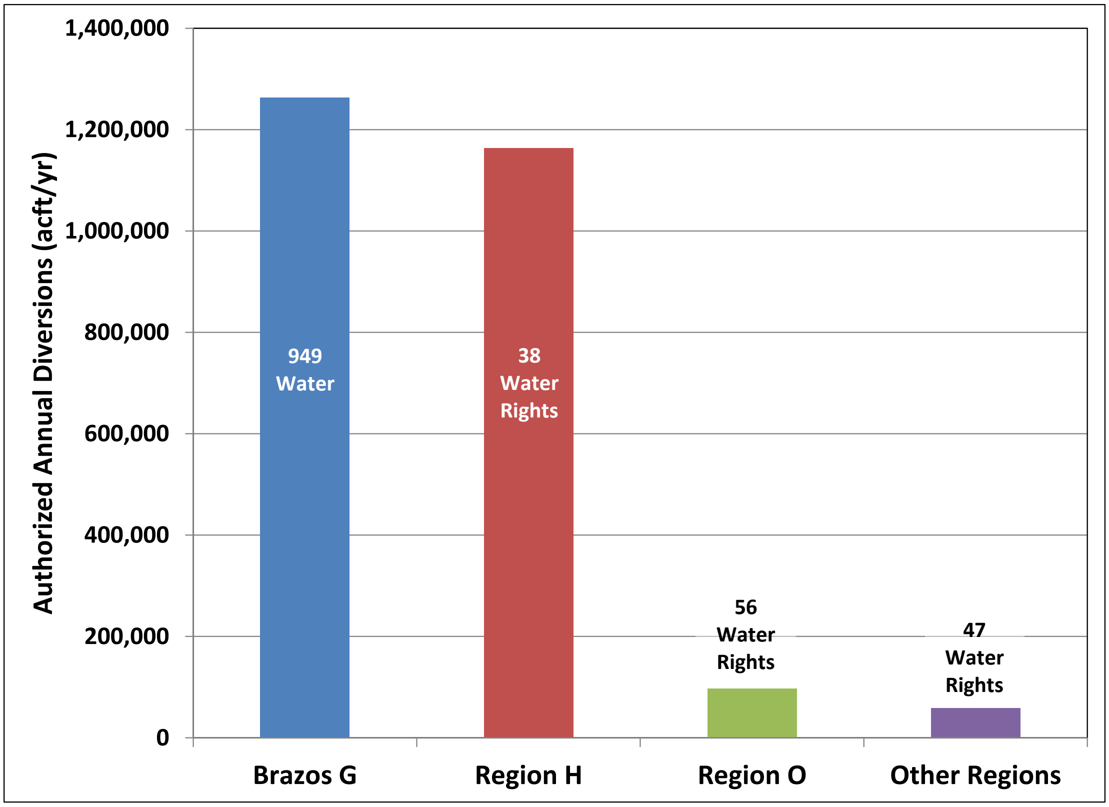
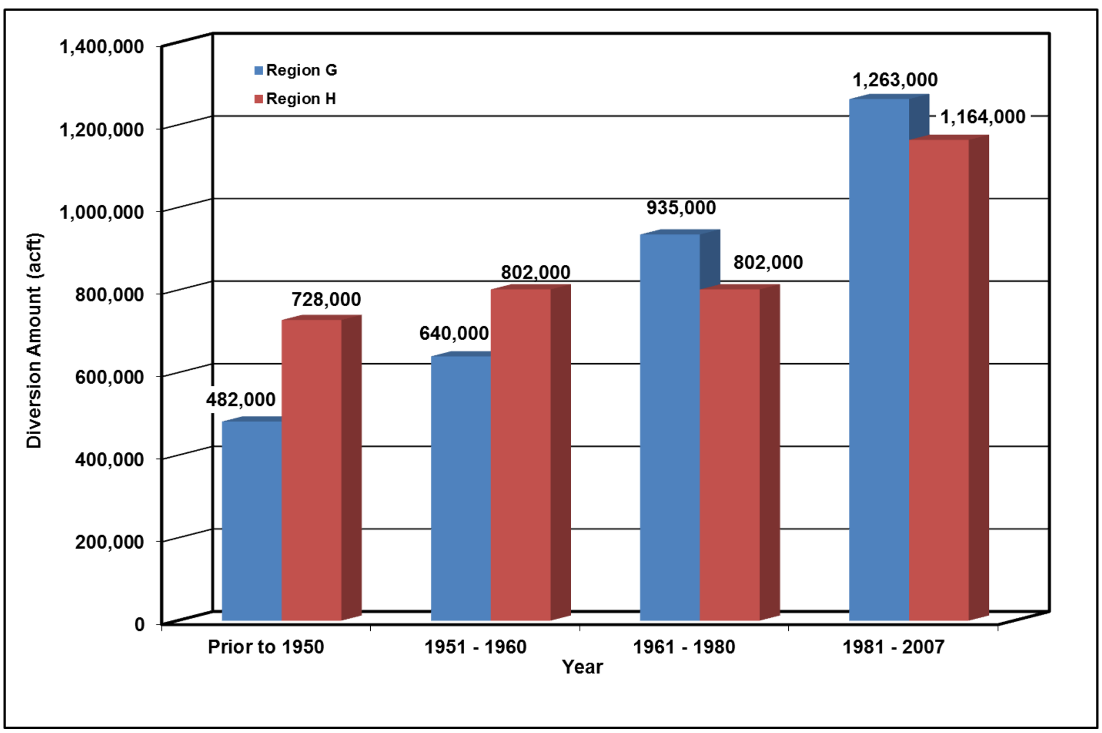


Figure 3.1-3. Comparison of Cumulative Diversion Volume and Priority Date for the Brazos G Area and Region H



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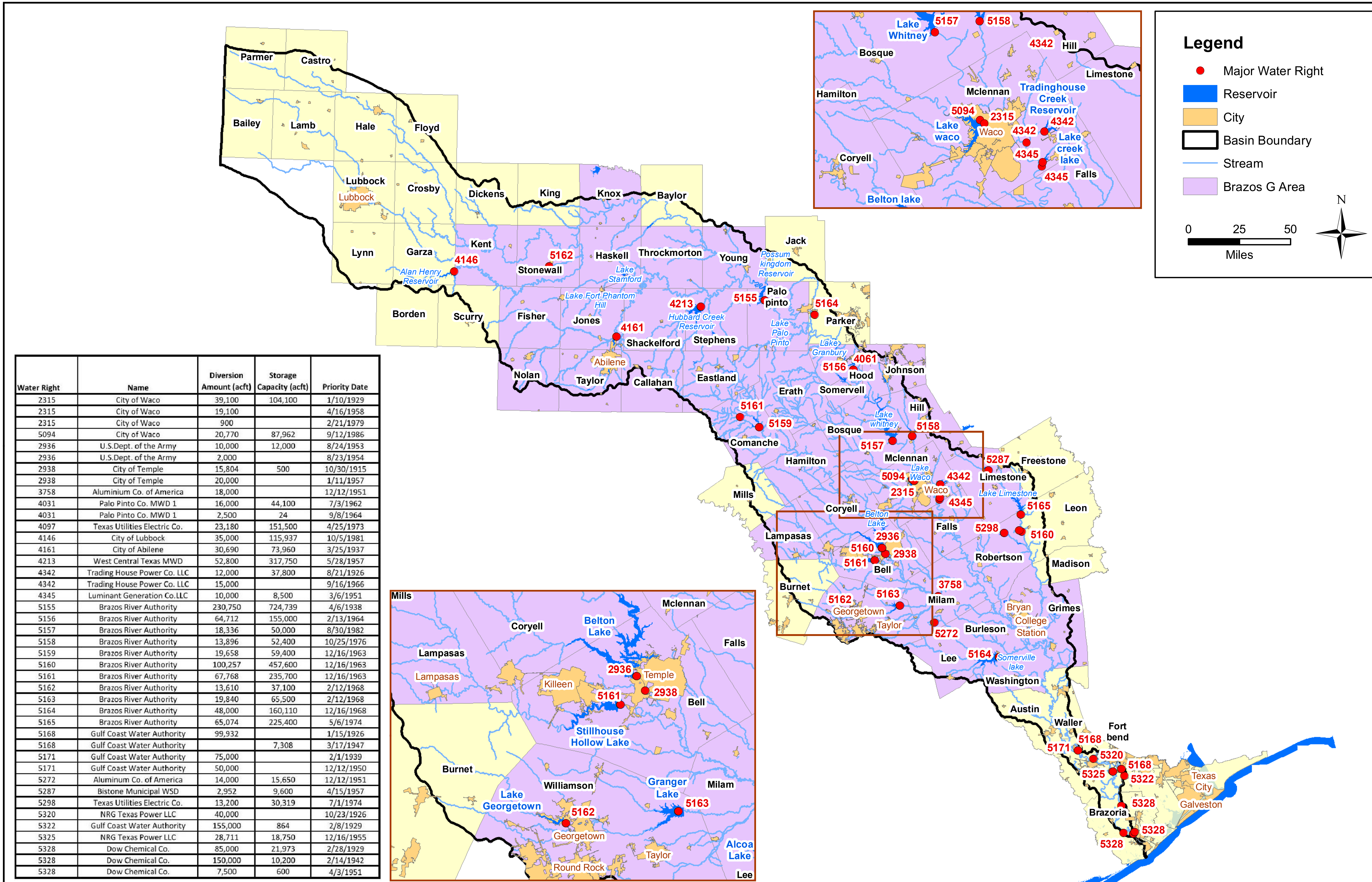

Water Right	Name	Diversion Amount (acft)	Storage Capacity (acft)	Priority Date
2315	City of Waco	39,100	104,100	1/10/1929
2315	City of Waco	19,100		4/16/1958
2315	City of Waco	900		2/21/1979
5094	City of Waco	20,770	87,962	9/12/1986
2936	U.S.Dept. of the Army	10,000	12,000	8/24/1953
2936	U.S.Dept. of the Army	2,000		8/23/1954
2938	City of Temple	15,804	500	10/30/1915
2938	City of Temple	20,000		1/11/1957
3758	Aluminium Co. of America	18,000		12/12/1951
4031	Palo Pinto Co. MWD 1	16,000	44,100	7/3/1962
4031	Palo Pinto Co. MWD 1	2,500	24	9/8/1964
4097	Texas Utilities Electric Co.	23,180	151,500	4/25/1973
4146	City of Lubbock	35,000	115,937	10/5/1981
4161	City of Abilene	30,690	73,960	3/25/1937
4213	West Central Texas MWD	52,800	317,750	5/28/1957
4342	Trading House Power Co. LLC	12,000	37,800	8/21/1926
4342	Trading House Power Co. LLC	15,000		9/16/1966
4345	Luminant Generation Co.LLC	10,000	8,500	3/6/1951
5155	Brazos River Authority	230,750	724,739	4/6/1938
5156	Brazos River Authority	64,712	155,000	2/13/1964
5157	Brazos River Authority	18,336	50,000	8/30/1982
5158	Brazos River Authority	13,896	52,400	10/25/1976
5159	Brazos River Authority	19,658	59,400	12/16/1963
5160	Brazos River Authority	100,257	457,600	12/16/1963
5161	Brazos River Authority	67,768	235,700	12/16/1963
5162	Brazos River Authority	13,610	37,100	2/12/1968
5163	Brazos River Authority	19,840	65,500	2/12/1968
5164	Brazos River Authority	48,000	160,110	12/16/1968
5165	Brazos River Authority	65,074	225,400	5/6/1974
5168	Gulf Coast Water Authority	99,932		1/15/1926
5168	Gulf Coast Water Authority		7,308	3/17/1947
5171	Gulf Coast Water Authority	75,000		2/1/1939
5171	Gulf Coast Water Authority	50,000		12/12/1950
5272	Aluminum Co. of America	14,000	15,650	12/12/1951
5287	Bistone Municipal WSD	2,952	9,600	4/15/1957
5298	Texas Utilities Electric Co.	13,200	30,319	7/1/1974
5320	NRG Texas Power LLC	40,000		10/23/1926
5322	Gulf Coast Water Authority	155,000	864	2/8/1929
5325	NRG Texas Power LLC	28,711	18,750	12/16/1955
5328	Dow Chemical Co.	85,000	21,973	2/28/1929
5328	Dow Chemical Co.	150,000	10,200	2/14/1942
5328	Dow Chemical Co.	7,500	600	4/3/1951

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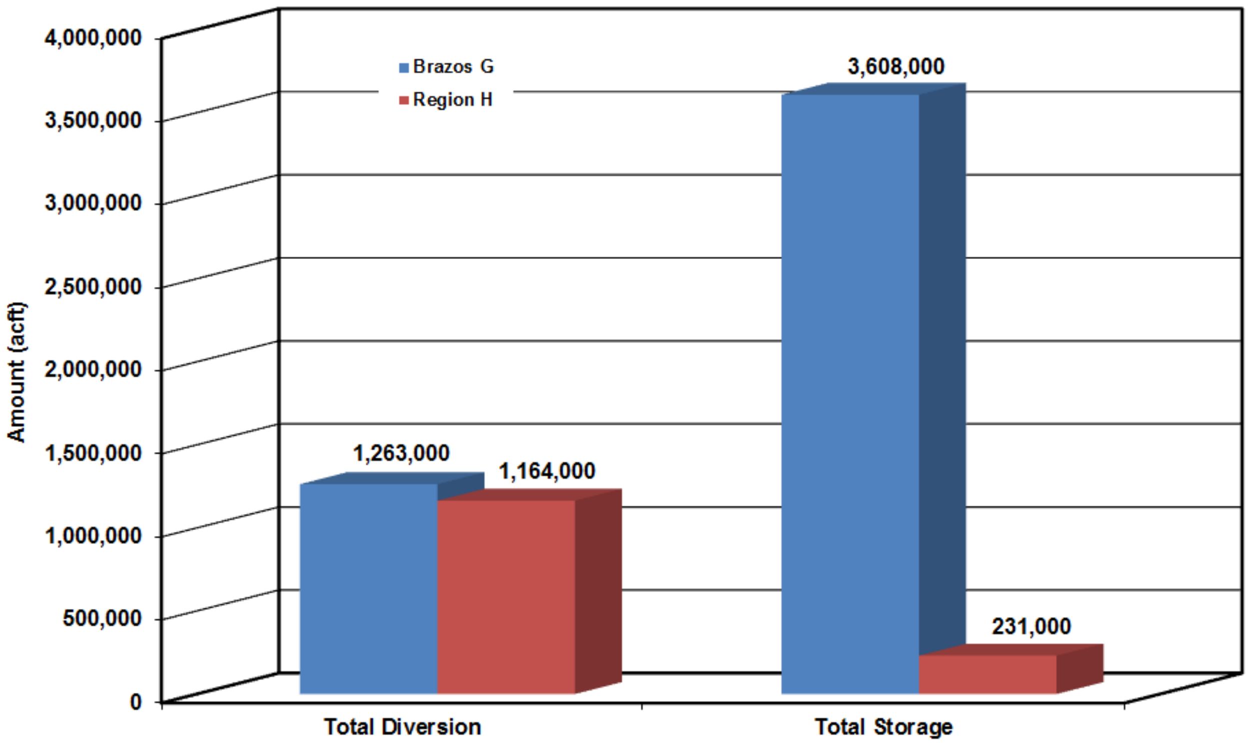
Figure 3.1-5. Comparison of Storage Diversion Volume for Brazos G and Region H



A total of 48 major reservoirs, with capacities greater than 5,000 acft, exist in the Brazos River Basin. The U.S. Army Corps of Engineers (USACE) owns several of these reservoirs, including Lake Georgetown, Lake Aquilla, Lake Granger, Lake Proctor, Lake Somerville, Lake Waco, Lake Belton, Lake Stillhouse Hollow, and Lake Whitney. These reservoirs were built for the primary purpose of flood control; however, they also included other benefits such as water supply and recreation. For purposes of water supply, the USACE has contracted conservation storage in each reservoir to the Brazos River Authority (BRA). The BRA owns the water right for each reservoir and manages the water supply conservation storage in each reservoir, except for Lake Waco, which is controlled by the City of Waco. Other major reservoirs in the basin that provide municipal, industrial, and irrigation water supply are owned by the BRA, City of Abilene, City of Mineral Wells, Palo Pinto County MWD No. 1, West Central Texas MWD, City of Cisco, City of Breckenridge, City of Sweetwater, City of Cleburne, and City of Stamford. A summary of major reservoirs in the Brazos River Basin is presented in Table 3.1-1 and the locations of the reservoirs are shown in Figure 3.1-4.

Table 3.1-1. Major Reservoirs[1] of the Brazos River Basin

Reservoir	Water Right Owner	Authorized Storage (acft)	Authorized Diversion (acft)	Priority Date	County	Planning Region
Abilene	City of Abilene	11,868	1,675	1/23/1918	Taylor	G
Alcoa Lake	Aluminum Company of America	15,650	14,000	12/12/1951	Milam	G

Table 3.1-1. Major Reservoirs[1] of the Brazos River Basin

Reservoir	Water Right Owner	Authorized Storage (acft)	Authorized Diversion (acft)	Priority Date	County	Planning Region
Alan Henry	City of Lubbock	115,937	35,200	10/5/1981	Garza	O
Allens Creek	Brazos River Authority/City of Houston	145,553	202,000	9/1/1999	Austin	H
Aquilla	Brazos River Authority	52,400	13,896	10/25/1976	Hill	G
Belton	Brazos River Authority	457,600	100,257	12/16/1963	Bell	G
Belton	U.S. Dept. of the Army[2]	12,000	10,000 2,000	8/24/1953 8/23/1954	Bell	G
Dow - Brazoria Reservoir	Dow Chemical[3]	21,973	--	4/7/1952	Brazoria	H
Dow - Harris Reservoir	Dow Chemical[3]	10,200	--	2/14/1942	Brazoria	H
Cisco	City of Cisco	45,110	1,971 1,000	4/16/1920 11/8/1954	Eastland	G
Daniel	City of Breckenridge	11,400	2,100	4/26/1946	Stephens	G
Dansby Power Plant	City of Bryan	15,227	850	5/30/1972	Brazos	G
Eagle Nest Lake	U.S. Dept. of the Interior	11,315	1,800	1/15/1948	Brazoria	H
Fort Phantom Hill	City of Abilene	73,960	30,690	3/25/1937	Jones	G
Georgetown	Brazos River Authority	37,100	13,610	2/12/1968	Williamson	G
Gibbons Creek Power	Texas Municipal Power Agency	26,824 5,260	9,740	2/22/1977 3/9/1989	Grimes	G
Graham/Eddleman	City of Graham	4,503 39,000 8,883	5,000 15,000	11/21/1927 11/15/1954 9/16/1957	Young	G
Granbury	Brazos River Authority	155,000	64,712	2/13/1964	Hood	G
Granger	Brazos River Authority	65,500	19,840	2/12/1968	Williamson	G
Hubbard Creek Lake	West Central Texas MWD	317,750	52,800 3,200	5/28/1957 8/14/1972	Stephens	G
Leon	Eastland Co WSD	28,000	1,265 2,438 2,597	5/17/1931 3/21/1952 3/25/1986		

Table 3.1-1. Major Reservoirs[1] of the Brazos River Basin

Reservoir	Water Right Owner	Authorized Storage (acft)	Authorized Diversion (acft)	Priority Date	County	Planning Region
Limestone	Brazos River Authority	225,400	65,074	5/6/1974	Robertson	G
Miller's Creek	North Central Texas MWA	30,696	5,000	10/1/1958	Baylor	B
Palo Pinto	Palo Pinto County MWD No. 1	44,100 24	16,000 2,500	7/3/1962 9/8/1964	Palo Pinto	G
Pat Cleburne Reservoir	City of Cleburne	25,600	5,760 240	8/6/1962 3/29/1976	Johnson	G
Possum Kingdom	Brazos River Authority	724,739	230,750	4/6/1938	Palo Pinto	G
Proctor	Brazos River Authority	59,400	19,658	12/16/1963	Comanche	G
Smithers Lake	Houston L&P	18,750	28,711	12/16/1955	Fort Bend	H
Somerville	Brazos River Authority	160,110	48,000	12/16/1963	Washington	G
Squaw Creek Reservoir	Luminant	151,500	23,180	4/25/1973	Somervell	G
Stamford	City of Stamford	60,000	10,000	6/8/1949	Haskell	G
Stillhouse Hollow	Brazos River Authority	235,700	67,768	12/16/1963	Bell	G
Sweetwater	City of Sweetwater	10,000	3,740	10/17/1927	Nolan	G
Tradinghouse Steam	Luminant	37,800	12,000 15,000	8/21/1926 9/16/1966	McLennan	G
Twin Oak Steam Electric	Luminant	30,319	13,200	7/1/1974	Robertson	G
Waco	City of Waco	104,100 87,962	39,100 19,100 900 20,770	1/10/1929 4/16/1985 2/21/1979 9/12/1986	McLennan	G
Whitney	Brazos River Authority	50,000	18,336	8/30/1982	Hill	G
White River Reservoir	White River MWD	33,160 5,072 6,665	6,000	9/22/1958 11/21/1960 8/16/1971	Crosby	O

1 – A major reservoir is defined as one with an authorized capacity equal to or greater than 5,000 acft

2 – The Dept. of the Army (Fort Hood) owns water rights in Lake Belton alongside the BRA.

3 – The Dow Chemical Company holds diversion rights from the Brazos River totaling 238,156 acft/yr with priority dates ranging from 1929 to 1976, which are used in conjunction with the two off-channel reservoirs.

A number of interbasin transfer permits exist in the Brazos River Basin. These permits include both authorizations for diversions from the Brazos River Basin to adjacent river basins and from adjacent river basins to the Brazos River Basin. Most of the interbasin transfer permits are obviously located along the basin divide. Examples of interbasin transfers that authorize diversions from an adjacent river basin to the Brazos River Basin include: Lake Meredith (Canadian River Basin) to the Lubbock and Plainview areas in Lubbock and Hale County; Oak Creek Reservoir (Colorado River Basin) to the City of Sweetwater in Nolan County; and Lake Travis (Colorado River Basin) to the City of Cedar Park in Williamson County. Interbasin transfers authorized for diversion from the Brazos River Basin to other river basins include: Lake Mexia in Limestone County to part of the City of Mexia that lies in the Trinity River Basin; Teague City Lake in Freestone County to part of the City of Teague that lies in the Trinity River Basin; and Lake Granbury in Hood County to part of Johnson County that lies in the Trinity River Basin. A summary of interbasin transfers (excluding transfers authorized to adjacent coastal basins) associated with the Brazos River Basin is presented in Table 3.1-2.

Table 3.1-2. Summary of Interbasin Transfers Associated with the Brazos River Basin[1]

River Basin of Origin	Location of Use			Description	Authorized Diversion (acft/yr)	Priority Date
	River Basin	Planning Region	County			
Brazos	Trinity	G	Johnson	Lake Granbury to Johnson County	2,600	11/7/86
Brazos	Trinity	G	Limestone	Lake Mexia to part of Mexia	N/A	N/A
Brazos	Trinity	C	Freestone	Teague City Lake to part of Teague	N/A	N/A
Brazos	Colorado	G	Lampasas	Brazos River to City of Lampasas	180	6/23/14
Brazos	Trinity	C	Multiple	Lake Possum Kingdom to Trinity Basin	5,240	4/6/38
Canadian	Brazos	O	Lubbock	Lake Meredith to Lubbock Co. Area	151,200	1/30/56
Colorado	Brazos	G	Fisher	Lake J B Thomas to Fisher Co.	N/A	N/A
Colorado	Brazos	G	Nolan	Oak Creek Res. to Lk Trammel/Sweetwater	3,000	N/A
Colorado	Brazos	G	Callahan	Lake Clyde to Clyde	200	2/2/65
Colorado	Brazos	G	Taylor	Lake O H Ivie to Abilene	15,000	2/2/78
Colorado	Brazos	G	Williamson	Lake Austin to Williamson Co.	N/A	N/A
Colorado	Brazos	G	Williamson	Lake Travis to Cedar Park	16,500	N/A
Colorado	Brazos	G	Williamson	Lake Travis to Leander	6,400	N/A
Colorado	Brazos	F	Fisher	Snyder to City of Rotan	N/A	N/A
Red	Brazos	B	Archer	Small Lakes to Megargel	N/A	N/A
Red	Brazos	B	Archer	Lake Cooper & Olney to Olney	35	8/11/80
Red	Brazos	O	Floyd	Lake MacKenzie to Floydada & Lockney	N/A	N/A

Table 3.1-2. Summary of Interbasin Transfers Associated with the Brazos River Basin[1]

River Basin of Origin	Location of Use			Description	Authorized Diversion (acft/yr)	Priority Date
	River Basin	Planning Region	County			
Trinity	Brazos	G	Grimes	Lake Livingston to Grimes County SE	N/A	6/27/98
Trinity	Brazos	C	Parker	Lake Weatherford to part of Weatherford	N/A	N/A

1 – Excludes transfers authorized to adjacent coastal basins.

3.1.4 Water Supply Contracts

Many entities within Brazos G obtain surface water through water supply contracts. These supplies are usually obtained from entities that own surface water rights, and the contracts specify the quantity of water each year to a buyer for an established unit price. The BRA is the largest provider of water supply contracts in Brazos G, and has contracted to sell 696,719 acft/yr from its system of reservoirs in the Brazos River Basin. The BRA contracts raw water to various entities for long-term supply as well as short-term supply for municipal, industrial, and irrigation uses. Other water right holders that contract large quantities of raw water supply to other entities include the West Central Texas MWD and the Palo Pinto County MWD No. 1. The West Central Texas MWD contracts raw water from Hubbard Creek Reservoir for municipal use to the Cities of Abilene, Albany, Anson, and Breckenridge. The City of Abilene provides water to several other surrounding cities and water supply corporations. The Palo Pinto County MWD No. 1 contracts raw water from Lake Palo Pinto for industrial use to Brazos Electric Co-op as well as for municipal use for the City of Mineral Wells and several smaller water supply corporations.

Table 3.1-3 provides a summary of the contracts held by the identified Wholesale Water Providers within Brazos G, and includes other demands that those entities meet currently, such as a portion of county-aggregated manufacturing demands, etc. Note that some of the supplies shown change between decades. These changes reflect either anticipated changes in contracted amounts (through cancellation or amendment) or "meets" contracts where a WWP agrees to meet the water supply needs of the customer without a fixed annual contractual amount. The contracts shown make up the bulk of the water contracts in the region; however, there are numerous smaller entities which often contract between each other for emergency supplies or various other reasons which are not summarized here. The list also excludes WWPs located primarily outside Brazos G such as the Lower Colorado River Authority and the Colorado River Municipal Water District. Supplies from these entities are discussed in Section 3.5.

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
BRA (LAKE AQUILLA)						
Aquilla WSD	5,953	5,953	5,953	5,953	5,953	5,953
City of Cleburne	5,300	5,300	5,300	5,300	5,300	5,300
Lake Whitney Water Company	150	150	150	150	150	150
Total Contracts	**11,403**	**11,403**	**11,403**	**11,403**	**11,403**	**11,403**
BRA (LITTLE RIVER SYSTEM)						
439 WSC	1,409	1,409	1,409	1,409	1,409	1,409
ALCOA	5,000	5,000	5,000	5,000	5,000	5,000
Bell County WCID #1	62,509	62,509	62,509	62,509	62,509	62,509
Bluebonnet WSC	8,301	8,301	8,301	8,301	8,301	8,301
Brushy Creek MUD	4,000	4,000	4,000	4,000	4,000	4,000
Central Texas WSC	12,045	12,045	12,045	12,045	12,045	12,045
Chisholm Trail SUD	11,100	11,100	11,100	11,100	11,100	11,100
City of Belton	2,500	2,500	2,500	2,500	2,500	2,500
City of Gatesville	5,898	5,898	5,898	5,898	5,898	5,898
City of Georgetown	32,168	32,168	32,168	32,168	32,168	32,168
City of Harker Heights	3,535	3,535	3,535	3,535	3,535	3,535
City of Lampasas	3,500	3,500	3,500	3,500	3,500	3,500
City of McGregor	810	810	810	810	810	810
City of Round Rock	24,854	24,854	24,854	24,854	24,854	24,854
City of Temple	30,453	30,453	30,453	30,453	30,453	30,453
Coryell City WSD	300	300	300	300	300	300
Country Harvest	8	8	8	8	8	8
Dog Ridge WSC	1,500	1,500	1,500	1,500	1,500	1,500
East Williamson Co Water	13,000	13,000	13,000	13,000	13,000	13,000
Fort Gates WSC	200	200	200	200	200	200
High Gabriel WSC	310	310	310	310	310	310
Jarrell-Schwertner WSC	1,000	1,000	1,000	1,000	1,000	1,000
Jerry Glaze	100	100	100	100	100	100
Jonah Water SUD	2,439	2,439	2,439	2,439	2,439	2,439
Kempner WSC	8,900	8,900	8,900	8,900	8,900	8,900
Lake Proctor Irrigation Authority	3,743	3,743	3,743	3,743	3,743	3,743

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
Moffat WSC	500	500	500	500	500	500
North Leon River Irrigation Corporation	2,909	2,909	2,909	2,909	2,909	2,909
Salado WSC	1,600	1,600	1,600	1,600	1,600	1,600
Sun City Georgetown	15	15	15	15	15	15
The Grove WSC	400	400	400	400	400	400
Upper Leon River MWD	6,437	6,437	6,437	6,437	6,437	6,437
Wildflower County Club	200	200	200	200	200	200
Total Contracts	**251,643**	**251,643**	**251,643**	**251,643**	**251,643**	**251,643**
BRA (MAIN STEM)						
Acton MUD	7,000	7,000	7,000	7,000	7,000	7,000
All Seasons Turf Grass	50	50	50	50	50	50
Basa Resources	1,000	1,000	1,000	1,000	1,000	1,000
Bosque Generating, L.P.	6,500	6,500	6,500	6,500	6,500	6,500
Brazos Electric Power Coop.	11,600	11,600	11,600	11,600	11,600	11,600
Carr-Thomas Ranch	50	50	50	50	50	50
Citation Oil & Gas Corp.[1]	175	175	175	175	175	175
City of Brenham	4,200	4,200	4,200	4,200	4,200	4,200
City of Cleburne	9,700	9,700	9,700	9,700	9,700	9,700
City of Graham	1,000	1,000	1,000	1,000	1,000	1,000
City of Granbury	10,800	10,800	10,800	10,800	10,800	10,800
City of Lorena	1,000	1,000	1,000	1,000	1,000	1,000
City of Lubbock[2]	961	961	961	961	961	961
City of Marlin	1,200	1,200	1,200	1,200	1,200	1,200
City of Richmond	2,932	2,932	2,932	2,932	2,932	2,932
City of Rosebud	100	100	100	100	100	100
City of Rosenberg	4,500	4,500	4,500	4,500	4,500	4,500
City of Sugarland	6,388	6,388	6,388	6,388	6,388	6,388
City of Stamford[2]	1,820	1,820	1,820	1,820	1,820	1,820
City of Whitney	750	750	750	750	750	750
Decordova Bend States Owners	400	400	400	400	400	400
Double Diamond, Inc.	1,000	1,000	1,000	1,000	1,000	1,000
Dow Pipeline Company	16,000	16,000	16,000	16,000	16,000	16,000

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
Exelon Generating	10,000	10,000	10,000	10,000	10,000	10,000
Fort Griffin SUD	353	353	353	353	353	353
Fred T. Owen Jr.	60	60	60	60	60	60
Granbury Recreational Association	50	50	50	50	50	50
Gulf Coast Water Authority	41,155	41,155	41,155	41,155	41,155	41,155
Hill Country Harbor Village	250	250	250	250	250	250
Horizon Turf Grass	350	350	350	350	350	350
Johnson County SUD	9,210	9,210	9,210	9,210	9,210	9,210
Key Energy Services	44	44	44	44	44	44
King Ranch Turfgrass	1,300	1,300	1,300	1,300	1,300	1,300
Lenmo Inc.	2,000	2,000	2,000	2,000	2,000	2,000
LSF Development Corp	90	90	90	90	90	90
Monarch Utilities I, L.P.	600	600	600	600	600	600
Mt Lakes Ranch	200	200	200	200	200	200
North Ridge Corporation	235	235	235	235	235	235
NRG Texas, LLC	83,000	83,000	83,000	83,000	83,000	83,000
NRG Texas, LLC	21,837	21,837	21,837	21,837	21,837	21,837
Oak Grove Management	3,838	3,838	3,838	3,838	3,838	3,838
Parker County SUD	1,100	1,100	1,100	1,100	1,100	1,100
Pecan Grove MUD	3,800	3,800	3,800	3,800	3,800	3,800
Pecan Plantation Owners Association	750	750	750	750	750	750
Possum Kingdom WSC	750	750	750	750	750	750
Ranch Owner's Association	250	250	250	250	250	250
Rex R. Worrell[3]	300	300	300	300	300	300
SLC Water Supply	200	200	200	200	200	200
South Texas Water Company	5,625	5,625	5,625	5,625	5,625	5,625
Sportsmans World MUD	125	125	125	125	125	125
Stephens County RWSC	800	800	800	800	800	800
Sugar Tree, Inc.	500	500	500	500	500	500
Texas Municipal Power Agency	3,600	3,600	3,600	3,600	3,600	3,600
TPWD	1,200	1,200	1,200	1,200	1,200	1,200
TXU Electric	122,447	122,447	122,447	122,447	122,447	122,447

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
Vulcan Construction Materials	1,000	1,000	1,000	1,000	1,000	1,000
Wellborn SUD	4,000	4,000	4,000	4,000	4,000	4,000
Western Company of Texas	1,000	1,000	1,000	1,000	1,000	1,000
White Bluff Property Owners	1,000	1,000	1,000	1,000	1,000	1,000
Total Contracts	**412,145**	**412,145**	**412,145**	**412,145**	**412,145**	**412,145**
1 – Contract has since expired and not renewed 2 – Contract represents a priority calls commitment 3 – Contract has since been amended to 240 acft/yr						
AQUILLA WATER SUPPLY						
Brandon-Irene WSC	287	287	287	287	287	287
Chatt WSC (Hill C-O)	86	86	86	86	86	86
Files Valley WSC	1,709	1,709	1,709	1,709	1,709	1,709
Hill County WSC	230	230	230	230	230	230
Hillsboro	4,200	3,640	3,640	3,640	3,640	3,640
Total Contracts	**6,512**	**5,952**	**5,952**	**5,952**	**5,952**	**5,952**
BELL COUNTY WCID #1						
439 Water Supply Corp	750	750	750	750	750	750
City of Belton	5,966	5,966	5,966	5,966	5,966	5,966
City of Copperas Cove	8,824	8,824	8,824	8,824	8,824	8,824
City of Harker Heights	5,265	5,265	5,265	5,265	5,265	5,265
City of Killeen	39,964	39,964	39,964	39,964	39,964	39,964
City of Nolanville	990	990	990	990	990	990
Bell County-Other	750	750	750	750	750	750
Total Contracts	**62,509**	**62,509**	**62,509**	**62,509**	**62,509**	**62,509**
BISTONE MWSD						
Bistone MWSD	146	144	142	141	141	141
City of Mexia	4,480	4,480	4,480	4,480	4,480	4,480
Mexia State School (Limestone C-O)	280	280	280	280	280	280
City of Coolidge	225	225	225	225	225	225
Whiterock WSC (Limestone C-O)	274	274	274	274	274	274
Total Contracts	**5,405**	**5,403**	**5,401**	**5,400**	**5,400**	**5,400**
BLUEBONNET WSC						
City of Bruceville-Eddy	938	938	938	938	938	938

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
Elm Creek WSC	654	654	654	654	654	654
City of McGregor	2,139	2,139	2,139	2,139	2,139	2,139
Moffat WSC	869	869	869	869	869	869
City of Moody	401	401	401	401	401	401
Pendleton WSC	461	461	461	461	461	461
Spring Valley WSC (McLennan C-O)	301	301	301	301	301	301
City of Woodway	1,362	1,362	1,362	1,362	1,362	1,362
Total Contracts	**7,125**	**7,125**	**7,125**	**7,125**	**7,125**	**7,125**
CENTRAL TEXAS WSC						
Armstrong WSC	783	783	783	783	783	783
Bell County WCID No. 5 (Bell C-O)	67	67	67	67	67	67
Bell-Milam-Falls WSC	2,327	2,327	2,327	2,327	2,327	2,327
City of Belton	100	100	100	100	100	100
Dog Ridge WSC	840	840	840	840	840	840
EAST BELL WSC	691	691	691	691	691	691
City of Holland	331	331	331	331	331	331
Little Elm Valley WSC (Milam C-O)	548	548	548	548	548	548
City of Lott	234	234	234	234	234	234
City of Rodgers	468	468	468	468	468	468
City of Rosebud	500	500	500	500	500	500
Salem-Elm Ridge WSC (Milam C-O)	245	245	245	245	245	245
Town of Buckholts	244	244	244	244	244	244
Town of Oenaville and Belfalls (Bell C-O)	157	157	157	157	157	157
West Bell County WSC	1,660	1,660	1,660	1,660	1,660	1,660
Westphalia WSC (Falls C-O)	45	45	45	45	45	45
Jarrell-Schwertner WSC	1,000	1,000	1,000	1,000	1,000	1,000
Total Contracts	**10,240**	**10,240**	**10,240**	**10,240**	**10,240**	**10,240**
EASTLAND CO WSD						
City of Eastland	3,314	3,314	3,314	3,314	3,314	3,314
City of Ranger	2,025	2,025	2,025	2,025	2,025	2,025
Eastland County Manufacturing	72	77	82	85	91	97
Total Contracts	**5,411**	**5,416**	**5,421**	**5,424**	**5,430**	**5,436**

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
HEART OF TEXAS SUPPLIERS, LLC						
City of Hutto	5,600	5,600	5,600	5,600	5,600	5,600
Total Contracts	**5,600**	**5,600**	**5,600**	**5,600**	**5,600**	**5,600**
NORTH CENTRAL TEXAS MWA						
City of Aspermont	118	118	118	118	118	118
City of Benjamin (Knox C-O)	13	13	13	13	13	13
City of Goree (Knox C-O)	63	63	63	63	63	63
City of Haskell	637	637	637	637	637	637
City of Knox City	260	260	260	260	260	260
City of Munday	268	268	268	268	268	268
City of O'Brian (Haskell C-O)	10	10	10	10	10	10
City of Rochester (Haskell C-O)	26	26	26	26	26	26
City of Rule	45	45	45	45	45	45
Weinert (Haskell C-O)	44	44	44	44	44	44
Baylor WSC (Region B)	147	147	147	147	147	147
Knox County Rural WSC (Knox C-O)	55	55	55	55	55	55
Rhineland WSC (Haskell C-O)	37	37	37	37	37	37
Paint Creek WSC (Haskell C-O)	74	74	74	74	74	74
Total Contracts	**1,797**	**1,797**	**1,797**	**1,797**	**1,797**	**1,797**
PALO PINTO CO MWD No. 1						
City of Mineral Wells[1]	5,164	5,265	5,320	5,391	5,462	5,521
Lake Palo Pinto Area WSC (Palo Pinto C-O)	250	250	250	250	250	250
Palo Pinto County Steam-Electric	4,000	4,000	4,000	4,000	4,000	4,000
Total Contracts	**9,414**	**9,515**	**9,570**	**9,641**	**9,712**	**9,771**
1- Includes municipal supply to portion of Mineral Wells located in Region C.						
UPPER LEON MWD						
City of Comanche	706	706	706	706	706	706
City of De Leon	307	307	307	307	307	307
City of Dublin	598	598	598	598	598	598
City of Gorman	169	169	169	169	169	169
City of Hamilton	921	921	921	921	921	921
City of Stephenville	1,862	1,862	1,862	1,862	1,862	1,862

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
Comanche County WSC	9	9	9	9	9	9
Total Contracts	**4,572**	**4,572**	**4,572**	**4,572**	**4,572**	**4,572**
WEST CENTRAL TEXAS MWD						
City of Abilene	20,400	20,400	20,400	20,400	20,400	20,400
City of Albany	2,200	2,200	2,200	2,200	2,200	2,200
City of Anson	2,400	2,400	2,400	2,400	2,400	2,400
City of Breckenridge	2,900	2,900	2,900	2,900	2,900	2,900
Total Contracts	**27,900**	**27,900**	**27,900**	**27,900**	**27,900**	**27,900**
ABILENE						
City of Abilene	22,032	20,857	21,302	21,901	22,350	22,694
Blair WSC (Taylor C-O)	77	77	77	77	77	77
City of Baird	77	77	77	77	77	77
City of Clyde	307	307	307	307	307	307
City of Lawn (Taylor C-O)	77	77	77	77	77	77
City of Merkel	353	353	353	353	353	353
City of Tye	184	184	184	184	184	184
Eula WSC (Callahan C-O)	61	61	61	61	61	61
Hamby WSC (Taylor C-O)	308	308	308	308	308	308
Hawley WSC	307	307	307	307	307	307
Potosi WSC	307	307	307	307	307	307
Steamboat Mountain WSC	307	307	307	307	307	307
S.U.N. WSC (Taylor C-O)	230	230	230	230	230	230
View Caps WSC (Taylor C-O)	199	199	199	199	199	199
Taylor County Manufacturing	1,248	1,395	1,537	1,658	1,831	2,019
City of Clyde[1]	11,837	11,837	11,837	11,837	11,837	11,837
Total Contracts	**37,911**	**36,883**	**37,470**	**38,190**	**38,812**	**39,344**
1 – Contract purchased by Clyde will be used to meet Jones County SE needs						
ANSON						
City of Anson	367	375	378	388	397	405
HAWLEY WSC	350	343	328	304	280	257
City of Hamlin	767	767	767	767	767	767
Total Contracts	**1,484**	**1,485**	**1,473**	**1,459**	**1,444**	**1,429**

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
BRYAN						
City of Bryan	15,203	14,670	18,726	21,795	25,027	28,509
Wellborn SUD	2,240	2,240	2,240	2,240	2,240	2,240
Wickson Creek SUD	1,710	1,534	1,366	1,241	1,129	1,041
City of College Station	385	450	1,656	4,973	8,566	12,716
Brazos County Manufacturing	95	95	95	95	95	95
Brazos County Steam Electric	1	1	1	1	1	1
Total Contracts	**19,634**	**18,990**	**24,084**	**30,345**	**37,058**	**44,602**
CEDAR PARK						
City of Cedar Park[1]	16,556	16,748	15,581	15,203	15,201	15,200
Indian Springs Subdivision (Williamson C-O)	13	13	13	13	13	13
Williamson-Travis Co. MUD No.1	989	989	989	989	989	989
Blockhouse MUD	1,098	1,098	1,098	1,098	1,098	1,098
Williamson County-Manufacturing	790	912	1,033	1,142	1,243	1,355
Total Contracts	**19,446**	**19,760**	**18,714**	**18,445**	**18,544**	**18,655**
1 – Includes municipal supply to portion of Cedar Park located in Region K.						
CLEBURNE						
City of Cleburne	5,720	5,761	6,274	6,929	7,636	8,393
Johnson County Steam Electric	1,344	1,344	1,344	1,344	1,344	1,344
Johnson County Manufacturing	2,329	2,714	3,105	3,455	3,801	4,182
Total Contracts	**9,393**	**9,819**	**10,723**	**11,728**	**12,781**	**13,919**
GATESVILLE						
City of Gatesville	4,216	4,329	4,435	4,422	4,397	4,791
Coryell City Water Supply District	934	1,046	1,172	1,287	1,415	1,543
Fort Gates WSC (Coryell C-O)	120	120	120	120	120	120
Mountain WSC (Coryell C-O)	280	280	280	280	280	280
Flat WSC (Coryell C-O)	102	102	102	102	102	102
Total Contracts	**5,652**	**5,877**	**6,109**	**6,211**	**6,314**	**6,836**
JOHNSON COUNTY SUD						
Johnson County SUD[1]	5,113	5,712	6,363	7,127	7,994	8,934
City of Alvarado	2,241	2,241	2,241	2,241	2,241	2,241
Bethany WSC	1,120	1,120	1,120	1,120	1,120	1,120

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
Monarch Utilities (Johnson C-O)	282	282	282	282	282	282
City of Keene	1,120	1,120	1,120	1,120	1,120	1,120
City of Joshua	951	1,115	1,292	1,494	1,722	1,968
Sundance (Johnson C-O)	56	56	56	56	56	56
Blue Water Oaks (Johnson C-O)	31	31	31	31	31	31
Walnut Creek MHP (Johnson C-O)	68	68	68	68	68	68
Total Contracts	**10,983**	**11,746**	**12,574**	**13,540**	**14,635**	**15,821**
1 – Includes municipal supply to portion of Johnson County SUD located in Region C.						
KEMPNER WSC						
Kempner WSC[1]	2,465	2,590	2,851	3,106	3,348	3,577
City of Kempner	195	209	225	240	254	267
City of Copperas Cove	252	252	252	252	252	252
City of Lampasas	1,281	1,281	1,281	1,281	1,281	1,281
Salado WSC	183	183	183	183	183	183
Lampasas County-Mining	25	25	25	25	25	25
Total Contracts	**4,400**	**4,539**	**4,816**	**5,087**	**5,343**	**5,584**
1 – Includes municipal supply to portion of Kempner WSC located in Region K.						
MINERAL WELLS						
City of Mineral Wells[1]	2,859	3,005	3,095	3,166	3,237	3,296
City of Graford	92	92	92	92	92	92
Palo Pinto WSC (Palo Pinto C-O)	179	179	179	179	179	179
Santo SUD (Palo Pinto C-O)	331	331	331	331	331	331
Sturdivant-Progress WSC (Palo Pinto C-O)	307	307	307	307	307	307
North Rural WSC (Palo Pinto C-O)	324	324	324	324	324	324
Palo Pinto County Manufacturing	10	10	10	10	10	10
Parker County SUD (Region C)	294	294	294	294	294	294
Millsap WSC (Region C)	184	184	184	184	184	184
Parker County Other (Region C)	479	479	479	479	479	479
Parker County Manufacturing (Region C)	25	25	25	25	25	25
Total Contracts	**5,084**	**5,230**	**5,320**	**5,391**	**5,462**	**5,521**
1 – Includes municipal supply to portion of Mineral Wells located in Region C.						
ROUND ROCK						

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
City of Round Rock	23,635	29,691	37,049	44,943	53,991	63,377
Williamson County MUD #9 (Vista Oaks MUD)	797	906	1,027	1,247	1,500	1,762
Fern Bluff MUD	1,153	1,043	943	930	930	930
Williamson County MUD #10	935	1,062	1,204	1,403	1,687	1,982
Williamson County MUD #11	542	616	707	862	1,037	1,218
Walsh Ranch MUD (Williamson C-O)	114	111	110	109	109	109
Paloma Lake MUD (Williamson C-O)	137	166	205	277	374	475
Round Rock Ranch PUD (Williamson C-O)	33	44	60	89	127	168
Williamson County (Williamson C-O)	110	132	164	221	299	379
Blessing MHP (Williamson C-O)	96	116	143	194	262	332
Tal Tex (Williamson C-O)	164	198	244	331	447	567
Williamson County-Mining	3	3	3	3	3	3
Williamson County-Manufacturing	1,042	1,200	1,359	1,503	1,638	1,784
Total Contracts	**28,761**	**35,287**	**43,219**	**52,111**	**62,404**	**73,086**
STAMFORD						
City of Stamford	803	769	722	673	625	616
City of Leuders (Jones C-O)	52	52	52	52	52	52
Ericksdahl WSC (Jones C-O)	37	37	37	37	37	37
Paint Creek WSC (Haskell C-O)	87	87	87	87	87	87
Sagerton WSC (Haskell C-O)	73	73	73	73	73	73
Haskell County SE	2,200	2,200	2,200	2,200	2,200	2,200
Total Contracts	**3,252**	**3,218**	**3,171**	**3,122**	**3,074**	**3,065**
SWEETWATER						
City of Sweetwater	1,813	1,893	1,913	1,977	2,030	2,079
Bitter Creek WSC	460	460	460	460	460	460
City of Blackwell	168	168	168	168	168	168
City of Bronte (Region F)	504	504	504	504	504	504
City of Roby	350	350	350	350	350	350
City of Trent	187	187	187	187	187	187
Nolan County Manufacturing	368	368	368	368	368	368
Total Contracts	**3,850**	**3,930**	**3,950**	**4,014**	**4,067**	**4,116**
TEMPLE						

Table 3.1-3. Water Supply Contracts Held by WWPs and Other Current Demands Supplied by WWPs (acft/yr)

Wholesale Water Supplier	Year					
	2020	2030	2040	2050	2060	2070
City of Temple	18,571	19,446	20,197	20,691	20,873	22,992
City of Little River-Academy	323	323	323	323	323	323
City of Morgans Point Resort	1,935	1,935	1,935	1,935	1,935	1,935
City of Troy	968	968	968	968	968	968
Arrowhead Hill (Bell C-O)	323	323	323	323	323	323
Bell County Manufacturing	481	481	481	481	481	481
Total Contracts	**22,601**	**23,476**	**24,227**	**24,721**	**24,903**	**27,022**
WACO						
City of Waco	30,114	29,344	28,224	27,059	26,921	28,333
City of Bellmead	0	0	0	0	0	0
City of Hewitt	383	558	877	1,198	1,519	1,833
City of Lacy-Lakeview	1,120	1,120	1,120	1,120	1,120	1,120
City of Woodway	431	657	859	1,083	1,316	1,548
City of Beverly Hills	252	261	268	281	297	312
City of West	1,120	1,120	1,120	1,120	1,120	1,120
City of Robinson	560	560	560	560	560	560
Bold Springs Water Supply (McLennan C-O)	560	560	560	560	560	560
Hilltop Water Supply (McLennan C-O)	97	97	97	97	97	97
Central Bosque WSC (McLennan C-O)	70	70	70	70	70	70
McLennan County Manufacturing	2,503	2,888	3,249	3,618	3,948	4,403
McLennan County Steam Electric (SCEA)	15,000	15,000	15,000	15,000	15,000	15,000
Total Contracts	**52,211**	**52,236**	**52,005**	**51,766**	**52,528**	**54,956**

3.2 Determination of Surface Water Availability

3.2.1 Modified TCEQ Water Availability Model of the Brazos River Basin (Brazos G WAM)

Determination of water availability for existing water rights is based on a rather complex function of location, hydrologic conditions, diversion volume, reservoir storage, and priority date. Computer models that are capable of analyzing these complex inter-relationships are typically employed to determine water availability for water rights. Water availability estimates for the Brazos G Area were developed using a computer model for the Brazos River Basin. The Water Rights Analysis Package (WRAP) computer model was developed at Texas A&M University for use as a water resources management tool. The model can be used to evaluate the reliability of existing water rights and to determine unappropriated streamflow potentially available for new water right permits. WRAP simulates the management and use of streamflow and reservoirs over a historical period of record, adhering to the prior appropriation doctrine governing water rights in Texas.

The TCEQ maintains a Water Availability Model (TCEQ WAM) for the Brazos River Basin that contains information on all water rights in the basin. The TCEQ WAM is the fundamental tool used to determine surface water availability throughout the Brazos River Basin for water rights permitting. Embedded within this model are certain assumptions that the TCEQ specifies when analyzing water right reliabilities. These assumptions are not necessarily the most appropriate to apply to the regional water planning process. For example, the TCEQ WAM utilizes permitted storage capacities for all reservoirs, whereas, water supply planning should be based upon current and future sedimentation conditions in the reservoirs.

The Brazos G RWPG has approved (and the TWDB has authorized) several assumptions to be incorporated into the TCEQ WAM for purposes of determining surface water availability. With these modifications, the TCEQ WAM is hereinafter referred to as the “Brazos G WAM.” These assumptions include the following items.

- Inclusion of a certain level of current and future return flows by entities located throughout the basin. These return flows were based on historical return flow information as well as projected future rates assuming an aggressive plan for future reuse. The return flow amounts were reviewed and acknowledged by each entity and by the Brazos G RWPG before being included in the model. Table 3.2-1 lists the entities and the annual amount of return flows approved for use in the Brazos G WAM. Multiple entries for the same entity indicate multiple discharge locations.
- The TCEQ WAM assumes all diversions from storage occur lakeside and does not take into account BRA contracts located throughout the basin. Therefore the Brazos G WAM was modified with all BRA contracts located and modeled at their actual diversion locations and able to receive releases from multiple reservoirs when applicable.
- The Brazos G WAM uses Year 2020, or the most up to date reservoir survey as available, and estimated Year 2070 elevation-area-capacity information for all reservoirs authorized for greater than 5,000 acft storage capacity.
- The Brazos G WAM includes five subordination agreements as agreed to by the TWDB:
    - Possum Kingdom Reservoir is subordinated to Lake Alan Henry,
    - Possum Kingdom Reservoir is subordinated to the Fort Phantom Hill Reservoir Scalping water right located on the Clear Fork of the Brazos River,
    - Possum Kingdom Reservoir is subordinated to Hubbard Creek Reservoir,
    - Possum Kingdom Reservoir is subordinated to the City of Stamford’s California Creek pump-back operation into Lake Stamford, and

- Lake Waco is subordinated to the City of Clifton's 1996 priority date water right.

These assumptions were used throughout the regional planning process for the analyses that were used to determine surface water availability for existing rights, and also for the analyses that were used to determine potential supplies from new water management strategies. The assignment of surface water availability to individual Water User Groups and Wholesale Water Providers is described in Chapter 4.

Table 3.2-1. Return Flows included in the Brazos G WAM

Facility	County	Current Returns (MGD)[1]	Confirmed Estimated 2070 Discharge (MGD)[2,3]
Bell County WCID	Bell	0.45	0.50
Bell County WCID	Bell	2.38	5.00
Bell County WCID	Bell	6.67	9.00
Bell County WCID	Bell	2.83	1.00
BRA SLRSS	Fort Bend	3.75	6.91
BRA/LCRA BCRWSS West	Williamson	13.94	26.03
BRA/LCRA BCRWSS East	Williamson	1.21	2.26
City of Angleton	Brazoria	1.82	2.65
City of Bellville	Austin	0.41	0.57
City of Breckenridge	Stephens	0.45	0.36
City of Brenham	Washington	1.85	1.69
City of Cameron	Milam	0.52	0.35
City of Copperas Cove	Coryell	0.72	0.77
City of Copperas Cove	Coryell	0.95	1.01
City of Copperas Cove	Coryell	0.42	0.44
City of Eastland	Eastland	0.23	0.18
City of Freeport	Brazoria	0.67	0.97
City of Gatesville	Coryell	0.59	0.63
City of Gatesville	Coryell	1.19	1.26
City of Georgetown	Williamson	1.20	1.00
City of Georgetown	Williamson	1.09	1.00
City of Graham	Young	0.76	0.48
City of Granbury	Hood	1.02	0.95
City of Harker Heights	Bell	1.76	2.40
City of Hearne	Robertson	0.49	0.52
City of Hillsboro	Hood	1.02	0.95
City of Hutto	Williamson	0.93	5.60

Table 3.2-1. Return Flows included in the Brazos G WAM

Facility	County	Current Returns (MGD)[1]	Confirmed Estimated 2070 Discharge (MGD)[2,3]
City of Lampasas	Lampasas	0.41	0.43
City of Leander	Williamson	0.92	1.71
City of Marlin	Falls	0.49	0.50
City of McGregor	McLennan	0.46	0.45
City of Mineral Wells	Parker	0.36	0.56
City of Mineral Wells	Palo Pinto	1.23	1.15
City of Navasota	Grimes	0.53	0.54
City of Richmond	Fort Bend	1.40	2.98
City of Richmond	Fort Bend	3.80	2.40
City of Rosenberg	Fort Bend	0.95	0.73
City of Rosenberg	Fort Bend	1.48	1.41
City of Stephenville	Erath	1.57	1.63
City of Sugarland	Fort Bend	3.71	6.83
City of Sugarland	Fort Bend	3.71	6.83
City of Taylor	Williamson	1.35	3.93
City of West Columbia	Brazoria	0.60	0.87
Fort Bend MUD 106	Fort Bend	0.99	1.82
Fort Bend MUD 112	Fort Bend	1.35	1.50
Pecan Grove MUD	Fort Bend	0.93	1.71
Prairie View A&M University	Waller	0.44	0.70
Texas A&M University	Brazos	0.30	0.17
	Total:	**76.30**	**113.33**
	Total (acft/yr):	**85,456**	**126,930**

1 – Current return flow estimates developed during the development of the 2016 Brazos G Plan and approved by the discharging entities.

2 – Initial estimate assumes 75% of Y2020 will continue to be discharged (assumed 25% reuse) and 50% of wastewater flows in excess of Y2020 levels will be discharged (50% reuse of any future increases in effluent). Final estimates were refined after consultation with local dischargers.

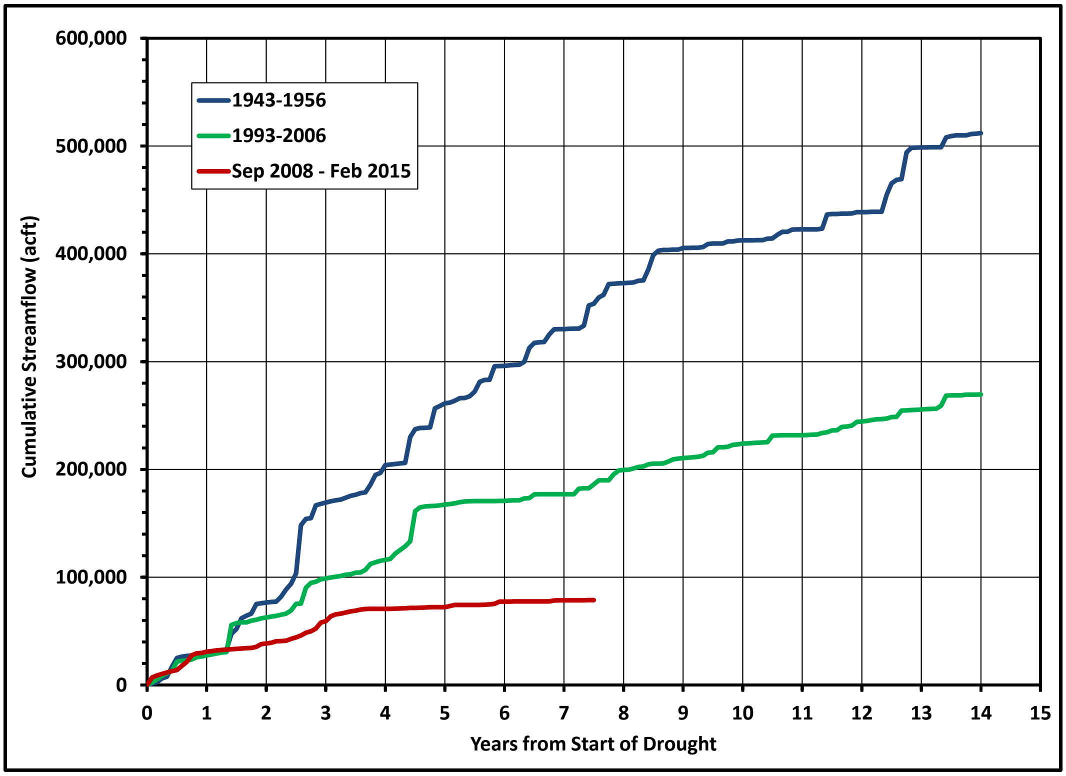
3 – Entities operating WWTPs but are not shown have requested that zero effluent be made available in the WAM because they plan to utilize (reuse) all future effluent.

The Brazos G WAM contains 77 primary control points that contain naturalized flow information, and 67 evaporation data sets used to calculate evaporation for the 650 reservoirs included in the model. The period of record for the TCEQ WAM is 1940-1997. This is also true for the Brazos G WAM, although Section 3.2.2 will discuss some updates made to more accurately reflect current drought conditions in the upper Brazos Basin. Water availability computations are performed at over 3,800 control points located throughout the river basin in the process of analyzing more than 1,700 water right records. The Brazos G WAM contains water right data available from the TCEQ for all water rights in the Brazos Basin as of September 2008 (obtained from the TCEQ on September 25, 2012). Water right applications submitted or approved after this date are not reflected in the model. A summary of yield data for major reservoirs analyzed in the Brazos G WAM is presented in Section 3.2.3.

3.2.2 Reliability of Surface Water Supplies and New Upper Basin Drought of Record

Hydrologic conditions are a primary factor that affects the reliability of water rights. Severe drought periods have been experienced in all areas of the Brazos River Basin. The drought of record for most areas of Brazos G occurred in the 1950s with other less severe drought periods occurring in the 1960s, 1970s, 1980s, and even recently in the 1990s. In some parts of the upper Brazos Basin, the recent drought of the 1990s has continued past the turn of the century, and in many places streamflow data indicate that its severity is greater than that of the drought that occurred in the 1950s. From 1993 through 2006, the region of Texas near Abilene experienced serious drought conditions. Streamflows in the Clear Fork of the Brazos River (Clear Fork) during this 14-year period were only 53 percent of the cumulative 14-year flows that occurred during the previous drought of record which occurred from 1943 through 1956. Figure 3.2-1 illustrates this with a comparison of cumulative gaged flows for the Clear Fork at Nugent gage during the drought of the 1950s and the drought from 1993 through 2006. The year 2007 saw an end to the latter drought period with most area streams returning to above normal flow conditions, and reservoir levels recovering from historically low conditions. The City of Abilene, located in this upper portion of the Brazos Basin, initiated a study to quantify the drought ending in 2007 and its effect on the supplies of the region. The drought primarily affected the upper parts of the Brazos Basin, specifically those reservoirs upstream of Possum Kingdom Reservoir located in the Clear Fork of the Brazos watershed, and others in close proximity. A new tool was developed to analyze the current drought, given that the period of record of the existing Brazos G WAM only extends through 1997.

Figure 3.2-1. Comparison of Cumulative Streamflows for Three Drought Periods for the Clear Fork at Nugent, TX Streamgage (08084000)



Several possible studies and tools were evaluated to determine their effectiveness at quantifying the current drought. The selected tool was a modified version of the existing Brazos G WAM. The hydrology of the Brazos G WAM for the Abilene study was extended through June of 2004 for the primary control points located within the drought-stricken area with the last control point in the model being the Brazos River at Palo Pinto. During the Brazos G Regional Planning Group Phase I studies preceding development of the 2011 Brazos G Plan, this tool developed for the City of Abilene was updated to include hydrology through June 2008 and renamed the Brazos G Mini-WAM. Naturalized flows were updated using the latest information for the 16 primary controls included in this segmented version of the Brazos G WAM, and 15 evaporation data sets were updated for inclusion into this model. All water rights and control points outside the updated drought study area were removed and not included in the analysis.

The modified Brazos G Mini-WAM was used to determine safe yields of reservoirs upstream of Possum Kingdom Reservoir (see Section 3.2.3). For some reservoirs, the drought ending in 2007 is more severe than the 1950s drought, resulting in lower estimates of yield and the need for entities in this part of the basin to consider 1-year and 2-year safe yields for water supply planning purposes.

Also included in Figure 3.2-1 is the gaged streamflow at Nugent for the current drought beginning in September 2008. When the current drought cumulative streamflows are compared to the other two droughts at the seven years mark from the beginning of the drought, total streamflow is 22 percent and 42 percent of the total streamflow for the 1950's and 2006 droughts, respectively. This comparison shows that the current drought is much more severe thus far but has not reached the duration of the previous droughts.

If the current drought continues, it is recommended that the Brazos G Mini-WAM be updated to include the current drought for the next regional planning cycle.

3.2.3 Yield Analysis for Large Reservoirs

Water availability estimates for reservoirs were evaluated using the Brazos G WAM and the Brazos G Mini-WAM. Two yield estimates were determined using updated elevation-area-capacity information for all reservoirs greater than 5,000 acft storage capacity and as-permitted capacities for all reservoirs where no detailed elevation-area-capacity information were available, typically those less than 5,000 acft capacity. Yields were limited to authorized diversions. Yields were determined for a current condition and a future condition, where the current condition is indicative of year 2020 sediment conditions and the future condition is indicative of estimated year 2070 reservoir sedimentation conditions. Yields were determined for all reservoirs greater than 5,000 acft authorized storage, and for smaller reservoirs that serve as the sole water supply for an entity.

Firm and safe yield estimates were used, depending on where a specific reservoir is located. Utilization of safe yield in lieu of firm yield is a common practice in west Texas where droughts are frequent and severe, and water managers are acutely aware that a drought more severe than recent recorded history could occur. Safe yield provides additional assurance of supply in an area where water resource alternatives are limited. Firm yields were calculated for all reservoirs located below and including Possum Kingdom Reservoir, except Lake Palo Pinto, where a 6-month safe yield was determined. All reservoirs upstream of Possum Kingdom were evaluated on a 1-year safe yield basis. A 1-year safe yield is defined as the amount of water that can be diverted from a reservoir during a repeat of the worst drought of record while still maintaining a reserve capacity equal to a 1-year supply. The period of record for the firm yield analyses using the Brazos G WAM was 1940 –1997. The period of record for the safe yields upstream of Possum Kingdom using the Brazos G Mini-WAM was 1940 – June 2008.

Two-year safe yields were calculated for Hubbard Creek Reservoir and Fort Phantom Hill Reservoir at the request of the reservoir owners, and approval of the TWDB. A 2-year safe yield is used to provide a greater assurance to reservoir owners that supplies are not over-estimated when considering droughts worse than the drought of record.

A summary of firm and safe yield estimates for major reservoirs and minor reservoirs used for municipal supply is presented in Table 3.2-2.

Table 3.2-2. Yields for Reservoirs in the Brazos G Area (acft/yr)

Water Right ID	Reservoir Name	Yield	
		2020	2070
BRA Reservoirs (Firm Yield)			
C5155	Possum Kingdom	230,750	224,692
C5156	Granbury	64,712	53,310
C5157	Whitney	18,336	18,336

Table 3.2-2. Yields for Reservoirs in the Brazos G Area (acft/yr)

Water Right ID	Reservoir Name	Yield	
		2020	2070
C5158	Aquilla	13,315	12,099
C5159	Proctor	17,742	16,957
C5160	Belton	110,562	108,722
C5161	Stillhouse Hollow	66,230	66,195
C5162	Georgetown	11,743	12,003
C5163	Granger[1]	17,017	14,192
C5164	Somerville	41,308	38,910
C5165	Limestone	65,364	55,677
Large Non-BRA Reservoirs (Firm Yield)			
C3758, C5272	Alcoa	14,000	14,000
C5311, C5307	Gibbons Creek	9,740	9,740
C4345	Lake Creek	9,835	9,810
C34403	Lake Davis[3]	160	70
C3470	Lake Leon	5,488	5,331
C40391	Lake Mineral Wells	2520	2406
C4031	Lake Palo Pinto[2]	12,879	11,799
C4106	Pat Cleburne	5,040	4,680
C4097	Squaw Creek	9,285	9,222
C4342	Tradinghouse	4,908	4,897
C5298	Twin Oaks	2,885	2,795
P5551, P5899	Waco	79,877	79,877
C3693	White Reservoir	1,099	0
Minor Non Mini-WAM Reservoirs (Firm Yield)			
P4135	Crawford	1	1
C3465	Eastland	460	450
C4024	Gordon	5	5
C4355	Marlin	1,550	1,550
P5000	Mart	0	-
P5085	Robinson	-	-
P5744	Somervell	-	-
C4019	Strawn	160	-
C3450	Throckmorton	325	325
Mini-WAM Reservoirs (Safe Yield)			

Table 3.2-2. Yields for Reservoirs in the Brazos G Area (acft/yr)

Water Right ID	Reservoir Name	Yield	
		2020	2070
C4142	Lake Abilene[1]	1,074	400
C4211	Lake Cisco	1,090	1,075
C4214	Lake Daniel	200	187
C4151, C4161, C4139, C4165	Fort Phantom Hill Reservoir[4]	11,650	10,320
C3458	Lake Graham-Eddleman	4,250	3,410
C4213	Hubbard Creek Reservoir[4]	27,010	26,317
C4150	Lake Kirby[1]	525	470
C4179	Lake Stamford	5,510	4,910
C4130	Lake Sweetwater[1]	1,120	1,115
C4128	Sweetwater_Trammel_RC4128[1]	545	-
C4152	Lytle Lake	230	-
C4180	City of Hamlin Lake	250	-
C4181	Anson North	202	-
C4194	Woodson	99	-
C4202	Baird	230	-
C4208	McCarty	380	-
C4207	Moran	85	-
C3462	Bryson	75	-
C3444	Millers Creek Reservoir[5]	1,300	200
Mini-WAM Reservoirs (Firm Yield)			
C4142	Lake Abilene[1]	1,675	1,100
C4211	Lake Cisco	1,315	1,311
C4214	Lake Daniel	290	269
C4151, C4161, C4139, C4165	Fort Phantom Hill Reservoir	21,799	21,630
C3458	Lake Graham-Eddleman	5,100	5,100
C4213	Hubbard Creek Reservoir	41,251	40,352
C4150	Lake Kirby[1]	935	880
C4179	Lake Stamford	8,640	7,910
C4130	Lake Sweetwater[1]	1,470	1,460
C4128	Sweetwater_Trammel_RC4128[1]	700	-
C4152	Lytle Lake	230	-
C4180	City of Hamlin Lake	300	-

Table 3.2-2. Yields for Reservoirs in the Brazos G Area (acft/yr)

Water Right ID	Reservoir Name	Yield	
		2020	2070
C4181	Anson North	300	-
C4194	Woodson	60	-
C4202	Baird	315	-
C4208	McCarty	550	-
C4207	Moran	175	-
C3462	Bryson	115	-
C3444	Millers Creek Reservoir[5]	3,000	600

1 – Reservoir not used for supply by owning entity.

2 – Yield volumes for Lake Palo Pinto are based on a 6-month safe yield calculation.

3 – Lake Davis is located upstream of Possum Kingdom Reservoir, but since it is not used for municipal supply, a firm yield was used to determine available supply and not safe yield.

4 – Yield volumes are based on a 2-year safe yield calculation. The 1-year safe yield estimate for Fort Phantom Hill Reservoir is 16,300 acft/yr and is 32,410 acft/yr for Hubbard Creek Reservoir.

5 – Not located in area covered by Brazos G Mini-WAM. Yield was calculated outside the WAM using extended stream flow records.

3.2.4 Reliability of Run-of-the-River and Small Reservoir Water Rights

The results of the Brazos G WAM simulations include water availability estimates for each water right located in the Brazos Basin. Summaries of water available to run-of-the-river water rights (including rights with small reservoirs) are presented in Appendix G. If the supply for a water right was determined by a firm or safe yield analysis then this number is shown in the appendix. Water availability for other rights is expressed in terms of the minimum annual supply, which is defined as the water available during the most severe drought year over the 58-year simulation period of 1940 to 1997. Water right reliabilities were calculated simulating both current and future reservoir sedimentation conditions. The minimum annual supplies for run-of-river water rights (based on minimum monthly diversions) were used to determine the supplies available by type of use and county for comparison with demands as described in Chapter 4.

In previous planning cycles another definition was by the Brazos G RWPG to define supply for irrigation water rights, which is commonly referred to as the 75/75 convention. The 75/75 convention defines a reliable irrigation supply as that quantity of which at least 75% can be diverted at least 75% of the time. Note that supplies as determined using the 75/75 convention would not be available during extreme droughts. Table 3.2-3 summarizes the 75/75 estimates from the 2011 Brazos G Water Plan as compared to the reliability of supplies for irrigation using the minimum annual reliability analysis. Utilization of the minimum annual reliability significantly reduces the estimates of available supply (by more than 113,000 acft/yr region-wide) and results in greater projected shortages for irrigation in numerous counties than the 75/75 convention.

Table 3.2-3. Comparison of Irrigation Reliability Analysis by County

County	75/75 Supply Reliability (acft/yr)	2070 Supply Reliability (acft/yr)
Bell	5,829	635
Bosque	11,140	131
Brazos	4,480	0
Burleson	8,840	0
Callahan	49	0
Comanche	19,117	3,511
Coryell	1,651	530
Eastland	2,404	75
Erath	5,230	98
Falls	8,188	174
Fisher	758	17
Grimes	1,678	0
Hamilton	4,070	47
Haskell	830	0
Hill	2,992	1,009
Hood	12,667	4,461
Johnson	1,079	187
Jones	2,570	646
Kent	345	0
Knox	2,951	70
Lampasas	1,253	103
Lee	181	20
Limestone	19	14
McLennan	8,868	1,337
Milam	8,823	42
Nolan	120	40
Palo Pinto	3,133	550
Robertson	9,081	535
Shackelford	85	0
Somervell	1,105	0
Stephens	3,541	0
Stonewall	11	8
Taylor	232	0
Throckmorton	12	8

Table 3.2-3. Comparison of Irrigation Reliability Analysis by County

County	75/75 Supply Reliability (acft/yr)	2070 Supply Reliability (acft/yr)
Washington	2,876	0
Williamson	1,087	66
Young	954	0
Total	**138,249**	**14,314**

3.2.5 Unappropriated Flows in the Brazos G Area

The Brazos G WAM calculates unappropriated flow each month for the 1940 – 1997 period at each modeled location in the basin. Unappropriated flow is the flow that could potentially be made available to a new water right permit. This unappropriated flow is computed assuming SB3 instream flow restrictions and full use of all existing water rights. The quantity of unappropriated flow varies throughout the river basin depending on location. Summaries of unappropriated flows from the Brazos G WAM were developed at the following locations:

- Brazos River at South Bend (BRSB23),
- Brazos River near Glen Rose (BRGR30),
- Brazos River near Aquilla (BRAQ33),
- Bosque River near Waco (BOWA40),
- Little River at Cameron (LRCA58),
- Brazos River near Bryan (BRBR59),
- Brazos River near Hempstead (BRHE68), and
- Brazos River at Richmond (BRRI70).

These locations effectively summarize flow conditions throughout the river basin and are located at current or discontinued USGS streamflow gaging stations, which are also primary control points in the Brazos G WAM. Table 3.2-4 summarizes the monthly and annual unappropriated flows at these selected locations for the future conditions run. Figures 3.2-2 through 3.2-9 illustrate the annual time series of unappropriated flows at each location. As Table 3.2-4 and Figures 3.2-2 through 3.2-9 demonstrate, locations further downstream on major streams tend to have more unappropriated flow than those upstream with less contributing drainage area. These data suggest that any new potential water rights requiring a firm supply would need to be permitted with storage. In order to provide a firm supply the right would have to operate to fill the reservoir and meet diversions during wet times, while relying on stored water to meet diversions during drought times. As shown in these figures, unappropriated flow is not available at the South Bend gage location for ten years, with three of these years occurring during the drought years of the 1950s. Conversely, unappropriated flow is potentially available in most years at Richmond in the lower basin, and often in large quantities. Unappropriated flow is not available at Richmond for three years during the severe drought of the 1950s, which is the lowest flow period during the 1940 to 1997 period for this gage.

Table 3.2-4. Summary of Unappropriated Flow at Selected Brazos G WAM Locations

Control Point	Unappropriated Flow Estimates								Max. No. of Consecutive Months with Zero Unappropriated Flow
	Monthly Unappropriated Flows (acft)				Annual Unappropriated Flows (acft)				
	Maximum	Minimum	Mean	Median	Maximum	Minimum	Mean	Median	
BRSB23	1,208,842	0	20,640	0	2,177,465	0	247,684	108,866	39
BRGR30	2,487,509	0	36,790	0	3,389,603	0	441,479	221,497	31
BRAQ33	2,742,890	0	56,843	0	3,904,733	0	682,119	475,177	31
BOWA40	525,111	0	19,150	0	947,992	0	230,129	179,294	33
LRCA58	1,374,049	0	62,291	0	3,611,680	0	747,492	553,871	41
BRBR59	4,141,594	0	168,753	0	9,109,566	0	2,025,035	1,640,037	31
BRHE68	4,783,453	0	213,478	0	11,041,229	0	2,561,741	2,210,633	31
BRRI70	5,134,010	0	247,730	1,653	11,919,416	0	2,972,757	2,492,537	27

Figure 3.2-2. Estimated Annual Unappropriated Flow at Brazos River at South Bend

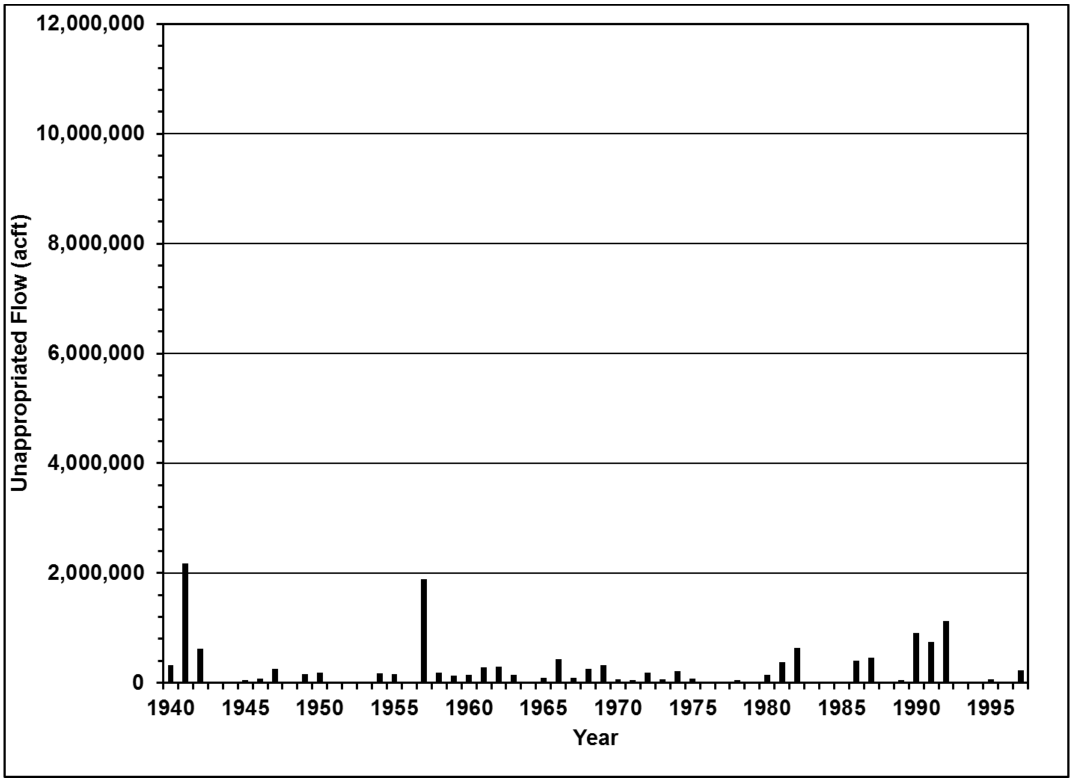


Figure 3.2-3. Estimated Annual Unappropriated Flow at Brazos River near Glen Rose

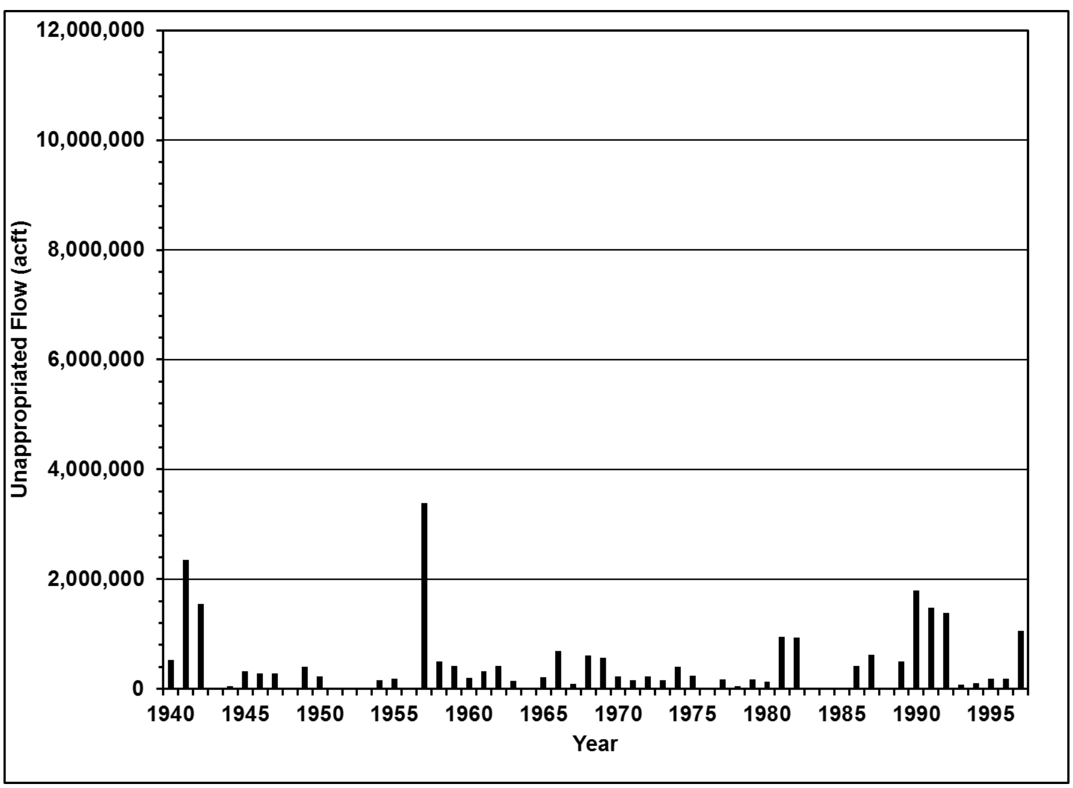


Figure 3.2-4. Estimated Annual Unappropriated Flow at Brazos River near Aquilla

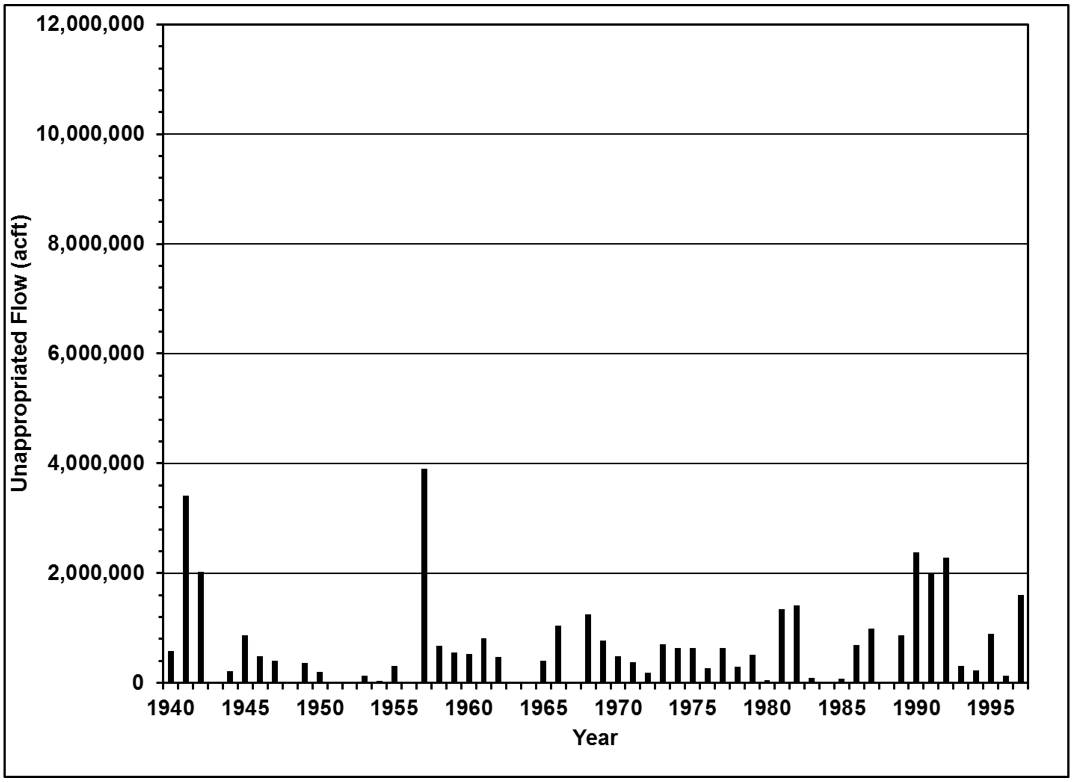


Figure 3.2-5. Estimated Annual Unappropriated Flow at Brazos River near Waco

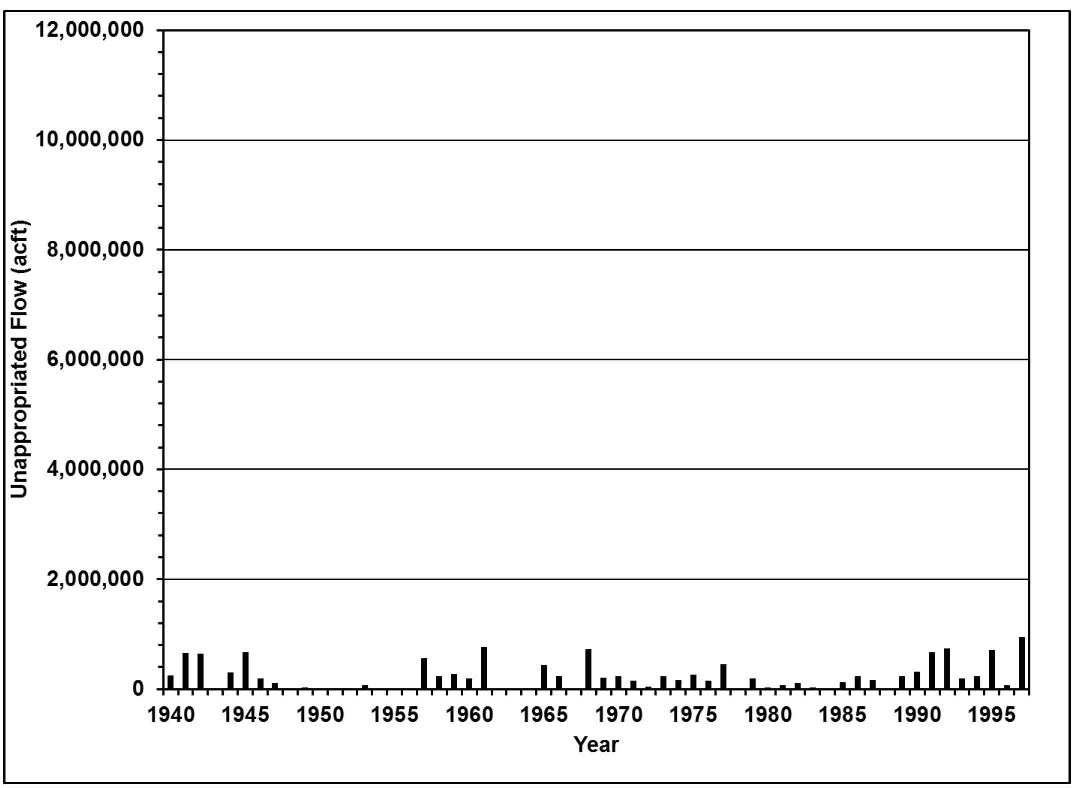


Figure 3.2-6. Estimated Annual Unappropriated Flow at Little River at Cameron

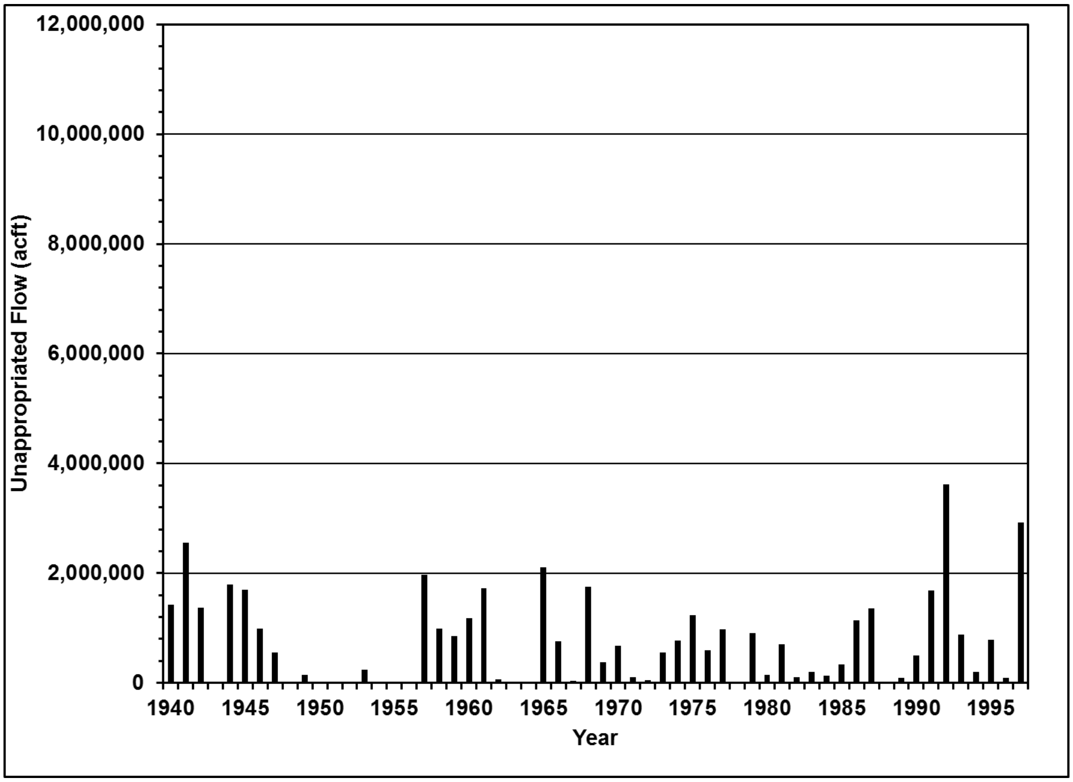


Figure 3.2-7. Estimated Annual Unappropriated Flow at Brazos River near Bryan

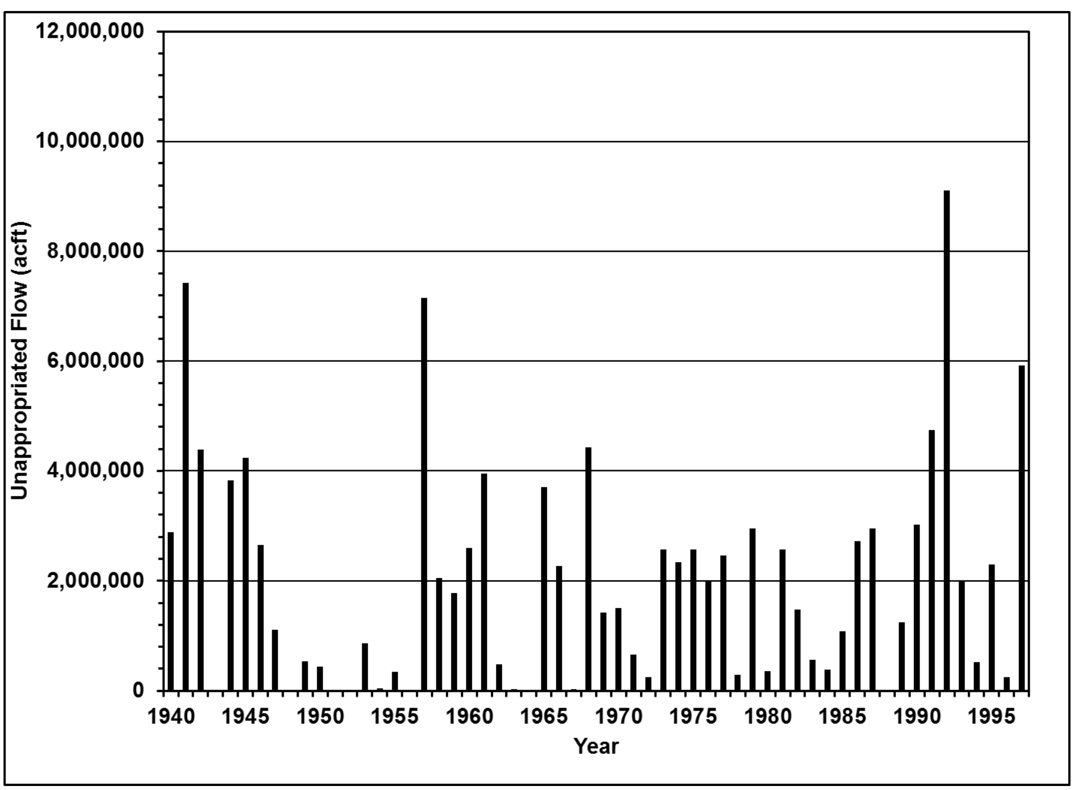


Figure 3.2-8. Estimated Annual Unappropriated Flow at Brazos River near Hempstead

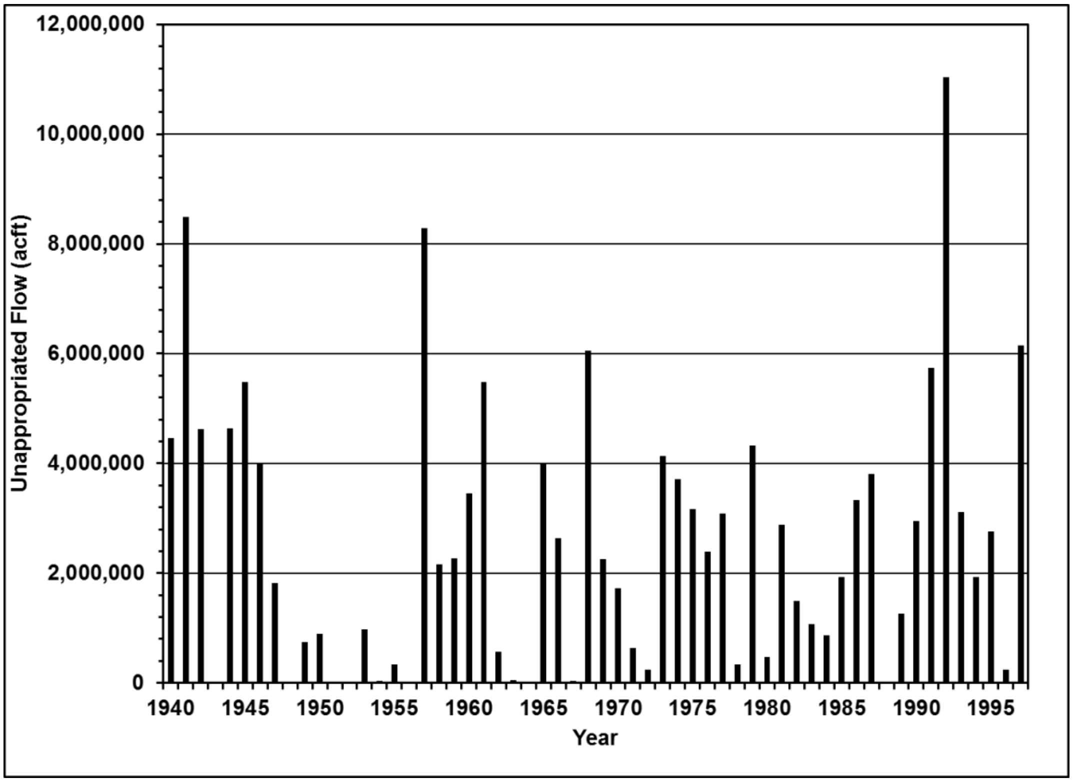
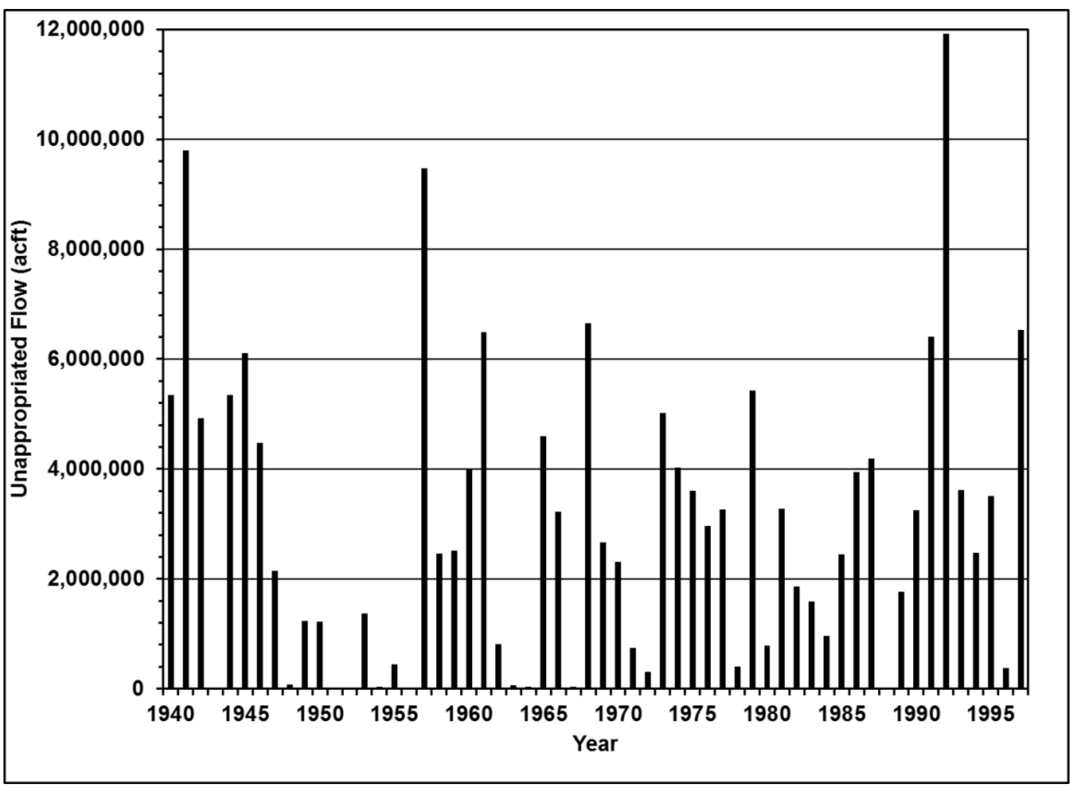


Figure 3.2-9. Estimated Annual Unappropriated Flow at Brazos River at Richmond



3.3 Water Quality Considerations Affecting Supply

The Brazos G WAM addresses the quantity of water available to existing water rights. However, water quality from some sources of water for existing water rights and contracts may limit the availability of water for certain beneficial uses. Water quality that does not meet criteria for designated uses such as public water supply, contact recreation, and aquatic life support is important to water supply considerations.

3.3.1 Point and Non-Point Source Pollution Water Quality

A number of stream segments and lakes in the Brazos G Area do not meet water quality standards due to point and/or nonpoint source pollution. The total maximum daily loads (TMDL) and individual water quality-based effluent limitations defined in 40 CFR 130.7 give TCEQ and USEPA the responsibility to identify water bodies that do not meet or are not expected to meet applicable water quality standards for designated uses.

As required under Sections 303(d) and 304(a) of the federal Clean Water Act, the 303(d) list identifies the water bodies in or bordering Texas for which effluent limitations are not stringent enough to implement water quality standards, and for which the associated pollutants are suitable for measurement by maximum daily load. Texas' 303(d) list is included as part of the Texas Integrated Report of Surface Water Quality[1].

One of three subcategories is assigned to each impaired parameter to provide information about water quality status and management activities on that water body. The categories are defined as:

- Category 5: The water body does not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants.
- Category 5a - TMDLs are underway, scheduled, or will be scheduled for one or more parameters.
- Category 5b - A review of the standards for one or more parameters will be conducted before a management strategy is selected, including the possible revision to the water quality standards.
- Category 5c - Additional data or information will be collected and/or evaluated for one or more parameters before a management strategy is selected.

The Brazos G Area stream segments and lakes identified in Texas' 303(d) list are summarized in Table 3.3-1[2].

The TCEQ has the responsibility to identify and prioritize water bodies that may require a TMDL allocation to address the cause and source of water quality impairment. TMDLs have been established on the North Bosque River (Segment 1226) and the Upper North Bosque River (Segment 1255) for nutrient concentrations (phosphorus). TMDL studies of bacteria are currently underway for the Leon River below Lake Proctor (Segment 1221). Carters Creek, Country Club Branch, and the San Gabriel River, Segments

[1] 2013, TCEQ. 2012 Texas Integrated Report of Surface Water Quality.

[2] Texas Commission on Environmental Quality, 2008 Texas 303(d) List (March 19, 2008).

1209C, 1209D, and 1214 respectively, are categorized as 5a, meaning TMDLs are underway, scheduled, or will be scheduled for one or more parameters

These water quality issues are beyond the scope of regional water planning activities. The Brazos G RWPG encourages TCEQ and USEPA to take responsibility and pursue their obligation to restore water quality to meet intended uses.

3.3.2 Comparison of Supplies with Water Quality Standards

Numerous stream segments within the Brazos G Area are listed on the State's 303(d) list for bacteria levels which exceed the standards for contact recreation; however, bacteria, unlike salts, are easily managed through required conventional water treatment to meet drinking water standards. The principal water quality issues in the Brazos River Basin are generally associated with total dissolved solids (TDS), chloride (Cl), and sulfate (SO4) concentrations on the main stem of the Brazos River. The Salt Fork of the Brazos River watershed is the primary source of natural salt in the Brazos Basin, and although it contributes only 14 to 18 percent of the total flow of the Brazos River, it contributes 45 to 55 percent of total dissolved minerals and 75 to 85 percent of dissolved salts. The dissolved salts concentrations in the lakes and streams increase due to droughts and evaporation and are diluted during rain events. Water sources with TDS, Cl, and SO4 concentrations exceeding TCEQ Drinking Water Standards of 1,000 mg/L, 300 mg/L, and 300 mg/L respectively, are generally considered as low quality and may require higher cost advanced treatment methods for use as a municipal or industrial supply.

A summary of water bodies in Brazos G that have high TDS, chloride, and/or sulfate concentrations that may affect regional surface water supplies are summarized in Table 3.3-2. The largest impacts in terms of quantity of supply are associated with Possum Kingdom Lake, Lake Granbury, and Lake Whitney. These reservoirs have a combined 2070 firm yield of 296,368 acft/yr. While not listed by TCEQ for impairments, Lake Georgetown and Lake Granger water quality exhibit increasing trends in chloride, sulfate, and/or TDS[3]. Advanced treatment is being utilized by some of the water right and contract holders that divert water directly from these reservoirs in order to meet drinking water standards. Other contract holders divert stored water released from these reservoirs at locations farther downstream, at which point the water quality is improved as it blends with downstream tributary streamflow.

During Phase 1 of the development of the 2011 Brazos G Plan, the Brazos G RWPG completed a study[4] investigating updating the drought of record for reservoirs upstream of Possum Kingdom Reservoir, and investigating the water quality implications of low reservoir levels. The study found that water quality in three reservoirs – Fort Phantom Hill Reservoir, Lake Graham and Lake Stamford – would substantially degrade as reservoir levels dropped during drought to the level corresponding to safe yield storage, due to increased concentrations of various constituents. The water quality during such times would be so degraded as to require advanced treatment measures, such as reverse osmosis, to produce potable supplies of sufficient quality.

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[3] Brazos River Authority, "Basin Highlights Report, 2009 Annual Water Quality Report."

[4] HDR, Inc., Updated Drought of Record and Water Quality Implications for Reservoirs Upstream of Possum Kingdom Reservoir, prepared for the Brazos G Regional Water Planning Group, April 2009.

Table 3.3-1. 2012 Texas 303(d) List (May 9, 2013) Brazos G Regional Planning Area

Segment Number	Segment Name	County	Category	Parameter of Concern	Year First Listed
1204A	Camp Creek	Johnson	5b	bacteria	2010
1208	Brazos River Above Possum Kingdom Lake	Young / Stonewall	5b	Bacteria	2008
1209	Navasota River Below Lake Limestone	Robertson	5b	Bacteria	2002
1209A	Country Club Lake	Brazos	5c	Toxicity in sediment	1999
1209B	Fin Feather Lake	Brazos	5c	Toxicity in sediment	2000
1209C	Carters Creek	Brazos	5a	Bacteria	1999
1209D	Country Club Branch	Brazos	5a	Bacteria	2006
1209E	Wickson Creek	Brazos	5b	Bacteria	2006
1209G	Cedar Creek	Robertson	5b	Bacteria	2002
1209H	Duck Creek	Robertson	5b	Bacteria	2006
			5c	Depressed dissolved oxygen	2012
1209I	Gibbons Creek	Grimes	5b	bacteria	2002
1209J	Shepherd Creek	Madison	5b	Bacteria	2002
1209K	Steele Creek	Limestone	5b	Bacteria	2002
1209L	Burton Creek	Brazos	5c	Bacteria	2006
1210A	Navasota River above Lake Mexia	Hill	5b	Bacteria	2002
1211A	Davidson Creek	Burleson	5b	Bacteria	2002
			5b	Depressed dissolved oxygen	2010
1212	Lake Somerville	Burleson / Washington	5c	pH	2002
1212A	Middle Yegua Creek	Lee / Williamson	5b	Bacteria	2010
1212B	East Yegua Creek	Lee / Milam	5b	Bacteria	2002
1213	Little River	Milam / Bell	5c	Bacteria	2006
1213A	Big Elm Creek	Milam	5c	Bacteria	2010
1214	San Gabriel River	Milam /	5a	Bacteria	2006

Table 3.3-1. 2012 Texas 303(d) List (May 9, 2013) Brazos G Regional Planning Area

Segment Number	Segment Name	County	Category	Parameter of Concern	Year First Listed
		Williamson	5b	Chloride	2008
			5b	Sulfate	2006
1216A	Trimmier Creek	Bell	5b	Bacteria	2010
1217B	Sulphur Creek	Lampasas	5c	Depressed dissolved oxygen	2010
1218	Nolan Creek / South Nolan Creek	Bell	5b	Bacteria	1996
1218C	Little Nolan Creek	Bell	5b	Bacteria	2010
1220A	Cowhouse Creek	Bell / Coryell	5b	Bacteria	2006
1221	Leon River below Proctor Lake	Comanche	5b	Bacteria	1996
1221A	Resley Creek	Comanche	5b	Bacteria	2004
			5b	Depressed dissolved oxygen	2006
1221B	South Leon River	Comanche	5b	Bacteria	2006
1221F	Walnut Creek	Erath	5b	Bacteria	2006
1222A	Duncan Creek	Comanche	5b	Bacteria	1999
1222B	Rush-Copperas Creek	Comanche	5b	Bacteria	2006
1222C	Sabana River	Comanche / Eastland	5c	Bacteria	2006
1222E	Sweetwater Creek	Comanche	5b	Bacteria	2006
1223	Leon River Below Leon Reservoir	Comanche / Eastland	5b	Bacteria	2006
			5c	Depressed dissolved oxygen	2008
1223A	Armstrong Creek	Erath	5b	Bacteria	2006
1226B	Green Creek	Erath	5b	Depressed dissolved oxygen	2006
1226E	Indian Creek	Erath	5b	Bacteria	2002
1226F	Sims Creek	Erath	5b	Bacteria	2002
1226H	Alarm Creek	Erath	5b	Bacteria	2010
1226K	Little Duffau Creek	Erath	5b	Bacteria	2006
1227	Nolan River	Hill / Johnson	5b	Sulfate	2002
			5b	TDS	2006
1232A	California Creek	Haskell / Jones	5b	Bacteria	2010

Table 3.3-1. 2012 Texas 303(d) List (May 9, 2013) Brazos G Regional Planning Area

Segment Number	Segment Name	County	Category	Parameter of Concern	Year First Listed
1232B	Deadman Creek	Jones	5b	Bacteria	2006
1241	Double Mountain Fork Brazos River	Stonewall / Kent	5b	Bacteria	2010
1242B	Cottonwood Branch	Brazos	5b	Bacteria	2006
1242C	Still Creek	Brazos	5b	Bacteria	2006
1242D	Thompsons Creek	Brazos	5b	Bacteria	2002
			5c	Depressed dissolved oxygen	2006
1242F	Pond Creek	Falls	5b	Bacteria	2010
1242I	Campbells Creek	Falls	5b	Bacteria	2002
1242J	Deer Creek	Falls	5b	Bacteria	2006
1242K	Mud Creek	Robertson	5b	Bacteria	2002
1242L	Pin Oak Creek	Robertson	5b	Bacteria	2002
1242M	Spring Creek	Robertson	5b	Bacteria	2002
1242O	Walnut Creek	Robertson	5b	Bacteria	2006
1242P	Big Creek	Falls	5b	Bacteria	2002
1244	Brushy Creek	Milam / Williamson	5b	Bacteria	2006
1246E	Wasp Creek	McLennan / Coryell	5b	Bacteria	2002
1247A	Willis Creek	Williamson	5b	Bacteria	2002
1248C	Mankins Branch	Williamson	5b	Bacteria	2004
1255	Upper North Bosque River	Erath	5b	Bacteria	1996
			5c	Depressed dissolved oxygen	2008
1255A	Goose Branch	Erath	5b	Bacteria	2002
1255B	North Fork Upper North Bosque River	Erath	5b	Bacteria	2002
1255C	Scarborough Creek	Erath	5b	Bacteria	2002
1255D	South Fork North Bosque River	Erath	5b	Bacteria	2010
1255E	Unnamed tributary of Goose Branch	Erath	5b	Bacteria	2002
1255F	Unnamed tributary of Scarborough Creek	Erath	5b	Bacteria	2002

Table 3.3-1. 2012 Texas 303(d) List (May 9, 2013) Brazos G Regional Planning Area

Segment Number	Segment Name	County	Category	Parameter of Concern	Year First Listed
1255G	Woodhollow Branch	Erath	5b	Bacteria	2002

Table 3.3-2. Water Bodies with Concerns for Meeting Public Water Quality Standards in the Brazos G Regional Water Planning Area

Water Body No.	Water Body Name	Public Water Supply Concern(s)				Texas Water Quality Standard		
		TDS	Chloride	Sulfate	Increased Costs for Demineralization	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)
1203	Lake Whitney	x	x	x	x	1,500	670	320
1205	Lake Granbury	x	x	x	x	2,500	1,000	600
1207	Possum Kingdom Lake	x	x	x	x	3,500	1,200	500
1235	Lake Stamford	x	x	x		2,100	580	400
1237	Lake Sweetwater			x		730	250	225
1242	Brazos River above Navasota River				x	1,000	350	200

3.3.3 Special Water Quality Studies and Activities in the Brazos River Basin

There are several special water quality studies that are on-going in the Brazos River Basin as described in the Brazos River Authority's 2014 Basin Highlights Report. A brief summary of these projects is described below.

Natural Salt Pollution Control

High concentrations of salt enter the Brazos River Basin from the semi-arid Upper Brazos Basin Region, consisting of salt and gypsum encrusted hills and canyon-like valleys. Major tributaries include the Salt and Double Mountain Forks of the Brazos River. Representatives from Stonewall, Kent, and Garza Counties have formed the Salt Fork Water Quality Corporation (SFWQC) to evaluate brine control to reduce salinity concentrations in the Brazos River. The project involves pumping brine water using shallow recovery wells in Stonewall and Kent counties, and is discussed in detail as a water management strategy in Chapter 7.3 in Volume II. In evaluating the project for the 2011 and 2016 Brazos G Plans, water quality modeling of TDS loads and concentrations in the Brazos Basin was conducted to estimate the project's potential effectiveness. The work shows that the project could potentially reduce TDS concentrations by an estimated 29 percent in Possum Kingdom Lake. Additional water quality modeling results are presented in Chapter 7.3 (Volume II). The planning stage of the project is on-going and includes an environmental site assessment; geophysical studies on Salt Croton Creek, Croton Creek, and Short Croton Creek; study of pipeline routing options; and financial analysis.

Watershed Protection Plan for Lake Granbury

In May 2002, a study of Escherichia coli for Lake Granbury commenced to address the concerns of the water quality in the canals and coves of Lake Granbury where there is little mixing of the water. In 2008, source identification projects were completed indicating various sources of bacteria contamination due to domestic, pet, livestock and wildlife waste. A Watershed Protection Plan has been completed based on the results of the sampling and source identification and will incorporate Best Management Practices to protect the water quality of the Lake.

Watershed Protection Plan for Lake Granger and San Gabriel River

The BRA and the Little River–San Gabriel Soil and Water Conservation District are developing a Watershed Protection Plan for Lake Granger and the San Gabriel River to address water quality issues of stream erosion, sedimentation and bacteria concentrations. The district has received funding to provide assistance to participants implementing best management practices on agricultural lands.

Watershed Protection Plan for Leon River

TCEQ began developing a TMDL for the river segment between Lake Procter and Hamilton in 2002 for bacteria concentrations. The BRA is working with stakeholders to develop a Watershed Protection Plan to assist TCEQ in selecting implementation strategies for the TMDL.

Little Brazos River Tributaries Bacteria Assessment

In 2002 a water quality data analysis determined that eight unclassified water bodies within the central watershed had bacteria concentrations exceeding state water quality standards for contact recreation. As a result these waterbodies were placed on the Texas §303(d) List of Impaired Waters. Three additional unclassified segments were added to the 2006 §303(d) List bringing the total number of water quality impairments (bacteria) on segment 1242 to eleven.

Five of the waterbodies impaired for bacteria are located within very close proximity of each other in Robertson County and share similar land use and water quality characteristics. They are all tributaries to the Little Brazos River (Segment 1242E). The five waterbodies in this project's study area are Campbells Creek (Segment 1242I), Mud Creek (Segment 1242K), Pin Oak Creek (Segment 1242L), Spring Creek (Segment 1242M), and Walnut Creek (Segment 1242O). The study area encompasses 327 square miles, almost entirely within Robertson County. The land use in the area is primarily agricultural with several small communities. In accordance with the Memorandum of Agreement Between the TCEQ and the TSSWCB Regarding TMDLs, Implementation

Plans, and Watershed Protection Plans, the TSSWCB has agreed to take the lead role in addressing the bacteria impairments for the five segments in the study area.[5] .

Clean Texas Marina and Clean Water Sticker Programs

Established in 2001, the Clean Texas Marina Program was established to provide technical assistance and pollution prevention programs to enhance water quality. Since 2004, the BRA has administered this program at Possum Kingdom Reservoir and Lake Granbury.

The Clean Water Sticker Program was established by the State Legislature to reduce sewage inputs into freshwater lakes. The BRA conducts inspections and certifications of pump out stations and boats with onboard sanitary facilities at Lake Granbury and Possum Kingdom Reservoir.

3.4 Groundwater Availability

Sixteen aquifers underlie parts of the Brazos G Area, including six of the major and ten of the minor aquifers in Texas[6]. The locations of the major and minor aquifers are shown in Chapter 1 of this report.

3.4.1 Method of Determination

When available, the amount of groundwater available for development is based on the TWDB's determination of Modeled Available Groundwater (MAG), which is based on Desired Future Conditions (DFC), as established by members of Groundwater Conservation Districts within a Groundwater Management Area (GMA). If a groundwater availability model (GAM) is available for an aquifer, it is to be used by the TWDB in making the MAG determination. Otherwise, the TWDB uses analytical methods.

In the Brazos G Area, an official MAG has been determined by the TWDB at the county level for each of the delineated aquifers. The groundwater management areas (GMA) are shown in Figure 3.4-1.

At a local level, municipal or county authorities in the North - Central Texas Trinity and Woodbine Aquifers and Central Texas -Trinity Aquifer in Priority Groundwater Management Areas (PGMAs) may require a groundwater availability certification for a new subdivision. If these authorities choose to require a certification, the developer of a new subdivision plat is to follow TCEQ Chapter 230 - Groundwater Availability Certification for Platting rules. It is unknown how many, if any, of these authorities in these PGMAs require subdivision certifications.

Table 3.4-1 summarizes groundwater availability by county and aquifer. A reference for the source of the estimates is included. The distribution of groundwater availability is summarized into western, central and eastern areas. As tabulated in Table 3.4-2 and shown in Figure 3.4-2, the groundwater in the Brazos G Area is not uniformly distributed, with about 15 percent occurring in the western area, about 33 percent in the central area,

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[5] Brazos River Authority, 2015. https://www.brazos.org/Little_Brazos_Trib.asp; Accessed: March 9, 2015.

[6] Texas Water Development Board, Water for Texas, 1997.

and about 52 percent in the eastern area. Assignment of MAG to individual Water User Groups and Wholesale Water Providers is explained in Chapter 4.

Figure 3.4-1. Groundwater Management Areas in Brazos G

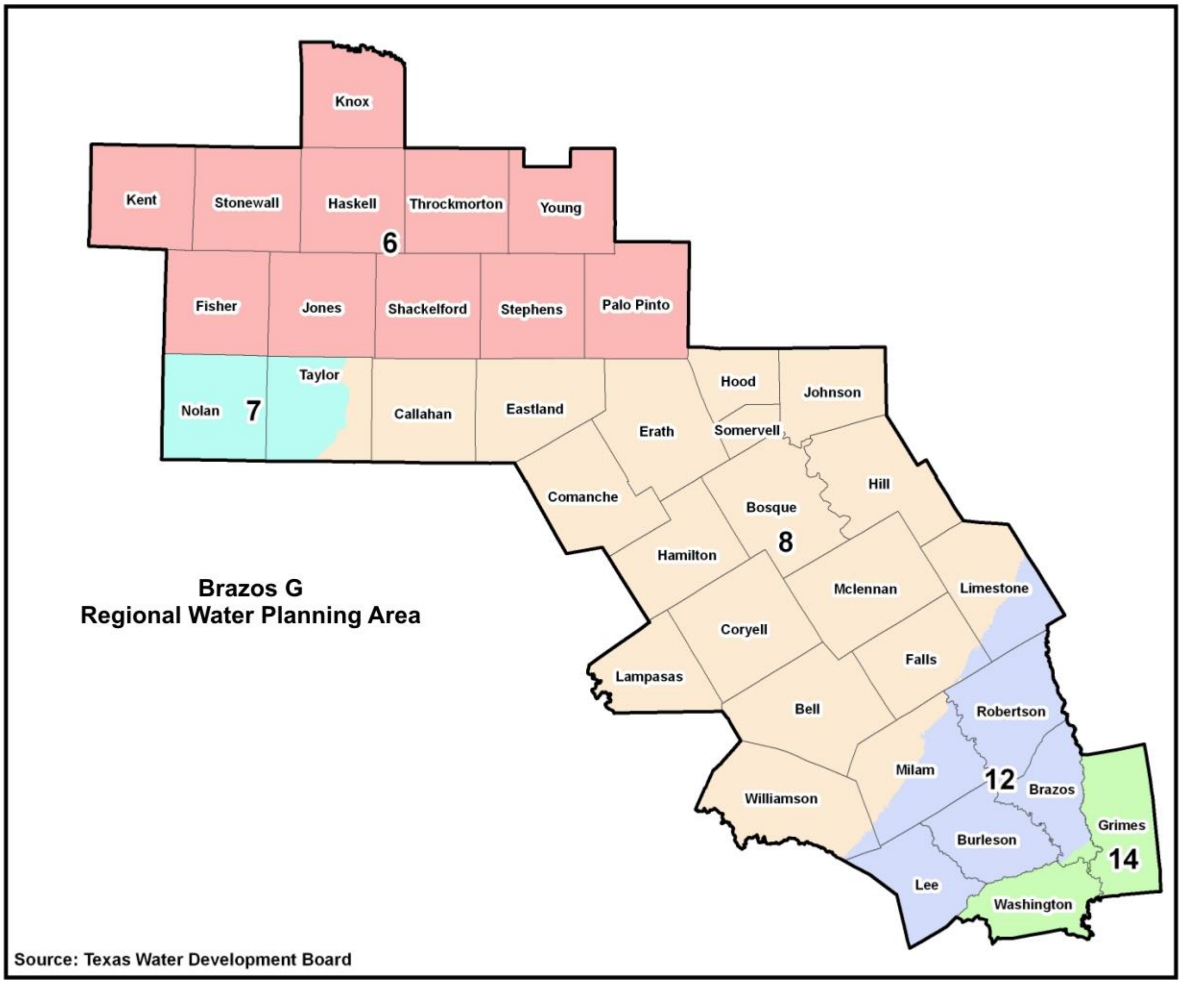


Table 3.4-1. Groundwater Availability Used in the 2016 Brazos G Regional Water Plan

County	Aquifer	Availability (acft/yr)					
		2020	2030	2040	2050	2060	2070
Bell	Edwards-BFZ (N. Segment)	6,469	6,469	6,469	6,469	6,469	6,469
	Trinity	7,068	7,068	7,068	7,068	7,068	7,068
	Subtotal	13,537	13,537	13,537	13,537	13,537	13,537
Bosque	Brazos River Alluvium	830	830	830	830	830	830
	Trinity	5,849	5,849	5,849	5,849	5,849	5,849
	Subtotal	6,679	6,679	6,679	6,679	6,679	6,679
Brazos	Brazos River Alluvium	12,500	12,500	12,500	12,500	12,500	12,500
	Carrizo-Wilcox	38,835	44,847	49,421	53,970	57,169	57,169
	Gulf Coast	1,189	1,189	1,189	1,189	1,189	1,189
	Queen City	604	634	587	533	529	529
	Sparta	5,941	7,308	7,305	7,307	7,307	7,307
	Yegua-Jackson	7,071	7,071	7,071	7,071	7,071	7,071
	Subtotal	66,140	73,549	78,073	82,570	85,765	85,765
Burleson	Brazos River Alluvium	22,056	22,056	22,056	22,056	22,056	22,056
	Carrizo-Wilcox	23,249	28,047	32,518	36,492	38,701	38,701
	Queen City	415	446	446	446	446	446
	Sparta	2,245	4,041	5,612	6,734	6,734	6,734
	Yegua-Jackson	12,923	12,923	12,923	12,923	12,923	12,923
	Subtotal	60,888	67,513	73,555	78,651	80,860	80,860
Callahan	Trinity	3,777	3,777	3,777	3,777	3,777	3,777
	Subtotal	3,777	3,777	3,777	3,777	3,777	3,777
Comanche	Trinity	32,235	32,235	32,235	32,235	32,235	32,235
	Subtotal	32,235	32,235	32,235	32,235	32,235	32,235
Coryell	Trinity	3,716	3,716	3,716	3,716	3,716	3,716
	Subtotal	3,716	3,716	3,716	3,716	3,716	3,716
Eastland	Trinity	4,720	4,720	4,720	4,720	4,720	4,720
	Subtotal	4,720	4,720	4,720	4,720	4,720	4,720
Erath	Trinity	32,926	32,926	32,926	32,926	32,926	32,926
	Subtotal	32,926	32,926	32,926	32,926	32,926	32,926
Falls	Brazos River Alluvium	16,684	16,684	16,684	16,684	16,684	16,684
	Carrizo-Wilcox	867	875	884	895	895	895
	Trinity	169	169	169	169	169	169
	Subtotal	17,720	17,728	17,737	17,748	17,748	17,748

Table 3.4-1. Groundwater Availability Used in the 2016 Brazos G Regional Water Plan

County	Aquifer	Availability (acft/yr)					
		2020	2030	2040	2050	2060	2070
Fisher	Blaine	5,062	5,062	5,062	5,062	5,062	5,062
	Dockum	2,880	2,880	2,880	2,880	2,880	2,880
	Seymour	2,935	2,931	2,920	2,915	2,733	2,733
	Subtotal	10,877	10,873	10,862	10,857	10,675	10,675
Grimes	Brazos River Alluvium	5,112	5,112	5,112	5,112	5,112	5,112
	Carrizo-Wilcox	11,791	11,791	11,791	11,791	11,791	11,791
	Gulf Coast	13,850	13,309	13,086	13,086	13,086	13,086
	Queen City	637	637	637	637	637	637
	Sparta	2,571	2,571	2,571	2,571	2,571	2,571
	Yegua-Jackson	3,278	3,278	3,278	3,278	3,278	3,278
	Navasota River Alluvium	2,216	2,216	2,216	2,216	2,216	2,216
	Subtotal	39,455	38,914	38,691	38,691	38,691	38,691
Hamilton	Trinity	2,144	2,144	2,144	2,144	2,144	2,144
	Subtotal:	2,144	2,144	2,144	2,144	2,144	2,144
Haskell	Seymour	46,180	44,575	42,358	42,524	43,617	43,617
	Subtotal	46,180	44,575	42,358	42,524	43,617	43,617
Hill	Brazos River Alluvium	632	632	632	632	632	632
	Trinity	3,147	3,147	3,147	3,147	3,147	3,147
	Woodbine	2,261	2,261	2,261	2,261	2,261	2,261
	Subtotal	6,040	6,040	6,040	6,040	6,040	6,040
Hood	Trinity	11,145	11,145	11,145	11,145	11,145	11,145
	Subtotal	11,145	11,145	11,145	11,145	11,145	11,145
Johnson	Trinity	12,871	12,871	12,871	12,871	12,871	12,871
	Woodbine	4,732	4,732	4,732	4,732	4,732	4,732
	Subtotal	17,603	17,603	17,603	17,603	17,603	17,603
Jones	Seymour	2,918	2,918	2,918	2,918	2,918	2,918
	Subtotal	2,918	2,918	2,918	2,918	2,918	2,918
Kent	Dockum	6,250	6,250	6,250	6,250	6,250	6,250
	Seymour	1,181	1,180	1,180	1,179	1,179	1,179
	Subtotal	7,431	7,430	7,430	7,429	7,429	7,429
Knox	Blaine	700	700	700	700	700	700
	Seymour	39,219	35,609	31,501	29,705	32,040	32,040
	Subtotal	39,919	36,309	32,201	30,405	32,740	32,740

Table 3.4-1. Groundwater Availability Used in the 2016 Brazos G Regional Water Plan

County	Aquifer	Availability (acft/yr)					
		2020	2030	2040	2050	2060	2070
Lampasas	Ellenburger-San Saba	2,593	2,593	2,593	2,593	2,593	2,593
	Hickory	113	113	113	113	113	113
	Marble Falls	2,837	2,837	2,837	2,837	2,837	2,837
	Trinity	3,117	3,117	3,117	3,117	3,117	3,117
	Subtotal	8,660	8,660	8,660	8,660	8,660	8,660
Lee	Carrizo-Wilcox	24,023	23,402	24,624	26,827	27,380	27,380
	Queen City	120	115	113	111	111	111
	Sparta	323	311	305	294	294	294
	Yegua-Jackson	635	635	635	635	635	635
	Subtotal	25,101	24,463	25,677	27,867	28,420	28,420
Limestone	Carrizo-Wilcox	12,294	12,424	12,604	12,906	12,906	12,906
	Trinity	69	69	69	69	69	69
	Woodbine	34	34	34	34	34	34
	Subtotal	12,397	12,527	12,707	13,009	13,009	13,009
McLennan	Brazos River Alluvium	15,023	15,023	15,023	15,023	15,023	15,023
	Trinity	20,690	20,690	20,690	20,690	20,690	20,690
	Woodbine	5	5	5	5	5	5
	Subtotal	35,718	35,718	35,718	35,718	35,718	35,718
Milam	Brazos River Alluvium	3,082	3,082	3,082	3,082	3,082	3,082
	Carrizo-Wilcox	23,923	20,206	19,112	21,359	22,319	22,319
	Queen City	53	56	56	56	56	56
	Trinity	288	288	288	288	288	288
	Subtotal	27,346	23,632	22,538	24,785	25,745	25,745
Nolan	Blaine	100	100	100	100	100	100
	Dockum	5,750	5,750	5,750	5,750	5,750	5,750
	Edwards-Trinity (Plateau)	693	693	693	693	693	693
	Subtotal	6,543	6,543	6,543	6,543	6,543	6,543
Palo Pinto	Trinity	12	12	12	12	12	12
	Subtotal	12	12	12	12	12	12
Robertson	Brazos River Alluvium	6,300	6,300	6,300	6,300	6,300	6,300
	Carrizo-Wilcox	45,435	45,814	46,238	46,582	46,583	46,583
	Queen City	-	-	-	-	-	-
	Sparta	300	400	500	616	616	616

Table 3.4-1. Groundwater Availability Used in the 2016 Brazos G Regional Water Plan

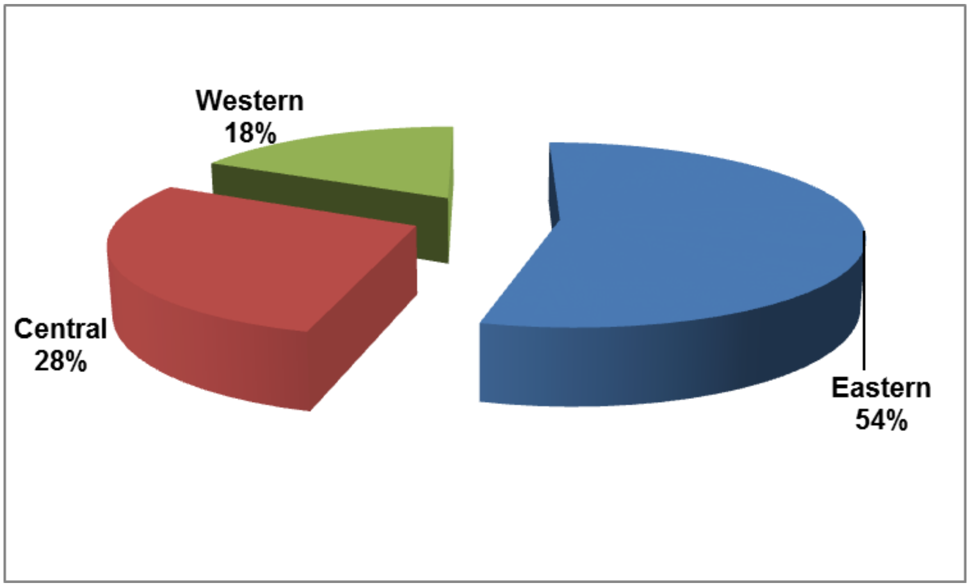
County	Aquifer	Availability (acft/yr)					
		2020	2030	2040	2050	2060	2070
	Subtotal	52,035	52,514	53,038	53,498	53,499	53,499
Shackelford	Other (Local) Aquifer	809	809	809	809	809	809
	Subtotal	809	809	809	809	809	809
Somervell	Trinity	2,485	2,485	2,485	2,485	2,485	2,485
	Subtotal	2,485	2,485	2,485	2,485	2,485	2,485
Stephens	Other (Local) Aquifer	705	705	705	705	705	705
	Subtotal	705	705	705	705	705	705
Stonewall	Blaine	8,700	8,700	8,700	8,700	8,700	8,700
	Seymour	233	230	224	215	214	214
	Subtotal	8,933	8,930	8,924	8,915	8,914	8,914
Taylor	Edwards-Trinity (Plateau)	489	489	489	489	489	489
	Trinity	431	431	431	431	431	431
	Subtotal	920	920	920	920	920	920
Throckmorton	Seymour	115	115	115	115	115	115
	Other (Local) Aquifer	364	364	364	364	364	364
	Subtotal	479	479	479	479	479	479
Washington	Brazos River Alluvium	5,770	5,770	5,770	5,770	5,770	5,770
	Gulf Coast	13,045	13,045	12,677	12,677	12,677	12,677
	Queen City	1	1	1	1	1	1
	Sparta	-	-	-	-	-	-
	Yegua-Jackson	149	149	149	149	149	149
	Subtotal	18,965	18,965	18,597	18,597	18,597	18,597
Williamson	Edwards-BFZ (N. Segment)	3,452	3,452	3,452	3,452	3,452	3,452
	Carrizo-Wilcox	7	7	7	7	7	7
	Hickory	15	15	15	15	15	15
	Trinity	1,582	1,582	1,582	1,582	1,582	1,582
	Other (Local) Aquifer	665	665	665	665	665	665
	Subtotal	5,721	5,721	5,721	5,721	5,721	5,721
Young	Other (Local) Aquifer	1,181	1,181	1,181	1,181	1,181	1,181
	Seymour	309	258	258	258	258	258
	Subtotal	1,490	1,439	1,439	1,439	1,439	1,439

Table 3.4-2. Groundwater Availability from the Brazos G Area Aquifers

Aquifer	2070 Groundwater Availability (acft/yr)	Typical Range in Well Yields (gpm)
Western Area		
Blaine	14,562	less than 25
Dockum	14,880	100 to 400
Edwards-Trinity (Plateau)	1,182	5 to 300
Other (Local) Aquifers	3,059	5 to 300
Seymour	83,074	100 to 1,000
Subtotal:	**116,757**	
Central Area		
Brazos River Alluvium	16,485	250 to 500
Edwards-BFZ (Northern Segment)	9,921	200 to 2,000
Ellenburger-San Saba	2,593	Unknown
Hickory	128	Unknown
Marble Falls	2,837	less than 100
Other (Local) Aquifers	665	5 to 300
Trinity	148,441	50 to 500
Woodbine	7,032	50 to 150
Subtotal:	**188,102**	
Eastern Area		
Brazos River Alluvium	71,504	250 to 500
Carrizo-Wilcox	217,751	100 to 3,000
Gulf Coast	26,952	300 to 800
Queen City	1,780	200 to 500
Sparta	17,522	200 to 600
Navasota River Alluvium	2,216	Unknown
Yegua-Jackson	24,056	50 to 300
Subtotal:	**361,781**	
Total:	**666,640**	

BFZ – Balcones Fault Zone.
ND indicates not determined.

Figure 3.4-2. Distribution of Groundwater by Area within Brazos G



3.4.2 Western Area

Only part of the western area is underlain by a major or minor aquifer, as shown in Figure 3.4-3. Together, the four aquifers, Blaine, Dockum, Edwards-Trinity (Plateau), and Seymour and the other (Local) aquifers, can supply up to 116,757 acft/yr. Of the four aquifers, the Seymour Aquifer has about 71 percent of the supplies and is scattered in six counties; however, about 90 percent of the supply is in Knox and Haskell Counties. The Dockum Aquifer exists only on the western fringe and can contribute about 13 percent of the groundwater supply in the area (Figure 3.4-4). Undifferentiated aquifers underlie some of the area, including all of Shackelford, Stephens, Throckmorton, and Young Counties. At best, the undifferentiated aquifers can provide only meager supplies for livestock and domestic uses.

Figure 3.4-3. Major and Minor Aquifers in the Western Area

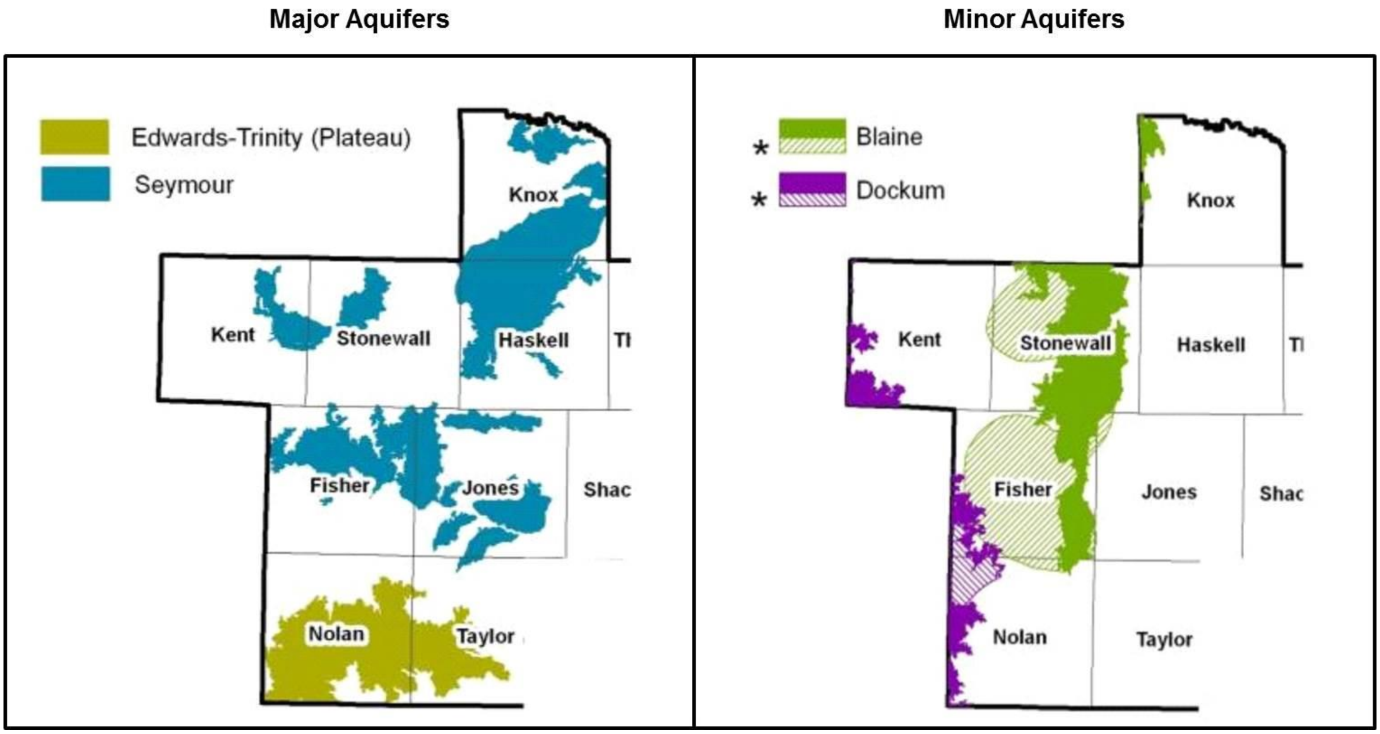
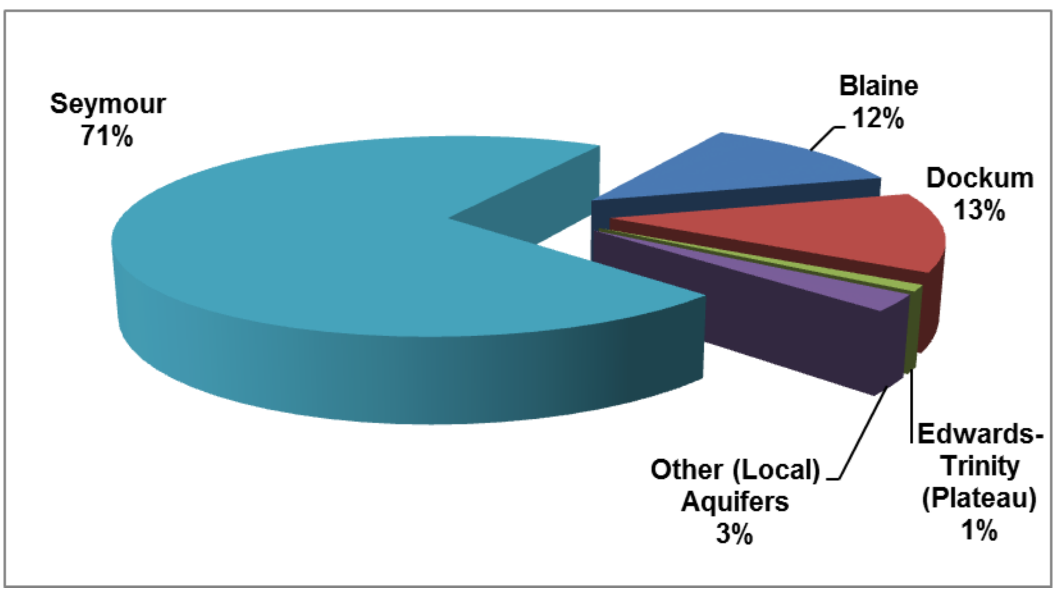


Figure 3.4-4. Groundwater Availability in the Western Area



3.4.3 Central Area

Major or minor aquifers exist in the southeastern two-thirds of the central area, as shown in Figure 3.4-5. Together, the eight aquifers (Brazos River Alluvium, Edwards-BFZ (Northern Segment), Ellenburger-San Saba, Hickory, Marble Falls, Trinity, Woodbine, and Other (Local) Aquifers) can provide up to 188,102 acft/yr. Of these aquifers, the

Trinity Aquifer is most extensive and has about 79 percent of the supplies (Figure 3.4-6). Although the Trinity Aquifer as a whole can provide 148,441 acft/yr, local areas have experienced very substantial drawdowns and probably will require many wells to be replaced with larger and deeper ones. The Edwards-BFZ (Northern Segment) exists only in parts of Bell and Williamson Counties and has about five percent of the area's groundwater supply.

Figure 3.4-5. Major and Minor Aquifers in the Central Area

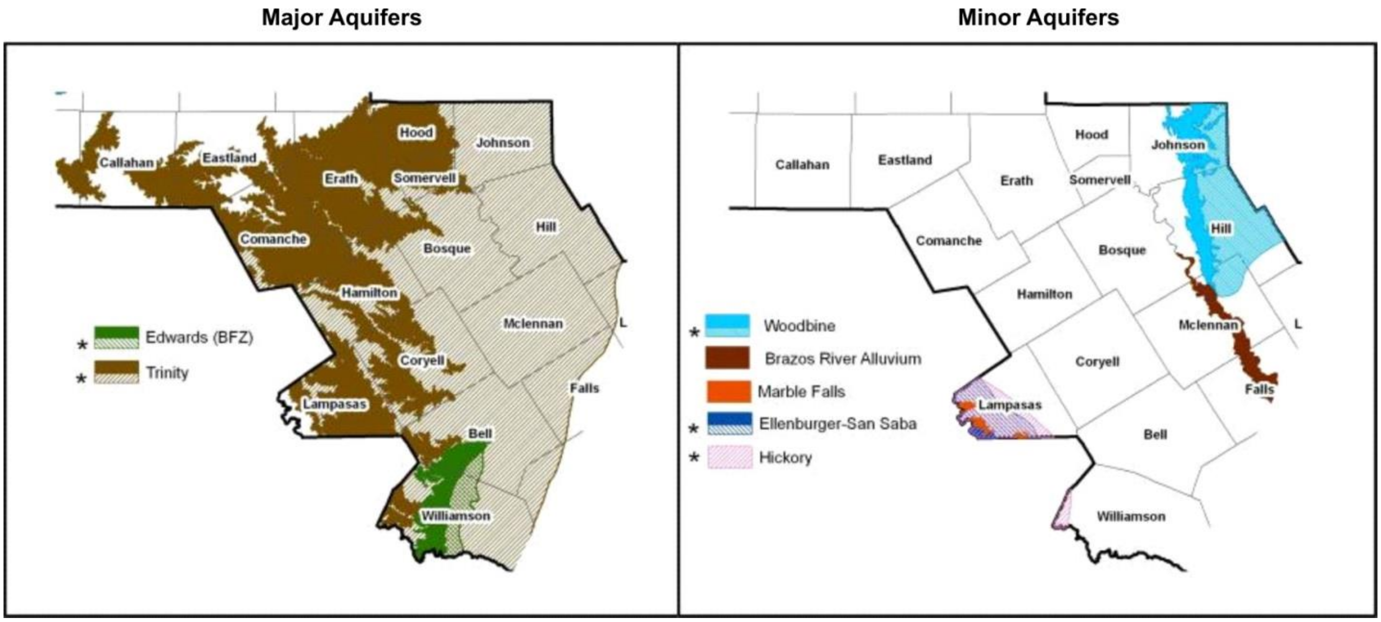
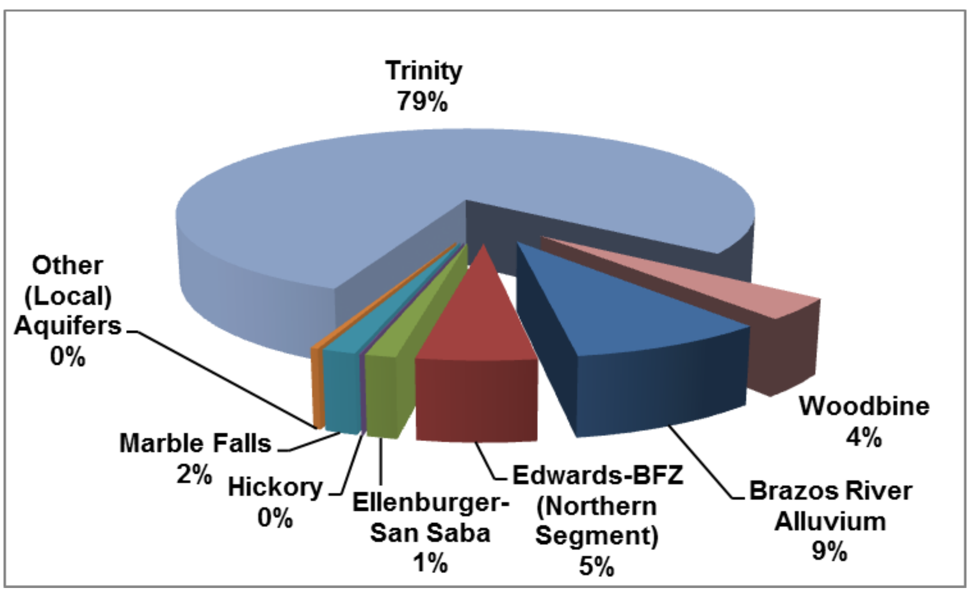


Figure 3.4-6. Groundwater Availability in the Central Area



3.4.4 Eastern Area

Major or minor aquifers exist throughout the eastern area except in the western fringe, as shown in Figure 3.4-7. Together, the seven aquifers (Brazos River Alluvium, Carrizo-Wilcox, Gulf Coast, Queen City, Sparta, Navasota River Alluvium and Yegua-Jackson) can provide up to 361,781 acft/yr. Of these aquifers, the Carrizo-Wilcox Aquifer is most extensive and has about 60 percent of the supplies (Figure 3.4-8). The Brazos River Alluvium has about 20 percent of the supplies.

Figure 3.4-7. Major and Minor Aquifers in the Eastern Area

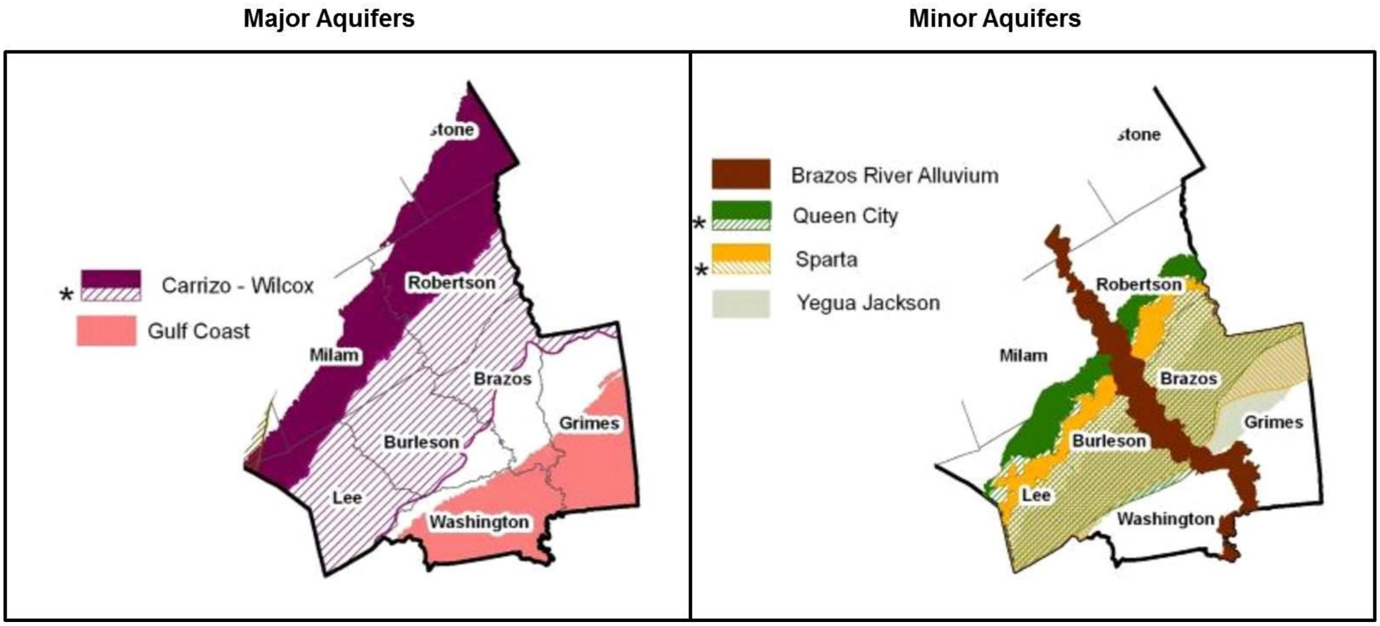
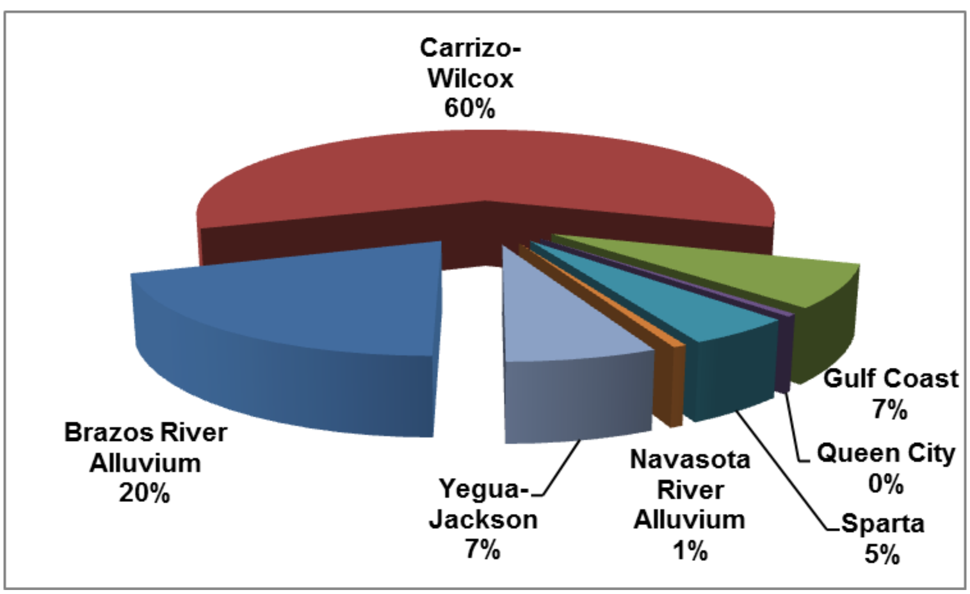


Figure 3.4-8. Groundwater Availability in the Eastern Area



3.5 Supplies from Other Regions

A limited number of entities within the Brazos G Area obtain water from sources owned by entities located outside of the region. These other sources are Benbrook Reservoir, Navarro Mills Reservoir, the Colorado River MWD System, Lake Livingston (Trinity River Authority), Lake Clyde, Lake Joe Pool (TRA), Richland Chambers and/or Cedar Creek Reservoirs (TRWD), and the Highland Lakes System (LCRA). Table 3.5-1 summarizes the current supplies from other regions to the Brazos G Area.

Table 3.5-1. Water Supplies from Other Regions

Receiving Entity	Source	Source Region	Amount Supplied (acft/yr)
Burleson	Lake Benbrook	C	Meets Contract
Mansfield	Lake Benbrook	C	Meets Contract
Hill County – Other	Navarro Mills Reservoir	C	353
Abilene	Colorado River MWD System	F	6,720[1]
Hubbard	Navarro Mills Reservoir	C	Meets Contract
Grimes County SE	Lake Livingston (TRA)	H	6,721
Cedar Park	Highland Lakes System[2]	K	18,000
Leander	Highland Lakes System	K	6,400
Lometa	Highland Lakes System	K	Meets Contract
Blockhouse MUD	Highland Lakes System	K	Included in Cedar Park
Wells Branch MUD	Highland Lakes System	K	Meets Contract
Williamson-Travis County MUD #1	Highland Lakes System	K	Included in Cedar Park
Clyde	Lake Clyde	F	500
Venus	Lake Joe Pool (TRA)	C	Meets Contract
Mountain Peak WSC	Lake Joe Pool (TRA)	C	1,120
Bethesda WSC	Richard Chambers / Cedar Creek Reservoirs	C	1,578
Grimes County SE	Lake Livingston (TRA) / Hunstville	H	6,721

1 – Current contract allows 10,900 acft/yr (16.54% of the one-year safe yield of O.H. Ivie Reservoir). Supply shown is constrained by treatment capacity.

2 – HB1437 provides for an additional 25,000 acft/yr of supply from the Highland Lakes System. These supplies are sold through a contract with the BRA with 20,928 acft/yr allocated to City of Round Rock and 600 acft/yr allocated to the City of Liberty Hill.

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4

Comparison of Water Demands with Water Supplies to Determine Needs

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4 Comparison of Water Demands with Water Supplies to Determine Needs

4.1 Introduction

In this section, the demand projections from Chapter 2 and the supply projections from Chapter 3 are brought together to estimate projected water needs in the Brazos G Area through year 2070.

As a recap, Chapter 2 presents demand projections for six types of use: municipal, manufacturing, steam-electric, mining, irrigation, and livestock. The projections are for dry-year demands. Chapter 3 presents estimates of surface water and groundwater availability under drought of record conditions.

4.1.1 Methods to Estimate Available Water Supplies in the Region

Surface Water Supplies

Surface water in the region available to meet projected demands consists of firm yield of reservoirs, dependable supply of run-of-river water rights through drought of record conditions, and local on-farm sources. Contracts and/or rights to reservoir yields and supplies to run-of-river rights were allocated as supplies to their stated type of use: municipal, industrial (manufacturing, steam-electric, and mining), and irrigation. Additionally, municipal supply was further allocated among cities and other municipal water supply entities. This was done by obtaining water seller information (i.e., which contract/right holders – a wholesaler – are reselling water to other water supply entities) and water purchase contract limits between buyers and sellers. This information was obtained from TWDB files and follow-up queries to water supply entities. All water supply contracts were assumed to be renewed at their existing levels unless otherwise directed by local entities.

Water associated with a wholesaler that is not resold remains as an available supply to the wholesaler in the supply tables. In the case where a wholesaler’s supply is deficient to meet its own demands and contractual commitments, it was assumed that contracts would not be met as well. In these cases, the supply available to each customer’s contract was prorated down according to the contract amount.

It was assumed that all livestock demands would be met from local water sources (e.g., shallow groundwater and stock ponds).

In certain instances the entity’s available water supply is constrained by lack of infrastructure. For example, an entity may hold a contract to divert water from a reservoir; however, the required pipeline has not been built. In this instance, the contract amount would not be included in the entity’s available water supply or would be identified as a constrained supply.

In some instances, specific operational, contractual, or legal constraints required modifications to the general surface water allocation procedure. For example, provisions in the current contract between the City of Abilene and the West Central Texas Municipal

Water District for supplies to the City from Hubbard Creek Reservoir preclude the City from receiving its normal pro-rata share of the reservoir's allocated safe yield during times when the reservoir is significantly drawn down. However, the other member cities of the district (Anson, Albany, and Breckenridge) do not have similar provisions in their contracts with the district.

Groundwater Allocation

Total groundwater availability in the region was determined based on the specific methods identified for each aquifer as discussed in Section 3.4. Total groundwater availability is shown for each county, by aquifer, in Table 3.4-1. For each county, total available groundwater was allocated among the six user groups—municipal, manufacturing, steam-electric, mining, irrigation, and livestock—in the following manner:

Municipal Allocation

Municipal supplies were allocated to users from each aquifer as follows:

a. Municipal supply is based upon well capacities. For cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the total Modeled Available Groundwater (MAG), the supply is prorated downward for every entity using that particular source.

b. For rural areas, it is assumed that the rural household (municipal type) demand would be met from aquifers underlying that river basin portion of the county. The rural supply is generally calculated as 125 percent of the year 2010 use from each particular aquifer. For cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the MAG, supply is prorated downward for every entity using that particular source.

Industrial (Steam-Electric and Manufacturing) Allocation

Industrial supply from groundwater sources is associated with aquifers underlying the river basin portion of the county. The industrial supply is generally calculated as 130 percent of the year 2010 use from each particular aquifer. For cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the MAG, supply is prorated downwards for every entity using that particular source.

Irrigation Allocation

Irrigation supply from groundwater sources is associated with aquifers underlying the river basin portion of the county. The irrigation supply is calculated as being equal to the projected demand in each decade. For cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the MAG, supply is prorated downward for every entity using that particular source.

Mining Allocation

Mining supply from groundwater sources is associated with aquifers underlying the river basin portion of the county. The mining supply is calculated as being equal to the projected demand in each decade. For cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the MAG, supply is prorated downward for every entity using that particular source.

In some specific instances, these general procedures were modified to more accurately reflect the interactions between water demands, supplies, and needs.

Constraints on Surface Water Supplies

In determining needs (shortages), an emphasis has been placed not only on a WUG's total raw water supply availability, but also on their infrastructure available to deliver and treat this supply.

Based on TCEQ records, the Normal Rated Design (NRD) of each surface water treatment plant of public water suppliers located in the Brazos G Area was used to determine the existing peaking capacities to treat and deliver surface water supplies. The average annual capacity (AAC) for the WTP was calculated as 50% of the NRD to account for peaking. For each WUG for which these data were available in the TCEQ database, the AAC was utilized to constrain the supply available from surface water sources, and was incorporated into the needs analysis for each WUG by utilizing a term referred to as "constrained supply." Constrained supply is defined as the amount of water available to a WUG considering the limiting effects of existing infrastructure. This methodology allows for water management strategies to be identified and developed that specifically address these constraints caused by limited infrastructure capacity. These strategies could include pipelines to existing reservoirs, treatment plant expansions, or other infrastructure required to deliver and treat water for the end user of the WUG. Generally, the only infrastructure constraint data that will be taken into account for the 2016 Plan is treatment capacity, as data on other types of infrastructure constraints are not readily available. Other constraints may have been added where the planning group was made aware of particular infrastructure capacity or lack of infrastructure. These infrastructure constraints were applied to the supply available for the WUG and to any contractual demands using that supply.

Twenty-two counties in the Brazos G Area have WUGs with potentially limiting surface water treatment capacity constraints. Of these, 11 counties contain WUGs that have their available supply constrained by treatment capacity, resulting in supply shortages in year 2060 in at least four counties. Constraints on surface water supplies are shown in the wholesale water provider tables in Chapter 4.3 and in the WUG supply-demand analyses presented in Appendix C.

Constraints on Groundwater Supplies

Similar to surface water availability, the groundwater supplies assume that the wells will be able to continue producing the supply into the foreseeable future. However, some of the MAGs adopted for use would allow substantial drawdown of aquifer levels, which would require that well pumps be lowered or, in some cases, that deeper replacement wells be drilled in order to continue to utilize the assumed supply available from the aquifer. This has been identified as a particularly crucial issue in the Trinity Aquifer, where the Modeled Available Groundwater adopted by the groundwater conservation districts allows for more than 400 feet of additional aquifer drawdown below current aquifer levels, and numerous WUGs depend largely on Trinity Aquifer supplies.

For groundwater supplies in the Trinity Aquifer, an additional analysis was performed using the Trinity Aquifer Groundwater Availability Model (Trinity GAM) to determine how future aquifer levels might constrain groundwater supplies to entities relying on Trinity Aquifer water. Pumping in the Trinity Aquifer GAM was modified to reflect expected future pumping as determined by water demands for municipal WUGs relying on the Trinity Aquifer. The resulting water levels were then compared to well data (location, depth, casing size) to determine if the expected future water levels would impact each WUG's wells. The wells potentially impacted by the future groundwater levels were identified, and the groundwater supply to the WUG was reduced correspondingly to reflect that the well would be no longer being useable in its present configuration. This groundwater supply is referred to as "constrained groundwater supply." Constraints on supplies from the Trinity Aquifer, assuming a MAG level of pumping, result in supply shortages in year 2070 to WUGs in five counties (Bosque, Hood, Johnson, Kent and McLennan). Constraints on groundwater supplies are shown in the tables in Appendix C.

4.2 Water Needs Projections for Water User Groups

If projected demands exceed projected supplies for a water user group, the difference or shortage, is identified as a "water need." This section contains a summary of the water needs (shortages) for each Water User Group (WUG) located in the Brazos G Area. Tables in Appendix C provide a detailed analysis of water needs for each water user group by county as well as a summary for the region as a whole. The following sections summarize the data presented in Appendix C.

4.2.1 Projected Municipal Shortages

Water shortages are projected for 85 municipal WUGs, which are listed in Table 4.2-1, along with the projected year 2040 and 2070 shortages, and the approximate decade that shortages are expected to begin. Multi-county WUGs are indicated with (P) in Table 4.2-1. Thirty of the 37 counties in the Brazos G Area are projected to have at least one municipal WUG shortage. The County-Other category includes water supply corporations, water districts, privately owned utilities, and small towns that generally supplied less than 280 acft of water in the year 2010 or served populations less than 500 persons. The County-Other category is projected to be water short in 10 counties: Bell, Comanche, Coryell, Erath, Hill, Hood, Knox, Nolan, Robertson and Williamson

Table 4.2-1. Municipal WUGs with Projected Water Shortages

WUG	County	Projected Shortages (acft/yr)		Decade of Need
		Year 2040	Year 2070	
439 WSC	BELL	242	(94)	2060
BARTLETT (P)	BELL	(166)	(241)	2020
BELTON	BELL	2,413	(41)	2070
CHISHOLM TRAIL SUD (P)	BELL	(467)	(746)	2020
ELM CREEK WSC (P)	BELL	15	(136)	2050
HARKER HEIGHTS	BELL	(939)	(3,171)	2040

Table 4.2-1. Municipal WUGs with Projected Water Shortages

WUG	County	Projected Shortages (acft/yr)		Decade of Need
		Year 2040	Year 2070	
KEMPNER WSC (P)	BELL	151	(29)	2070
LITTLE RIVER-ACADEMY	BELL	(59)	(190)	2030
NOLANVILLE	BELL	(858)	(2,188)	2020
SALADO WSC	BELL	219	(278)	2060
TEMPLE	BELL	(3,892)	(12,856)	2030
BELL COUNTY-OTHER	BELL	(718)	(3,738)	2040
CHILDRESS CREEK WSC	BOSQUE	3	(15)	2050
CROSS COUNTRY WSC (P)	BOSQUE	26	(141)	2050
VALLEY MILLS (P)	BOSQUE	10	(1)	2070
BRYAN	BRAZOS	(5,533)	(26,578)	2020
COLLEGE STATION	BRAZOS	(7,372)	(8,401)	2020
WELLBORN SUD (P)	BRAZOS	(625)	(2,588)	2030
COLEMAN COUNTY SUD	CALLAHAN	(10)	(11)	2020
POTOSI WSC (P)	CALLAHAN	(8)	(8)	2020
COMANCHE COUNTY-OTHER	COMANCHE	(135)	(183)	2020
CORYELL COUNTY-OTHER	CORYELL	234	(515)	2050
ELM CREEK WSC (P)	CORYELL	1	(18)	2050
GATESVILLE	CORYELL	(1,406)	(3,995)	2030
KEMPNER WSC (P)	CORYELL	211	(45)	2070
MULTI-COUNTY WSC (P)	CORYELL	(126)	(224)	2020
ERATH COUNTY-OTHER	ERATH	291	(315)	2060
TRI-COUNTY SUD (P)	FALLS	(55)	(61)	2020
WEST BRAZOS WSC (P)	FALLS	(110)	(118)	2020
ROTAN	FISHER	(60)	(84)	2020
MULTI-COUNTY WSC (P)	HAMILTON	(25)	(24)	2020
HASKELL	HASKELL	(193)	(442)	2020
HUBBARD	HILL	(32)	(69)	2030
ACTON MUD (P)	HOOD	1,675	(136)	2070
HOOD COUNTY-OTHER	HOOD	(77)	193	2020
CRESSON (P)	HOOD	(13)	(32)	2030
TOLAR	HOOD	12	(19)	2050
ACTON MUD (P)	JOHNSON	55	(24)	2070
BETHESDA WSC	JOHNSON	(1,692)	(3,137)	2020

Table 4.2-1. Municipal WUGs with Projected Water Shortages

WUG	County	Projected Shortages (acft/yr)		Decade of Need
		Year 2040	Year 2070	
BURLESON	JOHNSON	(3,425)	(5,982)	2020
CLEBURNE	JOHNSON	1,177	(2,373)	2060
CRESSON (P)	JOHNSON	(7)	(21)	2030
CROWLEY	JOHNSON	(17)	(35)	2020
FORT WORTH	JOHNSON	0	(1,573)	2050
GODLEY	JOHNSON	22	(25)	2060
JOHNSON COUNTY SUD	JOHNSON	2,194	2,601	2060
MANSFIELD	JOHNSON	(293)	(1,024)	2020
PARKER WSC (P)	JOHNSON	96	(182)	2060
RIO VISTA	JOHNSON	42	(71)	2060
VENUS	JOHNSON	(226)	(573)	2020
ABILENE (P)	JONES	(197)	(287)	2030
JAYTON	KENT	(89)	(88)	2020
KNOX CITY	KNOX	(118)	(226)	2020
MUNDAY	KNOX	(125)	(237)	2020
KEMPNER	LAMPASAS	(6)	(5)	2020
KEMPNER WSC (P)	LAMPASAS	(1,352)	(1,709)	2020
LAMPASAS	LAMPASAS	(227)	(505)	2020
COOLIDGE	LIMESTONE	(38	(140)	2040
GROESBECK	LIMESTONE	(668)	(672)	2020
MART (P)	LIMESTONE	(1)	(2)	2030
TRI-COUNTY SUD (P)	LIMESTONE	(20)	(23)	2020
CRAWFORD	MCLENNAN	(3)	(7)	2020
ELM CREEK WSC (P)	MCLENNAN	6	(76)	2050
HEWITT	MCLENNAN	(211)	(231)	2020
MART (P)	MCLENNAN	(181)	(243)	2020
NORTH BOSQUE WSC	MCLENNAN	(265)	(628)	2020
RIESEL	MCLENNAN	(11)	(19)	2020
ROBINSON	MCLENNAN	(720)	(1,909)	2030
TRI-COUNTY SUD (P)	MCLENNAN	(2)	(10)	2040
VALLEY MILLS (P)	MCLENNAN	4	(1)	2070
WACO	MCLENNAN	7,377	(1,348)	2070
WEST BRAZOS WSC (P)	MCLENNAN	(63)	(98)	2020

Table 4.2-1. Municipal WUGs with Projected Water Shortages

WUG	County	Projected Shortages (acft/yr)		Decade of Need
		Year 2040	Year 2070	
WOODWAY	MCLENNAN	(20)	(103)	2030
NOLAN COUNTY-OTHER	NOLAN	(108)	(125)	2020
SWEETWATER	NOLAN	(1,410)	(1,576)	2020
POSSUM KINGDOM WSC (P)	PALO PINTO	(137)	(215)	2020
ROBERTSON COUNTY-OTHER	ROBERTSON	168	(39)	2070
TRI-COUNTY SUD (P)	ROBERTSON	(16)	(42)	2020
GLEN ROSE	SOMERVELL	47	(39)	2060
POSSUM KINGDOM WSC (P)	STEPHENS	(6)	(7)	2020
FORT BELKNAPP WSC (P)	STEPHENS	(1)	(1)	2020
ABILENE (P)	TAYLOR	(8,918)	(11,027)	2030
COLEMAN COUNTY SUD	TAYLOR	(6)	(7)	2020
MERKEL	TAYLOR	6	(9)	2060
POTOSI WSC (P)	TAYLOR	(492)	(534)	2020
STEAMBOAT MOUNTAIN WSC	TAYLOR	(189)	(210)	2020
TYE	TAYLOR	(6)	(15)	2020
FORT BELKNAPP WSC (P)	THROCKMORTON	(2)	(2)	2020
BRENHAM	WASHINGTON	(400)	(928)	2030
BARTLETT (P)	WILLIAMSON	(178)	(231)	2020
BRUSHY CREEK MUD	WILLIAMSON	(920)	(1,848)	2020
CEDAR PARK	WILLIAMSON	(3,475)	(3,748)	2020
CHISHOLM TRAIL SUD (P)	WILLIAMSON	(4,599)	(9,624)	2020
WILLIAMSON COUNTY-OTHER	WILLIAMSON	(13,402)	(22,243)	2020
FERN BLUFF MUD	WILLIAMSON	(253)	(259)	2020
FLORENCE	WILLIAMSON	(65)	(92)	2020
GEORGETOWN	WILLIAMSON	(6,695)	(24,121)	2030
GRANGER	WILLIAMSON	(133)	(190)	2020
HUTTO	WILLIAMSON	(5,558)	(11,994)	2020
JONAH WATER SUD	WILLIAMSON	(819)	(2,977)	2030
LEANDER	WILLIAMSON	(8,273)	(28,901)	2030
ROUND ROCK	WILLIAMSON	(15,627)	(45,263)	2020
WILLIAMSON COUNTY MUD #10	WILLIAMSON	(352)	(688)	2020
WILLIAMSON COUNTY MUD #11	WILLIAMSON	(193)	(326)	2020

Table 4.2-1. Municipal WUGs with Projected Water Shortages

WUG	County	Projected Shortages (acft/yr)		Decade of Need
		Year 2040	Year 2070	
WILLIAMSON COUNTY MUD #9	WILLIAMSON	(263)	(448)	2020
FORT BELKNAPP WSC (P)	YOUNG	(39)	(79)	2020

(P) Indicates WUG is in multiple counties.

4.2.2 Projected Manufacturing Shortages

Eleven of the 37 counties in the Brazos G Area are projected to have manufacturing shortages. Table 4.2-2 lists the counties projected to have shortages in the Manufacturing Use category, projected year 2040 and 2070 shortages, and the approximate decade shortages are projected to begin.

Table 4.2-2. Counties with Projected Water Shortages for Manufacturing Use

County	Projected Shortages (acft/yr)		Decade of Need
	Year 2040	Year 2070	
BELL	(1,110)	(1,497)	2020
BOSQUE	(2,501)	(3,431)	2020
BRAZOS	(1,219)	(2,116)	2020
BURLESON	(44)	(102)	2030
FALLS	(1)	(1)	2020
FISHER	(79)	(159)	2020
LIMESTONE	(1)	0	2040
MCLENNAN	(2,204)	(2,834)	2020
NOLAN	(1,260)	(1,770)	2020
WASHINGTON	(192)	(399)	2020
WILLIAMSON	(11)	(11)	2020

4.2.3 Projected Steam-Electric Shortages

Table 4.2-3 lists the ten counties projected to have shortages in the Steam-Electric Use category, projected year 2040 and 2070 shortages, and the approximate decade shortages are projected begin.

Table 4.2-3. Counties with Projected Water Shortages for Steam-Electric Use

County	Projected Shortages (acft/yr)		Decade of Need
	Year 2040	Year 2070	
BELL	(5,804)	(9,693)	2020
BOSQUE	(2,262)	(8,345)	2030
BRAZOS	(197)	(121)	2020
GRIMES	(14,395)	(22,900)	2020
JOHNSON	(5,656)	(5,656)	2020
LIMESTONE	(9,017)	(30,893)	2030
MILAM	(76)	(6,757)	2030
NOLAN	(23,916)	(23,916)	2020
ROBERTSON	(2,012)	(18,478)	2020
SOMERVELL	(35,521)	(35,559)	2020

4.2.4 Projected Mining Shortages

Shortages are projected for mining use in most of the counties. Table 4.2-4 lists the thirty-three counties projected to have shortages in the Mining Use category, projected year 2040 and 2070 shortages, and the approximate decade shortages are projected to begin. Mining water use in Williamson County is primarily associated with dewatering for quarry operations.

Table 4.2-4. Counties with Projected Water Shortages for Mining Use

County	Projected Shortages (acft/yr)		Decade of Need
	Year 2040	Year 2070	
BELL	(4,599)	(6,968)	2020
BOSQUE	(1,763)	(1,692)	2020
BRAZOS	(1,433)	(814)	2020
BURLESON	(1,512)	(428)	2020
CALLAHAN	(214)	(180)	2020
COMANCHE	(337)	(102)	2020
CORYELL	(491)	(437)	2020
EASTLAND	(929)	(432)	2020
ERATH[1]	135	334	
FALLS	(259)	(331)	2020
FISHER	(359)	(238)	2020

Table 4.2-4. Counties with Projected Water Shortages for Mining Use

County	Projected Shortages (acft/yr)		Decade of Need
	Year 2040	Year 2070	
GRIMES	(438)	(95)	2020
HAMILTON	(89)	13	2020
HASKELL	(83)	(59)	2020
HOOD	(998)	(833)	2020
JOHNSON[2]	1,347	1,526	
JONES	(218)	(169)	2020
KNOX	(14)	(14)	2020
LAMPASAS	(216)	(288)	2020
LEE	(7,767)	(9,631)	2020
LIMESTONE	(9,056)	(10,616)	2020
MCLENNAN	(2,786)	(3,942)	2020
NOLAN	(200)	(141)	2020
ROBERTSON	(3,563)	(12,735)	2030
SHACKELFORD	(551)	(236)	2020
SOMERVELL	(441)	(266)	2020
STEPHENS	(3,458)	(1,773)	2020
STONEWALL	(337)	(163)	2020
TAYLOR	(366)	(315)	2020
THROCKMORTON	(171)	(116)	2020
WASHINGTON	(703)	(264)	2020
WILLIAMSON	(6,949)	(10,771)	2020
YOUNG	(196)	(73)	2020

1 - Projected shortage in 2030. Surplus in all other decades
2 - Projected shortage in 2020. Surplus in all other decades

4.2.5 Projected Irrigation Shortages

Table 4.2-5 lists the seventeen counties projected to have shortages in the Irrigation Use category, projected year 2040 and 2070 shortages, and the approximate decade shortages are projected to begin.

Table 4.2-5. Counties with Projected Water Shortages for Irrigation Use

County	Projected Shortages (acft/yr)		Decade of Need
	Year 2040	Year 2070	
BELL	(1,103)	(1,038)	2020
BOSQUE	(468)	(377)	2020
BRAZOS	(8,473)	(5,321)	2020
COMANCHE	(1,823)	(968)	2020
EASTLAND	(6,541)	(6,555)	2020
HAMILTON	(61)	(6)	2020
HASKELL	(3,197)	1,880	2020
KNOX	(8,505)	(5,105)	2020
LAMPASAS	(211)	(200)	2020
MCLENNAN	(2,325)	(2,363)	2020
NOLAN	(2,094)	(1,567)	2020
PALO PINTO	(2,513)	(2,394)	2020
ROBERTSON	(49,210)	(44,445)	2020
STEPHENS	(27)	(24)	2020
TAYLOR	(981)	(873)	2020
WILLIAMSON	(71)	(72)	2020
YOUNG	(48)	(44)	2020

4.2.6 Projected Livestock Shortages

There are no livestock shortages projected. As explained in Section 3, livestock demands were assumed to be met from stock tanks and locally-occurring groundwater.

4.3 Water Needs for Wholesale Water Providers

The TWDB's definition of a Wholesale Water Provider (WWP) is:

"A WWP is any person or entity, including river authorities and irrigation districts, that has contracts to sell more than 1,000 acft of water wholesale in any one year during the five years immediately preceding the adoption of the last Regional Water Plan. The Planning Groups shall include as wholesale water providers other persons and entities that enter or that the Planning Group expects or recommends to enter contracts to sell more than 1,000 acft of wholesale water during the period covered by the plan."

Under this definition, the list of WWPs for the Brazos G Area is as follows:

- Brazos River Authority,
- Aquilla Water Supply District,

- Bell County WCID No. 1,
- Bistone MWSD,
- Bluebonnet WSC,
- Central Texas WSC,
- Eastland County Water Supply District,
- Heart of Texas Water Suppliers LLC
- North Central Texas Municipal Water Authority,
- Palo Pinto County Municipal Water District No. 1,
- West Central Texas Municipal Water District,
- Upper Leon Municipal Water District,
- City of Abilene,
- City of Anson,
- City of Bryan
- City of Cedar Park,
- City of Cleburne,
- City of Gatesville
- Johnson County SUD
- Kempner WSC
- City of Mineral Wells
- City of Round Rock,
- City of Stamford,
- City of Sweetwater,
- City of Temple, and
- City of Waco

In addition, to these WWPs, there are other WWPs that provide water to Brazos G WUGs and WWPs from outside the Brazos G Area. These include the Lower Colorado River Authority (Region K), Colorado Municipal Water District (Region F), the Trinity River Authority (Region C), and the Cities of Fort Worth, Arlington, and Mansfield (Region C). Water supply plans will be developed for these entities by the regional water planning groups in the planning regions in which they are primarily located. Summaries for each WWP in the Brazos G Area, including a brief description, contracts for water sales, and supplies are provided in Tables 4.3-1 through 4.3-24. Projected demands are total contracts or projected demands of customer entities, whichever is greater, plus demands to be met from water management strategies recommended for that WWP.

4.3.1 Brazos River Authority

The largest provider of water in the Brazos G Area is the Brazos River Authority (BRA). The BRA also operates water and wastewater treatment systems, has programs to assess and protect water quality, does water supply planning and supports water conservation efforts in the Brazos River Basin. BRA provides water from three wholly owned and operated reservoirs: Lake Granbury, Possum Kingdom Lake, and Lake Limestone. BRA also contracts for conservation storage space and holds water rights in eight U.S. Army Corps of Engineers reservoirs in the region: Lakes Proctor, Belton, Stillhouse Hollow, Georgetown, Granger, Somerville, Whitney, and Aquilla. The BRA also contracts for storage space in Lake Waco on behalf of the City of Waco, which owns the water rights in Lake Waco. The total permitted capacity of the 11 reservoirs in the BRA system (Lake Waco excluded) is 2.22 million acft. BRA holds diversion rights in these reservoirs totaling more than 660,000 acft. In addition to these existing reservoirs, the BRA also holds water rights (shared with the City of Houston) to the proposed Allens Creek Reservoir in Region H. The water rights in Allens Creek Reservoir authorize an impoundment of 145,533 acft and diversions of 99,650 acft/yr.

BRA contracts to supply water to municipal, industrial and agricultural water customers in the BGRWPA and other regions. Although some BRA contracts may have an expiration date prior to 2070, all of these contracts are long term and considered perpetual through 2070 for regional water planning purposes. However, in reality, the BRA will consider contract renewals on a case by case basis as contracts expire. BRA's largest municipal customers include Bell County Water Control and Improvement District No. 1, the City of Round Rock, and the Central Texas Water Supply Corporation. For planning purposes, the overall BRA system has been divided into three separate systems: the Lake Aquilla system consisting of Lake Aquilla and its associated contracts; the Little River System consisting of Lake Proctor, Lake Belton, Stillhouse Hollow Reservoir, Lake Georgetown, and Lake Granger; and the Main Stem/Lower Basin System consisting of Possum Kingdom Reservoir, Lake Granbury, Lake Whitney, Lake Somerville, and Lake Limestone. The demands shown in Table 4.3-1 include all projected demands for water from the BRA in Brazos G, and Regions C, H, O and K, but they do not include water from the Lower Colorado River Authority to be supplied to entities in Williamson County or the yield impact of the subordination agreements that the BRA has with certain water purveyors in the basin.

Table 4.3-1. Projected Demands, Supplies and Balance for BRA

Projected Demands by System for Major Water Contract Holders *(contracts as of January 2013)*	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Aquilla System						
Existing Contracts (Brazos G)	11,403	11,403	11,403	11,403	11,403	11,403
Existing Contracts (Region C)[1]	-	-	-	-	-	-
New Demands (Brazos G)	-	-	-	-	-	-
New Demands (Region C)	-	-	-	-	-	-
Total Demands Lake Aquilla System	11,403	11,403	11,403	11,403	11,403	11,403
Little River System						
Existing Contracts (Brazos G)	251,643	251,643	251,643	251,643	251,643	251,643
Existing Contracts (Region K)	-	-	-	-	-	-
New Demands (Brazos G)	20,036	23,549	25,352	31,631	50,785	50,285
New Demands (Region K)	-	-	-	-	-	-
Total Demands Little River System	271,679	275,192	276,995	283,274	302,428	301,928
Main Stem/Lower Basin						
Existing Contracts (Brazos G)	247,595	247,595	247,595	247,595	247,595	247,595
Existing Contracts (Region C)	1,100	1,100	1,100	1,100	1,100	1,100
Existing Contracts (Region H)	163,450	163,450	163,450	163,450	163,450	163,450
New Demands (Brazos G)	78,548	79,293	80,693	84,518	88,703	93,238
New Demands (Region C)	-	-	-	-	-	-
New Demands (Region H)[2]	25,000	25,000	25,000	25,000	25,000	25,000
Total Demands Main Stem/Lower Basin	515,693	516,438	517,838	521,663	525,848	530,383
Total Demand (Brazos G)	609,225	613,483	616,686	626,790	650,129	654,164
Total Demand (Region C)	1,100	1,100	1,100	1,100	1,100	1,100
Total Demand (Region K)	-	-	-	-	-	-
Total Demand (Region H)	188,450	188,450	188,450	188,450	188,450	188,450
Projected Total Demand	798,775	803,033	806,236	816,340	839,679	843,714

1 – BRA supplies from Lake Aquilla to Region C are included in Existing Contracts (Brazos G).
2 – New demands in Region H are proposed to be supplied from the pending BRA System Operations Permit. BRA demands to be met in Region H from the proposed Allens Creek Reservoir are not shown.

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Aquilla System	13,315	13,072	12,829	12,585	12,342	12,099
Little River System	211,294	210,249	209,204	208,159	207,114	206,069
Main Stem/Lower Basin System	420,470	414,567	408,664	402,761	396,858	390,955
Total Supply	645,079	637,888	630,697	623,505	616,314	609,123

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Aquilla System	1,912	1,669	1,426	1,182	939	696
Little River System	(60,385)	(64,943)	(67,791)	(75,115)	(95,314)	(95,859)
Main Stem/Lower Basin System	(95,223)	(101,871)	(109,174)	(118,902)	(128,990)	(139,428)
Total Balance/(Shortage)	(153,696)	(165,145)	(175,539)	(192,835)	(223,365)	(234,591)

4.3.2 Aquilla Water Supply District

Aquilla Water Supply District is located in Hill County, and obtains raw water from Lake Aquilla through a contract with the BRA. The district supplies treated water to five wholesale customers. The City of Hillsboro is the district's largest customer with a contract to purchase up to 4,200 acft/yr. Projected demands, supplies and balances are shown in Table 4.3-2.

Table 4.3-2. Projected Demands, Supplies and Balance for Aquilla WSD

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
Brandon-Irene WSC	287	287	287	287	287	287
Chatt WSC (Hill C-O)	86	86	86	86	86	86
Files Valley WSC	1,709	1,709	1,709	1,709	1,709	1,709
Hill County WSC	230	230	230	230	230	230
Hillsboro	4,200	3,640	3,640	3,640	3,640	3,640
Total Demand	6,512	5,952	5,952	5,952	5,952	5,952

	Year (acft/yr)					
Supply Source	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Aquilla (BRA Contract)	5,953	5,953	5,953	5,953	5,953	5,953

	Year (acft/yr)					
Projected Balance	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	(559)	1	1	1	1	1

4.3.3 Bell County Water Control and Improvement District No. 1

Bell County Water Control and Improvement District (WCID) No. 1 obtains and treats water for its customers from Lake Belton through contracts with the Brazos River Authority for 62,509 acft/yr. Bell County WCID No. 1 also diverts and treats water for Fort Hood using the Department of the Army's water right in Lake Belton, which, for planning purposes, is not listed as a supply for Bell County WCID No. 1. Projected demands, supplies and balances are shown in Table 4.3-3.

Table 4.3-3. Projected Demands, Supplies and Balance for Bell County WCID No. 1

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
439 Water Supply Corp	750	750	750	750	750	750
City of Belton	5,966	5,966	5,966	5,966	5,966	5,966
City of Copperas Cove	8,824	8,824	8,824	8,824	8,824	8,824
City of Harker Heights	5,265	5,265	5,265	5,265	5,265	5,265
City of Killeen	39,964	39,964	39,964	39,964	39,964	39,964
City of Nolanville	990	990	990	990	990	990
Bell County-Other	750	750	750	750	750	750
Bell County-Other (Recommended)	0	0	23	467	731	995
Total Fresh Water Demands	62,509	62,509	62,532	62,976	63,240	63,504
Reuse Water Demands						
City of Harker Heights (Recommended)	185	185	185	185	185	185
439 WSC (Recommended)						20
Bell County - Manufacturing (Recommended)	1,000	1,000	1,000	1,360	1,360	1,360
City of Killeen (Recommended)	2,488	2,488	2,488	2,488	2,488	2,488
Total Reuse Water Demands	3,173	3,173	3,173	3,173	3,173	3,193

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Supplies						
Lake Belton (BCWCID #1 BRA Contract)	62,509	62,202	61,602	58,420	57,623	56,364
Reuse Water Supplies						
Undeveloped Bell Co. WCID No.1 Reuse Supply	19,264	20,732	22,199	23,667	25,134	26,602

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Balance/(Shortage)	0	(307)	(931)	(4,556)	(5,617)	(7,140)
Reuse Water Balance/(Shortage)	16,091	17,559	19,026	20,494	21,961	23,409

4.3.4 Bistone Municipal Water Supply District

Bistone Municipal Water Supply District (MWSD) owns and operates Lake Mexia in Limestone County with authorized diversions for municipal and industrial use of 2,887 acft. The MWSD serves the City of Mexia and other entities in Limestone County. The District's largest customer is the City of Mexia which receives 4,480 acft/yr. Other contract holders include Mexia State School, Coolidge and Whiterock WSC. Mexia State School contract is limited at 250,000 gallons per day. The City of Coolidge has the right to purchase 200,000 gallons per day. Whiterock WSC has a total contract right to purchase 245,000 gallons per day. Projected demands, supplies and balances are shown in Table 4.3-4.

Table 4.3-4. Projected Demands, Supplies and Balance for Bistone MWSD

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
Bistone MWSD	146	144	142	141	141	141
City of Mexia	4,480	4,480	4,480	4,480	4,480	4,480
Mexia State School (Limestone C-O)	280	280	280	280	280	280
City of Coolidge	225	225	225	225	225	225
Whiterock WSC (Limestone C-O)	274	274	274	274	274	274
Total Demand	5,405	5,403	5,401	5,400	5,400	5,400

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Mexia	1,135	1,028	921	814	707	600
Carrizo – Wilcox Aquifer	1,688	1,688	1,688	1,688	1,688	1,688
Total Supply	2,823	2,716	2,609	2,502	2,395	2,288

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	(2,582)	(2,687)	(2,792)	(2,898)	(3,005)	(3,112)

4.3.5 Bluebonnet Water Supply Corporation

The Bluebonnet Water Supply Corporation (WSC) is located in Bell County. The WSC obtains raw water from Lake Belton through contracts with the BRA totaling 8,301 acft. The WSC sells treated water to eight entities in the BGRWPA. The largest customer is the City of McGregor, which has a contract for 2,139 acft/yr. Projected demands, supplies and balances are shown in Table 4.3-5.

Table 4.3-5. Projected Demands, Supplies and Balance for Bluebonnet WSC

Projected Demands	*Year (acft/yr)*					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Bruceville-Eddy	938	938	938	938	938	938
Elm Creek WSC	654	654	654	654	654	654
City of McGregor	2,139	2,139	2,139	2,139	2,139	2,139
Moffat WSC	869	869	869	869	869	869
City of Moody	401	401	401	401	401	401
Pendleton WSC	461	461	461	461	461	461
Spring Valley WSC (McLennan C-O)	301	301	301	301	301	301
City of Woodway	1,362	1,362	1,362	1,362	1,362	1,362
Total Demand	7,125	7,125	7,125	7,125	7,125	7,125

Supply Source	*Year (acft/yr)*					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Belton (BRA Contract)	7,365	7,090	7,022	6,829	6,736	6,589
Total Supply	7,365	7,090	7,022	6,829	6,736	6,589

Projected Balance	*Year (acft/yr)*					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	240	(35)	(103)	(296)	(389)	(536)

4.3.6 Central Texas Water Supply Corporation

The Central Texas Water Supply Corporation (WSC) provides water to a number of water supply corporations and cities in Bell, Williamson, Milam and Lampasas Counties. The Central Texas WSC obtains water under contract with the Brazos River Authority (BRA) from Lake Stillhouse Hollow, with a total contracted supply of 12,045 acft/yr, of which 8,332 acft/yr is reliable supply, and two Trinity Aquifer wells. Central Texas WSC provides supply from four separate three-party contracts (BRA, Central Texas WSC, and third party) to Belton, Lampasas, Kempner WSC and Rosebud, in addition to treating and transmitting water to Lampasas and Kempner WSC that those entities have contracted for (raw supply) directly from BRA. Those supplies for which Lampasas and Kempner WSC have contracted directly to BRA are not shown in this table. Projected demands, supplies and balances are shown in Table 4.3-6.

Table 4.3-6. Projected Demands, Supplies and Balance for Central Texas WSC

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
Armstrong WSC	783	783	783	783	783	783
Bell County WCID No. 5 (Bell C-O)	67	67	67	67	67	67
Bell-Milam-Falls WSC	2,327	2,327	2,327	2,327	2,327	2,327
City of Belton	100	100	100	100	100	100
Dog Ridge WSC	840	840	840	840	840	840
EAST BELL WSC	691	691	691	691	691	691
City of Holland	331	331	331	331	331	331
Little Elm Valley WSC (Milam C-O)	548	548	548	548	548	548
City of Lott	234	234	234	234	234	234
City of Rodgers	468	468	468	468	468	468
City of Rosebud	500	500	500	500	500	500
Salem-Elm Ridge WSC (Milam C-O)	245	245	245	245	245	245
Town of Buckholts	244	244	244	244	244	244
Town of Oenaville and Belfalls (Bell C-O)	157	157	157	157	157	157
West Bell County WSC	1,660	1,660	1,660	1,660	1,660	1,660
Westphalia WSC (Falls C-O)	45	45	45	45	45	45
Jarrell-Schwertner WSC	1,000	1,000	1,000	1,000	1,000	1,000
Bell County-Other (Recommended Strategy)			500	500	500	500
Total Demand	10,240	10,240	10,740	10,740	10,740	10,740

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Trinity Aquifer	2,421	2,421	2,421	2,421	2,421	2,421
Lake Stillhouse Hollow (BRA Contract)	9,644	9,195	9,106	8,636	8,518	8,332
Total Supply	12,065	11,616	11,527	11,057	10,939	10,753

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	1,825	1,376	787	317	199	13

4.3.7 Eastland County Water Supply District

The Eastland County Water Supply District owns and operates Lake Leon and has a water right to divert 5,800 acft for municipal and industrial purposes and 500 acft for irrigation. The district currently provides treated water to entities in Eastland County through the Cities of Eastland and Ranger. Projected demands, supplies and balances are shown in Table 4.3-7.

Table 4.3-7. Projected Demands, Supplies and Balance for Eastland County WSD

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Eastland	3,314	3,314	3,314	3,314	3,314	3,314
City of Ranger	2025	2025	2025	2025	2025	2025
Eastland County Manufacturing	72	77	82	85	91	97
Total Demand	5,411	5,416	5,421	5,424	5,430	5,436

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Run-of-the-River Right	345	344	342	341	339	338
Lake Leon	5,488	5,456	5,425	5,394	5,362	5,331
Total Supply	5,833	5,800	5,767	5,734	5,701	5,668

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	422	384	346	310	271	232

4.3.8 Heart of Texas Water Suppliers LLC

Heart of Texas has a contract to provide 5,600 acft/yr to the City of Hutto. Heart of Texas has a well field in the Carrizo-Wilcox Aquifer (Hooper formation) in Williamson County; however, the current MAG for the Carrizo-Wilcox in Williamson County is only 7 acft/yr. Heart of Texas also holds permits with the Lost Pines Groundwater Conservation District in Lee County for 3,300 acft/yr. A well has been constructed in Lee County, but it has not yet been brought online and is not counted as a current source of supply. Projected demands, supplies and balances are shown in Table 4.3-8.

Table 4.3-8. Projected Demands, Supplies and Balance for Heart of Texas

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Hutto	5,600	5,600	5,600	5,600	5,600	5,600
City of Hutto (Recommended Strategy)				1,910	4,117	6,401
Total Demand	5,600	5,600	5,600	7,510	9,717	12,001

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Carrizo-Wilcox (Williamson County)	7	7	7	7	7	7
Carrizo-Wilcox (Lee County)	0	0	0	0	0	0
Total Supply	7	7	7	7	7	7

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	(5,593)	(5,593)	(5,593)	(7,503	(9,710_	(11,994)

4.3.9 North Central Texas Municipal Water Authority

North Central Texas Municipal Water District supplies treated water to entities in Knox, Haskell and Stonewall Counties. The district has water rights to divert 5,000 acft from Millers Creek Reservoir for municipal, industrial, and mining purposes. Projected demands, supplies and balances are shown in Table 4.3-9.

Table 4.3-9. Projected Demands, Supplies and Balance for North Central Texas MWA

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Aspermont	118	118	118	118	118	118
City of Benjamin (Knox C-O)	13	13	13	13	13	13
City of Goree (Knox C-O)	63	63	63	63	63	63
City of Haskell	637	637	637	637	637	637
City of Knox City	260	260	260	260	260	260
City of Munday	268	268	268	268	268	268
City of O'Brian (Haskell C-O)	10	10	10	10	10	10
City of Rochester (Haskell C-O)	26	26	26	26	26	26
City of Rule	45	45	45	45	45	45
Weinert (Haskell C-O)	44	44	44	44	44	44
Baylor WSC (Region B)	147	147	147	147	147	147
Knox County Rural WSC (Knox C-O)	55	55	55	55	55	55
Rhineland WSC (Haskell C-O)	37	37	37	37	37	37
Paint Creek WSC (Haskell C-O)	74	74	74	74	74	74
Total Demand	1,797	1,797	1,797	1,797	1,797	1,797

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Millers Creek Reservoir	1,300	1,080	860	640	420	200

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	(497)	(717)	(937)	(1,157)	(1,377)	(1,597)

4.3.10 Palo Pinto County Municipal Water District No. 1

Palo Pinto Municipal Water District owns and operates Lake Palo Pinto, which is used to supply water to entities in Palo Pinto and Parker Counties (Region C). The district has rights to 18,500 acft a year for municipal and steam electric power uses. Treated water is supplied to the City of Mineral Wells (and its customers) and Lake Palo Pinto Area Water Supply Corporation. The district is currently pursuing the Turkey Peak Dam project to increase its total reservoir storage capacity to the volume authorized in its water right permit. Projected demands, supplies and balances are shown in Table 4.3-10.

Table 4.3-10. Projected Demands, Supplies and Balance for Palo Pinto County MWD No. 1

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Mineral Wells[1]	5,164	5,265	5,320	5,391	5,462	5,521
Lake Palo Pinto Area WSC (Palo Pinto C-O)	250	250	250	250	250	250
Palo Pinto County Steam-Electric	4,000	4,000	4,000	4,000	4,000	4,000
Palo Pinto County Irrigation (Recommended)	2,494	2,392	2,299	2,260	2,222	2,188
Total Demand	11,908	11,907	11,869	11,901	11,934	11,959
1 – Includes municipal supply to portion of Mineral Wells located in Region C.						

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Palo Pinto	7,655	7,481	7,307	7,133	6,959	6,785

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	(4,253)	(4,426)	(4,562)	(4,768)	(4,975)	(5,174)

4.3.11 Upper Leon Municipal Water District

The Upper Leon Municipal Water District obtains water from Lake Proctor through contracts with the BRA totaling 6,437 acft. The MWD provides treated water to the Cities of Comanche, De Leon, Dublin, Gorman, Hamilton and Stephenville. Projected demands, supplies and balances are shown in Table 4.3-11.

Table 4.3-11. Projected Demands, Supplies and Balance for Upper Leon MWD

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Comanche	706	706	706	706	706	706
City of De Leon	307	307	307	307	307	307
City of Dublin	598	598	598	598	598	598
City of Gorman	169	169	169	169	169	169
City of Hamilton	921	921	921	921	921	921
City of Stephenville	1,862	1,862	1,862	1,862	1,862	1,862
Comanche County WSC	9	9	9	9	9	9
Total Demand	4,572	4,572	4,572	4,572	4,572	4,572

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Proctor (BRA Contract)	4,980	4,541	4,497	4,264	4,206	4,114

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	408	(31)	(75)	(308)	(366)	(458)

4.3.12 West Central Texas Municipal Water District

The West Central Texas Municipal Water District (MWD) holds a water right in Hubbard Creek Reservoir that authorize it to divert up to 56,000 acft of water per year from the reservoir for municipal, industrial, irrigation, mining, domestic, and livestock use. The District provides raw water to its member cities of Abilene, Albany, Anson, and Breckenridge. The District has opted to utilize a 2-year safe yield as the basis for supply from Hubbard Creek Reservoir for the 2016 Brazos G Plan. The District has currently contracted with its member cities up to an allocation of 85% of the one-year safe yield supply. The District also holds a long-term contract with the Colorado River Municipal Water District (CRMWD) for 16 percent of the yield in O.H. Ivie Reservoir (~15,000 acft) and a supporting contract with the City of Abilene to provide this water to the city. Currently the City of Abilene has facilities to utilize up to 6,720 acft/yr (6 MGD) of the supply from O.H. Ivie Reservoir. The O.H. Ivie supply is shown on summaries for the City of Abilene. Projected demands, supplies and balances are shown in Table 4.3-12.

Table 4.3-12. Projected Demands, Supplies and Balance for West Central Texas MWD

Projected Demands	*Year (acft/yr)*					
Major Water Contract Holders	*2020*	*2030*	*2040*	*2050*	*2060*	*2070*
City of Abilene	20,400	20,400	20,400	20,400	20,400	20,400
City of Albany	2,200	2,200	2,200	2,200	2,200	2,200
City of Anson	2,400	2,400	2,400	2,400	2,400	2,400
City of Breckenridge	2,900	2,900	2,900	2,900	2,900	2,900
Total Demand	27,900	27,900	27,900	27,900	27,900	27,900

Supply Source	*Year (acft/yr)*					
	2020	*2030*	*2040*	*2050*	*2060*	*2070*
Hubbard Creek Reservoir	27,010	26,872	26,733	26,594	26,456	26,317

Projected Balance	*Year (acft/yr)*					
	2020	*2030*	*2040*	*2050*	*2060*	*2070*
Balance/(Shortage)	(890)	(1,028)	(1,167)	(1,306)	(1,444)	(1,583)

4.3.13 City of Abilene

The City of Abilene has water rights for three reservoirs Lake Fort Phantom Hill, Lake Abilene, and Lake Kirby, all of which it owns and operates. Abilene obtains raw water supply from Lake Fort Phantom Hill. Lakes Abilene and Kirby are the original water supplies for Abilene but are no longer considered to provide reliable supply. The total permitted capacity of Lake Fort Phantom Hill is 73,960 acft. The City has the right to divert up to 30,690 acft/yr from the lake for municipal, industrial, and irrigation use. The City also uses surface water purchased from the West Central Texas Municipal Water District from Lake Hubbard, and Lake O.H. Ivie (operated by the CRMWD). The City currently has reverse osmosis facilities to utilize 6,720 acft/yr of the supply from O.H. Ivie. The City supplies treated water to 14 entities in the BGRWPA and Dyess Air Force Base, which is located in Abilene. The City also has a contract with the City of Hamlin to treat raw water from Hubbard Creek Reservoir that is purchased from the City of Anson. Projected demands, supplies and balances are shown in Table 4.3-13.

Table 4.3-13. Projected Demands, Supplies and Balance for City of Abilene

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Abilene[1]	22,032	20,857	21,302	21,901	22,350	22,694
Blair WSC (Taylor C-O)	77	77	77	77	77	77
City of Baird	77	77	77	77	77	77
City of Clyde	307	307	307	307	307	307
City of Lawn (Taylor C-O)	77	77	77	77	77	77
City of Merkel	353	353	353	353	353	353
City of Tye	184	184	184	184	184	184
Eula WSC (Callahan C-O)	61	61	61	61	61	61
Hamby WSC (Taylor C-O)	308	308	308	308	308	308
Hawley WSC	307	307	307	307	307	307
Potosi WSC	307	307	307	307	307	307
Steamboat Mountain WSC	307	307	307	307	307	307
S.U.N. WSC (Taylor C-O)	230	230	230	230	230	230
View Caps WSC (Taylor C-O)	199	199	199	199	199	199
Taylor County Manufacturing	1,248	1,395	1,537	1,658	1,831	2,019
City of Merkel (Recommended Strategy)	0	0	0	0	4	9
City of Potosi (Recommended Strategy)	466	485	500	515	529	542
Steamboat Mountain WSC (Recommended Strategy)	182	185	189	194	203	210
City of Sweetwater (Recommended Strategy)	742	974	1,137	1,355	1,562	1,777
City of Tye (Recommended Strategy)	2	4	6	9	13	15
City of Winters (Region F Recommended Strategy)	100	100	100	100	100	100
Total Treated Water Demand	27,566	26,794	27,565	28,526	29,286	30,160
City of Clyde (for steam-electric supply)	11,837	11,837	11,837	11,837	11,837	11,837
West Texas Water Partnership (Recommended)		10,000	10,000	10,000	10,000	10,000
Taylor County Mining (Recommended)	379	371	340	322	306	293
Taylor County Irrigation (Recommended)	1,010	943	877	842	807	776
Nolan County Steam-Electric (Recommended)		10,000	9,299	7,901	6,702	5,384

Raw Water Only Demand	13,226	33,151	32,453	31,002	29,752	28,390
Total Demand	40,692	59,845	59,918	59,428	58,939	58,449

1 – Demands include any conservation applied to the City's demands as a municipal WUG.

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Abilene[1]	0	0	0	0	0	0
Lake Kirby[2]	0	0	0	0	0	0
Lake O.H. Ivie (Colorado River MWD)[3]	4,811	4,668	4,525	4,383	4,240	4,097
Fort Phantom Hill[4]	10,000	9,792	9,584	9,376	9,168	8,960
West Central Texas MWD (Hubbard)[5]	19,510	19,372	19,233	19,094	18,956	18,817
Total Raw Water Supply	34,321	33,832	33,343	32,853	32,364	31,874
Treated Supply (Hubbard and Ft. Phantom)[6,7]	27,552	13,440	13,440	13,440	13,440	13,440
Total Treated Water Supply	32,363	18,108	17,965	17,823	17,680	17,537

1 – Lake Abilene is not considered a dependable supply by the City and is currently not used.

2 – Lake Kirby is not considered a dependable supply by the City and is used primarily to store water for the City's reuse customers. Reuse demands are not included in the water demand projections for the City.

3 – Updated yields with subordination, 16.54% of Ivie yield. Reduced by 15% for RO efficiency. Current treatment capacity (desalination) is approximately 6 MGD (6,720 acft/yr). Supply located in Region F.

4 – Abilene's portion of FPHR supply is based on a 2 year safe yield (10,320 acft/yr in 2070) for of the reservoir, less the 1 year safe yield of the City of Clyde's water right (1,360 acft/yr in 2070).

5 – The ongoing drought is not contained in the Brazos WAM and is not reflected in the yields presented. Abilene's supply from Hubbard Creek Reservoir will be reduced to zero (contractual stipulation) as lake levels decrease. As such, Brazos Basin supplies may be overstated.

6 – Supply has been constrained based on average annual capacity of the existing Northeast and Grimes treatment plants for 2010. The average annual capacity is determined as 50% of the normal rated design capacity (49.2 MGD). By 2020, the capacity of the Grimes treatment plant is reduced to zero for a total constrained supply of 13,440 AF.

7 – Abilene has a treatment contract with Hamlin to treat supplies for Hamlin using Anson supply from WCTMWD.

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Treated Water Balance/(Shortage)	4,797	(8,686)	(9,600)	(10,703)	(11,707)	(12,623)
Total Raw Water Balance/(Shortage)	(6,471)	(26,114)	(26,575)	(26,575)	(26,575)	(26,575)

4.3.14 City of Anson

The City of Anson receives surface water supplies from West Central Texas MWD and Lake Anson North. Although the City owns Lake Anson North, the water resource is unreliable and is not considered a supply. The City has a 1.8 MGD WTP for its own demand. Anson sells supply to Hawley WSC and City of Hamlin and contracts with Abilene to provide treatment for these supplies. Projected demands, supplies and balances are shown in Table 4.3-14.

Table 4.3-14. Projected Demands, Supplies and Balance for City of Anson

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Anson[1]	367	375	378	388	397	405
HAWLEY WSC	350	350	350	350	350	350
City of Hamlin	767	767	767	767	767	767
Total Demand	1,484	1,492	1,495	1,505	1,514	1,522
1 – Demand includes any conservation applied to the City's demands as a municipal WUG.						

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
West Central Texas MWD	2,400	2,400	2,400	2,400	2,400	2,400
Anson North Lake[1]	202	202	202	202	202	202
Total Supplies	2,400	2,400	2,400	2,400	2,400	2,400
Constrained Supply (WTP Capacity)	2,128	2,128	2,128	2,128	2,128	2,128
1 – The City does not consider Anson North Lake a reliable supply and does not intend to use as a water source.						

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	644	636	633	623	614	606

4.3.15 City of Bryan

The City of Bryan owns a total of twelve wells located in the Simsboro and Sparta formations of the Carrizo-Wilcox Aquifer with a production capacity of 43 MGD. The Brazos Valley Groundwater Conservation District has permitted the City to withdraw 33,540 acft/yr. The City supplies several neighboring communities as well as manufacturing and steam-electric entities. The City of College Station, Wellborn SUD and Wickson Creek SUD have agreements with Bryan to purchase or sell potable water through metered lines. These connections are typically only used during times of high demand or in emergency situations. The city has a bed and banks water right permit for reuse of the city's wastewater effluent. Projected demands, supplies and balances are shown in Table 4.3-15.

Table 4.3-15. Projected Demands, Supplies and Balance for City of Bryan

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Bryan[1]	15,203	14,670	18,726	21,795	25,027	28,509
Wellborn SUD	2,240	2,240	2,240	2,240	2,240	2,240
Wickson Creek SUD	1,710	1,534	1,366	1,241	1,129	1,041
City of College Station	385	450	1,656	4,973	8,566	12,716
Brazos County Manufacturing	95	95	95	95	95	95
Brazos County Steam Electric	1	1	1	1	1	1
Total Demand	19,634	18,990	24,084	30,345	37,058	44,602
Reuse Water Demands						
Grimes County Steam Electric (Recommended)	949	1,074	1,040	1,178	1,091	1,111
Brazos County Steam Electric (Recommended)	256	131	165	27	114	94
Total Reuse Demand	1,205	1,205	1,205	1,205	1,205	1,205

1 – Demand includes any conservation applied to the City's demands as a municipal WUG.

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Carrizo – Wilcox Aquifer	16,042	18,525	19,398	19,398	19,398	19,398
Sparta Aquifer	750	769	769	769	769	769
Total Supply	16,792	19,294	20,167	20,167	20,167	20,167
Reuse Water Supplies						
Undeveloped Reuse Supply	6,645	8,340	10,035	11,730	13,425	15,120

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Balance/(Shortage)	(2,841)	304	(3,917)	(10,178)	(16,891)	(24,436)
Reuse Water Balance/(Shortage)	5,440	7,135	8,830	10,525	12,220	13,915

4.3.16 City of Cedar Park

The City of Cedar Park is located in Williamson County and part of Travis County (Region K) and provides wholesale water to entities in Williamson and Travis Counties. The City is a participant in the Brushy Creek Regional Utility Authority to develop additional supplies from the Highland Lakes. Projected demands, supplies and balances are shown in Table 4.3-16.

Table 4.3-16. Projected Demands, Supplies and Balance for City of Cedar Park

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Cedar Park[1]	14,124	14,169	12,814	12,440	12,440	12,440
City of Cedar Park (Region K)[1]	2,186	2,100	2,153	2,039	1,939	1,839
Indian Springs Subdivision (Williamson C-O)	13	13	13	13	13	13
Williamson-Travis Co. MUD No.1	989	989	989	989	989	989
Blockhouse MUD	1,098	1,098	1,098	1,098	1,098	1,098
Williamson County-Manufacturing	790	912	1,033	1,142	1,243	1,355
Total Demand	19,200	19,281	18,100	17,721	17,722	17,734
1 – Demand includes any conservation applied to the City's demands as a municipal WUG.						

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Highland Lakes System (LCRA)	18,000	18,000	18,000	18,000	18,000	18,000

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	(1,200)	(1,281)	(100)	279	278	266

4.3.17 City of Cleburne

The City of Cleburne obtains its water supply from Lake Pat Cleburne, Lake Aquilla, and groundwater from the Trinity Aquifer. The City of Cleburne also has contracted supplies from Lake Whitney that are not yet connected. The City of Cleburne provides treated supplies for manufacturing use and wastewater reuse supplies for steam-electric customers in Johnson County. The city's water treatment plant has an average annual capacity of 11,200 acft/yr, which is sufficient for the current surface water supply. Projected demands, supplies and balances are shown in Table 4.3-17.

Table 4.3-17. Projected Demands, Supplies and Balance for City of Cleburne

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Cleburne[1]	5,720	5,761	6,274	6,929	7,636	8,393
Johnson County-Manufacturing	2,329	2,714	3,105	3,455	3,801	4,182
Johnson County SE (Recommended)	3,415	3,275	3,135	3,135	3,135	3,135
Total Fresh Water Demands	11,464	11,750	12,514	13,519	14,572	15,710
Reuse Water Demands						
Johnson County-SE	1,344	1,344	1,344	1,344	1,344	1,344
Johnson County SE (Recommended Strategy)	2,031	2,031	2,031	2,031	2,031	2,031
Total Reuse Demands	3,375	3,375	3,375	3,375	3,375	3,375

1 – Demand includes any conservation applied to the City's demands as a municipal WUG.

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Supplies						
Trinity Aquifer	1,292	1,292	1,292	1,292	1,292	1,292
Lake Pat Cleburne	4,838	4,769	4,700	4,631	4,562	4,493
Lake Aquilla	5,300	5,300	5,300	5,300	5,300	5,300
Lake Whitney	9,700	9,628	9,556	9,484	9,412	9,340
Lake Whitney Constrained Supplies[1]	0	0	0	0	0	0
Total Fresh Water Supplies	11,430	11,361	11,292	11,223	11,154	11,085
Constrained Fresh Water Supply[2]	11,200	11,200	11,200	11,200	11,154	11,085
Reuse Water Supplies						
Johnson County SE	1,344	1,344	1,344	1,344	1,344	1,344
Undeveloped Reuse Supply	2,283	3,089	3,895	4,702	5,508	6,314
Total Reuse Supply	3,627	4,433	5,239	6,046	6,852	7,658

1 – No current infrastructure to take Lake Whitney supplies.

2 – Fresh water supply has been constrained based on average annual capacity of the existing treatment plant(s). The average annual capacity is determined as 50% of the normal rated design capacity (20 MGD).

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Balance/(Shortage)	(264)	(550)	(1,314)	(2,319)	(3,418)	(4,625)
Reuse Water Balance/(Shortage)	252	1,058	1,864	2,671	3,477	4,283

4.3.18 City of Gatesville

The City of Gatesville is supplied by multiple contracts with BRA for a total of 5,898 acft/yr from Lake Belton. The City provides treated supplies to five municipal water user groups in Coryell County including supply for all the projected demand for Coryell City Water Supply District. The water supply plan for Coryell County-Other includes the City providing for the remaining water need. Projected wholesale demand on the City in 2070 is 3,931 acft. Projected demands, supplies and balances are shown in Table 4.3-18.

Table 4.3-18. Projected Demands, Supplies and Balance for City of Gatesville

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Gatesville	4,216	4,329	4,435	4,422	4,397	4,791
Coryell City Water Supply District	934	1,046	1,172	1,287	1,415	1,543
Fort Gates WSC (Coryell C-O)	120	120	120	120	120	120
Mountain WSC (Coryell C-O)	280	280	280	280	280	280
Grove WSC (Coryell C-O)	0	0	0	0	0	0
Flat WSC (Coryell C-O)	102	102	102	102	102	102
Coryell County-Manufacturing	10	11	12	13	14	15
Coryell County-Other (Recommended)				93	171	515
Total Demand	5,662	5,888	6,121	6,317	6,499	7,366
1 – Demand includes any conservation applied to the City's demands as a municipal WUG.						

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
BRA Contract	5,898	5,869	5,812	5,512	5,437	5,318
Total Supplies	5,898	5,869	5,812	5,512	5,437	5,318

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	236	(19)	(308)	(805)	(1,062)	(2,048)

4.3.19 Johnson County Special Utility District

Johnson County Special Utility District (SUD) is located in Johnson, Hill, Ellis (Region C) and Tarrant (Region C) counties. The SUD obtains its water supply from groundwater from the Trinity Aquifer, and a contract with the Brazos River Authority for water from Lake Granbury and a contract with the City of Mansfield (10,089 acft/yr) for water from the Tarrant Regional Water District. Supplies from Tarrant have been constrained based on availability from the District. Johnson County SUD also has a contract with Grand Prairie for 6,720 acft/yr, which will be implemented by 2020. The SUD has contracts to supply treated supplies to nine water user groups. Projected demands, supplies and balances are shown in Table 4.3-19.

Table 4.3-19. Projected Demands, Supplies and Balance for Johnson County SUD

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
Johnson County SUD (Region G)[1]	4,837	5,408	6,029	6,759	7,589	8,490
Johnson County SUD (Region C)[1]	295	323	356	391	431	470
City of Alvarado	2,241	2,241	2,241	2,241	2,241	2,241
Bethany WSC	1,120	1,120	1,120	1,120	1,120	1,120
Monarch Utilities (Johnson C-O)	282	282	282	282	282	282
City of Keene	1,120	1,120	1,120	1,120	1,120	1,120
City of Joshua[2]	951	1,115	1,292	1,494	1,722	1,968
Sundance (Johnson C-O)	56	56	56	56	56	56
Blue Water Oaks (Johnson C-O)	31	31	31	31	31	31
Walnut Creek MHP (Johnson C-O)	68	68	68	68	68	68
Johnson County-Mining	20	20	20	20	20	20
Total Demand	11,022	11,785	12,616	13,583	14,681	15,867

1 – Demand includes any conservation applied to the entity's demands as a municipal WUG.
2 – Contract to provide supplies to meet needs less assuming conservation has been applied to the entity.

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
City of Mansfield	6,884	6,302	5,631	4,717	4,260	3,858
BRA Contract (Lake Granbury)	9,210	9,210	9,210	9,210	9,210	9,210
Grand Prairie	0	0	0	0	0	0
Groundwater (Trinity)	2,081	2,081	2,081	2,081	2,081	2,081
Total Supplies	18,175	17,593	16,922	16,008	15,551	15,149
Constrained Supply (Total Treated)	16,626	16,044	15,373	14,459	14,002	13,600

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	5,604	4,259	2,757	876	(679)	(2,267)

4.3.20 Kempner Water Supply Corporation

Kempner WSC has service area in portions of Coryell, Bell, Burnet (Region C) and Lampasas Counties. The WSC receives surface water supplies from the Brazos River Authority out of Lake Stillhouse Hollow. Kempner WSC sells supplies to the cities of Kempner, Copperas Cove, Lampasas, as well as to Salado WSC and Lampasas County-Mining. Projected demands, supplies and balances are shown in Table 4.3-20.

Table 4.3-20. Projected Demands, Supplies and Balance for Kempner WSC

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
Kempner WSC [1]	2,336	2,444	2,684	2,918	3,143	3,356
Kempner WSC (Region K)	129	146	167	188	206	221
City of Kempner[2]	195	209	225	240	254	267
City of Copperas Cove	252	252	252	252	252	252
City of Lampasas	1,281	1,281	1,281	1,281	1,281	1,281
Salado WSC	183	183	183	183	183	183
Lampasas County-Mining	25	25	25	25	25	25
City of Lampasas (Recommended Strategy)	22	148	227	318	414	505
Total Demand	4,422	4,687	5,043	5,405	5,757	6,089

1 – Demand includes any conservation applied to the entity's demands as a municipal WUG.
2 – Contract to provide supplies to meet needs less assuming conservation has been applied to the entity.

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
BRA Contract	4,822	4,694	4,649	4,408	4,348	4,253
Other Buyer's BRA Contracts	1,871	1,846	1,828	1,734	1,742	1,802
Total Supplies	6,694	6,540	6,477	6,142	6,091	6,056
Constrained Supply (WTP Capacity)	3,965	3,965	3,965	3,965	3,965	3,965

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	(458)	(723)	(1,078)	(1,440)	(1,792)	(2,125)

4.3.21 City of Mineral Wells

City of Mineral Wells obtains raw water from Lake Mineral Wells and additional surface water supplies from Palo Pinto MWD No. 1. The city supplies treated water to ten water user groups in Palo Pinto and Parker County (Region C). Projected demands, supplies and balances are shown in Table 4.3-21

Table 4.3-21. Projected Demands, Supplies and Balance for City of Mineral Wells

Projected Demands	*Year (acft/yr)*					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Mineral Wells	2,523	2,677	2,775	2,856	2,935	3,002
City of Mineral Wells (Region C)	336	328	320	310	302	294
City of Graford	92	92	92	92	92	92
Palo Pinto WSC (Palo Pinto C-O)	179	179	179	179	179	179
Santo SUD (Palo Pinto C-O)	331	331	331	331	331	331
Sturdivant-Progress WSC (Palo Pinto C-O)	307	307	307	307	307	307
North Rural WSC (Palo Pinto C-O)	324	324	324	324	324	324
Palo Pinto County Manufacturing	10	10	10	10	10	10
Parker County SUD (Region C)	294	294	294	294	294	294
Millsap WSC (Region C)	184	184	184	184	184	184
Parker County Other (Region C)	479	479	479	479	479	479
Parker County Manufacturing (Region C)	25	25	25	25	25	25
Total Demand	5,084	5,230	5,320	5,391	5,462	5,521
1 – Demand includes any conservation applied to the City’s demands as a municipal WUG.						

Supply Source	*Year (acft/yr)*					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Palo Pinto Co MWD No. 1 (Lake Palo Pinto)	5,164	5,265	5,320	5,391	5,462	5,521
Lake Mineral Wells[1]	2,520	2,497	2,474	2,452	2,429	2,406
Total Treated Supply	5,164	5,265	5,320	5,391	5,462	5,521
1 – The City does not have a WTP to utilize this resource for municipal demand.						

Projected Balance	*Year (acft/yr)*					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	80	35	0	0	0	0

4.3.22 City of Round Rock

The City of Round Rock obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and contracts with the Brazos River Authority for water from Lake Georgetown and Lake Stillhouse Hollow. Based on the available groundwater and surface water supply and existing contractual demands, the City of Round Rock is projected to have a shortage from 2030 through 2070. Round Rock is a participant in the Brushy Creek Regional Utility Authority project to obtain supplies from the Highland Lakes. The City's reuse project provides 4,320 acft/yr for parkland within the city limits, reducing potable demand for irrigation water. Projected demands, supplies and balances are shown in Table 4.3-22.

Table 4.3-22. Projected Demands, Supplies and Balance for City of Round Rock

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Round Rock[1]	23,635	29,691	37,049	44,943	53,991	63,377
City of Round Rock (Region K)[1]	259	299	336	377	414	448
Williamson County MUD #9 (Vista Oaks MUD) [1,2]	797	906	1,027	1,247	1,500	1,762
Fern Bluff MUD[1,2]	1,153	1,043	943	930	930	930
Williamson County MUD #10[1]	935	1,062	1,204	1,403	1,687	1,982
Williamson County MUD #11[1]	542	616	707	862	1,037	1,218
Walsh Ranch MUD (Williamson C-O)	114	111	110	109	109	109
Paloma Lake MUD (Williamson C-O)	137	166	205	277	374	475
Round Rock Ranch PUD (Williamson C-O)	33	44	60	89	127	168
Williamson County (Williamson C-O)	110	132	164	221	299	379
Blessing MHP (Williamson C-O)	96	116	143	194	262	332
Tal Tex (Williamson C-O)	164	198	244	331	447	567
Williamson County-Mining	3	3	3	3	3	3
Williamson County-Manufacturing	1,042	1,200	1,359	1,503	1,638	1,784
Total Demand	29,019	35,586	43,555	52,488	62,818	73,534
1 – Demand includes any conservation applied to the entity's demands as a municipal WUG. 2 – Projected demands for Fern Bluff MUD and Williamson County MUD #9 are likely overstated.						
Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Stillhouse Hollow Reservoir (BRA Contract)	18,134	18,045	17,871	16,948	16,717	16,351
Lake Georgetown (BRA Contract)	6,720	6,687	6,622	6,280	6,195	6,059
Edwards-BFZ (Northern Segment) Aquifer	579	579	579	579	579	579
Manville WSC (Portion inside City Limits)	134	134	134	134	134	134
Reuse Supplies	4,320	4,320	4,320	4,320	4,320	4,320
LCRA – Lake Travis (Out of Region)	20,928	20,928	20,928	20,928	20,928	20,928
Constrained LCRA Supplies[3]	0	0	0	0	0	0
Total Supply	29,887	29,765	29,527	28,262	27,945	27,444
3 – Entities in Williamson County are implementing a strategy to access this supply by 2020.						

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	868	(5,821)	(14,028)	(24,227)	(34,874)	(46,089)

4.3.23 City of Stamford

The City of Stamford obtains supply from Lake Stamford and supplies water to several entities in Jones and Haskell Counties. The City of Stamford is authorized to store up to 60,000 acre-feet in Lake Stamford and to divert 10,000 acft/yr from the reservoir. The City also constructed a diversion structure on California Creek to divert from California Creek to Lake Stamford to augment supplies in the reservoir. The City has contracts to supply treated supplies to six water user groups. Projected demands, supplies and balances are shown in Table 4.3-23

Table 4.3-23. Projected Demands, Supplies and Balance for City of Stamford

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Stamford[1]	803	769	722	673	625	616
City of Leuders (Jones C-O)	52	52	52	52	52	52
Ericksdahl WSC (Jones C-O)	37	37	37	37	37	37
Paint Creek WSC (Haskell C-O)	87	87	87	87	87	87
Sagerton WSC (Haskell C-O)	73	73	73	73	73	73
Total Treated Water Demand	1,052	1,018	971	922	874	865
Haskell County SE	2,200	2,200	2,200	2,200	2,200	2,200
Raw Water Only Demand	2,200	2,200	2,200	2,200	2,200	2,200
Total Demand	3,252	3,218	3,171	3,122	3,074	3,065
1 – Demand includes any conservation applied to the City's demands as a municipal WUG.						

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Stamford	5,510	5,390	5,270	5,150	5,030	4,910
Treated Supply (WTP Capacity)	1,458	1,458	1,458	1,458	1,458	1,458

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Treated Water Balance/(Shortage)	406	441	487	536	584	593
Raw Water Balance/(Shortage)	2,258	2,172	2,099	2,028	1,956	1,845

4.3.24 City of Sweetwater

The City of Sweetwater owns and operates the Oak Creek Reservoir in Coke County (Region F) in the Colorado River Basin. Oak Creek Reservoir has a zero firm or safe yield supply, which can be increased through a proposed subordination agreement with downstream water rights holders (recommended strategy in Region F). The City also operates a groundwater well field in the Dockum Aquifer. Although the City owns Lake Sweetwater, the water resource is unreliable and is not considered a supply. The City of Sweetwater provides wholesale water to entities in Nolan and Fisher Counties, and the City of Bronte in Region F. Projected demands, supplies and balances are shown in Table 4.3-24.

Table 4.3-24. Projected Demands, Supplies and Balance for City of Sweetwater

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Sweetwater[1]	1,813	1,893	1,913	1,977	2,030	2,079
Bitter Creek WSC	460	460	460	460	460	460
City of Blackwell	168	168	168	168	168	168
City of Bronte (Region F)	504	504	504	504	504	504
City of Roby	350	350	350	350	350	350
City of Trent	187	187	187	187	187	187
Nolan County Manufacturing	368	368	368	368	368	368
Nolan County Manufacturing (Recommended)	838	991	1,134	1,288	1,442	1,608
Total Demand	4,688	4,921	5,084	5,302	5,509	5,724
1 – Demand includes any conservation applied to the City's demands as a municipal WUG.						

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Lake Trammel[1]	0	0	0	0	0	0
Lake Sweetwater[1]	0	0	0	0	0	0
Oak Creek Reservoir (Region F)	0	0	0	0	0	0
Dockum Aquifer	2,540	2,540	2,540	2,540	2,540	2,540
Total Supply	2,540	2,540	2,540	2,540	2,540	2,540
1 – The City does not consider Lake Sweetwater or Lake Trammel a reliable supply and does not intend to use either as a water source.						

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Balance/(Shortage)	(2,149)	(2,381)	(2,544)	(2,762)	(2,969)	(3,184)

4.3.25 City of Temple

The City of Temple has a contract with the Brazos River authority to provide 30,453 acft/yr of raw water and an additional 10,100 acft/yr from a run-of-the-river water right (Certificate of Adjudication C2938). The BRA contract can yield a reliable supply of 23,524 acft/yr and the City's water right can provide a reliable supply up to 1,869 acft/yr (supplies from the right increase over time due to sedimentation in the upstream Lake Belton and increased wastewater treatment plant discharges). A few water supply corporations provide water to customers inside the city limits which has been accounted in the supply to the City. The City provides supply to the Cities of Little River-Academy, Morgans Point Resort, and Troy. The City's water treatment plants have an annual average capacity of 27,955 acft. The water supply plan for Little River-Academy includes Temple supplying an additional 180 acft/yr of treated water by 2030. The City has a contract to supply effluent from its wastewater treatment plan to a new generating station owned by Panda Power. Projected demands, supplies and balances are shown in Table 4.3-25.

Table 4.3-25. Projected Demands, Supplies and Balance for City of Temple

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
City of Temple[1]	18,571	19,446	20,197	20,691	20,873	22,992
City of Little River-Academy	323	323	323	323	323	323
City of Morgans Point Resort	1,935	1,935	1,935	1,935	1,935	1,935
City of Troy	968	968	968	968	968	968
Arrowhead Hill (Bell C-O)	323	323	323	323	323	323
Bell County Manufacturing	481	481	481	481	481	481
Little River-Academy (Recommended)		180	180	180	180	180
Total Demand	22,601	23,656	24,407	24,901	25,083	27,202
Reuse Water Demands						
Bell County Steam-Electric (Panda Power)	8,407	8,407	8,407	8,407	8,407	8,407
Bell County Steam-Electric (Recommended)						1,300
Total Reuse Water Demand	8,407	8,407	8,407	8,407	8,407	9,707
1 – Demand includes any conservation applied to the City's demands as a municipal WUG.						

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Supplies						
Run-of-River Water Right	1,706	1,739	1,771	1,804	1,836	1,869
BRA Contract	23,890	22,432	22,956	22,232	22,096	23,524
Constrained Supply (WTP Capacity)	27,955	27,955	27,955	27,955	27,955	27,955
Little Elm Valley WSC[1]	50	50	50	50	50	50
Moffat WSC[1]	11	11	11	11	11	11
Pendleton WSC[1]	81	81	81	81	81	81
Total Fresh Water Supply	25,738	24,312	24,869	24,177	24,074	25,535
Reuse Water Supplies						

BRA TBRSS	14,092	14,092	14,092	14,092	14,092	14,092
1 – These entities provide to customers counted as part of the WUG population for Temple.						

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Balance/(Shortage)	3,137	656	461	(724)	(1,009)	(1,668)
Reuse Water Balance/(Shortage)	5,685	5,685	5,685	5,685	5,685	4,385

4.3.26 City of Waco

The City of Waco obtains raw water from Lake Waco, from a diversion authorized from Lake Brazos, and a small amount of groundwater from the Trinity Aquifer. In 2003, the City, in cooperation with the BRA and the U.S. Army Corps of Engineers, implemented a project to raise the water level in Lake Waco to provide for additional supply. With this additional supply, the City has the right to divert 79,870 acft/yr from Lake Waco for municipal, industrial, and irrigation uses. The City provides treated water to multiple neighboring communities and water supply corporations. The Waco Metropolitan Area Regional Sewerage System (WMARSS) facility is operated by the City of Waco on behalf of the member cities of Bellmead, Hewitt, Lacy Lakeview, Lorena, Robinson and Woodway. Effluent from the WMARSS is used to supply steam-electric cooling supply, and multiple other reuse projects are planned to offset potable water use for manufacturing and landscape irrigation in McLennan County. Projected demands, supplies and balances are shown in Table 4.3-26.

Table 4.3-26. Projected Demands, Supplies and Balance for City of Waco

Projected Demands	***Year (acft/yr)***					
Major Water Contract Holders	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Demands						
City of Waco[1]	30,114	29,344	28,224	27,059	26,921	28,333
City of Bellmead[2]	0	0	0	0	0	0
City of Hewitt[2]	383	558	877	1,198	1,519	1,833
City of Lacy-Lakeview	1,120	1,120	1,120	1,120	1,120	1,120
City of Woodway[2]	431	657	859	1,083	1,316	1,548
City of Beverly Hills[2]	252	261	268	281	297	312
City of West	1,120	1,120	1,120	1,120	1,120	1,120
City of Robinson	560	560	560	560	560	560
Bold Springs Water Supply (McLennan C-O)	560	560	560	560	560	560
Hilltop Water Supply (McLennan C-O)	97	97	97	97	97	97
Central Bosque WSC (McLennan C-O)	70	70	70	70	70	70
McLennan County Manufacturing	2,503	2,888	3,249	3,618	3,948	4,403
Cross County WSC (Recommended Strategy)				150	150	150
City of Mart (Recommended Strategy)	250	250	250	250	250	250
North Bosque WSC (Recommended Strategy)		200	200	200	200	200
City of Riesel (Recommended Strategy)	20	20	20	20	20	20
Total Fresh Water Demands	37,481	37,706	37,475	37,386	38,148	40,576
Reuse Water Demands						
McLennan County SE (SCEA)	15,000	15,000	15,000	15,000	15,000	15,000
City of Bellmead (Bellmead/Lacy-Lakeview)	1,120	1,120	1,120	1,120	1,120	1,120
City of Hallsburg (Waco East)	31	31	31	31	31	31
City of Hewitt (Bullhide Creek)	1,223	1,223	1,223	1,223	1,223	1,223
City of Lacy-Lakeview (Bellmead/Lacy-Lakeview)	1,120	1,120	1,120	1,120	1,120	1,120
City of Lorena (Bullhide Creek)	448	448	448	448	448	448
City of Mart (Waco East)	134	134	134	134	134	134
City of Riesel (Alternative: Waco East)	43	43	43	43	43	43

McLennan County Manufacturing (Flat Creek)	1,600	1,700	1,800	2,000	2,200	2,500
McLennan County Mining (North Reuse)	811	811	811	811	811	811
Total Reuse Water Demands	21,530	21,630	21,730	21,930	22,130	22,430

1 – Demand includes any conservation applied to the City's municipal demands as a WUG.
2 – Contract to provide supplies to meet needs less assumed conservation has been applied to the entity.

Supply Source	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Supplies						
Lake Waco (Municipal & Industrial)	79,877	79,877	79,877	79,877	79,877	79,877
Lake Brazos	5,600	5,600	5,600	5,600	5,600	5,600
Total Fresh Water Supplies	85,477	85,477	85,477	85,477	85,477	85,477
Constrained Fresh Water Supply[1]	50,400	50,400	50,400	50,400	50,400	50,400
Reuse Water Supplies (WMARSS)						
McLennan County SE (SCEA)	15,000	15,000	15,000	15,000	15,000	15,000
Undeveloped WMARSS Reuse Supply	12,035	13,902	15,769	17,636	19,503	21,370
Total Reuse Supply from WMARSS[2]	27,035	28,902	30,769	32,636	34,503	36,370

1 – Fresh water supply has been constrained based on average annual capacity of the existing Waco treatment plant. The average annual capacity is determined as 50% of the normal rated design capacity (90 MGD).

2 – Reuse supplies are based on projected WMARSS plant flows.

Projected Balance	***Year (acft/yr)***					
	2020	***2030***	***2040***	***2050***	***2060***	***2070***
Fresh Water Balance/(Shortage)	12,919	12,694	12,925	13,014	12,252	9,824
Reuse Water Balance/(Shortage)	5,505	7,272	9,039	10,706	12,373	13,940

4.3.27 WWP Summary

Table 4.3-27 summarizes the contractual demands by WWP as applied to use type (municipal, manufacturing, irrigation, mining or steam electric power) by county and by river basin. The volumes do not correlate to the contract amounts but to the available supply applied to meet current and projected needs. These volumes typically are less than the volumes assigned to recommended strategies for the WWPs or its customers.

Table 4.3-27. WWP Projected Contract Water Use by Type, County and Basin

Buyer/Use	County	Basin	Year					
			2020	2030	2040	2050	2060	2070
ABILENE								
MANUFACTURING	TAYLOR	BRAZOS	1,248	1,395	1,537	1,658	1,831	2,019
MUNICIPAL	CALLAHAN	BRAZOS	356	357	357	357	356	357
MUNICIPAL	CALLAHAN	COLORADO	94	93	93	93	94	93
MUNICIPAL	JONES	BRAZOS	210	209	209	208	207	205
MUNICIPAL	TAYLOR	BRAZOS	1,833	1,834	1,834	1,834	1,831	1,830
MUNICIPAL	TAYLOR	COLORADO	147	146	146	146	146	146
STEAM ELECTRIC	JONES	BRAZOS	8,247	11,837	11,837	11,837	11,837	11,837
		ABILENE TOTAL	**12,135**	**15,871**	**12,135**	**15,871**	**16,013**	**16,133**
ANSON								
MUNICIPAL	JONES	BRAZOS	1,014	1,013	1,013	1,012	1,011	1,009
MUNICIPAL	TAYLOR	BRAZOS	26	26	26	26	25	25
		ANSON TOTAL	**1,040**	**1,039**	**1,040**	**1,039**	**1,039**	**1,038**
AQUILLA WSD								
MUNICIPAL	ELLIS	TRINITY	268	347	399	448	502	556
MUNICIPAL	HILL	BRAZOS	4,420	4,272	4,251	4,236	4,220	4,203
MUNICIPAL	HILL	TRINITY	786	850	815	778	737	696
MUNICIPAL	NAVARRO	TRINITY	23	25	26	27	28	30
		AQUILLA WSD TOTAL	**5,497**	**5,494**	**5,497**	**5,494**	**5,491**	**5,489**
BELL COUNTY WCID #1								
MUNICIPAL	BELL	BRAZOS	53,678	53,414	52,899	50,166	49,482	48,400
MUNICIPAL	CORYELL	BRAZOS	8,571	8,451	8,335	7,873	7,749	7,571
MUNICIPAL	LAMPASAS	BRAZOS	253	330	361	374	385	386
		BELL COUNTY WCID #1 TOTAL	**62,502**	**62,195**	**62,502**	**62,195**	**61,595**	**58,413**
BISTONE MWSD								
MUNICIPAL	LIMESTONE	BRAZOS	1,486	1,411	1,340	1,272	1,200	1,128
MUNICIPAL	LIMESTONE	TRINITY	869	827	783	737	692	648
		BISTONE MWSD TOTAL	**2,355**	**2,238**	**2,355**	**2,238**	**2,123**	**2,009**

Table 4.3-27. WWP Projected Contract Water Use by Type, County and Basin

Buyer/Use	County	Basin	Year					
			2020	2030	2040	2050	2060	2070
BLUEBONNET WSC								
MUNICIPAL	BELL	BRAZOS	1,572	1,569	1,557	1,519	1,501	1,469
MUNICIPAL	CORYELL	BRAZOS	57	56	56	53	52	51
MUNICIPAL	FALLS	BRAZOS	3	3	3	3	2	2
MUNICIPAL	MCLENNAN	BRAZOS	5,276	5,245	5,188	5,036	4,964	4,849
BLUEBONNET WSC TOTAL			**6,908**	**6,873**	**6,908**	**6,873**	**6,804**	**6,611**
BRAZOS RIVER AUTHORITY								
IRRIGATION	BELL	BRAZOS	308	307	304	288	284	278
IRRIGATION	BRAZOS	BRAZOS	350	349	347	346	345	344
IRRIGATION	BURNET	BRAZOS	89	89	89	89	89	89
IRRIGATION	COMANCHE	BRAZOS	4,968	3,616	3,474	4,557	3,988	3,511
IRRIGATION	HILL	BRAZOS	1,000	1,000	1,000	1,000	1,000	1,000
IRRIGATION	HOOD	BRAZOS	4,060	4,060	4,060	4,060	4,060	4,060
IRRIGATION	PALO PINTO	BRAZOS	550	550	550	550	550	550
IRRIGATION	PARKER	BRAZOS	393	393	393	393	393	393
IRRIGATION	PARKER	TRINITY	107	107	107	107	107	107
IRRIGATION	WALLER	BRAZOS	50	50	50	50	50	50
IRRIGATION	WILLIAMSON	BRAZOS	67	67	67	66	66	66
MANUFACTURING	HOOD	BRAZOS	10,000	10,000	10,000	10,000	10,000	10,000
MANUFACTURING	PALO PINTO	BRAZOS	1,200	1,200	1,200	1,200	1,200	1,200
MINING	HILL	BRAZOS	1,000	952	843	901	878	855
MINING	HILL	TRINITY	0	32	124	50	56	63
MINING	PALO PINTO	BRAZOS	1,235	1,219	1,202	1,186	1,169	1,153
MINING	PARKER	BRAZOS	27	22	16	11	6	0
MINING	PARKER	TRINITY	17	13	10	7	3	0
MINING	STEPHENS	BRAZOS	1,000	1,000	1,000	1,000	1,000	1,000
MINING	STONEWALL	BRAZOS	175	175	175	175	175	175
MUNICIPAL	BELL	BRAZOS	25,590	24,087	24,655	24,554	24,939	26,345
MUNICIPAL	BRAZOS	BRAZOS	938	938	938	938	938	938
MUNICIPAL	BURNET	BRAZOS	201	239	273	304	333	358
MUNICIPAL	CORYELL	BRAZOS	5,401	5,266	5,096	4,662	4,715	4,456
MUNICIPAL	EASTLAND	BRAZOS	21	22	22	22	21	21
MUNICIPAL	ELLIS	TRINITY	18	19	20	20	20	20

Table 4.3-27. WWP Projected Contract Water Use by Type, County and Basin

Buyer/Use	County	Basin	Year					
			2020	2030	2040	2050	2060	2070
MUNICIPAL	FALLS	BRAZOS	1,300	1,300	1,300	1,300	1,300	1,300
MUNICIPAL	FORT BEND	BRAZOS	5,732	5,700	5,670	5,639	5,607	5,578
MUNICIPAL	FORT BEND	SAN JACINTO	30	31	30	30	30	30
MUNICIPAL	HILL	BRAZOS	202	199	198	196	194	193
MUNICIPAL	HILL	TRINITY	27	27	26	26	26	26
MUNICIPAL	HOOD	BRAZOS	7,695	7,709	7,705	7,691	7,679	7,669
MUNICIPAL	JOHNSON	BRAZOS	6,239	6,120	5,885	5,674	5,458	5,215
MUNICIPAL	JOHNSON	TRINITY	2,282	2,173	2,053	1,917	1,761	1,594
MUNICIPAL	LAMPASAS	BRAZOS	1,189	1,143	1,087	1,041	994	950
MUNICIPAL	LIMESTONE	BRAZOS	200	200	200	200	200	200
MUNICIPAL	MCLENNAN	BRAZOS	461	461	459	437	432	422
MUNICIPAL	PALO PINTO	BRAZOS	1,851	1,852	1,853	1,854	1,855	1,855
MUNICIPAL	PARKER	BRAZOS	561	561	561	561	561	561
MUNICIPAL	ROBERTSON	BRAZOS	182	182	182	182	182	182
MUNICIPAL	SHACKELFORD	BRAZOS	3	3	3	3	3	3
MUNICIPAL	STEPHENS	BRAZOS	435	435	433	434	434	434
MUNICIPAL	TARRANT	TRINITY	174	161	148	134	119	104
MUNICIPAL	THROCKMORTON	BRAZOS	25	23	24	22	22	22
MUNICIPAL	TRAVIS	COLORADO	225	203	177	146	123	102
MUNICIPAL	WASHINGTON	BRAZOS	3,909	3,909	3,909	3,909	3,909	3,909
MUNICIPAL	WILLIAMSON	BRAZOS	48,434	48,586	47,813	45,482	43,980	42,481
MUNICIPAL	YOUNG	BRAZOS	1,000	1,000	1,000	1,000	1,000	1,000
STEAM ELECTRIC	BOSQUE	BRAZOS	6,500	6,374	6,248	6,122	5,996	5,870
STEAM ELECTRIC	GRIMES	BRAZOS	2,520	2,460	2,399	2,339	2,278	2,218
STEAM ELECTRIC	GRIMES	SAN JACINTO	1,080	1,054	1,028	1,002	976	950
STEAM ELECTRIC	HOOD	BRAZOS	43,447	43,447	43,447	43,447	43,271	40,337
STEAM ELECTRIC	LIMESTONE	BRAZOS	21,837	21,530	21,223	20,916	20,609	20,302
STEAM ELECTRIC	MILAM	BRAZOS	2,683	4,329	4,352	4,673	4,609	4,508
STEAM ELECTRIC	PALO PINTO	BRAZOS	11,600	11,445	11,290	11,134	10,979	10,824
STEAM ELECTRIC	ROBERTSON	BRAZOS	25,000	24,819	24,638	24,457	24,275	24,094
STEAM ELECTRIC	SOMERVELL	BRAZOS	40,000	40,000	40,000	40,000	40,000	40,000
STEAM ELECTRIC	YOUNG	BRAZOS	14,000	14,000	14,000	14,000	14,000	14,000
BRAZOS RIVER AUTHORITY TOTAL			**309,588**	**307,208**	**309,588**	**307,208**	**305,356**	**302,504**

Table 4.3-27. WWP Projected Contract Water Use by Type, County and Basin

Buyer/Use	County	Basin	Year					
			2020	2030	2040	2050	2060	2070
BRYAN								
MANUFACTURING	BRAZOS	BRAZOS	95	95	95	95	95	95
MUNICIPAL	BRAZOS	BRAZOS	2,168	1,967	2,893	5,950	9,474	13,570
MUNICIPAL	GRIMES	BRAZOS	379	314	257	214	179	151
MUNICIPAL	GRIMES	TRINITY	51	43	35	29	25	21
MUNICIPAL	ROBERTSON	BRAZOS	140	100	62	21	17	15
STEAM ELECTRIC	BRAZOS	BRAZOS	1	1	1	1	1	1
		BRYAN TOTAL	**2,834**	**2,520**	**2,834**	**2,520**	**3,343**	**6,310**
CEDAR PARK								
MANUFACTURING	WILLIAMSON	BRAZOS	790	912	1,033	1,142	1,243	1,355
MUNICIPAL	TRAVIS	COLORADO	201	201	201	202	201	202
MUNICIPAL	WILLIAMSON	BRAZOS	1,886	1,886	1,886	1,885	1,886	1,885
MUNICIPAL	WILLIAMSON	COLORADO	10	9	8	7	6	5
		CEDAR PARK TOTAL	**2,887**	**3,008**	**2,887**	**3,008**	**3,128**	**3,236**
CENTRAL TEXAS WSC								
MUNICIPAL	BELL	BRAZOS	6,276	6,257	6,252	6,254	6,238	6,227
MUNICIPAL	FALLS	BRAZOS	1,375	1,360	1,330	1,287	1,273	1,259
MUNICIPAL	MILAM	BRAZOS	1,741	1,735	1,723	1,721	1,709	1,695
MUNICIPAL	WILLIAMSON	BRAZOS	848	888	935	978	1,020	1,059
		CENTRAL TEXAS WSC TOTAL	**10,240**	**10,240**	**10,240**	**10,240**	**10,240**	**10,240**
CLEBURNE								
IRRIGATION	JOHNSON	BRAZOS	102	100	99	97	96	94
IRRIGATION	JOHNSON	TRINITY	100	99	97	96	94	93
MANUFACTURING	JOHNSON	BRAZOS	2,329	2,714	3,105	3,455	3,801	4,182
STEAM ELECTRIC	JOHNSON	BRAZOS	1,344	1,344	1,344	1,344	1,344	1,344
		CLEBURNE TOTAL	**3,875**	**4,257**	**3,875**	**4,257**	**4,645**	**4,992**
EASTLAND COUNTY WSD								
MANUFACTURING	EASTLAND	BRAZOS	72	77	82	85	91	97
MUNICIPAL	EASTLAND	BRAZOS	5,219	5,219	5,219	5,219	5,219	5,219
		EASTLAND COUNTY WSD TOTAL	**5,291**	**5,296**	**5,291**	**5,296**	**5,301**	**5,304**
GATESVILLE								
MANUFACTURING	CORYELL	BRAZOS	10	11	12	13	14	15
MUNICIPAL	CORYELL	BRAZOS	1,311	1,401	1,508	1,603	1,710	1,818

Table 4.3-27. WWP Projected Contract Water Use by Type, County and Basin

Buyer/Use	County	Basin	Year 2020	2030	2040	2050	2060	2070
MUNICIPAL	MCLENNAN	BRAZOS	125	147	166	186	207	227
		GATESVILLE TOTAL	**1,446**	**1,559**	**1,446**	**1,559**	**1,686**	**1,802**
JOHNSON COUNTY SUD								
MINING	JOHNSON	BRAZOS	10	10	10	10	10	10
MINING	JOHNSON	TRINITY	10	10	10	10	10	10
MUNICIPAL	JOHNSON	BRAZOS	1,171	1,271	1,379	1,500	1,639	1,788
MUNICIPAL	JOHNSON	TRINITY	4,699	4,763	4,832	4,913	5,002	5,099
		JOHNSON COUNTY SUD TOTAL	**5,890**	**6,054**	**5,890**	**6,054**	**6,231**	**6,433**
KEMPNER WSC								
MINING	LAMPASAS	BRAZOS	25	25	25	25	25	25
MUNICIPAL	BELL	BRAZOS	183	183	183	183	183	183
MUNICIPAL	CORYELL	BRAZOS	245	243	242	241	240	240
MUNICIPAL	LAMPASAS	BRAZOS	1,346	1,348	1,351	1,354	1,352	1,347
		KEMPNER WSC TOTAL	**1,799**	**1,799**	**1,799**	**1,799**	**1,801**	**1,803**
MINERAL WELLS								
MANUFACTURING	PALO PINTO	BRAZOS	10	10	10	10	10	10
MANUFACTURING	PARKER	BRAZOS	1	1	0	0	0	1
MANUFACTURING	PARKER	TRINITY	24	24	25	25	25	24
MUNICIPAL	PALO PINTO	BRAZOS	1,158	1,158	1,158	1,158	1,158	1,158
MUNICIPAL	PARKER	BRAZOS	687	801	861	801	729	664
MUNICIPAL	PARKER	TRINITY	270	156	96	156	228	293
		MINERAL WELLS TOTAL	**2,150**	**2,150**	**2,150**	**2,150**	**2,150**	**2,150**
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY								
MUNICIPAL	BAYLOR	BRAZOS	147	147	119	89	60	28
MUNICIPAL	HASKELL	BRAZOS	739	613	489	363	239	114
MUNICIPAL	KNOX	BRAZOS	467	388	308	230	152	72
MUNICIPAL	KNOX	RED	10	8	7	5	3	2
MUNICIPAL	STONEWALL	BRAZOS	85	71	56	42	28	13
		NORTH CENTRAL TEXAS MWA TOTAL	**1,448**	**1,227**	**1,448**	**1,227**	**979**	**729**
PALO PINTO COUNTY MWD No.1								
MUNICIPAL	PALO PINTO	BRAZOS	2,768	2,883	2,950	3,031	3,110	3,177
MUNICIPAL	PARKER	BRAZOS	346	332	320	310	302	294
STEAM ELECTRIC	PALO PINTO	BRAZOS	2,241	1,966	1,737	1,492	1,247	1,014

Table 4.3-27. WWP Projected Contract Water Use by Type, County and Basin

Buyer/Use	County	Basin	Year					
			2020	2030	2040	2050	2060	2070
PALO PINTO COUNTY MWD No. 1 TOTAL			**5,355**	**5,181**	**5,355**	**5,181**	**5,007**	**4,833**
ROUND ROCK								
MANUFACTURING	WILLIAMSON	BRAZOS	565	651	780	924	1,059	1,205
MINING	WILLIAMSON	BRAZOS	3	3	3	3	3	3
MUNICIPAL	WILLIAMSON	BRAZOS	3,916	4,199	4,572	5,290	6,315	7,370
MUNICIPAL	WILLIAMSON	COLORADO	165	195	235	373	457	552
ROUND ROCK TOTAL			**4,649**	**5,048**	**4,649**	**5,048**	**5,590**	**6,590**
STAMFORD								
MUNICIPAL	HASKELL	BRAZOS	160	160	160	160	160	160
MUNICIPAL	JONES	BRAZOS	89	89	89	89	89	89
STEAM ELECTRIC	HASKELL	BRAZOS	2,200	2,200	2,200	2,200	2,200	2,200
STAMFORD TOTAL			**2,449**	**2,449**	**2,449**	**2,449**	**2,449**	**2,449**
SWEETWATER								
MANUFACTURING	NOLAN	BRAZOS	368	368	368	368	368	368
MUNICIPAL	FISHER	BRAZOS	538	533	528	525	521	519
MUNICIPAL	NOLAN	BRAZOS	272	277	282	285	289	291
MUNICIPAL	TAYLOR	BRAZOS	187	187	187	187	187	187
SWEETWATER TOTAL			**1,365**	**1,365**	**1,365**	**1,365**	**1,365**	**1,365**
TEMPLE								
MANUFACTURING	BELL	BRAZOS	481	481	481	481	481	481
MUNICIPAL	BELL	BRAZOS	3,540	3,540	3,540	3,540	3,540	3,540
TEMPLE TOTAL			**4,021**	**4,021**	**4,021**	**4,021**	**4,021**	**4,021**
UPPER LEON MWD								
MUNICIPAL	COMANCHE	BRAZOS	996	985	972	910	893	867
MUNICIPAL	EASTLAND	BRAZOS	169	168	166	156	153	149
MUNICIPAL	ERATH	BRAZOS	2,383	2,366	2,344	2,234	2,206	2,160
MUNICIPAL	HAMILTON	BRAZOS	673	665	654	599	584	562
UPPER LEON MWD TOTAL			**4,221**	**4,184**	**4,221**	**4,184**	**4,136**	**3,899**
WACO								
MANUFACTURING	MCLENNAN	BRAZOS	2,503	2,888	3,249	3,618	3,948	4,403
MUNICIPAL	MCLENNAN	BRAZOS	4,448	4,858	5,386	5,944	6,514	7,075
STEAM ELECTRIC	MCLENNAN	BRAZOS	15,000	15,000	15,000	15,000	15,000	15,000
WACO TOTAL			**21,951**	**22,746**	**21,951**	**22,746**	**23,635**	**24,562**

Table 4.3-27. WWP Projected Contract Water Use by Type, County and Basin

Buyer/Use	County	Basin	Year					
			2020	2030	2040	2050	2060	2070
WEST CENTRAL TEXAS MWD								
MUNICIPAL	JONES	BRAZOS	1,324	1,027	1,029	1,031	1,032	1,032
MUNICIPAL	SHACKELFORD	BRAZOS	448	460	465	466	466	466
MUNICIPAL	STEPHENS	BRAZOS	1,700	1,703	1,707	1,711	1,714	1,718
MUNICIPAL	TAYLOR	BRAZOS	6,852	344	383	442	451	446
WEST CENTRAL TEXAS MWD TOTAL			**10,324**	**3,534**	**10,324**	**3,534**	**3,584**	**3,650**

4.4 Water Supplied to Meet Demands Not in Brazos G

Existing or recommended water contracts in the Brazos G Area that are currently or projected to provide water to another region are included in the wholesale water provider summary tables (Table 4.3-1 through Table 4.3-26). These supplies have been coordinated with the adjacent regions.

4.5 Social and Economic Impacts of Not Meeting Projected Water Needs

Section 357.7(4) of the rules for implementing Senate Bill 1 requires that the social and economic impacts of not meeting regional water supply needs be evaluated by regional water planning groups. TWDB has provided technical assistance by conducting the required analysis for the Brazos G Area using a methodology similar to that used for other regions.

The purpose of this element of Senate Bill 1 planning is to provide an estimate of the social and economic importance of meeting projected water needs or, conversely, to provide estimates of potential costs of not meeting the projected needs of each water user group. The social and economic effects of not meeting a projected water need can be viewed as the potential benefit to be gained from implementing a strategy to meet the particular need. The summation of all the impacts gives a view of the ultimate magnitude of the economic impacts of not meeting all of the projected needs.

The information provided by the TWDB is summarized in a report included in Appendix H.

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5

County and WWP Plans

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5 County and WWP Plans

5.1 Bell County Water Supply Plan

Table 5.1-1 lists each water user group in Bell County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.1-1. Bell County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
439 WSC	242	(94)	Projected shortage – see plan below
Armstrong WSC	837	769	Projected surplus
City of Bartlett			See Williamson County
Bell-Milam Falls WSC	1,677	1,528	Projected surplus
City of Belton	2,413	(41)	Projected shortage – see plan below
Chisholm Trail SUD			See Williamson County
Dog Ridge WSC	1,076	806	Projected surplus
East Bell WSC	857	641	Projected surplus
Elm Creek WSC	23	(230)	Projected shortage – see plan below
Fort Hood	2,878	1,796	Projected surplus
City of Harker Heights	(938)	(3,170)	Projected shortage – see plan below
City of Holland	383	382	Projected surplus
Jarrell-Schwertner WSC			See Williamson County
Kempner WSC			See Lampasas County
City of Killeen	14,664	2,059	Projected surplus
Little River Academy	(59)	(190)	Projected shortage – see plan below
Moffat WSC	825	701	Projected surplus
Morgan's Point Resort	1,148	814	Projected surplus
City of Nolanville	(858)	(2,188)	Projected shortage – see plan below
Pendleton WSC	241	179	Projected surplus
City of Rogers	424	394	Projected surplus
Salado WSC	219	(278)	Projected shortage – see plan below
City of Temple	(4,373)	(13,337)	Projected shortage – see Chapter 5.38
City of Troy	987	933	Projected surplus
West Bell WSC	860	863	Projected surplus

Table 5.1-1. Bell County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
County-Other	(768)	(3,788)	Projected shortage – see plan below
Manufacturing	(1,110)	(1,497)	Projected shortage – see plan below
Steam-Electric	(5,804)	(9,693)	Projected shortage – see plan below
Mining	(4,599)	(6,968)	Projected shortage – see plan below
Irrigation	(1,103)	(1,038)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-1 and C-2, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.1.1 439 WSC

Description of Supply

439 WSC has a contract to purchase water from the Brazos River Authority from Lake Belton. 439 WSC contracts with Bell County WCID No. 1 to divert, treat, and deliver water from Lake Belton to the WSC, as well as purchase some allotment from Bell County WCID No. 1. Shortages are projected for 439 WSC beginning in 2060.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for 439 WSC.

a. Purchase reuse water from Bell County WCID#1

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: by 2070
- Project Cost: Costs to be borne by Bell County WCID No. 1
- Unit Cost: $930/acft

a. Water Supply from Bell County WCID No. 1

BRA provides this supply under contract to entity. BRA to develop any combinations of strategies as described in Section 5.38.2 to firm up this amount.

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2030
- Project Cost: cost borne by BRA
- Unit Cost: already contracted supplies

Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.1-2. Recommended Plan Costs by Decade for 439 WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*455*	*355*	*242*	*48*	*(47)*	*(94)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*455*	*355*	*242*	*48*	*(47)*	*(94)*
Reuse Supply from Bell County WCID No. 1						
Supply From Plan Element (acft/yr)	—	—	—	—	—	20
Annual Cost ($/yr)	—	—	—	—	—	$18,600
Unit Cost ($/acft)	—	—	—	—	—	$930
Projected Surplus/(Shortage) after Reuse (acft/yr)	*455*	*355*	*242*	*48*	*(47)*	*(74)*
Water Supply from Bell County WCID No.1						
Supply From Plan Element (acft/yr)	—	4	11	49	59	74
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/acft)	—	$0	$0	$0	$0	$0

5.1.2 Armstrong WSC

Description of Supply

Armstrong WSC obtains its water supply from the Trinity Aquifer and surface water from Central Texas WSC. No shortages are projected and no change in water supply is recommended.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Armstrong WSC.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $18,330 in 2030

Table 5.1-3. Recommended Plan Costs by Decade for Armstrong WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*865*	*853*	*837*	*817*	*793*	*769*
Conservation						
Supply From Plan Element (acft/yr)	14	39	32	29	30	32
Annual Cost ($/yr)	$6,580	$18,330	$15,040	$13,630	$14,100	$15,040
Projected Surplus/(Shortage) after Conservation (acft/yr)	*878*	*892*	*869*	*846*	*823*	*800*

5.1.3 Bell-Milam Falls WSC

Bell-Milam Falls WSC is located in multiple counties (Bell, Falls, Milam and Williamson) and obtains its water supply from the Trinity Aquifer and has a contract for surface water from Lake Stillhouse Hollow from Central Texas WSC. Totals shown in Table 5.1-1 represent cumulative totals for Bell-Milam Falls WSC. No shortages are projected and no changes to water supply are recommended for Bell-Milam Falls WSC. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.4 City of Belton

Description of Supply

The City of Belton has a contract to purchase water from the Brazos River Authority from Lake Belton. Belton contracts with Bell County WCID No. 1 to divert, treat, and deliver water from Lake Belton to the City. The City also has a contract with Central Texas WSC. Shortages are projected for the City of Belton in 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Belton.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $178,130 in 2070

b. Water Supply from Bell County WCID No. 1

BRA provides this supply under contract to entity. BRA to develop any combinations of strategies as described in Section 5.38.2 to firm up this amount.

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2030

- Project Cost: cost borne by BRA
- Unit Cost: already contracted supplies

Table 5.1-4. Recommended Plan Costs by Decade for City of Belton

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*3,592*	*3,049*	*2,413*	*1,434*	*722*	*(41)*
Conservation						
Supply From Plan Element (acft/yr)	119	340	318	321	347	379
Annual Cost ($/yr)	$55,930	$159,800	$149,460	$150,870	$163,090	$178,130
Projected Surplus/(Shortage) after Conservation (acft/yr)	*3,711*	*3,390*	*2,731*	*1,755*	*1,069*	*338*
Water Supply from Bell County WCID No.1						
Supply From Plan Element (acft/yr)	—	29	87	390	466	586
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/acft)	—	$0	$0	$0	$0	$0

5.1.5 Dog Ridge WSC

Dog Ridge WSC has surface water contracts with BRA and Central Texas WSC. No shortages are projected for Dog Ridge WSC and no changes in water supply are recommended. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.6 East Bell WSC

East Bell WSC obtains its water supply from the Trinity Aquifer and treated surface water from Central Texas WSC. This WUG is located in multiple counties (Bell and Falls) and the surplus/shortages shown in Table 5.1-1 represent the cumulative totals for East Bell WSC. Supplies are projected to be adequate to meet future demands and no change is recommended in water supplies. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.7 Elm Creek WSC

Description of Supply

Elm Creek WSC service area includes portions of Bell, Coryell, and McLennan Counties. Elm Creek WSC has a contract to purchase water from Bluebonnet WSC from Lake Belton. The surpluses and shortages shown in Table 5.1-5 represent the cumulative totals for Elm Creek WSC in the counties it serves. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Elm Creek WSC.

a. Water Supply from Bluebonnet WSC

BRA provides this supply under contract to entity. BRA to develop any combinations of strategies as described in Section 5.38.2 to firm up this amount.

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2050
- Project Cost: cost borne by BRA
- Unit Cost: already contracted supplies

Table 5.1-5. Recommended Plan Costs by Decade for Elm Creek WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*156*	*94*	*23*	*(63)*	*(144)*	*(230)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*156*	*94*	*23*	*(63)*	*(144)*	*(230)*
Water Supply from Bluebonnet WSC						
Supply From Plan Element (acft/yr)	—	—	—	63	144	230
Annual Cost ($/yr)	—	—	—	$0	$0	$0
Unit Cost ($/acft)	—	—	—	$0	$0	$0

5.1.8 Fort Hood

Description of Supply

The U.S. Department of the Army (Fort Hood) has a water right to store and divert 12,000 acft/yr in Lake Belton. The Fort Hood service area includes portions of Bell and Coryell Counties. Bell County WCID No. 1 and City of Gatesville divert, treat and deliver its Lake Belton supply to the Army base. No shortages are projected for Fort Hood and no changes in water supply are recommended. The surplus shown in Table 5.1-6 represents the cumulative totals for Fort Hood in the counties it serves.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Fort Hood.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $1,002,980 in 2060

Table 5.1-6. Recommended Plan Costs by Decade for Fort Hood

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/ (Shortage) (acft/yr)	*3,430*	*3,139*	*2,878*	*2,520*	*2,163*	*1,796*
Conservation						
Supply From Plan Element (acft/yr)	293	842	1,376	1,946	2,134	2,133
Annual Cost ($/yr)	$137,710	$395,740	$646,720	$914,620	$1,002,980	$1,002,510
Projected Surplus/ (Shortage) after Conservation (acft/yr)	*3,723*	*3,981*	*4,254*	*4,466*	*4,297*	*3,929*

5.1.9 City of Harker Heights

Description of Supply

The City of Harker Heights has a contract to purchase water from the Brazos River Authority from Lake Stillhouse Hollow and Lake Belton. Harker Heights also contracts with Bell County WCID No. 1 to divert, treat, and deliver water from Lake Belton to the City.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the City of Harker Heights. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $112,338 in 2030
- Unit Cost: $474/acft

b. Purchase reuse water from Bell County WCID No. 1. The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020

- Project Cost: $1,615,000 (City's portion)
- Unit Cost: $930/acft

c. Water Supply from Bell County WCID No. 1

BRA provides this supply under contract to entity. BRA to develop any combinations of strategies as described in Section 5.38.2 to firm up this amount.

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2030
- Project Cost: cost borne by BRA
- Unit Cost: already contracted supplies

d. Firm up Supplies through BRA Little River Strategies

BRA provides this supply under contract to entity. BRA to develop any combinations of strategies as described in Section 5.38.2 to firm up this amount.

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2020
- Project Cost: cost borne by BRA
- Unit Cost: already contracted supplies

e. Purchase Water from City of Killeen

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2070
- Project Cost: $2,580,000
- Unit Cost: $1,791/acft (wholesale water rate from City of Killeen and transmission costs)

Table 5.1-7. Recommended Plan Costs by Decade for City of Harker Heights

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*932*	*26*	*(938)*	*(1,496)*	*(1,974)*	*(3,170)*
Conservation						
Supply From Plan Element (acft/yr)	262	836	1,367	1,499	1,656	1,819
Annual Cost ($/yr)	$124,188	$396,264	$647,958	$710,526	$784,944	$862,206
Projected Surplus/(Shortage) after Conservation	*1,195*	*862*	*429*	*4*	*(318)*	*(1,351)*
Bell County WCID No. 1 Reuse						
Supply From Plan Element (acft/yr)	185	185	185	185	185	185
Annual Cost ($/yr)	$172,050	$172,050	$37,185	$37,185	$37,185	$37,185
Unit Cost ($/yr)	$930	$930	$201	$201	$201	$201

Table 5.1-7. Recommended Plan Costs by Decade for City of Harker Heights

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) after Reuse (acft/yr)	*1,378*	*1,046*	*612*	*188*	*(134)*	*(1,167)*
Water Supply from Bell County WCID No. 1						
Supply From Plan Element (acft/yr)	—	26	76	344	412	518
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/yr)	—	$0	$0	$0	$0	$0
Firm up Supplies through BRA Little River System Strategies-See section 5.38.2						
Supply From Plan Element (acft/yr)	1,645	1,671	1,621	891	276	347
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/yr)	$0	$0	$0	$0	$0	$0
Purchase from City of Killeen						
Supply From Plan Element (acft/yr)	—	—	—	—	—	302
Annual Cost ($/yr)	—	—	—	—	—	$540,882
Unit Cost ($/yr)	—	—	—	—	—	$1,791

5.1.10 City of Holland

The City of Holland has Trinity supplies and a contract to purchase water from the Central Texas WSC from Lake Stillhouse Hollow. No shortages are projected for the City of Holland and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.11 City of Killeen

Description of Supply

The City of Killeen has a contract to purchase water from Bell County WCID No. 1 to divert, treat, and deliver water from Lake Belton to the City. The city receives some 0.5 mgd of reuse supplies from Bell County WCID No. 1. No shortages are projected for the City of Killeen and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Bell County WCID No.1 is pursuing a strategy to provide reuse supplies for non-potable demands at Killeen. The strategy would supply 2,488 acft/yr for irrigation at golf courses, parks and cemeteries.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Killeen.

a. Water Supply from Bell County WCID No. 1

BRA provides this supply under contract to entity. BRA to develop any combinations of strategies as described in Section 5.38.2 to firm up this amount.

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2030
- Project Cost: cost borne by BRA
- Unit Cost: already contracted supplies

b. Purchase reuse water from Bell County WCID No. 1. The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers. The current use of 0.5 mgd of reuse supply is included as part of this strategy and not counted as current supply.

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Project Cost: construction costs to be borne by Bell County WCID No. 1
- Unit Cost: $811/acft

Table 5.1-8. Recommended Plan Costs by Decade for the City of Killeen

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*20,490*	*17,859*	*14,664*	*9,595*	*5,969*	*2,059*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*20,490*	*17,859*	*14,664*	*9,595*	*5,969*	*2,059*
Bell County WCID No. 1 Reuse						
Supply From Plan Element (acft/yr)	2,488	2,488	2,488	2,488	2,488	2,488
Annual Cost ($/yr)	$2,018,000	$2,018,000	$2,018,000	$2,018,000	$2,018,000	$2,018,000
Unit Cost ($/yr)	$811	$811	$811	$811	$811	$811
Projected Surplus/(Shortage) after Reuse	*22,985*	*20,354*	*17,159*	*12,090*	*8,464*	*4,554*
Water Supply from Bell County WCID No. 1						
Supply From Plan Element (acft/yr)	—	196	580	2,614	3,124	3,929
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/yr)	—	$0	$0	$0	$0	$0

5.1.12 Little River Academy

Description of Supply

Little River Academy obtains its water supply from the Trinity Aquifer and a contract for treated supplies from City of Temple. Little River Academy is projected to have a shortage beginning in 2030.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Little River Academy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $112,338 in 2030
- Unit Cost: $474/acft

b. Voluntary Redistribution from City of Temple

- Cost Source: City of Temple wholesale water rate
- Date to be Implemented: 2030
- Project Cost: assumes infrastructure in place to deliver supply
- Unit Cost: $977/acft/yr - wholesale water rate from City of Temple

Table 5.1-9. Recommended Plan Costs by Decade for Little River Academy

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/ (Shortage) (acft/yr)	*11*	*(21)*	*(59)*	*(102)*	*(146)*	*(190)*
Conservation						
Supply From Plan Element (acft/yr)	12	19	13	11	11	11
Annual Cost ($/yr)	$5,640	$8,930	$6,110	$5,170	$5,170	$5,170
Projected Surplus/(Shortage) after Conservation	*23*	*(2)*	*(46)*	*(91)*	*(135)*	*(179)*
Voluntary Redistribution from City of Temple						
Supply From Plan Element (acft/yr)	—	180	180	180	180	180
Annual Cost ($/yr)	—	$175,860	$175,860	$175,860	$175,860	$175,860
Unit Cost ($/yr)	—	$977	$977	$977	$977	$977

5.1.13 Moffat WSC

Moffat WSC has a contract to purchase water from the Brazos River Authority and Bluebonnet WSC from Lake Belton, as well as supplemental wells in the Trinity Aquifer. No shortages are projected for Moffat WSC and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.14 Morgan's Point Resort

Morgan's Point Resort contracts with the City of Temple for all of its water supply. No shortages are projected for Morgan's Point Resort and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.15 City of Nolanville

Description of Supply

The City of Nolanville contracts with Bell County WCID No. 1 to divert, treat, and deliver water from Lake Belton to the City. Exempt well use in the Trinity Aquifer inside the city limits meets a portion of the demand. Shortages are projected for Nolanville beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Nolanville.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $471,410 in 2070
- Unit Cost: $470/acft

b. Water Supply from Bell County WCID No. 1

BRA provides this supply under contract to entity. BRA to develop any combinations of strategies as described in Section 5.38.2 to firm up this amount.

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2030
- Project Cost: cost borne by BRA
- Unit Cost: already contracted supplies

c. Voluntary Redistribution of Bell County WCID No.1 supply

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020

- Project Cost: assumes infrastructure in place to deliver supply
- Unit Cost: $185.76/acft ($0.58/1,000 gallons)

Table 5.1-10. Recommended Plan Costs by Decade for City of Nolanville

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(72)*	*(444)*	*(858)*	*(1,330)*	*(1,758)*	*(2,188)*
Conservation						
Supply From Plan Element (acft/yr)	67	224	444	721	884	1,003
Annual Cost ($/yr)	$31,490	$105,280	$208,680	$338,400	$415,480	$471,410
Projected Surplus/(Shortage) after Conservation	*(5)*	*(220)*	*(415)*	*(609)*	*(875)*	*(1,185)*
Water Supply from Bell County WCID No. 1						
Supply From Plan Element (acft/yr)	—	5	14	65	77	97
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/yr)	—	$0	$0	$0	$0	$0
Voluntary Redistribution of Bell County WCID No.1 supply						
Supply From Plan Element (acft/yr)	5	215	401	544	798	1,088
Annual Cost ($/yr)	$929	$39,939	$74,491	$101,055	$148,239	$202,110
Unit Cost ($/yr)	$186	$186	$186	$186	$186	$186

5.1.16 Pendleton WSC

Pendleton WSC has wells in the Trinity Aquifer and a contract to purchase water from Bluebonnet WSC from Lake Belton. No shortages are projected for Pendleton WSC and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.17 City of Rogers

The City of Rogers has wells in the Trinity Aquifer and purchases treated surface water from Central Texas WSC. No shortages are projected for the City of Rogers and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.18 Salado WSC

Description of Supply

Salado WSC currently obtains water from the Edwards Aquifer, and purchases treated supply from Kempner WSC. The entity also has a contract with the BRA that has yet to be utilized. A shortage is projected in 2060 for Salado WSC.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Salado WSC.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum $490,680 in 2070
- Unit Cost: $470/acft

Table 5.1-11. Recommended Plan Costs by Decade for Salado WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*510*	*373*	*219*	*54*	*(112)*	*(278)*
Conservation						
Supply From Plan Element (acft/yr)	97	255	431	624	830	1,044
Annual Cost ($/yr)	$45,590	$119,850	$202,570	$293,280	$390,100	$490,680
Projected Surplus/(Shortage) after Conservation	*607*	*628*	*650*	*678*	*718*	*766*

5.1.19 City of Temple

The City of Temple obtains its water supply from surface water from Lake Belton through the BRA and run-of-the river water rights. The City supplies several neighboring communities with treated water. The City is projected to have a shortage of supplies through the planning period. Refer to Chapter 5.38 for the City's plan as a Wholesale Water Provider.

5.1.20 City of Troy

The City of Troy obtains its water from a contract with the City of Temple and wells located in the Trinity Aquifer. No shortages are projected for the City of Troy and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.21 West Bell County WSC

West Bell County WSC obtains its water through a contract with the Central Texas WSC. No shortages are projected for West Bell County WSC and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.1.22 Bell County-Other

Description of Supply

Bell County-Other entities obtain water supply from groundwater from the Trinity Aquifer and treated surface water from Bell County WCID No. 1, Central Texas WSC and City of Temple. Shortages are projected for County Other by 2040.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Bell County-Other.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum $68,448 in 2070
- Unit Cost: $496/acft

b. Water Supply from Bell County WCID No. 1

BRA provides this supply under contract to entity. BRA to develop any combinations of strategies as described in Section 5.38.2 to firm up this amount.

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2030
- Project Cost: cost borne by BRA
- Unit Cost: already contracted supplies

c. Voluntary Redistribution from Central Texas WSC

- Cost Source: Central Texas WSC wholesale water rate
- Date to be Implemented: 2030
- Project Cost: assumes infrastructure in place to deliver supply
- Unit Cost: $250/acft/yr

d. Groundwater Development – Edwards BFZ

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2040
- Project Cost: $3,736,000
- Unit Cost: $183/acft

Table 5.1-12. Recommended Plan Costs by Decade for Bell County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,084*	*234*	*(768)*	*(1,828)*	*(2,824)*	*(3,788)*
Conservation						
Supply From Plan Element (acft/yr)	14	62	73	94	117	138
Annual Cost ($/yr)	$6,944	$30,752	$36,208	$46,624	$58,032	$68,448
Projected Surplus/(Shortage) after Conservation	*1,098*	*297*	*(695)*	*(1,734)*	*(2,707)*	*(3,649)*
Water Supply from Bell County WCID#1						
Supply From Plan Element (acft/yr)	—	4	11	49	59	74
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/acft)	—	$0	$0	$0	$0	$0
Increase Contract with Bell County WCID No. 1						
Supply From Plan Element (acft/yr)	—	—	23	467	731	995
Annual Cost ($/yr)	—	—	$4,342	$86,782	$136,025	$185,036
Unit Cost ($/acft)	—	—	$185.76	$185.76	$185.76	$185.76
Voluntary Redistribution from Central Texas WSC						
Supply From Plan Element (acft/yr)	—	—	500	500	500	500
Annual Cost ($/yr)	—	—	$125,000	$125,000	$125,000	$125,000
Unit Cost ($/acft)	—	—	$250	$250	$250	$250
Groundwater Development – Edwards BFZ						
Supply From Plan Element (acft/yr)	—	—	2,081	2,081	2,081	2,081
Annual Cost ($/yr)	—	—	$380,626	$380,626	$103,626	$103,626
Unit Cost ($/acft)	—	—	$183	$183	$50	$50

5.1.23 Manufacturing

Description of Supply

Water supply for manufacturing in Bell County is obtained by purchase from a city or water supply corporation. Bell County Manufacturing is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Bell County Manufacturing.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: Not determined

b. Groundwater Development – Edwards BFZ

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $10,290,000
- Unit Cost: Max of $883/acft/yr

c. Alternative: Reuse Supplies from Bell County WCID No. 1

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Project Cost: costs to be borne by Bell County WCID No. 1
- Unit Cost: $765/acft

Table 5.1-13. Recommended Plan Costs by Decade for Bell County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/ (Shortage) (acft/yr)	*(873)*	*(993)*	*(1,110)*	*(1,214)*	*(1,350)*	*(1,497)*
Conservation						
Supply From Plan Element (acft/yr)	41	75	112	120	129	140
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/ (Shortage) after Conservation	*(832)*	*(919)*	*(998)*	*(1,094)*	*(1,221)*	*(1,357)*
Groundwater Development – Edwards BFZ						
Supply From Plan Element (acft/yr)	1,000	1,000	1,000	1,360	1,360	1,360
Annual Cost ($/yr)	$883,000	$883,000	$297,000	$403,351	$403,351	$403,351
Unit Cost ($/acft)	$883	$883	$297	$297	$297	$297
Alternative: Purchase Reuse Supplies from Bell County WCID No. 1						
Supply From Plan Element (acft/yr)	1,000	1,000	1,000	1,360	1,360	1,360
Annual Cost ($/yr)	$765,000	$765,000	$765,000	$1,040,400	$1,040,400	$1,040,400
Unit Cost ($/acft)	$765	$765	$765	$765	$765	$765

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location.

5.1.24 Steam-Electric

Description of Supply

Steam-Electric is projected to have a shortage through the planning period. The City of Temple has also recently entered into an agreement with Panda Temple Power L.L.C. to supply up to 7.5 MGD to a proposed new generating facility.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Bell County Steam-Electric. Conservation was also considered, however much of the new demands would be new construction, and would incorporate water efficient technologies.

a. Reuse supplies from City of Temple
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: N/A
   - Unit Cost: $138/acft or $0.42/1000 gal

b. Purchase Additional Reuse Supplies from the City of Temple
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2070
   - Project Cost: N/A
   - Unit Cost: $138/acft or $0.42/1000 gal

Table 5.1-14. Recommended Plan Costs by Decade for Bell County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(4,220)*	*(4,934)*	*(5,804)*	*(6,865)*	*(8,157)*	*(9,693)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(4,220)*	*(4,934)*	*(5,804)*	*(6,865)*	*(8,157)*	*(9,693)*
Reuse Supplies from City of Temple						
Supply From Plan Element (acft/yr)	8,407	8,407	8,407	8,407	8,407	8,407
Annual Cost ($/yr)	$1,160,000	$1,160,000	$1,160,000	$1,160,000	$1,160,000	$1,160,000
Unit Cost ($/acft)	$138	$138	$138	$138	$138	$138
Projected Surplus/(Shortage) after Conservation (acft/yr)	*4,187*	*3,473*	*2,603*	*1,542*	*250*	*(1,286)*

Table 5.1-14. Recommended Plan Costs by Decade for Bell County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Purchase Additional Reuse Supplies from the City of Temple						
Supply From Plan Element (acft/yr)	—	—	—	—	—	1,300
Annual Cost ($/yr)	—	—	—	—	—	$179,400
Unit Cost ($/acft)	—	—	—	—	—	$138

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.1.25 Mining

Description of Supply

Mining in Bell County has no current supply allocation and is projected to have a shortage through the planning period.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Bell County-Mining.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: 2020
   - Annual Cost: not determined

b. Groundwater Development – Edwards BFZ
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: $13,846,000

c. Groundwater Development – Trinity
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: $5,588,000

d. Leave Needs Unmet
   - Cost Source: Cost of not meeting needs – see Appendix H
   - Date to be Implemented: 2040

Table 5.1-15. Recommended Plan Costs by Decade for Bell County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(3,242)*	*(3,980)*	*(4,599)*	*(5,349)*	*(6,105)*	*(6,968)*
Conservation						
Supply From Plan Element (acft/yr)	97	199	322	374	427	488
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(3,145)*	*(3,781)*	*(4,277)*	*(4,975)*	*(5,678)*	*(6,480)*
Groundwater Development – Edwards BFZ						
Supply From Plan Element (acft/yr)	2,104	2,176	2,081	1,177	503	—
Annual Cost ($/yr)	$1,281,486	$1,281,486	$121,486	$121,486	$121,486	—
Unit Cost ($/acft)	$589	$589	$56	$56	$56	—
Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	582	582	582	582	260	120
Annual Cost ($/yr)	$514,267	$514,267	$46,267	$46,267	$20,540	$9,480
Unit Cost ($/acft)	$884	$884	$79	$79	$79	$79
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	459	1,023	1,614	3,216	4,915	6,360
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.1.26 Irrigation

Description of Supply

Bell County Irrigation is supplied by groundwater from the Trinity Aquifer and the Edwards Aquifer (BFZ), and run of the river water rights. Irrigation is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Bell County-Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: $230/acft

b. Groundwater Development – Edwards Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $13,384,000
- Unit Cost: Max of $1,120 in 2020

c. Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2070
- Project Cost: $2,541,000
- Unit Cost: $1,656

d. Alternative: BRA System Operation

- Cost Source: Volume II, Chapter 7.11
  - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2020
- Project Cost: Infrastructure assumed sufficient
- Unit Cost: $65.65/acft

Table 5.1-16. Recommended Plan Costs by Decade for Bell County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,157)*	*(1,127)*	*(1,103)*	*(1,088)*	*(1,061)*	*(1,038)*
Conservation						
Supply From Plan Element (acft/yr)	66	109	150	148	146	144
Annual Cost ($/yr)	$15,180	$25,070	$34,500	$34,040	$33,580	$33,120
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,091)*	*(1,019)*	*(953)*	*(940)*	*(915)*	*(894)*
Groundwater Development – Edwards Aquifer						
Supply From Plan Element (acft/yr)	1,091	1,019	953	940	915	754
Annual Cost ($/yr)	$1,222,446	$1,222,446	$101,446	$101,446	$101,446	$101,446
Unit Cost ($/acft)	$1,120	$1,120	$93	$93	$93	$93
Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	—	—	—	—	—	140
Annual Cost ($/yr)	—	—	—	—	—	$231,894
Unit Cost ($/acft)	—	—	—	—	—	$1,656

Table 5.1-16. Recommended Plan Costs by Decade for Bell County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Alternative: Purchase Supply from Brazos River Authority (System Operations)						
Supply From Plan Element (acft/yr)	1,200	1,200	1,200	1,200	1,200	1,250
Annual Cost ($/yr)	$78,780	$78,780	$78,780	$78,780	$78,780	$82,062
Unit Cost ($/acft)	$65.65	$65.65	$65.65	$65.65	$65.65	$65.65

5.1.27 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.2 Bosque County Water Supply Plan

Table 5.2-1 lists each water user group in Bosque County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.2-1. Bosque County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Childress Creek WSC	3	(15)	Projected shortage – see plan below
City of Clifton	270	206	Projected surplus
Cross Country WSC			See McLennan County
City of Meridian	249	241	Projected surplus
City of Valley Mills	14	(2)	Projected shortage – see plan below
City of Walnut Springs	93	89	Projected surplus
County-Other	124	66	Projected surplus
Manufacturing	(2,501)	(3,431)	Projected shortage – see plan below
Steam-Electric	(2,262)	(8,345)	Projected shortage – see plan below
Mining	(1,763)	(1,692)	Projected shortage – see plan below
Irrigation	(468)	(377)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-3 and C-4, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.2.1 Childress Creek WSC

Description of Supply

Childress Creek WSC obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater supply, the WSC is projected to have a shortage beginning in 2050 through year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for Childress Creek WSC. Associated costs are included for each strategy. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Rehab of Trinity Wells

- Cost Source: Volume II, Section 12.1
- Date to be Implemented: before 2050
- Project Cost:$15,000
- Unit Cost: $6/acft

b. Bosque County Regional Project

- Cost Source: Volume II, Section 8.1
- Date to be Implemented: before 2050
- Project Cost:$5,074,000 for Childress Creek WSC portion
- Unit Cost: $2,074/acft

Table 5.2-2. Recommended Plan Costs by Decade for Childress Creek WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*39*	*13*	*3*	*(4)*	*(10)*	*(15)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*39*	*13*	*3*	*(4)*	*(10)*	*(15)*
Rehab Trinity Wells						
Supply From Plan Element (acft/yr)	—	—	—	161	161	161
Annual Cost ($/yr)	—	—	—	$966	$966	$966
Unit Cost ($/acft)	—	—	—	$6	$6	$6
Bosque County Regional Project						
Supply From Plan Element (acft/yr)	203	203	203	203	203	203
Annual Cost ($/yr)	$421,000	$421,000	$214,000	$214,000	$52,000	$52,000
Unit Cost ($/acft)	$2,074	$2,074	$1,054	$1,054	$256	$256

5.2.2 City of Clifton

Description of Supply

The City of Clifton obtains its water supply from groundwater from the Trinity Aquifer and from surface water from the North Bosque River. The City of Clifton owns water rights on the North Bosque River and diverts water into a 500 acft off-channel reservoir. The project was planned to provide for additional phases to enlarge the project as demand increases. Currently, Meridian can receive up to 112 acft of treated water from Clifton and retains 10 percent of the storage volume in the off-channel reservoir. Based on the estimated availability of groundwater to the City and the firm yield of the new surface water supply project, the City of Clifton has a surplus in 2070. The ability to expand the project results in the City being a potential regional provider of water to other Bosque County entities.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for County-Other entities. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $36,531 in 2040; Unit cost of $474/acft

b. Bosque County Regional Project – includes expansion of the Clifton OCR and WTP

- Cost Source: Volume II, Section 8.1
- Date to be Implemented: before 2050
- Project Cost:$5,135,000 for the City's portion
- Unit Cost: $1,076/acft

Table 5.2-3. Recommended Plan Costs by Decade for City of Clifton

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*333*	*288*	*270*	*258*	*247*	*206*
Conservation						
Supply From Plan Element (acft/yr)	21	74	77	71	71	71
Annual Cost ($/yr)	$9,752	$35,012	$36,531	$33,745	$33,607	$33,654
Projected Surplus/(Shortage) after Conservation	*354*	*362*	*347*	*330*	*318*	*277*
Bosque County Regional Project						
Supply From Plan Element (acft/yr)	397	397	397	397	397	397
Annual Cost ($/yr)	$427,000	$427,000	$263,000	$263,000	$54,000	$54,000
Unit Cost ($/acft)	$1,076	$1,076	$662	$662	$136	$136

5.2.3 City of Meridian

Description of Supply

The City of Meridian obtains its water supply from groundwater from the Trinity Aquifer and has a contract to purchase treated water from the City of Clifton. No shortages are projected for the City of Meridian.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for County-Other entities. Associated costs are included for each strategy. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Bosque County Regional Project – includes expansion of the Clifton OCR and WTP

- Cost Source: Volume II, Section 8.1
- Date to be Implemented: 2020
- Project Cost:$3,220,000 for the City's portion
- Unit Cost: $1,223/acft

b. Alternative: Meridian Off-Channel Reservoir

- Cost Source: Volume II, Section 4.9
- Date to be Implemented: before 2050
- Project Cost:$21,702,000
- Unit Cost: $3,961/acft

Table 5.2-4. Recommended Plan Costs by Decade for City of Meridian

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/ (Shortage) (acft/yr)	*265*	*253*	*249*	*246*	*243*	*241*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/ (Shortage) after Conservation	*265*	*253*	*249*	*246*	*243*	*241*
Bosque County Regional Project						
Supply From Plan Element (acft/yr)	224	224	224	224	224	224
Annual Cost ($/yr)	$274,000	$274,000	$143,000	$143,000	$40,000	$40,000
Unit Cost ($/acft)	$1,223	$1,223	$638	$638	$179	$179
Alternative: Meridian Off-Channel Reservoir						
Supply From Plan Element (acft/yr)	615	615	615	615	615	615
Annual Cost ($/yr)	$2,436,000	$2,436,000	$1,128,000	$1,128,000	$750,000	$750,000
Unit Cost ($/acft)	$3,961	$3,961	$1,834	$1,834	$1,220	$1,220

5.2.4 City of Valley Mills

Description of Supply

The City of Valley Mills service area is primarily in Bosque County but also serves a small portion of McLennan County. The City obtains all of its water supply from groundwater from the Trinity Aquifer. Based on the groundwater supply available, the City of Valley Mills is projected to have a shortage in the year 2070. The surplus/shortages shown in Table 5.2-1 represent the cumulative totals for the City of Valley Mills.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for County-Other entities. Associated costs are included for each strategy. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Conservation

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $23,000 in 2040; Unit Cost of $474/acft

b. Bosque County Regional Project – includes expansion of the Clifton OCR and WTP

- Cost Source: Volume II, Section 8.1
- Date to be Implemented: 2020
- Project Cost:$4,730,000 for the City's portion
- Unit Cost: $2,126/acft

Table 5.2-5. Recommended Plan Costs by Decade for City of Valley Mills

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*42*	*23*	*14*	*8*	*2*	*(2)*
Conservation						
Supply From Plan Element (acft/yr)	10	31	48	47	48	48
Annual Cost ($/yr)	$4,744	$14,607	$22,969	$22,245	$22,562	$22,674
Projected Surplus/(Shortage) after Conservation	*52*	*54*	*63*	*55*	*50*	*46*
Bosque County Regional Project						
Supply From Plan Element (acft/yr)	182	182	182	182	182	182
Annual Cost ($/yr)	$387,000	$387,000	$194,000	$194,000	$43,000	$43,000
Unit Cost ($/acft)	$2,126	$2,126	$1,065	$1,065	$236	$236

5.2.5 City of Walnut Springs

Description of Supply

The City of Walnut Springs obtains its water supply from groundwater from the Trinity Aquifer. No shortages are projected for the City of Walnut Springs.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for County-Other entities. Associated costs are included for each strategy. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Alternative: Bosque County Regional Project – includes expansion of the Clifton OCR and WTP

- Cost Source: Volume II, Section 8.1
- Date to be Implemented: 2020
- Project Cost:$4,213,000 for the City's portion
- Unit Cost: $5,344/acft

Table 5.2-6. Recommended Plan Costs by Decade for City of Walnut Springs

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*98*	*94*	*93*	*92*	*90*	*89*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*98*	*94*	*93*	*92*	*90*	*89*
Alternative: Bosque County Regional Project						
Supply From Plan Element (acft/yr)	64	64	64	64	64	64
Annual Cost ($/yr)	$342,000	$342,000	$170,000	$170,000	$35,000	$35,000
Unit Cost ($/acft)	$5,344	$5,344	$2,656	$2,656	$547	$547

5.2.6 County-Other

Bosque County-Other entities obtain water supply from groundwater from the Trinity Aquifer. No shortages are projected for County Other and no changes in water supply are recommended. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.2.7 Manufacturing

Description of Supply

Water supply for manufacturing in Bosque County is obtained by purchase from a city or water supply corporation, from private wells operated by the manufacturing entity, or by limited surface water supplies.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Bosque County Manufacturing. Associated costs are included for each strategy.

a. Conservation
   - Cost Source: Volume II, Section 2
   - Date to be Implemented: before 2020
   - Annual Cost: not determined

b. Purchase from City of Clifton
   - Cost Source: based on cost for Bosque County Regional Project Volume II, Section 8.1
   - Date to be Implemented: before 2020
   - Project Cost: TBD
   - Unit Cost: $1,076/acft

c. Purchase from City of Meridian
   - Cost Source: based on cost for Bosque County Regional Project Volume II, Section 8.1
   - Date to be Implemented: before 2020
   - Project Cost: TBD
   - Unit Cost: $1,223/acft

d. BRA Systems Operations to Bosque County
   - Cost Source: BRA System Operations Supply (Volume II, Section 7.11)
     - Dependent on BRA being granted System Operations permit from TCEQ
   - Date to be Implemented: 2020
   - Project Cost: Not enough information to cost delivery
   - Unit Cost: $65.65/acft (BRA wholesale rate only)

Table 5.2-7. Recommended Plan Costs by Decade for Bosque County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,868)*	*(2,187)*	*(2,501)*	*(2,772)*	*(3,088)*	*(3,431)*
Conservation						
Supply From Plan Element (acft/yr)	82	153	236	255	277	301
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation	*(1,786)*	*(2,034)*	*(2,265)*	*(2,517)*	*(2,811)*	*(3,130)*
Purchase from City of Clifton						
Supply From Plan Element (acft/yr)	426	426	426	426	426	426
Annual Cost ($/yr)	$458,000	$458,000	$458,000	$458,000	$458,000	$458,000
Unit Cost ($/acft)	$1,076	$1,076	$1,076	$1,076	$1,076	$1,076
Purchase from City of Meridian						
Supply From Plan Element (acft/yr)	330	330	330	330	330	330
Annual Cost ($/yr)	$404,000	$404,000	$404,000	$404,000	$404,000	$404,000
Unit Cost ($/acft)	$1,223	$1,223	$1,223	$1,223	$1,223	$1,223
BRA System Operations						
Supply From Plan Element (acft/yr)	1,035	1,280	1,510	1,765	2,060	2,375
Annual Cost ($/yr)	$67,948	$84,032	$99,132	$115,872	$135,239	$155,919
Unit Cost ($/acft)	$66	$66	$66	$66	$66	$66

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location

5.2.8 Steam-Electric

Description of Supply

The water supply for Steam-Electric use in Bosque County consists of surface water contracts with the Brazos River Authority. Steam-Electric is projected to have a shortage from the year 2030 through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Bosque County Steam-Electric. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Section 2
- Date to be Implemented: 2030
- Annual Cost: not determined

b. BRA System Operation to Bosque County

- Cost Source: BRA System Operations Supply (Volume II, Section 7.11)
    - Dependent on BRA being granted System Operations permit from TCEQ
- Date to be Implemented: before 2030
- Project Cost: Infrastructure assumed sufficient
- Unit Cost: $65.65/acft (Current BRA System Rate)

Table 5.2-8. Recommended Plan Costs by Decade for Bosque County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*312*	*(861)*	*(2,262)*	*(3,943)*	*(5,965)*	*(8,345)*
Conservation						
Supply From Plan Element (acft/yr)	0	362	596	705	837	995
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*312*	*(499)*	*(1,667)*	*(3,239)*	*(5,128)*	*(7,350)*
BRA System Operation						
Supply From Plan Element (acft/yr)	—	500	1,670	3,240	5,130	7,350
Annual Cost ($/yr)	—	$32,825	$109,636	$212,706	$336,785	$482,528
Unit Cost ($/acft)	—	$65.65	$65.65	$65.65	$65.65	$65.65

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location.

5.2.9 Mining

Description of Supply

Mining operations in Bosque County are supplied by Trinity Groundwater. Demands for Mining are projected to increase significantly resulting in shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Bosque County-Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Leave needs unmet

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

Table 5.2-9. Recommended Plan Costs by Decade for Bosque County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,843)*	*(1,942)*	*(1,763)*	*(1,743)*	*(1,704)*	*(1,692)*
Conservation						
Supply From Plan Element (acft/yr)	59	104	132	131	128	127
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,784)*	*(1,839)*	*(1,631)*	*(1,612)*	*(1,576)*	*(1,565)*
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	1,780	1,840	1,635	1,615	1,580	1,565
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.2.10 Irrigation

Bosque County Irrigation is projected to have a surplus of water through the year 2070. No changes in water supply are recommended.

Description of Supply

Bosque County Irrigation is supplied by Trinity Groundwater and run of the river water rights. Irrigation is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Bosque County-Irrigation. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020
- Unit Cost: $230/acft

b. Groundwater Development – Trinity Aquifer

- Cost Source: Volume 2, Section 12.1
- Date to be Implemented: before 2020
- Project Cost: $11,048,000
- Unit Cost: $2,119

Table 5.2-10. Recommended Plan Costs by Decade for Bosque County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(536)*	*(502)*	*(468)*	*(438)*	*(407)*	*(377)*
Conservation						
Supply From Plan Element (acft/yr)	64	105	144	142	140	138
Annual Cost ($/yr)	$14,683	$24,081	$33,166	$32,667	$32,168	$31,685
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(473)*	*(398)*	*(324)*	*(295)*	*(267)*	*(239)*
Groundwater Development						
Supply From Plan Element (acft/yr)	475	475	475	475	475	475
Annual Cost ($/yr)	$1,006,457	$1,006,457	$81,457	$81,457	$81,457	$81,457
Unit Cost ($/acft)	$2,119	$2,119	$171	$171	$171	$171

5.2.11 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.3 Brazos County Water Supply Plan

Table 5.3-1 lists each water user group in Brazos County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.3-1. Brazos County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Bryan	(5,533)	(26,578)	Projected shortage – see Chapter 5.38
City of College Station	(7,372)	(8,401)	Projected shortage – see plan below
Texas A & M University	7,323	7,344	Projected surplus
Wellborn SUD	(358)	(2,524)	Projected shortage – see plan below
Wickson Creek SUD	1,502	366	Projected surplus
County-Other	424	28	Projected surplus
Manufacturing	(1,219)	(2,116)	Projected shortage – see plan below
Steam-Electric	(197)	(121)	Projected shortage – see plan below
Mining	(1,433)	(814)	Projected shortage – see plan below
Irrigation	(8,473)	(5,321)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-5 and C-6, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.3.1 City of Bryan

The recommended water supply plan for the City of Bryan is included in Chapter 5.38 with the wholesale water providers.

5.3.2 City of College Station

Description of Supply

The City of College Station obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. The city's utility does not provide service to the entire city limits. Portions of the city demand are currently served by City of Bryan and Wellborn SUD. The city also provides water supply for Brazos County Manufacturing. Shortages are projected beginning in year 2020 for the City of College Station.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for the City of College Station. Associated costs are included for each strategy.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: 2020
   - Annual Cost: maximum of $2,335,000 in 2070
   - Unit Cost: $474/acft
b. Groundwater Development – Yegua-Jackson Aquifer
   - Cost Source: Volume II, Chapter 9.2
   - Date to be Implemented: 2020
   - Project Cost: $32,957,000
   - Unit Cost: $656/acft
c. College Station Reuse
   - Cost Source: Volume II, Chapter 3
   - Date to be Implemented: 2020
   - Project Cost: $1,705,000
   - Unit Cost: $1,680/acft
d. College Station ASR
   - Cost Source: Volume II, Chapter 10.2
   - Date to be Implemented: 2020
   - Project Cost: $63,850,000
   - Unit Cost: $3,069/acft
e. Alternative: BRA System Operation
   - Cost Source: Volume II, Chapter 7.11
     - Dependent on BRA being granted System Operations permit from TCEQ
   - Date to be Implemented: 2020
   - Project Cost: $37,109,000
   - Unit Cost: $1,065/acft assuming wholesale water rate plus transmission
f. Alternative: College Station Direct Potable Reuse
   - Cost Source: Volume II, Chapter 3
   - Date to be Implemented: 2020
   - Project Cost: $56,192,000
   - Unit Cost: $3,484/acft

Table 5.3-2. Recommended Plan Costs by Decade for City of College Station

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(4,973)*	*(8,024)*	*(7,372)*	*(7,673)*	*(8,085)*	*(8,401)*
Conservation						
Supply From Plan Element (acft/yr)	679	2,585	3,465	3,823	4,332	4,926
Annual Cost ($/yr)	$322,000	$1,225,000	$1,642,000	$1,812,000	$2,053,000	$2,335,000
Projected Surplus/ (Shortage) after Conservation (acft/yr)	*(4,295)*	*(5,438)*	*(3,907)*	*(3,850)*	*(3,753)*	*(3,475)*
College Station Reuse Project						
Supply From Plan Element (acft/yr)	103	103	103	103	103	103
Annual Cost ($/yr)	$173,000	$173,000	$30,000	$30,000	$30,000	$30,000
Unit Cost ($/acft)	$1,680	$1,680	$291	$291	$291	$291
Projected Surplus/ (Shortage) after Conservation (acft/yr)	*(4,192)*	*(5,335)*	*(3,804)*	*(3,747)*	*(3,650)*	*(3,372)*
Groundwater Development – Yegua-Jackson Aquifer						
Supply From Plan Element (acft/yr)	4,452	5,565	5,565	5,565	5,565	5,565
Annual Cost ($/yr)	$2,923,000	$3,499,000	$1,572,000	$1,231,000	$1,231,000	$1,231,000
Unit Cost ($/acft)	$656	$629	$282	$221	$221	$221
College Station ASR Project						
Supply From Plan Element (acft/yr)	2,800	2,800	2,800	2,800	2,800	2,800
Annual Cost ($/yr)	$8,592,000	$8,592,000	$3,249,000	$3,249,000	$3,249,000	$3,249,000
Unit Cost ($/acft)	$3,068	$3,068	$1,160	$1,160	$1,160	$1,160
Alternative: BRA System Operation						
Supply From Plan Element (acft/yr)	6,000	6,000	6,000	6,000	6,000	6,000
Annual Cost ($/yr)	$6,390,000	$6,390,000	$3,282,000	$3,282,000	$3,282,000	$3,282,000
Unit Cost ($/acft)	$1,065	$1,065	$547	$547	$547	$547
Alternative: College Station Direct Potable Reuse						
Supply From Plan Element (acft/yr)	2,800	2,800	2,800	2,800	2,800	2,800
Annual Cost ($/yr)	$9,755,000	$9,755,000	$5,053,000	$5,053,000	$5,053,000	$5,053,000
Unit Cost ($/acft)	$3,484	$3,484	$1,805	$1,805	$1,805	$1,805

5.3.3 Texas A&M University

Description of Supply

Texas A&M University obtains its water supply from groundwater from the Sparta and Carrizo Aquifers. This supply is projected to be sufficient through the planning period.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Texas A&M University. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $1,255,000 in 2070
- Unit Cost: $470/acft

Table 5.3-3. Recommended Plan Costs by Decade for Texas A&M University

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*5,253*	*6,760*	*7,323*	*7,340*	*7,343*	*7,344*
Conservation						
Supply From Plan Element (acft/yr)	416	942	1,418	1,869	2,289	2,670
Annual Cost ($/yr)	$196,000	$443,000	$666,000	$878,000	$1,076,000	$1,255,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*5,669*	*7,701*	*8,741*	*9,209*	*9,632*	*10,014*

5.3.4 Wellborn SUD

Description of Supply

Wellborn SUD is located in Brazos and Robertson counties and currently obtains water from the Carrizo-Wilcox Aquifer and through contracts with BRA and the City of Bryan. Wellborn SUD has sufficient supplies but is constrained by its treatment plant capacity resulting in shortages beginning in 2040.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for Wellborn SUD. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $335,000 in 2070
- Unit Cost: $470/acft

b. Expand Water Treatment Plant (2 MGD)

- Cost Source: Volume II, Chapter 12

- Date to be Implemented: 2040
- Project Cost: $13,153,000
- Unit Cost: Max of $912 (2020)

Table 5.3-4. Recommended Plan Costs by Decade for Wellborn SUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*451*	*106*	*(358)*	*(1,010)*	*(1,728)*	*(2,524)*
Conservation						
Supply From Plan Element (acft/yr)	78	279	508	563	633	713
Annual Cost ($/yr)	$37,000	$131,000	$239,000	$265,000	$297,000	$335,000
Projected Surplus/ (Shortage) after Conservation (acft/yr)	*529*	*385*	*150*	*(447)*	*(1,095)*	*(1,811)*
Expand Water Treatment Plant (2 MGD)						
Supply From Plan Element (acft/yr)	—	—	2,240	2,240	2,240	2,085
Annual Cost ($/yr)	—	—	$2,042,000	$2,042,000	$941,000	$941,000
Unit Cost ($/acft)	—	—	$912	$912	$420	$420

5.3.5 Wickson Creek SUD

Wickson Creek SUD is located in multiple counties (Grimes, Robertson, and Brazos). The balances shown in Table 5.3-1 represent the cumulative totals for Wickson Creek SUD. Supplies are obtained from the Sparta and Carrizo Aquifers. The entity also provides supply to Brazos and Grimes County Manufacturing. No shortages are projected for Wickson Creek SUD and no change in water supply is recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.3.6 County-Other

Brazos County-Other entities obtain water supply from groundwater from the Carrizo and Sparta Aquifers. This supply is projected to be sufficient through the planning period and no change in water supply is recommended. Conservation was considered; however, the WUGs current per capita use rate is below the selected target rate of 140 gpcd.

5.3.7 Manufacturing

Water supply for manufacturing in Brazos County is obtained from nearby WUGs and Sparta wells operated by the manufacturing entity. Manufacturing is projected to have a shortage of water beginning in the year 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Manufacturing. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Groundwater Development – Gulf Coast Aquifer

- Cost Source: Volume II, Chapter 12.1
- Date to be Implemented: 2020
- Project Cost: $8,932,000
- Unit Cost: $1,815

c. Purchase from Texas A&M University

While Texas A&M University has ample groundwater supplies to provide water to manufacturing interests, the university may have no intention of providing those supplies. Alternatives include purchase of water from College Station, Bryan, Wellborn SUD or Wickson SUD. Whichever entities do provide supply, the source most likely will be from the Carrizo-Wilcox Aquifer System, which is the primary supply for entities in this region.

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: Not enough information to cost delivery
- Unit Cost: $977/acft (Texas A&M wholesale rate only)

Table 5.3-5. Recommended Plan Costs by Decade for Brazos County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,800)*	*(886)*	*(1,219)*	*(1,513)*	*(1,802)*	*(2,116)*
Conservation						
Supply From Plan Element (acft/yr)	74	139	218	238	259	281
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,726)*	*(747)*	*(1,001)*	*(1,275)*	*(1,543)*	*(1,835)*
Groundwater Development – Gulf Coast Aquifer						
Supply From Plan Element (acft/yr)	530	530	530	530	530	530
Annual Cost ($/yr)	$961,727	$961,727	$248,727	$248,727	$248,727	$248,727
Unit Cost ($/acft)	$1,815	$1,815	$469	$469	$469	$469
Purchase Water from Texas A&M University						
Supply From Plan Element (acft/yr)	1,200	300	500	800	1,100	1,400
Annual Cost ($/yr)	$1,172,400	$293,100	$488,500	$781,600	$1,074,700	$1,367,800
Unit Cost ($/acft)	$977	$977	$977	$977	$977	$977

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.3.8 Steam-Electric

Description of Supply

Supplies for Steam-Electric demand in Brazos County are obtained through groundwater from the Sparta Aquifer and Bryan Utilities Lake. Brazos County Steam-Electric is projected to have shortages beginning in year 2020 and continuing through year 2070.

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Brazos County Steam-Electric.

a. Conservation:
   - Date to be Implemented: 2020
   - Annual Cost: Not determined
b. Purchase reuse water from the City of Bryan at Bryan Utilities Lake:
   - Cost Source: Volume II, Chapter 3
   - Date to be Implemented: 2020
   - Project Cost: $8,989,000
   - Unit Cost:$1547/acft

Table 5.3-6. Recommended Plan Costs by Decade for Brazos County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(271)*	*(151)*	*(197)*	*(49)*	*(142)*	*(121)*
Conservation						
Supply From Plan Element (acft/yr)	15	20	32	22	28	27
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(256)*	*(131)*	*(165)*	*(27)*	*(114)*	*(94)*
Reuse Supply from City of Bryan						
Supply From Plan Element (acft/yr)	256	131	165	27	114	94
Annual Cost ($/yr)	$396,032	$202,657	$50,160	$8,208	$34,656	$28,576
Unit Cost ($/acft)	$1,547	$1,547	$304	$304	$304	$304
Projected Surplus/(Shortage) after Reuse(acft/yr)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.3.9 Mining

Description of Supply

There are currently no water supplies allocated to Mining operations in Brazos County. Demands for Mining are projected to increase significantly resulting in shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Brazos County-Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: not determined

b. Leave needs unmet

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

Table 5.3-7. Recommended Plan Costs by Decade for Brazos County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,088)*	*(1,610)*	*(1,433)*	*(1,144)*	*(923)*	*(814)*
Conservation						
Supply From Plan Element (acft/yr)	33	81	100	80	65	57
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,055)*	*(1,530)*	*(1,333)*	*(1,064)*	*(858)*	*(757)*
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	1,100	1,600	1,400	1,100	900	800
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.3.10 Irrigation

Description of Supply

Brazos County Irrigation is supplied by Sparta, Gulf Coast, Yegua-Jackson and Brazos River Alluvium groundwater and from run-of-river diversion rights from the Brazos River and contracts with BRA. Shortages are projected for irrigation beginning in year 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Brazos County-Irrigation. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $380,000 in 2040
- Unit Cost: $230/acft

b. BRA System Operations

- Cost Source: Volume II, Chapter 7.11
    - Dependent on BRA being granted System Operations permit from TCEQ
- Date to be Implemented: 2020
- Project Cost: Infrastructure assumed sufficient
- Unit Cost: $65.65/acft

Table 5.3-8. Recommended Plan Costs by Decade for Brazos County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(10,934)*	*(9,669)*	*(8,473)*	*(7,340)*	*(6,256)*	*(5,321)*
Conservation						
Supply From Plan Element (acft/yr)	782	1,240	1,652	1,572	1,496	1,431
Annual Cost ($/yr)	$180,000	$285,000	$380,000	$362,000	$344,000	$329,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(10,152)*	*(8,430)*	*(6,822)*	*(5,768)*	*(4,760)*	*(3,891)*
BRA System Operation						
Supply From Plan Element (acft/yr)	10,200	8,500	6,900	5,800	4,800	3,900
Annual Cost ($/yr)	$669,630	$558,025	$452,985	$380,770	$315,120	$256,035
Unit Cost ($/acft)	$65.65	$65.65	$65.65	$65.65	$65.65	$65.65

5.3.11 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.4 Burleson County Water Supply Plan

Table 5.4-1. lists each water user group in Burleson County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the water users are presented in the following subsections.

Table 5.4-1. Burleson County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Caldwell	1,279	1,244	Projected surplus
Deanville WSC	211	202	Projected surplus
Milano WSC			See Milam County
City of Snook	274	254	Projected surplus
City of Somerville	606	578	Projected surplus
Southwest Milam WSC			See Milam County
County-Other	170	32	Projected surplus
Manufacturing	(44)	(102)	Projected shortage – see plan below
Steam-Electric	0	0	No projected demand
Mining	(1,512)	(428)	Projected shortage – see plan below
Irrigation	1,905	4,493	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-7 and C-8, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.4.1 City of Caldwell

Description of Supply

The City of Caldwell obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. This supply is projected to be sufficient through the planning period.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for the City of Caldwell. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $116,000 in 2070
- Unit Cost: $470/acft

Table 5.4-2. Recommended Plan Costs by Decade for City of Caldwell

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,325*	*1,309*	*1,279*	*1,279*	*1,261*	*1,244*
Conservation						
Supply From Plan Element (acft/yr)	40	121	203	240	242	246
Annual Cost ($/yr)	$19,000	$57,000	$96,000	$113,000	$114,000	$116,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*1,365*	*1,430*	*1,482*	*1,519*	*1,503*	*1,490*

5.4.2 Deanville WSC

The Deanville WSC obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. This supply is projected to be sufficient through the planning period and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.4.3 City of Snook

Description of Supply

The City of Snook obtains its water supply from groundwater from the Sparta Aquifer. No shortages are projected through the planning period.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Snook. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $45,000 in 2070
- Unit Cost: $496/acft

Table 5.4-3. Recommended Plan Costs by Decade for City of Snook

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*291*	*280*	*274*	*266*	*259*	*254*
Conservation						
Supply From Plan Element (acft/yr)	11	26	42	59	76	91
Annual Cost ($/yr)	$5,000	$13,000	$21,000	$29,000	$38,000	$45,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*302*	*306*	*316*	*325*	*335*	*345*

5.4.4 City of Somerville

Description of Supply

The City of Somerville obtains its water supply from groundwater from the Sparta Aquifer. This supply is projected to be sufficient through the planning period.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Somerville.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $12,000 in 2030
- Unit Cost: $470/acft

Table 5.4-4. Recommended Plan Costs by Decade for City of Somerville

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*625*	*614*	*606*	*595*	*586*	*578*
Conservation						
Supply From Plan Element (acft/yr)	8	26	23	23	23	24
Annual Cost ($/yr)	$4,000	$12,000	$11,000	$11,000	$11,000	$11,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*633*	*640*	*629*	*618*	*609*	*602*

5.4.5 County-Other

Burleson County-Other entities obtain water supply from groundwater from the Queen City and Carrizo-Wilcox Aquifers. This supply is projected to be sufficient through the planning period and no change in water supply is recommended. Conservation was considered; however, the entity’s current per capita use rate is below the selected target rate of 140 gpcd.

5.4.6 Manufacturing

Description of Supply

Water supply for manufacturing in Burleson County is obtained from Sparta wells operated by the various manufacturing entities. Manufacturing is projected to have a shortage of water beginning in the year 2030.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Manufacturing. Associated costs are included for each strategy.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: not determined

b. Groundwater Development – Sparta Aquifer
   - Cost Source: Volume II, Chapter 12.1
   - Date to be Implemented: 2030
   - Project Cost: $932,000
   - Unit Cost: Max of $1,265 (2030)

c. Alternative: Purchase supplies from City of Caldwell
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2030
   - Project Cost: Not enough information to cost delivery
   - Unit Cost: $500/acft

Table 5.4-5. Recommended Plan Costs by Decade for Burleson County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*(22)*	*(44)*	*(64)*	*(82)*	*(102)*
Conservation						
Supply From Plan Element (acft/yr)	4	8	13	14	15	17
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*4*	*(14)*	*(31)*	*(50)*	*(67)*	*(85)*

Table 5.4-5. Recommended Plan Costs by Decade for Burleson County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Groundwater Development – Sparta Aquifer						
Supply From Plan Element (acft/yr)	—	50	50	50	85	85
Annual Cost ($/yr)	—	$107,534	$107,534	$35,534	$35,534	$35,534
Unit Cost ($/acft)	—	$1,265	$1,265	$418	$418	$418
Alternative: Purchase Water from City of Caldwell						
Supply From Plan Element (acft/yr)	—	50	50	50	85	85
Annual Cost ($/yr)	—	$25,000	$25,000	$25,000	$42,500	$42,500
Unit Cost ($/acft)	—	$500	$500	$500	$500	$500

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.4.7 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.4.8 Mining

Description of Supply

There are currently no water supplies allocated to Mining operations in Burleson County. Demands for Mining are projected to increase significantly resulting in shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Burleson County-Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: not determined

b. Groundwater Development – Sparta Aquifer

- Cost Source: Volume II, Chapter 12.1
- Date to be Implemented: 2020
- Project Cost: $5,466,000
- Unit Cost: Max of $678 (2020)

c. Leave needs unmet

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

Table 5.4-6. Recommended Plan Costs by Decade for Burleson County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(995)*	*(1,923)*	*(1,512)*	*(1,100)*	*(686)*	*(428)*
Conservation						
Supply From Plan Element (acft/yr)	30	96	106	77	48	30
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(965)*	*(1,827)*	*(1,406)*	*(1,023)*	*(638)*	*(398)*
Groundwater Development – Sparta Aquifer						
Supply From Plan Element (acft/yr)	740	740	740	740	740	740
Annual Cost ($/yr)	$501,602	$501,602	$42,602	$42,602	$42,602	$42,602
Unit Cost ($/acft)	$678	$678	$58	$58	$58	$58
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	250	1,100	700	300	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.4.9 Irrigation

Burleson County Irrigation is supplied by Carrizo, Yegua-Jackson and Brazos River Alluvium groundwater and from run-of-river diversion rights from the Brazos River. No shortages are projected for irrigation and no changes in water supply are recommended.

5.4.10 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.5 Callahan County Water Supply Plan

Table 5.5-1 lists each water user group in Callahan County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.5-1. Callahan County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)1		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Baird	80	81	Projected surplus
City of Clyde	261	257	Projected surplus
Coleman County SUD	(16)	(18)	Projected shortage
City of Cross Plains	223	217	Projected surplus
Potosi WSC			See Taylor County for Plan
County-Other	20	9	Projected surplus
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	(214)	(180)	Projected shortage
Irrigation	188	214	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-9 and C-10, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.5.1 City of Baird

Description of Supply

The City of Baird obtains its water supply from surface water supplied from Lake Baird and from the City of Abilene. From 2020 through 2070, the City's contractual purchase from the City of Abilene is 77 acft/yr and the total amount of surface water availability from Lake Baird is 230 acft/yr. Baird also receives reuse water from the City of Clyde in trade for potable water. Supplies are sufficient to meet demands through 2070. Conservation is recommended to reduce the City's gallons per capita per day (gpcd) in 2020 to a goal of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended for the City of Baird. Associated costs are included for each strategy.

a. Conservation:

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $3,173 in 2020
- Unit Cost: $496/acft

Table 5.5-2. Recommended Plan Costs by Decade for the City of Baird

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*66*	*74*	*80*	*81*	*81*	*81*
Conservation						
Supply from Plan Element (acft/yr)	6	—	—	—	—	—
Annual Cost ($/yr)	$3,173	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*72*	*74*	*80*	*81*	*81*	*81*

5.5.2 City of Clyde

The City of Clyde uses surface water from local sources which is projected to supply 500 acft/yr from 2020 through 2070. Clyde also has a contractual purchase plan of 307 acft/yr from the City of Abilene that can cover the city's projected demands. Clyde also has an arrangement with the City of Baird to receive potable water in trade for reuse water. No current or future shortages are projected. Clyde also has contractual sales to Eula WSC of 221 acft/yr through 2070. Clyde has recently acquired a 2,500 acft/yr water right for supplies from Fort Phantom Hill Reservoir; however, the full amount of the water right is not firm and supply will be less than 2,500 acft/yr. In addition, this supply cannot be applied until infrastructure is in place to deliver and treat the water. No change in water supply is recommended. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.5.3 Coleman County SUD

Description of Supply

Coleman County SUD obtains its water supply from the City of Coleman via Lake Brownwood in Region F. Shortages are projected beginning in 2020. This WUG is located in multiple counties (Callahan and Taylor). The values shown in Table 5.5-1 represent the cumulative totals for Coleman County WSC in these two counties.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and in coordination with Region F, the following water supply plan is recommended for Coleman County SUD. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Subordination Lake Coleman (Region F):

- Cost Source: 2016 Region F Water Plan
- Date to be Implemented: 2020
- Total Project Cost: no cost
- Unit Cost: none

Table 5.5-3. Recommended Plan Costs by Decade for the City of Baird

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(16)*	*(16)*	*(16)*	*(16)*	*(17)*	*(18)*
Conservation						
Supply from Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(16)*	*(16)*	*(16)*	*(16)*	*(17)*	*(18)*
Subordination Lake Coleman (Region F)						
Supply from Plan Element (acft/yr)	17	18	18	18	18	18
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.5.4 City of Cross Plains

Description of Supply

The City of Cross Plains uses locally available groundwater for all of its water supply and a surplus is projected. Conservation is recommended to reduce the City's gpcd between 2020 and 2070 to a goal of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended for the City of Cross Plains. Associated costs are included for each strategy.

a. Conservation:

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $4,750 in 2020
- Unit Cost: $496/acft

Table 5.5-4. Recommended Plan Costs by Decade for the City of Cross Plains

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*232*	*225*	*223*	*220*	*218*	*217*
Conservation						
Supply from Plan Element (acft/yr)	5	10	5	5	5	4
Annual Cost ($/yr)	$2,369	$4,750	$2,631	$2,486	$2,311	$2,029
Projected Surplus/(Shortage) after Conservation (acft/yr)	*236*	*234*	*228*	*225*	*222*	*221*

5.5.5 County-Other

The water supply entities comprising County-Other mostly rely on groundwater systems and show a projected surplus. Currently there is a contractual purchase of 61 acft/yr through 2070 from the City of Abilene to Eula WSC. No changes in water supply are recommended for Callahan County-Other. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.5.6 Manufacturing

No Manufacturing demand exists or is projected for the county.

5.5.7 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.5.8 Mining

Description of Supply

Mining activities are projected to increase in Callahan County requiring local water management strategies to meet the projected water demand. Conservation is recommended to reduce the Mining demand between 2020 and 2070. Available Trinity Aquifer supplies in Callahan County will also be used to meet the projected demands.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended for Mining in Callahan County. Associated costs are included for each strategy.

a. Conservation:

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Trinity Groundwater:

- Cost Source: Volume II, Section 12
- Date to be Implemented: before 2020
- Project Cost: $1,695,000
- Annual Cost: maximum of $155,732 in 2020

Table 5.5-5. Recommended Plan Costs by Decade for the Callahan County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(228)*	*(227)*	*(214)*	*(201)*	*(190)*	*(180)*
Conservation						
Supply from Plan Element (acft/yr)	7	11	15	14	13	13
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(221)*	*(216)*	*(199)*	*(187)*	*(177)*	*(167)*
Trinity Groundwater						
Supply from Plan Element (acft/yr)	221	216	199	187	177	167
Annual Cost ($/yr)	$155,732	$155,732	$13,732	$13,732	$13,732	$13,732
Unit Cost ($/acft)	$692	$692	$61	$61	$61	$61

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.5.9 Irrigation

Irrigation water use shows a projected surplus and no changes in water supply are recommended.

5.5.10 Livestock

No Livestock shortage exists or is projected for the county.

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5.6 Comanche County Water Supply Plan

Table 5.6-1 lists each water user group in Comanche County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.6-1. Comanche County Surplus/(Shortage)

Comanche County Surplus/(Shortage) Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
City of Comanche	147	38	Projected surplus
City of De Leon	85	42	Projected surplus
County Other	(135)	(183)	Projected shortage – see plan below
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	No projected demand
Mining	(337)	(102)	Projected shortage – see plan below
Irrigation	(1,823)	(968)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-11 and C-12, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.6.1 City of Comanche

The City of Comanche receives its water from the Upper Leon MWD (Lake Proctor surface water), which has an agreement to meet Comanche's water needs. Therefore, no shortage is projected for the City of Comanche and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.6.2 City of De Leon

The City of DeLeon receives its water from the Upper Leon MWD (Lake Proctor surface water), which has an agreement to meet DeLeon's water needs. Therefore, no shortage is projected for the City of DeLeon and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.6.3 County-Other

Description of Supply

The water supply entities for County-Other show a projected shortage from 2020 through 2070. Currently water supplies are provided from locally available Trinity Aquifer and contract purchases from Upper Leon MWD. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for County-Other. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: before 2020
- Unit Cost: $496/acft
- Annual Cost: maximum of $22,670 in 2030

b. Trinity Aquifer Development

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $2,033,000
- Unit Cost: $924/acft

Table 5.6-2. Recommended Plan Costs by Decade for Comanche County-Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(149)*	*(144)*	*(135)*	*(144)*	*(163)*	*(183)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(149)*	*(144)*	*(135)*	*(144)*	*(163)*	*(183)*
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	161	161	161	161	242	242
Annual Cost ($/yr)	$149,000	$149,000	$36,000	$36,000	$110,000	$110,000
Unit Cost ($/acft)	$924	$924	$223	$223	$455	$455

5.6.4 Manufacturing

Comanche County Manufacturing demand is met with supplies from City of Comanche. No shortages are projected and no changes in water supply are recommended.

5.6.5 Steam-Electric

There is no projected demand for Comanche County Steam-Electric.

5.6.6 Mining

Description of Supply

Mining operations in Comanche County are supplied by limited amounts of Trinity Aquifer groundwater. Supply shortages are expected for Mining beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Comanche County-Mining (Table 5.6-3). Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Trinity Aquifer Development

- Cost Source: Volume II, Section 12
- Date to be Implemented: before 2020
- Project Cost: $4,475,000
- Unit Cost: Max of $871/acft (2020)

Table 5.6-3. Recommended Plan Costs by Decade for Comanche County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(418)*	*(499)*	*(337)*	*(250)*	*(162)*	*(102)*
Conservation						
Supply From Plan Element (acft/yr)	14	26	26	19	13	9
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(404)*	*(473)*	*(311)*	*(230)*	*(149)*	*(93)*
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	404	473	311	320	149	93
Annual Cost ($/yr)	$411,796	$411,796	$36,796	$36,796	$36,796	$36,796
Unit Cost ($/acft)	$871	$871	$78	$78	$78	$78

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.6.7 Irrigation

Description of Supply

Comanche County Irrigation is supplied by Trinity Aquifer groundwater, run of the river water rights and BRA contracts. More than 10,000 acft/yr of irrigation water rights are not available during drought of record conditions. Irrigation is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Comanche County-Irrigation (Table 5.6-4). Associated costs are included for each strategy.

a. Conservation
   - Cost Source: Volume II, Section 2
   - Date to be Implemented: before 2020
   - Annual Cost: $230/acft

b. Groundwater Development – Trinity Aquifer
   - Cost Source: Volume II, Section 12
   - Date to be Implemented: before 2020
   - Project Cost: $11,015,000
   - Unit Cost: $1,666/acft

Table 5.6-4. Recommended Plan Costs by Decade for Comanche County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(893)*	*(1,962)*	*(1,823)*	*(463)*	*(757)*	*(968)*
Conservation						
Supply From Plan Element (acft/yr)	824	1,359	1,883	1,863	1,844	1,825
Annual Cost ($/yr)	$189,460	$312,513	$432,993	$428,534	$424,106	$419,824
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(69)*	*(603)*	*60*	*1,400*	*1,087*	*857*
Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	69	603	—	—	—	—
Annual Cost ($/yr)	$1,004,806	$1,004,806	—	—	—	—
Unit Cost ($/acft)	$1,666	$1,666	—	—	—	—

5.6.8 Livestock

No shortages are projected for Comanche County Livestock and no changes in water supply are recommended.

5.7 Coryell County Water Supply Plan

Table 5.7-1 lists each water user group in Coryell County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.7-1. Coryell County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
City of Copperas Cove	3,593	1,203	Projected surplus
Coryell City Water Supply District	255	241	Projected surplus
Elm Creek WSC			See Bell County
Fort Hood			See Bell County
City of Gatesville	(1,406)	(3,995)	Projected shortage – see 5.38
Kempner WSC			See Lampasas County
Multi-County WSC	(151)	(248)	Projected shortage – see plan below
County-Other	234	(515)	Projected shortage – see plan below
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	Demand equals supply
Mining	(491)	(437)	Projected shortage – see plan below
Irrigation	566	566	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-13 and C-14, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.7.1 City of Copperas Cove

The City of Copperas Cove contracts for treated surface water from Bell County WCID No.1 and currently reuses a portion of its supply for non potable uses. No shortages are projected for the City of Copperas Cove and no changes in water supply are recommended. Kempner WSC also has service area within the city limits and therefore shows a portion of supply to the City of Copperas Cove. This city is located in Coryell and Lampasas Counties. The quantity shown in Table 5.7-1 represents the cumulative totals for the City of Copperas Cove. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.7.2 Coryell City Water Supply District

Description of Supply

Coryell City Water Supply District holds a contract for supply from BRA treated by the City of Gatesville to meet demands. No shortages are projected for Coryell City Water

Supply District and no changes in water supply are recommended. This WUG is located in Coryell and McLennan Counties. The quantity shown in Table 5.7-1 represents the cumulative totals for Coryell City Water Supply District.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the Coryell City Water Supply District.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $15,850 in 2020
- Unit Cost: $470/acft

Table 5.7-2. Recommended Plan Costs by Decade for Coryell City Water Supply District

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*234*	*245*	*255*	*250*	*247*	*241*
Conservation						
Supply From Plan Element (acft/yr)	34	21	9	1	—	—
Annual Cost ($/yr)	$15,850	$9,955	$4,240	$470	—	—
Projected Surplus/(Shortage) after Conservation	*268*	*266*	*264*	*251*	*247*	*241*

5.7.3 City of Gatesville

The City of Gatesville is projected to have a shortage through the year 2070. Refer to Chapter 5.38 for Gatesville's plan as a Wholesale Water Provider.

5.7.4 Multi-Country WSC

Description of Supply

Multi-County WSC contracts for treated surface water from the City of Hamilton. This WUG is located in Coryell and Hamilton Counties. The quantity shown in Table 5.7-1 represents the cumulative totals for Multi-County WSC.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the Multi-County WSC. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Purchase additional water from City of Hamilton

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Unit Cost: assumed $250/acft
- Annual Cost: $25,000

b. Coryell County Off-Channel Reservoir

- Cost Source: Volume II, Chapter 4.3
  - Strategy potentially dependent on BRA securing System Operations permit from TCEQ
- Date to be Implemented: 2030
- Project Cost: $42,246,000
- Unit Cost: $1,405/acft

Table 5.7-3. Recommended Plan Costs by Decade for Multi-County WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(99)*	*(122)*	*(151)*	*(179)*	*(213)*	*(248)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(99)*	*(122)*	*(151)*	*(179)*	*(213)*	*(248)*
Purchase from City of Hamilton						
Supply From Plan Element (acft/yr)	100	100	—	—	—	—
Annual Cost ($/yr)	$25,000	$25,000	—	—	—	—
Unit Cost ($/acft)	$250	$250	—	—	—	—
Coryell County Off-Channel Reservoir						
Supply From Plan Element (acft/yr)	—	3,135	3,135	3,135	3,135	3,135
Annual Cost ($/yr)	—	$4,405,000	$4,405,000	$3,194,000	$3,194,000	$1,463,000
Unit Cost ($/yr)	—	$1,405	$1,405	$1,019	$1,019	$467

5.7.5 County-Other

Description of Supply

Water supply for county-other entities is obtained from Trinity Aquifer groundwater and a treated surface water contract with the City of Gatesville. Shortages are projected for Coryell County-Other starting by 2020. Local officials have requested that the Coryell County Reservoir be evaluated and recommended as a water management strategy to meet future needs in Coryell County. The project would likely be developed in cooperation with the Brazos River Authority. Some users included in Coryell County-Other receive water from BRA contracts.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the entities in Coryell County-Other. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2050
- Project Cost: $4,428,000
- Unit Cost: Max of $931/acft (2050)

b. Alternative: Purchase from Gatesville (Coryell County OCR)

- Cost Source: Volume II, Chapter 4.3
    - Strategy potentially dependent on BRA securing System Operations permit from TCEQ
- Date to be Implemented: 2050
- Project Cost: N/A
- Unit Cost: $1,309/acft

Table 5.7-4. Recommended Plan Costs by Decade for Coryell County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*870*	*594*	*234*	*(93)*	*(171)*	*(515)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*870*	*594*	*234*	*(93)*	*(171)*	*(515)*
Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	—	—	—	100	200	525
Annual Cost ($/yr)	—	—	—	$488,806	$488,806	$136,806
Unit Cost ($/yr)	—	—	—	$931	$931	$261
Alternative: Purchase from Gatesville (Coryell County Off-Channel Reservoir)						
Supply From Plan Element (acft/yr)	—	—	—	100	200	525
Annual Cost ($/yr)	—	—	—	$130,900	$261,800	$687,225
Unit Cost ($/yr)	—	—	—	$1,309	$1,309	$1,309

5.7.6 Manufacturing

Coryell County Manufacturing holds a contract with Gatesville to meet needs. No shortage is projected and no changes in water supply are recommended.

5.7.7 Steam-Electric

Coryell County has no current or projected future demand for Steam-Electric; therefore, no recommendations have been made.

5.7.8 Mining

Description of Supply

Mining demand in Coryell County is projected to peak in 2020, and slowly decrease until 2070. There are no supplies allocated to Coryell County Mining. Shortages are projected beginning in 2020.

Recommended Strategy

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Coryell County-Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: Not determined.

b. Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $20,220,000
- Unit Cost: Max of $1,236/acft (2020)

Table 5.7-5. Recommended Plan Costs by Decade for Coryell County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,510)*	*(1,072)*	*(491)*	*(363)*	*(398)*	*(437)*
Conservation						
Supply From Plan Element (acft/yr)	45	54	34	25	28	31
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,465)*	*(1,018)*	*(457)*	*(338)*	*(370)*	*(406)*

Table 5.7-5. Recommended Plan Costs by Decade for Coryell County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Groundwater Development - Trinity						
Supply From Plan Element (acft/yr)	1,500	1,500	500	500	500	500
Annual Cost ($/yr)	$1,853,751	$1,853,751	$159,751	$159,751	$159,751	$159,751
Unit Cost ($/acft)	$1,236	$1,236	$107	$107	$107	$107

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location.

5.7.9 Irrigation

No shortages are projected for Coryell County Irrigation and no changes in water supply are recommended.

5.7.10 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.8 Eastland County Water Supply Plan

Table 5.8-1 lists each water user group in Eastland County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.8-1. Eastland County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Cisco	236	237	Projected surplus
City of Eastland	2,565	2,575	Projected surplus
City of Gorman	75	59	Projected surplus
City of Ranger	1,575	1,578	Projected surplus
City of Rising Star	5	7	Projected surplus
Stephens Regional SUD			See Stephens County
County-Other	61	76	Projected surplus
Manufacturing	38	38	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	(929)	(432)	Projected shortage – see plan below
Irrigation	(2,257)	(2,271)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-15 and C-16, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.8.1 City of Cisco

The City of Cisco uses surface water from Lake Cisco which has a 2070 safe yield of 1,075 acft/yr. Cisco also has a contract sale to supply water to Westbound WSC with 147 acft/yr through 2070. No shortages are projected for the City of Cisco and no changes in water supply are recommended.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Cisco.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Unit Cost: $496/acft
- Annual Cost: maximum of $33,426 in 2030

Table 5.8-2. Recommended Plan Costs by Decade for City of Cisco

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*223*	*224*	*236*	*241*	*240*	*237*
Conservation						
Supply From Plan Element (acft/yr)	23	67	52	44	42	42
Annual Cost ($/yr)	$11,463	$33,426	$25,675	$21,629	$20,637	$20,637
Projected Surplus/(Shortage) after Conservation	*246*	*291*	*288*	*285*	*282*	*279*

5.8.2 City of Eastland

The City of Eastland receives its surface water from a contract with Eastland County Water Supply District. This contract supplies 3,314 acft/yr through 2070. Eastland has contracts to supply water to Westbound WSC and City of Carbon for a total of 120 acft/yr through 2070. No shortages are projected for the City of Eastland and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.8.3 City of Gorman

The City of Gorman purchases treated water from Upper Leon River Municipal Water District and no current or future shortage is projected. Therefore, no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.8.4 City of Ranger

The City of Ranger is supplied with surface water from a contract with Eastland County Water Supply District. This contract is scheduled to supply 2,025 acft/yr through 2070. No shortages are projected for the City of Ranger and no changes in water supply are recommended.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Ranger.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Unit Cost: $496/acft
- Annual Cost: maximum of $22,670 in 2030

Table 5.8-3. Recommended Plan Costs by Decade for City of Ranger

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,562*	*1,565*	*1,575*	*1,577*	*1,578*	*1,578*
Conservation						
Supply From Plan Element (acft/yr)	15	46	39	37	36	36
Annual Cost ($/yr)	$7,293	$22,670	$19,331	$18,339	$17,843	$17,843
Projected Surplus/(Shortage) after Conservation	*1,577*	*1,611*	*1,614*	*1,614*	*1,614*	*1,614*

5.8.5 City of Rising Star

The City of Rising Star uses locally available Trinity Aquifer groundwater for its water supply. No shortages are projected for the City of Rising Star and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.8.6 County-Other

The water supply entities for County-Other show a projected surplus from 2020 through 2070. Currently contract purchases through 2070 exist with the City of Cisco (147 acft/yr), the City of Clyde (221 acft/yr), and Eastland County WSC through the City of Eastland (120 acft/yr). Entities in County-Other also rely on Trinity Aquifer groundwater to meet needs. No changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.8.7 Manufacturing

Eastland County Manufacturing is supplied with surface water from Lake Eastland and Lake Leon. Manufacturing shows a projected surplus and no changes in water supply is recommended.

5.8.8 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.8.9 Mining

Description of Supply

Mining demand in Eastland County is projected to increase beginning in 2020, peak in 2030 and slowly decrease until 2070. Current groundwater allocations in Eastland County exceed the MAG and would not be available for Mining operations. Additional supplies for mining operations could be used from available Trinity Aquifer groundwater supplies in Erath County, which is adjacent to Eastland County and has a surplus of Trinity Aquifer groundwater.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Eastland County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Groundwater Development – Trinity Aquifer (Erath County)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $8,202,000
- Unit Cost: Max of $560 in 2020

Table 5.8-4. Recommended Plan Costs by Decade for Eastland County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,164)*	*(1,173)*	*(929)*	*(714)*	*(518)*	*(432)*
Conservation						
Supply From Plan Element (acft/yr)	35	59	65	50	36	30
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,129)*	*(1,114)*	*(864)*	*(664)*	*(482)*	*(402)*
Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	1,150	1,150	900	700	500	500
Annual Cost ($/yr)	$758,354	$758,354	$70,354	$70,354	$70,354	$70,354
Unit Cost ($/acft)	$560	$560	$52	$52	$52	$52

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.8.10 Irrigation

Description of Supply

Eastland County Irrigation is supplied by Trinity Groundwater, and run of the river water rights. Irrigation has 2,255 acft/yr in run of river rights which are not available during a drought of record. Irrigation is projected to have shortages beginning in 2020. Current Irrigation needs in Eastland County exceed the MAG. Additional supplies needed are being accounted against the available Trinity Aquifer supplies in adjacent Erath County.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Eastland County-Irrigation.

a. Conservation

- Cost Source: Volume II, Section 4B.2
- Date to be Implemented: before 2020
- Annual Cost: $230/acft

b. Groundwater Development – Trinity Aquifer (Erath County)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $24,210,000
- Unit Cost: Max of $1,255/acft in 2020

Table 5.8-5. Recommended Plan Costs by Decade for Eastland County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,238)*	*(2,248)*	*(2,257)*	*(2,260)*	*(2,263)*	*(2,271)*
Conservation						
Supply From Plan Element (acft/yr)	205	341	479	479	479	480
Annual Cost ($/yr)	$47,051	$78,534	$110,076	$110,124	$110,172	$110,285
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(2,033)*	*(1,907)*	*(1,778)*	*(1,781)*	*(1,784)*	*(1,791)*
Groundwater Development – Trinity Aquifer (Erath County)						
Supply From Plan Element (acft/yr)	2,033	1,907	1,778	1,781	1,784	1,791
Annual Cost ($/yr)	$2,213,162	$2,213,162	$182,162	$182,162	$182,162	$182,162
Unit Cost ($/acft)	$1,089	$1,089	$90	$90	$90	$90

5.8.11 Livestock

All of the livestock demand for Eastland County is met with local water supplies. No strategy is necessary or recommended.

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5.9 Erath County Water Supply Plan

Table 5.9-1 lists each water user group in Erath County and their corresponding surplus or shortage in years 2040 and 2070.

Table 5.9-1. Erath County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Dublin	97	15	Projected surplus
City of Stephenville	3,086	2,286	Projected surplus
County-Other	291	(315)	Projected shortage
Manufacturing	0	1	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	135	334	Projected shortage in 2030
Irrigation	825	1,088	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-17 and C-18, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.9.1 City of Dublin

The City of Dublin obtains its water supply from the Upper Leon Municipal Water District (Upper Leon MWD). The Upper Leon MWD has contracted for surface water from Lake Proctor and treats and delivers it to the City of Dublin. The City of Dublin and Upper Leon MWD have contracted for adequate quantities of water to provide a firm supply and meet Dublin's needs through the year 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd. The City provides supply for Manufacturing and for County-Other.

5.9.2 City of Stephenville

The City of Stephenville obtains its water supply from groundwater from the Trinity Aquifer. The City also has a contract with Upper Leon MWD for 1,862 acft/yr of supplies from Lake Proctor. The City has recently purchase property and begun development of a well field for emergency supply. The City has adequate water supplies to meet their needs through the year 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.9.3 County-Other

Description of Supply

The water supply entities comprising County-Other mostly rely on groundwater systems for water supply and show projected shortages beginning by 2060. Some surface water supplies are provided through the City of Dublin and City of Gordon. Available Trinity aquifer in Erath County will also be used to meet the projected demands.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended for the Erath County-Other. Associated costs are included for each strategy. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Groundwater Well Development:

- Cost Source: Volume II, Chapter 12.1
- Date to be Implemented: before 2060
- Project Cost: $1,463,000
- Annual Cost: maximum of $247,000 in 2070

Table 5.9-2. Recommended Plan Costs by Decade for Erath County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*692*	*477*	*291*	*93*	*(116)*	*(315)*
Conservation						
Supply from Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*692*	*477*	*291*	*93*	*(116)*	*(315)*
Groundwater Well Development						
Supply from Plan Element (acft/yr)	—	—	—	—	121	363
Annual Cost ($/yr)	—	—	—	—	$82,000	$247,000
Unit Cost ($/acft)	—	—	—	—	$678	$681

5.9.4 Manufacturing

Manufacturing is projected to have a surplus of water and no changes in water supply are recommended.

5.9.5 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.9.6 Mining

Mining is projected to have a shortage in 2030 but a surplus of water in other decades from available groundwater supplies. Conservation will be applied as a recommended strategy to reduce the Mining demand in 2030.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended for Mining in Erath County:

a. Conservation:

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2030
- Annual Cost: not determined

Table 5.9-3. Recommended Plan Costs by Decade for the Erath County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*6*	*(25)*	*135*	*207*	*279*	*334*
Conservation						
Supply from Plan Element (acft/yr)	—	27	—	—	—	—
Annual Cost ($/yr)	—	ND	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*6*	*1*	*135*	*207*	*279*	*334*

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.9.7 Irrigation

Irrigation is projected to have a surplus of water from available groundwater and surface water supplies and no changes in water supply are recommended.

5.9.8 Livestock

No shortages are projected for Livestock use and no changes in water supply are recommended.

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5.10 Falls County Water Supply Plan

Table 5.10-1 lists each water user group in Falls County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.10-1. Falls County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Bell-Milam Falls WSC			See Bell County for Plan
Bruceville-Eddy			See McLennan County for Plan
East Bell County WSC			See Bell County for Plan
City of Golinda	2	0	Projected surplus
City of Lott	161	161	Projected surplus
City of Marlin	930	872	Projected surplus– see plan below
City of Rosebud	430	425	Projected surplus
Tri-County SUD	(94)	(137)	Projected shortage – see plan below
West Brazos WSC	(173)	(216)	Projected shortage – see plan below
County-Other	90	68	Projected surplus
Manufacturing	(1)	(1)	Projected shortage – see plan below
Steam-Electric	0	0	No projected demand
Mining	(259)	(331)	Projected shortage – see plan below
Irrigation	2,478	2,847	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-19 and C-20, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.10.1 City of Golinda

The City of Golinda is in both Falls and McLennan County. There are three water providers that have service area within the city limits including Golinda WSC, Sudduth Water Systems and West Brazos WSC. Some exempt well use is estimated within the City. No change in water supply is recommended. Conservation was also considered; however, the entity’s current per capita use rate is below the selected target rate of 140 gpcd.

5.10.2 City of Lott

The City of Lott obtains its water supply from the Central Texas WSC, which treats and delivers water from Lake Stillhouse Hollow. The City of Lott has contracted with Central

Texas WSC for 234 acft/yr of supply, which exceeds its 2070 water demand of 73 acft/yr. No change in water supply is recommended. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.10.3 City of Marlin

Description of Supply

The City of Marlin obtains its water supply from surface water from local reservoirs and the Brazos River. The City owns and operates two existing reservoirs—Marlin City Lake and New Marlin Reservoir—that impound runoff from Big Sandy Creek. The City also owns water rights and authorizes diversion of 4,000 acft/yr from the Brazos River and has contracted with the Brazos River Authority for 1,200 acft/yr from the BRA System. Currently, the City utilizes surface water from the two existing reservoirs as its primary supply and diverts water from Brazos River only in an emergency to supplement the supply in the two existing reservoirs.

Water Supply Plan

The supplies projected are adequate to meet the City's water demand through 2070. Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended for the City of Marlin. Associated costs are included for each strategy.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020 – use rate exceeds 140 gpcd
   - Annual Cost: maximum of $355,000 in 2070
   - Unit Cost: $474/acft

b. Brushy Creek Reservoir (Volume II, Chapter 4.1)
   - Cost Source: Volume II, Chapter 4.1
   - Date to be Implemented: 2020
   - Total Project Cost: $20,836,000
   - Annual Cost: $1,743,000 (includes NRCS share of project)

Table 5.10-2. Recommended Plan Costs by Decade for the City of Marlin

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*979*	*923*	*930*	*978*	*927*	*872*
Conservation						
Supply From Plan Element (acft/yr)	86	226	357	480	619	756
Annual Cost ($/yr)	$40,333	$105,891	$167,336	$225,048	$290,278	$354,582
Projected Surplus/(Shortage) after Conservation (acft/yr)	*1,065*	*1,149*	*1,287*	*1,458*	*1,546*	*1,628*
Brushy Creek Reservoir						
Supply From Plan Element (acft/yr)	1,450	1,450	1,450	1,450	1,450	1,450
Annual Cost ($/yr)	$697,000	$697,000	$296,000	$296,000	$141,000	$141,000
Unit Cost ($/acft)	$481	$481	$204	$204	$97	$97

5.10.4 City of Rosebud

The City of Rosebud obtains its water supply from the Central Texas WSC, which treats and delivers water from Lake Belton. The City of Rosebud has contracted with Central Texas WSC for 500 acft/yr of supply and from BRA for 100 act/yr, which exceeds its 2070 projected water demand of 175 acft/yr. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd. No change in water supply is recommended.

5.10.5 Tri-County SUD

Description of Supply

Tri-County SUD obtains its water supply from the Trinity and Carrizo-Wilcox Aquifers, and does not have adequate water supplies to meet its projected water demands. This WUG is located in multiple counties (Limestone, McLennan, Robertson, and Falls). The needs shown in Table 5.10-1 represents the cumulative totals for Tri-County SUD in all counties it serves.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Tri-County SUD. Associated costs are included for each strategy. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Groundwater Development – Carrizo Wilcox Aquifer (Limestone Co):

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $1,445,000
- Annual Cost: maximum of $268,000 in 2020

Table 5.10-3. Recommended Plan Costs by Decade for Tri-County SUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(82)*	*(93)*	*(94)*	*(92)*	*(114)*	*(137)*
Conservation						
Supply from Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(82)*	*(93)*	*(94)*	*(92)*	*(114)*	*(137)*
Groundwater Development – Carrizo Wilcox						
Supply from Plan Element (acft/yr)	202	202	202	202	202	202
Annual Cost ($/yr)	$268,000	$268,000	$147,000	$147,000	$147,000	$147,000
Unit Cost ($/acft)	$1,329	$1,329	$729	$729	$729	$729

5.10.6 West Brazos WSC

Description of Supply

This WUG is located in multiple counties (McLennan and Falls) and relies on Trinity Aquifer groundwater to meet demands. The Trinity Aquifer in Falls County has current pumping that exceeds the MAG. The shortages shown in Table 5.10-4 represent the cumulative totals for West Brazos WSC in both counties.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended to meet the projected shortage of West Brazos WSC. Associated costs are included for each strategy. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Groundwater Development – Carrizo Wilcox Aquifer:

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $2,752,000
- Unit Cost: maximum of $1,446 (2020)

Table 5.10-4. Recommended Plan Costs by Decade for West Brazos WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(157)*	*(167)*	*(173)*	*(178)*	*(197)*	*(216)*
Conservation						
Supply from Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(157)*	*(167)*	*(173)*	*(178)*	*(197)*	*(216)*
Groundwater Development – Carrizo Wilcox Aquifer						
Supply from Plan Element (acft/yr)	202	202	202	202	202	216
Annual Cost ($/yr)	$292,010	$292,010	$69,010	$69,010	$69,010	$69,010
Unit Cost ($/acft)	$1,446	$1,446	$342	$342	$342	$319

5.10.7 County-Other

Description of Supply

Various entities are dealing with elevated levels of arsenic in groundwater supplies and have been pursuing water management strategies through the FHLM WSC. Through a TWDB sponsored study coordinated by FHLM WSC, these entities have considered a regional brackish RO WTP in Limestone County, Carrizo-Wilcox Regional Groundwater in Limestone County, Tehuacana Reservoir, and supplies from City of Marlin (Brushy Creek Reservoir), and City of Waco. The recommended strategy is to provide for arsenic treatment for individual entities. This strategy does not provide new supply. Surpluses are projected through the year 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Falls County-Other.

a. Upgrade Treatment for Arsenic

Entities within County-Other for which Arsenic treatment is recommended include Moore WS.

- Cost Source: Volume II, Chapter 12.5
- Date to be Implemented: 2020
- Project Cost: $220,000
- Unit Cost: $2,177/acft

Table 5.10-5. Recommended Plan Costs by Decade for the Falls County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*89*	*81*	*90*	*105*	*87*	*68*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*89*	*81*	*90*	*105*	*87*	*68*
Upgrade Treatment for Arsenic						
Supply From Plan Element (acft/yr)	53	53	53	53	53	53
Annual Cost ($/yr)	$115,000	$115,000	$97,000	$97,000	$97,000	$97,000
Unit Cost ($/yr)	$2,177	$2,177	$1,830	$1,830	$1,830	$1,830

5.10.8 Manufacturing

Description of Supply

Manufacturing is projected to have a one acre foot need for water through the year 2070. The location for this manufacturing demand within the county has not been determined. The City of Marlin has the largest population of the WUGs in Falls County and has current supply and would be a likely location and water supplier for the manufacturing demand.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended to meet the projected shortage of Falls County Manufacturing. Associated costs are included for each strategy. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Purchase water from City of Marlin:

- Cost Source: $4.67 per 1000 gal. Volume II, Chapter 12
- Date to be Implemented: before 2020
- Annual Cost: maximum of $1,522 in 2070

Table 5.10-6. Recommended Plan Costs by Decade for Falls County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*
Conservation						
Supply from Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*
Purchase from City of Marlin						
Supply from Plan Element (acft/yr)	1	1	1	1	1	1
Annual Cost ($/yr)	$1,522	$1,522	$1,522	$1,522	$1,522	$1,522
Unit Cost ($/acft)	$1,522	$1,522	$1,522	$1,522	$1,522	$1,522

5.10.9 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.10.10 Mining

Description of Supply

Mining is projected to have a shortage of water through the year 2070. Conservation will be applied as a recommended strategy to reduce the Mining demand.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended to meet the projected shortage of Falls County Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: Costs to implement conservation technologies will vary based on each location and have not been determined.

b. Reallocation from Falls County – Irrigation:

- Cost Source: Unknown – the exact location of the projected Mining demands in Falls County is unknown, but could logically be located near the supplies located in the county, and development of a cost is not feasible.
- Date to be Implemented: before 2020
- Annual Cost: not determined

Table 5.10-7. Recommended Plan Costs by Decade for Falls County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage)	*(225)*	*(246)*	*(259)*	*(286)*	*(307)*	*(331)*
Conservation						
Supply from Plan Element (acft/yr)	7	12	18	20	21	23
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(218)*	*(234)*	*(241)*	*(266)*	*(286)*	*(308)*
Reallocation of Supplies from Falls County Irrigation						
Supply from Plan Element (acft/yr)	218	234	241	266	286	308
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Unit Cost ($/acft)	ND	ND	ND	ND	ND	ND

ND – Not determined.

5.10.11 Irrigation

Irrigation is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended.

5.10.12 Livestock

Livestock is projected to have a no additional need for water through the year 2060 and no changes in water supply are recommended.

5.11 Fisher County Water Supply Plan

Table 5.11-1 lists each water user group in Fisher County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.11-1. Fisher County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Bitter Creek WSC			See Nolan County for Plan
City of Roby	268	270	Projected surplus
City of Rotan	(60)	(84)	Projected shortage – see plan below
County-Other	50	51	Projected surplus
Manufacturing	(79)	(159)	Projected shortage – see plan below
Steam-Electric	0	0	Demand equals supply
Mining	(359)	(238)	Projected shortage – see plan below
Irrigation	1,066	1,428	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-19 and C-20, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.11.1 City of Roby

Description of Supply

Water supplies are obtained from the Seymour Aquifer and the City of Sweetwater. No shortage is projected for the City of Roby throughout the planning period.

Water Supply Plan

The supplies projected are adequate to meet the City's water demand through 2070. Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Roby.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $7,133 in 2040
- Unit Cost: $496/acft

Table 5.11-2. Recommended Plan Costs by Decade for the City of Roby

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*263*	*266*	*268*	*269*	*270*	*270*
Conservation						
Supply From Plan Element (acft/yr)	5	13	14	13	12	12
Annual Cost ($/yr)	$2,460	$6,448	$6,944	$6,448	$5,952	$5,952
Projected Surplus/(Shortage) after Conservation (acft/yr)	*268*	*280*	*283*	*283*	*283*	*283*

5.11.2 City of Rotan

Description of Supply

The City of Rotan is currently purchasing water under contract from the City of Snyder. Shortages are projected by 2020. The city also provides supply for Manufacturing demand. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region F, the following water management strategies are recommended to meet water needs for the City of Rotan.

a. Water Supply from City of Snyder to meet Contract

- Cost Source: Costs applied to CRMWD to meet contracts (2016 Region F Water Supply Plan)
- Date to be Implemented: 2020
- Project Cost: none, existing infrastructure assumed sufficient
- Annual Cost: already contracted supplies

Table 5.11-3. Recommended Plan Costs by Decade for City of Rotan

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(89)*	*(50)*	*(60)*	*(67)*	*(76)*	*(84)*
Conservation						
Supply from Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(89)*	*(50)*	*(60)*	*(67)*	*(76)*	*(84)*
Water Supply from City of Snyder						
Supply from Plan Element (acft/yr)	89	50	60	67	76	84
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/acft)	$0	$0	$0	$0	$0	$0

5.11.3 County-Other

Entities in Fisher County-Other receive supplies from the Seymour Aquifer and are projected to have a surplus of water through the year 2070. No changes in water supply are recommended. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.11.4 Manufacturing

Description of Supply

Manufacturing obtains most of its supply from the Dockum Aquifer in combination with minimal supplies from Hamlin and Rotan. Manufacturing is projected to have a shortage of water through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended to meet the projected shortage for Fisher County Manufacturing.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: not determined

b. Groundwater Development - Dockum Aquifer (Brackish)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $10,081,000
- Unit Cost: Max of $14,040 (2020)

Table 5.11-3. Recommended Plan Costs by Decade for Fisher County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(20)*	*(50)*	*(79)*	*(105)*	*(131)*	*(159)*
Conservation						
Supply from Plan Element (acft/yr)	7	13	20	22	24	25
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(14)*	*(38)*	*(59)*	*(84)*	*(108)*	*(134)*
Groundwater Development - Dockum Aquifer (Brackish)						
Supply from Plan Element (acft/yr)	50	50	140	140	140	140
Annual Cost ($/yr)	$702,011	$702,011	$1,517,030	$1,517,030	$1,066,030	$1,066,030
Unit Cost ($/acft)	$14,040	$14,040	$10,836	$10,836	$7,614	$7,614

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location and have not been determined.

5.11.5 Steam-Electric

No Steam-Electric demand exists nor is projected for the county.

5.11.6 Mining

Description of Supply

Mining is projected to have a shortage of water through the year 2070. Conservation will be applied as a recommended strategy to reduce the Mining demand.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected shortage of Fisher County Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: Costs to implement industrial conservation technologies will vary based on each location and have not been determined.

b. Groundwater Development - Dockum Aquifer (Brackish)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $3,035,000
- Unit Cost: Max of $696/acft (2020)

Table 5.11-4. Recommended Plan Costs by Decade for Fisher County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(407)*	*(402)*	*(359)*	*(313)*	*(273)*	*(238)*
Conservation						
Supply from Plan Element (acft/yr)	12	20	25	22	19	17
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(395)*	*(382)*	*(334)*	*(291)*	*(254)*	*(221)*
Groundwater Development – Dockum Aquifer (Brackish)						
Supply from Plan Element (acft/yr)	400	400	400	400	400	400
Annual Cost ($/yr)	$278,431	$278,431	$23,431	$23,431	$23,431	$23,431
Unit Cost ($/acft)	$696	$696	$59	$59	$59	$59

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location.

5.11.7 Irrigation

Irrigation uses water supplies from the Blaine and Seymour Aquifers and run-of-the river water rights. Irrigation in Fisher County is projected to have a surplus of water through the year 2070 and no change in water supply is recommended.

5.11.8 Livestock

Livestock is projected to have a no additional need for water through the year 2070 and no changes in water supply are recommended.

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5.12 Grimes County Water Supply Plan

Table 5.12-1 lists each water user group in Grimes County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.12-1.Grimes County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Dobbin-Plantersville WSC	154	101	Projected surplus
G&W WSC	0	0	Demand equals supply
City of Navasota	643	502	Projected surplus
Wickson Creek SUD			See Brazos County
County-Other	211	66	Projected surplus
Manufacturing	59	0	Projected surplus
Steam-Electric	(14,738)	(23,243)	Projected shortage – see plan below
Mining	(438)	(95)	Projected shortage – see plan below
Irrigation	585	585	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-23 and C-24, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.12.1 Dobbin-Plantersville WSC

Dobbin Plantersville WSC provides water supply in Grimes and Montgomery counties. The majority of the demand for the entity is in Montgomery County which is part of Region H. This section will only deal with the supply, demands and strategies that are within Grimes County and the Brazos G Area. Dobbin-Plantersville WSC obtains water supply in Grimes County from the Gulf Coast Aquifer and is projected to have a surplus of water through the year 2070. No changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.12.2 G&W WSC

G&W WSC provides water supply in Grimes and Waller counties. The majority of the demand for the entity is in Waller County which is part of Region H. This section will only deal with the supply, demands and strategies that are within Grimes County and the Brazos G Area. G & W WSC obtains water supply in Grimes County from the Gulf Coast Aquifer and supplies in Region H sufficient to meet its demands in Grimes County. No changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.12.3 City of Navasota

Description of Supply

The City of Navasota obtains its water supply from groundwater from the Gulf Coast Aquifer. The existing production capacity of the wells and groundwater availability is adequate to supply the needs of the City of Navasota through the year 2070. The city provides a portion of supply to Grimes County Manufacturing.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for City of Navasota.

a. Conservation:

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $110,000 in 2070
- Unit Cost: $470/acft

Table 5.12-2. Recommended Plan Costs by Decade for City of Navasota

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*661*	*650*	*643*	*623*	*572*	*502*
Conservation						
Supply From Plan Element (acft/yr)	55	158	238	229	231	235
Annual Cost ($/yr)	$26,000	$74,000	$112,000	$107,000	$109,000	$110,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*716*	*807*	*881*	*851*	*803*	*737*

5.12.4 County-Other

Entities comprising Grimes County-Other obtain water supply from groundwater in the county. County-Other entities are projected to have a surplus of supply through 2070. Conservation was considered; however, the entity’s current per capita use rate is below the selected target rate of 140 gpcd.

5.12.5 Manufacturing

Description of Supply

Water supplies for manufacturing in Grimes County is obtained from nearby WUGs, run of river water rights, and Gulf Coast Aquifer wells operated by the manufacturing entity. Manufacturing is projected to have a shortage of water beginning in the year 2060.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for Grimes County Manufacturing.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2060
- Annual Cost: not determined

Table 5.12-3 Recommended Plan Costs by Decade for Grimes County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*154*	*107*	*59*	*17*	*(0)*	*(0)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	38	41
Annual Cost ($/yr)	—	—	—	—	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*154*	*107*	*59*	*17*	*38*	*41*

5.12.6 Steam-Electric

Description of Supply

Grimes County Steam-Electric obtains water supply Gibbons Creek Reservoir, Lake Livingston, reuse supplies from the City of Huntsville, and groundwater from the Gulf Coast Aquifer. Grimes County Steam-Electric is projected to have shortages beginning in year 2020 and continuing through year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Grimes County Steam-Electric.

a. Conservation:

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: Not determined

b. Gibbons Creek Reservoir Expansion:

- Cost Source: Volume II, Chapter 7.4
- Date to be Implemented: 2020
- Total Project Cost: $12,979,000

- Unit Cost: $359/acft

c. Purchase reuse water from the Cities of College Station and Bryan:

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: none
- Unit Cost: $304/acft

d. Groundwater Development – Gulf Coast Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $22,459,000
- Unit Cost: Max of $423/acft (2020)

e. Groundwater Development – Brackish Carrizo-Wilcox Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $8,182,000
- Unit Cost: Max of $2,971/acft/yr (2020)

Table 5.12-4. Recommended Plan Costs by Decade for Grimes County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/ (Shortage) (acft/yr)	*(11,666)*	*(13,152)*	*(14,738)*	*(16,825)*	*(19,911)*	*(23,243)*
Conservation						
Supply From Plan Element (acft/yr)	953	1,658	2,426	2,566	2,776	3,003
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/ (Shortage) after Conservation (acft/yr)	*(10,713)*	*(11,494)*	*(12,312)*	*(14,259)*	*(17,135)*	*(20,239)*
Reuse Supply from Bryan and College Station						
Supply From Plan Element (acft/yr)	1,529	2,310	3,128	5,075	7,951	11,056
Annual Cost ($/yr)	$464,816	$702,240	$950,912	$1,542,800	$2,417,104	$3,361,024
Unit Cost ($/acft)	$304	$304	$304	$304	$304	$304
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(8,841)*	*(8,841)*	*(8,841)*	*(8,841)*	*(8,841)*	*(8,840)*
Gibbons Creek Reservoir Expansion						
Supply From Plan Element (acft/yr)	2,605	2,605	2,605	2,605	2,605	2,605
Annual Cost ($/yr)	$934,000	$934,000	$934,000	$934,000	$125,000	$125,000
Unit Cost ($/acft)	$359	$359	$359	$359	$48	$48

Table 5.12-4. Recommended Plan Costs by Decade for Grimes County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Groundwater Development – Gulf Coast						
Supply From Plan Element (acft/yr)	6,236	6,236	6,236	6,236	6,236	6,236
Annual Cost ($/yr)	$2,639,903	$2,639,903	$895,903	$895,903	$895,903	$895,903
Unit Cost ($/acft)	$423	$423	$144	$144	$144	$144
Groundwater Development – Carrizo Wilcox						
Supply From Plan Element (acft/yr)	343	343	343	343	343	343
Annual Cost ($/yr)	$1,018,979	$1,018,979	$350,979	$350,979	$350,979	$350,979
Unit Cost ($/acft)	$2,971	$2,971	$1,023	$1,023	$1,023	$1,023

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location.

5.12.7 Mining

Description of Supply

Mining operations in Grimes County are supplied by groundwater from the Gulf Coast Aquifer. Demands for Mining are projected to increase resulting in shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Grimes County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Groundwater Development - Carrizo Wilcox Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $5,805,000
- Unit Cost: Max of $1,764 /acft (2020)

Table 5.12-5. Recommended Plan Costs by Decade for Grimes County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(290)*	*(569)*	*(438)*	*(307)*	*(176)*	*(95)*
Conservation						
Supply From Plan Element (acft/yr)	10	30	33	24	15	9
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(281)*	*(539)*	*(405)*	*(284)*	*(162)*	*(86)*
Groundwater Development – Carrizo Wilcox						
Supply From Plan Element (acft/yr)	300	550	550	300	300	100
Annual Cost ($/yr)	$529,113	$881,856	$395,856	$71,856	$71,856	$71,856
Unit Cost ($/acft)	$1,764	$1,603	$720	$131	$131	$131

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.12.8 Irrigation

Grimes County Irrigation is projected to have a surplus of water through the year 2070. No changes in water supply are recommended.

5.12.9 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.13 Hamilton County Water Supply Plan

Table 5.13-1 lists each water user group in Hamilton County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.13-1. Hamilton County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
City of Hamilton	137	52	Projected surplus
City of Hico	212	216	Projected surplus
County-Other	175	178	Projected surplus
Multi-County WSC			See Coryell County
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	No projected demand
Mining	(89)	13	Projected shortage – see plan below
Irrigation	(61)	(6)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-25 and C-26, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.13.1 City of Hamilton

Description of Supply

The City of Hamilton obtains its water supply from Lake Proctor through the Upper Leon Municipal Water District with a contract for 921 acft/yr of supply. The City of Hamilton sells a portion of its supply to Multi-County WSC and to Manufacturing in Bosque County and Hamilton County. The City's available supply exceeds the 2070 demands.

Water Supply Plan

Although, the City has sufficient supplies, working within the planning criteria established by the Brazos G RWPG and TWDB, conservation is recommended as the current per capita use rate is above the selected target of 140 gpcd.

a. Conservation

- Cost Source: Volume II, Section 2
- Date to be Implemented: before 2020 – use rate exceeds 140 gpcd
- Unit Cost: $474/acft
- Annual Cost: $14,963 in 2030

Table 5.13-2. Recommended Plan Costs by Decade for City of Hamilton

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*140*	*136*	*137*	*88*	*75*	*52*
Conservation						
Supply From Plan Element (acft/yr)	18	32	20	14	13	13
Annual Cost ($/yr)	$8,434	$14,963	$9,275	$6,431	$5,957	$5,957
Projected Surplus/(Shortage) after Conservation (acft/yr)	*157*	*168*	*157*	*102*	*87*	*65*

5.13.2 City of Hico

The City of Hico obtains its water supply from groundwater from the Trinity Aquifer. The existing production capacity of the wells and groundwater availability is adequate to supply the needs of the City of Hico through the year 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd. No change in water supply is recommended.

5.13.3 County-Other

Entities in Hamilton County-Other receive groundwater from the Trinity Aquifer. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd. No future shortages are projected and no changes in water supply are recommended.

5.13.4 Manufacturing

Hamilton County Manufacturing is supplied by City of Hamilton and Trinity groundwater. No future shortages are projected and no changes in water supply are recommended.

5.13.5 Steam-Electric

There is no projected water demand for Steam-Electric in Hamilton County.

5.13.6 Mining

Description of Supply

Mining operations in Hamilton County are supplied by Trinity Groundwater. Demands for Mining are projected to increase significantly resulting in shortages beginning in 2020.

Recommended Strategy

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following plan is recommended for Hamilton County Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $2,734,000
- Unit Cost: Max of $680/acft (2020)

Table 5.13-3. Recommended Plan Costs by Decade for Hamilton County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(381)*	*(224)*	*(89)*	*13*	*13*	*13*
Conservation						
Supply From Plan Element (acft/yr)	12	12	7	—	—	—
Annual Cost ($/yr)	ND	ND	ND	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(369)*	*(212)*	*(81)*	*13*	*13*	*13*
Groundwater Well Development - Trinity						
Supply From Plan Element (acft/yr)	370	370	370	—	—	—
Annual Cost ($/yr)	$251,735	$251,735	$22,735	—	—	—
Unit Cost ($/acft)	$680	$680	$61	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.13.7 Irrigation

Description of Supply

Irrigation demands are currently met with Trinity groundwater and run of river rights. An increase of Irrigation demand is projected for Hamilton County and shortages are projected beginning in 2020.

Recommended Strategy

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following plan is recommended for Hamilton County Irrigation. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $230/acft

b. Groundwater Development –Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $1,173,000
- Unit Cost: Max of $1,779/acft (2020)

Table 5.13-4. Recommended Plan Costs by Decade for Hamilton County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(71)*	*(69)*	*(61)*	*(39)*	*(17)*	*(6)*
Conservation						
Supply From Plan Element (acft/yr)	16	25	34	33	32	30
Annual Cost ($/yr)	$3,680	$5,750	$7,820	$7,590	$7,360	$6,900
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(55)*	*(44)*	*(27)*	*(6)*	*15*	*24*
Groundwater Well Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	60	60	60	60	—	—
Annual Cost ($/yr)	$106,733	$106,733	$8,733	$8,733	—	—
Unit Cost ($/acft)	$1,779	$1,779	$146	$146	—	—

5.13.8 Livestock

Livestock water supply is projected to meet demands through 2070 and no change in water supply is recommended.

5.14 Haskell County Water Supply Plan

Table 5.14-1 lists each water user group in Haskell County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.14-1. Haskell County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Haskell	(193)	(442)	Projected shortage – see plan below
City of Rule	55	38	Projected surplus
City of Stamford			See Jones County
County-Other	198	67	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	1,738	1,480	Projected surplus
Mining	(83)	(59)	Projected shortage – see plan below
Irrigation	(3,197)	1,880	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-27 and C-28, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.14.1 City of Haskell

Description of Supply

Surface water supplies are obtained from a contract with North Central Texas Municipal Water Authority (NCTMWA). While the contract exceeds the City's projected demands, the current supplies from the NCTMWA are not sufficient to meet demands through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortage for the City of Haskell.

a. Millers Creek Reservoir Augmentation strategy by NCTMWA. This will provide supply at least up to the current amount contracted from NCTMWA.
   - Cost Source: Volume II, Chapter 7.5
     - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit

- Date to be Implemented: 2020
- Project Cost: none (cost would be borne by NCTMWA)
- Unit Cost: none (supply already purchased from NCTMWA)

b. Alternative: Lake Creek Reservoir. This strategy would be developed by NCTMWA to augment existing supplies.

- Cost Source: Volume II, Chapter 4.10
    - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
- Date to be Implemented: 2020
- Project Cost: none (cost would be borne by NCTMWA)
- Unit Cost: none (supply already purchased from NCTMWA)

Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.14-2. Recommended Plan Costs by Decade for City of Haskell

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(58)*	*(126)*	*(193)*	*(269)*	*(353)*	*(442)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(58)*	*(126)*	*(193)*	*(269)*	*(353)*	*(442)*
Millers Creek Reservoir Augmentation						
Supply From Plan Element (acft/yr)	176	254	332	410	488	566
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Alternative: Lake Creek Reservoir						
Supply From Plan Element (acft/yr)	176	254	332	410	488	566
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.14.2 City of Rule

Description of Supply

The City of Rule obtains supply from the Seymour Aquifer and from a 45 acft/yr contract with NCTMWA. Although supplies from NCTMWA have been reduced due to projected availability of supplies, the City's supplies are projected to be adequate to meet demands through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Rule. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Millers Creek Reservoir Augmentation strategy by NCTMWA. This will provide supply at least up to the current amount contracted from NCTMWA.
   - Cost Source: Volume II, Chapter 7.5
     - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
   - Date to be Implemented: 2020
   - Project Cost: none (cost would be borne by NCTMWA)
   - Unit Cost: none (supply already purchased from NCTMWA)

b. Alternative: Lake Creek Reservoir. This strategy would be developed by NCTMWA to augment existing supplies.
   - Cost Source: Volume II, Chapter 4.10
     - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
   - Date to be Implemented: 2020
   - Project Cost: none (cost would be borne by NCTMWA)
   - Unit Cost: none (supply already purchased from NCTMWA)

Table 5.14-3. Recommended Plan Costs by Decade for City of Rule

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*71*	*64*	*55*	*49*	*45*	*38*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*71*	*64*	*55*	*49*	*45*	*38*
Millers Creek Reservoir Augmentation						
Supply From Plan Element (acft/yr)	12	18	23	29	34	40
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

Table 5.14-3. Recommended Plan Costs by Decade for City of Rule

Plan Element	2020	2030	2040	2050	2060	2070
Alternative: Lake Creek Reservoir						
Supply From Plan Element (acft/yr)	12	18	23	29	34	40
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.14.3 County-Other

Description of Supply

Supplies for Haskell County other are obtained from the Seymour Aquifer and contract purchases from the City of Stamford and NCTMWA. Although supplies from NCTMWA have been reduced due to projected availability of supplies, County-Other supplies are projected to be adequate to meet demands through 2070. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for entities included in County-Other.

a. Millers Creek Reservoir Augmentation strategy by NCTMWA. This will provide supply at least up to the current amount contracted from NCTMWA.
   - Cost Source: Volume II, Chapter 7.5
     - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
   - Date to be Implemented: 2020
   - Project Cost: none (cost would be borne by NCTMWA)
   - Unit Cost: none (supply already purchased from NCTMWA)

b. Alternative: Lake Creek Reservoir. This strategy would be developed by NCTMWA to augment existing supplies.
   - Cost Source: Volume II, Chapter 4.10
   - Date to be Implemented: 2020
   - Project Cost: none (cost would be borne by NCTMWA)
   - Unit Cost: none (supply already purchased from NCTMWA)

Table 5.14-4. Recommended Plan Costs by Decade for Haskell County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*280*	*242*	*198*	*155*	*114*	*67*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*280*	*242*	*198*	*155*	*114*	*67*
Millers Creek Reservoir Augmentation						
Supply From Plan Element (acft/yr)	53	76	100	123	146	170
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Alternative: Lake Creek Reservoir						
Supply From Plan Element (acft/yr)	53	76	100	123	146	170
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.14.4 Manufacturing

No Manufacturing demand exists or is projected for the county.

5.14.5 Steam-Electric

Haskell County Steam-Electric has a contract with City of Stamford for water supply. Steam-Electric shows a projected surplus through 2070 and no changes in water supply are recommended.

5.14.6 Mining

Description of Supply

Mining operations in Haskell County are projected to have a need beginning in 2020.

Recommended Strategy

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Haskell County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: not determined

b. Reallocation from Haskell County – Steam Electric (Stamford Supply):

- Cost Source: Capital cost unknown, as mining demands vary geographically.
- Date to be Implemented: 2020
- Unit Costs: $250/acft assumed

Table 5.14-5. Recommended Plan Costs by Decade for Haskell County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(93)*	*(92)*	*(83)*	*(74)*	*(66)*	*(59)*
Conservation						
Supply From Plan Element (acft/yr)	3	5	6	5	5	4
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(90)*	*(87)*	*(77)*	*(69)*	*(61)*	*(55)*
Reallocation from Haskell County – Steam Electric (Stamford Supply)						
Supply From Plan Element (acft/yr)	90	87	77	69	61	55
Annual Cost ($/yr)	$22,500	$21,750	$19,250	$17,250	$15,250	$13,750
Unit Cost ($/acft)	$250	$250	$250	$250	$250	$250

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.14.7 Irrigation

Description of Supply

Haskell County Irrigation is supplied by Seymour Groundwater. Irrigation is projected to have shortages beginning in 2020.

Recommended Strategy

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Haskell County-Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: $230/acft

b. Reallocation from Haskell County – Steam Electric (Stamford Supply):

- Cost Source: Capital cost unknown, as Irrigation demands vary geographically.
- Date to be Implemented: 2020
- Unit Cost: assumed $250/acft

Table 5.14-6. Recommended Plan Costs by Decade for Haskell County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,225)*	*(2,388)*	*(3,197)*	*(1,065)*	*682*	*1,880*
Conservation						
Supply From Plan Element (acft/yr)	1,435	2,321	3,153	3,015	2,968	2,884
Annual Cost ($/yr)	$330,124	$533,853	$725,144	$693,459	$682,721	$663,433
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(790)*	*(67)*	*(44)*	*1,951*	*682*	*1,880*
Reallocation from Haskell County – Steam Electric (Stamford Supply)						
Supply From Plan Element (acft/yr)	790	67	44	—	—	—
Annual Cost ($/yr)	$197,500	$16,750	$11,000	—	—	—
Unit Cost ($/acft)	$250	$250	$250	—	—	—

5.14.8 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.15 Hill County Water Supply Plan

Table 5.15-1 lists each water user group in Hill County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections. Water supply plans are also presented for some entities that need pumping/conveyance facilities to utilize their existing water resources, or to become a regional provider.

Table 5.15-1. Hill County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Brandon-Irene WSC[2]	93	50	Projected surplus
Files Valley WSC[2]	679	496	Projected surplus
City of Hillsboro	1,554	1,373	Projected surplus
City of Hubbard	(32)	(69)	Projected shortage – see plan below
City of Itasca	83	73	Projected surplus
Hill County WSC	415	375	Projected surplus
Johnson County SUD			See Johnson County for Plan
Parker WSC			See Johnson County for Plan
White Bluff Community WS	126	83	Projected surplus
City of Whitney	139	100	Projected surplus
Woodrow-Osceola WSC	217	184	Projected surplus
County-Other	247	63	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	No projected demand
Mining	223	477	Projected surplus
Irrigation	832	851	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-29 and C-30, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

2 – Balance includes totals from Brazos G and Region C.

5.15.1 Brandon-Irene WSC

Brandon-Irene WSC is located in Hill, Ellis and Navarro County, however most of its demand is located in Hill County. Brandon-Irene WSC obtains its water from the Trinity Aquifer and surface water through a contract with Aquilla WSD. The WSC also provides supply to the City of Bynum in Hill County. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Surpluses are projected through 2070 for Brandon Irene WSC, and no changes in water supply are recommended.

5.15.2 Files Valley WSC

Description of Supply

Files Valley WSC is located in Hill and Ellis (Region C) counties, however most of its demands is located in Hill County. The WSC has a contract for 1,709 acft/yr of treated surface water from Lake Aquilla through Aquilla Water Supply District. Files Valley WSC also provides water to Parker WSC and Milford. Balance and strategies represented in Table 5.15-2 are for the entire WSC in both counties and regions.

Water Supply Plan

Although the City has sufficient supplies, working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region C, the following plan is recommended to meet projected needs.

a. Conservation:

- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2020
- Project Cost: $2,010
- Unit Cost: $169/acft

b. Purchase Water from Waxahachie

- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2030
- Project Cost: $23,452,400
- Unit Cost: $570/acft

Table 5.15-2. Recommended Plan Costs by Decade for the Files Valley WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*618*	*722*	*679*	*625*	*564*	*496*
Conservation						
Supply From Plan Element (acft/yr)	1	2	2	3	5	7
Annual Cost ($/yr)	$169	$338	$0	$0	$0	$0
Projected Surplus/(Shortage) after Conservation (acft/yr)	*619*	*724*	*681*	*628*	*569*	*503*
Purchase Water from Waxahachie (Region C)						
Supply From Plan Element (acft/yr)	—	55	59	63	68	72
Annual Cost ($/yr)	—	$31,000	$34,000	$36,000	$39,000	$41,000
Unit Cost ($/acft)	—	$570	$570	$570	$570	$570

5.15.3 City of Hillsboro

Description of Supply

The City of Hillsboro purchases its water supply from the Aquilla WSD and has surpluses projected through 2070. No change in water supply is recommended.

Water Supply Plan

Although the City has sufficient supplies, working within the planning criteria established by the Brazos G RWPG and TWDB, conservation is recommended for the City as the current per capita use rate is above the selected target rate. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020 – use rate exceeds 140 gpcd
- Annual Cost: maximum of $245,040 in 2070
- Unit Cost: $474/acft

Table 5.15-3. Recommended Plan Costs by Decade for the City of Hillsboro

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,888*	*1,606*	*1,554*	*1,486*	*1,425*	*1,373*
Conservation						
Supply From Plan Element (acft/yr)	79	230	385	495	506	517
Annual Cost ($/yr)	$37,526	$109,198	$182,668	$234,424	$239,672	$245,040
Projected Surplus/(Shortage) after Conservation (acft/yr)	*1,968*	*1,836*	*1,939*	*1,981*	*1,931*	*1,890*

5.15.4 City of Hubbard

Description of Supply

The City of Hubbard obtains its water supply the Trinity Aquifer and from Lake Navarro Mills through the Post Oak Special Utility District (SUD). The Post Oak SUD purchases treated water from the City of Corsicana and delivers it to the City of Hubbard. The existing contractual arrangements and conveyance capacity of the system are adequate; however Corsicana's supplies are constrained causing a shortage on Hubbard.

Water Supply Plan

Although the City has sufficient supplies, working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region C, the following plan is recommended to meet projected needs. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Water Supply from Post Oak SUD

- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2030
- Project Cost: no cost to Hubbard
- Unit Cost: $570/acft

Table 5.15-4. Recommended Plan Costs by Decade for the City of Hubbard

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*29*	*(25)*	*(32)*	*(44)*	*(57)*	*(69)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*29*	*(25)*	*(32)*	*(44)*	*(57)*	*(69)*
Water Supply from Post Oak SUD (Region C)						
Supply From Plan Element (acft/yr)	—	25	32	44	57	69
Annual Cost ($/yr)	—	$14,000	$18,000	$25,000	$32,000	$39,000
Unit Cost ($/acft)	—	$570	$570	$570	$570	$570

5.15.5 City of Itasca

The City of Itasca obtains its water supply from the Trinity Aquifer. The production capacity of the wells and groundwater availability are adequate to supply the demands of the City of Itasca through the year 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd. No change in water supply is recommended.

5.15.6 Hill County WSC

Hill County WSC obtains its water supply from the Trinity Aquifer and a surface water contract with Aquilla Water Supply District. The existing contract and production capacity of the wells and groundwater availability are adequate to supply the needs of the WSC through the year 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd. No change in water supply is recommended.

5.15.7 White Bluff Community WS

Description of Supply

White Bluff Community WS obtains its water supply from the Trinity Aquifer. The existing production capacity of the wells and groundwater availability are adequate to supply the needs of the WUG through the year 2070.

Water Supply Plan

Although the WUG has sufficient supplies, working within the planning criteria established by the Brazos G RWPG and TWDB, conservation is recommended as the current per capita use rate is above the selected target rate. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd. Associated costs are included for each strategy.

a. Conservation:

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: By year 2020 - use rate exceeds 140 gpcd
- Annual Cost: maximum of $65,242 in 2070
- Unit Cost: $474/acft

Table 5.15-5. Recommended Plan Costs by Decade for White Bluff Community WS

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*166*	*142*	*126*	*109*	*95*	*83*
Conservation						
Supply From Plan Element (acft/yr)	24	63	103	125	128	132
Annual Cost ($/yr)	$12,066	$31,494	$50,907	$62,069	$63,646	$65,242
Projected Surplus/(Shortage) after Conservation (acft/yr)	*190*	*205*	*229*	*234*	*223*	*214*

5.15.8 City of Whitney

Description of Supply

The City of Whitney obtains its water supply from the Trinity Aquifer. The City of Whitney has also contracted with the Brazos River Authority for 750 acft/yr of supply from Lake Whitney; however, the City has not constructed the required infrastructure to utilize this supply. The production capacity of the City's existing wells and groundwater availability are adequate to supply the needs of the City of Whitney through the year 2070.

Water Supply Plan

Although the City has sufficient supplies, working within the planning criteria established by the Brazos G RWPG and TWDB, conservation is recommended as the current per capita use rate is above the selected target rate. Associated costs are included for each strategy.

a. Conservation:

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: By year 2020 - use rate exceeds 140 gpcd
- Annual Cost: maximum of $33,626 in 2070
- Unit Cost: $474/acft

Table 5.15-6. Recommended Plan Costs by Decade for City of Whitney

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*169*	*151*	*139*	*125*	*112*	*100*
Conservation						
Supply From Plan Element (acft/yr)	17	50	70	68	69	71
Annual Cost ($/yr)	$7,857	$23,644	$33,054	$32,182	$32,621	$33,626
Projected Surplus/(Shortage) after Conservation (acft/yr)	*185*	*201*	*209*	*193*	*181*	*171*

5.15.9 Woodrow-Osceola WSC

Woodrow-Osceola WSC obtains its water supply from the Trinity Aquifer. The existing production capacity of the wells and groundwater availability are adequate to supply the demands of the WSC through the year 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd. No change in water supply is recommended.

5.15.10 County-Other

Description of Supply

Entities in Hill County-Other use Trinity Aquifer groundwater and surface water from Aquilla Water Supply District and Brandon-Irene WSC. The WUG is projected to have a surplus of water in the year 2070. Various entities are dealing with elevated levels of arsenic in groundwater supplies and have been pursuing water management strategies through the FHLM WSC. Through a TWDB sponsored study coordinated by FHLM WSC, these entities have considered a regional brackish RO WTP in Limestone County, Carrizo-Wilcox Regional Groundwater in Limestone County, Tehuacana Reservoir, and supplies from City of Marlin (Brushy Creek Reservoir), and City of Waco. The recommended strategy is to provide for arsenic treatment for individual entities. This strategy does not provide new supply.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following plan is recommended to meet projected needs. Associated costs are included for each strategy. Conservation was considered but the current per capita use is below the targeted gpcd of 140.

a. Upgrade Treatment for Arsenic

Entities within County-Other for which Arsenic treatment is recommended include Birome WSC and City of Mount Calm.

- Cost Source: Volume II, Chapter 12.5
- Date to be Implemented: 2020
- Project Cost: $1,042,000
- Unit Cost: $1,453/acft

Table 5.15-7. Recommended Plan Costs by Decade for Hill County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	492	297	247	185	124	63
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*492*	*297*	*247*	*185*	*124*	*63*
Upgrade Treatment for Arsenic						
Supply From Plan Element (acft/yr)	250	250	250	250	250	250
Annual Cost ($/yr)	$364,000	$364,000	$277,000	$277,000	$277,000	$277,000
Unit Cost ($/acft)	$1,453	$1,453	$1,108	$1,108	$1,108	$1,108

5.15.11 Manufacturing

Hill County Manufacturing is projected to have sufficient water supplies through the year 2070 and no changes in water supply are recommended.

5.15.12 Steam-Electric

No Steam-Electric demand exists nor is any projected for the county.

5.15.13 Mining

Description of Supply

Supplies for Mining in Hill County include groundwater and a BRA contract for 1,000 acre feet/yr for Western Company of Texas. Mining is projected to have shortages in 2020 – 2030.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following plan is recommended for Hill County Mining. Associated costs are included for each strategy.

a. Conservation:

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Groundwater Development from the Woodbine Aquifer (Trinity Basin):

- Cost Source: Volume II, Chapter 12.1
- Date to be Implemented: By year 2020
- Project Cost: $4,684,000
- Unit Cost: $767/acft

Table 5.15-8. Recommended Plan Costs by Decade for Mining – Hill County

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(603)*	*(175)*	*223*	*579*	*529*	*477*
Conservation						
Supply From Plan Element (acft/yr)	49	60	—	—	—	—
Annual Cost ($/yr)	ND	ND	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(554)*	*(116)*	*223*	*579*	*529*	*477*
Groundwater Well Development						
Supply From Plan Element (acft/yr)	560	560	—	—	—	—
Annual Cost ($/yr)	$429,460	$429,460	—	—	—	—
Unit Cost ($/acft)	$767	$767	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.15.14 Irrigation

Irrigation is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended.

5.15.15 Livestock

Livestock water supply is projected to meet demands through the year 2070 and no changes in water supply are recommended.

5.16 Hood County Water Supply Plan

Table 5.16-1 lists each water user group in Hood County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.16-1. Hood County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
Acton MUD	1,731	(159)	Projected shortage – see plan below
City of Cresson[2]	(12)	(59)	Projected shortage – see plan below
City of Granbury	520	158	Projected surplus
Oak Trail Shores Subdivision	226	223	Projected surplus
City of Tolar	12	(19)	Projected shortage – see plan below
County-Other	(77)	193	Projected shortage – see plan below
Manufacturing	9,996	9,988	Projected surplus
Steam-Electric	35,602	27,133	Projected surplus
Mining	(998)	(833)	Projected shortage – see plan below
Irrigation	591	970	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-25 and C-26, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

2 – Balance is total between Brazos G and Region C for WUG.

5.16.1 Acton MUD

Description of Supply

The Acton MUD service area includes portions of Hood and Johnson Counties. Acton MUD obtains its water supply from groundwater from the Trinity Aquifer and a contract with the Brazos River Authority for water from Lake Granbury. Treated surface water is constrained by its allocated portion of the SWATS plant capacity, co-owned with Johnson County SUD through the Brazos Regional Public Utility Agency. The City of Granbury and Acton MUD are in the process of transferring Granbury's portion of the SWATS plant capacity to Acton MUD. The transfer will be completed in stages over several years. A shortage is projected for Acton MUD in 2070, caused by a need to increase its share of the SWATS plant. The surpluses and shortage shown in Table 5.16-1 represent the cumulative totals for Acton MUD in Hood and Johnson Counties.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for Acton MUD.

a. Reallocate SWATS Capacity:

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2070
- Project Cost: None
- Annual Cost: $552/acft for operation and maintenance

Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.16-2. Recommended Plan Costs by Decade for Acton MUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*4,408*	*2,790*	*1,731*	*1,180*	*546*	*(159)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/ (Shortage) after Conservation (acft/yr	*4,408*	*2,790*	*1,731*	*1,180*	*546*	*(159)*
Reallocate SWATS Capacity						
Supply From Plan Element (acft/yr)	—	—	—	—	—	200
Annual Cost ($/yr)	—	—	—	—	—	$110,400
Unit Cost ($/acft)	—	—	—	—	—	$552

5.16.2 City of Cresson

Description of Supply

This WUG is located in Johnson, Hood and Parker (Region C) counties. The surplus/shortages shown in Table 5.16-1 represent the cumulative totals for the City of Cresson in Brazos G and Region C counties. Supplies for the City of Cresson are from the Trinity and Paluxy aquifers and are not adequate to meet the City's projected needs.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region C, the following water management strategies are recommended to meet the projected water shortage for City of Cresson.

a. Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2040
- Project Cost: $771,000
- Unit Cost: Max of $1,556/acft/yr (2040)

Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.16-3. Recommended Plan Costs by Decade for City of Cresson

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*22*	*3*	*(12)*	*(27)*	*(44)*	*(59)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/ (Shortage) after Conservation	*22*	*3*	*(12)*	*(27)*	*(44)*	*(59)*
Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	—	—	60	60	60	60
Annual Cost ($/yr)	—	—	$93,379	$93,379	$34,379	$34,379
Unit Cost ($/acft)	—	—	$1,556	$1,556	$573	$573

5.16.3 City of Granbury

The City of Granbury obtains its water supply from groundwater from the Trinity Aquifer and a contract with the Brazos River Authority for water from Lake Granbury. The City is in the process of constructing a new surface water treatment plant that is scheduled to be complete in 2017. The City has adequate supplies to meet its projected demands. Note that groundwater supply is constrained between 2040 and 2070 based on projected drawdowns in the Trinity Aquifer. Conservation was considered but the current per capita use is below the targeted gpcd of 140. No changes in water supply are recommended.

5.16.4 Oak Trail Shores Subdivision

Oak Trail Shores Subdivision receives supply from Trinity Aquifer groundwater and surface water through Monarch Utilities, which has a 600 acft/yr contract with the Brazos River Authority. The WUG treats the surface water through its 1 MGD WTP. Current supplies are sufficient to meet the WUG's projected demands. Conservation was considered but the current per capita use is below the targeted gpcd of 140. No change in water supply is recommended.

5.16.5 City of Tolar

Description of Supply

The City of Tolar receives supply from the Trinity Aquifer. Based on increased drawdown projected for the Trinity Aquifer, Tolar is projected to have shortages beginning in 2050.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortage for the City of Tolar.

a. Rehab Trinity Wells

- Cost Source: Volume II, Chapter 5.12
- Date to be Implemented: By year 2050
- Project Cost: $20,000
- Annual Cost: maximum of $2,200 in 2070

Alternative strategies considered to meet this need include purchase of treated water from the City of Granbury. Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.16-4. Recommended Plan Costs by Decade for Hood County - Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*45*	*26*	*12*	*(1)*	*(11)*	*(19)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*45*	*26*	*12*	*(1)*	*(11)*	*(19)*
Rehab Trinity Wells						
Supply From Plan Element (acft/yr)	—	—	—	12	12	24
Annual Cost ($/yr)	—	—	—	$1,100	$1,100	$2,200
Unit Cost ($/acft)	—	—	—	$91	$91	$91

5.16.6 County-Other

Description of Supply

Entities in Hood County-Other receive groundwater from the Trinity Aquifer and surface water supplies through contracts with Acton MUD. Future population in County-Other is expected to decrease over time as those people begin to be served by retail water utilities. Shortages are projected only from 2020 through 2050.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for County-Other entities.

a. Trinity Aquifer Development
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: before 2020
   - Project Cost: $6,164,000
   - Unit Cost: $703/acft

b. Alternative: Purchase Additional Supply from Acton MUD
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: NA
   - Unit Cost: $977/acft

Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.16-5. Plan Costs by Decade for Hood County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(968)*	*(344)*	*(77)*	*(121)*	*(22)*	*193*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/ (Shortage) after Conservation	*(968)*	*(344)*	*(77)*	*(121)*	*(22)*	*193*
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	968	968	968	968	968	968
Annual Cost ($/yr)	$680,500	$680,500	$542,000	$542,000	$542,000	$542,000
Unit Cost ($/acft)	$703	$703	$560	$560	$560	$560
Alternative: Purchase Additional Supply from Acton MUD						
Supply From Plan Element (acft/yr)	968	344	77	121	22	—
Annual Cost ($/yr)	$946,000	$336,000	$75,000	$118,000	$22,000	—
Unit Cost ($/acft)	$977	$977	$977	$977	$977	—

5.16.7 Manufacturing

Hood County Manufacturing is projected to have a surplus of water through the year 2070. No changes in water supply are recommended.

5.16.8 Steam-Electric

Steam-Electric water demand in Hood County is associated with the DeCordova Power Plant owned and operated by Luminant (formerly Texas Utilities Company (TXU)). The DeCordova Power Plant is supplied by water from Lake Granbury. Luminant has contracted with the Brazos River Authority for water from the BRA system in sufficient quantity to exceed its needs through the year 2070. In consideration of the projected increased need for steam-electric generation water associated with the proposed new generating units at the Comanche Peak Station in Somervell County, 27,133 acft/yr of this excess supply is now transferred to Somervell County (see Chapter 5.30.4 Somervell County Steam-Electric). No other changes in water supply are recommended.

5.16.9 Mining

Description of Supply

Mining operations in Hood County are supplied by Trinity Groundwater. Demands for Mining are projected to increase significantly, resulting in shortages beginning in 2020.

Recommended Strategy

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Hood County-Mining.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: not determined

b. Groundwater Development – Trinity Aquifer (approximately nine 75 gpm wells)
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: before 2020
   - Project Cost: $6,197,000
   - Unit Cost: Max of $508/acft (2020)

Table 5.16-6. Recommended Plan Costs by Decade for Hood County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(854)*	*(1,212)*	*(998)*	*(909)*	*(819)*	*(833)*
Conservation						
Supply From Plan Element (acft/yr)	62	122	156	149	143	144
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(792)*	*(1,090)*	*(843)*	*(760)*	*(676)*	*(689)*
Groundwater Well Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	1,120	1,120	1,120	1,120	1,120	1,120
Annual Cost ($/yr)	$569,308	$569,308	$49,308	$49,308	$49,308	$49,308
Unit Cost ($/acft)	$508	$508	$44	$44	$44	$44

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.16.10 Irrigation

Hood County Irrigation is projected to have a surplus of water through the year 2070. No changes in water supply are recommended.

5.16.11 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.17 Johnson County Water Supply Plan

Table 5.17-1 lists each water user group in Johnson County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.17-1. Johnson County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
Acton MUD			See Hood County
City of Alvarado	2,015	1,829	Projected surplus
Bethany WSC	1,124	973	Projected surplus
Bethesda WSC[2]	(2,560)	(4,475)	Projected shortage – see plan below
City of Burleson[2]	(3,933)	(7,778)	Projected shortage – see plan below
City of Cleburne	1,177	(2,373)	Projected shortage – see 5.38
City of Cresson			See Hood County
City of Crowley[3]	(17)	(35)	Projected shortage – see plan below
City of Fort Worth[3]	0	(1,573)	Projected shortage – see plan below
City of Godley	22	(25)	Projected shortage – see plan below
City of Grandview	155	82	Projected surplus – see 5.38
Johnson County SUD[2]	2,757	(2,267)	Projected shortage – see 5.38
City of Joshua	0	0	Supply equals Demand
City of Keene	893	519	Projected surplus
City of Mansfield[3]	(293)	(1,024)	Projected shortage – see plan below
Mountain Peak SUD[3]	982	533	Projected surplus
Parker WSC	102	(179)	Projected shortage – see plan below
City of Rio Vista	42	(71)	Projected shortage (2060 and 2070)
City of Venus[2]	(237)	(604)	Projected shortage – see plan below
County-Other	166	309	Projected surplus
Manufacturing	92	92	Projected surplus
Steam-Electric	(5,656)	(5,656)	Projected shortage – see plan below
Mining	1,347	1,526	Projected surplus – see plan below
Irrigation	152	143	Projected surplus
Livestock	0	0	Supply equals Demand

1 – From Tables C-33 and C-34, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

2 – Balance is total between Brazos G and Region C for WUG.

3 – Balance is only for portion of WUG in Brazos G.

5.17.1 City of Alvarado

The City of Alvarado obtains its water supply from the Trinity Aquifer and treated surface water from Johnson County SUD. No shortages are projected for the City of Alvarado and no change in water supply is recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.17.2 Bethany WSC

Bethany WSC obtains its water supply from the Trinity Aquifer and treated surface water from Johnson County SUD. No shortages are projected for Bethany WSC and no change in water supply is recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.17.3 Bethesda WSC

Description of Supply

Bethesda WSC is located in Johnson and Tarrant (Region C) counties and obtains its water supply from the Trinity Aquifer and surface water from Tarrant Regional Water District (TRWD) through the Fort Worth System. Bethesda WSC is projected to have a shortage from 2020 to 2070. Balance and strategies represented in Table 5.17-1 are for the entire WSC in both counties and regions.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and in coordination with Region C, the following water management strategies are recommended to meet the projected water shortage for Bethesda WSC.

a. Conservation
    - Cost Source: Volume II, Chapter 2
    - Date to be Implemented: before 2020
    - Unit Cost: $470/acft
    - Annual Cost: maximum of $597,370 in 2070

b. Purchase Additional Supplies from Fort Worth
    - Cost Source: 2016 Region C Water Plan (Appendix K)
    - Date to be Implemented: 2020
    - Project Cost: none
    - Unit Cost: $639/acft ($1.96/1,000 gal)

c. Purchase Water Supplies from Arlington

- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2020
- Project Cost: $18,698,000
- Unit Cost: $1,518/acft

Table 5.17-2. Recommended Plan Costs by Decade for Bethesda WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,486)*	*(1,981)*	*(2,560)*	*(3,139)*	*(3,778)*	*(4,475)*
Conservation						
Supply From Plan Element (acft/yr)	161	465	832	1,101	1,237	1,388
Annual Cost ($/yr)	$75,754	$218,556	$391,040	$517,536	$581,247	$652,409
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,325)*	*(1,516)*	*(1,728)*	*(2,038)*	*(2,542)*	*(3,087)*
Purchase additional supplies from Fort Worth						
Supply From Plan Element (acft/yr)	1,067	1,461	1,941	2,410	2,928	3,496
Annual Cost ($/yr)	$682,000	$934,000	$1,240,000	$1,540,000	$1,871,000	$2,234,000
Unit Cost ($/acft)	$639	$639	$639	$639	$639	$639
Purchase additional supplies from Arlington						
Supply From Plan Element (acft/yr)	1,416	1,619	1,833	2,072	2,336	2,614
Annual Cost ($/yr)	$2,149,000	$2,458,000	$1,685,000	$1,904,000	$2,147,000	$2,402,000
Unit Cost ($/acft)	$1,518	$1,518	$919	$919	$919	$919

5.17.4 City of Burleson

Description of Supply

The City of Burleson obtains its water supply from Tarrant Regional Water District (TRWD) through the Fort Worth System. Burleson is projected to have a shortage from 2020 to 2070. Balance and strategies represented in Table 5.17-1 are for the entire city in both counties and regions. Conservation was considered but the current per capita use is below the targeted gpcd of 140.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for the City of Burleson. Conservation was considered; however, the entity's current per capita use rate in Brazos G is below the selected target rate of 140 gpcd.

a. Conservation in Region C
- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2020
- Capital Cost:$37,638
- Unit Cost: $287/acft

b. Purchase Additional Supplies from Fort Worth
- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2020
- Project Cost: $21,780,000
- Unit Cost: $1,039/acft

Table 5.17-3.Recommended Plan Costs by Decade for the City of Burleson

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,796)*	*(2,840)*	*(3,933)*	*(5,126)*	*(6,417)*	*(7,778)*
Conservation in Region C						
Supply From Plan Element (acft/yr)	11	15	15	27	41	55
Annual Cost ($/yr)	$3,150	$3,150	$0	$0	$0	$0
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,785)*	*(2,825)*	*(3,918)*	*(5,099)*	*(6,376)*	*(7,723)*
Purchase from Fort Worth						
Supply From Plan Element (acft/yr)	3,109	4,358	5,670	7,089	8,625	10,244
Annual Cost ($/yr)	$3,230,000	$4,528,000	$4,026,000	$5,033,000	$6,124,000	$7,273,000
Unit Cost ($/acft)	$1,039	$1,039	$710	$710	$710	$710

5.17.5 City of Cleburne

The City of Cleburne is projected to have a shortage beginning in 2060. Refer to Chapter 5.38 for the City's plan as a Wholesale Water Provider.

5.17.6 City of Crowley

Description of Supply

The City of Crowley is mostly located in Tarrant County; however, a portion of the city limits is within Johnson County. The City obtains its water supply from the Trinity Aquifer in Tarrant County and is projected to have a shortage in Johnson County. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and through coordination with Region C, the following water management strategy is recommended to meet water needs for the portion of the city within Johnson County. The full water plan for City of Crowley is discussed in the 2016 Region C Water Plan.

a. Purchase additional supplies from Fort Worth

- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2020
- Project Cost: $11,558,000
- Unit Cost: $1,033/acft

Table 5.17-4. Recommended Plan Costs by Decade for the City of Crowley (Brazos G)

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(9)*	*(12)*	*(17)*	*(23)*	*(29)*	*(35)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(9)*	*(12)*	*(17)*	*(23)*	*(29)*	*(35)*
Purchase from Fort Worth						
Supply From Plan Element (acft/yr)	9	12	17	23	29	35
Annual Cost ($/yr)	$9,000	$12,000	$18,000	$24,000	$30,000	$36,000
Unit Cost ($/acft)	$1,033	$1,033	$1,033	$1,033	$1,033	$1,033

5.17.7 City of Fort Worth

Description of Supply

The City of Fort Worth is a wholesale water provider in Region C in Tarrant County; however, a portion of the city limits is within Johnson County in Brazos G. The City obtains its water supply from surface water supplies located in Region C and is projected to have a shortage in Johnson County.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and through coordination with Region C, the following water management strategies are recommended to meet water needs for the portion of the city within Johnson County. The full water plan for City of Fort Worth is discussed in the 2016 Region C Water Plan.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2050
- Unit Cost: $470/acft
- Annual Cost: maximum of $97,290 in 2070

b. Purchase additional supplies from Tarrant Regional Water District

- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2050
- Project Cost: $0 Existing infrastructure assumed sufficient
- Unit Cost: $316/acft/yr (TRWD Wholesale Water Rate)

Table 5.17-5. Recommended Plan Costs by Decade for the City of Fort Worth (Brazos G)

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*0*	*0*	*(759)*	*(1,238)*	*(1,573)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	167	265	331
Annual Cost ($/yr)	—	—	—	$78,490	$124,550	$155,570
Projected Surplus/(Shortage) after Conservation (acft/yr)	*0*	*0*	*0*	*(592)*	*(973)*	*(1,242)*
Purchase from Tarrant Regional Water District						
Supply From Plan Element (acft/yr)	—	—	—	592	973	1,242
Annual Cost ($/yr)	—	—	—	$187,117	$307,468	$392,472
Unit Cost ($/acft)	—	—	—	$316	$316	$316

5.17.8 City of Godley

Description of Supply

The City of Godley obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater supply, the City of Godley is projected to have shortages beginning in 2060.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for the City of Godley. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Groundwater Development – Woodbine Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2060
- Project Cost: $375,000
- Unit Cost: $1,474/acft

Table 5.17-6. Recommended Plan Costs by Decade for the City of Godley

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*44*	*34*	*22*	*8*	*(8)*	*(25)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*44*	*34*	*22*	*8*	*(8)*	*(25)*
Groundwater Development – Woodbine Aquifer						
Supply From Plan Element (acft/yr)	—	—	—	—	30	30
Annual Cost ($/yr)	—	—	—	—	$44,206	$44,206
Unit Cost ($/acft)	—	—	—	—	$1,474	$1,474

5.17.9 City of Grandview

The City of Grandview obtains its water supply from groundwater from the Woodbine Aquifer and is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.17.10 Johnson County SUD

Johnson County SUD is projected to have a surplus through until 2060. This WUG is located in multiple counties (Johnson, Tarrant (Region C), Ellis (Region C), and Hill). The balance shown in Table 5.17-1 represent the cumulative totals for Johnson County SUD. Refer to Chapter 5.38 for Johnson County SUD's plan as a Wholesale Water Provider.

5.17.11 City of Joshua

The City of Joshua obtains its water supply from Johnson County SUD. The demand is projected to equal the supply and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.17.12 City of Keene

The City of Keene obtains its water supply from groundwater from the Trinity Aquifer and a contract with the Johnson County SUD. No shortages are projected for the City of Keene and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.17.13 City of Mansfield

Description of Supply

The City of Mansfield is located in Tarrant, Ellis and Johnson counties with a majority of its population and demand in Tarrant County. The City obtains its water supply from surface water from the Tarrant Regional Water District (TRWD), principally located in Region C. Table 5.17-7 includes the balance for the Johnson County (Brazos G) portion only. More information on City of Mansfield is discussed in the 2016 Region C Water Plan. Conservation was considered but the current per capita use is below the targeted gpcd of 140. The City of Mansfield is projected to have shortages starting in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and in coordination with Region C, the following water management strategy is recommended for the City of Mansfield.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $481,280 in 2070

Table 5.17-7. Recommended Plan Costs by Decade for City of Mansfield (Brazos G)

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(43)*	*(144)*	*(293)*	*(490)*	*(738)*	*(1,024)*
Conservation						
Supply From Plan Element (acft/yr)	43	144	293	490	738	1,024
Annual Cost ($/yr)	$20,210	$67,680	$137,710	$230,300	$346,860	$481,280
Projected Surplus/(Shortage) after Conservation	*0*	*0*	*0*	*0*	*0*	*0*

5.17.14 Mountain Peak SUD

Description of Supply

Mountain Peak SUD is located in Johnson and Ellis counties, with a majority of its population and demand in Ellis County (Region C). The WUG obtains its water supply from the Trinity Aquifer in Johnson and Ellis counties and surface water from the City of Midlothian, which is primarily used for peaking in the summer. No shortage is projected for Mountain Peak SUD, surpluses are projected through 2070. Table 5.17-8 includes the balance for the Johnson County (Brazos G) portion only. More information on Mountain Peak SUD is discussed in the 2016 Region C Water Plan.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region C, the following water management strategy is recommended for Mountain Peak SUD. Conservation was considered but the current per capita use is below the targeted gpcd of 140.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $261,066 in 2070

Table 5.17-8. Recommended Plan Costs by Decade for Mountain Peak SUD (Brazos G)

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,195*	*1,100*	*982*	*847*	*696*	*533*
Conservation						
Supply From Plan Element (acft/yr)	34	99	184	288	413	555
Annual Cost ($/yr)	$16,001	$46,439	$86,383	$135,451	$194,144	$261,066
Projected Surplus/(Shortage) after Conservation	*1,229*	*1,199*	*1,166*	*1,136*	*1,109*	*1,089*

5.17.15 Parker WSC

Description of Supply

Parker WSC is located in Hill and Johnson counties and obtains its water supply from the Trinity Aquifer and surface water supplies from Files Valley WSC. Based on the existing supply available from groundwater, a shortage begins in 2060. The surplus/shortages shown in Table 5.17-1 represent the cumulative totals for Parker WSC. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for Parker WSC.

a. Woodbine Aquifer Development (Trinity Basin)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2060
- Project Cost: $1,128,000
- Unit Cost: $737

Table 5.17-9. Recommended Plan Costs by Decade for Parker WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*245*	*175*	*102*	*17*	*(77)*	*(179)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*245*	*175*	*102*	*17*	*(77)*	*(179)*
Groundwater Development – Woodbine Aquifer						
Supply From Plan Element (acft/yr)	0	0	0	0	180	180
Annual Cost ($/yr)	—	—	—	—	$132,617	$132,617
Unit Cost ($/acft)	—	—	—	—	$737	$737

5.17.16 City of Rio Vista

Description of Supply

The City of Rio Vista obtains its water supply from groundwater from the Trinity Aquifer. Based on the existing supply available from groundwater, a shortage begins in 2060. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for the City of Rio Vista.

a. Groundwater Development – Woodbine Aquifer (Trinity Basin)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2060
- Project Cost: $753,000
- Unit Cost: Max of $1,179/acft (2020)

Table 5.17-10. Recommended Plan Costs by Decade for City of Rio Vista

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*99*	*71*	*42*	*8*	*(30)*	*(71)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*99*	*71*	*42*	*8*	*(30)*	*(71)*
Groundwater Development – Woodbine Aquifer						
Supply From Plan Element (acft/yr)	—	—	—	—	75	75
Annual Cost ($/yr)	—	—	—	—	$88,411	$88,411
Unit Cost ($/acft)	—	—	—	—	$1,179	$1,179

5.17.17 City of Venus

Description of Supply

The City of Venus obtains its water supply from the Woodbine Aquifer and surface water from the City of Midlothian in Region C. The city has a projected shortage starting in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region C, the following water management strategies are recommended to meet water needs for the City of Venus.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $73,510 in 2070
- Unit Cost: $470/acft

b. Purchase Water from Midlothian

- Cost Source: 2016 Region C Water Plan (Appendix K)
- Date to be Implemented: 2020
- Project Cost: NA
- Unit Cost: $815/acft

c. Alternative: Groundwater Development – Woodbine Aquifer (Trinity Basin)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $1,503,000
- Unit Cost: Max of $589/acft (2020)

Table 5.17-11. Recommended Plan Costs by Decade for City of Venus

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(24)*	*(117)*	*(237)*	*(355)*	*(478)*	*(604)*
Conservation						
Supply From Plan Element (acft/yr)	30	91	116	128	141	158
Annual Cost ($/yr)	$14,197	$42,948	$54,331	$59,992	$66,492	$74,450
Projected Surplus/(Shortage) after Conservation	6	(26)	(122)	(228)	(337)	(446)
Purchase Water from Midlothian						
Supply From Plan Element (acft/yr)	—	26	122	228	337	446
Annual Cost ($/yr)	—	$21,000	$99,000	$186,000	$275,000	$363,000
Unit Cost ($/yr)	—	$815	$815	$815	$815	$815
Alternative: Groundwater Development – Woodbine Aquifer						
Supply From Plan Element (acft/yr)	—	150	150	450	450	450
Annual Cost ($/yr)	—	$88,411	$88,411	$207,234	$207,234	$91,234
Unit Cost ($/yr)	—	$589	$589	$461	$461	$203

5.17.18 County-Other

Entities in Johnson County-Other obtain water supply from the Trinity and Woodbine Aquifers as well as treated surface water from Johnson County SUD. A surplus of supply is projected for Johnson County-Other through 2070. No changes in water supply are recommended. Conservation was considered; however, the current per capita use rate for the entities in County-Other are below the selected target rate of 140 gpcd.

5.17.19 Manufacturing

Johnson County Manufacturing is supplied by the Trinity Aquifer, and the cities of Burleson, Cleburne and Hillsboro. No shortage is projected for Johnson County Manufacturing and no changes in water supply are recommended.

5.17.20 Steam-Electric

Description of Supply

Johnson County Steam-Electric currently receives 1,344 acft/yr of reuse and potable water supplies from the City of Cleburne. Johnson County Steam-Electric is projected to have shortages through year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Johnson County Steam-Electric.

a. Conservation
  - Cost Source: Volume II, Chapter 2
  - Date to be Implemented: 2020
  - Annual Cost: Not determined

b. Purchase reuse water from the City of Cleburne
  - Cost Source: Volume II, Chapter 3
  - Date to be Implemented: 2020
  - Project Cost: $14,059,000
  - Unit Cost: $736/acft

c. Purchase water from the City of Cleburne (Lake Aquilla Augmentation)
  - Cost Source: Volume II, Chapter 3
  - Date to be Implemented: 2020
  - Project Cost: $79,627,000
  - Unit Cost: Max of $926/acft (2020)

Table 5.17-12. Recommended Plan Costs by Decade for Johnson County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(5,656)*	*(5,656)*	*(5,656)*	*(5,656)*	*(5,656)*	*(5,656)*
Conservation						
Supply From Plan Element (acft/yr)	210	350	490	490	490	490
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation	*(5,446)*	*(5,306)*	*(5,166)*	*(5,166)*	*(5,166)*	*(5,166)*
Purchase reuse water from the City of Cleburne						
Supply From Plan Element (acft/yr)	2,031	2,031	2,031	2,031	2,031	2,031
Annual Cost ($/yr)	$1,495,000	$1,495,000	$319,000	$319,000	$319,000	$319,000
Projected Surplus/(Shortage) after Reuse (acft/yr)	*(3,415)*	*(3,275)*	*(3,135)*	*(3,135)*	*(3,135)*	*(3,135)*
Purchase water from the City of Cleburne (Lake Aquilla Augmentation)						
Supply From Plan Element (acft/yr)	3,415	3,275	3,135	3,135	3,135	3,135
Annual Cost ($/yr)	$3,162,000	$3,033,000	$1,483,000	$1,483,000	$1,483,000	$1,483,000
Unit Cost ($/acft)	$926	$926	$473	$473	$473	$473

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location

5.17.21 Mining

Description of Supply

Johnson County Mining obtains its water supply from the Trinity Aquifer and Johnson County SUD. Johnson County Mining is projected to have a shortage in 2020 and surpluses from 2030 through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Johnson County Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: Not determined

b. Groundwater Development – Woodbine Aquifer (Trinity Basin)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $4,684,000
- Unit Cost: $383/acft

Table 5.17-13. Recommended Plan Costs by Decade for Johnson County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,264)*	*74*	*1,347*	*1,849*	*1,701*	*1,526*
Conservation						
Supply From Plan Element (acft/yr)	124	—	—	—	—	—
Annual Cost ($/yr)	ND	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(1,140)*	*74*	*1,347*	*1,849*	*1,701*	*1,526*
Groundwater Development – Woodbine Aquifer						
Supply From Plan Element (acft/yr)	1,140	—	—	—	—	—
Annual Cost ($/yr)	$437,051	—	—	—	—	—
Unit Cost ($/acft)	$383	—	—	—	—	—

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location

5.17.22 Irrigation

Johnson County Irrigation obtains its water supply from the Trinity Aquifer and run of the river supplies. No shortage is projected for Johnson County Irrigation and no changes in water supply are recommended.

5.17.23 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.18 Jones County Water Supply Plan

Table 5.18-1 lists each water user group in Jones County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.18-1. Jones County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
City of Abilene	9,115	11,314	See Taylor County
City of Anson	633	606	Projected surplus - see Chapter 5.38
City of Hamlin	320	287	Projected surplus
City of Hawley	0	0	Demand equals supply
Hawley WSC	160	136	Projected surplus
City of Stamford	315	249	Projected surplus - see Chapter 5.38
County-Other	57	37	Projected surplus
Manufacturing	44	44	Projected surplus
Steam-Electric	11,441	11,319	Projected surplus
Mining	(218)	(169)	Projected shortage – see plan below
Irrigation	(91)	139	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-35 and C-36, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.18.1 City of Anson

The recommended water supply plan for the City of Anson is included in Chapter 5.38 as a wholesale water provider.

5.18.2 City of Hamlin

Description of Supply

The City of Hamlin receives surface water supplies from the City of Anson and Lake Hamlin. No shortages are projected for the City of Hamlin.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Hamlin.

Conservation was considered but the current per capita use is below the targeted gpcd of 140.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $27,260 in 2070

Table 5.18-2. Recommended Plan Costs by Decade for City of Hamlin

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*341*	*329*	*320*	*307*	*296*	*287*
Conservation						
Supply From Plan Element (acft/yr)	14	43	57	57	58	58
Annual Cost ($/yr)	$6,580	$20,210	$26,790	$26,790	$27,260	$27,260
Projected Surplus/(Shortage) after Conservation	*355*	*372*	*377*	*364*	*354*	*346*

5.18.3 City of Hawley

The City of Hawley is supplied with water from Hawley WSC. No shortages are projected and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.18.4 Hawley WSC

Hawley WSC is located in multiple counties (Taylor, and Jones). The balance shown in Table 5.18-1 represents the cumulative totals for Hawley WSC. Hawley WSC is supplied with water from the City of Abilene and City of Anson. Hawley WSC provides supply to meet the current and projected demands for the City of Hawley. No shortages are projected for Hawley WSC through 2070 and no change in water supply is recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.18.5 City of Stamford

The recommended water supply plan for the City of Stamford is included in Chapter 5.38 as a wholesale water provider.

5.18.6 County-Other

Entities in County-Other receive supplies through the City of Stamford and the Seymour Aquifer. County Other is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.18.7 Manufacturing

There is no projected demand for Manufacturing in Jones County and no changes in water supply are recommended.

5.18.8 Steam-Electric

Supply for Jones County Steam-Electric can be met through a contract with the City of Abilene from Fort Phantom Hill Reservoir. No shortages are projected for Steam-Electric, and no changes in water supply are recommended.

5.18.9 Mining

Description of Supply

Jones County Mining obtains its water supply from run-of-the river water rights which are not reliable in the drought of record. Jones County Mining is projected to have a shortage between 2020 and 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Jones County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2030
- Annual Cost: not determined

b. Leave needs unmet

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

Table 5.18-3. Recommended Plan Costs by Decade for Jones County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(239)*	*(234)*	*(218)*	*(199)*	*(183)*	*(169)*
Conservation						
Supply From Plan Element (acft/yr)	7	12	15	14	13	12
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(232)*	*(222)*	*(203)*	*(185)*	*(170)*	*(157)*

Table 5.18-3. Recommended Plan Costs by Decade for Jones County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	232	222	203	185	170	157
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/yr)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.18.10 Irrigation

Description of Supply

Jones County Irrigation is supplied by the Seymour Aquifer. Irrigation is projected to have a shortage of water beginning in 2020 through 2050.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Jones County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $42,090
- Unit Cost: $230/acft

b. Leave needs unmet

New supplies for irrigation would be cost prohibitive to develop and most farms would switch to dry-land crops or allow fields to go fallow during a prolonged drought.

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

Table 5.18-4. Recommended Plan Costs by Decade for Jones County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(260)*	*(174)*	*(91)*	*(10)*	*68*	*139*
Conservation						
Supply From Plan Element (acft/yr)	86	139	189	183	—	—
Annual Cost ($/yr)	$19,780	$31,970	$43,470	$42,090	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(173)*	*(34)*	*98*	*174*	*68*	*139*

Table 5.18-4. Recommended Plan Costs by Decade for Jones County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	173	34	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/yr)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.18.11 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.19 Kent County Water Supply Plan

Table 5.19-1 lists each water user group in Kent County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of each water user group supply is presented in the following subsections.

Table 5.19-1. Kent County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Jayton	(89)	(88)	Projected shortage – see plan below
County-Other	13	13	Projected surplus
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	424	433	Projected surplus
Irrigation	278	371	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-37 and C-38, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.19.1 City of Jayton

Description of Supply

Water supply for the City of Jayton is from the Seymour and Dockum Aquifers. It is estimated that Jayton has sufficient supplies through 2070. However, the TCEQ has recently mandated that the City put in reverse osmosis treatment for its groundwater supply due to high levels of chlorides, sulfates and total dissolved solids. Shortages are projected from a treatment constraint and are projected through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended to meet for the City of Jayton. Associated costs are included for each strategy. Conservation was considered but the current per capita use is below the targeted gpcd of 140.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: $3,800
- Unit Cost: $474/acft

b. New Water Treatment Plant (0.4 MGD)
   - Cost Source: Volume II, Chapter 12.2
   - Date to be Implemented: before 2020
   - Annual Cost: $549,000

Table 5.19-1. Kent County Surplus/(Shortage)

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(92)*	*(91)*	*(89)*	*(89)*	*(88)*	*(88)*
Conservation						
Supply From Plan Element (acft/yr)	3	6	4	4	3	3
Annual Cost ($/yr)	$1,608	$2,994	$2,046	$2,046	$1,572	$1,572
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(89)*	*(85)*	*(85)*	*(85)*	*(85)*	*(85)*
New Water Treatment Plant (0.4 MGD)						
Supply From Plan Element (acft/yr)	224	224	224	224	224	224
Annual Cost ($/yr)	$549,000	$549,000	$253,000	$253,000	$253,000	$253,000
Unit Cost ($/acft)	$2,451	$2,451	$1,129	$1,129	$1,129	$1,129

5.19.2 County-Other

Water supply for County-Other is from local groundwater, and the Seymour and Dockum Aquifers. No shortages are projected, surpluses are projected through 2070, and no changes in water supply are recommended. Conservation was considered but the current per capita use is below the targeted gpcd of 140.

5.19.3 Manufacturing

No Manufacturing demand exists or is projected for the county.

5.19.4 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.19.5 Mining

No shortages are projected for Mining, surpluses are projected through 2070, and no changes in water supply are recommended.

5.19.6 Irrigation

No shortages are projected for Irrigation, surpluses are projected through 2070, and no changes in water supply are recommended.

5.19.7 Livestock

No shortages are projected for Livestock, the demand equals the supply, and no changes in water supply are recommended.

5.20 Knox County Water Supply Plan

Table 5.20-1 lists each water user group in Knox County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of each water user group supply is presented in the following subsections.

Table 5.20-1. Knox County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Knox City	(118)	(226)	Projected shortage – see plan below
City of Munday	(125)	(237)	Projected shortage – see plan below
County-Other	71	16	Projected surplus
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	(14)	(14)	Projected shortage – see plan below
Irrigation	(8,505)	(5,105)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-39 and C-40, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.20.1 Knox City

Description of Supply

Knox City obtains surface water via a contract with North Central Texas Municipal Water Authority (NCTMWA) and exempt groundwater use in the city limits from the Blaine Aquifer. Current supplies are insufficient to meet projected demands through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Knox City.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $27,280 in 2070
- Unit Cost: $496/acft

b. Millers Creek Reservoir Augmentation strategy by NCTMWA. This will provide supply at least up to the current amount contracted from NCTMWA.

- Cost Source: Volume II, Chapter 7.5
    - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
- Date to be Implemented: 2020
- Project Cost: none (cost would be borne by NCTMWA)
- Unit Cost: none (supply already purchased from NCTMWA)

c. Alternative: Lake Creek Reservoir. This strategy would be developed by NCTMWA to augment existing supplies.

- Cost Source: Volume II, Chapter 4.10
    - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
- Date to be Implemented: 2020
- Project Cost: none (cost would be borne by NCTMWA)
- Unit Cost: none (supply already purchased from NCTMWA)

Table 5.20-2. Recommended Plan Costs by Decade for Knox City

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(48)*	*(83)*	*(118)*	*(154)*	*(190)*	*(226)*
Conservation						
Supply From Plan Element (acft/yr)	9	25	45	54	54	55
Annual Cost ($/yr)	$4,464	$12,400	$22,320	$26,784	$26,784	$27,280
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(39)*	*(57)*	*(72)*	*(101)*	*(136)*	*(171)*
Millers Creek Reservoir Augmentation						
Supply From Plan Element (acft/yr)	72	104	136	167	199	231
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Alternative: Lake Creek Reservoir						
Supply From Plan Element (acft/yr)	72	104	136	167	199	231
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.20.2 City of Munday

Description of Supply

City of Munday obtains surface water via a contract with North Central Texas Municipal Water Authority (NCTMWA) and exempt groundwater use in the city limits from the Seymour Aquifer. Current supplies are insufficient to meet projected demands through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Munday.

a. Conservation
    - Cost Source: Volume II, Chapter 2
    - Date to be Implemented: 2020
    - Annual Cost: $27,280 in 2070
    - Unit Cost: $496/acft

b. Millers Creek Reservoir Augmentation strategy by NCTMWA. This will provide supply at least up to the current amount contracted from NCTMWA.
    - Cost Source: Volume II, Chapter 7.5
        - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
    - Date to be Implemented: 2020
    - Project Cost: none (cost would be borne by NCTMWA)
    - Unit Cost: none (supply already purchased from NCTMWA)

c. Alternative: Lake Creek Reservoir. This strategy would be developed by NCTMWA to augment existing supplies.
    - Cost Source: Volume II, Chapter 4.10
        - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
    - Date to be Implemented: 2020
    - Project Cost: none (cost would be borne by NCTMWA)
    - Unit Cost: none (supply already purchased from NCTMWA)

Table 5.20-3. Recommended Plan Costs by Decade for the City of Munday

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(55)*	*(91)*	*(125)*	*(164)*	*(200)*	*(237)*
Conservation						
Supply From Plan Element (acft/yr)	8	26	36	37	36	37
Annual Cost ($/yr)	$3,968	$12,896	$17,856	$18,352	$17,856	$18,352
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(47)*	*(65)*	*(89)*	*(127)*	*(164)*	*(200)*
Millers Creek Reservoir Augmentation						
Supply From Plan Element (acft/yr)	74	107	140	173	205	238
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Alternative: Lake Creek Reservoir						
Supply From Plan Element (acft/yr)	74	107	140	173	205	238
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.20.3 County-Other

Entities in Knox County-Other obtain water supply from the Seymour and Blaine Aquifers and surface water via contracts with NCTMWA. Water supply surplus are adequate through 2070.

Conservation was also considered; however, the County-Other's current per capita use rate is below the selected target of 140 gpcd.

5.20.4 Manufacturing

No Manufacturing demand exists or is projected for the county.

5.20.5 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.20.6 Mining

Description of Supply

No water supplies are currently allocated for Mining operations in Knox County. Water supply shortages are projected for Mining beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: not determined

a. Groundwater Development – Blaine Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $223,000
- Unit Cost: Max of $1,388 (2020)

Table 5.20-4. Recommended Plan Costs by Decade for Knox County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(15)*	*(15)*	*(14)*	*(14)*	*(14)*	*(14)*
Conservation						
Supply From Plan Element (acft/yr)	—	1	1	1	1	1
Annual Cost ($/yr)	—	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(15)*	*(14)*	*(13)*	*(13)*	*(13)*	*(13)*
Groundwater Development – Blaine Aquifer						
Supply From Plan Element (acft/yr)	15	15	15	15	15	15
Annual Cost ($/yr)	$20,815	$20,815	$1,815	$1,815	$1,815	$1,815
Unit Cost ($/acft)	$1,388	$1,388	$121	$121	$121	$121

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.20.7 Irrigation

Description of Supply

Knox County Irrigation obtains water supplies from the Seymour and the Blaine Aquifer as well as surface water supplies from Lake Davis and run-of-the river water rights. Irrigation shortages are projected through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020

- Annual Cost: $628,590 in 2030
- Unit Cost: $230/acft

b. Groundwater Development – Blaine Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $2,436,000
- Unit Cost: Max of $482/acft (2020)

c. Groundwater Development – Seymour Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $9,817,000
- Unit Cost: Max of $571/acft (2020)

d. Reallocate supplies from Stonewall County – Blaine Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2030
- Project Cost: Capital cost unknown, as demands vary geographically.
- Unit Cost: Assumed $250/acft

e. Brush Control (unquantifiable costs and savings)

Table 5.20-5. Recommended Plan Costs by Decade for Knox County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(3,121)*	*(5,515)*	*(8,505)*	*(9,283)*	*(5,956)*	*(5,105)*
Conservation						
Supply From Plan Element (acft/yr)	1,231	2,001	2,733	2,666	2,600	2,539
Annual Cost ($/yr)	$283,130	$460,230	$628,590	$613,180	$598,000	$583,970
Projected Surplus/(Shortage) after Conservation (acft/yr)	(1,890)	(3,514)	(5,773)	(6,618)	(3,356)	(2,566)
Groundwater Development – Blaine Aquifer						
Supply From Plan Element (acft/yr)	461	461	461	461	461	461
Annual Cost ($/yr)	$222,054	$222,054	$18,054	$18,054	$18,054	$18,054
Unit Cost ($/acft)	$482	$482	$39	$39	$39	$39
Groundwater Development – Seymour Aquifer						
Supply From Plan Element (acft/yr)	1,571	1,345	1,193	1,116	1,041	1,041
Annual Cost ($/yr)	$896,747	$896,747	$72,747	$72,747	$72,747	$72,747
Unit Cost ($/acft)	$571	$571	$46	$46	$46	$46

Table 5.20-5. Recommended Plan Costs by Decade for Knox County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Reallocate Supplies from Stonewall County – Blaine Aquifer						
Supply From Plan Element (acft/yr)	—	1,709	4,120	5,042	1,855	1,065
Annual Cost ($/yr)	—	$427,250	$1,030,000	$1,260,500	$463,750	$266,250
Unit Cost ($/acft)	—	$250	$250	$250	$250	$250

5.20.8 Livestock

No shortages are projected for Livestock, the demand equals the supply, and no changes in water supply are recommended.

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5.21 Lampasas County Water Supply Plan

Table 5.21-1 lists each water user group in Lampasas County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.21-1. Lampasas County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
Copperas Cove			See Coryell County for Plan
City of Kempner	(6)	(5)	Projected shortage – see plan below
Kempner WSC[2]	(1,076)	(1,868)	Projected shortage – see Chapter 5.38
City of Lampasas	(227)	(505)	Projected shortage – see plan below
City of Lometa	0	0	Demand equals supply
County-Other	102	150	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	Demand equals supply
Mining	(216)	(288)	Projected shortage – see plan below
Irrigation	(211)	(200)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-41 and C-42, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

2 – Balance includes totals in Brazos G and Region C

5.21.1 City of Kempner

Description of Supply

The City of Kempner obtains its water supply from surface water from Kempner WSC. Shortages are projected for Kempner in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Kempner WSC.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $4,607 in 2030
- Unit Cost: $470/acft

Table 5.21-2. Recommended Plan Costs by Decade for City of Kempner

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(7)*	*(10)*	*(6)*	*(6)*	*(5)*	*(5)*
Conservation						
Supply From Plan Element (acft/yr)	7	10	6	6	5	5
Annual Cost ($/yr)	$3,222	$4,607	$3,024	$2,630	$2,180	$2,393
Projected Surplus/(Shortage) after Conservation	*0*	*0*	*0*	*0*	*0*	*0*

5.21.2 Kempner WSC

Kempner WSC has service area in portions of Coryell, Bell, Lampasas and Burnet (Region K) Counties. The WSC receives surface water supplies from the Brazos River Authority out of Lake Stillhouse Hollow. Kempner WSC sells supplies to the cities of Kempner, Copperas Cove, Lampasas, as well as to Salado WSC and Lampasas County-Mining. Shortages are projected for Kempner WSC in 2020. Refer to Chapter 5.38 for the WSC's plan as a Wholesale Water Provider.

5.21.3 City of Lampasas

Description of Supply

The City of Lampasas has contracted for water supply from BRA and Kempner WSC. Its treated water supply is limited to its contract with Kempner WSC at 1,281 acft/yr. The City also has additional run of river rights. The City provides supply for Lampasas County-Manufacturing demands. Shortages are projected beginning in 2040.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the City of Lampasas.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $12,485 in 2030
- Unit Cost: $470/acft

b. Increase treatment contract with Kempner WSC to deliver BRA contracted supplies

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2040
- Project Cost: Existing Infrastructure assumed specific
- Unit Cost: $500/acft

Table 5.21-3. Recommended Plan Costs by Decade for City of Lampasas

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(49)*	*(148)*	*(227)*	*(318)*	*(414)*	*(505)*
Conservation						
Supply From Plan Element (acft/yr)	27	—	—	—	—	—
Annual Cost ($/yr)	$12,485	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(22)*	*(148)*	*(227)*	*(318)*	*(414)*	*(505)*
Increase treated water contract Kempner WSC						
Supply From Plan Element (acft/yr)	22	148	227	318	414	505
Annual Cost ($/yr)	$11,000	$74,000	$113,500	$159,000	$207,000	$252,500
Unit Cost ($/yr)	$500	$500	$500	$500	$500	$500

5.21.4 City of Lometa

Description of Supply

The City of Lometa water system is owned by the Lower Colorado River Authority, and is supplied water from the LCRA Highland Lakes System. A portion of the population in the city limits relies on exempt groundwater pumping from the Ellenburger Aquifer. The city has a sufficient quantity of water supply to meet its projected needs through the year 2070. No shortage is projected for the City of Lometa.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Lometa.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $13,712 in 2070
- Unit Cost: $470/acft

Table 5.21-4. Recommended Plan Costs by Decade for the City of Lometa

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*0*	*0*	*0*	*0*	*0*
Conservation						
Supply From Plan Element (acft/yr)	7	21	26	27	28	29
Annual Cost ($/yr)	$3,346	$9,951	$12,418	$12,705	$13,186	$13,712
Projected Surplus/(Shortage) after Conservation	7	21	26	27	28	29

5.21.5 County-Other

Entities included in Lampasas County-Other obtain water supply from the Trinity Aquifer and Marble Falls Aquifer. Surpluses are projected through 2070 and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.21.6 Manufacturing

Lampasas County Manufacturing obtains its water supply the City of Lampasas and run-of-river rights. Based on the available surface water supply, Lampasas County Manufacturing is projected to have adequate supplies through year 2070, and no changes in water supply are recommended.

5.21.7 Steam-Electric

No Steam-Electric demand is projected for Lampasas County.

5.21.8 Mining

Description of Supply

Lampasas County Mining currently obtains its water supply from Kempner WSC. Mining is projected to have shortages starting in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Lampasas County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: not determined

b. Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $2,219,000
- Unit Cost: $204,252

Table 5.21-5. Recommended Plan Costs by Decade for Lampasas County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(173)*	*(196)*	*(216)*	*(236)*	*(261)*	*(288)*
Conservation						
Supply From Plan Element (acft/yr)	6	11	17	18	20	22
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(167)*	*(185)*	*(199)*	*(218)*	*(241)*	*(266)*
Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	185	185	225	225	275	275
Annual Cost ($/yr)	$204,252	$204,252	$18,252	$18,252	$18,252	$18,252
Unit Cost ($/acft)	$743	$743	$66	$66	$66	$66

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location.

5.21.9 Irrigation

Description of Supply

Lampasas County Irrigation is supplied by the Trinity and Marble Falls Aquifers and run of the river water rights. Irrigation is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Lampasas County-Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $230/acft

b. Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $3,049,000
- Unit Cost: Max of $887/ acft(2020)

Table 5.21-6. Recommended Plan Costs by Decade for Lampasas County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(221)*	*(216)*	*(211)*	*(206)*	*(204)*	*(200)*
Conservation						
Supply From Plan Element (acft/yr)	12	19	26	26	26	26
Annual Cost ($/yr)	$2,670	$4,393	$6,070	$5,989	$5,957	$5,893
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(209)*	*(197)*	*(184)*	*(180)*	*(178)*	*(174)*
Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	210	210	210	210	210	210
Annual Cost ($/yr)	$278,636	$278,636	$22,636	$22,636	$22,636	$22,636
Unit Cost ($/acft)	$1,327	$1,327	$108	$108	$108	$108

5.21.10 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.22 Lee County Water Supply Plan

Table 5.22-1 lists each water user group in Lee County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections. Unmet needs exist for Lee County-Mining, whose primary source of supply is unknown. There is currently approximately 12,000 acft of Carrizo-Wilcox groundwater available under the MAG in Lee County; however, this supply has been permitted for use in Hays County through the Hays-Forestar project. Refer to the 2016 South Central Texas (Region L) Regional Water Plan for more information.

Table 5.22-1. Lee County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Aqua WSC[2]	0	0	Demand equals supply
City of Giddings	443	395	Projected surplus
Lee County WSC[3]	2,445	2,160	Projected surplus
City of Lexington	390	381	Projected surplus
Southwest Milam WSC			See Milam County
County-Other	8	0	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	No Projected Demand
Mining	(7,767)	(9,631)	Projected shortage – see plan below
Irrigation	62	98	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-43 and C-44, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.
2 – Balance includes totals for Brazos G and Region K
3 – Balance includes totals for Brazos G only

5.22.1 Aqua WSC

Description of Supply

Aqua WSC is located in Lee and Bastrop (Region K) Counties with a majority of its demand in Bastrop County. Aqua WSC obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. Based on the existing supply available from groundwater, demands are projected to match supplies from year 2020 through year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and in coordination with Region K, the following water management strategy is recommended for Aqua WSC.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $6,829 in 2020
- Unit Cost: $496/acft

Table 5.22-2. Recommended Plan Costs by Decade for Aqua WSC (Brazos G)

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*0*	*0*	*0*	*0*	*0*
Conservation						
Supply From Plan Element (acft/yr)	14	12	5	1	1	0
Annual Cost ($/yr)	$6,829	$5,718	$2,406	$618	$278	$162
Projected Surplus/(Shortage) after Conservation (acft/yr)	*14*	*12*	*5*	*1*	*1*	*0*

5.22.2 City of Giddings

Description of Supply

The City of Giddings obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. There are surpluses projected through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Giddings.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $115,707 in 2070
- Unit Cost: $496/acft

Table 5.22-3. Recommended Plan Costs by Decade for City of Giddings

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*614*	*502*	*443*	*424*	*406*	*395*
Conservation						
Supply From Plan Element (acft/yr)	39	131	231	230	232	233
Annual Cost ($/yr)	$19,176	$65,196	$114,817	$114,060	$114,869	$115,707
Projected Surplus/(Shortage) after Conservation	*653*	*633*	*674*	*654*	*637*	*628*

5.22.3 Lee County WSC

Lee County WSC is located in Lee, Bastrop (Region K) and Fayette (Region K) counties. The majority of water demand is located in Lee County. The WSC obtains its water supply from groundwater from the Queen City Aquifer. Balance and strategies represented in Table 5.22-1 are for the entire WSC in all counties and regions. No shortages are projected for the planning period. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.22.4 City of Lexington

Description of Supply

The City of Lexington obtains its water supply from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Lexington, surpluses are projected through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Lexington.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $12,899 in 2030
- Unit Cost: $496/acft

Table 5.22-4. Recommended Plan Costs by Decade for City of Lexington

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*425*	*402*	*390*	*386*	*383*	*381*
Conservation						
Supply From Plan Element (acft/yr)	8	26	23	21	21	21
Annual Cost ($/yr)	$3,807	$12,899	$11,384	$10,568	$10,267	$10,248
Projected Surplus/(Shortage) after Conservation	*432*	*428*	*413*	*407*	*403*	*401*

5.22.5 County-Other

Entities in Lee County-Other receive supplies from the Carrizo-Wilcox Aquifer. County-Other is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.22.6 Manufacturing

Manufacturing is supplied from City of Giddings and is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended.

5.22.7 Steam-Electric

No Steam-Electric demand exists nor is projected for the county.

5.22.8 Mining

Description of Supply

Mining operations in Lee County are projected to have demand, but currently have no supply sources. Shortages for Mining are projected between 2020 and 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Lee County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: not determined

b. Leave needs unmet

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

Table 5.22-5. Recommended Plan Costs by Decade for Lee County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(3,180)*	*(7,289)*	*(7,767)*	*(8,304)*	*(8,904)*	*(9,631)*
Conservation						
Supply From Plan Element (acft/yr)	95	364	543	581	623	674
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(3,085)*	*(6,925)*	*(7,223)*	*(7,723)*	*(8,281)*	*(8,957)*
Leave needs unmet						
Supply From Plan Element (acft/yr)	*3,085*	*6,925*	*7,223*	*7,723*	*8,281*	*8,957*
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.22.9 Irrigation

Lee County Irrigation is supplied from run-of-the river water rights and Carrizo-Wilcox Aquifer. Irrigation is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended.

5.22.10 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.23 Limestone County Water Supply Plan

Table 5.23-1 lists each water user group in Limestone County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.23-1. Limestone County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
City of Coolidge	38	(140)	Projected shortage – see plan below
City of Groesbeck	(668)	(672)	Projected shortage – see plan below
City of Mart			See McLennan County
City of Mexia[2]	1,082	497	Projected Surplus
City of Thornton	206	207	Projected Surplus
Tri-County SUD			See Falls County
County-Other	399	330	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	(9,017)	(30,893)	Projected shortage – see plan below
Mining	(9,056)	(10,616)	Projected shortage – see plan below
Irrigation	14	14	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-45 and C-46, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

2 – Mexia balance after Region C strategy applied to provide additional supply to Wortham.

5.23.1 City of Coolidge

Description of Supply

The City of Coolidge has a contract from Post Oak SUD in Region C and also has a contract for 225 acft/yr from Bistone MWSD, which obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer and surface water from Lake Mexia. However, Bistone MWSD does not have sufficient supplies to meet the contracted demand.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and in coordination with Region C, the following water management strategies are recommended to meet the projected water shortage for the City of Coolidge.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost:$2,502 Maximum in 2020
- Unit Cost: $496/acft

b. Increase supplies from Post Oak SUD

- Cost Source: 2016 Region C Water Plan (see Appendix K)
- Date to be Implemented: 2040
- Project Cost: None. Contracted supplies with existing infrastructure

c. Bistone MWSD to firm up contracts through Carrizo-Wilcox Aquifer Development

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: Infrastructure assumed appropriate

Table 5.23-2. Recommended Plan Costs by Decade for City of Coolidge

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*71*	*(12)*	*(38)*	*(70)*	*(105)*	*(140)*
Conservation						
Supply From Plan Element (acft/yr)	5	4	1	—	—	—
Annual Cost ($/yr)	$2,502	$2,213	$496	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*76*	*(7)*	*(37)*	*(70)*	*(105)*	*(140)*
Increase supplies from Post Oak SUD						
Supply From Plan Element (acft/yr)	—	—	—	—	—	13
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Bistone MWSD to firm up contracts through Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)	104	109	113	118	123	127
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.23.2 City of Groesbeck

Description of Supply

The City of Groesbeck obtains its water supply from the Navasota River. The City owns senior water rights (priority date of 1921) on the Navasota River and has limited storage available from Springfield Lake. The City recently purchased a quarry to temporarily store water supply to manage the most recent drought. However; until a permanent solution is identified, the City of Groesbeck is projected to have shortages with future droughts.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for the City of Groesbeck.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost:$793
- Unit Cost: $496/acft

b. Groesbeck Off-Channel Reservoir

- Cost Source: Volume II, Chapter 4.4
    - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
- Date to be Implemented: 2020
- Project Cost:$11,909,000
- Unit Cost: $617/acft

Table 5.23-3. Recommended Plan Costs by Decade for City of Groesbeck

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(688)*	*(677)*	*(668)*	*(665)*	*(668)*	*(672)*
Conservation						
Supply From Plan Element (acft/yr)	2	—	—	—	—	—
Annual Cost ($/yr)	$793	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(686)*	*(677)*	*(668)*	*(665)*	*(668)*	*(672)*
Groesbeck OCR						
Supply From Plan Element (acft/yr)	1,755	1,755	1,755	1,755	1,755	1,755
Annual Cost ($/yr)	$1,082,835	$1,082,835	$1,082,835	$1,082,835	$212,355	$212,355
Unit Cost ($/acft)	$617	$617	$617	$617	$121	$121

5.23.3 City of Mexia

The City of Mexia has a contract for 4,480 acft/yr from Bistone MWSD, which obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer and surface water from Lake Mexia. The city provides supply to the City of Wortham (Region C) and to other entities in Limestone County-Other. Region C has recommended that the contract with Wortham (157 acft/yr) be increased to 336 acft/yr by 2070 to meet projected shortages for Wortham. The city is projected to have surplus supply through 2070 and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.23.4 City of Thornton

The City of Thornton obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Thornton, and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.23.5 County-Other

Description of Supply

Entities in County-Other are projected to have a surplus of water through the year 2070 and no changes in water supply are recommended. Various entities are dealing with elevated levels of arsenic in groundwater supplies and have been pursuing water management strategies through the FHLM WSC. Through a TWDB sponsored study coordinated by FHLM WSC, these entities have considered a regional brackish RO WTP in Limestone County, Carrizo-Wilcox Regional Groundwater in Limestone County, Tehuacana Reservoir, and supplies from City of Marlin (Brushy Creek Reservoir), and City of Waco. The recommended strategy is to provide for arsenic treatment for individual entities. This strategy does not provide new supply. Surpluses are projected through the year 2070.

Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Limestone County-Other.

a. Upgrade Treatment for Arsenic

Entities within County-Other for which Arsenic treatment is recommended include Prairie Hill WSC.

- Cost Source: Volume II, Chapter 12.5
- Date to be Implemented: 2020
- Project Cost: $1,115,000
- Unit Cost: $1,414/acft

Table 5.23-4. Recommended Plan Costs by Decade for the Limestone County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*396*	*399*	*399*	*384*	*357*	*330*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*396*	*399*	*399*	*384*	*357*	*330*
Upgrade Treatment for Arsenic						
Supply From Plan Element (acft/yr)	268	268	268	268	268	268
Annual Cost ($/yr)	$379,000	$379,000	$286,000	$286,000	$286,000	$286,000
Unit Cost ($/yr)	$1,414	$1,414	$1,067	$1,067	$1,067	$1,067

5.23.6 Manufacturing

Limestone County Manufacturing obtains its water supply the cities of Coolidge, Groesbeck, Mexia and Bistone MWSD. Based on the available surface water supply, Limestone County Manufacturing is projected to have sufficient supplies through 2070.

5.23.7 Steam-Electric

Description of Supply

Steam-Electric water demand in Limestone County is associated with the NRG (formerly Reliant Energy) power plant located at Lake Limestone. NRG has contracted with the Brazos River Authority for water supply from Lake Limestone. Additional Steam-Electric demands are projected for Limestone County and are anticipated to come online before 2040. Based on the available surface water supply, Limestone County Steam-Electric is projected to have shortages from 2030 through the year 2070.

Recommended Strategy

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Limestone County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Reallocation of surplus McLennan County Steam-Electric supplies

- Cost Source: Unknown – the exact location of the projected Steam-Electric demands in Limestone County is unknown, but could be located near supplies in McLennan County.
- Date to be Implemented: 2030
- Project Cost: Capital cost unknown, as demands vary geographically.
- Unit Cost: assumed $250/acft

c. Reduce Demand through Alternative Cooling Technology

Steam-Electric cooling is often water-intensive, and the water demands provided by the TWDB reflect this. Alternative technologies that utilize air cooling or other less water intensive methods could be substituted. Costs shown are for the additional costs for implementation of these more advanced technologies for cooling.

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2060
- Project Cost: Unable to determine with available information

Table 5.23-5. Recommended Plan Costs by Decade for Limestone County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*78*	*(4,051)*	*(9,017)*	*(15,003)*	*(22,234)*	*(30,893)*
Conservation						
Supply From Plan Element (acft/yr)	678	1,321	2,176	2,573	3,058	3,642
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*78*	*(2,730)*	*(6,842)*	*(12,430)*	*(19,176)*	*(27,250)*
Reallocation of supplies from McLennan County Steam-Electric						
Supply From Plan Element (acft/yr)	—	2,730	6,842	12,430	17,963	17,129
Annual Cost ($/yr)	—	$682,500	$1,710,500	$3,107,500	$4,490,750	$4,282,250
Unit Cost ($/acft)	—	$250	$250	$250	$250	$250
Reduce Demand through Alternative Cooling Technology						
Supply From Plan Element (acft/yr)	—	—	—	—	1,213	10,121
Annual Cost ($/yr)	—	—	—	—	ND	ND
Unit Cost ($/acft)	—	—	—	—	ND	ND

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.23.8 Mining

Description of Supply

Mining operations in Limestone County are supplied by Carrizo-Wilcox groundwater. Demands for Mining exceed current supplies resulting in shortages beginning in 2020.

Recommended Strategy

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Limestone County-Mining.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: not determined

b. Carrizo-Wilcox Aquifer Development (Brazos-Basin)
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: before 2020
   - Project Cost: $31,546,000
   - Unit Cost: Max of $603 /acft (2020)

c. Carrizo-Wilcox Aquifer Development (Trinity-Basin)
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: before 2020
   - Project Cost: $5,871,000
   - Unit Cost: Max of $607 /acft (2020)

d. Leave needs unmet
   - Cost Source: Cost of not meeting needs – see Appendix H
   - Date to be Implemented: 2020

Table 5.23-6. Recommended Plan Costs by Decade for Limestone County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(9,508)*	*(9,116)*	*(9,056)*	*(9,530)*	*(9,996)*	*(10,616)*
Conservation						
Supply From Plan Element (acft/yr)	310	496	691	724	756	800
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(9,198)*	*(8,619)*	*(8,365)*	*(8,806)*	*(9,239)*	*(9,816)*
Carrizo Aquifer Development (Brazos Basin)						
Supply From Plan Element (acft/yr)	4,510	4,535	4,610	4,806	4,699	4,592
Annual Cost ($/yr)	$2,898,125	$2,898,125	$257,125	$257,125	$257,125	$257,125
Unit Cost ($/acft)	$603	$603	$54	$54	$54	$54

Table 5.23-6. Recommended Plan Costs by Decade for Limestone County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Carrizo Aquifer Development (Trinity Basin)						
Supply From Plan Element (acft/yr)	888	888	888	888	888	888
Annual Cost ($/yr)	$538,837	$538,837	$47,837	$47,837	$47,837	$47,837
Unit Cost ($/acft)	$607	$607	$54	$54	$54	$54
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	3,800	3,197	2,867	3,112	3,652	4,336
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location.

5.23.9 Irrigation

Irrigation is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended.

5.23.10 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.24 McLennan County Water Supply Plan

Table 5.24-1 lists each water user group in McLennan County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.24-1. McLennan County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
City of Bellmead	206	45	Projected surplus
City of Beverly Hills	0	0	Demand equals supply
City of Bruceville-Eddy	1,040	929	Projected surplus
Chalk Bluff WSC	466	471	Projected surplus
Coryell City Water Supply District			See Coryell County
City of Crawford	(3)	(7)	Projected shortage – see plan below
Cross Country WSC	109	(138)	Projected shortage – see plan below
Elm Creek WSC			See Bell County
City of Gholson	749	709	Projected surplus
City of Golinda			See Falls County
City of Hallsburg	0	0	Projected surplus
City of Hewitt	(211)	(231)	Projected shortage – see plan below
City of Lacy-Lakeview	261	95	Projected surplus
City of Lorena	95	1	Projected surplus
City of Mart	(182)	(245)	Projected shortage – see plan below
City of McGregor	2,004	1,759	Projected surplus
City of Moody	404	347	Projected surplus
North Bosque WSC	(265)	(628)	Projected shortage – see plan below
City of Riesel	(11)	(19)	Projected shortage – see plan below
City of Robinson	(720)	(1,909)	Projected shortage – see plan below
Tri-County SUD			See Falls County
Valley Mills			See Bosque County
City of Waco	12,925	9,827	Projected surplus – see Chapter 5.38
City of West	888	850	Projected surplus
West Brazos WSC			See Falls County
Western Hills WS	306	270	Projected surplus
City of Woodway	(20)	(103)	Projected shortage – see plan below
County-Other	301	340	Projected surplus

Table 5.24-1. McLennan County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Manufacturing	(2,204)	(2,834)	Projected shortage – see plan below
Steam-Electric	20,224	17,129	Projected surplus
Mining	(2,786)	(3,942)	Projected shortage – see plan below
Irrigation	(2,325)	(2,363)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-47 and C-48, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.24.1 City of Bellmead

Description of Supply

The City of Bellmead obtains its water supply from the Trinity Aquifer. The City of Bellmead also has contracted with the City of Waco for supplemental surface water supply from Lake Waco, but has no plans to utilize the contract. No shortages are projected for the City of Bellmead; however, the City of Waco and the City of Bellmead are considering alternate water supply in order to reduce Bellmead's dependence on Trinity Aquifer groundwater. The purchase of supplemental reuse water from WMARSS is recommended to reduce demands on Trinity Aquifer.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Bellmead.

a. Purchase reuse water from WMARSS (Bellmead/Lacy-Lakeview Reuse). The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers.

    - Cost Source: Volume II, Chapter 3
    - Date to be Implemented: by 2020
    - Project Cost:$2,884,000 (City's portion)
    - Unit Cost: $324/acft

Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.24-2. Recommended Plan Costs by Decade for City of Bellmead

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*261*	*233*	*206*	*163*	*105*	*45*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*261*	*233*	*206*	*163*	*105*	*45*
WMARSS Bellmead/Lacy Lakeview Reuse						
Supply From Plan Element (acft/yr)	1,120	1,120	1,120	1,120	1,120	1,120
Annual Cost ($/yr)	$362,500	$362,500	$121,000	$121,000	$121,000	$121,000
Unit Cost ($/acft)	$324	$324	$108	$108	$108	$108
Projected Surplus/(Shortage) after Reuse (acft/yr)	*1,381*	*1,353*	*1,326*	*1,283*	*1,225*	*1,165*

5.24.2 City of Beverly Hills

The City of Beverly Hills obtains its water supply from surface water from the City of Waco. No shortages are projected for the City of Beverly Hills and no change in water supply is recommended. Conservation was considered; however, the entity’s current per capita use rate is below the selected target rate of 140 gpcd.

5.24.3 City of Bruceville-Eddy

Description of Supply

The City of Bruceville-Eddy obtains its water supply from the Trinity Aquifer and has a contract for surface water from Lake Belton from Bluebonnet WSC for supplemental water supplies. No shortages are projected for the City of Bruceville-Eddy. This WUG is located in multiple counties (McLennan and Falls). The surpluses shown in Table 5-24.1 represent the cumulative totals for the City of Bruceville-Eddy.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Bruceville-Eddy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Unit Cost: $474/acft
- Annual Cost: maximum of $18,486 in 2070

b. Water Supply from Bluebonnet WSC

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2030
- Project Cost: assumes infrastructure in place to deliver supply
- Unit Cost: $500/acft (wholesale water rate from Bluebonnet WSC)

Table 5.24-3. Recommended Plan Costs by Decade for City of Bruceville-Eddy

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,084*	*1,064*	*1,040*	*999*	*968*	*929*
Conservation						
Supply From Plan Element (acft/yr)	11	33	38	36	38	40
Annual Cost ($/yr)	$5,214	$15,168	$17,538	$17,064	$17,538	$18,486
Projected Surplus/(Shortage) after Conservation	*1,095*	*1,097*	*1,078*	*1,035*	*1,006*	*969*
Water Supply from Bluebonnet WSC						
Supply From Plan Element (acft/yr)	—	5	14	39	51	71
Annual Cost ($/yr)	—	$2,500	$7,000	$19,500	$25,500	$35,500
Unit Cost ($/acft)	—	$500	$500	$500	$500	$500

5.24.4 Chalk Bluff WSC

Chalk Bluff WSC obtains its water supply from the Trinity Aquifer. No shortages are projected for the Chalk Bluff WSC. Conservation was considered; however, the entity’s current per capita use rate is below the selected target rate of 140 gpcd.

5.24.5 City of Crawford

Description of Supply

The City of Crawford obtains its water supply from the Trinity Aquifer and run-of-the-river diversion from Tonk Creek into Rock Quarry Lake. A small shortage is projected beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Crawford.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $13,746 in 2070
- Unit Cost: $474/acft

Table 5.24-4. Recommended Plan Costs by Decade for City of Crawford

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(5)*	*(3)*	*(3)*	*(3)*	*(5)*	*(7)*
Conservation						
Supply From Plan Element (acft/yr)	7	16	27	28	28	29
Annual Cost ($/yr)	$3,318	$7,584	$12,798	$13,272	$13,272	$13,746
Projected Surplus/(Shortage) after Conservation	*2*	*13*	*24*	*25*	*23*	*22*

5.24.6 Cross Country WSC

Description of Supply

Cross Country WSC obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater supply, Cross Country WSC is projected to have a shortage from 2050 through the year 2070. This WUG is located in multiple counties (McLennan and Bosque). The surplus/shortages shown in Table 5.24-1 represent the cumulative totals for Cross Country WSC.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the Cross Country WSC.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $14,000 in 2070
- Unit Cost: $474/acft

b. Purchase water from City of Waco

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2050
- Project Cost: $2,579,000
- Unit Cost: assumed unit cost of $3,273/acft ($10.15/1,000 gallons) for wholesale treated water, including transmission costs

Table 5.24-5. Recommended Plan Costs by Decade for Cross Country WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*114*	*109*	*109*	*(127)*	*(132)*	*(138)*
Conservation						
Supply From Plan Element (acft/yr)	20	24	14	10	8	8
Annual Cost ($/yr)	$9,759	$11,954	$6,820	$5,178	$4,157	$4,100
Projected Surplus/(Shortage) after Conservation	*133*	*133*	*122*	*(117)*	*(124)*	*(130)*
Purchase from Waco						
Supply From Plan Element (acft/yr)	—	—	—	150	150	150
Annual Cost ($/yr)	—	—	—	$491,000	$491,000	$275,000
Unit Cost ($/yr)	—	—	—	$3,273	$3,273	$1,833

5.24.7 City of Gholson

The City of Gholson obtains its water supply from groundwater from the Trinity Aquifer through Gholson WSC. A surplus is projected through the year 2070; and, there are no changes recommended to the water supply. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.24.8 City of Hallsburg

The City of Hallsburg obtains its water supply from groundwater from the Trinity Aquifer through H&H WSC. The WSC has sufficient supplies to meet the city's projected demands.

Water Supply Plan

To reduce demands on the Trinity Aquifer in McLennan County, the following water supply management strategy is an alternative for the City of Hallsburg.

a. Alternative: Purchase reuse water from WMARSS (Waco East Reuse). The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Project Cost: $250,970 (City's portion)
- Unit Cost: $869/acft

Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.24-6. Recommended Plan Costs by Decade for City of Hallsburg

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*0*	*0*	*0*	*0*	*0*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*0*	*0*	*0*	*0*	*0*	*0*
Alternative: WMARSS Waco East Reuse						
Supply From Plan Element (acft/yr)	31	31	31	31	31	31
Annual Cost ($/yr)	$26,939	$26,939	$5,921	$5,921	$5,921	$5,921
Unit Cost ($/acft)	$869	$869	$191	$191	$191	$191
Projected Surplus/(Shortage) after Reuse (acft/yr)	*31*	*31*	*31*	*31*	*31*	*31*

5.24.9 City of Hewitt

Description of Supply

The City of Hewitt obtains its water supply from groundwater from the Trinity Aquifer, and has a contract with the City of Waco for a supplemental supply from Lake Waco. Conservation and purchase of supplemental reuse water from WMARSS is recommended to reduce demands on water supplied from the Trinity Aquifer and by the City of Waco. The City of Waco contract is structured to “meet” the water needs of Hewitt. The shortages for Hewitt shown in Table 5.24-7 are artificially created to allow conservation savings to reduce the supplies needed from the City of Waco.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the City of Hewitt. Associated costs are included for each strategy.

a. Conservation

  - Cost Source: Volume II, Chapter 2
  - Date to be Implemented: before 2020
  - Annual Cost: maximum of $112,338 in 2030
  - Unit Cost: $474/acft

b. Purchase reuse water from WMARSS (Bulhide Creek Reuse). The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers.

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Project Cost: $4,657,000
- Unit Cost: $381/acft

Table 5.24-7. Recommended Plan Costs by Decade for City of Hewitt

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(87)*	*(237)*	*(211)*	*(204)*	*(216)*	*(231)*
Conservation						
Supply From Plan Element (acft/yr)	87	237	211	204	216	231
Annual Cost ($/yr)	$41,000	$112,000	$100,000	$97,000	$102,000	$109,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*0*	*0*	*0*	*0*	*0*	*0*
WMARSS – Bullhide Creek Reuse						
Supply From Plan Element (acft/yr)	1,223	1,223	1,223	1,223	1,223	1,223
Annual Cost ($/yr)	$470,000	$470,000	$183,000	$183,000	$183,000	$183,000
Unit Cost ($/yr)	$381	$381	$149	$149	$149	$149
Projected Surplus/(Shortage) after Reuse (acft/yr)	*1,223*	*1,223*	*1,223*	*1,223*	*1,223*	*1,223*

5.24.10 City of Lacy-Lakeview

Description of Supply

The City of Lacy-Lakeview obtains its water supply from the City of Waco. Based on the current contracted amount, the City of Lacy-Lakeview is projected to have a surplus of supplies. Supplemental reuse water from WMARSS is recommended to reduce demands on water supplied by the City of Waco.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Lacy-Lakeview.

a. Purchase reuse water from WMARSS (Bellmead/Lacy-Lakeview Reuse). The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers.

  - Cost Source: Volume II, Chapter 3
  - Date to be Implemented: before 2020
  - Project Cost:$2,884,000 (City's portion)
  - Unit Cost: $324/acft

Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.24-8. Recommended Plan Costs by Decade for the City of Lacy-Lakeview

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*348*	*303*	*261*	*212*	*154*	*95*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*348*	*303*	*261*	*212*	*154*	*95*
WMARSS – Bellmead/Lacy-Lakeview Reuse						
Supply From Plan Element (acft/yr)	1,120	1,120	1,120	1,120	1,120	1,120
Annual Cost ($/yr)	$362,500	$362,500	$121,000	$121,000	$121,000	$121,000
Unit Cost ($/yr)	$324	$324	$108	$108	$108	$108
Projected Surplus/(Shortage) after Reuse (acft/yr)	*1,468*	*1,423*	*1,381*	*1,332*	*1,274*	*1,215*

5.24.11 City of Lorena

Description of Supply

The City of Lorena obtains its water supply from a contract with the Brazos River Authority (treated by the City of Robinson) and the Trinity Aquifer. No shortages are projected for the City of Lorena; however, purchase of supplemental reuse water from WMARSS is recommended to reduce demands on groundwater from the Trinity Aquifer.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Lorena.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $5,000 in 2020
- Unit Cost: $474/acft

b. Purchase reuse water from WMARSS (Bullhide Creek Reuse). The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Project Cost:$2,884,000 (City's portion)
- Unit Cost: $324/acft

Table 5.24-9. Recommended Plan Costs by Decade for the City of Lorena

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*153*	*123*	*95*	*66*	*33*	*1*
Conservation						
Supply From Plan Element (acft/yr)	10	3	—	—	—	—
Annual Cost ($/yr)	$4,700	$1,400	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*163*	*126*	*95*	*66*	*33*	*1*
WMARSS – Bullhide Creek Reuse						
Supply From Plan Element (acft/yr)	448	448	448	448	448	448
Annual Cost ($/yr)	$171,000	$171,000	$67,000	$67,000	$67,000	$67,000
Unit Cost ($/yr)	$381	$381	$149	$149	$149	$149
Projected Surplus/(Shortage) after Conservation (acft/yr)	*611*	*574*	*543*	*514*	*481*	*449*

5.24.12 City of Mart

Description of Supply

The City of Mart obtains its water supply from the Trinity Aquifer and Lake Mart. Based on the available groundwater supply and little or no firm yield from Lake Mart, the City of Mart is projected to have a shortage through the year 2070. The City is located in multiple counties (McLennan and Limestone). The surplus/shortages shown in Table 5.24-1 represent the cumulative totals for the City of Mart.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Mart.

a. Purchase Water Supply from City of Waco

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $5,275,000
- Unit Cost: $3,028/acft for wholesale treated water, including transmission costs

b. Alternative: Purchase reuse water from WMARSS (Waco East Reuse). The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Project Cost:$1,085,000 (City's portion)
- Unit Cost: $869/acft

Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.24-10. Recommended Plan Costs by Decade for the City of Mart

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(150)*	*(167)*	*(182)*	*(200)*	*(222)*	*(245)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(150)*	*(167)*	*(182)*	*(200)*	*(222)*	*(245)*
Purchase Water Supply from City of Waco						
Supply From Plan Element (acft/yr)	250	250	250	250	250	250
Annual Cost ($/yr)	$757,000	$757,000	$316,000	$316,000	$316,000	$316,000
Unit Cost ($/yr)	$3,028	$3,028	$1,264	$1,264	$1,264	$1,264
Alternative: WMARSS – Waco East Reuse						
Supply From Plan Element (acft/yr)	134	134	134	134	134	134
Annual Cost ($/yr)	$116,000	$116,000	$26,000	$26,000	$26,000	$26,000
Unit Cost ($/yr)	$869	$869	$191	$191	$191	$191

5.24.13 City of McGregor

The City of McGregor obtains its water supply from the Trinity Aquifer and from surface water from Lake Belton via Bluebonnet WSC. No shortages are projected for the City of McGregor and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.24.14 City of Moody

The City of Moody obtains its water supply from the Trinity Aquifer and from surface water from Lake Belton via a contract with the Brazos River Authority. Bluebonnet WSC treats and delivers water to the City from Lake Belton. No shortages are projected for the City of Moody, and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.24.15 North Bosque WSC

Description of Supply

North Bosque WSC obtains its water supply from the Trinity Aquifer. Based on the available groundwater supply, North Bosque WSC is projected to have a shortage through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for North Bosque WSC. Associated costs are included for each strategy.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: maximum of $224,000 in 2070
   - Unit Cost: $474/acft

b. Purchase Water Supply from City of Waco
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: $2,203,000
   - Unit Cost: $2,325/acft for wholesale treated water, including transmission costs

Table 5.24-11. Recommended Plan Costs by Decade for North Bosque WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(14)*	*(146)*	*(265)*	*(385)*	*(507)*	*(628)*
Conservation						
Supply From Plan Element (acft/yr)	33	99	183	280	390	452
Annual Cost ($/yr)	$16,476	$49,108	$90,667	$138,754	$193,295	$224,365
Projected Surplus/(Shortage) after Conservation (acft/yr)	*20*	*(47)*	*(82)*	*(105)*	*(117)*	*(175)*
Purchase Water Supply from City of Waco						
Supply From Plan Element (acft/yr)	—	200	200	200	200	200
Annual Cost ($/yr)	—	$465,000	$465,000	$281,000	$281,000	$281,000
Unit Cost ($/yr)	—	$2,325	$2,325	$1,405	$1,405	$1,405

5.24.16 City of Riesel

Description of Supply

The City of Riesel obtains its water supply from the Trinity Aquifer. Based on the available groundwater supply, the City of Riesel is projected to have a shortage through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Riesel. Associated costs are included for each strategy.

a. Additional Purchase from RMS WSC
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Annual Cost: $19,540
   - Unit Cost: $977/acft (RMS WSC wholesale water rate)

b. Alternative: Purchase reuse water from WMARSS (Waco East Reuse). The reuse supply will reduce demands for landscape irrigation at existing or future parks, schools, ball fields, and other green spaces. Reuse water may also potentially supply existing or future industrial customers.
   - Cost Source: Volume II, Chapter 3
   - Date to be Implemented: 2020
   - Project Cost:$348,000 (City's portion)
   - Unit Cost: $869/acft

Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.24-12. Recommended Plan Costs by Decade for City of Riesel

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(11)*	*(11)*	*(11)*	*(12)*	*(15)*	*(19)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(11)*	*(11)*	*(11)*	*(12)*	*(15)*	*(19)*
Purchase Water Supply from RMS WSC						
Supply From Plan Element (acft/yr)	20	20	20	20	20	20
Annual Cost ($/yr)	$19,540	$19,540	$19,540	$19,540	$19,540	$19,540
Unit Cost ($/yr)	$977	$977	$977	$977	$977	$977
Alternative: WMARSS East Reuse						
Supply From Plan Element (acft/yr)	43	43	43	43	43	43
Annual Cost ($/yr)	$37,000	$37,000	$8,000	$8,000	$8,000	$8,000
Unit Cost ($/yr)	$869	$869	$191	$191	$191	$191

5.24.17 City of Robinson

Description of Supply

The City of Robinson obtains its water supply from the Trinity Aquifer, the Brazos River and the City of Waco. Western Brazos WSC also serves some customers within the city limits of Robinson, which is considered a supply for the City's demand. The city also has a 140 acft/yr contract to provide treated supply to the City of Lorena, which utilizes Lorena's contract with the BRA. Based on the constrained supply amounts, the City of Robinson is projected to have shortages. Although the City has sufficient raw water supply to meet its future needs, the City's water treatment plant has an annual average capacity of 1,125 acft.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Robinson. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum $312,000 in 2070
- Unit Cost: $474/acft

b. Expand Water Treatment Plant (4 MGD)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2030
- Project Cost: $13,153,000
- Unit Cost: Max of $912/acft

Table 5.24-13. Recommended Plan Costs by Decade for City of Robinson

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*72*	*(346)*	*(720)*	*(1,109)*	*(1,511)*	*(1,909)*
Conservation						
Supply From Plan Element (acft/yr)	91	316	507	549	605	663
Annual Cost ($/yr)	$43,000	$150,000	$240,000	$260,000	$287,000	$314,000
Projected Surplus/(Shortage) after Conservation	*163*	*(30)*	*(213)*	*(560)*	*(907)*	*(1,246)*
Expand WTP (4 MGD)						
Supply From Plan Element (acft/yr)	—	2,240	2,240	2,240	2,240	2,240
Annual Cost ($/yr)	—	$2,042,000	$2,042,000	$941,000	$941,000	$941,000
Unit Cost ($/yr)	—	$912	$912	$420	$420	$420

5.24.18 City of Waco

The City of Waco obtains its water supply from surface water from Lake Waco, for which it owns water rights. The City supplies several neighboring communities with treated water. A portion of the city's treated wastewater is also contracted to irrigation and industrial customers in the County. The City is projected to have a surplus of supplies through the planning period. Refer to Chapter 5.38 for the City's plan as a Wholesale Water Provider.

5.24.19 City of West

Description of Supply

The City of West obtains its water supply from the Trinity Aquifer and the City of Waco. Surpluses are projected through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of West.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum $10,870 in 2030
- Unit Cost: $474/acft

Table 5.24-14. Recommended Plan Costs by Decade for City of West

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*898*	*893*	*888*	*879*	*865*	*850*
Conservation						
Supply From Plan Element (acft/yr)	15	23	13	7	6	6
Annual Cost ($/yr)	$7,110	$10,902	$6,162	$3,318	$2,844	$2,844
Projected Surplus/(Shortage) after Conservation	*913*	*916*	*901*	*886*	*871*	*856*

5.24.20 Western Hills WS

Western Hills WS obtains its water supply from the Trinity Aquifer. Based on the available groundwater supply, Western Hills WS is projected to have a surplus of supply through 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.24.21 City of Woodway

Description of Supply

The City of Woodway obtains its water supply from the Trinity Aquifer, from Lake Waco from the City of Waco, and from Lake Belton from Bluebonnet WSC. The City provides 2 acft/yr for McLennan County Manufacturing. The supply contracts are adequate to meet demands; however under drought conditions, Bluebonnet WSC may not be able to provide the full contract amount to all of its customers, including Woodway.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Woodway.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum $896,000 in 2070
- Unit Cost: $474/acft

b. Water Supply from Bluebonnet WSC

- Cost Source: BRA to firm up water supply
- Date to be Implemented: 2030
- Project Cost: assumes infrastructure in place to deliver supply
- Unit Cost: $500/acft (wholesale water rate from Bluebonnet WSC)

Table 5.24-15. Recommended Plan Costs by Decade for City of Woodway

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*(7)*	*(20)*	*(57)*	*(74)*	*(103)*
Conservation						
Supply From Plan Element (acft/yr)	208	512	832	1,180	1,541	1,906
Annual Cost ($/yr)	$98,592	$242,688	$394,368	$559,320	$730,434	$903,444
Projected Surplus/(Shortage) after Conservation	*208*	*506*	*812*	*1,123*	*1,466*	*1,804*
Water Supply from Bluebonnet WSC						
Supply From Plan Element (acft/yr)	—	7	20	57	74	103
Annual Cost ($/yr)	—	$3,500	$10,000	$28,500	$37,000	$51,500
Unit Cost ($/acft)	—	$500	$500	$500	$500	$500

5.24.22 County-Other

Description of Supply

McLennan County-Other entities obtain water supply from groundwater from the Trinity Aquifer and surface water from Lake Belton and Lake Waco. Entities in County-Other provide additional supply to the cities of Hallsburg and Riesel, and provide supply to industrial customers in McLennan County. Various entities are dealing with elevated levels of arsenic in groundwater supplies and have been pursuing water management strategies through the FHLM WSC. Through a TWDB sponsored study coordinated by FHLM WSC, these entities have considered a regional brackish RO WTP in Limestone County, Carrizo-Wilcox Regional Groundwater in Limestone County, Tehuacana Reservoir, and supplies from City of Marlin (Brushy Creek Reservoir), and City of Waco. The recommended strategy is to provide for arsenic treatment for individual entities. This strategy does not provide new supply. Surpluses are projected through the year 2070.

Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for McLennan County-Other.

a. Upgrade Treatment for Arsenic

Entities within County-Other for which Arsenic treatment is recommended include EOL WSC, LTG WSC, MS WSC, and RMS WSC. This is a treatment strategy and does not increase the supply available to these entities. Total treatment is estimated at 917 acft/yr.

- Cost Source: Volume II, Chapter 12.5
- Date to be Implemented: 2020
- Project Cost: $3,811,000
- Unit Cost: $1,021/acft

Table 5.24-16. Recommended Plan Costs by Decade for the McLennan County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*84*	*204*	*301*	*344*	*349*	*340*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*84*	*204*	*301*	*344*	*349*	*340*
Upgrade Treatment for Arsenic						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	$936,000	$936,000	$617,000	$617,000	$617,000	$617,000
Unit Cost ($/yr)	$1,021	$1,021	$673	$673	$673	$673

5.24.23 Manufacturing

Description of Supply

Water supply for manufacturing in McLennan County is obtained by purchase from a city or water supply corporation, from Trinity Aquifer wells operated by the manufacturing entity, and from run-of-river rights and Lake Waco. McLennan County Manufacturing is projected to have shortages beginning in 2020. However, purchase of supplemental reuse water from WMARSS is recommended to reduce demands on water supplied by the run-of-river rights, Lake Waco and groundwater from the Trinity Aquifer

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for McLennan County Manufacturing.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: Not determined

b. WMARSS Flat Creek Reuse Project

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Project Cost: None. City of Waco is the project sponsor. Entity will purchase from the City.
- Unit Cost: $205/acft

Table 5.24-17. Recommended Plan Costs by Decade for McLennan County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,664)*	*(1,916)*	*(2,204)*	*(2,417)*	*(2,664)*	*(2,834)*
Conservation						
Supply From Plan Element (acft/yr)	153	286	446	487	527	571
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,511)*	*(1,630)*	*(1,758)*	*(1,930)*	*(2,137)*	*(2,263)*
Purchase Reuse Supplies from WMARSS – Flat Creek Project						
Supply From Plan Element (acft/yr)	1,600	1,700	1,800	2,000	2,200	2,500
Annual Cost ($/yr)	$328,000	$349,000	$189,000	$210,000	$231,000	$263,000
Unit Cost ($/acft)	$205	$205	$105	$105	$105	$105
Projected Surplus/(Shortage) after Reuse (acft/yr)	*89*	*70*	*42*	*70*	*63*	*237*

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location.

5.24.24 Steam-Electric

McLennan County Steam-Electric obtains its water supply from Tradinghouse Reservoir and from WMARSS reuse. No shortage is projected for McLennan County Steam-Electric and no changes in water supply are recommended.

5.24.25 Mining

Description of Supply

Mining operations in McLennan County are supplied by Brazos River Alluvium groundwater. Demands for Mining are projected to increase significantly resulting in shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for McLennan County-Mining. Associated costs are included for each strategy.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: not determined

b. WMARSS Flat Creek Reuse Project
   - Cost Source: Volume II, Chapter 3
   - Date to be Implemented: before 2030
   - Project Cost: None. City of Waco is the project sponsor. Entity will purchase from the City.
   - Unit Cost: $205

c. Brazos River Alluvium Development
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: before 2030
   - Project Cost: $7,185,000
   - Unit Cost: Max of $364/acft (2020)

d. Alternative: BRA System Operation to McLennan County
   - Cost Source: BRA System Operations Supply (Volume II, Chapter 7.11)
     - Supply dependent on BRA obtaining the System Operations permit from TCEQ
   - Date to be Implemented: before 2030
   - Project Cost: Infrastructure assumed sufficient
   - Unit Cost: $65.65/acft

Table 5.24-18. Recommended Plan Costs by Decade for McLennan County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,264)*	*(2,726)*	*(2,786)*	*(3,234)*	*(3,558)*	*(3,942)*
Conservation						
Supply From Plan Element (acft/yr)	76	150	214	246	268	295
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(2,188)*	*(2,576)*	*(2,572)*	*(2,989)*	*(3,290)*	*(3,647)*
WMARSS Flat Creek Reuse Project						
Supply From Plan Element (acft/yr)	811	811	811	811	811	811
Annual Cost ($/yr)	$166,000	$166,000	$85,000	$85,000	$85,000	$85,000
Unit Cost ($/acft)	$205	$205	$105	$105	$105	$105
Projected Surplus/(Shortage) after Reuse (acft/yr)	*(1,377)*	*(1,765)*	*(1,761)*	*(2,178)*	*(2,479)*	*(2,836)*
Brazos River Alluvium						
Supply From Plan Element (acft/yr)	1,800	1,800	1,800	2,500	2,500	2,900
Annual Cost ($/yr)	$656,028	$656,028	$53,028	$291,311	$291,311	$708,732
Unit Cost ($/acft)	$364	$364	$29	$117	$117	$244
Alternative: BRA System Operation						
Supply From Plan Element (acft/yr)	—	—	—	1,050	1,050	1,050
Annual Cost ($/yr)	—	—	—	$68,933	$68,933	$68,933
Unit Cost ($/acft)	—	—	—	$65.65	$65.65	$65.65

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.24.26 Irrigation

Description of Supply

McLennan County Irrigation is supplied by groundwater from the Trinity Aquifer and the Brazos River Alluvium, and run of the river water rights. Irrigation is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for McLennan County-Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: $230/acft

b. Groundwater Development – Brazos River Alluvium

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $16,763,000
- Unit Cost: Max of $696/acft (2020)

c. Alternative – Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $11,477,000
- Unit Cost: Max of $1,047 (2020)

d. Alternative – BRA System Operation to McLennan County

- Cost Source: BRA System Operations Supply (Volume II, Chapter 7.11)
  - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2020
- Project Cost: Infrastructure assumed sufficient
- Unit Cost: $65.65/ acft

Table 5.24-19. Recommended Plan Costs by Decade for McLennan County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,299)*	*(2,313)*	*(2,325)*	*(2,338)*	*(2,350)*	*(2,363)*
Conservation						
Supply From Plan Element (acft/yr)	146	244	341	341	340	340
Annual Cost ($/yr)	$34,000	$56,000	$78,000	$78,000	$78,000	$78,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(2,152)*	*(2,069)*	*(1,984)*	*(1,997)*	*(2,010)*	*(2,023)*
Groundwater Development – Brazos River Alluvium						
Supply From Plan Element (acft/yr)	2,200	2,200	2,200	2,200	2,200	2,200
Annual Cost ($/yr)	$1,531,732	$1,531,732	$123,732	$123,732	$123,732	$123,732
Unit Cost ($/acft)	$696	$696	$56	$56	$56	$56

Table 5.24-19. Recommended Plan Costs by Decade for McLennan County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Alternative: Groundwater Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	1,000	1,000	1,000	1,000	1,000	1,000
Annual Cost ($/yr)	$1,047,405	$1,047,405	$86,405	$86,405	$86,405	$86,405
Unit Cost ($/acft)	$1,047	$1,047	$86	$86	$86	$86
Alternative: BRA System Operations						
Supply From Plan Element (acft/yr)	1,200	1,200	1,200	1,200	1,200	1,200
Annual Cost ($/yr)	$78,780	$78,780	$78,780	$78,780	$78,780	$78,780
Unit Cost ($/acft)	$65.65	$65.65	$65.65	$65.65	$65.65	$65.65

5.24.27 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.25 Milam County Water Supply Plan

Table 5.25-1 lists each water user group in Milam County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.25-1.Milam County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Town of Buckholts	173	165	Projected surplus
Bell-Milam Falls WSC			See Bell County
City of Cameron	1,188	1,017	Projected surplus
Milano WSC	17	4	Projected surplus
City of Rockdale	174	308	Projected surplus
Southwest Milam WSC	198	103	Projected surplus
City of Thorndale	39	18	Projected surplus
County-Other	632	592	Projected surplus
Manufacturing	2	0	Projected surplus
Steam-Electric	(78)	(6,757)	Projected shortage – see plan below
Mining	0	0	Demand equals supply
Irrigation	12	439	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-49 and C-50, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.25.1 Town of Buckholts

The Town of Buckholts obtains its water supply from Central Texas WSC. No shortages are projected for the planning period. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.25.2 City of Cameron

Description of Supply

The City of Cameron obtains its water supply from run-of-the-river rights. The city provides supply to entities in Milam County-Other and to Manufacturing. No shortages are projected for the City of Cameron. The City has informed the Brazos G RWPG that it intends to develop a supply from the Carrizo-Wilcox Aquifer to replace its surface water supplies, which the City considers to be unreliable. Current uses have fully utilized the

MAG in Milam County and there is no remaining MAG in the Carrizo-Wilcox Aquifer in Milam County to accommodate including that strategy in the 2016 Brazos G Plan.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Cameron.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $496/acft
- Annual Cost: maximum of $230,338 in 2070

Table 5.25-2. Recommended Plan Costs by Decade for City of Cameron

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,270*	*1,220*	*1,188*	*1,129*	*1,073*	*1,017*
Conservation						
Supply From Plan Element (acft/yr)	58	163	269	389	448	464
Annual Cost ($/yr)	$29,006	$80,883	$133,608	$192,894	$222,241	$230,338
Projected Surplus/(Shortage) after Conservation	*1,328*	*1,383*	*1,457*	*1,518*	*1,521*	*1,481*

5.25.3 Milano WSC

Milano WSC obtains its water supply from the Carrizo-Wilcox Aquifer. This WUG is located in multiple counties (Milam and Burleson). The surplus shown in Table 5.25-1 represents the cumulative total for Milano WSC. No shortages are projected for Milano WSC and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.25.4 City of Rockdale

Description of Supply

The City of Rockdale obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Rockdale through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Rockdale.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $103,000 in 2030
- Unit Cost: $496/acft

Table 5.25-3. Recommended Plan Costs by Decade for City of Rockdale

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*841*	*662*	*174*	*320*	*355*	*308*
Conservation						
Supply From Plan Element (acft/yr)	43	128	198	195	200	207
Annual Cost ($/yr)	$21,000	$64,000	$98,000	$97,000	$99,000	$103,000
Projected Surplus/(Shortage) after Conservation	*883*	*790*	*372*	*515*	*555*	*515*

5.25.5 Southwest Milam WSC

Description of Supply

Southwest Milam WSC obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. This WUG is located in multiple counties (Milam, Lee, Williamson, and Burleson). The surplus/shortages shown in Table 5.25-4 represent the cumulative totals for Southwest Milam WSC. Southwest Milam WSC is projected to have a surplus from 2020 through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Southwest Milam WSC.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $103,000 in 2030
- Unit Cost: $496/acft

Table 5.25-4. Recommended Plan Costs by Decade for Southwest Milam WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*884*	*591*	*198*	*309*	*262*	*103*
Conservation						
Supply From Plan Element (acft/yr)	33	1	—	—	—	—
Annual Cost ($/yr)	$16,368	$496	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*916*	*592*	*198*	*309*	*262*	*103*

5.25.6 City of Thorndale

The City of Thorndale is located in Milam and partially in Williamson County. The city obtains its water supply from Southwest Milam WSC and from run of river water rights. No shortages are projected for the City of Thorndale and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.25.7 County-Other

Entities in County-Other receive supplies through the City of Cameron and Central Texas WSC. County Other is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.25.8 Manufacturing

Manufacturing receives supplies from City of Cameron. Manufacturing is projected to have sufficient water supplies through the year 2070 and no changes in water supply are recommended.

5.25.9 Steam-Electric

Description of Supply

Milam County Steam-Electric obtains its water supply from Lake Alcoa, Lake Granger from BRA and the Carrizo-Wilcox Aquifer. Based on the available surface water supply and the MAG limitations, Milam County Steam-Electric is projected to have a shortage beginning in year 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Milam County-Steam Electric.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2030
- Annual Cost: not determined

b. Little River Off-Channel Reservoir

- Cost Source: Volume II, Chapter 4.7
  - Strategy could be supplied by the BRA System Operation, dependent on permit approval by TCEQ
- Date to be Implemented: 2050
- Project Cost: $175,291,000
- Unit Cost: $710/acft

During the Brazos G regional water planning process, water management strategies such as additional development of Carrizo-Wilcox Aquifer groundwater and the Lake Granger Augmentation Project were preferred options to include in the 2016 Brazos G Regional Water Plan. When confronted by the Modeled Available Groundwater (MAG) limitations of these two options, the BGRWPG has little alternative but to make the Little River Off-Channel Reservoir a recommended strategy.

Table 5.25-5. Recommended Plan Costs by Decade for Milam County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,096*	*(34)*	*(78)*	*(7,223)*	*(6,646)*	*(6,757)*
Conservation						
Supply From Plan Element (acft/yr)	0	1,601	2,242	2,869	2,869	2,869
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*1,096*	*1,567*	*2,164*	*(4,353)*	*(3,777)*	*(3,888)*
Little River Off-Channel Reservoir						
Supply From Plan Element (acft/yr)	—	—	—	4,353	4,000	4,000
Annual Cost ($/yr)	—	—	—	$3,090,600	$2,840,000	$2,840,000
Unit Cost ($/acft)	—	—	—	$710	$710	$710

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.25.10 Mining

Milam County Mining obtains its water supply from the Carrizo-Wilcox Aquifer, used for mine reclamation. Milam County Mining is projected to have adequate supplies between 2020 and 2070.

5.25.11 Irrigation

Milam County Irrigation is supplied by groundwater from the Carrizo-Wilcox, Queen City and Brazos River Alluvium Aquifers as well as run of the river water rights. Irrigation is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended.

5.25.12 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.26 Nolan County Water Supply Plan

Table 5.26-1 lists each water user group in Nolan County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.26-1. Nolan County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Bitter Creek WSC	406	392	Projected surplus
City of Roscoe	79	62	Projected surplus
City of Sweetwater	(1,410)	(1,576)	Projected shortage – see plan below
County-Other	(108)	(125)	Projected shortage – see plan below
Manufacturing	(1,260)	(1,770)	Projected shortage – see plan below
Steam-Electric	(23,916)	(23,916)	Projected shortage – see plan below
Mining	(200)	(141)	Projected shortage – see plan below
Irrigation	(2,094)	(1,567)	Projected shortage – see plan below
Livestock	0	0	Demand equals Supply

1 – From Tables C-51 and C-52, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.26.1 Bitter Creek WSC

The Bitter Creek WSC obtains its water supply from the Dockum Aquifer and purchases treated water from the City of Sweetwater. This WUG is located in multiple counties (Nolan and Fisher). The surplus shown in Table 5.26-1 represents the cumulative totals for Bitter Creek WSC in both counties. No current or future shortages are projected and no changes in water supply uses are projected or recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.26.2 City of Roscoe

The City of Roscoe obtains surface water from local sources and groundwater from the Dockum Aquifer. A surplus is projected for the City of Roscoe through 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.26.3 City of Sweetwater

The recommended water supply plan for the City of Sweetwater is included in Chapter 5.38 with the wholesale water providers.

5.26.4 County-Other

Description of Supply

Entities in Nolan County-Other obtain their water from the City of Sweetwater and the Edwards-Trinity Aquifer. The supplies from Sweetwater are associated with Oak Creek Reservoir which has zero yield without subordination. Sweetwater strategies will firm up this contract amount. Shortages are projected through 2070. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for County-Other.

a. Water Supply from Sweetwater

- Cost Source: Costs applied to City of Sweetwater (Volume II, Chapter 6.2)
- Date to be Implemented: 2020
- Project Cost: Existing infrastructure assumed sufficient
- Unit Cost: $1,031/acft (Sweetwater Wholesale Rate)

Table 5.26-2. Recommended Plan Costs by Decade for Nolan County – Other

Plan Element	2020	2030	2040	2050	2070	2070
Projected Surplus/(Shortage) (acft/yr)	*(104)*	*(107)*	*(108)*	*(113)*	*(119)*	*(125)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(104)*	*(107)*	*(108)*	*(113)*	*(119)*	*(125)*
Additional Water from Sweetwater to meet Contract						
Supply From Plan Element (acft/yr)	168	168	168	168	168	168
Annual Cost ($/yr)	$173,208	$173,208	$173,208	$173,208	$173,208	$173,208
Unit Cost ($/acft)	$1,031	$1,031	$1,031	$1,031	$1,031	$1,031

5.26.5 Manufacturing

Description of Supply

Nolan County Manufacturing obtains its water supply from the City of Sweetwater and from the Edwards-Trinity (Plateau) Aquifer. Manufacturing is projected to have a shortage beginning in year 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Nolan County-Manufacturing.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: not determined

b. Additional Water Supply from Sweetwater

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: N/A. Infrastructure assumed sufficient
- Unit Cost: $1031/acft

Table 5.26-3. Recommended Plan Costs by Decade for Nolan County – Manufacturing

Plan Element	2020	2030	2040	2050	2070	2070
Projected Surplus/(Shortage) (acft/yr)	*(881)*	*(1,072)*	*(1,260)*	*(1,426)*	*(1,591)*	*(1,770)*
Conservation						
Supply From Plan Element (acft/yr)	43	81	126	138	149	162
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(838)*	*(991)*	*(1,134)*	*(1,288)*	*(1,442)*	*(1,608)*
Purchase from Sweetwater						
Supply From Plan Element (acft/yr)	838	991	1,134	1,288	1,442	1,608
Annual Cost ($/yr)	$863,978	$1,021,721	$1,169,154	$1,327,928	$1,486,702	$1,657,848
Unit Cost ($/yr)	$1,031	$1,031	$1,031	$1,031	$1,031	$1,031

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.26.6 Steam-Electric

Description of Supply

Nolan County Steam-Electric is projected to have a shortage beginning in year 2020. Conservation is not a viable option as these are new demands where conservation measures are anticipated to already be reflected in the demands.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Nolan County-Steam Electric.

a. Purchase from Abilene

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2030
- Project Cost: Not enough information to cost delivery
- Unit Cost: $100/acft (Abilene wholesale rate only)

b. Reallocate Supplies from Jones County-SE

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: Capital cost unknown, as demands vary geographically.
- Unit Cost: Assumed $250/acft as purchase price of supply

c. Reduce Demand through Alternative Cooling Technology

Steam-Electric cooling is often water-intensive, and the water demands provided by the TWDB reflect this. Alternative technologies that utilize air cooling or other less water intensive methods could be substituted. Costs shown are for the additional costs for implementation of these more advanced technologies for cooling.

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2060
- Project Cost: Undetermined. Technologies will vary.

Table 5.26-4. Recommended Plan Costs by Decade for Nolan County – Steam-Electric

Plan Element	2020	2030	2040	2050	2070	2070
Projected Surplus/(Shortage) (acft/yr)	*(13,526)*	*(23,916)*	*(23,916)*	*(23,916)*	*(23,916)*	*(23,916)*
Conservation Table 5.26-1. Nolan County Surplus/(Shortage)						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(13,526)*	*(23,916)*	*(23,916)*	*(23,916)*	*(23,916)*	*(23,916)*
Purchase from Abilene						
Supply From Plan Element (acft/yr)	—	9,999	9,298	7,901	6,602	5,383
Annual Cost ($/yr)	—	$1,000,000	$929,800	$790,100	$670,200	$538,400
Unit Cost ($/yr)	—	$100	$100	$100	$100	$100
Reallocate from Jones County- Steam Electric						
Supply From Plan Element (acft/yr)	8,247	11,837	11,837	11,837	11,837	11,837
Annual Cost ($/yr)	$2,062,000	$2,959,000	$2,959,000	$2,959,000	$2,959,000	$2,959,000
Unit Cost ($/yr)	$250	$250	$250	$250	$250	$250

Table 5.26-4. Recommended Plan Costs by Decade for Nolan County – Steam-Electric

Plan Element	2020	2030	2040	2050	2070	2070
Reduce Demand through Alternative Cooling Technology						
Supply From Plan Element (acft/yr)	5,279	5,279	5,279	5,279	5,477	6,696
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Unit Cost ($/yr)	ND	ND	ND	ND	ND	ND

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.26.7 Mining

Description of Supply

Nolan County Mining obtains its water supply from the Dockum and Edwards-Trinity (Plateau) Aquifers. Based on the available groundwater supply, Nolan County Mining is projected to have a shortage between 2020 and 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Nolan County-Mining.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: 2020
   - Annual Cost: not determined

b. Development of Groundwater - Edwards-Trinity (Plateau)
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: $2,448,000
   - Unit Cost: Max of $1,018/acft (2020)

Table 5.26-5. Recommended Plan Costs by Decade for Nolan County – Mining

Plan Element	2020	2030	2040	2050	2070	2070
Projected Surplus/(Shortage) (acft/yr)	*(225)*	*(222)*	*(200)*	*(178)*	*(158)*	*(141)*
Conservation						
Supply From Plan Element (acft/yr)	7	11	14	12	11	10
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(218)*	*(211)*	*(186)*	*(166)*	*(147)*	*(131)*

Table 5.26-5. Recommended Plan Costs by Decade for Nolan County – Mining

Plan Element	2020	2030	2040	2050	2070	2070
Development of Edwards-Trinity (Plateau)						
Supply From Plan Element (acft/yr)	220	220	220	220	220	220
Annual Cost ($/yr)	$223,861	$223,861	$18,861	$18,861	$18,861	$18,861
Unit Cost ($/acft)	$1,018	$1,018	$86	$86	$86	$86

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.26.8 Irrigation

Description of Supply

Nolan County Irrigation obtains its water supply from the Dockum and Edwards Trinity Aquifer and run-of-river diversions from the Brazos River. Based on the available supply, Nolan County Irrigation is projected to have a shortage between 2020 and 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Nolan County-Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: $113,000 in 2040
- Unit Cost: $230/acft

b. Leave Needs Unmet

New supplies for irrigation would be cost prohibitive to develop and most farms would switch to dry-land crops or allow fields to go fallow during a prolonged drought.

- Cost Source: Cost of not meeting needs – will be provided by TWDB
- Date to be Implemented: 2020

Table 5.26-6. Recommended Plan Costs by Decade for Nolan County – Irrigation

Plan Element	2020	2030	2040	2050	2070	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,483)*	*(2,287)*	*(2,094)*	*(1,912)*	*(1,733)*	*(1,567)*
Conservation						
Supply From Plan Element (acft/yr)	222	361	492	479	466	455
Annual Cost ($/yr)	$51,150	$82,996	$113,086	$110,156	$107,274	$104,602
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(2,261)*	*(1,926)*	*(1,602)*	*(1,433)*	*(1,267)*	*(1,112)*
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	2,261	1,926	1,602	1,433	1,267	1,112
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.26.9 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.27 Palo Pinto County Water Supply Plan

Table 5.27-1 lists each water user group in Palo Pinto County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.27-1. Palo Pinto County Surplus/(Shortage)

Water User Group	Table 5.27-1. Palo Pinto County Surplus/(Shortage)		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Graford	29	25	Projected surplus
City of Mineral Wells	0	0	See Chapter 5.38
Possum Kingdom WSC	(142)	(221)	Projected shortage – see plan below
Stephens Regional SUD			See Stephens County
City of Strawn	63	51	Projected surplus
County-Other	1,407	1,324	Projected surplus
Manufacturing	1,154	1,137	Projected surplus
Steam-Electric	9,028	7,839	Projected surplus
Mining	589	930	Projected surplus
Irrigation	(2,513)	(2,394)	Projected shortage – see plan below
Livestock	0	0	Demand equals Supply

1 – From Tables C-53 and C-54, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.27.1 City of Graford

The City of Graford obtains surface water from Keechi Creek and purchases treated water from the City of Mineral Wells. Projections indicate a surplus for the City of Graford and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.27.2 City of Mineral Wells

The recommended water supply plan for the City of Mineral Wells is included in Chapter 5.38 with the wholesale water providers.

5.27.3 Possum Kingdom WSC

Description of Supply

Possum Kingdom WSC is split between Stephens and Palo Pinto County. The WSC receives supply from the Brazos River Authority. Water shortages are projected between 2020 and 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the Possum Kingdom WSC.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $203,360 in 2070
- Unit Cost: $496/acft

b. Leave needs unmet

Advanced conservation eliminates the WSC's projected water shortages, except for a small shortage in 2020 prior to full implantation of the advanced conservation strategy. It is recommended that this shortage be addressed through drought management, or planning to simply not meet that portion of the entity's demands during a drought.

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

Table 5.27-2. Recommended Plan Costs by Decade for Possum Kingdom WSC

Plan Element	2020	2030	2040	2050	2070	2070
Projected Surplus/(Shortage) (acft/yr)	*(60)*	*(110)*	*(142)*	*(173)*	*(199)*	*(221)*
Conservation						
Supply From Plan Element (acft/yr)	53	126	198	271	342	410
Annual Cost ($/yr)	$26,288	$62,496	$98,208	$134,416	$169,632	$203,360
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(7)*	*16*	*56*	*98*	*143*	*189*
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	7	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.27.4 City of Strawn

Description of Supply

The City of Strawn is supplied by surface water from Lake Tucker and Trinity Aquifer and is projected to have surplus supplies through 2070. The city is participating in a joint drought response groundwater project with the cities of Mingus, Gordon and Barton WSC for Trinity supplies in Erath County.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Strawn.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $10,912 in 2070
- Unit Cost: $496/acft

Table 5.27-3. Recommended Plan Costs by Decade for City of Strawn

Plan Element	2020	2030	2040	2050	2070	2070
Projected Surplus/(Shortage) (acft/yr)	*73*	*66*	*63*	*58*	*54*	*51*
Conservation						
Supply From Plan Element (acft/yr)	5	16	22	22	22	22
Annual Cost ($/yr)	$2,480	$7,936	$10,912	$10,912	$10,912	$10,912
Projected Surplus/(Shortage) after Conservation (acft/yr)	*78*	*82*	*85*	*80*	*76*	*73*

5.27.5 County-Other

Entities in Palo Pinto County-Other obtain their water from Palo Pinto County MWD No. 1, City of Mineral Wells, City of Strawn and from Possum Kingdom Reservoir through BRA, and run-of-the-river diversions. Conservation was considered but the current per capita use is below the targeted gpcd of 140. Projections indicate a surplus of supply through the planning period and no changes in water supply are recommended.

5.27.6 Manufacturing

Palo Pinto County Manufacturing obtains its water supply from the City of Mineral Wells, Brazos River Authority and the Trinity Aquifer. Palo Pinto County Manufacturing shows a projected surplus and no changes in water supply are recommended.

5.27.7 Steam-Electric

Palo Pinto County Steam-Electric obtains its water supply from Palo Pinto County MWD No. 1 and from the Brazos River Authority. Steam-Electric is projected to have surplus supplies through the planning period and no change to water supply is recommended.

5.27.8 Mining

Palo Pinto County Mining obtains its water supply from Trinity Aquifer, Palo Pinto County MWD No. 1 and from the Brazos River Authority and run-of-the river water rights. Mining is projected to have adequate supplies through the planning period and no change to water supply is recommended.

5.27.9 Irrigation

Description of Supply

Palo Pinto County Irrigation obtains its water supply from run of the river water rights and the BRA. Based on the available supply, Palo Pinto County Irrigation is projected to have a shortage between 2020 and 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Palo Pinto County-Irrigation.

a. Conservation
    - Cost Source: Volume II, Chapter 2
    - Date to be Implemented: before 2020
    - Annual Cost: $49,220 in 2040
    - Unit Cost: $230/acft
b. Purchase Supply from Palo Pinto County Municipal Water District No. 1
    - Cost Source: Volume II, Chapter 4.13 (Lake Palo Pinto Enlargement)
    - Date to be Implemented: 2020
    - Project Cost: Not enough information to cost delivery
    - Unit Cost: $479/acft (Wholesale Rate Only)
c. Alternative: Leave needs unmet

New supplies for irrigation would be cost prohibitive to develop and most farms would switch to dry-land crops or allow fields to go fallow during a prolonged drought.

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

d. Alternative: BRA System Operation

- Cost Source: Volume II, Chapter 7.11
  - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2020
- Project Cost: Infrastructure assumed sufficient
- Unit Cost: $65.65/acft

Table 5.27-4. Recommended Plan Costs by Decade for Palo Pinto County – Irrigation

Plan Element	2020	2030	2040	2050	2070	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,588)*	*(2,547)*	*(2,513)*	*(2,472)*	*(2,431)*	*(2,394)*
Conservation						
Supply From Plan Element (acft/yr)	94	155	214	212	209	206
Annual Cost ($/yr)	$21,620	$35,650	$49,220	$48,760	$48,070	$47,380
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(2,494)*	*(2,392)*	*(2,299)*	*(2,260)*	*(2,222)*	*(2,188)*
Purchase Supply from Palo Pinto County MWD No. 1						
Supply From Plan Element (acft/yr)	2,494	2,392	2,299	2,260	2,222	2,188
Annual Cost ($/yr)	$1,194,626	$1,145,768	$1,101,221	$1,082,540	$1,064,338	$1,048,052
Unit Cost ($/acft)	$479	$479	$479	$479	$479	$479
Alternative: Leave Needs Unmet						
Supply From Plan Element (acft/yr)	2,494	2,392	2,299	2,260	2,222	2,188
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Alternative: Purchase Supply from Brazos River Authority (System Operations)						
Supply From Plan Element (acft/yr)	2,494	2,392	2,299	2,260	2,222	2,188
Annual Cost ($/yr)	$163,731	$157,035	$150,929	$148,369	$145,874	$143,642
Unit Cost ($/acft)	$65.65	$65.65	$65.65	$65.65	$65.65	$65.65

5.27.10 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.28 Robertson County Water Supply Plan

Table 5.28-1 lists each water user group in Robertson County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.28-1. Robertson County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Bremond	178	131	Projected surplus
City of Calvert	349	350	Projected surplus
City of Franklin	340	280	Projected surplus
City of Hearne	2,127	2,131	Projected surplus
Robertson County WSC	244	192	Projected surplus
Tri-County SUD			See Falls County
Wellborn SUD			See Brazos County
Wickson Creek SUD			See Brazos County
County-Other	168	(39)	Projected shortage – see plan below
Manufacturing	75	19	Projected surplus
Steam-Electric	(2,012	(18,478)	Projected shortage – see plan below
Mining	(3,563)	(12,735)	Projected shortage – see plan below
Irrigation	(49,210)	(44,445)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-55 and C-56, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.28.1 City of Bremond

Description of Supply

The City of Bremond obtains its water supply from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Bremond.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Bremond.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $12,000 in 2070
- Unit Cost: $470/acft

Table 5.28-2. Recommended Plan Costs by Decade for City of Bremond

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*202*	*190*	*178*	*162*	*147*	*131*
Conservation						
Supply From Plan Element (acft/yr)	6	20	22	23	23	25
Annual Cost ($/yr)	$3,000	$9,000	$10,000	$11,000	$11,000	$12,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*208*	*209*	*200*	*185*	*170*	*156*

5.28.2 City of Calvert

Description of Supply

The City of Calvert obtains its water supply from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Calvert.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Calvert.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $1,000
- Unit Cost: $470/acft

Table 5.28-3. Recommended Plan Costs by Decade for City of Calvert

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*339*	*346*	*349*	*349*	*350*	*350*
Conservation						
Supply From Plan Element (acft/yr)	3	—	—	—	—	—
Annual Cost ($/yr)	$1,000	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*342*	*346*	*349*	*349*	*350*	*350*

5.28.3 City of Franklin

The City of Franklin obtains its water supply from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Franklin. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.28.4 City of Hearne

Description of Supply

The City of Hearne obtains its water supply from the Carrizo-Wilcox Aquifer. The City also provides supply to Robertson County Manufacturing. No shortages are projected for the City of Hearne.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Hearne.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $16,000 in 2030
- Unit Cost: $470/acft

Table 5.28-4. Recommended Plan Costs by Decade for City of Hearne

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*2,085*	*2,108*	*2,127*	*2,129*	*2,131*	*2,131*
Conservation						
Supply From Plan Element (acft/yr)	22	35	16	14	12	12
Annual Cost ($/yr)	$10,000	$16,000	$8,000	$7,000	$6,000	$6,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*2,107*	*2,142*	*2,142*	*2,142*	*2,142*	*2,142*

5.28.5 Robertson County WSC

Robertson County WSC obtains its water supply from the Carrizo-Wilcox Aquifer. The entity also provides supply to Robertson County Manufacturing. No shortages are projected for the Robertson County WSC. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.28.6 County-Other

Description of Supply

Robertson County-Other entities obtain water supply from groundwater from the Carrizo-Wilcox Aquifer. A shortage of supply is projected in 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortage for County-Other.

a. Groundwater Development

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2070
- Project Cost: $825,000
- Unit Cost: $1,079/acft

Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.28-5. Recommended Plan Costs by Decade for County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*318*	*245*	*168*	*92*	*23*	*(39)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*318*	*245*	*168*	*92*	*23*	*(39)*
Groundwater Development – Carrizo Wilcox						
Supply From Plan Element (acft/yr)	—	—	—	—	—	81
Annual Cost ($/yr)	—	—	—	—	—	$87,000
Unit Cost ($/acft)	—	—	—	—	—	$1,079

5.28.7 Manufacturing

Water supply for manufacturing in Robertson County is obtained by purchase from a city or water supply corporation, or from Carrizo-Wilcox wells operated by the manufacturing entity. Manufacturing is projected to have a surplus of water through the year 2070 and no changes in water supply are recommended.

5.28.8 Steam-Electric

Description of Supply

Robertson County Steam-Electric entities obtain water supply from the Carrizo-Wilcox Aquifer, contracts with the Brazos River Authority for water from Lake Limestone, and various run-of-river rights. Based on the available groundwater and surface water supply, Robertson County Steam-Electric is projected to have shortages beginning in year 2040 and continuing through year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Steam-Electric.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Purchase depressurization water from Walnut Creek Mine

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2050
- Project Cost: Not enough information to cost delivery
- Unit Cost: $500/acft (Water purchase rate only)

c. BRA System Operation to Robertson County

- Cost Source: BRA System Operations Supply (Volume II, Chapter 7.11)
  - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2050
- Project Cost: Infrastructure assumed sufficient
- Unit Cost: $65.65/acft

Table 5.28-6. Recommended Plan Costs by Decade for Robertson County – Steam Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*16,438*	*3,319*	*(2,012)*	*(13,683)*	*(16,031)*	*(18,478)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	2,486	3,289	3,439	3,597
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*16,438*	*3,319*	*474*	*(10,394)*	*(12,592)*	*(14,882)*
Purchase Water from Walnut Creek Mine						
Supply From Plan Element (acft/yr)	—	—	—	9,000	9,000	9,000
Annual Cost ($/yr)	—	—	—	$4,500,000	$4,500,000	$4,500,000
Unit Cost ($/acft)	—	—	—	$500	$500	$500

Table 5.28-6. Recommended Plan Costs by Decade for Robertson County – Steam Electric

Plan Element	2020	2030	2040	2050	2060	2070
BRA System Operation						
Supply From Plan Element (acft/yr)	—	—	—	2,000	4,000	6,000
Annual Cost ($/yr)	—	—	—	$131,300	$262,600	$393,900
Unit Cost ($/acft)	—	—	—	$65.65	$65.65	$65.65

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.28.9 Mining

Description of Supply

Mining operations in Robertson County are supplied by Carrizo-Wilcox Groundwater. Demands for Mining are projected to increase significantly resulting in shortages beginning in 2030.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Robertson County-Mining.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: 2030
   - Annual Cost: not determined

b. Leave needs unmet
   - Cost Source: Cost of not meeting needs – see Appendix H
   - Date to be Implemented: 2030

Table 5.28-7. Recommended Plan Costs by Decade for Robertson County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*292*	*(1,548)*	*(3,563)*	*(6,017)*	*(9,012)*	*(12,735)*
Conservation						
Supply From Plan Element (acft/yr)	—	588	964	1,136	1,345	1,606
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*292*	*(960)*	*(2,599)*	*(4,881)*	*(7,667)*	*(11,129)*

Table 5.28-7. Recommended Plan Costs by Decade for Robertson County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	—	1,000	2,600	5,000	7,700	11,200
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.28.10 Irrigation

Description of Supply

Robertson County Irrigation is supplied by Carrizo-Wilcox, Queen City, Sparta and Brazos River Alluvium groundwater as well as run of the river water rights. Current pumping in the Brazos River Alluvium greatly exceeds the MAG for Robertson County reducing available groundwater to meet projected demands. Irrigation is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Robertson County-Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $963,000 in 2040

b. Groundwater Development – Carrizo Wilcox Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $128,018,000
- Unit Cost: Max of $726 /acft (2020)

c. Leave needs unmet

New supplies for irrigation would be cost prohibitive to develop and most farms would switch to dry-land crops or allow fields to go fallow during a prolonged drought.

- Cost Source: Cost of not meeting needs – see Appendix H
- Date to be Implemented: 2020

Table 5.28-8. Recommended Plan Costs by Decade for Robertson County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(52,989)*	*(51,076)*	*(49,210)*	*(47,448)*	*(45,781)*	*(44,445)*
Conservation						
Supply From Plan Element (acft/yr)	1,903	3,080	4,189	4,069	3,952	3,859
Annual Cost ($/yr)	$438,000	$708,000	$963,000	$936,000	$909,000	$888,000
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(51,086)*	*(47,995)*	*(45,021)*	*(43,379)*	*(41,829)*	*(40,586)*
Groundwater Development – Carrizo Wilcox Aquifer						
Supply From Plan Element (acft/yr)	15,764	16,143	16,222	15,172	8,912	1,179
Annual Cost ($/yr)	$11,713,251	$11,713,251	$992,251	$992,251	$992,251	$992,251
Unit Cost ($/acft)	$726	$726	$61	$61	$61	$61
Allow needs to remain unmet						
Supply From Plan Element (acft/yr)	35,322	31,852	28,799	28,207	32,917	39,407
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

5.28.11 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.29 Shackelford County Water Supply Plan

Table 5.29-1 lists each water user group in Shackelford County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.29-1. Shackelford County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
City of Albany	183	185	Projected surplus
Stephens County Rural SUD			See Stephens County for Plan
County-Other	0	0	Demand equals supply
Manufacturing	50	50	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	(551)	(236)	Projected shortage –see plan below
Irrigation	0	0	Demand equals supply
Livestock	0	0	Demand equals supply

1 – From Tables C-57 and C-58, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.29.1 City of Albany

Description of Supply

Water supply for the City of Albany is from Hubbard Creek Reservoir, owned by the West Central Texas MWD and from Lake McCarty. Although the City has sufficient supplies, conservation is recommended as the current per capita use rate is above the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for City of Albany. Associated costs are included for each strategy.

a. Conservation:

- Cost Source: Volume II, Chapter 5.2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $126,615 in 2070
- Unit Cost $474/acft

Table 5.29-2. Recommended Plan Costs by Decade for the City of Albany

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	*188*	*167*	*183*	*184*	*185*	*185*
Conservation						
Supply From Plan Element (acft/yr)	32	85	133	181	225	267
Annual Cost ($/yr)	$15,293	$40,258	$63,028	$85,617	$106,876	$126,615
Projected Surplus/(Shortage) after Conservation (acft/yr)	*220*	*251*	*316*	*364*	*410*	*452*

5.29.2 County-Other

Description of Supply

Projections indicate sufficient water supply for County-Other; however, a change in water supply is recommended. Shackleford WSC provides water to rural entities in the area and is not large enough to be classified as a WUG and is aggregated with County-Other. Even though Shackelford County-Other shows a surplus for the planning horizon, they are currently participating in a project referred to as the Midway Group. This project is comprised of multiple entities from Shackleford, Stephens and Throckmorton Counties that aim to serve the rural portions of their counties.

Water Supply Plan

Participate in the Midway Group project with Stephens Regional SUD, the City of Throckmorton and other potential participants. This project was described as part of the West Central Brazos Water Distribution System (WCBWDS) in the 2006 Brazos G Regional Water Plan. Working within the planning criteria established by the Brazos G RWPG and the TWDB, the following water supply plan is recommended for Shackelford County-Other. Associated costs are included for each strategy.

a. Water Supply from Midway Group and WCBWDS:

- Cost Source: Volume II, Chapter 8.4
    - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2020
- Project Cost: $21,148,000 at full implementation.
- Unit Cost: $2,492/acft

Conservation was also considered; however, the entity’s current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.29-3. Recommended Plan Costs by Decade for Shackelford County – Other

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	*423*	*423*	*423*	*423*	*423*	*423*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	423	423	423	423	423	423
Water Supply from Midway Group and WCBWDS						
Supply From Plan Element (acft/yr)	250	250	250	250	250	250
Annual Cost ($/yr)	$623,000	$623,000	$307,000	$307,000	$307,000	$307,000
Unit Cost ($/acft)	$2,492	$2,492	$1,228	$1,228	$1,228	$1,228

5.29.3 Manufacturing

Projections indicate a surplus of water for Manufacturing and no changes in water supply are recommended.

5.29.4 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.29.5 Mining

Description of Supply

Surface water for Mining in Shackelford County is obtained from Fort Griffin SUD and run of river water rights. Projections indicate an increase in water demand for Mining and shortages projected beginning in 2020. Changes in water supply are recommended.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: not determined

b. Groundwater Development (Other Aquifer):

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $8,095,000
- Unit Cost: Max of $1,044/acft (2020)

Table 5.29-4. Recommended Plan Costs by Decade for Shackelford County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(555)*	*(740)*	*(551)*	*(435)*	*(321)*	*(236)*
Conservation						
Supply From Plan Element (acft/yr)	17	37	39	31	23	17
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Unit Cost ($/acft)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(538)*	*(703)*	*(512)*	*(404)*	*(298)*	*(219)*
Groundwater Well Development						
Supply From Plan Element (acft/yr)	710	710	710	710	710	710
Annual Cost ($/yr)	$741,015	$741,015	$60,015	$60,015	$60,015	$60,015
Unit Cost ($/acft)	$1,044	$1,044	$85	$85	$85	$85

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.29.6 Irrigation

No Irrigation demand exists or is projected for the county. There are some irrigation rights located along the Clear Fork of the Brazos River; however, there is no surface water availability for those rights during a repeat of the drought of record.

5.29.7 Livestock

No future shortages are projected in the Livestock category and no changes in water supply are recommended.

5.30 Somervell County Water Supply Plan

Table 5.30-1 lists each water user group in Somervell County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.30-1. Somervell County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Glen Rose	47	(39)	Projected shortage – see plan below
County-Other	459	344	Projected surplus
Manufacturing	10	7	Projected surplus
Steam-Electric	(35,521)	(35,559)	Projected shortage – see plan below
Mining	(441)	(266)	Projected shortage – see plan below
Irrigation	22	25	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-59 and C-60, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.30.1 City of Glen Rose

Description of Supply

The City of Glen Rose obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater supply, the City of Glen Rose is projected to have a shortage from 2060 through year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for City of Glen Rose.

a. Conservation:
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: $1,200,000

b. Alternative: Purchase Supply from Somervell County Water Supply Project – the project will treat raw water from the Wheeler Branch Off-Channel Reservoir and transmit the treated water to customers of the Somervell County Water District. Phases 1-4 of the project are complete and are located in the immediate vicinity of Glen Rose.

- Cost Source: Volume II, Chapter 8.3
- Date to be Implemented: by 2060
- Annual Cost: $52,950 (based on current cost of service for highest rate tier ($3.25/1000 gal) published by the Somervell County WSD[1])

Table 5.30-2. Recommended Plan Costs by Decade for City of Glen Rose

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*141*	*86*	*47*	*15*	*(14)*	*(39)*
Conservation						
Supply From Plan Element (acft/yr)	24	73	128	167	172	178
Annual Cost ($/yr)	$11,515	$34,834	$60,577	$78,949	$81,471	$84,327
Projected Surplus/(Shortage) after Conservation (acft/yr)	*165*	*160*	*175*	*182*	*158*	*139*
Alternative: Somervell County Water Supply Project Phases 1-4						
Supply From Plan Element (acft/yr)	—	—	—	—	50	50
Annual Cost ($/yr)	—	—	—	—	$52,950	$52,950
Unit Cost ($/acft)	—	—	—	—	$1,059	$1,059

5.30.2 County-Other

Description of Supply

Somervell County-Other obtains its water supply from groundwater from the Trinity Aquifer, and there are surpluses projected through 2060. However, the Somervell County Water District has recently completed the Wheeler Branch Off-Channel Reservoir, and is implementing infrastructure to utilize that resource throughout the county. Phases 1 – 4 are complete and supply 1,400 acft/yr of supply. Remaining phases will supply an additional 600 acft/yr.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for County-Other entities.

a. Somervell County Water Supply Project – the project will treat raw water from the Wheeler Branch Off-Channel Reservoir and transmit the treated water to customers of the Somervell County Water District.
    - Cost Source: Volume II, Chapter 8.3
    - Date to be Implemented: approximately 2040 for Phases 7A and 9 – 17
    - Total Project Cost (Phases 7A and 9 – 17): $35,249,000
    - Annual Cost: $3,556,000

[1] http://www.scwd.com/uploads/1/2/8/1/12818560/scwd_service_policy_5-14.pdf

Costs are shown for the additional supply of water made available by the remaining phases, which are planned for completion by 2035. Costs shown are for new infrastructure only, and do not include existing debt service for existing phases of the project or for costs for supply from Wheeler Branch Reservoir.

Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.30-3. Recommended Plan Costs by Decade for Somervell County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*578*	*508*	*459*	*418*	*378*	*344*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*578*	*508*	*459*	*418*	*378*	*344*
Somervell County Water Supply Project Phases 7A and 9 – 17						
Supply From Plan Element (acft/yr)	600	600	600	600	600	600
Annual Cost ($/yr)	$3,556,000	$3,556,000	$3,556,000	$606,000	$606,000	$606,000
Unit Cost ($/acft)	$5,928	$5,928	$5,928	$1,010	$1,010	$1,010

5.30.3 Manufacturing

Somervell County Manufacturing obtains its water supply from groundwater from the Trinity Aquifer. There are surpluses projected through 2070 and no changes recommended to the water supply.

5.30.4 Steam-Electric

Description of Supply

Somervell County Steam-Electric obtains water supply Squaw Creek Reservoir and from the Brazos River Authority through Lake Granbury. Somervell County Steam-Electric is projected to have shortages beginning in year 2020 and continuing through year 2070. Local groundwater currently supplies potable water for plant staff and high-quality process water for boiler feed at the Comanche Peak Steam Electric Station. When the Somervell County Water Supply Project is developed, some potable water and process water for the Comanche Peak Station will be obtained from the project.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Somervell County Steam-Electric.

a. Transfer Steam-Electric Supplies from Hood County
   - Cost Source: zero cost for strategy as these supplies are already contracted from the BRA to Luminant
   - Date to be Implemented: 2020
   - Annual Cost: None

b. BRA System Operation
   - Cost Source: Volume II, Chapter 7.11 and Chapter 12 Costs include Luminant Infrastructure necessary to transport the water.
     - Supply dependent on BRA obtaining the System Operations permit from TCEQ
   - Date to be Implemented: 2020
   - Annual Cost: $22.87 million at full implementation
   - Unit Cost: $285/acft

c. Somervell County Water Supply Project – the project treats raw water from the Wheeler Branch Off-Channel Reservoir and transmits the treated water to customers of the Somervell County Water District. Potable water for plant staff and high-quality process water for boiler feed at the Comanche Peak Steam Electric Station is currently provided from local groundwater. The Somervell County Water Supply Project will provide some potable water and process water for the plant. Phases 1-4 of the project are complete and are located in the immediate vicinity of the plant.
   - Cost Source: Volume II, Chapter 8.3
   - Date to be Implemented: by 2060
   - Annual Cost: $317,700 (based on current cost of service for highest rate tier ($3.25/1000 gal) published by the Somervell County WSD[2]) for Phases 1 – 4

     $185,840 (based on unit costs of Phases 9 – 17 after debt service retired)

Conservation was not applied to this plan because the shortage results from the construction of new steam-electric facilities, which are assumed to be built with technologies minimizing water use as much as practicable.

[2] http://www.scwd.com/uploads/1/2/8/1/12818560/scwd_service_policy_5-14.pdf

Table 5.30-4. Recommended Plan Costs by Decade for Somervell County – Steam-Electric

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(35,496)*	*(35,508)*	*(35,521)*	*(35,534)*	*(35,546)*	*(35,559)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(35,496)*	*(35,508)*	*(35,521)*	*(35,534)*	*(35,546)*	*(35,559)*
Transfer Steam-Electric Supplies from Hood County to Somervell County						
Supply From Plan Element (acft/yr)	27,133	27,133	27,133	27,133	27,133	27,133
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
BRA System Operation						
Supply From Plan Element (acft/yr)	76,120	76,120	76,120	76,120	76,120	76,120
Annual Cost ($/yr)	$22,866,000	$22,866,000	$12,142,000	$12,142,000	$12,142,000	$12,142,000
Unit Cost ($/acft)	$285	$285	$160	$160	$160	$160
Somervell County Water Supply Project Phases 1-4						
Supply From Plan Element (acft/yr)	300	300	300	300	300	300
Annual Cost ($/yr)	$317,700	$317,700	$317,700	$317,700	$317,700	$317,700
Unit Cost ($/acft)	$1,059	$1,059	$1,059	$1,059	$1,059	$1,059
Somervell County Water Supply Project Phases 7A and 9-17						
Supply From Plan Element (acft/yr)	—	—	184	184	184	184
Annual Cost ($/yr)	—	—	$1,090,752	$185,840	$185,840	$185,840
Unit Cost ($/acft)	—	—	$5,928	$1,010	$1,010	$1,010

5.30.5 Mining

Description of Supply

Mining operations in Somervell County are supplied by Trinity Groundwater. Demands for Mining are projected to increase significantly resulting in shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Somervell County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Groundwater Development – Trinity Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $3,502,000
- Unit Cost: Max of $583/acft (2020)

Table 5.30-5. Recommended Plan Costs by Decade for Somervell County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(407)*	*(574)*	*(441)*	*(355)*	*(293)*	*(266)*
Conservation						
Supply From Plan Element (acft/yr)	33	64	80	74	70	68
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(374)*	*(510)*	*(361)*	*(281)*	*(223)*	*(198)*
Groundwater Well Development – Trinity Aquifer						
Supply From Plan Element (acft/yr)	550	550	550	550	550	550
Annual Cost ($/yr)	$320,542	$320,542	$27,542	$27,542	$27,542	$27,542
Unit Cost ($/acft)	$583	$583	$50	$50	$50	$50

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.30.6 Irrigation

Somervell County Irrigation is projected to have a surplus of water through the year 2070. No changes in water supply are recommended.

5.30.7 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.31 Stephens County Water Supply Plan

Table 5.31-1 lists each water user group in Stephens County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.31-1. Stephens County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Breckenridge	878	869	Projected surplus
Possum Kingdom WSC			See Palo Pinto County
Fort Belknap WSC			See Young County
Stephens Regional SUD	170	172	Projected surplus
County-Other	55	55	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	Demand equals supply
Mining	(3,458)	(1,773)	Projected shortage – see plan below
Irrigation	(27)	(24)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-61 and C-62, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.31.1 City of Breckenridge

Description of Supply

The City of Breckenridge obtains water from Hubbard Creek Reservoir through the West Central Texas Municipal Water District and from Lake Daniel. Projections indicate a surplus of water for the City of Breckenridge, and no change in supply is recommended.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Breckenridge.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $25,296 in 2030
- Unit Cost: $496/acft

b. Water Supply from Midway Group and WCBWDS:

- Cost Source: Volume II, Chapter 8.4
  - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2020
- Project Cost: $21,148,000 (Full Implementation)
- Unit Cost: $2,492/acft

Table 5.31-2. Recommended Plan Costs by Decade for City of Breckenridge

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*879*	*871*	*878*	*880*	*874*	*869*
Conservation						
Supply From Plan Element (acft/yr)	30	51	29	17	15	15
Annual Cost ($/yr)	$14,880	$25,296	$14,384	$8,432	$7,440	$7,440
Projected Surplus/(Shortage) after Conservation	*909*	*922*	*906*	*896*	*889*	*884*
Water Supply from Midway Group and WCBWDS						
Supply From Plan Element (acft/yr)	550	550	550	550	550	550
Annual Cost ($/yr)	$1,370,600	$1,370,600	$675,400	$675,400	$675,400	$675,400
Unit Cost ($/acft)	$2,492	$2,492	$1,228	$1,228	$1,228	$1,228

5.31.2 Stephens Regional SUD

Description of Supply

Stephens Regional SUD is located in multiple counties (Eastland, Shackelford, Palo Pinto, Throckmorton and Stephens). The surplus shown in Table 5.31-1 represents the cumulative totals for Stephens Regional SUD in all the counties it serves. The current supply comes through the Brazos River Authority for supply from Possum Kingdom Reservoir. The WUG also provides supply to the City of Woodson (Throckmorton County-Other). Even though Stephens Regional SUD shows a surplus for the planning horizon, they are currently participating in a project referred to as the Midway Group. This project is comprised of multiple entities in multiple counties that aim to serve the rural portions of their counties.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the Stephens Regional SUD. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Water Supply from Midway Group and WCBWDS

- Cost Source: Volume II, Chapter 8.4
  - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2020
- Project Cost: $21,148,000 (Full Implementation)
- Unit Cost: $2,492/acft

Table 5.31-3. Recommended Plan Costs by Decade for Stephens Regional SUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*162*	*165*	*170*	*174*	*173*	*172*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*162*	*165*	*170*	*174*	*173*	*172*
Water Supply from Midway Group and WCBWDS						
Supply From Plan Element (acft/yr)	400	400	400	400	400	400
Annual Cost ($/yr)	$996,800	$996,800	$491,200	$491,200	$491,200	$491,200
Unit Cost ($/acft)	$2,492	$2,492	$1,228	$1,228	$1,228	$1,228

5.31.3 County-Other

Water supply for county-other entities is obtained from local groundwater. Projections indicate adequate water supply and no changes are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.31.4 Manufacturing

The City of Breckenridge provides supply to meet Stephens County Manufacturing. No shortage is projected and no changes in water supply are recommended.

5.31.5 Steam-Electric

Stephens County has no current or projected future demand for Steam-Electric.

5.31.6 Mining

Description of Supply

Mining operations in Stephens County obtain supply from Possum Kingdom Reservoir through the Brazos River Authority. Mining demand in Stephens County is projected to peak in 2030, and slowly decrease until 2070. A shortage of supplies is projected beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Stephens County-Mining.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: 2020
   - Annual Cost: not determined

b. Leave needs unmet
   - Cost Source: Cost of not meeting needs – see Appendix H
   - Date to be Implemented: 2020

Table 5.31-4. Recommended Plan Costs by Decade for Stephens County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(4,064)*	*(4,141)*	*(3,458)*	*(2,825)*	*(2,257)*	*(1,773)*
Conservation						
Supply From Plan Element (acft/yr)	152	257	312	268	228	194
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(3,912)*	*(3,884)*	*(3,146)*	*(2,557)*	*(2,029)*	*(1,579)*
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	3,912	3,884	3,146	2,557	2,029	1,579
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location.

5.31.7 Irrigation

Description of Supply

Stephens County Irrigation obtains supply from local groundwater and run-of the river water rights which are not firm during a drought of record. Irrigation is projected to have a shortage of supply through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Stephens County-Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $230/acft

b. Groundwater Development – Other Aquifer

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $640,000
- Unit Cost: Max of $2,254/acft (2020)

Table 5.31-5. Recommended Plan Costs by Decade for Stephens County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(30)*	*(29)*	*(27)*	*(26)*	*(25)*	*(24)*
Conservation						
Supply From Plan Element (acft/yr)	4	6	8	8	8	8
Annual Cost ($/yr)	$920	$1,380	$1,840	$1,840	$1,840	$1,840
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(26)*	*(23)*	*(19)*	*(18)*	*(17)*	*(16)*
Groundwater Development – Other Aquifer						
Supply From Plan Element (acft/yr)	26	26	26	26	26	26
Annual Cost ($/yr)	$58,592	$58,592	$4,592	$4,592	$4,592	$4,592
Unit Cost ($/acft)	$2,254	$2,254	$177	$177	$177	$177

5.31.8 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.32 Stonewall County Water Supply Plan

Table 5.32-1 lists each water user group in Stonewall County and their corresponding surplus or shortage in years 2040 and 2070. A brief description of each water user group has been developed and is presented in the following subsections.

Table 5.32-1. Stonewall County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Aspermont	93	59	Projected surplus
County-Other	28	29	Projected surplus
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	(337)	(163)	Projected shortage – see plan below
Irrigation	72	85	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-63 and C-64, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.32.1 City of Aspermont

Description of Supply

The City of Aspermont is supplied from North Central Texas Municipal Water Authority (NCTMWA) and from local groundwater sources, primarily from the Seymour Aquifer. There is a projected surplus through 2070 and no changes in water supply are recommended. Although the City has sufficient supplies, conservation is recommended as the current per capita use rate is above the selected target rate of 140 gpcd.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for City of Aspermont. Associated costs are included for each strategy.

a. Conservation:

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $45,253 in 2070
- Unit Cost: $474/acft

b. Millers Creek Reservoir Augmentation strategy by NCTMWA. This will provide supply at least up to the current amount contracted from NCTMWA.

- Cost Source: Volume II, Chapter 7.5
    - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
- Date to be Implemented: 2020
- Project Cost: none (cost would be borne by NCTMWA)
- Unit Cost: none (supply already purchased from NCTMWA)

c. Alternative: Lake Creek Reservoir. This strategy would be developed by NCTMWA to augment existing supplies.

- Cost Source: Volume II, Chapter 4.10
    - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
- Date to be Implemented: 2020
- Project Cost: none (cost would be borne by NCTMWA)
- Unit Cost: none (supply already purchased from NCTMWA)

Table 5.32-2. Recommended Plan Costs by Decade for the City of Aspermont

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	*139*	*119*	*93*	*79*	*73*	*59*
Conservation						
Supply From Plan Element (acft/yr)	13	30	48	66	82	95
Annual Cost ($/yr)	$6,215	$14,363	$22,671	$31,472	$38,957	$45,253
Projected Surplus/(Shortage) after Conservation (acft/yr)	*152*	*149*	*140*	*146*	*155*	*154*
Millers Creek Reservoir Augmentation						
Supply From Plan Element (acft/yr)	33	47	62	76	90	105
Annual Cost ($/yr)	—	—	—	—	—	—
	—	—	—	—	—	—
Alternative: Lake Creek Reservoir						
Supply From Plan Element (acft/yr)	33	47	62	76	90	105
Annual Cost ($/yr)	—	—	—	—	—	—
	—	—	—	—	—	—

5.32.2 County-Other

The water supply entities for Stonewall County-Other show a projected surplus and no changes in water supply are recommended.

5.32.3 Manufacturing

No Manufacturing demand exists or is projected for the county.

5.32.4 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.32.5 Mining

Description of Supply

Surface water for Mining in Stonewall County is obtained from contracts with BRA and run of river water rights. Projections indicate an increase in water demand for Mining and shortages projected beginning in 2020. Changes in water supply are recommended.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for Mining. Associated costs are included for each strategy.

a. Conservation:
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Unit Cost: not determined

b. Groundwater Development (Blaine Aquifer):
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: $3,434,000
   - Unit Cost: Max of $790/acft (2020)

Table 5.32-3. Recommended Plan Costs by Decade for Stonewall County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(409)*	*(401)*	*(337)*	*(271)*	*(213)*	*(163)*
Conservation						
Supply From Plan Element (acft/yr)	18	29	36	31	27	24
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(391)*	*(372)*	*(301)*	*(240)*	*(186)*	*(139)*
Groundwater Well Development – Blaine Aquifer						
Supply From Plan Element (acft/yr)	400	400	400	400	400	400
Annual Cost ($/yr)	$316,023	$316,023	$27,023	$27,023	$27,023	$27,023
Unit Cost ($/acft)	$790	$790	$68	$68	$68	$68

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.32.6 Irrigation

Stonewall County Irrigation shows a projected surplus and no changes in water supply are recommended.

5.32.7 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.33 Taylor County Water Supply Plan

Table 5.33-1 lists each water user group in Taylor County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.33-1. Taylor County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Abilene	(26,575)	(26,575)	Projected shortage – see Chapter 5.38
Coleman County WSC			See Callahan County
Hawley WSC			See Jones County
City of Merkel	6	(9)	Projected shortage – see plan below
Potosi WSC	(500)	(542)	Projected shortage – see plan below
Steamboat Mountain WSC	(189)	(210)	Projected shortage – see plan below
City of Tuscola	0	0	Demand equals supply
City of Tye	(6)	(15)	Projected shortage – see plan below
County-Other	416	378	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	Demand equals supply
Mining	(366)	(315)	Projected shortage – see plan below
Irrigation	(981)	(873)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-65 and C-66, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.33.1 City of Abilene

Description of Supply

The City of Abilene obtains its water supply from surface water from Fort Phantom Hill, Hubbard Creek and O.H. Ivie (Region F) Reservoirs. Abilene also has a wastewater reuse system for non-potable use, with water stored in Lake Kirby. The City supplies several neighboring communities and projected demands indicate shortages through 2070. This WUG is located in multiple counties (Taylor and Jones). Refer to Chapter 5.38 for the City's plan as a Wholesale Water Provider.

5.33.2 City of Merkel

Description of Supply

The City of Merkel obtains surface water from local sources and from the City of Abilene. A shortage is projected starting in year 2060 for the City of Merkel.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for the City of Merkel. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Water Supply from Abilene

- Cost Source: Assumed Treated Wholesale Rate
- Date to be Implemented: before 2060
- Project Cost: $0 (Current infrastructure assumed to be adequate)
- Unit Cost: $100/acft

Table 5.33-2. Recommended Plan Costs by Decade for the City of Merkel

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*10*	*8*	*6*	*3*	*(4)*	*(9)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*10*	*8*	*6*	*3*	*(4)*	*(9)*
Purchase from Abilene						
Supply From Plan Element (acft/yr)	—	—	—	—	4	9
Annual Cost ($/yr)	—	—	—	—	$400	$900
Unit Cost ($/yr)	—	—	—	—	$100	$100

5.33.3 Potosi WSC

Description of Supply

The Potosi WSC purchases water from the City of Abilene, and shows a projected shortage. This WUG is located in multiple counties (Taylor and Callahan). The shortages shown in Table 5.33-1 represent the cumulative totals for Potosi WSC.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for Potosi

WSC. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Purchase Additional Water Supply from Abilene

- Cost Source: Assumed Treated Wholesale Rate
- Date to be Implemented: before 2020
- Project Cost: $0 (Current infrastructure assumed to be adequate)
- Unit Cost: $100/acft

Table 5.33-3. Recommended Plan Costs by Decade for Potosi WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(466)*	*(485)*	*(500)*	*(515)*	*(529)*	*(542)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(466)*	*(485)*	*(500)*	*(515)*	*(529)*	*(542)*
Purchase from City of Abilene						
Supply From Plan Element (acft/yr)	466	485	500	515	529	542
Annual Cost ($/yr)	$46,600	$48,500	$50,000	$51,500	$52,900	$54,200
Unit Cost ($/acft)	$100	$100	$100	$100	$100	$100

5.33.4 Steamboat Mountain WSC

Description of Supply

Steamboat Mountain WSC purchases water from the City of Abilene, and shows a projected shortage.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for Steamboat Mountain WSC.

a. Water Supply from Abilene

- Cost Source: Assumed Treated Wholesale Rate
- Date to be Implemented: before 2020
- Project Cost: $0 (Current infrastructure assumed to be adequate)
- Unit Cost: $100/acft

Table 5.33-4. Recommended Plan Costs by Decade for Steamboat Mountain WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(182)*	*(185)*	*(189)*	*(194)*	*(203)*	*(210)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(182)*	*(185)*	*(189)*	*(194)*	*(203)*	*(210)*
Purchase from City of Abilene						
Supply From Plan Element (acft/yr)	182	185	189	194	203	210
Annual Cost ($/yr)	$18,200	$18,500	$18,900	$19,400	$20,300	$21,000
Unit Cost ($/acft)	$100	$100	$100	$100	$100	$100

5.33.5 City of Tuscola

The City of Tuscola purchases water from Steamboat Mountain WSC and shows a supply equal to demand. No changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.33.6 City of Tye

Description of Supply

The City of Tye purchases water from the City of Abilene, and shows a small need throughout the planning period.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Tye. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

a. Water Supply from Abilene

- Cost Source: Assumed Treated Wholesale Rate
- Date to be Implemented: before 2020
- Project Cost: $0 (Current infrastructure assumed to be adequate)
- Unit Cost: $100/acft

Table 5.33-5. Recommended Plan Costs by Decade for the City of Tye

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2)*	*(4)*	*(6)*	*(9)*	*(13)*	*(15)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(2)*	*(4)*	*(6)*	*(9)*	*(13)*	*(15)*
Purchase from Abilene						
Supply From Plan Element (acft/yr)	2	4	6	9	13	15
Annual Cost ($/yr)	$200	$400	$600	$900	$1,300	$1,500
Unit Cost ($/yr)	$100	$100	$100	$100	$100	$100

5.33.7 County-Other

The water supply entities for Taylor County-Other show a projected surplus and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.33.8 Manufacturing

The water supply for Manufacturing equals demand and no changes in water supply are recommended.

5.33.9 Steam-Electric

The water supply entities for Taylor County Steam-Electric show no projected demand.

5.33.10 Mining

Description of Supply

Mining operations in Taylor County have no supplies currently allocated, and demands for Mining are projected to show shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Taylor County-Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Purchase from Abilene

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: Not enough information to cost delivery
- Unit Cost: $100/acft (BRA wholesale rate only)

Table 5.33-6. Recommended Plan Costs by Decade for Taylor County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(391)*	*(391)*	*(366)*	*(346)*	*(329)*	*(315)*
Conservation						
Supply From Plan Element (acft/yr)	12	20	26	24	23	22
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(379)*	*(371)*	*(340)*	*(322)*	*(306)*	*(293)*
Purchase from Abilene						
Supply From Plan Element (acft/yr)	379	371	340	322	306	293
Annual Cost ($/yr)	$37,900	$37,100	$34,000	$32,200	$30,600	$29,300
Unit Cost ($/acft)	$100	$100	$100	$100	$100	$100

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.33.11 Irrigation

Description of Supply

Taylor County Irrigation is supplied by groundwater from the Edwards-Trinity and Trinity Aquifers. Irrigation is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Taylor County-Irrigation.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: $230/acft

b. Purchase from Abilene

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: Not enough information to cost delivery
- Unit Cost: $100/acft (BRA wholesale rate only)

Table 5.33-7. Recommended Plan Costs by Decade for Taylor County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,057)*	*(1,019)*	*(981)*	*(944)*	*(906)*	*(873)*
Conservation						
Supply From Plan Element (acft/yr)	47	76	104	101	98	96
Annual Cost ($/yr)	$10,743	$17,469	$23,844	$23,248	$22,637	$22,105
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(1,010)*	*(943)*	*(877)*	*(842)*	*(807)*	*(776)*
Purchase from Abilene						
Supply From Plan Element (acft/yr)	1,010	943	877	842	807	776
Annual Cost ($/yr)	$101,000	$94,300	$87,700	$84,200	$80,700	$77,600
Unit Cost ($/acft)	$100	$100	$100	$100	$100	$100

5.33.12 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.34 Throckmorton County Water Supply Plan

Table 5.34-1 lists each water user group in Throckmorton County and their corresponding surplus or shortage in years 2040 and 2070. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 5.34-1. Throckmorton County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Fort Belknap WSC			See Young County for Plan
Stephens Regional SUD			See Stephens County for Plan
City of Throckmorton	150	151	Projected surplus
County-Other	54	54	Projected surplus
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	(171)	(116)	Projected shortage –see plan below
Irrigation	8	8	No projected demand
Livestock	0	0	Demand equals supply

1 – From Tables C-67 and C-68, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.34.1 City of Throckmorton

Description of Supply

The City of Throckmorton obtains water from Lake Throckmorton and shows a projected surplus through 2070. Should Lake Throckmorton become unreliable, the City is connected to Graham through Fort Belknapp WSC.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and the TWDB, the following water supply plan is recommended for the City of Throckmorton. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: $21,000 maximum in 2070
- Unit Cost: $474/acft

b. Water Supply from Throckmorton Reservoir:

- Strategy to develop new raw supply, only. Delivery and treatment would be required when supplies are needed.
- Cost Source: Volume II, Chapter 4.12
  - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
- Date to be Implemented: 2020
- Project Cost: $28,041,000
- Unit Cost: $1,760/acft

c. Water Supply from Midway Group and WCBWDS:

- Cost Source: Volume II, Chapter 8.4
  - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2020
- Annual Cost: $481,000 ($2,492/acft or $7.65/kgal)

Table 5.34-2. Recommended Plan Costs by Decade for the City of Throckmorton

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*143*	*147*	*150*	*150*	*151*	*151*
Conservation						
Supply From Plan Element (acft/yr)	8	20	32	45	44	44
Annual Cost ($/yr)	$3,641	$9,645	$15,369	$21,179	$20,705	$20,705
Projected Surplus/(Shortage) after Conservation (acft/yr)	*151*	*167*	*182*	*195*	*195*	*195*
Water Supply from Throckmorton Reservoir						
Supply From Plan Element (acft/yr)	1,125	1,125	1,125	1,125	1,125	1,125
Annual Cost ($/yr)	$1,979,000	$1,979,000	$1,979,000	$1,979,000	$233,000	$233,000
Unit Cost ($/acft)	$1,760	$1,760	$1,760	$1,760	$207	$207
Water Supply from Midway Group and WCBWDS						
Supply From Plan Element (acft/yr)	193	193	193	193	193	193
Annual Cost ($/yr)	$481,000	$481,000	$237,000	$237,000	$237,000	$237,000
Unit Cost ($/acft)	$2,492	$2,492	$1,228	$1,228	$1,228	$1,228

5.34.2 County-Other

The entities in Throckmorton County-Other receive treated surface water supplies from Stephens Regional SUD and show a projected surplus through 2070. Conservation was considered but the current per capita use is below the targeted gpcd of 140. No change is recommended in water supplies.

5.34.3 Manufacturing

No Manufacturing demand exists or is projected for the county.

5.34.4 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

5.34.5 Mining

Description of Supply

Mining in Throckmorton County currently has no associated supplies. Projections indicate an increase in water demand for Mining and shortages projected beginning in 2020. Changes in water supply are recommended.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Mining. Associated costs are included for each strategy.

a. Conservation:
    - Cost Source: Volume II, Chapter 2
    - Date to be Implemented: before 2020
    - Unit Cost: not determined

b. Groundwater Development (Other Aquifer):
    - Cost Source: Volume II, Chapter 12.1
    - Date to be Implemented: before 2020
    - Project Cost: $2,344,000
    - Unit Cost: Max of $1,072/acft (2020)

Table 5.34-3. Recommended Plan Costs by Decade for Throckmorton County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(194)*	*(191)*	*(171)*	*(150)*	*(132)*	*(116)*
Conservation						
Supply From Plan Element (acft/yr)	6	10	12	11	9	8
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(188)*	*(181)*	*(159)*	*(140)*	*(123)*	*(108)*
Groundwater Well Development						
Supply From Plan Element (acft/yr)	200	200	200	200	200	200
Annual Cost ($/yr)	$214,373	$214,373	$17,373	$17,373	$17,373	$17,373
Unit Cost ($/acft)	$1,072	$1,072	$87	$87	$87	$87

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.34.6 Irrigation

No Irrigation demand is projected for the county.

5.34.7 Livestock

No projected shortage exists and no change in water supply is recommended.

5.35 Washington County Water Supply Plan

Table 5.35-1 lists each water user group in Washington County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.35-1. Washington County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2040 (acft/yr)	Surplus/(Shortage)[1] 2070 (acft/yr)	Comment
City of Brenham	(400)	(928)	Projected shortage – see plan below
County-Other	114	5	Projected surplus
Manufacturing	(192)	(399)	Projected shortage – see plan below
Steam-Electric	0	0	Demand equals supply
Mining	(703)	(264)	Projected shortage – see plan below
Irrigation	151	151	Projected surplus
Livestock	0	0	Demand equals supply

1 – From Tables C-3 and C-4, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.35.1 City of Brenham

Description of Supply

The City of Brenham obtains its water supply through a contract with the Brazos River Authority for 4,200 acft/yr of water supply from Lake Somerville. The supply is currently restrained by water treatment plant capacity to 3,909 acft/yr, creating shortages before 2030. The city is also considering reuse strategies.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Brenham.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Unit Cost: $496/acft
- Annual Cost: maximum of $770,288 in 2070

Table 5.35-2. Recommended Plan Costs by Decade for City of Brenham

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*63*	*(217)*	*(400)*	*(605)*	*(780)*	*(928)*
Conservation						
Supply From Plan Element (acft/yr)	190	531	889	1,272	1,508	1,553
Annual Cost ($/yr)	$94,240	$263,376	$440,944	$630,912	$747,968	$770,288
Projected Surplus/(Shortage) after Conservation	*253*	*315*	*490*	*667*	*728*	*625*

5.35.2 County-Other

Washington County-Other is projected to have a surplus through the year 2070 and no changes in water supply are recommended. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.35.3 Manufacturing

Description of Supply

Water supply for manufacturing in Washington County is obtained by from the Gulf Coast Aquifer. Washington County Manufacturing is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Washington County Manufacturing.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: Not determined

b. Gulf Coast Aquifer Development
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: $3,380,000
   - Unit Cost: Max of $1,209/acft (2020)

Table 5.35-3. Recommended Plan Costs by Decade for Washington County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(62)*	*(127)*	*(192)*	*(249)*	*(321)*	*(399)*
Conservation						
Supply From Plan Element (acft/yr)	21	38	58	62	67	72
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation	*(41)*	*(89)*	*(134)*	*(187)*	*(254)*	*(326)*
Gulf Coast Aquifer Development						
Supply From Plan Element (acft/yr)	41	89	134	187	254	326
Annual Cost ($/yr)	$393,990	$393,990	$131,990	$131,990	$131,990	$131,990
Unit Cost ($/acft)	$1,209	$1,209	$405	$405	$405	$405

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location.

5.35.4 Steam-Electric

No Steam-Electric demand exists nor is projected for the county.

5.35.5 Mining

Description of Supply

Mining operations in Washington County are supplied by Brazos River Alluvium groundwater. Demands for Mining are projected to increase significantly resulting in shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Washington County-Mining.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Gulf Coast Aquifer Development

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $6,245,000
- Unit Cost: Max of $695/acft (2020)

Table 5.35-4. Recommended Plan Costs by Decade for Washington County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(569)*	*(866)*	*(703)*	*(538)*	*(373)*	*(264)*
Conservation						
Supply From Plan Element (acft/yr)	17	43	49	38	26	18
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(552)*	*(823)*	*(654)*	*(500)*	*(347)*	*(246)*
Gulf Coast Aquifer Development						
Supply From Plan Element (acft/yr)	552	823	654	500	347	246
Annual Cost ($/yr)	$571,931	$571,931	$47,931	$47,931	$47,931	$47,931
Unit Cost ($/acft)	$695	$695	$58	$58	$58	$58

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.35.6 Irrigation

Irrigation is projected to have a surplus of water from available groundwater and surface water supplies and no changes in water supply are recommended.

5.35.7 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.36 Williamson County Water Supply Plan

Table 5.36-1 lists each water user group in Williamson County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.36-1.Williamson County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Bartlett	(344)	(472)	Projected shortage – see plan below
Bell-Milam Falls WSC			See Bell County
Blockhouse MUD	279	287	Projected surplus
Brushy Creek MUD	(920)	(1,848)	Projected shortage – see plan below
City of Cedar Park	(4,082)	(4,348)	Projected shortage – see 5.38
Chisholm Trail SUD[2]	(5,070)	(10,401)	Projected shortage – see plan below
Fern Bluff MUD	(253)	(259)	Projected shortage – see plan below
City of Florence	(65)	(92)	Projected shortage – see plan below
City of Georgetown	(6,695)	(24,121)	Projected shortage – see plan below
City of Granger	(133)	(190)	Projected shortage – see plan below
City of Hutto	(5,558)	(11,994)	Projected shortage – see plan below
Jarrell	0	0	Demand equals supply
Jarrell-Schwertner WSC	1,020	263	Projected surplus
Jonah Water SUD	(819)	(2,977)	Projected shortage – see plan below
City of Leander[2]	(12,090)	(33,576)	Projected shortage – see plan below
City of Liberty Hill	56	56	Projected surplus
Manville WSC[3]	2,335	814	Projected surplus
City of Pflugerville[3]	0	0	Demand equals supply
City of Round Rock[2]	(14,028)	(46,089)	Projected shortage – see 5.38
Southwest Milam WSC			See Milam County
City of Taylor	0	0	Demand equals supply
City of Thorndale			See Milam County
Thrall	0	0	Demand equals supply
Williamson-Travis County MUD #1	212	218	Projected surplus
Williamson-Travis County MUD #10	(352)	(688)	Projected shortage – see plan below
Williamson-Travis County MUD #11	(193)	(326)	Projected shortage – see plan below
WILLIAMSON COUNTY MUD #9	(263)	(448)	Projected shortage – see plan below
County-Other	(13,402)	(22,243)	Projected shortage – see plan below

Table 5.36-1.Williamson County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Manufacturing	(11)	(11)	Projected shortage – see plan below
Steam-Electric	0	0	No projected demand
Mining	(6,949)	(10,771)	Projected shortage – see plan below
Irrigation	(71)	(72)	Projected shortage – see plan below
Livestock	0	0	Demand equals supply

1 – From Tables C-71 and C-72, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

2 – Balance is total between Brazos G and Region K for WUG.

3 – Balance is only for portion of WUG in Brazos G.

5.36.1 City of Bartlett

Description of Supply

The City of Bartlett obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater supply, the City of Bartlett is projected to have shortages through the year 2070. This WUG is located in multiple counties (Williamson and Bell). The shortages shown in Table 5.36-1 represent the cumulative totals for the City of Bartlett.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Bartlett.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: maximum of $24,310 in 2020
   - Unit Cost: $470/acft

b. Advanced Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: 2050
   - Annual Cost: maximum of $31,960 in 2070
   - Unit Cost: $470/acft

c. Brackish Trinity Development
   - Cost Source: Volume II, Chapter 12

- Date to be Implemented: before 2020
- Project Cost: $10,428,000
- Unit Cost: Max of $2,827 in 2020

Table 5.36-2. Recommended Plan Costs by Decade for City of Bartlett

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(281)*	*(309)*	*(344)*	*(383)*	*(428)*	*(472)*
Conservation						
Supply From Plan Element (acft/yr)	12	40	61	62	68	73
Annual Cost ($/yr)	$5,640	$18,800	$28,670	$29,140	$31,960	$34,310
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(269)*	*(269)*	*(283)*	*(321)*	*(360)*	*(399)*
Advanced Conservation						
Supply From Plan Element (acft/yr)	—	—	—	6	35	68
Annual Cost ($/yr)	—	—	—	$2,820	$16,450	$31,960
Projected Surplus/(Shortage) after Advanced Conservation (acft/yr)	*(269)*	*(269)*	*(283)*	*(315)*	*(325)*	*(331)*
Brackish Trinity Development						
Supply From Plan Element (acft/yr)	323	323	323	323	645	645
Annual Cost ($/yr)	$912,000	$912,000	$476,000	$476,000	$1,387,000	$1,387,000
Unit Cost ($/acft)	$2,827	$2,827	$1,476	$1,476	$2,150	$2,150

5.36.2 Blockhouse MUD

Blockhouse MUD obtains its water supply from the City of Cedar Park. No shortages are projected for Blockhouse MUD and no changes in water supply are recommended. Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of 120 gpcd in 2070.

5.36.3 Brushy Creek MUD

Description of Supply

Brushy Creek MUD obtains its water supply from a contract with the Brazos River Authority for water from Stillhouse Hollow Reservoir and from local groundwater. Brushy Creek MUD has a projected shortage through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Brushy Creek MUD.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $762,810 in 2070

b. Advanced Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $201,693 in 2070

c. Groundwater Development – Edwards Aquifer (BFZ)

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2050
- Project Cost: $182,000
- Unit Cost: $1,919/acft

Table 5.36-3. Recommended Plan Costs by Decade for Brushy Creek MUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(58)*	*(98)*	*(920)*	*(1,428)*	*(1,764)*	*(1,848)*
Conservation						
Supply From Plan Element (acft/yr)	197	589	947	1,282	1,600	1,623
Annual Cost ($/yr)	$92,590	$276,830	$445,090	$602,540	$752,000	$762,810
Projected Surplus/(Shortage) after Conservation	*139*	*491*	*27*	*(146)*	*(164)*	*(225)*
Advanced Conservation						
Supply From Plan Element (acft/yr)	39	81	111	135	152	430
Annual Cost ($/yr)	$18,342	$37,853	$52,226	$63,131	$71,213	$201,693
Projected Surplus/(Shortage) after Advanced Conservation	178	572	138	(11)	(12)	205
Edwards Aquifer Development						
Supply From Plan Element (acft/yr)	—	—	—	11	12	12
Annual Cost ($/yr)	—	—	—	$23,028	$23,028	$9,028
Unit Cost ($/acft)	—	—	—	$1,919	$1,919	$752

5.36.4 City of Cedar Park

The recommended water supply plan for the City of Cedar Park is included in Section 5.38 with the wholesale water providers.

5.36.5 Chisholm Trail SUD

Description of Supply

Chisholm Trail SUD has service area in Williamson and Burnet (Region K) County. The entity obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and contracts with the Brazos River Authority for water from Lake Stillhouse Hollow. Based on the available groundwater and surface water supply, Chisholm Trail SUD is projected to have a shortage starting in 2020. This WUG is located in multiple counties (Williamson and Bell). The City of Georgetown has recently taken over operations of the utility and is expected to be the primary supplier of future water needs for the utility. Balance and strategies represented in Table 5.36-4 represent the cumulative totals for Chisholm Trail SUD in both counties and regions.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and in coordination with Region K, the following water management strategy is recommended for the Chisholm Trail SUD.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Unit Cost: $470/acft
   - Annual Cost: maximum of $808,400 in 2070

b. Advanced Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Unit Cost: $470/acft
   - Annual Cost: maximum of $808,400 in 2070

c. Increase Water Treatment Plant
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Project Cost: $31,675,000
   - Unit Cost: $656

d. Reallocation from City of Georgetown
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: before 2020
   - Project Cost: Infrastructure assumed to be sufficient

- Unit Cost: Wholesale water rate of $977/acft assumed

Table 5.36-4. Recommended Plan Costs by Decade for Chisholm Trail SUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,392)*	*(3,577)*	*(5,070)*	*(6,685)*	*(8,512)*	*(10,401)*
Conservation						
Supply From Plan Element (acft/yr)	213	758	1,069	1,263	1,494	1,736
Annual Cost ($/yr)	$100,145	$356,046	$502,374	$593,766	$701,952	$816,153
Projected Surplus/(Shortage) after Conservation	*(2,179)*	*(2,820)*	*(4,001)*	*(5,422)*	*(7,019)*	*(8,665)*
Additional Conservation						
Supply From Plan Element (acft/yr)	—	—	6	503	1,159	1,967
Annual Cost ($/yr)	—	—	$3,037	$236,106	$543,669	$922,431
Projected Surplus/(Shortage) after Advanced Conservation	*(2,179)*	*(2,820)*	*(4,001)*	*(4,919)*	*(5,860)*	*(6,698)*
Increase Water Treatment Plant						
Supply From Plan Element (acft/yr)	3,527	3,334	3,639	4,604	5,931	7,489
Annual Cost ($/yr)	$2,314,000	$2,187,000	$1,099,000	$1,390,000	$1,791,000	$2,262,000
Unit Cost ($/yr)	$656	$656	$302	$302	$302	$302
Reallocation from City of Georgetown						
Supply From Plan Element (acft/yr)	—	—	400	400	—	—
Annual Cost ($/yr)	—	—	$391,000	$391,000	—	—
Unit Cost ($/yr)	—	—	$977	$977	—	—

5.36.6 Fern Bluff MUD

Description of Supply

Fern Bluff MUD obtains its water supply from the City of Round Rock, for which shortages are projected. Conservation is recommended to reduce the demand to eliminate anticipated shortages. The contract with Round Rock is sufficient to meet the remaining demands of Fern Bluff MUD.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Fern Bluff MUD.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $122,670 in 2050

- Unit Cost: $470/acft

Table 5.36-5. Recommended Plan Costs by Decade for Fern Bluff MUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(63)*	*(161)*	*(253)*	*(261)*	*(259)*	*(259)*
Conservation						
Supply From Plan Element (acft/yr)	63	161	253	261	259	259
Annual Cost ($/yr)	$29,610	$75,670	$118,910	$122,670	$121,730	$121,730
Projected Surplus/(Shortage) after Conservation	*0*	*0*	*0*	*0*	*0*	*0*

5.36.7 City of Florence

Description of Supply

The City of Florence obtains its water supply from groundwater from the Trinity Aquifer. Based on the City's available groundwater supply, the City of Florence is projected to have a shortage through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Florence.

a. Edwards Aquifer Development
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Annual Cost: $26,226
   - Unit Cost: $1,093/acft

b. Trinity Aquifer Development
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Annual Cost: Maximum of $701,000 in 2020
   - Unit Cost: Maximum of $5,795/acft in 2020

Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of 120 gpcd in 2070.

Table 5.36-6. Recommended Plan Costs by Decade for the City of Florence

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(59)*	*(61)*	*(65)*	*(72)*	*(81)*	*(92)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(59)*	*(61)*	*(65)*	*(72)*	*(81)*	*(92)*
Groundwater Development - Edwards						
Supply From Plan Element (acft/yr)	—	—	—	—	13	24
Annual Cost ($/yr)	—	—	—	—	$26,226	$26,226
Unit Cost ($/yr)	—	—	—	—	$1,093	$1,093
Groundwater Development –Trinity (Bell County)						
Supply From Plan Element (acft/yr)	121	121	121	121	121	121
Annual Cost ($/yr)	$701,000	$701,000	$261,000	$261,000	$261,000	$261,000
Unit Cost ($/yr)	$5,795	$5,795	$2,158	$2,158	$2,158	$2,158

5.36.8 City of Georgetown

Description of Supply

The City of Georgetown obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and contracts with the Brazos River Authority for water from Lake Georgetown and Stillhouse Hollow Reservoir. Based on the available treatment capacity of the city's water treatment plant, the City of Georgetown is projected to have a shortage from 2030 through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for The City of Georgetown. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $224,000 in 2070
- Unit Cost: $474/acft

b. Advanced Conservation

- Cost Source: Volume II, Chapter 2

- Date to be Implemented: before 2020
- Unit Cost: $470/acft
- Annual Cost: maximum of $201,693 in 2070

c. Increase Treatment Plant Capacity

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $44,534,000
- Unit Cost: $576/acft

The City of Georgetown has provided information regarding a potential strategy to pump flows from the South Fork of the San Gabriel River into Lake Georgetown through an existing 30-inch pipeline that could be repurposed for the diversion. Based upon an analysis of data from 1967 to 2007, an average annual diversion of about 4,000 acft/yr might be possible. The level of analysis available at this time precludes including this strategy in the 2016 Brazos G Regional Water Plan; however, this strategy warrants future consideration. Future evaluations of the project would need to include an analysis of the flows available for diversion constrained by downstream senior water rights and the resulting improvement to the firm yield of Lake Georgetown over the period of record in the Brazos WAM (1940-1997), costs for the river intake and associated infrastructure, and an evaluation of potential environmental impacts to the South Fork of the San Gabriel River.

Table 5.36-7. Recommended Plan Costs by Decade for City of Georgetown

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,600*	*(2,194)*	*(6,695)*	*(11,781)*	*(17,840)*	*(24,121)*
Conservation						
Supply From Plan Element (acft/yr)	734	2,507	5,068	8,141	9,756	11,442
Annual Cost ($/yr)	$344,980	$1,178,290	$2,381,960	$3,826,270	$4,585,320	$5,377,740
Projected Surplus/(Shortage) after Conservation	*2,334*	*313*	*(1,627)*	*(3,640)*	*(8,084)*	*(12,679)*
Advanced Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	1,612	4,404
Annual Cost ($/yr)	—	—	—	—	$757,640	$2,069,880
Projected Surplus/(Shortage) after Advanced Conservation	2,334	313	(1,627)	(3,640)	(6,472)	(8,275)
Increase Water Treatment Capacity (21 MGD expansion)						
Supply From Plan Element (acft/yr)	—	11,626	11,626	11,626	11,626	11,304
Annual Cost ($/yr)	—	$6,917,000	$6,917,000	$3,186,000	$3,186,000	$3,186,000
Unit Cost ($/yr)	—	$576	$576	$266	$266	$266

5.36.9 City of Granger

Description of Supply

The City of Granger obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater supply, the City of Granger is projected to have a shortage through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Granger.

a. BRA Supply (Lake Granger) through the East Williamson County Water Supply Project

   - Cost Source: Volume II, Chapter 8.2
   - Date to be Implemented: 2020
   - Project Cost $42,127,000
   - Unit Cost: $1,173/acft

Conservation was also considered; however, the entity’s current per capita use rate is below the selected target rate of 140 gpcd.

Table 5.36-8. Recommended Plan Costs by Decade for City of Granger

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(113)*	*(121)*	*(133)*	*(148)*	*(169)*	*(190)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(113)*	*(121)*	*(133)*	*(148)*	*(169)*	*(190)*
BRA Supply (Lake Granger) through the EWCWSP						
Supply From Plan Element (acft/yr)	200	200	200	200	200	200
Annual Cost ($/yr)	$234,600	$234,600	$150,800	$150,800	$150,800	$150,800
Unit Cost ($/yr)	$1,173	$1,173	$754	$754	$754	$754

5.36.10 City of Hutto

Description of Supply

The City of Hutto obtains its water supply from Heart of Texas Water Suppliers LLC, Manville WSC and City of Taylor. The contractual supply from the Heart of Texas totals 5,600 acft/yr, but the current supply from is limited by the MAG in Williamson County. Based on the available supplies, the City of Hutto is projected to have shortages through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for the City of Hutto. Associated costs are included for each strategy.

a. Increase Supply from Heart of Texas WSC

Heart of Texas Water Suppliers LLC does not currently have sufficient supply to meet the contractual requirements with Hutto. Limited groundwater is available under the MAG in Williamson County. It is anticipated that additional supplies will be developed by Heart of Texas WSC in Lee County to meet needs.

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: (cost to be borne by Heart of Texas WSC)
- Unit Cost: $977

b. Alternative: Little River Off-Channel Reservoir

- Cost Source: Volume II, Chapter 4.7
  - Strategy could be supplied by the BRA System Operation, dependent on permit approval by TCEQ
- Date to be Implemented: before 2030
- Project Cost: $487,611,000
- Unit Cost: $1,038/acft

During the Brazos G regional water planning process, water management strategies such as additional development of Carrizo-Wilcox Aquifer groundwater and the Lake Granger Augmentation Project were preferred options to include in the 2016 Brazos G Regional Water Plan. When confronted by the Modeled Available Groundwater (MAG) limitations of these two options, the BGRWPG has little alternative but to make the Little River Off-Channel Reservoir a recommended or alternative strategy.

Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of 120 gpcd in 2070.

Table 5.36-9. Recommended Plan Costs by Decade for City of Hutto

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,256)*	*(3,678)*	*(5,481)*	*(7,426)*	*(10,193)*	*(12,477)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*(2,256)*	*(3,678)*	*(5,481)*	*(7,426)*	*(10,193)*	*(12,477)*
Increase Supplies from Heart of Texas WSC (Volume II, Chapter 12)						
Supply From Plan Element (acft/yr)	5,593	5,593	5,593	7,503	9,710	11,994
Annual Cost ($/yr)	$5,464,000	$5,464,000	$5,464,000	$ 7,330,000	$9,487,000	$11,718,000
Unit Cost ($/yr)	$977	$977	$977	$977	$977	$977
Alternative: Little River Off-Channel Reservoir (BRA)						
Supply From Plan Element (acft/yr)	—	378	2,181	4,001	6,215	8,499
Annual Cost ($/yr)	—	$392,000	$2,264,000	$1,848,000	$2,871,000	$2,975,000
Unit Cost ($/yr)	—	$1,038	$1,038	$462	$462	$350

5.36.11 City of Jarrell

Description of Supply

The City of Jarrell obtains its supply from the Jerrell-Schwertner WSC through groundwater wells located within and near the City. The current groundwater supplies equal projected demand through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Granger.

a. BRA Supply (Lake Granger) through the East Williamson County Water Supply Project

- Cost Source: Volume II, Chapter 8.2
- Date to be Implemented: 2020
- Project Cost $42,127,000
- Unit Cost: $1,173/acft

Conservation and advanced conservation whereas considered; however, the entity's current per capita use rate is below the selected target rate of 140 120 gpcd in 2070.

Table 5.36-10. Recommended Plan Costs by Decade for City of Jarrell

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*0*	*0*	*0*	*0*	*0*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*0*	*0*	*0*	*0*	*0*	*0*
BRA Supply (Lake Granger) through the EWCWSP						
Supply From Plan Element (acft/yr)	100	100	100	100	100	100
Annual Cost ($/yr)	$117,300	$117,300	$75,400	$75,400	$75,400	$75,400
Unit Cost ($/yr)	$1,173	$1,173	$754	$754	$754	$754

5.36.12 Jarrell-Schwertner WSC

Jarrell-Schwertner WSC obtains its water supply from the Edwards-BFZ (Northern Segment) Aquifer, and Central Texas WSC. The WSC also has a contract with BRA for supplies from Stillhouse Hollow Lake. Based on the available water supply, Jarrell-Schwertner WSC is projected to have a surplus throughout the planning period. This WUG is located in multiple counties (Williamson and Bell). The surplus/shortages shown in Table 5.36-1 represent the cumulative totals for Jarrell-Schwertner WSC.

5.36.13 Jonah Water SUD

Description of Supply

Jonah Water SUD obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and a contract with the BRA for treated supply through the East Williamson County WTP. Based on the available groundwater and surface water supply, Jonah Water SUD is projected to have a shortage from 2030 through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Jonah Water SUD.

a. BRA Supply (Lake Granger) through the East Williamson County Water Supply Project

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost $42,127,000
- Unit Cost: Max of 1,173/acft

Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of 120 gpcd in 2070.

Table 5.36-11. Recommended Plan Costs by Decade for Jonah Water SUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*155*	*(266)*	*(819)*	*(1,525)*	*(2,229)*	*(2,977)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*155*	*(266)*	*(819)*	*(1,525)*	*(2,229)*	*(2,977)*
BRA Supply (Lake Granger) through the EWCWSP						
Supply From Plan Element (acft/yr)	3,000	3,000	3,000	3,000	3,000	3,000
Annual Cost ($/yr)	$3,519,000	$3,519,000	$2,262,000	$2,262,000	$2,262,000	$2,262,000
Unit Cost ($/acft)	$1,173	$1,173	$754	$754	$754	$754

5.36.14 City of Leander

Description of Supply

The City of Leander is located in Williamson and Travis (Region K) County and obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and contracts with the Lower Colorado River Authority for water from the Highland Lakes (Lake Travis and Lake Buchanan). Based on the available groundwater and surface water supply, the City of Leander is projected to have a shortage from the year 2030 through the year 2070. Leander is a participant in the Brushy Creek RUA project with Cedar Park and Round Rock and will obtain future supplies from the Highland Lakes. Balance and strategies represented in Table 5.36-12 represent the cumulative totals for Leander in both counties and regions.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region K, the following water management strategy is recommended for the City of Leander.

a. Brushy Creek RUA Water Supply Project
   - Cost Source: Volume II, Chapter 7.2
   - Date to be Implemented: 2020
   - Project Cost $142,186,000 (city's portion of project shared with Liberty Hill)
   - Unit Cost: $1,128

b. Contract Amendment with LCRA
   - Cost Source: 2016 Region K Water Plan
   - Date to be Implemented: 2050
   - Project Cost: None. Existing infrastructure assumed sufficient
   - Unit Cost: $ 151/acft

Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of 120 gpcd in 2070.

Table 5.36-12. Recommended Plan Costs by Decade for the City of Leander

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*361*	*(4,653)*	*(12,090)*	*(20,936)*	*(26,947)*	*(33,576)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*361*	*(4,653)*	*(12,090)*	*(20,936)*	*(26,947)*	*(33,576)*
Brushy Creek RUA Water Supply Project						
Supply From Plan Element (acft/yr)[1]	17,600	17,600	17,600	17,600	17,600	17,600
Annual Cost ($/yr)	$27,072,000	$27,072,000	$15,480,000	$15,480,000	$15,480,000	$15,480,000
Unit Cost ($/acft)	$1,128	$1,128	$645	$645	$645	$645
Contract Amendment with LCRA (Region K)						
Supply From Plan Element (acft/yr)	—	—	—	3,336	9,347	15,976
Annual Cost ($/yr)	—	—	—	$504,000	$1,411,000	$2,412,000
Unit Cost ($/acft)	—	—	—	$151	$151	$151

1- The total supply from the strategy is 24,000 acft/y of which the City is currently using 6,400 acft/yr.

5.36.15 Liberty Hill

Description of Supply

The City of Liberty Hill obtains its water supply from groundwater from the Trinity Aquifer. They also have a BRA contract for 600 acft/yr out of the Highland Lakes (HB1437). Liberty Hill is a participant in the Brushy Creek RUA project with Leander, Cedar Park and Round Rock and will obtain future supplies from the Highland Lakes. The City of Liberty Hill is projected to have a surplus through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region K, the following water management strategy is recommended for the City of Leander.

a. Brushy Creek RUA Water Supply Project

- Cost Source: Volume II, Chapter 7.2
- Date to be Implemented: 2020
- Project Cost $142,186,000 (city's portion of project shared with Leander)
- Unit Cost: $1,128

Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of120 gpcd in 2070.

Table 5.36-13. Recommended Plan Costs by Decade for the City of Liberty Hill

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*361*	*(4,653)*	*(12,090)*	*(20,936)*	*(26,947)*	*(33,576)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation	*361*	*(4,653)*	*(12,090)*	*(20,936)*	*(26,947)*	*(33,576)*
Brushy Creek RUA Water Supply Project						
Supply From Plan Element (acft/yr)	600	600	600	600	600	600
Annual Cost ($/yr)	$677,000	$677,000	$387,000	$387,000	$387,000	$387,000
Unit Cost ($/acft)	$1,128	$1,128	$645	$645	$645	$645

5.36.16 Manville WSC

Manville WSC is mostly located in Travis County (Region C); however a portion of the service area is in Williamson County. The WSC obtains its water supply from groundwater from the Edwards and Trinity Aquifers as well as other minor aquifers. No shortages are projected for Manville WSC in Brazos G. The full water plan for Manville WSC is discussed in the 2016 Region K Water Plan.

Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of 120 gpcd in 2070.

5.36.17 City of Pflugerville

Description of Supply

The City of Pflugerville obtains its supply from the Edwards (BFZ) Aquifer in Region K and from the Lower Colorado River Authority. No shortages are projected for the City of Pflugerville. The majority of the City is located in Region K and more details about supplies, needs and strategies are discussed in the 2016 Region K Water Plan.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB and in coordination with Region K, the following water management strategy is recommended for the City of Pflugerville.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $3,760 in 2070
- Unit Cost: $470/acft

Table 5.36-14. Recommended Plan Costs by Decade for the City of Pflugerville (Brazos G)

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*0*	*0*	*0*	*0*	*0*
Conservation						
Supply From Plan Element (acft/yr)	3	5	5	6	7	8
Annual Cost ($/yr)	$1,410	$2,350	$2,350	$2,820	$3,290	$3,760
Projected Surplus/(Shortage) after Conservation	*3*	*5*	*5*	*6*	*7*	*8*

5.36.18 City of Round Rock

The recommended water supply plan for the City of Round Rock is included in Section 5.38 with the wholesale water providers.

5.36.19 City of Taylor

Description of Supply

The City of Taylor obtains its water supply from a contract with the Brazos River Authority for water from Lake Granger through the East Williamson County WTP. No shortages are projected for the City of Taylor.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for The City of Taylor.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $32,250 in 2070
- Unit Cost: $470/acft

Table 5.36-15. Recommended Plan Costs by Decade for the City of Taylor

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*0*	*0*	*0*	*0*	*0*
Conservation						
Supply From Plan Element (acft/yr)	75	73	17	—	—	—
Annual Cost ($/yr)	$35,250	$34,310	$7,990	—	—	—
Projected Surplus/(Shortage) after Conservation	*75*	*73*	*17*	*0*	*0*	*0*

5.36.20 City of Thrall

The City of Thrall obtains its water supply from groundwater from a minor aquifer and treated surface water from City of Taylor. Based on the available supplies, the City of Thrall is projected to have a adequate supplies through the year 2070. No change in water supply is recommended. Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of 120 gpcd in 2070.

5.36.21 Williamson-Travis County MUD #1

Williamson-Travis County MUD #1 has demand in Williamson and Travis (Region K) counties and obtains its water supply from the City of Cedar Park. Balance information in Table 5.36-1 represents the cumulative totals for Williamson-Travis County MUD#1 in both counties and regions. Surpluses are projected through the year 2070 and no changes in water supply are recommended.

Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of120 gpcd in 2070.

5.36.22 Williamson County MUD #10

Description of Supply

Williamson County MUD #10 obtains its water supply from the City of Round Rock. While the contract will supply enough water to meet the needs of Williamson County MUD #10, conservation is recommended to reduce the demand.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended for Williamson County MUD #10.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $323,360 in 2070
- Unit Cost: $470/acft

Table 5.36-16. Recommended Plan Costs by Decade for Williamson County MUD #10

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(61)*	*(181)*	*(352)*	*(489)*	*(587)*	*(688)*
Conservation						
Supply From Plan Element (acft/yr)	61	181	352	489	587	688
Annual Cost ($/yr)	$28,670	$85,070	$165,440	$229,830	$275,890	$323,360
Projected Surplus/(Shortage) after Conservation	*0*	*0*	*0*	*0*	*0*	*0*

5.36.23 Williamson County MUD #11

Description of Supply

Williamson County MUD #11 obtains its water supply from the City of Round Rock. While the contract will supply enough water to meet the needs of Williamson County MUD #11, conservation is recommended to reduce the demand.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Williamson County MUD #11.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $155,320 in 2070
- Unit Cost: $470/acft

Table 5.36-17. Recommended Plan Costs by Decade for Williamson County MUD #11

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(35)*	*(103)*	*(193)*	*(233)*	*(278)*	*(326)*
Conservation						
Supply From Plan Element (acft/yr)	35	103	193	233	278	326
Annual Cost ($/yr)	$16,450	$48,410	$90,710	$109,510	$130,660	$153,220
Projected Surplus/(Shortage) after Conservation	*0*	*0*	*0*	*0*	*0*	*0*

5.36.24 Williamson County MUD #9

Description of Supply

Williamson County MUD #9 obtains its water supply from the City of Round Rock. While the contract will supply enough water to meet the needs of Williamson County MUD #9, conservation is recommended to reduce the demand.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for Williamson County MUD #9.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: maximum of $210,560 in 2070
- Unit Cost: $470/acft

Table 5.36-18. Recommended Plan Costs by Decade for Williamson County MUD #9

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(37)*	*(128)*	*(263)*	*(319)*	*(382)*	*(448)*
Conservation						
Supply From Plan Element (acft/yr)	37	128	263	319	382	448
Annual Cost ($/yr)	$17,390	$60,160	$123,610	$149,930	$179,540	$210,560
Projected Surplus/(Shortage) after Conservation	*0*	*0*	*0*	*0*	*0*	*0*

5.36.25 County-Other

Description of Supply

Entities in Williamson County-Other obtain water supply from groundwater from the Trinity and Edwards (BFZ) Aquifers as well as other minor aquifers. Williamson County-Other also obtains a portion of its water supply from the City of Round Rock, the City of Taylor, City of Austin, and run-of-river rights. A portion of County-Other demand is located in Region K portion of Williamson County. Based on the available groundwater and surface water supply, Williamson County-Other is projected to have a shortage from 2020 through year 2070. Balance and strategies represented in Table 5.36-19 represent the cumulative totals for Williamson County-Other in both regions.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and in coordination with Region K, the following water management strategies are recommended for Williamson County - Other.

a. Advanced Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Unit Cost: $470/acft
   - Annual Cost: maximum of $201,693 in 2070

b. Purchase from the BRA (Lake Granger) through the East Williamson County Water Supply Project
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Annual Cost: Maximum of $2,697,900 in 2020
   - Unit Cost: Maximum of $1,173/acft in 2020

c. Little River OCR

- Cost Source: Volume II, Chapters 7.4 and 12
  - Strategy could be supplied by the BRA System Operation, dependent on permit approval by TCEQ
- Date to be Implemented: 2030
- Project Cost: $487,611,000
- Unit Cost: $1,038/acft

During the Brazos G regional water planning process, water management strategies such as additional development of Carrizo-Wilcox Aquifer groundwater and the Lake Granger Augmentation Project were preferred options to include in the 2016 Brazos G Regional Water Plan. When confronted by the Modeled Available Groundwater (MAG) limitations of these two options, the BGRWPG has little alternative but to make the Little River Off-Channel Reservoir a recommended strategy.

d. Purchase from SAWS Vista Ridge Project

- Cost Source: Volume II, Chapters 12 and Region L (Appendix K)

  This project will contract to purchase 5,700 acft/yr from Vista Ridge Project sponsored by San Antonio Water Systems.
- Date to be Implemented: 2020
- Project Cost: none. Project costs to be borne by SAWS
- Unit Cost: $2,177/acft

Conservation and advanced conservation were considered; however, the entity's current per capita use rate is below the selected target rate of 120 gpcd in 2070.

Table 5.36-19. Recommended Plan Costs by Decade for Williamson County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(7,973)*	*(10,262)*	*(13,402)*	*(13,242)*	*(17,890)*	*(22,243)*
Advanced Conservation (Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	—	—	56	567	1,432	2,594
Annual Cost ($/yr)	—	—	$26,320	$266,490	$673,040	$1,219,180
Projected Surplus/(Shortage) after Advanced Conservation	*(7,973)*	*(10,262)*	*(13,346)*	*(12,675)*	*(16,458)*	*(19,649)*
Purchase from the BRA (Lake Granger) through the EWCWSP						
Supply From Plan Element (acft/yr)	2,300	2,300	2,300	2,300	2,300	2,300
Annual Cost ($/yr)	$2,697,900	$2,697,900	$1,734,200	$1,734,200	$1,734,200	$1,734,200
Unit Cost ($/yr)	$1,173	$1,173	$754	$754	$754	$754
Little River OCR						
Supply From Plan Element (acft/yr)	—	2,267	5,352	5,346	8,466	11,658

Table 5.36-19. Recommended Plan Costs by Decade for Williamson County – Other

Plan Element	2020	2030	2040	2050	2060	2070
Annual Cost ($/yr)	—	$2,353,000	$5,555,000	$2,470,000	$3,911,000	$4,080,000
Unit Cost ($/yr)	—	$1,038	$1,038	$462	$462	$350
Purchase from SAWS Vista Ridge Project (Region L)						
Supply From Plan Element (acft/yr)	5,700	5,700	5,700	5,700	5,700	5,700
Annual Cost ($/yr)	$12,409,000	$12,409,000	$12,409,000	$12,409,000	$12,409,000	$12,409,000
Unit Cost ($/yr)	$2,177	$2,177	$2,177	$2,177	$2,177	$2,177

5.36.26 Manufacturing

Description of Supply

Williamson County Manufacturing obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer as well as other minor aquifers. Williamson County Manufacturing also obtains a portion of its water supply from run-of-river rights. Based on the available groundwater and surface water supply, Williamson County Manufacturing is projected to have a shortage through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet water needs for Williamson County Manufacturing.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: Not determined

Table 5.36-20. Recommended Plan Costs by Decade for Williamson County – Manufacturing

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(11)*	*(10)*	*(11)*	*(11)*	*(11)*	*(11)*
Conservation						
Supply From Plan Element (acft/yr)	71	135	212	234	254	276
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation	*60*	*125*	*201*	*223*	*243*	*265*

ND – Not Determined. Costs to implement industrial conservation technologies will vary based on each location.

5.36.27 Steam-Electric

There is no Steam-Electric demand or supply in Williamson County.

5.36.28 Mining

Description of Supply

Williamson County Mining obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and run-of-river rights. Based on the available groundwater and surface water supply, Williamson County Mining is projected to have a shortage through the year 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Williamson County-Mining. Associated costs are included for each strategy.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: not determined

b. Leave needs unmet
   - Cost Source: Cost of not meeting needs – see Appendix H
   - Date to be Implemented: 2020

Table 5.36-21. Recommended Plan Costs by Decade for Williamson County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(4,748)*	*(5,832)*	*(6,949)*	*(8,140)*	*(9,367)*	*(10,771)*
Conservation						
Supply From Plan Element (acft/yr)	155	312	515	599	685	783
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(4,593)*	*(5,520)*	*(6,433)*	*(7,541)*	*(8,682)*	*(9,988)*
Leave Needs Unmet						
Supply From Plan Element (acft/yr)	4,593	5,520	6,433	7,541	8,682	9,988
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.36.29 Irrigation

Description of Supply

Williamson County Irrigation is supplied by groundwater from the Trinity and Edwards Aquifers and surface water from run of the river water rights. Irrigation is projected to have shortages beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Williamson County-Irrigation.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: $230/acft

b. Groundwater Development – Edwards Aquifer
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: before 2020
   - Project Cost: $1,220,000
   - Unit Cost: Max of $1,679 acft/yr (2020)

Table 5.36-22. Recommended Plan Costs by Decade for Williamson County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(71)*	*(71)*	*(71)*	*(72)*	*(72)*	*(72)*
Conservation						
Supply From Plan Element (acft/yr)	5	8	11	11	11	11
Annual Cost ($/yr)	$1,150	$1,840	$2,530	$2,530	$2,530	$2,530
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(66)*	*(63)*	*(60)*	*(61)*	*(61)*	*(62)*
Groundwater Development – Edwards Aquifer						
Supply From Plan Element (acft/yr)	66	63	60	61	61	62
Annual Cost ($/yr)	$110,800	$110,800	$8,800	$8,800	$8,800	$8,800
Unit Cost ($/acft)	$1,679	$1,679	$133	$133	$133	$133

5.36.30 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

5.37 Young County Water Supply Plan

Table 5.37-1 lists each water user group in Young County and their corresponding surplus or shortage in years 2040 and 2070. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 5.37-1. Young County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Fort Belknapp WSC	(41)	(81)	Projected shortage – see plan below.
City of Graham	379	88	Projected surplus
City of Newcastle	0	0	Demand equals supply
County-Other	82	15	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	11,869	10,542	Projected surplus
Mining	(196)	(73)	Projected shortage – see plan below.
Irrigation	(48)	(44)	Projected shortage – see plan below.
Livestock	0	0	Demand equals supply

1 – From Tables C-59 and C-60, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

5.37.1 Fort Belknapp WSC

Description of Supply

Fort Belknap WSC obtains water from the City of Graham and shows no projected shortages. This WUG is located in multiple counties (Young, Palo Pinto, Throckmorton, and Stephens). The surplus shown in Table 5.37-1 represents the cumulative totals for Fort Belknap WSC.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortage for Fort Belknapp WSC. Conservation was considered, but the entity's per capita use is less than the target per capita of 140 gpcd.

a. Purchase Additional Water from City of Graham:

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Unit Cost: $880/acft ($2.70/kgal) assumed treated wholesale rate. Existing infrastructure is assumed sufficient for additional supply
- Annual Cost: $74,800

Table 5.37-2. Recommended Plan Costs by Decade for Fort Belknapp WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(27)*	*(36)*	*(41)*	*(51)*	*(66)*	*(81)*
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(27)*	*(36)*	*(41)*	*(51)*	*(66)*	*(81)*
Purchase Additional Water from City of Graham						
Supply From Plan Element (acft/yr)	85	85	85	85	85	85
Annual Cost ($/yr)	$74,800	$74,800	$74,800	$74,800	$74,800	$74,800
Unit Cost ($/acft)	$880	$880	$880	$880	$880	$880

5.37.2 City of Graham

Description of Supply

The City of Graham obtains surface water from Lakes Graham and Eddleman and a contract with BRA for 1,000 acft/yr. There is some estimated exempt groundwater pumping within the city limits. The City has contracts to sell treated and raw water supply totaling 848 acft/yr to Newcastle, Bryson, Fort Belknapp WSC, entities in Young County-Other, Young County Manufacturing and Young County Steam-Electric. No future shortages are projected and no changes in water supply are recommended.

Water Supply Plan

Although the City has sufficient supplies, working within the planning criteria established by the Brazos G RWPG and TWDB, conservation is recommended for the City as the current per capita use rate is above the selected target rate of 140 gpcd.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020 – use rate exceeds 140 gpcd
- Annual Cost: $597,224 in 2070
- Unit Cost: $474/acft

Table 5.37-3. Recommended Plan Costs by Decade for City of Graham

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*539*	*444*	*379*	*291*	*190*	*88*
Conservation						
Supply From Plan Element (acft/yr)	140	354	568	795	1,029	1,260
Annual Cost ($/yr)	$66,267	$167,589	$269,394	$376,678	$487,688	$597,224
Projected Surplus/(Shortage) after Conservation (acft/yr)	*679*	*798*	*947*	*1,086*	*1,219*	*1,348*

5.37.3 City of Newcastle

The City of Newcastle receives all of its water supply from the City of Graham. No future shortages are projected for the City of Newcastle and no changes in water supply are recommended. Conservation was considered, but the entity's per capita use is less than the target per capita of 140 gpcd.

5.37.4 County-Other

Entities in Young County-Other receive water supply from City of Graham and groundwater. A portion of Young County-Other is located in Region B. No future shortages are projected and no changes in water supply are recommended. Conservation was considered, but the entity's per capita use is less than the target per capita of 140 gpcd.

5.37.5 Manufacturing

Young County Manufacturing is supplied by Graham and entities in Young County-Other. No future shortages are projected and no changes in water supply are recommended.

5.37.6 Steam-Electric

No future shortages are projected and no changes in water supply are recommended.

5.37.7 Mining

Description of Supply

Mining is projected to have shortages beginning in 2020. No supplies have been allocated to Mining in Young County.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following plan is recommended for Young County Mining. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: not determined

b. Groundwater Development – Undifferentiated "Other" Aquifers

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: before 2020
- Project Cost: $3,089,000
- Unit Cost: Max of $1,048/acft

Table 5.37-4. Recommended Plan Costs by Decade for Young County – Mining

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(187)*	*(276)*	*(196)*	*(151)*	*(105)*	*(73)*
Conservation						
Supply From Plan Element (acft/yr)	6	14	14	11	7	5
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(181)*	*(262)*	*(182)*	*(140)*	*(98)*	*(68)*
Groundwater Development – Undifferentiated "Other" Aquifers						
Supply From Plan Element (acft/yr)	270	270	260	260	260	260
Annual Cost ($/yr)	$282,900	$282,900	$22,900	$22,900	$22,900	$22,900
Unit Cost ($/acft)	$1,048	$1,048	$85	$85	$85	$85

ND – Not determined. Costs to implement industrial conservation technologies will vary based on each location

5.37.8 Irrigation

Description of Supply

An increase of Irrigation demand is projected for Young County, but no supplies are currently allocated and a shortage is projected beginning in 2020.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following plan is recommended for Young County Irrigation. Associated costs are included for each strategy.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Annual Cost: $690
- Unit Cost: $273/acft

b. Groundwater Development – Undifferentiated "Other" Aquifers

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020
- Project Cost: $1,172,000
- Unit Cost: $2,148/acft

Table 5.37-5. Recommended Plan Costs by Decade for Young County – Irrigation

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(51)*	*(50)*	*(48)*	*(47)*	*(45)*	*(44)*
Conservation						
Supply From Plan Element (acft/yr)	2	3	3	3	3	3
Annual Cost ($/yr)	$460	$690	$690	$690	$690	$690
Projected Surplus/(Shortage) after Conservation (acft/yr)	*(49)*	*(48)*	*(45)*	*(44)*	*(42)*	*(41)*
Groundwater Development – Undifferentiated "Other" Aquifers						
Supply From Plan Element (acft/yr)	50	50	50	50	50	50
Annual Cost ($/yr)	$107,418	$107,418	$8,418	$8,418	$8,418	$8,418
Unit Cost ($/acft)	$2,148	$2,148	$168	$168	$168	$168

5.37.9 Livestock

Livestock water supply is projected to meet demands through 2070 and no changes in water supply are recommended.

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5.38 Wholesale Water Provider Supply Plans

Table 5.38-1 lists each wholesale water provider in the Brazos G Area and its corresponding surplus or shortage in years 2040 and 2070. A brief summary of the wholesale water provider (WWP) and the plan for the selected WWPs are presented in the following sub chapters. For each wholesale water provider with a projected shortage, a water supply plan has been developed and is presented in the following sub chapters. **Note that shortages shown reflect full contractual commitments compared to existing supplies.**

Table 5.38-1.Wholesale Water Provider Surplus/(Shortage)

Wholesale Water Provider	Surplus/(Shortage)[1,2]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
Brazos River Authority (Lake Aquilla System)	1,426	696	Projected shortage – see plan below
Brazos River Authority (Little River System)	(67,791)	(95,859)	Projected shortage – see plan below
Brazos River Authority (Main Stem System)[3]	(109,174)	(139,428)	Projected shortage – see plan below
Aquilla Water Supply District	1	1	Projected surplus
Bell County WCID No. 1	(988)	(6,951)	Projected shortage – see plan below
Bistone MWSD	(2,792)	(3,112)	Projected shortage – see plan below
Bluebonnet WSC	(103)	(536)	Projected shortage – see plan below
Central Texas WSC	787	13	Projected surplus
Eastland County WSD	346	232	Projected surplus
Heart of Texas	(5,593)	(5,593)	Projected shortage – see plan below
North Central Texas MWA	(937)	(1,597)	Projected shortage – see plan below
Palo Pinto County MWD No. 1	(4,562)	(5,174)	Projected shortage – see plan below
Upper Leon MWD	(75)	(458)	Projected shortage – see plan below
West Central Texas MWD	(1,167)	(1,583)	Projected shortage – see plan below
City of Abilene	(27,176)	(27,206)	Projected shortage – see plan below
City of Anson	633	606	Projected surplus
City of Bryan	(5,533)	(26,578)	Projected shortage – see plan below
City of Cedar Park	(4,082)	(4,348)	Projected shortage – see plan below
City of Cleburne	(1,314)	(4,625)	Projected shortage – see plan below
City of Gatesville	(1,405)	(4,510)	Projected shortage – see plan below
Johnson County SUD	7,019	1,966	Projected surplus
Kempner WSC	(1,076)	(1,868)	Projected shortage – see plan below
City of Mineral Wells	0	0	Projected surplus
City of Round Rock	(14,028)	(46,089)	Projected shortage – see plan below
City of Stamford	2,099	1,845	Projected surplus

Table 5.38-1.Wholesale Water Provider Surplus/(Shortage)

Wholesale Water Provider	Surplus/(Shortage)[1,2]		Comment
	2040 (acft/yr)	2070 (acft/yr)	
City of Sweetwater	(2,544)	(3,184)	Projected shortage – see plan below
City of Temple	(4,554)	(13,518)	Projected shortage – see plan below
City of Waco	6,114	(2,730)	Projected surplus

1 - From Chapter 4.3 – Water Needs for Wholesale Water Providers

2 - Shortages shown above often include shortages from other WWPs. The shortages shown for individual WWPs should not be summed to a regional total.

3 - Includes demands from Region H.

5.38.1 Brazos River Authority (Lake Aquilla System)

Description of Supply

The Brazos River Authority (Lake Aquilla System) obtains water supply from Lake Aquilla. Based on the available surface water supply, the Lake Aquilla System is projected to have a surplus of 1,912 acft/yr in the year 2020 decreasing to 696 acft/yr by year 2070. Table 3.1-3 in Chapter 3 includes additional information on contracts and water supplies for the Lake Aquilla System. Due to the estimated reliable supply, surpluses are expected through 2070.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG, the following water supply plan is recommended for the Lake Aquilla System:

a. Lake Aquilla Reallocation (Volume II, Chapter 7.6)

- Cost Source: Volume II, Chapter 7.6
- Date to be Implemented: Before 2020
- Total Project Cost: $21,887,000
- Unit Cost: Max of $865/acft

Table 5.38-2. Recommended Plan Costs by Decade for BRA Lake Aquilla System

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,912*	*1,669*	*1,426*	*1,182*	*939*	*696*
Lake Aquilla Reallocation (Volume II, Chapter 7.6)						
Supply From Plan Element (acft/yr)	2,400	2,400	2,400	2,400	2,400	2,400
Annual Cost ($/yr)	$2,075,000	$2,075,000	$244,800	$244,800	$244,800	$244,800
Unit Cost ($/yr)	$865	$865	$102	$102	$102	$102

5.38.2 Brazos River Authority (Little River System)

Description of Supply

The Brazos River Authority Little River System obtains its water supply from Lake Proctor, Lake Belton, Stillhouse Hollow Reservoir, Lake Georgetown, and Lake Granger. Based on the available surface water supply and recommended water management strategies, the Brazos River Authority Little River System is projected to have a shortage of 90,223 acft/yr in the year 2040 and 123,386 acft/yr in the year 2070. Shortages for the BRA Little River System are based on a comparison of supplies and current contractual commitments, not projected demands for those entities holding contracts with the BRA. In addition, the shortages projected include other demands over and above current contractual commitments totaling approximately 50,285 acft/yr in year 2070.

Supplies from Lake Granger are allocated to meet BRA system demands, except for 13,015 acft/yr specifically allocated to the East Williamson County Water Treatment Plant (EWCWTP), which supplies water to the City of Taylor and is intended to supply other entities in eastern Williamson County and Bell County. Currently, 7,003 acft/yr of that supply is allocated to meet the City of Taylor's projected demands, with the remaining 6,012 acft/yr from the EWCWTP available for other users as a water management strategy. Table 3.1-3 in Chapter 3 includes additional information on contracts and water supplies for the Little River System.

Note that the shortages shown are based on full contractual supplies. Actual full use of those contracts is unlikely to occur until later years of the planning period and the shortages shown are more likely to occur later than shown here. The BRA has an existing System Order that allows BRA to divert from each individual reservoir an annual amount greater than the reservoir's authorized diversion and assign the difference to another reservoir in the system. While this does not increase the authorized supply from the BRA system, it provides operational flexibility within the BRA's system.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG, the following water supply plan is recommended to meet the projected shortages for BRA's Little River System:

a. Lake Granger Augmentation

- Cost Source: Volume II, Chapter 7.7
- Date to be Implemented: 2020
- Total Project Cost: $722,227,000

This strategy is recommended with a zero supply because the groundwater supply necessary to develop the project is not available under the MAG. Should additional MAG become available; this supply can be updated accordingly.

b. Little River OCR

- Cost Source: Volume II, Chapter 4.8
- Date to be Implemented: Before 2030

- Total Project Cost: $248,761,000 (Reservoir Only)
- Unit Cost: Max of $413 / acft in 2020

During the Brazos G regional water planning process, water management strategies such as additional development of Carrizo-Wilcox Aquifer groundwater and the Lake Granger Augmentation Project were preferred options to include in the 2016 Brazos G Regional Water Plan. When confronted by the Modeled Available Groundwater (MAG) limitations of these two options, the BGRWPG has little alternative but to make the Little River Off-Channel Reservoir a recommended or alternative strategy.

c. BRA System Operation
   - Cost Source: Volume II, Chapter 7.11
   - Date to be Implemented: by 2020
   - Total Project Cost: $23,581,674. Includes, engineering and legal costs necessary to obtain the water right permit and environmental studies.
   - Unit Cost: $20/acft

d. Lake Granger ASR
   - Cost Source: Volume II, Chapter 10.4
   - Date to be Implemented: before 2020
   - Total Project Cost: $99,820,000 (sum of 3 phases)
   - Unit Cost: Max of $1,291/acft in 2030

e. Belton to Stillhouse Pipeline – this strategy is for operational purposes and does not provide additional supply
   - Cost Source: Volume II, Chapter 7.1
   - Date to be Implemented: Before 2020
   - Total Project Cost: $38,069,000
   - Unit Cost: not applicable

f. Alternative: Lake Granger Augmentation Phase 1
   - Cost Source: Volume II, Chapter 7.7
   - Date to be Implemented: before 2020
   - Total Project Cost: $85,170,000
   - Unit Cost: Max of $584 / acft in 2020

g. Alternative: Lake Granger Augmentation Phase 2
   - Cost Source: Volume II, Chapter 7.7
   - Date to be Implemented: Sometime in the 2020 decade
   - Total Project Cost: $637,057,000
   - Unit Cost: Max of $1,611/ acft in 2020

h. Alternative: Storage Reallocation of Federal Reservoirs (Granger)

- Cost Source: Volume II, Chapter 7.7
- Date to be Implemented: Sometime in the 2020 decade
- Total Project Cost: $28,710,000
- Unit Cost: Max of $1,552 / acft in 2020

i. Alternative: Storage Reallocation of Federal Reservoirs (Stillhouse Hollow)

- Cost Source: Volume II, Chapter 7.8
- Date to be Implemented: 2020
- Total Project Cost: $36,553,000
- Unit Cost: Max of $1,177/ acft in 2020

j. Alternative: Sediment Reduction Program

- Cost Source: Volume II, Chapter 7.10
- Date to be Implemented: Sometime in the 2020 decade
- Total Project Cost: not determined for Little River Watershed
- Unit Cost: Not determined

Table 5.38-3. Recommended Plan Costs by Decade for the BRA Little River System

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(60,385)*	*(64,943)*	*(67,791)*	*(75,115)*	*(95,314)*	*(95,859)*
Lake Granger Augmentation (Volume II, Chapter 7.7)						
Supply From Plan Element (acft/yr)	0	0	0	0	0	0
Annual Cost ($/yr)	$79,502,171	$79,336,899	$79,172,211	$79,006,939	$23,439,965	$23,353,650
Unit Cost ($/yr)	ND	ND	ND	ND	ND	ND
Little River OCR (Volume II, Chapter 4.7)						
Supply From Plan Element (acft/yr)	—	56,150	56,150	56,150	56,150	56,150
Annual Cost ($/yr)	—	$23,189,950	$23,189,950	$23,189,950	$23,189,950	$4,548,150
Unit Cost ($/yr)	—	$413	$413	$413	$413	$81
BRA System Operations (Volume II, Chapter 7.11)						
Supply From Plan Element (acft/yr)	10,260	12,413	12,519	11,146	13,638	14,853
Annual Cost ($/yr)	$205,200	$248,260	$251,820	$229,920	$272,760	$297,060
Unit Cost ($/yr)	$20	$20	$20	$20	$20	$20
Lake Granger ASR (Volume II, Chapter 10.4)						
Supply From Plan Element (acft/yr)	9,050	9,050	9,050	9,050	9,050	9,050
Annual Cost ($/yr)	$7,874,000	$11,686,000	$11,686,000	$3,334,000	$3,334,000	$3,334,000
Unit Cost ($/yr)	$870	$1,291	$1,291	$368	$368	$368

Table 5.38-3. Recommended Plan Costs by Decade for the BRA Little River System

Plan Element	2020	2030	2040	2050	2060	2070
Belton to Stillhouse Pipeline (Volume II, Chapter 7.1)						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	$4,620,000	$4,620,000	$1,428,000	$1,428,000	$1,428,000	$1,428,000
Unit Cost ($/yr)	—	—	—	—	—	—
Alternative: Lake Granger Augmentation Phase 1 (Volume II, Chapter 7.7)						
Supply From Plan Element (acft/yr)	8,509	8,226	7,944	7,661	7,379	7,096
Annual Cost ($/yr)	$4,969,256	$4,803,984	$4,639,296	$4,474,024	$2,250,595	$2,164,280
Unit Cost ($/yr)	$584	$584	$584	$584	$305	$305
Alternative: Lake Granger Augmentation Phase 2						
Supply From Plan Element (acft/yr)	46,265	46,265	46,265	46,265	46,265	46,265
Annual Cost ($/yr)	$74,532,915	$74,532,915	$74,532,915	$74,532,915	$21,189,370	$21,189,370
Unit Cost ($/yr)	$1,611	$1,611	$1,611	$1,611	$458	$458
Alternative: Storage Reallocation of Federal Reservoirs (Granger)						
Supply From Plan Element (acft/yr)	1,940	1,940	1,940	1,940	1,940	1,940
Annual Cost ($/yr)	$3,011,000	$3,011,000	$609,000	$609,000	$609,000	$609,000
Unit Cost ($/yr)	$1,552	$1,552	$314	$314	$314	$314
Alternative: Storage Reallocation of Federal Reservoirs (Lake Stillhouse Hollow)						
Supply From Plan Element (acft/yr)	2,643	2,643	2,643	2,643	2,643	2,643
Annual Cost ($/yr)	$3,110,000	$3,110,000	$51,000	$51,000	$51,000	$51,000
Unit Cost ($/yr)	$1,177	$1,177	$19	$19	$19	$19
Alternative: Sediment Reduction Program						
Supply From Plan Element (acft/yr)	Not Determined for Little River Watershed Reservoirs					
Annual Cost ($/yr)						
Unit Cost ($/yr)						

5.38.3 Brazos River Authority (Main Stem/Lower Basin System)

Description of Supply

The Brazos River Authority (Main Stem/Lower Basin System) obtains water supply from Possum Kingdom Reservoir, Lake Granbury, Lake Whitney, Lake Somerville, and Lake Limestone. Based on the available surface water supply, the Brazos River Authority Main Stem/Lower Basin System is projected to have a shortage of 96,417 acft/yr in the year 2040 and 141,083 acft/yr in the year 2070, including the projected demands on the BRA Main Stem/Lower Basin System from Region H and supplies to Region C. Table 3.1-3 in Chapter 3 includes additional information on contracts and water supplies for the Main Stem/Lower Basin System.

Note that the shortages shown are based on full contractual supplies. Actual full use of those contracts is unlikely to occur until later years of the planning period and the shortages shown are more likely to occur later than shown here. The BRA has an existing System Order that allows BRA to divert from each individual reservoir an annual amount greater than the reservoir's authorized diversion and assign the difference to another reservoir in the system. While this does not increase the authorized supply from the BRA system, it provides operational flexibility within the BRA's system.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG, the following water supply plan is recommended to meet the projected shortages for the Main Stem System:

a. BRA System Operation

- Cost Source: Volume II, Chapter 7.11
- Date to be Implemented: by 2020
- Total Project Cost: $23,581,674. Includes, engineering and legal costs necessary to obtain the water right permit and environmental studies.
- Unit Cost: $20/acft

b. Chloride Control Project

- Cost Source: Volume II, Chapter 7.3
- Date to be Implemented: before 2030
- Total Project Cost: $172,652,000
- Unit Cost: Not determined. Cost benefits result from reduced treatment costs downstream. Cost benefits range from $115/acft in the upper basin to $45/acft in the lower basin. Estimated total annual treatment cost reduction across the basin for 11,202 acft/yr of municipal use is $25,653,000.

c. Alternative: Storage Reallocation of Federal Reservoirs (Whitney)

- Cost Source: Volume II, Chapter 7.9
- Date to be Implemented: Sometime in the 2020 decade
- Total Project Cost: $89,948,000
- Unit Cost: Max of $361 / acft in 2020

d. Alternative: Sediment Reduction Program (Lake Limestone watershed)

- Cost Source: Volume II, Chapter 7.10
- Date to be Implemented: before 2020
- Total Project Cost: $1,075,000
- Annual Cost: Max of $288,000 in 2020
- Unit Cost: Max of $324/acft in 2030

Table 5.38-4. Recommended Plan Costs by Decade for the BRA Main Stem System

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	(95,223)	(101,871)	(109,174)	(118,902)	(128,990)	(139,428)
BRA System Operations (Volume II, Chapter 7.11)[1]						
Supply From Plan Element (acft/yr)	118,264	117,241	119,213	122,010	125,267	129,803
Annual Cost ($/yr)	$1,904,460	$2,037,420	$21,834,480	—	—	—
Unit Cost ($/yr)	$20	$20	$20	$20	$20	$20
Chloride Control Project (Volume II, Chapter 7.3)						
Supply From Plan Element (acft/yr)	—	2,475	2,475	2,475	2,475	2,475
Annual Cost ($/yr)[2]	—	$14,447,000	$14,447,000	$0	$0	$0
Unit Cost ($/yr)	—	N/A	N/A	N/A	N/A	N/A
Alternative: Storage Reallocation of Federal Reservoirs (Whitney)						
Supply From Plan Element (acft/yr)	20,842	20,842	20,842	20,842	20,842	20,842
Annual Cost ($/yr)	$7,527,000	$7,527,000	$79,000	$79,000	$79,000	$79,000
Unit Cost ($/yr)	$361	$361	$4	$4	$4	$4
Alternative: Sediment Reduction Program						
Supply From Plan Element (acft/yr)	0	177	355	532	710	888
Annual Cost ($/yr)	$288,000	$288,000	$148,000	$148,000	$148,000	$148,000
Unit Cost ($/yr)	N/A	$1,627	$417	$278	$208	$167

1 – Includes supply to be made available for Region G and Region H needs.

2 – Project consultants have prepared a pro forma analysis indicating that revenue from salt sales would cover all O&M costs.

5.38.4 Aquilla Water Supply District

Description of Supply

Aquilla WSD obtains raw water from Lake Aquilla through a contract with the BRA. The district supplies treated water to five wholesale customers. Table 4.3-2 in Chapter 4 includes additional information on contracts and water supplies for Aquilla WSD. A shortage is projected in 2020 for the District due to a short term contract with Hillsboro.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortage for Aquilla WSD.

a. Lake Aquilla Augmentation (Volume II, Chapter 5.1)

- Cost Source: Volume II, Chapter 5.1
- Date to be Implemented: Before 2020

- Total Project Cost: $5,714,856
- Unit Cost: Max of $926/acft

Table 5.38-5. Recommended Plan Costs by Decade for Aquilla WSD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(559)*	*1*	*1*	*1*	*1*	*1*
Lake Aquilla Augmentation (Volume II, Chapter 5.1)						
Supply From Plan Element (acft/yr)	750	750	750	750	750	750
Annual Cost ($/yr)	$695,000	$695,000	$695,000	$695,000	$695,000	$695,000
Unit Cost ($/yr)	$926	$926	$926	$926	$926	$926

5.38.5 Bell County WCID No. 1

Description of Supply

Bell County WCID No. 1 obtains its water supply from Lake Belton through BRA contracts (62,509 acft/yr). The district's fresh water customers have year 2070 projected demands of 62,509 acft/yr, compared to the district's total supply from the BRA of 56,634 acft/yr (the full 62,509 acft/yr is not currently firm). Table 4.3-3 in Chapter 4 includes additional information on contracts and water supplies for Bell County WCID No.1. Therefore, the district has needs projected for its customers starting in 2030. BRA strategies for the Little River System will firm up contracts to provide the full amount of supply during drought of record conditions.

Bell County WCID is pursuing TCEQ Reclaimed Water Type I permits to utilize treated wastewater from wastewater treatment plants (WWTP) 1 and 2 and the South WWTP. The District has evaluated several wastewater reuse options as part of its Master Plan update. The reuse portion of the Master Plan identifies both near-term potential customers as well as other future customers that would utilize the total available reuse supply generated through the District's regional wastewater system.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortage for Bell County WCID No.1.

a. Firm up Supplies through BRA Little River System Strategies-See Section 5.38.2
    - Cost Source: Section 5.38.2
    - Date to be Implemented: 2020
    - Total Project Cost: borne by BRA
    - Unit Cost: already contracted supplies

b. Voluntary Redistribution from Killeen's Contract

Projections indicate that Killeen will have a surplus of supply under their current contract with Bell County WCID No.1. This recommended strategy would reduce the contracted amount to Killeen, while still providing a surplus of supply to Killeen and would enable Bell County WCID No. 1 to provide this supply to Bell County-Other entities. This strategy would require that Killeen be willing to restructure their contract with Bell County WCID No. 1.

- Cost Source: No Cost
- Date to be Implemented: 2040
- Total Project Cost: N/A
- Unit Cost: N/A

Table 5.38-6. Recommended Plan Costs by Decade for Bell County WCID No.1

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*0*	*(307)*	*(931)*	*(4,556)*	*(5,617)*	*(7,140)*
Firm up Supplies through BRA Little River System Strategies-See Section 5.38.2						
Supply From Plan Element (acft/yr)	—	307	908	4,089	4,886	6,145
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/yr)	—	$0	$0	$0	$0	$0
Voluntary Redistribution from Killeen Contract						
Supply From Plan Element (acft/yr)	0	0	23	467	731	995
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/yr)	—	—	—	—	—	—

Reuse Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected reuse water shortage for Bell County WCID No.1:

a. North Reuse

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Total Project Cost: $12,146,000
- Unit Cost: Max of $765 / acft in 2020

b. South Reuse

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Total Project Cost: $6,529,000
- Unit Cost: Max of $930 / acft in 2020

Table 5.38-7. Recommended Plan Costs by Decade for Bell County WCID No. 1 for Reuse Supplies

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(3,173)*	*(3,173)*	*(3,173)*	*(3,173)*	*(3,173)*	*(3,193)*
Bell County WCID #1-North Reuse (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	1,945	1,945	1,945	1,945	1,945	1,945
Annual Cost ($/yr)	$1,472,625	$1,472,625	$456,225	$456,225	$456,225	$456,225
Unit Cost ($/yr)	$765	$765	$237	$237	$237	$237
Bell County WCID #1-South Reuse (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	748	748	748	748	748	748
Annual Cost ($/yr)	$696,000	$696,000	$150,000	$150,000	$150,000	$150,000
Unit Cost ($/yr)	$930	$930	$201	$201	$201	$201

5.38.6 Bistone Municipal Water Supply District

Description of Supply

Bistone MWSD obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer and surface water from Lake Mexia. Bistone MWSD has contracts to provide 5,259 acft/yr to nearby water user groups and is projected to have supply shortages through 2070. Table 4.3-4 in Chapter 4 includes additional information on contracts and water supplies for Bistone MWSD.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortages for Bistone MWSD:

a. Additional Carrizo Groundwater Development

- Cost Source: (Volume II, Chapter 12)
- Date to be Implemented: before 2020
- Total Project Cost: Max of $817/yr in 2020
- Unit Cost: Max of $2.50/acft in 2020

Table 5.38-8. Recommended Plan Costs by Decade for Bistone MWSD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,582)*	*(2,687)*	*(2,792)*	*(2,898)*	*(3,005)*	*(3,112)*
Carrizo Groundwater Development (Volume II, Chapter 12)						
Supply From Plan Element (acft/yr)	2,582	2,687	2,792	2,898	3,005	3,112
Annual Cost ($/yr)	$817	$817	$244	$244	$244	$244
Unit Cost	$2.51	$2.51	$0.75	$0.75	$0.75	$0.75

5.38.7 Bluebonnet Water Supply Corporation

Description of Supply

Bluebonnet Water Supply Corporation (WSC) obtains raw water from Lake Belton through contracts with the BRA totaling 8,301 acft; however the firm supply of those contracts is 7,365 in 2020 and decrease over the planning period. The WSC has projected shortages starting in 2030. BRA strategies for the Little River System will firm up contracts to provide the full amount of supply during drought of record conditions. Table 4.3-5 in Chapter 4 includes additional information on contracts and water supplies for Bluebonnet WSC.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortages for Bluebonnet WSC:

a. Firm up Supplies through BRA Little River System Strategies-see Section 5.38.2

- Cost Source: Section 5.38.2
- Date to be Implemented: 2020
- Total Project Cost: borne by BRA
- Unit Cost: already contracted supplies

Table 5.38-9. Recommended Plan Costs by Decade for Bluebonnet WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*240*	*(35)*	*(103)*	*(296)*	*(389)*	*(536)*
Firm up Supplies through BRA Little River System Strategies-see Section 5.38.2						
Supply From Plan Element (acft/yr)	—	35	103	296	389	536
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/yr)	—	$0	$0	$0	$0	$0

5.38.8 Central Texas Water Supply Corporation

Description of Supply

Central Texas WSC obtains its water supply from Lake Stillhouse Hollow through contracts with the BRA totaling 12,045 acft; however the firm supply of those contracts is 9,645 in 2020 and decrease over the planning period. Central Texas WSC also has recently constructed two wells in the Trinity Aquifer in Bell County that are counted as current supply as they will be online prior to 2020. Based on the available surface water and groundwater supply, currently contracted supplies, and projected demands for its current customers, Central Texas WSC is not projected to have shortages through 2070, assuming that all demands can be treated and delivered through current infrastructure. Table 4.3-6 in Chapter 4 includes additional information on contracts and water supplies for Central Texas WSC.

BRA strategies for the Little River System will firm up contracts to provide full amount of supply during drought of record.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for Central Texas WSC.

a. Pipeline to EWCRWTS

- Cost Source: Volume II, Chapter 8.2
- Date to be Implemented: 2020 although the project can be delayed until projected demands for customers approaches the current reliable BRA supply.
- Total Project Cost: $42,127,000 (Total Cost for all Participating Entities)
- Unit Cost: Max of $1,173 in 2020

b. Firm up of Supplies through BRA Little River System Strategies-see Section 5.38.2

- Cost Source: Section 5.38.2
- Date to be Implemented: 2020
- Total Project Cost: borne by BRA
- Unit Cost: already contracted supplies

Table 5.38-10. Recommended Plan Costs by Decade for Central Texas WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*1,825*	*1,376*	*787*	*317*	*199*	*13*
East Williamson County Water Project						
Supply From Plan Element (acft/yr)	2,240	2,240	2,240	2,240	2,240	2,240
Annual Cost ($/yr)	$2,627,520	$2,627,520	$1,688,960	$1,688,960	$1,688,960	$1,688,960
Unit Cost ($/yr)	$1,173	$1,173	$754	$754	$754	$754
Firm up of Supplies through BRA Little River System Strategies-see Section 5.38.2						
Supply From Plan Element (acft/yr)	2,401	2,850	2,939	3,409	3,527	3,713
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/yr)	$0	$0	$0	$0	$0	$0

5.38.9 Eastland County WSC

Eastland County WSD obtains its water supply from Lake Leon and a run-of-the-river right. No shortages are projected for Eastland County WSD and no changes in water supply are recommended. Table 4.3-7 in Chapter 4 includes additional information on contracts and water supplies for Eastland County WSD.

5.38.10 Heart of Texas Water Suppliers, LLC

Description of Supply

Heart of Texas has a contract to provide 5,600 acft/yr to the City of Hutto. Heart of Texas has a well field in the Carrizo-Wilcox Aquifer (Hooper formation) in Williamson County; however, the current MAG for the Carrizo-Wilcox in Williamson County is only 7 acft/yr. Heart of Texas also holds permits with the Lost Pines Groundwater Conservation District in Lee County for 3,300 acft/yr. A well has been constructed in Lee County, but it has not yet been brought online and is not counted as a current source of supply.

Table 4.3-8 in Chapter 4 includes additional information on contracts and water supplies for Heart of Texas.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortages for Heart of Texas.

a. Lee County Well Field

Utilize existing permits in Lee County, and assume additional permits can be obtained to meet needs for City of Hutto.

- Cost Source: Volume II, Chapter 12
- Date to be Implemented: 2020

- Total Project Cost: $127,086,000
- Unit Cost: $1,619/acft

Table 5.38-11. Recommended Plan Costs by Decade for Heart of Texas Suppliers, LLC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(5,593)*	*(5,593)*	*(5,593)*	*(5,593)*	*(5,593)*	*(5,593)*
Carrizo-Wilcox (Lee County)						
Supply From Plan Element (acft/yr)	5,593	5,593	5,593	7,503	9,710	11,994
Annual Cost ($/yr)	$9,055,000	$9,055,000	$4,094,000	$5,492,000	$7,108,000	$8,780,000
Unit Cost ($/yr)	$1,619	$1,619	$732	$732	$732	$732

5.38.11 North Central Texas Municipal Water Authority

Description of Supply

North Central Texas MWA owns and obtains its water supply from Millers Creek Reservoir. Based on the available surface water supply, shortages are expected through 2070. Table 4.3-9 in Chapter 4 includes additional information on contracts and water supplies for North Central Texas Municipal Water Authority.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for the North Central Texas MWA.

a. Millers Creek Augmentation (Option 4)
   - Cost Source: Volume II, Chapter 7.5
     - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
   - Date to be Implemented: 2020
   - Total Project Cost: $99,896,000
   - Unit Cost: Max of $2,958/ acft in 2020

b. Alternative: Lake Creek Reservoir
   - Cost Source: Volume II, Chapter 4.10
     - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
   - Date to be Implemented: 2020
   - Total Project Cost: $193,524,000
   - Unit Cost: $1,308 / acft

Table 5.38-12. Recommended Plan Costs by Decade for North Central Texas MWA

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(497)*	*(717)*	*(937)*	*(1,157)*	*(1,377)*	*(1,597)*
Millers Creek Augmentation (Volume II, Chapter 7.5)						
Supply From Plan Element (acft/yr)	2,425	2,425	2,425	2,425	2,425	2,425
Annual Cost ($/yr)	$1,135,872	$1,135,872	$1,135,872	$1,135,872	$931,200	$931,200
Unit Cost ($/yr)	$2,958	$2,958	$2,958	$2,958	$384	$384
Alternative: Lake Creek Reservoir (Volume II, Chapter 4.10)						
Supply From Plan Element (acft/yr)	14,500	14,500	14,500	14,500	14,500	14,500
Annual Cost ($/yr)	$18,961,000	$18,961,000	$9,716,000	$9,716,000	$4,541,000	$4,541,000
Unit Cost ($/yr)	$1,308	$1,308	$670	$670	$313	$313

5.38.12 Palo Pinto County Municipal Water District No. 1

Description of Supply

Palo Pinto County Municipal Water District owns and operates Lake Palo Pinto, which is used to supply water to entities in Palo Pinto and Parker Counties. A portion of its supply is used in Region C. The district has rights to 18,500 acft/yr for municipal and steam electric power uses. Treated water is supplied to the City of Mineral Wells (and its customers) and Lake Palo Pinto Area Water Supply Corporation. Projected demands indicate shortages through 2070. Table 4.3-10 in Chapter 4 includes additional information on contracts and water supplies for Palo Pinto County MWD No.1.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for the Palo Pinto County Municipal Water District No.1.

a. Lake Palo Pinto Expansion (Turkey Peak Dam)
    - Cost Source: Volume II, Chapter 4.13
    - Date to be Implemented: 2020
    - Total Project Cost: $83,363,000
    - Unit Cost: Max of $749 / acft in 2020

b. Alternative: Lake Palo Pinto Off-Channel Reservoir
    - Cost Source: Volume II, Chapter 4.6
    - Date to be Implemented: 2020
    - Total Project Cost: $34,685,000
    - Unit Cost: $980/ acft

Table 5.38-13. Recommended Plan Costs by Decade for Palo Pinto County Municipal Water District No.1

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(4,253)*	*(4,426)*	*(4,562)*	*(4,768)*	*(4,975)*	*(5,174)*
Turkey Peak Reservoir (Volume II, Chapter 4.13)						
Supply From Plan Element (acft/yr)	8,100	8,100	8,100	8,100	8,100	8,100
Annual Cost ($/yr)	$6,065,000	$6,065,000	$4,989,000	$4,989,000	$595,000	$595,000
Unit Cost ($/yr)	$749	$749	$616	$616	$73	$73
Alternative: Lake Palo Pinto OCR (Volume II, Chapter 4.6)						
Supply From Plan Element (acft/yr)	3,110	3,110	3,110	3,110	3,110	3,110
Annual Cost ($/yr)	$3,048,000	$3,048,000	$1,641,000	$1,641,000	$527,000	$527,000
Unit Cost ($/yr)	$980	$980	$528	$528	$169	$169

5.38.13 Upper Leon Municipal Water District

Description of Supply

Upper Leon MWD obtains its water supply through a contract with the Brazos River Authority for 6,437 acft/yr of water from Lake Proctor; however the firm supply of those contracts is 4,980 in 2020 and decreases over the planning period. The WSC has projected shortages starting in 2030. BRA strategies for the Little River System will firm up contracts to provide the full amount of supply during drought of record conditions. Table 4.3-11 in Chapter 4 includes additional information on contracts and water supplies for Upper Leon MWD.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortage for Upper Leon MWD.

a. Firm up Supplies through BRA Little River System Strategies – see Section 5.38.2
   - Cost Source: Section 5.38.2
   - Date to be Implemented: 2020
   - Total Project Cost: borne by BRA
   - Unit Cost: already contracted supplies

b. Trinity Groundwater from Pecan Orchard
   - Cost Source: Intended Use Plan Budget submitted to TWDB in support of DWSRF Application
   - Date to be Implemented: 2020
   - Total Project Cost: $5,347,000

- Unit Cost: $319/acft

Table 5.38-14. Recommended Plan Costs by Decade for Upper Leon MWD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*408*	*(31)*	*(75)*	*(308)*	*(366)*	*(458)*
Firm up Supplies through BRA Little River System Strategies-see Section 5.38.2						
Supply From Plan Element (acft/yr)	1,457	1,896	1,940	2,173	2,231	2,323
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/yr)	$0	$0	$0	$0	$0	$0
Trinity Groundwater from Pecan Orchard						
Supply From Plan Element (acft/yr)	2,040	2,040	2,040	2,040	2,040	2,040
Annual Cost ($/yr)	$447,433	$447,433	$203,327	$203,327	$203,327	$203,327
Unit Cost ($/yr)	$319	$319	$100	$100	$100	$100

5.38.14 West Central Texas Municipal Water District

Description of Supply

West Central Texas MWD owns and obtains its water supply from Hubbard Creek Reservoir. Based on the available surface water supply constrained to a 2-year safe yield estimate, West Central Texas MWD is projected to have shortages throughout the planning period. Table 4.3-12 in Chapter 4 includes additional information on contracts and water supplies for West Central Texas MWD.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected water shortages for West Central Texas MWD

a. Voluntary Redistribution

The District's shortages have been applied to reduce the City of Abilene supply from Hubbard Creek Reservoir to less than its currently contracted amount, while retaining the supplies available to the other member cities at full contracted volumes. The recommended water supply plan for the West Central Texas Municipal Water District is to restructure its existing contract with the City of Abilene to reduce its contractual obligations to eliminate the apparent supply shortage. The various strategies in the water supply plan for the City of Abilene will accommodate these small shortages.

- Cost Source: No Cost
- Date to be Implemented: before 2020
- Total Project Cost: N/A
- Unit Cost: N/A

Table 5.38-15. Recommended Plan Costs by Decade for West Central Texas MWD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(890)*	*(1,028)*	*(1,167)*	*(1,306)*	*(1,444)*	*(1,583)*
Voluntary Redistribution from Abilene's Contract						
Supply From Plan Element (acft/yr)	890	1,028	167	1,306	1,444	1,583
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/yr)	$0	$0	$0	$0	$0	$0

5.38.15 City of Abilene

Description of Supply

The City of Abilene obtains its water supply from several surface water sources. The City owns water rights in Fort Phantom Hill Reservoir. The City has contracted for water in Hubbard Creek and O.H. Ivie Reservoirs with the West Central Texas Municipal Water District. Abilene also has a wastewater reuse system for non-potable use. The City supplies several neighboring communities and projected demands indicate shortages through 2070. Abilene is located in multiple counties (Taylor and Jones). Table 4.3-13 in Chapter 4 includes additional information on contracts and water supplies for City of Abilene.

Cedar Ridge Reservoir is the primary WMS selected to meet the bulk of the City's needs into the future. The City is also anticipating a treatment plant to go offline around the 2020 decade, which will be replaced by a new treatment plant with additional capacity.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortages for the City of Abilene.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: 2020
   - Unit Cost: $474 / acft

b. Water Treatment Plant Expansion – this will affect the City's treated water projected shortage but does not provide new supply.
   - Cost Source: Volume II, Chapter 12
   - Date to be Implemented: 2020
   - Total Project Cost: $48,257,000
   - Unit Cost: $577 / acft

c. Cedar Ridge Reservoir

- Cost Source: Volume II, Chapter 4.2
- Date to be Implemented: 2020
- Total Project Cost: $290,868,000
- Unit Cost: $1,031 / acft

d. Brush Control (Fort Phantom Hill Reservoir watershed)

- Cost Source: Volume II, Chapter 13
- Date to be Implemented: 2020
- Total Project Cost: $7,532,000
- Unit Cost: Not applicable – firm supply zero during drought of record conditions

e. Alternative: Possum Kingdom Supply

- Cost Source: Volume II, Chapter 5.2
  - Supply dependent on BRA obtaining the System Operations permit from TCEQ
- Date to be Implemented: 2020
- Total Project Cost: $269,334,000
- Unit Cost: $2,586 / acft

Table 5.38-16. Recommended Plan Costs by Decade for the City of Abilene

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(7,081)*	*(28,345)*	*(28,821)*	*(28,620)*	*(28,615)*	*(28,642)*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	710	2,331	2,246	2,045	2,040	2,067
Annual Cost ($/yr)	$336,540	$1,104,894	$1,064,604	$969,330	$966,960	$979,758
Projected Surplus/(Shortage) after Conservation	*(6,471)*	*(26,114)*	*(26,575)*	*(26,575*	*(26,575)*	*(26,575)*
Water Treatment Plant Expansion(Volume II, Chapter 12)						
Supply From Plan Element (acft/yr)	12,992	12,992	12,992	12,992	12,992	12,992
Annual Cost ($/yr)	$7,492,000	$7,492,000	$3,454,000	$3,454,000	$3,454,000	$3,454,000
Unit Cost ($/yr)	$577	$577	$266	$266	$266	$266
Cedar Ridge Reservoir(Volume II, Chapter 4.2)						
Supply From Plan Element (acft/yr)	26,575	26,575	26,575	26,575	26,575	26,575
Annual Cost ($/yr)	$27,383,000	$27,383,000	$15,818,000	$15,818,000	$6,314,000	$6,314,000
Unit Cost ($/yr)	$1,031	$1,031	$595	$595	$238	$238
Brush Control – Fort Phantom Hill Reservoir Watershed (Volume II, Chapter 13)						
Supply From Plan Element (acft/yr)	0	0	0	0	0	0
Annual Cost ($/yr)	$999,295	$999,295	$999,295	$999,295	$999,295	$999,295

Table 5.38-16. Recommended Plan Costs by Decade for the City of Abilene

Plan Element	2020	2030	2040	2050	2060	2070
Unit Cost ($/yr)	—	—	—	—	—	—
Alternative: Possum Kingdom Supply (Volume II, Chapter 5.2)						
Supply From Plan Element (acft/yr)	14,800	14,800	14,800	14,800	14,800	14,800
Annual Cost ($/yr)	$38,271,000	$38,271,000	$15,733,000	$15,733,000	$15,733,000	$15,733,000
Unit Cost ($/yr)	$2,586	$2,586	$1,063	$1,063	$1,063	$1,063

5.38.16 City of Anson

The City of Anson receives surface water supplies from West Central Texas MWD and Lake Anson North. The City has a 1.8 MGD WTP for its own demand. Anson sells supply to Hawley WSC and City of Hamlin and contracts with Abilene to provide treatment for these supplies. Table 4.3-14 in Chapter 4 includes additional information on contracts and water supplies for the City of Anson. A surplus of supply is projected for the planning period. Conservation was considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

5.38.17 City of Bryan

Description of Supply

City of Bryan has a total of twelve wells located in the Simsboro and Sparta formations of the Carrizo-Wilcox Aquifer with a production capacity of 43 MGD. The Brazos Valley Groundwater Conservation District has permitted the City to withdraw 33,540 acft/yr. The City supplies several neighboring communities as well as manufacturing and steam-electric entities. Table 4.3-15 in Chapter 4 includes additional information on contracts and water supplies for the City of Bryan. Due to the estimated reliable supply from groundwater of 16,792 acft/yr in 2020, shortages are expected through 2070.

The City of Bryan currently irrigates the Traditions Golf Course with Type 2 treated wastewater effluent from Thompson's Creek WWTP, a small package treatment plant located near the golf course with a capacity of 2.0 MGD. The City has two other WWTPs, Burton Creek and Still Creek, that produce effluent requiring additional treatment to meet Type 1 reuse water requirements. There are several parks, ball fields, and other green spaces dispersed throughout the City that could be irrigated with reuse water if the wastewater could be treated and distributed economically. The Still Creek WWTP Year 2070 Estimated WWTP Effluent is 3,557 acft/yr (3.17 MGD). The Burton Creek WWTP Year 2070 Estimated WWTP Effluent is 11,561 acft/yr (10.31 MGD). Bryan is considering utilizing these reuse supplies for non-potable demands within the City.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortages for the City of Bryan.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: 2020
   - Unit Cost: $474 / acft

b. Aquifer Storage and Recovery
   - Cost Source: Volume II, Chapter 10.1
   - Date to be Implemented: 2020
   - Total Project Cost: $57,328,000
   - Unit Cost: $385/acft (constant unit cost assumed, since infrastructure will be added each decade)

c. Groundwater Development - Carrizo-Wilcox Aquifer (Brazos County)
   - Cost Source: Volume II, Chapter 9.1
   - Date to be Implemented: by 2050
   - Total Project Cost: $24,570,000
   - Unit Cost: Max of $486 / acft in 2020

d. Alternative: Groundwater Development – Carrizo-Wilcox Aquifer (Robertson County)
   - Cost Source: Volume II, Chapter 9.1
   - Date to be Implemented: 2020
   - Total Project Cost: $81,596,000
   - Unit Cost: Max of $1,006 / acft in 2020

Table 5.38-17. Recommended Plan Costs by Decade for the City of Bryan

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(3,334)*	*(1,269)*	*(5,533)*	*(11,875)*	*(18,790)*	*(26,579)*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	493	1,573	1,616	1,697	1,899	2,143
Annual Cost ($/yr)	$233,851	$745,799	$766,035	$804,443	$900,310	$1,015,578
Projected Surplus/(Shortage) after Conservation	*(2,841)*	*304*	*(3,917)*	*(10,178)*	*(16,891)*	*(24,436)*
Aquifer Storage and Recovery (Volume II, Chapter 10.1)						
Supply From Plan Element (acft/yr)	2,841	2,841	3,917	5,581	12,294	19,839
Annual Cost ($/yr)	$1,094,000	$1,094,000	$1,508,000	$2,149,000	$4,733,000	$7,638,000
Unit Cost ($/yr)	$385	$385	$385	$385	$385	$385
Groundwater Development - Carrizo Wilcox Aquifer in Brazos County (Volume II, Chapter 9.1)						
Supply From Plan Element (acft/yr)	—	—	—	5,100	5,100	5,100

Table 5.38-17. Recommended Plan Costs by Decade for the City of Bryan

Plan Element	2020	2030	2040	2050	2060	2070
Annual Cost ($/yr)	—	—	—	$2,479,000	$2,479,000	$1,020,000
Unit Cost ($/yr)	—	—	—	$486	$486	$200
Alternative: Groundwater Development - Carrizo-Wilcox Aquifer in Robertson Co. (Volume II, Chapter 9.1)						
Supply From Plan Element (acft/yr)	3,826	3,826	4,171	5,565	11,826	19,478
Annual Cost ($/yr)	$3,850,000	$3,850,000	$1,131,000	$1,603,000	$3,744,000	$6,294,000
Unit Cost ($/yr)	$1,006	$1,006	$271	$288	$317	$323

Reuse Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected reuse water shortages for the City of Bryan.

a. Option 1 Reuse for Bryan Utilities Lake Supply
   - Cost Source: Volume II, Chapter 3
   - Date to be Implemented: 2020
   - Total Project Cost: $8,989,000
   - Unit Cost: Max of $1,547 / acft in 2020

b. Miramont Reuse
   - Cost Source: Volume II, Chapter 3
   - Date to be Implemented: 2020
   - Total Project Cost: $2,544,000
   - Unit Cost: Max of $408/ acft in 2020

c. Alternative: Option 2 Indirect Potable Reuse
   - Cost Source: Volume II, Chapter 3
   - Date to be Implemented: 2020
   - Total Project Cost: $24,206,000
   - Unit Cost: Max of $1,577/ acft in 2020

Table 5.38-18.Recommended Plan Costs by Decade for the City of Bryan for Reuse Supplies

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(1,205)*	*(1,205)*	*(1,205)*	*(1,205)*	*(1,205)*	*(1,205)*
Option 1 Reuse for Bryan Utilities Lake Supply (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	605	605	605	605	605	605
Annual Cost ($/yr)	$936,000	$936,000	$184,000	$184,000	$184,000	$184,000

Table 5.38-18.Recommended Plan Costs by Decade for the City of Bryan for Reuse Supplies

Plan Element	2020	2030	2040	2050	2060	2070
Unit Cost ($/yr)	$1,547	$1,547	$304	$304	$304	$304
Miramont Reuse (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	600	600	600	600	600	600
Annual Cost ($/yr)	$245,000	$245,000	$32,000	$32,000	$32,000	$32,000
Unit Cost ($/yr)	$408	$408	$53	$53	$53	$53
Alternative: Option 2 Indirect Potable Reuse for Bryan (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	2,419	2,419	2,419	2,419	2,419	2,419
Annual Cost ($/yr)	$3,815,000	$3,815,000	$1,789,000	$1,789,000	$1,789,000	$1,789,000
Unit Cost ($/yr)	$1,577	$1,577	$740	$740	$740	$740

5.38.18 City of Cedar Park

Description of Supply

The City of Cedar Park is located in Williamson County and part of Travis County (Region K) and provides wholesale water to entities in Williamson and Travis Counties. The City has an 18,000 acft/yr contract from LCRA for Highland Lakes supply. Cedar Park is a participant in the Brushy Creek Regional Utility Authority to develop additional supplies from the Highland Lakes in Region K. The project is under construction and remaining phases are anticipated to be completed by 2018. Based on the available surface water supply and contractual commitments to supply water to wholesale customers, the City of Cedar Park is projected to have a shortage through the year 2070. Table 4.3-16 in Chapter 4 includes additional information on contracts and water supplies for the City of Cedar Park.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortage for the City of Cedar Park.

a. Conservation: Additional advanced conservation was considered and not applied since no shortage remains in later decades after applying conservation.
    - Cost Source: Volume II, Chapter 2
    - Date to be Implemented: Before 2020
    - Unit Cost: $470 / acft

b. Brushy Creek RUA Water Supply Project
    - Cost Source: (Volume II, Chapter 7.2)
    - Date to be Implemented: before 2020
    - Total Project Cost: $69,666,000 (city's portion of cost)

- Unit Cost: $836/acft

c. Voluntary Redistribution through Brushy Creek RUA Water Supply Project

- Cost Source: (Volume II, Chapter 7.2)
- Date to be Implemented: before 2020
- Total Project Cost: $69,666,000 (city's portion of cost)
- Unit Cost: $836/acft

Table 5.38-19. Recommended Plan Costs by Decade for the City of Cedar Park

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,075)*	*(3,854)*	*(4,082)*	*(4,159)*	*(4,244)*	*(4,348)*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	875	2,573	3,982	4,438	4,522	4,614
Annual Cost ($/yr)	$411,250	$1,209,310	$1,871,540	$2,085,860	$2,125,340	$2,309,580
Projected Surplus/(Shortage) after Conservation	*(1,200)*	*(1,281)*	*(100)*	*279*	*278*	*266*
Brushy Creek RUA Water Supply Project (Volume II, Chapter 7.2)[1]						
Supply From Plan Element (acft/yr)	0	0	0	0	0	0
Annual Cost ($/yr)	$15,048,000	$15,048,000	$9,218,000	$9,218,000	$9,218,000	$9,218,000
Unit Cost ($/acft)	$836	$836	$512	$512	$512	$512
Voluntary Redistribution through Brushy Creek RUA Water Supply Project						
Supply From Plan Element (acft/yr)	1,200	1,281	100	—	—	—
Annual Cost ($/yr)	$1,003,200	$1,070,916	$51,200	—	—	—
Unit Cost ($/acft)	$836	$836	$512	—	—	—

1 – The LCRA contract is shown as a current supply to Cedar Park. This strategy provides additional flexibility to take supplies during drought by deep water intake in Lake Travis.

5.38.19 City of Cleburne

Description of Supply

City of Cleburne obtains groundwater from the Trinity Aquifer in Johnson County. Surface water supplies include Lake Pat Cleburne, Lake Aquilla, and Lake Whitney, although the city currently does not have the infrastructure to access Lake Whitney supplies. The City supplies fresh water to Johnson County Manufacturing and reuse supplies to Steam-Electric entities. Table 4.3-17 in Chapter 4 includes additional information on contracts and water supplies for the City of Cleburne. Due to the estimated increasing demands throughout the planning period, fresh water shortages are expected before 2050.

The City of Cleburne has embraced the beneficial use of reuse water as a viable water management strategy to meet anticipated future shortages. The City currently supplies 1.2 MGD (1,344 acft/yr) of reuse water directly to a Brazos Electric Power Cooperative

Plant located north of the city for use as cooling water. The City of Cleburne owns and operates the existing reuse water treatment facility located on the City's wastewater treatment plant site. The city plans to reuse available wastewater supplies to help meet its projected deficit in the year 2070, and has filed a water rights application for 8,440 acre feet (7.5 MGD) with TCEQ to allow reuse of all authorized discharges, which would provide for the city's needs well beyond the current planning horizon.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortages for the City of Cleburne.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Unit Cost: $470/acft
   - Annual Cost: maximum of $415,010 in 2070

b. Lake Aquilla Augmentation-Option A
   - Cost Source: Volume II, Chapter 5.1
   - Date to be Implemented:
   - Project Cost: $73912 ,144
   - Unit Cost: $926/acft

c. Alternative: Lake Whitney Diversion to Cleburne
   - Cost Source: Volume II, Chapter 5.1
   - Date to be Implemented: before 2020
   - Unit Cost: $3,151/acft in 2020

Table 5.38-20. Recommended Plan Costs by Decade for the City of Cleburne

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(264)*	*(550)*	*(1,314)*	*(2,319)*	*(3,418)*	*(4,625)*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	207	685	736	749	809	883
Annual Cost ($/yr)	$97,290	$321,950	$345,920	$352,030	$380,230	$415,010
Projected Surplus/(Shortage) after Conservation	*(57)*	*135*	*(578)*	*(1,570)*	*(2,609)*	*(3,742)*
Lake Aquilla Augmentation (Volume II, Chapter 5.1)						
Supply From Plan Element (acft/yr)	9,700	9,700	9,700	9,700	9,700	9,700
Annual Cost ($/yr)	$8,982,000	$8,982,000	$4,588,000	$4,588,000	$4,588,000	$4,588,000

Table 5.38-20. Recommended Plan Costs by Decade for the City of Cleburne

Plan Element	2020	2030	2040	2050	2060	2070
Unit Cost ($/yr)	$926	$926	$473	$473	$473	$473
Alternative: Lake Whitney Diversion to Cleburne (Volume II, Chapter 5.1)						
Supply From Plan Element (acft/yr)	2,130	2,130	2,130	2,130	2,130	2,130
Annual Cost ($/yr)	$6,711,630	$6,711,630	$2,803,080	$2,803,080	$2,803,080	$2,803,080
Unit Cost ($/yr)	$3,151	$3,151	$1,316	$1,316	$1,316	$1,316

Water Reuse Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended to meet the projected reuse water shortages for the City of Cleburne:

a. Reuse

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: before 2020
- Project Cost: $14,059,000
- Unit Cost: $736/acft

Table 5.38-21. Recommended Plan Costs by Decade for the City of Cleburne for Reuse Supplies

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,031)*	*(2,031)*	*(2,031)*	*(2,031)*	*(2,031)*	*(2,031)*
City of Cleburne Reuse						
Supply From Plan Element (acft/yr)	2,031	2,031	2,031	2,031	2,031	2,031
Annual Cost ($/yr)	$1,495,000	$1,495,000	$319,000	$319,000	$319,000	$319,000
Unit Cost ($/yr)	$736	$736	$157	$157	$157	$157

5.38.20 City of Gatesville

Description of Supply

The City of Gatesville obtains its supply from Lake Belton via a contract with BRA for 5,898 acft/yr. Not all of the supply contracted from the BRA is currently firm, but strategies being pursued by the BRA are intended to firm up the BRA's contractual commitments. This reduced supply from the BRA does not account for all of the City's projected shortages. The City of Gatesville owns and operates a 11 MGD regional treatment plant. Raw water is transferred from a raw water intake at Lake Belton through approximately 8 miles of transmission line to the regional treatment plant from which the water enters the distribution system. Gatesville has contracts to meet Coryell City Water Supply District's demands estimated at 1,543 acft/yr in 2070 in addition to contracts with entities included in the Coryell County-Other (500 acft/yr) and Coryell County Manufacturing Water User Groups. Table 4.3-18 in Chapter 4 includes additional information on contracts and water supplies for the City of Gatesville.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet the projected water shortages for the City of Gatesville.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Annual Cost: maximum of $1,156,913 in 2070
   - Unit Cost: $470/acft

b. Firm up of Supplies through BRA Little River System Strategies-see Section 5.38.2
   - Cost Source: Section 5.38.2
   - Date to be Implemented: 2020
   - Total Project Cost: borne by BRA
   - Unit Cost: already contracted supplies

c. Purchase from Multi-County WSC (Coryell County Off-Channel Reservoir)
   - Cost Source: Volume II, Section 4.3
     - Project requires a subordination agreement with the BRA, which is dependent on the BRA obtaining the System Operations permit
   - Date to be Implemented: 2030
   - Unit Cost: $1,309/acft

Table 5.38-22. Recommended Plan Costs by Decade for City of Gatesville

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*28*	*(629)*	*(1,405)*	*(2,449)*	*(3,323)*	*(4,510)*
Conservation						
Supply From Plan Element (acft/yr)	208	610	1,097	1,644	2,261	2,462
Annual Cost ($/yr)	$97,958	$286,723	$515,682	$772,806	$1,062,706	$1,156,913
Projected Surplus/(Shortage) after Conservation	*236*	*(19)*	*(308)*	*(805)*	*(1,062)*	*(2,048)*
Firm up of Supplies through BRA Little River System Strategies-see Section 5.38.2						
Supply From Plan Element (acft/yr)	—	29	86	386	461	580
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/yr)	—	$0	$0	$0	$0	$0

Table 5.38-22. Recommended Plan Costs by Decade for City of Gatesville

Plan Element	2020	2030	2040	2050	2060	2070
Purchase from Multi-County WSC (Coryell County Off-Channel Reservoir)						
Supply From Plan Element (acft/yr)	—	2,835	2,835	2,835	2,835	2,835
Annual Cost ($/yr)	—	$3,711,000	$3,711,000	$2,889,000	$2,889,000	$1,233,000
Unit Cost ($/yr)	—	$1,309	$1,309	$1,019	$1,019	$435

5.38.21 Johnson County SUD

Description of Supply

Johnson County Special Utility District (SUD) is located in Johnson, Hill, Ellis (Region C) and Tarrant (Region C) counties. The SUD obtains its water supply from groundwater from the Trinity Aquifer, and a contract with the Brazos River Authority for water from Lake Granbury and a contract with the City of Mansfield (10,089 acft/yr) for water from the Tarrant Regional Water District. Supplies from Tarrant have been constrained based on availability from the District. Johnson County SUD also has a contract with Grand Prairie for 6,720 acft/yr, which will be implemented by 2020. The SUD has contracts to supply treated water to eight water user groups.

Table 4.3-19 in Chapter 4 includes additional information on contracts and water supplies for Johnson County SUD.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, and through coordination with Region C, the following water management strategies are recommended for Johnson County SUD.

a. Conservation
   - Cost Source: 2016 Region C Water Plan (Appendix K)
   - Date to be Implemented: 2020
   - Project Cost: $4,470
   - Unit Cost: $186/acft

b. Purchase Supplies from Grand Prairie
   - Cost Source: 2016 Region C Water Plan (Appendix K)
   - Date to be Implemented: 2020
   - Project Cost: $86,140,000
   - Unit Cost: $2,063/acft

c. Purchase additional Supplies from Mansfield
   - Cost Source: 2016 Region C Water Plan

- Date to be Implemented: 2020
- Project Cost: contract in place for 10,089 acft/yr, reduced due to available supplies
- Unit Cost: wholesale water cost from Mansfield

d. Alternative: Johnson County ASR

- Cost Source: Volume II, Chapter 10.3
- Date to be Implemented: 2020
- Project Cost: $11,725,000
- Unit Cost: $1,131/acft

Table 5.38-23. Recommended Plan Costs by Decade for Johnson County SUD

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*5,604*	*4,259*	*2,757*	*876*	*(679)*	*(2,267)*
Conservation (Region C)						
Supply From Plan Element (acft/yr)	2	4	4	5	7	10
Annual Cost ($/yr)	$371	$744	$744	$930	$1,302	$1,860
Projected Surplus/(Shortage) after Conservation (acft/yr)	*9,919*	*8,544*	*7,023*	*5,132*	*3,570*	*1,976*
Purchase Supplies from Grand Prairie (Region C)						
Supply From Plan Element (acft/yr)	—	6,726	6,726	6,726	6,726	6,726
Annual Cost ($/yr)	—	$13,873,000	$13,873,000	$6,794,000	$6,794,000	$6,794,000
Unit Cost ($/acft)	—	$2,063	$2,063	$1,010	$1,010	$1,010
Full Contract Supplies from Mansfield (Region C)						
Supply From Plan Element (acft/yr)	3,196	3,778	4,449	5,363	5,820	6,222
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/acft)	$0	$0	$0	$0	$0	$0
Alternative: Johnson County ASR						
Supply From Plan Element (acft/yr)	2,000	2,000	2,000	2,000	2,000	2,000
Annual Cost ($/yr)	$2,262,000	$2,262,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000
Unit Cost ($/acft)	$1,131	$1,131	$640	$640	$640	$640

5.38.22 Kempner WSC

Description of Supply

Kempner WSC has service area in portions of Coryell, Bell, Burnet (Region C) and Lampasas Counties. The WSC receives surface water supplies from the Brazos River Authority out of Lake Stillhouse Hollow, totaling 8,900 acft/yr; however the firm supply of those contracts is 4,822 acft/yr in 2020 and decreases over the planning period. Kempner WSC sells supplies to the cities of Kempner, Copperas Cove, Lampasas, as well as to Salado WSC and Lampasas County-Mining. Shortages are projected for Kempner WSC in 2020. Table 4.3-20 in Chapter 4 includes additional information on contracts and water supplies.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Kempner WSC. Once BRA firms up supplies as shown in Chapter 5.38.2, Kempner WSC will be able to utilize its full contract amount up to 8,900 acft/yr.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Annual Cost: maximum of $116,560 in 2070
- Unit Cost: $470/acft

b. Firm up of Supplies through BRA Little River System Strategies-see Section 5.38.2

- Cost Source: Section 5.38.2
- Date to be Implemented: 2020
- Total Project Cost: borne by BRA
- Unit Cost: already contracted supplies

Table 5.38-24. Recommended Plan Costs by Decade for Kempner WSC

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(536)*	*(814)*	*(1,076)*	*(1,344)*	*(1,612)*	*(1,868)*
Conservation						
Supply From Plan Element (acft/yr)	100	239	225	222	234	248
Annual Cost ($/yr)	$47,000	$112,330	$105,750	$104,340	$109,980	$116,560
Projected Surplus/(Shortage) after Conservation	*(458)*	*(723)*	*(1,078)*	*(1,440)*	*(1,792)*	*(2,125)*
Firm up Supplies through BRA Little River System Strategies-see Section 5.38.2						
Supply From Plan Element (acft/yr)	4,078	4,206	4,251	4,492	4,552	4,647
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/yr)	—	—	—	—	—	—

5.38.23 City of Mineral Wells

Description of Supply

City of Mineral Wells obtains raw water from Lake Mineral Wells and additional surface water supplies from Palo Pinto County MWD No. 1 (Lake Palo Pinto). The city supplies treated water to ten water user groups in Palo Pinto County and Parker County (Region

C). The city supplies treated water from Lake Palo Pinto to it's customers but does not have a water treatment plant to utilize supplies from Lake Mineral Wells. The City is projected to have enough supply through the planning period. Table 4.3-21 in Chapter 4 includes additional information on contracts and water supplies for Mineral Wells.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for Mineral Wells.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: before 2020
- Unit Cost: $496/acft
- Annual Cost: maximum of $34,720 in 2020

Table 5.38-25. Recommended Plan Costs by Decade for Mineral Wells

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*10*	*4*	*0*	*0*	*0*	*0*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	70	31	0	0	0	0
Annual Cost ($/yr)	$34,720	$17,360	0	0	0	0
Projected Surplus/(Shortage) after Conservation	*80*	*35*	*0*	*0*	*0*	*0*

5.38.24 City of Round Rock

Description of Supply

The City of Round Rock obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and contracts with the Brazos River Authority for water from Lake Georgetown and Stillhouse Hollow Reservoir. In addition the city utilizes reuse supplies and receives out of region supply from LCRA. Based on the available groundwater and surface water supply and existing contractual demand, the City of Round Rock is projected to have a shortage from 2030 through 2070. The shortages shown include projected needs for Williamson County Manufacturing. Table 4.3-22 in Chapter 4 includes additional information on contracts and water supplies for the City of Round Rock.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the City of Round Rock.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Unit Cost: $474 / acft
b. Additional Advanced Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: before 2020
   - Unit Cost: $474 / acft
c. Firm up Supplies through BRA Little River System Strategies-see Section 5.38.2
   - Cost Source: Section 5.38.2
   - Date to be Implemented: 2020
   - Total Project Cost: borne by BRA
   - Unit Cost: already contracted supplies
d. Brushy Creek RUA Water Supply Project
   - Cost Source: Volume II, Chapter 4.1
   - Date to be Implemented: Before 2020
   - Total Project Cost: $102,995,000 (city's portion)
   - Unit Cost: $976 / acft
e. Little River OCR
   - Cost Source: Volume II, Chapter 4.7
     - Strategy could be supplied by the BRA System Operation, dependent on permit approval by TCEQ
   - Date to be Implemented: by 2050
   - Total Project Cost: $487,611,000
   - Unit Cost: $1,038/acft
f. Alternative: Lake Granger ASR
   - Cost Source: Volume II, Chapter 10.4
   - Date to be Implemented: by 2070
   - Total Project Cost: $99,820,000 (sum of 3 phases)
   - Unit Cost: $368 acft in 2060

Table 5.38-26. Recommended Plan Costs by Decade for the City of Round Rock

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*348*	*(5,702)*	*(14,028)*	*(24,227)*	*(34,874)*	*(46,089)*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	520	119	0	0	0	0
Annual Cost ($/yr)	$244,400	$55,930	$0	$0	$0	$0
Projected Surplus/(Shortage) after Conservation	*868*	*(5,821)*	*(14,028)*	*(24,227)*	*(34,874)*	*(46,089)*
Advanced Conservation (Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	0	0	1,060	2,825	5,310	8,446
Annual Cost ($/yr)	$0	$0	$497,240	$1,324,850	$2,490,465	$3,961,318
Projected Surplus/(Shortage) after Additional Advanced Conservation	(1,307)	(7,783)	(12,968)	(21,402)	(29,564)	(37,643)
Firm up Supplies through BRA Little River System Strategies-see Section 5.38.2						
Supply From Plan Element (acft/yr)	—	122	361	1,626	1,943	2,443
Annual Cost ($/yr)	—	$0	$0	$0	$0	$0
Unit Cost ($/yr)	—	$0	$0	$0	$0	$0
Brushy Creek RUA Water Supply Project (Volume II, Chapter 4.1)						
Supply From Plan Element (acft/yr)	24,400	24,400	24,400	24,400	24,400	24,400
Annual Cost ($/yr)	$23,819,000	$23,819,000	$15,201,000	$15,201,000	$15,201,000	$15,201,000
Unit Cost ($/yr)	$976	$976	$623	$623	$623	$623
Little River OCR (Volume II, Chapter 4.7)						
Supply From Plan Element (acft/yr)	—	—	—	—	3,300	10,800
Annual Cost ($/yr)	—	—	—	—	$3,425,400	$11,210,400
Unit Cost ($/yr)	—	—	—	—	$1,038	$1,038
Alternative: Lake Granger ASR (Volume II, Chapter 10.4)						
Supply From Plan Element (acft/yr)	—	—	—	—	9,050	9,050
Annual Cost ($/yr)	—	—	—	—	$3,334,000	$3,334,000
Unit Cost ($/yr)	—	—	—	—	$368	$368

5.38.25 City of Stamford

Description of Supply

The City of Stamford located in Jones and Haskell counties has contracts to provide supply to nearby water user groups including a raw water contact with Haskell County Steam-Electric. The existing supply is constrained by treatment capacity to 1,458 acft/yr, however, the City is projected to have surpluses through 2070. Table 4.3-23 in Chapter 4 includes additional information on contracts and water supplies for the City of Stamford.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategy is recommended for the City of Stamford.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: 2020
- Unit Cost: $470 / acft

Table 5.38-27. Recommended Plan Costs by Decade for Stamford

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*2,218*	*2,067*	*1,927*	*1,782*	*1,640*	*1,501*
Conservation(Volume II, Chapter 5.2)						
Supply From Plan Element (acft/yr)	40	105	172	246	316	344
Annual Cost ($/yr)	$18,701	$49,576	$80,928	$115,420	$148,628	$161,538
Projected Surplus/(Shortage) after Conservation	*2,258*	*2,172*	*2,099*	*2,028*	*1,956*	*1,845*

5.38.26 City of Sweetwater

Description of Supply

Groundwater supplies for the City of Sweetwater are obtained from the Dockum Aquifer. Surface water supplies which are considered by the city to be unreliable include Oak Creek Reservoir (Region F, Colorado River Basin), Lake Trammel, and Lake Sweetwater. Firm yield supplies from Oak Creek Reservoir are zero. The long-term, firm annual supply from the City's Champion Well Field is about 2,540 acft/yr. The City of Sweetwater is projected to have supply shortages through 2070. Table 4.3-24 in Chapter 4 includes additional information on contracts and water supplies for the City of Sweetwater.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the City of Sweetwater.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: Before 2020
- Unit Cost: $496 / acft

b. Oak Creek Reservoir Conjunctive Use (Volume 2, Chapter 6.2)

- Cost Source: 2016 Region F Water Plan

- Date to be Implemented: before 2020
- Total Project Cost: No cost
- Unit Cost: none

c. Purchase from Abilene

- Cost Source: (Volume II, Chapter 12)
- Date to be Implemented: before 2020
- Total Project Cost: $13,036,000 for transmission facilities
- Unit Cost: $815/acft assuming wholesale rate plus transmission

Table 5.38-28. Recommended Plan Costs by Decade for the City of Sweetwater

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(2,188)*	*(2,381)*	*(2,544)*	*(2,762)*	*(2,969)*	*(3,184)*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	39	0	0	0	0	0
Annual Cost ($/yr)	$18,330	$0	$0	$0	$0	$0
Projected Surplus/(Shortage) after Conservation	*(2,149)*	*(2,381)*	*(2,544)*	*(2,762)*	*(2,969)*	*(3,184)*
Oak Creek Reservoir Conjunctive Use (Volume II, Chapter 6.2)						
Supply From Plan Element (acft/yr)	1,575	1,575	1,575	1,575	1,575	1,575
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/yr)	—	—	—	—	—	—
Purchase from Abilene (Volume II, Chapter 12)						
Supply From Plan Element (acft/yr)	742	974	1,137	1,355	1,562	1,777
Annual Cost ($/yr)	$604,730	$793,810	$228,537	$272,355	$313,962	$357,177
Unit Cost ($/yr)	$815	$815	$201	$201	$201	$201

5.38.27 City of Temple

Description of Supply

The City of Temple has contracts with the Brazos River Authority for 30,453 acft/yr of raw water and an additional 10,100 acft/yr from a run-of-the-river water right (Certificate of Adjudication 12-2938). The BRA contract can yield a reliable supply of 23,542 acft/yr and the City's water right can provide a reliable supply up to 1,869 acft/yr (supplies from the right increase over time due to sedimentation in the upstream Lake Belton and increased wastewater treatment plant discharges). A few water supply corporations provide water to customers inside the city limits, and these supplies have been accounted for in the supply to the city as a WUG. The City provides supply to the Cities of Little River-Academy, Morgans Point Resort, and Troy. The City's water treatment plants have an annual average capacity of 27,955 acft. The water supply plan for Little River-Academy includes Temple supplying an additional 180 acft/yr of treated water by

2030. The City has a contract to supply effluent from its wastewater treatment plan to a new generating station owned by Panda Power.

The City of Temple is projected to have supply shortages through 2070. Table 4.3-25 in Chapter 4 includes additional information on contracts and water supplies for the City of Temple.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the City of Temple.

a. Conservation
   - Cost Source: Volume II, Chapter 2
   - Date to be Implemented: Before 2020
   - Unit Cost: $474 / acft

b. Firm up of Supplies through BRA Little River System Strategies-see Section 5.38.2
   - Cost Source: Section 5.38.2
   - Date to be Implemented: 2020
   - Total Project Cost: borne by BRA
   - Unit Cost: already contracted supplies

Table 5.38-29. Recommended Plan Costs by Decade for the City of Temple

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*2,223*	*(2,084)*	*(4,554)*	*(8,448)*	*(11,780)*	*(13,518)*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	914	2,740	5,015	7,724	10,771	11,850
Annual Cost ($/yr)	$433,105	$1,298,837	$2,376,991	$3,660,947	$5,105,344	$5,616,738
Projected Surplus/(Shortage) after Conservation	*3,137*	*656*	*461*	*(724)*	*(1,009)*	*(1,668)*
Firm up of Supplies through BRA Little River System Strategies-see Section 5.38.2						
Supply From Plan Element (acft/yr)	6,563	8,021	7,497	8,221	8,357	6,929
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/acft)	$0	$0	$0	$0	$0	$0

5.38.28 City of Waco

Description of Supply

The City of Waco obtains its surface water supply from Lake Waco, in which it owns water rights, and from Lake Brazos on the Brazos River. The City supplies several neighboring communities and has sufficient water supply to meet its municipal and regional needs without conservation through 2060. Waco has a projected shortage of

2,730 acft in 2070. Table 4.3-26 in Chapter 4 includes additional information on contracts and water supplies for the City of Waco.

The City has demonstrated a commitment to provide regional water supply in McLennan County, and has plans to extend regional water supplies beyond the 2070 planning horizon by actively pursuing a reuse program. Since the 2011 Brazos G Regional Plan, Waco Metropolitan Area Regional Sewerage System (WMARSS) has constructed the Sandy Creek Energy Associates (SCEA) Project which provides 15,000 acft/yr of treated effluent from the WMARSS Central Wastewater Treatment Plant to the SCEA power plant. WMARSS continues to pursue the development of four wastewater reuse systems to supply reuse water to customers. The Year 2011 effluent from WMARSS was 25,355 acft/yr (22.6 MGD). The Year 2070 estimated effluent available from WMARSS is projected to be 36,370 acft/yr (32.5 MGD), which includes the 15,000 acft/yr of sales to the Sandy Creek Project.

Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the City of Waco.

a. Conservation

- Cost Source: Volume II, Chapter 2
- Date to be Implemented: Before 2020
- Unit Cost: $474 / acft

b. McLennan County ASR

- Cost Source: Volume II, Chapter 10.5
- Date to be Implemented: 2020
- Total Project Cost: $43,940,000
- Unit Cost: $677/ acft

Table 5.38-30.Recommended Plan Costs by Decade for the City of Waco

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*11,457*	*8,661*	*6,144*	*3,233*	*312*	*(2,730)*
Conservation(Volume II, Chapter 2)						
Supply From Plan Element (acft/yr)	1,462	4,033	6,781	9,781	11,940	12,554
Annual Cost ($/yr)	$692,979	$1,911,441	$3,214,161	$4,636,431	$5,659,560	$5,950,518
Projected Surplus/(Shortage) after Conservation	*12,919*	*12,694*	*12,925*	*13,014*	*12,252*	*9,824*
McLennan County ASR (Volume II, Chapter 10.5)						
Supply From Plan Element (acft/yr)	8,000	8,000	8,000	8,000	8,000	8,000
Annual Cost ($/yr)	$5,416,000	$5,416,000	$1,744,000	$1,744,000	$1,744,000	$1,744,000
Unit Cost ($/yr)	$677	$677	$218	$218	$218	$218

Reuse Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water management strategies are recommended to meet water needs for the City of Waco:

a. WMARSS- Bullhide Creek Reuse

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Total Project Cost: $4,657,000
- Unit Cost: $381/acft

b. WMARSS- Bellmead/Lacy-Lakeview Reuse

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Total Project Cost: $ $5,768,000
- Unit Cost: $324/acft

c. WMARSS- Flat Creek Reuse

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Total Project Cost: $9,371,000
- Unit Cost: $205/acft

d. Alternative: WMARSS- North Reuse

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Total Project Cost: $21,945,000
- Unit Cost: $1,009/acft

e. Alternative. WMARSS- East Reuse

- Cost Source: Volume II, Chapter 3
- Date to be Implemented: 2020
- Total Project Cost: $8,970,000
- Unit Cost: $869 / acft

Table 5.38-31. Recommended Plan Costs by Decade for the City of Waco for Reuse Supplies

Plan Element	2020	2030	2040	2050	2060	2070
Projected Surplus/(Shortage) (acft/yr)	*(6,530)*	*(6,630)*	*(6,730)*	*(6,930)*	*(7,130)*	*(7,430)*
WMARSS-Bullhide Reuse (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	1,681	1,671	1,671	1,671	1,671	1,671
Annual Cost ($/yr)	$641,000	$641,000	$251,000	$251,000	$251,000	$251,000
Unit Cost ($/yr)	$381	$381	$150	$150	$150	$150
WMARSS-Bellmead/Lacy Lakeview Reuse (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	2,240	2,240	2,240	2,240	2,240	2,240
Annual Cost ($/yr)	$725,000	$725,000	$242,000	$242,000	$242,000	$242,000
Unit Cost ($/yr)	$324	$324	$108	$108	$108	$108
WMARSS-Flat Creek Reuse (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	7,847	7,847	7,847	7,847	7,847	7,847
Annual Cost ($/yr)	$1,609,000	$1,609,000	$825,000	$825,000	$825,000	$825,000
Unit Cost ($/yr)	$205	$205	$105	$105	$105	$105
Alternative: WMARSS-North Reuse (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	3,360	3,360	3,360	3,360	3,360	3,360
Annual Cost ($/yr)	$3,390,000	$3,390,000	$1,554,000	$1,554,000	$1,554,000	$1,554,000
Unit Cost ($/yr)	$1,009	$1,009	$463	$463	$463	$463
Alternative: WMARSS-East Reuse (Volume II, Chapter 3)						
Supply From Plan Element (acft/yr)	208	208	208	208	208	208
Annual Cost ($/yr)	$180,752	$180,752	$39,728	$39,728	$39,728	$39,728
Unit Cost ($/yr)	$869	$869	$191	$191	$191	$191

5.39 Summary of Recommended and Alternative Water Management Strategies

5.39.1 Recommended and Alternative Water Management Strategies and Unmet Needs

Recommended Water Management Strategies as applied to the Water User Groups (Section 5.1 – 5.37) and the Wholesale Water Provider (Section 5.38) are summarized in Table 5.39-1 and listed in Table 5.39-2. A summary of the Alternative Water Management Strategies as applied to the Water User Groups (Section 5.1 – 5.37) and the Wholesale Water Provider (Section 5.38) is listed in Table 5.39-3. A full description of each of these strategies is included in Volume II.

A total of 15 Water User Groups are recommended to not have needs met. Table 5.39-4 from the DB17 application includes a summary of unmet needs by Water User Group.

Table 5.39-1. Summary of Recommended Strategies Applied to WUG and/or WWPs

Recommended Strategies	WUG/ WWP using Strategy[1]	1st Decade Average Annual Unit Cost ($/acft)	Supply Developed						Total Project Cost
			2020	2030	2040	2050	2060	2070	
Municipal Conservation	93	$478	10,845	30,658	46,765	61,587	73,849	81,664	NA
Irrigation Conservation	10	$230	4,431	7,168	9,739	9,453	9,175	8,940	NA
Industrial Conservation	19	ND	2,399	6,684	12,564	14,853	16,081	17,526	ND
Advanced Conservation	6	$470	39	81	1,233	4,036	9,700	17,909	NA
Advanced Industrial Conservation	2	ND	5,279	5,279	5,279	5,279	6,690	16,817	NA
Voluntary Redistribution	5	ND	1,205	1,676	1,262	1,547	2,043	2,574	NA
Leave Needs Unmet	15	ND	56,916	59,998	58,116	61,814	72,014	85,347	NA
Purchase Additional Water	27	$903	12,180	21,818	21,327	21,247	20,971	21,065	NA
Increase WTP Capacity	7	$1,000	18,983	30,436	32,981	33,946	35,273	36,554	$122,634,000
Reuse	21	$635	35,077	35,833	36,785	38,794	41,957	46,662	$76,898,000
Millers Creek Reservoir Augmentation	7	$740	2,833	3,013	3,194	3,374	3,554	3,735	$99,896,000
Throckmorton Reservoir	1	$601	3,540	3,540	3,540	3,540	3,540	3,540	$28,041,000
Turkey Peak Reservoir	1	$643	8,100	8,100	8,100	8,100	8,100	8,100	$83,363,000
Little River OCR	4	$800	0	56,150	56,150	56,150	56,150	56,150	$487,611,000
Blaine Groundwater	3	$887	876	876	876	876	876	876	$6,093,000
Brazos River Alluvium Groundwater	2	$530	4,000	4,000	4,000	4,700	4,700	5,100	$23,948,000

Table 5.39-1. Summary of Recommended Strategies Applied to WUG and/or WWPs

Recommended Strategies	WUG/ WWP using Strategy [1]	1st Decade Average Annual Unit Cost ($/acft)	Supply Developed						Total Project Cost
			2020	2030	2040	2050	2060	2070	
Carrizo Groundwater	11	$974	30,384	31,143	31,402	35,504	29,244	21,406	$231,702,609
Dockum Groundwater	2	$7,368	450	450	540	540	540	540	$13,116,000
Edwards Groundwater	8	$1,061	4,481	4,478	4,475	4,487	4,501	4,513	$45,324,000
Gulf Coast Groundwater	4	$1,036	7,359	7,678	7,554	7,453	7,367	7,338	$41,016,000
Other Groundwater	5	$1,513	1,256	1,256	1,246	1,246	1,246	1,246	$15,340,000
Seymour Groundwater	1	$571	1,571	1,345	1,193	1,116	1,041	1,041	$9,817,000
Sparta Groundwater	2	$972	740	790	790	790	825	825	$6,398,000
Trinity Groundwater	23	$1,358	12,546	13,023	10,979	10,521	10,445	10,963	$152,155,000
Woodbine Groundwater	5	$908	1,700	560	0	0	285	285	$11,624,000
Yegua-Jackson Groundwater	1	$656	4,452	5,565	5,565	5,565	5,565	5,565	$32,957,000
Rehab Existing Wells	2	$49	0	0	0	173	173	185	$35,000
Lake Granger ASR	1	$870	9,050	9,050	9,050	9,050	9,050	9,050	$99,820,000
McLennan County ASR	1	$677	8,000	8,000	8,000	8,000	8,000	8,000	$43,940,000
College Station ASR	1	$3,069	2,800	2,800	2,800	2,800	2,800	2,800	$63,850,000
Belton to Stillhouse Pipeline	1	$154	30,000	30,000	30,000	30,000	30,000	30,000	$38,069,000
Purchase from Walnut Creek Mine	1	$500	0	0	0	9,000	9,000	9,000	NA
Lake Aquilla Augmentation	3	$926	14,700	14,700	14,700	14,700	14,700	14,700	$79,627,000
Lake Aquilla Reallocation	1	$865	2,400	2,400	2,400	2,400	2,400	2,400	$21,887,000
Bosque County Interconnection	6	$2,277	1,070	1,070	1,070	1,070	1,070	1,070	$22,372,000
Brushy Creek Reservoir	1	$481	1,450	1,450	1,450	1,450	1,450	1,450	$20,836,000
Cedar Ridge Reservoir	1	$1,031	26,575	26,575	26,575	26,575	26,575	26,575	$290,868,000
Coryell County OCR	3	$1,405	0	3,135	3,135	3,135	3,135	3,135	$42,246,000
Gibbons Creek Reservoir Expansion	1	$359	2,605	2,605	2,605	2,605	2,605	2,605	$12,979,000
Groesbeck OCR	1	$617	1,755	1,755	1,755	1,755	1,755	1,755	$11,909,000
Reallocation of Supplies	9	$330	40,574	47,927	54,849	61,366	63,360	61,786	NA
Oak Creek Reservoir Conjunctive Management	1	ND	1,575	1,575	1,575	1,575	1,575	1,575	NA
WCBWDS	5	$2,492	1,400	1,400	1,400	1,400	1,400	1,400	$21,148,000

Table 5.39-1. Summary of Recommended Strategies Applied to WUG and/or WWPs

Recommended Strategies	WUG/ WWP using Strategy [1]	1st Decade Average Annual Unit Cost ($/acft)	Supply Developed						Total Project Cost
			2020	2030	2040	2050	2060	2070	
Somervell County Water Supply Project	2	$4,305	900	900	1,084	1,084	1,084	1,084	$35,249,000
East Williamson County Water Project	5	$1,173	8,400	8,400	8,400	8,400	8,400	8,400	$42,127,000
BCRUA Water Supply Project	4	$994	67,000	67,000	67,000	67,000	67,000	67,000	$314,847,000
BRA System Operation	6	$20	95,223	101,871	109,174	125,682	155,969	166,952	$23,582,000
Restructure Contracts	1	ND	890	1,028	167	1,306	1,444	1,583	NA

ND - costs and/or supply from strategy not determined
1 – Number of WUG/WWPs that are using the strategy in the final adopted regional water plan

Table 5.39-2. Recommended Projects Associated with Water Management Strategies (DB17 Report)

Sponsor Name	Is Sponsor a WWP?	Project Name	Project Description	Capital Cost	Online Decade
ABILENE	Y	BRUSH CONTROL	BRUSH CONTROL CAPITAL COST	$7,532,000	2020
ABILENE	Y	CEDAR RIDGE RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$290,868,000	2020
ABILENE	Y	WTP EXPANSION (23.2 MGD)-ABILENE	WATER TREATMENT PLANT EXPANSION	$48,257,000	2020
AQUILLA WSD	Y	LAKE AQUILLA AUGMENTATION-A	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$5,714,856	2020
BARTLETT	N	TRINITY AQUIFER DEVELOPMENT- BARTLETT	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$10,428,000	2020
BELL COUNTY WCID #1	Y	BELL COUNTY WCID #1- NORTH REUSE	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK	$12,146,000	2020
BELL COUNTY WCID #1	Y	BELL COUNTY WCID #1- SOUTH REUSE	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; NEW WATER TREATMENT PLANT	$6,529,000	2020
BELLMEAD	N	REUSE- BELLMEAD/ LACY-LAKE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$2,884,000	2020
BELL-MILAM FALLS WSC	N	EAST WILLIAMSON COUNTY WATER PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; STORAGE TANK	$2,808,467	2020
BISTONE MWSD	Y	CARRIZO (BRAZOS) DEVELOPMENT-BISTONE MWSD	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$22,689,000	2020
BRAZOS RIVER AUTHORITY	Y	BELTON TO STILLHOUSE PIPELINE-BRA	CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; NEW SURFACE WATER INTAKE	$38,069,000	2020
BRAZOS RIVER AUTHORITY	Y	BRA SYSTEM OPERATION-MAIN STEM	NEW AGREEMENT	$23,581,674	2020
BRAZOS RIVER AUTHORITY	Y	BRA SYSTEM OPERATIONS-LITTLE RIVER	NEW WATER RIGHT/PERMIT	$23,581,674	2050
BRAZOS RIVER AUTHORITY	Y	CHLORIDE CONTROL PROJECT-BRA	INJECTION WELL; NEW WATER TREATMENT PLANT	$172,652,000	2020
BRAZOS RIVER AUTHORITY	Y	LAKE AQUILLA REALLOCATION- BRA	RAISE CONSERVATION POOL	$21,887,000	2020
BRAZOS RIVER AUTHORITY	Y	LAKE GRANGER ASR	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$99,820,000	2020
BRAZOS RIVER AUTHORITY	Y	LAKE GRANGER AUGMENTATION-PHASE 1-BRA	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; PUMP STATION; WATER TREATMENT PLANT EXPANSION	$85,170,000	2020
BRAZOS RIVER AUTHORITY	Y	LAKE GRANGER AUGMENTATION-PHASE 2-BRA	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$637,057,000	2020
BRAZOS RIVER AUTHORITY	Y	LITTLE RIVER OCR-BRA	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION	$487,611,000	2030
BRECKENRIDGE	N	WEST CENTRAL BRAZOS WATER DISTRIBUTION SYSTEM	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT	$8,308,142	2020
BRUSHY CREEK MUD	N	EDWARDS AQUIFER DEVELOPMENT-BRUSHY CREEK MUD	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$182,000	2050
BRYAN	Y	BRYAN ASR (CARRIZO-WILCOX)	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$57,328,000	2020
BRYAN	Y	CARRIZO-WILCOX DEVELOPMENT-BRYAN	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; PUMP STATION; WATER TREATMENT PLANT EXPANSION	$24,569,609	2020
BRYAN	Y	REUSE- BRYAN (OPTION 1)	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$8,989,000	2020
BRYAN	Y	REUSE- MIRAMONT	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$2,544,000	2020
CEDAR PARK	Y	BRUSHY CREEK RUA WATER SUPPLY	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; NEW WATER TREATMENT PLANT	$69,665,771	2020

Table 5.39-2. Recommended Projects Associated with Water Management Strategies (DB17 Report)

Sponsor Name	Is Sponsor a WWP?	Project Name	Project Description	Capital Cost	Online Decade
CENTRAL TEXAS WSC	Y	EAST WILLIAMSON COUNTY WATER PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; STORAGE TANK	$11,233,867	2020
CHILDRESS CREEK WSC	N	BOSQUE COUNTY-RWSP	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$5,074,000	2020
CHILDRESS CREEK WSC	N	TRINITY WELL REHAB-CHILDRESS CREEK WSC	DEEPEN WELL	$15,000	2050
CHISHOLM TRAIL SUD	N	CHISHOLM TRAIL SUD WTP EXPANSION	NEW WATER TREATMENT PLANT	$31,675,000	2020
CLEBURNE	Y	LAKE AQUILLA AUGMENTATION-A	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$73,912,144	2020
CLEBURNE	Y	REUSE- CLEBURNE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$14,059,000	2020
CLIFTON	N	BOSQUE COUNTY-RWSP	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$5,135,000	2020
COLLEGE STATION	N	COLLEGE STATION ASR (REUSE)	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$63,850,000	2020
COLLEGE STATION	N	REUSE-COLLEGE STATION	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$1,705,000	2020
COLLEGE STATION	N	YEGUA-JACKSON DEVELOPMENT-COLLEGE STATION	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$32,957,000	2020
COUNTY-OTHER, BELL	N	EDWARDS AQUIFER DEVELOPMENT-BELL COUNTY OTHER	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$3,736,000	2040
COUNTY-OTHER, COMANCHE	N	TRINITY AQUIFER DEVELOPMENT- COMANCHE COUNTY-OTHER	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$2,033,000	2020
COUNTY-OTHER, CORYELL	N	TRINITY AQUIFER DEVELOPMENT- CORYELL COUNTY-OTHER	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$4,428,000	2050
COUNTY-OTHER, ERATH	N	TRINITY AQUIFER DEVELOPMENT- ERATH COUNTY-OTHER	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$2,195,000	2060
COUNTY-OTHER, FALLS	N	UPGRADE WTP FOR ARSENIC-FALLS COUNTY-OTHER	WATER TREATMENT PLANT EXPANSION	$220,000	2020
COUNTY-OTHER, HILL	N	UPGRADE WTP FOR ARSENIC-HILL COUNTY-OTHER	WATER TREATMENT PLANT EXPANSION	$1,042,000	2020
COUNTY-OTHER, HOOD	N	TRINITY AQUIFER DEVELOPMENT- HOOD COUNTY-OTHER	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$6,164,000	2020
COUNTY-OTHER, LIMESTONE	N	UPGRADE WTP FOR ARSENIC-LIMESTONE COUNTY-OTHER	WATER TREATMENT PLANT EXPANSION	$1,115,000	2020
COUNTY-OTHER, MCLENNAN	N	UPGRADE WTP FOR ARSENIC-MCLENNAN COUNTY OTHER	WATER TREATMENT PLANT EXPANSION	$3,811,000	2020
COUNTY-OTHER, ROBERTSON	N	CARRIZO AQUIFER DEVELOPMENT-ROBERTSON COUNTY-OTHER	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$825,000	2070
COUNTY-OTHER, SHACKELFORD	N	WEST CENTRAL BRAZOS WATER DISTRIBUTION SYSTEM	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT	$3,776,429	2020
COUNTY-OTHER, SOMERVELL	N	SOMERVELLE COUNTY WATER SUPPLY PROJECTS PHASES 1-4, 7A, 9-17	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$35,249,000	2020
COUNTY-OTHER, WILLIAMSON	N	EAST WILLIAMSON COUNTY WATER PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; STORAGE TANK	$11,534,774	2020
CRESSON	N	TRINITY AQUIFER DEVELOPMENT- CRESSON	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$771,000	2040
CROSS COUNTRY WSC	N	INTERCONNECT FROM WACO TO CROSS COUNTRY WSC	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; NEW SURFACE WATER INTAKE	$2,579,000	2050
FLORENCE	N	EDWARDS AQUIFER DEVELOPMENT-FLORENCE	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$218,000	2060
FLORENCE	N	TRINITY AQUIFER DEVELOPMENT (BELL CO.)-FLORENCE	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$3,778,000	2020
GEORGETOWN	N	EXPAND WTP (21 MGD)- GEORGETOWN	WATER TREATMENT PLANT EXPANSION	$44,534,000	2030
GODLEY	N	WOODBINE AQUIFER DEVELOPMENT-GODLEY	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$375,000	2060

Table 5.39-2. Recommended Projects Associated with Water Management Strategies (DB17 Report)

Sponsor Name	Is Sponsor a WWP?	Project Name	Project Description	Capital Cost	Online Decade
GRANGER	N	EAST WILLIAMSON COUNTY WATER PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; STORAGE TANK	$1,003,024	2020
GROESBECK	N	GROESBECK OCR- GROESBECK	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION	$11,909,000	2020
HARKER HEIGHTS	N	INTERCONNECT FROM KILLEEN TO HARKER HEIGHTS	CONVEYANCE/TRANSMISSION PIPELINE; STORAGE TANK; PUMP STATION	$2,580,000	2070
HEART OF TEXAS WATER SUPPLIERS LLC	Y	CARRIZO AQUIFER DEVELOPMENT-HUTTO (HEART OF TEXAS-LEE CO.)	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$127,086,000	2020
HEWITT	N	REUSE- BULLHIDE CREEK	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$4,657,000	2020
IRRIGATION, BELL	N	EDWARDS AQUIFER DEVELOPMENT-BELL COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$13,384,000	2020
IRRIGATION, BELL	N	TRINITY AQUIFER DEVELOPMENT-BELL COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$2,541,000	2070
IRRIGATION, BOSQUE	N	TRINITY AQUIFER DEVELOPMENT-BOSQUE COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$11,048,000	2020
IRRIGATION, COMANCHE	N	TRINITY AQUIFER DEVELOPMENT- COMANCHE COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$11,015,000	2050
IRRIGATION, EASTLAND	N	TRINITY AQUIFER DEVELOPMENT- EASTLAND COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$24,210,000	2020
IRRIGATION, HAMILTON	N	TRINITY AQUIFER DEVELOPMENT- HAMILTON COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$1,173,000	2020
IRRIGATION, KNOX	N	BLAINE AQUIFER DEVELOPMENT- KNOX COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$2,436,000	2020
IRRIGATION, KNOX	N	SEYMOUR AQUIFER DEVELOPMENT- KNOX COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$9,817,000	2020
IRRIGATION, LAMPASAS	N	TRINITY AQUIFER DEVELOPMENT- LAMPASAS COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$3,049,000	2020
IRRIGATION, MCLENNAN	N	BRAZOS RIVER ALLUVIUM DEVELOPMENT-MCLENNAN COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$16,763,000	2020
IRRIGATION, ROBERTSON	N	CARRIZO AQUIFER DEVELOPMENT-ROBERTSON COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$128,018,000	2020
IRRIGATION, STEPHENS	N	OTHER AQUIFER DEVELOPMENT-STEPHENS IRRIGATION	MULTIPLE WELLS/WELL FIELD	$640,000	2020
IRRIGATION, WILLIAMSON	N	EDWARDS AQUIFER DEVELOPMENT-WILLIAMSON IRRIGATION	MULTIPLE WELLS/WELL FIELD	$1,220,000	2020
IRRIGATION, YOUNG	N	OTHER AQUIFER DEVELOPMENT-YOUNG IRRIGATION	MULTIPLE WELLS/WELL FIELD	$1,172,000	2020
JARRELL	N	EAST WILLIAMSON COUNTY WATER PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; STORAGE TANK	$501,512	2020
JAYTON	N	NEW WTP(0.4 MGD)-JAYTON	WATER TREATMENT PLANT EXPANSION	$3,537,000	2020
JONAH WATER SUD	N	EAST WILLIAMSON COUNTY WATER PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; STORAGE TANK	$15,045,357	2020
LACY-LAKEVIEW	N	REUSE- BELLMEAD/ LACY-LAKE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$2,884,000	2020
LEANDER	N	BRUSHY CREEK RUA WATER SUPPLY	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; NEW WATER TREATMENT PLANT	$142,186,421	2020
LIBERTY HILL	N	BRUSHY CREEK RUA WATER SUPPLY	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; NEW WATER TREATMENT PLANT	$3,554,660	2020
LORENA	N	REUSE- BULLHIDE CREEK	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$2,884,000	2020
MANUFACTURING, BRAZOS	N	GULF COAST DEVELOPMENT-BRAZOS COUNTY MANUFACTURING	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$8,932,000	2020
MANUFACTURING, BURLESON	N	SPARTA AQUIFER DEVELOPMENT-BURLESON COUNTY MANUFACTURING	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$932,000	2020
MANUFACTURING, FISHER	N	DOCKUM AQUIFER DEVELOPMENT- FISHER COUNTY MANUFACTURING	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$10,081,000	2020
MANUFACTURING, WASHINGTON	N	GULF COAST DEVELOPMENT-WASHINGTON MININGMANUFACTURING	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$3,380,000	2020

Table 5.39-2. Recommended Projects Associated with Water Management Strategies (DB17 Report)

Sponsor Name	Is Sponsor a WWP?	Project Name	Project Description	Capital Cost	Online Decade
MARLIN	N	BRUSHY CREEK RESERVOIR- MARLIN	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION; STORAGE TANK	$20,836,000	2020
MART	N	INTERCONNECT FROM WACO TO MART	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; NEW SURFACE WATER INTAKE	$5,617,000	2020
MART	N	INTERCONNECT FROM WACO TO NORTH BOSQUE	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; NEW SURFACE WATER INTAKE	$2,203,000	2030
MERIDIAN	N	BOSQUE COUNTY-RWSP	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$3,220,000	2020
MINING, BELL	N	EDWARDS AQUIFER DEVELOPMENT-BELL COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$13,846,000	2020
MINING, BELL	N	TRINITY AQUIFER DEVELOPMENT-BELL COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$14,731,000	2020
MINING, BURLESON	N	SPARTA AQUIFER DEVELOPMENT-BURLESON COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$5,466,000	2020
MINING, CALLAHAN	N	TRINITY AQUIFER DEVELOPMENT CALLAHAN MINING	MULTIPLE WELLS/WELL FIELD	$1,695,000	2020
MINING, COMANCHE	N	TRINITY AQUIFER DEVELOPMENT- COMANCHE COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$4,475,000	2020
MINING, CORYELL	N	TRINITY AQUIFER DEVELOPMENT- CORYELL COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$20,220,000	2020
MINING, EASTLAND	N	TRINITY AQUIFER DEVELOPMENT- EASTLAND COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$8,202,000	2020
MINING, FISHER	N	DOCKUM AQUIFER DEVELOPMENT- FISHER COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$3,035,000	2020
MINING, GRIMES	N	CARRIZO AQUIFER DEVELOPMENT-GRIMES COUNTY MINING	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$5,805,000	2020
MINING, HAMILTON	N	TRINITY AQUIFER DEVELOPMENT HAMILTON MINING	MULTIPLE WELLS/WELL FIELD	$2,734,000	2020
MINING, HILL	N	WOODBINE AQUIFER DEVELOPMENT- HILL COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$4,684,000	2020
MINING, HOOD	N	TRINITY AQUIFER DEVELOPMENT- HOOD COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$6,197,000	2020
MINING, JOHNSON	N	WOODBINE AQUIFER DEVELOPMENT- JOHNSON COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$4,684,000	2020
MINING, KNOX	N	BLAINE AQUIFER DEVELOPMENT- KNOX COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$223,000	2020
MINING, LAMPASAS	N	TRINITY AQUIFER DEVELOPMENT- LAMPASAS COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$2,219,000	2020
MINING, LIMESTONE	N	CARRIZO (BRAZOS) DEVELOPMENT-LIMESTONE COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$31,546,000	2020
MINING, LIMESTONE	N	CARRIZO (TRINITY) DEVELOPMENT-LIMESTONE COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$5,871,000	2020
MINING, MCLENNAN	N	BRAZOS RIVER ALLUVIUM DEVELOPMENT- MCLENNAN COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$7,185,000	2020
MINING, NOLAN	N	EDWARDS AQUIFER DEVELOPMENT-NOLAN COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$2,448,000	2020
MINING, SHACKELFORD	N	OTHER AQUIFER DEVELOPMENT-SHACKELFORD MINING	MULTIPLE WELLS/WELL FIELD	$8,095,000	2020
MINING, SOMERVELL	N	TRINITY AQUIFER DEVELOPMENT- SOMERVELL COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$3,502,000	2020
MINING, STONEWALL	N	BLAINE AQUIFER DEVELOPMENT- STONEWALL MINING	MULTIPLE WELLS/WELL FIELD	$3,434,000	2020
MINING, THROCKMORTON	N	OTHER AQUIFER DEVELOPMENT- THROCKMORTON MINING	MULTIPLE WELLS/WELL FIELD	$2,344,000	2020
MINING, WASHINGTON	N	GULF COAST DEVELOPMENT-WASHINGTON MINING	MULTIPLE WELLS/WELL FIELD	$6,245,000	2020
MINING, YOUNG	N	OTHER AQUIFER DEVELOPMENT-YOUNG MINING	MULTIPLE WELLS/WELL FIELD	$3,089,000	2020
MULTI-COUNTY WSC	N	CORYELL COUNTY OCR-BRA	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION	$42,246,000	2030
NORTH BOSQUE WSC	N	INTERCONNECT FROM WACO TO NORTH BOSQUE	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; NEW SURFACE WATER INTAKE	$2,203,000	2030

Table 5.39-2. Recommended Projects Associated with Water Management Strategies (DB17 Report)

Sponsor Name	Is Sponsor a WWP?	Project Name	Project Description	Capital Cost	Online Decade
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY	Y	MILLERS CREEK AUGMENTATION-NCTWA	RESERVOIR CONSTRUCTION	$74,399,000	2020
PALO PINTO COUNTY MWD #1	Y	TURKEY PEAK RESERVOIR	RESERVOIR CONSTRUCTION	$71,988,000	2020
PARKER WSC	N	WOODBINE AQUIFER DEVELOPMENT- PARKER WSC	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$1,128,000	2060
RIO VISTA	N	WOODBINE AQUIFER DEVELOPMENT-RIO VISTA	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$753,000	2020
ROBINSON	N	EXPAND WTP(4MGD)-ROBINSON	WATER TREATMENT PLANT EXPANSION	$13,153,000	2020
ROUND ROCK	Y	BRUSHY CREEK RUA WATER SUPPLY	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; NEW WATER TREATMENT PLANT	$102,994,808	2020
STEAM ELECTRIC POWER, GRIMES	N	CARRIZO AQUIFER DEVELOPMENT-GRIMES COUNTY STEAM-ELECTRIC	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$8,182,000	2020
STEAM ELECTRIC POWER, GRIMES	N	GIBBONS CREEK RESERVOIR-GRIMES SE	RAISE CONSERVATION POOL	$12,979,000	2020
STEAM ELECTRIC POWER, GRIMES	N	GULF COAST DEVELOPMENT-GRIMES COUNTY STEAM-ELECTRIC	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$22,459,000	2020
STEAM ELECTRIC POWER, SOMERVELL	N	BRA SYSTEM OPS INFRASTRUCTURE-SOMERVELL SE	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION	$128,162,000	2020
STEPHENS REGIONAL SUD	N	WEST CENTRAL BRAZOS WATER DISTRIBUTION SYSTEM	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT	$6,042,286	2020
SWEETWATER	Y	INTERCONNECT FROM ABILENE TO SWEETWATER	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK	$13,036,000	2020
THROCKMORTON	N	THROCKMORTON RESERVOIR-THROCKMORTON	RESERVOIR CONSTRUCTION	$28,041,000	2020
THROCKMORTON	N	WEST CENTRAL BRAZOS WATER DISTRIBUTION SYSTEM	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT	$2,915,403	2020
TOLAR	N	TRINITY WELL REHAB- TOLAR	DEEPEN WELL	$20,000	2050
TRI-COUNTY SUD	N	CARRIZO-WILCOX DEVELOPMENT-TRI-COUNTY SUD	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$1,445,000	2020
UPPER LEON MWD	Y	TRINITY AQUIFER DEVELOPMENT- UPPER LEON (FROM PECAN ORCHARD)	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$5,347,000	2020
VALLEY MILLS	N	BOSQUE COUNTY-RWSP	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$4,730,000	2020
WACO	Y	MCLENNAN COUNTY ASR (WACO)	MULTIPLE WELLS/WELL FIELD	$43,940,000	2020
WACO	Y	REUSE- FLAT CREEK	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$9,371,000	2020
WALNUT SPRINGS	N	BOSQUE COUNTY-RWSP	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$4,213,000	2020
WELLBORN SUD	N	EXPAND WTP (4MGD)- WELLBORN SUD	WATER TREATMENT PLANT EXPANSION	$13,153,000	2040
WEST BRAZOS WSC	N	CARRIZO AQUIFER DEVELOPMENT-WEST BRAZOS WSC	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$2,752,000	2020

Region G Total Recommended Capital Cost	$3,926,014,878

*Projects with a capital cost of zero are excluded from the report list.

Table 5.39-3. Alternative Water Management Strategies Summary (DB17 Report)

				Water Management Strategy Supplies							
WUG Entity Name	WMS Sponsor Region	WMS Name	Source Name	2020	2030	2040	2050	2060	2070	Unit Cost 2020	Unit Cost 2070
ABILENE	G	POSSUM KINGDOM TO ABILENE	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	14,800	14,800	14,800	14,800	14,800	14,800	$2586	$1063
ASPERMONT	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	33	47	62	76	90	105	$0	$0
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE GRANGER AUGMENTATION-PH 1	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	17,017	17,017	17,017	17,017	17,017	17,017	$0	$0
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE GRANGER AUGMENTATION-PH 1	G | TRINITY AQUIFER | WILLIAMSON COUNTY	8,509	8,509	8,509	8,509	8,509	8,509	$584	$305
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE GRANGER AUGMENTATION-PH 2	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	18,107	18,107	18,107	18,107	18,107	18,107	$0	$0
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE GRANGER AUGMENTATION-PH 2	G | CARRIZO-WILCOX AQUIFER | MILAM COUNTY	28,118	28,118	28,118	28,118	28,118	28,118	$1611	$458
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	SEDIMENT REDUCTION PROGRAM (LAKE LIMESTONE WATERSHED)	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	0	177	355	532	710	888	N/A	$167
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	STORAGE REALLOCATION OF LAKE GRANGER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	1,940	1,940	1,940	1,940	1,940	1,940	$1552	$314
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	STORAGE REALLOCATION OF LAKE WHITNEY	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	20,842	20,842	20,842	20,842	20,842	20,842	$361	$4
BRAZOS RIVER AUTHORITY - UNASSIGNED WATER VOLUMES	G	STORAGE REALLOCATION OF STILLHOUSE HOLLOW RESERVOIR	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	2,643	2,643	2,643	2,643	2,643	2,643	$1177	$19
BRYAN	G	CARRIZO AQUIFER DEVELOPMENT	G | CARRIZO-WILCOX AQUIFER | ROBERTSON COUNTY	3,826	3,826	4,171	5,565	11,826	19,478	$1006	$323
COLLEGE STATION	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	6,000	6,000	6,000	6,000	6,000	6,000	$1065	$547
COLLEGE STATION - UNASSIGNED WATER VOLUMES	G	DPR- COLLEGE STATION	G | DIRECT REUSE	2,800	2,800	2,800	2,800	2,800	2,800	$3484	$1805
COUNTY-OTHER, CORYELL	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	0	0	0	100	200	525	N/A	$1309
COUNTY-OTHER, HASKELL	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	53	76	100	123	146	170	$0	$0
COUNTY-OTHER, HOOD	G	ACTON MUD REDUCTION TO HOOD COUNTY-OTHER	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	968	344	77	121	22	0	$977	N/A
GLEN ROSE	G	SOMERVELL COUNTY WSP	G | BRAZOS RUN-OF-RIVER	0	0	0	0	50	50	N/A	$1059

Table 5.39-3. Alternative Water Management Strategies Summary (DB17 Report)

WUG Entity Name	WMS Sponsor Region	WMS Name	Source Name	Water Management Strategy Supplies 2020	2030	2040	2050	2060	2070	Unit Cost 2020	Unit Cost 2070
HALLSBURG	G	REUSE- WMARSS WACO EAST	G | DIRECT REUSE	31	31	31	31	31	31	$869	$191
HASKELL	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	176	254	332	410	488	566	$0	$0
HUTTO	G	LITTLE RIVER OCR	G | LITTLE RIVER OFF-CHANNEL LAKE/RESERVOIR	0	378	2,181	4,001	6,215	8,499	N/A	$350
IRRIGATION, BELL	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	1,200	1,200	1,200	1,200	1,200	1,250	$66	$66
IRRIGATION, MCLENNAN	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	1,200	1,200	1,200	1,200	1,200	1,200	$66	$66
IRRIGATION, MCLENNAN	G	TRINITY AQUIFER DEVELOPMENT	G | TRINITY AQUIFER | MCLENNAN COUNTY	1,000	1,000	1,000	1,000	1,000	1,000	$1047	$86
IRRIGATION, PALO PINTO	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	2,494	2,392	2,299	2,260	2,222	2,188	$66	$66
JOHNSON COUNTY SUD	G	TRINITY - JOHNSON COUNTY ASR	G | TRINITY AQUIFER ASR | JOHNSON COUNTY	2,000	2,000	2,000	2,000	2,000	2,000	$1131	$640
KNOX CITY	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	72	104	136	167	199	231	$0	$0
MANUFACTURING, BELL	G	REUSE-BCWCID #1 NORTH	G | DIRECT REUSE	1,000	1,000	1,000	1,360	1,360	1,360	$765	$765
MANUFACTURING, BURLESON	G	CALDWELL REDUCTION TO BURLESON MANUFACTURING	G | CARRIZO-WILCOX AQUIFER | BURLESON COUNTY	0	50	50	50	85	85	N/A	$500
MART	G	REUSE- WMARSS WACO EAST	G | DIRECT REUSE	134	134	134	134	134	134	$869	$191
MERIDIAN	G	MERIDIAN OCR	G | MERIDIAN OFF-CHANNEL LAKE/RESERVOIR	615	615	615	615	615	615	$3961	$1220
MINING, MCLENNAN	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	0	0	0	1,050	1,050	1,050	N/A	$66
MUNDAY	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	74	107	140	173	205	238	$0	$0
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY - UNASSIGNED WATER VOLUMES	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	13,815	13,511	13,208	12,905	12,601	12,298	$1308	$313
PALO PINTO COUNTY MWD #1 - UNASSIGNED WATER VOLUMES	G	PALO PINTO OCR	G | LAKE PALO PINTO OFF-CHANNEL LAKE/RESERVOIR	3,110	3,110	3,110	3,110	3,110	3,110	$980	$169
RIESEL	G	REUSE- WMARSS WACO EAST	G | DIRECT REUSE	43	43	43	43	43	43	$869	$191
ROUND ROCK	G	TRINITY - WILLIAMSON COUNTY ASR	G | TRINITY AQUIFER ASR | WILLIAMSON COUNTY	0	0	0	0	9,050	9,050	N/A	$368
RULE	G	LAKE CREEK RESERVOIR	G | LAKE CREEK LAKE/RESERVOIR	12	18	23	29	34	40	$0	$0
VENUS	G	WOODBINE AQUIFER DEVELOPMENT	G | WOODBINE AQUIFER | JOHNSON COUNTY	0	150	150	450	450	450	N/A	$203
WACO - UNASSIGNED WATER VOLUMES	G	REUSE- WMARSS WACO EAST	G | DIRECT REUSE	0	0	0	0	0	0	N/A	N/A
			Region G Total Alternative WMS Supplies	152,632	152,543	154,393	159,481	177,112	187,430		

Table 5.39-4. Unmet Needs for Water User Groups (DB17 Report)

REGION G	WUG UNMET NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
BELL COUNTY						
BRAZOS BASIN						
MINING	459	1,023	1,614	3,216	4,915	6,360
BOSQUE COUNTY						
BRAZOS BASIN						
MINING	1,784	1,838	1,631	1,612	1,576	1,565
BRAZOS COUNTY						
BRAZOS BASIN						
MINING	1,055	1,529	1,333	1,064	858	757
BURLESON COUNTY						
BRAZOS BASIN						
MINING	225	1,087	666	283	0	0
JONES COUNTY						
BRAZOS BASIN						
MINING	232	222	203	185	170	157
IRRIGATION	174	35	0	0	0	0
LEE COUNTY						
BRAZOS BASIN						
MINING	2,406	5,401	5,634	6,024	6,459	6,986
COLORADO BASIN						
MINING	679	1,524	1,589	1,699	1,822	1,971
LIMESTONE COUNTY						
BRAZOS BASIN						
MINING	3,431	2,876	2,572	2,797	3,295	3,923
TRINITY BASIN						
MINING	368	320	294	314	357	412
NOLAN COUNTY						
BRAZOS BASIN						
IRRIGATION	1,357	1,155	962	860	760	667
COLORADO BASIN						
IRRIGATION	904	771	640	573	507	445
PALO PINTO COUNTY						
BRAZOS BASIN						
POSSUM KINGDOM WSC	7	0	0	0	0	0
ROBERTSON COUNTY						
BRAZOS BASIN						
MINING	0	960	2,599	4,881	7,667	11,129
IRRIGATION	35,322	31,853	28,799	28,207	32,917	39,407
STEPHENS COUNTY						
BRAZOS BASIN						
MINING	3,912	3,884	3,146	2,557	2,029	1,579
WILLIAMSON COUNTY						
BRAZOS BASIN						
MINING	4,593	5,520	6,434	7,541	8,682	9,988

5.39.2 Potentially Feasible Water Management Strategies

Table 5.39-5 includes a list of water management strategies that have been evaluated in the Brazos G Regional Water Plan since 2001. This table indicates for which plan(s) the strategies were evaluated. Some of these strategies such as the Wheeler Off-Channel Reservoir may have been implemented or others may have changed names since the 2001 plan. This list represents potentially feasible water management strategies for the Brazos G Area.

Table 5.39-5. Potentially Feasible Water Management Strategies Evaluated in Brazos G Regional Water Plans

Strategy	2001	2006	2011	2016
Advanced Conservation				X
Advanced Industrial Conservation				X
Bosque County Regional Project	X	X	X	X
BRA Reservoir Connection			X	X
BRA SWATS	X		X	
BRA System Operation		X	X	X
Brackish Desal	X		X	X
Brazos River Alluvium	X			X
Breckenridge Reservoir				
Brush Control			X	X
Brushy Creek Reservoir			X	X
Brushy Creek RUA Water Supply Project	X	X	X	X
Bryan ASR				X
Carrizo-Aquifer Development	X	X		X
Carrizo-Wilcox Groundwater	X	X	X	
Cedar Ridge Reservoir		X	X	X
Chloride Control Project	X		X	X
College Station ASR				X
College Station DPR				X
Coordinated use of Fort Phantom Hill and Hubbard Creek Reservoirs	X			
Coordinated Use of Lake Leon Water Supply with Local Groundwater	X			
Coryell County Off-Channel Reservoir			X	X
Double Mtn. Fork (East) Reservoir		X	X	
Double Mtn. Fork (West) Reservoir		X	X	
East Williamson County Water Supply Project				X
Future Phases of Lake Whitney Water Supply Project			X	X
Gibbons Creek Reservoir Expansion			X	X

Table 5.39-5. Potentially Feasible Water Management Strategies Evaluated in Brazos G Regional Water Plans

Strategy	2001	2006	2011	2016
Groesbeck Off-Channel Reservoir	X	X	X	X
Groundwater Development			X	X
Gulf Coast Groundwater			X	X
Hamilton County Reservoir				X
Increase WTP Capacity	X	X	X	X
Industrial Conservation		X	X	X
Irrigation Conservation		X	X	X
Johnson County ASR				X
Kerr-McGee transmission	X			
Lake Aquilla Augmentation			X	X
Lake Bosque	X			
Lake Cisco Augmentation				
Lake Creek Reservoir				X
Lake Granger ASR				X
Lake Granger Augmentation		X	X	X
Lake Leon Augmentation	X			
Lake Palo Pinto Off-Channel Reservoir		X	X	X
Lake Stamford Augmentation				
Lake Sweetwater Augmentation				
Lake Whitney Desal	X			
Leave Needs Unmet				X
Little River Off-Channel Reservoir	X	X	X	X
Little River Reservoir			X	
McLennan County ASR				X
Meridian Off-Channel Reservoir	X		X	X
Millers Creek Reservoir Augmentation			X	X
Millican-Bundic Reservoir	X	X		
Millican-Panther Reservoir			X	
Municipal Conservation		X	X	X
Oak Creek Reservoir Conjunctive Management			X	X
Paluxy Reservoir	X			
Peach Creek Off-Channel Reservoir	X	X	X	X
Phase I Lake Whitney Water Supply Project			X	X
Possum Kingdom		X	X	X

Table 5.39-5. Potentially Feasible Water Management Strategies Evaluated in Brazos G Regional Water Plans

Strategy	2001	2006	2011	2016
Purchase Additional Water		X	X	X
Purchase Additional Water + Infrastructure	X	X	X	X
Purchase from Walnut Creek Mine				X
Reallocation of Supplies			X	X
Rehabilitate Existing Wells			X	X
Restructure Contracts			X	X
Reuse Supply	X	X	X	X
Run-of-river water right of unappropriated flows			X	
Sediment Reduction Program			X	X
Seymour ASR Project	X	X	X	
Somervell County Off-Channel Reservoir	X			
Somervell County WSP			X	X
South Bend Reservoir	X	X	X	X
Storage Reallocation	X		X	X
Subordination Agreement			X	X
Throckmorton Reservoir			X	X
TRA Reuse - Joe Pool		X	X	
Trinity ASR Project		X	X	X
Trinity Groundwater			X	X
Turkey Peak Reservoir		X	X	X
Voluntary Redistribution			X	X
West Central Brazos Water Distribution System				X
Weather Modification			X	
Wheeler Branch Off-Channel Reservoir[1]		X	X	

1 – Strategy has been implemented.

5.40 Water Conservation Recommendations

Regional water planning guidelines require each regional water planning group to consider water conservation to meet projected shortages, although funding to implement such water conservation programs is limited. Conservation is shown as a recommended strategy for all water user groups with needs identified during the planning period. The Brazos G RWPG adopted the following water conservation recommendations for the 2016 Plan which are further described in Volume II, Section 2.

- Municipal water user groups with per capita rates exceeding 140 gallons per person per day (gpcd) were recommended to reduce per capita consumption by 1% annually through 2070 until a 140 gpcd rate is attained. This recommendation applies to all municipal water user groups with and without projected water supply needs (shortages). For Water User Groups (WUGs) in Williamson County, an additional advanced conservation goal of 120 gpcd by 2070 was recommended. Annual reduction rates ranging from 0.35% to 1.1% for Williamson County WUGs were applied to bring the gpcd of each WUG to 120 gpcd. Conservation can be achieved through a variety of best management practices, some of which are listed in Section 2.1.2. For municipal entities reporting real losses greater than 15% of water system input volume, an infrastructure replacement program to reduce water loss is summarized in Section 2.1.8.
- Irrigation water user groups with identified needs were recommended to reduce water use by 3% by 2020, 5% by 2030, and 7% from 2040-2070. A list of best management practices prepared by the Water Conservation Implementation Task Force that can be implemented to achieve these goals is included in Section 2.2.2.
- Manufacturing, steam-electric, and mining water user groups with identified needs were recommended to reduce water use by 3% by 2020, 5% by 2030, and 7% from 2040-2070. A list of best management practices prepared by the Water Conservation Implementation Task Force that can be implemented to achieve these goals is included in Section 2.3.2.
- Conservation recommendations were not made for livestock water user groups.

A summary was prepared of common water conservation best management practices (Table 5.40-1) and recommended 5- and 10-year water conservation targets (Table 5.40-2) obtained from local water conservation plans for entities located in Brazos G. The Brazos G RWPG suggests that water user groups in the region review the list and look to identify water user groups at a relevant size with similar water supply type and consider voluntary implementation of those best management practices, if applicable.

TCEQ has prepared model water conservation plans (WCPs) for municipal public water suppliers, wholesale providers, industrial and mining entities, and agricultural users to provide guidance and suggestions to entities with regard to the preparation of water conservation plans. Not all items in the model plan will apply to every system's situation, but the overall model plan can be used as a starting point for most entities. For water user groups wishing to develop a new WCP, Brazos G suggests considering best management practices from local water conservation plans for entities similar in size, as discussed previously, in addition to the TCEQ Model WCPs. The TCEQ model water conservation plans can be found in on TCEQ's website at the following link:

https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/conserve.html

Table 5.40-1. Summary of Water Conservation BMPs in the Brazos G Area

Wholesale Water Provider	WCP Available	Date	Best Management Practices							
			Reduce Water Losses/ Unaccounted for Water/Leak Detection	Water Conservation Pricing/Seasonal or Inverted Block Rates	Reuse	Improve Meter Accuracy	Toilet Replacement/ Retrofit Programs	Public/School Education	Landscape Conservation/Xeriscape	Others
Aquilla WSD	Y	2014	√	√		√				√
Bellmead	Y	2010	√	√		√	√	√	√	
Belton	Y	2000	√	√		√		√		√
Bethesda WSC	Y	2009	√	√		√		√	√	√
Block House MUD	Y	2013	√		√	√	√	√	√	√
Blum	Y	2002	√	√		√		√	√	√
Brazos Valley GCD	Y	2012	√			√	√	√	√	√
Bryan	Y	2011	√	√	√	√	√	√	√	√
Buffalo Gap	Y	2010	√			√		√		
Clyde	Y	2010	√	√		√		√		√
Fort Hood	Y	2002	√		√	√	√	√	√	
Gatesville	Y	2000	√	√	√	√	√	√		
Georgetown	Y	2009	√	√	√	√		√	√	√
Harker Heights	Y	2011	√	√	√	√	√	√	√	√
Hico	Y	2013	√	√		√		√		√
Lampasas	Y	2001	√	√	√	√	√	√	√	√
LCRA	Y	2012	√	√		√	√	√	√	√
Manville WSC	Y	2011	√			√		√		
Mexia	Y	2002	√	√		√		√	√	√
Navasota	Y	1999	√			√		√		√
Ranger	Y	2012	√	√		√		√		√
Robinson	Y	2002		√		√	√	√	√	
Stamford	Y	2011	√	√		√	√	√		√

Table 5.40-1. Summary of Water Conservation BMPs in the Brazos G Area

Wholesale Water Provider	WCP Available	Date	Best Management Practices							
			Reduce Water Losses/ Unaccounted for Water/Leak Detection	Water Conservation Pricing/Seasonal or Inverted Block Rates	Reuse	Improve Meter Accuracy	Toilet Replacement/ Retrofit Programs	Public/School Education	Landscape Conservation/Xeriscape	Others
Stephens Regional SUD	Y	2014	√	√		√		√		√
Vista Oaks MUD	Y	2012	√			√		√	√	√
West Central Texas MUD	Y	1999	√			√				√
Woodway	Y	2009	√			√	√	√	√	√

Table 5.40-2. Summary of 5- and 10-Year Water Conservation Goals in the Brazos G Area

Wholesale Water Provider	5-Year Goal		10-Year Goal	
	GPCD Target	General	GPCD Target	General
Aquilla WSD	151	Not available	150	Not available
Bellmead	118	Not available	113	Not available
Belton	–	Not available	–	5 to 10% reduction
Bethesda WSC	121	Not available	117	Not available
Block House MUD	–	2.5% per capita decrease	–	5% per capita decrease
Blum	NA	1%/year reduction in unaccounted water	–	1%/year reduction in unaccounted water
Brazos Valley GCD	–	Not available	–	Not available
Bryan	167	Not available	137	Not available
Buffalo Gap	51.8	Not available	46.8	Not available
Clyde	82	Not available	77	Not available
Fort Hood	–	Not available	–	Not available
Gatesville	–	Not available	–	Not available
Georgetown	190	12% water loss	180	10% water loss
Harker Heights	143	Reduce water loss to 12%	143	Reduce water loss to 10%
Hico	188	Residential GPCD of 140.20; GPCD reduction of 30; 16.2 % water loss	186	Residential GPCD of 138.94; Water loss GPCD reduction of 29; 15.5 % water loss

Table 5.40-2. Summary of 5- and 10-Year Water Conservation Goals in the Brazos G Area

Wholesale Water Provider	5-Year Goal		10-Year Goal	
	GPCD Target	General	GPCD Target	General
Lampasas	–	Not available	–	Not available
LCRA	104	2% decrease in water use	100	6% decrease in water use
Manville WSC	122	2 gpcd reduction in water loss	120	4 gpcd reduction in water loss
Mexia	–	Not available	–	Not available
Navasota	143	Not available	–	Not available
Ranger	137	33% water loss	110	20% water loss
Robinson	128.8	Not available	126.6	Not available
Stamford	154	Not available	152	Not available
Stephens Regional SUD	79.9	GPCD reduction of 13.2, or 21%	77.4	GPCD reduction of 11.7, or 19%
Vista Oaks MUD	–	Reduce GPCD by 3%	–	Reduce GPCD by 6%
West Central Texas MUD	–	Not available	–	Not available
Woodway	175.6	5% or 10.36 GPCD reduction	165.3	10% or 20.72 GPCD reduction

6

Consistency with Long Term Protection of the State's Water, Agricultural, and Natural Resources

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6 Consistency with Long-Term Protection of the State's Water, Agricultural, and Natural Resources

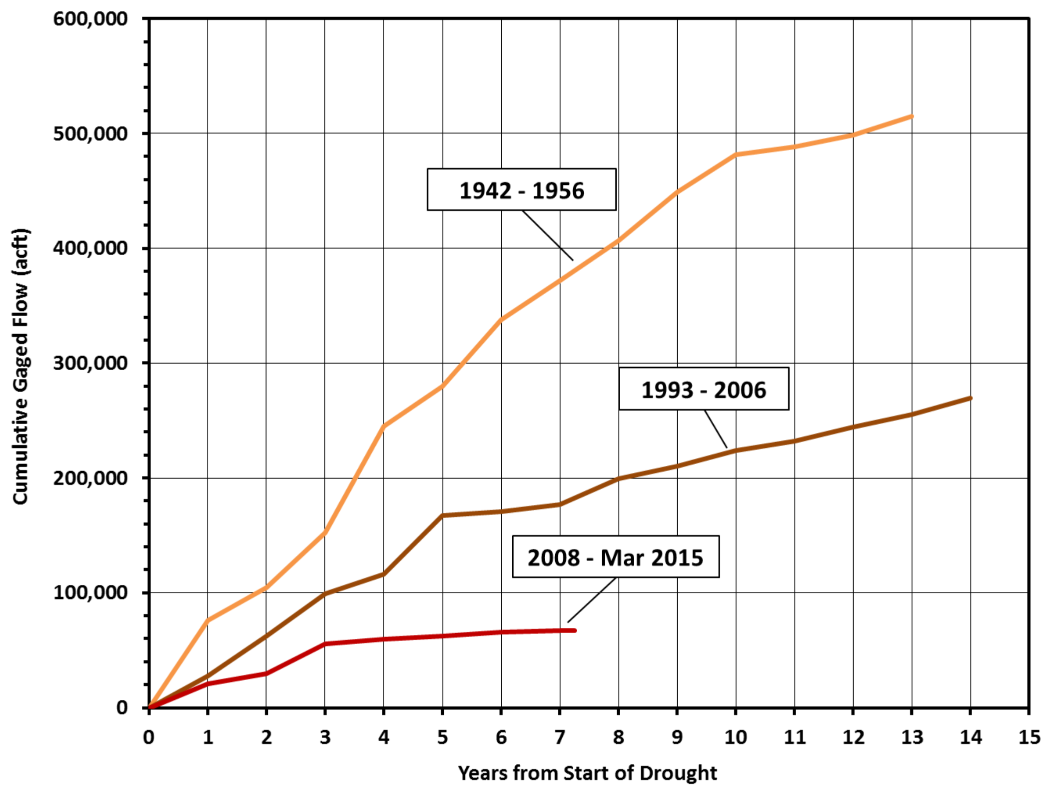
The 2016 Plan is consistent with long-term protection of the state's water resources, agricultural resources, and natural resources and is developed based on guidance principles outlined in the Texas Administrative Code Chapter 358 – State Water Planning Guidelines. The 2016 Plan was produced with an understanding of the importance of orderly development, management, and conservation of water resources and is consistent with all laws applicable to water use for the state and regional water planning areas. Furthermore, the plan was developed according to principles governing surface water and groundwater rights. Availability of water for new surface water supplies considered environmental flow needs as defined by the environmental flow standards adopted in the Brazos Basin and incorporated into the Brazos Water Availability Model (BWAM), and protection of existing water rights. For groundwater, the 2016 Plan recognizes principles for groundwater management in Texas, and estimates of groundwater availability take into the Modeled Available Groundwater (MAG) as determined by the TWDB.

The 2016 Plan identifies actions and policies necessary to meet the Brazos G Area's near and long-term water needs by developing and recommending water management strategies to meet needs with reasonable cost, good water quality, and sufficient protection of agricultural and natural resources of the state. The Brazos G Regional Water Planning Group (RWPG) has recommended water management strategies that consider the public interest of the state, wholesale water providers, protection of existing water rights, and opportunities that encourage voluntary transfers of water resources while balancing economic, social, and ecological viability. When needs could not be met economically with water management strategies, a socioeconomic impact analysis was performed to estimate the economic loss associated with not meeting these needs. This analysis is shown in the final plan in (Appendix H).

The 2016 Plan considers environmental information resulting from site-specific studies and ongoing development of water projects when evaluating water management strategies. Cumulative effects of water management strategies on Brazos River instream flows and inflows to the Gulf of Mexico were considered, as documented later in this chapter. A list of endangered and threatened species in the Brazos G Area for each county was obtained from the U.S. Fish and Wildlife Service and possible impacts to these species and/or their habitats were considered for each water management strategy evaluated.

The 2016 Plan consists of initiatives to respond to continuing drought conditions in the western part of the region, and makes use of relatively low-impact strategies such as reuse of wastewater return flows and the Brazos River Authority's proposed System Operations Permit to increase supplies. As a further drought protection provision, the Brazos G RWPG adopted use of safe yield analyses for purposes of determining water supply for municipal supply reservoirs upstream of Possum Kingdom Reservoir. The use of safe yield analyses anticipates that a future drought may occur that is greater in severity than the worst drought of record and reserves a certain amount of water in storage (i.e., a 6-month, or 1- or 2-year supply) for such an event. Use of safe yield in the upper Brazos Basin is justified based on the severity of the recent and ongoing drought. Figure 6-1 presents the cumulative gaged streamflow for the USGS gage located on the Clear Fork of the Brazos River near Nugent, TX. The figure shows how flows during the current drought beginning in 2008 are significantly less than those of the drought of record (1950's drought) and the drought beginning in 1993. After seven years from the beginning of the droughts, the cumulative gaged flow of the current drought is 82 and 62 percent less than the cumulative gaged flows of the 1950's and 1993 drought, respectively.

Figure 6-1. Cumulative Gaged Flows at Clear Fork of the Brazos near Nugent



The Brazos G RWPG conducted numerous meetings during the 2016 planning cycle, which were open to the public, and decisions were based on accurate, objective, and reliable information. The Brazos G RWPG coordinated water planning activities with local, regional and state agencies, and was committed to facilitating the initiatives and addressing the concerns of local and regional entities.

The Brazos G RWPG developed policy recommendations regarding State water policy after extensive consideration and deliberation, and these are presented in Chapter 8 of this report. The Brazos G RWPG considered recommendations of stream segments with unique ecological value by Texas Parks and Wildlife and sites of unique value for construction of reservoirs. At this time, the Brazos G RWPG recommends that no stream segments be designated as unique; however, there are recommendations to identify certain reservoir sites as unique (Chapter 8).

6.1 Cumulative Hydrologic Effects of Implementing the Brazos G Regional Water Plan

The following sections describe in more detail the hydrologic effects of the recommended water management strategies on surface water and groundwater resources.

6.1.1 Surface Water

Sophisticated hydrologic models have been employed to quantify the cumulative effects of implementation of the 2016 Plan through the year 2070. Surface water effects were quantified using the TECQ Brazos WAM Run 3 which, as per the TWDB planning guidelines, was the standard tool utilized to evaluate surface water strategies in the region. The Brazos WAM Run 3 assumptions include no return flows (unless included as a specific component to a strategy), as-permitted reservoir contents, BRA water rights diverted lakeside, and the environmental flow standards adopted by the TCEQ for the Brazos Basin.

The cumulative effects of the plan can be quantified by comparing conditions prior to implementation of the plan (base condition) to conditions with the plan in place. The base condition against which to compare conditions with the plan in place was streamflow computed by the Brazos WAM under the Run 3 assumptions.

The conditions with the plan in place include the base condition assumptions, with the addition of any recommended strategies that could measurably affect streamflows, i.e., those that result in development of additional water supply. The recommended water management strategies, shown in Figure 6-2 and listed in Table 6-1, were incorporated into the model. Specific strategies not included in the analysis are direct reuse projects, conservation, strategies transferring water from one entity to another through new or increased purchases, and development of additional groundwater. The base condition assumes full utilization of water rights, and conservation or transfers of water will not impact the assumption of full utilization of water rights. Surface water/groundwater interactions are difficult to quantify, but reductions in streamflow due to increased utilization of groundwater resources are expected to be small.

The cumulative effects of the 2016 Plan on streamflows were evaluated at the eight locations presented in Table 6-2. Each selected location is located in the Brazos G portion of the Brazos River Basin, except the Brazos River at Richmond site. This location was included in the analysis to illustrate the impacts of not only Brazos G strategies on the lower part of the basin, but also to include the effects of the Region H strategies (Allens Creek Reservoir and lower basin diversions from BRA System Operations) that were included in the analysis.

Figure 6-2. Location of Recommended Water Management Strategies Included in the Cumulative Impacts Analysis

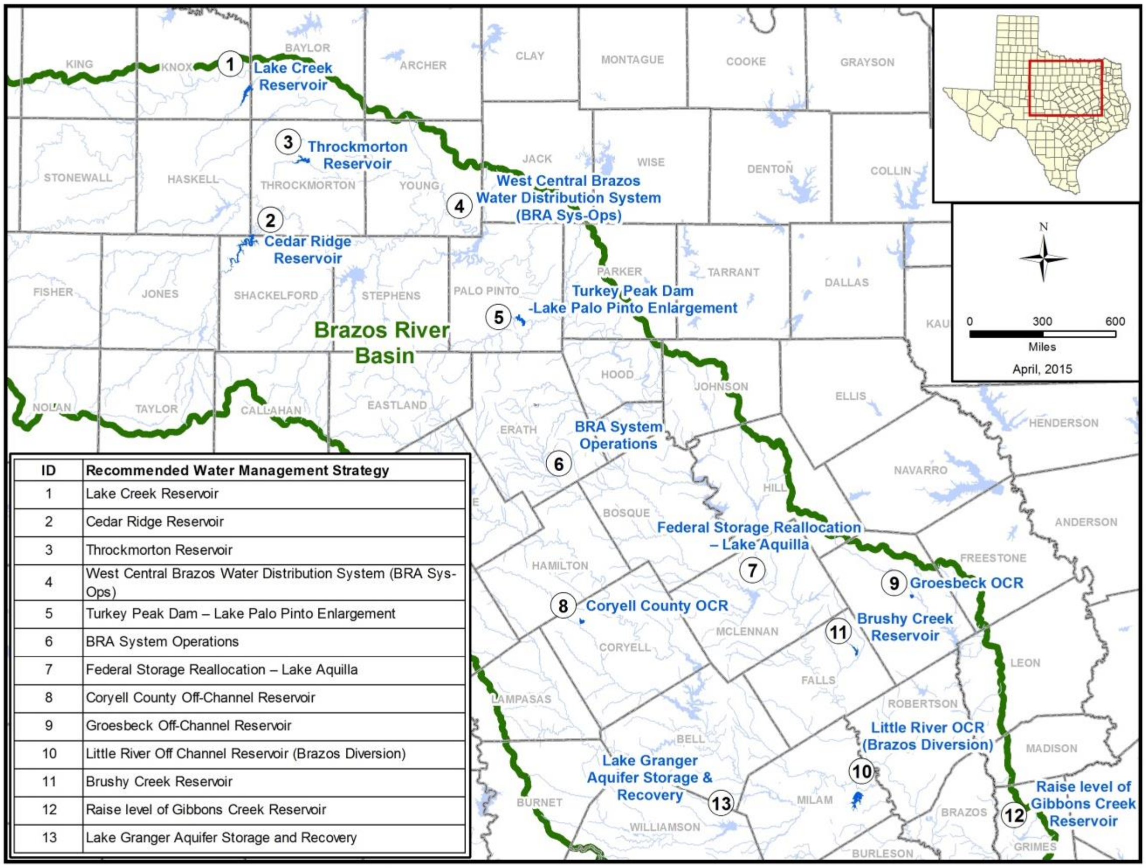


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Table 6-1. Recommended Water Management Strategies Included in the Cumulative Impacts Analysis

Recommended Water Management Strategy	WUG or WWP	Plan Section
Lake Creek Reservoir	North Central Texas Municipal Water Authority	4.10
Cedar Ridge Reservoir	City of Abilene	4.2
Throckmorton Reservoir	City of Throckmorton	4.12
West Central Brazos Water Distribution System (BRA Sys-Ops)	Multiple	8.4
Turkey Peak Dam – Lake Palo Pinto Enlargement	Palo Pinto County MWD No.1	4.13
BRA System Operations	BRA - Multiple	7.12
Federal Storage Reallocation – Lake Aquilla	BRA	7.6

Table 6-1. Recommended Water Management Strategies Included in the Cumulative Impacts Analysis

Recommended Water Management Strategy	WUG or WWP	Plan Section
Coryell County Off-Channel Reservoir	BRA - Multiple	4.3
Groesbeck Off-Channel Reservoir	City of Groesbeck	4.4
Little River Off Channel Reservoir (Brazos Diversion)	BRA - Multiple	4.7
Brushy Creek Reservoir	City of Marlin	4.1
Gibbons Creek Reservoir Expansion	Grimes County Steam Electric	7.4
Lake Granger Aquifer Storage and Recovery	BRA - Multiple	10.4
Allens Creek Reservoir [a]	BRA	N/A

[a] Allens Creek Reservoir is a recommended strategy in the Region H Plan. Allens Creek is neither recommended nor discouraged in the Brazos G Plan.

Table 6-2. Locations for Evaluating the Effects of Recommended Strategies on Streamflow

Location	WAM Control Point Identifier	Region Location (G/H)
Brazos River at South Bend	BRSB23	G
Brazos River near Glen Rose	BRGR30	G
Brazos River near Aquilla	BRAQ33	G
Bosque River near Waco	BOWA40	G
Little River near Cameron	LRCA58	G
Brazos River near Bryan	BRBR59	G
Brazos River near Hempstead	BRHE68	H
Brazos River at Richmond	BRRI70	H

The new strategies were operated junior to the proposed appropriation under the BRA System Operations Permit, since this strategy will receive a priority date from the TCEQ that is senior to all strategies listed, except for Brushy Creek Reservoir and Allens Creek Reservoir, which are already permitted. It was assumed during evaluation of most of the strategies that some form of priority calls agreement would be required between the BRA and the entity developing a new water supply project to more fully realize the yield potential of a project. These agreements were not included for new strategies in the cumulative impacts analysis, unless the entity sponsoring a strategy already has an agreement with the BRA. In all cases, the priorities of BRA's existing rights were honored, as simulated under system operations.

The Region H portion of the supply made available under BRA System Operations was diverted at the Rosharon control point (BRRO72) in the model. The existing priority calls agreements with the BRA and other water right holders were considered in this model run. The inclusion or exclusion of the subordination agreements does not affect the resulting streamflows at the selected locations in a substantive manner.

The cumulative effects of the recommended water management strategies on regulated streamflow were evaluated by comparing descriptive streamflow statistics for the base condition with those from the plan condition at the selected evaluation locations.

Also included in the comparisons are flows as obtained from the version of the Brazos WAM maintained by the TCEQ known as Run 8. Run 8 attempts to duplicate flows under "current" conditions of use for individual water rights, return flows, and year 2010 reservoir sedimentation conditions. The TCEQ has not updated Run 8 for the Brazos basin since the 2011 Plan, therefore the Run 8 flows included in the last plan were utilized for comparisons and assumed to accurately reflect current conditions to the degree necessary for this analysis. Differences between Run 8 and the plan condition flows are not due solely to the water management strategies recommended in the plan, but also due to full utilization of existing water rights, differences in assumed return flows, reservoir sedimentation conditions, and locations of BRA diversions. The Run 8 information is provided as a snapshot of the current utilization of supplies in the Brazos basin and allows for comparison with the base condition and plan condition scenarios.

through Figure 6-10 present these comparisons for regulated streamflow at each of the evaluation locations. Regulated flow is the total streamflow remaining in the stream after all existing water rights have been exercised and other water management activities have taken place. It represents the total flow passing a location (control point) after all water rights have appropriated the flows to which they are entitled.

One noticeable trend in the monthly median graphs for most locations is that monthly median streamflows are significantly greater January through June than July through December. In order to investigate this apparent trend, a comparison of naturalized flows with the regulated flows was completed to verify if this trend was a by-product of the modeling, or if it occurs naturally in the streamflow records. Figure 6-11 illustrates the median naturalized flows at the Brazos River at Richmond location compared to the regulated flows of both the base and the implemented plan scenarios. This graph demonstrates that the trend in flows computed by the modeling follows the same pattern in the underlying natural flows upon which the simulations are based.

Many locations exhibit larger flows with the implementation of the 2016 Plan than with the base condition. This is due primarily to releases being made from upstream BRA reservoirs as part of the BRA System Operations to the diversions modeled at various locations along the main stem of the Brazos River.

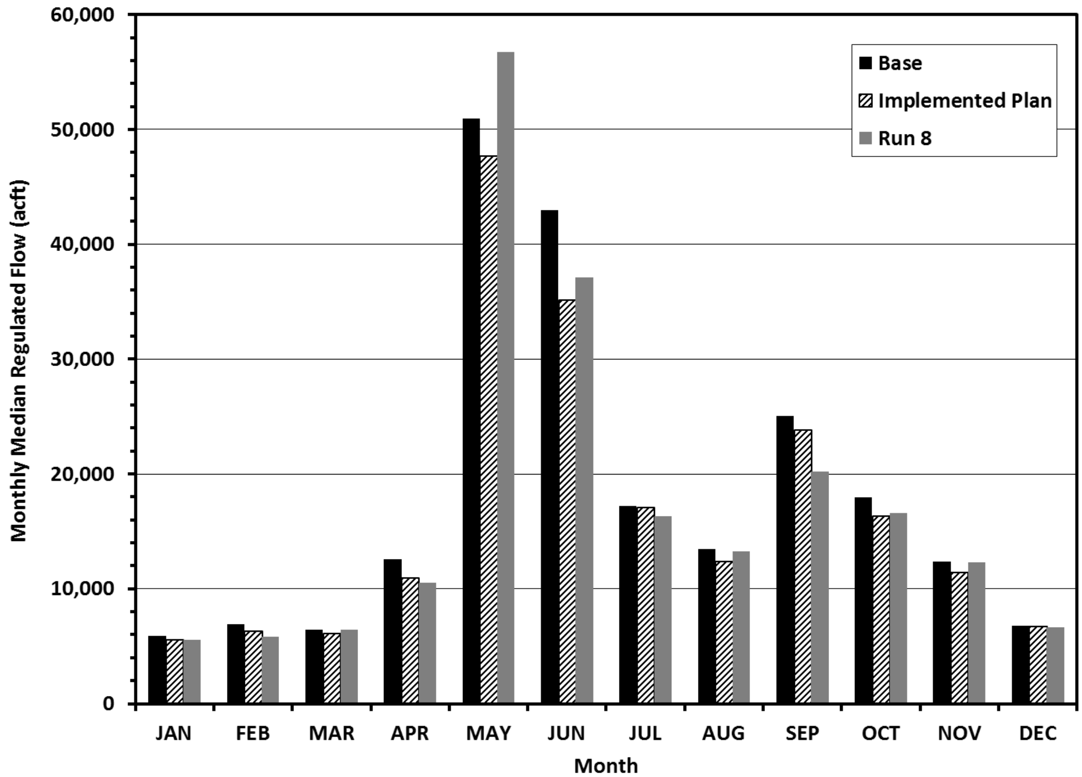
The Brazos River near South Bend is the only location that shows there are more months where the median streamflow would decrease between the base and the plan conditions than where it would stay the same or increase. These reductions are the result of the implementation of the Cedar Ridge and Lake Creek Reservoirs. The increases in median flow, especially at the Brazos River near Glen Rose, are the results of BRA System Operations releases from Possum Kingdom Reservoir and Lake Granbury. For the South Bend location, the largest decrease occurs in June at 22%. Even with this modest difference in median streamflow, the frequency plots show that the overall change to the flow regime is minor.

The Brazos River near Aquilla location shows increases in median streamflow for 11 of the 12 months. The range of differences at this location is a 19% decrease to a 78% increase. Again these differences are primarily attributed to the impacts of BRA System Operations and new upstream reservoirs. The Bosque River near Waco location controls a relatively small watershed compared to the other locations investigated in this analysis. Changes associated with this location are relatively negligible. The Run 8 flows are much greater than the base or plan condition flows, apparently from under-utilization of existing water rights. The Little River near Cameron location reflects changes from projects recommended for implementation in the Little River watershed, specifically the Lake Granger ASR. While monthly median flows exhibit mostly increases up to 29%, little difference is apparent in the overall frequency of flows.

The three most downstream locations, Brazos River near Bryan, Brazos River near Hempstead and the Brazos River at Richmond, are all located on the main stem of the Brazos River and the changes in streamflow at these locations show similar trends. These locations are located downstream in the basin and downstream from the majority of the recommended water management strategies. These locations have the potential to be impacted by the implementation of any of the proposed strategies. New reservoir and diversion projects will tend to reduce streamflow at these locations, while the BRA System Operations tends to increase streamflows as releases from upstream reservoirs pass these locations to satisfy demands at downstream locations. The Bryan location shows increases in median streamflow for 11 of the 12 months by as much as 56%, with the largest reduction of 21%. Hempstead sees 11 months with increase in median streamflow ranging from 3% to 46% and 1 month with a reduction of 16%. At the Richmond location, 8 of the 12 months have an increase in median flow.

Overall the cumulative effects of the implemented plan will have a slight to modest effect on streamflows in the Brazos Basin with both increases and decreases. Locations below new reservoirs or reservoirs with augmented supplies will generally experience reduced streamflows; although generally not to a significant level, and the detrimental effects of these reductions can be minimized with proper consideration of reservoir pass-through requirements to maintain flows necessary to meet the needs of the environment. Locations lower in the basin will often experience greater streamflows in the lower portion of the streamflow regime, as the BRA System Operations releases water during dry times to downstream diversion points. None of the locations will experience significantly different streamflows with implementation of the recommended water management strategies in the 2016 Plan.

Figure 6-3. Effects of Plan Implementation on Streamflows – Brazos River at South Bend



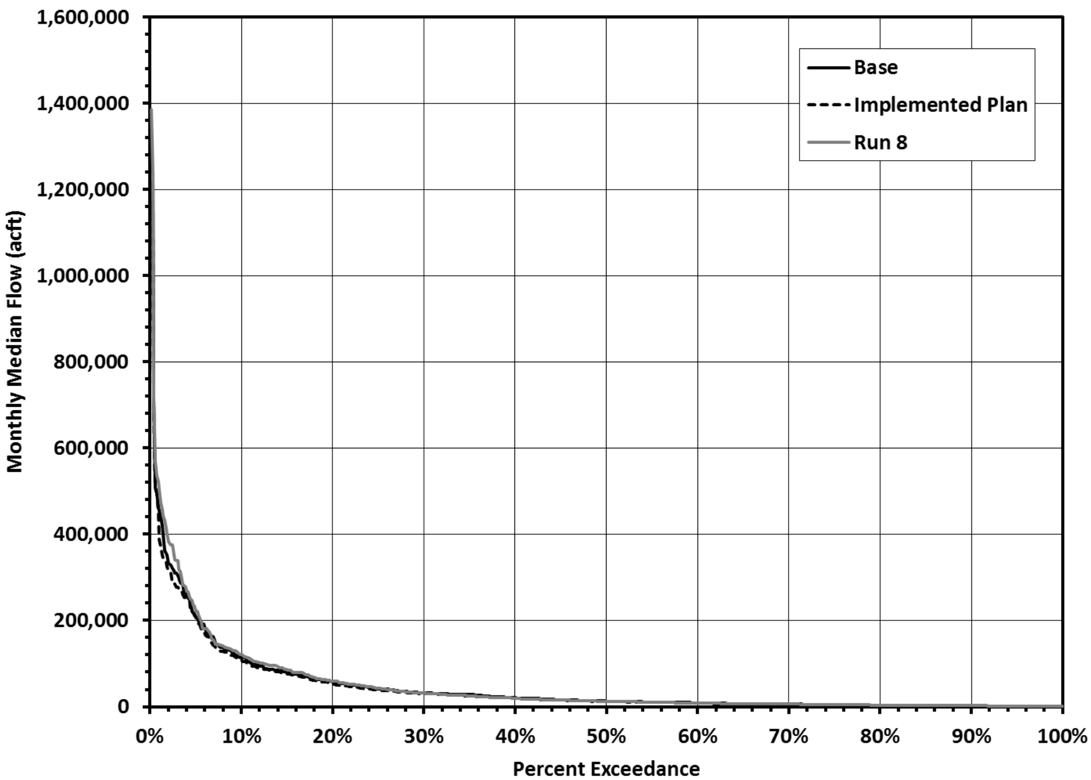
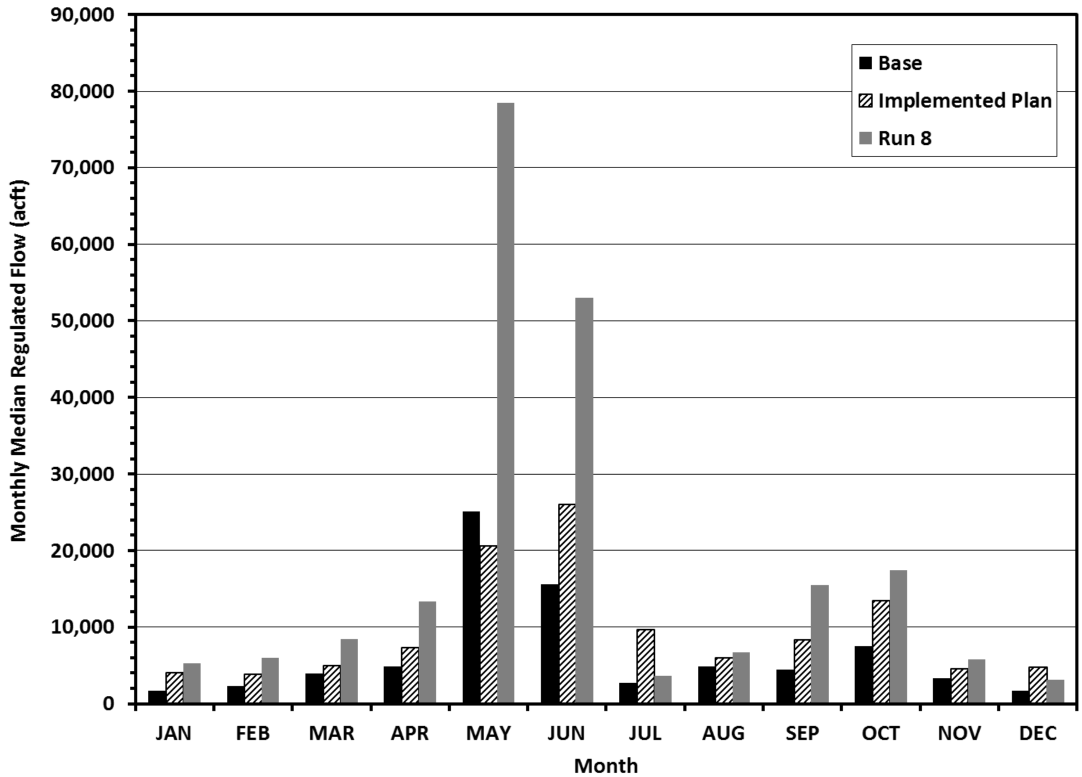


Figure 6-4. Effects of Plan Implementation on Streamflows – Brazos River near Glen Rose



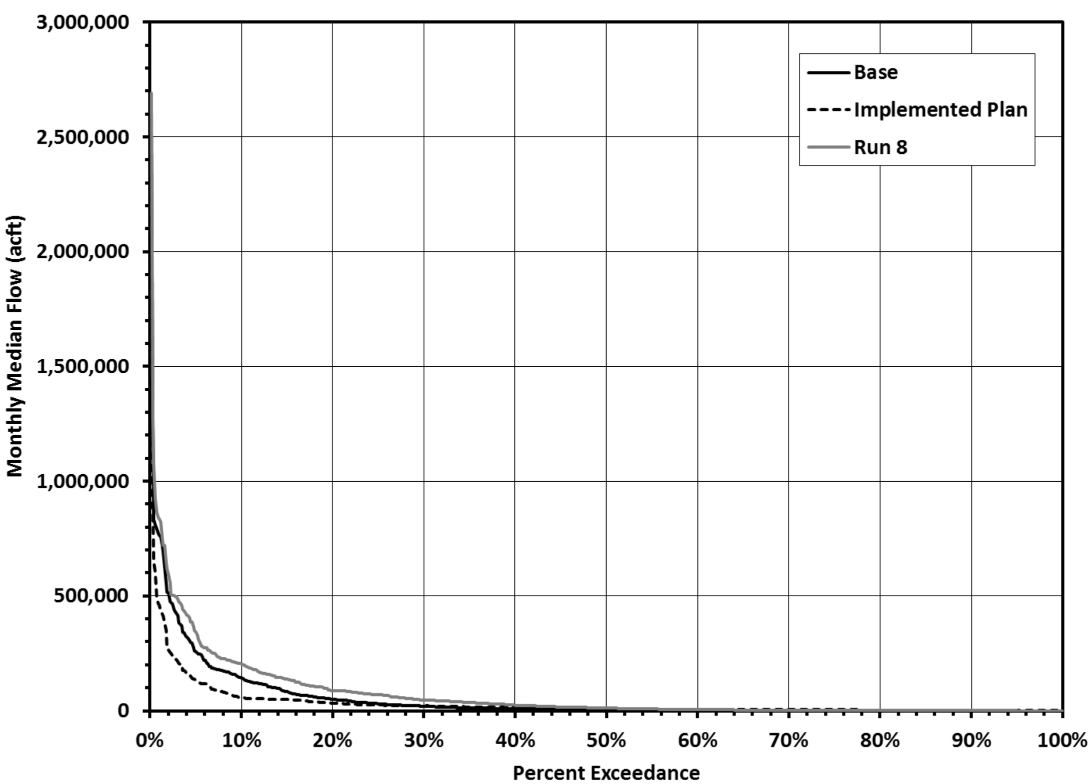
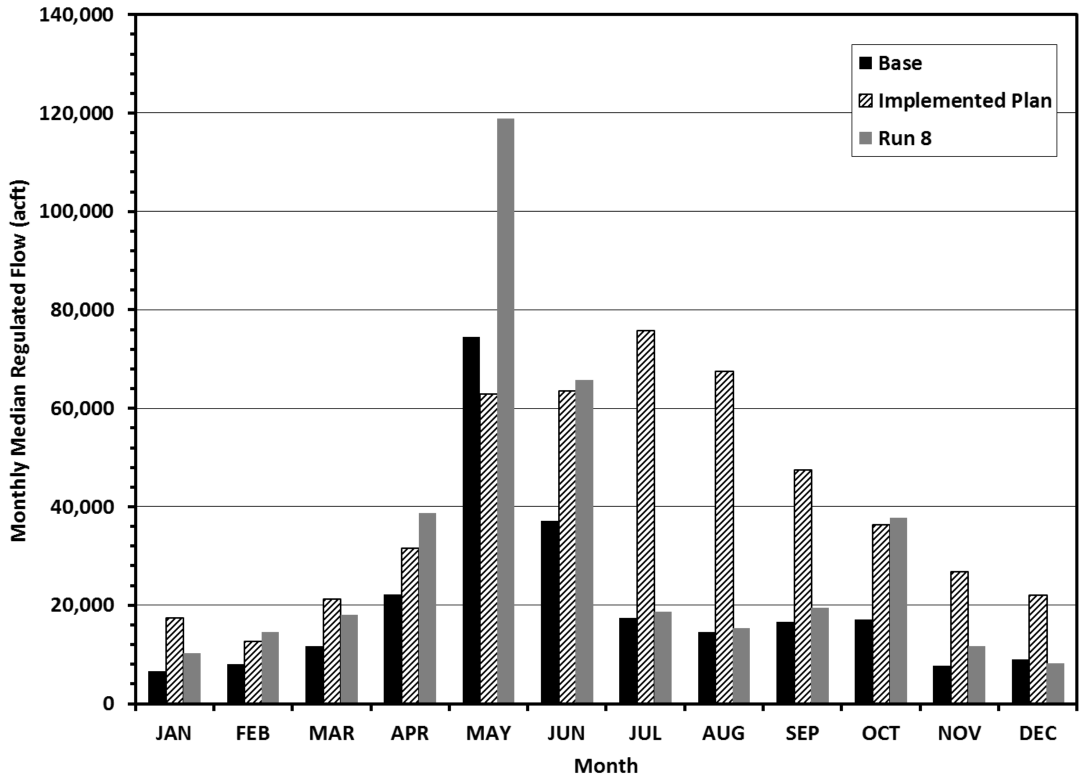


Figure 6-5. Effects of Plan Implementation on Streamflows – Brazos River near Aquilla



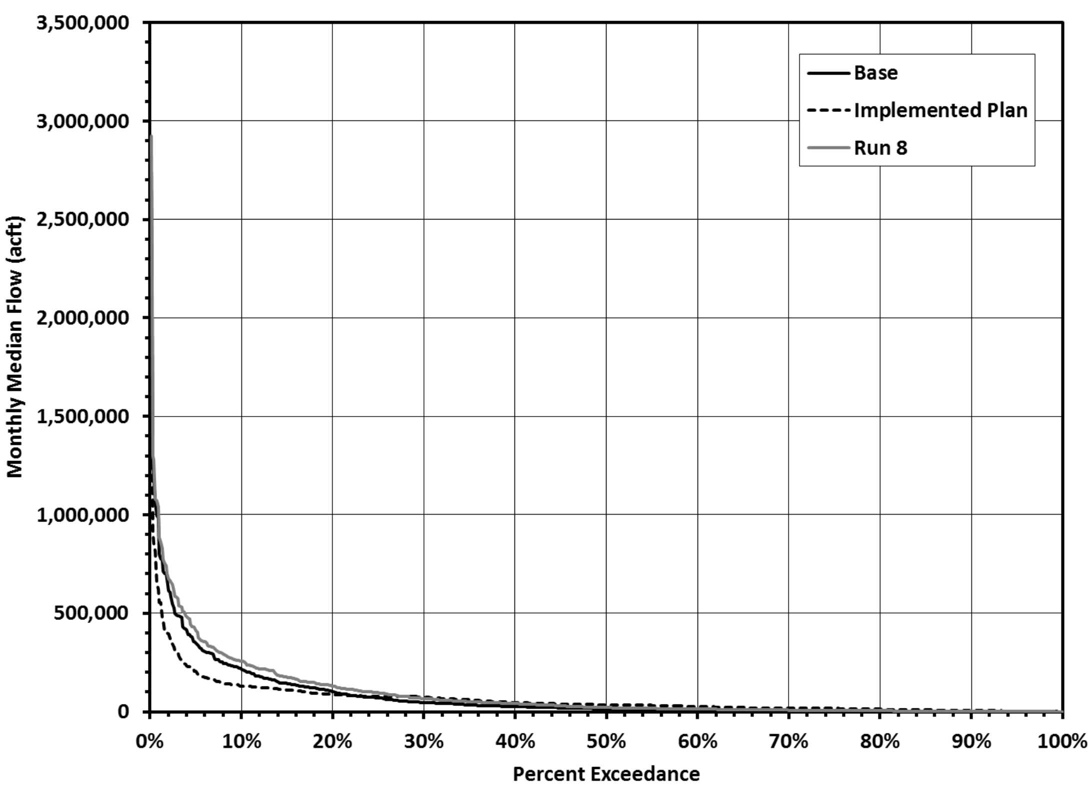
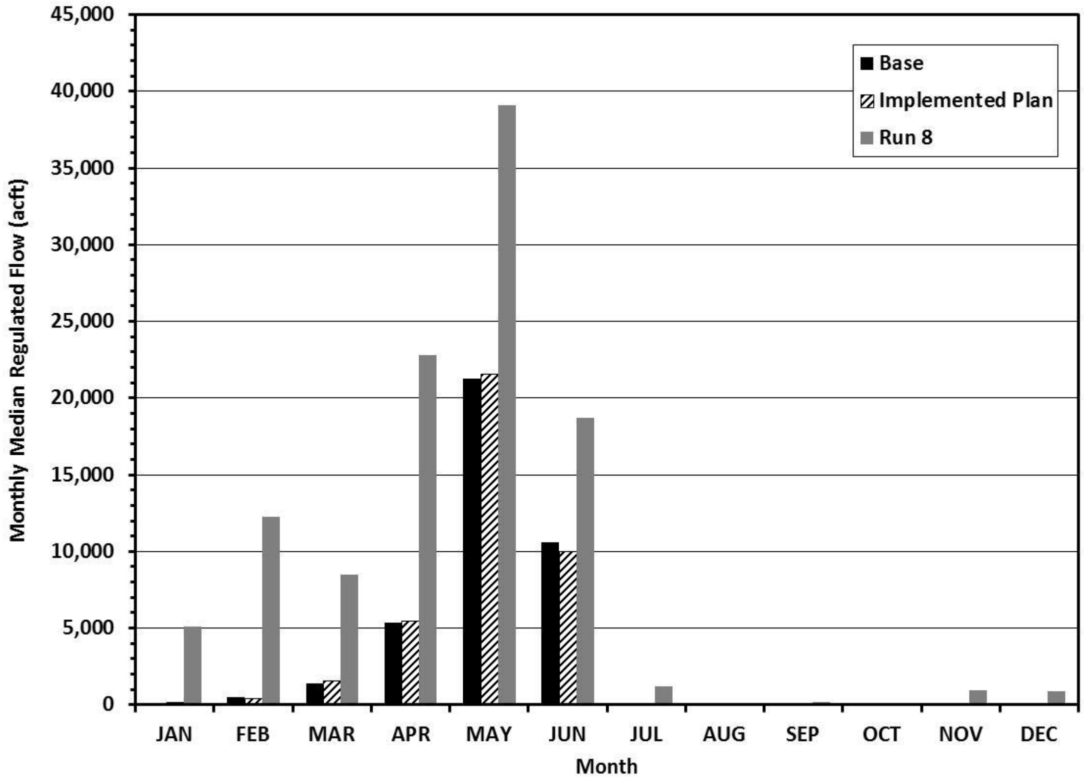


Figure 6-6. Effects of Plan Implementation on Streamflows – Bosque River near Waco



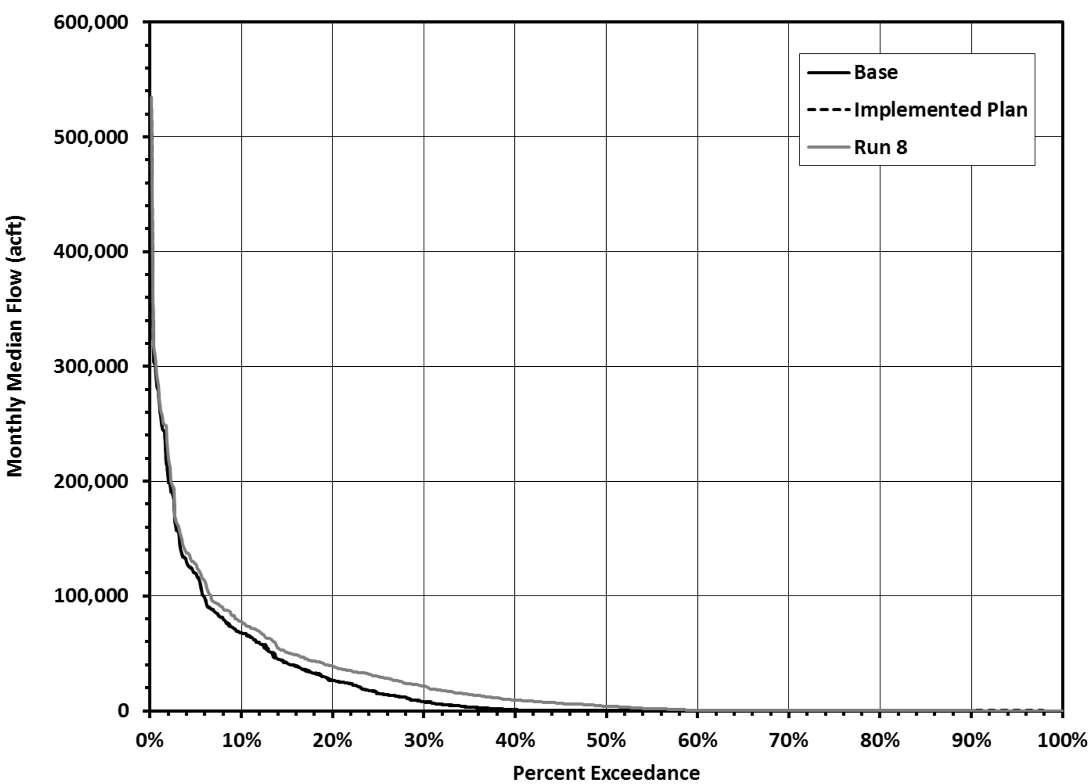
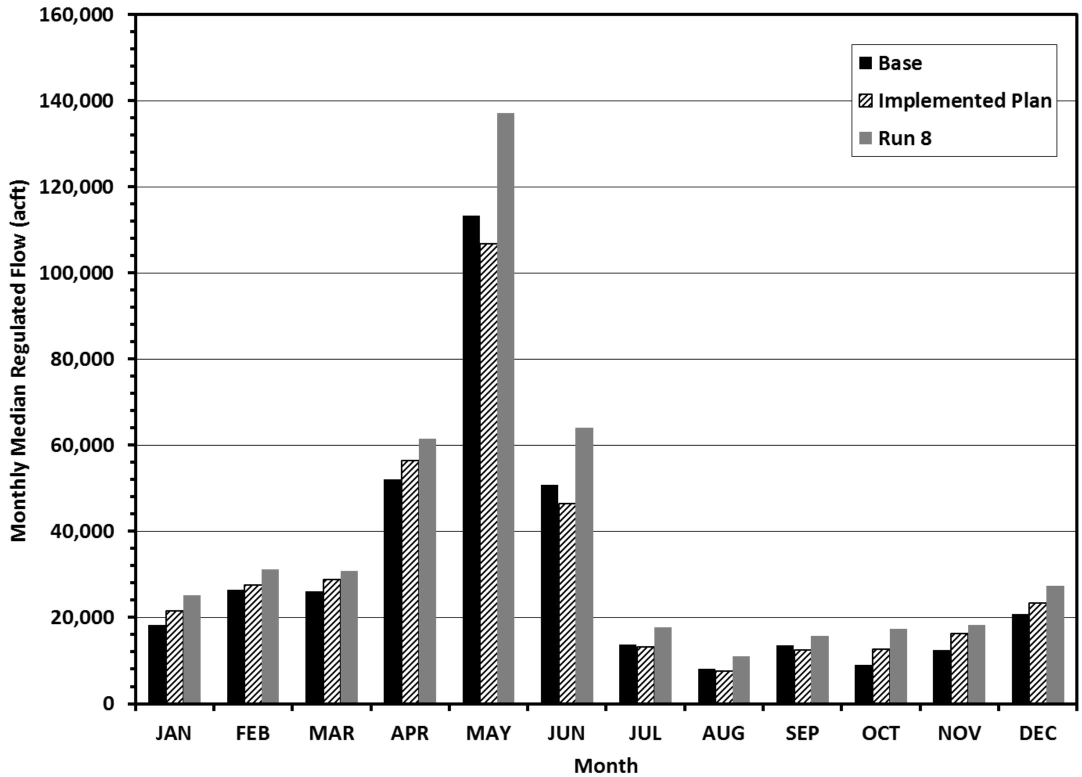


Figure 6-7. Effects of Plan Implementation on Streamflows – Little River near Cameron



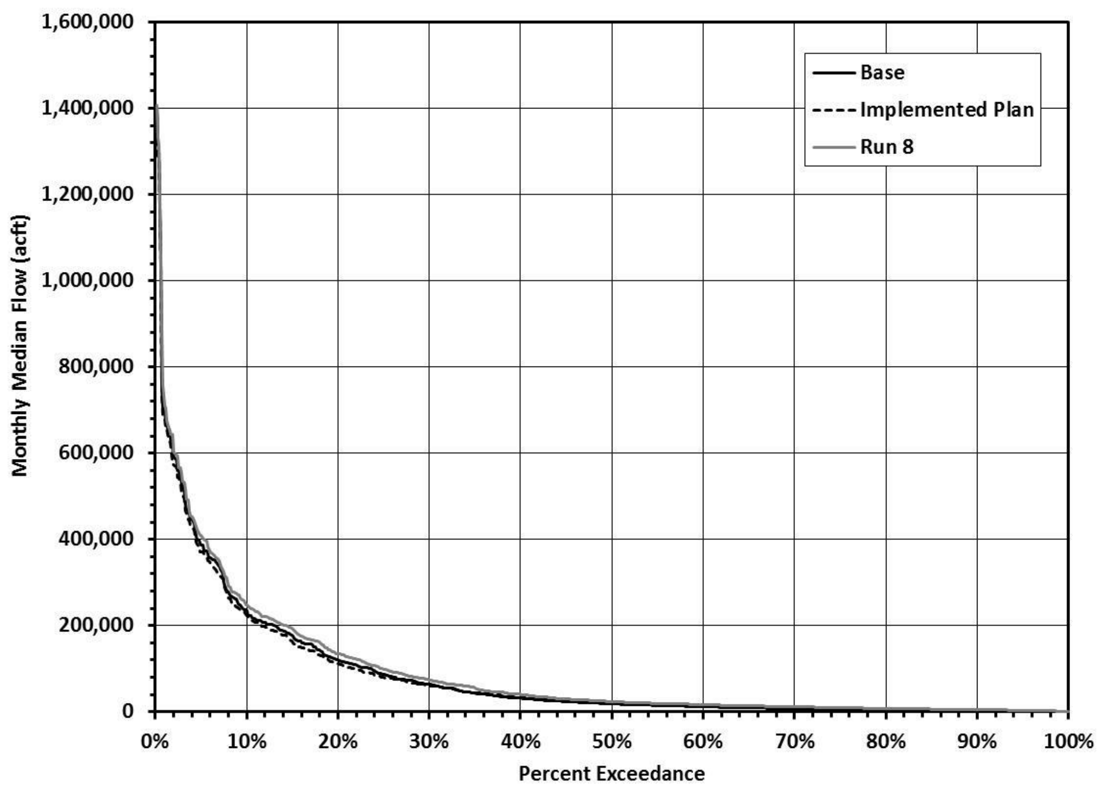
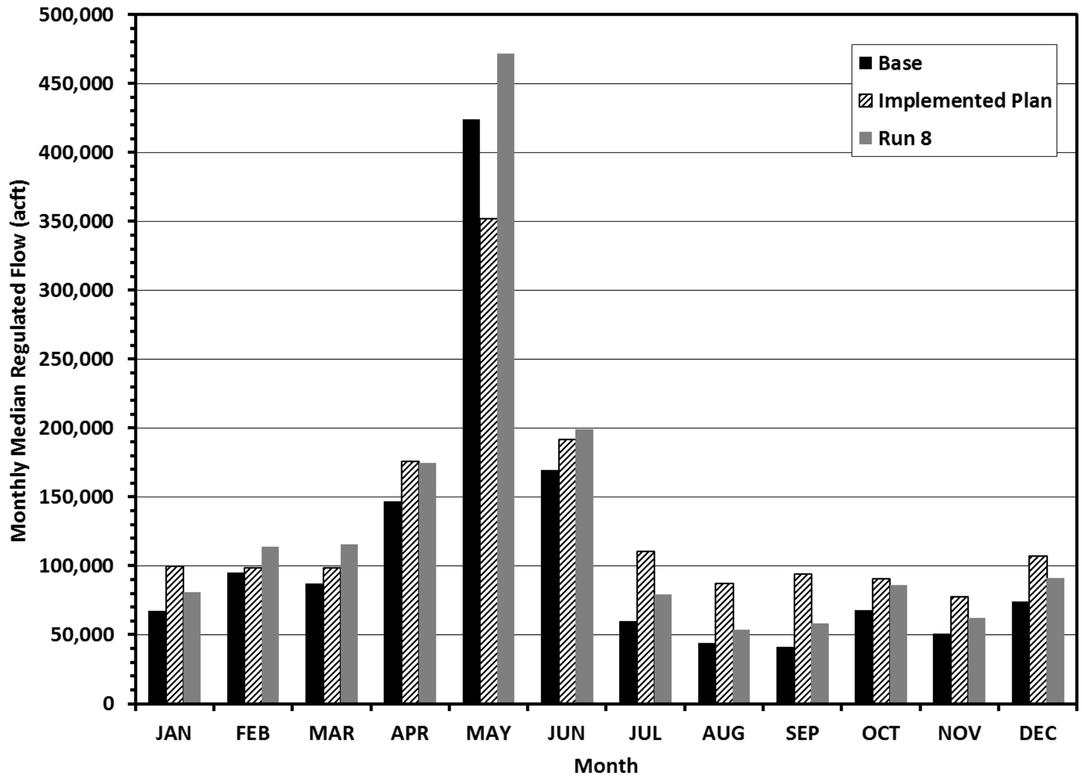


Figure 6-8. Effects of Plan Implementation on Streamflows – Brazos River near Bryan



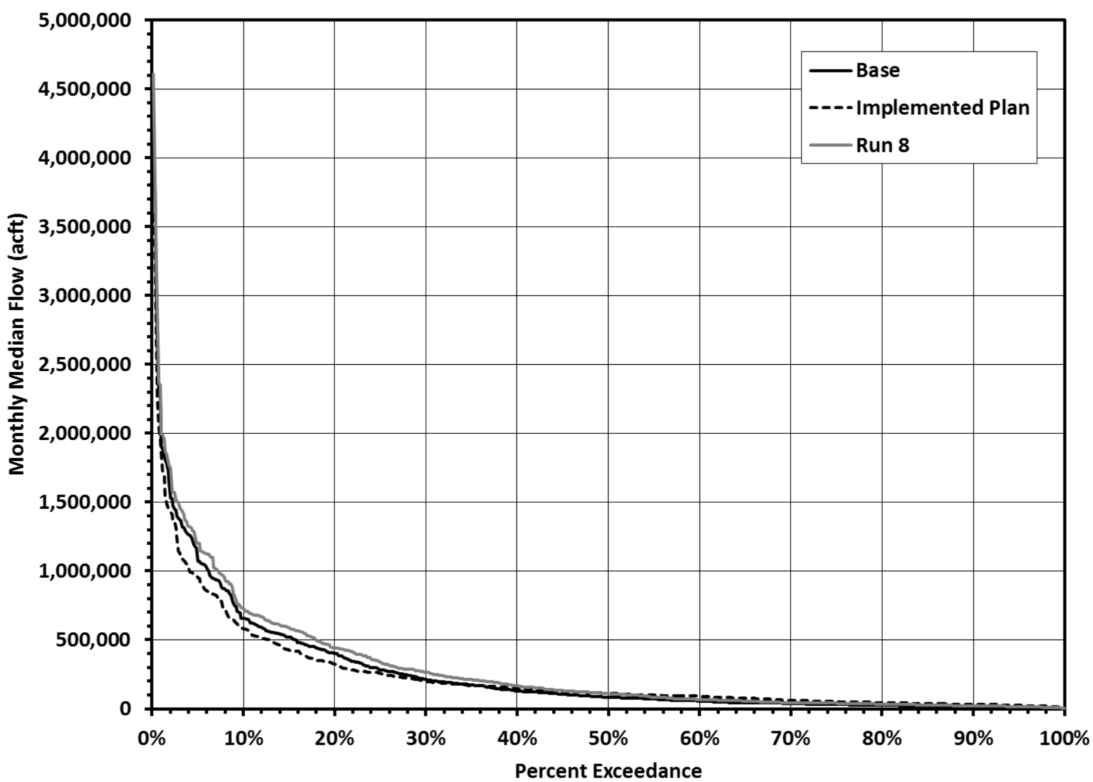


Figure 6-9. Effects of Plan Implementation on Streamflows – Brazos River near Hempstead

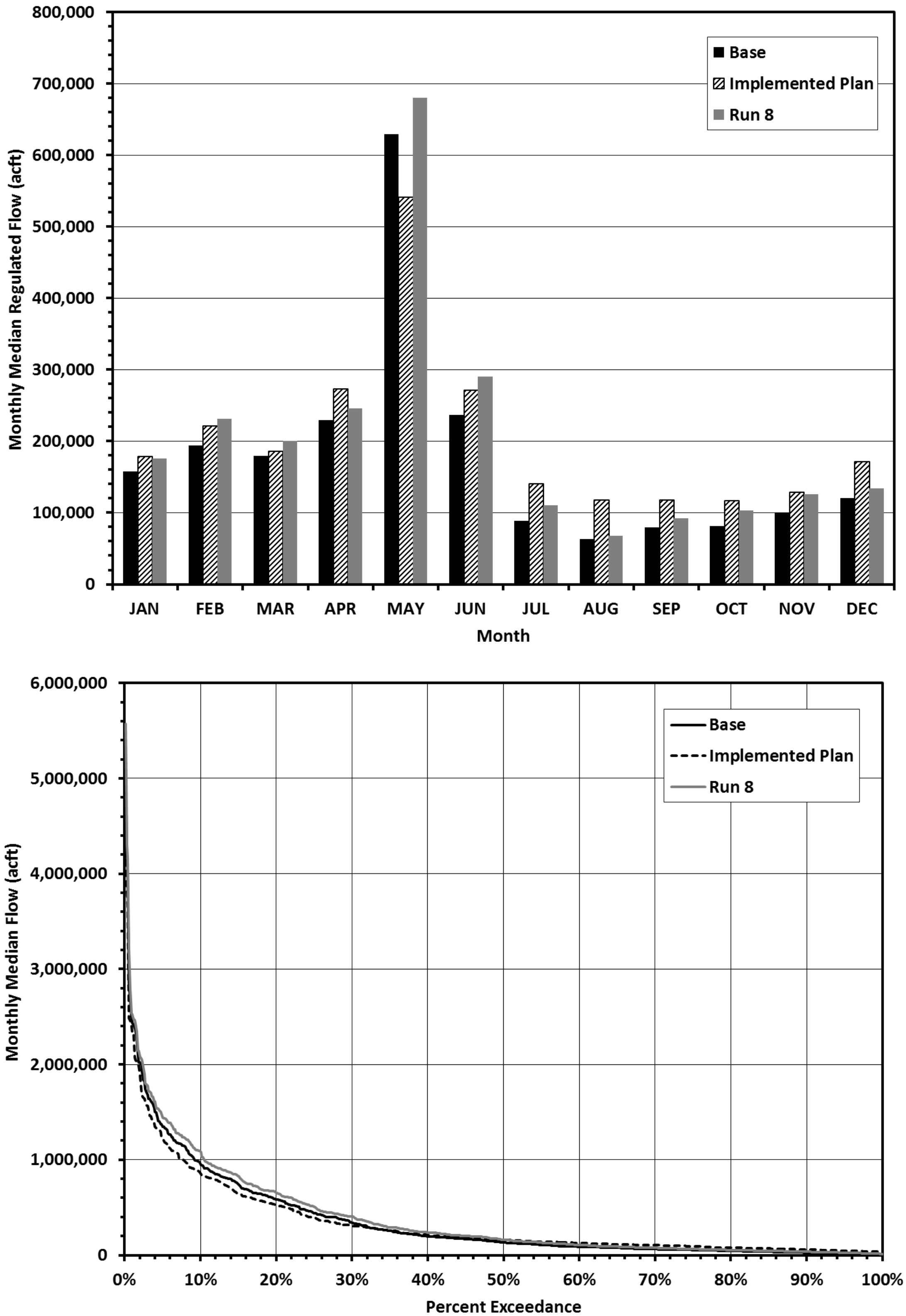
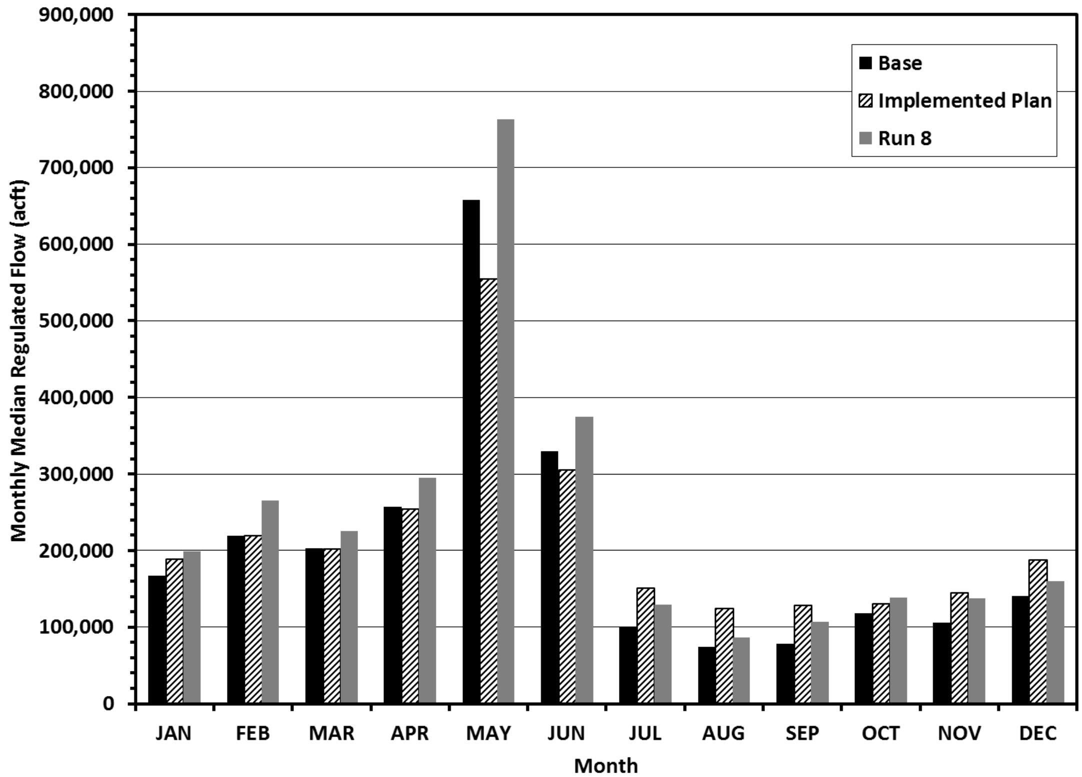


Figure 6-10. Effects of Plan Implementation on Streamflows – Brazos River at Richmond



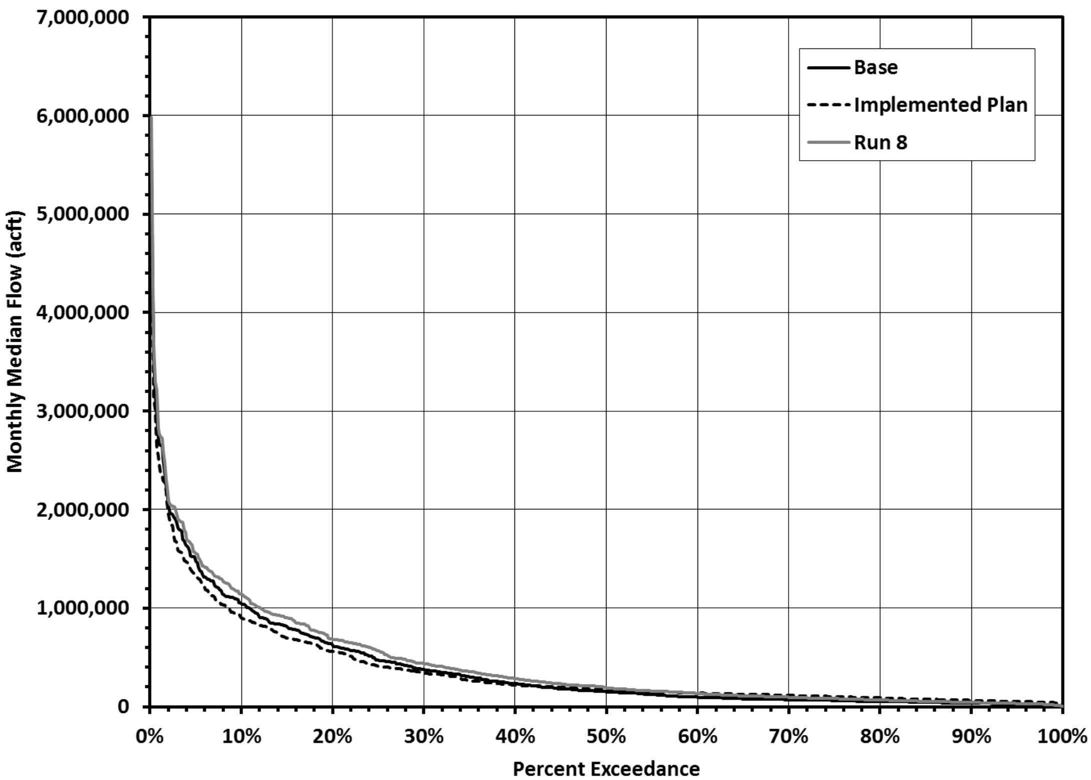
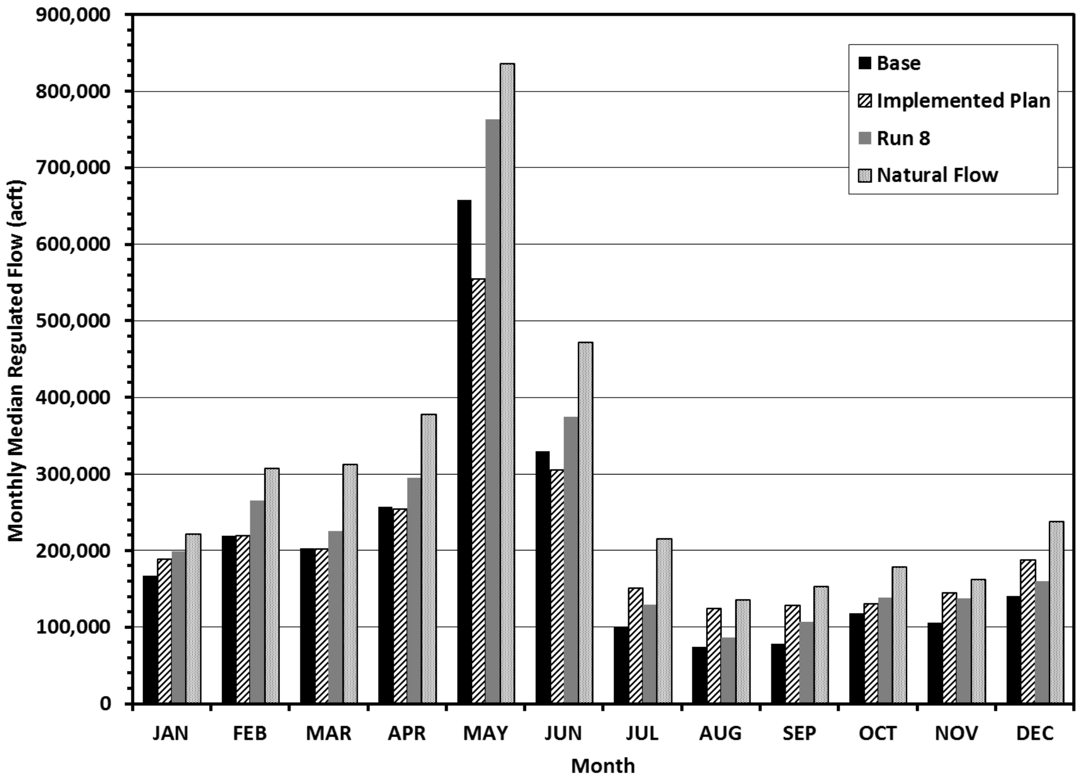


Figure 6-11. Comparison of Regulated and Natural Flows – Brazos River at Richmond



6.1.2 Groundwater

Recommended water management strategies involving additional development of groundwater would increase total groundwater usage by entities in the Brazos G Area by slightly more than 76,000 acft/yr in 2020 to slightly more than 84,000 acft/yr in 2070. The greatest increase occurs in the Carrizo-Wilcox Aquifer where strategies involving groundwater development for Brazos G entities would increase pumping by about 31,000 acft/yr in 2020 and 39,000 acft/yr 2070 over what is considered to be existing supplies. Note that this does not include the expected pumping related to the SAW/Vista Ridge Project in Region L. In the Trinity Aquifer, strategies include an additional 16,000 acft/yr of pumping by 2070. Overall, the amount of groundwater identified for water management strategies is rather modest in comparison to the amount from all the other water management strategies. However, the development of groundwater is likely to be concentrated in a few areas, which could experience noticeable declines in groundwater levels. However, none of the strategies increase projected groundwater pumpage beyond the Modeled Available Groundwater (MAG) established by county and aquifer. Thus, projected groundwater conditions are expected to be within the Desired Future Conditions (DFC) and within a range that the local groundwater conservation districts consider manageable.

6.2 Summary of the Environmental Effects of the 2016 Brazos G Regional Water Plan

Overall, the strategies recommended in the 2016 Plan will have limited negative effects on the environment. The largest localized impacts will be from new reservoirs. New reservoirs recommended as strategies in the 2016 Plan (Lake Creek Reservoir, Cedar Ridge Reservoir, Throckmorton Reservoir, Turkey Peak Reservoir, Coryell County Off-Channel Reservoir, City of Groesbeck Off-Channel, Little River Off-Channel Reservoir, and Brushy Creek Reservoir) will inundate more than 17,400 acres, reducing wildlife habitat, bottomland hardwood forestland and cultivated farmland as documented in the individual strategy evaluations (Volume II). Permitting for these projects will require mitigation land of at least equal ecological value, reducing the negative environmental consequences of the projects. Streamflows immediately downstream from these projects will decrease, but permit requirements will also specify reservoir pass-through flows necessary to maintain ecological health in the downstream receiving stream.

Many elements of the 2016 Plan augment existing resources and delay or eliminate the need for new constructed projects. For example, the BRA's proposed System Operations Permit will make better use of existing reservoir facilities and make available additional supply that previously would have only been made available through construction of a major water supply project. Utilization of water from the Colorado River Basin's Highland Lakes System in Williamson County reduces the need for new major water supply projects to serve Williamson County needs. The utilization of reuse water by several WUGs and WWPs will extend supplies and could delay the need for new raw water projects. Augmentation of Lake Granger through conjunctive use with an Aquifer Storage and Recovery (ASR) project maximizes the use of the existing reservoir facility.

Overall the strategies recommended in the 2016 Plan maximize use of existing resources and reduce the need for several large, costly reservoir projects, minimizing impacts to the environment.

6.3 Impacts of Recommended Water Management Strategies on Key Parameters of Water Quality and Moving Water from Rural and Agricultural Areas

The guidelines for 2016 Regional Water Plans include describing major impacts of recommended water management strategies on key parameters of water quality identified by the regional water planning group and consideration of third party social and economic impacts associated with voluntary redistribution of water from rural and agricultural areas.

6.3.1 Impacts of Water Management Strategies on Key Parameters of Water Quality

The Brazos G RWPG has identified the following eleven key parameters of water quality to consider for recommended water management strategies:

- Chlorides,

- Sulfates,
- Total Dissolved Solids (TDS),
- Total Suspended Solids (TSS),
- Dissolved Oxygen,
- pH Range,
- Indicator Bacteria (Escherichia coli or fecal coliform),
- Temperature,
- Nitrates,
- Total Phosphorous, and
- Total Nitrogen- ammonia.

The selection of key water quality parameters is based on Texas Surface Water Quality Standards Chapter 307, current water quality concerns identified in the Brazos River Authority's Basin Highlights Report, water user concerns expressed during Brazos G RWPG meetings, and regional water quality studies. Total Phosphorous and Total Nitrogen were selected based on nutrient concerns in the North Bosque Watershed and will be considered throughout the Brazos G Area.

The major impacts of recommended water management strategies on key parameters of water quality were identified by the Brazos G RWPG pursuant to Texas Administrative Code Chapter 357-Regional Water Planning Guidelines. The recommended water management strategies for the Brazos G Area and effects of the key water quality parameters are presented in Table 6-3.

Water quality concerns affecting existing supplies are described in greater detail in Chapter 3.3, which also includes a summary of special water quality studies and activities in the Brazos River Basin. These identified water quality concerns present challenges that may need to be overcome before a water management strategy can be used as a water supply. For water quality parameters that cannot be fully addressed due to lack of available information or inconclusive water quality studies, the Brazos G RWPG recommends further studies prior to implementing a water management strategy.

6.3.2 Impacts of Voluntary Redistribution of Water from Rural and Agricultural Areas

Several opportunities for voluntary redistribution exist for the Brazos G Area, such as supplying groundwater from the Carrizo-Wilcox Aquifer in Lee and Milam Counties to Williamson County. While this groundwater water management strategy provides regional water supply and economic benefits, it will result in lowering of artesian levels in the Carrizo-Wilcox Aquifer and, consequently, may increase costs to pump water for water supply for rural and agricultural users.

The remaining water management strategies recommended to meet water needs (Chapter 5) do not include transferring significant quantities of water needed by rural and agricultural users and, therefore, are not considered to impact them.

Table 6-3. Summary of Water Management Strategies, Potential Water Quality Concerns and WUGs Potentially Affected

Recommended WMS	Project Origination	Beneficiaries of Project	Potential Water Quality Concerns Affecting Use of Supply
Treated Effluent Reuse	Bell, Brazos, Grimes, Johnson, McLennan	Manufacturing (McLennan County) Steam-Electric (Brazos, Bell, Johnson and Grimes Counties) Municipal (Cities of Round Rock, Bryan, College Station, Cleburne, Waco, Bellmead, Lacy-Lakeview, Hewitt, Lorena, , Harker Heights, and Killeen and 439 WSC)	Indicator bacteria
Water Conservation	Varies	All municipal, industrial, and agricultural users with projected needs (shortages)*	Total dissolved solids, sulfates, and chlorides
Interbasin Transfer of Surface Water from Lower Colorado River Basin (Region K)			
BCRUA	Varies	Municipal (Leander, Liberty Hill, Round Rock and Cedar Park)	None identified
New Reservoirs			
Brushy Creek Reservoir	Falls	Municipal (City of Marlin)	None identified
Cedar Ridge Reservoir	Clear Fork	Municipal (City of Abilene)	None identified
Coryell County OCR	Coryell	Municipal (Gatesville and Multi-County WSC)	None identified
Groesbeck OCR	Limestone	Municipal (City of Groesbeck)	None identified
Lake Creek Reservoir	Throckmorton and Baylor	Municipal (North Central Texas Municipal Water Authority)	Total dissolved solids, sulfates, and chlorides from Brazos River diversion
Little River OCR (Brazos River Diversion)	Milam and Williamson	Municipal (Chisholm Trail SUD, Hutto, Williamson County-Other, Round Rock); Steam-Electric (Milam County)	Total dissolved solids, sulfates, and chlorides from Brazos River diversion
Throckmorton Reservoir	Throckmorton	Municipal (City of Throckmorton)	None identified
Augmentation of Existing Surface Water Supplies			

Table 6-3. Summary of Water Management Strategies, Potential Water Quality Concerns, and WUGs Potentially Affected

Recommended WMS	Project Origination	Beneficiaries of Project	Potential Water Quality Concerns Affecting Use of Supply
Gibbons Creek Reservoir Expansion	Grimes	Steam/Electric (Grimes County)	Indicator bacteria, temperature, pH
Lake Aquilla Reallocation	Hill	BRA	None identified
Lake Granger ASR	Williamson	BRA	Increasing trends in sulfates, chlorides, elevated nutrients, and sedimentation from total suspended solids
Turkey Peak Dam – Lake Palo Pinto Enlargement	Palo Pinto	Municipal (Palo Pinto County MWD No. 1)	None identified
System Approaches			
BRA System Operations	Varies	Manufacturing (Bosque and Hill Counties); Steam/Electric (Bosque and Somervell Counties); Municipal (Bell County WCID #1, Bosque County-Other, Brandon-Irene WSC, City of Hillsboro, White Bluff community WS and Woodrow-Osceola WSC)	Chlorides, total dissolved solids, total suspended solids, and nutrients
Groundwater Development			
Blaine Aquifer	Stonewall, Knox	Mining (Stonewall, Knox counties); Irrigation (Knox County)	Chlorides and total dissolved solids
Brazos River Alluvium	McLennan	Mining, Irrigation	Chlorides and total dissolved solids
Carrizo-Wilcox Aquifer	Brazos, Lee, Robertson, Coryell, Erath, Falls, Limestone, Grimes	Mining (Limestone, Grimes counties); Irrigation (Robertson County); Municipal (West Brazos WSC, Tri-County SUD, Robertson County-Other, Bryan, Bistone MWSD, Heart of Texas)	Iron and manganese and temperature (deep wells only)
Dockum Aquifer	Fisher	Manufacturing; Mining	None identified

Table 6-3. Summary of Water Management Strategies, Potential Water Quality Concerns, and WUGs Potentially Affected

Recommended WMS	Project Origination	Beneficiaries of Project	Potential Water Quality Concerns Affecting Use of Supply
Edwards Aquifer	Bell, Nolan, Williamson	Irrigation (Williamson County); Manufacturing (Bell County); Mining (Bell and Nolan counties); Municipal (Bell County-Other, Brushy Creek MUD, Florence)	None
Trinity Aquifer	Bell, Bosque, Callahan, Comanche, Coryell, Erath, Hamilton, Hood, Somervell, McLennan, Lampasas, Eastland, Williamson	Mining (Callahan, Hamilton, Hood, Somervell, Comanche, Eastland, Coryell, Lampasas, Bell counties); Irrigation (Hamilton, Bosque, McLennan, Lampasas, Comanche, Eastland, Bell counties); Municipal (Bartlett, Florence, Comanche County-Other, Coryell County-Other, Erath County-Other, Hood County-Other	Chlorides and total dissolved solids
Gulf Coast Aquifer	Grimes, Brazos, Washington	Manufacturing (Brazos and Washington County); Steam-Electric (Grimes County);	None identified
Seymour Aquifer	Knox	Irrigation	Chlorides and total dissolved solids
Sparta Aquifer	Burleson	Manufacturing; Mining	Iron and manganese
Woodbine Aquifer	Hill, Johnson	Mining (Hill and Johnson counties); Municipal (Godley, Rio Vista, Hill County-Other)	Chlorides, total dissolved solids, iron and manganese
Yegua-Jackson Aquifer	Brazos	College Station	Chlorides and total dissolved solids

*For municipal users with shortages, additional conservation was recommended only for WUGs exceeding 140 gallons per capita per day

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7

Drought Response Information, Activities and Recommendations

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7 Drought Response Information, Activities and Recommendations

Droughts are of great importance to the planning and management of water resources in Texas. Although droughts can occur in all climatic zones, they have the greatest potential to become catastrophic in dry or arid regions such as West and Central Texas. It is not uncommon for mild droughts to occur over short periods of time in Texas; however, there is no certain way to predict how long or severe a drought will be while it is occurring. The only defense available in drought prone areas such as Brazos G is proper planning and preparation for worst case scenarios. This requires understanding of drought patterns and the historical droughts in the region.

Due to significant population growth throughout Texas, which is expected to continue in the Brazos G Area based on TWDB projections, the demand for water has increased. With growing demand and the threat of climate change contributing to water scarcity, planning is even more important to prevent shortages, deterioration of water quality and lifestyle/financial impacts on water suppliers and users. This chapter presents information on drought preparedness in the Brazos G Area, including regional droughts of record, current example drought contingency plans, emergency interconnects, and responses to local drought conditions, and methods to estimate available water supplies in the region.

7.1 Droughts of Record in the Brazos G Area

7.1.1 Background

One of the best tools in drought preparedness is a thorough understanding of the drought of record (DOR), or the worst drought to occur for a particular area during the available period of hydrologic data. However, there are many ways that the "worst drought" can be defined (degree of dryness, agricultural impacts, socioeconomic impacts, effects of precipitation etc.). Regional water planning focuses on hydrological drought, which is typically the type of drought associated with the largest shortfalls in surface and/or subsurface water supply. The frequency and severity of hydrological drought is often defined on a watershed or river basin scale, although it could be different from one area to the next, even within a planning region.

7.1.2 Current Drought of Record

In terms of severity and duration, the devastating drought of the 1950s is considered the drought of record for most of Texas, including most of the Brazos G Area. By 1956, 244 of the 254 counties were considered disaster areas. This drought lasted almost a decade in many places and not only affected Texas, but other states throughout the nation. The 1950's drought has been used by water resource engineers and managers as a benchmark drought for water supply planning. Texas has experienced two recent droughts centered around 2008 and 2011. Incorporating these recent droughts into future water planning efforts would be prudent. These droughts have not yet been widely considered to be new droughts of record for most of Texas, but have shown to be more severe in some parts of the Brazos G Area.

7.1.3 Drought Indicators

Water Availability Modeling

Engineers and planners often use surface water models to demonstrate the effects of historical droughts on water supply. Surface water effects are more readily observed than groundwater, and reservoir supplies that were not in place during historic droughts can be assessed using historic hydrology and these modeling tools. The primary tool used in regional planning in Texas to observe the performance of reservoirs under historic drought conditions is the TCEQ Water Availability Model (WAM). The WAM is the same tool used to determine the available flow and firm yields of surface water projects in the regional water plan.

The Brazos River Basin WAM (Brazos WAM) includes hydrologic information from 1940 through 1997 and supports the use of the 1950's drought as the drought of record for nearly all reservoirs in the Brazos G Area. However, it has not been updated to include information from more recent periods of drought after the turn of the century. A related tool called the Brazos Mini Water Availability Model (Mini-WAM), developed by HDR Inc , has been utilized by Brazos G to model reservoirs upstream of Possum Kingdom Reservoir and has been updated to include hydrology through June 2008. Applications of this tool support the more recent drought cycle that began in the late 1990's as potentially being more severe than the drought of the 1950's; however it also does not capture the entirety of the 2007-2009 drought or the drought that plagued parts of the region between 2011 and the Spring of 2015.

Drought Indices

Several Drought Indices have been developed to assess the effect of a drought through parameters such as severity, duration and spatial extent. The Palmer Drought Severity Index (PDSI) was one of the first comprehensive efforts using precipitation and temperature for estimating the moisture of a region. PDSI values greater than 0.49 correspond to wetter than normal conditions and values from -0.5 to 6 represent varying degrees of drought. Information is available for climate regions across the country through 2014, which makes the PDSI a helpful tool for understanding recent drought periods not included in the WAM.

Most of Brazos G lies in Texas Climate Division 3. A graph of yearly PDSI values for Texas Climate Division 3 shows that while the 1908 and the more recent drought in the early 21st century were severe, the drought of the 1950's was the most intense over a longer period of time, supporting the continued use of this drought as the drought of record for Brazos G (Figure 7-1). However, the eight most upstream counties in Brazos G, containing Lake Davis, Lake Stamford, Lake Fort Phantom Hill, Lake Kirby, Lake Abilene, and Lake Sweetwater, are located in Texas Climate Division 2. Figure 7-2 shows that while the drought of the 1950's has, to this point, lasted longer than the most recent drought, the PDSI in 2011 is more severe than the PDSI in 1956. The available information is not strong enough to change the drought of record, but it is worth noting the intensity of 2011.

Figure 7-1. Parmer Drought Severity Index: Division 3

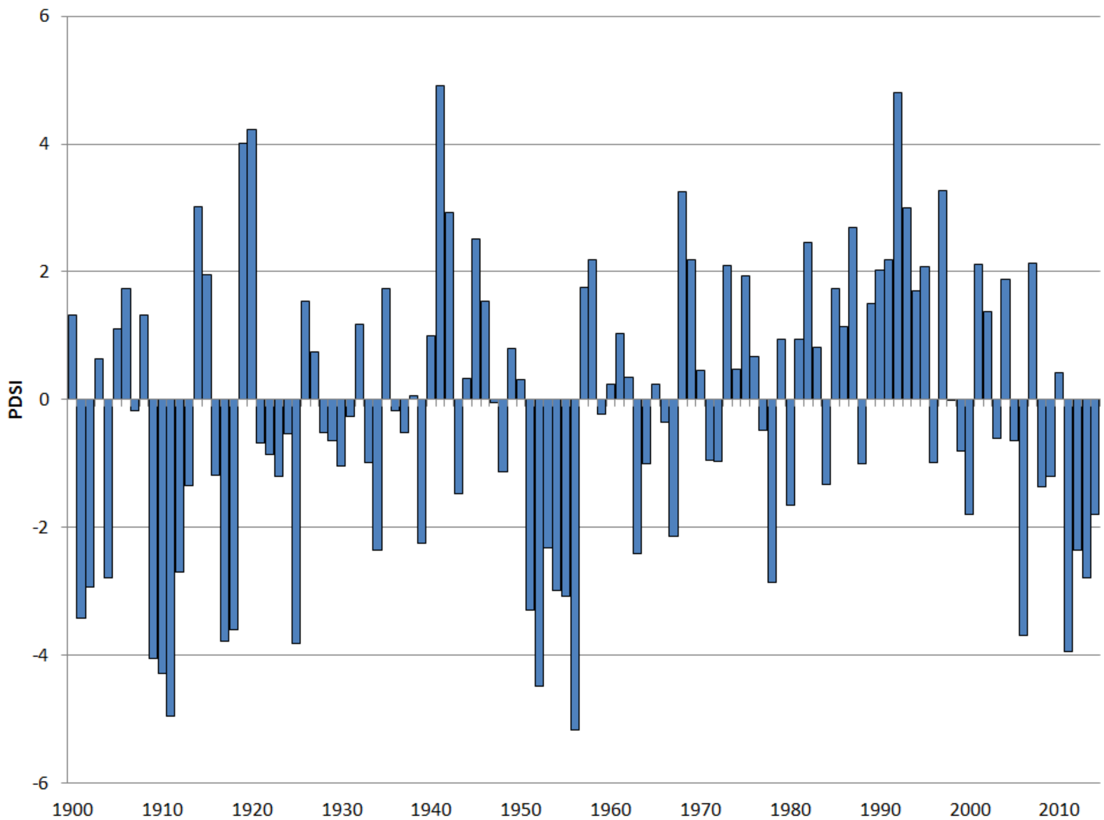
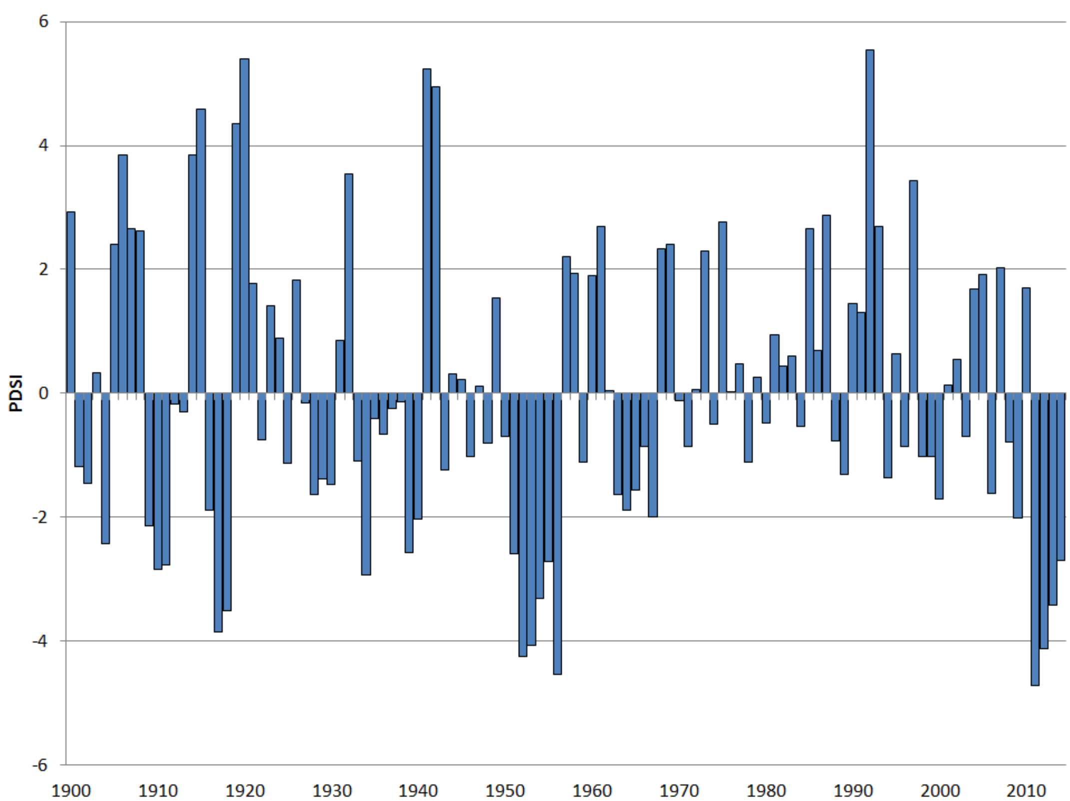


Figure 7-2. Parmer Drought Severity Index: Division 2



7.1.4 Recent Droughts

During development of the 2011 Brazos G Regional Water Plan, Brazos G completed a study[1] of reservoir yields for 19 reservoirs located upstream of Possum Kingdom Reservoir in the upper Brazos Basin, due to concerns that the drought conditions being experienced since 1997 may have been more severe than the 1950's drought. The update to the Brazos Mini-WAM was competed as part of this effort, with the hydrologic record extended through June 2008.

The results of the study indicated that the period after 1997 through June 2008 was more severe than the 1950's drought for 11 of the 19 reservoirs, based on the year when minimum storage was computed by the model, typically either 2000 or 2004. As an indication of a new drought of record, the results demonstrate that some of the reservoirs in the upper Brazos Basin have experienced a drought worse than the 1950's drought during the 1997 – 2008 period. The fact that not all of the upper basin reservoirs studied indicated new drought of record demonstrates that "the severity of a drought has much to do with reservoir characteristics and how a reservoir relates to surrounding water rights in addition to hydrologic processes."[2]

In 2011, severely decreased precipitation resulted in substantial declines in streamflow throughout Texas. Record high temperatures also occurred June through August leading to an increase in evaporation rates. The evaporation was so great that by August 4, 2011, state climatologist John Nielson-Gammon declared 2011 to be the worst 1-year drought on record in Texas[3]. The 2011 water year statewide annual precipitation was 11.27 inches, more than 2 inches less than the previous record low of 13.91 inches in 1956.

The severe one-year drought experienced in 2011 can be considered to be part of an overall continuation of a drought cycle that began around 2008 (possibly since 1998), and in some parts of the state continued until the spring of 2015, when a large storm system caused flooding throughout much of the Brazos Basin and replenished much of the reservoir storage depleted during the drought. However, some reservoirs in the western part of the Brazos G Area have still not refilled, such as Hubbard Creek Reservoir and Lake Fort Phantom Hill. While the length of this recently concluded drought does not yet equal the drought of the 1950's, if weather patterns continue, the current drought cycle could very well be considered the drought of record throughout Texas. The current drought extending to present day and including 2011 has been identified as the new Drought of Record in the adjacent Colorado River Basin. The Lower Colorado River Authority (LCRA) recently reduced the estimated firm yield of the Highland Lakes system, and the Colorado River Municipal Water District (CRMWD) similarly has reduced the estimated yield of O.H. Ivie Reservoir.

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[1] HDR, Inc., Study 1 – Updated Drought of Record and Water Quality Implications for Reservoirs Upstream of Possum Kingdom Reservoir, Brazos G Regional Water Planning Group, April 2009.

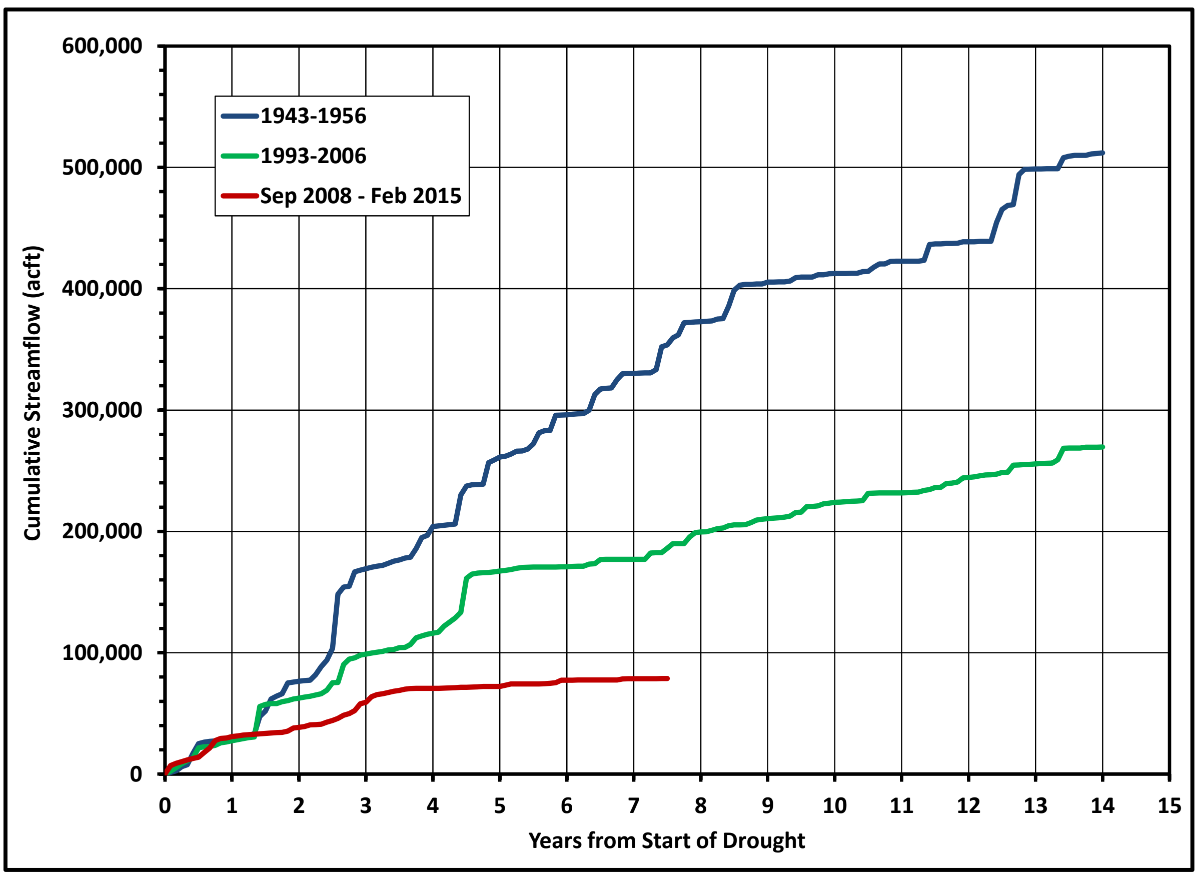
2 Ibid.

3 Winters, K.E., 2013, A historical perspective on precipitation, drought severity, and streamflow in Texas during 1951–56 and 2011: U.S. Geological Survey Scientific Investigations Report 2013–5113, p.1 http://pubs.usgs.gov/sir/2013/5113

The severity of the current drought is illustrated in Figure 7-3, which presents cumulative streamflows measured at USGS Streamgage 08084000 Clear Fork of the Brazos River near Nugent, TX. In the figure, cumulative streamflows since drought initiation are compared for three drought periods: 1950's, 1993 – 2006, and 2008 – February 15, 2015. When cumulative streamflows for the three drought periods are compared at a point in time seven years from initiation (essentially mid way through the 1950's drought), total streamflow for the current drought cycle is 22 percent and 42 percent of the total streamflow for the 1950's and 2006 droughts, respectively.

While the 2011 drought year and recent years appear to be very severe and can provide helpful information to water planners and managers throughout the state, the duration of the 1950's drought combined with the overall severity for more than a decade in the Brazos G Area suggests that it is still a valid choice as the DOR for regional planning purposes over the majority of the Brazos G Area. However, it appears from data such as presented in Figure 7-3 and the analyses performed previously that the upper Brazos Basin may be experiencing a new drought of record. This would have to be confirmed by more detailed analyses beyond the scope of this regional water plan. However, conditions in the middle and lower portions of the basin for these more recent droughts do not appear to be as severe as those experienced during the 1950's drought.

Figure 7-3. Comparison of Cumulative Streamflows for Three Drought Periods for the Clear Fork at Nugent, TX Streamgage (08084000)



7.2 Current Drought Preparations and Response

7.2.1 Current Drought Preparations and Responses

WUG Level Planning

WUGs in Brazos G can prepare for drought by participating in the regional planning process. The regional planning process attempts to meet projected water demands during a drought of severity equivalent to the drought of record. WUGs that provide accurate information to the planning group and Texas Water Development Board and consider recommendations accepted by the regional planning group should be able to supply water through drought periods. In addition, all wholesale water providers and most municipalities develop individual drought contingency plans or emergency action plans to be implemented at various stages of a drought.

Basin Responses

Throughout Texas, including the Brazos River Basin, water rights are issued under the prior appropriation system. During times of shortage, curtailment of water rights has become necessary in recent droughts. Dow Chemical made priority water rights calls in the Brazos River Basin in 2009, 2011, 2012, and 2013. When a priority call is made, upstream water rights that are junior in priority to the water right making the call are required to forgo diversions and impoundment of water and allow streamflows to pass downstream to honor the priority of downstream senior rights. The priority calls affected most water rights in the basin. Partly in response to the priority calls and in response to the ongoing drought, the Brazos Watermaster Program was established by petition and subsequent order issued by the TCEQ Commissioners on April 21, 2014. The program has jurisdiction over the Lower Brazos River Basin including and below Possum Kingdom Reservoir. The Brazos Watermaster will monitor water use and streamflow, and coordinate with water rights holders when flows need to be passed to honor senior water rights.

7.2.2 Overall Assessment of Local Drought Contingency Plans

Predicting the timing, severity and length of a drought is an inexact science; however, it is safe to assume that it is an inevitable component of the Texas climate. For this reason, it is critical to plan for these occurrences with policy outlining adjustments to the use, allocation and conservation of water in response to drought conditions. Drought and other circumstances that interrupt the reliable supply or water quality of a source often lead to water shortages. During a drought period, there generally is a greater demand on the already decreased supply as individuals attempt to maintain landscape vegetation through irrigation because less rainfall is available. This can further exacerbate a water supply shortage situation.

TCEQ requires all wholesale public water suppliers, retail public water suppliers serving 3,300 connections or more, and irrigation districts to submit drought contingency plans. In accordance with the requirements of Texas Administrative Code §288(b), DCPs must be updated every 5 years and adopted by retail public water providers. The TCEQ defines a DCP as "A strategy or combination of strategies for temporary supply and demand management responses to temporary and potentially recurring water supply shortages and other water supply emergencies."[4] According to a TCEQ handbook[5] the underlying philosophy of drought contingency planning is that:

- While often unpreventable, short-term water shortages and other water supply emergencies can be anticipated,
- The potential risks and impacts of drought or other emergency conditions can be considered and evaluated in advance of an actual event; and, most importantly,
- Response measures and best management practices can be determined with implementation procedures defined, again in advance, to avoid, minimize, or mitigate the risks and impacts of drought-related shortages and other emergencies.

Model Drought Contingency plans are available on TCEQ's website, however, it is not possible to create a single DCP that will adequately address local concerns for all entities throughout the State of Texas. The conditions that define a water shortage can be very location specific because most communities in Brazos G rely primarily on local water supplies. For example, some communities rely on reservoirs that are regularly operated at full conditions; in this case a shortage could exist when the supplies are at 75 percent. Other reservoirs may rarely refill and be considered a concern at 25 percent capacity. Similarly, unique aquifer systems are considered at risk under location specific conditions. While the approach to planning may be different between entities all DCP's should include:

- Specific, quantified targets for water use reductions,
- Drought response stages,
- Triggers to begin and end each stage,
- Supply management measures,
- Demand management measures,
- Descriptions of drought indicators,
- Notification procedures,
- Enforcement procedures,
- Procedures for granting exceptions,
- Public input to the plan,
- Ongoing public education,
- Adoption of plan, and
- Coordination with regional water planning groups.

For water suppliers such as those in Brazos G, the primary goal of DCP development is to have a plan that can ensure an uninterrupted supply of water in an amount that can satisfy essential human needs. A secondary but also important goal is to minimize

[4] http://www.twdb.texas.gov/conservation/training/archives/more-than-a-drop-workshop/doc/5_%20TCEQ%20Rules.pdf

[5] https://www.tceq.texas.gov/assets/public/comm_exec/pubs/archive/rg424.pdf

negative impacts on quality of life, the economy and the local environment. In order to meet these goals, action needs to be taken in an expedient, pre-determined procedure, requiring that an approved DCP be in place before drought conditions occur.

In accordance with Texas Administrative code, most Region G entities have submitted DCPs to be implemented when local shortages occur. Brazos G was able to obtain DCPs for multiple WUGs and WWPs. These plans identify multiple triggers for initiation and termination of drought stages, responses to be implemented and reduction targets based on each stage. The plans also include information regarding public notification procedures and enforcement measures. Some WUGs or WWPs have included a method of granting a variance should the need arise.

7.2.3 Summary of Existing Triggers and Responses

Through timely implementation of drought response measures it is possible to meet the goals of the DCP by avoiding, minimizing or mitigating risks and impacts of water shortages and drought. In order to accomplish this, DCP's are built around a collection of drought responses and triggers based on various drought stages. Stages are generally similar for all DCP's but can vary from entity to entity. Stage one will normally represent mild water shortage conditions and the severity of the situation will increase through the stages until emergency water conditions are reached and, in some cases, a water allocation stage is determined.

Brazos G compiled stage, trigger and response information for 25 DCP's in the region including those from WWPs, WUGs and County-Other suppliers. Compliance in the majority of the DCPs in the region is voluntary under Stage I and mandatory under Stage II and III. Most Entities included a Stage IV and a few plans specify a Stage V and/or Stage VI scenario. Target reductions, triggers and responses are included for most stages. Triggers, stages and responses for entities in Brazos G can be found in Table 7-1.

Table 7-1. Common Drought Response Measures

Entity Name	DCP Date	Stage Number	Triggers										Responses											Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Others	SW	GW
City of Thrall	2003	1								√					√	√			√				√		√
		2		√		√									√			√	√				√		
		3		√		√									√			√	√				√		
		4		√		√									√			√	√				√		
		Emergency	√		√							√					√	√	√				√		
Central Texas WSC	2009	1						√									√		√					√	
		2						√								√	√								
		3						√						√		√	√								
		Emergency						√									√			√			√		
Upper Leon River MWD	2009	1		√				√			√	√					√							√	
		2		√				√			√	√					√								
		Emergency	√		√			√			√	√					√					√			
City of Harker Heights	2012	1		√											√			√	√					√	
		2		√											√			√	√				√		
		3	√	√	√				√			√			√			√	√		√	√	√		
City of Sweetwater	2011	1		√			√	√											√				√	√	√
		2		√			√	√							√			√	√						
		3		√			√	√							√		√	√	√						
		4		√			√	√						√	√		√	√	√			√			
		Emergency			√							√	√	√			√		√				√		
City of Comanche	2011	1		√				√				√			√	√	√		√				√	√	
		2		√				√				√			√	√	√		√				√		
		3		√				√				√			√	√	√	√	√				√		
		Emergency	√	√	√			√				√		√	√		√		√			√	√		
City of Robinson	2002	1		√			√			√						√	√	√	√				√	√	√
		2		√			√			√					√		√	√	√				√		
		3		√			√			√					√		√	√	√				√		
		4		√	√		√			√					√		√	√	√				√		
		Emergency	√		√												√	√	√				√		
City of Mexia	2002	1		√		√		√							√				√				√	√	√
		2		√		√		√							√			√	√				√		
		3		√		√		√						√				√	√			√	√		
City of Lampasas	2001	1		√	√						√	√			√	√	√		√				√	√	
		2		√	√						√	√			√	√		√	√				√		
		3	√	√	√						√	√			√	√	√	√	√			√	√		
		Emergency	√	√	√						√	√	√				√		√				√		
Bethesda WSC	2009	1		√							√	√			√		√	√					√	√	√
		2		√			√		√		√	√			√		√	√	√				√		
		3	√	√	√		√		√		√	√			√		√	√	√				√		
City of Hearne	2001	1					√									√	√		√				√		√
		2					√								√	√	√		√				√		
		3					√								√	√	√		√				√		
		4					√								√	√	√		√				√		
		Emergency	√		√												√		√						
City of Georgetown	2009	1								√													√	√	√
		2		√		√		√	√			√			√			√					√		
		3		√		√		√	√			√			√			√					√		
		Emergency		√					√			√						√					√		

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Table 7-1. Common Drought Response Measures (Continued)

			Triggers										Responses											Water Supplies	
Entity Name	DCP Date	Stage Number	Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Others	SW	GW
Tri-County SUD	2002	1		√																			√		
		2		√											√								√		
		3		√											√			√					√		√
		4		√											√			√					√		
		Emergency	√		√													√							
City of Taylor	2002	1		√											√			√					√		
		2		√											√			√					√		
		3		√											√			√					√	√	
		4		√											√			√					√		
		Emergency	√	√	√							√		√				√				√	√		
City of Copperas Cove	2002	1		√											√		√	√	√				√		
		2		√					√						√		√	√	√				√		
		3		√											√		√	√	√				√	√	
		4		√	√										√		√	√	√				√		
		Emergency	√		√										√		√	√	√				√		
		Water Allocation	√		√							√		√	√		√	√	√			√	√		
City of Anson	2009	1		√				√								√			√				√		
		2		√				√								√		√	√				√	√	
		3		√				√								√		√	√			√	√		
		Emergency	√		√								√				√						√		
Manville WSC	2009	1		√			√																√		
		2		√			√		√						√								√		√
		3		√	√		√		√			√			√			√							
		Emergency	√		√								√				√					√	√		
Stephens Regional SUD	2014	1							√										√				√		
		2							√						√				√				√	√	
		3							√									√	√				√		
		Emergency	√		√				√				√	√			√		√			√	√		
City of Rule	2013	1									√				√								√		
		2									√				√			√					√	√	√
		3									√				√			√					√		
		Emergency	√		√									√				√				√	√		
Block House MUD	2013	1										√							√				√		
		2		√								√			√			√					√	√	
		3		√								√			√			√					√		
		Emergency		√								√			√			√				√	√		
City of Stamford	2012	1						√	√														√		
		2		√			√	√	√					√	√			√					√	√	
		3		√			√	√	√					√	√			√					√		
		4		√	√		√	√	√			√		√				√				√	√		
City of Killeen	2012	1								√													√		
		2								√					√			√					√	√	
		3										√			√			√					√		
		Emergency										√			√			√					√		
City of Gatesville	2000	1					√	√											√				√		
		2					√	√							√				√				√	√	
		3			√		√	√										√					√		
North Central Texas Municipal Water Authority	2000	1						√	√										√				√		
		2						√	√								√		√				√	√	
		3						√	√								√		√			√	√		
		Emergency	√		√								√				√						√		

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7.3 Existing and Potential Emergency Interconnects

A goal of the regional planning process is to ensure a connected supply that meets or exceeds drought of record demands for the next 50 years. However, it is also important for regions to plan for emergency supplies in the event of a prolonged drought or an interruption/impairment of supply from an existing source. An interconnection between two collaborating municipal water user groups (WUGs) can serve as an alternative means of providing emergency drinking water in lieu of trucking in supply or other expensive options. In Compliance with Texas Administrative Code (TAC), Chapter 357 Regional Water Planning Guidelines, available information on existing major water infrastructure facilities that may be used for interconnections in event of an emergency shortage of water was collected.

For the Brazos G Regional Water Planning Area, all municipal water user groups and wholesale water providers were sent a survey in 2013 regarding their water supply and use. As part of the survey, individual municipalities and wholesale water providers were asked to confirm or update information regarding the existence of emergency interconnects integrated with their system and the provider of the potential emergency supply. Of the 237 WUGs in Region G, 56 responded to the survey and only ten reported having emergency interconnects.

The TCEQ Texas Drinking Water Watch database (TCEQ database) was used as a secondary source of emergency interconnection information. While more WUGs had reported information to TCEQ than had completed the Brazos G survey, some interconnects reported on the survey were not found in the TCEQ database. However, 22 additional interconnects were noted from the TCEQ database bringing the total to 32 reported emergency interconnects. While this should not be considered a comprehensive list, it is the extent of information available at this time.

Some circumstances that would require the use of an emergency interconnect system to be operated could affect an entire body of water or aquifer, such as drought or contamination. It is important to know the source of the emergency interconnect provider’s supply for this reason. The source to each provider was determined using the TCEQ Water Watch database and surface water (SW) or groundwater (GW) designation is noted. Information on existing and potential interconnect supply capacity or location was not available from either source. In accordance with Texas Water Code §16.053(r) the information gathered is considered confidential and was submitted to the executive administrator but not included in the regional plan.

7.4 Emergency Response to Local Drought Conditions or Loss of Municipal Supply

The regional and state water plans aim to prepare entities for severe drought scenarios based on the drought of record as described in section 7.1. However, entities may find themselves in a local drought or facing a loss of municipal supply. While rare, it is important to have a back up plan in case of infrastructure failure or water supply contamination. This is especially important for smaller entities that rely on a sole source of supply. While many entities and wholesale water providers have DCP’s as described in section 7.2, it is less common for small municipalities or those included in County-Other to have these emergency plans. An analysis of a broad range of emergency response options was performed for small WUGs with 2010 Census populations less than 7,500 and a sole supply source as well as for all County-Other WUGs in the region.

A WUG relying on groundwater is considered sole source if its entire supply comes from the same aquifer regardless of varying groundwater districts or combination of contractual and local development supplies. A WUG relying on surface water is considered sole source if their yield comes from one river intake or one reservoir, regardless of the number of contracts in place. A WUG with a BRA contract was not considered sole-source due to system operations. WUGs with both groundwater and surface water supplies were not included, with the exception of county-other entities.

A broad range of emergency situations could result in a loss of reliable municipal supply and it is not possible to plan one solution to meet any possible emergency. Accordingly, a range of possible responses were selected for each entity based on source type and location. A WUG utilizing groundwater was analyzed for potential additional fresh water and brackish water wells, based on the existence of appropriate aquifers in the area. MAG availability was not considered since the wells are assumed temporary over the course of an emergency. Surface water WUGs were analyzed for curtailment of junior water rights and for releases from upstream reservoirs. Additional yield availability was not analyzed for reservoir releases; in the case of a temporary, localized emergency, special arrangements can be made.

A nearby entity that could provide supply in the case of an isolated incident was identified for each WUG and existing interconnects were noted if information was available. In addition, trucking in water was considered as a supply option under severe circumstances. Any infrastructure required for implementation of the options is also reported. A total of 84 entities were analyzed including 38 county-other WUGs. The results of this analysis are summarized in Table 7-2, with the detailed results presented in Table 7-3.

Table 7-2. Summary of Emergency Supply Options

Entity		Potential Emergency Water Supply Sources					
Primary Source	Total WUGs	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity
Groundwater	57	0	0	57	17	57	57
Surface Water	9	5	9	0	0	9	9
Blend	18	11	18	18	9	18	18
Total:	84	16	27	75	26	84	84

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
BELL COUNTY-OTHER	BELL	5,166	870	BLEND		X	X	X	X	X		KILLEEN	Well, Pipeline, Transportation
CHILDRESS CREEK WSC	BOSQUE	2,656	410	TRINITY			X		X	X		CLIFTON	Well, Pipeline, Transportation
VALLEY MILLS	BOSQUE	1,349	264	TRINITY			X		X	X		CLIFTON	Well, Pipeline, Transportation
WALNUT SPRINGS	BOSQUE	922	97	TRINITY			X		X	X		CLIFTON	Well, Pipeline, Transportation
BOSQUE COUNTY-OTHER	BOSQUE	9,167	1,271	GW			X		X	X		CLIFTON	Well, Pipeline, Transportation
BRAZOS COUNTY-OTHER	BRAZOS	6,168	904	GW			X	X	X	X		COLLEGE STATION	Well, Pipeline, Transportation
CALDWELL	BURLESON	4,896	1,027	CARRIZO			X		X	X		ROCKDALE	Well, Pipeline, Transportation
DEANVILLE WSC	BURLESON	3,598	465	CARRIZO			X		X	X		CALDWELL	Well, Pipeline, Transportation
SNOOK	BURLESON	552	184	SPARTA			X	X	X	X		CALDWELL	Well, Pipeline, Transportation
SOMERVILLE	BURLESON	1,485	266	SPARTA			X	X	X	X		CALDWELL	Well, Pipeline, Transportation
BURLESON COUNTY-OTHER	BURLESON	5,341	615	GW			X	X	X	X		CALDWELL	Well, Pipeline, Transportation

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
BELL COUNTY-OTHER	BELL	5,166	870	BLEND		X	X	X	X	X		KILLEEN	Well, Pipeline, Transportation
CHILDRESS CREEK WSC	BOSQUE	2,656	410	TRINITY			X		X	X		CLIFTON	Well, Pipeline, Transportation
VALLEY MILLS	BOSQUE	1,349	264	TRINITY			X		X	X		CLIFTON	Well, Pipeline, Transportation
WALNUT SPRINGS	BOSQUE	922	97	TRINITY			X		X	X		CLIFTON	Well, Pipeline, Transportation
BOSQUE COUNTY-OTHER	BOSQUE	9,167	1,271	GW			X		X	X		CLIFTON	Well, Pipeline, Transportation
BRAZOS COUNTY-OTHER	BRAZOS	6,168	904	GW			X	X	X	X		COLLEGE STATION	Well, Pipeline, Transportation
CALDWELL	BURLESON	4,896	1,027	CARRIZO			X		X	X		ROCKDALE	Well, Pipeline, Transportation
DEANVILLE WSC	BURLESON	3,598	465	CARRIZO			X		X	X		CALDWELL	Well, Pipeline, Transportation
SNOOK	BURLESON	552	184	SPARTA			X	X	X	X		CALDWELL	Well, Pipeline, Transportation
SOMERVILLE	BURLESON	1,485	266	SPARTA			X	X	X	X		CALDWELL	Well, Pipeline, Transportation
BURLESON COUNTY-OTHER	BURLESON	5,341	615	GW			X	X	X	X		CALDWELL	Well, Pipeline, Transportation

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
CROSS PLAINS	CALLAHAN	1,051	179	TRINITY			X		X	X		CLYDE	Well, Pipeline, Transportation
CALLAHANCOUNTY-OTHER	CALLAHAN	7,728	613	BLEND	X	X	X		X	X		CLYDE	Well, Pipeline, Transportation
COMANCHE COUNTY-OTHER	COMANCHE	7,672	805	BLEND	X	X	X		X	X		COMANCHE	Well, Pipeline, Transportation
CORYELL COUNTY-OTHER	CORYELL	4,807	564	BLEND	X	X	X	X	X	X		COPPERAS COVE	Well, Pipeline, Transportation
RISING STAR	EASTLAND	867	100	TRINITY			X		X	X		EASTLAND	Well, Pipeline, Transportation
EASTLANDCOUNTY-OTHER	EASTLAND	6,450	583	BLEND	X	X	X		X	X		EASTLAND	Well, Pipeline, Transportation
MOUNTAIN PEAK SUD	JOHNSON	7,272	2,284	TRINITY			X		X	X		BURLESON	Well, Pipeline, Transportation
ERATH COUNTY-OTHER	ERATH	19,031	2,665	BLEND		X	X		X	X		STEPHENVILLE	Well, Pipeline, Transportation
WEST BRAZOS WSC	FALLS	2,781	399	TRINITY			X		X	X	WACO	MARLIN	Well, Pipeline, Transportation
FALLS COUNTY-OTHER	FALLS	4,153	526	BLEND		X	X	X	X	X		MARLIN	Well, Pipeline, Transportation
FISHER COUNTY-OTHER	FISHER	989	115	SEYMOUR			X	X	X	X		ROTAN	Well, Pipeline, Transportation

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
NAVASOTA	GRIMES	7,291	1,428	GULF COAST			X		X	X		COLLEGE STATION	Well, Pipeline, Transportation
GRIMES COUNTY-OTHER	GRIMES	12,659	1,789	GW			X	X	X	X		NAVASOTA	Well, Pipeline, Transportation
HICO	HAMILTON	1,385	180	TRINITY			X		X	X		HAMILTON	Well, Pipeline, Transportation
HAMILTON COUNTY-OTHER	HAMILTON	3,387	423	TRINITY			X		X	X		HAMILTON	Well, Pipeline, Transportation
HASKELL COUNTY-OTHER	HASKELL	1,911	255	BLEND		X	X	X	X	X		HASKELL	Well, Pipeline, Transportation
ITASCA	HILL	1,773	156	TRINITY			X	X	X	X		HILLSBORO	Well, Pipeline, Transportation
WHITE BLUFF COMMUNITY WS	HILL	2,022	434	TRINITY			X		X	X		HILLSBORO	Well, Pipeline, Transportation
WOODROW-OSCEOLA WSC	HILL	4,205	384	TRINITY			X		X	X		HILLSBORO	Well, Pipeline, Transportation
HILL COUNTY-OTHER	HILL	8,692	968	BLEND	X	X	X	X	X	X		HILLSBORO	Well, Pipeline, Transportation
TOLAR	HOOD	858	120	TRINITY			X		X	X		GRANBURY	Well, Pipeline, Transportation
HOOD COUNTY-OTHER	HOOD	26,999	2,823	BLEND	X	X	X		X	X		GRANBURY	Well, Pipeline, Transportation

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
GODLEY	JOHNSON	1,133	115	TRINITY			X		X	X		BURLESON	Well, Pipeline, Transportation
GRANDVIEW	JOHNSON	1,754	182	WOODBINE			X		X	X		BURLESON	Well, Pipeline, Transportation
RIO VISTA	JOHNSON	1,080	150	TRINITY			X		X	X		BURLESON	Well, Pipeline, Transportation
JOHNSON COUNTY-OTHER	JOHNSON	15,131	1,613	BLEND	X	X	X		X	X		BURLESON	Well, Pipeline, Transportation
JONES COUNTY-OTHER	JONES	2,220	279	BLEND	X	X	X	X	X	X		ABILENE	Well, Pipeline, Transportation
JAYTON	KENT	528	92	SEYMOUR			X	X	X	X		ASPERMONT	Well, Pipeline, Transportation
KENT COUNTY-OTHER	KENT	270	33	SEYMOUR			X	X	X	X		JAYTON	Well, Pipeline, Transportation
KNOX COUNTY-OTHER	KNOX	1,333	138	BLEND		X	X	X	X	X		MUNDAY	Well, Pipeline, Transportation
LAMPASAS COUNTY-OTHER	LAMPASAS	2,364	317	GW			X	X	X	X		LAMPASAS	Well, Pipeline, Transportation
GIDDINGS	LEE	5,621	1,120	CARRIZO			X	X	X	X		THRALL	Well, Pipeline, Transportation
LEXINGTON	LEE	1,355	242	CARRIZO			X		X	X		GIDDINGS	Well, Pipeline, Transportation

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
LEE COUNTY-OTHER	LEE	1,870	195	GW			X	X	X	X		GIDDINGS	Well, Pipeline, Transportation
GROESBECK	LIMESTONE	4,377	688	SW	X	X			X	X		MEXIA	Pipeline, Transportation
THORNTON	LIMESTONE	529	70	CARRIZO			X		X	X		MEXIA	Well, Pipeline, Transportation
LIMESTONE COUNTY-OTHER	LIMESTONE	9,384	892	BLEND	X	X	X	X	X	X		MEXIA	Well, Pipeline, Transportation
CHALK BLUFF WSC	MCLENNAN	2,646	269	TRINITY			X		X	X		WACO	Well, Pipeline, Transportation
CROSS COUNTRY WSC	MCLENNAN	3,175	533	TRINITY			X		X	X		WACO	Well, Pipeline, Transportation
GHOLSON	MCLENNAN	1,174	155	TRINITY			X		X	X		WACO	Well, Pipeline, Transportation
MART	MCLENNAN	2,375	353	TRINITY			X		X	X		WACO	Well, Pipeline, Transportation
NORTH BOSQUE WSC	MCLENNAN	2,436	619	TRINITY			X		X	X		WACO	Well, Pipeline, Transportation
WESTERN HILLS WS	MCLENNAN	3,142	212	TRINITY			X		X	X		WACO	Well, Pipeline, Transportation
MCLENNAN COUNTY-OTHER	MCLENNAN	27,613	3,533	BLEND	X	X	X		X	X		WACO	Well, Pipeline, Transportation

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
MILANO WSC	MILAM	3,805	432	CARRIZO			X		X	X		CAMERON	Well, Pipeline, Transportation
ROCKDALE	MILAM	5,929	1,159	CARRIZO			X		X	X		CAMERON	Well, Pipeline, Transportation
MILAM COUNTY-OTHER	MILAM	2,438	300	SW		X		X	X	X		CAMERON	Pipeline, Transportation
ROSCOE	NOLAN	1,402	200	DOCKUM			X		X	X		SWEETWATER	Well, Pipeline, Transportation
NOLAN COUNTY-OTHER	NOLAN	1,948	228	BLEND		X	X		X	X		SWEETWATER	Well, Pipeline, Transportation
STRAWN	PALO PINTO	710	137	SW	X	X			X	X		MINERAL WELLS	Pipeline, Transportation
PALO PINTO COUNTY-OTHER	PALO PINTO	11,432	1,063	SW	X	X			X	X		MINERAL WELLS	Pipeline, Transportation
BREMOND	ROBERTSON	1,027	189	CARRIZO			X		X	X		HEARNE	Well, Pipeline, Transportation
CALVERT	ROBERTSON	1,192	190	CARRIZO			X		X	X		HEARNE	Well, Pipeline, Transportation
FRANKLIN	ROBERTSON	1,728	256	CARRIZO			X		X	X		HEARNE	Well, Pipeline, Transportation
HEARNE	ROBERTSON	4,459	757	CARRIZO			X		X	X		HEARNE	Well, Pipeline, Transportation
ROBERTSON COUNTY WSC	ROBERTSON	3,049	246	CARRIZO			X		X	X		HEARNE	Well, Pipeline, Transportation

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
ROBERTSON COUNTY-OTHER	ROBERTSON	3,890	439	CARRIZO			X	X	X	X		HEARNE	Well, Pipeline, Transportation
SHACKELFORD COUNTY-OTHER	SHACKELFORD	1,242	125	SW	X	X			X	X		ALBANY	Pipeline, Transportation
GLEN ROSE	SOMERVELL	2,730	583	TRINITY			X		X	X		TOLAR	Well, Pipeline, Transportation
SOMERVELL COUNTY-OTHER	SOMERVELL	6,752	822	SW	X	X			X	X		GLEN ROSE	Pipeline, Transportation
STEPHENS COUNTY-OTHER	STEPHENS	1,447	156	GW			X		X	X		BRECKENRIDGE	Well, Pipeline, Transportation
STONEWALL COUNTY-OTHER	STONEWALL	575	68	SEYMOUR			X	X	X	X		ASPERMONT	Well, Pipeline, Transportation
TAYLOR COUNTY-OTHER	TAYLOR	5,714	660	SW		X			X	X		ABILENE	Pipeline, Transportation
THROCKMORTON	THROCKMORTON	831	182	SW		X			X	X	FORT BELKNAP WSC	GRAHAM	Pipeline, Transportation
THROCKMORTON COUNTY-OTHER	THROCKMORTON	496	48	SW		X			X	X		THROCKMORTON	Pipeline, Transportation
G & W WSC	GRIMES	7,638	851	GULF COAST			X		X	X		NAVASOTA	Well, Pipeline, Transportation
WASHINGTON COUNTY-OTHER	WASHINGTON	18,844	2,424	GULF COAST			X	X	X	X		BRENHAM	Well, Pipeline, Transportation

Table 7-3. Potential Emergency Supply Options for Small Water User Groups

Entity					Potential Emergency Water Supply Sources						Implementation Requirements		
Water User Group	County	2020 Population	2020 Demand (acft)	Source	Release From Upstream Reservoir	Curtailment of Junior Water Rights	Local Groundwater Well	Brackish Groundwater Well	Truck in Water	Supply from Nearby Entity	Known Existing Interconnect	Potential Entity Providing Supply	Type of Infrastructure Required
BARTLETT	WILLIAMSON	1,855	356	TRINITY			X	X	X	X		ROUND ROCK	Well, Pipeline, Transportation
FLORENCE	WILLIAMSON	1,238	119	TRINITY			X		X	X		ROUND ROCK	Well, Pipeline, Transportation
GRANGER	WILLIAMSON	1,568	212	TRINITY			X	X	X	X		ROUND ROCK	Well, Pipeline, Transportation
THRALL	WILLIAMSON	1,000	89	GW			X		X	X		ROUND ROCK	Well, Pipeline, Transportation
WILLIAMSON COUNTY-OTHER	WILLIAMSON	71,170	11,047	BLEND	X	X	X	X	X	X		ROUND ROCK	Well, Pipeline, Transportation
YOUNG COUNTY-OTHER	YOUNG	1,757	214	BLEND		X	X		X	X		GRAHAM	Well, Pipeline, Transportation

7.5 Region Specific Drought Response Recommendations and Model Drought Contingency Plans

Brazos G acknowledges that DCPs are a useful drought management tool for entities with both surface and groundwater sources and recommends that all entitles consider adopting a DCP in preparation for drought conditions. The region also recommends that in accordance with TCEQ guidelines, entities update their DCPs every five years as triggers can change as wholesale and retail water providers reassess their contracts and supplies. Brazos G obtained 24 drought contingency plans from across the region. Fourteen of these participating water providers and WUGs rely solely on surface water, four entities rely solely on groundwater and six of them utilize both sources to meet needs.

7.5.1 Drought Response Recommendations for Surface Water

Surface water accounts for approximately 75% of projected 2070 municipal supplies in Brazos G. Surface water supply is sold by more than 25 wholesale water providers and comes from over 50 lakes and numerous river intakes. With such a variety of supply sources it is difficult to create a set of triggers and responses that fit the needs of each WUG in the regional planning area. Brazos G recognizes that supplies are understood best by the operators and suggests that WUGs without DCPs look to the DCPs of their water providers as examples, if available.

For entities without DCPs which supply themselves with local surface water, Brazos G suggests reviewing the drought responses and recommendations used by similar entities in the region. An example of triggers and responses from the DCP for the City of Abilene is presented below (Table 7-4). Abilene was selected as a representative example because they provide water to several entities throughout the Brazos G Area and rely on various types of surface water triggers that can be applied throughout the region. The DCP includes four water stages ranging from “Water Alert” to “Water Crisis”. The triggers depend on parameters such as treatment plant use, storage levels, reservoir elevations, and system failures. The responses include categories ranging from home irrigation limits to commercial and industrial use reductions.

Table 7-4. Abilene Surface Water Drought Contingency Response

Drought Stage	Trigger	Actions
Stage I – Water Alert	• Combined treatment plant use > 49.5 MGD for 2 Days, or • Storage levels do not refill above 50% overnight, or • Ft. Phantom Reservoir at or below EL. 1625.9 if Hubbard Creek Reservoir is at 60% capacity or less, or • Ft. Phantom Reservoir at or below EL. 1624.9 if Hubbard Creek Reservoir is at greater than 60% capacity.	• Announcement and Implementation by the City • Irrigation limited to designated day of the week during restricted hours unless hand held hose or less than 5 gallons of faucet water is used • Vehicle washing is only permissible by using a five gallon container and/or a hand held hose equipped with a quick shutoff nozzle. • Water may be added to swimming pools or fountains to sustain appropriate maintenance levels only on designated irrigation day • Use of water from fire hydrants shall be limited to firefighting activities or other activities necessary to maintain public health, safety and welfare • Water wasting is prohibited • Commercial and industrial users shall reduce water use by 15%
Stage II – Water Warning	• Combined treatment plant use > 49.5 MGD for 2 Days, or • Storage levels do not refill above 50% overnight, or • Ft. Phantom Reservoir at or below EL. 1618.9, or • Major line breaks or pump system failure causes loss of capacity to provide service.	• Announcement and Implementation by the City • Irrigation limited to designated day once every two weeks during restricted hours unless hand held hose or less than 5 gallons of faucet water is used • Vehicle washing is only permissible by using a five gallon container and/or a hand held hose equipped with a quick shutoff nozzle. • Water may be added to swimming pools or fountains to sustain appropriate maintenance levels only on designated irrigation day • Use of water from fire hydrants shall be limited to firefighting activities or other activities necessary to maintain public health, safety and welfare • Water Wasting is prohibited • Commercial and industrial users shall reduce water use by 15%, golf courses by 30%
Stage III – Water Emergency	• Combined treatment plant use > 30 MGD for 3 days, and Ft. Phantom Reservoir at or below EL. 1614.9, or • Major line breaks or pump system failure causes loss of capacity to provide service.	• Announcement and Implementation by the City • Irrigation limited to hand held hose or less than 5 gallons of faucet water is used, no lawn use • Only permissible to wash vehicles on the premises of a commercial car wash station • Water may be added to swimming pools or fountains to sustain appropriate maintenance levels only on designated irrigation day • Use of water from fire hydrants shall be limited to firefighting activities or other activities necessary to maintain public health, safety and welfare • Water Wasting is prohibited • Commercial and industrial users shall reduce water use by 15%, golf courses by 50%

Table 7-4. Abilene Surface Water Drought Contingency Response

Drought Stage	Trigger	Actions
Stage IV – Water Crisis	• Loss of capability to provide water service, or • Contamination of supply source, or • Other unforeseen conditions.	• All outdoor irrigation of vegetation including lawns, using potable water is prohibited • Only washing of mobile equipment in the critical interest of the public health or safety is allowed • Filling of swimming pools or fountains is prohibited • Use of water from fire hydrants shall be limited to fire fighting and related activities • Water for domestic use only may be purchased from the bulk loading station • Commercial and industrial users of water shall continue to maintain at least a 15% use reduction

7.5.2 Drought Response Recommendations for Groundwater

Groundwater accounts for approximately 25% of projected 2070 municipal supplies. Entities in Brazos G utilize both brackish and non-brackish wells from over 15 aquifers or formations. With such a variety of supply sources it is difficult to create a set of triggers and responses that fit the needs of each WUG in the regional planning area. Brazos G recognizes that supplies are understood best by the operators and suggests that WUGs without DCPs look to the DCP's of their water providers and groundwater conservation districts as examples, if available.

For entities without DCPs supplying themselves with local groundwater, Brazos G suggests reviewing the drought responses and recommendations used by similar entities in the region. An example of triggers and responses from the DCP for the City of Thrall is presented below (Table 7-5). Thrall was selected as a representative example because they are a small WUG utilizing local groundwater like many of the groundwater reliant WUGS who have not yet developed a DCP. The DCP includes four water stages ranging from "Mild" to "Water Emergency". The triggers depend on parameters such as season, ground storage levels, contamination, and system failures. The responses include categories ranging from residential irrigation limits to commercial and industrial use reductions.

Table 7-5. Thrall Groundwater Drought Contingency Response

Drought Stage	Trigger	Actions
Stage I – MILD	Yearly: May 1st – September 30th.	• City reduces water main flushing • Voluntary limit on irrigation to 2 days a week at designated times • City of Thrall should adhere to Stage 2 restrictions below • Customers are requested to minimize or discontinue non-essential water use

Table 7-5. Thrall Groundwater Drought Contingency Response

Drought Stage	Trigger	Actions
Stage II – MODERATE	Ground Storage does not gain over 20ft.	• Mandatory limit on irrigation to 2 days a week at designated times or by hand held hose or 5 gallon bucket • Vehicle washing allowed only with hand held bucket or hose • Filling of pools or Jacuzzis limited to watering days/times • Non-circulating ponds or fountains are prohibited unless supporting aquatic life. • Use of water from fire hydrants shall be limited to firefighting activities or other activities necessary to maintain public health, safety and welfare. • All restaurants are prohibited from serving water unless requested • Non essential uses are prohibited
Stage III – SEVERE	Ground Storage does not gain over 15 ft.	• All actions listed in Stage II • Irrigation limited to hand held hose or less than 5 gallons of faucet water is used during designated watering days and times. • The use of water for construction from designated hydrants under special permit is discontinued.
Stage IV – CRITICAL	Ground Storage does not gain over 10 ft	• All actions listed in Stages II and III • Only washing of mobile equipment in the critical interest of the public health or safety is allowed. Commercial car washes can be used during designated hours. • Filling of swimming pools or fountains is prohibited • No applications for new, additional or expanded water service infrastructure shall be approved
Stage V – EMERGENCY	• Infrastructure breaks • Contamination • System outage	• All actions described in previous stages • Irrigation of landscaped areas is absolutely prohibited • Use of water to wash any vehicle is absolutely prohibited

7.5.3 Model Drought Contingency Plans

TCEQ has prepared model drought contingency plans for wholesale and retail water suppliers to provide guidance and suggestions to entities with regard to the preparation of drought contingency plans. Not all items in the model will apply to every system's situation, but the overall model can be used as a starting point for most entities. Brazos G suggests that the TCEQ Model DCPs should be used in conjunction with drought contingency measures such as those listed above for Abilene and Thrall for entities wishing to develop a new DCP. The TCEQ model drought contingency plans can be found in on TCEQ's website at the following link:

https://www.tceq.texas.gov/permitting/water_rights/contingency.html

7.6 Drought Management WMS

The regional water plan is developed to meet projected water demands during a drought of severity equivalent to the drought of record. Brazos G sees the purpose of the planning as ensuring that sufficient supplies are available to meet future water demands. For this reason, drought management recommendations have not been made by Brazos G as a water management strategy for specific WUG needs. Reducing water demands during a drought as a defined water management strategy does not ensure that sufficient supplies will be available to meet the projected water demands; but simply eliminates the demands. While Brazos G encourages entities in the region to promote demand management during a drought, it should not be identified as a "new source" of supply. Recommending demand reductions as a water management strategy is antithetical to the concept of planning to meet projected water demands. It does not make more efficient use of existing supplies as does conservation, but instead effectively turns the tap off when the water is needed most. It is planning to not meet future water demands.

While Drought Management WMS are not supported by the RGWPG, DCPs are encouraged for all entities and the region supports the implementation of the drought responses outlined in these DCPs when corresponding triggers occur. While the relief provided from these DCP responses can prolong supply and reduce impacts to communities, they are not considered to be reliable for all entities under all potential droughts.

7.7 Other Drought Recommendations

7.7.1 Model Updates

It is of upmost importance that regional water planning groups have the most up to date information available to make decisions. The Brazos G WAM is used to determine both the drought of record and the firm yield of reservoirs, but has not been updated in almost 20 years. The Brazos G Regional Water Planning Group recommends that the Texas legislature approve a budget for TCEQ to pursue updated WAMs before the next regional planning cycle. This will be especially important if the duration of the recent drought continues or the severity increases.

7.7.2 Monitoring and Assessment

Brazos G recommends that all entities monitor the drought situation around the state and locally in order to prepare for and facilitate decisions. Several state and local agencies are monitoring and reporting on conditions with up to date information. A few informative sources are listed below.

- Brazos River Authority Drought Information: http://www.brazos.org/DroughtStatus.asp
- Parmer Drought Severity Index: http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/
- TWDB Drought Information: http://waterdatafortexas.org/drought/

- TCEQ Drought Information: https://www.tceq.texas.gov/response/drought

In addition, Brazos G supports the efforts of the Texas Drought Preparedness Council administered by the Texas Department of Public Safety, and recommends that entities review information developed by the council. The Drought Preparedness Council was established by the legislature in 1999 and is composed of 15 representatives from several state agencies. The council is responsible for assessment and public reporting of drought monitoring and water supply conditions, advising the governor on drought conditions, and ensuring effective coordination among agencies. The council currently is promoting outreach to inform entities of the assistance they can provide and looking for input as to how they can be more useful. Brazos G suggests that entities take advantage of the resources available to them through the Drought Preparedness Council such as the Drought Annex (2014), which describes the activities that help minimize potential impacts of drought and outlines an effective mechanism for proactive monitoring and assessment. More information on the Drought Preparedness Council can be found here:

http://www.txdps.state.tx.us/dem/CouncilsCommittees/droughtCouncil/stateDroughtPrepCouncil.htm

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8

Recommendations for Unique Stream Segments, Unique Reservoir Sites, and Other Legislative Policy Recommendations

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8 Recommendations for Unique Stream Segments, Unique Reservoir Sites, and Other Legislative Policy Recommendations

8.1 Recommendations Concerning River and Stream Segments Having Unique Ecological Value

Regional water planning groups are given the option of designating stream segments having "unique ecological value" within their planning areas. Five criteria are utilized to identify such segments:

1. Biological Function:
   - Quantity (acreage or areal extent of habitat), and
   - Quality (biodiversity, age, uniqueness).
2. Hydrologic Function:
   - Water Quality,
   - Flood Attenuation and Flow Stabilization, and
   - Groundwater Recharge and Discharge.
3. Occurrence of Riparian Conservation Areas.
4. Occurrence of High Water Quality, Exceptional Aquatic Life or High Aesthetic Value.
5. Occurrence of Threatened or Endangered Species and/or Unique Communities.

The Brazos G RWPG has chosen not to designate any stream segments as having unique ecological value.

8.2 Recommendations Concerning Sites Uniquely Suited for Reservoir Construction

The Brazos G RWPG has chosen to identify the following five sites as uniquely suited for reservoir construction. Each of these sites is associated with a request by a potential local project sponsor to include the project as a recommended or alternative water management strategy in the 2016 Plan.

- Cedar Ridge Reservoir (City of Abilene),
- Turkey Peak Reservoir (Palo Pinto County Municipal Water District No. 1),
- Millers Creek Off-Channel Reservoir (North Central Texas Municipal Water District),
- Brushy Creek Reservoir (City of Marlin), and
- Coryell County Off-Channel Reservoir (Coryell County).

8.3 Legislative and Policy Recommendations

The Brazos G Regional Water Planning Group (Brazos G) established a Water Policy Workgroup to discuss various issues concerning State water policy and to formulate proposed positions for the planning group to consider for recommendation to the TWDB and the Texas Legislature. As the population and economic demands grow, water supplies become more stressed. These developments coupled with recent drought conditions make it increasingly important for water planning groups to consider diverse water management strategies.

Regional water planning rules require use of the Texas Commission on Environmental Quality (TCEQ) Water Availability Models in determining surface water supply availability. The period of record for most existing TCEQ Water Availability Models ends with the year 1997. In some parts of the State, and possibly in some portions of the Brazos River Basin, hydrologic conditions since 1997 may be worse than conditions experienced prior to 1997. Therefore, firm water availability from existing surface water supply sources and from new surface water supply strategies may be overstated. As a result, water shortages may exist that are not apparent in the regional and State water plans. Brazos G considers it prudent to explore alternatives to the historic drought of record for water planning purposes. As more diverse water management planning strategies are developed alternative water planning measurements may include firm yield, safe yield and/or operational yield as appropriate. In addition, the water planning process requires coordination with agencies such as the TCEQ and the TWDB. These agencies need sufficient funding and staffing in order to assist water planning groups in fulfilling their water planning mission. Also, funding should be provided for TCEQ to update the hydrology for all Water Availability Models (WAMs) to extend through 2016 to account for the ongoing drought with additional funding for regular maintenance updates.

Brazos G will promote water development policies that support efforts to protect both groundwater and surface water sources by encouraging sound practices that will not adversely affect water supply or quality. We support other agencies and organizations in their efforts to encourage responsible land management and will oppose any practice or action in our watersheds or recharge zones that could adversely affect our water resources. Maintaining our watershed health, economic sustainability, and community viability are all critical elements in our water planning efforts. Protecting source water and sensible stewardship of the areas adjacent to and around river basins, sensitive sub-basins, aquifers, and recharge zones is essential for maintaining these resources for present and future needs.

For the 2016 Plan, the Water Policy Workgroup revisited several legislative and water policy recommendations that had been incorporated into the 2006 Plan. The Water Policy Workgroup also reviewed the specific legislative and water policy recommendations that had been incorporated into the 2011 Plan. The Water Policy Workgroup offered specific revised recommendations to the full planning group for consideration.

Brazos G offers the following specific recommendations concerning State water policy to the TWDB and the Texas Legislature.

Issue #1: Streamlining the Permitting Processes for Project Implementation

"Brazos G recommends that the Legislature direct all State agencies involved in planning and/or permitting water projects to streamline the process of evaluating, approving, permitting, and funding in order to allow timely project implementation. The amount of time required to gain approval for surface water projects is just one example of the need for more streamlined processes."

Issue #2: Plan Implementation

"Brazos G recognizes the need for expeditious implementation of the State Water Plan facilitated by the use of the State Water Implementation Fund for Texas (SWIFT)."

Issue #3: Coordination between Regional Water Planning Groups and Groundwater Conservation Districts

"Brazos G is committed to working cooperatively with Groundwater Conservation Districts (GCDs) when developing the Regional Plan. The GCDs are requested to review water demand, population projections, and water availability numbers for their respective Districts and comment accordingly.

Brazos G recognizes, pursuant to SB 660, that GCDs are statutorily required to determine the amount of groundwater that is available for use in the Regional Water Plan. SB 660, passed by the 82nd Texas Legislature (2011), outlines a process by which Modeled Available Groundwater (MAG) figures are supplied to the GMA and its member GCDs. MAG is the amount of water that may be withdrawn while maintaining or achieving the Desired Future Conditions (DFCs) adopted by the GCDs within a GMA. "Desired future condition" means a quantitative description of the desired condition of the groundwater resources in a management area at one or more specified future times.

Regional water plans are required to use the MAGs in place at the time of adoption of TWDB's state water plan in the next regional water planning cycle or, at the option of the regional water planning group, established subsequent to the adoption of the most recent plan.

The use of DFCs to take a long term view of the health of aquifers and MAG to allow the use of groundwater for beneficial purposes without depleting aquifers is consistent with Brazos G's historical policy that does not allow the adoption of water management strategies that will substantially deplete the aquifers.

However, the strict use of MAGs can restrict the ability of planning groups to develop feasible regional water plans. Therefore, a planning group should be allowed to exceed a MAG within a tolerance agreed to by the applicable groundwater conservation district, recognizing that protection of local aquifer systems will be accomplished through oversight and management by groundwater conservation districts."

Issue #4: System Operation of Water Facilities

"Brazos G recognizes the inherent benefit of system operations of existing water supply sources and recommends that State water planning as well as permitting continue to promote such water management strategies.

System operation involves coordinated operation of two or more water supply sources (including surface water reservoirs and run-of-river diversions, as well as groundwater aquifers) such that the system yield is greater than the sum of the individual sources.

System operation provides several significant benefits to the State, including: better utilization of existing infrastructure; efficient use of water supplies to meet needs; delay or avoidance of expensive new water supply infrastructure; and reduced environmental impact potentially occurring due to major new projects."

Issue #5: Outdated Hydrology Used for Surface Water Supply Availability

"Regional water planning rules require use of the TCEQ Water Availability Models in determining surface water supply availability. The period of record for existing TCEQ Water Availability Models ends with the year 1997. In some parts of the State, and possibly in some portions of the Brazos River Basin, hydrologic conditions since 1997 may be worse than conditions experienced prior to 1997. Therefore, firm water availability from existing surface water supply sources and from new surface water supply strategies may be overstated. As a result, water shortages may exist that aren't apparent in the regional and State water plans. The TCEQ should be adequately funded to update the hydrology for all WAMS to extend through 2016 to account for the ongoing drought and additional annual funding should be provided for regular maintenance updates."

Issue #6: Interbasin Transfers of Surface Water

"Brazos G recognizes that Interbasin Transfers have been a critical component of water management in Region G and are a necessary component of overall State water management strategies. The automatic assignment of junior rights to an interbasin water transfer is a deterrent and suppresses the development of interbasin water supply projects. We recommend the re-evaluation of the junior water rights provision that is automatically assigned to interbasin transfers. We also recommend that statutory rules, policies and administrative code be reviewed and the permitting and review process be streamlined to eliminate any unnecessary obstacles to IBT's."

Issue #7: Rule of Capture

"While Brazos G recognizes that the Rule of Capture remains valid law in Texas, we also recognize that advances in science, changes in water marketing, recent Texas Supreme Court rulings, and increasing pressures on groundwater add complexity to this issue.

The State groundwater supply is being tapped to its limits, and in many instances, landowners risk loss due to depletion by over-pumping. Local control through checks and balances can most effectively and fairly regulate usage and protect individual property rights. Groundwater Conservation Districts are the appropriate mechanisms to provide local control of groundwater, to fairly preserve historic use, ensure future sustainability, and protect private property rights – both the rights of those pumping groundwater, and their neighbors.

As such, Brazos G supports the continued management of fresh, brackish, and saline groundwater by groundwater conservation districts."

Issue #8: Conjunctive Use of Groundwater and Surface Water

"Brazos G recognizes conjunctive use as an important management strategy. Conjunctive use is the systematic utilization of groundwater and surface water to optimize the combined yield from both sources. Conjunctive use seeks to maximize the advantages and minimize the disadvantages of each source when both are utilized together. As conjunctive use projects are recognized, they should be included as management strategies for the regional water plan. Brazos G encourages development of conjunctive use projects. Construction of surface water reservoirs, which provide new sources of water, along with judicial use of groundwater resources, which can be a finite quantity, will provide an integrated solution for the water needs of the future."

Issue #9: Aquifer storage and recovery (ASR)

"*ASR projects have the potential to store large amounts of water, eliminate evaporative losses of stored water, and minimize the impact on surface owners when compared to large reservoir projects. While ASR projects could be beneficial, there are a number of questions regarding ownership of the injected water, percentage of injected water that is recoverable, impact to existing users, the appropriate degree of oversight for Groundwater Conservation Districts in the development and permitting of these projects, and the quality to which injected water must be treated. An improved legal/public policy framework is needed to address these issues and enhance adoption. We support groundwater conservation districts having the authority to monitor ASR projects and enact rules to regulate and protect ASR supplies and ensure there are no detrimental impacts to the existing groundwater supplies or private property rights or the entity injecting the water for the ASR. Further, we recommend that these water management strategies include sufficient hydrologic study to protect receiving aquifers."*

Issue #10: Municipal Per Capita Water Use

"Brazos G recommends the regional water planning process be changed to separate commercial and residential water use and look at both individually. The current practice of using a city's overall gallons per capita/day unfairly characterizes some cities as water wasters. Cities with a vibrant commercial sector see an influx of workers and customers commuting in and raising water usage, which is then applied to the resident population. Also, there needs to be consistency in the calculations of GPCD, and better guidance as to whether regional planning groups are to use raw water delivered or treated water provided in calculating GPCD numbers."

Issue # 11: Reservoir Water Management

"Brazos G recognizes that the primary purpose of conservation storage capacity in Texas reservoirs authorized for water supply is, in fact, water supply. Although recreational and aesthetic benefits of these reservoirs may provide economic impacts locally, these are secondary incidental benefits. Therefore, we recommend that appropriate State agencies and State legislative bodies uphold the critically important primary purpose of Texas water supply reservoirs to ensure long-standing agreements and contracts are met and deliveries are not jeopardized by secondary interests. Further, consideration of providing

educational programs regarding reservoir purpose and management and other appropriate assistance for businesses and others impacted is recommended."

Issue #12: Support for Brush Control Projects as Viable Water Management Strategies

"Brazos G supports brush control projects as water management strategies and encourages the Texas legislature to instruct the Texas State Soil and Water Conservation Board to allow funding for these projects, via its Water Supply Enhancement Program, even if they are not included in a Regional Water Plan or the State Water Plan. Brush control projects are often not included in water plans due to the difficulty of assigning a specific amount of new water contributed; however, such projects may have a positive impact on aquifer recharge and stream flows."

Issue #13: Watershed Planning/Source Water Protection

"Brazos G will promote water development policies that support efforts to protect both groundwater and surface water sources by encouraging sound practices that will not adversely affect water supply or quality. We support other agencies and organizations in their efforts to encourage responsible land management and will oppose any practice or action in our watersheds or recharge zones that could adversely affect our water resources. Maintaining our watershed health, economic sustainability and community viability are all critical elements in our water planning efforts. Sensible stewardship of the areas adjacent to and around river basins, sensitive sub-basins, aquifers and re-charge zones is essential for maintaining these resources. Through source water protection, Texas can promote equitable costs for present and future water sources."

Issue #14: Water Pricing and Conservation

"Brazos G encourages retail water providers to seriously consider implementing appropriate rate structures that would be consistent with best management practices for conserving water. Properly designed rate structures allow a consistent price signal to the ratepayer, without resulting in over earnings to the utility. This increasingly favored approach heightens the interest in water conservation to the end users."

Issue #15: Integrating Water Quality and Water Supply Considerations

"Brazos G continues to support existing efforts of regulatory agencies to protect current and future sources of drinking water, including both groundwater and surface water supplies. Brazos G, as well as the regulatory agencies, is committed to ensuring both the quality and quantity of water for our constituents. Furthermore, Brazos G encourage all governmental agencies, when making regulatory or permitting decisions or influencing decisions regarding land and resource use, to give preference to alternatives to protect or enhance the quality of water so that such water resources may be utilized for beneficial use. As a planning group, protecting and enhancing these resources and sustaining our supply will always be among Brazos G's priority commitments."

Issue #16: Education

"Research indicates that there is a strong relationship between knowledge of water sources and a willingness to conserve. Conservation is the most cost-effective means of securing future water supply. Brazos G believes strongly that water education is important and supports water conservation and public awareness programs at the state and local level."

Issue #17: Effects of the Federal Safe Drinking Water Act (SDWA) on Water Supply Systems

"Brazos G recognizes the difficulty in meeting the standards of the Federal Safe Drinking Water Act for some water supply systems. Therefore, we encourage the regionalization of these systems, and/or education and proactive planning."

Brazos G is one the most diverse regional water planning areas in Texas, covering 37 counties along the Brazos River Basin. The geographic area extends from Kent, Stonewall and Knox Counties in the northwest to Washington and Lee Counties in the southeast.

For sixteen years, Brazos G has been an important platform in regional water planning. Its central mission is to develop a regional water plan. The planning process is the true added value. Bringing together perspectives from agriculture, industries, municipalities, counties, small business, water utilities, the public, electric utilities, groundwater management representatives, environmental and river authorities has helped to enhance the overall water planning process.

Brazos G does not operate in a vacuum. We use resources such as our consultant, HDR Engineering, Inc., to collect reliable data to include in our regional water plan. We reach out to constituents in the 37 counties as we develop the regional water plan. We engage with other stakeholders in addressing water planning issues. Our planning group meetings are forums for vetting ideas for or against water planning ideas. This process encourages transparency.

Brazos G serves an important role as an entry point for public engagement in the water planning process. This role also makes it a good resource for the State Legislature as it grapples with the realities of an ongoing drought, a burgeoning population, and strong economic development.

We welcome such a role and stand ready to be of assistance.

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9

Infrastructure Financing

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9 Infrastructure Financing

9.1 Introduction

Senate Bill 2 (77th Texas Legislature) requires that an Infrastructure Financing Report (IFR) be incorporated into the regional water planning process. In order to meet this requirement, each regional water planning group (RWPG) is required to examine the funding needed to implement the water management strategies and projects identified and recommended in the planning area's 2016 regional water plan.

9.2 Objectives of the Infrastructure Financing Report

The primary objective of the Infrastructure Financing Report is to determine the financing options proposed by political subdivisions to meet future water infrastructure needs (including the identification of any State funding sources considered).

9.3 Methods and Procedures

For the Brazos G Regional Water Planning Area, all municipal water user groups and wholesale water providers having water needs and recommended water management strategies with an associated capital cost in the initially prepared regional plan were surveyed using the questionnaire provided by the TWDB (Exhibit 9-A). Individual municipalities and wholesale water providers were provided a link to complete the survey online through the Brazos G website.

For each project with an identified capital cost, the survey respondents were asked to enter only the amounts that they wish to receive from the TWDB program listed below:

- Planning, Design, and Permitting: Costs were entered into this category if the entity wanted to participate in the TWDB programs offering subsidized interest and deferral of principal and interest for planning, design, and permitting costs.
- Construction Funding: Costs were entered into this category if the entity wants to obtain subsidized interest for all construction costs, including planning, design, and construction.
- State Participation: Percentages of costs were entered into this category if the entity wanted to participate in the State Participation Program. State Participation funding offers partial interest and principal deferral for the incremental cost of project elements which are designed and built to serve needs beyond 10 years.

9.4 Survey Responses

The Brazos G RWPG sent letters to 64 municipal water user groups and wholesale water providers and as of November 15, 2015, had received 11 responses, a 17 percent response rate. In addition to the surveys that were returned, a number of other WUGs and WWPs provided feedback and questions about the survey but have not returned their survey. Limited feedback indicated that there was concern that the survey information could commit the entity into a certain financing strategy for water management strategies projected to come online more than 20 years from today.

As shown in Table 9-1, the 11 responses represent about 20 percent of the estimated capital costs of water management strategies included in the 2016 Brazos G Plan. Of those responding, for which total capital costs are $3,330,118,675, the survey shows that approximately $646 million would be sought through the state participation programs. It is also important to note that it is unclear how the remaining 80 percent of the capital costs for those entities not responding would be financed. Note that these survey results represent responses to recommended water management strategies with capital costs as included in the initially prepared plan.

Table 9-1. Summary of Responses to the Infrastructure Financing Survey*

Sponsor	Project Name	Capital Cost	Planning, Design, Permitting and Acquisition		Construction	
			Funding Amount	Year	Funding Amount	Year
ABILENE	BRUSH CONTROL	$7,532,000	not to be funded by State Programs			
ABILENE	CEDAR RIDGE RESERVOIR	$290,868,000	$99,700,000	2023	$191,168,000	2025
ABILENE	WTP EXPANSION (23.2 MGD)-ABILENE	$48,257,000	$13,720,000	2018	$34,537,000	2020
AQUILLA WSD	LAKE AQUILLA AUGMENTATION-A	$5,714,856	NA	NA	NA	NA
BARTLETT	TRINITY AQUIFER DEVELOPMENT-BARTLETT	$10,428,000	No Response			
BELL COUNTY WCID #1	BELL COUNTY WCID #1- NORTH REUSE	$12,146,000	No Response			
BELL COUNTY WCID #1	BELL COUNTY WCID #1- SOUTH REUSE	$6,529,000	No Response			
BELL-MILAM FALLS WSC	EAST WILLIAMSON COUNTY WATER PROJECT	$2,808,467	Removing strategy from WUG			
BELLMEAD	REUSE- BELLMEAD/ LACY-LAKE	$5,768,000	No Response			
BETHESDA WSC	BETHESDA WSC - CONNECT TO AND PURCHASE WATER FROM ARLINGTON Q-184	$18,698,000	No Response			
BETHESDA WSC	CONSERVATION, WATER LOSS CONTROL - BETHESDA WSC	$139,100	No Response			
BISTONE MWSD	CARRIZO (BRAZOS) DEVELOPMENT-BISTONE MWSD	$22,689,000	No Response			
BRANDON-IRENE WSC	CONSERVATION, WATER LOSS CONTROL - BRANDON-IRENE WSC	$98	$0	NA	$0	NA
BRAZOS RIVER AUTHORITY	BELTON TO STILLHOUSE PIPELINE-BRA	$38,069,000	No Response			
BRAZOS RIVER AUTHORITY	BRA SYSTEM OPERATION-MAIN STEM	$23,581,674	No Response			
BRAZOS RIVER AUTHORITY	BRA SYSTEM OPERATIONS-LITTLE RIVER	$23,581,674	No Response			
BRAZOS RIVER AUTHORITY	CHLORIDE CONTROL PROJECT-BRA	$172,652,000	No Response			

Table 9-1. Summary of Responses to the Infrastructure Financing Survey*

Sponsor	Project Name	Capital Cost	Planning, Design, Permitting and Acquisition		Construction	
			Funding Amount	Year	Funding Amount	Year
BRAZOS RIVER AUTHORITY	LAKE AQUILLA REALLOCATION- BRA	$21,887,000	No Response			
BRAZOS RIVER AUTHORITY	LAKE GRANGER ASR	$99,820,000	No Response			
BRAZOS RIVER AUTHORITY	LITTLE RIVER OCR-BRA	$487,611,000	No Response			
BRECKENRIDGE	WEST CENTRAL BRAZOS WATER DISTRIBUTION SYSTEM	$8,308,142	No Response			
BRUSHY CREEK MUD	EDWARDS AQUIFER DEVELOPMENT-BRUSHY CREEK MUD	$182,000	$0	NA	$0	NA
BRYAN	CARRIZO-WILCOX DEVELOPMENT-BRYAN	$24,569,609	$4,000,000	2045	$20,000,000	2050
BRYAN	REUSE- BRYAN (OPTION 1)	$8,989,000	$1,200,000	2017	$7,700,000	2020
BRYAN	REUSE- MIRAMONT	$2,544,000	$350,000	2016	$2,194,000	2018
BRYAN	BRYAN ASR (CARRIZO/WILCOX)	$57,328,000	$8,000,000	2017	$49,000,000	2019
BURLESON	BURLESON - INCREASE DELIVERY INFRASTRUCTURE TO PURCHASE ADDITIONAL WATER FROM FORT WORTH Q-186	$21,780,000	No Response			
BURLESON	CONSERVATION, WATER LOSS CONTROL - BURLESON	$37,638	No Response			
CEDAR PARK	BRUSHY CREEK RUA WATER SUPPLY	$69,665,771	$20,899,731	2016	$48,766,040	2017
CEDAR PARK	MUNICIPAL CONSERVATION - CEDAR PARK	$238,695	$0	NA	$0	NA
CENTRAL TEXAS WSC	EAST WILLIAMSON COUNTY WATER PROJECT	$11,233,867	No Response			
CHILDRESS CREEK WSC	BOSQUE COUNTY-RWSP	$22,372,000	No Response			
CHILDRESS CREEK WSC	TRINITY WELL REHAB-CHILDRESS CREEK WSC	$15,000	No Response			
CLEBURNE	REUSE- CLEBURNE	$14,059,000	No Response			
CLEBURNE	LAKE AQUILLA AUGMENTATION-A	$73,912,144	No Response			
COLLEGE STATION	COLLEGE STATION ASR (REUSE)	$63,850,000	No Response			
COLLEGE STATION	REUSE-COLLEGE STATION	$1,705,000	No Response			
COLLEGE STATION	YEGUA-JACKSON DEVELOPMENT-COLLEGE STATION	$32,957,000	No Response			
CRESSON	CONSERVATION, WATER LOSS CONTROL - CRESSON	$5,210	No Response			
CRESSON	CRESSON - NEW WELL IN TRINITY AQUIFER Q-170	$917,300	No Response			

Table 9-1. Summary of Responses to the Infrastructure Financing Survey*

Sponsor	Project Name	Capital Cost	Planning, Design, Permitting and Acquisition		Construction	
			Funding Amount	Year	Funding Amount	Year
CRESSON	TRINITY AQUIFER DEVELOPMENT-CRESSON	$771,000	No Response			
CROSS COUNTRY WSC	INTERCONNECT FROM WACO TO CROSS COUNTRY WSC	$2,579,000	No Response			
FILES VALLEY WSC	CONSERVATION, WATER LOSS CONTROL - FILES VALLEY WSC	$2,010	No Response			
FLORENCE	EDWARDS AQUIFER DEVELOPMENT-FLORENCE	$218,000	No Response			
FLORENCE	TRINITY AQUIFER DEVELOPMENT (BELL CO.)- FLORENCE	$3,778,000	No Response			
GEORGETOWN	EXPAND WTP (21 MGD)-GEORGETOWN	$44,534,000	$8,906,800	2017	$35,627,200	2020
GODLEY	WOODBINE AQUIFER DEVELOPMENT-GODLEY	$375,000	No Response			
GRANGER	EAST WILLIAMSON COUNTY WATER PROJECT	$1,003,024	No Response			
GROESBECK	GROESBECK OCR- GROESBECK	$11,909,000	No Response			
HARKER HEIGHTS	INTERCONNECT FROM KILLEEN TO HARKER HEIGHTS	$2,580,000	No Response			
HEWITT	REUSE- BULLHIDE CREEK	$7,541,000	No Response			
JARRELL	EAST WILLIAMSON COUNTY WATER PROJECT	$501,512	No Response			
JAYTON	NEW WTP(0.4 MGD)-JAYTON	$3,537,000	No Response			
JOHNSON COUNTY SUD	CONSERVATION, WATER LOSS CONTROL - JOHNSON COUNTY SUD	$4,470	No Response			
JOHNSON COUNTY SUD	JOHNSON COUNTY SUD - CONNECT TO PURCHASE WATER FROM GRAND PRAIRIE Q-188	$86,140,000	No Response			
JONAH WATER SUD	EAST WILLIAMSON COUNTY WATER PROJECT	$15,045,357	No Response			
LEANDER	BRUSHY CREEK RUA WATER SUPPLY	$142,186,421	No Response			
LIBERTY HILL	BRUSHY CREEK RUA WATER SUPPLY	$3,554,660	No Response			
MARLIN	BRUSHY CREEK RESERVOIR- MARLIN	$20,836,000	No Response			
MART	INTERCONNECT FROM WACO TO MART	$5,617,000	No Response			
MART	INTERCONNECT FROM WACO TO NORTH BOSQUE	$4,406,000	No Response			
MINERAL WELLS	CONSERVATION, WATER LOSS CONTROL - MINERAL WELLS	$6,389	$6,389	2018	$0	NA
MULTI-COUNTY WSC	CORYELL COUNTY OCR-BRA	$42,246,000	No Response			

Table 9-1. Summary of Responses to the Infrastructure Financing Survey*

Sponsor	Project Name	Capital Cost	Planning, Design, Permitting and Acquisition		Construction	
			Funding Amount	Year	Funding Amount	Year
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY	MILLERS CREEK AUGMENTATION-NCTWA	$74,399,000	No Response			
PALO PINTO MWD #1	TURKEY PEAK RESERVOIR	$71,988,000	$17,100,000	2015	$70,100,000	2018
PARKER WSC	WOODBINE AQUIFER DEVELOPMENT-PARKER WSC	$1,128,000	No Response			
RIO VISTA	WOODBINE AQUIFER DEVELOPMENT-RIO VISTA	$753,000	No Response			
ROBINSON	EXPAND WTP(4MGD)-ROBINSON	$13,153,000	No Response			
ROUND ROCK	MUNICIPAL CONSERVATION - ROUND ROCK	$36,147	No Response			
ROUND ROCK	BRUSHY CREEK RUA WATER SUPPLY	$102,994,808	No Response			
STEPHENS REGIONAL SUD	WEST CENTRAL BRAZOS WATER DISTRIBUTION SYSTEM	$6,042,286	No Response			
SWEETWATER	INTERCONNECT FROM ABILENE TO SWEETWATER	$13,036,000	$1,500,000	2018	$11,536,000	2020
THROCKMORTON	THROCKMORTON RESERVOIR-THROCKMORTON	$28,041,000	No Response			
THROCKMORTON	WEST CENTRAL BRAZOS WATER DISTRIBUTION SYSTEM	$2,915,403	No Response			
TOLAR	TRINITY WELL REHAB- TOLAR	$20,000	No Response			
TRI-COUNTY SUD	CARRIZO-WILCOX DEVELOPMENT-TRI-COUNTY SUD	$1,445,000	No Response			
UPPER LEON MWD	TRINITY AQUIFER DEVELOPMENT-UPPER LEON (FROM PECAN ORCHARD)	$5,347,000	No Response			
VENUS	CONSERVATION, WATER LOSS CONTROL - VENUS	$740	No Response			
WACO	MCLENNAN COUNTY ASR (WACO)	$43,940,000	No Response			
WACO	REUSE- FLAT CREEK	$9,371,000	No Response			
WELLBORN SUD	EXPAND WTP (4MGD)- WELLBORN SUD	$13,153,000	No Response			
WEST BRAZOS WSC	CARRIZO AQUIFER DEVELOPMENT-WEST BRAZOS WSC	$2,752,000	No Response			
Total		$3,300,118,675	$175,382,920		$470,628,240	

*Note: The survey responses presented are related to water management strategies and capital costs included in the Initially Prepared 2016 Plan. As a result of public and agency comments on the Initially Prepared 2016 Plan, some strategies and capital costs have been modified in the final 2016 Plan, and those changes are not necessarily reflected here. Responses are as of November 15, 2015.

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Public Participation and Adoption of Plan

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10 Public Participation and Adoption of Plan

10.1 Public Participation

The Brazos G Regional Water Planning Group (BGRWPG) provided considerable opportunity for the public to participate in the planning process. Notices and meeting agendas were posted prior to each meeting in accordance with State law, and these and other meeting materials were posted on the BGRWPG website (www.brazosgwater.org) as they became available prior to each meeting. The public was invited to speak during public comment periods during each planning group and committee meeting. In addition, stakeholders were often invited to participate in planning group and committee meetings (as formal items of the meeting agenda) to present information to the planning group that was pertinent to issues the planning group was considering.

The BGRWPG formally adopted its process for identifying, evaluating and selecting water management strategies on January 26, 2012 and included opportunities for public input during the development of the scope of work to develop the 2016 Plan.

The BGRWPG held three sub-regional meetings in March 2015 to solicit comments on the draft WUG and WWP plans prior to development of the Initially Prepared Plan. These meetings were held in Abilene on March 24, 2015 (Upper Subregion), in Waco on March 25, 2015 (Middle Subregion), and in College Station on March 26, 2015 (Lower Subregion).

As described below, the BGRWPG held a public hearing on June 23, 2015 to receive comments from the public on the Initially Prepared Plan.

10.2 Brazos G Regional Water Planning Group Website (www.brazosgwater.org)

The BGRWPG has directed the Brazos River Authority (BRA) to maintain a website where meeting notices, agendas, and presentation materials may be viewed by the public. In addition to meeting materials, the 2001, 2006 and 2011 Brazos G Regional Water Plans are posted for public viewing and download, as well as documents from the planning process for the 2016 Plan. The website offers other features including member contact information, planning area maps, planning data, and audio transcripts of meetings.

10.3 Coordination with Water User Groups and Wholesale Water Providers

The BGRWPG coordinated with multiple water user groups, wholesale water providers, county judges, and councils of governments in the region regarding population and water demand projections developed by the Texas Water Development Board (TWDB), groundwater and surface water availability estimates, proposed water management strategies, and recommendations for sites uniquely suited for reservoir construction.

Representatives from the BGRWPG met with representatives from multiple entities in Williamson County on January 21, 2015 and March 16, 2015 to discuss options available to address large water needs in that county. At those meetings, various options were presented and the representatives prioritized those water management strategies they considered most desirable. The resulting plans for entities in Williamson County reflect the outcome from those meetings.

Surveys were disseminated to water user group and wholesale water providers to obtain input regarding draft population and water demand projections and current sources of supply (March/April 2013), draft water needs and strategies to supply those needs (October 2013), implementation of water management strategies recommended in the 2011 Brazos G Regional Water Plan (June 2015), and infrastructure financing recommendations for water management strategies recommended in the 2016 Plan (September 2015).

The Brazos G technical consultant worked closely with 30 water user groups during May – July, 2013 to refine or correct information used by the TWDB to determine per capita water use (gpcd) values used to project municipal water demands.

Draft plans for each water user group and wholesale water provider were presented to water user groups and wholesale water providers at the three subregional meetings held in January. In addition, the Initially Prepared 2016 Plan was provided to county libraries and county clerks in all Brazos G counties, and posted on the Brazos G website for public review and comment.

10.4 Coordination with Other Planning Regions

Coordination with other planning regions was accomplished primarily through the technical consultants, who coordinated data and shared information that was later reported to the planning groups. Coordination was accomplished with the technical consultants from Regions B, C, F, H, K, L and O.

10.5 Brazos G Regional Water Planning Group Meetings

The BGRWPG held 51 public meetings during the 2016 planning cycle, between March 1, 2011 and December 31, 2015, including regular meetings of the full planning group; periodic meetings of the Executive, Scope of Work, and Finance Committees; and periodic meetings of the Water Policy Workgroup.

10.6 Public Hearing and BGRWPG Responses to Public Comments on Initially Prepared Plan

The BGRWPG held a public hearing on June 23, 2015 to receive comments concerning the Initially Prepared 2016 Brazos G Regional Water Plan. The oral comments received can be heard from the audio transcripts on the BGRWPG website (www.brazosgwater.org), and a transcript of the public hearing can be viewed at the same location. At the public hearing, 20 members of the public provided oral comments and/or submitted written comments to the planning group concerning various aspects of the plan, predominantly focused on the proposed Little River Off-Channel Reservoir.

Written comments were received from several individuals that mirror or expand upon their oral comments.

Following the June 23, 2015 public hearing, written public comments were received by the planning group through August 24, 2015. Additional comments were received from the Texas Water Development Board and the Texas Parks and Wildlife Department. No comments were received from federal agencies.

The following section summarizes the public comments received and the responses of the BGRWPG. Comments are summarized in *italics*, with the response from the BGRWPG following in regular type. Copies of written comments received and a transcript of oral comments received at the public hearing are included in Appendix I. When duplicate written information was provided by different parties in support of written comments, only one copy of the duplicate document is included in the appendix.

Comments Received Opposing Inclusion of the Little River Off-Channel Reservoir in the 2016 Brazos G Regional Water Plan (oral and written comments)

Numerous comments were received in opposition to the Little River Off-Channel Reservoir. Those providing comments in opposition to the proposed reservoir are listed below. This list was compiled from signatories of hard copy and email comments received by the Brazos River Authority, and from the record of those making oral comments at the June 23, 2015 public hearing in the Initially Prepared Plan. In addition, opponents presented the results of a hard copy petition and a petition on the Change.org website, with a combined total of 2,442 signatures reported by the organizers.

Milam County Commissioners Court
Gause Independent School District Board
Milano City Council
22 Hills Homeowners' Association Architectural Control Committee, Gause, TX
Patsy Alford, Gause, TX
Judge Dave Barkemeyer, Milam County Judge – oral comments
Elaine Shafer Baumann, Gause, TX
Eugene and Elaine Baumann, Gause, TX
Curtis Chubb, Ph.D., Milam County, TX
Joyce and Mike Conner, Gause, TX – oral and written comments
Dave Cunningham, Gause, TX – oral comments
Cindy and James Delulio, Calvert, TX
Dan Fischer, Gause, TX
Wayne Fisher, Milan County and Harris County – oral comments
Sherry Hughes Garner
Don & Lynn Hagan, Gause, TX
Kimberly Hahn, Dewitt County – oral comments
Sheryl Hall, Gause, TX – oral comments
Linda Hoppe, Gause Independent School District – oral comments
Tommi Ivey

Steven Gonzales, Executive Director, El Camino Real de los Tejas National Historic Trail Association – oral and written comments

Robert W. Knight, Ph.D., Texas A&M University

Gary, Lisa, Sara and Scott Kornegay – oral and written comments

Julie Kornegy

Mary Lou Kornegay

Michael Wayne Kornegay, Gause, TX – oral and written comments

Steve and Cathy Lazarus, Calvert, TX – oral and written comments

Judy Marks, Gause, TX

Allison Shafer Riherd

Reece Riherd

Parker Riherd

Deborah, Jerrod, Graham and Sean Russell, Tomball, TX

Norma Schroeder Schendel, Yorktown, TX

Arlene Schroeder, Yorktown, TX

Marlan Scully – oral comments

Clay Shafer

Frank A. Shafer, Franklin, TX

Harold C. and Susan Shafer

Kyle Shafer

Philip Shafer

Watson Hubert & Opal Shafer, Gause, TX

William Shafer

Melissa Shehane, College Station, TX – oral and written comments

Amanda and John Sulzbach, The Woodlands, TX

Colby Theis, Robertson County, TX

Cathy Tooley

Marion Brewer Travis, Cameron, TX

Kathy and V.V. Turner, Gause, TX

James and Mary Waldson

Carl and Stephanie Wall

Frank Louis Wall II

Irma Andrea Wall

Maria Elizabeth Wall

Michelle Wall – oral comments

Stephanie Wall

Melvin F. Wall, Gause, TX – oral and written comments

Gary Westbrook, General Manager, Post Oak Savannah GCD, Milano, TX – oral and written comments

Benjamin Whittington

Jacob Whittington

Jerald Wise P.E. (Ret), Cameron, TX

Many of the comments opposing the reservoir focus on one or more common themes or technical arguments. Each of these is summarized below, followed by the BGRWPG's response. Note that numbers assigned to the comments are solely for organizational purposes.

1. *Each commenter identified above requested removal of the Little River Off-Channel Reservoir from the 2016 Brazos G Regional Water Plan as a recommended water management strategy.*

The BGRWPG understands the concerns voiced regarding the Little River Off-Channel Reservoir. During the Brazos G regional water planning process, water management strategies such as additional development of Carrizo-Wilcox Aquifer groundwater and the Lake Granger Augmentation Project were preferred options to include in the 2016 Brazos G Regional Water Plan. When confronted by the Modeled Available Groundwater (MAG) limitations of these two options, the BGRWPG has little alternative but to make the Little River Off-Channel Reservoir a recommended strategy.

At this time, the planning group believes it is prudent to continue the project as a recommended water management strategy in the 2016 Brazos G Regional Water Plan. Many of the issues put forth by opponents of the project are more appropriately dealt with during state and federal permitting processes and not during the regional water planning process. At this time, no entity has been identified as wishing to pursue the project, but if that should happen, environmental, cultural resource and technical issues will need to be addressed in much greater depth than is done during the regional water planning process. Retaining the project in the plan facilitates the opportunity to receive state funding to study the project further and provide greater definition of the impact of the issues identified by the project's opponents. If the project is not a recommended water management strategy in the plan, then state funding for those studies will not be available. These further studies will determine with greater certainty whether the project is, in actuality, feasible to develop or not. If the project is removed from the regional water plan, there is no certainty that it won't be recommended in some future regional water planning cycle. By allowing the project to remain as a recommended water management strategy in the 2016 Plan, the opportunity will remain for any entity wising to pursue the project to obtain state funding for the in-depth technical studies necessary to determine the actual viability of the project. These studies would include a more detailed alternative siting analysis, where sites other than the one identified in the plan would be investigated more fully.

2. *Remove designation of the Little River Off-Channel Reservoir as a Unique Reservoir Site.*

The Texas Legislature is responsible for designating Unique Reservoir Sites, and usually does so upon the recommendation of one or more regional water planning group and/or the Texas Water Development Board. The Brazos G Regional Water Planning Group has not recommended that the Little River Off-Channel Reservoir be designated as a Unique Reservoir Site. The Brazos G Regional Water Planning Group only recommends such designation when requested by a project sponsor. The Region H Water Planning Group has recommended that the project be designated as a Unique Reservoir Site in the 2011 Region H Plan and in the 2016 Initially Prepared Region H Plan. Requests to remove that designation should be made to the Region H Water Planning Group, the Texas Water Development Board, and the Texas Legislature.

3. *Remove the Little River Off-Channel Reservoir from evaluation in future water plans.*

The Brazos G Regional Water Planning group cannot guarantee that the project won't be evaluated in future regional water planning cycles. The Brazos G Regional Water Planning Group has no authority to prevent future members of the Brazos G Regional Water Planning Group from evaluating the project during future planning cycles or to prevent other regional water planning groups from evaluating the project.

4. *The proposed Little River Off-Channel Reservoir will inundate multiple cultural resources, including the Pin Oak Cemetery, designated an Historic Cemetery by the Texas Historical Commission, numerous family homesteads including Texas Department of Agriculture Family Land Heritage Program designations, Native American artifacts and a portion of the El Camino Real de los Tejas, a National Historic Trail.*

The BGRWPG appreciates the various commenters' concerns that the proposed reservoir will inundate numerous areas that have cultural and archeological significance. . Many of the impacts identified by the commenters, i.e., the Pin Oak Cemetery, are identified in the technical evaluation of the project (Volume II) and will be more fully assessed during the federal permitting process.

The portion of the El Camino Real de los Tejas within the area that would be inundated by the reservoir is largely on private property, and there is no public park system or other public access to view or otherwise visit this portion of the historic route.

5. *The proposed Little River Off-Channel Reservoir will inundate areas having substantial natural resource value, and this loss of habitat will negatively impact area wildlife as well as permanently destroy areas of natural beauty, such as dogwood forests and pristine streams. Maps do not show what land will be used for environmental mitigation.*

The BGRWPG understands the concerns that the proposed reservoir will inundate these areas and have these impacts to area wildlife. These issues are addressed during the federal permitting process and will require appropriate mitigation for those impacts. This mitigation process may include established mitigation banks. Identification of those mitigation areas is outside the scope of the regional water planning process.

6. *The proposed Little River Off-Channel Reservoir is not needed to meet the needs of Williamson County – other water management strategies can be recommended to meet those demands, such as additional conservation, aquifer storage and recovery projects, groundwater development, more aggressive levels of wastewater reuse and ocean water desalination.*

The BGRWPG is responsible for water planning in all areas of Brazos G, including Williamson County. The BGRWPG coordinated with entities in Williamson County, who requested that the Little River Off-Channel Reservoir be recommended to meet future water needs for entities in Williamson County. This is not the only strategy recommended to meet water needs in Williamson County. Other strategies recommended include developing water from the Highland Lakes, reuse, and aquifer storage and recovery associated with overdrafting of Lake Granger. Additional advanced conservation was also recommended for those entities having per capita water use rates greater than 120 gpcd to achieve that level within the planning horizon, while the target for the rest of the Brazos G Area is 140 gpcd. Only limited additional groundwater development can be recommended in the plan for any of the aquifer systems near Williamson County (including Milam County) because of limitations imposed by the estimates of the Managed Available Groundwater (MAG) for those aquifer systems.

7. *The proposed Little River Off-Channel Reservoir would impart a large increase on the BRA's system rate, and would produce a large cost on users of the supply. The costs for the project are much more expensive than other alternatives, such as the Allens Creek Reservoir.*

The BRA is identified as the project sponsor in the 2016 Plan by default because no entity has requested to be identified as the project sponsor. The impact of the project on BRA's system rate would be determined when and if the BRA decided to pursue the project. The BRA has no current plans to develop the project. A reservoir project is expensive, and will have a large impact on the end users' water rates.

8. *Specific errors or anomalies have been identified with regard to how supplies are assigned from the Little River OCR to various water user groups and the Brazos River Authority. Additionally, a completion date of 2020 appears unrealistic and should be changed to 2050 or later.*

These technical items have been reviewed and the values corrected, as necessary.

9. *Supplies from the proposed Little River Off-Channel Reservoir will be used to meet demands for Williamson County entities only, and therefore, any recommended strategy should be located in Williamson County. The citizens of Milam County would not benefit from supplies from the proposed reservoir.*

Supplies from the proposed Little River Off-Channel Reservoir are identified in the plan to supplement supplies available from the Brazos River Authority (Lakes Belton, Stillhouse Hollow, Georgetown and Granger), and from groundwater sources. The plan addresses specific water user groups in Williamson County. However, entities in Milam County also receive supplies from the BRA system through the Central Texas WSC, including the Town of Buckholts, Bell-Milam-Falls WSC, Little Elm Valley WSC, and Salem-Elm Ridge WSC. Although this is not specifically identified in the plan, these utilities would benefit from the proposed reservoir by reducing dependence on the limited supplies from the existing BRA reservoirs. Additionally, future steam-electric demands in Milam County are identified in the plan to be supplied from the reservoir.

10. *The water demands for Williamson County are overstated and the reservoir is not needed.*

The population of Williamson County is expected to increase from the 2010 census of 211,306 persons to 705,691 persons in 2030 and 1,523,206 persons in 2070. These projections were developed by the Texas State Demographer and accepted by entities in Williamson County. Water demand projections for water user groups in Williamson County reflect this dramatic population increase, but also reflect conservation through the increased use of water efficient plumbing fixtures. Williamson County entities requested that the plan include additional advanced conservation as a strategy to achieve a water conservation goal of 120 gpcd rather than the standard goal of 140 gpcd used for the rest of the Brazos G Area. Further, population projections are frequently evaluated during the water planning process.

11. *The proposed Little River Off-Channel Reservoir is located above the recharge zone of the Carrizo-Wilcox Aquifer and the reservoir will be unable to hold water, if constructed. This will cause degradation of the water quality in the aquifer because Brazos River has lower water quality than the native water in the aquifer.*

Any impacts of locating the reservoir above the recharge zone of the Carrizo-Wilcox Aquifer would be determined through a detailed technical study. Such a study will help address issues such as determining if the reservoir is a viable option. Assessment of long-term leakage would be affected by such factors as reservoir depth, aquifer properties, and other characteristics that might influence the rate of migration of water into the underlying aquifer.

12. *Other sites for the proposed Little River Off-Channel Reservoir should have been investigated.*

This specific site for the Little River Off-Channel Reservoir has been identified in the regional water planning process since the first planning cycle that developed the 2001 Plan. No other sites have ever been suggested for the project, and no detailed alternative siting analysis has been performed. A detailed review of other potential sites would most likely be one of the first priorities should a project sponsor be identified that is interested in pursuing the Little River Off-Channel Reservoir.

13. *The proposed Little River Off-Channel Reservoir will destroy the investments made by previous and current landowners to improve their property.*

The BGRWPG understands the concerns about the loss of investments in sometimes multi-generation held property. These are economic compensation issues that are addressed if the Little River Off-Channel Reservoir is pursued by a project sponsor.

14. *The proposed Little River Off-Channel Reservoir will destroy parts of FM 2095 and impair access to the City of Cameron by citizens of the communities of Gause and Hanover.*

These are issues that are addressed if the Little River Off-Channel Reservoir is pursued by a project sponsor.

15. *The proposed Little River Off-Channel Reservoir will have an adverse affect on the tax bases of the Gause Independent School District, the Milano Independent School District, and Milam County.*

The BGRWPG understands the concern about the impact of the Little River Off-Channel Reservoir affecting the tax base. Development of the reservoir will remove roughly 4,400 acres (6.875 square miles) from the tax rolls. The impact of this on the tax base of the two school districts and the county are not determined as part of the regional water planning study. The total area of Milam County is 1,022 square miles, so the area of the reservoir represents roughly 0.67 percent (a little more than half a percent) of the total land area in the county. The impact to the tax base of the two school districts would be proportionally greater because the reservoir footprint includes a greater portion of the school districts' areas. This is the kind of issue assessed if there is a project sponsor willing to pursue the project.

16. *The proposed Little River Off-Channel Reservoir will cover agricultural lands protected by the federal Farmland Protection Policy Act.*

The Farmland Protection Policy Act is intended to minimize the extent to which Federal programs "contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses." The act directs the Department of Agriculture and other Federal agencies to take steps to assure that the actions of the Federal Government do not cause farmland to be irreversibly converted in cases in which other national interests do not outweigh the benefits of maintaining farmland resources. It appears that this specific legislation would only apply if the project sponsor for the Little River Off-Channel Reservoir were a federal entity.

17. *The proposed Little River Off-Channel Reservoir would provide no significant recreational or economic value to the citizens of Milam County.*

This concern appears to be premature, as the use of a reservoir is determined by the project sponsor that owns and controls the rights to the reservoir's use, including recreational use.

18. *The TWDB has new requirements for water conservation content to be included in the Plans including directives…to assess the highest level of water conservation and efficiencies achievable, report the resulting projected water use savings in gallons per capita per day, and develop conservation strategies based on this information. The IPP…fails to report any savings from water conservation for the entities in Williamson County that are to receive water from the Little River Off-Channel Reservoir. Please break this information out as required.*

Conservation savings are documented for each of the Williamson County municipal WUGs identified to receive water from the Little River Off-Channel Reservoir. These include Brushy Creek MUD, Chisholm Trail SUD, City of Georgetown, City of Round Rock and Williamson County-Other. Conservation (140 gpcd) savings are documented in Volume II, Section 2.1.3 and additional advanced conservation (120 gpcd) savings are documented in Volume II, Section 2.1.4.

19. *There would be little water available to fill the reservoir. It will seldom be full and most of the time would be quite low.*

Water available to the project was determined using the Brazos River Basin Water Availability Model (Brazos WAM), as stipulated by Texas Water Development Board planning rules. A storage trace showing how the reservoir would perform over a historical period of record analysis is included in the technical evaluation of the project in Volume II, Figure 4.7-2, page 4.7-3. More detailed technical studies will assess points concerning water availability and retention.

20. *Please remove from the plan all identified off-channel reservoir sites.*

State law requires that the BGRWPG prepare a plan consisting of water planning strategies. Most of the off-channel reservoir sites identified in the technical evaluations in Volume II are not recommended strategies, but were potentially feasible alternatives that were considered and evaluated, but not recommended. These are potentially feasible water management strategies that were evaluated during the process of developing the 2016 Plan and should remain documented as such in the report.

21. *Milam County OCR should be preferred over the Little River OCR because it is a smaller, less expensive project and would have fewer negative environmental impacts. The Milam County OCR could also replace the Peach Creek OCR (specific comment from Mr. Theis)*

The Milam County OCR is not the recommended option because it does not generate sufficient supply. Future evaluations of alternative sizes for the project may prove that the Milam County OCR is the more preferred option. However, evaluation of multiple iterations of the project was outside the scope of this planning study. The Peach Creek OCR was evaluated, but is not a recommended water management strategy in the 2016 Plan.

22. *Impacted areas where projects are located should be notified when projects are included that affect them.*

The Brazos G Regional Water Planning Group posts public notices of all of its meetings. In addition, the planning group disseminates the Initially Prepared Plan to each county clerk and a public library in each county in the planning area. The planning group holds a public hearing on the Initially Prepared Plan to obtain public input, with the intention that comments on the Initially Prepared Plan will be considered and incorporated as appropriate into the final plan. Information is also available to the public on the brazosgwater.org website. At the time a project is actually pursued by a water supply entity and detailed plans are developed so that a more accurate determination can be made of property owners that might be affected by a particular project, notices will be sent by the appropriate entity.

23. *Use of "place holder" strategies that will never be built wastes the state's resources and misrepresents the state's water balance.*

Several alternatives exist by which regional water planning groups can account for how projected water needs will be met. One alternative is to assume in the plan that certain water needs will go unmet. Another alternative is to include a potentially feasible water management strategy in the plan to meet the projected needs. Another alternative is to include more than one strategy to meet a projected need with the expectation that future detailed evaluations will identify the preferred alternative. Readers should recognize that the strategies recommended are a plan, nothing more and nothing less, and nothing is binding regarding the strategies or the water user groups and wholesale water providers for which they are recommended.

24. *Environmental impacts of the proposed reservoir have not been fully determined, including downstream riparian impacts due to modified river flow regimes.*

Detailed environmental evaluations are part of the state and federal permitting process. Such studies are done when a project sponsor elects to pursue permitting of the Little River Off-Channel Reservoir.

25. *Use of GAM and WAM values appear to not be widely accepted amongst all users. Models and water availability estimates used in the planning process should be accepted by all stakeholders.*

The GAM and WAM models used in the planning process are stipulated by Texas Water Development Board rules, and are considered to be the standards by which water supplies are to be evaluated.

26. *Utilizing the lowest annual rainfall year to determine the amount of water needed is a flawed approach because it proposes a solution to a problem that has an extremely low probability of existing. Planning should be based on what is probable, not a worst case scenario.*

Hydrology in Texas is highly variable and is characterized by extremes. The Texas Legislature established that all water demands in regional water planning be based upon what is needed in a "dry" year, but not necessarily the driest year on record. Water demands in the Brazos G Area are based on that dry year methodology.

Similarly, supplies are to be developed based on drought of record analysis, i.e., how much water would be available throughout a repeat of the drought of record. The drought of record is based upon recorded historical observations, which represent a relatively short period of time, often less than 100 years. We know that there have been pre-historic periods that appear to have been much drier than what is generally accepted as the drought of record. Because drought periods in Texas span multiple years, water supplies need to be developed that allow for supply to be maintained through sequences of dry years. The need for water is so critical, that prudence calls for planning to meet water demands through a drought of record period.

27. *Inclusion of the reservoir location in the water plan unnecessarily encumbers the affected landowners because the land is at risk for condemnation in the future. This has a negative effect on any landowner attempting to sell property.*

The Brazos G Regional Water Planning Group understands the concerns of those land owners whose property is identified as being within areas shown to be impacted by the project. If the project were being pursued definitely by a project sponsor, it would be appropriate to show the project area to a level of detail that individual properties might be identified because the project sponsor would already have completed a more detailed site alternatives analysis and been in communication with those property owners affected. Conversely, in the absence of a project sponsor, the Brazos G Regional Water Planning Group believes it would be better to simply describe a project as being "in the vicinity" of Milam County without identifying a specific project footprint on a map because there is less definition of the project and the actual project might eventually be located miles or more from the location shown in the plan. However, Texas Water Development Board planning rules require that a footprint of the proposed project be shown in the plan.

Comments Received Supporting Inclusion of the Little River Off-Channel Reservoir in the 2016 Brazos G Regional Water Plan

Numerous comments were received in support of the Little River Off-Channel Reservoir. Those commenting in support of the proposed reservoir are listed below.

Dale Ross, Mayor, City of Georgetown, TX

Several officers of the Chisholm Trail SUD

Board of Directors, Lone Star Regional Water Authority, Jarrell, TX

David L. Mann, Sr., Chairman, The Woods Ad Hoc Water Committee, Georgetown, TX

William L. McGavran III, Chairperson, Williamson County Greater Water Committee, Georgetown, TX

Don Scott, Chairman, Woodland Park and Woodland Park West Water Committee, Georgetown, TX

Judith Prehar, Water Committee Member of Fountainwood, Georgetown, TX

Carlene Boyd, Shady Oaks Ad Hoc Water Committee, Georgetown, TX

Diana Rogoff, Georgetown, TX

These themes and arguments in support of the reservoir are summarized below.

1. *Williamson County and the entire Brazos Basin will be enhanced by inclusion of the project in the plan.*
2. *Every water resource that can be developed, in the Brazos Basin, is a resource that will provide for the continued prosperity of Texas.*
3. *…maintaining a diverse set of identified resource options is proper long-term regional planning.*
4. *Maintaining the reservoir in the plan will continue to make it eligible for state and federal funding.*

The BGRWPG understands your support of the Little River Off-Channel Reservoir and has opted to retain it as a recommended water management strategy in the 2016 Brazos G Regional Water Plan.

Commenter — T. Barret Lyne, Ph.D., Bryan, TX (oral and written comments)

The groundwater model, MODFLOW, is based upon equations that have limited ability to describe groundwater flow and decisions based upon modeling in MODFLOW are suspect and should not be relied upon by water planners and water managers.

The MODFLOW model has been proven to be a reliable system for evaluating groundwater systems and is used widely in the industry and in academia. It has general acceptance in the water supply community and is the basis for many decisions made by groundwater districts and for establishing Modeled Available Groundwater estimates by the Texas Water Development Board.

Comments Received from the Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department provided a comment letter noting several aspects of the initially prepared plan. Those comments requiring a response involving a potential modification to the plan are summarized and responded to below.

1. *There appears to be an error on page ES-16 stating municipal conservation savings in the 2016 Plan are 21,366 acft/yr.*

The typographic error has been corrected to 73,835 acft/yr.

2. *Please include updated information to help clarify the present status of zebra mussels in Texas. The present known distribution (as of July 27, 2015) of zebra mussels in Texas reservoirs includes two reservoirs in Brazos G: Lake Waco and Belton Reservoir.*

The information has been added to the plan in Chapter 1, Section 1.9 as a threat to water supply in the Brazos G Area.

3. *The proposed Cedar Ridge Reservoir will alter streamflow variability, could potentially affect up to 27 threatened, endangered, and rare species, would increase concentrations of dissolved salts and minerals in Possum Kingdom Reservoir, and would increase fluctuations in lake levels at Possum Kingdom Reservoir.*

The Cedar Ridge Reservoir was evaluated using environmental flow standards adopted by the TCEQ, which were developed through a stakeholder-driven public process by the

Brazos River and Associated Bay and Estuary System Stakeholder Committee (BBASC) and Expert Science Team (BBEST), as per TWDB planning requirements. The expected environmental impacts of the proposed reservoir are discussed in detail in the technical evaluation of the project in Volume II. Any additional environmental evaluations of the project will be during the state and federal permitting processes for the project.

4. *The upper Brazos drainages support a unique prairie stream ecosystem. Alterations in hydrologic and water quality conditions due to reservoir construction and operation, water diversions, control of brine sources, and consequent effects may disrupt the dynamics of the unique ecosystem and render habitat unsuitable for species adapted to prairie streams, including pupfish, killifish and minnows (Smalley Shiner and Sharpnose Shiner).*

Anticipated environmental impacts of the each strategy are documented in the technical evaluations found in Volume II, which were completed as per regional planning rules and guidelines. Any of the recommended water management strategies located in the upper Brazos River Basin will undergo additional environmental assessment during the state and federal permitting processes for the projects. Such additional assessments are beyond the scope of the regional water planning process.

5. *The IPP does not recommend any stream segments be nominated as ecologically unique. No explanation is provided for the lack of recommendations.*

The BGRWPG is concerned regarding the impact such designation may have on limiting future activities in the vicinity of any streams designated as ecologically unique and has chosen to not nominate any streams.

Comments Received from the Brazos River Authority

1. *…all of BRA's existing supplies are fully contracted, so subordination agreements…may not be possible…the BRA requests that Brazos G and HDR, Inc. include a caveat in every water management strategy that assumes a subordination agreement with BRA that clearly states subordination may not be possible.*

The appropriate text has been added to each water management strategy that assumes a subordination agreement with BRA.

2. *There are frequent references that subordination for some recommended water management strategies will be possible upon issuance of BRA's System Operation Permit. BRA does not want sponsors of other recommended water management strategies to assume that a subordination agreement with BRA is "automatic."*

The appropriate text has been added to each water management strategy that assumes a subordination agreement with BRA related to the pending BRA System Operation Permit.

3. *BRA recommends that the Brazos G consultant revisit the use of BRA's System Operation Permit as a recommended water management strategy and limit the new supply to a volume closer to the 84,899 acft/yr that is contained in the 2011 Brazos G Plan.*

The total supply from BRA's System Operation Permit in the 2011 Brazos G Plan is actually 102,581 acft/yr, when accounting for the supply necessary to develop the Lake Granger Augmentation project, which would utilize an additional 17,682 acft/yr from the System Operation Permit. The total supply from the permit in the Initially Prepared 2016 Brazos G Plan is 141,952 acft/yr, or about 39,371 acft/yr more than the 2011 Plan.

4. *For planning purposes, it is assumed that all existing water supply contracts will be renewed. BRA notes that not all contracts will necessarily be renewed and requested the following text be added to the plan to the second sentence of the second paragraph of section 4.3.1: "…all of these contracts are long term and considered perpetual through 2070 for regional water planning purposes. However, in reality, the BRA will consider contract renewals on a case by case basis as contracts expire."*

The suggested text has been added, as requested.

5. *The BRA has requested that the current system rate charged to system contractual customers be used when presenting costs of strategies involving BRA supplies.*

Per regional water planning guidelines, costs are presented in September 2013 dollars. The costs in the plan utilize the 2014 BRA system rate of $65.65/acft, which was adopted for the BRA fiscal year beginning September 1, 2013.

6. *BRA has recommends revising the list of entities potentially involved with the West Central Brazos Water Distribution System (WCBWDS) because some have already contracted for water from BRA.*

The strategy evaluation was specific to those entities included in the evaluation and only those entities should continue to be identified with the project.

7. *BRA recommends removing the regional WTP expansion in Breckenridge from the WCBWDS strategy evaluation in Chapter 8.4 of Volume II because project participants have elected to build individual water treatment plants,, and notes that the City of Abilene is constructing new treatment capacity near Breckenridge that would benefit Abilene and possibly Breckenridge.*

The regional WTP identified in the strategy evaluation is part of the original formulation of the water management strategy, which has not been updated in this round of planning. Brazos G notes that the WCBWDS strategy should be updated in future plans to reflect current plans of selected entities, none of which have informed Brazos G of their intentions to build separate WTPs and forgo the regional WTP identified in the original plan formulation. The West Central Brazos Water Distribution System water management strategy was evaluated for a specific set of water user groups in the vicinity of Shackelford, Stephens, and Throckmorton Counties. The City of Abilene was not a participant in this water management strategy. The regional WTP identified in the strategy evaluation is for those entities, and does not involve Abilene. The WTP being constructed by Abilene is for Abilene's sole use and is not associated with this water management strategy.

8. *Regarding Table 8.4-2, BRA states "For Fish and Wildlife Habitat section, it will be more than a low to moderate impacts if brine effluent is discharged to surface water streams. The Sharp Nose Shiner has already precluded Abilene from discharging in the river above PK. Same comment for Threatened and Endangered Species below."*

The impacts to fish and wildlife habitat and threatened and endangered species if brine effluent were to be discharged to surface water streams should remain shown as "low to moderate" in Table 8.4-2. The actual method of brine disposal has not been determined, nor have specific streams been identified as candidates for brine disposal. Furthermore, the City of Abilene has requested that Brazos G note that the discharge permit in question for Abilene (which is not related to this water management strategy) is still under review and no determination has been made regarding Abilene's ability to discharge brine upstream of Possum Kingdom Reservoir. Endangered species have not been demonstrated to preclude Abilene from discharging in the river above Possum Kingdom Reservoir.

9. *The BRA suggests miscellaneous formatting, typographical corrections, and wording suggestions to refine information presented and improve the clarity of the text.*

Brazos G thanks the BRA for their thorough and careful review of the text of the initially prepared plan and will adopt those suggested revisions as appropriate in the text of the final plan.

Jayson Barfknecht, Ph.D., P.E., Public Works Director, City of Bryan

Dr. Barfknecht requested that the City of Bryan ASR project be made a recommended water management strategy with changes to the technical evaluation to demonstrate water available for ASR storage. The City offered to provide technical analysis in coordination with the TWDB to demonstrate water that would be made available by the project.

The BGRWPG will replace the current technical evaluation of the project with the evaluation demonstrating the water available for ASR that will not exceed the MAG for the Carrizo-Wilcox Aquifer in Brazos and Robertson Counties.

John Firth, Coryell County Judge

Judge Firth expressed support for inclusion of the Coryell County Off-Channel Reservoir as a recommended water management strategy in the 2016 Brazos G Regional Water Plan.

The Coryell County Off-Channel Reservoir is a recommended water management strategy in the plan.

Coryell County Commissioners Court

The Coryell County Commissioners Court provided a resolution passed by the court on June 22, 2015 that reads as follows:

> “The County of Coryell request that the State Water Development Board and Region G support increasing the priority for the construction of the Coryell Off-Channel Reservoir given the limited known water resources that will be available to Western Coryell County and neighboring counties.”

The BGRWPG supports the development of the Coryell County Off-Channel Reservoir. The BGRWPG have recommended it as a water management strategy to meet projected water needs in the area and have recommended that the Texas Legislature designate the site of the proposed reservoir as a “Unique Reservoir Site.”

Jimmy Wood, President, Multi-County Water Supply Corporation

Mr. Wood, on behalf of the Multi-County Water Supply Corporation, expressed support for the Coryell County Off-Channel Reservoir and requested that the Multi-County Water Supply Corporation be identified as the project sponsor in the 2016 Brazos G Regional Water Plan.

The BGRWPG supports the development of the Coryell County Off-Channel Reservoir. The BGRWPG have recommended it as a water management strategy to meet projected water needs in the area and have recommended that the Texas Legislature designate the site of the proposed reservoir as a "Unique Reservoir Site." Furthermore, the BGRWPG has modified the 2016 Brazos G Regional Water Plan to identify the Multi-County WSC as the sponsor of the project.

Kleber Denny, P.E., on behalf of the Salt Fork Water Quality Corporation

Mr. Denny expresses concerns that the evaluation of the Upper Brazos Basin Salinity Control project is not shown as developing a quantified water supply. Mr. Denny presented some research and computations to demonstrate that the reduced salinity results in less reject water (brine) coming from desalination treatment processes along the main stem of the Brazos River, which increases usable supply to entities desalinating the water prior to use.

The BGRWPG has considered the information provided by Mr. Denny and has incorporated it into the technical evaluation of the project. The project is now shown as making water supply available to municipal users due to reduced volumes of reject brine being produced by desalination facilities.

Rodney Kroll, President (written comments) and Scooter Radcliffe, General Manager (oral and written comments), Southern Trinity Groundwater Conservation District

Mr. Kroll and Mr. Radcliffe express support of the plan and inform the BGRWPG that the groundwater district is "developing policies and programs that promote the conjunctive use of groundwater and surface water to optimize the amount of water available to McLennan County during surface water shortages and extending the viability of the Trinity aquifer for many decades." Mr. Kroll also notes that the district's "approach and use of the existing Trinity Aquifer MAG…allows our permitted volumes to be equal to or less than the MAG while promoting long term conservation of the aquifer through reduced pumping during times of adequate surface water supplies."

The BGRWPG appreciates that the district's management of the Trinity Aquifer in McLennan County is consistent with the MAG, and looks forward to working with the district as the plans are formulated for conjunctive use of surface and groundwater supplies.

Janice Bezanson, Executive Director, Texas Conservation Alliance in coordination with Friends of the Brazos River (oral and written comments)

Ms. Bezanson expresses concerns over water demands shown for the City of Abilene, the supplies available to Abilene, and the resulting need for Cedar Ridge Reservoir as a recommended water management strategy for Abilene. Ms. Bezanson recommends that the Cedar Ridge Reservoir be replaced as a recommended water management strategy with a diversion from the Clear Fork of the Brazos River to Hubbard Creek Reservoir.

The projected water demands and supplies were developed using technical methods approved by the TWDB and reflect the best known information regarding the City's current and future water supply commitments and water supplies currently available to the City.

The BGRWPG strives for the Brazos G Plan to reflect the plans of local water user groups and wholesale water providers and will continue to recommend the Cedar Ridge Reservoir at the request of the City of Abilene.

William Oliver

Mr. Oliver expresses support for the proposed South Bend Reservoir project.

The BGRWPG has opted not to recommend the South Bend Reservoir project in the 2016 Brazos G Regional Water Plan, but recognizes that future circumstances could cause the project to become a more viable water management strategy.

10.7 TWDB Comments on Initially Prepared Plan and BGRWPG Responses

The following section summarizes the comments received from the TWDB and the responses of the BGRWPG. Level 1 comments are required to be addressed in order to meet statutory, agency rule, and/or contract requirements. Level 2 comments and suggestions are suggested for consideration to clarify or enhance the plan.

10.7.1 Level 1 TWDB Comments

1. *Tables 2-5 through 2-10 present water user group (WUG) demands by category of use, but do not include demand projections over the planning horizon for wholesale water providers (WWP) by water use category and by county. Please include WWP demands by category of use and county in the final, adopted regional water plan. [31 Texas Administrative Code (TAC) §357.31(b)]*

The information regarding demands by category of use for each WWP has been added in a new table.

2. *Page 3-51, Table 3.4-1 and Appendix B, page B-13: The Dockum Aquifer table of availability in Appendix B presents water volumes that differ from Table 3.4-1. Please reconcile Table 3.4-1 for the Dockum Aquifer in Nolan County with Appendix B information in the final, adopted regional water plan. [31 TAC §357.32(d)]*

The information between Chapter 3 and Appendix B has been reconciled.

3. *Volume I, Section 3.2.4 and Volume II, Section 1.2: Section 3.2.4 states that water availability was determined as the minimum annual supply for run-of-river rights; however, in Vol. II, Section 1.2, the methodology states the use of a 75/75 criteria for water right availability. Water availability for water management strategies must represent the anticipated diversion volume under drought of record conditions. Please confirm annual run-of-river availability and whether it is anticipated to be available under drought of record conditions. If necessary, please adjust strategy yields to reflect the volume of the run-of-river supplies that would be available under drought of record conditions in the final, adopted regional water plan. [31 TAC §357.34(d)(3)(A); Contract Exhibit 'C', Section 3.4]*

The text in Section 1.2 is a typographical error and has been corrected.

4. *Volume I, Table 5.39-2: The Summary of Recommended Strategies includes "Out of Region." It is not clear what this strategy rollup represents and an associated technical memorandum in Volume II could not be identified. Please clarify the "Out of*

Region" water management strategy(s) in the final, adopted regional water plan. [Contract Exhibit 'C', Section 12.1.2]

That table has been replaced with a report from DB17.

5. *Please describe how publicly available plans of major agricultural, municipal, manufacturing and commercial water users were considered in the final, adopted regional water plan. [31 TAC §357.22(a)(4)]*

A paragraph has been added to the beginning of Chapter 5 explaining how local, publically available plans were incorporated into the 2016 Brazos G Regional Water Plan.

6. *Please provide a statement regarding any water availability requirements promulgated by a county commissioners court pursuant to Texas Water Code §35.019, which in Region G applies to the North - Central Texas Trinity and Woodbine Aquifers and Central Texas - Trinity Priority Groundwater Management Areas. [31 TAC §357.22(a)(6)]*

Explanatory text has been added to the descriptions of aquifer availability for the Trinity and Woodbine Aquifers in Appendix B, and a brief explanation has been added to section 3.4.1.

7. *The plan does not include a subchapter in Chapter 5 consolidating the planning group's recommendations regarding water conservation and model water conservation plans. Please consolidate this information in the final, adopted regional water plan. [31 TAC §357.34(g)]*

The information has been added to Chapter 5 of the plan.

8. *The plan does not appear to document the planning group's process for identifying potentially feasible water management strategies. Please include this documentation in the final, adopted regional water plan. [31 TAC §357.12(b) and §357.34(b)]*

The process for identifying potentially feasible water management strategies has been documented in Chapter 5, section 5.39.3.

9. *The plan, in some instances, does not appear to include a quantitative reporting of impacts to agricultural resources. For example, Volume II strategy evaluation 4.7 identifies crops present in the reservoir and pipeline footprint, but does not appear to include quantified impacts to agricultural resources. Other strategy evaluations (e.g., 4.1, 4.2) do not appear to quantify impacts, including no impacts. Please include quantitative reporting of impacts, including if negligible, to agricultural resources in the final, adopted regional water plan. [31 TAC §357.34 (d)(3)(C)]*

Quantitative reporting of impacts, including negligible impacts, has been added to each water management strategy evaluation.

10. *Pages 5.10-4, 5.33-3: The plan does not appear to consider conservation as a potentially feasible strategy for all identified water supply needs. For example, West Brazos WSC and Steamboat Mountain WSC have identified water needs but no conservation strategy is summarized as potentially feasible. Please include documentation that conservation water management strategies were considered to meet identified needs and, if not recommended, please document the reason in the final, adopted regional water plan. [31 TAC §357.34(f)(2)(B)]*

For municipal conservation, an annual 1% reduction in gpcd is applied until a target of gpcd of 140 is met. If a municipal entity had a gpcd less than 140 (120 for Williamson County entities), no additional conservation is recommended as a water management strategy. Brazos G's approach for considering conservation is documented in Chapter 2 of Volume II. For most WUGs, this is also reiterated in Chapter 5 in the plan for each WUG. We have added that standard phrase for every WUG for which conservation is not a recommended water management strategy because the gpcd is below the 140 target (or 120 target in Williamson County).

11. *Tables 5.39-2 and 5.39-6: The plan appears to include the Lake Granger ASR recommended strategy also in the summary of alternative strategies. Both tables include identical costs and strategy volumes and the technical evaluations in Volume II do not describe an alternative configuration. Please reconcile in the final, adopted regional water plan. [31 TAC §357.34(e)]*

The Lake Granger ASR project in included in both tables because the project is identified as both a recommended strategy (BRA Little River System) and an alternative strategy (for City of Round Rock). We will remove it as an alternative strategy for the City of Round Rock to avoid any confusion. That table has been replaced by a DB17 report.

12. *The plan does not appear to include model water conservation plans. Please include in the final, adopted regional water plan for example, as an online link. [31 TAC §357.34(g)]*

These will be included in the final plan as an appendix.

13. *The technical evaluations of the water management strategies do not appear to estimate water losses from the associated strategies. Please include an estimate of water losses in the final, adopted regional water plan, for example as an estimated percent loss. [31 TAC §357.34(d)(3)(A); Contract Exhibit 'C', Section 5.1.1]*

Water loss from newly constructed water management strategies is assumed to be negligible (less than 1 percent). Supplies from water management strategies are sufficient to overcome minor losses and still meet the supplies assigned to individual water user groups and wholesale water providers. An explanatory statement has been included in the introduction of Volume II of the Plan.

14. *Volume II, Page 3.5-41: The City of Cleburne reuse strategy appears to include retail distribution-level infrastructure in the strategy evaluation (i.e., 6-inch spur line to the sports complex). Please remove all distribution-level infrastructures and associated costs from the plan and confirm water management evaluations throughout the plan. [31 TAC §357.34(d)(3)(A), Conforms with Contract Exhibit 'C', Section 5.1.2.3]*

None of the reuse strategy infrastructure should be considered "retail distribution-level" infrastructure. The entire infrastructure included in the strategy evaluations is used to transport the raw reuse supply to the place of its intended use. Retail distribution from the raw water source occurs downstream from these appurtenances.

15. *Volume II, Strategy Evaluation 7.2: The plan does not appear to include consideration given to the highest practicable level of water conservation achievable by water users as relates to the interbasin transfer water management strategy Brushy Creek Regional Utility Authority System. Please include this documentation in the final, adopted regional water plan. [31 TAC §357.34(f)(2)(C), Contract Exhibit 'C', Section 5.1]*

As per 31 TAC §357.34(f)(2)(c), the Brazos G Regional Water Planning Group consulted with Williamson County entities regarding strategies to meet needs in Williamson County. Additional advanced water conservation was identified to reduce per capita municipal consumption to 120 gpcd, which is less than the target of 140 gpcd established by

Brazos G as the goal for municipal water conservation. This was considered by the Williamson County entities as the highest practicable level of conservation to consider. This is documented in Chapter 2 of Volume II of the plan. In addition, the supply developed by the Brushy Creek Regional Utility Authority is not a proposed interbasin transfer, but is, in fact, an existing interbasin transfer authorization. As such, this strategy is exempt from this requirement.

16. *Volume II, Strategy Evaluation 7.11: The plan does not appear to report system gain as a separate permitted amount from the system in the analysis of the "BRA System Operation of Reservoirs". Please present the methodology used and the system gain volume separate from the system volume in the final, adopted regional water plan. [Contract Exhibit 'C', Section 3.5]*

It is shown in Table 7.11-1 as "Total Sys Ops Yield Supply". This quantity is the system gain volume.

10.7.2 Level 2 TWDB Comments

1. *In the Volume II, Table of Contents, the table heading number 3 for "Reuse" appears to have been omitted. Please consider revising in the final, adopted regional water plan.*

The typo has been corrected.

2. *Tables 5.39-2 and 5.39-6: Recommend clarifying that the numbers listed in the column "WUG/WWP using Strategy" are the number of entities using the strategy in the final, adopted regional water plan.*

We have added a footnote explaining the column.

3. *Tables 5.39-2 and 5.39-6: The "Supply Developed" for the "Reuse" alternative strategy appears to only account for the City of Bryan and does not account for WMARSS reuse (WMARSS is indicated as an alternative strategy for Cities of Mart, Riesel, and Waco). Suggest confirming supply volumes in the final, adopted regional water plan.*

We have corrected the tables for consistency.

4. *Table 5.39-6: It appears that the following Alternative Strategies are missing from Table 5.39-6: Voluntary Transfers such as Lake Whitney diversion to Cleburne (City of Cleburne), supply from City of Caldwell (Burleson Co. Manufacturing), supply for City of Gatesville (Coryell Co. – Other), supply from City of Granbury (City of Tolar), supply from Acton MUD (Hood Co. – Other), and supply from Somervell Co. water supply project (City of Glen Rose); Groundwater development of Edwards BFZ (Bell Co. Manufacturing); and WMARSS – Reuse (Cities of Mart, Riesel, and Waco). Please consider adding these alternative strategies to the table in the final, adopted regional water plan.*

The table has been replaced by a DB17 report in the final plan.

10.8 Final Plan Adoption

On September 15, October 7 and November 4, 2015, the BGRWPG reviewed and adopted responses to the oral and written comments received. On November 4, 2015, the final plan was adopted by unanimous vote of the members present pending completion of the changes noted in response to comments received and final formatting and editorial revisions.

11

Implementation and Comparison to the 2011 Brazos G Regional Water Plan

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11 Implementation and Comparison to the 2011 Brazos G Regional Water Plan

11.1 Implementation of the 2011 Brazos G Regional Water Plan

A survey was sent to Brazos G WUGs and WWPs regarding the status of recommended strategies presented in the 2011 Brazos G Regional Water Plan and the survey results compiled. The survey includes information regarding the project description and infrastructure type. Survey participants were asked to update the regional water planning group on the level of implementation currently achieved, the initial volume of water provided, the funds expended to date, project cost, funding source and year the project went online. If the project is a phased project, the survey participants were asked about the ultimate volume of water to be supplied, project cost, and year that the project will reach maximum capacity. If the project has not been implemented, the WUGs and WWPs were asked to comment on why that was the case.

The survey was sent to 89 WUGs and WWPs regarding 202 projects. Of those 89 entities, 18 responded to the survey, providing information regarding a total of 36 projects. A summary of the survey results received is shown in Table 11-1 and full Survey results will be presented in Appendix N. Table 11-1 shows that approximately 31 percent of the projects for which we collected responses are completed, 36 percent are ongoing and 28 percent have not been implemented. For those projects which were classified as “not implemented”, 43% of respondents listed that it was too soon for the project to begin, 13 percent stated that financing is still in progress and 13 percent of the projects are experiencing permit constraints.

11.2 Comparison to the 2011 Brazos G Regional Water Plan

There are several notable differences between the 2011 and 2016 Plans. For example, the planning horizons for the two plans are different; the 2011 Plan covered the period from 2010 to 2060, while the 2016 Plan covers the period from 2020 to 2070. Other differences between the two plans are due to differences in water demands, supplies, needs, and water management strategies recommended to meet needs. New municipal WUGs have been added and some have been combined with County-Other WUGs due to population growth and decline. Additionally, several new WWPs have been added since the 2011 Plan.

Table 11-1. Summary of Implementation Survey

Sponsor	Recommended Water Management Strategy	At what level of Implementation is the project?	If not implemented, why?	Year the Project is Online?	Is this a phased project?	Year project reaches maximum capacity?	What is the project funding source(s)?	Included in the 2016 Plan?
ABILENE	Cedar Ridge Reservoir	Permit Application Submitted/Pending			No	2060	Other	Yes
ABILENE	Increase treatment capacity	Not Implemented	Too soon		No	2060	Other	Yes
ABILENE	Municipal water conservation	Currently Operating			Yes	2020	Self (cash)	Yes
ABILENE	Wastewater reuse	Currently Operating		2012	No	2012	Self (cash)	No
AQUA WSC	Additional Carrizo Aquifer development (includes overdrafting)							No
BAIRD	Municipal water conservation	Not Implemented	Too soon					
BRA	Belton to Stillhouse pipeline	Feasibility Study Ongoing	Other		No	2020	Other	Yes
BRA	Coryell County Reservoir (BRA System)							
BRA	Groundwater/ surface water conjunctive use (Lake Granger Augmentation)	Under Construction			Yes	2050	Other	Yes
BRA	Stonewall, Kent, and Garza chloride control project	Feasibility Study Ongoing	Too soon	2016	Yes	2030	Other	Yes
BRA	Storage reallocation of federal reservoirs - Lake Aquilla	Feasibility Study Ongoing	Too soon		No	2035	Other	Yes
BRUSHY CREEK MUD	Municipal water conservation	Implemented and Ongoing		2012	Yes	2019	NA	Yes
BRUSHY CREEK MUD	Rehabilitate existing wells	Complete		2012, 2015	Yes	2015	Operating Revenues	No
CEDAR PARK	Municipal water conservation	Currently Operating						
CEDAR PARK	Regional surface waters supply to Williamson County from Lake Travis	Currently Operating		2012	Yes	2040	TWDB	Yes
GATESVILLE	Coryell County Reservoir (BRA System)	Not Implemented	Too soon		No	2030	Other	Yes
GEORGETOWN	Increase treatment capacity	Feasibility Study Ongoing	Too soon		Yes	2060	Local (market issue)	No
GEORGETOWN	Municipal water conservation	Currently Operating		2014	No	2060	Self (cash)	No
GROESBECK	City of Groesbeck off-channel reservoir	Not Implemented	Financing	2016	No	2018	Self (cash)	No
JARRELL-SCHWERTNER WSC	BRA supply through the East Williamson County Regional Water Treatment System	Sponsor Has Taken Action to Initiate			No		TWDB	Yes
JARRELL-SCHWERTNER WSC	Municipal water conservation	Currently Operating		2013	No		Self (cash)	Yes
MERKEL	Voluntary redistribution	Not Implemented	Too soon					
MINERAL WELLS	Municipal water conservation	Not Implemented	Financing					
MINERAL WELLS	Turkey Peak Reservoir	Permit Application Submitted/Pending	Permit contraints		No	2020	TWDB	Yes
NCTMWA	Millers Creek augmentation	Feasibility Study Ongoing	Permit contraints	2016	Yes	2035	TWDB	Yes
PPMWD #1	New water treatment plant	Not Implemented	Too soon					
PPMWD #2	Turkey Peak Reservoir	Permit Application Submitted/Pending	Permit contraints	2016	No	2020	TWDB	Yes
STRAWN	Municipal water conservation	Acquisition and Design Phase	Financing	2016	No		TWDB	
STRAWN	Voluntary redistribution	Not Implemented	Too soon					
SWEETWATER	Conjunctive management of Champion well field and Oak Creek Reservoir with subordination agreement	Currently Operating			Yes	2030	Self (cash)	Yes
SWEETWATER	Expansion of Champion well field	Currently Operating		2015	No	2015	Self (cash)	No
SWEETWATER	Municipal water conservation	Currently Operating			Yes	2020	Self (cash)	Yes
SWEETWATER	Oak Creek Reservoir with subordination agreement	Not Implemented	Other		No	2030	Self (cash)	No
TEMPLE	Increase treatment capacity	Sponsor Has Taken Action to Initiate		2016	Yes	2060	Local (market issue)	Yes
THROCKMORTON	Midway pipeline project (West Central Brazos distribution system)	Not Implemented	Too soon					
THROCKMORTON	Municipal water conservation	Currently Operating						

This chapter compares projected water demands, water supplies, needs, and water management strategies between this plan and the 2011 Plan. Population and water demands typically are updated each regional water planning cycle to reflect updated information on population from the latest census or better updated estimates from the Texas State Demographer. Per capita water use changes due to shifting water use patterns with municipal water systems resulting from water conservation efforts, drought measures, and patterns of development. County-aggregated water demands such as irrigation and steam-electric change between planning cycles for similar reasons as the TWDB updates demand estimates for these WUGs.

Groundwater supplies available for current uses and for water management strategies can change due to revisions in estimated available groundwater resulting from newly adopted Modeled Available Groundwater determinations arising out of the Groundwater Management Area process. Surface water supplies available for current uses and water management strategies will change as the Brazos Basin WAM is updated by the TCEQ, new projections of future return flows are developed, projections of reservoir sedimentation are revised, and as the TWDB changes requirements for water availability determination (such as no longer allowing the 75/75 convention for irrigation supply).

11.2.1 Changes to WUGs and WWPs

Changes to WUGs and WWPs included in the plan are shown in Table 11-2.

Table 11-2. Changes to WUGs and WWPs in the 2016 Plan

Entity	County	Comments
	New WUGs	
Armstrong WSC	Bell	Population increase
Buckholts	Milam	Population increase
Coryell City WSD	Coryell, McLennan	Population increase
Crowley	Johnson	Population increase
Deanville WSC	Burleson	Population increase
Dobbin-Plantersville WSC	Grimes	Population increase
Fort Worth	Johnson	Population increase
G & W WSC	Grimes	Population increase
Golinda	Falls, McLennan	Population increase
Hill County WSC	Hill	Population increase
Multi-County WSC	Coryell, Hamilton	Population increase
Pflugerville	Williamson	Population increase
Possum Kingdom WSC	Palo Pinto, Stephens	Population increase
Texas A & M University	Brazos	Split from College Station
Williamson County MUD #9	Williamson	Population increase
Williamson County MUD #10	Williamson	Population increase

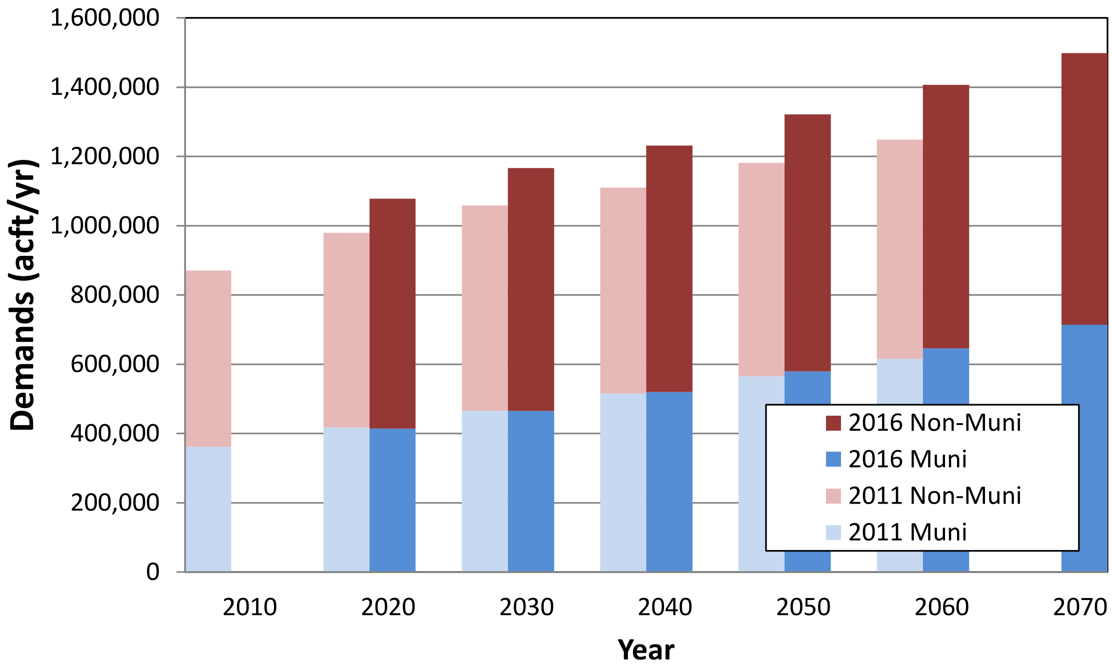
Table 11-2. Changes to WUGs and WWPs in the 2016 Plan

Entity	County	Comments
Williamson County MUD #11	Williamson	Population increase
New WWPs		
City of Anson	Jones	Projected sales > 1,000 acft/yr
City of Cleburne	Johnson	Projected sales > 1,000 acft/yr
City of Gatesville	Coryell	Projected sales > 1,000 acft/yr
City of Graham	Young	Projected sales > 1,000 acft/yr
City of Mineral Wells	Palo Pinto	Projected sales > 1,000 acft/yr
Heart of Texas	Williamson	Projected sales > 1,000 acft/yr
Johnson County SUD	Johnson	Projected sales > 1,000 acft/yr
Kempner WSC	Bell, Coryell, Lampasas	Projected sales > 1,000 acft/yr
WUGs Now Included with County-Other		
Bistone MWSD	Limestone	Below WUG size
Decordova	Hood	Below WUG size
Fort Gates WSC	Coryell	Below WUG size
Kosse	Limestone	Below WUG size
Lake Whitney Water Company	Bosque, Hill	Below WUG size
Lipan	Hood	Below WUG size
Morgan	Bosque	Below WUG size
Weir	Williamson	Below WUG size
Wells Branch MUD	Williamson	Below WUG size

11.2.2 Water Demand Projections

Overall, water demand projections for the region are greater in the 2016 Plan than in the 2011 Plan, as illustrated in Figure 11-1. Municipal water demand projections are slightly higher in the 2016 Plan for each decade, increasing to 714,086 acft/yr by the 2070 decade. Non-Municipal demands are substantially greater in the 2016 Plan than in the 2011 Plan in all decades.

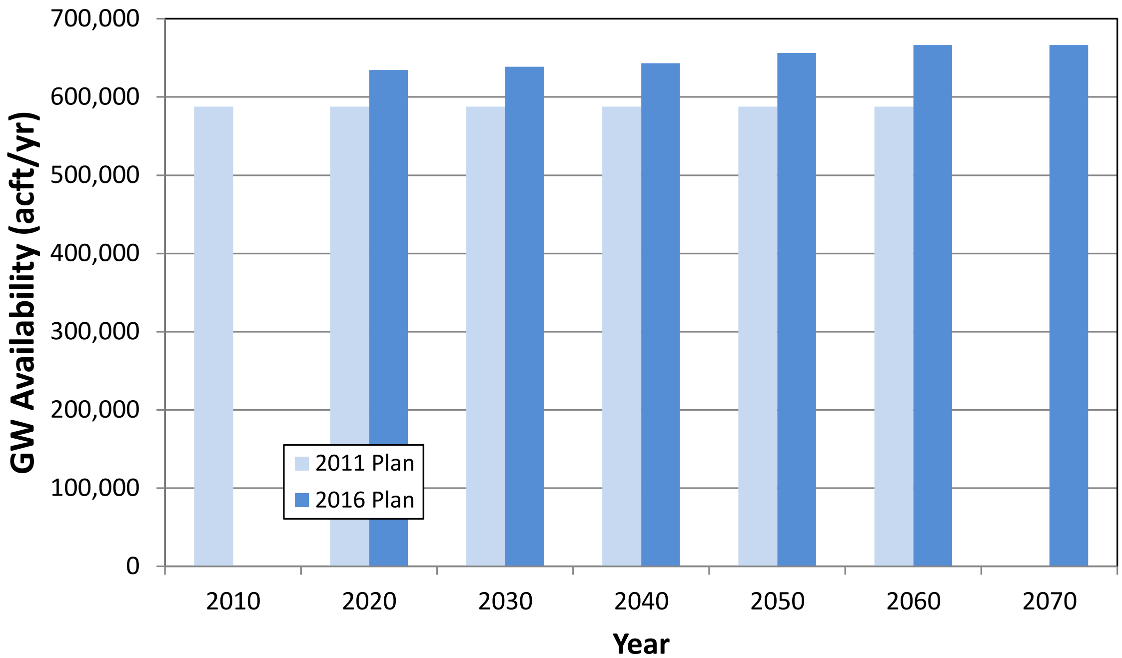
Figure 11-1. Water Demand Projections in the 2011 and 2016 Brazos G Plans



11.2.3 Water Supply Assumptions

For the 2011 Plan, the Groundwater Management Area process was not yet complete for most aquifers in the Brazos G Area. However, the process was sufficiently complete in some areas for an estimate of the expected Managed Available Groundwater (MAG, now "Modeled Available Groundwater") to be used in the 2011 Brazos G Plan. For other areas, groundwater availability was estimated using the detailed analyses completed for the 2006 Plan. For the 2016 Plan, the MAGs determined for aquifer systems in the Brazos G Area were used. For those aquifers without MAGs, the Brazos G RWPG adopted availability estimates based on those used in the 2011 Plan. Chapter 3 and Appendix B provide greater discussion on estimates for specific aquifers. Total groundwater availability in the Brazos G Area is compared for the 2011 and 2016 Plans in Figure 11-2. Groundwater supplies in both plans were then allocated to individual WUGs and WWPs based upon installed well capacities and records of recent groundwater withdrawals, prorated downward so that the total supply from an aquifer in a county did not exceed the estimated available groundwater.

Figure 11-2. Groundwater Availability in the Brazos G Area



For surface water availability, both plans utilized the TCEQ Brazos WAM as the base model, supplemented with the Brazos G Mini-WAM for reservoirs in the upper Brazos Basin. Similar modifications were made to the model in both plans for determining water available to existing water rights. The single most significant difference between the surface water availability analyses in the two plans concerned the methodology for determining reliable supplies to run-of-river irrigation rights. In the 2011 Plan, the 75/75 convention was used, as explained in Chapter 3. In the 2016 Plan, minimum annual supply based on minimum monthly diversions was used. This substantially decreased the estimated irrigation supplies from surface water rights.

Assumptions for determining groundwater and surface water availability in both plans are compared in Table 11-3.

Table 11-3. Assumptions for Determining Water Available to Current Supplies and Water Management Strategies

2011 Brazos G Plan	2016 Brazos G Plan
Groundwater availability based on **expected MAG results**, and **2006 estimates elsewhere**	Groundwater availability based on **Modeled Available Groundwater** where determined, and **2011 estimates elsewhere**
Existing surface water supply based on estimated 2010 and 2060 Effluent Discharges adjusted for reuse assumptions	Existing surface water supply based on estimated 2020 and 2070 Effluent Discharges adjusted for reuse assumptions
Existing surface water supply to **irrigation** rights based on **75/75 convention**[1]	Existing surface water supply to **irrigation** rights based on **minimum annual supply** from minimum monthly diversions

Table 11-3. Assumptions for Determining Water Available to Current Supplies and Water Management Strategies

2011 Brazos G Plan	2016 Brazos G Plan
Surface water management strategies **include** Effluent Discharges adjusted for reuse assumptions	Surface water management strategies **exclude** Effluent Discharges (TCEQ Run 3 assumptions), except where effluent is part of the supply from the strategy
Surface water management strategies subject to **Consensus Criteria for Environmental Flow Needs**	Surface water management strategies subject to **TCEQ Environmental Flow Standards**

1. See Chapter 3 Supplies, Section 3.2.4 for a detailed description of the 75/75 convention.

11.2.4 Existing Water Supplies

Water supplies available to WUGs and WWPs in the Brazos G Area have changed significantly since the last planning cycle. Municipal supplies have increased slightly, but supplies to non-municipal WUGs have decreased substantially. Groundwater supplies, surface water supplies, and total supplies are compared in Figure 11-3, Figure 11-4 and Figure 11-5, respectively, for municipal and non-municipal WUGs.

Figure 11-3. Groundwater Supplies Available to WUGs in the 2011 and 2016 Brazos G Plans

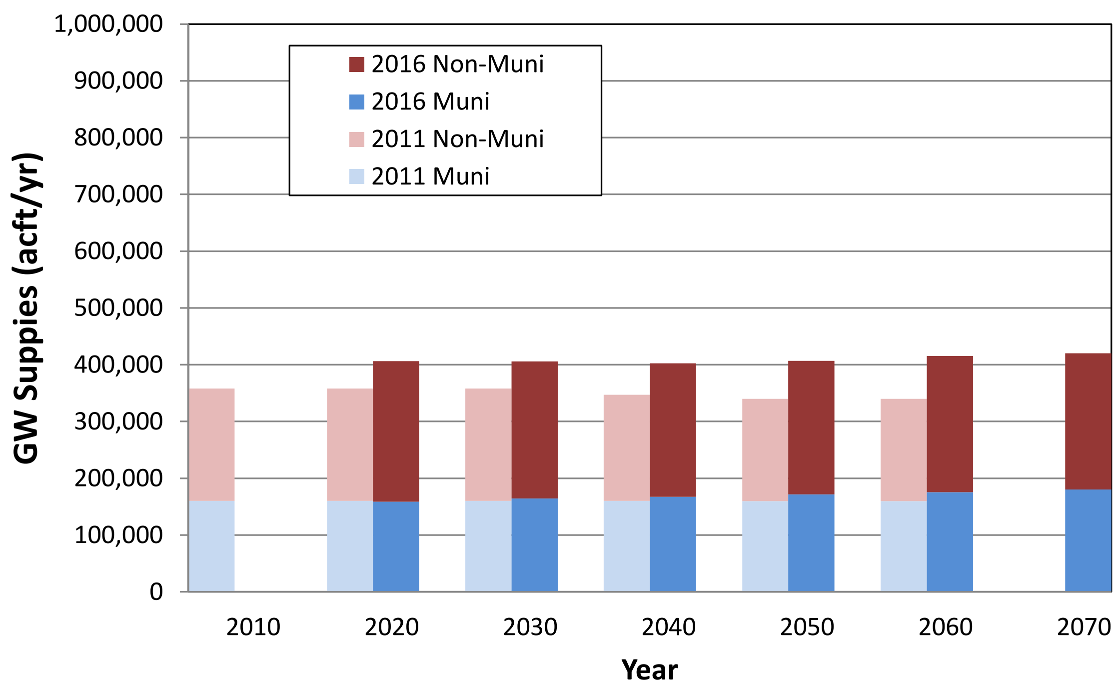


Figure 11-4. Surface Water Supplies Available to WUGs in the 2011 and 2016 Brazos G Plans

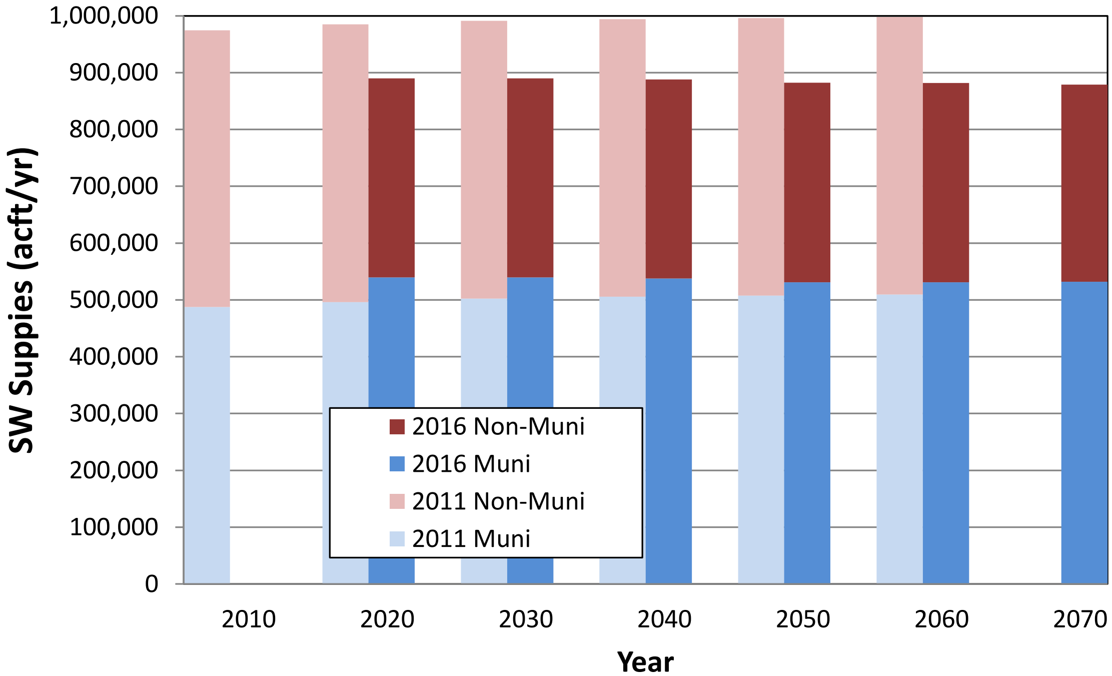
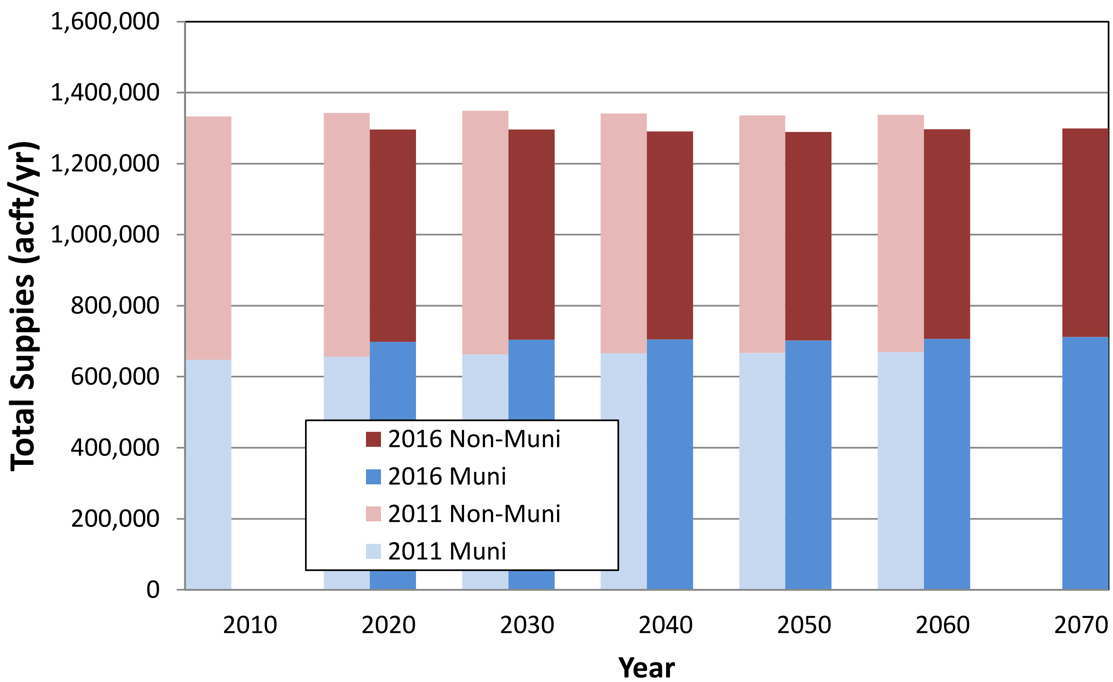


Figure 11-5. Total Water Supplies Available to WUGs in the 2011 and 2016 Brazos G Plans



11.2.5 Needs

Municipal need projections increase for each decade in both the 2011 and 2016 Plans, however, the municipal needs are less in the 2011 Plan than in the 2016 Plan during the 2020 and 2030 decades, but by the 2050 decade municipal needs are greater in the 2016 Plan. For municipal WUGs with surpluses, however, the total surpluses are always greater in the 2016 Plan. Total municipal needs (shortages) and total municipal surpluses for both plans are shown in Figure 11-6. When total needs and total surpluses are compared for both plans in Figure 11-7, total surpluses are less and total needs are greater in the 2016 Plan, caused by reduced supplies available to non-municipal WUGs.

Figure 11-6. Municipal Surpluses and Needs (Shortages) in the 2011 and 2016 Brazos G Plans

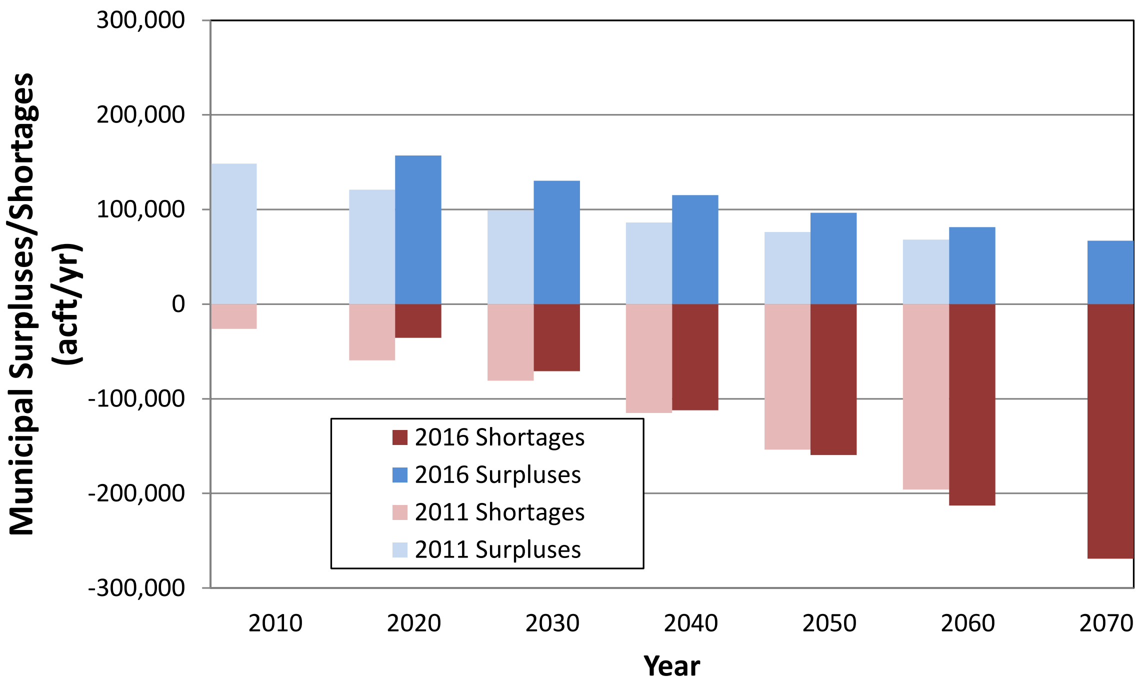
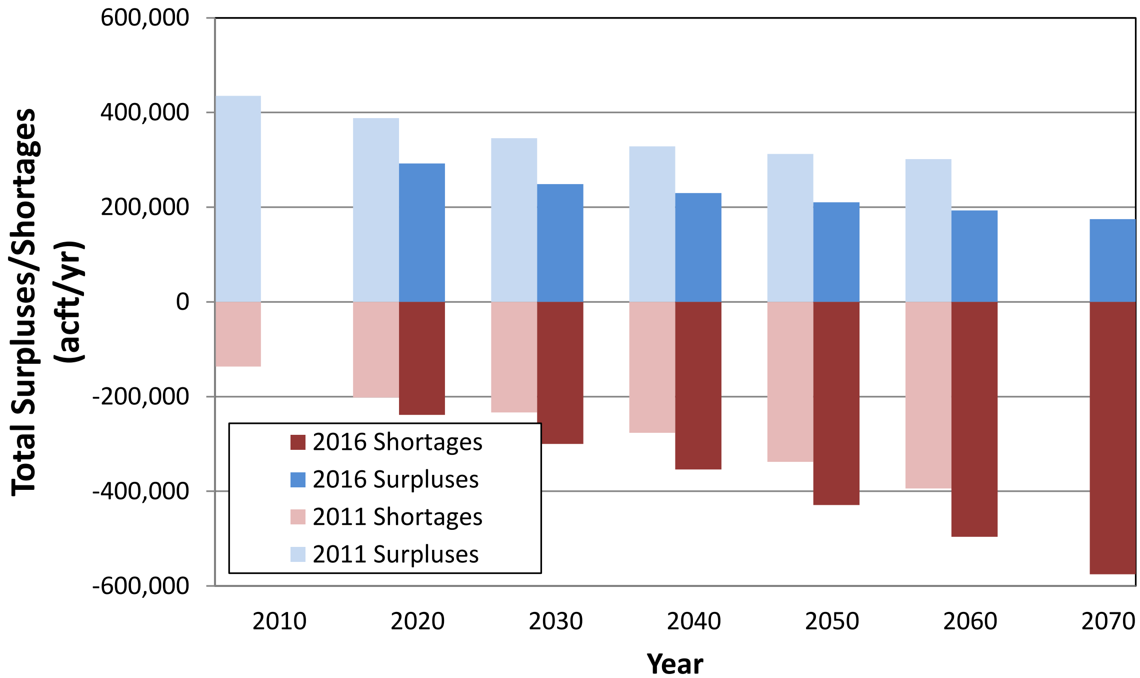


Figure 11-7. Total Surpluses and Needs (Shortages) in the 2011 and 2016 Brazos G Plans



11.2.6 Water Management Strategies

As expected, many of the water management strategies recommended in the 2011 Plan are again recommended in the 2016 Plan; however, the greater needs in the 2016 Plan necessitate additional strategies in the 2016 Plan. This section generally identifies differences in water management strategies between the 2011 and 2016 Plans.

Conservation and Reuse

Conservation in the 2016 Plan is much more aggressively considered than in the 2011 Plan. In the 2011 Plan, conservation as a water management strategy was recommended for all municipal water user groups with needs and per capita water use greater than 140 GPCD, and all other non-municipal water user groups with needs. In the 2016 Plan, conservation is recommended for all municipal water user groups with per capita water use greater than 140 GPCD, regardless of projected needs or surplus. In addition, conservation targets for some municipal entities in Williamson County are more aggressively recommended to achieve per capita water use of 120 GPCD by 2070. Total municipal conservation savings in the 2060 decade in the 2011 Plan was 21,366 acft/yr versus 99,573 acft/yr in the 2016 Plan.

Reuse is a key water management strategy in both the 2011 and 2016 Plans. In the 2016 Plan, water management strategies involving reuse total 46,662 acft/yr, versus 71,767 acft/yr in the 2011 Plan. This decrease is due in large part to some reuse projects being implemented since the 2011 Plan, including Steam-Electric supplies in Bell County and reuse supplies for the City of Round Rock.

Supplies from Other Regions

The 2011 Plan in the 2060 decade includes roughly 64,000 acft/yr of water to be supplied from outside the Brazos G Area, while the 2016 Plan includes almost 108,000 acft/yr of out-of-region supplies. These supplies in both plans are concentrated in the Brushy Creek Regional Utility Authority project for supplies from Region K for the cities of Cedar Park, Leander, Round Rock (and Chisholm Trail SUD in 2011), and in supplies from Region C for entities in Johnson County. The greater supplies to Johnson County entities from out-of-region suppliers in the 2016 Plan reflects greater demands for those entities that receive supplies from Region C entities.

New Reservoirs

The 2011 Plan recommended construction of the Groesbeck Off-Channel, Coryell County, Cedar Ridge, Little River OCR, and Brushy Creek Reservoir. The 2016 Plan recommends those same reservoirs, plus Throckmorton Reservoir and Lake Creek Reservoir, which replaces the Millers Creek Augmentation Project as the recommended strategy to increase supplies for the North Central Texas Municipal Water Authority.

During the Brazos G regional water planning process, water management strategies such as additional development of Carrizo-Wilcox Aquifer groundwater and the Lake Granger Augmentation Project were preferred options to include in the 2016 Brazos G Regional Water Plan. When confronted by the Modeled Available Groundwater (MAG) limitations of these two options, the BGRWPG has little alternative but to make the Little River Off-Channel Reservoir a recommended strategy.

BRA System Operations

Supplies to meet new WUG demands from the pending BRA System Operations Permit are similar in the 2011 and 2016 Plans, and are dominated by about 76,000 acft/yr to be supplied to meet steam-electric needs in Somervell County. Much of the rest of the supply from the BRA System Operations Permit would be used to firm up existing contractual commitments of the BRA.

Additional Groundwater Development

The 2016 Plan recommends substantially greater levels of groundwater development (65,000 acft/yr) than does the 2011 Plan (20,902 acft/yr), largely due to the greater needs projected for many of the county-aggregated WUGs such as irrigation, mining and manufacturing.

Aquifer Storage and Recovery (ASR)

The 2016 Plan includes four recommended ASR projects for College Station, Bryan, Waco (McLennan County ASR) and the BRA (Lake Granger ASR) that are not included in the 2011 Plan. In addition, the 2016 Plan includes an ASR project as an alternative strategy for Johnson County SUD.

Unmet Needs

The 2011 Plan contained sufficient recommended water management strategies that there were no needs unmet in the plan. In the 2016 Plan, however, increased county-aggregated demands such as irrigation demands in Robertson County and decreased supplies due to abandonment of the 75/75 convention for surface water irrigation supply has substantially increased many county-aggregated needs with few economically reasonable strategies to supply those uses. The Brazos G Regional Water Planning Group opts to not recommend strategies to meet those needs when no economically or practically viable strategies are identified. Those needs, therefore, remain unmet in the 2016 Plan, totaling approximately 85,000 acft/yr of mostly irrigation and mining demands.

Alternative Water Management Strategies

Both the 2011 Plan and the 2016 Plan identify alternative water management strategies for certain WUGs and WWPs that can replace one or more recommended strategies should the recommended strategies prove to be unfeasible in the future. Examples of such alternative strategies include the Lake Palo Pinto Off-Channel Reservoir project as an alternative to the recommended Turkey Peak Dam – Lake Palo Pinto Enlargement Project for the Palo Pinto County MWD No. 1, and supplies from the BRA's System Operation Permit as an alternative supply for several entities.